

Agathon Mini Fine Centering

7980 | 7981 | 7989



Multi-cavity molds – Higher precision for floating mold inserts thanks to mini fine centering

Initial situation | Previous approach

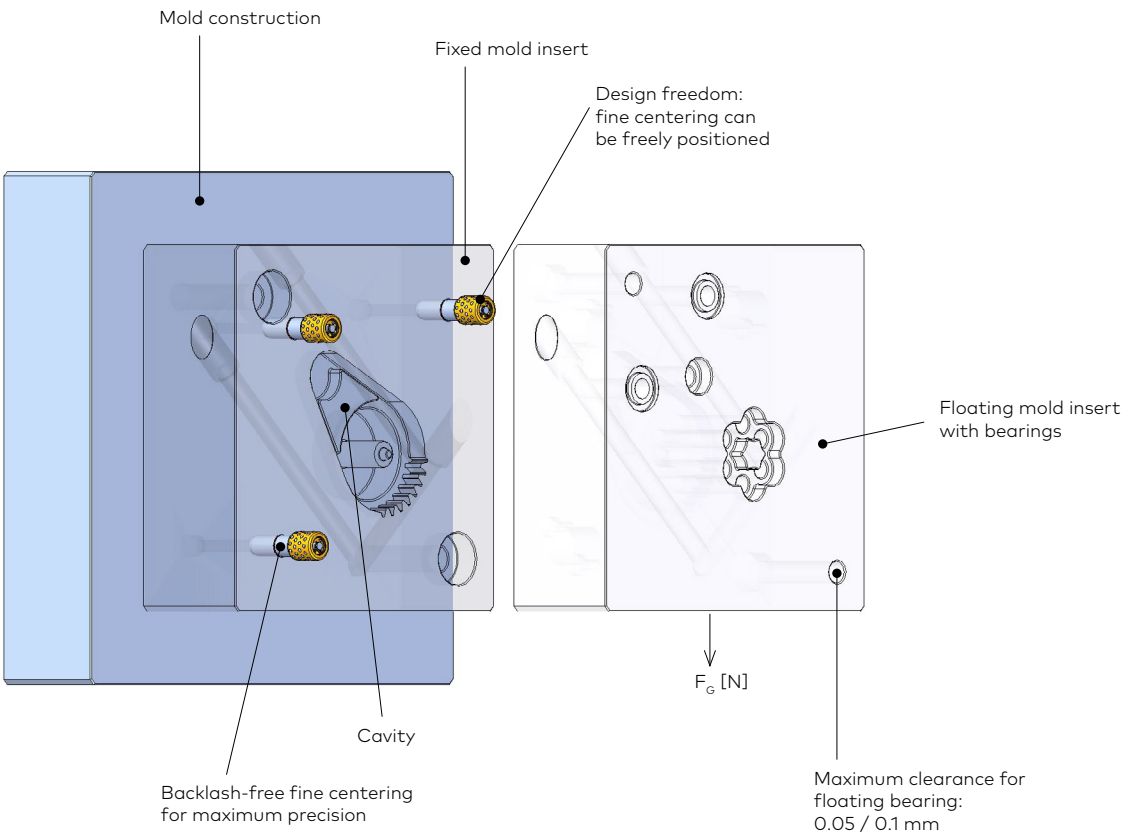
- To be able to close floating mold inserts with high precision, the inserts are centered using friction style side or tapered locks. Disadvantage: Early wear and increased play
- Conventional centering systems take up a lot of space and adjustment time. Producing the pockets is also expensive and inaccurate

Expensive, wear on inserts, space intensive

The Agathon concept

- The mold inserts are centered without play at each closing. Only one half of the two inserts is floating
- Agathon mini fine centering units including cage retaining system serve as the centering system
- Mold inserts can therefore be centered backlash-free, without wear and with high precision – for light and precise centering applications
- In addition, the mini fine centering takes up very little space. A compact tool design is therefore guaranteed
- Depending on the material hardness of the mold insert, the respective centering bushing can be omitted

Fast, compact, cost-effective and highly efficient

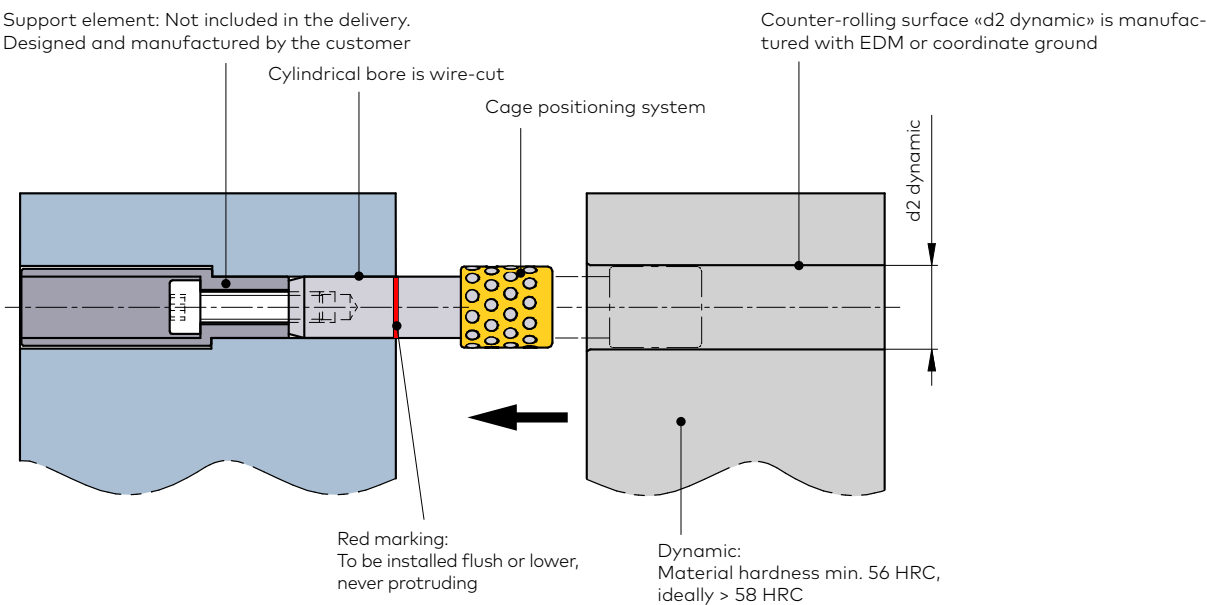
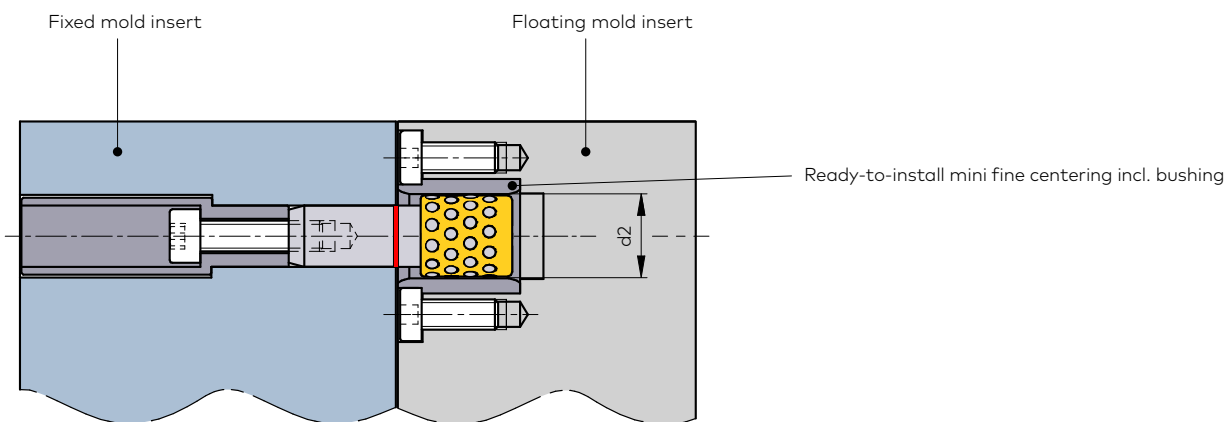


Advantages of the Agathon concept

- **Reduced machining effort:** Location holes for round centerings are less expensive and can be produced more precisely with less effort than square location pockets for other centering systems
- **Efficient processes:** Mini fine centering guarantees high process reliability. This ensures high quality part production
- **Pure precision:** Mold inserts are centered precisely and repetitively
- **Minimum space requirement:** Agathon fine centering units are designed to be compact. In many cases, the bushing can be omitted and much needed space can be saved. In these cases, the counter-rolling surface «d2 dynamic» is manufactured by the customer
- **Robust and available:** Agathon fine centering units are temperature-resistant up to approx. 170°C (338°F), standardized and available from stock

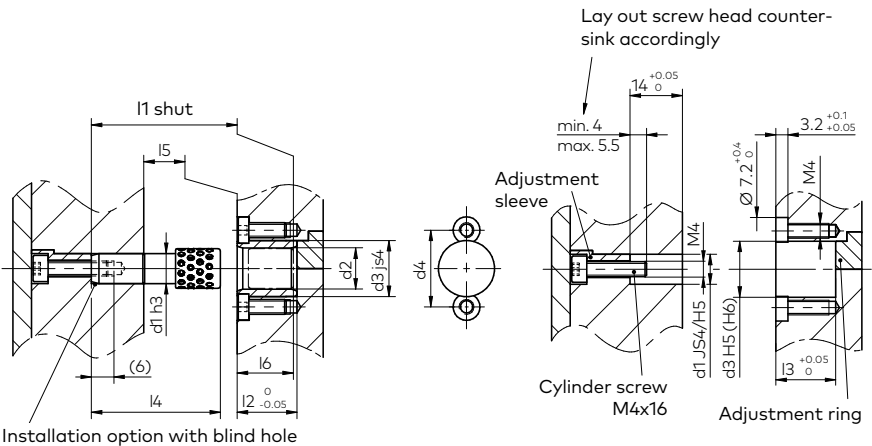
Benefits

- **Cost:** Up to half the costs can be saved
- **Space:** Up to 30% more cavity space can be utilized
- **Lifespan:** Wear in the tool is massively reduced
- **Time:** Tool handling is easier and considerably faster
- **Flexibility:** More installation variants can be realized

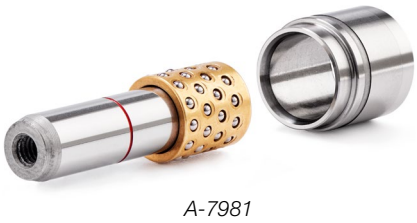


Installation variants:
Mini fine centering with and without bushing

Installation option with bushing, support element
(Through hole/wire eroding)



Delivered with: 1x M4x16 (A-07000180), 2x M4x8 (A-07007530)
Material of the bushing, balls: 100Cr6 - 1.3505, hardened 62 to 64 HRC;
Centering pillar: 16MnCr5, hardened 61 to 63 HRC.

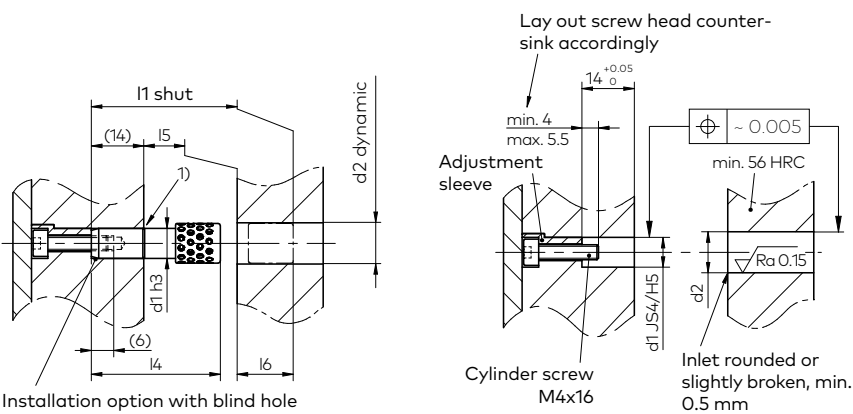


d1 = Centering pillar, diameter tolerance ISO h3, superfinish ground
d2 = Bushing inner diameter
d2_{dyn} = External rolling diameter, tolerance for self-made products, dynamic applications
d3 = Outer diameter bore of the centering bushing
d4 = Bolt circle for fastening screw M4x10
l1 = Nominal length of the centering unit in the fully shut position, incl. from cage end, mold shut
l2 = Overall length of the centering bushing
l3 = Installation depth of the centering bushing
l4 = Overall length of the fine centering unit
l5 = Entrance in the centering (preload), respectively guided distance
l6 = Installation depth of the centering

incl. all standard fastening elements, without support element



Installation option without bushing, with support element
(Through hole/wire EDM)



1) Red marking flush or maximum 3 mm lower installed

| Article | d1 | d2 | d2 dynamic | d3 | d4 | l1 | l2 | l3 | l4 | l5 | l6 | C, C ₀ [N] - Indic. value |
|------------------------------|----|----|-----------------------|----|------|----|----|----|------|-----|----|--|
| 7980.008.029 without bushing | 8 | | - 0.002 11 - 0.006 | | | 29 | | | 34.5 | -12 | 15 | Entry (C): 48 Shut (C ₀): 194 |
| 7981.008.029 with bushing | 8 | 11 | | 15 | 20.5 | 29 | 16 | 16 | 34.5 | -11 | 15 | Entry (C): 48 Shut (C ₀): 194 |
| 7989.008.016 | 8 | 11 | | | | | 16 | | | -11 | | |
| 7980.010.029 without bushing | 10 | | - 0.003 14 - 0.007 | | | 29 | | | 34.5 | -12 | 15 | Entry (C): 86 Shut (C ₀): 345 |
| 7981.010.029 with bushing | 10 | 14 | | 20 | 25.5 | 29 | 16 | 16 | 34.5 | -11 | 15 | Entry (C): 86 Shut (C ₀): 345 |
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C = dynamic load rating in N – Initial load capacity

C₀ = static load rating in N – Tool fully shut

Calculation example

$$F_g = m \times g = 8.25 \text{ kg} \times 9.81 \text{ m/s}^2 = 80.93 \text{ N}$$

$$\text{Cent}_n = \frac{F_g}{C} = \frac{80.93 \text{ N}}{48 \text{ N}} = 1.68 = 2 \times \text{A-7981.008.029}$$

$$C_n = 2 \times C = 2 \times 48 \text{ N} = 96 \text{ N} > \text{when using 2 mini fine centering units}$$

For volume production, a safety factor of > 1.75 is recommended

Demanding application (example: S = 1.75)

$$\text{Cent}_n = \frac{F_g \cdot S}{C} = \frac{80.93 \text{ N} \cdot 1.75}{48 \text{ N}} = 2.95 = 3 \times \text{A-7981.008.029}$$

$$S_{\text{ist}} = \frac{\text{Cent}_n \cdot C}{F_g} = \frac{3 \cdot 48 \text{ N}}{80.93 \text{ N}} = 1.78 > \text{suitable for mass production}$$

Legend:

F_g = Weight force of a mold insert half = m x g [N]

Cent_n = Determination of number of mini fine centering units

C = Dynamic load rating of the individual mini fine centering units = initial load capacity [N], (see Agathon data sheet)

C_n = C₁ + C₂ + C₃ + ... + C_x Sum of the basic load ratings of all mini fine centering units used [N]

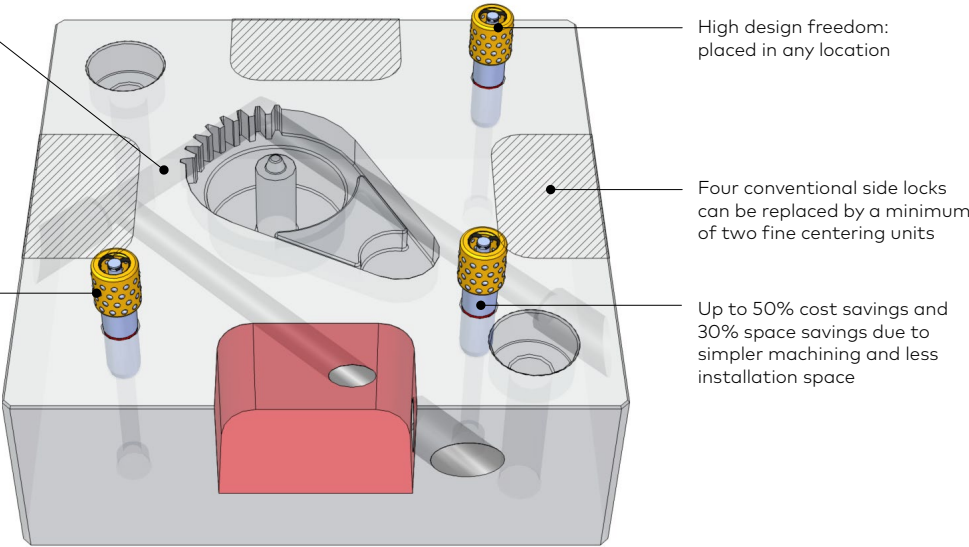
S = Safety

S_{ist} = Actual safety factor, recommendation > 1.75 for volume production

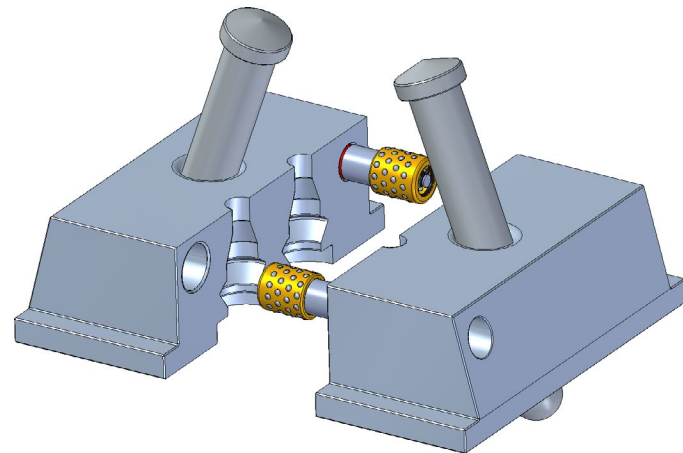
Concepts in comparison

Little space required, leaving more space for cooling and ejector, and up to 30% more space for cavities in the same area

Machining of the bores is more precise and cheaper than pocket machining

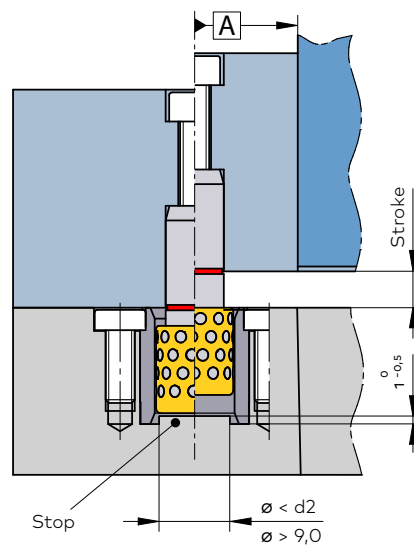


Slider and chuck centering

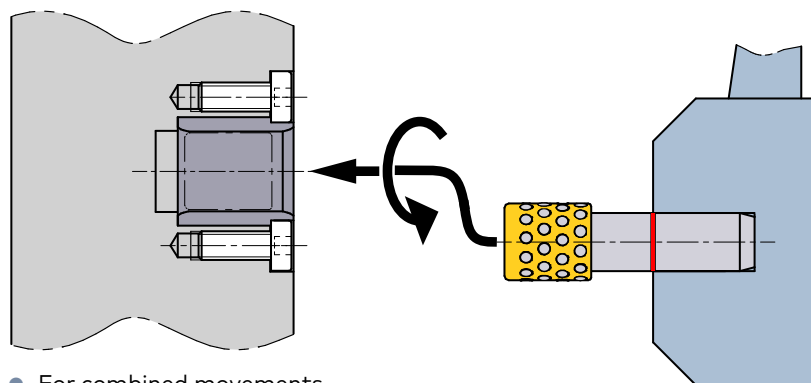


Short stroke – Application example

- High precision guidance of the stripper plate
- Ideal for 1 mm max. stroke and max. 400 strokes/minute
- Guide plate protected against tipping over
- Die contour and location holes can be produced in one clamping (A)
- For medium batch size production



Positioning of gripper tool



- For combined movements

Agathon centering concept

- Offset for centering up to 0.15 mm, for long-run < 0.05 mm
- For lifting and swiveling movements
- For dynamic centering applications, v_{max} approx. 0.25 m/s
- Short stroke: the centering remains preloaded over the entire cycle – the cage must move against a stop at the front end
- Suitable for radial loads
- For high-speed applications
- Short stroke application: Stroke < L5 - 1.5 mm

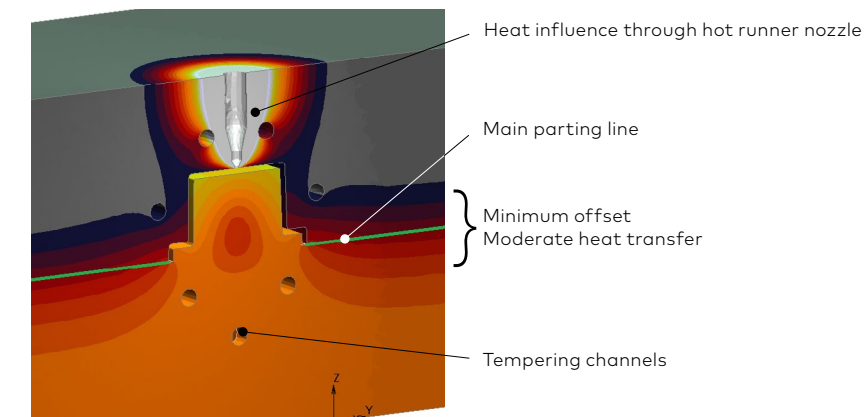
Advantages of the Agathon concept

- Repetitive centering accuracy < 0.5 μ m
- No tilting of the plates. Precision at the location hole is maintained
- Optional without bushing and enormous space savings

Benefits of the Agathon centering concept

- Gentle and precise handling
- Guarantees maximum process reliability
- Eliminates vibrations
- Centering units are not paired, use of several different bushing styles possible

Thermal expansion in injection molding



Conclusion:

For homogeneously tempered tools up to ΔT of 30 K, no problems are to be expected with thermal expansion.

- Case study: asymmetrically tempered tool, $\Delta T = 50$ K
- Temperature: Ejector side 90 °C (194 °F)
Nozzle side 40 °C (104 °F)
- Actual offset is reduced by a **factor of 3-5** by heat transfer at the tool separation!
- Analyzed offset at separation: 6.2 μ m > Agathon centering can be used

More information can also be found in our factsheet.

Maintenance



- After delivery: Remove rust inhibitor from the centering unit
- During maintenance: Remove old grease without leaving any residue
- Apply a new lubricating grease to the cage of the fine centering unit – see Agathon catalog for recommendations
- Units consisting of pillar and bushing can be interchanged. If possible, however, we recommend using them paired
- For cleanroom applications, excess grease can be wiped off with a fluff-free cloth
- Centering elements must be replaced when the preload is no longer present. Preventive replacement as part of normal maintenance is advisable

Injection molding variant –
Centering quick-change mold inserts

Initial situation |
Previous approach

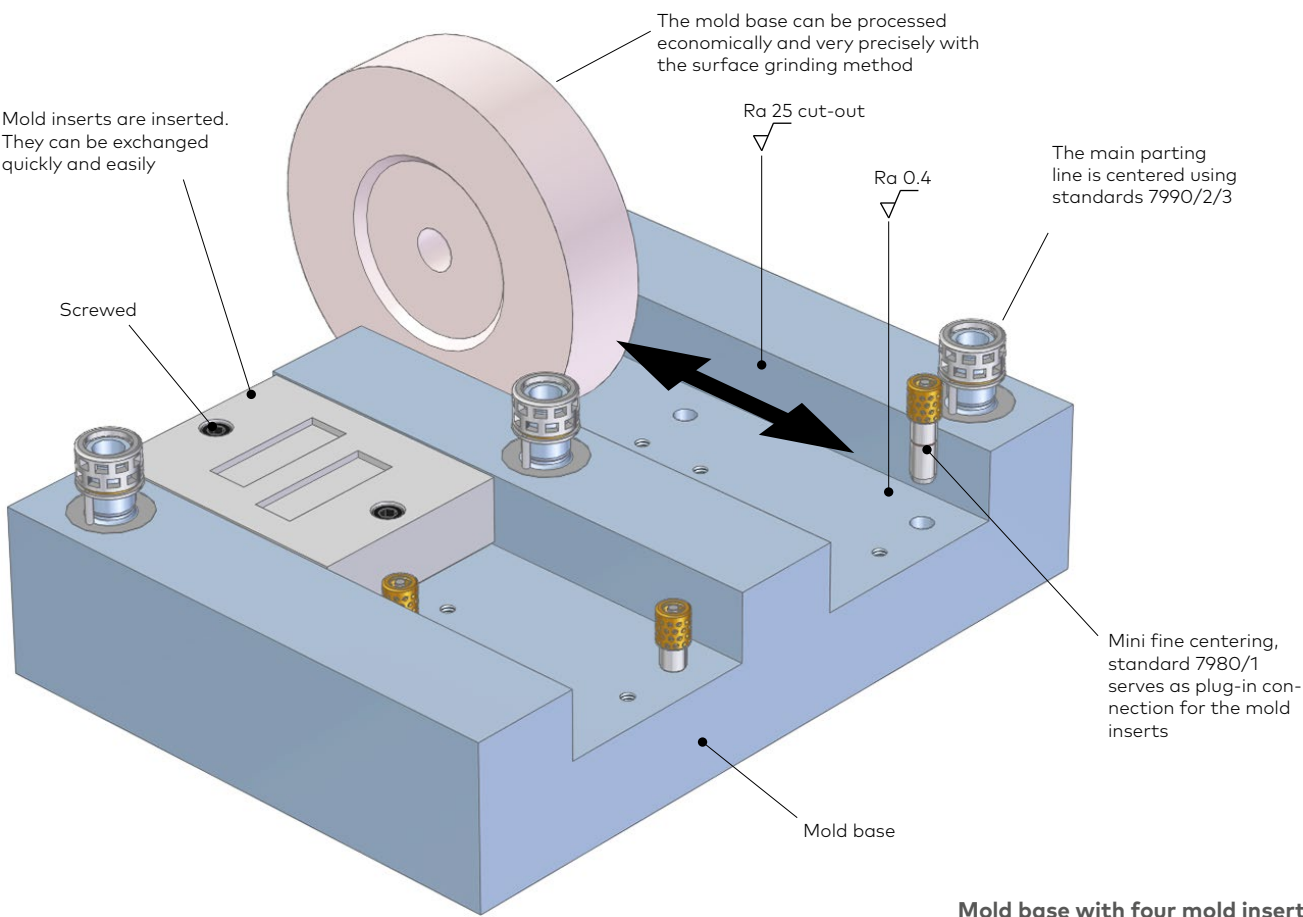
- To ensure that mold inserts could be fitted into the mold base with high precision, previously the pockets and inserts had to be machined at high expense
- The exchange of mold inserts was complicated, time-consuming and only possible with special know-how

Expensive, slow and therefore inefficient

The Agathon concept

- Mold inserts and mold base are combined via a plug-in connection
- Agathon mini fine centering units serve as plug-in connectors
- Mold inserts can therefore be centered backlash-free, easy to roll off and thus with high precision
- In addition, mold inserts can be changed quickly and without tilting. No special know-how is required for doing this
- Depending on how hard the material of the mold insert is, the respective centering bushing can be omitted. The centering pillar and cage are mounted directly in the mold insert

Fast, compact, cost-effective and therefore highly efficient



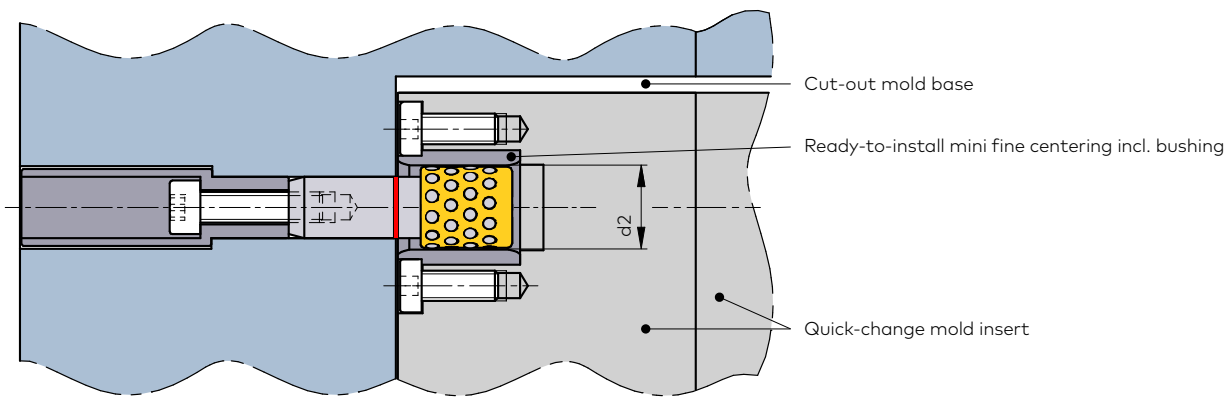
Mold base with four mold inserts

Advantages of the Agathon concept

- **Reduced machining effort:** Mold pockets do not have to be precision machined. Side walls are cut out and simply roughened just like the mold inserts
- **Short changeover time:** Due to the fine centering, mold inserts can be easily removed from the mold base and changed
- **Efficient processes:** Mold inserts do not jam, as they are freely installed. In addition, no highly skilled personnel is required to ensure rapid tool change-over
- **Pure precision:** Mold inserts are positioned precisely, backlash-free and repetitively
- **Minimum space requirement:** Agathon fine centering units are compact in design. In many cases the bushing can be omitted and additional space can be saved. In these cases, the counter-rolling surface «d2 static» is manufactured by the customer
- **Robust and available:** Agathon fine centering units are temperature-resistant up to approx. 170°C (338°F), standardized and available from stock

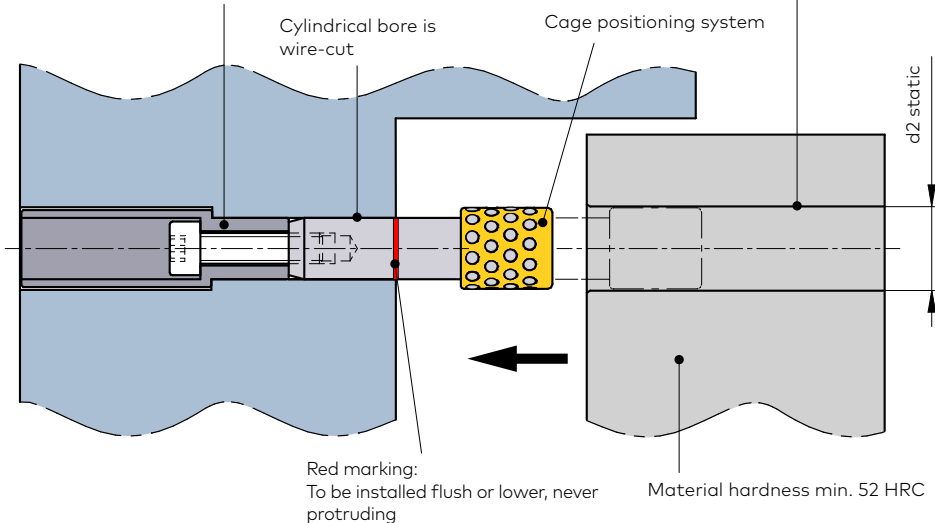
Benefits

- Enormous cost and time savings
- Simple, efficient processes
- No wear
- Space-saving design
- Flexibility for the installation variants
- Plug-and-play installation



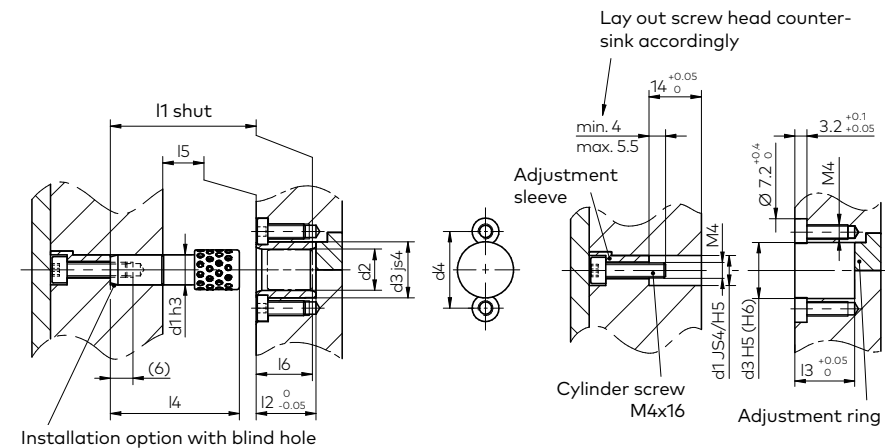
Support element: Not included in the delivery. Designed and manufactured by the customer

Counter-rolling surface «d2 static» is manufactured with EDM or coordinate ground



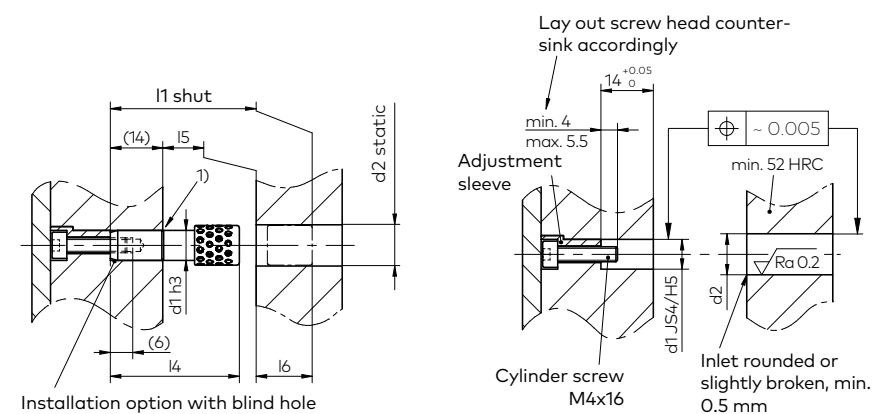
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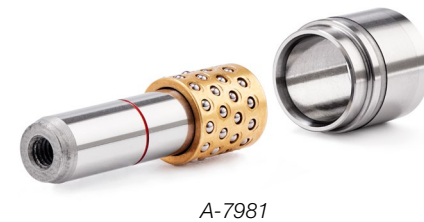


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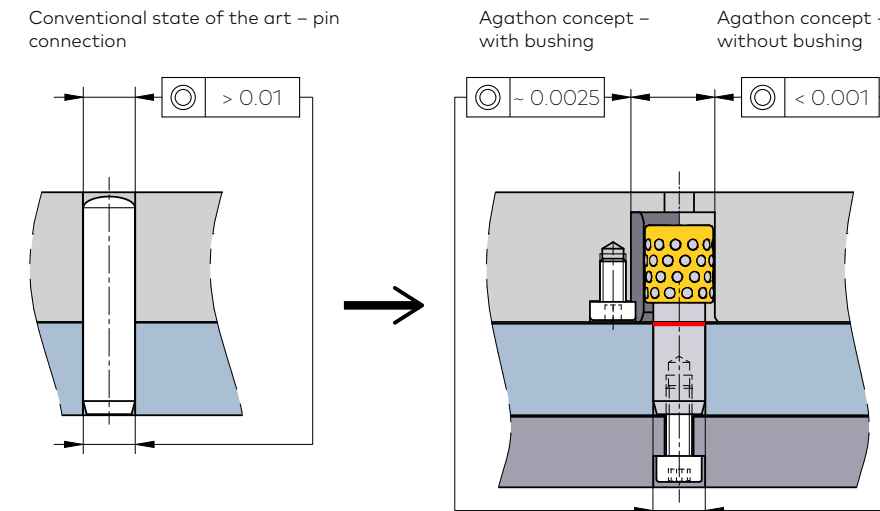


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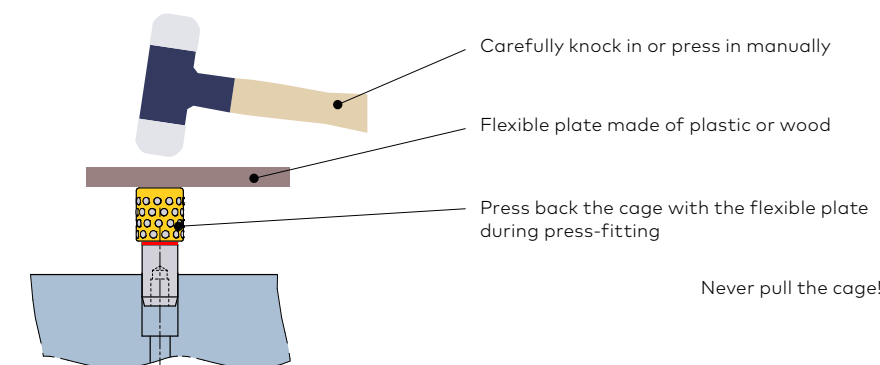
Comparison of positioning concepts



Agathon centering concept

- Offset for centering up to 0.15 mm
- Guided centering stroke $l_5 = 12/11$ mm

Installation



Alternative fastening

- Gluing
- Laser welding
- Tolerances see standard 799x

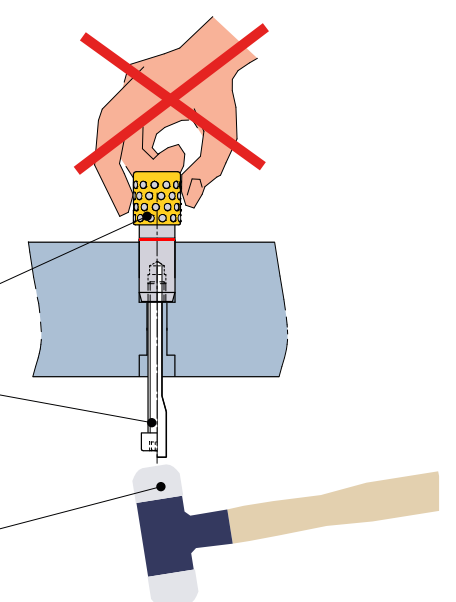
Advantages of the Agathon concept

- Repetitive centering accuracy
 $< 0.5 \mu\text{m}$
- No tilting of the plates. Precision
 at the location hole is maintained
- Optional without bushing and thus
 enormous space saving
- Centering accuracy up to $1 \mu\text{m}$
 possible

Benefits of the Agathon centering concept

- Gentle and precise component installation and removal
- Without slip
- Greatly shortens assembly time

Removal



Other Agathon fine centering units



Universal – Standard 7990

- Centering of the main parting line
- Centering of hybrid injection molds
- Centering of the mold on the machine plate of the injection molding machine



Small applications – Standard 7992

- Centering of the individual cavities
- Centering at main separation for small or micro tools
- Further developed for volume production



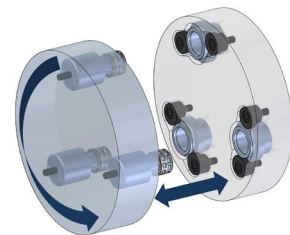
Highest demands – Standard 7993

- Ideal for high cleanroom requirements
- High-temperature applications
- Long centering stroke for perfect ejection of molded parts
- No restrictions regarding cleaning procedures



Short stroke – Standard 7995

- Mold making: guidance of ejector stroke, venting stroke
- General mechanical engineering: for repetitive sequences with short stroke. The pillar does not extend from the preload – or constant short-stroke application



Multiple centering

- Paired in requested batches
- Centering for turning and sliding tools