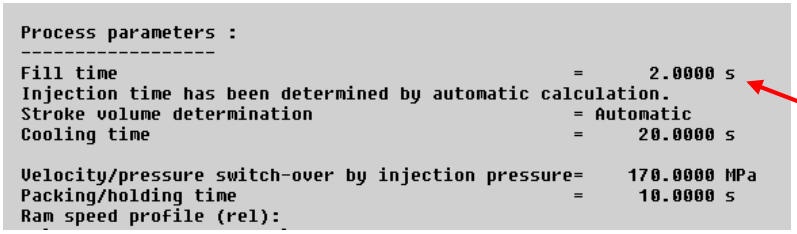
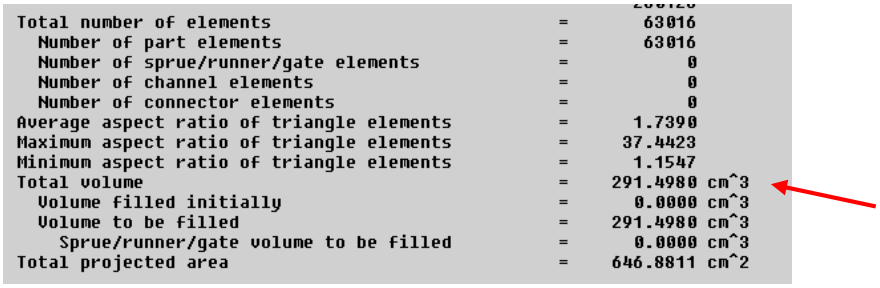
LAMPIRAN A. PERHITUNGAN

1. Perhitungan diameter *gate*

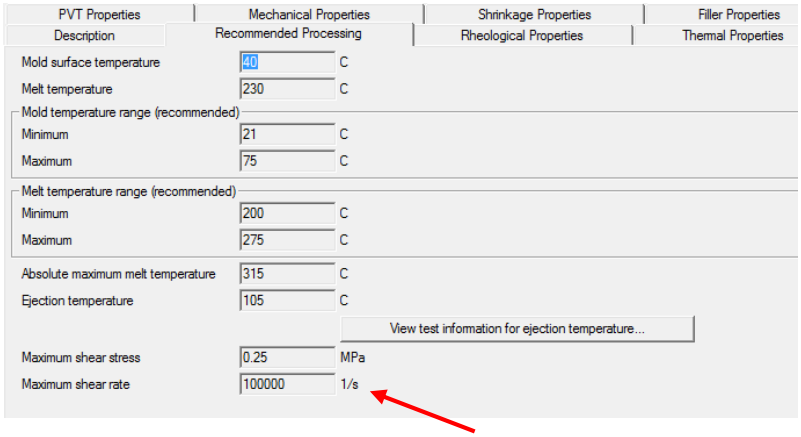


```
Process parameters :
------------------
Fill time                                          =      2.0000 s
Injection time has been determined by automatic calculation.
Stroke volume determination                        = Automatic
Cooling time                                       =     20.0000 s

Velocity/pressure switch-over by injection pressure=    170.0000 MPa
Packing/holding time                               =     10.0000 s
Ram speed profile (rel):
```



```
Total number of elements                           =      63016
  Number of part elements                          =      63016
  Number of sprue/runner/gate elements             =          0
  Number of channel elements                       =          0
  Number of connector elements                     =          0
Average aspect ratio of triangle elements          =     1.7390
Maximum aspect ratio of triangle elements          =    37.4423
Minimum aspect ratio of triangle elements          =     1.1547
Total volume                                       =   291.4980 cm^3
  Volume filled initially                          =     0.0000 cm^3
  Volume to be filled                              =   291.4980 cm^3
    Sprue/runner/gate volume to be filled          =     0.0000 cm^3
Total projected area                               =   646.8811 cm^2
```



Diketahui

Tebal produk = 2 dan diameter gate asumi = 1,9 mm= 0,19 cm

r = asumsi diameter gate < tebal produk

r = 0,095 cm

shot volume/ total volume = 291cm^3

fill time = 2 s

maximum shear rate material = 100000 1/s

Ditanya

Shear rate diameter 1.9... ?

Jawab :

$$= r = \sqrt[3]{\frac{4Q}{3{,}14 \cdot shear\ rate}}$$

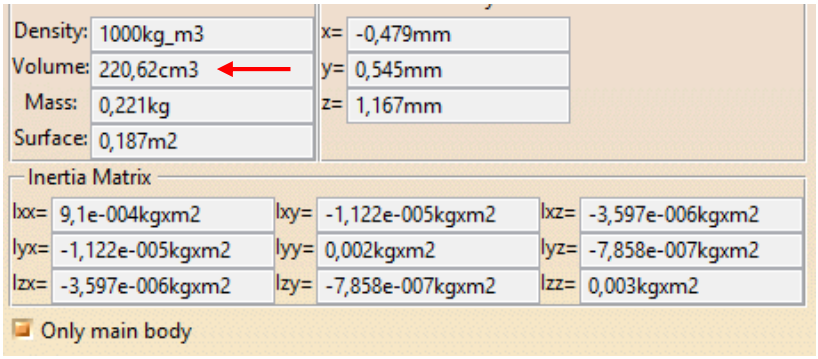
Share rate = $\frac{4 \cdot Q}{3{,}14 \cdot r^3}$

Q = $\frac{shot\ volume}{injection\ time}$

Q = $\frac{291\ cm3}{2\ s}$ = 145,5 cm^3/s

Shear rate = $\frac{4 \cdot 145{,}5\ cm3/s}{3{,}14 \cdot (0.95 cm^3)}$ = 216073 1/s < 100000 1/s dengan asumsi diameter paling mendekati tebal produk didapatkan shear rate maximal pada diameter 1.9 mm adalah 216073 1/s.

2. Perhitungan diameter *runner*



Diketahui

ρ material PP = 0,910 gram/cm^3

V = 220,62 cm^3

L (panjang runner) = runner primer 114 mm & runner sekunder 37 mm

W = V· ρ material PP = 220,62 cm^3 · 0,910 gram/cm^3 = 200,76 gram

Ditanya

Diameter runner primer ?

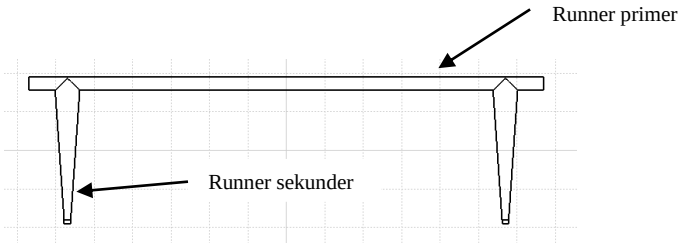
Diameter runner sekunder ?

Jawab

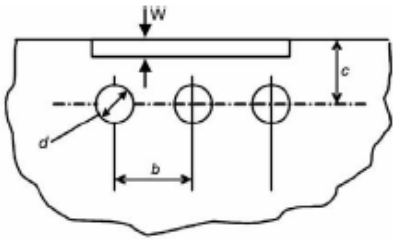
$$D = \frac{W^{\frac{1}{2}} \cdot L^{\frac{1}{4}}}{3,7}$$

$$D \text{ primer} = \frac{200,76^{\frac{1}{2}} \cdot 114\ mm^{\frac{1}{4}}}{3,7} = 12,48 \text{ mm diameter minimal}$$

$$D \text{ sekunder} = \frac{200,76^{\frac{1}{2}} \cdot 37\ mm^{\frac{1}{4}}}{3,7} = 9,4 \text{ mm diameter minimal}$$



3. Perhitungan diameter *cooling*



Part thickness *W*	Channel Diameter *d*
2 mm ·····	8–10 mm
4 mm	10–12 mm
6 mm	12–15 mm
$c = 2d$ to $3d$	$b = 3d$ to $4d$

Diketahui

d = 10 mm

w = 2 mm

Ditanya

c jarak cooling dengan produk (dapat dilihat pada input cooling) ?

b jarak cooling dengan cooling (dapat dilihat pada input cooling) ?

Jawab

c = 3·d = 3·10 mm = 30 mm

b = 4·d = 4·10 mm = 40 mm

4. Perhitungan *clamping force*

Sebelum mencari nilai *clamping force* terlebih dahulu mencari nilai *flow path* pada produk *glove box* untuk mencari tekanan *cavity*

Dari senter gate didapat *Flow path* produk *glove box* = 155 mm

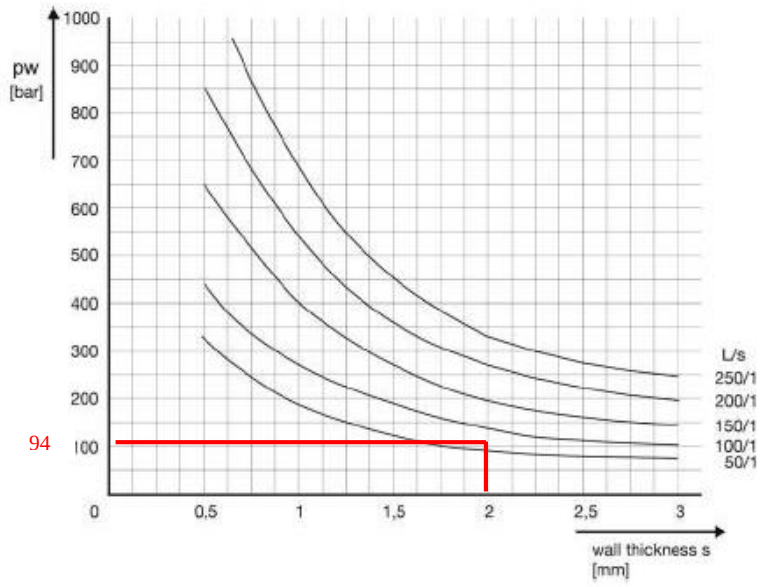
Tebal produk *glove box* (WT) = 2 mm

$$ratio = \frac{Flow\ Path}{\text{WT}}$$

$$ratio = \frac{155\ \text{mm}}{2\ \text{mm}}$$

= 77,5 mm jadi ratio produk adalah 77,5 mm

Ratio 77,5 : 1 pada grafik di bawah antara 50/1 - 100/1



Diketahui

Ap (luas proyeksi *glove box*) = P· *L* (30,9 cm · 20,8 cm)

= 642,72 cm^2

Pi (tekanan cavity pada grafik) = 94 kg/cm^3

Ditanya

Fc (*clamping force*)...?

Jawab

$Fc = Ap \cdot Pi$

$= 642{,}72\ cm^2 \cdot 94\ kg/cm^2$

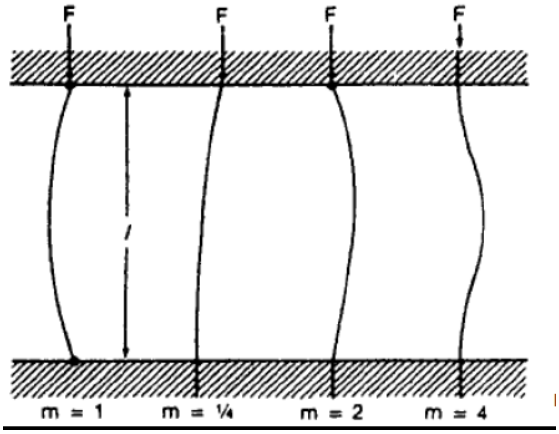
$= 60373{,}38\ kg$

$= 60{,}373\ Ton$

sehingga dari hasil clamping force yang sudah diketahui dapat menentukan mesin injeksi yang akan digunakan, untuk keamanan harus menggunakan mesin injeksi yang memiliki kapasitas *clamping force* 20% lebih dari 60 Ton.

5. Perhitungan kekuatan pin *ejector*

m tergantung dari konfigurasi dari ujung-ujung kolom
m =1; kedua ujung sendi atau engsel
m = ¼; satu ujung mati dan ujung lain bebas
m = 2; satu ujung mati dan ujung lain sendi
m = 4; kedua ujung mati



Diketahui

Diameter pin ejector = 8 mm

L panjang pin ejector = 165

Keliling cavity (d) = 2· (309+208) = 1034 mm dan tebal produk = 2 mm

Luas bidang kontak terhadap cavity (A) = 53000 mm^2

Koefisien gesek PP terhadap baja (μ)= 0,2

Koefisien ekspansi thermal PP = 0,00018 ^{0}C

Poiton ratio (γ) = 0,392

Gaya cavity material PP = 40 N/mm^2

Suhu cairan PP = 235^{0}C Suhu mold = 35 ^{0}C

Beda temperatur ΔT = 235^{0}C - 35^{0}C = 200 ^{0}C

E modulus material SKH51 = 219 Gpa = 219000 Mpa

E modulus material PP rata-rata = $\frac{1300+1800}{2}$ Mpa

= 1550 Mpa

Kontraksi thermal terhadap keliling St

St = (kel cavity · Koefisien ekspansi thermal PP · ΔT)

St = (1034 mm· 0,00018 ^{0}C · 200 ^{0}C)

St = 37,224 mm

Ditanya

a. Gaya buckling ?
b. Gaya cavity terhadap permukaan ejector ?
c. Ejection load ?

(Ejection load < gaya buckling dan gaya cavity terhadap permukaan ejector < gaya buckling) untuk Diketahuiatakan aman

Jawab

Gaya buckling = $\frac{m \cdot \pi^2 \cdot E\ mateial\ SKH51 \cdot I}{L^2}$

Momen I = $\frac{\pi \cdot D^4}{64}$

$= \frac{\pi \cdot (8mm)^2}{64} = 201{,}06\ \text{mm}^4$

a. Gaya buckling = $\frac{2 \cdot \pi^2 \cdot 219000\ \text{Mpa} \cdot 201{,}06\ \text{mm4}}{165^2}$

$= 31925{,}05\ \text{N}$

b. Gaya cavity terhadap permukaan ejector = gaya cavity $\cdot \frac{\pi \cdot D^2}{4}$

$= 40\ \text{N/mm}^2 \cdot \frac{\pi \cdot (8\ mm)^2}{4} = 2010{,}61\ \text{N}$

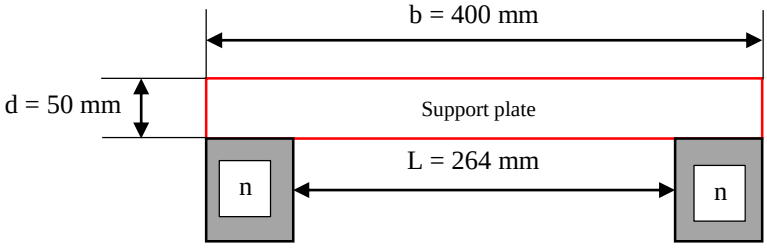
c. Ejection load = $\frac{St \cdot E\ modulus\ PP \cdot A \cdot \mu}{d\ (\frac{d}{2 \cdot t} - \frac{d}{4 \cdot t}) \cdot \gamma}$

Ejection load = $\frac{37{,}224\ \text{mm} \cdot 1550\ \text{Mpa} \cdot 53000\ mm^2 \cdot 0{,}2}{1034\ \text{mm}\left(\frac{1034\ \text{mm}}{2 \cdot 2} - \frac{1034\ \text{mm}}{4 \cdot 2}\right) \cdot 0{,}392}$

$= 11674{,}10\ \text{N}$

11674,10 N < 31925,05 N dan 2010,61 N < 31925,05 Jadi pin *ejector* aman digunakan untuk mengeluarkan produk *glove box*

6. Perhitungan *support plate*



Diketahui

σt material S45C = 800 N/mm^2

n = 2

Atot (P · l) = (309mm · 208mm) = 64272 mm^2

Pinj material PP = 100-130 N/mm^2 = $\frac{100+130}{2}$ N/mm^2

= 115 N/mm^2

W beban pada plat = Fk = Atot · Pinj

= 64272 mm^2 · 115 N/mm^2

= 7391280 N

Z modulus tahanan = $\frac{b \cdot d^2}{6}$

= $\frac{400mm \cdot (50mm)^2}{6}$ = 166666,67 mm^3

Ditanya

σt yang terjadi pada *support plate* ?

(σt yang terjadi pada *support plate* < σt material S45C) untuk diakatakan aman dan tidak memerlukan *Support Bolt*

Jawab

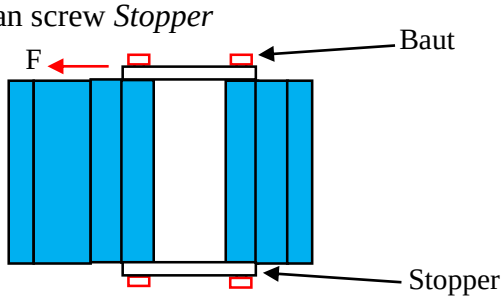
σt yang terjadi pada *support plate* $= \frac{W \cdot L}{n \cdot 8 \cdot Z}$

$= \frac{7391280\ \text{N} \cdot\ 264\ \text{mm}}{2 \cdot 8 \cdot 166666{,}67\ \text{mm3}}$

$= 731,\ 74\ \text{N/mm}^2$

Jadi 731, 74 N/mm^2 < 800 N/mm^2 di katakan aman dan tidak memerlukan *Support Bolt*

7. Perhitungan screw *Stopper*



Diketahui

τ material SCM435 = 200000 N/mm^2

n jumlah baut = 4

opening force stroke (Fs) = (350-500) Kn

$= \frac{350+500}{2}$ Kn

= 425 Kn

= 425000 N

Ditanya

di diameter ijin baut ?

Jawab

$$di = \sqrt{\frac{4 \cdot Fs}{\pi \cdot \tau\ material\ SCM435 \cdot n}}$$

$$di = \sqrt{\frac{4 \cdot 425000\ \text{N}}{\pi \cdot\ 200000\ \text{N}/mm^2 \cdot 4}}$$

di = 8,22 mm jadi diameter yang di ijinkan adalah 8,22 mm, tetapi untuk lebih amannya dipilih diameter M 12

8. Perhitungan diameter *eye bolts*

Diketahui

σt material SS400 = 400 N/mm^2

Berat mold atau (gaya) = 100 kg = 1000 N

Ditanya

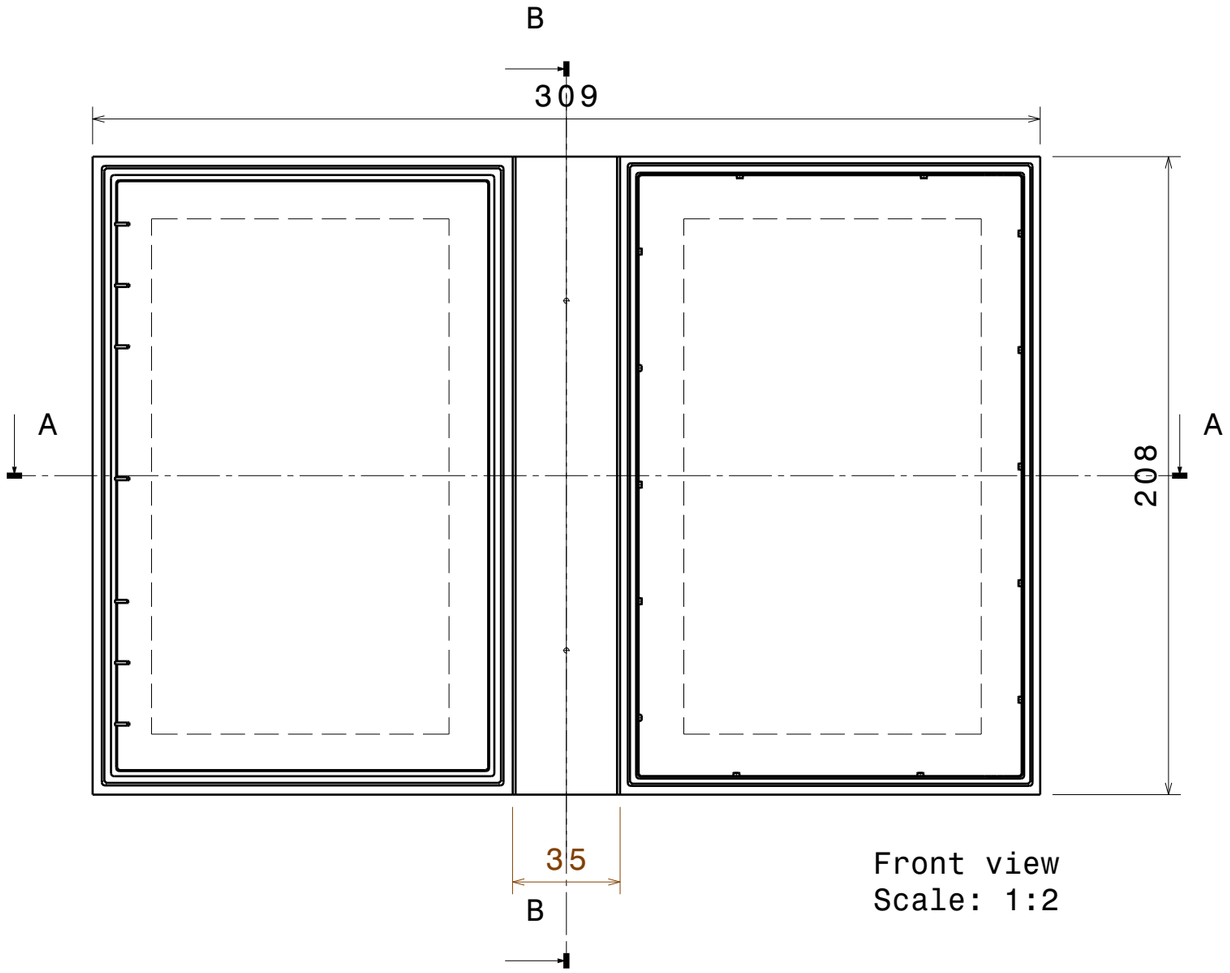
(di) diameter ijin baut *eye bolt* untuk menahan berat mold ?

Jawab

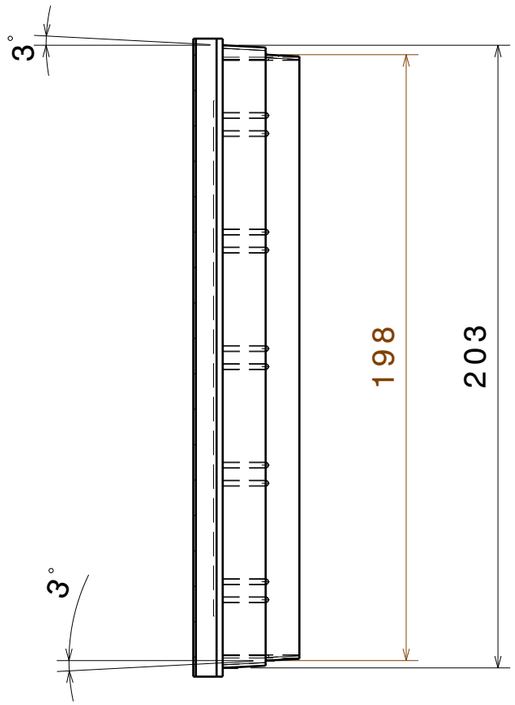
$$di = \sqrt{\frac{4 \cdot F}{\pi \cdot \sigma\ material\ SS400}}$$

$$di = \sqrt{\frac{4 \cdot 1000\ \text{N}}{\pi \cdot\ 400\ \text{N}/mm^2}}$$

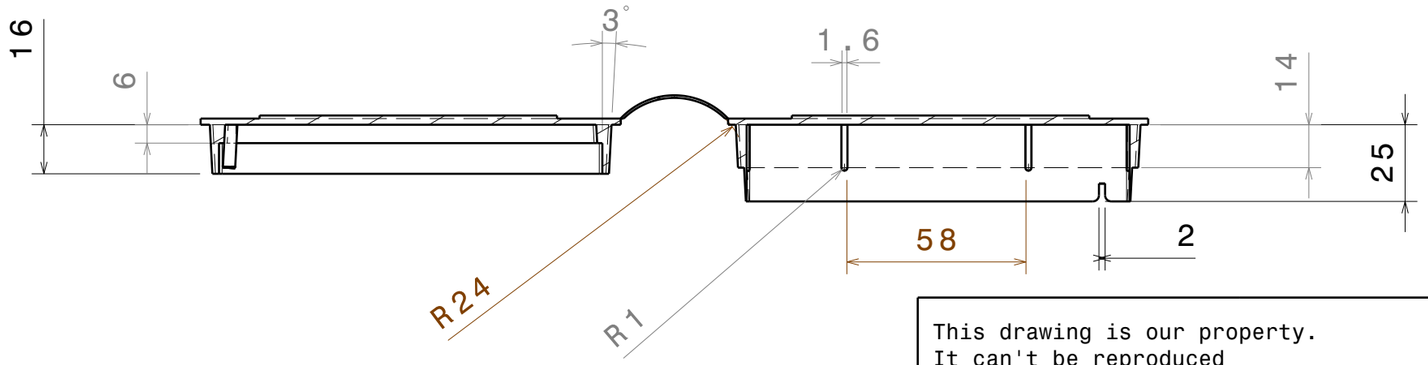
di = 17,84 mm jadi diameter yang di ijinkan adalah 17, 84 mm, tetapi untuk lebih amannya dipilih diameter M 22



Front view
Scale: 1:2



Section view B-B
Scale: 1:2



Section view A-A
Scale: 1:2

Polypropylene
Shrinkage 2,5%
Draft angle 3^0

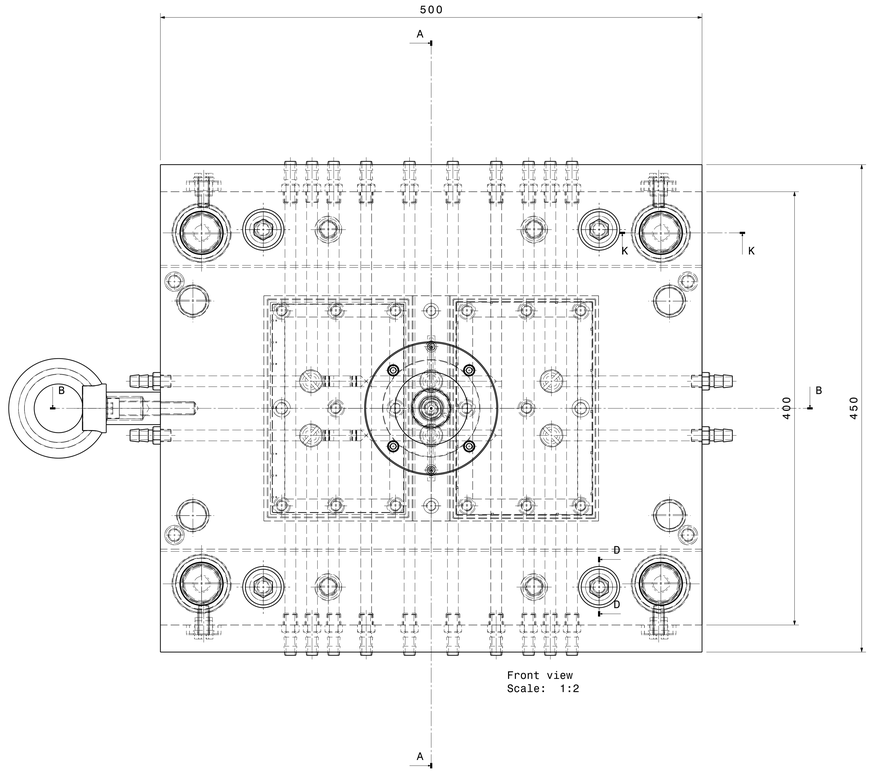
DRAWN BY: Ali Khaerul Mufid	DATE: 05/03/2017	
CHECKED BY: Cahyo Budiantoro,S.T.,M.Sc	DATE: 10/06/2017	
DESIGNED BY: Ali Khaerul Mufid	DATE: 01/03/2017	

TEKNIK MESIN - UMY

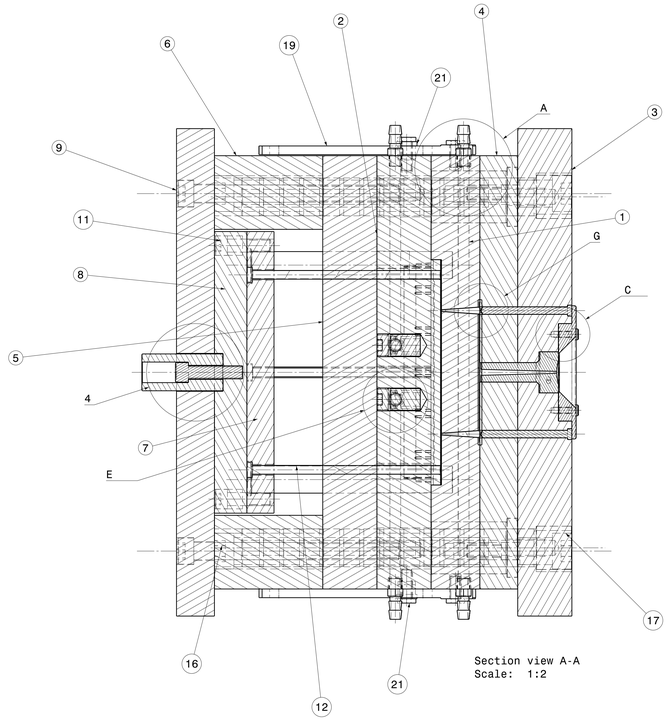
DRAWING TITLE: Glove Box

SIZE	DRAWING NUMBER	REV
A3	001	X

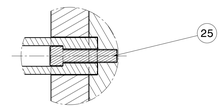
SCALE	WEIGHT(kg)		SHEET
1:2	0,22		B.1



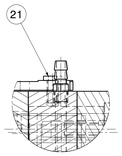
Front view
Scale: 1:2



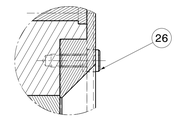
Section view A-A
Scale: 1:2



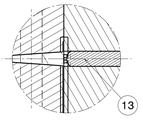
Detail D
Scale: 1:2



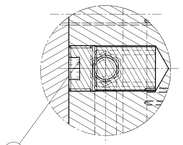
Detail A
Scale: 1:2



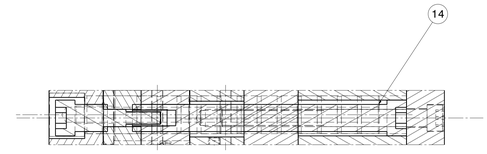
Detail C
Scale: 1:2



Detail G
Scale: 1:2

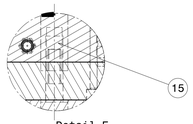


Detail E
Scale: 1:1

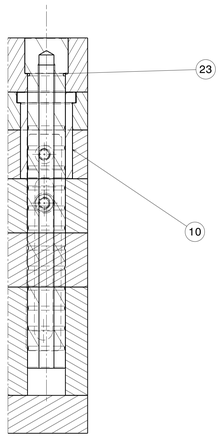


Section view D-D
Scale: 1:2

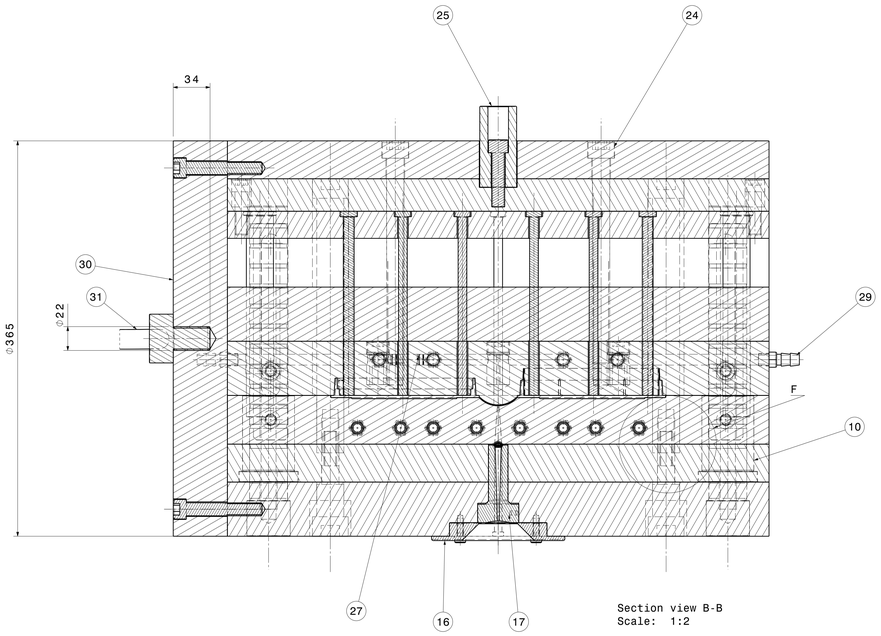
Material: PP
Shrinkage: 2,5%
Clamping Force: 60 Ton
Ejector Stroke: 45
Mold Hight: 365



Detail F
Scale: 1:2



Section view K-K
Scale: 1:2



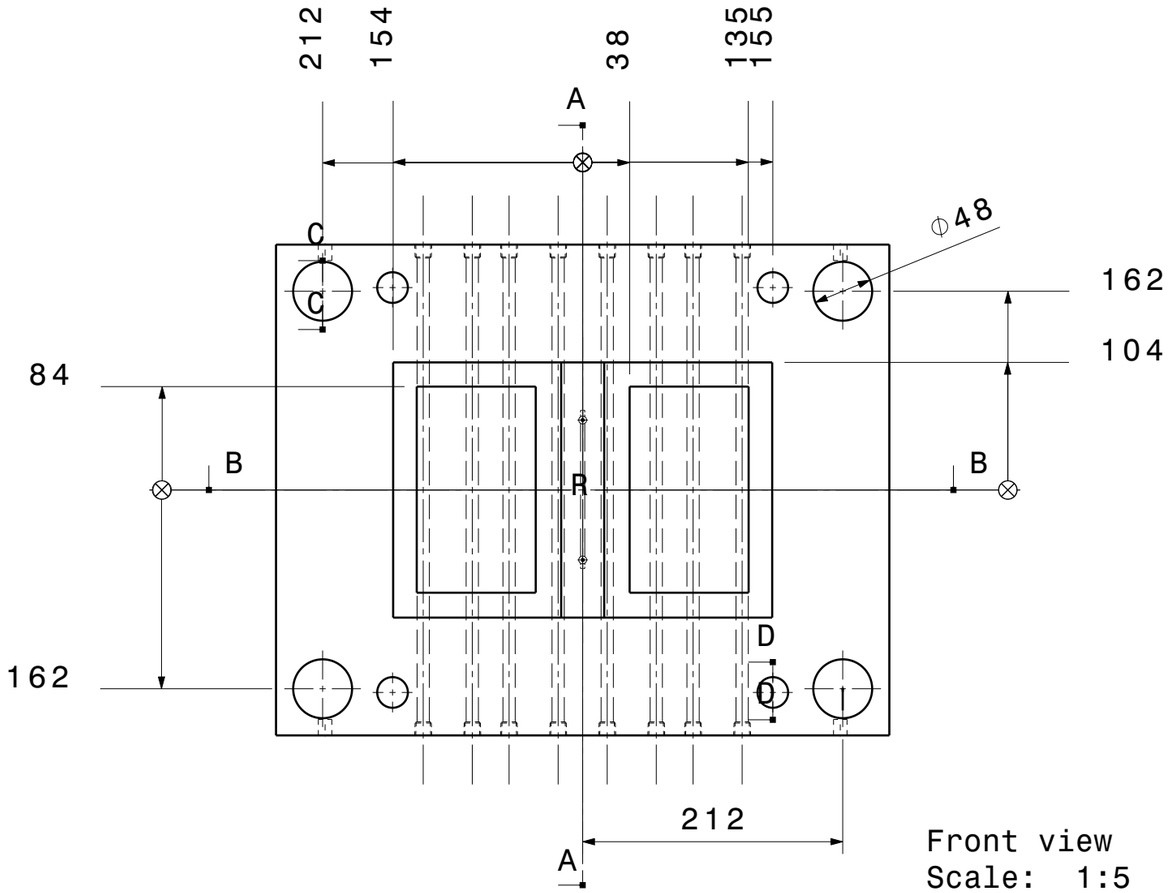
Section view B-B
Scale: 1:2

1	Eye Bolts	31	SM DIN 580	
1	Lifting	30	S400	
22	ConnectorPlug	29	Brass (C36000)	-
6	Baffle	28	SUS304	-
4	Cooling Plug	27	SCM435	
4	CapScrew_Z30_3	26	SCM435	-
1	KnockOut_M-BSA_4	25	S45C	-
4	CapScrew_M_1	24	SCM435	-
4	LeaderPin_M-SPN_4	23	SUJ2	-
4	ReturnPin_M-RPN_4	22	SUJ2	-
4	Link Retainers Screw	21	SCM435	-
4	Link Retainers Screw core	20	SCM435	-
4	Tension Links	19	SCM435	-
4	Link Retainers	18	SCM435	-
1	SprueBushing_Z51_3	17	SKD61	-
1	LocatingRing_K100-1_3	16	S45C	-
4	Stop Bolts	15	SCM435	-
4	Puller Bolts	14	SCM435	-
2	Runner lock pins	13	SKH51	-
20	Ejector_A_10	12	SKH51	-
4	CapScrew_M_6	11	SCM435	-
4	Bushing	10	SUJ2	-
1	Buttom Clamping Plate	9	S45C	-
1	Ejector Back Plate	8	S45C	-
1	Ejector Plate	7	SS400	-
1	Distance Block	6	S45C	-
1	sport plate	5	S45C	-
1	Runner Plate	4	S55C	-
1	Top Clamping	3	S45C	-
1	core plate	2	S55C	3-004
1	cavity plate	1	S55C	3-003
Qty	Nama Design	Item	Material	Drwg.wr

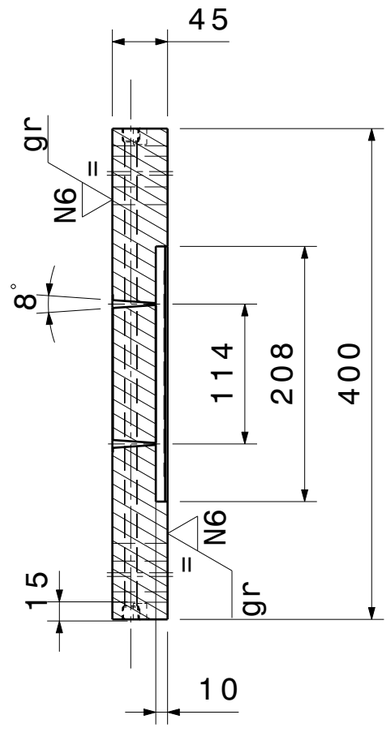
TEKNIK MESIN - UMY

DRAWING TITLE: MOLD for Glove Box

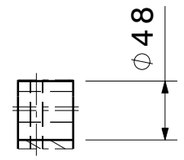
DRAWN BY	DATE	SIZE	DRAWING NUMBER			REV
Ali Khaerul Mufid	05/06/2017	A0	002			1
CHECKED BY	DATE	SCALE 1:2	WEIGHT(kg) 75,58		SHEET	B.2
Cahyo Budiantoro,S.T.,M.Sc	10/06/2017					
DESIGNED BY	DATE					
Ali Khaerul Mufid	01/03/2017					



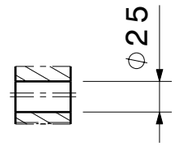
Front view
Scale: 1:5



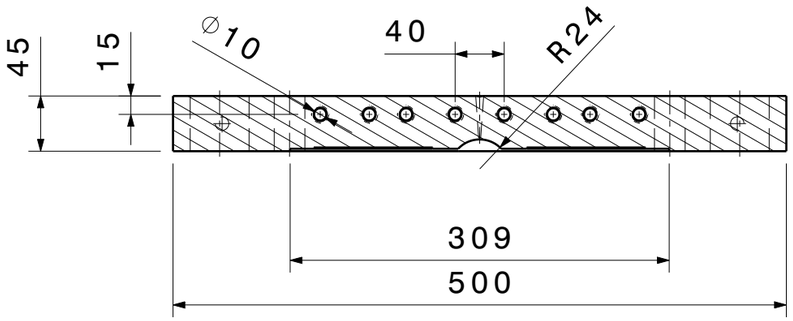
Section view A-A
Scale: 1:5



Section view C-C
Scale: 1:5



Section view D-D
Scale: 1:5

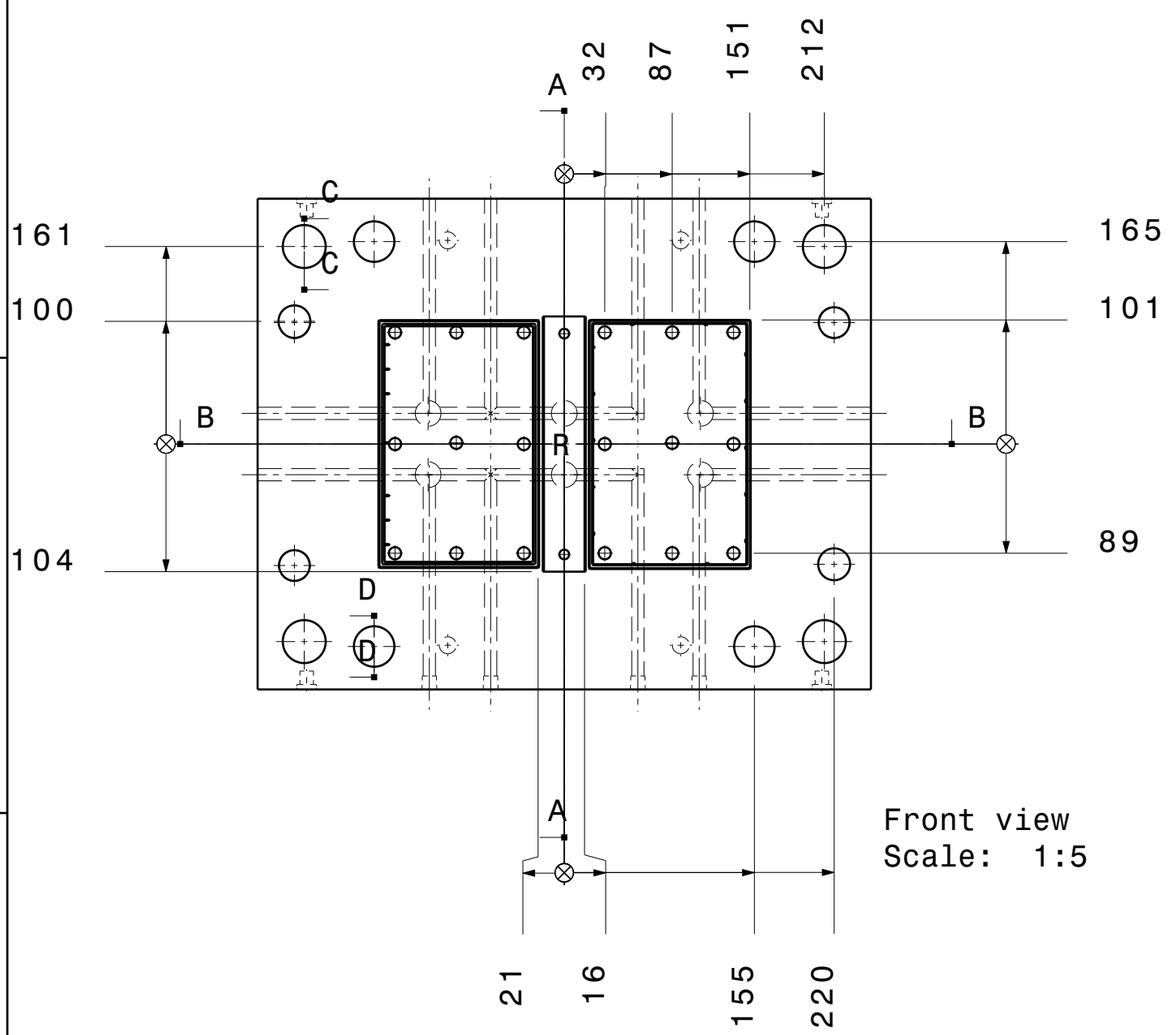


Section view B-B
Scale: 1:5

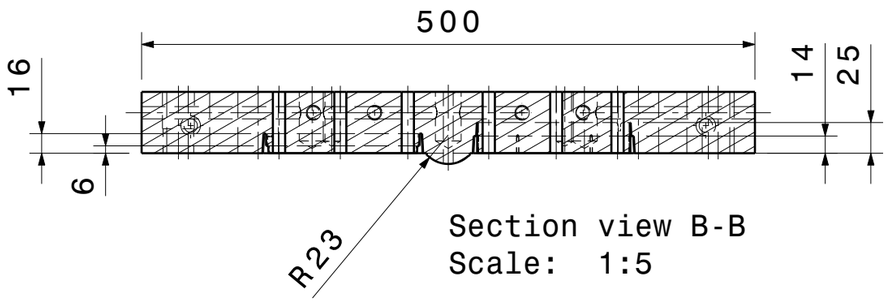
1	cavity plate	1	S55C	3-003
QTY	Nama Design	Item	Material	Drwg.wr

TEKNIK MESIN-UMY

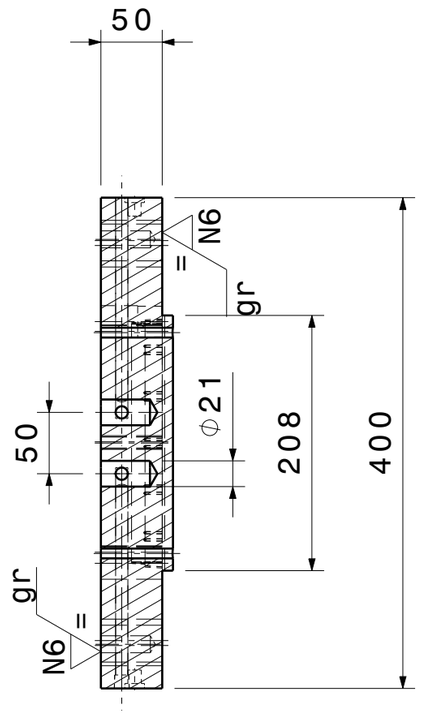
DRAWN BY: Ali Khaerul Mufid	DATE: 05/06/2017	DRAWING TITLE: Cavity glove box
CHECKED BY: Cahyo Budiantoro,S.T.,M.Sc	DATE: 10/07/2017	SIZE: A3 / DRAWING NUMBER: 003 / REV: 1
DESIGNED BY: Ali Khaerul Mufid	DATE: 01/06/2017	SCALE 1:5 / WEIGHT(kg)8,124 Kg / SHEET B.3



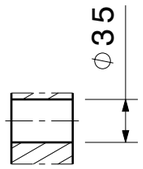
Front view
Scale: 1:5



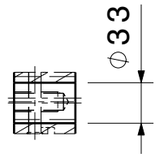
Section view B-B
Scale: 1:5



Section view A-A
Scale: 1:5



Section view C-C
Scale: 1:5



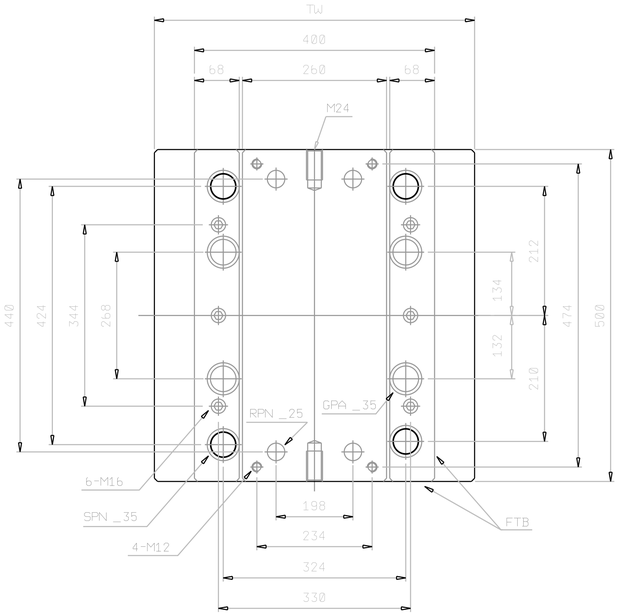
Section view D-D
Scale: 1:5

1	core plate	2	S55C	3-004
Qty	Nama Design	Item	Material	Drwg.wr

TEKNIK MESIN - UMY

DRAWN BY: Ali Khaerul Mufid	DATE: 05/06/2017	DRAWING TITLE: Core	
CHECKED BY: Cahyo Budiantoro,S.T.,M.Sc	DATE: 10/06/207	SIZE: A3	DRAWING NUMBER: 004 / REV: 1
DESIGNED BY: Ali Khaerul Mufid	DATE: 01/03/2017	SCALE: 1:5	WEIGHT(kg) 9,143 / SHEET: B.4

D.E Series 4050



T SPECIFICATION	TW
JT TYPE	450
HT TYPE	400

MDC ☐ 4050 ☐ ☐ ☐ ☐ ☐ ☐ ☐

TYPE	DA	DB	DC	DD	EA	EB	EC	ED

NOM.SIZE

A THICKNNES	40	50	60	70	80	90	100	110	120	130	140	150

B THICKNNES	40	50	60	70	80	90	100	110	120	130	140	150

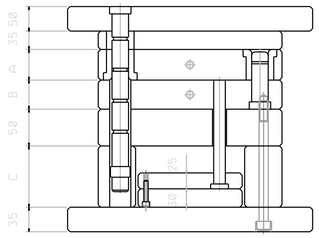
C HEIGHT	100	110	120	130	

GUIDE PIN / CLAMPING PLATE	POSITION OF GUIDE PIN	
	G.P. INSERTED TO THE PLATE B	G.P. INSERTED TO THE PLATE B
JT TYPE	S	Y
HT TYPE	H	K

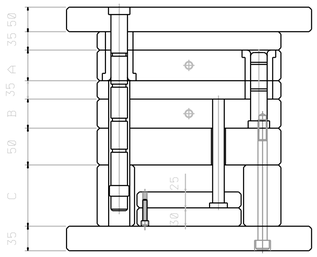
LENGHT OF S.P				
160	170	180	190	200
210	220	230	240	250
260	270	280	290	300
310	320	330	340	350
360	380	400		

S.P POSITION	
OH	S.P OUTSIDE WITH BUSH
IH	S.P INSIDE WITH BUSH
ON	S.P OUTSIDE WITHOUT BUSH
IN	S.P INTSIDE WITHOUT BUSH

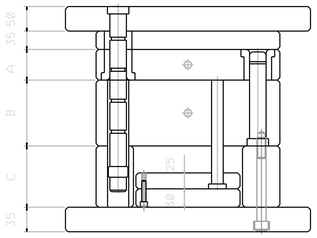
DA Type



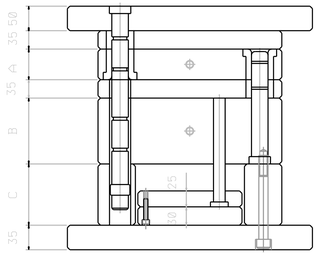
DB Type



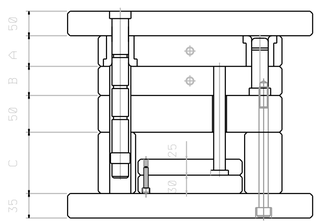
DC Type



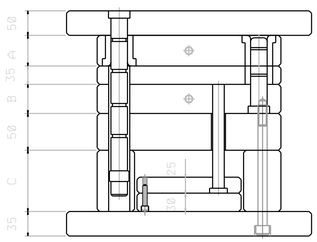
DD Type



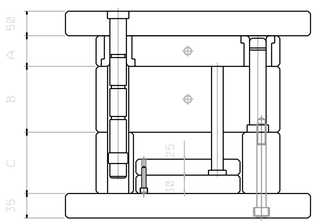
EA Type



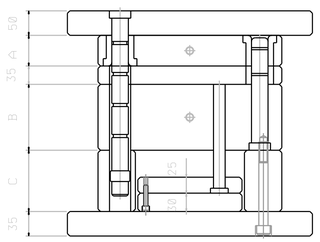
EB Type

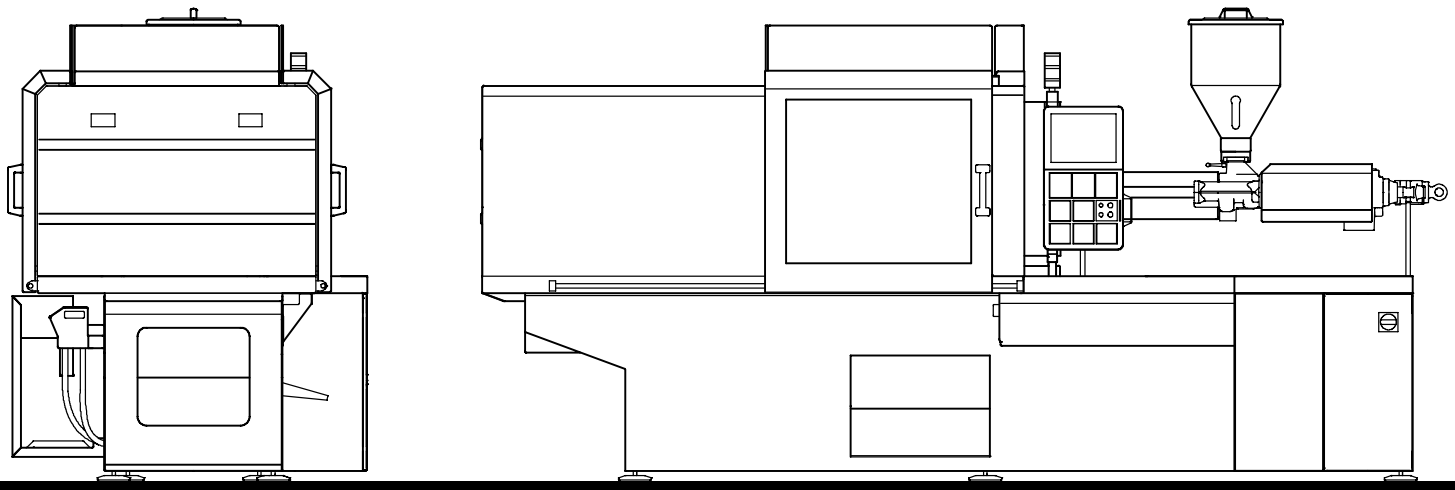


EC Type



ED Type





ALLROUNDER 470 S

Technical data

Tie bar distance: 470 x 470 mm
Clamping forces: 800, 1000, 1100 kN
Injection units (according to EUROMAP): 170, 290, 400

ARBURG

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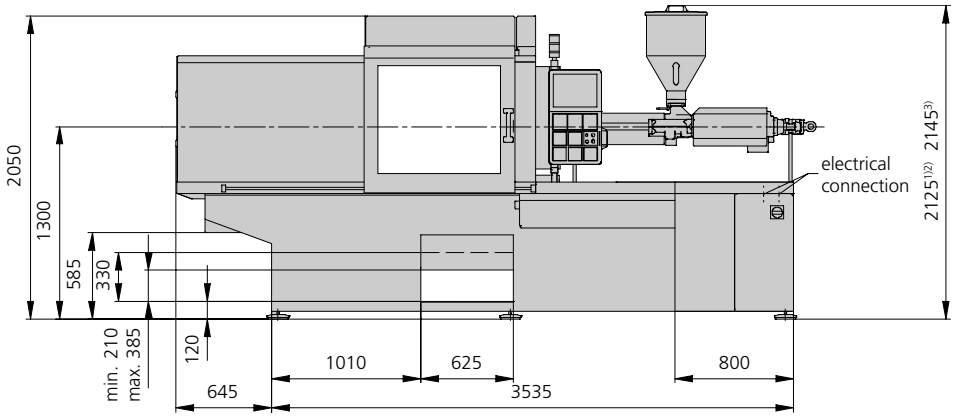
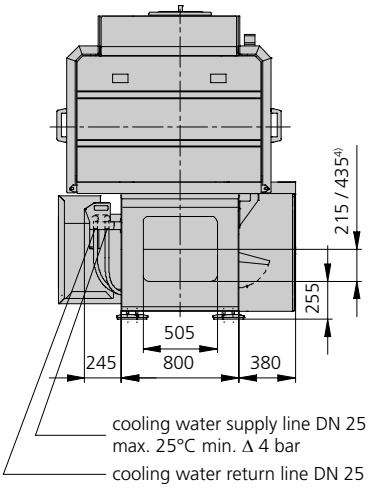
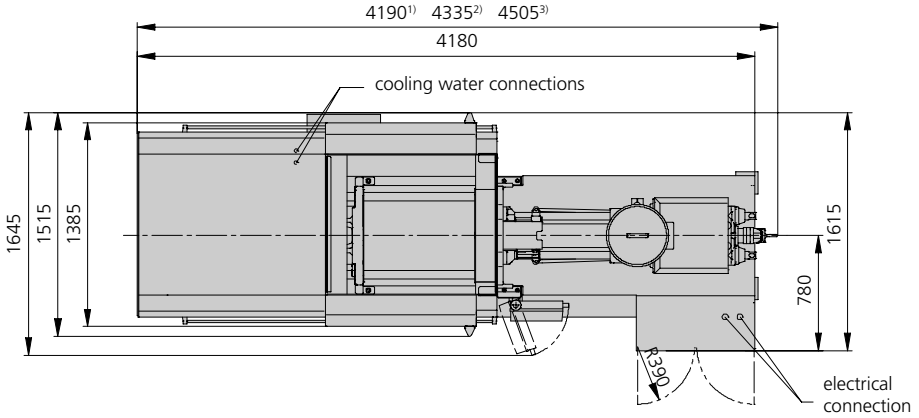






1) Dimension applies to injection unit 170
2) Dimension applies to injection unit 290
3) Dimension applies to injection unit 400
4) Dimension only valid in conjunction with conveyor belt

Technical data | 470 S

Machine model			470 S	470 S	470 S
EUROMAP size indication[1]			800-170 | 1000-170 | 1100-170	800-290 | 1000-290 | 1100-290	1000-400 | 1100-400
Clamping unit					
Clamping force	max.	kN	800 | 1000 | 1100	800 | 1000 | 1100	1000 | 1100
Closing force	max.	kN	50	50	50
Opening force / increased	max.	kN	34/ 255	34/ 255	34/ 255
Opening stroke	max.	mm	500	500	500
Mould height	min.	mm	250	250	250
Daylight	max.	mm	750	750	750
Distance between tie bars		mm	470 x 470	470 x 470	470 x 470
Platen size (hor. x vert.)		mm	637 x 637	637 x 637	637 x 637
Weight of mov. mould half	max.	kg	760	760	760
Ejector force	max.	kN	40	40	40
Ejector stroke	max.	mm	175	175	175
Hydraulics, drive, general					
Drive power of the hydraulic pump		kW	15 | 18,5 | 18,5	15 | 18,5 | 18,5	18,5 | 22
Dry cycle time for opening stroke[5]		s-mm	2,3 (1,8)-329 | 2,1 (1,8)-329 | 1,8-329	2,3 (1,8)-329 | 2,1 (1,8)-329 | 1,8-329	2,1 (1,8)-329 | 1,8-329
Total connected load[2]		kW	26,1 | 29,6 | 29,6	23,9 | 27,4 | 27,4	30,4 | 33,9
Colour: plastic coated, structure light grey / mint green / canary yellow					
Control cabinet					
Safety standard according to			DIN EN 60204	DIN EN 60204	DIN EN 60204
Socket combination (1 single phase, 1 three-phase)			1 x 16 A	1 x 16 A	1 x 16 A
Injection unit			170	290	400
Screw diameter		mm	25 / 30 / 35	30 / 35 / 40	35 / 40 / 45
Effective screw length		L/D	24 / 20 / 17	23,3 / 20 / 17,5	23 / 20 / 18
Screw stroke	max.	mm	120	150	160
Calculated injection volume	max.	cm^3	59 / 85 / 115	106 / 144 / 188	154 / 201 / 254
Shot weight	max.	g PS	54 / 77 / 105	97 / 132 / 172	141 / 184 / 232
Material throughput[4]	max.	kg/h PS	10 / 13,5 / 16	17 / 20,5 / 24,5	25 / 29 / 35
	max.	kg/h PA 6.6	5 / 7 / 8	8,5 / 10,5 / 12,5	12,5 / 15 / 17,5
Injection pressure[3]	max.	bar	2500 / 2000 / 1470	2500 / 2000 / 1530	2500 / 2000 / 1580
Injection flow[3]	max.	cm^3/s	94 / 136 / 186 | 120 / 172 / 236 | 120 / 172 / 236	102 / 140 / 182 | 130 / 178 / 232 | 130 / 178 / 232	128 / 168 / 212 | 128 / 168 / 212
Injection flow with accumulator	max.	cm^3/s	216 / 312 / 424	316 / 430 / 562	492 / 642 / 814
Back pressure positive/negative	max.	bar	350 / 200	350 / 200	350 / 160
Circumferential screw speed	max.	m/min	49 / 59 / 69 | 63 / 75 / 80 | 63 / 75 / 80	46 / 54 / 62 | 59 / 69 / 79 | 59 / 69 / 79	47 / 53 / 60 | 47 / 53 / 60
Screw torque	max.	Nm	210 / 250 / 290	320 / 380 / 430	480 / 550 / 610
Nozzle contact force	max.	kN	50	60	60
Nozzle retraction stroke	max.	mm	210	240	300
Installed cylinder heating power / heating zones		kW	8,8 / 4	5,8 / 4	8,8 / 4
Installed nozzle heating power		kW	0,6	0,6	0,6
Material hopper capacity		l	50	50	50
Horizontal injection position	max.	mm	170	170	170
Machine dimensions and weights of the basic machine					
Oil capacity		l	175	175	175
Net weight		kg	4500	4550	4750
Electrical connection[2]		A	80 | 80 | 80	80 | 80 | 80	80 | 100

1) 1st figure: clamping force (kN), 2nd figure: max. dosage volume (cm^3) x max. injection pressure (kbar)
2) Values refer to 400 V/50 Hz. The load is symmetrically distributed on three phases (observe phase loading when installing new equipment).
3) a combination of max. injection pressure and max injection flow (max. injection capacity) can be mutually exclusive, depending on the equipment-related motor output.
4) Deviations are possible depending upon process settings and material type
5) According to EUROMAP for the basic machine. Values shown in parentheses apply for dual-pump technology, basic equipment version with 1100 kN clamping force

The shown specifications reflect the state at the time of printing. In the interest of a continuous development of our products, we reserve the right to modify specifications.

Control system and control cabinet

■ SELOGICA direct control system (touchscreen user interface for direct data access)
■ Available in different language versions
■ Language change
■ Cycle sequence programming with symbols
■ Cycle step display in sequence diagram
○ Cycle time diagram
■ Swivelling monitor unit, central on the operator's side, with colour monitor
■ Process graphics for injection speed, screw stroke and injection pressure
■ Quality assurance program with fault evaluation and monitoring chart
■ Optimisation and operator help, follow-up functions at program end, for freely-programmable parameter pages, choice of segments
■ Modular control cabinet design with self-recognition of plug in circuit board system
■ Operating modes:
- Set-up
- Freely programmed test run
- Reconfiguration
- Automatic purging and dosing
○ Equipment for switch-over to holding pressure via injection pressure, material pressure with different pressure transducers, or via external switch over signal
■ Data record management via Compact Flash
■ Visual warning signal (warning lamp)
○ Visual / audible warning signal (flashing light / siren)
■ Printer interface for hard copy, data record and quality protocol
○ Interfaces for: PC keyboard, plotter, robotic system according to EUROMAP 12 or 67, part weighing scale, optical barrier, host processor, AQC, ALLROUNDER@web, colouring unit, LSR dosing system, INJESTER, container change, wiper unit (brush), THERMOLIFT, hot runner control unit and temperature control units for moulds and cylinder
■ Socket combination 1 CEE, 1 Schuko 230 V
○ Socket combination 1 CEE, 1 Schuko or 2 CEE, 2 Schuko 230 V with external supply line
○ 1 additional heating regulation circuit for the nozzle
○ Electric heating regulation circuits for moulds mounted to the fixed mould platen (adaptive) (3, 6, 9, 12, 15, 18); mould heating fused at 10 A
○ Fuses for mould heating 16 A
○ 4 or 8 freely programmable inputs / outputs
○ Core pull programs in many versions integrated in the SELOGICA control system
○ Special processes such as injection coining, mould venting, variotherm temperature control, intruding, marbling
○ Monitoring: Freely-programmable position monitoring
○ Many individual options for special processes

Machine base and hydraulic system

■ Free standing machine base on anti-vibration pads
■ Ergonomic protection cover with free access to mould and nozzle
■ Space for peripheral devices within floor space
■ The hydraulic system operates with an energy-saving variable displacement pump and a servo valve for pressure and speed regulation
○ Expansion to up to 2 hydraulic control circuits
○ Hydraulic accumulator technology for high speeds and simultaneous movements. All axes are servo-regulated
○ ARBURG energy saving system AES (rpm changeable for hydraulic pump drive)
■ Minimum oil volume, oil change interval every 20,000 hours
■ Monitoring of oil level, oil temperature and oil filter contamination
■ Fine mesh oil filter in the return line
■ Mechanical regulation of hydraulic oil temperature
○ Electronic regulation of hydraulic oil temperature. Display and monitoring via screen
■ Hydraulic oil preheating program to reduce start-up time
○ Separate, continuous oil circulation for additional cooling and filtration
■ Manually adjustable, machine-related cooling water circuits with 4 free mould connections
○ 6 or 8 free cooling water circuits, manually adjustable
○ Programmable, machine and mould-related cooling water circuits
○ Maximum of 4 water cooling circuits mounted to the fixed and/or movable mould platen
○ 1 or 2 central shut-off valves for cooling water (supply and/or return)
○ Conveyor belt (electrically driven), height-adjustable in 3 steps, can be integrated into the machine base with or without sorter unit
○ Crane with electric hoist to facilitate mould installation and to swivel or shift the injection unit

Clamping unit

■ Compact, centrally applied, fully-hydraulic clamping system with individually removable tie bars
■ Vertical support of the movable mould platens
■ Movement profiles for the mould clamping unit are programmable and regulated. They are serially driven using energy-saving one-circuit pump technology (Technology stage 1)
○ Movement profiles for the mould clamping unit are programmable and regulated. They are driven using two-circuit pump technology (Technology stage 2 - servo-regulated). The closing pressure is regulated. Simultaneous movement of nozzle and ejector is possible
○ Movement profiles for the mould clamping unit are programmable and regulated and are achieved via pressure accumulators. The locking pressure is servo-regulated. Extended simultaneous movements are possible
■ Closing and opening profiles are 2-stage programmable (4-stage with Technology stage 2)
○ Intermediate stop possible when closing and opening (standard with T2)
■ Regulated hydraulic mould protection with monitoring of mould protection time. Follow-up functions: Open or stop after 1 or 2 activations of mould protection
○ Extended mould protection (e.g. for spring loaded moulds). Freely-programmable start and end
■ Automatic ramp control during switch-over to a lower speed and during stopping of a movement function
■ Hydraulic ejector with quick release coupling is integrated into the clamping system
■ Hydraulic ejector: Forces and speeds, multiple stroke (up to 10) and ejector advanced at program end are programmable
○ Hydraulic ejector for simultaneous movements regulated with servo valve
■ Mould monitoring via ejector platen safety switch
○ Electro-mechanical servo drive for ejector system, position controlled for simultaneous drive movements
○ Hydraulic core pulls with rapid connect coupling on the movable mould platen
○ Hydraulic core pull movement profiles programmable and regulated
○ Core holding pressure manually adjustable

○ Hydraulic core pull, simultaneous movements regulated
○ Hydraulic unscrewing units for threaded cores in one or two directions of rotation for mounting on fixed or movable clamping platen. Restricted ejector stroke
○ Unscrewing unit with electromechanical servo drive for 2-direction threaded cores for installation on the movable clamping platen for ultra-precise positioning and reproducibility. Restricted ejector stroke
■ Attachment option for robotic handling device
○ Mechanical rapid clamping system with mould support to facilitate mould installation
■ Enlarged guarding on opposite side to the operating side, open-top
○ Power-operated safety gate, programmable opening time
○ Mould blow unit with pressure relief valve
○ Sorter unit (SELECTRON)
○ Mechanical mould closing protection

Injection unit

■ Central injection unit, can be re-positioned and swivelled as a complete assembly
○ Horizontally displaceable injection unit (VARIO principle)
○ Device for injection into the parting line for injection unit 290
■ Plasticising module with universal screw, central coupling and adaptive temperature regulation, available in different diameters
■ Thermoplastic cylinder with universal screw in wear resistant execution
○ Thermoplastic cylinder complete with very high wear resistant equipment
○ Plasticising module for processing thermoset, elastomer and silicone materials
○ Thermoplast screws for special applications, e.g. self-dyeing (mixing section), PVC (shear-sensitive), POM, PA (semi-crystalline)
■ Programmable nozzle speeds (advance 2, retract 1 stage) and advance and retract delay
■ Monitored nozzle contact
■ Continuous nozzle contact during the complete cycle
■ Programmable nozzle contact force
○ Regulated nozzle contact force
■ Regulated injection speed profile, 2 steps programmable with injection delay
○ Hydraulic accumulator technology for very fast injection
○ Position-regulated screw (forced movement of injection axis)
○ Injection process control with external sensor
■ Measurement, display and monitoring of the injection time, switchover volume and switchover pressure
■ Switch over to holding pressure as a volume or time dependent function
■ Material cushion monitoring
■ Holding pressure profile regulated via polygon with 4 base points
■ Programmable delay times for all movements
■ Screw circumferential speed display
■ Positively and negatively programmable back pressure
■ Dosage time display with programmable dosage time monitoring
■ Dosage possible before or after nozzle retraction
■ Material decompression with programmable decompression speed
○ Dosage with electro-mechanical servo drive, energy-saving
■ Open nozzle with screw-in tip
○ Needle type shut off nozzle, spring force actuated
○ Needle type shut off nozzle, hydraulically actuated
■ Zone-dependent monitoring of heating circuits for continuity, short circuit and defective sensors
■ Temperature monitoring with release tolerance range and zone-dependent monitoring tolerance
○ Automatic temperature sink can be selected on error or after automatic switch off
■ 50-litre corrosion proof stainless steel material hopper, movable to shut off and discharge position
○ Granulate feed zone temperature programmable and regulated with monitoring

Extended functions

■ Extended monitoring of the mechanical sequence of mould and machine for complex applications
■ Extended drive movements: Increase in number of movement stages, intermediate stop functions and extended locking force program
■ Production control with nominal temperature value control, programmable alarm cycles, programmable switch-on / switch-off sequences as well as time-controlled automatic switch-on/ off in second programming level for follow-up batch

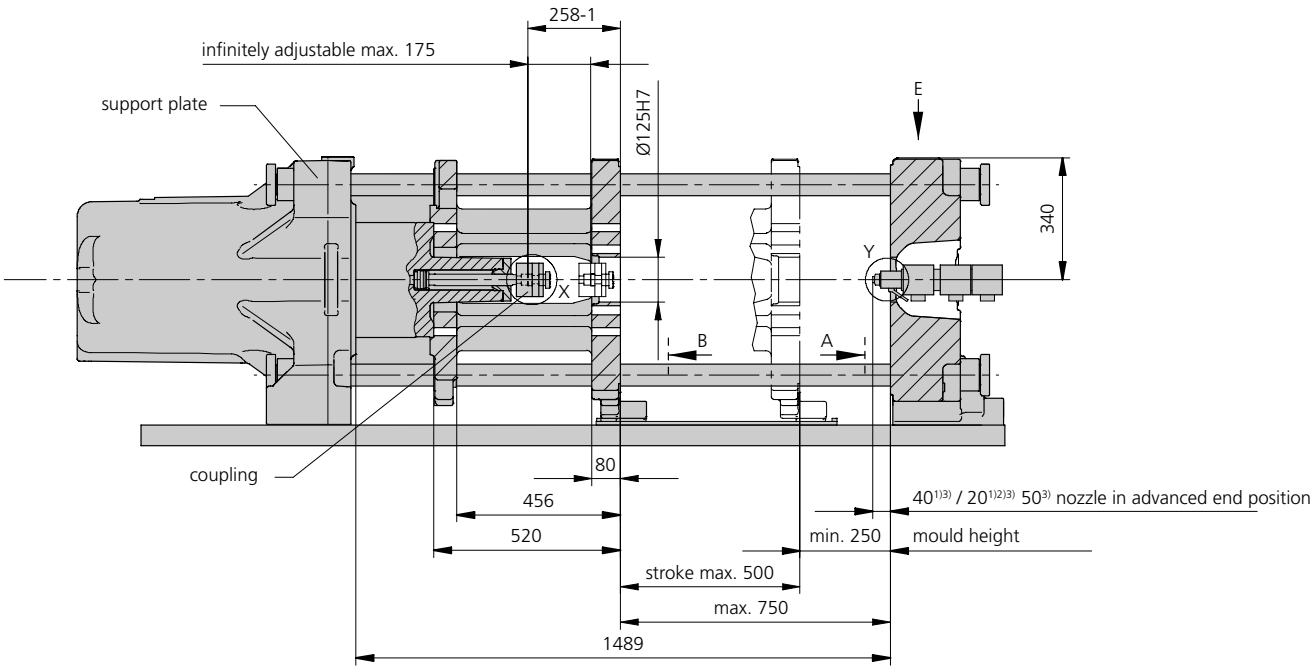
Regulated parameters

■ Control cabinet temperature
■ Hydraulic oil temperature
■ Plasticising cylinder temperature (adaptive)
■ Screw rotation speed
■ Injection flow or injection speed
■ Holding pressure
■ Movements and force of mould, nozzle and ejector
■ Ramp control sequence for mould, ejector and nozzle end position
■ Back pressure
○ Electrical mould heating circuits (adaptive)
○ Mould cooling circuits
○ Internal cavity pressure or screw chamber pressure (external sensor)
○ Nozzle contact force
○ Screw position
○ Granulate feed zone temperature
○ Ejection force for simultaneous movements

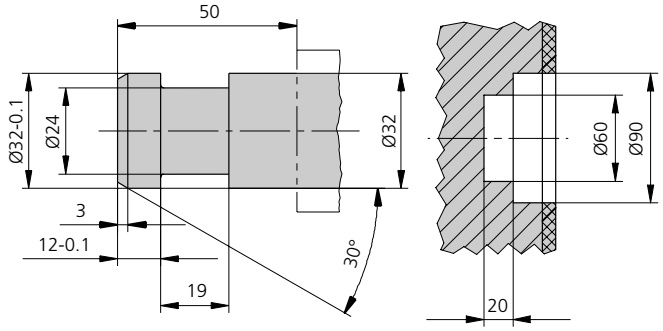
ARBURG robotic systems

○ INTEGRALPICKER H: sprue picker operating horizontally from the rear of the machine under the protection cover; pneumatic drive
○ INTEGRALPICKER V: vertical sprue picker operating from above, pneumatic drive
○ MULTILIFT H: robotic system operating horizontally from the rear of the machine with servo-electric Z-axis (other axes driven pneumatically)
○ MULTILIFT V: versatile robotic system operating vertically from above with three servo-electrically driven axes (longitudinal and transverse installation possible)
○ MULTILIFT V SELECT: pre-configured robotic system operating vertically from above with three servo-electrically driven axes

■ Basic machine
○ Options



X

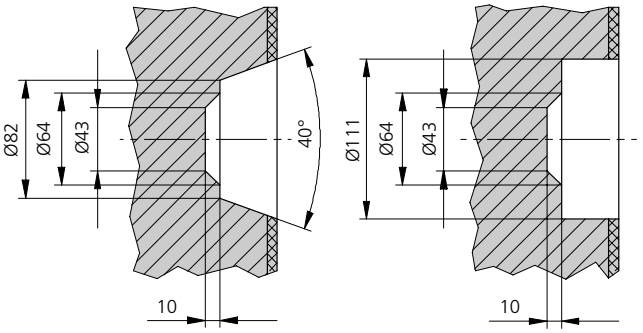


ejector bolt

counter bore in the mould required
only for short sprue

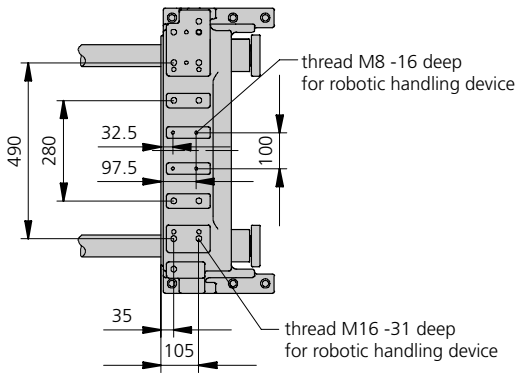
Y

injection unit 400



dimensions for thermoset moulds

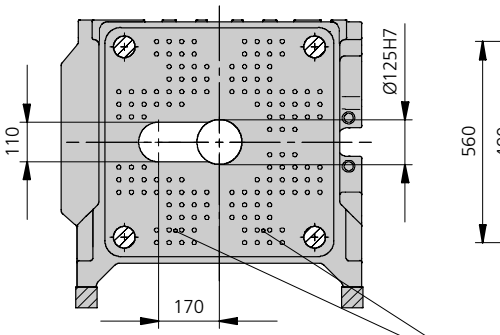
View E



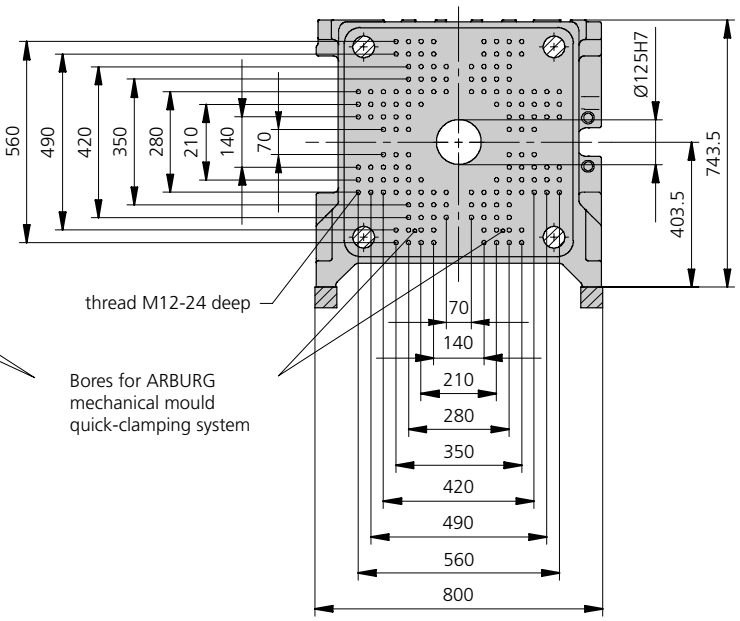
1) Dimension applies to injection units 170 / 290
2) Dimensions are valid for thermoset moulds
3) Dimensions for horizontally displaceable injection unit reduced by 20 mm
For parting line device see separate dimension sheet (on request)

Fixed platen

View A / for horizontally displaceable injection unit

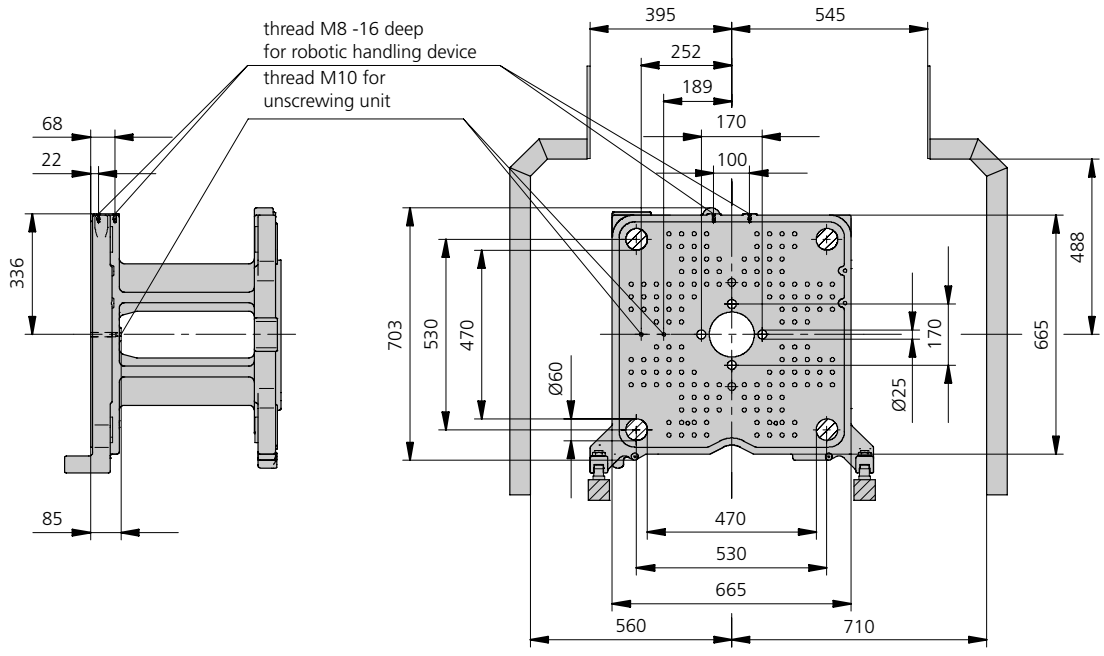


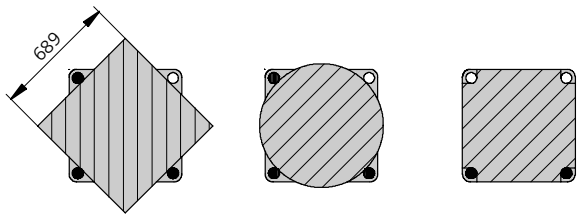
View A / for central injection unit



Movable platen

View B





Usable mounting surface with tie bars removed

Maximum theoretical shot weights for the most important injection moulding materials (in grams)										
Injection units according to EUROMAP		**170**			**290**			**400**		
Screw diameter	mm	**25**	**30**	**35**	**30**	**35**	**40**	35	40	45
Polystyrene	PS	54	77	105	97	132	172	141	184	232
Styrene heteropolymerizates	SB	53	76	103	95	129	168	137	179	227
	SAN, ABS[1)]	52	74	101	93	126	165	135	176	223
Cellulose acetate	CA[1)]	61	87	119	109	148	194	158	207	262
Celluloseacetobutyrate	CAB[1)]	56	81	110	101	138	180	147	192	243
Polymethyl methacrylate	PMMA	56	80	109	100	136	178	145	190	240
Polyphenylene ether, mod.	PPE	50	72	98	90	122	160	131	171	216
Polycarbonate	PC	57	81	111	102	139	181	148	193	244
Polysulphone	PSU	58	84	115	105	143	187	153	199	252
Polyamides	PA 6.6, PA 6[1)]	53	77	104	96	131	171	140	183	231
	PA 6.10, PA 11[1)]	50	72	98	90	122	160	131	171	216
Polyoximethylene (Polyacetal)	POM	66	96	130	120	163	213	174	227	287
Polyethylene terephthalate	PET	64	92	126	115	157	205	167	219	277
Polyethylene	PE-LD	41	59	80	73	100	130	106	139	176
	PE-HD	42	60	82	76	103	134	110	143	181
Polypropylene	PP	43	62	84	77	105	137	112	146	185
Fluorpolymerides	FEP, PFA, PCTFE[1)]	86	124	169	155	211	276	225	294	372
	ETFE	76	109	148	136	185	242	196	256	324
Polyvinyl chloride	PVC-U	65	94	127	117	159	208	170	222	281
	PVC-P[1)]	60	87	118	108	147	192	157	205	260

1) average value

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528481_EN_GB_012009 · Subject to alterations
Printed in Germany