

Machining guideline

Punching Tool Construction

That's where

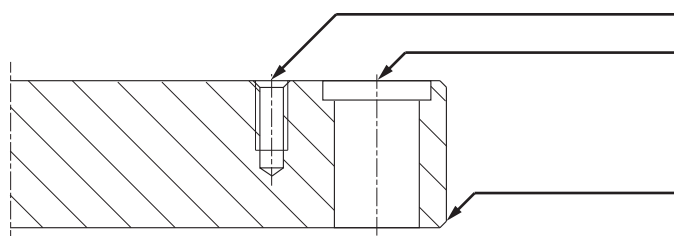
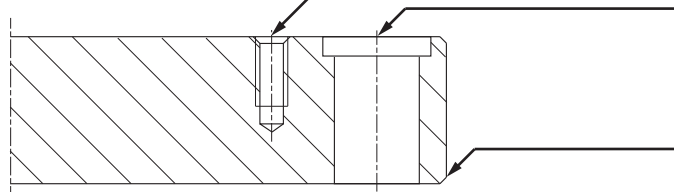
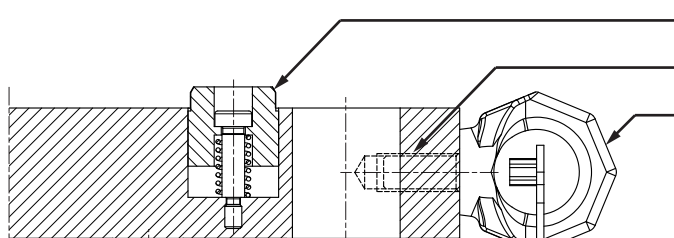
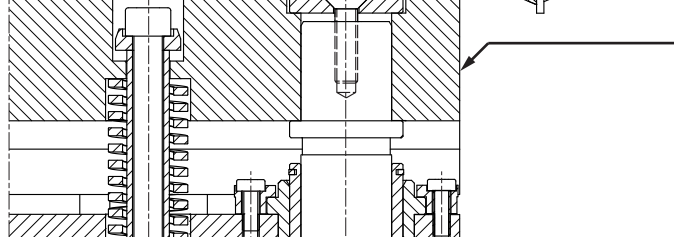
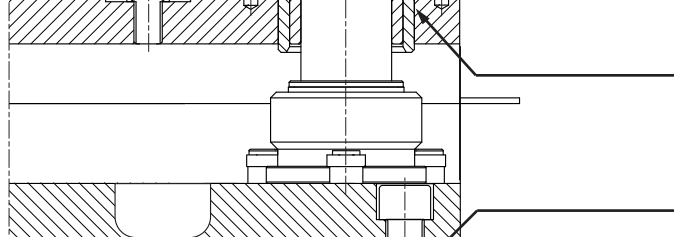
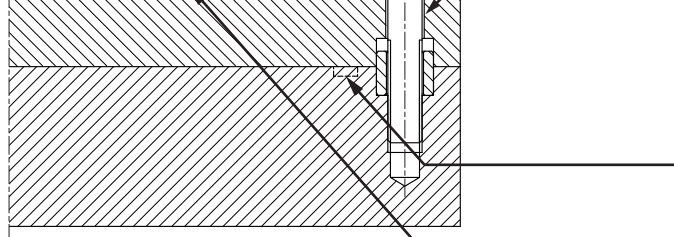
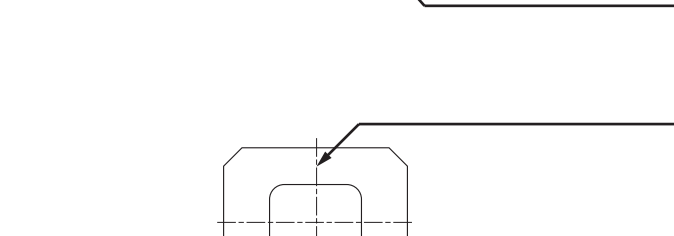
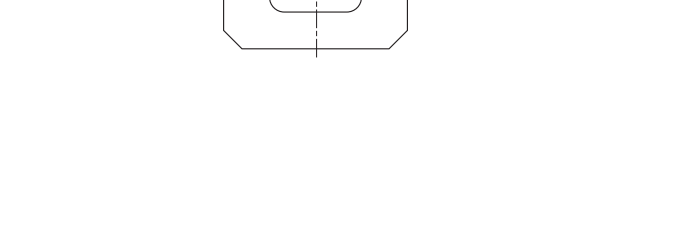
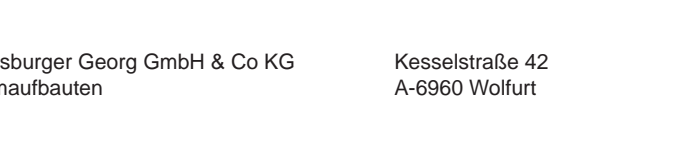
we are **strong.**



index

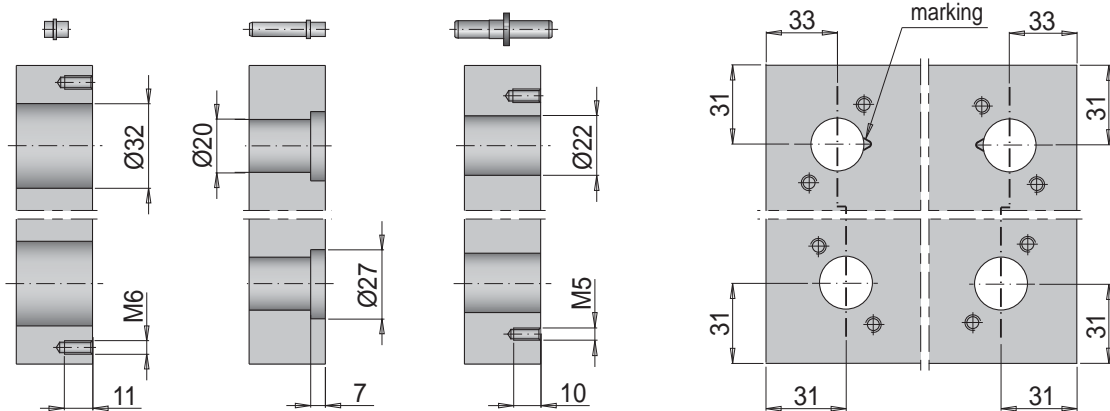
| | |
|---------------------------------------|-------|
| flame cutting | 6 |
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content

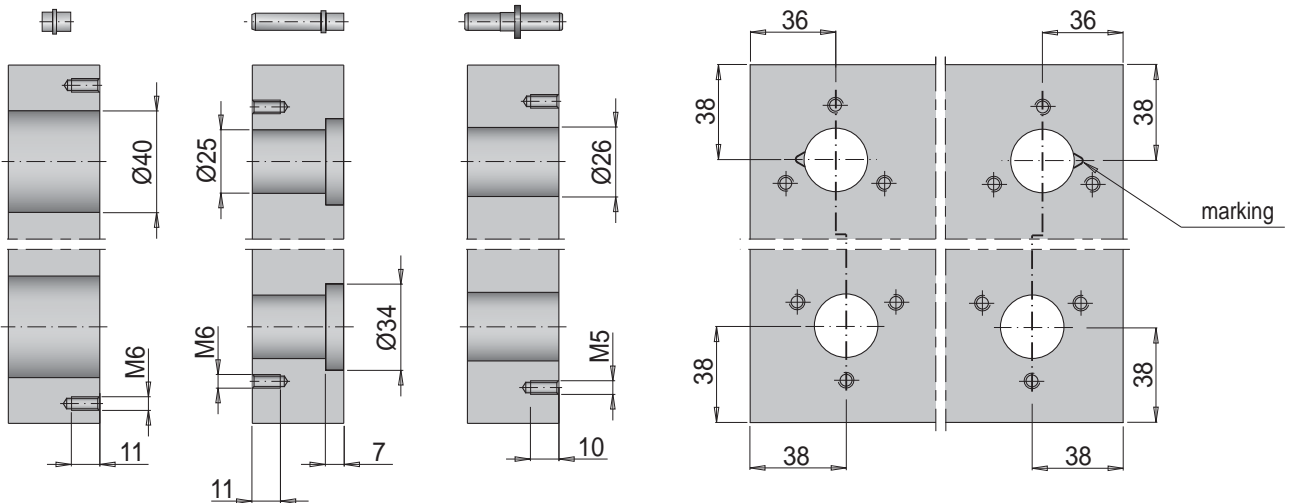
| | | |
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| | page 6 | flame cutting |

Meusburger bores pattern / Ø 20 - Ø 32

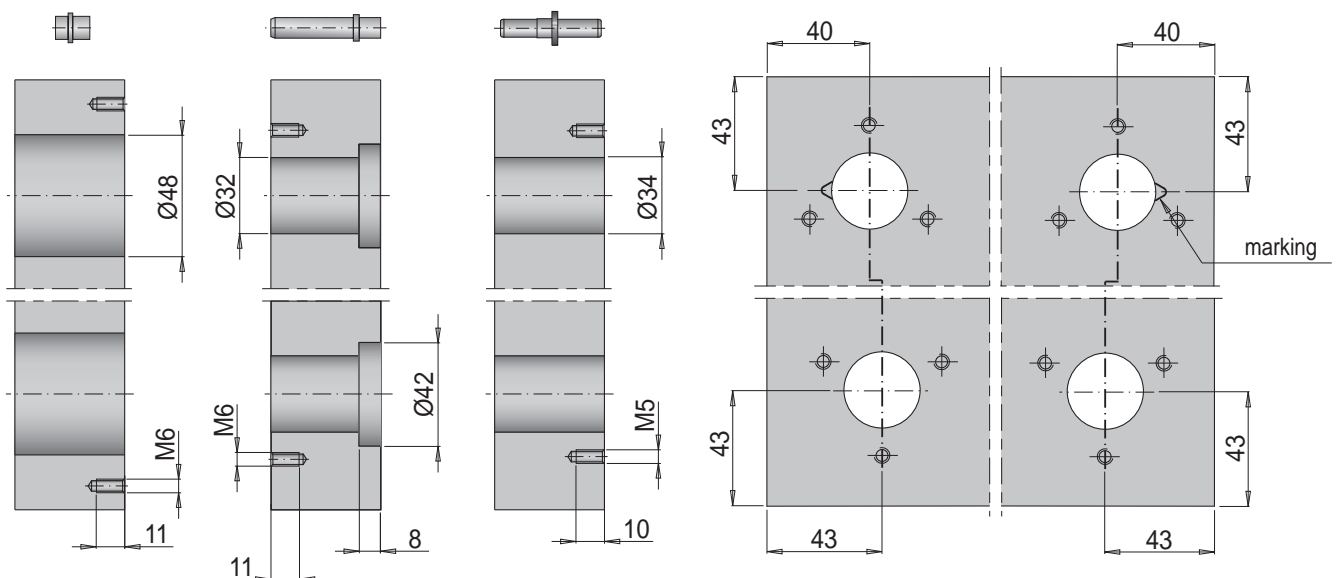
Ø 20



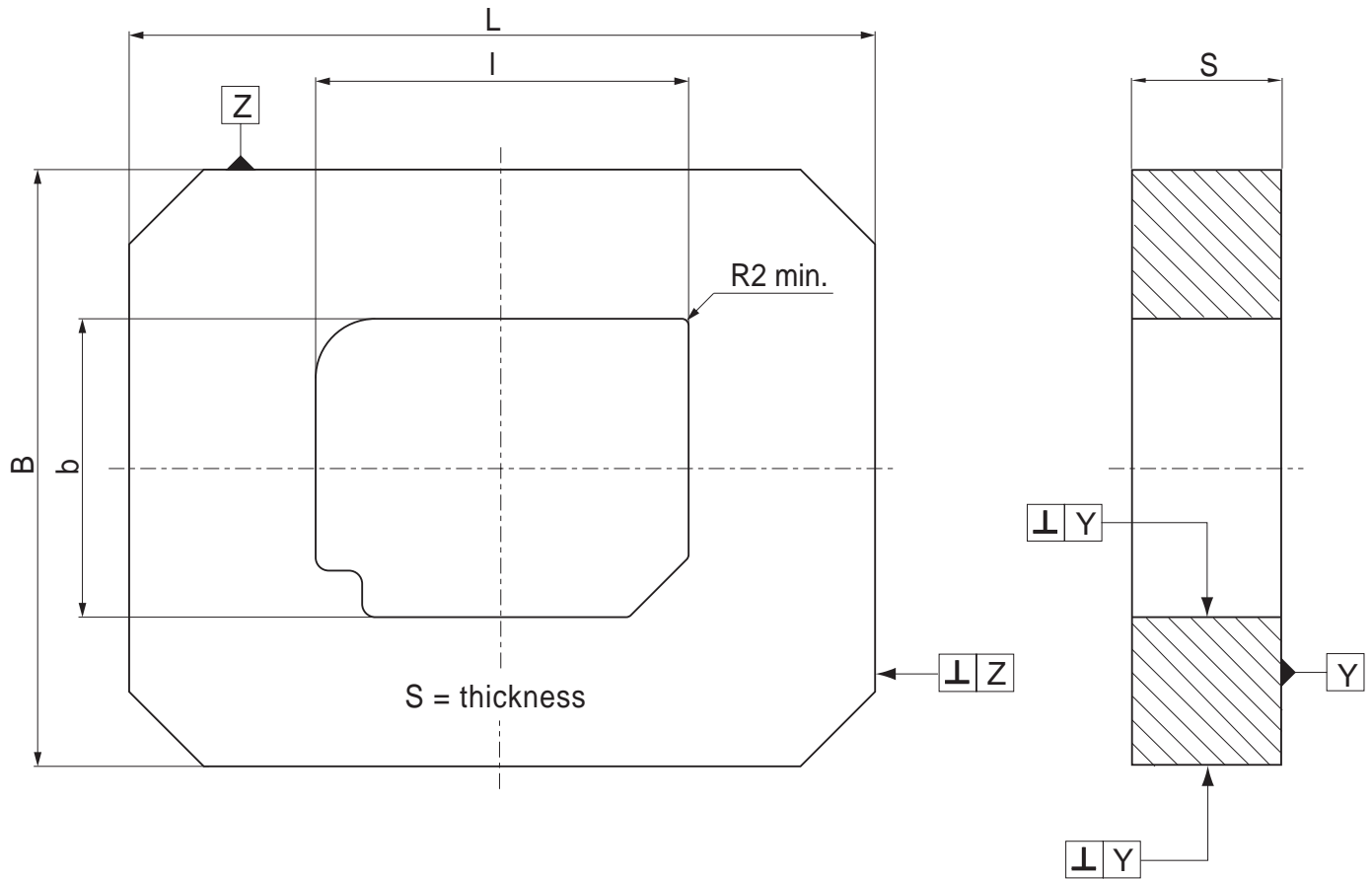
Ø 25



Ø 32



flame cutting



allowance and tolerance

| B/L b/l | S max. 200 | all. B/L all. b/l | tol. B/L tol. b/l | mat. |
|----------------|-----------------|--------------------------|--------------------------|----------------------|
| $\cong 400$ | $\cong 140$ | 6,0 | - 2,0 | 1730 2311 2312 |
| | > 140 | 8,0 | - 2,0 | |
| $\cong 600$ | $\cong 140$ | 7,0 | - 2,0 | |
| | > 140 | 9,0 | - 2,0 | |
| > 600 | $\cong 140$ | 8,0 | - 2,0 | |
| | > 140 | 10,0 | - 3,0 | |

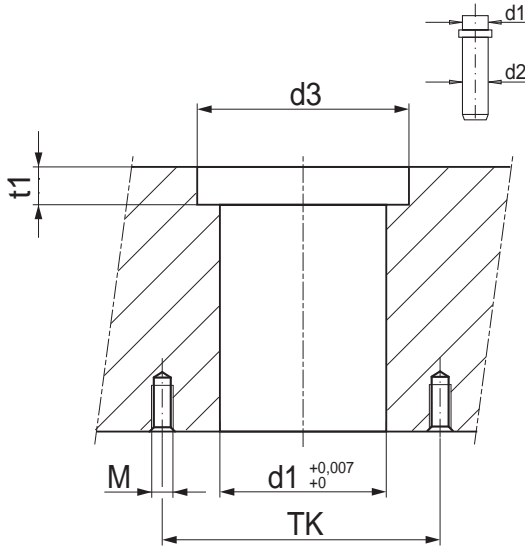
| | |
|-----------|-----------|
| $\perp Y$ | 1,0 / 100 |
| $\perp Z$ | 0,2 / 100 |

bores pattern - special

pillars:

SV-standard die set:

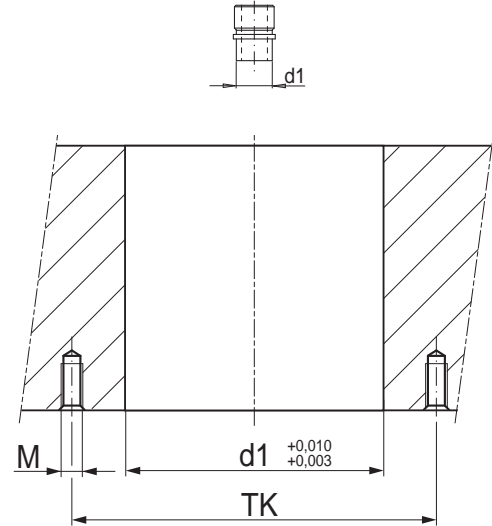
E 5000



| d2 | d1 | TK | d3 | t1 | M |
|----|----|----|----|----|---|
| 20 | 20 | 36 | 27 | 7 | 6 |
| 25 | 25 | 43 | 34 | 7 | 6 |
| 32 | 32 | 51 | 42 | 8 | 6 |
| 40 | 40 | 61 | 52 | 8 | 6 |
| 50 | 50 | 74 | 62 | 9 | 6 |

bushes:

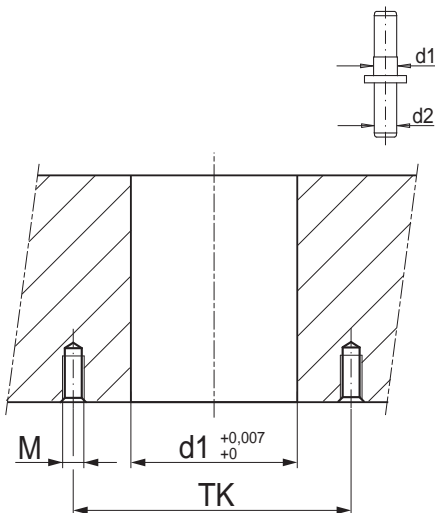
E 5120 / E 5122 / E 5124 / E 5212



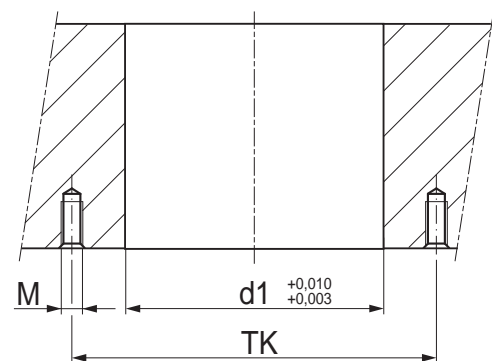
| d1 | TK | M |
|----|----|---|
| 32 | 52 | 6 |
| 40 | 60 | 6 |
| 48 | 67 | 6 |
| 58 | 77 | 6 |
| 70 | 91 | 6 |

SP-precision die set:

E 5080

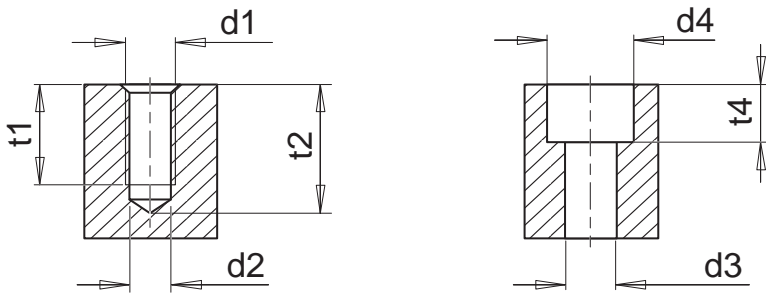


| d2 | d1 | TK | M |
|----|----|----|---|
| 20 | 22 | 33 | 5 |
| 25 | 26 | 38 | 5 |
| 32 | 34 | 48 | 5 |
| 40 | 42 | 56 | 6 |



| d1 | TK | M |
|----|----|---|
| 32 | 52 | 6 |
| 40 | 60 | 6 |
| 48 | 67 | 6 |
| 58 | 77 | 6 |

threads



metric threads

| d1 | pitch in mm | d2 | t1 | t2 | d3 | d4 | t4 |
|-----|-------------|------|----|-----|------|------|------|
| M 3 | 0,50 | 2,5 | 6 | 10 | 3,5 | 6,5 | 3,5 |
| M 4 | 0,70 | 3,3 | 8 | 12 | 4,5 | 8,0 | 4,5 |
| M 5 | 0,80 | 4,2 | 10 | 14 | 5,5 | 9,5 | 6,0 |
| M 6 | 1,00 | 5,0 | 11 | 15 | 6,6 | 11,0 | 7,0 |
| M 8 | 1,25 | 6,8 | 14 | 20 | 9,0 | 15,0 | 9,0 |
| M10 | 1,50 | 8,5 | 19 | 25 | 11,0 | 18,0 | 11,0 |
| M12 | 1,75 | 10,2 | 25 | 32 | 14,0 | 20,0 | 13,0 |
| M14 | 2,00 | 12,0 | 25 | 32 | 16,0 | 24,0 | 15,0 |
| M16 | 2,00 | 14,0 | 28 | 34 | 18,0 | 26,0 | 17,0 |
| M18 | 2,50 | 15,5 | 32 | 40 | 20,0 | 29,0 | 19,5 |
| M20 | 2,50 | 17,5 | 33 | 42 | 22,0 | 32,0 | 21,5 |
| M22 | 2,50 | 19,5 | 37 | 48 | 24,0 | 35,0 | 23,5 |
| M24 | 3,00 | 21,0 | 38 | 52 | 26,0 | 38,0 | 25,5 |
| M27 | 3,00 | 24,0 | 46 | 60 | 29,0 | 42,0 | 28,5 |
| M30 | 3,50 | 26,5 | 55 | 70 | 32,0 | 48,0 | 32,0 |
| M36 | 4,00 | 32,0 | 65 | 85 | 39,0 | 57,0 | 38,0 |
| M42 | 4,50 | 37,5 | 75 | 95 | 45,0 | 66,0 | 44,0 |
| M48 | 5,00 | 43,0 | 85 | 110 | 52,0 | 76,0 | 50,0 |

imperial threads (inches)

| d1 | pitch | pitch in mm | d2 |
|----------|-------|-------------|-------|
| R 1/8" | 28G/" | 0,91 | 8,70 |
| R 1/4" | 19G/" | 1,34 | 11,60 |
| R 3/8" | 19G/" | 1,34 | 15,00 |
| R 1/2" | 14G/" | 1,81 | 19,00 |
| R 3/4" | 14G/" | 1,81 | 24,25 |
| R 7/8" | 14G/" | 1,81 | 28,00 |
| R 1" | 11G/" | 2,31 | 30,00 |
| R 1 1/4" | 11G/" | 2,31 | 39,00 |
| R 1 1/2" | 11G/" | 2,31 | 45,00 |

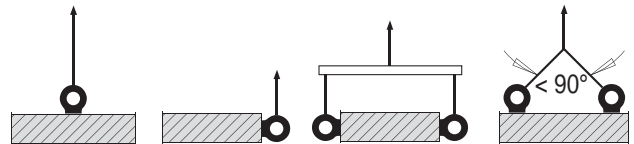
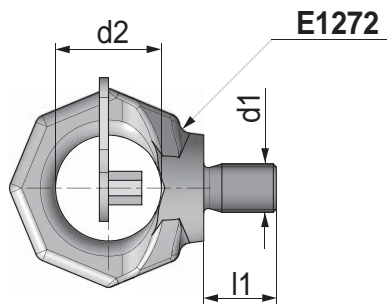
fine threads

| d1 | d2 |
|-----------|------|
| M 4x0,5 | 3,5 |
| M 5x0,5 | 4,5 |
| M 6x0,5 | 5,5 |
| M 6x0,75 | 5,2 |
| M 8x0,5 | 7,5 |
| M 8x0,75 | 7,2 |
| M 8x1 | 7,0 |
| M 10x1 | 9,0 |
| M 10x1,25 | 8,8 |
| M 10x1,5 | 8,5 |
| M 12x1 | 11,0 |
| M 12x1,25 | 10,8 |
| M 12x1,5 | 10,5 |
| M 14x1 | 13,0 |
| M 14x1,5 | 12,5 |

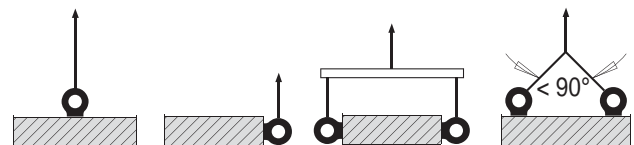
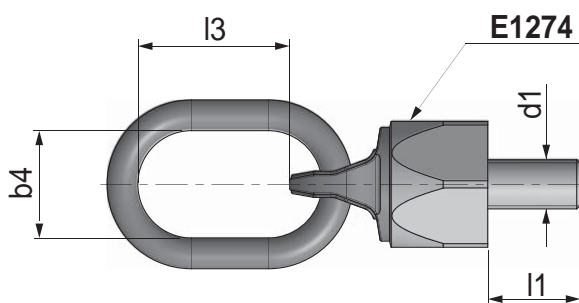
| d1 | d2 |
|----------|------|
| M 16x1 | 15,0 |
| M 16x1,5 | 14,5 |
| M 18x1,5 | 16,5 |
| M 20x1,5 | 18,5 |
| M 22x1 | 21,0 |
| M 22x1,5 | 20,5 |
| M 24x1 | 23,0 |
| M 24x1,5 | 22,5 |
| M 24x2 | 22,0 |
| M 26x1,5 | 24,5 |
| M 27x1,5 | 25,5 |
| M 27x2 | 25,0 |
| M 28x1,5 | 26,5 |
| M 30x1 | 29,0 |
| M 30x1,5 | 28,5 |

| d1 | d2 |
|----------|------|
| M 30x2 | 28,0 |
| M 32x1,5 | 30,5 |
| M 33x2 | 31,0 |
| M 34x1,5 | 32,5 |
| M 35x1,5 | 33,5 |
| M 36x1,5 | 34,5 |
| M 36x2 | 34,0 |
| M 38x1,5 | 36,5 |
| M 40x1,5 | 38,5 |
| M 42x1,5 | 40,5 |
| M 42x2 | 40,0 |
| M 48x2 | 46,0 |
| M 48x3 | 45,0 |
| M 50x1,5 | 48,5 |
| M 52x2 | 50,0 |

eye bolt



| d1 | d2 | l1 | max. kg | max. kg | max. kg | max. kg |
|------|----|----|---------|---------|---------|---------|
| M 10 | 25 | 15 | 1000 | 400 | 800 | 1120 |
| M 12 | 30 | 18 | 2000 | 750 | 1500 | 2000 |
| M 16 | 35 | 24 | 4000 | 1500 | 3000 | 4200 |
| M 20 | 40 | 30 | 6000 | 2300 | 4600 | 6400 |
| M 24 | 48 | 36 | 8000 | 3200 | 6400 | 9000 |
| M 30 | 60 | 45 | 12000 | 4500 | 9000 | 12600 |
| M 36 | 75 | 54 | 16000 | 7000 | 14000 | 19600 |

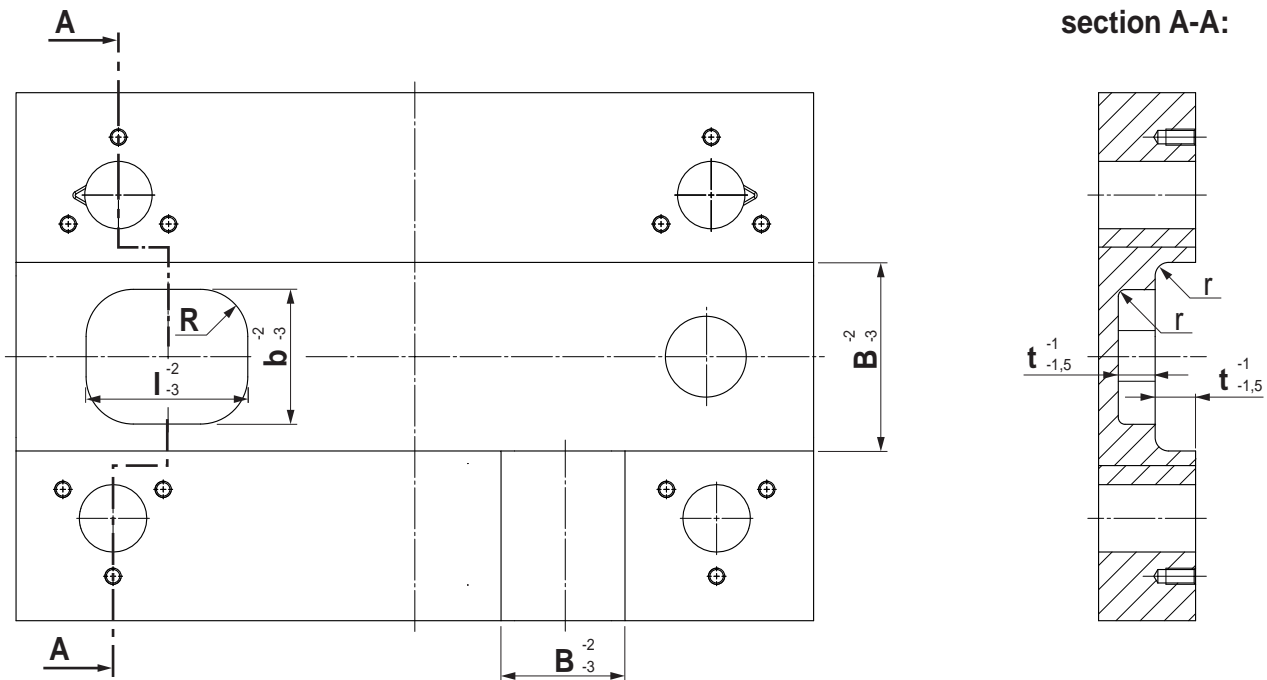


| d1 | b4 | l1 | l3 | max. kg | max. kg | max. kg | max. kg |
|------|----|----|----|---------|---------|---------|---------|
| M 10 | 29 | 17 | 33 | 900 | 450 | 900 | 1260 |
| M 12 | 35 | 21 | 51 | 1200 | 600 | 1200 | 1680 |
| M 16 | 38 | 25 | 47 | 2600 | 1300 | 2600 | 3640 |
| M 20 | 35 | 33 | 56 | 4000 | 2000 | 4000 | 5600 |
| M 24 | 40 | 40 | 68 | 7000 | 3500 | 7000 | 9800 |
| M 30 | 50 | 50 | 93 | 10000 | 5000 | 10000 | 14000 |

**If plate weight > 800 kg
provide threads for eye bolts!**

roughing

pocket milled with insert cutters



corner radius / depth

| b / l | R | t | max. t)* |
|-----------|------|------|----------|
| < 100/100 | 17,5 | -100 | - |
| < 300/300 | 26 | -150 | -240 |
| > 300/300 | 33 | -210 | -300 |

)* avoid max. depth (t) if possible (higher machining costs, larger radius R)!

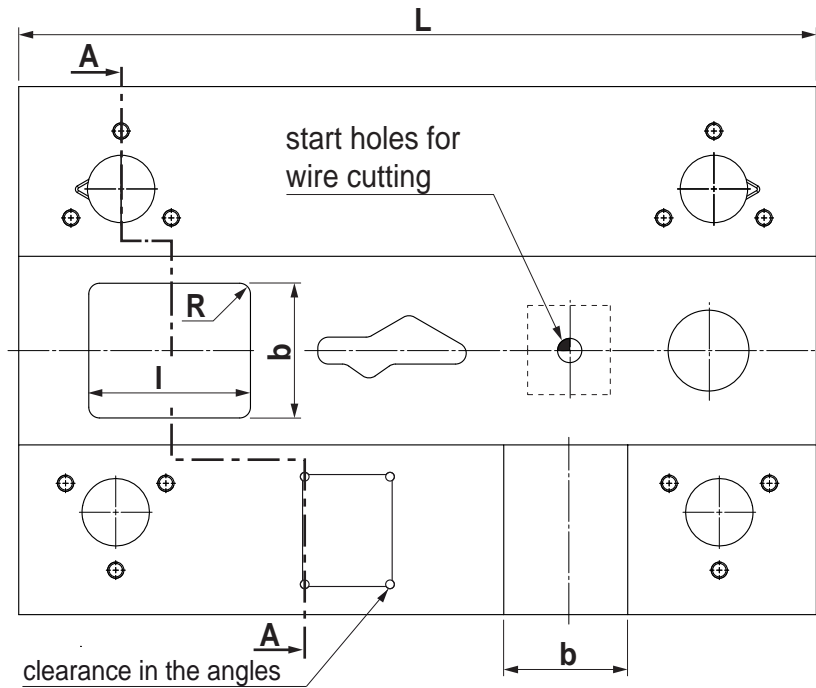
radius r = 3 mm - 6 mm depending on the tool used

for complex forms:

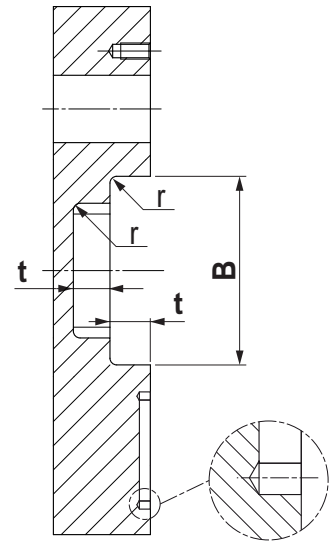
provide:

- pre-work drawing
- 2D-data: DXF, DWG
- 3D-data: Parasolid, STEP

finishing



section A-A:



In case of a small radii the clearances are drilled deeper than the pocket bottom!

corner radius / depth

| depth (t) | min. corner radius (R) | bottom radius (r) |
|-------------|------------------------|-------------------|
| 35 | 4 | 0, 1, 2 |
| 45 | 5 | |
| 55 | 6 | 0, 1, 2, 4 |
| 80 | 8 | |
| 90 | 10 | |
| 100 | 12 | 0, 1, 2, 4, 6 |
| 105 | 16 | |
| 125 | 20 | |
| 150 | 25 | |
| 200 | 30 | |
| 250 | 35 | |

Avoid max. depth (t) if possible (higher machining costs)!

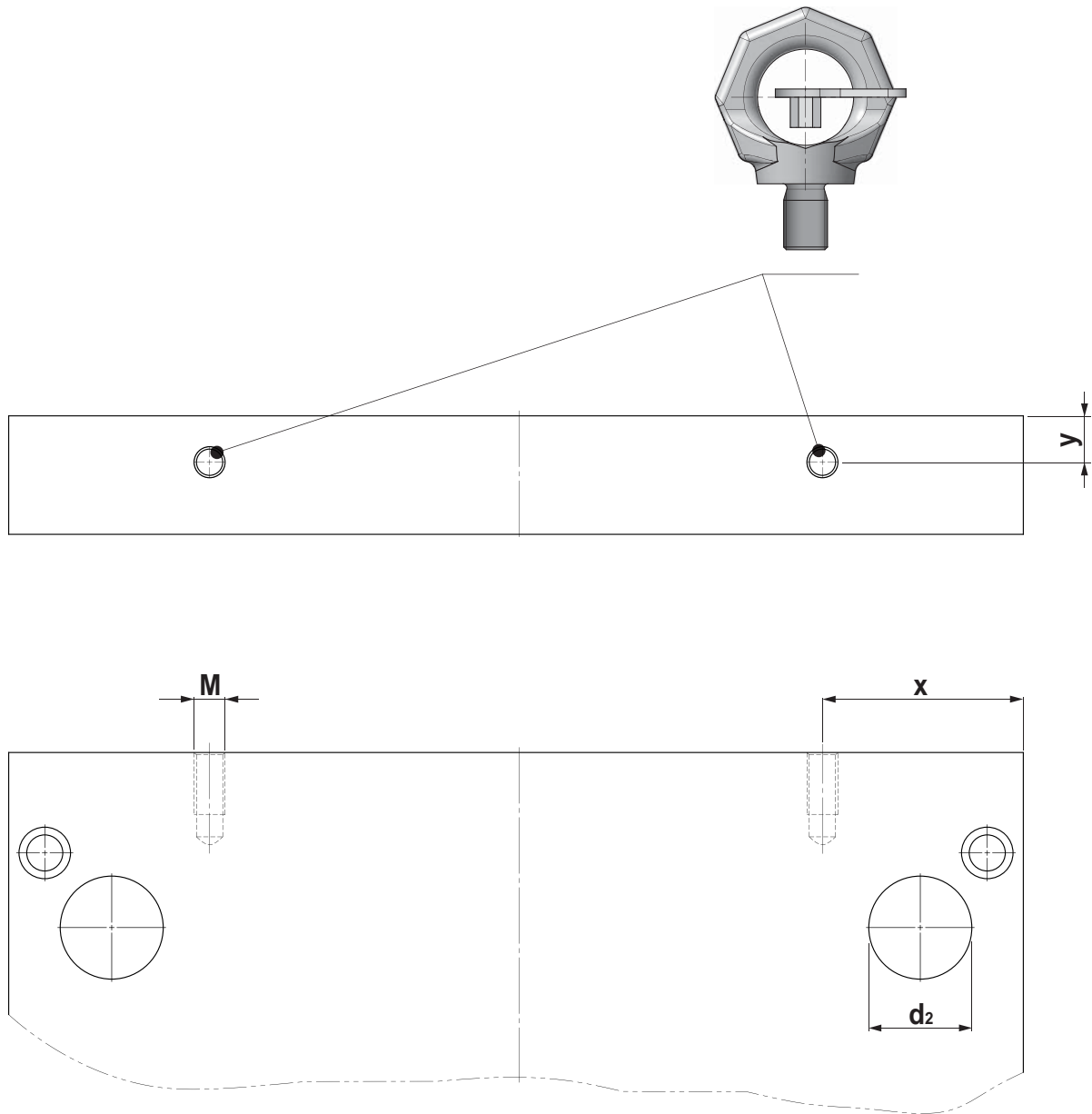
pocket

| b / l | Tol. b / l | Tol. t |
|-------|----------------|--------------|
| ≅ 200 | +0,04 +0,01 | +0 - 0,02 |
| ≅ 400 | +0,05 +0,01 | |
| ≅ 600 | +0,06 +0,01 | +0 - 0,04 |
| ≅ 600 | +0,07 +0,01 | |

slot

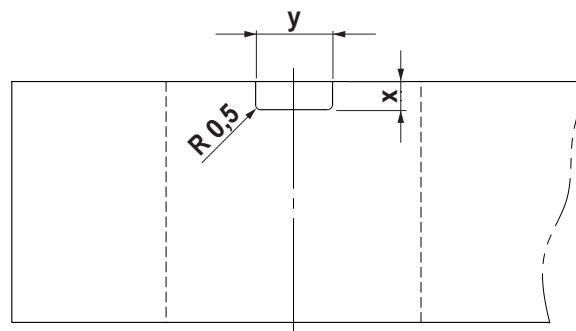
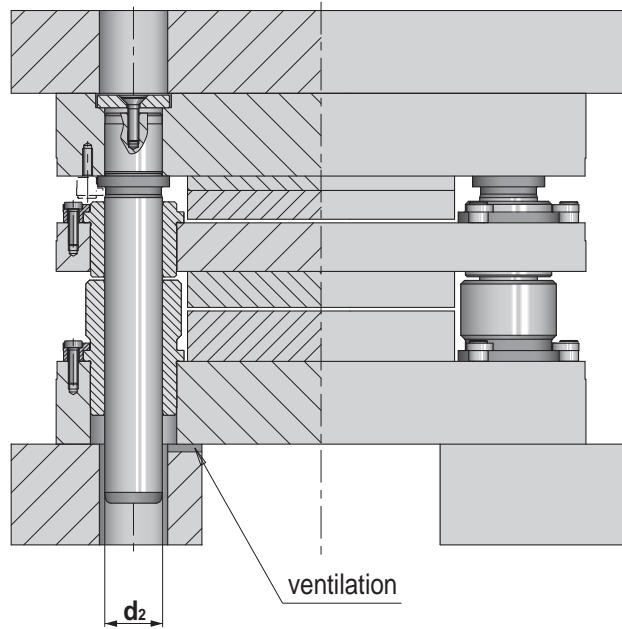
| B / L | Tol. B | Tol. t |
|-------|-------------|--------------|
| ≅ 400 | +0,02 +0 | +0 - 0,02 |
| ≅ 600 | +0,03 +0 | |

eyebolt holes



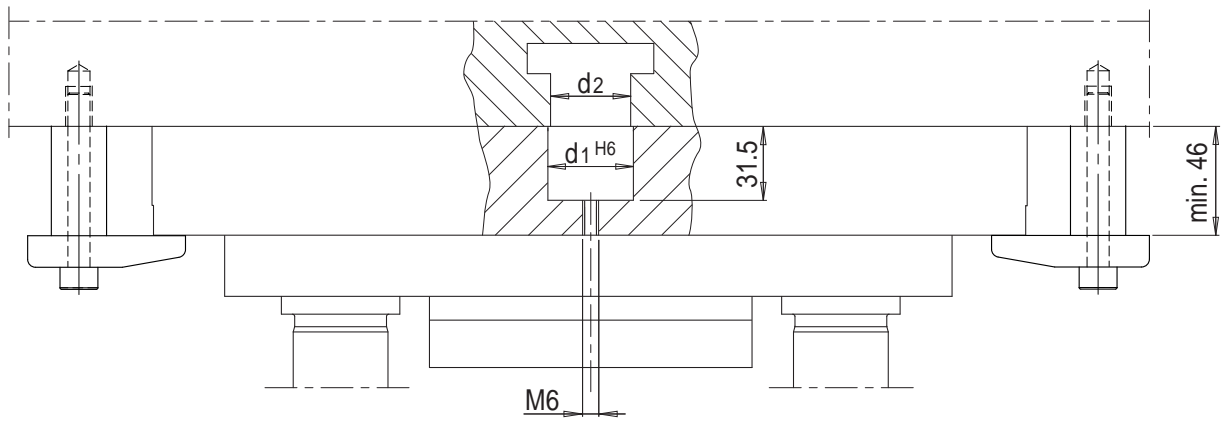
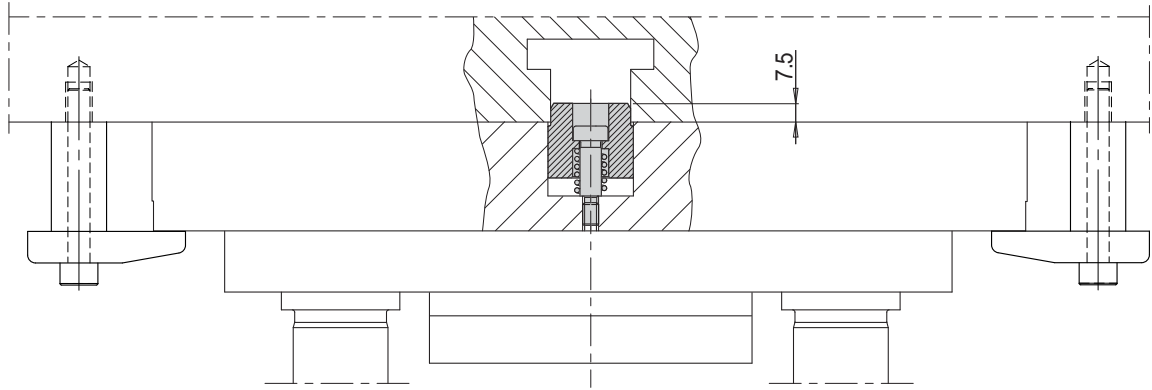
| d₂ | x | y | M |
|----------------------|----------|----------|----------|
| Ø 20 | 78 | 18 | M 12 |
| Ø 25 | 78 | 18 | M 12 |
| Ø 32 | 108 | 18 | M 16 |
| Ø 40 | 108 | 18 | M 16 |
| Ø 50 | 108 | 18 | M 16 |

ventilation



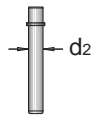
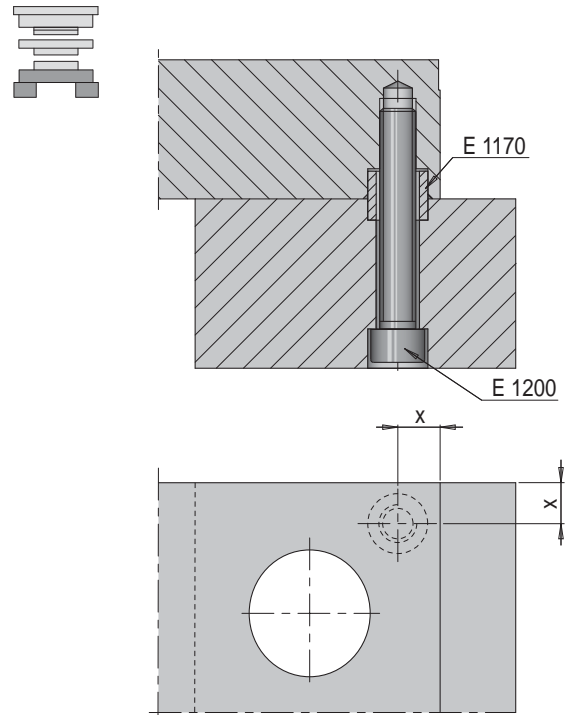
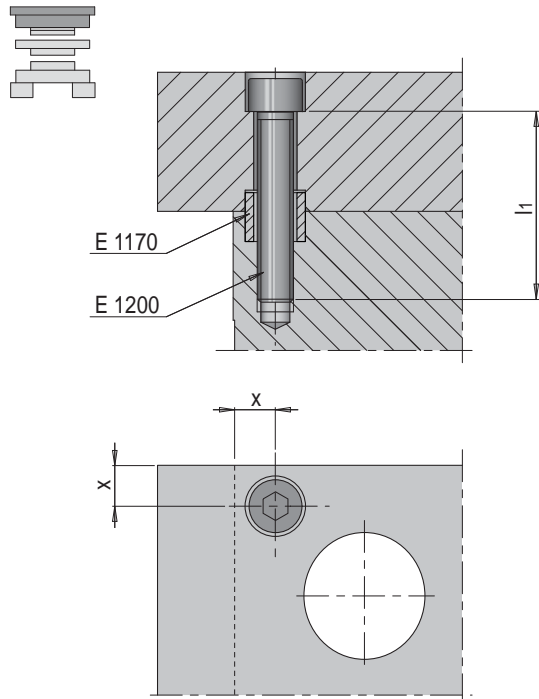
| d2 | x | y |
|------|---|----|
| Ø 20 | 3 | 8 |
| Ø 25 | 3 | 8 |
| Ø 32 | 3 | 8 |
| Ø 40 | 4 | 10 |
| Ø 50 | 4 | 10 |

centering unit



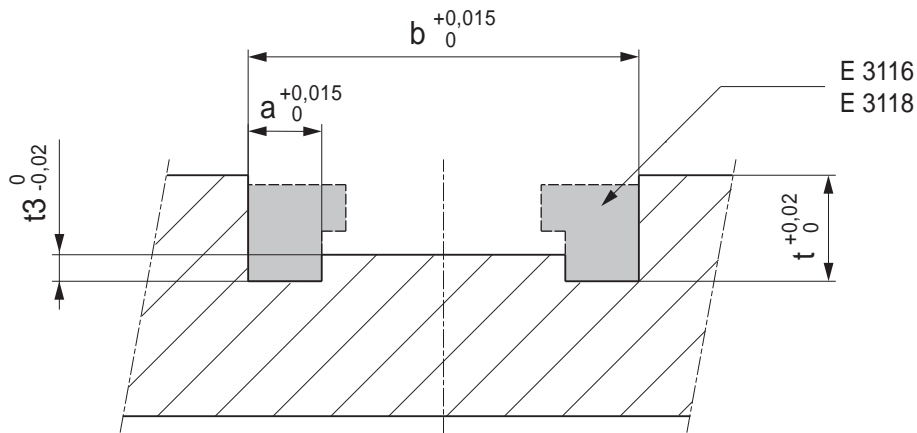
| d1 | d2 |
|----|----|
| 24 | 18 |
| | 20 |
| | 22 |
| | 24 |
| 32 | 28 |
| | 30 |
| | 32 |

screw holes



| d2 | x | E 1170 | E 1200 |
|----|----|-----------|----------------|
| 20 | 12 | E 1170/16 | E 1200/10 x l1 |
| 25 | 14 | E 1170/20 | E 1200/12 x l1 |
| 32 | 14 | E 1170/20 | E 1200/12 x l1 |
| 40 | 14 | E 1170/20 | E 1200/12 x l1 |
| 50 | 18 | E 1170/30 | E 1200/16 x l1 |

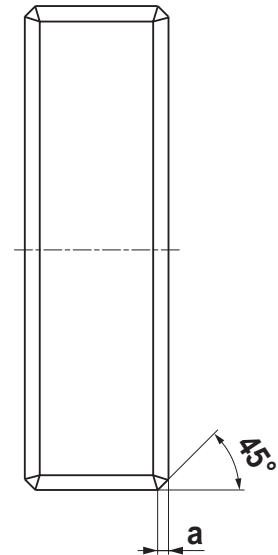
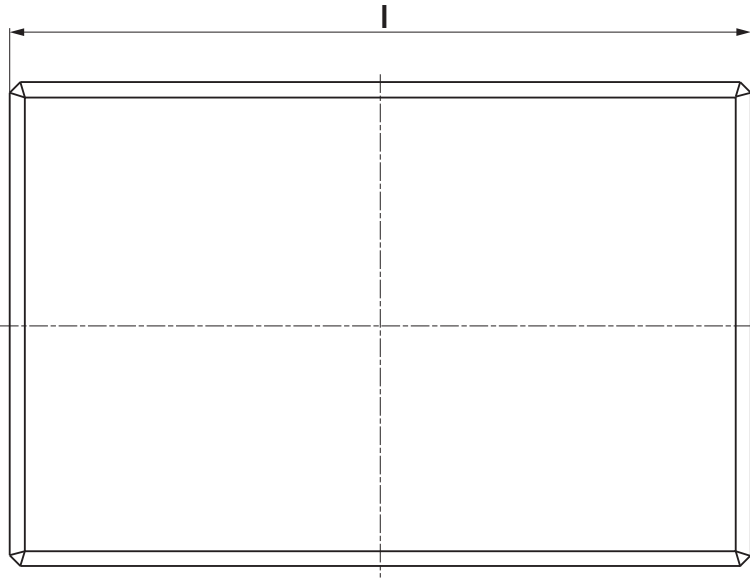
guiding rails



| a | t3 |
|----------|-----------|
| 11 | 3 |
| 12 | 2 |
| 15 | 3 |
| 19 | 4 |
| 24 | |

chamfers

SV / SP / P-plates and risers



chamfer sizes / standard

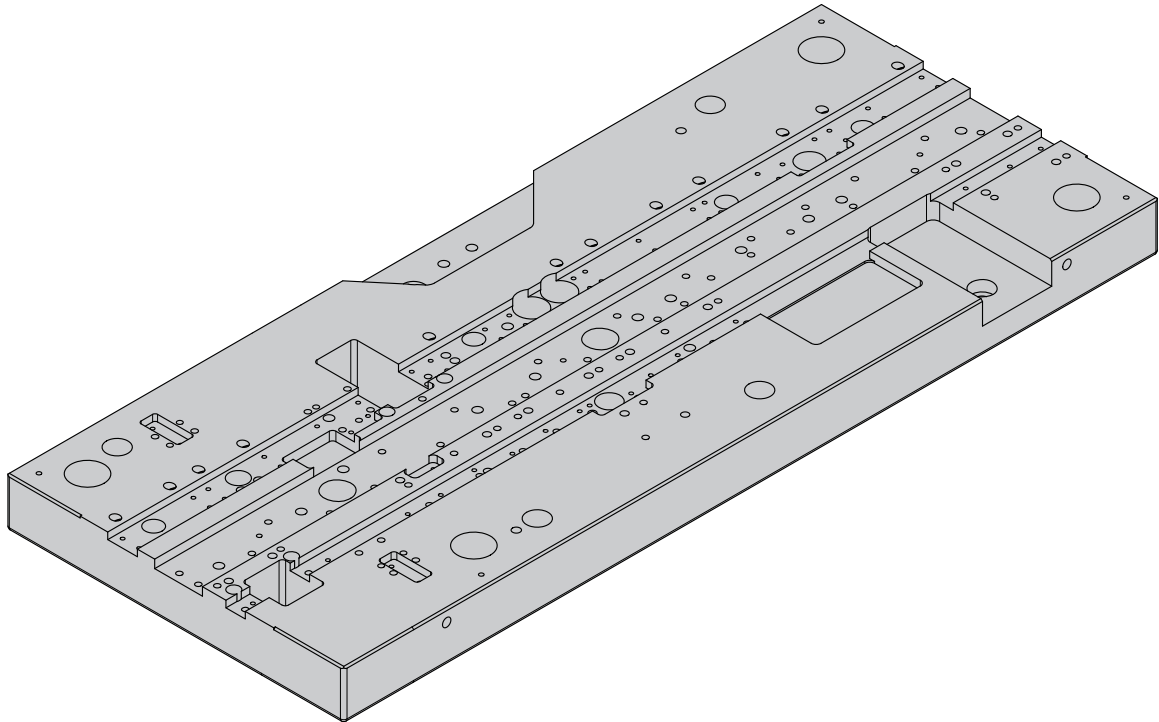
| l | a min. | a max. |
|-------|--------|--------|
| ≅ 396 | 1,0 | 1,2 |
| ≅ 596 | 1,4 | 1,6 |
| > 596 | 1,8 | 2,0 |

recommended chamfer sizes: 1

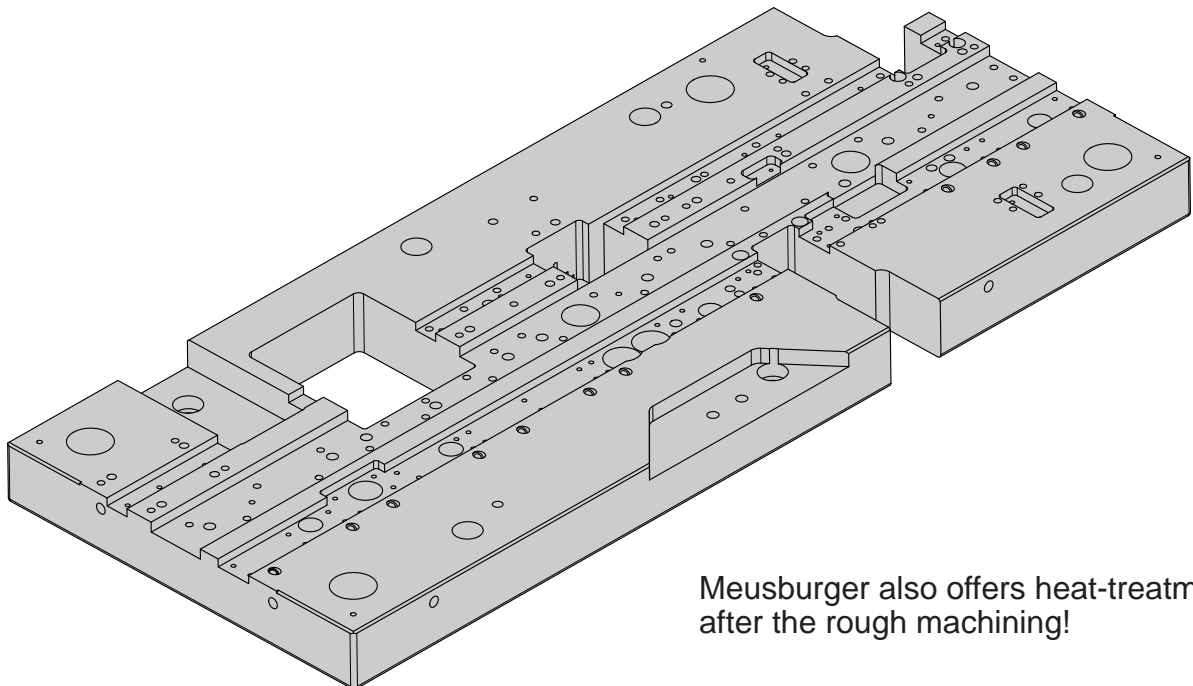
- 1,5
- 2
- 3
- 4
- 5
- 6
- 8

distortion

Machining with little distortion!



Distortion possible due to the following machining!



**Meusburger also offers heat-treatment
after the rough machining!**

roughing 3D

data import

WKF - from VISI, Parasolid, Step
direct interfaces (Catia V4, V5, Unigraphics, Pro-E)

max. size

width: 1.100 mm
length: 1.600 mm
weight: 2.500 kg
for exceeding dimensions, the feasibility will be determined accordingly
(clamping, weight, job execution).

machining

allowance to be selected: Standard 1 - 2 mm
smallest possible tool Ø: 35 mm (R 17.5)
angle radius (pocket bottom): R 3 - R 6

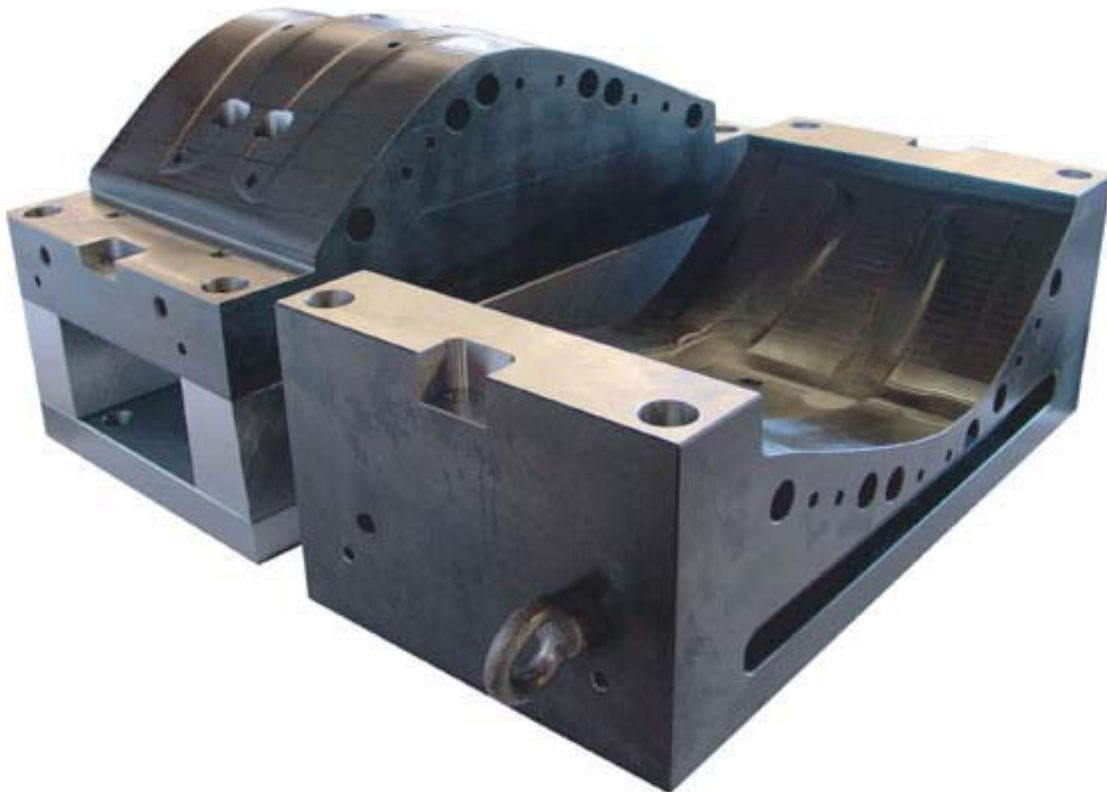
Support areas for subsequent machining to customer specifications

stress-relieving heat treatment

any plate which has been massively roughed will be stress-relieved again.
After this process the reference surface will be finished and the
2D machining achieved (e.g. holes, threads, pockets etc.)

data export

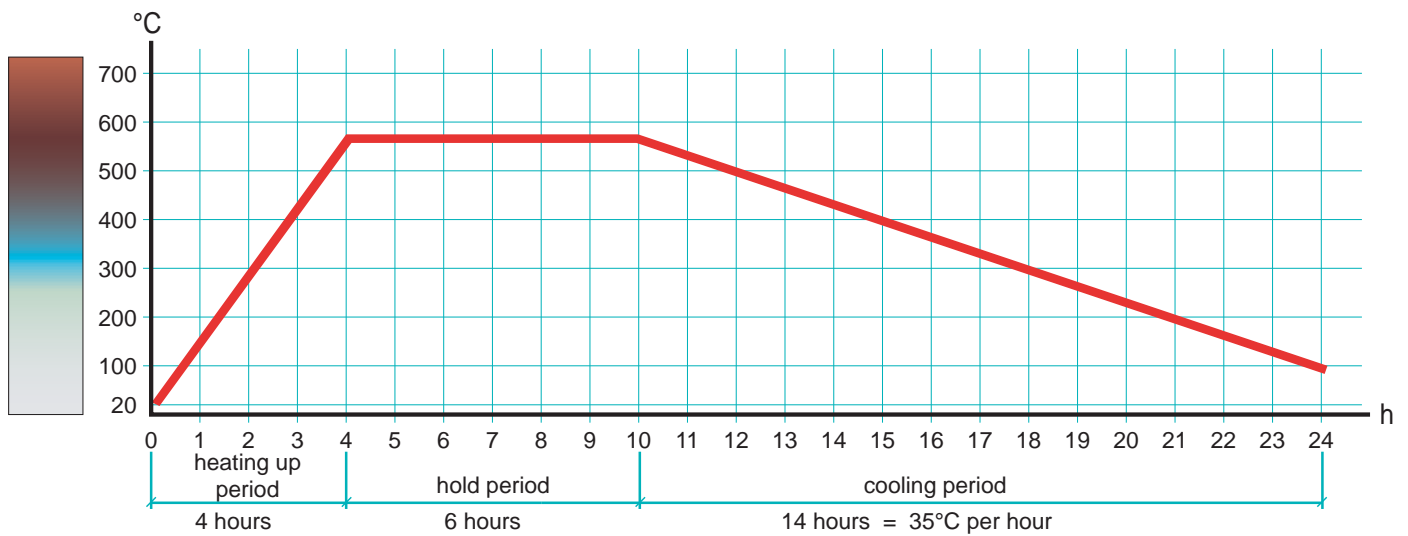
we supply the customers with STL files for subsequent machining.



Stress-relieving heat-treatment

Any steel which we machine is stress-relieved with great care. Thanks to a long maintaining of the temperature and a slow cooling of the oven at the rate of 35°C/h we obtain best results in terms of stress-free material.

heat-treatment graphic



capacity: 120 tons per day

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