


University of Stellenbosch  
Department of Industrial Engineering



# Suitability of Layer Manufacturing Technologies for Rapid Tooling Development in Investment Casting

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the requirements for the degree Master of  
Science in Engineering (Industrial) at the  
University of Stellenbosch

**Study leader: Prof D. Dimitrov**

*March 2008*



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*Declaration*

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Ek, die ondergetekende verklaar hiermee dat die werk gedoen in hierdie tesis my eie oorspronklike werk is wat nog nie voorheen gedeeltelik of volledig by enige universiteit vir 'n graad aangebied is nie.

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**Signature:**

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## *Synopsis*

This thesis forms part of the AMTS Project on Investment Casting Capabilities for Light Metal Alloys in South Africa, the focus area being Rapid Tooling Development.

Various issues of the investment casting process are being discussed from an industrial engineering point of view. These issues are related to the possibilities of improving the investment casting process' lead times by shortening it while still maintaining affordable costs and required quality. Hereby the possibilities given by the newly developed "rapid technologies" are investigated.

The focus is on Rapid Pattern Making as one of the most essential components for accelerated development of new products. Three of the most widely used layer manufacturing processes available in South Africa are selected for the study, namely Three Dimensional Printing – Drop-on-Bed (Z-Corporation), Selective Laser Sintering (EOS) and Three Dimensional Printing – Drop-on-Drop (ThermoJet - 3D Systems). These three methods represent different materials; therefore different mechanical properties, different process economics as well as different technological characteristics.

A standard benchmark part is used as a study base. Four patterns are produced by these three methods. A comprehensive measurement programme is conducted, followed by an appropriate statistical analysis and evaluation regarding accuracy and surface finish.

Rapid Die Making is analysed with the possibilities of using additive methods for rapid tooling. Two dies are built with the same technology – Selective Laser Sintering (EOS), but in different materials. The same evaluation methodology is used for the statistical analysis and comparison.

The two dies are injected with wax in order to produce the original benchmark part. The best wax patterns from each die are selected and evaluated, using the same methodology for analysis and comparison.

The current state of Direct Shell Production is shortly discussed.

The research concludes that RP&T techniques can successfully be used for creating accurate patterns and dies in order to shorten lead times in the investment casting process chain. Each RP&T process has its own set of advantages and disadvantages. All users should evaluate their requirements and the capabilities of the variety of techniques before deciding on a process to apply.



## *Opsomming*

Die tesis vorm deel van die “AMTS” Projek oor die Verlore-was Gietproses van ligte metale in Suid Afrika en die fokusarea is Snel Gereedskap-ontwikkeling.

’n Verskeidenheid kwessies wat verband hou met die verlore-was gietproses word bespreek deur die perspektief van bedryfsingenieurswese. Hierdie kwessies handel oor die moontlikhede om die verlore-was gietproses se aanvoortye te verkort, maar deur terselfdertyd bekostigbare pryse en kwaliteitstandaarde te handhaaf. Die moontlikhede van die nuut-ontwikkelende sneltegnologieë word ondersoek.

Die fokus word geplaas op snel patroonontwikkeling as een van die belangrikste komponente vir die verhaasde ontwikkeling van nuwe produkte. Drie van die bekendste laagsgewys vervaardigingsprosesse in Suid-Afrika is geselekteer vir hierdie studie, naamlik “Three Dimensional Printing – Drop-on-Bed (Z-Corporation), Selective Laser Sintering (EOS), Three Dimensional Printing – Drop-on-Drop (ThermoJet - 3D Systems)”. Die drie metodes verteenwoordig verskillende materiale en verskillende maganiese eienskappe, ekonomiese prosesverskille sowel as verskillende tegnologiese eienskappe.

As basis vir die studie is ’n standaard hoogtemerk-part gebruik. Vier patrone is geproduseer deur die drie tegnologieë toe te pas. ’n Omvattende opmetingstudie is gedoen en opgevolg deur ’n statistiese analise ten opsigte van akkuraatheid en oppervlak-grofheid.

Versnelde Matrys Vervaardiging word geanaliseer ten opsigte van die moontlikhede om toevoegingsmetodes te gebruik vir snel-gereedskap. Twee matryse is gebou deur dieselfde tegnologie, naamlik “Selective Laser Sintering (EOS)”, te gebruik, maar in verskillende materiale. Dieselfde evalueringsmetode is gebruik vir die statistiese analise en vergelyking.

Die twee matryse is met was gevul om patrone van die oorspronklike hoogtemerk-part te verkry. Die beste patrone van elke matrys is geselekteer en geëvalueer op dieselfde manier as wat gebruik is vir die statistiese analise en vergelyking. Die huidige stand van Direkte Dop-produksie word kortliks beskryf.

Die navorsing kom tot die beslissing dat Snel-Prototipe en Gereedskap -tegnieke suksesvol gebruik kan word vir die bou van akkurate patrone en matryse om die aanvoortye in die verlore-was gietproses-ketting te verkort. Elke Snel-Prototipe en Gereedskap –proses het sy eie voordele en nadele. Elke gebruiker moet sy eie vereistes en die vermoëns van elke afsonderlike tegniek teen mekaar opweeg voor hy besluit watter proses hy sal toepas.





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*Dedication*

To my beloved father Pat Hugo.



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## Glossary

3DP	Three Dimensional Printing
ABS	Acrylonitrile-Butadiene-Styrene
AMTS	Advanced Manufacturing Technology Strategy
ANOVA	Analysis of Variance
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CMM	Coordinate Measuring Machine
CNC	Computer Numerical Controlled
CRPM	Centre for Rapid Prototyping and Manufacturing
CUT	Central University of Technology
DAI	Dimensional Accuracy Index
DFA	Design for Assembly
DFM	Design for Manufacturing
DMD	Direct Metal Deposition
DMDS	Direct Metal Deposition System
DMLS	Direct Metal Laser Sintering
DoB	Drop-on-Bed
DoD	Drop-on-Demand
DoP	Drop-on-Powder
DSPC	Direct Shell Production Casting
DST	Department of Science and Technology
EBM	Electron Beam Melting
EC	European Commission
EDF	Error Distribution Function
EOS	Electro Optical Systems
FDM	Fused Deposition Modelling
FEA	Finite Element Analysis
IC	Investment Casting
LENS	Laser Engineered Net Shape
LM	Layer Manufacturing
LOM	Laminated Object Manufacturing
LS	Laser Sintering
LSS	Least Square Straight Line
MCP	Mining & Chemical Products
MIT	Massachusetts Institute of Technology
MM2	Model Maker 2



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POM	Precision Optical Manufacturing
<i>Ra</i>	Roughness Value
RIC	Rapid Investment Casting
RM	Rapid Manufacturing
RP	Rapid Prototyping
RT	Rapid Tooling
SLA	Stereolithography
SLM	Selective Laser Melting
SLS	Selective Laser Sintering
SMC	Solid Model Casting
UV	Ultra Violet



# 1. Introduction

## 1.1 Background

This thesis report forms part of an AMTS (Advanced Manufacturing Technology Strategy) project endorsed by the South African government and funded by the Department of Science and Technology (DST). It focuses on building of Investment Casting capabilities for light metal alloys in South Africa. The technology exists in SA for materials like aluminium but compared to the industrialised world, this technology is still at an emerging stage in our country for materials like magnesium and titanium [1]. Therefore the investment casting capability has to be developed nationally in order to support and enhance South Africa's industry.

The diagram below, Figure 1, illustrates the research areas forming the basis for the overall AMTS project. Various universities and institutions are involved. Stellenbosch University is conducting the Rapid Tooling Development research. The main sectors involved are the automotive and aerospace industries. World wide focus is placed on global warming meaning that less fuel should be used and therefore lighter vehicles and airplanes. Light metals are to be a key focus area in order to reduce weight.

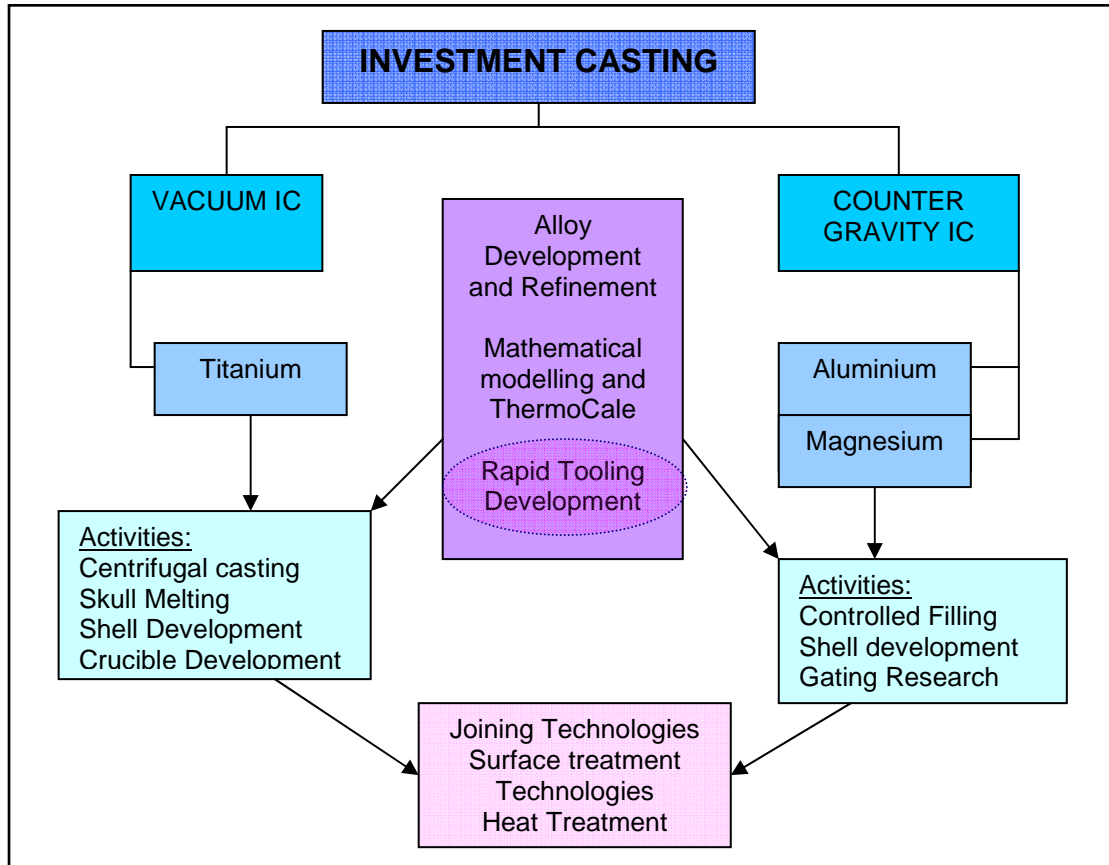


Figure 1 Research Areas for Investment Casting [1]



Investment Casting can be divided into two main focus areas namely vacuum IC, which is mainly used for titanium, and counter gravity IC, used mainly for aluminium and magnesium [1].

Investment casting poses many benefits. Some of them are design flexibility, a wide choice of alloys, reduced production costs, less assembly operations, reproduce of fine details, high dimensional accuracy for light and heavy parts, elimination of certain tooling when using rapid tooling techniques etc. A wide variety of ferrous and nonferrous alloys can be used in the investment casting processes [1]. Multiple parts can be produced as a single part and costly machining operations can be reduced or eliminated.

The main research and development areas are focused on [1]:

1. The development and consolidation of investment casting capability
2. The development and refinement of alloy for specific applications
3. Rapid tooling development
4. Process quality improvement
5. Cost effectiveness improvement
6. Process application to produce complex, high value and thin walled components
7. Component optimization technologies

## **1.2 Problem Statement**

This thesis report studies the introduction of Rapid Prototyping (RP) into the process chain of Investment Casting (IC), together known as Rapid Investment Casting (RIC). RIC can be divided into three main areas namely Pattern Making, Die Making and Shell Making. Rapid Prototyping (additive or layer manufacturing) technologies can be used in each of these three areas with varying results.

The main question is: What are the capabilities of rapid prototyping for rapid tooling development in the investment casting industry of South Africa? Various Layer Manufacturing (LM) technologies exist on the market, of which some are available in South Africa too. Certain LM machines can be employed to manufacture patterns, dies and shells for investment casting by applying different materials than those conventionally used for investment casting.

The castings manufactured from rapidly produced patterns, dies and shells should be within close dimensional tolerances, produced in high melting alloys, conforming to high standards of metallurgical quality and the costs involved should be lower than for alternative techniques available.



Locally available LM technologies shall be selected and compared in terms of their accuracy, surface finish and other capabilities. Various process chains for RIC will also be identified and investigated. Furthermore, when comparing conventional investment casting to rapid investment casting, certain design and process parameters shall be analysed and discussed.

### **1.3 Objectives**

The overall objective of the project is to explore the applicability of layer manufacturing methods for rapid tooling development so that complex, near-net shape, high value components can be produced. The specific objectives of this thesis can be stated as follows [1]:

#### A. Rapid Pattern Making

1. To determine the suitability of Layer Manufacturing (LM-) processes available in SA, such as 3D Printing, Selective Laser Sintering and others that are used to make patterns for investment casting with regards to material property, achievable accuracy and surface finish.
2. To investigate the economics related to RP-methods and process chains and to do a cost analysis.
3. To develop a guideline framework for the manufacturing of large objects that exceeds the available work envelope of LM machines.

#### B. Rapid Die Making

1. To determine the suitability of Layer Manufacturing (LM-) processes, such as Selective Laser Sintering, for die making in the investment casting process with regards to material properties, achievable accuracy and surface finish.
2. Analysing costs and investigating the economics of RP-methods and process chains for die making.

In addition to the above objectives a literature study was performed to investigate the suitability of Layer Manufacturing (LM-) processes, such as 3D Printing, Selective Laser Sintering and others that are used for direct shell production for investment casting with regards to material properties, achievable accuracy and surface finish.



## ***2. Investment Casting Issues – An Overview***

### **2.1 Introduction**

Investment casting is also known as Lost Wax Process, Precision Casting, Precision Investment Casting, Lost Pattern Casting and Hot-Investment Casting. It is one of the oldest manufacturing processes and can be used to make intricate shapes with high accuracy. It is also suitable for parts with undercuts. However, it must be remembered that when a die is used to create a pattern, it must still be possible to remove the pattern from the die.

The investment casting process can be divided into two distinct categories due to the use of expendable or permanent patterns. In expendable patterns the pattern is destroyed in the process. In permanent patterns the pattern is manufactured from metal, plaster or wood and the dies are directly made from the patterns. With permanent patterns multiple dies are usually created instead of single dies. Multiple dies are used in order to get the pattern out; meaning that the die splits into more than two parts and not just one core and cavity. Precision Investment Casting refers to the use of expandable patterns. Both types of categories of investment casting give smooth surface finishes with very good accuracy. However, some accuracy is lost when using permanent patterns due to the need for alignment of multiple dies [3].

Expendable patterns are melted or vaporized during the process. The following materials are generally applied for conventional IC pattern manufacturing [2]:

- a) Wax of various types and grades
- b) Plastics that leave no residue after they are burnt
- c) Low-melting point metallic alloys, for instance tin
- d) Frozen mercury
- e) Thermoplastic materials such as polystyrene
- f) Various materials as applicable for different RP methods

### **2.2 The Conventional Investment Casting Process**

#### **2.2.1 General Process Steps**

The conventional investment casting process is explained in the following steps (Figure 2) [3, 4, 5]:

**a) Pattern Making**

Firstly a wax replica (pattern) of the part needed is made. Patterns are usually formed by injecting wax or polystyrene into a pre-manufactured die, usually a metal die. Dies can be simple and hand operated ranging up to fully automated multi-cavity tools. Patterns are slightly larger to allow for volumetric shrinkage during pattern making and for metal shrinkage during casting. Wax characteristics determine the quality of the finished casting. Most casters use a blend of wax, resins and filler materials; premixed by suppliers.

**b) Clustering (Assembly)**

Small patterns are assembled into a spray or cluster around a gating and feeding system, forming an tree to be cast. Feeder heads and gates are designed on the principle of directional solidification; however enclosed systems are usually used to facilitate investments, with the main sprue allowing the only access to the outside [3]. Bigger parts are assembled in smaller groups of one or more parts.

**c) Ceramic Shell Making [6]**

The wax assembly is dipped into thin refractory slurry and then after draining fine refractory grains (usually zircon) are deposited on the damp surface, forming the primary coating. The covering of the wax assembly with refractory is known as investing. Binders are usually alcohol based (ethyl silicate) or water based (silica sol), or a mixture of the two.

*For low temperature melts:* Slurry = “a mixture of plaster, a binder and powder silica that functions as a refractory”.

*For high temperature melts:* Slurry = “an alumina-silicate [namely sillimanite], used as a refractory and silica is used as a binder”.

The first or primary layer is very important because it directly affects the parts surface finish. Prevention of bubbles in the primary layer by proper cleaning of the pattern is also essential. The dipping process is repeated until the desired shell thickness is obtained. The fine sand (stucco) acts as stressor points that help prevent cracking of the shell during casting, known as stuccoing.

**d) De-waxing**

An autoclave is generally used to remove the wax from the shells (thermally), chemical processes can also be used. The wax is literally melted out, leaving only a negative impression of the part to be cast. Polystyrene patterns get vaporized. The shell is then fired to a high temperature to eliminate any residual wax and to allow chemical and physical changes in the refractories to take place (sintering process). These changes allows for maximum strength and stability of the shells.

**e) Casting**

Most foundries use air melting and cast a wide range of ferrous and non-ferrous materials. Gravity, pressure or vacuum casting can be used. The shell is preheated to  $\pm 1000$  °C before casting to prevent it from breaking during the casting process and also to promote metal flow during filling of the shell. The ceramic shell is filled with molten metal. Care must be taken on the permeability of the shell to let all the air out during casting. The parts, gates, runner and pouring cup become one solid object as the metal cools.

**f) Knockout**

After the metal has fully solidified and cooled down, the shell is broken off using impact, vibration, chemical dissolution or high-pressure water blasting.

**g) Cut-Off**

Parts are cut off from the runner system by means of a high speed abrasive slitting wheel or with a band-saw.

**h) Final Castings**

Gates are ground and the surface cleaned. Small finishing operations are carried out on each casting that resembles the original part and then inspected. Further operations like milling, drilling, grinding etc. are carried out if required.

Most castings weigh less than 5 kg and intricate parts below 0.5 kg. Heavy castings exceeding 50 kg are also produced; in these cases the Replicast Process is normally implemented and makes use of expanded polystyrene patterns [3].

Literature indicates the following essentials related to investment casting [3, 7]:

1. Tolerances of  $\pm 0.15$ mm are normally accepted for linear dimensions up to 25mm, which extends to  $\pm 1.5$ mm for sizes of 250mm. Under favourable circumstances, using lower melting point alloys and painstaking process controls these values can be halved.
2. Surface finishes of 0.8  $\mu$ m for aluminium alloys up to 3.2  $\mu$ m for steels are reported.
3. The minimum wall thicknesses are on average between 1 mm to 1.5 mm (depending partly on the area of the section concerned) for metals that can be cast easily such as aluminium alloys. Wall thicknesses of 0.75mm or even less can be achieved for small areas.



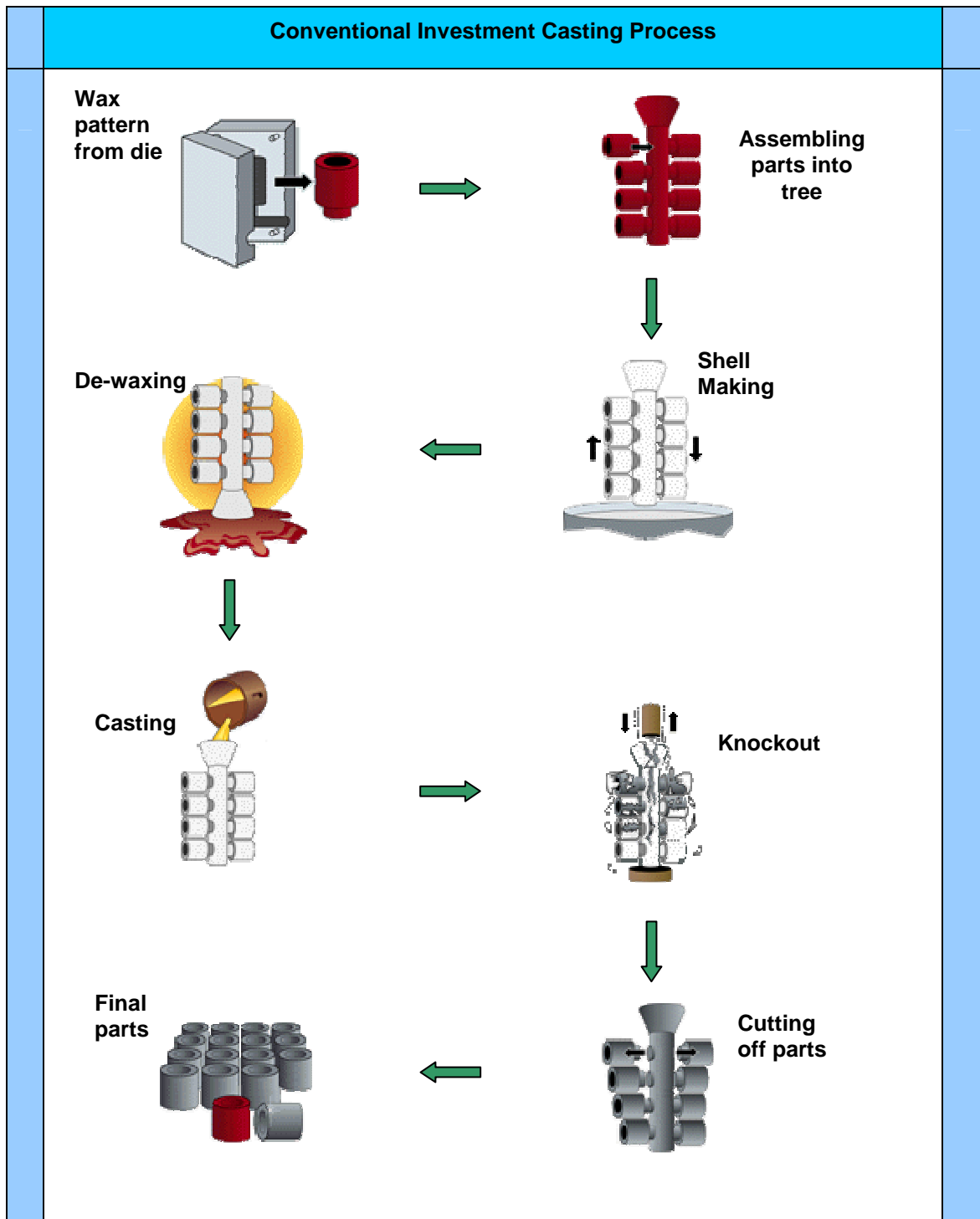


Figure 2 Conventional Investment Casting – Principle Scheme [5]



## 2.2.2 Advantages of Conventional Investment Casting

Investment casting offers a wide range of advantages. Design flexibility is increased by the wide variety of alloys that can be used and the precise detail obtainable. The size of parts to cast can range from a few milligrams up to several kilograms. Investment casting reduces production costs due to minimization and elimination of costly machining operations.

Fine details can be produced like splines, lettering, holes, serrations, bosses and even some threads. Investment casting is furthermore well suited for metals that are hard to fabricate or machine and it can be used to make parts that cannot be produced by traditional manufacturing techniques. Examples are the complex shapes of turbine blades and aeroplane parts that must be able to withstand high temperatures [6].

## 2.2.3 Disadvantages of Conventional Investment Casting (Compared to other Casting Processes)

The following disadvantages can be summarized:

1. Large quantities of castings must usually be produced to justify the expensive investment in dies, depending on the specific die.
2. Full advantage must be taken of the investment casting process to eliminate all machining operations due to the higher casting costs.
3. The maximum size of potential castings may be limited.

## 2.2.4 Defects Occurring During Conventional Investment Casting

There are basically four general defects that can occur during investment casting due to poor process control [8]:

a) *Incomplete running*

Incomplete running usually occurs when there is not enough pressure during casting or when the metal is too cold when poured.

b) *Casting distortions*

Distortions are caused by careless handling of castings and when stored in unsuited environments.

c) *Shrinkage*

Shrinkage defects occur when too little metal is used or when the metal is too cold when poured.

d) *Surface markings*

The surface finish of the pattern directly affects the surface finish of the part. Markings can also be caused by careless handling during the casting stages.



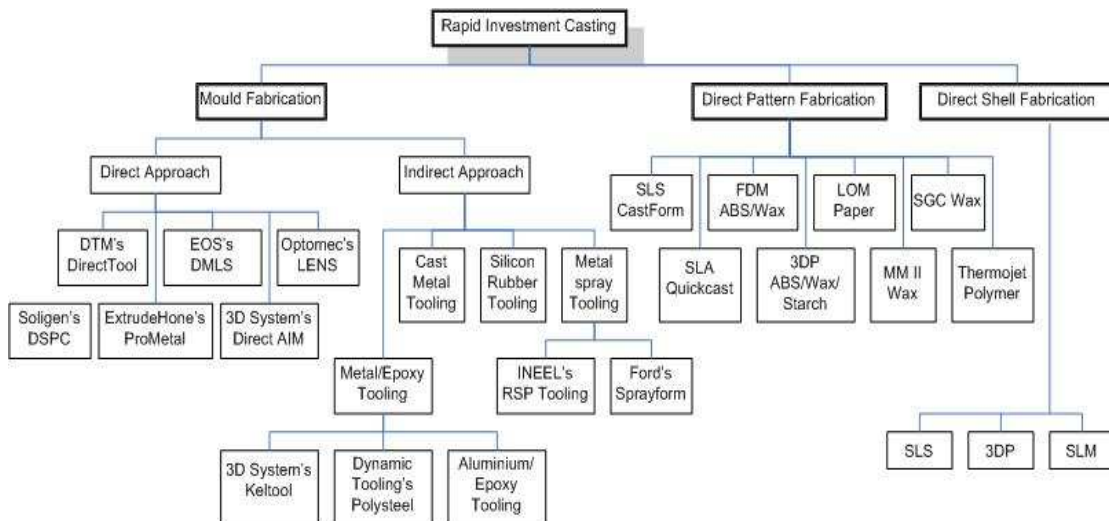
## 2.3 Rapid Investment Casting

### 2.3.1 General Overview

The Conventional Investment Casting process can be grouped into three main stages namely:

- Die Making,
- Pattern Making and
- Shell Making.

Rapid prototyping and rapid tooling techniques can be used in each of the stages and therefore it can be called Rapid Investment Casting (RIC). Figure 3 illustrates the leading techniques to date that are applied to fabricate patterns and dies for investment casting. Solid Ground Curing, however, is no longer used for pattern fabrication.



**Figure 3 Rapid Investment Casting [9]**

The next section illustrates the various process chains that can be followed to develop patterns, dies and shells for investment casting using rapid prototyping and rapid tooling techniques.

#### Rapid Pattern Making

Patterns for investment casting can be directly produced by various rapid prototyping machines. It is possible to use RP patterns for investment casting purposes, because the patterns from any material that can be burnt or melted without leaving too much ash residue or damage to the shell can be used for IC.



RP investment casting patterns were first used in 1989 [9]. Currently nearly all available RP systems, namely FDM (Fused Deposition Modelling), SLS (Selective Laser Sintering), 3DP (3D Printing), SLA (Stereolithography), MM2 (InkJet Plotting), LOM (Laminated Object Manufacturing), and Multi-jet modelling, have produced patterns for IC with varying results [8].

### **Rapid Die Making**

Die fabrication is divided into a direct and indirect approach. These dies are used for wax injection. The direct approach creates the die without any in-between steps and by applying various rapid prototyping techniques. Accuracy and surface finish of dies must usually be increased by post processing steps. Certain dies may also need additional strengthening. Direct approach dies fabricated from certain metals or polymers can be used for medium to high production volumes [9].

When using the indirect approach, a pattern is first created by applying rapid prototyping and then the pattern is used to create a die. Indirect approach dies are not that strong and can easily be damaged except for Cast Metal Tooling; therefore they are intended for low production volumes [9].

### **Rapid Shell Making**

Rapid prototyping can be used to directly produce ceramic tooling as a substitute for shells. Ceramic-laser sintering uses ceramic powder to directly manufacture ceramic tooling (shells and cores) for investment casting. Basically any ceramic powder with a liquid state can be processed, but usually zirconium silicate is used for investment casting purposes. Shells are cleaned and pre-heated, where after they are directly used in the casting process. Accuracy and surface finish are good, but can be further increased by post processing [10].

Surface quality is claimed to be 30–50  $\mu\text{m}$   $R_z$  with accuracy well below  $\pm 0.6\%$ . Analyses carried out on successful castings indicate lead-time reductions of up to 95 % from conventional IC. These claims are based on case studies where the EOSINT M 160 rapid prototyping system is used. The process is still being under further development at the Fraunhofer Institute for Production Technology (IPT), Aachen, Germany [9, 11].

Ceramic shells are also being produced by DSPC (Direct Shell Production Casting) which utilizes the 3D Printing process. Alumina powders are used with a colloidal silica binder. Shells are fired before used with very little shrinkage occurring. Typical build accuracy is within  $\pm 0.02$  mm [9]. Success achieved in using 3DP ceramic shells is reported in literature where they are utilised for casting nickel super-alloys at 1660  $^{\circ}\text{C}$  [9, 12]. DSPC is a trademark of Soligen Inc. California.



With numerous benefits achievable, it is not astonishing to note that RP&T techniques are gaining widespread acceptance among traditional foundries. Some examples include Shellcast Foundries Inc. in Montreal, where the Solid Model Casting (SMC) process is developed to directly convert RP models into castings without the application of hard tooling. The Cercast Group has identified important parameters critical in designing RP patterns, as well as the strengths and limitations of various RP patterns. Nuclear Metals Inc. has evaluated different RP techniques for casting Beralcast alloys [9].

It has to be however stated that the processing of ceramics using LM technologies is still a hot topic in international manufacturing research [11].

### 2.3.2 Process Chains for Rapid Investment Casting

The process chains and lead times in this section are adapted from literature and modified as needed [9].

The conventional IC process, discussed earlier, can be summarized in the following eight steps illustrated in Figure 4. The process chains to follow will be based on this conventional investment casting process chain, where certain steps will be eliminated and other replaced by rapid prototyping technologies.

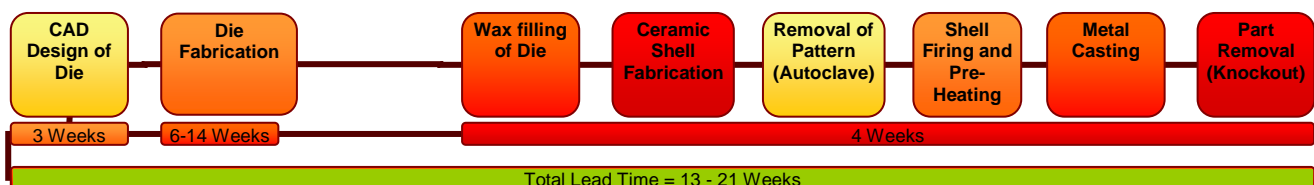


Figure 4 Conventional Investment Casting Process Chain

#### 2.3.2.1 Direct Pattern Fabrication

Direct pattern fabrication for rapid investment casting follows the same steps as conventional investment casting, except that there is no need to manufacture a die and filling it with wax (Figure 5). The patterns are simply directly printed, grown or built with the use of rapid prototyping technology. Processes include LOM, SLS, SLA, FDM, 3D-Printing in various versions such as drop-on-drop (MM2, ThermoJet) or drop-on-bed (Z-Corp) and others.

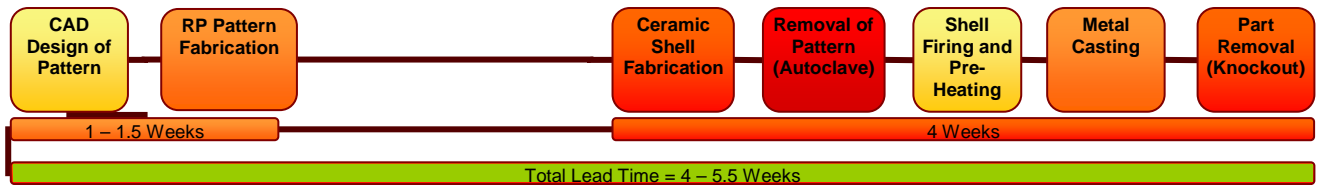


Figure 5 Direct Pattern Fabrication

### 2.3.2.2 Direct Die Fabrication

After a die has been designed, it must be cut from wood or certain materials (Figure 6). This process can be performed in a manual manner or by using specific cutting technologies like CNC cutting. Rapid investment casting involves directly manufacturing the die in metal or some polymer by applying a layer manufacturing process such as 3DP, SLS or SLM.

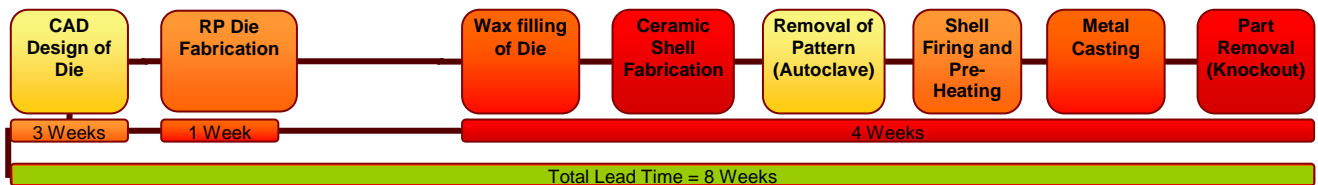


Figure 6 Direct Die Fabrication

### 2.3.2.3 Indirect Tool Fabrication

Dies are also indirectly manufactured. First a master pattern is produced by using certain layer manufacturing processes, where after the die is manufactured from this master pattern using rapid tooling technologies as applicable.

Indirect tooling can be split into two categories namely soft-tooling and hard-tooling. The difference between Figure 7 and Figure 8 is the method and material used to manufacture the die. Soft-tooling is used for small production quantities, and hard-tooling for larger production quantities. Processes for soft-tooling include Epoxy resins and Silicone rubbers. Processes for hard-tooling include Metal Spraying, 3D Keltool and Cast Metal.

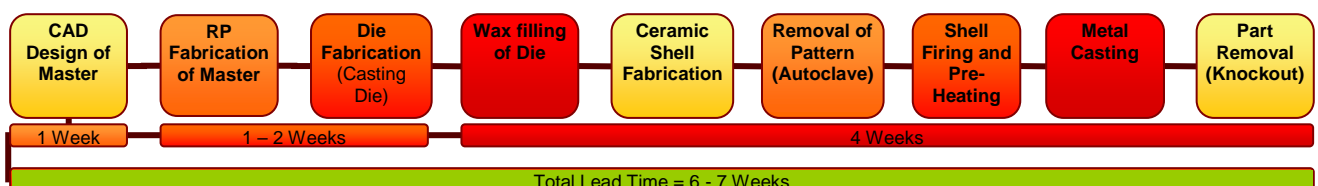


Figure 7 Indirect Soft Tooling

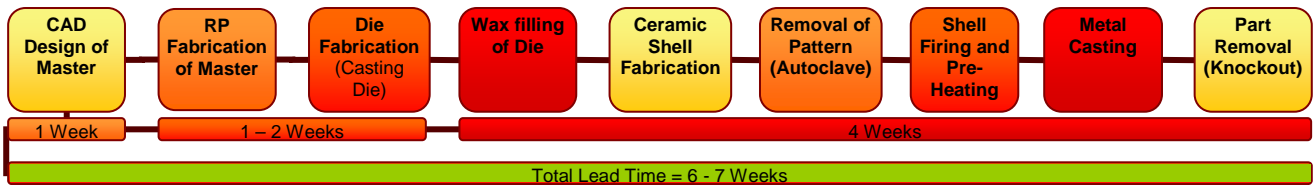


Figure 8 Indirect Hard Tooling

### 2.3.2.4 Direct Shell Fabrication

Using layer manufacturing processes to directly produce ceramic shells eliminates the pattern and die manufacturing steps. Even cores can be directly included in the shell. Processes include Direct-Sintering and DSPC (3D Printing) (Figure 9).

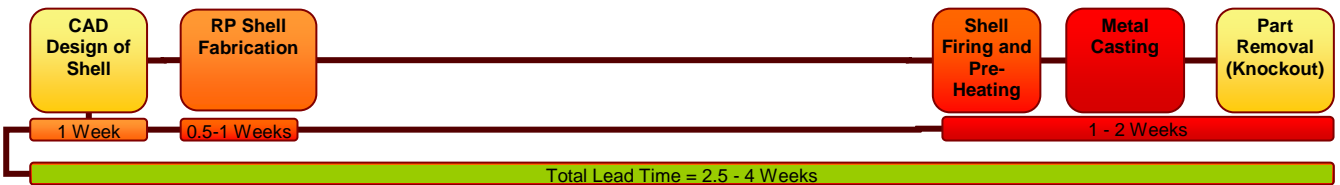


Figure 9 Direct Ceramic Shell Fabrication

### 2.3.3 Added Advantages of Rapid Investment Casting

The greatest advantage of using Rapid Prototyping techniques within the Investment Casting process chain is the shortening of the total lead-time to produce a part. Furthermore, RP technologies can be used to make much more complex parts - even parts that were impossible to manufacture before. RP requires no fixtures or tooling and therefore it makes manufacturing much easier. RP and tooling techniques can be used by concurrent engineering in order to evaluate parts and tooling through a few iterations which will ensure the best design. Shrinkage allowances for pattern material can be corrected before pattern production and therefore errors can be eliminated before casting even begins. Although these facts prove to be very beneficial during the product development phase, it is only valid in "one-off" or small scale runs.

Certain RP machines can produce non-wax patterns which are much stronger and less fragile than normal wax patterns; these allow thin walled structures to be cast. Non-wax patterns also allow for more post processing in order to increase surface finish.



Die designs can be optimized before manufacturing of expensive permanent dies. RP dies allows the inclusion of conformal cooling channels which in turn reduces the time needed to inject wax into the dies, thus affecting manufacturing time and cost. RP dies have very high heat insulating properties and therefore need the cooling channels to help wax solidify.

Directly fabricating shells for investment casting can reduce lead time and cost even further due to the elimination of producing a pattern. Shells and cores can be produced as one; hereby eliminating the potential of cores moving and therefore losing geometric accuracy. Because the shell thickness can be controlled, it means that the heat transfer can be controlled to a certain extent. Once again, the success of the concept depends on the particular requirements regarding the number of components needed.

### **2.3.4 Added Disadvantages of Rapid Investment Casting**

The lack of information on each RP process and the specifications on their various materials can at present be seen as the main disadvantages. Using RP technology currently relies on the experience of other users and manufacturers skills; therefore the subject of this project.

Each RP and tooling technique uses different materials to produce patterns and dies and thus requires different post processing steps before they can be utilized. Various infiltrants must be used to increase strength, density and surface finish of produced parts.

Non-wax patterns produced by certain RP technologies can cause shell cracking due to their high thermal expansion properties. However, certain strategies like manufacturing hollow parts have already been worked on to counter this setback. Non-wax patterns leave more ash residue behind after burnout and require more shell cleaning. Incomplete burnout of patterns can also sometimes lead to problems. (Cleaning of shells is discussed in a later section.)

Any marks or defects on the surface finish of a pattern, die or shell produced by rapid manufacturing and tooling, will be resembled in the final part cast. Incomplete burnout and cleaning of shells leave residues that create small inclusions which in its turn cause casting defects.

Rapid prototyping technology is still in its development years and each of the disadvantages mentioned can be seen as temporary setbacks. Better materials and techniques are constantly been worked on by researchers. Further strategies to counteract certain drawbacks are discussed in the next chapters.





## **2.4 South African Capabilities on Investment Casting** [13, 14, 15]

Investment casting in South Africa is being used in the medical, mining, pumps & valves, aerospace, small arms, petrochemical and other general engineering fields. The country currently has three companies specializing in investment casting namely IntraCast Precision Castings, Rely Precision Castings and Castco Precision Castings. Each has certain capabilities and can cast various metals (Table 1). The CSIR also provides specialized research facilities for investment casting.

Rely has been an investment casting company for the last 25 years and is the largest investment casting facility in South Africa. IntraCast Precision Castings has been investment casting for about 11 years and has an excellent reputation for innovation and specializing in the rapid prototyping field. Recently Pamodzi Industrials (Pty) Ltd (formerly Allied Production Industries (API)), owners of Rely Precision Castings, acquired IntraCast Precision Castings and thereby merged the two companies now known as Rely IntraCast. The Managing Director of the company is Peter Goode – the former Managing Director of IntraCast Precision Castings.

Rely IntraCast supplies, among others, the automotive, steel making, mining, valve and pump, power generation and glass making industries with precision castings for car door hinges, tap hole drills, hose couplings, valve bodies, impellers, boiler spacers, baffles, guide plates etc. [14].

Castco Precision Castings was established in 1974 as a sand foundry and in 1979 installed a lost-wax investment casting facility. The company specializes in thin-walled aluminium castings and offer a wide range of castings for all industries in various air melting alloys. Castco also offers various other services like in-house tooling, spectrographic analyses, x-ray facility, microstructure, dye penetrant, heat treatment, full metrology backup and electro-polishing.

More details of the three companies can be found in Appendix B.



Metal	Castco Precision Castings	IntraCast Precision Castings	Rely Precision Castings
Steels	Carbon & Low Alloy Steels Cast Tool Steels Alloy Steels Alloy Iron Precipitation Hardening Stainless Steels Chromium-Nickel Stainless Steels Austenitic Manganese Steel Chromium Stainless Steels	Stainless Steels Low Alloy Steels Low and medium carbon steels Magnesium alloys	Iron Popular Stainless Steel alloy grades (with additional grades concerning ferritic, martensitic, duplex and precipitation hardening properties.) Duplex and Super-Duplex Stainless Steels Heat resisting alloys Abrasion and wear resistant alloys – (chrome irons, tool steels and chrome cobalt alloys) Corrosion resistance alloys
Aluminium	A201, A206, C335, A356, A357, LM5, LM25	Aluminium alloys	
Copper Alloys	Tin Bronzes, Leaded Tin Bronze, Brass, Aluminium Bronzes	Brass & Bronze alloys	Copper based alloys
Special Alloys	Nickel Based Alloys Cobalt Based Alloys	Nickel and cobalt based heat resistant super alloys	Nickel and cobalt based alloys Pure Nickel based alloys Various types of Monel type and Ni-resist as well as IN657
<b>Specifications</b>			
Mass	1 g to 50 kg	5 g to 50 kg	13 furnaces with capacities from 25 – 500 kg.
Size	1000 x 1000 x 1500mm	5 mm to 500 mm	
Surface Finish (Roughness)	N6 or better	Surface finish, 3 micron <i>Ra</i>	Carbon steel finishes are generally about 36 micron
Tolerances	Angular tolerance, 0.5°	Angular tolerance, 0.5°	
Tolerances	Consult Foundry	Linear tolerance, 0.13 mm per 25 mm (0.52 %)	Tolerances as tight as 0,125 mm over 25 mm.

**Table 1 IC in South Africa (South African Capabilities) [13, 14, 15]**

## 2.5 Economy of Scale

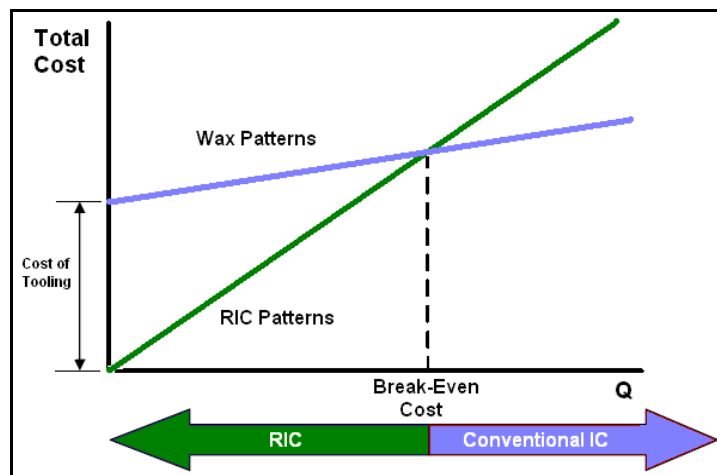
It must be remembered that Layer Manufacturing processes are still expensive to use and can become time consuming when a large number of parts need to be built or printed. Using rapid prototyping and rapid tooling techniques for investment casting, known as Rapid Investment Casting techniques, is only economically feasible to a certain extent.

The advantage of RIC is that there is no need for expensive tooling to create IC patterns, and therefore no time needed to create such tooling. Using conventional investment casting, there is always a tooling cost involved as well as initial time needed to manufacture the tooling. A breakeven analysis can always be made before RIC patterns are used to see if it is

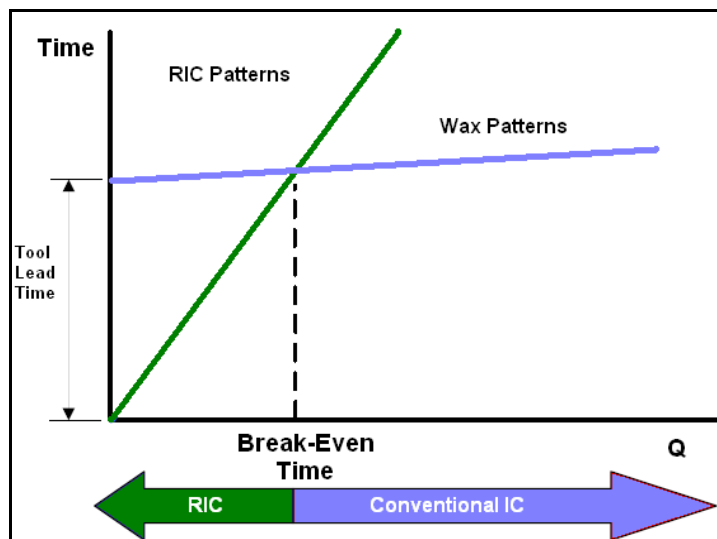


feasible and/or time worthy versus using conventional IC patterns for specific production quantities (Figure 10).

The two figures below illustrate the break-even quantities for cost and time in a generic manner. RIC patterns start at zero because there is no initial tooling involved and they have a steeper constant slope due to the manufacturing cost and time needed per pattern. Conventional IC patterns start off at a certain time and cost due to the tooling involved and have a gentler slope due to the material cost and injection times involved for pattern manufacturing [16].



a) Break-Even Cost Graph



b) Break-Even Time Graph

Figure 10 Break-Even Analysis [16]

### 3. Layer Manufacturing Processes – An Overview

#### 3.1 Introduction

Rapid prototyping started in the late 1980s when 3D Systems Inc. introduced the first machine namely the SLA-1. Currently there are more than 44 manufacturers in the world offering different RP systems and materials to customers for various applications [9, 17].

Conventionally fabrication involves the subtraction of materials like milling, drilling, CNC machining, laser cutting etc. RP is based on the principle of layer manufacturing where material is added in layers. Each layer represents the cross-section of a part and each layer is formed by processing a liquid, powder or solid sheet feed stock. Layers are fused together one at a time to create the final part.



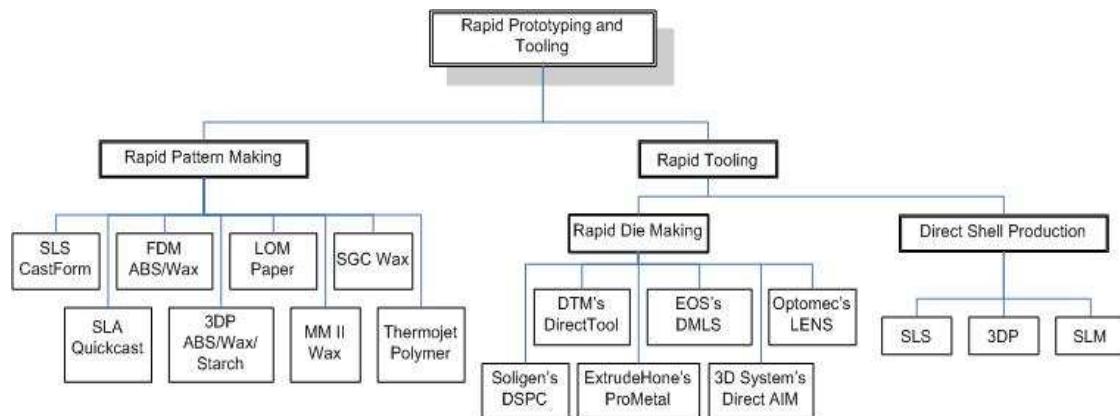
**Figure 11 General RP Process Chain [9]**

Rapid tooling (RT) involves the use of RP technologies to manufacture tooling and tooling inserts. Rapid Production Tooling aims at long-term consistency tools able to form thousands or even millions of parts before wearing out [18].

Rapid Investment Casting involves the use of RP- and RT techniques in the IC process where the aim is to reduce the production cycle time of IC.

#### 3.2 LM Processes for Rapid Pattern Making and Rapid Tooling

Figure 12 shows the rapid prototyping and rapid tooling processes.



**Figure 12 Rapid Prototyping and Tooling Processes [9]**

### 3.2.1 Stereolithography

Stereolithography (SLA) works on the principle that certain liquid photopolymer resins turn solid when exposed to a specific colour of light. Ultraviolet light is most commonly used [19].

Process description (Figure 13):

- a) As the part is growing layer by layer, a working table moves downward in a vat of the liquid resin.
- b) The laser is moved by a scanner system to trace the cross-section's geometry of the parts being grown.
- c) A knife edge is sometimes used to help with the recoating of each layer of resin, smoothing it.
- d) Overhangs and/or undercuts must have support structures.
- e) After growing, the part is elevated from the vat and excess resin is manually removed from the surfaces.
- f) Post curing is often carried out by placing the part under intense light – a setup that can be compared to an oven.
- g) Afterwards the supports are cut off and the surface finished.

Currently Stereolithography is still known to give the best surface finish and accuracy compared to most other LM processes. SLA is a registered trademark of 3D Systems.

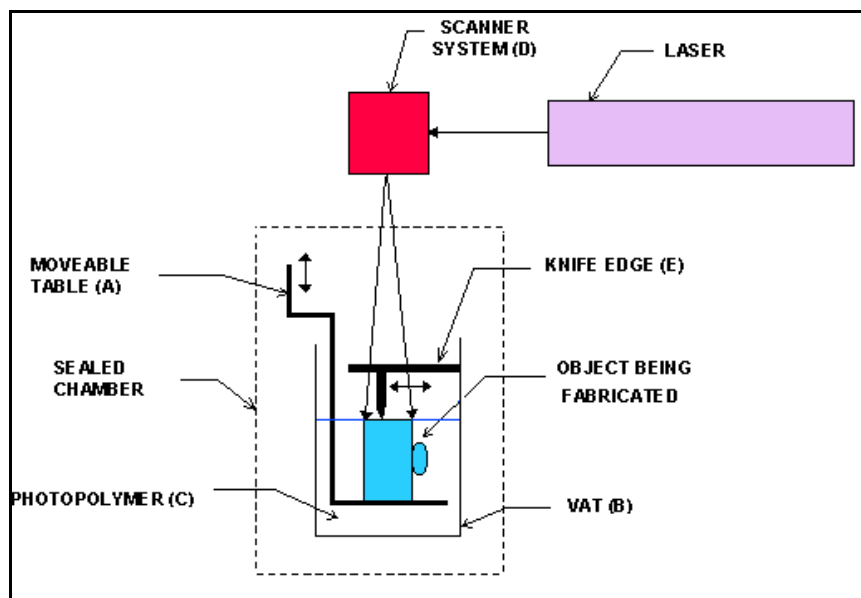


Figure 13 Stereolithography - Principle Scheme [19]

### 3.2.2 Selective Laser Sintering

Selective Laser Sintering (SLS) uses a laser beam to melt a powder made from thermoplastic material (Figure 14) [19]:

- a) The process uses two pistons. The one piston's function is to build volume where the piston incrementally moves down in a cylinder after each layer is built. The second piston contains the powder which is incrementally lifted after each added layer.
- b) The content of the powder volume is spread over the build cylinder with a roller.
- c) A scanner system is applied to guide the CO<sub>2</sub> laser to provide a concentrated infrared beam.
- d) To speed up the whole building process the building chamber is heated to just below the melting point of the powder, meaning that the powder only need to be heated slightly in order to melt.
- e) Overhangs and undercuts are supported by the tightly packed powder bed.

Parts must usually be left in the chamber to cool down before removal. This period can finish in as little as an hour or two or it can take as long as two days for large parts with thin sections. Excess powder is brushed, vacuumed and air-blown away. Parts are porous due to the sintering process and may need to be infiltrated to increase mechanical properties.

SLS can also produce metal and ceramic parts. The whole process is kept under a nitrogen gas atmosphere because of the explosive properties of certain powders [19].

SLS does not have the best surface finish or density qualities. It is a registered trademark of 3D Systems [17].

SLS can be used to build polystyrene patterns for IC. Wax and polycarbonate patterns have also been applied, but are prone to distortions and poor surface finish. Hollow structures cannot be built due to the powder entrapment, except if openings are left for powder removal. The high porosity of powders entrapped helps prevent excessive pattern expansion and cracking [9].

Electro Optical Systems (EOS) offers the use of a variety of materials, for example on the basis of metals, polymers or foundry sand. EOS is used for prototyping, direct parts, direct tooling, direct patterns and direct sand moulds [20]. The term Laser Sintering (LS) is used and not SLS when used in connection with EOS processes, due to a court case between 3D-Systems and EOS. The term SLS will in the thesis will also refer to LS.

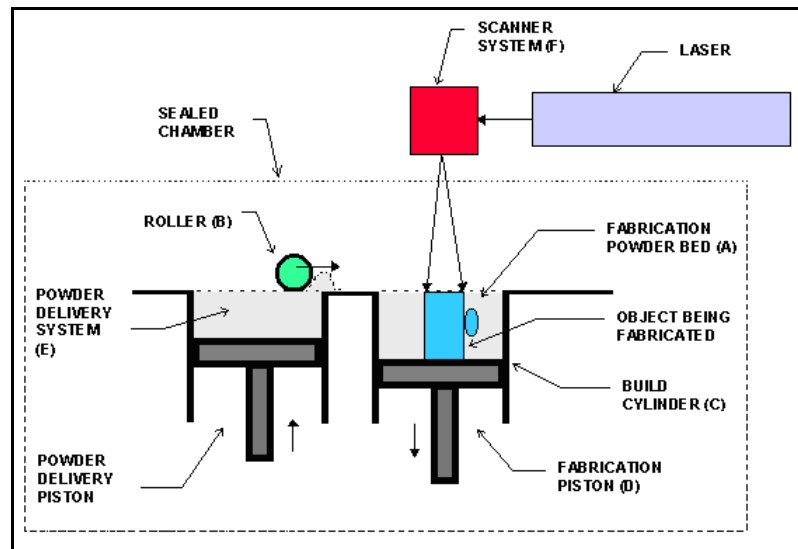


Figure 14 Selective Laser Sintering - Principle Scheme [19]

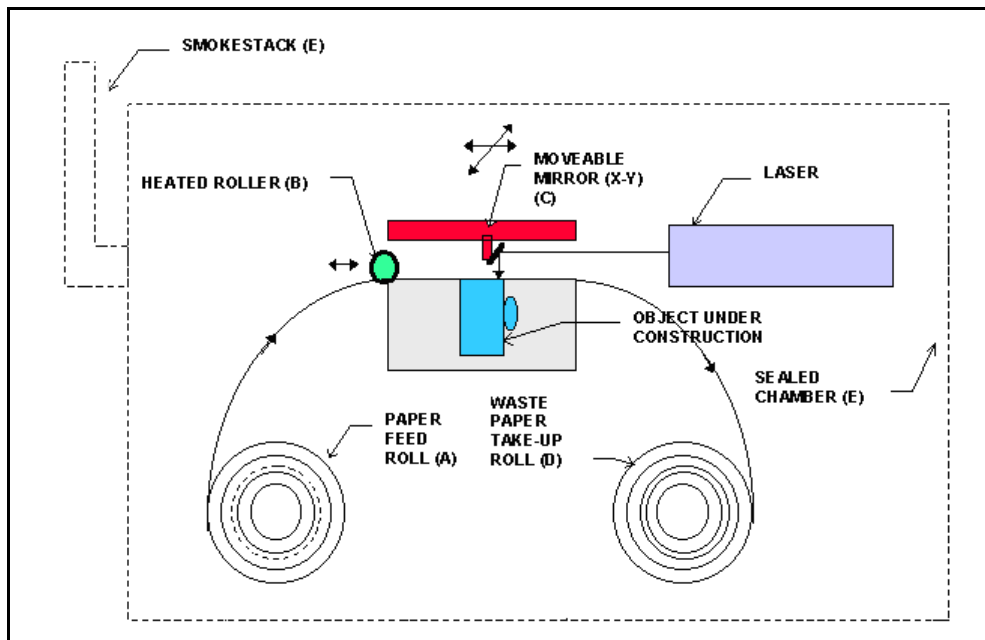
### 3.2.3 Laminated Object Manufacturing

Laminated Object Manufacturing (LOM) parts are manufactured from layers of paper (Figure 15). A roll of paper is wound in incremental lengths at a time from a feed roll to a receiving roll. Each time a new incremental length of paper is bonded on top of the previous layer using a heated roller which melts a plastic coating on the bottom side of the paper. Other processes of bonding are also applied, for instance by means of a solvent.

Cross section profiles are cut using a CO<sub>2</sub> laser or knife system mounted to an optics system. The excess paper supports all undercuts and overhangs. Excess paper is automatically cross hatched during each layer to help the removal of the part afterwards. The LOM process generates a lot of smoke and a chimney or a charcoal filtration system must be applied to remove smoke from a sealed chamber [19].

LOM does not have the best finish and accuracy, but these can be greatly improved during post processing. LOM is a registered trademark of Helisys Inc.

LOM is utilized to produce paper patterns for IC. Patterns must be coated with a layer of sealant to prevent it from swelling and delaminating due to moisture absorption. LOM patterns are cheap to produce, but sometimes lack intricacy due to difficulties in removing excess paper [9].



**Figure 15 Laminated object Manufacturing - Principle Scheme [19]**

### 3.2.4 3D-Printing Techniques

Phase change inkjets work on the principle of squirting a building material which is in a melted or liquid state. It then cools and sets to form a solid once it gets in contact with a surface. Depending on the inkjet method, a thermal, polymer or physical phase change takes place.

Three Dimensional Printing is a development of Ink-Jet Printing technology. There are two types of Ink Jet Printing [21]:

- Continuous Ink Jet Printing (continuous deposition) uses a stream of charged droplets and deflects those, which are to be used for printing.
- Drop-on-Demand Ink Jet Printing positions the ink jet printing head over the place where printing is to occur before depositing a droplet.

Many techniques are developed from ink jet printing technology. A printer head is the only common element which serves to shoot either droplets of binder, or of liquid-to-solid compound. The shooting of droplets of the actual building material (liquid-to-solid compound) in Drop-on-Demand mode is known as Drop-on-Drop (DoD) deposition, while the shooting of droplets of binder on the powder material is called Drop-on-Powder (DoP), or Drop-on-Bed (DoB) deposition [21]. Table 2 shows how different technologies relate to different deposition techniques.



Aimed Deposition Process	Technology
Drop-on-drop deposition	3D Plotting Multi-Jet Modelling
Drop-on-powder deposition	3D Printing
Continuous deposition	Fused Deposition Modelling

**Table 2 Deposition Processes and Corresponding Technologies [21]**

### **3.2.4.1 Drop-on-Drop Deposition**

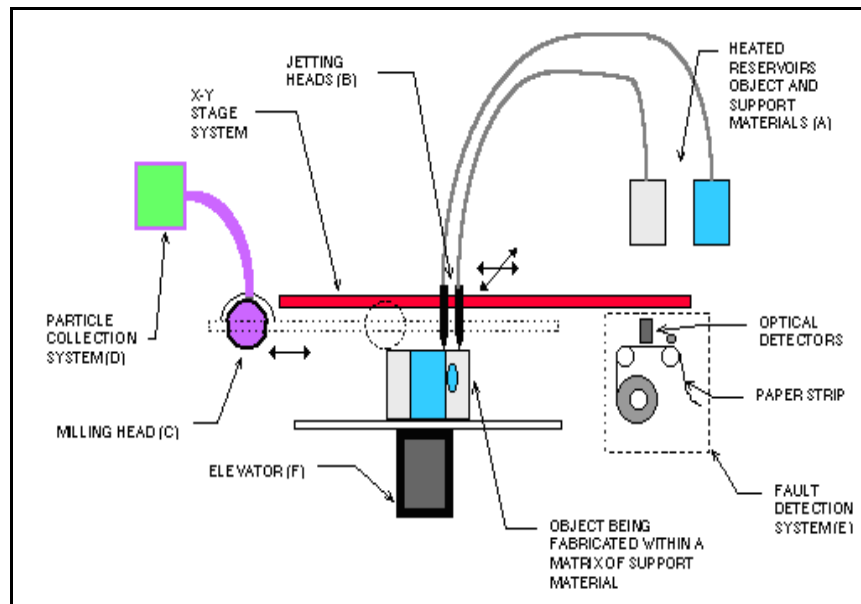
#### **Thermal Phase Change Inkjets (MM2)**

Single- and Multi-Jet systems are used to deposit molten building and support material. The material hardens as its temperature drops. Phase change ink-jets are limited to certain materials and make fragile parts [19].

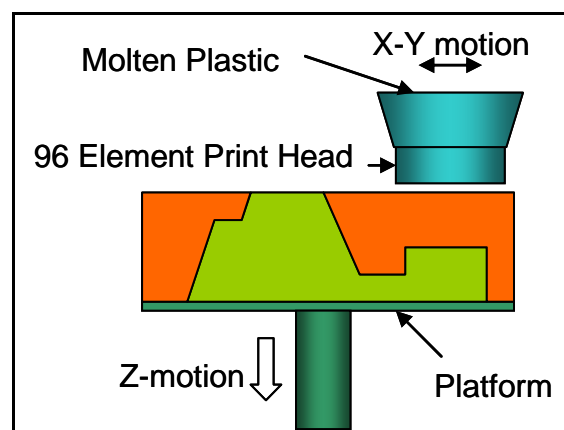
- a) The material is held in a melted state in reservoirs above the machine, which is fed to individual jetting heads.
- b) Each jet deposits tiny drops of the material at specific points as the head moves over the layer along the geometry.
- c) A milling stage follows each layer to ensure uniform thickness of each layer.
- d) Clogged jets are cleaned via a cleaning cycle and defective layers are milled away and redone.
- e) Wax supports are melted or dissolved away after part completion.
- f) Multiple-jet printers use the same building material to print thin hair-like structures for support and are merely brushed away afterwards.

The Single-Jet system by Solidscape uses two print heads with single jets, one for depositing the thermoplastic building material and the other for depositing supporting wax. They can produce fine surface finishes with exceptional accuracy, but lacks speed. Solidscape Inc. calls it "3D Plotting", (Figure 16) [21].

The Multiple-Jet system by 3D Systems using its ThermoJet Modeler™ inkjet technology utilizes several hundred nozzles in a wide head configuration to deposit molten plastic [21]. It is less accurate than Solidscape's Single-Jet, but a lot faster (MultiJet Modeling) (Figure 17).



**Figure 16 Solidscape's Single-Jet Inkjet - Principle Scheme [19]**



**Figure 17 Multi-Jet Modelling™ - Principle Scheme [21]**

**Photopolymer Phase Change Inkjets (ThermoJet Modeler™)**

The process here is based on photopolymers as building materials (Figure 18) [19]:

- a) Inkjet head is used to deposit the building material for each layer.
- b) The same head also deposits the support material.
- c) A UV flood lamp mounted on the print-head cures each layer printed.
- d) Photo-polymeric supports are simply washed away afterwards.

The Photopolymer technology has not been on the market that long and still needs a few years to be comparable to the development of stereolithography. The PolyJet technology by

Objet Geometries Ltd. (an Israeli company, 2000), using their ThermoJet Modeler™ inkjet process (2002), can be seen as typical representative of this method.

A similar photopolymer-based system called InVision™ was introduced by 3D Systems in 2003. The typical application of the Photopolymer Phase Change inkjets is the conceptual modelling, characterised by a high quality of the models built [21].

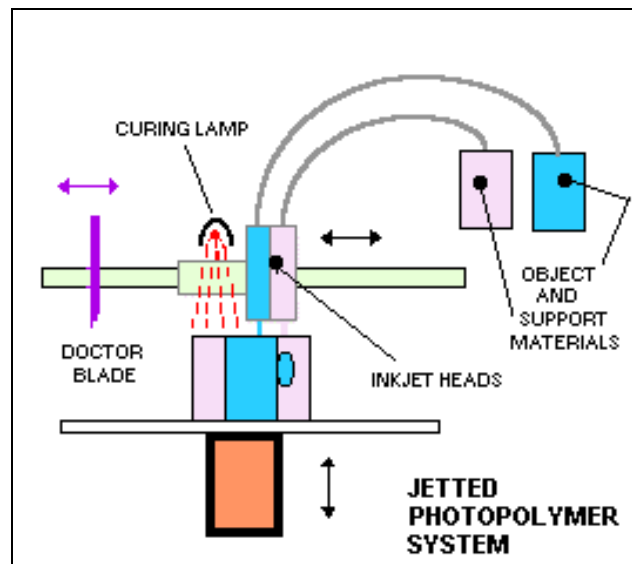


Figure 18 Jetted Photopolymer System - Principle Scheme [19]

### 3.2.4.2 Drop-on-Powder Deposition

#### 3D-Printing

3D-Printing (3DP) uses an inject head to deposit a liquid bonding agent on a bed of powder (drop-on-bed process). The agent bonds the powder wherever it is deposited. The process follows the following principle steps (Figure 19):

1. The machine has two pistons; the one is at the bottom and filled with powder and the building piston is at the top.
2. The powder piston moves one increment up and the print or building piston moves one increment down.
3. The roller moves over to spread a uniform layer of powder over the print piston.
4. The multichannel jetting inkjet head moves over the print piston and deposits a binder liquid along the pattern.
5. The powder piston moves one increment up and the print piston goes one increment down. The process is repeated.
6. After printing, the print piston is elevated and the excess powder brushed away. The fragile part is known as a 'green part'.

7. Green parts are placed in a heated chamber to allow it to dry. The part shrinks as it is dried.
8. The green part is infiltrated to make the part more rigid. The infiltrator could be a hardener or wax, depending on the building material that was used.

3-DP technology was developed at MIT, but is licensed to the following companies:

1. Z-Corp: Currently the third most used printer seller in the world [17].
2. ProMetal uses it for the production of metal tooling.
3. Soligen uses it for Direct Shell Production Capabilities (DSPC), patterns and other applications [17].
4. Therics uses it for tissue engineering purposes.

3DP can be applied to print starch based patterns for IC. Hollow structures cannot be printed due to the powder entrapment, except if openings are left to remove the entrapped powder. The high porosity of powders entrapped helps prevent excessive pattern expansion and cracking [9]. The porous patterns can be infiltrated with wax after printing to obtain a pattern suitable for IC.

ProMetal a division of Ex One company directly convert CAD files into steel moulding inserts. An electrostatic ink-jet printing head is used to deposit a liquid binder onto the metal powders. The binder is dried with a drying lamp [21].

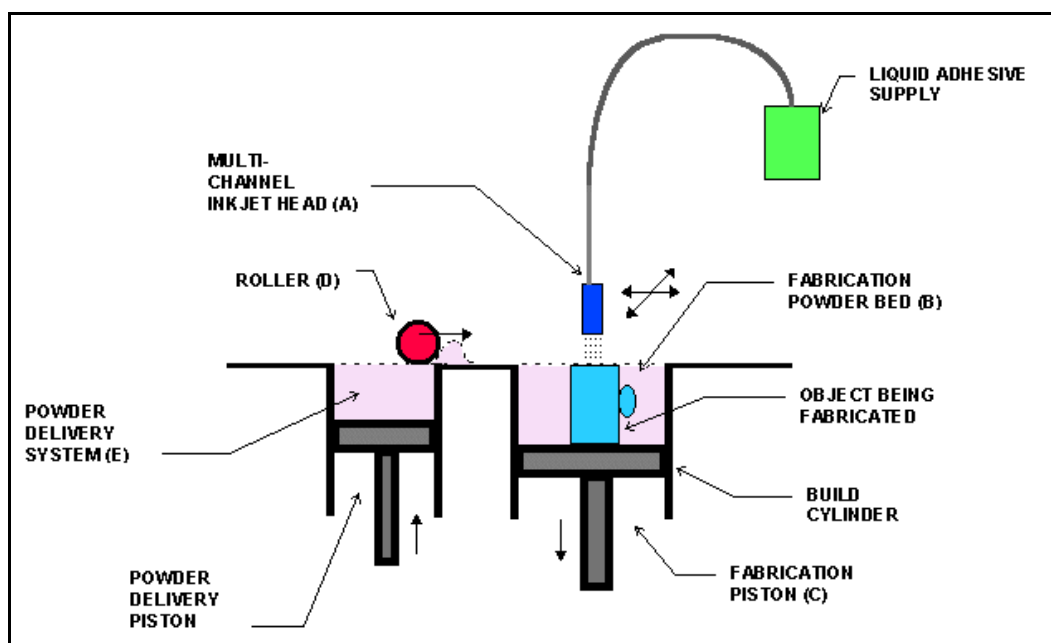


Figure 19 Three Dimensional Printing - Principle Scheme

[19]



### 3.2.4.3 Continuous Deposition

#### **Fused Deposition Modelling**

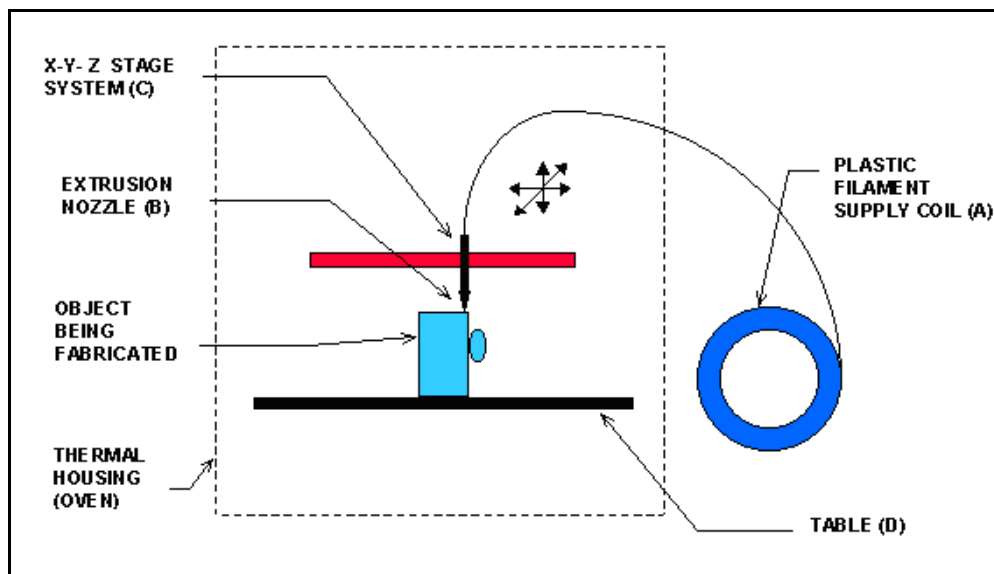
Fused Deposition Modelling (FDM) is the most widely used rapid prototyping technology [17].

Plastic pellets or filament is fed to an extrusion nozzle which is heated to melt the plastic material. The nozzle is mounted to a mechanical stage which can move in the x, y, and z direction. The nozzle moves over the building table all along the geometry of the new layer and deposits a thin layer of droplets to form the next layer. The plastic quickly hardens and bonds to the layer below after being deposited. The whole building system is within a heated chamber which keeps the temperature just below the melting point of the plastic, resulting in only a small increase in temperature (by the nozzle) needed to melt the plastic (Figure 20) [19].

Support structures for any undercuts must be incorporated in the design and constructed. The support structures are later removed. They can be made from nylon-like polymer and certain waxes. Today water soluble support materials are also available. Manufacturing materials include ABS plastic, polycarbonate, poly(phenyl)sulfone, various other polymers, ceramic materials and some metallic materials [19, 22].

FDM is commercialised by Stratasys. The Fused Deposition Modelling process in combination with the continuous ink jet printing technique is utilised by Stratasys in two of their low cost products - Prodigy Plus and Dimension [21]. FDM is slow when parts with wide cross sections must be built and stereolithography still provides a better finish. Stratasys FDM technology manufactures parts in production-grade thermoplastics [17, 23]. The final product material is not hygroscopic and the parts are therefore geometrically stable [21].

FDM can also be used to manufacture ABS (acrylonitrile-butadiene-styrene) patterns but wax and elastomers are also used. However, some minor changes are needed to the IC process in order to use these patterns. The minor changes involve that the pattern is placed in a flash fire furnace where temperatures reach 1093 °C, causing the pattern to combust. An autoclave cannot be used because the pattern will not melt at the relatively lower temperatures. Shells are checked for cracks and repaired [9, 24].



**Figure 20 Fused Deposition Modelling - Principle Scheme [19]**

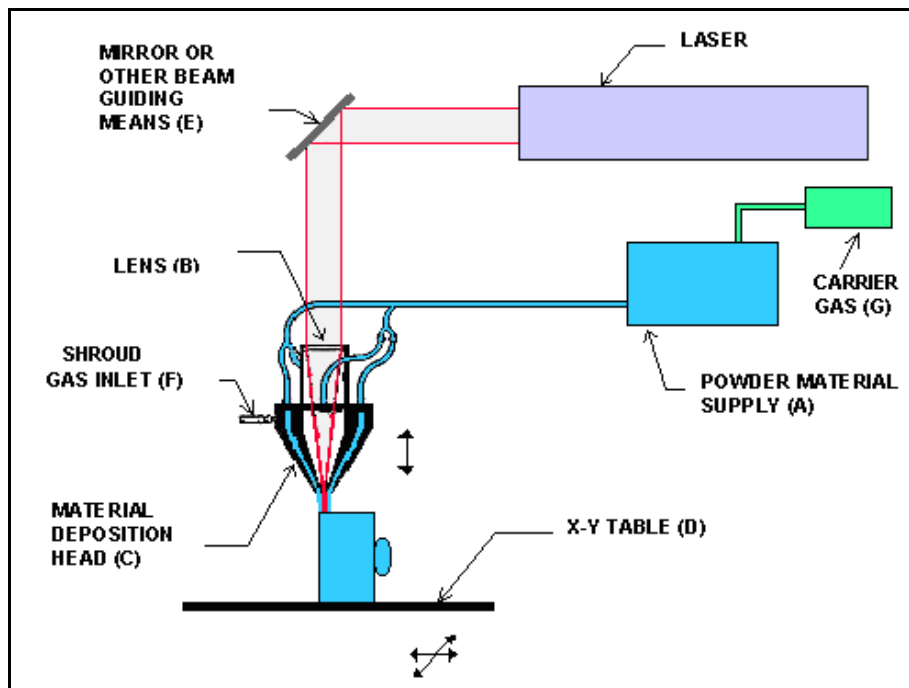
### 3.2.5 Laser Engineered Net Shaping

Laser Engineered Net Shaping (LENS) is a laser powder forming technology. The main advantage of this technology is its ability to fabricate 'fully dense metal parts' with excellent metallurgical properties. A few variations of the process exist and are sometimes referred to as laser fusing. LENS technology is used for tooling purposes and not for pattern making in investment casting (Figure 21) [19].

1. A deposition head is utilized to supply the metal powder coaxially to the focus of a laser beam.
2. The laser beam normally passes through the centre of the deposition head and through one or more lenses in order to focus the beam to a certain spot.
3. The object table moves in x and y directions to fabricate each part layer. Usually the deposition head moves upward incrementally after each layer fabricated.
4. The laser beam is typically delivered to the work using a right-angle mirror or fibre optics. Other means can also be employed.
5. Gravity is used to convey and distribute metal powders around the edge of the head or a (inert) pressurized gas is utilized to carry the powder. "Even in cases where it's not required for feeding, an inert shroud gas is typically employed to shield the melt pool from atmospheric oxygen for better control of properties, and to promote layer to layer adhesion by providing better surface wetting" [25].
6. The building area is shielded to protect the operator against inhaling powders, gasses or being exposed to the laser.

Parts fabricated are fully-dense with nearly the same properties as the fundamental materials used. The disadvantage is that support structures are solid and difficult to remove. LENS can also be used to repair parts.

Materials that can be used range from stainless steel, aluminium, copper, inconel, titanium etc. The LENS trademark belongs to Sandia National Labs. and Sandia Corp. The DMDS Direct Metal Deposition System™ (DMDS) is used by Optomec.



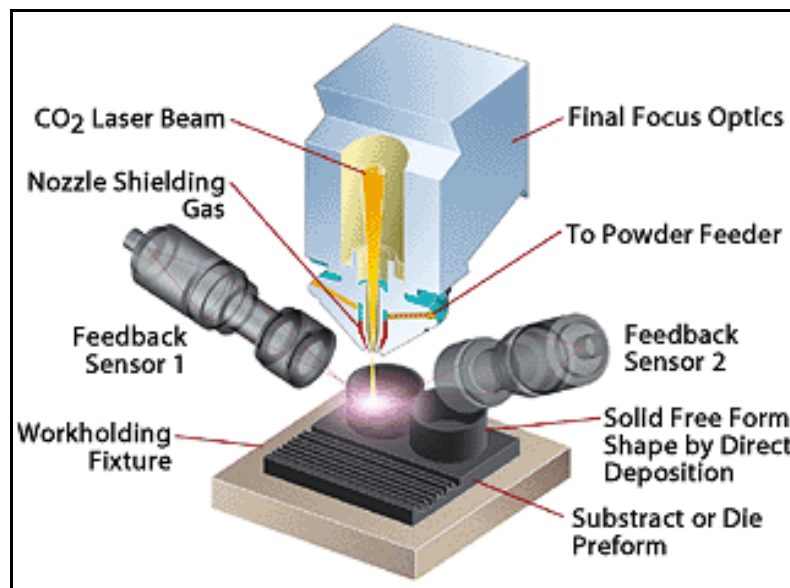
**Figure 21 Laser Engineered Net Shaping - Principle Scheme [19]**

### 3.2.6 Direct Metal Deposition

Direct Metal Deposition (DMD) from the Precision Optical Manufacturing (POM) group, similar to the LENS process [17], is used to produce moulds, dies or metal prototypes. The metal is in powder form and is sprayed through a coaxial nozzle to a CO<sub>2</sub> focused laser beam. The laser melts the powder which then forms a thin molten pool on the object aimed at (Figure 22) [26].

POM has revolutionized this technology by using a feedback system that ensures the quality and dimensional stability of products during the fabrication stage. The fast cooling characteristics of DMD produce a fine grain microstructure, which results in fully dense parts. Parts have excellent mechanical and metallurgical properties. POM enhances the ability of DMD to create bimetallic parts – these are parts that consist of more than one metal.

Conformal cooling channels can easily be included in tooling. DMD is mostly used to create and repair dies and moulds [27].



**Figure 22 Direct Metal Deposition - Principle Scheme [27]**

### 3.2.7 Electron Beam Melting

Electron Beam Melting (EBM) is utilized to create solid metal parts from metal powders. The powders employed have characteristics of the final material intended. The machine lays down successive layers of powdered material after which each layer is fused together by means of an electron beam. A computer system controls the whole process. “The electron beam’s high power ensures a high rate of deposition and an even temperature distribution within the part which gives a fully melted metal with excellent mechanical and physical properties” [28].

Building commences under a vacuum environment which helps to maintain the chemical composition of the material. The vacuum environment also provides for the use of reactive materials like titanium alloys (Figure 23).

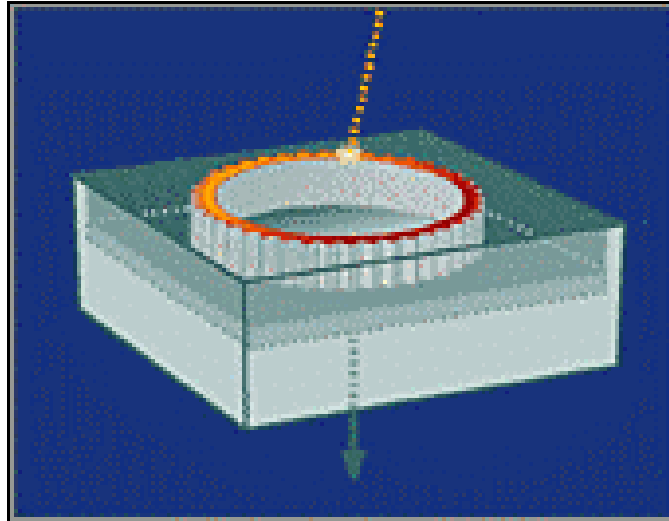
The melted material is made of a pure alloy in powder form from the final material to be fabricated [29]. It is due to this reason that no additional thermal treatment is required in order to obtain full mechanical properties of parts. The final parts are solid metal parts.

In comparison to SLS and DMLS, EBM has a generally inferior building rate due to its scanning method [28].

EBM technology employed by Arcam allows for the production of solid parts in titanium and steel, which can be machined afterwards and is able to sustain under actual operating



conditions. Parts from Arcam have been utilized for engine parts and rock drill tools with great success. EBM machines, manufactured by Arcam, are used for rapid manufacturing of medical implants and a range of aerospace and automotive industry products [28].



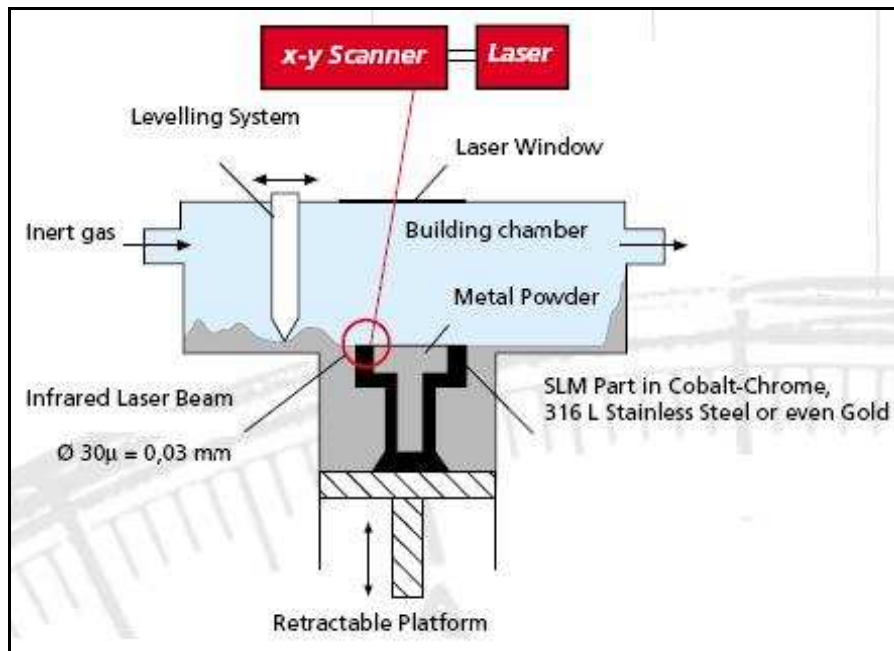
**Figure 23 Electron Beam Melting - Principle Scheme [28]**

### 3.2.8 Selective Laser Melting

SLM (Selective Laser Melting) is a new rapid tooling method that makes it possible to produce close to 100 % dense metal parts, using customary metal powders. SLM is a layer manufacturing technology that employs an intensive infrared laser beam to trace the profile of each layer, melting the metal powder without overheating or distorting the surrounding material (Figure 24). No post processing like heat treatment or infiltration is needed but is possible if necessary. Very fine details are possible for example thin vertical walls of less than 0.1 mm thickness. Surface roughness values of 10 to 30  $\mu\text{m}$  ( $R_z$ ) are obtained directly after the production of parts or tools [30].

Parts and tooling inserts can be built of basically any type of metal or ceramic materials namely: zinc, bronze, stainless steel, tool steel, titanium, chromium-cobalt and MCP low melting point alloys. Internal undercuts and channels can be built and used as conformal cooling channels.

On average 5 cm<sup>3</sup> of dense steel per hour can be built, making this quite a high speed building process. SLM is used to build titanium medical implants as well as tooling inserts from a variety of materials [30]. SLM can be used to build dies and ceramic shells for investment casting purposes. MCP markets their machines under the Realizer<sup>SLS</sup> name. A similar process was developed by Concept Laser GmbH. It is marketed under the name Laser Cusing [17].



**Figure 24 Selective Laser Melting - Principle Scheme [30]**

### 3.3 Conclusion

Table 3 lists the processes and their applicability to investment casting.

Process		Applicability to Investment Casting		
		Patterns	Dies	Shells
1	SLA	X	-	-
2	SLS (and LS)	X	X	X
3	FDM	X	-	-
4	LOM	X	X	-
5a	3DP (MM2)	X	-	-
5b	3DP (ThermoJet)	X	-	-
6	3DP	X	X	X
7	LENS	-	X	-
8	Direct Metal Deposition	-	X	-
9	EBM	-	X	-
10	DMLS	-	X	-
11	SLM	-	X	X

**Table 3 LM Processes Applicability to Investment Casting**

Each kind of process technology has its unique area of relevance for investment casting, as well as its own set of advantages and disadvantages. Careful thought must be given when selecting a specific process, because there is a great deal of factors that should be taken into consideration. Certain processes are better known for their use to create patterns, dies and shells. The better known processes are referred to in Table 3 and summarized below.

Patterns [6, 9]:

- FDM and MM2 are already well known to foundries for their wax patterns.
- Due to the fact that non-wax patterns have higher thermal expansion coefficients, shell cracking can be caused during autoclaving. FDM helps to prevent such cracking by allowing for patterns to be built with quasi-hollow structures. SLS and 3DP patterns do not allow the building of hollow structures, (except if there is openings left for powder removal), but they also help to prevent shell cracking through their high porosity.
- SLS, 3DP and FDM patterns have porous surfaces and must be sealed to prevent slurry penetration during shelling.
- The surface finish of almost any pattern can be improved by polishing.
- The amount of ash residue left behind by each pattern differs. SLA and FDM (ABS) leaves small amounts, about 0.02 - 0.05 %. More dense patterns like LOM require longer burnout times and leave larger amounts of ash behind.
- Material cost is a very important consideration. ThermoJet patterns are very expensive, while the cost of 3DP and LOM patterns are much lower.

Direct Metal Dies [9]:

- Laser sintered dies are well known and commercialised under RapidTool and DirectTool. RapidTool dies are strengthened and densified by means of bronze infiltration. Reports claim that complex dies are produced in less than two weeks and that they are able to produce 50 000 to 100 000 parts [9]. The DMLS technique is employed for the DirectTool process (EOS) to produce dies that are made from a blend of nickel, bronze and copper-phosphate, with dimensional accuracies of  $\pm 0.05$  %. The density is increased by infiltration with tin, silver and epoxy. EOS also offers DirectSteel, a powder that is steel-based and DirectMetal, a powder that is bronze-based.
- ProMetal is a 3DP technology used to produce dies which are 60 % dense and are infiltrated with bronze afterwards. The 3DP process is relatively fast and offers a variety of metals including tool-steel. Post processing reduces die accuracies to  $\pm 0.1$  mm.
- It has been reported that LENS moulds can produce more than 100 000 injection moulded components, therefore a much greater amount of wax patterns can be



obtained from such a die for investment casting. DMD is also used for direct metal die fabrication and allows for inclusion of conformal cooling channels.

- EBM allows for the use of reactive materials like titanium alloys. Solid parts can be built in titanium and steel, and machined afterwards.
- SLM can build close to 100 % dense dies. Post processing and infiltration is only done if necessary. Surface roughness values of 10 to 30  $\mu m$  ( $R_z$ ) are possible without finishing. Tooling inserts and parts are built from basically any type of material and the process allows for the inclusion of conformal cooling channels [30].

Direct polymer or wood dies [9]:

- SLA, FDM, LOM and SLS are used to produce wax-injection dies. FDM produced ABS dies must be infiltrated with epoxy or aluminium-filled epoxy to seal and strengthen. LOM paper or CNC cut wood dies must be sealed to prevent moisture absorption.
- Pure non-metal dies have poor thermal conductivity properties and therefore much longer injection cycles are needed. It is however possible to make use of cooling channels.

Direct Shells [9]:

- DSPC, a 3DP technology, produces shells with an accuracy of  $\pm 0.2$  mm. Here small batches of fully functional castings are permitted a quick turnaround in a variety of metals.
- The EOSINT M 160 RP system employs LS to directly sinter ceramic shells with accuracies of  $\pm 0.6$  % and surface finishes of 30 – 50  $\mu m$  reported.

Various related issues such as shell cracking, hollow structures, ash residue etc., will be more clearly explained in the following chapters.



## 4. *Rapid Pattern Making*

### 4.1 *Introduction*

The use of rapid prototyped IC patterns comes from the concept that any material can be used as long as it can be burned or melted out without damaging the ceramic shell. The main goal of designing any casting is still to minimise all costs in achieving full functional performance of the part designed. Investment casting is an economical process when thin walled parts with good surface finish and/or complicated parts with undercuts are needed. Applying rapid prototyped parts as patterns for the IC process means that the die-making phase of IC can be eliminated. Such elimination saves time and reduces cost when only one or a few final parts are needed.

Every casting process has various requirements that have to be considered when designing a part. Conventional investment casting wax patterns differ from patterns produced by RP machines mainly due to the different materials used. Using rapid prototyped parts means that certain specific requirements will apply to the design process.

### 4.2 *Design for Manufacturability Issues*

Design for Manufacturability (DFM) is a method or mindset that applies manufacturing principles to design a part. The function of DFM is to design parts that are more economical and easier to produce. Some principles are utilized for efficient manufacturing such as developing a modular design, using standard components, design for flexibility and to be multifunctional. By far the most important principle is to design for ease of manufacture, which in turn depends on the fabrication processes adopted. These guidelines are well documented elsewhere [25, 31].

DFM places limitations on the complexity of the part being designed. In casting, the limitations are usually due to the die. The more complex a part the more complex and expensive the tooling (die) will be. Two usual design considerations include the selection of the parting line position and draft angles for pattern removal, however this is not needed for IC. A trade-off for DFM is DFA (Design for Assembly), this requires the integration of multiple parts to reduce the total number of parts.

Probably one of the biggest advantages of layer manufacturing processes is that there is no need for tooling to obtain the patterns. However, in certain cases soft tooling can be used as a secondary method to obtain a better pattern. The elimination of tooling means that most of the DFM principles in the modern manufacturing environment are no longer applicable. "The



ability to produce whatever geometry that is created in a 3D CAD system actually means that one is entering a new dimension of 'manufacture for design' rather than the more conventional DFM philosophy" [31].

The absence of tooling also means that the need to produce enough parts to justify the cost of expensive tooling is no longer needed. 'Cost-effective custom manufacturing' now becomes more evident.

### **4.3 Basic Casting Guidelines**

#### **4.3.1 Design Guidelines**

The following rules serve as a guideline when designing parts for investment casting and considering only the casting phase of the process [4]:

- a) Section thicknesses should be kept constant as far as possible. Design to eliminate poor feeding conditions and hot spots.
- b) Design the feeder placement so that the molten metal will solidify from the outer extremities towards the feeder.
- c) For unavoidable section changes, make sure the changes are gradual. Keep changes to a minimum.
- d) Make use of fillets and radii on sharp corners. Avoid any sharp intersections. Radius size is important in order to avoid hot spots and shrinkage cavities.
- e) Design to avoid the intersection of multiple sections.

#### **4.3.2 Casting Requirements**

Each type of casting process necessitates adhering to certain requirements in order to be able to carry out the process. Some of the basic requirements of any pattern or part for any type of casting include the following [4, 11]:

- a) Additional material for secondary machining (machining allowances)
- b) No non-straight holes
- c) No non-blanked holes
- d) Draft angles
- e) Straight flow paths
- f) Shrinkage allowances

The main reason for some of these requirements is the need for pattern removal from tooling (moulds or dies). Requirements like non-straight holes can be bypassed by using cores or



simply drilling the holes afterwards. However, rapid manufacturing techniques and investment casting eliminate the need for most of the above requirements. Investment casting is well known for its accuracy and therefore minimum additional machining allowances are needed. Still allowances due to material shrinkage are however always necessary to obtain the anticipated size casting.

### 4.3.3 RP Process Limitations

Certain limitations to parts still apply, like minimum wall thicknesses, minimum feature size, part size, the use of fillets and avoidance of sharp corners. The designer must always work with the foundry and now also with the RP specialist to ensure that all part features and specifications are obtainable.

Specific limitations to RP include [3, 31]:

- a) Poor surface finish
- b) Lack of dimensional accuracy
- c) Limited range of materials
- d) Build time (especially for large components)
- e) Resolution
- f) Repeatability
- g) Cost

The extent of each limitation depends on the type of RP process and on the machine (model) used [32]. Technology has advanced so much in the past few years that some of the limitations mentioned are no longer seen as constraining factors. Manufacturers keep on introducing new materials with better properties, faster machines, better surface finish and higher accuracy.

## 4.4 Specific Requirements of Patterns for IC

Investment casting has its own specific requirements concerning the patterns used for casting. Two very important requirements include pattern accuracy and low ash content. A third important requirement is the thermal expansion properties of the pattern's material used.

### 4.4.1 Accuracy

Accuracy is a vital concern in investment casting patterns. The required accuracy of a pattern is debatable. Solidform, an aluminium investment casting foundry in Fort Worth, Texas, uses a rule of thumb where the pattern tolerances are at least equal or smaller than half the



tolerances on the final casting. For example, if the casting dimension tolerances are + 0.025, then the pattern dimension tolerances should be + 0.0125 [33].

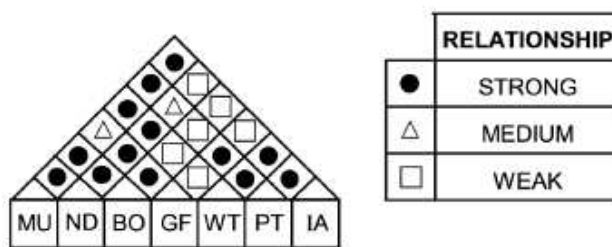
Various factors influence the achievable accuracy of each pattern. The first and very influential are the basic process properties like the scaling factor and the build parameters. Different materials and application purposes require different scaling factors and saturation values, which are usually recommended by the system manufacturers. Environmental factors can also hugely affect the values and factors recommended. Even the specific build location within the building envelope of a RP system influences the pattern accuracy. (The build orientation will be discussed later.)

Probably the most influential factor on achievable accuracy is the skills and experience of the user and the manner in which the post processing is done [34].

Research results and experience indicate that certain factors have much higher impact on pattern accuracy namely [35]:

- a) Material used (MU)
- b) Nominal dimensions – small, medium, large (ND)
- c) Build orientation – in relation to the different axes (BO)
- d) Geometric features and their topology – e.g. open or closed contours (GF)
- e) Wall thickness – shell or solid (WT)
- f) Post treatment procedures (PT)
- g) Infiltrating agent (IA)

The interrelationship between these factors is indicated by Figure 25.



**Figure 25 Factors Influencing the Achievable Accuracy [35]**

Measuring Accuracy

Measuring accuracy in can be influenced by many factors. Some of the factors included are the choice of axis to be measured, the machine calibration, the part orientation, the type of features, the time of day, environmental exposure etc.





Some of the main sources of error in RP are [35, 36]:

- a. Occurrence of the staircase effect due to restricted layer thickness
- b. A STL file approximation error
- c. Location errors of deposition nozzles (printing heads) or laser beams
- d. Material properties and the age of the material
- e. Shrinkage and expansion of parts during the RP process
- f. The application of shrinkage rates

Effects of shrinkage usually can cause warping and curling. Curling is an adverse result of shrinkage and residual stress. Certain RP parts are greatly affected by moisture. Parts absorb moisture and warp and/or swell. Photopolymer type processes typically tend to be significantly affected. For example, SLA and Polyjet parts are affected by moisture but SLS and FDM parts are not affected [34].

#### **4.4.2 Low Ash Content**

The investment casting process involves melting or vaporizing the pattern from the shell. The pattern that is removed by being melted or vaporized usually leaves a small amount of residue behind. Low ash content indicates how well all shell cavities will be cleaned after shell firing. Ash residue trapped in tight cavities or deep recesses might be very difficult to remove or even impossible.

Ash residues left after burnout of patterns must be controlled because they affect the quality of the final castings. The ash residues serve as inclusions which causes defects in castings. Mostly wax patterns are used for investment casting which leaves a very low ash content after melting. Each RP process makes use of different materials and therefore each case has different ash residue properties. To the investment caster it is important that these new RP patterns have similar or less ash residue than the conventional investment casting waxes used.

During the last few years RP materials used improved so much that ash residue is no longer such a big problem. Certain RP patterns like, for example, LOM still might contain substantial ash residue.

#### **4.4.3 Pattern Thermal Expansion**

The thermal expansion coefficient of materials used for patterns must be as small as possible. After the ceramic coating of patterns, the pattern must be removed by melting it out in an autoclave or firing it in a furnace. The pattern and shell usually expands when heated and



causes the shell to crack due to the shell and pattern thermal expansion coefficients clashing. Operating temperatures must always be closely monitored to control expansion.

Various methods are being used to overcome this problem, namely [3, 9]:

- a) Firstly try using patterns with the minimum thermal expansion coefficient or ones that softens or melts easily at low temperatures.
- b) A flask (solid mould) casting can be used to prevent shell cracking.
- c) Wax patterns can be removed by quickly heating the shell with steam. This causes the outer layer of the pattern to quickly melt, therefore leaving room for the rest of the pattern to expand.
- d) Certain RP processes allow the building of hollow patterns, where the pattern easily softens and collapses when heated and shell cracking is avoided. Additional advantages include a faster building time, a drop in material cost and less residue because less material is used.
- e) One of the first methods were QuickCast, where the inside of the pattern is grown with small raster formation structures, leaving the pattern partly hollow (quasi-hollow structures). Small holes are left in the pattern to allow excess resin to escape. The pattern also collapses after heated to prevent shell cracking. As before the build time is faster, material cost decreases and there is less material, therefore less ash residue left behind. QuickCast build styles can reduce 60 to 95 % of the internal mass of epoxy (SLA) and ABS (FDM) patterns, resulting in ash residues of 0.02-0.05 % [9]. Solidiform, Inc. is a leading provider of aluminium investment castings from direct patterns and one of the first foundries to develop the capability to process QuickCast patterns. Solidiform was the initial beta site for 3D Systems' QuickCast development effort [16].

Patterns with very dense structures, that require longer burning out time, result in much higher ash residue left behind, i.e. LOM patterns [9].

#### **4.4.4 Ash Removal**

Patterns never completely burn out and the ash left behind must be removed. Research based on LOM patterns experimented with many ways of ash removal. Multiple liquids have been tried, hoping that it would dissolve the LOM patterns ash residues and wash it out. The liquids must be strong enough to dissolve the ash without affecting the surface of the shell. In previous experiments acetone, pure lye, drain cleaner and hot soapy water was tested, but the attempts were unsuccessful [6].



Residual ash is generally removed by flushing the cooled shell with compressed air or water. Shells must be properly dried because water and molten metal does not mix well and can be dangerous. Cooled shells are reheated before pouring molten metal. Mould vents help accelerate pattern burnout, but increases grinding and finishing time [6, 9].

Firing duration, shell thickness and firing temperature have a clear effect on the ash left behind after burnout. In previous studies various plots have been established: of burnout time versus shell thickness versus cleanliness and time versus temperature versus cleanliness [6].

LOM patterns previously caused shell cracking during firing. The layer roughness of patterns absorbed moisture from the slurry which caused the cracking on firing. Firstly patterns were dipped into thick liquids like wax and epoxy, but these changed the part size and tolerance, which was unacceptable. Secondly sprayed-on coatings like primer and acrylic were used; this gave the appropriate water-tight sealing without changing part dimensions. Clear acrylic enamel spray worked best. However, with sufficient surface finish the patterns required no sealing. Long firing times left a white flaky ash which can easily be removed by air. Wood putty fillers and primers should not be used, because they leave additional ash after firing [6].

#### 4.4.5 Other Pattern Requirements

Allowances include the following [3, 4, 37]:

- a) Pattern Shrinkage allowance. In this case 3DP patterns, for example, are shrunk to size by placing them in an oven to dry them out after manufacturing.
- b) Part shrinkage allowance, where each type of metal shrinks by a certain percentage during cooling after being cast.
- c) Distortion allowance due to parts distorting during cooling after being manufactured and during post processing.
- d) Machining allowances where machining is required on the final part.

Patterns might require further finishing - obtaining the specified surface finish. Fillers are used to cover marks and blemishes, followed by sanding [38]. In certain cases parts will be dipped in molten wax to obtain a smooth surface finish and to seal porous surfaces. Patterns should not be cleaned with oily substances, which may be detrimental to the shelling process. Oily substances left by mould release-agents decrease wettability [6]. Hydrocarbon solvents should not be used to clean patterns, because they may soften the pattern. Rather use an isopropyl alcohol of high concentrations [24]. It is essential that shells are completely cleaned from wax residues, otherwise the final part might gain blowholes when cast [3].



Parts with overhangs usually need support structures in order to build the features. Certain processes utilize additional or the same materials to build support structures. Parts built in a powder bed do not usually require additional support structures due to the supporting qualities of the surrounding powder. Experience with 3DP however shows that support structures are needed in order to attain the required accuracy [39]. Support structures are simply cut away or dissolved after built parts have cooled down.

#### 4.5 Build orientation

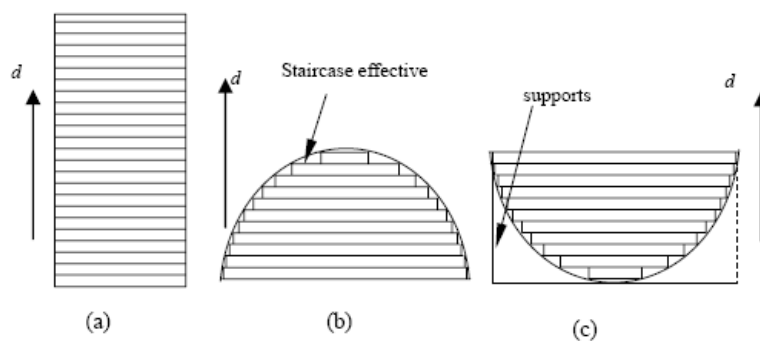
Selecting the optimal build orientation for building parts on RP machines directly affects the part quality, part cost, build time and support structures. Build orientation can be seen as one of the critical factors to control part cost, quality, use of support structures and time.

All factors cannot be optimized at once and there is usually some trade-off. Various studies have been done to find ways and methods to determine the best trade-off for a specific situation. The majority of studies focus on finding some algorithm to determine the best build orientation.

Surface roughness is mainly due to the staircase effect caused by the layering process. The contact areas of supports also influence surface quality.

The following illustration (Figure 26) presents some basic ideas regarding build orientation [40]:

- a Figure (a) presents the best surface finish due to no staircase effect encountered, but the added layers results in a longer building time required.
- b Figure (b) will take less building time, but will have more surface roughness due to the staircase effect on the surface.
- c Figure (c) requires some supports for the surface and the part is in an unstable position.



**Figure 26 Effects of build orientation [40]**



Build time is directly dependent on the number of slices, therefore the height of a part. The total size of support structures to be built by certain RP systems also influence build time. According to Hong et al. [41], it is hard to calculate an accurate build time since it is difficult to consider all the process parameters, including the acceleration and deceleration of a nozzle or a laser beam. Basic build time parameters consists of platform movement, sweep period, z-wait, tip cleaning time, roller movement, part bed movement, chamber movement, system delay, warm up time, build time for each layer, curing time and cooling down time; all depending on the type of system used.

Part cost is another important factor to consider when determining build orientation. Estimations of part cost for different build orientations can be made. Part cost consists of labour time, raw material cost and support material cost. The time component will consist of pre-processing time, post processing time like removal of supports and actual build time, each of which involves a certain cost portion.

Various works have been done to obtain the optimal part build orientation, depending on certain conditions [40, 41, 42].

#### 4.6 Pattern Quality

Table 4 below shows the quality attributes of various untreated patterns. Many of the different RP patterns are well within the acceptable tolerance range ( $\pm 0.05$  to  $\pm 0.254$  mm) and surface quality ( $16\text{-}20 \mu\text{m Ra}$ ) [9].

RP technique	Process	Build materials	Layer thickness (mm)	Surface roughness ( $\mu\text{m Ra}$ as processed)	Part accuracy (mm)	Residual ash (%)
SLA	Photocuring	Epoxy	0.1	12.5	$\pm 0.05$	
SLS	Sintering of powders	Polystyrene	0.075	13	$\pm 0.25$	< 0.02 %
		Polycarbonate				
FDM	Melt extrusion	ABS	0.05	12.5	$\pm 0.127$	
		Wax				
LOM	Paper lamination	Paper	0.05	25	$\pm 0.25$	$\approx 0 - 50$ %
SGC	Photocuring	Epoxy	0.06	25	0.1 %	
3DP	Ink-Jet printing	Starch	0.1		$\pm 0.020$	1 - 2 %
MM2	Ink-Jet printing	Wax	0.013		0.03 %	$\approx 0$ %
Ther Mojojet	Ink-Jet printing	Organic Polymer	0.04	5.090		

**Table 4 RP Techniques and Pattern Quality [9]**

The values in Table 4 were constructed by Cheah et al. [9] using various sources, however there is a disparity from values from other studies. Studies carried out at Stellenbosch University indicate an accuracy of  $\pm 0.247\text{mm}$  per 2mm and  $\pm 0.303\text{mm}$  per 54mm for 3DP



starch based,  $\pm 0.04\text{mm}$  for SLS and  $\pm 0.08\text{mm}$  for LOM patterns [35, 43]. Accuracy should be stated for a certain distance because errors tend to compound when increasing measuring distances.

Due to the layer manufacturing principle utilized by LM machines, the stair-stepping effect occurs and causes a roughness to the surface. If the machine allows it, the effect can be reduced by employing thinner layers, but this will increase building time. A trade-off between surface finish and build time will have to be made.

Processes that produce porous patterns require a sealant to coat the surface in order to prevent ceramic slurry to enter the pattern during the shelling process.

Non-wax patterns are not always easily accepted by foundries, because they have a higher possibility of shell cracking. They do, however, offer two advantages. The first is strength and durability that allows the casting of thin wall structures, which is normally difficult to obtain with fragile wax patterns. Secondly, a better strength of these patterns allows for surface finishing operations to be carried out more easily.

## **4.7 Large Parts Exceeding Work Envelope of LM Machines**

### **4.7.1 Introduction**

The building envelopes of RP machines limit the size of parts that can be printed or grown. The need for large parts that exceed the printing envelope arises all the time. Parts can however be split into multiple sections and assembled after being built separately. Such parts need to conform to a certain level of strength, accuracy and surface finish, which makes the RP process a much more difficult task.

Substantial research has been done to determine the best ways in which a large part can be sliced into smaller sections [32, 44]. In theory one would like to develop various strategies to slice up these parts to allow for the highest accuracy, strength and surface finish after assembly. However, every part differs in size, geometry, complexity, wall thickness, undercuts, internal cavities etc. and therefore it is difficult to develop only one or a few slicing strategies.

The manner in which a large part is sliced, is mainly determined by the experience and proficiency of each rapid prototypist. The rest of the chapter will be used to explain some principles and develop some guidelines. Two examples are used for illustration purposes.



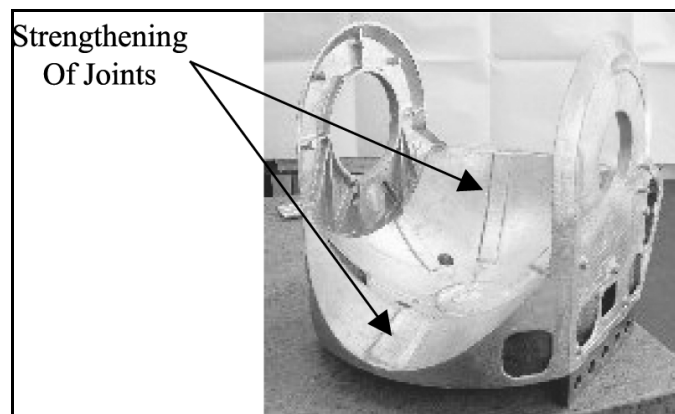
### 4.7.2 Guidelines for Slicing Parts

The parts have to be manually assembled and are therefore time consuming and prone to human error. The overall strength of a finished assembly must be as strong as possible. Cutting through thin sections should be avoided. Critical strength areas on the part should be identified and avoided when selecting cutting planes. An appropriate way to determine critical stress areas is to do a Finite Element Analyses (FEA) on the part. FEA packages can demonstrate the most stressed areas visually.

The following is an example of a Gimble  $\varnothing 350$  mm x 440 mm for the aerospace industry, built on a Z-Corp (Z402) printer. The dome part was sliced into 7 sections. Due to the natural rounded curve of each section, the sections easily distorts (deforms) during post wax infiltration. Ribs are added to close the geometry to prevent distortion during infiltration and they are removed prior to assembly (Figure 27, Figure 28) [32, 44].



**Figure 27 The Sections of a Gimble's Dome**



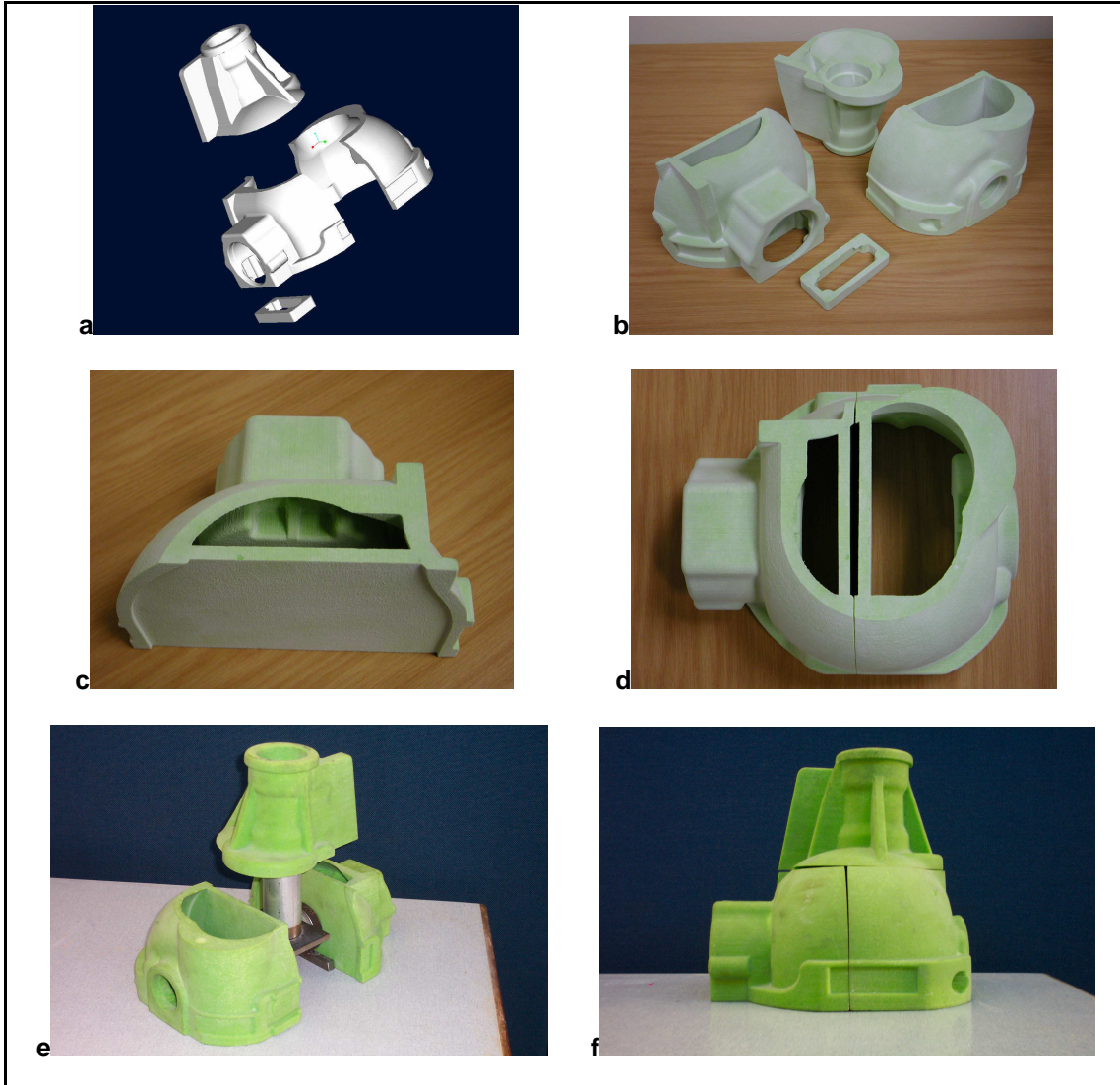
**Figure 28 Aluminium Casting of the Gimble**

The Gimble has a 3 mm wall thickness that caused a major challenge. A part with such a thin wall easily warps and increases the difficulty of aligning the sections afterwards. However,





constant wall thickness is ideal for casting. Having a constant thin wall over such a large part results in a complex assembly process, especially with accuracy requirements of  $\pm 0.2$  mm [44].



**Figure 29 IC Pattern for Differential Housing**

Figure 29 shows the four individual prints for a differential housing. The differential housing has a thicker wall thickness than the gimble, which made sections deform even more during wax solidification. In order to counteract the deformation, the geometry was closed by adding ribs (see Figure 29 photo (b), (c) and (d)).

Cutting planes must be selected in a way that ensures the minimum geometrical distortion and helps facilitate assembly.

Design for Assembly (DFA) principles can be used where applicable. The number of parts should be minimized where possible. Subassemblies should be created and each one should





be inspected and tested before continuing. Because the assembly direction should ease the assembly process, it is necessary to have a secure base part [45].

### **Guidelines Summarized**

The guidelines are influenced by the type of RP machine used. The summary is a short list of things to keep in mind when slicing parts.

- a. Use Design For Assembly (DFA) principles where applicable.
- b. Do not cut through critical stress areas.
- c. Avoid cutting through thin sections.
- d. Add support structures to sections if needed.
- e. Add ribs to help prevent deformation.
- f. Add webs to close open geometries to counteract distortion.
- g. Try selecting cutting planes to ensure the least amount of geometrical distortion.
- h. Try selecting cutting planes to facilitate the assembling of sections.
- i. Minimize the number of parts.
- j. Build on a secure base.



## 5. *Benchmarking*

### 5.1 *Introduction*

Effective benchmarking of rapid prototyped parts requires the use of a well-designed benchmark part and a standardized measuring methodology. A benchmark part for rapid prototyping should include a range of geometric features to test the capability of the different RP processes.

In the first part of this section the basic terminology used to describe dimensional and geometric accuracy, as well as statistical definitions, will be explained.

### 5.2 *Dimensional and Geometric Accuracy: Terms and Descriptive Statistics*

#### 5.2.1 **Descriptive Statistics [46, 47]**

- a. **Error Distribution Function (EDF)** is a **histogram** that plots the frequency of each size of error against the different sizes of errors. A histogram can be used to visually detect any abnormal observations like outliers or gaps in the data set. The EDF can furthermore be used to show if the errors are systematic or random. As long as the function is symmetric and centred around zero, meaning that half of the errors are positive and the other half negative, the error is random. Any shift from symmetry indicates the occurrence of a systematic error.
- b. **Mean:** In mathematical terms the mean is the overall sum off all the deviations divided by the number of observations.
- c. **Standard Error:** The standard error of an estimator is its standard deviation. Standard error depends on the sample size; the larger the sample size, the smaller the standard error. Standard errors reflect how much sampling fluctuation a statistic will show.
- d. **Median:** The median is the value where roughly half of the data are smaller and roughly half of the data are larger, reflecting the central tendency of the sample.



- e. **90th Percentile:** A percentile is a value on a scale of 100 that indicate the percent of a distribution that is equal to or lower than it. For example: from all the measurements taken, it can be stated that at least 90 % of the values will be within the required value reported.
- f. **Mode:** The mode is the value that most frequently occurs in the data set.
- g. **Standard deviation:** Standard deviation is a measure of the spread (or dispersion) of a set of data values. Standard deviation increases as the values spread wider apart.
- h. **Sample variance:** Sample variance is a measure of the spread (or dispersion) within a set of sample data. It is the square of the sample standard deviation. Variance is an unbiased estimator.
- i. **Kurtosis:** Kurtosis refers to the way in which the peakedness of the distribution is measured. Basically it measures the extent to which probability is concentrated around the mean and in the tails compared to a normal distribution. A normal distribution has a kurtosis coefficient of 3.
- Platykurtic            <3        Low peak and flat midrange distribution.
  - Leptokurtic           >3        High peak, thin midrange and fat tails distribution.
  - Mesokurtic            =3
- j. **Symmetry:** Symmetry refers to when the observation values are distributed in the same means above and below the middle of the sample.
- k. **Skewness:** Skewness refers to the phenomenon where values on the one side of the sample's data distribution are further from the middle than the values on the other side. Skewness is also defined as asymmetry in the distribution of the values. Positive values for skewness indicate that the distribution is hanging over to the left and negative values that the distribution is hanging to the right.
- l. **Range:** The range is the difference between the largest and smallest value of all the observations in the sample. It is also an indicator of variability that is used to characterize the dispersion among the measures in a given population.
- m. **Minimum:** The minimum is the smallest value in the group of values.
- n. **Maximum:** The maximum is the largest value in the group of values.



- o. **Sum:** The sum is the addition of all the values in a sample, and also takes the sign of each value into account.
  
- p. **Count:** The count is the number of values in the sample.
  
- q. **Confidence interval:** A confidence interval gives an approximate range of values which is likely to include the unknown population parameter. By taking independent samples repeatedly, a certain percentage of the samples will contain the specified parameter. The width of the interval gives an indication of how unsure we are about the unknown parameter.
  
- r. **Confidence level:** The confidence level is associated with the confidence interval and is the possibility that the interval, that will result once data are collected, will contain the corresponding parameter. It is usually expressed as a percentage.

#### **ANOVA Analysis (Single Factor)**

ANOVA single factor analysis is used to perform a simple analysis of variance on data for two or more samples. "The analysis provides a test of the hypothesis that each sample is drawn from the same underlying probability distribution against the alternative hypothesis that underlying probability distributions are not the same for all samples" [48].

The hypothesis should be rejected if  $F$  is larger than  $F_{crit}$ , or if the P-value is smaller than the alpha ( $\alpha = 0.05$ ) value.



### 5.2.2 Accuracy Related Terms

The following are definitions obtained from ISO and MAHR [48, 49].

Type	Description	Symbol	Diagram
<b>Perpendicularity</b>	The tolerance zone is limited in the measuring plane by two parallel, straight lines a distance $t$ apart and perpendicular to the datum.		
<b>Roundness</b>	The tolerance zone is limited in the measuring plane perpendicular to the axis by two concentric circles a distance $t$ apart.		
<b>Cylindricity</b>	The tolerance zone is limited by two coaxial cylinders a distance $t$ apart.		
<b>Straightness</b>	The tolerance zone is limited in the measuring plane by two parallel straight lines a distance $t$ apart.		
<b>Flatness</b>	The tolerance zone is limited by two parallel planes a distance $t$ apart.		
<b>Parallelism</b>	The tolerance zone is limited in the measuring plane by two straight lines a distance $t$ apart and parallel to the datum.		
<b>Angularity</b>	The tolerance zone is limited by two parallel planes a distance $t$ apart and inclined at the specified angle to the surface.		
<b>Concentricity/Coaxiality</b>	The tolerance zone is limited by a cylinder of diameter $t$ , the axis of which coincides with the datum axis.		
<b>Profile of a line</b>	The tolerance zone is limited by two lines enveloping circles of diameter $t$ , the centres of which are situated on a line having the true geometrical form.		



<p><b>Profile of a surface</b></p>	<p>The tolerance zone is limited by two surfaces enveloping spheres of diameter <math>t</math>, the centres of which are situated on a surface having the true geometrical form.</p>		
<p><b>Symmetry</b></p>	<p>The tolerance zone is limited by two parallel planes a distance <math>t</math> apart and symmetrically disposed to the median plane with respect to the datum axis or datum plane.</p>		
<p><b>Conicity</b></p>	<p>The tolerance zone is limited in the measuring plane by two straight lines a distance <math>t</math> apart and parallel to the datum. Not the measured profile, but that section of the reference straight line calculated according to <b>LSS</b> which is restricted to the measuring length shall be contained within the tolerance zone. (LSS = Least Square Straight line)</p>		
<p><b>True Position</b></p>	<p>If the tolerance value is preceded by the sign <math>\perp</math>, the tolerance zone is limited by a cylinder of diameter <math>t</math>, the axis of which is in the theoretically exact position of the tolerated line.</p>		
<p><b>Runout (Radial)</b></p>	<p>The tolerance zone is limited in the measuring plane perpendicular to the axis by two concentric circles a distance <math>t</math> apart, the common centre of which lies on the datum axis.</p>		
<p><b>Total Runout (Total Axial)</b></p>	<p>The tolerance zone is limited by two parallel planes a distance <math>t</math> apart and perpendicular to the datum axis.</p>		
<p><b>Squareness</b></p>	<p>See Perpendicularity</p>		

**Table 5 Geometric Tolerance Descriptions** [48, 49]



### 5.3 Surface Quality

There are two main reasons for measuring surface finish. In the first place it helps to forecast the performance of machined parts like pistons and secondly it also helps to control manufacturing processes.

According to Campbell et al. [50] a surface consists of three basic components: the form, its waviness and its roughness. On a turned part, form is the result of errors in the way the lathe produces a part, commonly known as straightness errors, and waviness is a result of various vibrations, both in the machine tool and from outside sources. Roughness, on the other hand, is the result of feed-rate tool geometry, tool condition, and variations in material and hardness.

Two basic methods of measuring or gauging a surface finish exist. The first method is based on the discernment of the individual, where the individual will use his eyes and fingers to compare the work piece to a “representative sample”, “a surface finish tablet that has various finish standards imbedded” [51]. This method is low-cost, but individual readings will differ.

The second method uses a surface tracing machine that automatically pulls a stylus over the surface and measures waviness and roughness. The machine can be expensive and is very sensitive to its surroundings. There are also a third group of methods that apply optics to measure surface finish [51].

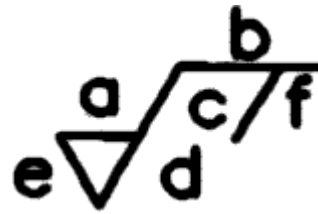
Surface quality can be measured in multiple ways and is presented by various parameters. Each parameter differs from the next and sometimes more than one parameter is used to adequately describe a surface. The most frequently used parameter is  $R_a$  (Arithmetic Average Roughness), which resembles the average roughness measured from a centre line. “ $R_a$  is not a good discriminator for different types of surfaces as it is incapable of differentiating between “spiky” and “scratched” surfaces having the same  $R_a$ . Additional parameters should be specified for this purpose, such as  $R_p$  (Maximum Peak Height),  $R_v$  (Maximum Valley Depth) and  $R_y$  (Maximum Peak-to-Valley Roughness Height)” [50].

Surface finish is denoted by the following symbol and can specify several other things than only surface roughness. Roughness grade numbers can also be used to denote surface finish as it can be seen in

Table 6 (ISO standard 1992) [52, 53].  $R_a$  is usually given in  $\mu in$  or  $\mu m$ . Surface testers must be periodically calibrated to ensure accuracy.



Roughness values <i>Ra</i>	Roughness Grade Numbers
$\mu\text{m}$	
<b>50</b>	<b>N12</b>
<b>25</b>	<b>N11</b>
<b>12.5</b>	<b>N10</b>
<b>6.3</b>	<b>N9</b>
<b>3.2</b>	<b>N8</b>
<b>1.6</b>	<b>N7</b>
<b>0.8</b>	<b>N6</b>
<b>0.4</b>	<b>N5</b>
<b>0.2</b>	<b>N4</b>
<b>0.1</b>	<b>N3</b>
<b>0.05</b>	<b>N2</b>
<b>0.025</b>	<b>N1</b>

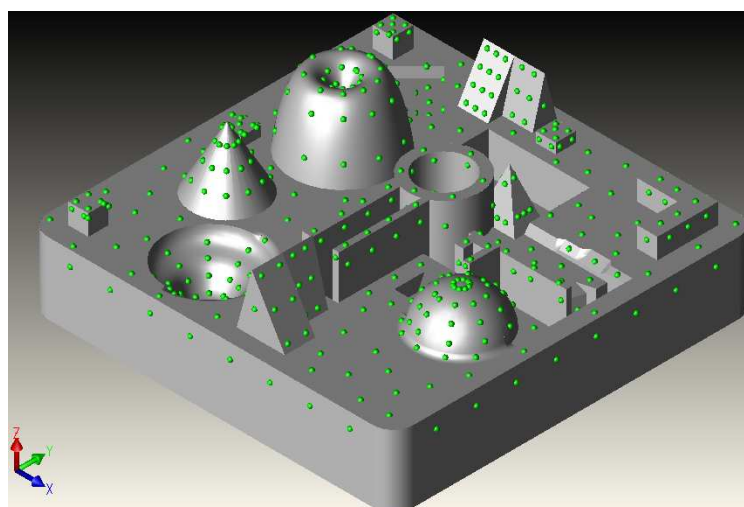


- a – Roughness value (*Ra*)
- b – Production method, treatment, coating, etc.
- c – Sampling length (cut-off)
- d – Direction of lay
- e – Minimum material removal
- f – Roughness value other than *Ra* preceded by its symbol, (e.g. *Ry* 1.2)

**Table 6 Roughness Grade Numbers [52, 53]**

### 5.4 Euro Benchmark Part

The part used for benchmarking can be seen in Figure 30. It was designed within tooling projects from the FP6 Framework of the EC and used for similar studies [54]. The dies will represent an exact negative of the pattern, but will include a shrinkage allowance for the investment casting wax to be used. Wax patterns from the dies will be evaluated in order to determine the suitability of the dies for creating investment casting patterns.



**Figure 30 Benchmark Part**





Basic description of part:

<b>Size</b>	Medium
<b>Dimensions</b>	150x150x25 base
<b>Features Incorporated</b>	Spherical, Cone, Pyramid, Squares, Cylindrical, Triangles, Thin wall, Square holes etc.
<b>Complexity of measurement</b>	Straightforward using CMM programmed measurements

A range of features will be measured according to certain geometric tolerances. The range of feature measurements is marked in Figure A, Figure B and Figure C in Appendix A. Each feature incorporated on the benchmark part has a certain purpose for the benchmarking process and is used to measure specific tolerances. Table 7 lists the various features on the benchmark part and the purposes of each of them. The same features will be measured on LM patterns, LM dies and wax patterns from LM dies.

Feature	Purpose	Quantity and Nominal size
<b>Cubes</b>	Straightness, repeatability, linear accuracy	2 (8 x 8 x 8 mm ) 2 (8 x 8 x 4 mm ) (Half-Cube)
<b>Rectangular protrusion</b>	Perpendicularity, linear accuracy	1 (25 x 8 x 8 mm)
<b>Pyramid</b>	Angularity, accuracy	1 (12 x 17 x 20 mm)
<b>Sphere (half)</b>	Symmetry, repeatability of a constantly changing sloping profile, axial runout, radial runout	1 (ø35 mm)
<b>Cone</b>	Constant sloping profile, taper, axial runout, radial runout, symmetry	1 (ø30 x 26 mm)
<b>Free-form (conical)</b>	Non-constant sloping profile, axial runout, radial runout, symmetry	1 (ø40 x 30 mm)
<b>Free-form (sinkhole)</b>	Non-constant sloping profile, axial runout, radial runout, symmetry	1 (ø30 x 20 mm)
<b>Wedges</b>	Angularity	(X direction 20 x 20 mm) (Y direction 20 x 25 mm)
<b>Rectangular Hole</b>	Perpendicularity,	1 (25 x 8 x 5 mm)
<b>Cylindrical Hole/ Hollow Cylinder</b>	Concentricity, circularity, accuracy	1 (ø30 x ø20 x 27 mm)
<b>Triangular Hole</b>	Angularity, perpendicularity	1 (10 x 8 x 4 mm)
<b>Flat Thin Walls</b>	Parallelism, thickness	1 (35 x 27 x 5 mm) 1 (35 x 27 x 3 mm)
<b>Square base</b>	Flatness, straightness, parallelism	1 (150 x 150 mm )
<b>Mechanical Features</b>	Competence of machine to build particular features ( <b>Visual Inspection</b> )	Free-form, Chamfer, Fillet
<b>Yes/No Features</b>	Machines ability to build certain features ( <b>Visual Inspection</b> )	Small triangular hole, Small cross-shaped hole, Thin walls

**Table 7 Purpose of Each Feature**



Table 8 lists all features and the type of tolerances to be measured. Using standardized measurement techniques on the same benchmark part can decrease variability between the measurement results of the various layer manufactured parts.

Tolerance No.	Feature	Tol. Element Name	2 <sup>nd</sup> Element Name	Type of Tolerance
A1–A16	See Drawings	Line	Point	Distances
B1–B2	See Drawings	Line	Point	Distances
C1–C6	See Drawings	Line	Point	Distances
CC3-CC5	See Drawings	Line	Point	Distances
D1-D5	See Drawings	Line	Point	Distances
D5	See Drawings	Line	Point	Distances
E1-E12	See Drawings	Line	Point	Distances
EE1-EE3	See Drawings	Line	Point	Distances
AA1	Wedge X-direction	Line	Line	Angularity
AA2	Wedge X-direction	Line	Line	Angularity
AA3	Wedge X-direction	Line	Line	Angularity
BB1	Wedge Y-direction	Line	Line	Angularity
BB2	Wedge Y-direction	Line	Line	Angularity
BB3	Wedge Y-direction	Line	Line	Angularity
CC1	Pyramid	Line	Line	Angularity
CC2	Pyramid	Line	Line	Angularity
DD1	Pyramid	Line	Line	Angularity
DD2	Pyramid	Line	Line	Angularity
T1	Triangular Hole	Line	Line	Perpendicularity
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity
T5	Square Base	Plane		Flatness
T6	Square Base	Left_Side	Bottom Side	Perpendicularity
T7	Square Base	Top_Side	Right Side	Perpendicularity
T8	Square Base	Left_Side	Right Side	Parallelism
T9	Square Base	Top_Side	Bottom Side	Parallelism
T10	Thin Walls	Line	Line	Parallelism
T11	Thin Walls	Line	Line	Parallelism
T12	Thin Walls	Line	Line	Thickness
T13	Thin Walls	Line	Line	Thickness
T14	Cube's 2,3,1	Cube 2, 3, 1		Straightness
T15	Cube's 1, 4, Rect.Protrusion	Cube 1,4, Rect.Protrusion.		Straightness
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity



T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element
T24	Cone	Cone Bottom Circle	Cone	Circular runout
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout
T29	Cone	plane_2	Cone	Axial runout
T31	Cone	Cone	plane_2	Symmetry tol. axis element
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element
T33	Cone	Cone	plane_2	Angularity
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality
T36	Cone	Cone	Actual Cone Axis	Coaxiality
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout
T38	Sphere	Sphere Bottom Circle	Theoretical Sphere Axis	Circular runout
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout
T58	Dome	plane_2	Actual Dome axis	Axial runout
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element
T67	Dome	plane_2	Actual Dome axis	Perpendicularity
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout
T71	Sinkhole	Sinkhole Upper Circle	Actual Sinkhole Axis	Circular runout
T72	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout



T73	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout
T74	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout
T79	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element
T81	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element
T82	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element
T84	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity
T85	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality
T86	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity

**Table 8 Feature and Tolerance Measurements**

### 5.5 Evaluation Methodology

A layout of the methodology ensures that the same procedure is followed to evaluate and study each part. The CMM machine used is a Mitutoyo Bright 710 with a calibrated accuracy of 5 $\mu$ m and volumetric accuracy of 6.1 $\mu$ m.

#### Basic CM Machine Procedure:

- a) Switch on all the equipment and start up the software.
- b) Mount the calibration ball on the CMM table.
- c) Insert the 2x20 probe.
- d) Select the calibration program, select the 2x20 probe and select the calibration angles needed.
- e) Manually select 1 point on top of the calibration ball.
- f) The program automatically runs the machine and calibrates the probe at all selected angles.
- g) Save the calibration settings.
- h) Remove the calibration ball from table and make sure the table is clean.

#### Part Measurement

Two measurement programs are pre-written to measure each part. Hereby the consistency of measurements is ensured, because the same point on each part is measured. The first program basically consists of  $\pm 600$  measured coordinate points on each part which is used to perform a statistical analysis. Statistica 7 Software is employed to do an ANOVA analysis. The software compares (Mitutoyo COSMOS V1.5. and 3D-Tol V2.4.R9) the points measured to the original CAD model of the part and calculates the differences in the x, y and z directions. The second program measures various distances, angles and tolerances, all used to do various tolerance evaluations.



#### Basic Part Setup and Measurement Procedure:

- a. Mount the part to the CMM table using a glue gun.
- b. Select and start-up the program.
- c. Manually select the x and y direction of the part.
- d. Manually select the z plane.
- e. Manually select the cylinder centre as the zero point of all axes.
- f. The program then automatically measures each point as programmed.
- g. The program written automatically calculates a 'Best Fit' for the data.
- h. A manual 'Best Fit' can also be done after the program finishes.
- i. Save the final data (data can be exported to an excel file).

To help evaluate the data, a DAI (Dimensional Accuracy Index) is created for each part measured. An arbitrary upper and lower tolerance was set at +0.5 mm and -0.5 mm respectively. The tolerance is used to determine a certain level of accuracy for the purpose of determining the capability of each of the LM manufacturing processes (Table 9). The DAI is only an estimation method used to determine the dimensional accuracy of a part as a percentage. The descriptive statistics indicate how accurate the part statistically is. The descriptive statistics and ANOVA analysis should be used for final decision making of part accuracy.

Rating	Tolerance	
High	> 0.5	Outside tolerance
Good	> -0.5 and < 0.5	Inside tolerance
Low	< -0.5	Outside tolerance

**Table 9 Dimensional Accuracy Index Tolerances**

Each 'good' measurement can be seen as successful and the total number of successes determines the percentage of successfulness, namely the dimensional accuracy index.

$$DAI = \frac{Good}{Total} \times 100\%$$

#### Basic Data Usage Procedure

- a. Extract the data and organize it in an Excel sheet.
- b. Use Excel and Statistica 7 to calculate basic statistical values.
- c. Create an error distribution function (EDF) of the data (histogram).
- d. Analyze the statistical (Statistical Accuracy) and tolerance data and compare it to previous parts measured.



- e. Calculate the DAI for each part and compare them to other parts. (Dimensional Accuracy)
- f. Do an ANOVA analysis of the statistical data.
- g. Use the statistical analysis and ANOVA analysis for final accuracy decisions.

#### Surface Quality Measurement Procedure

- a. Switch the surface tester on.
- b. Calibrate the machine.
- c. Select  $R_a$  and a Cut-off length on the machine.
- d. Place the machine on a surface to be tested, making sure that the bottom surface of the machine is securely placed on a surface.
- e. Start the machine and take measurement.
- f. Repeat the measurements for various features and log.

#### Wax Injection Moulding Procedure (Schott 20 Ton Injection Machine)

- a. Switch the machine on.
- b. Make sure that the wax level is sufficient.
- c. Check the wax temperature.
- d. Align nozzle height with die injection point.
- e. Adjust clamping force, and all other variables.
- f. Spray core and cavity with silicone release agent.
- g. Ensure the die is properly closed and aligned.
- h. Push die in front of injection nozzle.
- i. Push both starting buttons at the same time and wait till the digital screen indicates the seconds counting.
- j. Open the die slowly.
- k. Use compressed air to remove pattern.



## 6. *Suitability of Layer Manufactured Patterns for Investment Casting*

### **6.1 Rapid Pattern Making - Evaluation Results and Discussion**

The benchmark pattern was built on three LM machines, namely a 3D-Printer (Z-Corp), LS (EOS P380) and a ThermoJet. The 3DP patterns were printed in August 2006 and the LS and ThermoJet patterns in August 2007. The same 3D-Tol and features program on the coordinate measuring machine was used for every pattern in this thesis.

#### **6.1.1 Patterns Built with Three Dimensional Printing**

##### **Statistical Observations**

Initially (in August 2006), three patterns with varying wall thickness namely a 2 mm, 3 mm and a 4 mm part, were printed with the 3D-Printer. The process involves printing the patterns in a starch based material and then infiltrating them with surgical wax. The 2 mm pattern collapsed during wax infiltration, because it was not strong enough to carry the weight of the wax. Measurements were therefore only done on the 3 mm and 4 mm pattern. A slight sagging around the centre of the 3 mm pattern can also be observed. Measurements was taken in August 2006 and again in August 2007 (on the same patterns, no new patterns were printed).

The Error Distribution Function (EDF), a histogram, lends itself as a quick visual summary of all the errors. Observations were made from the EDF and the list of descriptive statistics based on the new data (August 2007). The old data (August 2006) is only stated to indicate the duration stability of the patterns; however this is not very important for IC because castings are usually made shortly after pattern making. All analysis is based on the new data.

The histograms and medians illustrate that the error distributions are generally centered around zero, indicating that the errors are random and not systematic. The median is an indicator of the central tendency with -0.02 mm for the 3 mm pattern and 0.0705 mm for the 4 mm pattern.

Standard errors reflect how much sampling fluctuation a statistic will show. The standard error of a statistic also depends on the sample size. For instance, the larger the sample size is, the smaller the error will be. Confidence intervals are constructed using standard errors. Both the 3 mm and 4 mm pattern have very small standard errors, indicating that the sample size used is sufficient to support the results with good confidence.



Skewness exhibits small positive values for both patterns meaning that both distributions are slightly hanging over to the left, indicating that the patterns are slightly smaller than the original CAD model. The 3 mm pattern has a larger positive skewness than the 4 mm pattern; this is mainly due to slight sagging near the centre of the 3 mm pattern during the wax infiltration.

Both patterns have kurtosis values lower than 3, meaning that their distributions are considered platykurtic. Platykurtic indicates that the distributions have low peaks and flat midranges. The largest and smallest measured values are 1.46 and -1.73 respectively for the 3 mm pattern and 1.534 and -1.773 respectively for the 4 mm pattern.

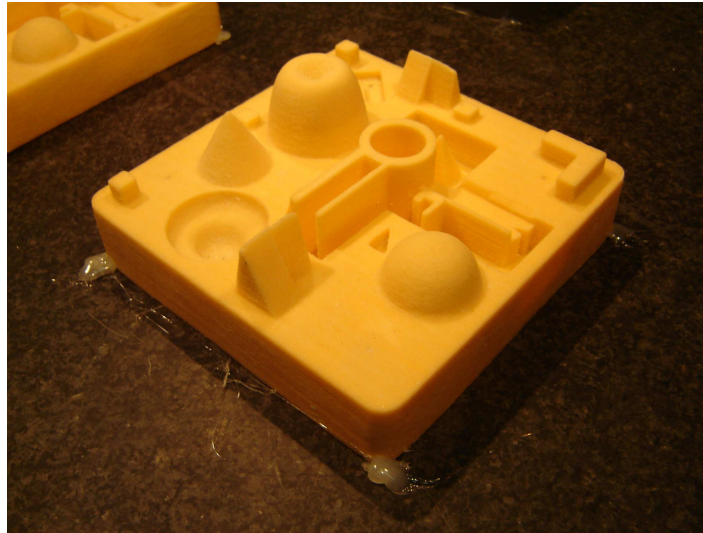
Table 10 illustrates the difference in the values of the descriptive statistics. The main reason for this change in values is due to the deterioration of patterns over time, concluding poor duration stability. Patterns shrink and deform over the course of time (Figure 31, Figure 32). Coordinate setup, machine calibration, humidity and temperature also influence the values of measurements over the course of time.

The large difference in range and maximum values for the Aug-06 measurements can be explained due to the fact that the patterns are printed larger than the required size and then shrunk to size during the drying process in an oven. The pattern size is monitored with a vernier caliper until approximately the correct size is achieved and then wax infiltrated. This manual monitoring is prone to error and hence the difference between the 3mm and 4mm patterns. The large difference in the mode values of the Aug-07 measurements is also due to the shrinking and infiltration process as described above.

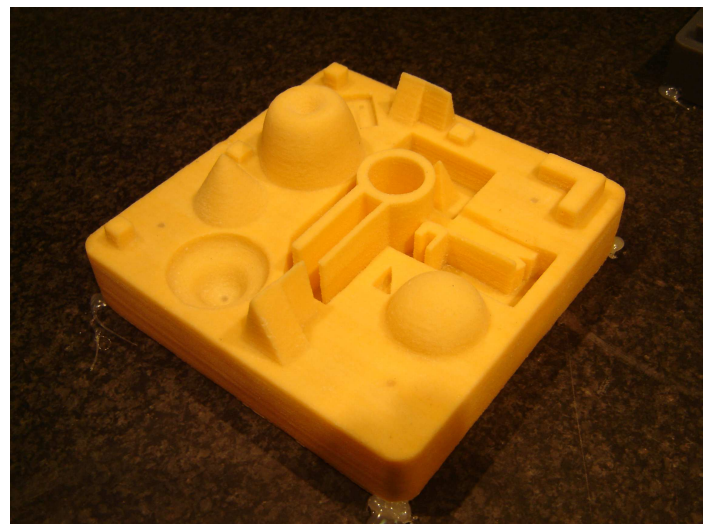
Statistics	Aug-06			Aug-07		
	3mm	4mm	Better Option	3mm	4mm	Better Option
Mean	-0.1443	0.0754	4mm	0.0074	0.1198	3mm
Standard Error	0.0365	0.0163	4mm	0.0218	0.0250	3mm
Median	-0.1940	0.0670	4mm	-0.0200	0.0705	3mm
Mode	0.0990	0.1580	4mm	-0.0230	1.1040	3mm
Standard Deviation	0.8319	0.3716	4mm	0.4990	0.5706	3mm
Sample Variance	0.6921	0.1381	4mm	0.2490	0.3256	3mm
Kurtosis	-0.8493	-0.7683	4mm	0.1795	-0.2784	3mm
Skewness	0.2791	0.0007	4mm	0.0936	0.1951	3mm
Range	3.6440	1.7970	4mm	3.1900	3.3070	3mm
Minimum	-1.6990	-0.9050	4mm	-1.7300	-1.7730	3mm
Maximum	1.9450	0.8920	4mm	1.4600	1.5340	3mm
Sum	-75.0590	39.1830	4mm	3.8450	62.5200	3mm
Count	520	520		522	522	
Largest(1)	1.9450	0.8920	4mm	1.4600	1.5340	3mm
Smallest(1)	-1.6990	-0.9050	4mm	-1.7300	-1.7730	3mm
Confidence Level(95.0%)	0.0717	0.0320	4mm	0.0429	0.0491	3mm

**Table 10 3DP Statistics**





**Figure 31 Pattern - 3DP 3mm**



**Figure 32 Pattern - 3DP 4mm**

Table 11 and 12 depicts the descriptive statistics and the error distribution for each pattern. Results of the measured tolerances are shown in Table 13 and 14. All CMM statistical measurements for the patterns can be found in Appendix D.

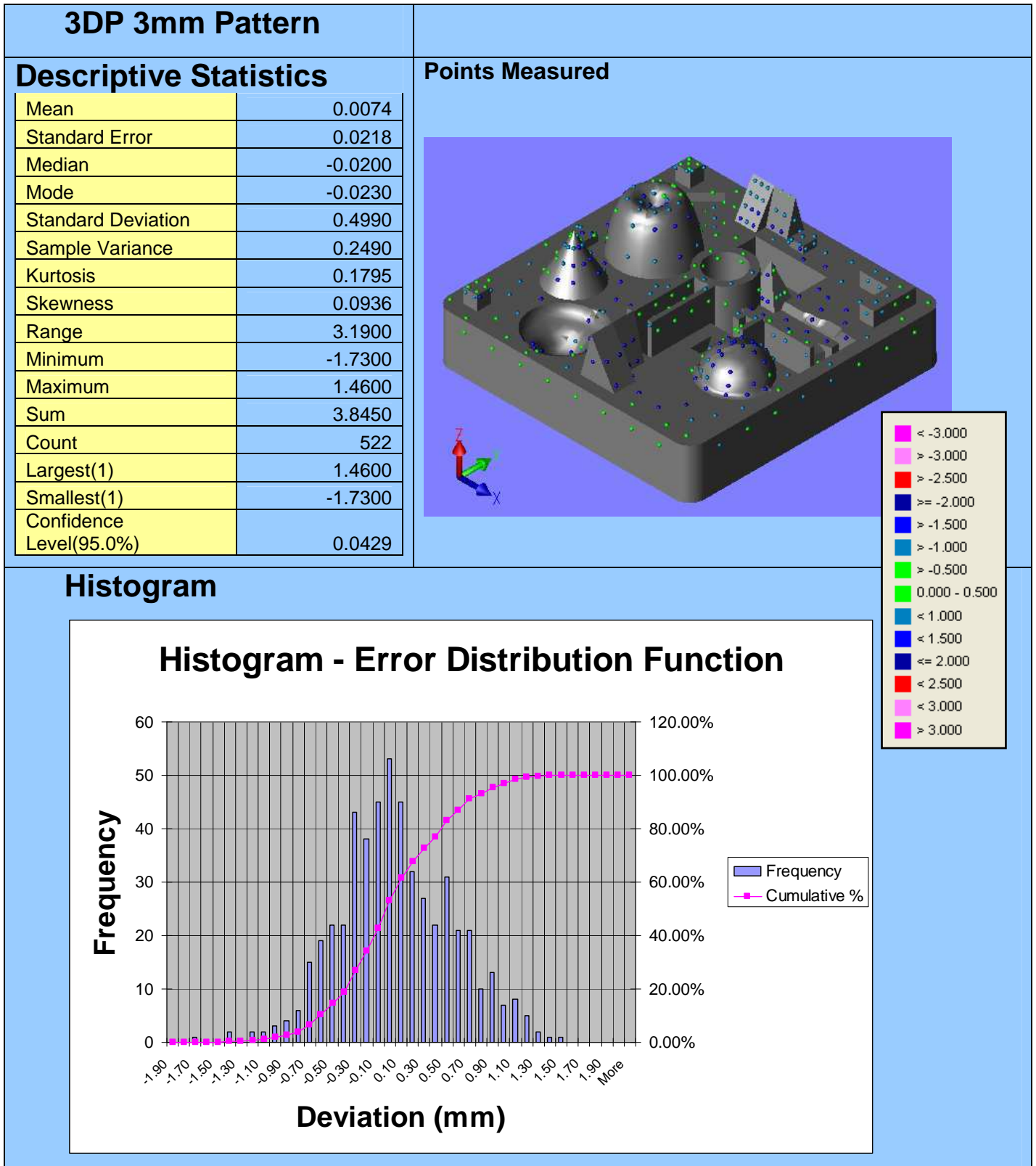


Table 11 Descriptive Statistics – 3DP 3mm

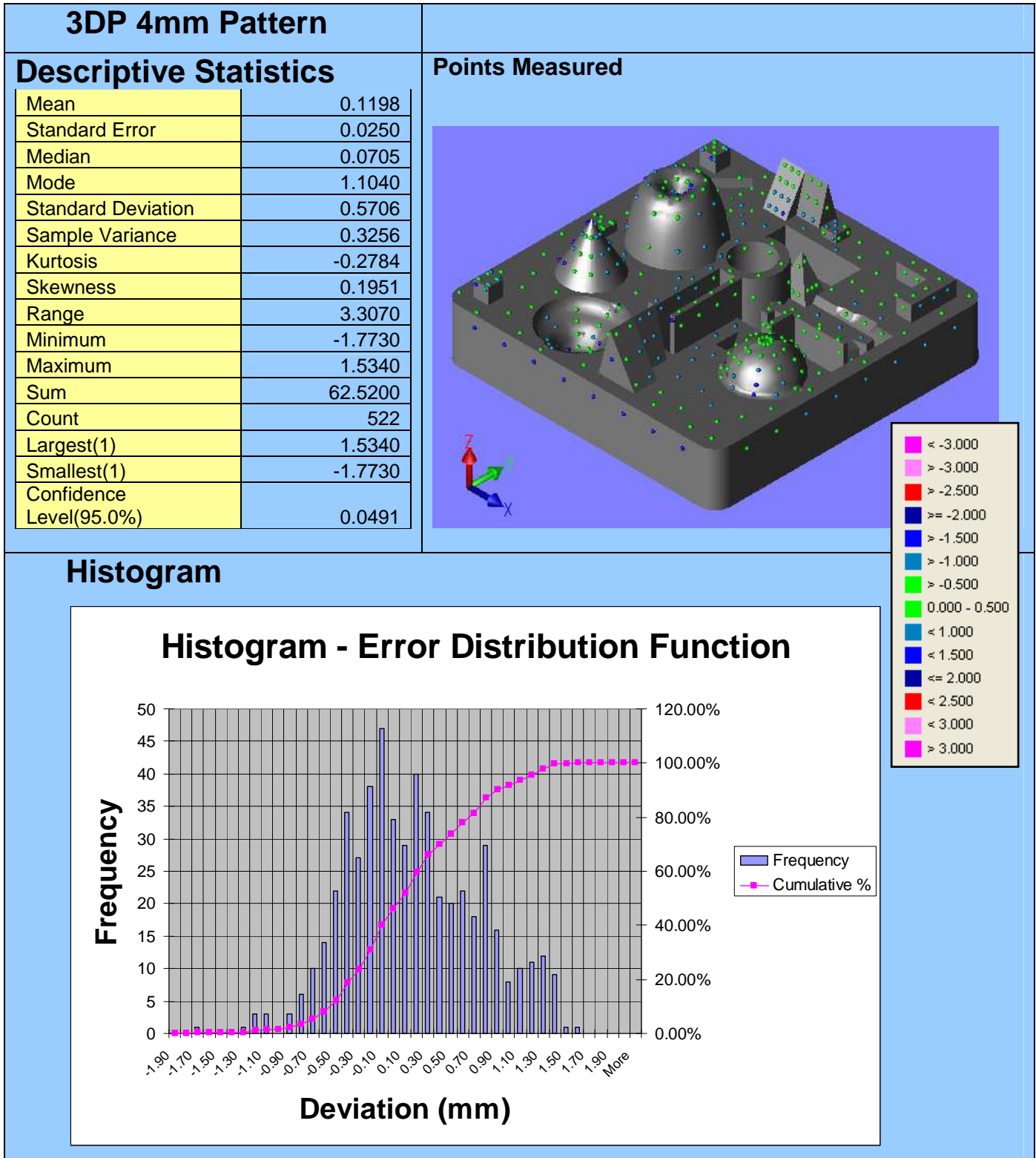


Table 12 Descriptive Statistics – 3DP 4mm



Feature Tolerances - 3DP Pattern 3mm										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	61.195	2.275	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.350	-0.190	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.823	-0.277	Good
A4	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	25.517	0.267	Good
T81	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	1.129	1.129	High
T82	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.314	0.314	Good
T84	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	2.808	2.808	High
T85	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	2.195	2.195	High
T86	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.842	0.842	High

**Table 13** Geometric Observations - 3DP 3mm  
 (This is only an extract; see Appendix C for the full table)



Feature Tolerances - 3DP Pattern 4mm										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	61.453	2.533	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.976	0.436	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	2.252	0.152	Good
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	25.826	0.576	High
T81	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	1.614	1.614	High
T82	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.243	0.243	Good
T84	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	1.403	1.403	High
T85	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	2.686	2.686	High
T86	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.352	0.352	Good

**Table 14** Geometric Observations – 3DP 4mm  
 (This is only an extract; see the Appendix C for the full table)



A basic tolerance of  $\pm 0.5$  mm is used for all feature measurements on all patterns. A theoretical axis and an actual axis for the dome, cone, sphere and sinkhole features are created in order to measure various tolerances.

### **Analysis of the built features (3DP)**

#### *Cubes*

The cubes were used to check for straightness in the  $x$  and  $y$  direction, by checking if they were printed in a straight line. The highest straightness deviation was 0.411 mm in the  $x$  direction. The overall sizes of all cubes on both patterns are within tolerance except for two measurements with a deviation of -0.513 mm in the  $x$  direction and -0.656 mm in the  $z$  direction, both on cube 3 of the 3 mm pattern.

#### *Wedges*

Tolerance A8 (wedge  $x$ ) for both patterns are out of tolerance with the highest value 1.005 mm on the 3 mm pattern. Tolerance E2 (wedge  $y$ ) is slightly out of tolerance for the 4 mm pattern with a deviation of 0.599 mm. All other sizes are within tolerance. All angles on wedge  $x$  is out of tolerance with the highest deviation reaching 2.536 mm on the 3 mm pattern. Tolerance BB2 (angularity) of wedge  $y$  on both patterns are also out of tolerance. All other wedge  $y$  angles are within tolerance.

#### *Pyramid*

Angularity on the 3 mm pattern is very poor with only one angle within tolerance, the highest deviation reaching -2.228 mm. Angularity on the 4 mm pattern is also poor with the highest deviation reaching -1.921 mm.

#### *Cylinder*

Good cylindricity and concentricity is exhibited by both patterns, all within the  $\pm 0.5$  mm tolerance.

#### *Square Base*

Both patterns are larger in the  $x$  and  $y$  directions with nearly all deviations exceeding 1 mm. The reason for this larger size is due to the oven-enhanced shrinking process of the patterns to obtain the correct size and then infiltrating with wax. The slightest timing error in this shrinkage process can cause over- or undersized patterns. Parallelism and perpendicularity for both patterns are good in the  $x$  and  $y$  directions. A flatness of 2.889 mm for the 3 mm pattern is caused by sagging of the pattern due to the wax infiltration process. The 4 mm pattern showed little sagging in the middle with a flatness of 0.778 mm.

#### *Thin Walls*

Parallelism for the 3 mm pattern is poor due to sagging near the centre. Tolerance EE2 and EE3 (Actual Thickness of walls) is well within tolerance for both patterns. The line-to-line



thicknesses of the thin walls are slightly out of tolerance on the 3 mm pattern, caused by slight warpage of the walls due to sagging.

#### *Rectangular Protrusion/Hole*

Perpendicularity for the protrusions on both patterns is out of tolerance but the overall sizes are all within tolerance in the x, y and z directions, except for one distance in the x direction on the 4 mm pattern with a deviation of 1.976 mm.

Perpendicularity for the rectangular holes is within tolerance except for one deviation of 0.613 mm. The overall sizes are all in tolerance except for one distance at 45° to the x direction on the 4 mm pattern with a deviation of 0.752 mm. The z direction-distances (depth) are also below the 0.5 mm tolerance.

#### *Cone*

Both cones exhibit very good symmetry. The cones on both patterns have good circular runouts in terms of the circles measured around the cone and also when using the cone's actual axis as reference. Very poor circular runout is obtained when the theoretical axis is used as reference. Looking at coaxiality between the actual and theoretical axis of the cones, a clear discrepancy can be seen. The coaxiality of the theoretical axis is far out of tolerance with a deviation of 2.235 mm for the 3 mm pattern and 3.213 mm for the 4 mm pattern. Analysing the raw data it turns out that the coaxiality deviation is mainly in the x direction.

The cones exhibit good axial runouts around the cone axes, but extremely poor axial runouts when using the plane as reference element with deviations of 6.704 mm for the 3 mm pattern and 4.466 mm for the 4 mm pattern. It can be concluded that sagging caused the discrepancy between axes.

#### *Sphere*

Both spheres have bad symmetry when using the plane as reference element with a deviation of 6.944 mm for the 3 mm pattern and 3.636 mm for the 4 mm pattern. The spheres on both patterns have reasonable circular runouts in terms of circles measured around the sphere, but are out of tolerance when using the theoretical axis as reference element. Looking at coaxiality between the actual and theoretical axis of the spheres, a discrepancy can be seen with a deviation of 1.339 mm for the 3 mm pattern and 1.184 mm for the 4 mm pattern. Analysis of the raw data indicates that the deviation is mainly in the x direction.

The spheres present poor axial runouts around the sphere axes with a deviation of 1.368 mm for the 3 mm pattern and 5.215 mm for the 4 mm pattern when using the theoretical axes. It can be concluded that sagging is the cause of the discrepancies.





*Dome*

Both domes present very good circular runouts. Symmetry is slightly out of tolerance for the 3 mm pattern with a deviation of 0.688 mm. Perpendicularity and concentricity for the 3 mm pattern is out of tolerance with deviations of 1.592 mm and 0.892 mm. Axial runout around the domes axes is far out of tolerance with a deviation of 7.958 mm for the 3 mm pattern and 2.374 mm for the 4 mm pattern. The dome is the tallest feature on the benchmark pattern and the discrepancies on the 3 mm pattern can be explained by the sagging at the centre of the pattern.

*Sinkhole*

Both sinkholes exhibit good circularity when using the actual sinkhole axes, but function very poorly when using the theoretical axis as reference element. The maximum circular runout reaches a deviation of 3.171 mm on the 4 mm pattern (tolerance T72). The axial runout is out of tolerance for both patterns with a deviation of 0.909 mm for the 3 mm pattern and 1.176 mm for the 4 mm pattern (using the theoretical axis as reference element). Symmetry is out of tolerance for both patterns when using the theoretical axis as reference element.

Perpendicularity for both patterns is also out of tolerance with a deviation of 2.808 mm for the 3 mm pattern and 1.403 for the 4 mm pattern.

Looking at coaxiality between the actual and theoretical axis of the sinkholes, a discrepancy is observed with a deviation of 2.195 mm for the 3 mm pattern and 2.686 mm for the 4 mm pattern. Analysing of the raw data indicates that the deviation is mainly in the x direction.

It can be concluded that sagging is the cause of the discrepancies between axes, which causes most of the far out-of-tolerance deviations.

DAI - 3DP Pattern 3mm					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				50.00%
	High	Good	Low	Total	
	54	60	6	120	

DAI - 3DP Pattern 4mm					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				63.78%
	High	Good	Low	Total	
	45	81	1	127	

**Table 15 DAI - 3DP 3&4mm**

A best-fit is done at the end of each measurement program to ensure that the best measurement values are obtained. The dimensional accuracy index for the new data, based on various features and their tolerances measured shows that the 4 mm is dimensionally more accurate with a DAI of 63.78 % compared to the DAI of 50 % for the 3 mm pattern (Table 15). However, after evaluating the newly measured descriptive statistics, it can be concluded that the 3 mm pattern is statistically superior to the 4 mm pattern.





## 6.1.2 Pattern Built with Selective Laser Sintering

### Statistical Observations

Selective Laser Sintering (EOS P380 machine) was used to build a pattern in polystyrene. The pattern is given a wax coating for final finishing. Visual inspection signifies a very good pattern with high definition, especially on sharp edges and corners (Figure 33).

Observations were made from the EDF and the list of descriptive statistics. The CMM measurements can be found in Appendix D.

The histogram and median indicate that the error distribution is generally centered around zero, illustrating that the errors are random and not systematic. The median is an indicator of the central tendency with a value of -0.046 for the pattern.

The polystyrene pattern has a small standard error of 0.0049, indicating that the sample size used is more than sufficient to support the results. Sampling fluctuation is therefore very small for these statistics.

Skewness shows a small negative value of -0.078 for the pattern, meaning that the distribution is slightly hanging over to the right, indicating that the pattern is larger than the original CAD model.

The polystyrene pattern has a kurtosis value of 4 – because it is higher than 3, it means that the distribution is considered leptokurtic. Leptokurtic indicates that the distribution have a high peak with a thin midrange and flat tails. The largest and smallest measured values are 0.307 mm and -0.428 mm respectively for the pattern.



**Figure 33 Pattern - LS 3mm**

Table 16 depicts the descriptive statistics and the error distribution the pattern. Results of the measured tolerances are shown in Table 17.

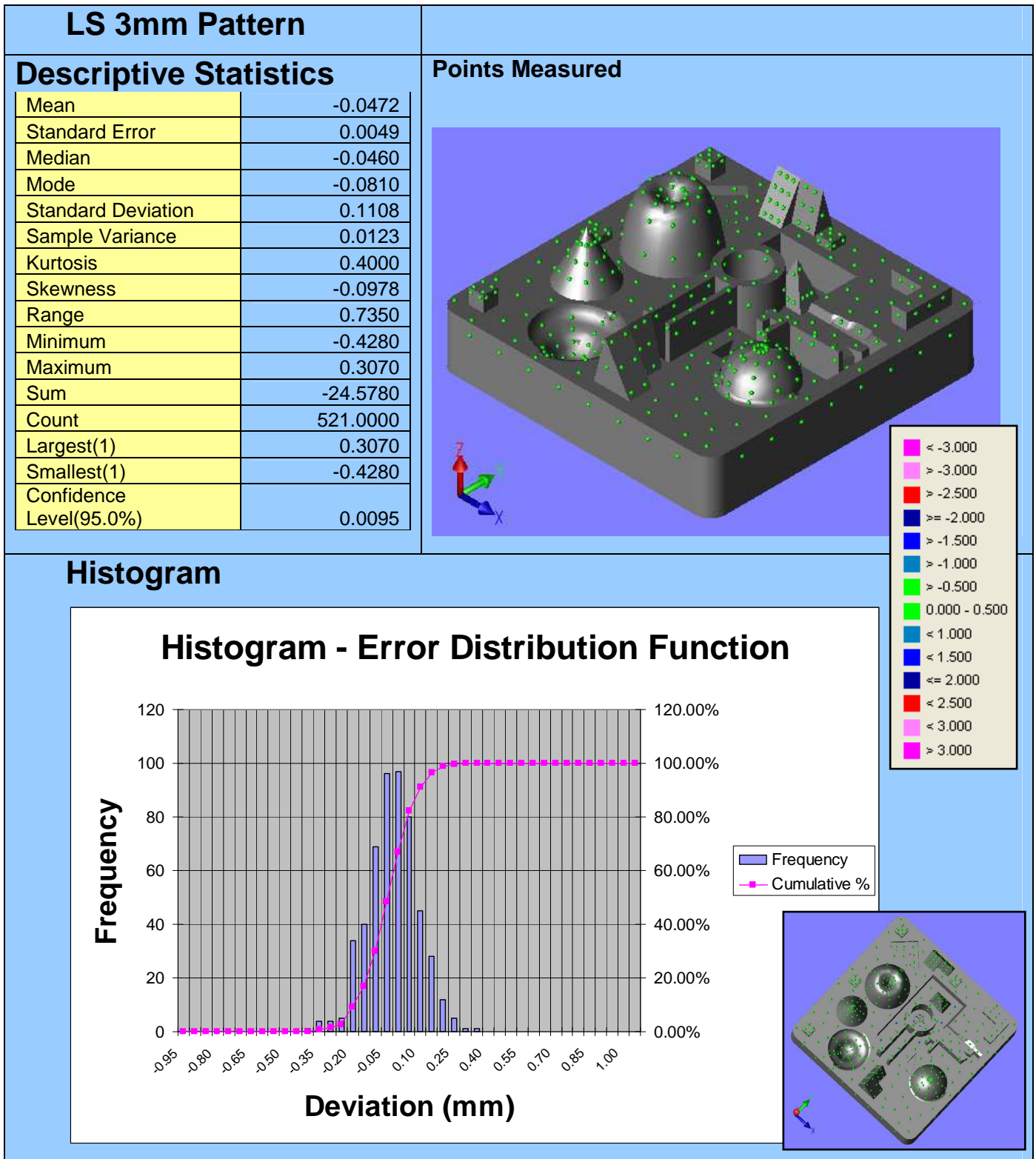


Table 16 Descriptive Statistics – LS 3mm



Feature Tolerances - LS Pattern 3mm										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.854	1.934	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.491	-0.049	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	2.082	-0.018	Good
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	25.198	-0.052	Good
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.348	-0.072	Good
T82	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.076	0.076	Good
T84	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.275	0.275	Good
T85	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.252	0.252	Good
T86	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.078	0.078	Good

**Table 17** Geometric Observations – LS 3mm  
 (This is only an extract; see the Appendix C for the full table)



### **Analysis of the built features (LS)**

#### *Cubes*

The cubes were used to examine the straightness of the x and y direction, by checking if they were built in a straight line. The maximum straightness deviation was 0.052 mm in the x direction. The overall sizes of all cubes are well within the  $\pm 0.5$  mm tolerance.

#### *Wedges*

The size of wedge x is extremely good and the angularity is good as well. Wedge y is slightly undersized, but well within tolerance. Angularity of wedge y is also good.

#### *Pyramid*

Angularity is slightly better than for the 3DP 4 mm pattern with only two measurements slightly out of tolerance, the highest deviation reaching -0.549 mm. The LS pyramid presents the best angularity of all the patterns measured.

#### *Cylinder*

The LS pattern cylinder presents the best cylindricity and concentricity of all patterns measured; all measurements well within tolerance.

#### *Square Base*

The pattern is slightly undersized in the x direction and slightly oversized in the y direction, but still within the 0.5 mm tolerance. Parallelism and perpendicularity are very good in the x and y directions, all below 0.14 mm. The LS pattern exhibits the best flatness with a value of 0.279 mm.

#### *Thin Walls*

The LS pattern exhibits the best line to line thickness of all patterns with very good parallelism. Tolerance EE2 and EE3 (Actual Thickness of walls) for the LS pattern is the best of all patterns.

#### *Rectangular Protrusion/Hole*

Perpendicularity for the rectangular hole and protrusion is well within tolerance as well as the overall sizes in the x, y and z directions, with a maximum deviation of 0.422 mm for perpendicularity on the inner-side of the rectangular hole.



*Cone*

The cone exhibits good symmetry and circular runouts, all well within the  $\pm 0.5$  mm tolerance. Angularity between the cone and plane is very good. Coaxiality between the actual and theoretical axis of the cone indicates little discrepancy. The cone presents good axial runout around the cone axis, but slightly out of tolerance axial runouts when using the plane as reference element with a deviation of 0.954 mm.

*Sphere*

The sphere presents very good circular runouts, perpendicularity and concentricity. Symmetry is very good except when using the plane as reference element with a deviation of 3.574 mm for the LS 3 mm pattern. Looking at coaxiality between the actual and theoretical axis of the sphere, there is only a small discrepancy for the theoretical axis. Axial runout around the sphere axis is out of tolerance with a deviation of 1.168 mm.

*Dome*

The dome exhibits the best circular runouts, symmetry and concentricity of all patterns measured. The dome also presents very good perpendicularity that is well within tolerance. The axial runout around the actual dome axis is out of tolerance with a deviation of 1.091 mm.

*Sinkhole*

The sinkhole presents the best circular runouts, axial runout, symmetry, perpendicularity, coaxiality and concentricity of all patterns measured.

DAI - SLS Pattern 3mm					Dimensional Accuracy Index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X < 0.5				
Low	X < -0.5				
Pattern Model	Counts				91.38%
	High	Good	Low	Total	
	8	106	2	116	

**Table 18 DAI – LS 3mm**

LS presents one of the most accurate patterns according to the dimensional accuracy index (DAI) with a value of 91.38 % (Table 18). Evaluating the descriptive statistics of all patterns it can be evidently concluded that the LS pattern is statistically superior to all the other patterns.



### 6.1.3 Pattern Grown with ThermoJet

#### Statistical Observations

A Thermojet was used to grow a wax pattern. Visual inspection signifies a very good pattern with high definition, but slightly less than the polystyrene pattern. On the ThermoJet pattern multiple growing lines are visible, which clearly affects the surface finish of the pattern (Figure 34).

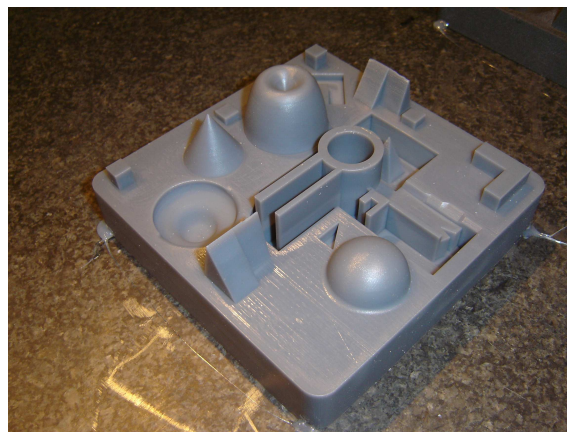
Observations were made from the EDF and the list of descriptive statistics.

The histogram and median clearly indicate that the error distribution is generally centered around zero, indicating that the errors are random and not systematic. The Thermojet has the best median value among the four patterns with a value of -0.0080 for the pattern.

A small standard error of 0.0089 indicates that the sample size used is more than sufficient to support the results with good confidence. Sampling fluctuation is therefore very small for these statistics.

Skewness has a small negative value of -0.0524 for the pattern meaning that the distribution is slightly hanging over to the right, indicating that the pattern is larger than the original CAD model.

The pattern has a kurtosis value of -0.1917; because it is lower than 3, the distribution is considered platykurtic. Platykurtic indicates that the distribution have a low peak and flat midrange. The largest and smallest measured values are 0.532 mm and -0.564 mm respectively.



**Figure 34 Pattern – ThermoJet 3mm**

Table 19 depicts the descriptive statistics and error distribution of the pattern. Results of the measured tolerances are shown in Table 20.



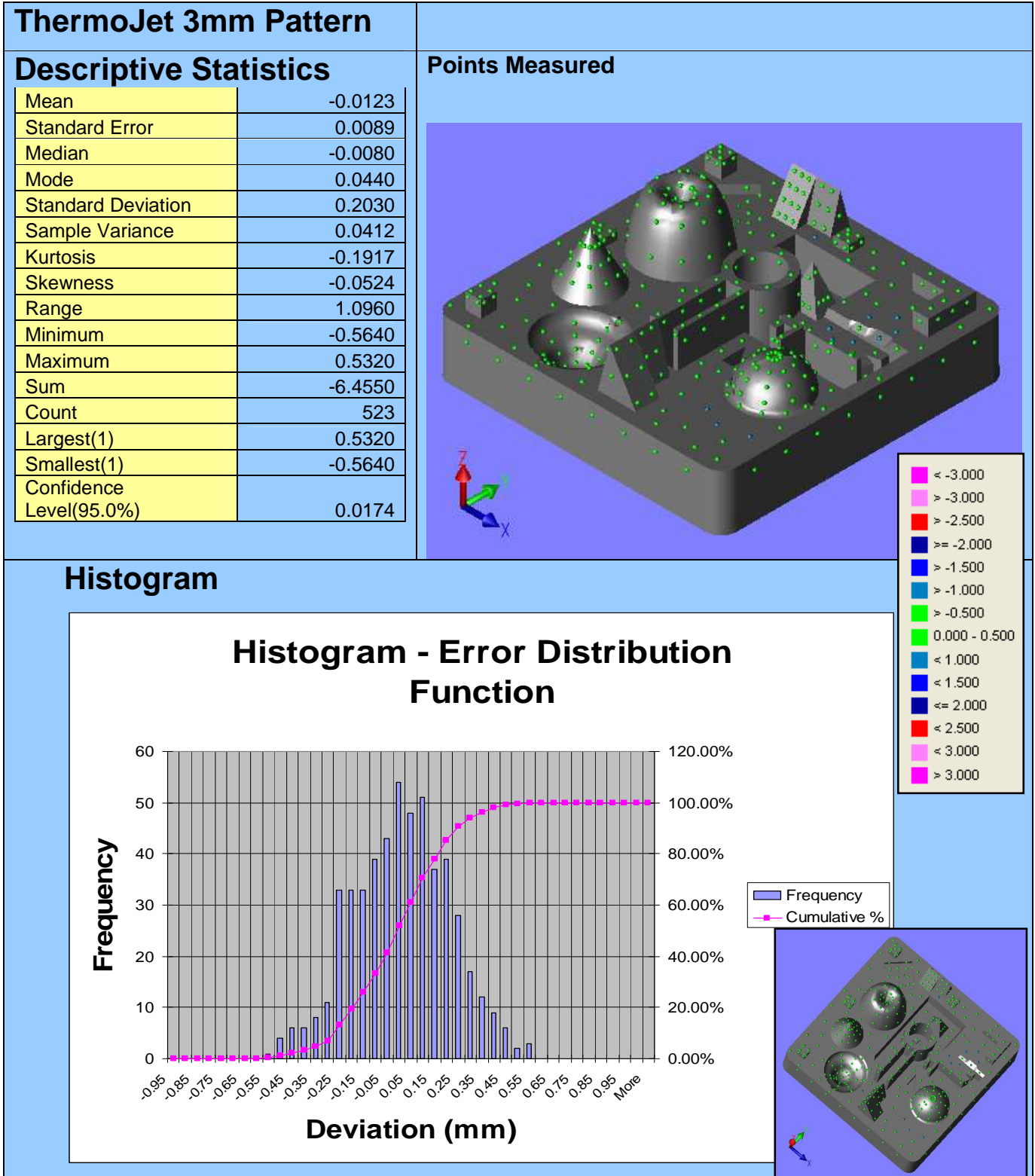


Table 19 Descriptive Statistics – ThermoJet 3mm



Feature Tolerances - ThermoJet Pattern 3mm										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.725	1.805	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.687	0.147	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	2.075	-0.025	Good
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	25.103	-0.147	Good
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.327	-0.093	Good
T81	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.410	0.410	Good
T82	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.217	0.217	Good
T84	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	1.128	1.128	High
T85	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.165	0.165	Good
T86	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.321	0.321	Good

**Table 20** Geometric Observations – ThermoJet 3mm  
**(This is only an extract; see the Appendix C for the full table)**





### **Analysis of the built features (ThermoJet)**

#### *Cubes*

The cubes were used to examine the straightness of the  $x$  and  $y$  direction, by checking if they were grown in a straight line. The maximum straightness deviation was 0.090 mm in the  $x$  direction. The overall sizes of all cubes are well within the  $\pm 0.5$  mm tolerance, except for one deviation in the  $x$  direction on cube 2 with a value of -0.610 mm.

#### *Wedges*

The size of wedge  $x$  and  $y$  is very good, although both are slightly undersized. The angularity for wedge  $x$  is good, except for one outlier namely tolerance AA3 with a deviation of 1.454 mm. The angularity of wedge  $y$  is poor, with all angles measured slightly out of tolerance.

#### *Pyramid*

Angularity is slightly better than for the 3DP patterns, but worse than for the LS pattern. Only one angle is within tolerance, the maximum deviation reaching -0.927 mm.

#### *Cylinder*

The ThermoJet pattern cylinder presents very good cylindricity and concentricity, better than the 3DP patterns but not as good as the LS pattern.

#### *Square Base*

The pattern is slightly oversized in the  $x$  and  $y$  direction, but still below the  $\pm 0.5$  mm tolerance. Parallelism and perpendicularity are very good in the  $x$  and  $y$  directions, which are all below 0.12 mm. Its flatness is also good with a value of 0.368 which is below the 0.5 mm tolerance.

#### *Thin Walls*

The ThermoJet pattern presents the best parallelism of all patterns with its very good line to line thickness. Tolerance EE2 and EE3 (the actual thickness of walls) for the ThermoJet pattern is well within tolerance.

#### *Rectangular Protrusion/Hole*

Perpendicularity for the rectangular hole and protrusion is well within tolerance as well as the overall sizes, in the  $x$ ,  $y$  and  $z$  directions, with a maximum deviation of 0.325 mm for perpendicularity on the outer side of the rectangular hole.



*Cone*

The cone exhibits satisfying symmetry and circular runouts, except for one out-of-tolerance value of 0.677 mm for tolerance T26. Angularity between the cone and plane is very good. Looking at coaxiality between the actual and theoretical axis of the cone, there is only a small discrepancy for the theoretical axis, which leads to the discrepancy in the circular runout.

Good axial runout is observed around the cone where the axis or plane is used as reference element.

*Sphere*

The sphere presents very good concentricity, perpendicularity and circular runouts, except for one slightly out-of-tolerance circular runout with a deviation of 0.616 mm. Symmetry is good except when using the plane as reference element with a deviation of 2.704 mm for the ThermoJet 3 mm pattern.

Coaxiality between the actual and theoretical axis of the sphere has a larger deviation than the LS pattern with a deviation of 0.680 mm for the ThermoJet pattern. Axial runout around the sphere axis is far out of tolerance with a deviation of 5.291 mm.

*Dome*

The dome exhibits very good runouts, symmetry, concentricity and perpendicularity. Axial runout around the actual dome axis is out of tolerance with a deviation of 0.978 mm.

*Sinkhole*

The sinkhole presents very good axial runout, symmetry, coaxiality and concentricity. Circular runout around the actual sinkhole axis is slightly out of tolerance with a deviation of 0.628 mm. Perpendicularity is out of tolerance with a deviation of 1.128 mm.

DAI - ThermoJet Pattern 3mm					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X < 0.5				
Low	X < -0.5				
Pattern Model	Counts				81.90%
	High	Good	Low	Total	
	17	95	4	116	

**Table 21 DAI - ThermoJet 3mm**

As shown in Table 21 the ThermoJet also presents a very good dimensional accuracy with a DAI of 81.90 %. The ThermoJet pattern is statistically superior to the 3DP patterns but inferior to the LS pattern.



### 6.1.4 ANOVA Analysis

The following hypothesis is formulated to determine whether there is a significant difference between the accuracy of the patterns produced on different machines:

$H_0$  : All mean measurements are equal

$H_1$  : All mean measurements are not equal

The tables below provide the results when tested against a 95 % confidence level.

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
3DP 3mm	523	4.454	0.009	0.249		
3DP 4mm	523	63.227	0.121	0.326		
SLS 3mm	523	-24.588	-0.047	0.012		
Thermojet 3mm	523	-6.455	-0.012	0.041		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.278	3	2.759	17.558	2.93E-11	2.609
Within Groups	327.969	2088	0.157			
Total	336.246	2091				

**Table 22 Single factor ANOVA (all groups) Results @ 95% Confidence (New data for 3DP patterns)**

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
3DP 3mm	523	-75.805	-0.145	0.698		
3DP 4mm	523	38.141	0.073	0.138		
SLS 3mm	523	-24.588	-0.047	0.012		
Thermojet 3mm	523	-6.455	-0.012	0.041		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	12.748	3	4.249	19.111	3.17E-12	2.609
Within Groups	464.269	2088	0.222			
Total	477.017	2091				

**Table 23 Single factor ANOVA (all groups) Results @ 95% Confidence (Old data for 3DP patterns)**



Using the old and new data of the 3DP patterns, the results indicate that the Null hypothesis cannot be accepted. There is a significant difference between the accuracy of the patterns.

The 3DP 3 mm pattern is eliminated from the group due to its sagging defect and the following hypothesis is stated:

$H_0$  : There is no significant difference between the accuracy of the following patterns –  
3DP 4 mm, LS 3 mm and ThermoJet 3 mm

$H_1$  : There is significant difference between the accuracy of the following patterns –  
3DP 4 mm, LS 3 mm and ThermoJet 3 mm

The results are shown in the table below testing at a confidence level of 95 %.

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
3DP 4mm	523	63.227	0.121	0.326		
SLS 3mm	523	-24.588	-0.047	0.012		
Thermojet 3mm	523	-6.455	-0.012	0.041		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.219	2	4.110	32.525	1.45E-14	3.001
Within Groups	197.866	1566	0.126			
Total	206.850	1568				

**Table 24 Single factor ANOVA Results @ 95% Confidence (3DP 4mm, LS and ThermoJet Patterns) (New data for 3DP pattern)**

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
3DP 4mm	523	38.141	0.073	0.138		
SLS 3mm	523	-24.588	-0.047	0.012		
Thermojet 3mm	523	-6.455	-0.012	0.041		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3.985	2	1.993	31.169	5.32E-14	3.001
Within Groups	100.110	1566	0.064			
Total	104.095	1568				

**Table 25 Single factor ANOVA Results @ 95% Confidence (3DP 4mm, LS and ThermoJet Patterns) (Old data for 3DP pattern)**



Using the old and new data of the 3DP patterns, the results indicate that the Null hypothesis cannot be accepted. There is significant difference between the accuracy of the patterns.

Both 3DP patterns are eliminated from the group due to their deterioration and the following hypothesis is stated:

$H_0$  : There is no significant difference between the accuracy of the following patterns – LS 3 mm and ThermoJet 3 mm

$H_1$  : There is significant difference between the accuracy of the following patterns – LS 3 mm and ThermoJet 3 mm

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
SLS 3mm	523	-24.588	-0.047	0.012		
Thermojet 3mm	523	-6.455	-0.012	0.041		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.314	1	0.314	11.760	6.29E-04	3.850
Within Groups	27.906	1044	0.027			
Total	28.220	1045				

**Table 26 Single factor ANOVA Results @ 95% Confidence (LS and ThermoJet Patterns)**

The results indicate that the Null hypothesis cannot be accepted. There is still a significant difference between the accuracy of the patterns namely the LS and ThermoJet pattern.

The obvious conclusion to be made from these hypotheses is that a significant difference exists between the accuracy of the patterns produced on the different machines. LS produces the best geometric and dimensional accuracy, followed by the Thermojet and then the 3D-Printing patterns.

The goodness of these patterns for investment casting is still to be determined when the castings are made. The castings are excluded from this thesis due to the shortage of time, but will be included in the next part of the investment casting project.



## 6.2 Pattern Surface Roughness

A Mitutoyo Surftest 211 was used to take surface measurements. The machine drags a probe over a pre-determined distance on the surface, namely the cut-off-length. Ten random measurements were taken in the x, y and z directions and averaged to obtain the overall roughness for each pattern.  $R_a$  is selected as the roughness parameter to be measured and a cut-off-length of 0.8mm used.

	3DP-3mm	3DP-4mm	LS	ThermoJet
Direction	$R_a$ ( $\mu\text{m}$ )	$R_a$ ( $\mu\text{m}$ )	$R_a$ ( $\mu\text{m}$ )	$R_a$ ( $\mu\text{m}$ )
x	13.26	12.35	13.50	1.35
x	13.33	13.49	14.63	1.17
x	14.21	15.15	22.56	1.18
x	12.31	12.93	20.52	2.07
x	16.13	18.73	23.51	1.16
x	14.26	29.37	21.57	3.74
x	18.78	26.69	21.71	5.80
x	16.43	25.41	23.10	4.00
x	14.37	23.31	20.31	3.20
x	14.71	20.12	26.31	1.81
<b>x (avg.)</b>	<b>14.78</b>	<b>19.76</b>	<b>20.77</b>	<b>2.55</b>
y	18.92	18.32	21.74	4.83
y	7.72	15.05	21.84	5.03
y	14.66	17.18	20.31	4.51
y	19.31	17.17	20.34	5.61
y	22.68	18.31	19.26	5.45
y	20.41	16.42	19.83	2.03
y	25.21	17.33	24.14	6.45
y	23.41	15.93	25.12	4.61
y	22.74	16.28	22.81	5.43
y	19.34	17.43	22.27	5.21
<b>y (avg.)</b>	<b>19.44</b>	<b>16.94</b>	<b>21.77</b>	<b>4.92</b>
z	18.87	16.41	24.14	4.06
z	19.73	16.91	18.79	4.75
z	14.72	15.23	20.43	4.61
z	19.31	19.43	23.19	5.31
z	17.21	17.32	19.42	6.90
z	22.41	17.75	20.83	4.22
z	21.13	17.32	20.17	5.18
z	14.31	15.31	24.30	4.26
z	15.39	14.27	21.33	4.31
z	14.81	14.81	21.71	5.71
<b>z (avg.)</b>	<b>17.79</b>	<b>16.48</b>	<b>21.43</b>	<b>4.93</b>
<b>Pattern (avg.)</b>	<b>17.34</b>	<b>17.72</b>	<b>21.32</b>	<b>4.13</b>

Table 27 Patterns Surface Roughness



The results indicate, as shown in Table 27 above, that the ThermoJet pattern has the best surface quality with a  $Ra$  value of  $4.13 \mu m$ , followed by the 3DP patterns and then the LS pattern. The polystyrene pattern has a  $Ra$  value of  $21.2 \mu m$ , making it the pattern with the lowest surface quality.

### 6.3 Economics of the Process

The prices as shown in Table 28 are industry related and in certain cases it can be reduced by 15 % due to the research purpose of the patterns. All prices exclude 14 % VAT.

		Cost per Pattern
<b>RAPID PRODUCT DEVELOPMENT (RPD) LABORATORY - Stellenbosch University</b>		R1000.00
3DP 3mm	Wax Infiltrated Pattern	
<b>RPD LABORATORY - Stellenbosch University</b>		R1000.00
3DP 4mm	Wax Infiltrated Pattern	
<b>CENTRE OF RAPID PROTOTYPING AND MANUFACTURING – Central University of Technology, Freestate</b>		R2898.00
LS 3mm	Polystyrene Pattern	
<b>INSTITUTE OF TECHNOLOGY INNOVATION - Tswane University of Technology</b>		R3451.02
ThermoJet 3mm	Wax Pattern	

**Table 28 Process Economics – LM Patterns**

The most influential factor on price is material cost. Manufacturing time and post processing also have a slight influence on the price. Each supplier can manufacture a pattern in roughly one day, depending on the size of the pattern.

3DP patterns are the cheapest to produce, with a cost of R 1000 per pattern, due to the low cost of material compared to LS and the ThermoJet. The LS polystyrene pattern has a cost of R2898 which is nearly triple the cost of the 3DP pattern. The ThermoJet uses very expensive material and has the highest cost per pattern with a value of R3451.02.



## 6.4 Conclusions

It can be concluded that the 3DP 3 mm pattern is geometrically superior to the 3DP 4 mm pattern for this study. However, various factors influence the accuracy of a pattern. The main influence in this regard is the manual handling of the pattern during post processing. Due to the improving handling skills of the person handling the pattern, the quality of the pattern will improve with each attempt. Using various techniques combined with extremely careful handling, it will be possible to print the 3DP 2 mm pattern as well without the pattern collapsing.

Shrinkage of a pattern during drying (after building, growing or printing) influences the size of the pattern. The euro-benchmark pattern used in this study was a solid object at first, but was changed to a shelled part in order to save material and test the capabilities of LM machines to manufacture uniform thin wall thickness parts as well as the capability of investment casting. Parts with varying thickness can easily warp during the drying process and the possibility of cracks forming increases.

The LS and ThermoJet patterns are more superior to the 3DP patterns in terms of geometrical accuracy. Comparing old and new descriptive statistics and feature measurements indicates only slight changes in accuracy; thus the 3DP patterns have very good durational stability. Most patterns from LM machines have a certain shelf life, depending on the material used and the environment they are kept in.

Comparing LS and ThermoJet, the LS pattern made from polystyrene proves to be geometrically more accurate and present better tolerance values. Visual inspection indicates that the LS pattern provides much sharper corners with high definition. The ThermoJet also provides very good definition.

The ThermoJet pattern proves to have the best surface finish, although clear grow lines are visible.

If the 3DP patterns would be printed and measured again, the accuracy results might look better, because the problem of deterioration over time will be eliminated.

3DP patterns are the cheapest to produce and the ThermoJet patterns the most expensive, which is mostly due to the difference in material costs. The polystyrene patterns from the LS machine is also quite expensive, nearly three times that of the 3DP patterns. The selection of which pattern to use will require a trade of between accuracy and cost.





Machine	Pattern	Company or Literature Indications of Accuracy	Accuracy of Measured Patterns	DAI Calculated
Z 310 Printer	3DP-3mm	0.02mm [9]	0.0074mm ( $\sigma = 0.50$ )	50.00%
Z 310 Printer	3DP-4mm	0.083mm [55] 0.42mm [56]	0.1198mm ( $\sigma = 0.57$ )	63.78%
EOS P380	LS-3mm	0.25mm [9] 0.05mm [57]	0.0472mm ( $\sigma = 0.11$ )	91.38%
ThermoJet	ThermoJet-3mm	0.39mm [56]	0.0123mm ( $\sigma = 0.20$ )	81.90%

**Table 29 Accuracy Comparison (Patterns & Literature)**

Table 29 compares the accuracies of the patterns measured to accuracies obtained through other studies in literature. Unfortunately there are limited or no specific accuracy values available from RP machine manufacturers. It can be seen that the measured values differs from previous studies. This can be due to the use of newer/older materials, different models of the machines, different measuring equipment, newer/older versions of software used and different post processing steps used. Accuracies must be stated per length, because the values tend to compound over increase in length as stated before.

The break-even graphs were discussed in section 2.5. Figure 35 and Figure 36 illustrates the break-even points for RP patterns vs. Conventional tooling. RPD quoted R40 000 for the tooling with a lead time of 3 weeks. At least 40 patterns must be needed before 3DP becomes uneconomical for this specific benchmark part used in this study. Of the LS at least 14 patterns are needed and of the TermoJet at least 12. A die for the benchmark part is not that complex and therefore the tooling cost is not that high but for a very intricate die the tooling cost will be much higher. The higher the tooling cost the more economical it becomes to use RP patterns if only a few parts are needed.

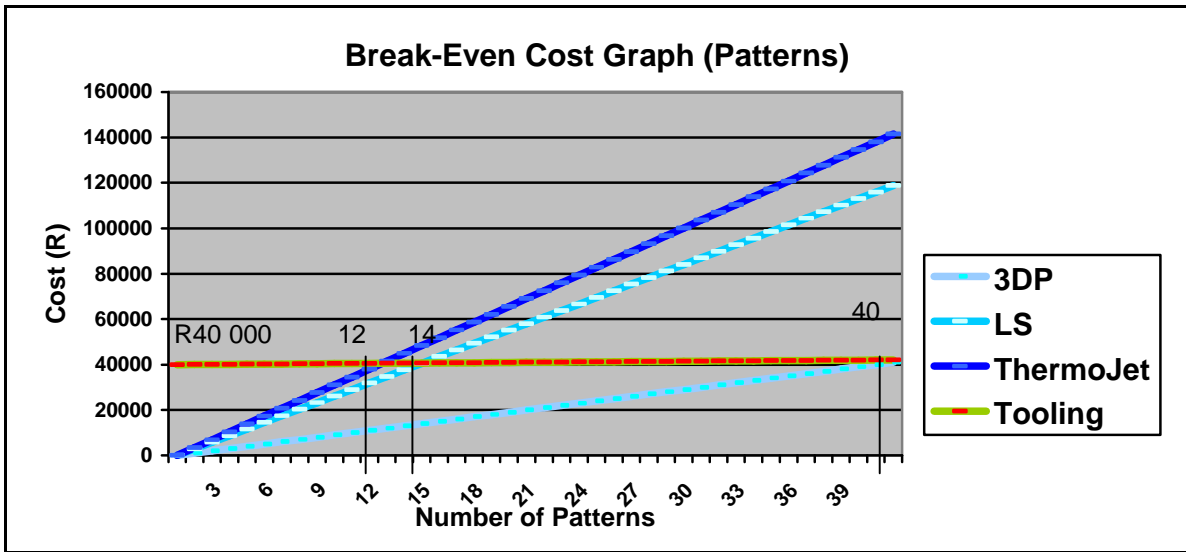


Figure 35 Break-Even Cost Graph (Patterns)

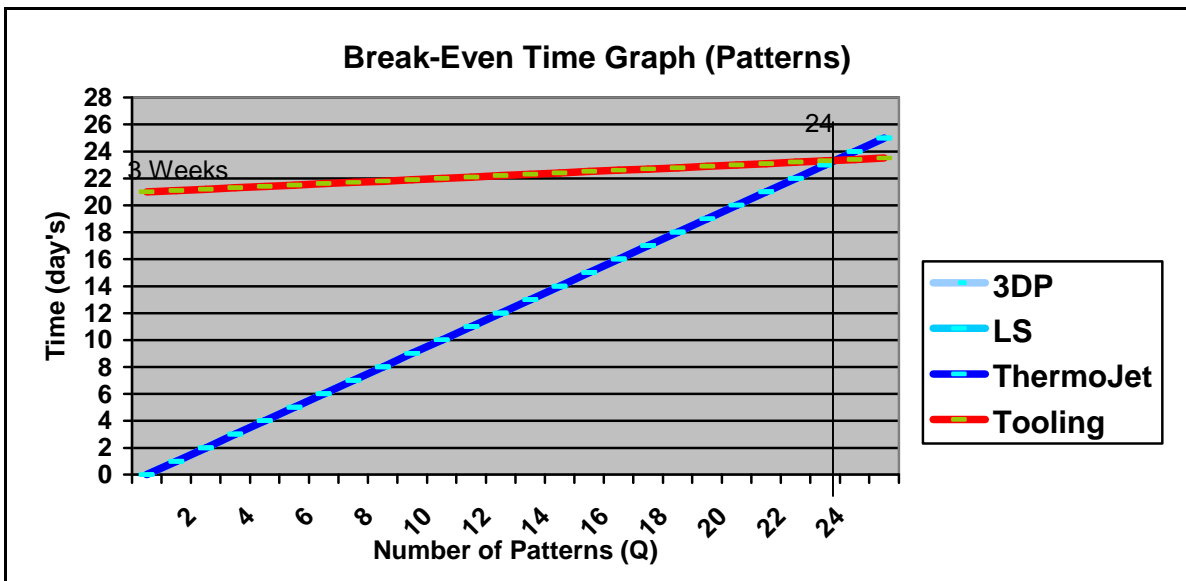


Figure 36 Break-Even Time Graph (Patterns)



## **7. Suitability of Layer Manufactured Dies for Investment Casting**

### **7.1 Rapid Die Making**

#### **7.1.1 Introduction**

More than six commercialised systems are available that allow metal die production. Direct metal tooling have drastically improved the lead time and reduced the cost for producing prototype and production tooling [9].

The fabrication of RP dies allows the inclusion of conformal cooling channels. Conformal cooling can drastically reduce injection cycle times. Reduced cycle times in turn directly influence the production rate and cost of parts. RP dies are mechanically weaker than conventional dies due to their porosity. Dies are expected to match the performance of injection moulding when used by the less forceful injection process to create wax patterns. Temperatures and pressures for wax injection are 55-60 °C and 1-3 MPa respectively as opposed to 200 °C and 100 MPa respectively for injection moulding [9, 58].

A die consists of at least two parts namely a core and cavity. Conventional dies are machined from aluminium or steel. The investment casting process is able to produce very complex parts and therefore dies are often required to split into multiple parts. This complexity may sometimes require a number of loose inserts incorporated in the die. The more complex a die is, the higher the cost and lead time will be. Complex dies can easily be built with RP machines, which reduce the cost and lead time, especially for low volume production.

#### **7.1.2 Specifics of Layer Manufactured Dies for IC**

The sections under Chapter 4 namely Design for Manufacturability, Basic Casting Guidelines, Accuracy, Build Orientation, Pattern Quality and Surface Quality all apply to rapid die making as well.

For the purpose of convenience in the current context some of the information on basic characteristics of direct metal and direct polymer die manufacture under section 3.3. is repeated below:

Direct Metal Dies [9]:

- Laser sintered dies are well known and commercialised under RapidTool and DirectTool. RapidTool dies are strengthened and densified by means of bronze infiltration. Reports claim that complex dies are produced in less than two weeks and



that they are able to produce 50 000 to 100 000 parts. The DMLS technique is employed for the DirectTool process (EOS) to produce dies that are made from a blend of nickel, bronze and copper-phosphate, with dimensional accuracies of  $\pm 0.05$  %. The density is increased by infiltration with tin, silver and epoxy. EOS also offers DirectSteel, a powder that is steel-based and DirectMetal, a powder that is bronze-based.

- ProMetal is a 3DP technology used to produce dies which are 60 % dense and are infiltrated with bronze afterwards. The 3DP process is relatively fast and offers a variety of metals including tool-steel. Post processing reduces die accuracies to  $\pm 0.1$  mm.
- It has been reported that LENS moulds can produce more than 100 000 injection moulded components, therefore a much greater amount of wax patterns can be obtained from such a die for investment casting. DMD is also used for direct metal die fabrication and allows for inclusion of conformal cooling channels.
- EBM allows for the use of reactive materials like titanium alloys. Solid parts can be built in titanium and steel, and machined afterwards.
- SLM can build close to 100 % dense dies. Post processing and infiltration is only done if necessary. Surface roughness values of 10 to 30  $\mu\text{m}$  ( $R_z$ ) are possible without finishing. Tooling inserts and parts are built from basically any type of material and the process allows for the inclusion of conformal cooling channels [30].

Direct polymer or wood dies [9]:

- SLA, FDM, LOM and LS are used to produce wax-injection dies. FDM produced ABS dies must be infiltrated with epoxy or aluminium-filled epoxy to seal and strengthen. LOM paper or CNC cut wood dies must be sealed to prevent moisture absorption.
- Pure non-metal dies have poor thermal conductivity properties and therefore much longer injection cycles are needed. It is however possible to make use of cooling channels.

### 7.1.3 Building the Dies

Two dies of different materials namely Alumide and Polyamide were built on an EOS P385 LS machine by the CUT's Centre for Rapid Prototyping and Manufacturing (CRPM), Free State. The Alumide and Polyamide material data sheets can be found in Appendix I. A 0.8 % shrinkage factor was added to the dies for wax shrinkage and release angles of  $1^\circ$  to  $2^\circ$  were added to certain surfaces for ease of pattern removal from the dies. Due to the high cost of materials, the core and cavity of each die were built hollow, except for the Alumide core which was built as a solid (Figure 37). Building hollow dies is standard practice to keep costs down and allow for reinforcement. Hollow dies also allow for inclusion of cooling channels. The LS dies are more rigid due to the graphite in the materials used, that prevents problematic sagging during part removal and oven curing [59].

The following table lists some of the specifications of the EOSINT P385:



Build Volume	340 x 340 x 620mm
Build Speed	10 – 25mm/hr
Layer Thickness (Material Dependant)	0.1 – 0.15mm
Stackable build chamber	Yes
Laser Type	50W CO2 laser with F-theta lens
Scan Speed	5m/s
Machine Size	1,230 x 1,175 x 2,100mm
Weight	1,060Kg
Price From	€335,000

**Table 30 EOSINT P385 Specifications [20]**

The specifications provide some indication of the capability of the process. The thin layer thickness ensures that the stair-stepping effect is minimized and that a high degree of accuracy is attainable.

### 7.1.4 Evaluation Results and Discussion of Dies

The dies were measured and evaluated by following the same procedure as for the patterns, comparing them to their original CAD models. A best-fit is done at the end of each measurement program to ensure the best measurement values are obtained. Only the cavities were measured, because they will represent the top part of the patterns with all the features (Figure 38 and Figure 39).

#### 7.1.4.1 Dies Built with Selective Laser Sintering

##### Statistical Observations

The Error Distribution Function (EDF), a histogram, lends itself as a quick visual summary of all the errors. Observations were made from the EDF and the list of descriptive statistics (Table 31). The statistical data can be found in Appendix F.

The histograms and medians indicate that the error distributions are generally centered around zero, indicating that the errors are random and not systematic. The median is an indication of the central tendency with -0.033 mm for the alumide die and 0.012 mm for the polyamide die. The histograms indicate that the alumide die distribution is much more evenly spread and closer to a normal distribution than the polyamide die (Table 32 and Table 33).

Confidence intervals are constructed using standard errors. Both the alumide die and polyamide die have very small standard errors, which indicate that the sample size used is sufficient to support the results with good confidence.

Skewness show small positive values for both dies, which means that both distributions are slightly hanging over to the left. The dies are thus to some extent smaller than the original CAD model. Both dies have kurtosis values lower than 3, meaning that their distributions are considered platykurtic. Platykurtic indicates that the distributions have low peaks and flat midranges.



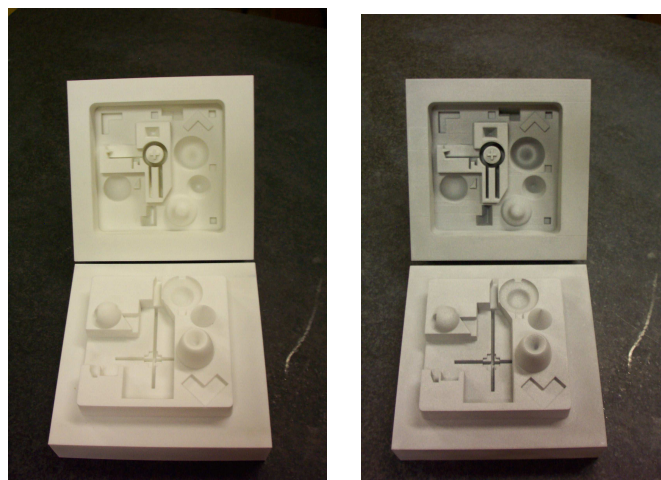
The largest and smallest measured values are 0.486 and -0.402 respectively for the alumide die and 0.641 and -0.356 respectively for the polyamide die.

The confidence level is a quick method to compare the accuracy of the two parts. For the alumide die 95 % of the errors will be smaller than 0.0108 mm while for the polyamide die 95 % of the errors will be smaller than 0.0167 mm. These small values indicate that both parts are very accurate.

The Alumide part has a smaller average error than the Polyamide part. This leads to the conclusion that the Alumide part is slightly more accurate than the Polyamide part.

Descriptive Statistics	Alumide	Polyamide	Better Result
Mean	-0.0188	0.0648	Alumide
Standard Error	0.0055	0.0085	Alumide
Median	-0.0330	0.0120	Polyamide
Mode	0.0320	-0.0670	Alumide
Standard Deviation	0.1371	0.2122	Alumide
Sample Variance	0.0188	0.0450	Alumide
Kurtosis	1.2294	-0.8667	Alumide
Skewness	0.6803	0.4397	Polyamide
Range	0.8880	0.9970	Alumide
Minimum	-0.4020	-0.3560	Polyamide
Maximum	0.4860	0.6410	Alumide
Sum	-11.6910	40.3730	Alumide
Count	623	623	
Largest(1)	0.4860	0.6410	Alumide
Smallest(1)	-0.4020	-0.3560	Polyamide
Confidence Level (95.0%)	0.0108	0.0167	Alumide
<b>Statistically Better Die</b>			<b>Alumide</b>

**Table 31 Comparing Statistical Results of Dies**



**Figure 37 Polyamide and Alumide Die Sets**





**Figure 38 Polyamide Cavity**



**Figure 39 Alumide Cavity**

Table 32 and 33 depicts the descriptive statistics and the error distribution for each pattern. Results of the measured tolerances are shown in Table 35 and Table 36.

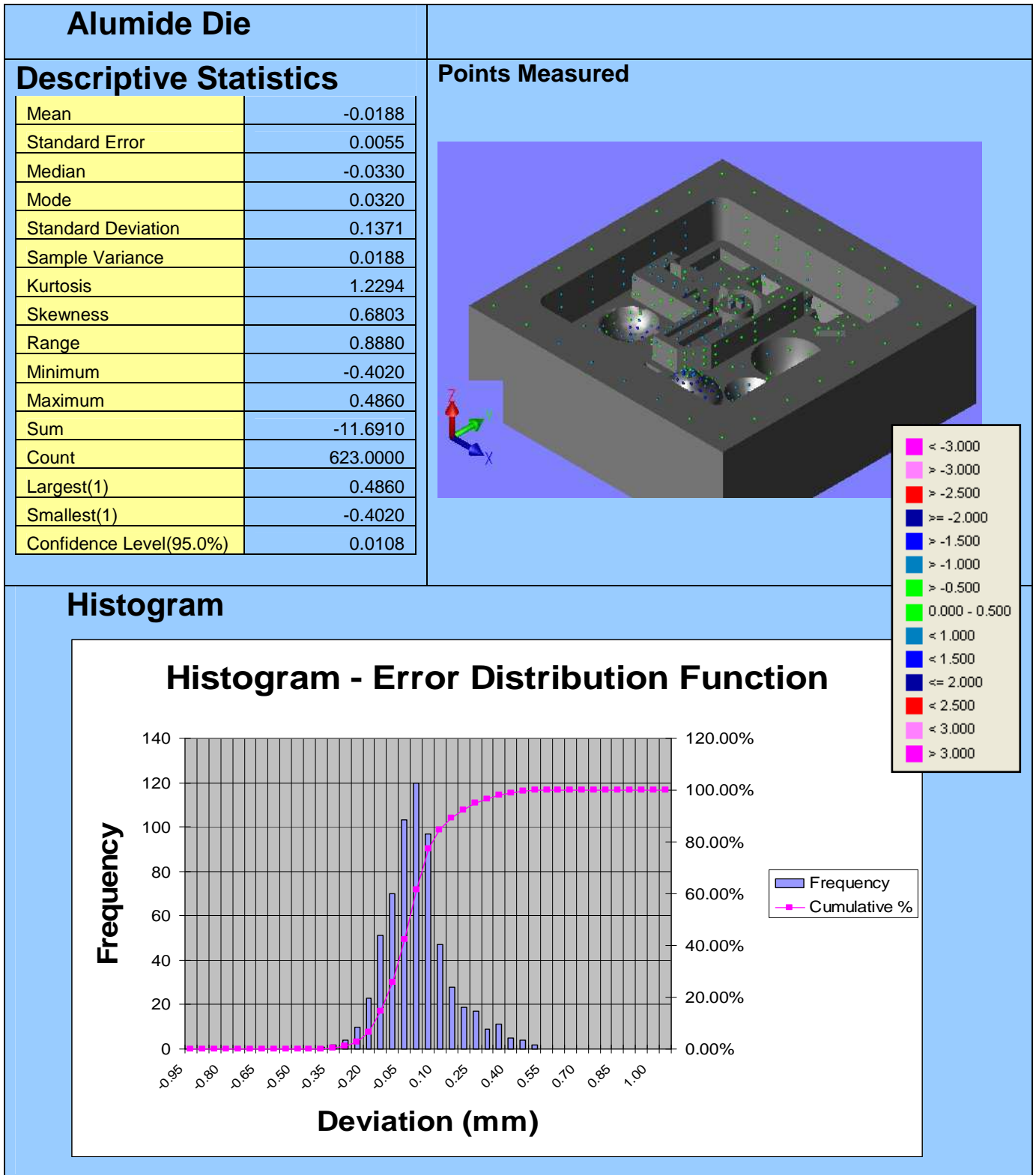
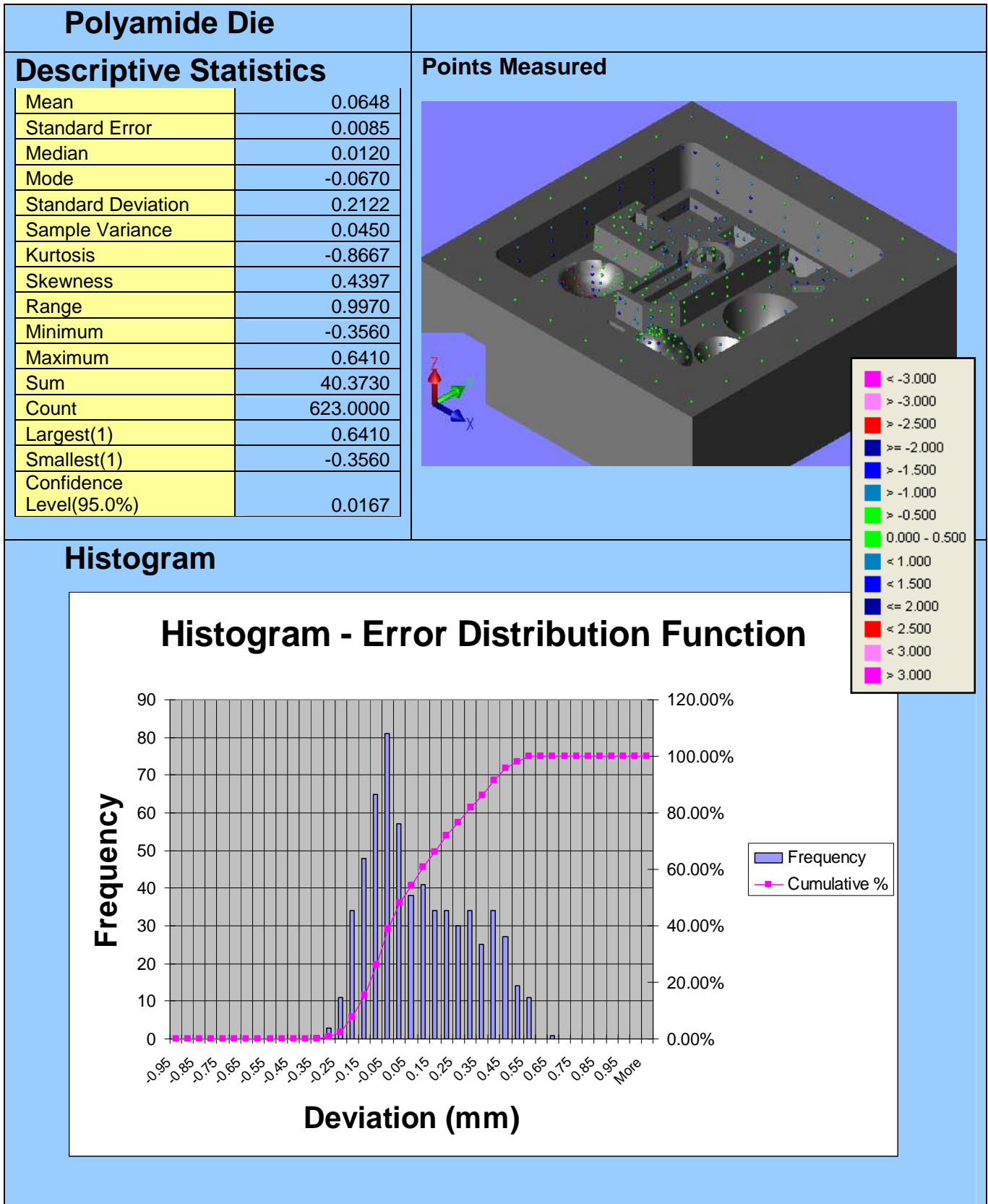


Table 32 Descriptive Statistics – Alumide Die





**Table 33 Descriptive Statistics – Polyamide Die**



### Analysis of built features (Alumide and Polyamide Die)

A basic tolerance of  $\pm 0.5$  mm is used for all feature measurements on the two dies. A theoretical axis and the actual axis for the dome, cone, sphere and sinkhole features are created in order to measure various tolerances. The results are tabulated in the Appendix E, (see Table 35 and Table 36 for an extract of these values).

Looking at the dimensional accuracy index, based on various features and their tolerances measured, the Polyamide die proves to be slightly more accurate with a DAI of 93.02 % compared to the DAI of 90.70 % for the alumide die. However, after evaluating the measured descriptive statistics, it can be concluded that the alumide die is more superior to the Polyamide die.

Table 34 summarizes the DAI for the two dies measured.

DAI – Dies					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	$X > 0.5$				
Good	$-0.5 < X < 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				
	High	Good	Low	Total	
Alumide Die	1	39	3	<b>43</b>	90.70%
Polyamide Die	3	40	0	<b>43</b>	93.02%

**Table 34 DAI of Die Cavities**

Both die cavities demonstrate very good dimensional and geometric accuracy with very few values and features out of tolerance. This indicates that both materials could possibly provide very accurate dies for the creation of wax patterns for investment casting. The DAI is only an estimation method and there is little difference between the two values. Based on the statistical analysis, it can therefore be concluded that the alumide die is more accurate than the polyamide die.



Feature Tolerances - 3DP Pattern 3mm										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
1	XY Plane	Plane		Flatness		-0.500	0.500	0.026	0.026	Good
2	Base	Line	Line	Parallelism		-0.500	0.500	0.095	0.095	Good
3	Base	Line	Line	Parallelism		-0.500	0.500	0.034	0.034	Good
4	Base	Left Side	Bottom Side	Perpendicularity		-0.500	0.500	0.029	0.029	Good
5	Base	Right Side	Bottom Side	Perpendicularity		-0.500	0.500	0.066	0.066	Good
...										
...										
...										
...										
40	Sunken Cone	Actual Cone Axis	Cone	Axial runout		-0.500	0.500	0.045	0.045	Good
41	Sunken Cone	Bottom Plane	Actual Cone Axis	Perpendicularity		-0.500	0.500	0.128	0.128	Good
42	Sunken Dome	Sunken Dome Top Circle	Sunken Dome Bottom Circle	Concentricity		-0.500	0.500	0.088	0.088	Good
43	Round Protrusion	Round Protrusion Top Circle	Round Protrusion Bottom Circle	Concentricity		-0.500	0.500	0.124	0.124	Good

**Table 35** Geometric Observations – Alumide Die  
 (This is only an extract; see the Appendix E for the full table)



Feature Tolerances - 3DP Pattern 4mm										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
1	XY Plane	Plane		Flatness		-0.500	0.500	0.051	0.051	Good
2	Base	Line	Line	Parallelism		-0.500	0.500	0.046	0.046	Good
3	Base	Line	Line	Parallelism		-0.500	0.500	0.045	0.045	Good
4	Base	Left Side	Bottom Side	Perpendicularity		-0.500	0.500	0.021	0.021	Good
5	Base	Right Side	Bottom Side	Perpendicularity		-0.500	0.500	0.025	0.025	Good
...										
...										
...										
...										
40	Sunken Cone	Actual Cone Axis	Cone	Axial runout		-0.500	0.500	0.597	0.597	High
41	Sunken Cone	Bottom Plane	Actual Cone Axis	Perpendicularity		-0.500	0.500	0.092	0.092	Good
42	Sunken Dome	Sunken Dome Top Circle	Sunken Dome Bottom Circle	Concentricity		-0.500	0.500	0.132	0.132	Good
43	Round Protrusion	Round Protrusion Top Circle	Round Protrusion Bottom Circle	Concentricity		-0.500	0.500	0.103	0.103	Good

**Table 36** Geometric Observations – Polyamide Die  
 (This is only an extract; see the Appendix E for the full table)



### 7.1.4.2 ANOVA Analysis of Dies

The following hypothesis is stated to determine whether there is a significant difference between the accuracy of the alumide and polyamide die produced on a LS machine:

$H_0$  : All mean measurements are equal

$H_1$  : All mean measurements are not equal

The table below provides the results when tested against a 95 % confidence level.

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Alumide Cavity	623	-11.691	-0.019	0.019		
Polyamide Cavity	623	40.373	0.065	0.045		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.175	1	2.175	68.176	0.000	3.849
Within Groups	39.696	1244	0.032			
Total	41.871	1245				

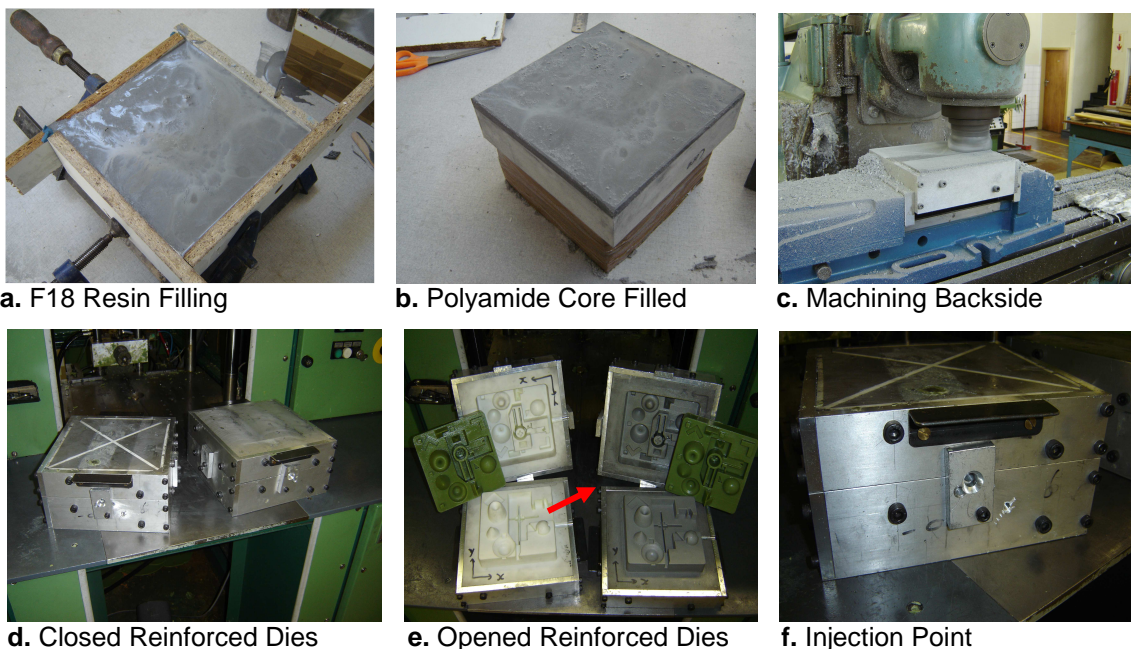
**Table 37 Single factor ANOVA Results @ 95% Confidence (LS Dies)**

The results indicate that the Null hypothesis cannot be accepted. Statistically there is a significant difference between the accuracy of the two dies.

## 7.2 Suitability of Wax Patterns from Layer Manufactured Dies for Investment Casting

### 7.2.1 Preparation of Dies for Wax Injection

Firstly the dies have to be prepared for use in a wax injection machine. The dies are very fragile and cannot withstand the clamping force of a wax injection machine during injection. MCP F18 resin is used to fill the hollow cavities and hollow polyamide core (Figure 40a and b). The cavities and cores are each reinforced with a 10 mm aluminum plate (fixed to the dies with M8 bolts), and machined flat on its backside to allow for even clamping from the wax injection machine (Figure 40c, d and e). A guiding/location plate is added to each side of each die. A 10 mm runner is machined along the splitting line of each die. Figure 40f illustrates the injection point and guide plate of the Polyamide die.



**Figure 40 Reinforcement of dies**

### 7.2.2 The Wax Injection Process

A Schott 20 Ton injection machine (Figure 41a) is used for wax injection; it belongs to the CSIR in Pretoria and is the only one of its kind in South Africa. The type of wax used is '289B Green wax' [58]. The machine is used for research due to its controllability over most of the variables that affects the quality of a pattern during the wax-injection process, namely:

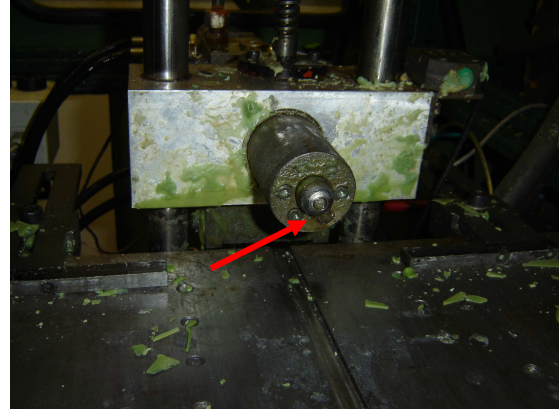
- Injection Time
- Dwell Time
- Cooling Time
- Wax Filling



- Injection Pressure
- Dwell Pressure
- Wax Temperature
- Clamping Force

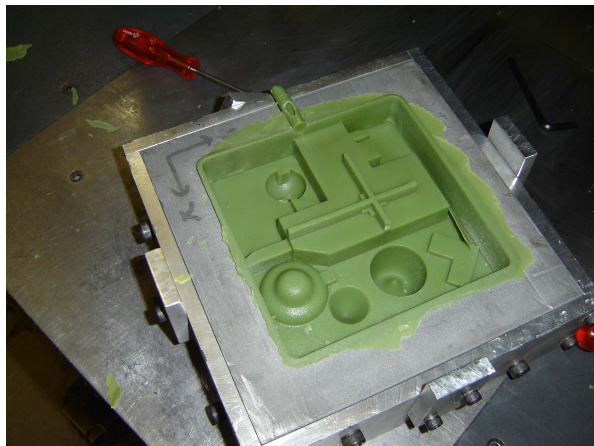


a. Schott 20 Ton Wax Injection Machine



b. Injection Nozzle

**Figure 41 Wax Injection Machine**



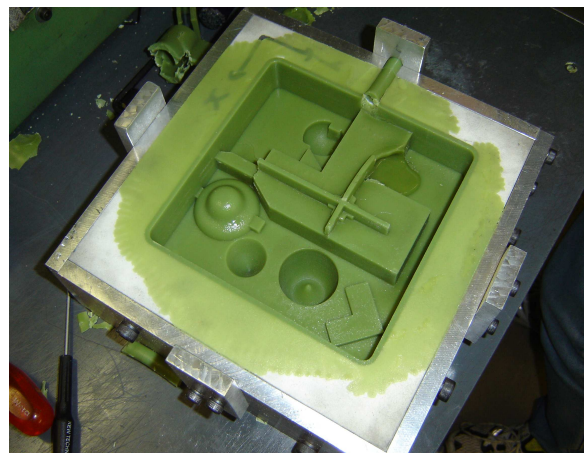
a. Pattern Stuck to Polyamide Cavity



b. Pattern Melted with Butane Flame



c. Alumide Cavity Cleaned with Trichloroethylene



d. Pattern Stuck to Polyamide Die

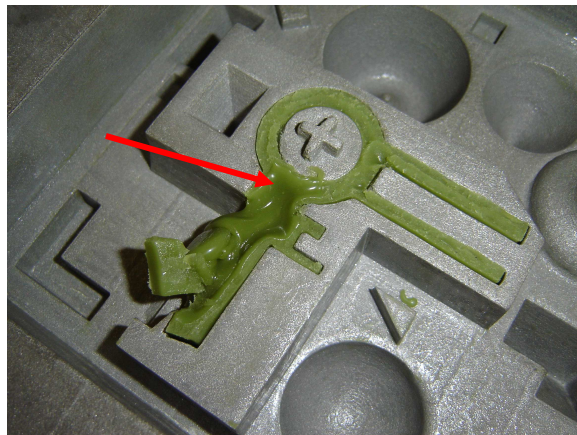
**Figure 42 Patterns Stuck to Dies**

The first objective was to obtain at least one wax pattern from each die. The injection machine variables were set as low as possible at first to allow minimum strain on the dies. Later certain variables were kept constant and the other varied to obtain the best pattern. Each die is sprayed with a silicone release agent so that the wax would not stick to the surfaces. The first injection for each die was disastrous, because the patterns were sticking to the cavity of each die (Figure 42a and d). A butane flame had to be used to literally melt the wax out of the alumide cavity, taking care that the surface is not damaged (Figure 42b). The last wax residues that stuck deep in the cavity were removed with a screwdriver and scalpel – a practice that is not standard when working with dies. Trichloroethylene was used as a cleaning solvent to remove the wax from the surfaces (Figure 42c).

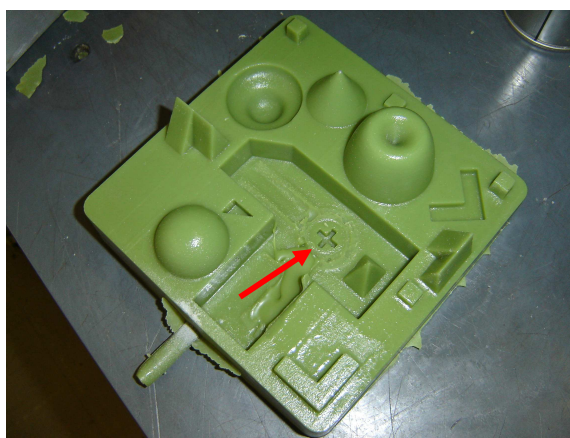
The dies are porous and were absorbing the releasing agent before injection could take place. Due to the thesis time constraint no other coating possibilities were considered, but will be included in future research. Releasing agent was sprayed multiple times until it seemed that the surfaces became saturated, before injecting again. A few of the surfaces were lightly sanded to help ease ejection of patterns from the cavities. These steps helped to produce the first pattern for each die, but with poor definition (Figure 43a).



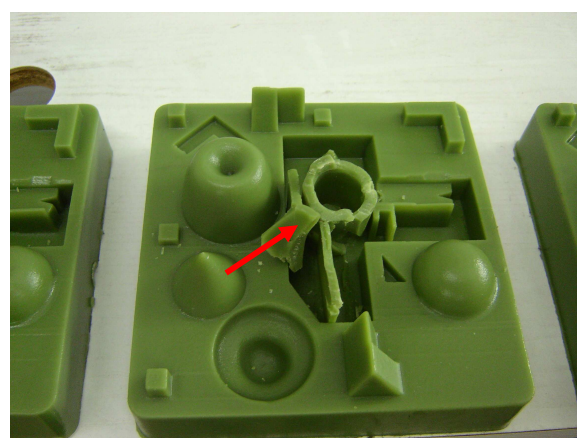
a. Poor Definition on Edges and Points



b. Wax Part Broke Off



c. Poor Solidification Near the Centre

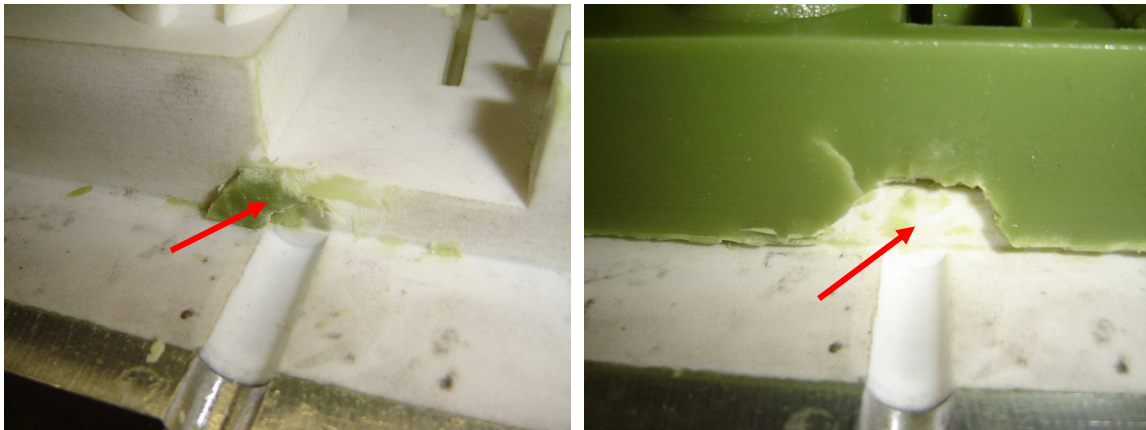


d. Poor Solidification Near the Centre

**Figure 43 Poor Solidification of Wax Pattern (Alumide Die)**



The 3<sup>rd</sup> to 8<sup>th</sup> attempts for the alumide die were all unsuccessful. The cylinder part of each pattern broke off during ejection, due to the centre part not totally solidifying (Figure 43b, c and d). Wax temperature was dropped to a minimum and the dwell time increased, which caused solidification to slightly enhance, but not enough. The die materials have poor heat transferring properties and became too warm for wax solidification. The dies were left to cool down before the next patterns were produced. It can be concluded that cooling channels will be needed to improve the cooling of these dies.



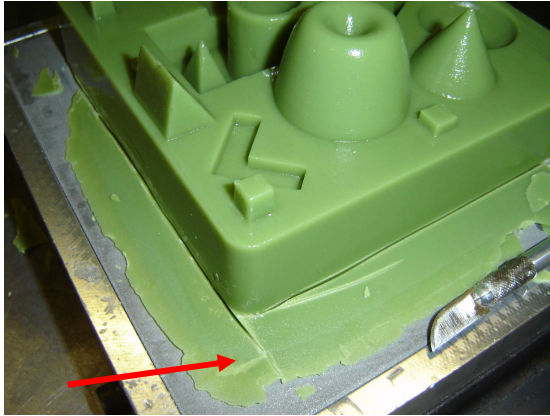
a. Wax Pushed Into the Core Surface

b. Pattern Cut Loose from the Core

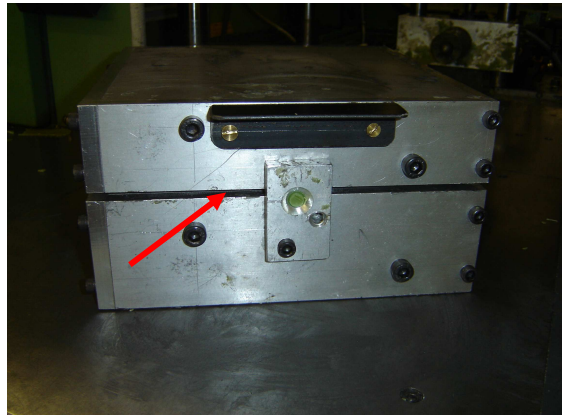
#### Figure 44 Wax Inlet Stuck to Core (Polymide Die)

The wax at the inlet of the alumide die became stuck during every injection (Figure 44a). Due to the porosity of the die material, the wax starts penetrating the core surface right in front of the injection nozzle during long dwelling times at constant pressure. Inlets had to be cut from each pattern in order to eject the patterns (Figure 44b).

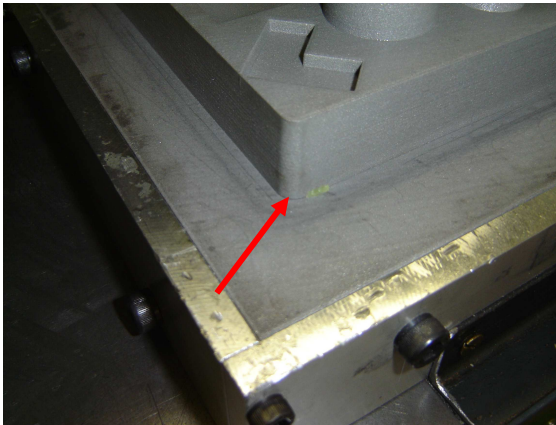
Patterns are removed from the dies by blowing compressed air between the pattern and die to break the slight vacuum caused by the release agent. Slight buckling of the patterns is caused by the removal process, but can be reduced or eliminated by the use of ejector pins.



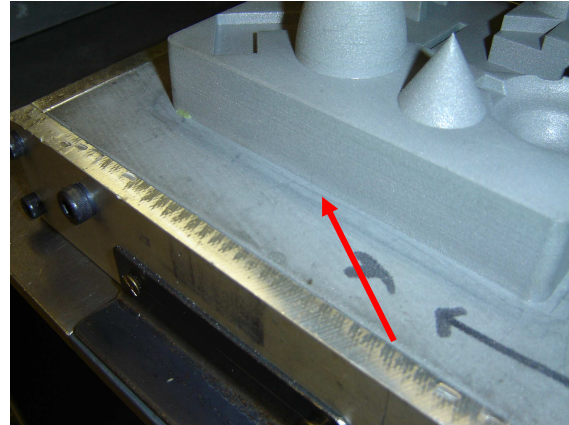
a. Thick Wax Layer Forming



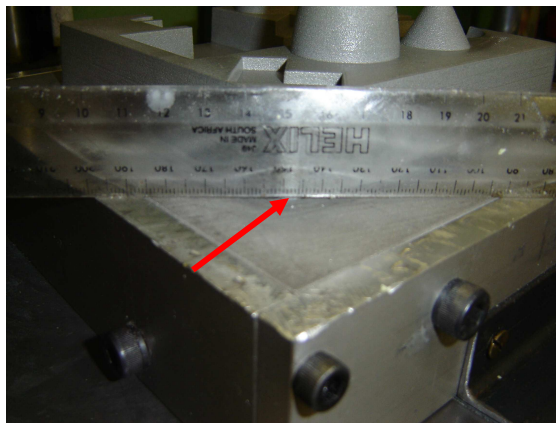
b. The Wax Layer Pushes the Die Open



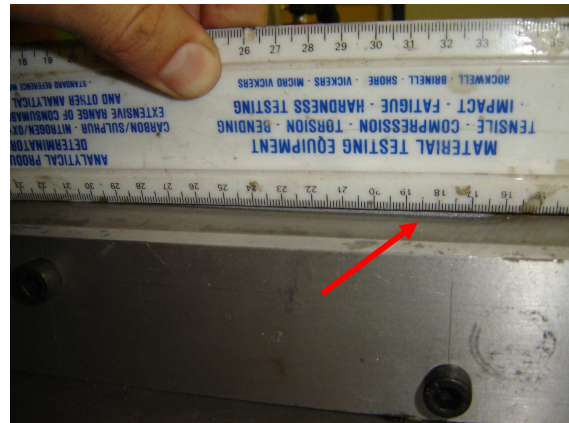
c. Small Cracks Forming on Corners



d. Sagging of Core



e. Corners Visibly Sagging Under Ruler



f. Core Side Visibly Sagging Under Ruler

### Figure 45 Polyamide Core Compressing

The polyamide patterns started forming a layer of wax around the pattern, between the core and cavity, which caused the die to slightly open when releasing the clamping force after injection (Figure 45a and b). The layer became thicker after each injection cycle. With close inspection it became apparent that the core was compressing due to its porosity. The pattern part of the core was literally sagging into the solid base (Figure 45d, e and f). Small cracks were also forming between the core and its base (Figure 45c).

The excess release agent used causes marks on the surface of the patterns. Altogether 12 patterns were produced from the Alumide die and 7 from the Polyamide die (Figure 46).

The following results were obtained:

Pattern Number	Injection Time (sec)	Dwell Time (sec)	Cooling Time (sec)	Wax Temperature (°C)	Clamping Force (Bar)	Injection Pressure (Bar)	Time For Pressure Increase (sec)	Dwell Pressure (Bar)	Outcome (Success or Failure)	Comments
<b>Alumide</b>										
1	1	15	20	65	0	10	25	30	F	Whole pattern stuck to cavity
2	1	10	30	65	0	10	25	30	S	Poor definition
3	1	15	20	65	0	10	25	30	F	Cylinder breaks; stuck to cavity
4	1	10	30	65	0	10	25	30	F	Cylinder breaks; stuck to cavity
5	1	10	40	65	0	10	25	30	F	Cylinder breaks; stuck to cavity
6	1	10	60	65	0	10	25	30	F	Cylinder breaks; stuck to cavity
7	1	10	90	65	0	10	25	30	F	Cylinder breaks; stuck to cavity
8	1	10	120	65	0	10	25	30	F	Cylinder breaks; stuck to cavity
9	1	10	260	65	0	10	25	30	S	Success
10	1	20	260	65	0	15	30	41	F	Cylinder breaks; stuck to cavity
11	1	20	260	65	0	15	30	41	S	Success
12	1	20	240	65	0	15	30	30	S	Success
<b>Polyamide</b>										
1	1	20	260	65	0	15	30	41	F	Pattern stuck to cavity
2	1	20	260	65	0	15	30	41	S	Inlet stuck, but success
3	1	20	260	65	0	15	30	41	S	Inlet stuck, but success
4	1	20	200	65	0	15	30	30	S	Inlet stuck, Small piece broke of
5	1	20	200	65	0	15	30	25	F	Inlet stuck, but success
6	1	20	220	65	0	15	30	33	S	Inlet stuck, but success
7	1	20	240	65	0	15	30	30	S	Inlet stuck, but success

**Table 38 Wax Injection Pattern Characteristics**



a. All the Wax Patterns from Dies



b. Wax Patterns from Polyamide Die

**Figure 46 Wax Patterns Produced**



### 7.2.3 Evaluation Results and Selection of Best Wax Pattern for Each Die

Visual inspection is used to select the three best patterns from each die. Each of the six patterns is measured following the same procedure as before, comparing them to their original CAD models.

#### 7.2.3.1 Wax Patterns Measurements

The 3D-Tol and features results are compared to select the best pattern for each die (Table 39). Only the results of the two selected patterns will be described in the next section. Data for the results of pattern A1, A2, A3, P1, P2 and P3 can be found in Appendix G and H.

	Alumide Wax Pattern				Polyamide Wax Pattern			
Statistics	A1	A2	A3	Better Option	P1	P2	P3	Better Option
Mean	0.0313	0.0068	0.0419	A2	-0.0537	-0.0481	-0.0560	P2
Standard Error	0.0202	0.0154	0.0173	A2	0.0103	0.0139	0.0184	P1
Median	-0.0070	-0.0090	-0.0100	A1	-0.0400	-0.0250	-0.1300	P2
Mode	-0.1230	-0.1940	-0.1610	A1	0.0110	-0.1130	-0.4880	P1
Standard Deviation	0.4629	0.3522	0.3962	A2	0.2345	0.3187	0.4201	P1
Sample Variance	0.2143	0.1241	0.1570	A2	0.0550	0.1016	0.1765	P1
Kurtosis	-0.4560	0.6394	-0.1217	A2	0.8502	0.4382	1.4860	P2
Skewness	0.2375	-0.0119	0.2516	A2	-0.3391	-0.1188	0.9373	P2
Range	2.7310	2.6270	2.4780	A3	1.5930	1.9380	2.4490	P1
Minimum	-1.2750	-1.5210	-1.1830	A3	-0.8770	-1.0880	-0.9280	P1
Maximum	1.4560	1.1060	1.2950	A2	0.7160	0.8500	1.5210	P1
Sum	16.368	3.539	21.938	A2	-28.104	-25.138	-29.3	P2
Count	523	523	523		523	523	523	
Largest(1)	1.4560	1.1060	1.2950	A2	0.7160	0.8500	1.5210	P1
Smallest(1)	-1.2750	-1.5210	-1.1830	A3	-0.8770	-1.0880	-0.9280	P1
Confidence Level(95.0%)	0.0398	0.0303	0.0340	A2	0.0201	0.0274	0.0361	P1
	Pattern Selected			A2	Pattern Selected			P1

**Table 39 Wax Pattern Statistics**

Statistical values and the dimensional accuracy index both indicate that the Alumide-A2 pattern and the Polyamide-P1 pattern should be selected. A2 has a DAI of 64.66 % and P1 a DAI of 65.52 % (Table 39 and Table 40).

DAI – Wax Patterns from Dies					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				
	High	Good	Low	Total	
Alumide1	36	55	25	116	47.41%
Alumide2	25	75	16	116	64.66%
Alumide3	26	74	16	116	63.79%
Polyamide1	17	76	23	116	65.52%
Polyamide2	16	75	25	116	64.66%
Polyamide3	28	58	30	116	50.00%

**Table 40 DAI of Wax Patterns from Dies**

**7.2.3.2 ANOVA Analysis**

The following hypothesis is stated to determine whether there is a significant difference between the accuracy of the three selected wax patterns from the alumide die:

$H_0$  : All mean measurements are equal

$H_1$  : All mean measurements are not equal

The table below provides the results when tested against a 95 % confidence level.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Alumide - Wax Pattern1	523	16.368	0.031	0.214		
Alumide - Wax Pattern2	523	3.539	0.007	0.124		
Alumide - Wax Pattern3	523	21.938	0.042	0.157		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.340	2	0.170	1.031	0.357	3.001
Within Groups	258.565	1566	0.165			
Total	258.905	1568				

**Table 41 Single factor ANOVA Results @ 95% Confidence (Alumide – Wax Patterns)**

The results indicate that the Null hypothesis cannot be rejected. There is no evidence to reject the hypothesis that all mean measurements are equal. The DAI indicate poor repeatability, (Table 40), but this is only an estimation method, therefore it can be concluded from this hypothesis that the alumide die have good repeatability properties.

The following hypothesis is stated to determine whether there is a significant difference between the accuracy of the three selected wax patterns from the polyamide die:

$H_0$  : All mean measurements are equal

$H_1$  : All mean measurements are not equal

The table below provides the results when tested against a 95 % confidence level.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Polyamide - Wax Pattern 1	523	-28.104	-0.054	0.055		
Polyamide - Wax Pattern 2	523	-25.138	-0.048	0.102		
Polyamide - Wax Pattern 3	523	-29.300	-0.056	0.176		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.018	2	0.009	0.079	0.924	3.001
Within Groups	173.861	1566	0.111			
Total	173.878	1568				

**Table 42 Single factor ANOVA Results @ 95% Confidence (Polyamide – Wax Patterns)**

The results indicate that the Null hypothesis cannot be rejected. There is no evidence to reject the hypothesis that all mean measurements are equal. The DAI indicate poor repeatability, (Table 40), but this is only an estimation method, therefore it can be concluded from this hypothesis that the polyamide die have good repeatability properties too.

## 7.2.4 Evaluation Results and Discussion of Best Wax Pattern

### 7.2.4.1 Selected Wax Pattern

#### Statistical Observations

Observations were made from the EDF and the list of descriptive statistics. All CMM statistical measurements for the patterns can be found in Appendix H.

The histograms and medians indicate that the error distributions are generally centered around zero, which means that the errors are random and not systematic. The medians

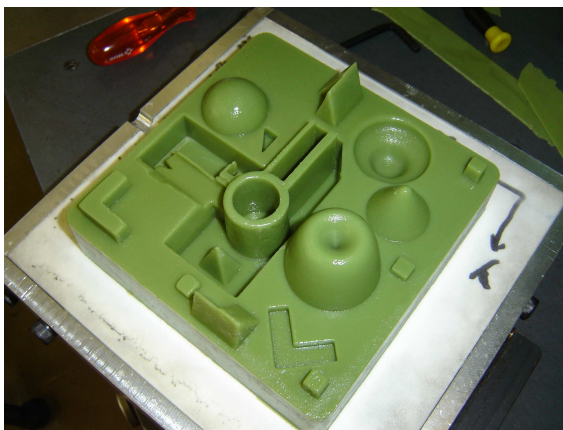
indicate very good central tendency with values of -0.009 mm for the alumide wax pattern and -0.04 mm for the polyamide wax pattern. Both histograms indicate a close-to-normal shape. Confidence intervals are constructed using standard errors. Both the alumide wax pattern and polyamide wax pattern have very small standard errors indicating that the sample size used is sufficient to support the results with good confidence.

Skewness show small negative values for both dies, which means that both distributions are slightly hanging over to the right. The wax patterns are thus in some cases larger than the original CAD model.

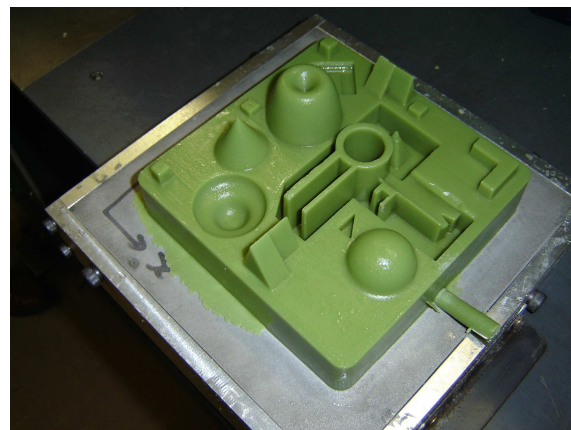
Both wax patterns have kurtosis values lower than 3 and therefore their distributions are considered platykurtic. Platykurtic indicates that the distributions have low peaks and flat midranges. The largest and smallest measured values are 1.106 and -1.295 respectively for the alumide wax pattern and 0.716 and -0.877 respectively for the polyamide wax pattern.

The confidence level is a quick method to compare the accuracy of the two parts. For the alumide wax pattern 95 % of the errors will be smaller than 0.0303 mm while for the polyamide wax pattern 95 % of the errors will be smaller than 0.0201 mm. These small values indicate that both parts have very good accuracy.

The polyamide wax pattern has a slightly smaller standard error than the alumide wax pattern. This leads to the conclusion that the polyamide wax pattern is vaguely more accurate than the alumide wax pattern (a. Pattern on Polyamide Core **b.** Pattern on Alumide Core Figure 47a and b).



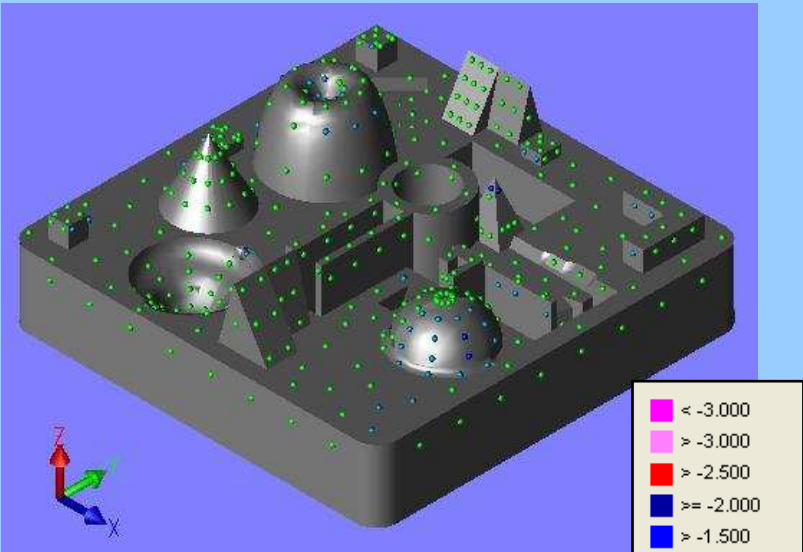
a. Pattern on Polyamide Core



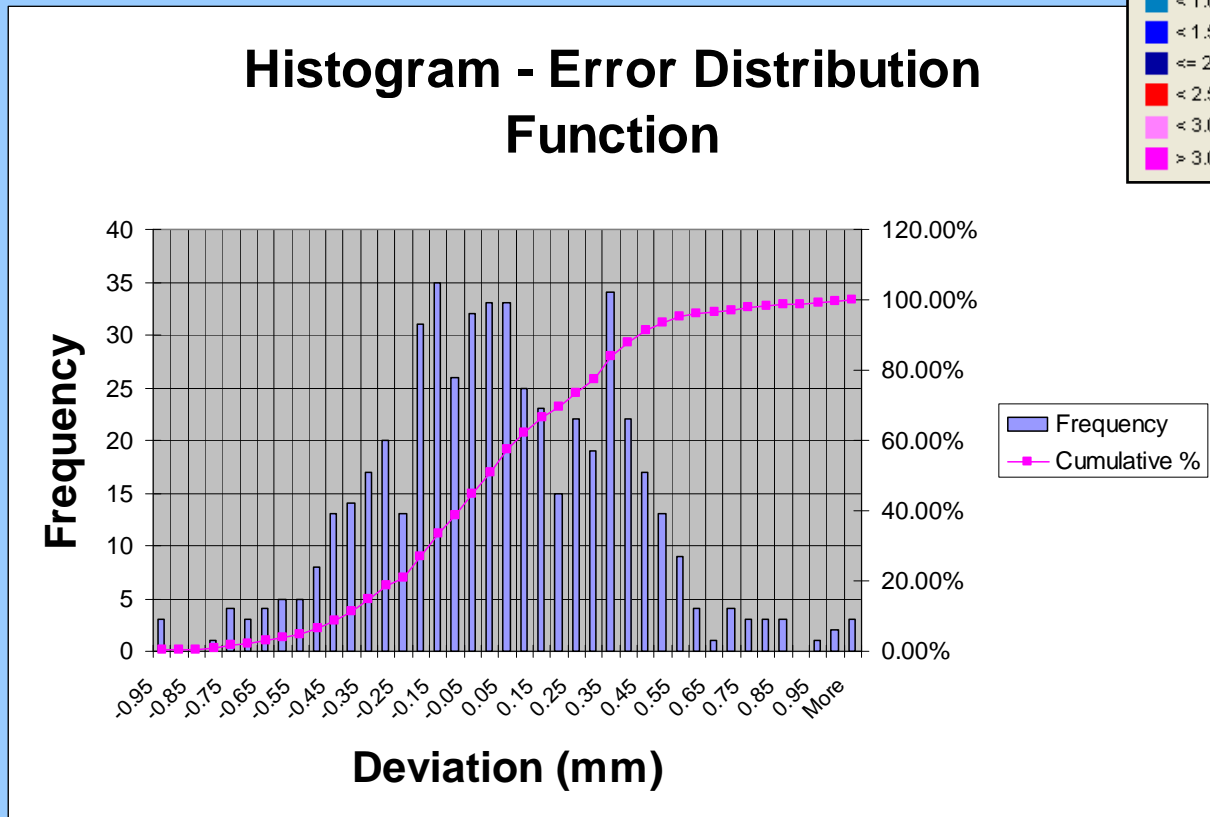
b. Pattern on Alumide Core

### Figure 47 Wax Patterns on Cores

Table 43 and 44 depicts the descriptive statistics and the error distribution for each pattern. Results of the measured feature tolerances are shown in Table 45 and 46. The feature data can be found in Appendix G.

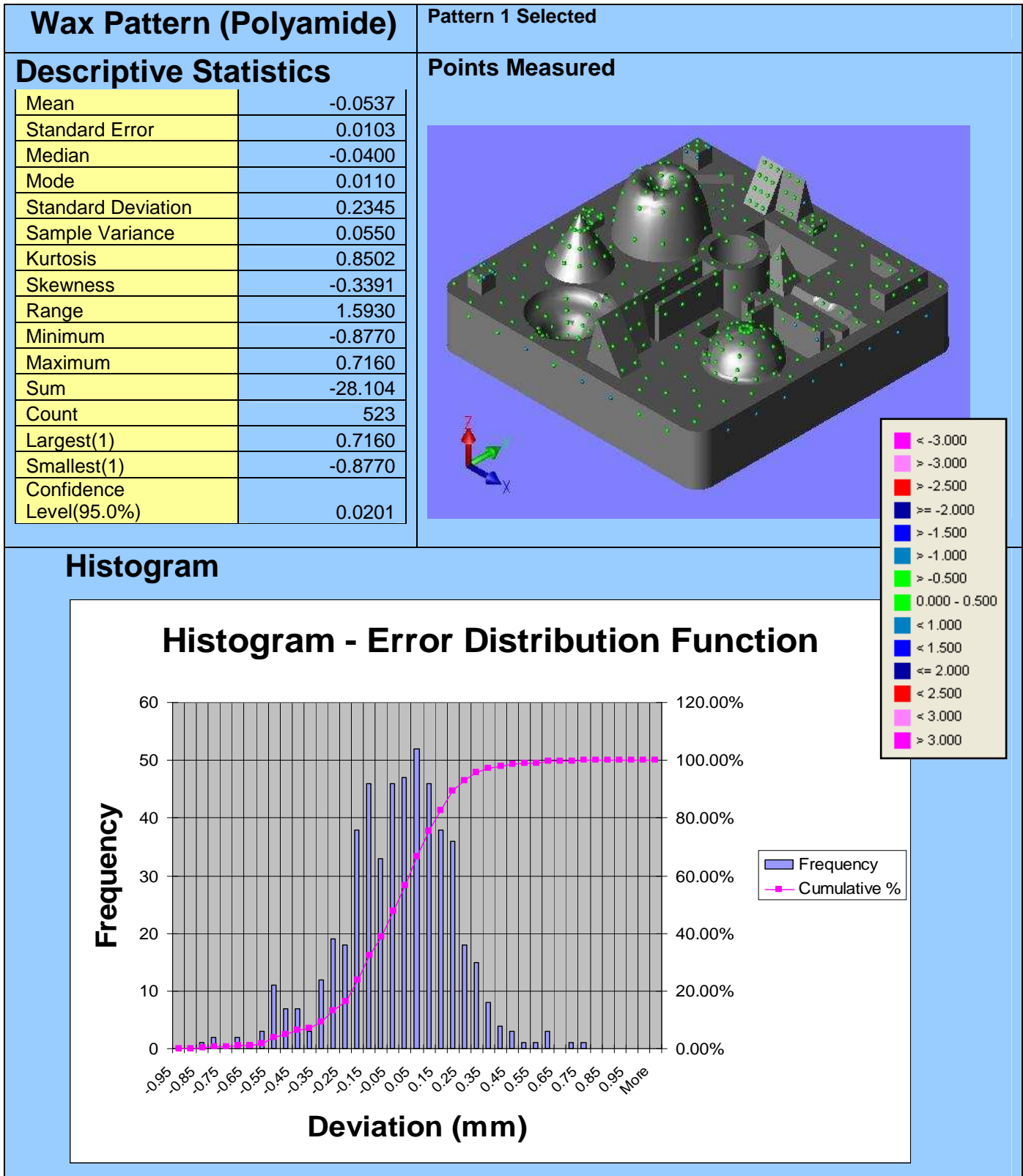
<b>Wax Pattern (Alumide)</b>		Pattern 2 Selected
<b>Descriptive Statistics</b>		<b>Points Measured</b>
Mean	0.0068	
Standard Error	0.0154	
Median	-0.0090	
Mode	-0.1940	
Standard Deviation	0.3522	
Sample Variance	0.1241	
Kurtosis	0.6394	
Skewness	-0.0119	
Range	2.6270	
Minimum	-1.5210	
Maximum	1.1060	
Sum	3.539	
Count	523	
Largest(1)	1.1060	
Smallest(1)	-1.5210	
Confidence Level(95.0%)	0.0303	

**Histogram**



**Table 43 Descriptive Statistics – Wax Pattern (Alumide)**





**Table 44 Descriptive Statistics – Wax Pattern (Polyamide)**



Feature Tolerances – Wax Pattern (Alumide)										
Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>A1</b>	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.701	1.781	<b>High</b>
<b>A2</b>	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.528	-0.012	<b>Good</b>
<b>A3</b>	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.384	-0.716	<b>Low</b>
<b>A4</b>	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.941	-0.309	<b>Good</b>
...										
...										
...										
...										
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.462	0.462	<b>Good</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.109	0.109	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.627	0.627	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	1.258	1.258	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.157	0.157	<b>Good</b>

**Table 45** Geometric Observations – Wax Pattern (Alumide)

(This is only an extract; see the Appendix G for the full table)



<b>Feature Tolerances – Wax Pattern (Polyamide)</b>										
<b>Tolerance No.</b>	<b>Feature</b>	<b>Tol.ElemName</b>	<b>Compared to</b>	<b>Type of Tolerance</b>	<b>Spec.</b>	<b>Lower Tol.</b>	<b>Upper Tol.</b>	<b>Actual</b>	<b>Tol. Deviation</b>	<b>Result</b>
<b>A1</b>	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.410	1.490	<b>High</b>
<b>A2</b>	Pattern	Line	Point	Distance	71.54	-0.500	0.500	70.617	-0.923	<b>Low</b>
<b>A3</b>	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.402	-0.698	<b>Low</b>
<b>A4</b>	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.717	-0.533	<b>Low</b>
...										
...										
...										
...										
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.515	0.515	<b>High</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.114	0.114	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.506	0.506	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.871	0.871	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.121	0.121	<b>Good</b>

**Table 46** Geometric Observations – Wax Pattern (Polyamide)  
 (This is only an extract; see the Appendix G for the full table)

A basic tolerance of  $\pm 0.5$  mm is used for all feature measurements on all wax patterns. A theoretical axis and an actual axis for the dome, cone, sphere and sinkhole features are created in order to measure various tolerances.

### **Analysis of the built features (Wax Patterns from Alumide and Polyamide Die)**

#### *Cubes*

The cubes were used to check for straightness in the x and y direction, by checking if they were built in a straight line. The highest straightness deviation was 0.254 mm in the x direction and the others were all below 0.03 mm. The measurements for cube 3 and 4 on both patterns are within tolerance for nearly all measurements. Almost every measurement on cube 2 is out of tolerance with the largest value being -1.0 mm for both patterns in the x-direction. Cube 1 measurements are within tolerance except for the sizes in the x-direction which is slightly out of tolerance.

#### *Wedges*

The polyamide wedges have very good angularity, of which all are within tolerance. They also have good dimensions with the exception of tolerance C5 (wedge x) and E4 (wedge y) with deviations of -1.084 mm and -0.553 mm respectively. Wedge y on the alumide wax pattern has very good angularity, except for two dimensions slightly out of tolerance namely E2 and E4. Wedge x on the alumide wax pattern has poor angularity and dimensions, with values of -0.750 mm, 0.827 mm and -0.869 mm for AA2, AA3 and C5 respectively.

#### *Pyramid*

Angularity on the polyamide wax pattern is very good with all angles within tolerance. Angularity on the alumide wax pattern is also good with the exception of CC2, which has a value of 3.324 mm and is far out of tolerance.

#### *Cylinder*

Both patterns present good cylindricity and concentricity, all within the  $\pm 0.5$  mm tolerance. Every inner and outer cylinder diameter is within tolerance.

#### *Square Base*

Both wax patterns are smaller in the x and y directions with all values on the polyamide exceeding 1.1 mm. Parallelism and perpendicularity for both patterns are very good in the x and y directions. The polyamide wax pattern also has a very good flatness. A flatness of 0.91 mm is measured for the alumide wax pattern, which is due to the fact that the core of the die deformed under the pressure of the multiple wax injection cycles.



### *Thin Walls*

All thin walls on both patterns present excellent thickness dimensions and parallelism, each one being well within tolerance.

### *Rectangular Protrusion/Hole*

The rectangular protrusions on both patterns present excellent perpendicularity values, all well within tolerance. The alumide wax pattern protrusion has very good dimensions, but the polyamide wax pattern protrusion has slightly worse dimensions with a highest value of -0.790 mm for C3. The rectangular holes on both patterns present very good perpendicularity and dimensional values.

### *Tri-angular Hole*

The rectangular holes on both patterns present excellent perpendicularity and dimensional values, all well within tolerance.

### *Cone*

Both cones exhibit very good symmetry. The cones on both patterns have good circular runouts in terms of circles measured around the cone, when using the actual cone axis. Very poor circular runout is obtained when the theoretical axis is used as reference. There is a discrepancy between using the theoretical or actual cone axis. When analysing the raw data, it becomes apparent that the deviation between the theoretical and actual axis is mainly in the x direction. The alumide wax pattern has poor axial runout values, which could be due to the deterioration of the dies caused by the injection cycles. The polyamide wax pattern presents out of tolerance values only when using the theoretical axis as reference.

### *Sphere*

Both spheres have extremely bad symmetry when using the plane as reference element with a deviation of 2.165 mm for the alumide wax pattern and 4.088 mm for the polyamide wax pattern. The spheres on both patterns have reasonable circular runouts in terms of circles measured around the sphere, except for the alumide wax pattern when using the theoretical axis with a value of 2.069 mm for T38. When looking at the coaxiality between the actual and theoretical axis of the spheres, a discrepancy can be witnessed - a deviation of 2.165 mm for the alumide wax pattern and 0.409 mm for the polyamide wax pattern. Analysing the raw data, it indicates that the deviation is mainly in the x direction.

The spheres present poor axial runouts around their actual and theoretical axes.

*Dome*

The polyamide wax pattern dome exhibits exceptionally good perpendicularity of actual axis to base, circular runouts, axial runouts, symmetry and concentricity, all well within tolerance. The alumide wax pattern also presents good circular runouts and concentricity of circles, but has a poor axial runout and perpendicularity of actual axis to base.

*Sinkhole*

Both sinkholes present good circular runouts when using the actual sinkhole axes, but poor ones when using the theoretical axis as reference element. Axial runout is out of tolerance for the polyamide wax pattern with a deviation of 0.519 mm utilizing the theoretical axis as reference element. Both patterns have good symmetry, except T81 on the polyamide wax pattern with a value of 0.515 mm – which indicates a discrepancy between the actual and theoretical axis. Due to this discrepancy, perpendicularity and coaxiality for both patterns is out of tolerance with a maximum deviation of 0.871 mm for coaxiality between the actual and theoretical axis on the polyamide wax pattern.

It can be concluded that deformation of the dies, caused by the pressure of multiple wax injection cycles, is the cause of the discrepancy between axes. In turn, the latter might be the cause of most of the other far out-of-tolerance deviations.

DAI - Wax Pattern (Alumide2)					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X < 0.5				
Low	X < -0.5				
Pattern Model	Counts				64.66%
	High	Good	Low	Total	
	25	75	16	116	

DAI - Wax Pattern (Polymide1)					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X < 0.5				
Low	X < -0.5				
Pattern Model	Counts				65.52%
	High	Good	Low	Total	
	17	76	23	116	

**Table 47 DAI – Selected Wax Patterns**

A best-fit is done at the end of each measurement program to ensure the best measurement values are obtained. After evaluating the descriptive statistics, features measured and the dimensional accuracy index, it seems that the polyamide wax pattern is slightly more accurate than the alumide wax pattern (Table 43, 44 and 47).



### 7.2.4.2 ANOVA Analysis

The following hypothesis is formulated to determine whether there is a significant difference between the accuracy of a wax pattern from an alumide die and polyamide die:

$H_0$  : All mean measurements are equal

$H_1$  : All mean measurements are not equal

The table below provides the results when tested against a 95 % confidence level.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Alumide - Wax Pattern 2	523	3.539	0.007	0.124		
Polyamide - Wax Pattern 1	523	-28.104	-0.054	0.055		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.957	1	0.957	10.692	0.001	3.850
Within Groups	93.468	1044	0.090			
Total	94.425	1045				

**Table 48 Single factor ANOVA Results @ 95% Confidence (Selected Wax Patterns)**

The results indicate that the Null hypothesis cannot be accepted. There is a significant difference between the accuracy of the two wax patterns, (namely A2 and P1).

It can be confidently concluded from this hypothesis that a significant difference in accuracy exists between the patterns produced from the alumide die and those from the polyamide die.

It can be concluded that the polyamide die produces slightly more accurate patterns than the alumide die.

## 7.3 Surface Roughness of Dies and Wax Patterns

Ten random measurements were taken in the x, y and z directions and averaged to obtain the overall roughness for each die and pattern.  $R_a$  is selected as the roughness parameter to be measured and a cut-off length of 0.8 mm is used (Table 49). Die surface roughness measurements were taken before any release agent was applied.



	Alumide Die	Polyamide Die	Wax Pattern (Alumide)	Wax Pattern (Polyamide)
Direction	Ra ( $\mu\text{m}$ )	Ra ( $\mu\text{m}$ )	Ra ( $\mu\text{m}$ )	Ra ( $\mu\text{m}$ )
x	18.06	15.66	6.13	6.85
x	15.19	15.46	3.95	7.30
x	14.97	13.98	8.55	7.20
x	15.74	15.69	3.62	8.71
x	17.93	13.76	4.26	3.84
x	15.88	15.92	2.55	4.30
x	16.52	14.26	5.54	4.61
x	15.42	15.83	3.73	3.57
x	17.10	15.21	4.96	4.24
x	16.14	14.308	5.32	3.84
<b>x (avg.)</b>	<b>16.30</b>	<b>15.08</b>	<b>4.861</b>	<b>5.446</b>
y	14.93	15.27	6.86	6.77
y	15.07	17.18	4.78	9.31
y	15.91	17.07	4.53	8.67
y	15.44	14.57	6.85	6.41
y	15.39	18.12	5.24	3.57
y	14.91	15.76	6.11	3.35
y	15.31	15.92	3.11	4.13
y	15.43	15.41	3.41	4.41
y	14.72	16.82	5.28	4.32
y	15.89	17.16	5.91	3.20
<b>y (avg.)</b>	<b>15.28</b>	<b>16.33</b>	<b>5.208</b>	<b>5.414</b>
z	15.65	14.75	2.77	7.62
z	15.82	14.98	2.54	8.13
z	14.86	16.73	2.29	8.37
z	15.63	15.62	2.18	8.02
z	16.40	15.78	2.00	6.22
z	15.54	15.32	3.58	7.71
z	17.26	15.89	2.02	8.64
z	14.85	15.96	3.00	6.63
z	15.42	15.74	3.04	6.78
z	16.32	16.22	4.08	7.11
<b>z (avg.)</b>	<b>15.775</b>	<b>15.70</b>	<b>2.75</b>	<b>7.523</b>
<b>Roughness (avg.)</b>	<b>15.785</b>	<b>15.703</b>	<b>4.273</b>	<b>6.128</b>

**Table 49 Dies and Wax Patterns Surface Roughness**

### Conclusion

The results indicate that there is a very small difference between the surface roughnesses of the two dies; a difference of only  $0.082 \mu\text{m}$ . The reason for these close values can be explained by the fact that both materials have an average grain size of  $60 \mu\text{m}$  as obtained from their Material Data Sheets (Appendix I).





The alumide wax pattern has a better surface finish value than the polyamide pattern with values of 4.273  $\mu\text{m}$  and 6.128  $\mu\text{m}$  respectively. The patterns have better surface finishes than the dies. This is due to the excessive use of release agent and slight sanding of surfaces to help pattern removal from dies.

#### 7.4 Economics of the Process

The prices shown in Table 50 are industry-related prices (VAT excluded) and can in certain cases be reduced by 15 % due to the research purpose of the parts.

		Alumide	Polyamide
<b>CENTRE OF RAPID PROTOTYPING AND MANUFACTURING – Central University of Technology, Free State</b>			
LS	Alumide Die (5mm wall thickness)	R15 095	
LS	Polyamide Die (5mm wall thickness)		R7 910
<b>RPD LABORATORY - Stellenbosch University</b>			
Preparation of Dies	F18 Resin Filling	R500	R1 000
	10mm Aluminium Plating	R1 000	R1 000
<b>CSIR (Pretoria)</b>			
Wax Patterns	Alumide Die	R250	Per Pattern
	Polyamide Die	Per Pattern	R250
<b>Total</b>		<b>R16 845</b>	<b>R10 160</b>

**Table 50 Process Economics – Wax Patterns from Dies**

The most influential factor on price is material cost. Manufacturing time and post processing also has a slight influence on the price. It takes roughly a day to build a die and another two days to prepare the die for wax injection, if all machines and materials are already available. Suppliers will roughly take a week to deliver a die and another week to reinforce the die. The wax injection cycle takes about 5 minutes per pattern.

The total process cost amounted to R16 845 to produce the first wax pattern from an alumide die and R10 160 to produce the first wax pattern from a polyamide die. Producing more patterns from each die will drastically reduce the cost per pattern. The dies are grown with a 5 mm wall thickness; if the dies were grown solid the cost would have been R 39 115 for the alumide die and R17 620 for the polyamide die.



The higher cost of the alumide die does not justify the alumide die when accuracy and surface finish is taken into account. However, tool life might justify this higher cost when more than one pattern is needed, but this is beyond the scope of this thesis.

Figure 48 and Figure 49 illustrates the tooling cost and lead time for different tooling. A tool for the benchmark part is not that complex a therefore not that expensive, but for a very complex die the cost can easily increase to R150000 or more, also depending on the die material used.

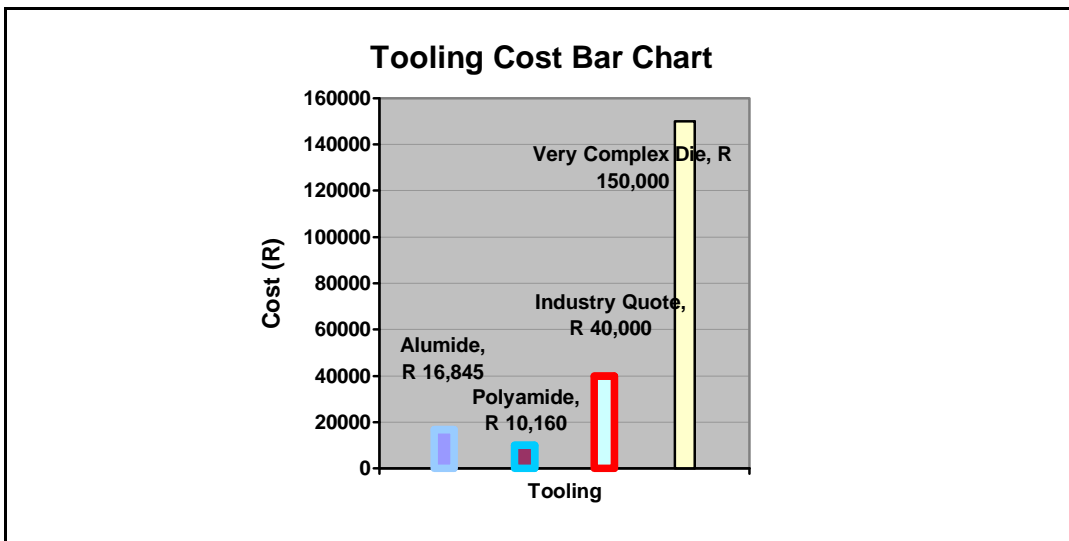


Figure 48 Cost Comparison of Tooling (Dies)

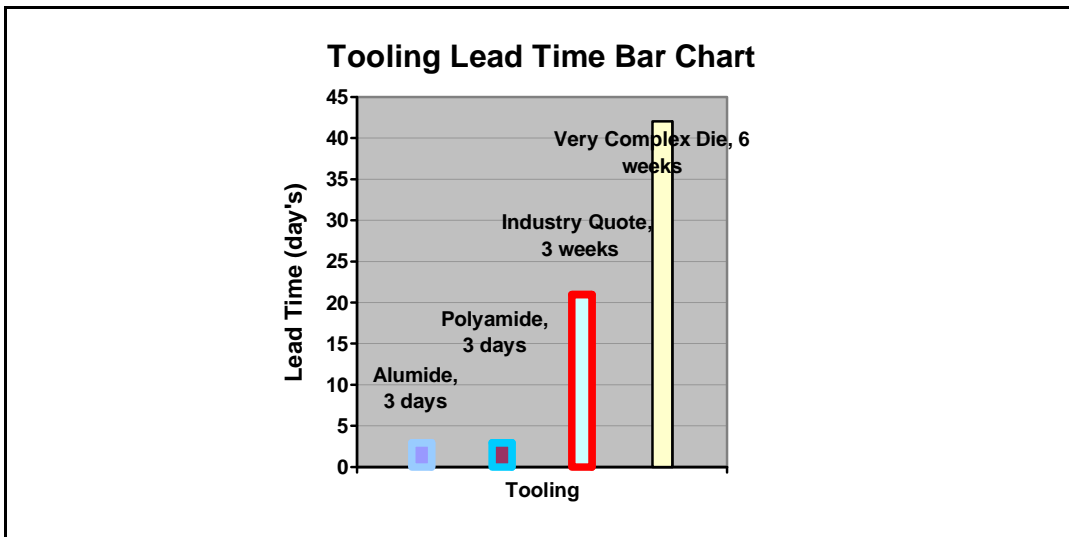


Figure 49 Lead Time Comparison of Tooling (Dies)



## ***8. Suitability of Layer Manufactured Shells for Investment Casting***

### **8.1 Rapid Shell Making**

#### **8.1.1 Introduction**

Direct Shell Production Casting (DSPC) was invented by Emanuel Sachs from the Massachusetts Institute of Technology (MIT) in 1989 [9]. The process was bought and marketed by Soligen. DSPC is an extremely flexible process that provides the manufacturing industry with a method that shortens the production cycle significantly. DSPC can be used for casting of metal parts containing integral metal cores directly and automatically from a CAD file. The process allows for the accommodation of design changes literally to within hours of the casting being done. Tooling and setup times to prepare moulds are completely removed. Ceramics or alumina powders are the main types of materials used in this advanced process. One of the drawbacks of the process is the fact that only a limited amount of materials can be applied. DSPC eliminates the need for a foundry to maintain patterns or dies. Each casting is made from a custom designed mould that can be prepared in a few hours once the design is completed [60, 61].

#### **8.1.2 Direct Shell Production Casting**

The process used was derived from the layer manufacturing process 3D Printing where powders are joined by a binder, layer by layer [60, 61].

Soligen developed a software program that makes use of the CAD file of the designed part to be cast. The software program designs the shell automatically from this file. The designer must keep an eye on this process, ensuring that no problems occur and that the necessary supports are in place.

The model of the part is scaled to allow for shrinkage during the cooling stage of the casting process. Features that are not feasible to print are removed, only to be machined later. Sprues, runners, gates and – if necessary - even cooling ducts are included in the design.



DSPC moulding shells can consist of several cavities, building a tree or allowing more than one part to be cast at a time. Integral ceramic cores can be included in the shell, allowing hollow parts to be made. The layer thickness of the shell can be specified, depending on the complexity and quality of the final part.

The shell production unit includes a bin containing alumina ceramic powder. A platform in the bin moves vertically in precise increments to create each layer. Above the platform is a hopper with fine ceramic powder. A roller spreads a thin layer of the alumina powder for each layer. An ink-jet print-head ejects tiny drops of liquid binder (colloidal silica) onto the powder to form the cross section, selectively bonding the particles together.

A pressurized stream of binder is divided into droplets through a continuous-jet ink-jet head when it is vibrated by a piezoelectric ceramic cavity as it exits. The droplets pass through a capacitor and is charged after which they are deflected to a specific location using an electric field. The alumina powder hardens into a solid ceramic when the binder is added. The unbound powder around the part provides support for further layers to be printed later [61].

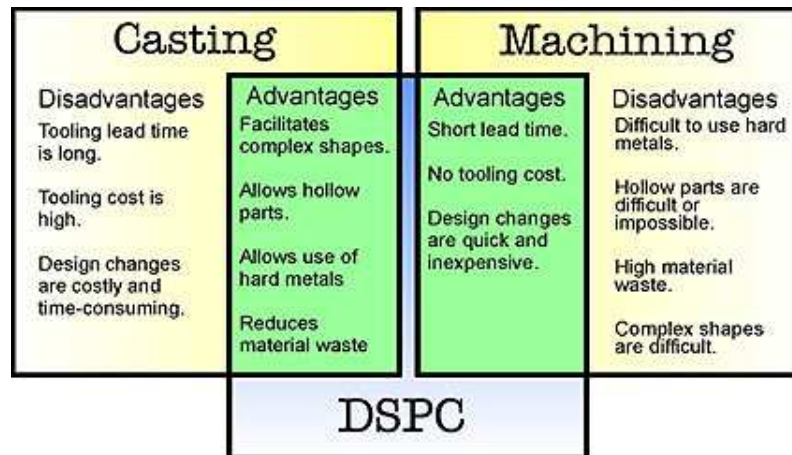
After firing, all excess powder is removed and the shell is ready for metal casting.

The internal surface finish of the moulds is still a concern for Soligen and MIT developers. Research is being conducted to smooth or coat the internal surface of moulds. The use of these moulds are however only suited for product development, (prototypes) [61].

DSPC is a manufacturing process for metal parts that combines the advantages of casting and of machining and eliminates the disadvantages of both of these processes [60]. For every part a new shell must be built. This process is only feasible when making one cast of a very complex part (Figure 50).



**Figure 50 Ceramic Shells for Complex Parts from Soligen [60]**



**Figure 51 Advantages of DSPC [60]**

Eliminating casting tools not only shorten lead time and save cost, but add tremendous flexibility to the designing of complex cast parts which can be vital through the development phase. DSPC eliminates the disadvantages of casting and machining when used for low runs (Figure 51).

### 8.1.3 Specifics of Layer Manufactured Shells for IC

The basic ideas in the sections under chapter 4, namely Design for Manufacturability, Accuracy, Build Orientation, Pattern Quality and Surface Quality all apply to rapid shell making as well.

The listing of direct shells under section 3.3 is repeated here for a better clarity in the context:

Direct Shells [9]:

- DSPC, a 3DP technology, produces shells with an accuracy of  $\pm 0.2$  mm. Here small batches of fully functional castings are permitted a quick turnaround, in a variety of metals.
- The EOSINT M 160 RP system employs LS to directly sinter ceramic shells with accuracies of  $\pm 0.6$  % and surface finishes of 30 – 50  $\mu m$  reported.



## **8.2 Conclusions**

Direct shell production can tremendously reduce lead time and cost due to the elimination of patterns and die manufacturing if only one or a few parts are needed. It must be remembered that one shell can only produce one part.

A big advantage is that the whole shell can be printed as one single object and the need for inserts is eliminated, therefore also eliminating the risk of core shifting.

A certain degree of control is allowed over heat transfer from the casting due to the ability to change the ceramic shell. DSPC involves minimal shell transfers, therefore reducing the risk of damage while preserving dimensional tolerances [9].



## 9. *Conclusion & Recommendations*

### **Rapid Patterns**

Handling skills have a great influence on the manufacturing of patterns. The study indicates that the LS pattern has the best dimensional and geometric accuracy, but the worst surface quality. The LS and ThermoJet patterns prove to be geometrically more accurate than the 3DP patterns. The 3DP-3 mm pattern had the best mean and skewness values for the dimensional measurements. Comparing old and new data for the 3DP patterns indicates very good long-term dimensional stability for these parts. The Thermojet pattern has the best surface finish, although many growing lines are visible.

It can also be concluded that all the processes used for each of the patterns studied are capable of building uniform thin-walled structures with a thickness of at least 3 mm.

It can be recommended to re-measure the new patterns that were printed for casting purposes in order to re-evaluate conclusions.

### **Rapid Dies**

Errors on the dies are random and not systematic. The alumide dies both exhibit close-to-normal distributions according to the shape of their histograms. Statistics indicate that the dies are slightly smaller than the original CAD model of the dies, meaning that the shrinkage values used during building could be slightly increased. Confidence levels indicate that the dies are very accurate.

Both die cavities demonstrate very good dimensional and geometric accuracy with very few values and features out of tolerance. This indicates that both materials could possibly provide very accurate dies for the creation of wax patterns for investment casting. The DAI is only an estimation method and there is little difference between the two values. However, the ANOVA analysis concludes that there is still a significant difference in accuracy between the dies.

It can be concluded that the alumide die is more accurate than the polyamide die - based on the statistical analysis. Both dies provided good features with adequate definition. However further research will determine whether the achieved accuracy is sufficient for the IC requirements.



### **Wax Injection**

The dies are very fragile and porous and reinforcement is a definite requirement when used for wax injection. Proper alignment of the dies using guide pins or plates is necessary to prevent the core from bumping against the cavity and causing damage to the surface and features of the die.

Continuous layers of silicone release agent must be applied until the porous dies become saturated in order to obtain a first pattern. The excess amounts of release agent influence the surface quality of the wax patterns. Excessive scraping and heat (butane flame) used to remove wax from dies causes damage to the surface finish and die definition. Wax dissolving solvents should be used for cleaning or removing wax from surfaces. Light sanding of die inner side walls is necessary for easy pattern removal.

Poor heat-transferring properties of dies limit the number of continuous injections. Dies become too warm and wax does not solidify at thick sections. This is a clear indication that cooling channels will be needed to reduce injection cycle times. Increasing dwell times allows for better solidification of wax, but only until die temperatures become too high. Water cooling channels could easily have been included in the die cavities by inserting copper pipes in the back of the hollow dies before filling them with resin.

Die porosity allows for wax penetration at areas experiencing continuous high wax pressure. This complicates pattern removal from dies. Slight buckling of the patterns is caused by the removal process, but can be reduced or eliminated by the use of ejector pins.

The alumide core was compacted by the pressure of the wax injection. The pattern thickness nearly doubled after a dozen injection cycles. The compacting is due to the porosity of the dies. The sagging of the core was so much that fine cracks started forming. Therefore it can be concluded that RP dies are mechanically weaker than conventional dies due to their porosity. Building hollow dies and reinforcing them with resin can reduce the overall compacting effect. The dies can also be infiltrated with an epoxy to strengthen them. It is a point for future research.

Injection of each die was only repeated until three good patterns (visually selected) were obtained. The injection cycles can be repeated to obtain many more patterns. Mould life is also a point for future research.

### **Wax Patterns**

The ANOVA analyses of the numerous wax patterns from each die indicate that each die have good repeatability properties.





The histograms and medians indicate that the error distributions are generally centered around zero, which means that the errors are random and not systematic. Wax patterns are larger than the original CAD model of the patterns. As previously stated the dies were slightly smaller than their CAD model, this means that the wax shrinkage factor used for the die design was too much. The compression of the porous surfaces of the dies could also have influenced the size of the patterns. This is a further point for future research.

The wax pattern from the polyamide die has a slightly smaller standard error than the wax pattern from the alumide die. The wax pattern from the polyamide die is vaguely more accurate than the wax pattern from the alumide die.

The deformation of the dies under the pressure of multiple injection cycles might be the cause of some of the far out-of-tolerance deviations on the patterns.

The DAI is only an estimation method and there is little difference between the two values. However, the ANOVA analyses indicate that there is still a significant difference in accuracy between the two wax patterns. It can be concluded that the wax pattern from the polyamide die is statistically more accurate than the one from the alumide die.

#### **Die and Wax Pattern Surface roughness**

Surface roughness only differs by a fraction between the two dies. The wax pattern from the alumide die has a better surface finish than ones from the polyamide die.

#### **Pattern and Die Economics**

Material cost is still one of the most influential factors on the final expenditure for patterns and dies. Manufacturing time and post processing also have a slight influence on the price.

3DP starch based and wax infiltrated patterns are the cheapest to produce due to the low cost of its materials compared to LS polystyrene and ThermoJet wax patterns. The cost of a LS polystyrene pattern is nearly three times the cost of a 3DP pattern. The ThermoJet uses very expensive material and has the highest cost per pattern, more than three and a half times the cost of a 3DP pattern.

The LS powders and reinforcement materials used for the dies are expensive and the total cost can be anything from ten to twenty thousand rand to produce the first benchmark pattern from a LS die made of alumide or polyamide. It is expensive, but compared to conventional tooling for the production of only one pattern it is a minimal price to pay. The dies were grown with a 5 mm wall thickness; if the dies were grown solid the cost would have been more than double for each



die. The higher cost of the alumide die does not justify the alumide die when accuracy and surface finish is taken into account. However, tool life might justify the higher cost depending on the number of patterns required. The study of the tool life is beyond the scope of this thesis and forms another point for future research.

Each supplier can manufacture a pattern in roughly one day, depending on the size of the pattern. Suppliers can roughly produce and deliver a die in a week's time. The reinforcement of the die and injection will take further two or three days before delivery of the first pattern. Producing more patterns from each die will drastically cut the cost per pattern.

### **Direct Shell Production**

Although direct shell production can tremendously reduce lead-time and cost, it must be remembered that each shell can only produce one part. The internal surface roughness of these shells is still a big concern.

### **Future Research**

The thesis forms a base for the continuing research of the AMTS project focusing on building of Investment Casting capabilities for light metal alloys in South Africa. Three patterns of each of the three processes, namely 3DP, LS and ThermoJet, were already built again and will be cast in selected titanium, magnesium and aluminium alloys. The objectives for future research include the following:

#### Rapid Pattern Making

1. Investigating methodical aspects to determine the most suitable pattern-making method for a particular product, depending on part geometry (shape complexity) and part technological requirements.
2. Developing material property's specifications of light metals, especially with regard to the shrinkage behaviour occurring after several steps within the investment casting process chain.
3. Developing, evaluating and selecting of process chains for rapid pattern making for investment casting.

#### Rapid Die Making

1. Investigating methodical aspects to determine the most suitable die making method for a particular product depending on part geometry (shape complexity) and part technological requirements.
2. Development, evaluation and selection of process chains for rapid die making.

#### Direct Shell Production

1. Cost analysis and investigations regarding the economics of RP-methods and process chains for direct shell production.



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# Appendix

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*Appendix A Features Measured -  
Drawings*

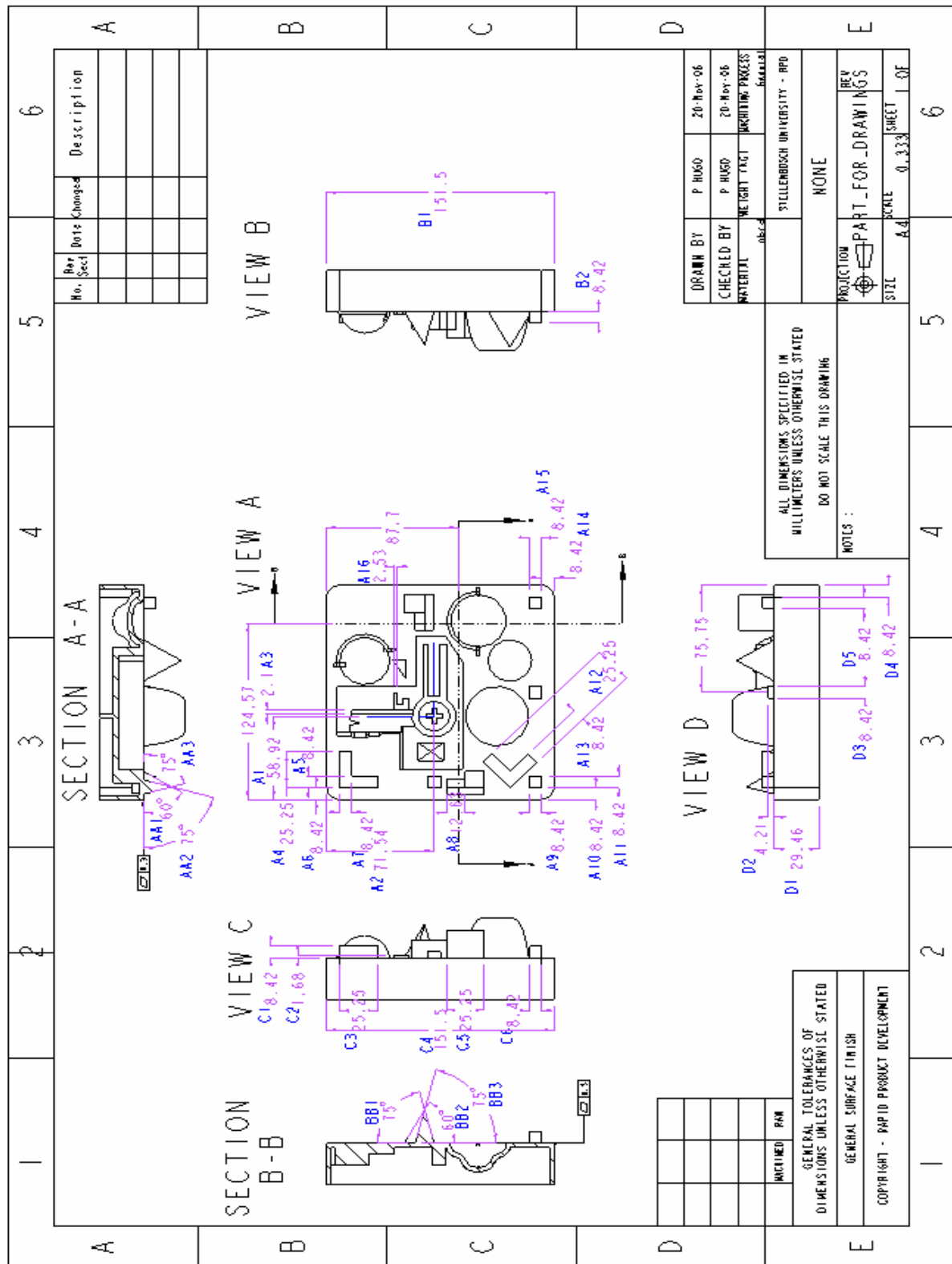


Figure A Features Measured a

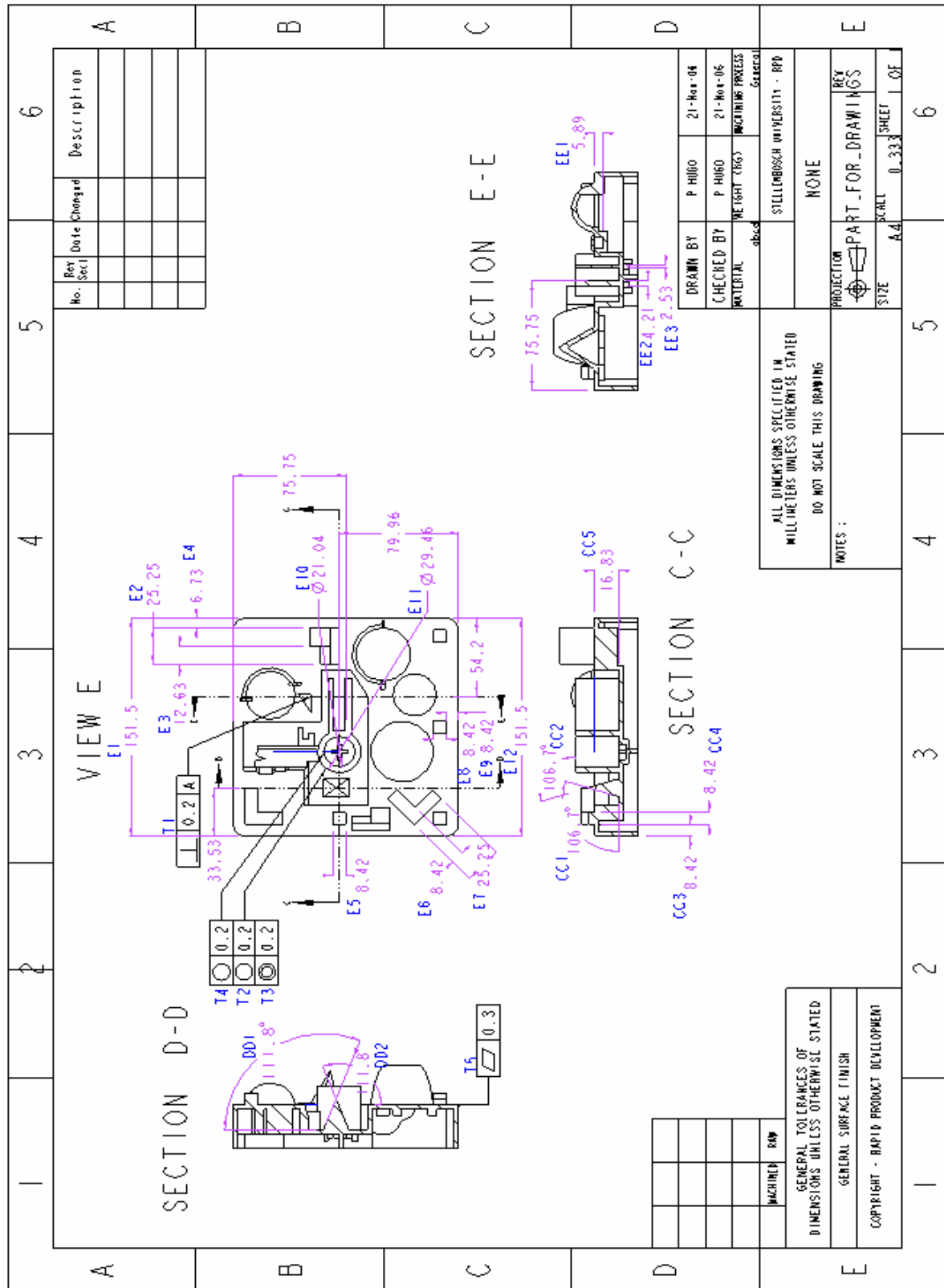


Figure B Features Measured b

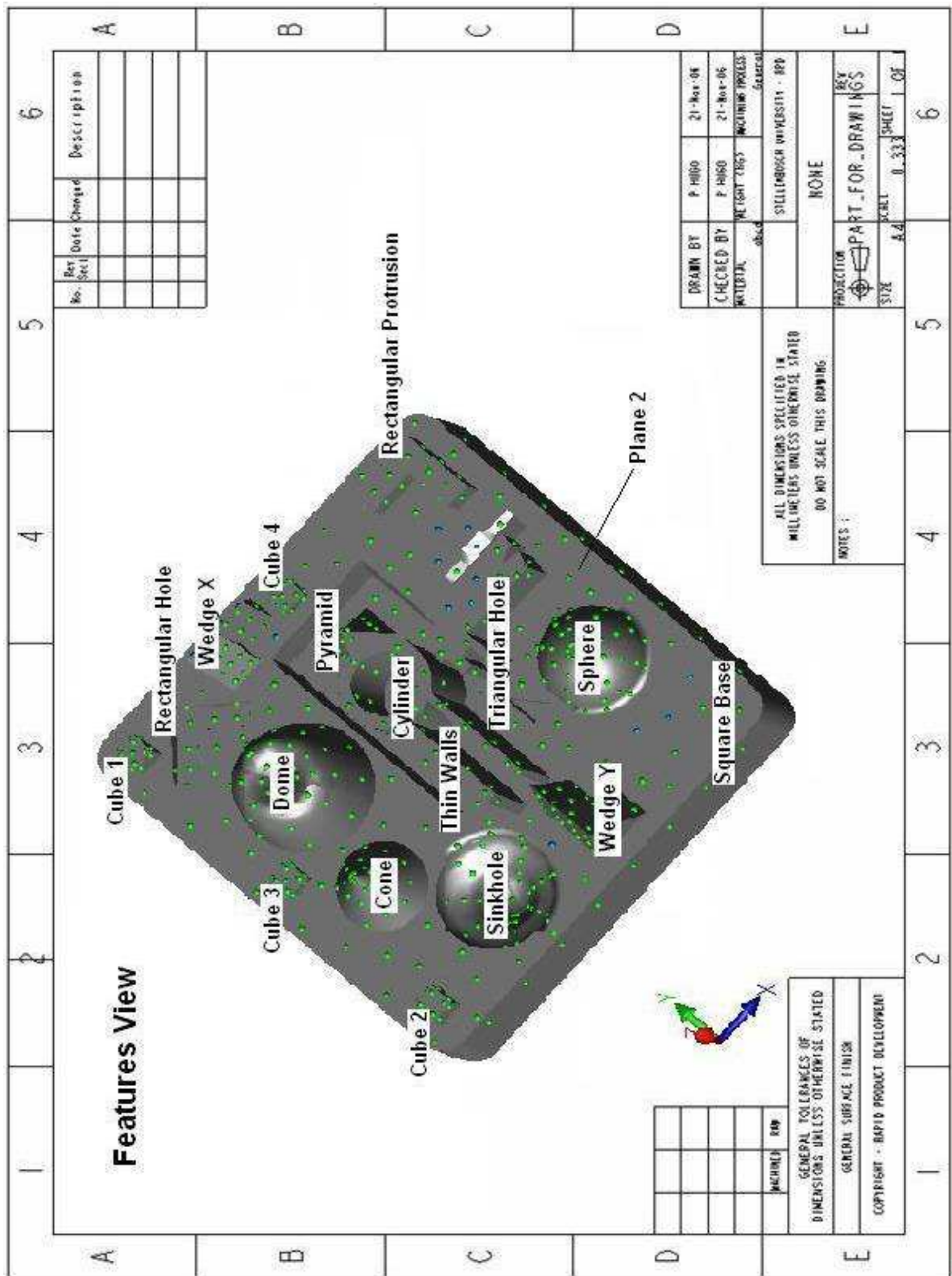


Figure C Features Measured c



*Appendix B Investment Casting  
Companies in South  
Africa*



<b>CastCo Precision Casting</b>	<b>IntraCast Precision Casting</b>	<b>Rely Precision Casting</b>
<p><b>Physical Address:</b> 30 Assegaai Road Parow Industria Western Cape</p> <p><b>Postal address:</b> P.O. Box 19133 Tygerberg 7505 South Africa</p> <p>Tel: +(27) (0)21 931 8276 Tel: +(27) (0)21 931 6324 Email: <a href="mailto:info@castco.co.za">info@castco.co.za</a></p>	<p><b>Physical Address:</b> 2 Main Road Anderbolt Boksburg North</p> <p><b>Postal address:</b> P.O. Box 9558 Brentwood Park 1505 South Africa</p> <p>Tel: (27 11) 918-1943/4 Fax: (27 11) 918-1999 Email: <a href="mailto:inquiry@intracast.co.za">inquiry@intracast.co.za</a></p>	<p><b>Physical Address:</b> 512 Commissioner Street Industrial Sites Boksburg</p> <p><b>Postal address:</b> P O Box 222 Boksburg 1460 South Africa</p> <p>Tel: +27 11 914-1640 Fax: +27 11 914-3586 email: <a href="mailto:sales@rely.co.za">sales@rely.co.za</a></p>

### IC Companies in South Africa



*Appendix C LM Patterns -  
Features CMM  
Data*





## Feature Tolerances - 3DP Pattern 3mm

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>A1</b>	Square Base	Line	Point	Distance	58.92	-0.500	0.500	61.195	2.275	High
<b>A2</b>	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.350	-0.190	Good
<b>A3</b>	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.823	-0.277	Good
<b>A4</b>	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	25.517	0.267	Good
<b>A5</b>	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.506	0.086	Good
<b>A6</b>	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.439	0.019	Good
<b>A7</b>	Pattern	Line	Point	Distance	8.42	-0.500	0.500	8.103	-0.317	Good
<b>A8</b>	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	13.635	1.005	High
<b>A9</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.582	0.162	Good
<b>A10</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	9.034	0.614	High
<b>A11</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.384	-0.036	Good
<b>A12</b>	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.374	0.174	Good
<b>A13</b>	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.653	0.233	Good
<b>A14</b>	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.611	0.191	Good
<b>A15</b>	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.299	-0.121	Good
<b>A16</b>	Pattern	Line	Point	Distance	2.53	-0.500	0.500	2.136	-0.394	Good
<b>B1</b>	Square Base	Line	Point	Distance	151.5	-0.500	0.500	152.077	0.577	High
<b>B2</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.526	0.106	Good
<b>C1</b>	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	7.998	-0.422	Good
<b>C2</b>	Pattern	Line	Point	Distance	1.68	-0.500	0.500	1.586	-0.094	Good
<b>C3</b>	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.984	-0.266	Good
<b>C4</b>	Square Base	Line	Point	Distance	151.5	-0.500	0.500	152.077	0.577	High
<b>C5</b>	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	25.246	-0.004	Good
<b>C6</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.100	-0.320	Good
<b>CC3</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.384	-0.036	Good
<b>CC4</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	9.034	0.614	High



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	18.269	1.439	High
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	29.954	0.494	Good
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	3.554	-0.656	Low
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.446	0.026	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.771	0.351	Good
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.708	0.288	Good
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	152.561	1.061	High
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	25.701	0.451	Good
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.735	0.105	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	7.636	0.906	High
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.103	-0.317	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.618	0.198	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.677	0.427	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.907	-0.513	Low
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.025	-1.395	Low
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.132	0.092	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.752	0.292	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	152.551	1.051	High
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.854	-0.036	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.247	0.037	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.369	-0.161	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	61.489	1.489	High
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	77.536	2.536	High
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.294	-0.706	Low
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	76.194	1.194	High
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.291	0.291	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.268	0.268	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.177	0.477	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	105.923	-0.777	Low
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	109.572	-2.228	Low
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.856	1.056	High
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.135	0.135	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.218	0.218	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.289	0.289	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.147	0.147	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	2.888	2.888	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.291	0.291	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.399	0.399	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.181	0.181	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.073	0.073	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.917	0.917	High
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	1.024	1.024	High
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.960	0.960	High
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.997	0.997	High
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.411	0.411	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.094	0.094	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.915	0.915	High
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.756	0.756	High
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.613	0.613	High
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.146	0.146	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol.		-0.500	0.500	0.027	0.027	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
				axis element						
<b>T24</b>	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.528	0.528	<b>High</b>
<b>T26</b>	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	2.475	2.475	<b>High</b>
<b>T27</b>	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.909	0.909	<b>High</b>
<b>T29</b>	Cone	plane_2	Cone	Axial runout		-0.500	0.500	6.704	6.704	<b>High</b>
<b>T31</b>	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	1.681	1.681	<b>High</b>
<b>T32</b>	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.033	0.033	<b>Good</b>
<b>T33</b>	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.062	0.062	<b>Good</b>
<b>T34</b>	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	2.235	2.235	<b>High</b>
<b>T36</b>	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.590	0.590	<b>High</b>
<b>T37</b>	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.232	0.232	<b>Good</b>
<b>T38</b>	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	1.406	1.406	<b>High</b>
<b>T39</b>	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.173	0.173	<b>Good</b>
<b>T40</b>	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.909	0.909	<b>High</b>
<b>T41</b>	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	1.368	1.368	<b>High</b>
<b>T42</b>	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	6.944	6.944	<b>High</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.622	0.622	High
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.009	0.009	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	2.931	2.931	High
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	1.339	1.339	High
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.038	0.038	Good
T53	Dome	Dome Bottom Circle	Theoretical Dome Axis	Circular runout		-0.500	0.500	4.878	4.878	High
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.137	0.137	Good
T55	Dome	Dome Upper Circle	Theoretical Dome Axis	Circular runout		-0.500	0.500	4.091	4.091	High
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.173	0.173	Good
T57	Dome	plane_2	Theoretical Dome Axis	Axial runout		-0.500	0.500	0.909	0.909	High
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	7.958	7.958	High
T61	Dome	Theoretical Dome axis	plane_2	Symmetry tol. axis element		-0.500	0.500	1.630	1.630	High
T63	Dome	Actual Dome Axis	Theoretical Dome Axis	Symmetry tol. axis element		-0.500	0.500	1.427	1.427	High
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.688	0.688	High



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T67</b>	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	1.592	1.592	<b>High</b>
<b>T68</b>	Dome	Actual Dome Axis	Theoretical Dome Axis	Coaxiality		-0.500	0.500	5.057	5.057	<b>High</b>
<b>T69</b>	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.892	0.892	<b>High</b>
<b>T70</b>	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	2.352	2.352	<b>High</b>
<b>T71</b>	Sinkhole	Sinkhole Upper Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.353	0.353	<b>Good</b>
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	2.473	2.473	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.248	0.248	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.909	0.909	<b>High</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	1.868	1.868	<b>High</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	1.129	1.129	<b>High</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.314	0.314	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole	Perpendicularity		-0.500	0.500	2.808	2.808	<b>High</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
			Axis							
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	2.195	2.195	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.842	0.842	<b>High</b>

### Feature Tolerances - 3DP Pattern 4mm

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>A1</b>	Square Base	Line	Point	Distance	58.92	-0.500	0.500	61.453	2.533	<b>High</b>
<b>A2</b>	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.976	0.436	<b>Good</b>
<b>A3</b>	Pattern	Line	Point	Distance	2.1	-0.500	0.500	2.252	0.152	<b>Good</b>
<b>A4</b>	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	25.826	0.576	<b>High</b>
<b>A5</b>	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.642	0.222	<b>Good</b>
<b>A6</b>	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.847	0.427	<b>Good</b>
<b>A7</b>	Pattern	Line	Point	Distance	8.42	-0.500	0.500	8.300	-0.120	<b>Good</b>
<b>A8</b>	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	13.169	0.539	<b>High</b>
<b>A9</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.342	-0.078	<b>Good</b>
<b>A10</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.342	-0.078	<b>Good</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.425	0.005	Good
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.683	0.483	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.617	0.197	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.558	0.138	Good
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.397	-0.023	Good
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	2.609	0.079	Good
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	153.476	1.976	High
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.319	-0.101	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.701	0.281	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	2.013	0.333	Good
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	25.186	-0.064	Good
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	153.476	1.976	High
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	25.358	0.108	Good
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.349	-0.071	Good
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.425	0.005	Good
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.342	-0.078	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.561	-0.269	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	30.056	0.596	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	3.930	-0.280	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.554	0.134	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.511	0.091	Good
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.449	0.029	Good
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	153.422	1.922	High
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	25.849	0.599	High
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.911	0.281	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	7.055	0.325	Good
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.390	-0.030	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.857	0.437	Good





Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	26.002	0.752	High
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.192	-0.228	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.745	0.325	Good
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.602	0.562	High
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.926	0.466	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	153.418	1.918	High
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	6.128	0.238	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.002	-0.208	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.594	0.064	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	62.504	2.504	High
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	77.511	2.511	High
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	72.860	-2.140	Low
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	76.005	1.005	High
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.167	0.167	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	74.664	-0.336	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.488	0.788	High
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.326	-0.374	Good
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.548	-0.252	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	113.721	1.921	High
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.151	0.151	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.220	0.220	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.149	0.149	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.296	0.296	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	0.778	0.778	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.137	0.137	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.170	0.170	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.201	0.201	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.167	0.167	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.060	0.060	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.388	0.388	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.302	0.302	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.354	0.354	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.006	0.006	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.161	0.161	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.862	0.862	High
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.017	0.017	Good
T18	Rectangular Hole Outer	RecH4	RecH3	Perpendicularity		-0.500	0.500	0.124	0.124	Good
T19	Rectangular Hole Inner	RecH1	RecH2	Perpendicularity		-0.500	0.500	0.297	0.297	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.402	0.402	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.387	0.387	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	3.228	3.228	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	1.158	1.158	High
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	4.466	4.466	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.377	0.377	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.273	0.273	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.068	0.068	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	3.213	3.213	High



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T36</b>	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.431	0.431	<b>Good</b>
<b>T37</b>	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.234	0.234	<b>Good</b>
<b>T38</b>	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	1.443	1.443	<b>High</b>
<b>T39</b>	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.298	0.298	<b>Good</b>
<b>T40</b>	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	1.158	1.158	<b>High</b>
<b>T41</b>	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	5.215	5.215	<b>High</b>
<b>T42</b>	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	3.636	3.636	<b>High</b>
<b>T43</b>	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.932	0.932	<b>High</b>
<b>T47</b>	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.144	0.144	<b>Good</b>
<b>T50</b>	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	1.303	1.303	<b>High</b>
<b>T51</b>	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	1.184	1.184	<b>High</b>
<b>T52</b>	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.183	0.183	<b>Good</b>
<b>T54</b>	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.132	0.132	<b>Good</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T56</b>	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.270	0.270	<b>Good</b>
<b>T58</b>	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	2.374	2.374	<b>High</b>
<b>T65</b>	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.088	0.088	<b>Good</b>
<b>T67</b>	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	0.475	0.475	<b>Good</b>
<b>T69</b>	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.304	0.304	<b>Good</b>
<b>T70</b>	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	2.834	2.834	<b>High</b>
<b>T71</b>	Sinkhole	Sinkhole Upper Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.288	0.288	<b>Good</b>
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	3.171	3.171	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.233	0.233	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	1.176	1.176	<b>High</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.314	0.314	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	1.614	1.614	<b>High</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.243	0.243	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	1.403	1.403	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	2.686	2.686	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.352	0.352	<b>Good</b>



## Feature Tolerances - LS Pattern 3mm

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.854	1.934	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.491	-0.049	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	2.082	-0.018	Good
A4	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	25.198	-0.052	Good
A5	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.348	-0.072	Good
A6	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.285	-0.135	Good
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	8.410	-0.010	Good
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.670	0.040	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.216	-0.204	Good
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.334	-0.086	Good
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.388	-0.032	Good
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.296	0.096	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.471	0.051	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.202	-0.218	Good
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.429	0.009	Good
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	2.521	-0.009	Good
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.387	-0.113	Good
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.380	-0.040	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.308	-0.112	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	1.675	-0.005	Good
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	25.182	-0.068	Good
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.387	-0.113	Good
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	25.310	0.060	Good
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.523	0.103	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.388	-0.032	Good
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.334	-0.086	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.991	0.161	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	30.199	0.739	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.111	-0.099	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.375	-0.045	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.361	-0.059	Good
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.396	-0.024	Good
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.541	0.041	Good
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	25.147	-0.103	Good
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.506	-0.124	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.706	-0.024	Good
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.411	-0.009	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.539	0.119	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.325	0.075	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.454	0.034	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.445	0.025	Good
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.018	-0.022	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.430	-0.030	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.644	0.144	Good
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.934	0.044	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.215	0.005	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.538	0.008	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	59.774	-0.226	Good
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.892	-0.108	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	75.244	0.244	Good
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.317	0.317	Good
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.173	0.173	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	74.958	-0.042	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.176	-0.524	Low
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.540	-0.160	Good
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.924	0.124	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.251	-0.549	Low
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.019	0.019	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.015	0.015	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.031	0.031	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.038	0.038	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	0.297	0.297	Good
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.117	0.117	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.131	0.131	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.112	0.112	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.136	0.136	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.196	0.196	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.071	0.071	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.107	0.107	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.100	0.100	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.052	0.052	Good





Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.018	0.018	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.052	0.052	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.187	0.187	Good
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.039	0.039	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.422	0.422	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.051	0.051	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.132	0.132	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	0.411	0.411	Good
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.151	0.151	Good
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	0.954	0.954	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.244	0.244	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.086	0.086	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.008	0.008	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	0.291	0.291	Good
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.134	0.134	Good
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.067	0.067	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	0.093	0.093	Good
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.033	0.033	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.137	0.137	Good
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	1.168	1.168	High
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	3.574	3.574	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.046	0.046	Good
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.041	0.041	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.357	0.357	Good
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	0.110	0.110	Good
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.041	0.041	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.052	0.052	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.029	0.029	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	1.091	1.091	High
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.043	0.043	Good
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	0.218	0.218	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T69</b>	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.103	0.103	<b>Good</b>
<b>T70</b>	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.241	0.241	<b>Good</b>
<b>T71</b>	Sinkhole	Sinkhole Upper Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.111	0.111	<b>Good</b>
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.204	0.204	<b>Good</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.069	0.069	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.153	0.153	<b>Good</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.247	0.247	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.220	0.220	<b>Good</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.076	0.076	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.275	0.275	<b>Good</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.252	0.252	<b>Good</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.078	0.078	<b>Good</b>

### Feature Tolerances - ThermoJet Pattern 3mm

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>A1</b>	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.725	1.805	<b>High</b>
<b>A2</b>	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.687	0.147	<b>Good</b>
<b>A3</b>	Pattern	Line	Point	Distance	2.1	-0.500	0.500	2.075	-0.025	<b>Good</b>
<b>A4</b>	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	25.103	-0.147	<b>Good</b>
<b>A5</b>	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.327	-0.093	<b>Good</b>
<b>A6</b>	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.320	-0.100	<b>Good</b>
<b>A7</b>	Pattern	Line	Point	Distance	8.42	-0.500	0.500	8.376	-0.044	<b>Good</b>
<b>A8</b>	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.627	-0.003	<b>Good</b>
<b>A9</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.261	-0.159	<b>Good</b>
<b>A10</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.363	-0.057	<b>Good</b>
<b>A11</b>	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.372	-0.048	<b>Good</b>
<b>A12</b>	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.187	-0.013	<b>Good</b>
<b>A13</b>	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.365	-0.055	<b>Good</b>
<b>A14</b>	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.810	-0.610	<b>Low</b>
<b>A15</b>	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.396	-0.024	<b>Good</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	2.566	0.036	Good
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.644	0.144	Good
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.743	0.323	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.432	0.012	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	1.792	0.112	Good
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	25.130	-0.120	Good
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.644	0.144	Good
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	25.231	-0.019	Good
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.444	0.024	Good
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.372	-0.048	Good
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.363	-0.057	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.459	-0.371	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	29.522	0.062	Good
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.118	-0.092	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.395	-0.025	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.512	0.092	Good
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	8.306	-0.114	Good
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.866	0.366	Good
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	25.103	-0.147	Good
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.461	-0.169	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.963	0.233	Good
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.309	-0.111	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.416	-0.004	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.194	-0.056	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.397	-0.023	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.452	0.032	Good
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.071	0.031	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.418	-0.042	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.901	0.401	Good
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.737	-0.153	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.122	-0.088	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.593	0.063	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	60.340	0.340	Good
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.658	-0.342	Good
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	76.454	1.454	High
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.610	0.610	High
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.528	0.528	High
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.558	0.558	High
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	105.773	-0.927	Low
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.233	-0.467	Good
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.238	-0.562	Low
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.187	-0.613	Low
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.001	0.001	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.027	0.027	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.081	0.081	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.093	0.093	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	0.368	0.368	Good
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.105	0.105	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.056	0.056	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.115	0.115	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.046	0.046	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.085	0.085	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.024	0.024	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.186	0.186	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.198	0.198	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.090	0.090	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.026	0.026	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.143	0.143	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.043	0.043	Good
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.325	0.325	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.017	0.017	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.004	0.004	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.119	0.119	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	0.677	0.677	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.322	0.322	Good
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	0.094	0.094	Good
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.326	0.326	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.042	0.042	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.026	0.026	Good
T34	Cone	Cone	Theoretical	Coaxiality		-0.500	0.500	0.609	0.609	High



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
			Cone Axis							
<b>T36</b>	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.066	0.066	<b>Good</b>
<b>T37</b>	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.119	0.119	<b>Good</b>
<b>T38</b>	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	0.616	0.616	<b>High</b>
<b>T39</b>	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.126	0.126	<b>Good</b>
<b>T40</b>	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.309	0.309	<b>Good</b>
<b>T41</b>	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	5.291	5.291	<b>High</b>
<b>T42</b>	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	2.704	2.704	<b>High</b>
<b>T43</b>	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.391	0.391	<b>Good</b>
<b>T47</b>	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.186	0.186	<b>Good</b>
<b>T50</b>	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	1.227	1.227	<b>High</b>
<b>T51</b>	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	0.680	0.680	<b>High</b>
<b>T52</b>	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.187	0.187	<b>Good</b>





Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
<b>T54</b>	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.167	0.167	<b>Good</b>
<b>T56</b>	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.038	0.038	<b>Good</b>
<b>T58</b>	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	0.978	0.978	<b>High</b>
<b>T65</b>	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.108	0.108	<b>Good</b>
<b>T67</b>	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	0.196	0.196	<b>Good</b>
<b>T69</b>	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.109	0.109	<b>Good</b>
<b>T70</b>	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.363	0.363	<b>Good</b>
<b>T71</b>	Sinkhole	Sinkhole Upper Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.165	0.165	<b>Good</b>
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.628	0.628	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.082	0.082	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.338	0.338	<b>Good</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.295	0.295	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical	Symmetry tol.		-0.500	0.500	0.410	0.410	<b>Good</b>



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
			Sinkhole axis	axis element						
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.217	0.217	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	1.128	1.128	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.165	0.165	<b>Good</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.321	0.321	<b>Good</b>

<b>DAI - 3DP Pattern 3mm</b>					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				50.00%
	High	Good	Low	Total	
	54	60	6	120	
<b>DAI - 3DP Pattern 4mm</b>					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				63.78%
	High	Good	Low	Total	
	45	81	1	127	
<b>DAI - LS Pattern 3mm</b>					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				91.38%
	High	Good	Low	Total	
	8	106	2	116	
<b>DAI - ThermoJet Pattern 3mm</b>					Dimensional Accuracy index (DAI = Good/Total x 100%)
High	X > 0.5				
Good	-0.5 < X > 0.5				
Low	X < -0.5				
Pattern Model	Counts				81.90%
	High	Good	Low	Total	
	17	95	4	116	

*Appendix D LM Patterns -  
Statistical CMM Raw  
Data (3D-Tol Data)*

## 3D-Tol Data from CMM for 3DP-3mm Pattern

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
54.225	59.525	-5.073	54.225	58.917	-5.073	0	0.609	0	0.609
37.675	59.456	-5.163	37.675	58.917	-5.163	0	0.539	0	0.539
21.132	59.411	-5.255	21.132	58.917	-5.255	0	0.494	0	0.494
4.586	59.333	-5.345	4.586	58.917	-5.345	0	0.416	0	0.416
-11.958	59.338	-5.436	-11.958	58.917	-5.436	0	0.422	0	0.422
-28.502	59.38	-5.528	-28.502	58.917	-5.528	0	0.463	0	0.463
-45.046	59.377	-5.619	-45.046	58.917	-5.619	0	0.46	0	0.46
-61.592	59.411	-5.71	-61.592	58.917	-5.71	0	0.495	0	0.495
-80.38	40.377	-5.779	-79.958	40.377	-5.779	-0.422	0	0	0.422
-80.394	23.833	-5.744	-79.958	23.833	-5.744	-0.436	0	0	0.436
-80.468	7.287	-5.709	-79.958	7.287	-5.709	-0.51	0	0	0.51
-80.487	-9.258	-5.675	-79.958	-9.258	-5.675	-0.529	0	0	0.529
-80.49	-25.803	-5.64	-79.958	-25.803	-5.64	-0.531	0	0	0.531
-80.634	-42.347	-5.606	-79.958	-42.347	-5.606	-0.676	0	0	0.676
-80.59	-58.894	-5.571	-79.958	-58.894	-5.571	-0.631	0	0	0.631
-80.589	-75.437	-5.536	-79.958	-75.437	-5.536	-0.63	0	0	0.63
-61.306	-93.328	-5.385	-61.306	-92.583	-5.385	0	-0.745	0	0.745
-44.76	-93.387	-5.291	-44.76	-92.583	-5.291	0	-0.804	0	0.804
-28.217	-93.184	-5.201	-28.217	-92.583	-5.201	0	-0.601	0	0.601
-11.673	-93.216	-5.11	-11.673	-92.583	-5.11	0	-0.633	0	0.633
4.874	-93.427	-5.018	4.874	-92.583	-5.018	0	-0.844	0	0.844
21.417	-93.482	-4.927	21.417	-92.583	-4.927	0	-0.899	0	0.899
37.96	-93.183	-4.837	37.96	-92.583	-4.837	0	-0.6	0	0.6
54.506	-93.217	-4.746	54.506	-92.583	-4.746	0	-0.634	0	0.634
71.615	-75.15	-4.685	71.542	-75.15	-4.685	0.074	0	0	0.074
71.735	-58.605	-4.717	71.542	-58.605	-4.717	0.193	0	0	0.193
71.714	-42.061	-4.752	71.542	-42.061	-4.752	0.172	0	0	0.172
71.53	-25.517	-4.788	71.542	-25.517	-4.788	-0.011	0	0	-0.011
71.569	-8.972	-4.822	71.542	-8.972	-4.822	0.028	0	0	0.028
71.98	7.574	-4.855	71.542	7.574	-4.855	0.438	0	0	0.438
72.133	24.12	-4.888	71.542	24.12	-4.888	0.591	0	0	0.591
72.232	40.664	-4.923	71.542	40.664	-4.923	0.69	0	0	0.69
-69.383	43.129	8.353	-69.383	43.129	8.417	0	0	-0.064	-0.064
-64.33	43.138	8.229	-64.33	43.138	8.417	0	0	-0.187	-0.187
-64.342	48.188	8.345	-64.342	48.188	8.417	0	0	-0.072	-0.072
-69.393	48.178	8.394	-69.393	48.178	8.417	0	0	-0.023	-0.023
-67.256	45.777	8.25	-67.256	45.777	8.417	0	0	-0.167	-0.167
-71.698	43.117	6.888	-71.542	43.117	6.888	-0.156	0	0	0.156
-71.729	48.167	6.88	-71.542	48.167	6.88	-0.188	0	0	0.188
-69.383	50.765	6.89	-69.383	50.5	6.89	0	0.265	0	0.265
-64.334	50.646	6.92	-64.334	50.5	6.92	0	0.146	0	0.146
-64.315	42.413	6.939	-64.315	42.083	6.939	0	0.33	0	-0.33
-69.366	42.368	6.911	-69.366	42.083	6.911	0	0.284	0	-0.284
-63.545	48.188	6.937	-63.125	48.188	6.937	-0.42	0	0	-0.42
-62.999	42.289	6.948	-63.125	42.083	6.948	0.126	0.205	0	0.241

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-63.208	-14.947	4.217	-63.125	-14.947	4.208	-0.083	0	0.009	0.084
-69.251	-14.958	3.605	-69.251	-14.958	4.208	0	0	-0.604	-0.604
-69.242	-20.911	4.268	-69.242	-21.042	4.208	0	0.131	0.06	0.144
-64.19	-20.972	4.223	-64.19	-21.042	4.208	0	0.07	0.015	0.071
-67.367	-17.381	3.53	-67.367	-17.381	4.208	0	0	-0.678	-0.678
-69.251	-12.603	4.194	-69.251	-12.625	4.208	0	0.022	-0.014	0.026
-64.201	-12.654	4.227	-64.201	-12.625	4.208	0	-0.029	0.019	-0.035
-63.331	-14.944	4.427	-63.125	-14.944	4.208	-0.206	0	0.218	-0.3
-63.075	-20.918	3.713	-63.125	-21.042	3.713	0.05	0.124	0	0.134
-63.28	-21.113	3.706	-63.125	-21.042	3.706	-0.155	-0.072	0	0.171
-69.233	-20.956	4.271	-69.233	-21.042	4.208	0	0.085	0.063	-0.106
-71.529	-20.013	3.655	-71.542	-20.013	3.655	0.012	0	0	-0.012
-71.695	-14.964	3.646	-71.542	-14.964	3.646	-0.153	0	0	0.153
-64.115	-78.061	8.86	-64.115	-78.061	8.417	0	0	0.444	0.444
-69.166	-78.071	8.936	-69.166	-78.071	8.417	0	0	0.519	0.519
-69.157	-83.122	9.144	-69.157	-83.122	8.417	0	0	0.727	0.727
-64.106	-83.111	9.02	-64.106	-83.111	8.417	0	0	0.603	0.603
-69.157	-75.491	7.158	-69.157	-75.75	7.158	0	0.259	0	0.259
-64.105	-75.799	7.188	-64.105	-75.75	7.188	0	-0.049	0	-0.049
-63.016	-78.064	8.131	-63.125	-78.064	8.417	0.109	0	-0.285	0.306
-63.081	-84.049	7.212	-63.125	-84.167	7.212	0.044	0.118	0	0.126
-64.087	-84.084	7.206	-64.087	-84.167	7.206	0	0.082	0	-0.082
-69.136	-84.157	7.179	-69.136	-84.167	7.179	0	0.01	0	-0.01
-71.864	-83.133	7.153	-71.542	-83.133	7.153	-0.323	0	0	0.323
-72.038	-78.082	7.143	-71.542	-78.082	7.143	-0.496	0	0	0.496
-2.022	42.34	4.329	-2.022	42.083	4.208	0	0.257	0.121	0.284
3.028	42.354	4.339	3.028	42.083	4.208	0	0.27	0.13	0.3
3.016	48.3	3.989	3.016	48.3	4.208	0	0	-0.219	-0.219
-2.034	48.291	3.956	-2.034	48.291	4.208	0	0	-0.252	-0.252
-0.189	46.278	3.823	-0.189	46.278	4.208	0	0	-0.385	-0.385
-4.233	43.23	2.63	-4.208	43.23	2.63	-0.024	0	0	0.024
-4.593	48.28	2.62	-4.208	48.28	2.62	-0.385	0	0	0.385
3.981	42.003	2.68	4.208	42.083	2.68	-0.228	-0.081	0	0.242
-2.007	42.537	2.653	-2.007	42.083	2.653	0	0.453	0	-0.453
4.049	48.299	2.679	4.208	48.299	2.679	-0.16	0	0	-0.16
3.999	43.249	2.69	4.208	43.249	2.69	-0.209	0	0	-0.209
-2.027	51.026	2.632	-2.027	50.5	2.632	0	0.526	0	0.526
3.024	50.948	2.661	3.024	50.5	2.661	0	0.448	0	0.448
-64.804	36.129	-0.118	-64.837	36.163	0	0.033	-0.033	-0.118	0.128
-54.102	46.857	-0.077	-54.122	46.878	0	0.021	-0.021	-0.077	0.082
-46.201	46.512	-0.968	-46.357	46.357	-0.968	0.155	0.155	0	-0.22
-35.659	35.627	-0.889	-35.643	35.643	-0.889	-0.016	-0.016	0	0.023
-40.386	28.502	-0.894	-40.396	28.493	-0.894	0.01	0.01	0	0.014
-47.64	35.527	-0.948	-47.535	35.632	-0.948	-0.105	-0.105	0	-0.148
-36.027	29.823	-1.262	-35.747	29.544	-1.262	-0.28	0.28	0	0.396
-54.338	35.207	-0.995	-54.114	34.983	-0.995	-0.224	0.224	0	0.317
-59.111	30.455	-1.01	-58.877	30.22	-1.01	-0.235	0.235	0	0.332

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-64.874	28.928	-0.929	-64.755	29.047	-0.929	-0.118	-0.118	0	-0.167
-60.83	32.91	-4.663	-60.83	32.91	-4.208	0	0	-0.455	-0.455
-56.27	37.674	-4.548	-56.27	37.674	-4.208	0	0	-0.34	-0.34
-49.785	43.088	-4.456	-49.785	43.088	-4.208	0	0	-0.248	-0.248
-44.215	38.051	-4.399	-44.215	38.051	-4.208	0	0	-0.191	-0.191
-39.531	33.251	-4.389	-39.531	33.251	-4.208	0	0	-0.18	-0.18
50.155	42.515	6.727	50.155	42.083	6.727	0	0.431	0	-0.431
43.422	42.493	6.69	43.422	42.083	6.69	0	0.41	0	-0.41
54.922	29.878	6.774	54.708	29.878	6.774	0.213	0	0	-0.213
54.764	36.612	6.758	54.708	36.612	6.758	0.056	0	0	-0.056
59.327	25.56	6.318	59.327	25.25	6.318	0	0.31	0	-0.31
63.023	29.898	6.829	63.125	29.898	6.829	-0.102	0	0	-0.102
63.115	37.473	6.817	63.125	37.473	6.817	-0.01	0	0	-0.01
63.124	45.049	6.801	63.125	45.049	6.801	-0.001	0	0	-0.001
58.551	51.072	6.752	58.551	50.5	6.752	0	0.572	0	0.572
50.972	51.019	6.712	50.972	50.5	6.712	0	0.519	0	0.519
43.397	51.051	6.669	43.397	50.5	6.669	0	0.551	0	0.551
37.839	45.788	5.925	37.875	45.788	5.925	-0.036	0	0	0.036
43.647	45.978	8.525	43.647	45.978	8.417	0	0	0.108	0.108
50.878	45.7	8.709	50.878	45.7	8.417	0	0	0.292	0.292
58.85	45.383	8.918	58.85	45.383	8.417	0	0	0.502	0.502
59.605	37.12	8.723	59.605	37.12	8.417	0	0	0.306	0.306
59.495	30.273	8.529	59.495	30.273	8.417	0	0	0.113	0.113
-30.479	48.919	16.995	-30.479	48.894	17.009	0	0.025	-0.014	-0.029
-30.445	46.105	11.918	-30.445	45.992	11.983	0	0.112	-0.065	-0.13
-30.413	43.381	6.789	-30.413	43.091	6.957	0	0.291	-0.168	-0.336
-30.381	40.464	1.775	-30.381	40.19	1.933	0	0.274	-0.158	-0.317
-26.592	40.437	1.815	-26.592	40.201	1.952	0	0.236	-0.136	-0.273
-26.625	43.406	6.802	-26.625	43.102	6.977	0	0.304	-0.175	-0.351
-26.659	46.091	11.952	-26.659	46.004	12.003	0	0.087	-0.05	-0.101
-26.693	48.96	16.995	-26.693	48.904	17.027	0	0.056	-0.032	-0.064
-22.903	48.949	17.025	-22.903	48.915	17.045	0	0.035	-0.02	-0.04
-22.87	46.191	11.915	-22.87	46.013	12.018	0	0.179	-0.103	-0.206
-22.837	43.536	6.75	-22.837	43.112	6.994	0	0.424	-0.245	-0.49
-22.805	40.71	1.68	-22.805	40.211	1.969	0	0.499	-0.288	-0.577
-16.503	46.065	2.024	-16.503	45.489	2.178	0	0.576	-0.154	-0.597
-16.548	47.884	9.612	-16.548	47.508	9.713	0	0.376	-0.101	-0.389
-16.593	49.552	17.251	-16.593	49.529	17.257	0	0.023	-0.006	-0.023
-11.541	49.439	17.311	-11.541	49.537	17.285	0	-0.098	0.026	0.101
-11.497	47.711	9.693	-11.497	47.516	9.745	0	0.194	-0.052	-0.201
-11.453	46.013	2.068	-11.453	45.496	2.207	0	0.516	-0.138	-0.535
-8.329	49.089	8.032	-8.178	49.089	8.032	-0.151	0	0	-0.151
-30.479	51.436	15.718	-30.479	50.837	15.558	0	0.599	0.161	0.621
-30.455	53.125	10.107	-30.455	52.352	9.9	0	0.772	0.207	0.799
-30.425	54.588	4.444	-30.425	53.866	4.25	0	0.722	0.193	0.747
-23.69	54.658	4.501	-23.69	53.857	4.286	0	0.801	0.215	0.829
-23.721	52.926	10.092	-23.721	52.343	9.936	0	0.583	0.156	0.604

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-23.748	51.398	15.747	-23.748	50.827	15.593	0	0.571	0.153	0.591
-17.012	51.366	15.767	-17.012	50.82	15.621	0	0.546	0.146	0.566
-16.99	52.957	10.134	-16.99	52.335	9.967	0	0.622	0.167	0.644
-16.959	54.586	4.507	-16.959	53.85	4.31	0	0.736	0.197	0.762
-10.222	54.562	4.535	-10.222	53.842	4.342	0	0.72	0.193	0.746
-10.25	52.774	10.125	-10.25	52.325	10.004	0	0.449	0.12	0.465
-10.281	51.274	15.779	-10.281	50.811	15.654	0	0.464	0.124	0.48
-33.832	48.385	10.023	-33.428	48.385	10.023	-0.404	0	0	0.404
5.392	-63.608	19.727	5.293	-63.608	19.754	0.099	0	-0.027	-0.102
3.753	-63.626	12.591	3.399	-63.626	12.686	0.353	0	-0.095	-0.366
1.88	-63.644	5.517	1.505	-63.644	5.618	0.375	0	-0.101	-0.388
1.657	-70.379	5.594	1.51	-70.379	5.634	0.147	0	-0.039	-0.153
3.443	-70.36	12.689	3.403	-70.36	12.7	0.04	0	-0.011	-0.041
5.243	-70.341	19.782	5.297	-70.341	19.767	-0.054	0	0.014	0.056
4.978	-77.082	19.865	5.3	-77.082	19.779	-0.322	0	0.086	0.333
3.383	-77.096	12.72	3.407	-77.096	12.714	-0.024	0	0.006	0.024
1.543	-77.115	5.641	1.514	-77.115	5.649	0.029	0	-0.008	-0.03
1.382	-83.85	5.698	1.517	-83.85	5.662	-0.135	0	0.036	0.14
3.28	-83.827	12.767	3.412	-83.827	12.732	-0.131	0	0.035	0.136
5.009	-83.809	19.876	5.305	-83.809	19.797	-0.295	0	0.079	0.306
8.164	-85.266	11.236	8.164	-85.85	11.236	0	0.584	0	-0.584
7.12	-83.797	21.381	7.457	-83.797	21.576	-0.337	0	-0.195	-0.389
12.516	-83.807	11.931	12.898	-83.807	12.152	-0.382	0	-0.22	-0.441
18.052	-83.817	2.562	18.339	-83.817	2.728	-0.287	0	-0.166	-0.332
17.696	-76.243	2.348	18.343	-76.243	2.721	-0.647	0	-0.374	-0.747
12.241	-76.233	11.765	12.901	-76.233	12.146	-0.66	0	-0.381	-0.762
6.903	-76.222	21.248	7.461	-76.222	21.57	-0.558	0	-0.322	-0.644
6.396	-69.909	21.727	6.776	-69.909	21.829	-0.38	0	-0.102	-0.394
8.813	-69.926	12.276	9.301	-69.926	12.407	-0.488	0	-0.131	-0.505
11.242	-69.94	2.824	11.826	-69.94	2.98	-0.585	0	-0.157	-0.605
11.06	-64.892	2.766	11.829	-64.892	2.971	-0.769	0	-0.206	-0.796
8.463	-64.875	12.171	9.303	-64.875	12.396	-0.841	0	-0.225	-0.87
6.856	-64.859	21.847	6.777	-64.859	21.825	0.079	0	0.021	0.081
7.091	-59.479	11.92	7.091	-60.6	11.92	0	1.121	0	1.121
-29.826	-50.271	-5.681	-29.822	-50.477	-5.454	-0.004	0.205	-0.227	-0.306
-29.509	-54.902	-8.635	-29.507	-55.28	-7.96	-0.002	0.378	-0.675	-0.773
-29.212	-58.378	-11.414	-29.214	-58.433	-11.385	0.002	0.055	-0.03	-0.063
-28.983	-61.502	-16.185	-28.996	-61.669	-15.942	0.014	0.166	-0.243	-0.295
-33.662	-63.456	-16.694	-33.417	-63.682	-16.133	-0.245	0.226	-0.561	-0.652
-36.269	-61.143	-11.762	-35.98	-61.406	-11.556	-0.289	0.263	-0.206	-0.442
-38.525	-59.145	-8.849	-38.196	-59.442	-8.123	-0.329	0.297	-0.726	-0.851
-42.155	-55.91	-6.187	-41.828	-56.204	-5.643	-0.327	0.294	-0.544	-0.7
-46.748	-68.82	-6.162	-46.187	-68.771	-5.516	-0.561	-0.048	-0.646	-0.857
-41.83	-68.59	-8.845	-41.353	-68.541	-8.015	-0.476	-0.048	-0.83	-0.958
-39.254	-68.512	-11.983	-38.264	-68.393	-11.45	-0.991	-0.119	-0.533	-1.131
-35.639	-68.35	-16.989	-34.99	-68.243	-15.995	-0.649	-0.107	-0.995	-1.192
-33.217	-73.05	-16.578	-32.794	-72.407	-15.649	-0.423	-0.643	-0.929	-1.207



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-35.385	-75.351	-11.654	-34.832	-74.603	-11.136	-0.553	-0.749	-0.518	-1.065
-37.393	-77.4	-8.354	-37.199	-77.153	-7.723	-0.194	-0.246	-0.631	-0.705
-40.651	-80.913	-5.482	-40.397	-80.604	-5.118	-0.255	-0.309	-0.364	-0.541
-28.831	-67.943	-18.417	-28.75	-68.022	-16.944	-0.081	0.078	-1.473	-1.477
-25.592	-62.585	-15.615	-25.595	-62.588	-15.61	0.003	0.003	-0.005	-0.007
-24.223	-59.991	-11.155	-24.218	-59.984	-11.16	-0.005	-0.008	0.005	0.011
-23.511	-56.412	-7.762	-23.497	-56.422	-7.758	-0.014	0.01	-0.004	-0.018
-20.428	-52.802	-4.986	-20.367	-52.704	-5.089	-0.061	-0.098	0.103	0.155
-12.306	-63.123	-4.537	-12.315	-63.125	-4.531	0.01	0.002	-0.007	-0.012
-16.446	-64.343	-8.155	-16.746	-64.412	-7.468	0.3	0.069	-0.686	-0.752
-20.333	-65.563	-10.919	-20.43	-65.582	-10.861	0.097	0.019	-0.058	-0.115
-22.883	-66.353	-15.118	-22.892	-66.354	-15.11	0.009	0.001	-0.008	-0.012
-23.32	-70.87	-15.176	-23.567	-70.728	-14.93	0.247	-0.143	-0.245	-0.376
-21.122	-72.06	-10.886	-21.379	-71.914	-10.708	0.257	-0.146	-0.178	-0.345
-17.672	-73.93	-7.768	-17.832	-73.841	-7.345	0.16	-0.089	-0.423	-0.461
-13.93	-75.974	-4.102	-13.841	-76.023	-4.156	-0.088	0.049	0.053	0.114
-23.86	-84.241	-4.428	-23.882	-84.176	-4.387	0.021	-0.065	-0.041	-0.08
-25.126	-79.935	-7.74	-25.174	-79.797	-7.408	0.047	-0.138	-0.332	-0.362
-26.121	-76.378	-11.012	-26.258	-76.007	-10.778	0.137	-0.371	-0.235	-0.46
-26.782	-74.024	-15.638	-26.993	-73.496	-15.112	0.211	-0.528	-0.526	-0.775
-32.402	-72.783	-15.542	-32.429	-72.771	-15.543	0.026	-0.013	0.002	0.029
-33.803	-75.313	-11.051	-33.815	-75.308	-11.052	0.012	-0.005	0.001	0.013
-35.483	-78.464	-7.629	-35.53	-78.447	-7.644	0.046	-0.017	0.016	0.052
-37.589	-82.557	-4.874	-37.774	-82.556	-4.947	0.186	-0.001	0.073	0.2
-24.706	-86.596	-0.003	-24.683	-86.691	-0.222	-0.024	0.096	0.219	0.24
-12.327	-77.735	-0.468	-12.421	-77.678	-0.225	0.094	-0.057	-0.243	-0.267
-9.182	-62.009	-0.003	-9.172	-62.007	0	-0.01	-0.003	-0.003	0.011
-14.611	-53.343	-0.04	-14.194	-52.949	0	-0.418	-0.394	-0.04	0.575
-24.923	-48.063	-1.008	-25.008	-48.424	-0.53	0.085	0.361	-0.478	-0.605
-47.368	-38.483	18.979	-47.089	-38.411	19.145	-0.278	-0.073	-0.166	-0.332
-44.191	-37.081	12.571	-43.743	-36.924	12.845	-0.448	-0.157	-0.274	-0.548
-40.899	-35.573	6.247	-40.429	-35.39	6.538	-0.47	-0.182	-0.291	-0.582
-40.41	-41.63	6.06	-39.881	-41.752	6.374	-0.529	0.122	-0.313	-0.627
-43.771	-40.982	12.505	-43.464	-41.059	12.688	-0.307	0.077	-0.183	-0.366
-47.248	-40.283	18.875	-47.044	-40.345	18.997	-0.203	0.061	-0.123	-0.245
-47.975	-41.945	18.953	-47.985	-41.933	18.944	0.011	-0.011	0.009	0.018
-45.521	-44.512	12.584	-45.467	-44.569	12.629	-0.054	0.057	-0.045	-0.091
-43.094	-47.047	6.194	-42.947	-47.202	6.317	-0.147	0.154	-0.123	-0.246
-48.605	-49.801	6.246	-48.565	-50.024	6.377	-0.04	0.222	-0.131	-0.261
-49.084	-46.507	12.741	-49.102	-46.417	12.688	0.018	-0.09	0.053	0.106
-49.642	-42.804	18.993	-49.641	-42.807	18.996	-0.001	0.004	-0.002	-0.005
-52.152	-42.451	19.205	-52.181	-42.378	19.176	0.03	-0.073	0.029	0.084
-53.272	-45.919	12.853	-53.267	-45.906	12.845	-0.005	-0.012	0.008	0.016
-54.967	-49.164	6.549	-54.957	-49.143	6.535	-0.01	-0.021	0.013	0.027
-50.854	-40.255	22.985	-51.091	-40.382	23.114	0.237	0.127	-0.13	-0.298
-56.615	-42.994	13.109	-56.529	-42.942	13.051	-0.086	-0.052	0.058	0.116
-62.115	-45.699	3.179	-61.774	-45.511	2.955	-0.34	-0.188	0.224	0.449

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-63.419	-37.354	3.299	-63.129	-37.397	3.13	-0.29	0.044	0.169	0.339
-57.407	-38.442	13.242	-57.387	-38.444	13.23	-0.021	0.003	0.012	0.024
-51.35	-39.375	23.159	-51.614	-39.399	23.312	0.265	0.023	-0.153	-0.307
-51.047	-38.717	23.248	-51.23	-38.522	23.402	0.183	-0.195	-0.154	-0.309
-55.216	-34.286	13.29	-55.227	-34.274	13.3	0.011	-0.012	-0.01	-0.019
-59.369	-29.867	3.321	-59.221	-30.024	3.197	-0.148	0.157	0.124	0.249
-51.594	-26.793	3.01	-51.613	-26.58	3.134	0.019	-0.213	-0.123	-0.247
-50.907	-32.623	13.089	-50.922	-32.374	13.232	0.015	-0.248	-0.144	-0.287
-49.927	-38.478	23.304	-49.977	-38.342	23.359	0.05	-0.136	-0.055	-0.155
-50.027	-38.248	23.146	-49.925	-38.248	23.174	-0.101	0	-0.028	-0.105
-47.175	-33.13	13.06	-47.129	-33.13	13.073	-0.046	0	-0.013	-0.047
-44.38	-28.008	2.963	-44.334	-28.013	2.973	-0.046	0.005	-0.01	-0.048
-46.258	3.795	24.895	-46.157	3.703	25.026	-0.101	0.092	-0.13	-0.189
-49.93	7.26	27.475	-49.948	7.276	27.655	0.017	-0.016	-0.179	-0.181
-54.125	11.231	22.681	-53.646	10.784	22.378	-0.479	0.447	0.303	0.722
-56.892	13.871	8.813	-56.441	13.448	8.698	-0.452	0.423	0.116	0.63
-62.294	-2.285	8.772	-61.639	-2.211	8.649	-0.654	-0.074	0.123	0.67
-58.622	-1.94	22.642	-57.832	-1.848	22.278	-0.79	-0.093	0.364	0.875
-52.862	-1.471	27.298	-52.925	-1.479	27.617	0.063	0.009	-0.318	-0.325
-48.23	-1.179	24.596	-47.639	-1.066	25.184	-0.591	-0.113	-0.588	-0.841
-45.18	-5.387	25.205	-45.049	-5.159	25.476	-0.131	-0.228	-0.271	-0.378
-48.388	-9.404	27.333	-48.419	-9.45	27.502	0.031	0.046	-0.169	-0.178
-51.558	-13.588	22.418	-51.191	-13.062	22.13	-0.367	-0.526	0.288	0.703
-53.634	-16.454	8.692	-53.395	-16.113	8.614	-0.239	-0.341	0.077	0.424
-37.997	-19.264	8.616	-37.998	-19.259	8.615	0.001	-0.005	0.001	0.006
-38.72	-15.827	22.125	-38.764	-15.619	22.03	0.044	-0.207	0.094	0.232
-39.577	-11.423	27.429	-39.581	-11.406	27.388	0.004	-0.017	0.041	0.044
-40.617	-5.603	26.034	-40.528	-5.942	25.658	-0.089	0.339	0.376	0.514
-39.774	19.741	8.774	-39.799	19.532	8.735	0.024	0.209	0.039	0.214
-40.201	15.774	22.405	-40.209	15.702	22.372	0.009	0.072	0.033	0.08
-40.645	10.849	27.832	-40.65	10.81	27.624	0.005	0.039	0.208	0.212
-41.055	4.965	25.696	-40.942	5.511	25.154	-0.113	-0.546	0.542	0.777
-38.464	3.418	26.146	-37.869	3.981	25.325	-0.595	-0.562	0.821	1.16
-34.793	8.488	27.754	-34.824	8.452	27.571	0.031	0.036	0.183	0.189
-32.119	11.988	22.174	-31.952	12.189	22.294	-0.167	-0.201	-0.12	-0.288
-29.587	15.189	8.73	-29.589	15.187	8.729	0.002	0.003	0.001	0.003
-23.697	6.14	8.65	-23.426	6.231	8.703	-0.271	-0.091	-0.053	-0.291
-27.62	4.725	21.879	-26.972	4.937	22.188	-0.648	-0.212	-0.309	-0.749
-31.189	3.39	27.498	-31.191	3.39	27.492	0.002	0.001	0.007	0.007
-37.118	1.027	26.425	-36.238	1.209	25.494	-0.881	-0.182	0.931	1.295
-36.998	-1.572	26.459	-36.249	-1.804	25.625	-0.749	0.232	0.834	1.145
-30.792	-2.766	27.408	-30.792	-2.766	27.41	-0.001	0	-0.002	-0.002
-27.078	-3.527	21.849	-26.563	-3.648	22.086	-0.515	0.121	-0.237	-0.58
-23.286	-4.324	8.596	-22.907	-4.411	8.668	-0.379	0.087	-0.072	-0.395
-28.026	-13.561	8.61	-27.918	-13.666	8.638	-0.108	0.105	-0.028	-0.153
-30.757	-10.976	21.943	-30.616	-11.113	22.03	-0.141	0.137	-0.087	-0.215
-33.668	-8.198	27.419	-33.684	-8.182	27.368	0.016	-0.016	0.052	0.056

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-38.125	-3.928	26.323	-37.704	-4.346	25.683	-0.421	0.418	0.639	0.872
-41.608	5.112	25.584	-41.564	5.58	25.129	-0.044	-0.468	0.455	0.654
-41.767	10.912	27.861	-41.768	10.87	27.63	0.001	0.042	0.231	0.235
-41.806	15.893	22.423	-41.808	15.806	22.383	0.002	0.087	0.04	0.095
-41.778	19.915	8.78	-41.782	19.663	8.733	0.004	0.252	0.047	0.257
-40.836	-0.972	21.175	-40.298	-1.391	20.742	-0.537	0.419	0.433	0.807
-45.677	-0.365	21.222	-44.964	-0.292	21.707	-0.713	-0.072	-0.484	-0.865
-40.653	-2.154	22.321	-40.379	-2.567	21.979	-0.275	0.413	0.342	0.603
44.99	-41.165	15.065	45.132	-41.256	15.146	-0.141	0.091	-0.081	-0.187
42.565	-45.763	13.437	42.632	-45.831	13.491	-0.068	0.068	-0.054	-0.11
40.531	-49.8	10.249	40.499	-49.736	10.209	0.032	-0.064	0.04	0.082
39.689	-52.801	5.546	39.652	-52.877	5.585	0.037	0.076	-0.039	-0.093
32.43	-45.229	5.678	32.372	-45.255	5.708	0.058	0.026	-0.03	-0.07
35.658	-43.943	10.19	35.461	-44.032	10.406	0.197	0.089	-0.217	-0.306
39.957	-42.237	13.174	39.747	-42.34	13.661	0.21	0.103	-0.487	-0.54
45.461	-40.818	15.179	45.39	-40.783	15.216	0.072	-0.034	-0.037	-0.088
44.698	-38.8	14.634	44.638	-38.788	15.236	0.059	-0.012	-0.602	-0.605
39.749	-37.14	13.312	39.546	-37.079	13.773	0.203	-0.062	-0.46	-0.507
35.295	-35.649	10.313	35.086	-35.583	10.538	0.209	-0.066	-0.225	-0.314
31.988	-34.538	5.724	31.852	-34.495	5.793	0.136	-0.044	-0.069	-0.158
38.715	-26.163	5.725	38.642	-26.038	5.794	0.073	-0.125	-0.069	-0.16
40.531	-29.166	10.275	40.406	-28.95	10.531	0.125	-0.216	-0.256	-0.358
42.948	-33.132	13.313	42.847	-32.951	13.761	0.101	-0.181	-0.448	-0.494
45.673	-37.595	14.551	45.647	-37.53	15.232	0.026	-0.065	-0.681	-0.684
47.186	-37.302	14.475	47.226	-37.221	15.186	-0.04	-0.081	-0.711	-0.717
47.953	-32.26	13.067	48.017	-31.993	13.634	-0.065	-0.267	-0.567	-0.63
48.641	-27.79	10.069	48.706	-27.476	10.39	-0.065	-0.314	-0.321	-0.454
49.178	-24.4	5.628	49.215	-24.215	5.718	-0.036	-0.185	-0.09	-0.209
39.689	-52.799	5.546	39.652	-52.876	5.586	0.037	0.077	-0.04	-0.095
40.531	-49.798	10.247	40.499	-49.736	10.209	0.031	-0.063	0.039	0.08
42.565	-45.763	13.438	42.632	-45.831	13.491	-0.067	0.067	-0.053	-0.109
44.98	-41.158	15.065	45.132	-41.255	15.146	-0.152	0.096	-0.081	-0.198
47.204	-37.06	15.082	47.379	-37.143	15.168	-0.175	0.082	-0.086	-0.211
49.704	-32.489	13.478	49.89	-32.546	13.555	-0.186	0.058	-0.077	-0.209
51.981	-28.603	10.263	52.044	-28.602	10.294	-0.064	-0.001	-0.031	-0.071
53.59	-25.772	5.67	53.591	-25.772	5.67	-0.001	0	0	-0.001
60.945	-34.811	5.641	60.924	-34.861	5.631	0.022	0.05	0.011	0.056
58.556	-35.409	9.564	58.635	-35.485	9.337	-0.079	0.076	0.227	0.252
53.559	-36.896	12.823	53.83	-36.812	13.359	-0.271	-0.084	-0.535	-0.606
48.936	-38.705	14.438	49.044	-38.688	15.089	-0.108	-0.017	-0.65	-0.659
48.983	-40.238	14.481	49.078	-40.277	15.049	-0.096	0.039	-0.569	-0.578
53.652	-41.805	12.776	53.896	-41.893	13.249	-0.244	0.089	-0.473	-0.54
57.678	-43.156	9.715	57.916	-43.24	9.949	-0.238	0.084	-0.234	-0.344
60.596	-44.135	5.379	60.756	-44.191	5.456	-0.16	0.056	-0.077	-0.186
54.539	-52.025	5.44	54.551	-52.043	5.45	-0.011	0.018	-0.01	-0.023
52.907	-49.391	9.851	52.969	-49.487	9.957	-0.062	0.096	-0.106	-0.156
50.63	-45.687	12.871	50.747	-45.864	13.259	-0.117	0.177	-0.389	-0.443

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF (mm)
48.019	-41.431	14.421		48.087	-41.522	15.053		-0.069	0.091	-0.633	-0.643
45.686	-41.414	15.276		45.2	-41.131	15.166		0.486	-0.283	0.109	0.573
45.78	-46.716	12.944		45.765	-46.949	13.387		0.016	0.233	-0.443	-0.501
45.154	-51.01	9.86		45.13	-51.262	10.102		0.024	0.253	-0.242	-0.351
44.701	-54.196	5.466		44.686	-54.337	5.531		0.015	0.141	-0.065	-0.156
53.585	-25.773	5.669		53.59	-25.772	5.671		-0.006	-0.001	-0.002	-0.006
51.979	-28.603	10.262		52.045	-28.602	10.293		-0.065	-0.001	-0.031	-0.072
49.703	-32.489	13.479		49.889	-32.547	13.556		-0.186	0.058	-0.077	-0.21
47.201	-37.059	15.083		47.379	-37.143	15.168		-0.178	0.084	-0.085	-0.214
33.344	-49.762	1.208		33.33	-49.774	1.22		0.015	0.012	-0.012	-0.023
37.63	-53.926	0.482		37.566	-54.035	0.626		0.064	0.109	-0.144	-0.191
45.9	-55.889	0.912		45.896	-56.034	1.019		0.003	0.144	-0.107	-0.18
54.775	-53.689	1.385		54.709	-53.576	1.314		0.066	-0.113	0.071	0.149
60.648	-47.658	1.526		60.588	-47.623	1.495		0.06	-0.036	0.031	0.077
62.738	-39.768	1.999		62.743	-39.768	1.998		-0.005	0	0	-0.005
6.103	30.092	-9.559		6.103	29.267	-9.807		0	0.825	0.248	0.862
2.733	30.116	-9.567		2.733	29.271	-9.82		0	0.845	0.254	0.883
2.685	27.043	0.984		2.685	26.113	0.705		0	0.93	0.279	0.971
-0.633	30.125	-9.583		-0.633	29.276	-9.838		0	0.849	0.255	0.887
6.141	20.62	-12.331		6.141	20.143	-12.188		0	0.477	-0.143	-0.498
2.709	23.819	-1.843		2.709	23.294	-1.685		0	0.525	-0.157	-0.548
2.774	20.605	-12.35		2.774	20.137	-12.209		0	0.468	-0.14	-0.489
-0.593	20.529	-12.344		-0.593	20.132	-12.225		0	0.397	-0.119	-0.414
8.162	27.052	-10.072		7.891	27.052	-10.181		0.271	0	0.109	0.292
8.072	24.526	-10.107		7.89	24.526	-10.179		0.182	0	0.073	0.196
4.301	24.541	0.595		3.68	24.541	0.346		0.621	0	0.248	0.669
8.177	22.002	-10.06		7.888	22.002	-10.175		0.289	0	0.116	0.311
-4.544	27.021	-11.839		-4.32	27.021	-11.929		-0.224	0	0.09	0.242
0.297	24.525	-1.556		-0.106	24.525	-1.395		0.403	0	-0.161	-0.434
-4.591	24.496	-11.812		-4.317	24.496	-11.922		-0.274	0	0.109	0.295
-4.461	21.968	-11.858		-4.315	21.968	-11.917		-0.146	0	0.058	0.157
-8.848	4.627	-1.509		-9.323	4.875	-1.509		0.475	-0.249	0	0.537
-8.531	4.442	10.281		-9.332	4.859	10.281		0.801	-0.417	0	0.903
-0.061	9.869	10.308		-0.065	10.521	10.308		0.004	-0.652	0	0.652
-0.014	10.191	-1.477		-0.014	10.521	-1.477		0	-0.33	0	0.33
9.044	5.511	-1.421		8.984	5.475	-1.421		0.06	0.036	0	-0.07
9.168	5.68	10.36		8.943	5.541	10.36		0.225	0.139	0	-0.264
10.805	-3.853	10.387		9.91	-3.534	10.387		0.895	-0.319	0	-0.951
10.398	-3.726	1.546		9.904	-3.549	1.546		0.494	-0.177	0	-0.525
0.678	-10.885	1.515		0.654	-10.501	1.515		0.024	-0.385	0	-0.386
0.623	-11.178	10.355		0.586	-10.505	10.355		0.038	-0.674	0	-0.675
-9.458	-3.854	10.289		-9.743	-3.97	10.289		0.285	0.116	0	0.307
-9.671	-3.963	1.45		-9.735	-3.99	1.45		0.064	0.026	0	0.07
11.39	-10.744	4.527		10.715	-10.106	4.527		0.676	-0.637	0	0.929
-10.906	-10.3	4.39		-10.708	-10.113	4.39		-0.197	-0.186	0	0.272
-14.424	1.455	1.398		-14.655	1.479	1.398		0.231	-0.023	0	-0.232
-8.046	11.976	4.359		-8.214	12.226	4.359		0.168	-0.251	0	-0.302

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
4.055	14.137	1.483	4.061	14.158	1.483	-0.006	-0.021	0	-0.022
13.436	6.536	4.501	13.245	6.443	4.501	0.191	0.093	0	0.212
2.546	1.615	-15.694	2.546	1.615	-16.833	0	0	1.139	1.139
-3.132	3.275	-15.817	-3.132	3.275	-16.833	0	0	1.017	1.017
-3.198	-4.658	-15.758	-3.198	-4.658	-16.833	0	0	1.076	1.076
4.374	-4.499	-15.941	4.374	-4.499	-16.833	0	0	0.893	0.893
1.049	-1.053	-18.65	1.08	-1.084	-18.65	-0.031	0.031	0	0.044
-8.846	-9.03	13.231	-8.846	-9.03	12.625	0	0	0.606	0.606
-11.512	3.024	13.672	-11.512	3.024	12.625	0	0	1.047	1.047
-0.452	11.524	13.51	-0.452	11.524	12.625	0	0	0.885	0.885
11.726	4.475	12.875	11.726	4.475	12.625	0	0	0.25	0.25
11.097	-7.467	12.604	11.097	-7.467	12.625	0	0	-0.021	-0.021
0.967	-13.291	12.838	0.967	-13.291	12.625	0	0	0.213	0.213
0.086	-15.378	7.555	0.083	-14.729	7.555	0.004	-0.649	0	0.649
7.378	-47.249	7.527	6.972	-47.249	7.527	0.406	0	0	0.406
7.4	-37.241	7.51	6.972	-37.241	7.51	0.428	0	0	0.428
7.406	-27.234	7.488	6.972	-27.234	7.488	0.434	0	0	0.434
7.566	-17.226	7.468	6.972	-17.226	7.468	0.594	0	0	0.594
5.088	-18.197	7.439	4.447	-18.197	7.439	0.641	0	0	-0.641
4.803	-27.921	7.458	4.447	-27.921	7.458	0.356	0	0	-0.356
4.819	-37.643	7.478	4.447	-37.643	7.478	0.372	0	0	-0.372
4.655	-47.367	7.498	4.447	-47.367	7.498	0.208	0	0	-0.208
-3.483	-47.383	10.416	-3.97	-47.383	10.416	0.486	0	0	0.486
-3.482	-37.697	10.397	-3.97	-37.697	10.397	0.488	0	0	0.488
-3.534	-28.014	10.376	-3.97	-28.014	10.376	0.436	0	0	0.436
-3.531	-18.329	10.355	-3.97	-18.329	10.355	0.439	0	0	0.439
-7.931	-16.615	4.418	-8.178	-16.615	4.418	0.247	0	0	-0.247
-8.059	-26.816	4.439	-8.178	-26.816	4.439	0.119	0	0	-0.119
-8.139	-37.019	4.46	-8.178	-37.019	4.46	0.039	0	0	-0.039
-8.091	-47.218	4.483	-8.178	-47.218	4.483	0.087	0	0	-0.087
-5.423	-51.41	7.912	-5.423	-50.5	7.912	0	-0.91	0	0.91
6.313	-51.498	11.211	6.313	-50.5	11.211	0	-0.998	0	0.998
7.283	-47.013	12.56	6.972	-47.013	12.56	0.311	0	0	-0.311
7.217	-37.967	12.528	6.972	-37.967	12.625	0.245	0	-0.097	-0.263
6.976	-28.922	12.622	6.972	-28.922	12.625	0.004	0	-0.003	-0.005
6.388	-17.955	12.445	6.388	-17.955	12.625	0	0	-0.18	-0.18
-5.606	-17.417	12.934	-5.606	-17.417	12.625	0	0	0.309	0.309
-5.704	-27.821	12.645	-5.704	-27.821	12.625	0	0	0.02	0.02
-5.712	-36.64	12.401	-5.712	-36.64	12.625	0	0	-0.224	-0.224
-4.259	-48.393	12.693	-3.97	-48.393	12.625	-0.289	0	0.068	0.297
63.734	-86.17	1.156	63.734	-86.17	0	0	0	1.156	1.156
52.307	-86.561	0.895	52.307	-86.561	0	0	0	0.895	0.895
31.563	-86.119	0.402	31.563	-86.119	0	0	0	0.402	0.402
27.569	-78.41	-0.42	27.569	-78.41	0	0	0	-0.42	-0.42
40.755	-80.112	-0.106	40.755	-80.112	0	0	0	-0.106	-0.106
57.182	-76.691	0.43	57.182	-76.691	0	0	0	0.43	0.43
61.817	-67.385	0.159	61.817	-67.385	0	0	0	0.159	0.159

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
47.838	-70.662	-0.628	47.838	-70.662	0	0	0	-0.628	-0.628
38.312	-66.286	-1.269	38.312	-66.286	0	0	0	-1.269	-1.269
24.664	-65.982	-1.57	24.664	-65.982	-3.03	0	0	1.46	1.46
20.682	-53.888	-2.005	20.682	-53.888	-3.03	0	0	1.025	1.025
15.902	-46.771	-2.063	15.902	-46.771	-3.03	0	0	0.967	0.967
23.764	-46.01	-1.866	23	-46.01	-3.03	0.764	0	1.164	1.392
15.531	-35.836	-2.011	15.531	-35.836	-3.03	0	0	1.019	1.019
16.18	-25.874	-1.823	15.938	-25.874	-3.03	0.242	0	1.207	1.23
26.291	-28.792	-1.442	26.291	-28.792	0	0	0	-1.442	-1.442
34.265	-23.784	-1.003	34.265	-23.784	0	0	0	-1.003	-1.003
62.353	-24.877	0.122	62.353	-24.877	0	0	0	0.122	0.122
68.75	-35.386	0.376	68.75	-35.386	0	0	0	0.376	0.376
65.98	-55.363	0.316	65.98	-55.363	0	0	0	0.316	0.316
69.554	-6.935	0.37	69.554	-6.935	0	0	0	0.37	0.37
66.681	18.057	0.408	66.681	18.057	0	0	0	0.408	0.408
52.777	18.61	-0.444	52.777	18.61	0	0	0	-0.444	-0.444
38.901	18.335	-0.538	38.901	18.335	0	0	0	-0.538	-0.538
25.548	18.635	-0.552	25.548	18.635	0	0	0	-0.552	-0.552
27.632	28.097	-0.341	27.632	28.097	0	0	0	-0.341	-0.341
34.775	26.447	-0.294	34.775	26.447	0	0	0	-0.294	-0.294
46.519	25.533	-0.331	46.519	25.533	0	0	0	-0.331	-0.331
46.186	34.074	-0.07	46.186	34.074	0	0	0	-0.07	-0.07
30.204	38.959	-0.106	30.204	38.959	0	0	0	-0.106	-0.106
17.843	41.78	-0.399	17.843	41.78	0	0	0	-0.399	-0.399
7.609	38.89	-0.439	7.609	38.89	0	0	0	-0.439	-0.439
10.759	48.949	-0.132	10.759	48.949	0	0	0	-0.132	-0.132
23.44	51.934	0.08	23.44	51.934	0	0	0	0.08	0.08
43.734	55.222	0.417	43.734	55.222	0	0	0	0.417	0.417
66.926	53.933	1.008	66.926	53.933	0	0	0	1.008	1.008
67.544	37.956	0.726	67.544	37.956	0	0	0	0.726	0.726
-11.679	40.329	-0.253	-11.679	40.329	0	0	0	-0.253	-0.253
-22.218	17.019	0.426	-22.218	17.019	0	0	0	0.426	0.426
-23.544	30.207	0.289	-23.544	30.207	0	0	0	0.289	0.289
-30.712	25.509	0.16	-30.712	25.509	0	0	0	0.16	0.16
-42.443	26.148	-0.143	-42.443	26.148	0	0	0	-0.143	-0.143
-49.94	29.988	-0.314	-49.94	29.988	0	0	0	-0.314	-0.314
-39.924	45.558	-0.021	-39.924	45.558	0	0	0	-0.021	-0.021
-47.064	54.101	-0.025	-47.064	54.101	0	0	0	-0.025	-0.025
-75.076	53.267	0.309	-75.076	53.267	0	0	0	0.309	0.309
-75.259	36.985	0.094	-75.259	36.985	0	0	0	0.094	0.094
-74.012	18.828	-0.154	-74.012	18.828	0	0	0	-0.154	-0.154
-56.543	24.761	-0.435	-56.543	24.761	0	0	0	-0.435	-0.435
-65.557	11.438	-0.717	-65.557	11.438	0	0	0	-0.717	-0.717
-68.046	-1.625	-0.699	-68.046	-1.625	0	0	0	-0.699	-0.699
-76.386	-11.334	-0.136	-76.386	-11.334	0	0	0	-0.136	-0.136
-76.217	-29.808	0.082	-76.217	-29.808	0	0	0	0.082	0.082
-61.953	-25.382	-0.733	-61.953	-25.382	0	0	0	-0.733	-0.733

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF (mm)
-49.272	-22.398	-0.957	-49.272	-22.398	0	0	0	-0.957	-0.957
-34.935	-27.073	-0.726	-34.935	-27.073	0	0	0	-0.726	-0.726
-22.2	-18.565	0.141	-22.2	-18.565	0	0	0	0.141	0.141
-27.172	-37.519	-0.726	-27.172	-37.519	0	0	0	-0.726	-0.726
-12.173	-51.049	-0.011	-11.405	-50.569	-0.011	-0.767	-0.481	0	0.905
-4.498	-60.619	-1.73	-4.498	-60.619	0	0	0	-1.73	-1.73
-5.717	-71.421	-1.099	-5.717	-71.421	0	0	0	-1.099	-1.099
-7.041	-86.64	0.069	-7.041	-86.64	0	0	0	0.069	0.069
-26.464	-91.27	0.604	-26.464	-91.27	0	0	0	0.604	0.604
-40.159	-89.053	0.525	-40.159	-89.053	0	0	0	0.525	0.525
-52.926	-82.664	0.31	-52.926	-82.664	0	0	0	0.31	0.31
-62.125	-91.302	1.026	-62.125	-91.302	0	0	0	1.026	1.026
-76.461	-86.627	1.067	-76.461	-86.627	0	0	0	1.067	1.067
-74.84	-65.053	0.443	-74.84	-65.053	0	0	0	0.443	0.443
-71.264	-44.779	-0.056	-71.264	-44.779	0	0	0	-0.056	-0.056
-65.088	-56.672	-0.251	-65.088	-56.672	0	0	0	-0.251	-0.251
-61.443	-66.456	-0.193	-61.443	-66.456	0	0	0	-0.193	-0.193
-49.737	-59.373	-0.831	-49.737	-59.373	0	0	0	-0.831	-0.831
-49.468	-73.429	-0.288	-49.468	-73.429	0	0	0	-0.288	-0.288
-13.311	-38.471	-17.445	-13.311	-38.471	-16.833	0	0	-0.612	-0.612
-13.748	-17.074	-16.752	-13.748	-17.074	-16.833	0	0	0.082	0.082
-12.993	15.606	-16.294	-12.993	15.606	-16.833	0	0	0.539	0.539
-12.849	28.813	-16.512	-12.849	28.813	-16.833	0	0	0.322	0.322
15.213	31.123	-17.125	15.213	31.123	-16.833	0	0	-0.292	-0.292
16.094	23.418	-17.134	16.094	23.418	-16.833	0	0	-0.301	-0.301
16.378	11.73	-16.933	16.378	11.73	-16.833	0	0	-0.1	-0.1
60.578	3.894	-16.717	60.578	3.894	-16.833	0	0	0.116	0.116
59.044	-10.381	-16.734	59.044	-10.381	-16.833	0	0	0.099	0.099
49.564	-15.692	-17.202	49.564	-15.692	-16.833	0	0	-0.369	-0.369
37.144	-10.118	-17.024	37.144	-10.118	-16.833	0	0	-0.19	-0.19
31.392	-18.154	-17.822	31.392	-18.154	-16.833	0	0	-0.989	-0.989
13.929	-15.666	-17.563	13.929	-15.666	-16.833	0	0	-0.73	-0.73
20.117	2.356	-4.728	20.117	2.356	-4.208	0	0	-0.52	-0.52
29.495	6.78	-4.833	29.495	6.78	-4.208	0	0	-0.625	-0.625
35.027	2.532	-4.557	35.027	2.532	-4.208	0	0	-0.349	-0.349
41.774	6.926	-4.761	41.774	6.926	-4.208	0	0	-0.553	-0.553
47.008	1.749	-4.407	47.008	1.749	-4.208	0	0	-0.199	-0.199
52.595	7.978	-4.647	52.595	7.978	-4.208	0	0	-0.438	-0.438
51.42	-3.609	0.145	51.42	-3.609	0	0	0	0.145	0.145
40.896	-3.424	0.234	40.896	-3.424	0	0	0	0.234	0.234
29.203	-3.254	0.147	29.203	-3.254	0	0	0	0.147	0.147
17.516	-1.894	-0.045	17.516	-1.926	0	0	0.032	-0.045	-0.055
19.139	-9.789	1.728	19.139	-9.789	1.683	0	0	0.045	0.045
25.292	-6.945	1.771	25.292	-6.945	1.683	0	0	0.088	0.088
26.417	-15.25	2.061	26.417	-15.25	1.683	0	0	0.378	0.378
19.412	-12.796	-3.326	19.412	-12.447	-3.326	0	-0.349	0	0.349
26.293	-16.627	1.705	26.293	-16.655	1.683	0	0.028	0.021	-0.035



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
33.603	-3.772	-3.332		33.603	-4.03	-3.332		0	0.258	0		-0.258
40.622	-3.697	-2.54		40.622	-4.03	-2.54		0	0.334	0		-0.334
54.186	-4.186	-3.745		54.614	-4.03	-3.745		-0.428	-0.156	0		0.456
55.396	-0.177	-8.011		55.193	-0.112	-8.011		0.203	-0.065	0		0.213
56.818	7.493	-8.766		56.527	7.493	-8.766		0.291	0	0		0.291
60.033	12.46	-0.707		60.033	12.411	-0.601		0	0.05	-0.106		-0.117
49.82	13.528	-1.791		49.82	13.257	-1.323		0	0.27	-0.468		-0.541
39.983	13.017	-1.528		39.983	12.594	-1.106		0	0.423	-0.423		-0.598

### 3D-Tol Data from CMM for 3DP-4mm Pattern

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
53.839	59.623	-5.714		53.839	58.917	-5.714		0	0.707	0		0.707
37.29	59.536	-5.724		37.29	58.917	-5.724		0	0.62	0		0.62
20.745	59.491	-5.736		20.745	58.917	-5.736		0	0.575	0		0.575
4.2	59.558	-5.747		4.2	58.917	-5.747		0	0.641	0		0.641
-12.347	59.676	-5.758		-12.347	58.917	-5.758		0	0.759	0		0.759
-28.891	59.747	-5.769		-28.891	58.917	-5.769		0	0.83	0		0.83
-45.436	59.759	-5.78		-45.436	58.917	-5.78		0	0.842	0		0.842
-61.98	59.668	-5.791		-61.98	58.917	-5.791		0	0.751	0		0.751
-81.266	40.922	-5.821		-79.958	40.922	-5.821		-1.308	0	0		1.308
-81.221	24.377	-5.833		-79.958	24.377	-5.833		-1.263	0	0		1.263
-81.205	7.832	-5.846		-79.958	7.832	-5.846		-1.247	0	0		1.247
-81.272	-8.711	-5.858		-79.958	-8.711	-5.858		-1.314	0	0		1.314
-81.222	-25.257	-5.871		-79.958	-25.257	-5.871		-1.263	0	0		1.263
-81.164	-41.803	-5.884		-79.958	-41.803	-5.884		-1.205	0	0		1.205
-81.248	-58.344	-5.896		-79.958	-58.344	-5.896		-1.29	0	0		1.29
-81.193	-74.892	-5.909		-79.958	-74.892	-5.909		-1.234	0	0		1.234
-61.708	-93.899	-5.911		-61.708	-92.583	-5.911		0	-1.316	0		1.316
-45.165	-93.911	-5.899		-45.165	-92.583	-5.899		0	-1.328	0		1.328
-28.619	-93.73	-5.888		-28.619	-92.583	-5.888		0	-1.147	0		1.147
-12.076	-93.814	-5.877		-12.076	-92.583	-5.877		0	-1.231	0		1.231
4.471	-93.87	-5.866		4.471	-92.583	-5.866		0	-1.286	0		1.286
21.016	-93.893	-5.855		21.016	-92.583	-5.855		0	-1.31	0		1.31
37.561	-93.7	-5.844		37.561	-92.583	-5.844		0	-1.117	0		1.117
54.105	-93.687	-5.832		54.105	-92.583	-5.832		0	-1.104	0		1.104
71.919	-74.625	-5.806		71.542	-74.625	-5.806		0.377	0	0		0.377
72.318	-58.08	-5.792		71.542	-58.08	-5.792		0.776	0	0		0.776
72.328	-41.535	-5.779		71.542	-41.535	-5.779		0.786	0	0		0.786
72.336	-24.99	-5.766		71.542	-24.99	-5.766		0.794	0	0		0.794
72.437	-8.444	-5.752		71.542	-8.444	-5.752		0.895	0	0		0.895
72.342	8.1	-5.741		71.542	8.1	-5.741		0.801	0	0		0.801
72.408	24.645	-5.728		71.542	24.645	-5.728		0.866	0	0		0.866
72.497	41.193	-5.715		71.542	41.193	-5.715		0.955	0	0		0.955
-69.7	43.63	8.703		-69.7	43.63	8.417		0	0	0.286		0.286



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-64.649	43.638	8.672		-64.649	43.638	8.417		0	0	0.255		0.255
-64.658	48.688	8.674		-64.658	48.688	8.417		0	0	0.258		0.258
-69.709	48.679	8.665		-69.709	48.679	8.417		0	0	0.248		0.248
-67.573	46.278	8.639		-67.573	46.278	8.417		0	0	0.223		0.223
-72.527	43.625	6.812		-71.542	43.625	6.812		-0.985	0	0		0.985
-72.652	48.675	6.817		-71.542	48.675	6.817		-1.11	0	0		1.11
-69.713	51.344	6.822		-69.713	50.5	6.822		0	0.844	0		0.844
-64.664	51.353	6.826		-64.664	50.5	6.826		0	0.853	0		0.853
-64.644	42.065	7.812		-64.644	42.083	8.417		0	-0.018	-0.605		0.605
-69.695	42.014	7.802		-69.695	42.083	8.417		0	-0.07	-0.614		0.618
-64.327	48.694	6.824		-63.125	48.694	6.824		-1.202	0	0		-1.202
-63.324	42.647	6.819		-63.324	42.083	6.819		0	0.564	0		0.564
-64.55	-14.432	3.939		-64.55	-14.432	4.208		0	0	-0.269		-0.269
-69.6	-14.443	4.046		-69.6	-14.443	4.208		0	0	-0.163		-0.163
-69.591	-19.493	4.058		-69.591	-19.493	4.208		0	0	-0.15		-0.15
-64.541	-19.483	3.969		-64.541	-19.483	4.208		0	0	-0.24		-0.24
-67.717	-16.866	4.029		-67.717	-16.866	4.208		0	0	-0.179		-0.179
-69.605	-12.661	3.406		-69.605	-12.625	3.406		0	-0.036	0		-0.036
-64.552	-12.738	3.411		-64.552	-12.625	3.411		0	-0.113	0		-0.113
-64.504	-14.43	3.409		-63.125	-14.43	3.409		-1.379	0	0		-1.379
-63.396	-20.476	3.405		-63.396	-21.042	3.405		0	0.566	0		0.566
-64.536	-20.93	3.4		-64.536	-21.042	3.4		0	0.112	0		-0.112
-69.585	-21.363	3.398		-69.585	-21.042	3.398		0	-0.321	0		0.321
-72.774	-19.496	3.397		-71.542	-19.496	3.397		-1.232	0	0		1.232
-72.711	-14.448	3.402		-71.542	-14.448	3.402		-1.169	0	0		1.169
-64.447	-77.561	8.23		-64.447	-77.561	8.417		0	0	-0.187		-0.187
-69.498	-77.571	8.705		-69.498	-77.571	8.417		0	0	0.288		0.288
-69.489	-82.62	8.542		-69.489	-82.62	8.417		0	0	0.126		0.126
-64.438	-82.612	8.409		-64.438	-82.612	8.417		0	0	-0.007		-0.007
-69.497	-76.915	6.725		-69.497	-75.75	6.725		0	-1.165	0		-1.165
-63.45	-76.521	6.729		-63.125	-76.521	6.729		-0.325	0	0		0.325
-64.898	-77.558	6.727		-63.125	-77.558	6.727		-1.773	0	0		-1.773
-63.623	-83.603	6.723		-63.623	-84.167	6.723		0	0.564	0		0.564
-64.428	-85.143	6.718		-64.428	-84.167	6.718		0	-0.976	0		0.976
-69.482	-85.527	6.716		-69.482	-84.167	6.716		0	-1.36	0		1.36
-73.076	-82.627	6.715		-71.542	-82.627	6.715		-1.534	0	0		1.534
-72.937	-77.574	6.72		-71.542	-77.574	6.72		-1.396	0	0		1.396
-2.364	43.746	3.774		-2.364	43.746	4.208		0	0	-0.434		-0.434
2.688	43.754	3.8		2.688	43.754	4.208		0	0	-0.408		-0.408
2.678	48.804	3.914		2.678	48.804	4.208		0	0	-0.294		-0.294
-2.372	48.795	3.822		-2.372	48.795	4.208		0	0	-0.386		-0.386
-0.529	46.783	3.813		-0.529	46.783	4.208		0	0	-0.395		-0.395
-4.429	43.742	2.228		-4.208	43.742	2.228		-0.221	0	0		0.221
-4.905	48.793	2.233		-4.208	48.793	2.233		-0.697	0	0		0.697
3.654	41.936	2.232		4.208	42.083	2.232		-0.554	-0.148	0		0.573
-2.358	42.512	2.229		-2.358	42.083	2.229		0	0.429	0		-0.429
4.072	48.812	2.239		4.208	48.812	2.239		-0.136	0	0		-0.136
4	43.76	2.236		4.208	43.76	2.236		-0.208	0	0		-0.208

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-2.377	51.201	2.237		-2.377	50.5	2.237		0	0.701	0		0.701
2.674	51.243	2.242		2.674	50.5	2.242		0	0.743	0		0.743
-65.014	36.503	-0.188		-65.014	36.503	0		0	0	-0.188		0.188
-54.216	47.134	-0.171		-54.216	47.134	0		0	0	-0.171		0.171
-46.796	46.81	-1.164		-46.803	46.803	-1.164		0.007	0.007	0		-0.009
-36.061	36.117	-1.165		-36.089	36.089	-1.165		0.028	0.028	0		-0.04
-40.736	29.048	-0.29		-40.843	28.94	0		0.107	0.107	-0.29		0.327
-47.871	36.197	-0.296		-47.985	36.082	0		0.114	0.114	-0.296		0.337
-36.304	30.248	-1.549		-35.673	29.618	-1.549		-0.631	0.631	0		0.892
-54.791	35.821	-1.178		-54.033	35.064	-1.178		-0.757	0.757	0		1.071
-59.597	31.099	-1.183		-58.797	30.3	-1.183		-0.8	0.8	0		1.131
-65.179	29.525	-0.133		-65.206	29.498	0		0.028	0.028	-0.133		0.139
-61.211	33.448	-4.35		-61.211	33.448	-4.208		0	0	-0.142		-0.142
-56.651	38.209	-4.369		-56.651	38.209	-4.208		0	0	-0.16		-0.16
-50.165	43.623	-4.48		-50.165	43.623	-4.208		0	0	-0.271		-0.271
-44.596	38.586	-4.545		-44.596	38.586	-4.208		0	0	-0.336		-0.336
-39.913	33.786	-4.654		-39.913	33.786	-4.208		0	0	-0.446		-0.446
49.823	42.728	6.051		49.823	42.083	6.051		0	0.644	0		-0.644
43.09	42.644	6.047		43.09	42.083	6.047		0	0.56	0		-0.56
55.518	30.372	6.046		54.708	30.372	6.046		0.809	0	0		-0.809
55.48	37.106	6.052		54.708	37.106	6.052		0.772	0	0		-0.772
58.992	25.571	5.549		58.992	25.25	5.549		0	0.321	0		-0.321
63.871	30.392	6.053		63.125	30.392	6.053		0.746	0	0		0.746
63.783	37.967	6.06		63.125	37.967	6.06		0.658	0	0		0.658
63.869	45.544	6.065		63.125	45.544	6.065		0.744	0	0		0.744
58.221	51.288	6.064		58.221	50.5	6.064		0	0.788	0		0.788
50.643	51.211	6.061		50.643	50.5	6.061		0	0.711	0		0.711
43.067	51.222	6.057		43.067	50.5	6.057		0	0.722	0		0.722
38.276	46.287	5.328		37.875	46.287	5.328		0.401	0	0		-0.401
43.329	46.462	8.708		43.329	46.462	8.417		0	0	0.291		0.291
50.562	46.184	8.683		50.562	46.184	8.417		0	0	0.266		0.266
58.534	45.866	8.681		58.534	45.866	8.417		0	0	0.264		0.264
59.287	37.603	8.626		59.287	37.603	8.417		0	0	0.209		0.209
59.176	30.758	8.439		59.176	30.758	8.417		0	0	0.022		0.022
-30.757	49.015	16.941		-30.757	48.895	17.01		0	0.12	-0.069		-0.139
-30.748	46.268	11.83		-30.748	45.995	11.988		0	0.273	-0.158		-0.316
-30.74	43.535	6.709		-30.74	43.094	6.964		0	0.441	-0.255		-0.509
-30.733	40.767	1.601		-30.733	40.191	1.934		0	0.577	-0.333		-0.666
-26.945	40.765	1.611		-26.945	40.194	1.94		0	0.57	-0.329		-0.659
-26.953	43.558	6.701		-26.953	43.097	6.967		0	0.461	-0.266		-0.532
-26.962	46.274	11.832		-26.962	45.997	11.992		0	0.277	-0.16		-0.32
-26.969	49.018	16.945		-26.969	48.898	17.015		0	0.121	-0.07		-0.139
-23.181	49.087	16.914		-23.181	48.901	17.021		0	0.186	-0.107		-0.214
-23.173	46.292	11.823		-23.173	45.998	11.993		0	0.294	-0.17		-0.339
-23.166	43.583	6.691		-23.166	43.099	6.971		0	0.485	-0.28		-0.559
-23.158	41.01	1.476		-23.158	40.197	1.945		0	0.813	-0.469		-0.939
-16.854	46.245	1.769		-16.854	45.437	1.985		0	0.807	-0.216		-0.836
-16.861	47.703	9.456		-16.861	47.457	9.522		0	0.246	-0.066		-0.255

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-16.87	49.619	17.023		-16.87	49.477	17.061		0	0.142	-0.038		-0.147
-11.819	49.686	17.012		-11.819	49.479	17.068		0	0.208	-0.056		-0.215
-11.81	47.611	9.488		-11.81	47.458	9.529		0	0.152	-0.041		-0.158
-11.803	46.066	1.825		-11.803	45.439	1.993		0	0.627	-0.168		-0.649
-8.581	49.586	7.655		-8.178	49.586	7.655		-0.403	0	0		-0.403
-30.763	51.477	15.35		-30.763	50.931	15.204		0	0.546	0.146		0.565
-30.765	53.171	9.744		-30.765	52.446	9.549		0	0.725	0.194		0.75
-30.764	54.837	4.128		-30.764	53.962	3.893		0	0.875	0.235		0.906
-24.028	54.663	4.084		-24.028	53.961	3.896		0	0.701	0.188		0.726
-24.029	53.189	9.752		-24.029	52.446	9.552		0	0.744	0.199		0.77
-24.03	51.467	15.347		-24.03	50.931	15.203		0	0.536	0.144		0.555
-17.295	51.29	15.302		-17.295	50.931	15.206		0	0.36	0.096		0.372
-17.297	53.092	9.725		-17.297	52.446	9.552		0	0.647	0.173		0.669
-17.296	54.646	4.08		-17.296	53.961	3.897		0	0.685	0.183		0.709
-10.561	54.501	4.045		-10.561	53.96	3.9		0	0.541	0.145		0.56
-10.562	52.912	9.678		-10.562	52.445	9.553		0	0.467	0.125		0.483
-10.562	51.198	15.279		-10.562	50.931	15.207		0	0.268	0.072		0.277
-33.954	48.879	9.78		-33.428	48.879	9.78		-0.526	0	0		0.526
4.847	-63.149	19.039		5.084	-63.149	18.975		-0.237	0	0.064		0.245
3.1	-63.145	11.932		3.191	-63.145	11.907		-0.091	0	0.024		0.094
1.141	-63.144	4.882		1.297	-63.144	4.84		-0.156	0	0.042		0.162
1.253	-69.877	4.85		1.296	-69.877	4.838		-0.044	0	0.012		0.045
2.917	-69.879	11.98		3.19	-69.879	11.907		-0.273	0	0.073		0.283
4.85	-69.881	19.038		5.084	-69.881	18.975		-0.234	0	0.063		0.243
4.741	-76.616	19.063		5.083	-76.616	18.971		-0.342	0	0.092		0.354
2.981	-76.613	11.958		3.189	-76.613	11.902		-0.208	0	0.056		0.216
1.189	-76.61	4.864		1.296	-76.61	4.836		-0.106	0	0.029		0.11
1.102	-83.343	4.886		1.295	-83.343	4.834		-0.193	0	0.052		0.2
2.691	-83.345	12.037		3.19	-83.345	11.903		-0.498	0	0.133		0.516
4.646	-83.347	19.088		5.083	-83.347	18.971		-0.437	0	0.117		0.452
7.844	-86.984	10.394		7.844	-85.85	10.394		0	-1.134	0		1.134
7.587	-83.34	20.981		7.747	-83.34	21.073		-0.16	0	-0.092		-0.185
13.045	-83.323	11.566		13.189	-83.323	11.649		-0.144	0	-0.083		-0.166
18.574	-83.307	2.196		18.628	-83.307	2.227		-0.055	0	-0.032		-0.063
18.472	-75.732	2.15		18.623	-75.732	2.237		-0.15	0	-0.087		-0.173
12.939	-75.749	11.519		13.183	-75.749	11.659		-0.243	0	-0.14		-0.281
7.613	-75.766	21.01		7.741	-75.766	21.084		-0.128	0	-0.074		-0.148
6.709	-69.452	21.097		6.954	-69.452	21.163		-0.245	0	-0.066		-0.254
9.215	-69.442	11.666		9.48	-69.442	11.737		-0.265	0	-0.071		-0.275
11.714	-69.431	2.235		12.005	-69.431	2.313		-0.292	0	-0.078		-0.302
11.74	-64.381	2.25		12.003	-64.381	2.321		-0.263	0	-0.07		-0.272
9.076	-64.392	11.636		9.478	-64.392	11.744		-0.402	0	-0.108		-0.416
6.684	-64.404	21.098		6.953	-64.404	21.17		-0.269	0	-0.072		-0.278
6.772	-60.957	11.165		6.772	-60.6	11.165		0	-0.357	0		-0.357
-30.175	-50.789	-5.089		-30.188	-50.471	-5.438		0.014	-0.318	0.349		0.473
-29.888	-55.149	-7.737		-29.89	-55.088	-7.851		0.002	-0.061	0.115		0.13
-29.598	-59.107	-11.308		-29.607	-58.547	-11.603		0.01	-0.56	0.295		0.633
-29.423	-61.777	-15.583		-29.422	-61.563	-15.882		-0.001	-0.214	0.298		0.367

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-33.612	-63.325	-16.277		-33.482	-63.45	-16.004		-0.129	0.125	-0.273		-0.327
-35.914	-61.27	-11.764		-35.827	-61.352	-11.701		-0.088	0.082	-0.063		-0.136
-38.433	-59.05	-8.176		-38.338	-59.138	-7.943		-0.095	0.088	-0.233		-0.267
-41.837	-56.008	-5.636		-41.797	-56.044	-5.573		-0.039	0.036	-0.063		-0.083
-46.612	-68.231	-6.131		-46.151	-68.207	-5.58		-0.461	-0.024	-0.551		-0.719
-41.849	-68.001	-8.644		-41.471	-67.981	-7.973		-0.378	-0.02	-0.671		-0.77
-39.286	-67.88	-12.319		-38.164	-67.817	-11.734		-1.122	-0.062	-0.585		-1.267
-35.612	-67.694	-16.818		-35.026	-67.666	-16.013		-0.585	-0.027	-0.805		-0.996
-33.516	-72.209	-16.895		-33.096	-71.704	-15.94		-0.42	-0.505	-0.955		-1.158
-36.089	-74.965	-12.387		-36.911	-75.887	-13.037		0.822	0.923	0.65		1.396
-37.747	-76.758	-8.649		-37.48	-76.455	-7.908		-0.267	-0.303	-0.741		-0.844
-41.052	-80.325	-6.194		-40.648	-79.872	-5.503		-0.404	-0.453	-0.691		-0.92
-29.838	-67.105	-17.496		-29.494	-67.398	-16.844		-0.344	0.293	-0.652		-0.794
-26.477	-62.66	-15.215		-26.255	-62.311	-15.742		-0.222	-0.348	0.527		0.67
-25.286	-60.463	-11.105		-24.875	-59.786	-11.524		-0.411	-0.677	0.42		0.896
-23.27	-56.695	-7.605		-23.226	-56.619	-7.777		-0.044	-0.076	0.172		0.193
-21.265	-53.016	-4.737		-20.994	-52.542	-5.282		-0.271	-0.474	0.545		0.771
-13.265	-62.725	-4.825		-12.936	-62.631	-5.139		-0.329	-0.094	0.314		0.464
-17.44	-63.953	-7.597		-17.389	-63.939	-7.706		-0.052	-0.015	0.109		0.121
-21.577	-65.181	-11.078		-20.903	-64.997	-11.451		-0.674	-0.184	0.373		0.791
-23.911	-65.872	-15.157		-23.541	-65.774	-15.609		-0.371	-0.098	0.452		0.593
-24.063	-70.105	-15.606		-24.042	-70.116	-15.635		-0.021	0.011	0.028		0.037
-21.77	-71.364	-11.345		-21.601	-71.452	-11.447		-0.169	0.088	0.102		0.216
-18.331	-73.247	-7.797		-18.374	-73.224	-7.699		0.043	-0.023	-0.098		-0.109
-14.372	-75.401	-5.12		-14.33	-75.423	-5.164		-0.042	0.022	0.044		0.065
-24.203	-83.952	-5.735		-24.329	-83.554	-5.311		0.126	-0.398	-0.424		-0.594
-25.558	-79.359	-8.201		-25.627	-79.148	-7.765		0.068	-0.211	-0.437		-0.49
-26.449	-76.252	-11.829		-26.634	-75.701	-11.521		0.186	-0.551	-0.308		-0.658
-27.311	-73.313	-16.324		-27.456	-72.909	-15.767		0.145	-0.404	-0.557		-0.703
-32.175	-73.108	-16.817		-31.901	-72.526	-15.904		-0.274	-0.582	-0.913		-1.117
-33.863	-76.209	-12.234		-33.357	-75.189	-11.637		-0.506	-1.02	-0.597		-1.286
-35.832	-77.905	-8.116		-35.31	-78.044	-7.877		-0.523	0.139	-0.239		-0.592
-38.07	-82.041	-5.673		-37.536	-82.12	-5.465		-0.534	0.079	-0.208		-0.578
-24.956	-86.687	-1.081		-25.053	-86.269	-0.519		0.097	-0.418	-0.562		-0.708
-12.746	-77.181	-0.728		-12.823	-77.136	-0.627		0.076	-0.045	-0.101		-0.134
-11.063	-61.91	-0.433		-10.918	-61.867	-0.609		-0.145	-0.043	0.176		0.232
-16.074	-53.891	-0.259		-15.84	-53.656	-0.634		-0.234	-0.235	0.375		0.5
-25.512	-48.559	-0.277		-25.468	-48.347	-0.55		-0.045	-0.213	0.273		0.349
-47.692	-38.159	18.491		-47.087	-37.913	18.868		-0.605	-0.246	-0.377		-0.754
-44.333	-36.587	12.215		-43.792	-36.349	12.556		-0.542	-0.238	-0.342		-0.683
-41.121	-35.063	5.851		-40.5	-34.783	6.244		-0.621	-0.281	-0.394		-0.787
-40.297	-41.242	5.854		-39.698	-41.356	6.205		-0.598	0.114	-0.352		-0.703
-43.826	-40.589	12.199		-43.283	-40.694	12.519		-0.543	0.105	-0.319		-0.639
-47.434	-39.915	18.495		-46.866	-40.029	18.83		-0.569	0.114	-0.335		-0.67
-47.962	-41.823	18.768		-47.875	-41.91	18.839		-0.087	0.087	-0.071		-0.142
-45.407	-44.493	12.484		-45.356	-44.545	12.526		-0.051	0.052	-0.042		-0.084
-42.85	-47.175	6.206		-42.842	-47.184	6.213		-0.009	0.009	-0.007		-0.014
-48.765	-50.547	6.512		-48.829	-50.131	6.269		0.064	-0.416	0.243		0.486

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-49.261	-46.858	12.78		-49.317	-46.518	12.581		0.056	-0.34	0.199		0.397
-49.765	-43.192	19.059		-49.818	-42.907	18.892		0.054	-0.284	0.167		0.334
-52.344	-43.221	19.377		-52.043	-42.581	18.969		-0.301	-0.64	0.408		0.816
-54.121	-46.537	13.133		-53.753	-45.801	12.659		-0.368	-0.735	0.475		0.949
-55.917	-49.863	6.897		-55.481	-49.012	6.345		-0.436	-0.851	0.552		1.104
-52.519	-40.443	23.374		-51.711	-39.986	22.839		-0.807	-0.457	0.535		1.071
-57.939	-43.063	13.374		-56.949	-42.562	12.733		-0.99	-0.501	0.641		1.281
-63.349	-45.647	3.367		-62.208	-45.083	2.632		-1.141	-0.564	0.735		1.47
-64.471	-36.731	3.354		-63.318	-36.943	2.677		-1.154	0.212	0.677		1.355
-58.594	-37.84	13.377		-57.583	-38.023	12.784		-1.011	0.182	0.593		1.187
-52.662	-38.94	23.36		-51.848	-39.076	22.884		-0.814	0.136	0.477		0.953
-51.718	-37.885	23.151		-51.398	-38.258	22.867		-0.321	0.373	0.284		0.568
-55.783	-33.539	13.12		-55.371	-33.989	12.768		-0.412	0.45	0.352		0.704
-59.808	-29.272	3.043		-59.369	-29.746	2.67		-0.439	0.473	0.373		0.745
-51.922	-26.357	2.589		-51.927	-26.311	2.616		0.005	-0.046	-0.027		-0.054
-51.202	-32.009	12.766		-51.193	-32.097	12.715		-0.008	0.087	0.051		0.101
-49.927	-38.019	22.948		-49.854	-38.118	22.918		-0.072	0.099	0.03		0.126
-50.296	-38.153	22.534		-49.804	-38.026	22.735		-0.492	-0.127	-0.201		-0.547
-47.361	-33.078	12.447		-47.007	-32.907	12.631		-0.354	-0.171	-0.185		-0.434
-44.549	-27.964	2.354		-44.212	-27.791	2.535		-0.336	-0.174	-0.181		-0.419
-46.012	3.82	25.203		-46.085	3.89	25.105		0.072	-0.07	0.097		0.14
-50.295	7.826	28.185		-50.174	7.711	27.562		-0.121	0.116	0.623		0.645
-54.392	11.682	22.449		-53.672	10.999	22.009		-0.72	0.683	0.44		1.086
-57.149	14.296	8.565		-56.397	13.581	8.374		-0.753	0.714	0.191		1.055
-63.009	-1.842	8.591		-61.742	-1.73	8.357		-1.267	-0.111	0.234		1.293
-59.004	-1.516	22.444		-58.002	-1.426	21.998		-1.002	-0.09	0.446		1.1
-53.426	-1.062	28.276		-53.229	-1.044	27.557		-0.197	-0.018	0.719		0.746
-47.727	-0.607	25.023		-47.637	-0.597	25.11		-0.09	-0.01	-0.087		-0.125
-45.128	-4.464	25.439		-45.273	-4.677	25.187		0.145	0.213	0.252		0.36
-48.85	-9.278	28.14		-48.74	-9.127	27.527		-0.11	-0.151	0.613		0.641
-52.068	-13.495	22.277		-51.606	-12.871	21.935		-0.462	-0.624	0.342		0.848
-54.321	-16.464	8.467		-53.86	-15.843	8.325		-0.461	-0.62	0.142		0.786
-38.176	-19.502	8.326		-38.204	-19.361	8.3		0.028	-0.141	0.026		0.147
-38.86	-15.973	21.988		-38.911	-15.72	21.875		0.051	-0.253	0.113		0.282
-39.739	-11.333	27.934		-39.77	-11.183	27.488		0.031	-0.15	0.446		0.472
-40.896	-5.043	25.835		-40.767	-5.593	25.274		-0.13	0.55	0.562		0.797
-40.099	20.036	8.438		-40.138	19.637	8.364		0.039	0.398	0.074		0.407
-40.43	16.376	22.178		-40.476	15.913	21.972		0.047	0.463	0.206		0.509
-40.867	11.342	28.012		-40.882	11.202	27.537		0.015	0.14	0.475		0.496
-41.363	5.214	25.552		-41.31	5.596	25.176		-0.053	-0.382	0.377		0.539
-38.942	3.671	26.105		-38.371	4.339	25.238		-0.572	-0.668	0.868		1.235
-34.969	8.98	27.828		-35.033	8.899	27.509		0.064	0.081	0.319		0.335
-32.254	12.566	21.901		-32.217	12.613	21.927		-0.037	-0.048	-0.027		-0.066
-29.955	15.585	8.346		-29.962	15.577	8.344		0.006	0.008	0.002		0.011
-23.962	6.628	8.238		-23.543	6.782	8.32		-0.419	-0.153	-0.082		-0.454
-27.373	5.346	21.717		-27.015	5.476	21.884		-0.358	-0.13	-0.167		-0.416
-31.242	3.886	27.717		-31.319	3.859	27.482		0.077	0.028	0.234		0.248
-37.315	1.575	26.023		-36.614	1.806	25.288		-0.701	-0.232	0.735		1.042

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-37.195	-1.078	26.095		-36.433	-1.246	25.314		-0.762	0.168	0.781		1.104
-30.785	-2.388	27.639		-30.848	-2.375	27.465		0.062	-0.013	0.174		0.186
-26.761	-3.209	21.684		-26.378	-3.289	21.855		-0.383	0.08	-0.171		-0.427
-23.324	-3.908	8.195		-22.754	-4.027	8.302		-0.57	0.119	-0.107		-0.592
-28.05	-13.361	8.229		-27.782	-13.615	8.296		-0.267	0.255	-0.068		-0.375
-30.548	-10.979	21.801		-30.46	-11.063	21.854		-0.088	0.084	-0.053		-0.133
-33.68	-7.975	27.769		-33.759	-7.9	27.467		0.079	-0.075	0.302		0.321
-38.359	-3.459	26.012		-37.846	-3.936	25.311		-0.513	0.477	0.701		0.991
-41.887	5.325	25.472		-41.876	5.637	25.167		-0.012	-0.313	0.305		0.437
-41.996	11.388	28.014		-41.997	11.25	27.541		0.001	0.138	0.473		0.492
-42.052	16.534	22.215		-42.053	15.992	21.976		0.001	0.541	0.239		0.592
-42.083	20.279	8.467		-42.083	19.733	8.367		0	0.546	0.1		0.555
-41.092	-0.449	20.921		-40.249	-0.831	20.345		-0.843	0.382	0.576		1.09
-45.19	0.158	21.4		-44.9	0.143	21.594		-0.29	0.015	-0.195		-0.35
-40.966	-1.5	22.103		-40.433	-2.215	21.508		-0.533	0.715	0.595		1.072
45.379	-41.267	15.244		45.384	-41.257	15.162		-0.005	-0.011	0.083		0.084
42.727	-46.147	13.514		42.754	-46.094	13.4		-0.027	-0.053	0.114		0.128
40.469	-50.286	10.024		40.549	-50.131	9.864		-0.081	-0.155	0.16		0.237
38.968	-53.05	5.033		39.055	-52.886	4.956		-0.086	-0.164	0.077		0.201
32.133	-44.749	4.872		31.861	-44.857	4.994		0.272	0.108	-0.123		-0.317
34.981	-43.631	9.746		34.808	-43.699	9.918		0.172	0.068	-0.171		-0.252
39.139	-42.003	13.412		39.123	-42.009	13.444		0.015	0.006	-0.032		-0.036
44.273	-39.984	15.111		44.265	-39.988	15.177		0.008	0.003	-0.066		-0.066
44.23	-38.299	15.101		44.221	-38.295	15.172		0.009	-0.004	-0.071		-0.071
39.083	-36.571	13.246		38.992	-36.538	13.432		0.091	-0.032	-0.186		-0.21
34.934	-35.173	9.591		34.612	-35.06	9.906		0.322	-0.112	-0.315		-0.464
32.208	-34.255	4.732		31.621	-34.052	4.992		0.587	-0.203	-0.26		-0.673
38.632	-26.083	4.774		38.423	-25.726	4.946		0.21	-0.357	-0.172		-0.449
40.164	-28.6	9.607		40.039	-28.385	9.834		0.125	-0.215	-0.227		-0.337
42.468	-32.376	13.189		42.42	-32.291	13.373		0.048	-0.085	-0.184		-0.208
45.279	-36.976	15.141		45.278	-36.974	15.151		0.001	-0.001	-0.011		-0.011
46.936	-36.64	15.134		46.935	-36.641	15.123		0	0.002	0.01		0.011
47.745	-31.266	13.272		47.747	-31.255	13.293		-0.002	-0.011	-0.02		-0.023
48.42	-26.79	9.748		48.419	-26.797	9.742		0.001	0.007	0.006		0.009
48.863	-23.859	4.848		48.877	-23.777	4.882		-0.014	-0.082	-0.034		-0.09
38.967	-53.051	5.032		39.054	-52.886	4.954		-0.087	-0.165	0.077		0.202
40.471	-50.286	10.024		40.552	-50.131	9.865		-0.08	-0.154	0.159		0.236
42.725	-46.146	13.513		42.752	-46.093	13.4		-0.027	-0.053	0.113		0.127
45.38	-41.267	15.243		45.384	-41.257	15.162		-0.004	-0.01	0.081		0.082
47.749	-36.913	15.142		47.746	-36.917	15.111		0.003	0.004	0.031		0.031
50.372	-32.095	13.372		50.341	-32.149	13.259		0.031	0.053	0.113		0.128
52.553	-28.092	9.822		52.485	-28.211	9.7		0.067	0.119	0.122		0.183
54.021	-25.394	4.927		53.933	-25.551	4.853		0.089	0.158	0.074		0.195
61.363	-33.269	5.051		60.828	-33.477	4.818		0.535	0.208	0.233		0.619
58.326	-34.463	9.926		58.037	-34.575	9.652		0.289	0.112	0.274		0.414
54.022	-36.153	13.47		53.893	-36.203	13.219		0.13	0.05	0.251		0.287
48.877	-38.177	15.209		48.859	-38.183	15.097		0.017	0.006	0.112		0.113
48.927	-39.878	15.255		48.903	-39.871	15.101		0.024	-0.007	0.154		0.157



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
54.216	-41.649	13.565		54.039	-41.592	13.228		0.177	-0.056	0.337		0.385
58.754	-43.166	10.122		58.266	-43.008	9.666		0.488	-0.158	0.456		0.686
61.885	-44.211	5.149		61.121	-43.963	4.822		0.764	-0.249	0.326		0.867
55.176	-53.141	5.28		54.635	-52.288	4.866		0.541	-0.853	0.413		1.091
53.4	-50.245	10.331		53.041	-49.685	9.733		0.359	-0.561	0.598		0.894
50.816	-46.029	13.71		50.691	-45.838	13.288		0.125	-0.191	0.422		0.48
47.87	-41.213	15.304		47.853	-41.19	15.122		0.017	-0.023	0.182		0.184
46.197	-41.543	15.24		46.197	-41.53	15.149		-0.001	-0.013	0.091		0.092
45.361	-47.109	13.654		45.379	-46.957	13.364		-0.018	-0.153	0.29		0.328
44.665	-51.761	10.083		44.701	-51.476	9.822		-0.037	-0.284	0.261		0.388
44.189	-54.939	5.085		44.241	-54.551	4.923		-0.052	-0.387	0.162		0.423
54.02	-25.394	4.926		53.932	-25.551	4.853		0.088	0.157	0.074		0.195
52.553	-28.092	9.823		52.485	-28.211	9.701		0.068	0.119	0.122		0.183
50.37	-32.097	13.371		50.34	-32.149	13.26		0.03	0.052	0.111		0.127
47.747	-36.913	15.139		47.745	-36.917	15.111		0.002	0.004	0.028		0.028
32.656	-49.536	0.482		32.559	-49.61	0.622		0.097	0.074	-0.14		-0.186
36.962	-53.913	0.517		36.976	-53.89	0.48		-0.014	-0.023	0.037		0.046
45.467	-56.608	1.253		45.489	-56.155	0.852		-0.021	-0.453	0.401		0.605
55.218	-54.629	1.604		54.794	-53.893	0.86		0.423	-0.735	0.744		1.129
61.761	-48.04	1.438		61.155	-47.691	0.735		0.606	-0.349	0.703		0.992
63.943	-39.311	1.239		63.442	-39.306	0.736		0.501	-0.005	0.503		0.71
5.693	30.173	-10.19		5.693	29.447	-10.408		0	0.726	0.218		0.758
2.322	30.189	-10.186		2.322	29.447	-10.408		0	0.742	0.222		0.774
2.326	27.127	0.363		2.326	26.291	0.113		0	0.836	0.251		0.873
-1.042	30.072	-10.223		-1.042	29.448	-10.411		0	0.624	0.187		0.651
5.717	20.4	-12.625		5.717	20.044	-12.519		0	0.355	-0.107		-0.371
2.337	23.656	-2.139		2.337	23.199	-2.002		0	0.457	-0.137		-0.477
2.349	20.42	-12.633		2.349	20.044	-12.52		0	0.376	-0.113		-0.392
-1.018	20.4	-12.632		-1.018	20.042	-12.525		0	0.357	-0.107		-0.373
8.217	27.597	-10.402		8.012	27.597	-10.484		0.205	0	0.082		0.221
8.206	25.073	-10.41		8.013	25.073	-10.487		0.193	0	0.077		0.208
4.033	25.058	0.125		3.805	25.058	0.034		0.228	0	0.091		0.246
8.305	22.547	-10.374		8.014	22.547	-10.49		0.291	0	0.116		0.313
-4.56	27.574	-12.449		-4.533	27.574	-12.46		-0.028	0	0.011		0.03
-0.196	25.048	-1.988		-0.323	25.048	-1.938		0.127	0	-0.051		-0.137
-4.754	25.047	-12.37		-4.532	25.047	-12.459		-0.222	0	0.089		0.24
-4.597	22.523	-12.433		-4.532	22.523	-12.46		-0.065	0	0.026		0.07
-9.229	5.187	-2.012		-9.172	5.155	-2.012		-0.058	0.032	0		-0.066
-9.275	5.199	9.774		-9.178	5.144	9.774		-0.098	0.055	0		-0.112
-0.43	10.605	9.782		-0.426	10.512	9.782		-0.004	0.093	0		-0.093
-0.428	10.707	-2.003		-0.42	10.512	-2.003		-0.008	0.194	0		-0.194
8.758	6.182	-2		8.595	6.067	-2		0.163	0.115	0		-0.199
8.927	6.302	9.785		8.595	6.068	9.785		0.332	0.234	0		-0.407
10.606	-3.363	9.778		10.029	-3.179	9.778		0.578	-0.183	0		-0.606
10.335	-3.268	0.94		10.031	-3.172	0.94		0.304	-0.096	0		-0.318
0.279	-10.599	0.929		0.277	-10.517	0.929		0.002	-0.082	0		-0.082
0.272	-10.77	9.77		0.266	-10.517	9.77		0.006	-0.253	0		-0.253
-10.092	-3.401	9.766		-9.97	-3.36	9.766		-0.122	-0.041	0		-0.129

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-10.116	-3.406	0.929		-9.971	-3.357	0.929		-0.145	-0.049	0		-0.153
11.149	-10.355	3.881		10.792	-10.024	3.881		0.357	-0.332	0		0.487
-11.31	-9.891	3.865		-11.087	-9.696	3.865		-0.223	-0.195	0		0.296
-14.766	1.94	0.927		-14.604	1.919	0.927		-0.162	0.021	0		0.164
-8.333	12.393	3.886		-8.218	12.223	3.886		-0.114	0.17	0		0.205
3.707	14.59	0.951		3.627	14.276	0.951		0.08	0.314	0		0.324
13.309	7.115	3.899		12.99	6.944	3.899		0.319	0.171	0		0.362
2.106	2.175	-16.833		2.106	2.175	-16.833		0	0	0		0
-3.573	3.837	-16.94		-3.573	3.837	-16.833		0	0	-0.106		-0.106
-3.64	-4.096	-16.887		-3.64	-4.096	-16.833		0	0	-0.054		-0.054
3.932	-3.937	-16.852		3.932	-3.937	-16.833		0	0	-0.018		-0.018
-0.12	0.22	-20.976		-0.12	0.22	-21.042		0	0	0.066		0.066
-9.149	-8.551	13.322		-9.149	-8.551	12.625		0	0	0.697		0.697
-11.808	3.502	13.348		-11.808	3.502	12.625		0	0	0.723		0.723
-0.749	12.001	13.201		-0.749	12.001	12.625		0	0	0.576		0.576
11.424	4.952	13.116		11.424	4.952	12.625		0	0	0.491		0.491
10.791	-6.989	13.111		10.791	-6.989	12.625		0	0	0.486		0.486
0.662	-12.812	13.121		0.662	-12.812	12.625		0	0	0.496		0.496
-0.228	-14.889	6.956		-0.225	-14.727	6.956		-0.002	-0.162	0		0.162
6.958	-46.753	6.798		6.972	-46.753	6.798		-0.014	0	0		-0.014
7.119	-36.744	6.806		6.972	-36.744	6.806		0.147	0	0		0.147
7.254	-26.737	6.815		6.972	-26.737	6.815		0.282	0	0		0.282
7.132	-16.731	6.822		6.972	-16.731	6.822		0.16	0	0		0.16
4.711	-17.701	6.817		4.447	-17.701	6.817		0.264	0	0		-0.264
4.702	-27.424	6.81		4.447	-27.424	6.81		0.255	0	0		-0.255
4.582	-37.147	6.802		4.447	-37.147	6.802		0.134	0	0		-0.134
4.219	-46.87	6.794		4.447	-46.87	6.794		-0.228	0	0		0.228
-4.368	-46.895	9.737		-3.97	-46.895	9.737		-0.399	0	0		-0.399
-4.237	-37.209	9.745		-3.97	-37.209	9.745		-0.267	0	0		-0.267
-4.234	-27.525	9.751		-3.97	-27.525	9.751		-0.264	0	0		-0.264
-4.018	-17.84	9.76		-3.97	-17.84	9.76		-0.048	0	0		-0.048
-8.265	-16.106	3.863		-8.178	-16.106	3.863		-0.087	0	0		0.087
-8.285	-26.308	3.856		-8.178	-26.308	3.856		-0.107	0	0		0.107
-8.395	-36.509	3.848		-8.178	-36.509	3.848		-0.217	0	0		0.217
-8.616	-46.709	3.84		-8.178	-46.709	3.84		-0.438	0	0		0.438
-5.761	-51.318	7.235		-5.761	-50.5	7.235		0	-0.818	0		0.818
5.992	-51.578	10.476		5.992	-50.5	10.476		0	-1.078	0		1.078
5.97	-46.531	13.087		5.97	-46.531	12.625		0	0	0.462		0.462
5.976	-37.487	13.152		5.976	-37.487	12.625		0	0	0.527		0.527
5.869	-28.444	13.198		5.869	-28.444	12.625		0	0	0.573		0.573
6.08	-17.475	13.158		6.08	-17.475	12.625		0	0	0.533		0.533
-5.912	-16.938	13.211		-5.912	-16.938	12.625		0	0	0.586		0.586
-6.014	-27.341	13.333		-6.014	-27.341	12.625		0	0	0.708		0.708
-6.023	-36.16	13.289		-6.023	-36.16	12.625		0	0	0.664		0.664
-5.545	-47.912	13.257		-5.545	-47.912	12.625		0	0	0.632		0.632
63.362	-85.665	0.077		63.362	-85.665	0		0	0	0.077		0.077
51.933	-86.053	0.088		51.933	-86.053	0		0	0	0.088		0.088
31.187	-85.608	-0.021		31.187	-85.608	0		0	0	-0.021		-0.021



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
27.19	-77.897	-0.167		27.19	-77.897	0		0	0	-0.167		-0.167
40.378	-79.6	-0.133		40.378	-79.6	0		0	0	-0.133		-0.133
56.808	-76.184	-0.1		56.808	-76.184	0		0	0	-0.1		-0.1
61.441	-66.878	-0.289		61.441	-66.878	0		0	0	-0.289		-0.289
47.456	-70.153	-0.379		47.456	-70.153	0		0	0	-0.379		-0.379
37.929	-65.773	-0.447		37.929	-65.773	0		0	0	-0.447		-0.447
24.28	-65.467	-0.439		24.28	-65.467	0		0	0	-0.439		-0.439
20.299	-53.371	-0.507		20.299	-53.371	0		0	0	-0.507		-0.507
15.519	-46.252	-0.602		15.519	-46.252	0		0	0	-0.602		-0.602
23.927	-45.492	-0.578		23.927	-45.492	0		0	0	-0.578		-0.578
15.15	-35.319	-0.686		15.15	-35.319	0		0	0	-0.686		-0.686
15.997	-25.357	-0.806		15.997	-25.357	0		0	0	-0.806		-0.806
25.914	-28.277	-0.585		25.914	-28.277	0		0	0	-0.585		-0.585
33.891	-23.271	-0.555		33.891	-23.271	0		0	0	-0.555		-0.555
61.984	-24.37	-0.296		61.984	-24.37	0		0	0	-0.296		-0.296
68.38	-34.88	-0.332		68.38	-34.88	0		0	0	-0.332		-0.332
65.608	-54.856	-0.243		65.608	-54.856	0		0	0	-0.243		-0.243
69.189	-6.429	-0.215		69.189	-6.429	0		0	0	-0.215		-0.215
66.32	18.564	-0.22		66.32	18.564	0		0	0	-0.22		-0.22
52.412	19.119	-0.464		52.412	19.119	0		0	0	-0.464		-0.464
38.536	18.846	-0.413		38.536	18.846	0		0	0	-0.413		-0.413
25.182	19.148	-0.376		25.182	19.148	0		0	0	-0.376		-0.376
27.268	28.61	-0.196		27.268	28.61	0		0	0	-0.196		-0.196
34.412	26.96	-0.2		34.412	26.96	0		0	0	-0.2		-0.2
46.155	26.044	-0.278		46.155	26.044	0		0	0	-0.278		-0.278
45.825	34.584	-0.104		45.825	34.584	0		0	0	-0.104		-0.104
29.844	39.471	-0.004		29.844	39.471	0		0	0	-0.004		-0.004
17.483	42.295	-0.19		17.483	42.295	0		0	0	-0.19		-0.19
7.248	39.407	-0.552		7.248	39.407	0		0	0	-0.552		-0.552
10.399	49.463	-0.194		10.399	49.463	0		0	0	-0.194		-0.194
23.083	52.447	-0.071		23.083	52.447	0		0	0	-0.071		-0.071
43.378	55.731	0.016		43.378	55.731	0		0	0	0.016		0.016
66.572	54.437	0.191		66.572	54.437	0		0	0	0.191		0.191
67.187	38.461	0.007		67.187	38.461	0		0	0	0.007		0.007
-12.04	40.847	-0.825		-12.04	40.847	0		0	0	-0.825		-0.825
-22.577	17.537	-0.565		-22.577	17.537	0		0	0	-0.565		-0.565
-23.902	30.726	-0.688		-23.902	30.726	0		0	0	-0.688		-0.688
-31.071	26.028	-0.503		-31.071	26.028	0		0	0	-0.503		-0.503
-42.803	26.67	-0.352		-42.803	26.67	0		0	0	-0.352		-0.352
-50.302	30.511	-0.26		-50.302	30.511	0		0	0	-0.26		-0.26
-40.284	46.078	-0.281		-40.284	46.078	0		0	0	-0.281		-0.281
-47.42	54.623	-0.077		-47.42	54.623	0		0	0	-0.077		-0.077
-75.429	53.793	0.071		-75.429	53.793	0		0	0	0.071		0.071
-75.618	37.511	0.01		-75.618	37.511	0		0	0	0.01		0.01
-74.374	19.354	0.029		-74.374	19.354	0		0	0	0.029		0.029
-56.906	25.285	-0.179		-56.906	25.285	0		0	0	-0.179		-0.179
-65.923	11.964	-0.15		-65.923	11.964	0		0	0	-0.15		-0.15
-68.414	-1.099	-0.227		-68.414	-1.099	0		0	0	-0.227		-0.227

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-76.753	-10.807	-0.105		-76.753	-10.807	0		0	0	-0.105		-0.105
-76.584	-29.282	-0.105		-76.584	-29.282	0		0	0	-0.105		-0.105
-62.326	-24.856	-0.284		-62.326	-24.856	0		0	0	-0.284		-0.284
-49.644	-21.873	-0.479		-49.644	-21.873	0		0	0	-0.479		-0.479
-35.307	-26.55	-0.435		-35.307	-26.55	0		0	0	-0.435		-0.435
-22.566	-18.047	-0.473		-22.566	-18.047	0		0	0	-0.473		-0.473
-27.547	-36.998	-0.312		-27.547	-36.998	0		0	0	-0.312		-0.312
-13.395	-51.058	-0.377		-13.395	-51.058	0		0	0	-0.377		-0.377
-4.881	-60.098	-0.565		-4.881	-60.098	0		0	0	-0.565		-0.565
-6.098	-70.903	-0.598		-6.098	-70.903	0		0	0	-0.598		-0.598
-7.417	-86.123	-0.315		-7.417	-86.123	0		0	0	-0.315		-0.315
-26.838	-90.752	-0.158		-26.838	-90.752	0		0	0	-0.158		-0.158
-40.534	-88.533	-0.072		-40.534	-88.533	0		0	0	-0.072		-0.072
-53.301	-82.142	0.14		-53.301	-82.142	0		0	0	0.14		0.14
-62.495	-90.779	-0.124		-62.495	-90.779	0		0	0	-0.124		-0.124
-76.83	-86.103	-0.16		-76.83	-86.103	0		0	0	-0.16		-0.16
-75.21	-64.528	-0.019		-75.21	-64.528	0		0	0	-0.019		-0.019
-71.636	-44.254	0.069		-71.636	-44.254	0		0	0	0.069		0.069
-65.462	-56.147	0.122		-65.462	-56.147	0		0	0	0.122		0.122
-61.819	-65.932	0.122		-61.819	-65.932	0		0	0	0.122		0.122
-50.114	-58.849	-0.042		-50.114	-58.849	0		0	0	-0.042		-0.042
-49.845	-72.906	0.054		-49.845	-72.906	0		0	0	0.054		0.054
-13.766	-37.905	-17.372		-13.766	-37.905	-16.833		0	0	-0.539		-0.539
-14.197	-16.507	-17.284		-14.197	-16.507	-16.833		0	0	-0.451		-0.451
-13.435	16.172	-17.397		-13.435	16.172	-16.833		0	0	-0.563		-0.563
-13.289	29.378	-17.655		-13.289	29.378	-16.833		0	0	-0.822		-0.822
14.769	31.686	-17.443		14.769	31.686	-16.833		0	0	-0.61		-0.61
15.648	23.981	-17.316		15.648	23.981	-16.833		0	0	-0.482		-0.482
15.932	12.292	-17.247		15.932	12.292	-16.833		0	0	-0.414		-0.414
60.132	4.45	-17.309		60.132	4.45	-16.833		0	0	-0.476		-0.476
58.597	-9.824	-17.377		58.597	-9.824	-16.833		0	0	-0.544		-0.544
49.112	-15.133	-17.418		49.112	-15.133	-16.833		0	0	-0.585		-0.585
36.695	-9.559	-17.289		36.695	-9.559	-16.833		0	0	-0.456		-0.456
30.938	-17.591	-17.596		30.938	-17.591	-16.833		0	0	-0.763		-0.763
13.475	-15.103	-17.308		13.475	-15.103	-16.833		0	0	-0.474		-0.474
19.728	2.882	-4.489		19.728	2.882	-4.208		0	0	-0.281		-0.281
29.107	7.305	-4.635		29.107	7.305	-4.208		0	0	-0.426		-0.426
34.639	3.055	-4.42		34.639	3.055	-4.208		0	0	-0.211		-0.211
41.386	7.448	-4.641		41.386	7.448	-4.208		0	0	-0.433		-0.433
46.621	2.272	-4.421		46.621	2.272	-4.208		0	0	-0.213		-0.213
52.208	8.499	-4.68		52.208	8.499	-4.208		0	0	-0.472		-0.472
51.055	-3.101	0.141		51.055	-3.101	0		0	0	0.141		0.141
40.531	-2.914	0.092		40.531	-2.914	0		0	0	0.092		0.092
28.838	-2.744	0.104		28.838	-2.744	0		0	0	0.104		0.104
17.15	-1.955	-0.137		17.15	-1.955	0		0	0	-0.137		-0.137
18.78	-9.282	1.817		18.78	-9.282	1.683		0	0	0.133		0.133
24.934	-6.437	1.802		24.934	-6.437	1.683		0	0	0.118		0.118
26.06	-14.743	1.986		26.06	-14.743	1.683		0	0	0.303		0.303

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
19.024	-12.555	-4.012		19.024	-12.447	-4.012		0	-0.108	0		0.108
25.93	-16.741	0.373		25.93	-16.655	0.373		0	-0.085	0		0.085
33.218	-4.013	-4.062		33.218	-4.03	-4.062		0	0.017	0		-0.017
40.24	-3.982	-3.302		40.24	-4.03	-3.302		0	0.049	0		-0.049
52.863	-3.816	-4.57		52.863	-4.03	-4.57		0	0.214	0		-0.214
56.092	0.011	-8.838		55.312	0.261	-8.838		0.78	-0.249	0		0.819
57.112	8.032	-9.577		56.527	8.032	-9.577		0.585	0	0		0.585
59.665	12.648	-0.818		59.665	12.522	-0.549		0	0.126	-0.269		-0.297
49.448	13.523	-1.65		49.448	13.315	-1.289		0	0.208	-0.36		-0.416
39.61	12.73	-1.436		39.61	12.497	-1.203		0	0.233	-0.233		-0.329

### 3D-Tol Data from CMM for LS-3mm Pattern

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
53.672	58.907	-5.725		53.672	58.917	-5.725		0	-0.01	0		-0.01
37.128	58.906	-5.728		37.128	58.917	-5.728		0	-0.011	0		-0.011
20.583	58.909	-5.731		20.583	58.917	-5.731		0	-0.008	0		-0.008
4.037	58.947	-5.735		4.037	58.917	-5.735		0	0.03	0		0.03
-12.507	58.941	-5.738		-12.507	58.917	-5.738		0	0.024	0		0.024
-29.053	58.949	-5.742		-29.053	58.917	-5.742		0	0.032	0		0.032
-45.596	58.972	-5.745		-45.596	58.917	-5.745		0	0.055	0		0.055
-62.141	59.012	-5.749		-62.141	58.917	-5.749		0	0.095	0		0.095
-79.847	40.999	-5.748		-79.958	40.999	-5.748		0.111	0	0		-0.111
-79.921	24.454	-5.745		-79.958	24.454	-5.745		0.037	0	0		-0.037
-79.956	7.909	-5.741		-79.958	7.909	-5.741		0.003	0	0		-0.003
-79.962	-8.636	-5.738		-79.958	-8.636	-5.738		-0.004	0	0		0.004
-79.931	-25.18	-5.735		-79.958	-25.18	-5.735		0.027	0	0		-0.027
-80.041	-41.725	-5.731		-79.958	-41.725	-5.731		-0.083	0	0		0.083
-80.014	-58.269	-5.727		-79.958	-58.269	-5.727		-0.055	0	0		0.055
-80.061	-74.815	-5.725		-79.958	-74.815	-5.725		-0.103	0	0		0.103
-62.077	-92.65	-5.72		-62.077	-92.583	-5.72		0	-0.067	0		0.067
-45.532	-92.604	-5.715		-45.532	-92.583	-5.715		0	-0.02	0		0.02
-28.986	-92.653	-5.711		-28.986	-92.583	-5.711		0	-0.069	0		0.069
-12.442	-92.64	-5.707		-12.442	-92.583	-5.707		0	-0.057	0		0.057
4.103	-92.624	-5.704		4.103	-92.583	-5.704		0	-0.041	0		0.041
20.648	-92.624	-5.701		20.648	-92.583	-5.701		0	-0.04	0		0.04
37.192	-92.594	-5.698		37.192	-92.583	-5.698		0	-0.011	0		0.011
53.737	-92.618	-5.694		53.737	-92.583	-5.694		0	-0.034	0		0.034
71.535	-74.751	-5.696		71.542	-74.751	-5.696		-0.007	0	0		-0.007
71.587	-58.206	-5.697		71.542	-58.206	-5.697		0.045	0	0		0.045
71.507	-41.661	-5.701		71.542	-41.661	-5.701		-0.034	0	0		-0.034
71.49	-25.116	-5.705		71.542	-25.116	-5.705		-0.051	0	0		-0.051
71.586	-8.572	-5.708		71.542	-8.572	-5.708		0.044	0	0		0.044
71.575	7.972	-5.712		71.542	7.972	-5.712		0.033	0	0		0.033
71.526	24.518	-5.714		71.542	24.518	-5.714		-0.015	0	0		-0.015

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
71.521	41.062	-5.718		71.542	41.062	-5.718		-0.021	0	0		-0.021
-69.878	43.701	8.61		-69.878	43.701	8.417		0	0	0.194		0.194
-64.829	43.703	8.458		-64.829	43.703	8.417		0	0	0.042		0.042
-64.832	48.754	8.454		-64.832	48.754	8.417		0	0	0.037		0.037
-69.881	48.751	8.525		-69.881	48.751	8.417		0	0	0.108		0.108
-67.75	46.346	8.488		-67.75	46.346	8.417		0	0	0.071		0.071
-71.624	43.697	6.877		-71.542	43.697	6.877		-0.082	0	0		0.082
-71.582	48.749	6.877		-71.542	48.749	6.877		-0.041	0	0		0.041
-69.885	50.807	6.874		-69.885	50.5	6.874		0	0.307	0		0.307
-64.833	50.761	6.876		-64.833	50.5	6.876		0	0.261	0		0.261
-64.828	42.296	6.879		-64.828	42.083	6.879		0	0.212	0		-0.212
-69.878	42.312	6.878		-69.878	42.083	6.878		0	0.229	0		-0.229
-63.027	48.754	6.876		-63.125	48.754	6.876		0.098	0	0		0.098
-63.11	43.704	6.878		-63.125	43.704	6.878		0.015	0	0		0.015
-64.805	-14.373	4.127		-64.805	-14.373	4.208		0	0	-0.081		-0.081
-69.856	-14.375	4.128		-69.856	-14.375	4.208		0	0	-0.081		-0.081
-69.853	-19.426	4.109		-69.853	-19.426	4.208		0	0	-0.099		-0.099
-64.802	-19.423	4.172		-64.802	-19.423	4.208		0	0	-0.037		-0.037
-67.975	-16.803	4.102		-67.975	-16.803	4.208		0	0	-0.106		-0.106
-69.858	-12.58	3.521		-69.858	-12.625	3.521		0	0.045	0		0.045
-64.806	-12.612	3.522		-64.806	-12.625	3.522		0	0.013	0		0.013
-63.159	-14.372	3.522		-63.125	-14.372	3.522		-0.034	0	0		-0.034
-63.205	-19.422	3.524		-63.125	-19.422	3.524		-0.08	0	0		-0.08
-64.802	-21.02	3.525		-64.802	-21.042	3.525		0	0.022	0		-0.022
-69.852	-20.989	3.524		-69.852	-21.042	3.524		0	0.052	0		-0.052
-71.652	-19.427	3.523		-71.542	-19.427	3.523		-0.111	0	0		0.111
-71.612	-14.377	3.524		-71.542	-14.377	3.524		-0.071	0	0		0.071
-64.781	-77.497	8.423		-64.781	-77.497	8.417		0	0	0.007		0.007
-69.831	-77.499	8.389		-69.831	-77.499	8.417		0	0	-0.028		-0.028
-69.828	-82.55	8.471		-69.828	-82.55	8.417		0	0	0.055		0.055
-64.779	-82.547	8.447		-64.779	-82.547	8.417		0	0	0.031		0.031
-69.834	-75.882	6.901		-69.834	-75.75	6.901		0	-0.132	0		-0.132
-64.782	-75.892	6.902		-64.782	-75.75	6.902		0	-0.142	0		-0.142
-63.292	-77.497	6.901		-63.125	-77.497	6.901		-0.167	0	0		-0.167
-63.286	-82.547	6.903		-63.125	-82.547	6.903		-0.161	0	0		-0.161
-64.777	-84.305	6.903		-64.777	-84.167	6.903		0	-0.138	0		0.138
-69.827	-84.323	6.904		-69.827	-84.167	6.904		0	-0.156	0		0.156
-71.714	-82.552	6.902		-71.542	-82.552	6.902		-0.173	0	0		0.173
-71.75	-77.501	6.902		-71.542	-77.501	6.902		-0.208	0	0		0.208
-2.545	43.727	4.175		-2.545	43.727	4.208		0	0	-0.033		-0.033
2.507	43.729	4.205		2.507	43.729	4.208		0	0	-0.003		-0.003
2.503	48.779	4.123		2.503	48.779	4.208		0	0	-0.086		-0.086
-2.547	48.777	4.081		-2.547	48.777	4.208		0	0	-0.128		-0.128
-0.708	46.762	4.227		-0.708	46.762	4.208		0	0	0.019		0.019
-4.127	43.724	2.263		-4.208	43.724	2.263		0.081	0	0		-0.081
2.507	42.215	2.264		2.507	42.083	2.264		0	0.131	0		-0.131
-2.543	42.239	2.264		-2.543	42.083	2.264		0	0.155	0		-0.155
4.241	48.78	2.261		4.208	48.78	2.261		0.032	0	0		0.032

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
4.284	43.729	2.264		4.208	43.729	2.264		0.076	0	0		0.076
-2.55	50.63	2.261		-2.55	50.5	2.261		0	0.13	0		0.13
2.502	50.634	2.262		2.502	50.5	2.262		0	0.134	0		0.134
-64.899	36.249	-1.117		-64.825	36.175	-1.117		-0.074	0.074	0		-0.105
-54.166	46.944	-1.117		-54.111	46.889	-1.117		-0.055	0.055	0		-0.078
-46.762	47.056	-1.114		-46.909	46.909	-1.114		0.147	0.147	0		-0.208
-36.08	36.313	-1.109		-36.196	36.196	-1.109		0.116	0.116	0		-0.164
-40.925	29.088	-1.11		-40.958	29.055	-1.11		0.033	0.033	0		0.046
-48.048	36.245	-1.113		-48.098	36.195	-1.113		0.05	0.05	0		0.07
-35.791	29.554	-1.488		-35.764	29.527	-1.488		-0.027	0.027	0		0.038
-54.137	35.014	-1.114		-54.11	34.987	-1.114		-0.027	0.027	0		0.039
-58.904	30.258	-1.112		-58.872	30.225	-1.112		-0.033	0.033	0		0.046
-65.243	29.71	-1.017		-65.331	29.622	-1.017		0.088	0.088	0		0.124
-61.411	33.495	-4.206		-61.411	33.495	-4.208		0	0	0.002		0.002
-56.843	38.252	-4.26		-56.843	38.252	-4.208		0	0	-0.052		-0.052
-50.35	43.657	-4.203		-50.35	43.657	-4.208		0	0	0.005		0.005
-44.787	38.613	-4.326		-44.787	38.613	-4.208		0	0	-0.118		-0.118
-40.11	33.806	-4.318		-40.11	33.806	-4.208		0	0	-0.109		-0.109
49.64	42.221	6.062		49.64	42.083	6.062		0	0.137	0		-0.137
42.905	42.219	6.061		42.905	42.083	6.061		0	0.136	0		-0.136
54.789	30.281	6.066		54.708	30.281	6.066		0.081	0	0		-0.081
54.778	37.015	6.065		54.708	37.015	6.065		0.07	0	0		-0.07
58.784	25.406	5.572		58.784	25.25	5.572		0	0.156	0		-0.156
63.179	30.287	6.066		63.125	30.287	6.066		0.054	0	0		0.054
63.19	37.864	6.065		63.125	37.864	6.065		0.065	0	0		0.065
63.197	45.438	6.063		63.125	45.438	6.063		0.072	0	0		0.072
58.049	50.586	6.061		58.049	50.5	6.061		0	0.086	0		0.086
50.475	50.569	6.061		50.475	50.5	6.061		0	0.069	0		0.069
42.898	50.604	6.059		42.898	50.5	6.059		0	0.104	0		0.104
38.043	46.217	5.342		37.875	46.217	5.342		0.168	0	0		-0.168
43.153	46.39	8.309		43.153	46.39	8.417		0	0	-0.108		-0.108
50.386	46.103	8.403		50.386	46.103	8.417		0	0	-0.014		-0.014
58.357	45.774	8.337		58.357	45.774	8.417		0	0	-0.08		-0.08
59.101	37.511	8.466		59.101	37.511	8.417		0	0	0.05		0.05
58.979	30.664	8.377		58.979	30.664	8.417		0	0	-0.04		-0.04
-30.928	49.126	16.934		-30.928	48.92	17.054		0	0.207	-0.119		-0.239
-30.924	46.198	11.924		-30.924	46.018	12.028		0	0.18	-0.104		-0.207
-30.923	43.293	6.903		-30.923	43.118	7.004		0	0.175	-0.101		-0.202
-30.919	40.337	1.91		-30.919	40.217	1.979		0	0.121	-0.07		-0.139
-27.131	40.36	1.897		-27.131	40.217	1.98		0	0.143	-0.083		-0.165
-27.136	43.269	6.919		-27.136	43.119	7.005		0	0.15	-0.087		-0.174
-27.138	46.214	11.918		-27.138	46.019	12.03		0	0.195	-0.112		-0.225
-27.14	49.106	16.949		-27.14	48.921	17.056		0	0.184	-0.107		-0.213
-23.351	49.122	16.939		-23.351	48.921	17.055		0	0.201	-0.116		-0.232
-23.349	46.201	11.926		-23.349	46.02	12.031		0	0.181	-0.105		-0.209
-23.347	43.293	6.905		-23.347	43.119	7.006		0	0.175	-0.101		-0.202
-23.344	40.364	1.896		-23.344	40.218	1.981		0	0.146	-0.085		-0.169
-17.036	45.598	1.976		-17.036	45.446	2.017		0	0.152	-0.041		-0.157

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-17.036	47.672	9.502		-17.036	47.466	9.557		0	0.206	-0.055		-0.213
-17.041	49.71	17.035		-17.041	49.486	17.095		0	0.224	-0.06		-0.232
-11.989	49.696	17.041		-11.989	49.486	17.097		0	0.209	-0.056		-0.217
-11.986	47.664	9.505		-11.986	47.466	9.558		0	0.197	-0.053		-0.204
-11.984	45.599	1.978		-11.984	45.446	2.019		0	0.153	-0.041		-0.159
-8.136	49.577	7.681		-8.178	49.577	7.681		0.042	0	0		0.042
-30.93	51.13	15.284		-30.93	50.925	15.229		0	0.205	0.055		0.212
-30.93	52.59	9.619		-30.93	52.439	9.579		0	0.152	0.041		0.157
-30.929	54.091	3.959		-30.929	53.954	3.922		0	0.137	0.037		0.141
-24.195	54.048	3.948		-24.195	53.954	3.923		0	0.094	0.025		0.097
-24.196	52.591	9.62		-24.196	52.439	9.579		0	0.153	0.041		0.158
-24.196	51.108	15.28		-24.196	50.924	15.231		0	0.184	0.049		0.191
-17.463	51.098	15.278		-17.463	50.924	15.232		0	0.174	0.047		0.181
-17.464	52.553	9.61		-17.464	52.438	9.579		0	0.114	0.031		0.118
-17.462	54.071	3.954		-17.462	53.954	3.923		0	0.117	0.031		0.121
-10.728	54.051	3.95		-10.728	53.954	3.924		0	0.097	0.026		0.1
-10.729	52.567	9.614		-10.729	52.438	9.58		0	0.128	0.034		0.133
-10.729	51.07	15.272		-10.729	50.924	15.233		0	0.146	0.039		0.151
-33.347	48.906	9.823		-33.428	48.906	9.823		0.081	0	0		-0.081
5.131	-63.161	19.012		5.097	-63.161	19.021		0.034	0	-0.009		-0.035
3.241	-63.163	11.943		3.203	-63.163	11.953		0.038	0	-0.01		-0.04
1.373	-63.165	4.87		1.309	-63.165	4.887		0.063	0	-0.017		-0.066
1.369	-69.899	4.873		1.31	-69.899	4.889		0.059	0	-0.016		-0.061
3.208	-69.895	11.956		3.204	-69.895	11.957		0.005	0	-0.001		-0.005
5.128	-69.893	19.014		5.097	-69.893	19.022		0.031	0	-0.008		-0.032
5.09	-76.628	19.026		5.097	-76.628	19.024		-0.007	0	0.002		0.007
3.218	-76.628	11.953		3.204	-76.628	11.957		0.014	0	-0.004		-0.014
1.353	-76.631	4.878		1.31	-76.631	4.889		0.043	0	-0.012		-0.045
1.315	-83.366	4.891		1.311	-83.366	4.892		0.004	0	-0.001		-0.004
3.215	-83.362	11.957		3.205	-83.362	11.96		0.01	0	-0.003		-0.01
5.091	-83.36	19.029		5.098	-83.36	19.027		-0.007	0	0.002		0.007
7.491	-85.989	10.548		7.491	-85.85	10.548		0	-0.139	0		0.139
7.574	-83.356	21.317		7.599	-83.356	21.331		-0.025	0	-0.014		-0.028
13.029	-83.356	11.903		13.038	-83.356	11.909		-0.01	0	-0.006		-0.011
18.492	-83.355	2.49		18.481	-83.355	2.483		0.012	0	0.007		0.014
18.454	-75.781	2.468		18.48	-75.781	2.483		-0.026	0	-0.015		-0.03
13.023	-75.781	11.899		13.039	-75.781	11.908		-0.015	0	-0.009		-0.018
7.559	-75.782	21.312		7.597	-75.782	21.334		-0.038	0	-0.022		-0.044
6.902	-69.469	21.368		6.9	-69.469	21.367		0.002	0	0.001		0.002
9.372	-69.47	11.93		9.425	-69.47	11.944		-0.052	0	-0.014		-0.054
11.905	-69.471	2.511		11.949	-69.471	2.523		-0.044	0	-0.012		-0.046
11.935	-64.421	2.52		11.949	-64.421	2.523		-0.014	0	-0.004		-0.015
9.363	-64.421	11.928		9.424	-64.421	11.945		-0.061	0	-0.016		-0.063
6.847	-64.42	21.354		6.899	-64.42	21.368		-0.053	0	-0.014		-0.055
6.46	-60.783	11.291		6.46	-60.6	11.291		0	-0.183	0		-0.183
-30.525	-50.328	-5.405		-30.522	-50.387	-5.343		-0.004	0.059	-0.062		-0.086
-30.225	-54.981	-7.93		-30.221	-55.039	-7.817		-0.004	0.058	-0.112		-0.127
-30	-58.461	-11.514		-29.998	-58.503	-11.492		-0.003	0.042	-0.022		-0.048

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-29.813	-61.358	-15.978		-29.806	-61.481	-15.814		-0.007	0.123	-0.164		-0.205
-33.891	-63.399	-15.906		-33.841	-63.444	-15.816		-0.05	0.044	-0.09		-0.112
-36.077	-61.446	-11.497		-36.068	-61.453	-11.491		-0.008	0.007	-0.006		-0.013
-38.678	-59.113	-7.886		-38.652	-59.136	-7.817		-0.026	0.024	-0.068		-0.077
-42.16	-55.992	-5.396		-42.122	-56.025	-5.344		-0.037	0.033	-0.052		-0.072
-46.508	-68.183	-5.394		-46.438	-68.179	-5.322		-0.07	-0.003	-0.071		-0.1
-41.827	-67.965	-7.89		-41.784	-67.962	-7.805		-0.044	-0.002	-0.085		-0.095
-38.275	-67.805	-11.466		-38.299	-67.806	-11.479		0.024	0.001	0.013		0.027
-35.411	-67.673	-15.906		-35.331	-67.669	-15.799		-0.08	-0.005	-0.106		-0.133
-33.495	-71.781	-15.88		-33.438	-71.718	-15.769		-0.057	-0.063	-0.111		-0.14
-35.456	-73.895	-11.473		-35.438	-73.876	-11.459		-0.018	-0.019	-0.014		-0.03
-37.86	-76.477	-7.871		-37.831	-76.445	-7.788		-0.029	-0.031	-0.083		-0.093
-41.015	-79.884	-5.318		-40.997	-79.864	-5.29		-0.019	-0.02	-0.028		-0.039
-29.672	-67.438	-17.136		-29.702	-67.453	-16.871		0.031	0.015	-0.266		-0.268
-26.592	-62.062	-15.962		-26.64	-62.174	-15.801		0.048	0.112	-0.16		-0.201
-25.179	-59.491	-11.524		-25.214	-59.564	-11.481		0.035	0.073	-0.043		-0.092
-23.517	-56.44	-7.949		-23.544	-56.508	-7.808		0.028	0.068	-0.141		-0.159
-21.285	-52.365	-5.39		-21.311	-52.419	-5.328		0.025	0.054	-0.062		-0.086
-13.054	-62.577	-5.355		-13.107	-62.593	-5.299		0.053	0.015	-0.056		-0.079
-17.492	-63.88	-7.955		-17.573	-63.903	-7.79		0.081	0.023	-0.165		-0.185
-20.891	-64.887	-11.489		-20.937	-64.9	-11.464		0.046	0.013	-0.026		-0.054
-23.658	-65.699	-15.927		-23.768	-65.73	-15.777		0.111	0.031	-0.15		-0.189
-24.149	-70.276	-15.924		-24.263	-70.213	-15.755		0.114	-0.063	-0.168		-0.213
-21.618	-71.654	-11.489		-21.689	-71.615	-11.446		0.071	-0.039	-0.043		-0.092
-18.55	-73.328	-7.873		-18.593	-73.304	-7.776		0.043	-0.024	-0.097		-0.109
-14.474	-75.553	-5.307		-14.507	-75.535	-5.27		0.033	-0.018	-0.037		-0.053
-24.631	-83.733	-5.302		-24.642	-83.698	-5.265		0.01	-0.036	-0.037		-0.052
-25.942	-79.266	-7.846		-25.953	-79.231	-7.773		0.01	-0.035	-0.072		-0.081
-26.925	-75.92	-11.484		-26.947	-75.844	-11.442		0.022	-0.076	-0.042		-0.09
-27.739	-73.139	-15.881		-27.768	-73.039	-15.747		0.03	-0.1	-0.134		-0.17
-32.352	-72.611	-15.873		-32.302	-72.539	-15.761		-0.049	-0.072	-0.112		-0.142
-33.727	-75.143	-11.468		-33.71	-75.116	-11.451		-0.017	-0.027	-0.017		-0.036
-35.414	-78.226	-7.844		-35.395	-78.201	-7.783		-0.018	-0.025	-0.061		-0.068
-37.654	-82.327	-5.329		-37.628	-82.288	-5.283		-0.026	-0.039	-0.046		-0.065
-25.387	-86.351	-0.508		-25.386	-86.354	-0.511		0	0.002	0.003		0.004
-12.938	-77.286	-0.711		-12.966	-77.269	-0.676		0.028	-0.017	-0.035		-0.048
-10.987	-61.799	-0.673		-10.998	-61.802	-0.66		0.011	0.003	-0.012		-0.017
-16.006	-53.495	-0.678		-16.021	-53.51	-0.654		0.015	0.015	-0.023		-0.031
-25.755	-48.202	-0.607		-25.766	-48.261	-0.53		0.011	0.059	-0.077		-0.097
-47.432	-37.892	18.955		-47.256	-37.811	19.068		-0.176	-0.081	-0.112		-0.224
-44.123	-36.333	12.651		-43.959	-36.257	12.755		-0.164	-0.076	-0.104		-0.208
-40.822	-34.77	6.343		-40.666	-34.697	6.443		-0.156	-0.073	-0.1		-0.199
-39.999	-41.323	6.328		-39.83	-41.356	6.428		-0.17	0.033	-0.1		-0.2
-43.575	-40.648	12.646		-43.412	-40.679	12.742		-0.163	0.032	-0.096		-0.192
-47.185	-39.964	18.941		-46.993	-40.003	19.055		-0.193	0.039	-0.113		-0.227
-48.129	-41.845	18.981		-48.057	-41.922	19.043		-0.072	0.078	-0.061		-0.123
-45.639	-44.481	12.659		-45.554	-44.572	12.73		-0.085	0.09	-0.071		-0.143
-43.147	-47.124	6.339		-43.053	-47.223	6.417		-0.093	0.099	-0.079		-0.157



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-49.107	-50.035	6.384		-49.101	-50.085	6.413		-0.006	0.05	-0.029		-0.058
-49.573	-46.434	12.701		-49.569	-46.472	12.723		-0.005	0.038	-0.022		-0.044
-50.041	-42.824	19.018		-50.037	-42.857	19.038		-0.004	0.033	-0.019		-0.038
-52.205	-42.481	19.054		-52.194	-42.46	19.041		-0.011	-0.021	0.014		0.028
-53.937	-45.661	12.731		-53.936	-45.66	12.73		-0.001	-0.002	0.001		0.002
-55.707	-48.831	6.41		-55.713	-48.842	6.417		0.005	0.011	-0.007		-0.014
-51.791	-39.95	22.872		-51.743	-39.925	22.84		-0.048	-0.024	0.031		0.062
-57.028	-42.448	12.755		-57.005	-42.437	12.741		-0.022	-0.011	0.014		0.029
-62.248	-44.934	2.629		-62.269	-44.944	2.643		0.021	0.01	-0.013		-0.027
-63.303	-36.95	2.64		-63.33	-36.945	2.656		0.027	-0.005	-0.016		-0.032
-57.601	-38.018	12.757		-57.599	-38.019	12.755		-0.002	0	0.001		0.003
-51.88	-39.075	22.863		-51.865	-39.078	22.854		-0.015	0.002	0.009		0.017
-51.431	-38.345	22.843		-51.46	-38.315	22.867		0.029	-0.03	-0.024		-0.048
-55.419	-34.137	12.723		-55.471	-34.082	12.767		0.052	-0.055	-0.044		-0.088
-59.424	-29.898	2.624		-59.476	-29.844	2.668		0.052	-0.055	-0.043		-0.087
-52.156	-26.467	2.617		-52.168	-26.372	2.672		0.012	-0.094	-0.055		-0.11
-51.406	-32.275	12.703		-51.422	-32.156	12.773		0.015	-0.119	-0.069		-0.139
-50.657	-38.073	22.792		-50.675	-37.938	22.871		0.017	-0.136	-0.079		-0.158
-49.939	-38.253	22.755		-49.84	-38.092	22.865		-0.099	-0.162	-0.109		-0.219
-47.143	-33.134	12.662		-47.045	-32.976	12.768		-0.098	-0.158	-0.107		-0.214
-44.328	-27.987	2.58		-44.249	-27.858	2.667		-0.078	-0.129	-0.087		-0.174
-46.338	3.948	25.152		-46.272	3.887	25.242		-0.066	0.061	-0.089		-0.127
-50.291	7.684	27.413		-50.317	7.709	27.533		0.026	-0.025	-0.12		-0.125
-53.682	10.887	21.983		-53.732	10.933	22.013		0.05	-0.047	-0.03		-0.075
-56.445	13.493	8.422		-56.457	13.504	8.425		0.012	-0.011	-0.003		-0.017
-61.736	-1.657	8.418		-61.737	-1.657	8.418		0.001	0	0		-0.001
-57.993	-1.348	21.993		-58.008	-1.349	22		0.015	0.001	-0.007		-0.017
-53.326	-0.968	27.445		-53.35	-0.97	27.524		0.024	0.002	-0.079		-0.083
-47.867	-0.531	25.182		-47.79	-0.524	25.259		-0.077	-0.007	-0.076		-0.108
-45.597	-4.66	25.19		-45.544	-4.591	25.277		-0.053	-0.07	-0.087		-0.123
-48.919	-9.003	27.424		-48.937	-9.026	27.516		0.018	0.023	-0.092		-0.096
-51.697	-12.645	21.946		-51.758	-12.726	21.991		0.062	0.081	-0.045		-0.111
-53.986	-15.649	8.404		-54.024	-15.699	8.415		0.038	0.05	-0.012		-0.064
-38.457	-19.315	8.406		-38.444	-19.385	8.419		-0.013	0.069	-0.013		-0.072
-39.165	-15.567	21.93		-39.138	-15.71	21.995		-0.027	0.144	-0.065		-0.16
-40.011	-11.092	27.354		-40.001	-11.143	27.515		-0.009	0.05	-0.161		-0.169
-41.018	-5.761	25.176		-41.038	-5.658	25.281		0.019	-0.104	-0.105		-0.149
-40.337	19.626	8.427		-40.336	19.644	8.43		-0.002	-0.018	-0.003		-0.018
-40.683	15.786	21.97		-40.672	15.909	22.024		-0.011	-0.123	-0.055		-0.135
-41.093	11.18	27.405		-41.09	11.219	27.538		-0.003	-0.039	-0.133		-0.139
-41.573	5.78	25.134		-41.582	5.682	25.231		0.009	0.098	-0.097		-0.138
-38.558	4.579	25.162		-38.603	4.522	25.234		0.044	0.058	-0.072		-0.102
-35.269	8.909	27.37		-35.239	8.948	27.537		-0.03	-0.039	-0.167		-0.174
-32.464	12.585	21.964		-32.384	12.689	22.023		-0.08	-0.105	-0.059		-0.144
-30.141	15.631	8.425		-30.111	15.671	8.434		-0.03	-0.039	-0.009		-0.05
-23.683	6.822	8.412		-23.592	6.856	8.43		-0.091	-0.034	-0.018		-0.099
-27.288	5.482	21.932		-27.105	5.55	22.019		-0.183	-0.068	-0.087		-0.214
-31.541	3.891	27.392		-31.502	3.905	27.533		-0.04	-0.015	-0.14		-0.146



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-36.655	1.976	25.185		-36.711	1.955	25.244		0.057	0.021	-0.059		-0.085
-36.442	-1.232	25.211		-36.486	-1.222	25.256		0.045	-0.01	-0.045		-0.064
-31.084	-2.334	27.343		-31.029	-2.346	27.526		-0.055	0.012	-0.184		-0.192
-26.62	-3.262	21.933		-26.45	-3.298	22.01		-0.17	0.036	-0.077		-0.191
-22.885	-4.038	8.408		-22.784	-4.059	8.427		-0.101	0.021	-0.019		-0.105
-27.992	-13.638	8.403		-27.911	-13.716	8.424		-0.08	0.078	-0.021		-0.114
-30.732	-10.998	21.924		-30.606	-11.12	22.002		-0.126	0.122	-0.078		-0.192
-33.992	-7.858	27.386		-33.962	-7.887	27.52		-0.03	0.029	-0.134		-0.141
-37.948	-4.051	25.221		-37.982	-4.017	25.268		0.034	-0.033	-0.047		-0.067
-42.148	5.771	25.163		-42.147	5.703	25.23		-0.001	0.068	-0.067		-0.095
-42.201	11.233	27.44		-42.201	11.262	27.538		0	-0.029	-0.098		-0.102
-42.243	15.867	21.977		-42.244	15.971	22.023		0.001	-0.104	-0.046		-0.114
-42.277	19.738	8.435		-42.276	19.72	8.432		0	0.018	0.003		0.018
-40.69	1.453	20.266		-40.714	1.428	20.288		0.024	0.025	-0.022		-0.041
-45.137	0.193	21.678		-45.011	0.185	21.763		-0.126	0.008	-0.085		-0.152
-40.714	-2.498	21.445		-40.76	-2.422	21.504		0.046	-0.076	-0.059		-0.107
45.114	-41.284	15.029		45.108	-41.299	15.139		0.006	0.015	-0.11		-0.111
42.512	-46.049	13.29		42.499	-46.076	13.346		0.013	0.027	-0.056		-0.063
40.346	-50.012	9.783		40.326	-50.053	9.825		0.02	0.041	-0.042		-0.062
38.879	-52.696	4.945		38.845	-52.764	4.976		0.034	0.067	-0.032		-0.082
31.958	-44.767	4.924		31.837	-44.815	4.978		0.121	0.048	-0.054		-0.141
34.821	-43.642	9.727		34.716	-43.683	9.831		0.105	0.041	-0.103		-0.153
38.97	-42.02	13.298		38.943	-42.031	13.352		0.027	0.011	-0.054		-0.062
44.022	-40.043	15.071		44.013	-40.047	15.141		0.01	0.004	-0.07		-0.07
43.985	-38.37	15.042		43.971	-38.365	15.143		0.014	-0.005	-0.1		-0.101
38.836	-36.633	13.304		38.809	-36.624	13.357		0.026	-0.009	-0.053		-0.06
34.609	-35.211	9.737		34.505	-35.176	9.836		0.103	-0.035	-0.1		-0.148
31.745	-34.246	4.906		31.57	-34.187	4.983		0.175	-0.059	-0.077		-0.2
38.291	-26.014	4.915		38.206	-25.874	4.984		0.085	-0.14	-0.069		-0.178
39.868	-28.598	9.755		39.82	-28.52	9.839		0.048	-0.079	-0.084		-0.125
42.207	-32.438	13.279		42.184	-32.401	13.36		0.022	-0.037	-0.081		-0.092
45.025	-37.058	15.076		45.02	-37.05	15.143		0.005	-0.008	-0.067		-0.068
46.669	-36.729	15.072		46.671	-36.718	15.143		-0.002	-0.01	-0.071		-0.072
47.479	-31.39	13.245		47.488	-31.332	13.356		-0.009	-0.058	-0.111		-0.126
48.168	-26.857	9.83		48.17	-26.846	9.84		-0.002	-0.011	-0.01		-0.015
48.619	-23.894	4.934		48.636	-23.78	4.982		-0.017	-0.114	-0.048		-0.125
38.879	-52.696	4.946		38.845	-52.763	4.977		0.034	0.067	-0.031		-0.081
40.347	-50.01	9.782		40.326	-50.052	9.825		0.021	0.042	-0.043		-0.064
42.512	-46.049	13.29		42.498	-46.076	13.346		0.013	0.027	-0.056		-0.063
45.113	-41.284	15.028		45.108	-41.3	15.139		0.006	0.016	-0.111		-0.112
47.458	-36.994	15.062		47.465	-36.984	15.142		-0.007	-0.01	-0.08		-0.081
50.043	-32.26	13.239		50.075	-32.207	13.356		-0.032	-0.054	-0.118		-0.133
52.214	-28.288	9.764		52.253	-28.221	9.835		-0.039	-0.067	-0.071		-0.105
53.699	-25.57	4.949		53.737	-25.503	4.981		-0.038	-0.067	-0.032		-0.083
60.708	-33.517	4.954		60.764	-33.495	4.979		-0.056	-0.022	-0.025		-0.065
57.875	-34.62	9.821		57.883	-34.617	9.829		-0.008	-0.003	-0.008		-0.012
53.632	-36.283	13.297		53.658	-36.273	13.351		-0.027	-0.01	-0.054		-0.061
48.578	-38.26	15.039		48.592	-38.254	15.14		-0.014	-0.005	-0.101		-0.103

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
48.608	-39.926	14.971		48.631	-39.934	15.138		-0.024	0.008	-0.168		-0.17
53.791	-41.676	13.35		53.788	-41.675	13.344		0.003	-0.001	0.007		0.007
58.093	-43.122	9.836		58.081	-43.118	9.823		0.013	-0.004	0.012		0.018
61.028	-44.114	4.983		61.007	-44.107	4.974		0.02	-0.007	0.009		0.023
54.377	-52.396	4.975		54.377	-52.396	4.974		0	-0.001	0		0.001
52.775	-49.765	9.827		52.771	-49.759	9.821		0.003	-0.006	0.006		0.009
50.404	-45.873	13.307		50.415	-45.89	13.343		-0.01	0.017	-0.037		-0.042
47.572	-41.231	15.014		47.581	-41.246	15.138		-0.01	0.016	-0.124		-0.125
45.933	-41.566	15.043		45.931	-41.58	15.138		0.002	0.014	-0.095		-0.096
45.117	-46.958	13.337		45.116	-46.961	13.344		0	0.003	-0.006		-0.007
44.449	-51.366	9.757		44.438	-51.438	9.823		0.011	0.072	-0.066		-0.099
43.982	-54.451	4.956		43.976	-54.493	4.973		0.006	0.041	-0.017		-0.045
53.699	-25.569	4.95		53.737	-25.503	4.982		-0.038	-0.066	-0.032		-0.082
52.214	-28.289	9.764		52.253	-28.221	9.835		-0.039	-0.068	-0.071		-0.106
50.044	-32.26	13.238		50.076	-32.206	13.356		-0.032	-0.054	-0.118		-0.133
47.458	-36.993	15.062		47.465	-36.984	15.142		-0.007	-0.01	-0.08		-0.08
32.359	-49.604	0.385		32.318	-49.635	0.459		0.042	0.031	-0.074		-0.091
36.699	-53.931	0.255		36.674	-53.968	0.333		0.024	0.037	-0.078		-0.09
45.2	-56.208	0.724		45.198	-56.234	0.75		0.002	0.026	-0.026		-0.037
54.501	-53.964	1.03		54.484	-53.933	1.004		0.017	-0.03	0.026		0.044
60.797	-47.745	1.187		60.749	-47.717	1.151		0.048	-0.028	0.036		0.066
63.121	-39.407	1.179		63.096	-39.406	1.163		0.025	0	0.016		0.029
5.488	29.386	-10.375		5.488	29.433	-10.361		0	-0.047	-0.014		-0.049
2.121	29.372	-10.38		2.121	29.433	-10.361		0	-0.061	-0.018		-0.063
2.123	26.304	0.169		2.123	26.276	0.161		0	0.028	0.008		0.029
-1.246	29.37	-10.38		-1.246	29.433	-10.361		0	-0.063	-0.019		-0.065
5.495	20.11	-12.502		5.495	20.054	-12.486		0	0.056	-0.017		-0.059
2.124	23.25	-1.976		2.124	23.21	-1.964		0	0.039	-0.012		-0.041
2.13	20.098	-12.5		2.13	20.054	-12.487		0	0.044	-0.013		-0.046
-1.238	20.085	-12.497		-1.238	20.053	-12.487		0	0.031	-0.009		-0.033
7.998	27.55	-10.364		7.969	27.55	-10.376		0.029	0	0.012		0.031
8.013	25.024	-10.357		7.968	25.024	-10.375		0.045	0	0.018		0.048
3.861	25.024	0.185		3.76	25.024	0.145		0.101	0	0.04		0.109
8.047	22.499	-10.344		7.968	22.499	-10.375		0.079	0	0.031		0.085
-4.345	27.542	-12.572		-4.545	27.542	-12.492		0.2	0	-0.08		-0.215
-0.245	25.02	-2.004		-0.336	25.02	-1.968		0.091	0	-0.036		-0.098
-4.314	25.016	-12.582		-4.544	25.016	-12.49		0.231	0	-0.092		-0.248
-4.304	22.492	-12.584		-4.544	22.492	-12.488		0.239	0	-0.096		-0.257
-9.179	4.993	-1.941		-9.242	5.027	-1.941		0.063	-0.034	0		0.072
-9.199	5.006	9.844		-9.241	5.029	9.844		0.042	-0.023	0		0.048
-0.666	10.427	9.845		-0.67	10.499	9.845		0.005	-0.073	0		0.073
-0.662	10.42	-1.939		-0.667	10.5	-1.939		0.005	-0.08	0		0.08
8.481	6.122	-1.936		8.531	6.158	-1.936		-0.049	-0.036	0		0.061
8.478	6.128	9.851		8.527	6.163	9.851		-0.048	-0.035	0		0.06
9.966	-3.279	9.85		9.994	-3.288	9.85		-0.028	0.009	0		0.029
9.961	-3.278	1.013		9.994	-3.289	1.013		-0.032	0.011	0		0.034
0	-10.532	1.012		0	-10.521	1.012		0	-0.011	0		-0.011
0.001	-10.566	9.851		0.001	-10.521	9.851		0	-0.045	0		-0.045

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-9.979	-3.285	9.846		-9.993	-3.29	9.846		0.014	0.005	0		0.015
-9.925	-3.27	1.006		-9.992	-3.292	1.006		0.068	0.022	0		0.071
10.632	-10.124	3.958		10.667	-10.157	3.958		-0.035	0.033	0		-0.048
-11.168	-9.573	3.955		-11.183	-9.586	3.955		0.015	0.013	0		-0.02
-14.541	1.875	1.006		-14.608	1.884	1.006		0.067	-0.009	0		-0.068
-8.311	12.051	3.952		-8.362	12.125	3.952		0.051	-0.074	0		-0.09
3.425	14.248	1.007		3.443	14.321	1.007		-0.018	-0.073	0		-0.075
12.915	6.977	3.956		12.959	7.001	3.956		-0.044	-0.024	0		-0.05
1.105	2.131	-16.812		1.08	2.131	-16.833		0.024	0	0.021		0.032
-3.813	3.799	-17.218		-3.813	3.799	-16.833		0	0	-0.384		-0.384
-3.892	-4.133	-17.164		-3.892	-4.133	-16.833		0	0	-0.33		-0.33
3.68	-3.984	-17.262		3.68	-3.984	-16.833		0	0	-0.428		-0.428
-0.367	0.173	-21.338		-0.367	0.173	-21.042		0	0	-0.297		-0.297
-9.393	-8.553	12.396		-9.393	-8.553	12.625		0	0	-0.229		-0.229
-12.035	3.503	12.497		-12.035	3.503	12.625		0	0	-0.128		-0.128
-0.967	11.989	12.561		-0.967	11.989	12.625		0	0	-0.064		-0.064
11.198	4.926	12.46		11.198	4.926	12.625		0	0	-0.165		-0.165
10.549	-7.015	12.488		10.549	-7.015	12.625		0	0	-0.137		-0.137
0.415	-12.826	12.394		0.415	-12.826	12.625		0	0	-0.231		-0.231
-0.464	-14.743	7.044		-0.463	-14.722	7.044		-0.001	-0.021	0		0.021
6.945	-46.783	6.911		6.972	-46.783	6.911		-0.027	0	0		-0.027
6.989	-36.774	6.909		6.972	-36.774	6.909		0.017	0	0		0.017
6.983	-26.768	6.907		6.972	-26.768	6.907		0.011	0	0		0.011
6.953	-16.762	6.905		6.972	-16.762	6.905		-0.019	0	0		-0.019
4.39	-17.725	6.906		4.447	-17.725	6.906		-0.057	0	0		0.057
4.431	-27.448	6.909		4.447	-27.448	6.909		-0.016	0	0		0.016
4.436	-37.171	6.911		4.447	-37.171	6.911		-0.011	0	0		0.011
4.44	-46.893	6.913		4.447	-46.893	6.913		-0.007	0	0		0.007
-4.01	-46.908	9.857		-3.97	-46.908	9.857		-0.041	0	0		-0.041
-4.009	-37.222	9.852		-3.97	-37.222	9.852		-0.039	0	0		-0.039
-3.972	-27.538	9.85		-3.97	-27.538	9.85		-0.002	0	0		-0.002
-3.967	-17.853	9.849		-3.97	-17.853	9.849		0.002	0	0		0.002
-8.134	-16.119	3.957		-8.178	-16.119	3.957		0.044	0	0		-0.044
-8.161	-26.319	3.96		-8.178	-26.319	3.96		0.017	0	0		-0.017
-8.158	-36.519	3.962		-8.178	-36.519	3.962		0.02	0	0		-0.02
-8.156	-46.719	3.964		-8.178	-46.719	3.964		0.022	0	0		-0.022
-6.066	-50.555	7.362		-6.066	-50.5	7.362		0	-0.055	0		0.055
5.684	-50.554	10.597		5.684	-50.5	10.597		0	-0.054	0		0.054
5.677	-46.552	12.497		5.677	-46.552	12.625		0	0	-0.128		-0.128
5.696	-37.508	12.462		5.696	-37.508	12.625		0	0	-0.163		-0.163
5.601	-28.464	12.445		5.601	-28.464	12.625		0	0	-0.18		-0.18
5.825	-17.495	12.466		5.825	-17.495	12.625		0	0	-0.159		-0.159
-6.166	-16.943	12.476		-6.166	-16.943	12.625		0	0	-0.149		-0.149
-6.282	-27.346	12.435		-6.282	-27.346	12.625		0	0	-0.19		-0.19
-6.301	-36.163	12.466		-6.301	-36.163	12.625		0	0	-0.159		-0.159
-5.838	-47.917	12.444		-5.838	-47.917	12.625		0	0	-0.181		-0.181
63.014	-85.771	0.249		63.014	-85.771	0		0	0	0.249		0.249
51.585	-86.144	0.158		51.585	-86.144	0		0	0	0.158		0.158

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
30.84	-85.674	0.193		30.84	-85.674	0		0	0	0.193		0.193
26.853	-77.957	0.081		26.853	-77.957	0		0	0	0.081		0.081
40.037	-79.677	0.145		40.037	-79.677	0		0	0	0.145		0.145
56.471	-76.282	0.147		56.471	-76.282	0		0	0	0.147		0.147
61.119	-66.982	0.11		61.119	-66.982	0		0	0	0.11		0.11
47.127	-70.239	0.103		47.127	-70.239	0		0	0	0.103		0.103
37.608	-65.846	0.04		37.608	-65.846	0		0	0	0.04		0.04
23.957	-65.523	-0.026		23.957	-65.523	0		0	0	-0.026		-0.026
19.992	-53.423	-0.039		19.992	-53.423	0		0	0	-0.039		-0.039
15.221	-46.299	-0.112		15.221	-46.299	0		0	0	-0.112		-0.112
23.63	-45.549	-0.119		23.63	-45.549	0		0	0	-0.119		-0.119
14.866	-35.364	-0.03		14.866	-35.364	0		0	0	-0.03		-0.03
15.726	-25.403	-0.012		15.726	-25.403	0		0	0	-0.012		-0.012
25.638	-28.336	-0.041		25.638	-28.336	0		0	0	-0.041		-0.041
33.622	-23.34	0		33.622	-23.34	0		0	0	0		0
61.713	-24.475	0.026		61.713	-24.475	0		0	0	0.026		0.026
68.098	-34.992	0.083		68.098	-34.992	0		0	0	0.083		0.083
65.3	-54.965	0.097		65.3	-54.965	0		0	0	0.097		0.097
68.942	-6.543	0.124		68.942	-6.543	0		0	0	0.124		0.124
66.104	18.454	0.142		66.104	18.454	0		0	0	0.142		0.142
52.197	19.026	0.075		52.197	19.026	0		0	0	0.075		0.075
38.321	18.772	-0.005		38.321	18.772	0		0	0	-0.005		-0.005
24.967	19.09	0.04		24.967	19.09	0		0	0	0.04		0.04
27.067	28.55	0.042		27.067	28.55	0		0	0	0.042		0.042
34.208	26.89	-0.032		34.208	26.89	0		0	0	-0.032		-0.032
45.95	25.96	0.023		45.95	25.96	0		0	0	0.023		0.023
45.631	34.5	0.061		45.631	34.5	0		0	0	0.061		0.061
29.656	39.407	0.078		29.656	39.407	0		0	0	0.078		0.078
17.298	42.246	0.005		17.298	42.246	0		0	0	0.005		0.005
7.058	39.372	-0.051		7.058	39.372	0		0	0	-0.051		-0.051
10.224	49.424	0.037		10.224	49.424	0		0	0	0.037		0.037
22.911	52.392	0.071		22.911	52.392	0		0	0	0.071		0.071
43.21	55.649	-0.02		43.21	55.649	0		0	0	-0.02		-0.02
66.403	54.328	0.103		66.403	54.328	0		0	0	0.103		0.103
66.997	38.35	0.104		66.997	38.35	0		0	0	0.104		0.104
-12.228	40.837	-0.044		-12.228	40.837	0		0	0	-0.044		-0.044
-22.793	17.54	-0.058		-22.793	17.54	0		0	0	-0.058		-0.058
-24.102	30.73	-0.09		-24.102	30.73	0		0	0	-0.09		-0.09
-31.278	26.042	-0.051		-31.278	26.042	0		0	0	-0.051		-0.051
-43.007	26.698	0.004		-43.007	26.698	0		0	0	0.004		0.004
-50.502	30.549	-0.003		-50.502	30.549	0		0	0	-0.003		-0.003
-40.463	46.103	-0.02		-40.463	46.103	0		0	0	-0.02		-0.02
-47.588	54.658	0.147		-47.588	54.658	0		0	0	0.147		0.147
-75.599	53.864	0.239		-75.599	53.864	0		0	0	0.239		0.239
-75.81	37.582	0.13		-75.81	37.582	0		0	0	0.13		0.13
-74.588	19.423	0.129		-74.588	19.423	0		0	0	0.129		0.129
-57.112	25.332	0.111		-57.112	25.332	0		0	0	0.111		0.111
-66.146	12.023	0.062		-66.146	12.023	0		0	0	0.062		0.062

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-68.653	-1.038	0.027		-68.653	-1.038	0		0	0	0.027		0.027
-77.004	-10.735	0.056		-77.004	-10.735	0		0	0	0.056		0.056
-76.86	-29.21	0.094		-76.86	-29.21	0		0	0	0.094		0.094
-62.595	-24.803	-0.066		-62.595	-24.803	0		0	0	-0.066		-0.066
-49.91	-21.836	-0.213		-49.91	-21.836	0		0	0	-0.213		-0.213
-35.579	-26.53	-0.138		-35.579	-26.53	0		0	0	-0.138		-0.138
-22.828	-18.044	-0.108		-22.828	-18.044	0		0	0	-0.108		-0.108
-27.832	-36.989	-0.11		-27.832	-36.989	0		0	0	-0.11		-0.11
-13.698	-51.066	-0.087		-13.698	-51.066	0		0	0	-0.087		-0.087
-5.195	-60.118	-0.043		-5.195	-60.118	0		0	0	-0.043		-0.043
-6.427	-70.92	-0.053		-6.427	-70.92	0		0	0	-0.053		-0.053
-7.766	-86.14	0.048		-7.766	-86.14	0		0	0	0.048		0.048
-27.193	-90.742	0.078		-27.193	-90.742	0		0	0	0.078		0.078
-40.884	-88.507	0.163		-40.884	-88.507	0		0	0	0.163		0.163
-53.643	-82.099	0.037		-53.643	-82.099	0		0	0	0.037		0.037
-62.849	-90.725	0.18		-62.849	-90.725	0		0	0	0.18		0.18
-77.178	-86.032	0.206		-77.178	-86.032	0		0	0	0.206		0.206
-75.53	-64.457	0.122		-75.53	-64.457	0		0	0	0.122		0.122
-71.93	-44.188	0.024		-71.93	-44.188	0		0	0	0.024		0.024
-65.771	-56.088	0.129		-65.771	-56.088	0		0	0	0.129		0.129
-62.14	-65.877	0.048		-62.14	-65.877	0		0	0	0.048		0.048
-50.427	-58.811	-0.044		-50.427	-58.811	0		0	0	-0.044		-0.044
-50.176	-72.866	0.029		-50.176	-72.866	0		0	0	0.029		0.029
-14.061	-37.93	-17.197		-14.061	-37.93	-16.833		0	0	-0.363		-0.363
-14.465	-16.532	-17.21		-14.465	-16.532	-16.833		0	0	-0.377		-0.377
-13.66	16.146	-17.091		-13.66	16.146	-16.833		0	0	-0.258		-0.258
-13.497	29.352	-17.055		-13.497	29.352	-16.833		0	0	-0.221		-0.221
14.561	31.626	-17.139		14.561	31.626	-16.833		0	0	-0.306		-0.306
15.433	23.92	-17.153		15.433	23.92	-16.833		0	0	-0.32		-0.32
15.7	12.229	-17.179		15.7	12.229	-16.833		0	0	-0.346		-0.346
59.891	4.331	-17.017		59.891	4.331	-16.833		0	0	-0.183		-0.183
58.337	-9.94	-16.975		58.337	-9.94	-16.833		0	0	-0.142		-0.142
48.847	-15.237	-17.076		48.847	-15.237	-16.833		0	0	-0.243		-0.243
36.437	-9.648	-17.101		36.437	-9.648	-16.833		0	0	-0.267		-0.267
30.668	-17.673	-17.075		30.668	-17.673	-16.833		0	0	-0.241		-0.241
13.211	-15.162	-17.207		13.211	-15.162	-16.833		0	0	-0.374		-0.374
19.491	2.827	-4.32		19.491	2.827	-4.208		0	0	-0.111		-0.111
28.876	7.238	-4.332		28.876	7.238	-4.208		0	0	-0.124		-0.124
34.402	2.983	-4.27		34.402	2.983	-4.208		0	0	-0.062		-0.062
41.155	7.366	-4.252		41.155	7.366	-4.208		0	0	-0.043		-0.043
46.384	2.183	-4.289		46.384	2.183	-4.208		0	0	-0.08		-0.08
51.978	8.403	-4.264		51.978	8.403	-4.208		0	0	-0.056		-0.056
50.813	-3.19	0.006		50.813	-3.19	0		0	0	0.006		0.006
40.289	-2.992	0.06		40.289	-2.992	0		0	0	0.06		0.06
28.596	-2.806	-0.017		28.596	-2.806	0		0	0	-0.017		-0.017
16.908	-2.003	-0.042		16.908	-2.003	0		0	0	-0.042		-0.042
18.53	-9.33	1.516		18.53	-9.33	1.683		0	0	-0.168		-0.168
24.688	-6.493	1.566		24.688	-6.493	1.683		0	0	-0.117		-0.117

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
25.804	-14.799	1.586		25.804	-14.799	1.683		0	0	-0.098		-0.098
18.764	-12.387	-3.934		18.764	-12.447	-3.934		0	0.06	0		-0.06
25.664	-16.652	0.451		25.664	-16.655	0.451		0	0.003	0		-0.003
32.968	-3.995	-3.998		32.968	-4.03	-3.998		0	0.036	0		-0.036
39.993	-4.018	-3.242		39.993	-4.03	-3.242		0	0.012	0		-0.012
52.615	-3.946	-4.515		52.615	-4.03	-4.515		0	0.084	0		-0.084
55.211	0.102	-8.793		55.257	0.088	-8.793		-0.046	0.015	0		-0.049
56.501	7.922	-9.54		56.527	7.922	-9.54		-0.026	0	0		-0.026
59.439	12.438	-0.559		59.439	12.449	-0.583		0	-0.011	0.024		0.026
49.224	13.292	-1.363		49.224	13.266	-1.318		0	0.026	-0.045		-0.052
39.386	12.535	-1.275		39.386	12.479	-1.22		0	0.055	-0.055		-0.078

### 3D-Tol Data from CMM for ThermoJet-3mm Pattern

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
53.714	58.978	-5.812		53.714	58.917	-5.812		0	0.061	0		0.061
37.166	58.994	-5.82		37.166	58.917	-5.82		0	0.077	0		0.077
20.62	58.996	-5.828		20.62	58.917	-5.828		0	0.08	0		0.08
4.076	59.012	-5.836		4.076	58.917	-5.836		0	0.095	0		0.095
-12.469	59.006	-5.844		-12.469	58.917	-5.844		0	0.089	0		0.089
-29.014	59.007	-5.852		-29.014	58.917	-5.852		0	0.091	0		0.091
-45.558	59.062	-5.861		-45.558	58.917	-5.861		0	0.145	0		0.145
-62.102	59.084	-5.869		-62.102	58.917	-5.869		0	0.167	0		0.167
-80.139	41.052	-5.883		-79.958	41.052	-5.883		-0.18	0	0		0.18
-80.068	24.507	-5.886		-79.958	24.507	-5.886		-0.11	0	0		0.11
-80.002	7.962	-5.89		-79.958	7.962	-5.89		-0.044	0	0		0.044
-79.995	-8.582	-5.893		-79.958	-8.582	-5.893		-0.037	0	0		0.037
-80.003	-25.128	-5.897		-79.958	-25.128	-5.897		-0.045	0	0		0.045
-80.034	-41.672	-5.9		-79.958	-41.672	-5.9		-0.076	0	0		0.076
-80.078	-58.217	-5.904		-79.958	-58.217	-5.904		-0.119	0	0		0.119
-80.121	-74.762	-5.908		-79.958	-74.762	-5.908		-0.162	0	0		0.162
-62.083	-92.904	-5.903		-62.083	-92.583	-5.903		0	-0.32	0		0.32
-45.537	-92.843	-5.894		-45.537	-92.583	-5.894		0	-0.26	0		0.26
-28.993	-92.749	-5.886		-28.993	-92.583	-5.886		0	-0.166	0		0.166
-12.448	-92.72	-5.878		-12.448	-92.583	-5.878		0	-0.137	0		0.137
4.097	-92.782	-5.869		4.097	-92.583	-5.869		0	-0.199	0		0.199
20.641	-92.906	-5.862		20.641	-92.583	-5.862		0	-0.323	0		0.323
37.187	-92.911	-5.853		37.187	-92.583	-5.853		0	-0.328	0		0.328
53.731	-92.892	-5.846		53.731	-92.583	-5.846		0	-0.309	0		0.309
71.688	-74.744	-5.834		71.542	-74.744	-5.834		0.146	0	0		0.146
71.707	-58.2	-5.828		71.542	-58.2	-5.828		0.165	0	0		0.165
71.766	-41.654	-5.824		71.542	-41.654	-5.824		0.224	0	0		0.224
71.759	-25.111	-5.822		71.542	-25.111	-5.822		0.217	0	0		0.217
71.786	-8.565	-5.818		71.542	-8.565	-5.818		0.244	0	0		0.244
71.707	7.979	-5.814		71.542	7.979	-5.814		0.165	0	0		0.165
71.664	24.524	-5.811		71.542	24.524	-5.811		0.123	0	0		0.123

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
71.679	41.068	-5.806		71.542	41.068	-5.806		0.137	0	0		0.137
-69.85	43.744	8.774		-69.85	43.744	8.417		0	0	0.358		0.358
-64.799	43.745	8.783		-64.799	43.745	8.417		0	0	0.366		0.366
-64.8	48.795	8.766		-64.8	48.795	8.417		0	0	0.349		0.349
-69.85	48.794	8.754		-69.85	48.794	8.417		0	0	0.337		0.337
-67.719	46.389	8.716		-67.719	46.389	8.417		0	0	0.299		0.299
-71.85	43.742	6.746		-71.542	43.742	6.746		-0.309	0	0		0.309
-71.861	48.795	6.748		-71.542	48.795	6.748		-0.319	0	0		0.319
-69.85	50.751	6.75		-69.85	50.5	6.75		0	0.251	0		0.251
-64.799	50.762	6.753		-64.799	50.5	6.753		0	0.262	0		0.262
-64.796	42.381	6.751		-64.796	42.083	6.751		0	0.298	0		-0.298
-69.847	42.381	6.749		-69.847	42.083	6.749		0	0.298	0		-0.298
-63.441	48.795	6.753		-63.125	48.795	6.753		-0.316	0	0		-0.316
-63.436	43.746	6.753		-63.125	43.746	6.753		-0.311	0	0		-0.311
-64.792	-14.33	3.997		-64.792	-14.33	4.208		0	0	-0.211		-0.211
-69.842	-14.33	4.085		-69.842	-14.33	4.208		0	0	-0.124		-0.124
-69.84	-19.38	4.118		-69.84	-19.38	4.208		0	0	-0.091		-0.091
-64.791	-19.379	4.038		-64.791	-19.379	4.208		0	0	-0.171		-0.171
-67.962	-16.758	3.984		-67.962	-16.758	4.208		0	0	-0.224		-0.224
-69.84	-12.681	3.369		-69.84	-12.625	3.369		0	-0.056	0		-0.056
-64.791	-12.687	3.373		-64.791	-12.625	3.373		0	-0.062	0		-0.062
-63.293	-14.329	3.373		-63.125	-14.329	3.373		-0.168	0	0		-0.168
-63.005	-19.379	4.086		-63.125	-19.379	4.208		0.12	0	-0.123		0.171
-64.787	-21.087	3.37		-64.787	-21.042	3.37		0	-0.045	0		0.045
-69.839	-21.056	3.369		-69.839	-21.042	3.369		0	-0.014	0		0.014
-71.699	-19.382	3.365		-71.542	-19.382	3.365		-0.157	0	0		0.157
-71.688	-14.331	3.368		-71.542	-14.331	3.368		-0.147	0	0		0.147
-64.788	-77.456	8.87		-64.788	-77.456	8.417		0	0	0.453		0.453
-69.838	-77.456	8.848		-69.838	-77.456	8.417		0	0	0.431		0.431
-69.837	-82.507	8.833		-69.837	-82.507	8.417		0	0	0.416		0.416
-64.787	-82.506	8.855		-64.787	-82.506	8.417		0	0	0.438		0.438
-69.836	-76.035	6.722		-69.836	-75.75	6.722		0	-0.285	0		-0.285
-64.787	-76.031	6.726		-64.787	-75.75	6.726		0	-0.281	0		-0.281
-63.507	-77.455	6.726		-63.125	-77.455	6.726		-0.382	0	0		-0.382
-63.486	-82.505	6.726		-63.125	-82.505	6.726		-0.361	0	0		-0.361
-64.782	-84.401	6.723		-64.782	-84.167	6.723		0	-0.235	0		0.235
-69.835	-84.385	6.721		-69.835	-84.167	6.721		0	-0.219	0		0.219
-71.913	-82.508	6.718		-71.542	-82.508	6.718		-0.372	0	0		0.372
-71.912	-77.456	6.721		-71.542	-77.456	6.721		-0.371	0	0		0.371
-2.514	43.751	4.268		-2.514	43.751	4.208		0	0	0.06		0.06
2.537	43.751	4.264		2.537	43.751	4.208		0	0	0.056		0.056
2.535	48.802	4.275		2.535	48.802	4.208		0	0	0.067		0.067
-2.515	48.801	4.28		-2.515	48.801	4.208		0	0	0.072		0.072
-0.675	46.786	4.199		-0.675	46.786	4.208		0	0	-0.009		-0.009
-4.164	43.751	2.151		-4.208	43.751	2.151		0.045	0	0		-0.045
-4.166	48.802	2.153		-4.208	48.802	2.153		0.043	0	0		-0.043
2.541	42.323	2.154		2.541	42.083	2.154		0	0.239	0		-0.239
-2.512	42.321	2.153		-2.512	42.083	2.153		0	0.237	0		-0.237



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
4.163	48.803	2.157		4.208	48.803	2.157		-0.046	0	0		-0.046
4.158	43.753	2.157		4.208	43.753	2.157		-0.05	0	0		-0.05
-2.512	50.657	2.154		-2.512	50.5	2.154		0	0.157	0		0.157
2.537	50.641	2.157		2.537	50.5	2.157		0	0.141	0		0.141
-64.909	36.337	-1.245		-64.786	36.214	-1.245		-0.123	0.123	0		-0.174
-54.196	47.051	-1.237		-54.073	46.927	-1.237		-0.123	0.123	0		-0.175
-46.964	46.859	-1.235		-46.912	46.912	-1.235		-0.053	-0.053	0		0.075
-36.202	36.202	-1.232		-36.202	36.202	-1.232		0	0	0		0
-40.962	29.06	-1.235		-40.962	29.059	-1.235		0.001	0.001	0		0.001
-48.105	36.196	-1.237		-48.102	36.199	-1.237		-0.003	-0.003	0		-0.004
-35.876	29.711	-1.614		-35.728	29.563	-1.614		-0.148	0.148	0		0.209
-54.234	35.185	-1.242		-54.073	35.024	-1.242		-0.161	0.161	0		0.228
-58.981	30.406	-1.245		-58.836	30.261	-1.245		-0.145	0.145	0		0.205
-65.344	29.627	-1.148		-65.34	29.631	-1.148		-0.004	-0.004	0		-0.006
-61.38	33.541	-4.252		-61.38	33.541	-4.208		0	0	-0.044		-0.044
-56.812	38.297	-4.267		-56.812	38.297	-4.208		0	0	-0.059		-0.059
-50.316	43.699	-4.306		-50.316	43.699	-4.208		0	0	-0.098		-0.098
-44.756	38.652	-4.31		-44.756	38.652	-4.208		0	0	-0.102		-0.102
-40.081	33.845	-4.296		-40.081	33.845	-4.208		0	0	-0.088		-0.088
49.671	42.316	5.964		49.671	42.083	5.964		0	0.232	0		-0.232
42.937	42.336	5.963		42.937	42.083	5.963		0	0.252	0		-0.252
54.937	30.288	5.965		54.708	30.288	5.965		0.229	0	0		-0.229
54.959	37.023	5.966		54.708	37.023	5.966		0.251	0	0		-0.251
58.813	25.575	5.471		58.813	25.25	5.471		0	0.325	0		-0.325
63.332	30.291	5.97		63.125	30.291	5.97		0.207	0	0		0.207
63.331	37.868	5.972		63.125	37.868	5.972		0.206	0	0		0.206
63.348	45.443	5.974		63.125	45.443	5.974		0.223	0	0		0.223
58.086	50.654	5.971		58.086	50.5	5.971		0	0.154	0		0.154
50.508	50.663	5.969		50.508	50.5	5.969		0	0.163	0		0.163
42.932	50.675	5.964		42.932	50.5	5.964		0	0.175	0		0.175
38.194	46.23	5.241		37.875	46.23	5.241		0.319	0	0		-0.319
43.184	46.399	8.613		43.184	46.399	8.417		0	0	0.196		0.196
50.417	46.11	8.561		50.417	46.11	8.417		0	0	0.145		0.145
58.388	45.779	8.579		58.388	45.779	8.417		0	0	0.162		0.162
59.128	37.515	8.547		59.128	37.515	8.417		0	0	0.131		0.131
59.005	30.669	8.596		59.005	30.669	8.417		0	0	0.179		0.179
-30.895	49.003	16.91		-30.895	48.879	16.982		0	0.125	-0.072		-0.144
-30.893	46.113	11.873		-30.893	45.975	11.953		0	0.138	-0.08		-0.16
-30.889	43.239	6.833		-30.889	43.074	6.929		0	0.165	-0.095		-0.19
-30.887	40.371	1.789		-30.887	40.173	1.904		0	0.198	-0.114		-0.229
-27.099	40.408	1.768		-27.099	40.173	1.904		0	0.235	-0.135		-0.271
-27.104	43.286	6.812		-27.104	43.077	6.933		0	0.21	-0.121		-0.242
-27.107	46.154	11.854		-27.107	45.977	11.956		0	0.177	-0.102		-0.204
-27.11	49.014	16.905		-27.11	48.879	16.983		0	0.135	-0.078		-0.156
-23.32	49.01	16.908		-23.32	48.879	16.983		0	0.131	-0.075		-0.151
-23.317	46.151	11.857		-23.317	45.977	11.957		0	0.174	-0.1		-0.201
-23.316	43.284	6.816		-23.316	43.078	6.935		0	0.206	-0.119		-0.238
-23.313	40.458	1.742		-23.313	40.174	1.905		0	0.284	-0.164		-0.328



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-17	45.625	1.867		-17	45.42	1.922		0	0.205	-0.055		-0.212
-17.006	47.7	9.39		-17.006	47.44	9.46		0	0.26	-0.07		-0.269
-17.01	49.732	16.925		-17.01	49.46	16.998		0	0.272	-0.073		-0.282
-11.958	49.731	16.928		-11.958	49.46	17		0	0.271	-0.073		-0.28
-11.954	47.665	9.4		-11.954	47.44	9.46		0	0.225	-0.06		-0.233
-11.95	45.614	1.872		-11.95	45.421	1.924		0	0.193	-0.052		-0.2
-8.299	49.601	7.575		-8.178	49.601	7.575		-0.121	0	0		-0.121
-30.898	51.452	15.252		-30.898	50.954	15.118		0	0.498	0.133		0.516
-30.897	52.862	9.567		-30.897	52.47	9.462		0	0.392	0.105		0.406
-30.896	54.146	3.854		-30.896	53.984	3.811		0	0.162	0.043		0.168
-24.159	54.113	3.848		-24.159	53.983	3.814		0	0.129	0.035		0.134
-24.163	52.817	9.559		-24.163	52.469	9.466		0	0.348	0.093		0.36
-24.164	51.43	15.25		-24.164	50.953	15.122		0	0.477	0.128		0.494
-17.431	51.467	15.262		-17.431	50.953	15.124		0	0.514	0.138		0.532
-17.431	52.842	9.566		-17.431	52.469	9.466		0	0.373	0.1		0.386
-17.429	54.083	3.844		-17.429	53.983	3.817		0	0.1	0.027		0.104
-10.691	54.107	3.852		-10.691	53.982	3.818		0	0.125	0.034		0.13
-10.695	52.865	9.576		-10.695	52.468	9.47		0	0.397	0.107		0.412
-10.698	51.452	15.261		-10.698	50.952	15.127		0	0.5	0.134		0.517
-33.52	48.938	9.705		-33.428	48.938	9.705		-0.092	0	0		0.092
4.963	-63.144	18.904		5.059	-63.144	18.879		-0.096	0	0.026		0.099
3.127	-63.144	11.822		3.165	-63.144	11.812		-0.038	0	0.01		0.039
1.345	-63.141	4.723		1.271	-63.141	4.742		0.074	0	-0.02		-0.076
1.375	-69.875	4.712		1.27	-69.875	4.74		0.105	0	-0.028		-0.109
3.172	-69.875	11.807		3.164	-69.875	11.809		0.008	0	-0.002		-0.008
4.992	-69.877	18.895		5.058	-69.877	18.877		-0.066	0	0.018		0.068
5.011	-76.612	18.886		5.057	-76.612	18.874		-0.046	0	0.012		0.047
3.178	-76.609	11.802		3.163	-76.609	11.805		0.014	0	-0.004		-0.015
1.37	-76.608	4.711		1.27	-76.608	4.738		0.101	0	-0.027		-0.104
1.294	-83.342	4.731		1.269	-83.342	4.738		0.025	0	-0.007		-0.025
3.162	-83.342	11.806		3.163	-83.342	11.806		-0.001	0	0		0.001
5.003	-83.344	18.886		5.057	-83.344	18.872		-0.053	0	0.014		0.055
7.483	-86.219	10.387		7.483	-85.85	10.387		0	-0.369	0		0.369
7.819	-83.343	21.303		7.666	-83.343	21.214		0.153	0	0.088		0.177
13.16	-83.339	11.822		13.106	-83.339	11.791		0.053	0	0.031		0.062
18.467	-83.337	2.322		18.547	-83.337	2.368		-0.08	0	-0.046		-0.092
18.449	-75.761	2.316		18.545	-75.761	2.371		-0.096	0	-0.055		-0.111
13.142	-75.765	11.817		13.104	-75.765	11.795		0.038	0	0.022		0.044
7.796	-75.768	21.294		7.664	-75.768	21.217		0.132	0	0.076		0.153
7.031	-69.454	21.252		6.937	-69.454	21.227		0.094	0	0.025		0.097
9.489	-69.451	11.809		9.463	-69.451	11.802		0.026	0	0.007		0.027
11.877	-69.45	2.348		11.988	-69.45	2.378		-0.111	0	-0.03		-0.115
11.905	-64.401	2.358		11.987	-64.401	2.38		-0.082	0	-0.022		-0.085
9.515	-64.403	11.819		9.462	-64.403	11.805		0.053	0	0.014		0.055
7.048	-64.404	21.258		6.937	-64.404	21.228		0.111	0	0.03		0.115
6.462	-61.119	11.14		6.462	-60.6	11.14		0	-0.519	0		-0.519
-30.505	-50.498	-5.367		-30.507	-50.458	-5.411		0.003	-0.04	0.044		0.059
-30.213	-55.058	-7.856		-30.212	-55.07	-7.834		-0.001	0.012	-0.022		-0.025

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-29.972	-58.768	-11.487		-29.984	-58.558	-11.598		0.013	-0.209	0.11		0.237
-29.785	-61.666	-15.685		-29.792	-61.54	-15.858		0.007	-0.126	0.173		0.214
-33.741	-63.479	-15.834		-33.76	-63.462	-15.869		0.019	-0.017	0.035		0.043
-36.007	-61.458	-11.611		-35.999	-61.466	-11.605		-0.008	0.008	-0.006		-0.013
-38.632	-59.107	-7.936		-38.595	-59.14	-7.841		-0.037	0.033	-0.095		-0.107
-42.074	-56.021	-5.479		-42.036	-56.055	-5.424		-0.038	0.034	-0.055		-0.075
-46.476	-68.137	-5.573		-46.336	-68.131	-5.421		-0.14	-0.007	-0.152		-0.206
-41.809	-67.921	-8.012		-41.719	-67.916	-7.84		-0.091	-0.004	-0.172		-0.195
-38.46	-67.766	-11.725		-38.234	-67.755	-11.606		-0.226	-0.011	-0.119		-0.255
-35.29	-67.62	-15.947		-35.236	-67.617	-15.872		-0.055	-0.003	-0.076		-0.093
-33.435	-71.674	-15.977		-33.377	-71.611	-15.859		-0.058	-0.063	-0.118		-0.146
-35.586	-73.992	-11.734		-35.411	-73.802	-11.598		-0.175	-0.19	-0.136		-0.292
-37.84	-76.416	-7.964		-37.793	-76.365	-7.832		-0.047	-0.051	-0.132		-0.149
-41.014	-79.84	-5.539		-40.933	-79.752	-5.41		-0.081	-0.088	-0.128		-0.175
-29.719	-67.426	-16.82		-29.713	-67.424	-16.87		-0.006	-0.002	0.05		0.05
-26.706	-62.372	-15.648		-26.636	-62.245	-15.846		-0.071	-0.127	0.199		0.246
-25.323	-59.837	-11.463		-25.209	-59.632	-11.587		-0.114	-0.206	0.124		0.266
-23.535	-56.556	-7.819		-23.533	-56.553	-7.826		-0.002	-0.003	0.007		0.007
-21.348	-52.555	-5.333		-21.319	-52.5	-5.4		-0.03	-0.054	0.067		0.091
-13.179	-62.579	-5.408		-13.201	-62.585	-5.384		0.022	0.006	-0.024		-0.034
-17.622	-63.882	-7.846		-17.636	-63.886	-7.819		0.014	0.004	-0.027		-0.031
-21.159	-64.925	-11.497		-21.007	-64.881	-11.58		-0.152	-0.044	0.083		0.179
-23.957	-65.745	-15.686		-23.852	-65.715	-15.835		-0.105	-0.03	0.148		0.184
-24.37	-70.113	-15.773		-24.333	-70.133	-15.83		-0.037	0.02	0.058		0.072
-21.759	-71.539	-11.562		-21.734	-71.553	-11.577		-0.025	0.013	0.015		0.032
-18.627	-73.248	-7.856		-18.645	-73.238	-7.816		0.018	-0.01	-0.04		-0.045
-14.55	-75.478	-5.429		-14.591	-75.456	-5.379		0.041	-0.022	-0.049		-0.068
-24.651	-83.632	-5.455		-24.668	-83.573	-5.389		0.017	-0.059	-0.066		-0.09
-25.959	-79.17	-7.876		-25.968	-79.142	-7.819		0.008	-0.028	-0.056		-0.064
-26.928	-75.86	-11.635		-26.956	-75.768	-11.584		0.027	-0.092	-0.051		-0.109
-27.783	-72.935	-15.863		-27.788	-72.918	-15.839		0.005	-0.017	-0.024		-0.03
-32.281	-72.491	-15.954		-32.243	-72.43	-15.855		-0.039	-0.061	-0.099		-0.123
-33.797	-75.249	-11.715		-33.674	-75.05	-11.593		-0.123	-0.199	-0.123		-0.264
-35.387	-78.175	-7.943		-35.354	-78.124	-7.828		-0.033	-0.05	-0.115		-0.13
-37.625	-82.27	-5.518		-37.569	-82.179	-5.403		-0.057	-0.091	-0.115		-0.157
-25.392	-86.315	-0.617		-25.399	-86.278	-0.571		0.008	-0.037	-0.046		-0.06
-12.897	-77.283	-0.874		-13.011	-77.215	-0.741		0.114	-0.069	-0.133		-0.188
-10.937	-61.757	-0.84		-11.056	-61.793	-0.711		0.119	0.036	-0.129		-0.179
-16.025	-53.49	-0.761		-16.067	-53.532	-0.699		0.041	0.043	-0.062		-0.086
-25.755	-48.205	-0.683		-25.774	-48.301	-0.562		0.019	0.096	-0.121		-0.156
-47.345	-37.827	18.851		-47.2	-37.76	18.943		-0.144	-0.067	-0.092		-0.184
-44.119	-36.303	12.493		-43.905	-36.203	12.63		-0.214	-0.101	-0.137		-0.273
-40.897	-34.777	6.136		-40.612	-34.642	6.318		-0.286	-0.135	-0.182		-0.365
-40.029	-41.284	6.152		-39.757	-41.336	6.312		-0.272	0.051	-0.16		-0.319
-43.533	-40.627	12.512		-43.34	-40.664	12.625		-0.194	0.037	-0.114		-0.228
-47.054	-39.964	18.86		-46.922	-39.99	18.938		-0.132	0.025	-0.078		-0.155
-48.023	-41.932	18.913		-48	-41.957	18.932		-0.023	0.024	-0.019		-0.038
-45.55	-44.545	12.573		-45.494	-44.603	12.619		-0.055	0.058	-0.046		-0.093

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-43.098	-47.137	6.219		-42.991	-47.25	6.309		-0.107	0.113	-0.09		-0.18
-49.08	-50.182	6.329		-49.085	-50.144	6.308		0.005	-0.037	0.022		0.043
-49.545	-46.615	12.669		-49.556	-46.531	12.62		0.011	-0.084	0.049		0.098
-50.009	-43.052	19.006		-50.026	-42.919	18.929		0.017	-0.133	0.077		0.155
-52.353	-42.73	19.079		-52.233	-42.508	18.934		-0.119	-0.221	0.145		0.29
-54.067	-45.873	12.73		-53.977	-45.708	12.622		-0.089	-0.165	0.108		0.216
-55.793	-49.038	6.394		-55.722	-48.909	6.308		-0.071	-0.13	0.085		0.17
-52.151	-40.101	22.95		-51.808	-39.935	22.731		-0.342	-0.166	0.22		0.439
-57.277	-42.54	12.757		-57.075	-42.443	12.628		-0.202	-0.096	0.129		0.258
-62.464	-44.994	2.604		-62.345	-44.938	2.528		-0.119	-0.056	0.076		0.152
-63.437	-36.884	2.563		-63.391	-36.892	2.536		-0.046	0.009	0.027		0.054
-57.842	-37.938	12.744		-57.66	-37.972	12.637		-0.182	0.034	0.107		0.214
-52.26	-38.985	22.931		-51.928	-39.044	22.737		-0.331	0.059	0.194		0.389
-51.657	-38.081	22.875		-51.497	-38.249	22.741		-0.16	0.169	0.134		0.269
-55.548	-33.96	12.679		-55.501	-34.009	12.64		-0.046	0.049	0.039		0.078
-59.487	-29.78	2.529		-59.5	-29.766	2.54		0.014	-0.014	-0.011		-0.023
-52.148	-26.398	2.482		-52.161	-26.295	2.541		0.013	-0.103	-0.06		-0.119
-51.417	-32.114	12.622		-51.421	-32.079	12.642		0.004	-0.034	-0.02		-0.04
-50.694	-37.77	22.795		-50.682	-37.863	22.741		-0.012	0.093	0.054		0.108
-49.837	-38.082	22.703		-49.805	-38.028	22.739		-0.032	-0.054	-0.036		-0.073
-47.107	-33.073	12.529		-47.009	-32.91	12.638		-0.097	-0.163	-0.109		-0.219
-44.347	-28.012	2.39		-44.213	-27.792	2.538		-0.133	-0.219	-0.148		-0.296
-46.303	3.964	25.044		-46.203	3.87	25.179		-0.1	0.094	-0.134		-0.192
-50.349	7.781	27.628		-50.325	7.758	27.521		-0.024	0.023	0.107		0.112
-53.855	11.092	21.965		-53.747	10.99	21.9		-0.108	0.101	0.065		0.162
-56.56	13.655	8.319		-56.448	13.55	8.291		-0.111	0.105	0.028		0.156
-61.861	-1.629	8.3		-61.765	-1.621	8.282		-0.096	-0.008	0.018		0.097
-58.234	-1.336	21.967		-58.059	-1.321	21.89		-0.175	-0.014	0.077		0.192
-53.396	-0.946	27.583		-53.375	-0.944	27.517		-0.021	-0.002	0.067		0.07
-47.903	-0.501	25.006		-47.721	-0.485	25.184		-0.182	-0.016	-0.179		-0.256
-45.554	-4.59	25.111		-45.502	-4.521	25.195		-0.052	-0.069	-0.084		-0.12
-48.961	-9.044	27.566		-48.951	-9.031	27.512		-0.01	-0.014	0.054		0.057
-51.829	-12.799	21.905		-51.797	-12.757	21.882		-0.032	-0.042	0.023		0.058
-54.108	-15.797	8.299		-54.045	-15.714	8.28		-0.063	-0.083	0.019		0.106
-38.428	-19.379	8.28		-38.423	-19.406	8.285		-0.005	0.027	-0.005		-0.028
-39.137	-15.654	21.841		-39.118	-15.755	21.886		-0.019	0.101	-0.045		-0.113
-39.981	-11.176	27.582		-39.985	-11.153	27.511		0.004	-0.022	0.071		0.075
-41.049	-5.497	25.28		-41.034	-5.576	25.201		-0.015	0.08	0.079		0.114
-40.31	19.708	8.307		-40.314	19.666	8.299		0.004	0.042	0.008		0.043
-40.65	15.956	21.907		-40.65	15.958	21.908		0	-0.002	-0.001		-0.002
-41.067	11.317	27.684		-41.071	11.267	27.522		0.004	0.05	0.161		0.169
-41.577	5.593	25.215		-41.573	5.63	25.179		-0.003	-0.037	0.036		0.052
-38.702	4.403	25.288		-38.638	4.487	25.184		-0.065	-0.084	0.104		0.148
-35.188	9.016	27.623		-35.208	8.99	27.521		0.019	0.025	0.102		0.107
-32.442	12.62	21.843		-32.355	12.733	21.905		-0.086	-0.113	-0.062		-0.155
-30.182	15.577	8.276		-30.096	15.69	8.302		-0.086	-0.113	-0.026		-0.144
-23.884	6.768	8.241		-23.577	6.882	8.301		-0.307	-0.114	-0.06		-0.333
-27.275	5.501	21.802		-27.061	5.58	21.902		-0.214	-0.079	-0.1		-0.249

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-31.44	3.948	27.597		-31.463	3.939	27.518		0.023	0.009	0.079		0.083
-36.929	1.893	25.354		-36.769	1.952	25.188		-0.16	-0.059	0.166		0.238
-36.725	-1.143	25.382		-36.539	-1.183	25.196		-0.186	0.04	0.186		0.266
-30.97	-2.334	27.572		-30.988	-2.33	27.515		0.018	-0.004	0.058		0.061
-26.643	-3.23	21.785		-26.395	-3.282	21.896		-0.248	0.052	-0.111		-0.277
-23.136	-3.957	8.226		-22.755	-4.036	8.298		-0.381	0.08	-0.071		-0.396
-28.064	-13.527	8.245		-27.873	-13.711	8.294		-0.191	0.184	-0.049		-0.27
-30.718	-10.974	21.789		-30.552	-11.135	21.89		-0.166	0.161	-0.101		-0.253
-33.916	-7.899	27.56		-33.927	-7.889	27.512		0.011	-0.011	0.049		0.051
-38.116	-3.848	25.343		-38.011	-3.95	25.2		-0.105	0.102	0.143		0.205
-42.129	5.629	25.202		-42.129	5.653	25.179		0	-0.024	0.023		0.034
-42.184	11.354	27.655		-42.184	11.313	27.522		0	0.041	0.132		0.139
-42.225	16.057	21.922		-42.225	16.022	21.907		0	0.035	0.015		0.038
-42.254	19.813	8.312		-42.253	19.745	8.299		-0.001	0.068	0.013		0.069
-40.828	1.313	20.27		-40.753	1.392	20.203		-0.076	-0.079	0.068		0.129
-45.152	0.237	21.521		-44.941	0.221	21.663		-0.211	0.016	-0.142		-0.255
-40.842	-2.296	21.456		-40.803	-2.368	21.402		-0.039	0.072	0.054		0.098
45.109	-41.335	15.269		45.118	-41.318	15.137		-0.009	-0.017	0.131		0.133
42.465	-46.176	13.422		42.492	-46.127	13.32		-0.026	-0.048	0.102		0.116
40.287	-50.166	9.808		40.314	-50.116	9.757		-0.027	-0.05	0.051		0.077
38.833	-52.83	4.873		38.842	-52.814	4.866		-0.009	-0.016	0.007		0.02
32.004	-44.735	4.775		31.79	-44.819	4.869		0.214	0.084	-0.094		-0.248
34.761	-43.661	9.66		34.657	-43.702	9.762		0.105	0.041	-0.102		-0.152
38.907	-42.037	13.3		38.894	-42.042	13.326		0.013	0.005	-0.026		-0.029
43.988	-40.052	15.223		44	-40.047	15.139		-0.012	-0.005	0.084		0.084
43.948	-38.349	15.205		43.957	-38.352	15.14		-0.009	0.003	0.065		0.066
38.809	-36.616	13.236		38.762	-36.6	13.329		0.047	-0.016	-0.092		-0.105
34.647	-35.211	9.581		34.451	-35.145	9.768		0.196	-0.066	-0.187		-0.279
31.874	-34.273	4.727		31.533	-34.158	4.875		0.341	-0.115	-0.147		-0.388
38.372	-26.122	4.742		38.195	-25.831	4.881		0.177	-0.29	-0.14		-0.368
39.901	-28.633	9.593		39.797	-28.463	9.773		0.104	-0.17	-0.18		-0.268
42.185	-32.382	13.262		42.166	-32.351	13.332		0.019	-0.032	-0.07		-0.079
45.011	-37.022	15.211		45.017	-37.031	15.141		-0.005	0.009	0.071		0.071
46.682	-36.681	15.242		46.68	-36.696	15.139		0.002	0.015	0.103		0.104
47.505	-31.262	13.362		47.502	-31.28	13.328		0.003	0.018	0.034		0.038
48.178	-26.85	9.708		48.188	-26.784	9.769		-0.01	-0.066	-0.061		-0.091
48.623	-23.924	4.801		48.652	-23.739	4.877		-0.028	-0.185	-0.077		-0.202
38.832	-52.829	4.872		38.841	-52.814	4.865		-0.008	-0.016	0.007		0.019
40.288	-50.167	9.808		40.316	-50.117	9.757		-0.027	-0.05	0.052		0.077
42.466	-46.175	13.423		42.492	-46.126	13.32		-0.026	-0.048	0.102		0.116
45.108	-41.335	15.27		45.117	-41.318	15.137		-0.009	-0.017	0.132		0.134
47.501	-36.955	15.266		47.492	-36.971	15.138		0.009	0.017	0.127		0.129
50.141	-32.129	13.405		50.121	-32.166	13.326		0.02	0.037	0.079		0.09
52.28	-28.171	9.758		52.283	-28.165	9.765		-0.004	-0.006	-0.006		-0.009
53.706	-25.556	4.835		53.758	-25.466	4.878		-0.052	-0.09	-0.043		-0.112
60.83	-33.467	4.885		60.804	-33.478	4.873		0.026	0.01	0.011		0.03
58.048	-34.552	9.862		57.941	-34.593	9.759		0.106	0.041	0.103		0.153
53.803	-36.216	13.499		53.713	-36.251	13.32		0.09	0.035	0.18		0.204

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
48.635	-38.234	15.303		48.612	-38.243	15.137		0.023	0.009	0.166		0.168
48.679	-39.948	15.324		48.652	-39.939	15.135		0.027	-0.009	0.188		0.19
53.964	-41.729	13.562		53.839	-41.686	13.316		0.125	-0.042	0.246		0.279
58.327	-43.2	9.929		58.142	-43.137	9.753		0.186	-0.063	0.176		0.264
61.175	-44.161	4.924		61.049	-44.118	4.87		0.126	-0.043	0.055		0.144
54.507	-52.594	4.943		54.407	-52.431	4.864		0.1	-0.164	0.078		0.207
52.912	-49.982	9.933		52.807	-49.811	9.752		0.104	-0.171	0.181		0.27
50.508	-46.042	13.553		50.442	-45.934	13.316		0.066	-0.108	0.237		0.269
47.607	-41.283	15.315		47.592	-41.26	15.135		0.014	-0.023	0.18		0.182
45.929	-41.617	15.288		45.932	-41.595	15.136		-0.003	-0.022	0.152		0.154
45.096	-47.097	13.49		45.109	-47.006	13.319		-0.014	-0.091	0.171		0.194
44.409	-51.632	9.873		44.429	-51.501	9.754		-0.02	-0.131	0.119		0.178
43.948	-54.679	4.924		43.97	-54.537	4.865		-0.021	-0.142	0.059		0.155
53.706	-25.554	4.835		53.758	-25.465	4.877		-0.052	-0.089	-0.042		-0.111
52.28	-28.17	9.76		52.283	-28.165	9.765		-0.003	-0.005	-0.005		-0.008
50.14	-32.128	13.406		50.119	-32.165	13.326		0.021	0.037	0.08		0.091
47.501	-36.955	15.267		47.492	-36.972	15.139		0.009	0.017	0.128		0.129
32.34	-49.607	0.218		32.245	-49.678	0.403		0.095	0.071	-0.184		-0.219
36.667	-53.968	0.182		36.634	-54.02	0.297		0.033	0.051	-0.115		-0.13
45.189	-56.398	0.728		45.193	-56.333	0.656		-0.004	-0.066	0.072		0.098
54.589	-54.109	0.954		54.543	-54.025	0.87		0.047	-0.084	0.084		0.127
60.913	-47.803	1.064		60.843	-47.762	1.003		0.069	-0.041	0.061		0.101
63.213	-39.403	1.022		63.201	-39.402	1.012		0.013	0	0.01		0.016
5.522	29.492	-10.465		5.522	29.466	-10.472		0	0.025	0.008		0.026
2.153	29.476	-10.472		2.153	29.467	-10.475		0	0.009	0.003		0.01
2.151	26.489	0.102		2.151	26.31	0.048		0	0.179	0.054		0.187
-1.215	29.49	-10.468		-1.215	29.467	-10.475		0	0.023	0.007		0.024
5.527	20.111	-12.611		5.527	20.024	-12.585		0	0.087	-0.026		-0.09
2.152	23.272	-2.094		2.152	23.18	-2.066		0	0.092	-0.028		-0.096
2.16	20.124	-12.617		2.16	20.024	-12.587		0	0.1	-0.03		-0.105
-1.209	20.137	-12.623		-1.209	20.023	-12.588		0	0.114	-0.034		-0.119
7.942	27.576	-10.512		8.012	27.576	-10.484		-0.07	0	-0.028		-0.075
7.951	25.051	-10.509		8.012	25.051	-10.485		-0.061	0	-0.024		-0.066
3.841	25.049	0.052		3.803	25.049	0.037		0.037	0	0.015		0.04
7.941	22.526	-10.515		8.013	22.526	-10.486		-0.071	0	-0.029		-0.077
-4.448	27.575	-12.634		-4.581	27.575	-12.581		0.133	0	-0.053		-0.143
-0.331	25.047	-2.076		-0.372	25.047	-2.059		0.041	0	-0.017		-0.045
-4.451	25.049	-12.633		-4.581	25.049	-12.581		0.13	0	-0.052		-0.14
-4.442	22.524	-12.636		-4.581	22.524	-12.58		0.138	0	-0.055		-0.149
-9.216	5.066	-2.067		-9.22	5.068	-2.067		0.004	-0.002	0		0.004
-9.21	5.057	9.718		-9.222	5.064	9.718		0.012	-0.007	0		0.014
-0.65	10.55	9.722		-0.647	10.501	9.722		-0.003	0.049	0		-0.049
-0.639	10.49	-2.063		-0.64	10.501	-2.063		0.001	-0.011	0		0.011
8.525	6.161	-2.058		8.527	6.162	-2.058		-0.002	-0.002	0		0.003
8.508	6.153	9.725		8.525	6.166	9.725		-0.017	-0.012	0		0.021
9.961	-3.247	9.723		10.003	-3.26	9.723		-0.042	0.014	0		0.044
9.983	-3.251	0.885		10.004	-3.258	0.885		-0.021	0.007	0		0.022
0.018	-10.533	0.879		0.018	-10.521	0.879		0	-0.012	0		-0.012

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
0.013	-10.555	9.719		0.013	-10.521	9.719		0	-0.034	0		-0.034
-9.952	-3.257	9.715		-9.999	-3.273	9.715		0.047	0.015	0		0.05
-9.965	-3.261	0.877		-9.999	-3.273	0.877		0.034	0.011	0		0.036
10.669	-10.126	3.831		10.683	-10.14	3.831		-0.014	0.014	0		-0.02
-11.166	-9.562	3.818		-11.188	-9.58	3.818		0.021	0.018	0		-0.028
-14.565	1.909	0.874		-14.604	1.915	0.874		0.039	-0.005	0		-0.039
-8.305	12.098	3.825		-8.336	12.143	3.825		0.031	-0.045	0		-0.054
3.452	14.278	0.886		3.462	14.317	0.886		-0.009	-0.039	0		-0.04
12.94	6.999	3.836		12.955	7.008	3.836		-0.015	-0.008	0		-0.017
1.888	1.496	-16.772		1.888	1.441	-16.833		0	0.056	0.062		0.083
-3.789	3.834	-17.087		-3.789	3.834	-16.833		0	0	-0.254		-0.254
-3.87	-4.099	-17.091		-3.87	-4.099	-16.833		0	0	-0.257		-0.257
3.703	-3.953	-17.043		3.703	-3.953	-16.833		0	0	-0.209		-0.209
-0.342	0.208	-21.181		-0.342	0.208	-21.042		0	0	-0.14		-0.14
-9.379	-8.53	12.827		-9.379	-8.53	12.625		0	0	0.202		0.202
-12.02	3.528	12.847		-12.02	3.528	12.625		0	0	0.222		0.222
-0.947	12.009	12.882		-0.947	12.009	12.625		0	0	0.257		0.257
11.214	4.942	12.937		11.214	4.942	12.625		0	0	0.312		0.312
10.563	-6.998	12.902		10.563	-6.998	12.625		0	0	0.277		0.277
0.425	-12.805	12.82		0.425	-12.805	12.625		0	0	0.195		0.195
-0.453	-14.766	6.91		-0.451	-14.722	6.91		-0.001	-0.044	0		0.044
6.934	-46.762	6.767		6.972	-46.762	6.767		-0.038	0	0		-0.038
6.964	-36.755	6.77		6.972	-36.755	6.77		-0.008	0	0		-0.008
6.983	-26.748	6.772		6.972	-26.748	6.772		0.011	0	0		0.011
7.008	-16.74	6.774		6.972	-16.74	6.774		0.036	0	0		0.036
4.459	-17.704	6.77		4.447	-17.704	6.77		0.012	0	0		-0.012
4.439	-27.426	6.768		4.447	-27.426	6.768		-0.008	0	0		0.008
4.421	-37.149	6.767		4.447	-37.149	6.767		-0.026	0	0		0.026
4.393	-46.872	6.765		4.447	-46.872	6.765		-0.055	0	0		0.055
-4.039	-46.885	9.71		-3.97	-46.885	9.71		-0.069	0	0		-0.069
-4.033	-37.2	9.71		-3.97	-37.2	9.71		-0.063	0	0		-0.063
-4.011	-27.516	9.712		-3.97	-27.516	9.712		-0.042	0	0		-0.042
-4.007	-17.831	9.715		-3.97	-17.831	9.715		-0.037	0	0		-0.037
-8.112	-16.092	3.819		-8.178	-16.092	3.819		0.066	0	0		-0.066
-8.135	-26.292	3.817		-8.178	-26.292	3.817		0.043	0	0		-0.043
-8.149	-36.492	3.815		-8.178	-36.492	3.815		0.029	0	0		-0.029
-8.166	-46.692	3.813		-8.178	-46.692	3.813		0.012	0	0		-0.012
-6.062	-50.569	7.21		-6.062	-50.5	7.21		0	-0.069	0		0.069
5.689	-50.6	10.449		5.689	-50.5	10.449		0	-0.1	0		0.1
5.679	-46.534	13.001		5.679	-46.534	12.625		0	0	0.376		0.376
5.7	-37.489	12.955		5.7	-37.489	12.625		0	0	0.33		0.33
5.607	-28.446	12.951		5.607	-28.446	12.625		0	0	0.326		0.326
5.835	-17.475	12.941		5.835	-17.475	12.625		0	0	0.316		0.316
-6.156	-16.922	12.837		-6.156	-16.922	12.625		0	0	0.212		0.212
-6.275	-27.324	12.869		-6.275	-27.324	12.625		0	0	0.244		0.244
-6.297	-36.142	12.869		-6.297	-36.142	12.625		0	0	0.244		0.244
-5.837	-47.895	12.923		-5.837	-47.895	12.625		0	0	0.298		0.298
63.007	-85.766	0.016		63.007	-85.766	0		0	0	0.016		0.016

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
51.578	-86.135	-0.102		51.578	-86.135	0		0	0	-0.102		-0.102
30.833	-85.658	-0.157		30.833	-85.658	0		0	0	-0.157		-0.157
26.847	-77.94	-0.15		26.847	-77.94	0		0	0	-0.15		-0.15
40.033	-79.664	-0.342		40.033	-79.664	0		0	0	-0.342		-0.342
56.468	-76.274	-0.264		56.468	-76.274	0		0	0	-0.264		-0.264
61.117	-66.974	-0.402		61.117	-66.974	0		0	0	-0.402		-0.402
47.126	-70.227	-0.526		47.126	-70.227	0		0	0	-0.526		-0.526
37.606	-65.832	-0.409		37.606	-65.832	0		0	0	-0.409		-0.409
23.957	-65.504	-0.202		23.957	-65.504	0		0	0	-0.202		-0.202
19.994	-53.403	-0.176		19.994	-53.403	0		0	0	-0.176		-0.176
15.226	-46.278	-0.211		15.226	-46.278	0		0	0	-0.211		-0.211
23.636	-45.53	-0.271		23.636	-45.53	0		0	0	-0.271		-0.271
14.874	-35.343	-0.231		14.874	-35.343	0		0	0	-0.231		-0.231
15.737	-25.382	-0.161		15.737	-25.382	0		0	0	-0.161		-0.161
25.648	-28.318	-0.2		25.648	-28.318	0		0	0	-0.2		-0.2
33.634	-23.325	-0.119		33.634	-23.325	0		0	0	-0.119		-0.119
61.726	-24.468	-0.084		61.726	-24.468	0		0	0	-0.084		-0.084
68.105	-34.987	-0.14		68.105	-34.987	0		0	0	-0.14		-0.14
65.302	-54.96	-0.094		65.302	-54.96	0		0	0	-0.094		-0.094
68.958	-6.538	0.034		68.958	-6.538	0		0	0	0.034		0.034
66.129	18.46	-0.055		66.129	18.46	0		0	0	-0.055		-0.055
52.222	19.036	-0.488		52.222	19.036	0		0	0	-0.488		-0.488
38.345	18.785	-0.564		38.345	18.785	0		0	0	-0.564		-0.564
24.992	19.108	-0.207		24.992	19.108	0		0	0	-0.207		-0.207
27.094	28.567	-0.269		27.094	28.567	0		0	0	-0.269		-0.269
34.235	26.906	-0.407		34.235	26.906	0		0	0	-0.407		-0.407
45.976	25.971	-0.529		45.976	25.971	0		0	0	-0.529		-0.529
45.66	34.512	-0.172		45.66	34.512	0		0	0	-0.172		-0.172
29.687	39.424	-0.217		29.687	39.424	0		0	0	-0.217		-0.217
17.33	42.266	-0.428		17.33	42.266	0		0	0	-0.428		-0.428
7.089	39.395	-0.342		7.089	39.395	0		0	0	-0.342		-0.342
10.258	49.446	-0.22		10.258	49.446	0		0	0	-0.22		-0.22
22.946	52.41	-0.075		22.946	52.41	0		0	0	-0.075		-0.075
43.247	55.662	0.07		43.247	55.662	0		0	0	0.07		0.07
66.438	54.333	0.283		66.438	54.333	0		0	0	0.283		0.283
67.028	38.354	0.026		67.028	38.354	0		0	0	0.026		0.026
-12.195	40.867	-0.457		-12.195	40.867	0		0	0	-0.457		-0.457
-22.769	17.571	-0.27		-22.769	17.571	0		0	0	-0.27		-0.27
-24.073	30.763	-0.298		-24.073	30.763	0		0	0	-0.298		-0.298
-31.251	26.077	-0.185		-31.251	26.077	0		0	0	-0.185		-0.185
-42.981	26.736	-0.195		-42.981	26.736	0		0	0	-0.195		-0.195
-50.474	30.59	-0.217		-50.474	30.59	0		0	0	-0.217		-0.217
-40.43	46.141	-0.216		-40.43	46.141	0		0	0	-0.216		-0.216
-47.553	54.698	-0.097		-47.553	54.698	0		0	0	-0.097		-0.097
-75.565	53.912	0.117		-75.565	53.912	0		0	0	0.117		0.117
-75.78	37.63	-0.088		-75.78	37.63	0		0	0	-0.088		-0.088
-74.563	19.471	-0.107		-74.563	19.471	0		0	0	-0.107		-0.107
-57.087	25.375	-0.185		-57.087	25.375	0		0	0	-0.185		-0.185



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
-66.123	12.067	-0.109		-66.123	12.067	0		0	0	-0.109		-0.109
-68.636	-0.991	-0.145		-68.636	-0.991	0		0	0	-0.145		-0.145
-76.989	-10.686	-0.121		-76.989	-10.686	0		0	0	-0.121		-0.121
-76.85	-29.162	-0.117		-76.85	-29.162	0		0	0	-0.117		-0.117
-62.584	-24.759	-0.151		-62.584	-24.759	0		0	0	-0.151		-0.151
-49.899	-21.796	-0.13		-49.899	-21.796	0		0	0	-0.13		-0.13
-35.569	-26.494	-0.198		-35.569	-26.494	0		0	0	-0.198		-0.198
-22.815	-18.011	-0.33		-22.815	-18.011	0		0	0	-0.33		-0.33
-27.825	-36.956	-0.265		-27.825	-36.956	0		0	0	-0.265		-0.265
-13.695	-51.036	-0.285		-13.695	-51.036	0		0	0	-0.285		-0.285
-5.194	-60.091	-0.408		-5.194	-60.091	0		0	0	-0.408		-0.408
-6.43	-70.893	-0.477		-6.43	-70.893	0		0	0	-0.477		-0.477
-7.772	-86.112	-0.226		-7.772	-86.112	0		0	0	-0.226		-0.226
-27.201	-90.709	0.107		-27.201	-90.709	0		0	0	0.107		0.107
-40.892	-88.469	0.054		-40.892	-88.469	0		0	0	0.054		0.054
-53.65	-82.058	0.024		-53.65	-82.058	0		0	0	0.024		0.024
-62.859	-90.68	0.17		-62.859	-90.68	0		0	0	0.17		0.17
-77.185	-85.983	0.204		-77.185	-85.983	0		0	0	0.204		0.204
-75.532	-64.408	-0.034		-75.532	-64.408	0		0	0	-0.034		-0.034
-71.926	-44.14	-0.079		-71.926	-44.14	0		0	0	-0.079		-0.079
-65.77	-56.043	-0.059		-65.77	-56.043	0		0	0	-0.059		-0.059
-62.142	-65.833	-0.024		-62.142	-65.833	0		0	0	-0.024		-0.024
-50.427	-58.77	-0.161		-50.427	-58.77	0		0	0	-0.161		-0.161
-50.18	-72.826	-0.115		-50.18	-72.826	0		0	0	-0.115		-0.115
-14.05	-37.892	-16.874		-14.05	-37.892	-16.833		0	0	-0.041		-0.041
-14.446	-16.494	-16.893		-14.446	-16.494	-16.833		0	0	-0.06		-0.06
-13.633	16.182	-16.902		-13.633	16.182	-16.833		0	0	-0.069		-0.069
-13.465	29.389	-16.891		-13.465	29.389	-16.833		0	0	-0.057		-0.057
14.595	31.654	-16.849		14.595	31.654	-16.833		0	0	-0.016		-0.016
15.463	23.948	-16.85		15.463	23.948	-16.833		0	0	-0.016		-0.016
15.728	12.257	-16.853		15.728	12.257	-16.833		0	0	-0.02		-0.02
59.916	4.346	-16.859		59.916	4.346	-16.833		0	0	-0.026		-0.026
58.358	-9.926	-16.859		58.358	-9.926	-16.833		0	0	-0.026		-0.026
48.865	-15.219	-16.841		48.865	-15.219	-16.833		0	0	-0.007		-0.007
36.456	-9.626	-16.841		36.456	-9.626	-16.833		0	0	-0.007		-0.007
30.687	-17.65	-16.834		30.687	-17.65	-16.833		0	0	0		0
13.228	-15.133	-16.841		13.228	-15.133	-16.833		0	0	-0.008		-0.008
19.512	2.848	-4.58		19.512	2.848	-4.208		0	0	-0.372		-0.372
28.898	7.257	-4.699		28.898	7.257	-4.208		0	0	-0.491		-0.491
34.423	3	-4.681		34.423	3	-4.208		0	0	-0.473		-0.473
41.177	7.381	-4.716		41.177	7.381	-4.208		0	0	-0.507		-0.507
46.404	2.196	-4.575		46.404	2.196	-4.208		0	0	-0.367		-0.367
52.001	8.414	-4.552		52.001	8.414	-4.208		0	0	-0.344		-0.344
50.83	-3.181	0.113		50.83	-3.181	0		0	0	0.113		0.113
40.307	-2.979	0.018		40.307	-2.979	0		0	0	0.018		0.018
28.615	-2.789	-0.077		28.615	-2.789	0		0	0	-0.077		-0.077
16.925	-1.983	-0.09		16.925	-1.983	0		0	0	-0.09		-0.09
18.546	-9.31	1.755		18.546	-9.31	1.683		0	0	0.072		0.072



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF (mm)
24.705	-6.475	1.707		24.705	-6.475	1.683		0	0	0.024		0.024
25.817	-14.783	1.906		25.817	-14.783	1.683		0	0	0.222		0.222
18.784	-12.265	-4.062		18.784	-12.447	-4.062		0	0.182	0		-0.182
25.681	-16.536	0.323		25.681	-16.655	0.323		0	0.119	0		-0.119
32.99	-3.834	-4.119		32.99	-4.03	-4.119		0	0.196	0		-0.196
40.012	-3.749	-3.362		40.012	-4.03	-3.362		0	0.281	0		-0.281
52.636	-3.735	-4.63		52.636	-4.03	-4.63		0	0.295	0		-0.295
55.374	0.073	-8.903		55.264	0.109	-8.903		0.111	-0.035	0		0.116
56.75	7.934	-9.647		56.527	7.934	-9.647		0.223	0	0		0.223
59.464	12.507	-0.791		59.464	12.417	-0.598		0	0.09	-0.193		-0.213
49.248	13.458	-1.745		49.248	13.225	-1.341		0	0.233	-0.403		-0.466
39.41	12.74	-1.582		39.41	12.429	-1.271		0	0.311	-0.311		-0.44

*Appendix E Dies - Features CMM  
Data*

**Geometric Observations – Alumide Die (Cavity)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
1	XY Plane	Plane		Flatness		-0.500	0.500	0.026	0.026	Good
2	Base	Line	Line	Parallelism		-0.500	0.500	0.095	0.095	Good
3	Base	Line	Line	Parallelism		-0.500	0.500	0.034	0.034	Good
4	Base	Left Side	Bottom Side	Perpendicularity		-0.500	0.500	0.029	0.029	Good
5	Base	Right Side	Bottom Side	Perpendicularity		-0.500	0.500	0.066	0.066	Good
6	Base	Right Side	Top Side	Perpendicularity		-0.500	0.500	0.100	0.100	Good
7	Base	Left Side	Top Side	Perpendicularity		-0.500	0.500	0.004	0.004	Good
8	Extruded Elbow	Line	Line	Angularity	90	-0.500	0.500	89.891	-0.109	Good
9	Extruded Elbow	Line	Line	Angularity	90	-0.500	0.500	89.977	-0.023	Good
10	Extruded Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.114	0.114	Good
11	Extruded Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.024	0.024	Good
12	Sunken Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.094	0.094	Good
13	Sunken Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.401	0.401	Good
14	Cube Line Y	Line		Straightness		-0.500	0.500	0.008	0.008	Good
15	Cube Line X	Line		Straightness		-0.500	0.500	0.031	0.031	Good
16	Triangular Protrusion	Line	Line	Perpendicularity		-0.500	0.500	0.244	0.244	Good
17	Cylinder	Outer Circle		Circularity		-0.500	0.500	0.068	0.068	Good
18	Cylinder	Inner Circle		Circularity		-0.500	0.500	0.049	0.049	Good
19	Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.012	0.012	Good
20	Bottom Plane	Bottom Plane		Flatness		-0.500	0.500	0.093	0.093	Good
21	X Wedge	Line	Line	Angularity	45	-0.500	0.500	44.454	-0.546	Low
22	X Wedge	Line	Line	Angularity	30	-0.500	0.500	29.799	-0.201	Good
23	X Wedge	Line	Line	Angularity	15	-0.500	0.500	14.656	-0.344	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
24	Y Wedge	Line	Line	Angularity	45	-0.500	0.500	44.297	-0.703	Low
25	Y Wedge	Line	Line	Angularity	30	-0.500	0.500	30.000	0.000	Good
26	Y Wedge	Line	Line	Angularity	15	-0.500	0.500	14.278	-0.722	Low
27	Sunken Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.334	0.634	High
28	Sunken Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.887	0.187	Good
29	Sunken Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.018	0.218	Good
30	Sunken Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.146	0.346	Good
31	Sphere	Sphere Bottom Circle		Circularity		-0.500	0.500	0.088	0.088	Good
32	Sphere	Sphere Top Circle		Circularity		-0.500	0.500	0.059	0.059	Good
33	Sphere	Sphere Bottom Circle	Sphere Top Circle	Concentricity		-0.500	0.500	0.077	0.077	Good
34	Sphere	Actual Sphere Axis	Sphere	Circular runout		-0.500	0.500	0.120	0.120	Good
35	Sphere	Actual Sphere Axis	Sphere	Axial runout		-0.500	0.500	0.111	0.111	Good
36	Sphere	Bottom Plane	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.113	0.113	Good
37	Sphere	Sphere	Sphere Top Circle	Concentricity		-0.500	0.500	0.084	0.084	Good
38	Sunken Cone	Actual Cone Axis	Cone Circles	Circular runout		-0.500	0.500	0.337	0.337	Good
39	Sunken Cone	Actual Cone Axis	Cone	Circular runout		-0.500	0.500	0.050	0.050	Good
40	Sunken Cone	Actual Cone Axis	Cone	Axial runout		-0.500	0.500	0.045	0.045	Good
41	Sunken Cone	Bottom Plane	Actual Cone Axis	Perpendicularity		-0.500	0.500	0.128	0.128	Good
42	Sunken Dome	Sunken Dome Top Circle	Sunken Dome	Concentricity		-0.500	0.500	0.088	0.088	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
			Bottom Circle							
43	Round Protrusion	Round Protrusion Top Circle	Round Protrusion Bottom Circle	Concentricity		-0.500	0.500	0.124	0.124	Good

### Geometric Observations – Polyamide Die (Cavity)

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
1	XY Plane	Plane		Flatness		-0.500	0.500	0.051	0.051	Good
2	Base	Line	Line	Parallelism		-0.500	0.500	0.046	0.046	Good
3	Base	Line	Line	Parallelism		-0.500	0.500	0.045	0.045	Good
4	Base	Left Side	Bottom Side	Perpendicularity		-0.500	0.500	0.021	0.021	Good
5	Base	Right Side	Bottom Side	Perpendicularity		-0.500	0.500	0.025	0.025	Good
6	Base	Right Side	Top Side	Perpendicularity		-0.500	0.500	0.020	0.020	Good
7	Base	Left Side	Top Side	Perpendicularity		-0.500	0.500	0.066	0.066	Good
8	Extruded Elbow	Line	Line	Angularity	90	-0.500	0.500	89.613	-0.387	Good
9	Extruded Elbow	Line	Line	Angularity	90	-0.500	0.500	90.008	0.008	Good
10	Extruded Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.405	0.405	Good
11	Extruded Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.008	0.008	Good
12	Sunken Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.232	0.232	Good
13	Sunken Elbow	Line	Line	Perpendicularity		-0.500	0.500	0.341	0.341	Good
14	Cube Line Y	Line		Straightness		-0.500	0.500	0.076	0.076	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
15	Cube Line X	Line		Straightness		-0.500	0.500	0.055	0.055	Good
16	Triangular Protrusion	Line	Line	Perpendicularity		-0.500	0.500	0.853	0.853	High
17	Cylinder	Outer Circle		Circularity		-0.500	0.500	0.073	0.073	Good
18	Cylinder	Inner Circle		Circularity		-0.500	0.500	0.025	0.025	Good
19	Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.026	0.026	Good
20	Bottom Plane	Bottom Plane		Flatness		-0.500	0.500	0.038	0.038	Good
21	X Wedge	Line	Line	Angularity	45	-0.500	0.500	44.855	-0.145	Good
22	X Wedge	Line	Line	Angularity	30	-0.500	0.500	29.537	-0.463	Good
23	X Wedge	Line	Line	Angularity	15	-0.500	0.500	15.318	0.318	Good
24	Y Wedge	Line	Line	Angularity	45	-0.500	0.500	45.518	0.518	High
25	Y Wedge	Line	Line	Angularity	30	-0.500	0.500	30.447	0.447	Good
26	Y Wedge	Line	Line	Angularity	15	-0.500	0.500	15.070	0.070	Good
27	Sunken Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.599	-0.101	Good
28	Sunken Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.996	0.296	Good
29	Sunken Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.876	0.076	Good
30	Sunken Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.641	-0.159	Good
31	Sphere	Sphere Bottom Circle		Circularity		-0.500	0.500	0.330	0.330	Good
32	Sphere	Sphere Top Circle		Circularity		-0.500	0.500	0.097	0.097	Good
33	Sphere	Sphere Bottom Circle	Sphere Top Circle	Concentricity		-0.500	0.500	0.118	0.118	Good
34	Sphere	Actual Sphere Axis	Sphere	Circular runout		-0.500	0.500	0.108	0.108	Good
35	Sphere	Actual Sphere Axis	Sphere	Axial runout		-0.500	0.500	0.268	0.268	Good
36	Sphere	Bottom Plane	Actual	Perpendicularity		-0.500	0.500	0.063	0.063	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
			Sphere Axis							
37	Sphere	Sphere	Sphere Top Circle	Concentricity		-0.500	0.500	0.032	0.032	Good
38	Sunken Cone	Actual Cone Axis	Cone Circles	Circular runout		-0.500	0.500	0.356	0.356	Good
39	Sunken Cone	Actual Cone Axis	Cone	Circular runout		-0.500	0.500	0.034	0.034	Good
40	Sunken Cone	Actual Cone Axis	Cone	Axial runout		-0.500	0.500	0.597	0.597	High
41	Sunken Cone	Bottom Plane	Actual Cone Axis	Perpendicularity		-0.500	0.500	0.092	0.092	Good
42	Sunken Dome	Sunken Dome Top Circle	Sunken Dome Bottom Circle	Concentricity		-0.500	0.500	0.132	0.132	Good
43	Round Protrusion	Round Protrusion Top Circle	Round Protrusion Bottom Circle	Concentricity		-0.500	0.500	0.103	0.103	Good

*Appendix F      Dies - Statistical  
CMM Raw Data (3D-  
Tol Data)*



**3D-Tol Data from CMM for Alumide Die (Cavity)**

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-86.181	-113.697	0.098	-86.181	-113.697	0	0	0	0.098	0.098
-59.179	-113.692	-0.011	-59.179	-113.692	0	0	0	-0.011	-0.011
-32.18	-113.688	-0.049	-32.18	-113.688	0	0	0	-0.049	-0.049
-5.18	-113.684	-0.087	-5.18	-113.684	0	0	0	-0.087	-0.087
21.82	-113.679	-0.082	21.82	-113.679	0	0	0	-0.082	-0.082
48.82	-113.675	-0.022	48.82	-113.675	0	0	0	-0.022	-0.022
75.821	-113.67	0.075	75.821	-113.67	0	0	0	0.075	0.075
102.82	-113.667	0.125	102.82	-113.667	0	0	0	0.125	0.125
102.814	-86.665	0.082	102.814	-86.665	0	0	0	0.082	0.082
-86.185	-86.698	0.055	-86.185	-86.698	0	0	0	0.055	0.055
-86.19	-59.697	0.017	-86.19	-59.697	0	0	0	0.017	0.017
102.812	-59.666	0.004	102.812	-59.666	0	0	0	0.004	0.004
102.806	-32.667	-0.009	102.806	-32.667	0	0	0	-0.009	-0.009
-86.194	-32.698	0.008	-86.194	-32.698	0	0	0	0.008	0.008
-86.198	-5.697	0.034	-86.198	-5.697	0	0	0	0.034	0.034
102.802	-5.666	0.008	102.802	-5.666	0	0	0	0.008	0.008
102.797	21.334	-0.001	102.797	21.334	0	0	0	-0.001	-0.001
-86.203	21.302	0.028	-86.203	21.302	0	0	0	0.028	0.028
-86.207	48.303	0.059	-86.207	48.303	0	0	0	0.059	0.059
102.793	48.334	0.038	102.793	48.334	0	0	0	0.038	0.038
102.788	75.334	-0.036	102.788	75.334	0	0	0	-0.036	-0.036
75.787	75.329	-0.004	75.787	75.329	0	0	0	-0.004	-0.004
48.788	75.324	0.012	48.788	75.324	0	0	0	0.012	0.012
21.788	75.32	0.01	21.788	75.32	0	0	0	0.01	0.01
-5.212	75.316	-0.001	-5.212	75.316	0	0	0	-0.001	-0.001
-32.212	75.311	-0.006	-32.212	75.311	0	0	0	-0.006	-0.006
-59.211	75.307	0.017	-59.211	75.307	0	0	0	0.017	0.017
-86.211	75.302	0.023	-86.211	75.302	0	0	0	0.023	0.023
18.679	30.113	-15.333	18.679	30.113	-15.333	0	0	0	0
18.621	-2.606	-15.32	18.678	-2.606	-15.318	-0.057	0	-0.002	-0.057
18.628	-35.325	-15.305	18.678	-35.325	-15.303	-0.05	0	-0.002	-0.05
18.899	-35.327	-21.284	18.887	-35.327	-21.284	0.012	0	0	0.012
18.916	-2.608	-21.297	18.887	-2.608	-21.298	0.029	0	0.001	0.029
18.939	30.111	-21.31	18.888	30.111	-21.312	0.051	0	0.002	0.051
19.154	30.107	-27.289	19.096	30.107	-27.291	0.058	0	0.002	0.058
19.123	-2.611	-27.276	19.096	-2.611	-27.277	0.027	0	0.001	0.027
19.106	-35.33	-27.261	19.095	-35.33	-27.262	0.011	0	0	0.011
10.262	-48.892	-12.891	10.262	-48.892	-12.812	0	0	-0.078	-0.078
0.735	-48.894	-12.949	0.735	-48.894	-12.812	0	0	-0.136	-0.136
-8.794	-48.896	-12.948	-8.794	-48.896	-12.812	0	0	-0.135	-0.135
-8.795	-37.222	-12.953	-8.795	-37.222	-12.812	0	0	-0.14	-0.14
0.734	-37.221	-12.93	0.734	-37.221	-12.812	0	0	-0.118	-0.118
10.261	-37.219	-12.933	10.261	-37.219	-12.812	0	0	-0.121	-0.121
10.259	-25.546	-12.878	10.259	-25.546	-12.812	0	0	-0.065	-0.065
0.73	-25.549	-12.897	0.73	-25.549	-12.812	0	0	-0.084	-0.084

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-8.797	-25.551	-12.928	-8.797	-25.551	-12.812	0	0	-0.115	-0.115
-56.439	-13.885	-12.921	-56.439	-13.885	-12.812	0	0	-0.109	-0.109
-46.91	-13.884	-12.935	-46.91	-13.884	-12.812	0	0	-0.122	-0.122
-37.381	-13.882	-12.926	-37.381	-13.882	-12.812	0	0	-0.114	-0.114
-27.854	-13.88	-13.101	-27.854	-13.88	-12.812	0	0	-0.288	-0.288
-18.326	-13.878	-12.9	-18.326	-13.878	-12.812	0	0	-0.088	-0.088
-8.798	-13.877	-12.938	-8.798	-13.877	-12.812	0	0	-0.125	-0.125
10.258	-13.874	-12.85	10.258	-13.874	-12.812	0	0	-0.037	-0.037
-56.44	-2.212	-12.934	-56.44	-2.212	-12.812	0	0	-0.122	-0.122
-18.33	9.467	-12.832	-18.33	9.467	-12.812	0	0	-0.019	-0.019
10.252	21.144	-12.875	10.252	21.144	-12.812	0	0	-0.063	-0.063
-18.333	21.139	-12.885	-18.333	21.139	-12.812	0	0	-0.072	-0.072
-18.334	32.812	-12.901	-18.334	32.812	-12.812	0	0	-0.089	-0.089
-8.805	32.813	-12.91	-8.805	32.813	-12.812	0	0	-0.097	-0.097
0.722	32.815	-12.924	0.722	32.815	-12.812	0	0	-0.111	-0.111
10.25	32.816	-12.884	10.25	32.816	-12.812	0	0	-0.072	-0.072
12.195	15.706	-12.867	12.195	15.706	-12.812	0	0	-0.055	-0.055
-10.786	13.598	-12.853	-10.786	13.598	-12.812	0	0	-0.04	-0.04
-13.298	23.509	-12.89	-13.298	23.509	-12.812	0	0	-0.078	-0.078
-1.445	17.208	-12.835	-1.445	17.208	-12.812	0	0	-0.022	-0.022
16.536	-1.627	-12.869	16.536	-1.627	-12.812	0	0	-0.057	-0.057
-50.405	59.509	-5.944	-50.405	59.584	-5.946	0	-0.075	0.003	0.075
-24.778	59.495	-5.944	-24.778	59.584	-5.947	0	-0.089	0.003	0.089
0.847	59.48	-5.944	0.847	59.584	-5.948	0	-0.104	0.004	0.104
26.473	59.5	-5.946	26.473	59.584	-5.949	0	-0.084	0.003	0.084
52.098	59.489	-5.947	52.098	59.584	-5.951	0	-0.095	0.003	0.095
52.095	59.227	-14.919	52.095	59.271	-14.92	0	-0.043	0.002	0.043
26.47	59.202	-14.916	26.47	59.271	-14.918	0	-0.069	0.002	0.069
0.845	59.211	-14.915	0.845	59.271	-14.917	0	-0.06	0.002	0.06
-24.78	59.212	-14.914	-24.78	59.271	-14.916	0	-0.059	0.002	0.059
-50.405	59.257	-14.915	-50.405	59.271	-14.915	0	-0.014	0	0.014
-50.404	58.913	-23.882	-50.404	58.958	-23.884	0	-0.045	0.002	0.045
-24.778	58.857	-23.881	-24.778	58.958	-23.885	0	-0.1	0.004	0.1
0.847	58.798	-23.881	0.847	58.958	-23.887	0	-0.159	0.006	0.159
26.471	58.892	-23.885	26.471	58.958	-23.887	0	-0.065	0.002	0.065
52.097	58.876	-23.884	52.097	58.958	-23.887	0	-0.082	0.003	0.082
80.781	37.587	-5.938	80.938	37.587	-5.943	-0.157	0	0.005	0.158
80.687	11.96	-5.922	80.939	11.96	-5.931	-0.252	0	0.009	0.252
80.653	-13.664	-5.909	80.939	-13.664	-5.919	-0.286	0	0.01	0.286
80.626	-39.29	-5.897	80.94	-39.29	-5.908	-0.314	0	0.011	0.314
80.6	-64.914	-5.885	80.94	-64.914	-5.896	-0.34	0	0.012	0.34
80.358	-64.918	-14.858	80.627	-64.918	-14.867	-0.269	0	0.009	0.269
80.35	-39.293	-14.868	80.626	-39.293	-14.878	-0.276	0	0.01	0.276
80.412	-13.666	-14.882	80.626	-13.666	-14.89	-0.214	0	0.007	0.214
80.422	11.959	-14.894	80.625	11.959	-14.901	-0.203	0	0.007	0.204
80.516	37.584	-14.908	80.625	37.584	-14.911	-0.109	0	0.004	0.109
80.023	37.579	-23.87	80.312	37.579	-23.88	-0.289	0	0.01	0.289

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
79.929	11.952	-23.855	80.312	11.952	-23.868	-0.383	0	0.013	0.384
79.871	-13.673	-23.841	80.313	-13.673	-23.857	-0.441	0	0.015	0.442
79.854	-39.297	-23.829	80.313	-39.297	-23.845	-0.46	0	0.016	0.46
79.828	-64.923	-23.817	80.314	-64.923	-23.834	-0.486	0	0.017	0.486
58.952	-93.487	-5.876	58.952	-93.753	-5.885	0	0.265	0.009	0.266
33.326	-93.448	-5.871	33.326	-93.753	-5.881	0	0.305	0.011	0.305
7.703	-93.408	-5.868	7.703	-93.753	-5.88	0	0.345	0.012	0.345
-17.924	-93.422	-5.867	-17.924	-93.753	-5.878	0	0.331	0.012	0.332
-43.548	-93.446	-5.867	-43.548	-93.753	-5.877	0	0.307	0.011	0.307
-43.548	-93.128	-14.837	-43.548	-93.44	-14.848	0	0.312	0.011	0.312
-17.922	-93.138	-14.839	-17.922	-93.44	-14.85	0	0.301	0.011	0.301
7.703	-93.104	-14.84	7.703	-93.44	-14.851	0	0.336	0.012	0.336
33.327	-93.158	-14.843	33.327	-93.44	-14.853	0	0.281	0.01	0.281
58.952	-93.216	-14.845	58.952	-93.44	-14.853	0	0.224	0.008	0.224
58.951	-92.796	-23.812	58.951	-93.126	-23.823	0	0.33	0.012	0.33
33.326	-92.743	-23.807	33.326	-93.127	-23.82	0	0.384	0.013	0.384
7.7	-92.731	-23.804	7.7	-93.127	-23.818	0	0.396	0.014	0.396
-17.925	-92.723	-23.803	-17.925	-93.127	-23.817	0	0.403	0.014	0.404
-43.55	-92.765	-23.804	-43.55	-93.127	-23.817	0	0.362	0.013	0.362
-72.196	-71.77	-5.882	-72.399	-71.77	-5.889	0.202	0	0.007	0.202
-72.191	-46.142	-5.892	-72.398	-46.142	-5.899	0.207	0	0.007	0.207
-72.161	-20.517	-5.901	-72.398	-20.517	-5.91	0.237	0	0.008	0.237
-72.178	5.106	-5.913	-72.397	5.106	-5.921	0.22	0	0.008	0.22
-72.249	30.732	-5.927	-72.397	30.732	-5.932	0.148	0	0.005	0.148
-71.927	30.728	-14.896	-72.084	30.728	-14.902	0.156	0	0.005	0.157
-71.88	5.101	-14.883	-72.084	5.101	-14.89	0.205	0	0.007	0.205
-71.897	-20.525	-14.872	-72.085	-20.525	-14.879	0.187	0	0.007	0.187
-71.907	-46.149	-14.861	-72.085	-46.149	-14.867	0.178	0	0.006	0.179
-71.914	-71.775	-14.851	-72.085	-71.775	-14.857	0.171	0	0.006	0.171
-71.609	-71.776	-23.82	-71.772	-71.776	-23.826	0.163	0	0.006	0.163
-71.618	-46.15	-23.832	-71.772	-46.15	-23.837	0.154	0	0.005	0.154
-71.564	-20.524	-23.84	-71.771	-20.524	-23.848	0.208	0	0.007	0.208
-71.567	5.097	-23.853	-71.771	5.097	-23.86	0.204	0	0.007	0.204
-71.616	30.725	-23.865	-71.771	30.725	-23.87	0.155	0	0.005	0.155
-65.152	6.87	-26.426	-65.254	6.87	-26.423	0.102	0	-0.004	-0.102
-65.205	-14.144	-26.415	-65.253	-14.144	-26.413	0.048	0	-0.002	-0.048
-64.803	-14.138	-16.166	-64.895	-14.138	-16.163	0.092	0	-0.003	-0.092
-64.772	6.875	-16.177	-64.896	6.875	-16.172	0.124	0	-0.004	-0.124
-62.693	-20.509	-15.311	-62.693	-20.608	-15.308	0	0.1	-0.003	-0.1
-62.692	-20.954	-26.412	-62.692	-20.996	-26.411	0	0.043	-0.001	-0.043
-47.518	-21.008	-26.41	-47.518	-20.996	-26.411	0	-0.012	0	0.012
-47.519	-20.564	-15.309	-47.519	-20.608	-15.307	0	0.044	-0.002	-0.044
-32.344	-20.59	-15.309	-32.344	-20.608	-15.309	0	0.018	-0.001	-0.018
-32.346	-21.01	-26.412	-32.346	-20.996	-26.413	0	-0.014	0	0.014
-17.17	-21.043	-26.411	-17.17	-20.996	-26.413	0	-0.047	0.002	0.047
-17.17	-20.548	-15.311	-17.17	-20.608	-15.309	0	0.061	-0.002	-0.061
-11.904	-26.009	-15.306	-11.907	-26.009	-15.306	0.003	0	0	-0.003

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-12.315	-26.013	-25.555	-12.265	-26.013	-25.557	-0.05	0	0.002	0.05
-12.313	-39.69	-25.549	-12.265	-39.69	-25.55	-0.048	0	0.002	0.048
-11.99	-39.684	-15.297	-11.907	-39.684	-15.3	-0.083	0	0.003	0.083
-11.955	-53.361	-15.293	-11.907	-53.361	-15.295	-0.048	0	0.002	0.048
-12.297	-53.367	-25.544	-12.265	-53.367	-25.545	-0.032	0	0.001	0.032
-9.341	-56.363	-16.154	-9.341	-56.513	-16.148	0	0.15	-0.005	-0.15
-9.34	-56.738	-25.548	-9.34	-56.841	-25.544	0	0.103	-0.004	-0.103
3.945	-56.76	-25.546	3.945	-56.841	-25.544	0	0.081	-0.003	-0.081
3.945	-56.404	-16.153	3.945	-56.513	-16.149	0	0.109	-0.004	-0.109
10.346	-52.249	-16.155	10.404	-52.285	-16.152	-0.058	0.036	-0.002	-0.068
10.465	-52.323	-20.852	10.543	-52.372	-20.849	-0.078	0.049	-0.003	-0.092
10.641	-52.436	-25.548	10.681	-52.461	-25.546	-0.04	0.025	-0.002	-0.047
16.817	-42.653	-25.55	16.822	-42.656	-25.55	-0.005	0.003	0	-0.006
16.643	-42.544	-20.854	16.683	-42.569	-20.852	-0.04	0.025	-0.002	-0.048
16.511	-42.459	-16.156	16.545	-42.481	-16.155	-0.034	0.021	-0.001	-0.04
12.773	37.503	-15.337	12.773	37.566	-15.335	0	-0.063	-0.001	-0.063
-2.172	37.484	-15.337	-2.172	37.566	-15.335	0	-0.082	-0.001	-0.082
-17.123	37.49	-15.336	-17.123	37.566	-15.334	0	-0.076	-0.001	-0.076
-17.122	37.623	-21.315	-17.122	37.67	-21.314	0	-0.047	-0.001	-0.047
-2.174	37.621	-21.315	-2.174	37.67	-21.314	0	-0.049	-0.001	-0.049
12.775	37.625	-21.315	12.775	37.67	-21.314	0	-0.045	-0.001	-0.045
12.774	37.728	-27.295	12.774	37.774	-27.294	0	-0.046	-0.001	-0.046
-2.173	37.725	-27.294	-2.173	37.774	-27.293	0	-0.049	-0.001	-0.049
-17.123	37.73	-27.292	-17.123	37.774	-27.291	0	-0.044	-0.001	-0.044
-20.642	34.593	-14.485	-20.689	34.593	-14.484	0.048	0	-0.001	-0.048
-20.651	22.464	-14.479	-20.689	22.464	-14.478	0.038	0	-0.001	-0.038
-20.653	10.336	-14.473	-20.689	10.336	-14.473	0.036	0	-0.001	-0.036
-20.733	10.335	-18.242	-20.755	10.335	-18.242	0.022	0	0	-0.022
-20.75	22.464	-18.247	-20.755	22.464	-18.247	0.005	0	0	-0.005
-20.764	34.592	-18.252	-20.755	34.592	-18.253	-0.009	0	0	0.009
-21.231	34.741	-21.699	-21.318	34.741	-21.676	0.088	0	-0.024	-0.091
-22.681	34.737	-27.34	-22.826	34.737	-27.301	0.145	0	-0.039	-0.15
-22.673	22.496	-27.335	-22.824	22.496	-27.295	0.151	0	-0.041	-0.157
-21.233	22.499	-21.69	-21.316	22.499	-21.668	0.083	0	-0.022	-0.086
-21.206	10.257	-21.693	-21.315	10.257	-21.664	0.109	0	-0.029	-0.113
44.757	1.917	-51.997	44.848	2.002	-51.913	-0.091	-0.085	-0.084	-0.15
48.689	5.627	-57.602	48.75	5.684	-57.438	-0.061	-0.058	-0.164	-0.185
52.244	8.982	-57.142	52.16	8.903	-56.999	0.084	0.079	-0.143	-0.184
55.013	11.603	-50.593	54.995	11.586	-50.584	0.018	0.017	-0.01	-0.027
57.231	13.7	-38.229	57.295	13.76	-38.245	-0.063	-0.06	0.016	0.089
62.572	2.549	-38.234	62.598	2.553	-38.239	-0.026	-0.003	0.005	0.027
59.485	2.145	-50.586	59.462	2.142	-50.578	0.023	0.003	-0.009	-0.025
55.698	1.654	-57.116	55.598	1.642	-56.991	0.1	0.013	-0.125	-0.161
50.863	1.031	-57.607	50.946	1.042	-57.442	-0.084	-0.011	-0.165	-0.186
45.439	0.337	-52.041	45.62	0.359	-51.917	-0.181	-0.022	-0.123	-0.22
45.137	-1.342	-52.033	45.279	-1.421	-51.923	-0.142	0.079	-0.11	-0.196
49.92	-3.962	-57.623	49.998	-4.004	-57.448	-0.078	0.043	-0.175	-0.196

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
54.23	-6.316	-57.142	54.115	-6.253	-56.98	0.116	-0.063	-0.162	-0.209
57.548	-8.126	-50.578	57.526	-8.114	-50.568	0.023	-0.012	-0.01	-0.028
60.218	-9.576	-38.214	60.303	-9.623	-38.232	-0.086	0.047	0.018	0.099
51.256	-18.054	-38.212	51.29	-18.126	-38.227	-0.034	0.073	0.015	0.082
49.947	-15.298	-50.575	49.934	-15.272	-50.564	0.013	-0.027	-0.011	-0.031
48.318	-11.868	-57.107	48.271	-11.769	-56.972	0.047	-0.1	-0.135	-0.174
46.225	-7.447	-57.626	46.263	-7.527	-57.452	-0.038	0.08	-0.174	-0.195
43.893	-2.515	-52.037	43.961	-2.66	-51.928	-0.069	0.146	-0.109	-0.194
42.19	-2.767	-52.014	42.166	-2.891	-51.929	0.023	0.124	-0.085	-0.152
41.187	-8.113	-57.597	41.174	-8.184	-57.454	0.013	0.071	-0.143	-0.16
40.289	-12.89	-57.086	40.307	-12.797	-56.969	-0.018	-0.094	-0.117	-0.151
39.592	-16.598	-50.557	39.591	-16.606	-50.561	0.002	0.008	0.003	0.009
39.022	-19.638	-38.213	39.008	-19.711	-38.227	0.014	0.073	0.014	0.075
40.924	19.926	-38.24	40.92	19.972	-38.249	0.004	-0.046	0.008	0.047
41.201	16.815	-50.589	41.201	16.818	-50.591	0	-0.003	0.001	0.003
41.54	13.025	-57.123	41.549	12.928	-57.002	-0.009	0.097	-0.121	-0.156
41.973	8.178	-57.582	41.967	8.254	-57.433	0.007	-0.076	-0.148	-0.167
42.463	2.709	-52.052	42.444	2.917	-51.911	0.019	-0.208	-0.141	-0.253
40.845	2.015	-52.04	40.718	2.152	-51.914	0.127	-0.137	-0.126	-0.225
37.147	6.04	-57.601	37.09	6.102	-57.437	0.057	-0.062	-0.164	-0.184
33.865	9.615	-57.097	33.919	9.557	-56.999	-0.054	0.059	-0.099	-0.127
31.289	12.43	-50.581	31.283	12.436	-50.584	0.005	-0.006	0.003	0.008
29.211	14.702	-38.226	29.147	14.771	-38.243	0.064	-0.07	0.017	0.096
23.098	3.468	-38.212	22.961	3.492	-38.237	0.136	-0.024	0.025	0.141
26.093	2.931	-50.571	26.075	2.934	-50.578	0.017	-0.003	0.007	0.019
29.821	2.263	-57.097	29.908	2.248	-56.989	-0.087	0.015	-0.108	-0.14
34.603	1.418	-57.59	34.528	1.431	-57.442	0.074	-0.013	-0.148	-0.166
39.952	0.473	-52.01	39.817	0.496	-51.918	0.135	-0.023	-0.093	-0.166
40.23	-1.296	-52.017	40.106	-1.361	-51.923	0.124	0.065	-0.094	-0.169
35.391	-3.801	-57.591	35.327	-3.834	-57.449	0.064	0.033	-0.142	-0.16
31.089	-6.029	-57.074	31.16	-5.992	-56.977	-0.071	-0.037	-0.097	-0.126
27.744	-7.753	-50.553	27.708	-7.771	-50.568	0.036	0.019	0.015	0.043
24.902	-9.22	-38.231	24.899	-9.221	-38.231	0.003	0.002	0.001	0.003
43.575	2.61	-52.03	43.631	2.779	-51.909	-0.056	-0.169	-0.12	-0.215
45.283	7.793	-57.593	45.308	7.871	-57.434	-0.026	-0.078	-0.159	-0.179
46.805	12.418	-57.124	46.774	12.326	-57.003	0.03	0.092	-0.121	-0.155
47.986	16.001	-50.574	47.998	16.036	-50.588	-0.011	-0.035	0.014	0.039
48.964	18.975	-38.234	48.987	19.043	-38.248	-0.023	-0.069	0.013	0.073
36.753	29.498	-27.288	36.822	29.567	-27.291	-0.069	-0.069	0.003	0.098
40.379	28.305	-27.288	40.318	28.366	-27.291	0.061	-0.061	0.003	0.086
48.907	36.836	-27.292	48.847	36.896	-27.295	0.06	-0.06	0.003	0.085
53.541	36.791	-27.289	53.649	36.9	-27.295	-0.109	-0.109	0.005	0.154
62.097	28.293	-27.288	62.176	28.373	-27.292	-0.079	-0.079	0.004	0.112
66.891	30.766	-27.292	66.884	30.773	-27.293	0.007	-0.007	0	0.011
65.65	36.654	-27.296	65.684	36.688	-27.294	-0.034	-0.034	-0.002	-0.048
54.759	47.514	-27.3	54.808	47.563	-27.298	-0.049	-0.049	-0.002	-0.069
47.693	47.542	-27.296	47.681	47.553	-27.295	0.011	-0.011	-0.001	-0.016

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
36.822	36.667	-27.294	36.809	36.68	-27.294	0.014	-0.014	-0.001	-0.019
38.709	30.852	-25.585	38.709	30.852	-25.625	0	0	0.04	0.04
63.782	30.856	-25.639	63.782	30.856	-25.625	0	0	-0.014	-0.014
51.242	47.471	-25.615	51.242	47.471	-25.625	0	0	0.01	0.01
68.325	46.968	-38.486	68.325	46.968	-38.437	0	0	-0.049	-0.049
72.343	46.97	-34.129	72.456	46.97	-34.133	-0.113	0	0.004	0.113
68.325	51.005	-34.133	68.325	51.102	-34.136	0	-0.097	0.003	0.097
64.242	46.972	-34.132	64.21	46.972	-34.133	0.032	0	0.001	0.032
68.326	42.862	-34.132	68.326	42.856	-34.132	0	0.006	0	0.006
68.336	-17.093	-34.221	68.336	-17.093	-34.167	0	0	-0.055	-0.055
68.336	-12.894	-31.545	68.336	-12.87	-31.546	0	-0.023	0.001	0.023
64.089	-17.09	-31.545	64.12	-17.09	-31.544	-0.031	0	-0.001	-0.031
68.336	-21.252	-31.541	68.336	-21.297	-31.542	0	0.044	0.002	0.044
72.333	-17.093	-31.536	72.547	-17.093	-31.543	-0.214	0	0.007	0.214
53.585	-52.271	-33.674	53.586	-52.277	-33.678	-0.001	0.006	0.003	0.007
53.149	-49.959	-37.87	53.14	-49.914	-37.843	0.009	-0.046	-0.027	-0.054
52.698	-47.565	-42.014	52.695	-47.552	-42.006	0.003	-0.014	-0.008	-0.016
52.252	-45.191	-46.171	52.252	-45.189	-46.17	0	-0.002	-0.001	-0.003
51.807	-42.845	-50.341	51.804	-42.829	-50.331	0.003	-0.017	-0.01	-0.02
49.973	-42.623	-50.348	49.984	-42.599	-50.332	-0.011	-0.024	-0.015	-0.03
48.945	-44.785	-46.183	48.953	-44.768	-46.172	-0.008	-0.017	-0.011	-0.022
47.908	-46.969	-42.024	47.921	-46.941	-42.006	-0.013	-0.028	-0.018	-0.036
46.872	-49.154	-37.869	46.892	-49.113	-37.843	-0.02	-0.041	-0.026	-0.053
45.845	-51.327	-33.705	45.864	-51.286	-33.679	-0.019	-0.041	-0.026	-0.052
40.109	-45.988	-33.737	40.192	-45.942	-33.682	-0.083	-0.046	-0.055	-0.11
42.22	-44.836	-37.904	42.304	-44.79	-37.849	-0.084	-0.046	-0.055	-0.111
44.344	-43.681	-42.06	44.416	-43.642	-42.013	-0.072	-0.039	-0.047	-0.095
46.478	-42.516	-46.209	46.527	-42.489	-46.178	-0.048	-0.027	-0.032	-0.064
48.59	-41.373	-50.374	48.64	-41.345	-50.341	-0.051	-0.028	-0.034	-0.067
48.246	-39.525	-50.367	48.283	-39.529	-50.345	-0.037	0.004	-0.021	-0.043
45.829	-39.206	-46.225	45.901	-39.215	-46.183	-0.072	0.009	-0.042	-0.083
43.402	-38.89	-42.08	43.514	-38.904	-42.015	-0.112	0.014	-0.065	-0.131
41.034	-38.581	-37.911	41.132	-38.593	-37.854	-0.098	0.012	-0.057	-0.114
38.612	-38.267	-33.769	38.748	-38.284	-33.689	-0.136	0.017	-0.079	-0.158
41.969	-31.129	-33.786	42.084	-31.237	-33.695	-0.114	0.108	-0.091	-0.182
43.739	-32.803	-37.932	43.83	-32.889	-37.859	-0.091	0.086	-0.072	-0.145
45.471	-34.44	-42.106	45.577	-34.54	-42.022	-0.106	0.1	-0.084	-0.169
47.25	-36.12	-46.247	47.326	-36.191	-46.187	-0.076	0.071	-0.06	-0.12
49.027	-37.8	-50.386	49.072	-37.842	-50.35	-0.045	0.042	-0.036	-0.072
50.91	-27.911	-35.044	50.913	-28.028	-34.977	-0.003	0.117	-0.068	-0.135
50.975	-30.13	-38.886	50.978	-30.245	-38.82	-0.003	0.116	-0.067	-0.134
51.038	-32.362	-42.726	51.041	-32.465	-42.666	-0.003	0.103	-0.06	-0.119
51.103	-34.59	-46.56	51.106	-34.682	-46.507	-0.003	0.092	-0.053	-0.106
51.168	-36.835	-50.387	51.17	-36.899	-50.35	-0.002	0.065	-0.037	-0.075
52.961	-37.374	-50.376	52.932	-37.415	-50.347	0.028	0.041	-0.029	-0.058
54.192	-35.537	-46.528	54.168	-35.572	-46.504	0.024	0.036	-0.025	-0.05
55.413	-33.715	-42.671	55.403	-33.73	-42.661	0.01	0.014	-0.01	-0.02

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
56.684	-31.826	-38.862	56.642	-31.889	-38.818	0.042	0.063	-0.044	-0.087
57.904	-30.002	-34.999	57.876	-30.042	-34.971	0.027	0.04	-0.028	-0.056
62.374	-35.728	-34.973	62.366	-35.731	-34.968	0.008	0.003	-0.005	-0.01
60.321	-36.497	-38.834	60.287	-36.51	-38.813	0.034	0.013	-0.021	-0.042
58.227	-37.291	-42.668	58.211	-37.297	-42.658	0.016	0.006	-0.01	-0.019
56.165	-38.064	-46.519	56.134	-38.076	-46.5	0.031	0.011	-0.019	-0.038
54.082	-38.85	-50.361	54.057	-38.859	-50.345	0.025	0.009	-0.016	-0.031
54.144	-40.688	-50.346	54.133	-40.685	-50.339	0.011	-0.003	-0.007	-0.014
56.288	-41.25	-46.497	56.281	-41.248	-46.492	0.007	-0.002	-0.004	-0.009
58.413	-41.818	-42.644	58.424	-41.821	-42.651	-0.01	0.003	0.006	0.012
60.595	-42.401	-38.824	60.567	-42.394	-38.808	0.028	-0.007	-0.017	-0.033
62.692	-42.958	-34.95	62.713	-42.964	-34.962	-0.021	0.006	0.013	0.025
58.78	-49.039	-34.95	58.791	-49.052	-34.96	-0.011	0.013	0.01	0.019
57.387	-47.35	-38.811	57.379	-47.34	-38.804	0.008	-0.01	-0.007	-0.015
55.966	-45.625	-42.645	55.968	-45.627	-42.647	-0.002	0.002	0.002	0.003
54.546	-43.907	-46.482	54.554	-43.918	-46.489	-0.008	0.01	0.008	0.015
53.148	-42.215	-50.34	53.141	-42.206	-50.333	0.007	-0.009	-0.007	-0.013
68.346	-81.157	-38.439	68.346	-81.157	-38.437	0	0	-0.002	-0.002
68.345	-85.131	-34.071	68.345	-85.271	-34.075	0	0.139	0.005	0.139
72.25	-81.156	-34.07	72.458	-81.156	-34.077	-0.208	0	0.007	0.208
68.346	-76.949	-34.081	68.346	-77.021	-34.078	0	0.072	-0.003	-0.072
64.163	-81.154	-34.08	64.209	-81.154	-34.078	-0.046	0	-0.002	-0.046
31.466	-71.162	-12.783	31.449	-71.176	-12.759	0.017	0.014	-0.024	-0.032
32.05	-75.09	-15.656	32.151	-75.407	-15.429	-0.101	0.316	-0.227	-0.402
32.864	-77.664	-20.164	32.944	-77.916	-19.96	-0.08	0.252	-0.204	-0.334
34.196	-81.86	-23.092	34.235	-81.985	-22.781	-0.04	0.125	-0.311	-0.338
35.298	-85.338	-25.902	35.396	-85.648	-25.737	-0.098	0.31	-0.166	-0.365
23.311	-84.987	-25.868	23.216	-85.228	-25.736	0.095	0.241	-0.132	-0.291
24.677	-81.542	-23.053	24.635	-81.649	-22.778	0.043	0.108	-0.275	-0.299
26.273	-77.506	-20.097	26.205	-77.681	-19.953	0.069	0.175	-0.145	-0.237
27.261	-75.017	-15.591	27.173	-75.239	-15.428	0.088	0.222	-0.164	-0.29
28.71	-71.359	-13.006	28.696	-71.394	-12.767	0.014	0.035	-0.239	-0.242
27.063	-69.925	-12.944	27.039	-69.939	-12.765	0.024	0.014	-0.179	-0.181
23.568	-71.875	-15.539	23.421	-71.957	-15.424	0.147	0.082	-0.115	-0.204
21.223	-73.185	-20.033	21.127	-73.239	-19.949	0.095	0.053	-0.084	-0.138
17.506	-75.265	-23.044	17.407	-75.32	-22.775	0.099	0.055	-0.27	-0.293
14.163	-77.127	-25.809	14.038	-77.197	-25.736	0.125	0.07	-0.073	-0.161
12.049	-65.179	-25.76	12.005	-65.171	-25.738	0.044	-0.008	-0.023	-0.05
15.884	-65.858	-22.953	15.81	-65.845	-22.772	0.075	-0.013	-0.181	-0.196
20.01	-66.588	-19.954	20.002	-66.587	-19.948	0.008	-0.001	-0.006	-0.01
22.638	-67.051	-15.458	22.589	-67.043	-15.423	0.049	-0.009	-0.034	-0.06
26.691	-67.769	-12.897	26.671	-67.766	-12.765	0.02	-0.004	-0.132	-0.134
28.295	-65.539	-12.679	28.358	-65.518	-12.755	-0.062	-0.021	0.076	0.1
25.06	-62.71	-15.427	25.057	-62.707	-15.424	0.003	-0.004	-0.003	-0.006
23.327	-60.7	-19.926	23.344	-60.72	-19.946	-0.017	0.02	0.02	0.032
20.608	-57.541	-22.932	20.564	-57.49	-22.773	0.044	-0.051	-0.16	-0.173
18.055	-54.582	-25.752	18.04	-54.565	-25.741	0.015	-0.017	-0.011	-0.025



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
31.05	-50.278	-25.638	31.051	-50.261	-25.625	-0.001	-0.017	-0.013	-0.021
39.957	-53.377	-25.537	39.971	-53.355	-25.522	-0.015	-0.022	-0.015	-0.03
46.024	-60.535	-25.601	46.147	-60.475	-25.522	-0.123	-0.06	-0.079	-0.158
47.688	-69.714	-25.64	47.893	-69.73	-25.522	-0.205	0.016	-0.118	-0.237
44.543	-78.463	-25.659	44.742	-78.601	-25.52	-0.198	0.137	-0.139	-0.278
41.426	-76.312	-22.999	41.528	-76.382	-22.705	-0.101	0.07	-0.294	-0.319
43.909	-69.421	-22.918	43.998	-69.428	-22.705	-0.089	0.007	-0.213	-0.231
42.547	-62.216	-22.91	42.625	-62.179	-22.703	-0.078	-0.038	-0.207	-0.225
37.751	-56.657	-22.845	37.785	-56.607	-22.7	-0.034	-0.05	-0.145	-0.157
30.795	-54.28	-22.805	30.798	-54.235	-22.698	-0.003	-0.045	-0.107	-0.117
30.538	-58.359	-19.83	30.536	-58.383	-19.848	0.002	0.024	0.018	0.03
35.439	-60.105	-19.895	35.469	-60.06	-19.855	-0.03	-0.045	-0.04	-0.067
38.745	-64.056	-19.97	38.88	-63.991	-19.858	-0.135	-0.065	-0.112	-0.186
39.665	-69.094	-19.997	39.846	-69.108	-19.861	-0.182	0.014	-0.136	-0.227
37.884	-73.858	-20.057	38.103	-74.009	-19.859	-0.219	0.151	-0.199	-0.332
35.728	-72.366	-15.589	35.975	-72.536	-15.38	-0.247	0.171	-0.208	-0.365
37.034	-68.889	-15.541	37.264	-68.907	-15.38	-0.23	0.018	-0.16	-0.281
36.395	-65.196	-15.499	36.551	-65.121	-15.379	-0.155	-0.075	-0.12	-0.21
33.992	-62.254	-15.419	34.025	-62.206	-15.378	-0.033	-0.049	-0.041	-0.072
30.375	-60.921	-15.349	30.372	-60.961	-15.377	0.003	0.04	0.028	0.049
30.113	-65.079	-12.898	30.115	-65.059	-12.766	-0.001	-0.021	-0.132	-0.133
31.724	-65.635	-12.944	31.74	-65.612	-12.767	-0.016	-0.023	-0.177	-0.179
32.843	-66.916	-12.907	32.863	-66.906	-12.768	-0.02	-0.01	-0.139	-0.141
33.156	-68.59	-12.929	33.182	-68.592	-12.768	-0.025	0.002	-0.161	-0.163
32.576	-70.185	-13.008	32.607	-70.207	-12.768	-0.031	0.022	-0.24	-0.243
-39.193	-53.976	-33.508	-39.175	-54.008	-33.519	-0.018	0.032	0.012	0.039
-50.276	-55.494	-33.465	-50.309	-55.656	-33.517	0.034	0.162	0.052	0.174
-59.735	-49.59	-33.477	-59.855	-49.683	-33.525	0.12	0.093	0.048	0.16
-63.125	-38.942	-33.496	-63.242	-38.936	-33.534	0.117	-0.006	0.037	0.123
-58.817	-28.565	-33.54	-58.829	-28.554	-33.545	0.012	-0.012	0.005	0.018
-57.496	-29.811	-37.586	-57.461	-29.843	-37.555	-0.035	0.033	-0.03	-0.056
-61.374	-39.033	-37.547	-61.369	-39.034	-37.544	-0.006	0	-0.004	-0.007
-58.352	-48.527	-37.516	-58.372	-48.542	-37.532	0.02	0.015	0.016	0.03
-49.923	-53.814	-37.511	-49.926	-53.829	-37.521	0.003	0.015	0.01	0.019
-40.052	-52.394	-37.541	-40.066	-52.368	-37.522	0.014	-0.026	-0.019	-0.035
-41.379	-49.962	-41.026	-41.427	-49.877	-40.92	0.048	-0.085	-0.106	-0.145
-49.358	-51.117	-40.991	-49.344	-51.052	-40.919	-0.014	-0.065	-0.072	-0.099
-56.16	-46.832	-40.974	-56.125	-46.806	-40.926	-0.034	-0.027	-0.047	-0.064
-58.607	-39.17	-41.026	-58.527	-39.174	-40.939	-0.08	0.004	-0.087	-0.119
-55.479	-31.72	-41.087	-55.389	-31.804	-40.953	-0.09	0.084	-0.134	-0.182
-52.824	-34.228	-43.687	-52.752	-34.295	-43.499	-0.072	0.067	-0.188	-0.212
-54.958	-39.353	-43.589	-54.906	-39.355	-43.49	-0.052	0.002	-0.1	-0.112
-53.313	-44.641	-43.618	-53.256	-44.597	-43.481	-0.057	-0.044	-0.138	-0.155
-48.616	-47.587	-43.616	-48.601	-47.513	-43.473	-0.015	-0.074	-0.143	-0.162
-43.115	-46.784	-43.643	-43.159	-46.706	-43.473	0.045	-0.078	-0.171	-0.193
-45.138	-43.08	-45.112	-45.151	-43.061	-45.013	0.012	-0.019	-0.099	-0.102
-47.751	-43.456	-45.045	-47.749	-43.449	-45.013	-0.001	-0.007	-0.032	-0.033



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-49.973	-42.064	-45.053	-49.967	-42.059	-45.017	-0.007	-0.005	-0.036	-0.037
-50.76	-39.561	-45.062	-50.751	-39.561	-45.022	-0.009	0	-0.04	-0.041
-49.739	-37.144	-45.095	-49.727	-37.154	-45.027	-0.011	0.01	-0.068	-0.07
-53.855	-25.026	-33.53	-53.88	-24.972	-33.549	0.025	-0.053	0.019	0.062
-43.372	-23.824	-33.554	-43.376	-23.841	-33.549	0.004	0.017	-0.006	-0.019
-34.324	-29.335	-33.572	-34.392	-29.391	-33.544	0.068	0.056	-0.028	-0.093
-30.649	-39.274	-33.551	-30.704	-39.275	-33.534	0.054	0.001	-0.017	-0.057
-33.849	-49.327	-33.521	-33.84	-49.334	-33.525	-0.009	0.007	0.004	0.012
-35.259	-48.298	-37.601	-35.35	-48.231	-37.529	0.092	-0.067	-0.072	-0.134
-32.368	-39.323	-37.672	-32.576	-39.329	-37.54	0.208	0.006	-0.133	-0.247
-35.687	-30.453	-37.681	-35.844	-30.582	-37.551	0.157	0.129	-0.129	-0.241
-43.763	-25.531	-37.649	-43.795	-25.673	-37.556	0.032	0.142	-0.093	-0.173
-53.124	-26.586	-37.62	-53.082	-26.675	-37.558	-0.042	0.089	-0.063	-0.116
-51.93	-29.137	-41.101	-51.873	-29.259	-40.954	-0.057	0.122	-0.147	-0.199
-44.386	-28.305	-41.125	-44.42	-28.457	-40.954	0.035	0.152	-0.171	-0.231
-37.919	-32.292	-41.12	-38.042	-32.393	-40.946	0.123	0.101	-0.174	-0.236
-35.25	-39.408	-41.115	-35.417	-39.412	-40.934	0.167	0.004	-0.182	-0.247
-37.565	-46.621	-41.031	-37.645	-46.562	-40.924	0.08	-0.059	-0.108	-0.146
-40.474	-44.495	-43.689	-40.565	-44.429	-43.476	0.091	-0.067	-0.213	-0.241
-38.908	-39.514	-43.736	-39.04	-39.518	-43.486	0.131	0.003	-0.25	-0.283
-40.741	-34.619	-43.743	-40.841	-34.701	-43.495	0.101	0.082	-0.248	-0.28
-45.197	-31.892	-43.705	-45.221	-31.997	-43.5	0.024	0.104	-0.205	-0.231
-50.813	-32.773	-43.565	-50.767	-32.781	-43.508	-0.047	0.008	-0.057	-0.074
-48.79	-36.426	-45.086	-48.773	-36.431	-45.03	-0.018	0.005	-0.056	-0.059
-46.133	-36.038	-45.144	-46.139	-36.063	-45.029	0.006	0.025	-0.115	-0.118
-44.031	-37.325	-45.157	-44.054	-37.344	-45.024	0.023	0.019	-0.133	-0.136
-43.19	-39.641	-45.046	-43.195	-39.641	-45.02	0.006	0	-0.026	-0.026
-43.9	-41.997	-45.145	-43.923	-41.98	-45.015	0.024	-0.018	-0.13	-0.133
-23.514	-39.951	-26.836	-23.514	-40.039	-26.833	0	0.088	-0.003	-0.088
-26.179	-37.921	-24.117	-26.095	-37.977	-23.917	-0.084	0.056	-0.2	-0.224
-21.552	-31.276	-23.837	-21.604	-31.241	-23.917	0.052	-0.035	0.08	0.101
-19.242	-33.76	-26.831	-19.357	-33.76	-26.835	0.115	0	0.004	0.115
-21.294	-30.617	-26.836	-21.306	-30.609	-26.836	0.012	-0.008	0	-0.014
-26.41	-38.31	-26.834	-26.43	-38.297	-26.833	0.02	-0.013	-0.001	-0.024
-52.353	42.827	-34.127	-52.353	42.856	-34.126	0	-0.03	-0.001	-0.03
-41.922	42.862	-34.126	-41.922	42.856	-34.126	0	0.006	0	0.006
-38.529	46.952	-34.13	-38.585	46.952	-34.128	0.057	0	-0.002	-0.057
-43.572	50.962	-34.125	-43.572	51.102	-34.13	0	-0.14	0.005	0.14
-58.947	51.062	-34.129	-58.947	51.102	-34.13	0	-0.04	0.001	0.04
-63.713	46.094	-34.119	-63.915	46.094	-34.126	0.202	0	0.007	0.202
-63.702	30.719	-34.113	-63.915	30.719	-34.12	0.213	0	0.007	0.213
-59.796	25.897	-34.113	-59.796	25.772	-34.117	0	0.125	0.004	0.125
-55.606	29.071	-34.122	-55.668	29.071	-34.119	0.062	0	-0.002	-0.062
-55.58	39.5	-34.127	-55.668	39.5	-34.124	0.088	0	-0.003	-0.088
-58.764	29.645	-38.541	-58.764	29.645	-38.437	0	0	-0.104	-0.104
-58.767	45.915	-38.538	-58.767	45.915	-38.437	0	0	-0.1	-0.1
-42.497	45.917	-38.44	-42.497	45.917	-38.437	0	0	-0.003	-0.003

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-0.008	46.959	-34.174		-0.008	46.959	-34.167		0	0	-0.007		-0.007
4.23	46.959	-31.569		4.212	46.959	-31.569		0.017	0	-0.001		-0.017
-0.01	42.727	-31.568		-0.01	42.767	-31.566		0	-0.04	-0.001		-0.04
-4.088	46.96	-31.563		-4.212	46.96	-31.568		0.124	0	0.004		0.124
-0.007	51.049	-31.565		-0.007	51.192	-31.57		0	-0.142	0.005		0.142
23.665	47.211	-43.338		23.665	47.364	-43.25		0	-0.153	-0.089		-0.177
30.072	47.214	-43.335		30.072	47.364	-43.249		0	-0.149	-0.086		-0.172
30.073	41.13	-32.826		30.073	41.292	-32.733		0	-0.162	-0.094		-0.187
23.666	41.143	-32.818		23.666	41.292	-32.732		0	-0.149	-0.086		-0.172
21.33	45.159	-33.682		21.244	45.159	-33.685		0.085	0	0.003		0.085
19.073	47.882	-39.077		19.073	48.022	-39.039		0	-0.141	-0.038		-0.146
11.659	47.887	-39.074		11.659	48.022	-39.038		0	-0.134	-0.036		-0.139
11.661	45.698	-30.848		11.661	45.819	-30.816		0	-0.12	-0.032		-0.125
19.075	45.648	-30.862		19.075	45.819	-30.817		0	-0.17	-0.046		-0.176
8.589	50.885	-33.681		8.432	50.885	-33.687		0.157	0	0.005		0.157
30.072	54.783	-33.691		30.072	54.804	-33.696		0	-0.021	0.006		0.021
30.073	52.476	-42.298		30.073	52.497	-42.304		0	-0.022	0.006		0.023
14.696	54.75	-33.681		14.696	54.804	-33.695		0	-0.054	0.014		0.056
-1.317	28.078	-25.261		-1.317	28.104	-25.269		0	-0.026	0.008		0.027
-1.318	30.787	-16.414		-1.318	30.763	-16.406		0	0.025	-0.007		-0.026
-6.442	30.783	-16.412		-6.442	30.763	-16.406		0	0.02	-0.006		-0.021
-6.622	24.456	-23.147		-6.581	24.456	-23.13		-0.041	0	-0.016		-0.044
-9.743	24.459	-15.349		-9.701	24.459	-15.332		-0.043	0	-0.017		-0.046
-9.755	27.985	-15.357		-9.7	27.985	-15.334		-0.055	0	-0.022		-0.059
-5.586	19.873	-15.997		-5.586	19.974	-15.967		0	-0.101	-0.03		-0.105
-0.89	22.203	-23.798		-0.89	22.314	-23.764		0	-0.111	-0.033		-0.116
-0.889	19.891	-15.992		-0.889	19.974	-15.967		0	-0.083	-0.025		-0.087
1.505	4.613	-8.655		1.466	4.613	-8.542		0.039	0	-0.114		-0.12
5.788	0.171	-8.722		5.737	0.171	-8.542		0.051	0	-0.18		-0.188
1.185	0.171	-8.538		1.185	0.171	-8.542		0	0	0.003		0.003
-3.146	0.171	-8.566		-3.146	0.171	-8.542		0	0	-0.025		-0.025
1.5	-4.271	-8.643		1.466	-4.271	-8.542		0.034	0	-0.102		-0.107
9.814	3.178	-18.736		9.76	3.16	-18.737		0.055	0.018	0.001		0.057
6.062	8.335	-18.739		6.034	8.297	-18.739		0.028	0.039	0.001		0.048
-0.002	10.311	-18.738		-0.002	10.259	-18.739		0	0.052	0.001		0.052
-6.062	8.326	-18.738		-6.039	8.293	-18.739		-0.024	0.033	0.001		0.04
-9.763	3.157	-18.737		-9.761	3.156	-18.737		-0.002	0.001	0		0.002
-8.364	-5.98	-18.732		-8.345	-5.966	-18.732		-0.019	-0.014	0		0.024
-2.638	-9.934	-18.73		-2.633	-9.915	-18.73		-0.005	-0.019	0		0.02
4.329	-9.443	-18.73		4.275	-9.325	-18.732		0.054	-0.118	0.002		0.129
9.302	-4.5	-18.733		9.235	-4.468	-18.734		0.068	-0.033	0.001		0.075
13.064	-7.892	-18.73		13.153	-7.946	-18.732		-0.089	0.054	0.002		0.104
14.846	3.434	-18.729		14.971	3.464	-18.731		-0.125	-0.029	0.002		0.129
8.22	12.775	-18.73		8.315	12.922	-18.733		-0.095	-0.147	0.003		0.175
-3.021	14.93	-18.732		-3.047	15.061	-18.734		0.027	-0.131	0.002		0.134
-12.553	8.577	-18.728		-12.687	8.669	-18.731		0.135	-0.092	0.003		0.163
8.57	-20.314	-18.724		8.718	-20.314	-18.727		-0.148	0	0.003		0.148

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
8.592	-32.117	-18.714	8.718	-32.117	-18.716	-0.126	0	0.002	0.126
8.601	-43.919	-18.708	8.718	-43.919	-18.71	-0.118	0	0.002	0.118
6.17	-51.519	-18.704	6.17	-51.669	-18.706	0	0.15	0.003	0.15
3.616	-44.307	-18.711	3.61	-44.307	-18.711	0.006	0	0	0.006
3.642	-33.094	-18.713	3.61	-33.094	-18.713	0.032	0	0.001	0.032
3.739	-21.881	-18.717	3.61	-21.881	-18.719	0.129	0	0.002	0.129
-5.787	-51.504	-18.709	-5.787	-51.669	-18.712	0	0.165	0.003	0.165
-16.131	-3.918	-21.295	-16.131	-3.942	-21.295	0	0.024	0	0.024
-17.297	-8.228	-16.51	-17.332	-8.228	-16.509	0.035	0	-0.001	-0.035
-18.974	-12.485	-16.502	-18.974	-12.567	-16.504	0	0.083	0.001	0.083
-22.822	-8.134	-22.147	-22.822	-8.198	-22.148	0	0.064	0.001	0.064
-51.196	-3.838	-21.292	-51.196	-3.942	-21.294	0	0.104	0.002	0.104
-41.322	-3.862	-21.291	-41.322	-3.942	-21.292	0	0.08	0.001	0.08
-31.45	-3.9	-21.292	-31.45	-3.942	-21.293	0	0.042	0.001	0.042
-55.002	-2.269	-21.283	-55.277	-2.269	-21.287	0.275	0	0.005	0.275
-55.895	0.595	-19.148	-56.102	0.529	-19.151	0.207	0.066	0.004	0.217
-53.321	3.925	-19.154	-53.329	3.955	-19.154	0.009	-0.03	0.001	0.032
-53.469	5.903	-19.16	-53.5	5.784	-19.162	0.031	0.119	0.002	0.123
-57.026	9.098	-19.153	-57.256	9.098	-19.157	0.23	0	0.004	0.23
-41.405	11.922	-27.862	-41.405	11.896	-27.888	0	0.027	0.027	0.038
-56.137	11.651	-27.174	-56.137	11.591	-27.175	0	0.059	0.001	0.059
-61.048	11.661	-27.167	-61.048	11.591	-27.168	0	0.07	0.001	0.07
-61.044	11.575	-20.756	-61.044	11.479	-20.758	0	0.096	0.002	0.096
-61.045	11.414	-14.349	-61.045	11.367	-14.35	0	0.047	0.001	0.047
-52.773	10.165	-25.635	-52.773	10.165	-25.625	0	0	-0.01	-0.01
-35.287	10.167	-25.672	-35.287	10.167	-25.625	0	0	-0.047	-0.047
-17.801	4.673	-25.567	-17.801	4.673	-25.625	0	0	0.058	0.058
-35.288	4.67	-25.611	-35.288	4.67	-25.625	0	0	0.014	0.014
-52.771	-0.829	-25.623	-52.771	-0.829	-25.625	0	0	0.002	0.002
-35.286	-0.827	-25.618	-35.286	-0.827	-25.625	0	0	0.007	0.007
-17.8	-0.823	-25.597	-17.8	-0.823	-25.625	0	0	0.028	0.028
-27.064	-5.124	-27.783	-27.256	-5.124	-27.787	0.193	0	0.003	0.193
-27.299	-5.119	-16.498	-27.453	-5.119	-16.501	0.154	0	0.003	0.154
-49.675	13.535	-28.856	-49.675	13.646	-28.664	0	-0.111	-0.192	-0.221
-17.904	7.242	-19.162	-17.904	7.33	-19.164	0	-0.088	0.002	0.089
-9.234	-76.901	-48.982	-9.201	-76.901	-48.963	-0.033	0	-0.019	-0.038
-17.544	-76.899	-34.645	-17.487	-76.899	-34.612	-0.057	0	-0.033	-0.066
-17.54	-84.587	-34.645	-17.486	-84.587	-34.614	-0.054	0	-0.031	-0.062
-9.232	-84.59	-48.979	-9.202	-84.59	-48.962	-0.03	0	-0.017	-0.035
-4.028	-86.661	-34.558	-4.028	-86.962	-34.568	0	0.301	0.011	0.301
-3.065	-66.653	-41.799	-3.181	-66.653	-41.768	0.116	0	-0.031	-0.12
-1.209	-66.647	-34.607	-1.259	-66.647	-34.594	0.05	0	-0.013	-0.052
-1.216	-74.337	-34.606	-1.259	-74.337	-34.594	0.043	0	-0.012	-0.045
-3.118	-74.341	-41.785	-3.181	-74.341	-41.768	0.063	0	-0.017	-0.065
-5.043	-82.031	-48.951	-5.101	-82.031	-48.935	0.059	0	-0.016	-0.061
-3.116	-82.025	-41.777	-3.179	-82.025	-41.76	0.063	0	-0.017	-0.066
-1.249	-82.022	-34.589	-1.257	-82.022	-34.587	0.008	0	-0.002	-0.009

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-6.397	-61.552	-34.598	-6.397	-61.664	-34.594	0	0.112	-0.004	-0.112
-5.078	5.065	-12.853	-5.078	5.065	-12.812	0	0	-0.04	-0.04
6.093	5.068	-12.837	6.093	5.068	-12.812	0	0	-0.024	-0.024
6.094	-6.103	-12.839	6.094	-6.103	-12.812	0	0	-0.027	-0.027
-5.077	-6.105	-12.847	-5.077	-6.105	-12.812	0	0	-0.035	-0.035
-71.382	-88.481	-8.86	-71.656	-88.595	-8.87	0.274	0.115	0.01	0.297
-66.519	-93.059	-2.875	-66.645	-93.453	-2.889	0.126	0.393	0.014	0.413
-67.218	58.822	-5.941	-67.268	58.943	-5.945	0.05	-0.121	0.005	0.131
-71.869	53.761	-2.944	-72.096	53.834	-2.953	0.227	-0.073	0.008	0.238
80.123	54.374	-5.943	80.3	54.448	-5.95	-0.177	-0.074	0.007	0.192
75.153	59.138	-2.957	75.199	59.279	-2.962	-0.046	-0.141	0.005	0.149
75.671	-92.774	-5.873	75.811	-93.111	-5.886	-0.141	0.337	0.013	0.366
80.238	-87.882	-2.884	80.636	-88.01	-2.898	-0.398	0.129	0.015	0.419
-63.548	-42.86	-31.367	-63.572	-42.865	-31.379	0.024	0.005	0.011	0.027
-54.863	-56.402	-30.218	-54.836	-56.345	-30.031	-0.027	-0.057	-0.187	-0.198
64.557	-64.183	-29.951	64.557	-64.183	-29.896	0	0	-0.055	-0.055
-28.364	-28.354	-29.913	-28.364	-28.354	-29.896	0	0	-0.018	-0.018
-28.364	-28.354	-29.913	-28.364	-28.354	-29.896	0	0	-0.018	-0.018
-64.338	-61.136	-29.984	-64.338	-61.136	-29.896	0	0	-0.088	-0.088
-33.242	-78.335	-29.985	-33.242	-78.335	-29.896	0	0	-0.09	-0.09
55.161	-74.092	-29.969	55.161	-74.092	-29.896	0	0	-0.073	-0.073
68.55	-54.667	-29.962	68.55	-54.667	-29.896	0	0	-0.066	-0.066
26.454	-28.675	-29.895	26.454	-28.675	-29.896	0	0	0.001	0.001
60.332	-19.725	-29.849	60.332	-19.725	-29.896	0	0	0.047	0.047
72.258	13.602	-29.961	72.258	13.602	-29.896	0	0	-0.065	-0.065
51.56	33.277	-29.906	51.56	33.277	-29.896	0	0	-0.01	-0.01
-23.45	53.113	-29.926	-23.45	53.113	-29.896	0	0	-0.03	-0.03
-48.061	36.216	-29.957	-48.061	36.216	-29.896	0	0	-0.061	-0.061
-29.005	19.369	-29.956	-29.005	19.369	-29.896	0	0	-0.061	-0.061
-38.517	4.412	-25.593	-38.517	4.412	-25.625	0	0	0.032	0.032
-17.449	1.906	-25.56	-17.449	1.906	-25.625	0	0	0.065	0.065
-62.642	10.045	-12.894	-62.642	10.045	-12.812	0	0	-0.081	-0.081
-61.944	-8.377	-12.916	-61.944	-8.377	-12.812	0	0	-0.103	-0.103
-40.593	-9.305	-12.934	-40.593	-9.305	-12.812	0	0	-0.122	-0.122
14.381	-38.723	-12.899	14.381	-38.723	-12.812	0	0	-0.087	-0.087
12.902	33.219	-12.873	12.902	33.219	-12.812	0	0	-0.06	-0.06
-39.432	23.909	-29.976	-39.432	23.909	-29.896	0	0	-0.081	-0.081
-61.015	19.545	-29.949	-61.015	19.545	-29.896	0	0	-0.053	-0.053
-26.424	-42.913	-29.908	-26.424	-42.913	-29.896	0	0	-0.012	-0.012
-48.712	-66.916	-29.98	-48.712	-66.916	-29.896	0	0	-0.084	-0.084
-29.558	-65.363	-29.985	-29.558	-65.363	-29.896	0	0	-0.089	-0.089
-61.167	-83.547	-29.989	-61.167	-83.547	-29.896	0	0	-0.093	-0.093
-52.894	-69.068	-29.947	-52.894	-69.068	-29.896	0	0	-0.051	-0.051
-27.449	-85.92	-30.001	-27.449	-85.92	-29.896	0	0	-0.105	-0.105
-22.956	-46.235	-29.886	-22.956	-46.235	-29.896	0	0	0.01	0.01
-23.215	-68.534	-29.968	-23.215	-68.534	-29.896	0	0	-0.072	-0.072
6.158	-83.744	-29.887	6.158	-83.744	-29.896	0	0	0.009	0.009

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
6.217	-65.402	-29.955	6.217	-65.402	-29.896	0	0	-0.059	-0.059
54.255	-63.38	-29.967	54.255	-63.38	-29.896	0	0	-0.071	-0.071
67.808	-60.351	-29.954	67.808	-60.351	-29.896	0	0	-0.059	-0.059
60.543	-66.595	-29.943	60.543	-66.595	-29.896	0	0	-0.047	-0.047
71.262	-51.973	-29.973	71.262	-51.973	-29.896	0	0	-0.077	-0.077
74.294	-40.595	-29.973	74.294	-40.595	-29.896	0	0	-0.077	-0.077
66.947	-25.9	-29.967	66.947	-25.9	-29.896	0	0	-0.071	-0.071
74.323	-6.652	-29.961	74.323	-6.652	-29.896	0	0	-0.065	-0.065
66.669	11.231	-29.931	66.669	11.231	-29.896	0	0	-0.035	-0.035
74.042	27.452	-29.91	74.042	27.452	-29.896	0	0	-0.014	-0.014
75.207	46.424	-29.833	75.207	46.424	-29.896	0	0	0.063	0.063
55.807	54.415	-29.876	55.807	54.415	-29.896	0	0	0.02	0.02
38.827	54.479	-29.87	38.827	54.479	-29.896	0	0	0.026	0.026
38.791	46.721	-29.849	38.791	46.721	-29.896	0	0	0.047	0.047
16.647	42.639	-29.821	16.647	42.639	-29.896	0	0	0.075	0.075
4.398	55.118	-29.854	4.398	55.118	-29.896	0	0	0.042	0.042
-16.752	54.582	-29.893	-16.752	54.582	-29.896	0	0	0.003	0.003
-19.928	43.813	-29.884	-19.928	43.813	-29.896	0	0	0.012	0.012
-33.213	40.474	-29.931	-33.213	40.474	-29.896	0	0	-0.035	-0.035
-37.834	32.894	-29.949	-37.834	32.894	-29.896	0	0	-0.053	-0.053
-48.891	21.082	-29.99	-48.891	21.082	-29.896	0	0	-0.094	-0.094
-59.67	-5.834	-12.922	-59.67	-5.834	-12.812	0	0	-0.109	-0.109
-60.357	2.971	-12.903	-60.357	2.971	-12.812	0	0	-0.09	-0.09
-51.786	-11.832	-12.94	-51.786	-11.832	-12.812	0	0	-0.127	-0.127
-30.544	-9.745	-12.924	-30.544	-9.745	-12.812	0	0	-0.111	-0.111
-22.248	-11.219	-12.863	-22.248	-11.219	-12.812	0	0	-0.05	-0.05
-14.359	-11.34	-12.858	-14.359	-11.34	-12.812	0	0	-0.046	-0.046
-10.302	-22.309	-12.9	-10.302	-22.309	-12.812	0	0	-0.088	-0.088
-10.842	-33.073	-12.963	-10.842	-33.073	-12.812	0	0	-0.151	-0.151
-10.271	-42.926	-12.938	-10.271	-42.926	-12.812	0	0	-0.125	-0.125
-2.072	-43.034	-12.95	-2.072	-43.034	-12.812	0	0	-0.137	-0.137
-0.423	-30.288	-12.913	-0.423	-30.288	-12.812	0	0	-0.1	-0.1
-2.472	-18.03	-12.833	-2.472	-18.03	-12.812	0	0	-0.02	-0.02
13.101	-21.007	-12.873	13.101	-21.007	-12.812	0	0	-0.061	-0.061
16.802	-27.336	-12.947	16.802	-27.336	-12.812	0	0	-0.135	-0.135
16.023	-15.48	-12.912	16.023	-15.48	-12.812	0	0	-0.099	-0.099
14.146	24.343	-12.868	14.146	24.343	-12.812	0	0	-0.055	-0.055
18.697	21.927	-16.014	18.703	21.927	-16.014	-0.006	0	0	-0.006
18.81	9.325	-18.771	18.799	9.325	-18.771	0.011	0	0	0.011
18.84	-13.709	-20.085	18.845	-13.709	-20.085	-0.005	0	0	-0.005
18.72	-25.802	-16.486	18.719	-25.802	-16.486	0.001	0	0	0.001
13.139	-47.895	-17.498	13.189	-47.926	-17.496	-0.051	0.032	-0.002	-0.06
-5.563	-56.447	-16.95	-5.563	-56.541	-16.947	0	0.093	-0.003	-0.093
1.979	-56.675	-23.687	1.979	-56.776	-23.684	0	0.1	-0.004	-0.101
-12.214	-45.187	-22.595	-12.162	-45.187	-22.597	-0.052	0	0.002	0.052
-12.023	-36.347	-17.727	-11.992	-36.347	-17.728	-0.032	0	0.001	0.032
-20.736	-20.728	-19.289	-20.736	-20.747	-19.289	0	0.02	-0.001	-0.02

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-40.706	-20.788	-20.334	-40.706	-20.784	-20.334	0	-0.004	0	0.004
-59.04	-20.896	-24.747	-59.04	-20.938	-24.746	0	0.042	-0.001	-0.042
-61.108	-78.147	-30.021	-61.108	-78.147	-29.896	0	0	-0.126	-0.126
-44.982	-78.18	-30.007	-44.982	-78.18	-29.896	0	0	-0.112	-0.112
60.174	-61.05	-29.928	60.174	-61.05	-29.896	0	0	-0.033	-0.033
58.971	-20.607	-29.888	58.971	-20.607	-29.896	0	0	0.008	0.008
49.077	-23.044	-29.917	49.077	-23.044	-29.896	0	0	-0.021	-0.021
30.285	-23.969	-29.994	30.285	-23.969	-29.896	0	0	-0.098	-0.098
26.815	21.876	-29.936	26.815	21.876	-29.896	0	0	-0.04	-0.04
43.18	34.156	-25.593	43.18	34.156	-25.625	0	0	0.032	0.032
47.436	42.198	-25.604	47.436	42.198	-25.625	0	0	0.021	0.021
58.824	38.228	-25.655	58.824	38.228	-25.625	0	0	-0.03	-0.03
66.554	19.551	-29.954	66.554	19.551	-29.896	0	0	-0.058	-0.058
56.076	20.822	-29.919	56.076	20.822	-29.896	0	0	-0.023	-0.023

### 3D-Tol Data from CMM for Polyamide Die (Cavity)

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-86.206	-113.713	-0.076	-86.206	-113.713	0	0	0	-0.076	-0.076
-59.205	-113.715	-0.091	-59.205	-113.715	0	0	0	-0.091	-0.091
-32.205	-113.716	-0.112	-32.205	-113.716	0	0	0	-0.112	-0.112
-5.206	-113.718	-0.101	-5.206	-113.718	0	0	0	-0.101	-0.101
21.796	-113.719	-0.089	21.796	-113.719	0	0	0	-0.089	-0.089
48.796	-113.721	-0.054	48.796	-113.721	0	0	0	-0.054	-0.054
75.794	-113.723	-0.011	75.794	-113.723	0	0	0	-0.011	-0.011
102.794	-113.724	0.009	102.794	-113.724	0	0	0	0.009	0.009
102.795	-86.724	-0.014	102.795	-86.724	0	0	0	-0.014	-0.014
-86.204	-86.714	-0.11	-86.204	-86.714	0	0	0	-0.11	-0.11
-86.203	-59.712	-0.112	-86.203	-59.712	0	0	0	-0.112	-0.112
102.798	-59.724	-0.034	102.798	-59.724	0	0	0	-0.034	-0.034
102.799	-32.724	-0.065	102.799	-32.724	0	0	0	-0.065	-0.065
-86.201	-32.713	-0.126	-86.201	-32.713	0	0	0	-0.126	-0.126
-86.199	-5.713	-0.105	-86.199	-5.713	0	0	0	-0.105	-0.105
102.802	-5.724	-0.065	102.802	-5.724	0	0	0	-0.065	-0.065
102.803	21.276	-0.044	102.803	21.276	0	0	0	-0.044	-0.044
-86.197	21.287	-0.075	-86.197	21.287	0	0	0	-0.075	-0.075
-86.196	48.287	0.026	-86.196	48.287	0	0	0	0.026	0.026
102.806	48.275	0.012	102.806	48.275	0	0	0	0.012	0.012
102.806	75.275	0.122	102.806	75.275	0	0	0	0.122	0.122
75.806	75.277	0.015	75.806	75.277	0	0	0	0.015	0.015
48.806	75.279	-0.043	48.806	75.279	0	0	0	-0.043	-0.043
21.806	75.28	-0.08	21.806	75.28	0	0	0	-0.08	-0.08
-5.194	75.281	-0.081	-5.194	75.281	0	0	0	-0.081	-0.081
-32.194	75.283	-0.034	-32.194	75.283	0	0	0	-0.034	-0.034
-59.194	75.284	0.025	-59.194	75.284	0	0	0	0.025	0.025

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-86.195	75.287	0.181	-86.195	75.287	0	0	0	0.181	0.181
18.627	30.091	-15.349	18.679	30.091	-15.347	-0.052	0	-0.002	-0.052
18.717	-2.627	-15.367	18.68	-2.627	-15.368	0.037	0	0.001	0.037
18.786	-35.347	-15.387	18.681	-35.347	-15.391	0.105	0	0.004	0.105
18.954	-35.342	-21.367	18.89	-35.342	-21.369	0.065	0	0.002	0.065
18.931	-2.623	-21.345	18.889	-2.623	-21.347	0.042	0	0.001	0.042
18.836	30.096	-21.327	18.888	30.096	-21.325	-0.052	0	-0.002	-0.052
19.024	30.099	-27.308	19.097	30.099	-27.306	-0.073	0	-0.003	-0.073
19.129	-2.619	-27.326	19.098	-2.619	-27.327	0.031	0	0.001	0.031
19.16	-35.338	-27.346	19.099	-35.338	-27.348	0.062	0	0.002	0.062
10.257	-48.915	-12.923	10.257	-48.915	-12.812	0	0	-0.11	-0.11
0.729	-48.915	-12.958	0.729	-48.915	-12.812	0	0	-0.146	-0.146
-8.8	-48.914	-12.884	-8.8	-48.914	-12.812	0	0	-0.072	-0.072
-8.799	-37.241	-12.955	-8.799	-37.241	-12.812	0	0	-0.142	-0.142
0.73	-37.242	-12.976	0.73	-37.242	-12.812	0	0	-0.163	-0.163
10.257	-37.242	-12.903	10.257	-37.242	-12.812	0	0	-0.09	-0.09
10.258	-25.57	-12.917	10.258	-25.57	-12.812	0	0	-0.104	-0.104
0.729	-25.569	-12.994	0.729	-25.569	-12.812	0	0	-0.181	-0.181
-8.799	-25.569	-12.964	-8.799	-25.569	-12.812	0	0	-0.152	-0.152
-56.437	-13.893	-12.902	-56.437	-13.893	-12.812	0	0	-0.09	-0.09
-46.908	-13.893	-12.933	-46.908	-13.893	-12.812	0	0	-0.12	-0.12
-37.381	-13.894	-12.935	-37.381	-13.894	-12.812	0	0	-0.123	-0.123
-27.853	-13.895	-12.912	-27.853	-13.895	-12.812	0	0	-0.1	-0.1
-18.324	-13.895	-12.972	-18.324	-13.895	-12.812	0	0	-0.159	-0.159
-8.797	-13.895	-13.018	-8.797	-13.895	-12.812	0	0	-0.205	-0.205
10.259	-13.897	-12.942	10.259	-13.897	-12.812	0	0	-0.13	-0.13
-56.437	-2.22	-12.899	-56.437	-2.22	-12.812	0	0	-0.087	-0.087
-18.322	9.45	-13.022	-18.322	9.45	-12.812	0	0	-0.21	-0.21
10.262	21.121	-12.996	10.262	21.121	-12.812	0	0	-0.184	-0.184
-18.323	21.122	-13.014	-18.323	21.122	-12.812	0	0	-0.201	-0.201
-18.322	32.796	-12.978	-18.322	32.796	-12.812	0	0	-0.165	-0.165
-8.792	32.795	-13.004	-8.792	32.795	-12.812	0	0	-0.191	-0.191
0.733	32.795	-13.011	0.733	32.795	-12.812	0	0	-0.198	-0.198
10.261	32.793	-13.026	10.261	32.793	-12.812	0	0	-0.213	-0.213
12.205	15.683	-13.017	12.205	15.683	-12.812	0	0	-0.204	-0.204
-10.777	13.579	-13.048	-10.777	13.579	-12.812	0	0	-0.235	-0.235
-13.287	23.492	-12.99	-13.287	23.492	-12.812	0	0	-0.177	-0.177
-1.436	17.186	-13.075	-1.436	17.186	-12.812	0	0	-0.262	-0.262
16.54	-1.652	-12.981	16.54	-1.652	-12.812	0	0	-0.169	-0.169
-50.384	59.372	-5.943	-50.384	59.584	-5.95	0	-0.212	0.007	0.212
-24.76	59.388	-5.937	-24.76	59.584	-5.944	0	-0.196	0.007	0.197
0.865	59.456	-5.933	0.865	59.584	-5.938	0	-0.128	0.004	0.128
26.489	59.459	-5.927	26.489	59.585	-5.931	0	-0.126	0.004	0.126
52.114	59.446	-5.919	52.114	59.585	-5.924	0	-0.139	0.005	0.139
52.118	59.151	-14.89	52.118	59.272	-14.894	0	-0.12	0.004	0.12
26.49	59.114	-14.895	26.49	59.271	-14.9	0	-0.157	0.005	0.157
0.864	59.102	-14.902	0.864	59.271	-14.908	0	-0.169	0.006	0.17



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-24.76	58.986	-14.903	-24.76	59.271	-14.913	0	-0.285	0.01	0.285
-50.385	59.028	-14.91	-50.385	59.271	-14.919	0	-0.243	0.008	0.243
-50.38	58.629	-23.877	-50.38	58.957	-23.889	0	-0.328	0.011	0.329
-24.755	58.676	-23.871	-24.755	58.958	-23.881	0	-0.281	0.01	0.282
0.869	58.722	-23.867	0.869	58.958	-23.875	0	-0.236	0.008	0.236
26.493	58.721	-23.861	26.493	58.958	-23.869	0	-0.238	0.008	0.238
52.119	58.768	-23.856	52.119	58.958	-23.862	0	-0.191	0.007	0.191
80.696	37.543	-5.921	80.939	37.543	-5.929	-0.243	0	0.008	0.243
80.681	11.918	-5.939	80.938	11.918	-5.948	-0.257	0	0.009	0.257
80.641	-13.708	-5.954	80.938	-13.708	-5.964	-0.296	0	0.01	0.297
80.7	-39.333	-5.973	80.937	-39.333	-5.981	-0.237	0	0.008	0.237
80.664	-64.957	-5.989	80.936	-64.957	-5.999	-0.272	0	0.01	0.272
80.356	-64.951	-14.958	80.623	-64.951	-14.967	-0.268	0	0.009	0.268
80.307	-39.326	-14.938	80.624	-39.326	-14.949	-0.317	0	0.011	0.317
80.291	-13.701	-14.921	80.624	-13.701	-14.932	-0.333	0	0.012	0.334
80.289	11.924	-14.904	80.625	11.924	-14.915	-0.336	0	0.012	0.336
80.341	37.55	-14.888	80.626	37.55	-14.898	-0.285	0	0.01	0.285
79.881	37.555	-23.853	80.312	37.555	-23.868	-0.431	0	0.015	0.432
79.907	11.928	-23.871	80.312	11.928	-23.885	-0.405	0	0.014	0.405
79.81	-13.696	-23.885	80.311	-13.696	-23.902	-0.501	0	0.017	0.501
79.905	-39.321	-23.904	80.311	-39.321	-23.918	-0.405	0	0.014	0.406
79.871	-64.947	-23.921	80.31	-64.947	-23.936	-0.439	0	0.015	0.439
58.936	-93.389	-6.007	58.936	-93.748	-6.02	0	0.359	0.013	0.359
33.308	-93.395	-6.014	33.308	-93.748	-6.026	0	0.353	0.012	0.353
7.685	-93.468	-6.023	7.685	-93.748	-6.033	0	0.28	0.01	0.28
-17.943	-93.434	-6.029	-17.943	-93.747	-6.04	0	0.314	0.011	0.314
-43.566	-93.385	-6.033	-43.566	-93.747	-6.046	0	0.362	0.013	0.362
-43.563	-93.028	-15.002	-43.563	-93.434	-15.016	0	0.406	0.014	0.406
-17.936	-92.999	-14.991	-17.936	-93.434	-15.007	0	0.436	0.015	0.436
7.689	-93.053	-14.987	7.689	-93.435	-15	0	0.381	0.013	0.381
33.314	-93.039	-14.98	33.314	-93.435	-14.993	0	0.396	0.014	0.396
58.94	-93.035	-14.973	58.94	-93.435	-14.987	0	0.4	0.014	0.4
58.941	-92.654	-23.941	58.941	-93.122	-23.957	0	0.468	0.016	0.468
33.313	-92.592	-23.945	33.313	-93.122	-23.963	0	0.53	0.018	0.53
7.688	-92.62	-23.953	7.688	-93.121	-23.971	0	0.502	0.018	0.502
-17.938	-92.575	-23.959	-17.938	-93.121	-23.978	0	0.546	0.019	0.546
-43.563	-92.68	-23.969	-43.563	-93.121	-23.984	0	0.441	0.015	0.441
-72.193	-71.781	-6.034	-72.393	-71.781	-6.041	0.2	0	0.007	0.2
-72.194	-46.155	-6.016	-72.394	-46.155	-6.023	0.2	0	0.007	0.2
-72.17	-20.53	-5.999	-72.394	-20.53	-6.007	0.224	0	0.008	0.225
-72.133	5.095	-5.98	-72.395	5.095	-5.99	0.262	0	0.009	0.262
-72.117	30.72	-5.963	-72.396	30.72	-5.973	0.279	0	0.01	0.279
-71.776	30.725	-14.931	-72.082	30.725	-14.942	0.307	0	0.011	0.307
-71.734	5.099	-14.946	-72.082	5.099	-14.958	0.348	0	0.012	0.348
-71.757	-20.525	-14.965	-72.081	-20.525	-14.976	0.324	0	0.011	0.324
-71.789	-46.15	-14.983	-72.081	-46.15	-14.993	0.291	0	0.01	0.291
-71.81	-71.775	-15.001	-72.08	-71.775	-15.011	0.27	0	0.009	0.27



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-71.401	-71.769	-23.966	-71.767	-71.769	-23.979	0.366	0	0.013	0.366
-71.369	-46.143	-23.946	-71.767	-46.143	-23.96	0.399	0	0.014	0.399
-71.346	-20.518	-23.929	-71.768	-20.518	-23.943	0.422	0	0.015	0.423
-71.351	5.106	-23.912	-71.769	5.106	-23.927	0.417	0	0.015	0.418
-71.395	30.732	-23.897	-71.769	30.732	-23.91	0.375	0	0.013	0.375
-64.94	6.881	-26.498	-65.256	6.881	-26.487	0.316	0	-0.011	-0.316
-64.987	-14.131	-26.511	-65.256	-14.131	-26.501	0.27	0	-0.009	-0.27
-64.668	-14.138	-16.259	-64.899	-14.138	-16.251	0.23	0	-0.008	-0.23
-64.662	6.874	-16.245	-64.898	6.874	-16.237	0.236	0	-0.008	-0.236
-62.689	-20.585	-15.403	-62.689	-20.612	-15.402	0	0.027	-0.001	-0.027
-62.688	-20.965	-26.508	-62.688	-20.999	-26.506	0	0.034	-0.001	-0.034
-47.512	-20.962	-26.504	-47.512	-20.999	-26.503	0	0.037	-0.001	-0.037
-47.517	-20.591	-15.398	-47.517	-20.611	-15.398	0	0.02	-0.001	-0.02
-32.341	-20.563	-15.397	-32.341	-20.611	-15.395	0	0.049	-0.002	-0.049
-32.34	-20.911	-26.502	-32.34	-20.999	-26.499	0	0.088	-0.003	-0.088
-17.165	-20.938	-26.497	-17.165	-20.999	-26.495	0	0.061	-0.002	-0.061
-17.169	-20.557	-15.391	-17.169	-20.611	-15.389	0	0.055	-0.002	-0.055
-11.998	-26.02	-15.388	-11.91	-26.02	-15.391	-0.087	0	0.003	0.087
-12.443	-26.014	-25.636	-12.268	-26.014	-25.642	-0.175	0	0.006	0.175
-12.305	-39.69	-25.649	-12.268	-39.69	-25.65	-0.036	0	0.001	0.036
-11.994	-39.698	-15.395	-11.91	-39.698	-15.398	-0.084	0	0.003	0.084
-11.954	-53.375	-15.408	-11.911	-53.375	-15.41	-0.043	0	0.002	0.043
-12.241	-53.368	-25.661	-12.269	-53.368	-25.66	0.028	0	-0.001	-0.028
-9.346	-56.289	-16.275	-9.346	-56.517	-16.267	0	0.228	-0.008	-0.228
-9.344	-56.606	-25.671	-9.344	-56.845	-25.662	0	0.239	-0.008	-0.239
3.942	-56.686	-25.665	3.942	-56.845	-25.659	0	0.159	-0.006	-0.159
3.938	-56.382	-16.268	3.938	-56.517	-16.263	0	0.135	-0.005	-0.135
10.318	-52.254	-16.26	10.397	-52.303	-16.257	-0.079	0.049	-0.003	-0.093
10.436	-52.323	-20.961	10.538	-52.387	-20.957	-0.102	0.064	-0.004	-0.12
10.585	-52.411	-25.658	10.68	-52.47	-25.654	-0.094	0.059	-0.004	-0.111
16.811	-42.658	-25.646	16.821	-42.664	-25.646	-0.01	0.006	0	-0.011
16.667	-42.57	-20.949	16.681	-42.579	-20.948	-0.014	0.009	-0.001	-0.016
16.542	-42.497	-16.248	16.539	-42.496	-16.249	0.003	-0.002	0	0.003
12.79	37.42	-15.345	12.79	37.566	-15.343	0	-0.145	-0.003	-0.145
-2.159	37.431	-15.347	-2.159	37.566	-15.345	0	-0.134	-0.002	-0.134
-17.106	37.378	-15.353	-17.106	37.566	-15.349	0	-0.187	-0.003	-0.187
-17.103	37.497	-21.331	-17.103	37.67	-21.328	0	-0.174	-0.003	-0.174
-2.156	37.527	-21.326	-2.156	37.67	-21.323	0	-0.143	-0.003	-0.143
12.792	37.56	-21.322	12.792	37.67	-21.321	0	-0.11	-0.002	-0.111
12.793	37.619	-27.304	12.793	37.774	-27.301	0	-0.155	-0.003	-0.155
-2.156	37.613	-27.307	-2.156	37.775	-27.304	0	-0.161	-0.003	-0.161
-17.103	37.587	-27.312	-17.103	37.775	-27.308	0	-0.188	-0.003	-0.188
-20.71	34.581	-14.504	-20.69	34.581	-14.505	-0.02	0	0	0.02
-20.709	22.453	-14.512	-20.69	22.453	-14.512	-0.019	0	0	0.019
-20.682	10.324	-14.52	-20.69	10.324	-14.52	0.008	0	0	-0.008
-20.724	10.327	-18.29	-20.756	10.327	-18.29	0.031	0	-0.001	-0.031
-20.745	22.456	-18.281	-20.756	22.456	-18.281	0.01	0	0	-0.01

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-20.713	34.583	-18.273	-20.755	34.583	-18.272	0.043	0	-0.001	-0.043
-21.263	34.736	-21.706	-21.322	34.736	-21.69	0.059	0	-0.016	-0.061
-22.73	34.739	-27.343	-22.83	34.739	-27.316	0.099	0	-0.027	-0.103
-22.715	22.499	-27.354	-22.831	22.499	-27.323	0.116	0	-0.031	-0.12
-21.258	22.495	-21.713	-21.324	22.495	-21.695	0.065	0	-0.017	-0.068
-21.275	10.253	-21.718	-21.326	10.253	-21.704	0.051	0	-0.014	-0.052
44.831	1.982	-51.983	44.868	2.016	-51.949	-0.037	-0.035	-0.034	-0.062
48.824	5.754	-57.329	48.777	5.71	-57.456	0.047	0.044	0.128	0.143
52.001	8.754	-56.714	52.164	8.908	-56.993	-0.164	-0.154	0.278	0.358
54.739	11.332	-50.463	54.998	11.575	-50.597	-0.259	-0.244	0.134	0.38
57.102	13.556	-38.213	57.304	13.745	-38.264	-0.201	-0.189	0.051	0.281
62.231	2.495	-38.201	62.594	2.542	-38.268	-0.363	-0.046	0.067	0.372
59.074	2.098	-50.454	59.453	2.147	-50.598	-0.379	-0.049	0.144	0.409
55.356	1.624	-56.692	55.596	1.655	-56.991	-0.24	-0.031	0.299	0.385
51.01	1.064	-57.395	50.978	1.06	-57.459	0.032	0.004	0.064	0.071
45.571	0.362	-52.002	45.642	0.371	-51.953	-0.071	-0.009	-0.049	-0.087
45.273	-1.402	-51.983	45.306	-1.42	-51.957	-0.033	0.018	-0.026	-0.046
50.08	-4.024	-57.35	50.031	-3.997	-57.462	0.049	-0.027	0.111	0.125
53.914	-6.119	-56.716	54.11	-6.226	-56.993	-0.196	0.107	0.277	0.356
57.207	-7.92	-50.468	57.522	-8.092	-50.604	-0.315	0.172	0.136	0.384
59.971	-9.442	-38.206	60.296	-9.62	-38.274	-0.325	0.178	0.068	0.377
51.181	-17.876	-38.234	51.294	-18.114	-38.282	-0.113	0.237	0.048	0.267
49.84	-15.036	-50.523	49.941	-15.249	-50.612	-0.101	0.213	0.089	0.251
48.205	-11.57	-56.789	48.279	-11.724	-57.002	-0.073	0.155	0.213	0.273
46.328	-7.608	-57.282	46.29	-7.528	-57.459	0.038	-0.08	0.177	0.198
44.002	-2.709	-51.926	43.984	-2.67	-51.955	0.019	-0.039	0.029	0.052
42.153	-3.026	-51.869	42.175	-2.908	-51.951	-0.022	-0.119	0.082	0.146
41.164	-8.298	-57.23	41.185	-8.187	-57.454	-0.021	-0.111	0.224	0.251
40.353	-12.637	-56.856	40.331	-12.756	-57.005	0.022	0.118	0.15	0.192
39.63	-16.46	-50.569	39.607	-16.587	-50.618	0.024	0.127	0.049	0.138
39.041	-19.592	-38.266	39.02	-19.702	-38.287	0.021	0.11	0.021	0.114
40.954	19.789	-38.235	40.938	19.97	-38.268	0.016	-0.181	0.033	0.184
41.249	16.571	-50.511	41.227	16.815	-50.604	0.022	-0.244	0.092	0.262
41.584	12.808	-56.851	41.573	12.929	-57.003	0.011	-0.121	0.152	0.195
41.976	8.387	-57.246	41.985	8.284	-57.448	-0.009	0.103	0.202	0.227
42.454	2.992	-51.908	42.458	2.94	-51.943	-0.004	0.052	0.035	0.063
40.627	2.277	-51.844	40.72	2.175	-51.937	-0.093	0.102	0.094	0.167
37.026	6.213	-57.229	37.1	6.132	-57.445	-0.074	0.081	0.216	0.242
34.016	9.497	-56.896	33.953	9.565	-57.012	0.063	-0.069	0.116	0.149
31.418	12.333	-50.551	31.312	12.449	-50.611	0.106	-0.116	0.059	0.168
29.241	14.693	-38.253	29.163	14.778	-38.274	0.078	-0.085	0.021	0.117
22.977	3.495	-38.281	22.97	3.496	-38.282	0.007	-0.001	0.001	0.007
26.112	2.945	-50.61	26.093	2.949	-50.618	0.019	-0.003	0.007	0.02
30.049	2.25	-56.887	29.947	2.268	-57.017	0.102	-0.018	0.13	0.166
34.394	1.477	-57.172	34.531	1.453	-57.443	-0.136	0.024	0.271	0.304
39.577	0.553	-51.781	39.806	0.513	-51.938	-0.228	0.04	0.157	0.28
39.902	-1.461	-51.799	40.091	-1.363	-51.943	-0.189	-0.098	0.144	0.257

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
35.203	-3.889	-57.172	35.327	-3.824	-57.447	-0.124	-0.064	0.275	0.309
31.276	-5.921	-56.907	31.198	-5.961	-57.016	0.077	0.04	0.109	0.14
27.754	-7.74	-50.606	27.723	-7.756	-50.62	0.031	0.016	0.013	0.038
24.924	-9.214	-38.284	24.911	-9.221	-38.287	0.013	0.007	0.003	0.015
43.657	2.826	-51.924	43.648	2.798	-51.944	0.009	0.028	0.02	0.035
45.351	7.962	-57.322	45.33	7.899	-57.452	0.021	0.063	0.13	0.146
46.744	12.176	-56.807	46.792	12.324	-57	-0.049	-0.148	0.193	0.248
47.938	15.798	-50.509	48.014	16.026	-50.6	-0.076	-0.228	0.091	0.257
48.936	18.837	-38.227	49.001	19.035	-38.265	-0.066	-0.198	0.038	0.212
36.638	29.359	-27.293	36.834	29.555	-27.302	-0.196	-0.196	0.01	0.277
40.318	28.369	-27.302	40.32	28.368	-27.302	-0.002	0.002	0	-0.002
48.84	36.905	-27.294	48.848	36.897	-27.294	-0.008	0.008	0	-0.012
53.458	36.678	-27.282	53.665	36.884	-27.292	-0.207	-0.207	0.01	0.292
62.002	28.159	-27.286	62.196	28.353	-27.296	-0.194	-0.194	0.01	0.274
66.826	30.831	-27.295	66.884	30.773	-27.292	-0.058	0.058	-0.003	-0.082
65.524	36.494	-27.299	65.701	36.671	-27.29	-0.177	-0.177	-0.009	-0.251
54.643	47.357	-27.292	54.828	47.543	-27.283	-0.185	-0.185	-0.009	-0.262
47.619	47.622	-27.281	47.685	47.556	-27.284	-0.066	0.066	0.003	0.094
36.755	36.739	-27.292	36.811	36.683	-27.295	-0.056	0.056	0.003	0.079
38.724	30.837	-25.882	38.724	30.837	-25.625	0	0	-0.257	-0.257
63.798	30.835	-25.827	63.798	30.835	-25.625	0	0	-0.202	-0.202
51.261	47.452	-25.822	51.261	47.452	-25.625	0	0	-0.197	-0.197
68.349	46.961	-38.428	68.349	46.961	-38.437	0	0	0.009	0.009
72.053	46.958	-34.095	72.457	46.958	-34.11	-0.404	0	0.014	0.404
68.35	50.87	-34.105	68.35	51.103	-34.113	0	-0.233	0.008	0.233
64.002	46.958	-34.123	64.21	46.958	-34.116	-0.208	0	-0.007	-0.208
68.348	42.768	-34.119	68.348	42.856	-34.116	0	-0.088	-0.003	-0.088
68.343	-17.106	-34.125	68.343	-17.106	-34.167	0	0	0.042	0.042
68.344	-12.904	-31.593	68.344	-12.872	-31.594	0	-0.032	0.001	0.032
64.012	-17.106	-31.6	64.122	-17.106	-31.596	-0.11	0	-0.004	-0.11
68.344	-21.08	-31.588	68.344	-21.295	-31.595	0	0.215	0.007	0.215
72.104	-17.106	-31.578	72.545	-17.106	-31.593	-0.441	0	0.015	0.441
53.528	-51.984	-33.591	53.577	-52.241	-33.742	-0.048	0.257	0.151	0.302
53.073	-49.549	-37.717	53.135	-49.876	-37.909	-0.062	0.327	0.192	0.384
52.638	-47.228	-41.902	52.692	-47.514	-42.071	-0.054	0.287	0.168	0.337
52.192	-44.841	-46.052	52.251	-45.151	-46.234	-0.059	0.31	0.182	0.365
51.741	-42.419	-50.183	51.812	-42.787	-50.4	-0.071	0.368	0.216	0.433
50.128	-42.317	-50.242	50.012	-42.568	-50.402	0.116	0.251	0.159	0.319
49.053	-44.564	-46.129	48.973	-44.736	-46.238	0.08	0.171	0.109	0.218
48.015	-46.751	-41.977	47.942	-46.906	-42.076	0.073	0.155	0.099	0.198
47.002	-48.896	-37.791	46.914	-49.081	-37.909	0.087	0.185	0.118	0.236
45.958	-51.091	-33.643	45.882	-51.252	-33.745	0.076	0.161	0.103	0.205
40.259	-45.913	-33.732	40.23	-45.928	-33.751	0.028	0.016	0.019	0.037
42.421	-44.735	-37.863	42.342	-44.779	-37.916	0.08	0.044	0.052	0.105
44.502	-43.593	-42.047	44.45	-43.621	-42.081	0.052	0.028	0.034	0.068
46.607	-42.445	-46.214	46.56	-42.47	-46.245	0.047	0.026	0.031	0.062
48.794	-41.252	-50.327	48.671	-41.32	-50.408	0.123	0.068	0.081	0.162

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
48.328	-39.517	-50.408	48.323	-39.517	-50.411	0.006	-0.001	0.003	0.006
45.853	-39.197	-46.295	45.938	-39.208	-46.246	-0.084	0.011	-0.049	-0.098
43.486	-38.897	-42.122	43.554	-38.906	-42.083	-0.068	0.009	-0.039	-0.079
41.102	-38.592	-37.954	41.167	-38.601	-37.916	-0.065	0.008	-0.038	-0.076
38.724	-38.288	-33.786	38.782	-38.296	-33.752	-0.058	0.007	-0.034	-0.067
42.016	-31.174	-33.826	42.108	-31.26	-33.753	-0.091	0.086	-0.072	-0.145
43.763	-32.822	-37.993	43.857	-32.91	-37.918	-0.094	0.088	-0.074	-0.149
45.512	-34.471	-42.162	45.607	-34.561	-42.086	-0.096	0.09	-0.076	-0.152
47.287	-36.141	-46.304	47.358	-36.208	-46.248	-0.071	0.067	-0.056	-0.113
49.065	-37.817	-50.443	49.107	-37.856	-50.41	-0.041	0.039	-0.033	-0.066
50.919	-28.02	-35.051	50.92	-28.058	-35.029	-0.001	0.038	-0.022	-0.043
50.984	-30.241	-38.896	50.985	-30.277	-38.875	-0.001	0.037	-0.021	-0.042
51.049	-32.433	-42.753	51.051	-32.494	-42.717	-0.002	0.061	-0.035	-0.071
51.115	-34.652	-46.6	51.116	-34.714	-46.564	-0.002	0.062	-0.036	-0.072
51.184	-36.92	-50.414	51.184	-36.932	-50.407	0	0.012	-0.007	-0.014
52.841	-37.56	-50.322	52.92	-37.446	-50.402	-0.079	-0.115	0.08	0.161
54.092	-35.69	-46.498	54.152	-35.601	-46.56	-0.06	-0.089	0.062	0.124
55.319	-33.866	-42.64	55.391	-33.758	-42.714	-0.073	-0.107	0.075	0.15
56.576	-31.994	-38.815	56.629	-31.916	-38.869	-0.053	-0.078	0.054	0.109
57.808	-30.162	-34.969	57.866	-30.076	-35.029	-0.058	-0.086	0.06	0.12
62.11	-35.838	-34.882	62.34	-35.752	-35.023	-0.229	-0.085	0.141	0.283
60.03	-36.617	-38.726	60.261	-36.531	-38.869	-0.231	-0.086	0.142	0.284
57.928	-37.402	-42.554	58.183	-37.307	-42.711	-0.255	-0.095	0.157	0.314
55.834	-38.187	-46.392	56.103	-38.087	-46.558	-0.269	-0.1	0.166	0.332
53.731	-38.974	-50.219	54.025	-38.866	-50.401	-0.295	-0.108	0.181	0.362
53.699	-40.546	-50.155	54.105	-40.656	-50.398	-0.406	0.11	0.243	0.485
55.91	-41.144	-46.351	56.248	-41.235	-46.553	-0.338	0.091	0.202	0.405
58.051	-41.721	-42.506	58.391	-41.813	-42.709	-0.34	0.092	0.203	0.407
60.225	-42.304	-38.68	60.535	-42.387	-38.865	-0.31	0.083	0.185	0.37
62.36	-42.881	-34.83	62.678	-42.966	-35.02	-0.318	0.086	0.19	0.38
58.553	-48.772	-34.831	58.763	-49.028	-35.022	-0.21	0.256	0.191	0.382
57.15	-47.056	-38.678	57.358	-47.309	-38.867	-0.208	0.253	0.189	0.379
55.721	-45.325	-42.505	55.946	-45.598	-42.71	-0.225	0.274	0.204	0.409
54.307	-43.602	-46.344	54.538	-43.883	-46.553	-0.231	0.281	0.21	0.419
52.874	-41.852	-50.164	53.132	-42.165	-50.398	-0.258	0.313	0.234	0.468
68.34	-81.165	-38.314	68.34	-81.165	-38.437	0	0	0.124	0.124
68.34	-84.792	-34.182	68.34	-85.266	-34.198	0	0.474	0.017	0.475
72.1	-81.168	-34.186	72.454	-81.168	-34.199	-0.354	0	0.012	0.355
68.341	-76.78	-34.206	68.341	-77.025	-34.197	0	0.245	-0.009	-0.245
64.067	-81.167	-34.206	64.213	-81.167	-34.201	-0.146	0	-0.005	-0.146
31.42	-71.24	-12.694	31.464	-71.204	-12.764	-0.044	-0.036	0.07	0.09
32.068	-75.199	-15.71	32.153	-75.47	-15.52	-0.086	0.271	-0.19	-0.342
32.875	-77.744	-20.264	32.954	-77.992	-20.057	-0.079	0.248	-0.208	-0.333
34.222	-81.984	-22.951	34.24	-82.043	-22.805	-0.019	0.059	-0.146	-0.159
35.305	-85.394	-25.993	35.402	-85.699	-25.839	-0.097	0.306	-0.154	-0.356
23.284	-85.039	-25.959	23.192	-85.273	-25.838	0.093	0.234	-0.121	-0.279
24.628	-81.66	-22.929	24.609	-81.708	-22.805	0.019	0.049	-0.124	-0.135

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
26.237	-77.596	-20.194	26.174	-77.756	-20.056	0.063	0.16	-0.137	-0.22
27.221	-75.112	-15.65	27.149	-75.295	-15.518	0.072	0.183	-0.132	-0.237
28.686	-71.42	-12.847	28.681	-71.431	-12.773	0.004	0.011	-0.073	-0.074
27.018	-69.972	-12.783	27.017	-69.973	-12.771	0.002	0.001	-0.012	-0.012
23.406	-71.982	-15.535	23.376	-71.999	-15.512	0.03	0.017	-0.023	-0.042
21.111	-73.262	-20.09	21.066	-73.288	-20.049	0.046	0.026	-0.042	-0.067
17.358	-75.355	-22.8	17.358	-75.355	-22.8	0	0	0	0
14.081	-77.179	-25.876	13.999	-77.225	-25.831	0.082	0.046	-0.045	-0.104
11.883	-65.156	-25.779	11.964	-65.17	-25.819	-0.081	0.014	0.04	0.091
15.747	-65.846	-22.754	15.762	-65.849	-22.791	-0.015	0.003	0.037	0.04
19.804	-66.565	-19.928	19.935	-66.588	-20.033	-0.13	0.023	0.105	0.169
22.396	-67.031	-15.409	22.533	-67.054	-15.502	-0.137	0.024	0.093	0.167
26.65	-67.788	-12.792	26.647	-67.788	-12.768	0.004	-0.001	-0.024	-0.025
27.753	-65.872	-12.856	27.744	-65.861	-12.765	0.009	-0.011	-0.091	-0.092
24.842	-62.487	-15.318	25.013	-62.684	-15.493	-0.17	0.197	0.175	0.314
23.152	-60.52	-19.855	23.293	-60.683	-20.025	-0.141	0.163	0.17	0.274
20.515	-57.453	-22.718	20.533	-57.475	-22.786	-0.019	0.022	0.068	0.074
17.873	-54.381	-25.701	18.013	-54.544	-25.806	-0.141	0.163	0.106	0.24
31.061	-50.08	-25.458	31.047	-50.289	-25.575	0.013	0.209	0.117	0.239
40.044	-53.257	-25.528	39.994	-53.332	-25.578	0.05	0.075	0.05	0.103
46.153	-60.487	-25.606	46.185	-60.471	-25.586	-0.032	-0.016	-0.02	-0.041
47.807	-69.741	-25.664	47.932	-69.75	-25.594	-0.125	0.01	-0.069	-0.143
44.606	-78.53	-25.713	44.769	-78.643	-25.603	-0.163	0.113	-0.109	-0.227
41.522	-76.402	-22.822	41.556	-76.425	-22.725	-0.034	0.023	-0.097	-0.105
44.004	-69.449	-22.785	44.031	-69.451	-22.72	-0.027	0.002	-0.065	-0.07
42.65	-62.183	-22.729	42.656	-62.18	-22.714	-0.005	-0.003	-0.015	-0.016
37.801	-56.6	-22.725	37.805	-56.594	-22.709	-0.004	-0.006	-0.016	-0.017
30.798	-54.207	-22.686	30.798	-54.215	-22.706	0.001	0.008	0.02	0.022
30.545	-58.173	-19.798	30.535	-58.33	-19.918	0.01	0.158	0.12	0.199
35.569	-59.925	-19.831	35.503	-60.023	-19.92	0.066	0.097	0.09	0.148
38.923	-63.99	-19.94	38.936	-63.984	-19.929	-0.013	-0.006	-0.011	-0.018
39.811	-69.124	-20.01	39.903	-69.132	-19.939	-0.093	0.007	-0.071	-0.117
37.988	-73.953	-20.097	38.147	-74.064	-19.948	-0.159	0.111	-0.149	-0.245
35.825	-72.462	-15.61	36.006	-72.588	-15.46	-0.18	0.126	-0.149	-0.266
37.217	-68.926	-15.519	37.312	-68.934	-15.454	-0.095	0.008	-0.065	-0.115
36.639	-65.095	-15.415	36.598	-65.115	-15.446	0.041	0.02	0.031	0.055
34.142	-62.041	-15.328	34.052	-62.175	-15.438	0.09	0.133	0.11	0.195
30.385	-60.686	-15.272	30.37	-60.922	-15.433	0.015	0.235	0.161	0.286
30.108	-65.079	-12.846	30.109	-65.066	-12.765	-0.001	-0.013	-0.081	-0.082
31.731	-65.636	-12.866	31.74	-65.623	-12.765	-0.009	-0.013	-0.101	-0.102
32.859	-66.932	-12.848	32.87	-66.926	-12.767	-0.012	-0.005	-0.081	-0.082
33.18	-68.62	-12.832	33.19	-68.621	-12.77	-0.01	0.001	-0.063	-0.063
32.597	-70.232	-12.876	32.611	-70.242	-12.772	-0.014	0.01	-0.104	-0.105
-39.291	-53.787	-33.572	-39.19	-53.972	-33.641	-0.101	0.185	0.068	0.222
-50.224	-55.243	-33.52	-50.302	-55.616	-33.644	0.078	0.373	0.124	0.401
-59.46	-49.366	-33.496	-59.829	-49.652	-33.648	0.37	0.286	0.152	0.491
-62.751	-38.941	-33.497	-63.205	-38.919	-33.645	0.454	-0.022	0.148	0.478

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-58.562	-28.782	-33.538		-58.795	-28.562	-33.641		0.232	-0.219	0.104		0.336
-57.248	-30.017	-37.486		-57.412	-29.862	-37.632		0.164	-0.155	0.146		0.269
-60.868	-39.035	-37.344		-61.311	-39.014	-37.631		0.444	-0.022	0.287		0.529
-57.987	-48.228	-37.355		-58.328	-48.492	-37.634		0.341	0.264	0.279		0.513
-49.839	-53.409	-37.391		-49.913	-53.764	-37.625		0.074	0.355	0.234		0.431
-40.187	-52.142	-37.496		-40.094	-52.311	-37.621		-0.092	0.169	0.124		0.229
-41.527	-49.686	-40.823		-41.457	-49.814	-40.983		-0.07	0.128	0.16		0.217
-49.281	-50.739	-40.724		-49.33	-50.976	-40.989		0.049	0.237	0.265		0.359
-55.812	-46.545	-40.63		-56.075	-46.748	-40.995		0.263	0.203	0.365		0.493
-58.136	-39.167	-40.637		-58.463	-39.151	-40.996		0.327	-0.016	0.359		0.486
-55.193	-31.952	-40.781		-55.336	-31.817	-40.996		0.143	-0.135	0.216		0.292
-52.613	-34.392	-43.264		-52.708	-34.301	-43.518		0.096	-0.091	0.254		0.286
-54.61	-39.344	-43.055		-54.851	-39.332	-43.518		0.241	-0.012	0.463		0.522
-53.051	-44.417	-43.12		-53.213	-44.542	-43.515		0.163	0.126	0.395		0.446
-48.549	-47.264	-43.163		-48.586	-47.442	-43.511		0.037	0.178	0.349		0.393
-43.238	-46.546	-43.293		-43.185	-46.644	-43.507		-0.054	0.098	0.214		0.241
-45.215	-42.929	-44.582		-45.167	-43.016	-45.024		-0.048	0.088	0.442		0.453
-47.716	-43.295	-44.572		-47.736	-43.395	-45.026		0.021	0.1	0.454		0.465
-49.852	-41.945	-44.527		-49.941	-42.014	-45.028		0.089	0.069	0.501		0.513
-50.605	-39.541	-44.511		-50.721	-39.535	-45.029		0.116	-0.006	0.517		0.53
-49.618	-37.217	-44.56		-49.695	-37.145	-45.03		0.077	-0.072	0.47		0.482
-53.815	-25.075	-33.607		-53.854	-24.992	-33.637		0.039	-0.084	0.03		0.097
-43.359	-23.79	-33.659		-43.376	-23.868	-33.633		0.018	0.078	-0.026		-0.084
-34.339	-29.336	-33.663		-34.419	-29.402	-33.629		0.08	0.066	-0.033		-0.109
-30.685	-39.262	-33.648		-30.736	-39.263	-33.632		0.051	0.001	-0.016		-0.053
-33.925	-49.261	-33.613		-33.864	-49.305	-33.637		-0.06	0.044	0.024		0.079
-35.456	-48.136	-37.566		-35.389	-48.186	-37.62		-0.068	0.05	0.054		0.1
-32.659	-39.315	-37.595		-32.626	-39.314	-37.616		-0.034	-0.001	0.022		0.04
-35.837	-30.569	-37.653		-35.88	-30.604	-37.617		0.043	0.035	-0.036		-0.066
-43.788	-25.666	-37.65		-43.799	-25.713	-37.619		0.011	0.047	-0.031		-0.057
-53.017	-26.78	-37.578		-53.05	-26.709	-37.628		0.033	-0.07	0.05		0.092
-51.795	-29.388	-40.876		-51.841	-29.291	-40.994		0.045	-0.097	0.118		0.159
-44.424	-28.491	-40.99		-44.425	-28.493	-40.987		0	0.002	-0.002		-0.003
-38.07	-32.406	-40.994		-38.078	-32.413	-40.983		0.008	0.007	-0.011		-0.015
-35.552	-39.397	-40.893		-35.47	-39.395	-40.982		-0.081	-0.002	0.089		0.12
-37.78	-46.437	-40.852		-37.684	-46.507	-40.982		-0.096	0.07	0.13		0.176
-40.678	-44.32	-43.318		-40.599	-44.378	-43.506		-0.079	0.058	0.188		0.212
-39.17	-39.5	-43.335		-39.08	-39.498	-43.507		-0.09	-0.002	0.172		0.194
-40.919	-34.748	-43.394		-40.872	-34.709	-43.51		-0.047	-0.038	0.116		0.131
-45.231	-32.045	-43.461		-45.225	-32.019	-43.512		-0.006	-0.026	0.051		0.058
-50.27	-32.651	-43.339		-50.309	-32.568	-43.516		0.039	-0.084	0.177		0.2
-48.517	-36.402	-44.634		-48.555	-36.322	-45.03		0.037	-0.081	0.396		0.405
-46.153	-36.133	-44.693		-46.136	-36.06	-45.028		-0.017	-0.073	0.335		0.343
-44.12	-37.381	-44.701		-44.063	-37.335	-45.025		-0.057	-0.046	0.324		0.332
-43.301	-39.618	-44.64		-43.214	-39.616	-45.024		-0.087	-0.002	0.384		0.393
-44.002	-41.887	-44.658		-43.936	-41.936	-45.024		-0.067	0.049	0.365		0.374
-23.512	-39.886	-26.942		-23.512	-40.042	-26.937		0	0.157	-0.005		-0.157



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-25.806	-38.173	-23.939	-25.806	-38.173	-23.917	0	0	-0.022	-0.022
-21.554	-31.277	-23.839	-21.606	-31.243	-23.917	0.051	-0.034	0.077	0.099
-19.212	-33.758	-26.925	-19.354	-33.758	-26.93	0.141	0	0.005	0.141
-21.357	-30.572	-26.924	-21.307	-30.605	-26.926	-0.05	0.033	0.002	0.06
-26.468	-38.269	-26.933	-26.432	-38.293	-26.934	-0.036	0.024	0.002	0.043
-52.328	42.611	-34.156	-52.328	42.857	-34.148	0	-0.245	-0.009	-0.246
-41.899	42.678	-34.15	-41.899	42.857	-34.143	0	-0.179	-0.006	-0.179
-38.507	46.965	-34.143	-38.586	46.965	-34.141	0.079	0	-0.003	-0.079
-43.547	50.764	-34.129	-43.547	51.102	-34.141	0	-0.337	0.012	0.338
-58.922	50.774	-34.133	-58.922	51.102	-34.145	0	-0.328	0.011	0.328
-63.558	46.111	-34.135	-63.914	46.111	-34.148	0.356	0	0.012	0.356
-63.497	30.737	-34.144	-63.914	30.737	-34.159	0.417	0	0.015	0.417
-59.778	25.657	-34.164	-59.778	25.774	-34.16	0	-0.117	-0.004	-0.117
-55.42	29.088	-34.166	-55.67	29.088	-34.157	0.25	0	-0.009	-0.25
-55.383	39.517	-34.161	-55.669	39.517	-34.151	0.287	0	-0.01	-0.287
-58.743	29.666	-38.374	-58.743	29.666	-38.437	0	0	0.064	0.064
-58.744	45.935	-38.472	-58.744	45.935	-38.437	0	0	-0.034	-0.034
-42.475	45.935	-38.447	-42.475	45.935	-38.437	0	0	-0.01	-0.01
0.014	46.962	-34.277	0.014	46.962	-34.167	0	0	-0.11	-0.11
4.097	46.961	-31.564	4.212	46.961	-31.568	-0.116	0	0.004	0.116
0.013	42.633	-31.576	0.013	42.767	-31.571	0	-0.134	-0.005	-0.134
-4.049	46.962	-31.565	-4.212	46.962	-31.571	0.163	0	0.006	0.163
0.017	50.863	-31.557	0.017	51.192	-31.568	0	-0.329	0.011	0.329
23.692	47.239	-43.321	23.692	47.364	-43.249	0	-0.125	-0.072	-0.144
30.098	47.264	-43.301	30.098	47.361	-43.245	0	-0.097	-0.056	-0.112
30.095	41.16	-32.802	30.095	41.289	-32.727	0	-0.13	-0.075	-0.15
23.687	41.147	-32.81	23.687	41.289	-32.728	0	-0.143	-0.082	-0.165
21.222	45.158	-33.683	21.244	45.158	-33.682	-0.022	0	-0.001	-0.022
19.1	47.862	-39.078	19.1	48.021	-39.036	0	-0.159	-0.043	-0.165
11.686	47.893	-39.071	11.686	48.021	-39.037	0	-0.129	-0.034	-0.133
11.684	45.625	-30.864	11.684	45.818	-30.812	0	-0.193	-0.052	-0.2
19.098	45.587	-30.87	19.098	45.817	-30.809	0	-0.23	-0.062	-0.238
8.521	50.885	-33.678	8.432	50.885	-33.681	0.09	0	0.003	0.09
30.097	54.57	-33.618	30.097	54.808	-33.682	0	-0.237	0.064	0.246
30.099	52.232	-42.216	30.099	52.501	-42.289	0	-0.27	0.072	0.279
14.72	54.513	-33.606	14.72	54.807	-33.685	0	-0.294	0.079	0.304
-1.298	27.914	-25.237	-1.298	28.097	-25.292	0	-0.183	0.055	0.191
-1.303	30.577	-16.374	-1.303	30.756	-16.428	0	-0.179	0.054	0.187
-6.429	30.536	-16.365	-6.429	30.755	-16.431	0	-0.22	0.066	0.229
-6.49	24.45	-23.126	-6.57	24.45	-23.158	0.08	0	0.032	0.087
-9.651	24.445	-15.35	-9.688	24.445	-15.365	0.037	0	0.015	0.039
-9.639	27.969	-15.344	-9.688	27.969	-15.363	0.049	0	0.02	0.053
-5.575	19.862	-16.031	-5.575	19.983	-15.995	0	-0.121	-0.036	-0.127
-0.874	22.23	-23.812	-0.874	22.32	-23.786	0	-0.09	-0.027	-0.093
-0.877	19.871	-16.027	-0.877	19.982	-15.993	0	-0.112	-0.033	-0.117
1.471	4.588	-8.558	1.466	4.588	-8.542	0.005	0	-0.016	-0.017
5.749	0.145	-8.591	5.737	0.145	-8.542	0.012	0	-0.049	-0.05

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
1.189	0.146	-8.772	1.189	0.146	-8.542	0	0	-0.231	-0.231
-3.142	0.146	-8.778	-3.142	0.146	-8.542	0	0	-0.236	-0.236
1.476	-4.296	-8.576	1.466	-4.296	-8.542	0.01	0	-0.034	-0.035
9.774	3.146	-18.782	9.766	3.143	-18.783	0.008	0.003	0	0.008
6.049	8.292	-18.78	6.046	8.289	-18.78	0.003	0.004	0	0.004
0.008	10.233	-18.78	0.008	10.259	-18.779	0	-0.026	0	-0.026
-6.041	8.293	-18.783	-6.041	8.292	-18.783	-0.001	0.001	0	0.001
-9.764	3.151	-18.787	-9.764	3.151	-18.787	0	0	0	0
-8.333	-5.969	-18.795	-8.341	-5.975	-18.795	0.008	0.006	0	-0.01
-2.636	-9.935	-18.796	-2.631	-9.917	-18.796	-0.005	-0.019	0	0.019
4.279	-9.328	-18.794	4.278	-9.325	-18.794	0.001	-0.003	0	0.003
9.249	-4.485	-18.788	9.232	-4.476	-18.788	0.018	-0.009	0	0.02
13.051	-7.893	-18.788	13.148	-7.952	-18.79	-0.097	0.059	0.002	0.113
14.758	3.395	-18.77	14.975	3.445	-18.774	-0.216	-0.05	0.004	0.222
8.228	12.754	-18.767	8.33	12.912	-18.77	-0.102	-0.158	0.003	0.188
-2.999	14.874	-18.773	-3.037	15.062	-18.776	0.038	-0.189	0.003	0.192
-12.551	8.574	-18.782	-12.688	8.667	-18.785	0.136	-0.093	0.003	0.165
8.653	-20.327	-18.798	8.717	-20.327	-18.799	-0.064	0	0.001	0.064
8.662	-32.132	-18.806	8.717	-32.132	-18.807	-0.054	0	0.001	0.054
8.657	-43.934	-18.814	8.717	-43.934	-18.815	-0.06	0	0.001	0.06
6.165	-51.301	-18.812	6.165	-51.667	-18.818	0	0.366	0.006	0.366
3.715	-44.322	-18.805	3.611	-44.322	-18.807	0.104	0	0.002	0.104
3.702	-33.107	-18.799	3.611	-33.107	-18.8	0.091	0	0.002	0.091
3.698	-21.894	-18.79	3.611	-21.894	-18.792	0.087	0	0.002	0.087
-5.79	-51.144	-18.813	-5.79	-51.667	-18.822	0	0.523	0.009	0.523
-16.118	-3.876	-21.355	-16.118	-3.941	-21.356	0	0.065	0.001	0.065
-17.388	-8.239	-16.576	-17.333	-8.239	-16.577	-0.055	0	0.001	0.055
-18.969	-12.344	-16.573	-18.969	-12.566	-16.576	0	0.222	0.004	0.222
-22.812	-8.087	-22.213	-22.812	-8.197	-22.214	0	0.11	0.002	0.11
-51.185	-3.869	-21.363	-51.185	-3.941	-21.364	0	0.072	0.001	0.072
-41.313	-3.865	-21.355	-41.313	-3.941	-21.356	0	0.076	0.001	0.076
-31.441	-3.881	-21.352	-31.441	-3.941	-21.353	0	0.061	0.001	0.061
-54.839	-2.267	-21.357	-55.276	-2.267	-21.365	0.437	0	0.008	0.437
-55.715	0.652	-19.211	-56.101	0.529	-19.218	0.385	0.123	0.007	0.405
-53.267	3.778	-19.216	-53.318	3.957	-19.219	0.051	-0.179	0.003	0.186
-53.458	5.889	-19.222	-53.486	5.781	-19.224	0.028	0.107	0.002	0.111
-56.798	9.097	-19.208	-57.255	9.097	-19.216	0.457	0	0.008	0.457
-41.392	11.581	-27.228	-41.392	11.592	-27.228	0	-0.011	0	-0.011
-56.121	11.556	-27.232	-56.121	11.592	-27.231	0	-0.036	-0.001	-0.036
-61.036	11.528	-27.233	-61.036	11.592	-27.231	0	-0.064	-0.001	-0.064
-61.038	11.425	-20.817	-61.038	11.48	-20.816	0	-0.055	-0.001	-0.055
-61.04	11.361	-14.407	-61.04	11.368	-14.407	0	-0.007	0	-0.007
-52.76	10.171	-25.798	-52.76	10.171	-25.625	0	0	-0.173	-0.173
-35.276	10.169	-25.853	-35.276	10.169	-25.625	0	0	-0.228	-0.228
-17.792	4.672	-25.879	-17.792	4.672	-25.625	0	0	-0.254	-0.254
-35.277	4.671	-25.834	-35.277	4.671	-25.625	0	0	-0.209	-0.209
-52.763	-0.825	-25.722	-52.763	-0.825	-25.625	0	0	-0.097	-0.097



MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-35.276	-0.825	-25.783	-35.276	-0.825	-25.625	0	0	-0.158	-0.158
-17.791	-0.826	-25.841	-17.791	-0.826	-25.625	0	0	-0.216	-0.216
-26.998	-5.12	-27.847	-27.255	-5.12	-27.852	0.257	0	0.004	0.257
-27.209	-5.13	-16.563	-27.452	-5.13	-16.567	0.243	0	0.004	0.243
-49.659	13.603	-28.808	-49.659	13.675	-28.681	0	-0.073	-0.126	-0.146
-17.891	7.208	-19.214	-17.891	7.329	-19.216	0	-0.121	0.002	0.121
-8.823	-76.879	-48.883	-9.141	-76.879	-49.067	0.318	0	0.184	0.368
-17.165	-76.891	-34.561	-17.429	-76.891	-34.713	0.264	0	0.152	0.305
-17.162	-84.578	-34.575	-17.422	-84.578	-34.725	0.26	0	0.15	0.3
-8.786	-84.567	-48.867	-9.139	-84.567	-49.071	0.353	0	0.204	0.407
-4.035	-86.316	-34.699	-4.035	-86.957	-34.721	0	0.64	0.022	0.641
-3.387	-66.637	-41.849	-3.215	-66.637	-41.895	-0.172	0	0.046	0.178
-1.377	-66.644	-34.691	-1.291	-66.644	-34.714	-0.086	0	0.023	0.09
-1.375	-74.332	-34.704	-1.294	-74.332	-34.726	-0.081	0	0.022	0.084
-3.29	-74.326	-41.879	-3.216	-74.326	-41.898	-0.074	0	0.02	0.076
-5.359	-82.009	-49.022	-5.14	-82.009	-49.08	-0.218	0	0.059	0.226
-3.354	-82.012	-41.859	-3.215	-82.012	-41.896	-0.139	0	0.037	0.143
-1.361	-82.018	-34.706	-1.294	-82.018	-34.724	-0.067	0	0.018	0.07
-6.398	-61.501	-34.724	-6.398	-61.668	-34.718	0	0.168	-0.006	-0.168
-5.072	5.047	-12.995	-5.072	5.047	-12.812	0	0	-0.182	-0.182
6.099	5.046	-12.997	6.099	5.046	-12.812	0	0	-0.185	-0.185
6.099	-6.125	-12.967	6.099	-6.125	-12.812	0	0	-0.155	-0.155
-5.072	-6.124	-12.984	-5.072	-6.124	-12.812	0	0	-0.171	-0.171
-71.29	-88.44	-9.027	-71.651	-88.591	-9.04	0.361	0.151	0.014	0.392
-66.516	-93.013	-3.047	-66.655	-93.443	-3.062	0.139	0.43	0.016	0.452
-67.085	58.547	-5.94	-67.251	58.95	-5.956	0.167	-0.402	0.015	0.436
-71.727	53.703	-2.955	-72.099	53.822	-2.968	0.372	-0.119	0.014	0.391
79.968	54.25	-5.907	80.323	54.394	-5.92	-0.355	-0.145	0.013	0.383
75.13	58.956	-2.918	75.233	59.27	-2.929	-0.103	-0.313	0.012	0.33
75.581	-92.649	-5.998	75.776	-93.121	-6.015	-0.194	0.472	0.018	0.511
80.214	-87.931	-3.007	80.614	-88.064	-3.022	-0.4	0.132	0.015	0.422
-63.096	-42.758	-31.257	-63.543	-42.843	-31.452	0.448	0.085	0.195	0.496
-54.789	-56.237	-29.828	-54.822	-56.307	-30.045	0.033	0.07	0.216	0.23
64.552	-64.197	-29.965	64.552	-64.197	-29.896	0	0	-0.07	-0.07
-28.359	-28.35	-30.031	-28.359	-28.35	-29.896	0	0	-0.136	-0.136
-28.359	-28.349	-30.032	-28.359	-28.349	-29.896	0	0	-0.137	-0.137
-64.342	-61.124	-29.9	-64.342	-61.124	-29.896	0	0	-0.004	-0.004
-33.249	-78.331	-29.936	-33.249	-78.331	-29.896	0	0	-0.04	-0.04
55.156	-74.106	-29.952	55.156	-74.106	-29.896	0	0	-0.056	-0.056
68.548	-54.684	-29.974	68.548	-54.684	-29.896	0	0	-0.078	-0.078
26.458	-28.684	-30.028	26.458	-28.684	-29.896	0	0	-0.132	-0.132
60.337	-19.741	-29.972	60.337	-19.741	-29.896	0	0	-0.076	-0.076
72.272	13.583	-29.978	72.272	13.583	-29.896	0	0	-0.082	-0.082
51.577	33.263	-30.042	51.577	33.263	-29.896	0	0	-0.146	-0.146
-23.427	53.117	-29.987	-23.427	53.117	-29.896	0	0	-0.091	-0.091
-48.042	36.225	-30.056	-48.042	36.225	-29.896	0	0	-0.16	-0.16
-28.989	19.372	-30.105	-28.989	19.372	-29.896	0	0	-0.209	-0.209

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-38.505	4.415	-25.812	-38.505	4.415	-25.625	0	0	-0.187	-0.187
-17.441	1.903	-25.883	-17.441	1.903	-25.625	0	0	-0.258	-0.258
-62.635	10.039	-12.866	-62.635	10.039	-12.812	0	0	-0.054	-0.054
-61.939	-8.384	-12.864	-61.939	-8.384	-12.812	0	0	-0.051	-0.051
-40.589	-9.318	-12.947	-40.589	-9.318	-12.812	0	0	-0.135	-0.135
14.377	-38.746	-12.966	14.377	-38.746	-12.812	0	0	-0.154	-0.154
12.915	33.196	-13.005	12.915	33.196	-12.812	0	0	-0.193	-0.193
-39.416	23.917	-30.109	-39.416	23.917	-29.896	0	0	-0.214	-0.214
-60.999	19.557	-29.988	-60.999	19.557	-29.896	0	0	-0.092	-0.092
-26.422	-42.909	-30.013	-26.422	-42.909	-29.896	0	0	-0.117	-0.117
-48.717	-66.908	-29.988	-48.717	-66.908	-29.896	0	0	-0.092	-0.092
-29.562	-65.358	-29.977	-29.562	-65.358	-29.896	0	0	-0.081	-0.081
-61.177	-83.537	-29.942	-61.177	-83.537	-29.896	0	0	-0.047	-0.047
-52.899	-69.058	-29.962	-52.899	-69.058	-29.896	0	0	-0.066	-0.066
-27.46	-85.917	-29.908	-27.46	-85.917	-29.896	0	0	-0.012	-0.012
-22.956	-46.233	-30.02	-22.956	-46.233	-29.896	0	0	-0.124	-0.124
-23.219	-68.532	-29.95	-23.219	-68.532	-29.896	0	0	-0.054	-0.054
6.149	-83.747	-29.892	6.149	-83.747	-29.896	0	0	0.004	0.004
6.211	-65.406	-29.936	6.211	-65.406	-29.896	0	0	-0.041	-0.041
54.252	-63.394	-30.011	54.252	-63.394	-29.896	0	0	-0.115	-0.115
67.805	-60.368	-29.957	67.805	-60.368	-29.896	0	0	-0.061	-0.061
60.54	-66.611	-29.976	60.54	-66.611	-29.896	0	0	-0.08	-0.08
71.262	-51.993	-29.961	71.262	-51.993	-29.896	0	0	-0.066	-0.066
74.295	-40.614	-29.931	74.295	-40.614	-29.896	0	0	-0.035	-0.035
66.953	-25.918	-29.986	66.953	-25.918	-29.896	0	0	-0.09	-0.09
74.332	-6.67	-29.945	74.332	-6.67	-29.896	0	0	-0.049	-0.049
66.682	11.215	-29.982	66.682	11.215	-29.896	0	0	-0.086	-0.086
74.06	27.433	-29.967	74.06	27.433	-29.896	0	0	-0.071	-0.071
75.229	46.404	-29.982	75.229	46.404	-29.896	0	0	-0.086	-0.086
55.831	54.399	-30.005	55.831	54.399	-29.896	0	0	-0.109	-0.109
38.85	54.467	-30.057	38.85	54.467	-29.896	0	0	-0.161	-0.161
38.814	46.709	-30.056	38.814	46.709	-29.896	0	0	-0.161	-0.161
16.668	42.633	-30.041	16.668	42.633	-29.896	0	0	-0.145	-0.145
4.423	55.115	-30.017	4.423	55.115	-29.896	0	0	-0.121	-0.121
-16.728	54.584	-29.963	-16.728	54.584	-29.896	0	0	-0.067	-0.067
-19.907	43.816	-30.033	-19.907	43.816	-29.896	0	0	-0.137	-0.137
-33.194	40.48	-30.063	-33.194	40.48	-29.896	0	0	-0.167	-0.167
-37.815	32.901	-30.098	-37.815	32.901	-29.896	0	0	-0.202	-0.202
-48.875	21.089	-30.077	-48.875	21.089	-29.896	0	0	-0.181	-0.181
-59.665	-5.841	-12.883	-59.665	-5.841	-12.812	0	0	-0.071	-0.071
-60.353	2.963	-12.888	-60.353	2.963	-12.812	0	0	-0.076	-0.076
-51.783	-11.843	-12.904	-51.783	-11.843	-12.812	0	0	-0.092	-0.092
-30.54	-9.758	-12.988	-30.54	-9.758	-12.812	0	0	-0.176	-0.176
-22.247	-11.235	-12.982	-22.247	-11.235	-12.812	0	0	-0.169	-0.169
-14.356	-11.359	-13.017	-14.356	-11.359	-12.812	0	0	-0.204	-0.204
-10.301	-22.329	-12.974	-10.301	-22.329	-12.812	0	0	-0.162	-0.162
-10.845	-33.093	-12.92	-10.845	-33.093	-12.812	0	0	-0.108	-0.108

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-10.275	-42.946	-12.923	-10.275	-42.946	-12.812	0	0	-0.111	-0.111
-2.078	-43.051	-12.952	-2.078	-43.051	-12.812	0	0	-0.139	-0.139
-0.426	-30.309	-12.984	-0.426	-30.309	-12.812	0	0	-0.171	-0.171
-2.47	-18.05	-12.973	-2.47	-18.05	-12.812	0	0	-0.161	-0.161
13.102	-21.031	-12.969	13.102	-21.031	-12.812	0	0	-0.157	-0.157
16.801	-27.36	-12.982	16.801	-27.36	-12.812	0	0	-0.17	-0.17
16.025	-15.504	-12.983	16.025	-15.504	-12.812	0	0	-0.17	-0.17
14.155	24.319	-13.014	14.155	24.319	-12.812	0	0	-0.202	-0.202
18.688	21.907	-16.035	18.703	21.907	-16.035	-0.015	0	-0.001	-0.015
18.806	9.308	-18.807	18.8	9.308	-18.807	0.006	0	0	0.006
18.887	-13.725	-20.146	18.847	-13.725	-20.147	0.04	0	0.001	0.04
18.834	-25.821	-16.56	18.722	-25.821	-16.564	0.112	0	0.004	0.112
13.15	-47.91	-17.6	13.189	-47.934	-17.598	-0.039	0.024	-0.002	-0.046
-5.569	-56.43	-17.071	-5.569	-56.545	-17.066	0	0.115	-0.004	-0.115
1.98	-56.565	-23.806	1.98	-56.78	-23.799	0	0.215	-0.008	-0.215
-12.179	-45.195	-22.702	-12.165	-45.195	-22.702	-0.013	0	0	0.013
-12.058	-36.356	-17.826	-11.995	-36.356	-17.828	-0.063	0	0.002	0.063
-20.741	-20.659	-19.374	-20.741	-20.75	-19.371	0	0.091	-0.003	-0.091
-40.699	-20.719	-20.425	-40.699	-20.787	-20.422	0	0.068	-0.002	-0.068
-59.035	-20.905	-24.843	-59.035	-20.941	-24.841	0	0.036	-0.001	-0.036
-61.113	-78.135	-29.939	-61.113	-78.135	-29.896	0	0	-0.043	-0.043
-44.989	-78.172	-29.963	-44.989	-78.172	-29.896	0	0	-0.067	-0.067
60.171	-61.063	-29.984	60.171	-61.063	-29.896	0	0	-0.088	-0.088
58.975	-20.623	-29.963	58.975	-20.623	-29.896	0	0	-0.067	-0.067
49.082	-23.057	-29.992	49.082	-23.057	-29.896	0	0	-0.096	-0.096
30.289	-23.979	-30.044	30.289	-23.979	-29.896	0	0	-0.148	-0.148
26.83	21.867	-30.088	26.83	21.867	-29.896	0	0	-0.192	-0.192
43.198	34.141	-25.865	43.198	34.141	-25.625	0	0	-0.24	-0.24
47.455	42.18	-25.841	47.455	42.18	-25.625	0	0	-0.216	-0.216
58.842	38.207	-25.838	58.842	38.207	-25.625	0	0	-0.213	-0.213
66.569	19.534	-30.009	66.569	19.534	-29.896	0	0	-0.113	-0.113
56.091	20.808	-30.041	56.091	20.808	-29.896	0	0	-0.145	-0.145

*Appendix G Wax Patterns -  
Features CMM Data*

**Feature Tolerances - Wax Pattern (Alumide1)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.615	1.695	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.008	-0.532	Low
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.426	-0.674	Low
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	24.913	-0.337	Good
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	7.859	-0.561	Low
A6	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.014	-0.406	Good
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	7.870	-0.550	Low
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.515	-0.115	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.745	-0.675	Low
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.784	-0.636	Low
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.922	-0.498	Good
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.411	0.211	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.474	0.054	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.616	-0.804	Low
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.778	-0.642	Low
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	1.571	-0.959	Low
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.484	-1.016	Low
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.323	-0.097	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.232	-0.188	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	2.770	1.090	High
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.889	-0.361	Good
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.484	-1.016	Low
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	24.460	-0.790	Low
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.870	-0.550	Low
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.922	-0.498	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.784	-0.636	Low
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.200	-0.630	Low
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	31.145	1.685	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.320	0.110	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.107	-0.313	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.729	-0.691	Low
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.918	-0.502	Low
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.740	-0.760	Low
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	24.472	-0.778	Low
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.341	-0.289	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.002	-0.728	Low
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.119	-0.301	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.499	0.079	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.486	0.236	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.137	-0.283	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.811	-0.609	Low
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.180	0.140	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.477	0.017	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.540	-0.960	Low
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.792	-0.098	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.145	-0.065	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.564	0.034	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	58.165	-1.835	Low
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	72.972	-2.028	Low
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	77.665	2.665	High
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.340	0.340	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.542	0.542	High
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.276	0.276	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.817	0.117	Good
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	105.993	-0.707	Low
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.894	0.094	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.702	-0.098	Good
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.003	0.003	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.076	0.076	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.028	0.028	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.070	0.070	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	1.423	1.423	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.215	0.215	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.193	0.193	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.073	0.073	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.095	0.095	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.476	0.476	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.444	0.444	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.383	0.383	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.373	0.373	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.108	0.108	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.127	0.127	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.305	0.305	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.760	0.760	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.001	0.001	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.135	0.135	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.203	0.203	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.528	0.528	High
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	0.815	0.815	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.513	0.513	High
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	8.846	8.846	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.852	0.852	High
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.057	0.057	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.021	0.021	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	1.019	1.019	High
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.712	0.712	High
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.084	0.084	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	1.211	1.211	High
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.209	0.209	Good
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.513	0.513	High
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	2.423	2.423	High



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	2.287	2.287	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.686	0.686	High
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.076	0.076	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.801	0.801	High
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	1.286	1.286	High
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.105	0.105	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.215	0.215	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.125	0.125	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	5.921	5.921	High
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.645	0.645	High
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	1.228	1.228	High
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.678	0.678	High
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.676	1.676	High
T71	Sinkhole	Sinkhole Upper	Actual	Circular runout		-0.500	0.500	0.235	0.235	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
		Circle	Sinkhole Axis							
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.605	0.605	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.125	0.125	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.513	0.513	<b>High</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.733	0.733	<b>High</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	2.092	2.092	<b>High</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.562	0.562	<b>High</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	4.184	4.184	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	2.181	2.181	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	1.245	1.245	<b>High</b>

**Feature Tolerances - Wax Pattern (Alumide2)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.701	1.781	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.528	-0.012	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.384	-0.716	Low
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	24.941	-0.309	Good
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	7.956	-0.464	Good
A6	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.061	-0.359	Good
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	7.901	-0.519	Low
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.605	-0.025	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.899	-0.521	Low
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.275	-0.145	Good
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.961	-0.459	Good
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.432	0.232	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.493	0.073	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.418	-1.002	Low
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.791	-0.629	Low
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	1.581	-0.949	Low
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.754	-0.746	Low
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.597	0.177	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.381	-0.039	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	2.438	0.758	High
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.811	-0.439	Good
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.754	-0.746	Low
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	24.381	-0.869	Low
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.831	-0.589	Low
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.961	-0.459	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.275	-0.145	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.684	-0.146	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	31.907	2.447	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.271	0.061	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.135	-0.285	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.758	-0.662	Low
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.883	-0.537	Low
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.287	-0.213	Good
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	24.674	-0.576	Low
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.657	0.027	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.218	-0.512	Low
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.096	-0.324	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.595	0.175	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.499	0.249	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.082	-0.338	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.971	-0.449	Good
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.225	0.185	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.463	0.003	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.874	-0.626	Low
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.812	-0.078	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.162	-0.048	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.514	-0.016	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	60.499	0.499	Good
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	75.827	0.827	High
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.250	-0.750	Low
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.489	0.489	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.184	0.184	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	74.839	-0.161	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.114	0.414	Good
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	110.024	3.324	High
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.174	0.374	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.177	0.377	Good
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.019	0.019	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.068	0.068	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.051	0.051	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.032	0.032	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	0.910	0.910	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.189	0.189	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.071	0.071	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.042	0.042	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.160	0.160	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.376	0.376	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.317	0.317	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.178	0.178	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.216	0.216	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.254	0.254	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.012	0.012	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.232	0.232	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.023	0.023	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.103	0.103	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.398	0.398	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.255	0.255	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.303	0.303	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	0.780	0.780	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.884	0.884	High
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	5.806	5.806	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.119	0.119	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.006	0.006	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.052	0.052	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	0.716	0.716	High
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.432	0.432	Good
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.040	0.040	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	2.069	2.069	High
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.095	0.095	Good
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.884	0.884	High
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	4.421	4.421	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	2.165	2.165	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	1.101	1.101	High
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.108	0.108	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.496	0.496	Good
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	2.165	2.165	High
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.130	0.130	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.209	0.209	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.111	0.111	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	9.122	9.122	High
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.837	0.837	High
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	1.825	1.825	High
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.487	0.487	Good
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.220	1.220	High
T71	Sinkhole	Sinkhole Upper	Actual	Circular runout		-0.500	0.500	0.104	0.104	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
		Circle	Sinkhole Axis							
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.215	1.215	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.141	0.141	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.491	0.491	<b>Good</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.284	0.284	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.462	0.462	<b>Good</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.109	0.109	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.627	0.627	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	1.258	1.258	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.157	0.157	<b>Good</b>



**Feature Tolerances - Wax Pattern (Alumide3)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.929	2.009	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	71.180	-0.360	Good
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.090	-1.010	Low
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	24.968	-0.282	Good
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	7.955	-0.465	Good
A6	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.067	-0.353	Good
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	7.958	-0.462	Good
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.691	0.061	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.854	-0.566	Low
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.002	-0.418	Good
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.927	-0.493	Good
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.347	0.147	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.399	-0.021	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.759	-0.661	Low
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.839	-0.581	Low
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	1.548	-0.982	Low
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.852	-0.648	Low
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.420	0.000	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.531	0.111	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	2.768	1.088	High
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.863	-0.387	Good
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.852	-0.648	Low
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	24.435	-0.815	Low
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.844	-0.576	Low
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.927	-0.493	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.002	-0.418	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.411	-0.419	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	35.222	5.762	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.180	-0.030	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.146	-0.274	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.763	-0.657	Low
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.935	-0.485	Good
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	151.252	-0.248	Good
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	24.649	-0.601	Low
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.520	-0.110	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.143	-0.587	Low
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.072	-0.348	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.636	0.216	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.580	0.330	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.123	-0.297	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.573	-0.847	Low
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.260	0.220	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.480	0.020	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.805	-0.695	Low
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.766	-0.124	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.126	-0.084	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.522	-0.008	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	59.630	-0.370	Good
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.282	-0.718	Low
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	75.548	0.548	High
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.431	0.431	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	60.330	0.330	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.110	0.110	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.155	0.455	Good
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.362	-0.338	Good
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.167	0.367	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.292	-0.508	Low
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.048	0.048	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.048	0.048	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.016	0.016	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.038	0.038	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	1.058	1.058	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.140	0.140	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.009	0.009	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.096	0.096	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.245	0.245	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.204	0.204	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.111	0.111	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.165	0.165	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.162	0.162	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.049	0.049	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.199	0.199	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.072	0.072	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.066	0.066	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.105	0.105	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.123	0.123	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.023	0.023	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.307	0.307	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	1.452	1.452	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.384	0.384	Good
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	5.086	5.086	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.375	0.375	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.017	0.017	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.018	0.018	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	1.537	1.537	High
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.396	0.396	Good
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.051	0.051	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	1.677	1.677	High
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.087	0.087	Good
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.512	0.512	High
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	0.951	0.951	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	2.857	2.857	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	1.248	1.248	High
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.041	0.041	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.300	0.300	Good
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	1.708	1.708	High
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.045	0.045	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.139	0.139	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.069	0.069	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	5.023	5.023	High
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.527	0.527	High
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	1.005	1.005	High
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.567	0.567	High
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.798	1.798	High
T71	Sinkhole	Sinkhole Upper	Actual	Circular runout		-0.500	0.500	0.159	0.159	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
		Circle	Sinkhole Axis							
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.321	1.321	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.146	0.146	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.501	0.501	<b>High</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.287	0.287	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	1.848	1.848	<b>High</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.177	0.177	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	1.472	1.472	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	1.929	1.929	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.428	0.428	<b>Good</b>

**Feature Tolerances - Wax Pattern (Polyamide1)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.410	1.490	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	70.617	-0.923	Low
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.402	-0.698	Low
A4	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.717	-0.533	Low
A5	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	7.842	-0.578	Low
A6	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.264	-0.156	Good
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	7.830	-0.590	Low
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.601	-0.029	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.872	-0.548	Low
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.161	-0.259	Good
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.724	-0.696	Low
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.538	0.338	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.596	0.176	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.494	-0.926	Low
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.650	-0.770	Low
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	1.260	-1.270	Low
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.081	-1.419	Low
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.980	-0.440	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.252	-0.168	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	1.214	-0.466	Good
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.460	-0.790	Low
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.081	-1.419	Low
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	24.166	-1.084	Low
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.741	-0.679	Low
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.724	-0.696	Low

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.161	-0.259	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.904	0.074	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	30.799	1.339	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.034	-0.176	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.901	-0.519	Low
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.899	-0.521	Low
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.562	-0.858	Low
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.310	-1.190	Low
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	24.185	-1.065	Low
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.136	-0.494	Good
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.177	-0.553	Low
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	7.961	-0.459	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.608	0.188	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.563	0.313	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.924	-0.496	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	8.043	-0.377	Good
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.098	0.058	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.305	-0.155	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.396	-1.104	Low
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.903	0.013	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.068	-0.142	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.439	-0.091	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	60.481	0.481	Good
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	75.423	0.423	Good
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.589	-0.411	Good
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.473	0.473	Good



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	59.568	-0.432	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	74.593	-0.407	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.101	0.401	Good
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.758	0.058	Good
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.260	0.460	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.137	0.337	Good
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.026	0.026	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.077	0.077	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.049	0.049	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.016	0.016	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	0.406	0.406	Good
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.132	0.132	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.066	0.066	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.114	0.114	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.084	0.084	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.230	0.230	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.280	0.280	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.106	0.106	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.133	0.133	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.016	0.016	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.029	0.029	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.330	0.330	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.246	0.246	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.149	0.149	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.498	0.498	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.074	0.074	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.067	0.067	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	1.179	1.179	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.519	0.519	High
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	0.233	0.233	Good
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.071	0.071	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.038	0.038	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.065	0.065	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	1.153	1.153	High
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.074	0.074	Good
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.033	0.033	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	0.403	0.403	Good
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.116	0.116	Good
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.519	0.519	High
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	1.238	1.238	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	4.088	4.088	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.258	0.258	Good
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.029	0.029	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.541	0.541	High
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	0.409	0.409	Good
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.034	0.034	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.062	0.062	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.032	0.032	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	0.400	0.400	Good
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.016	0.016	Good
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	0.172	0.172	Good
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.046	0.046	Good
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.923	0.923	High
T71	Sinkhole	Sinkhole Upper	Actual	Circular runout		-0.500	0.500	0.089	0.089	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
		Circle	Sinkhole Axis							
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.042	1.042	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.045	0.045	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.519	0.519	<b>High</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.099	0.099	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.515	0.515	<b>High</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.114	0.114	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.506	0.506	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.871	0.871	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.121	0.121	<b>Good</b>

**Feature Tolerances - Wax Pattern (Polyamide2)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.552	1.632	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	70.562	-0.978	Low
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.339	-0.761	Low
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	24.735	-0.515	Low
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	7.859	-0.561	Low
A6	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	8.152	-0.268	Good
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	7.849	-0.571	Low
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.571	-0.059	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.864	-0.556	Low
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.048	-0.372	Good
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.775	-0.645	Low
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.548	0.348	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.585	0.165	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.419	-1.001	Low
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.700	-0.720	Low
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	1.361	-1.169	Low
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.004	-1.496	Low
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.142	-0.278	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.217	-0.203	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	1.775	0.095	Good
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.544	-0.706	Low
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.004	-1.496	Low
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	24.176	-1.074	Low
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.720	-0.700	Low
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.775	-0.645	Low

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.048	-0.372	Good
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.873	0.043	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	30.824	1.364	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.135	-0.075	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.916	-0.504	Low
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.870	-0.550	Low
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.571	-0.849	Low
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.242	-1.258	Low
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	24.176	-1.074	Low
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.081	-0.549	Low
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.148	-0.582	Low
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.021	-0.399	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.591	0.171	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.523	0.273	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.922	-0.498	Good
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.961	-0.459	Good
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.075	0.035	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.306	-0.154	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.340	-1.160	Low
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.807	-0.083	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.078	-0.132	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.462	-0.068	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	60.173	0.173	Good
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	74.975	-0.025	Good
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	75.000	0.000	Good
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.528	0.528	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	59.628	-0.372	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	74.459	-0.541	Low
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.006	0.306	Good
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	106.729	0.029	Good
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.680	-0.120	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.201	0.401	Good
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.774	0.774	High
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.097	0.097	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.073	0.073	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.028	0.028	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	0.633	0.633	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.100	0.100	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.082	0.082	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.097	0.097	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.085	0.085	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.037	0.037	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.014	0.014	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.002	0.002	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.016	0.016	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.006	0.006	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.119	0.119	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.200	0.200	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.220	0.220	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.210	0.210	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.475	0.475	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.079	0.079	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.119	0.119	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	1.046	1.046	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.355	0.355	Good
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	0.617	0.617	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.090	0.090	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.042	0.042	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.028	0.028	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	1.065	1.065	High
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.129	0.129	Good
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.051	0.051	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	0.477	0.477	Good
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.061	0.061	Good
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.358	0.358	Good
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	0.874	0.874	High



Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	4.389	4.389	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.051	0.051	Good
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.030	0.030	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.379	0.379	Good
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	0.437	0.437	Good
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.048	0.048	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.073	0.073	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.027	0.027	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	0.495	0.495	Good
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.066	0.066	Good
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	0.099	0.099	Good
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.073	0.073	Good
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.773	0.773	High
T71	Sinkhole	Sinkhole Upper	Actual	Circular runout		-0.500	0.500	0.126	0.126	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
		Circle	Sinkhole Axis							
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	0.887	0.887	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.058	0.058	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.355	0.355	<b>Good</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.020	0.020	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.346	0.346	<b>Good</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.133	0.133	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	0.667	0.667	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	0.742	0.742	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.181	0.181	<b>Good</b>

**Feature Tolerances - Wax Pattern (Polyamide3)**

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
A1	Square Base	Line	Point	Distance	58.92	-0.500	0.500	60.476	1.556	High
A2	Pattern	Line	Point	Distance	71.54	-0.500	0.500	70.516	-1.024	Low
A3	Pattern	Line	Point	Distance	2.1	-0.500	0.500	1.276	-0.824	Low
A4	Rectangular Protrosion	Line	Point	Distance	25.25	-0.500	0.500	24.730	-0.520	Low
A5	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	7.839	-0.581	Low
A6	Rectangular Protrosion	Line	Point	Distance	8.42	-0.500	0.500	7.889	-0.531	Low
A7	Pattern	Line	Point	Distance	8.42	-0.500	0.500	7.844	-0.576	Low
A8	Wedge X	Line	Point	Distance	12.63	-0.500	0.500	12.568	-0.062	Good
A9	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.935	-0.485	Good
A10	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.883	-0.537	Low
A11	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.812	-0.608	Low
A12	Rectangular Hole	Line	Point	Distance	25.2	-0.500	0.500	25.506	0.306	Good
A13	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.529	0.109	Good
A14	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.655	-0.765	Low
A15	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.698	-0.722	Low
A16	Pattern	Line	Point	Distance	2.53	-0.500	0.500	1.656	-0.874	Low
B1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.026	-1.474	Low
B2	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	8.239	-0.181	Good
C1	Rectangular Protrusion	Line	Point	Distance	8.42	-0.500	0.500	8.285	-0.135	Good
C2	Pattern	Line	Point	Distance	1.68	-0.500	0.500	2.789	1.109	High
C3	Rectangular Protrusion	Line	Point	Distance	25.25	-0.500	0.500	24.468	-0.782	Low
C4	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.026	-1.474	Low
C5	Wedge X	Line	Point	Distance	25.25	-0.500	0.500	24.119	-1.131	Low
C6	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.709	-0.711	Low
CC3	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.812	-0.608	Low

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
CC4	Cube 1	Line	Point	Distance	8.42	-0.500	0.500	7.883	-0.537	Low
CC5	Cylinder Depth	Line	Point	Distance	16.83	-0.500	0.500	16.677	-0.153	Good
D1	Square Base Depth	Line	Point	Distance	29.46	-0.500	0.500	30.688	1.228	High
D2	Cube 3	Line	Point	Distance	4.21	-0.500	0.500	4.167	-0.043	Good
D3	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.930	-0.490	Good
D4	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.874	-0.546	Low
D5	Cube 2	Line	Point	Distance	8.42	-0.500	0.500	7.633	-0.787	Low
E1	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.103	-1.397	Low
E2	Wedge Y	Line	Point	Distance	25.25	-0.500	0.500	24.209	-1.041	Low
E3	Wedge Y	Line	Point	Distance	12.63	-0.500	0.500	12.078	-0.552	Low
E4	Wedge Y	Line	Point	Distance	6.73	-0.500	0.500	6.137	-0.593	Low
E5	Cube 4	Line	Point	Distance	8.42	-0.500	0.500	8.009	-0.411	Good
E6	Rectangular Hole	Line	Point	Distance	8.42	-0.500	0.500	8.642	0.222	Good
E7	Rectangular Hole	Line	Point	Distance	25.25	-0.500	0.500	25.574	0.324	Good
E8	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.911	-0.509	Low
E9	Cube 3	Line	Point	Distance	8.42	-0.500	0.500	7.770	-0.650	Low
E10	Cylinder Inner Diameter	Line	Point	Distance	21.04	-0.500	0.500	21.022	-0.018	Good
E11	Cylinder Outer Diameter	Line	Point	Distance	29.46	-0.500	0.500	29.325	-0.135	Good
E12	Square Base	Line	Point	Distance	151.5	-0.500	0.500	150.280	-1.220	Low
EE1	Triangular Hole	Line	Point	Distance	5.89	-0.500	0.500	5.654	-0.236	Good
EE2	Thin Walls	Line	Point	Distance	4.21	-0.500	0.500	4.094	-0.116	Good
EE3	Thin Walls	Line	Point	Distance	2.53	-0.500	0.500	2.499	-0.031	Good
AA1	Wedge X-direction	Line	Line	Angularity	60	-0.500	0.500	59.024	-0.976	Low
AA2	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	73.789	-1.211	Low
AA3	Wedge X-direction	Line	Line	Angularity	75	-0.500	0.500	76.102	1.102	High
BB1	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	75.156	0.156	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
BB2	Wedge Y-direction	Line	Line	Angularity	60	-0.500	0.500	59.903	-0.097	Good
BB3	Wedge Y-direction	Line	Line	Angularity	75	-0.500	0.500	74.769	-0.231	Good
CC1	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	107.320	0.620	High
CC2	Pyramid	Line	Line	Angularity	106.7	-0.500	0.500	105.809	-0.891	Low
DD1	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	111.803	0.003	Good
DD2	Pyramid	Line	Line	Angularity	111.8	-0.500	0.500	112.609	0.809	High
T1	Triangular Hole	Line	Line	Perpendicularity		-0.500	0.500	0.015	0.015	Good
T2	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.076	0.076	Good
T3	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Concentricity		-0.500	0.500	0.025	0.025	Good
T4	Cylinder Hole/ Hollow Cylinder	Outer Circle	Inner Circle	Circularity		-0.500	0.500	0.028	0.028	Good
T5	Square Base	Plane		Flatness		-0.500	0.500	1.343	1.343	High
T6	Square Base	Left_Side	Bottom Side	Perpendicularity		-0.500	0.500	0.123	0.123	Good
T7	Square Base	Top_Side	Right Side	Perpendicularity		-0.500	0.500	0.050	0.050	Good
T8	Square Base	Left_Side	Right Side	Parallelism		-0.500	0.500	0.106	0.106	Good
T9	Square Base	Top_Side	Bottom Side	Parallelism		-0.500	0.500	0.068	0.068	Good
T10	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.221	0.221	Good
T11	Thin Walls	Line	Line	Parallelism		-0.500	0.500	0.215	0.215	Good
T12	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.236	0.236	Good
T13	Thin Walls	Line	Line	Thickness		-0.500	0.500	0.251	0.251	Good
T14	Cube's 2,3,1	Cube231		Straightness		-0.500	0.500	0.076	0.076	Good
T15	Cube's 1,4, RecProtr	Cube14Rec		Straightness		-0.500	0.500	0.014	0.014	Good
T16	Rectangular Protrusion Outer	RecP2	RecP1	Perpendicularity		-0.500	0.500	0.227	0.227	Good
T17	Rectangular Protrusion Inner	RecP4	RecP3	Perpendicularity		-0.500	0.500	0.637	0.637	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T18	Rectangular Hole Outer	Rech4	Rech3	Perpendicularity		-0.500	0.500	0.462	0.462	Good
T19	Rectangular Hole Inner	Rech1	Rech2	Perpendicularity		-0.500	0.500	0.206	0.206	Good
T23	Cone	Actual Cone Axis	Cone	Symmetry tol. axis element		-0.500	0.500	0.097	0.097	Good
T24	Cone	Cone Bottom Circle	Cone	Circular runout		-0.500	0.500	0.204	0.204	Good
T26	Cone	Cone Bottom Circle	Theoretical Cone Axis	Circular runout		-0.500	0.500	1.261	1.261	High
T27	Cone	plane_2	Theoretical Cone Axis	Axial runout		-0.500	0.500	0.875	0.875	High
T29	Cone	plane_2	Cone	Axial runout		-0.500	0.500	4.056	4.056	High
T31	Cone	Cone	plane_2	Symmetry tol. axis element		-0.500	0.500	0.452	0.452	Good
T32	Cone	Cone Bottom Circle	Cone	Symmetry tol. point element		-0.500	0.500	0.041	0.041	Good
T33	Cone	Cone	plane_2	Angularity		-0.500	0.500	0.011	0.011	Good
T34	Cone	Cone	Theoretical Cone Axis	Coaxiality		-0.500	0.500	1.292	1.292	High
T36	Cone	Cone	Actual Cone Axis	Coaxiality		-0.500	0.500	0.257	0.257	Good
T37	Cone	Cone_Bottom_Circle	Actual Cone Axis	Circular runout		-0.500	0.500	0.077	0.077	Good
T38	Sphere	Sphere Bottom Circle	Sphere Axis	Circular runout		-0.500	0.500	0.568	0.568	High
T39	Sphere	Sphere Bottom Circle	Actual Sphere Axis	Circular runout		-0.500	0.500	0.111	0.111	Good
T40	Sphere	plane_2	Theoretical Sphere Axis	Axial runout		-0.500	0.500	0.875	0.875	High
T41	Sphere	plane_2	Actual Sphere Axis	Axial runout		-0.500	0.500	0.711	0.711	High

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
T42	Sphere	plane_2	Sphere	Symmetry tol. plane element		-0.500	0.500	3.587	3.587	High
T43	Sphere	Theoretical Sphere Axis	Sphere	Symmetry tol. axis element		-0.500	0.500	0.242	0.242	Good
T47	Sphere	Sphere Bottom Circle	Sphere	Symmetry tol. point element		-0.500	0.500	0.010	0.010	Good
T50	Sphere	plane_2	Actual Sphere Axis	Perpendicularity		-0.500	0.500	0.790	0.790	High
T51	Sphere	Actual Sphere Axis	Theoretical Sphere Axis	Coaxiality		-0.500	0.500	0.566	0.566	High
T52	Sphere	Sphere	Sphere Bottom Circle	Concentricity		-0.500	0.500	0.063	0.063	Good
T54	Dome	Dome Bottom Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.051	0.051	Good
T56	Dome	Dome Upper Circle	Actual Dome axis	Circular runout		-0.500	0.500	0.005	0.005	Good
T58	Dome	plane_2	Actual Dome axis	Axial runout		-0.500	0.500	3.733	3.733	High
T65	Dome	Dome Bottom Circle	Dome Upper Circle	Symmetry tol. point element		-0.500	0.500	0.395	0.395	Good
T67	Dome	plane_2	Actual Dome axis	Perpendicularity		-0.500	0.500	0.747	0.747	High
T69	Dome	Dome Upper Circle	Dome Bottom Circle	Concentricity		-0.500	0.500	0.397	0.397	Good
T70	Sinkhole	Sinkhole Upper Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.369	1.369	High
T71	Sinkhole	Sinkhole Upper	Actual	Circular runout		-0.500	0.500	0.113	0.113	Good

Tolerance No.	Feature	Tol.ElemName	Compared to	Type of Tolerance	Spec.	Lower Tol.	Upper Tol.	Actual	Tol. Deviation	Result
		Circle	Sinkhole Axis							
<b>T72</b>	Sinkhole	Sinkhole Bottom Circle	Theoretical Sinkhole axis	Circular runout		-0.500	0.500	1.034	1.034	<b>High</b>
<b>T73</b>	Sinkhole	Sinkhole Bottom Circle	Actual Sinkhole Axis	Circular runout		-0.500	0.500	0.049	0.049	<b>Good</b>
<b>T74</b>	Sinkhole	plane_2	Theoretical Sinkhole axis	Axial runout		-0.500	0.500	0.875	0.875	<b>High</b>
<b>T79</b>	Sinkhole	Theoretical Sinkhole Axis	plane_2	Symmetry tol. axis element		-0.500	0.500	0.289	0.289	<b>Good</b>
<b>T81</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Symmetry tol. axis element		-0.500	0.500	0.927	0.927	<b>High</b>
<b>T82</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Bottom Circle	Symmetry tol. point element		-0.500	0.500	0.178	0.178	<b>Good</b>
<b>T84</b>	Sinkhole	plane_2	Actual Sinkhole Axis	Perpendicularity		-0.500	0.500	1.543	1.543	<b>High</b>
<b>T85</b>	Sinkhole	Actual Sinkhole Axis	Theoretical Sinkhole axis	Coaxiality		-0.500	0.500	1.529	1.529	<b>High</b>
<b>T86</b>	Sinkhole	Sinkhole Bottom Circle	Sinkhole Lower Circle	Concentricity		-0.500	0.500	0.416	0.416	<b>Good</b>



DAI - Wax Pattern (Alumide1)					
High	$X > 0.5$			Dimensional Accuracy index (DAI = Good/Total x 100%)	
Good	$-0.5 < X > 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				47.41%
	High	Good	Low	Total	
	36	55	25	116	

DAI - Wax Pattern (Polymide1)					
High	$X > 0.5$			Dimensional Accuracy index (DAI = Good/Total x 100%)	
Good	$-0.5 < X > 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				65.52%
	High	Good	Low	Total	
	17	76	23	116	

DAI - Wax Pattern (Alumide2)					
High	$X > 0.5$			Dimensional Accuracy index (DAI = Good/Total x 100%)	
Good	$-0.5 < X > 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				64.66%
	High	Good	Low	Total	
	25	75	16	116	

DAI - Wax Pattern (Polymide2)					
High	$X > 0.5$			Dimensional Accuracy index (DAI = Good/Total x 100%)	
Good	$-0.5 < X > 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				64.66%
	High	Good	Low	Total	
	16	75	25	116	

DAI - Wax Pattern (Alumide3)					
High	$X > 0.5$			Dimensional Accuracy index (DAI = Good/Total x 100%)	
Good	$-0.5 < X > 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				63.79%
	High	Good	Low	Total	
	26	74	16	116	

DAI - Wax Pattern (Polymide3)					
High	$X > 0.5$			Dimensional Accuracy index (DAI = Good/Total x 100%)	
Good	$-0.5 < X > 0.5$				
Low	$X < -0.5$				
Pattern Model	Counts				50.00%
	High	Good	Low	Total	
	28	58	30	116	

*Appendix H Wax Patterns -  
Statistical CMM Raw  
Data (3D-Tol Data)*

**3D-Tol Data from CMM for Wax Pattern (Alumide1)**

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
53.924	58.464	-6.255		53.924	58.917	-6.255		0	-0.452	0	-0.452
37.377	58.406	-6.272		37.377	58.917	-6.272		0	-0.511	0	-0.511
20.833	58.309	-6.289		20.833	58.917	-6.289		0	-0.607	0	-0.607
4.288	58.27	-6.306		4.288	58.917	-6.306		0	-0.647	0	-0.647
-12.258	58.264	-6.323		-12.258	58.917	-6.323		0	-0.653	0	-0.653
-28.801	58.341	-6.339		-28.801	58.917	-6.339		0	-0.576	0	-0.576
-45.346	58.433	-6.356		-45.346	58.917	-6.356		0	-0.484	0	-0.484
-61.891	58.489	-6.373		-61.891	58.917	-6.373		0	-0.428	0	-0.428
-79.634	41.18	-6.424		-79.958	41.18	-6.424		0.324	0	0	-0.324
-79.518	24.636	-6.451		-79.958	24.636	-6.451		0.44	0	0	-0.44
-79.458	8.09	-6.478		-79.958	8.09	-6.478		0.5	0	0	-0.5
-79.388	-8.454	-6.505		-79.958	-8.454	-6.505		0.57	0	0	-0.57
-79.323	-25	-6.533		-79.958	-25	-6.533		0.636	0	0	-0.636
-79.297	-41.543	-6.56		-79.958	-41.543	-6.56		0.662	0	0	-0.662
-79.316	-58.089	-6.587		-79.958	-58.089	-6.587		0.642	0	0	-0.642
-79.375	-74.633	-6.614		-79.958	-74.633	-6.614		0.584	0	0	-0.584
-62.144	-92.22	-6.627		-62.144	-92.583	-6.627		0	0.363	0	-0.363
-45.599	-92.175	-6.609		-45.599	-92.583	-6.609		0	0.409	0	-0.409
-29.055	-92.108	-6.592		-29.055	-92.583	-6.592		0	0.475	0	-0.475
-12.509	-92.148	-6.575		-12.509	-92.583	-6.575		0	0.436	0	-0.436
4.035	-92.203	-6.559		4.035	-92.583	-6.559		0	0.38	0	-0.38
20.58	-92.277	-6.542		20.58	-92.583	-6.542		0	0.306	0	-0.306
37.125	-92.308	-6.525		37.125	-92.583	-6.525		0	0.276	0	-0.276
53.669	-92.367	-6.508		53.669	-92.583	-6.508		0	0.216	0	-0.216
71.289	-74.887	-6.459		71.542	-74.887	-6.459		-0.253	0	0	-0.253
71.222	-58.342	-6.43		71.542	-58.342	-6.43		-0.319	0	0	-0.319
71.169	-41.797	-6.403		71.542	-41.797	-6.403		-0.373	0	0	-0.373
71.143	-25.252	-6.375		71.542	-25.252	-6.375		-0.399	0	0	-0.399
71.061	-8.707	-6.348		71.542	-8.707	-6.348		-0.481	0	0	-0.481
70.934	7.838	-6.321		71.542	7.838	-6.321		-0.607	0	0	-0.607
70.914	24.383	-6.294		71.542	24.383	-6.294		-0.628	0	0	-0.628
71.017	40.928	-6.266		71.542	40.928	-6.266		-0.524	0	0	-0.524
-69.676	43.829	7.97		-69.676	43.829	8.417		0	0	-0.446	-0.446
-64.626	43.82	7.977		-64.626	43.82	8.417		0	0	-0.44	-0.44
-64.618	48.871	7.965		-64.618	48.871	8.417		0	0	-0.451	-0.451
-69.669	48.88	7.973		-69.669	48.88	8.417		0	0	-0.443	-0.443
-67.541	46.471	8.003		-67.541	46.471	8.417		0	0	-0.413	-0.413
-71.743	43.841	6.214		-71.542	43.841	6.214		-0.201	0	0	0.201
-71.851	48.891	6.224		-71.542	48.891	6.224		-0.309	0	0	0.309
-69.658	50.712	6.231		-69.658	50.5	6.231		0	0.212	0	0.212
-64.609	50.652	6.238		-64.609	50.5	6.238		0	0.152	0	0.152
-63.653	42.001	6.218		-63.125	42.083	6.218		-0.528	-0.082	0	0.535
-69.68	42.778	6.214		-69.68	42.083	6.214		0	0.694	0	-0.694
-63.066	49.854	6.233		-63.125	50.5	6.233		0.059	-0.646	0	0.648
-64.007	43.823	6.225		-63.125	43.823	6.225		-0.882	0	0	-0.882

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
-64.717	-14.247	4.041		-64.717	-14.247	4.208		0	0	-0.168	-0.168
-69.769	-14.238	3.891		-69.769	-14.238	4.208		0	0	-0.317	-0.317
-69.777	-19.289	3.917		-69.777	-19.289	4.208		0	0	-0.291	-0.291
-64.726	-19.298	4.054		-64.726	-19.298	4.208		0	0	-0.155	-0.155
-67.894	-16.665	3.863		-67.894	-16.665	4.208		0	0	-0.345	-0.345
-69.76	-12.878	2.759		-69.76	-12.625	2.759		0	-0.253	0	-0.253
-64.709	-12.872	2.765		-64.709	-12.625	2.765		0	-0.247	0	-0.247
-63.044	-14.247	3.734		-63.125	-14.247	4.208		0.081	0	-0.475	0.481
-63.042	-19.297	3.725		-63.125	-19.297	4.208		0.083	0	-0.484	0.491
-64.73	-20.869	2.747		-64.73	-21.042	2.747		0	0.173	0	-0.173
-69.781	-20.967	2.742		-69.781	-21.042	2.742		0	0.075	0	-0.075
-71.907	-19.278	2.743		-71.542	-19.278	2.743		-0.366	0	0	0.366
-71.898	-14.228	2.753		-71.542	-14.228	2.753		-0.357	0	0	0.357
-64.827	-76.397	8.475		-64.827	-75.75	8.417		0	-0.647	0.058	0.65
-69.877	-76.388	8.471		-69.877	-75.75	8.417		0	-0.638	0.054	0.64
-70.866	-82.421	8.48		-71.542	-82.421	8.417		0.676	0	0.064	0.679
-63.855	-82.429	8.492		-63.125	-82.429	8.417		-0.73	0	0.076	0.734
-70.848	-75.677	6.021		-71.542	-75.75	6.021		0.694	0.073	0	0.698
-64.819	-76.745	6.027		-64.819	-75.75	6.027		0	-0.995	0	-0.995
-63.039	-76.401	6.024		-63.125	-75.75	6.024		0.086	-0.651	0	0.657
-63.865	-82.429	6.016		-63.125	-82.429	6.016		-0.74	0	0	-0.74
-64.838	-84.394	6.007		-64.838	-84.167	6.007		0	-0.227	0	0.227
-69.89	-84.443	6.004		-69.89	-84.167	6.004		0	-0.276	0	0.276
-71.603	-82.409	6.006		-71.542	-82.409	6.006		-0.061	0	0	0.061
-71.546	-77.358	6.015		-71.542	-77.358	6.015		-0.004	0	0	0.004
-2.339	43.724	4.184		-2.339	43.724	4.208		0	0	-0.024	-0.024
2.71	43.715	4.164		2.71	43.715	4.208		0	0	-0.044	-0.044
2.719	48.767	3.975		2.719	48.767	4.208		0	0	-0.233	-0.233
-2.331	48.775	3.981		-2.331	48.775	4.208		0	0	-0.228	-0.228
-0.495	46.759	4.095		-0.495	46.759	4.208		0	0	-0.113	-0.113
-4.25	43.737	1.654		-4.208	43.737	1.654		-0.042	0	0	0.042
-4.203	48.789	1.663		-4.208	48.789	1.663		0.005	0	0	-0.005
2.711	42.531	1.658		2.711	42.083	1.658		0	0.447	0	-0.447
-2.341	42.525	1.653		-2.341	42.083	1.653		0	0.442	0	-0.442
3.96	48.769	1.674		4.208	48.769	1.674		-0.249	0	0	-0.249
3.957	43.719	1.665		4.208	43.719	1.665		-0.252	0	0	-0.252
-2.32	50.787	1.67		-2.32	50.5	1.67		0	0.287	0	0.287
2.73	50.779	1.676		2.73	50.5	1.676		0	0.279	0	0.279
-65.055	36.738	-1.786		-64.658	36.342	-1.786		-0.396	0.396	0	-0.56
-54.335	47.449	-1.756		-53.943	47.057	-1.756		-0.392	0.392	0	-0.555
-46.864	46.841	-1.752		-46.853	46.853	-1.752		-0.011	-0.011	0	0.016
-36.18	36.097	-1.759		-36.139	36.139	-1.759		-0.042	-0.042	0	0.059
-41.023	28.891	-1.771		-40.909	29.006	-1.771		-0.115	-0.115	0	-0.162
-48.113	36.087	-1.765		-48.051	36.148	-1.765		-0.062	-0.062	0	-0.087
-35.884	29.916	-2.146		-35.629	29.662	-2.146		-0.255	0.255	0	0.36
-54.288	35.479	-1.776		-53.953	35.144	-1.776		-0.335	0.335	0	0.474
-59.05	30.72	-1.789		-58.714	30.383	-1.789		-0.336	0.336	0	0.475

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
-65.477	29.434	-1.696		-65.31	29.601	-1.696		-0.167	-0.167	0	-0.236
-61.218	33.629	-4.629		-61.218	33.629	-4.208		0	0	-0.421	-0.421
-56.642	38.378	-4.591		-56.642	38.378	-4.208		0	0	-0.383	-0.383
-50.137	43.769	-4.6		-50.137	43.769	-4.208		0	0	-0.391	-0.391
-44.586	38.711	-4.367		-44.586	38.711	-4.208		0	0	-0.158	-0.158
-39.918	33.895	-4.232		-39.918	33.895	-4.208		0	0	-0.024	-0.024
49.84	42.561	5.494		49.84	42.083	5.494		0	0.478	0	-0.478
43.106	42.575	5.486		43.106	42.083	5.486		0	0.492	0	-0.492
55.168	30.164	5.48		54.708	30.164	5.48		0.46	0	0	-0.46
55.111	36.9	5.491		54.708	36.9	5.491		0.403	0	0	-0.403
58.953	25.532	4.98		58.953	25.25	4.98		0	0.282	0	-0.282
62.999	30.147	5.491		63.125	30.147	5.491		-0.126	0	0	-0.126
63.033	37.723	5.504		63.125	37.723	5.504		-0.092	0	0	-0.092
63.104	45.297	5.516		63.125	45.297	5.516		-0.021	0	0	-0.021
58.276	50.412	5.519		58.276	50.5	5.519		0	-0.088	0	-0.088
50.698	50.411	5.512		50.698	50.5	5.512		0	-0.089	0	-0.089
43.123	50.432	5.506		43.123	50.5	5.506		0	-0.068	0	-0.068
38.206	46.137	4.771		37.875	46.137	4.771		0.331	0	0	-0.331
43.361	46.288	7.878		43.361	46.288	8.417		0	0	-0.539	-0.539
50.593	45.984	7.853		50.593	45.984	8.417		0	0	-0.564	-0.564
58.564	45.64	7.909		58.564	45.64	8.417		0	0	-0.507	-0.507
59.29	37.375	7.799		59.29	37.375	8.417		0	0	-0.618	-0.618
59.154	30.529	7.794		59.154	30.529	8.417		0	0	-0.622	-0.622
-30.721	49.409	16.175		-30.721	48.661	16.606		0	0.747	-0.431	-0.863
-30.723	46.282	11.277		-30.723	45.759	11.579		0	0.523	-0.302	-0.604
-30.723	43.18	6.365		-30.723	42.857	6.552		0	0.323	-0.186	-0.373
-30.724	40.1	1.443		-30.724	39.955	1.526		0	0.145	-0.084	-0.168
-26.934	40.072	1.459		-26.934	39.955	1.527		0	0.117	-0.067	-0.135
-26.934	43.238	6.33		-26.934	42.856	6.551		0	0.382	-0.221	-0.441
-26.933	46.305	11.264		-26.933	45.759	11.579		0	0.546	-0.315	-0.631
-26.934	49.391	16.184		-26.934	48.661	16.605		0	0.73	-0.421	-0.843
-23.146	49.383	16.189		-23.146	48.661	16.605		0	0.722	-0.417	-0.833
-23.147	46.279	11.281		-23.147	45.76	11.58		0	0.519	-0.3	-0.599
-23.148	43.208	6.35		-23.148	42.857	6.553		0	0.351	-0.203	-0.405
-23.148	40.062	1.466		-23.148	39.956	1.527		0	0.106	-0.061	-0.123
-16.825	45.638	1.361		-16.825	45.294	1.453		0	0.344	-0.092	-0.356
-16.828	47.948	8.823		-16.828	47.315	8.992		0	0.634	-0.17	-0.656
-16.832	50.281	16.79		-16.832	50.491	16.846		0	-0.21	-0.056	0.217
-11.782	50.248	16.802		-11.782	50.486	16.866		0	-0.238	-0.064	0.246
-11.78	47.917	8.833		-11.78	47.315	8.994		0	0.602	-0.161	-0.624
-11.776	45.635	1.365		-11.776	45.295	1.456		0	0.34	-0.091	-0.352
-8.81	49.581	7.084		-8.178	49.581	7.084		-0.632	0	0	-0.632
-30.71	51.94	14.877		-30.71	51.081	14.647		0	0.859	0.23	0.89
-30.702	53.291	9.182		-30.702	52.595	8.996		0	0.696	0.186	0.72
-30.694	54.516	3.451		-30.694	54.11	3.342		0	0.406	0.109	0.42
-23.96	54.447	3.443		-23.96	54.107	3.352		0	0.34	0.091	0.352
-23.97	53.247	9.18		-23.97	52.593	9.004		0	0.654	0.175	0.677

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-23.978	51.998	14.908		-23.978	51.077	14.661		0	0.921	0.247		0.953
-17.243	51.952	14.903		-17.243	51.075	14.668		0	0.877	0.235		0.908
-17.234	53.242	9.187		-17.234	52.59	9.012		0	0.652	0.175		0.675
-17.228	54.457	3.455		-17.228	54.105	3.361		0	0.352	0.094		0.364
-10.492	54.48	3.471		-10.492	54.102	3.37		0	0.377	0.101		0.391
-10.503	53.226	9.192		-10.503	52.588	9.021		0	0.638	0.171		0.66
-10.511	51.9	14.899		-10.511	51.072	14.678		0	0.828	0.222		0.857
-33.404	48.965	9.201		-33.428	48.965	9.201		0.024	0	0		-0.024
5.049	-63.198	18.228		4.895	-63.198	18.269		0.154	0	-0.041		-0.159
3.127	-63.183	11.169		3.002	-63.183	11.202		0.125	0	-0.034		-0.129
1.289	-63.168	4.086		1.108	-63.168	4.135		0.181	0	-0.049		-0.188
1.355	-69.904	4.056		1.105	-69.904	4.123		0.251	0	-0.067		-0.259
3.211	-69.918	11.132		2.998	-69.918	11.189		0.213	0	-0.057		-0.22
5.061	-69.933	18.21		4.892	-69.933	18.256		0.17	0	-0.045		-0.176
5.136	-76.666	18.177		4.888	-76.666	18.243		0.248	0	-0.066		-0.257
3.285	-76.65	11.097		2.994	-76.65	11.175		0.291	0	-0.078		-0.301
1.457	-76.635	4.014		1.101	-76.635	4.109		0.356	0	-0.095		-0.368
1.431	-83.371	4.007		1.098	-83.371	4.096		0.334	0	-0.089		-0.345
3.284	-83.385	11.083		2.991	-83.385	11.162		0.293	0	-0.079		-0.303
5.197	-83.4	18.147		4.885	-83.4	18.231		0.313	0	-0.084		-0.324
7.425	-86.292	9.708		7.425	-85.85	9.708		0	-0.442	0		0.442
8.134	-83.413	20.847		7.942	-83.413	20.736		0.192	0	0.111		0.222
13.534	-83.409	11.398		13.384	-83.409	11.311		0.151	0	0.087		0.174
18.973	-83.402	1.972		18.825	-83.402	1.887		0.148	0	0.085		0.171
19.066	-75.825	2.035		18.821	-75.825	1.893		0.245	0	0.141		0.283
13.53	-75.831	11.402		13.381	-75.831	11.316		0.149	0	0.086		0.172
8.215	-75.838	20.901		7.939	-75.838	20.742		0.277	0	0.16		0.319
7.378	-69.524	20.7		7.099	-69.524	20.625		0.279	0	0.075		0.289
9.891	-69.515	11.272		9.624	-69.515	11.201		0.267	0	0.071		0.276
12.463	-69.502	1.861		12.149	-69.502	1.777		0.314	0	0.084		0.325
12.509	-64.451	1.882		12.147	-64.451	1.785		0.362	0	0.097		0.375
9.938	-64.462	11.292		9.622	-64.462	11.207		0.316	0	0.085		0.328
7.422	-64.474	20.718		7.097	-64.474	20.631		0.325	0	0.087		0.337
6.452	-61.875	10.501		6.452	-60.6	10.501		0	-1.275	0		-1.275
-30.435	-51.265	-5.304		-30.457	-50.908	-5.786		0.022	-0.357	0.482		0.6
-30.167	-55.551	-7.453		-30.183	-55.277	-7.946		0.016	-0.273	0.493		0.564
-29.952	-58.975	-12.001		-29.962	-58.81	-12.086		0.01	-0.164	0.084		0.185
-29.761	-61.974	-15.997		-29.764	-61.909	-16.105		0.004	-0.065	0.107		0.125
-33.352	-63.77	-15.925		-33.44	-63.69	-16.126		0.088	-0.081	0.2		0.233
-35.61	-61.752	-11.984		-35.776	-61.601	-12.099		0.166	-0.151	0.115		0.252
-38.294	-59.357	-7.676		-38.41	-59.252	-7.956		0.116	-0.105	0.28		0.32
-41.554	-56.427	-5.54		-41.686	-56.308	-5.779		0.132	-0.119	0.239		0.298
-46.041	-68.051	-5.908		-45.931	-68.047	-5.761		-0.11	-0.005	-0.147		-0.183
-41.492	-67.841	-7.997		-41.478	-67.841	-7.973		-0.014	-0.001	-0.025		-0.028
-37.976	-67.678	-12.126		-37.97	-67.678	-12.123		-0.006	0	-0.003		-0.007
-34.844	-67.532	-16.139		-34.84	-67.531	-16.133		-0.004	0	-0.006		-0.008
-33.137	-71.278	-16.179		-33.121	-71.261	-16.141		-0.015	-0.016	-0.038		-0.044

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
-35.388	-73.694	-12.228		-35.264	-73.56	-12.134		-0.125	-0.134	-0.094	-0.206
-37.744	-76.227	-8.231		-37.648	-76.124	-7.982		-0.096	-0.103	-0.249	-0.287
-40.899	-79.615	-6.137		-40.702	-79.404	-5.755		-0.197	-0.211	-0.382	-0.479
-29.769	-67.402	-17.15		-29.802	-67.409	-16.881		0.032	0.007	-0.269	-0.271
-26.854	-62.587	-16.043		-26.839	-62.558	-16.096		-0.016	-0.029	0.053	0.062
-25.418	-59.972	-12.004		-25.349	-59.845	-12.078		-0.069	-0.127	0.074	0.162
-23.794	-57.01	-7.375		-23.643	-56.735	-7.94		-0.151	-0.275	0.565	0.646
-21.76	-53.307	-5.188		-21.545	-52.916	-5.792		-0.215	-0.391	0.604	0.751
-13.968	-62.805	-5.356		-13.663	-62.716	-5.784		-0.305	-0.089	0.428	0.533
-18.089	-64.007	-7.531		-17.867	-63.942	-7.947		-0.222	-0.065	0.416	0.476
-21.345	-64.94	-12.048		-21.27	-64.918	-12.088		-0.075	-0.022	0.04	0.087
-24.239	-65.778	-16.113		-24.246	-65.781	-16.101		0.007	0.002	-0.012	-0.014
-24.661	-69.912	-16.166		-24.688	-69.897	-16.115		0.027	-0.015	-0.051	-0.06
-21.887	-71.44	-12.151		-21.963	-71.399	-12.107		0.076	-0.041	-0.044	-0.097
-18.91	-73.086	-7.89		-18.876	-73.104	-7.96		-0.034	0.019	0.07	0.08
-14.983	-75.245	-5.762		-14.986	-75.243	-5.758		0.003	-0.002	-0.005	-0.006
-24.734	-83.467	-6.138		-24.819	-83.18	-5.743		0.084	-0.288	-0.394	-0.496
-26.033	-79.003	-8.222		-26.072	-78.87	-7.977		0.039	-0.133	-0.245	-0.281
-26.979	-75.729	-12.25		-27.047	-75.501	-12.128		0.067	-0.228	-0.122	-0.267
-27.889	-72.586	-16.276		-27.914	-72.502	-16.128		0.025	-0.085	-0.148	-0.172
-32.054	-72.073	-16.194		-32.039	-72.046	-16.141		-0.015	-0.028	-0.053	-0.062
-33.627	-74.971	-12.235		-33.539	-74.803	-12.137		-0.088	-0.168	-0.097	-0.213
-35.289	-78.024	-8.273		-35.218	-77.876	-7.982		-0.071	-0.149	-0.29	-0.334
-37.495	-82.104	-6.166		-37.369	-81.815	-5.751		-0.126	-0.29	-0.415	-0.522
-25.413	-86.435	-1.239		-25.504	-86.005	-0.849		0.091	-0.43	-0.39	-0.588
-13.004	-77.236	-1.244		-13.24	-77.094	-1.044		0.236	-0.142	-0.199	-0.34
-11.479	-61.918	-0.75		-11.256	-61.851	-0.938		-0.223	-0.067	0.188	0.299
-16.569	-54.051	-0.435		-16.193	-53.663	-0.892		-0.376	-0.387	0.457	0.707
-25.902	-48.987	-0.173		-25.802	-48.47	-0.714		-0.1	-0.516	0.541	0.755
-47.433	-37.854	18.145		-46.95	-37.626	18.453		-0.482	-0.227	-0.308	-0.616
-43.952	-36.204	11.95		-43.656	-36.065	12.138		-0.296	-0.14	-0.189	-0.377
-40.47	-34.555	5.758		-40.363	-34.505	5.826		-0.107	-0.051	-0.068	-0.137
-39.457	-41.352	5.838		-39.475	-41.348	5.827		0.018	-0.003	0.011	0.021
-43.252	-40.644	12.026		-43.058	-40.68	12.14		-0.194	0.036	-0.114	-0.228
-47.016	-39.944	18.23		-46.64	-40.013	18.451		-0.376	0.069	-0.221	-0.442
-47.776	-42.154	18.469		-47.791	-42.137	18.456		0.016	-0.016	0.013	0.026
-45.227	-44.839	12.191		-45.283	-44.78	12.144		0.056	-0.058	0.047	0.093
-42.66	-47.55	5.93		-42.777	-47.427	5.832		0.117	-0.123	0.098	0.196
-48.988	-50.786	6.052		-49.037	-50.413	5.835		0.049	-0.373	0.217	0.434
-49.454	-47.216	12.393		-49.509	-46.799	12.149		0.055	-0.418	0.243	0.486
-49.924	-43.588	18.697		-49.978	-43.184	18.462		0.054	-0.404	0.235	0.471
-52.73	-43.401	18.905		-52.37	-42.739	18.47		-0.36	-0.662	0.435	0.87
-54.432	-46.513	12.526		-54.12	-45.941	12.15		-0.312	-0.572	0.376	0.752
-56.116	-49.577	6.132		-55.874	-49.134	5.841		-0.242	-0.444	0.292	0.584
-52.946	-40.457	22.834		-52.057	-40.037	22.266		-0.888	-0.42	0.567	1.135
-58.009	-42.836	12.583		-57.339	-42.521	12.156		-0.669	-0.315	0.427	0.854
-62.935	-45.149	2.263		-62.616	-44.999	2.059		-0.319	-0.15	0.204	0.407

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-63.947	-36.699	2.239		-63.645	-36.758	2.061		-0.303	0.059	0.178		0.356
-58.526	-37.752	12.517		-57.92	-37.869	12.161		-0.606	0.117	0.356		0.713
-52.946	-38.83	22.707		-52.193	-38.975	22.264		-0.753	0.145	0.443		0.886
-51.84	-37.847	22.401		-51.671	-38.03	22.257		-0.169	0.183	0.144		0.287
-55.862	-33.541	12.334		-55.652	-33.767	12.156		-0.211	0.226	0.178		0.357
-59.769	-29.363	2.173		-59.633	-29.508	2.058		-0.136	0.146	0.115		0.23
-52.151	-25.928	2.098		-52.141	-26.008	2.052		-0.01	0.08	0.046		0.093
-51.413	-31.81	12.142		-51.415	-31.793	12.152		0.002	-0.016	-0.009		-0.019
-50.669	-37.805	22.118		-50.695	-37.579	22.249		0.026	-0.226	-0.131		-0.263
-49.953	-38.209	21.947		-49.668	-37.777	22.245		-0.285	-0.432	-0.298		-0.597
-47.02	-32.891	11.986		-46.872	-32.66	12.144		-0.148	-0.231	-0.158		-0.316
-44.084	-27.554	2.036		-44.077	-27.542	2.044		-0.007	-0.011	-0.008		-0.016
-45.921	3.725	24.88		-45.929	3.732	24.87		0.008	-0.008	0.01		0.015
-50.529	8.071	28.33		-50.325	7.876	27.494		-0.204	0.195	0.836		0.882
-54.463	11.81	21.842		-53.814	11.19	21.467		-0.65	0.62	0.376		0.973
-56.86	14.114	7.86		-56.434	13.706	7.755		-0.427	0.407	0.106		0.599
-62.492	-1.618	7.843		-61.87	-1.568	7.731		-0.623	-0.049	0.112		0.635
-59.236	-1.378	21.879		-58.244	-1.299	21.463		-0.992	-0.08	0.416		1.078
-53.71	-0.949	28.306		-53.439	-0.927	27.496		-0.271	-0.022	0.81		0.854
-47.489	-0.45	24.783		-47.41	-0.443	24.856		-0.079	-0.007	-0.073		-0.107
-45.111	-4.109	25.134		-45.27	-4.325	24.884		0.159	0.216	0.249		0.366
-49.151	-9.361	28.361		-48.968	-9.119	27.485		-0.183	-0.242	0.876		0.927
-52.288	-13.445	21.697		-51.895	-12.927	21.426		-0.393	-0.518	0.271		0.705
-54.327	-16.104	7.777		-54.099	-15.803	7.71		-0.229	-0.301	0.068		0.384
-38.325	-19.59	7.722		-38.342	-19.497	7.705		0.018	-0.092	0.017		0.096
-38.991	-16.105	21.463		-39.021	-15.949	21.397		0.03	-0.156	0.066		0.172
-39.846	-11.535	28.263		-39.9	-11.256	27.471		0.054	-0.279	0.792		0.842
-41.12	-4.601	25.596		-40.974	-5.299	24.929		-0.146	0.697	0.668		0.976
-40.161	19.987	7.808		-40.184	19.751	7.765		0.023	0.236	0.042		0.24
-40.489	16.537	21.618		-40.527	16.143	21.452		0.038	0.395	0.166		0.43
-40.927	11.659	28.285		-40.954	11.38	27.482		0.028	0.279	0.804		0.851
-41.53	4.891	25.378		-41.475	5.374	24.923		-0.055	-0.482	0.455		0.665
-39.192	3.615	25.699		-38.692	4.241	24.947		-0.5	-0.625	0.752		1.099
-34.897	9.271	28.191		-35.056	9.066	27.469		0.159	0.205	0.721		0.766
-32.152	12.86	21.44		-32.166	12.843	21.43		0.013	0.017	0.009		0.024
-30.04	15.624	7.736		-29.969	15.717	7.757		-0.071	-0.092	-0.021		-0.119
-23.868	6.741	7.667		-23.471	6.888	7.742		-0.397	-0.147	-0.076		-0.43
-27.131	5.516	21.284		-26.851	5.62	21.408		-0.28	-0.103	-0.124		-0.323
-31.094	4.035	28.033		-31.291	3.962	27.46		0.198	0.073	0.573		0.611
-37.869	1.506	25.875		-36.956	1.833	24.962		-0.913	-0.326	0.913		1.332
-37.775	-0.881	25.974		-36.738	-1.093	24.974		-1.037	0.212	0.999		1.456
-30.611	-2.405	28.033		-30.821	-2.361	27.456		0.209	-0.044	0.577		0.615
-26.561	-3.24	21.231		-26.183	-3.319	21.391		-0.377	0.079	-0.16		-0.417
-23.057	-3.95	7.652		-22.649	-4.035	7.727		-0.409	0.085	-0.075		-0.424
-27.845	-13.659	7.692		-27.758	-13.743	7.713		-0.087	0.084	-0.022		-0.123
-30.509	-11.113	21.308		-30.366	-11.25	21.39		-0.143	0.137	-0.082		-0.214
-33.619	-8.123	28.096		-33.788	-7.961	27.46		0.169	-0.162	0.636		0.678



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-38.829	-3.049	25.875		-38.115	-3.718	24.954		-0.714	0.669	0.92		1.343
-42.012	4.952	25.335		-42.005	5.4	24.915		-0.006	-0.449	0.419		0.614
-42.084	11.717	28.295		-42.084	11.434	27.483		0	0.283	0.813		0.861
-42.117	16.667	21.644		-42.116	16.216	21.456		-0.001	0.451	0.188		0.488
-42.129	20.133	7.817		-42.128	19.842	7.765		-0.001	0.291	0.052		0.295
-41.236	-0.362	20.33		-40.51	-0.671	19.851		-0.726	0.31	0.479		0.923
-44.881	0.254	21.081		-44.652	0.233	21.232		-0.229	0.021	-0.151		-0.275
-41.188	-1.273	21.603		-40.677	-2.001	21.027		-0.512	0.728	0.576		1.06
45.017	-41.445	15.017		45.019	-41.463	15.11		-0.002	0.018	-0.093		-0.095
42.374	-46.468	13.241		42.398	-46.424	13.152		-0.024	-0.044	0.089		0.102
40.141	-50.538	9.513		40.207	-50.417	9.396		-0.065	-0.121	0.117		0.181
38.732	-53.11	4.381		38.784	-53.015	4.341		-0.051	-0.095	0.04		0.115
31.875	-44.872	4.269		31.636	-44.967	4.364		0.239	0.095	-0.096		-0.274
34.534	-43.847	9.331		34.422	-43.892	9.434		0.112	0.045	-0.103		-0.159
38.751	-42.21	13.082		38.696	-42.232	13.187		0.054	0.022	-0.105		-0.12
43.975	-40.179	14.9		43.944	-40.193	15.123		0.031	0.014	-0.223		-0.225
43.939	-38.453	14.87		43.901	-38.442	15.136		0.038	-0.011	-0.266		-0.269
38.691	-36.668	12.965		38.554	-36.624	13.225		0.137	-0.044	-0.26		-0.297
34.517	-35.247	9.178		34.185	-35.137	9.479		0.332	-0.11	-0.302		-0.462
31.955	-34.369	4.152		31.334	-34.162	4.397		0.622	-0.207	-0.246		-0.699
38.48	-26.299	4.155		38.102	-25.679	4.429		0.378	-0.62	-0.274		-0.776
39.872	-28.607	9.179		39.669	-28.275	9.516		0.202	-0.332	-0.337		-0.515
42.145	-32.371	12.971		42.064	-32.239	13.252		0.08	-0.131	-0.281		-0.32
45.015	-37.104	14.949		45	-37.079	15.145		0.015	-0.024	-0.197		-0.199
46.715	-36.76	14.972		46.719	-36.736	15.144		-0.004	-0.025	-0.172		-0.174
47.568	-31.214	13.131		47.579	-31.149	13.252		-0.011	-0.065	-0.121		-0.138
48.258	-26.743	9.374		48.284	-26.576	9.521		-0.027	-0.167	-0.147		-0.224
48.697	-23.911	4.319		48.749	-23.582	4.445		-0.052	-0.33	-0.126		-0.357
38.732	-53.111	4.381		38.784	-53.015	4.34		-0.052	-0.096	0.04		0.116
40.143	-50.537	9.513		40.208	-50.417	9.397		-0.065	-0.12	0.116		0.18
42.378	-46.467	13.242		42.401	-46.423	13.153		-0.024	-0.044	0.089		0.103
45.017	-41.443	15.016		45.019	-41.461	15.111		-0.002	0.018	-0.095		-0.096
47.443	-36.983	14.985		47.472	-36.973	15.14		-0.029	-0.01	-0.155		-0.158
50.274	-32.072	13.241		50.274	-32.072	13.241		0	0	0		0
52.504	-28.013	9.525		52.497	-28.027	9.511		0.008	0.014	0.014		0.021
53.806	-25.361	4.425		53.84	-25.316	4.446		-0.034	-0.044	-0.021		-0.06
61.353	-33.407	4.558		61.016	-33.535	4.422		0.337	0.128	0.136		0.385
58.491	-34.529	9.716		58.226	-34.629	9.472		0.265	0.1	0.244		0.374
54.075	-36.25	13.445		53.951	-36.296	13.207		0.124	0.046	0.239		0.273
48.693	-38.346	15		48.712	-38.34	15.127		-0.019	-0.006	-0.127		-0.129
48.737	-40.086	15.039		48.748	-40.091	15.113		-0.011	0.004	-0.074		-0.075
54.238	-41.947	13.506		54.058	-41.884	13.167		0.179	-0.064	0.339		0.389
58.783	-43.481	9.788		58.379	-43.34	9.422		0.405	-0.141	0.366		0.563
61.721	-44.466	4.594		61.193	-44.284	4.385		0.528	-0.183	0.209		0.596
54.734	-53.081	4.549		54.461	-52.631	4.354		0.273	-0.45	0.196		0.562
53.121	-50.439	9.719		52.922	-50.11	9.392		0.199	-0.33	0.327		0.505
50.651	-46.382	13.458		50.559	-46.23	13.143		0.092	-0.152	0.315		0.362

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
47.648	-41.442	15.052		47.653	-41.449	15.105		-0.004	0.007	-0.053	-0.054
45.939	-41.779	15.032		45.938	-41.79	15.106		0.002	0.012	-0.074	-0.075
45.071	-47.438	13.344		45.088	-47.326	13.143		-0.017	-0.112	0.201	0.231
44.363	-52.06	9.593		44.399	-51.82	9.387		-0.036	-0.24	0.206	0.318
43.909	-55.03	4.445		43.952	-54.742	4.337		-0.043	-0.288	0.108	0.31
53.806	-25.36	4.425		53.84	-25.316	4.446		-0.033	-0.044	-0.02	-0.058
52.503	-28.012	9.527		52.495	-28.027	9.512		0.008	0.014	0.014	0.022
50.274	-32.074	13.242		50.274	-32.074	13.242		0	0	0	0
47.442	-36.985	14.984		47.47	-36.975	15.141		-0.029	-0.011	-0.156	-0.159
31.69	-50.184	0.412		31.762	-50.129	0.102		-0.073	-0.055	0.31	0.323
36.288	-54.651	0.351		36.323	-54.598	0.057		-0.034	-0.053	0.295	0.301
45.141	-57.241	0.396		45.147	-57.153	0.157		-0.006	-0.088	0.24	0.255
54.946	-54.869	0.473		54.893	-54.774	0.244		0.052	-0.095	0.229	0.254
61.542	-48.295	0.54		61.442	-48.235	0.336		0.101	-0.06	0.204	0.236
63.951	-39.547	0.563		63.849	-39.545	0.405		0.102	-0.002	0.158	0.189
5.684	29.828	-10.866		5.684	29.605	-10.933		0	0.223	0.067	0.233
2.316	29.813	-10.875		2.316	29.606	-10.937		0	0.207	0.062	0.216
2.3	26.837	-0.303		2.3	26.45	-0.419		0	0.387	0.116	0.404
-1.05	29.838	-10.876		-1.05	29.608	-10.944		0	0.23	0.069	0.24
5.665	19.755	-13.035		5.665	19.878	-13.072		0	-0.124	0.037	0.129
2.291	23.078	-2.564		2.291	23.034	-2.551		0	0.044	-0.013	-0.046
2.296	19.76	-13.039		2.296	19.877	-13.074		0	-0.118	0.035	0.123
-1.071	19.749	-13.036		-1.071	19.877	-13.075		0	-0.129	0.039	0.134
8.448	27.551	-10.884		8.21	27.551	-10.979		0.238	0	0.095	0.256
8.472	25.025	-10.876		8.211	25.025	-10.981		0.261	0	0.105	0.282
4.176	25.016	-0.392		4.003	25.016	-0.461		0.174	0	0.069	0.187
8.489	22.5	-10.872		8.212	22.5	-10.983		0.277	0	0.111	0.299
-4.944	27.584	-12.894		-4.739	27.584	-12.976		-0.205	0	0.082	0.221
-0.659	25.031	-2.41		-0.533	25.031	-2.461		-0.127	0	0.051	0.136
-4.933	25.057	-12.904		-4.741	25.057	-12.981		-0.192	0	0.077	0.207
-4.956	22.53	-12.899		-4.742	22.53	-12.985		-0.214	0	0.086	0.231
-8.917	4.958	-2.623		-9.195	5.113	-2.623		0.278	-0.155	0	0.318
-9.141	5.057	9.163		-9.206	5.093	9.163		0.065	-0.036	0	0.075
-0.526	10.518	9.178		-0.525	10.508	9.178		-0.001	0.01	0	-0.01
-0.496	10.273	-2.607		-0.508	10.509	-2.607		0.011	-0.235	0	0.236
8.469	5.997	-2.604		8.586	6.08	-2.604		-0.117	-0.083	0	0.144
8.698	6.153	9.181		8.589	6.076	9.181		0.109	0.077	0	-0.133
10.193	-3.347	9.167		9.996	-3.282	9.167		0.197	-0.065	0	-0.208
9.964	-3.256	0.329		10.001	-3.267	0.329		-0.036	0.012	0	0.038
0.114	-10.459	0.31		0.115	-10.52	0.31		-0.001	0.061	0	0.061
0.106	-10.657	9.149		0.105	-10.52	9.149		0.001	-0.136	0	-0.136
-9.997	-3.325	9.149		-9.983	-3.321	9.149		-0.014	-0.005	0	-0.014
-9.794	-3.25	0.311		-9.985	-3.313	0.311		0.191	0.063	0	0.201
10.873	-10.29	3.263		10.698	-10.124	3.263		0.175	-0.166	0	0.241
-11.172	-9.636	3.241		-11.153	-9.621	3.241		-0.018	-0.016	0	0.024
-14.634	1.934	0.311		-14.602	1.93	0.311		-0.032	0.004	0	0.032
-8.273	12.207	3.283		-8.263	12.193	3.283		-0.01	0.015	0	0.018

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
3.617	14.443	0.355		3.578	14.288	0.355		0.039	0.155	0	0.16
13.093	6.977	3.297		12.999	6.927	3.297		0.094	0.05	0	0.107
1.998	2.158	-16.001		1.998	2.158	-16.833		0	0	0.833	0.833
-3.674	3.837	-16.072		-3.674	3.837	-16.833		0	0	0.761	0.761
-3.768	-4.094	-16.087		-3.768	-4.094	-16.833		0	0	0.747	0.747
3.805	-3.962	-16.067		3.805	-3.962	-16.833		0	0	0.766	0.766
-0.232	0.212	-20.437		-0.232	0.212	-21.042		0	0	0.605	0.605
-9.301	-8.558	13.422		-9.301	-8.558	12.625		0	0	0.797	0.797
-11.92	3.505	13.456		-11.92	3.505	12.625		0	0	0.831	0.831
-0.834	11.967	13.39		-0.834	11.967	12.625		0	0	0.765	0.765
11.316	4.878	13.34		11.316	4.878	12.625		0	0	0.715	0.715
10.644	-7.062	13.33		10.644	-7.062	12.625		0	0	0.705	0.705
0.495	-12.851	13.387		0.495	-12.851	12.625		0	0	0.762	0.762
-0.388	-14.798	6.33		-0.386	-14.724	6.33		-0.002	-0.074	0	0.074
7.078	-46.809	6.148		6.972	-46.809	6.148		0.106	0	0	0.106
7.104	-36.802	6.165		6.972	-36.802	6.165		0.132	0	0	0.132
7.117	-26.795	6.181		6.972	-26.795	6.181		0.145	0	0	0.145
7.13	-16.789	6.198		6.972	-16.789	6.198		0.158	0	0	0.158
4.525	-17.739	6.19		4.447	-17.739	6.19		0.078	0	0	-0.078
4.51	-27.463	6.173		4.447	-27.463	6.173		0.063	0	0	-0.063
4.488	-37.185	6.158		4.447	-37.185	6.158		0.041	0	0	-0.041
4.495	-46.907	6.142		4.447	-46.907	6.142		0.048	0	0	-0.048
-3.667	-46.917	9.084		-3.97	-46.917	9.084		0.302	0	0	0.302
-3.727	-37.232	9.099		-3.97	-37.232	9.099		0.243	0	0	0.243
-3.792	-27.548	9.115		-3.97	-27.548	9.115		0.178	0	0	0.178
-3.837	-17.864	9.132		-3.97	-17.864	9.132		0.133	0	0	0.133
-8.113	-16.101	3.233		-8.178	-16.101	3.233		0.065	0	0	-0.065
-8.127	-26.303	3.217		-8.178	-26.303	3.217		0.051	0	0	-0.051
-8.069	-36.503	3.201		-8.178	-36.503	3.201		0.109	0	0	-0.109
-7.969	-46.703	3.184		-8.178	-46.703	3.184		0.209	0	0	-0.209
-6.058	-50.807	6.575		-6.058	-50.5	6.575		0	-0.307	0	0.307
5.69	-50.769	9.821		5.69	-50.5	9.821		0	-0.269	0	0.269
5.692	-46.587	13.261		5.692	-46.587	12.625		0	0	0.636	0.636
5.728	-37.543	13.3		5.728	-37.543	12.625		0	0	0.675	0.675
5.65	-28.5	13.307		5.65	-28.5	12.625		0	0	0.682	0.682
5.897	-17.532	13.366		5.897	-17.532	12.625		0	0	0.741	0.741
-6.092	-16.955	13.423		-6.092	-16.955	12.625		0	0	0.798	0.798
-6.229	-27.358	13.336		-6.229	-27.358	12.625		0	0	0.711	0.711
-6.267	-36.176	13.297		-6.267	-36.176	12.625		0	0	0.672	0.672
-5.828	-47.929	13.27		-5.828	-47.929	12.625		0	0	0.645	0.645
62.957	-85.9	-0.515		62.957	-85.9	0		0	0	-0.515	-0.515
51.528	-86.25	-0.574		51.528	-86.25	0		0	0	-0.574	-0.574
30.783	-85.736	-0.501		30.783	-85.736	0		0	0	-0.501	-0.501
26.812	-78.012	-0.295		26.812	-78.012	0		0	0	-0.295	-0.295
39.994	-79.758	-0.499		39.994	-79.758	0		0	0	-0.499	-0.499
56.435	-76.396	-0.714		56.435	-76.396	0		0	0	-0.714	-0.714
61.1	-67.106	-0.756		61.1	-67.106	0		0	0	-0.756	-0.756

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
47.103	-70.334	-0.474		47.103	-70.334	0		0	0	-0.474	-0.474
37.59	-65.923	-0.252		37.59	-65.923	0		0	0	-0.252	-0.252
23.943	-65.572	0.051		23.943	-65.572	0		0	0	0.051	0.051
20	-53.463	0.321		20	-53.463	0		0	0	0.321	0.321
15.245	-46.33	0.463		15.245	-46.33	0		0	0	0.463	0.463
23.655	-45.598	0.315		23.655	-45.598	0		0	0	0.315	0.315
14.912	-35.394	0.565		14.912	-35.394	0		0	0	0.565	0.565
15.792	-25.436	0.604		15.792	-25.436	0		0	0	0.604	0.604
25.699	-28.39	0.341		25.699	-28.39	0		0	0	0.341	0.341
33.693	-23.409	0.183		33.693	-23.409	0		0	0	0.183	0.183
61.783	-24.599	-0.738		61.783	-24.599	0		0	0	-0.738	-0.738
67.168	-35.131	0.034		66.907	-35.131	0		0.26	0	0.034	0.262
65.307	-55.099	-0.767		65.307	-55.099	0		0	0	-0.767	-0.767
69.048	-6.683	-1.015		69.048	-6.683	0		0	0	-1.015	-1.015
66.262	18.32	-0.669		66.262	18.32	0		0	0	-0.669	-0.669
52.355	18.921	-0.608		52.355	18.921	0		0	0	-0.608	-0.608
38.478	18.693	-0.123		38.478	18.693	0		0	0	-0.123	-0.123
25.125	19.039	0.156		25.125	19.039	0		0	0	0.156	0.156
27.244	28.495	-0.019		27.244	28.495	0		0	0	-0.019	-0.019
34.381	26.821	-0.173		34.381	26.821	0		0	0	-0.173	-0.173
46.122	25.866	-0.463		46.122	25.866	0		0	0	-0.463	-0.463
45.821	34.408	-0.591		45.821	34.408	0		0	0	-0.591	-0.591
29.856	39.347	-0.304		29.856	39.347	0		0	0	-0.304	-0.304
17.504	42.211	-0.167		17.504	42.211	0		0	0	-0.167	-0.167
7.258	39.357	-0.013		7.258	39.357	0		0	0	-0.013	-0.013
10.445	49.404	-0.404		10.445	49.404	0		0	0	-0.404	-0.404
23.138	52.346	-0.463		23.138	52.346	0		0	0	-0.463	-0.463
43.444	55.563	-0.452		43.444	55.563	0		0	0	-0.452	-0.452
66.634	54.191	-0.286		66.634	54.191	0		0	0	-0.286	-0.286
67.196	38.213	-0.483		67.196	38.213	0		0	0	-0.483	-0.483
-12.024	40.863	0.077		-12.024	40.863	0		0	0	0.077	0.077
-22.639	17.585	0.666		-22.639	17.585	0		0	0	0.666	0.666
-23.92	30.78	0.414		-23.92	30.78	0		0	0	0.414	0.414
-31.106	26.105	0.409		-31.106	26.105	0		0	0	0.409	0.409
-42.834	26.786	0.173		-42.834	26.786	0		0	0	0.173	0.173
-50.32	30.654	-0.072		-50.32	30.654	0		0	0	-0.072	-0.072
-40.25	46.187	-0.304		-40.25	46.187	0		0	0	-0.304	-0.304
-47.357	54.757	-0.496		-47.357	54.757	0		0	0	-0.496	-0.496
-75.37	54.019	-0.431		-75.37	54.019	0		0	0	-0.431	-0.431
-75.613	37.737	-0.511		-75.613	37.737	0		0	0	-0.511	-0.511
-74.428	19.576	-0.404		-74.428	19.576	0		0	0	-0.404	-0.404
-56.941	25.449	-0.15		-56.941	25.449	0		0	0	-0.15	-0.15
-66.002	12.157	-0.287		-66.002	12.157	0		0	0	-0.287	-0.287
-68.537	-0.897	-0.319		-68.537	-0.897	0		0	0	-0.319	-0.319
-76.907	-10.577	-0.499		-76.907	-10.577	0		0	0	-0.499	-0.499
-76.8	-29.052	-0.552		-76.8	-29.052	0		0	0	-0.552	-0.552
-62.527	-24.674	-0.037		-62.527	-24.674	0		0	0	-0.037	-0.037

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-49.837	-21.734	0.274		-49.837	-21.734	0		0	0	0.274		0.274
-35.515	-26.458	0.631		-35.515	-26.458	0		0	0	0.631		0.631
-22.747	-17.997	0.897		-22.747	-17.997	0		0	0	0.897		0.897
-27.79	-36.933	0.739		-27.79	-36.933	0		0	0	0.739		0.739
-13.685	-51.04	0.69		-13.685	-51.04	0		0	0	0.69		0.69
-5.2	-60.108	0.43		-5.2	-60.108	0		0	0	0.43		0.43
-6.453	-70.908	0.019		-6.453	-70.908	0		0	0	0.019		0.019
-7.823	-86.125	-0.41		-7.823	-86.125	0		0	0	-0.41		-0.41
-28.196	-90.686	0.128		-28.59	-90.686	0		0.395	0	0.128		0.415
-40.946	-88.422	-0.636		-40.946	-88.422	0		0	0	-0.636		-0.636
-53.693	-81.988	-0.772		-53.693	-81.988	0		0	0	-0.772		-0.772
-62.916	-90.596	-0.819		-62.916	-90.596	0		0	0	-0.819		-0.819
-77.234	-85.871	-0.893		-77.234	-85.871	0		0	0	-0.893		-0.893
-75.543	-64.301	-0.766		-75.543	-64.301	0		0	0	-0.766		-0.766
-71.903	-44.039	-0.544		-71.903	-44.039	0		0	0	-0.544		-0.544
-65.767	-55.953	-0.497		-65.767	-55.953	0		0	0	-0.497		-0.497
-62.156	-65.75	-0.593		-62.156	-65.75	0		0	0	-0.593		-0.593
-50.429	-58.707	-0.123		-50.429	-58.707	0		0	0	-0.123		-0.123
-50.207	-72.764	-0.448		-50.207	-72.764	0		0	0	-0.448		-0.448
-14.007	-37.87	-16.122		-14.007	-37.87	-16.833		0	0	0.711		0.711
-14.367	-16.469	-16.082		-14.367	-16.469	-16.833		0	0	0.751		0.751
-13.495	16.204	-16.133		-13.495	16.204	-16.833		0	0	0.701		0.701
-13.305	29.412	-16.37		-13.305	29.412	-16.833		0	0	0.463		0.463
14.759	31.627	-16.718		14.759	31.627	-16.833		0	0	0.115		0.115
15.614	23.92	-16.572		15.614	23.92	-16.833		0	0	0.262		0.262
15.859	12.228	-16.427		15.859	12.228	-16.833		0	0	0.406		0.406
60.033	4.241	-17.468		60.033	4.241	-16.833		0	0	-0.635		-0.635
58.45	-10.029	-17.359		58.45	-10.029	-16.833		0	0	-0.525		-0.525
48.948	-15.306	-17.011		48.948	-15.306	-16.833		0	0	-0.177		-0.177
36.548	-9.691	-16.538		36.548	-9.691	-16.833		0	0	0.296		0.296
30.764	-17.705	-16.582		30.764	-17.705	-16.833		0	0	0.252		0.252
13.312	-15.158	-16.166		13.312	-15.158	-16.833		0	0	0.667		0.667
19.62	2.796	-3.737		19.62	2.796	-4.208		0	0	0.472		0.472
29.012	7.187	-4.065		29.012	7.187	-4.208		0	0	0.143		0.143
34.531	2.918	-4.12		34.531	2.918	-4.208		0	0	0.088		0.088
41.293	7.29	-4.377		41.293	7.29	-4.208		0	0	-0.169		-0.169
46.509	2.095	-4.329		46.509	2.095	-4.208		0	0	-0.121		-0.121
52.117	8.306	-4.8		52.117	8.306	-4.208		0	0	-0.591		-0.591
50.925	-3.295	-0.032		50.925	-3.295	0		0	0	-0.032		-0.032
40.402	-3.074	0.181		40.402	-3.074	0		0	0	0.181		0.181
28.71	-2.865	0.278		28.71	-2.865	0		0	0	0.278		0.278
17.022	-2.038	0.304		17.022	-2.038	0		0	0	0.304		0.304
18.628	-9.372	2.166		18.628	-9.372	1.683		0	0	0.483		0.483
24.792	-6.547	2.092		24.792	-6.547	1.683		0	0	0.409		0.409
25.891	-14.856	2.222		25.891	-14.856	1.683		0	0	0.538		0.538
18.862	-12.165	-4.629		18.862	-12.447	-4.629		0	0.282	0		-0.282
24.867	-16.793	-0.246		24.59	-16.655	-0.246		0.277	-0.138	0		0.309

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
33.083	-3.702	-4.665		33.083	-4.03	-4.665		0	0.328	0	-0.328
40.106	-3.63	-3.904		40.106	-4.03	-3.904		0	0.401	0	-0.401
52.728	-3.538	-5.167		52.728	-4.03	-5.167		0	0.492	0	-0.492
55.136	0.073	-9.43		55.242	0.04	-9.43		-0.106	0.034	0	-0.111
56.307	7.823	-10.162		56.527	7.823	-10.162		-0.221	0	0	-0.221
59.584	11.27	-1.073		59.584	11.175	-1.177		0	0.095	0.104	0.141
49.37	13.066	-1.762		49.37	12.923	-1.515		0	0.143	-0.247	-0.285
39.528	12.109	-1.56		39.528	12.124	-1.576		0	-0.015	0.015	0.022

### 3D-Tol Data from CMM for Wax Pattern (Alumide2)

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
53.688	58.845	-5.95		53.688	58.917	-5.95		0	-0.072	0	-0.072
37.144	58.78	-5.898		37.144	58.917	-5.898		0	-0.137	0	-0.137
20.6	58.701	-5.847		20.6	58.917	-5.847		0	-0.215	0	-0.215
4.054	58.679	-5.796		4.054	58.917	-5.796		0	-0.237	0	-0.237
-12.491	58.672	-5.746		-12.491	58.917	-5.746		0	-0.245	0	-0.245
-29.035	58.698	-5.695		-29.035	58.917	-5.695		0	-0.218	0	-0.218
-45.579	58.731	-5.644		-45.579	58.917	-5.644		0	-0.185	0	-0.185
-62.123	58.695	-5.593		-62.123	58.917	-5.593		0	-0.222	0	-0.222
-79.565	41.151	-5.59		-79.958	41.151	-5.59		0.394	0	0	-0.394
-79.5	24.606	-5.635		-79.958	24.606	-5.635		0.458	0	0	-0.458
-79.505	8.062	-5.68		-79.958	8.062	-5.68		0.453	0	0	-0.453
-79.476	-8.483	-5.725		-79.958	-8.483	-5.725		0.482	0	0	-0.482
-79.352	-25.028	-5.771		-79.958	-25.028	-5.771		0.606	0	0	-0.606
-79.336	-41.573	-5.816		-79.958	-41.573	-5.816		0.623	0	0	-0.623
-79.329	-58.117	-5.861		-79.958	-58.117	-5.861		0.629	0	0	-0.629
-79.414	-74.663	-5.907		-79.958	-74.663	-5.907		0.545	0	0	-0.545
-62.262	-92.39	-6.015		-62.262	-92.583	-6.015		0	0.194	0	-0.194
-45.716	-92.382	-6.066		-45.716	-92.583	-6.066		0	0.201	0	-0.201
-29.172	-92.375	-6.117		-29.172	-92.583	-6.117		0	0.208	0	-0.208
-12.627	-92.413	-6.168		-12.627	-92.583	-6.168		0	0.17	0	-0.17
3.918	-92.456	-6.218		3.918	-92.583	-6.218		0	0.127	0	-0.127
20.462	-92.503	-6.27		20.462	-92.583	-6.27		0	0.08	0	-0.08
37.007	-92.5	-6.32		37.007	-92.583	-6.32		0	0.083	0	-0.083
53.552	-92.53	-6.372		53.552	-92.583	-6.372		0	0.053	0	-0.053
71.603	-74.801	-6.381		71.542	-74.801	-6.381		0.062	0	0	0.062
71.599	-58.255	-6.333		71.542	-58.255	-6.333		0.057	0	0	0.057
71.552	-41.711	-6.287		71.542	-41.711	-6.287		0.01	0	0	0.01
71.417	-25.167	-6.241		71.542	-25.167	-6.241		-0.124	0	0	-0.124
71.205	-8.623	-6.194		71.542	-8.623	-6.194		-0.336	0	0	-0.336
71.189	7.923	-6.149		71.542	7.923	-6.149		-0.353	0	0	-0.353
71.308	24.468	-6.105		71.542	24.468	-6.105		-0.233	0	0	-0.233
71.36	41.011	-6.059		71.542	41.011	-6.059		-0.181	0	0	-0.181
-69.832	43.793	8.668		-69.832	43.793	8.417		0	0	0.252	0.252

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
-64.78	43.789	8.683	-64.78	43.789	8.417	0	0	0.266	0.266
-64.778	48.837	8.736	-64.778	48.837	8.417	0	0	0.319	0.319
-69.827	48.841	8.777	-69.827	48.841	8.417	0	0	0.361	0.361
-67.696	46.436	8.732	-67.696	46.436	8.417	0	0	0.315	0.315
-71.551	43.803	7.019	-71.542	43.803	7.019	-0.01	0	0	0.01
-71.655	48.853	7.035	-71.542	48.853	7.035	-0.113	0	0	0.113
-69.836	50.519	7.032	-69.836	50.5	7.032	0	0.019	0	0.019
-64.784	50.487	7.017	-64.784	50.5	7.017	0	-0.013	0	-0.013
-64.792	41.937	7.931	-64.792	42.083	8.417	0	-0.146	-0.486	0.507
-69.842	42.569	7.003	-69.842	42.083	7.003	0	0.486	0	-0.486
-63.006	48.844	7.954	-63.125	48.844	8.417	0.119	0	-0.462	0.477
-63.009	43.794	7.944	-63.125	43.794	8.417	0.116	0	-0.473	0.487
-64.852	-14.273	3.762	-64.852	-14.273	4.208	0	0	-0.447	-0.447
-69.901	-14.271	3.922	-69.901	-14.271	4.208	0	0	-0.286	-0.286
-69.904	-19.321	4.007	-69.904	-19.321	4.208	0	0	-0.201	-0.201
-64.853	-19.324	3.84	-64.853	-19.324	4.208	0	0	-0.368	-0.368
-68.023	-16.697	3.872	-68.023	-16.697	4.208	0	0	-0.336	-0.336
-69.905	-12.54	4.135	-69.905	-12.625	4.208	0	0.085	-0.073	0.112
-64.853	-12.554	4.143	-64.853	-12.625	4.208	0	0.071	-0.065	0.096
-63.096	-14.271	4.178	-63.125	-14.271	4.208	0.029	0	-0.031	0.042
-63.091	-19.322	4.171	-63.125	-19.322	4.208	0.034	0	-0.037	0.051
-64.862	-21.123	4.13	-64.862	-21.042	4.208	0	-0.082	-0.079	0.113
-69.912	-21.147	4.116	-69.912	-21.042	4.208	0	-0.105	-0.093	0.14
-71.456	-19.313	3.479	-71.542	-19.313	3.479	0.085	0	0	-0.085
-71.448	-14.263	3.495	-71.542	-14.263	3.495	0.094	0	0	-0.094
-64.895	-77.411	8.207	-64.895	-77.411	8.417	0	0	-0.21	-0.21
-69.945	-77.408	8.229	-69.945	-77.408	8.417	0	0	-0.188	-0.188
-69.95	-82.458	8.254	-69.95	-82.458	8.417	0	0	-0.163	-0.163
-64.898	-82.462	8.276	-64.898	-82.462	8.417	0	0	-0.141	-0.141
-70.936	-75.703	6.685	-71.542	-75.75	6.685	0.606	0.047	0	0.608
-64.902	-76.784	6.67	-64.902	-75.75	6.67	0	-1.034	0	-1.034
-63.037	-76.428	6.656	-63.125	-75.75	6.656	0.088	-0.678	0	0.683
-63.863	-82.456	6.642	-63.125	-82.456	6.642	-0.738	0	0	-0.738
-64.91	-84.469	6.639	-64.91	-84.167	6.639	0	-0.302	0	0.302
-69.961	-84.511	6.656	-69.961	-84.167	6.656	0	-0.345	0	0.345
-71.639	-82.446	6.674	-71.542	-82.446	6.674	-0.097	0	0	0.097
-71.554	-77.397	6.69	-71.542	-77.397	6.69	-0.012	0	0	0.012
-2.513	43.743	3.999	-2.513	43.743	4.208	0	0	-0.21	-0.21
2.539	43.739	4.024	2.539	43.739	4.208	0	0	-0.184	-0.184
2.541	48.787	4.013	2.541	48.787	4.208	0	0	-0.195	-0.195
-2.508	48.792	3.996	-2.508	48.792	4.208	0	0	-0.212	-0.212
-0.667	46.776	4.016	-0.667	46.776	4.208	0	0	-0.192	-0.192
-4.023	43.754	2.182	-4.208	43.754	2.182	0.186	0	0	-0.186
-4.052	48.803	2.201	-4.208	48.803	2.201	0.156	0	0	-0.156
2.527	42.678	2.151	2.527	42.083	2.151	0	0.595	0	-0.595
-2.523	42.663	2.167	-2.523	42.083	2.167	0	0.58	0	-0.58
4.126	48.794	2.161	4.208	48.794	2.161	-0.082	0	0	-0.082



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
4.117	43.743	2.149		4.208	43.743	2.149		-0.092	0	0	-0.092
-2.517	50.903	2.195		-2.517	50.5	2.195		0	0.403	0	0.403
2.536	50.894	2.18		2.536	50.5	2.18		0	0.394	0	0.394
-64.718	36.179	-0.146		-64.77	36.23	0		0.051	-0.051	-0.146	0.163
-54.015	46.912	-0.121		-54.051	46.949	0		0.036	-0.036	-0.121	0.132
-46.83	47.065	-1.047		-46.948	46.948	-1.047		0.118	0.118	0	-0.166
-36.109	36.36	-1.109		-36.235	36.235	-1.109		0.126	0.126	0	-0.178
-40.989	29.114	-1.115		-41.003	29.1	-1.115		0.014	0.014	0	0.02
-48.129	36.253	-1.072		-48.143	36.24	-1.072		0.014	0.014	0	0.019
-35.972	29.812	-1.505		-35.726	29.565	-1.505		-0.246	0.246	0	0.349
-54.317	35.297	-1.051		-54.059	35.038	-1.051		-0.259	0.259	0	0.366
-59.061	30.519	-1.048		-58.819	30.278	-1.048		-0.242	0.242	0	0.342
-65.45	29.63	-0.941		-65.394	29.686	-0.941		-0.056	-0.056	0	-0.079
-61.418	33.613	-4.453		-61.418	33.613	-4.208		0	0	-0.244	-0.244
-56.846	38.364	-4.355		-56.846	38.364	-4.208		0	0	-0.146	-0.146
-50.345	43.761	-4.26		-50.345	43.761	-4.208		0	0	-0.052	-0.052
-44.79	38.709	-4.374		-44.79	38.709	-4.208		0	0	-0.165	-0.165
-40.119	33.896	-4.551		-40.119	33.896	-4.208		0	0	-0.342	-0.342
49.672	42.87	5.795		49.672	42.083	5.795		0	0.787	0	-0.787
42.938	42.865	5.815		42.938	42.083	5.815		0	0.782	0	-0.782
55.421	30.221	5.75		54.708	30.221	5.75		0.713	0	0	-0.713
55.402	36.954	5.769		54.708	36.954	5.769		0.693	0	0	-0.693
58.794	25.931	5.225		58.794	25.25	5.225		0	0.681	0	-0.681
63.324	30.215	5.715		63.125	30.215	5.715		0.199	0	0	0.199
63.351	37.789	5.74		63.125	37.789	5.74		0.226	0	0	0.226
63.358	45.365	5.76		63.125	45.365	5.76		0.233	0	0	0.233
58.095	50.842	5.798		58.095	50.5	5.798		0	0.342	0	0.342
50.52	50.82	5.824		50.52	50.5	5.824		0	0.32	0	0.32
42.945	50.802	5.846		42.945	50.5	5.846		0	0.302	0	0.302
38.462	46.182	5.128		37.875	46.182	5.128		0.587	0	0	-0.587
43.201	46.334	7.965		43.201	46.334	8.417		0	0	-0.452	-0.452
50.435	46.036	7.964		50.435	46.036	8.417		0	0	-0.453	-0.453
58.406	45.697	8.02		58.406	45.697	8.417		0	0	-0.396	-0.396
59.139	37.432	7.962		59.139	37.432	8.417		0	0	-0.454	-0.454
59.008	30.587	8.007		59.008	30.587	8.417		0	0	-0.41	-0.41
-30.849	48.937	17.074		-30.849	48.933	17.076		0	0.004	-0.002	-0.004
-30.866	46.094	12.012		-30.866	46.03	12.049		0	0.064	-0.037	-0.074
-30.884	43.258	6.949		-30.884	43.129	7.023		0	0.13	-0.075	-0.15
-30.902	40.494	1.844		-30.902	40.227	1.998		0	0.266	-0.154	-0.308
-27.114	40.518	1.817		-27.114	40.222	1.988		0	0.297	-0.171	-0.343
-27.097	43.298	6.912		-27.097	43.123	7.013		0	0.175	-0.101	-0.202
-27.078	46.122	11.985		-27.078	46.026	12.04		0	0.096	-0.055	-0.111
-27.06	48.958	17.049		-27.06	48.927	17.067		0	0.031	-0.018	-0.036
-23.272	48.953	17.037		-23.272	48.921	17.056		0	0.032	-0.018	-0.037
-23.292	46.114	11.973		-23.292	46.018	12.028		0	0.095	-0.055	-0.11
-23.309	43.299	6.898		-23.309	43.117	7.003		0	0.182	-0.105	-0.21
-23.328	40.523	1.8		-23.328	40.216	1.977		0	0.308	-0.178	-0.355



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
-17.012	45.852	1.883		-17.012	45.439	1.993		0	0.412	-0.111	-0.427
-16.985	47.697	9.469		-16.985	47.46	9.533		0	0.237	-0.064	-0.246
-16.96	49.622	17.033		-16.96	49.479	17.071		0	0.143	-0.038	-0.148
-11.909	49.597	17.023		-11.909	49.475	17.055		0	0.122	-0.033	-0.126
-11.936	47.695	9.45		-11.936	47.455	9.515		0	0.241	-0.064	-0.249
-11.962	45.856	1.866		-11.962	45.435	1.978		0	0.421	-0.113	-0.436
-8.531	49.591	7.626		-8.178	49.591	7.626		-0.353	0	0	-0.353
-30.852	51.241	15.337		-30.852	50.919	15.251		0	0.322	0.086	0.333
-30.869	52.898	9.723		-30.869	52.433	9.598		0	0.465	0.125	0.481
-30.884	54.416	4.068		-30.884	53.949	3.943		0	0.467	0.125	0.483
-24.149	54.355	4.032		-24.149	53.954	3.925		0	0.402	0.108	0.416
-24.132	52.848	9.692		-24.132	52.438	9.582		0	0.41	0.11	0.424
-24.118	51.243	15.319		-24.118	50.923	15.234		0	0.319	0.086	0.331
-17.384	51.178	15.282		-17.384	50.928	15.215		0	0.25	0.067	0.258
-17.401	52.82	9.663		-17.401	52.443	9.562		0	0.377	0.101	0.391
-17.417	54.376	4.021		-17.417	53.958	3.909		0	0.419	0.112	0.433
-10.683	54.348	3.996		-10.683	53.962	3.892		0	0.386	0.103	0.399
-10.667	52.76	9.63		-10.667	52.447	9.546		0	0.313	0.084	0.324
-10.651	51.103	15.245		-10.651	50.932	15.2		0	0.17	0.046	0.176
-33.113	48.951	9.853		-33.428	48.951	9.853		0.315	0	0	-0.315
5.339	-63.194	18.514		4.986	-63.194	18.609		0.353	0	-0.095	-0.365
3.412	-63.174	11.457		3.093	-63.174	11.543		0.319	0	-0.086	-0.331
1.58	-63.153	4.37		1.198	-63.153	4.473		0.382	0	-0.102	-0.395
1.617	-69.885	4.341		1.193	-69.885	4.454		0.423	0	-0.113	-0.438
3.452	-69.907	11.424		3.087	-69.907	11.522		0.364	0	-0.098	-0.377
5.322	-69.927	18.5		4.982	-69.927	18.591		0.341	0	-0.091	-0.353
5.347	-76.663	18.472		4.976	-76.663	18.571		0.371	0	-0.099	-0.384
3.48	-76.64	11.396		3.082	-76.64	11.503		0.398	0	-0.107	-0.412
1.64	-76.619	4.315		1.189	-76.619	4.436		0.452	0	-0.121	-0.468
1.579	-83.352	4.312		1.184	-83.352	4.418		0.395	0	-0.106	-0.409
3.45	-83.373	11.384		3.077	-83.373	11.484		0.373	0	-0.1	-0.386
5.363	-83.394	18.448		4.971	-83.394	18.553		0.392	0	-0.105	-0.405
7.368	-86.116	10.042		7.368	-85.85	10.042		0	-0.266	0	0.266
8.21	-83.401	21.226		7.797	-83.401	20.988		0.413	0	0.239	0.477
13.612	-83.381	11.784		13.236	-83.381	11.567		0.376	0	0.217	0.434
19.052	-83.359	2.359		18.677	-83.359	2.143		0.375	0	0.216	0.433
19.015	-75.783	2.356		18.669	-75.783	2.156		0.346	0	0.2	0.4
13.58	-75.809	11.786		13.227	-75.809	11.582		0.353	0	0.204	0.407
8.196	-75.831	21.237		7.789	-75.831	21.002		0.407	0	0.235	0.47
7.379	-69.513	21.056		7.01	-69.513	20.957		0.37	0	0.099	0.383
9.901	-69.487	11.631		9.535	-69.487	11.533		0.366	0	0.098	0.379
12.44	-69.465	2.21		12.06	-69.465	2.108		0.38	0	0.102	0.394
12.471	-64.415	2.233		12.057	-64.415	2.122		0.415	0	0.111	0.429
9.908	-64.442	11.649		9.531	-64.442	11.548		0.378	0	0.101	0.391
7.36	-64.466	21.067		7.006	-64.466	20.972		0.355	0	0.095	0.367
6.376	-61.626	10.869		6.376	-60.6	10.869		0	-1.026	0	-1.026
-30.619	-50.796	-5.131		-30.639	-50.509	-5.449		0.02	-0.287	0.318	0.429

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-30.34	-55.295	-7.446		-30.355	-55.089	-7.838		0.015	-0.206	0.392		0.443
-30.135	-58.992	-11.474		-30.166	-58.611	-11.674		0.031	-0.381	0.2		0.431
-29.968	-61.808	-15.565		-29.989	-61.583	-15.879		0.021	-0.224	0.314		0.386
-33.709	-63.607	-15.555		-33.859	-63.476	-15.822		0.149	-0.131	0.267		0.333
-35.825	-61.711	-11.489		-36.033	-61.527	-11.634		0.208	-0.184	0.146		0.313
-38.568	-59.237	-7.516		-38.681	-59.137	-7.807		0.112	-0.1	0.29		0.327
-41.926	-56.227	-5.14		-42.1	-56.072	-5.389		0.175	-0.156	0.249		0.342
-46.377	-68.063	-5.4		-46.37	-68.063	-5.393		-0.007	0	-0.008		-0.011
-41.74	-67.845	-7.721		-41.785	-67.847	-7.807		0.045	0.002	0.087		0.098
-38.2	-67.671	-11.632		-38.219	-67.671	-11.642		0.019	0.001	0.01		0.022
-35.275	-67.525	-15.792		-35.301	-67.526	-15.826		0.026	0.001	0.035		0.043
-33.564	-71.508	-15.995		-33.506	-71.449	-15.88		-0.058	-0.059	-0.115		-0.141
-35.765	-73.9	-11.881		-35.513	-73.638	-11.692		-0.252	-0.262	-0.19		-0.41
-37.964	-76.304	-7.988		-37.909	-76.246	-7.836		-0.055	-0.058	-0.152		-0.172
-41.16	-79.754	-5.674		-41.022	-79.608	-5.452		-0.138	-0.146	-0.222		-0.3
-29.887	-67.376	-17.201		-29.923	-67.379	-16.894		0.035	0.003	-0.307		-0.309
-26.932	-62.351	-15.775		-26.883	-62.253	-15.934		-0.05	-0.098	0.159		0.193
-25.566	-59.889	-11.546		-25.414	-59.599	-11.717		-0.152	-0.291	0.171		0.37
-23.805	-56.735	-7.483		-23.708	-56.552	-7.87		-0.097	-0.182	0.387		0.439
-21.646	-52.806	-5.177		-21.506	-52.546	-5.517		-0.14	-0.261	0.34		0.451
-13.608	-62.633	-5.378		-13.441	-62.583	-5.587		-0.168	-0.05	0.21		0.273
-17.951	-63.893	-7.649		-17.817	-63.853	-7.906		-0.134	-0.04	0.257		0.293
-21.27	-64.843	-11.707		-21.138	-64.803	-11.778		-0.131	-0.04	0.071		0.155
-24.127	-65.665	-15.974		-24.112	-65.66	-15.998		-0.015	-0.005	0.024		0.028
-24.503	-70.078	-16.138		-24.576	-70.038	-16.011		0.072	-0.04	-0.127		-0.151
-21.666	-71.635	-11.912		-21.855	-71.531	-11.8		0.189	-0.104	-0.112		-0.243
-18.839	-73.182	-7.908		-18.835	-73.185	-7.918		-0.005	0.003	0.01		0.011
-14.794	-75.4	-5.644		-14.829	-75.38	-5.596		0.035	-0.019	-0.048		-0.062
-24.805	-83.65	-5.805		-24.864	-83.441	-5.551		0.06	-0.209	-0.254		-0.334
-26.127	-79.149	-8.095		-26.156	-79.046	-7.896		0.029	-0.103	-0.198		-0.226
-27.014	-76.181	-12.025		-27.142	-75.717	-11.775		0.128	-0.464	-0.25		-0.542
-27.967	-72.96	-16.24		-28.013	-72.786	-15.971		0.046	-0.174	-0.268		-0.323
-32.425	-72.38	-16.067		-32.367	-72.281	-15.904		-0.058	-0.099	-0.163		-0.2
-33.99	-75.273	-11.923		-33.787	-74.917	-11.709		-0.203	-0.355	-0.213		-0.461
-35.346	-78.183	-8.019		-35.334	-78.088	-7.85		-0.012	-0.095	-0.169		-0.194
-37.573	-82.321	-5.708		-37.53	-82.108	-5.476		-0.043	-0.212	-0.232		-0.318
-25.518	-86.427	-0.918		-25.565	-86.201	-0.666		0.047	-0.226	-0.252		-0.342
-12.975	-77.307	-1.076		-13.161	-77.195	-0.892		0.186	-0.112	-0.184		-0.285
-11.262	-61.802	-0.744		-11.177	-61.776	-0.825		-0.085	-0.026	0.081		0.12
-16.454	-53.786	-0.416		-16.195	-53.516	-0.776		-0.259	-0.27	0.36		0.52
-25.963	-48.644	-0.191		-25.901	-48.313	-0.592		-0.062	-0.331	0.4		0.523
-47.434	-37.857	18.787		-47.202	-37.747	18.935		-0.233	-0.11	-0.149		-0.297
-44.082	-36.25	12.517		-43.916	-36.17	12.623		-0.166	-0.079	-0.106		-0.213
-40.732	-34.642	6.246		-40.63	-34.594	6.311		-0.102	-0.049	-0.065		-0.131
-39.741	-41.328	6.303		-39.748	-41.327	6.299		0.007	-0.001	0.004		0.008
-43.416	-40.647	12.566		-43.333	-40.663	12.614		-0.083	0.016	-0.049		-0.097
-47.1	-39.961	18.819		-46.916	-39.997	18.927		-0.184	0.036	-0.108		-0.216

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-48.015	-41.973	18.911		-48.01	-41.979	18.916		-0.005	0.005	-0.004		-0.009
-45.46	-44.687	12.646		-45.511	-44.632	12.603		0.051	-0.055	0.043		0.087
-42.906	-47.404	6.382		-43.015	-47.288	6.29		0.109	-0.116	0.092		0.184
-49.119	-50.499	6.481		-49.16	-50.166	6.287		0.041	-0.333	0.193		0.387
-49.571	-46.838	12.768		-49.606	-46.549	12.6		0.036	-0.289	0.168		0.337
-50.026	-43.145	19.034		-50.052	-42.933	18.91		0.026	-0.212	0.123		0.246
-52.455	-42.86	19.147		-52.261	-42.506	18.914		-0.194	-0.353	0.233		0.466
-54.239	-46.064	12.846		-54.033	-45.692	12.6		-0.206	-0.372	0.245		0.491
-56.01	-49.243	6.532		-55.806	-48.875	6.289		-0.204	-0.368	0.243		0.485
-52.252	-40.148	22.993		-51.818	-39.938	22.715		-0.434	-0.21	0.278		0.557
-57.539	-42.614	12.891		-57.102	-42.408	12.612		-0.438	-0.206	0.279		0.559
-62.67	-44.997	2.691		-62.389	-44.866	2.513		-0.28	-0.131	0.179		0.358
-63.611	-36.81	2.651		-63.392	-36.852	2.522		-0.219	0.042	0.129		0.258
-58.061	-37.879	12.854		-57.665	-37.953	12.622		-0.396	0.074	0.232		0.465
-52.381	-38.965	22.986		-51.935	-39.045	22.725		-0.445	0.079	0.261		0.522
-51.7	-38.053	22.891		-51.508	-38.252	22.731		-0.192	0.199	0.16		0.32
-55.638	-33.891	12.733		-55.517	-34.018	12.632		-0.121	0.127	0.101		0.202
-59.534	-29.756	2.546		-59.517	-29.774	2.532		-0.018	0.018	0.015		0.029
-52.215	-26.41	2.469		-52.229	-26.299	2.533		0.015	-0.111	-0.065		-0.129
-51.459	-32.09	12.629		-51.46	-32.08	12.635		0.001	-0.01	-0.006		-0.011
-50.694	-37.846	22.743		-50.692	-37.861	22.735		-0.002	0.014	0.008		0.017
-49.899	-38.195	22.618		-49.803	-38.024	22.731		-0.096	-0.171	-0.113		-0.226
-47.075	-33.042	12.544		-47.007	-32.907	12.632		-0.068	-0.136	-0.087		-0.175
-44.281	-27.949	2.43		-44.211	-27.789	2.53		-0.069	-0.16	-0.1		-0.202
-46.569	4.234	24.715		-46.209	3.895	25.2		-0.36	0.34	-0.485		-0.693
-50.234	7.7	27.382		-50.268	7.732	27.539		0.034	-0.032	-0.157		-0.164
-54.189	11.436	22.305		-53.699	10.973	22.006		-0.49	0.463	0.299		0.737
-56.772	13.888	8.514		-56.415	13.55	8.423		-0.358	0.338	0.091		0.501
-62.163	-1.609	8.473		-61.748	-1.576	8.396		-0.415	-0.033	0.077		0.423
-58.677	-1.367	22.277		-58.018	-1.313	21.985		-0.659	-0.054	0.293		0.723
-53.263	-0.952	27.328		-53.324	-0.957	27.532		0.061	0.005	-0.204		-0.213
-48.278	-0.548	24.679		-47.742	-0.501	25.208		-0.536	-0.047	-0.528		-0.754
-45.558	-4.652	25.11		-45.491	-4.562	25.221		-0.067	-0.09	-0.111		-0.158
-48.918	-9.043	27.53		-48.916	-9.04	27.517		-0.003	-0.003	0.013		0.014
-51.928	-12.937	22.033		-51.781	-12.744	21.926		-0.146	-0.193	0.106		0.264
-54.198	-15.816	8.367		-54.086	-15.671	8.333		-0.111	-0.146	0.034		0.186
-38.484	-19.328	8.26		-38.468	-19.416	8.276		-0.016	0.087	-0.016		-0.09
-39.163	-15.524	21.775		-39.119	-15.758	21.879		-0.044	0.235	-0.104		-0.261
-39.96	-11.177	27.521		-39.961	-11.171	27.504		0.001	-0.006	0.017		0.018
-41.074	-5.228	25.602		-41.003	-5.599	25.229		-0.072	0.371	0.373		0.531
-40.302	19.911	8.438		-40.326	19.65	8.39		0.023	0.26	0.048		0.266
-40.6	16.15	22.081		-40.62	15.924	21.98		0.021	0.227	0.101		0.249
-41.025	11.218	27.496		-41.024	11.229	27.533		-0.001	-0.011	-0.037		-0.038
-41.528	5.663	25.183		-41.529	5.646	25.2		0.002	0.017	-0.017		-0.024
-38.767	4.233	25.503		-38.581	4.471	25.206		-0.186	-0.238	0.296		0.423
-35.172	8.944	27.507		-35.169	8.948	27.524		-0.003	-0.004	-0.017		-0.018
-32.42	12.586	21.884		-32.335	12.696	21.945		-0.084	-0.11	-0.061		-0.151

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
-30.157	15.644	8.336		-30.118	15.695	8.348		-0.039	-0.051	-0.012	-0.065
-23.937	6.761	8.236		-23.581	6.893	8.305		-0.355	-0.132	-0.07	-0.385
-27.495	5.388	21.703		-27.054	5.551	21.909		-0.441	-0.163	-0.206	-0.514
-31.448	3.892	27.467		-31.434	3.897	27.514		-0.014	-0.005	-0.047	-0.049
-37.274	1.723	25.786		-36.728	1.919	25.216		-0.547	-0.196	0.571	0.814
-37.151	-1.074	25.866		-36.516	-1.213	25.225		-0.635	0.138	0.64	0.913
-30.991	-2.357	27.419		-30.964	-2.363	27.505		-0.027	0.006	-0.086	-0.09
-26.974	-3.183	21.621		-26.393	-3.305	21.88		-0.58	0.122	-0.259	-0.647
-23.192	-3.947	8.192		-22.751	-4.039	8.274		-0.441	0.092	-0.083	-0.458
-28.084	-13.541	8.212		-27.886	-13.732	8.263		-0.198	0.192	-0.05	-0.28
-30.903	-10.816	21.658		-30.556	-11.152	21.869		-0.347	0.336	-0.211	-0.527
-33.923	-7.898	27.432		-33.907	-7.914	27.501		-0.016	0.016	-0.069	-0.073
-38.422	-3.554	25.818		-37.992	-3.971	25.228		-0.43	0.417	0.59	0.84
-42.09	5.743	25.133		-42.09	5.674	25.201		0	0.069	-0.068	-0.097
-42.133	11.257	27.475		-42.133	11.275	27.534		0	-0.018	-0.059	-0.062
-42.196	16.266	22.108		-42.194	15.988	21.985		-0.002	0.278	0.123	0.304
-42.266	19.998	8.444		-42.264	19.727	8.394		-0.002	0.271	0.05	0.275
-41.022	1.041	20.529		-40.691	1.366	20.242		-0.331	-0.324	0.287	0.545
-45.578	0.267	21.282		-44.964	0.22	21.698		-0.614	0.047	-0.416	-0.743
-41.053	-1.89	21.813		-40.784	-2.385	21.439		-0.27	0.495	0.374	0.676
45.04	-41.458	15.263		45.051	-41.438	15.116		-0.011	-0.02	0.147	0.149
42.307	-46.435	13.478		42.38	-46.303	13.206		-0.072	-0.132	0.271	0.31
40.06	-50.506	9.747		40.184	-50.28	9.524		-0.124	-0.226	0.224	0.341
38.627	-53.082	4.617		38.727	-52.9	4.537		-0.1	-0.182	0.08	0.223
31.981	-44.751	4.445		31.681	-44.868	4.57		0.3	0.118	-0.125	-0.345
34.582	-43.758	9.463		34.49	-43.794	9.549		0.092	0.036	-0.086	-0.131
38.723	-42.16	13.246		38.735	-42.156	13.223		-0.012	-0.005	0.023	0.026
43.914	-40.143	15.114		43.913	-40.143	15.121		0.001	0	-0.007	-0.007
43.873	-38.417	15.117		43.871	-38.416	15.131		0.002	-0.001	-0.014	-0.014
38.673	-36.652	13.103		38.597	-36.628	13.248		0.076	-0.025	-0.146	-0.166
34.599	-35.268	9.283		34.273	-35.161	9.584		0.326	-0.108	-0.301	-0.457
32.088	-34.409	4.327		31.411	-34.183	4.605		0.677	-0.225	-0.278	-0.766
38.477	-26.444	4.328		38.073	-25.788	4.63		0.404	-0.656	-0.302	-0.828
39.852	-28.699	9.293		39.658	-28.386	9.617		0.193	-0.313	-0.325	-0.491
42.099	-32.383	13.107		42.05	-32.304	13.278		0.049	-0.079	-0.17	-0.194
44.948	-37.063	15.176		44.951	-37.068	15.14		-0.003	0.004	0.036	0.036
46.65	-36.715	15.226		46.648	-36.726	15.144		0.002	0.012	0.082	0.083
47.488	-31.186	13.324		47.485	-31.205	13.289		0.003	0.019	0.035	0.04
48.152	-26.763	9.534		48.169	-26.655	9.63		-0.016	-0.108	-0.097	-0.146
48.558	-23.996	4.486		48.612	-23.633	4.63		-0.054	-0.363	-0.144	-0.395
38.627	-53.084	4.618		38.728	-52.9	4.538		-0.101	-0.184	0.081	0.224
40.061	-50.506	9.748		40.185	-50.28	9.524		-0.124	-0.226	0.224	0.341
42.308	-46.435	13.479		42.381	-46.303	13.207		-0.072	-0.133	0.272	0.311
45.041	-41.458	15.263		45.052	-41.438	15.116		-0.011	-0.02	0.147	0.149
47.484	-36.997	15.229		47.478	-37.007	15.144		0.006	0.011	0.085	0.086
50.207	-32.008	13.482		50.156	-32.102	13.286		0.051	0.093	0.196	0.223
52.399	-27.975	9.712		52.352	-28.061	9.625		0.047	0.086	0.086	0.131

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
53.797	-25.394	4.614		53.807	-25.376	4.622		-0.01	-0.018	-0.008		-0.022
61.492	-33.25	4.824		60.923	-33.469	4.587		0.568	0.22	0.237		0.654
58.581	-34.407	10.061		58.093	-34.595	9.601		0.488	0.188	0.46		0.696
54.077	-36.176	13.78		53.818	-36.274	13.271		0.259	0.098	0.509		0.579
48.644	-38.3	15.319		48.619	-38.309	15.139		0.025	0.009	0.18		0.182
48.694	-40.055	15.375		48.659	-40.041	15.129		0.035	-0.013	0.246		0.249
54.298	-41.951	13.932		53.939	-41.824	13.24		0.359	-0.126	0.692		0.79
59.014	-43.538	10.242		58.274	-43.282	9.558		0.74	-0.256	0.683		1.039
62.074	-44.565	4.928		61.141	-44.244	4.547		0.932	-0.321	0.38		1.057
54.85	-53.377	4.877		54.383	-52.601	4.529		0.467	-0.777	0.348		0.971
53.198	-50.645	10.163		52.826	-50.025	9.534		0.372	-0.62	0.629		0.958
50.638	-46.43	13.843		50.461	-46.133	13.218		0.177	-0.297	0.625		0.715
47.594	-41.416	15.366		47.575	-41.383	15.12		0.019	-0.033	0.246		0.249
45.875	-41.749	15.303		45.88	-41.72	15.116		-0.005	-0.029	0.188		0.19
44.998	-47.446	13.642		45.036	-47.206	13.205		-0.037	-0.24	0.437		0.5
44.267	-52.14	9.909		44.336	-51.696	9.52		-0.069	-0.444	0.39		0.595
43.788	-55.146	4.72		43.865	-54.656	4.53		-0.077	-0.49	0.191		0.532
53.791	-25.39	4.614		53.801	-25.372	4.621		-0.01	-0.018	-0.008		-0.022
52.398	-27.975	9.711		52.352	-28.06	9.625		0.047	0.085	0.086		0.13
50.205	-32.011	13.483		50.154	-32.104	13.288		0.051	0.093	0.196		0.222
47.484	-36.997	15.23		47.478	-37.008	15.144		0.006	0.011	0.085		0.086
31.805	-49.962	0.378		31.869	-49.914	0.176		-0.064	-0.048	0.202		0.217
36.268	-54.447	0.404		36.317	-54.373	0.104		-0.049	-0.074	0.3		0.313
45.032	-57.15	0.697		45.047	-56.936	0.246		-0.015	-0.215	0.452		0.5
54.986	-55.083	0.936		54.828	-54.792	0.251		0.158	-0.29	0.685		0.761
61.855	-48.484	1.039		61.518	-48.282	0.287		0.337	-0.202	0.752		0.849
64.247	-39.488	1.057		63.825	-39.479	0.421		0.422	-0.008	0.636		0.764
5.453	29.737	-10.439		5.453	29.48	-10.517		0	0.258	0.077		0.269
2.086	29.738	-10.429		2.086	29.477	-10.507		0	0.261	0.078		0.273
2.115	25.01	0.183		2.115	23.95	0.501		0	1.06	-0.318		1.106
-1.28	29.727	-10.423		-1.28	29.474	-10.498		0	0.253	0.076		0.264
5.438	20.149	-12.68		5.438	20.008	-12.638		0	0.14	-0.042		-0.146
2.107	23.388	-2.176		2.107	23.167	-2.11		0	0.221	-0.066		-0.231
2.07	20.156	-12.673		2.07	20.011	-12.629		0	0.145	-0.044		-0.152
-1.296	20.14	-12.657		-1.296	20.014	-12.619		0	0.126	-0.038		-0.131
8.242	27.595	-10.428		8.024	27.595	-10.515		0.218	0	0.087		0.235
8.244	25.069	-10.434		8.027	25.069	-10.521		0.218	0	0.087		0.234
2.403	25.048	-0.558		3.815	25.048	0.007		-1.412	0	-0.565		-1.521
8.22	22.544	-10.449		8.029	22.544	-10.526		0.192	0	0.077		0.206
-4.513	27.613	-12.646		-4.594	27.613	-12.614		0.081	0	-0.032		-0.087
-0.374	25.054	-2.102		-0.387	25.054	-2.097		0.013	0	-0.005		-0.014
-4.512	25.088	-12.656		-4.597	25.088	-12.622		0.085	0	-0.034		-0.092
-4.515	22.563	-12.661		-4.599	22.563	-12.628		0.084	0	-0.034		-0.091
-9.047	4.943	-2.127		-9.232	5.045	-2.127		0.186	-0.102	0		0.212
-9.336	5.094	9.66		-9.235	5.039	9.66		-0.101	0.055	0		-0.115
-0.671	10.566	9.648		-0.667	10.5	9.648		-0.004	0.066	0		-0.066
-0.693	10.288	-2.137		-0.707	10.497	-2.137		0.014	-0.209	0		0.21

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
8.373	6.104	-2.169		8.502	6.198	-2.169		-0.129	-0.094	0	0.159
8.5	6.133	9.616		8.532	6.156	9.616		-0.032	-0.023	0	0.04
9.982	-3.302	9.586		9.988	-3.304	9.586		-0.006	0.002	0	0.006
9.891	-3.254	0.748		9.994	-3.288	0.748		-0.103	0.034	0	0.109
-0.058	-10.462	0.76		-0.058	-10.521	0.76		0	0.059	0	0.059
-0.025	-10.673	9.598		-0.025	-10.521	9.598		0	-0.153	0	-0.153
-10.182	-3.334	9.641		-9.999	-3.274	9.641		-0.184	-0.06	0	-0.193
-9.918	-3.216	0.801		-10.008	-3.245	0.801		0.09	0.029	0	0.094
10.737	-10.256	3.662		10.651	-10.174	3.662		0.086	-0.082	0	0.119
-11.302	-9.623	3.74		-11.215	-9.549	3.74		-0.087	-0.074	0	0.115
-14.775	1.944	0.838		-14.603	1.922	0.838		-0.172	0.023	0	0.174
-8.419	12.214	3.794		-8.359	12.128	3.794		-0.06	0.087	0	0.105
3.451	14.444	0.813		3.423	14.326	0.813		0.028	0.118	0	0.121
12.961	7.012	3.705		12.955	7.008	3.705		0.007	0.004	0	0.007
1.77	2.201	-16.705		1.77	2.201	-16.833		0	0	0.129	0.129
-3.901	3.877	-16.625		-3.901	3.877	-16.833		0	0	0.208	0.208
-3.99	-4.056	-16.515		-3.99	-4.056	-16.833		0	0	0.318	0.318
3.584	-3.916	-16.517		3.584	-3.916	-16.833		0	0	0.316	0.316
-0.476	0.259	-20.979		-0.476	0.259	-21.042		0	0	0.063	0.063
-9.4	-8.555	12.907		-9.4	-8.555	12.625		0	0	0.282	0.282
-12.027	3.507	12.879		-12.027	3.507	12.625		0	0	0.254	0.254
-0.945	11.976	12.881		-0.945	11.976	12.625		0	0	0.256	0.256
11.21	4.896	13.001		11.21	4.896	12.625		0	0	0.376	0.376
10.544	-7.044	13.019		10.544	-7.044	12.625		0	0	0.394	0.394
0.4	-12.842	12.971		0.4	-12.842	12.625		0	0	0.346	0.346
-0.505	-14.793	6.774		-0.502	-14.721	6.774		-0.002	-0.072	0	0.072
6.917	-46.783	6.521		6.972	-46.783	6.521		-0.055	0	0	-0.055
6.945	-36.777	6.55		6.972	-36.777	6.55		-0.027	0	0	-0.027
6.965	-26.769	6.578		6.972	-26.769	6.578		-0.007	0	0	-0.007
6.98	-16.762	6.605		6.972	-16.762	6.605		0.008	0	0	0.008
4.393	-17.722	6.617		4.447	-17.722	6.617		-0.054	0	0	0.054
4.372	-27.447	6.591		4.447	-27.447	6.591		-0.075	0	0	0.075
4.354	-37.167	6.564		4.447	-37.167	6.564		-0.093	0	0	0.093
4.335	-46.889	6.538		4.447	-46.889	6.538		-0.112	0	0	0.112
-3.982	-46.904	9.502		-3.97	-46.904	9.502		-0.013	0	0	-0.013
-3.973	-37.218	9.529		-3.97	-37.218	9.529		-0.003	0	0	-0.003
-3.986	-27.534	9.555		-3.97	-27.534	9.555		-0.016	0	0	-0.016
-4.054	-17.85	9.583		-3.97	-17.85	9.583		-0.085	0	0	-0.085
-8.225	-16.089	3.715		-8.178	-16.089	3.715		-0.047	0	0	0.047
-8.228	-26.291	3.687		-8.178	-26.291	3.687		-0.05	0	0	0.05
-8.196	-36.49	3.658		-8.178	-36.49	3.658		-0.018	0	0	0.018
-8.153	-46.691	3.631		-8.178	-46.691	3.631		0.025	0	0	-0.025
-6.153	-50.838	7.002		-6.153	-50.5	7.002		0	-0.338	0	0.338
5.61	-50.782	10.2		5.61	-50.5	10.2		0	-0.282	0	0.282
5.62	-46.573	12.924		5.62	-46.573	12.625		0	0	0.299	0.299
5.651	-37.529	12.929		5.651	-37.529	12.625		0	0	0.304	0.304
5.568	-28.485	12.927		5.568	-28.485	12.625		0	0	0.302	0.302

MEAS X	MEAS Y	MEAS Z	CAD X	CAD Y	CAD Z	DIF X	DIF Y	DIF Z	TOT DIF
5.808	-17.518	12.998	5.808	-17.518	12.625	0	0	0.373	0.373
-6.184	-16.949	12.989	-6.184	-16.949	12.625	0	0	0.364	0.364
-6.314	-27.353	12.953	-6.314	-27.353	12.625	0	0	0.328	0.328
-6.343	-36.171	12.931	-6.343	-36.171	12.625	0	0	0.306	0.306
-5.896	-47.925	12.893	-5.896	-47.925	12.625	0	0	0.268	0.268
62.86	-85.831	-0.53	62.86	-85.831	0	0	0	-0.53	-0.53
51.431	-86.19	-0.458	51.431	-86.19	0	0	0	-0.458	-0.458
30.687	-85.69	-0.293	30.687	-85.69	0	0	0	-0.293	-0.293
26.711	-77.969	-0.184	26.711	-77.969	0	0	0	-0.184	-0.184
39.895	-79.706	-0.317	39.895	-79.706	0	0	0	-0.317	-0.317
56.333	-76.332	-0.521	56.333	-76.332	0	0	0	-0.521	-0.521
60.991	-67.038	-0.517	60.991	-67.038	0	0	0	-0.517	-0.517
46.996	-70.277	-0.31	46.996	-70.277	0	0	0	-0.31	-0.31
37.482	-65.872	-0.156	37.482	-65.872	0	0	0	-0.156	-0.156
23.833	-65.53	-0.047	23.833	-65.53	0	0	0	-0.047	-0.047
19.883	-53.425	0.082	19.883	-53.425	0	0	0	0.082	0.082
15.122	-46.295	0.182	15.122	-46.295	0	0	0	0.182	0.182
23.534	-45.557	0.171	23.534	-45.557	0	0	0	0.171	0.171
14.781	-35.36	0.362	14.781	-35.36	0	0	0	0.362	0.362
15.657	-25.401	0.509	15.657	-25.401	0	0	0	0.509	0.509
25.568	-28.347	0.409	25.568	-28.347	0	0	0	0.409	0.409
33.557	-23.361	0.397	33.557	-23.361	0	0	0	0.397	0.397
61.642	-24.533	-0.083	61.642	-24.533	0	0	0	-0.083	-0.083
68.015	-35.059	-0.023	68.015	-35.059	0	0	0	-0.023	-0.023
65.188	-55.028	-0.383	65.188	-55.028	0	0	0	-0.383	-0.383
68.894	-6.61	0.009	68.894	-6.61	0	0	0	0.009	0.009
66.091	18.39	0.065	66.091	18.39	0	0	0	0.065	0.065
52.183	18.982	-0.379	52.183	18.982	0	0	0	-0.379	-0.379
38.306	18.745	-0.136	38.306	18.745	0	0	0	-0.136	-0.136
24.954	19.08	0.098	24.954	19.08	0	0	0	0.098	0.098
27.066	28.537	-0.017	27.066	28.537	0	0	0	-0.017	-0.017
34.205	26.869	-0.194	34.205	26.869	0	0	0	-0.194	-0.194
45.946	25.923	-0.405	45.946	25.923	0	0	0	-0.405	-0.405
45.636	34.465	-0.447	45.636	34.465	0	0	0	-0.447	-0.447
29.668	39.393	-0.239	29.668	39.393	0	0	0	-0.239	-0.239
17.313	42.248	-0.345	17.313	42.248	0	0	0	-0.345	-0.345
7.07	39.387	-0.255	7.07	39.387	0	0	0	-0.255	-0.255
10.252	49.435	-0.297	10.252	49.435	0	0	0	-0.297	-0.297
22.941	52.386	-0.286	22.941	52.386	0	0	0	-0.286	-0.286
43.244	55.616	-0.323	43.244	55.616	0	0	0	-0.323	-0.323
66.436	54.263	-0.201	66.436	54.263	0	0	0	-0.201	-0.201
67.011	38.284	-0.109	67.011	38.284	0	0	0	-0.109	-0.109
-12.214	40.879	-0.283	-12.214	40.879	0	0	0	-0.283	-0.283
-22.809	17.592	-0.056	-22.809	17.592	0	0	0	-0.056	-0.056
-24.1	30.787	-0.108	-24.1	30.787	0	0	0	-0.108	-0.108
-31.283	26.108	-0.284	-31.283	26.108	0	0	0	-0.284	-0.284
-43.013	26.781	-0.446	-43.013	26.781	0	0	0	-0.446	-0.446



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
-50.502	30.641	-0.286		-50.502	30.641	0		0	0	-0.286	-0.286
-40.441	46.181	-0.041		-40.441	46.181	0		0	0	-0.041	-0.041
-47.555	54.744	0.222		-47.555	54.744	0		0	0	0.222	0.222
-75.567	53.986	0.439		-75.567	53.986	0		0	0	0.439	0.439
-75.799	37.705	0.166		-75.799	37.705	0		0	0	0.166	0.166
-74.601	19.545	0.006		-74.601	19.545	0		0	0	0.006	0.006
-57.119	25.433	-0.431		-57.119	25.433	0		0	0	-0.431	-0.431
-66.171	12.134	-0.59		-66.171	12.134	0		0	0	-0.59	-0.59
-68.697	-0.921	-0.532		-68.697	-0.921	0		0	0	-0.532	-0.532
-77.059	-10.61	-0.062		-77.059	-10.61	0		0	0	-0.062	-0.062
-76.937	-29.084	-0.104		-76.937	-29.084	0		0	0	-0.104	-0.104
-62.667	-24.695	-0.281		-62.667	-24.695	0		0	0	-0.281	-0.281
-49.978	-21.744	-0.378		-49.978	-21.744	0		0	0	-0.378	-0.378
-35.652	-26.46	-0.088		-35.652	-26.46	0		0	0	-0.088	-0.088
-22.888	-17.99	0.113		-22.888	-17.99	0		0	0	0.113	0.113
-27.92	-36.929	0.104		-27.92	-36.929	0		0	0	0.104	0.104
-13.803	-51.026	0.127		-13.803	-51.026	0		0	0	0.127	0.127
-5.311	-60.088	0.004		-5.311	-60.088	0		0	0	0.004	0.004
-6.56	-70.889	-0.056		-6.56	-70.889	0		0	0	-0.056	-0.056
-7.918	-86.107	-0.039		-7.918	-86.107	0		0	0	-0.039	-0.039
-27.35	-90.684	-0.003		-27.35	-90.684	0		0	0	-0.003	-0.003
-41.04	-88.428	-0.038		-41.04	-88.428	0		0	0	-0.038	-0.038
-53.791	-82.005	-0.151		-53.791	-82.005	0		0	0	-0.151	-0.151
-63.008	-90.619	-0.106		-63.008	-90.619	0		0	0	-0.106	-0.106
-77.331	-85.904	-0.157		-77.331	-85.904	0		0	0	-0.157	-0.157
-75.655	-64.334	-0.174		-75.655	-64.334	0		0	0	-0.174	-0.174
-72.028	-44.068	-0.145		-72.028	-44.068	0		0	0	-0.145	-0.145
-65.884	-55.977	-0.09		-65.884	-55.977	0		0	0	-0.09	-0.09
-62.266	-65.772	-0.109		-62.266	-65.772	0		0	0	-0.109	-0.109
-50.543	-58.72	0.031		-50.543	-58.72	0		0	0	0.031	0.031
-50.31	-72.777	-0.029		-50.31	-72.777	0		0	0	-0.029	-0.029
-14.205	-37.836	-16.781		-14.205	-37.836	-16.833		0	0	0.052	0.052
-14.581	-16.438	-16.778		-14.581	-16.438	-16.833		0	0	0.056	0.056
-13.733	16.237	-16.823		-13.733	16.237	-16.833		0	0	0.01	0.01
-13.552	29.445	-16.878		-13.552	29.445	-16.833		0	0	-0.045	-0.045
14.509	31.679	-16.863		14.509	31.679	-16.833		0	0	-0.03	-0.03
15.372	23.972	-16.76		15.372	23.972	-16.833		0	0	0.074	0.074
15.623	12.282	-16.727		15.623	12.282	-16.833		0	0	0.107	0.107
59.802	4.327	-17.134		59.802	4.327	-16.833		0	0	-0.3	-0.3
58.229	-9.946	-17.038		58.229	-9.946	-16.833		0	0	-0.205	-0.205
48.733	-15.229	-16.789		48.733	-15.229	-16.833		0	0	0.044	0.044
36.33	-9.624	-16.52		36.33	-9.624	-16.833		0	0	0.314	0.314
30.552	-17.643	-16.508		30.552	-17.643	-16.833		0	0	0.326	0.326
13.097	-15.108	-16.408		13.097	-15.108	-16.833		0	0	0.425	0.425
19.443	2.838	-4.054		19.443	2.838	-4.208		0	0	0.154	0.154
28.834	7.236	-4.2		28.834	7.236	-4.208		0	0	0.009	0.009
34.356	2.973	-4.258		34.356	2.973	-4.208		0	0	-0.05	-0.05



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
41.112	7.348	-4.42		41.112	7.348	-4.208		0	0	-0.212	-0.212
46.335	2.158	-4.348		46.335	2.158	-4.208		0	0	-0.14	-0.14
51.937	8.371	-4.533		51.937	8.371	-4.208		0	0	-0.324	-0.324
50.77	-3.236	-0.047		50.77	-3.236	0		0	0	-0.047	-0.047
40.246	-3.02	-0.152		40.246	-3.02	0		0	0	-0.152	-0.152
28.555	-2.82	0.219		28.555	-2.82	0		0	0	0.219	0.219
16.867	-2.002	0.119		16.867	-2.002	0		0	0	0.119	0.119
18.484	-9.337	1.888		18.484	-9.337	1.683		0	0	0.205	0.205
24.651	-6.507	1.893		24.651	-6.507	1.683		0	0	0.21	0.21
25.755	-14.817	2.04		25.755	-14.817	1.683		0	0	0.357	0.357
18.692	-12.012	-4.26		18.692	-12.447	-4.26		0	0.435	0	-0.435
24.64	-16.667	0.091		24.59	-16.655	0.091		0.05	-0.011	0	0.051
32.906	-3.427	-4.346		32.906	-4.03	-4.346		0	0.603	0	-0.603
39.933	-3.377	-3.614		39.933	-4.03	-3.614		0	0.653	0	-0.653
52.551	-3.457	-4.928		52.551	-4.03	-4.928		0	0.573	0	-0.573
55.36	0.017	-9.205		55.246	0.054	-9.205		0.114	-0.036	0	0.12
56.588	7.903	-9.933		56.527	7.903	-9.933		0.061	0	0	0.061
59.413	12.311	-0.791		59.413	12.256	-0.673		0	0.055	-0.118	-0.131
49.197	13.208	-1.632		49.197	13.086	-1.421		0	0.121	-0.21	-0.243
39.357	12.447	-1.532		39.357	12.307	-1.393		0	0.14	-0.14	-0.198

### 3D-Tol Data from CMM for Wax Pattern (Alumide3)

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z	TOT DIF
53.832	58.833	-5.871		53.832	58.917	-5.871		0	-0.083	0	-0.083
37.286	58.755	-5.88		37.286	58.917	-5.88		0	-0.161	0	-0.161
20.742	58.666	-5.89		20.742	58.917	-5.89		0	-0.25	0	-0.25
4.197	58.607	-5.901		4.197	58.917	-5.901		0	-0.31	0	-0.31
-12.348	58.545	-5.91		-12.348	58.917	-5.91		0	-0.371	0	-0.371
-28.893	58.486	-5.921		-28.893	58.917	-5.921		0	-0.431	0	-0.431
-45.437	58.514	-5.931		-45.437	58.917	-5.931		0	-0.403	0	-0.403
-61.983	58.481	-5.942		-61.983	58.917	-5.942		0	-0.436	0	-0.436
-79.767	41.181	-5.983		-79.958	41.181	-5.983		0.191	0	0	-0.191
-79.726	24.636	-6.009		-79.958	24.636	-6.009		0.232	0	0	-0.232
-79.714	8.092	-6.035		-79.958	8.092	-6.035		0.245	0	0	-0.245
-79.698	-8.452	-6.061		-79.958	-8.452	-6.061		0.261	0	0	-0.261
-79.639	-24.998	-6.086		-79.958	-24.998	-6.086		0.319	0	0	-0.319
-79.619	-41.542	-6.112		-79.958	-41.542	-6.112		0.339	0	0	-0.339
-79.611	-58.087	-6.138		-79.958	-58.087	-6.138		0.348	0	0	-0.348
-79.644	-74.632	-6.163		-79.958	-74.632	-6.163		0.315	0	0	-0.315
-62.127	-92.475	-6.184		-62.127	-92.583	-6.184		0	0.108	0	-0.108
-45.582	-92.429	-6.173		-45.582	-92.583	-6.173		0	0.154	0	-0.154
-29.037	-92.409	-6.163		-29.037	-92.583	-6.163		0	0.175	0	-0.175
-12.493	-92.432	-6.153		-12.493	-92.583	-6.153		0	0.151	0	-0.151
4.052	-92.441	-6.143		4.052	-92.583	-6.143		0	0.142	0	-0.142

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
20.597	-92.484	-6.133		20.597	-92.583	-6.133		0	0.099	0		-0.099
37.142	-92.483	-6.122		37.142	-92.583	-6.122		0	0.1	0		-0.1
53.686	-92.535	-6.112		53.686	-92.583	-6.112		0	0.048	0		-0.048
71.406	-74.779	-6.072		71.542	-74.779	-6.072		-0.135	0	0		-0.135
71.399	-58.234	-6.044		71.542	-58.234	-6.044		-0.143	0	0		-0.143
71.334	-41.689	-6.019		71.542	-41.689	-6.019		-0.207	0	0		-0.207
71.217	-25.143	-5.991		71.542	-25.143	-5.991		-0.324	0	0		-0.324
71.087	-8.599	-5.965		71.542	-8.599	-5.965		-0.454	0	0		-0.454
71.066	7.945	-5.939		71.542	7.945	-5.939		-0.476	0	0		-0.476
71.112	24.49	-5.915		71.542	24.49	-5.915		-0.43	0	0		-0.43
71.133	41.035	-5.888		71.542	41.035	-5.888		-0.409	0	0		-0.409
-69.749	43.841	8.353		-69.749	43.841	8.417		0	0	-0.064		-0.064
-64.696	43.836	8.316		-64.696	43.836	8.417		0	0	-0.101		-0.101
-64.693	48.886	8.352		-64.693	48.886	8.417		0	0	-0.065		-0.065
-69.744	48.89	8.408		-69.744	48.89	8.417		0	0	-0.009		-0.009
-67.613	46.482	8.372		-67.613	46.482	8.417		0	0	-0.044		-0.044
-71.764	43.848	6.651		-71.542	43.848	6.651		-0.222	0	0		0.222
-71.861	48.898	6.662		-71.542	48.898	6.662		-0.319	0	0		0.319
-69.741	50.49	6.665		-69.741	50.5	6.665		0	-0.01	0		-0.01
-64.689	50.453	6.668		-64.689	50.5	6.668		0	-0.047	0		-0.047
-64.699	42.602	6.649		-64.699	42.083	6.649		0	0.519	0		-0.519
-69.749	42.563	6.648		-69.749	42.083	6.648		0	0.48	0		-0.48
-63.072	49.872	6.662		-63.125	50.5	6.662		0.053	-0.628	0		0.631
-63.059	43.839	7.637		-63.125	43.839	8.417		0.066	0	-0.78		0.783
-64.752	-14.232	4.148		-64.752	-14.232	4.208		0	0	-0.06		-0.06
-69.802	-14.228	4.119		-69.802	-14.228	4.208		0	0	-0.089		-0.089
-69.806	-19.278	4.166		-69.806	-19.278	4.208		0	0	-0.043		-0.043
-64.755	-19.282	4.172		-64.755	-19.282	4.208		0	0	-0.037		-0.037
-67.925	-16.657	4.128		-67.925	-16.657	4.208		0	0	-0.081		-0.081
-69.8	-12.516	4.034		-69.8	-12.625	4.208		0	0.109	-0.174		0.206
-64.749	-12.519	4.038		-64.749	-12.625	4.208		0	0.106	-0.17		0.2
-63.113	-14.23	4.157		-63.125	-14.23	4.208		0.012	0	-0.051		0.053
-63.109	-19.281	4.146		-63.125	-19.281	4.208		0.016	0	-0.062		0.064
-64.759	-21.111	3.183		-64.759	-21.042	3.183		0	-0.069	0		0.069
-69.808	-21.11	3.183		-69.808	-21.042	3.183		0	-0.068	0		0.068
-71.952	-19.271	3.186		-71.542	-19.271	3.186		-0.41	0	0		0.41
-71.959	-14.221	3.197		-71.542	-14.221	3.197		-0.417	0	0		0.417
-64.816	-77.363	8.005		-64.816	-77.363	8.417		0	0	-0.411		-0.411
-69.866	-77.36	8.125		-69.866	-77.36	8.417		0	0	-0.292		-0.292
-69.869	-82.41	8.226		-69.869	-82.41	8.417		0	0	-0.19		-0.19
-64.818	-82.414	8.198		-64.818	-82.414	8.417		0	0	-0.219		-0.219
-70.849	-75.737	6.467		-71.542	-75.75	6.467		0.692	0.013	0		0.692
-64.813	-76.933	6.469		-64.813	-75.75	6.469		0	-1.183	0		-1.183
-63.112	-76.375	6.466		-63.125	-75.75	6.466		0.013	-0.625	0		0.625
-63.965	-82.411	6.458		-63.125	-82.411	6.458		-0.84	0	0		-0.84
-64.822	-84.542	6.45		-64.822	-84.167	6.45		0	-0.375	0		0.375
-69.871	-84.641	6.45		-69.871	-84.167	6.45		0	-0.474	0		0.474

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-71.773	-82.402	6.455		-71.542	-82.402	6.455		-0.231	0	0		0.231
-71.677	-77.352	6.465		-71.542	-77.352	6.465		-0.136	0	0		0.136
-2.412	43.782	3.845		-2.412	43.782	4.208		0	0	-0.363		-0.363
2.64	43.778	3.807		2.64	43.778	4.208		0	0	-0.401		-0.401
2.642	48.829	3.739		2.642	48.829	4.208		0	0	-0.469		-0.469
-2.407	48.832	3.754		-2.407	48.832	4.208		0	0	-0.455		-0.455
-0.569	46.813	3.811		-0.569	46.813	4.208		0	0	-0.398		-0.398
-4.231	43.79	2.064		-4.208	43.79	2.064		-0.023	0	0		0.023
-4.261	48.84	2.075		-4.208	48.84	2.075		-0.053	0	0		0.053
3.599	41.948	2.062		4.208	42.083	2.062		-0.609	-0.135	0		0.624
-2.412	42.692	2.063		-2.412	42.083	2.063		0	0.608	0		-0.608
3.909	48.832	2.076		4.208	48.832	2.076		-0.299	0	0		-0.299
3.891	43.781	2.068		4.208	43.781	2.068		-0.317	0	0		-0.317
-2.404	50.936	2.078		-2.404	50.5	2.078		0	0.436	0		0.436
2.647	50.937	2.082		2.647	50.5	2.082		0	0.437	0		0.437
-64.586	36.21	-0.422		-64.688	36.312	0		0.102	-0.102	-0.422		0.446
-53.888	46.943	-0.387		-53.973	47.027	0		0.085	-0.085	-0.387		0.405
-46.954	46.855	-1.327		-46.904	46.904	-1.327		-0.049	-0.049	0		0.07
-36.239	36.142	-1.337		-36.191	36.191	-1.337		-0.049	-0.049	0		0.069
-41.123	28.894	-1.347		-40.96	29.057	-1.347		-0.163	-0.163	0		-0.231
-48.269	36.028	-1.339		-48.1	36.197	-1.339		-0.169	-0.169	0		-0.239
-35.967	29.969	-1.723		-35.645	29.646	-1.723		-0.322	0.322	0		0.456
-54.359	35.494	-1.346		-53.981	35.116	-1.346		-0.378	0.378	0		0.535
-59.091	30.71	-1.352		-58.739	30.358	-1.352		-0.352	0.352	0		0.497
-65.589	29.407	-1.263		-65.352	29.643	-1.263		-0.237	-0.237	0		-0.335
-61.286	33.646	-4.525		-61.286	33.646	-4.208		0	0	-0.316		-0.316
-56.713	38.397	-4.465		-56.713	38.397	-4.208		0	0	-0.257		-0.257
-50.212	43.793	-4.488		-50.212	43.793	-4.208		0	0	-0.279		-0.279
-44.657	38.74	-4.388		-44.657	38.74	-4.208		0	0	-0.18		-0.18
-39.987	33.926	-4.368		-39.987	33.926	-4.208		0	0	-0.16		-0.16
49.769	42.891	5.882		49.769	42.083	5.882		0	0.808	0		-0.808
43.035	42.859	5.878		43.035	42.083	5.878		0	0.775	0		-0.775
55.206	30.259	5.867		54.708	30.259	5.867		0.498	0	0		-0.498
55.188	36.993	5.879		54.708	36.993	5.879		0.48	0	0		-0.48
58.892	25.953	5.364		58.892	25.25	5.364		0	0.703	0		-0.703
63.149	30.251	5.871		63.125	30.251	5.871		0.024	0	0		0.024
63.145	37.826	5.885		63.125	37.826	5.885		0.02	0	0		0.02
63.099	45.402	5.897		63.125	45.402	5.897		-0.026	0	0		-0.026
58.194	50.885	5.904		58.194	50.5	5.904		0	0.385	0		0.385
50.617	50.857	5.901		50.617	50.5	5.901		0	0.357	0		0.357
43.043	50.816	5.896		43.043	50.5	5.896		0	0.316	0		0.316
38.182	46.22	5.164		37.875	46.22	5.164		0.307	0	0		-0.307
43.289	46.377	8.073		43.289	46.377	8.417		0	0	-0.344		-0.344
50.521	46.078	8.191		50.521	46.078	8.417		0	0	-0.226		-0.226
58.492	45.739	8.358		58.492	45.739	8.417		0	0	-0.059		-0.059
59.224	37.473	8.432		59.224	37.473	8.417		0	0	0.015		0.015
59.093	30.628	8.542		59.093	30.628	8.417		0	0	0.125		0.125

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-30.793	49.213	16.73		-30.793	48.853	16.938		0	0.36	-0.208		-0.415
-30.793	46.272	11.723		-30.793	45.95	11.909		0	0.323	-0.186		-0.373
-30.793	43.307	6.734		-30.793	43.048	6.883		0	0.259	-0.149		-0.299
-30.793	40.424	1.695		-30.793	40.145	1.856		0	0.279	-0.161		-0.322
-27.003	40.442	1.687		-27.003	40.146	1.857		0	0.295	-0.17		-0.341
-27.004	43.347	6.71		-27.004	43.048	6.883		0	0.299	-0.172		-0.345
-27.004	46.295	11.709		-27.004	45.95	11.909		0	0.345	-0.199		-0.399
-27.005	49.217	16.726		-27.005	48.852	16.936		0	0.365	-0.211		-0.422
-23.216	49.237	16.714		-23.216	48.852	16.937		0	0.385	-0.222		-0.445
-23.217	46.3	11.706		-23.217	45.949	11.909		0	0.35	-0.202		-0.404
-23.217	43.371	6.697		-23.217	43.048	6.883		0	0.323	-0.187		-0.373
-23.217	40.447	1.687		-23.217	40.148	1.86		0	0.299	-0.173		-0.345
-16.9	45.852	1.732		-16.9	45.402	1.852		0	0.45	-0.121		-0.466
-16.9	47.891	9.26		-16.9	47.42	9.386		0	0.47	-0.126		-0.487
-16.904	50.048	17.276		-16.904	50.354	17.358		0	-0.306	-0.082		0.317
-11.854	50.011	17.287		-11.854	50.349	17.378		0	-0.338	-0.091		0.35
-11.852	47.91	9.26		-11.852	47.421	9.391		0	0.489	-0.131		-0.506
-11.849	45.869	1.73		-11.849	45.402	1.855		0	0.467	-0.125		-0.484
-8.739	49.636	7.491		-8.178	49.636	7.491		-0.561	0	0		-0.561
-30.79	51.499	15.171		-30.79	50.978	15.032		0	0.522	0.14		0.54
-30.785	52.991	9.509		-30.785	52.493	9.375		0	0.498	0.133		0.515
-30.781	54.407	3.829		-30.781	54.008	3.722		0	0.399	0.107		0.413
-24.046	54.39	3.831		-24.046	54.006	3.728		0	0.384	0.103		0.398
-24.051	52.99	9.516		-24.051	52.491	9.382		0	0.499	0.134		0.516
-24.055	51.507	15.18		-24.055	50.976	15.038		0	0.532	0.142		0.55
-17.322	51.485	15.178		-17.322	50.975	15.041		0	0.51	0.137		0.528
-17.319	52.967	9.515		-17.319	52.49	9.387		0	0.477	0.128		0.494
-17.312	54.402	3.84		-17.312	54.005	3.734		0	0.397	0.106		0.411
-10.579	54.395	3.845		-10.579	54.003	3.74		0	0.392	0.105		0.406
-10.584	52.963	9.521		-10.584	52.488	9.394		0	0.474	0.127		0.491
-10.588	51.418	15.167		-10.588	50.973	15.047		0	0.445	0.119		0.461
-33.344	48.998	9.622		-33.428	48.998	9.622		0.084	0	0		-0.084
5.198	-63.138	18.604		4.999	-63.138	18.657		0.199	0	-0.053		-0.206
3.263	-63.125	11.548		3.105	-63.125	11.59		0.157	0	-0.042		-0.163
1.416	-63.112	4.467		1.212	-63.112	4.522		0.205	0	-0.055		-0.212
1.475	-69.846	4.441		1.209	-69.846	4.513		0.266	0	-0.071		-0.275
3.291	-69.859	11.529		3.103	-69.859	11.58		0.189	0	-0.051		-0.195
5.208	-69.872	18.589		4.996	-69.872	18.646		0.212	0	-0.057		-0.22
5.245	-76.605	18.568		4.993	-76.605	18.635		0.252	0	-0.067		-0.261
3.351	-76.591	11.5		3.099	-76.591	11.567		0.251	0	-0.067		-0.26
1.528	-76.578	4.414		1.206	-76.578	4.5		0.322	0	-0.086		-0.333
1.485	-83.313	4.414		1.203	-83.313	4.489		0.282	0	-0.076		-0.292
3.363	-83.326	11.486		3.097	-83.326	11.557		0.266	0	-0.071		-0.275
5.281	-83.338	18.548		4.991	-83.338	18.626		0.291	0	-0.078		-0.301
7.443	-86.221	10.123		7.443	-85.85	10.123		0	-0.371	0		0.371
8.082	-83.344	21.216		7.769	-83.344	21.036		0.313	0	0.181		0.361
13.476	-83.336	11.768		13.209	-83.336	11.614		0.267	0	0.154		0.308

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
18.888	-83.326	2.328		18.649	-83.326	2.191		0.239	0	0.138		0.276
18.857	-75.75	2.32		18.645	-75.75	2.198		0.211	0	0.122		0.244
13.433	-75.761	11.754		13.204	-75.761	11.622		0.229	0	0.132		0.264
8.061	-75.771	21.215		7.764	-75.771	21.044		0.296	0	0.171		0.342
7.252	-69.455	21.08		6.995	-69.455	21.011		0.257	0	0.069		0.266
9.753	-69.443	11.646		9.521	-69.443	11.584		0.232	0	0.062		0.24
12.244	-69.431	2.215		12.046	-69.431	2.161		0.199	0	0.053		0.206
12.293	-64.382	2.235		12.044	-64.382	2.169		0.249	0	0.067		0.258
9.775	-64.395	11.66		9.519	-64.395	11.591		0.256	0	0.069		0.265
7.22	-64.407	21.078		6.994	-64.407	21.017		0.226	0	0.061		0.234
6.449	-61.699	10.914		6.449	-60.6	10.914		0	-1.099	0		-1.099
-30.471	-50.947	-5.065		-30.495	-50.562	-5.505		0.024	-0.385	0.44		0.585
-30.189	-55.373	-7.331		-30.205	-55.1	-7.849		0.017	-0.274	0.519		0.587
-29.955	-59.075	-11.505		-29.982	-58.631	-11.736		0.027	-0.444	0.232		0.501
-29.778	-61.821	-15.616		-29.79	-61.614	-15.911		0.012	-0.207	0.295		0.36
-33.525	-63.588	-15.691		-33.648	-63.474	-15.934		0.123	-0.113	0.242		0.295
-35.735	-61.61	-11.647		-35.892	-61.467	-11.757		0.157	-0.143	0.111		0.24
-38.404	-59.229	-7.552		-38.526	-59.119	-7.861		0.122	-0.11	0.309		0.35
-41.767	-56.214	-5.291		-41.915	-56.081	-5.52		0.148	-0.133	0.229		0.303
-46.334	-68.036	-5.695		-46.204	-68.031	-5.543		-0.131	-0.005	-0.152		-0.201
-41.652	-67.821	-7.904		-41.641	-67.821	-7.884		-0.011	0	-0.021		-0.023
-38.282	-67.657	-11.86		-38.144	-67.652	-11.788		-0.138	-0.005	-0.072		-0.156
-35.173	-67.51	-16.055		-35.11	-67.508	-15.962		-0.063	-0.002	-0.093		-0.112
-33.407	-71.518	-16.181		-33.316	-71.422	-15.984		-0.09	-0.096	-0.197		-0.237
-35.71	-74	-12.051		-35.395	-73.664	-11.812		-0.315	-0.336	-0.239		-0.519
-37.858	-76.318	-8.16		-37.763	-76.216	-7.901		-0.096	-0.102	-0.258		-0.294
-41.063	-79.765	-5.886		-40.877	-79.567	-5.564		-0.185	-0.199	-0.321		-0.421
-29.394	-67.478	-17.104		-29.521	-67.448	-16.852		0.127	-0.03	-0.252		-0.284
-26.803	-62.439	-15.681		-26.726	-62.297	-15.91		-0.077	-0.142	0.23		0.28
-25.529	-60.114	-11.474		-25.29	-59.675	-11.734		-0.239	-0.439	0.261		0.564
-23.74	-56.85	-7.254		-23.589	-56.574	-7.85		-0.151	-0.276	0.596		0.674
-21.641	-53.018	-4.952		-21.407	-52.59	-5.509		-0.234	-0.428	0.557		0.741
-13.669	-62.661	-5.166		-13.369	-62.573	-5.526		-0.3	-0.089	0.361		0.477
-17.952	-63.912	-7.431		-17.732	-63.846	-7.862		-0.22	-0.065	0.431		0.488
-21.441	-64.916	-11.58		-21.12	-64.82	-11.754		-0.32	-0.097	0.174		0.377
-24.108	-65.692	-15.781		-24.009	-65.662	-15.931		-0.1	-0.031	0.15		0.183
-24.44	-69.99	-15.999		-24.462	-69.979	-15.963		0.022	-0.012	-0.037		-0.044
-21.761	-71.463	-11.805		-21.798	-71.443	-11.784		0.037	-0.02	-0.022		-0.047
-18.782	-73.11	-7.776		-18.732	-73.137	-7.882		-0.05	0.027	0.106		0.12
-14.718	-75.337	-5.565		-14.733	-75.329	-5.546		0.015	-0.008	-0.02		-0.026
-24.671	-83.609	-5.837		-24.736	-83.388	-5.565		0.065	-0.221	-0.273		-0.357
-25.99	-79.09	-8.076		-26.017	-78.999	-7.9		0.027	-0.092	-0.176		-0.2
-26.874	-76.044	-12.024		-26.99	-75.653	-11.812		0.116	-0.391	-0.211		-0.459
-27.795	-72.87	-16.212		-27.839	-72.722	-15.981		0.044	-0.148	-0.231		-0.278
-32.234	-72.359	-16.176		-32.173	-72.249	-15.988		-0.06	-0.11	-0.188		-0.226
-33.823	-75.396	-12.069		-33.619	-74.949	-11.814		-0.205	-0.448	-0.255		-0.554
-35.344	-78.135	-8.177		-35.285	-77.998	-7.905		-0.059	-0.136	-0.272		-0.31

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-37.59	-82.277	-5.904		-37.479	-82.015	-5.569		-0.111	-0.262	-0.336		-0.441
-25.39	-86.436	-1		-25.451	-86.15	-0.691		0.061	-0.286	-0.309		-0.425
-12.919	-77.23	-1.036		-13.091	-77.128	-0.861		0.171	-0.102	-0.175		-0.265
-11.395	-61.841	-0.536		-11.143	-61.764	-0.786		-0.252	-0.077	0.25		0.364
-16.55	-53.97	-0.163		-16.136	-53.541	-0.752		-0.415	-0.429	0.589		0.838
-25.892	-48.844	0.018		-25.794	-48.337	-0.595		-0.098	-0.507	0.612		0.801
-47.601	-37.904	18.477		-47.133	-37.679	18.777		-0.468	-0.225	-0.3		-0.6
-44.194	-36.285	12.235		-43.839	-36.115	12.462		-0.355	-0.17	-0.227		-0.455
-40.803	-34.673	5.985		-40.547	-34.551	6.149		-0.256	-0.122	-0.164		-0.327
-39.804	-41.261	6.071		-39.657	-41.288	6.157		-0.147	0.027	-0.086		-0.172
-43.489	-40.576	12.327		-43.242	-40.621	12.472		-0.247	0.045	-0.145		-0.29
-47.197	-39.89	18.566		-46.825	-39.956	18.784		-0.372	0.066	-0.218		-0.436
-47.916	-41.988	18.79		-47.916	-41.989	18.79		-0.001	0.001	0		-0.001
-45.356	-44.688	12.524		-45.409	-44.633	12.48		0.053	-0.055	0.044		0.088
-42.81	-47.374	6.244		-42.902	-47.278	6.168		0.091	-0.096	0.077		0.153
-49.008	-50.664	6.434		-49.066	-50.219	6.175		0.058	-0.444	0.259		0.518
-49.479	-47.044	12.742		-49.537	-46.606	12.487		0.058	-0.438	0.255		0.51
-49.953	-43.4	19.036		-50.007	-42.992	18.799		0.054	-0.408	0.238		0.475
-52.659	-43.242	19.248		-52.289	-42.565	18.802		-0.371	-0.677	0.445		0.891
-54.397	-46.409	12.913		-54.042	-45.762	12.487		-0.355	-0.647	0.426		0.852
-56.118	-49.555	6.568		-55.791	-48.958	6.175		-0.327	-0.596	0.393		0.785
-52.738	-40.341	23.129		-51.892	-39.948	22.591		-0.846	-0.394	0.539		1.077
-57.921	-42.772	12.96		-57.175	-42.423	12.485		-0.745	-0.349	0.475		0.95
-62.995	-45.156	2.732		-62.453	-44.902	2.386		-0.542	-0.254	0.346		0.691
-63.93	-36.693	2.656		-63.462	-36.784	2.381		-0.468	0.091	0.275		0.55
-58.366	-37.765	12.854		-57.735	-37.888	12.483		-0.631	0.123	0.371		0.743
-52.661	-38.865	22.967		-52.009	-38.996	22.583		-0.651	0.131	0.384		0.767
-51.635	-38.059	22.651		-51.543	-38.159	22.572		-0.092	0.1	0.079		0.157
-55.716	-33.698	12.632		-55.527	-33.901	12.472		-0.189	0.203	0.16		0.32
-59.641	-29.504	2.483		-59.511	-29.643	2.373		-0.13	0.14	0.11		0.221
-52.133	-26.231	2.339		-52.139	-26.189	2.364		0.005	-0.043	-0.025		-0.05
-51.398	-32.059	12.418		-51.408	-31.976	12.466		0.01	-0.083	-0.048		-0.097
-50.023	-37.827	22.774		-49.804	-38.025	22.734		-0.219	0.199	0.04		0.298
-50.018	-38.403	22.255		-49.756	-37.938	22.562		-0.262	-0.464	-0.308		-0.616
-47.129	-33.116	12.265		-46.96	-32.821	12.462		-0.169	-0.296	-0.197		-0.393
-44.273	-27.893	2.236		-44.165	-27.704	2.362		-0.109	-0.19	-0.126		-0.252
-46.147	3.935	25.033		-46.093	3.883	25.105		-0.054	0.052	-0.073		-0.105
-50.425	7.96	28.086		-50.292	7.833	27.512		-0.133	0.127	0.574		0.603
-54.339	11.668	22.161		-53.724	11.082	21.794		-0.615	0.586	0.368		0.925
-56.832	14.065	8.272		-56.391	13.644	8.161		-0.441	0.421	0.111		0.62
-62.571	-1.602	8.284		-61.797	-1.541	8.142		-0.774	-0.06	0.141		0.789
-59.106	-1.344	22.224		-58.107	-1.265	21.79		-0.999	-0.079	0.434		1.092
-53.542	-0.908	28.045		-53.376	-0.894	27.518		-0.166	-0.013	0.527		0.553
-47.894	-0.446	24.828		-47.628	-0.425	25.084		-0.266	-0.02	-0.256		-0.37
-45.39	-4.389	25.155		-45.432	-4.444	25.088		0.042	0.056	0.067		0.097
-49.067	-9.186	28.151		-48.945	-9.025	27.515		-0.123	-0.161	0.636		0.668
-52.231	-13.314	22.058		-51.831	-12.79	21.773		-0.399	-0.524	0.285		0.718

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-54.4	-16.138	8.221		-54.082	-15.722	8.126		-0.318	-0.416	0.095		0.532
-38.363	-19.503	8.138		-38.377	-19.427	8.124		0.014	-0.076	0.014		0.078
-39.049	-15.897	21.8		-39.067	-15.802	21.758		0.018	-0.095	0.042		0.106
-39.905	-11.341	28.079		-39.94	-11.157	27.507		0.035	-0.183	0.572		0.602
-41.089	-4.952	25.622		-40.984	-5.475	25.108		-0.105	0.522	0.514		0.74
-40.233	19.81	8.191		-40.245	19.684	8.168		0.012	0.126	0.023		0.129
-40.562	16.263	21.895		-40.586	16.007	21.784		0.024	0.256	0.111		0.28
-40.993	11.503	28.046		-41.01	11.324	27.503		0.017	0.179	0.544		0.573
-41.555	5.158	25.544		-41.512	5.58	25.134		-0.043	-0.422	0.411		0.59
-39.06	3.9	25.81		-38.64	4.441	25.145		-0.42	-0.541	0.665		0.955
-35.058	9.146	27.916		-35.144	9.034	27.497		0.086	0.111	0.419		0.442
-32.368	12.671	21.722		-32.298	12.762	21.771		-0.07	-0.091	-0.05		-0.125
-30.199	15.52	8.122		-30.064	15.697	8.162		-0.135	-0.177	-0.041		-0.226
-24.024	6.739	8.061		-23.559	6.913	8.152		-0.465	-0.174	-0.091		-0.505
-27.393	5.472	21.585		-27.009	5.615	21.762		-0.384	-0.143	-0.177		-0.446
-31.299	4.01	27.805		-31.397	3.974	27.494		0.099	0.037	0.311		0.328
-37.651	1.656	26.014		-36.816	1.968	25.148		-0.835	-0.312	0.866		1.242
-37.485	-0.922	26.046		-36.574	-1.105	25.144		-0.911	0.183	0.902		1.295
-30.816	-2.326	27.811		-30.921	-2.304	27.495		0.104	-0.022	0.316		0.333
-26.758	-3.162	21.564		-26.326	-3.251	21.755		-0.432	0.089	-0.19		-0.48
-23.209	-3.883	8.048		-22.714	-3.984	8.14		-0.495	0.102	-0.092		-0.513
-27.983	-13.52	8.086		-27.809	-13.687	8.13		-0.174	0.167	-0.044		-0.245
-30.666	-10.955	21.64		-30.474	-11.139	21.754		-0.192	0.184	-0.115		-0.29
-33.769	-7.967	27.892		-33.864	-7.876	27.499		0.094	-0.09	0.393		0.414
-38.601	-3.276	25.927		-38.001	-3.84	25.13		-0.6	0.564	0.798		1.147
-42.061	5.25	25.477		-42.059	5.606	25.131		-0.002	-0.357	0.346		0.497
-42.124	11.553	28.057		-42.123	11.371	27.504		-0.001	0.182	0.553		0.582
-42.164	16.396	21.922		-42.163	16.076	21.784		-0.002	0.32	0.138		0.348
-42.182	19.958	8.203		-42.181	19.769	8.168		-0.001	0.189	0.034		0.192
-41.28	0.732	20.613		-40.695	1.265	20.127		-0.585	-0.533	0.486		0.929
-45.225	0.322	21.286		-44.851	0.283	21.538		-0.374	0.038	-0.251		-0.453
-41.113	-1.547	21.814		-40.692	-2.219	21.292		-0.421	0.672	0.522		0.95
45.078	-41.351	15.101		45.077	-41.355	15.129		0.001	0.004	-0.028		-0.029
42.406	-46.316	13.474		42.459	-46.217	13.269		-0.053	-0.099	0.206		0.234
40.161	-50.41	9.844		40.271	-50.209	9.642		-0.109	-0.201	0.202		0.306
38.688	-53.104	4.793		38.811	-52.877	4.691		-0.123	-0.226	0.102		0.277
31.934	-44.77	4.616		31.73	-44.85	4.703		0.204	0.08	-0.087		-0.236
34.633	-43.724	9.607		34.577	-43.746	9.661		0.056	0.022	-0.054		-0.081
38.844	-42.089	13.254		38.83	-42.095	13.283		0.015	0.006	-0.029		-0.033
44.004	-40.079	14.991		43.984	-40.087	15.135		0.02	0.008	-0.143		-0.145
43.961	-38.381	15.007		43.943	-38.375	15.139		0.019	-0.006	-0.132		-0.134
38.804	-36.632	13.099		38.702	-36.598	13.298		0.102	-0.034	-0.199		-0.226
34.654	-35.219	9.412		34.371	-35.124	9.677		0.283	-0.095	-0.266		-0.399
32.016	-34.317	4.495		31.475	-34.135	4.722		0.54	-0.182	-0.227		-0.614
38.54	-26.365	4.462		38.181	-25.772	4.739		0.36	-0.593	-0.277		-0.747
39.954	-28.694	9.375		39.77	-28.392	9.69		0.183	-0.301	-0.314		-0.472
42.21	-32.42	13.059		42.141	-32.307	13.305		0.069	-0.113	-0.245		-0.279



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
45.024	-37.054	15.03		45.016	-37.04	15.142		0.009	-0.014	-0.111		-0.112
46.693	-36.717	15.05		46.695	-36.704	15.14		-0.002	-0.013	-0.09		-0.091
47.525	-31.288	13.202		47.534	-31.235	13.301		-0.008	-0.053	-0.099		-0.113
48.198	-26.899	9.521		48.227	-26.715	9.687		-0.029	-0.184	-0.166		-0.249
48.631	-24.085	4.581		48.693	-23.689	4.742		-0.062	-0.396	-0.16		-0.432
38.687	-53.104	4.793		38.811	-52.878	4.69		-0.123	-0.227	0.102		0.278
40.163	-50.411	9.847		40.273	-50.209	9.643		-0.11	-0.202	0.204		0.307
42.407	-46.316	13.475		42.461	-46.217	13.269		-0.053	-0.099	0.206		0.235
45.079	-41.35	15.104		45.078	-41.354	15.13		0.001	0.004	-0.026		-0.026
47.468	-36.971	15.057		47.477	-36.962	15.138		-0.01	-0.009	-0.081		-0.083
50.178	-32.125	13.312		50.174	-32.132	13.296		0.004	0.008	0.016		0.018
52.301	-28.127	9.652		52.319	-28.1	9.682		-0.018	-0.028	-0.03		-0.044
53.697	-25.551	4.675		53.785	-25.416	4.739		-0.088	-0.134	-0.064		-0.173
61.228	-33.354	4.879		60.873	-33.491	4.727		0.355	0.137	0.152		0.41
58.297	-34.502	9.916		58.034	-34.603	9.666		0.263	0.101	0.25		0.376
53.931	-36.209	13.556		53.792	-36.262	13.282		0.139	0.053	0.274		0.312
48.645	-38.271	15.125		48.646	-38.27	15.133		-0.001	0	-0.008		-0.009
48.691	-39.983	15.159		48.686	-39.982	15.128		0.004	-0.002	0.031		0.031
54.139	-41.826	13.703		53.914	-41.749	13.267		0.225	-0.077	0.436		0.497
58.745	-43.378	10.134		58.222	-43.2	9.645		0.523	-0.178	0.489		0.737
61.834	-44.417	5.015		61.101	-44.168	4.708		0.733	-0.249	0.308		0.833
54.836	-53.173	5.007		54.426	-52.499	4.694		0.41	-0.674	0.313		0.849
53.139	-50.391	10.137		52.845	-49.908	9.637		0.294	-0.484	0.5		0.755
50.605	-46.234	13.697		50.481	-46.03	13.26		0.124	-0.204	0.437		0.497
47.619	-41.32	15.168		47.616	-41.314	15.126		0.003	-0.005	0.041		0.042
45.935	-41.65	15.123		45.934	-41.651	15.128		0	0.001	-0.005		-0.005
45.076	-47.279	13.581		45.101	-47.108	13.264		-0.026	-0.171	0.317		0.361
44.356	-51.984	9.977		44.413	-51.603	9.637		-0.057	-0.381	0.34		0.514
43.883	-55.079	4.878		43.955	-54.606	4.689		-0.071	-0.472	0.189		0.514
53.698	-25.549	4.677		53.785	-25.417	4.74		-0.087	-0.133	-0.063		-0.171
52.301	-28.126	9.654		52.319	-28.1	9.682		-0.017	-0.026	-0.028		-0.042
50.179	-32.125	13.311		50.175	-32.132	13.296		0.004	0.007	0.015		0.017
47.468	-36.97	15.057		47.478	-36.962	15.138		-0.01	-0.008	-0.082		-0.083
32.063	-49.812	0.428		32.116	-49.773	0.308		-0.052	-0.039	0.12		0.137
36.492	-54.235	0.405		36.538	-54.165	0.212		-0.046	-0.071	0.192		0.21
45.156	-56.839	0.809		45.172	-56.59	0.45		-0.016	-0.248	0.359		0.437
54.917	-54.737	1.108		54.7	-54.345	0.533		0.217	-0.392	0.576		0.73
61.537	-48.201	1.194		61.114	-47.949	0.645		0.423	-0.251	0.548		0.736
63.825	-39.446	1.123		63.44	-39.439	0.735		0.385	-0.007	0.387		0.546
5.61	29.759	-10.499		5.61	29.498	-10.577		0	0.262	0.078		0.273
2.243	29.757	-10.504		2.243	29.499	-10.581		0	0.258	0.077		0.269
2.234	26.82	0.083		2.234	26.343	-0.06		0	0.477	0.143		0.499
-1.124	29.763	-10.506		-1.124	29.5	-10.585		0	0.263	0.079		0.275
5.602	20.094	-12.711		5.602	19.995	-12.681		0	0.098	-0.03		-0.103
2.232	23.419	-2.241		2.232	23.151	-2.161		0	0.268	-0.08		-0.28
2.235	20.095	-12.713		2.235	19.995	-12.683		0	0.101	-0.03		-0.105
-1.132	20.069	-12.705		-1.132	19.995	-12.683		0	0.074	-0.022		-0.077



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
8.091	27.617	-10.595		8.061	27.617	-10.607		0.03	0	0.012		0.032
8.1	25.091	-10.593		8.062	25.091	-10.609		0.038	0	0.015		0.041
3.949	25.079	-0.047		3.853	25.079	-0.086		0.096	0	0.039		0.104
8.104	22.566	-10.595		8.063	22.566	-10.612		0.041	0	0.016		0.044
-4.725	27.633	-12.598		-4.606	27.633	-12.645		-0.119	0	0.048		0.128
-0.509	25.086	-2.084		-0.4	25.086	-2.128		-0.11	0	0.044		0.118
-4.73	25.108	-12.601		-4.608	25.108	-12.65		-0.122	0	0.049		0.131
-4.735	22.582	-12.604		-4.61	22.582	-12.654		-0.125	0	0.05		0.135
-9.006	5.035	-2.21		-9.183	5.134	-2.21		0.177	-0.099	0		0.202
-9.222	5.133	9.575		-9.193	5.117	9.575		-0.029	0.016	0		-0.033
-0.582	10.625	9.586		-0.576	10.505	9.586		-0.007	0.119	0		-0.12
-0.557	10.353	-2.199		-0.565	10.506	-2.199		0.008	-0.153	0		0.153
8.445	6.09	-2.197		8.533	6.154	-2.197		-0.088	-0.063	0		0.109
8.686	6.25	9.59		8.54	6.145	9.59		0.146	0.105	0		-0.18
10.148	-3.275	9.575		10.012	-3.231	9.575		0.136	-0.044	0		-0.143
9.885	-3.175	0.738		10.017	-3.217	0.738		-0.132	0.042	0		0.139
0.069	-10.455	0.724		0.069	-10.521	0.724		0	0.065	0		0.065
0.064	-10.59	9.562		0.063	-10.521	9.562		0	-0.07	0		-0.07
-10.037	-3.269	9.56		-10.004	-3.258	9.56		-0.033	-0.011	0		-0.035
-9.87	-3.2	0.722		-10.008	-3.245	0.722		0.137	0.045	0		0.145
10.812	-10.208	3.669		10.71	-10.112	3.669		0.102	-0.097	0		0.141
-11.196	-9.581	3.658		-11.191	-9.576	3.658		-0.005	-0.005	0		0.007
-14.712	1.983	0.73		-14.597	1.967	0.73		-0.115	0.016	0		0.116
-8.321	12.249	3.697		-8.276	12.184	3.697		-0.044	0.065	0		0.079
3.566	14.501	0.763		3.517	14.303	0.763		0.049	0.198	0		0.204
13.054	7.044	3.699		12.963	6.994	3.699		0.092	0.049	0		0.104
1.945	2.217	-16.706		1.945	2.217	-16.833		0	0	0.128		0.128
-3.727	3.893	-16.36		-3.727	3.893	-16.833		0	0	0.474		0.474
-3.816	-4.041	-16.314		-3.816	-4.041	-16.833		0	0	0.52		0.52
3.758	-3.902	-16.351		3.758	-3.902	-16.833		0	0	0.482		0.482
-0.285	0.27	-20.774		-0.285	0.27	-21.042		0	0	0.267		0.267
-9.335	-8.503	13.274		-9.335	-8.503	12.625		0	0	0.649		0.649
-11.961	3.556	13.26		-11.961	3.556	12.625		0	0	0.635		0.635
-0.879	12.026	13.155		-0.879	12.026	12.625		0	0	0.53		0.53
11.275	4.946	13.114		11.275	4.946	12.625		0	0	0.489		0.489
10.609	-6.994	13.149		10.609	-6.994	12.625		0	0	0.524		0.524
0.466	-12.792	13.222		0.466	-12.792	12.625		0	0	0.597		0.597
-0.417	-14.713	6.742		-0.418	-14.723	6.742		0	0.01	0		-0.01
7.154	-46.743	6.558		6.972	-46.743	6.558		0.182	0	0		0.182
7.178	-36.737	6.575		6.972	-36.737	6.575		0.206	0	0		0.206
7.166	-26.729	6.59		6.972	-26.729	6.59		0.194	0	0		0.194
7.143	-16.723	6.605		6.972	-16.723	6.605		0.17	0	0		0.17
4.576	-17.68	6.603		4.447	-17.68	6.603		0.129	0	0		-0.129
4.584	-27.403	6.588		4.447	-27.403	6.588		0.137	0	0		-0.137
4.579	-37.126	6.572		4.447	-37.126	6.572		0.132	0	0		-0.132
4.567	-46.847	6.558		4.447	-46.847	6.558		0.12	0	0		-0.12
-3.813	-46.859	9.498		-3.97	-46.859	9.498		0.156	0	0		0.156

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-3.81	-37.174	9.513		-3.97	-37.174	9.513		0.16	0	0		0.16
-3.82	-27.489	9.528		-3.97	-27.489	9.528		0.15	0	0		0.15
-3.879	-17.806	9.542		-3.97	-17.806	9.542		0.09	0	0		0.09
-8.122	-16.051	3.651		-8.178	-16.051	3.651		0.056	0	0		-0.056
-8.112	-26.251	3.636		-8.178	-26.251	3.636		0.066	0	0		-0.066
-8.108	-36.452	3.619		-8.178	-36.452	3.619		0.07	0	0		-0.07
-8.05	-46.652	3.604		-8.178	-46.652	3.604		0.128	0	0		-0.128
-6.066	-50.767	6.992		-6.066	-50.5	6.992		0	-0.267	0		0.267
5.686	-50.664	10.234		5.686	-50.5	10.234		0	-0.164	0		0.164
5.684	-46.523	13.064		5.684	-46.523	12.625		0	0	0.439		0.439
5.713	-37.479	13.151		5.713	-37.479	12.625		0	0	0.526		0.526
5.631	-28.436	13.132		5.631	-28.436	12.625		0	0	0.507		0.507
5.871	-17.467	13.139		5.871	-17.467	12.625		0	0	0.514		0.514
-6.119	-16.899	13.289		-6.119	-16.899	12.625		0	0	0.664		0.664
-6.25	-27.303	13.245		-6.25	-27.303	12.625		0	0	0.62		0.62
-6.28	-36.12	13.212		-6.28	-36.12	12.625		0	0	0.587		0.587
-5.832	-47.873	13.21		-5.832	-47.873	12.625		0	0	0.585		0.585
62.971	-85.797	-0.842		62.971	-85.797	0		0	0	-0.842		-0.842
51.543	-86.155	-0.772		51.543	-86.155	0		0	0	-0.772		-0.772
30.797	-85.656	-0.511		30.797	-85.656	0		0	0	-0.511		-0.511
26.821	-77.934	-0.336		26.821	-77.934	0		0	0	-0.336		-0.336
40.004	-79.672	-0.573		40.004	-79.672	0		0	0	-0.573		-0.573
56.444	-76.298	-0.763		56.444	-76.298	0		0	0	-0.763		-0.763
61.102	-67.005	-0.73		61.102	-67.005	0		0	0	-0.73		-0.73
47.107	-70.243	-0.601		47.107	-70.243	0		0	0	-0.601		-0.601
37.592	-65.838	-0.399		37.592	-65.838	0		0	0	-0.399		-0.399
23.943	-65.496	-0.185		23.943	-65.496	0		0	0	-0.185		-0.185
19.994	-53.391	0.068		19.994	-53.391	0		0	0	0.068		0.068
15.232	-46.26	0.242		15.232	-46.26	0		0	0	0.242		0.242
23.642	-45.522	0.104		23.642	-45.522	0		0	0	0.104		0.104
14.892	-35.325	0.403		14.892	-35.325	0		0	0	0.403		0.403
15.767	-25.367	0.513		15.767	-25.367	0		0	0	0.513		0.513
25.676	-28.313	0.315		25.676	-28.313	0		0	0	0.315		0.315
33.666	-23.327	0.305		33.666	-23.327	0		0	0	0.305		0.305
61.755	-24.499	-0.269		61.755	-24.499	0		0	0	-0.269		-0.269
67.236	-35.026	0.156		66.907	-35.026	0		0.329	0	0.156		0.364
65.3	-54.995	-0.622		65.3	-54.995	0		0	0	-0.622		-0.622
69.007	-6.578	-0.149		69.007	-6.578	0		0	0	-0.149		-0.149
66.204	18.423	0.323		66.204	18.423	0		0	0	0.323		0.323
52.299	19.014	-0.161		52.299	19.014	0		0	0	-0.161		-0.161
38.421	18.779	-0.198		38.421	18.779	0		0	0	-0.198		-0.198
25.068	19.115	-0.077		25.068	19.115	0		0	0	-0.077		-0.077
27.18	28.573	-0.24		27.18	28.573	0		0	0	-0.24		-0.24
34.319	26.903	-0.313		34.319	26.903	0		0	0	-0.313		-0.313
46.06	25.956	-0.335		46.06	25.956	0		0	0	-0.335		-0.335
45.753	34.497	-0.354		45.753	34.497	0		0	0	-0.354		-0.354
29.785	39.427	-0.489		29.785	39.427	0		0	0	-0.489		-0.489

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
17.43	42.283	-0.56		17.43	42.283	0		0	0	-0.56		-0.56
7.187	39.421	-0.441		7.187	39.421	0		0	0	-0.441		-0.441
10.368	49.47	-0.621		10.368	49.47	0		0	0	-0.621		-0.621
23.058	52.419	-0.598		23.058	52.419	0		0	0	-0.598		-0.598
43.362	55.651	-0.387		43.362	55.651	0		0	0	-0.387		-0.387
66.552	54.295	-0.094		66.552	54.295	0		0	0	-0.094		-0.094
67.126	38.317	0.175		67.126	38.317	0		0	0	0.175		0.175
-12.097	40.914	-0.328		-12.097	40.914	0		0	0	-0.328		-0.328
-22.695	17.628	0.341		-22.695	17.628	0		0	0	0.341		0.341
-23.985	30.822	0.097		-23.985	30.822	0		0	0	0.097		0.097
-31.167	26.143	0.109		-31.167	26.143	0		0	0	0.109		0.109
-42.897	26.816	-0.005		-42.897	26.816	0		0	0	-0.005		-0.005
-50.385	30.678	-0.105		-50.385	30.678	0		0	0	-0.105		-0.105
-40.325	46.218	-0.283		-40.325	46.218	0		0	0	-0.283		-0.283
-47.44	54.783	-0.195		-47.44	54.783	0		0	0	-0.195		-0.195
-75.451	54.026	0.031		-75.451	54.026	0		0	0	0.031		0.031
-75.685	37.743	-0.09		-75.685	37.743	0		0	0	-0.09		-0.09
-74.486	19.583	-0.055		-74.486	19.583	0		0	0	-0.055		-0.055
-57.002	25.471	-0.157		-57.002	25.471	0		0	0	-0.157		-0.157
-66.055	12.171	-0.215		-66.055	12.171	0		0	0	-0.215		-0.215
-68.58	-0.885	-0.176		-68.58	-0.885	0		0	0	-0.176		-0.176
-76.944	-10.571	-0.07		-76.944	-10.571	0		0	0	-0.07		-0.07
-76.824	-29.046	-0.076		-76.824	-29.046	0		0	0	-0.076		-0.076
-62.554	-24.658	-0.002		-62.554	-24.658	0		0	0	-0.002		-0.002
-49.864	-21.709	0.097		-49.864	-21.709	0		0	0	0.097		0.097
-35.54	-26.424	0.328		-35.54	-26.424	0		0	0	0.328		0.328
-22.776	-17.954	0.533		-22.776	-17.954	0		0	0	0.533		0.533
-27.809	-36.894	0.376		-27.809	-36.894	0		0	0	0.376		0.376
-13.691	-50.99	0.366		-13.691	-50.99	0		0	0	0.366		0.366
-5.201	-60.053	0.166		-5.201	-60.053	0		0	0	0.166		0.166
-6.449	-70.853	-0.048		-6.449	-70.853	0		0	0	-0.048		-0.048
-7.809	-86.07	-0.164		-7.809	-86.07	0		0	0	-0.164		-0.164
-27.241	-90.647	-0.149		-27.241	-90.647	0		0	0	-0.149		-0.149
-40.931	-88.391	-0.171		-40.931	-88.391	0		0	0	-0.171		-0.171
-53.681	-81.966	-0.281		-53.681	-81.966	0		0	0	-0.281		-0.281
-62.898	-90.581	-0.218		-62.898	-90.581	0		0	0	-0.218		-0.218
-77.221	-85.867	-0.187		-77.221	-85.867	0		0	0	-0.187		-0.187
-75.543	-64.295	-0.188		-75.543	-64.295	0		0	0	-0.188		-0.188
-71.915	-44.03	-0.161		-71.915	-44.03	0		0	0	-0.161		-0.161
-65.772	-55.939	-0.166		-65.772	-55.939	0		0	0	-0.166		-0.166
-62.156	-65.734	-0.245		-62.156	-65.734	0		0	0	-0.245		-0.245
-50.431	-58.683	-0.008		-50.431	-58.683	0		0	0	-0.008		-0.008
-50.201	-72.739	-0.134		-50.201	-72.739	0		0	0	-0.134		-0.134
-14.032	-37.821	-16.476		-14.032	-37.821	-16.833		0	0	0.358		0.358
-14.407	-16.423	-16.449		-14.407	-16.423	-16.833		0	0	0.385		0.385
-13.558	16.253	-16.551		-13.558	16.253	-16.833		0	0	0.282		0.282
-13.375	29.46	-16.767		-13.375	29.46	-16.833		0	0	0.066		0.066

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
14.687	31.695	-17.08		14.687	31.695	-16.833		0	0	-0.247		-0.247
15.547	23.986	-16.889		15.547	23.986	-16.833		0	0	-0.056		-0.056
15.798	12.297	-16.726		15.798	12.297	-16.833		0	0	0.108		0.108
59.978	4.338	-16.926		59.978	4.338	-16.833		0	0	-0.093		-0.093
58.405	-9.932	-16.994		58.405	-9.932	-16.833		0	0	-0.161		-0.161
48.907	-15.216	-16.824		48.907	-15.216	-16.833		0	0	0.009		0.009
36.504	-9.609	-16.559		36.504	-9.609	-16.833		0	0	0.274		0.274
30.727	-17.627	-16.575		30.727	-17.627	-16.833		0	0	0.258		0.258
13.27	-15.092	-16.362		13.27	-15.092	-16.833		0	0	0.471		0.471
19.571	2.866	-3.989		19.571	2.866	-4.208		0	0	0.219		0.219
28.962	7.265	-4.223		28.962	7.265	-4.208		0	0	-0.014		-0.014
34.484	3.001	-4.198		34.484	3.001	-4.208		0	0	0.011		0.011
41.242	7.377	-4.323		41.242	7.377	-4.208		0	0	-0.115		-0.115
46.464	2.185	-4.275		46.464	2.185	-4.208		0	0	-0.067		-0.067
52.066	8.399	-4.364		52.066	8.399	-4.208		0	0	-0.155		-0.155
50.882	-4.057	-0.015		50.882	-4.03	0		0	-0.027	-0.015		-0.031
40.359	-3.912	0.043		40.359	-4.03	0		0	0.119	0.043		0.126
28.667	-2.786	0.286		28.667	-2.786	0		0	0	0.286		0.286
16.98	-1.967	0.234		16.98	-1.967	0		0	0	0.234		0.234
18.591	-9.299	1.97		18.591	-9.299	1.683		0	0	0.287		0.287
24.754	-6.47	1.938		24.754	-6.47	1.683		0	0	0.255		0.255
25.859	-14.779	1.395		25.859	-14.779	1.683		0	0	-0.288		-0.288
18.823	-12.035	-4.224		18.823	-12.447	-4.224		0	0.412	0		-0.412
24.779	-16.717	0.156		24.59	-16.655	0.156		0.189	-0.062	0		0.199
33.039	-3.496	-4.267		33.039	-4.03	-4.267		0	0.534	0		-0.534
40.062	-3.447	-3.509		40.062	-4.03	-3.509		0	0.583	0		-0.583
52.686	-3.471	-4.776		52.686	-4.03	-4.776		0	0.559	0		-0.559
55.196	0.135	-9.043		55.265	0.113	-9.043		-0.069	0.022	0		-0.072
56.506	7.921	-9.777		56.527	7.921	-9.777		-0.021	0	0		-0.021
59.531	12.296	-0.528		59.531	12.344	-0.632		0	-0.048	0.104		0.114
49.316	13.221	-1.488		49.316	13.159	-1.38		0	0.063	-0.108		-0.125
39.477	12.47	-1.445		39.477	12.362	-1.337		0	0.108	-0.108		-0.153

### 3D-Tol Data from CMM for Wax Pattern (Polyamide1)

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
53.915	58.374	-5.686		53.915	58.917	-5.686		0	-0.542	0		-0.542
37.37	58.352	-5.717		37.37	58.917	-5.717		0	-0.565	0		-0.565
20.824	58.339	-5.748		20.824	58.917	-5.748		0	-0.577	0		-0.577
4.28	58.357	-5.78		4.28	58.917	-5.78		0	-0.56	0		-0.56
-12.265	58.353	-5.81		-12.265	58.917	-5.81		0	-0.564	0		-0.564
-28.809	58.366	-5.842		-28.809	58.917	-5.842		0	-0.55	0		-0.55
-45.354	58.408	-5.874		-45.354	58.917	-5.874		0	-0.508	0		-0.508
-61.9	58.421	-5.905		-61.9	58.917	-5.905		0	-0.496	0		-0.496

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-79.574	41.021	-5.924		-79.958	41.021	-5.924		0.384	0	0		-0.384
-79.52	24.476	-5.907		-79.958	24.476	-5.907		0.438	0	0		-0.438
-79.427	7.931	-5.889		-79.958	7.931	-5.889		0.532	0	0		-0.532
-79.403	-8.614	-5.875		-79.958	-8.614	-5.875		0.555	0	0		-0.555
-79.389	-25.158	-5.858		-79.958	-25.158	-5.858		0.57	0	0		-0.57
-79.424	-41.704	-5.845		-79.958	-41.704	-5.845		0.535	0	0		-0.535
-79.464	-58.247	-5.829		-79.958	-58.247	-5.829		0.494	0	0		-0.494
-79.501	-74.792	-5.811		-79.958	-74.792	-5.811		0.458	0	0		-0.458
-61.834	-92.239	-5.755		-61.834	-92.583	-5.755		0	0.345	0		-0.345
-45.29	-92.191	-5.723		-45.29	-92.583	-5.723		0	0.392	0		-0.392
-28.745	-92.036	-5.693		-28.745	-92.583	-5.693		0	0.547	0		-0.547
-12.2	-92.085	-5.661		-12.2	-92.583	-5.661		0	0.498	0		-0.498
4.344	-92.055	-5.631		4.344	-92.583	-5.631		0	0.529	0		-0.529
20.888	-92.061	-5.599		20.888	-92.583	-5.599		0	0.523	0		-0.523
37.435	-92.085	-5.568		37.435	-92.583	-5.568		0	0.498	0		-0.498
53.979	-92.155	-5.536		53.979	-92.583	-5.536		0	0.428	0		-0.428
70.96	-74.728	-5.522		71.542	-74.728	-5.522		-0.581	0	0		-0.581
70.927	-58.183	-5.538		71.542	-58.183	-5.538		-0.615	0	0		-0.615
70.904	-41.638	-5.554		71.542	-41.638	-5.554		-0.637	0	0		-0.637
70.807	-25.094	-5.569		71.542	-25.094	-5.569		-0.735	0	0		-0.735
70.711	-8.549	-5.586		71.542	-8.549	-5.586		-0.831	0	0		-0.831
70.664	7.996	-5.601		71.542	7.996	-5.601		-0.877	0	0		-0.877
70.827	24.541	-5.618		71.542	24.541	-5.618		-0.714	0	0		-0.714
70.884	41.086	-5.634		71.542	41.086	-5.634		-0.658	0	0		-0.658
-69.665	43.734	8.351		-69.665	43.734	8.417		0	0	-0.066		-0.066
-64.615	43.735	8.353		-64.615	43.735	8.417		0	0	-0.064		-0.064
-64.617	48.786	8.327		-64.617	48.786	8.417		0	0	-0.09		-0.09
-69.668	48.784	8.343		-69.668	48.784	8.417		0	0	-0.074		-0.074
-67.536	46.379	8.31		-67.536	46.379	8.417		0	0	-0.107		-0.107
-71.559	43.729	6.713		-71.542	43.729	6.713		-0.018	0	0		0.018
-71.61	48.781	6.708		-71.542	48.781	6.708		-0.068	0	0		0.068
-69.661	50.411	6.712		-69.661	50.5	6.712		0	-0.089	0		-0.089
-64.611	50.366	6.724		-64.611	50.5	6.724		0	-0.134	0		-0.134
-63.646	41.97	6.734		-63.125	42.083	6.734		-0.521	-0.114	0		0.533
-69.66	42.655	6.726		-69.66	42.083	6.726		0	0.572	0		-0.572
-63.031	48.783	7.707		-63.125	48.783	8.417		0.094	0	-0.709		0.716
-63.056	42.753	6.737		-63.125	42.083	6.737		0.069	0.67	0		0.673
-64.582	-14.343	4.22		-64.582	-14.343	4.208		0	0	0.011		0.011
-69.633	-14.344	4.162		-69.633	-14.344	4.208		0	0	-0.046		-0.046
-69.632	-19.395	4.165		-69.632	-19.395	4.208		0	0	-0.043		-0.043
-64.58	-19.394	4.22		-64.58	-19.394	4.208		0	0	0.011		0.011
-67.753	-16.772	4.139		-67.753	-16.772	4.208		0	0	-0.07		-0.07
-69.628	-12.603	4.18		-69.628	-12.625	4.208		0	0.022	-0.028		0.036
-64.577	-12.646	4.24		-64.577	-12.625	4.208		0	-0.021	0.031		-0.038
-63.176	-14.346	4.353		-63.125	-14.346	4.208		-0.051	0	0.145		-0.154
-63.18	-19.395	4.344		-63.125	-19.395	4.208		-0.055	0	0.135		-0.146
-64.575	-21.129	4.122		-64.575	-21.042	4.208		0	-0.087	-0.086		0.123

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-69.627	-20.888	3.419		-69.627	-21.042	3.419		0	0.154	0		-0.154
-71.707	-19.398	3.407		-71.542	-19.398	3.407		-0.166	0	0		0.166
-71.662	-14.348	3.402		-71.542	-14.348	3.402		-0.12	0	0		0.12
-64.562	-77.464	8.136		-64.562	-77.464	8.417		0	0	-0.281		-0.281
-69.614	-77.466	8.23		-69.614	-77.466	8.417		0	0	-0.187		-0.187
-69.612	-82.516	8.246		-69.612	-82.516	8.417		0	0	-0.171		-0.171
-64.561	-82.514	8.231		-64.561	-82.514	8.417		0	0	-0.186		-0.186
-69.608	-75.721	7.818		-69.608	-75.75	8.417		0	0.029	-0.599		0.599
-63.574	-75.872	6.846		-63.125	-75.872	6.846		-0.449	0	0		0.449
-63.11	-77.466	7.835		-63.125	-77.466	8.417		0.015	0	-0.581		0.581
-63.048	-82.516	7.834		-63.125	-82.516	8.417		0.077	0	-0.583		0.588
-64.555	-84.116	6.856		-64.555	-84.167	6.856		0	0.051	0		-0.051
-69.608	-84.217	6.846		-69.608	-84.167	6.846		0	-0.05	0		0.05
-71.546	-82.52	6.834		-71.542	-82.52	6.834		-0.005	0	0		0.005
-71.364	-77.47	6.829		-71.542	-77.47	6.829		0.178	0	0		-0.178
-2.323	43.758	4.216		-2.323	43.758	4.208		0	0	0.008		0.008
2.726	43.76	4.273		2.726	43.76	4.208		0	0	0.064		0.064
2.724	48.811	4.368		2.724	48.811	4.208		0	0	0.16		0.16
-2.328	48.809	4.287		-2.328	48.809	4.208		0	0	0.079		0.079
-0.486	46.794	4.296		-0.486	46.794	4.208		0	0	0.087		0.087
-4.151	43.754	2.212		-4.208	43.754	2.212		0.057	0	0		-0.057
-4.114	48.806	2.208		-4.208	48.806	2.208		0.094	0	0		-0.094
2.733	42.423	2.233		2.733	42.083	2.233		0	0.339	0		-0.339
-2.318	42.445	2.223		-2.318	42.083	2.223		0	0.362	0		-0.362
3.862	48.807	2.229		4.208	48.807	2.229		-0.346	0	0		-0.346
3.845	43.758	2.237		4.208	43.758	2.237		-0.363	0	0		-0.363
-2.318	50.488	2.211		-2.318	50.5	2.211		0	-0.012	0		-0.012
2.731	50.504	2.222		2.731	50.5	2.222		0	0.004	0		0.004
-64.6	36.211	-0.339		-64.695	36.305	0		0.094	-0.094	-0.339		0.364
-53.899	46.932	-0.321		-53.983	47.017	0		0.085	-0.085	-0.321		0.342
-46.767	46.843	-1.235		-46.805	46.805	-1.235		0.038	0.038	0		-0.054
-36.038	36.146	-1.204		-36.092	36.092	-1.204		0.054	0.054	0		-0.077
-40.942	28.861	-1.203		-40.853	28.95	-1.203		-0.089	-0.089	0		-0.126
-48.121	35.965	-1.224		-47.994	36.091	-1.224		-0.127	-0.127	0		-0.179
-35.773	29.797	-1.583		-35.633	29.658	-1.583		-0.139	0.139	0		0.197
-54.208	35.342	-1.242		-53.981	35.116	-1.242		-0.227	0.227	0		0.321
-58.989	30.602	-1.247		-58.742	30.355	-1.247		-0.247	0.247	0		0.349
-65.377	29.37	-1.152		-65.228	29.519	-1.152		-0.149	-0.149	0		-0.211
-61.175	33.519	-4.016		-61.175	33.519	-4.208		0	0	0.192		0.192
-56.609	38.275	-4.001		-56.609	38.275	-4.208		0	0	0.207		0.207
-50.115	43.683	-4.004		-50.115	43.683	-4.208		0	0	0.204		0.204
-44.553	38.637	-4.003		-44.553	38.637	-4.208		0	0	0.205		0.205
-39.876	33.831	-4.04		-39.876	33.831	-4.208		0	0	0.169		0.169
49.859	42.425	6.109		49.859	42.083	6.109		0	0.342	0		-0.342
43.125	42.468	6.096		43.125	42.083	6.096		0	0.384	0		-0.384
55.028	30.316	6.126		54.708	30.316	6.126		0.319	0	0		-0.319
55.033	37.051	6.117		54.708	37.051	6.117		0.324	0	0		-0.324

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
59.007	25.592	5.648		59.007	25.25	5.648		0	0.342	0		-0.342
62.824	30.32	6.146		63.125	30.32	6.146		-0.301	0	0		-0.301
62.85	37.895	6.139		63.125	37.895	6.139		-0.275	0	0		-0.275
62.884	45.47	6.132		63.125	45.47	6.132		-0.241	0	0		-0.241
58.273	50.296	6.113		58.273	50.5	6.113		0	-0.204	0		-0.204
50.696	50.285	6.099		50.696	50.5	6.099		0	-0.215	0		-0.215
43.122	50.26	6.084		43.122	50.5	6.084		0	-0.24	0		-0.24
38.232	46.251	5.36		37.875	46.251	5.36		0.357	0	0		-0.357
43.367	46.426	8.469		43.367	46.426	8.417		0	0	0.052		0.052
50.599	46.139	8.509		50.599	46.139	8.417		0	0	0.093		0.093
58.57	45.812	8.547		58.57	45.812	8.417		0	0	0.13		0.13
59.314	37.547	8.43		59.314	37.547	8.417		0	0	0.013		0.013
59.193	30.702	8.319		59.193	30.702	8.417		0	0	-0.098		-0.098
-30.727	49.111	16.873		-30.727	48.889	17.001		0	0.222	-0.128		-0.256
-30.717	46.075	11.926		-30.717	45.988	11.976		0	0.087	-0.05		-0.1
-30.706	43.263	6.85		-30.706	43.087	6.951		0	0.176	-0.101		-0.203
-30.696	40.382	1.807		-30.696	40.184	1.922		0	0.198	-0.115		-0.229
-26.906	40.397	1.808		-26.906	40.188	1.929		0	0.209	-0.121		-0.241
-26.918	43.272	6.853		-26.918	43.091	6.957		0	0.181	-0.105		-0.209
-26.929	46.136	11.899		-26.929	45.992	11.982		0	0.144	-0.083		-0.166
-26.939	49.019	16.934		-26.939	48.893	17.007		0	0.126	-0.073		-0.145
-23.151	48.994	16.958		-23.151	48.897	17.013		0	0.097	-0.056		-0.112
-23.142	46.093	11.931		-23.142	45.995	11.988		0	0.098	-0.056		-0.113
-23.132	43.258	6.867		-23.132	43.093	6.962		0	0.165	-0.095		-0.19
-23.12	40.398	1.818		-23.12	40.192	1.937		0	0.206	-0.119		-0.238
-16.809	45.657	1.902		-16.809	45.431	1.963		0	0.226	-0.061		-0.234
-16.824	47.776	9.411		-16.824	47.45	9.499		0	0.326	-0.087		-0.337
-16.84	49.672	16.988		-16.84	49.471	17.042		0	0.2	-0.054		-0.207
-11.789	49.428	17.061		-11.789	49.473	17.049		0	-0.046	0.012		0.047
-11.776	47.52	9.493		-11.776	47.454	9.511		0	0.067	-0.018		-0.069
-11.76	45.696	1.901		-11.76	45.434	1.972		0	0.263	-0.07		-0.272
-8.816	49.608	7.627		-8.178	49.608	7.627		-0.638	0	0		-0.638
-30.722	50.87	15.11		-30.722	50.951	15.132		0	-0.081	-0.022		-0.083
-30.712	52.512	9.49		-30.712	52.466	9.478		0	0.046	0.012		0.048
-30.702	54.096	3.854		-30.702	53.981	3.823		0	0.115	0.031		0.119
-23.97	53.991	3.838		-23.97	53.978	3.834		0	0.013	0.004		0.014
-23.98	52.42	9.477		-23.98	52.463	9.488		0	-0.043	-0.011		-0.044
-23.991	50.831	15.112		-23.991	50.948	15.144		0	-0.117	-0.031		-0.121
-17.255	50.749	15.102		-17.255	50.945	15.154		0	-0.196	-0.053		-0.203
-17.246	52.355	9.47		-17.246	52.46	9.499		0	-0.105	-0.028		-0.109
-17.235	53.98	3.848		-17.235	53.975	3.846		0	0.006	0.002		0.006
-10.503	53.965	3.856		-10.503	53.972	3.858		0	-0.007	-0.002		-0.007
-10.514	52.32	9.474		-10.514	52.457	9.511		0	-0.137	-0.037		-0.142
-10.525	50.61	15.078		-10.525	50.941	15.167		0	-0.332	-0.089		-0.344
-33.116	48.942	9.72		-33.428	48.942	9.72		0.312	0	0		-0.312
5.112	-63.118	19.121		5.123	-63.118	19.118		-0.011	0	0.003		0.011
3.397	-63.124	12.003		3.228	-63.124	12.048		0.168	0	-0.045		-0.174



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
1.481	-63.131	4.943		1.335	-63.131	4.982		0.146	0	-0.039		-0.151
1.519	-69.866	4.939		1.336	-69.866	4.988		0.183	0	-0.049		-0.189
3.27	-69.857	12.046		3.23	-69.857	12.056		0.039	0	-0.01		-0.04
5.1	-69.851	19.13		5.124	-69.851	19.124		-0.024	0	0.006		0.025
5.085	-76.584	19.142		5.126	-76.584	19.131		-0.042	0	0.011		0.043
3.417	-76.59	12.014		3.232	-76.59	12.063		0.185	0	-0.049		-0.191
1.542	-76.598	4.942		1.339	-76.598	4.997		0.203	0	-0.054		-0.21
1.418	-83.332	4.981		1.34	-83.332	5.002		0.077	0	-0.021		-0.08
3.26	-83.324	12.063		3.234	-83.324	12.07		0.026	0	-0.007		-0.027
5.145	-83.317	19.132		5.128	-83.317	19.137		0.017	0	-0.005		-0.018
7.707	-85.487	10.624		7.707	-85.85	10.624		0	0.363	0		-0.363
7.292	-83.314	21.11		7.618	-83.314	21.298		-0.325	0	-0.188		-0.376
12.828	-83.321	11.741		13.058	-83.321	11.874		-0.23	0	-0.133		-0.266
18.455	-83.327	2.427		18.498	-83.327	2.452		-0.044	0	-0.025		-0.05
18.483	-75.752	2.438		18.5	-75.752	2.448		-0.018	0	-0.01		-0.02
12.829	-75.746	11.738		13.06	-75.746	11.872		-0.231	0	-0.133		-0.267
7.251	-75.739	21.082		7.619	-75.739	21.295		-0.368	0	-0.213		-0.425
6.572	-69.427	21.289		6.897	-69.427	21.376		-0.325	0	-0.087		-0.336
9.18	-69.434	11.885		9.423	-69.434	11.95		-0.243	0	-0.065		-0.251
11.798	-69.443	2.488		11.948	-69.443	2.528		-0.15	0	-0.04		-0.155
11.788	-64.393	2.482		11.948	-64.393	2.525		-0.161	0	-0.043		-0.166
9.165	-64.384	11.878		9.424	-64.384	11.948		-0.258	0	-0.069		-0.267
6.635	-64.377	21.302		6.898	-64.377	21.372		-0.263	0	-0.07		-0.272
6.678	-61.42	11.341		6.678	-60.6	11.341		0	-0.82	0		-0.82
-30.258	-50.51	-5.199		-30.265	-50.372	-5.342		0.007	-0.138	0.143		0.199
-29.961	-55.131	-7.612		-29.965	-55.025	-7.816		0.004	-0.106	0.204		0.23
-29.701	-58.724	-11.374		-29.708	-58.493	-11.497		0.007	-0.231	0.123		0.262
-29.506	-61.617	-15.614		-29.508	-61.468	-15.812		0.001	-0.148	0.198		0.247
-33.553	-63.428	-15.856		-33.589	-63.394	-15.926		0.035	-0.034	0.07		0.086
-35.859	-61.365	-11.546		-35.897	-61.33	-11.574		0.038	-0.035	0.027		0.059
-38.383	-59.122	-7.762		-38.431	-59.078	-7.883		0.048	-0.044	0.121		0.138
-41.879	-55.994	-5.428		-41.903	-55.972	-5.463		0.024	-0.022	0.035		0.048
-46.34	-68.163	-5.577		-46.261	-68.159	-5.488		-0.079	-0.004	-0.09		-0.12
-41.598	-67.945	-7.902		-41.599	-67.945	-7.903		0.001	0	0.001		0.001
-38.466	-67.806	-11.713		-38.239	-67.794	-11.593		-0.226	-0.012	-0.119		-0.256
-35.178	-67.658	-16.03		-35.123	-67.655	-15.949		-0.055	-0.003	-0.081		-0.098
-33.259	-71.823	-16.027		-33.19	-71.741	-15.878		-0.069	-0.082	-0.149		-0.184
-35.505	-74.233	-11.721		-35.274	-73.969	-11.536		-0.231	-0.264	-0.186		-0.397
-37.637	-76.493	-7.932		-37.611	-76.463	-7.858		-0.026	-0.029	-0.074		-0.084
-40.891	-79.995	-5.581		-40.787	-79.88	-5.414		-0.104	-0.115	-0.167		-0.228
-29.489	-67.377	-16.757		-29.482	-67.367	-16.839		-0.007	-0.01	0.083		0.083
-26.403	-62.367	-15.486		-26.312	-62.219	-15.704		-0.091	-0.148	0.217		0.279
-25.078	-59.913	-11.287		-24.944	-59.686	-11.429		-0.134	-0.227	0.141		0.3
-23.31	-56.619	-7.604		-23.271	-56.551	-7.759		-0.039	-0.068	0.154		0.173
-21.104	-52.567	-5.102		-21.041	-52.454	-5.227		-0.064	-0.113	0.125		0.18
-12.95	-62.595	-5.102		-12.93	-62.59	-5.12		-0.02	-0.006	0.019		0.028
-17.453	-63.922	-7.574		-17.392	-63.905	-7.703		-0.061	-0.017	0.129		0.144



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-21.025	-64.985	-11.274		-20.869	-64.941	-11.361		-0.156	-0.044	0.088		0.184
-23.663	-65.767	-15.464		-23.547	-65.735	-15.605		-0.116	-0.031	0.142		0.186
-24.026	-70.167	-15.619		-24.033	-70.164	-15.609		0.007	-0.004	-0.01		-0.013
-21.529	-71.534	-11.381		-21.575	-71.51	-11.353		0.046	-0.024	-0.028		-0.059
-18.412	-73.243	-7.648		-18.39	-73.255	-7.699		-0.022	0.012	0.051		0.057
-14.27	-75.501	-5.172		-14.316	-75.476	-5.124		0.047	-0.025	-0.048		-0.071
-24.358	-83.778	-5.35		-24.394	-83.659	-5.229		0.037	-0.118	-0.12		-0.173
-25.704	-79.191	-7.738		-25.701	-79.197	-7.752		-0.002	0.007	0.014		0.015
-26.614	-76.002	-11.538		-26.687	-75.779	-11.413		0.073	-0.223	-0.126		-0.266
-27.461	-73.089	-15.816		-27.49	-73.005	-15.705		0.029	-0.084	-0.111		-0.143
-32.342	-72.499	-15.965		-32.251	-72.446	-15.842		-0.091	-0.054	-0.123		-0.162
-33.937	-75.257	-11.651		-33.695	-75.088	-11.51		-0.242	-0.169	-0.14		-0.327
-35.365	-78.125	-7.865		-35.348	-78.115	-7.834		-0.017	-0.01	-0.031		-0.037
-37.709	-82.291	-5.52		-37.582	-82.204	-5.376		-0.127	-0.086	-0.144		-0.211
-25.128	-86.404	-0.605		-25.147	-86.324	-0.494		0.018	-0.08	-0.111		-0.138
-12.817	-77.184	-0.606		-12.819	-77.183	-0.604		0.002	-0.001	-0.003		-0.004
-10.866	-61.81	-0.6		-10.888	-61.816	-0.573		0.022	0.006	-0.028		-0.036
-15.895	-53.604	-0.534		-15.861	-53.569	-0.593		-0.035	-0.035	0.059		0.077
-25.553	-48.366	-0.397		-25.535	-48.282	-0.511		-0.017	-0.085	0.114		0.143
-47.477	-37.957	18.746		-47.171	-37.821	18.94		-0.306	-0.136	-0.193		-0.387
-44.075	-36.369	12.497		-43.87	-36.275	12.627		-0.205	-0.094	-0.13		-0.261
-40.812	-34.833	6.161		-40.572	-34.722	6.314		-0.24	-0.111	-0.153		-0.306
-39.966	-41.26	6.175		-39.746	-41.301	6.304		-0.22	0.041	-0.129		-0.258
-43.523	-40.591	12.507		-43.33	-40.627	12.62		-0.193	0.036	-0.113		-0.227
-47.201	-39.901	18.761		-46.911	-39.954	18.931		-0.29	0.053	-0.17		-0.341
-48.037	-41.742	18.857		-47.918	-41.86	18.953		-0.119	0.118	-0.097		-0.193
-45.434	-44.468	12.616		-45.404	-44.499	12.641		-0.03	0.031	-0.025		-0.05
-42.92	-47.113	6.303		-42.892	-47.142	6.326		-0.028	0.029	-0.023		-0.046
-48.875	-50.211	6.455		-48.895	-50.077	6.377		0.02	-0.133	0.078		0.155
-49.36	-46.597	12.766		-49.38	-46.465	12.689		0.021	-0.131	0.077		0.153
-49.866	-42.887	19.019		-49.872	-42.854	19		0.006	-0.033	0.02		0.039
-52.133	-42.617	19.12		-52.08	-42.511	19.052		-0.052	-0.106	0.069		0.137
-53.909	-45.928	12.873		-53.804	-45.723	12.74		-0.105	-0.205	0.133		0.266
-55.637	-49.131	6.561		-55.532	-48.93	6.431		-0.105	-0.201	0.131		0.261
-51.806	-39.989	22.939		-51.712	-39.939	22.877		-0.094	-0.05	0.061		0.123
-57.158	-42.572	12.904		-56.962	-42.476	12.779		-0.196	-0.096	0.126		0.252
-62.494	-45.128	2.852		-62.222	-44.996	2.678		-0.272	-0.132	0.175		0.35
-63.497	-36.847	2.8		-63.302	-36.884	2.685		-0.195	0.037	0.115		0.23
-57.729	-37.927	12.881		-57.569	-37.958	12.787		-0.16	0.03	0.094		0.187
-51.847	-39.031	22.892		-51.838	-39.033	22.887		-0.009	0.002	0.006		0.011
-51.271	-38.365	22.765		-51.377	-38.236	22.862		0.106	-0.129	-0.096		-0.193
-55.371	-33.955	12.776		-55.356	-33.971	12.763		-0.015	0.017	0.013		0.026
-59.377	-29.694	2.684		-59.351	-29.722	2.662		-0.026	0.028	0.022		0.044
-51.948	-26.4	2.568		-51.958	-26.315	2.618		0.01	-0.086	-0.05		-0.1
-51.227	-32.172	12.675		-51.234	-32.101	12.716		0.007	-0.071	-0.041		-0.083
-49.901	-38.075	22.94		-49.857	-38.124	22.928		-0.044	0.049	0.012		0.067
-50.057	-38.257	22.589		-49.812	-38.042	22.766		-0.245	-0.215	-0.177		-0.371

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-47.148	-33.051	12.567		-47.017	-32.925	12.667		-0.131	-0.126	-0.1		-0.208
-44.385	-27.95	2.449		-44.221	-27.807	2.566		-0.164	-0.143	-0.118		-0.247
-46.124	4.003	25.093		-46.081	3.96	25.152		-0.043	0.043	-0.06		-0.085
-50.21	7.823	27.702		-50.177	7.792	27.546		-0.032	0.031	0.157		0.163
-53.809	11.216	22.07		-53.643	11.057	21.968		-0.167	0.159	0.102		0.252
-56.55	13.815	8.389		-56.358	13.632	8.34		-0.192	0.184	0.049		0.27
-62.03	-1.669	8.403		-61.75	-1.645	8.351		-0.28	-0.023	0.052		0.285
-58.291	-1.347	22.109		-58.016	-1.324	21.987		-0.275	-0.023	0.122		0.302
-53.296	-0.935	27.735		-53.246	-0.931	27.555		-0.05	-0.004	0.18		0.187
-47.749	-0.487	25.05		-47.667	-0.48	25.129		-0.082	-0.007	-0.079		-0.114
-45.398	-4.631	25.124		-45.369	-4.591	25.172		-0.029	-0.04	-0.048		-0.069
-48.822	-9.062	27.701		-48.794	-9.025	27.542		-0.027	-0.037	0.159		0.165
-51.761	-12.933	22.049		-51.664	-12.804	21.977		-0.097	-0.129	0.071		0.177
-54.001	-15.917	8.391		-53.911	-15.796	8.363		-0.09	-0.121	0.028		0.153
-38.244	-19.311	8.358		-38.235	-19.354	8.366		-0.009	0.043	-0.008		-0.045
-38.951	-15.687	21.945		-38.949	-15.695	21.949		-0.002	0.008	-0.003		-0.009
-39.81	-11.145	27.624		-39.817	-11.111	27.514		0.007	-0.034	0.11		0.115
-40.841	-5.513	25.303		-40.827	-5.574	25.241		-0.014	0.061	0.062		0.088
-40.131	19.65	8.338		-40.131	19.642	8.337		0.001	0.008	0.002		0.009
-40.483	15.993	21.961		-40.489	15.932	21.934		0.006	0.062	0.027		0.068
-40.906	11.307	27.64		-40.91	11.268	27.517		0.004	0.038	0.122		0.128
-41.379	5.606	25.271		-41.373	5.653	25.225		-0.006	-0.047	0.046		0.066
-38.522	4.399	25.355		-38.469	4.464	25.271		-0.053	-0.065	0.083		0.118
-35.06	8.994	27.553		-35.072	8.979	27.497		0.012	0.015	0.056		0.059
-32.303	12.599	21.885		-32.261	12.654	21.916		-0.043	-0.055	-0.031		-0.076
-30.081	15.47	8.31		-29.984	15.595	8.339		-0.097	-0.125	-0.029		-0.161
-23.784	6.742	8.302		-23.563	6.824	8.345		-0.221	-0.081	-0.043		-0.239
-27.225	5.478	21.824		-27.049	5.542	21.906		-0.176	-0.065	-0.082		-0.205
-31.353	3.944	27.492		-31.356	3.943	27.484		0.003	0.001	0.008		0.008
-36.748	1.909	25.404		-36.649	1.945	25.299		-0.099	-0.035	0.105		0.148
-36.547	-1.114	25.436		-36.419	-1.139	25.306		-0.128	0.026	0.131		0.185
-30.878	-2.293	27.486		-30.88	-2.293	27.482		0.001	0	0.004		0.004
-26.61	-3.183	21.811		-26.39	-3.229	21.909		-0.22	0.045	-0.098		-0.245
-23.047	-3.933	8.299		-22.756	-3.993	8.354		-0.291	0.06	-0.055		-0.302
-27.938	-13.46	8.323		-27.787	-13.603	8.361		-0.151	0.143	-0.038		-0.212
-30.584	-10.919	21.855		-30.47	-11.028	21.925		-0.114	0.109	-0.069		-0.172
-33.779	-7.838	27.535		-33.789	-7.828	27.493		0.01	-0.01	0.043		0.045
-37.923	-3.819	25.399		-37.84	-3.895	25.288		-0.083	0.076	0.112		0.159
-41.933	5.663	25.24		-41.933	5.687	25.216		-0.001	-0.024	0.024		0.034
-42.021	11.357	27.653		-42.021	11.316	27.521		0	0.041	0.132		0.138
-42.059	16.102	21.979		-42.059	16.009	21.938		0	0.093	0.041		0.101
-42.067	19.793	8.347		-42.067	19.739	8.337		0	0.054	0.01		0.055
-40.692	1.12	20.437		-40.532	1.249	20.309		-0.16	-0.129	0.128		0.242
-45.045	0.266	21.533		-44.911	0.254	21.623		-0.134	0.012	-0.09		-0.162
-40.648	-2.14	21.595		-40.554	-2.28	21.483		-0.094	0.14	0.112		0.202
45.152	-41.136	14.988		45.175	-41.176	15.159		-0.023	0.04	-0.171		-0.177
42.566	-45.955	13.425		42.566	-45.952	13.42		0	-0.003	0.005		0.006

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
40.378	-49.953	9.934		40.377	-49.96	9.94		0.002	0.007	-0.006		-0.009
38.872	-52.71	5.094		38.87	-52.718	5.098		0.002	0.009	-0.004		-0.01
32.072	-44.775	5.041		31.909	-44.839	5.116		0.163	0.064	-0.075		-0.19
34.982	-43.627	9.853		34.859	-43.676	9.977		0.124	0.049	-0.124		-0.182
39.203	-41.97	13.313		39.136	-41.997	13.453		0.067	0.027	-0.14		-0.157
44.252	-39.991	14.921		44.221	-40.004	15.17		0.031	0.013	-0.25		-0.252
44.213	-38.343	14.906		44.18	-38.33	15.169		0.033	-0.013	-0.263		-0.265
39.083	-36.613	13.288		39.005	-36.585	13.447		0.078	-0.027	-0.16		-0.179
34.805	-35.172	9.817		34.652	-35.119	9.967		0.152	-0.053	-0.15		-0.221
31.849	-34.178	5.018		31.652	-34.11	5.107		0.197	-0.068	-0.089		-0.227
38.488	-25.957	5.001		38.398	-25.804	5.076		0.09	-0.153	-0.076		-0.193
40.075	-28.57	9.827		40.024	-28.484	9.92		0.051	-0.086	-0.092		-0.136
42.418	-32.421	13.321		42.395	-32.382	13.408		0.023	-0.039	-0.087		-0.098
45.242	-37.056	14.904		45.226	-37.024	15.154		0.016	-0.032	-0.25		-0.253
46.858	-36.734	14.893		46.866	-36.698	15.134		-0.008	-0.035	-0.242		-0.244
47.674	-31.368	13.313		47.678	-31.349	13.349		-0.003	-0.019	-0.036		-0.041
48.355	-26.927	9.821		48.362	-26.891	9.855		-0.006	-0.037	-0.034		-0.05
48.822	-23.923	5.001		48.836	-23.836	5.038		-0.014	-0.087	-0.037		-0.096
38.872	-52.709	5.094		38.87	-52.718	5.098		0.003	0.009	-0.004		-0.01
40.379	-49.952	9.934		40.377	-49.959	9.94		0.002	0.007	-0.006		-0.01
42.566	-45.954	13.425		42.566	-45.952	13.42		0	-0.002	0.004		0.005
45.152	-41.136	14.987		45.175	-41.176	15.159		-0.024	0.04	-0.172		-0.178
47.459	-36.891	14.918		47.518	-36.887	15.125		-0.059	-0.004	-0.207		-0.216
50.106	-32.153	13.327		50.104	-32.154	13.324		0.001	0.001	0.003		0.003
52.412	-28.301	9.824		52.413	-28.299	9.825		-0.001	-0.001	-0.001		-0.002
53.695	-25.556	5		53.729	-25.518	5.021		-0.034	-0.038	-0.021		-0.055
60.703	-33.569	4.974		60.771	-33.543	5.005		-0.068	-0.026	-0.031		-0.079
57.921	-34.649	9.783		57.93	-34.645	9.791		-0.009	-0.004	-0.009		-0.013
53.743	-36.277	13.229		53.774	-36.265	13.291		-0.031	-0.012	-0.062		-0.07
48.745	-38.232	14.948		48.769	-38.223	15.113		-0.025	-0.009	-0.165		-0.167
48.779	-39.881	14.907		48.81	-39.89	15.114		-0.031	0.009	-0.207		-0.21
53.873	-41.597	13.237		53.904	-41.607	13.296		-0.031	0.01	-0.06		-0.068
58.128	-43.032	9.795		58.132	-43.034	9.799		-0.004	0.001	-0.004		-0.006
61.091	-44.031	5.045		61.022	-44.008	5.014		0.069	-0.023	0.031		0.079
54.603	-52.382	5.101		54.53	-52.267	5.043		0.073	-0.116	0.058		0.148
52.961	-49.7	9.915		52.922	-49.638	9.847		0.039	-0.062	0.067		0.1
50.587	-45.816	13.363		50.579	-45.803	13.336		0.008	-0.012	0.027		0.031
47.751	-41.172	14.923		47.77	-41.197	15.128		-0.018	0.026	-0.206		-0.208
46.134	-41.497	14.915		46.131	-41.53	15.149		0.002	0.034	-0.234		-0.237
45.315	-46.914	13.428		45.318	-46.895	13.392		-0.002	-0.018	0.036		0.04
44.636	-51.439	9.96		44.643	-51.386	9.911		-0.007	-0.053	0.049		0.072
44.174	-54.545	5.114		44.183	-54.475	5.084		-0.01	-0.069	0.03		0.076
53.696	-25.555	5.001		53.729	-25.518	5.022		-0.033	-0.037	-0.02		-0.054
52.411	-28.3	9.825		52.411	-28.299	9.826		0	0	-0.001		-0.001
50.105	-32.153	13.327		50.104	-32.154	13.325		0.001	0.001	0.003		0.003
47.457	-36.891	14.911		47.518	-36.887	15.125		-0.062	-0.004	-0.214		-0.223
32.626	-49.54	0.649		32.602	-49.559	0.681		0.024	0.018	-0.032		-0.044

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
36.95	-53.861	0.534		36.962	-53.842	0.504		-0.012	-0.019	0.03		0.037
45.417	-56.229	1.022		45.424	-56.098	0.914		-0.007	-0.13	0.108		0.169
54.723	-53.939	1.215		54.632	-53.78	1.089		0.09	-0.159	0.126		0.222
60.942	-47.67	1.244		60.819	-47.598	1.152		0.123	-0.072	0.092		0.17
63.153	-39.375	1.116		63.135	-39.375	1.104		0.018	0	0.012		0.021
5.739	29.4	-10.396		5.739	29.44	-10.385		0	-0.04	-0.012		-0.042
2.371	29.347	-10.418		2.371	29.441	-10.389		0	-0.095	-0.028		-0.099
2.353	26.018	0.053		2.353	26.285	0.133		0	-0.266	-0.08		-0.278
-0.995	29.38	-10.413		-0.995	29.443	-10.394		0	-0.063	-0.019		-0.065
5.747	20.241	-12.546		5.747	20.053	-12.49		0	0.188	-0.056		-0.196
2.357	23.34	-2.013		2.357	23.208	-1.973		0	0.132	-0.04		-0.138
2.378	20.258	-12.558		2.378	20.051	-12.496		0	0.207	-0.062		-0.216
-0.988	20.25	-12.561		-0.988	20.049	-12.501		0	0.201	-0.06		-0.209
7.877	27.568	-10.525		8.007	27.568	-10.472		-0.131	0	-0.052		-0.141
7.857	25.042	-10.531		8.007	25.042	-10.471		-0.149	0	-0.06		-0.161
3.476	25.052	-0.078		3.798	25.052	0.051		-0.322	0	-0.129		-0.347
7.877	22.518	-10.519		8.005	22.518	-10.468		-0.128	0	-0.051		-0.138
-4.419	27.56	-12.477		-4.523	27.56	-12.435		0.103	0	-0.041		-0.111
-0.13	25.047	-1.98		-0.311	25.047	-1.908		0.181	0	-0.072		-0.195
-4.387	25.037	-12.484		-4.52	25.037	-12.43		0.133	0	-0.053		-0.144
-4.38	22.51	-12.484		-4.519	22.51	-12.428		0.14	0	-0.056		-0.15
-8.86	4.991	-1.962		-9.167	5.163	-1.962		0.306	-0.173	0		0.352
-8.988	5.065	9.827		-9.166	5.165	9.827		0.178	-0.1	0		0.204
-0.435	10.539	9.834		-0.434	10.512	9.834		-0.001	0.027	0		-0.027
-0.396	10.331	-1.951		-0.403	10.513	-1.951		0.007	-0.182	0		0.182
8.57	6.03	-1.933		8.604	6.054	-1.933		-0.035	-0.024	0		0.042
8.762	6.196	9.851		8.59	6.074	9.851		0.172	0.121	0		-0.21
10.339	-3.284	9.862		10.027	-3.185	9.862		0.312	-0.099	0		-0.327
10.056	-3.192	1.02		10.028	-3.183	1.02		0.029	-0.009	0		-0.03
0.256	-10.412	1.012		0.258	-10.518	1.012		-0.003	0.105	0		0.106
0.238	-10.588	9.851		0.237	-10.518	9.851		0.002	-0.07	0		-0.07
-9.79	-3.267	9.828		-9.98	-3.331	9.828		0.189	0.063	0		0.2
-9.622	-3.229	0.992		-9.974	-3.347	0.992		0.352	0.118	0		0.372
10.91	-10.156	3.983		10.781	-10.036	3.983		0.129	-0.12	0		0.177
-10.986	-9.572	3.935		-11.105	-9.676	3.935		0.119	0.104	0		-0.158
-14.417	1.912	0.97		-14.601	1.936	0.97		0.185	-0.024	0		-0.186
-8.182	12.191	3.917		-8.208	12.23	3.917		0.026	-0.039	0		-0.047
3.684	14.445	0.995		3.64	14.272	0.995		0.044	0.172	0		0.178
13.21	7.054	3.97		12.993	6.938	3.97		0.217	0.116	0		0.246
2.119	1.52	-16.737		2.119	1.441	-16.833		0	0.079	0.096		0.124
-3.556	3.817	-16.786		-3.556	3.817	-16.833		0	0	0.047		0.047
-3.635	-4.117	-16.782		-3.635	-4.117	-16.833		0	0	0.051		0.051
3.937	-3.968	-16.838		3.937	-3.968	-16.833		0	0	-0.005		-0.005
-0.102	0.185	-20.973		-0.102	0.185	-21.042		0	0	0.069		0.069
-9.183	-8.515	12.575		-9.183	-8.515	12.625		0	0	-0.05		-0.05
-11.828	3.542	12.626		-11.828	3.542	12.625		0	0	0.001		0.001
-0.759	12.028	12.603		-0.759	12.028	12.625		0	0	-0.022		-0.022

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
11.406	4.964	12.431		11.406	4.964	12.625		0	0	-0.194		-0.194
10.757	-6.978	12.39		10.757	-6.978	12.625		0	0	-0.235		-0.235
0.621	-12.788	12.509		0.621	-12.788	12.625		0	0	-0.116		-0.116
-0.257	-14.692	7.051		-0.258	-14.727	7.051		0.001	0.035	0		-0.035
7.017	-46.751	6.956		6.972	-46.751	6.956		0.045	0	0		0.045
7.103	-36.744	6.946		6.972	-36.744	6.946		0.131	0	0		0.131
7.151	-26.737	6.937		6.972	-26.737	6.937		0.179	0	0		0.179
7.212	-16.73	6.927		6.972	-16.73	6.927		0.24	0	0		0.24
4.67	-17.692	6.917		4.447	-17.692	6.917		0.223	0	0		-0.223
4.62	-27.414	6.928		4.447	-27.414	6.928		0.173	0	0		-0.173
4.588	-37.137	6.938		4.447	-37.137	6.938		0.141	0	0		-0.141
4.553	-46.859	6.947		4.447	-46.859	6.947		0.106	0	0		-0.106
-3.804	-46.873	9.885		-3.97	-46.873	9.885		0.165	0	0		0.165
-3.726	-37.189	9.872		-3.97	-37.189	9.872		0.244	0	0		0.244
-3.737	-27.505	9.863		-3.97	-27.505	9.863		0.233	0	0		0.233
-3.737	-17.82	9.853		-3.97	-17.82	9.853		0.232	0	0		0.232
-7.943	-16.088	3.944		-8.178	-16.088	3.944		0.235	0	0		-0.235
-7.997	-26.287	3.957		-8.178	-26.287	3.957		0.181	0	0		-0.181
-8.004	-36.488	3.968		-8.178	-36.488	3.968		0.174	0	0		-0.174
-7.996	-46.687	3.976		-8.178	-46.687	3.976		0.182	0	0		-0.182
-5.845	-50.571	7.387		-5.845	-50.5	7.387		0	-0.071	0		0.071
5.9	-50.302	10.642		5.9	-50.5	10.642		0	0.198	0		-0.198
5.889	-46.515	12.511		5.889	-46.515	12.625		0	0	-0.114		-0.114
5.905	-37.468	12.489		5.905	-37.468	12.625		0	0	-0.136		-0.136
5.811	-28.426	12.476		5.811	-28.426	12.625		0	0	-0.149		-0.149
6.802	-17.456	12.761		6.972	-17.456	12.625		-0.17	0	0.136		0.218
-5.958	-16.904	12.533		-5.958	-16.904	12.625		0	0	-0.092		-0.092
-6.074	-27.307	12.572		-6.074	-27.307	12.625		0	0	-0.053		-0.053
-6.093	-36.127	12.603		-6.093	-36.127	12.625		0	0	-0.022		-0.022
-5.628	-47.879	12.538		-5.628	-47.879	12.625		0	0	-0.087		-0.087
63.245	-85.741	0.443		63.245	-85.741	0		0	0	0.443		0.443
51.816	-86.115	0.424		51.816	-86.115	0		0	0	0.424		0.424
31.069	-85.643	0.312		31.069	-85.643	0		0	0	0.312		0.312
27.082	-77.927	0.276		27.082	-77.927	0		0	0	0.276		0.276
40.269	-79.647	0.351		40.269	-79.647	0		0	0	0.351		0.351
56.703	-76.25	0.342		56.703	-76.25	0		0	0	0.342		0.342
61.348	-66.951	0.289		61.348	-66.951	0		0	0	0.289		0.289
47.357	-70.208	0.281		47.357	-70.208	0		0	0	0.281		0.281
37.837	-65.817	0.238		37.837	-65.817	0		0	0	0.238		0.238
24.186	-65.492	0.152		24.186	-65.492	0		0	0	0.152		0.152
20.221	-53.394	0.08		20.221	-53.394	0		0	0	0.08		0.08
15.451	-46.268	0.09		15.451	-46.268	0		0	0	0.09		0.09
23.861	-45.519	0.089		23.861	-45.519	0		0	0	0.089		0.089
15.095	-35.333	0.045		15.095	-35.333	0		0	0	0.045		0.045
15.956	-25.373	0.043		15.956	-25.373	0		0	0	0.043		0.043
25.869	-28.307	0.06		25.869	-28.307	0		0	0	0.06		0.06
33.852	-23.31	0.089		33.852	-23.31	0		0	0	0.089		0.089

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
61.944	-24.445	-0.12		61.944	-24.445	0		0	0	-0.12		-0.12
68.327	-34.962	-0.055		68.327	-34.962	0		0	0	-0.055		-0.055
65.53	-54.934	0.139		65.53	-54.934	0		0	0	0.139		0.139
69.171	-6.512	-0.37		69.171	-6.512	0		0	0	-0.37		-0.37
66.333	18.484	-0.102		66.333	18.484	0		0	0	-0.102		-0.102
52.427	19.057	-0.109		52.427	19.057	0		0	0	-0.109		-0.109
38.548	18.8	-0.119		38.548	18.8	0		0	0	-0.119		-0.119
25.195	19.12	0.073		25.195	19.12	0		0	0	0.073		0.073
27.294	28.581	0.073		27.294	28.581	0		0	0	0.073		0.073
34.436	26.92	0.019		34.436	26.92	0		0	0	0.019		0.019
46.179	25.989	-0.043		46.179	25.989	0		0	0	-0.043		-0.043
45.857	34.531	0.091		45.857	34.531	0		0	0	0.091		0.091
29.883	39.438	0.129		29.883	39.438	0		0	0	0.129		0.129
17.524	42.276	0.078		17.524	42.276	0		0	0	0.078		0.078
7.285	39.4	0.086		7.285	39.4	0		0	0	0.086		0.086
10.451	49.454	0.154		10.451	49.454	0		0	0	0.154		0.154
23.138	52.422	0.212		23.138	52.422	0		0	0	0.212		0.212
43.437	55.681	0.276		43.437	55.681	0		0	0	0.276		0.276
66.629	54.357	0.27		66.629	54.357	0		0	0	0.27		0.27
67.226	38.381	0.153		67.226	38.381	0		0	0	0.153		0.153
-11.997	40.865	-0.004		-11.997	40.865	0		0	0	-0.004		-0.004
-22.566	17.568	0.145		-22.566	17.568	0		0	0	0.145		0.145
-23.875	30.758	0.06		-23.875	30.758	0		0	0	0.06		0.06
-31.05	26.07	0.072		-31.05	26.07	0		0	0	0.072		0.072
-42.782	26.727	0.122		-42.782	26.727	0		0	0	0.122		0.122
-50.275	30.576	0.099		-50.275	30.576	0		0	0	0.099		0.099
-40.236	46.131	0.099		-40.236	46.131	0		0	0	0.099		0.099
-47.362	54.685	0.116		-47.362	54.685	0		0	0	0.116		0.116
-75.373	53.89	0.065		-75.373	53.89	0		0	0	0.065		0.065
-75.582	37.609	0.052		-75.582	37.609	0		0	0	0.052		0.052
-74.359	19.45	0.053		-74.359	19.45	0		0	0	0.053		0.053
-56.884	25.36	0.121		-56.884	25.36	0		0	0	0.121		0.121
-65.919	12.049	0.147		-65.919	12.049	0		0	0	0.147		0.147
-68.426	-1.011	0.133		-68.426	-1.011	0		0	0	0.133		0.133
-76.776	-10.708	-0.007		-76.776	-10.708	0		0	0	-0.007		-0.007
-76.632	-29.183	0.011		-76.632	-29.183	0		0	0	0.011		0.011
-62.367	-24.775	0.144		-62.367	-24.775	0		0	0	0.144		0.144
-49.682	-21.808	0.15		-49.682	-21.808	0		0	0	0.15		0.15
-35.35	-26.501	0.14		-35.35	-26.501	0		0	0	0.14		0.14
-22.599	-18.015	0.133		-22.599	-18.015	0		0	0	0.133		0.133
-27.603	-36.96	0.088		-27.603	-36.96	0		0	0	0.088		0.088
-13.468	-51.038	-0.035		-13.468	-51.038	0		0	0	-0.035		-0.035
-4.965	-60.089	-0.095		-4.965	-60.089	0		0	0	-0.095		-0.095
-6.196	-70.892	-0.055		-6.196	-70.892	0		0	0	-0.055		-0.055
-7.534	-86.109	0.15		-7.534	-86.109	0		0	0	0.15		0.15
-26.961	-90.714	0.144		-26.961	-90.714	0		0	0	0.144		0.144
-40.654	-88.478	0.113		-40.654	-88.478	0		0	0	0.113		0.113

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-53.414	-82.071	0.176		-53.414	-82.071	0		0	0	0.176		0.176
-62.618	-90.698	0.15		-62.618	-90.698	0		0	0	0.15		0.15
-76.949	-86.004	0.095		-76.949	-86.004	0		0	0	0.095		0.095
-75.3	-64.431	0.091		-75.3	-64.431	0		0	0	0.091		0.091
-71.7	-44.16	0.101		-71.7	-44.16	0		0	0	0.101		0.101
-65.54	-56.061	0.198		-65.54	-56.061	0		0	0	0.198		0.198
-61.91	-65.851	0.185		-61.91	-65.851	0		0	0	0.185		0.185
-50.198	-58.782	0.145		-50.198	-58.782	0		0	0	0.145		0.145
-49.945	-72.838	0.162		-49.945	-72.838	0		0	0	0.162		0.162
-13.803	-37.914	-16.815		-13.803	-37.914	-16.833		0	0	0.018		0.018
-14.208	-16.514	-16.726		-14.208	-16.514	-16.833		0	0	0.107		0.107
-13.403	16.161	-16.776		-13.403	16.161	-16.833		0	0	0.057		0.057
-13.241	29.37	-16.817		-13.241	29.37	-16.833		0	0	0.016		0.016
14.819	31.642	-16.806		14.819	31.642	-16.833		0	0	0.027		0.027
15.689	23.936	-16.838		15.689	23.936	-16.833		0	0	-0.005		-0.005
15.958	12.245	-16.85		15.958	12.245	-16.833		0	0	-0.017		-0.017
60.149	4.348	-16.825		60.149	4.348	-16.833		0	0	0.008		0.008
58.594	-9.922	-16.565		58.594	-9.922	-16.833		0	0	0.268		0.268
49.104	-15.22	-16.848		49.104	-15.22	-16.833		0	0	-0.015		-0.015
36.693	-9.63	-16.876		36.693	-9.63	-16.833		0	0	-0.043		-0.043
30.927	-17.657	-16.858		30.927	-17.657	-16.833		0	0	-0.025		-0.025
13.468	-15.145	-16.807		13.468	-15.145	-16.833		0	0	0.026		0.026
19.728	2.853	-4.222		19.728	2.853	-4.208		0	0	-0.013		-0.013
29.112	7.265	-4.248		29.112	7.265	-4.208		0	0	-0.04		-0.04
34.638	3.01	-4.175		34.638	3.01	-4.208		0	0	0.033		0.033
41.391	7.393	-4.269		41.391	7.393	-4.208		0	0	-0.061		-0.061
46.62	2.21	-4.135		46.62	2.21	-4.208		0	0	0.074		0.074
52.215	8.431	-4.227		52.215	8.431	-4.208		0	0	-0.018		-0.018
51.044	-4.147	-0.265		51.044	-4.03	-0.265		0	-0.116	0		-0.116
40.517	-2.961	0.194		40.517	-2.961	0		0	0	0.194		0.194
28.826	-2.774	0.041		28.826	-2.774	0		0	0	0.041		0.041
17.138	-1.974	-0.461		17.138	-1.974	0		0	0	-0.461		-0.461
18.756	-9.3	1.633		18.756	-9.3	1.683		0	0	-0.05		-0.05
24.915	-6.462	1.599		24.915	-6.462	1.683		0	0	-0.085		-0.085
26.031	-14.769	1.53		26.031	-14.769	1.683		0	0	-0.153		-0.153
19.93	-12.61	-3.897		20.382	-12.447	-3.897		-0.452	-0.163	0		0.481
24.91	-16.619	0.502		24.59	-16.619	0.502		0.32	0	0		0.32
33.207	-3.554	-3.942		33.207	-4.03	-3.942		0	0.476	0		-0.476
40.228	-3.464	-3.176		40.228	-4.03	-3.176		0	0.567	0		-0.567
52.853	-3.473	-4.429		52.853	-4.03	-4.429		0	0.557	0		-0.557
54.979	0.28	-8.703		55.287	0.182	-8.703		-0.308	0.098	0		-0.324
56.329	7.941	-9.454		56.527	7.941	-9.454		-0.198	0	0		-0.198
59.671	12.57	-0.698		59.671	12.504	-0.557		0	0.066	-0.141		-0.155
49.457	13.43	-1.487		49.457	13.316	-1.289		0	0.114	-0.198		-0.228
39.617	12.698	-1.366		39.617	12.516	-1.184		0	0.182	-0.182		-0.257



**3D-Tol Data from CMM for Wax Pattern (Polyamide2)**

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
53.824	58.338	-5.928		53.824	58.917	-5.928		0	-0.579	0		-0.579
37.278	58.29	-5.942		37.278	58.917	-5.942		0	-0.627	0		-0.627
20.733	58.294	-5.959		20.733	58.917	-5.959		0	-0.622	0		-0.622
4.189	58.318	-5.972		4.189	58.917	-5.972		0	-0.599	0		-0.599
-12.356	58.3	-5.989		-12.356	58.917	-5.989		0	-0.617	0		-0.617
-28.9	58.323	-6.005		-28.9	58.917	-6.005		0	-0.594	0		-0.594
-45.446	58.397	-6.021		-45.446	58.917	-6.021		0	-0.52	0		-0.52
-61.991	58.435	-6.036		-61.991	58.917	-6.036		0	-0.481	0		-0.481
-79.622	40.993	-6.026		-79.958	40.993	-6.026		0.337	0	0		-0.337
-79.564	24.448	-6.001		-79.958	24.448	-6.001		0.394	0	0		-0.394
-79.454	7.903	-5.976		-79.958	7.903	-5.976		0.504	0	0		-0.504
-79.394	-8.64	-5.952		-79.958	-8.64	-5.952		0.564	0	0		-0.564
-79.352	-25.186	-5.929		-79.958	-25.186	-5.929		0.606	0	0		-0.606
-79.42	-41.731	-5.904		-79.958	-41.731	-5.904		0.539	0	0		-0.539
-79.475	-58.275	-5.88		-79.958	-58.275	-5.88		0.483	0	0		-0.483
-79.532	-74.819	-5.856		-79.958	-74.819	-5.856		0.426	0	0		-0.426
-61.96	-92.114	-5.809		-61.96	-92.583	-5.809		0	0.469	0		-0.469
-45.415	-92.059	-5.793		-45.415	-92.583	-5.793		0	0.524	0		-0.524
-28.87	-91.888	-5.779		-28.87	-92.583	-5.779		0	0.696	0		-0.696
-12.325	-91.93	-5.762		-12.325	-92.583	-5.762		0	0.653	0		-0.653
4.218	-91.896	-5.748		4.218	-92.583	-5.748		0	0.687	0		-0.687
20.764	-91.929	-5.732		20.764	-92.583	-5.732		0	0.655	0		-0.655
37.308	-91.996	-5.716		37.308	-92.583	-5.716		0	0.587	0		-0.587
53.853	-92.094	-5.7		53.853	-92.583	-5.7		0	0.49	0		-0.49
70.753	-74.792	-5.711		71.542	-74.792	-5.711		-0.789	0	0		-0.789
70.681	-58.246	-5.735		71.542	-58.246	-5.735		-0.861	0	0		-0.861
70.646	-41.702	-5.759		71.542	-41.702	-5.759		-0.896	0	0		-0.896
70.58	-25.157	-5.783		71.542	-25.157	-5.783		-0.962	0	0		-0.962
70.505	-8.612	-5.807		71.542	-8.612	-5.807		-1.037	0	0		-1.037
70.454	7.932	-5.831		71.542	7.932	-5.831		-1.088	0	0		-1.088
70.578	24.477	-5.855		71.542	24.477	-5.855		-0.964	0	0		-0.964
70.683	41.021	-5.88		71.542	41.021	-5.88		-0.859	0	0		-0.859
-69.745	43.71	8.148		-69.745	43.71	8.417		0	0	-0.268		-0.268
-64.694	43.712	8.067		-64.694	43.712	8.417		0	0	-0.35		-0.35
-64.696	48.762	8.119		-64.696	48.762	8.417		0	0	-0.298		-0.298
-69.746	48.761	8.142		-69.746	48.761	8.417		0	0	-0.275		-0.275
-67.614	46.356	8.122		-67.614	46.356	8.417		0	0	-0.295		-0.295
-71.71	43.705	6.603		-71.542	43.705	6.603		-0.169	0	0		0.169
-71.686	48.757	6.595		-71.542	48.757	6.595		-0.145	0	0		0.145
-69.743	50.496	6.593		-69.743	50.5	6.593		0	-0.004	0		-0.004
-64.693	50.365	6.6		-64.693	50.5	6.6		0	-0.135	0		-0.135
-64.69	42.019	7.597		-64.69	42.083	8.417		0	-0.065	-0.82		0.822
-69.741	42.753	6.612		-69.741	42.083	6.612		0	0.67	0		-0.67
-63.071	49.741	6.608		-63.125	50.5	6.608		0.054	-0.759	0		0.761



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-63.157	42.723	6.616		-63.157	42.083	6.616		0	0.64	0		0.64
-64.68	-14.369	4.095		-64.68	-14.369	4.208		0	0	-0.113		-0.113
-69.731	-14.37	4.039		-69.731	-14.37	4.208		0	0	-0.169		-0.169
-69.729	-19.418	4.122		-69.729	-19.418	4.208		0	0	-0.086		-0.086
-64.679	-19.417	4.132		-64.679	-19.417	4.208		0	0	-0.076		-0.076
-67.85	-16.796	4.034		-67.85	-16.796	4.208		0	0	-0.174		-0.174
-69.728	-12.518	4.078		-69.728	-12.625	4.208		0	0.107	-0.13		0.169
-64.678	-12.566	4.126		-64.678	-12.625	4.208		0	0.059	-0.083		0.102
-63.145	-14.371	4.286		-63.125	-14.371	4.208		-0.02	0	0.077		-0.08
-63.147	-19.421	4.294		-63.125	-19.421	4.208		-0.022	0	0.086		-0.089
-64.675	-21.106	4.124		-64.675	-21.042	4.208		0	-0.065	-0.084		0.106
-69.725	-21.131	4.099		-69.725	-21.042	4.208		0	-0.089	-0.109		0.141
-71.775	-19.425	3.327		-71.542	-19.425	3.327		-0.233	0	0		0.233
-71.726	-14.374	3.321		-71.542	-14.374	3.321		-0.185	0	0		0.185
-64.672	-77.487	8.292		-64.672	-77.487	8.417		0	0	-0.125		-0.125
-69.723	-77.489	8.311		-69.723	-77.489	8.417		0	0	-0.105		-0.105
-69.72	-82.537	8.319		-69.72	-82.537	8.417		0	0	-0.097		-0.097
-64.671	-82.537	8.304		-64.671	-82.537	8.417		0	0	-0.113		-0.113
-69.719	-75.659	7.754		-69.719	-75.75	8.417		0	0.091	-0.663		0.669
-63.685	-75.736	6.785		-63.125	-75.75	6.785		-0.56	0.014	0		0.561
-63.109	-77.491	7.775		-63.125	-77.491	8.417		0.016	0	-0.642		0.642
-63.069	-82.542	7.782		-63.125	-82.542	8.417		0.056	0	-0.635		0.638
-64.666	-84.056	6.8		-64.666	-84.167	6.8		0	0.11	0		-0.11
-69.717	-84.135	6.797		-69.717	-84.167	6.797		0	0.032	0		-0.032
-71.608	-82.544	6.786		-71.542	-82.544	6.786		-0.066	0	0		0.066
-71.463	-77.493	6.78		-71.542	-77.493	6.78		0.079	0	0		-0.079
-2.408	43.718	4.33		-2.408	43.718	4.208		0	0	0.122		0.122
2.644	43.72	4.371		2.644	43.72	4.208		0	0	0.163		0.163
2.641	48.769	4.352		2.641	48.769	4.208		0	0	0.143		0.143
-2.409	48.767	4.311		-2.409	48.767	4.208		0	0	0.103		0.103
-0.569	46.753	4.356		-0.569	46.753	4.208		0	0	0.148		0.148
-4.305	43.709	2.038		-4.208	43.709	2.038		-0.097	0	0		0.097
-4.258	48.762	2.031		-4.208	48.762	2.031		-0.05	0	0		0.05
2.647	42.487	2.049		2.647	42.083	2.049		0	0.404	0		-0.404
-2.403	42.514	2.047		-2.403	42.083	2.047		0	0.431	0		-0.431
3.774	48.764	2.041		4.208	48.764	2.041		-0.434	0	0		-0.434
3.753	43.714	2.05		4.208	43.714	2.05		-0.456	0	0		-0.456
-2.405	50.585	2.028		-2.405	50.5	2.028		0	0.085	0		0.085
2.645	50.574	2.034		2.645	50.5	2.034		0	0.074	0		0.074
-64.666	36.154	-0.429		-64.756	36.244	0		0.09	-0.09	-0.429		0.447
-53.949	46.866	-0.434		-54.042	46.958	0		0.092	-0.092	-0.434		0.453
-46.82	46.843	-1.37		-46.831	46.831	-1.37		0.012	0.012	0		-0.016
-36.096	36.139	-1.344		-36.118	36.118	-1.344		0.021	0.021	0		-0.03
-41.007	28.855	-1.341		-40.882	28.979	-1.341		-0.125	-0.125	0		-0.176
-48.176	35.969	-1.358		-48.024	36.121	-1.358		-0.152	-0.152	0		-0.215
-35.923	29.822	-1.722		-35.696	29.595	-1.722		-0.227	0.227	0		0.321
-54.32	35.333	-1.367		-54.042	35.055	-1.367		-0.278	0.278	0		0.393

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-59.111	30.6	-1.36		-58.804	30.293	-1.36		-0.307	0.307	0		0.434
-65.451	29.366	-1.267		-65.263	29.554	-1.267		-0.188	-0.188	0		-0.266
-61.268	33.489	-4.139		-61.268	33.489	-4.208		0	0	0.069		0.069
-56.701	38.244	-4.12		-56.701	38.244	-4.208		0	0	0.088		0.088
-50.206	43.648	-4.141		-50.206	43.648	-4.208		0	0	0.067		0.067
-44.645	38.601	-4.075		-44.645	38.601	-4.208		0	0	0.133		0.133
-39.969	33.795	-4.048		-39.969	33.795	-4.208		0	0	0.161		0.161
49.778	42.404	5.881		49.778	42.083	5.881		0	0.321	0		-0.321
43.043	42.443	5.875		43.043	42.083	5.875		0	0.359	0		-0.359
54.838	30.261	5.901		54.708	30.261	5.901		0.13	0	0		-0.13
54.842	36.996	5.89		54.708	36.996	5.89		0.134	0	0		-0.134
58.92	25.542	5.42		58.92	25.25	5.42		0	0.292	0		-0.292
62.671	30.264	5.91		63.125	30.264	5.91		-0.454	0	0		-0.454
62.714	37.84	5.901		63.125	37.84	5.901		-0.411	0	0		-0.411
62.753	45.414	5.89		63.125	45.414	5.89		-0.372	0	0		-0.372
58.191	50.256	5.872		58.191	50.5	5.872		0	-0.244	0		-0.244
50.614	50.273	5.864		50.614	50.5	5.864		0	-0.227	0		-0.227
43.041	50.278	5.858		43.041	50.5	5.858		0	-0.222	0		-0.222
38.084	46.2	5.143		37.875	46.2	5.143		0.209	0	0		-0.209
43.288	46.376	8.37		43.288	46.376	8.417		0	0	-0.047		-0.047
50.519	46.088	8.371		50.519	46.088	8.417		0	0	-0.046		-0.046
58.491	45.758	8.375		58.491	45.758	8.417		0	0	-0.041		-0.041
59.233	37.493	8.274		59.233	37.493	8.417		0	0	-0.143		-0.143
59.111	30.648	8.171		59.111	30.648	8.417		0	0	-0.246		-0.246
-30.795	49.291	16.602		-30.795	48.817	16.876		0	0.474	-0.274		-0.547
-30.789	46.205	11.679		-30.789	45.914	11.847		0	0.291	-0.168		-0.336
-30.785	43.296	6.659		-30.785	43.013	6.823		0	0.283	-0.163		-0.327
-30.778	40.395	1.634		-30.778	40.112	1.798		0	0.283	-0.163		-0.327
-26.992	40.396	1.638		-26.992	40.114	1.801		0	0.283	-0.163		-0.326
-26.998	43.321	6.65		-26.998	43.015	6.827		0	0.305	-0.176		-0.353
-27.004	46.194	11.69		-27.004	45.916	11.851		0	0.279	-0.161		-0.322
-27.008	49.206	16.652		-27.008	48.817	16.876		0	0.388	-0.224		-0.448
-23.219	49.159	16.682		-23.219	48.819	16.879		0	0.34	-0.196		-0.393
-23.214	46.173	11.706		-23.214	45.918	11.854		0	0.256	-0.148		-0.295
-23.209	43.292	6.671		-23.209	43.017	6.83		0	0.275	-0.159		-0.317
-23.204	40.387	1.644		-23.204	40.114	1.802		0	0.273	-0.158		-0.315
-16.893	45.726	1.71		-16.893	45.388	1.801		0	0.339	-0.091		-0.351
-16.901	47.7	9.258		-16.901	47.407	9.336		0	0.293	-0.079		-0.303
-16.909	49.805	16.774		-16.909	49.427	16.875		0	0.378	-0.101		-0.392
-11.857	49.76	16.791		-11.857	49.428	16.88		0	0.332	-0.089		-0.343
-11.85	47.709	9.259		-11.85	47.408	9.34		0	0.301	-0.081		-0.312
-11.842	45.665	1.73		-11.842	45.389	1.804		0	0.276	-0.074		-0.286
-8.947	49.57	7.45		-8.178	49.57	7.45		-0.769	0	0		-0.769
-30.796	51.148	15.036		-30.796	50.988	14.993		0	0.16	0.043		0.166
-30.793	52.668	9.383		-30.793	52.503	9.338		0	0.165	0.044		0.171
-30.79	54.196	3.732		-30.79	54.018	3.684		0	0.178	0.048		0.184
-24.053	54.103	3.713		-24.053	54.016	3.69		0	0.087	0.023		0.09

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-24.058	52.61	9.372		-24.058	52.502	9.343		0	0.108	0.029		0.112
-24.064	51.124	15.035		-24.064	50.986	14.998		0	0.137	0.037		0.142
-17.328	51.057	15.023		-17.328	50.985	15.004		0	0.072	0.019		0.075
-17.328	52.583	9.371		-17.328	52.5	9.349		0	0.083	0.022		0.085
-17.322	54.073	3.711		-17.322	54.015	3.695		0	0.058	0.015		0.06
-10.586	54.092	3.723		-10.586	54.013	3.702		0	0.078	0.021		0.081
-10.591	52.543	9.366		-10.591	52.499	9.355		0	0.044	0.012		0.046
-10.596	50.956	15.003		-10.596	50.983	15.01		0	-0.027	-0.007		-0.028
-33.264	48.91	9.57		-33.428	48.91	9.57		0.164	0	0		-0.164
5.042	-63.155	18.982		5.083	-63.155	18.971		-0.042	0	0.011		0.043
3.244	-63.165	11.887		3.189	-63.165	11.902		0.055	0	-0.015		-0.057
1.34	-63.175	4.824		1.296	-63.175	4.836		0.044	0	-0.012		-0.046
1.362	-69.909	4.828		1.298	-69.909	4.845		0.063	0	-0.017		-0.066
3.143	-69.897	11.926		3.192	-69.897	11.913		-0.05	0	0.013		0.051
5.012	-69.887	18.999		5.085	-69.887	18.979		-0.073	0	0.02		0.076
4.978	-76.622	19.018		5.088	-76.622	18.989		-0.11	0	0.029		0.114
3.142	-76.632	11.934		3.194	-76.632	11.92		-0.052	0	0.014		0.053
1.364	-76.642	4.835		1.3	-76.642	4.852		0.064	0	-0.017		-0.067
1.289	-83.376	4.864		1.302	-83.376	4.861		-0.013	0	0.003		0.013
3.114	-83.364	11.955		3.197	-83.364	11.932		-0.083	0	0.022		0.086
5.097	-83.353	18.998		5.091	-83.353	19		0.006	0	-0.002		-0.007
7.598	-85.493	10.499		7.598	-85.85	10.499		0	0.357	0		-0.357
7.277	-83.348	21.032		7.648	-83.348	21.246		-0.371	0	-0.214		-0.428
12.755	-83.362	11.633		13.087	-83.362	11.825		-0.333	0	-0.192		-0.384
18.35	-83.374	2.297		18.528	-83.374	2.4		-0.178	0	-0.103		-0.206
18.385	-75.798	2.308		18.532	-75.798	2.393		-0.147	0	-0.085		-0.17
12.781	-75.786	11.638		13.091	-75.786	11.818		-0.31	0	-0.179		-0.359
7.239	-75.774	21		7.652	-75.774	21.239		-0.413	0	-0.239		-0.477
6.551	-69.46	21.176		6.924	-69.46	21.276		-0.373	0	-0.1		-0.386
9.125	-69.474	11.765		9.449	-69.474	11.852		-0.324	0	-0.087		-0.335
11.747	-69.487	2.368		11.974	-69.487	2.429		-0.227	0	-0.061		-0.235
11.749	-64.437	2.362		11.976	-64.437	2.423		-0.227	0	-0.061		-0.235
9.16	-64.424	11.768		9.451	-64.424	11.846		-0.291	0	-0.078		-0.301
6.623	-64.41	21.187		6.926	-64.41	21.268		-0.303	0	-0.081		-0.314
6.576	-61.416	11.206		6.576	-60.6	11.206		0	-0.816	0		-0.816
-30.378	-50.586	-5.3		-30.385	-50.469	-5.428		0.006	-0.117	0.128		0.173
-30.083	-55.188	-7.672		-30.088	-55.094	-7.85		0.005	-0.094	0.178		0.202
-29.845	-58.681	-11.516		-29.851	-58.546	-11.587		0.006	-0.135	0.071		0.152
-29.653	-61.623	-15.798		-29.655	-61.564	-15.88		0.002	-0.059	0.082		0.101
-33.689	-63.481	-15.947		-33.678	-63.491	-15.926		-0.011	0.01	-0.021		-0.025
-36	-61.41	-11.645		-35.965	-61.441	-11.621		-0.034	0.031	-0.024		-0.052
-38.492	-59.176	-7.829		-38.512	-59.157	-7.88		0.02	-0.018	0.051		0.057
-41.977	-56.057	-5.49		-41.968	-56.066	-5.476		-0.009	0.008	-0.014		-0.019
-46.429	-68.199	-5.611		-46.292	-68.192	-5.459		-0.137	-0.007	-0.152		-0.205
-41.689	-67.981	-7.942		-41.652	-67.979	-7.873		-0.037	-0.002	-0.068		-0.078
-38.505	-67.846	-11.754		-38.229	-67.831	-11.609		-0.276	-0.016	-0.145		-0.312
-35.274	-67.703	-16.054		-35.174	-67.697	-15.912		-0.1	-0.006	-0.142		-0.174

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-33.361	-71.824	-16.026		-33.275	-71.725	-15.847		-0.086	-0.099	-0.179		-0.222
-35.534	-74.151	-11.729		-35.32	-73.912	-11.559		-0.213	-0.24	-0.169		-0.363
-37.742	-76.507	-7.97		-37.694	-76.453	-7.833		-0.048	-0.053	-0.137		-0.155
-41.001	-80.014	-5.629		-40.852	-79.851	-5.393		-0.149	-0.163	-0.236		-0.323
-29.602	-67.453	-16.83		-29.599	-67.451	-16.859		-0.003	-0.002	0.029		0.029
-26.533	-62.394	-15.666		-26.474	-62.296	-15.82		-0.058	-0.098	0.153		0.191
-25.154	-59.854	-11.447		-25.06	-59.691	-11.547		-0.094	-0.163	0.1		0.213
-23.442	-56.674	-7.656		-23.401	-56.602	-7.815		-0.041	-0.072	0.159		0.179
-21.241	-52.637	-5.23		-21.181	-52.529	-5.36		-0.061	-0.108	0.13		0.18
-13.118	-62.654	-5.23		-13.071	-62.641	-5.278		-0.046	-0.013	0.048		0.068
-17.587	-63.968	-7.632		-17.519	-63.949	-7.77		-0.067	-0.019	0.138		0.154
-21.086	-65.008	-11.409		-20.934	-64.966	-11.492		-0.151	-0.042	0.083		0.178
-23.793	-65.814	-15.626		-23.705	-65.791	-15.742		-0.088	-0.024	0.116		0.148
-24.219	-70.192	-15.683		-24.198	-70.204	-15.713		-0.021	0.011	0.03		0.038
-21.696	-71.566	-11.456		-21.679	-71.575	-11.466		-0.017	0.009	0.01		0.022
-18.548	-73.282	-7.712		-18.53	-73.291	-7.751		-0.017	0.009	0.039		0.044
-14.44	-75.523	-5.272		-14.464	-75.51	-5.245		0.025	-0.013	-0.028		-0.039
-24.502	-83.761	-5.4		-24.536	-83.648	-5.282		0.034	-0.113	-0.118		-0.167
-25.839	-79.212	-7.788		-25.841	-79.204	-7.77		0.003	-0.008	-0.017		-0.02
-26.794	-75.919	-11.559		-26.835	-75.786	-11.485		0.041	-0.133	-0.074		-0.158
-27.63	-73.063	-15.833		-27.65	-73	-15.748		0.02	-0.063	-0.085		-0.108
-32.348	-72.539	-15.967		-32.262	-72.466	-15.825		-0.086	-0.074	-0.142		-0.182
-33.878	-75.263	-11.675		-33.687	-75.075	-11.54		-0.19	-0.188	-0.136		-0.3
-35.406	-78.177	-7.91		-35.365	-78.145	-7.816		-0.041	-0.033	-0.094		-0.108
-37.739	-82.35	-5.569		-37.587	-82.213	-5.366		-0.152	-0.137	-0.203		-0.288
-25.259	-86.411	-0.638		-25.279	-86.321	-0.518		0.02	-0.09	-0.121		-0.152
-12.954	-77.218	-0.639		-12.932	-77.231	-0.667		-0.022	0.013	0.028		0.038
-11.048	-61.869	-0.576		-10.979	-61.848	-0.656		-0.069	-0.021	0.08		0.108
-16.037	-53.677	-0.542		-15.956	-53.594	-0.668		-0.081	-0.083	0.126		0.171
-25.674	-48.445	-0.407		-25.65	-48.323	-0.561		-0.024	-0.122	0.154		0.198
-47.411	-37.913	18.749		-47.16	-37.8	18.908		-0.251	-0.113	-0.159		-0.318
-44.079	-36.352	12.454		-43.86	-36.251	12.594		-0.219	-0.101	-0.139		-0.279
-40.788	-34.805	6.136		-40.561	-34.7	6.281		-0.227	-0.105	-0.144		-0.289
-39.989	-41.302	6.121		-39.736	-41.35	6.27		-0.253	0.048	-0.149		-0.298
-43.556	-40.623	12.443		-43.317	-40.669	12.584		-0.24	0.046	-0.141		-0.282
-47.179	-39.935	18.734		-46.898	-39.989	18.899		-0.281	0.054	-0.165		-0.33
-48.091	-41.777	18.785		-47.946	-41.926	18.905		-0.145	0.149	-0.12		-0.24
-45.518	-44.498	12.529		-45.443	-44.576	12.592		-0.075	0.078	-0.063		-0.125
-43.013	-47.147	6.217		-42.939	-47.225	6.279		-0.074	0.078	-0.062		-0.124
-48.976	-50.192	6.339		-48.984	-50.133	6.304		0.008	-0.059	0.034		0.069
-49.452	-46.582	12.655		-49.461	-46.519	12.618		0.009	-0.063	0.037		0.073
-49.938	-42.935	18.947		-49.942	-42.906	18.93		0.005	-0.029	0.017		0.034
-52.211	-42.638	19.03		-52.156	-42.532	18.961		-0.055	-0.107	0.069		0.138
-53.986	-45.933	12.775		-53.884	-45.74	12.649		-0.101	-0.193	0.126		0.252
-55.721	-49.132	6.462		-55.621	-48.943	6.338		-0.1	-0.189	0.123		0.246
-51.915	-40.028	22.864		-51.772	-39.955	22.772		-0.143	-0.074	0.093		0.186
-57.273	-42.604	12.832		-57.026	-42.483	12.674		-0.246	-0.12	0.158		0.317

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-62.572	-45.138	2.756		-62.287	-45	2.573		-0.285	-0.138	0.183		0.366
-63.589	-36.875	2.713		-63.368	-36.916	2.583		-0.221	0.041	0.13		0.26
-57.87	-37.936	12.825		-57.633	-37.98	12.686		-0.237	0.044	0.139		0.279
-51.996	-39.025	22.839		-51.901	-39.043	22.784		-0.095	0.017	0.056		0.112
-51.407	-38.282	22.74		-51.45	-38.234	22.777		0.043	-0.048	-0.037		-0.074
-55.532	-33.897	12.748		-55.447	-33.988	12.677		-0.085	0.091	0.072		0.143
-59.531	-29.666	2.641		-59.453	-29.749	2.576		-0.078	0.083	0.066		0.131
-52.061	-26.294	2.548		-52.062	-26.288	2.551		0.001	-0.006	-0.003		-0.007
-51.327	-32.071	12.655		-51.327	-32.074	12.653		0	0.003	0.002		0.004
-50.006	-37.935	22.942		-49.849	-38.108	22.897		-0.158	0.173	0.044		0.238
-50.034	-38.279	22.527		-49.8	-38.02	22.723		-0.234	-0.259	-0.196		-0.4
-47.121	-33.041	12.517		-47.004	-32.901	12.62		-0.117	-0.14	-0.103		-0.21
-44.324	-27.916	2.424		-44.209	-27.784	2.522		-0.115	-0.131	-0.098		-0.2
-46.195	3.965	24.991		-46.105	3.879	25.112		-0.09	0.086	-0.12		-0.173
-50.299	7.826	27.725		-50.256	7.786	27.53		-0.043	0.041	0.195		0.204
-53.958	11.274	22.006		-53.718	11.045	21.862		-0.24	0.228	0.145		0.362
-56.685	13.836	8.289		-56.426	13.591	8.224		-0.259	0.245	0.065		0.362
-62.12	-1.693	8.304		-61.769	-1.663	8.24		-0.35	-0.03	0.064		0.358
-58.4	-1.369	22.024		-58.064	-1.341	21.876		-0.336	-0.028	0.148		0.368
-53.387	-0.953	27.76		-53.32	-0.947	27.534		-0.068	-0.006	0.226		0.236
-47.777	-0.504	24.984		-47.647	-0.493	25.11		-0.13	-0.012	-0.126		-0.181
-45.412	-4.56	25.115		-45.396	-4.537	25.143		-0.017	-0.023	-0.028		-0.04
-48.911	-9.101	27.734		-48.871	-9.049	27.523		-0.039	-0.053	0.212		0.222
-51.847	-12.967	21.958		-51.731	-12.812	21.873		-0.117	-0.155	0.085		0.212
-54.054	-15.89	8.28		-53.969	-15.778	8.254		-0.085	-0.112	0.026		0.143
-38.349	-19.263	8.231		-38.324	-19.392	8.255		-0.025	0.129	-0.024		-0.134
-39.034	-15.683	21.823		-39.02	-15.751	21.853		-0.013	0.069	-0.031		-0.076
-39.879	-11.192	27.624		-39.887	-11.153	27.505		0.008	-0.038	0.119		0.126
-40.948	-5.415	25.313		-40.922	-5.541	25.187		-0.026	0.126	0.126		0.18
-40.202	19.736	8.228		-40.208	19.671	8.217		0.006	0.064	0.012		0.066
-40.544	16.066	21.878		-40.552	15.979	21.84		0.008	0.087	0.038		0.095
-40.968	11.336	27.676		-40.973	11.284	27.514		0.005	0.051	0.162		0.17
-41.462	5.572	25.17		-41.46	5.591	25.151		-0.002	-0.019	0.019		0.027
-38.65	4.312	25.319		-38.561	4.423	25.18		-0.089	-0.111	0.139		0.199
-35.095	9.016	27.588		-35.112	8.993	27.501		0.018	0.023	0.087		0.092
-32.311	12.659	21.8		-32.271	12.71	21.828		-0.039	-0.051	-0.028		-0.07
-30.1	15.521	8.192		-30.007	15.64	8.22		-0.092	-0.12	-0.028		-0.154
-23.814	6.728	8.173		-23.542	6.828	8.226		-0.273	-0.1	-0.053		-0.295
-27.23	5.478	21.724		-27.016	5.557	21.823		-0.214	-0.079	-0.099		-0.249
-31.376	3.937	27.492		-31.376	3.937	27.491		0	0	0		0
-36.926	1.853	25.398		-36.74	1.919	25.204		-0.186	-0.067	0.194		0.277
-36.753	-1.113	25.45		-36.517	-1.162	25.213		-0.236	0.049	0.237		0.338
-30.903	-2.326	27.488		-30.903	-2.326	27.488		0	0	0		0
-26.669	-3.213	21.689		-26.363	-3.277	21.825		-0.306	0.064	-0.136		-0.341
-23.098	-3.97	8.171		-22.745	-4.044	8.237		-0.353	0.074	-0.066		-0.367
-28.039	-13.474	8.194		-27.828	-13.677	8.247		-0.211	0.202	-0.053		-0.297
-30.666	-10.937	21.734		-30.491	-11.104	21.839		-0.174	0.167	-0.105		-0.264

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-33.828	-7.885	27.525		-33.836	-7.877	27.493		0.008	-0.008	0.033		0.034
-38.101	-3.754	25.417		-37.948	-3.898	25.21		-0.153	0.144	0.207		0.295
-42.014	5.623	25.147		-42.014	5.622	25.148		0	0.001	-0.001		-0.001
-42.089	11.389	27.695		-42.089	11.332	27.516		0	0.057	0.179		0.187
-42.129	16.181	21.9		-42.129	16.051	21.843		0	0.131	0.057		0.143
-42.152	19.882	8.238		-42.152	19.761	8.216		0	0.121	0.022		0.123
-40.814	1.068	20.355		-40.614	1.236	20.194		-0.2	-0.168	0.161		0.307
-45.064	0.229	21.457		-44.884	0.215	21.578		-0.18	0.014	-0.121		-0.218
-40.825	-2.064	21.57		-40.685	-2.293	21.393		-0.14	0.229	0.177		0.321
44.996	-41.105	14.581		45.125	-41.269	15.144		-0.128	0.164	-0.563		-0.6
42.52	-45.922	13.086		42.501	-46.071	13.349		0.019	0.149	-0.263		-0.303
40.364	-49.901	9.658		40.319	-50.065	9.809		0.045	0.164	-0.151		-0.228
38.876	-52.662	4.881		38.836	-52.78	4.932		0.04	0.118	-0.051		-0.134
31.968	-44.823	4.889		31.844	-44.872	4.944		0.124	0.049	-0.055		-0.145
34.946	-43.649	9.635		34.741	-43.731	9.837		0.205	0.082	-0.202		-0.299
39.174	-41.988	13.028		39.003	-42.057	13.377		0.171	0.068	-0.349		-0.394
44.918	-40.522	15.332		45.397	-40.769	15.217		-0.479	0.247	0.114		0.551
44.15	-38.395	14.562		44.071	-38.367	15.156		0.079	-0.027	-0.595		-0.6
39.041	-36.675	13.027		38.864	-36.615	13.382		0.177	-0.06	-0.355		-0.401
34.723	-35.22	9.643		34.518	-35.151	9.841		0.205	-0.069	-0.198		-0.293
31.728	-34.218	4.867		31.561	-34.161	4.941		0.168	-0.057	-0.074		-0.192
38.387	-25.99	4.834		38.275	-25.803	4.925		0.112	-0.187	-0.09		-0.236
39.983	-28.616	9.656		39.89	-28.46	9.822		0.094	-0.156	-0.166		-0.247
42.352	-32.499	13.07		42.272	-32.364	13.367		0.08	-0.135	-0.297		-0.336
45.168	-37.123	14.553		45.126	-37.048	15.151		0.042	-0.075	-0.597		-0.604
46.766	-36.804	14.543		46.784	-36.717	15.14		-0.018	-0.087	-0.596		-0.603
47.579	-31.466	13.037		47.605	-31.309	13.335		-0.026	-0.157	-0.298		-0.338
48.262	-26.994	9.62		48.291	-26.814	9.785		-0.029	-0.18	-0.165		-0.246
48.734	-23.934	4.832		48.761	-23.766	4.902		-0.027	-0.167	-0.07		-0.183
38.876	-52.661	4.882		38.836	-52.779	4.933		0.04	0.118	-0.051		-0.135
40.364	-49.9	9.658		40.319	-50.065	9.809		0.045	0.165	-0.151		-0.228
42.52	-45.919	13.086		42.502	-46.069	13.35		0.018	0.15	-0.264		-0.304
44.997	-41.105	14.58		45.125	-41.269	15.144		-0.127	0.163	-0.564		-0.601
47.295	-36.922	14.578		47.493	-36.934	15.134		-0.198	0.013	-0.556		-0.59
49.984	-32.249	13.035		50.109	-32.144	13.319		-0.125	-0.105	-0.283		-0.327
52.16	-28.303	9.608		52.282	-28.168	9.768		-0.122	-0.136	-0.161		-0.243
53.644	-25.607	4.821		53.755	-25.471	4.892		-0.111	-0.136	-0.071		-0.189
60.585	-33.629	4.775		60.824	-33.537	4.88		-0.239	-0.092	-0.105		-0.277
58.604	-34.834	9.266		58.635	-34.892	9.119		-0.03	0.058	0.146		0.16
53.581	-36.353	12.9		53.779	-36.278	13.292		-0.198	-0.076	-0.392		-0.445
48.621	-38.293	14.5		48.711	-38.26	15.123		-0.091	-0.033	-0.624		-0.631
48.661	-39.915	14.515		48.751	-39.945	15.121		-0.089	0.03	-0.605		-0.613
53.702	-41.621	12.9		53.9	-41.687	13.285		-0.198	0.066	-0.384		-0.437
57.908	-43.038	9.489		58.165	-43.125	9.733		-0.257	0.086	-0.243		-0.364
60.881	-44.047	4.812		61.048	-44.103	4.884		-0.167	0.056	-0.072		-0.19
54.398	-52.266	4.848		54.466	-52.377	4.901		-0.068	0.111	-0.054		-0.141
52.79	-49.621	9.606		52.878	-49.763	9.756		-0.088	0.142	-0.15		-0.224

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
50.437	-45.768	12.985		50.527	-45.913	13.302		-0.09	0.145	-0.316		-0.36
47.645	-41.187	14.528		47.696	-41.263	15.126		-0.051	0.077	-0.599		-0.606
45.248	-41.174	15.188		45.194	-41.141	15.165		0.054	-0.033	0.023		0.067
45.239	-46.861	13.072		45.22	-46.998	13.332		0.019	0.137	-0.259		-0.294
44.562	-51.344	9.664		44.543	-51.483	9.791		0.02	0.139	-0.128		-0.19
44.102	-54.413	4.873		44.085	-54.53	4.922		0.017	0.117	-0.049		-0.128
53.643	-25.608	4.821		53.755	-25.471	4.892		-0.112	-0.137	-0.071		-0.191
52.16	-28.303	9.609		52.282	-28.168	9.769		-0.122	-0.135	-0.16		-0.242
49.983	-32.249	13.033		50.11	-32.143	13.318		-0.127	-0.105	-0.285		-0.329
47.294	-36.921	14.577		47.493	-36.934	15.134		-0.199	0.013	-0.557		-0.591
32.461	-49.636	0.368		32.395	-49.685	0.482		0.066	0.05	-0.113		-0.14
36.815	-53.95	0.196		36.771	-54.019	0.338		0.044	0.069	-0.142		-0.164
45.316	-56.217	0.584		45.311	-56.31	0.683		0.005	0.093	-0.099		-0.136
54.559	-53.887	0.772		54.614	-53.985	0.87		-0.055	0.099	-0.098		-0.15
60.637	-47.606	1.895		60.467	-47.505	1.998		0.17	-0.101	-0.103		0.223
62.903	-39.429	1.901		62.752	-39.426	1.998		0.151	-0.003	-0.097		0.18
5.636	29.691	-10.473		5.636	29.485	-10.535		0	0.206	0.062		0.215
2.266	29.715	-10.468		2.266	29.486	-10.537		0	0.23	0.069		0.24
2.259	26.615	0.07		2.259	26.329	-0.016		0	0.286	0.086		0.298
-1.099	29.759	-10.458		-1.099	29.486	-10.539		0	0.272	0.082		0.284
5.642	20.18	-12.715		5.642	20.001	-12.661		0	0.179	-0.054		-0.187
2.264	23.434	-2.229		2.264	23.156	-2.146		0	0.278	-0.083		-0.29
2.276	20.263	-12.744		2.276	20	-12.666		0	0.263	-0.079		-0.274
-1.092	20.217	-12.735		-1.092	19.999	-12.669		0	0.218	-0.065		-0.228
7.972	27.518	-10.627		8.056	27.518	-10.594		-0.084	0	-0.033		-0.09
7.986	24.992	-10.618		8.055	24.992	-10.591		-0.069	0	-0.027		-0.074
3.79	25.007	-0.093		3.846	25.007	-0.07		-0.056	0	-0.023		-0.061
7.979	22.467	-10.618		8.053	22.467	-10.588		-0.074	0	-0.03		-0.08
-4.778	27.51	-12.542		-4.594	27.51	-12.615		-0.184	0	0.073		0.198
-0.381	25	-2.089		-0.384	25	-2.088		0.003	0	-0.001		-0.003
-4.75	24.985	-12.549		-4.593	24.985	-12.612		-0.157	0	0.063		0.169
-4.782	22.461	-12.532		-4.592	22.461	-12.608		-0.19	0	0.076		0.205
-8.987	4.953	-2.114		-9.214	5.078	-2.114		0.227	-0.125	0		0.259
-9.073	5.013	9.672		-9.209	5.088	9.672		0.135	-0.075	0		0.155
-0.529	10.466	9.668		-0.531	10.507	9.668		0.002	-0.041	0		0.041
-0.505	10.311	-2.113		-0.515	10.508	-2.113		0.01	-0.198	0		0.198
8.439	5.959	-2.101		8.594	6.069	-2.101		-0.155	-0.11	0		0.19
8.634	6.134	9.683		8.577	6.093	9.683		0.057	0.041	0		-0.07
10.204	-3.318	9.694		10.005	-3.253	9.694		0.198	-0.065	0		-0.209
9.932	-3.24	0.855		10.002	-3.263	0.855		-0.07	0.023	0		0.074
0.141	-10.452	0.858		0.142	-10.52	0.858		-0.001	0.068	0		0.068
0.134	-10.633	9.696		0.133	-10.52	9.696		0.001	-0.113	0		-0.113
-9.898	-3.306	9.678		-9.979	-3.333	9.678		0.081	0.027	0		0.086
-9.732	-3.272	0.84		-9.972	-3.353	0.84		0.24	0.081	0		0.253
10.861	-10.239	3.818		10.717	-10.104	3.818		0.144	-0.135	0		0.197
-11.137	-9.657	3.795		-11.128	-9.649	3.795		-0.009	-0.008	0		0.012
-14.564	1.883	0.825		-14.608	1.889	0.825		0.044	-0.006	0		-0.044



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-8.238	12.115	3.76		-8.282	12.18	3.76		0.044	-0.065	0		-0.078
3.584	14.358	0.823		3.567	14.291	0.823		0.017	0.068	0		0.07
13.086	6.992	3.791		12.991	6.942	3.791		0.095	0.051	0		0.108
2.006	2.095	-16.154		2.006	2.095	-16.833		0	0	0.68		0.68
-3.67	3.767	-15.989		-3.67	3.767	-16.833		0	0	0.844		0.844
-3.751	-4.166	-15.983		-3.751	-4.166	-16.833		0	0	0.85		0.85
3.823	-4.019	-15.987		3.823	-4.019	-16.833		0	0	0.847		0.847
-0.92	-0.562	-19.139		-1.445	-1.084	-19.139		0.525	0.523	0		0.741
-9.271	-8.549	13.275		-9.271	-8.549	12.625		0	0	0.65		0.65
-11.913	3.51	13.348		-11.913	3.51	12.625		0	0	0.723		0.723
-0.842	11.993	13.363		-0.842	11.993	12.625		0	0	0.738		0.738
11.32	4.925	13.158		11.32	4.925	12.625		0	0	0.533		0.533
10.669	-7.015	13.066		10.669	-7.015	12.625		0	0	0.441		0.441
0.533	-12.823	13.172		0.533	-12.823	12.625		0	0	0.547		0.547
-0.348	-14.772	6.9		-0.347	-14.725	6.9		-0.001	-0.047	0		0.047
7.028	-46.792	6.813		6.972	-46.792	6.813		0.056	0	0		0.056
7.055	-36.785	6.799		6.972	-36.785	6.799		0.083	0	0		0.083
7.094	-26.778	6.784		6.972	-26.778	6.784		0.122	0	0		0.122
7.108	-16.771	6.769		6.972	-16.771	6.769		0.136	0	0		0.136
4.576	-17.735	6.763		4.447	-17.735	6.763		0.129	0	0		-0.129
4.539	-27.456	6.779		4.447	-27.456	6.779		0.092	0	0		-0.092
4.524	-37.179	6.794		4.447	-37.179	6.794		0.077	0	0		-0.077
4.515	-46.901	6.807		4.447	-46.901	6.807		0.068	0	0		-0.068
-3.859	-46.911	9.75		-3.97	-46.911	9.75		0.111	0	0		0.111
-3.82	-37.227	9.734		-3.97	-37.227	9.734		0.149	0	0		0.149
-3.813	-27.542	9.721		-3.97	-27.542	9.721		0.157	0	0		0.157
-3.856	-17.858	9.706		-3.97	-17.858	9.706		0.113	0	0		0.113
-8.074	-16.129	3.804		-8.178	-16.129	3.804		0.104	0	0		-0.104
-8.12	-26.328	3.819		-8.178	-26.328	3.819		0.058	0	0		-0.058
-8.136	-36.529	3.834		-8.178	-36.529	3.834		0.042	0	0		-0.042
-8.104	-46.729	3.85		-8.178	-46.729	3.85		0.074	0	0		-0.074
-5.948	-50.584	7.258		-5.948	-50.5	7.258		0	-0.084	0		0.084
5.8	-50.431	10.504		5.8	-50.5	10.504		0	0.069	0		-0.069
5.791	-46.552	12.892		5.791	-46.552	12.625		0	0	0.267		0.267
5.809	-37.506	12.935		5.809	-37.506	12.625		0	0	0.31		0.31
5.716	-28.463	13.033		5.716	-28.463	12.625		0	0	0.408		0.408
5.943	-17.494	13.065		5.943	-17.494	12.625		0	0	0.44		0.44
-6.047	-16.938	13.173		-6.047	-16.938	12.625		0	0	0.548		0.548
-6.166	-27.342	13.174		-6.166	-27.342	12.625		0	0	0.549		0.549
-6.188	-36.161	13.11		-6.188	-36.161	12.625		0	0	0.485		0.485
-5.726	-47.914	12.959		-5.726	-47.914	12.625		0	0	0.334		0.334
63.127	-85.8	0.227		63.127	-85.8	0		0	0	0.227		0.227
51.698	-86.17	0.205		51.698	-86.17	0		0	0	0.205		0.205
30.952	-85.694	0.142		30.952	-85.694	0		0	0	0.142		0.142
26.966	-77.976	0.123		26.966	-77.976	0		0	0	0.123		0.123
40.151	-79.701	0.141		40.151	-79.701	0		0	0	0.141		0.141
56.587	-76.308	0.101		56.587	-76.308	0		0	0	0.101		0.101



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
61.235	-67.009	-0.061		61.235	-67.009	0		0	0	-0.061		-0.061
47.244	-70.263	0.015		47.244	-70.263	0		0	0	0.015		0.015
37.724	-65.87	0.007		37.724	-65.87	0		0	0	0.007		0.007
24.074	-65.541	0.068		24.074	-65.541	0		0	0	0.068		0.068
20.111	-53.44	0.105		20.111	-53.44	0		0	0	0.105		0.105
15.342	-46.314	0.213		15.342	-46.314	0		0	0	0.213		0.213
23.751	-45.567	0.073		23.751	-45.567	0		0	0	0.073		0.073
14.988	-35.379	0.244		14.988	-35.379	0		0	0	0.244		0.244
15.852	-25.42	0.263		15.852	-25.42	0		0	0	0.263		0.263
25.764	-28.356	0.086		25.764	-28.356	0		0	0	0.086		0.086
33.748	-23.362	0.017		33.748	-23.362	0		0	0	0.017		0.017
61.84	-24.504	-0.597		61.84	-24.504	0		0	0	-0.597		-0.597
67.279	-35.023	0.111		66.907	-35.023	0		0.371	0	0.111		0.387
65.42	-54.992	-0.281		65.42	-54.992	0		0	0	-0.281		-0.281
69.072	-6.573	-0.755		69.072	-6.573	0		0	0	-0.755		-0.755
66.24	18.424	-0.341		66.24	18.424	0		0	0	-0.341		-0.341
52.333	19	-0.179		52.333	19	0		0	0	-0.179		-0.179
38.456	18.749	-0.016		38.456	18.749	0		0	0	-0.016		-0.016
25.103	19.072	0.235		25.103	19.072	0		0	0	0.235		0.235
27.203	28.531	0.162		27.203	28.531	0		0	0	0.162		0.162
34.344	26.869	0.056		34.344	26.869	0		0	0	0.056		0.056
46.086	25.935	-0.095		46.086	25.935	0		0	0	-0.095		-0.095
45.77	34.478	-0.018		45.77	34.478	0		0	0	-0.018		-0.018
29.795	39.387	0.105		29.795	39.387	0		0	0	0.105		0.105
17.438	42.23	0.131		17.438	42.23	0		0	0	0.131		0.131
7.198	39.355	0.22		7.198	39.355	0		0	0	0.22		0.22
10.367	49.408	0.095		10.367	49.408	0		0	0	0.095		0.095
23.054	52.373	0.087		23.054	52.373	0		0	0	0.087		0.087
43.353	55.627	0.105		43.353	55.627	0		0	0	0.105		0.105
66.545	54.299	0.112		66.545	54.299	0		0	0	0.112		0.112
67.137	38.321	-0.06		67.137	38.321	0		0	0	-0.06		-0.06
-12.086	40.825	0.121		-12.086	40.825	0		0	0	0.121		0.121
-22.659	17.531	0.287		-22.659	17.531	0		0	0	0.287		0.287
-23.964	30.721	0.171		-23.964	30.721	0		0	0	0.171		0.171
-31.141	26.034	0.16		-31.141	26.034	0		0	0	0.16		0.16
-42.872	26.694	0.123		-42.872	26.694	0		0	0	0.123		0.123
-50.365	30.545	0.056		-50.365	30.545	0		0	0	0.056		0.056
-40.322	46.099	0.025		-40.322	46.099	0		0	0	0.025		0.025
-47.446	54.655	-0.113		-47.446	54.655	0		0	0	-0.113		-0.113
-75.458	53.865	-0.209		-75.458	53.865	0		0	0	-0.209		-0.209
-75.67	37.583	-0.189		-75.67	37.583	0		0	0	-0.189		-0.189
-74.453	19.426	-0.136		-74.453	19.426	0		0	0	-0.136		-0.136
-56.976	25.331	0.074		-56.976	25.331	0		0	0	0.074		0.074
-66.012	12.022	0.055		-66.012	12.022	0		0	0	0.055		0.055
-68.524	-1.037	0.042		-68.524	-1.037	0		0	0	0.042		0.042
-76.876	-10.733	-0.198		-76.876	-10.733	0		0	0	-0.198		-0.198
-76.735	-29.207	-0.17		-76.735	-29.207	0		0	0	-0.17		-0.17

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-62.47	-24.803	0.134		-62.47	-24.803	0		0	0	0.134		0.134
-49.784	-21.838	0.195		-49.784	-21.838	0		0	0	0.195		0.195
-35.455	-26.537	0.223		-35.455	-26.537	0		0	0	0.223		0.223
-22.701	-18.05	0.317		-22.701	-18.05	0		0	0	0.317		0.317
-27.71	-36.998	0.201		-27.71	-36.998	0		0	0	0.201		0.201
-13.579	-51.078	0.071		-13.579	-51.078	0		0	0	0.071		0.071
-5.077	-60.131	0.03		-5.077	-60.131	0		0	0	0.03		0.03
-6.311	-70.935	-0.052		-6.311	-70.935	0		0	0	-0.052		-0.052
-7.653	-86.153	0		-7.653	-86.153	0		0	0	0		0
-27.08	-90.751	0.019		-27.08	-90.751	0		0	0	0.019		0.019
-40.773	-88.511	-0.021		-40.773	-88.511	0		0	0	-0.021		-0.021
-53.53	-82.102	0.074		-53.53	-82.102	0		0	0	0.074		0.074
-62.738	-90.727	0.056		-62.738	-90.727	0		0	0	0.056		0.056
-77.066	-86.029	0.038		-77.066	-86.029	0		0	0	0.038		0.038
-75.413	-64.457	-0.079		-75.413	-64.457	0		0	0	-0.079		-0.079
-71.809	-44.187	0.003		-71.809	-44.187	0		0	0	0.003		0.003
-65.653	-56.088	0.114		-65.653	-56.088	0		0	0	0.114		0.114
-62.023	-65.879	0.105		-62.023	-65.879	0		0	0	0.105		0.105
-50.309	-58.813	0.134		-50.309	-58.813	0		0	0	0.134		0.134
-50.061	-72.869	0.059		-50.061	-72.869	0		0	0	0.059		0.059
-13.927	-37.962	-16.529		-13.927	-37.962	-16.833		0	0	0.304		0.304
-14.326	-16.561	-16.355		-14.326	-16.561	-16.833		0	0	0.478		0.478
-13.515	16.114	-16.379		-13.515	16.114	-16.833		0	0	0.455		0.455
-13.348	29.32	-16.567		-13.348	29.32	-16.833		0	0	0.266		0.266
14.712	31.587	-16.629		14.712	31.587	-16.833		0	0	0.204		0.204
15.58	23.882	-16.533		15.58	23.882	-16.833		0	0	0.3		0.3
15.847	12.19	-16.304		15.847	12.19	-16.833		0	0	0.529		0.529
60.034	4.283	-16.284		60.034	4.283	-16.833		0	0	0.55		0.55
58.478	-9.989	-16.472		58.478	-9.989	-16.833		0	0	0.361		0.361
48.986	-15.284	-16.916		48.986	-15.284	-16.833		0	0	-0.082		-0.082
36.576	-9.691	-16.607		36.576	-9.691	-16.833		0	0	0.227		0.227
30.808	-17.715	-16.8		30.808	-17.715	-16.833		0	0	0.033		0.033
13.35	-15.201	-16.324		13.35	-15.201	-16.833		0	0	0.509		0.509
19.625	2.804	-3.631		19.625	2.804	-4.208		0	0	0.577		0.577
29.011	7.214	-3.891		29.011	7.214	-4.208		0	0	0.317		0.317
34.537	2.956	-3.846		34.537	2.956	-4.208		0	0	0.362		0.362
41.29	7.339	-3.997		41.29	7.339	-4.208		0	0	0.211		0.211
46.517	2.154	-3.814		46.517	2.154	-4.208		0	0	0.394		0.394
52.114	8.374	-4.117		52.114	8.374	-4.208		0	0	0.091		0.091
50.944	-4.119	-0.039		50.944	-4.03	0		0	-0.089	-0.039		-0.097
40.42	-3.012	0.465		40.42	-3.012	0		0	0	0.465		0.465
28.727	-2.824	0.372		28.727	-2.824	0		0	0	0.372		0.372
17.038	-2.022	-0.158		17.038	-2.022	0		0	0	-0.158		-0.158
18.658	-9.347	1.965		18.658	-9.347	1.683		0	0	0.282		0.282
24.816	-6.509	1.969		24.816	-6.509	1.683		0	0	0.286		0.286
25.931	-14.817	1.766		25.931	-14.817	1.683		0	0	0.082		0.082
18.898	-12.017	-4.067		18.898	-12.447	-4.067		0	0.43	0		-0.43

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
24.814	-16.681	0.327		24.59	-16.655	0.327		0.224	-0.026	0		0.226
33.105	-3.627	-4.132		33.105	-4.03	-4.132		0	0.403	0		-0.403
40.126	-3.574	-3.37		40.126	-4.03	-3.37		0	0.456	0		-0.456
52.749	-3.54	-4.635		52.749	-4.03	-4.635		0	0.491	0		-0.491
54.838	0.226	-8.915		55.258	0.092	-8.915		-0.42	0.134	0		-0.441
56.132	7.879	-9.671		56.527	7.879	-9.671		-0.396	0	0		-0.396
59.576	12.496	-0.88		59.576	12.374	-0.618		0	0.122	-0.262		-0.289
49.361	13.295	-1.559		49.361	13.183	-1.365		0	0.112	-0.194		-0.224
39.522	12.5	-1.419		39.522	12.39	-1.309		0	0.109	-0.109		-0.155

### 3D-Tol Data from CMM for Wax Pattern (Polyamide3)

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
53.907	58.194	-6.5		53.907	58.917	-6.5		0	-0.723	0		-0.723
37.36	58.16	-6.482		37.36	58.917	-6.482		0	-0.756	0		-0.756
20.816	58.118	-6.463		20.816	58.917	-6.463		0	-0.799	0		-0.799
4.272	58.098	-6.445		4.272	58.917	-6.445		0	-0.819	0		-0.819
-12.274	58.074	-6.426		-12.274	58.917	-6.426		0	-0.843	0		-0.843
-28.818	58.078	-6.408		-28.818	58.917	-6.408		0	-0.839	0		-0.839
-45.361	58.207	-6.39		-45.361	58.917	-6.39		0	-0.71	0		-0.71
-61.908	58.288	-6.373		-61.908	58.917	-6.373		0	-0.629	0		-0.629
-79.479	40.956	-6.309		-79.958	40.956	-6.309		0.479	0	0		-0.479
-79.465	24.413	-6.266		-79.958	24.413	-6.266		0.493	0	0		-0.493
-79.417	7.867	-6.225		-79.958	7.867	-6.225		0.542	0	0		-0.542
-79.389	-8.677	-6.183		-79.958	-8.677	-6.183		0.569	0	0		-0.569
-79.393	-25.224	-6.14		-79.958	-25.224	-6.14		0.566	0	0		-0.566
-79.432	-41.767	-6.097		-79.958	-41.767	-6.097		0.526	0	0		-0.526
-79.47	-58.313	-6.056		-79.958	-58.313	-6.056		0.488	0	0		-0.488
-79.5	-74.857	-6.014		-79.958	-74.857	-6.014		0.458	0	0		-0.458
-61.794	-92.154	-5.984		-61.794	-92.583	-5.984		0	0.429	0		-0.429
-45.25	-92.061	-6.002		-45.25	-92.583	-6.002		0	0.522	0		-0.522
-28.705	-91.965	-6.02		-28.705	-92.583	-6.02		0	0.618	0		-0.618
-12.16	-91.968	-6.039		-12.16	-92.583	-6.039		0	0.615	0		-0.615
4.385	-91.886	-6.057		4.385	-92.583	-6.057		0	0.698	0		-0.698
20.928	-91.89	-6.075		20.928	-92.583	-6.075		0	0.693	0		-0.693
37.474	-91.938	-6.093		37.474	-92.583	-6.093		0	0.646	0		-0.646
54.018	-92.087	-6.111		54.018	-92.583	-6.111		0	0.497	0		-0.497
70.787	-74.746	-6.178		71.542	-74.746	-6.178		-0.754	0	0		-0.754
70.728	-58.202	-6.218		71.542	-58.202	-6.218		-0.814	0	0		-0.814
70.699	-41.657	-6.261		71.542	-41.657	-6.261		-0.843	0	0		-0.843
70.654	-25.113	-6.302		71.542	-25.113	-6.302		-0.887	0	0		-0.887
70.617	-8.567	-6.344		71.542	-8.567	-6.344		-0.925	0	0		-0.925
70.613	7.977	-6.387		71.542	7.977	-6.387		-0.928	0	0		-0.928
70.692	24.523	-6.429		71.542	24.523	-6.429		-0.85	0	0		-0.85

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
70.791	41.066	-6.471		71.542	41.066	-6.471		-0.751	0	0		-0.751
-69.622	43.697	7.975		-69.622	43.697	8.417		0	0	-0.442		-0.442
-64.572	43.701	7.916		-64.572	43.701	8.417		0	0	-0.501		-0.501
-63.627	48.751	8.555		-63.125	48.751	8.417		-0.502	0	0.138		0.52
-69.627	48.746	7.901		-69.627	48.746	8.417		0	0	-0.516		-0.516
-67.493	46.341	7.759		-67.493	46.341	8.417		0	0	-0.657		-0.657
-71.407	43.687	6.301		-71.542	43.687	6.301		0.134	0	0		-0.134
-71.398	48.738	6.288		-71.542	48.738	6.288		0.144	0	0		-0.144
-69.63	50.442	6.281		-69.63	50.5	6.281		0	-0.058	0		-0.058
-64.581	50.339	6.277		-64.581	50.5	6.277		0	-0.161	0		-0.161
-63.613	41.97	6.3		-63.125	42.083	6.3		-0.488	-0.113	0		0.5
-69.624	42.65	6.306		-69.624	42.083	6.306		0	0.567	0		-0.567
-63.678	48.745	6.281		-63.125	48.745	6.281		-0.553	0	0		-0.553
-63.715	43.695	6.296		-63.125	43.695	6.296		-0.59	0	0		-0.59
-64.533	-14.385	3.985		-64.533	-14.385	4.208		0	0	-0.223		-0.223
-69.586	-14.389	3.941		-69.586	-14.389	4.208		0	0	-0.268		-0.268
-69.581	-19.439	3.954		-69.581	-19.439	4.208		0	0	-0.254		-0.254
-64.53	-19.435	4.02		-64.53	-19.435	4.208		0	0	-0.188		-0.188
-67.705	-16.815	3.91		-67.705	-16.815	4.208		0	0	-0.298		-0.298
-69.588	-12.48	3.941		-69.588	-12.625	4.208		0	0.145	-0.267		0.304
-64.538	-12.524	3.975		-64.538	-12.625	4.208		0	0.101	-0.233		0.254
-63.074	-14.388	4.025		-63.125	-14.388	4.208		0.051	0	-0.183		0.19
-63.074	-19.438	4.035		-63.125	-19.438	4.208		0.051	0	-0.174		0.181
-64.528	-20.867	3.095		-64.528	-21.042	3.095		0	0.175	0		-0.175
-69.581	-20.922	3.102		-69.581	-21.042	3.102		0	0.119	0		-0.119
-71.682	-19.445	3.095		-71.542	-19.445	3.095		-0.141	0	0		0.141
-71.654	-14.396	3.084		-71.542	-14.396	3.084		-0.112	0	0		0.112
-64.484	-77.499	8.106		-64.484	-77.499	8.417		0	0	-0.311		-0.311
-69.536	-77.503	8.16		-69.536	-77.503	8.417		0	0	-0.256		-0.256
-69.531	-82.554	8.168		-69.531	-82.554	8.417		0	0	-0.248		-0.248
-64.481	-82.549	8.139		-64.481	-82.549	8.417		0	0	-0.277		-0.277
-69.539	-76.55	6.604		-69.539	-75.75	6.604		0	-0.8	0		-0.8
-63.503	-75.742	6.601		-63.125	-75.75	6.601		-0.378	0.008	0		0.378
-63.047	-76.524	6.603		-63.125	-75.75	6.603		0.078	-0.774	0		0.778
-63.002	-83.522	6.617		-63.125	-84.167	6.617		0.123	0.644	0		0.656
-64.478	-84.11	6.623		-64.478	-84.167	6.623		0	0.057	0		-0.057
-69.532	-84.182	6.629		-69.532	-84.167	6.629		0	-0.015	0		0.015
-71.472	-82.561	6.622		-71.542	-82.561	6.622		0.07	0	0		-0.07
-71.339	-77.512	6.612		-71.542	-77.512	6.612		0.203	0	0		-0.203
-2.294	43.736	4.116		-2.294	43.736	4.208		0	0	-0.092		-0.092
2.757	43.739	4.071		2.757	43.739	4.208		0	0	-0.137		-0.137
2.753	48.79	3.97		2.753	48.79	4.208		0	0	-0.238		-0.238
-2.298	48.785	4.01		-2.298	48.785	4.208		0	0	-0.198		-0.198
-0.456	46.773	4.048		-0.456	46.773	4.208		0	0	-0.16		-0.16
-4.018	43.724	1.597		-4.208	43.724	1.597		0.191	0	0		-0.191
-4.015	48.773	1.586		-4.208	48.773	1.586		0.193	0	0		-0.193
2.756	42.427	1.597		2.756	42.083	1.597		0	0.344	0		-0.344

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-2.295	42.45	1.603		-2.295	42.083	1.603		0	0.366	0		-0.366
3.994	48.783	1.578		4.208	48.783	1.578		-0.214	0	0		-0.214
4.019	43.733	1.592		4.208	43.733	1.592		-0.189	0	0		-0.189
-2.301	50.519	1.577		-2.301	50.5	1.577		0	0.019	0		0.019
2.748	50.517	1.573		2.748	50.5	1.573		0	0.017	0		0.017
-64.937	36.504	-1.68		-64.717	36.283	-1.68		-0.22	0.22	0		-0.311
-54.235	47.232	-1.718		-54.001	46.999	-1.718		-0.233	0.233	0		-0.33
-46.746	46.807	-1.727		-46.776	46.776	-1.727		0.031	0.031	0		-0.043
-36.038	36.091	-1.712		-36.064	36.064	-1.712		0.026	0.026	0		-0.037
-40.947	28.792	-1.69		-40.821	28.918	-1.69		-0.126	-0.126	0		-0.178
-48.102	35.923	-1.701		-47.964	36.061	-1.701		-0.138	-0.138	0		-0.195
-35.742	29.734	-2.08		-35.65	29.641	-2.08		-0.092	0.092	0		0.131
-54.143	35.243	-1.694		-53.998	35.099	-1.694		-0.145	0.145	0		0.204
-58.929	30.504	-1.677		-58.761	30.336	-1.677		-0.168	0.168	0		0.237
-65.378	29.302	-1.564		-65.194	29.485	-1.564		-0.183	-0.183	0		-0.259
-61.167	33.465	-4.33		-61.167	33.465	-4.208		0	0	-0.121		-0.121
-56.601	38.223	-4.324		-56.601	38.223	-4.208		0	0	-0.115		-0.115
-50.109	43.631	-4.341		-50.109	43.631	-4.208		0	0	-0.133		-0.133
-44.545	38.588	-4.163		-44.545	38.588	-4.208		0	0	0.046		0.046
-39.866	33.784	-4.043		-39.866	33.784	-4.208		0	0	0.166		0.166
49.895	42.5	5.332		49.895	42.083	5.332		0	0.417	0		-0.417
43.159	42.543	5.34		43.159	42.083	5.34		0	0.459	0		-0.459
55.035	30.309	5.357		54.708	30.309	5.357		0.326	0	0		-0.326
55.063	37.043	5.337		54.708	37.043	5.337		0.355	0	0		-0.355
59.046	25.644	4.871		59.046	25.25	4.871		0	0.394	0		-0.394
62.906	30.318	5.346		63.125	30.318	5.346		-0.219	0	0		-0.219
62.909	37.893	5.331		63.125	37.893	5.331		-0.216	0	0		-0.216
62.935	45.468	5.312		63.125	45.468	5.312		-0.19	0	0		-0.19
58.303	50.371	5.298		58.303	50.5	5.298		0	-0.129	0		-0.129
50.726	50.374	5.308		50.726	50.5	5.308		0	-0.126	0		-0.126
43.15	50.371	5.315		43.15	50.5	5.315		0	-0.129	0		-0.129
38.282	46.238	4.614		37.875	46.238	4.614		0.407	0	0		-0.407
43.409	46.423	7.912		43.409	46.423	8.417		0	0	-0.505		-0.505
50.641	46.138	7.87		50.641	46.138	8.417		0	0	-0.547		-0.547
58.612	45.812	7.82		58.612	45.812	8.417		0	0	-0.596		-0.596
59.359	37.548	7.868		59.359	37.548	8.417		0	0	-0.548		-0.548
59.24	30.703	7.913		59.24	30.703	8.417		0	0	-0.503		-0.503
-30.66	49.335	16.192		-30.66	48.651	16.588		0	0.685	-0.395		-0.79
-30.662	46.211	11.298		-30.662	45.75	11.563		0	0.461	-0.266		-0.532
-30.665	43.196	6.338		-30.665	42.849	6.538		0	0.347	-0.2		-0.4
-30.668	40.204	1.363		-30.668	39.947	1.512		0	0.257	-0.148		-0.297
-26.881	40.174	1.378		-26.881	39.946	1.51		0	0.229	-0.132		-0.264
-26.88	43.194	6.336		-26.88	42.847	6.536		0	0.346	-0.2		-0.4
-26.877	46.235	11.281		-26.877	45.749	11.562		0	0.486	-0.28		-0.561
-26.873	49.222	16.256		-26.873	48.65	16.586		0	0.572	-0.33		-0.661
-23.083	49.187	16.275		-23.083	48.649	16.585		0	0.538	-0.31		-0.621
-23.087	46.199	11.299		-23.087	45.748	11.56		0	0.451	-0.26		-0.521

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-23.09	43.202	6.327		-23.09	42.846	6.533		0	0.356	-0.206		-0.411
-23.094	40.161	1.383		-23.094	39.945	1.508		0	0.216	-0.125		-0.249
-16.785	45.573	1.335		-16.785	45.284	1.413		0	0.289	-0.078		-0.3
-16.78	47.755	8.828		-16.78	47.303	8.949		0	0.452	-0.121		-0.468
-16.774	49.976	16.827		-16.774	50.462	16.957		0	-0.485	-0.13		0.503
-11.722	49.956	16.828		-11.722	50.46	16.963		0	-0.504	-0.135		0.521
-11.729	47.756	8.824		-11.729	47.302	8.946		0	0.454	-0.122		-0.47
-11.736	45.59	1.327		-11.736	45.283	1.409		0	0.307	-0.082		-0.318
-8.666	49.587	7.011		-8.178	49.587	7.011		-0.488	0	0		-0.488
-30.667	51.329	14.684		-30.667	51.088	14.619		0	0.241	0.065		0.249
-30.676	52.809	9.022		-30.676	52.603	8.967		0	0.207	0.055		0.214
-30.683	54.157	3.322		-30.683	54.118	3.312		0	0.039	0.01		0.04
-23.946	54.069	3.291		-23.946	54.12	3.305		0	-0.051	-0.014		-0.053
-23.943	52.712	8.988		-23.943	52.605	8.959		0	0.108	0.029		0.111
-23.936	51.298	14.668		-23.936	51.09	14.612		0	0.209	0.056		0.216
-17.199	51.246	14.645		-17.199	51.092	14.604		0	0.154	0.041		0.159
-17.208	52.671	8.968		-17.208	52.607	8.951		0	0.064	0.017		0.066
-17.217	54.063	3.281		-17.217	54.122	3.297		0	-0.059	-0.016		-0.061
-10.481	54.087	3.278		-10.481	54.124	3.288		0	-0.037	-0.01		-0.039
-10.476	52.642	8.953		-10.476	52.609	8.944		0	0.034	0.009		0.035
-10.469	51.236	14.634		-10.469	51.094	14.596		0	0.142	0.038		0.147
-32.94	48.916	9.185		-33.428	48.916	9.185		0.488	0	0		-0.488
5.112	-63.117	18.675		5.011	-63.117	18.702		0.101	0	-0.027		-0.105
3.293	-63.137	11.587		3.117	-63.137	11.634		0.175	0	-0.047		-0.182
1.279	-63.157	4.552		1.224	-63.157	4.567		0.055	0	-0.015		-0.057
1.318	-69.891	4.561		1.229	-69.891	4.585		0.089	0	-0.024		-0.092
3.213	-69.869	11.627		3.122	-69.869	11.651		0.091	0	-0.025		-0.095
5.114	-69.85	18.692		5.016	-69.85	18.718		0.099	0	-0.026		-0.102
5.107	-76.586	18.712		5.02	-76.586	18.735		0.087	0	-0.023		-0.091
3.268	-76.604	11.63		3.126	-76.604	11.668		0.142	0	-0.038		-0.147
1.375	-76.623	4.562		1.233	-76.623	4.601		0.143	0	-0.038		-0.148
1.327	-83.358	4.596		1.238	-83.358	4.62		0.089	0	-0.024		-0.092
3.229	-83.337	11.66		3.131	-83.337	11.686		0.098	0	-0.026		-0.101
5.221	-83.317	18.703		5.025	-83.317	18.755		0.195	0	-0.052		-0.202
7.795	-85.478	10.175		7.795	-85.85	10.175		0	0.372	0		-0.372
7.596	-83.307	20.767		7.842	-83.307	20.909		-0.247	0	-0.142		-0.285
12.984	-83.327	11.311		13.284	-83.327	11.484		-0.299	0	-0.173		-0.346
18.461	-83.347	1.911		18.723	-83.347	2.063		-0.262	0	-0.151		-0.303
18.51	-75.772	1.923		18.73	-75.772	2.05		-0.221	0	-0.128		-0.255
13.019	-75.752	11.317		13.29	-75.752	11.473		-0.271	0	-0.156		-0.313
7.546	-75.733	20.722		7.849	-75.733	20.897		-0.303	0	-0.175		-0.35
6.754	-69.42	20.836		7.023	-69.42	20.908		-0.269	0	-0.072		-0.279
9.311	-69.443	11.419		9.548	-69.443	11.483		-0.237	0	-0.063		-0.245
11.894	-69.465	2.009		12.074	-69.465	2.057		-0.18	0	-0.048		-0.186
11.911	-64.414	2.003		12.076	-64.414	2.047		-0.165	0	-0.044		-0.171
9.317	-64.393	11.409		9.551	-64.393	11.471		-0.234	0	-0.063		-0.242
6.789	-64.371	20.833		7.026	-64.371	20.897		-0.236	0	-0.063		-0.245

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
6.757	-61.409	10.859		6.757	-60.6	10.859		0	-0.809	0		-0.809
-30.209	-50.871	-5.361		-30.218	-50.668	-5.608		0.009	-0.203	0.246		0.319
-29.922	-55.346	-7.637		-29.928	-55.198	-7.909		0.006	-0.148	0.272		0.31
-29.683	-58.827	-11.712		-29.687	-58.652	-11.802		0.005	-0.174	0.091		0.197
-29.5	-61.793	-15.932		-29.5	-61.745	-16.006		0	-0.048	0.074		0.088
-33.451	-63.589	-16.115		-33.44	-63.6	-16.089		-0.012	0.011	-0.026		-0.03
-35.8	-61.47	-11.859		-35.81	-61.461	-11.866		0.01	-0.009	0.007		0.015
-38.295	-59.237	-7.907		-38.324	-59.21	-7.976		0.029	-0.027	0.069		0.08
-41.72	-56.163	-5.677		-41.723	-56.161	-5.682		0.003	-0.003	0.005		0.006
-46.236	-68.214	-5.893		-46.052	-68.204	-5.662		-0.185	-0.01	-0.232		-0.296
-41.539	-67.999	-8.13		-41.455	-67.994	-7.982		-0.084	-0.005	-0.148		-0.171
-38.338	-67.869	-11.984		-38.097	-67.855	-11.859		-0.241	-0.015	-0.125		-0.272
-35.001	-67.721	-16.217		-34.917	-67.715	-16.081		-0.084	-0.006	-0.136		-0.16
-33.125	-71.754	-16.177		-33.044	-71.657	-15.987		-0.08	-0.097	-0.19		-0.228
-35.343	-74.14	-11.94		-35.145	-73.91	-11.782		-0.199	-0.23	-0.158		-0.342
-37.588	-76.531	-8.181		-37.492	-76.423	-7.917		-0.096	-0.108	-0.264		-0.301
-40.833	-80.028	-5.921		-40.629	-79.8	-5.561		-0.204	-0.228	-0.361		-0.473
-29.524	-67.453	-16.862		-29.524	-67.454	-16.853		0.001	0.001	-0.009		-0.009
-26.46	-62.544	-15.799		-26.419	-62.477	-15.911		-0.042	-0.067	0.112		0.137
-25.09	-60.024	-11.627		-24.986	-59.848	-11.734		-0.105	-0.175	0.106		0.23
-23.383	-56.85	-7.569		-23.309	-56.724	-7.846		-0.073	-0.126	0.277		0.313
-21.254	-52.946	-5.22		-21.132	-52.731	-5.5		-0.122	-0.214	0.28		0.374
-13.284	-62.747	-5.213		-13.145	-62.708	-5.365		-0.14	-0.04	0.152		0.21
-17.621	-64.026	-7.558		-17.515	-63.996	-7.774		-0.106	-0.03	0.217		0.243
-21.127	-65.082	-11.587		-21.001	-65.048	-11.655		-0.126	-0.034	0.068		0.148
-23.81	-65.881	-15.72		-23.755	-65.867	-15.795		-0.055	-0.014	0.075		0.094
-24.194	-70.142	-15.804		-24.224	-70.126	-15.761		0.03	-0.016	-0.044		-0.055
-21.701	-71.489	-11.636		-21.722	-71.478	-11.624		0.021	-0.011	-0.012		-0.027
-18.503	-73.224	-7.758		-18.504	-73.224	-7.756		0.001	-0.001	-0.002		-0.002
-14.427	-75.439	-5.416		-14.501	-75.399	-5.329		0.074	-0.04	-0.086		-0.121
-24.353	-83.702	-5.645		-24.421	-83.485	-5.401		0.068	-0.217	-0.244		-0.334
-25.688	-79.178	-7.959		-25.713	-79.101	-7.801		0.025	-0.077	-0.158		-0.177
-26.661	-75.843	-11.768		-26.723	-75.652	-11.663		0.063	-0.191	-0.105		-0.227
-27.517	-72.958	-15.964		-27.551	-72.861	-15.825		0.034	-0.097	-0.139		-0.173
-32.274	-72.355	-16.082		-32.176	-72.308	-15.953		-0.098	-0.047	-0.129		-0.169
-33.851	-75.114	-11.872		-33.634	-74.976	-11.754		-0.217	-0.138	-0.117		-0.283
-35.423	-78.064	-8.067		-35.298	-78.023	-7.89		-0.125	-0.041	-0.177		-0.221
-37.795	-82.151	-5.778		-37.504	-82.06	-5.525		-0.291	-0.091	-0.253		-0.396
-25.068	-86.461	-0.895		-25.126	-86.207	-0.58		0.058	-0.255	-0.316		-0.41
-12.863	-77.16	-0.799		-12.93	-77.12	-0.72		0.067	-0.039	-0.079		-0.111
-11.191	-61.957	-0.524		-11.02	-61.907	-0.708		-0.171	-0.05	0.184		0.256
-16.147	-53.949	-0.398		-15.918	-53.719	-0.727		-0.229	-0.23	0.329		0.462
-25.565	-48.708	-0.302		-25.507	-48.431	-0.625		-0.058	-0.277	0.323		0.43
-47.391	-37.965	18.381		-46.99	-37.793	18.633		-0.401	-0.172	-0.252		-0.504
-44.021	-36.395	12.11		-43.689	-36.246	12.321		-0.332	-0.149	-0.21		-0.421
-40.703	-34.839	5.808		-40.389	-34.696	6.007		-0.313	-0.143	-0.199		-0.398
-39.854	-41.302	5.829		-39.574	-41.354	5.994		-0.28	0.053	-0.165		-0.329



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-43.46	-40.611	12.129		-43.154	-40.668	12.308		-0.305	0.057	-0.179		-0.359
-47.124	-39.911	18.392		-46.734	-39.982	18.621		-0.391	0.071	-0.229		-0.458
-47.933	-41.78	18.52		-47.762	-41.945	18.657		-0.171	0.165	-0.137		-0.274
-45.358	-44.494	12.263		-45.258	-44.595	12.345		-0.1	0.101	-0.082		-0.164
-42.817	-47.192	5.985		-42.76	-47.251	6.032		-0.057	0.058	-0.047		-0.094
-48.804	-50.325	6.169		-48.82	-50.223	6.109		0.016	-0.102	0.06		0.12
-49.276	-46.683	12.465		-49.289	-46.607	12.421		0.013	-0.076	0.044		0.089
-49.768	-43.023	18.749		-49.774	-42.993	18.732		0.006	-0.03	0.018		0.035
-52.17	-42.85	18.937		-52.081	-42.661	18.816		-0.089	-0.189	0.12		0.241
-53.916	-46.097	12.647		-53.804	-45.875	12.504		-0.111	-0.221	0.143		0.286
-55.64	-49.28	6.323		-55.538	-49.081	6.194		-0.103	-0.199	0.129		0.259
-52.061	-40.154	22.828		-51.81	-40.017	22.663		-0.251	-0.137	0.165		0.33
-57.314	-42.701	12.735		-57.052	-42.571	12.566		-0.261	-0.13	0.169		0.337
-62.507	-45.199	2.595		-62.306	-45.101	2.466		-0.201	-0.099	0.129		0.258
-63.536	-36.873	2.543		-63.425	-36.894	2.478		-0.111	0.021	0.065		0.13
-57.87	-37.909	12.687		-57.688	-37.943	12.581		-0.182	0.034	0.107		0.214
-52.146	-38.965	22.791		-51.955	-39.004	22.678		-0.191	0.039	0.113		0.226
-51.37	-38.184	22.58		-51.429	-38.109	22.635		0.058	-0.075	-0.055		-0.109
-55.434	-33.839	12.551		-55.42	-33.855	12.539		-0.014	0.015	0.012		0.024
-59.412	-29.656	2.417		-59.438	-29.628	2.439		0.026	-0.028	-0.022		-0.044
-51.922	-26.315	2.279		-51.938	-26.166	2.366		0.016	-0.149	-0.086		-0.173
-51.17	-32.103	12.374		-51.184	-31.949	12.463		0.014	-0.154	-0.089		-0.178
-49.802	-37.964	22.661		-49.782	-37.986	22.656		-0.02	0.022	0.006		0.03
-50.137	-38.07	22.286		-49.734	-37.899	22.484		-0.403	-0.171	-0.198		-0.481
-47.175	-32.935	12.24		-46.939	-32.781	12.384		-0.236	-0.154	-0.143		-0.316
-44.333	-27.799	2.16		-44.142	-27.663	2.282		-0.191	-0.136	-0.122		-0.264
-45.941	3.941	24.787		-45.854	3.852	24.903		-0.087	0.089	-0.116		-0.171
-50.193	7.911	27.727		-50.152	7.871	27.535		-0.041	0.04	0.192		0.201
-53.929	11.4	21.791		-53.706	11.185	21.658		-0.223	0.215	0.132		0.337
-56.568	13.849	7.997		-56.401	13.689	7.955		-0.167	0.16	0.042		0.235
-62.134	-1.714	8.067		-61.81	-1.686	8.008		-0.324	-0.028	0.059		0.331
-58.562	-1.387	21.9		-58.133	-1.351	21.715		-0.429	-0.036	0.185		0.468
-53.323	-0.944	27.796		-53.255	-0.938	27.553		-0.068	-0.006	0.244		0.253
-47.69	-0.495	24.618		-47.42	-0.471	24.869		-0.27	-0.024	-0.251		-0.369
-45.215	-4.551	24.839		-45.156	-4.466	24.936		-0.059	-0.085	-0.097		-0.142
-48.785	-9.166	27.756		-48.745	-9.111	27.53		-0.04	-0.055	0.226		0.236
-51.854	-13.186	21.814		-51.679	-12.95	21.688		-0.175	-0.236	0.126		0.32
-54.042	-16.072	8.053		-53.901	-15.884	8.011		-0.14	-0.189	0.043		0.239
-38.171	-19.422	7.962		-38.172	-19.417	7.961		0.001	-0.005	0.001		0.005
-38.83	-15.836	21.606		-38.832	-15.824	21.601		0.002	-0.012	0.005		0.013
-39.674	-11.265	27.694		-39.689	-11.191	27.479		0.016	-0.074	0.215		0.228
-40.78	-5.166	25.241		-40.731	-5.36	25.05		-0.049	0.194	0.191		0.276
-40.082	19.663	7.876		-40.076	19.719	7.886		-0.006	-0.056	-0.01		-0.057
-40.394	16.053	21.54		-40.39	16.086	21.554		-0.003	-0.032	-0.014		-0.035
-40.788	11.424	27.639		-40.794	11.368	27.48		0.006	0.055	0.159		0.169
-41.285	5.278	25.167		-41.261	5.434	25.016		-0.024	-0.157	0.151		0.219
-38.695	4.016	25.389		-38.494	4.254	25.089		-0.201	-0.238	0.299		0.432



MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-34.892	9.08	27.532		-34.914	9.052	27.441		0.022	0.028	0.092		0.098
-32.225	12.586	21.409		-32.094	12.752	21.497		-0.13	-0.166	-0.089		-0.229
-30.036	15.445	7.817		-29.89	15.632	7.86		-0.146	-0.187	-0.043		-0.241
-23.748	6.711	7.802		-23.465	6.814	7.857		-0.282	-0.103	-0.054		-0.305
-27.181	5.457	21.33		-26.863	5.574	21.472		-0.319	-0.117	-0.142		-0.368
-31.16	3.982	27.449		-31.173	3.978	27.415		0.013	0.005	0.034		0.037
-37.15	1.717	25.506		-36.787	1.844	25.133		-0.364	-0.127	0.373		0.536
-36.972	-0.994	25.539		-36.57	-1.073	25.142		-0.402	0.078	0.398		0.571
-30.687	-2.304	27.428		-30.693	-2.303	27.412		0.006	-0.001	0.016		0.017
-26.569	-3.176	21.325		-26.207	-3.25	21.48		-0.363	0.074	-0.155		-0.402
-23.013	-3.948	7.811		-22.672	-4.019	7.874		-0.341	0.071	-0.063		-0.354
-27.868	-13.499	7.875		-27.714	-13.645	7.914		-0.154	0.146	-0.038		-0.216
-30.471	-10.945	21.433		-30.305	-11.101	21.529		-0.166	0.156	-0.096		-0.247
-33.593	-7.907	27.544		-33.624	-7.879	27.436		0.031	-0.028	0.108		0.115
-38.14	-3.486	25.428		-37.896	-3.702	25.113		-0.244	0.216	0.314		0.453
-41.805	5.349	25.124		-41.799	5.476	25.003		-0.007	-0.127	0.121		0.176
-41.915	11.48	27.661		-41.916	11.42	27.487		0.001	0.06	0.174		0.184
-41.976	16.184	21.573		-41.976	16.169	21.567		0	0.015	0.006		0.016
-42.026	19.793	7.888		-42.026	19.819	7.893		0	-0.027	-0.005		-0.027
-40.829	0.522	20.329		-40.397	0.702	20.042		-0.432	-0.18	0.286		0.549
-44.953	0.258	21.115		-44.69	0.235	21.289		-0.263	0.024	-0.174		-0.317
-40.713	-1.716	21.466		-40.479	-2.01	21.22		-0.234	0.294	0.246		0.449
44.959	-41.034	14.734		45.157	-41.21	15.154		-0.197	0.176	-0.42		-0.496
42.446	-46.013	13.121		42.465	-46.138	13.308		-0.018	0.125	-0.188		-0.226
40.257	-50.057	9.531		40.248	-50.196	9.643		0.01	0.139	-0.112		-0.179
38.789	-52.826	4.604		38.777	-52.887	4.628		0.011	0.061	-0.023		-0.066
31.877	-44.882	4.603		31.745	-44.935	4.659		0.132	0.053	-0.056		-0.153
34.825	-43.718	9.511		34.631	-43.795	9.697		0.193	0.077	-0.186		-0.279
39.156	-42.016	12.99		38.976	-42.089	13.357		0.18	0.073	-0.367		-0.415
45.019	-40.484	15.35		45.437	-40.697	15.226		-0.417	0.213	0.123		0.485
44.247	-38.318	14.645		44.181	-38.292	15.167		0.066	-0.026	-0.522		-0.527
39.038	-36.571	12.936		38.832	-36.499	13.346		0.206	-0.073	-0.41		-0.464
34.69	-35.115	9.415		34.41	-35.018	9.679		0.28	-0.097	-0.264		-0.397
31.745	-34.138	4.521		31.47	-34.044	4.634		0.275	-0.094	-0.114		-0.312
38.487	-25.889	4.441		38.322	-25.609	4.566		0.165	-0.28	-0.126		-0.348
40.058	-28.44	9.37		39.924	-28.211	9.603		0.133	-0.228	-0.232		-0.352
42.426	-32.307	12.954		42.338	-32.15	13.286		0.089	-0.157	-0.332		-0.378
45.298	-37.007	14.618		45.266	-36.937	15.146		0.033	-0.07	-0.528		-0.533
46.946	-36.681	14.575		46.968	-36.599	15.116		-0.022	-0.082	-0.54		-0.547
47.767	-31.246	12.914		47.796	-31.09	13.199		-0.029	-0.156	-0.285		-0.326
48.435	-26.802	9.305		48.473	-26.585	9.496		-0.038	-0.217	-0.19		-0.291
48.884	-23.834	4.407		48.919	-23.626	4.488		-0.035	-0.208	-0.081		-0.226
38.788	-52.827	4.603		38.777	-52.888	4.627		0.011	0.061	-0.023		-0.066
40.257	-50.055	9.53		40.248	-50.195	9.643		0.009	0.14	-0.113		-0.18
42.446	-46.011	13.122		42.465	-46.137	13.309		-0.019	0.125	-0.187		-0.226
44.96	-41.034	14.734		45.157	-41.209	15.154		-0.197	0.176	-0.42		-0.496
47.337	-36.706	14.687		47.585	-36.764	15.103		-0.248	0.058	-0.416		-0.488

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
50.093	-31.958	12.923		50.248	-31.891	13.16		-0.155	-0.067	-0.237		-0.291
52.281	-28.027	9.321		52.415	-27.924	9.453		-0.134	-0.102	-0.132		-0.214
53.725	-25.425	4.4		53.838	-25.319	4.455		-0.113	-0.106	-0.056		-0.165
60.8	-33.554	4.343		60.995	-33.479	4.422		-0.195	-0.075	-0.079		-0.223
58.623	-34.925	9.016		58.635	-34.861	9.107		-0.012	-0.064	-0.09		-0.111
53.895	-36.24	12.758		54.083	-36.168	13.112		-0.189	-0.072	-0.354		-0.407
48.845	-38.216	14.485		48.94	-38.181	15.084		-0.096	-0.034	-0.599		-0.608
48.89	-39.883	14.519		48.982	-39.91	15.087		-0.092	0.027	-0.567		-0.575
54.022	-41.614	12.76		54.217	-41.676	13.119		-0.194	0.062	-0.359		-0.413
58.238	-43.046	9.204		58.465	-43.12	9.408		-0.227	0.074	-0.204		-0.314
61.089	-44.02	4.384		61.241	-44.07	4.445		-0.153	0.05	-0.061		-0.172
54.648	-52.373	4.49		54.681	-52.425	4.513		-0.032	0.051	-0.023		-0.065
53.069	-49.765	9.378		53.139	-49.875	9.491		-0.07	0.11	-0.113		-0.172
50.7	-45.865	12.885		50.791	-46.004	13.181		-0.091	0.139	-0.297		-0.34
47.854	-41.193	14.573		47.906	-41.261	15.108		-0.052	0.069	-0.535		-0.542
45.405	-41.185	15.243		45.229	-41.078	15.174		0.176	-0.107	0.068		0.217
45.379	-47.016	13.04		45.364	-47.138	13.266		0.014	0.122	-0.226		-0.257
44.691	-51.538	9.475		44.673	-51.676	9.597		0.018	0.138	-0.122		-0.185
44.217	-54.651	4.585		44.214	-54.68	4.596		0.004	0.029	-0.011		-0.032
53.722	-25.427	4.397		53.838	-25.319	4.454		-0.116	-0.108	-0.057		-0.169
52.281	-28.026	9.32		52.415	-27.924	9.453		-0.134	-0.103	-0.132		-0.214
50.092	-31.96	12.923		50.247	-31.892	13.161		-0.155	-0.068	-0.238		-0.292
47.336	-36.705	14.687		47.585	-36.765	15.103		-0.25	0.059	-0.417		-0.489
32.345	-49.806	0.408		32.346	-49.805	0.405		-0.001	-0.001	0.003		0.003
36.832	-54.129	0.171		36.804	-54.174	0.276		0.029	0.045	-0.105		-0.118
45.454	-56.476	0.289		45.448	-56.595	0.458		0.006	0.119	-0.169		-0.207
54.828	-54.051	0.268		54.928	-54.225	0.527		-0.099	0.174	-0.259		-0.327
61.037	-47.71	0.234		61.275	-47.849	0.571		-0.238	0.138	-0.336		-0.435
63.317	-39.386	0.156		63.64	-39.391	0.558		-0.323	0.005	-0.402		-0.516
5.726	29.759	-10.9		5.726	29.608	-10.946		0	0.151	0.045		0.158
2.356	29.745	-10.899		2.356	29.607	-10.94		0	0.138	0.042		0.145
2.371	26.761	-0.327		2.371	26.451	-0.42		0	0.31	0.093		0.324
-1.011	29.798	-10.88		-1.011	29.606	-10.938		0	0.192	0.058		0.2
5.735	19.833	-13.045		5.735	19.882	-13.06		0	-0.049	0.015		0.051
2.375	23.213	-2.588		2.375	23.039	-2.536		0	0.174	-0.052		-0.182
2.367	19.974	-13.083		2.367	19.883	-13.056		0	0.091	-0.027		-0.095
-1.001	19.923	-13.065		-1.001	19.884	-13.053		0	0.039	-0.012		-0.041
8.297	27.525	-10.982		8.223	27.525	-11.012		0.074	0	0.03		0.079
8.366	24.999	-10.947		8.221	24.999	-11.005		0.146	0	0.058		0.157
4.205	25.024	-0.409		4.013	25.024	-0.486		0.192	0	0.077		0.207
8.374	22.475	-10.94		8.219	22.475	-11.002		0.155	0	0.062		0.167
-4.842	27.509	-12.901		-4.727	27.509	-12.947		-0.115	0	0.046		0.123
-0.441	25.012	-2.448		-0.516	25.012	-2.418		0.074	0	-0.03		-0.08
-4.836	24.982	-12.896		-4.725	24.982	-12.941		-0.111	0	0.044		0.12
-4.869	22.456	-12.874		-4.722	22.456	-12.933		-0.148	0	0.059		0.159
-8.784	4.924	-2.502		-9.177	5.144	-2.502		0.393	-0.22	0		0.451
-8.904	5.03	9.282		-9.161	5.174	9.282		0.256	-0.145	0		0.294

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-0.372	10.493	9.258		-0.373	10.514	9.258		0.001	-0.021	0		0.021
-0.369	10.22	-2.525		-0.38	10.514	-2.525		0.011	-0.294	0		0.294
8.548	5.962	-2.524		8.629	6.019	-2.524		-0.081	-0.057	0		0.099
8.777	6.152	9.258		8.615	6.039	9.258		0.162	0.113	0		-0.198
10.324	-3.269	9.278		10.03	-3.176	9.278		0.294	-0.093	0		-0.308
10.034	-3.204	0.439		10.022	-3.2	0.439		0.012	-0.004	0		-0.012
0.289	-10.416	0.468		0.292	-10.517	0.468		-0.003	0.101	0		0.101
0.301	-10.58	9.308		0.299	-10.517	9.308		0.002	-0.063	0		-0.063
-9.701	-3.277	9.299		-9.968	-3.367	9.299		0.266	0.09	0		0.281
-9.56	-3.252	0.462		-9.96	-3.388	0.462		0.4	0.136	0		0.423
10.987	-10.214	3.405		10.788	-10.028	3.405		0.199	-0.185	0		0.272
-10.968	-9.619	3.426		-11.074	-9.712	3.426		0.106	0.093	0		-0.141
-14.419	1.883	0.452		-14.605	1.908	0.452		0.186	-0.024	0		-0.188
-8.127	12.137	3.364		-8.195	12.239	3.364		0.068	-0.102	0		-0.122
3.704	14.409	0.4		3.667	14.265	0.4		0.037	0.144	0		0.148
13.263	7.043	3.356		13.009	6.908	3.356		0.254	0.135	0		0.288
2.102	2.096	-15.379		2.102	2.096	-16.833		0	0	1.454		1.454
-3.573	3.762	-15.395		-3.573	3.762	-16.833		0	0	1.438		1.438
-3.65	-4.169	-15.312		-3.65	-4.169	-16.833		0	0	1.521		1.521
3.924	-4.018	-15.328		3.924	-4.018	-16.833		0	0	1.506		1.506
0.564	-0.568	-18.487		1.08	-1.084	-18.487		-0.516	0.516	0		0.73
-9.11	-8.523	13.898		-9.11	-8.523	12.625		0	0	1.273		1.273
-11.759	3.533	13.912		-11.759	3.533	12.625		0	0	1.287		1.287
-0.692	12.022	13.834		-0.692	12.022	12.625		0	0	1.209		1.209
11.474	4.962	13.661		11.474	4.962	12.625		0	0	1.036		1.036
10.83	-6.98	13.676		10.83	-6.98	12.625		0	0	1.051		1.051
0.696	-12.793	13.804		0.696	-12.793	12.625		0	0	1.179		1.179
-0.208	-14.764	6.516		-0.208	-14.728	6.516		-0.001	-0.036	0		0.036
7.116	-46.768	6.447		6.972	-46.768	6.447		0.144	0	0		0.144
7.19	-36.761	6.424		6.972	-36.761	6.424		0.218	0	0		0.218
7.242	-26.753	6.398		6.972	-26.753	6.398		0.27	0	0		0.27
7.287	-16.746	6.372		6.972	-16.746	6.372		0.315	0	0		0.315
4.676	-17.712	6.374		4.447	-17.712	6.374		0.229	0	0		-0.229
4.643	-27.435	6.398		4.447	-27.435	6.398		0.196	0	0		-0.196
4.583	-37.157	6.423		4.447	-37.157	6.423		0.136	0	0		-0.136
4.588	-46.88	6.448		4.447	-46.88	6.448		0.141	0	0		-0.141
-3.653	-46.89	9.407		-3.97	-46.89	9.407		0.316	0	0		0.316
-3.662	-37.203	9.383		-3.97	-37.203	9.383		0.308	0	0		0.308
-3.642	-27.521	9.358		-3.97	-27.521	9.358		0.327	0	0		0.327
-3.641	-17.835	9.334		-3.97	-17.835	9.334		0.329	0	0		0.329
-7.963	-16.116	3.437		-8.178	-16.116	3.437		0.215	0	0		-0.215
-7.962	-26.317	3.463		-8.178	-26.317	3.463		0.216	0	0		-0.216
-7.971	-36.517	3.489		-8.178	-36.517	3.489		0.207	0	0		-0.207
-7.969	-46.717	3.516		-8.178	-46.717	3.516		0.209	0	0		-0.209
-5.778	-50.574	6.924		-5.778	-50.5	6.924		0	-0.074	0		0.074
5.976	-50.379	10.144		5.976	-50.5	10.144		0	0.121	0		-0.121
5.973	-46.518	13.361		5.973	-46.518	12.625		0	0	0.736		0.736

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
5.985	-37.474	13.427		5.985	-37.474	12.625		0	0	0.802		0.802
5.887	-28.431	13.574		5.887	-28.431	12.625		0	0	0.949		0.949
6.109	-17.462	13.593		6.109	-17.462	12.625		0	0	0.968		0.968
-5.881	-16.913	13.849		-5.881	-16.913	12.625		0	0	1.224		1.224
-5.995	-27.317	13.827		-5.995	-27.317	12.625		0	0	1.202		1.202
-6.011	-36.135	13.71		-6.011	-36.135	12.625		0	0	1.085		1.085
-5.544	-47.887	13.576		-5.544	-47.887	12.625		0	0	0.951		0.951
63.302	-85.752	-0.13		63.302	-85.752	0		0	0	-0.13		-0.13
51.873	-86.128	-0.143		51.873	-86.128	0		0	0	-0.143		-0.143
31.126	-85.665	-0.163		31.126	-85.665	0		0	0	-0.163		-0.163
27.137	-77.949	-0.108		27.137	-77.949	0		0	0	-0.108		-0.108
40.325	-79.665	-0.14		40.325	-79.665	0		0	0	-0.14		-0.14
56.757	-76.264	-0.247		56.757	-76.264	0		0	0	-0.247		-0.247
61.399	-66.963	-0.409		61.399	-66.963	0		0	0	-0.409		-0.409
47.41	-70.224	-0.234		47.41	-70.224	0		0	0	-0.234		-0.234
37.888	-65.835	-0.097		37.888	-65.835	0		0	0	-0.097		-0.097
24.237	-65.516	0.06		24.237	-65.516	0		0	0	0.06		0.06
20.267	-53.416	0.345		20.267	-53.416	0		0	0	0.345		0.345
15.495	-46.292	0.54		15.495	-46.292	0		0	0	0.54		0.54
23.905	-45.54	0.386		23.905	-45.54	0		0	0	0.386		0.386
15.137	-35.357	0.64		15.137	-35.357	0		0	0	0.64		0.64
15.995	-25.397	0.686		15.995	-25.397	0		0	0	0.686		0.686
25.908	-28.327	0.443		25.908	-28.327	0		0	0	0.443		0.443
33.889	-23.329	0.265		33.889	-23.329	0		0	0	0.265		0.265
61.98	-24.456	-0.691		61.98	-24.456	0		0	0	-0.691		-0.691
67.384	-34.972	0.009		66.907	-34.972	0		0.476	0	0.009		0.476
65.578	-54.946	-0.657		65.578	-54.946	0		0	0	-0.657		-0.657
69.203	-6.522	-0.685		69.203	-6.522	0		0	0	-0.685		-0.685
66.359	18.474	-0.525		66.359	18.474	0		0	0	-0.525		-0.525
52.45	19.043	-0.198		52.45	19.043	0		0	0	-0.198		-0.198
38.573	18.784	0.071		38.573	18.784	0		0	0	0.071		0.071
25.22	19.098	0.314		25.22	19.098	0		0	0	0.314		0.314
27.317	28.558	0.08		27.317	28.558	0		0	0	0.08		0.08
34.459	26.902	0.004		34.459	26.902	0		0	0	0.004		0.004
46.202	25.974	-0.184		46.202	25.974	0		0	0	-0.184		-0.184
45.88	34.514	-0.254		45.88	34.514	0		0	0	-0.254		-0.254
29.902	39.417	-0.189		29.902	39.417	0		0	0	-0.189		-0.189
17.544	42.251	-0.175		17.544	42.251	0		0	0	-0.175		-0.175
7.306	39.373	-0.035		7.306	39.373	0		0	0	-0.035		-0.035
10.468	49.427	-0.331		10.468	49.427	0		0	0	-0.331		-0.331
23.154	52.398	-0.456		23.154	52.398	0		0	0	-0.456		-0.456
43.452	55.662	-0.583		43.452	55.662	0		0	0	-0.583		-0.583
66.645	54.347	-0.685		66.645	54.347	0		0	0	-0.685		-0.685
67.245	38.37	-0.56		67.245	38.37	0		0	0	-0.56		-0.56
-11.979	40.833	-0.042		-11.979	40.833	0		0	0	-0.042		-0.042
-22.54	17.533	0.479		-22.54	17.533	0		0	0	0.479		0.479
-23.852	30.723	0.234		-23.852	30.723	0		0	0	0.234		0.234

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
-31.027	26.033	0.277		-31.027	26.033	0		0	0	0.277		0.277
-42.757	26.684	0.169		-42.757	26.684	0		0	0	0.169		0.169
-50.252	30.533	-0.013		-50.252	30.533	0		0	0	-0.013		-0.013
-40.218	46.089	-0.182		-40.218	46.089	0		0	0	-0.182		-0.182
-47.348	54.641	-0.466		-47.348	54.641	0		0	0	-0.466		-0.466
-75.358	53.838	-0.435		-75.358	53.838	0		0	0	-0.435		-0.435
-75.562	37.556	-0.355		-75.562	37.556	0		0	0	-0.355		-0.355
-74.334	19.398	-0.279		-74.334	19.398	0		0	0	-0.279		-0.279
-56.86	25.313	-0.052		-56.86	25.313	0		0	0	-0.052		-0.052
-65.89	12	-0.111		-65.89	12	0		0	0	-0.111		-0.111
-68.395	-1.061	-0.109		-68.395	-1.061	0		0	0	-0.109		-0.109
-76.742	-10.761	-0.267		-76.742	-10.761	0		0	0	-0.267		-0.267
-76.591	-29.236	-0.237		-76.591	-29.236	0		0	0	-0.237		-0.237
-62.327	-24.823	-0.046		-62.327	-24.823	0		0	0	-0.046		-0.046
-49.643	-21.852	0.144		-49.643	-21.852	0		0	0	0.144		0.144
-35.31	-26.541	0.347		-35.31	-26.541	0		0	0	0.347		0.347
-22.562	-18.049	0.627		-22.562	-18.049	0		0	0	0.627		0.627
-27.561	-36.997	0.424		-27.561	-36.997	0		0	0	0.424		0.424
-13.421	-51.069	0.39		-13.421	-51.069	0		0	0	0.39		0.39
-4.915	-60.119	0.217		-4.915	-60.119	0		0	0	0.217		0.217
-6.145	-70.923	-0.021		-6.145	-70.923	0		0	0	-0.021		-0.021
-7.478	-86.143	-0.233		-7.478	-86.143	0		0	0	-0.233		-0.233
-26.903	-90.752	-0.264		-26.903	-90.752	0		0	0	-0.264		-0.264
-40.597	-88.521	-0.284		-40.597	-88.521	0		0	0	-0.284		-0.284
-53.357	-82.117	-0.181		-53.357	-82.117	0		0	0	-0.181		-0.181
-62.56	-90.746	-0.129		-62.56	-90.746	0		0	0	-0.129		-0.129
-76.89	-86.058	-0.049		-76.89	-86.058	0		0	0	-0.049		-0.049
-75.249	-64.483	-0.165		-75.249	-64.483	0		0	0	-0.165		-0.165
-71.657	-44.212	-0.135		-71.657	-44.212	0		0	0	-0.135		-0.135
-65.492	-56.11	-0.06		-65.492	-56.11	0		0	0	-0.06		-0.06
-61.86	-65.898	-0.109		-61.86	-65.898	0		0	0	-0.109		-0.109
-50.148	-58.828	0.008		-50.148	-58.828	0		0	0	0.008		0.008
-49.893	-72.883	-0.148		-49.893	-72.883	0		0	0	-0.148		-0.148
-13.81	-37.971	-16.129		-13.81	-37.971	-16.833		0	0	0.704		0.704
-14.221	-16.573	-15.903		-14.221	-16.573	-16.833		0	0	0.93		0.93
-13.426	16.104	-16.143		-13.426	16.104	-16.833		0	0	0.691		0.691
-13.268	29.31	-16.511		-13.268	29.31	-16.833		0	0	0.323		0.323
14.791	31.591	-16.733		14.791	31.591	-16.833		0	0	0.101		0.101
15.663	23.886	-16.479		15.663	23.886	-16.833		0	0	0.355		0.355
15.936	12.196	-16.011		15.936	12.196	-16.833		0	0	0.822		0.822
60.129	4.314	-15.681		60.129	4.314	-16.833		0	0	1.153		1.153
58.578	-9.96	-16.377		58.578	-9.96	-16.833		0	0	0.457		0.457
49.088	-15.261	-16.74		49.088	-15.261	-16.833		0	0	0.093		0.093
36.677	-9.674	-16.305		36.677	-9.674	-16.833		0	0	0.529		0.529
30.912	-17.702	-16.492		30.912	-17.702	-16.833		0	0	0.342		0.342
13.455	-15.195	-15.833		13.455	-15.195	-16.833		0	0	1.001		1.001
19.747	2.827	-3.194		19.747	2.827	-4.208		0	0	1.014		1.014

MEAS X	MEAS Y	MEAS Z		CAD X	CAD Y	CAD Z		DIF X	DIF Y	DIF Z		TOT DIF
29.129	7.239	-3.627		29.129	7.239	-4.208		0	0	0.582		0.582
34.656	2.985	-3.567		34.656	2.985	-4.208		0	0	0.641		0.641
41.407	7.37	-3.816		41.407	7.37	-4.208		0	0	0.393		0.393
46.638	2.191	-3.614		46.638	2.191	-4.208		0	0	0.595		0.595
52.23	8.411	-3.979		52.23	8.411	-4.208		0	0	0.229		0.229
51.073	-4.15	-0.018		51.073	-4.03	0		0	-0.12	-0.018		-0.121
40.549	-2.98	-0.06		40.549	-2.98	0		0	0	-0.06		-0.06
28.858	-2.794	0.822		28.858	-2.794	0		0	0	0.822		0.822
17.168	-1.996	0.354		17.168	-1.996	0		0	0	0.354		0.354
18.797	-9.318	2.459		18.797	-9.318	1.683		0	0	0.776		0.776
24.953	-6.479	2.414		24.953	-6.479	1.683		0	0	0.731		0.731
26.072	-14.785	2.188		26.072	-14.785	1.683		0	0	0.504		0.504
19.024	-12.073	-4.494		19.024	-12.447	-4.494		0	0.374	0		-0.374
26.905	-16.687	-0.109		27.115	-16.655	-0.109		-0.21	-0.031	0		0.212
33.226	-3.614	-4.596		33.226	-4.03	-4.596		0	0.416	0		-0.416
40.249	-3.624	-3.851		40.249	-4.03	-3.851		0	0.406	0		-0.406
52.87	-3.614	-5.14		52.87	-4.03	-5.14		0	0.417	0		-0.417
54.942	0.261	-9.43		55.278	0.154	-9.43		-0.336	0.107	0		-0.353
56.218	7.912	-10.197		56.527	7.912	-10.197		-0.309	0	0		-0.309
59.696	12.338	-0.977		59.696	12.207	-0.696		0	0.131	-0.281		-0.31
49.48	13.051	-1.585		49.48	12.989	-1.478		0	0.062	-0.107		-0.124
39.641	12.199	-1.577		39.641	12.161	-1.539		0	0.038	-0.038		-0.054



## Alumide Material Data Sheet

### ALUMIDE® for EOSINT P

#### General

A typical application for ALUMIDE® is the manufacture of stiff parts of metallic appearance for applications in automotive manufacture (e.g. wind tunnel tests or parts that are not safety-relevant), for tool inserts for injecting and moulding small production runs, for illustrative models (metallic appearance), for education and jig manufacture, among other aspects.

Surfaces of parts made of ALUMIDE® can be finished by grinding, polishing or coating. An additional advantage is that low tool-wear machining is possible, e.g. milling, drilling or turning.

ALUMIDE® is suitable for processing on the following systems:

- EOSINT P 700
- with or without powder conveying system P 380:
- EOSINT P 380
- EOSINT P 360 with upgrade S&P
- EOSINT P 350/2 + upgrade 99 + upgrade S&P

The recommended layer thickness amounts to 0.15 mm. To assure a consistent quality of parts, it is recommended solely to use new powder.

#### Technical data

##### General material properties

Average grain size	Laser diffraction	60	µm
Bulk density	DIN 53466	0.64 ± 0.04	g/cm <sup>3</sup>
Density of laser-sintered part	EOS-method	1.36 ± 0.05	g/cm <sup>3</sup>

##### Mechanical properties

Tensile Modulus	DIN EN ISO 527	3800 ± 150	N/mm <sup>2</sup>
Tensile strength	DIN EN ISO 527	46 ± 3	N/mm <sup>2</sup>
Elongation at break	DIN EN ISO 527	3.5 ± 1	%
Flexural Modulus	DIN EN ISO 178	3000 ± 150	N/mm <sup>2</sup>
Flexural strength	DIN EN ISO 178	74 ± 2	N/mm <sup>2</sup>
Charpy - Impact strength	DIN EN ISO 179	29 ± 2	kJ/m <sup>2</sup>
Charpy - Notched impact strength	DIN EN ISO 179	4.6 ± 0.3	kJ/m <sup>2</sup>
Shore D - hardness	DIN 53505	76 ± 2	

##### Thermal properties

Melting point	DIN 53736	172 - 180	°C
Heat Deflection Temperatur	ASTMD648 (0,45 Mpa)	177.1	°C
Vicat softening temperature B/50	DIN EN ISO 306	169	°C
Heat conductivity (170 °C)	Hot wire method	0.5 - 0.8	W(mK) <sup>-1</sup>

The mechanical properties depend on the x-, y-, z- position of the test parts and on the exposure parameters used. The data are based on our latest knowledge and are subject to changes without notice. They do not guarantee properties for a particular part and in a particular application.

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## Polyamide Material Data Sheet

### Fine Polyamide PA 2200 for EOSINT P

#### Application:

PA 2200 is suitable for use in all EOSINT P systems with fine polyamide option. The recommended layer thickness is 0.15 mm. Unexposed powder can be reused. Depending on building time it has to be mixed with fresh powder by a ratio of 2:1 to 1:1 (old : new) in order to guarantee constant process parameters and persisting part quality.

Typical applications of the material are fully functional prototypes with high end finish right from the process. They easily withstand high mechanical and thermal load.

#### Material Properties:

Average grain size	Laser diffraction	60	µm
Bulk density	DIN 53466	0,435 - 0,445	g/cm <sup>3</sup>
Density of laser-sintered part	EOS-Method	0,9 - 0,95	g/cm <sup>3</sup>

#### Mechanical Properties\*:

Tensile Modulus	DIN EN ISO 527	1700 ± 150	N/mm <sup>2</sup>
Tensile strength	DIN EN ISO 527	45 ± 3	N/mm <sup>2</sup>
Elongation at break	DIN EN ISO 527	20 ± 5	%
Flexural Modulus	DIN EN ISO 178	1240 ± 130	N/mm <sup>2</sup>
Charpy - Impact strength	DIN EN ISO 179	53 ± 3,8	kJ/m <sup>2</sup>
Charpy - Notched impact strength	DIN EN ISO 179	4,8 ± 0,3	kJ/m <sup>2</sup>
Izod - Impact Strength	DIN EN ISO 180	32,8 ± 3,4	kJ/m <sup>2</sup>
Izod - Notched Impact Strength	DIN EN ISO 180	4,4 ± 0,4	kJ/m <sup>2</sup>
Ball indentation hardness	DIN EN ISO 2039	77,6 ± 2	
Shore D - hardness	DIN 53505	75 ± 2	

#### Thermal Properties:

Melting point	DIN 53736	172 - 180	°C
Vicat softening temperature B/50	DIN EN ISO 306	183	°C
Vicat softening temperature A/50	DIN EN ISO 306	181	°C

\* The mechanical properties depend on the x-, y-, z-position and on the exposure parameters used.

The data are based on our latest knowledge and are subject to changes without notice. They do not guarantee properties for a particular part and in a particular application.