

SMARTElectrode

Training

Comparison and compatibility with SE 7.0

Workflow

User Interface

Assembly Mode

Part Mode

Training

Assembly Creation

Preparation

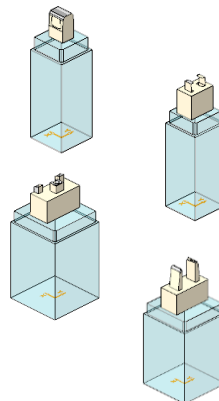
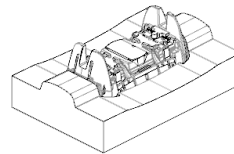
Set Zero

Electrode 1

Electrode 2

Electrode 3

Electrode 4



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

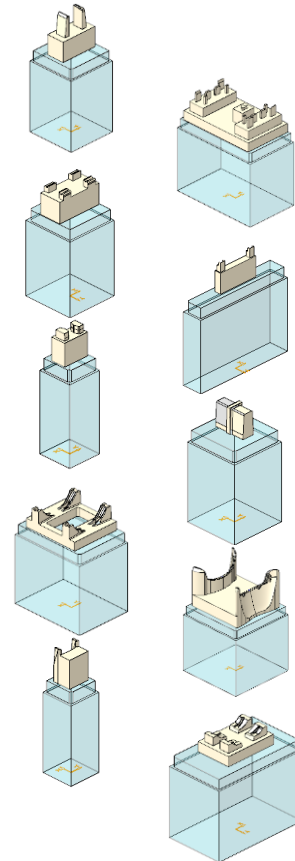
Electrode 10

Electrode 11

Electrode 12

Electrode 13

Electrode 14



More User Interfaces

- Check Electrodes

- Holder

- Drawings

- Manufacturing

- Output

- Burnsheet

Best Practices

- Modeling

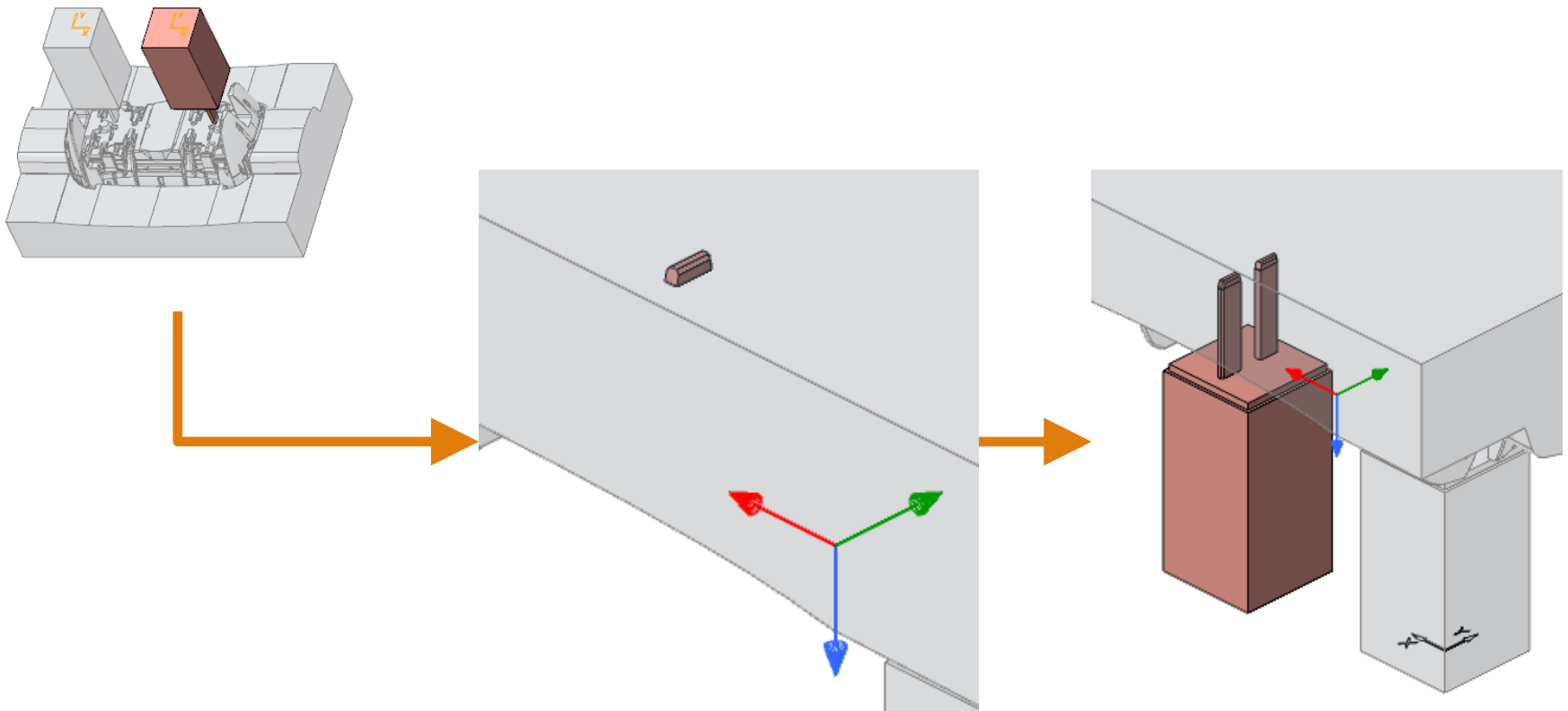
- Design Changes

- Regeneration Behavior in Creo

YouTube-Playlist

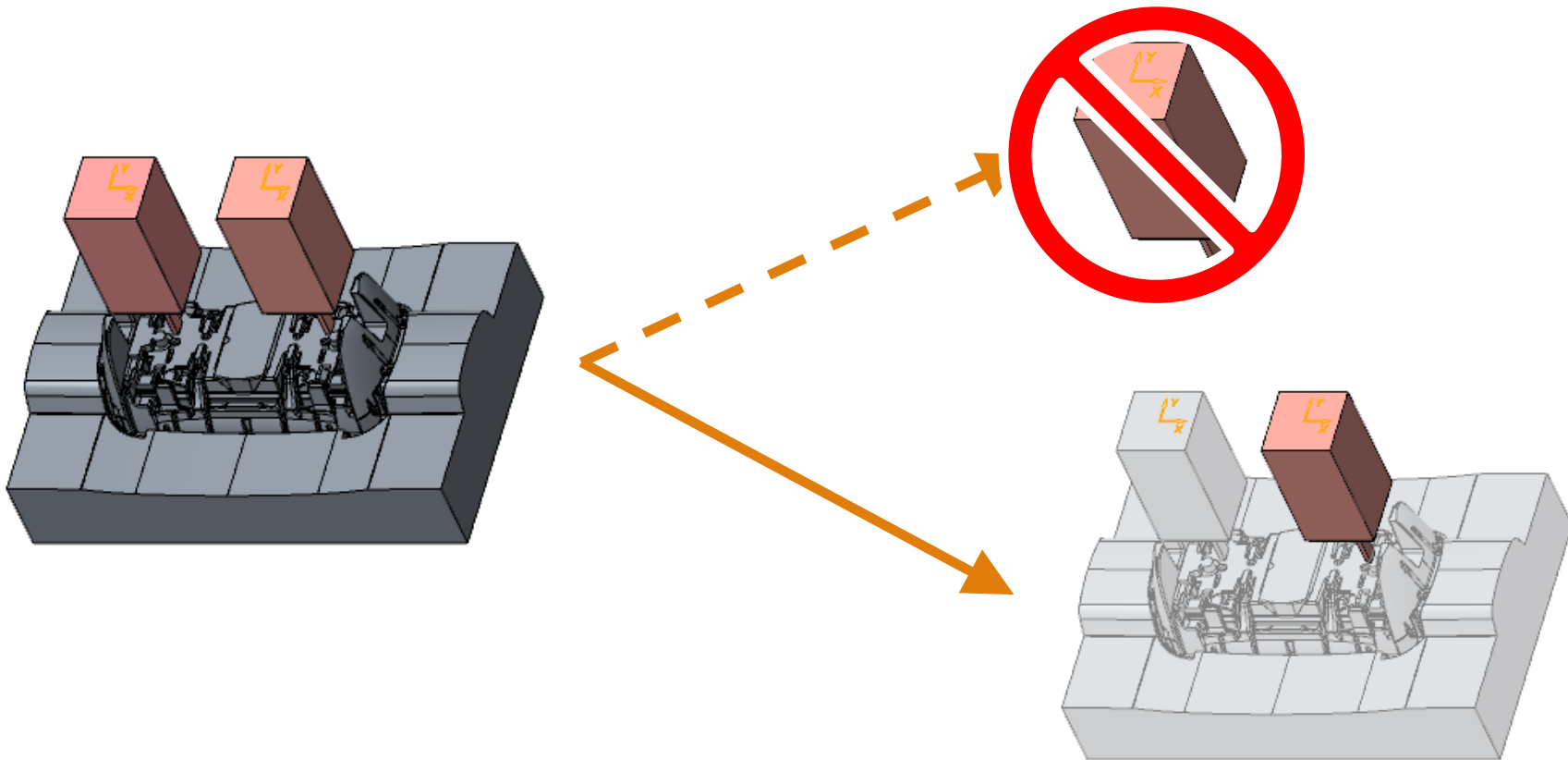
Comparison and compatibility with SE 7.0

✓ **Electrodes can be changed at any time!**

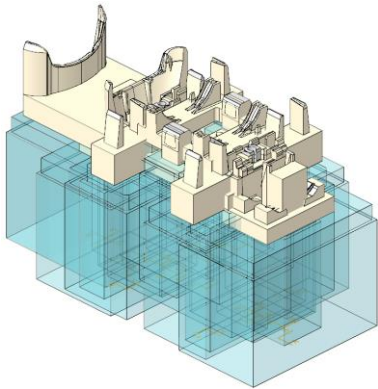


Comparison and compatibility with SE 7.0

- ✓ All tasks are done in the project assembly - no change between parts and assembly mode!



- ✓ **Electrodes can be changed at any time!**
- ✓ **All tasks are done in the project assembly!**
- ✓ **Add or remove models directly!**
- ✓ **Definition of Operation**
 - ✓ No additional sub-assembly necessary!
 - ✓ New defaults for free face, start and secure position!
- ✓ **Project Management**
 - ✓ Holder can be assigned to several models!
 - ✓ Create drawings at any time!
 - ✓ Create output at any time!

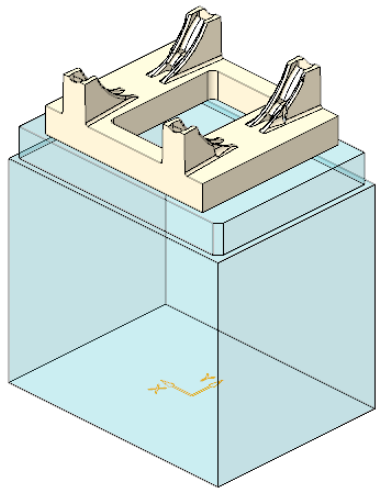


Following features are available for **assemblies from SE 7.0**:

- Edit parameter
- Create output
- Check functionality
- Drawing creation
- Control of visibility

Electrodes from SE 7.0

- Edit parameter
- Check functionality
- Import in **current** assembly
- Design changes have to be done interactively!



Agenda

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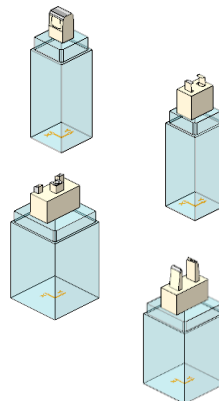
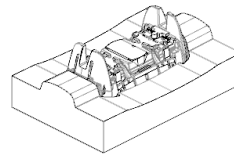
Set Zero

Electrode 1

Electrode 2

Electrode 3

Electrode 4



Creation...

...of assembly and zero (Operation)

Creation...

...of electrodes

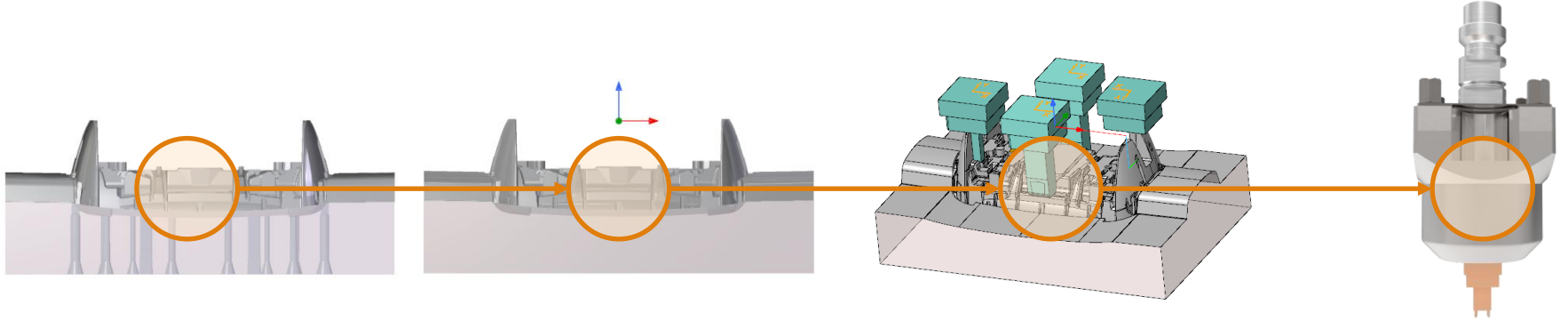
Add...

...all technology parameters

Output...

...of all necessary data and formats

Workflow in SMARTElectrode



Start

Workpiece
(prt)

Workpieces
(asm)

Assembly

Simplify
Geometry

Set Origin(s)

Electrodes

Create
Geometry

Set
Technology

Holder
CMM

Output

Drawings

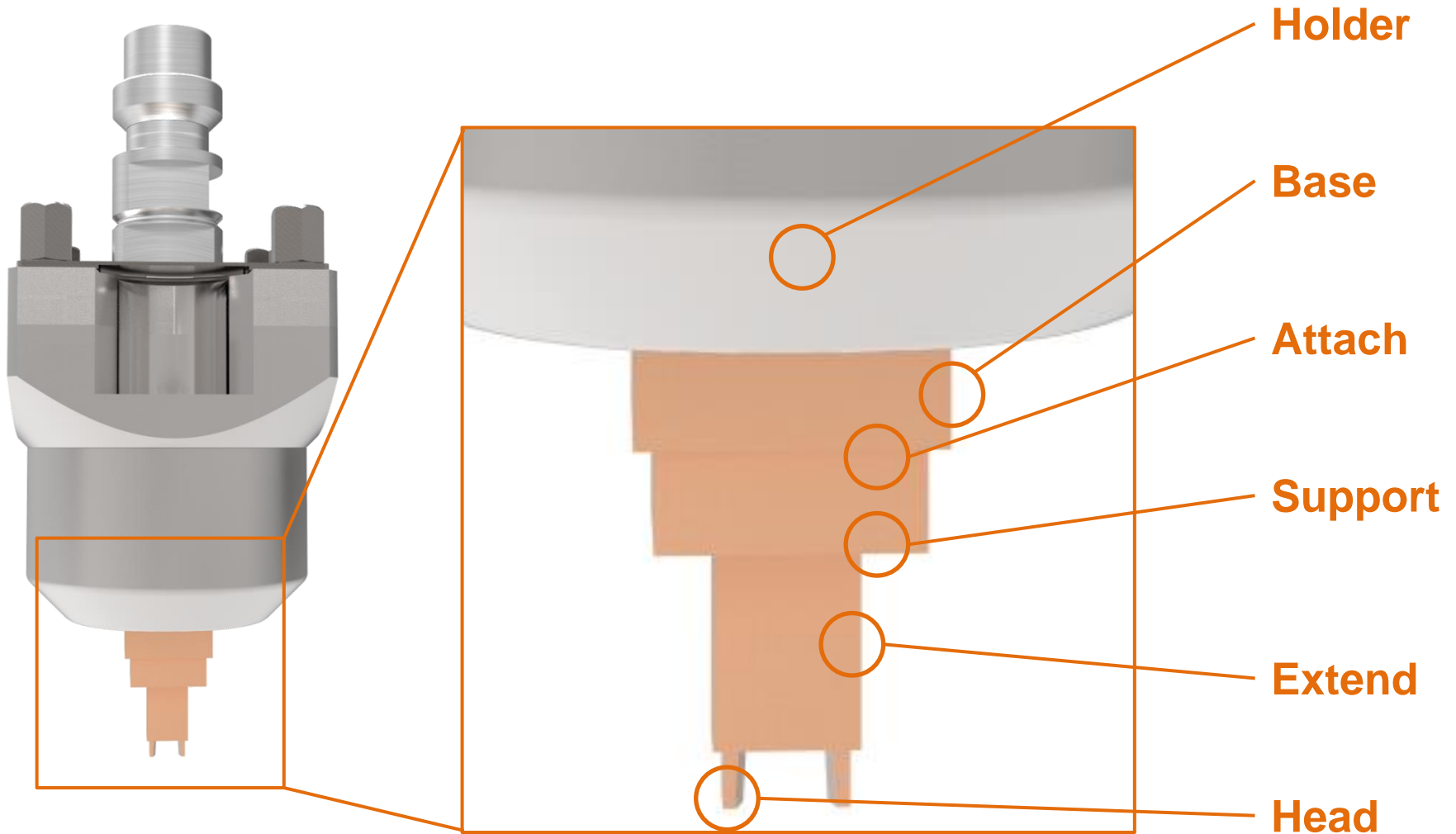
3d Output

EDM Output

Workflow Electrode Creation

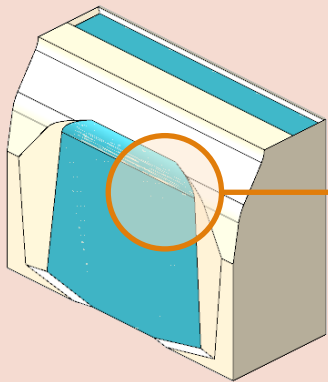
Note

Creation from top to base!

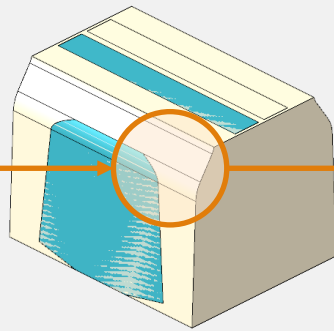


Workflow Electrode Creation

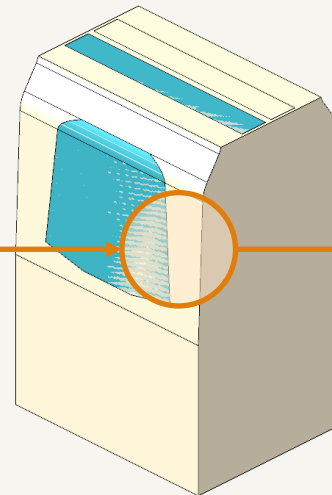
Get Data



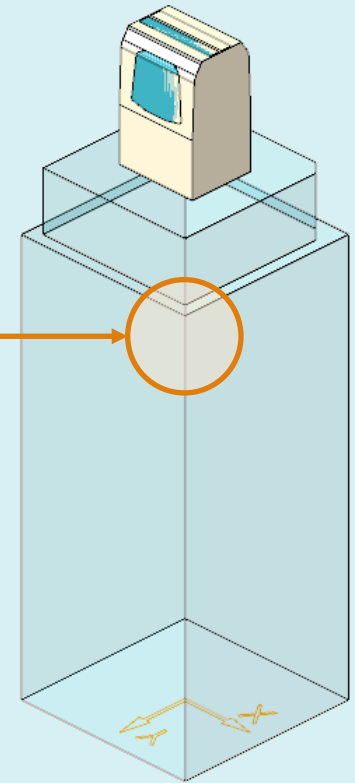
Detailing



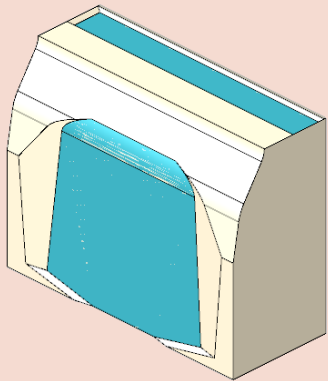
Attach



Base



Get Data



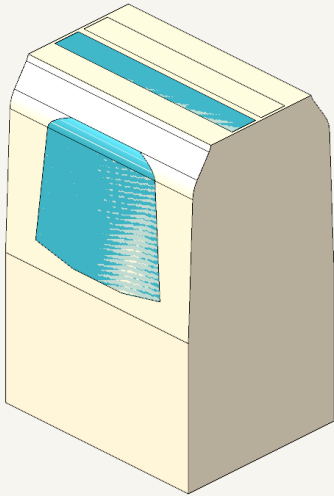
Get selected geometry from **Workpiece** using:

- **Solid + Cutout**
- **CopyGeometry of surfaces**

Get geometry from **Electrodes**:

- **Mirror**
- **Merge**
- **Split up**

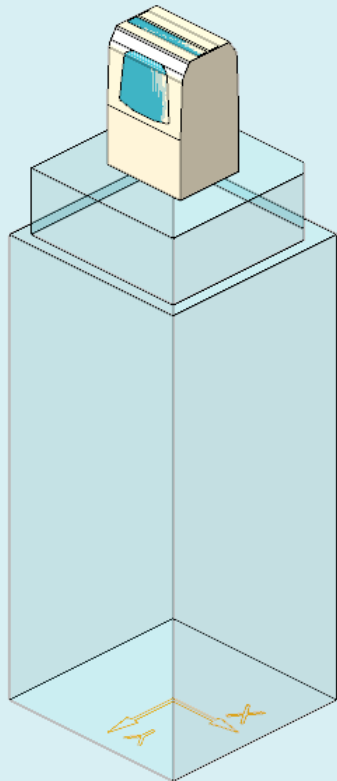
Attach



On **Attach** material between head and **FREE_FACE** is inserted. The following options are available:

- straight connection
- connection with support geometry
- user modeled connection

Base



Adding the base completes the design of the electrode

- **Position**
(centered at the beginning)
- **Blank**
(SE sets appropriate size)
- **Technology parameters**

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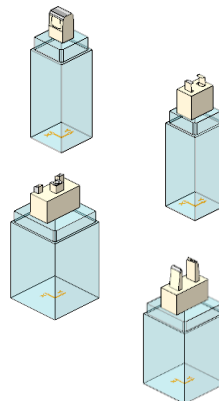
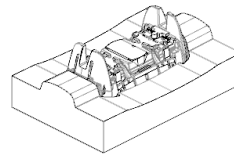
Set Zero

Electrode 1

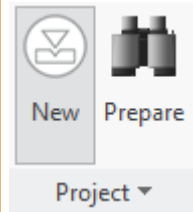
Electrode 2

Electrode 3

Electrode 4

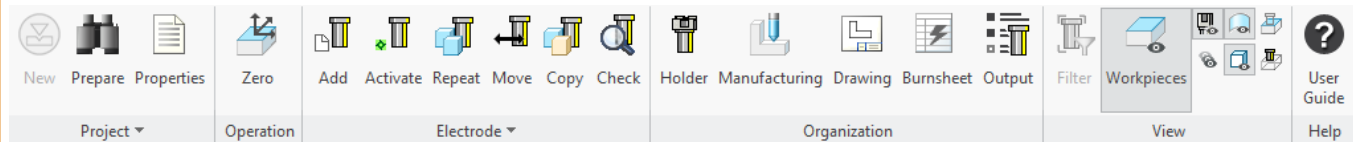


Empty Session



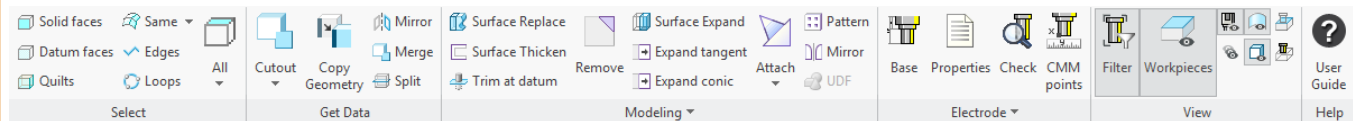
Process Level

Active Assembly

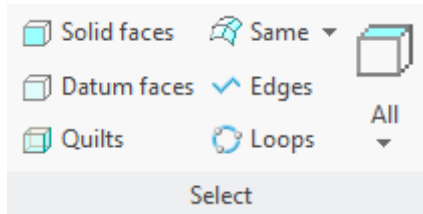


Design Sub-menu

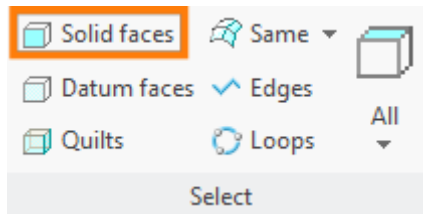
Active Electrode Component



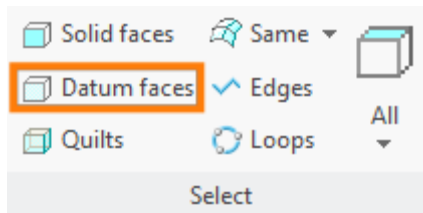
Ribbon UI – Group ‚Select‘



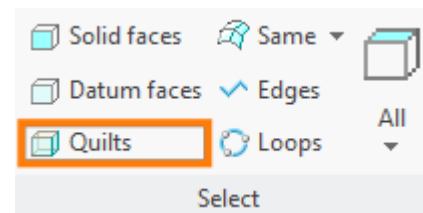
The selection commands can be used to extract or detail electrode geometry.



- **Solid faces**

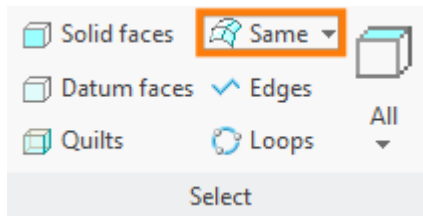


- **Datum surfaces**

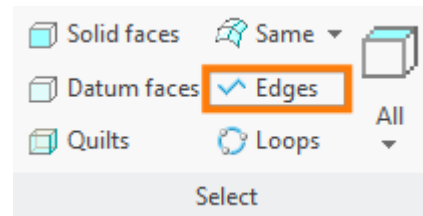


- **Quilts**

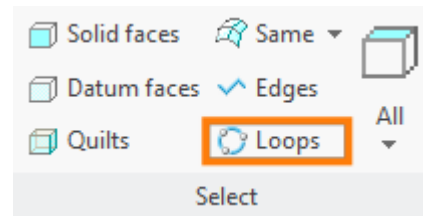
Ribbon UI – Group ‚Select‘



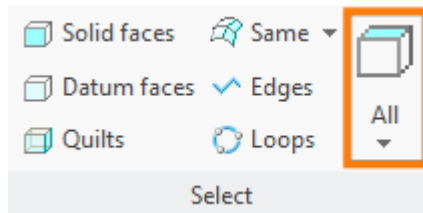
- **Special selection filters for rounds, similar surfaces and areas with same color**



- **Boundary edges (one-sided edges)**



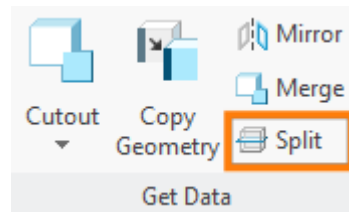
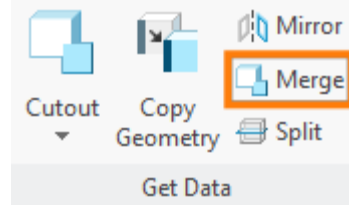
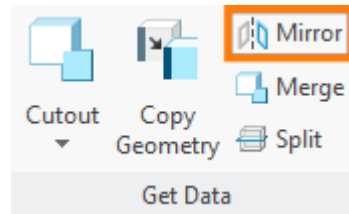
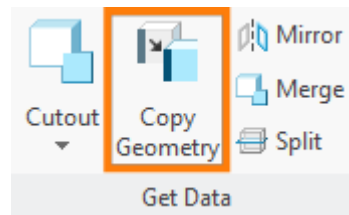
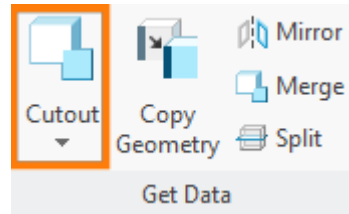
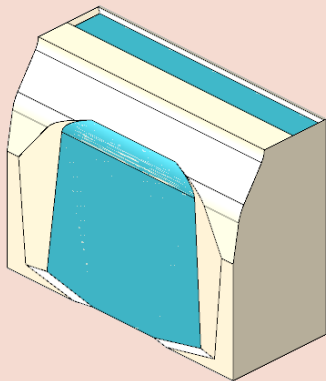
- **Complete boundary loops of quilts**



- **Top surfaces that are not attached**

Ribbon UI – Group ‚Get Data‘

Get Data



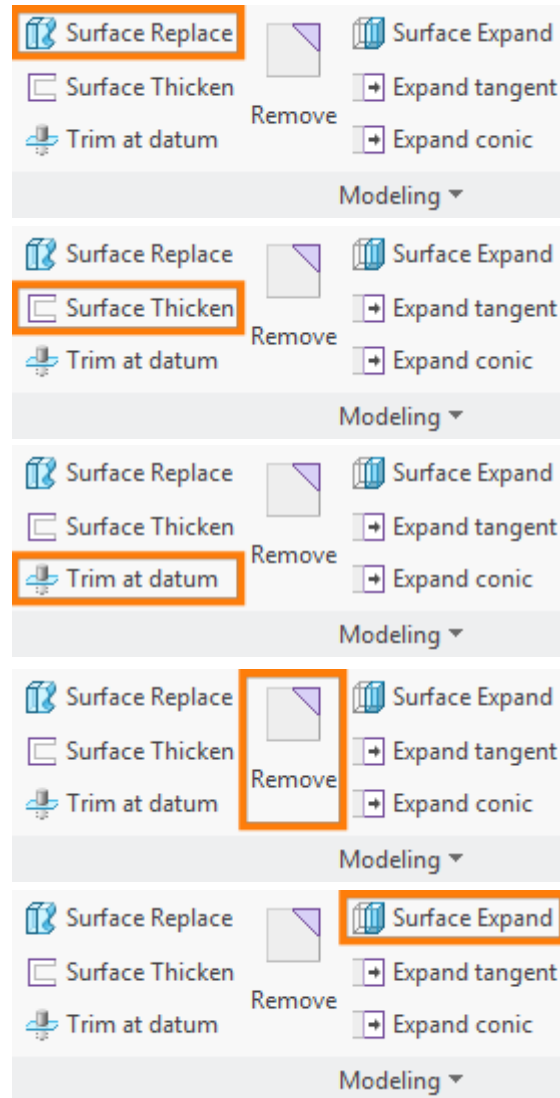
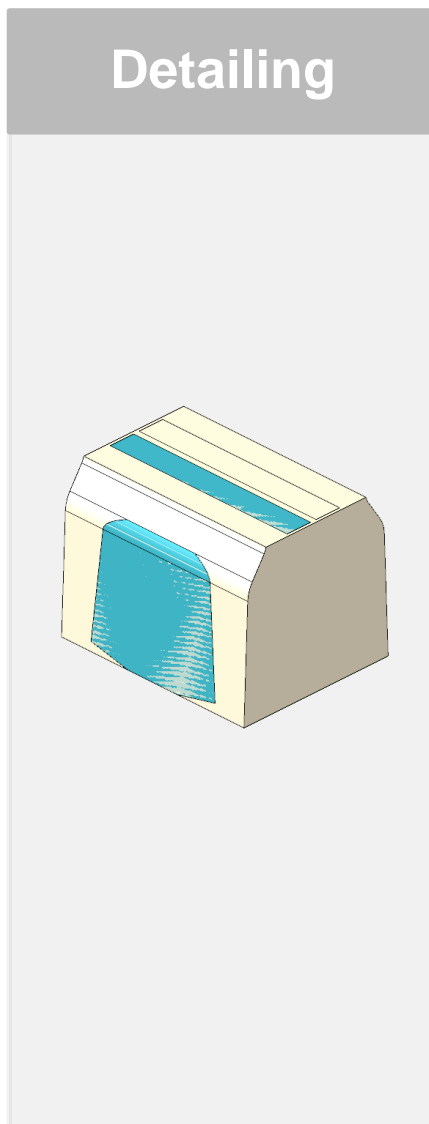
Get selected geometry from **workpiece** using:

- Solid + Cutout
- CopyGeom of surfaces

Get geometry from **electrodes**:

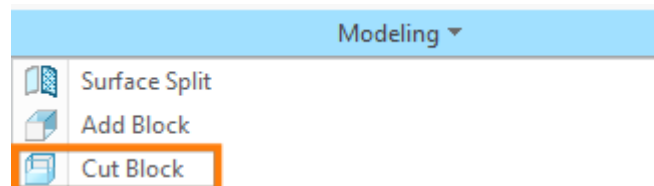
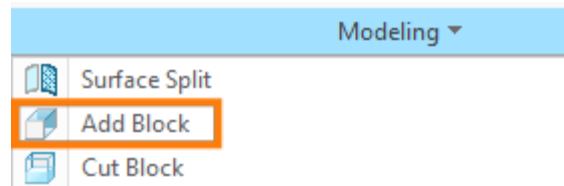
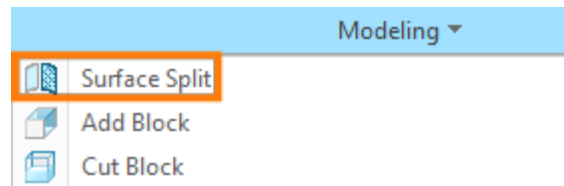
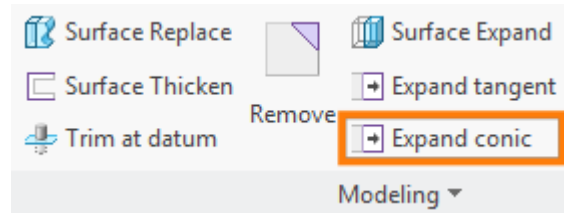
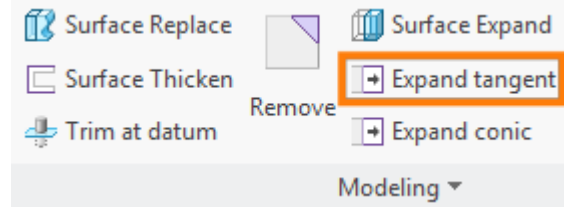
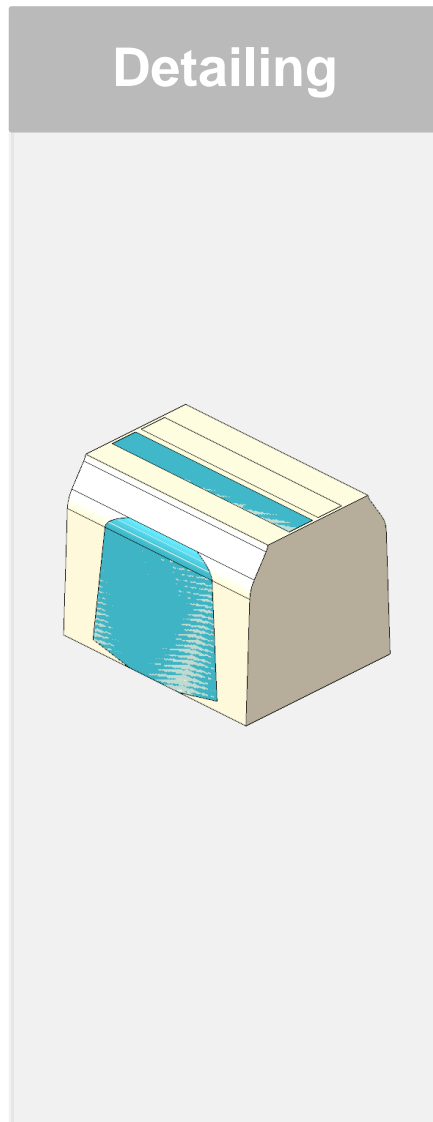
- Mirror
- Merge
- Split up

Ribbon UI – Group ,Modeling‘

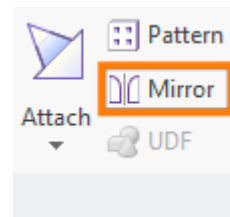
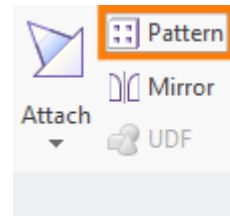
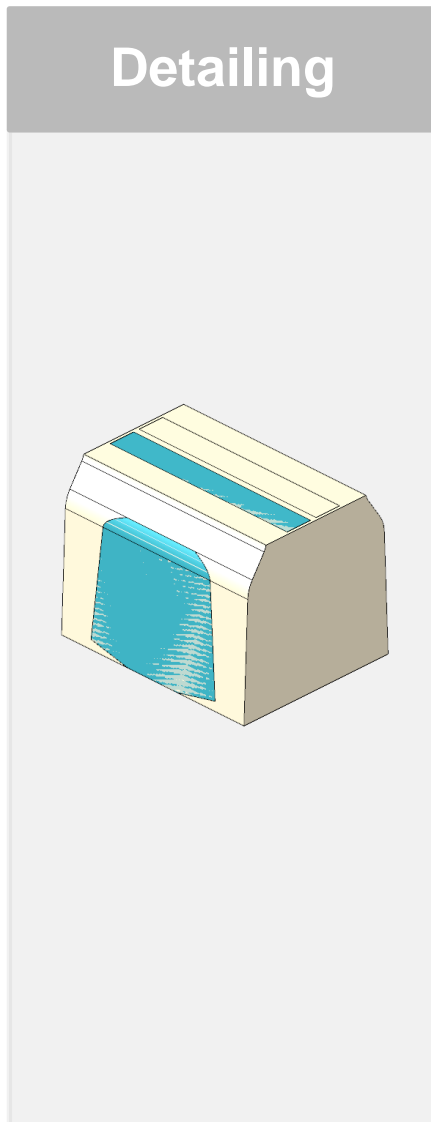


- **Replace surface through surface**
- **Thicken surface**
- **Trim at datum**
- **Remove**
- **Expand surface**

Workflow Electrode Creation

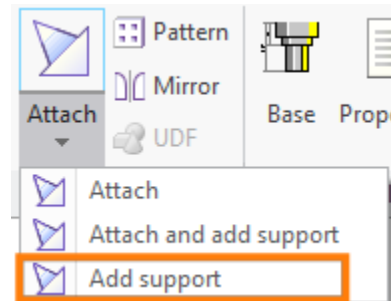
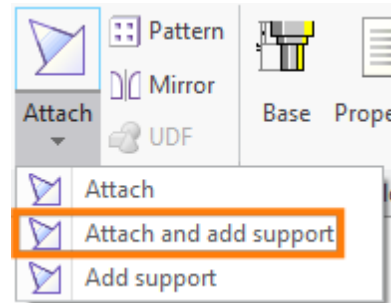
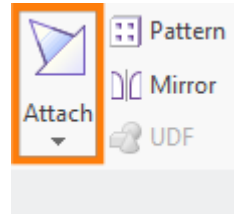
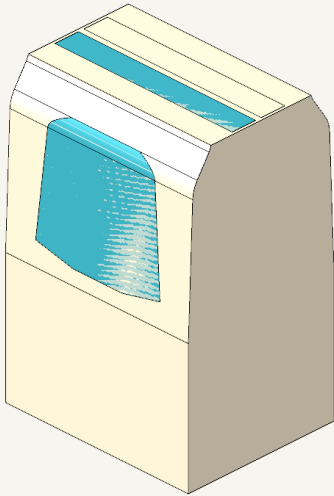


- **Expand tangent**
- **Expand conic**
- **Surface split**
- **Add block**
- **Cut block**



- **Create geometry pattern**
- **Mirror electrode geometry**

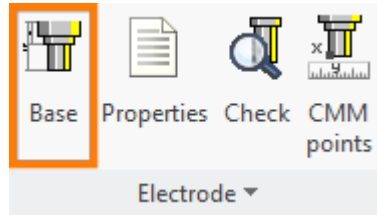
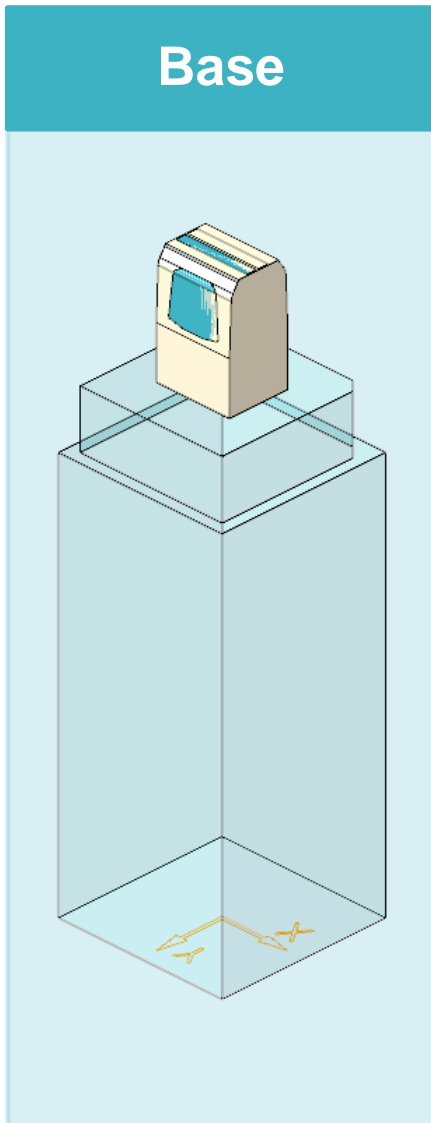
Attach



Attach fills gap between solid and later base.

- **Attach to FREE_FACE**
- **Attach and add support geometry**
- **Add support geometry for whole solid**

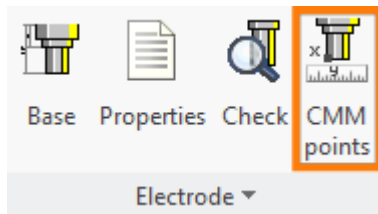
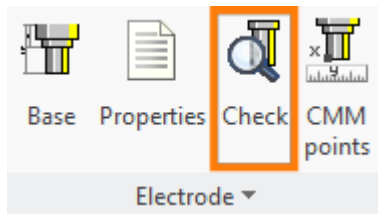
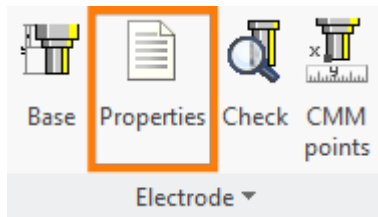
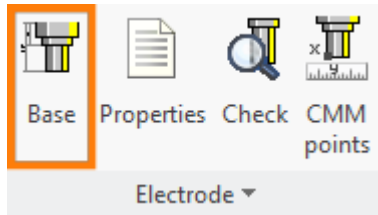
Ribbon UI – Group ‚Electrode‘



Set data of electrode

- Add or change base

Ribbon UI – Group ‚Electrode‘



- **Add or change base**
- **Edit electrode parameter**
- **Check active electrode**
- **Add CMM points**



The commands in '**View**' control the visibility of objects and elements. These commands are available at any time.



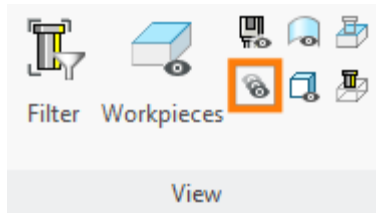
- **Show active electrode**
(automatically on activation of component)



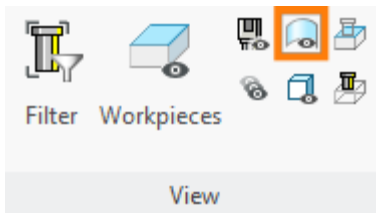
- **Show/hide workpieces**



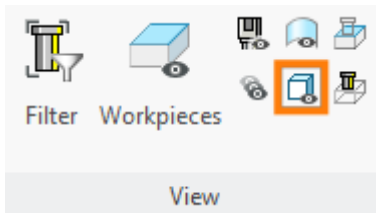
- **Show/hide holders**



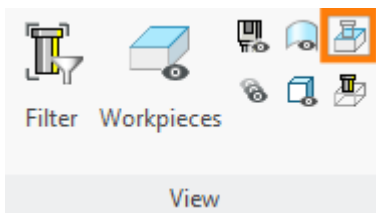
- **Show all**
Show all objects – also objects hidden by user.



- **Show/hide datum surfaces/quilts**



- **Show/hide of Volumengeometrie**



- **Activate/disable wirframe style for electrodes**



- **Activate/disable wirframe style for workpieces**

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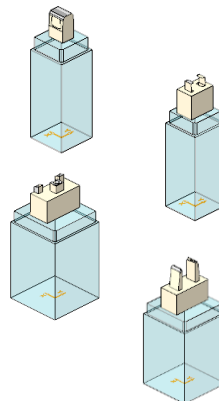
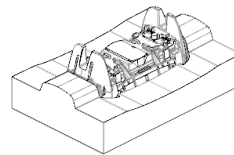
Set Zero

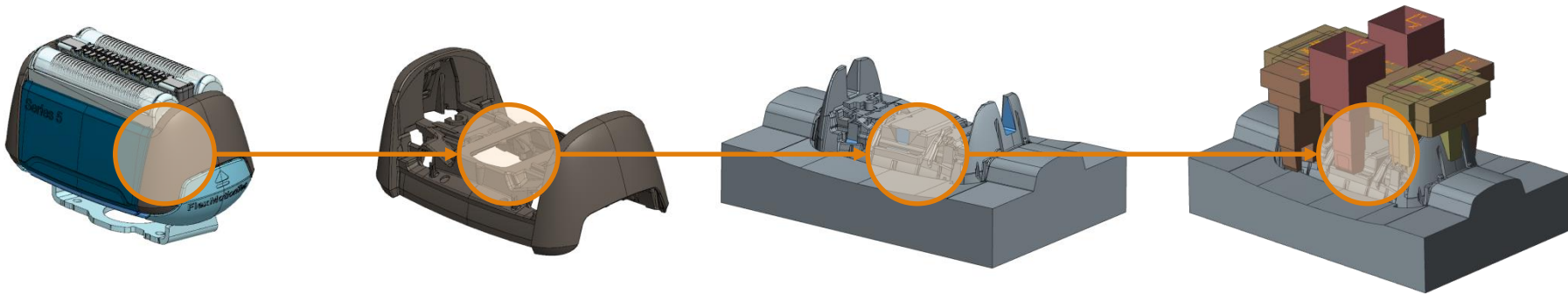
Electrode 1

Electrode 2

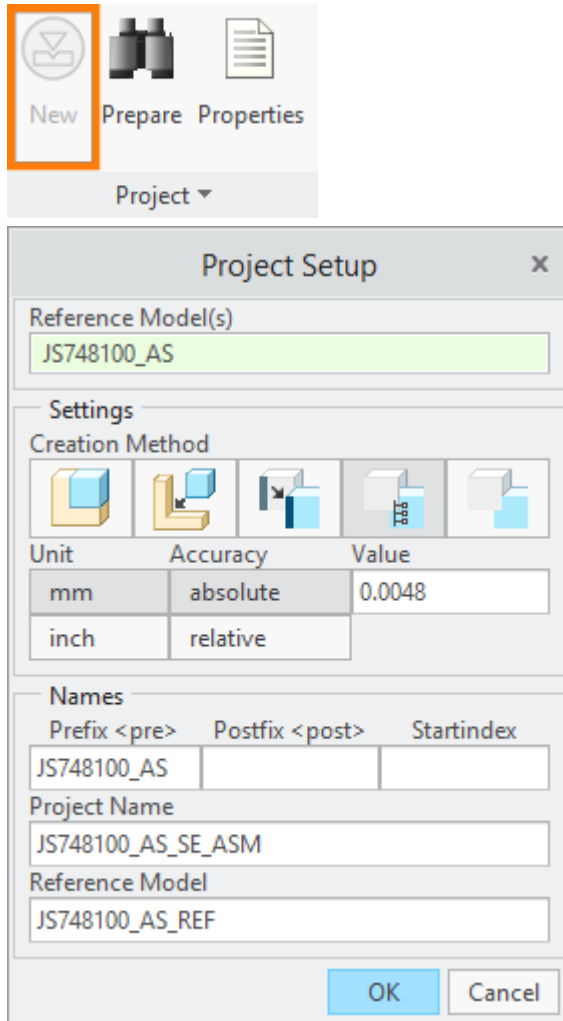
Electrode 3

Electrode 4





Usage of model
js748100_as
and
default configuration



- **Main Assembly**
 - Workpieces (Cores)
 - Operation (Zero)
 - Electrodes
- **Select workpieces**
- **Reference Method**
 - Use current assembly
 - Use original models
 - Create reference model
 - Inheritance
 - Merge
 - Copy solid faces and solidify

Note

When using a reference model, zero offsets are corrected.

Creation Main Assembly

1

New Prepare Properties

Project ▾

Project Setup

Reference Model(s)
JS748100_AS

Settings

Creation Method

Unit Accuracy Value

| | | |
|------|----------|--------|
| mm | absolute | 0.0048 |
| inch | relative | |

Names

| Prefix <pre> | Postfix <post> | Startindex |
|--------------|----------------|------------|
| JS748100_AS | | |

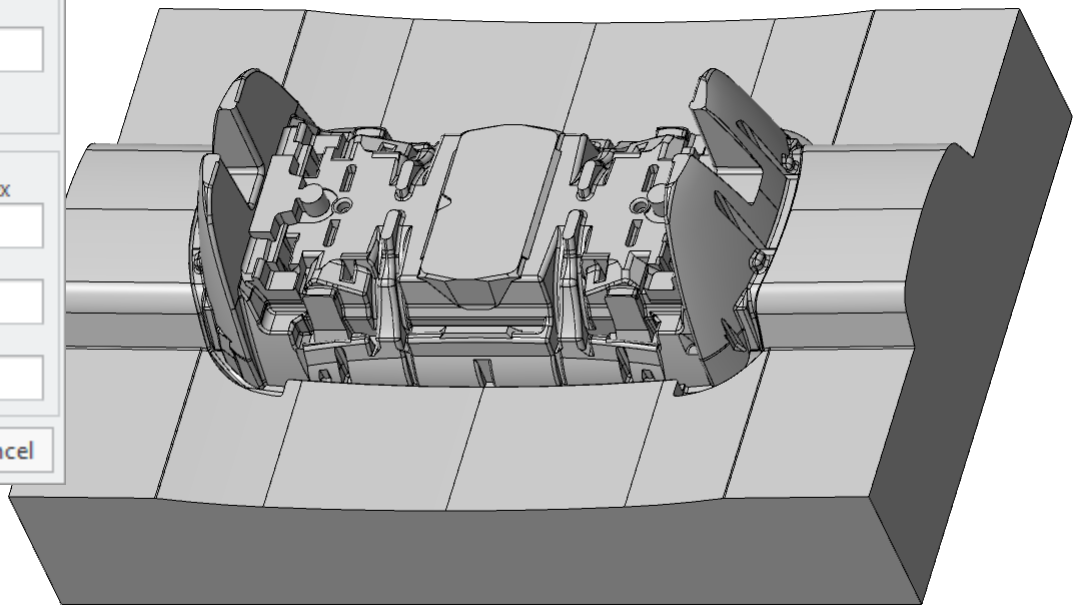
Project Name
JS748100_AS_SE_ASM

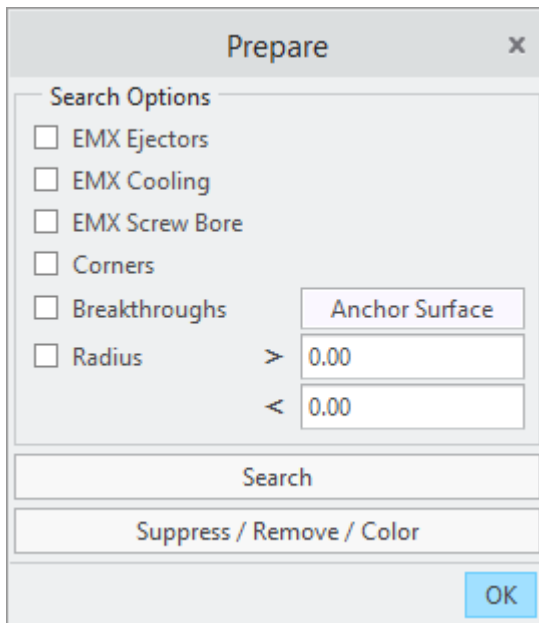
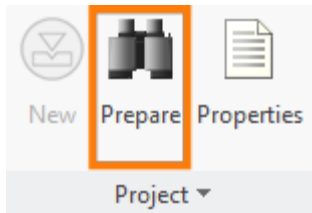
Reference Model
JS748100_AS_REF

OK Cancel

2

3





Simplification of geometry

- in reference models
- to simplify electrode extraction

Suppress or remove

- Features from EMX
 - Ejectors
 - Cooling
 - Bores
- Breakthroughs in Imported parts

Search & Color

- Surfaces with sharp-edged transitions (convex edges)
- Rounds within minimum and maximum radius value

Preparation – Features from EMX

1

New Prepare Properties

Project ▾

2

Vorbereiten

Suchoptionen

- EMX Auswerfer
- EMX Kühlung
- EMX Bohrungen
- Ecken
- Durchbrüche
- Radius

Ankerfläche

> 0.00

< 0.00

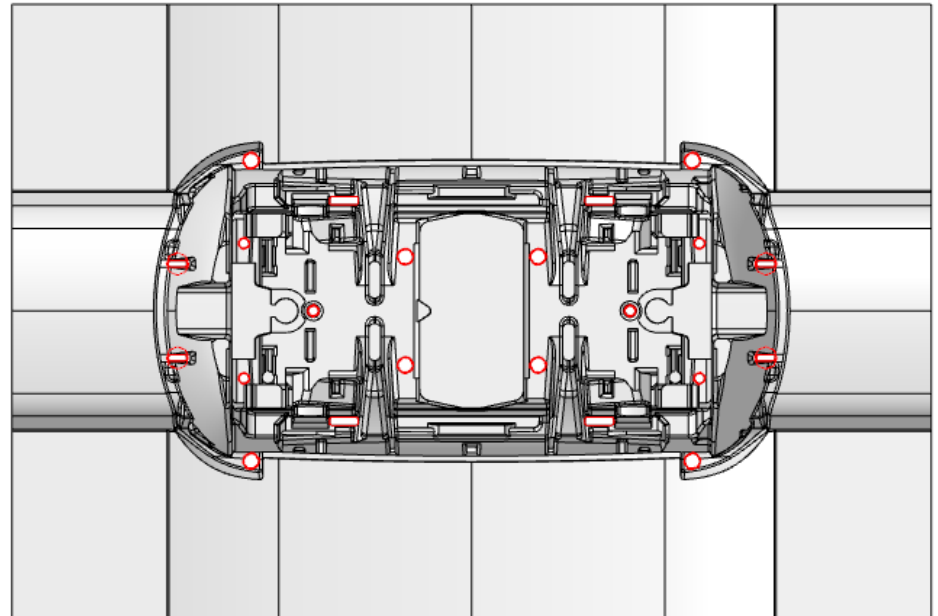
3

Suchen


Unterdrücken

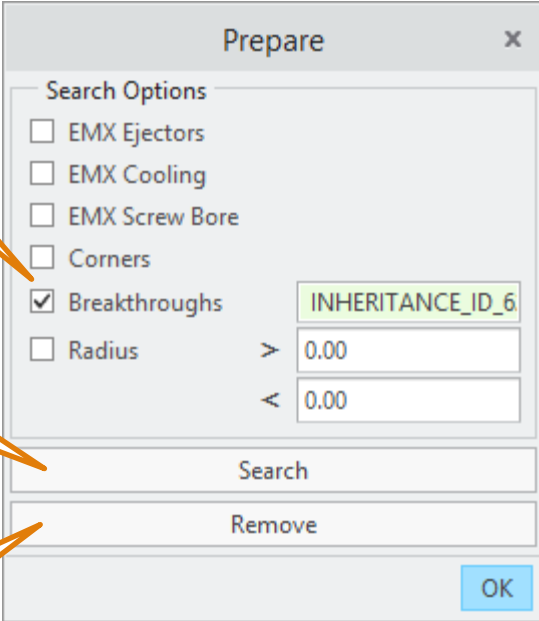
4

OK



Preparation – Import

1  New Prepare Properties
Project ▾

2 

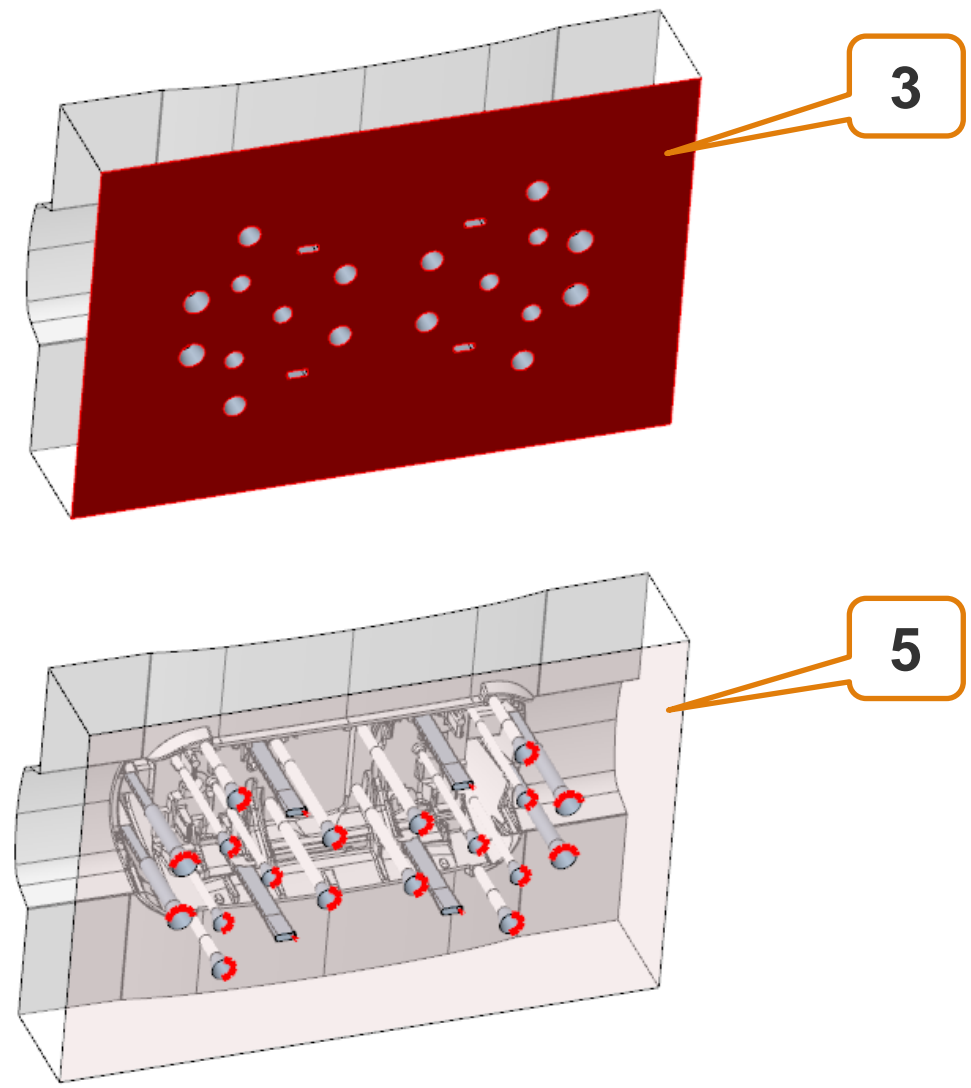
4 Search

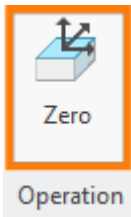
6 Remove OK

Prepare x

Search Options

- EMX Ejectors
- EMX Cooling
- EMX Screw Bore
- Corners
- Breakthroughs INHERITANCE_ID_6
- Radius > 0.00 < 0.00





Operation x

Name
JS748100_AS_OP_01

Selected Zero
URSPRUNG_1

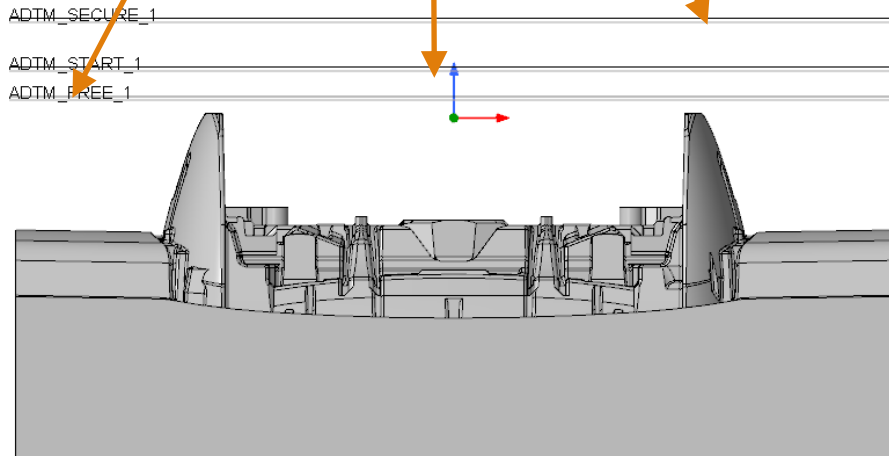
Select New On Side

Default Planes Offset

| Free | Start | Secure |
|------|----------|--------|
| 2 | 0.000000 | 5 |

Comment

OK Cancel



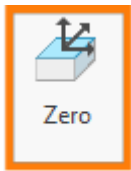
Operation

- Defines reference CSYS for Electrodes
- One zero per assembly
- Definition can be changed at any time

Retraction Planes

- Free face / Z-reference
- Start plane (Standard)
- Secure plane (Standard)

Csys on centers of bounding box



Operation

Operation x

Name
JS748100_AS_OP_01

Selected Zero

Select CSYS

Select New On Side

Default Planes Offset

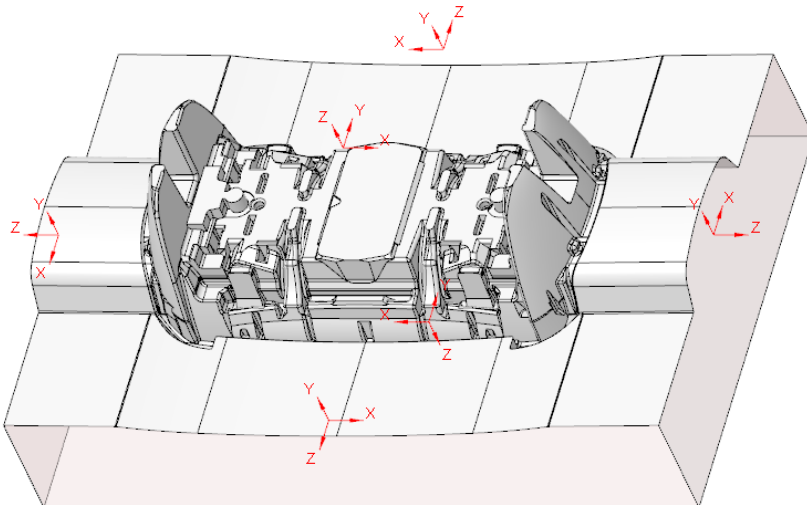
| Free | Start | Secure |
|------|----------|--------|
| 2 | 0.000000 | 5 |

Comment

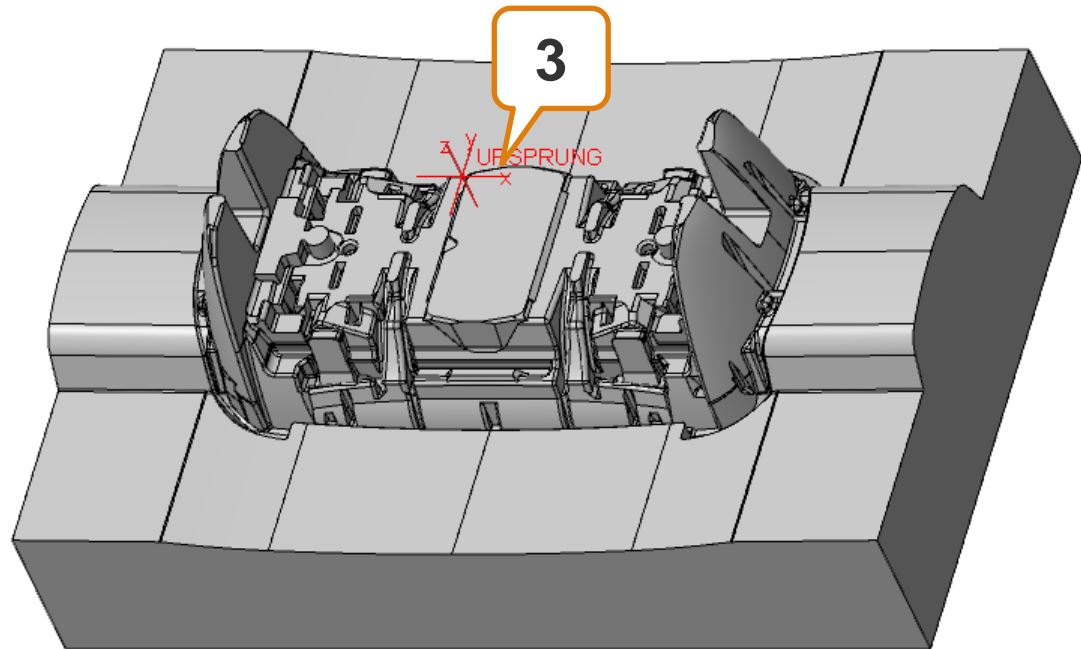
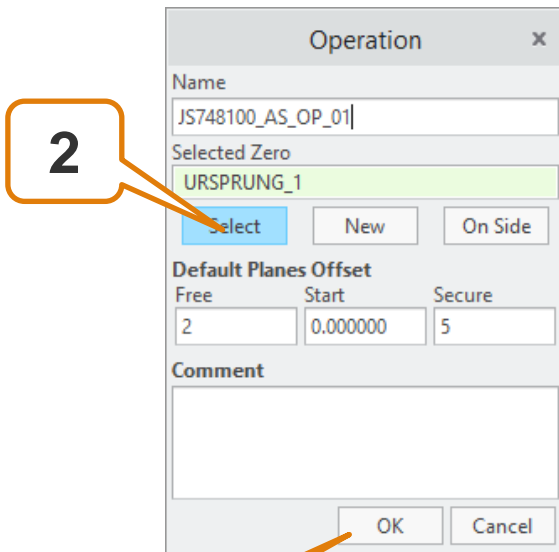
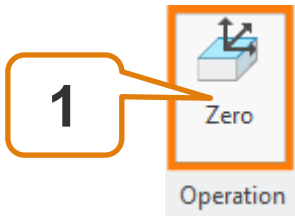
OK Cancel

On side

- One Csys on each side of the bounding box
- Csys can be updated in UI



Selection of Zero



Agenda

Comparison and compatibility with SE 7.0

Workflow

User Interface

Assembly Mode

Part Mode

Training

Assembly Creation

Preparation

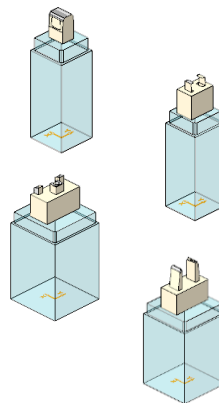
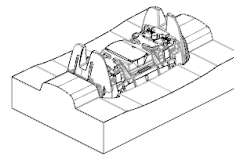
Set Zero

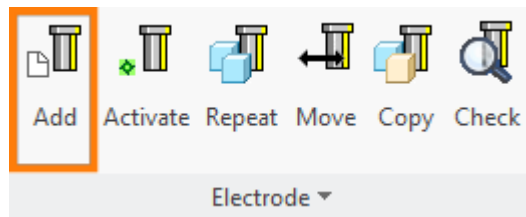
Electrode 1

Electrode 2

Electrode 3

Electrode 4



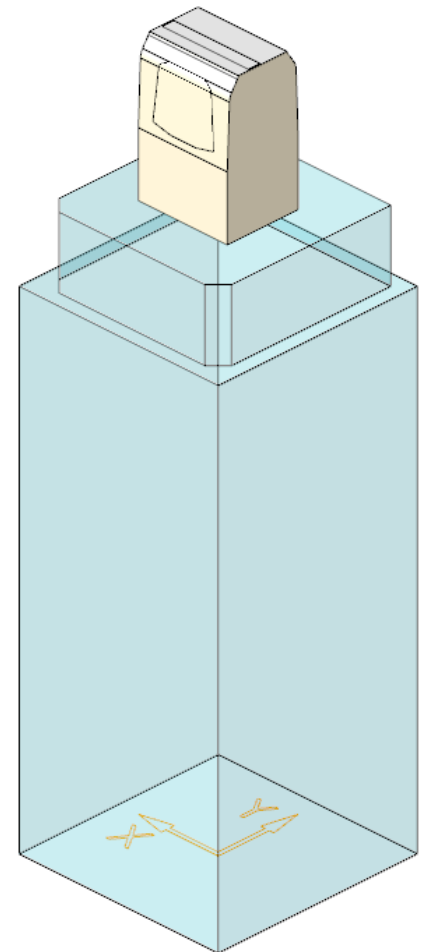


A new Electrode is ...

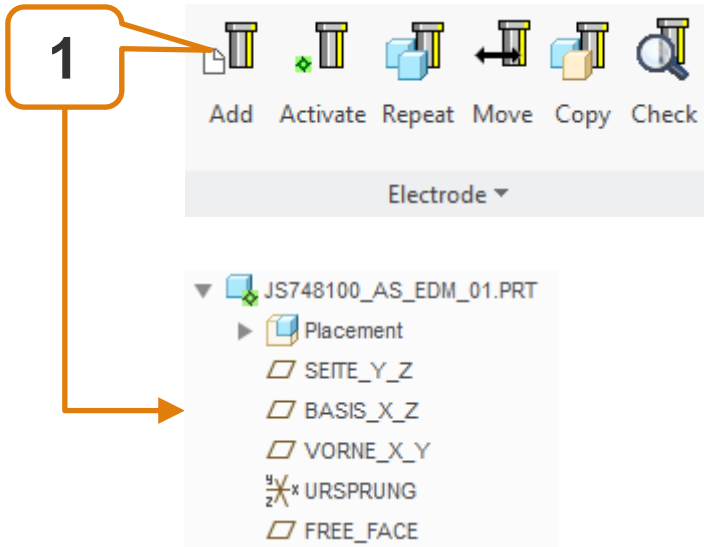
- A ***new part*** copied from default template
- Assembled on ,**Default**‘ in assembly
- **Named by name format**
(counter is updated automatically, gaps are closed)
- **Contains a copy of FREE_FACE**
- **Automatically active to start the construction mode**

Topics...

- Add new electrode
- Copy burn-faces
- Detailing
- Mirror geometry
- Attach to **FREE_FACE**
- Add base
- Assemble electrode again

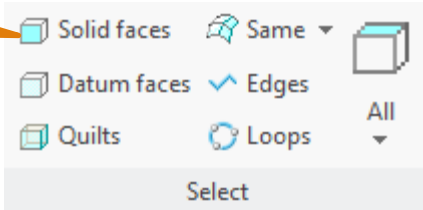


Electrode 1 – Add new Electrode

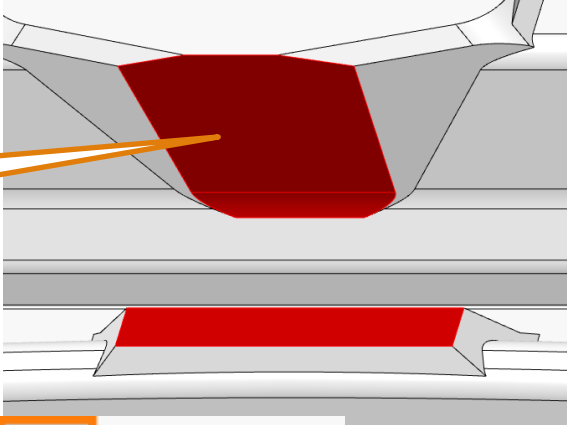


Electrode 1 – Get Data

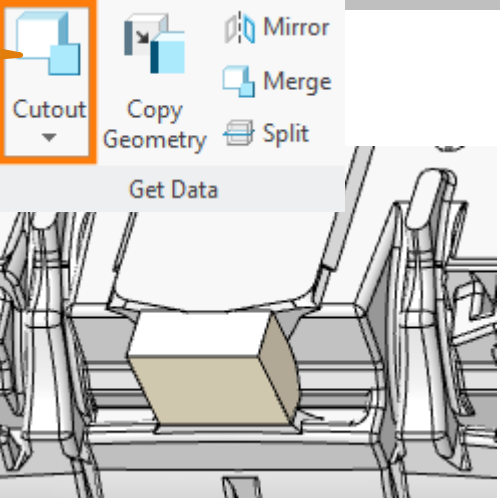
1



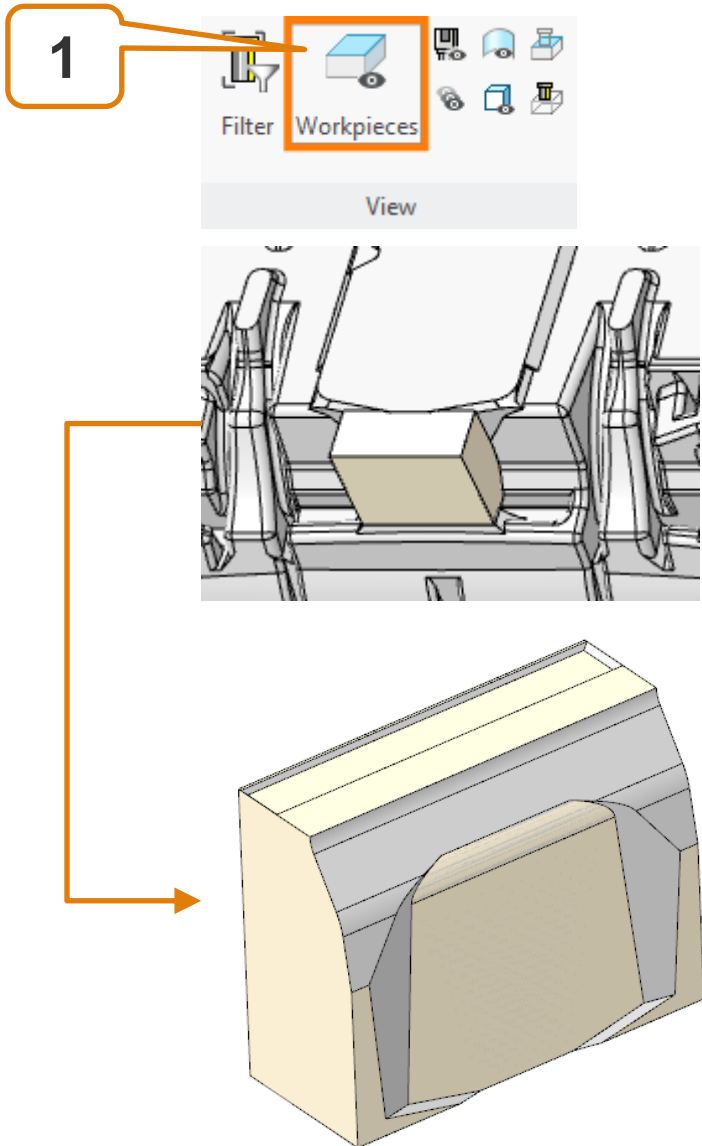
2



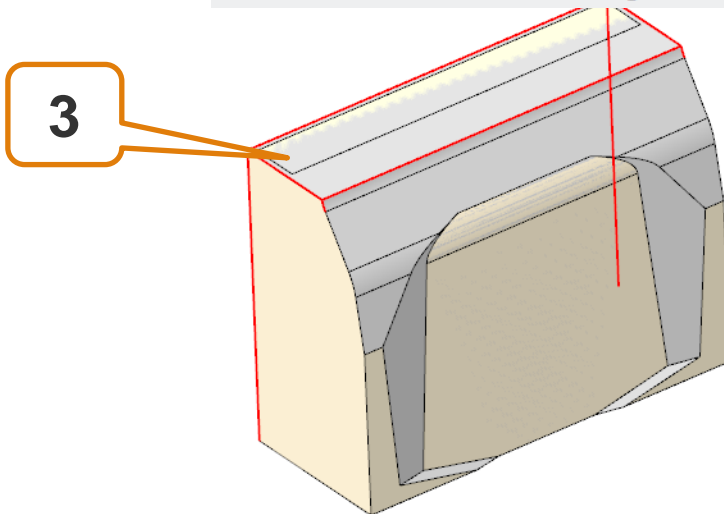
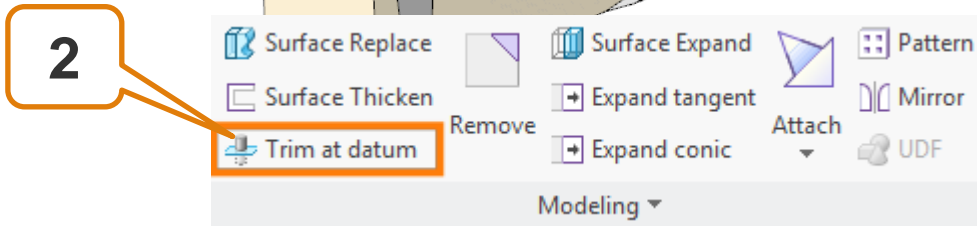
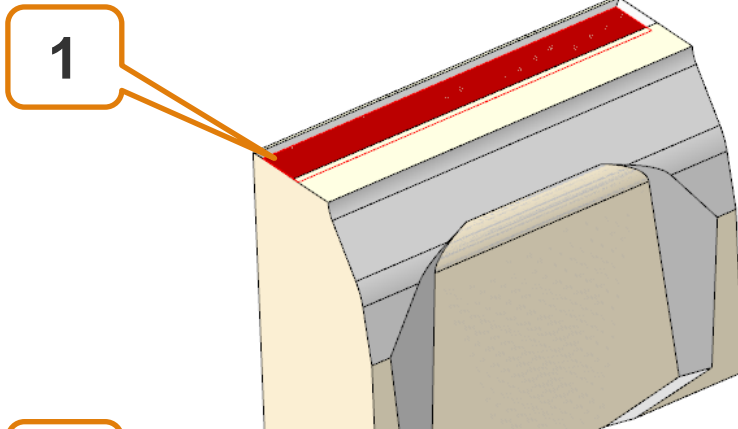
3



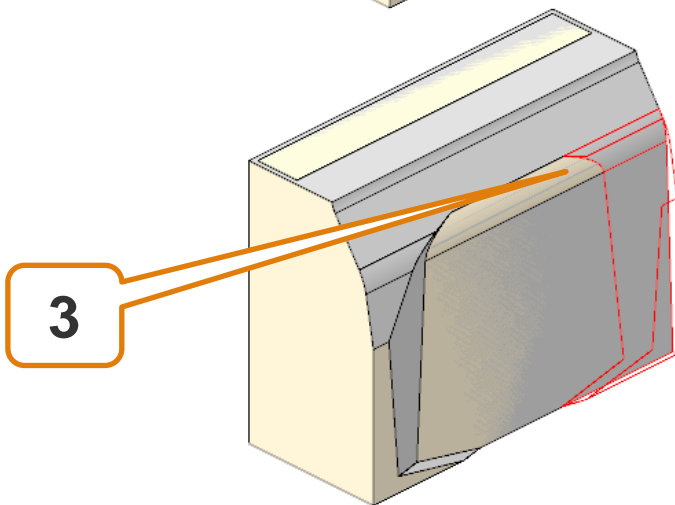
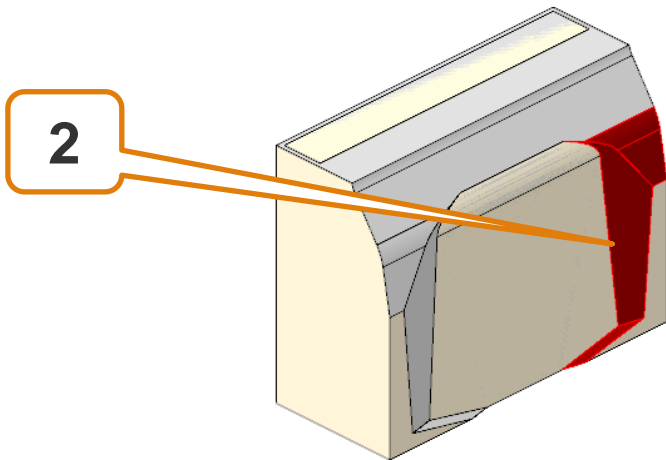
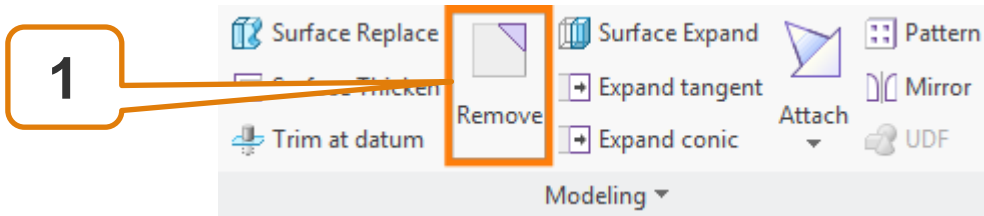
Electrode 1 – Set View



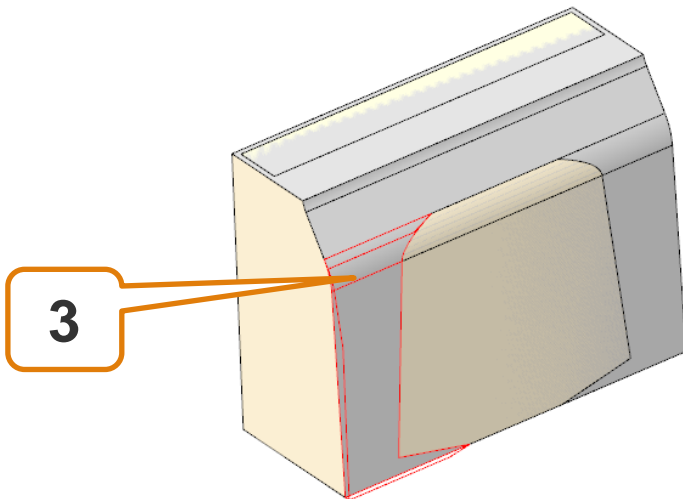
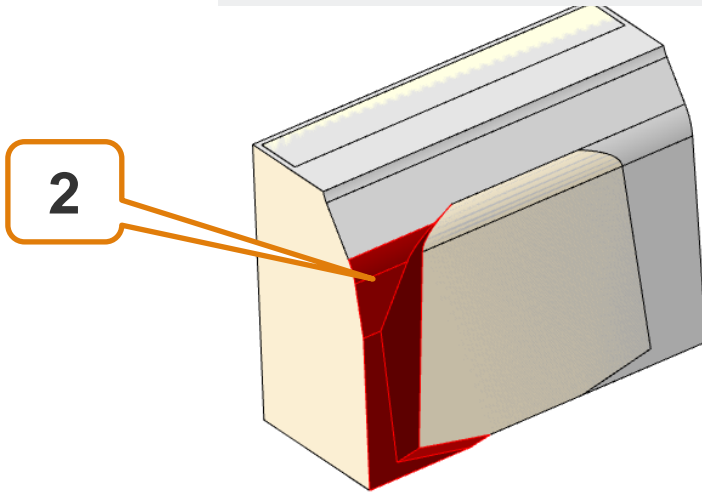
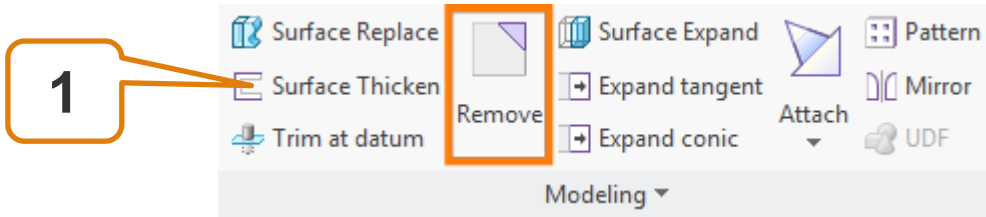
Electrode 1 – Detailing



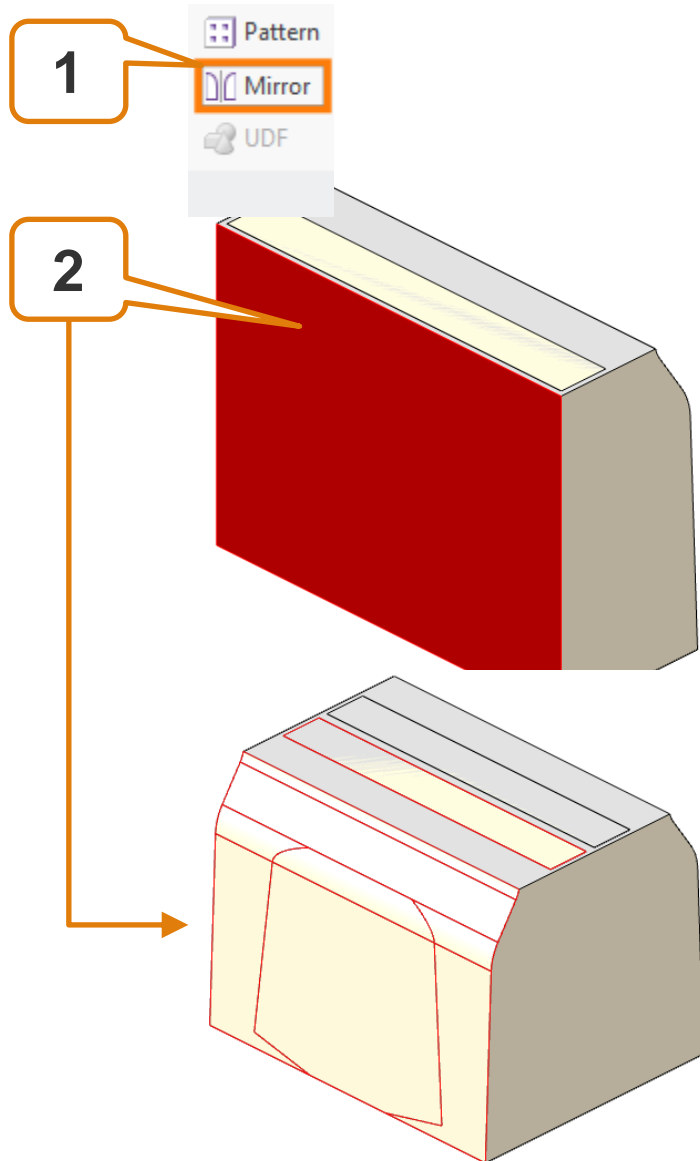
Electrode 1 – Detailing



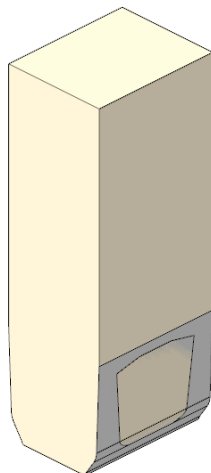
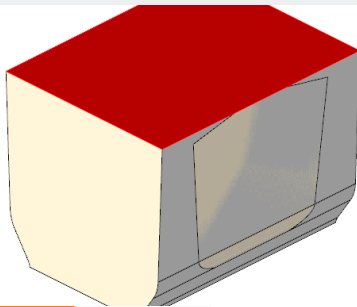
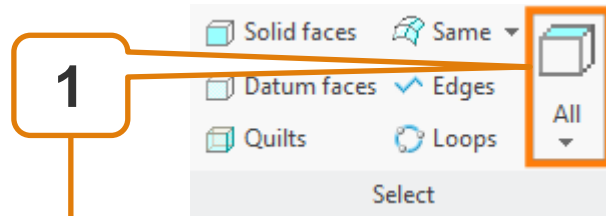
Electrode 1 – Detailing



Electrode 1 – Mirror



Electrode 1 – Attach

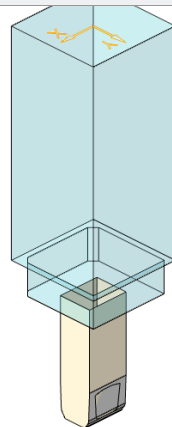
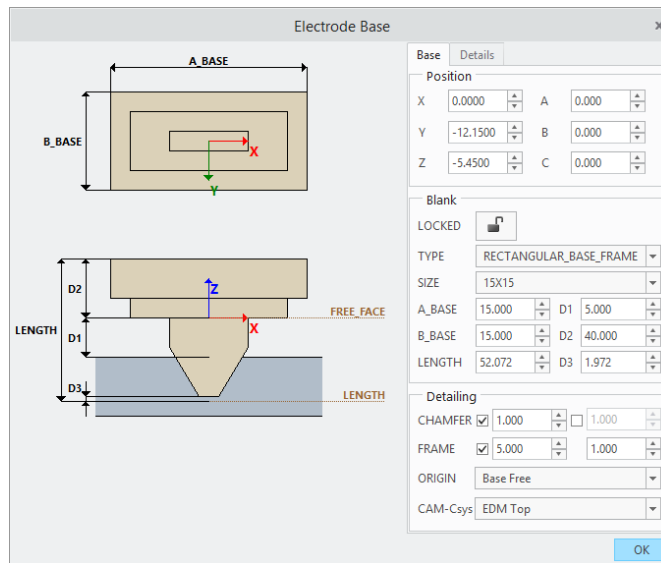
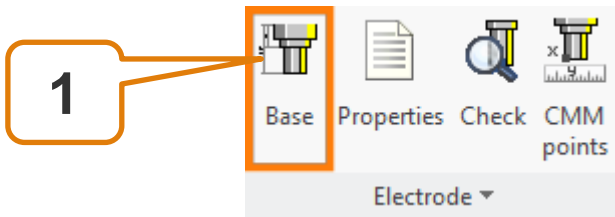


Attach to FREE_FACE

- (1) **Filter ,All Tops ‘**
 - Selects all faces that are **not** attached to FREE_FACE

- (2) **Command ,Attach‘**
 - Expands solid
 - Connects solid with FREE_FACE

Electrode 1 - Add Base



- **Add Base**

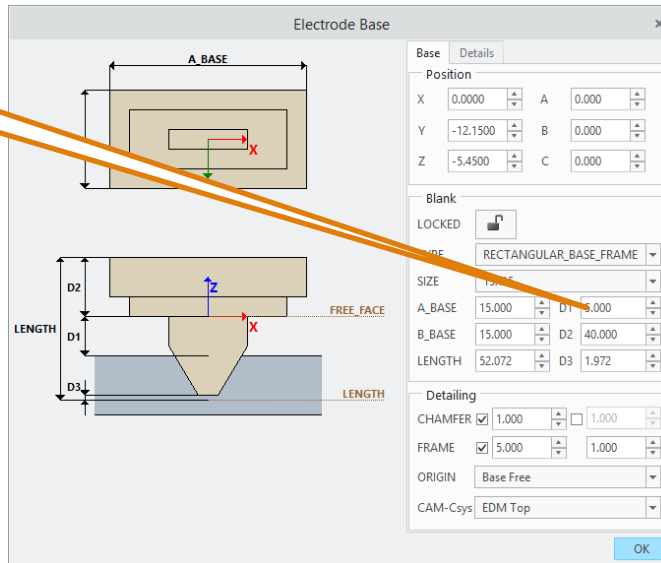
- Position of base
- Type and section
- Blank size
- EDM origin (csys)

- **Automatic selection of**

- Supplier
- Type
- Size from list

Electrode 1 – Adjust Base

1



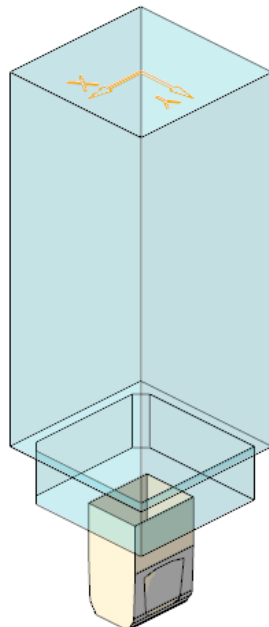
Adjust Base

• Dimensions

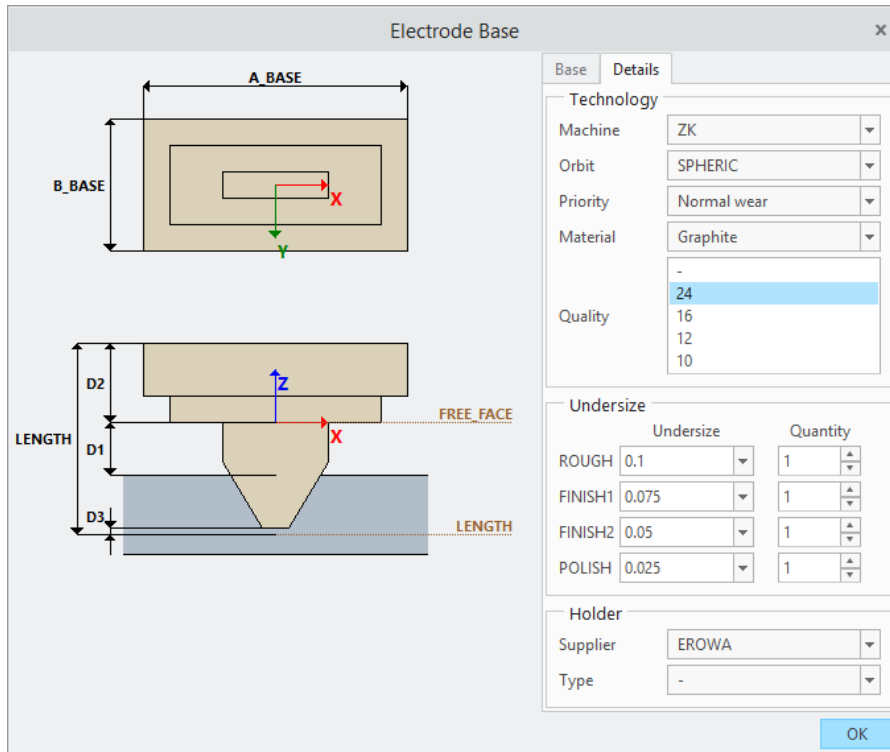
- Length A_BASE
- Width B_BASE
- Blank height
- Base height D2

• Frontal distance to workpiece D1

• Oversize from EDM top to blank height D3



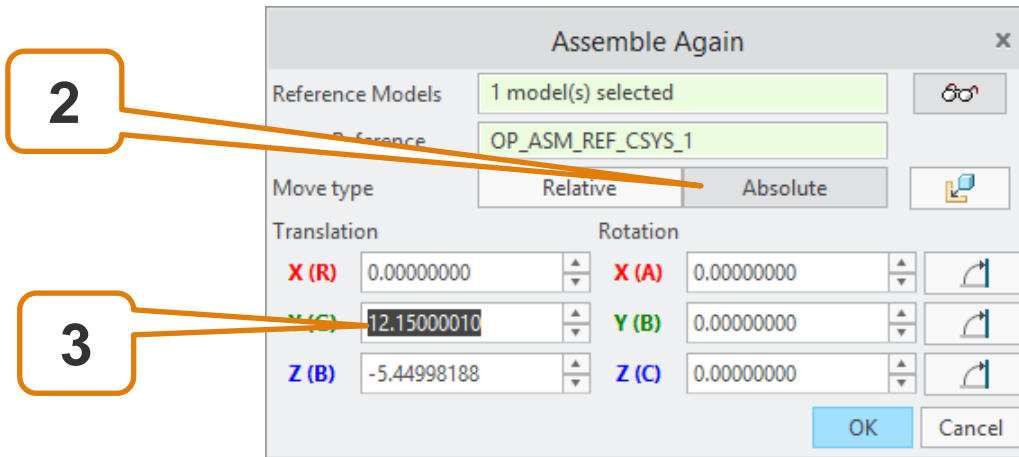
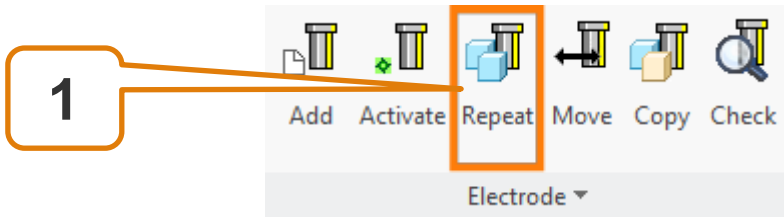
Electrode 1 - Adjust Base



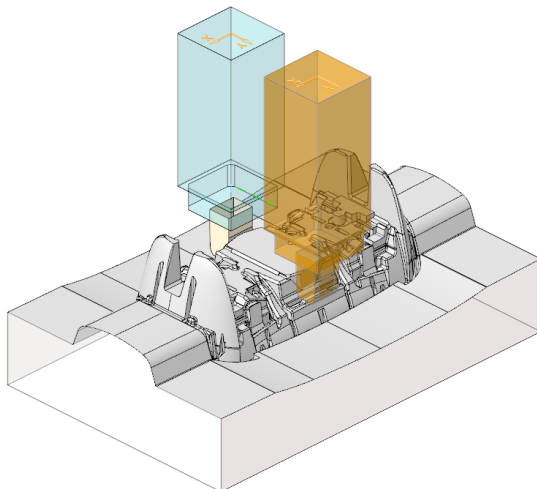
Technology data on 2nd page

- Control
 - Orbit
 - Undersize/burngap
 - Holder
-
- Close with *OK*
 - Press *Strg+A* to activate main assembly

Electrode 1 – Assemble Again



- Select electrode
- Select ,**Assemble again**'
- Switch to ,**absolute**' movement
- Change sign at Y-position
- Confirm with **OK**



Agenda

Comparison and compatibility with SE 7.0

Workflow

User Interface

Assembly Mode

Part Mode

Training

Assembly Creation

Preparation

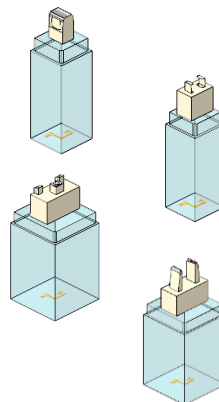
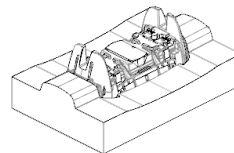
Set Zero

Electrode 1

Electrode 2

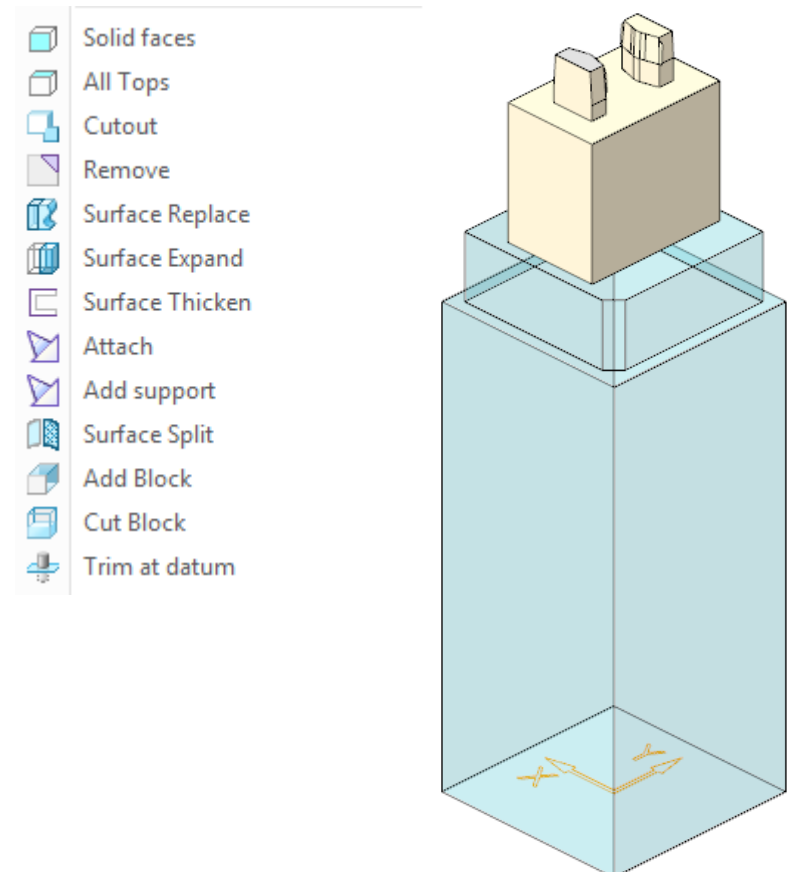
Electrode 3

Electrode 4

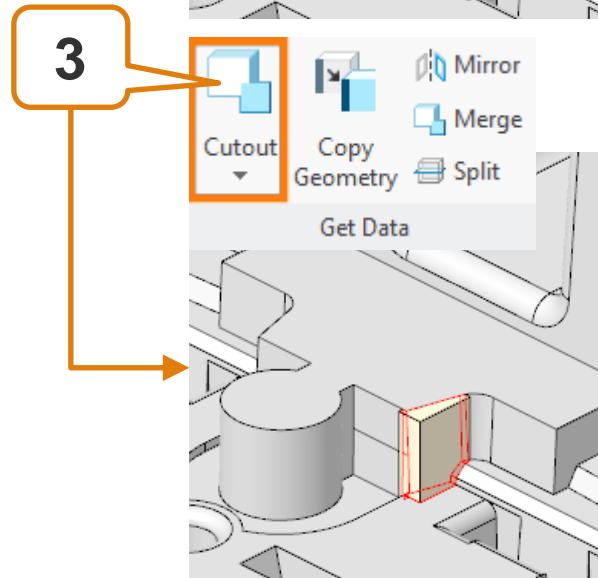
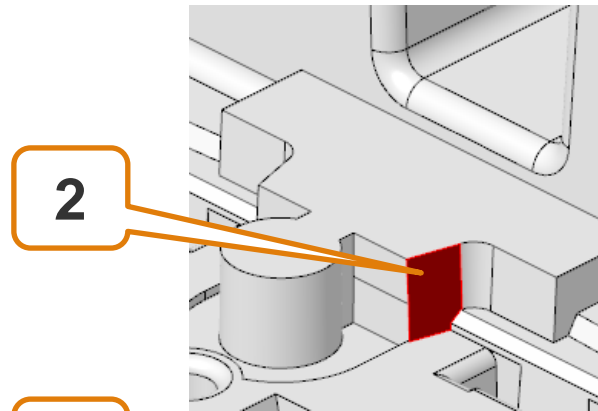
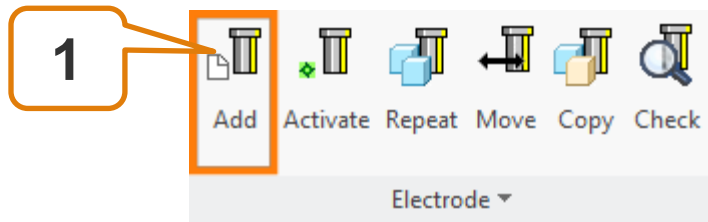


Topics...

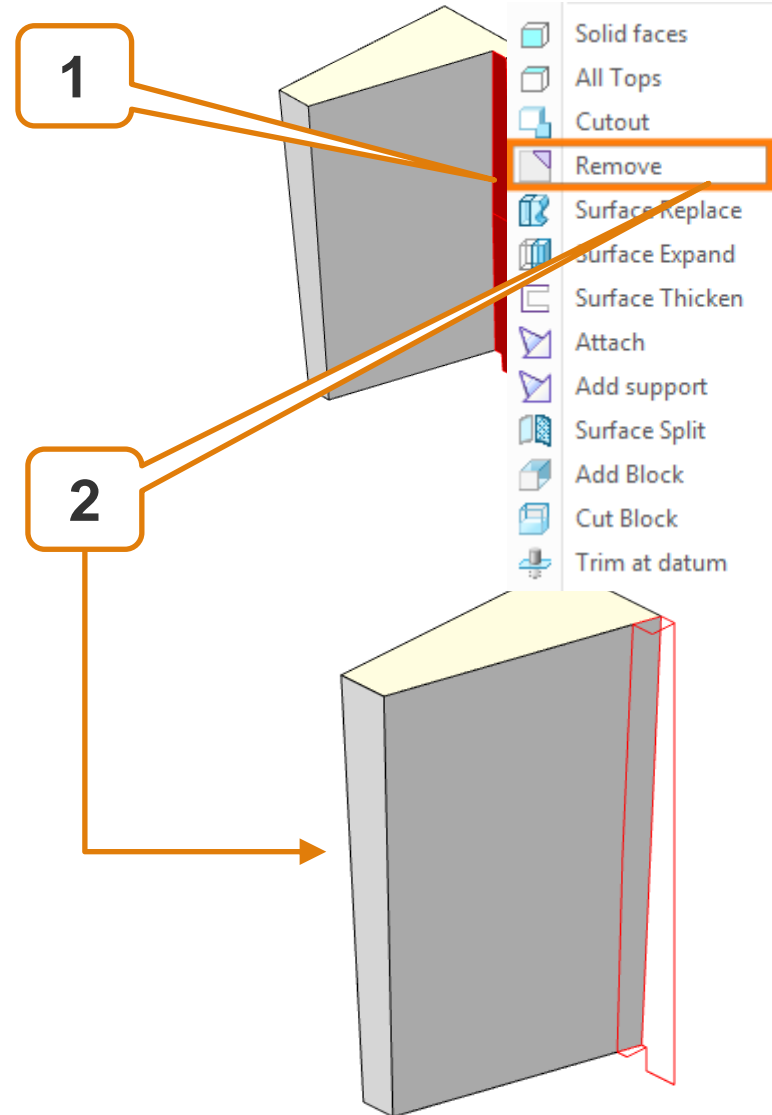
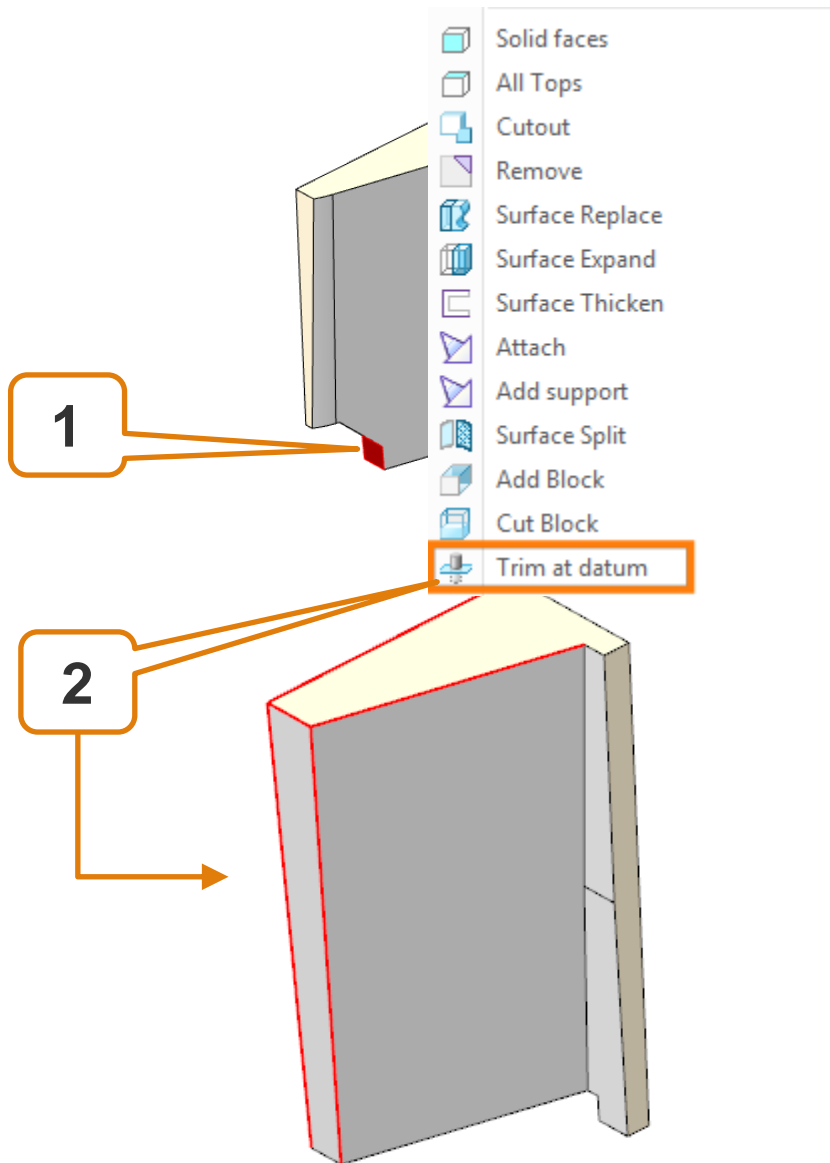
- **Usage of context menu**
(right mouse button)



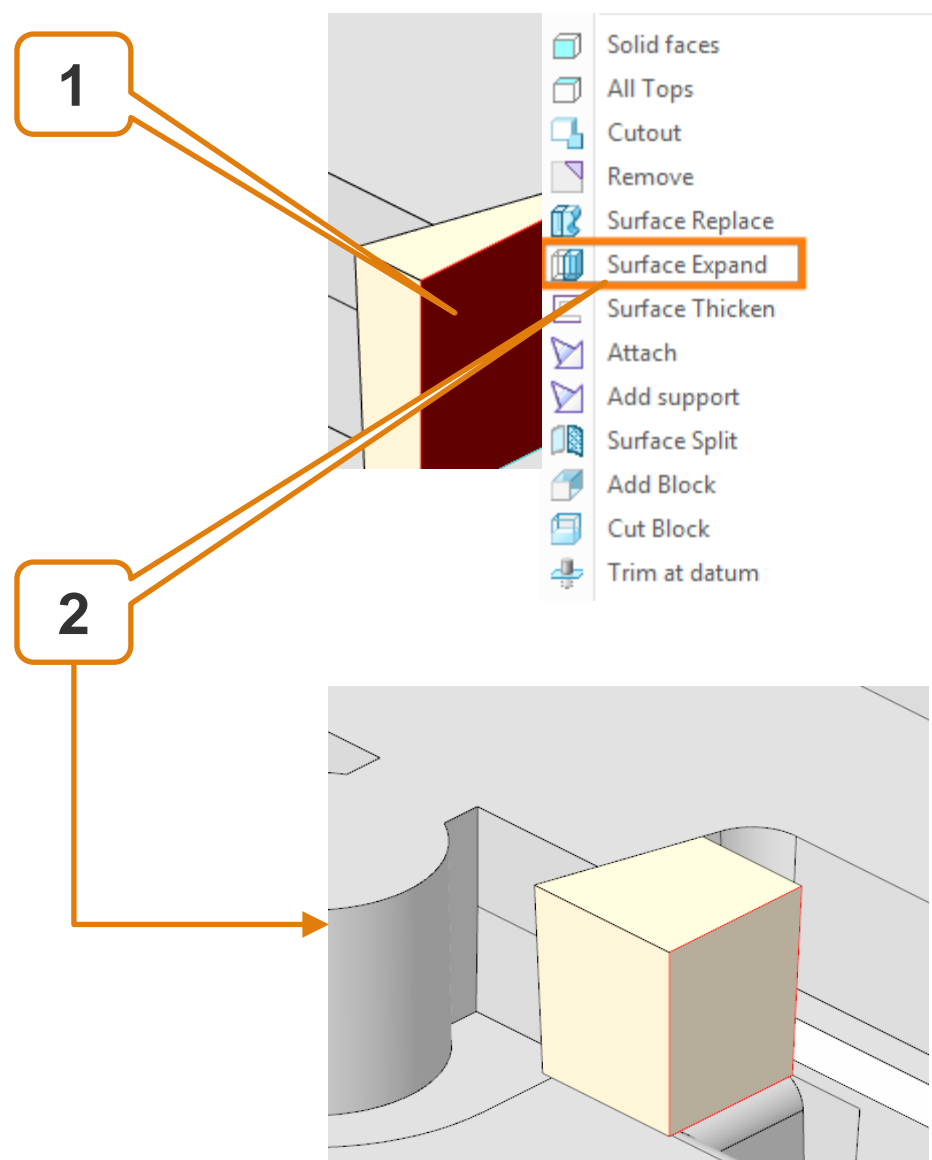
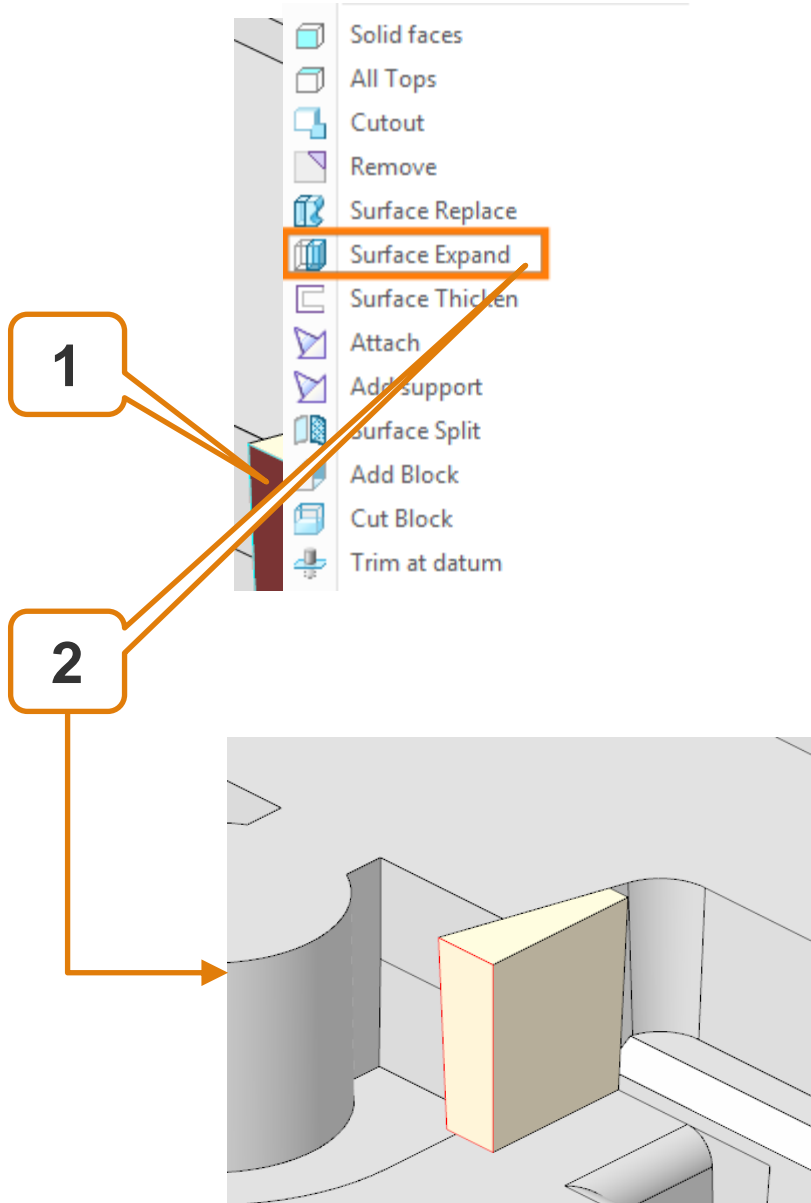
Electrode 2 – Get Data



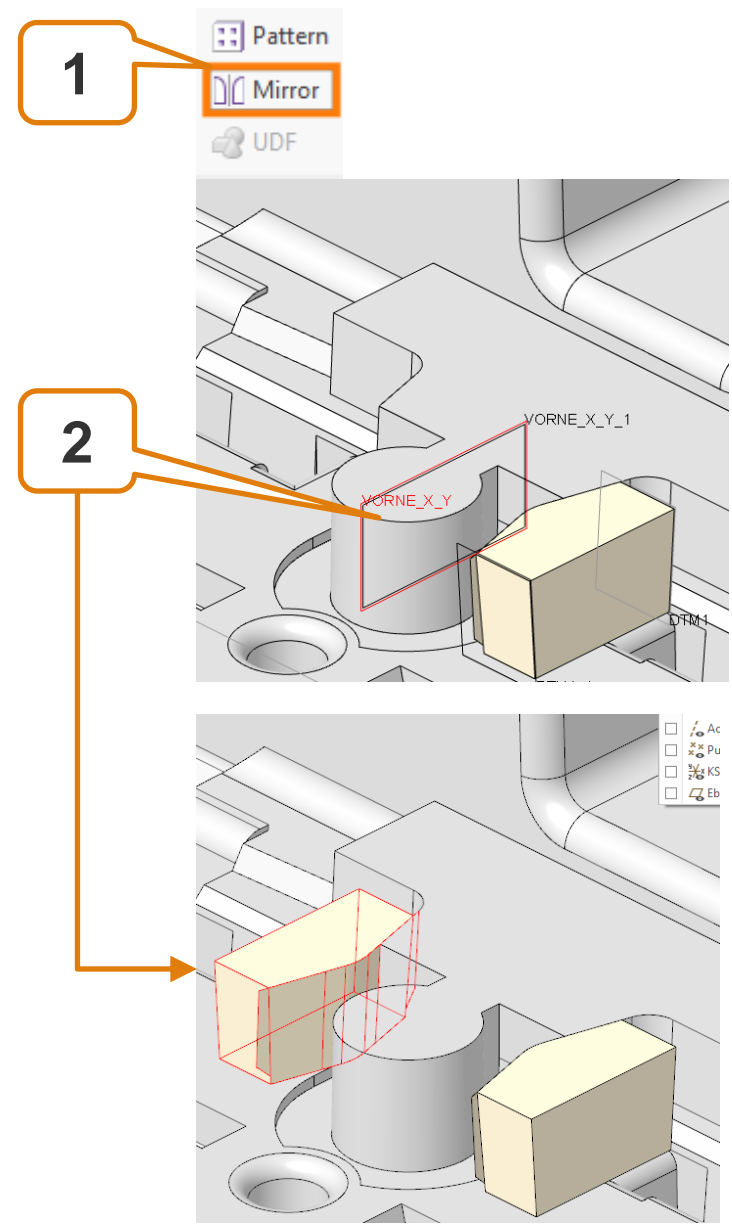
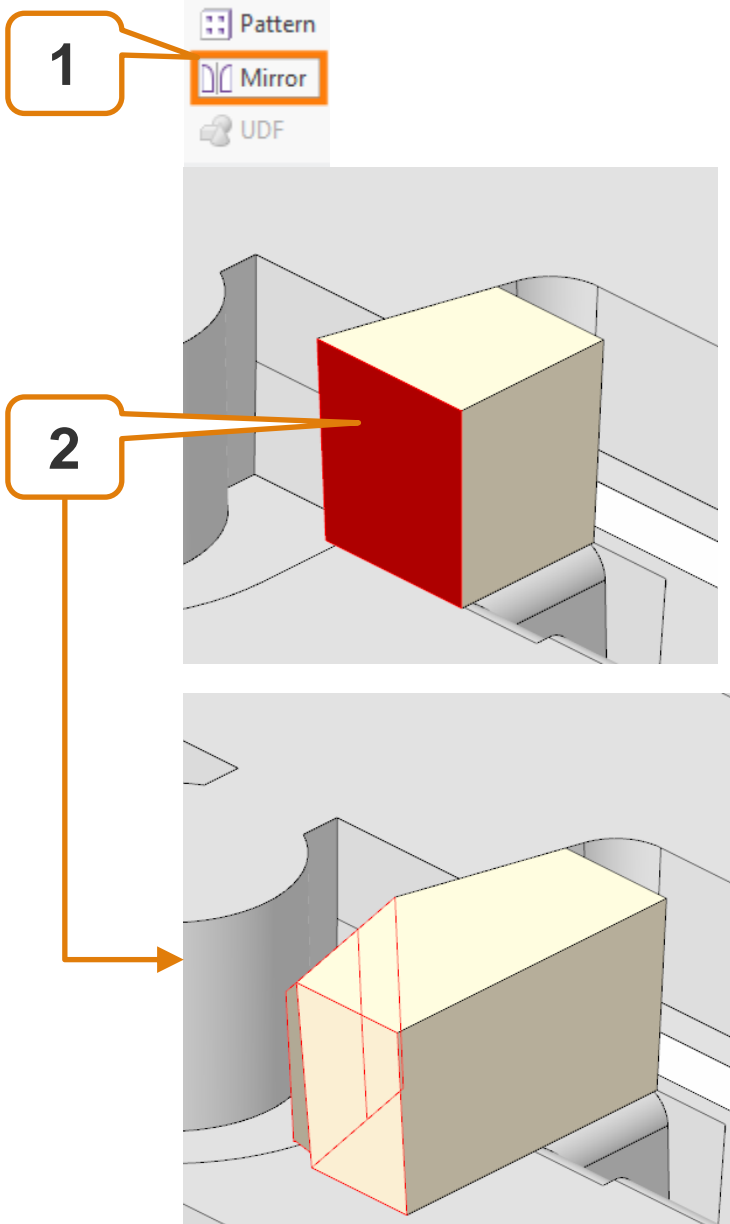
Electrode 2 – Detailing



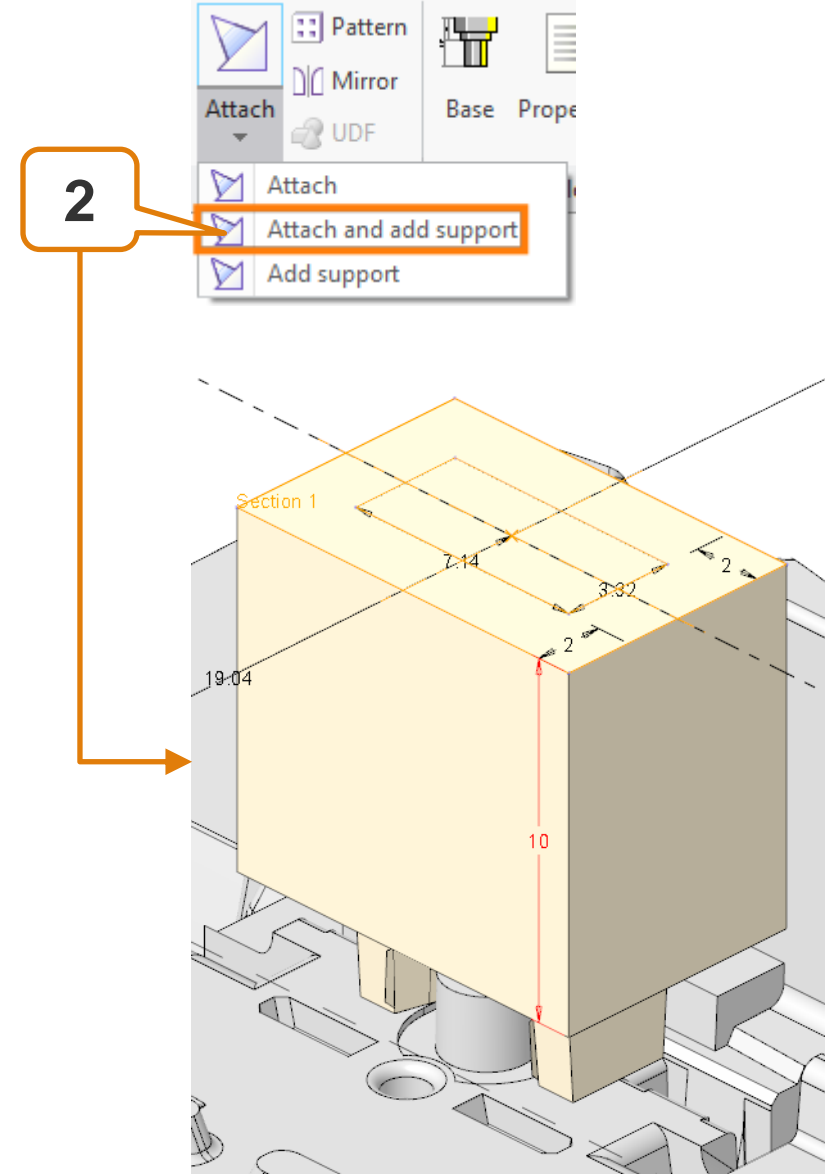
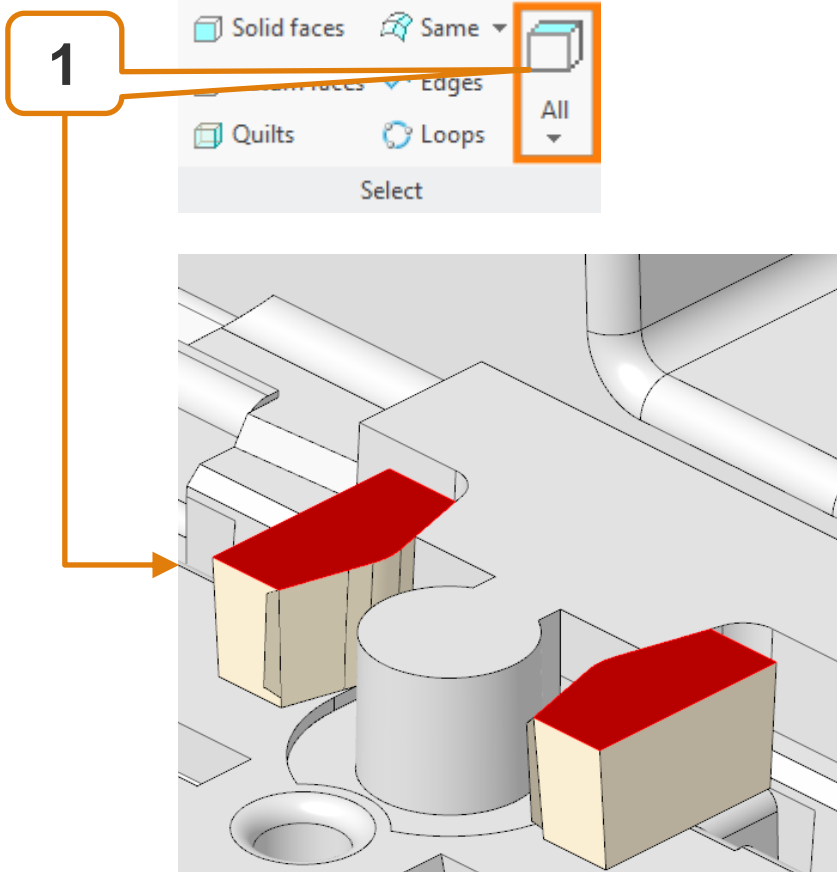
Electrode 2 – Detailing



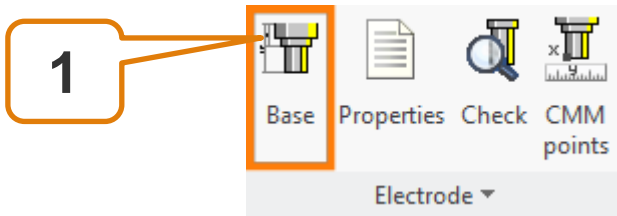
Electrode 2 – Detailing



Electrode 2 – Attach



Electrode 2 – Add Base



Electrode Base

Top View: Dimensions A_BASE and B_BASE are shown. A coordinate system with X and Y axes is centered on the base.

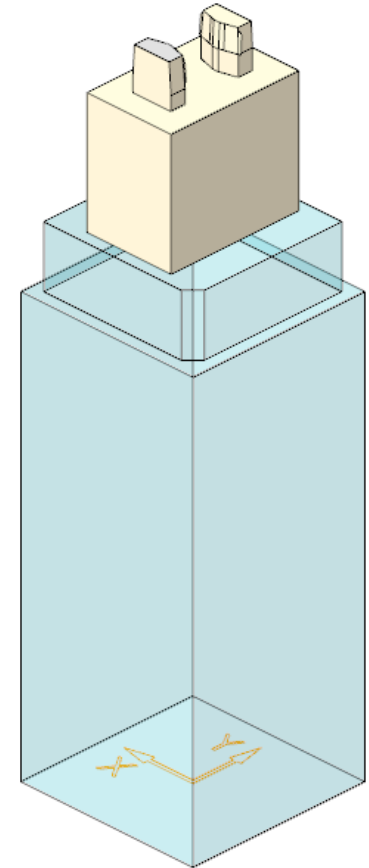
Side View: Dimensions D1, D2, D3, and LENGTH are shown. A coordinate system with Z and X axes is shown. The top surface is labeled "FREE FACE".

| Position | |
|----------|---------|
| X | 19.0352 |
| Y | 0.0000 |
| Z | 2.4783 |

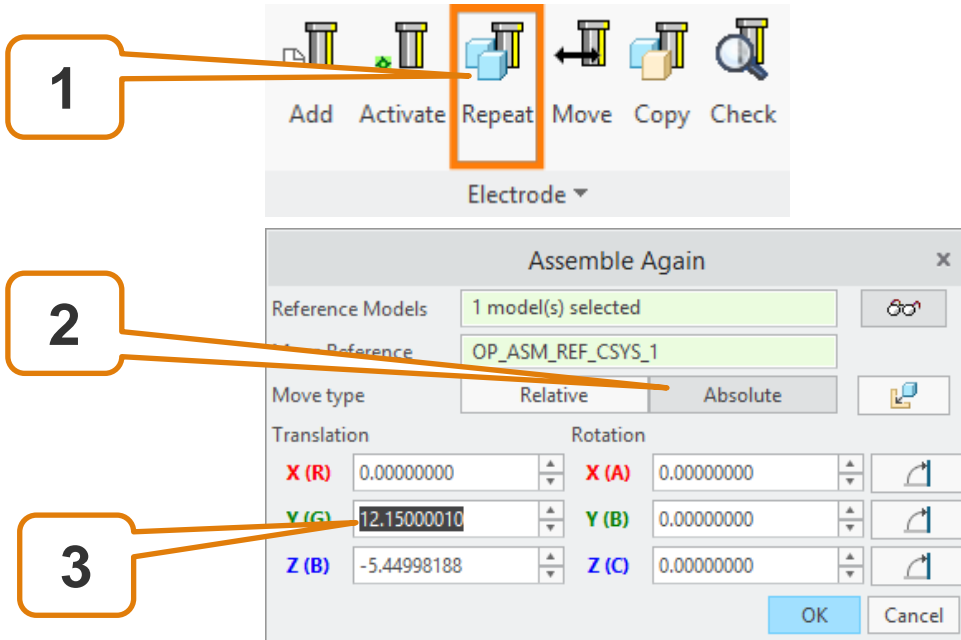
| Blank | |
|--------|--------------------------|
| LOCKED | <input type="checkbox"/> |
| TYPE | RECTANGULAR_BASE_FRAME |
| SIZE | 15X15 |
| A_BASE | 15.000 |
| B_BASE | 15.000 |
| LENGTH | 55.000 |

| Detailing | |
|-----------|---|
| CHAMFER | <input checked="" type="checkbox"/> 1.000 |
| FRAME | <input checked="" type="checkbox"/> 5.000 |
| ORIGIN | Base Free |
| CAM-Csys | EDM Top |

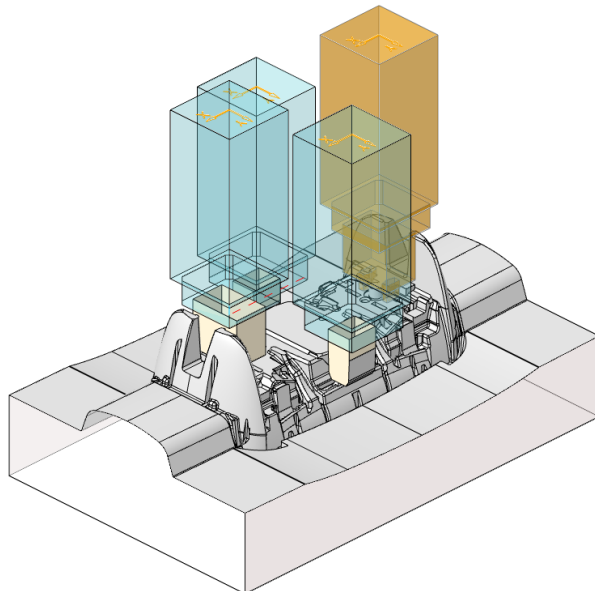
OK



Electrode 2 – Assemble Again



- Select electrode
- Select ,**Assemble again**‘
- Switch to ,**absolute**‘ movement
- Change sign at X-position
- Confirm with **OK**



Description - Assemble Again

Assemble Again

Reference Models: 1 model(s) selected

Move Reference: OP_ASM_REF_CSYS_1

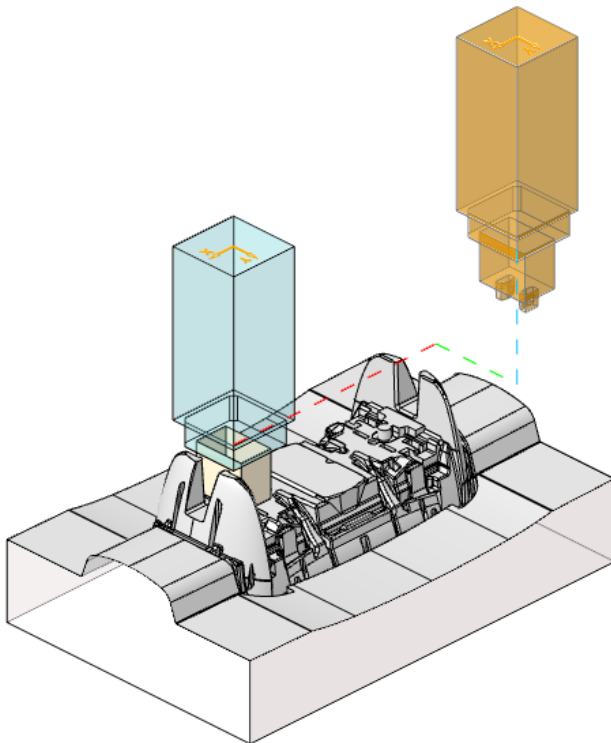
Move type: Relative Absolute

| Translation | | Rotation | |
|-------------|--------------|----------|------------|
| X (R) | -50.00000000 | X (A) | 0.00000000 |
| Y (G) | 20.00000000 | Y (B) | 0.00000000 |
| Z (B) | 20.00000000 | Z (C) | 0.00000000 |

OK Cancel


Relative Movement

Movement regarding current position of the Electrode




Description - Assemble Again

Assemble Again ×

Reference Models 

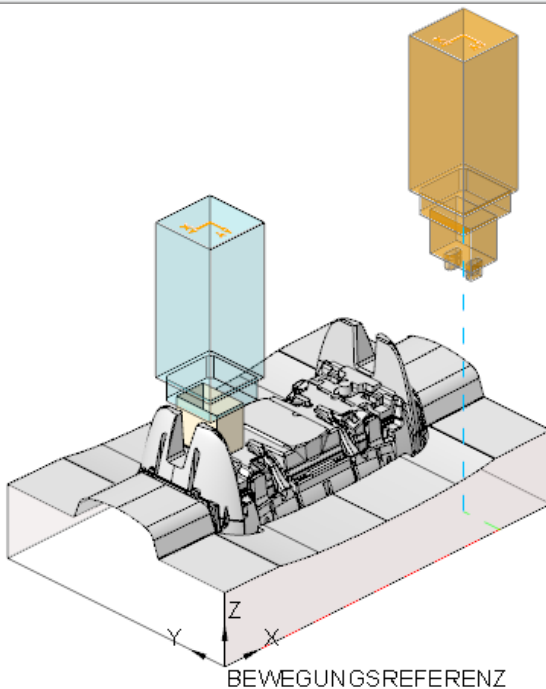
Move Reference

Move type 

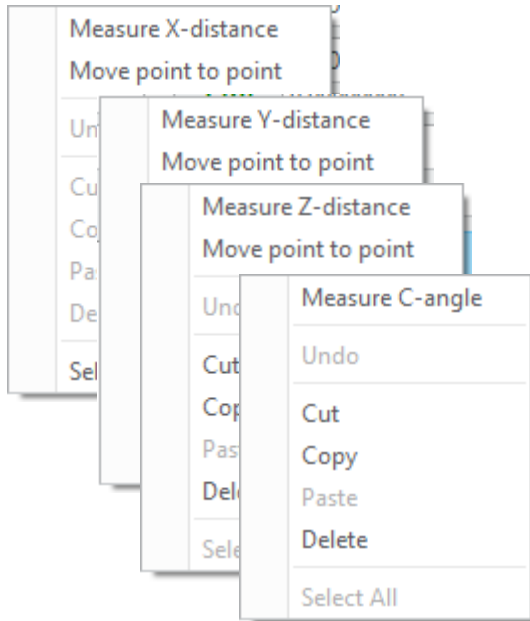
| Translation | | Rotation | |
|--------------|--|--------------|---|
| X (R) | <input type="text" value="75.96483803"/> | X (A) | <input type="text" value="0.00000000"/> |
| Y (G) | <input type="text" value="10.00000000"/> | Y (B) | <input type="text" value="0.00000000"/> |
| Z (B) | <input type="text" value="57.47831923"/> | Z (C) | <input type="text" value="180.00000000"/> |

Absolute Movement

- Movement with respect to **selectable zero**
- Operation zero pre-selected



Description - Assemble Again



Measurement

- **Move by X / Y / Z distance**
- **Move from point to point**
- **Align surface of base with other surface → set C-angle**

Agenda

Comparison and compatibility with SE 7.0

Workflow

User Interface

Assembly Mode

Part Mode

Training

Assembly Creation

Preparation

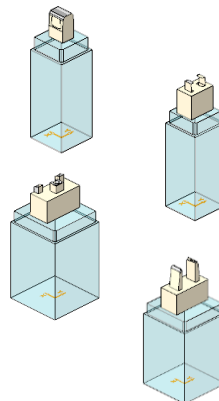
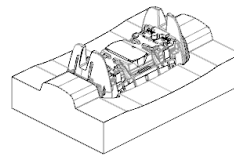
Set Zero

Electrode 1

Electrode 2

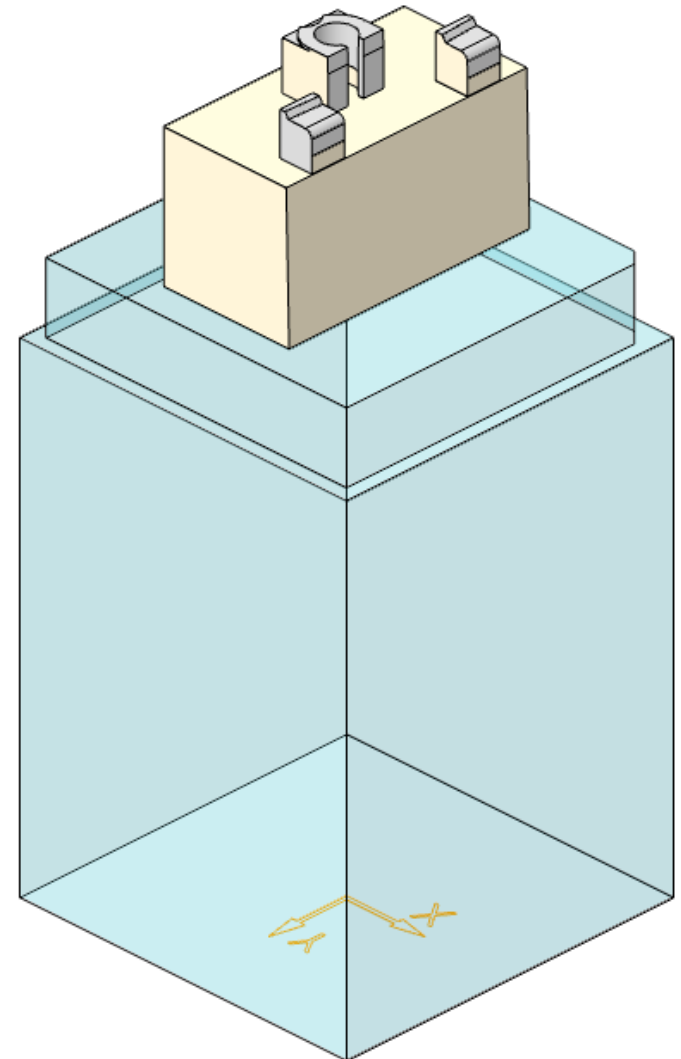
Electrode 3

Electrode 4

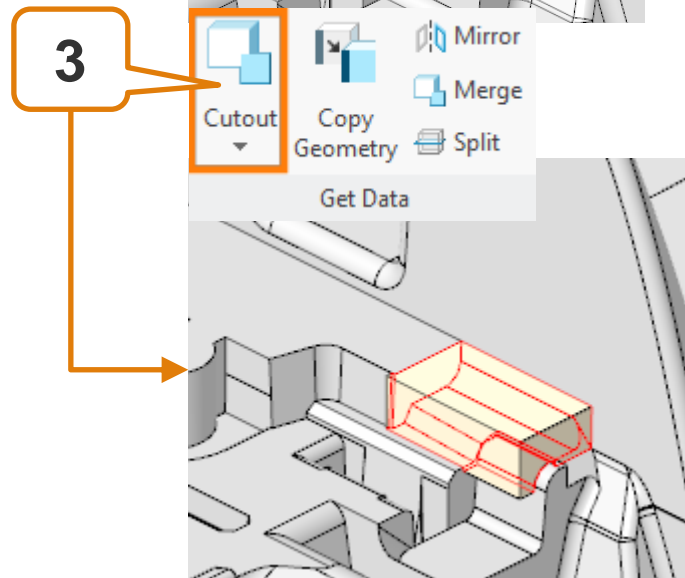
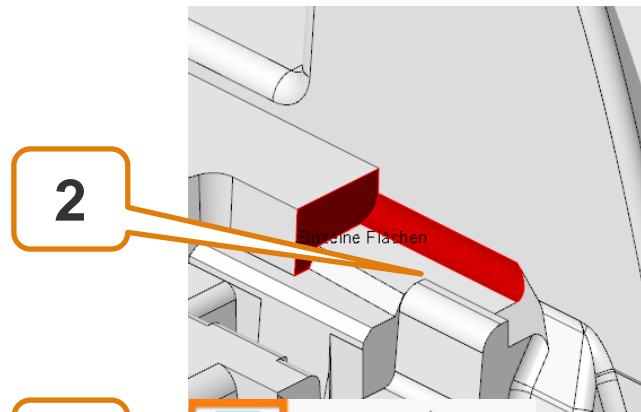
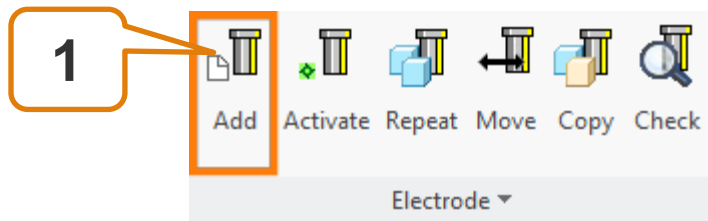


Topics...

- Several cutouts
- Replace with external reference

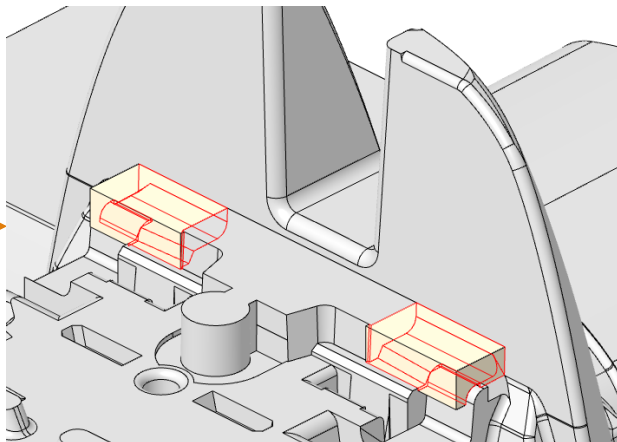
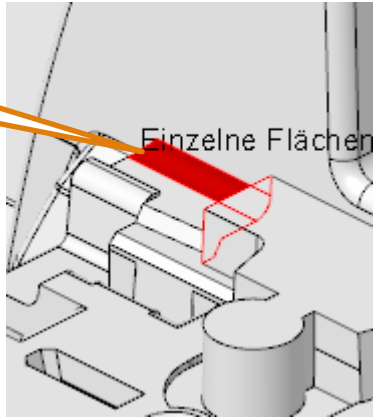


Electrode 3 – Get Data

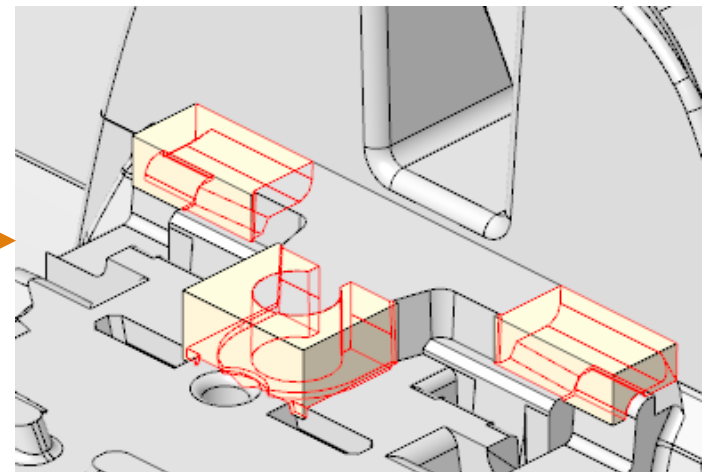
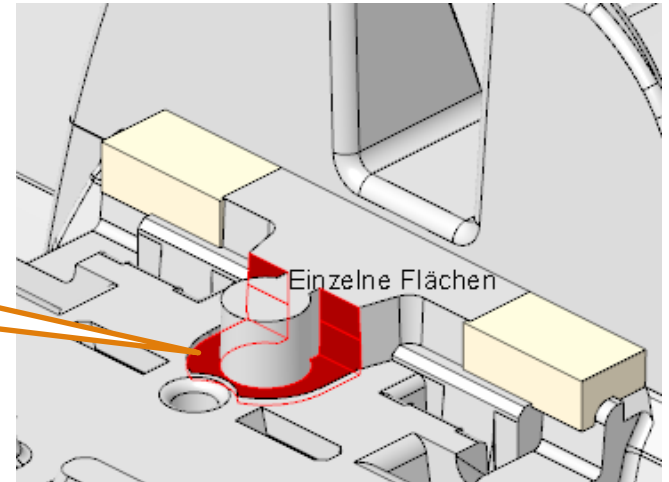


Electrode 3 – Get Data

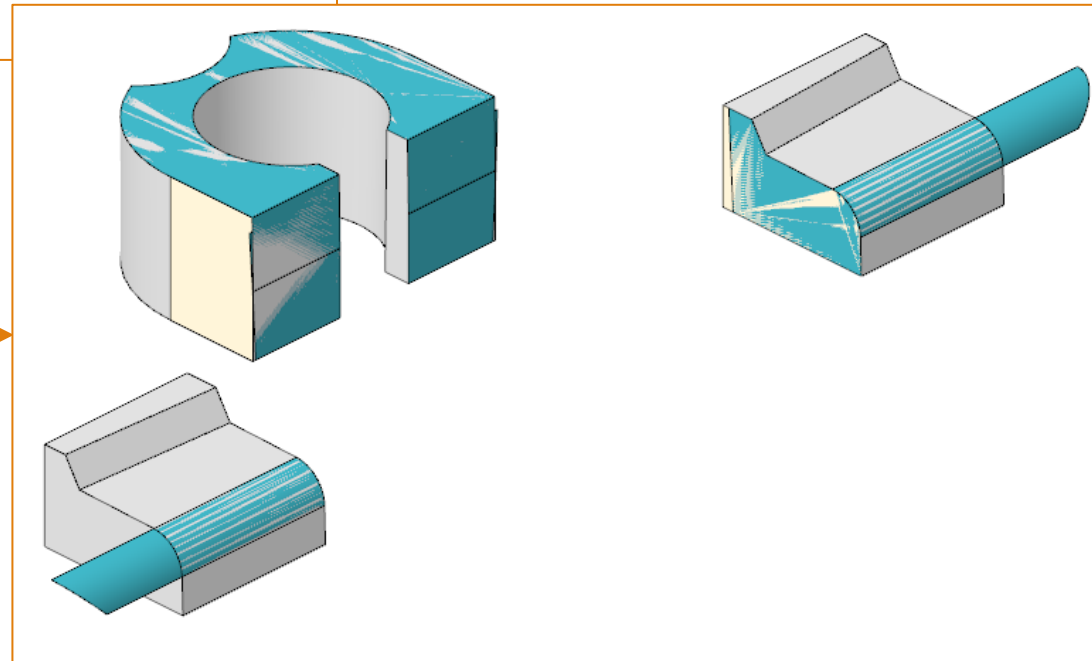
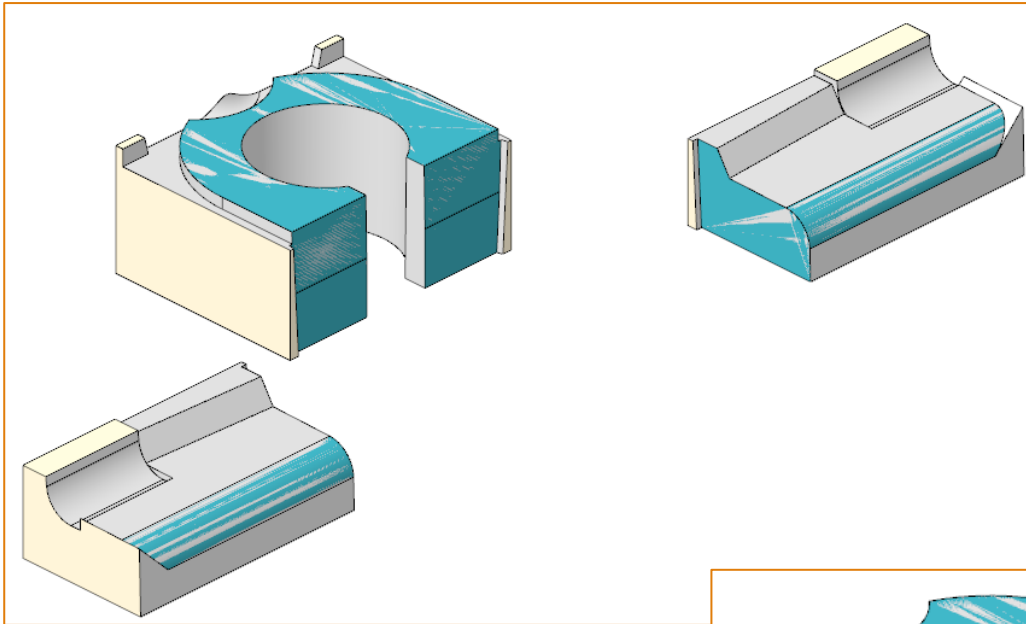
1



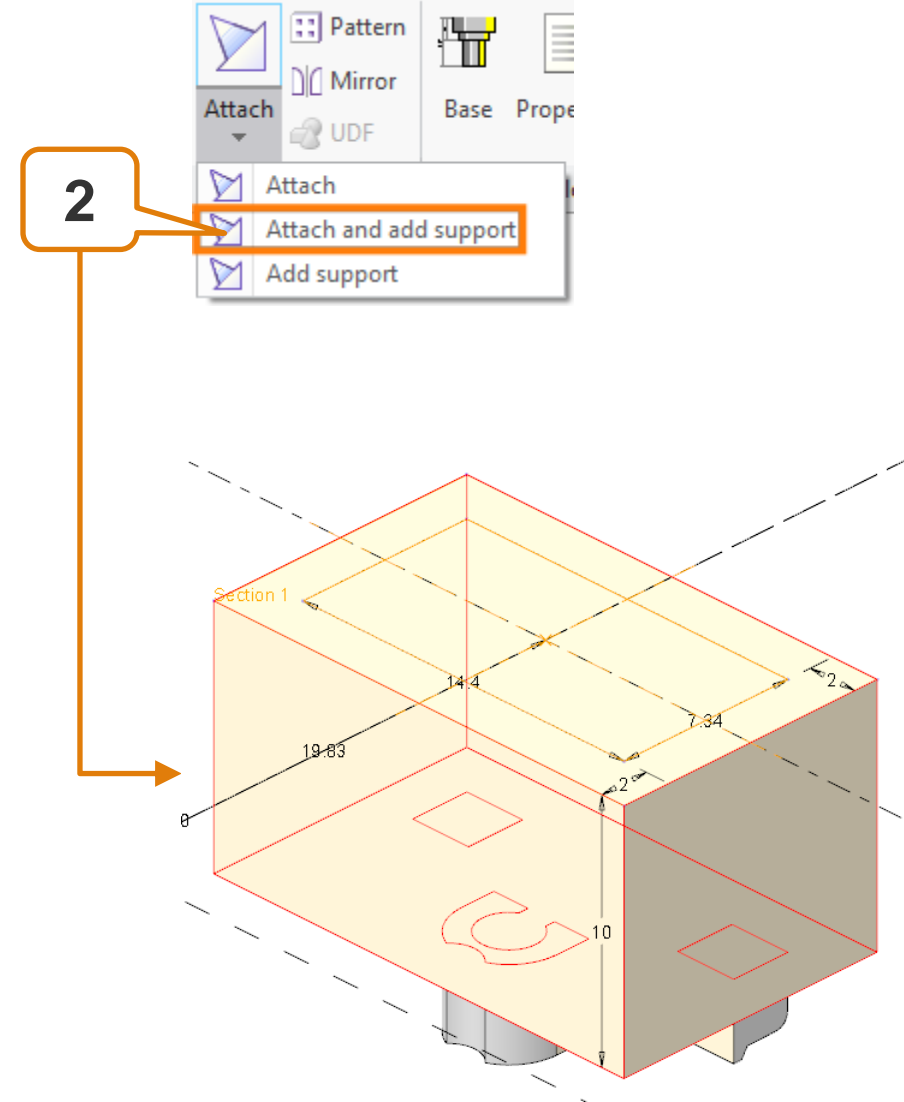
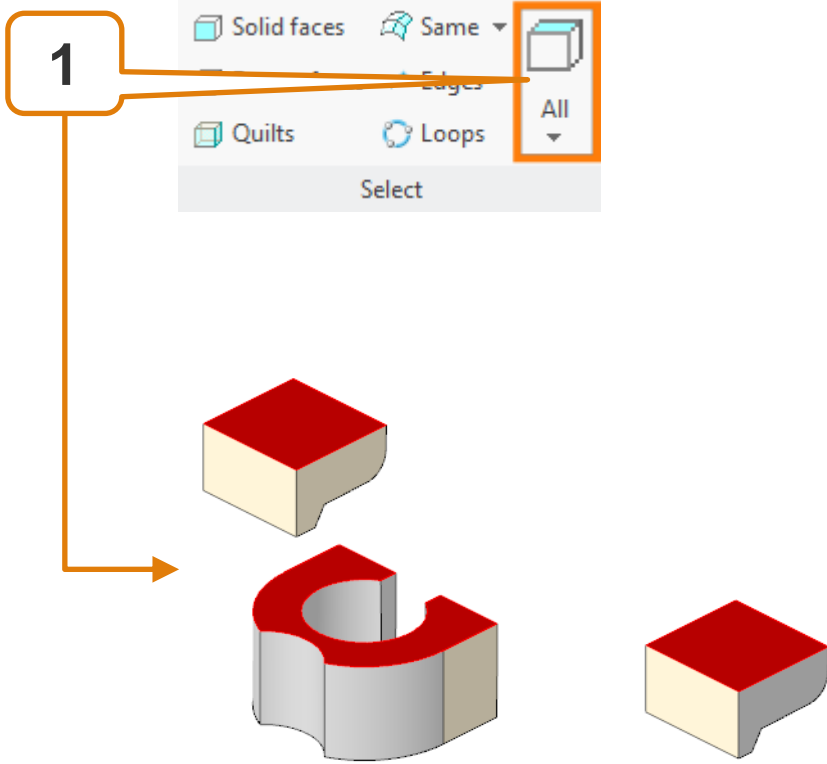
2



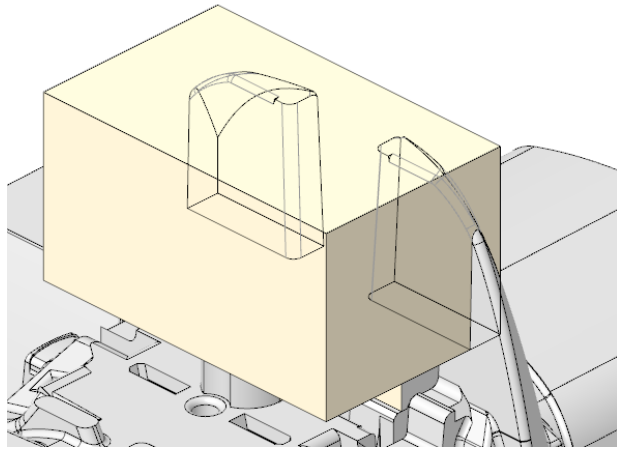
Electrode 3 – Detailing



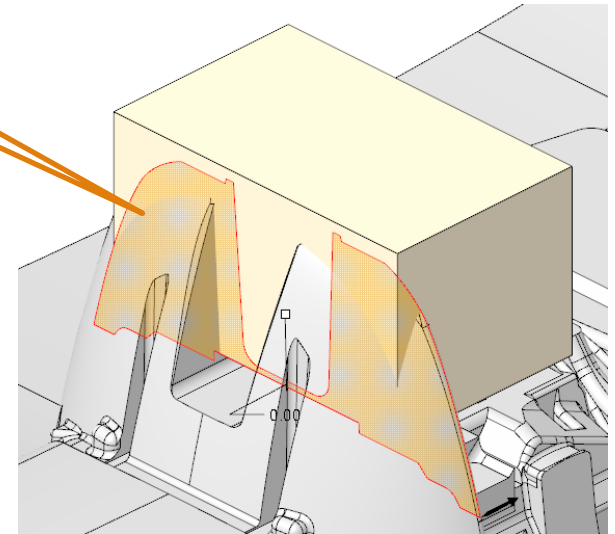
Electrode 3 – Attach with support



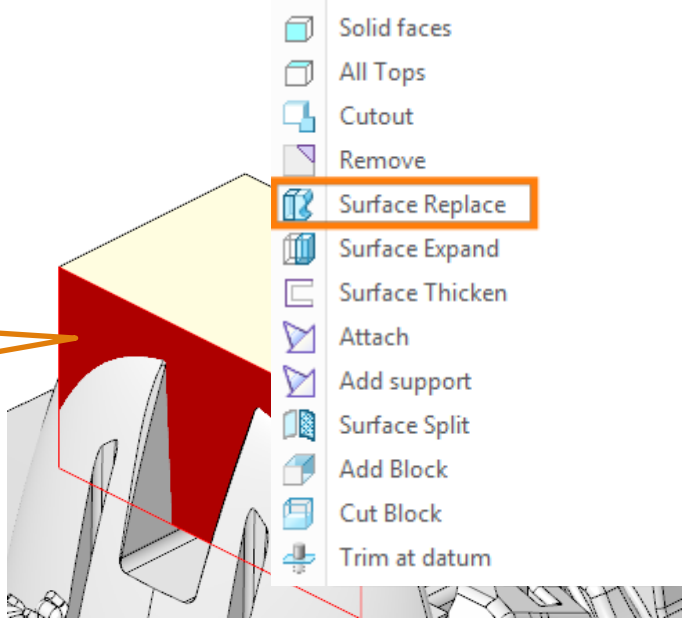
Electrode 3 – Replace at external reference



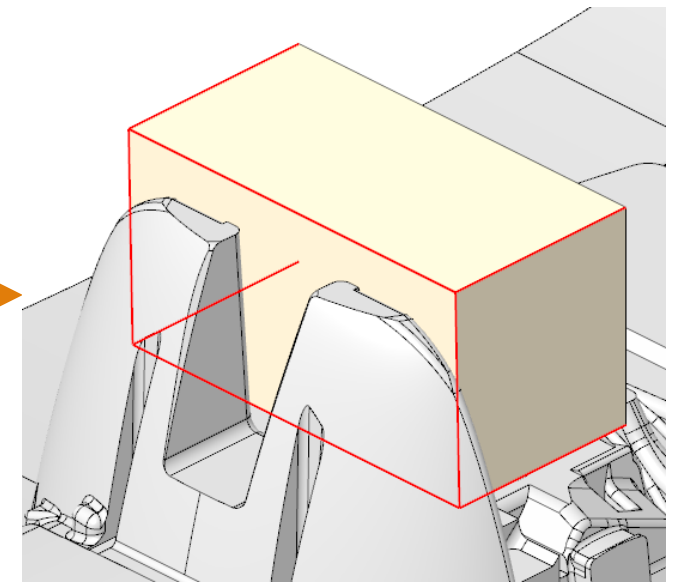
2



1

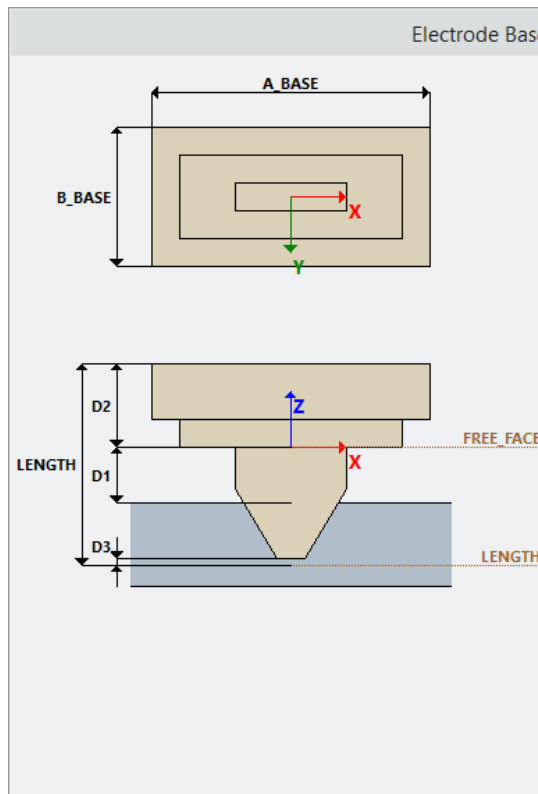


- Solid faces
- All Tops
- Cutout
- Remove
- Surface Replace**
- Surface Expand
- Surface Thicken
- Attach
- Add support
- Surface Split
- Add Block
- Cut Block
- Trim at datum



Electrode 3 – Finish

Electrode Base



Base Details

Position

| | | | |
|---|---------|---|-------|
| X | 18.9575 | A | 0.000 |
| Y | 0.0000 | B | 0.000 |
| Z | 2.4783 | C | 0.000 |

Blank

LOCKED

TYPE RECTANGULAR_BASE_FRAME

SIZE 25X25

| | | | |
|--------|--------|----|--------|
| A_BASE | 25.000 | D1 | 2.000 |
| B_BASE | 25.000 | D2 | 40.000 |
| LENGTH | 55.000 | D3 | 1.322 |

Detailing

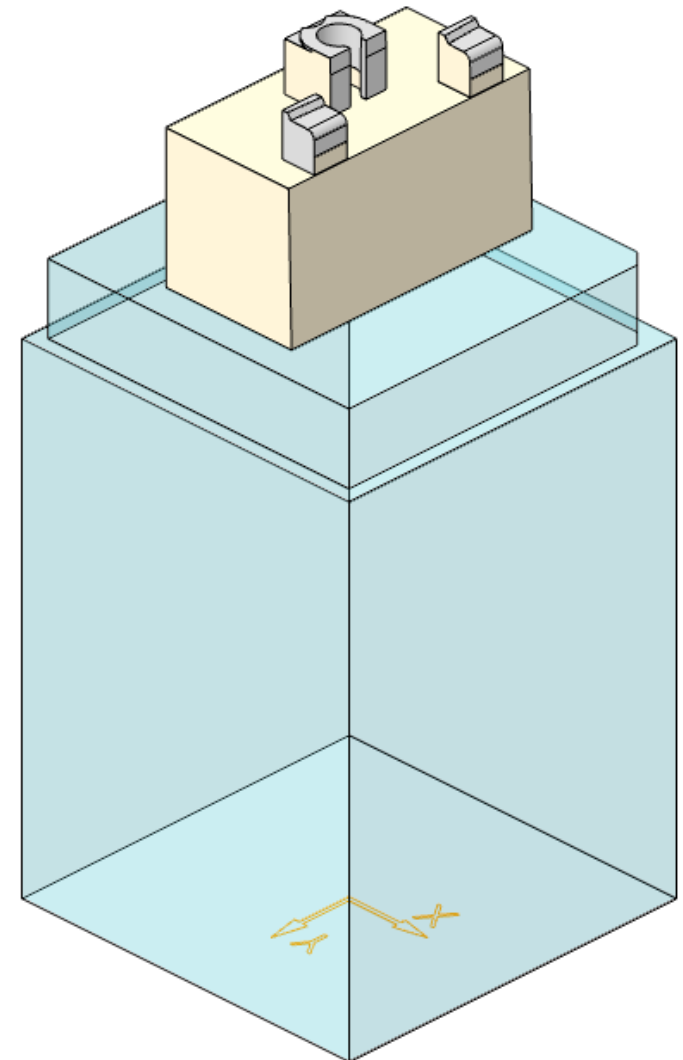
CHAMFER 1.000 1.000

FRAME 5.000 1.000

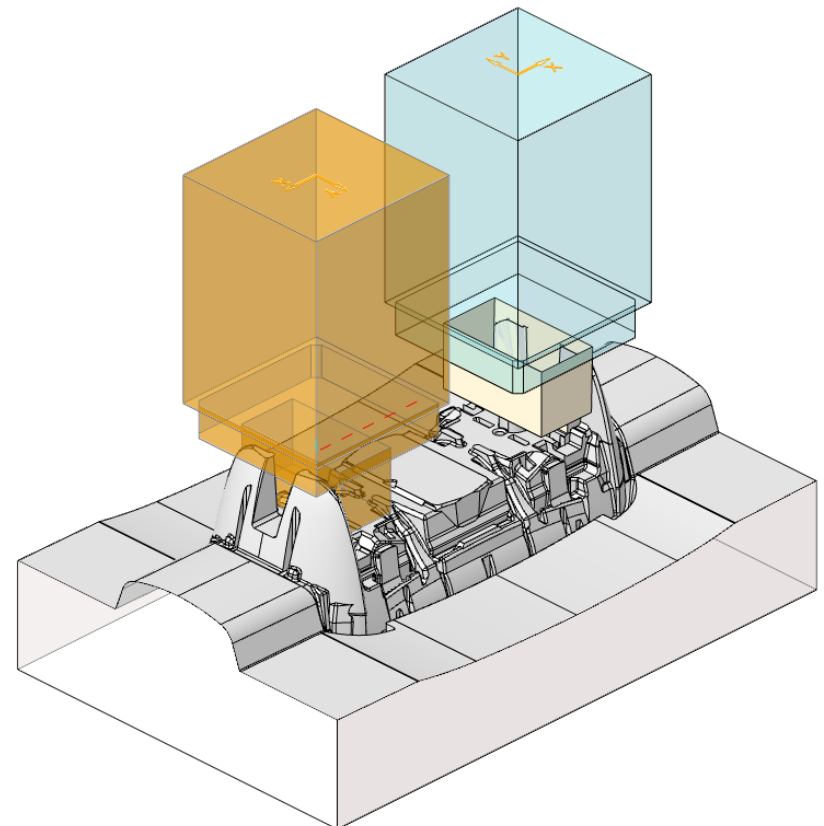
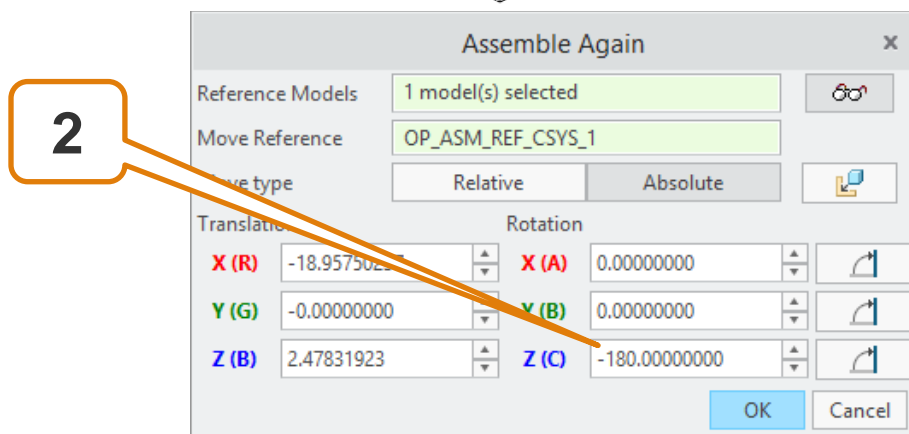
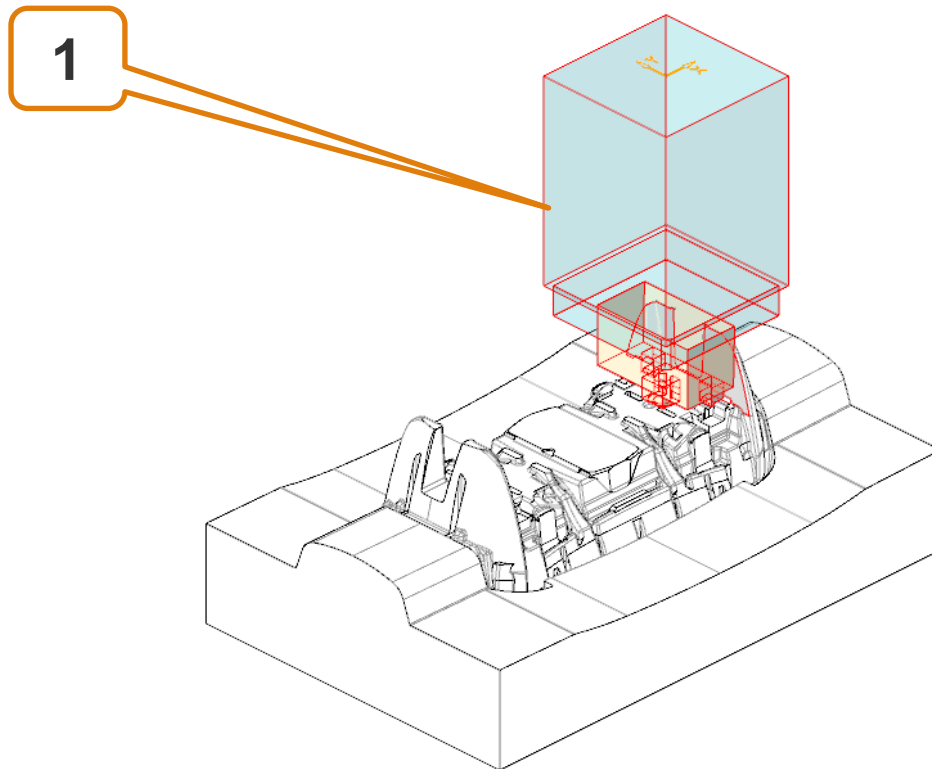
ORIGIN Base Free

CAM-Csys EDM Top

OK



Electrode 3 – Assemble Again



Agenda

Comparison and compatibility with SE 7.0

Workflow

User Interface

Assembly Mode

Part Mode

Training

Assembly Creation

Preparation

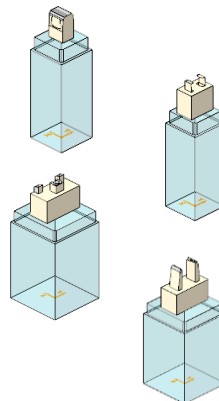
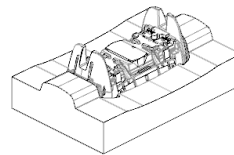
Set Zero

Electrode 1

Electrode 2

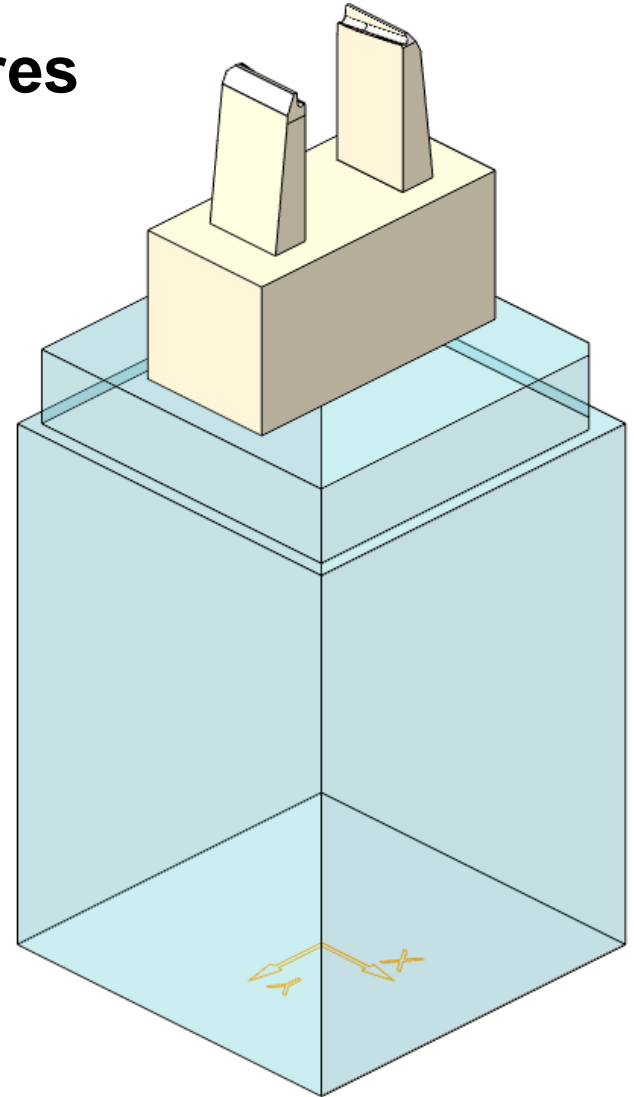
Electrode 3

Electrode 4

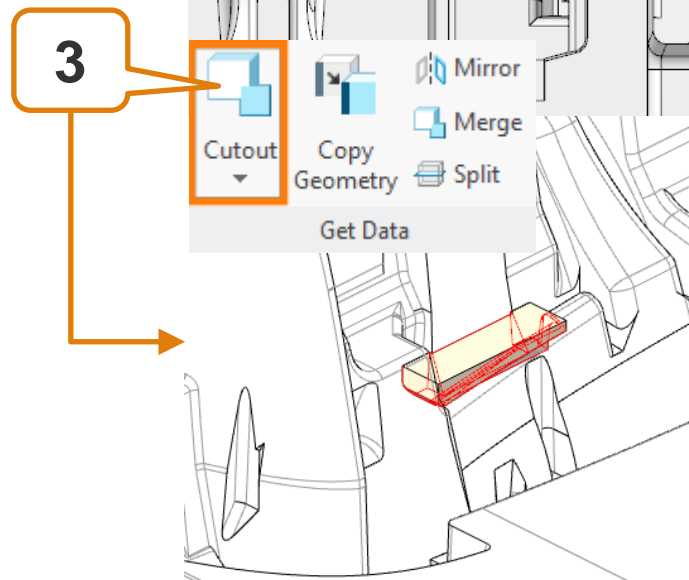
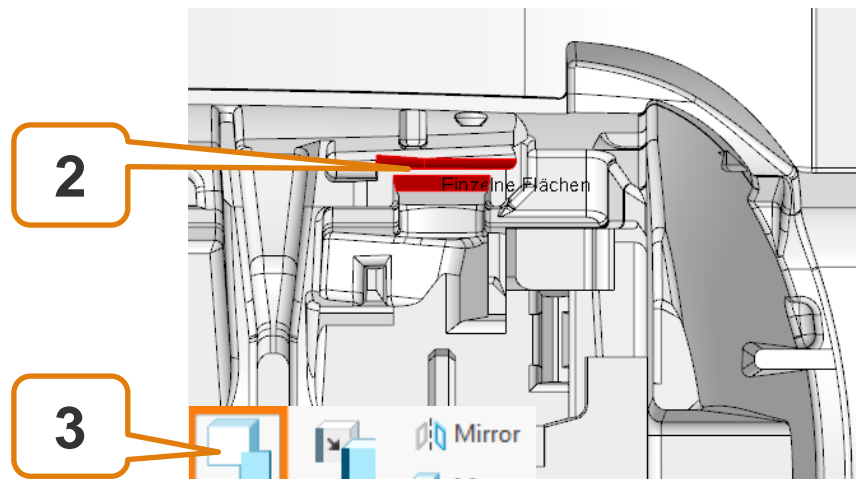
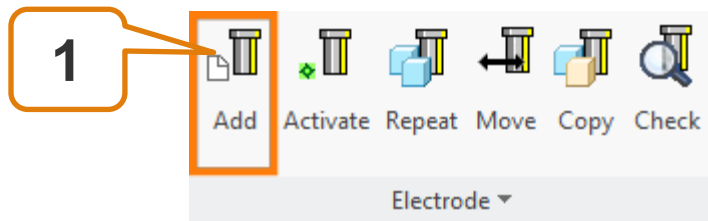


Topics...

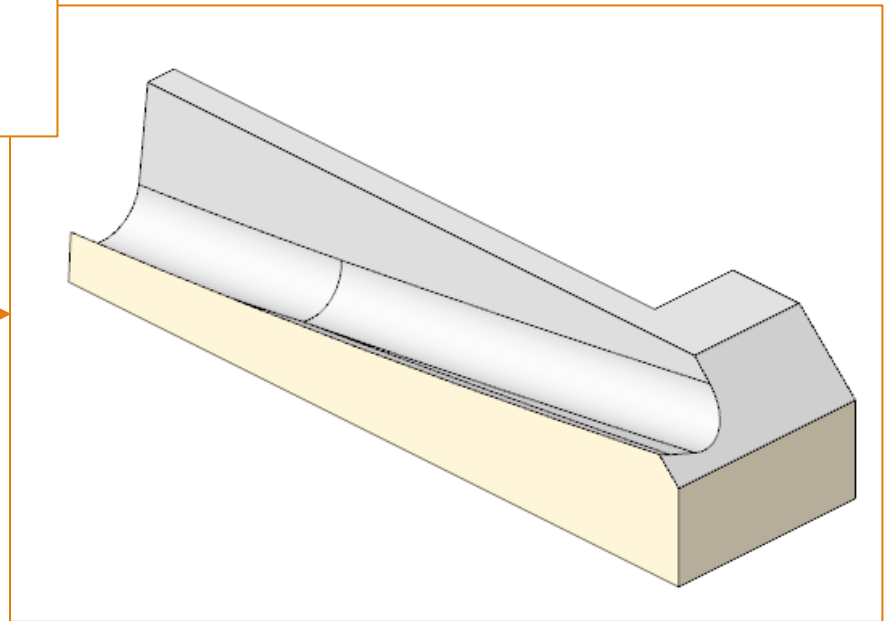
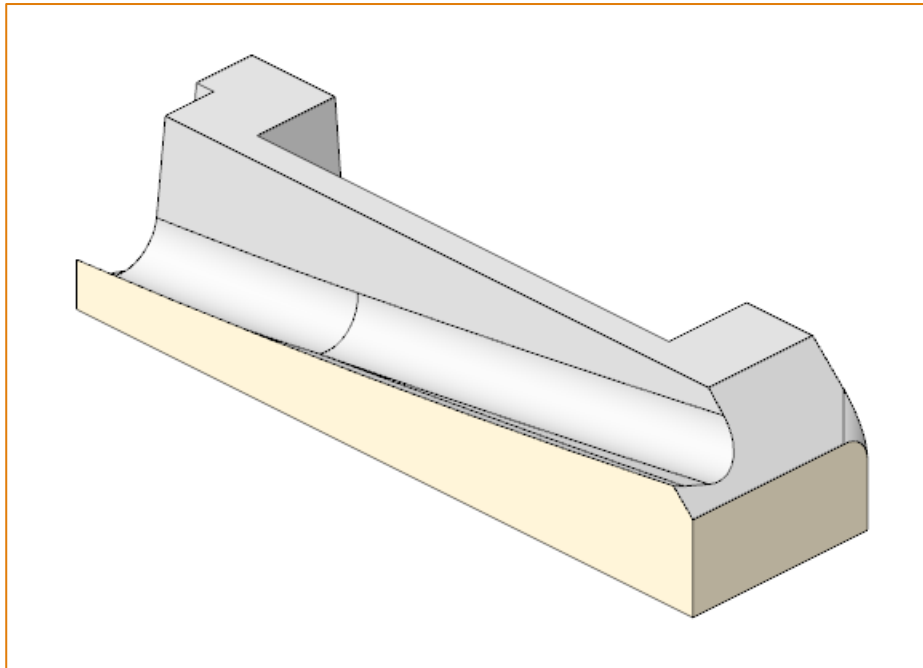
- Mix SE commands and Creo features
- Command ,**Cut Block** ‘
- Create geometry pattern



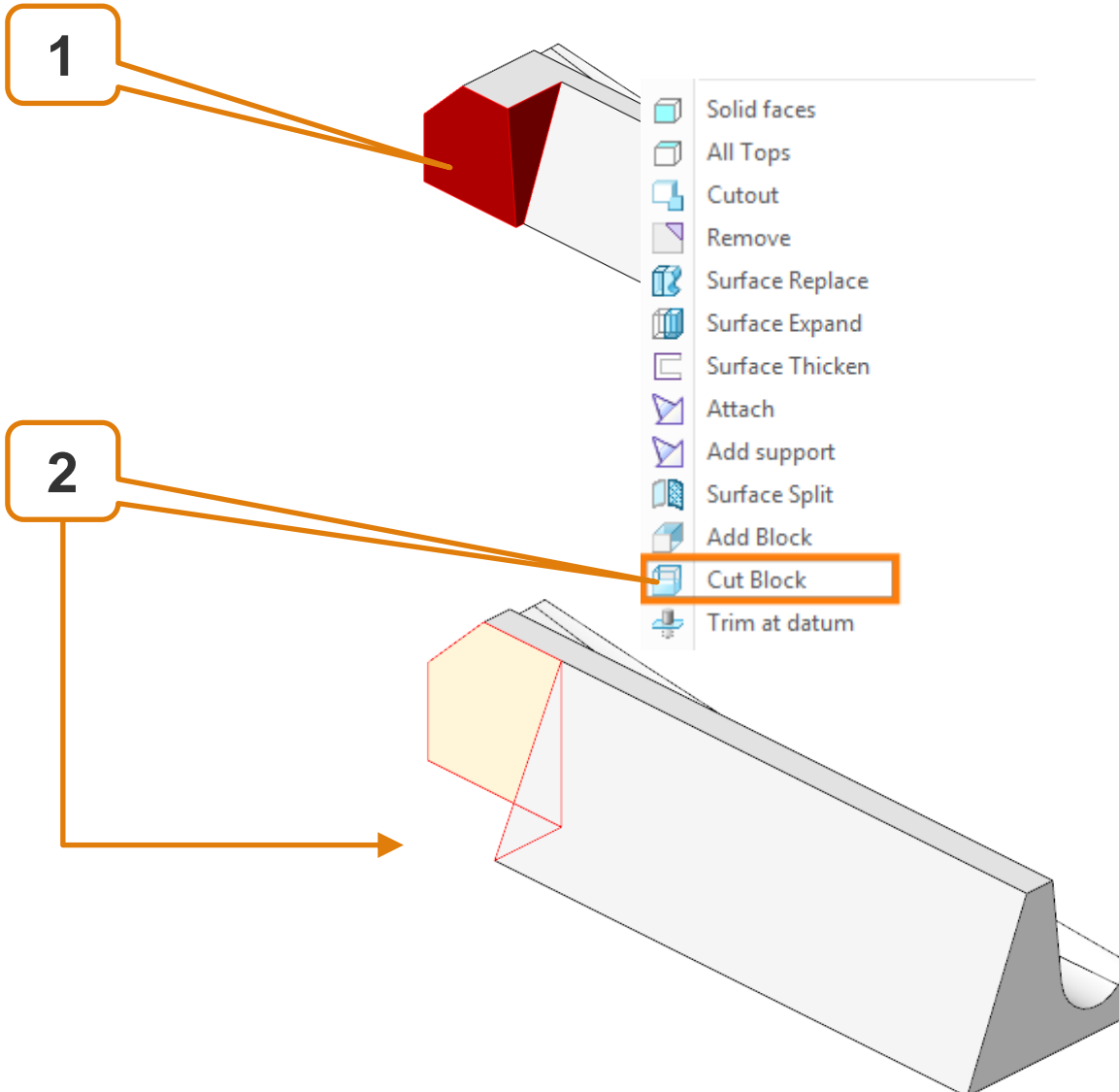
Electrode 4 – Get Data



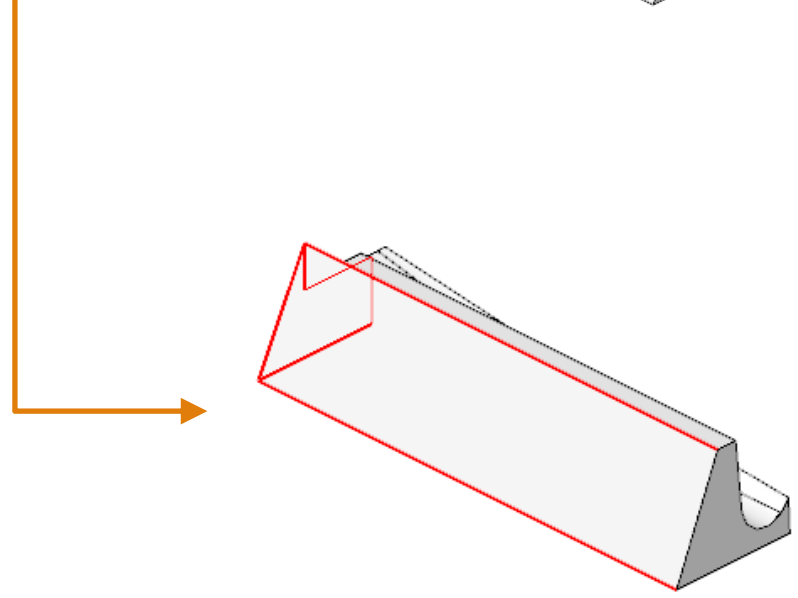
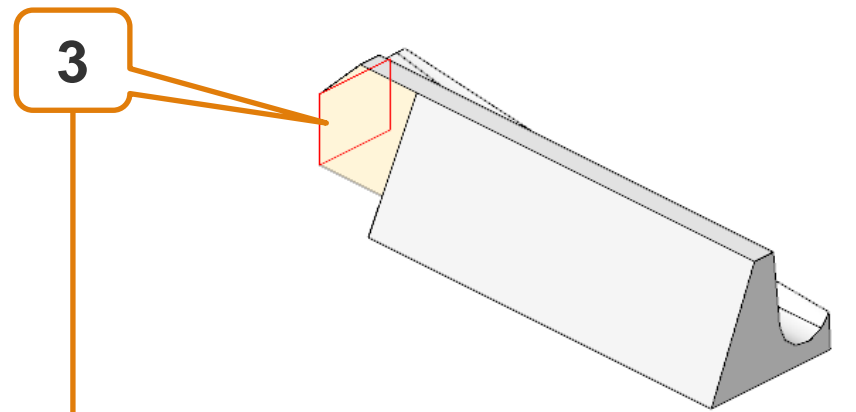
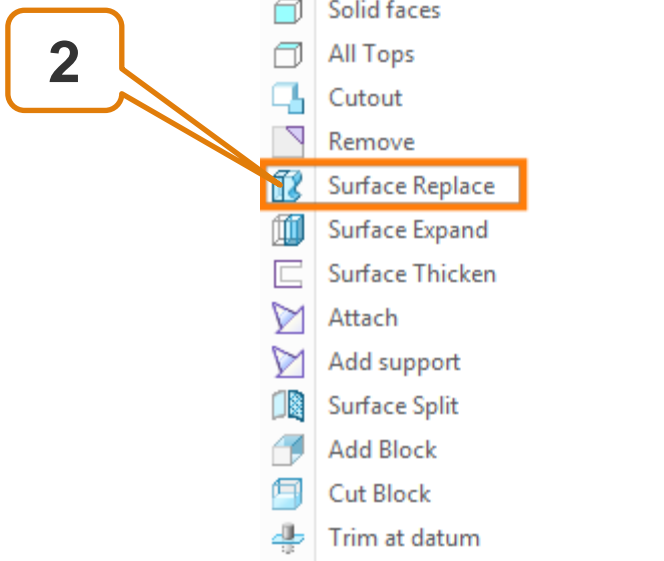
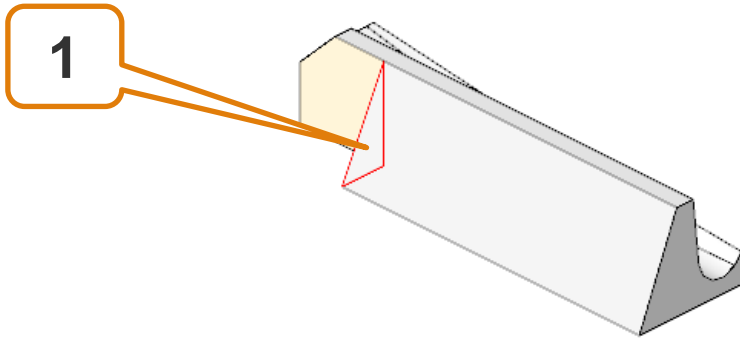
Electrode 4 – Detailing



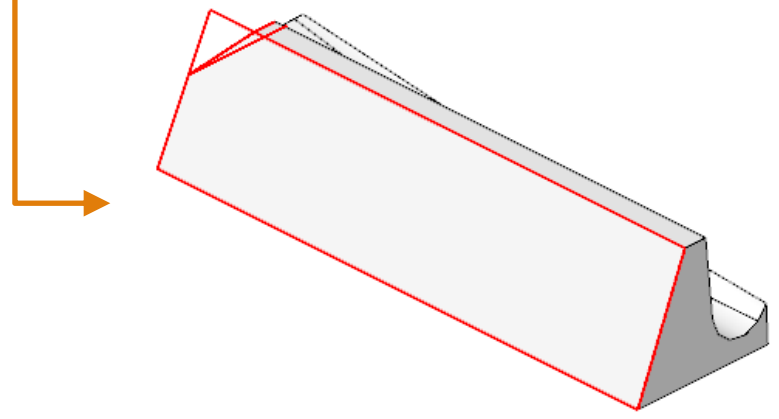
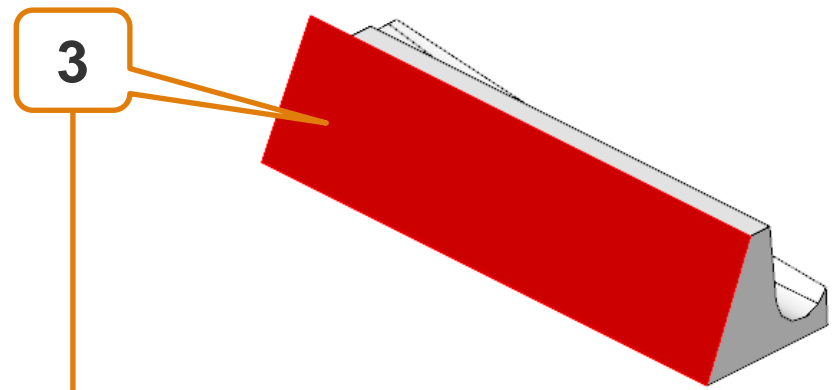
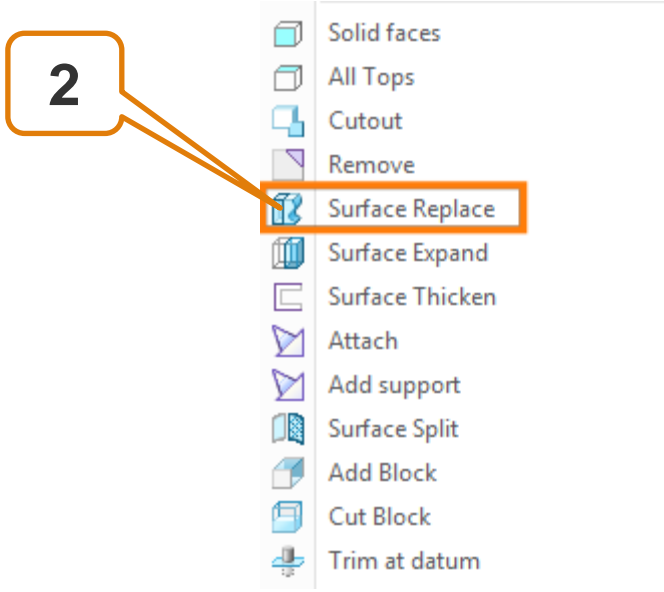
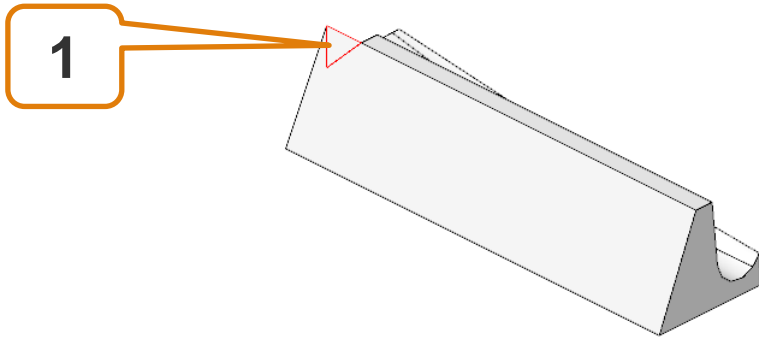
Electrode 4 – Detailing



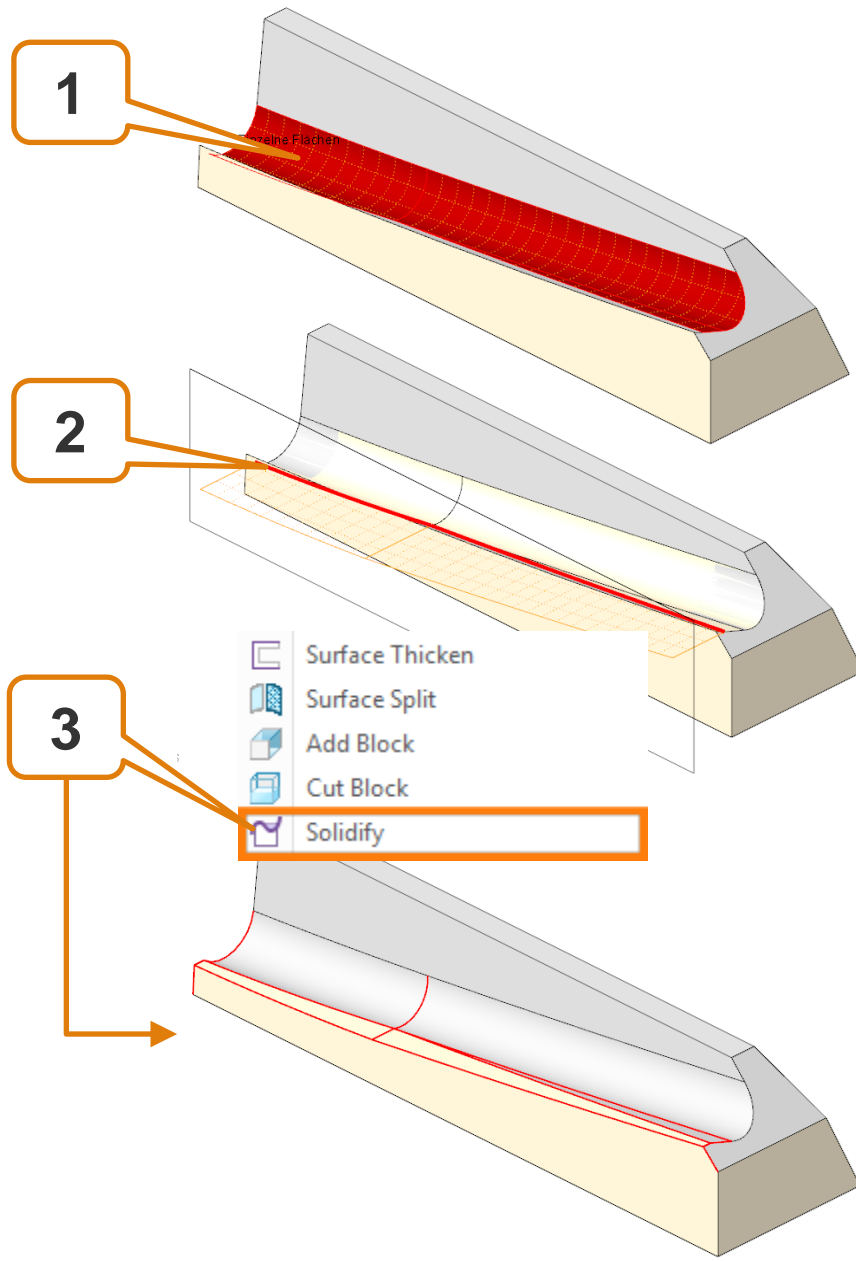
Electrode 4 – Detailing



Electrode 4 – Detailing



Electrode 4 – Surface Modeling



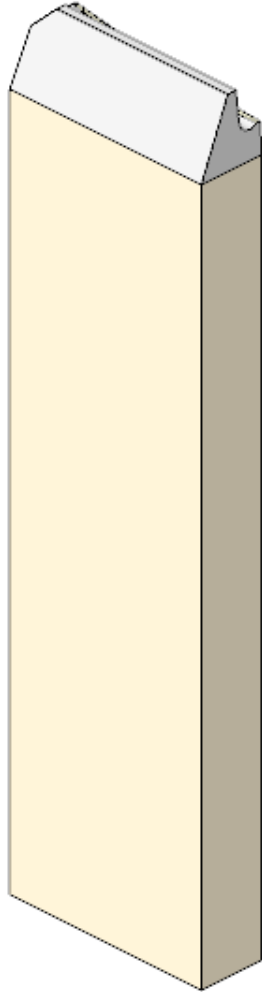
- Copy surfaces

- Extend quilt at contour

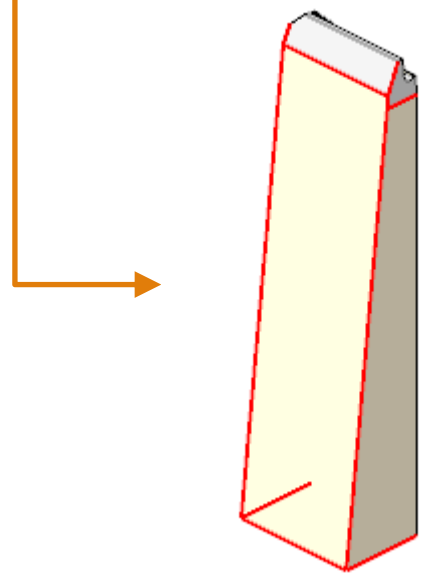
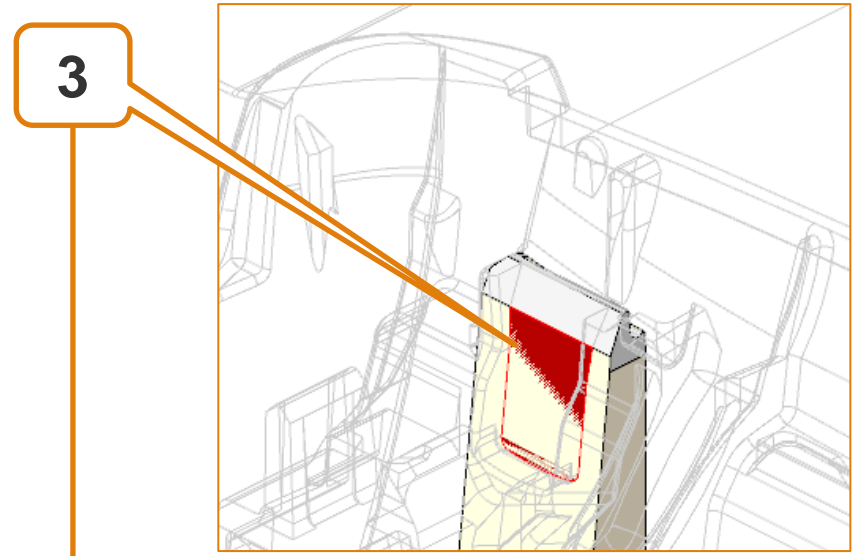
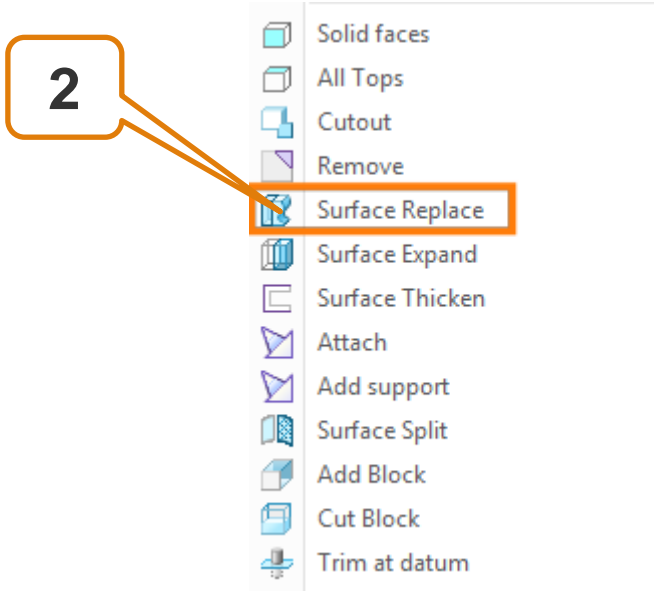
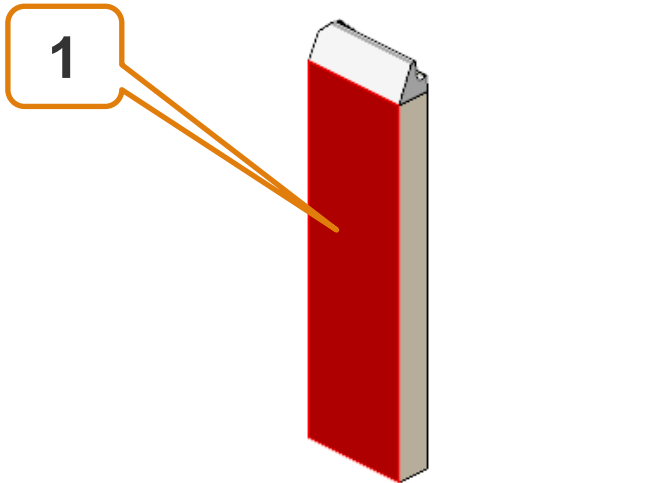
- Replace with quilt (solidify)

Electrode 4 – Detailing

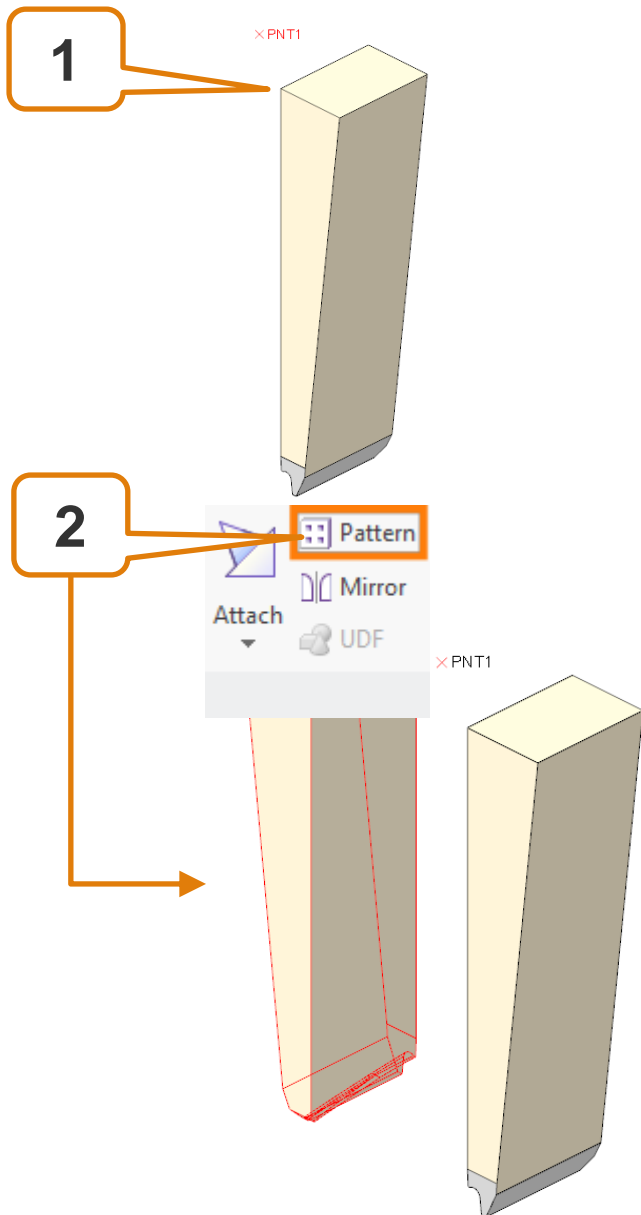
- **Attach solid**



Electrode 4 – Detailing



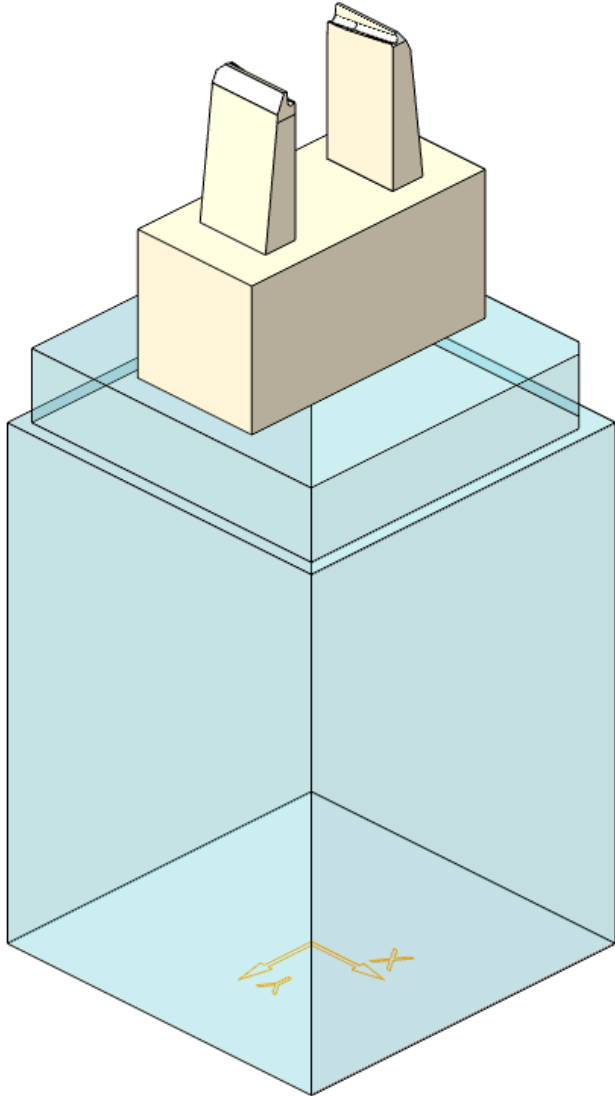
Electrode 4 – Geometriemuster



- Prepare axis
- Create rotated geometry pattern around axis with 180°

Electrode 4 - Finish

- **Add Base**



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

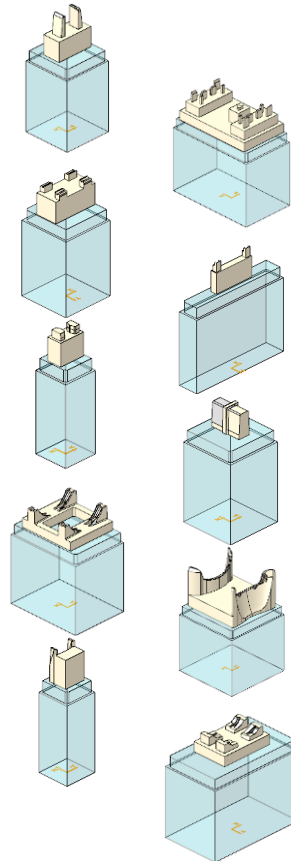
Electrode 10

Electrode 11

Electrode 12

Electrode 13

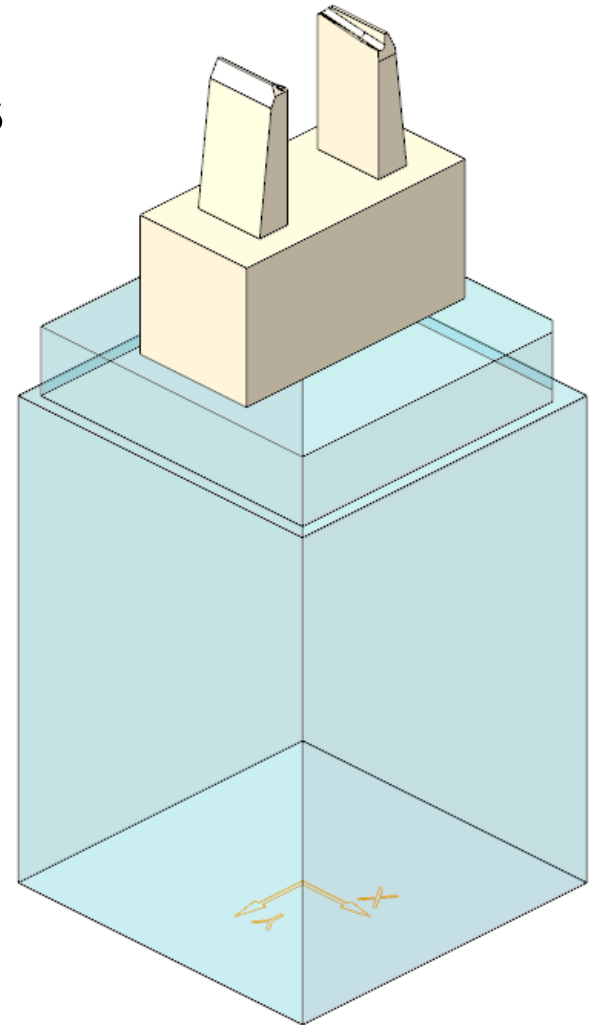
Electrode 14



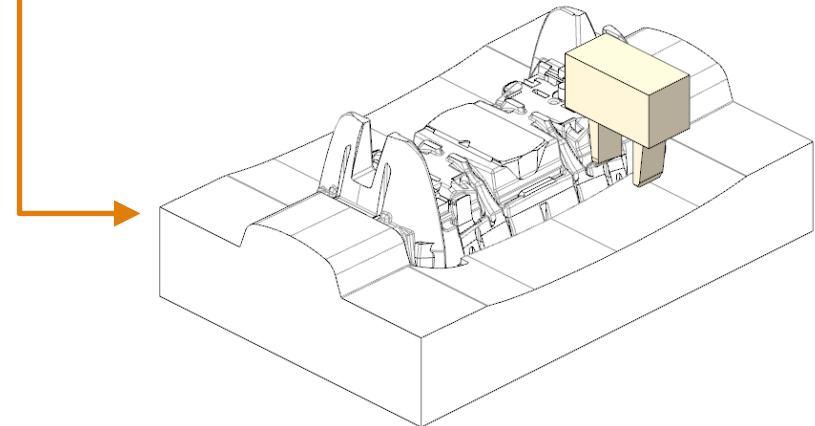
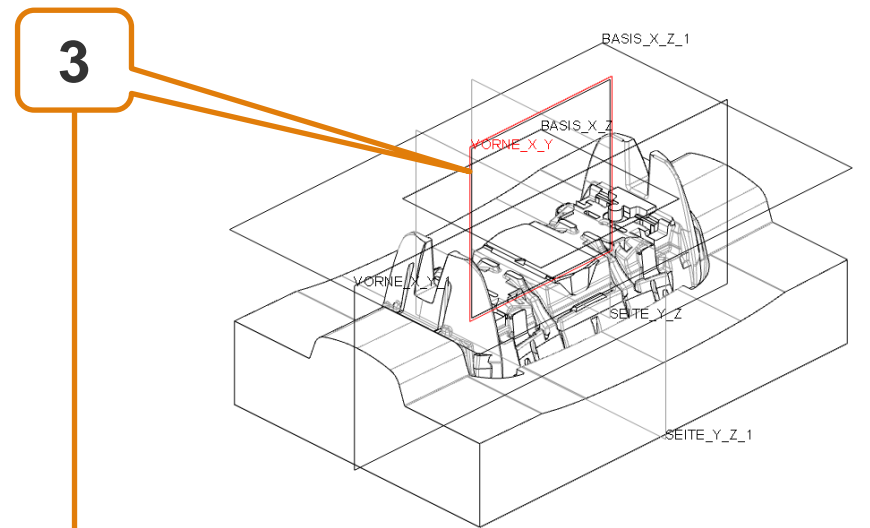
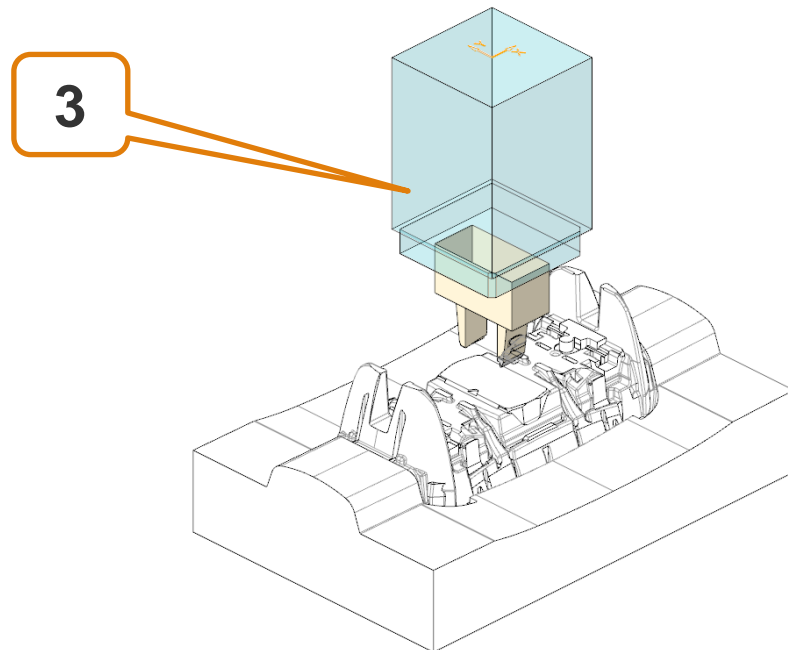
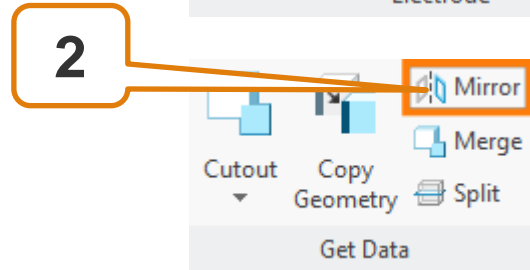
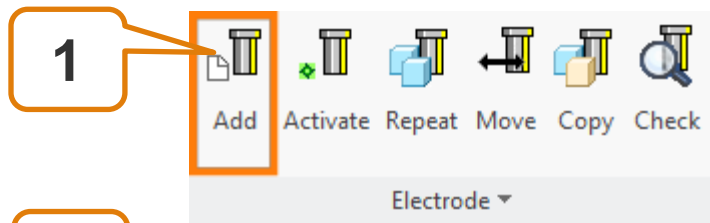
Electrode 5

Topics...

- **Mirror electrode geometry**
- **Assemble again several electrodes**

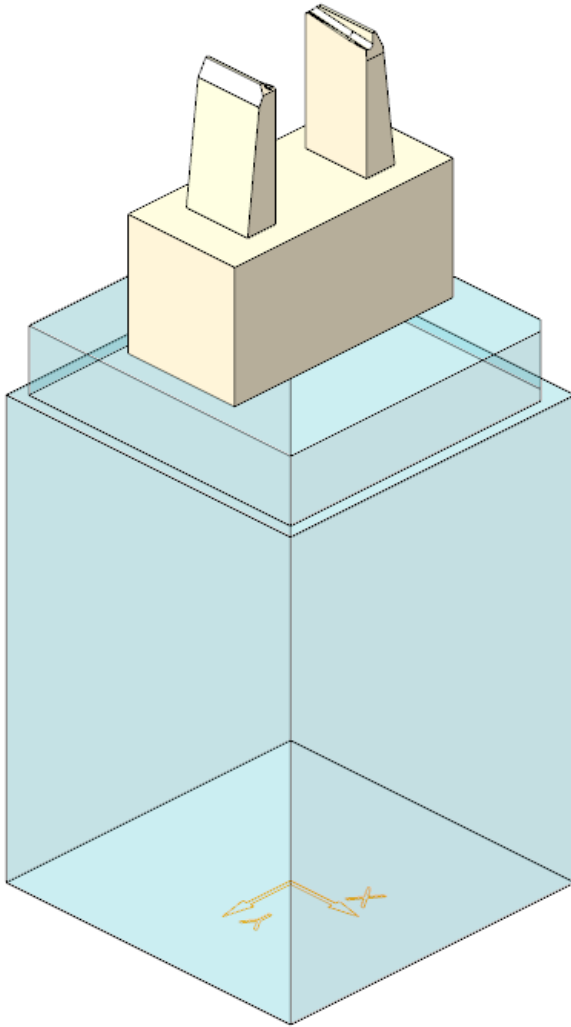


Electrode 5 – Electrode Mirror



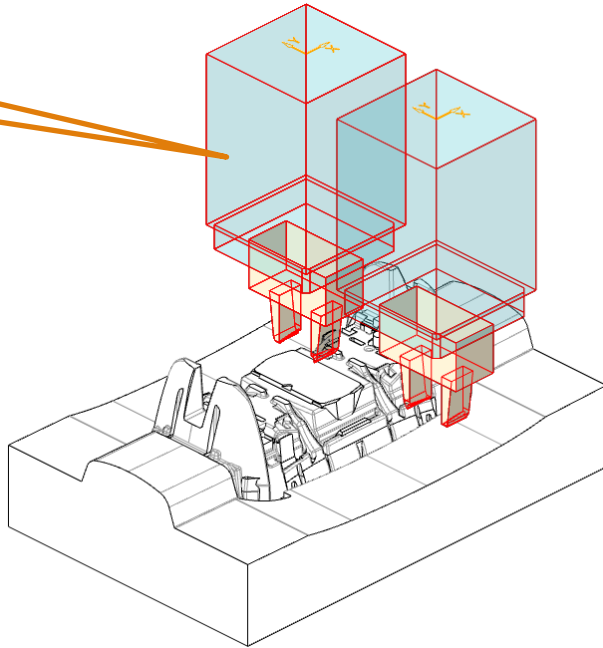
Electrode 5 - Base

- **Add Base**



Electrode 4 & 5 – Assemble Again

1



2

Assemble Again [X]

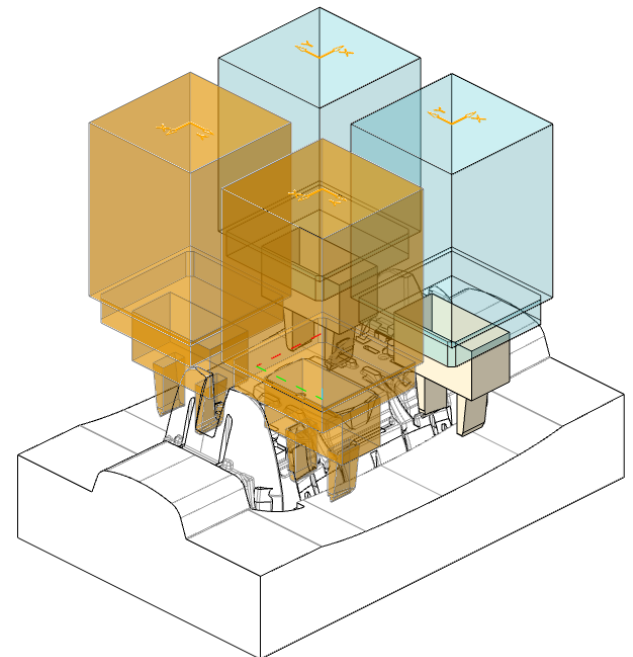
Reference Models: 2 model(s) selected [Reset]

Move Reference: OP_ASM_REF_CSYS_1

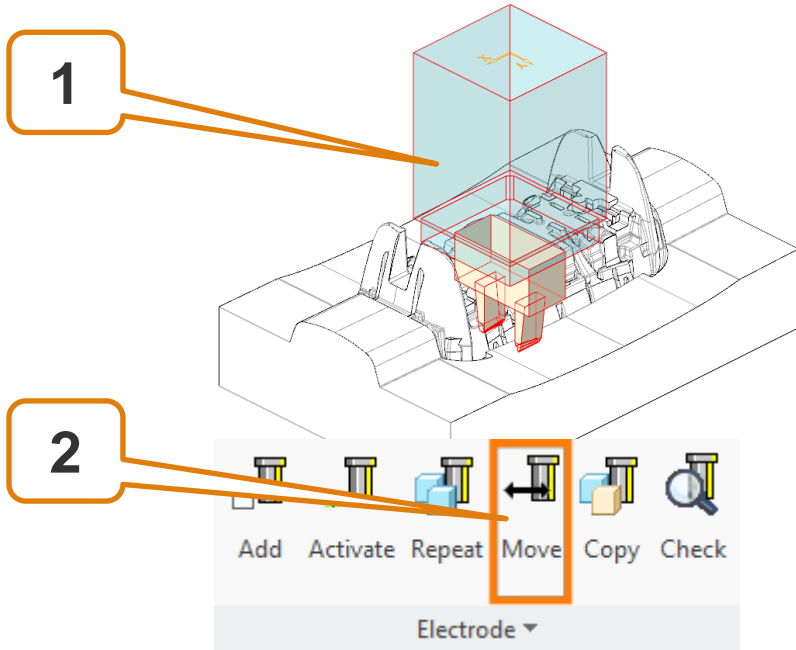
Move type: Relative Absolute [Reset]

| Translation | | Rotation | |
|-------------|--------------|----------|---------------|
| X (A) | -16.00206232 | X (A) | 0.00000000 |
| Y (G) | -16.36240411 | Y (B) | 0.00000000 |
| Z (B) | 2.47831923 | Z (C) | -180.00000000 |

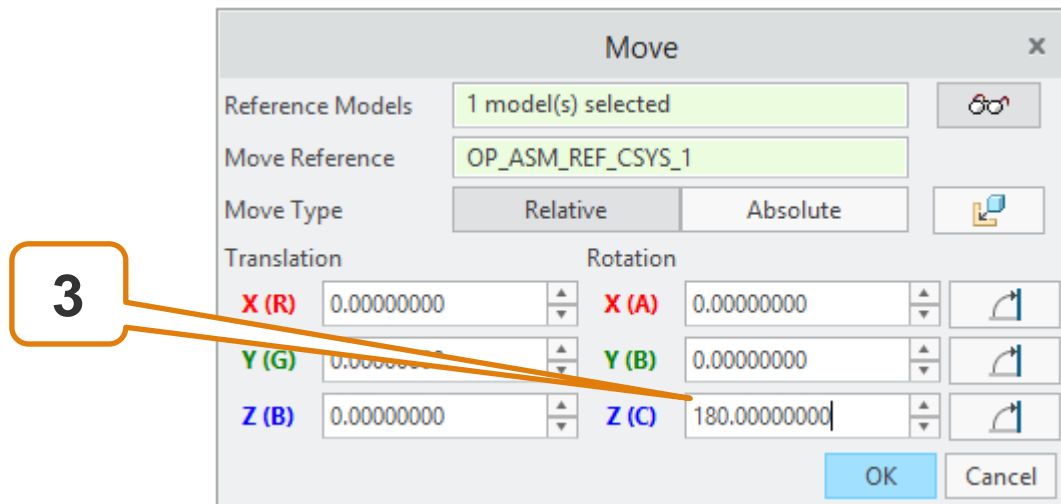
[OK] [Cancel]



Electrode 4 & 5 – Move



- Same areas erode after first rotation.
- Rotate around EDM origin to use mirrored geometry.
- Move electrodes 4 and 5 in succession



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

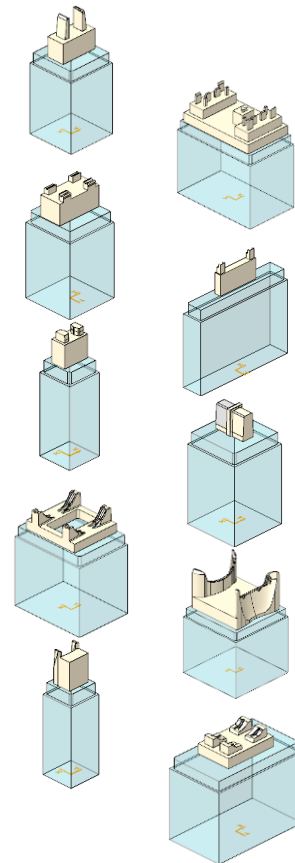
Electrode 10

Electrode 11

Electrode 12

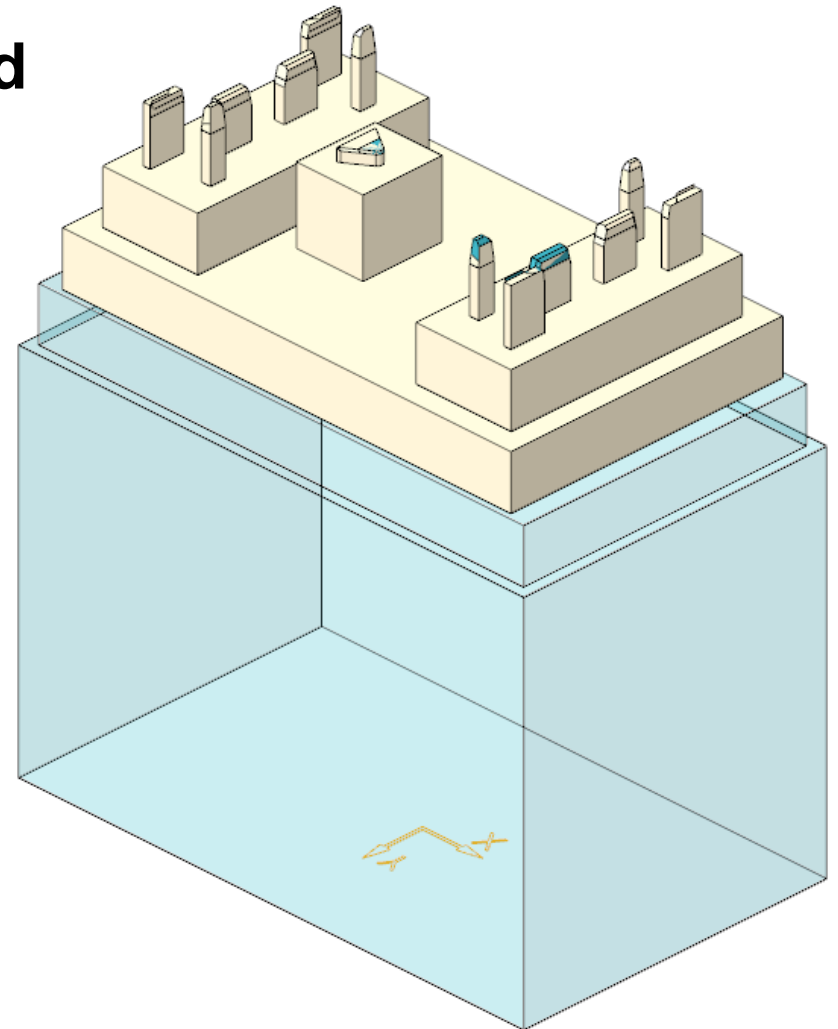
Electrode 13

Electrode 14

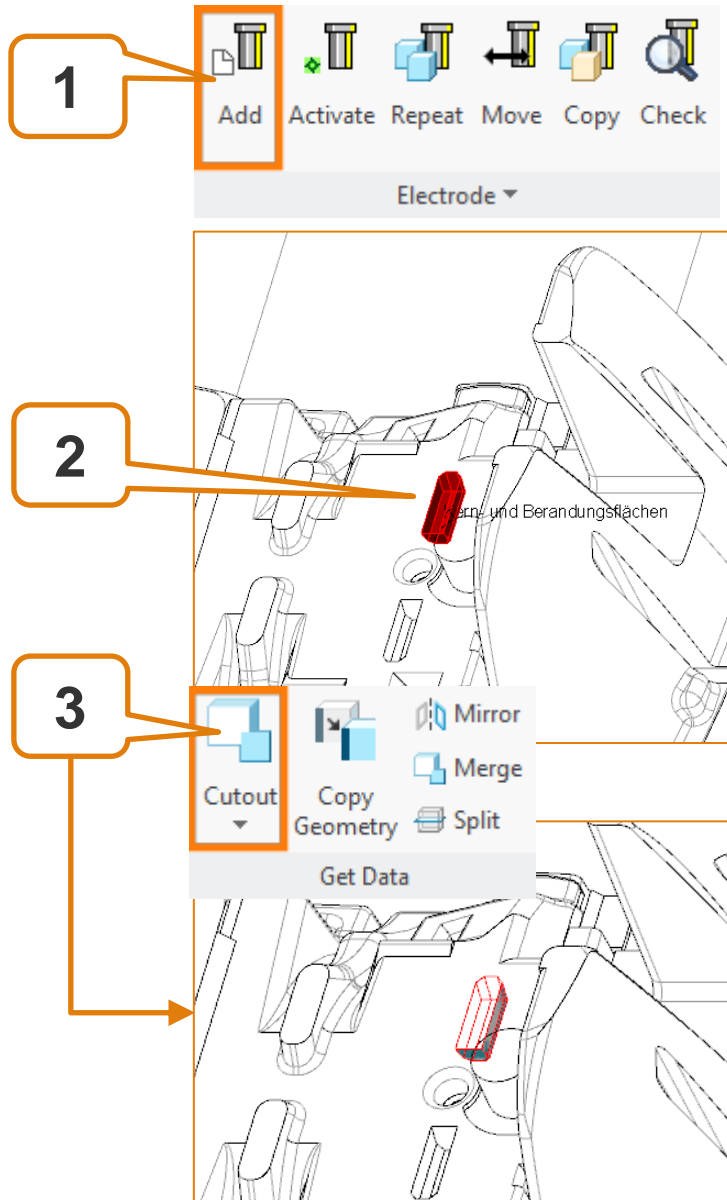


Topics...

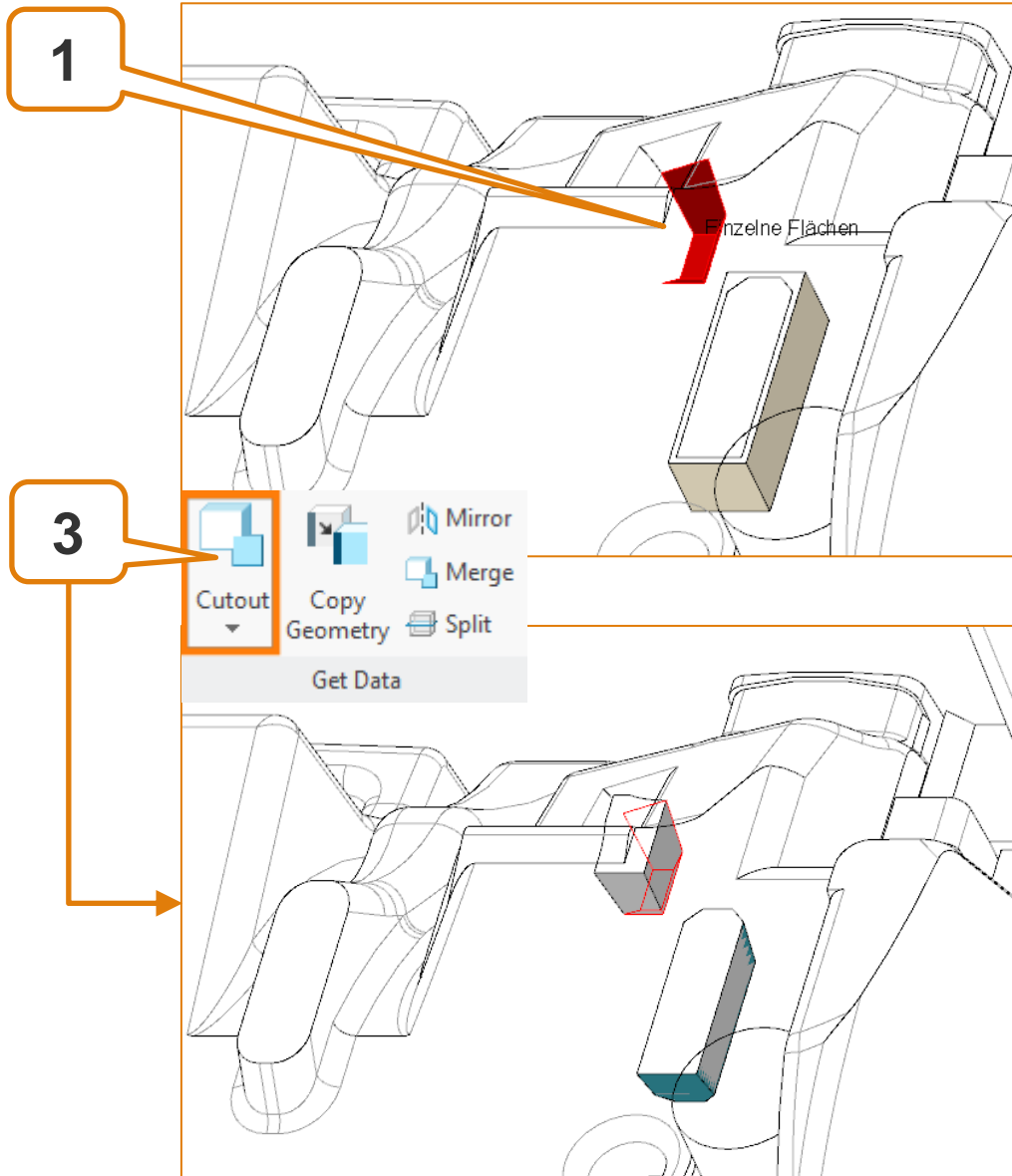
- **Mix solid and surface approach**
- **Mirror several times and add support**



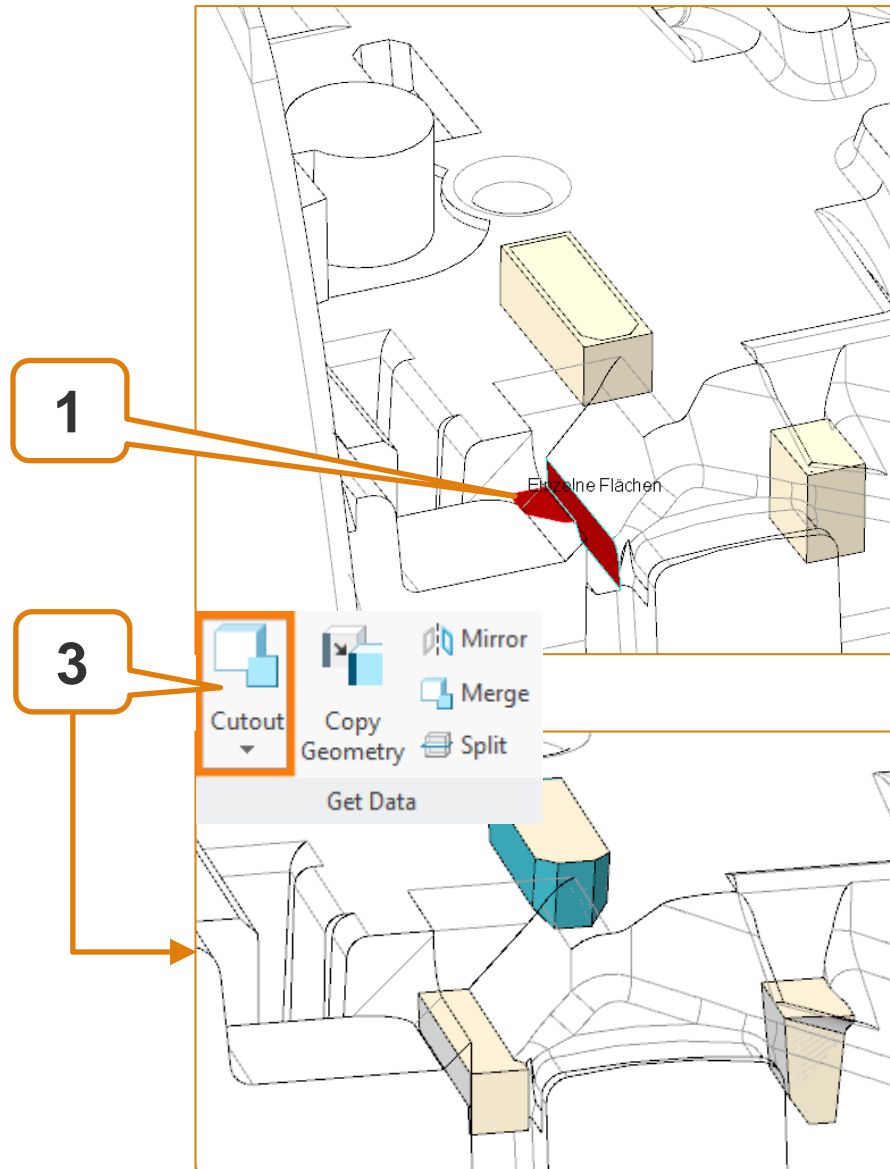
Electrode 6 – 1. Bereich ausschneiden



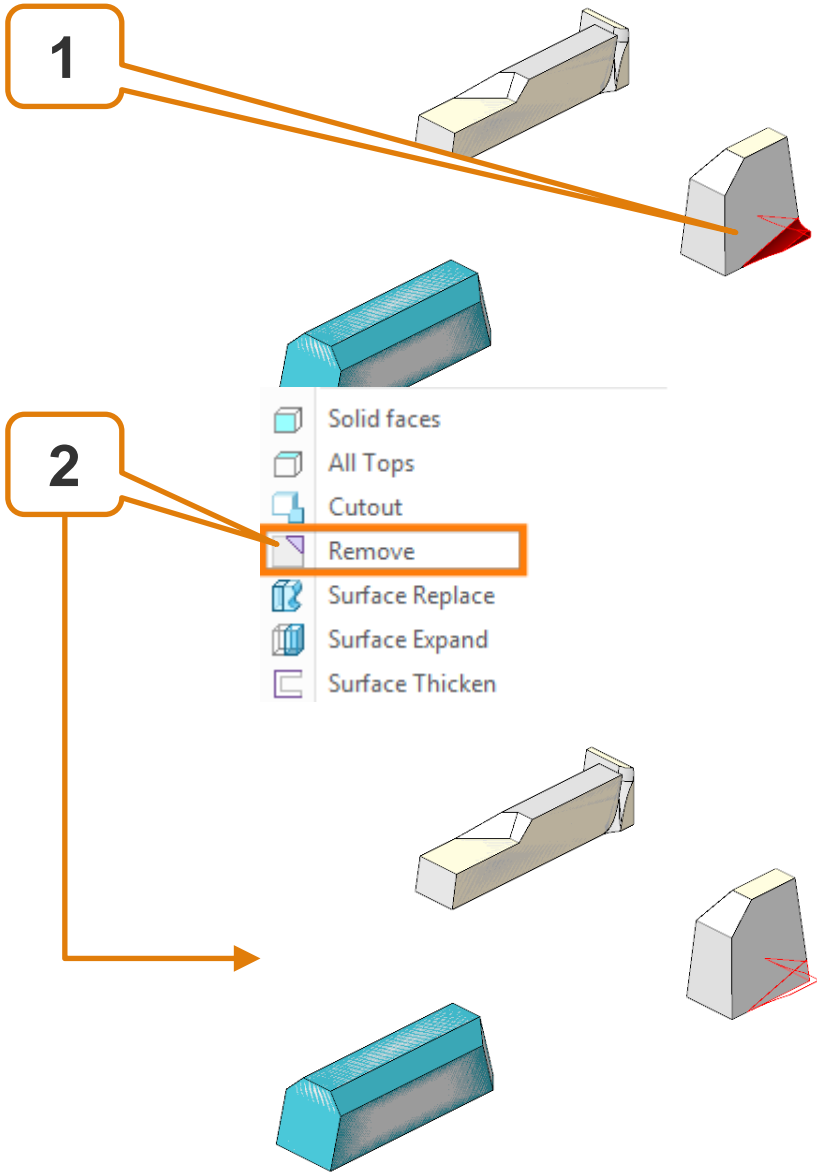
Electrode 6 – 2. Bereich ausschneiden



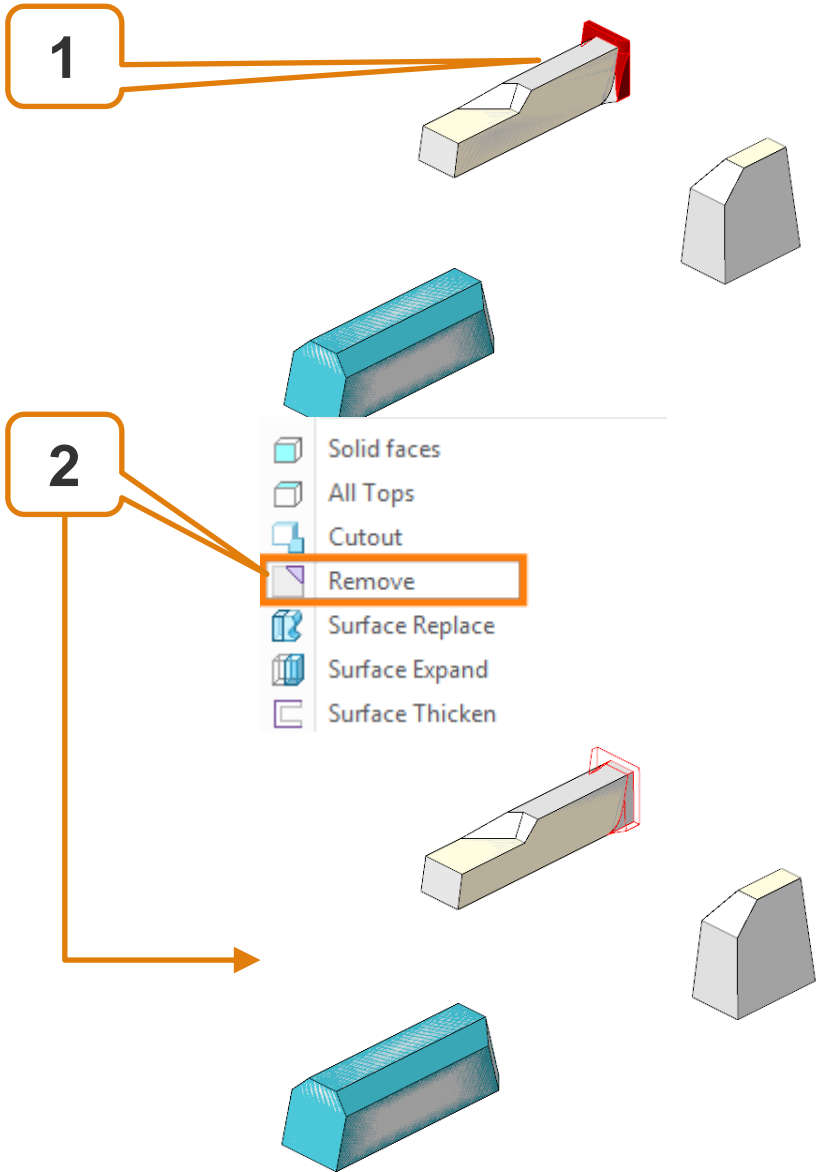
Electrode 6 – 3. Bereich ausschneiden



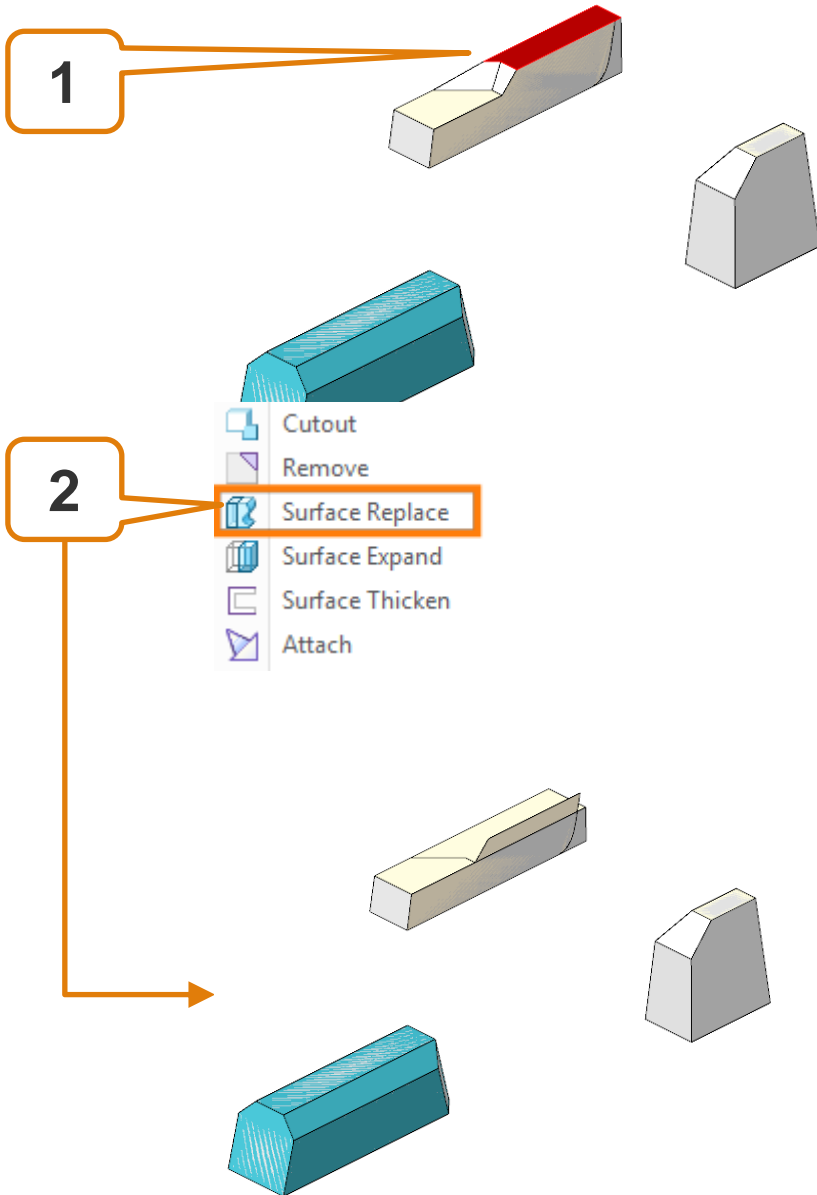
Electrode 6 – Detailing



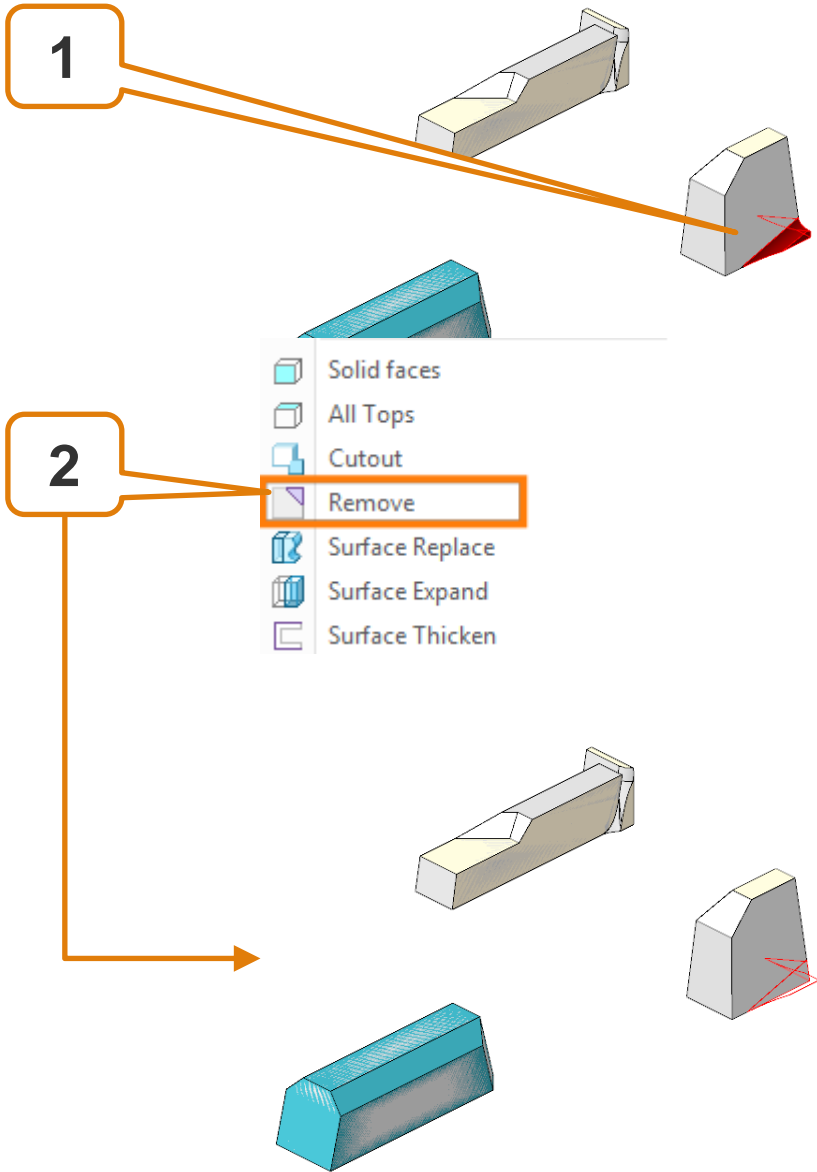
Electrode 6 – Detailing



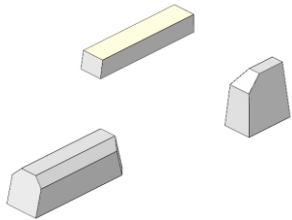
Electrode 6 – Detailing



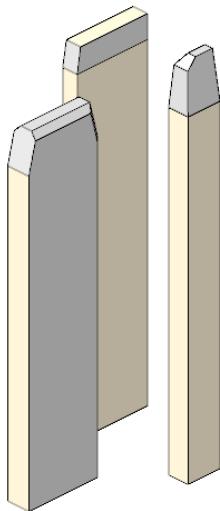
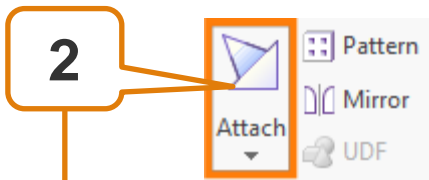
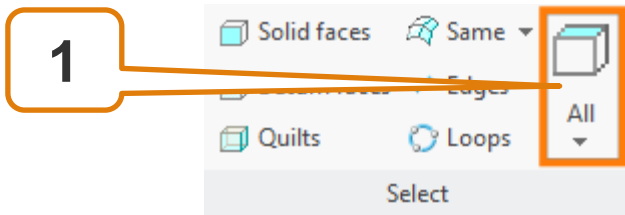
Electrode 6 – Detailing



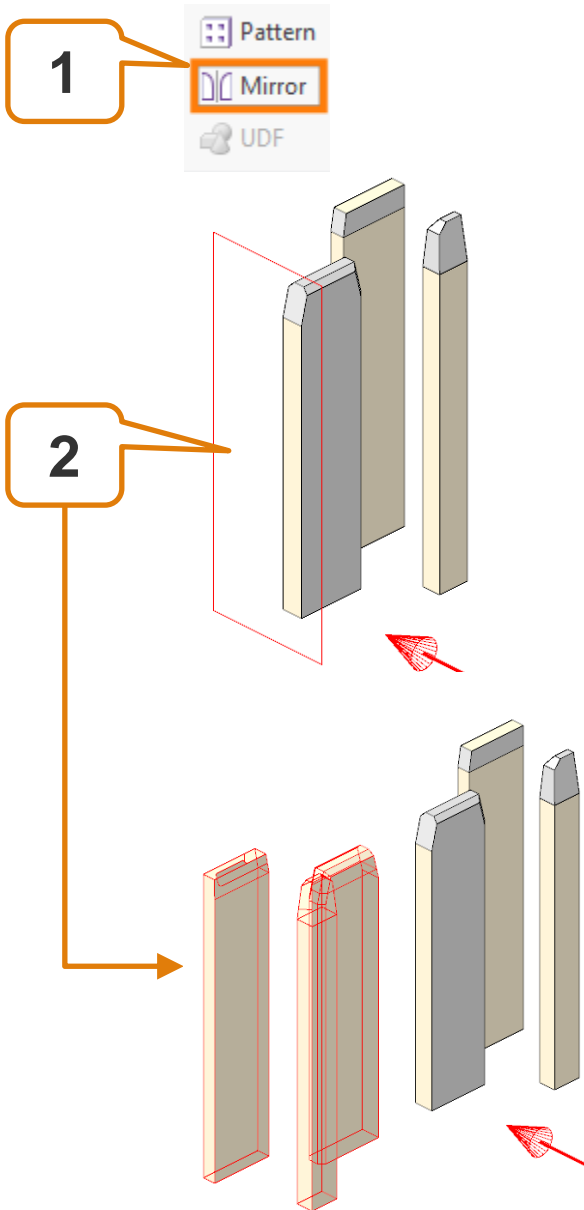
Electrode 6 - Attach



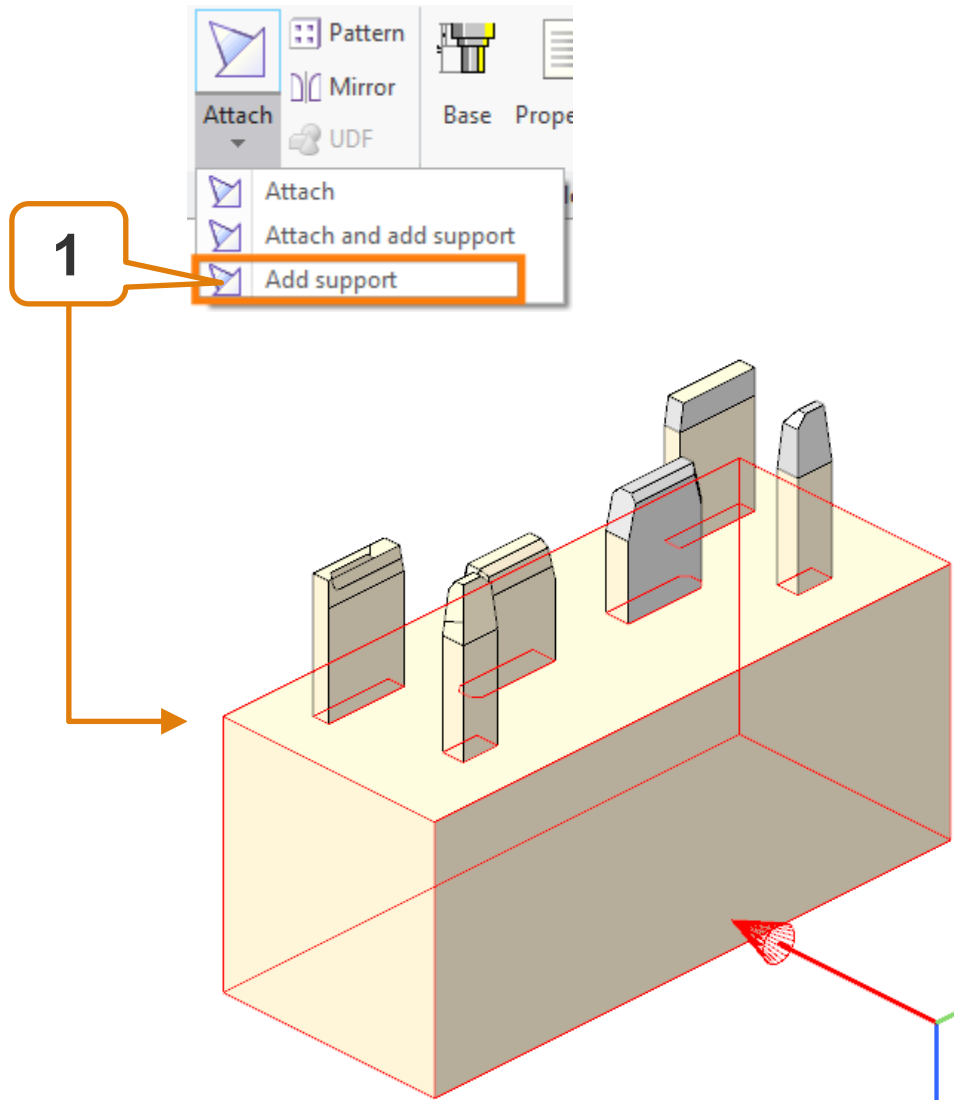
- **Select all top surfaces that are not attached**
- **Attach solid to FREE_FACE**



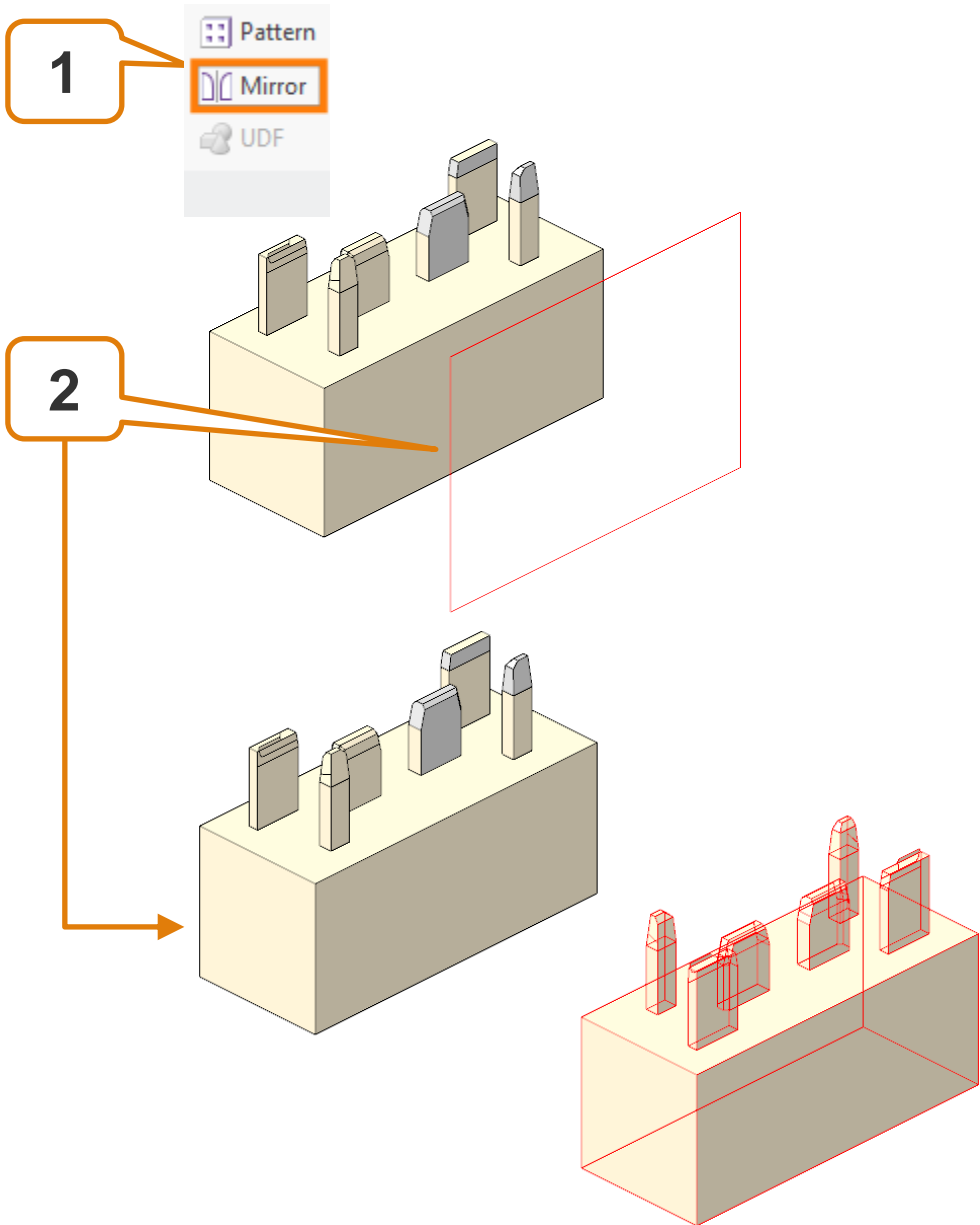
Electrode 6 – Mirror



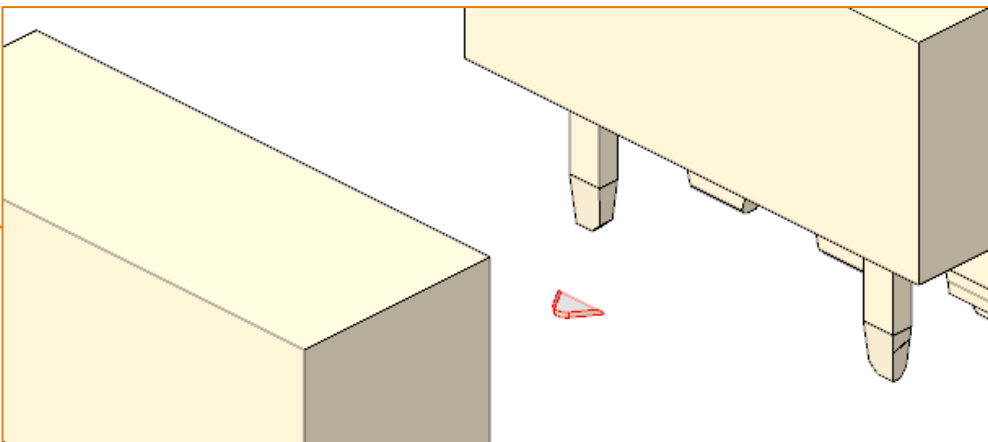
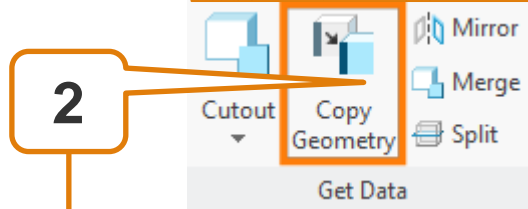
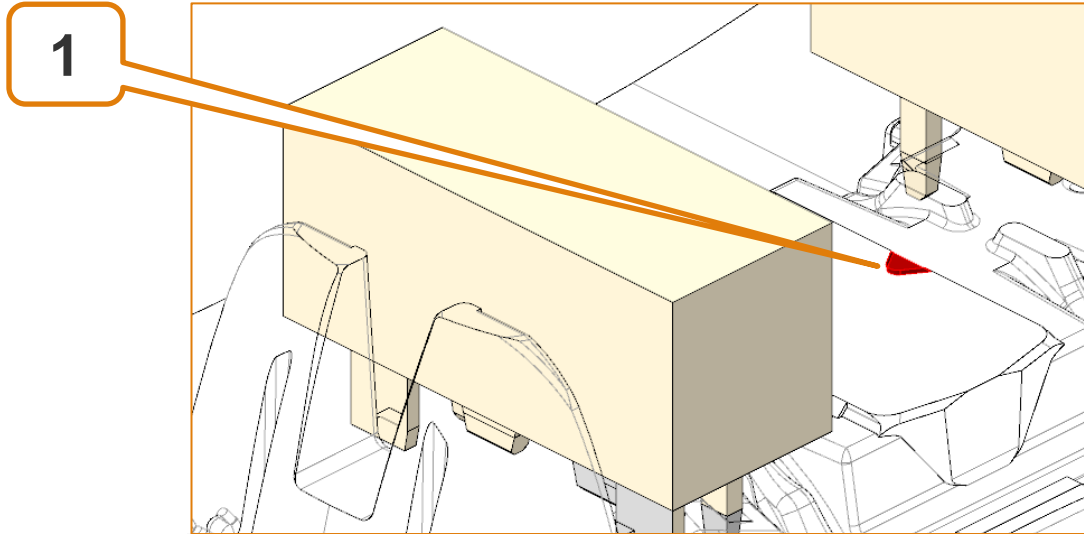
Electrode 6 – Detailing



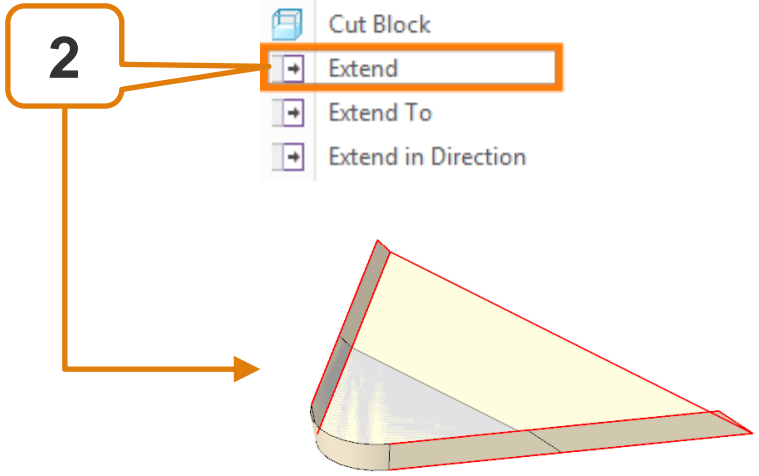
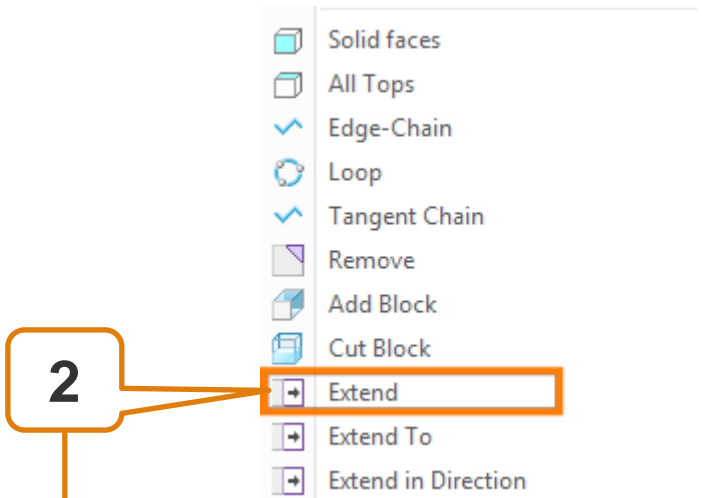
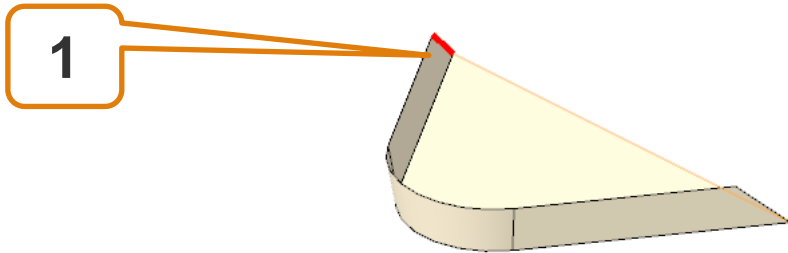
Electrode 6 – Mirror



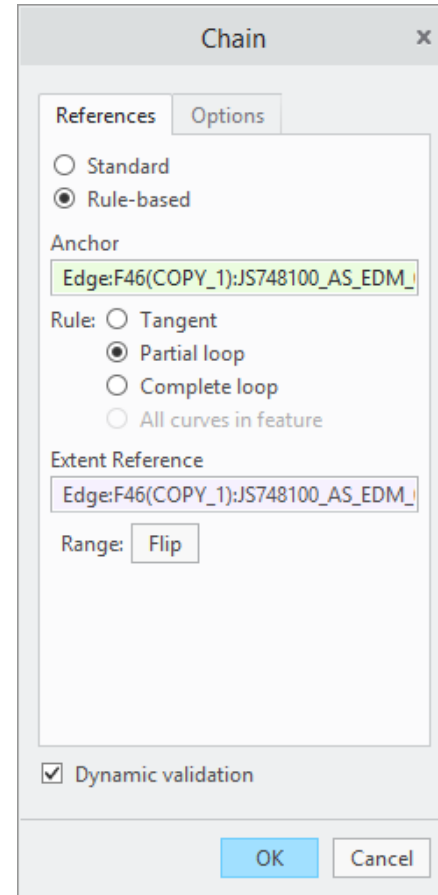
Electrode 6 – Copy 4. Region



Electrode 6 – Detailing

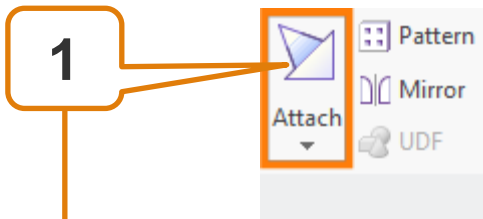


- **Select curve chain**

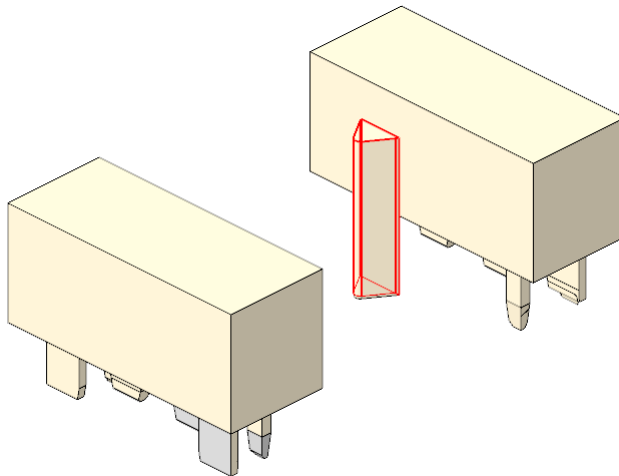


- **Extend quilt**

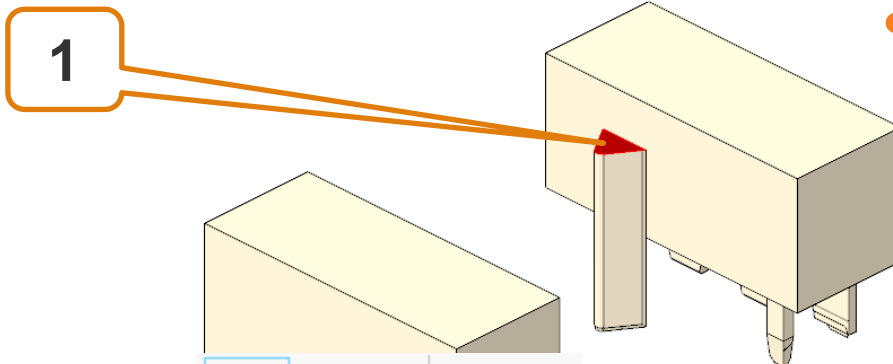
Electrode 6 – Attach



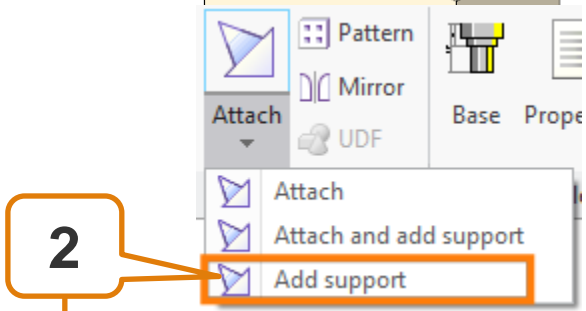
- Activate **Attach**, because new feature is still selected



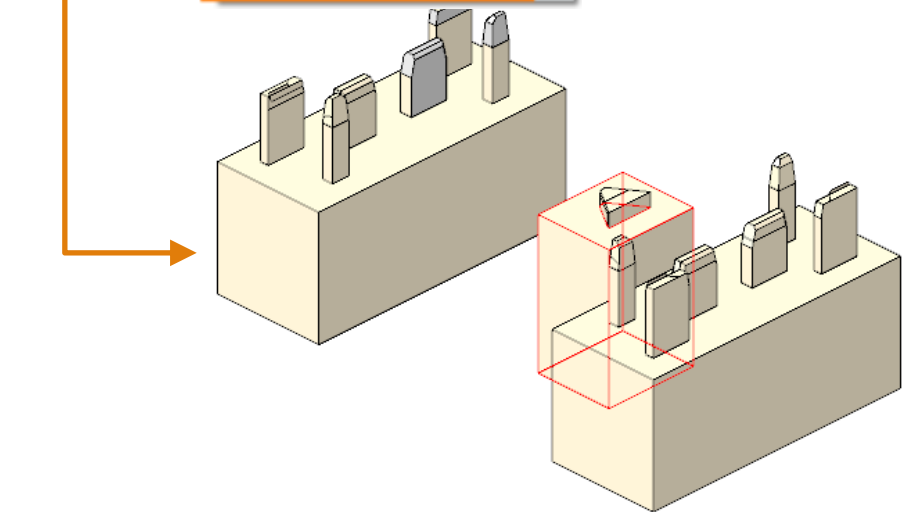
Electrode 6 – Support



- **Select surface**

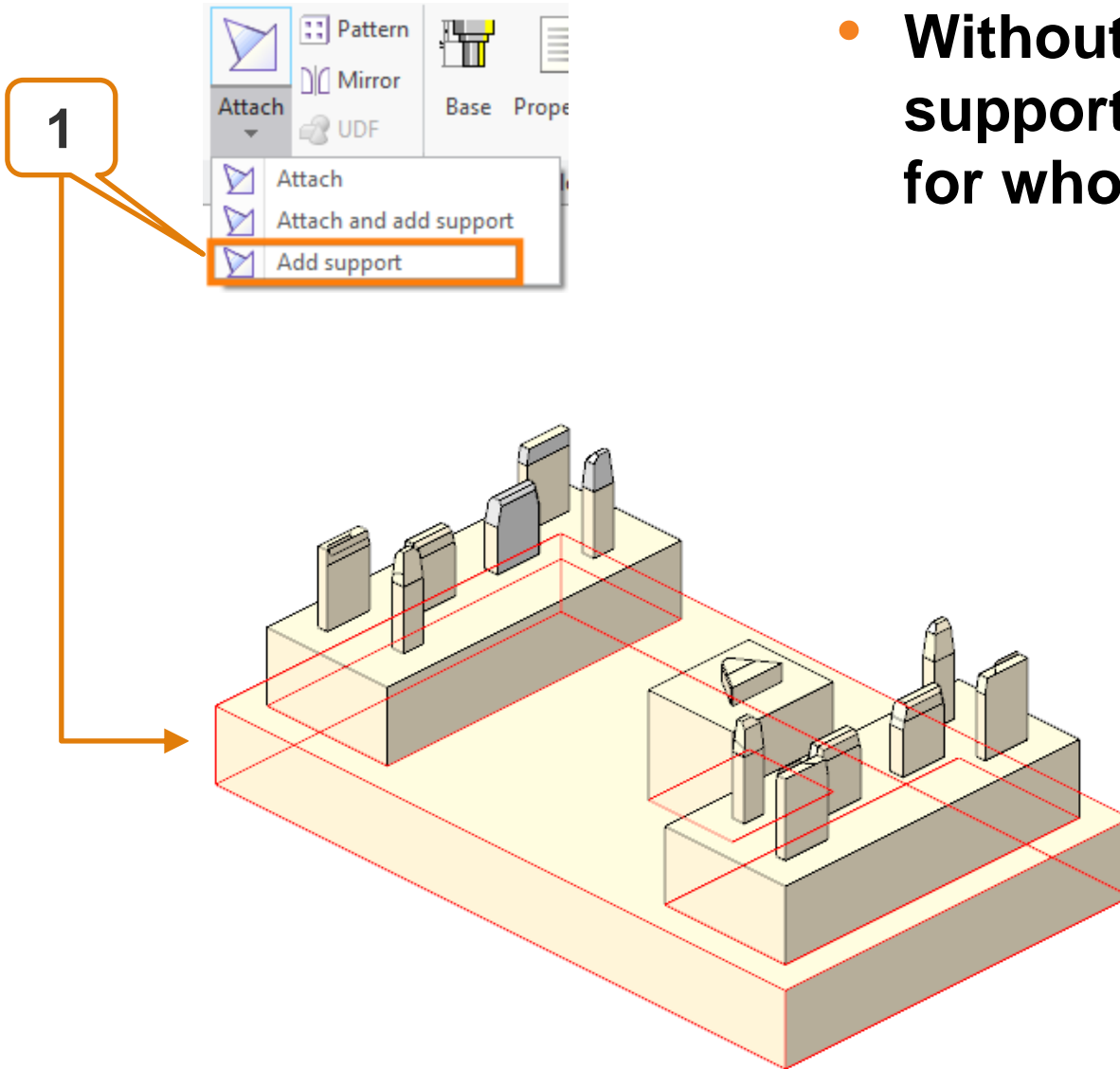


- **Create support for selected surface**



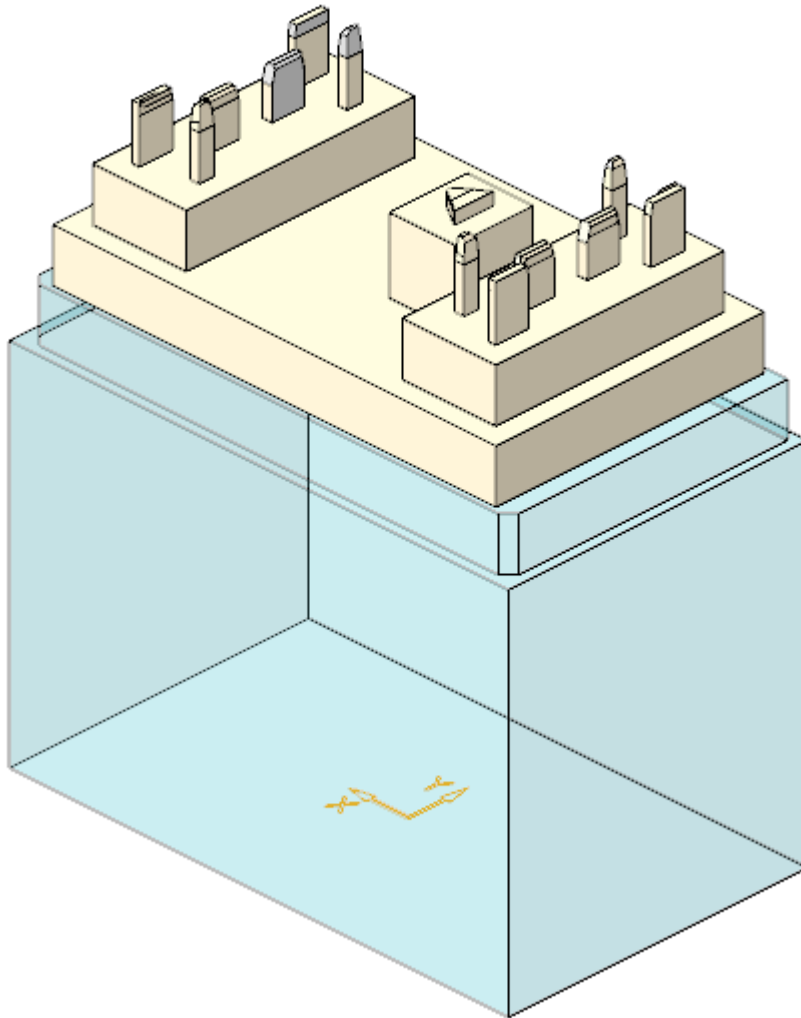
Electrode 6 – Support

- **Without any selection, support will be created for whole solid**



Electrode 6 - Base

- Add Base



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

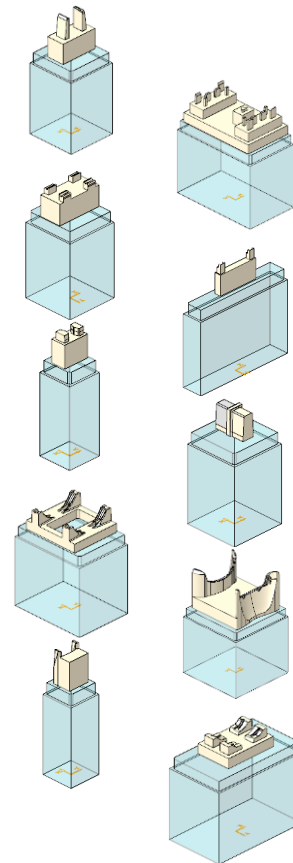
Electrode 10

Electrode 11

Electrode 12

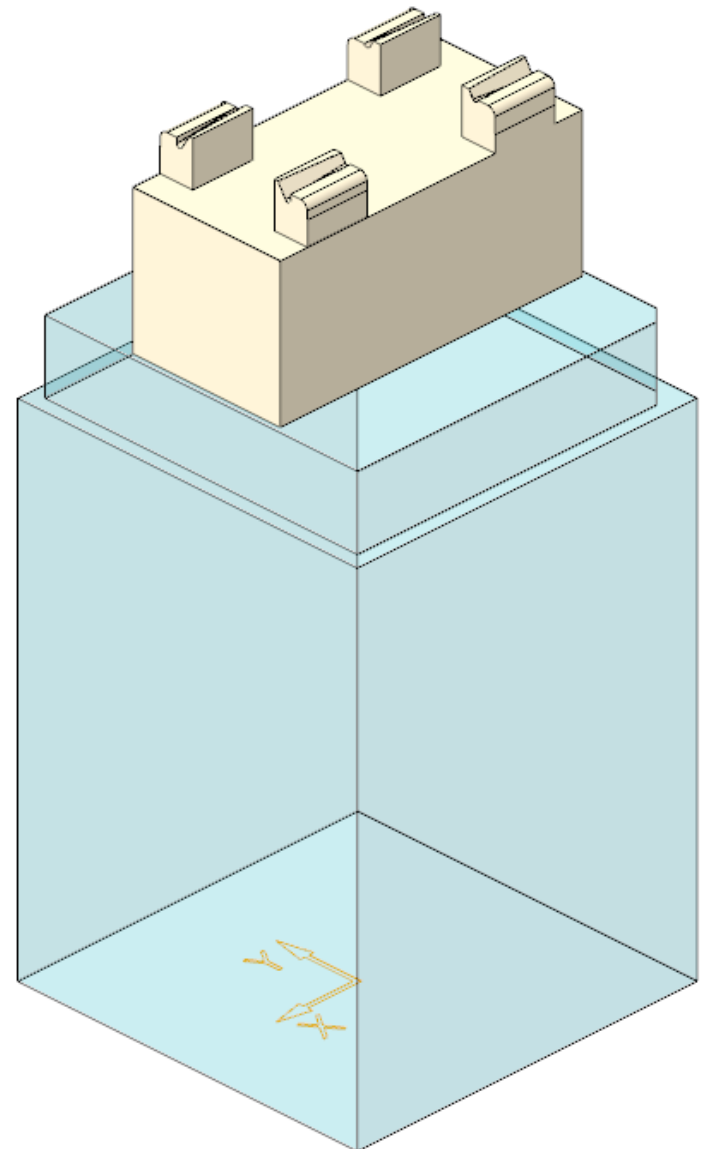
Electrode 13

Electrode 14

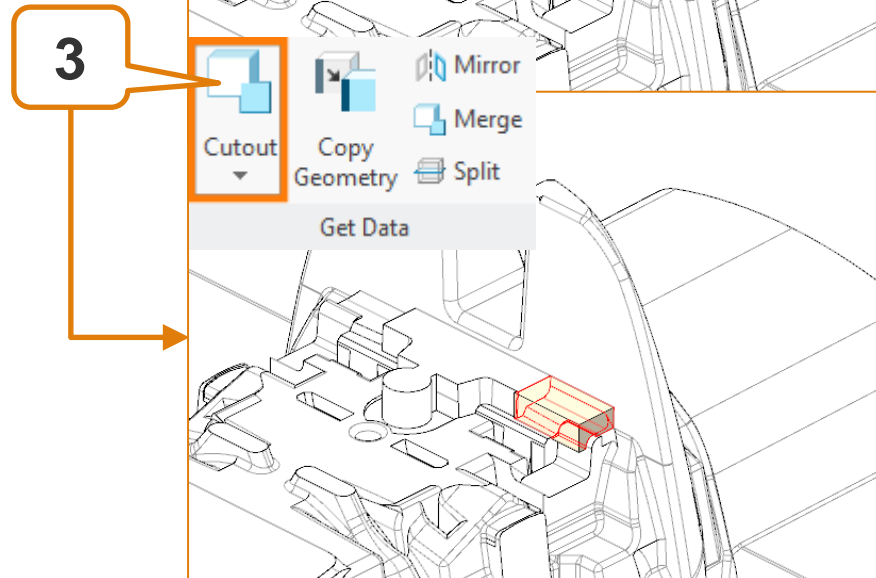
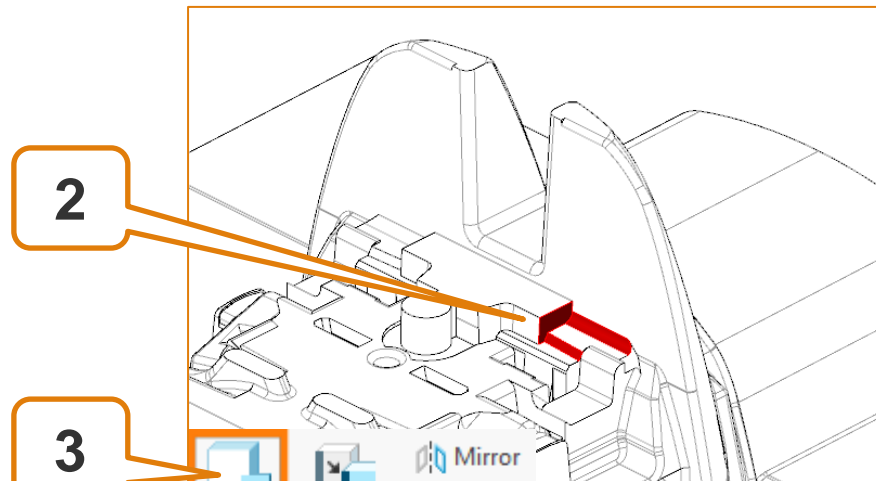
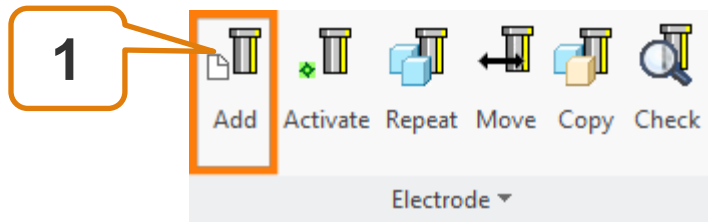


Topics...

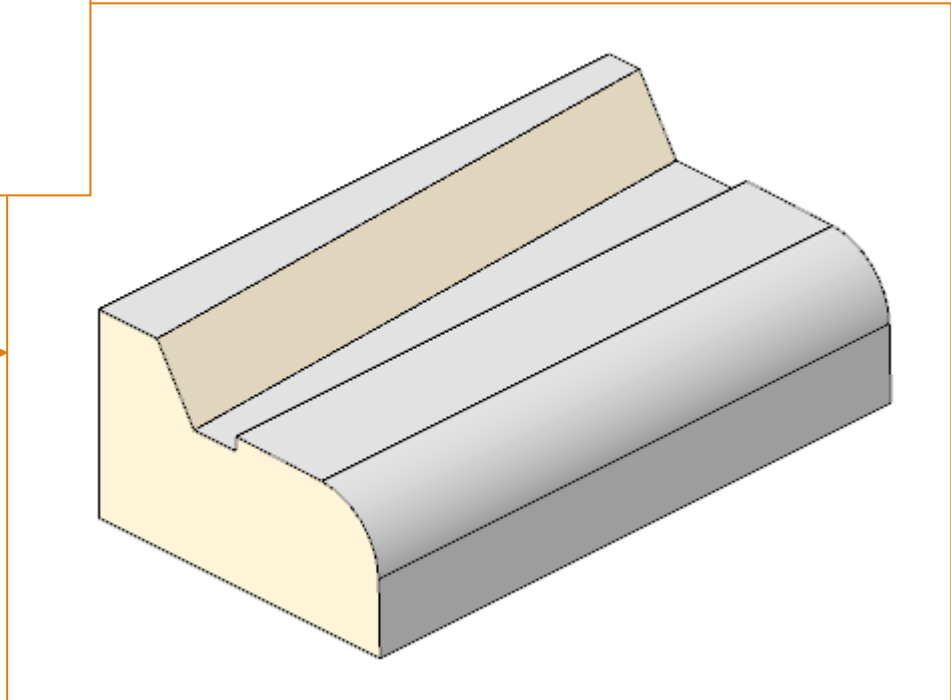
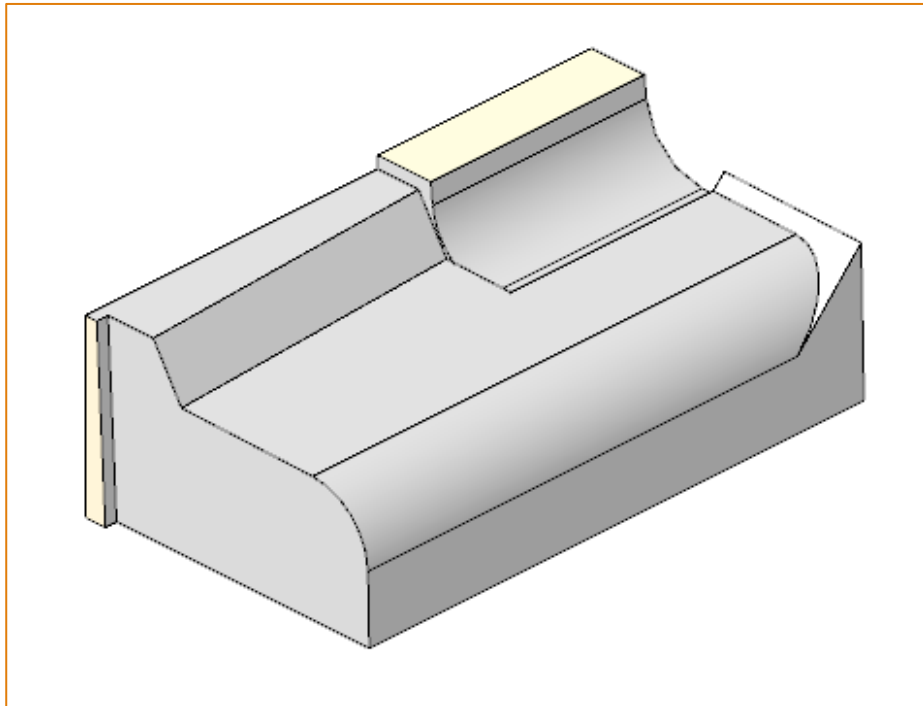
- Usage of Creo features



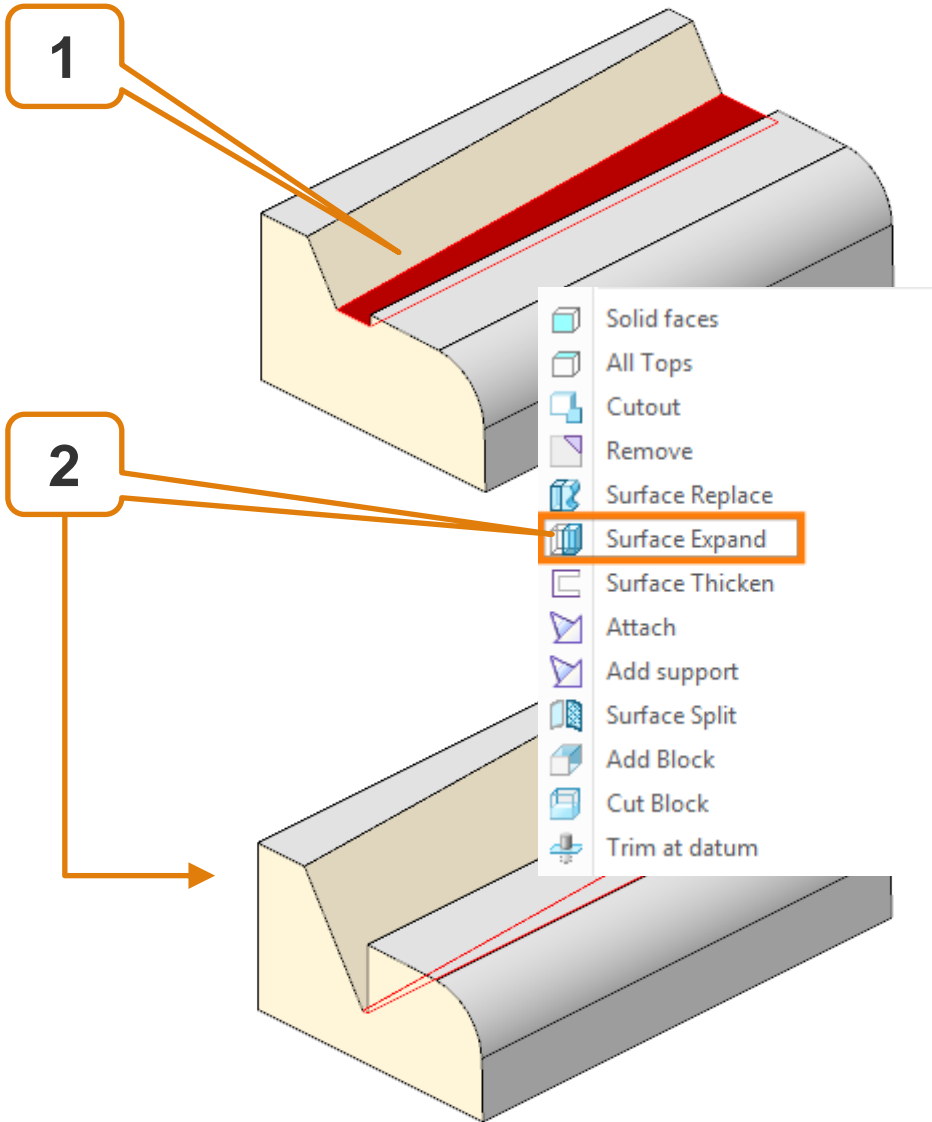
Electrode 7 – Get Data



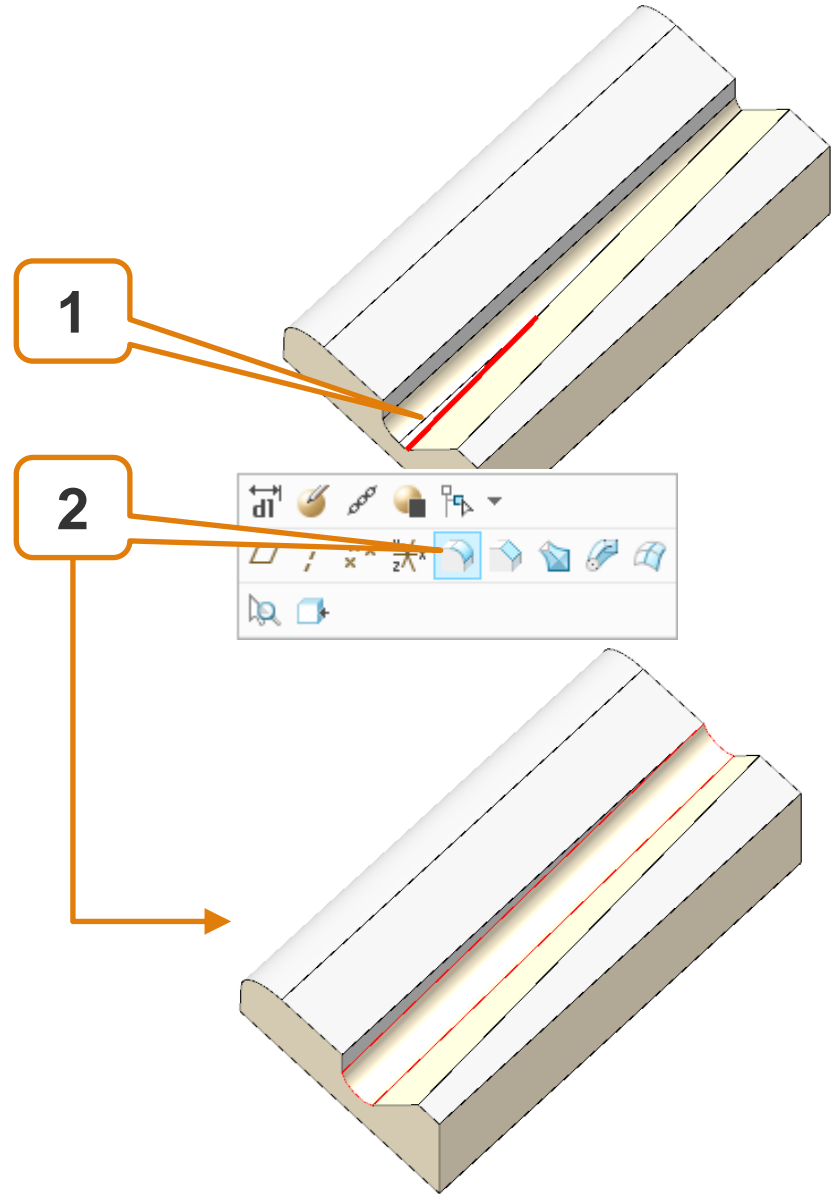
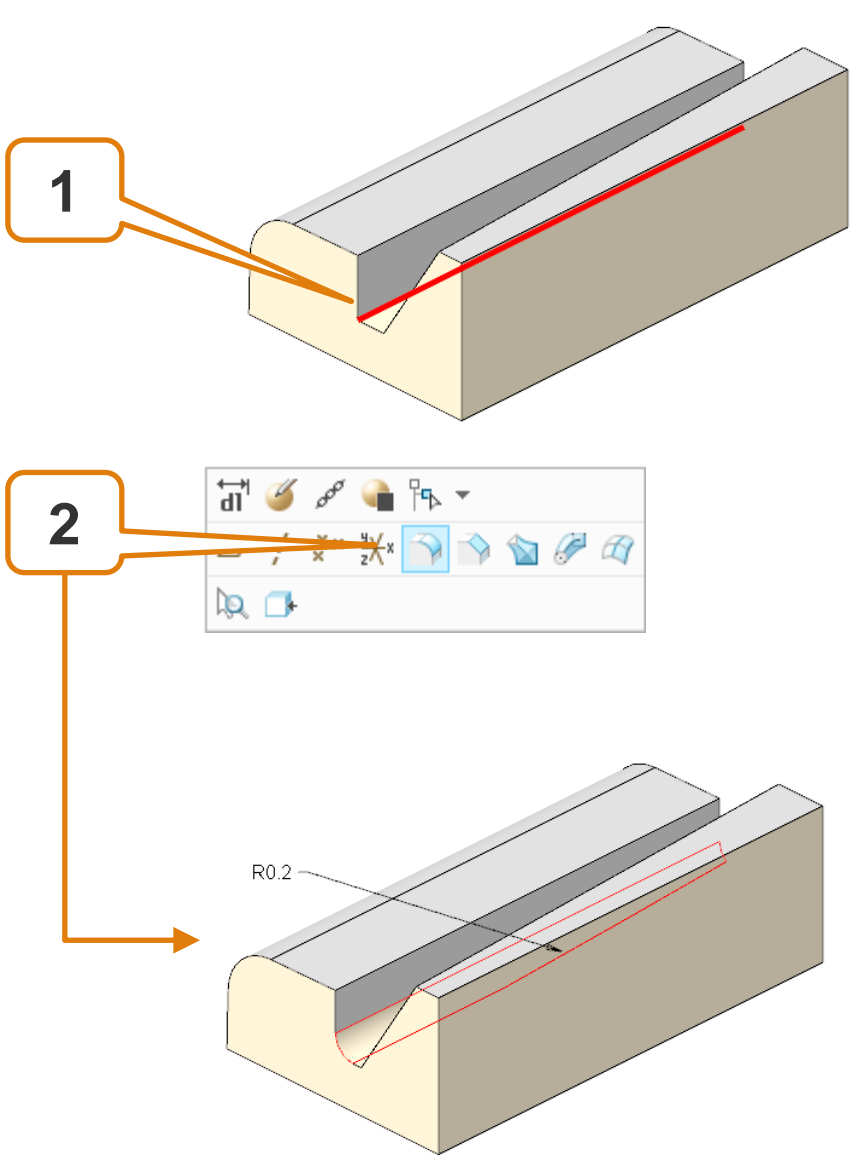
Electrode 7 – Detailing



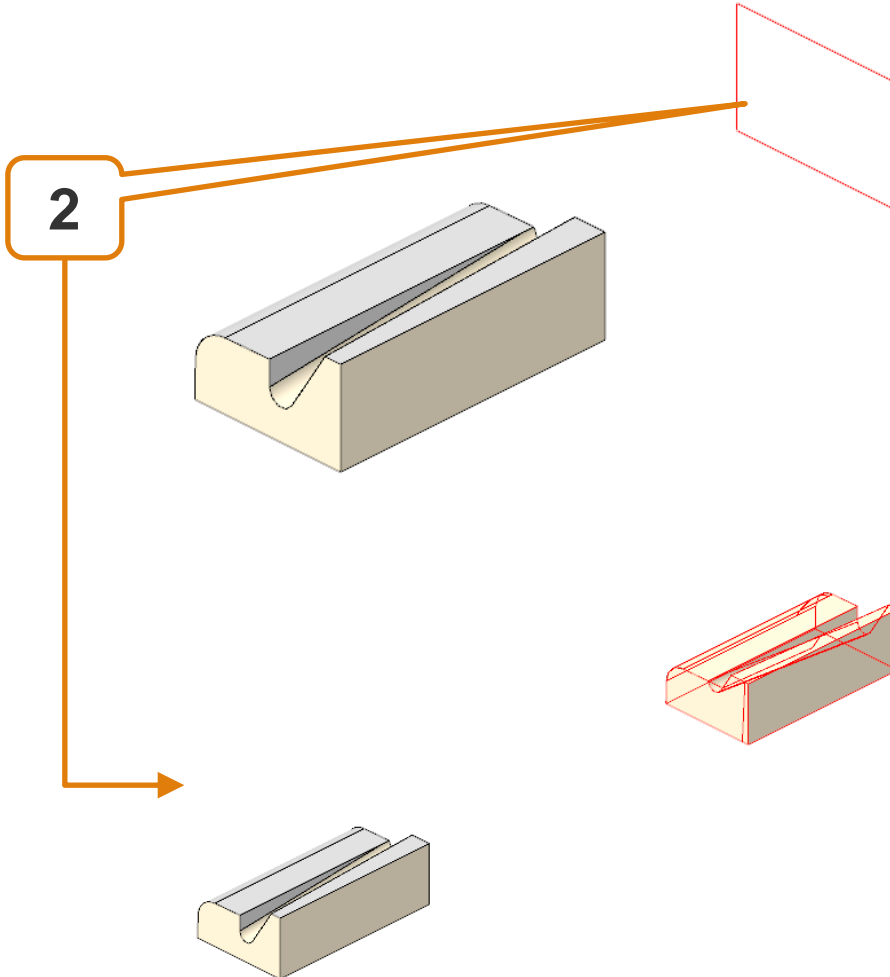
Electrode 7 – Detailing



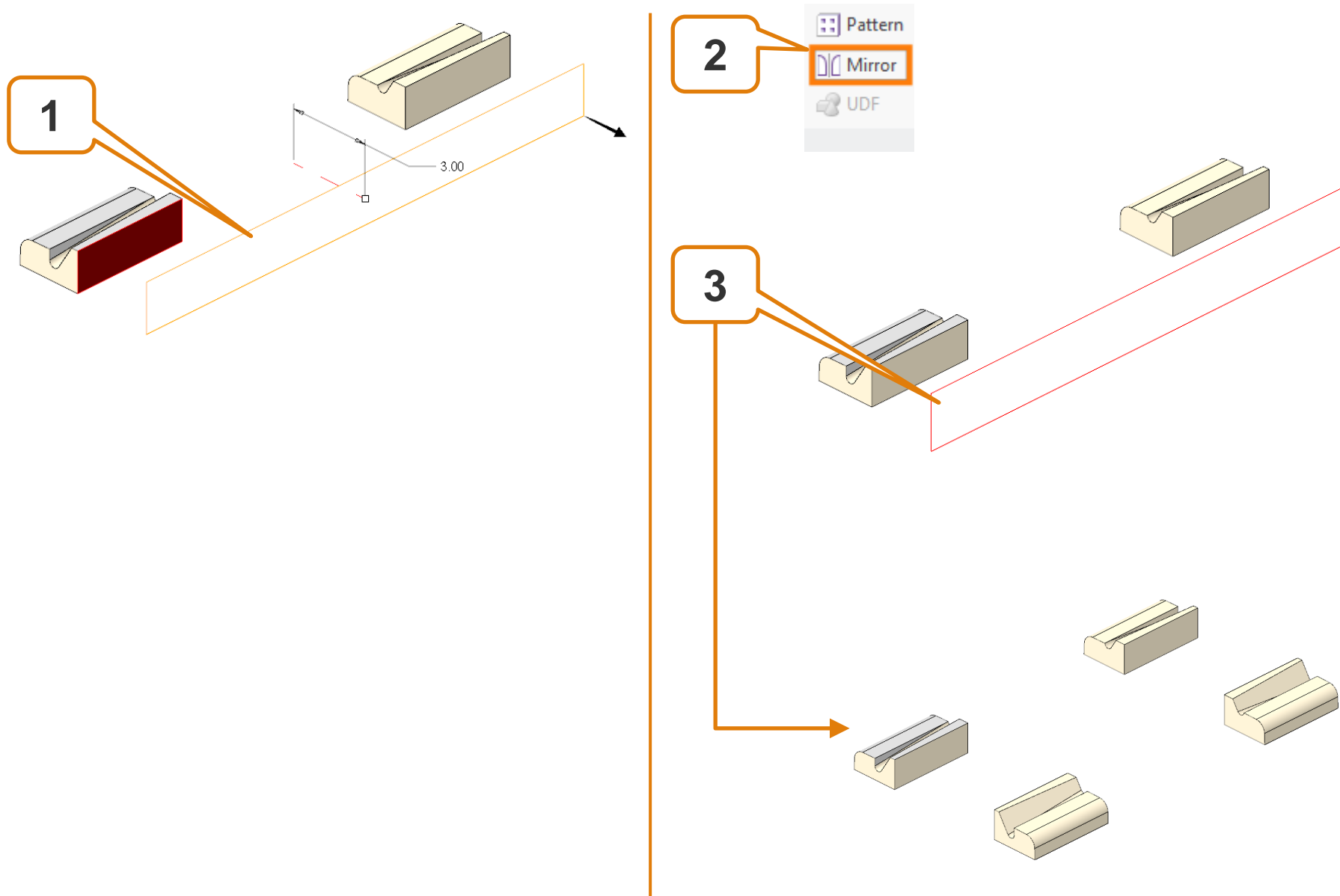
Electrode 7 – Detailing



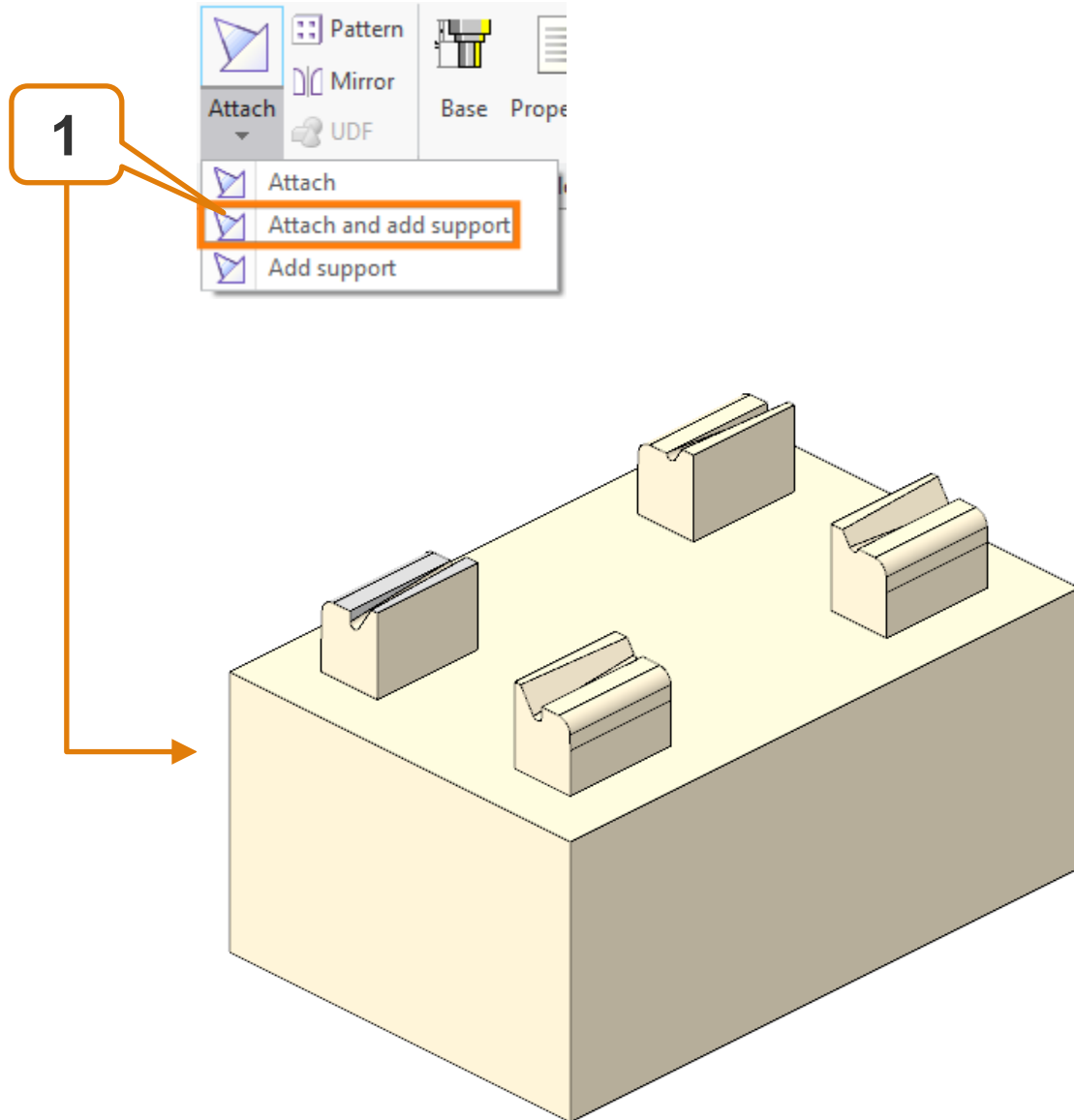
Electrode 7 – Mirror



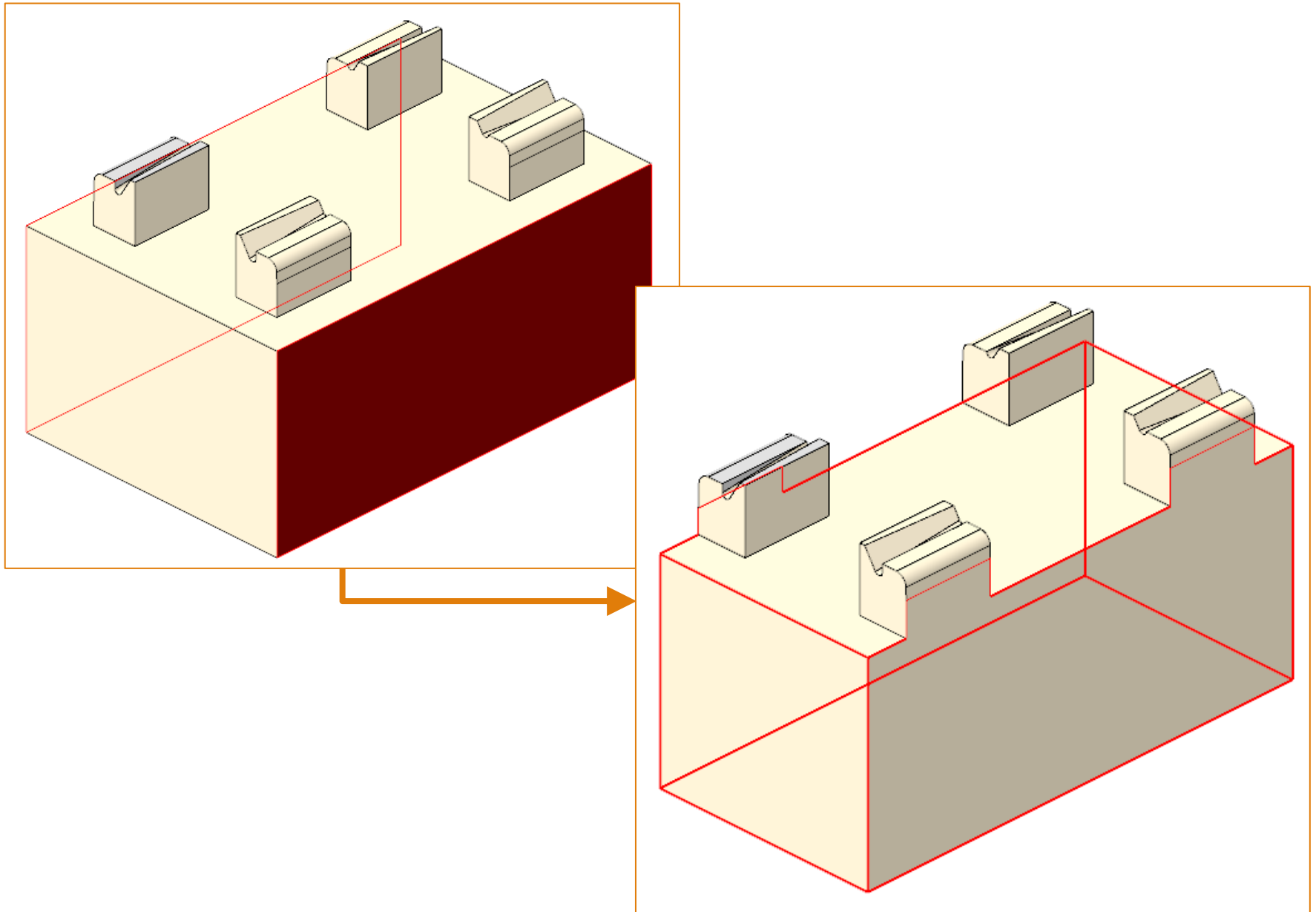
Electrode 7 – Mirror



Electrode 7 – Detailing

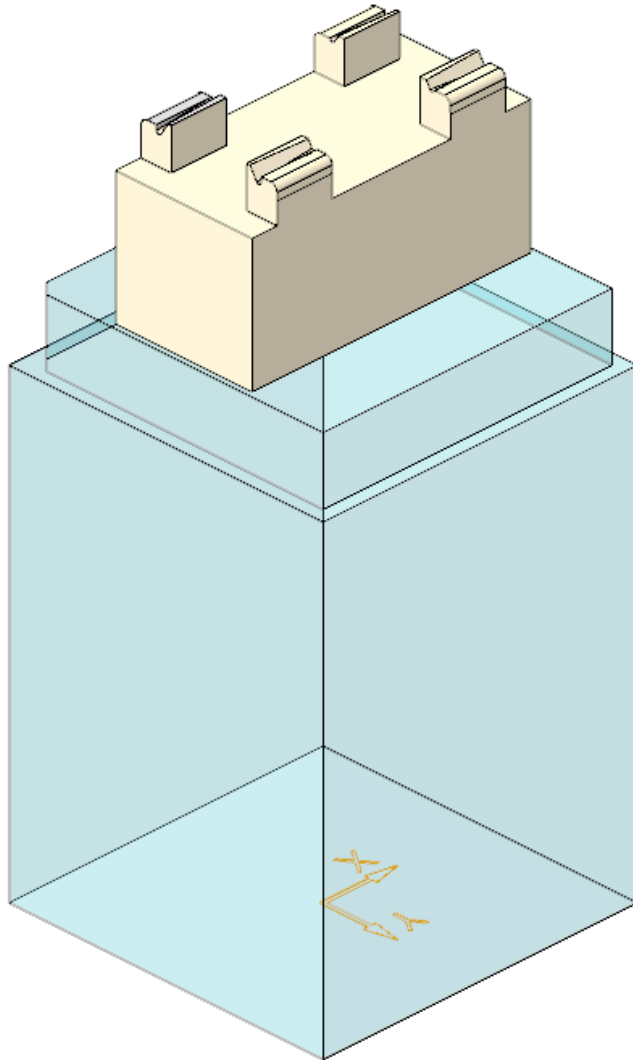


Electrode 7 – Detailing

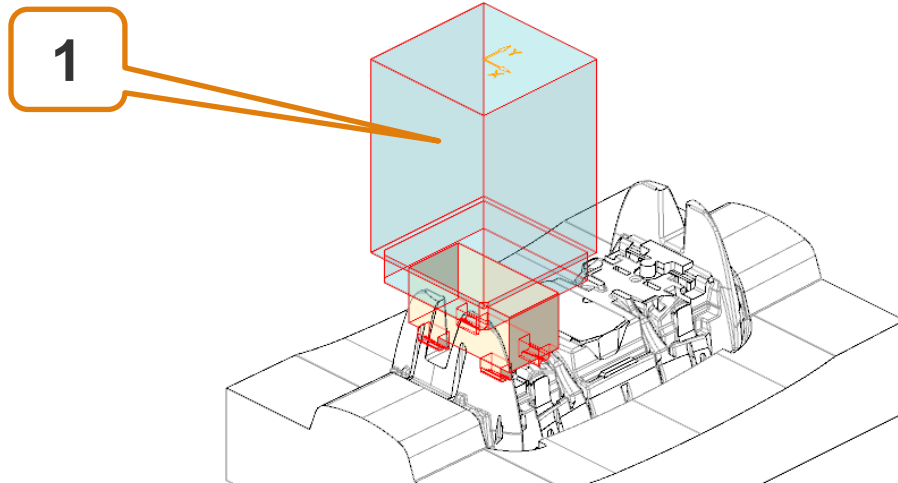


Electrode 7 - Base

- **Add Base**



Electrode 7 – Assemble Again



2

- Activate
- Properties
- Repeat**
- Copy
- Classify
- Rename

3

Repeat Again

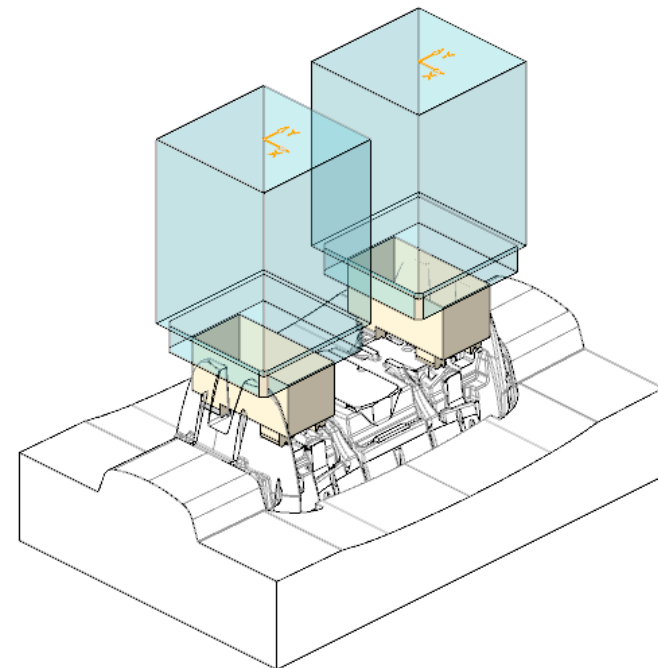
Reference models: 1 model(s) selected

Move Reference: OP_ASM_REF_CSYS_1

Move type: Relative Absolute

| Translation | | Rotation | |
|-------------|--------------|----------|-------------|
| X (R) | -18.07348442 | X (A) | 0.00000000 |
| Y (G) | 0.00000000 | Y (B) | 0.00000000 |
| Z (B) | 2.47831923 | Z (C) | 90.00000000 |

OK Cancel



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

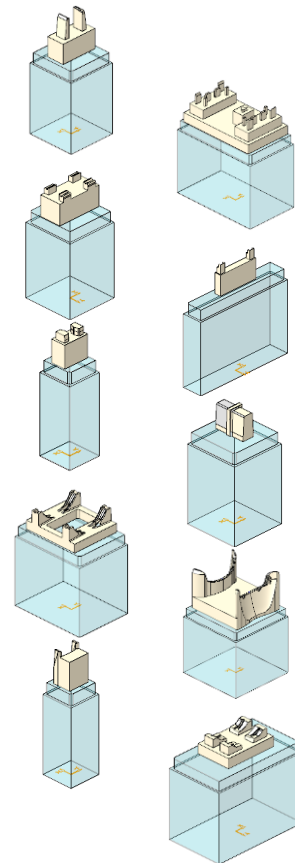
Electrode 10

Electrode 11

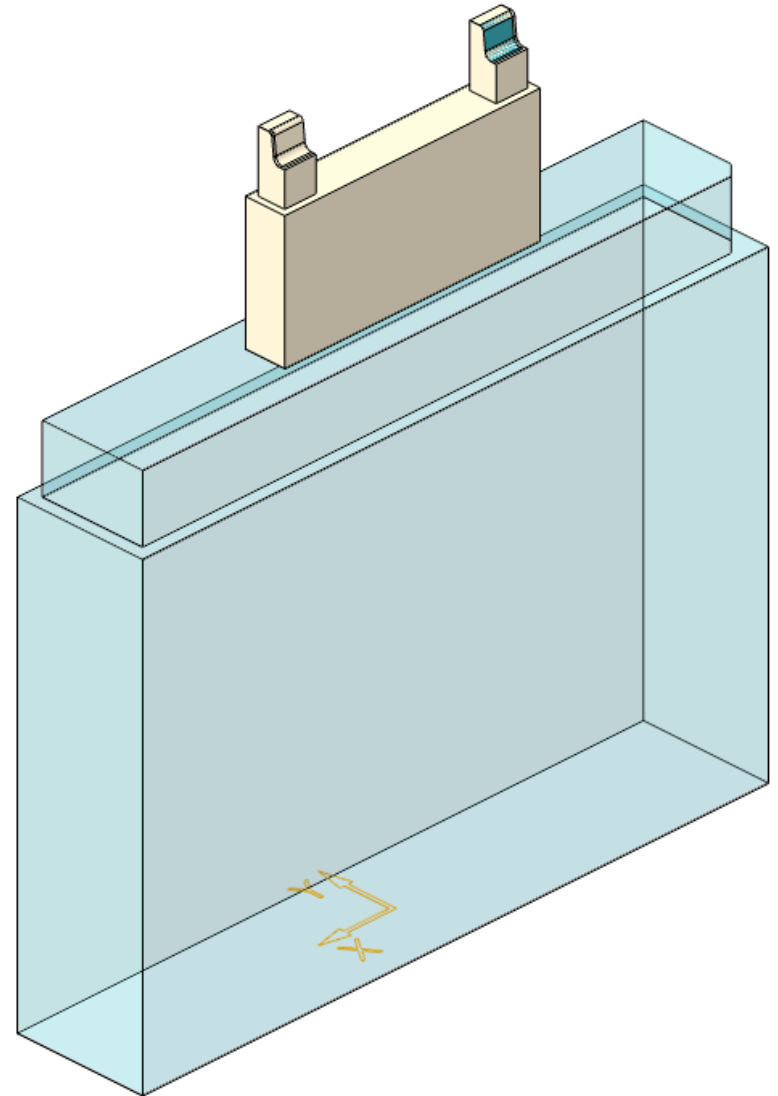
Electrode 12

Electrode 13

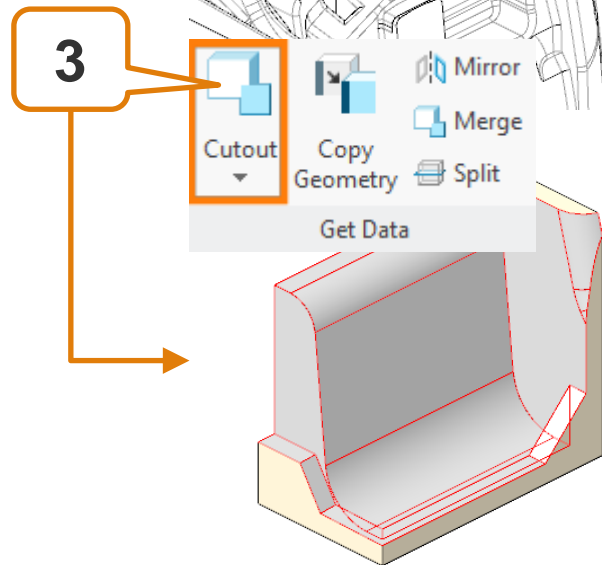
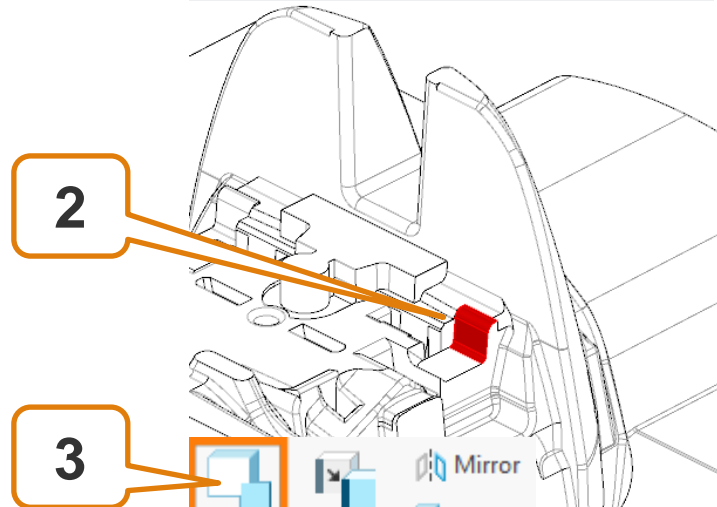
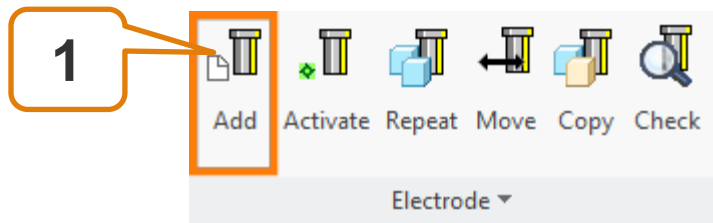
Electrode 14



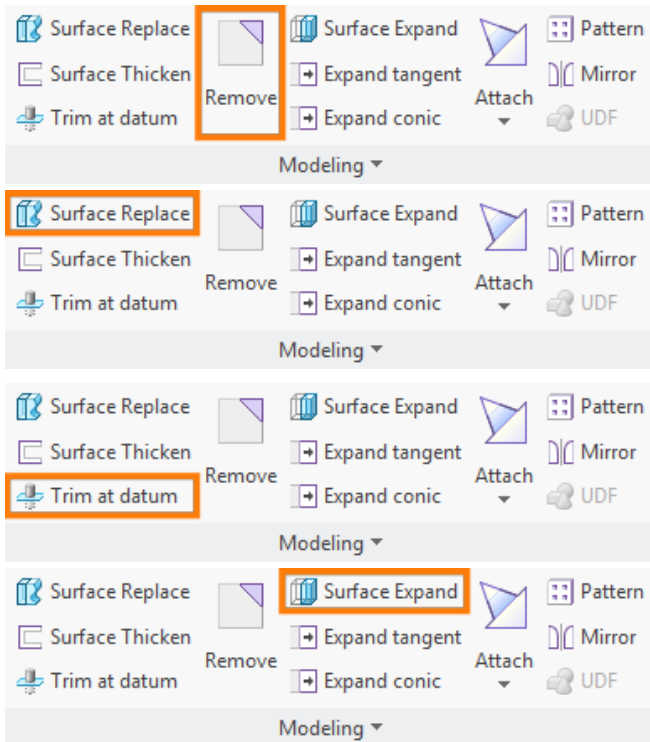
Topics...



Electrode 8 – Get Data

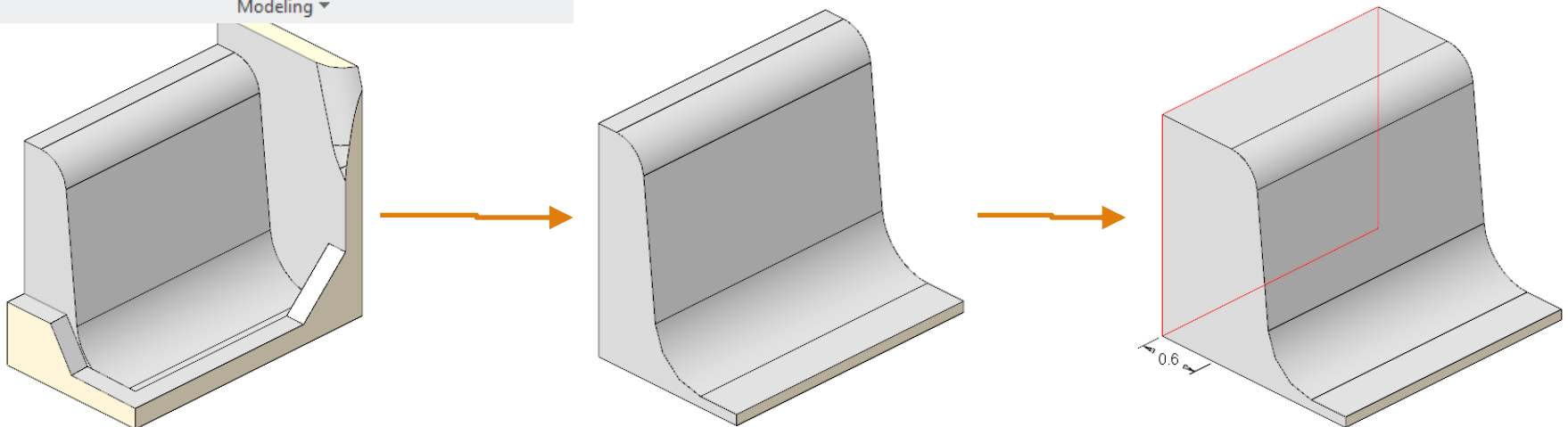


Electrode 8 – Detailing

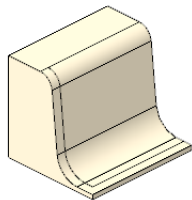
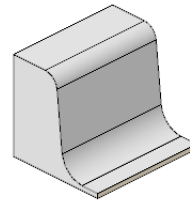
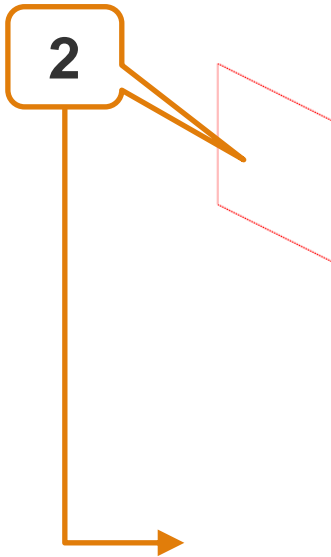
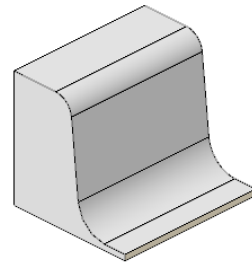
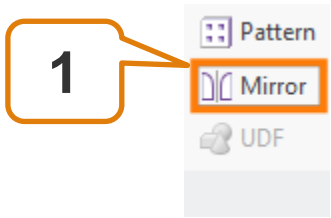


Detailing using...

- Remove
- Replace surface
- Trim at datum
- Expand

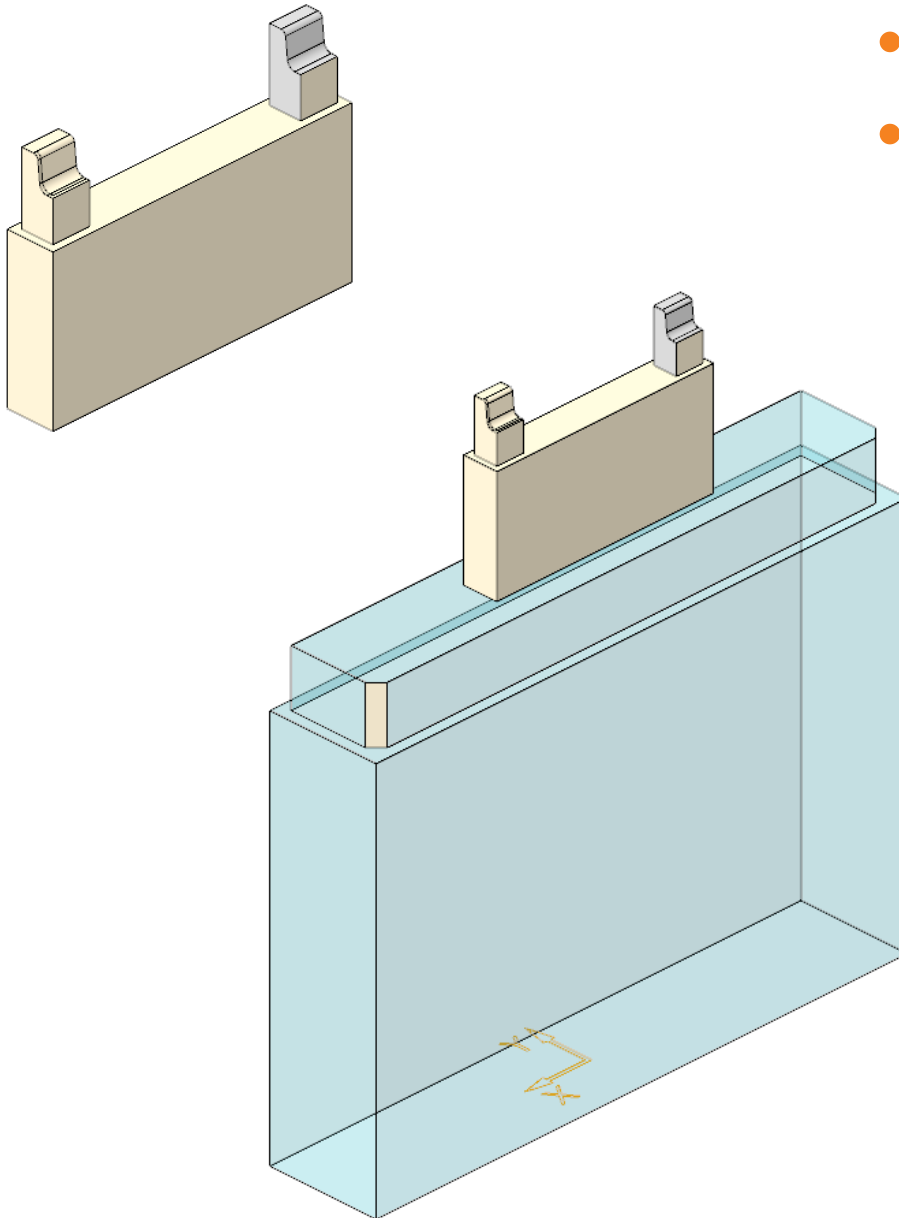


Electrode 8 – Mirror

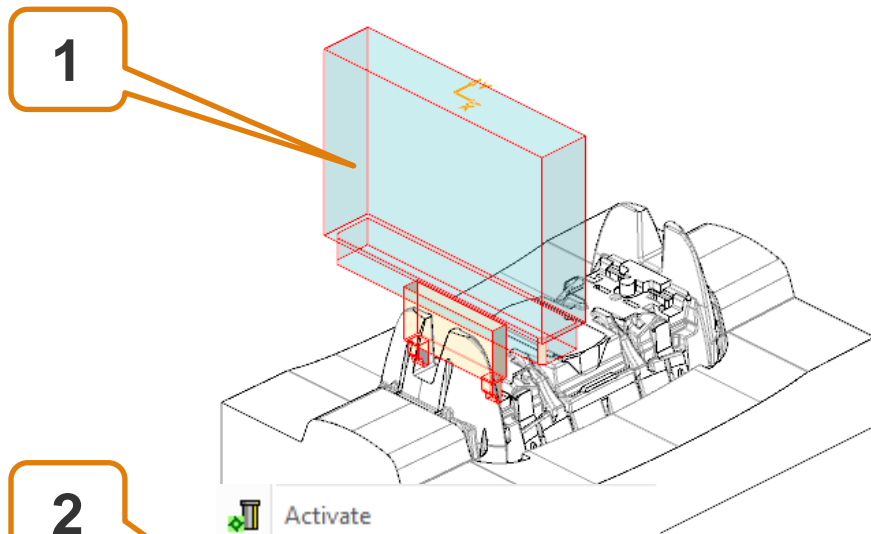


Electrode 8 - Finish

- Create support
- Finish electrode with base



Electrode 8 – Assemble Again



2

3

Activate
Properties
Repeat
Copy
Classify
Rename

Assemble Again

Reference Models: 1 model(s) selected

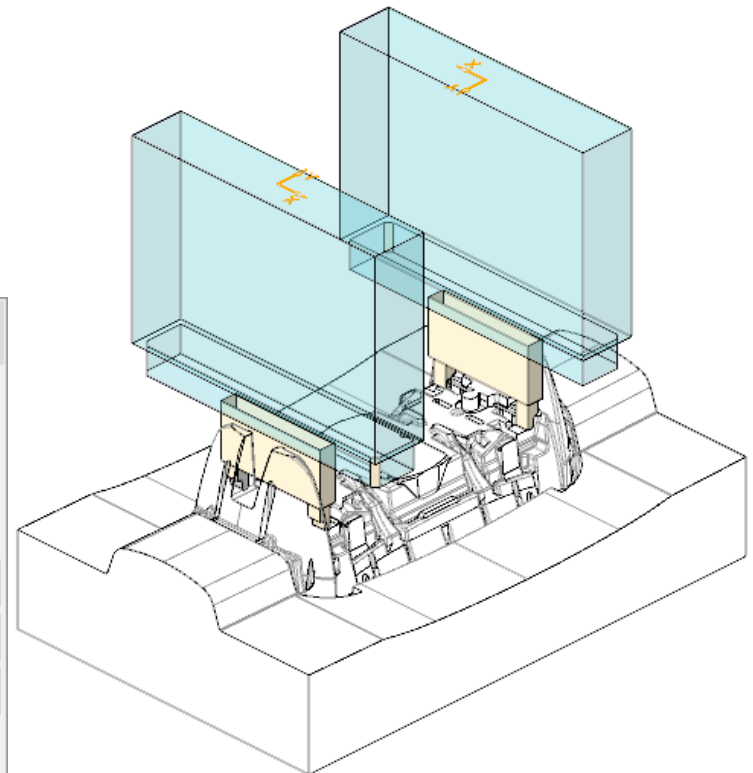
Move Reference: OP_ASM_REF_CSYS_1

Move type: Relative Absolute

| Translation | | Rotation | |
|-------------|--------------|----------|--------------|
| X (R) | -21.38925266 | X (A) | 0.00000000 |
| Y (G) | 0.00000000 | Y (B) | 0.00000000 |
| Z (B) | 2.47831923 | Z (C) | -90.00000000 |

OK Cancel

The image shows a CAD software interface. A context menu is open over the assembly, with the 'Repeat' option highlighted. Below it, the 'Assemble Again' dialog box is displayed. The dialog shows the reference model 'OP_ASM_REF_CSYS_1' and the move type set to 'Absolute'. The translation values are X: -21.38925266, Y: 0.00000000, and Z: 2.47831923. The rotation values are X: 0.00000000, Y: 0.00000000, and Z: -90.00000000. Callout '2' points to the 'Repeat' option, and callout '3' points to the X translation value.



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

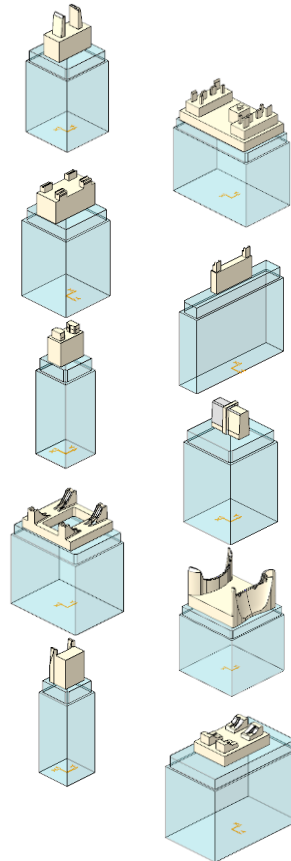
Electrode 10

Electrode 11

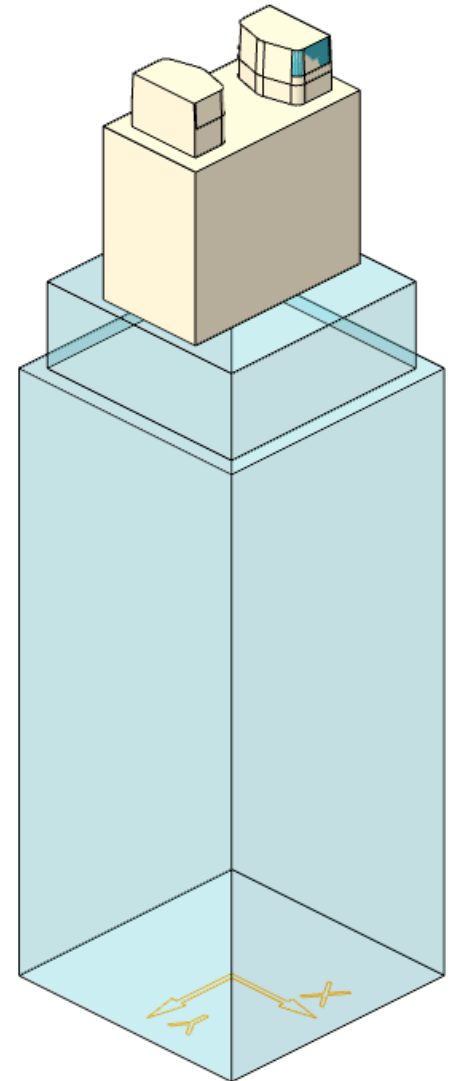
Electrode 12

Electrode 13

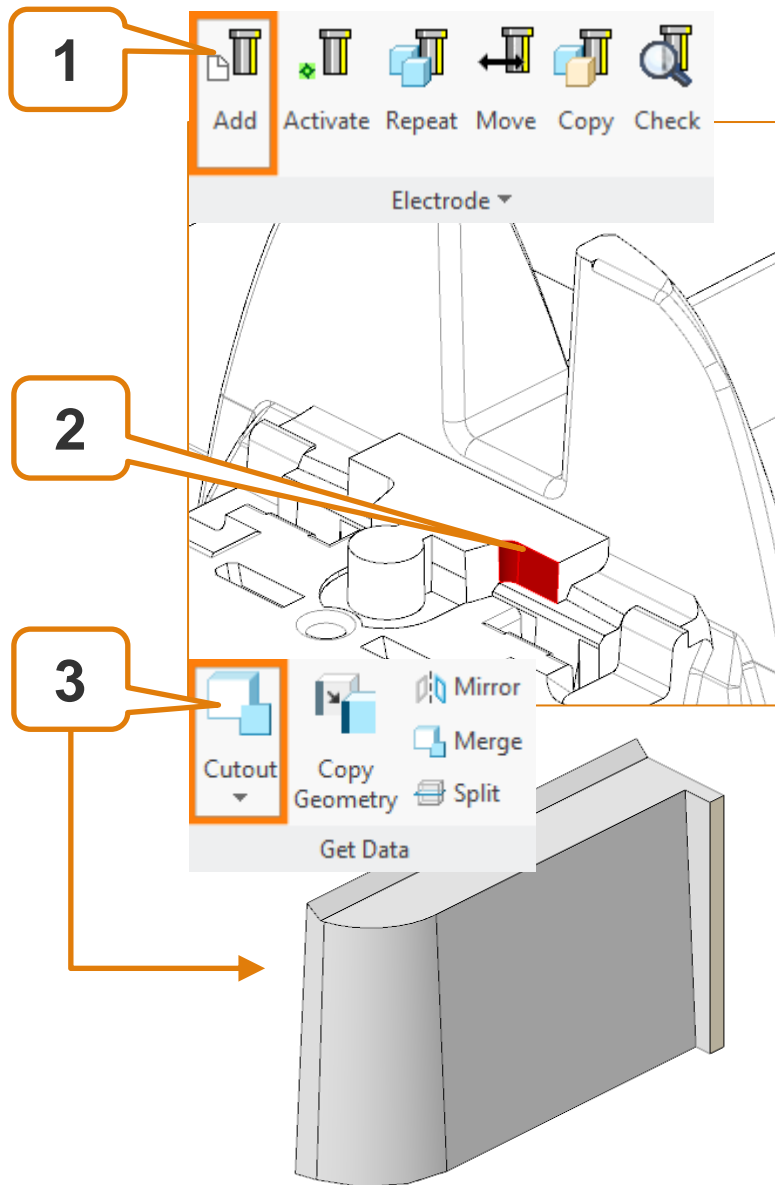
Electrode 14



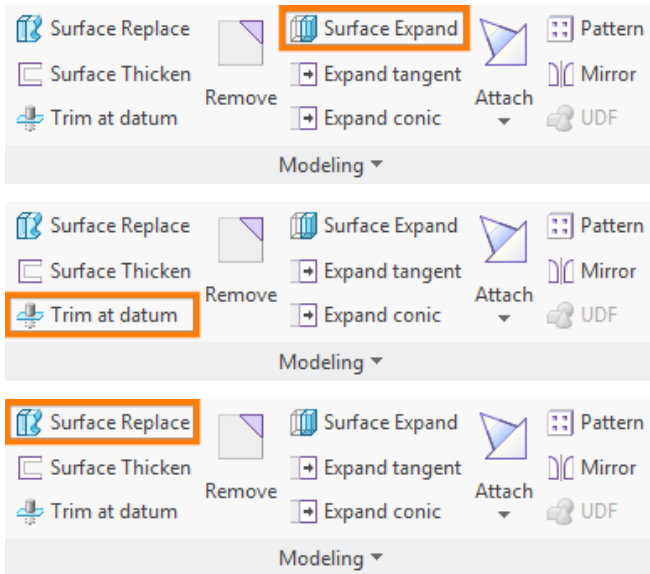
Topics...



Electrode 9 – Get Data

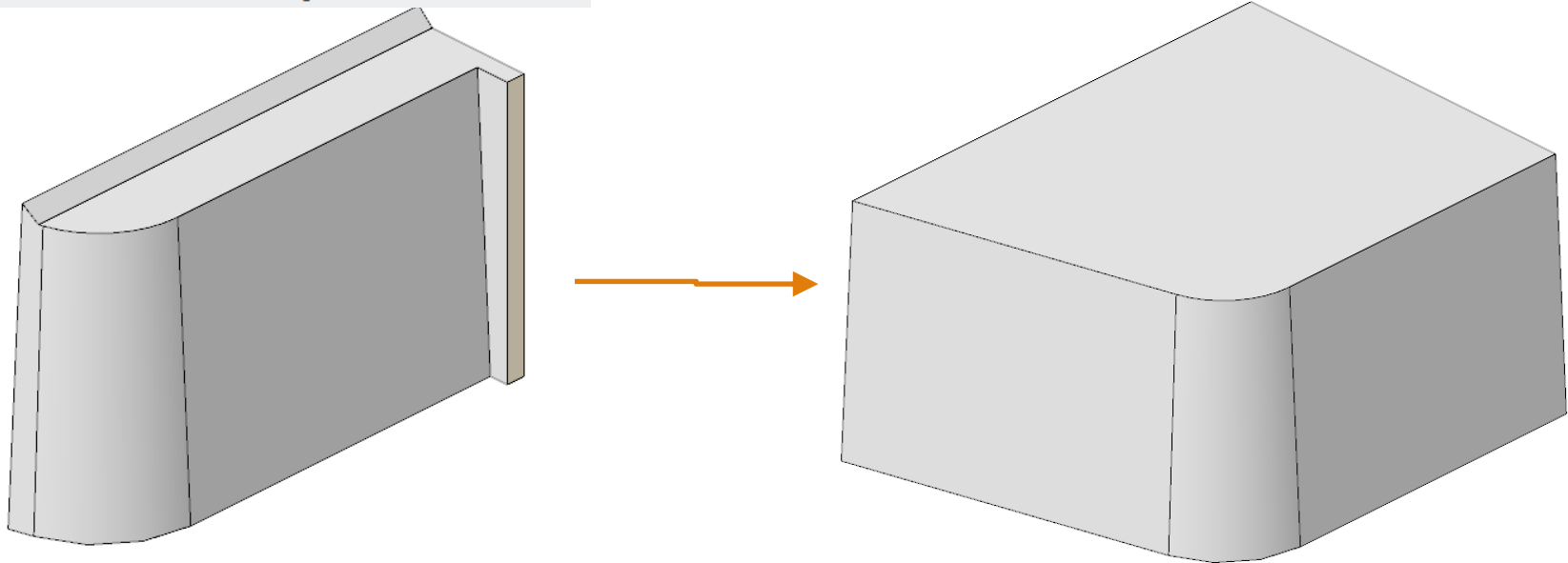


Electrode 9 – Detailing

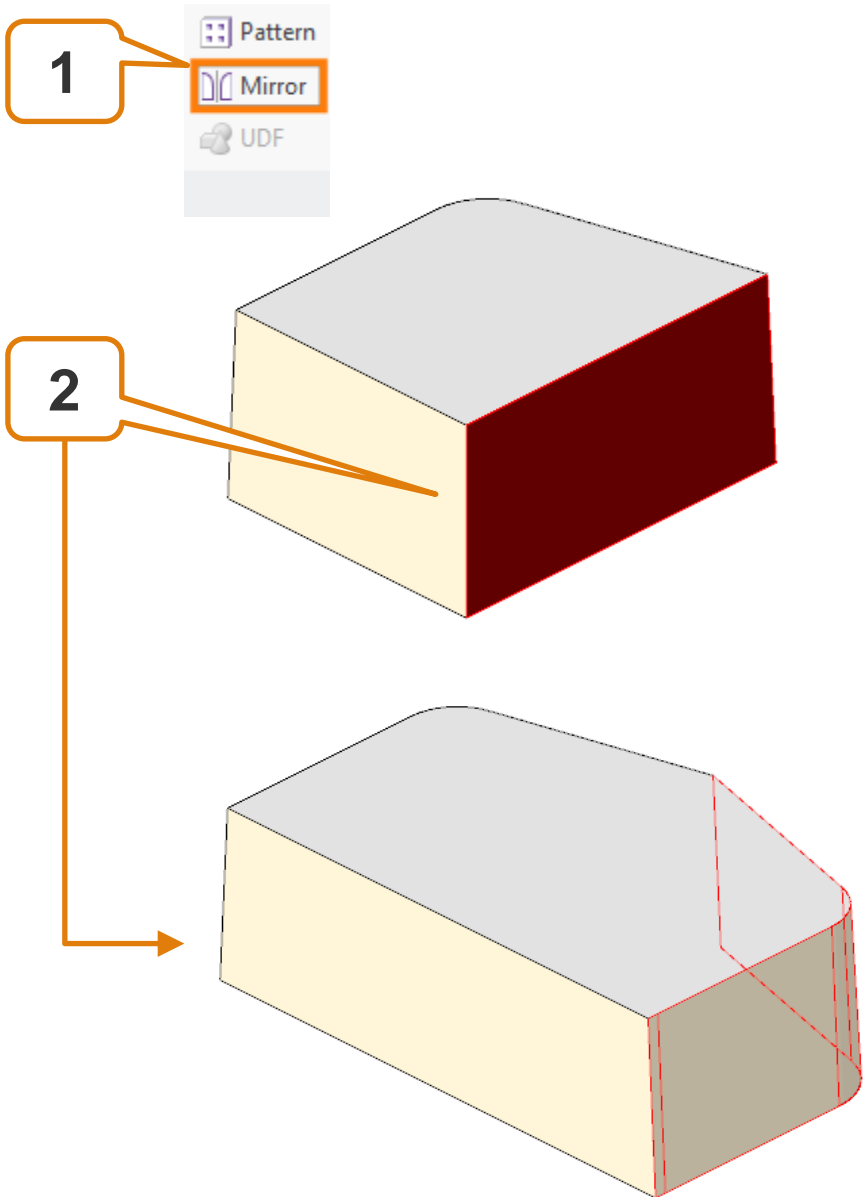


Detailing using...

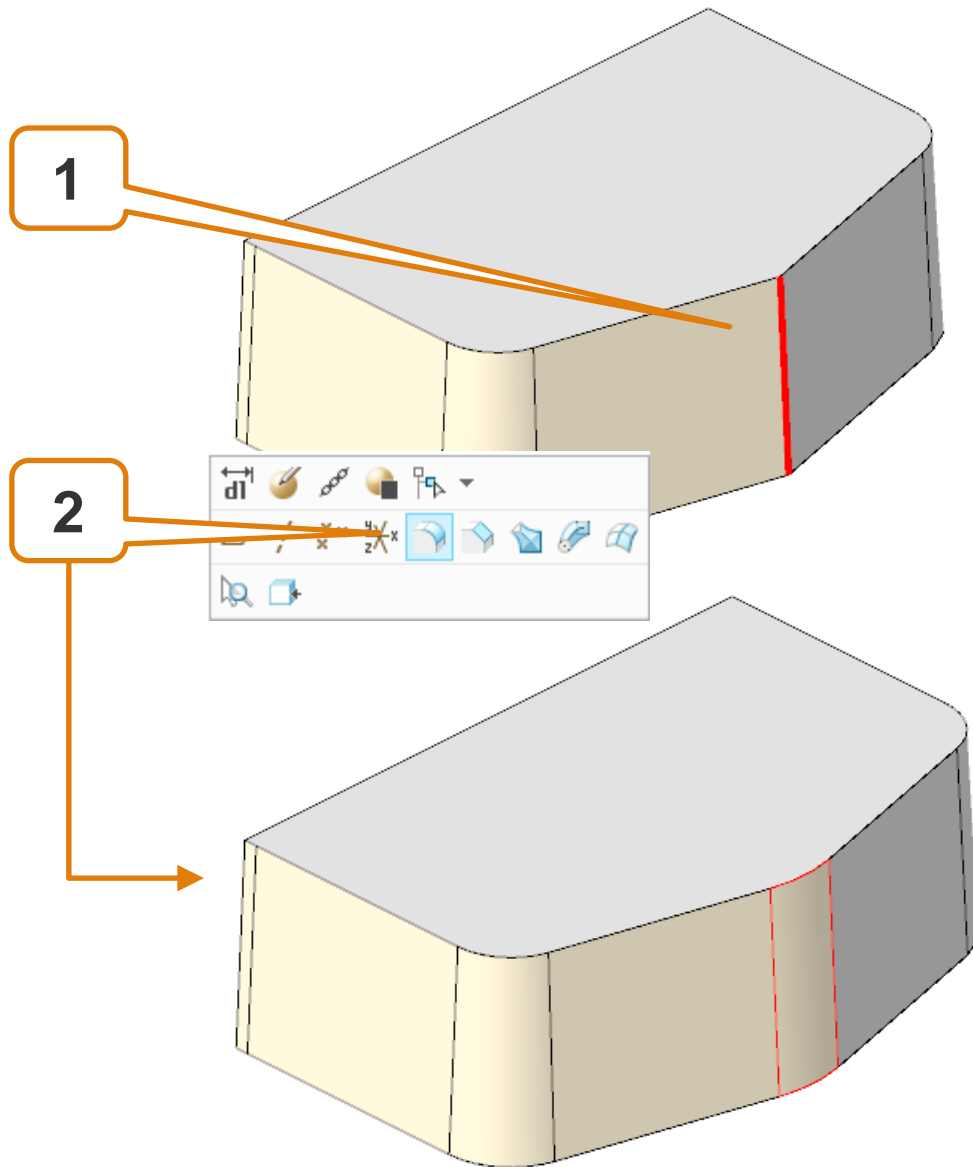
- **Expand**
- **Trim at datum**
- **Replace surface**



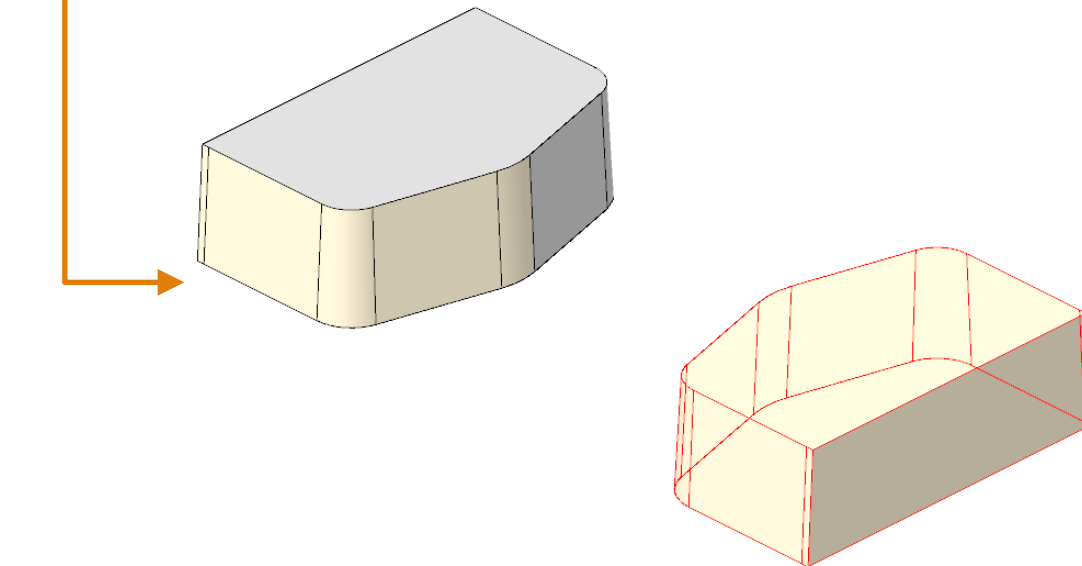
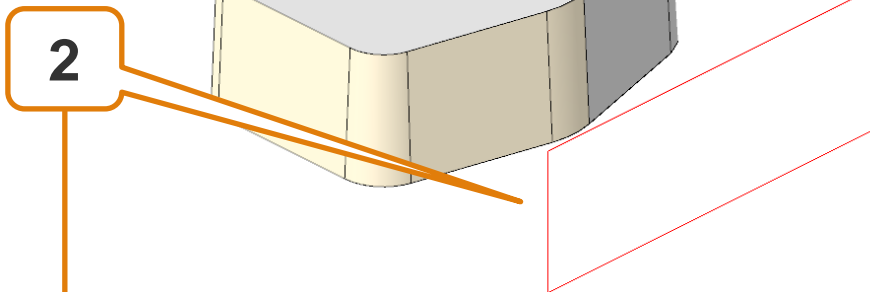
Electrode 9 – Mirror



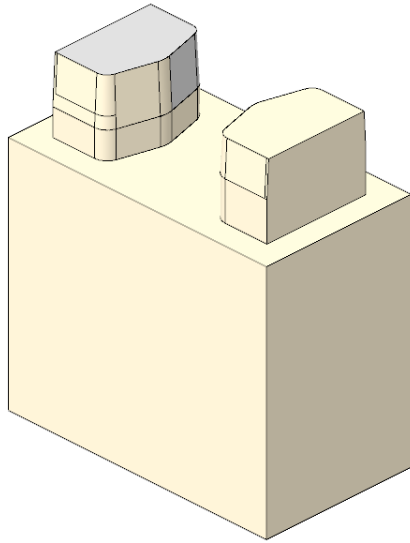
Electrode 9 – Detailing



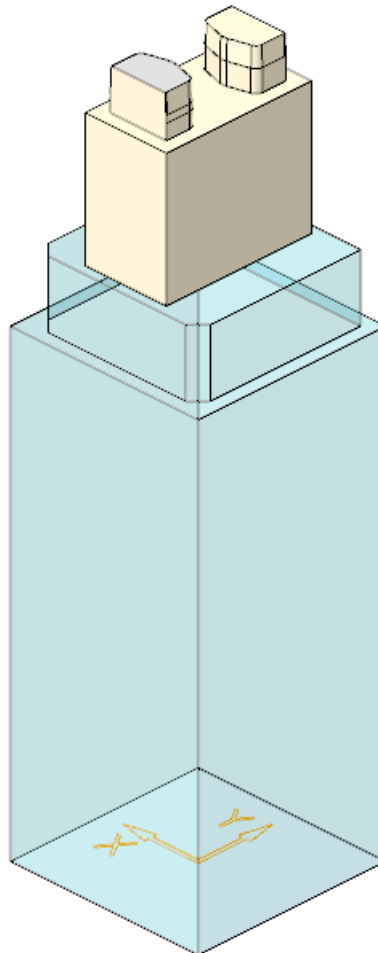
Electrode 9 – Mirror



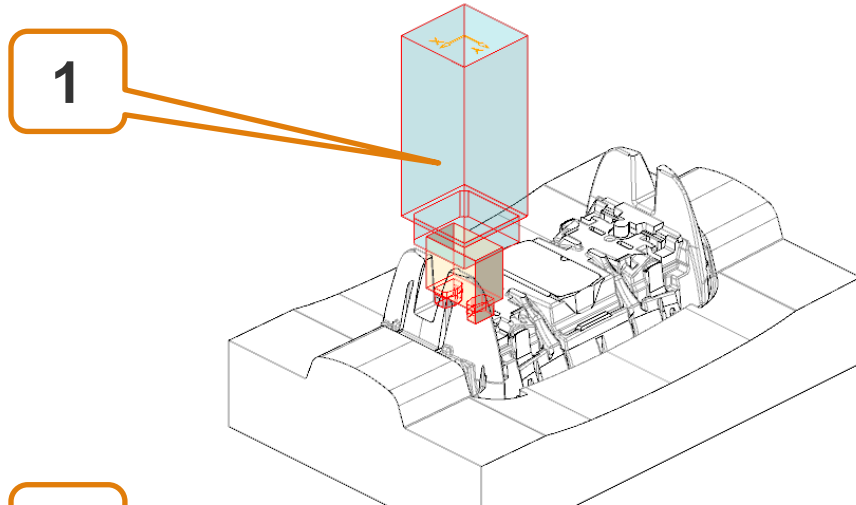
Electrode 9 - Finish



- **Create support**
- **Finish electrode with base**



Electrode 9 – Assemble Again



2

- Activate
- Properties
- Repeat**
- Copy
- Classify
- Rename

3

Move Again

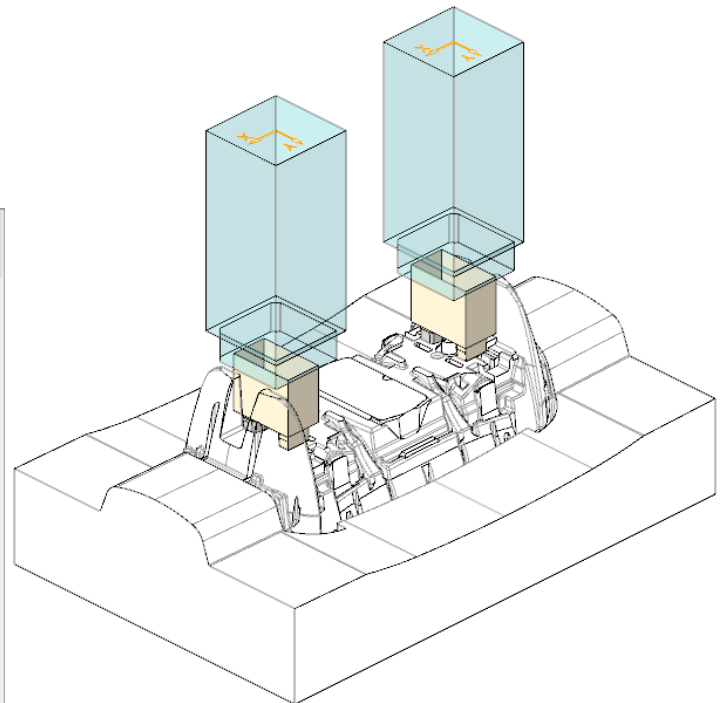
reference model: [Model(s) selected]

Move Reference: OP_ASM_REF_CSYS_1

Move type: Relative Absolute

| Translation | | Rotation | |
|-------------|--------------|----------|------------|
| X (R) | -19.02107525 | X (A) | 0.00000000 |
| Y (G) | 0.00000000 | Y (B) | 0.00000000 |
| Z (B) | 2.47831923 | Z (C) | 0.00000000 |

OK Cancel



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

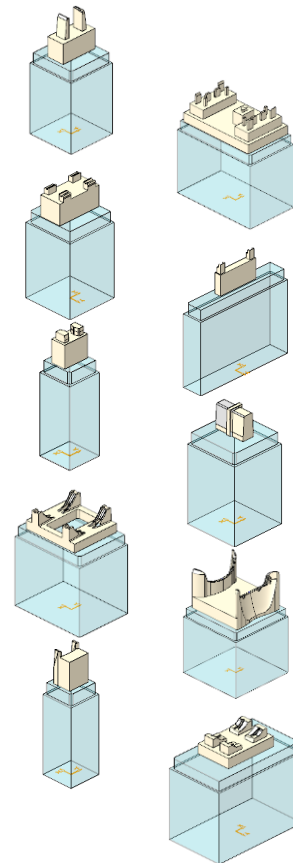
Electrode 10

Electrode 11

Electrode 12

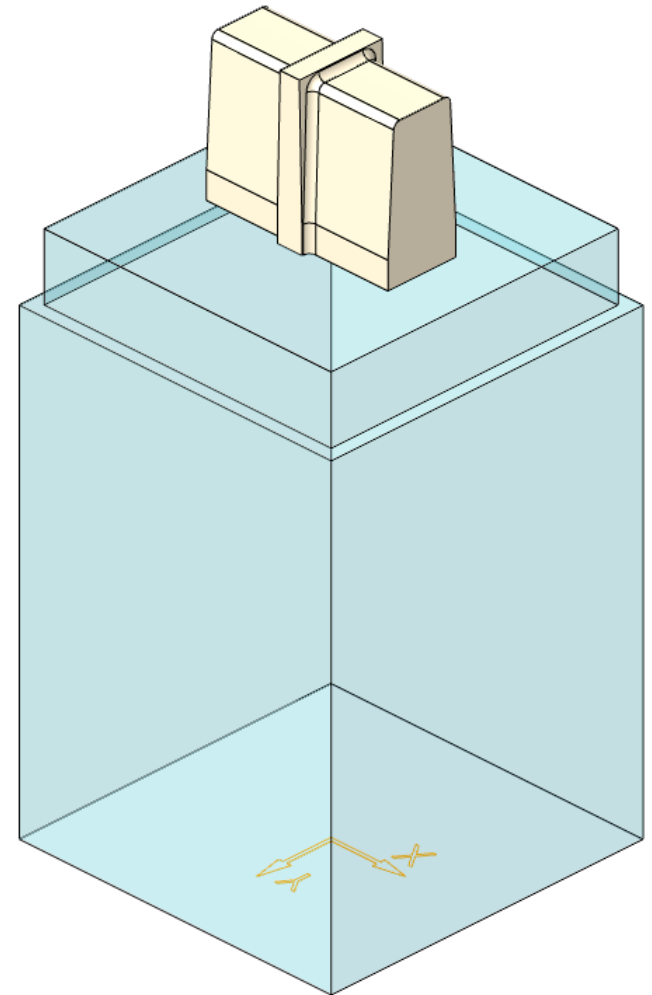
Electrode 13

Electrode 14

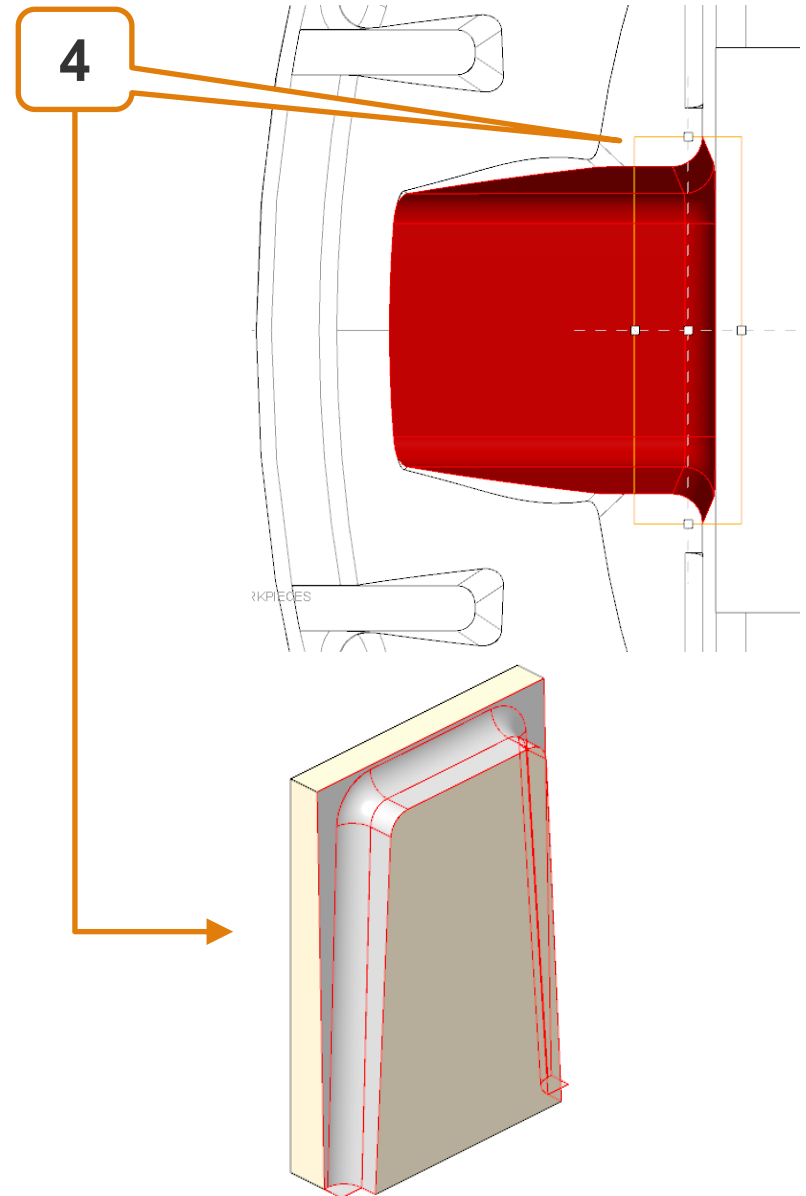
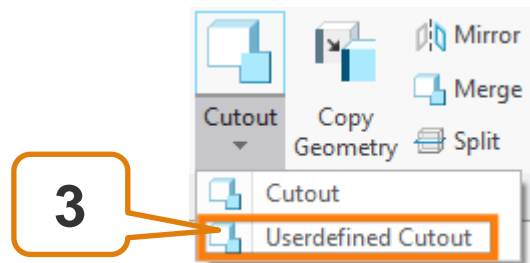
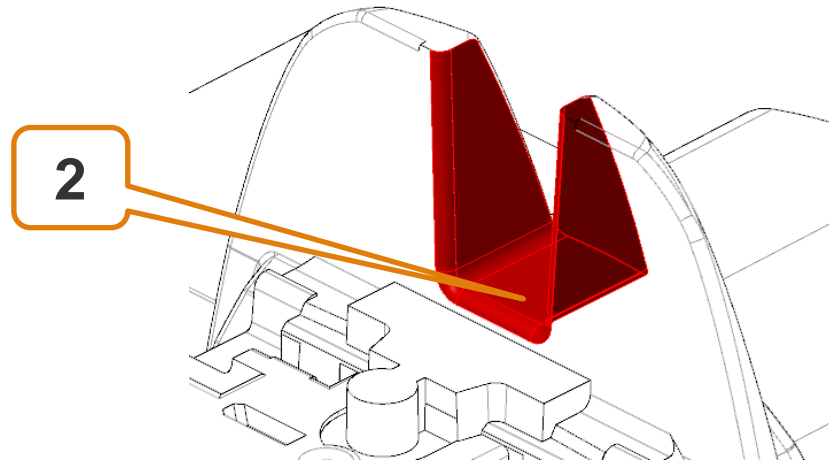
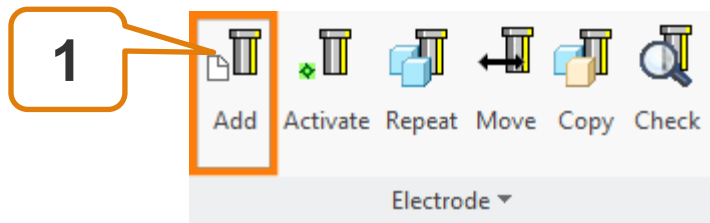


Topics...

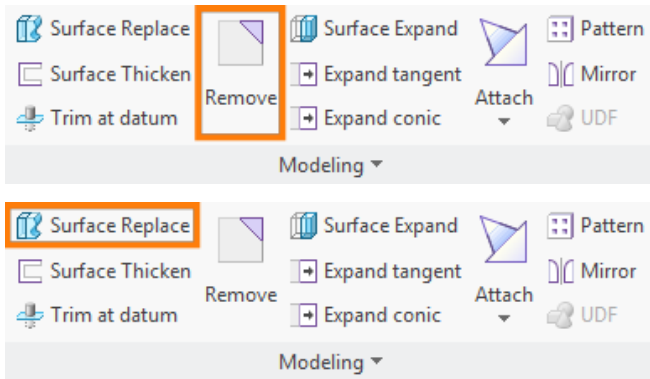
- Command **,User defined Cutout** ‘



Electrode 10 – Get Data

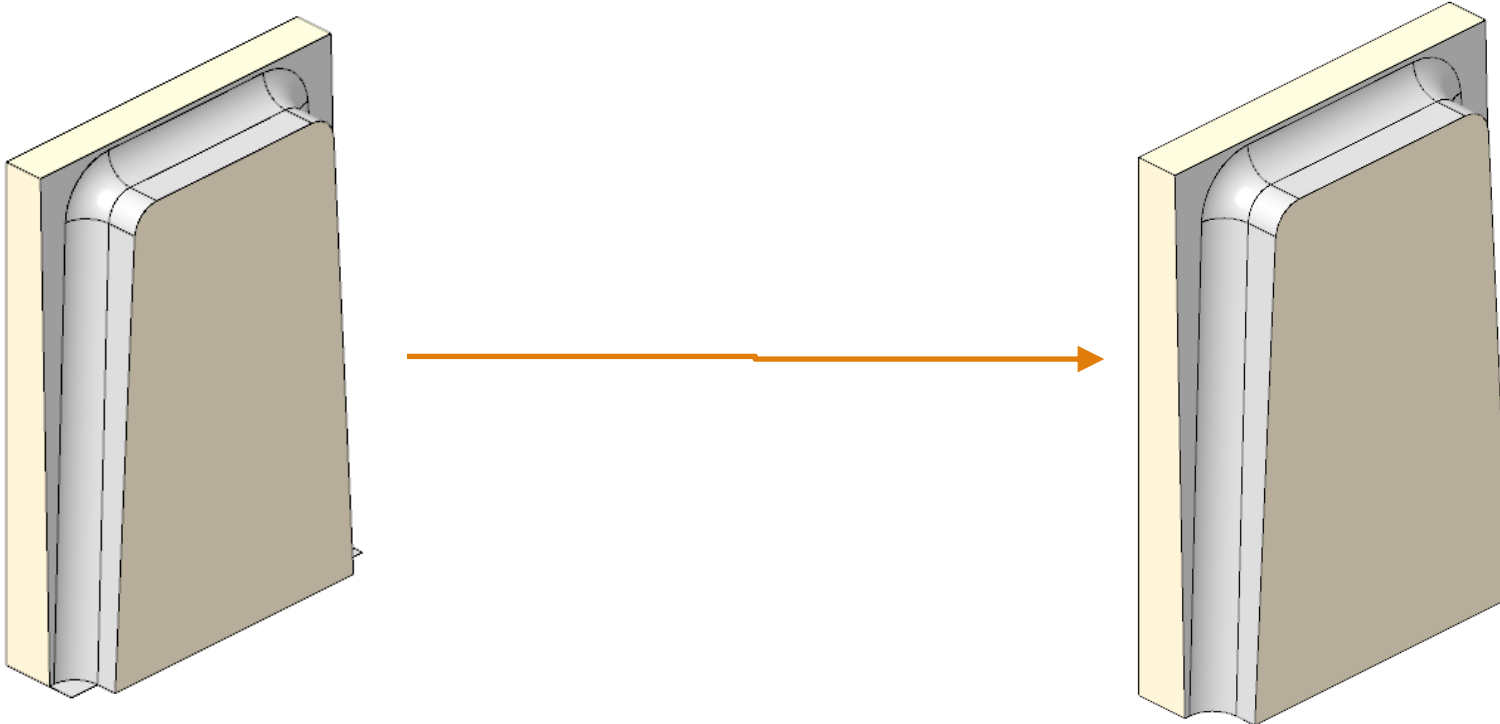


Electrode 10 – Detailing

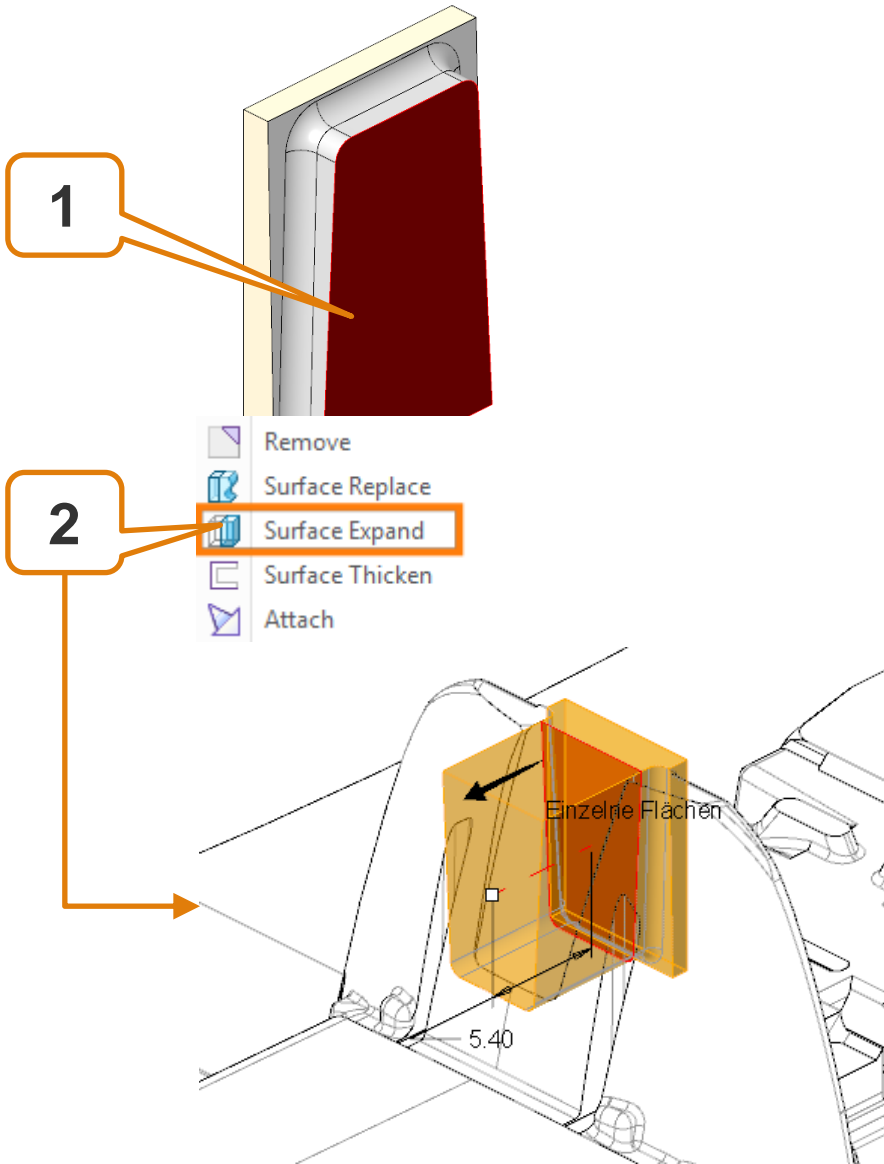


Detailing using...

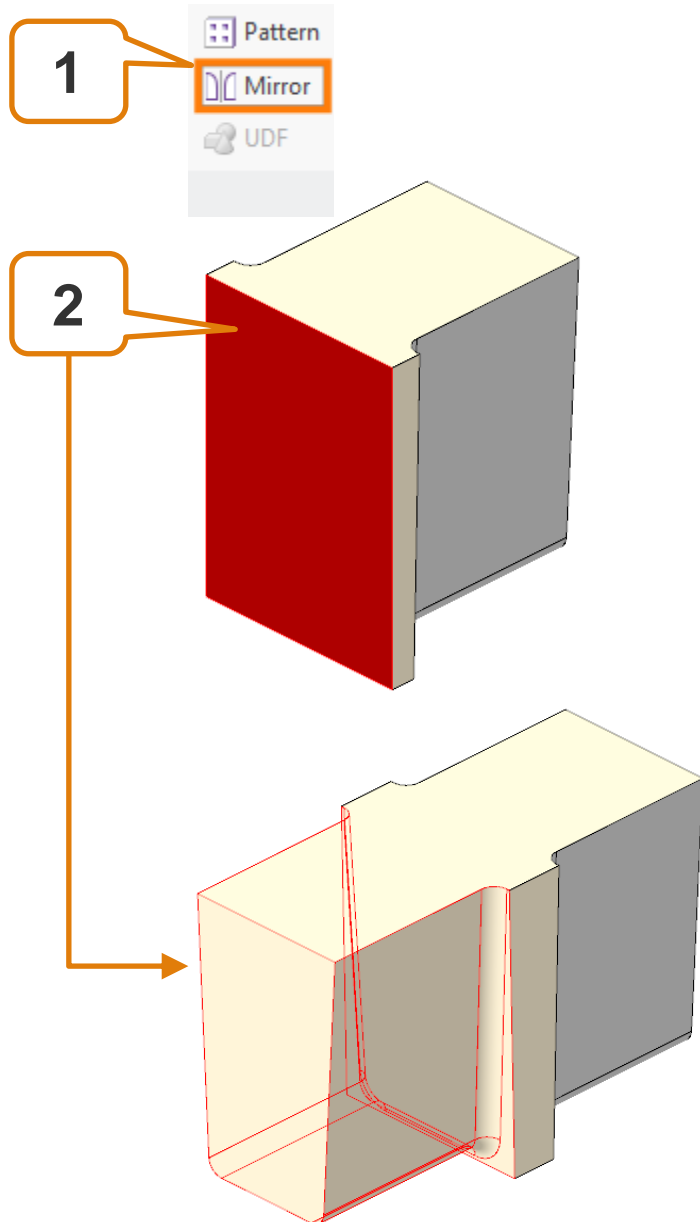
- Replace surface or
- Remove



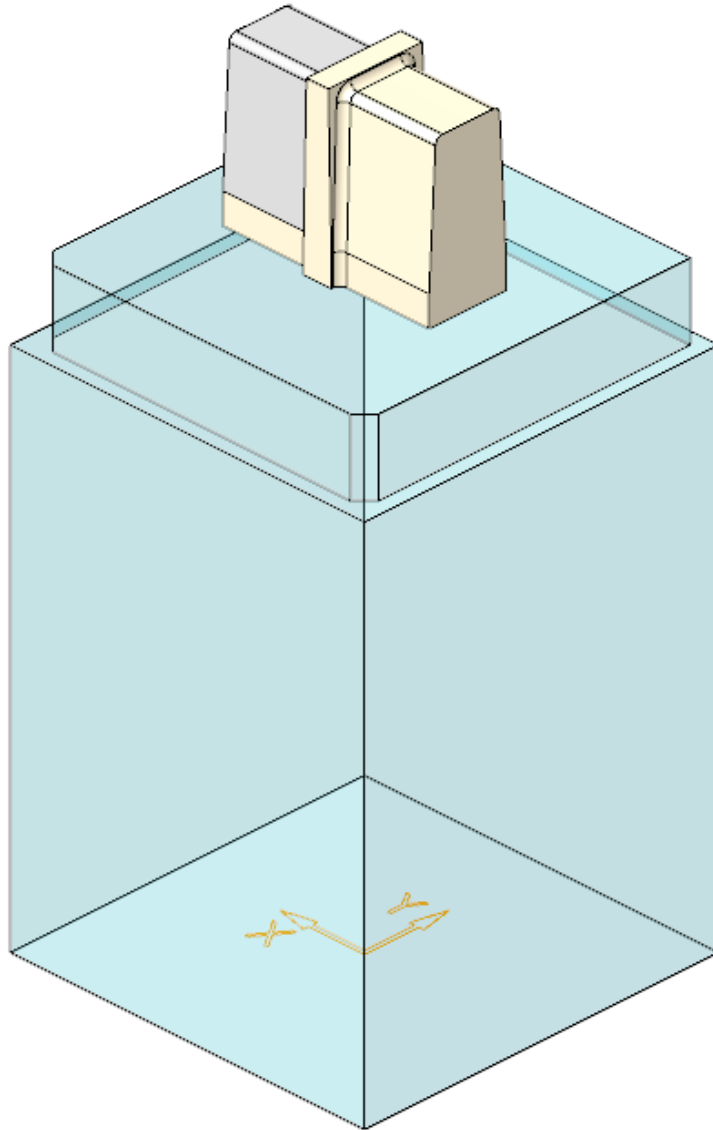
Electrode 10 – Detailing



Electrode 10 – Mirror

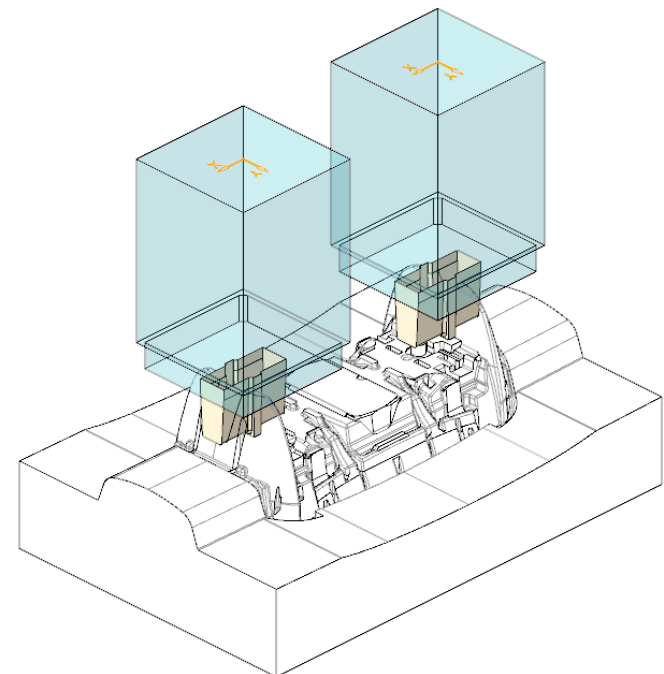
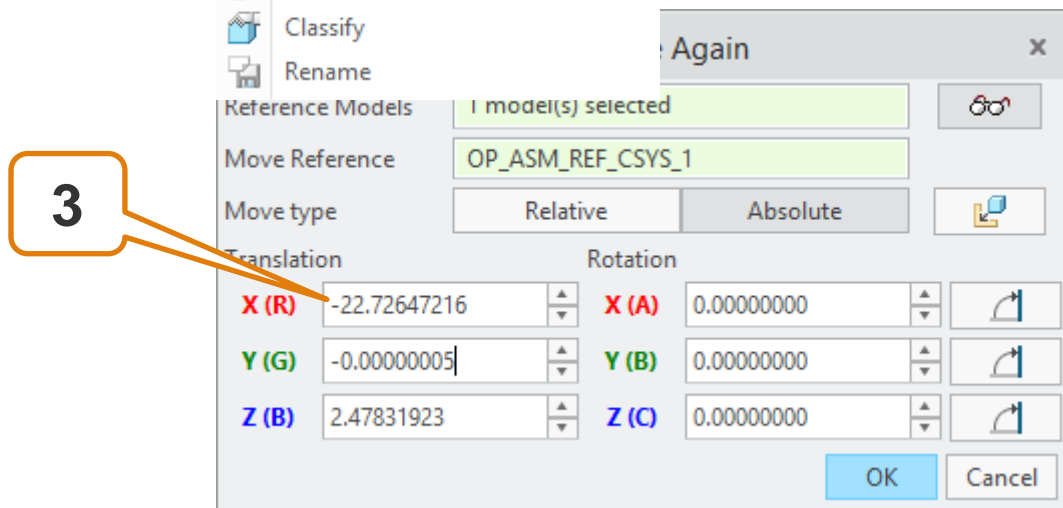
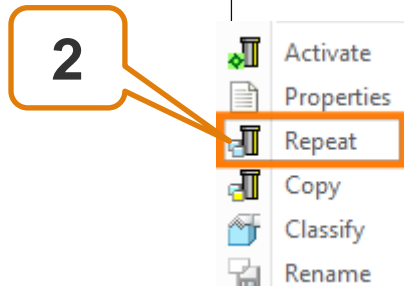
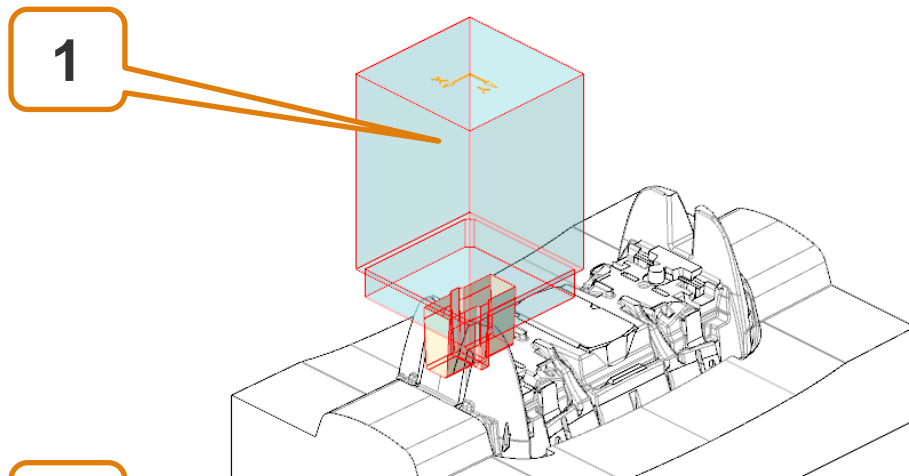


Electrode 10 - Finish



- **Finish electrode with base**

Electrode 10 – Assemble Again



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

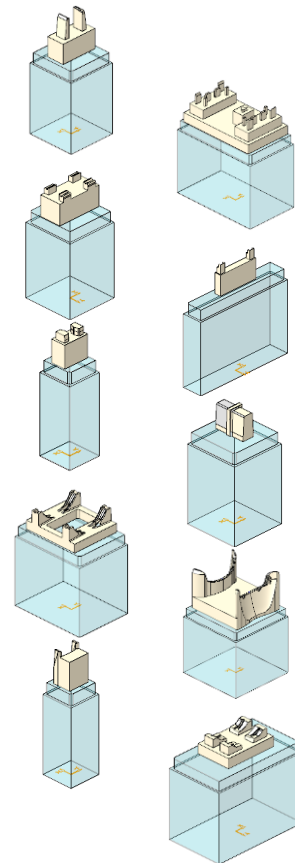
Electrode 10

Electrode 11

Electrode 12

Electrode 13

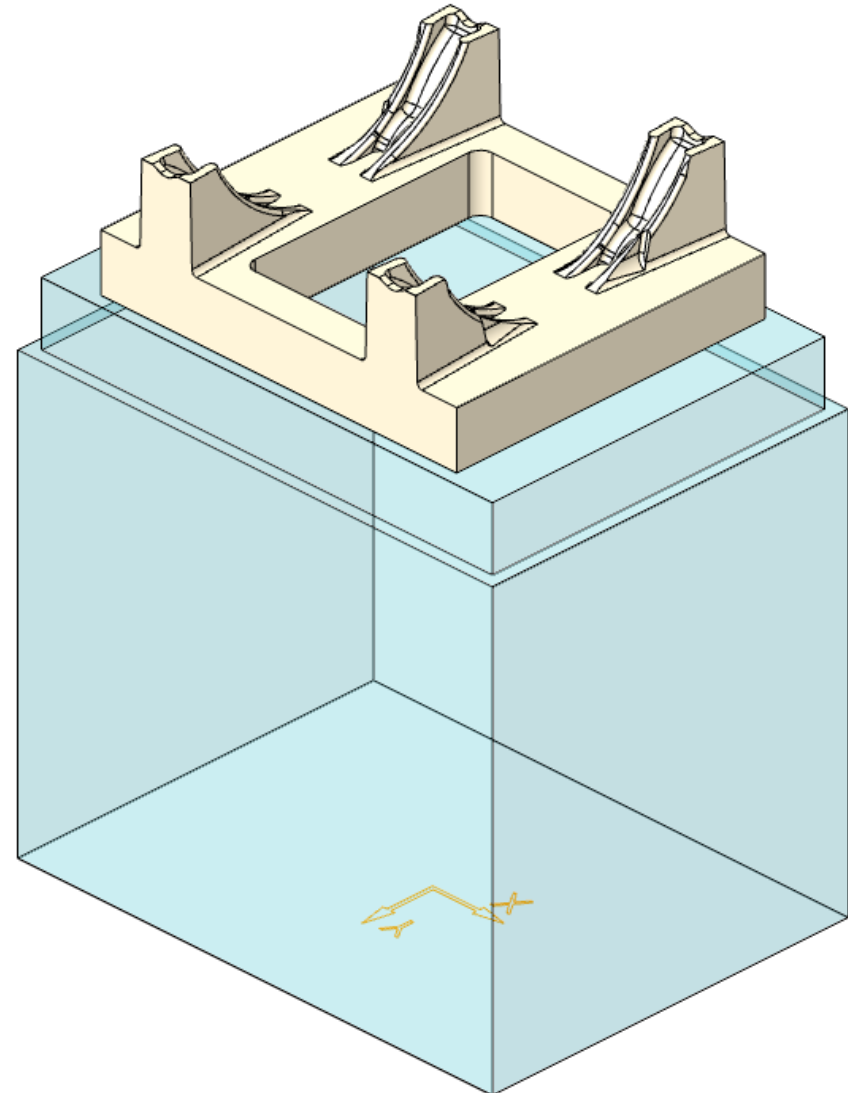
Electrode 14



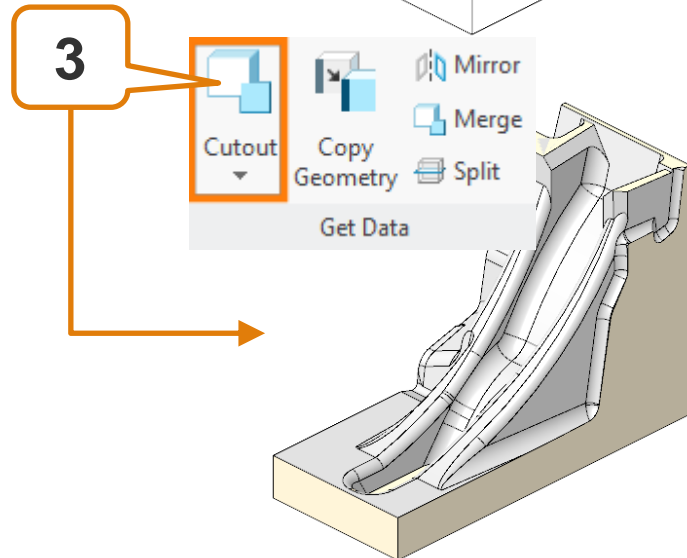
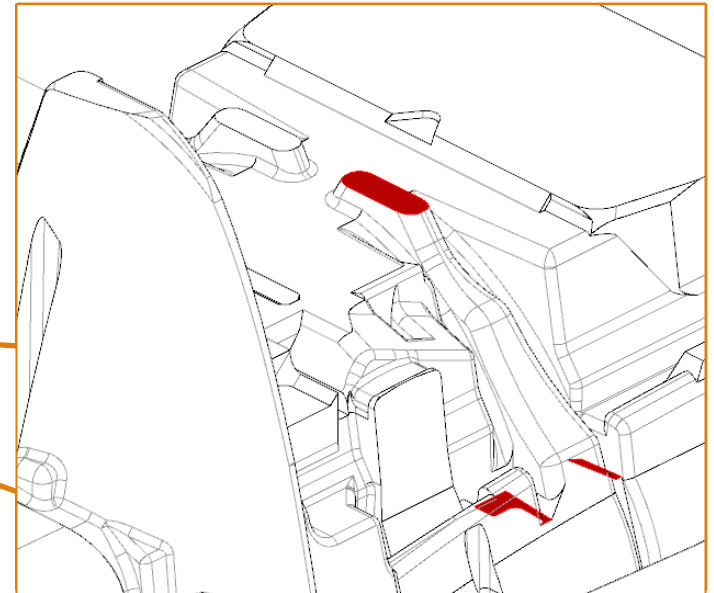
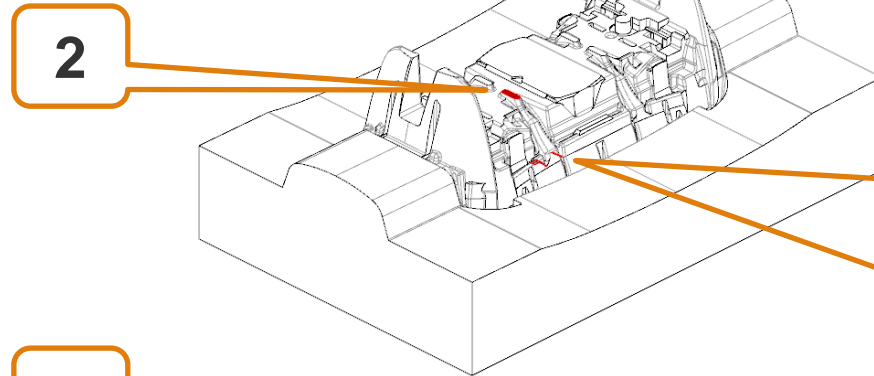
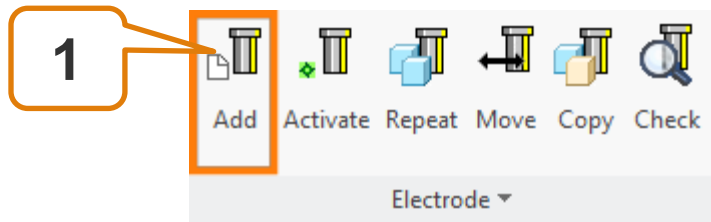
Electrode 11

Topics...

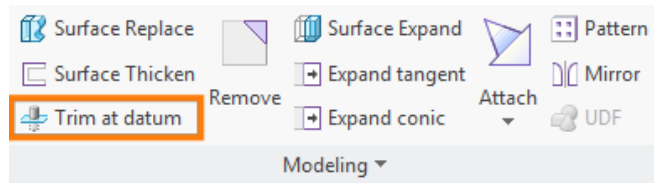
- Cut out with Creo extrude
- user defined FREE_FACE



Electrode 11 – Get Data

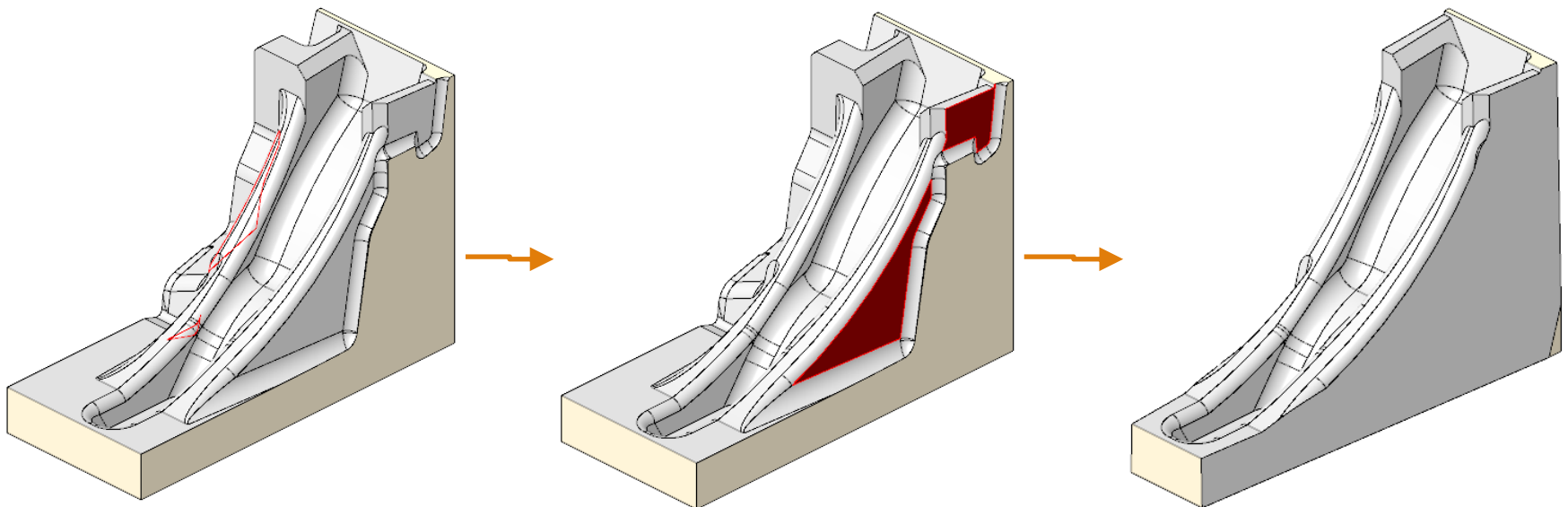


Electrode 11 – Detailing

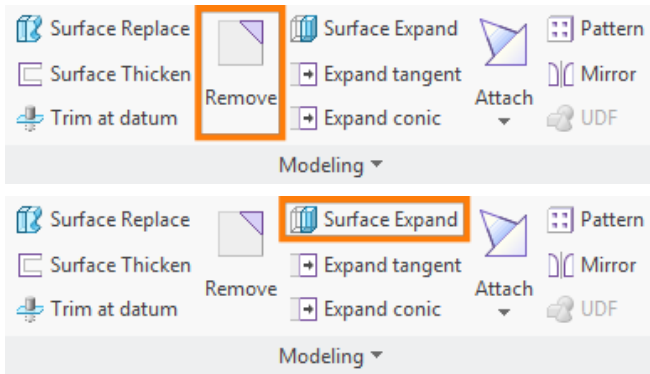


Detailing using...

- Trim at datum

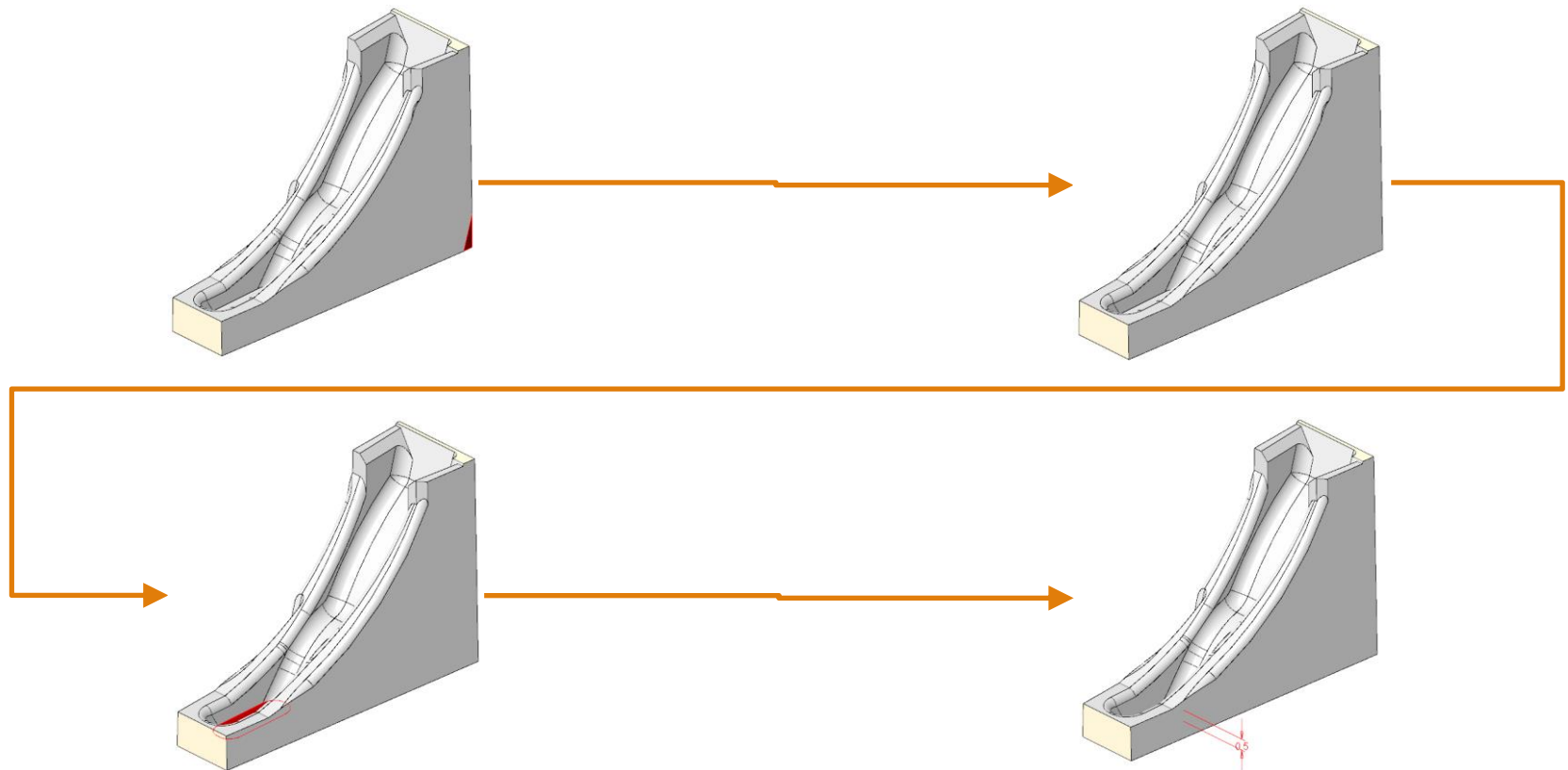


Electrode 11 – Detailing

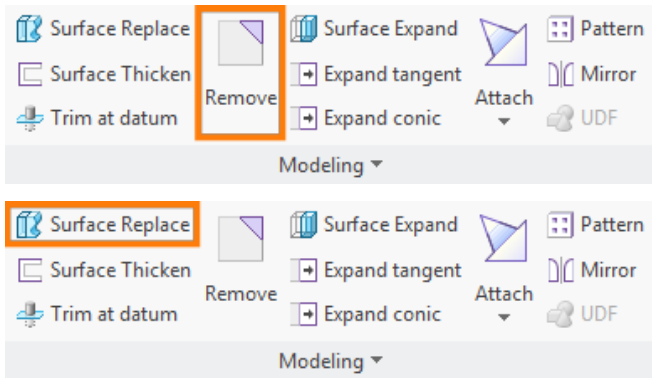


Detailing using...

- Remove
- Fläche Expand

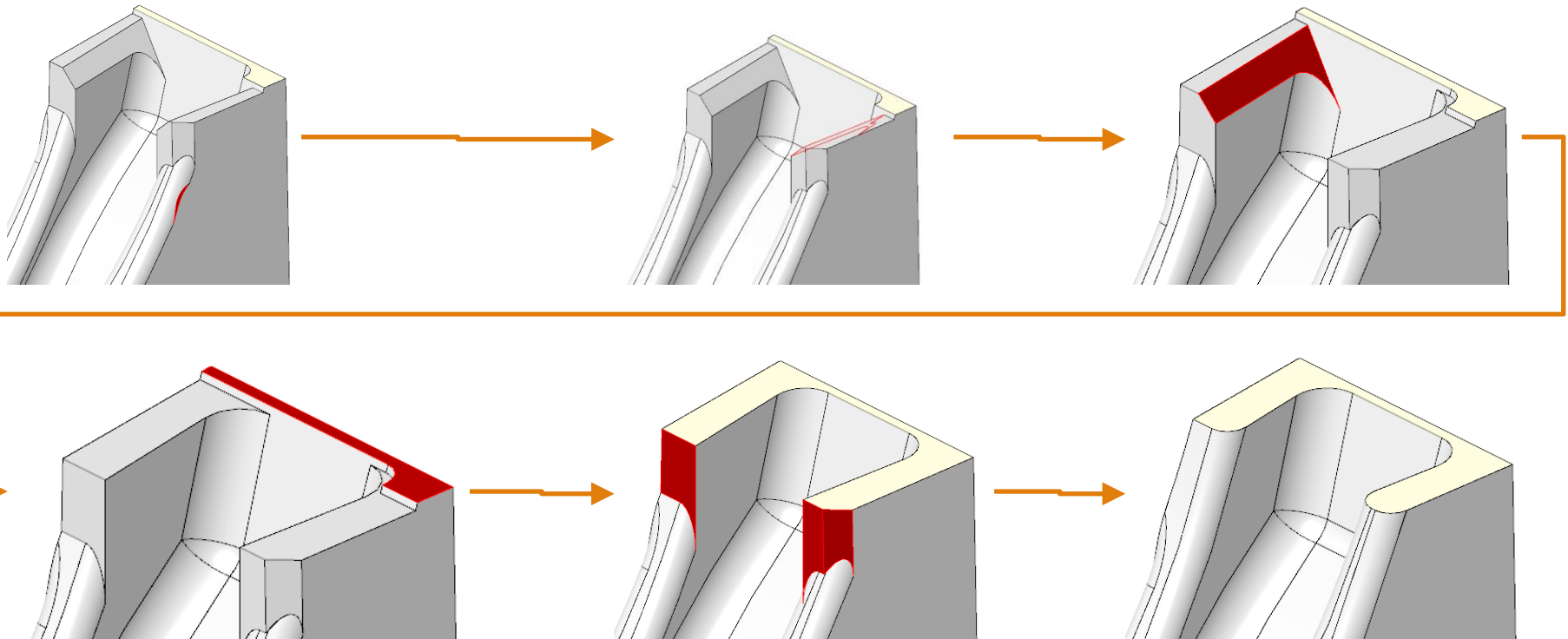


Electrode 11 – Detailing

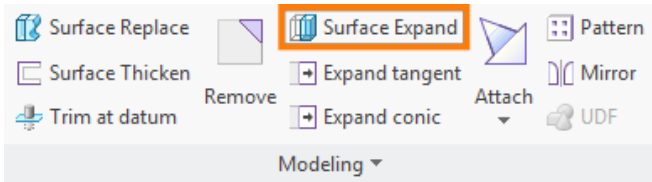


Detailing using...

- **Remove**
- **Replace surface**

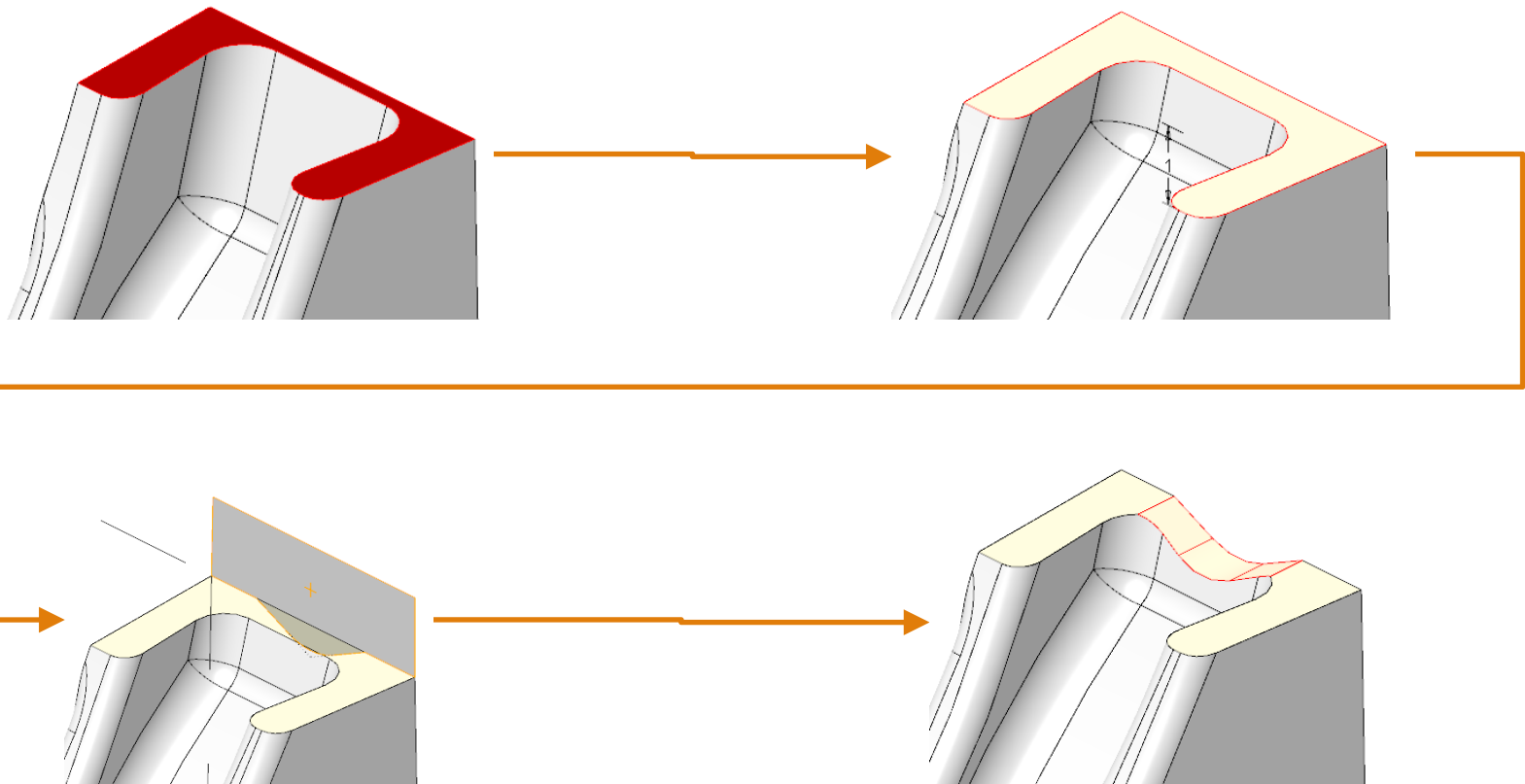


Electrode 11 – Detailing

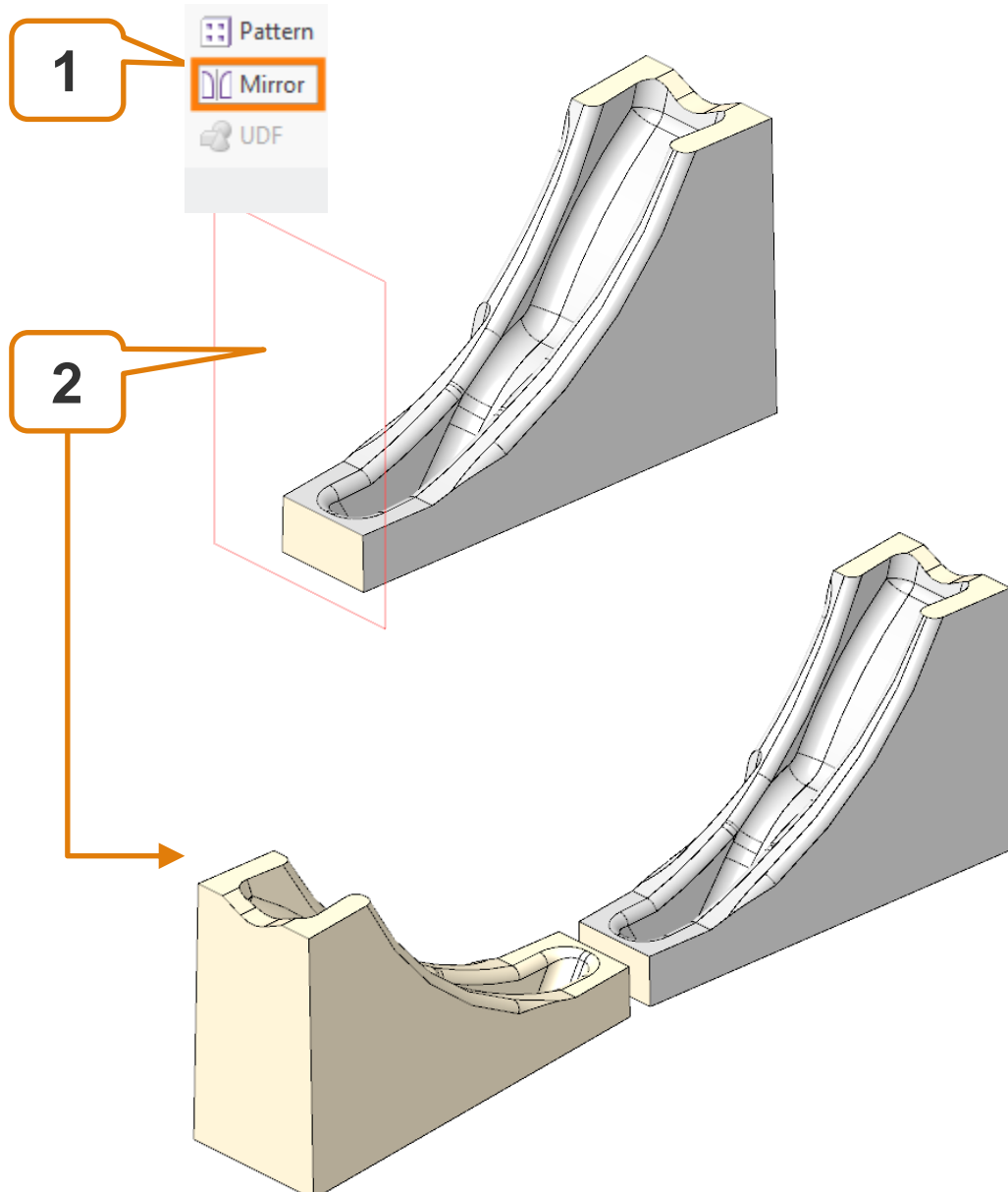


Detailing using...

- Fläche Expand
- Extruded cut

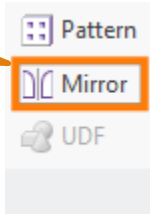


Electrode 11 – Mirror

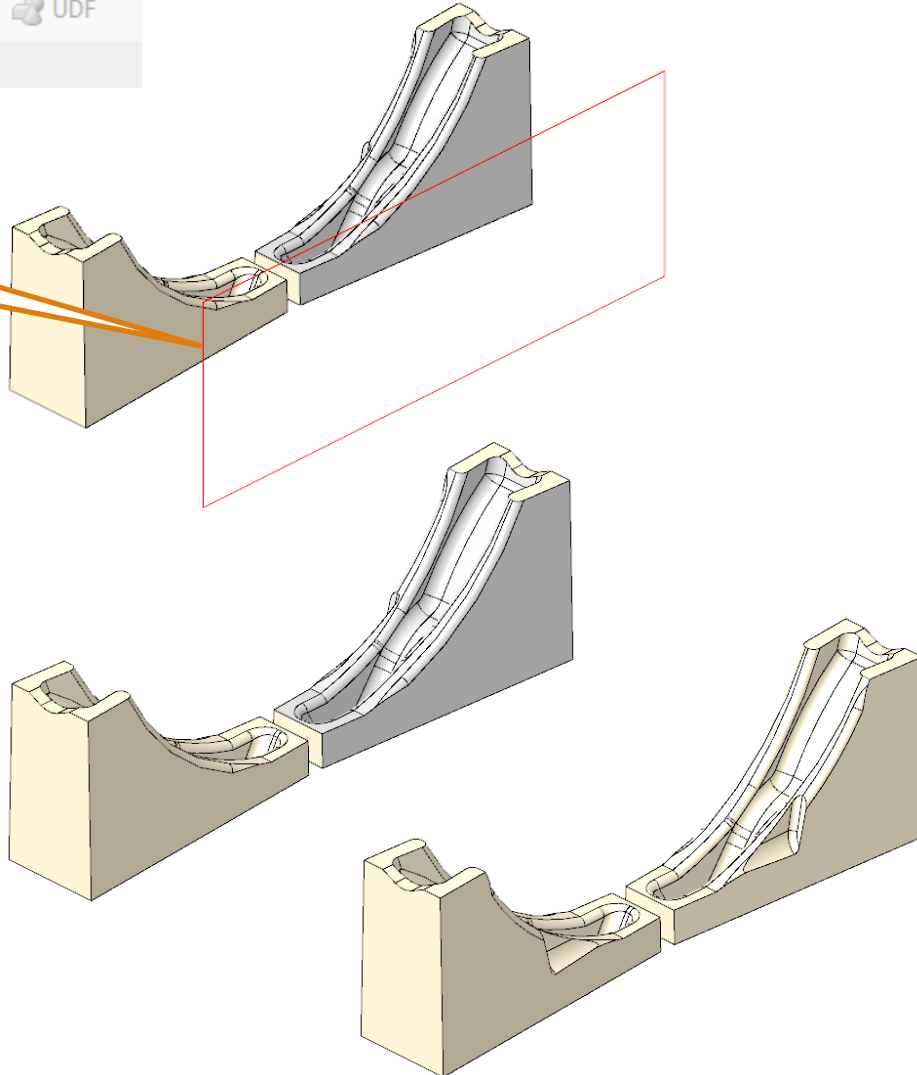


Electrode 11 – Mirror

1

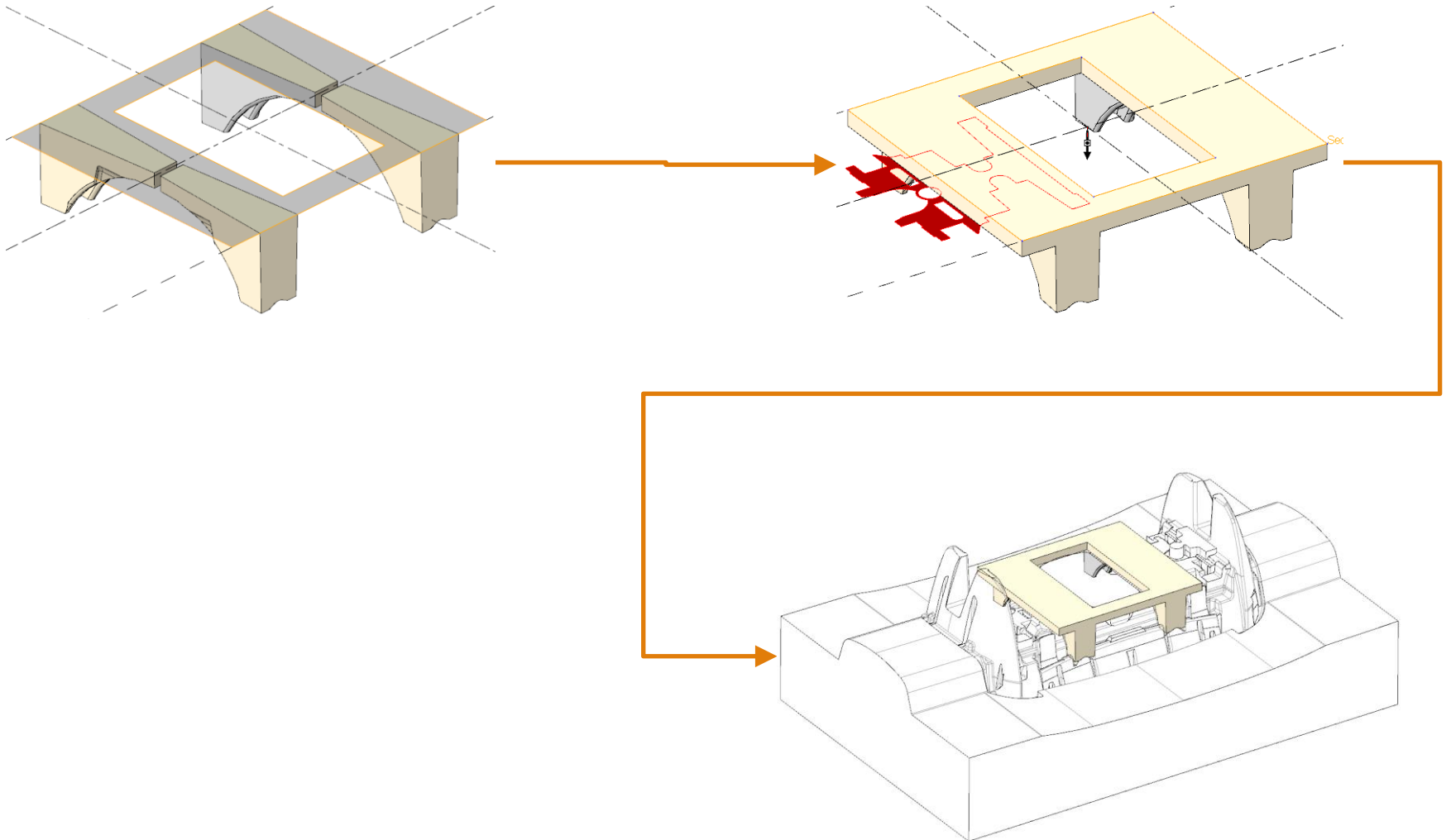


2

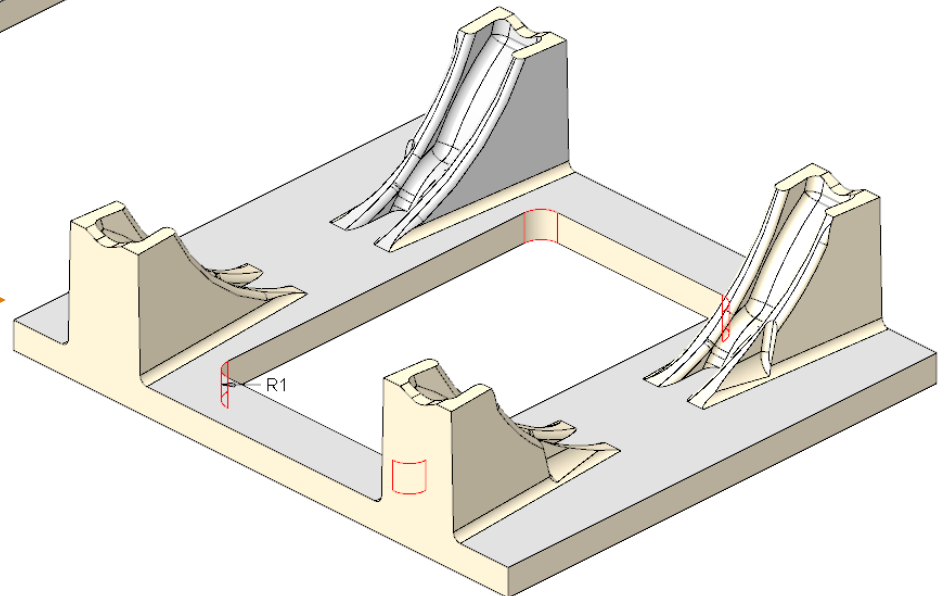
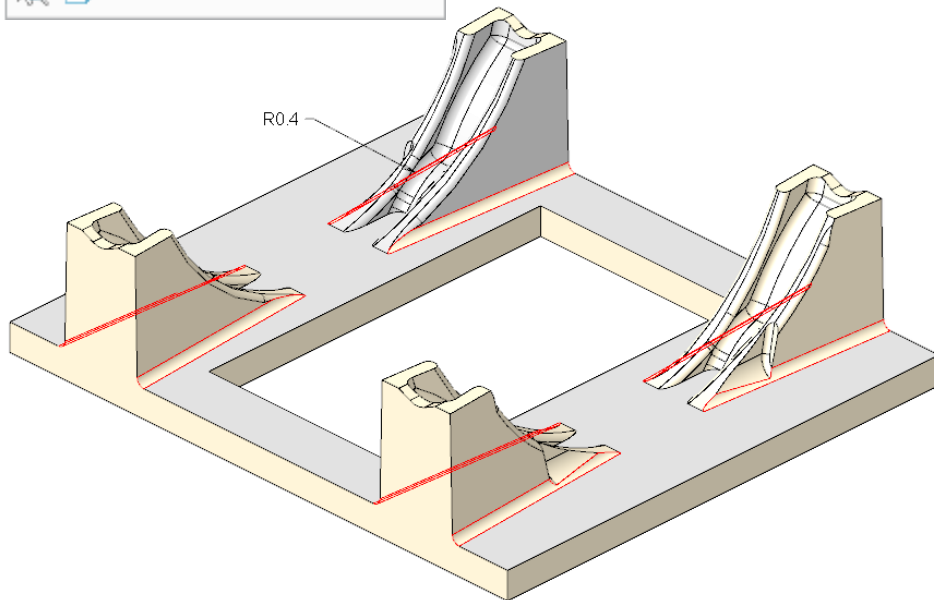
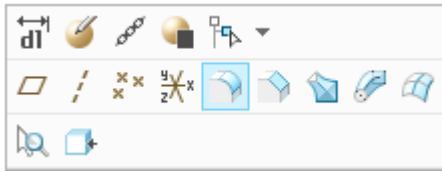


Detailing using...

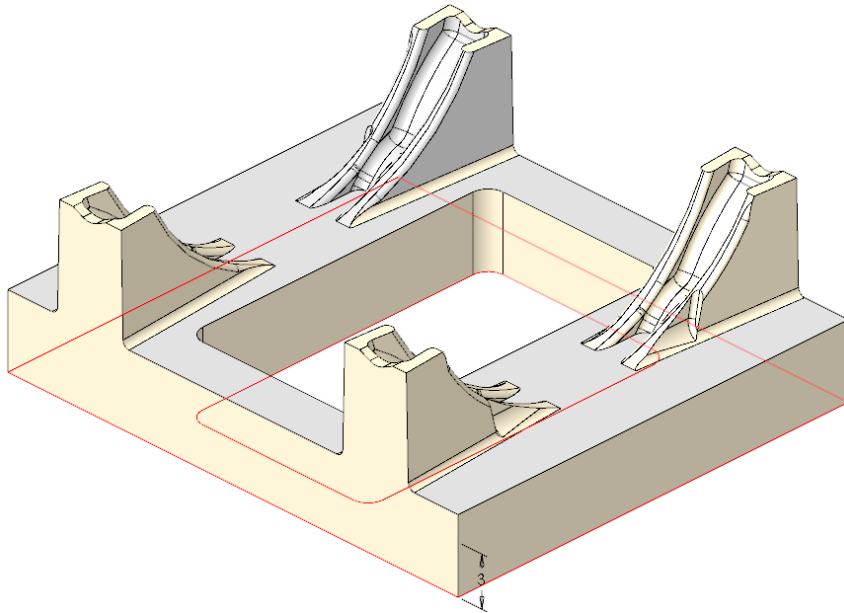
- Extrude



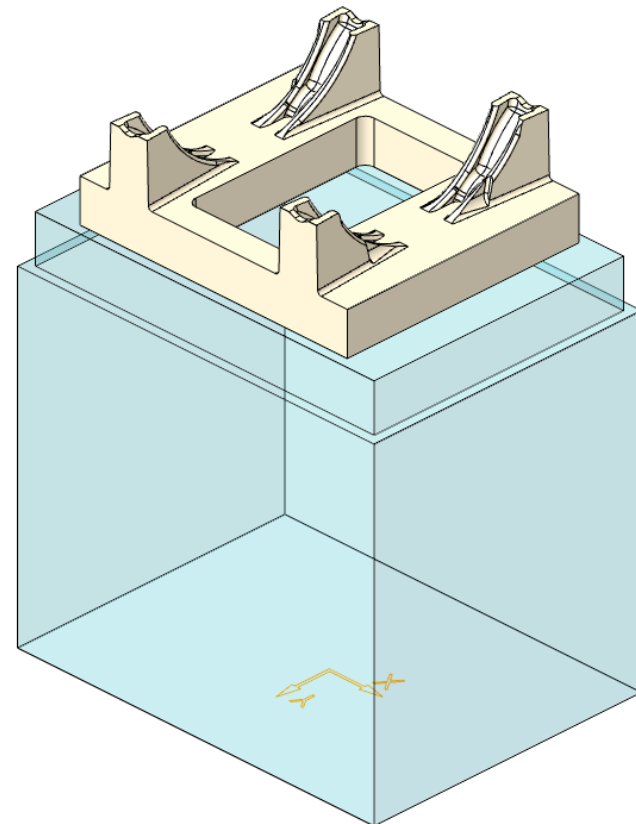
Electrode 11 – Detailing



Electrode 11 - Finish



- **Select FREE_FACE**
- **Finish electrode with base**



Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

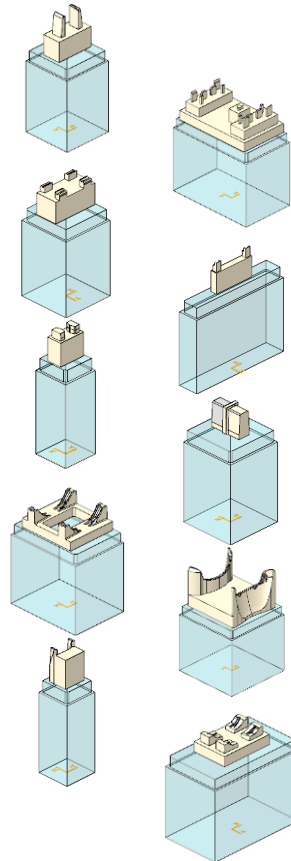
Electrode 10

Electrode 11

Electrode 12

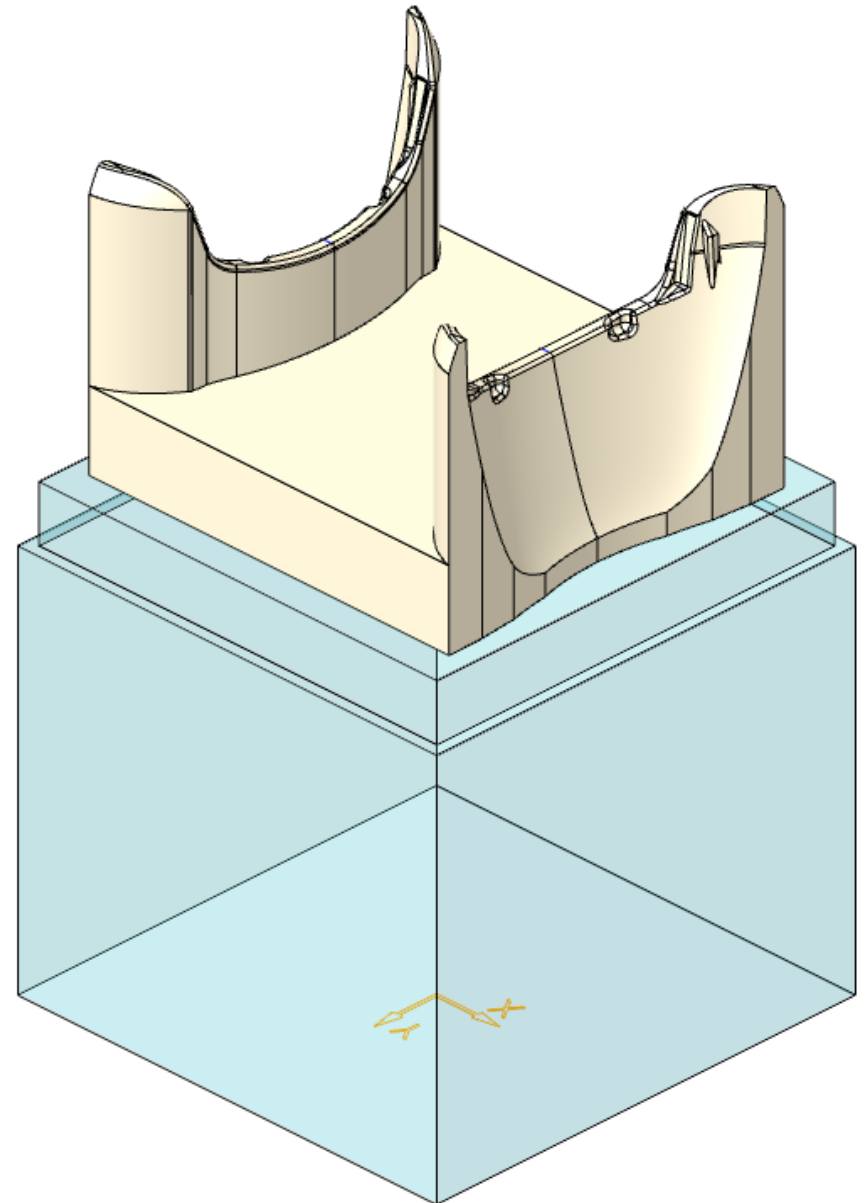
Electrode 13

Electrode 14

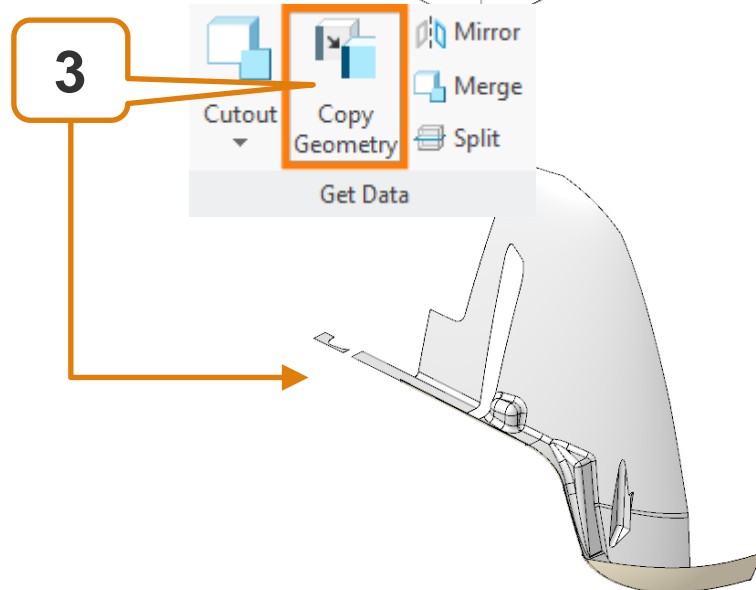
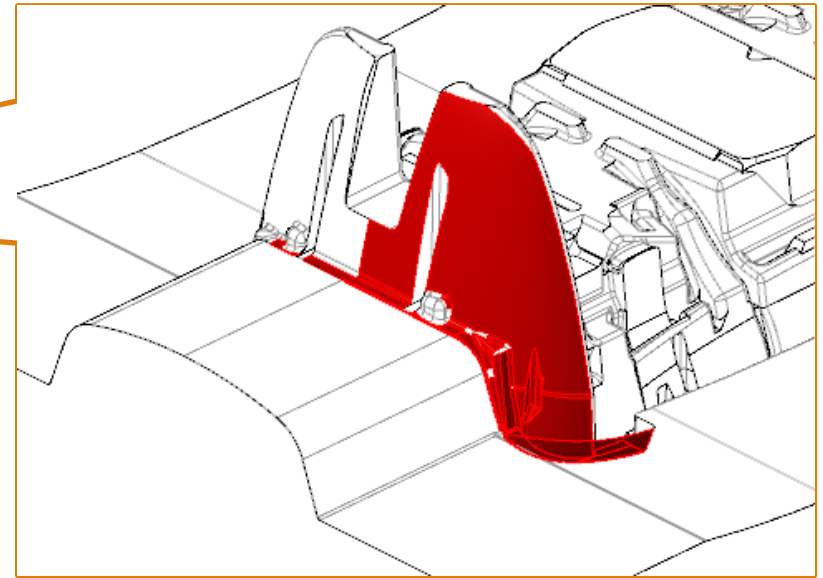
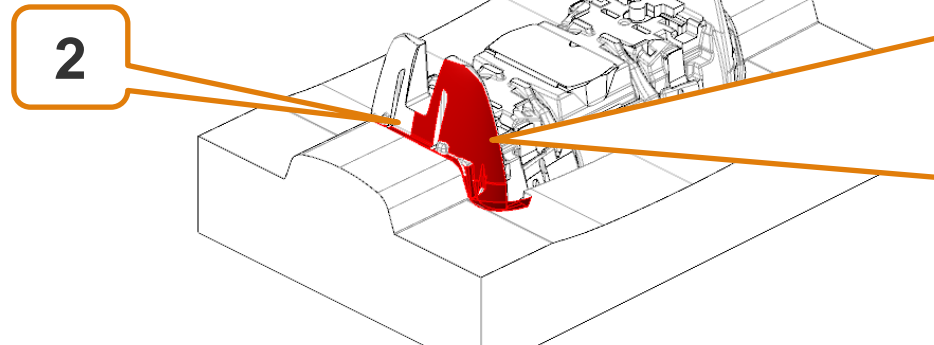
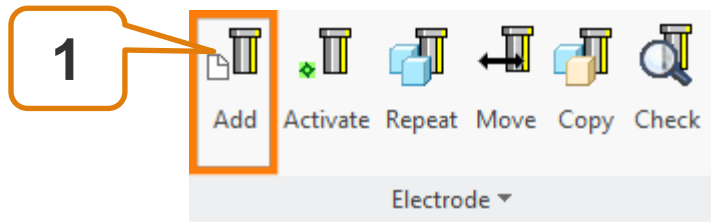


Topics...

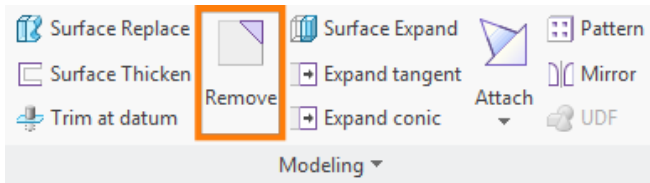
- Working with surfaces



Electrode 12 – Get Data

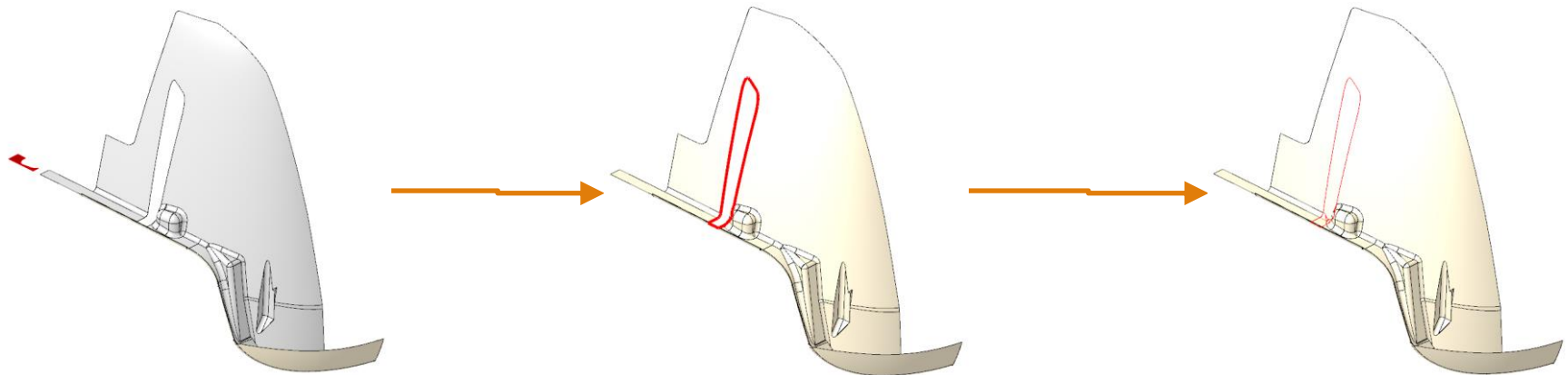


Electrode 12 – Detailing

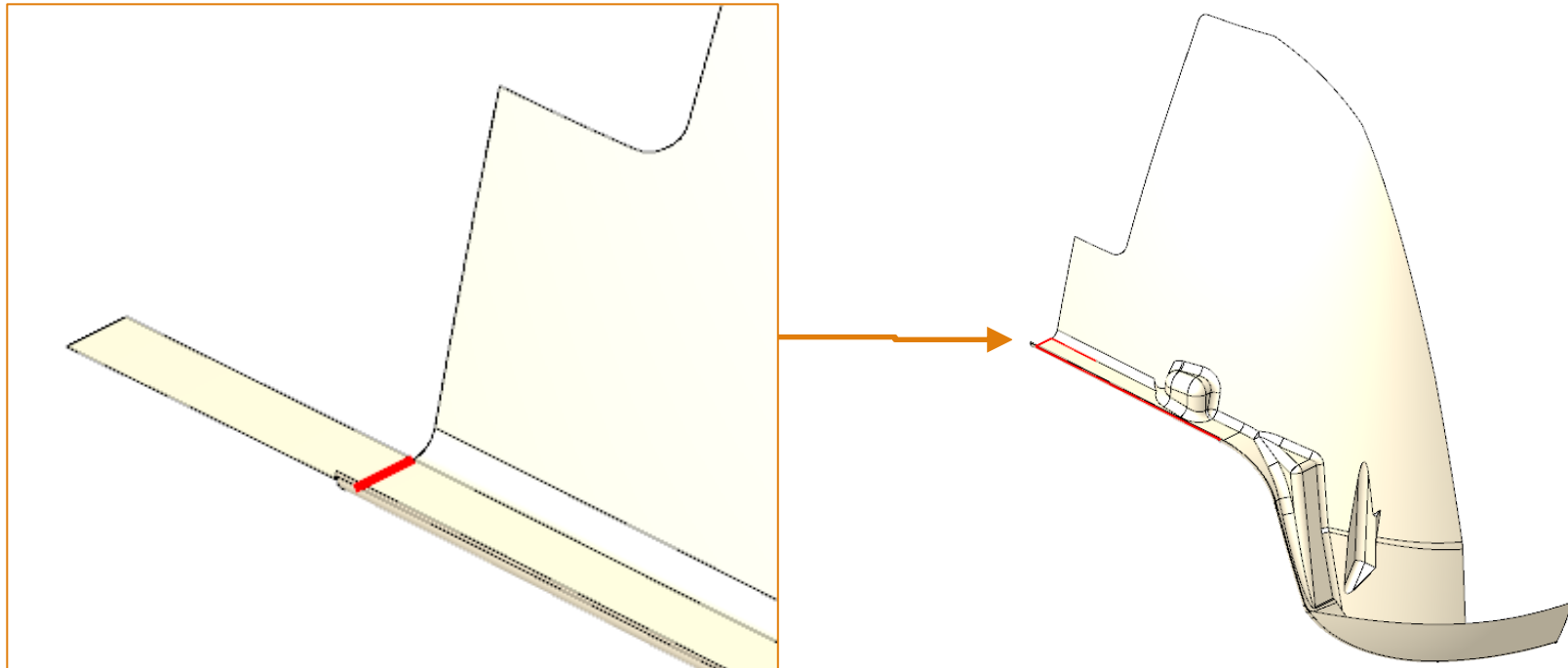


Detailing using...

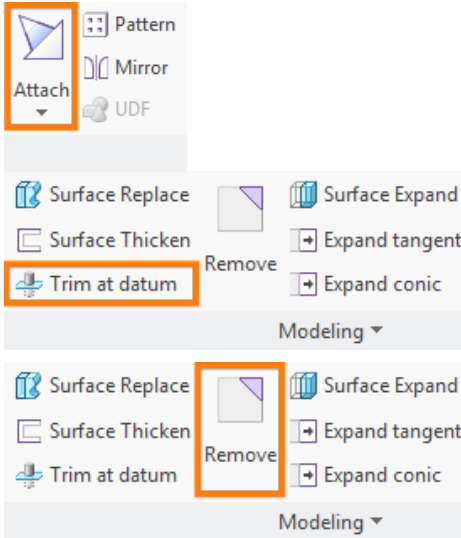
- **Copy surfaces**
- **Remove patch from quilt**
- **Remove contour from quilt**



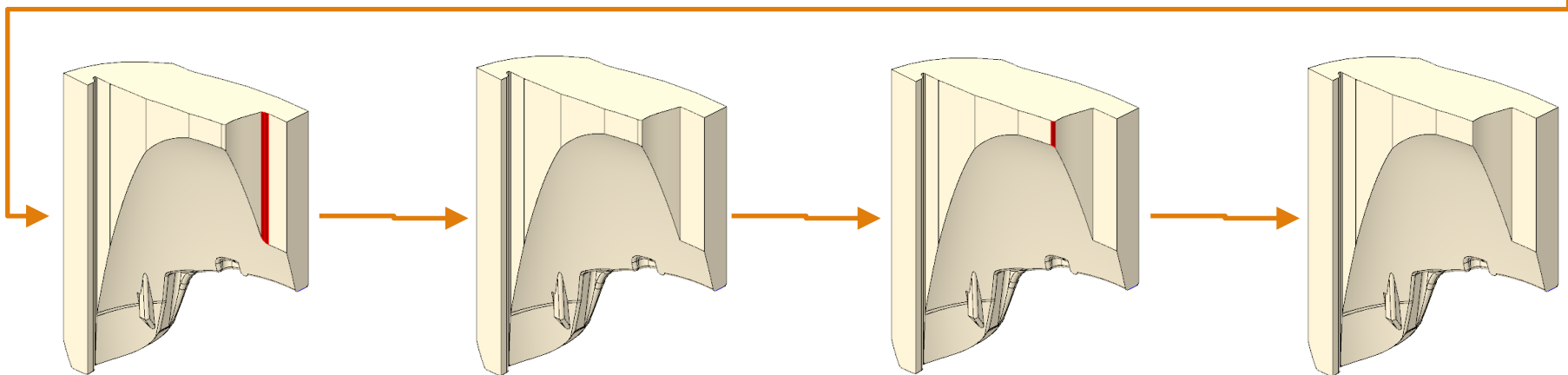
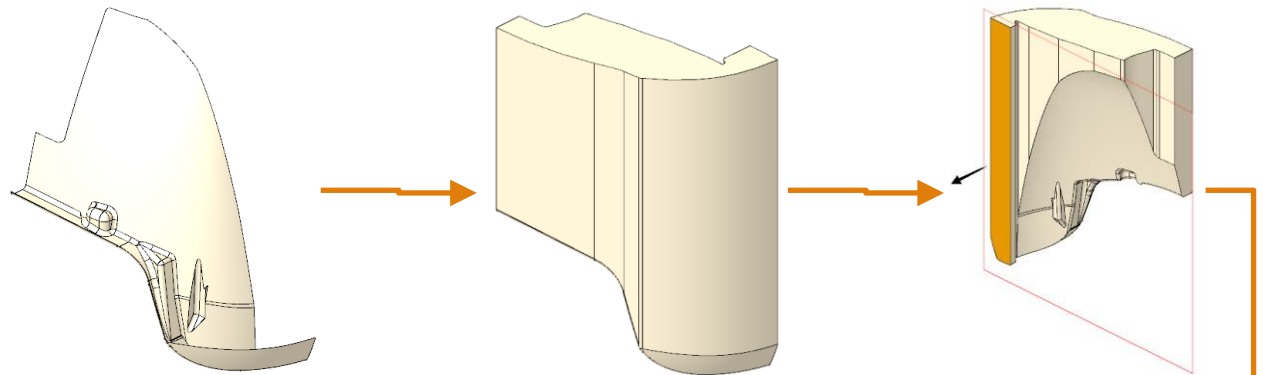
- Trim at created curve



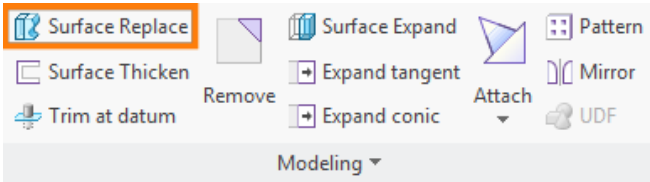
Electrode 12 – Detailing



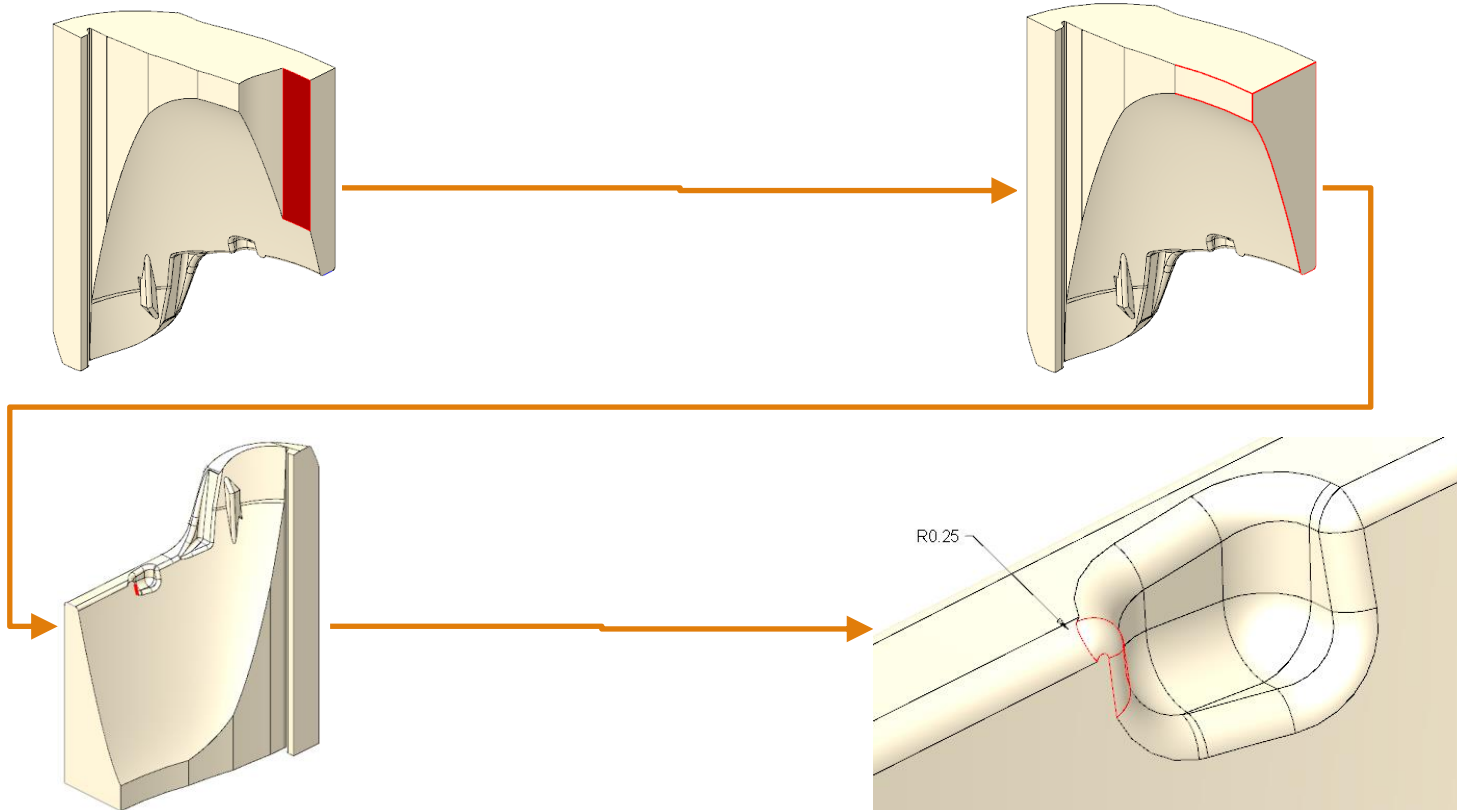
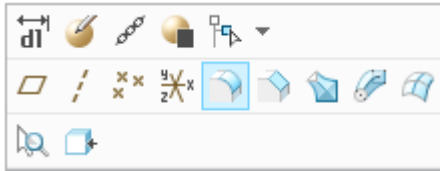
- **Attach quilt**
- **Trim at datum**
- **Remove**



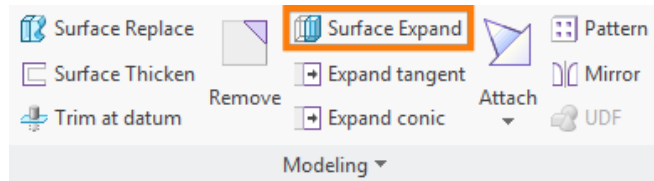
Electrode 12 – Detailing



- **Replace surface**
- **Rundung**

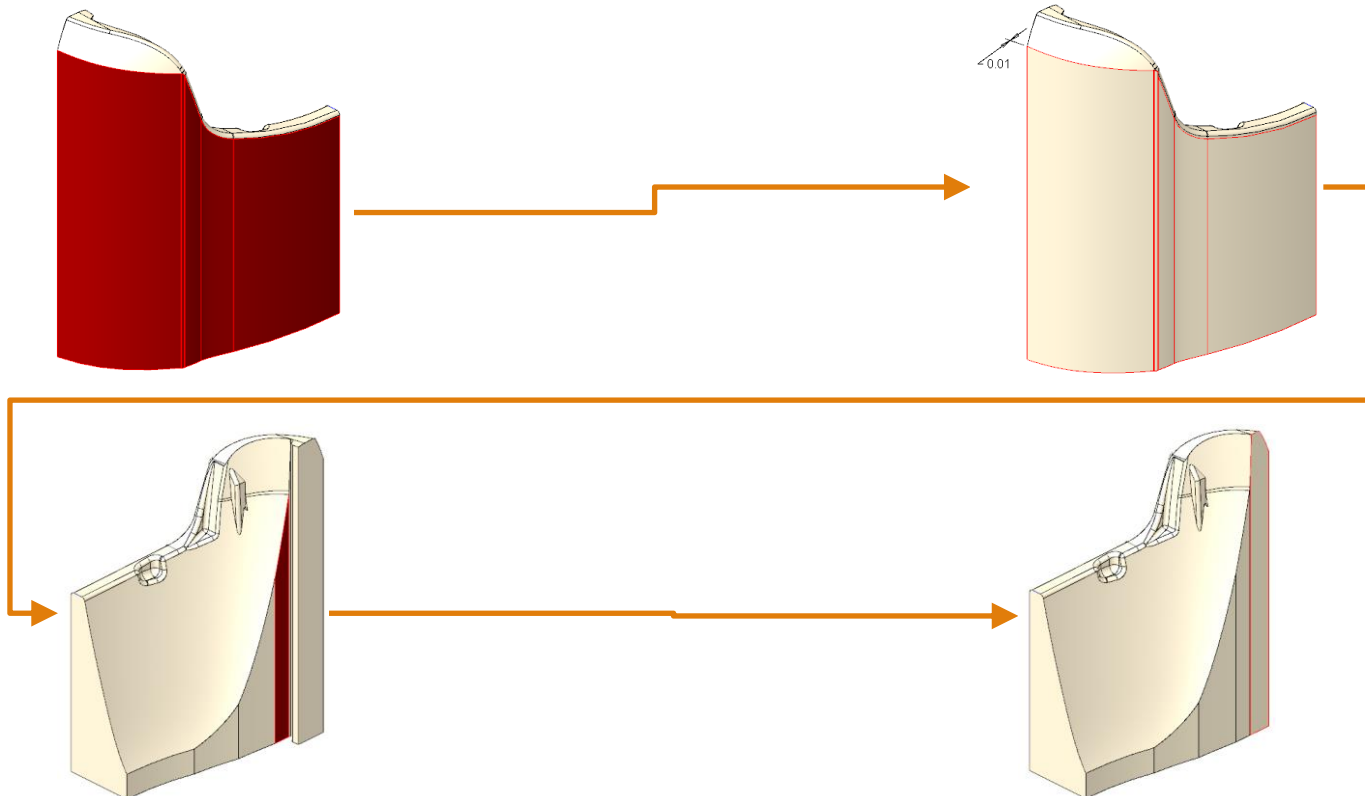
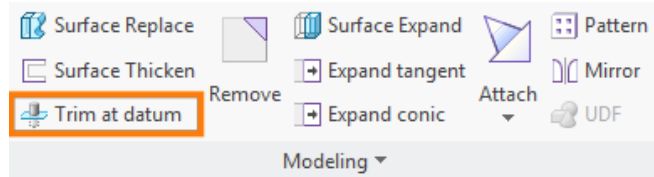


Electrode 12 – Detailing

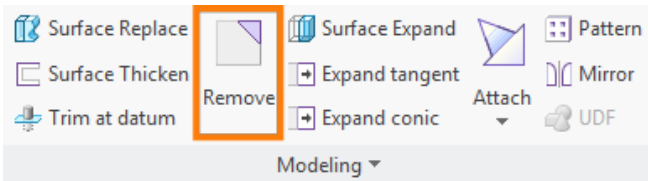


Detailing using...

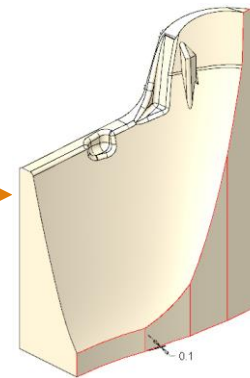
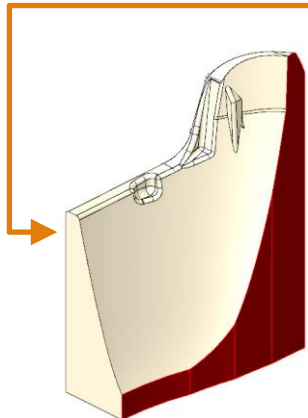
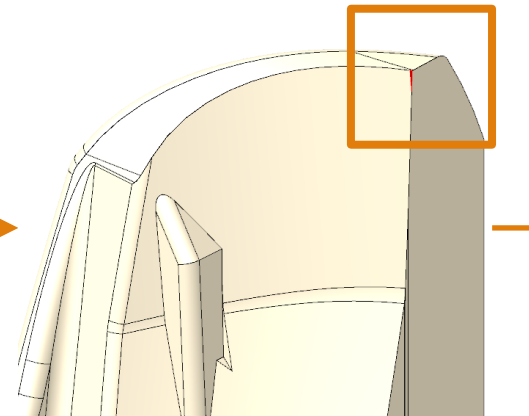
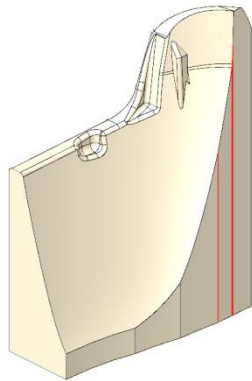
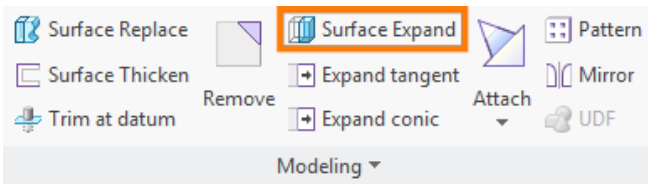
- **Surface expand (0.01)**
- **Trim at datum**



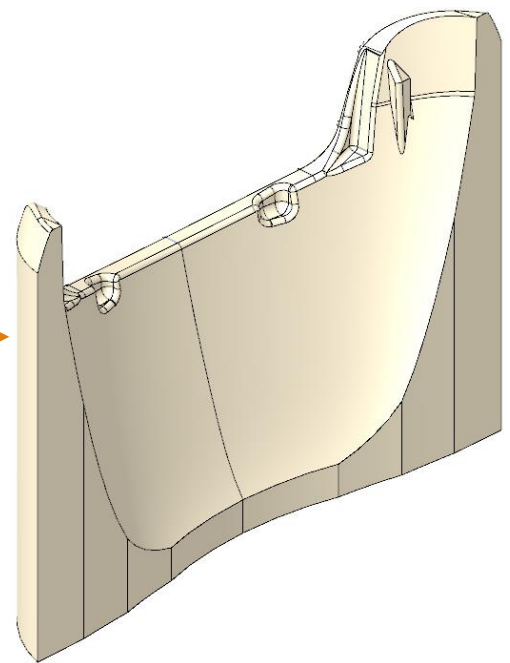
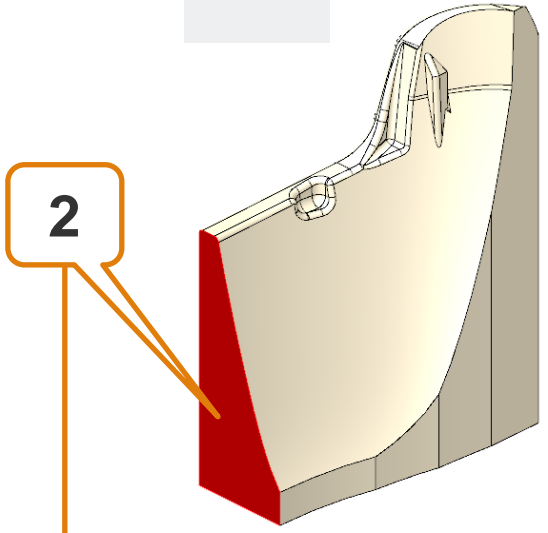
Electrode 12 – Detailing



- **Remove**
- **Expand (0.1)**

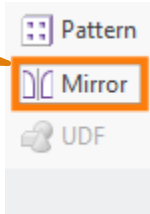


Electrode 12 – Mirror

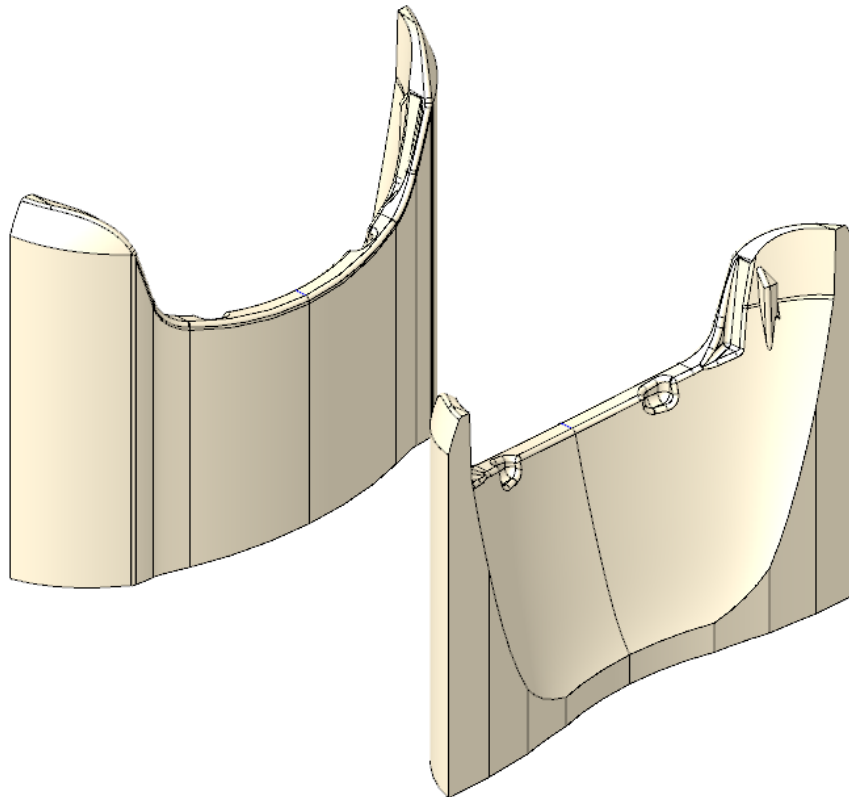


Electrode 12 – Mirror

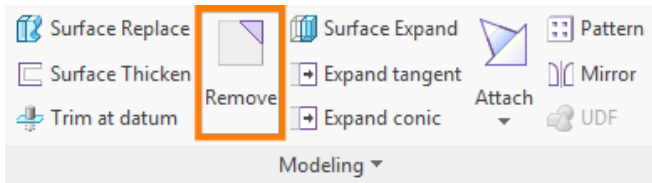
1



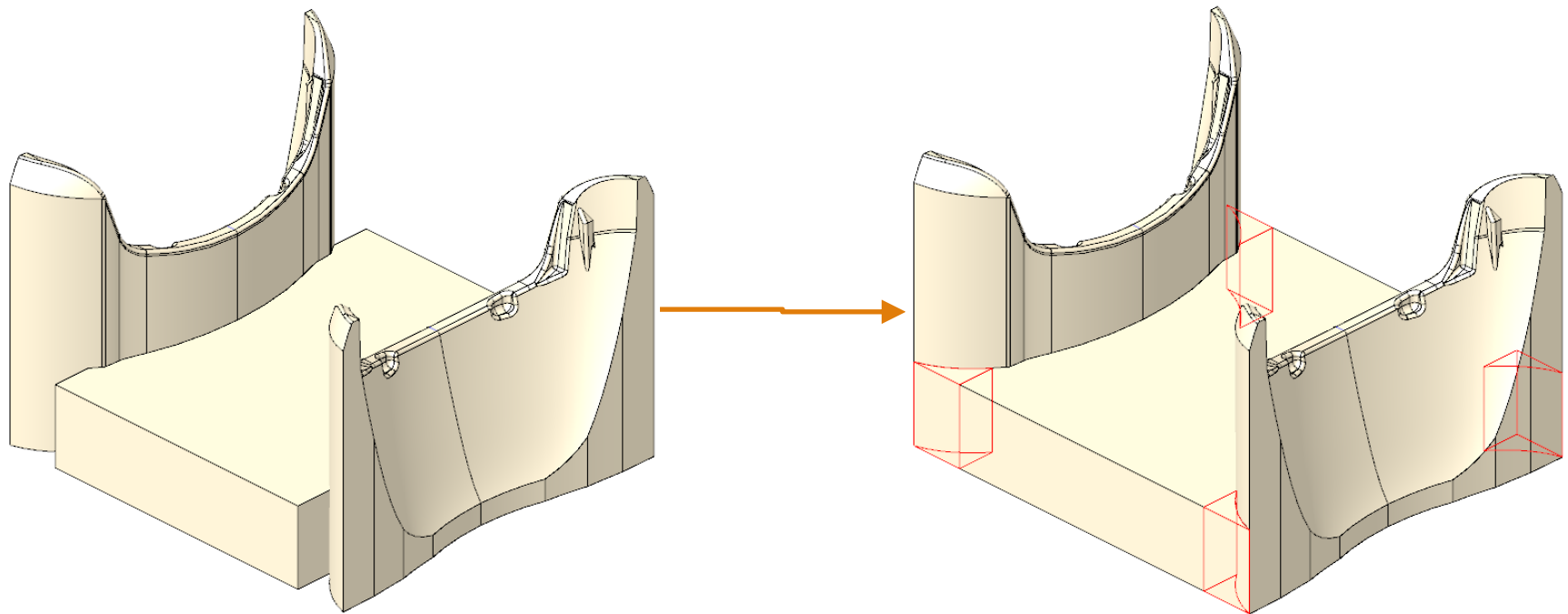
- Use created datum plane for mirror



Electrode 12 – Detailing

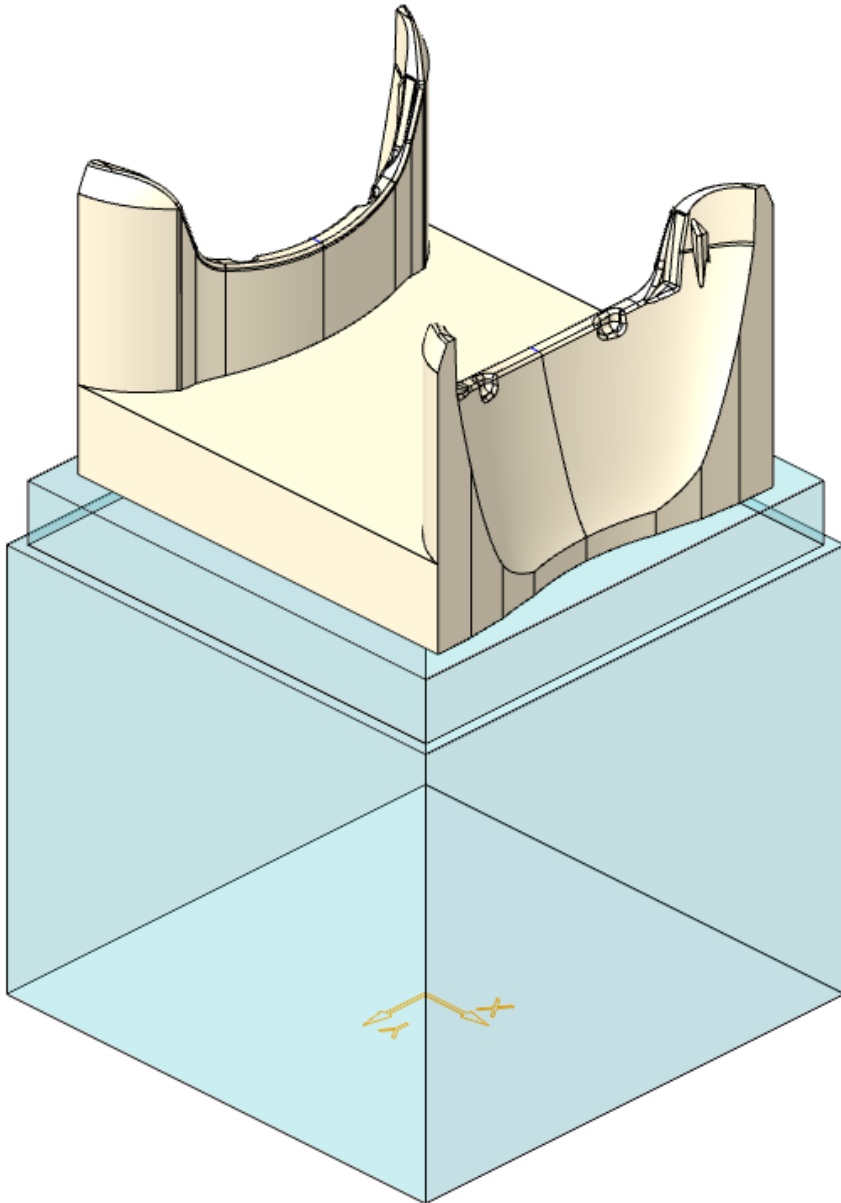


- **Create extrusion to connect solids**
- **Remove**



Electrode 12 - Finish

- Create support
- Finish electrode with base



Electrode 12 – Assemble Again

1

2

Activate
Properties
Repeat
Copy
Classify
Rename

3

Assemble Again x

Reference Models: 1 model(s) selected

Move Reference: OP_ASM_REF_CSYS_1

Move type: Relative Absolute

| Translation | | Rotation | |
|-------------|--------------|----------|------------|
| X (R) | -40.90000057 | X (A) | 0.00000000 |
| Y (G) | 0.00000000 | Y (B) | 0.00000000 |
| Z (B) | 2.47831923 | Z (C) | 0.00000000 |

OK Cancel

Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

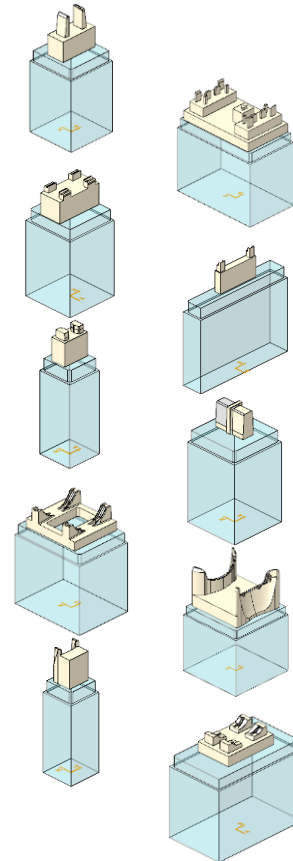
Electrode 10

Electrode 11

Electrode 12

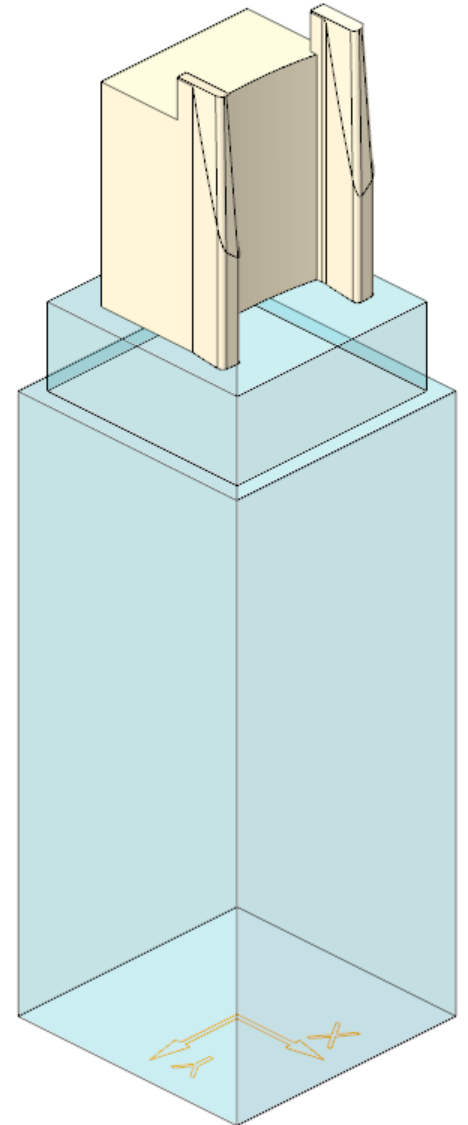
Electrode 13

Electrode 14

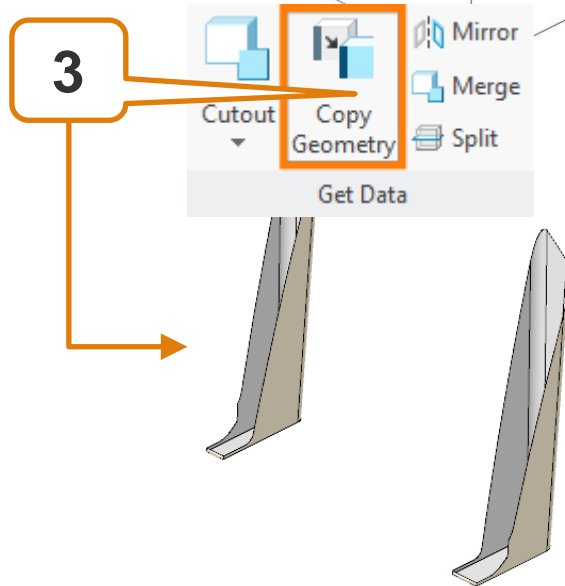
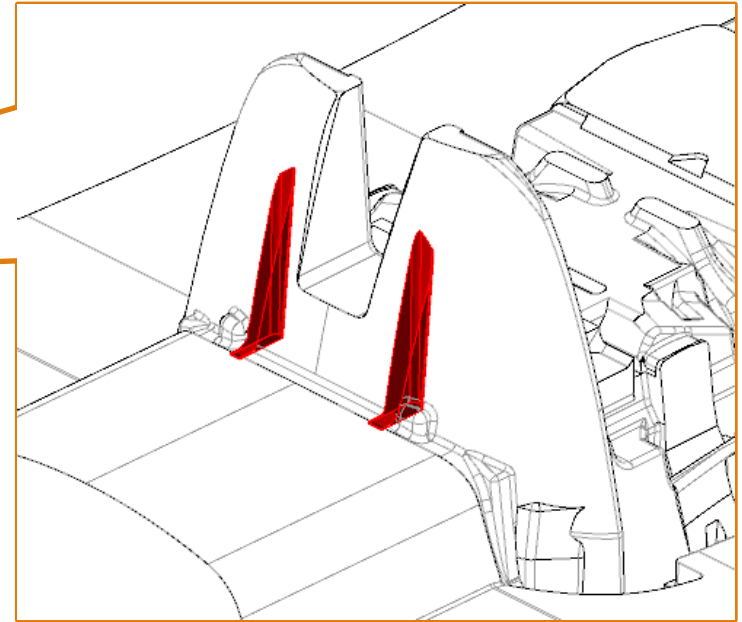
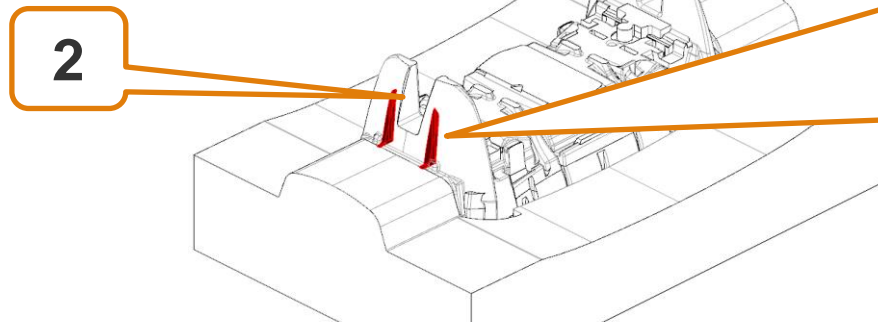
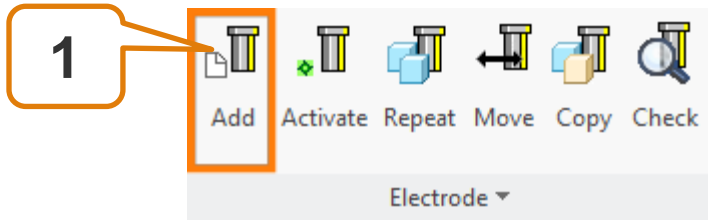


Topics...

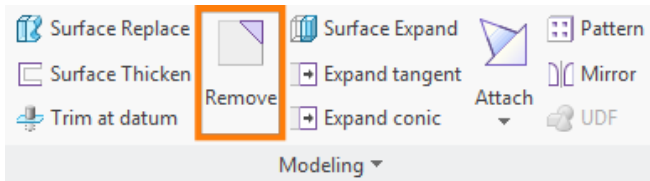
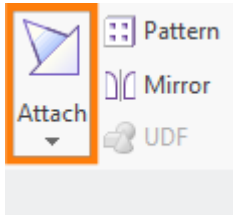
- Working with surfaces



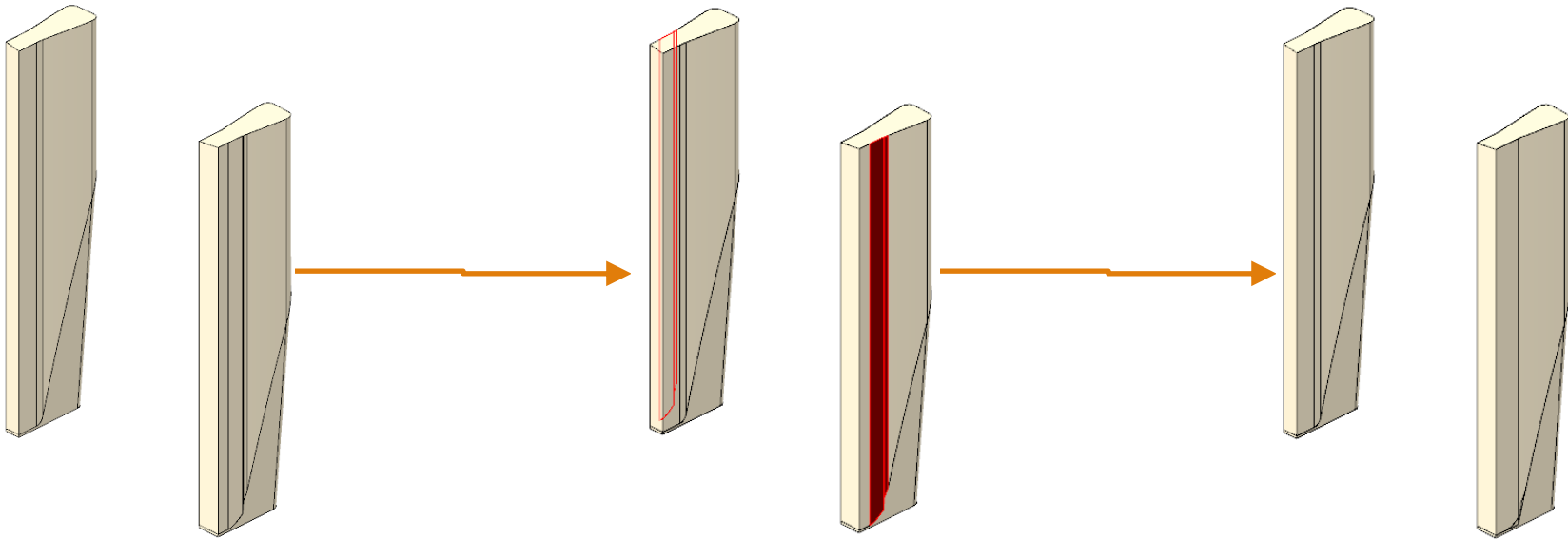
Electrode 13 – Get Data



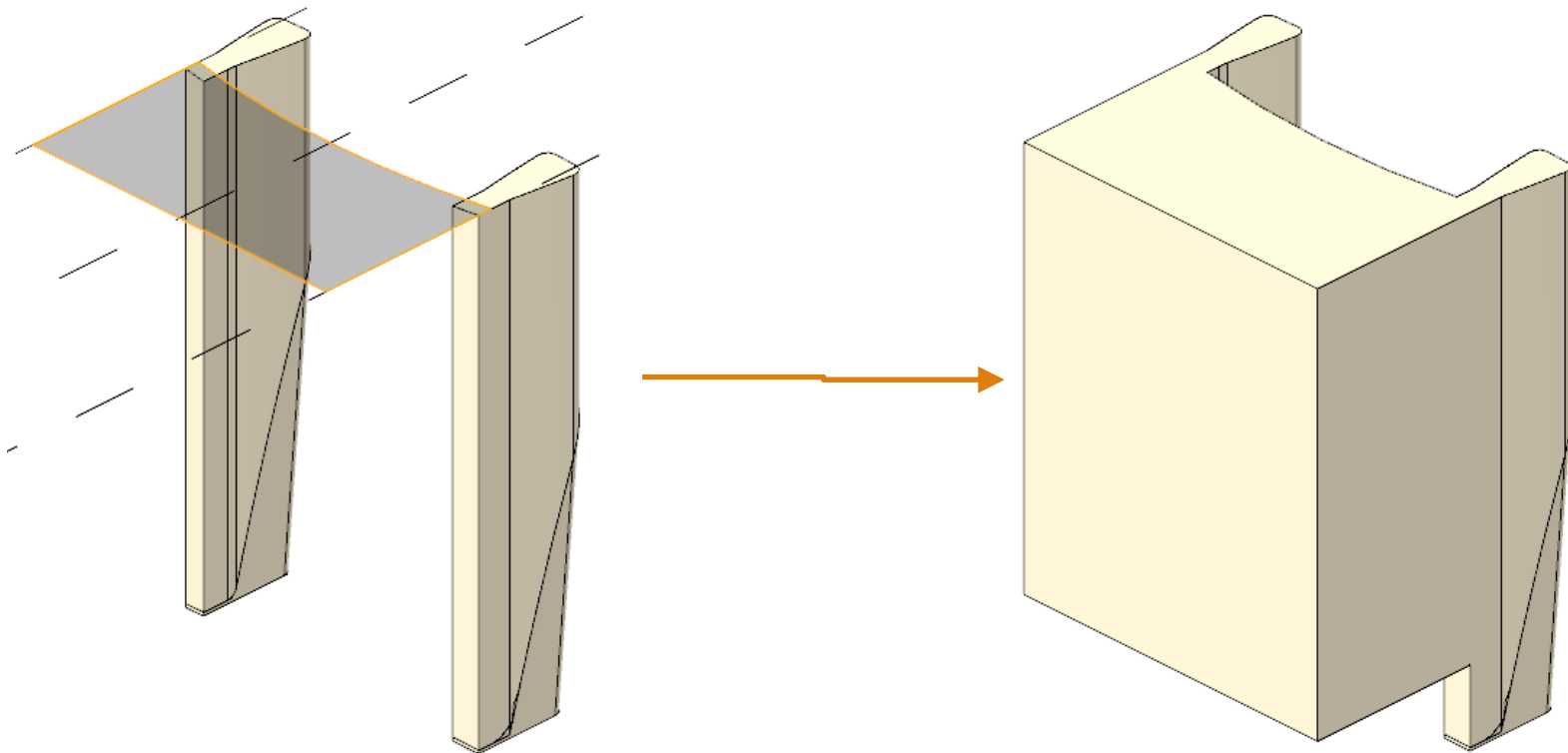
Electrode 13 – Detailing



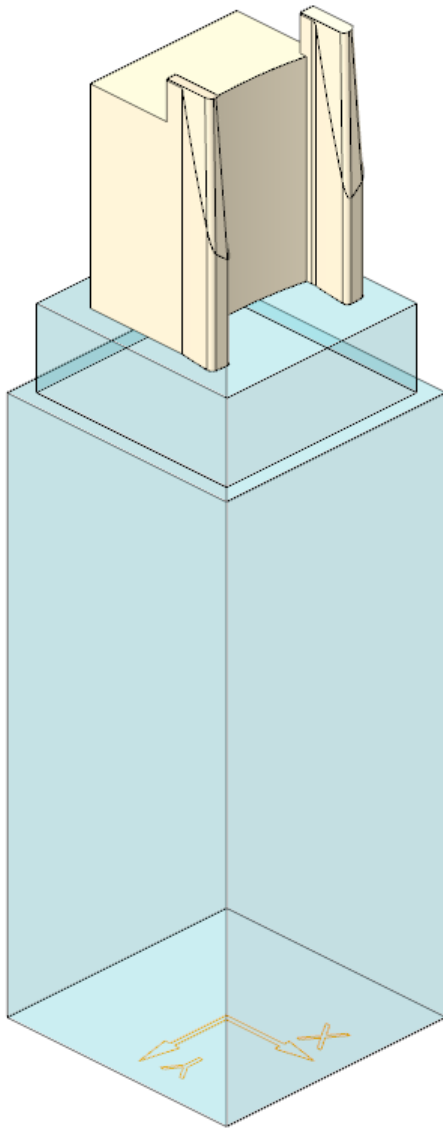
- **Attach quilt**
- **Remove**



- Use extrude to create connection



Electrode 13 - Finish



- **Finish electrode with base**

Training

Electrode 5

Electrode 6

Electrode 7

Electrode 8

Electrode 9

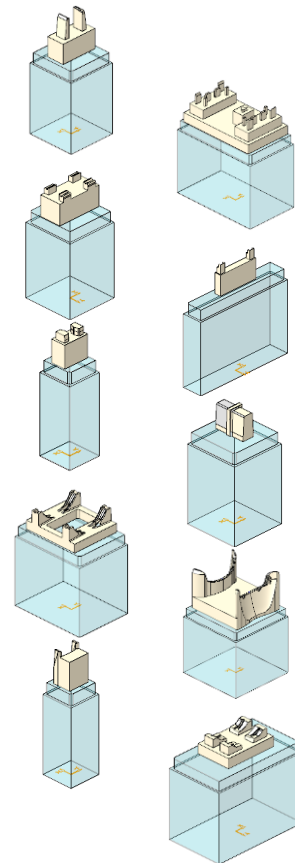
Electrode 10

Electrode 11

Electrode 12

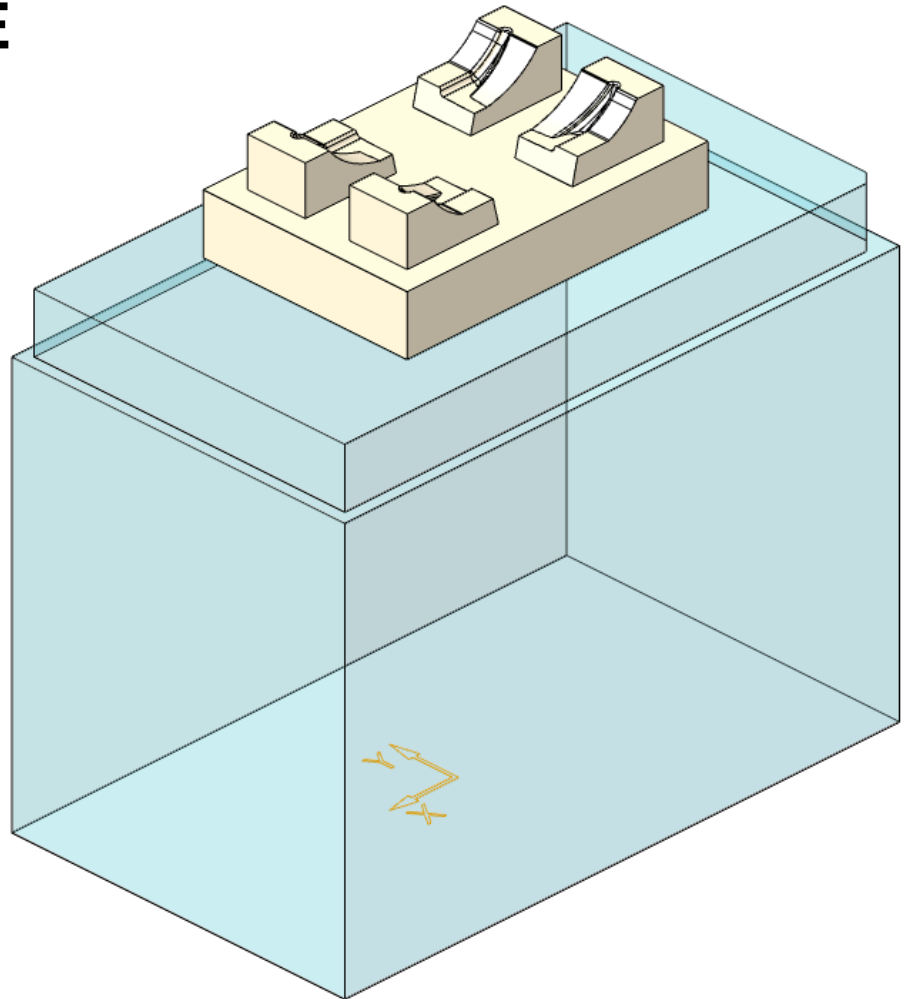
Electrode 13

Electrode 14

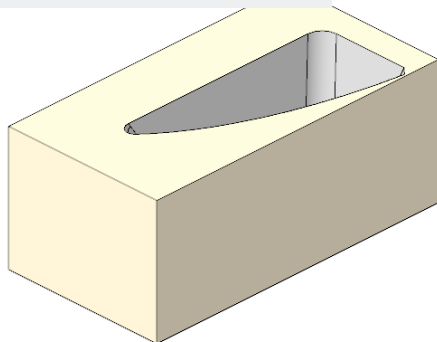
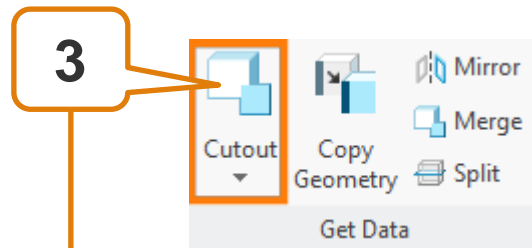
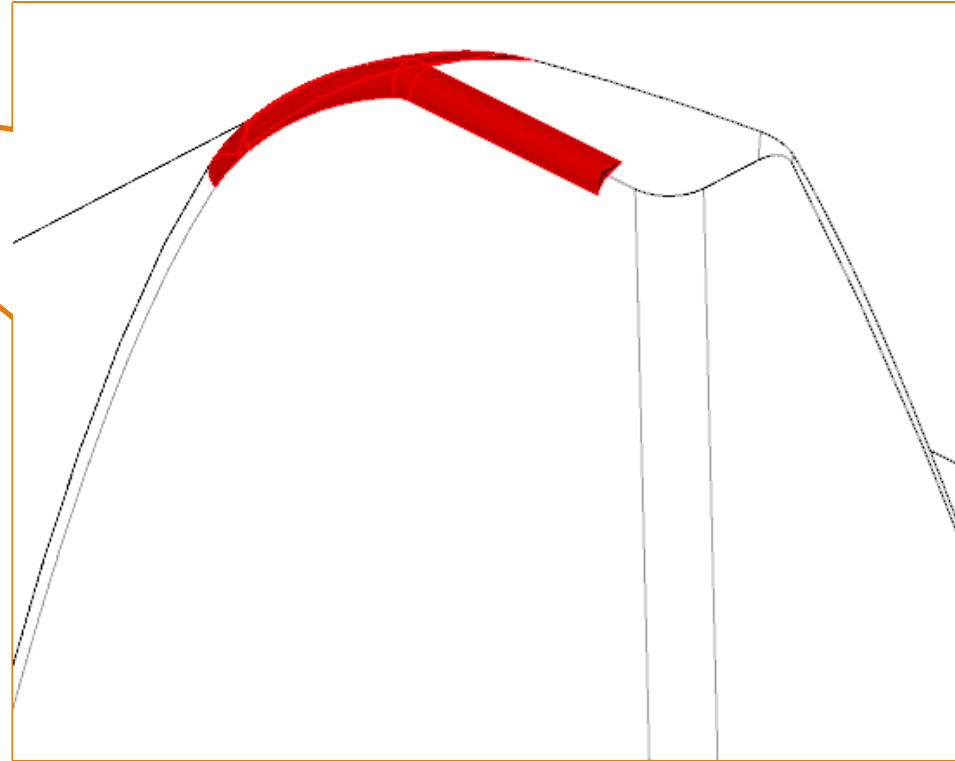
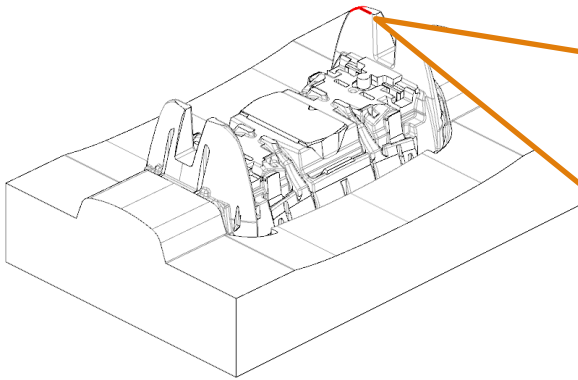


Topics...

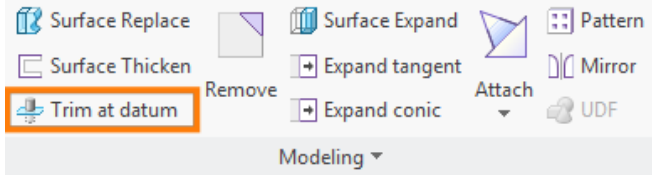
- Cut out with Creo extrude
- User defined FREE_FACE



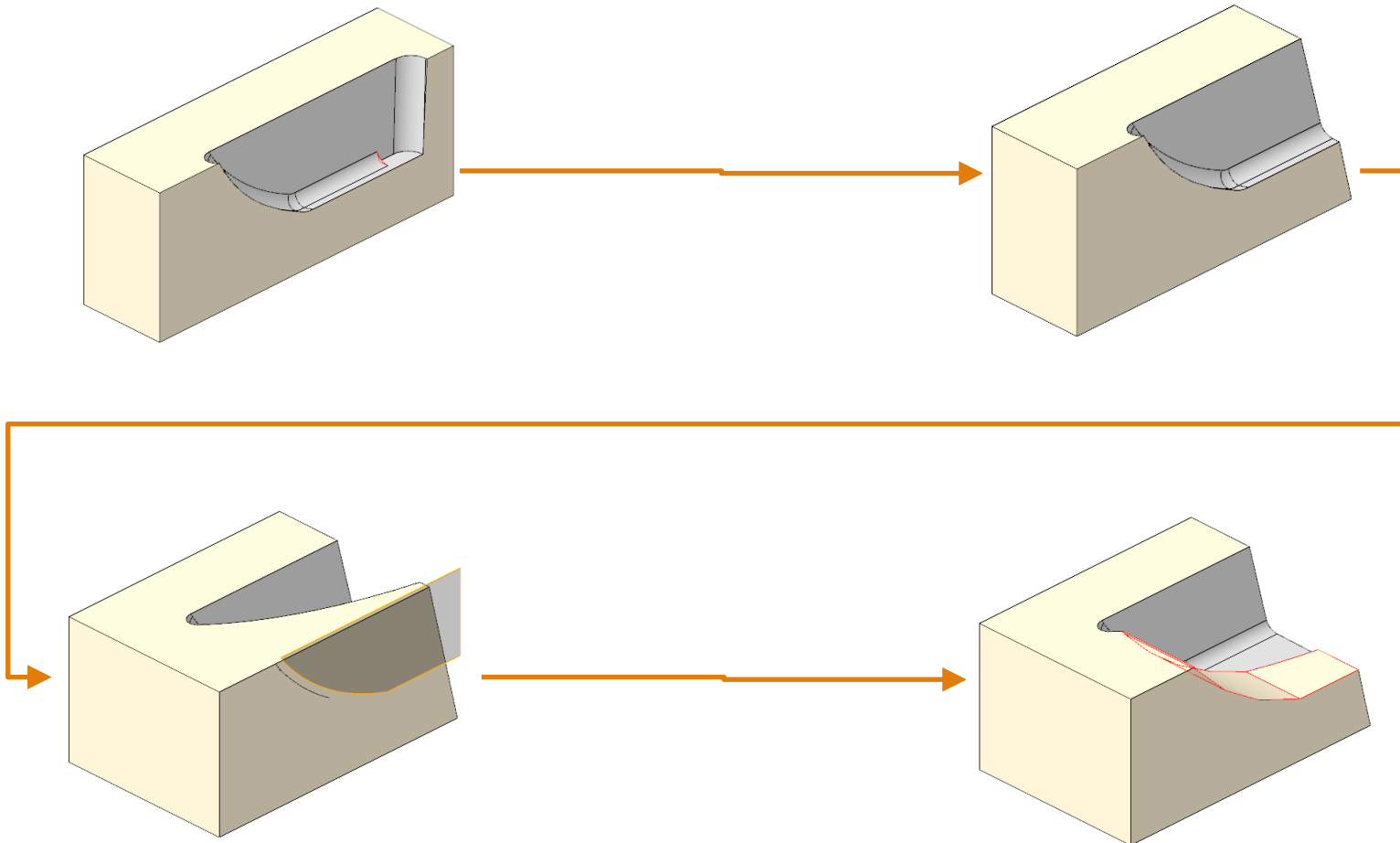
Electrode 14 – Get Data



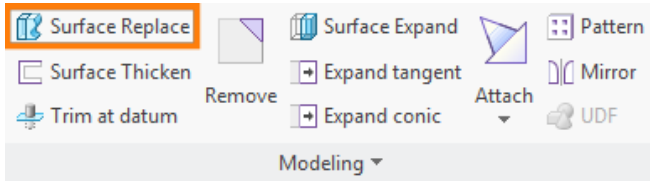
Electrode 14 – Detailing



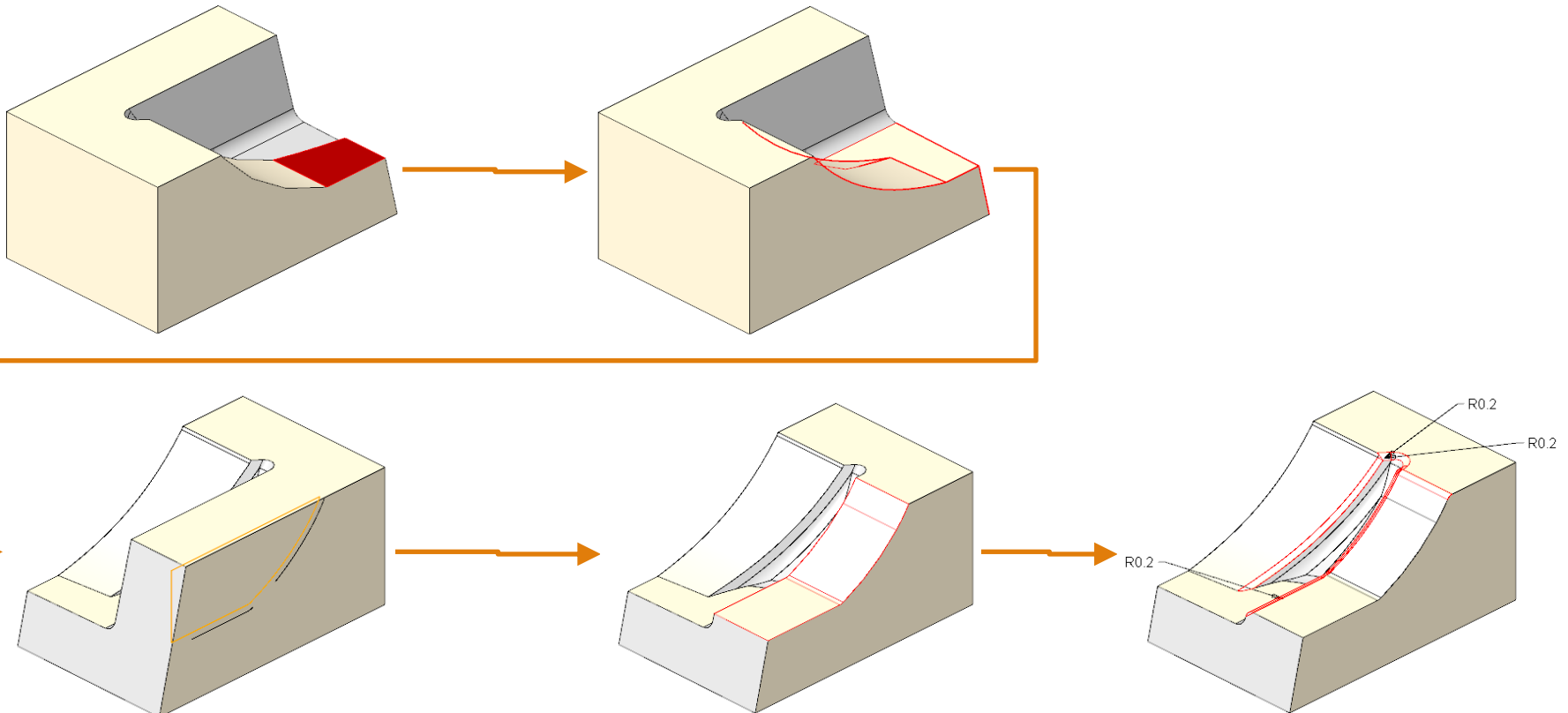
- Trim at datum
- Cut out using Creo extrude



Electrode 14 – Detailing

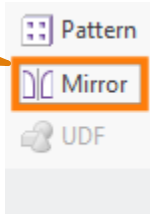


- **Replace surface**
- **Cut out using Creo extrude**
- **Add rounds (0.2)**

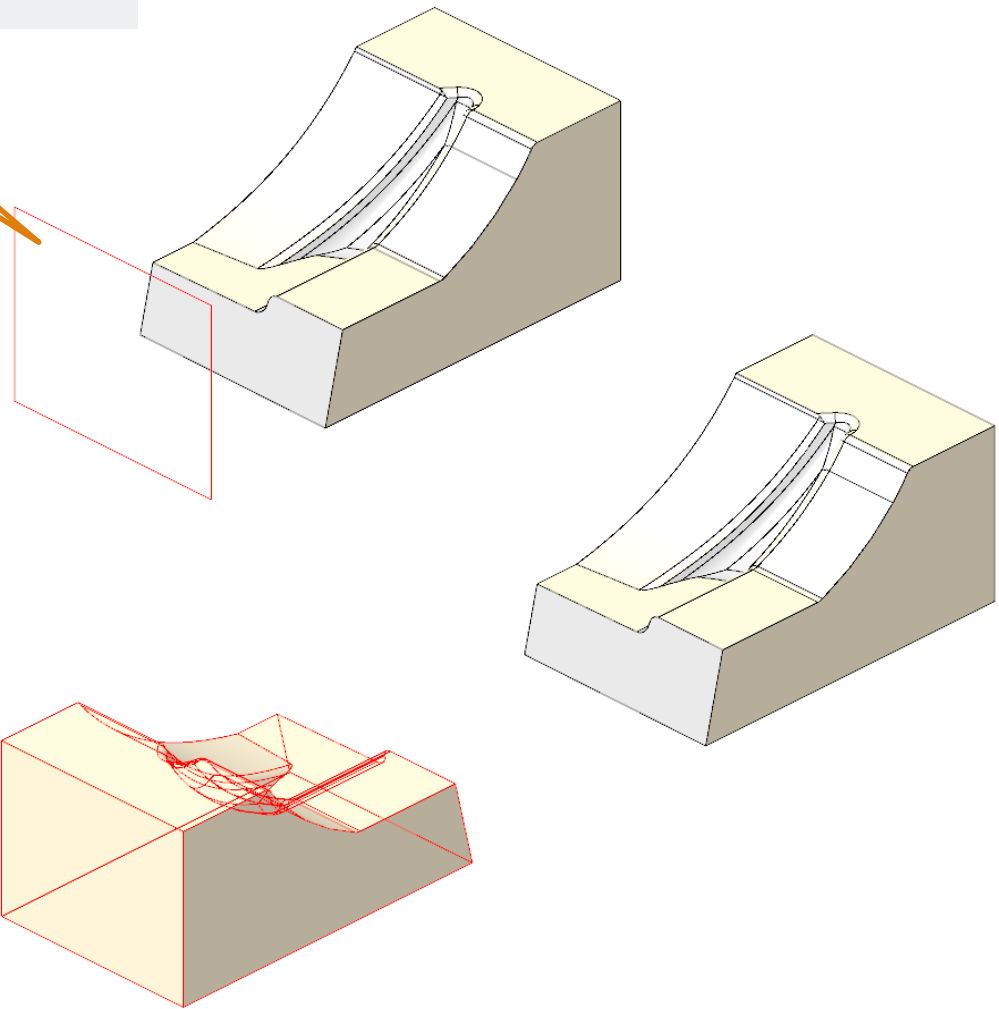


Electrode 14 – Mirror

1

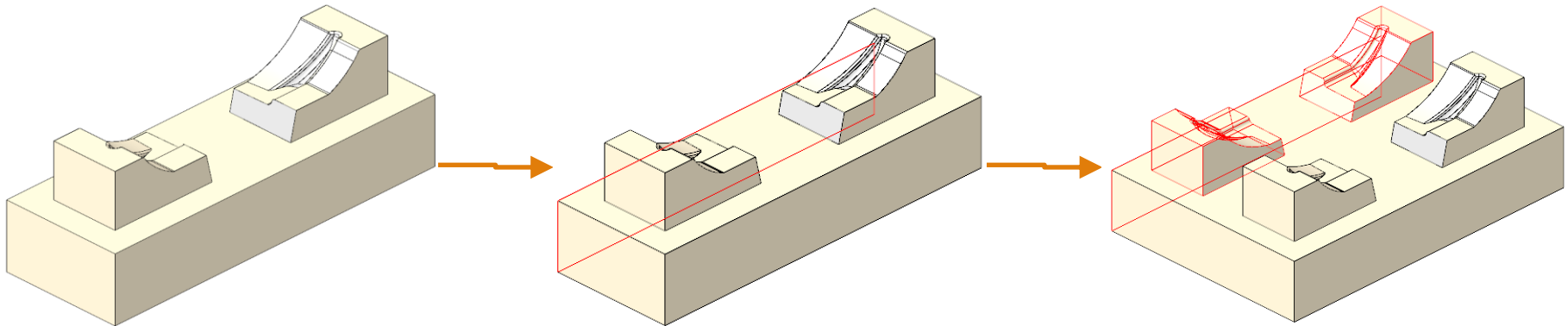
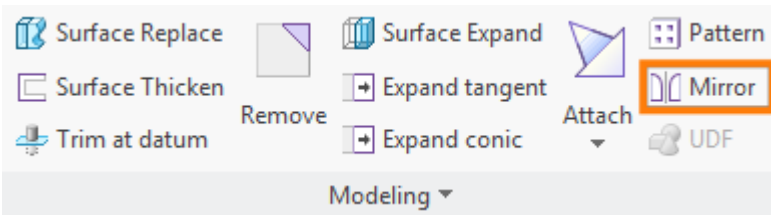
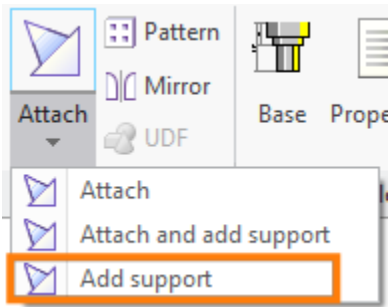


2

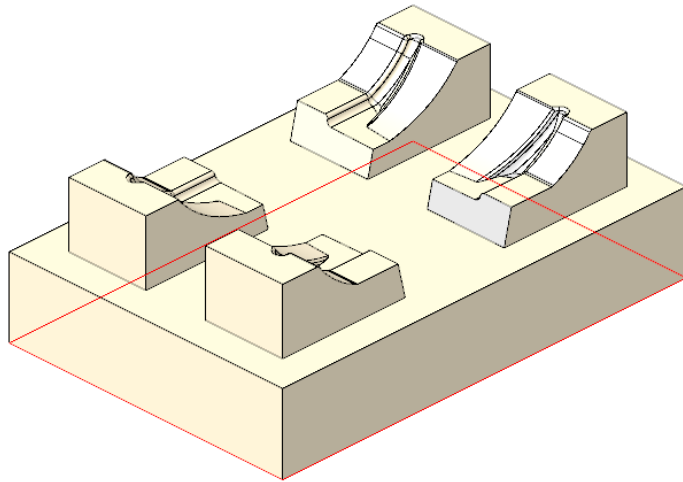


Electrode 14 – Detailing

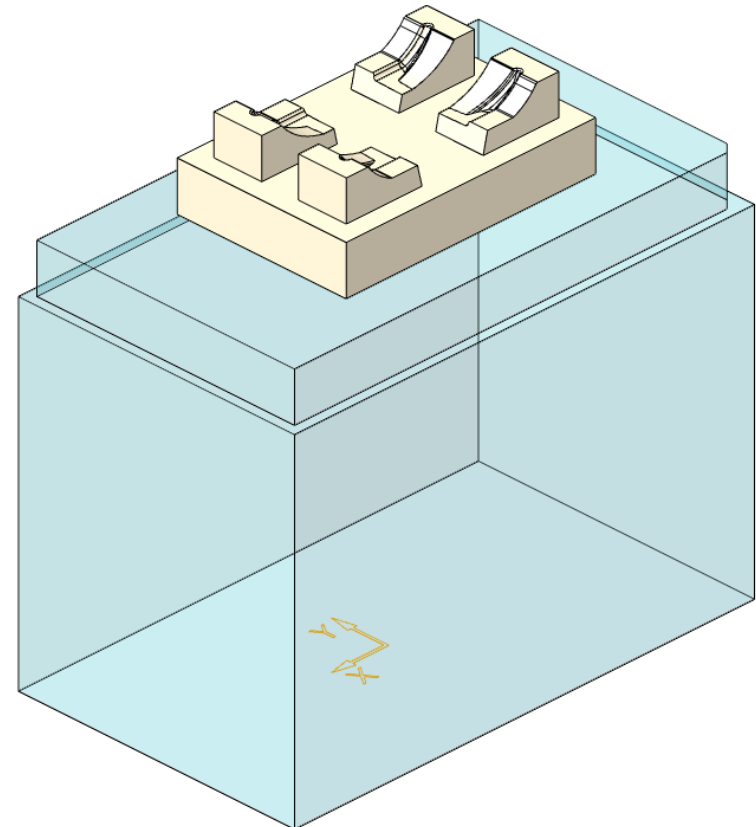
- Create support
- Mirror



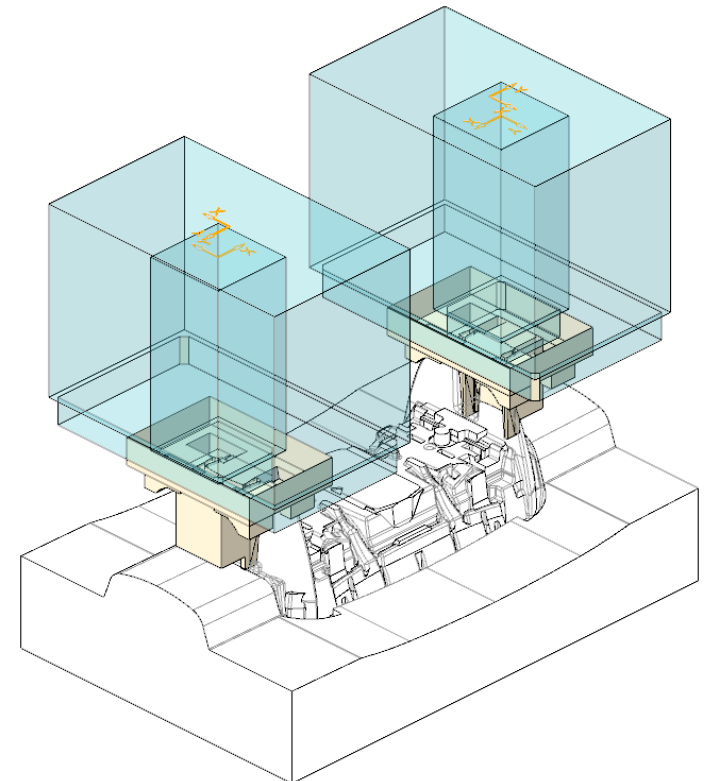
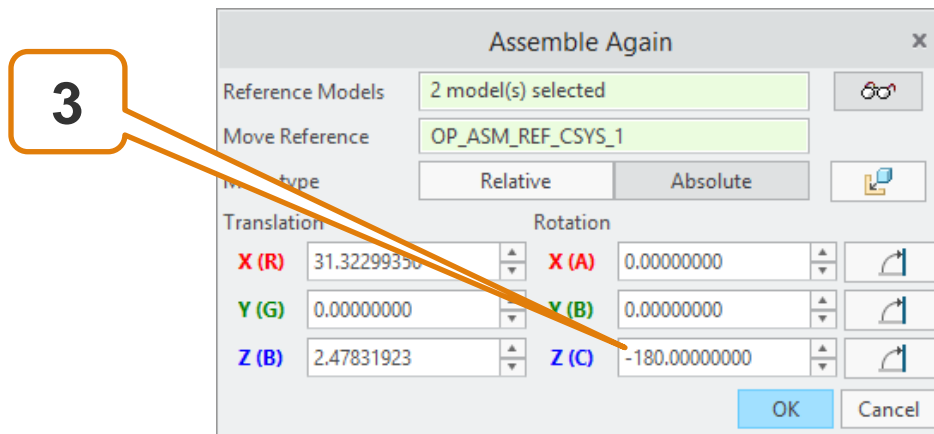
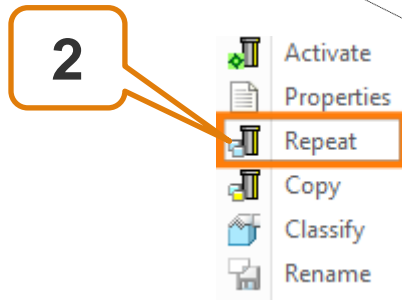
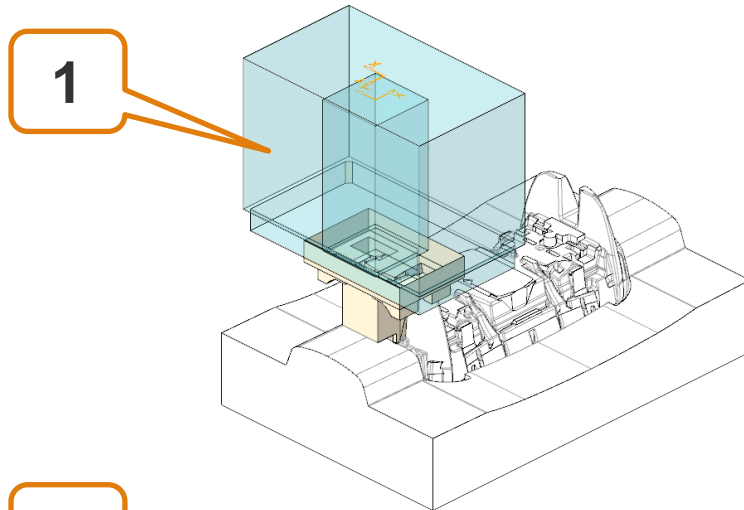
Electrode 14 - Finish



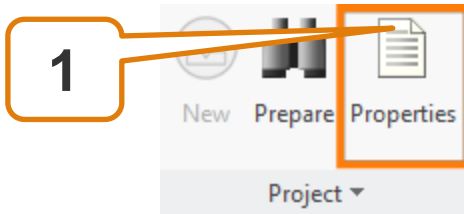
- **Select FREE_FACE**
- **Finish electrode with base**



Electrodes 13 & 14 – Assemble Again



Set Electrode Properties



- **Set properties/parameters of**
 - Active component
 - Main Assembly
 - Workpieces/Cores
 - Electrodes
- **System parameters (2) are locked and can't be edited**
- **Unlock normal parameters (3) to overwrite default value (4)**

More User Interfaces

- Check Electrodes

- Holder

- Drawings

- Manufacturing

- Output

- Burnsheet

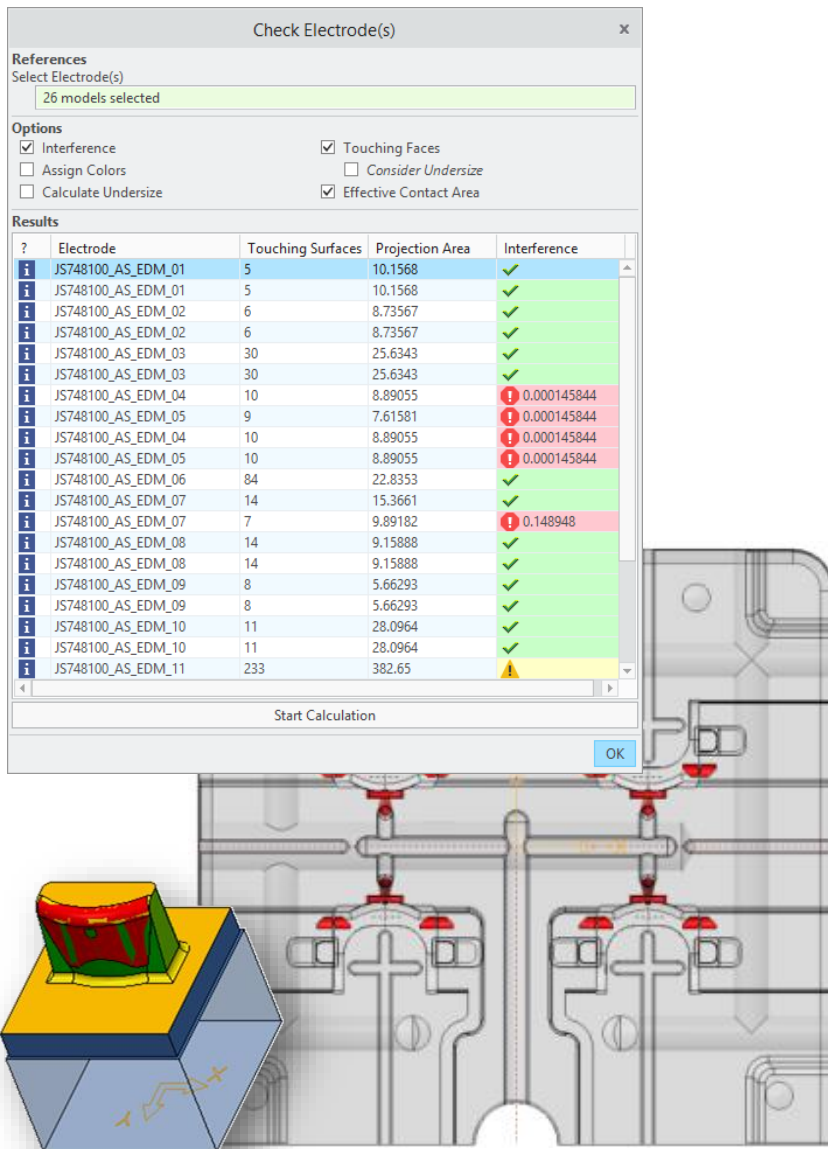
Best Practices

- Modeling

- Design Changes

- Regeneration Behavior in Creo

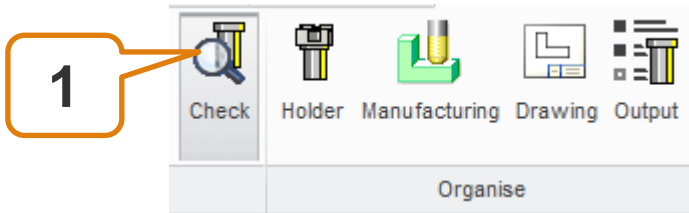
More User Interfaces - Check Electrodes



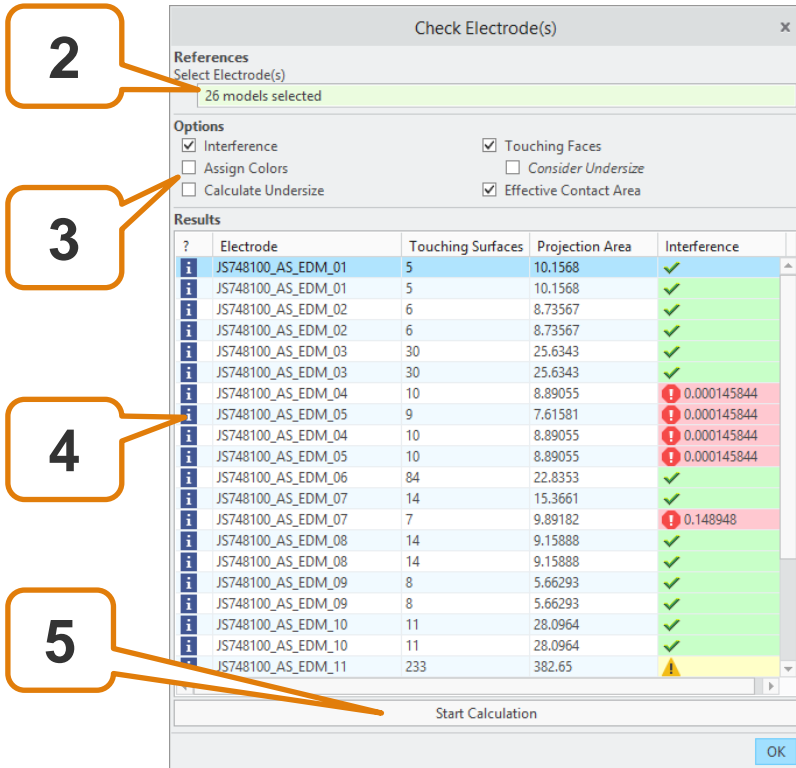
Use Check UI to...

- find interferences
- assign color formats
- burn-faces
(touching surface analysis not available in Creo Parametric)
- Calculate effective burn-area
- Calculate undersize using projection and surface quality

More User Interfaces - Check Electrodes

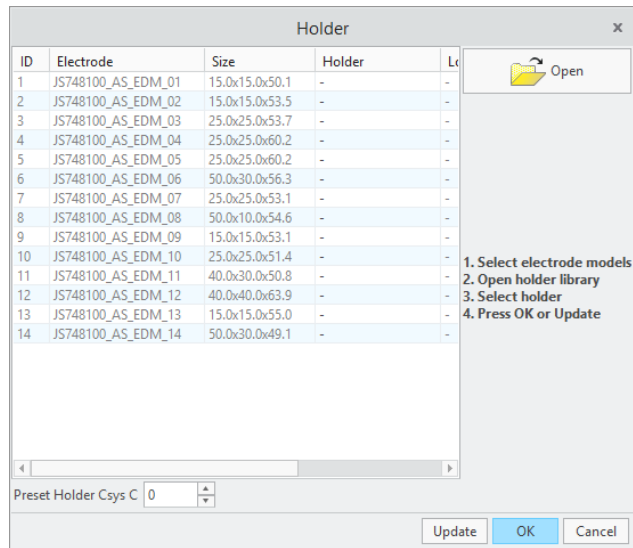


- Open UI (1)



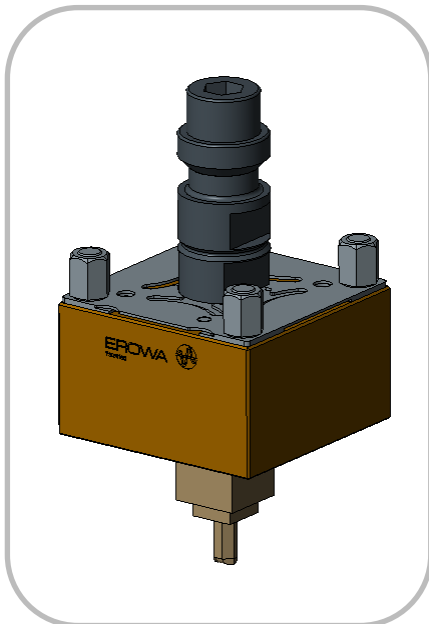
- Select electrodes (2)
- Choose from analysis options (3)
- ,Start Calculation' (5)
- List view with results (4)

More User Interfaces – Electrode Holder

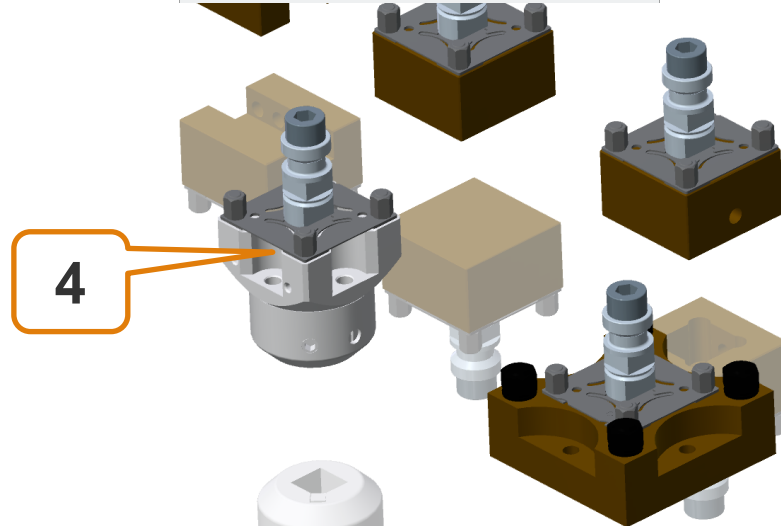
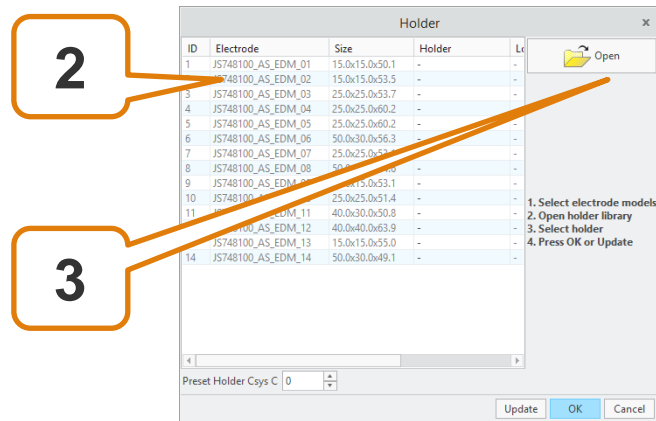
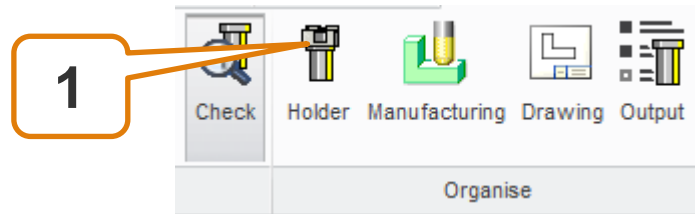


Use Holder UI to

- Select holder
- Set holder for all selected models and their positions
- Holder are imported as surface geometry into electrode model



More User Interfaces - Electrode Holder



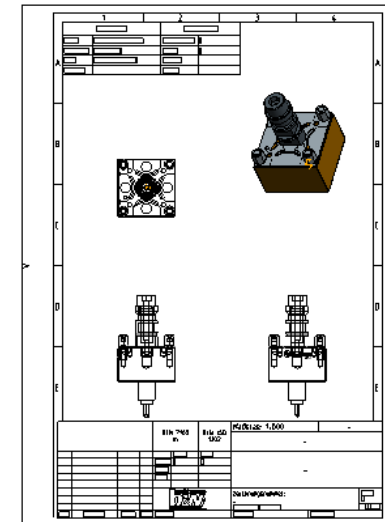
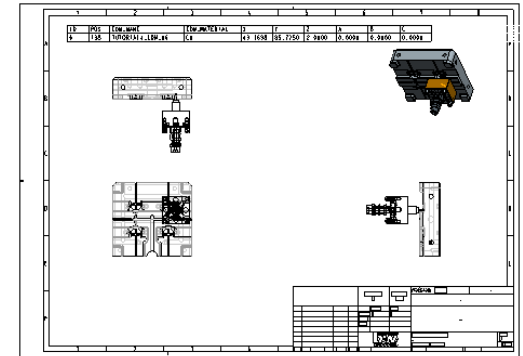
- Open UI (1)
- Select electrodes (2)
- Open library (3)
- Select holder (4)

More User Interfaces - Drawings

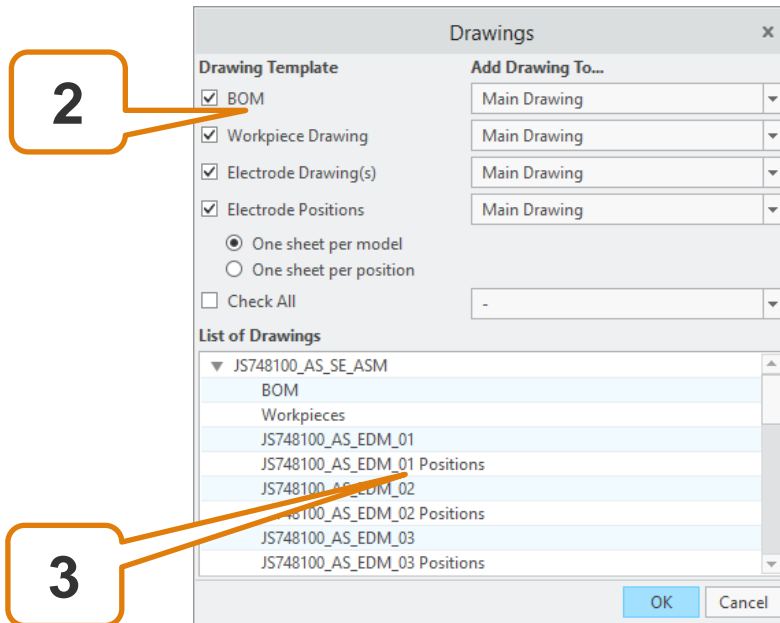
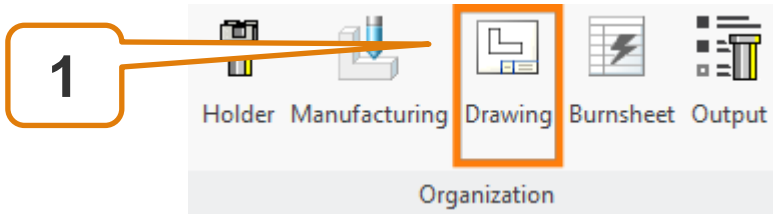
SE creates two types of drawings:

- **Assembly drawing sheets to show *all data related to EDM***
 - Positions
 - Technology

- **Part drawing sheets to show *all data related to manufacturing of electrode***
 - Material
 - Blank size

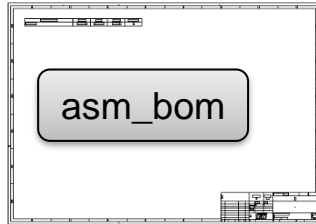


More User Interfaces - Drawings

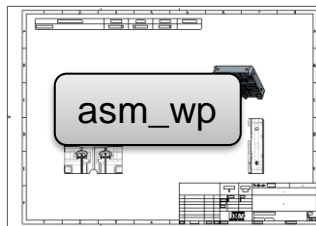


- **Open UI (1)**
- **Select drawing templates to use (2)**
- **Preview of drawings that will be created (3)**

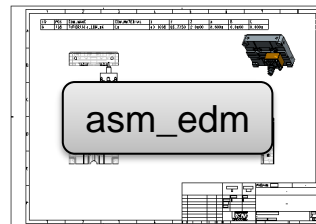
- **There are 4 Creo drawing templates available:**



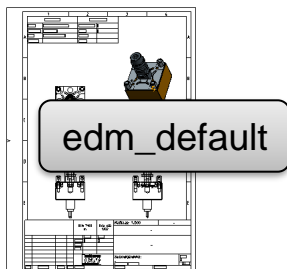
- Shows all electrodes in assembly



- All workpieces will be shown on one sheet

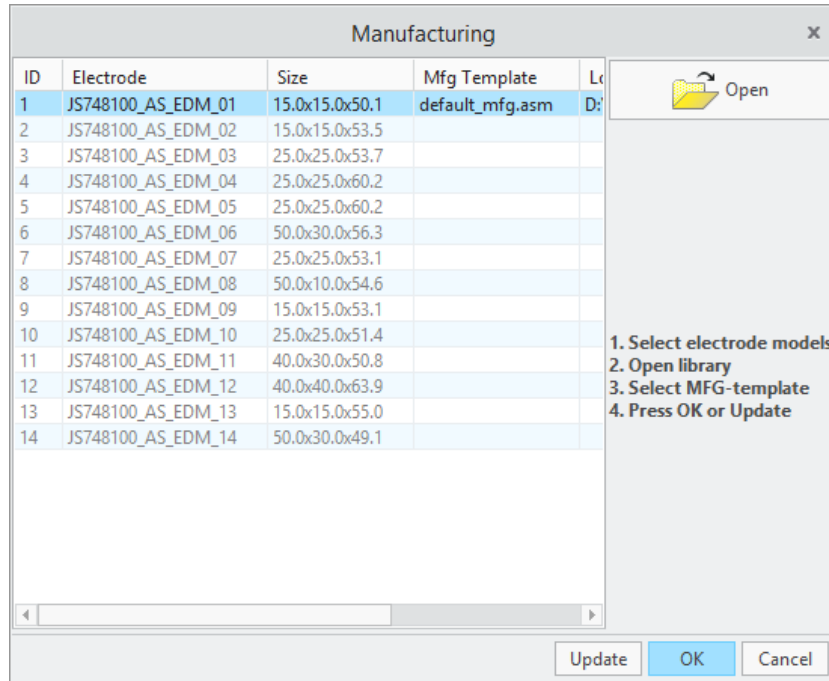


- Template for electrode assembly sheet



- Template for electrode part drawing

More User Interfaces – Manufacturing UI



- **Templates can be prepared for different use cases**
- **Templates follow a fixed structure that allows replacement of workpiece and reference model**

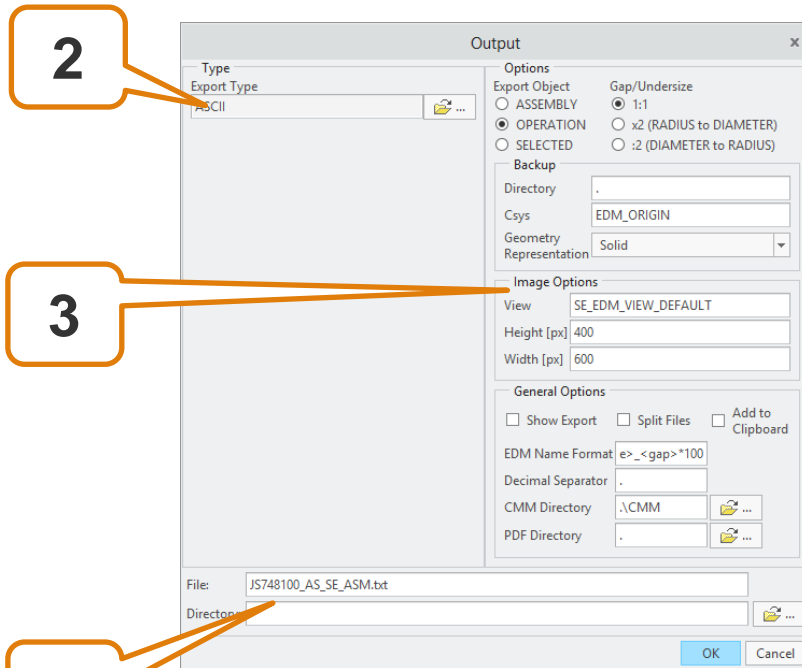
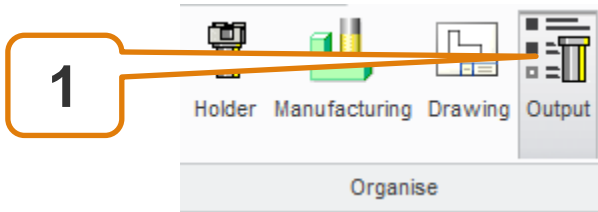
INTEGRATED FORMATS

- **Agie**
- **Charmilles**
- **Ingersoll**
- **Exeron**
- **Makino** (EPX)
- **Mitsubishi** (EPX)
- **Sodick** (EPX)
- **Zimmer & Kreim**
- **Certa Systems**
(Zwicker Systems)

CUSTOMIZED FORMATS

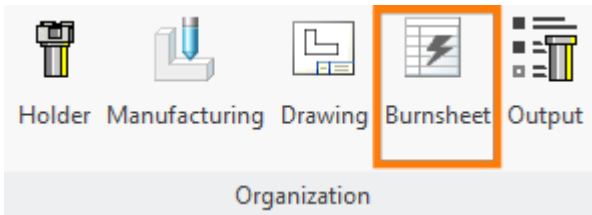
- **TXT**
 - **XML**
 - **HTML**
 - **CSV**
 - **STEP**
 - **IGES**
 - **CAQ / CMM**
 - **CAM**
- 
- A decorative curved line in the bottom right corner, consisting of a grey outer curve and an orange inner curve.

More User Interfaces – Output UI



- Open UI (1)
- Select export type (2)
- Set Options (3)
- Name and location (4)

More User Interfaces – Burnsheets UI

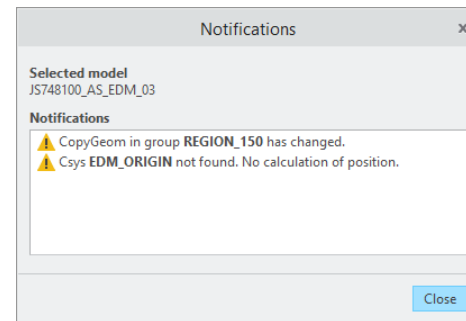


Burnsheets shows all visible parameters.

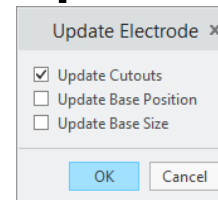
Use UI to ...

- **Change parameters**
- **Set visibility and dependency**
- **Check notifications and**

| Project | Visibility | Dependency | Status | ID | EDM_NAME |
|--------------------|-------------------------------------|-------------------------------------|--------|----|--------------------|
| JS748100_AS_SE_ASM | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_REF | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_01 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_02 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_03 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_04 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_05 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_06 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | 6 | JS748100_AS_EDM_06 |
| JS748100_AS_EDM_07 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_08 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_09 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_10 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_11 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | 11 | JS748100_AS_EDM_11 |
| JS748100_AS_EDM_12 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_13 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |
| JS748100_AS_EDM_14 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | ✓ | | |



- **Update electrodes**



Agenda

More User Interfaces

Check Electrodes

Holder

Drawings

Manufacturing

Output

Burnsheet

Best Practices

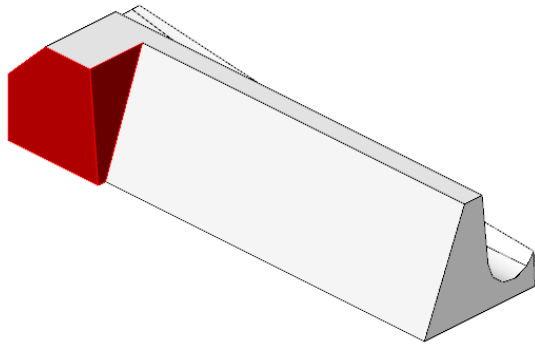
Modeling

Design Changes

Regeneration Behavior in Creo

Problem

- **Problems with remove of Material**



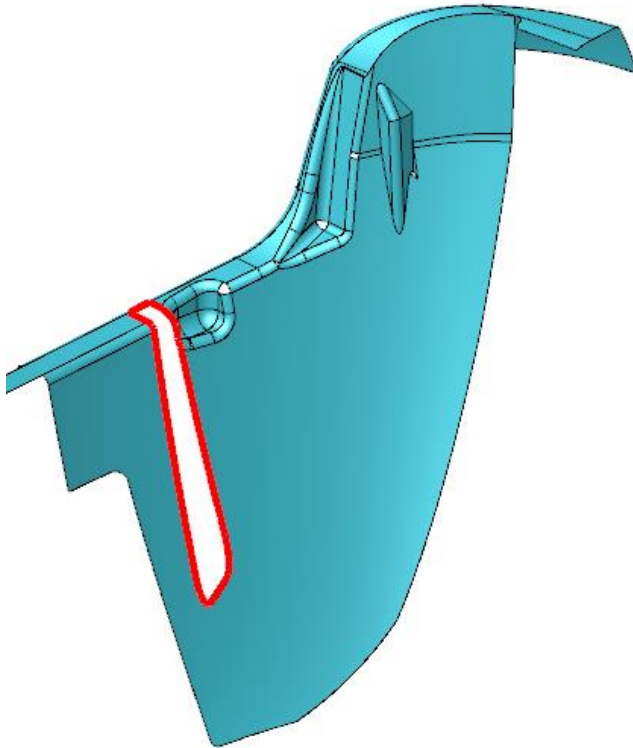
Solutions

Use various features...

- **Remove**
- **Replace surface**
- **Cut Block**
- **Thicken as cut**
- **Creo extrude**

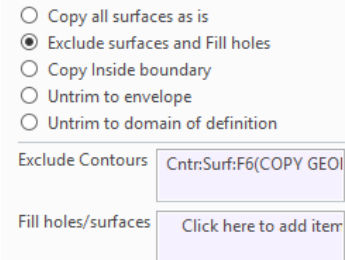
Problem

- Close holes in quilts

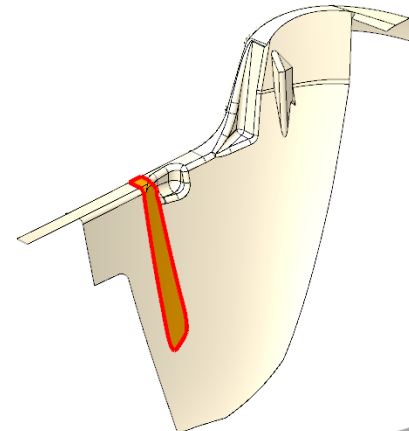


Solutions

- Copy with option „Fill holes/surfaces“

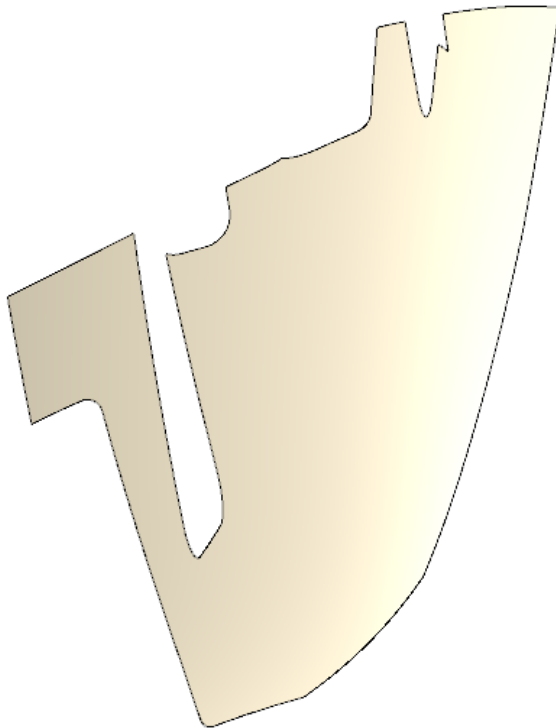


- Remove feature with option „Edges to remove“



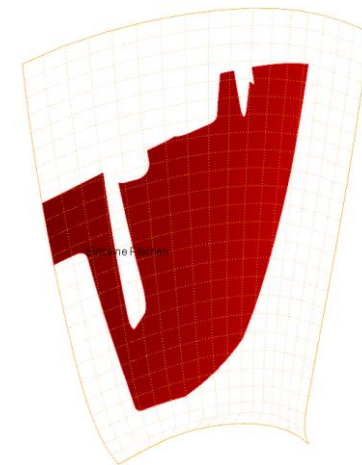
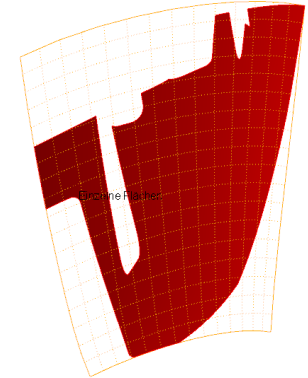
Problem

- Cleanup contour of surface



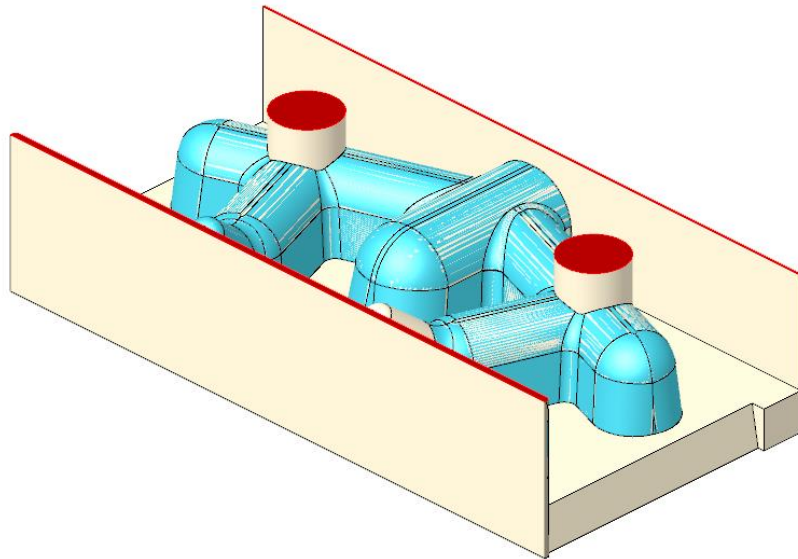
Solutions

- Copy with option „Untrim to envelope“
- Copy with option „Untrim to domain of definition“
- Trim and/or merge may be necessary afterwards



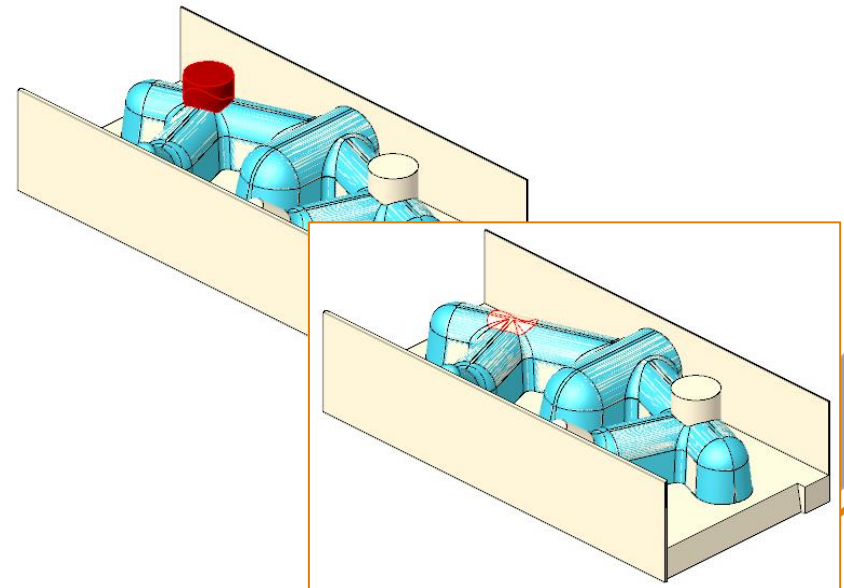
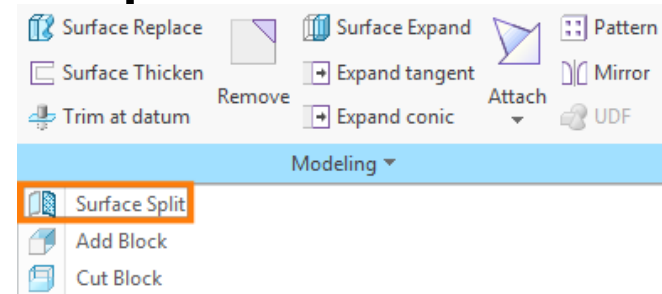
Problem

- Surfaces with several contours can't be removed or replaced



Solutions


- Separate contours into unique surfaces

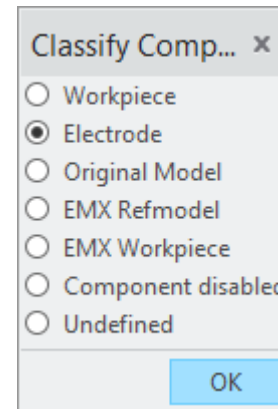


Problem

- Add additional workpieces

Solution

- Assemble model electrode assembly 
- Classification will be done on next update of data



Problem

- Electrodes patterned in assembly

Solution

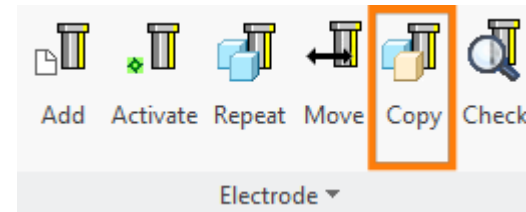
- Use Creo command ,**Pattern** ‘
 - *Ctrl+A* to activate window
 - SE captures data automatically
- 
- A decorative curved line in the bottom right corner, consisting of a thick grey arc and a thin orange arc.

Problem

- Reuse electrodes from other SMARTElectrode-assemblies
- Use prepared electrodes

Solution

- Assemble electrode or complete assembly
- Copy electrodes to be added to assembly



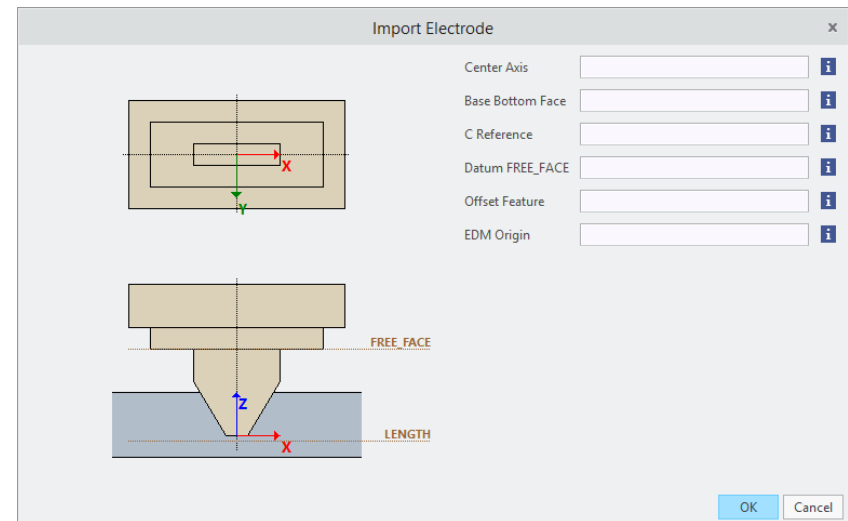
- Electrodes from other assemblies will be independent always

Problem

- Use electrodes **NOT** created in SMARTElectrode

Solution


- Assemble electrode
- *Ctrl+A* to activate window
- Classify as electrode
- Import UI will be opened automatically



Problem

- Extensive design changes necessary

Solution

- Activate component to show Design-ribbon
 - Delete base
 - Add or redefine cutouts
 - Detail
 - Add base again
- 
- A decorative graphic element consisting of a thick grey curved line and a thin orange curved line, both curving upwards from the bottom right corner of the slide.

Problem

- **Avoid unwanted regeneration for assembly/electrodes**

Solution

- **Use options to change behavior of software**
- ***SET_COPY_GEOM_INDEPENDENT=YES***
Creates independent reference models
- ***MAKE_TRIM_DEPENDENT=NEIN***
Creates independent electrodes
- **Status for cutouts and copy-geoms can be switched in Burnsheat UI**

- **Note**
***Ctrl+C* and *Ctrl+V* creates depdent copies without reference control**

Reason

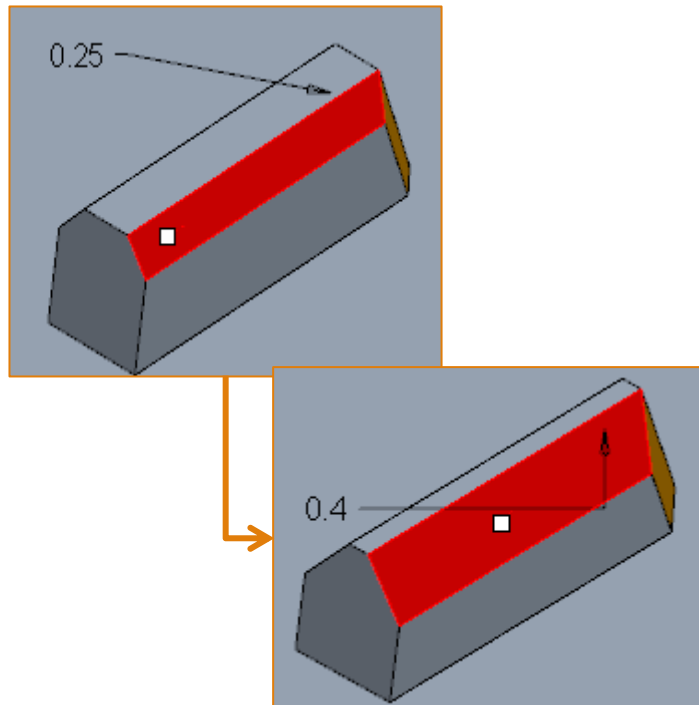
- Baugruppe wird aufgrund Design Changes durchregeneriert

Possible results

1. Assembly regenerates without error, electrodes are up-to-date and geometrically correct
2. Assembly regenerates without error, electrodes are up-to-date and geometrically wrong
3. Regeneration error in Creo electrodes are not up-to-date and geometrically wrong

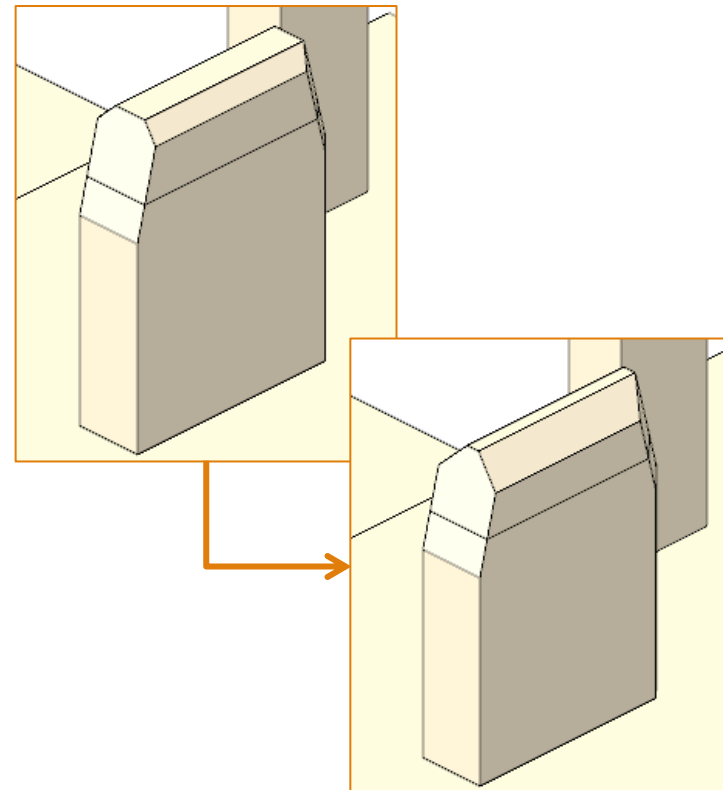
Result

1. Assembly regenerates without error, electrodes are up-to-date and geometrically correct



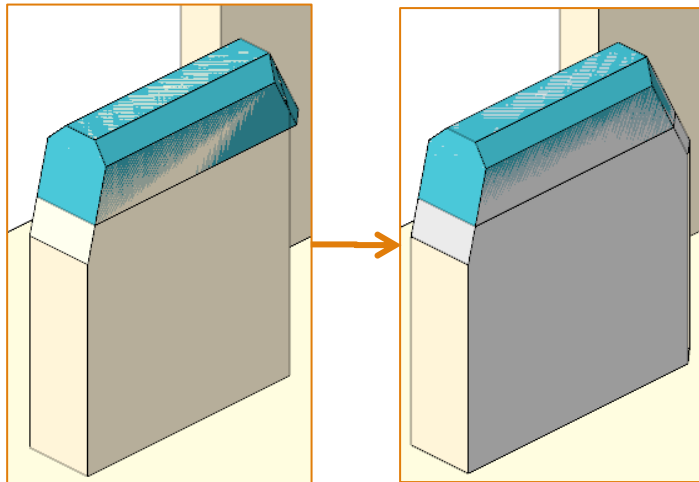
Necessary Action

- No action necessary!



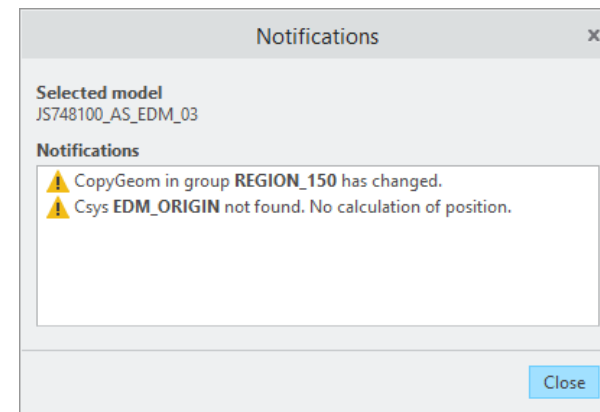
Result

1. ...
2. Assembly regenerates without error, electrodes are up-to-date and geometrically **wrong**

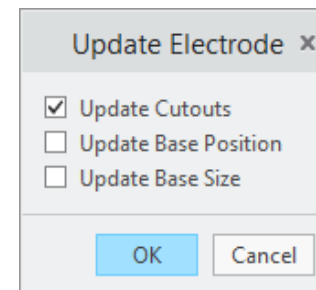


Necessary Action

- If selected burn-faces changed outline, a notification will be shown in burnsheets UI

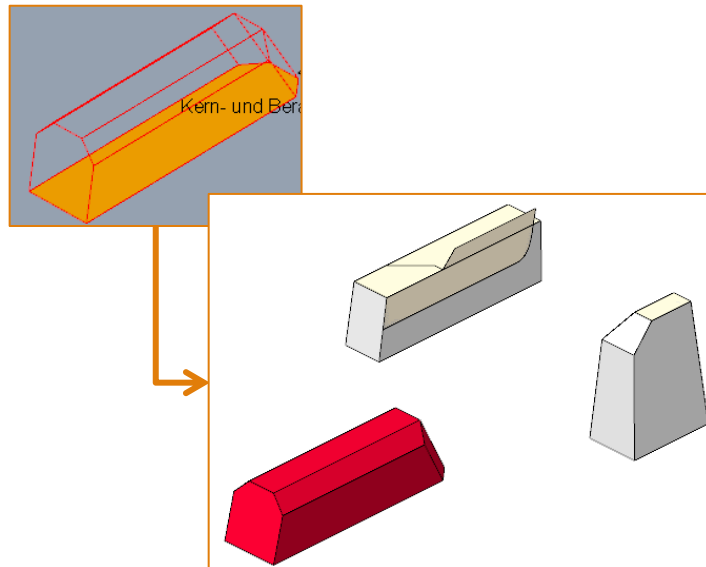


- Use context menu to update cutouts



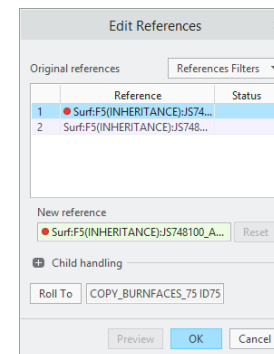
Result

1. ...
2. ...
3. **Regeneration error in Creo electrodes are not up-to-date and geometrically wrong**



Necessary Action

- **Solve regeneration errors in Creo**



- **Check for interferences**
- **Update effective burn-area**
- **Open BurnsHEET UI to get additional information**

JS748100_AS_EDM_06



