RE 63127
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rexroth
A Bosch Company

Overload protection for mechanical presses

Type IH04S


H1234

- Size 25, 40, 63
- Component series 3X
- Maximum response pressure 315 bar
- Maximum flow: 5000 l/min

Features

- For single-point and multi-point cushion
- For direct slide mounting or as piping version
- Maximum compact design
- Optimized switching time
- Reaction time < 5 ms
- Galvanized block surface
- Low pressure peak when triggering
- Suitable for asymmetric slide load
- For internal and external triggering

Contents

Ordering code

01	02	03	04	05	06	07
IH04S	**–**	**3X**	**/**	**–**	**315**	**–**	**140**	**–**	**M**	*****

01	Overload protection for mechanical presses	**IH04S**
02	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

Size

03	NG25	**25**
	NG40	**40**
	NG63	**63**
04	Maximum response pressure 315 bar	**315**
05	Pressure cut-off ratio p(F) : p(P) = 1.4: 1	**140**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 8)

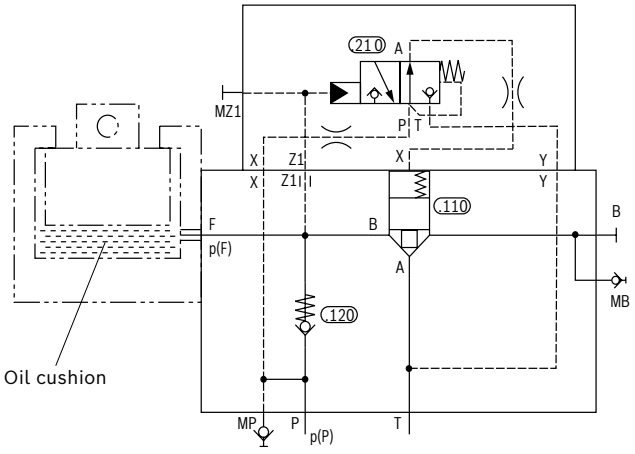
06	NBR seals (others upon request)	**M**
07	Further details in the plain text	

Function

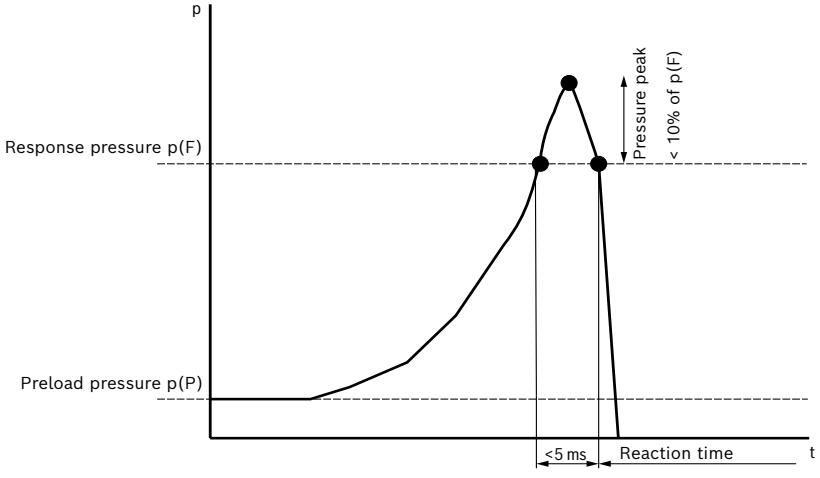
The hydraulic overload protection for mechanical presses is designed as a flow-optimized compact block design. The connection of the hydraulic shut-off valve and proven 2-way cartridge valve technology enables optimum protection of tools, drive and press frame in case of overload. The overload protection is suitable for single-point and multi-point cushions.

The preload pressure p(P) (for calculation, see page 10) is generated by the pump at the power unit.
Via item 120, it reaches port F into the oil cushion of the press and to the shut-off valve item 210.
While the press is working, the pressure in the oil cushion fluctuates between preload pressure p(P) and response pressure p(F).
The overload module triggers if pressure p(F) exceeds pressure p(P) by 1.4 times at the press.
Then, the shut-off valve item 210 switches from basic position to switching position.

The 2-way cartridge valve opens almost at the same time and the pre-tensioned oil in the oil cushion is drained from port F via item 110 to port T and then to the oil tank. The pressure in the oil cushion collapses abruptly.
If the overload case occurs, the mechanical press must be brought to a standstill by the machine operator.
Before the press is put back into operation, the oil cushion must be brought back to preload pressure p(P).
The pump at the power unit fills the oil cushion, which automatically switches the shut-off valve item 210 back into the basic position and the 2-way cartridge valve item 110 closes. When the preload pressure p(P) is reached, the press is ready for operation again.
The critical pressure peak for tools, drive and press frame is below 10% of the response pressure p(F).
The non-critical pressure range is achieved again within a reaction time of less than 5 ms.
The reaction time and the pressure peak occurring during the switch-off process depends on the operating conditions of the mechanical press and on the installation situation.



P	Pump port
T	Tank port
F	Slide connection
B	Piping connection for multi-point cushions
MP	Measuring port pump
MB	Measuring port oil cushions
MZ1	Remote control port slide relief
.110	2-way cartridge valve
.120	Check valve
.210	Shut-off valve



Functional example of single-point cushions

The application shown (page 5) represents a mechanical press with single-point cushion. The overload module IH04S is directly connected to the oil cushion.

To make the overload module ready for operation, the preload pressure p(P) is generated by a Rexroth hydraulic power unit, e.g. ABSKG. To enable the fastest possible relief to the tank, no return flow filter may be installed.

The desired preload pressure (for calculation, see page 10) can be set e.g. by means of a proportional pressure relief valve item 100.

At port MP, the preload pressure is measured via a pressure switch item 300, if it falls below the desired value, the directional valve item 200 switches to switching position B and charges the overload module again.

At the pressure relief valve item 400, the pressure for the max. admissible press force is set for safety reasons, but max. to the admissible operating pressure of the IH04S. This way, the machine is protected if the overload protection is not set correctly.

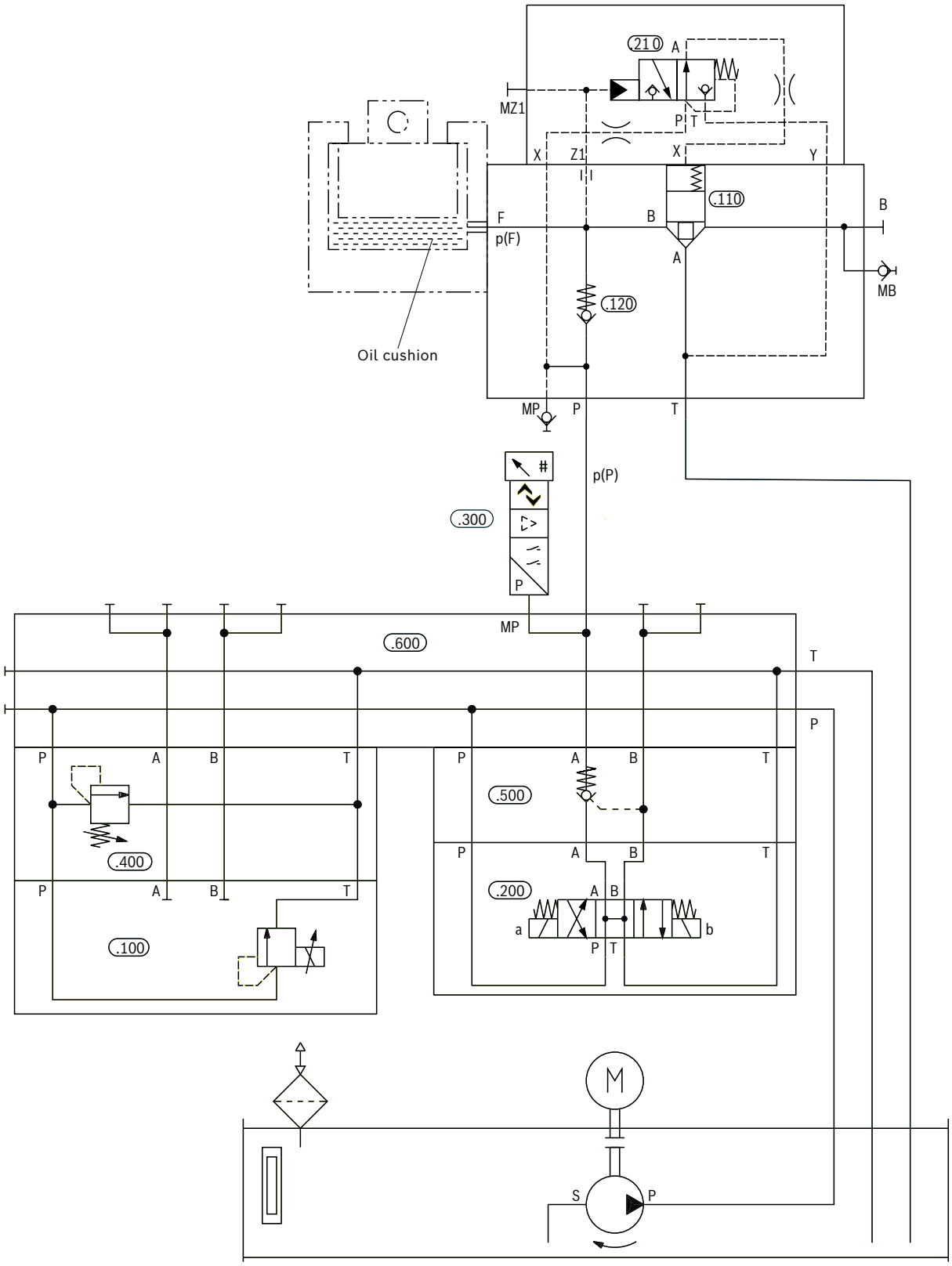
If a lower value is to be set, the overload protection must first be depressurized via the directional valve item 200 since the preload pressure is supported by the check valve item 500.

A control block item 600, e.g. configurable HSR06/10 from Rexroth, enables control of the overload module and other auxiliary functions.

Via the pressure switch item 300, the readiness for operation can be displayed via a second switching point, for example. The set pressure should be approx. 50 ... 100 bar below the preload pressure p(P). This ensures the correct functioning of the machine. The signal of the pressure switch can be used to switch off the press in case of an error. For fast switching off in case of overload, the measuring coupling in port MB can be replaced by a pressure switch, e.g. a HEDE11 from Rexroth. It monitors the pressure p(F) in the oil cushion and, in case of an error, sends a signal for switching off the press.

☞ **Note:**
For information on the design of the overload protection IH04S, see page 9

Circuit diagram example of single-point cushions



Functional example of double-point cushions

The application shown (page 7) is a mechanical press with double-point cushion. The IH04S overload modules are directly connected to the oil cushion.

To make the overload modules ready for operation, the preload pressure p(P) is generated by means of a hydraulic power unit, e.g. CytroPac from Rexroth. To enable the fastest possible relief to the tank, the returning oil must not be directed through the return flow filter. In addition, it must be ensured that the installed air filter is dimensioned according to the flow at the T connections of the overload modules.

The desired preload pressure (for calculation see page 10), can be set directly via the CytroPac. By means of the integrated pressure monitoring (MP) in CytroPac, the hydraulic power unit is automatically switched off if the command pressure is reached and the flow rate below the set threshold value or respectively switched on if the pressure is dropping ("sleep function"). This increases energy efficiency.

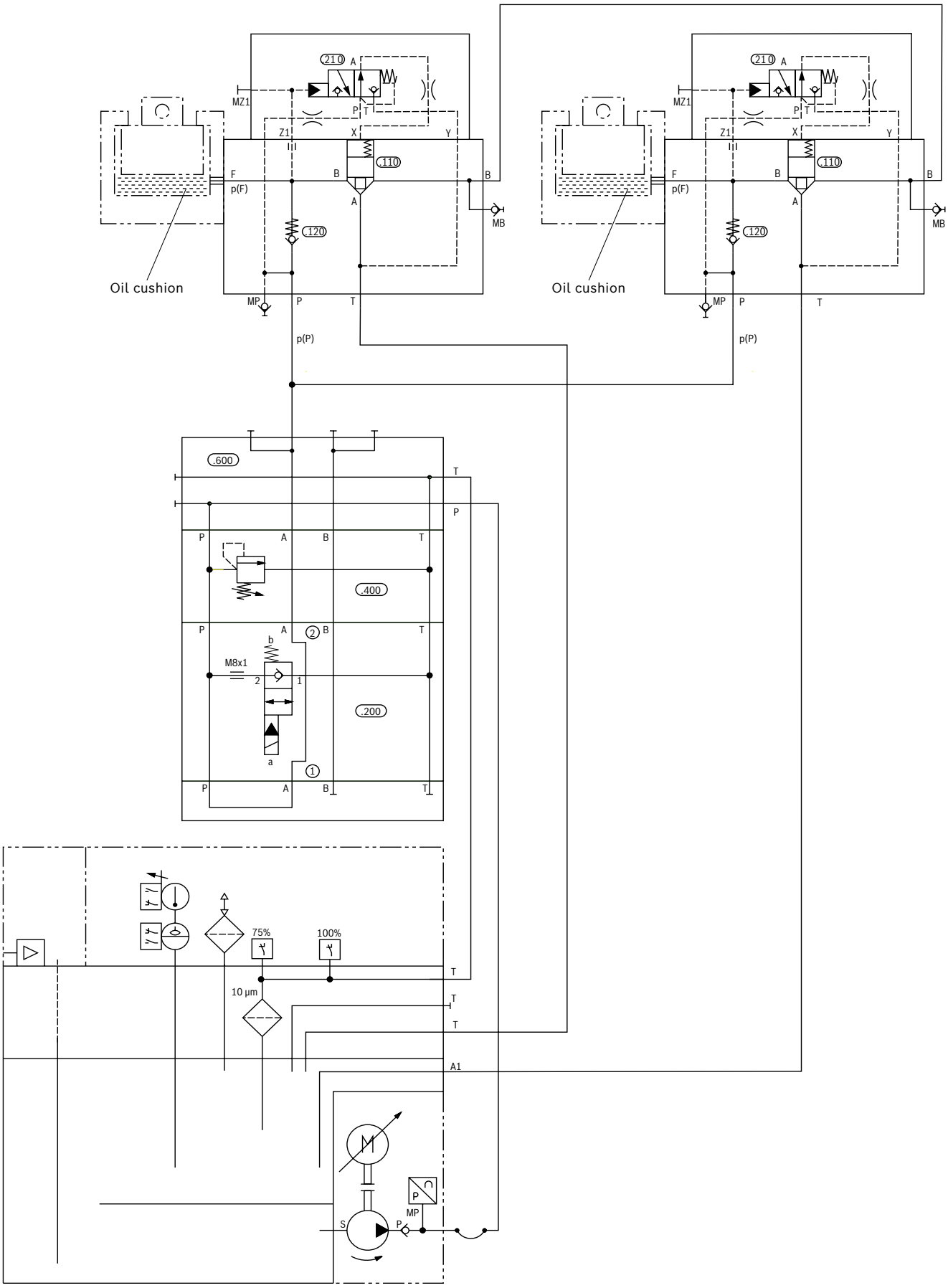
At the pressure relief valve item 400, the pressure for the max. admissible press force is set for safety reasons, but max. to the admissible operating pressure of the IH04S.
This way, the machine is protected if the overload protection is not set correctly.

If a lower value is to be set, the overload protection must first be depressurized via the seat valve item 200, since the preload pressure is supported by the integrated check valve in the CytroPac.
Multistation manifolds item 600, e.g. configurable HSR06/10 from Rexroth, can be used to control the overload module as well as other auxiliary functions.

The built-in sensor technology in the CytroPac can be used, for example, to display readiness for operation via a second switching point. The set pressure should be approx. 50 ... 100 bar below the preload pressure p(P). This ensures the correct functioning of the machine. The signal can be used to switch off the press in case of an error. The STO functionality (Safe Torque Off) prevents unexpected start-up of the CytroPac. By means of this function, the energy supply of the motor can be safely interrupted. For fast switching off in case of overload, the measuring coupling in port MB can be replaced by a pressure switch, e.g. a HEDE11 from Rexroth. It monitors the pressure p(F) in the oil cushion and, in case of an error, sends a signal for switching off the press.

☞ **Note:**
For information on the design of the overload protection IH04S, see page 9

Circuit diagram example of double-point cushions



Technical data:

Hydraulic			
Maximum operating pressure	▶ Port P, MP	bar	225
	▶ Port T	bar	0 (depressurized)
	▶ Port F, B, MB, MZ1	bar	315
Maximum flow		l/min	5000
Hydraulic fluid [1]			See table below
Hydraulic fluid temperature range		°C	–20 ... +80; preferably +40 ... +50
Viscosity range		mm^2/s	10 ... 500, preferably 30 ... 46
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15

Hydraulic fluid	**Classification**	**Suitable sealing materials**	**Standards**	**Data sheet**
Mineral oils [1]	HL, HLP, HLPD, HVLP, HVLPD	NBR [2]	DIN 51524	90220

[1] For other hydraulic fluids, please contact us

[2] Others upon request

☞ **Important information on hydraulic fluids:**

▶ For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us!

☞ **Note:**

In order to achieve the most favorable conditions for quick pressure reduction and optimal operational safety, the following points should be observed:

- Ideally direct attachment to oil cushions
- Without installation of a tank return flow filter
- Sufficient dimensioning of the air filter in the tank

For pipeline connection:

- as short as possible
- sufficiently dimensioned
- Avoid changes of direction

In case of multi-point cushions:

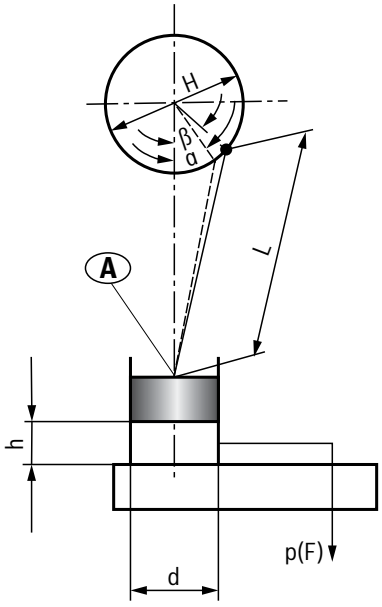
- Symmetrical module arrangement
- Tank lines of the individual modules separately to the tank

☞ **Note:**

Due to the design, pressure may be trapped in the overload module IH04S after the machine stop.
The module must be pressure-relieved before carrying out any work on the IH04 overload module! For checking the absence of pressure, measuring equipment at the existing measuring ports is to be used.

Technical data: Calculation of the flow, data for the determination of the size

A press with an overload cylinder



Designation	Abbreviation	Unit
Press force	F	kN
Speed	n	rpm
Working angle (normal operation)	α	°
max. of BDC (response of the overload protection)	β	°
max. stroke	H	mm
Connecting rod length	L	mm
Number of cylinders	Z	Quantity
Piston diameter	d	mm
Total pressure cushion area	A	cm²
Overload stroke (max.)	h	mm
max. response pressure in case of overload	p(F)	bar
Preload pressure	p(P)	bar

Max. flow for overload in l/min

$$Q = H \cdot \pi \cdot n \cdot A \cdot (\sin \beta + \frac{H}{4 \cdot L} \cdot \sin 2 \cdot \beta) \cdot 10^{-4}$$

Total cylinder area in cm²

$$A = \frac{d^2 \cdot \pi \cdot Z}{400}$$

Required pump pressure: see page 10

☞ **Note:**
Selection of the appropriate overload module via calculated maximum flow Q.
See table on page 10.

If you have any questions regarding the design, please contact your sales contact person.

Technical data: Calculation principles for pump pressure

Required pump pressure p(P)
The selected difference between preload and response pressure has a factor of 1.4.
This factor must be taken into account when determining the pump pressure.

Example:
With a response pressure p(F)of 280 bar

$$p(P) = \frac{p(F)}{1.4} = \frac{280\ bar}{1.4} = 200\ bar$$

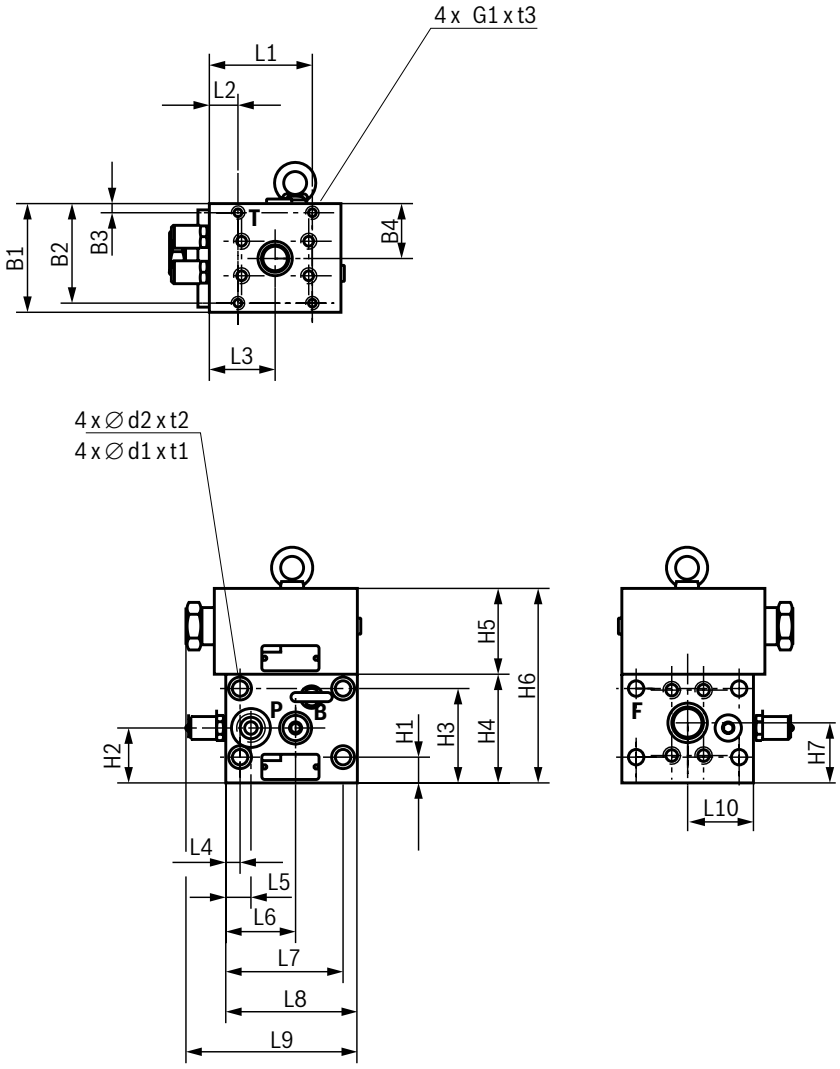
Thus, the preload pressure p(P) is 200 bar

Overview of available overload modules:

Material number	Type		NG	max. flow for overload
R901550558	PRESS BLOCK	IH04S-3X/25-315-140-M	25	up to 750 l/min
R901551502	PRESS BLOCK	IH04S-3X/40-315-140-M	40	up to 2100 l/min
R901551503	PRESS BLOCK	IH04S-3X/63-315-140-M	63	up to 5000 l/min

Dimensions

(dimensions in mm)



Size	H1	H2	H3	H4	H5	H6	H7	B1	B2	B3	B4	L1	L2	L3	L4	L5
25	22.5	48	82.5	95	75	170	52.5	95	87	8	48	90	25	57.5	12.5	22
40	28	60	118	135	75	210	73	160	117	14	65.5	127	38	82.5	15	30
63	40	100	145	190	110	300	95	220	160	20	90	185	45	115	20	27

Size	L6	L7	L8	L9	L10	Ød1	Ød2	G1	t1	t2	t3
25	61	102.5	115	150	57.5	13.5	20	M8	82.4	12.6	13
40	82.5	150	165	200	82.5	18	26	M10	140	20	20
63	115	210	230	265	115	22	33	M12	203	17	25

Connection designation	Port size SAE ports according to ISO 6162-2		
	Size 25	**Size 40**	**Size 63**
B	G 3/8	G 3/8	G 3/8
P	G 1/2	G 1/2	G 1/2
F	SAE 1 H	SAE 1 1/2 H	TK145 PN320 [1]
T	SAE 1 1/4 S	SAE 1 1/2 S	SAE 2 1/2 S

[1] 4 x M24x37 according to ISO 6164

Accessories:

Mounting screws overload module cylinder

Size	Designation	Material number
25	HEXAGON SOCKET HEAD CAP SCREW ISO4762-M12X100-10.9	**R913014792**
40	HEXAGON SOCKET HEAD CAP SCREW ISO4762-M16X170-10.9	**R913015648**
63	HEXAGON SOCKET HEAD CAP SCREW ISO4762-M20X230-10.9	**R913015682**

Sandwich plate for SAE flange in pipeline installation (between overload module and connection flange)

Size	Designation	Material number
25	SANDWICH PLATE ZP403-SAE1-6000PSI	**R901036754**
40	SANDWICH PLATE ZP405-SAE11/2-6000PSI	**R900231195**

Connection flanges for SAE ports

Size	Designation	Material number
25	FLANGE SAE1 H- 30.0 X 4.0&	**R900012345**
40	FLANGE SAE11/2H- 48.3 X 8.0&	**R900015663**
25	FLANGE SAE11/4S- 42.0 X 3.0&	**R900012341**
40	FLANGE SAE11/2S- 42.0 X 3.0&	**R900013501**
63	FLANGE SAE21/2S- 76.1 X 3.6&	**R900012336**

Example of counterflange solution

Size	Designation	Material number
63	WELDING FLANGE FFG063-11-001	**R901554472**

Further information

▶ Directional spool valve	Data sheet 23178
▶ Subplates	Data sheet 45100
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ CytroPac small power unit	Data sheet 51055
▶ Modular standard power units ABSKG	Data sheet 51013
▶ Multistation manifolds HSR06	Data sheet 48107
▶ Multistation manifolds HSR10	Data sheet 48110
▶ Electronic pressure switch, type HEDE 11.../2/ ▶ with two switching outputs	Data sheet 30279
▶ Hexagon socket head cap screw, metric/UNC	Data sheet 08936
▶ Operating instructions for manifolds and modules	Operating instructions 07601-B
▶ Information on available spare parts	www.boschrexroth.com/spc

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