



HYDRAULIC VALVE

SM4-15



 **SKS HYDRAULICS**

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COMPANY
PROFILE

SKS HYDRAULICS

SKS HYDRAULIC is one of the biggest manufacturers of hydraulic parts, with the most comprehensive product line. After years of development, our product line includes hydraulic piston pump, hydraulic piston motor, hydraulic spare parts, gearbox, precision casting & precision forging, these products are widely used in construction machines, marine machines, mining machines etc.

All of the advanced casting production lines, heat treatment lines, machining lines and testing benches are imported from Germany, Japan, Denmark and Taiwan, could be able to develop & produce the product independently with the world-class production system of hydraulic parts & gearbox.

The company has a provincial-level high-tech R&D center, and have finished 2 national torch plan projects, 1 national key project of new product and 1 national major scientific & technological achievements transformation project. At same time, many of the company's products have won the industry technology progress award. In 2019, the company was rated as "Invisible Champion Enterprise of Zhejiang Province". As of the end 2020, SKS has 104 patens, including 22 invention patents and 82 utility model patents. And established a provincial-level high-tech R&D center and a high-end hydraulic research institute.

SKS hydraulic has more than 50 domestic and foreign dealers, has established a complete distributor system and service system, covering all of the domestic market and extending to major global market.

SKS hydraulic is committed to providing global customers with the high-quality products and hydraulic transmission solutions, striving to become a leading enterprise in the hydraulic transmission industry and configuring "China Core" for the construction machinery.



HYDRAULIC VALVE

Load-sensing control block in sandwich plate design

SM4-15 series



Size 15

Nominal pressure

on the pump side 350 bar
on the consumer side 420 bar

Maximum fow

on the pump side 400 l/min
on the consumer side 200 l/min

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Functional description

Control block M4-15

The directional valves are proportional valves according to the load-sensing principle.

Consumer control

The control spool (2) is used to determine the flow direction and the flow level that reaches the consumer ports (A or B). Pressure reducing valves (10) control the position of the control spool (2). The size of the electric current on the pressure reducing valve determines the level of the pilot pressure in the spring chambers (9) and thereby the stroke of the control spool (P → A; P → B). The pressure compensator (3) keeps the pressure differential on the control spool (2) and thereby the flow to the consumers constant.

Load pressure compensation

The pressure compensator (3) regulates pressure changes on the consumers or on the pump. The flow to the consumers remains constant, including with varying loads.

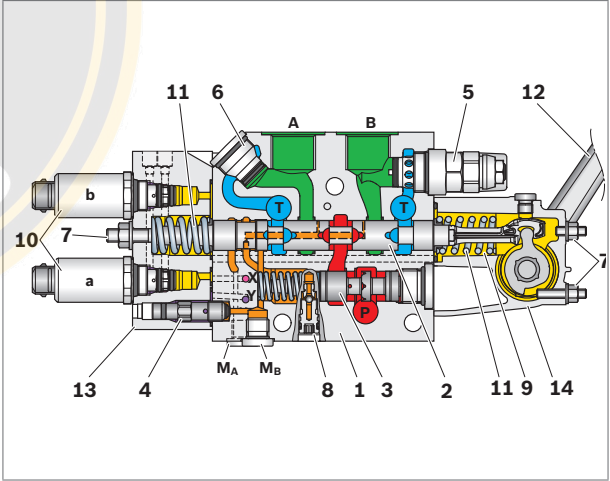
Flow limitation

The maximum flow can be individually set mechanically at the factory according to the ordering code using the stroke limitations (7).

Pressure limitation

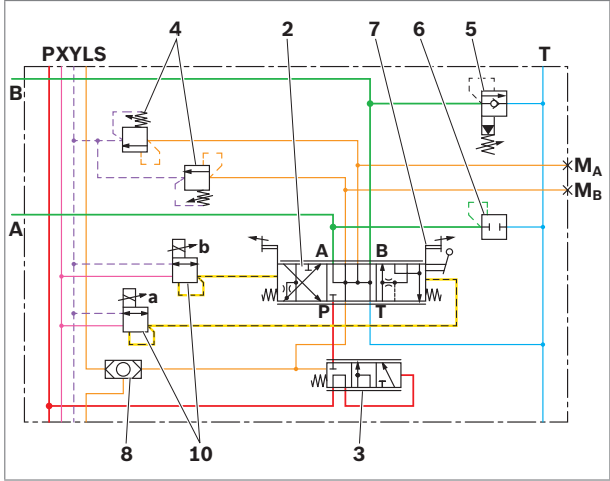
The LS pressure for each consumer port can optionally be overridden internally via the LS pressure relief valves (4), electro-proportionally for each section or externally via the LS ports M_A, M_B. Pressure relief valves with combined feed function (5) protect the consumer ports A and B from pressure peaks and from external forces. The highest load pressure on the pump is reported via the LS line and the integrated shuttle valve (8).

Sectional view M4-15



- | | |
|----------------------------|--|
| 1 Housing | 5 Pressure relief valve with feed function |
| 2 Control spool | 6 Threaded plug |
| 3 Pressure compensator | 7 Stroke limiter |
| 4 LS pressure relief valve | |

Symbol M4-15



- | | |
|----------------------------|-----------------|
| 8 LS shuttle valve | 12 Hand lever |
| 9 Spring chamber | 13 Cover A side |
| 10 Pressure reducing valve | 14 Cover B side |
| 11 Compression spring | |



SM4 - 15 Series <<<



General								
Weight	Inlet plate		J	P	VL, VR	JZ	VZ	JK
		kg	6.6	10	10.7	8.5	10.7	11
	Directional valve section		M	H	W	CBA		
		kg	7.1	7.1	7.5	7.8		
	Hand lever surplus weight	kg	0.6					
	End plate		LA	LAPT	LAY	LAYPT	LAX	LAXPT
		kg	5.8	6.3	5.6	5.6	5.8	6.2
			LZ	LZPT	LZY	LZYPT	LZX	LZXPT
		kg	5.8	6.3	5.8	5.2	5.6	6.3
			LU	LUT	LVZ	TI		
	kg	5.6	5.7	5.6	9.3			
Installation position		Ideally horizontal to the spool axis. For versions with spool position sensor, horizontal to the spool axis or vertical, with the sensor cable on the bottom.						
Consumer line connections		Pipe thread according to ISO 228/1 (inches), ISO 11926-1 (UNF) or JIS B 2351-1 (on request)						
Ambient temperature range	θ	°C	-20 ... +80 (-40 ... +100 °C on request)					
Priming (standard)		One-coat paint RAL 5010 (more on request)						
Surface protection according to DIN EN 60068-2-11	Standard priming	h	96					
	Special painting	h	480					
	Painting for SO-038	h	1000					

Mechanical			
Actuating force on the hand lever (encapsulated)	Mechanically operated	N	< 20
	Mechanical override (with parallel hydraulic actuation)	N	< 70
	Mechanical override (with parallel electrohydraulic actuation)	N	< 50
Actuating force for control spool (not encapsulated)	Tongue	N	< 250
	Detent with tongue	N	< 350

Hydraulic				
Maximum working pressure at port	P	p_{max}	bar	350
	A, B	p_{max}	bar	420
	LS	p_{max}	bar	420
	T	p_{max}	bar	30 (20 with mechanical actuation only)
	Y	p_{max}	bar	Must be drained to reservoir without pressure
Maximum pilot pressure at port	a, b	p_{St}	bar	35
	X	p_{St}	bar	35
Pilot pressure range	hydraulic	p_{St}	bar	8.5 ... 22.5
	electrohydraulic	p_{St}	bar	6.5 ... 17.2
Required differential pressure control Δp on the control block	Version S, C	p	bar	18
	Version T	p	bar	25
Recommended hydraulic pilot control devices				TH6 control curve 97, see data sheet 64552 or 64555



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Hydraulic									
Required pump controller				Controller without LS connection to reservoir, e.g. DFR1, DRS					
Maximum primary pressure relief		p	bar	370 (set at the factory according to ordering code), min. 20 bar above the pressure cut-off value of the pump					
LS pressure relief		p	bar	50 ... 330 (set at the factory according to ordering code) The highest reduce response pressure of the valve block LS pressure relief valves set at the factory must be at least 20 bar lower than the pressure cut-off value of the pump.					
Maximum flow	Inlet plate			J	P	VL, VR	JZ	VZ	JK
	Port P	q_{Vmax}	l/min	200	200	200	300	300	300
	Port S	q_{Vmax}	l/min	–	–	150	150	150	–
	Directional valve section	q_{Vmax}	l/min	160 with pressure compensator S and load holding function					
	Port A, B	q_{Vmax}	l/min	200 with pressure compensator T and without load holding function					
		q_{Vmax}	l/min	200 without pressure compensator					
	End plate			LAPT	LAYPT	LAXPT	LZPT	LZYPT	LZXPT
	Port P	q_{Vmax}	l/min	100	100	100	100	100	100
Hydraulic fluid				Mineral oil (HL, HLP) according to DIN 51524, HEES (synthetic ester) according to ISO 15380 and other hydraulic fluids on request					
Hydraulic fluid temperature range		ϑ	°C	–20 ... +80 –40 ... +100 on request					
Viscosity range		ν	mm ² /s	10 ... 380					
Maximum admissible degree of contamination of hydraulic fluid				Level 20/18/15, we recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$					
Cleanliness level according to ISO 4406 (c)									
Required filtration rate for port X (external pilot oil supply) for CPM actuation				Minimum retention rate of $\beta_{100} \geq 200$					

Electric		
Electrical pilot control valves		FTWE2K..., see data sheet 58007 ¹⁾ FTDRE2K..., see data sheet 58032 ¹⁾
Recommended amplifier (other actuating options on request)		RA 1-0/10 (1 section), see data sheet 95230 RA 2-1/10, (4 to 6 sections), see data sheet 95230 BODAS control units
Connector version	1 and 3	Junior timer, 2-pin (AMP)
	8 and 9	DT04-2P (DEUTSCH)
Type of protection according to ISO 20653	Connector version 1 and 3	IP6K5 ¹⁾ IP6K7 and IP6K9K ¹⁾ (only with Rexroth type R901022127 and R900313533)
	Connector version 8 and 9	IP6K5, IP6K7 and IP6K9K ¹⁾
On-board electronics (CPM)		Data from page 43; see also instruction manual 64819-B or 64820-B
Spool position sensor		PSM, see data sheet 95190

Notice

- For applications outside these values, please consult us!
- The technical data were determined at a viscosity of $\nu = 32 \text{ mm}^2/\text{s}$ (HLP46: 50 °C).

¹⁾ With installed and locked plug-in connector. Plug-in connectors are not included in the scope of delivery and must be ordered separately, see page 46.

Modular system

Control blocks in the M4-15 series have a modular structure. They can be combined to provide the perfect solution for the application at hand.

Control block with lateral inlet plate

1. Inlet plate

- A: Closed center **VR** with external priority consumer
- B: Open center **P**
- C: Closed center **J**

2. Directional valve sections

- 2.1 LS pressure relief
- 2.2 Secondary valves
- 2.3 Actuation A side
 - A: Mechanical actuation **A**
 - B: Mechanical actuation **M**
 - C: Hydraulic actuation **H**
 - D: Electrohydraulic actuation **W**
 - E: Electrohydraulic actuation **W** with spool position sensor
 - F: Electrohydraulic actuation with on-board electronics CPM **CPS**

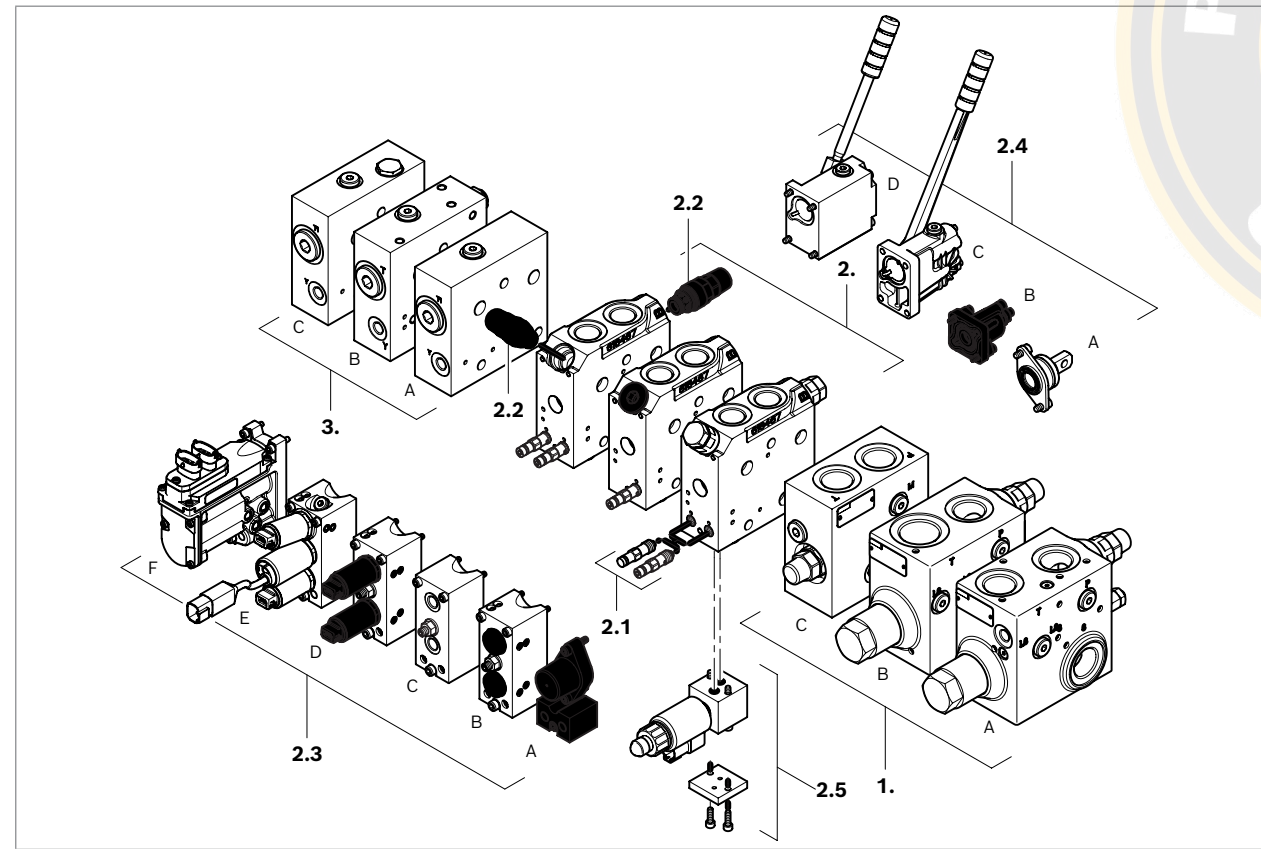
2.4 Actuation B side

- A: Mechanical actuation **Z** with tongue
- B: Standard cover –
- C: Mechanical actuation **K** with hand lever
- D: Mechanical actuation **B2** with clamping piece and hand lever (aluminum-free)

2.5 Electro-proportional LS pressure relief

3. End plate

- A: End plate **LA, LZ**
- B: With internal pilot oil supply **LAY, LZY**
- C: With external pilot oil supply **LAX, LZX**



Control block with central inlet plate

1. Central inlet plate

- A: Closed Center **JZ**
- B: Closed center **VZ** with priority valve

2. Directional valve sections

- 2.1 LS pressure relief
- 2.2 Secondary valves
- 2.3 Actuation A side
 - A: Mechanical actuation **A**
 - B: Mechanical actuation **M**
 - C: Hydraulic actuation **H**
 - D: Electrohydraulic actuation **W**
 - E: Electrohydraulic actuation **W** with spool position sensor
 - F: Electrohydraulic actuation with on-board electronics CPM **CPS**

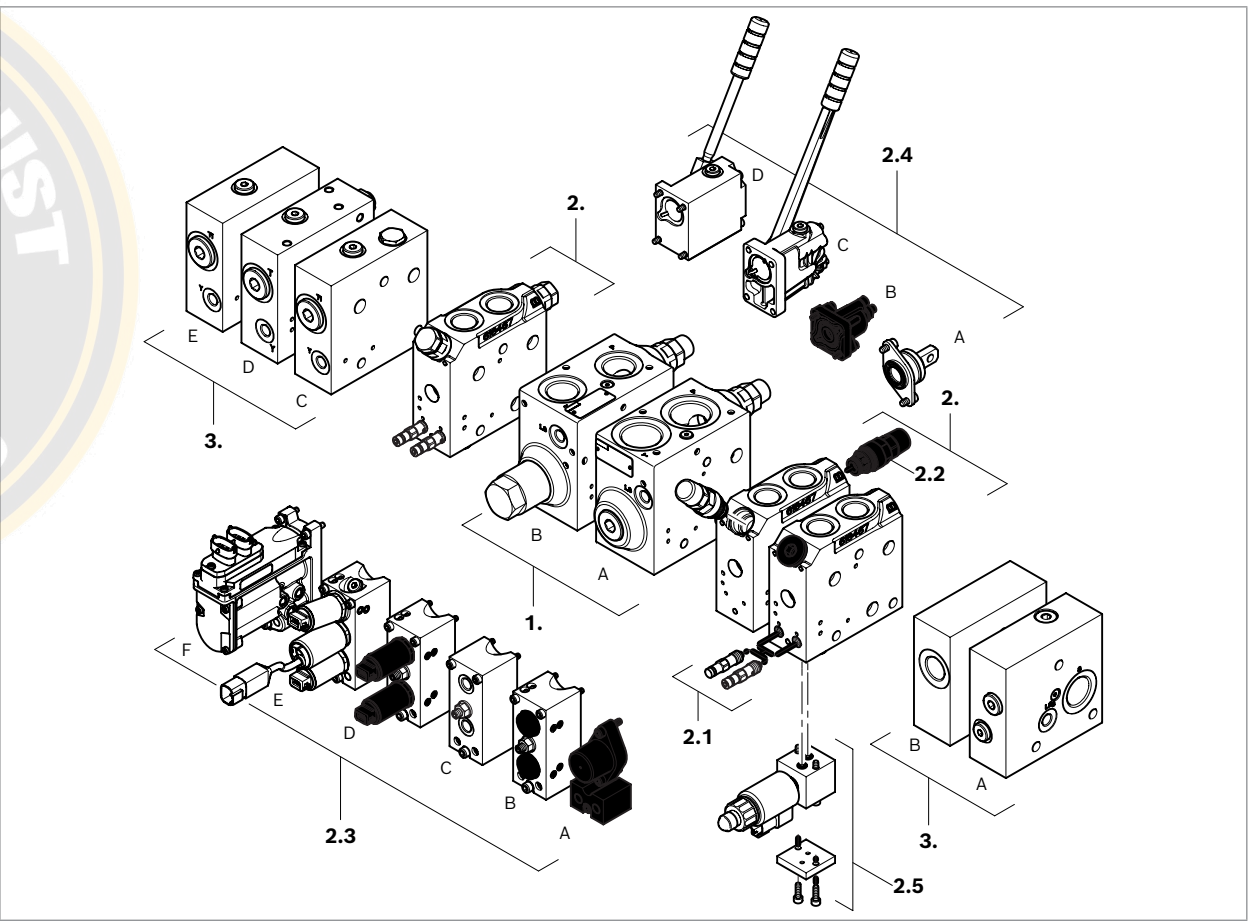
2.4 Actuation B side

- A: Mechanical actuation **Z** with tongue
- B: Standard cover –
- C: Mechanical actuation **K** with hand lever
- D: Mechanical actuation **B2** with clamping piece and hand lever (aluminum-free)

2.5 Electro-proportional LS pressure relief

3. End plate

- A: Diversion plate with external priority connection **LVZ**
- B: Diversion plate **LUT**
- C: With LS unloading **LA, LZ**
- D: With LS port and pilot oil supply **LAY, LZY**
- E: With LS port and pilot oil supply **LAX, LZX**





Ordering code

Specifications on the name plate

The ordering code is used to record the technical features and requirements.
The Rexroth sales organization uses the ordering code to derive a short type and a material number.

The complete control block is defined as per the type code according to DCCS 46001-10.
For recording the ordering code, the M4 configurator is alternatively available at: www.boschrexroth.com/m4

Example: M4-15 control block with three directional valve sections

01	02	03	04	05	06	07	08	09	10	11	12			
SM4	-	G12345	-	2	0	/	3	M4-15	J	W21	-	V	01	-450

01	Series: Load-sensing control block M4
02	6-digit control block number
03	Series 2X (unchanged installation and connection dimensions)
04	Series amendment status
05	Total number of directional valve sections (1 to 18) ¹⁾
06	Directional valve size
07	Inlet plate
08	A side actuation (primarily)
09	B side actuation (primarily)
10	Sealing material (mostly)
11	Line connections
12	Optional: Special designation

¹⁾ Each side can support up to 9 directional valve sections. Always indicate "9" for 10 or more directional valves.

Inlet plate

	01	02	03	04	05
SM4-15-2X	/				

Design, system

01	Open center	Lateral inlet plate	P
	Closed center	Lateral inlet plate	J
		Lateral inlet plate, internal priority consumer, external subordinate consumer	VL
		Lateral inlet plate, external priority consumer, internal subordinate consumer	VR
		Central inlet plate	JZ
		Central inlet plate with priority valve	VZ
		Central inlet plate for combination M4-12/M4-15 ¹⁾	JK
		Central inlet plate with logic valve for connecting or switching off a main function with high flow (no other ordering codes required)	XZ

Primary pressure limitation

02	Without primary pressure relief valve (can be retrofitted, not possible with open center version P)	Q
	With primary pressure relief valve, specified pressure in bar, 3-digit	...

Priority valve (information only required with version V.)

03	Static priority valve	A
	Dynamic priority valve	B

LS pressure relief priority valve

04	Specified pressure in bar, 3-digit	...
----	------------------------------------	-----

Optional

05	With LS damping nozzles, specification of the nozzle diameter in mm, e.g. S0.6–0.6 (not in conjunction with inlet P)	S...-...
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¹⁾ For details see data sheet 64276

= preferred program



SM4 - 15 Series <<<



Directional valve sections

SM4-15-2X /	01	02	03	04	05	06	07	08	09	10	11	12	13
													*
	1st directional valve section												
													*
2nd directional valve section													
													*
3rd directional valve section, etc.													

Pressure compensator

01	With pressure compensator, with load holding function	S
	With pressure compensator, without load holding function	T
	Without pressure compensator, with load holding function	C
	Without pressure compensator, without load holding function	Q

LS pressure relief and housing variant

		02	03	04
02	Without LS pressure relief valve (LS-PRV cannot be retrofitted; M not possible)	Z		Z
04	With threaded plug (Z not possible) ¹⁾	Q		Q
	With LS pressure relief valve (specified pressure in bar, 3-digit; Z not possible) ¹⁾	...		...
	With 1 LS pressure relief valve for same pressure setting in A and B (specified pressure in bar, 3-digit) ¹⁾	=		...
	LS relief plug	B		B
03	Housing with measuring ports		M	
	Housing without measuring ports		Z	
	Housing for electro-proportional LS pressure relief or switchable directional valves ²⁾		K	
	– 210 bar, decreasing characteristic curve ²⁾		L	
	– 210 bar, increasing characteristic curve ²⁾		J	
	– 350 bar, decreasing characteristic curve ²⁾		R	
	– 350 bar, increasing characteristic curve ²⁾		N	

Spool type³⁾

05	Control spool E	E
	Control spool J	J
	Control spool Q	Q
	Control spool with regeneration function	R
	Floating position spool ⁴⁾	W
	Floating position spool ⁴⁾	Y

Flow

06	Flow in consumer port A and B (parameter in l/min, 3-digit)	...-...
	Control spool with pressure function T (only in conjunction with E , J or Q) ⁴⁾	...T...

1) Only in combination with pressure compensator S and T
2) Exact specifications in plain text, see information from page 27
3) For symbols, see "Control spool" on page 20
4) Please consult our technical sales department

= preferred program



SM4 - 15 Series <<<

Actuation A side

07	Mechanical only	Spring-centered	A
		With detent in 1	B1
		With detent in 2	B2
		With detent in 1, 2	B4
	Mechanical ⁵⁾	Encapsulated, spring-centered	M
	Hydraulic ⁶⁾		H
	Electrohydraulically proportional	Standard	W2
		With measuring ports, on both sides	W8
		With damping nozzle + check valve for hydraulic superposition	G2
	Electrohydraulically switchable	Standard	W4
		With damping nozzles, on both sides	W5
		With measuring ports, on both sides	W6
		With damping nozzle, with measuring ports, on both sides	W7
		With damping nozzle + check valve for hydraulic superposition	G4
	Electrohydraulic with digital On-board electronics (CPM)	CANopen control	CPS
		(Flange-mountable wiring variant in the plain text)	

Supply voltage and connector version⁷⁾

08	Junior timer, 2-pin (AMP)	24 V	12 V
		1	3
		8	9

Actuation B side

09	Mechanical only, spool end with tongue		Z
		Standard cover	-
	Cover with hand lever ⁸⁾		
		Without hand lever	X
		Hand lever position 60°	N
		Hand lever position 0°	O
		Hand lever position -60°	P

Secondary valves for consumer ports A and B

10	Without ⁹⁾	With threaded plug (secondary valves can be retrofitted)	Q
		Feed valve	E
		Pressure relief / feed valve, adjustable	H...

Optional special designation

12	One-sided actuation, two switching positions	-011
	With spool position sensor	-100

Optional

13	Further details in plain text	*
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5) Always in conjunction with revolving hand lever
6) For combination with mechanically superposed actuation (B side), Bosch Rexroth recommends a non-revolving hand lever
7) Parameter only required with electrohydraulic actuation and with electro-proportional LS pressure relief

8) For more details and versions, see "Variant overview" on page 24
9) Secondary valves must be present in the hydraulic circuit

= preferred program

End plate, additional information

	01	02	03	04	05
SM4-15-2X	/			01	*

End plate

01	With LS relief	Without LS relief	External pilot oil supply	Internal pilot oil supply	With additional P and T port	
	•					LA
	•				•	LAPT
	•			•		LAY
	•			•	•	LAYPT
	•		•			LAX
	•		•		•	LAXPT
		•				LZ
		•			•	LZPT
		•		•		LZY
		•		•	•	LZYPT
		•	•			LZX
		•	•		•	LZXPT
Diversion plate for use with central inlet plate						LU
With additional T port						LUT
With additional LS, P and T port						LUPT
Intermediate plate for M4-12 directional valves with pilot oil supply						L12Y
for M4-12 directional valves without pilot oil supply						L12Q
External priority connection (option for connecting another LS control block)						LVZ

Sealing material

02	FKM (fluoroelastomer)	V
	NBR (nitrile rubber), FKM (fluoroelastomer)	MV
	NBR/FKM (nitrile rubber and fluoroelastomer) for low temperature range down to -40 °C (on request)	MT

Pipe thread line connections

03	Inches according to ISO 228/1 ¹⁾	01
	UNF according to ISO 11926/-1 ²⁾	19
	JIS B 2351-1 (on request)	64

Optional special designation

04	Increased corrosion protection (seawater-resistant) ³⁾	-038
	Aluminum-free	-450
	For safety-related applications	-S

Optional

05	Further details in plain text	*
----	-------------------------------	---

1) See "Line connections" on page 33.

2) For UNF thread, see data sheet RA 64283.

3) Please consult our technical sales department

 = preferred program

Order examples

Closed center with lateral inlet plate

Example:

- 3-fold control block with 3 directional valve sections
- Variable pump $q_{V, max} = 200$ l/min via inlet + 100 l/min via end plate is possible

Inlet plate

- Closed center, lateral
- With primary pressure relief valve, set to 250 bar
- With internal pilot oil supply

1st directional valve section

- With pressure compensator, without load holding function
- With 1 LS pressure relief valve for consumer ports A and B 200 bar
- Spool symbol J
- Flow in A and B 190 l/min
- Type of actuation: hydraulic
- Secondary valves: Pressure valve/feed valve, consumer port A and B 320 bar

2nd and 3rd directional valve section

- With pressure compensator, with load holding function
- With LS pressure relief valve for consumer port A 180 bar, consumer port B 120 bar
- Spool symbol E
- Flow in A 85 l/min, in B 60 l/min
- Type of actuation: hydraulic
- Secondary valves: Pressure valve/feed valve, consumer port A and B 320 bar

End plate, additional information

- With internal LS unloading and additional P and T port
- FKM seals
- Pipe thread connections

Ordering code:

Short type, inlet plate

						01	02
3	M4	-	15	-	2X	/	J 250

1st directional valve section

	01	02	03	04	05	06	07	09	10	11
T	=	M	200	J	190-190	H	-	H320	H320	

2nd directional valve section

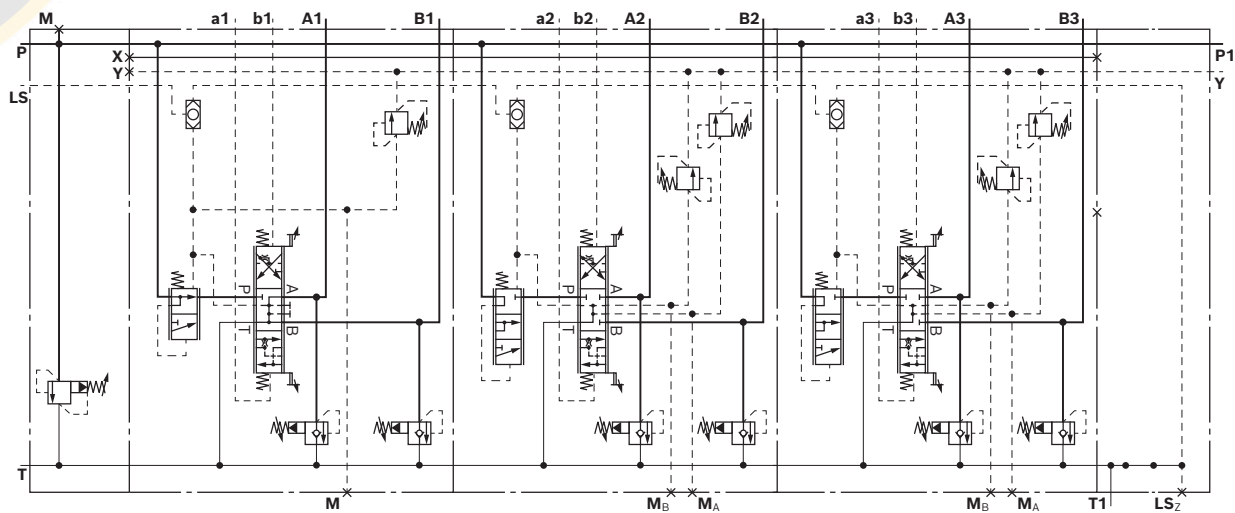
	01	02	03	04	05	06	07	09	10	11
S	180	M	120	E	085-060	H	-	H320	H320	

3rd directional valve section

	01	02	03	04	05	06	07	09	10	11
S	180	M	120	E	085-060	H	-	H320	H320	

End plate, additional information

	01	02	03
LAPT	V	01	



SM4-15 Series <<<



Closed center with central inlet plate

Example:	– 2-fold control block with 2 directional valve sections – Variable pump $q_{V, \max} = 300$ l/min
Short type, diversion plate	– Diversion plate
1st directional valve section	– With pressure compensator, with load holding function – Without LS pressure relief valve bore – Spool symbol E – Flow in A and B 140 l/min – Type of actuation: electrohydraulically proportional – With Junior Timer, 2-pin (AMP) 24 V – Overriding hand lever (revolving) – Secondary valve bores plugged
Inlet plate	– Closed center, central – With primary pressure relief valve, set to 300 bar – With priority valve (dynamic), set to 250 bar
2nd directional valve section	– With pressure compensator, with load holding function – With LS pressure relief valve for consumer port A 270 bar, consumer port B 300 bar – With electro-proportional LS pressure relief, 210 bar (decreasing characteristic curve) – Spool symbol E – Flow in A and B 90 l/min – Type of actuation: digital OBE – Overriding hand lever (revolving) – Secondary valve bores plugged
End plate, additional information	– With internal LS unloading and pilot oil supply – FKM seals – Pipe thread connections

Ordering code:

Short type, diversion plate

												01
2	M4	-	15	-	2X	/	LU					

1st directional valve section

01	02	03	04	05	06	07	08	09	10	11
S	Z	Z	Z	E	140-140	W2	1	K	Q	Q

Inlet plate

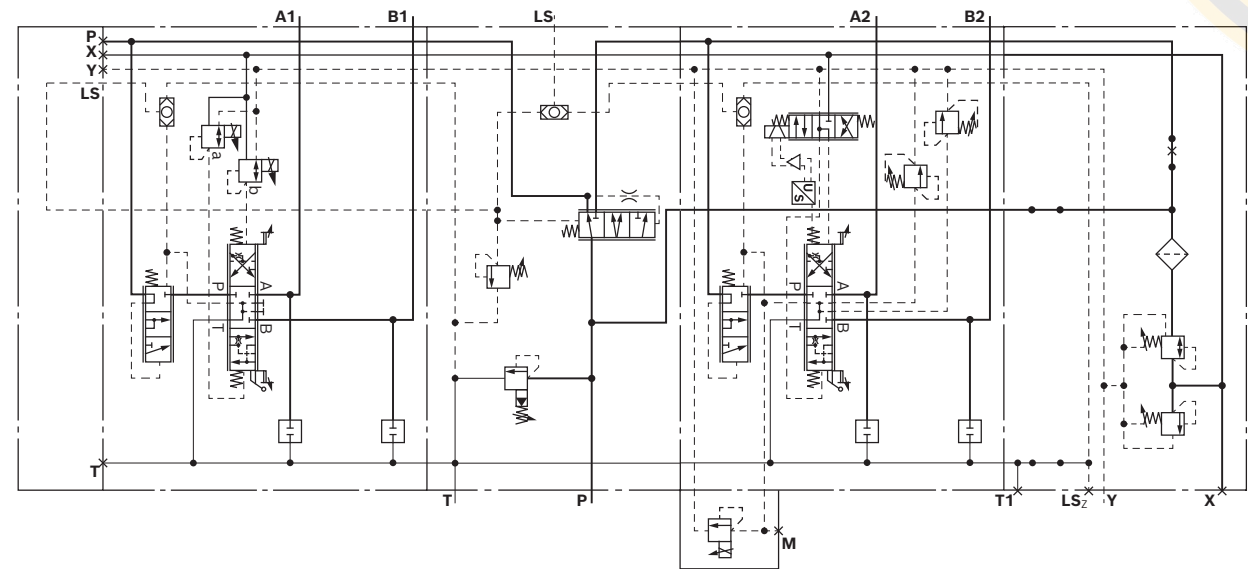
01	02	03	04
VZ	300	B	250

2nd directional valve section

01	02	03	04	05	06	07	09	10	11	13
S	270	L	300	E	090-090	CPS	K	Q	Q	KBPSL8BA

End plate, additional information

01	02	03
LAY	V	01



SM4-15 Series <<<

Closed center with central inlet plate for connecting or switching off a main function with high flow

Example:	– 2-fold control block with 2 directional valve sections – Variable pump $q_{V, \max} = 200$ l/min
Short type, diversion plate	– Diversion plate with additional LS, P and T port – With pressure relief valve, set to 310 bar
1st directional valve section	– With pressure compensator, with load holding function – Without LS pressure relief valve bore for consumer port A and B – With electro-proportional LS pressure relief, 250 bar (decreasing characteristic curve) – Spool symbol J – Flow in A and B 130 l/min – Type of actuation: electrohydraulically proportional – With DT04-2P connector (DEUTSCH) 24 V – Secondary valve bores plugged
Inlet plate	– Closed center, central – With logic valve for connecting or switching off a main function with high flow – For two individual pump circuits P1 and P2 and a shared tank port – With load sensing for both consumer ports for the left and right directional valve sections
2nd directional valve section	– With pressure compensator, with load holding function – Without LS pressure relief valves for consumer port A and B (plugged) – With electro-proportional LS pressure relief, 250 bar (decreasing characteristic curve) – Spool symbol J – Flow in A and B 130 l/min – Type of actuation: electrohydraulically proportional – With DT04-2P connector (DEUTSCH) 24 V – Secondary valve bores plugged
End plate, additional information	– With internal LS unloading and internal pilot oil supply – FKM seals – Pipe thread connections

Ordering code:

Short type, diversion plate

												01	02
2	M4	-	15	-	2X	/	LUPT	310					

1st directional valve section

01	02	03	04	05	06	07	08	09	10	11	12
S	Z	K	Z	J	130-130	W2	8	-	Q	Q	KBPSN8BA

Inlet plate

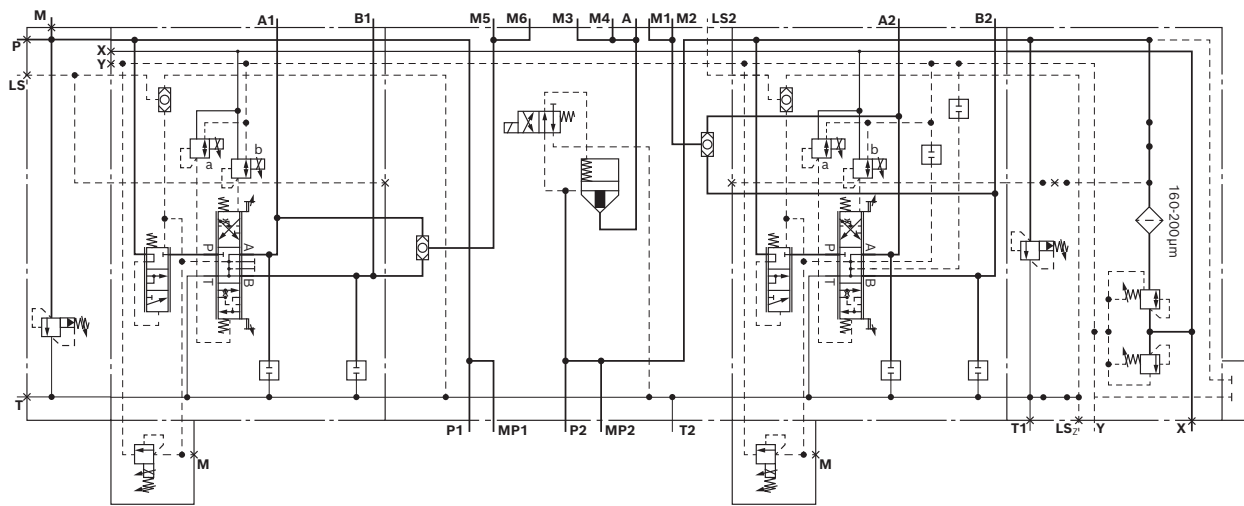
01
XZ

2nd directional valve section

01	02	03	04	05	06	07	08	09	10	11	12
S	Q	K	Q	J	130-130	W2	8	-	Q	Q	KBPSN8BA

End plate, additional information

01	02	03
LAY	V	01



SM4-15 Series <<<



Inlet plates

Open center

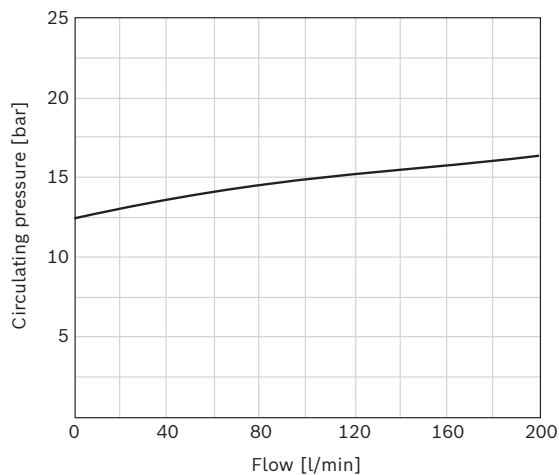
With primary pressure relief valve

Ordering code:

P ...

- Specified pressure in bar required after **P** (3-digit)

▼ Circulating pressure **P** → **T**



Closed center

Without primary pressure relief valve

Ordering code:

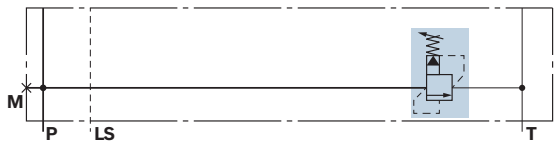
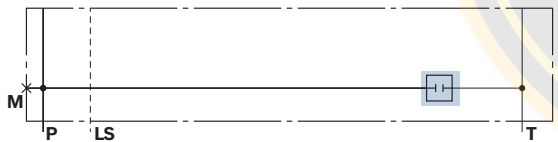
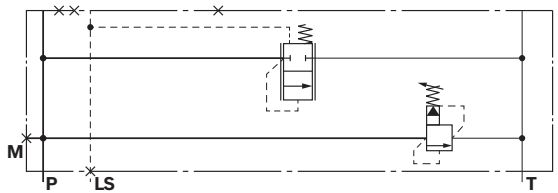
J **Q**

With primary pressure relief valve

Ordering code:

J ...

- Specified pressure in bar required after **J** (3-digit)



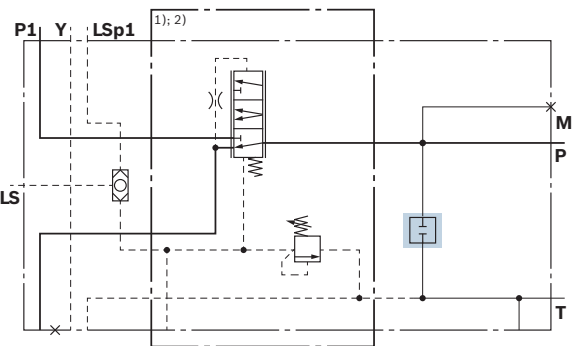
SM4-15 Series <<<

Without primary pressure relief valve, internal priority consumer, external subordinate consumer

Ordering code:

VL **Q** **A** ...

- Specified pressure in bar required after **A** for LS pressure relief priority valve (3-digit)
- Priority consumer is limited to a pressure compensator Δp of max. 14 bar and 150 l/min

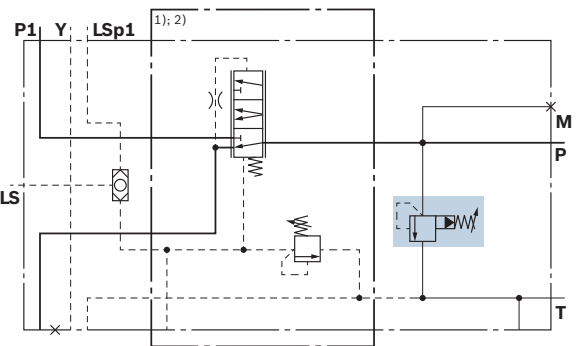


With primary pressure relief valve, internal priority consumer, external subordinate consumer

Ordering code:

VL ... **A** ...

- Specified pressure in bar required after **VL** for primary pressure relief valve (3-digit)
- Specified pressure in bar required after **A** for LS pressure relief priority valve (3-digit)
- Priority consumer is limited to a pressure compensator Δp of max. 14 bar and 150 l/min

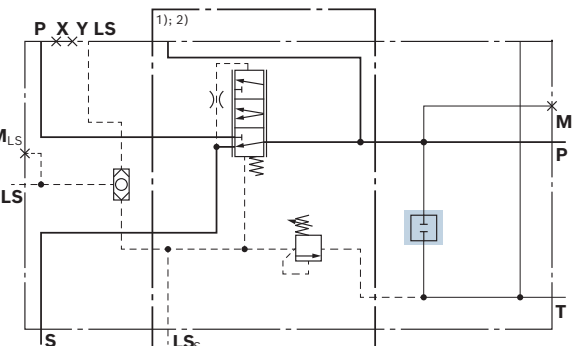


Without primary pressure relief valve, external priority consumer, internal subordinate consumer

Ordering code:

VR **Q** **A** ...

- Specified pressure in bar required after **A** for LS pressure relief priority valve (3-digit)
- Priority consumer is limited to a pressure compensator Δp of max. 14 bar and 150 l/min

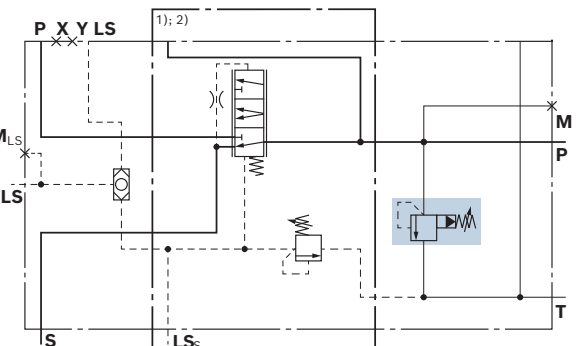


With primary pressure relief valve, external priority consumer, internal subordinate consumer

Ordering code:

VR ... **A** ...

- Specified pressure in bar required after **VR** for primary pressure relief valve (3-digit)
- Specified pressure in bar required after **A** for LS pressure relief priority valve (3-digit)
- Priority consumer is limited to a pressure compensator Δp of max. 14 bar and 150 l/min



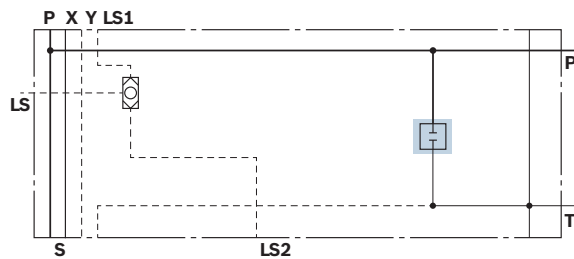
1); 2) Priority valve version, see page 18

Central closed center inlet plates

Without primary pressure relief valve

Ordering code:

JZ Q

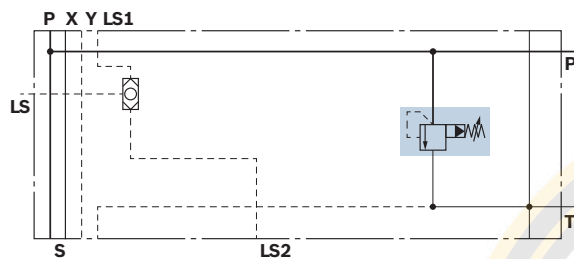


With primary pressure relief valve

Ordering code:

JZ ...

- Specified pressure in bar required after JZ (3-digit)

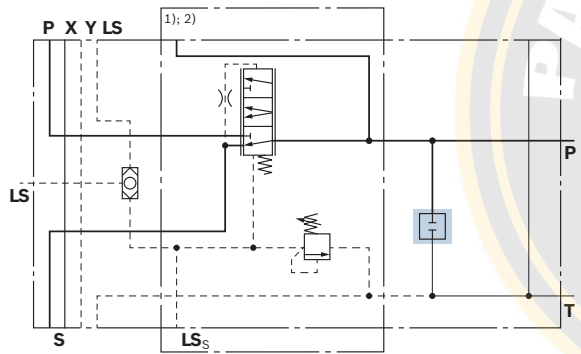


Without primary pressure relief valve, with priority valve

Ordering code:

VZ Q A ...

- Specified pressure in bar required after A for LS pressure relief priority valve (3-digit)
- Priority consumer is limited to a pressure compensator Δp of max. 14 bar and 150 l/min
- Refer also to the end plate LVZ on page 32.

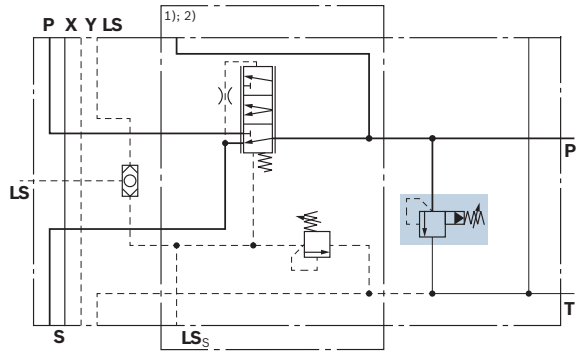


With primary pressure relief valve, with priority valve

Ordering code:

VZ ... A ...

- Specified pressure in bar required after VZ for primary pressure relief valve (3-digit)
- Specified pressure in bar required after A for LS pressure relief priority valve (3-digit)
- Priority consumer is limited to a pressure compensator Δp of max. 14 bar and 150 l/min
- Refer also to the end plate LVZ on page 32.



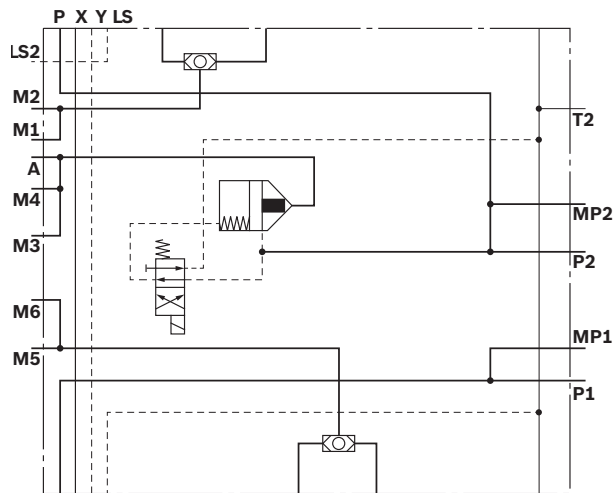
1); 2) Priority valve version, see page 18

With logic valve for connecting or switching off a main function with high flow

Ordering code:

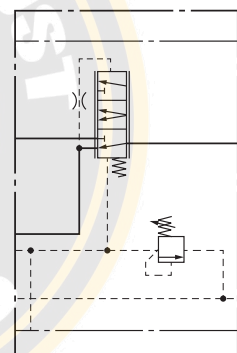
XZ

- For two individual pump circuits P1 and P2 (<10 bar at 200 liters in single operation) and a shared tank port
- With load sensing for both consumer ports for the left and right directional valve sections
- Design by technical sales.



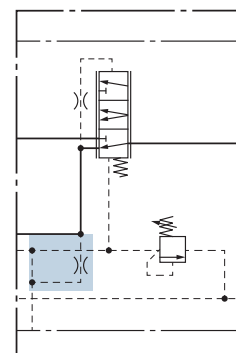
- 1) For priority consumers with constant flow, version V ... A is recommended.

Version V ... A



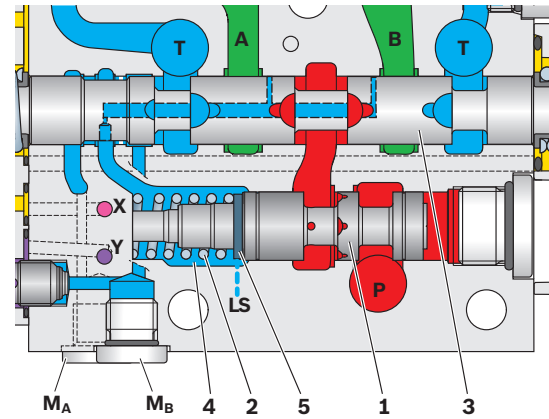
- 2) For dynamic priority consumers (e.g. control), version V ... B is recommended.

Version V ... B

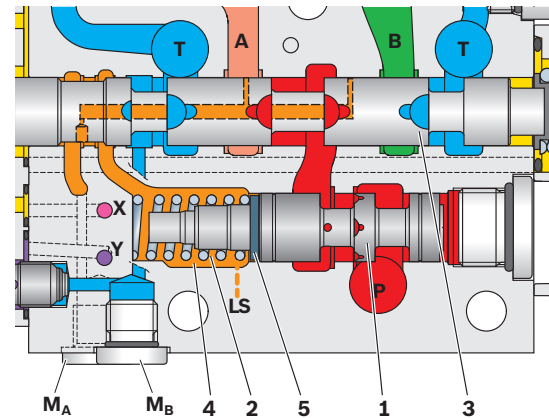


Pressure compensator

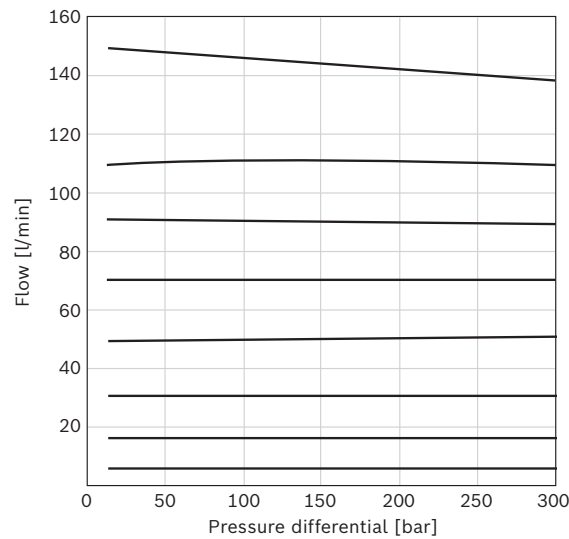
Control spool in central position



Control spool actuated



Flow control by pressure compensator



In the control spool central position there is no connection from **P** to the consumer ports **A** and **B**. Pump pressure shifts the compensator spool (1) to the left against the spring (2) in this operating condition. When the control spool (3) (= metering orifice) is actuated, the LS pressure reaches the spring chamber (4) and shifts the pressure compensator spool to the right into the control position. The flow is also kept constant in parallel operation of consumers with different load pressures. The pressure compensator **S** is equipped with load holding function. This function is not free of leakage oil. It is equipped with one ring (5) as standard. The number of rings fitted depends on the required flow.

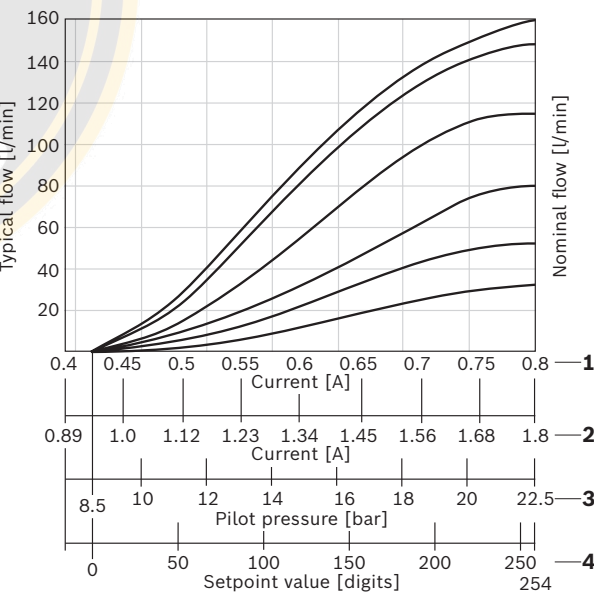
Type	Summary	Symbol
S	▶ With pressure compensator ▶ With load holding function¹⁾ ▶ Maximum flow 160 l/min	
T	▶ With pressure compensator ▶ Without load holding function ▶ Maximum flow 200 l/min	
C	▶ Without pressure compensator ▶ With load holding function¹⁾ ▶ Maximum flow 200 l/min	
Q	▶ Without pressure compensator ▶ Without load holding function ▶ Maximum flow 200 l/min	

1) This load holding function is not leak-free

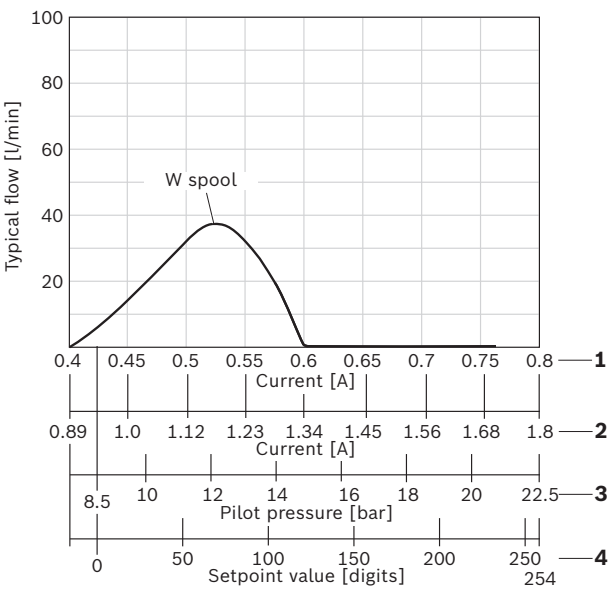
Control spool

Hydraulic cylinder as consumer	Regeneration function (P, B → A)	
E	R	
Hydraulic motors as consumers	Floating position	
J	W	
Application with defined residual opening (A/B → T), consumer port unloaded in neutral position	Floating position ¹⁾	Spool with pressure function ¹⁾ pilot-pressure dependent consumer supply pressure
Q	Y	(E, J, Q) ... T ...

Characteristic curves symmetric control spools P → A/B



Characteristic curves floating position spool P → B (floating position with maximum actuation)



- 1 Electrohydraulic actuation, 24 V control
- 2 Electrohydraulic actuation, 12 V control
- 3 Hydraulic actuation
- 4 Digital on-board electronics (CPM, default characteristic curve)

1) Design by technical sales.

SM4-15 Series <<<



Flow

This is an overview of the preferred spool types. Further of the spool and groove geometry for the desired control spool types are available on request. Individual adaptation behavior is possible.

Symmetric control spools

Spool type	Pressure compensator	Flow in l/min						
E, J, Q	S	160–160	150–150	120–120	080–080	050–050	032–032	023–023
		140–140	130–130	100–100	070–070	045–045	028–028	020–020
		120–120	110–110	085–085	060–060	040–040	025–025	017–017
	C	200–200	175–175	145–145	110–110	080–080	045–045	028–028
	T	200–200	190–190	160–160	100–100	065–065	040–040	

Asymmetric control spools

Spool type	Pressure compensator	Flow in l/min						
E, J, Q	S	150–120	120–080	080–050	050–032			
		130–100	100–070	070–045	045–028			
		110–085	085–060	060–040	040–025			
	C	175–145	145–110	110–080	080–045			
	T	190–160	160–100	100–065	065–040			

Floating position and regeneration spool

Spool type	Pressure compensator	Flow in l/min (others on request)	
W	S	065–065	
Y		045–045	
R		130–100	100–140

Notice
Design by technical sales.

Example:

- Spool type J
- Pressure compensator S
- Setpoint value: $q_{consumers} = 140$ l/min

Solution:

- 130-liter spool + 2 rings = 150 l/min
- Set 140 liters via stroke limiter.

Spool type	Pressure compensator	Flow in l/min	Number of rings
E, J, Q	S	150–150	With 2 rings (pressure compensator $\Delta p = 9$ to 12 bar)
		130–130	With 1 ring (pressure compensator $\Delta p = 7.5$ to 10.5 bar)
		110–110	Without ring (pressure compensator $\Delta p = 6$ to 9 bar)

Notice
Place directional valve sections with maximum flow as close as possible to the inlet plate.

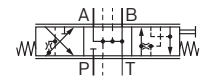


SM4-15 Series <<<

Types of actuation

Mechanical only (not encapsulated) with tongue

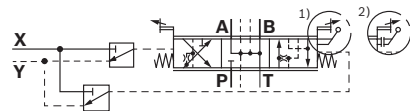
AZ



- Centering in central position by means of springs in case of non-actuation.

Mechanical (encapsulated)

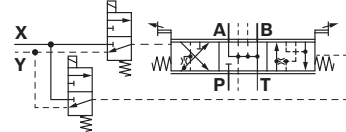
M



- Centering in central position by means of springs in case of non-actuation.
- All hand lever position options are possible, cf. also ordering code on page 24.
 - 1) Revolving hand lever
 - 2) Non-revolving hand lever

Electrohydraulically switchable

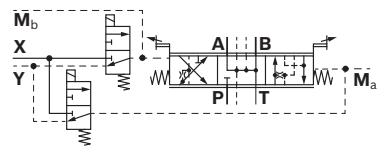
W4



- FTDRE2K on/off valve according to data sheet 58007

Electrohydraulically switchable with measuring ports on both sides

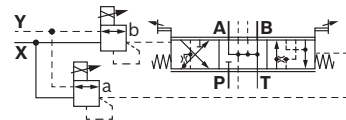
W6



- FTDRE2K on/off valve according to data sheet 58007

Electrohydraulically proportional

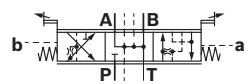
W2



- FTDRE2K proportional pressure reducing valve according to data sheet 58032

Hydraulic

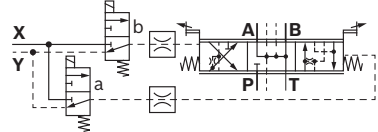
H



- Centering in central position by means of springs in case of non-actuation.
- Recommended hydraulic pilot control devices:
Type 2TH6 and 4TH6 according to data sheet 64552 or 64555

Electrohydraulically switchable with damping nozzle on both sides

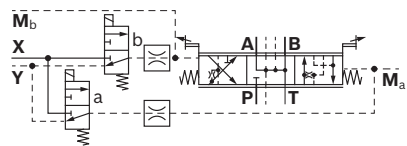
W5



- FTDRE2K on/off valve according to data sheet 58007

Electrohydraulically switchable with damping nozzle, with measuring ports on both sides

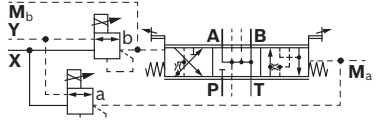
W7



- FTDRE2K on/off valve according to data sheet 58007

Electrohydraulically proportional with measuring ports on both sides

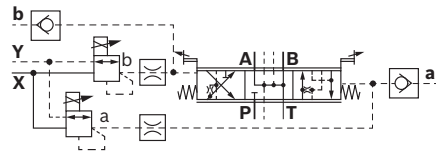
W8



- FTDRE2K proportional pressure reducing valve according to data sheet 58032

Electrohydraulically proportional with damping nozzle and check valve for hydraulic superposition

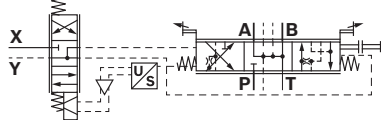
G2



► FTDRE2K proportional pressure reducing valve according to data sheet 58032

CAN bus-controlled pilot module

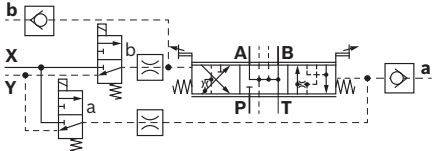
CPS



► Digital interface with electronics and position sensor for stricter requirements regarding EMC and functional safety, see instruction manual 64819-B or 64820-B and as of page 43

Electrohydraulically switchable with damping nozzle and check valve for hydraulic superposition

G4



► FTDRE2K on/off valve according to data sheet 58007

Variant overview for mechanical actuation only (not encapsulated)

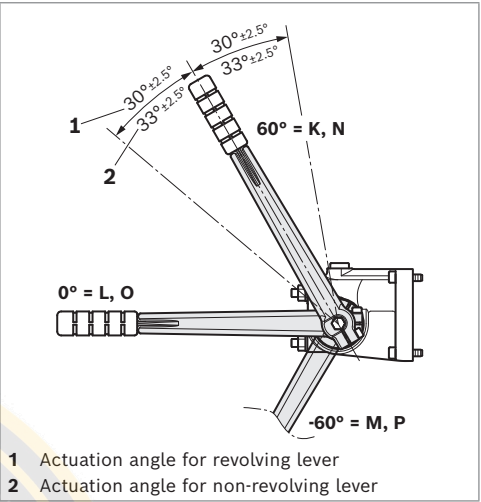
Spring-centered + tongue	
	A Z
Detent + tongue	
	B1 Z
	B2 Z
	B4 Z

Actuating force:

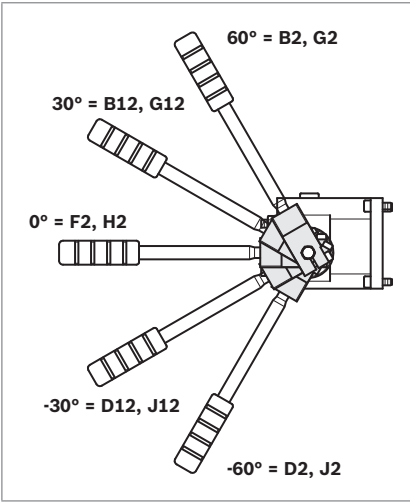
Tongue <250 N (for control spool)

Variant overview for mechanical actuation with hand lever (encapsulated)

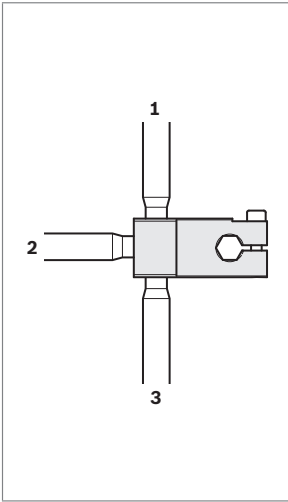
▼ Standard cover with hand lever



▼ Cover with clamping piece and hand lever, aluminum-free
(Example: Lever screw fitting in position 2)



▼ Lever screw fitting on the clamping piece



Ordering code

Lever	Standard cover		Clamping piece with lever				Clamping piece without lever	
	Revolving	Non-revolving	Revolving		Non-revolving		Revolving	Non-revolving
Upward, 60°	K	N	B	2 3	G	2 3	T	Q
Upward, 30°			B1	2 3	G1	2 3	T1	Q1
Straight, 0°	L	O	F	1 2 3	H	1 2 3	U	S
Downward, -30°			D1	1 2	J1	1 2	V1	C1
Downward, -60°	M	P	D	1 2	J	1 2	V	C
Without lever	R	X						

Actuating force (on the hand lever)

- Mechanical <20 N
- Mechanical override (with parallel hydraulic actuation) <50 N
- Mechanical override (with parallel electrohydraulic actuation) <70 N

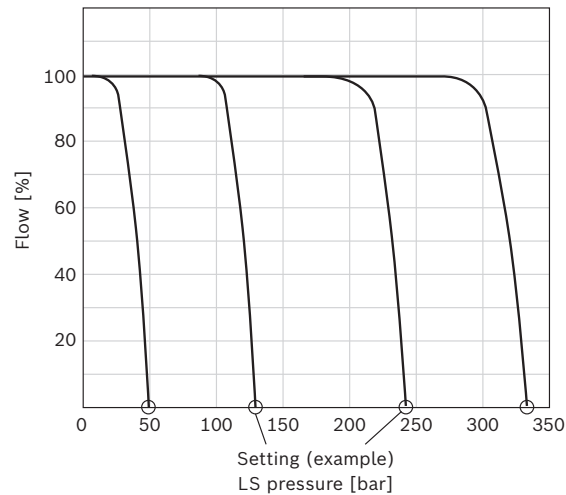
= preferred program

Notices

- Revolving hand lever:
Mechanical actuation can override the electrohydraulic actuation. The hand lever is directly connected to the control spool and follows the spool movement in electrohydraulic control.
- Non-revolving hand lever:
The hand lever is connected to the control spool via a coupling. If the control spool is in the central position, the hand lever can be snapped into place. With electrohydraulic control, it does not follow the spool movement in this way.

LS pressure relief

▼ Consumer flow reduction by LS pressure relief



Minimum setting: 50 bar
Maximum setting: 330 bar

With LS pressure relief valve and LS threaded plug

Ordering code:

S	...	M	Q	J	...-...	W2	1	-	Q	H...
---	-----	---	---	---	---------	----	---	---	---	------

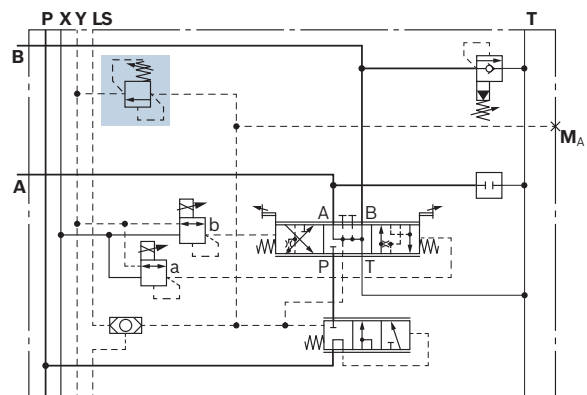
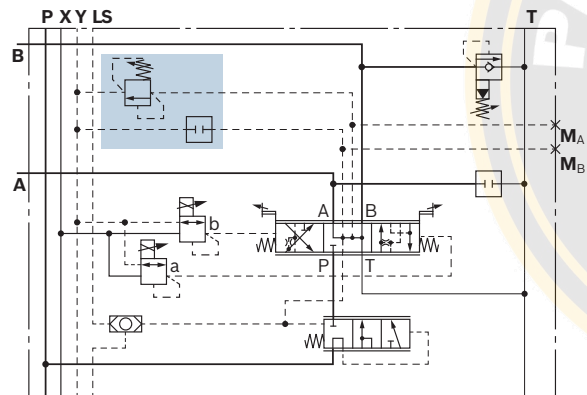
- Specified pressure in bar for consumer port **A** (3-digit)
- Threaded plug for consumer port **B**
- With the **QM** version, LS pressure relief can be retrofitted onto the directional valve.
- The LS pressure can be influenced externally via ports **M_A** and **M_B**. These ports can also be used as measuring ports.

With 1 LS pressure relief valve

Ordering code:

S	=	M	...	J	...-...	W2	1	-	Q	H...
---	---	---	-----	---	---------	----	---	---	---	------

- Only 1 LS-PRV for the same pressure setting in **A** and **B**, specified pressure in bar (3-digit)
- 1 measuring port

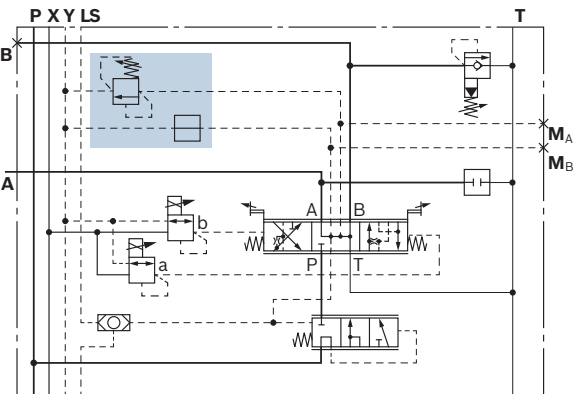


With LS pressure relief valve and relief plug

Ordering code:

S	...	M	B	J	...-000	W2	1	-	Q	H...
---	-----	---	---	---	---------	----	---	---	---	------

- Specified pressure in bar for consumer port **A** (3-digit)
- Relief plug for consumer port **B**
- E.g., for cylinders actuated on one side

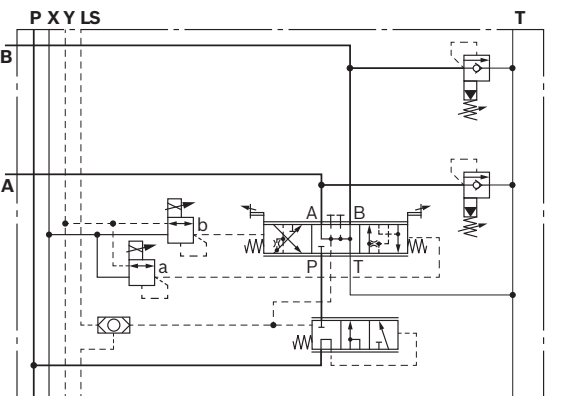


Without LS pressure relief valves

Ordering code:

S	Z	Z	Z	J	...-...	W2	1	-	H...	H...
---	---	---	---	---	---------	----	---	---	------	------

- LS-PRV cannot be retrofitted
- Housing without measuring ports

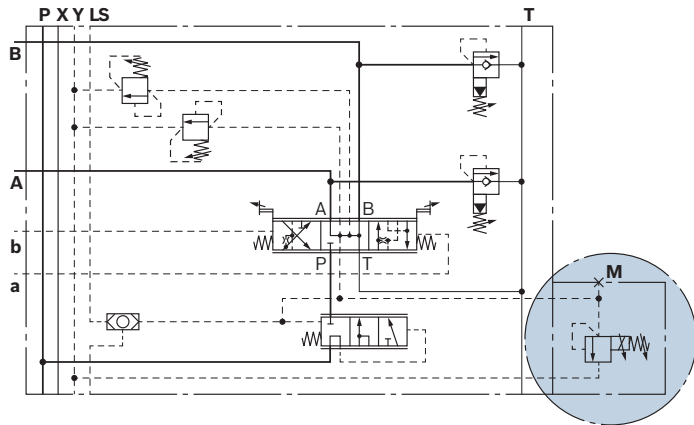


Housing for electro-proportional LS pressure relief/ hydraulically switchable directional valve sections

Distinction between:

1. Type KBPS
2. Housing KBPS and plug
3. Porting pattern KBPS and cover plate
4. Type MH2DAD and type KBPS
5. Type KKDE

The exact designation of the valve must be specified in plain text as follows.



1. Electro-proportional LS pressure relief valve type KBPS

(see also data sheet 18139-04; 18139-05)

Preferred program:

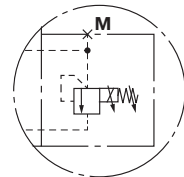
S	...	L	...	J	...	H	-	H...	H...	KBPSL8BA
S	...	J	...	J	...	H	-	H...	H...	KBPSL8AA
S	...	R	...	J	...	H	-	H...	H...	KBPSR8BA
S	...	N	...	J	...	H	-	H...	H...	KBPSR8AA

Supplementary program, e.g.:

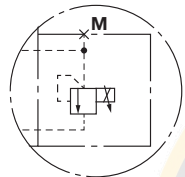
S	...	K	...	J	...	H	-	H...	H...	KBPSH8BA	-033
---	-----	---	-----	---	-----	---	---	------	------	----------	------

	Decreasing characteristic curve	Increasing characteristic curve	Add. SO no. (Option: 24 V; 0.8 A)
50 bar	KBPSC8BA	KBPSC8AA	
100 bar	KBPSF8BA	KBPSF8AA	
150 bar	KBPSH8BA	KBPSH8AA	
210 bar	KBPSL8BA ⁽²⁾	KBPSL8AA ⁽⁴⁾	-033
250 bar	KBPSN8BA	KBPSN8AA	
315 bar	KBPSP8BA	KBPSP8AA	
350 bar	KBPSR8BA ⁽¹⁾	KBPSR8AA ⁽³⁾	
420 bar	KBPST8BA	KBPST8AA	

= preferred program

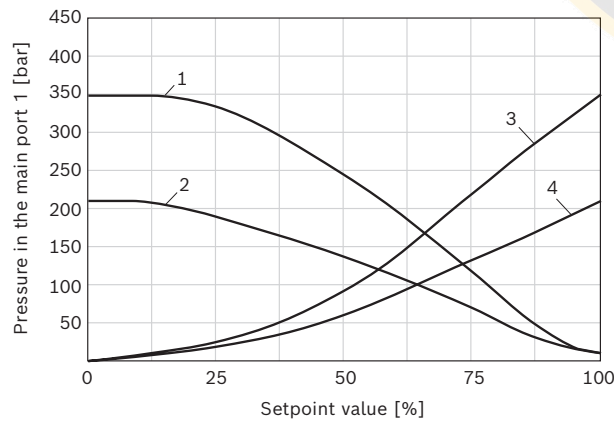


KBPS...BA:
Decreasing characteristic curve



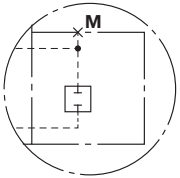
KBPS...AA:
Increasing characteristic curve

▼ Pressure control by electro-proportional LS pressure relief



2. Housing KBPS and plug

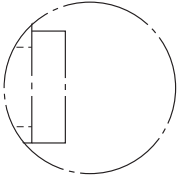
S	...	K	...	J	...	H	-	H...	H...	Q
---	-----	---	-----	---	-----	---	---	------	------	---



Plug

3. Porting pattern KBPS and cover plate

S	...	K	...	J	...	H	-	H...	H...	A
---	-----	---	-----	---	-----	---	---	------	------	---

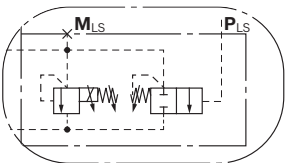


Cover plate

4. LS pressure cut-off valve type MH2DAD and electro-proportional LS pressure relief valve type KBPS

(see also data sheet 64586, 18139-04, 18139-05)

S	...	K	...	J	...	H	-	H...	H...	MH2DAD+KBPSH8BA
S	...	K	...	J	...	H	-	H...	H...	MH2DAD+Q



5. 2/2-way spool valve type KKDE

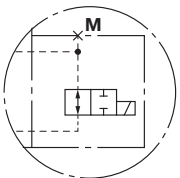
(see also data sheet 18136-08)

S	...	K	...	J	...	H	-	H...	H...	KKDER8PA
---	-----	---	-----	---	-----	---	---	------	------	----------

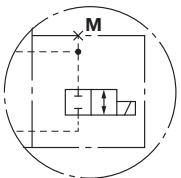
- Normally open: KKDER8PA
- Normally closed: KKDER8NA

Notice

The consumer pressure is not depressurized!



KKDE...PA:
Normally open



KKDE...NA:
Normally closed

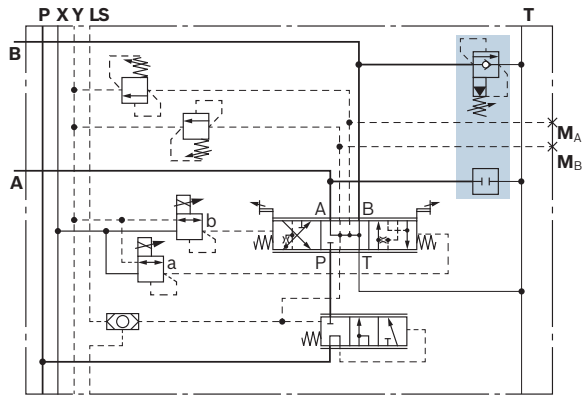
Secondary valves

Pressure relief / feed valve, adjustable

Ordering code:

S	...	M	...	J	...-...	W2	1	-	Q	H...
---	-----	---	-----	---	---------	----	---	---	---	------

- ▶ Adjustable pressure relief / feed valve, pilot operated (type VMR1-16, see data sheet 18318-35)
- ▶ Specified pressure in bar required after **H** (3-digit)
- ▶ **Example: Q H200**
Q: Threaded plug for consumer port **A** H200: Pressure relief/feed valve, set to 200 bar for consumer port **B**

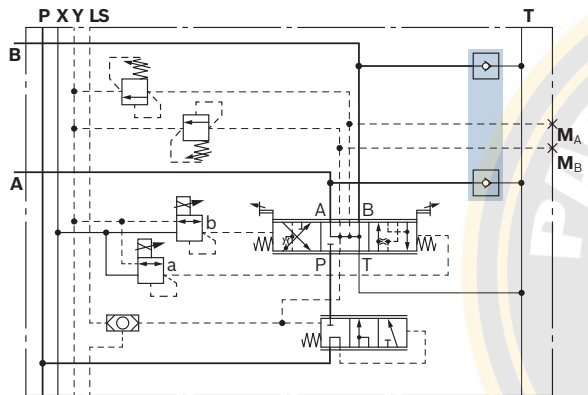


Feed valves

Ordering code:

S	...	M	...	J	...-...	W2	1	-	E	E
---	-----	---	-----	---	---------	----	---	---	---	---

- ▶ Type VUR1-16, see data sheet 18319-01



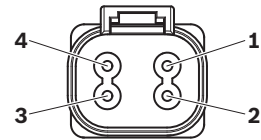
Options

Electrohydraulic, with spool position sensor type PSM

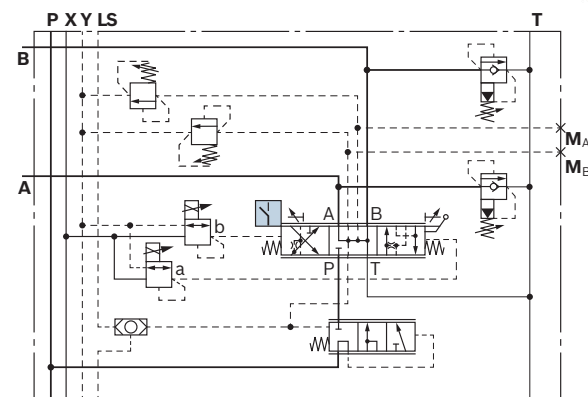
Ordering code:

S	...	M	...	J	...-...	W2	1	K	H...	H...	-100
---	-----	---	-----	---	---------	----	---	---	------	------	------

- ▶ Control spool neutral position and A and B direction of motion detected and monitored by an analogue voltage output signal
- ▶ Pin assignment for connector (Connector version DT04-4P, DEUTSCH)



Pin 1: +U_{Batt}
Pin 2: GND
Pin 3: Sensor signal for flow direction of consumer port **B**
Pin 4: Sensor signal for flow direction of consumer port **A**



Notice

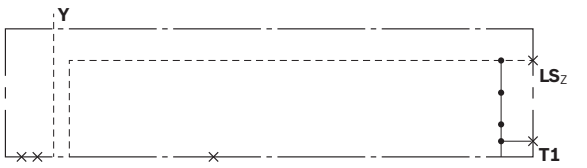
For further information, see PSM data sheet 95190.

End plates

End plate with LS unloading

Ordering code:

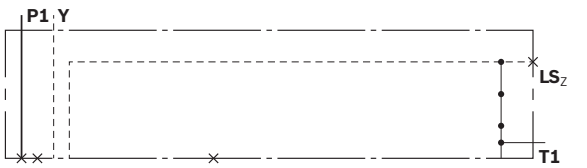
LA



End plate with LS unloading and additional P and T port

Ordering code:

LAPT

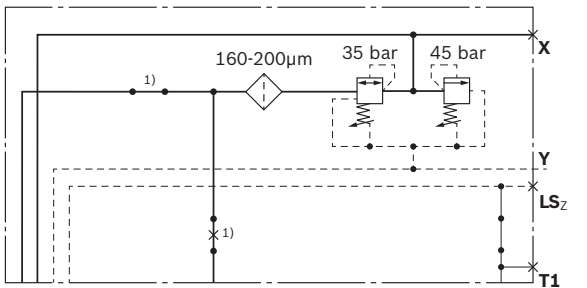


End plate with LS unloading and internal pilot oil supply

Ordering code:

LAY

- ▶ Takes oil from **P** line, pressure reduced to 35 bar (fixed), pressure relief valve set to 45 bar

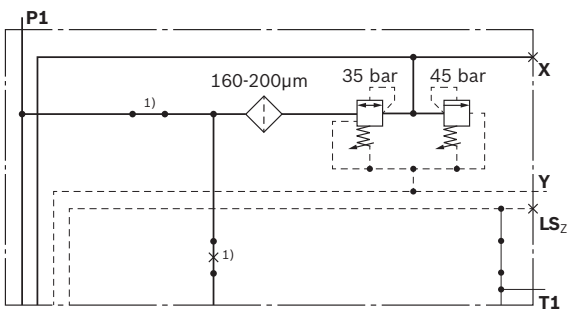


End plate with LS unloading and internal pilot oil supply and additional P and T port

Ordering code:

LAYPT

- ▶ Takes oil from **P** line, pressure reduced to 35 bar (fixed), pressure relief valve set to 45 bar

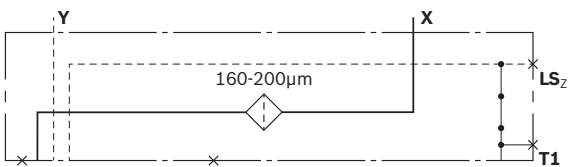


End plate with LS unloading and pilot oil supply

Ordering code:

LAX

- ▶ External pilot oil supply required
 $p_{st \max} = 35 \text{ bar constant}$



1) When using an inlet plate with priority VR... or VZ... the plug is changed.

SM4-15 Series <<<

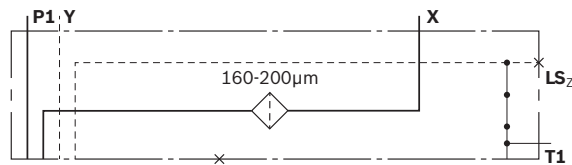


End plate with LS unloading and pilot oil supply and additional P and T port

Ordering code:

LAXPT

- ▶ External pilot oil supply required
 $p_{st \max} = 35 \text{ bar}$ constant

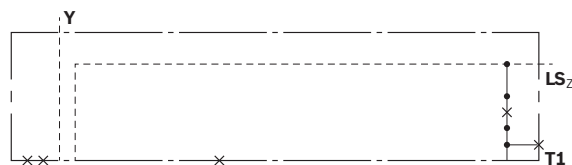


End plate without LS unloading

Ordering code:

LZ

- ▶ Supply of parallel switched LS signals
- ▶ LS relief must be provided externally

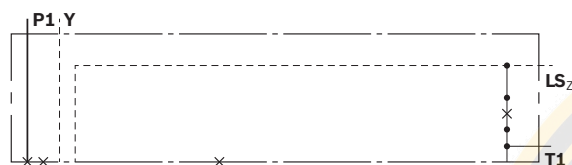


End plate without LS unloading and additional P and T port

Ordering code:

LZPT

- ▶ Supply of parallel switched LS signals
- ▶ LS relief must be provided externally

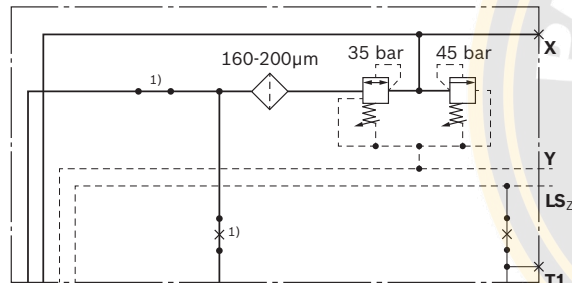


End plate without LS unloading and with internal pilot oil supply

Ordering code:

LZY

- ▶ Takes oil from **P** line, pressure reduced to 35 bar (fixed), pressure relief valve set to 45 bar
- ▶ Supply of parallel switched LS signals
- ▶ LS relief must be provided externally

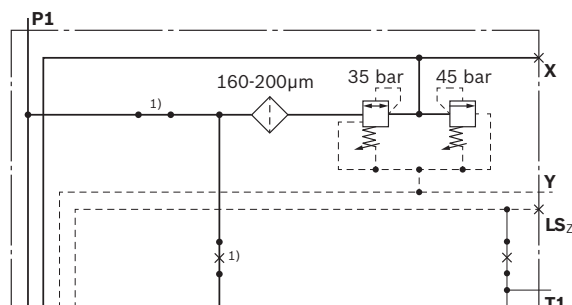


End plate without LS unloading and with internal pilot oil supply and additional P and T port

Ordering code:

LZYP

- ▶ Takes oil from **P** line, pressure reduced to 35 bar (fixed), pressure relief valve set to 45 bar
- ▶ Supply of parallel switched LS signals
- ▶ LS relief must be provided externally



1) When using an inlet plate with priority VR... or VZ... the plug is changed.



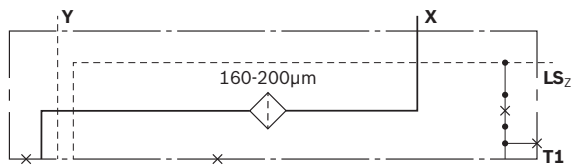
SM4-15 Series <<<

End plate without LS unloading, with pilot oil supply

Ordering code:

LZX

- ▶ Supply of parallel switched LS signals
- ▶ External pilot oil supply required
 $p_{st \max} = 35 \text{ bar}$

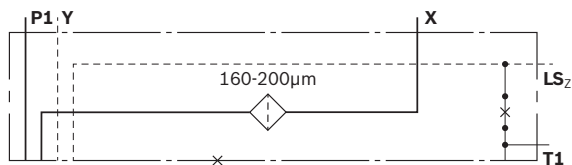


End plate without LS unloading, with pilot oil supply and additional P and T port

Ordering code:

LZXPT

- ▶ Supply of parallel switched LS signals
- ▶ External pilot oil supply required
 $p_{st \max} = 35 \text{ bar}$



End plate for use with central inlet plate

Ordering code:

LU



End plate for central inlet plate with additional T port

Ordering code:

LUT

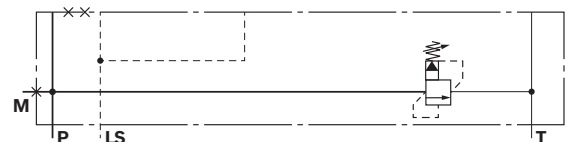


End plate for central inlet plate with additional LS, P and T port

Ordering code:

LUP ...

- ▶ Specified pressure in bar required (3-digit)

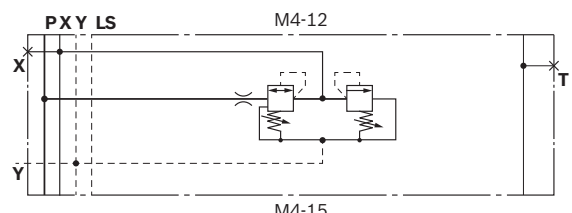


Intermediate plate for M4-12 directional valve sections

Ordering code:

L12Y

- ▶ With integrated pilot oil supply
- ▶ For flange-mounting additional M4-12 directional valve sections, see data sheet 64276

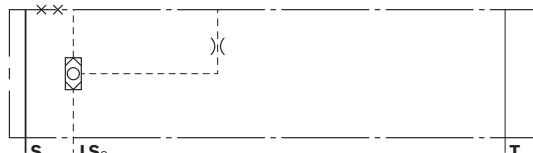


End plate with external priority connection

Ordering code:

LVZ

- ▶ For connecting external priority consumers



Dimensions

Line connections

Ports									
P	Pump port	LS	Load sensing signal						
A, B	Consumer port	LS ₂	LS supply						
a, b	Pilot oil port	M	Pump measuring port						
T	Tank port	M _A , M _B	LS pressure measuring port						
X	Pilot oil supply	M _b , M _b	Pilot pressure measuring port						
Y	Return line	S	Priority consumer						

Pipe thread line connections (version 01)

		P	T	A, B	a, b	LS	X, Y	M, M _A , M _B	M _a , M _b	S
Inlet plate	P	G 1	G 1 1/4	–	–	G 1/4	G 1/4	G 1/4	–	–
	J	G 1	G 1	–	–	G 1/4	G 1/4	G 1/4	–	G 1/4
	JZ	G 1 1/4	G 1 1/4	–	–	G 1/4	G 1/4	–	–	–
	JK	G 1 1/4	G 1 1/4	–	–	G 1/4	G 1/4	–	–	–
	VZ	G 1	G 1	–	–	G 1/4	G 1/4	–	–	–
	XZ	G 1 1/4	G 1 1/2	G 1 1/4	–	G 1/4	–	G 1/4	–	–
Directional valve section		–	–	G 3/4	G 1/4	–	–	G 1/4	G 1/8	–
End plate		G 3/4	G 3/4	–	–	G 1/4	G 1/4	–	–	–

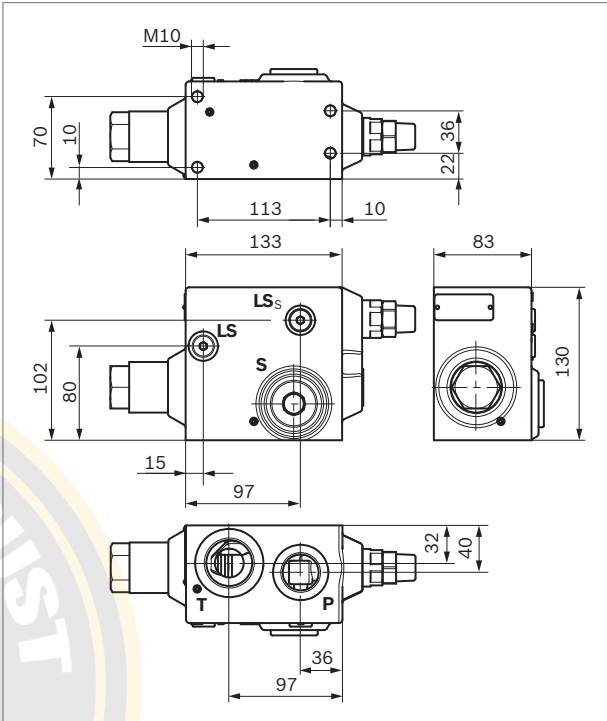
Mounting bolts M10 according to EN ISO 4762 or EN ISO 4014:

Property class	8.8	10.9
Tightening torque	41±2 Nm	60±3 Nm

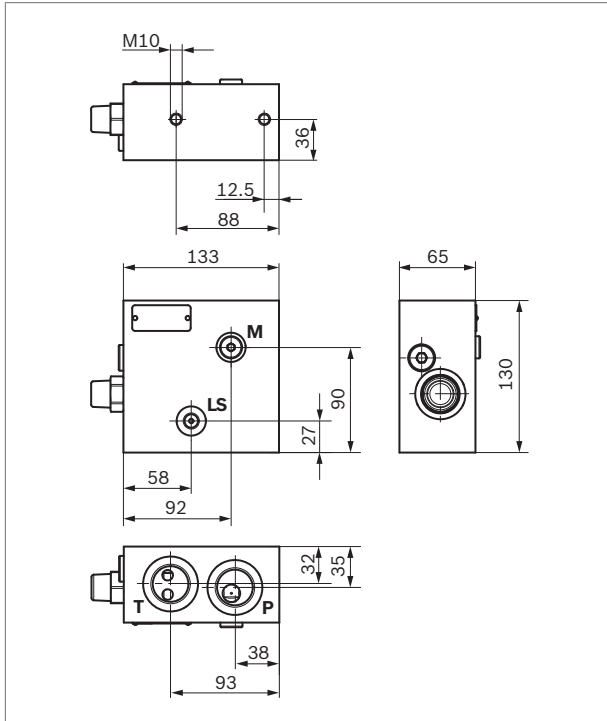
Ports according to ISO 1179-1

Inlet plates

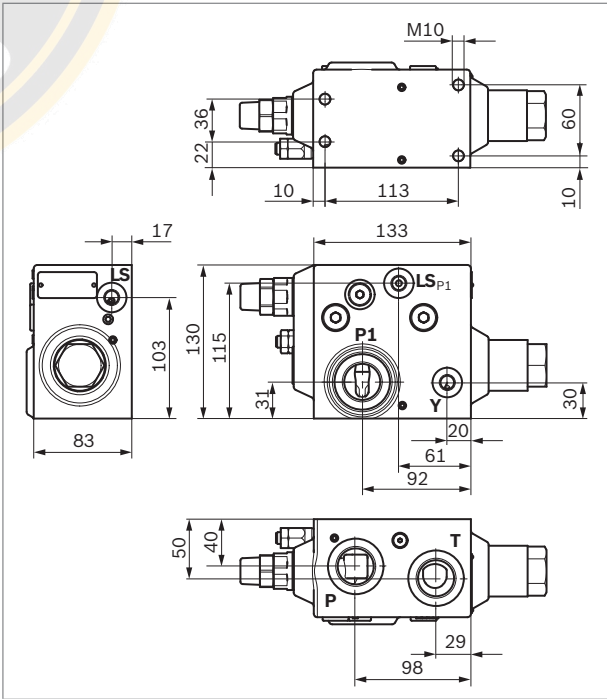
▼ Lateral inlet plate P



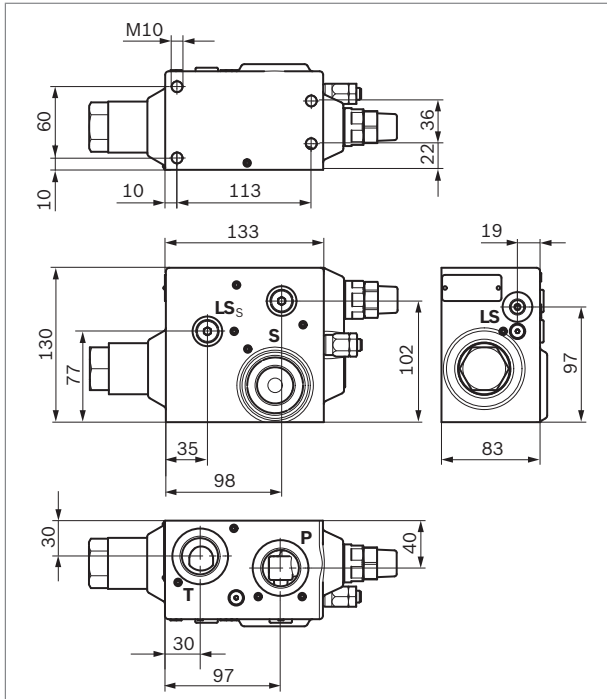
▼ Lateral inlet plate J



▼ Lateral inlet plate VL



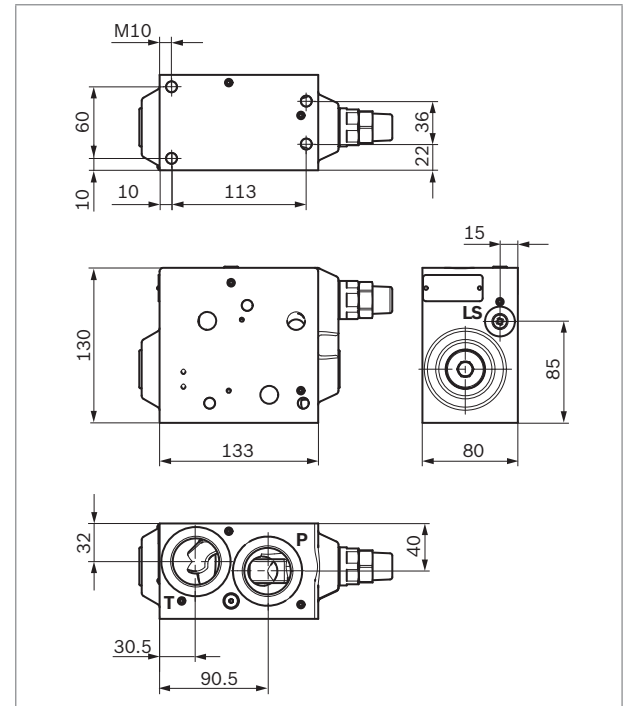
▼ Lateral inlet plate VR



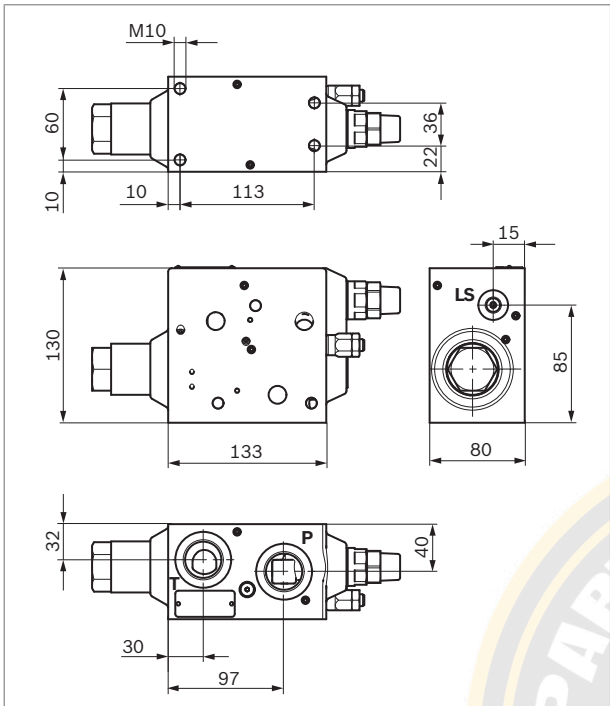
SM4 - 15 Series <<<



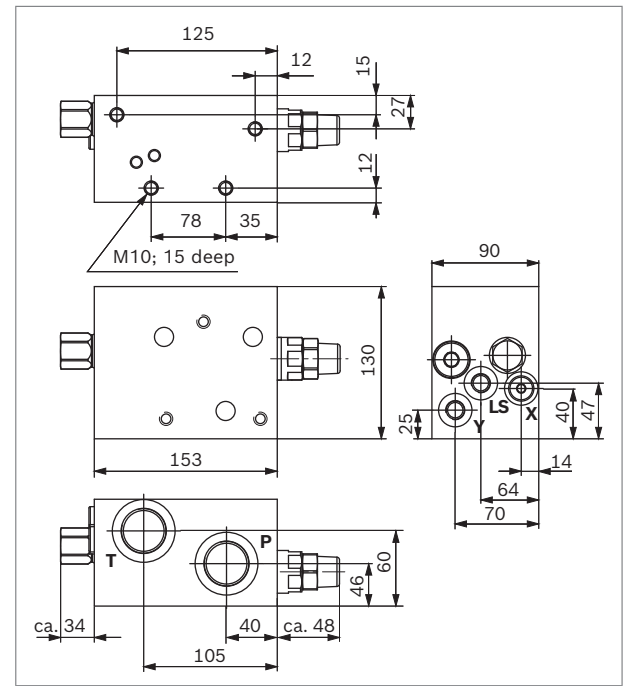
▼ Central inlet plate JZ



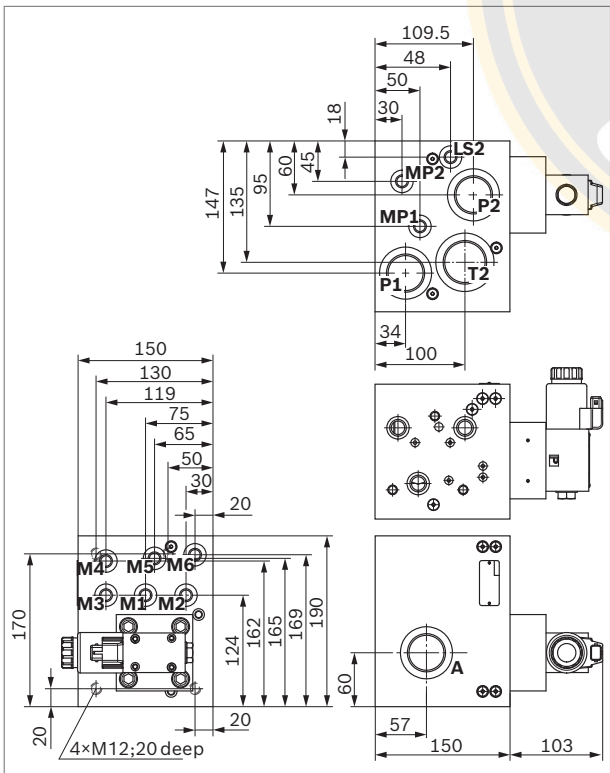
▼ Central inlet plate VZ



▼ Central inlet plate JK



▼ Central inlet plate XZ



SM4 - 15 Series <<<

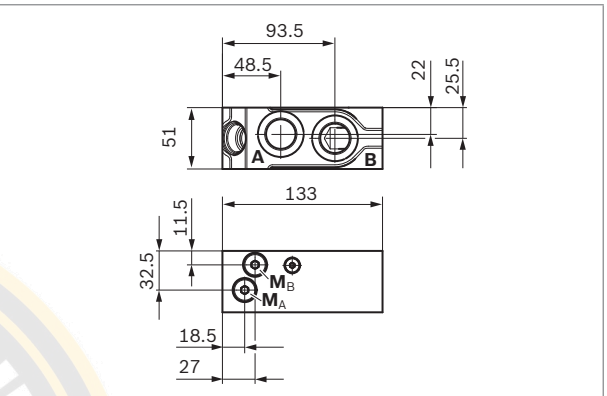
Directional valve sections

▼ Housing with secondary valve bore, consumer port G 3/4

Ordering code:

... H... H... ...

... E E ...

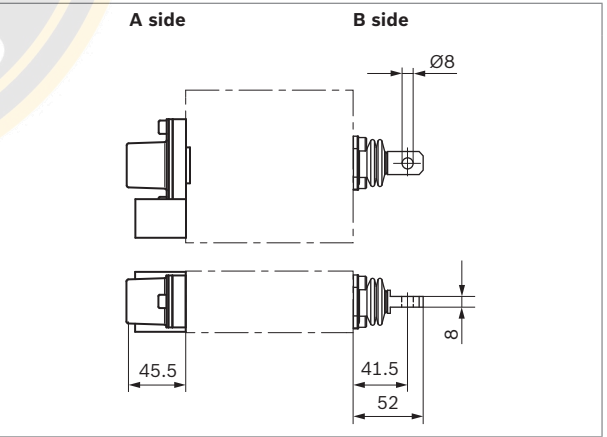


Actuation

▼ Mechanical actuation only, spring-centered with tongue

Ordering code:

... A Z ...

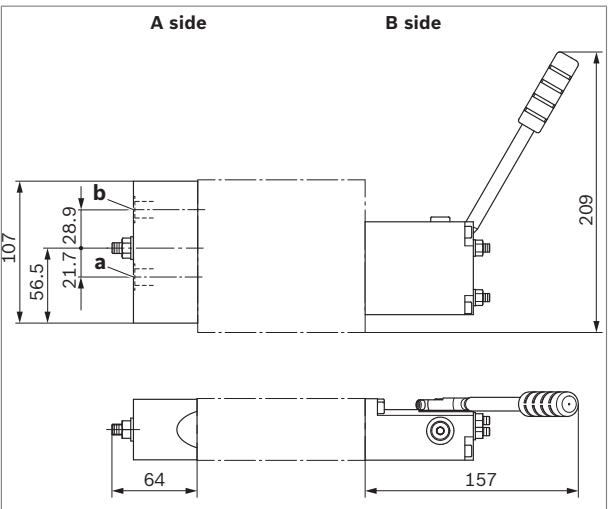


▼ Mechanical/hydraulic actuation with cover with clamping piece and hand lever (encapsulated), aluminum-free

Ordering code:

... M B2 ...

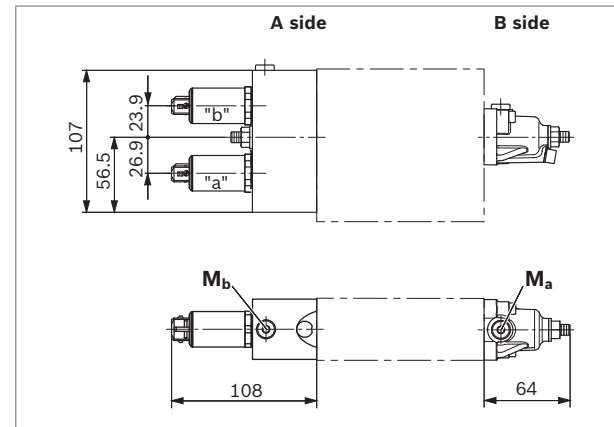
... H B2 ...



▼ Electrohydraulic actuation with standard cover

Ordering code:

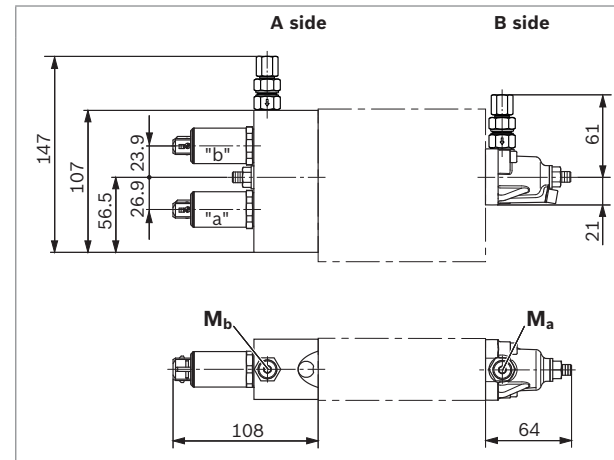
... W - ...



▼ Electrohydraulic actuation with check valve for hydraulic superposition

Ordering code:

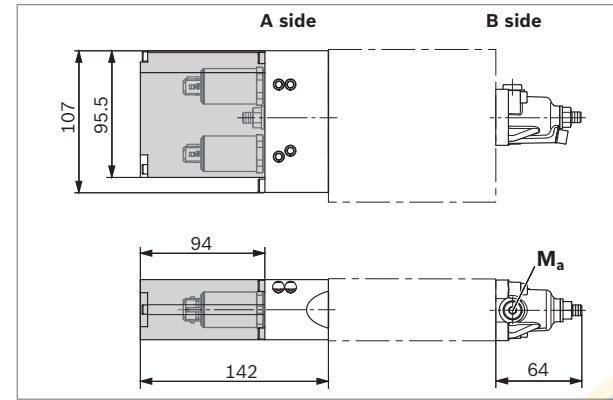
... G - ...



▼ Electrohydraulic actuation (seawater resistant) with standard cover

Ordering code:

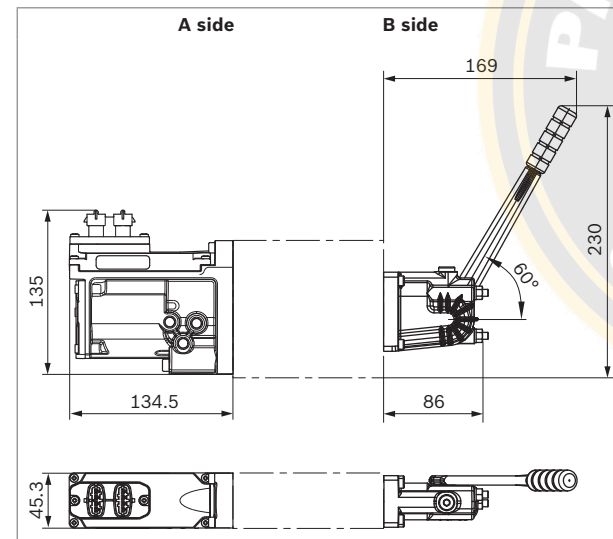
... W - ... -038



▼ Electronic pilot module CPM with hand lever (encapsulated)

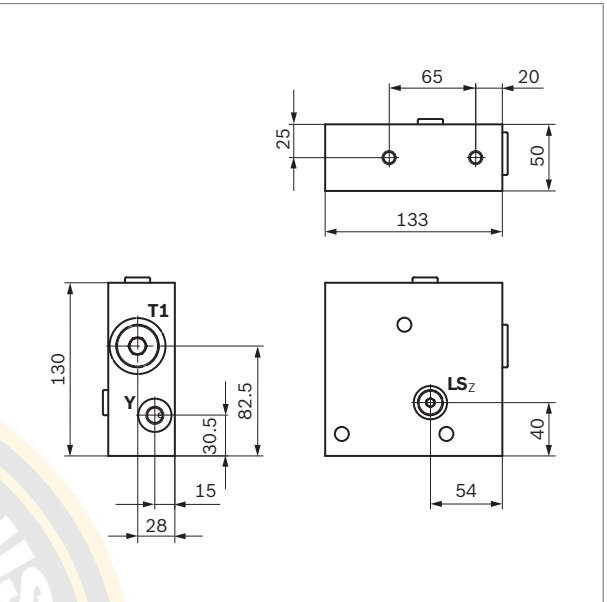
Ordering code:

... CPS K ...

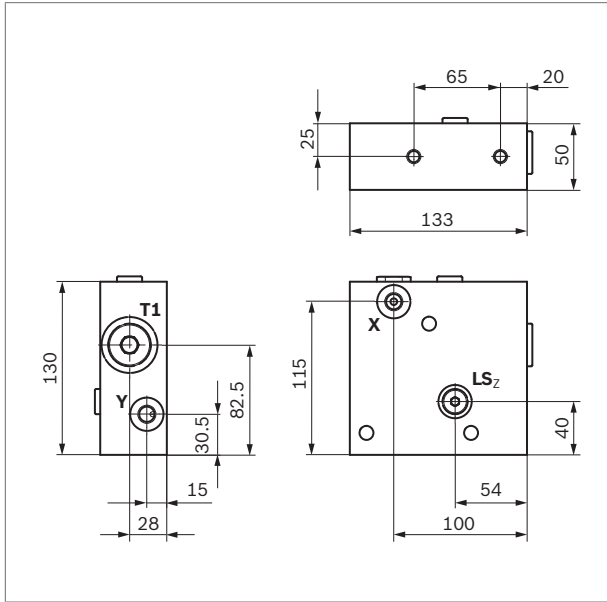


End plates

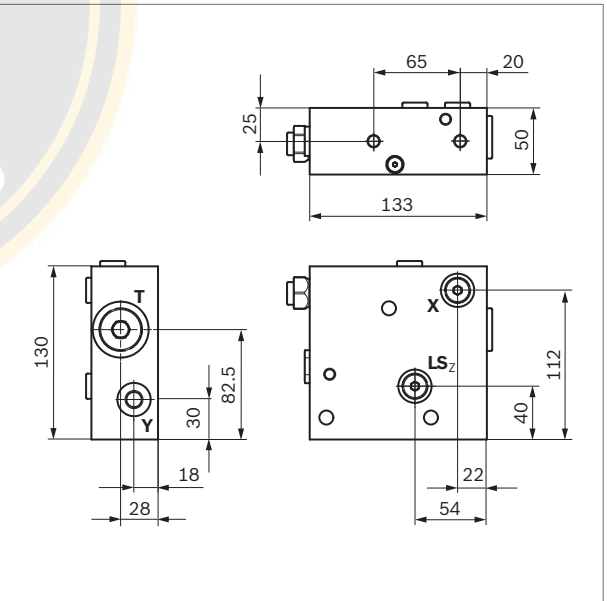
▼ End plate LA, LZ



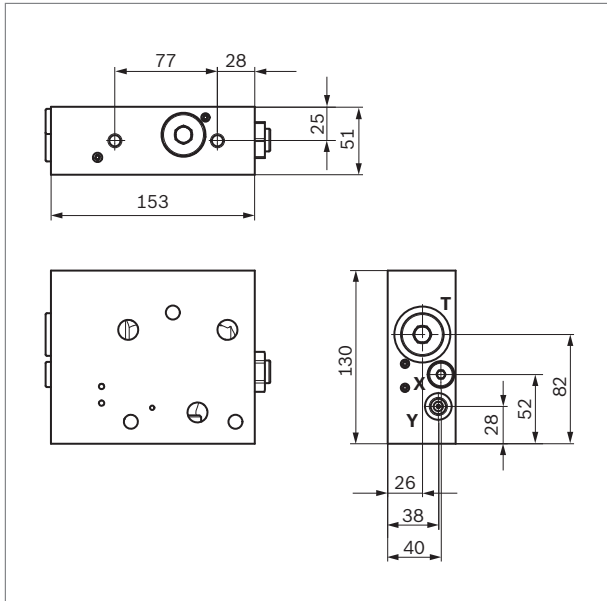
▼ End plate LAX, LZx



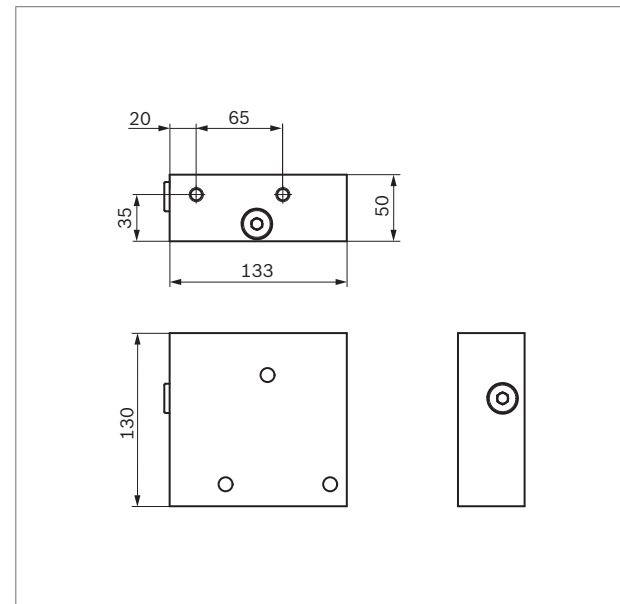
▼ End plate LAY, LZy



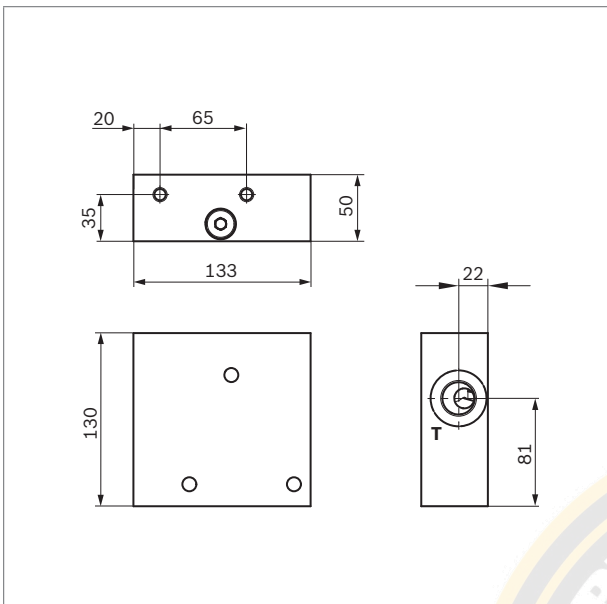
▼ End plate L12



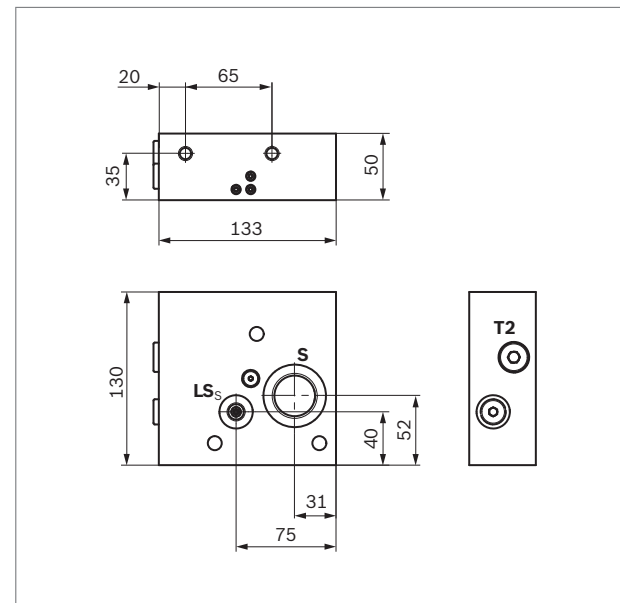
▼ End plate LU



▼ End plate LUT

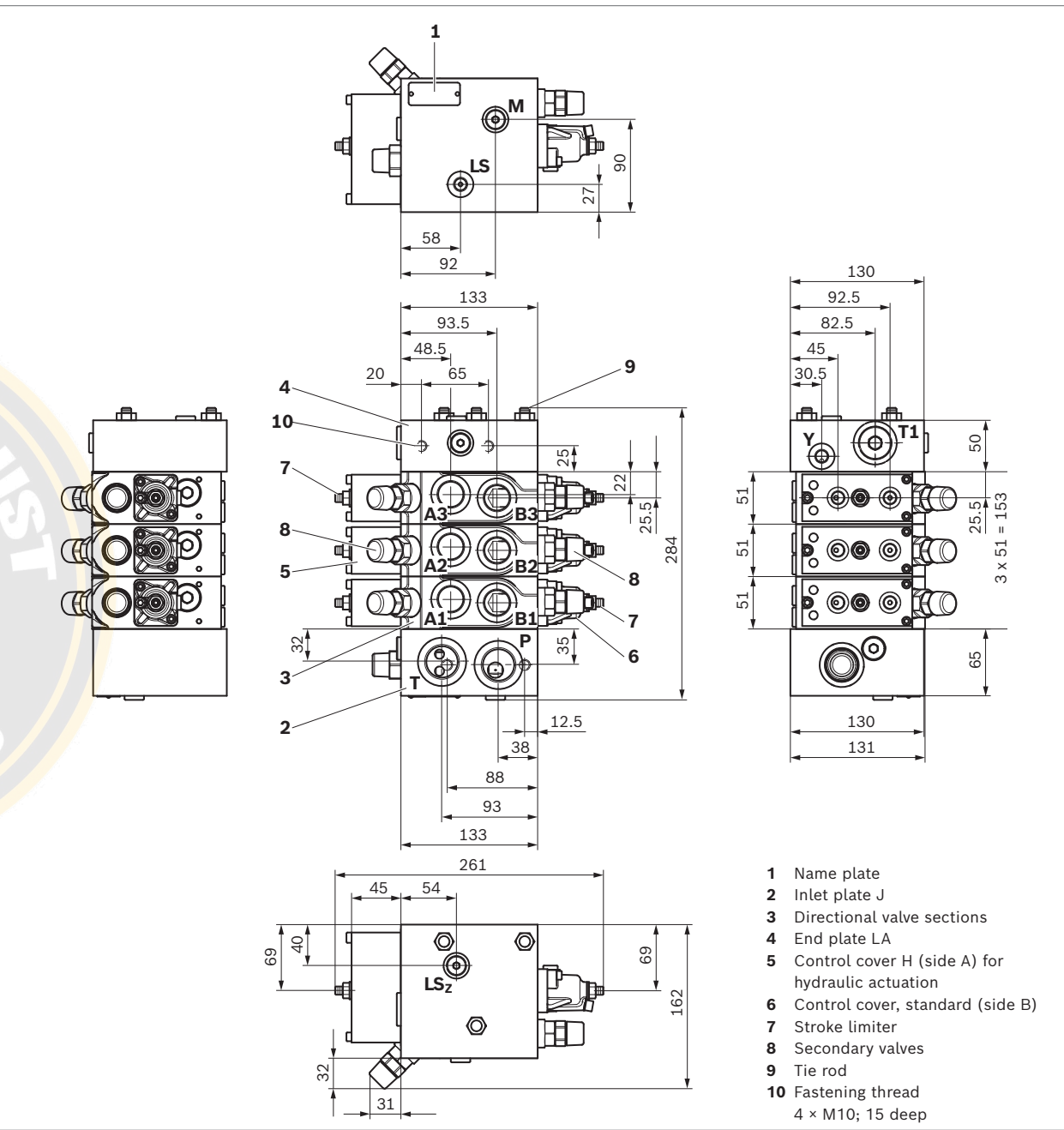


▼ End plate LVZ



Order examples

▼ Closed center control block with lateral inlet plate (according to order example on page 12)



SM4 - 15 Series <<<



▼ Closed center control block with central inlet plate (according to order example on page 13)

