



PTC **Education** Program

CoCreate 17.0

CoCreate Modeling

Machining Features

Agenda

Machining features extensions

- Unique identifiers within tables
- Stepped hole feature

Machining features extensions

Unique identifiers within tables

- Prior to CoCreate Modeling 17.0 there was restriction concerning multiple rows for the same `apply_column`.

```
(sd-create-logical-table "mach_adv_library-counterbored_throughhole-hole_dia-table"
:columns      ' (:description :hole_dia      :hole_dia_tol  :sink_dia_prop  :sink_depth_prop)
:columnNames  ` ("Description" "Hole Diameter" "Hole Diameter Tolerance" "Sink Diameter" "Sink Depth")
:types        ' (:string :length :list :list :list)
:units        ' (nil :mm nil nil nil)
:contents     '(
  ("H m 8" 9.0
   (:tol_type :iso :iso "H13")
   (:value 15 :tol_type :iso :iso "H13")
   (:value 6 :tol_type :upper_lower :lower_tol 0.0 :upper_tol 0.4))
  ("J m 8" 9.0
   (:tol_type :iso :iso "H12")
   (:value 15 :tol_type :iso :iso "H12")
   (:value 6 :tol_type :upper_lower :lower_tol 0.1 :upper_tol 0.3))
)
```

```
(sd-create-display-table "mach_adv_library-counterbored_throughhole-hole_dia-table"
:tableTitle      "Counterbores"
:logicalTable    "mach_adv_library-counterbored_throughhole-hole_dia-table"
:columns         ' (:description :hole_dia)
:filterStatusLine nil
:applyColumns    ' (:hole_dia)
:selectionMode   :single-row
:applyAction     :default-tokens
)
```

Machining features extensions

Unique identifiers within tables

- All variables that can have a table have a `variable_name_id` column.

```
(sd-create-logical-table "mach_adv_library-counterbored_throughhole-hole_dia-table"
:columns      '(:hole_dia_id :hole_dia :hole_dia_tol :sink_dia_prop :sink_depth_prop)
:columnNames  `("Description" "Hole Diameter" "Hole Diameter Tolerance" "Sink Diameter" "Sink Depth")
:types        '(:string :length :list :list :list)
:units        '(nil :mm nil nil nil)
:contents     '(
  ("H m 8" 9.0
   (:tol_type :iso :iso "H13")
   (:value 15 :tol_type :iso :iso "H13")
   (:value 6 :tol_type :upper_lower :lower_tol 0.0 :upper_tol 0.4))
  ("J m 8" 9.0
   (:tol_type :iso :iso "H12")
   (:value 15 :tol_type :iso :iso "H12")
   (:value 6 :tol_type :upper_lower :lower_tol 0.1 :upper_tol 0.3))
)
```

```
(sd-create-display-table "mach_adv_library-counterbored_throughhole-hole_dia-table"
:tableTitle      "Counterbores"
:logicalTable    "mach_adv_library-counterbored_throughhole-hole_dia-table"
:columns         '(:hole_dia_id :hole_dia) ;; instead of '(description :hole_dia)
:filterStatusLine nil
:applyColumns    '(:hole_dia_id) ;; instead of '(hole_dia)
:selectionMode   :single-row
:applyAction     :default-tokens
)
```

Machining features extensions

The column key `:tap` has been replaced by `:thread_dia_id` within the "thread_dia" table.

- With CoCreate Modeling 17.0 the need to implement both the "tap" table and the "thread_dia" table and to keep those synchronized has been mostly eliminated. It is only needed, if you have other dialogs using the threaded holes which specify the thread via the `:tap` parameter.

```
(sd-create-display-table "mach_adv_library-tappedholes-tap-table"  
  :tableTitle      "Threads"  
  :logicalTable    "mach_adv_library-tappedholes-tap-table"  
  :columns         '(:tap_units :tap :drill_depth :tap_depth)  
  :filterStatusLine nil  
  :applyColumns   '(:tap )  
  :selectionMode  :single-row  
  :applyAction    :default-tokens  
)  
(sd-create-display-table "mach_adv_library-tappedholes-thread_dia-table"  
  :tableTitle      "Threads"  
  :logicalTable    "mach_adv_library-tappedholes-thread_dia-table"  
  :columns         '(:tap_units :tap :drill_depth :tap_depth)  
  :filterStatusLine nil  
  :applyColumns   '(:tap)  
  :selectionMode  :single-row  
  :applyAction    :default-tokens  
)
```

No longer needed
with 17.0

Machining features extensions

For features with threads three additional columns have been added.

- NTP and UNC threads to be displayed as fractions

```
Threaded Throughhole
Drill 43.5 (1.7126") Dia Hole to depth 63
Thread Diameter NPT 2" x Thread Size 11½ tpi
```

- Customizations need to be updated if they are based on the predefined logical table
- Alternatively – if you don't need these columns – you can create your own logical table without these columns. In that case the thread_size is taken into account.

Thread TPI

Key: :thread_tpi
 Type: :number
 Unit: nil

Thread TPI denominator

Key: :thread_tpi_den
 Type: :number
 Unit: nil

Thread TPI nominator

Key: :thread_tpi_num
 Type: :number
 Unit: nil

Machining features extensions

Together with the `thread_size` column these columns offer different ways of specifying the thread size

- The improvement has been done for achieving values properly displayed in Annotation for certain NPT and UNC threads (like 11 1/2)
- NPT 11.5

Thread Size: 0.0
 Thread TPI: 11
 Thread TPI numerator: 1
 Thread TPI denominator: 2

Threaded Throughhole
 Drill 43.5 (1.7126") Dia Hole to depth 63
 Thread Diameter NPT 2" x Thread Size 11½ tpi

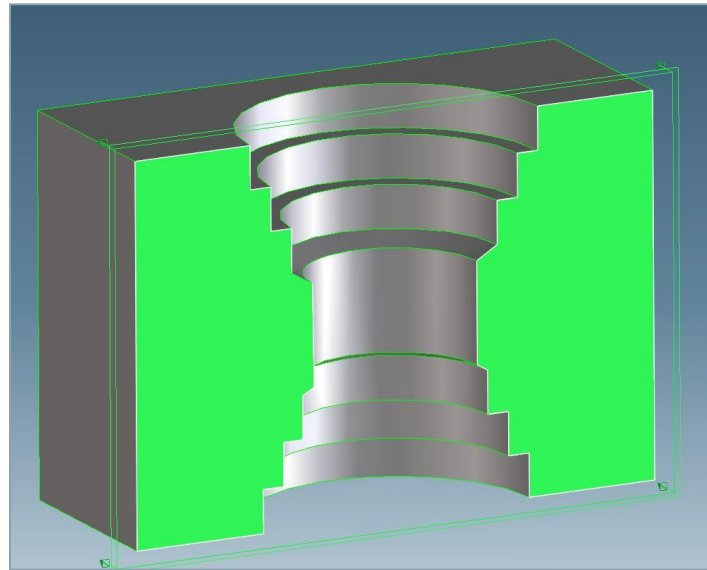
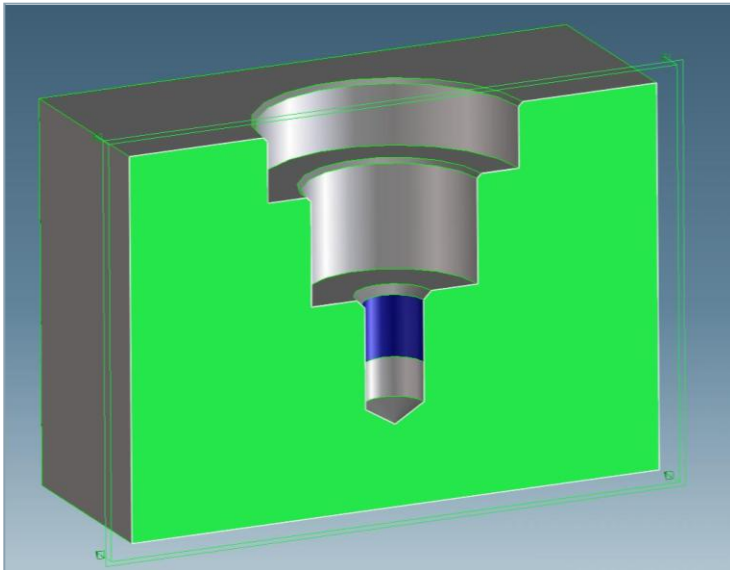
`mach_adv_library-tappedholes-thread_dia-table`

Tap Units	Tap Size	Drill Rad	Tap Rad	Thread Size	Chamfer Rad	Std Tap Clearance	Thread Starts	Nominal Pipe Dia	Thread TPI	Thread TPI numerator	Thread TPI denominator
metric	M3	1.25	1.5	0.5	1.7	3	1	0	0	0	1
metric	M4	1.65	2	0.7	2.315	4.2	1	0	0	0	1
metric	M5	2.1	2.5	0.8	2.86	4.8	1	0	0	0	1
metric	M10	4.25	5	1.5	5.5	10	1	0	0	0	1
inch	#4-40	1.1303	1.4224	0	1.7145	3.81	1	0	40	0	1
inch	#5-40	1.28905	1.5875	0	1.8796	3.81	1	0	40	0	1
NPT	A 11 1/2	21.75	24.027	0	26	15	1	50.8	11	1	2

Machining features extensions - Stepped hole feature

Create stepped blind holes and stepped through holes

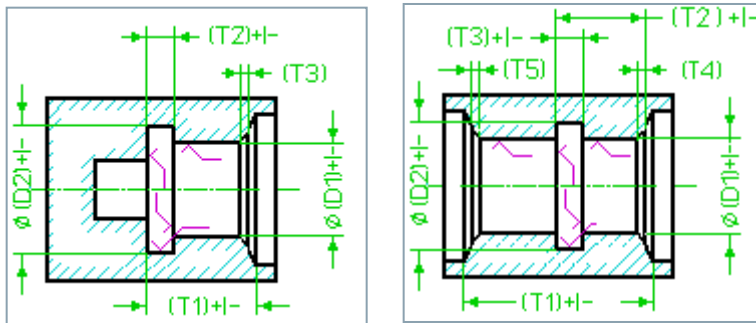
- **Stepped blind holes:** If you see the diameters from the start point, with a stepped blind hole the further from the start the step is located, the smaller the diameter, i.e. every step has to have a smaller diameter than its predecessor.
- **Stepped through holes:** A stepped through hole has to be made from two stepped blind holes from the start and end point, i.e. the diameters will have to decrease first and can increase after a through hole step again.



Machining features extensions - Stepped hole feature

Restrictions

- Stepped holes with recesses or grooves are neither allowed nor possible at the moment.
- Thus the following examples are not supported

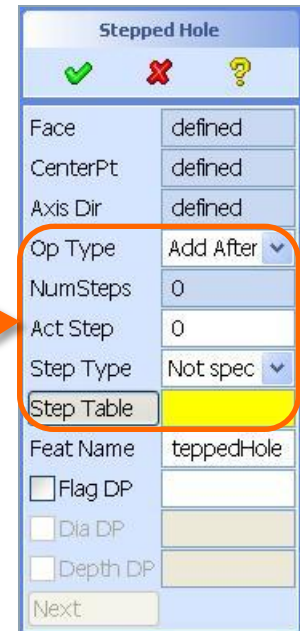


Machining features extensions - Stepped hole feature

Create a stepped hole

- It is a logical further development of the simple hole features and the counterbore hole (which is a stepped hole as well).
- The steps definition area in the menu is used to add, remove or modify the steps of the feature.
- For each step you choose between a set of step types available for creating the next step

Step definition area

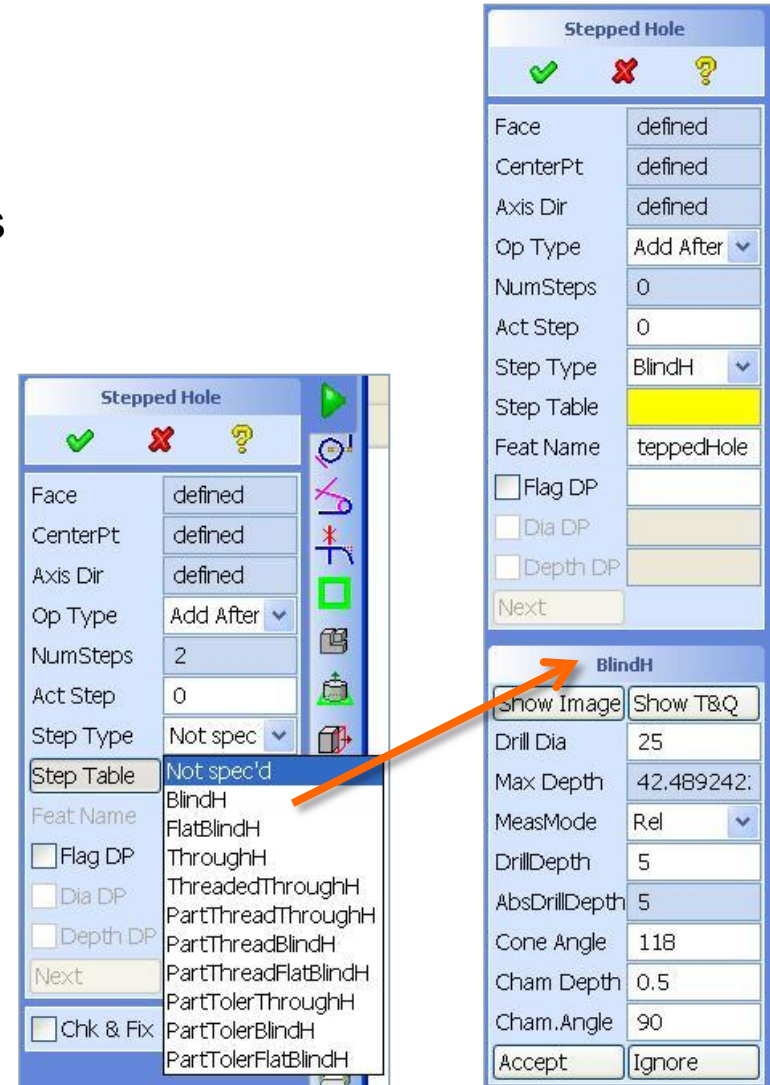


Stepped Hole	
Face	defined
CenterPt	defined
Axis Dir	defined
Op Type	Add After
NumSteps	0
Act Step	0
Step Type	Not spec
Step Table	
Feat Name	teppedHole
<input type="checkbox"/> Flag DP	
<input type="checkbox"/> Dia DP	
<input type="checkbox"/> Depth DP	
Next	

Machining features extensions - Stepped hole feature

Create a stepped hole

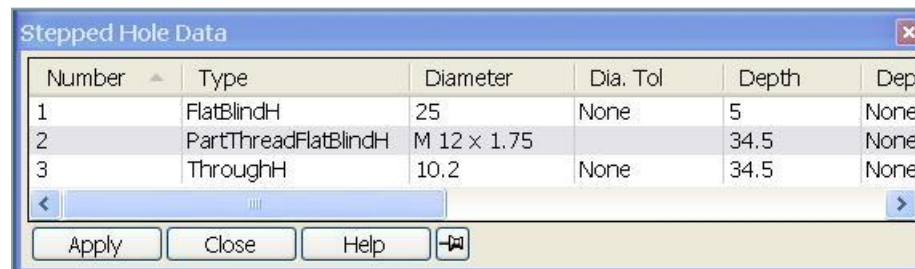
- If you select a step type for an individual step you want to create a sub dialog opens showing the appropriate parameters
- Currently there are 10 step types available (derived from individual simple feature types that were available so far)
- With Accept you confirm and move on to the next step



Machining features extensions - Stepped hole feature

Create a stepped hole

- Use the Act Step variable to open the Stepped hole data table and navigate through the individual steps
- Select the step to modify, remove or use as reference for add. The value of zero is allowed in order to specify "no step is selected", the maximum allowed value is the number of steps already added.



Number	Type	Diameter	Dia. Tol	Depth	Dep
1	FlatBlindH	25	None	5	None
2	PartThreadFlatBlindH	M 12 x 1.75	None	34.5	None
3	ThroughH	10.2	None	34.5	None



Stepped Hole

Face: defined

CenterPt: defined

Axis Dir: defined

Op Type: Add After

NumSteps: 2

Act Step: 2

Step Type: Not spec

Step Table: defined

Feat Name: teppedHole

Flag DP

Dia DP

Depth DP

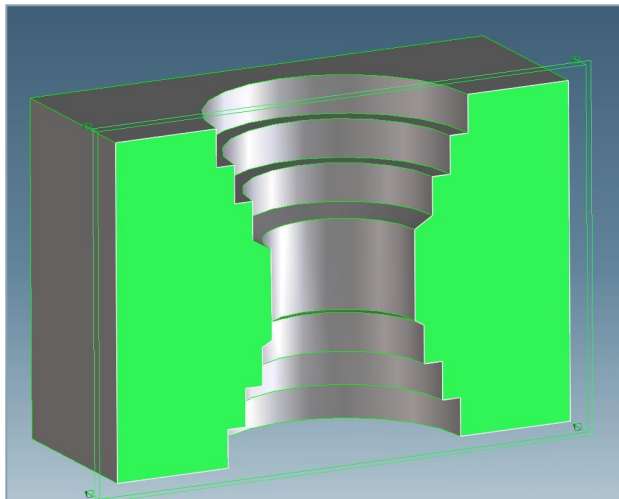
Next

Chk & Fix

Machining features extensions - Stepped hole feature

Stepped through hole

- Stepped through holes (STH) have a through hole step in the middle
- Through hole steps show a drill depth anyway, as further steps may follow
- For STH the steps after the through hole are turned around automatically



Stepped Hole Data

Number	Type	Diameter	Dia. Tol	Depth	DepthTol
1	FlatBlindH	70	None	10	None
2	FlatBlindH	60	None	10	None
3	FlatBlindH	50	None	10	None
4	ThroughH	40	None	28	None
5	FlatBlindH	45	None	10	None
6	FlatBlindH	55	None	10	None
7	FlatBlindH	65	None	10	None

Apply Close Help

Stepped Hole

Face: defined
 CenterPt: defined
 Axis Dir: defined
 Op Type: Modify V:
 NumSteps: 7
 Act Step: 4
 Step Type: Through
 Feat Name: teppedHole
 Flag DP
 Dia DP
 Depth DP

 Chk & Fix

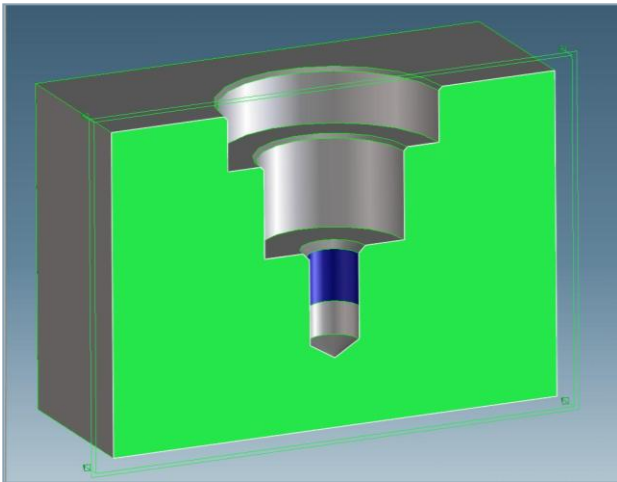
ThroughH

Drill Dia: 40
 MeasMode: Rel
 DrillDepth: 28
 AbsDrillDepth:
 Cham Depth: 0
 Cham.Angle: 90
 BckChDepth: 0
 BckChAngle: 90

Machining features extensions - Stepped hole feature

Stepped blind hole

- Final step is a blind hole



Stepped Hole Data

Number	Type	Diameter	Dia. Tol	Depth	Dep
1	FlatBlindH	60	None	15	None
2	FlatBlindH	40	None	25	None
3	PartThreadFlatBlindH	M 16 x 2		25	None

Apply Close Help

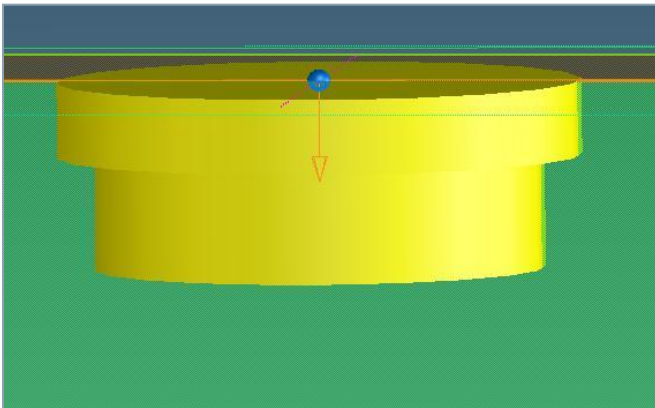
Machining features extensions - Stepped hole feature

Additional Information

- The depth of the individual steps can be entered as relative or absolute values

Graphical feedback :

- As soon as enough data is defined a graphical feedback is provided to outline the size of the feature being defined. This feedback is updated with every new parameter.



FlatBlindH		FlatBlindH	
Show Image	Show T&Q	Show Image	Show T&Q
Drill Dia	60	Drill Dia	60
Max Depth	78	Max Depth	78
MeasMode	Rel	MeasMode	Abs
DrillDepth	15	DrillDepth	15
AbsDrillDepth	25	AbsDrillDepth	25
Cham Depth	0	Cham Depth	0
Cham.Angle	90	Cham.Angle	90
Accept	Ignore	Accept	Ignore

Machining features extensions - Stepped hole feature

Additional Information

- Input tables can be specified for step variables

mach_adv_library-stepped_hole-drill_di...

Drill Diameter ID	Drill Diameter	Drill Depth
5x5	5	5
5x10	5	10
10x10	10	10
10x20	10	20
20x10	20	10
20x20	20	20
30x10	30	10
30x20	30	20
30x30	30	30
50x10	50	10
50x20	50	20
50x30	50	30
50x40	50	40
60x10	60	10
60x20	60	20
60x30	60	30
60x40	60	40

Apply Close Help

Stepped Hole

Face defined

CenterPt defined

Axis Dir defined

Op Type Add After

NumSteps 0

Act Step 0

Step Type FlatBlindH

Feat Name teppedHole

Flag DP

Dia DP

Depth DP

Next

FlatBlindH

Show Image Show T&Q

Drill Dia

Max Depth 88

MeasMode Rel

DrillDepth

AbsDrillDepth

Cham Depth 0

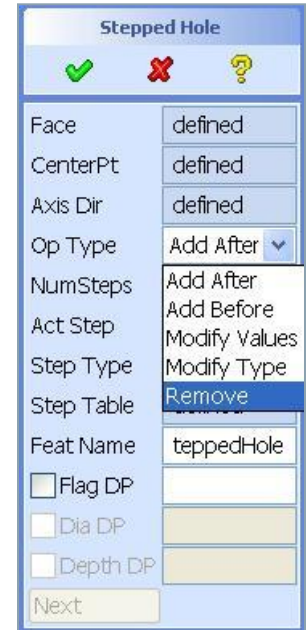
Cham.Angle 90

Accept Ignore

Machining features extensions - Stepped hole feature

Create a stepped hole feature - operations

- The Operation Type pick list controls which operation you want to take for the current step (Act step). There are 5 operation types:
 - **Add After:** The next step definition will be added to step table after the current step (ACT_STEP). This is the default because normally you define a stepped hole from the beginning.
 - **Add Before:** The next step definition will be added to step table before the current step (ACT_STEP). This option is mainly needed to insert a step in front of the steps already defined.
 - **Modify Values:** Edit the definition of the current step.
 - **Modify Type:** Change the feature type of the current step. The current step will be replaced by a feature of the new type.
 - **Remove:** The selected step will be removed after the next selection of a step (i.e. an entry into the variable act_step) without further confirmation. You will be guided to the ACT_STEP variable after selecting REMOVE_STEP. Every other entry will reset the operation type to ADD_STEP_AFTER.



Machining features extensions - Stepped hole feature

Dynamic Modification Behavior

- If a dynamic modify operation (such as the Offset command in Modify 3D) interferes with a machined hole feature, the feature is given the status invalid. This is indicated by the label turning red (see the following graphic). The feature is given the status invalid regardless whether the feature is still usable or not.
- Similar to the simple holes the stepped hole has a verifier mechanism which will try to (re-)validate invalidated features and similar restrictions apply.

lab files

Theme	Filename
Machining customization	ma_tappedholes_nominator.lsp
Machining customization	hole_dia.lsp
Machining customization	hole_dia_id.lsp
Package file	steppedhole_prepared.pkg
Package file	steppedblindhole.pkg
Package file	steppedthroughhole.pkg