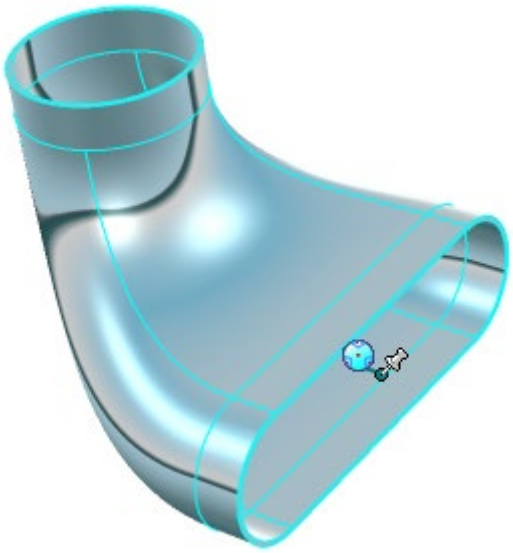
Managing the Anchor Point



Managing the Anchor Point in IRONCAD

The Anchor Point in IRONCAD is the permanent property which decides where in a 3D scene an object is placed, and which orientation it has along the global XYZ axis.

Permanent in that way that it is always there and cannot be removed, but nevertheless mobile and possible to control in an easy way!

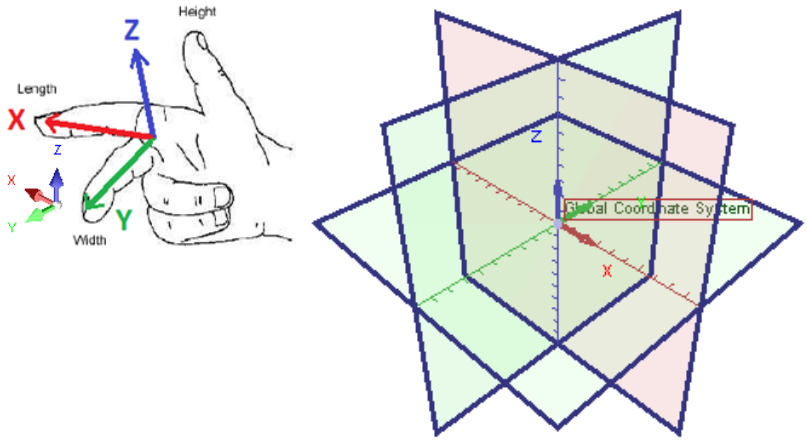
You will be quite fine using IRONCAD without knowing about the existence of the Anchor Point and how it works. You simply don't have to manage it at all – you will still have full control where in space one or more objects are placed.

However, there are certain rules which are good to know about, since they will ease up some situations that you will end up in from time to time. Many users will notice, after a certain time, that "*that needle*" might be good knowing better.

Content

The Coordinate System

Objects placed in the IRONCAD 3D scene is managed by a Right-Hand Oriented Cartesian Coordinate System, just like most of the Computer Aided Design / Manufacturing systems and Numerical Controlled machines on the market today. https://en.wikipedia.org/wiki/Cartesian_coordinate_system



Control of Position and Orientation

In contrast to traditional ”wholly” parametric 3D CAD systems, you don’t need to define an ”individual coordinate system” per object in the IRONCAD 3D environment, which can be more or less time consuming in other systems. Instead, a unique “position per object” is automatically created in IRONCAD, called the “Anchor Point”, which can be managed by various tools and settings.

Just like the traditional 3D CAD systems, you can have ”free” or ”constrained” objects in 3D space. The big difference compared with all other systems is that in IRONCAD there’s another “mode” – ”precision control of position and orientation” by the TriBall tool.

IRONCAD

FREE <-> ANCHOR POINT / TRIBALL <-> CONSTRAINED / RELATION

OTHER 3D CAD SYSTEMS

FREE <-> CONSTRAINED / RELATION

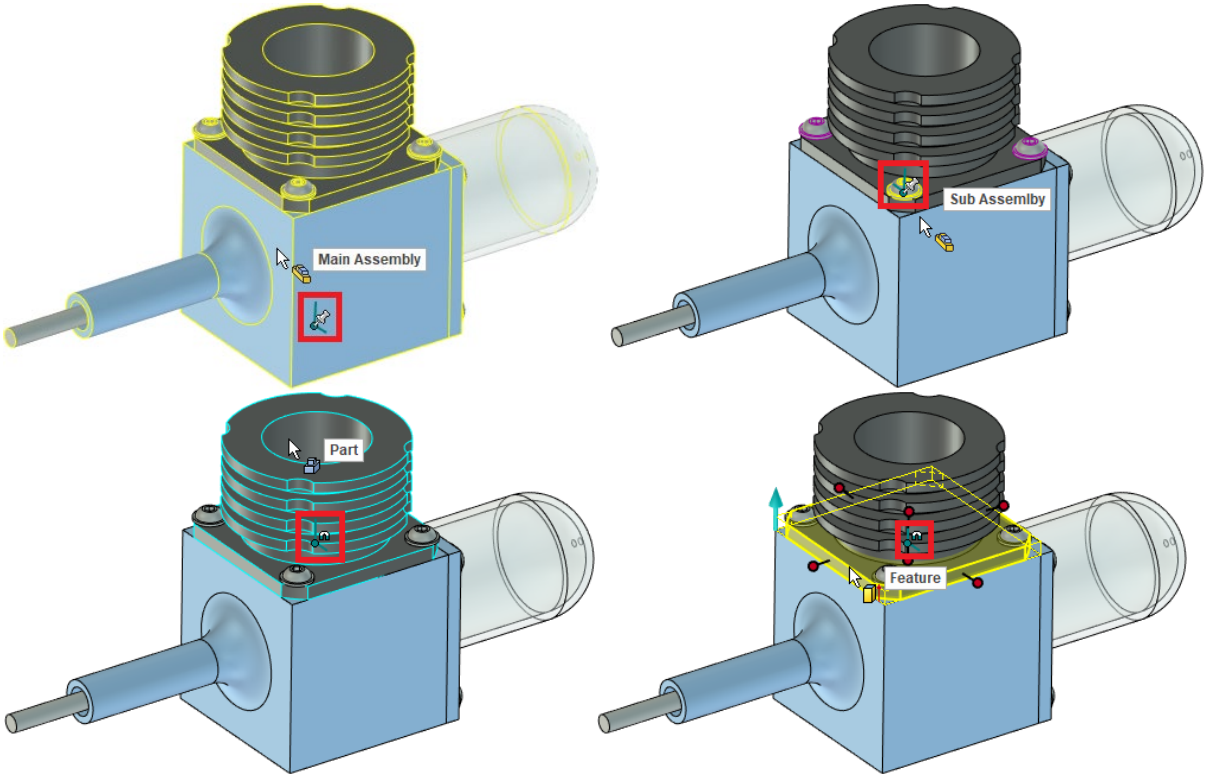
IRONCAD doesn’t not demand a constraint/relation to other objects in space in order to have control. With the TriBall you can freely move objects and keep the precision.

An ”object” is a *Part*, *Assembly* or *Feature* (*Extrude* / *Spin* / *Sweep* / *Loft*) in the 3D scene. But you can also move other ”3D scene specific objects” like cameras, lights, textures/decals and much more.

The Anchor Point

Every object created in IRONCAD will automatically receive an ***Anchor Point***, in order to manage the object within the rigid coordinate system.

Below are the *Main Assembly* (top level), *Sub Assembly*, *Part* and *Feature* levels;



When you drag and drop an object from a catalog it is “actually” the Anchor Point that is dropped into the 3D scene. Even if the geometry is what you see and think about, it is the Anchor Point that was managed by the system. It’s not until you know about it that you actually see it.

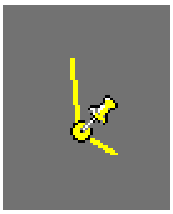
The Anchor Point of the first object created in a new empty 3D scene will always be placed in the origin point of the coordinate system. In a 3D scene which already contains objects, the new object will be placed at the exact location or “voxel” (volume pixel) of the mouse cursor, where it was dropped in space.

To move an object, you can simply use the TriBall, which will move the object together with its owned Anchor Point. Usually there’s no need to move the Anchor Point itself since it is the geometry you are working with, but it can be done in the same way with the TriBall.

The Anchor Point has four modes which is either set automatically by the system or toggled manually depending on where or what it was dropped on.

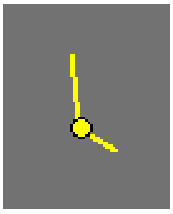
By right clicking on an Anchor Point you reach these four modes;

Disallow Drag



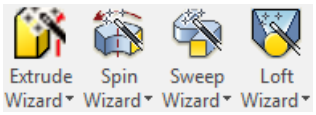
The bottom option is also the default mode called *Disallow Drag.* This means that the Anchor Point cannot be moved just by dragging it, or it's owning object, with the mouse cursor. Instead, a function like the TriBall or a Smart Dimension is needed. At the center of the Anchor Point there's a needle that visually indicates this mode.

Drag Freely in Space

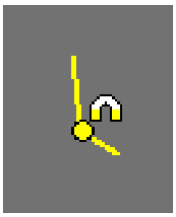


With the mode *Drag Freely in Space* it is possible to drag the Anchor Point or its owning object freely in space with the mouse cursor. Though there's no precision involved and is usually not recommended.

Though *Drag Freely in Space* is the default mode for the Anchor Point when new parts have been created starting off with the tools *Extrude Wizard*, *Spin Wizard*, *Sweep Wizard* and *Loft Wizard*. For that reason, it is good to adjust the mode to *Disallow Drag* on new parts when they have been made.



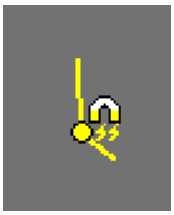
Drag Along Surfaces



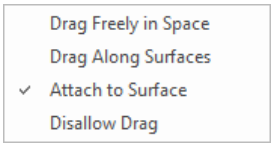
With the mode *Drag Along Surfaces* you can ”hoover” along faces on all objects within the same structure level (Feature under Part and Part under Assembly etc). At the center of the Anchor Point there's a magnet that indicates this visually. Click and hold the center point with the left mouse button to drag the Anchor Point.

It is also possible, when a feature is selected, to use the [Shift] key to snap against other geometry. For example, the tangency between a plane and a cylindrical face of two different features or the center of cylindrical shapes.

Attach to Surface



The mode *Attach to Surface* is only shown on the Anchor Point owned by a feature. It makes it possible to hoover along faces within the same part. At the center of the Anchor Point there's a magnet with two flashes that indicates this visually.

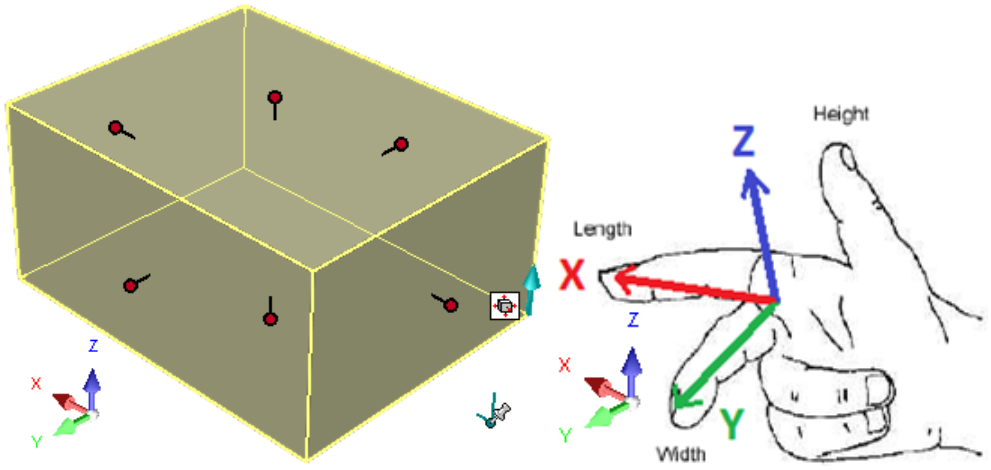


When a model changes dimension all other shapes attached to it using this setting will follow to keep the Anchor Point attached to the surface. It is also possible to use the [Shift] key to snap against other geometry within the part, as with the mode *Drag Along Surfaces*.

Internal Coordinate System of the Anchor Point

The Anchor Point has its own coordinate system with a positive and negative XYZ direction. For that reason, the Anchor Point can have a different orientation than the rigid coordinate system of the 3D scene. It doesn't even have to be attached to the geometry of the object it is connected to, even if that is usually the case.

Since the visual symbol is quite small on the screen, it can sometimes be hard to see in which direction it is currently pointing.

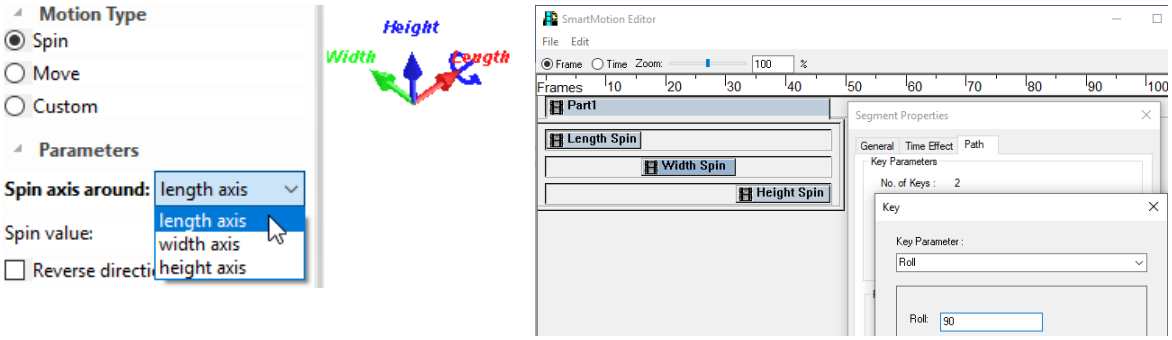


The long leg corresponds to the positive Z direction, or the right-hand thumb if you will. The short leg corresponds to the positive X direction, or the right-hand index finger. The positive Y direction lacks a "visual leg shape" but you can visualize it as the middle finger of the right hand.

Animations

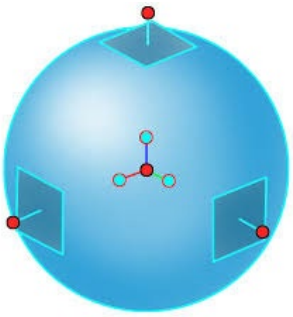
When creating animations in IRONCAD it is the Anchor Point that moves and rotates and takes its object with it. For that reason, it is good to know about the three direction and orientation labels of the three legs.

Z (blue) is called **Height** when moved and **Pan** at rotation.
X (red) is called **Length** (left image) when moved and **Tilt** at rotation.
Y (green) is called **Width** when moved and **Roll** at rotation (right image).



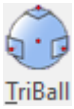
Learn more about animation in IRONCAD with the training material
Day 4, Video 10-11: https://www.youtube.com/playlist?list=PL8CD029539E412C61

TriBall

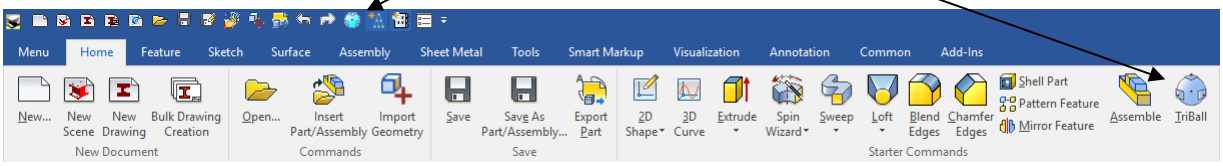


Since the Anchor Point in IRONCAD is “mobile” you need a tool to manage this with precision – that precision tool is the ***TriBall***.

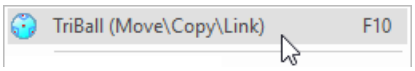
Activate the TriBall tool:

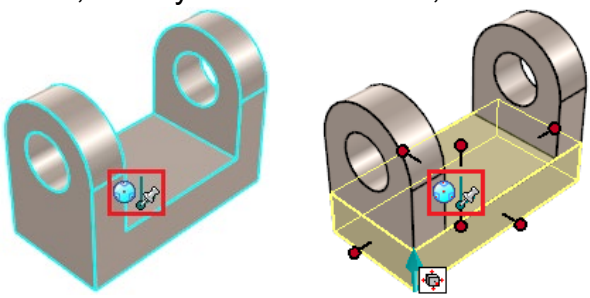


The activator icon for the TriBall can be found at many places in IRONCAD, such as the *Quick Access Toolbar*, the Ribbon Bar *Home* and *Tools* tab.

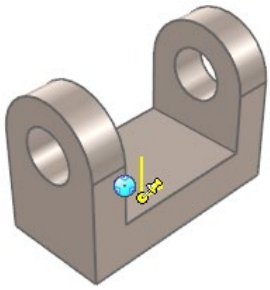


The TriBall is also available on the right click menu, and by an activator icon, on IntelliShapes, Parts and Assemblies;

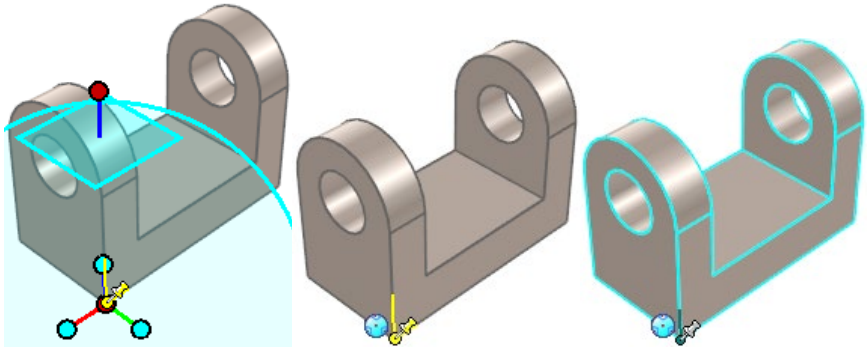




To move the Anchor Point itself with the TriBall it must be selected first. The color of the Anchor Point changes from green to yellow and the edges of the affected IntelliShape, Part or Assembly will be turned off.

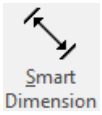


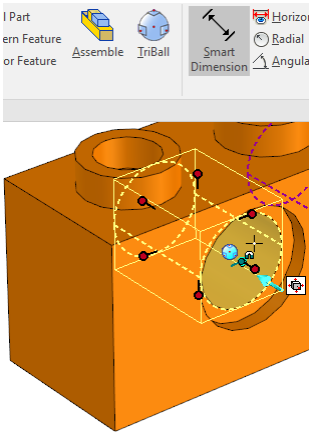
When the TriBall is activated, it is now the Anchor Point that is moved and reoriented. For example, if you want the origin point of a part in a certain corner, instead of the center of the part where it often starts off.



Learn more about how the TriBall works with the training material, day 1 video 5-7: https://www.youtube.com/playlist?list=PLADF556976EF56F01

Smart Dimensions

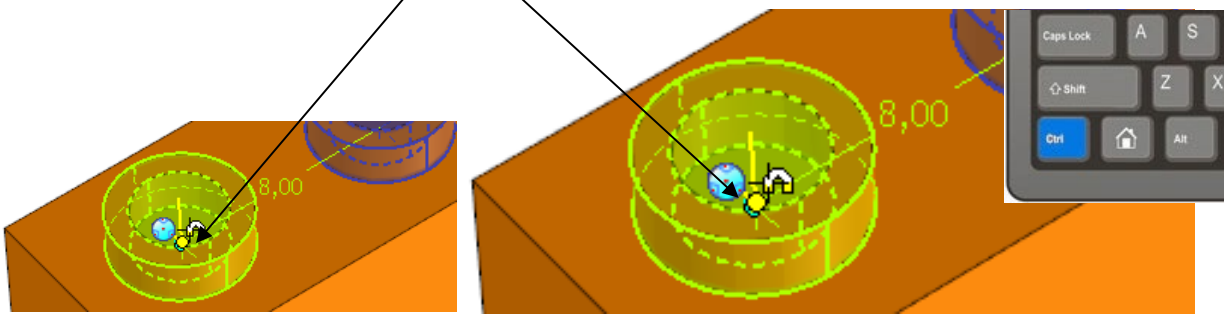




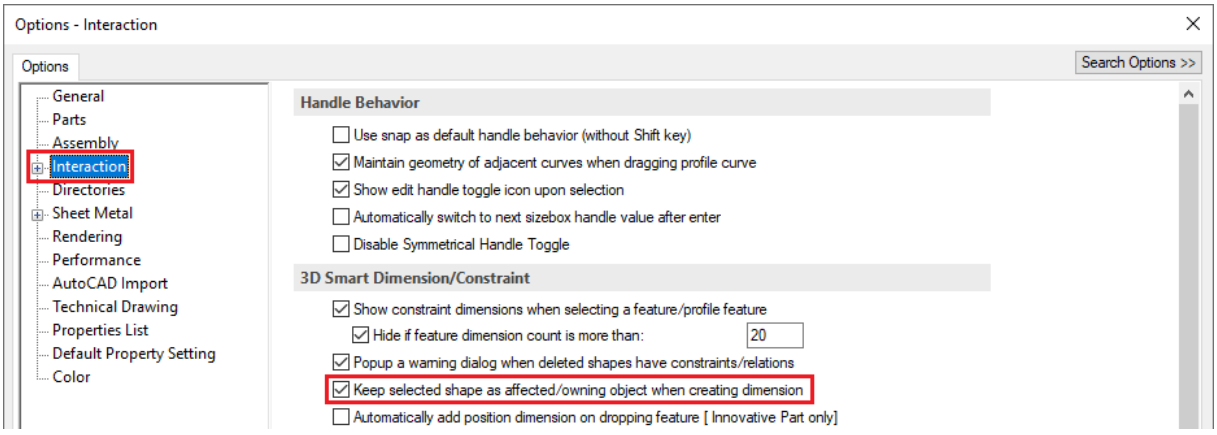
By placing Smart Dimensions, it is possible to control the position of objects in the 3D scene, even the Anchor Point. It is not very common (except when controlling parameters) that dimensions are connected to the Anchor Point. Usually, “position controlling dimensions” are placed between objects in combinations like ”hole – block”, ”part – part” or ”part – assembly” and so on.

Smart Dimension to an Anchor Point

To tie the Smart Dimension to an Anchor Point you must first select the owning object (Feature, Part or Assembly) and hold down the [Ctrl] key. At the center of the Anchor Point there will be a larger cyan blue point that the dimension will attach to, no matter where on the object you click. It can be partly hidden by the yellow center point.



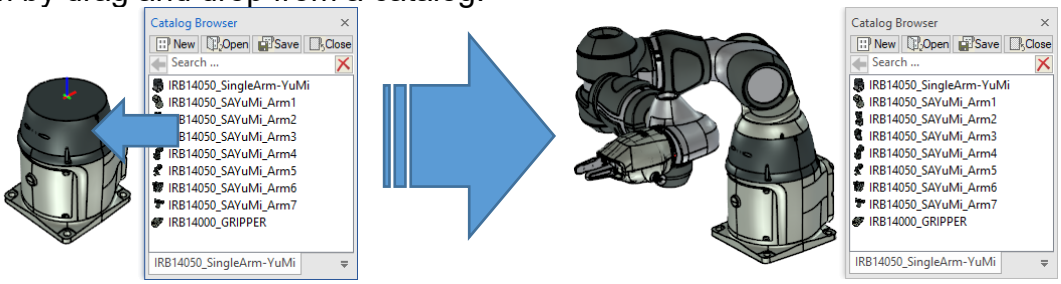
For *Patterns* created by the TriBall, you must also activate a certain setting under the Options, or else the dimension will be tied to the object (Feature, Part or Assembly) instead of the Anchor Point of the Pattern.



The setting can be found under *Interaction* and is called *Keep selected shape as affected/owning object when creating dimension*. Without this setting active it is not possible to tie dimensions to the Anchor Point of Patterns.

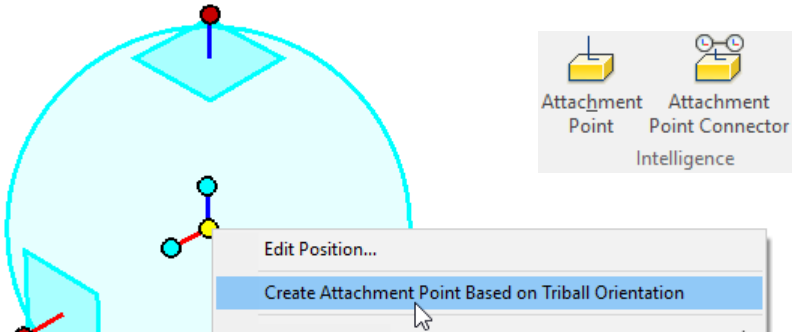
Attachment Points

With the use of ”magnetic” ***Attachment Points*** it is possible to add more points to an object, beside the Anchor Point. These Attachment Points (AP) can also sense other AP’s nearby when they are dropped onto an object with the same kind of AP. That way, it is very easy to pick and place together pieces for a robot or pipes in a tubing system by drag and drop from a catalog.

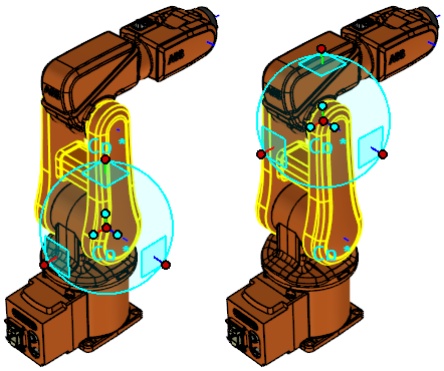


Attachment Points and the TriBall

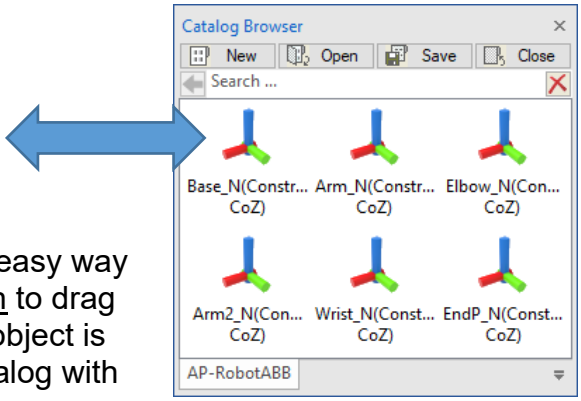
The tools to create and manage Attachment Points are located under the tab *Tools*, icon group *Intelligence*. It is also possible to create AP’s from the right click menu of the Center handle of the TriBall:



The main difference between the two is that the Attachment Point created by the TriBall isn’t automatically associated with the object it is attached to, which it will be when created with the AP tool or dropped from a catalog. Since a face or point will light up in green on drop, there will also be an associativity created to that face or point.

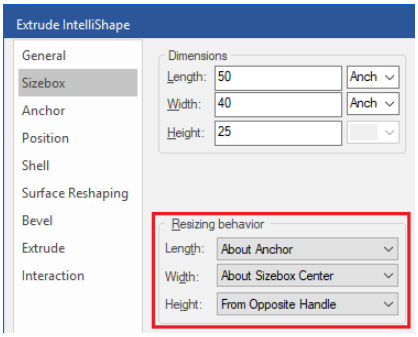


Using the [TAB] key, the TriBall can easily move between the AP’s available on the selected object.



Attachment Points can also be reused in an easy way through catalogs. Use the right mouse button to drag an AP into a catalog. Make sure the correct object is selected before dropping an AP from the catalog with the left mouse button.

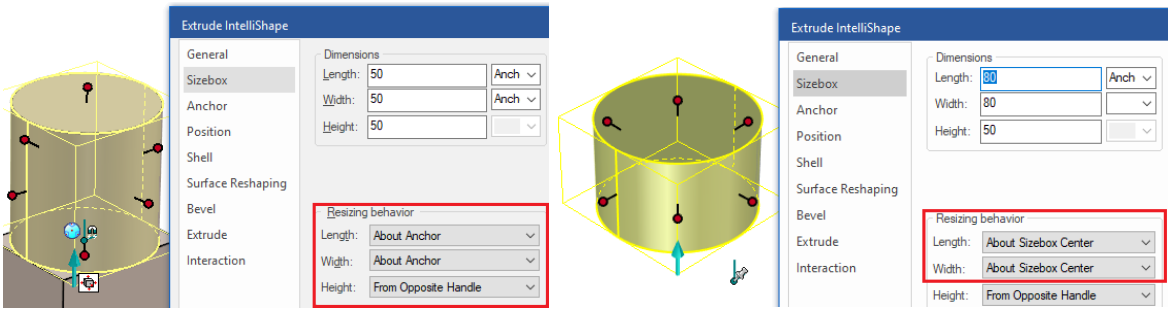
Intellishape Sizebox



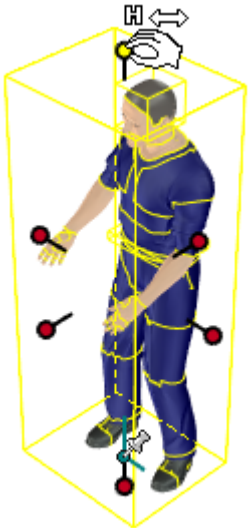
Under the *Intellishape Properties* you can manage the three basic rules on how the Sizebox L-, W- and Z-handles should behave when dragged and the Anchor Point is involved here as well.

Under *Resizing behavior* it is possible to choose that the change in a certain direction is permitted only ***About Anchor***. For example, the *Cylinder, Ellipse* or *Sphere* shapes found under the *Starter* catalog.

Though, in these specific cases it is only predictable if the Anchor Point is placed in the center of the shape (left image below). If not, the shape will no longer resize in a symmetrical way around the center which is probably not very usable.



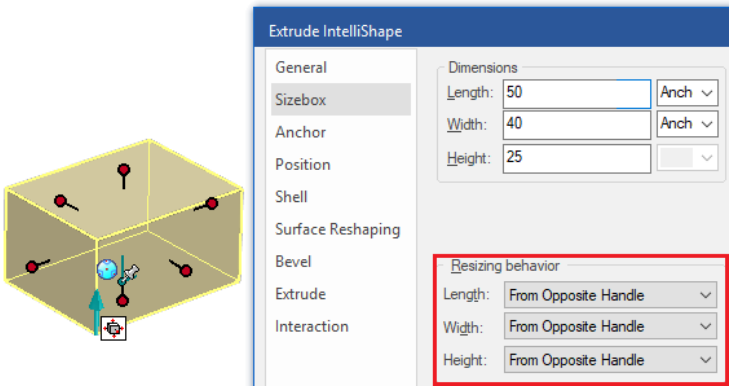
In the case of a symmetrical shape with the Anchor Point outside the center (right image above) it could use ***About Sizebox Center*** only on the *Length* and *Width* handles. It will ignore the position of the Anchor Point and only use the Sizebox handles relative to each other.



It is also used when a Part or Assembly should be scaled symmetrical in all directions and set on all handles. Useful when the imported model needs to keep its ratio when modified, like the 3D figure to the right:

The *Height* handle is usually set using the behavior ***From Opposite Handle***, where the other handles won't be affected by the change and the opposite side is standing still where it was first placed.

The standard *Block* or *H Block* shapes uses this behavior on all handles.

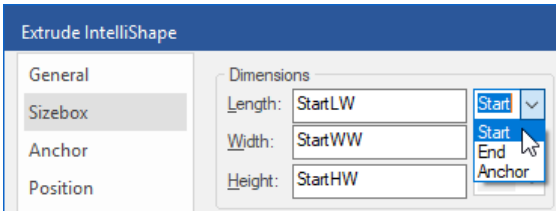


Parameter control of IntelliShape

Instead of changing the size of the Sizebox by dragging one of the L-, W- and Z-handles, you can control the shape size from the Parameter table, by connecting a parameter to a Sizebox handle under the IntelliShape properties.

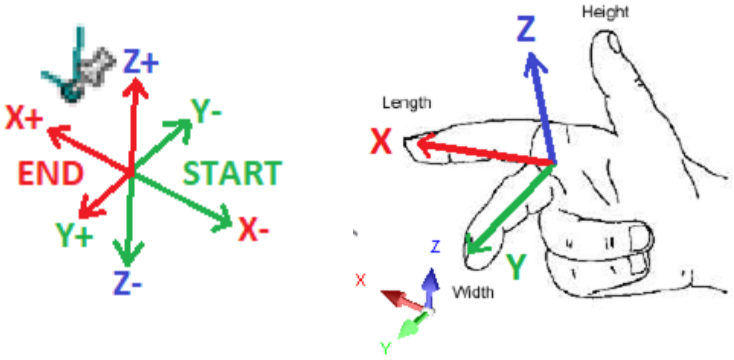
From now on, dragging the handle itself is no longer a valid way of editing the dimension values, which is also visually indicated with a cyan blue color on the handles (red is the standard color of the handles).

When the dimension change is forced down by a parameter, it will be able to move in one direction or both (symmetrical) and this must be possible to control.



Being able to lock the Sizebox handle behavior relative the Anchor Point position and orientation is useful when using parametric control of the Sizebox dimension values. This can be done at the Assembly, Part and Feature level Sizebox settings.

By default, the Sizebox dimension control is set to the *Anchor* mode which means that the dimension change that is forced down from the Parameter table will affect the Sizebox symmetrically – both from the location and orientation of the Anchor Point.



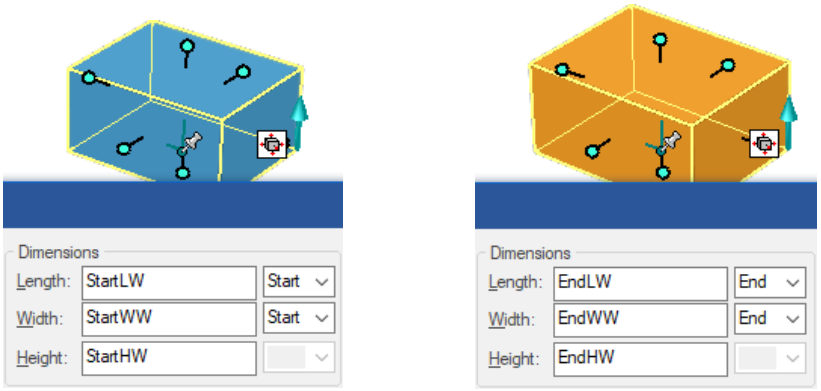
By changing from *Anchor* mode to *Start* or *End* mode, the Sizebox dimension change will only be relative to the orientation of the Anchor Point. The position is ignored.

- *Start* – means that the direction of change goes in the opposite direction of the visual legs of the Anchor Point. Negative X, Y and Z (green START arrows on the left image above).

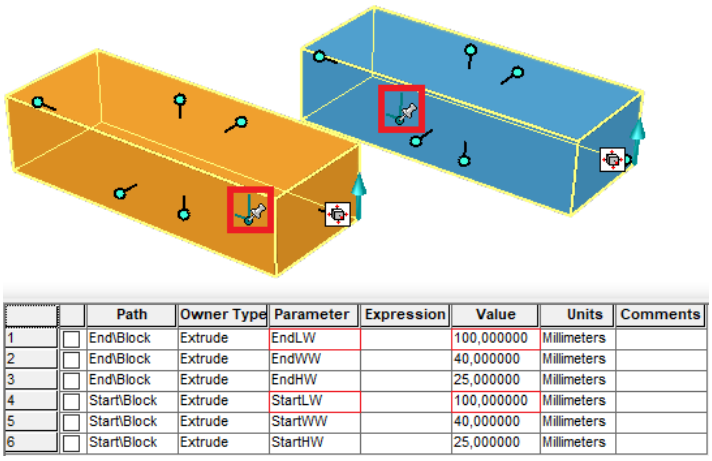
- *End* – means that the direction of change goes in the same direction as the visual legs of the Anchor Point. Positive X, Y and Z (red END arrows on the left image above).

- *Anchor* – means symmetrical change in both directions of the Anchor Point center (default mode). Both its position and orientation will affect the way the Sizebox dimension changes.

When the same parameter value is changed on the example models below, the dimension will be changed in the direction in which the Sizebox Dimension mode is set to – *Start* or *End*.



The *Length* parameter named ***LW* (short for ****Length Write*) is connected to the Sizebox *Length* handle in the IntelliShape Properties.



		Path	Owner Type	Parameter	Expression	Value	Units	Comments
1		End\Block	Extrude	EndLW		100,000000	Millimeters	
2		End\Block	Extrude	EndWW		40,000000	Millimeters	
3		End\Block	Extrude	EndHW		25,000000	Millimeters	
4		Start\Block	Extrude	StartLW		100,000000	Millimeters	
5		Start\Block	Extrude	StartWW		40,000000	Millimeters	
6		Start\Block	Extrude	StartHW		25,000000	Millimeters	

When the blue model *Length* dimension (*StartLW*)) changes from 50 to 100 in the Parameter table, it will update the model in the Anchor Point *Start* direction – it becomes longer on the right side (or the negative X direction).

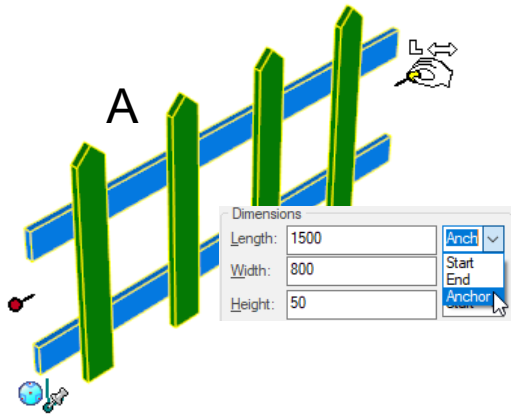
While the orange model *Length* dimension (*EndLW*) changes in the *End* direction – to the left (or the positive X direction).

The models are equal in all other aspects. Only the *Start* or *End* drop down setting is different. This makes it possible to control the direction of change using both parameters and Sizebox handles.

Another example is a parametrically controlled assembly of a wooden fence. The fence can only be allowed to change in one direction of the Sizebox *Length* handle, but in this case by dragging the handle, which will update the parameter table too. It is not allowed to change in both directions at the same time.

There are two solutions to control this;

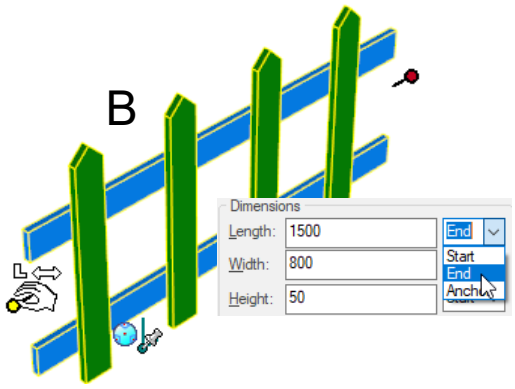
A) ***Anchor*** – the Anchor Point is placed on the opposite side of the Sizebox from which it should be able to be modified with the *Length* handle. That will obstruct the other *Length* handle on the same side as the Anchor Point from being modified.



The fence can only by modified in one direction -> the opposite side of the Anchor Point.

Even if the *Anchor* mode allows dual direction changes, there is no geometry behind it to change. This means that only geometry ahead can be changed – by dragging the L handle in that direction.

B) ***Start/End*** – for some reason, the Anchor Point cannot be placed in one corner of the fence, maybe because the origin point of the fence shouldn't be at the very bottom corner of the fence. Instead, the Anchor Point must be positioned at a certain point with a certain distance from one end of the fence.



It is no longer the position of the Anchor Point that controls the change of the L handles, but the orientation (of the visual legs) alone. The Anchor Point will also change its position and follow in the direction of change and keep its relative position within the Sizebox of the Assembly.