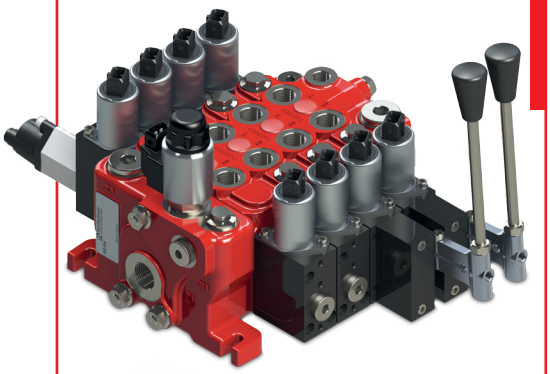
HYDAC INTERNATIONAL

Open-Center Sectional Directional Control Valve
RS 160



Max. pressure: 250 bar

Max. flow rate

- Pump port: 60 l/min
- Working ports: 60 l/min

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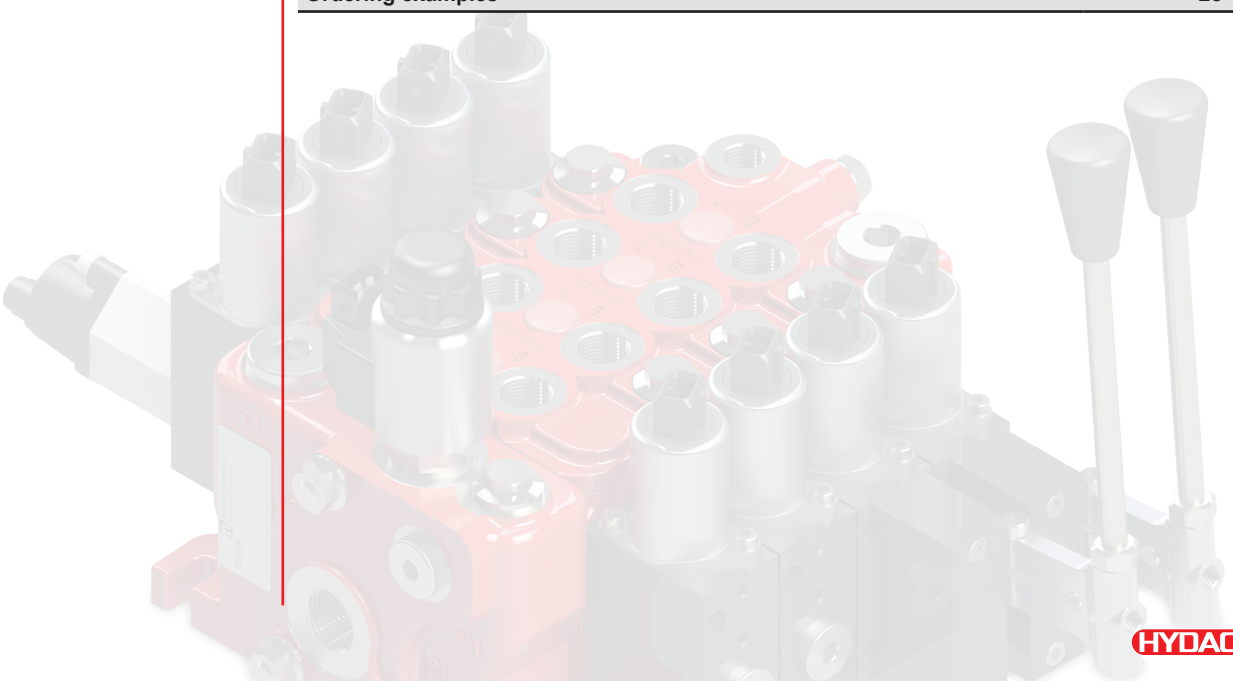


Product features

- Flow-optimized valve design
- Compact size and low weight
- Several connection options for pump and tank
- Applicable for constant and load-sensing pumps
- Symmetrical sections (Inlet plate can be placed left or right)
- Modular design up to 10 working sections
- Operation type is electrohydraulic proportional (with/without hand lever)
- Shock / anti-cavitation valves for protection of actuators
- Endplate with port for pilot oil supply (optional internal pilot oil supply)
- Two or more valve blocks can be connected in different arrangements
- Areas of application:
  - Outriggers of mobile machines
  - Municipal machines
  - Truck applications
  - Agriculture machines
  - Wheel loader
  - Construction machines
  - Cranes
  - Stationary applications

General information and functional description

The RS 160 is a proportional control valve according to the open-center principle with electro-hydraulic operation.

The maximum flow rate to the working ports A and B is 60 l/min. The spool 2.1 determines the flow rate and the flow direction.

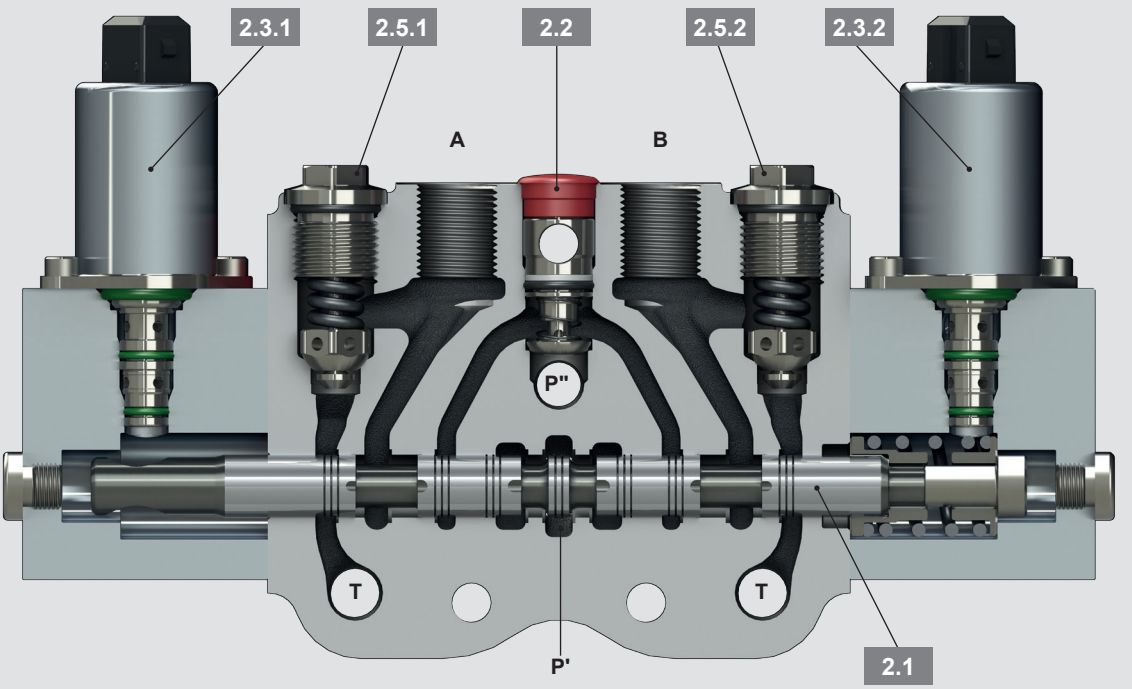
The pressure control valves 2.3.1 and 2.3.2 are providing shifting pressure to the face sides of the main spool 2.1 .

The level of electric current determines the level of pilot pressure and therefore the position of the spool.

Shock / anti-cavitation valves 2.5.1 and 2.5.2 protect the working ports A and B from pressure peaks and/or cavitation.

The check valve 2.2 in the parallel channel P" prevents the load from descending if the spool is moved and the pump does not provide the system with enough pressure (on A and B side).

Overview



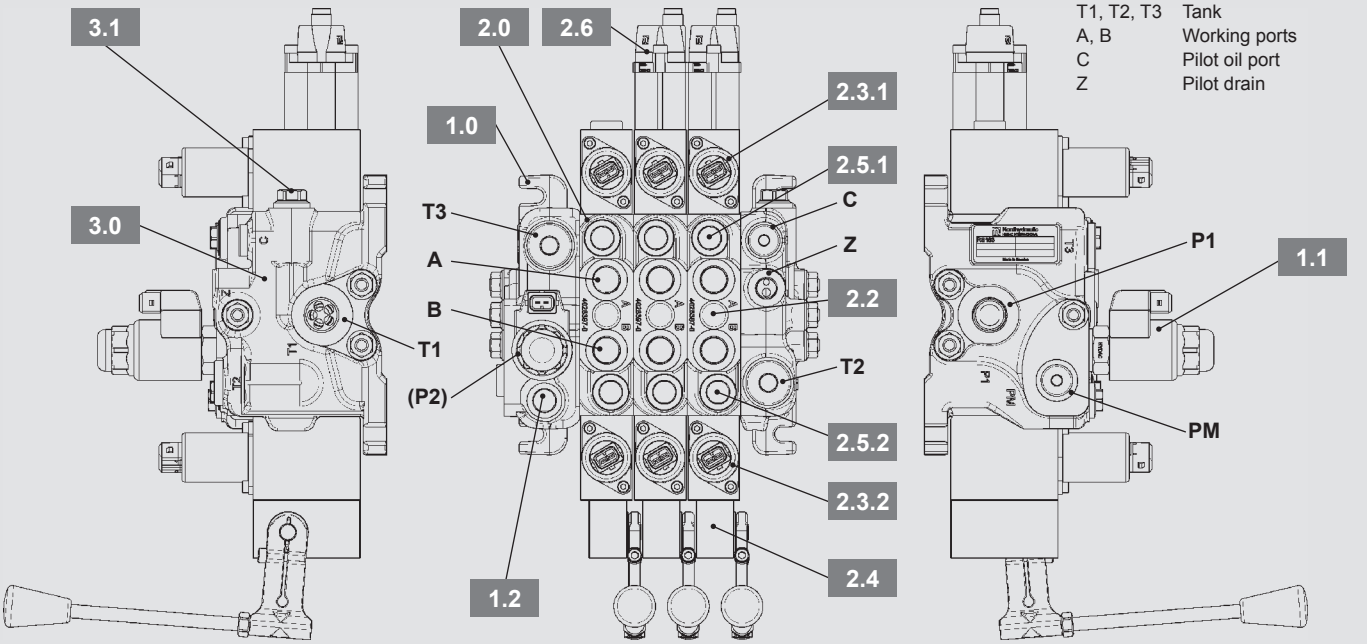
A, B Working ports
T Tank channel
P' Center channel
P" Parallel channel

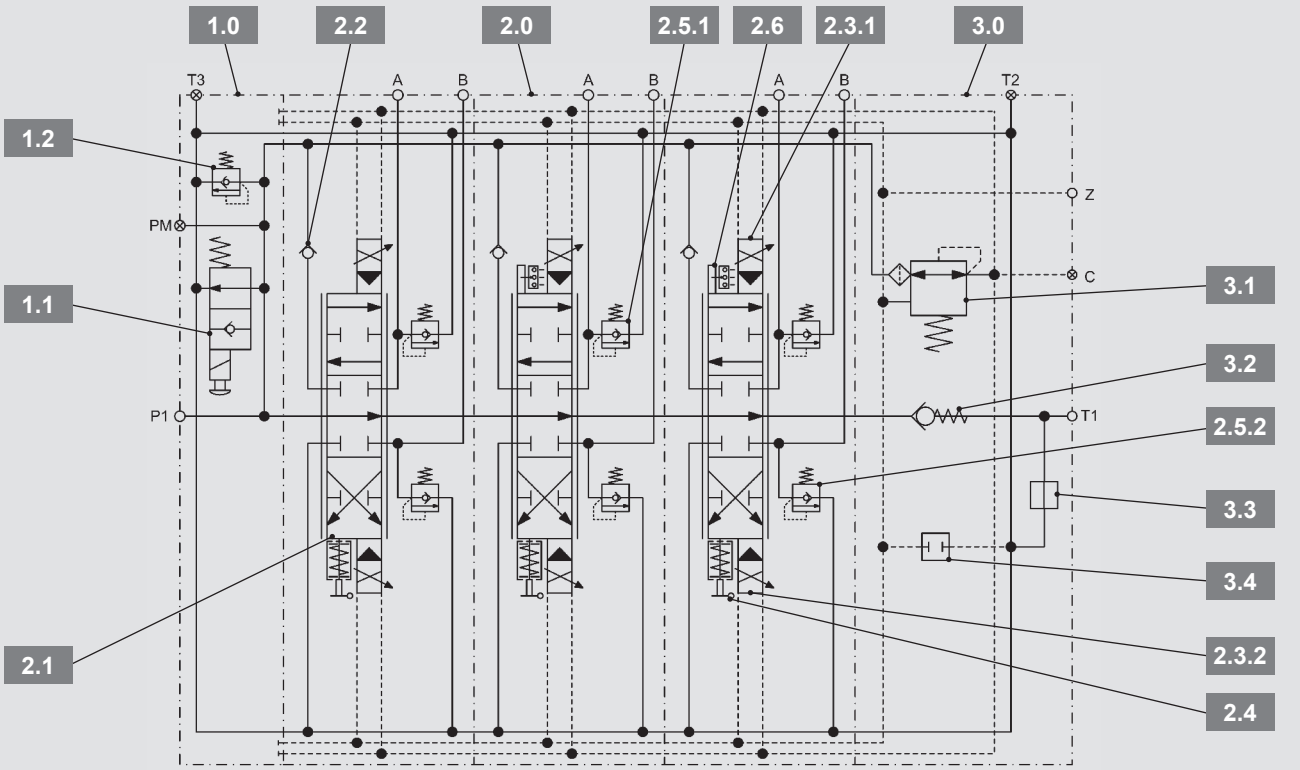
2.1	Spool
2.2	Check valve
2.3.1	Pressure control valve A side
2.3.2	Pressure control valve B side
2.5.1	Working port valve port A
2.5.2	Working port valve port B

Overview

Ports

P1, P2	Pump
PM	Pump measuring port
T1, T2, T3	Tank
A, B	Working ports
C	Pilot oil port
Z	Pilot drain





1.0	Inlet plate
1.1	Unloading valve
1.2	Main relief valve
2.0	Working section
2.1	Spool
2.2	Check valve
2.3.1	Pressure control valve port A
2.3.2	Pressure control valve port B
2.4	Mechanical actuation
2.5.1	Working port valve A side
2.5.2	Working port valve B side
2.6	Position sensor
3.0	End plate
3.1	Pressure reducing valve for internal pilot oil supply
3.2	Center channel pre-charging valve
3.3	Tank connection or high pressure carry over
3.4	Connection or separation of pilot drain to tank

Technical data

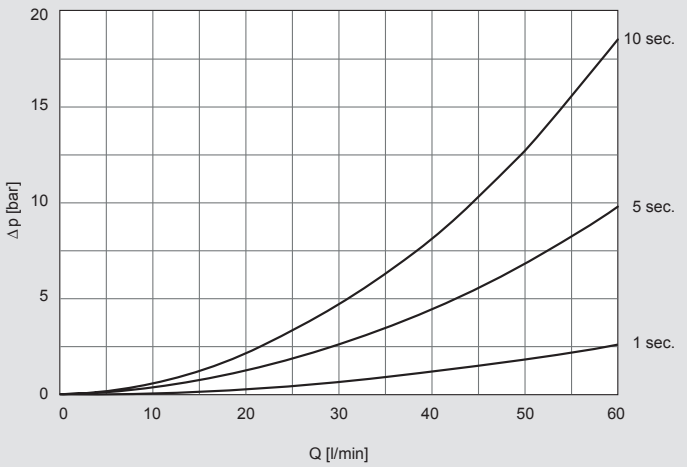
General data and operating conditions		
No. of working sections		1 ... 10
Installation position		optional
Mass in kg	Inlet plate P15 / U15	2.6 / 3.0
	Working section BP4E	2.3
	SP4E	2.1
	Electro-hydraulic EH	0.4
	Manual override	0.3
	End plate E5E1 / E5E2	2.2
	Tie rod for working section 2 / 4 / 6 / 8	0.2 / 0.3 / 0.4 / 0.5 / 0.6
Connection type (thread type)		BSPP (acc. to ISO 1179-1); SAE (acc. to ISO 11926-1 or SAE J1626)
Ambient temperature range		-20 … +60 °C
Hydraulic fluid temperature range		-15 … +80 °C
Painting		Standard primer or top coat RAL 9005 on inquiry
Hydraulic data		
Max. flow rate	P1, P2, A, B	60 l/min
Max. operating pressure at port	A, B, P1, P2, PM, HPCO	250 bar
	T1, T2, T3	25 bar 10 bar for internal connection Z → T
	Z	10 bar, drained to tank preferred
External pilot oil supply	C	30 bar max.
Pilot pressure range		20 bar min., electrohydraulic
Required min. pump pressure at block		9 bar
Hydraulic fluid		Mineral oil (HL / HLP) acc. to DIN 51524, other hydraulic fluids on inquiry
Viscosity range		10 – 400 mm²/s
Max. permitted degree of contamination of the hydraulic fluid		20/18/15 acc. to ISO 4406 (c) Please contact HYDAC Filtration Technology to ensure system cleanliness
Electrical data		
Supply voltages		12 V DC / 24 V DC
Solenoid data		See section “Operation units” and “Solenoid valves and coils”
Connector type and IP protection class (with mating connector mounted and locked)		AMP Junior Timer, 2-pin, axial / up to IP6K6[1)] Deutsch DT04, 2-pin, axial / up to IP6K9K[1)]
Amplifiers and control devices		See product catalogue 18.500 – Control technology for mobile machines

[1)] Mating plug-in connectors are not included

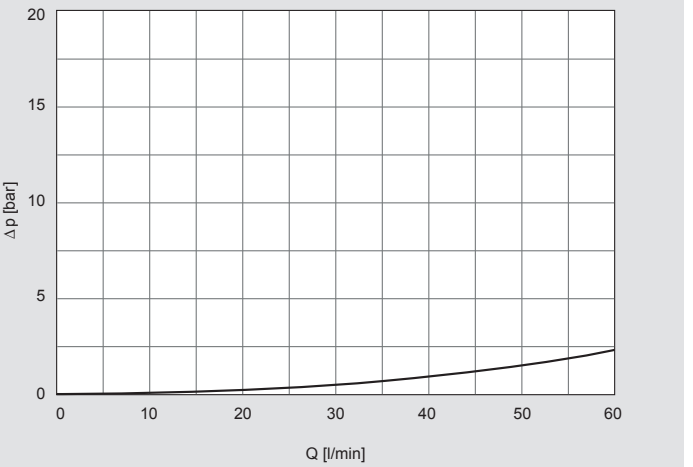
⚠ The technical data were measured at a viscosity of 32 mm²/s.

Characteristic curves

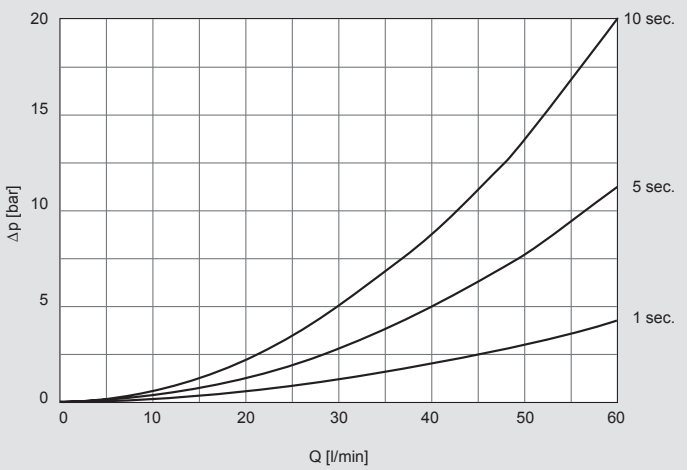
Pressure drop P1 → T1



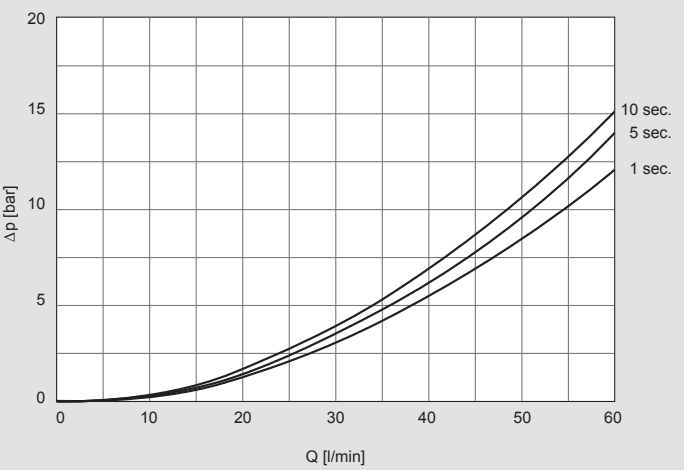
Pressure drop P1 → T1, released by unloading valve



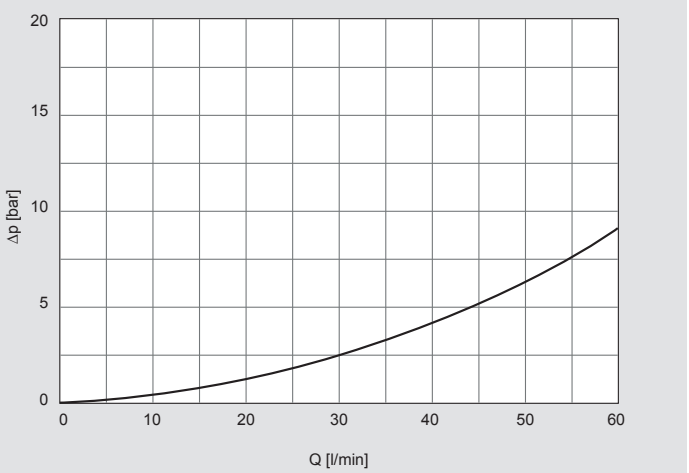
Pressure drop P1 → T2 (T3)



Pressure drop P1 → A/B



Pressure drop A/B → T1



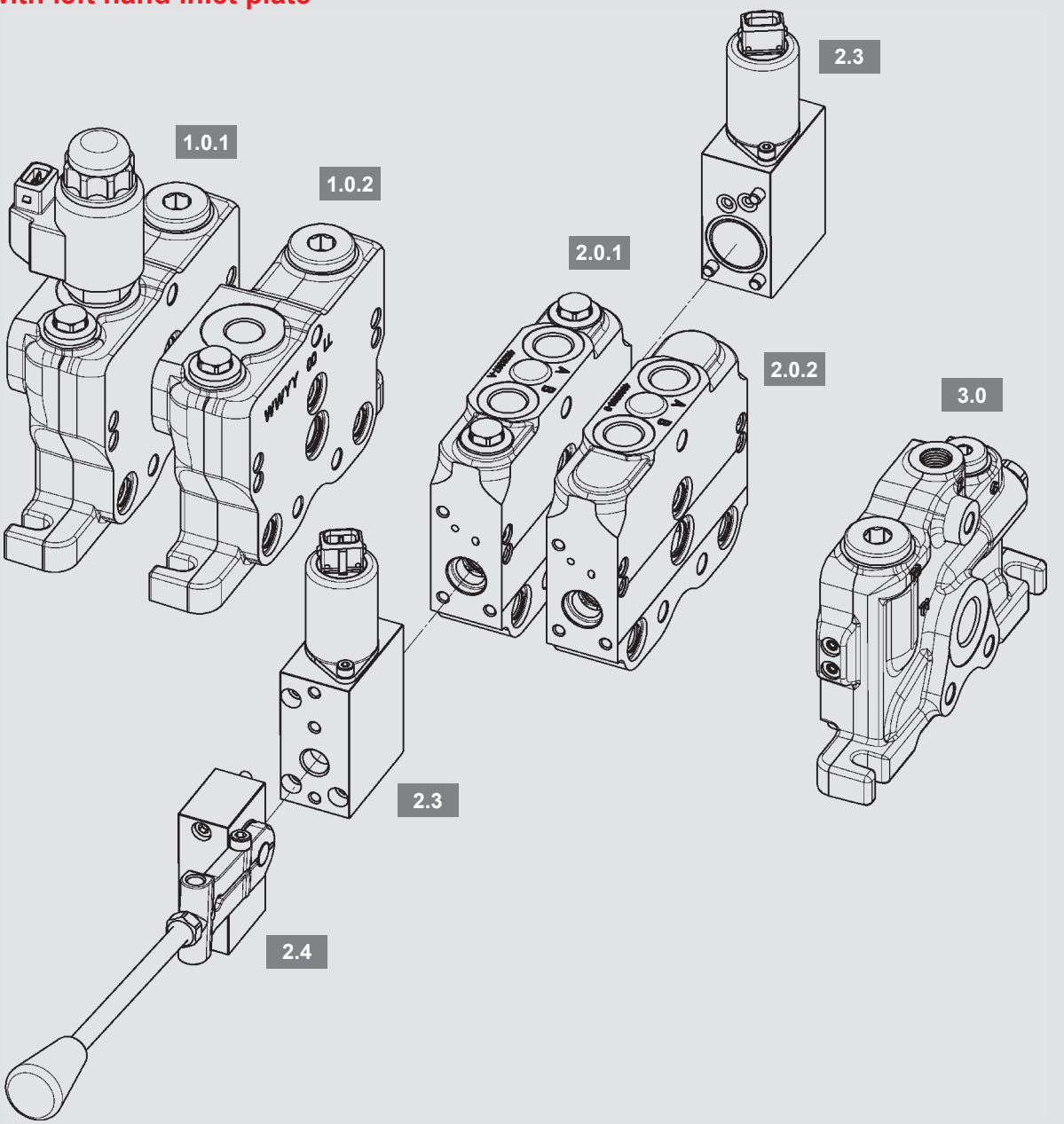
⚠ The characteristic curves were measured with a 16AA-spool (max. volume flow 60 l/min) at a viscosity of 32 mm²/s.

⚠ The pressure drop from P1 to T1 will have an additional Δp-Offset of 9 bar while using the center channel precharging valve.

Modular structure

The RS 160 can be customized to different applications and machines.
The principle sectional design and modular structure consists of an inlet plate, max. 10 working sections and an end plate.
A complete control block is defined by a type code system.

Setup with left hand inlet plate



Type code structure

General — **RS 16_ / B0**

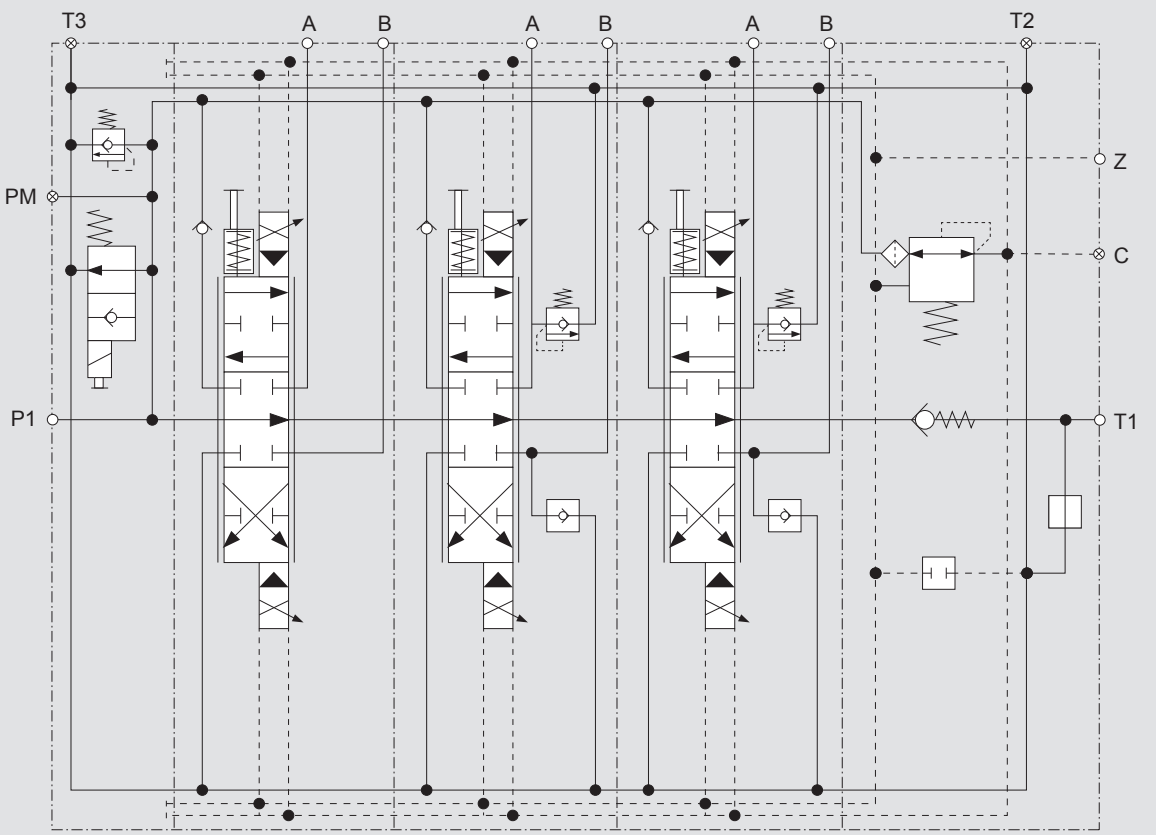
- Connection type B (BSPP) or S (SAE)
- No. of working sections (1 .. 0 (0 = 10 working sections))

Inlet plate	**U15 / Y1A / 250F**	**1.0.1**	Inlet plate U15 / Y1A / 250F
		1.0.2	Inlet plate P15 / … / …
Working section	**BP4E / 11AZ / …**	**2.0.1**	Working section SP4E
	.	**2.0.2**	Working section BP4E
	.	**2.3**	Electrohydraulic actuation EH01A – EHH1A, …
		2.4	Manual override
End plate	**E5E2 / …**	**3.0**	End plate E5E2 / …

Example of block specification and type code

Example: Control block for hydraulic system with center channel precharging valve

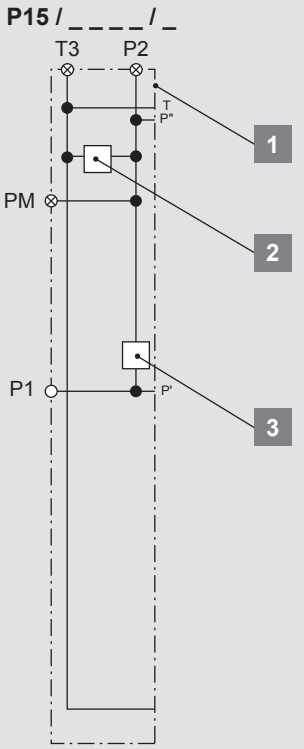
Type code		Control block specification	
Valve type		RS 163	RS 160 with 3 working sections
RS 163-EH / B0		B0	Connection type BSPP, valve series 0
Inlet plate		U15	Inlet plate with unloading valve
U15 / Y1D / 250F		Y1D	Unloading valve, normally open, with 12V solenoid and connector type Deutsch DT04-2P, 2-pin - axial
		250F	Main relief valve fixed setting of 250 bar
Working section 1		BP4E	Working section w/o shock / anti-cavitation valves – parallel section
BP4E / 14AA / EHC1D – EH01D		14AA	3 position spool, double acting, neutral position closed, max. flow 45 l/min
		EHC1D – EH01D	Electrohydraulic operation, lever axis firmly connected to the spool on A-side – Electrohydraulic operation w/o further options on the B-side, 12 V solenoid and connector type Deutsch DT04-2P, 2-pin - axial
Working sections 2 and 3		SP4E	Working section with shock / anti-cavitation valves – parallel section
SP4E / 14AA / 180F – A / EHC1D – EH01D		14AA	3 position spool, double acting, neutral position closed, max. flow 45 l/min
		180F – A	Working port valve A side fixed setting of 180 bar – anti-cavitation valve on B-side
		EHC1D – EH01D	Electrohydraulic operation, lever axis firmly connected to the spool on A-side – Electrohydraulic operation w/o further options on the B-side, 12 V solenoid and connector type Deutsch DT04-2P, 2-pin - axial
End plate		E5E2	End plate with internal pilot oil supply
E5E2 / 0C		0C	external Z-port, center channel pre-charging valve

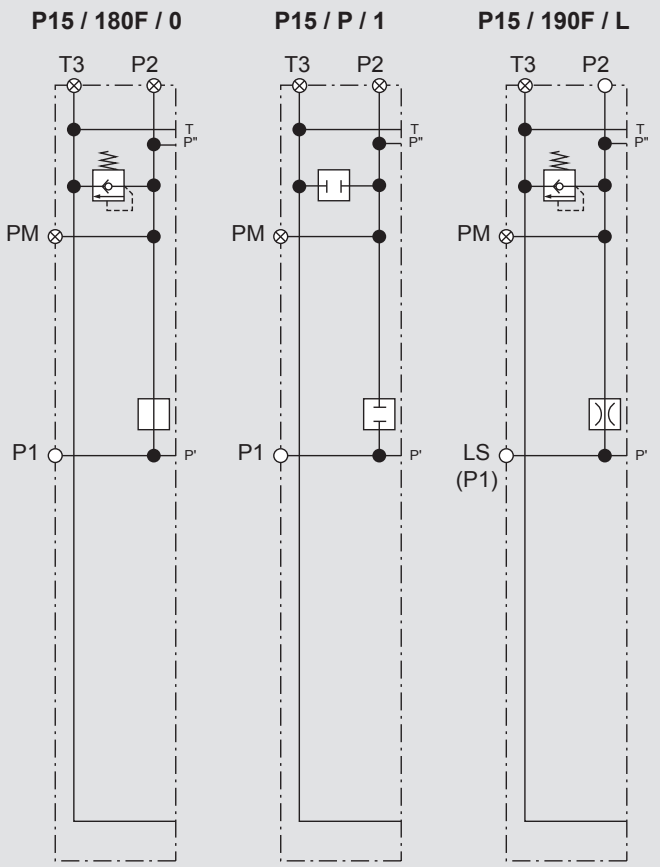


Type code

P15 / 180F / 0

1	2	3





1	**Basic type**	
P_ _	Inlet plate with P2 port (w/o unloading valve)	
_ 1 _	Version	
_ _ 5	Port size P1 [1]	
2	**Main relief valve** [2]	
_ _ _ F	Pressure setting in bar, 3-digit, fixed set, max. 250 bar *(TBS)*	
P	Plug screw *(P110)*	
3	**Cavity for fitting**	
0	Parallel channel connected to center channel	
1	Parallel channel disconnected from center channel *(K16)*	
L	Throttled connection (Loadsensing pumps) on request *(L16)*	

[1] see section – Connection type, fastening and tie rods
[2] see section – Working port valves

Fitting in cavity pos. 3:

- Parallel channel connected to center channel w/o fitting “0” (standard)
- Parallel channel disconnected from center channel with fitting K16 “1” (see section – Block connection examples)
- Using a load-sensing pump with fitting L16 “L”, P1-port turns into a LS-port, pump must be connected to P2-port

Example configurations

P15 / 180F / 0

- Inlet plate with P2 port (w/o unloading valve)
- Main relief valve fixed setting of 180 bar
- Parallel channel connected to center channel

P15 / P / 1

- Inlet plate with P2 port (w/o unloading valve)
- No main relief valve
- Parallel channel disconnected from center channel

P15 / 190F / L

- Inlet plate with P2 port (w/o unloading valve)
- Main relief valve fixed setting of 190 bar
- Throttled connection between parallel and center channel for use of load sensing pumps
- The throttle adjustment has to be done individual, on request only

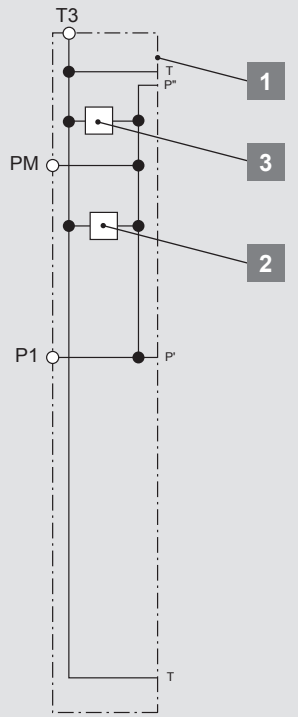
Inlet plate U15

Type code

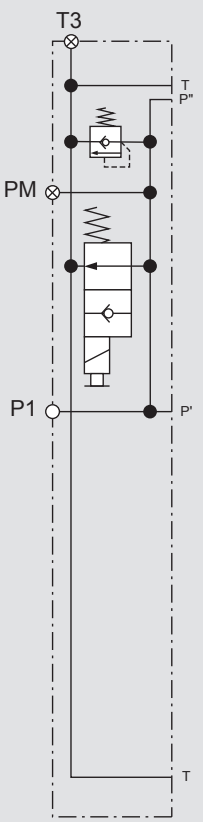
U15 / Y2D / 180F

1	2	3

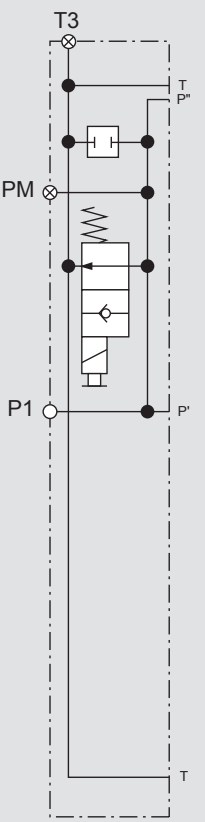
U15 / _ _ / _ _ _ _



U15 / Y2D / 180F



U15 / Y1A / P



1	**Basic type**	
	U _ _	Inlet plate with unloading valve
	_ 1 _	Version
	_ _ 5	Port size P1 [1]
2	**Solenoid (Electrical supply voltage, connector type)** [2]	
	Y _ _	Unloading valve normally open with emergency manual override
	_ 1 _	12 V
	_ 2 _	24 V
	_ _ A	AMP Junior Timer, 2-pin – axial
	_ _ D	Deutsch DT04-2P, 2-pin – axial
	P	Plug screw 
3	**Main relief valve** [3]	
	_ _ _ F	Pressure setting in bar, 3-digit, fixed set, max. 250 bar *(TBS)* 
	P	Plug screw *(P110)* 

[1] see section – Connection type, fastening and tie rods
[2] see section – Solenoid valves and coils
[3] see section – Working port valves

⚠ The inlet plate U15 may not be used for load sensing pumps.

Example configurations

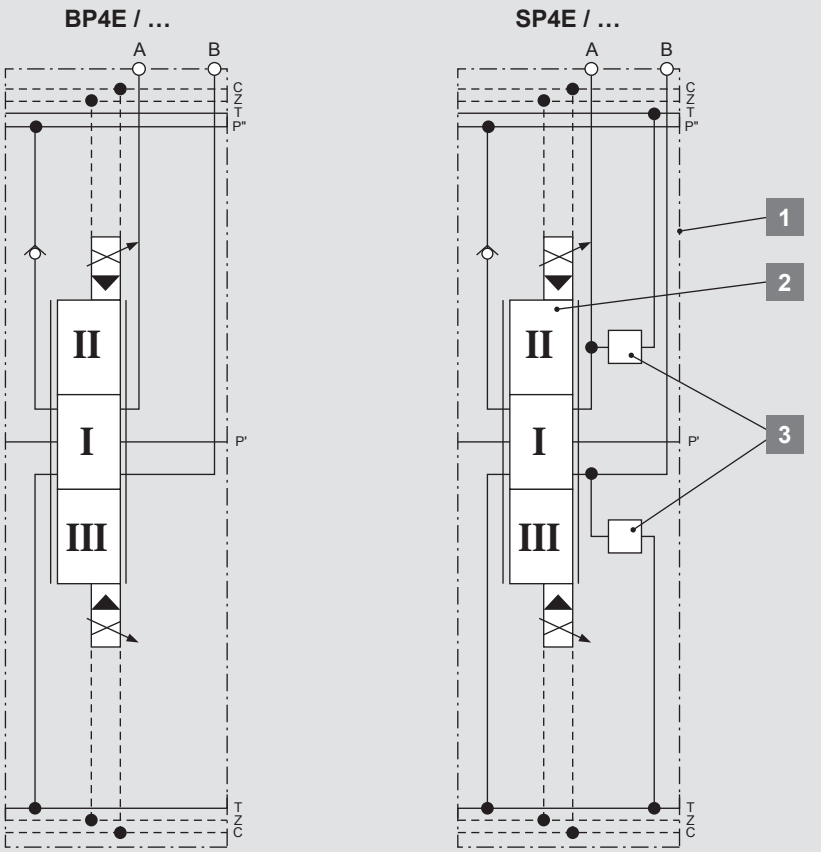
U15 / Y2D / 180F

- Inlet plate with unloading valve
- Solenoid 24 V and connector type Deutsch DT04-2P
- Main relief valve fixed setting of 180 bar

U15 / Y1A / P

- Inlet plate with unloading valve
- Solenoid 12 V and connector type AMP Junior Timer
- No main relief valve

Working sections BP4E / SP4E



Ports and flange channels

A, B	Working ports
C	Pilot oil
Z	Pilot drain
T	Tank
P'	Center channel
P"	Parallel channel

Type code

BP4E / 14AA / …

SP4E / 12AY / 180F – P / …

1	2	3

1	**Basic types**	
	B _ _ _	**B**asic section w/o working port valves
	S _ _ _	**S**ection with working port valves
	_ P _ _	**P**arallel section
	_ _ 4 _	Port size A/B[1)]
	_ _ _ E	**E**lectrohydraulic operation
2	**Spool types**	
3	**Working port valves**	

[1)] see section – Connection type, fastening and tie rods

Section description

Parallel section

The parallel section is the standard section for RS160 valve blocks. The parallel channel is connected continuously with the center channel.

⚠ Other section types on request.

Spools

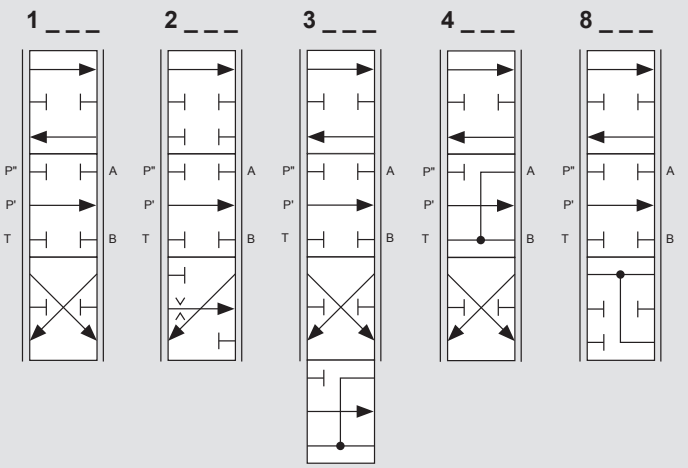
Type code

SP4E / 12AY / 180F – P / EH01A – EHM1A

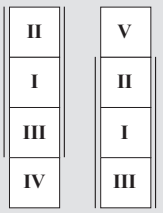
Beispiele

1	2	A	Y
1	2	3	4

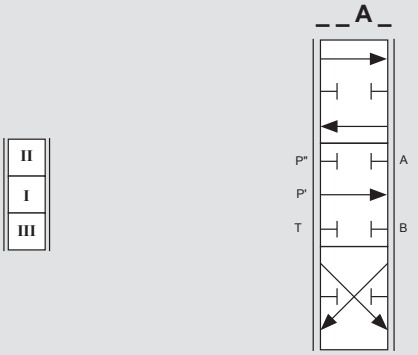
1	Type
2	Max. volume flow
3	Details
4	Release specification

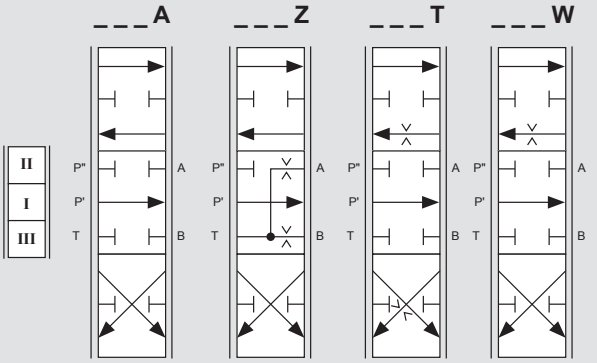


Position definition of the spool



I: Neutral position
II: Volume flow to A
III: Volume flow to B
IV: 4th position
V: 5th position





⚠ Other spool types and configurations on request.

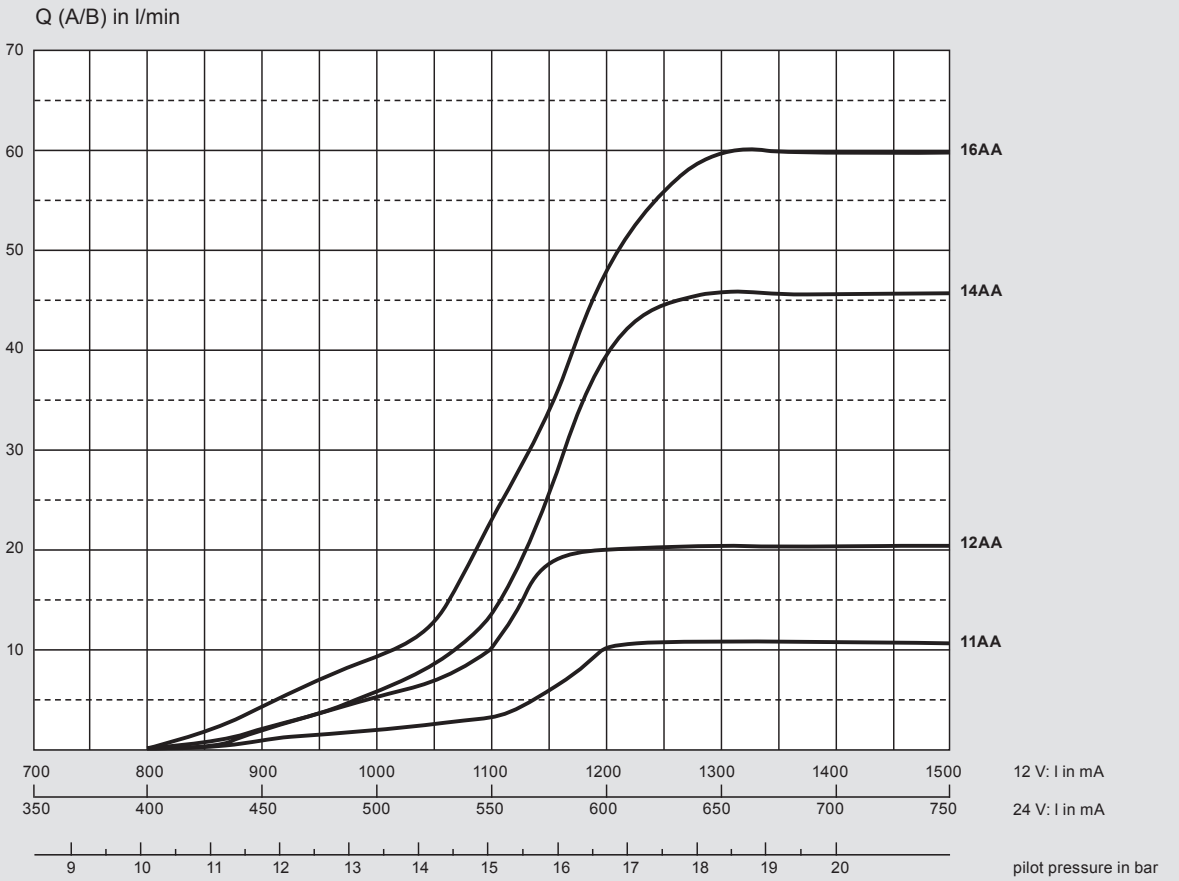
1	Type
1 _ _ _	4/3-way (double acting)
2 _ _ _	3/3-way (single acting)
3 _ _ _	4/4-way (double acting with float position)
4 _ _ _	Motor spool
8 _ _ _	Regeneration spool

2	Max. volume flow
_ 1 _ _	10 l/min
_ 2 _ _	20 l/min
_ 4 _ _	45 l/min
_ 6 _ _	60 l/min

3	Details
_ _ A _	Standard

4	Release specification
_ _ _ A	Ports A and B closed in neutral position
_ _ _ Z	Port A and B throttled to tank in neutral position
_ _ _ X	Port A throttled to tank in neutral position
_ _ _ Y	Port B throttled to tank in neutral position
_ _ _ T	Port A and B throttled to tank
_ _ _ U	Port A throttled to tank
_ _ _ W	Port B throttled to tank
_ _ _ 0	no release specification

Characteristic curves with electrohydraulic actuation, for nominal flow rates of spool, without load (measured at 32 mm²/s)



Type code

SP4E / 12AY / 180F – P / EH01A – EHM1A

180F – P

1 **2**

Shock / anti-cavitation valves protect the working ports A and B against pressure peaks and cavitation.

⚠ Shock / anti-cavitation valves are fixed set ex works. The pressure setting is defined at a flow rate of 10 l/min.

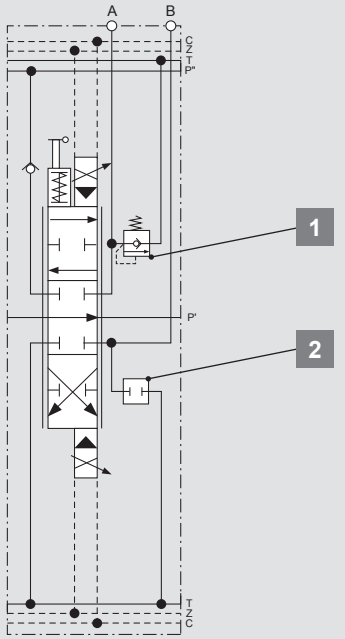
Pressure settings of fixed Shock / anti-cavitation valves

Pressure range: 50 up to 250 bar at 10 bar steps

Pressure range	50 – 100	110 – 160	170 – 250
Tolerance in bar	±5	±7	±10

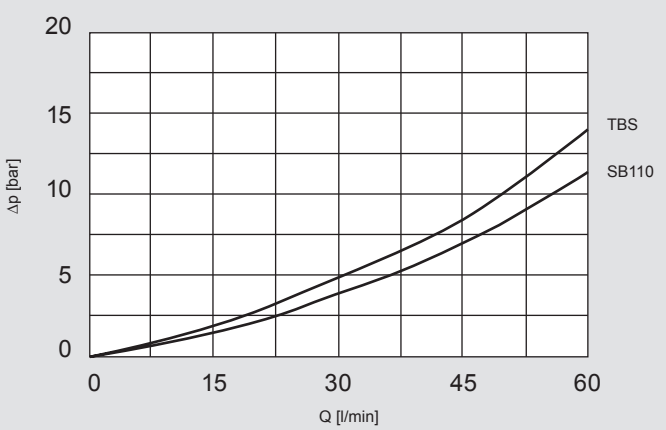
⚠ Elevated tank pressure due to high tank return flow must be taken in account as it will raise the valve setting.

⚠ Adjustable Shock/anti-cavitation valves on request.



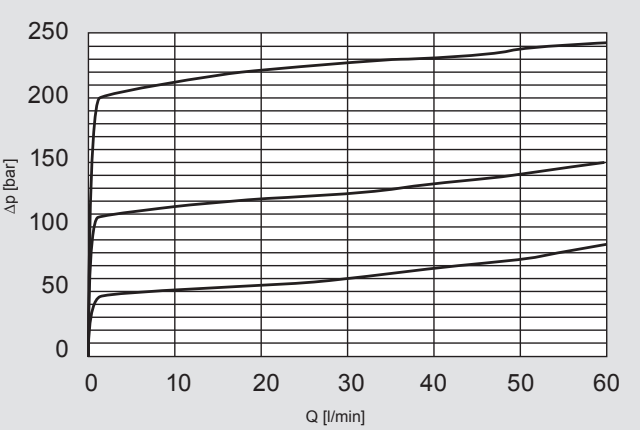
1	Working port valve A side
2	Working port valve B side
Basic types	
_ _ _ F	Pressure setting in bar, 3-digit, fixed set, max. 250 bar *(TBS)*
A	Anti-cavitation valve *(SB110)*
P	Plug screw *(P110)*

Characteristic curves (measured at 32 mm²/s)



Anti-cavitation curve SB110 and TBS

Characteristic curves (measured at 32 mm²/s)



Shock function A/B → T

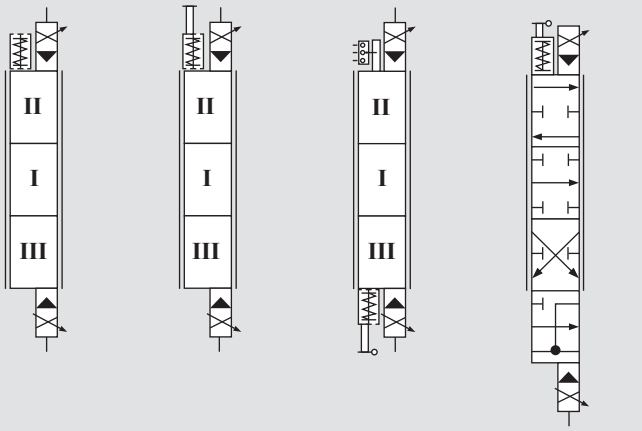
Type code

SP4E / 12AY / 180F – P / EH01A – EHM1A

EH	0	1A	–	EH	M	1A
1	2	3		1	2	3

1	Basic type
2	Hand lever, hand lever connection, position sensor and float position
3	Electrical supply voltage, connector type

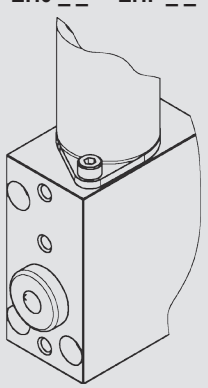
EH02D-EH02D **EHM1D-EH01D** **EHP2A-EHL2A** **EHL1A-EHF1A**



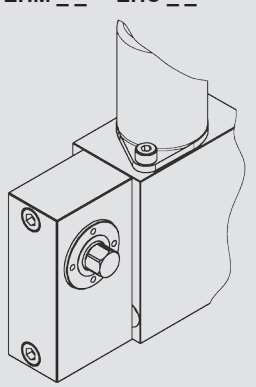
To reduce the spool hysteresis the hand lever is not firmly connected to the spool and does not follow the spool movement, while using the electrohydraulic actuation. Therefor a return stroke of ± 13° has to be made until the spool can be moved using the manual override.

A firmly connected hand lever without return stroke can be chosen as an option.

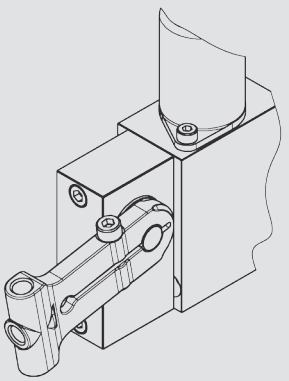
EH0 _ _ **EHF _ _**



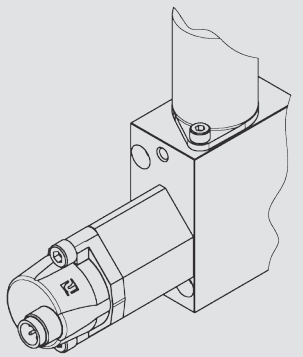
EHM _ _ **EHC _ _**



EHH _ _ **EHL _ _** **EHW _ _**



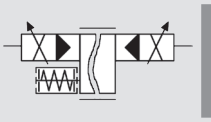
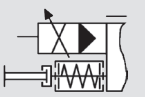
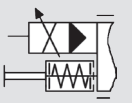
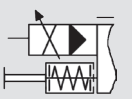
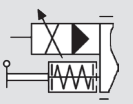
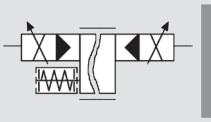
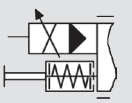
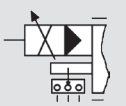
EHP _ _



1 Basic type

EH_ _ _ – ...	Definition of the electrohydraulic actuation on side A
... – EH_ _ _	Definition of the electrohydraulic actuation on side B

2 Hand lever, hand lever connection, float position, position sensor

	_ _0_ _	w/o further option
	_ _M_ _	Hand lever axis
	_ _C_ _	Hand lever axis, axis with spool firmly connected
	_ _H_ _	Hand lever axis with clamping piece
	_ _L_ _	Hand lever axis with clamping piece, axis with spool firmly connected
	_ _F_ _	Float position w/o hand lever axis
	_ _W_ _	Hand lever axis with clamping piece and float position
	_ _P_ _	Position sensor

⚠ If you choose the float option, the hand lever axis is always firmly connected with the spool.

⚠ If you choose the float option, an external pilot pressure oil supply is obligatory.

⚠ The position sensor can only be used with spools with 3 positions.

⚠ The hand lever rods have to be ordered separately.

Operation unit

Technical data for electrohydraulic pilot valves

Supply voltage	V DC	12	24
Max. control current	mA	1,500	750
PWM frequency (recommended)[1)]	Hz	100 … 150	
Coil resistance at 20 °C (±5 %)	Ω	4.7	20.8
Duty cycle	%	100	
Connector type and IP protection class (with mating connector mounted and locked)			
AMP Junior Timer, 2-pin, axial		up to IP6K6[2)]	
Deutsch DT04, 2-pin, axial		up to IP6K9K[2)]	
Protective screen	µm	125	

[1)] The PWM frequency is to be optimized depending on the application.

[2)] Mating plug-in connectors are not included.

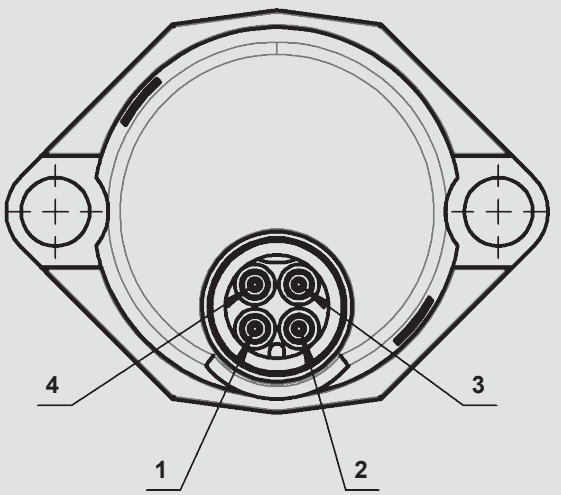
⚠ Standards ISO 13732-1 und ISO 4413 must be observed in regard to the surface temperatures occurring on the coils.

3 Electrical supply voltage, connector type

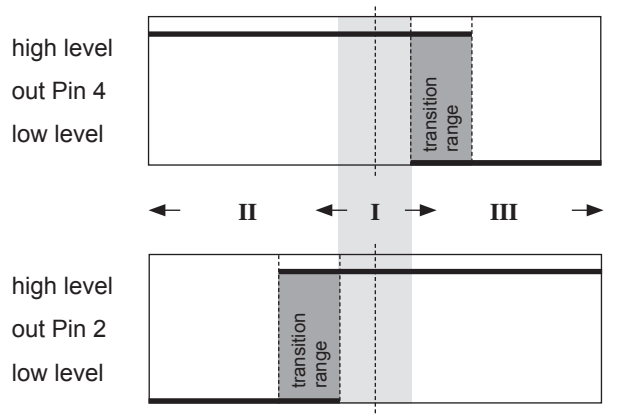
_ _ _ 1 _	12 V
_ _ _ 2 _	24 V
_ _ _ _ A	AMP Junior Timer, 2-pin – axial
_ _ _ _ D	Deutsch DT04-2P, 2-pin – axial

Position sensor for spools with 3 positions

Electrical connection:	M12x1 (4-pin)
Supply voltage Ucc:	9 – 36 V DC
Current consumption excl. outputs:	< 25 mA
Output voltage high level:	> (+Ucc-2V)
Output voltage low level:	< (GND+1V)
Current per output:	max. 50 mA
Resistive load per output to GND:	< 3.3 kΩ
Capacitive load per output to GND:	< 33 nF

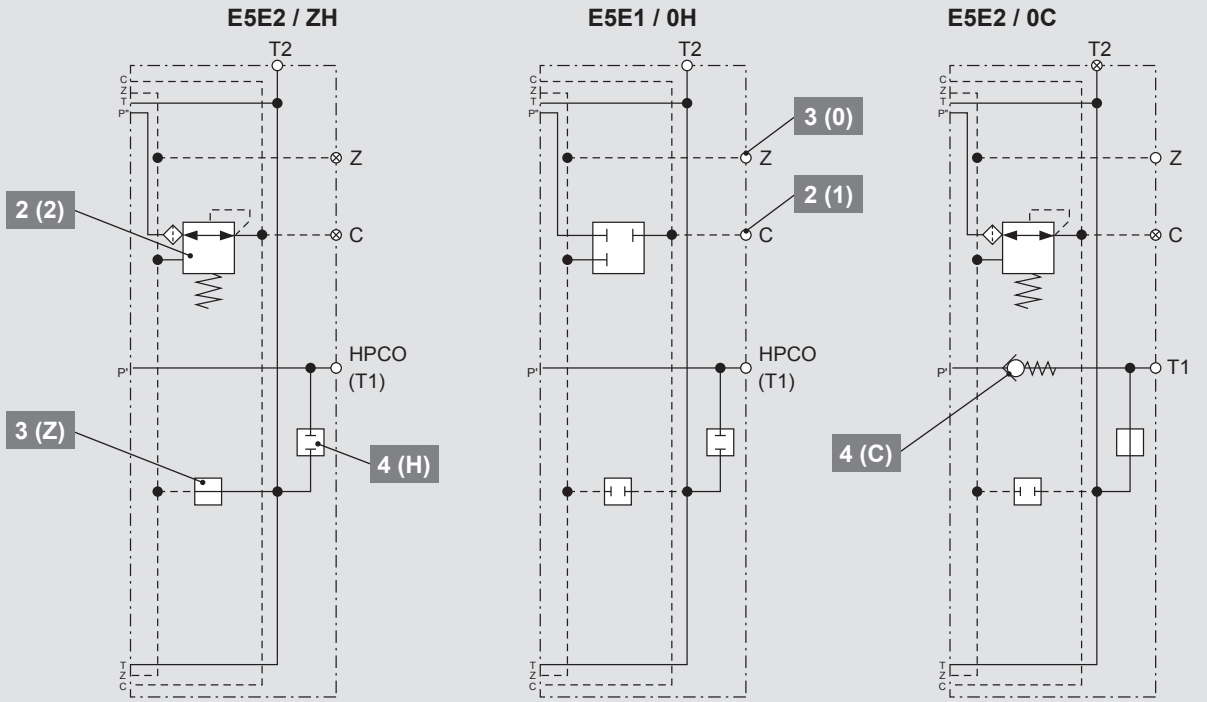


Connector:
Pin 1: +Ucc
Pin 2: Out + (spool position **II**)
Pin 3: GND
Pin 4: Out - (spool position **III**)



⚠ For more information see HYDAC data sheet “HLS 200”.

End plates



Ports / flange channels

C	Pilot oil channel	HPCO	High pressure carry over
Z	Pilot oil drain channel	P'	Center channel
T1, T2	Tank channel	P''	Parallel channel

Type code

E5E	2	/	Z	C
1	2		3	4

1	**Basic type**	
	E _ _ _	End plate
	_ 5 _ _	Port size T1[1)]
	_ _ E _	electrohydraulic
2	**Pilot pressure supply**	
	_ _ _ 1	external pilot pressure oil supply
	_ _ _ 2	internal pilot pressure oil supply
3	**Pilot drain**	
	0 _	Pilot drain external
	Z _	Pilot drain internally connected to T
4	**Center channel precharging valve / HPCO**	
	_ C	with center channel precharging valve
	_ H	with high pressure carry over *(S16)*
	_ 0	w/o option

[1)] see section – Connection type, fastening and tie rods

The center channel precharging valve 4 (C) provides the center channel with a pressure higher than 8 bar. This ensures that the pilot oil circuit is always supplied sufficiently.

The adapter for the high pressure carry over function (HPCO) 4 (H) is assembled to port T1 of the end plate. Port T1 can no longer be used as a tank port.

Example configurations

E5E2 / ZH

- End plate with internal pilot oil supply
- Pilot drain internally connected to T
- With adapter for high pressure carry over (HPCO)

E5E1 / 0H

- End plate with external pilot oil supply
- External port for pilot drain
- With adapter for high pressure carry over (HPCO)

E5E2 / 0C

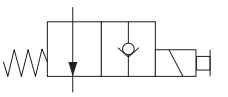
- End plate with internal pilot oil supply
- External port for pilot drain
- With center channel precharging valve

Solenoid valves, coils and electrical connections

Electrohydraulic pilot valves: see section – Operation units

Unloading valve for inlet plate U15:

On/Off valve:
With manual emergency operation (push-button)



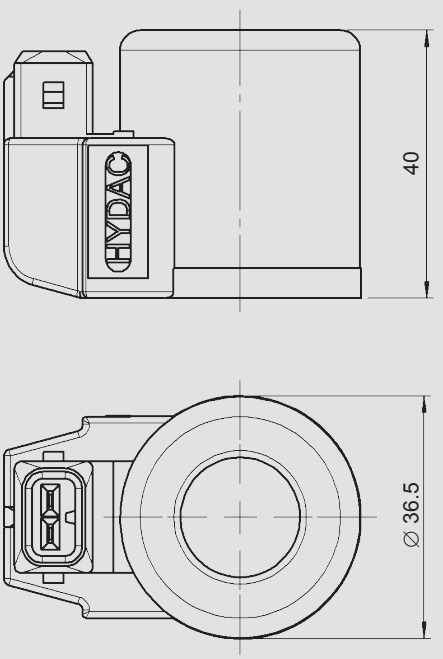
Valve type		Poppet valve	
Nominal voltage U_N	V DC	12	24
Nominal current I_N	A	1.5	0.8
Min. current I_{min}	A	1.05	0.56
Nominal power P_N	W	18	19
Response time	On: ms	35	
	Off: ms	50	
Max. permitted voltage deviation from U_N	%	± 15	
Duty cycle at + 115 % U_N	%	100	
Ambient temperature range[1)]	°C	-20 … +60	
Max. permitted coil temperature[2)]	°C	180	
Insulation class as per EN 60085		H	
Integrated free-wheeling diode		yes	
Coil length	mm	40	
Connector type and IP protection class (with mating connector mounted)		AMP Junior Timer, 2-pin, axial / up to IP6K6[3)] Deutsch DT04, 2-pin, axial / up to IP6K9K[3)]	
Valve body and coil surface protection		Zinc-Nickel (ZnNi)	

[1)] Deviation of data at request only

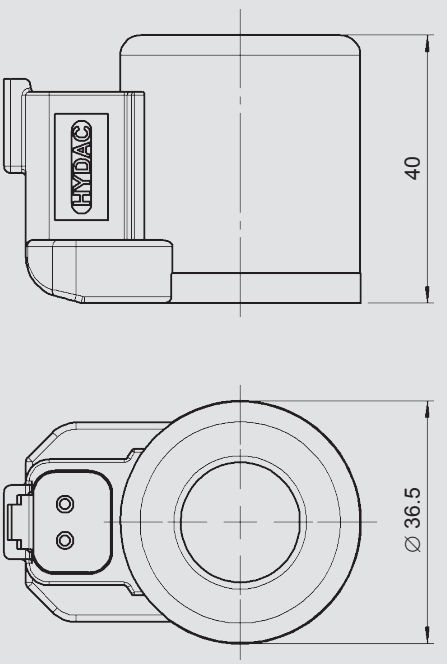
[2)] Standards ISO 13732-1 and ISO 4413 must be observed in regard to the surface temperatures occurring on the coils

[3)] Mating plug-in connectors are not included

AMP Junior Timer axial



Deutsch DT04 axial



Connection type, fastening and tie rods

Type code

RS16	3	/	B	0
1	2		3	4

⚠ Only use fittings with deformable seal materials.

1	Valve type	
2	Specification type	
	–	Complete control block No. of working sections (1 .. 0 (0 = 10 working sections))
	X	Single modules (Inlet plate, Working section, end plate)
3	Connection type	
	B	**B**SPP acc. to ISO 1179-1
	S	**S**AE acc. to ISO 11926-1 or SAE J1626
4	valve series	

Connection type			B	Countersink ∅ in mm	S		Countersink ∅ in mm
Inlet plate	P1	Pump	G 1/2	38	7/8-14 UNF	SAE-10	38
	P2	Pump	G 3/8	32	3/4-16 UNF	SAE-8	32
	T3	Tank	G 1/2	30	7/8-14 UNF	SAE-10	30
	PM	Pump measuring port	G 1/4	25	7/16-20 UNF	SAE-4	25
Working section	A/B	Working ports	G 3/8	30	3/4-16 UNF	SAE-8	25
End plate	T1	Tank	G 1/2	37	7/8-14 UNF	SAE-10	37
	T2	Tank	G 1/2	30	7/8-14 UNF	SAE-10	30
	Z	Pilot drain	G 1/4	22	9/16-18 UNF	SAE-6	22
	C	Pilot oil supply	G 1/4	22	9/16-18 UNF	SAE-6	22

Fastening:

Use 3 of the 4 fixation points to mount the control block without tensioning.

Fastening screws:

- M8 or 5/16-24 UNF (SAE-2)
- Property class 10.9, fastening torque 25 Nm ± 3 Nm

Tie rods:

M8 tie rods with flange nut 13 mm, M_Z = 20 Nm ± 2 Nm

⚠ Only use genuine RS160 tie rod kits.

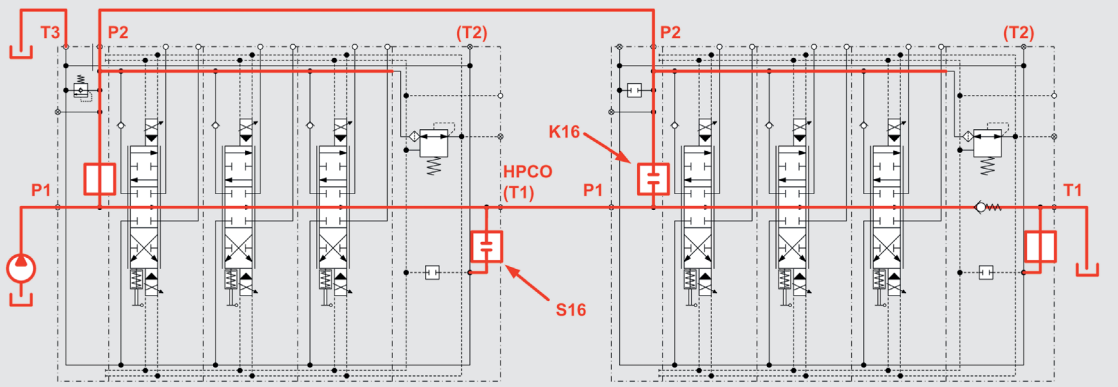
Installation, usage and maintenance information

Installation, adjustment, maintenance must be done by authorized and trained staff.

The use of this product outside the specified technical limits, use of non-specified fluids and/or use of not genuine spare parts will cause the expiration of the warranty.

Interconnection examples

Parallel connection

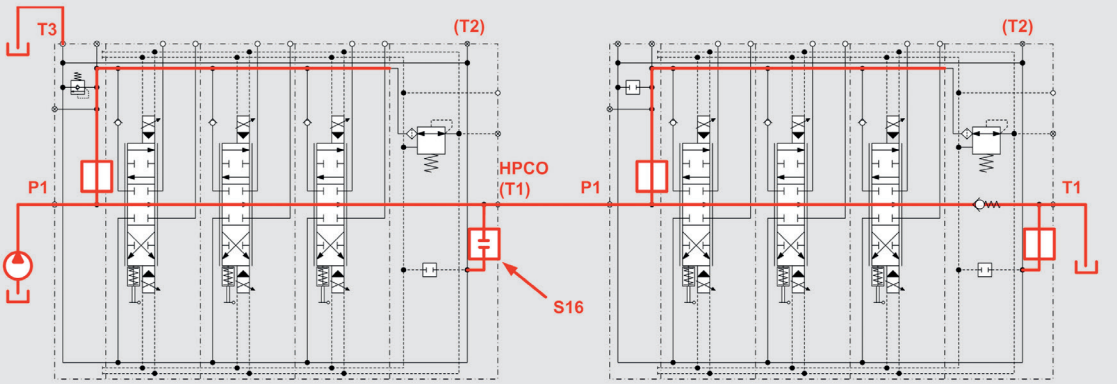


Connecting two blocks parallel, as shown: Connect port T1 of the first block with port P1 of the second block, using adapter S16 and K16. Adapter S16 (HPCO = **H**igh **P**ressure **C**arry **O**ver) disconnects the center channel from the tank channel. Adapter K16 disconnects the parallel channel from the center channel. The P2 ports of both blocks are connected to supply the parallel channel of the second block with pump pressure.

S16 is needed to prevent oil flow from the center channel of the first block to tank (T2 or T3) if a working section of the second block is operated.

K16 is needed to prevent oil flow to tank (T1, T2 or T3) of the second block if a working section of the first block is operated.

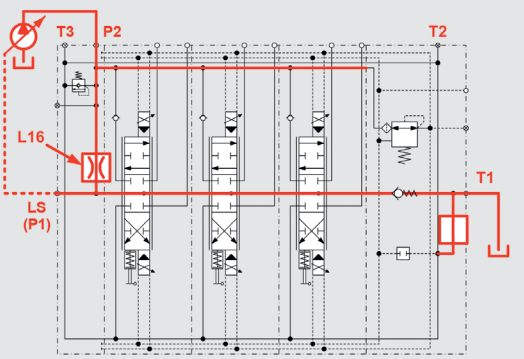
Serial connection



Connecting two blocks serial, as shown: Connect port T1 of the first block with port P1 of the second block, using adapter S16. Adapter S16 (HPCO = **H**igh **P**ressure **C**arry **O**ver) disconnects the center channel from the tank channel. If operating a working section of the first block (full stroke) then operating a working section of the second block is not possible (priority circuit).

S16 is needed to prevent oil flow from the center channel of the first block to tank (T2 or T3) if a working section of the second block is operated.

Loadsensing pump connection



The RS160 valve block can also be operated with a load sensing pump. Therefore the adapter L16 is needed in port P1, which generates a throttled pressure signal for the pump controller. Port P1 is connected to the pump controller (LS port). Pump must be connected to P2.

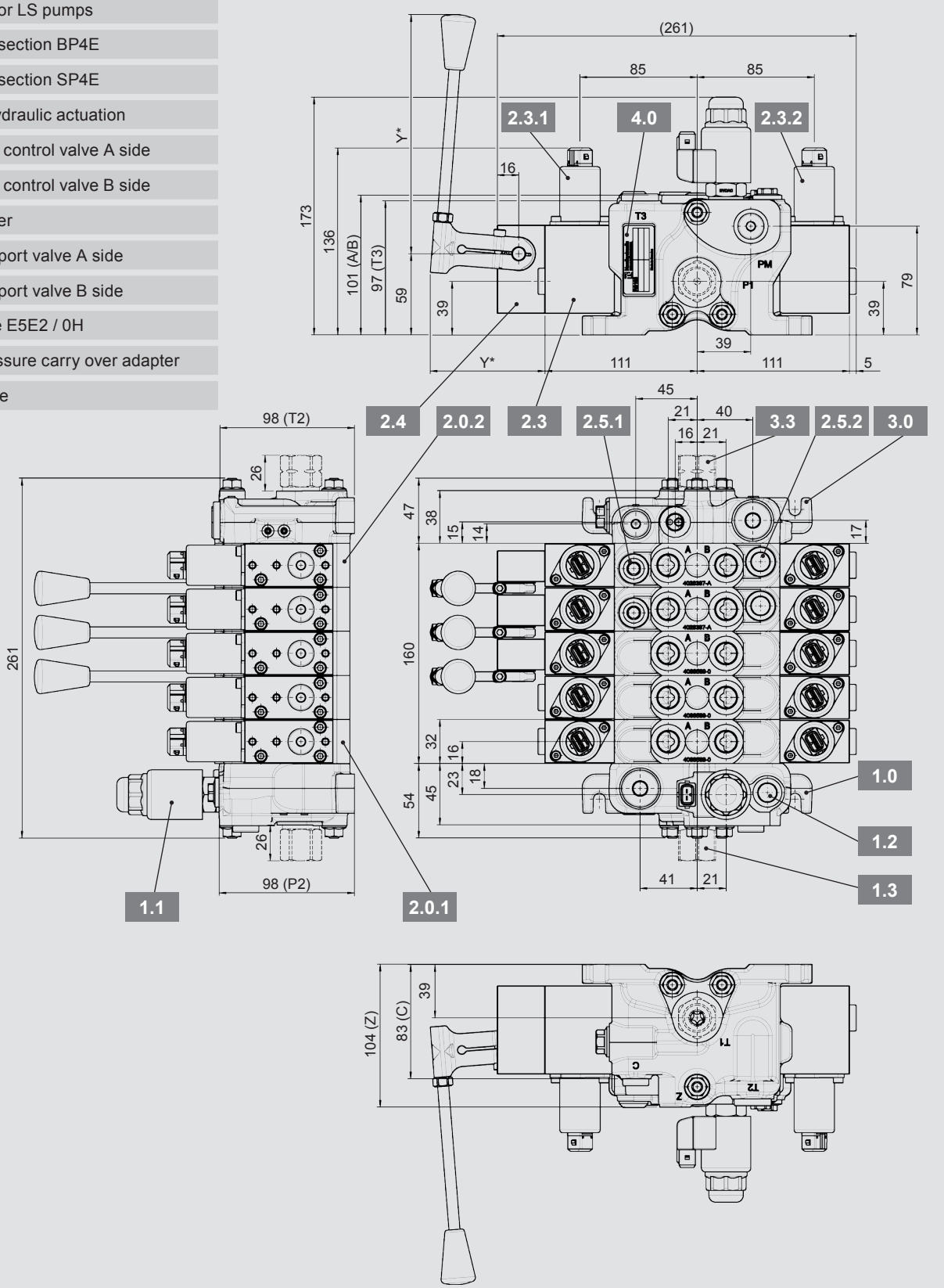
Dimensions

All dimensions in mm, subject to change!

Example block: Inlet with unloading valve, end plate with internal pilot oil supply, manual override at three sections

Electrical connection type: AMP Junior Timer, 2-pin – axial

1.0	Inlet plate U15 / Y2A / 210F
1.1	Unloading valve
1.2	Main relief valve
1.3	Parallel channel disconnected from center channel / adapter for LS pumps
2.0.1	Working section BP4E
2.0.2	Working section SP4E
2.3	Electrohydraulic actuation
2.3.1	Pressure control valve A side
2.3.2	Pressure control valve B side
2.4	Hand lever
2.5.1	Working port valve A side
2.5.2	Working port valve B side
3.0	End plate E5E2 / 0H
3.3	High pressure carry over adapter
4.0	Type plate

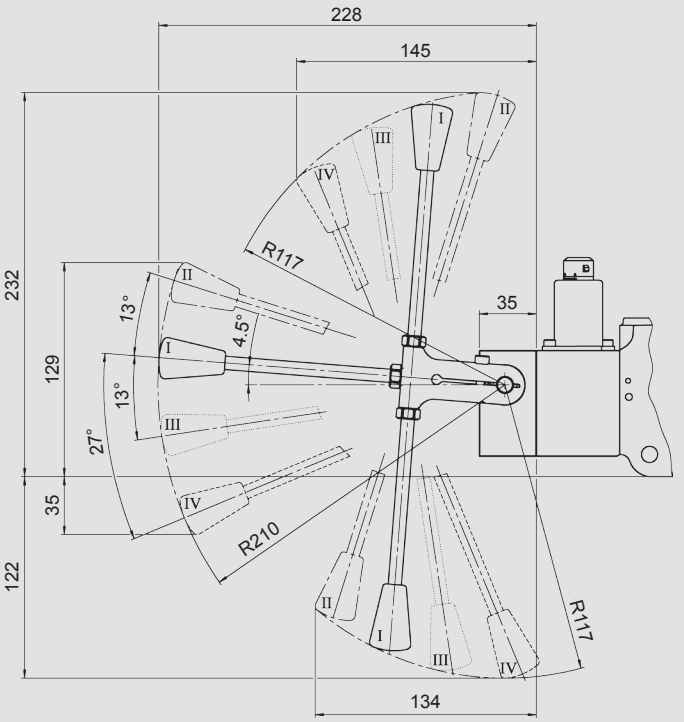


* see page 21

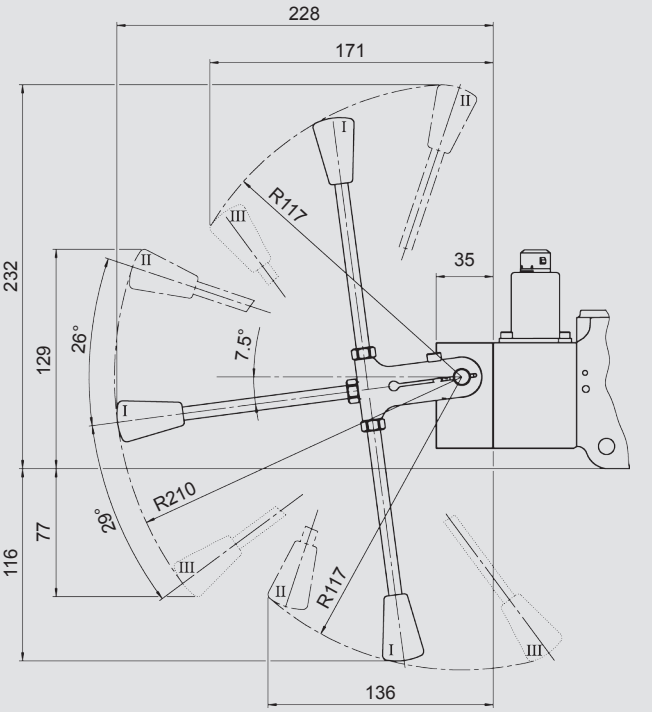
Dimensions

All dimensions in mm, subject to change!

Hand lever: Neutral position and max. stroke with firmly connected hand lever axis

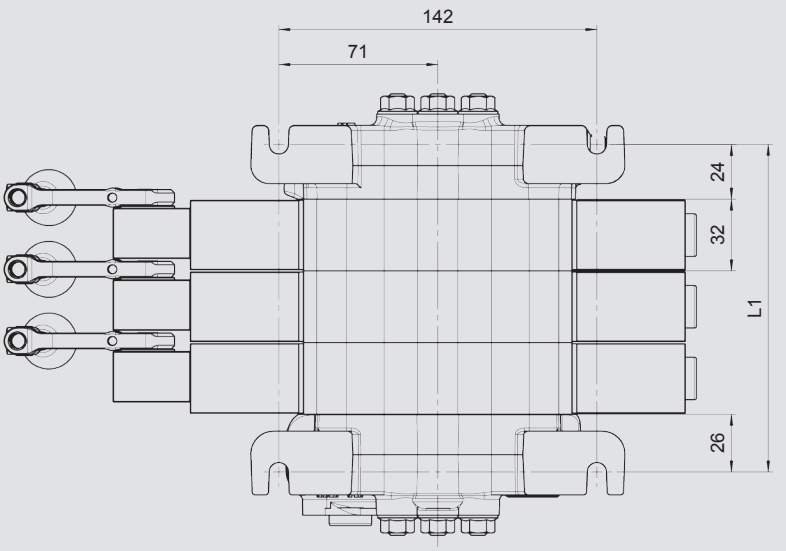


Hand lever: Neutral position and max. stroke with NOT firmly connected hand lever axis

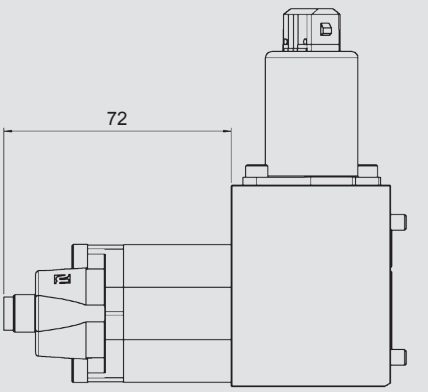


The exemplary shown hand lever rod has the dimension M8 x 160

Valve block fastening points (4x M8)



Position sensor



No. of working sections		1	2	3	4	5	6	7	8	9	10
L1	mm	82	114	146	178	210	242	274	306	338	370

Type code

Structure and sequence			
	1.	**General**	(control block always defined from left to right)
	2.	**Inlet plate**	
	3.	**1. Working section**	
		2. Working section	
		n. Working section	
	4.	**End plate**	

1.	**General**							
	Type:	**RS16**	**4**	**/**	**B**	**0**		
	Pos.	**1.**	**2.**		**3.**	**4.**		

	Pos. / designation:	Type code:	Description / function:	Comment:
	1. Open-center valve series	**RS16**	Open-center valve, Size **2**	
	2. No. of working sections	**_**	1-digit, 1 ... 0 (0 = 10 working sections)	max. 10 working sections
	Spec. / identification of single module	**X**	Inlet plate, working section or end plate	
	3. Connection thread	**B**	**B**SPP acc. to ISO 1179-1	
		S	**S**AE acc. to ISO 11926-1 or SAE J1626	
	4. Valve series	**0**	Valve series production status	

2.	**Inlet plate**								
	Type:	**P15**	**/**	**200F**	**/**	**L**			
		U15	**/**	**Y1D**	**/**	**P**			
	Pos.	**1.**		**2.**		**3.**			

	Pos. / designation:	Type code:	Description / function:	Comment:
	1. Basic type			
		P15	**P** with P2 port **1** version **5** port size P/T	Port size 5: BSPP: G1/2; SAE: 7/8-14 UNF
	2. Main relief valve			
		_ _ _ F	Pressure setting in bar, 3-digit, fixed set, max. 250 bar *(TBS)*	see section – Working port valves
		P	Plug screw *(P110)*	w/o pressure relief valve
	3. Cavity for fitting			
		0	Parallel channel connected to center channel	
		1	Parallel channel disconnected from center channel *(K16)*	
		L	Throttled connection (load sensing pumps) on request *(L16)*	

	Pos. / designation:	Type code:	Description / function:	Comment:
	1. Basic type			
		U15	**U** with unloading valve **1** version **5** port size P/T	Port size 5: BSPP: G1/2; SAE: 7/8-14 UNF
	2. Unloading valve			
	Valve type	**Y _ _**	Unloading valve normally open	
	Supply voltage DC	**_ 1 _**	**1**2 V	
		_ 2 _	**2**4 V	
	Connector type	**_ _ A**	**A**MP - Junior Timer, 2-pin, axial	
		_ _ D	**D**eutsch - DT04, 2-pin, axial	
		P	Blind **P**lug	
	3. Main relief valve			
		_ _ _ F	Pressure setting in bar, 3-digit, fixed set, max. 250 bar *(TBS)*	see section – Working port valves
		P	Plug screw *(P110)*	w/o pressure relief valve

Type code

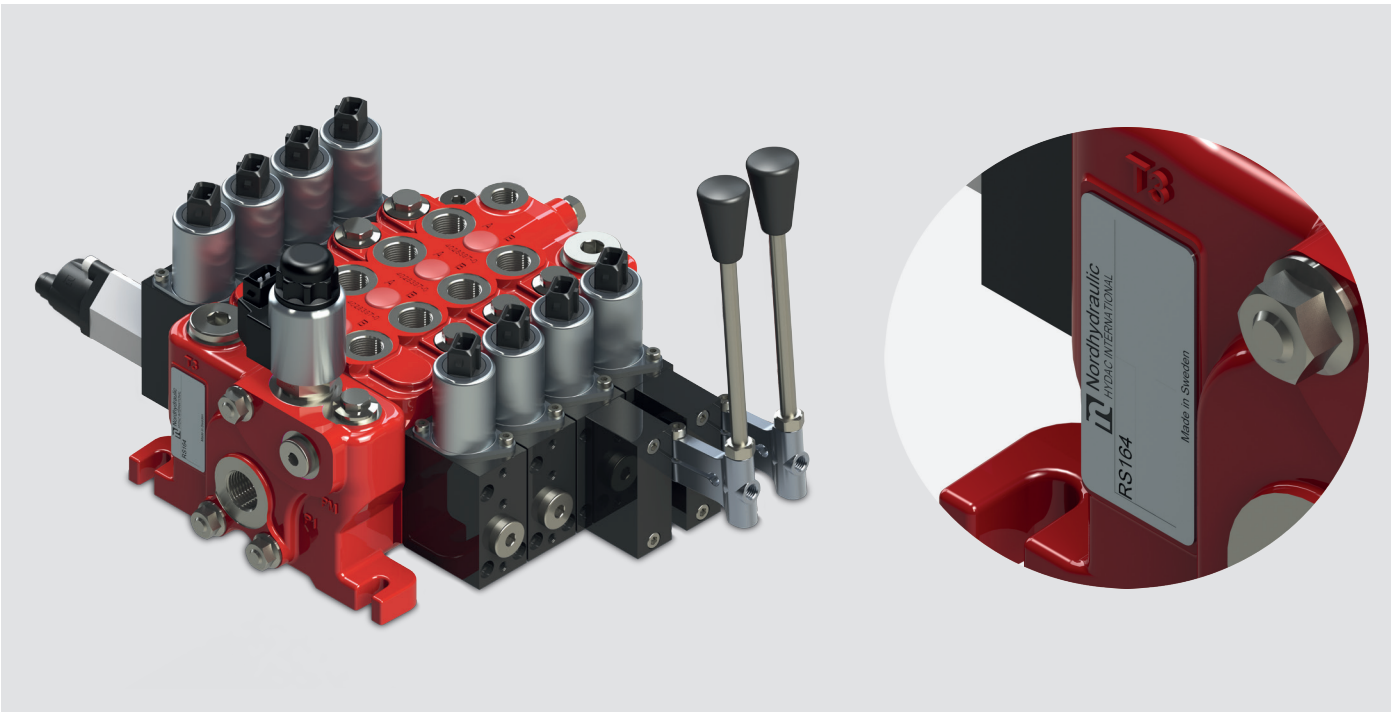
3.	Working sections												
	Type:		BP4E	/	12AA	/			EH01A – EHM1A				
			SP4E	/	12AY	/	P–180F	/	EH01A – EHM1A				
	Pos.		1.		2.		3.		4.				

	Pos. / designation:		Type code:	Description / function:	Comment:
	1. Basic type				
			B _ **4** _	w/o working port valves **4** port size A/B	Port size 4: BSPP: G3/8; SAE: 3/4-16 UNF
			S _ **4** _	With working port valves	
			_ **P** _ _	**P**arallel section	
			_ _ _ **E**	**E**lectrohydraulic operation	
	2. Spool				
	1 Type		**1** _ _ _	4/3-way, double acting	
			2 _ _ _	3/3-way, single acting	
			3 _ _ _	4/4-way, double acting with float position	
			4 _ _ _	Motor spool	
	2 Max. volume flow		_ **1** _ _	10 l/min	
			_ **2** _ _	20 l/min	
			_ **4** _ _	45 l/min	
			_ **6** _ _	60 l/min	
	3 Details		_ _ **A** _	Standard	
	4 Release specification		_ _ _ **A**	Port A and B closed in neutral position	
			_ _ _ **Z**	Port A and B throttled to tank in neutral position	
			_ _ _ **X**	Port A throttled to tank in neutral position	
			_ _ _ **Y**	Port B throttled to tank in neutral position	
			_ _ _ **T**	Port A and B throttled to tank	
			_ _ _ **U**	Port A throttled to tank	
			_ _ _ **W**	Port B throttled to tank	
			_ _ _ **0**	no release specification	
	3. Working port valve				
			_ _ _ **F**	Pressure setting in bar, 3-digit, fixed set, max. 250 bar *(TBS)*	see section – Working port valves
			A	Anti-cavitation valve *(SB110)*	
			P	Plug screw *(P110)*	w/o pressure relief valve
	4. Operation units				
	1 Basic type		**EH**_ _ _- …	definition of the electrohydraulic actuation on side A	
			… - **EH**_ _ _	definition of the electrohydraulic actuation on side B	
	2 Hand lever, hand lever connection, float position, position sensor		_ _ **0** _ _	w/o further option	
			_ _ **M** _ _	Hand lever axis	
			_ _ **C** _ _	Hand lever axis, axis with spool firmly connected	
			_ _ **H** _ _	Hand lever axis with clamping piece	
			_ _ **L** _ _	Hand lever axis with clamping piece, axis with spool firmly connected	
			_ _ **F** _ _	Float position w/o hand lever axis	
			_ _ **W** _ _	Hand lever axis with clamping piece and float position	
			_ _ **P** _ _	Position sensor	
	3 Supply voltage DC, connector type		_ _ _ **1** _	**1**2 V	
			_ _ _ **2** _	**2**4 V	
			_ _ _ _ **A**	**A**MP - Junior Timer, 2-pin, axial	
			_ _ _ _ **D**	**D**eutsch - DT04, 2-pin, axial	

Type code

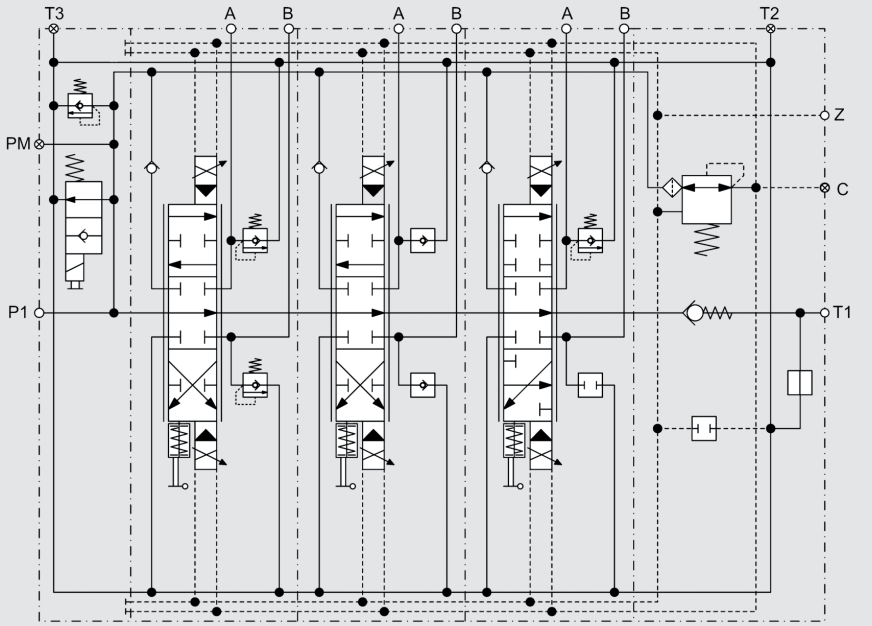
4.	End plate						
	Type:	E5E	2	/	Z	H
		E5E	1	/	0	0
	Pos.	1.	2.		3.	4.

	Pos. / designation:	Type code:	Description / function:	Comment:
	1. Basic type			
		E5_ _	**E**nd plate **5** port size P/T	Port size 5: BSPP: G1/2; SAE: 7/8-14 UNF
		_ _ E _	**E**lectro hydraulic	
	2. Pilot pressure supply			
		_ _ _ 1	External pilot pressure oil supply	
		_ _ _ 2	Internal pilot pressure oil supply	
	3. Pilot drain			
		0 _	Pilot drain external	
		Z _	Pilot drain connected internal to T	
	4. Center channel precharging valve / HPCO			
		_ C	With center channel precharging valve	
		_ H	With **h**igh **p**ressure **c**arry **o**ver (HPCO)	
		_ O	w/o option	



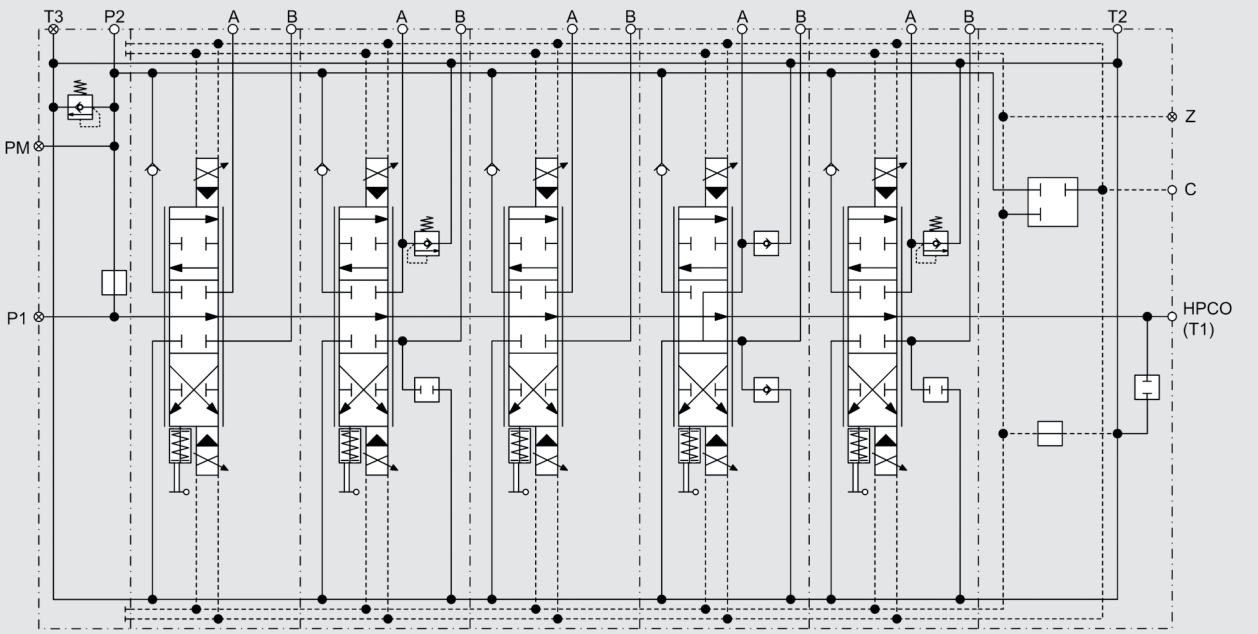
Ordering examples

Example of a control block with unloading valve in the inlet plate and internal pilot oil supply in the end plate



General	RS163 / B0
Inlet plate	U15 / Y2D / 230F
1. Working section	SP4E / 12AA / 250F – 250F / EH02D – EHH2D
2. Working section	SP4E / 12AA / A – A / EH02D – EHH2D
3. Working section	SP4E / 22AA / 250F – P / EH02D – EHH2D
End plate	E5E2 / 0C

Example of a control block with external pilot oil supply and HPCO in the end plate



General	RS165 / B0
Inlet plate	P15 / 230F / 0
1. Working section	BP4E / 14AA / EH01A-EHL1A
2. Working section	SP4E / 14AA / 250F – P / EH01A-EHL1A1
3. Working section	BP4E / 14AA / EH01A-EHL1A
4. Working section	SP4E / 44AA / A – A / EH01A-EHL1A
5. Working section	SP4E / 14AA / 250F – P / EH01A-EHL1A
End plate	E5E1 / ZH

Notes

Notes

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical and other changes.

Nordhydraulic
HYDAC INTERNATIONAL

Head office
HYDAC INTERNATIONAL
GMBH

Industriegebiet
66280 Sulzbach/Saar
Germany

Tel.: +49 6897 509-01
Fax: +49 6897 509-577

E-mail: mobilevalves@hydac.com
Internet: www.hydac.com