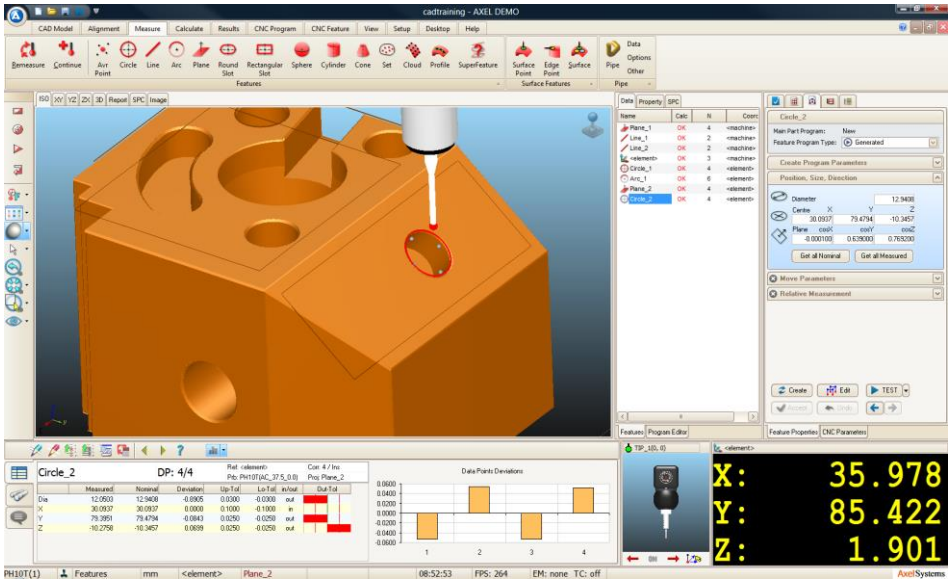
What's New

# Axel 7 Software

Axel Systems Ltd



# Contents

# Introduction

**Axel 7** is the new major release of our previous version. This document shows the main additions and changes over previous version. This is the major rewrite of our software. In addition to visible user interface changes and functionality, we have reorganised the inside of our software to cope with future requirements such as cloud and video inspection.

It offers fully integrated measuring environment that provides the solution to any metrology requirement. The innovative and unique user interface will guide through both manual and automatic inspection with ease.

It has been design to handle with the same ease inspection on CMM machines and measuring arms. Programming based on the CAD model cannot be any easier. You simply choose the CAD feature to measure and the rest is done for you.

## Why upgrade to Axel 7

We recommend that the existing users read through this document. We personally believe that there are many reasons to upgrade to version 7. The first and obvious one is the ***new CNC programming*** operation. It cannot be any simpler. For most applications you will only need to choose the features you need to inspect and the program will be done for you. And for those special applications there is still our powerful programming engine.

In addition there are new features for CAD inspection and operating with ***Articulated Measuring Arms***. New scanning options have been added.

The user interface has changed. It has been based on our already successful tabs and menus. Now with ***Office 2007 feel and look*** makes it a familiar platform for everyone.

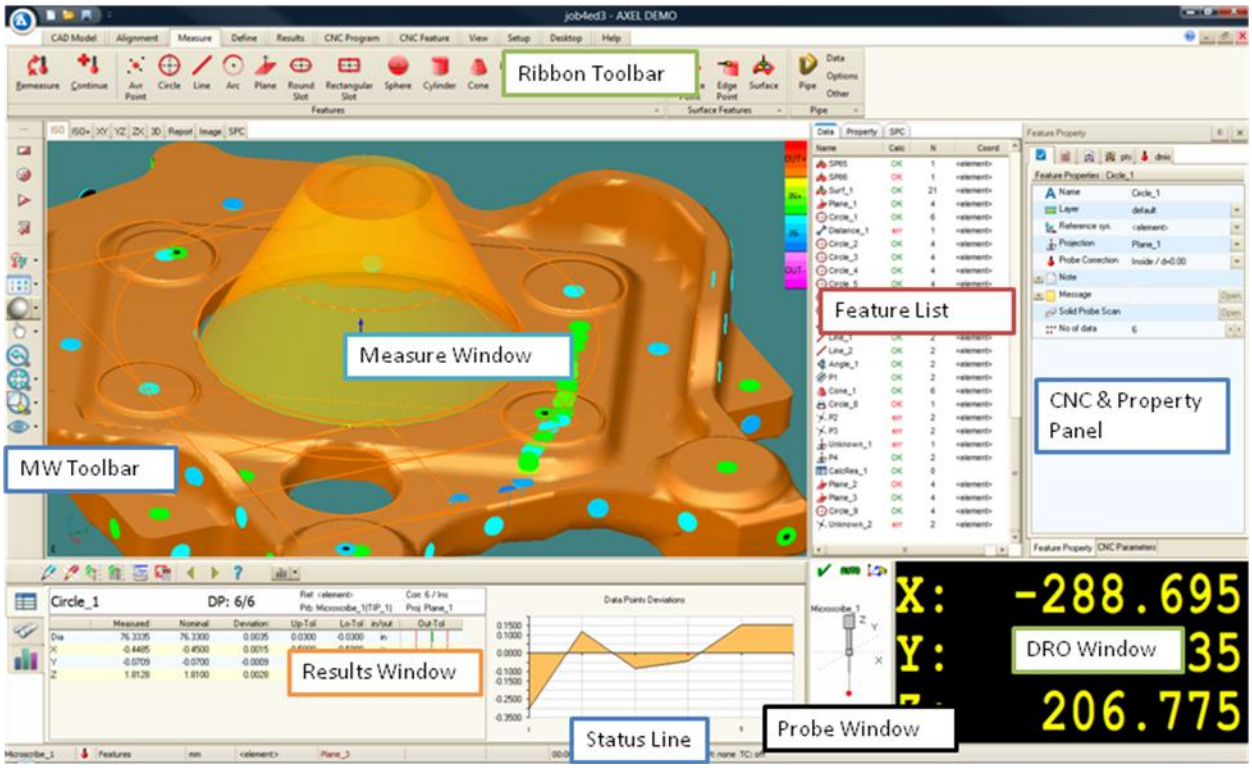
And more importantly the software has been updated internally to allow for many new exciting features that will be coming out over in the new future.

# General

## *New* user Ribbon interface

Work smarter and faster with a uniform Ribbon interface. Our already successful interface of tabs and toolbars has been enhanced with Ribbon which accelerates the personal workflow and guarantees more efficiency in daily business.

The tabs on the Ribbon, display the commands that are the most relevant for each of the task areas in Axel. Long winded searching for needed commands is a thing of the past. The Axel button is a single entry point for settings and file management.

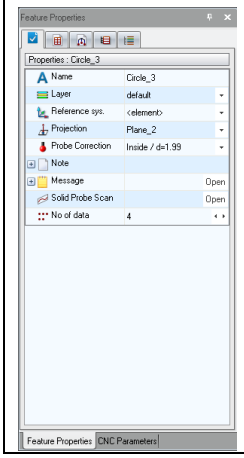
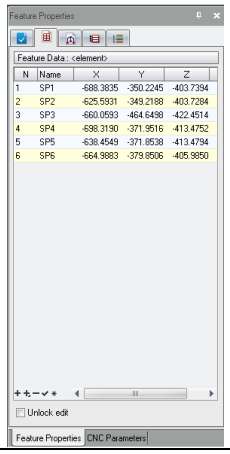
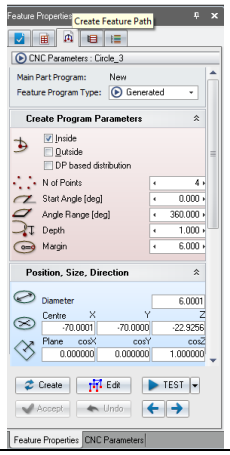
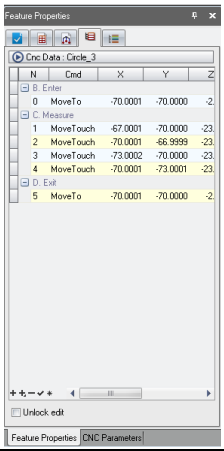
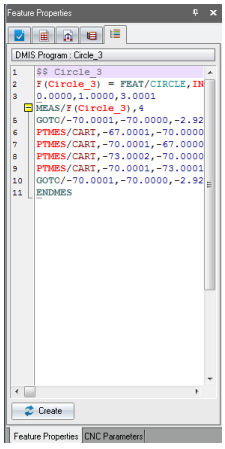



## User Interface

Axel 7 User Interface has been designed for widescreen monitors

# Feature Properties dialog

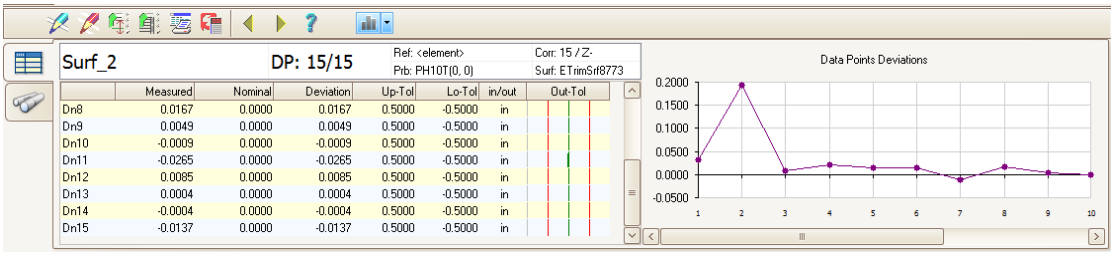
The New Feature Properties Panel displays inspected feature properties grouped together. Its data points are available at the glance as well as construction elements. Available tabs provide complete description of feature manual and cnc properties.

| Feature property tab | Data points or feature element for constructions and alignment | CNC Feature program | Feature CNC program commands | Feature DMIS command |
|---|---|---|---|---|
|  |  |  |  |  |

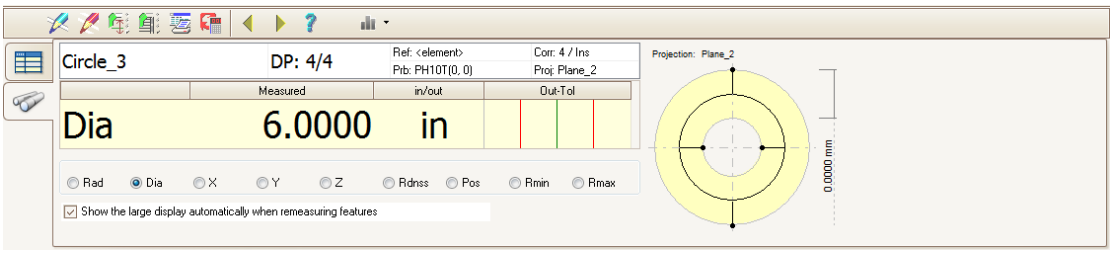
# New Results Window

The Results Window displays results of the currently selected or measured feature.

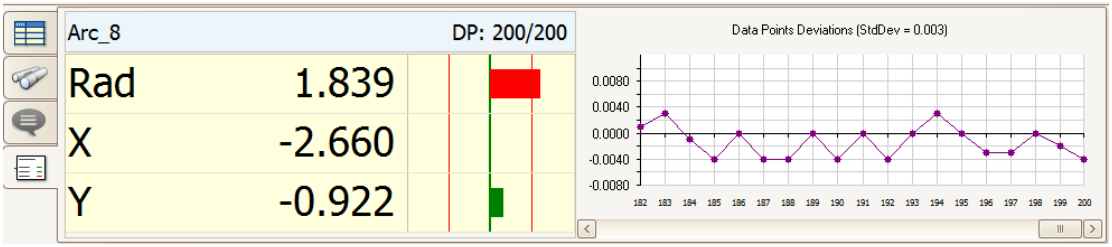
## All Results Tab with New points deviation graph




## Large One Result Display



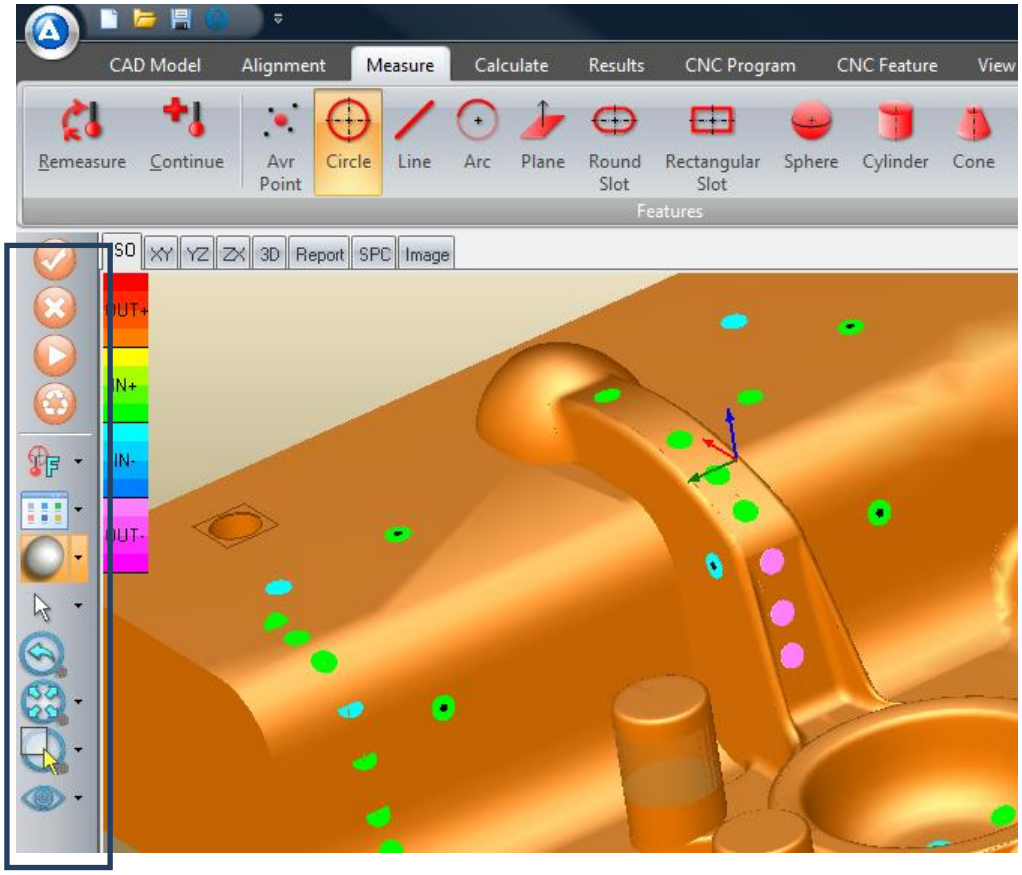
## Large ‘During inspection results’ window




## User Message Panel


# Measure Window Toolbar

The Measure Window Toolbar is docked by default on the left side of the Measure Window.



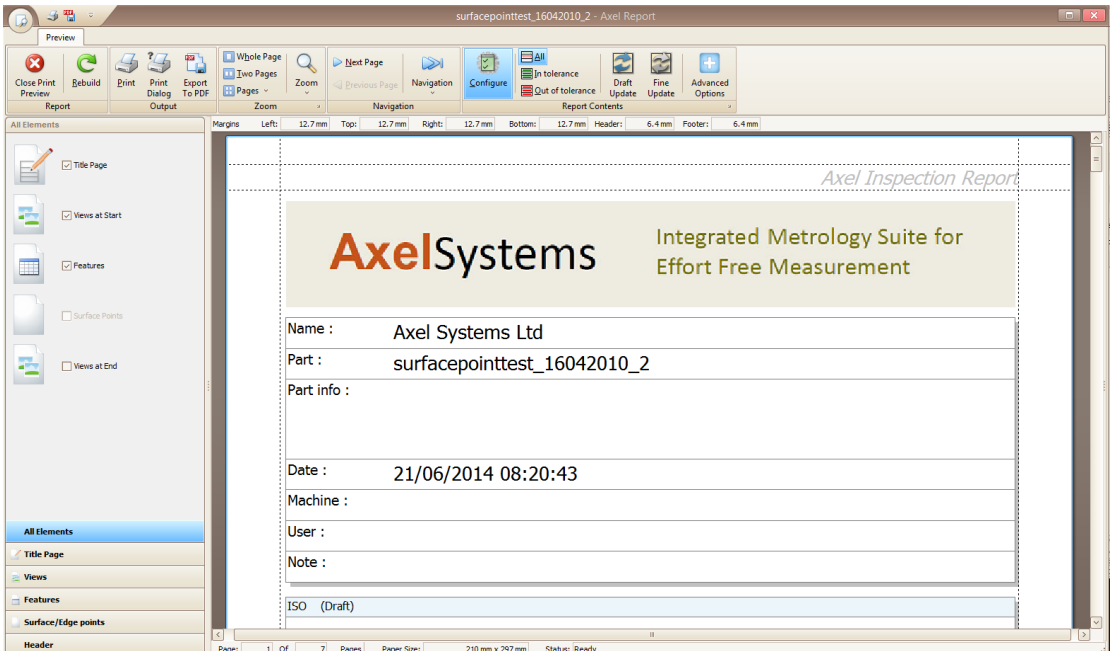

## Measure Window Toolbar commands

| Command | Description |
|---|---|
| Finish  | The **Finish command** is used to end various operations in Axel. This is a context sensitive button therefore its function will depend on the operation you are executing at the time. Typically you will use it to Finish current feature measurement or to exit from Go mode. |
| Cancel  | The **Cancel command** abandons the current feature measurement. If it was a new feature it will be removed from Feature List, if the feature was remeasured or continued, the original data points will be restored. |
| Go Mode  | The GO command starts or finishes the semiautomatic execution of Feature List. The Feature List is executed from the highlighted feature. |
| Repeat Mode  | The Repeat command is used to reselect currently measured type after feature. For example if the series of circles needs to be measured, selecting Circle feature with Repeat mode active, will automatically reselect the Circle feature after the previous one has finished. |
| Mouse selection modes  | Selects Measure Window operating mode. |
| Display Options  | Switches on and off display elements of the Measure Window. |
| 3D  | The commands are used for choosing rendering mode for CAD model and measured features |

| | |
|---|---|
| CAD pickup Tool | The commands are used for extracting CAD entities from CAD model. |
| Zoom Last | Go to last zoom |
| Zoom Options A | Zoom commands set A |
| Zoom Options B | Zoom commands set B |
| Auto View Options | Measure Window view options |

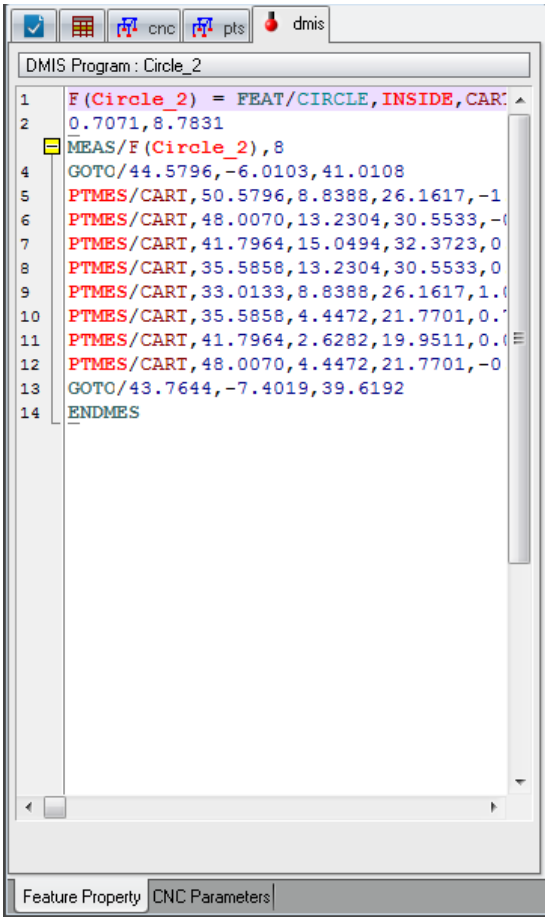
# New Report

New Axel report provides standard inspection results. It is shown as one of the Measure Window standard tabs.



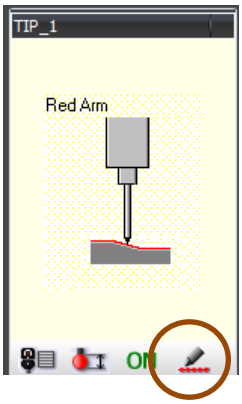

# DMIS programming

The DMIS tab displays the DMIS command for the currently selected feature.



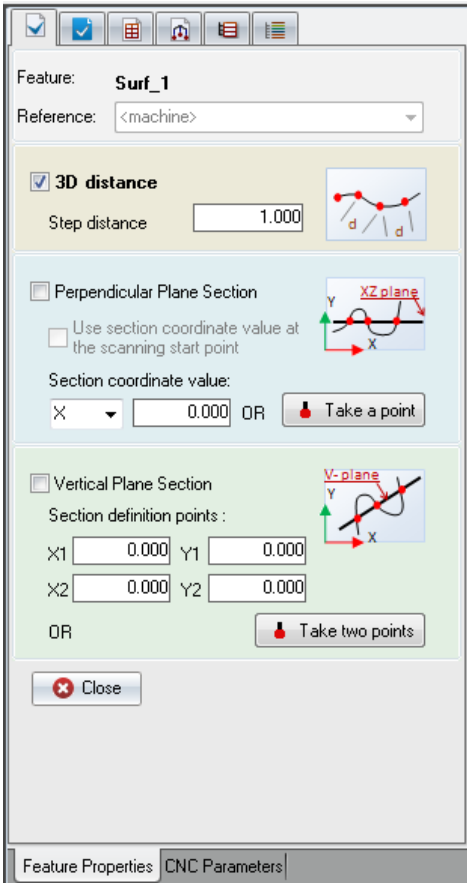

# Scan Features for articulated arms

Measuring Arm probe can operate in either single point or scanning mode. The selection is done with the button marked below.

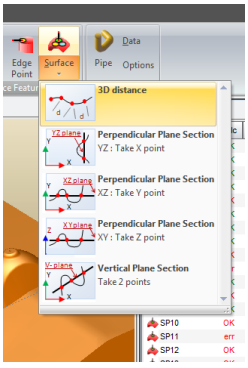



When scanning mode is selected, the continuous train of data points may be collected for each geometric feature. As for the SET and SURFACE block features, points may be collected either at equal time or distance intervals or alongside predefined plane.

The dialog shown below appears when selecting SET or SURFACE feature. There are 3 possible scanning methods – 3D distance, Perpendicular plane section and Vertical Plane section.




The scan gallery allows easy access to specific scanning method.

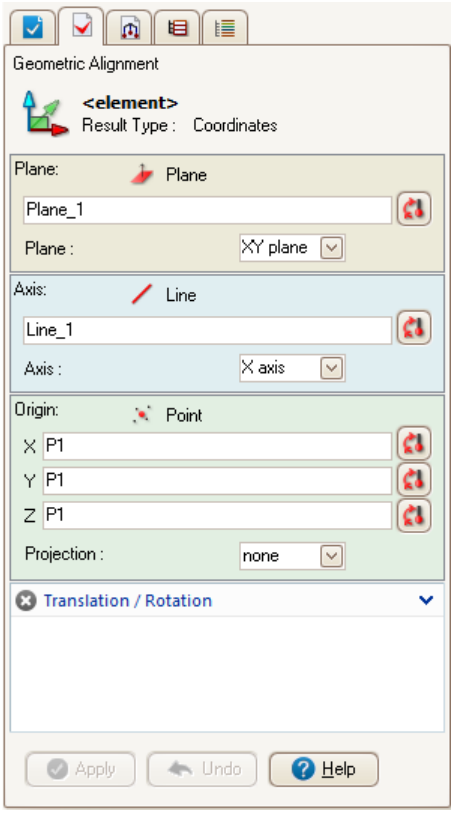



# New Alignment functions

The **Define Element command** is used for creating new Element coordinate system (Datum). It aligns axes of the part with the axes of the machine. The procedure is normally carried out at the start of the measurement, although there may be occasions where a new coordinate system may be required part way through the job.

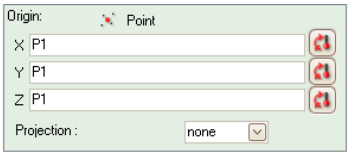
**Note:** Only one Element system may be defined for the part. All other datums should be defined as Local coordinate systems and they are referenced to the Element datum.

## The Define Element Dialog box .




## The Define Element Dialog box

Use this box to define plane, line and origin for the alignment.

| Option | Description |
|---|---|
|  | Aligns a plane of the Element system. On pressing this button the Define Plane of <Element> window appears. |
|  | Aligns an axis of the new Element system. On pressing this button the Define Axis of <Element> window appears. |
|  | Aligns an origin of the new Element system. On pressing this button the Define Origin of <Element> window appears. |


| 1st feature | 2nd feature | 3rd feature | Plane calculation | Axis Calculation | Origin Calculation | Origin Projection |
|---|---|---|---|---|---|---|
| Plane | Line | Point | | PROJ ln2-pl1 | | 3D, Pl, Ax |
| Plane | Line | Line | | PROJ ln2-pl1 | INT ln2-ln3 | |
| Plane | Plane | Point | | INT pl1 – pl2 | | 3D, Pl, Ax |
| Plane | Plane | Line | | INT pl1–pl2 | INT (pl1-pl2) - ln3 | |
| Plane | Plane | Plane | | INT pl1–pl2 | INT pl1-pl2-pl3 | |
| Plane | Point | Point | | LINE pt2-pt3 | | |
| Line | Line | Point | Ln1 + Pt3 | PROJ ln2-ln1 | | 3D, ln1 |

Legend

PROJ ln2-pl1 – Projection of Line2 onto Plane 1

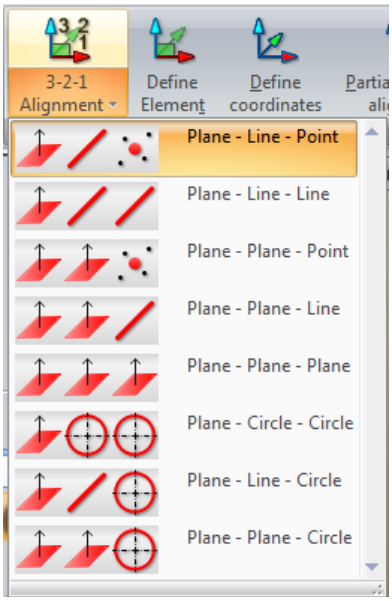
INT pl1-pl2 Intersection between Plane1 and Plane2

| PLANE features | LINE features | POINT features |
|---|---|---|
| Plane,<br>Round slot<br>Rect. slot | Line<br>Cylinder<br>Cone<br>Round slot<br>Rect. Slot | Point<br>Arc<br>Circle<br>Sphere<br>Round Slot<br>Rect. slot |

Note: On selecting Element datum, program expects 3 data entry. It provides for quick alignment definition.

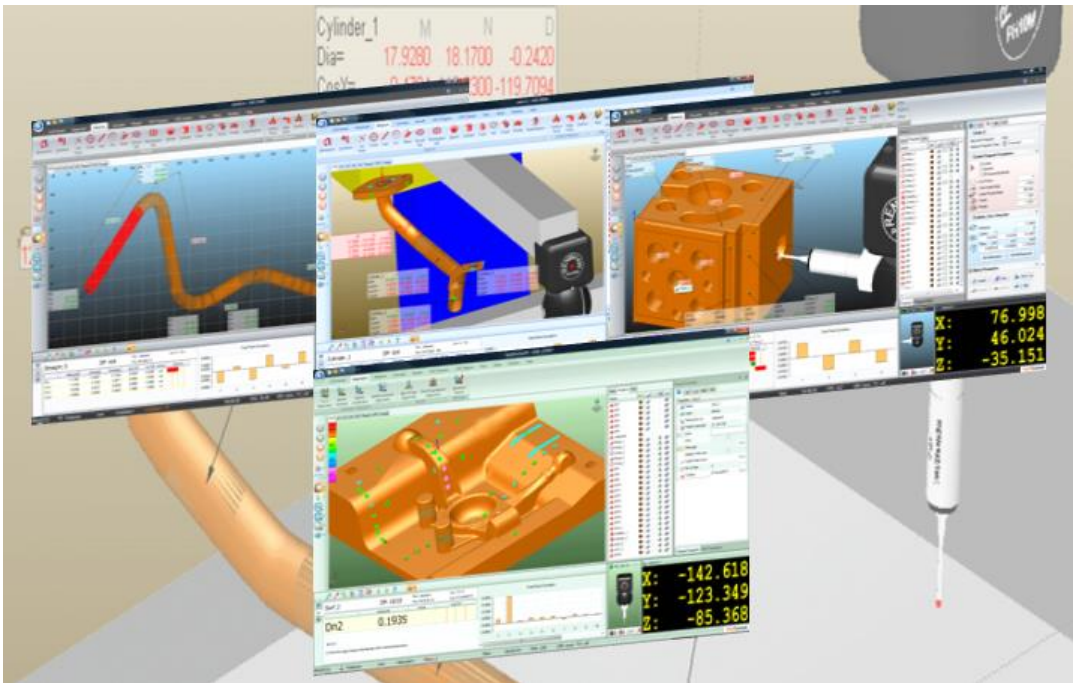
# 3-2-1 Alignment

3-2-1 Alignment will accept data points directly into set of features that define the alignment. The 3-2-1 gallery shows all available alignment options.




# Customized user interface – colour schemes

Axel 7 is organised around familiar Office 2007 interface. In addition various colour schemes are available. The user interface is supplied with predefined desktop arrangements for manual, automatic, surface and pipe inspection.



# CNC

AXEL 7 comes with extremely easy to use and flexible programming for CNC machines. It is virtually click and measure operation. At the same it maintains the powerful programming facility for those special applications that come along every now and then.

## Click & Measure

Axel software strikes perfect balance between power and ease of use, Majority of applications can be handled with a simple Click and Measure functionality whereas for those special tough jobs there is a Visual Program Editor.

When creating a program using CAD, the feature CNC program is created immediately after the feature is extracted from the CAD. Also the approach sequence of moves is created taking the probe between the last measured feature and the newly created one avoiding crashes.

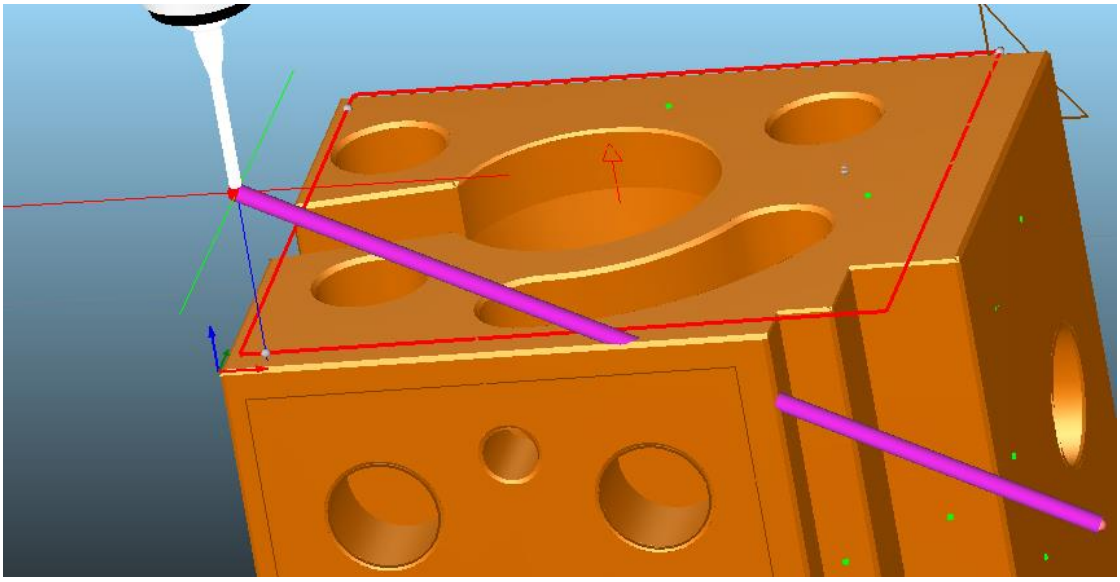
Also probe is automatically selected for the probe.

See the manual for detailed description of action taken when creating a feature CNC program.

## Collision avoidance

When creating a program using CAD, Axel will automatically try to avoid collision when moving in between measured features.

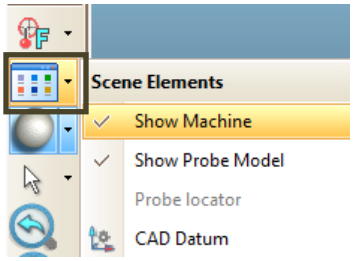
Also when instructing to move to the selected feature, program will always check for possible collision and will alert the user about crash possibility.



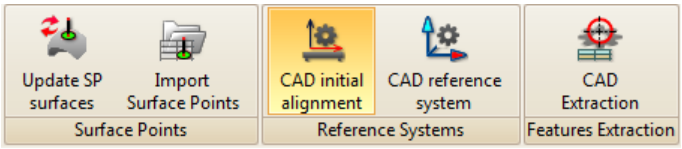
# CAD Initial alignment

The purpose of the initial alignment is to place the CAD model within the CMM machine model working range. The positioning of the part is important when using indexable probes such as MIH, PH10.

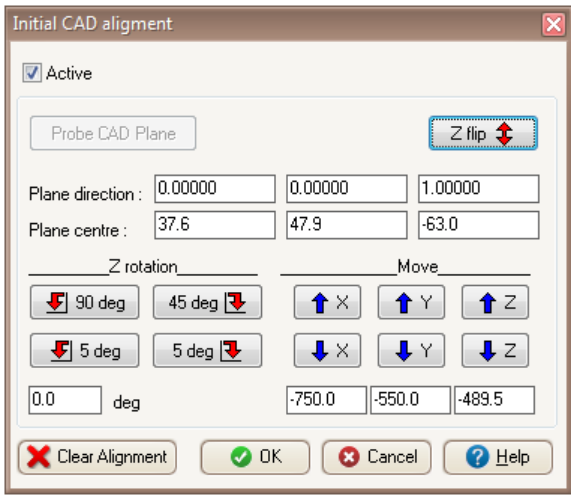
1. Import CAD part
2. It is recommended to switch off machine view now as it might obstruct the CAD.



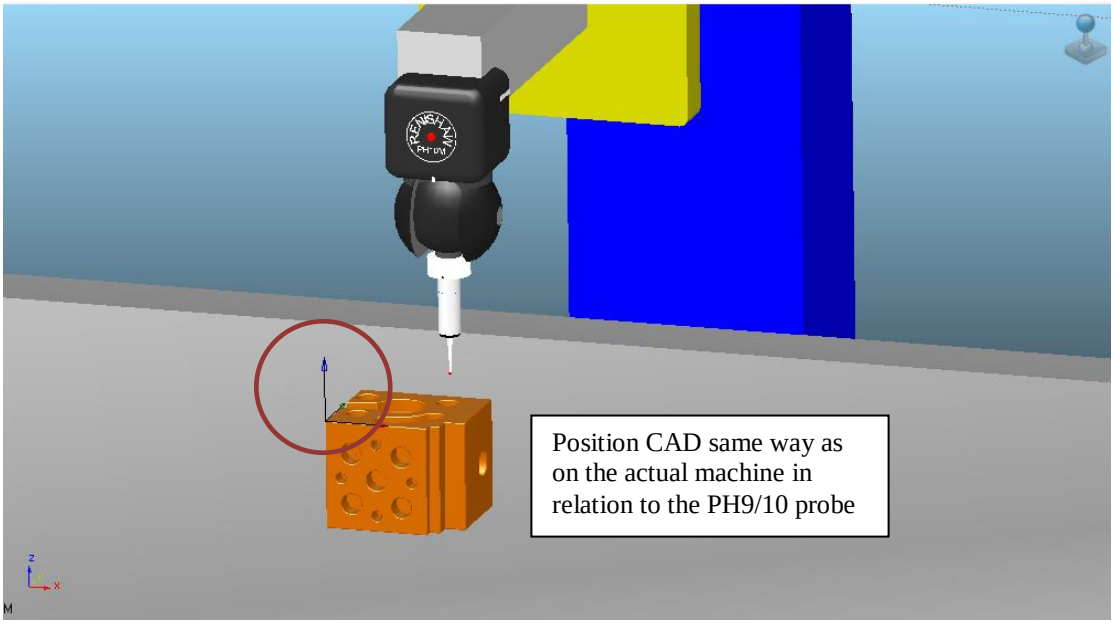

3. From the CAD Model Tab, select CAD Initial Alignment




4. The Initial CAD alignment dialog box opens.



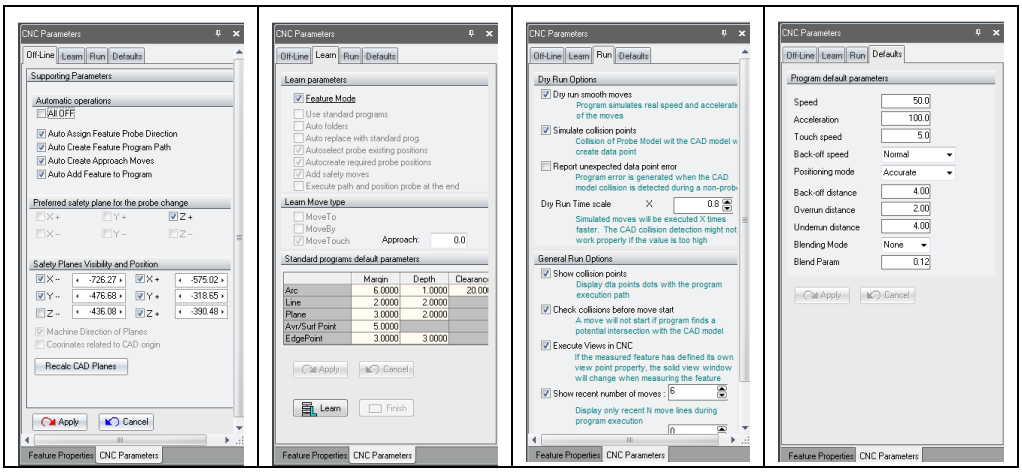

5. Probe the bottom plane. The part will rest on this plane on the machine base.
6. Using arrows in the Initial CAD alignment dialog adjust parts direction and height. It is important to align the same way as on the machine in order for PH9/10 direction to agree with the model.




# New CNC Parameters dialog

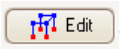
All CNC parameters and setup have been placed together under 4 tabs within CNC parameter dialog.

| | | | |
|---|---|---|---|
| Manual/CNC program options | Learn program tab – switching between Learn 7 and the original one | CNC RUN options | CNC program default parameters |

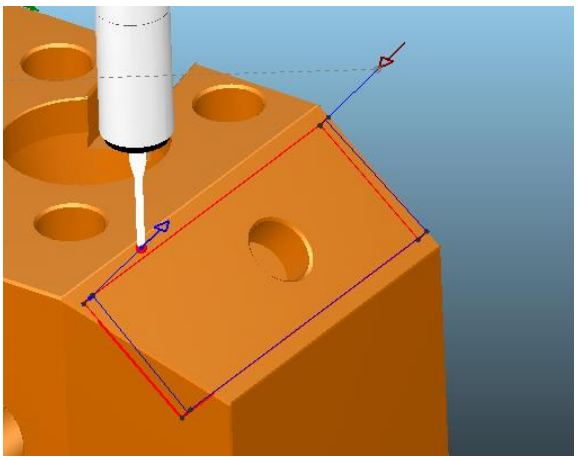



# Graphical CNC feature edit

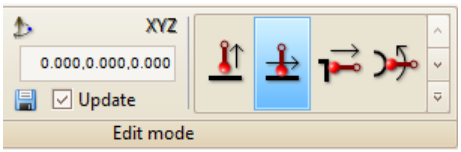
## To change the position of Plane data point (example)

1. The measured plane is not of regular rectangular shape. Please note that the 3rd probing point falls outside the plane. In order to move this point inside the plane, follow the steps below.
2. Press Edit 

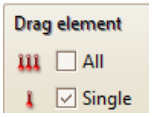
button to enter edit mode. The plane program is highlighted in Measure Window.



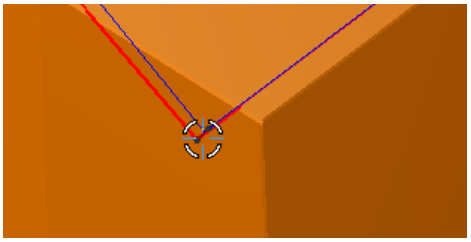
3. From Edit mode gallery choose Plane Parallel button. This option is for moving the data point position in the plane parallel to the measured plane.



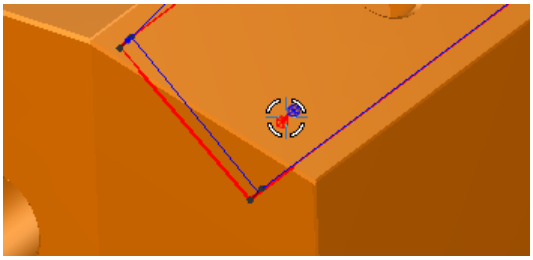

4. Select Single in the Drag Element menu.



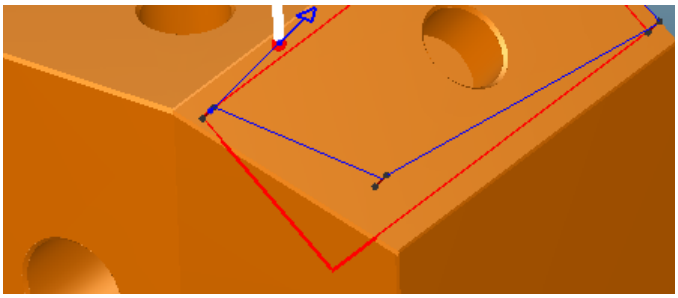
5. Position the mouse over the first data point on the left of the arc. The cursor changes.



6. Click and hold the left button and move mouse the data point is position on the plane.



7. To accept the new data point position click the right mouse button while holding left. Releasing left button doesn't not make any changes.



8. Make sure program is in Off-line mode and press Test 

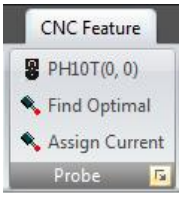
button to run Plane program. This time plane is measured at 4 points as expected.

9. Click Accept 

button to save the newly changed sequence, to return to original click Undo.

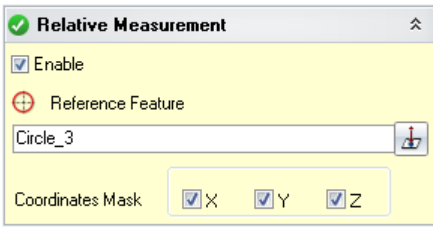
# Automatic selection of Renishaw probe positions

The position of PH10 is automatically selected during off line programming. User may select the current PH10 position or program may choose the optimal probe position for inspected feature.



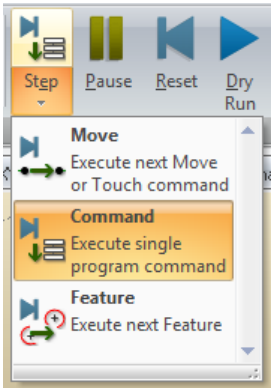

# Relative moves

Current feature program may be now easily referenced to any other feature.

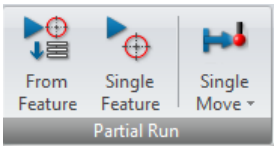



# Multiple Step program run

There is a gallery of Single move options. It will help in debugging and testing written programs.



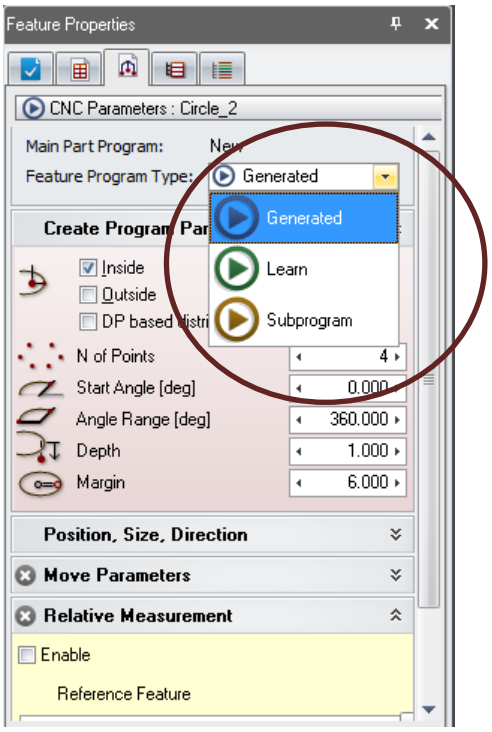

Also program can be easily started from any feature or single selected feature can be executed. Of course there is still our normal option of setting a program breakpoint and setting program start point in the Visual Programming Window.




# New Learn mode

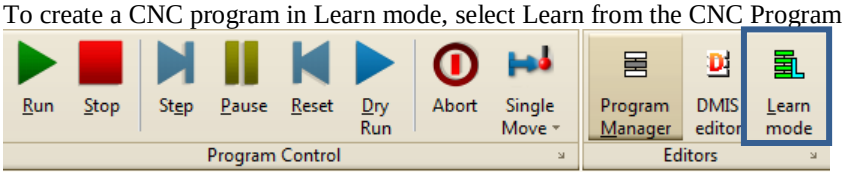
There are times where program is written without CAD model. We have updated the Learn mode to fall within our standard program structure. Our new Learn mode is created in same way as you would create the program using CAD model. As a result once Learn program is created, each feature may be easily modified and feature program changed between Generated and Learn options.

We are confident you will find the new Learn program at great advantage and ease.

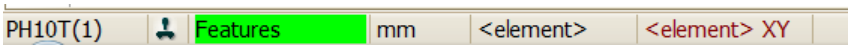



## Create Learn Program - example

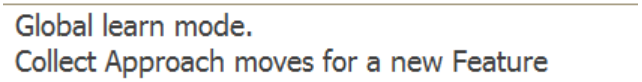
1. To create a CNC program in Learn mode, select Learn from the CNC Program Tab.



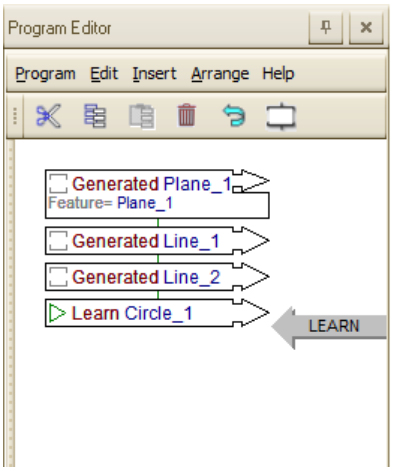

2. The Mode=Features in status bar will flash green,




the Measure Tab opens and Message is shown in the Results window.



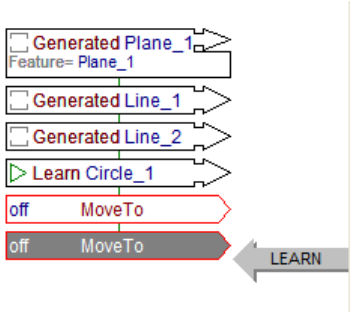

3. Program Manager is ready for collecting Learn moves




4. Moves for each feature consist of approach moves, feature measurement moves and exit move. The approach moves are the moves from the previous feature exit point to current feature entry point. The entry point should be such that there is a clear and unobstructed path from it to the first feature data point.

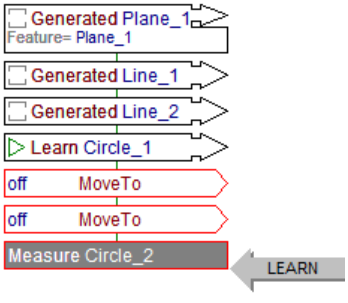
## Approach moves

5. Press Space bar or Learn Button on the machine joystick to record machine position. Repeat entering moves to avoid any obstruction on the way until you get close to the feature you need to measure.
6. Approach moves are recorded and shown in red in the program manager

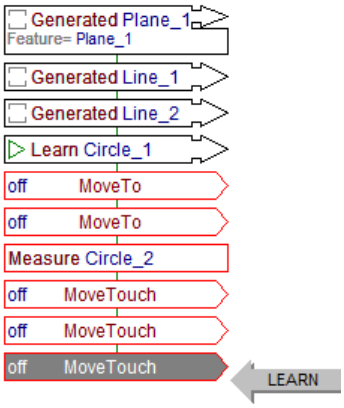



## Feature inspection

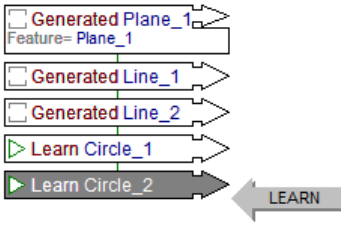
7. From Measure Tab, choose Circle. Please make sure that there is a clear path between the last position of the approach and the first intended data point on the circle.




8. Measure manually 4 points on the circle. If the default number of circle data points is set to 4, the feature measurements will terminate automatically after the 4$^{th}$ data point.




9. After the last 4th point is entered, the circle is calculated and all the approach moves and feature inspection moves are presented as a single box in the Program Editor.

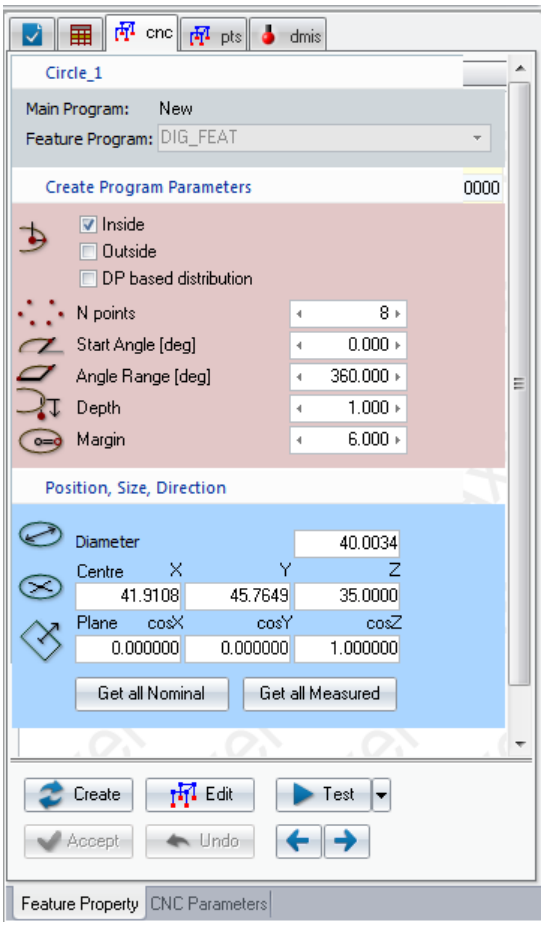



### Exit Point

10. Now the program waits for the Exit move to be recorded. The Exit point is normally entered at safe and convenient stand-off position. The Exit point entry completes feature program.
11. Repeats steps 4 – 8 to measure more feature.
12. Depress the Learn in the CNC Program Tab to finish the Learn sequence.

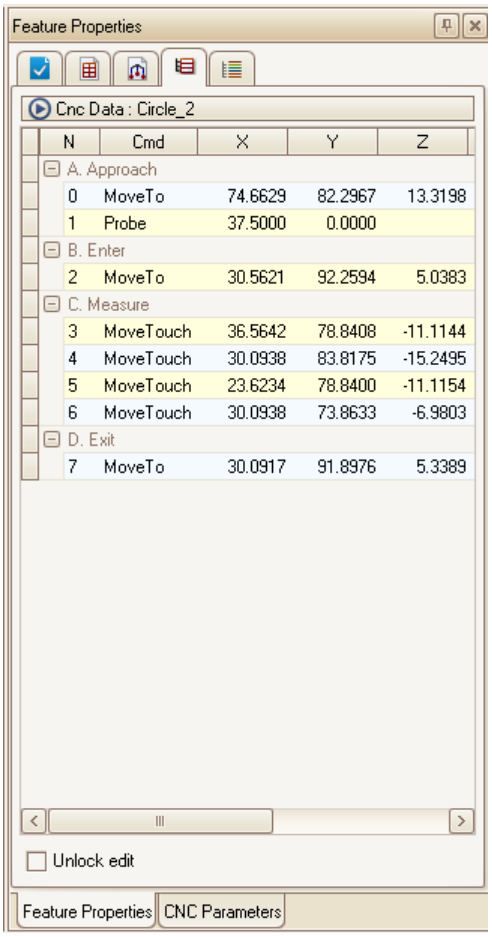
# CNC Parameters dialog

Each feature CNC program is defined in the Feature CNC Program tab. The program is created based on its standard nominal or measured values with default parameters.




# New CNC Feature program table

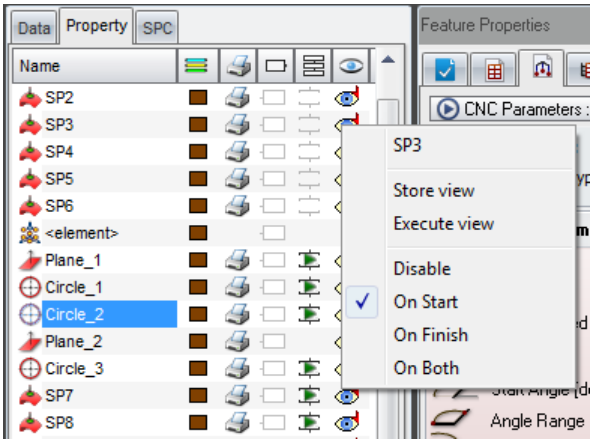
The CNC Feature program table displays the move commands that measure the feature. The probing, non-probing and probe change commands are shown.




# Measure Windows Views

Each time new feature is defined from CAD, the current at the time view is also saved. When running CNC program, the view is recalled.

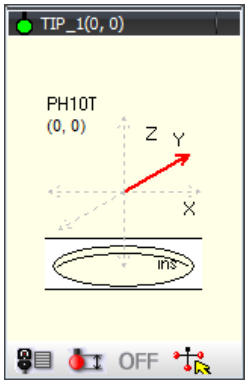
Views may be defined at any time.



# New PH10 probe window

The Probe selection window has been redesign. Each probe comes with its own predefined set of functions. There is also direct access to the probe calibration.


Probe Selection window with Select Styli Picture Box




Probe Selection window with Select Probing Directions Picture Box.

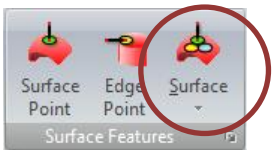
# Surface

Touch Probe tip must be calibrated before any measurement can take place. Multiposition probes (star probes, MIH and PH9) must have each tip position calibrated. Program calculates tip diameter and its relative position from the reference one. Each probe has a reference tip marked in red on the list. All the other positions are referenced to it.

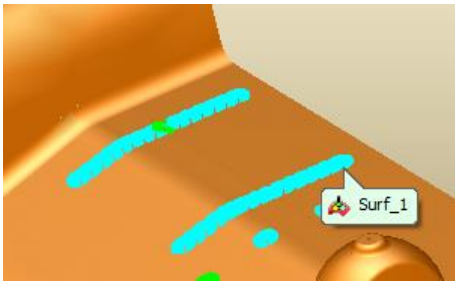
When calibrating or measuring a part you must first select the measuring probe and also its measuring position (tip) in case of multi position probes.

## Surface Block inspection

The new Surface feature can be found in the Surface features section of the Measure ribbon.

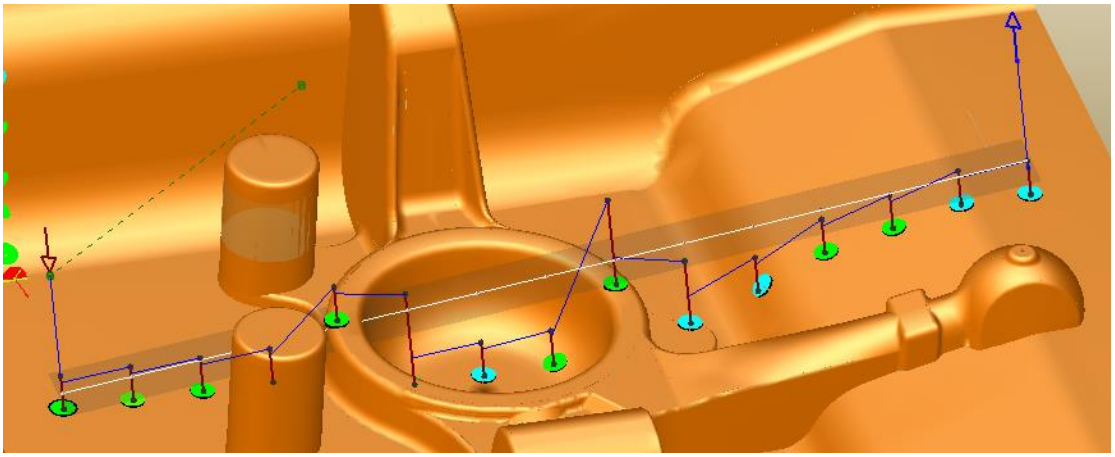



The feature is used for grouping individual surface points under a single feature. It is also used for scanning with the scanning probe mounted on the machine or on measuring arm.



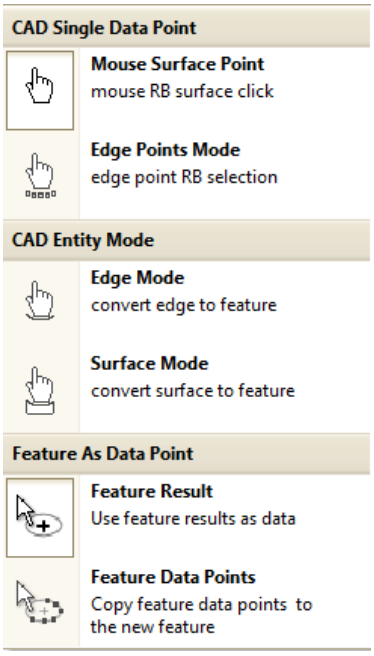

## Surface Block CNC feature

The surface feature CNC feature program is created automatically. The Surface feature can be scan along a single line or around the selected area in grid fashion.



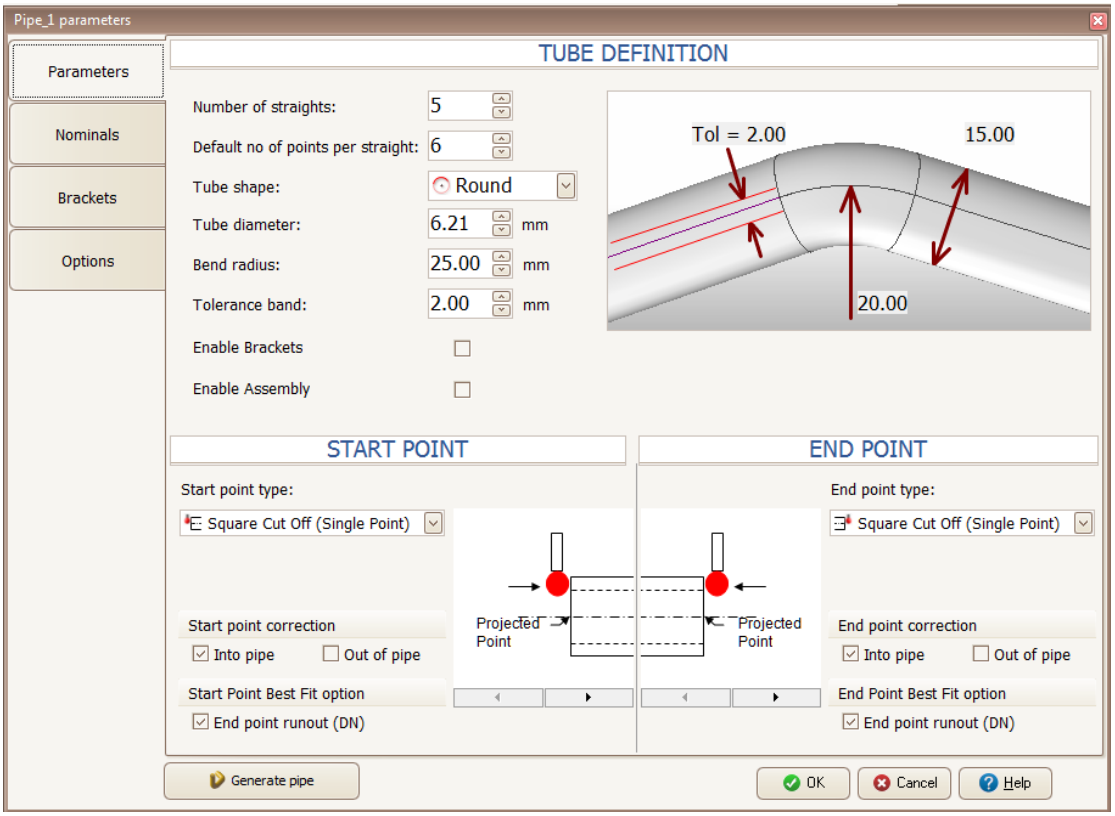
# CAD Pickup tools Options 

The commands are used for extracting features from CAD model. The range of available commands allows extracting just about any geometric or surface feature from CAD files.

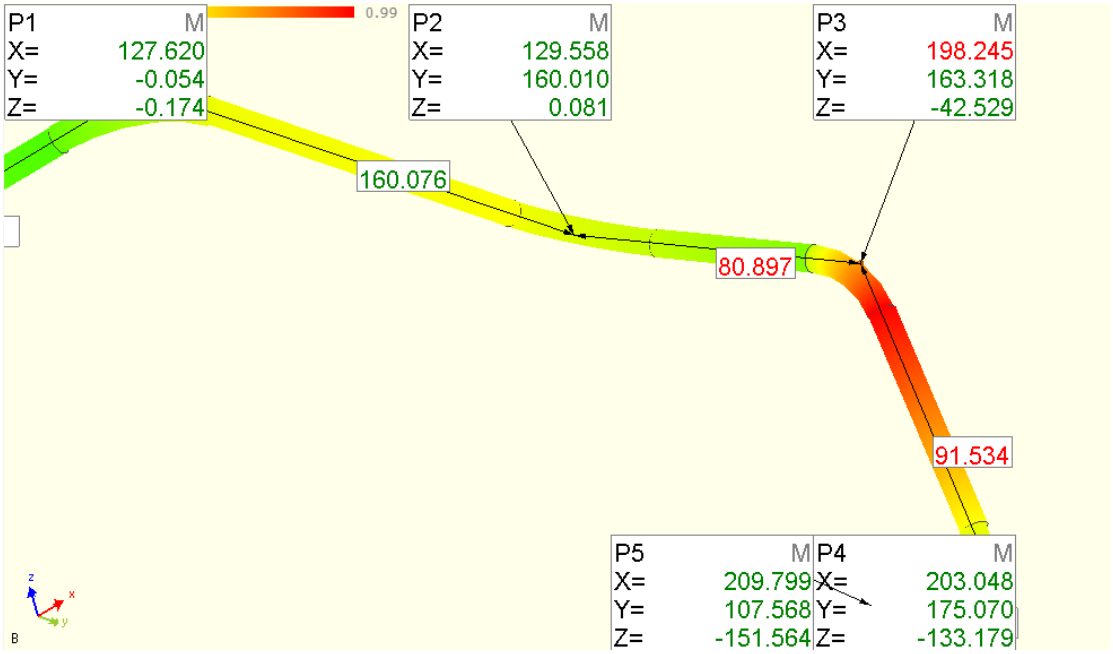


# Pipe

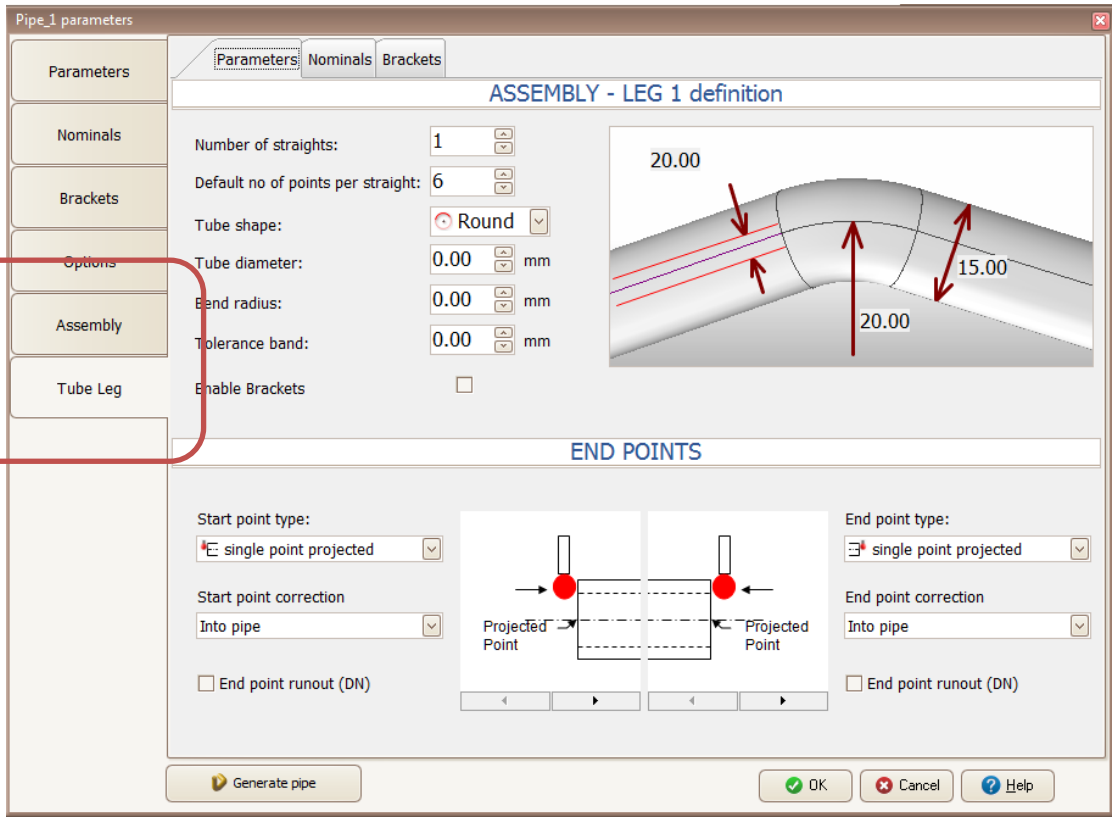
## New Pipe wizard



# Deviation colour overlay




# Pipe assembly inspection



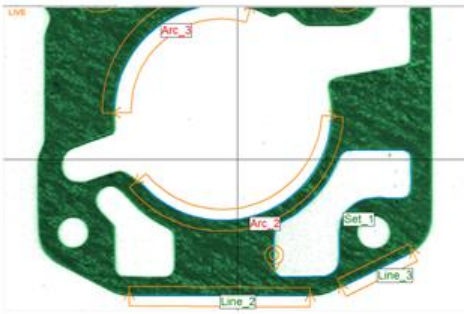
# Image

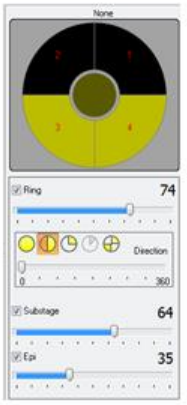
## Video

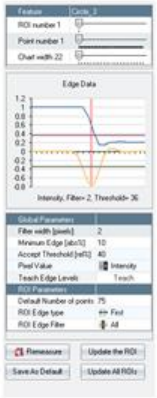
New module to handle camera inspection. Fully integrated with Axel, can also be supplied as stand alone.

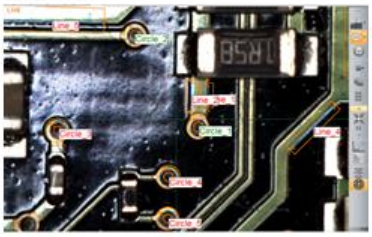
### Key features

- ***Add-on module for Axel Software*** – Vision software is available as an stand alone package for Video CMM machines or as an addition for our Axel Metrology Suite for CMM machine where Touch Probe and Image Probe are both installed.
- ***Geometric Features*** – full range of geometric inspection features measured with wide range of image tools.
- **Auto Feature** – one click operation to measure the range of features.
- ***Adaptive Edge Detection Techniques*** – Extensive set of edge detection tools is available. Automatic edge detection within defined ROI, auto edge points. Edge detection comes with tools and setups to deal with variety of surface finishes and lighting conditions.
- ***AutoFocus*** – Build in autofocus is offered for manual and automatic video systems to increase inspection accuracy.
- **Dual Screen Operation** – Video inspection can be configured for dual screen operation
- ***Reverse Engineering*** – features to reverse engineer parts with export to CAD packages.
- ***Go-Mode –*** Automatic Feature List program creation for repetitive running of inspection routines with user defined messages.
- Go mode auto view play to enhance feature inspection
- DDE / File / Serial Data export to SPC & Excel
- Export results to ***MS Excel and HTML*** with multiple templates
- User configurable, fully featured text & Graphical Report Generator



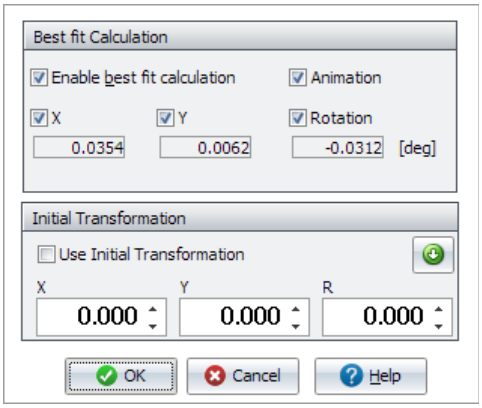



# Profile

## New profile tab


Coloured deviations

Best fit




Unknown profile scanning – camera and touch probe

# Index