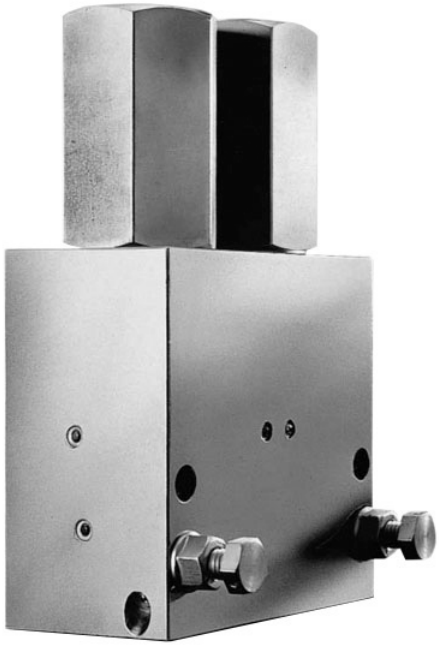
Load-holding valve type LHK

Product documentation

Pressure setting $p_{s\ max}$:	400 bar
Load pressure $p_{1\ max}$:	320 bar
Flow rate Q_{max}:	100 l/min



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HAWE HYDRAULIK

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Table of Contents

1 Overview of load-holding valve type LHK

Load-holding valves are a type of pressure valve. They prevent loads on cylinders or motors dropping in an uncontrolled manner. For this purpose they are pre-loaded with a pressure setting that is higher than the largest possible load. A hydraulic piston controls the opening of the valve to achieve the required lowering velocity.

The load-holding valves type LHK are suitable for applications that are not particularly prone to oscillations.

Shock valves and shuttle valves with or without restrictor check valve can be fitted in the load-holding valves type LHK, e.g. to relieve hydraulic brakes with a delay.

Load-holding valve type LHK

Features and advantages

- Pressure settings up to 400 bar
- Various adjustment options
- Various models

Intended applications

- Cranes
- Construction machinery
- Lifting devices

2 Available versions

2.1 Valves for one-sided load direction V → F

Ordering examples

LHK 22	G	-11 H	-180	
LHK 33	G	-15 C	-250	/220
LHK 44	F	-14 W	-200	

Shock setting (bar) [2] [3]

Pressure setting (bar) [1] [3]

Circuit symbol and housing version 2.1.1 "Basic type and size"

2.1.2 "Damping variant"

2.1.1 "Basic type and size"

[1]) Different pressure ranges (compression springs) according to the specified pressure setting.

[2]) Shock pressure $p_{max} \leq 340$ bar (pressure ranges: 150 to 250 bar and 251 to 340 bar)

[3]) If no specification is present, the setting is 80% of the p_{max} of the respective pressure range.

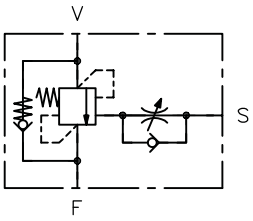
2.1.1 Basic type and size

Type	Damping variant see Chapter 2.1.2	Circuit symbol and housing version		Release ratio	Flow rate Q_{max} (l/min)	Pressure setting p_{max} (bar) *	Ports (ISO 228-1) A, B, F/V, R
LHK 21	G	-14	Threaded connection	1 : 4.6	15	50 to 200	G 1/4
		-14 T					
		-14 T-3/8				50 to 200 201 to 400	G 3/8
LHK 22	G, F, U	-11	Threaded connection	1 : 4.6	20	50 to 200 201 to 400	G 3/8
		-11 H	V-banjo bolt connection				M16x1.5 G 3/8
		-11 H16					
		-11 K -11 P	V-flange port				G 3/8
LHK 227	G, F	-11 K	V-flange port	1 : 7	20	50 to 200 201 to 400	G 3/8
LHK 30	G, F	-11 PV -11 C PV	Manifold mounting, external pressure adjustment	1 : 4.4	60	60 to 130 131 to 320 321 to 360	--
LHK 32	G, F, U	-11	Threaded connection	1 : 4.4	40	60 to 130 131 to 320	G 3/8
LHK 33	G, F, U	-11 -11 C	Threaded connection	1 : 4.4	60	60 to 130 131 to 320 321 to 360	G 1/2
		-11 H	V-banjo bolt connection				
		-11 K -11 P	V-flange port				
		-14 -14 W -15 -15 C	Threaded connection				
LHK 337	G, F, U	-11	Threaded connection	1 : 7	60	60 to 130 131 to 320 321 to 360	G 1/2
		-11 K -11 P	V-flange port				
LHK 40	G, F	-11 PV -11 C PV	Manifold mounting, external pressure adjustment	1 : 4.4	100	0 to 159 160 to 350	--
LHK 43		-14	Threaded connection	1 : 4.4	80		G 3/4 G 1/2
LHK 44	G, F, U	-11 -11 C	Threaded connection	1 : 4.4	100	0 to 159 160 to 350	G 3/4
		-11 P	V-flange port				
		-14 -14 W	Threaded connection				
		-14 W M1C	V-flange port				
		-15 -15 C	Threaded connection				

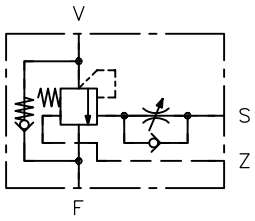
* Different pressure ranges (compression springs) according to the specified pressure setting.

Circuit symbols

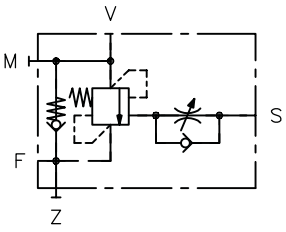
-11



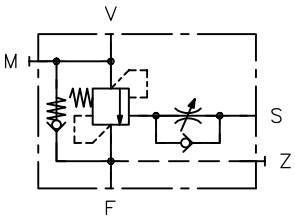
-11 C



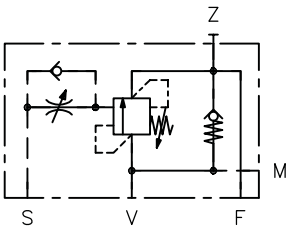
-11 K
-11 P



-11 H
-11 H16



-11 PV



INFORMATION

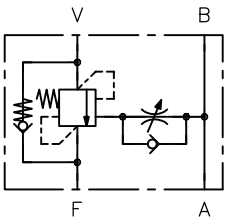
Circuit symbols -11, -11C

The valve is released from the inflow-side load line via an external control line S. In version **-11**, the control piston rear chamber is connected to port F, i.e. the return pressure (flow resistance of the directional valve and tank line) influences the opening behaviour of the valve. This is also the reason for the functional restriction in differential circuits (see "functional restriction").

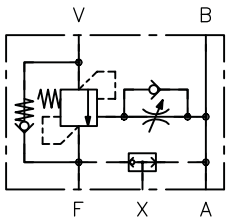
With circuit symbol **-11C**, the rear side of the control piston is routed out separately (connection Z, route to the tank without pressure). This eliminates the influence of return pressure.

This version can also be used with the differential circuit mentioned above, as well as for retrofitting existing directional valves with a directional spool valve closed in the neutral position (ensures safe closing of the load-holding valve).

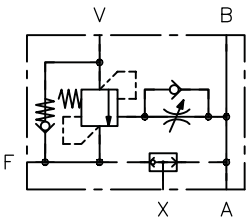
-14



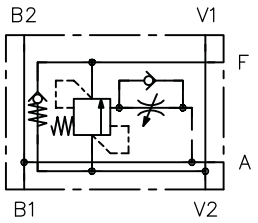
-14 W



-14 W M1C



-14 T
-14 T-3/8



INFORMATION

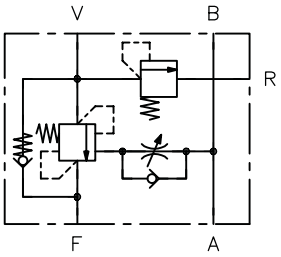
Circuit symbols -14, -14W, -14W M1C

Opposite the circuit symbol **-11**, internally routed load line (A - B) with control line tapping. This eliminates the need for piping of the control line.

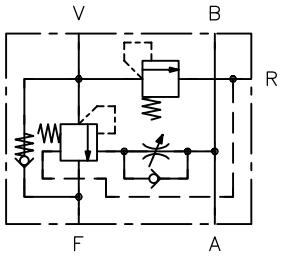
The **-14W** version also has an integrated shuttle valve for a brake control line (connection X), e.g. for hydraulic motors with hydraulically released brakes (winches, etc.).

The **-14W M1C** version is a variant that can be directly flanged onto Denison motors (e.g. type M1C) or VOAC motors (e.g. type F 12).

-15



-15 C

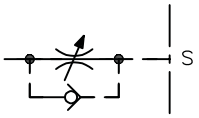
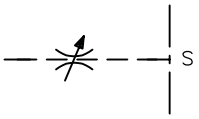
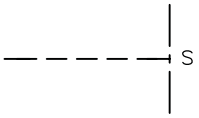


INFORMATION

Circuit symbols -15, -15C

The cylinder side is protected with an additional shock valve. This means that there is a separation between maximum load pressure (set here on the shock valve) and opening behaviour (depending on the pilot ratio and pressure setting on the load-holding valve).

2.1.2 Damping variant

Coding	Description	Circuit symbol
G	damped with restrictor check valve combination (throttle screw adjustable)	
F	simply damped with throttle screw (adjustable)	
U	undamped	

2.2 Valves for load direction change

Ordering examples

LHK 22 LHK 33 LHK 44	G G F	-21 -25 WD -21	-220 -280 -180	/220 /280 /180	-260	/260

Shock setting V2 (bar) [2] [3]

Shock setting V1 (bar) [2] [3]

Pressure setting V2 (bar) [1] [3]

Pressure setting V1 (bar) [1] [3]

2.2.2 "Circuit symbol"

2.1.2 "Damping variant"

2.2.1 "Basic type and size"

[1]) Different pressure ranges (compression springs) according to the specified pressure setting.

[2]) Pressure setting for shock valve p_3, $p_{4\ max} \leq 400$ bar (pressure ranges: 0 to 160 bar, 161 to 315 bar and 316 to 400 bar)

[3]) If no specification is present, the setting is 80% of the p_{max} of the respective pressure range.

2.2.1 Basic type and size

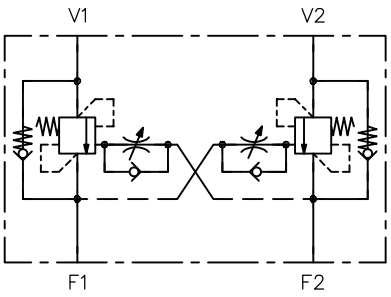
Type	Flow rate Q_{max} (l/min)	Pressure $p_{1\ max}$ (bar)	Possible damping variants see Chapter 2.1.2
LHK 22	20	50 to 200 201 to 400	G, F, U
LHK 33	60	60 to 130 131 to 320 321 to 360	
LHK 337			
LHK 44	100	60 to 160 161 to 350	
LHK 447			

2.2.2 Circuit symbol

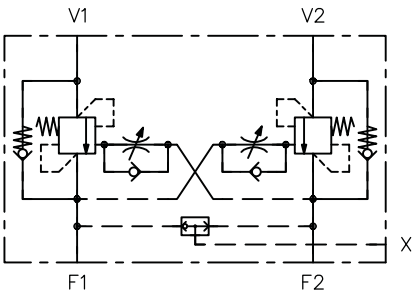
Coding	suitable for type	Housing version	Pilot ratio	Ports (ISO 228-1)
				A, B, F, V, R
-21	LHK 22	Threaded connection	1 : 4.6	G 3/8
-21 **-21 W**	LHK 33		1 : 4.4	G 1/2
-25 **-25 W** **-25 WD**				
-21	LHK 337		1 : 7	
-25				
-21 **-21 W**	LHK 44		1 : 4.4	G 3/4
-21	LHK 447		1 : 7	

Circuit symbols

-21



-21 W

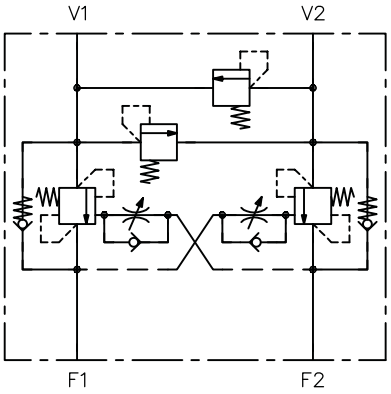


INFORMATION

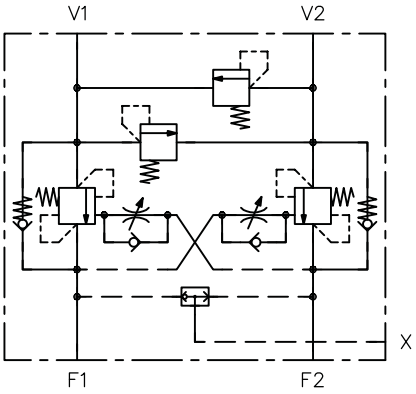
Circuit symbols -21, -21W

Valve for load direction change (e.g. passing a dead centre).
Both sides can be set independently of one another (load pressure and damping behaviour).
The **-21W** version also has an integrated shuttle valve (see circuit symbol **-14W**).

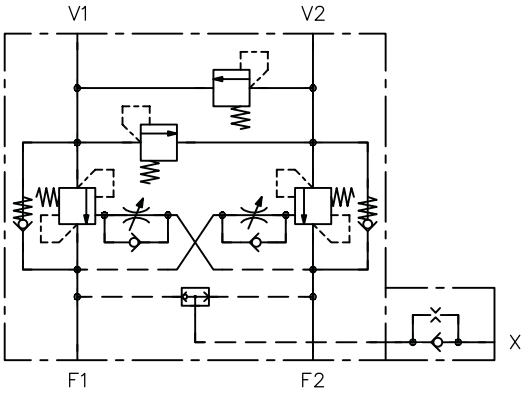
-25



-25 W



-25 WD



INFORMATION

Circuit symbols -25, -25W, -25WD

Version for turning, swivelling or rotating devices using hydraulic motors. A shuttle valve can be integrated analogously to the circuit symbol **-14W** (see circuit symbol **-14W**). An additional restrictor check valve with circuit symbol **-25WD** enables a delayed relief of the hydraulic brake (soft application).

2.3 Load-holding valve inserts

For self-made basic bodies with connections V and S, installation kits can be supplied in individual parts. The functional test and pressure setting must then be implemented on site after assembly. The specification of the intended load pressure is necessary for the correct spring selection.

Notes on setting: see Chapter 6.1, "Pressure setting"

Type FG 2 as per D 7275 (connection A = control piston side, connection B = control inflow side) is suitable as a restrictor check valve for control piston damping.

Ordering examples

LHK 21	**-180**
LHK 30 V	**-260**
LHK 447	**-120**
	intended pressure setting p_1 (bar)

2.3.1 "Basic type and size"

2.3.1 Basic type and size

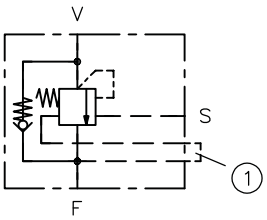
Type	Pilot ratio	Flow rate Q_{max} (l/min)	Pressure $p_{1\ max}$ (bar) [1] [2]	Ports (ISO 228-1)	used for circuit symbol
LHK 20 V	1 : 4.6	15	50 to 200	-- [3]	--
LHK 21				G 1/4	-14.
LHK 22		20	50 to 200 201 to 400	G 3/8	11., 21
LHK 227	1 : 7				11.
LHK 30 V	1 : 4.4	60	60 to 130 131 to 320 321 to 360	-- [3]	11 PV 11 CPV
LHK 32		40	60 to 130 131 to 320	G 3/8	11
LHK 33		60	60 to 130 131 to 320 321 to 360	G 1/2	11., 14., 15. 17., 21., 25.
LHK 33 S					11 SK
LHK 33 SL					21 SL
LHK 337	1 : 7				11., 21., 25
LHK 40 V	1 : 4.4	100	60 to 130 131 to 350	-- [3]	11 PV 11 CPV
LHK 44				G 3/4	11., 14. 15., 21.
LHK 447	1 : 7				21

1) Different pressure ranges (compression springs) according to the specified pressure setting.

2) If no specification is present, the setting is 80% of the p_{max} of the respective pressure range.

3) All ports are located on the basic body. The pressure setting can be adjusted by loosening a lock nut.

Circuit symbol



1 Connecting hole Y

see Chapter 4.3, "Load-holding valve inserts"

3 Parameters

3.1 General data

Designation	Load-holding valve, with hydraulic relief, with bypass check valve
Design	▪ Pressure valve part (load-holding valve): Ball or conical seat valve ▪ Bypass check valve: Manifold seated valve
Model	▪ Single or twin valve for pipe connection ▪ Manifold mounting valve ▪ Screw-in valve, version for banjo bolt mounting
Material	Steel Surface treatment: – Electro-galvanised blocks – Spring housing: nitrocarburised
Attachment	see Chapter 4, "Dimensions"
Tightening torque	see Chapter 4, "Dimensions"
Installation position	As desired
Ports/connections	▪ **F (1, 2); V (1, 2); A, B, R** = Main pressure connections depending on the type ▪ **S, X, M** = Control ports and measurement fittings depending on the type All ports can withstand full operating pressure.
Flow direction	**Working direction (load-holding function)** ▪ V (1, 2) → F (1, 2) **Free flow** ▪ F (1, 2) → V (1, 2)
Pilot ratio	The release pressure corresponds to the following multiples of the difference between the pressure setting and the load pressure at the following ratios: ▪ at 1 : 4.4 = 0.23x ▪ at 1 : 4.6 = 0.22x ▪ at 1 : 7 = 0.14x The surface ratio for hydraulic cylinders is taken into account in the calculation.
Hydraulic fluid	Hydraulic fluid, according to DIN 51524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 1500 mm²/s Optimal operating range: approx. 10 - 500 mm²/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	**ISO 4406** 21/18/15...19/17/13

Temperatures	Environment: approx. -40 to +80 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

3.2 Weight

Valves for one-sided load direction

Type		Type	
LHK 21 ..-14	= 0.7 kg	LHK 33(7) ..-11 C	= 1.0 kg
LHK 21 ..-14 T(-3/8)	= 1.0 kg	LHK 33(7) ..-11.-...	= 1.0 kg
LHK 22 ..-11 K	= 0.5 kg	LHK 33 ..-..H	= 1.0 kg
LHK 22(7) ..-11-...	= 0.5 kg	LHK 40 ..-11 CPV	= 1.8 kg
LHK 22 ..-..H	= 0.6 kg	LHK 40 ..-11 PV	= 1.8 kg
LHK 22 ..-..H 16	= 0.6 kg	LHK 43 ..-14	= 2.6 kg
LHK 22 ..-11 P(K)-..	= 0.6 kg	LHK 44 ..-14 W M1C	= 2.5 kg
LHK 30 ..-11 CPV	= 1.5 kg	LHK 44 ..-14 (W)	= 2.6 kg
LHK 30 ..-11 PV	= 1.5 kg	LHK 44 G-15 (C)	= 2.6 kg
LHK 32 ..-11-...	= 1.0 kg	LHK 44(7) ..-11 C-...	= 1.6 kg
LHK 33 (337) ..-11 P(K)-...	= 1.0 kg	LHK 44(7) ..-11.-...	= 1.6 kg
LHK 33 ..-14 (W)	= 1.6 kg	LHK 44 ..-11-P(K)-..	= 2.0 kg
LHK 33 G-15 (C)	= 1.6 kg		

Valves for load direction change

Type	
LHK 22 ..-21	= 0.85 kg
LHK 33 ..-21 (W)	= 2.4 kg
LHK 33 ..-25-...	= 2.7 kg
LHK 33 ..-25 W	= 2.7 kg
LHK 33 ..-25 WD	= 2.7 kg
LHK 44 ..-21 (W)	= 3.5 kg

Installation kits

Type	
LHK 20 V	= 0.3 kg
LHK 21, LHK 22	= 0.1 kg
LHK 30 V	= 1.0 kg
LHK 32, LHK 33	= 0.3 kg
LHK 33 S	= 1.2 kg
LHK 40 V	= 1.3 kg
LHK 44	= 1.0 kg

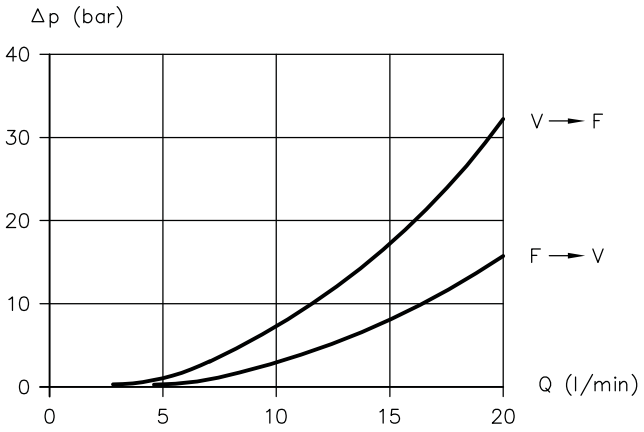
3.3 Characteristic lines

Viscosity of the hydraulic fluid approx. 50 mm²/s

Δp-Q characteristic lines

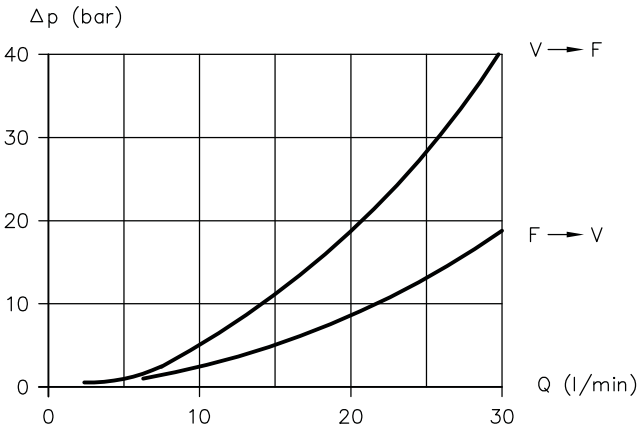
For self-manufactured housings (port side F), the flow resistance may vary depending on the design of the oil channels.

LHK 21



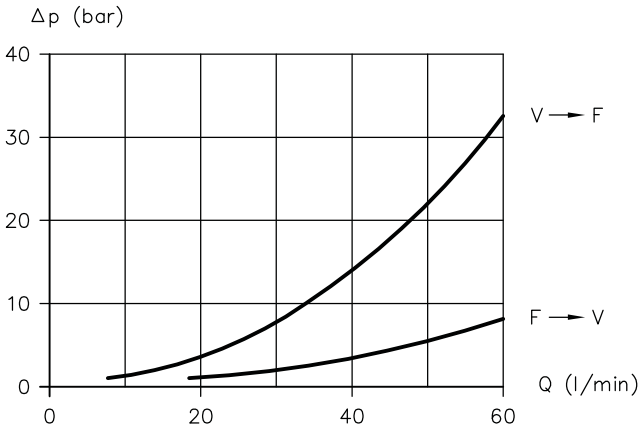
Q flow rate (l/min); Δp flow resistance (bar)

LHK 20, LHK 22



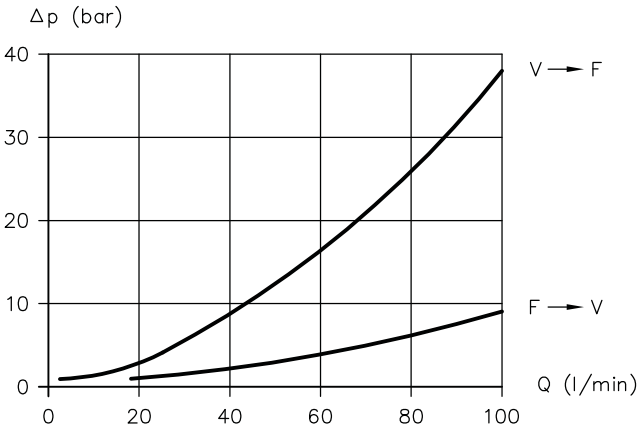
Q flow rate (l/min); Δp flow resistance (bar)

LHK 30, LHK 32
LHK 33, LHK 337



Q flow rate (l/min); Δp flow resistance (bar)

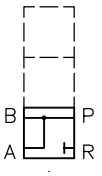
LHK 40, LHK, 43
LHK 44, LHK 447



Q flow rate (l/min); Δp flow resistance (bar)

NOTICE
Functional restriction

Load-holding valves cannot be used in conjunction with directional spool valves with the flow diagram of the differential circuit in a (any) switching position (e.g. with coding **C**, **Y** according to D 5650/1).
Do not use load-holding valves with circuit symbol **-15** on the rod side of the connected cylinder. Exception: Load-holding valves with circuit symbols **-11C** or **-15C** with external control piston relief (port Z).

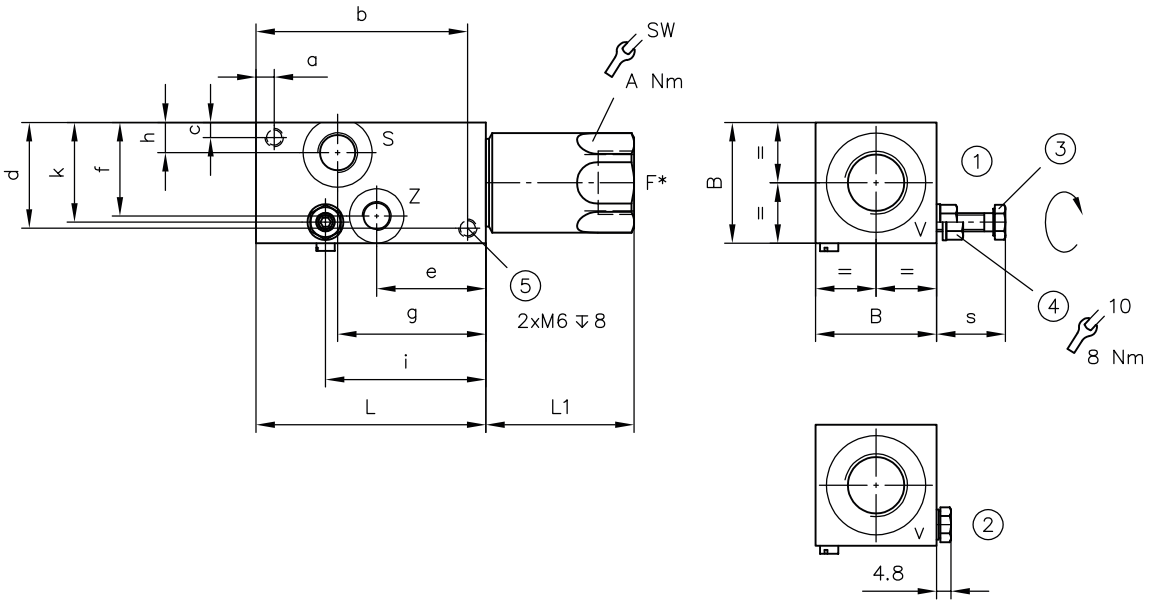


4 Dimensions

All dimensions in mm, subject to change.

4.1 Valves for one-sided load direction V → F

LHK .. -11
LHK .. -11 C



SW = Width across flats

1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but no check valve (hole sealed)
2 With coding **U:** no check valve, no throttle screw (tapped plugs instead)
3 Grub screw SW3 (LHK 22) or hex bolt SW10 (LHK 3., LHK 44) for valve damping. Throttle effect increases clockwise.
4 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
5 only for type LHK 3. and LHK 44

*

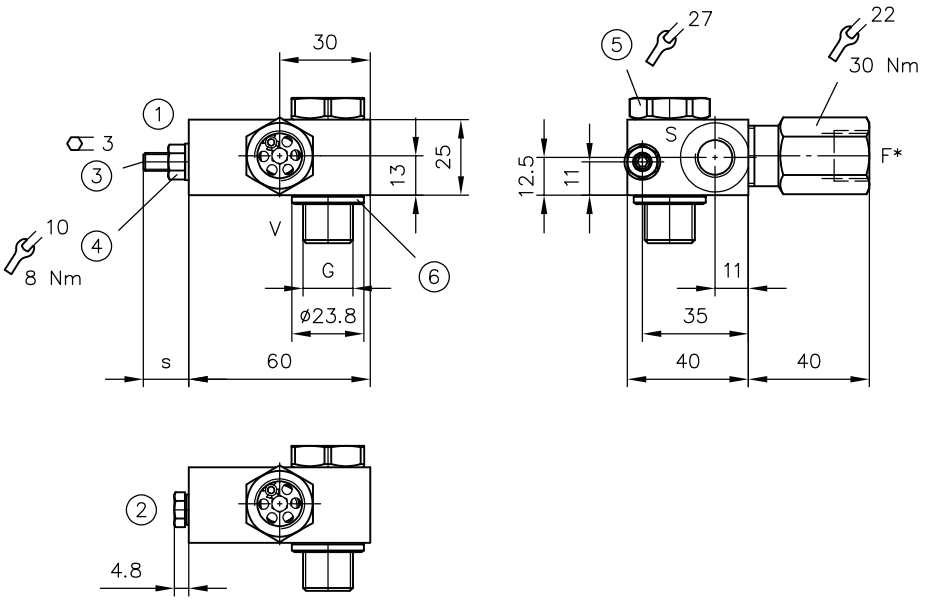
NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	L	B	a	b	c	d	e	f	g	h	i	k	s	
													min	max
LHK 22 -11	57	32	--	--	--	--	--	--	35	8	35	25	8	17
LHK 32 -11	74	40	5	69	5	35	--	--	49	10	53	33	14	24
LHK 33(7) -11	76	40	6	70	5	35	--	--	49	10	53	33	14	24
LHK 33 -11 C	76	40	6	70	5	35	36.1	31	49	10	53	33	14	24
LHK 44 -11	80	45	5	75	5	40	--	--	51.5	21	55	39.5	14	24
LHK 44 -11 C	80	45	5	75	5	40	38	36	51.5	21	55	39.5	14	24

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

Type	SW	max. tightening torque (Nm)	Ports (ISO 228-1)		
		A	V, F	S	Z
LHK 22 -11	22	30	G 3/8	G 1/8	--
LHK 32 -11	30	160	G 3/8	G 1/4	--
LHK 33(7) -11	30	160	G 1/2	G 1/4	--
LHK 33 -11 C	30	160	G 1/2	G 1/4	G 1/8
LHK 44 -11	36	180	G 3/4	G 1/4	--
LHK 44 -11 C	36	180	G 3/4	G 1/4	G 1/8

LHK 22 -H
LHK 22 -H16



1 With coding **G**: Check valve and throttle screw
With coding **F**: Throttle screw, but no check valve (hole sealed)
2 With coding **U**: no check valve, no throttle screw (tapped plugs instead)
3 Grub screw for valve damping. Throttle effect increases clockwise.
4 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
5 Banjo bolt (360° rotatable housing) can be fitted on both sides
6 Sealing edge ring ERMETO DKA 3/8
The diameter of the sealing edge ring and the reflection are identical.

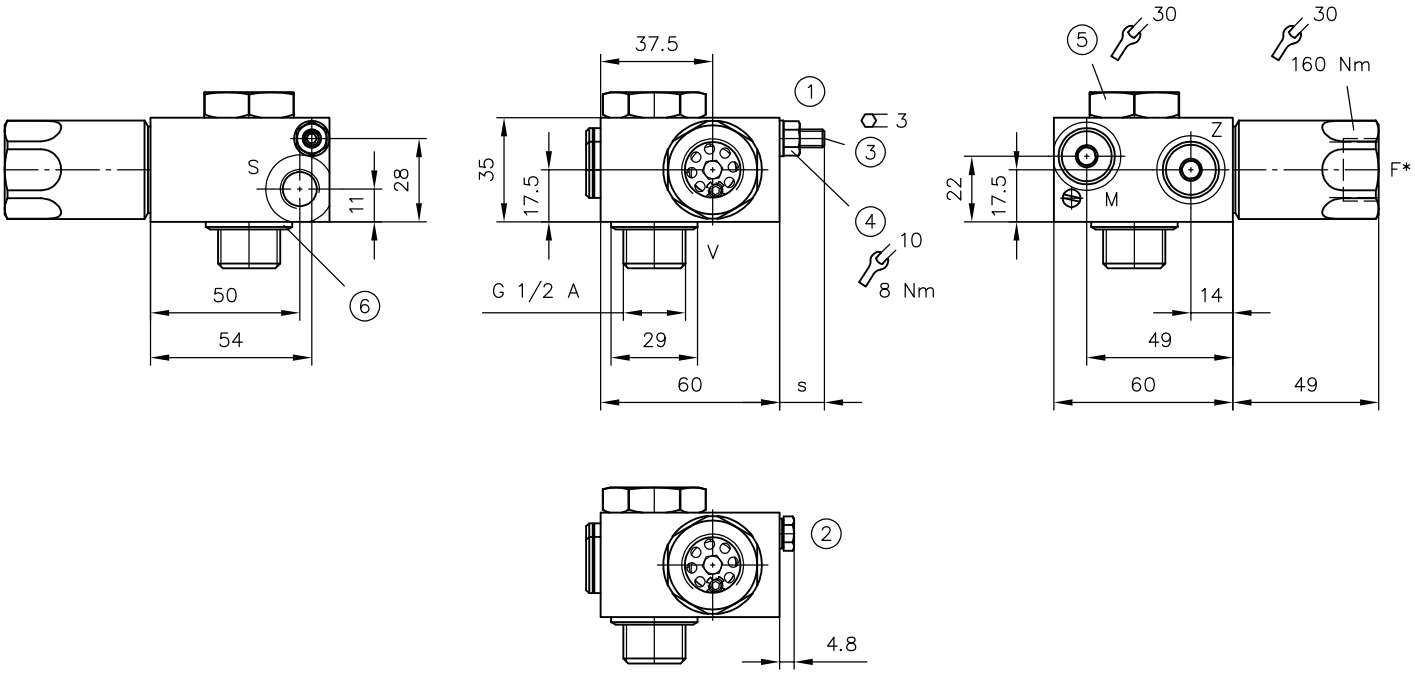
*

NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	G	s		Ports (ISO 228-1)	
		min	max	F	S
LHK 22 -11 H	G 3/8 A	8	17	G 3/8	G 1/4
LHK 22 -11 H16	M16x1.5	8	17	G 3/8	G 1/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK 33 -11 H



1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but no check valve (hole sealed)
2 With coding **U:** no check valve, no throttle screw (tapped plugs instead)
3 Grub screw for valve damping. Throttle effect increases clockwise.
4 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
5 Banjo bolt (360° rotatable housing) can be fitted on both sides
6 Sealing edge ring ERMETO DKA 1/2
The diameter of the sealing edge ring and the reflection are identical.

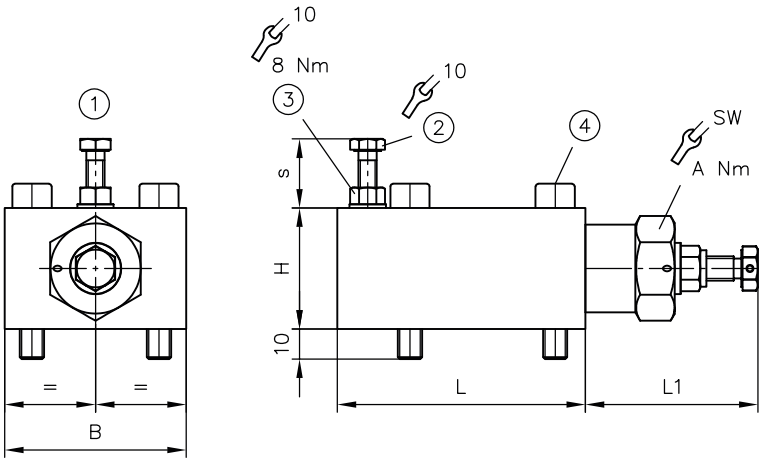
*

NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	s		Ports (ISO 228-1)	
	min	max	F	M, S, Z
LHK 33 -11 H	6	15	G 1/2	G 1/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK .. -11 PV
LHK .. -11 CPV



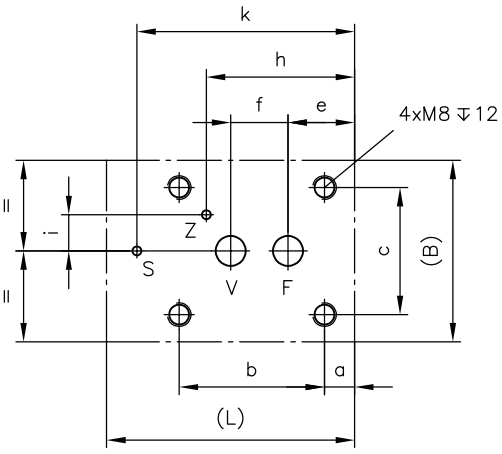
SW = Width across flats

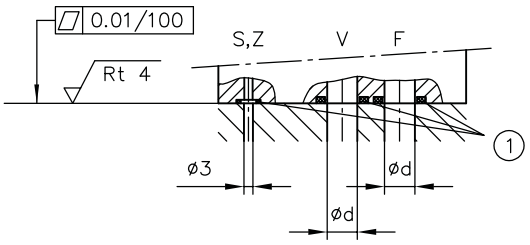
1 With coding **G**: Check valve and throttle screw
With coding **F**: Throttle screw, but no check valve (hole sealed)
2 Hex bolt for valve damping. Throttle effect increases clockwise.
3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
4 Cylinder screws
LHK 30: DIN 912-M8x50-8.8-A2K
LHK 40: DIN 912-M8x60-8.8-A2K

Type	L	L1	B	H	s		SW	max. tightening torque (Nm)
					min	max		A
LHK 30 -11 PV LHK 30 -11 CPV	82	57	60	40	14	24	30	160
LHK 40 -11 PV LHK 40 -11 CPV	80	85	62	50	12	24	36	180

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

Hole pattern of the base plate

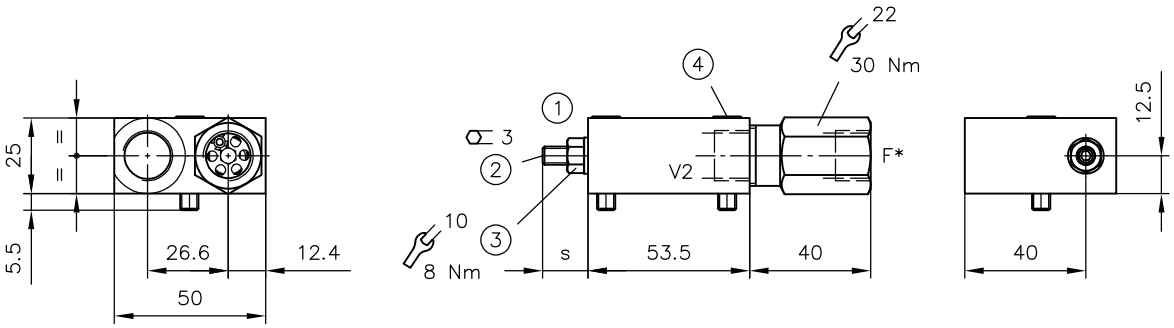




1 O-ring

Type	L	B	a	b	c	e	f	h	i	k	∅d	O-ring NBR 90 Sh	
												F, V	S, Z
LHK 30 -11 PV	82	60	10	48	42	22	19	--	--	72	10	12.37x2.62	4.47x1.78
LHK 30 -11 CPV								49	12				
LHK 40 -11 PV	80	62	17	50	48	28.5	24	--	--	74	14	17.12x2.62	4.47x1.78
LHK 40 -11 CPV								60	15				

LHK 22 G-11 K
LHK 227 G-11 K



1 With coding G: Check valve and throttle screw
2 Hex bolt for valve damping. Throttle effect increases clockwise.
3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
4 Cylinder screws DIN 912-M6x25-8.8-A2K

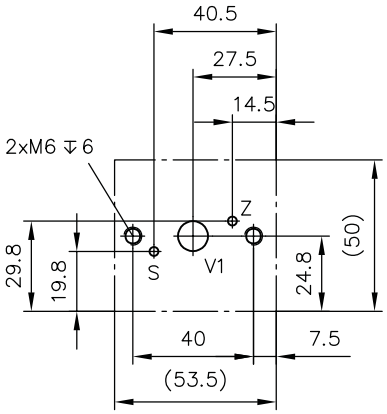
*

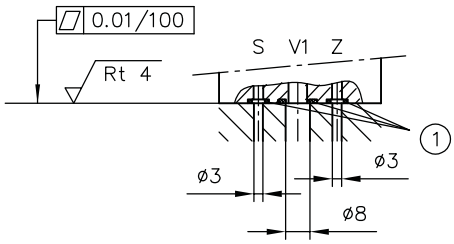
NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	s		Ports (ISO 228-1)
	min	max	F, V2
LHK 22 G-11 K LHK 227 G-11 K	8	17	G 3/8

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

Hole pattern of the base plate

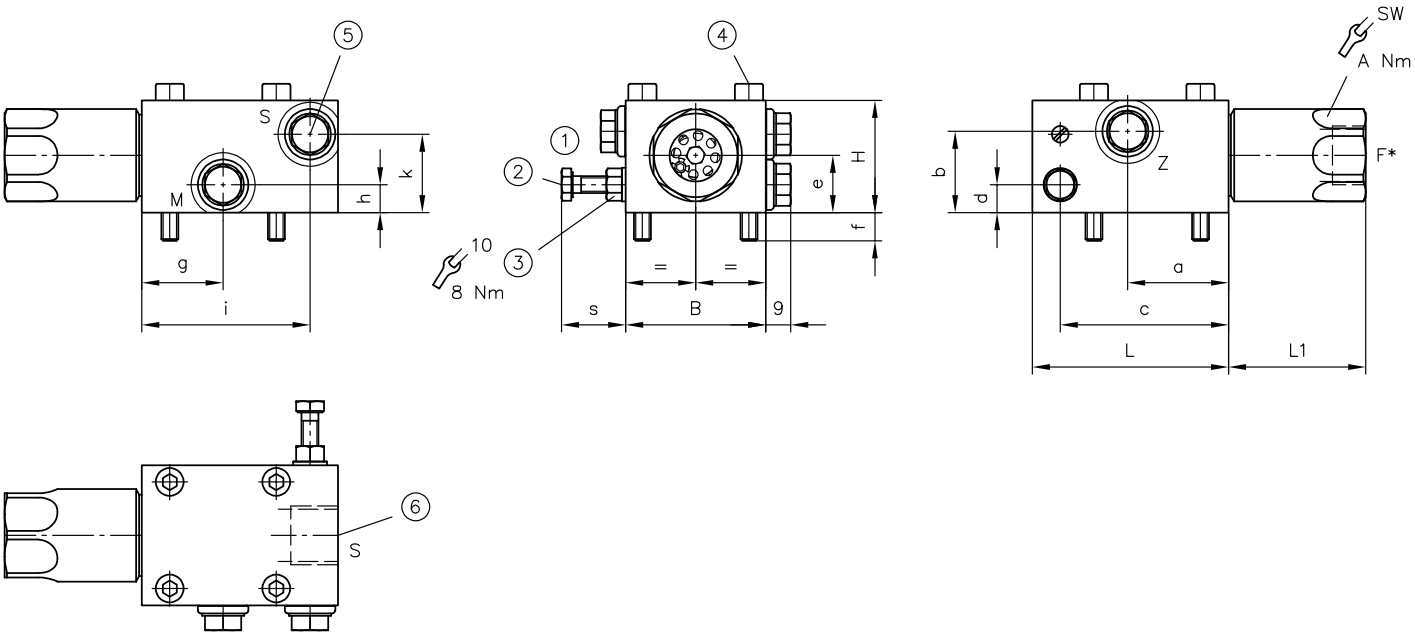




1 O-ring

Type	O-ring NBR 90 Shore	
	V1	S, Z
LHK 22 G-11 K LHK 227 G-11 K	9.25x1.78	3.7x1.78

LHK ... -11 K
LHK ... -11 P



SW = Width across flats

1 With coding **G**: Check valve and throttle screw
With coding **F**: Throttle screw, but no check valve (hole sealed)
2 Grub screw SW3 (LHK 22) or hex bolt SW10 (LHK 33, LHK 44) for valve damping. Throttle effect increases clockwise.
3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
4 Cylinder screws
LHK 22: DIN 912-M6x35-8.8-A2K
LHK 33: DIN 912-M6x50-8.8-A2K
LHK 44: DIN 912-M6x60-8.8-A2K
5 Position of connection S with type LHK 33
6 Position of connection S with type LHK 22 -11 P

*

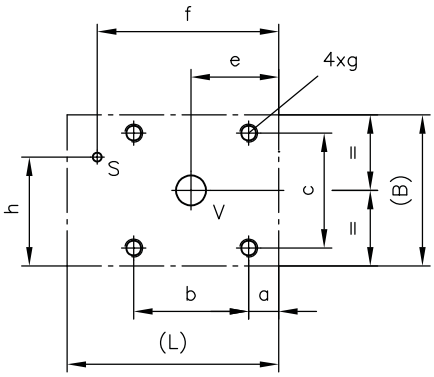
NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

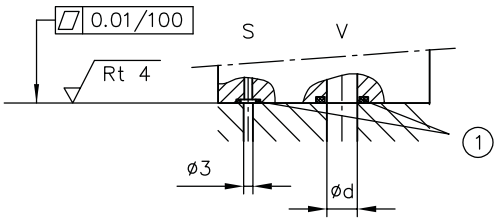
Type	L	L1	B	H	a	b	c	d	e	f	g	h	i	k
LHK 22 -11 P	64	40	40	28	--	--	44.75	14	14	7	--	--	--	--
LHK 33 -11 K LHK 33 -11 P	70	49	50	40	36	29	60	10	20.5	10	29	10	60	28
LHK 44 -11 P	60	90	60	48	--	--	54.5	12	25	12	--	--	--	--

Type	s		SW	max. tightening torque (Nm)	Ports (ISO 228-1)		
	min	max		A	F	S	M, Z
LHK 22 -11 P	8	15	22	30	G 3/8	G 3/8	--
LHK 33 -11 K LHK 33 -11 P	14	24	30	160	G 1/2	G 1/4	G 1/4
LHK 44 -11 P	12	24	36	180	G 3/4	--	--

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

Hole pattern of the base plate

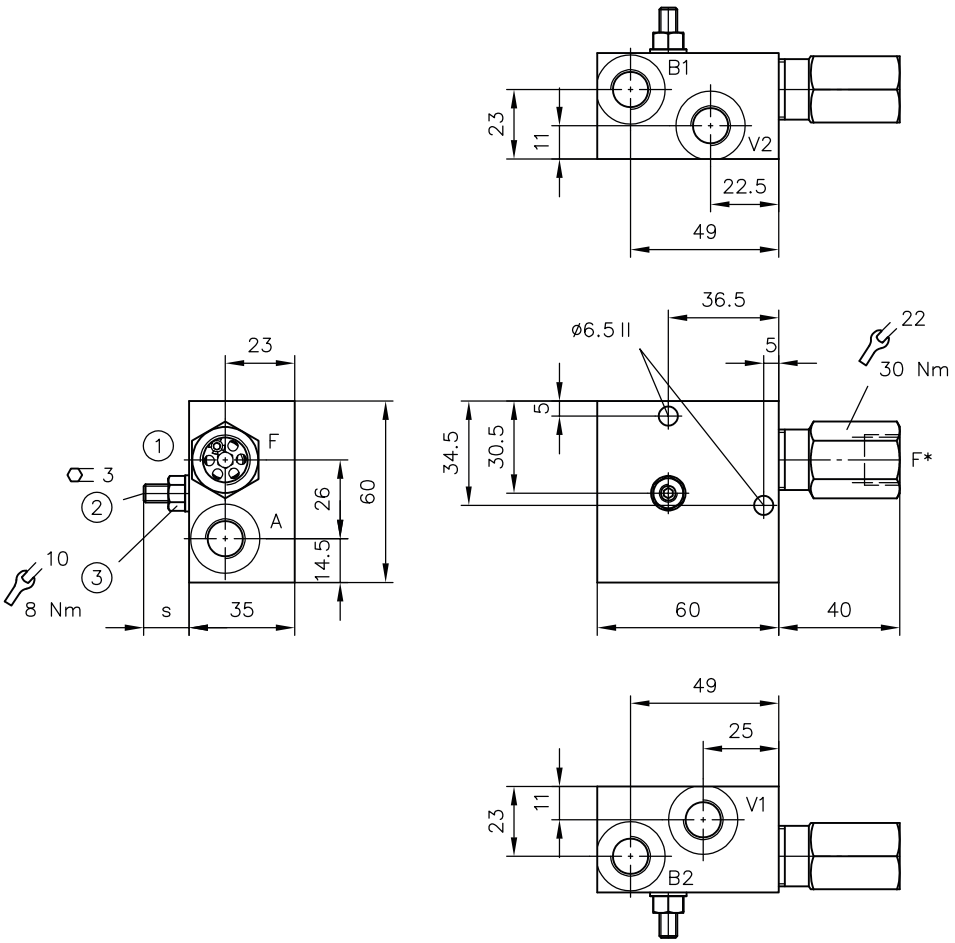




1 O-ring

Type	L	B	a	b	c	e	f	h	g	∅d	O-ring NBR 90 Sh	
											V	S
LHK 22 -11 P	64	40	9.5	28	28	23.5	--	--	M6, 8 deep	8	10.77x2.62	--
LHK 33 -11 K	70	50	10	38	38	29	--	--	M6, 11 deep	10	12.37x2.62	--
LHK 33 -11 P	70	50	10	38	38	29	60	36	M6, 11 deep	10	12.37x2.62	4.47x1.78
LHK 44 -11 P	60	60	18	28	46	33	54.5	30	M8, 14 deep	14	15.55x2.62	4.47x1.78

LHK 21 -14 T
LHK 21 -14 T-3/8



1 With coding **G**: Check valve and throttle screw
2 Hex bolt for valve damping. Throttle effect increases clockwise.
3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,

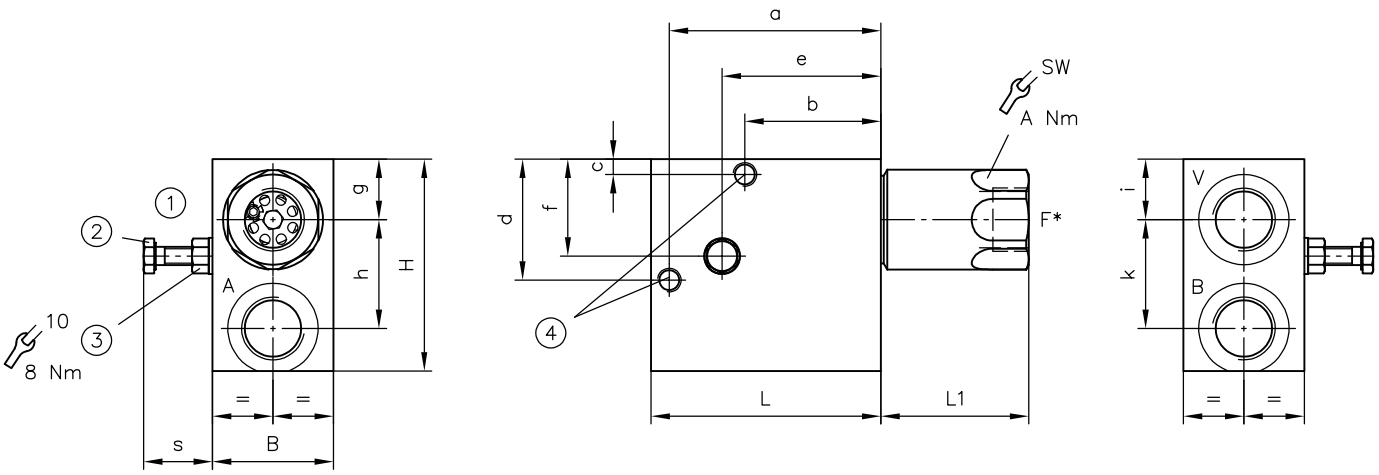
*

NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	s		Ports (ISO 228-1)	
	min	max	F	A, B1, B2, V1, V2
LHK 21 -14 T	12	17	G 1/4	G 1/4
LHK 21 -14 T-3/8	12	17	G 3/8	G 1/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK 21 -14, LHK 33 -14
LHK 43 -14, LHK 44 -14



SW = Width across flats

1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but no check valve (hole sealed)
2 Grub screw SW3 (LHK 22) or hex bolt SW10 (LHK 33, LHK 43(44)) for valve damping. Throttle effect increases clockwise.
3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
4 M8, 10 deep on both sides, ∅6.8 through; for type LHK 21, only ∅6.5 through

*

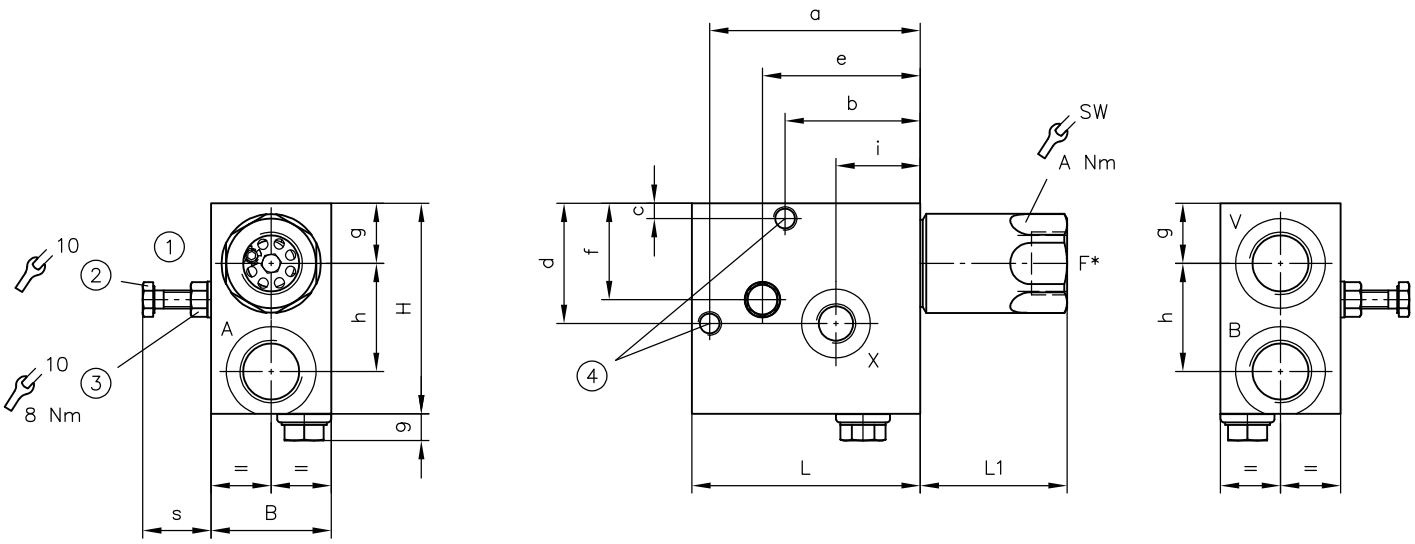
NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	L	L1	B	H	a	b	c	d	e	f	g	h	i	k
LHK 21 -14	57	40	30	50	47	17	28.5	0	35	24.5	15	24.5	11.5	28
LHK 33 -14	76	49	40	70	70	45	5	40	52.5	32	20	36	20	36
LHK 43 -14	80	90	50	80	73	47	6	46	54.5	46	23	40	23	40
LHK 44 -14	80	90	50	85	73	47	8	48	54.5	12	23	44	23	44

Type	s		SW	max. tightening torque (Nm)	Ports (ISO 228-1)	
	min	max		A	A, B	F, V
LHK 21 -14	12	17	22	30	G 1/4	G 1/4
LHK 33 -14	15	24	30	160	G 1/2	G 1/2
LHK 43 -14	14	25	36	180	G 1/2	G 3/4
LHK 44 -14	14	25	36	180	G 3/4	G 3/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK 33 -14 W
LHK 44 -14 W



SW = Width across flats

1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but check valve (hole sealed)

2 Hex bolt for valve damping. Throttle effect increases clockwise.

3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,

4 M8, 10 deep on both sides, ∅6.8 through

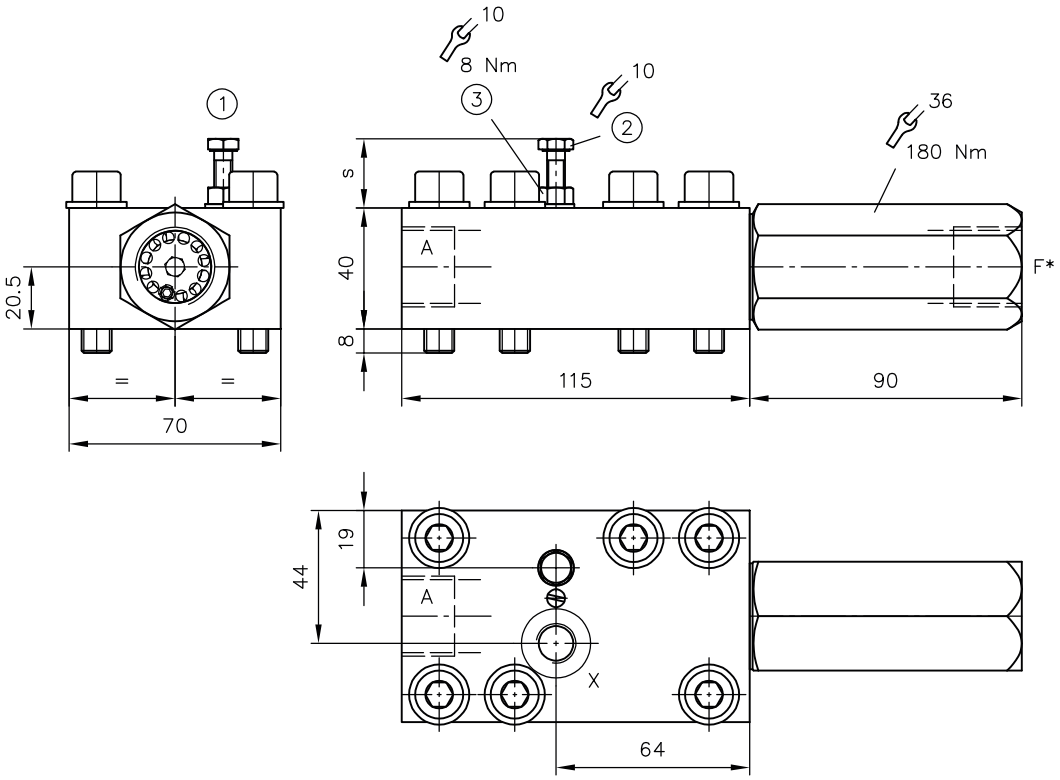
* **NOTICE**
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	L	L1	B	H	a	b	c	d	e	f	g	h	i
LHK 33 -14 W	76	49	40	70	70	45	5	40	52.5	32	20	36	28
LHK 44 -14 W	80	90	50	85	73	47	8	48	54.5	12	23	44	32

Type	s		SW	max. tightening torque (Nm)	Ports (ISO 228-1)	
	min	max		A	A, B, F, V	X
LHK 33 -14 W	15	24	30	160	G 1/2	G 1/4
LHK 44 -14 W	14	25	36	180	G 3/4	G 1/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK 44 -14 W M1C



1 With coding **G**: Check valve and throttle screw

2 Hex bolt for valve damping. Throttle effect increases clockwise.

3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,

*

NOTICE

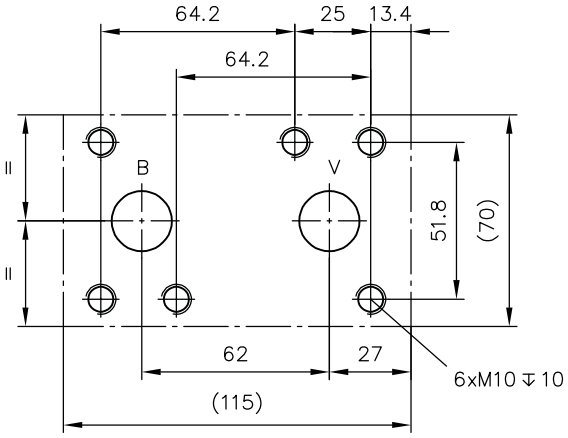
When assembling the connection fittings, hold the hexagonal spring housing in place!

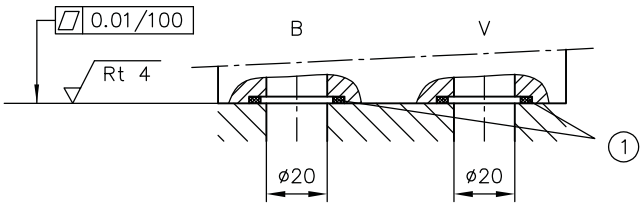
Type	s		Ports (ISO 228-1)	
	min	max	F, A	X
LHK 44 -14 W M1C	14	24	G 3/4	G 1/4

NOTICE

Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

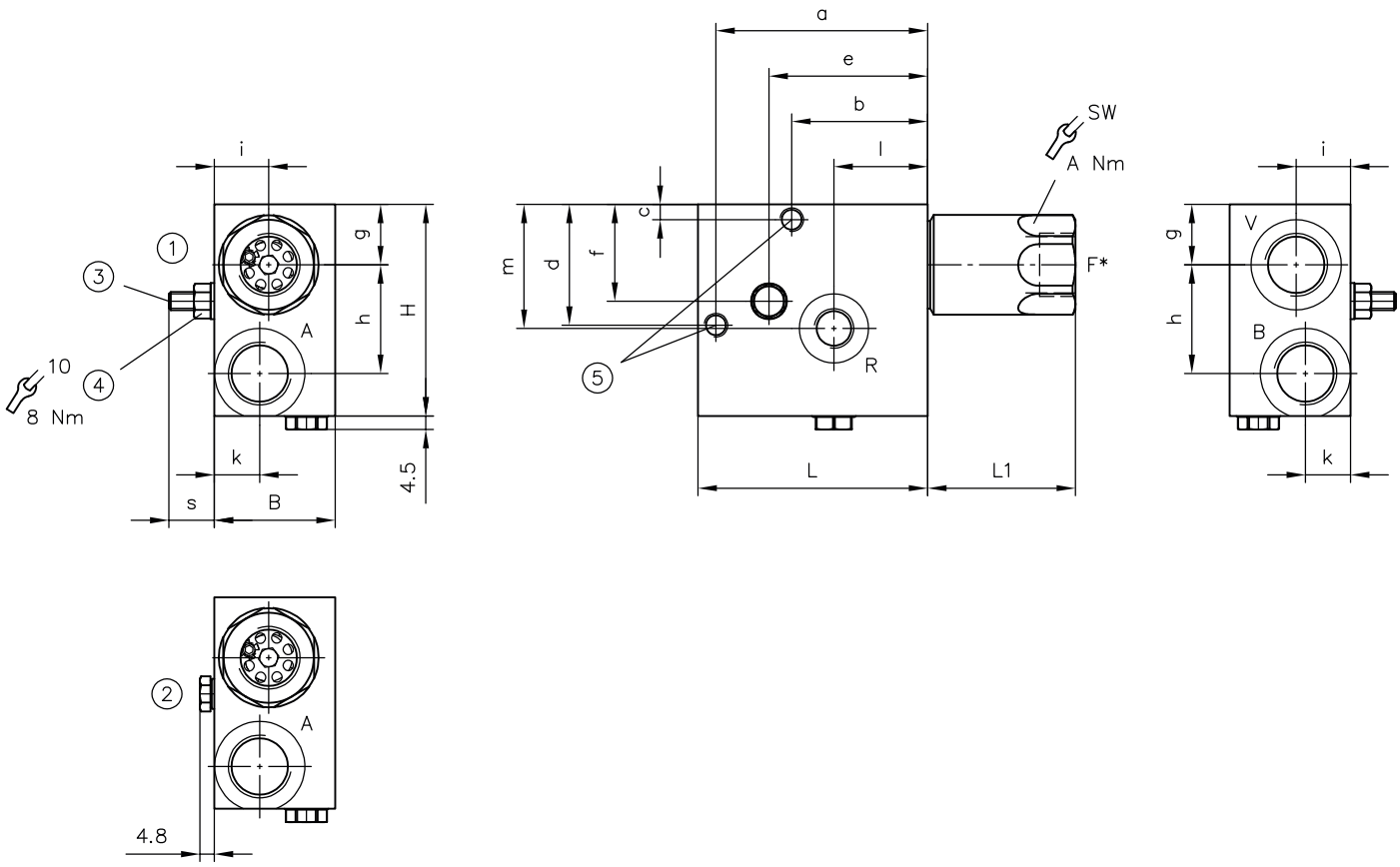
Hole pattern of the base plate





1 O-ring 26.64x2.62 NBR 90 Shore

LHK 33 -15, LHK 33 -15 C
LHK 44 -15, LHK 44 -15 C



SW = Width across flats

1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but no check valve (hole sealed)
2 With coding **U:** no check valve, no throttle screw (tapped plugs instead)
3 Grub screw SW3 (LHK 33) or hex bolt SW10 (LHK 44) for valve damping. Throttle effect increases clockwise.
4 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
5 M8, 10 deep on both sides, ∅6.8 through

*

NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	L	L1	B	H	a	b	c	d	e	f	g	h	i	k
LHK 33 -15 LHK 33 -15 C	76	49	40	70	70	45	5	40	52.5	32	20	36	18	15
LHK 44 -15 LHK 44 -15 C	80	90	50	85	73	47	8	48	54.5	12	23	44	25	25

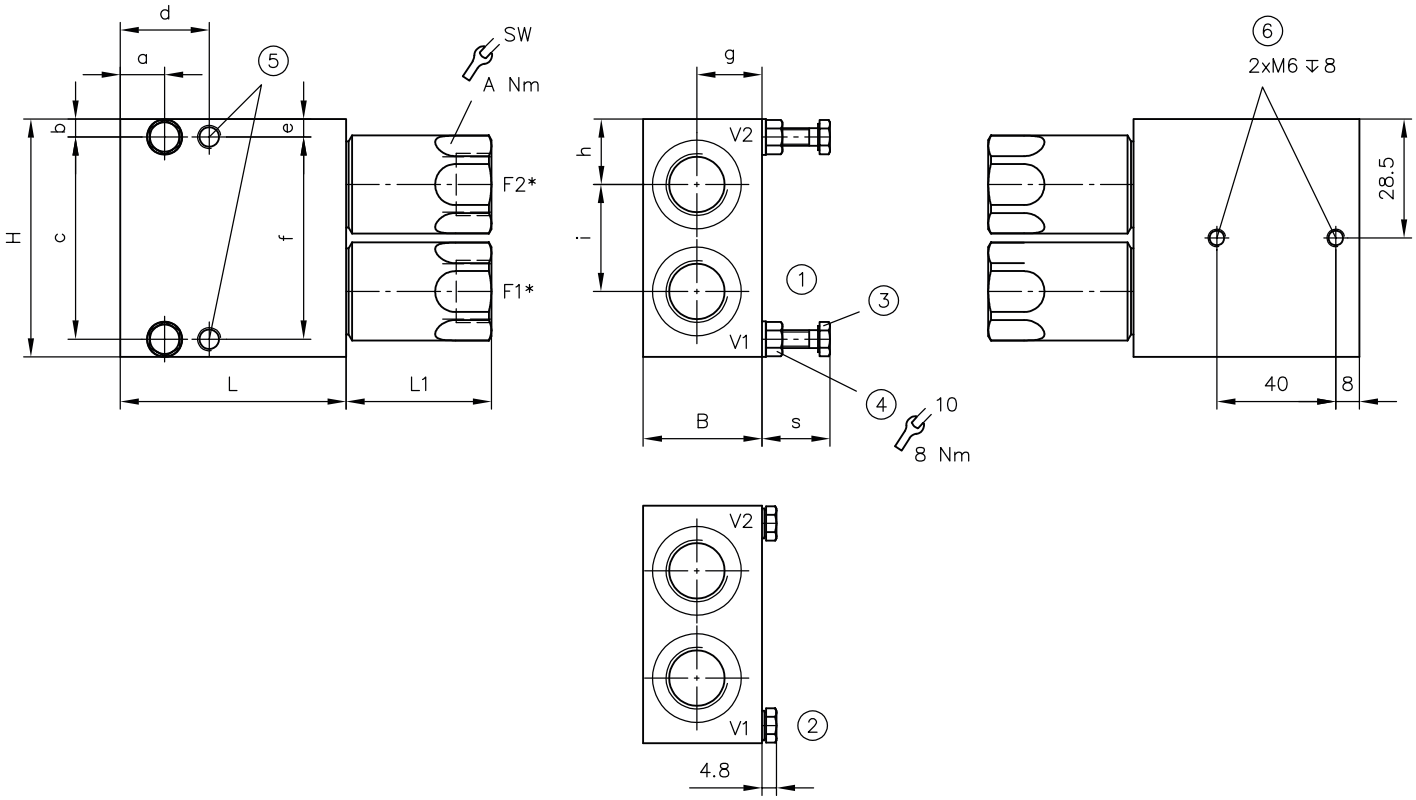
Type	l	m	s		SW	max. tightening torque (Nm)	Ports (ISO 228-1)	
			min	max		A	A, B, F, V	R
LHK 33 -15 LHK 33 -15 C	31	41	13	22	30	160	G 1/2	G 1/4
LHK 44 -15 LHK 44 -15 C	37.5	53.5	19	28	36	180	G 3/4	G 1/4

NOTICE

Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

4.2 Valves for load direction change

LHK 22 -21, LHK 33 -21, LHK 44 -21



SW = Width across flats

1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but no check valve (hole sealed)
2 With coding **U:** no check valve, no throttle screw (tapped plugs instead)
3 Grub screw SW3 (LHK 22) or hex bolt SW10 (LHK 33, LHK 44) for valve damping. Throttle effect increases clockwise.
4 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
5 Type LHK 33 and LHK 44: M8, 10 deep on both sides; core hole ∅6.8 through with type LHK 33
6 only for type LHK 22

*

NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

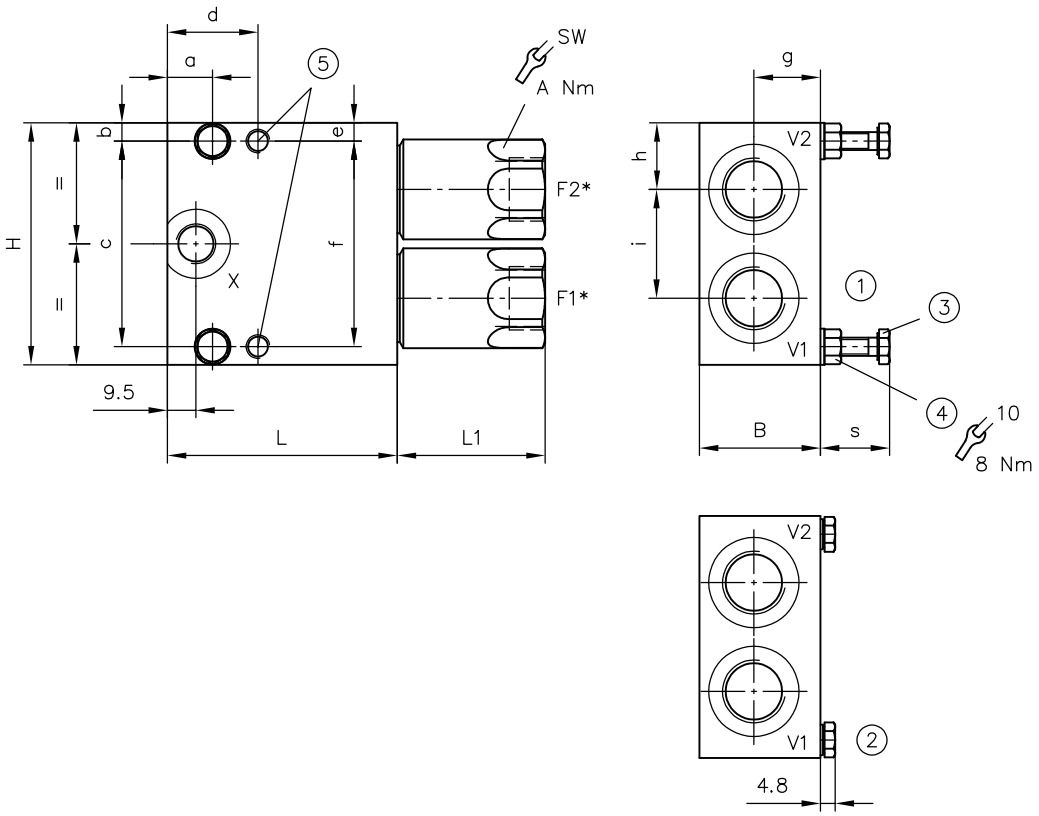
Type	L	L1	B	H	a	b	c	d	e	f	g	h	i
LHK 22 -21	58	40	30	60	21	6	48	--	--	--	16	16	28
LHK 33 -21	76	49	40	80	15	6	68	30	6	68	22	22	36
LHK 44 -21	80	90	50	90	15	5	80	30	7.5	75	25	44	44

Type	s		SW	max. tightening torque (Nm)	Ports (ISO 228-1)
	min	max		A	F1, F2, V1, V2
LHK 22 -21	12	19	22	30	G 3/8
LHK 33 -21	15	25	30	160	G 1/2
LHK 44 -21	14	25	36	180	G 3/4

NOTICE

Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK 33 -21 W
LHK 44 -21 W



SW = Width across flats

1 With coding **G:** Check valve and throttle screw
With coding **F:** Throttle screw, but no check valve (hole sealed)
2 With coding **U:** no check valve, no throttle screw (tapped plugs instead)
3 Grub screw SW3 (LHK 22) or hex bolt SW10 (LHK 33, LHK 44) for valve damping. Throttle effect increases clockwise.
4 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
5 Type LHK 33 and LHK 44: M8, 10 deep on both sides; core hole ∅6.8 through with type LHK 33

*

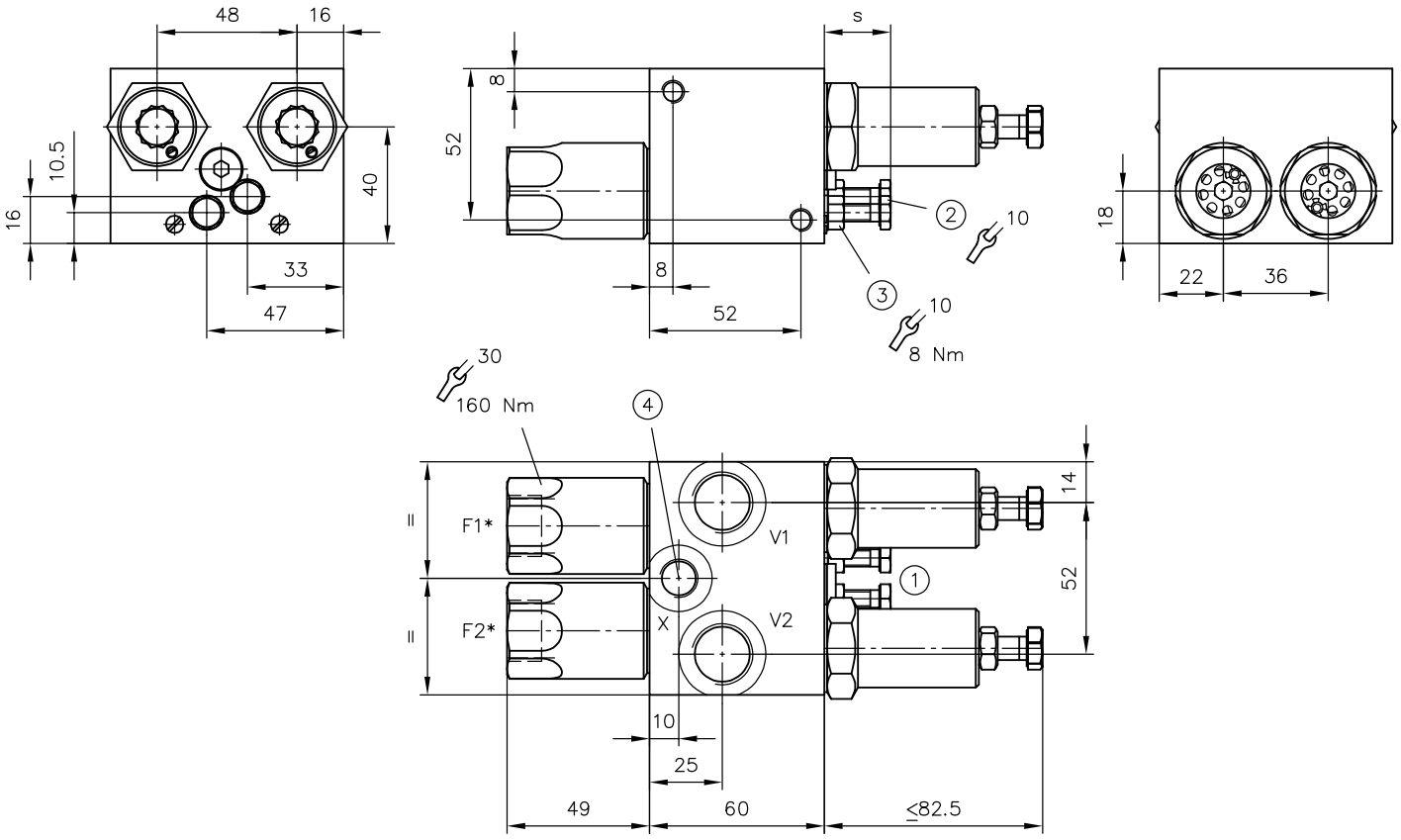
NOTICE
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	L	L1	B	H	a	b	c	d	e	f	g	h	i
LHK 33 -21 W	76	49	40	80	15	6	68	30	6	68	22	22	36
LHK 44 -21 W	80	90	50	90	15	5	80	30	7.5	75	25	23	44

Type	s		SW	max. tightening torque (Nm)	Ports (ISO 228-1)	
	min	max		A	F1, F2, V1, V2	X
LHK 33 -21 W	15	25	30	160	G 1/2	G 1/4
LHK 44 -21 W	14	25	36	180	G 3/4	G 1/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

LHK 33 -25
LHK 33 -25 W
LHK 33 -25 WD



1 With coding **G**: Check valve and throttle screw
2 Hex bolt for valve damping. Throttle effect increases clockwise.
3 Loosen the lock nut (seal-lock nut) sufficiently before adjusting the hex bolt, in order to prevent the thread from damaging the vulcanised sealing ring,
4 only for type LHK 33 -25 W(WD)

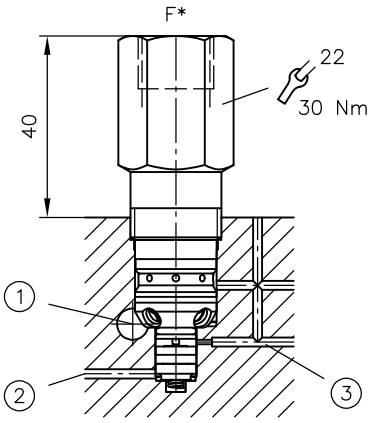
* **NOTICE**
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	s		Ports (ISO 228-1)	
	min	max	F1, F2, V1, V2	X
LHK 33 -25 LHK 33 -25 W LHK 33 -25 WD	20	31	G 1/2	G 1/4

NOTICE
Do not unscrew the thread type throttle beyond S_{max}. Due to the design, it cannot be secured inside the device!

4.3 Load-holding valve inserts

LHK 21, LHK 22

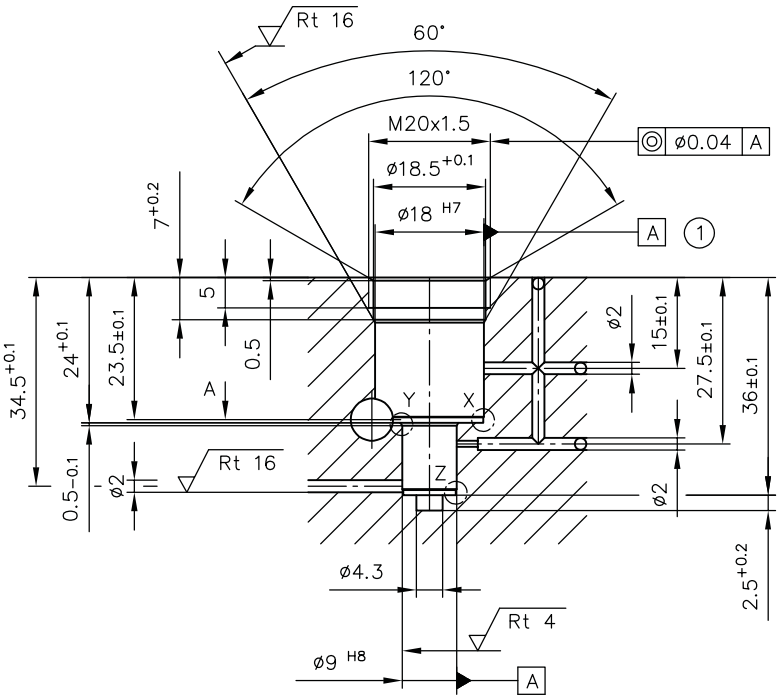


1 Consumer port V
2 Control port S
3 Connecting hole Y

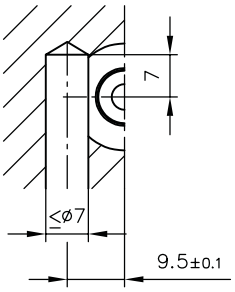
* **NOTICE**
When assembling the connection fittings, hold the hexagonal spring housing in place!

Type	Ports (ISO 228-1)
	F
LHK 21	G 1/4
LHK 22	G 3/8

Mounting hole

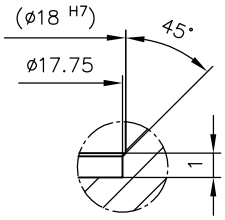


Partial cut **A**

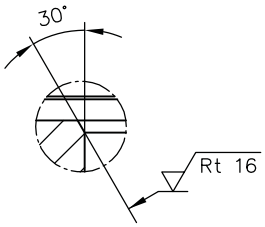


1 Do not damage the fit due to the thread!

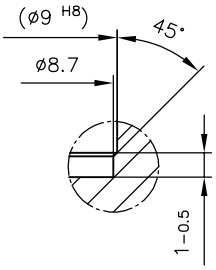
Detail for **X**



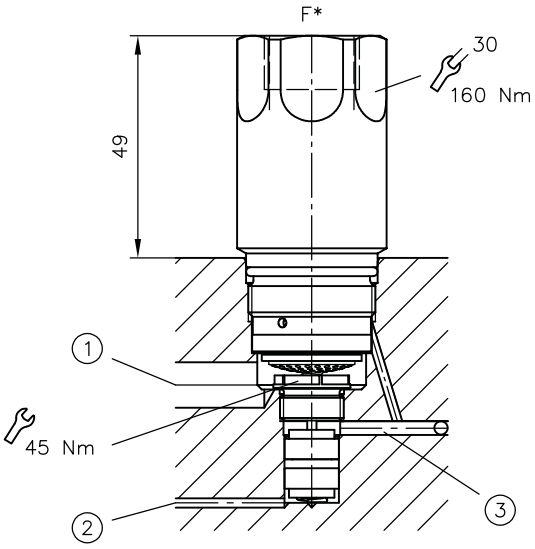
Detail for **Y**



Detail for **Z**



LHK 32, LHK 33

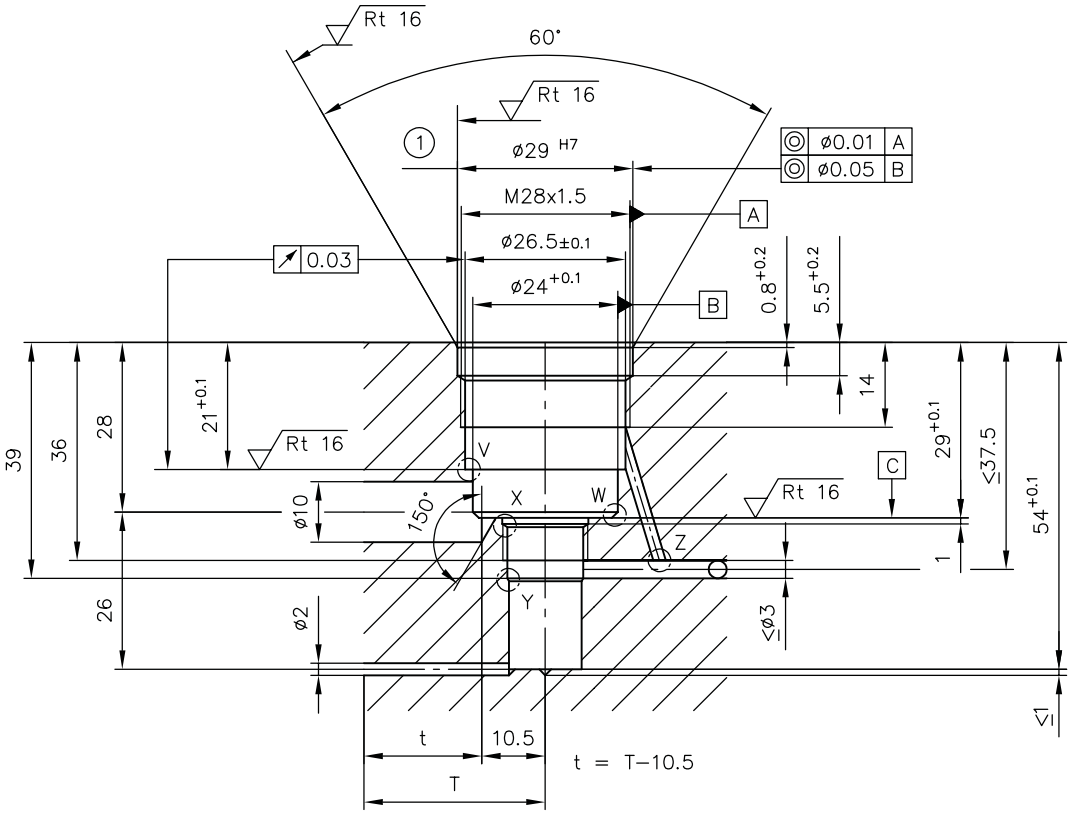


1 Consumer port V
2 Control port S
3 Connecting hole Y must meet the surface line between the specified depths.

* **NOTICE**
When assembling the connection fittings, hold the hexagonal spring housing in place!

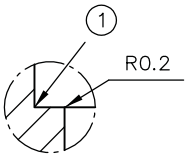
Type	Ports (ISO 228-1)
	F
LHK 32	G 3/8
LHK 33	G 1/2

Mounting hole



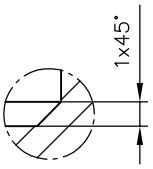
1 Reaming depth 5

Detail for **V**

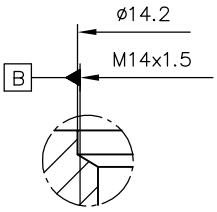


1 sharp-edged

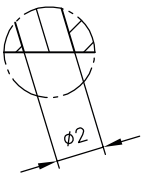
Detail for **W**



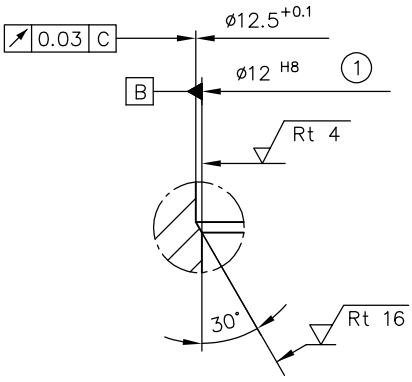
Detail for **X**



Detail for **Z**

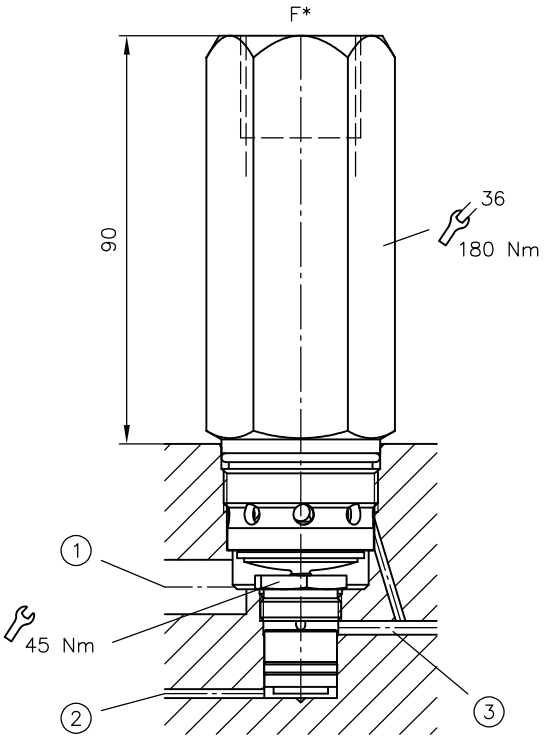


Detail for **Y**



1 Reaming depth 53-0.5

LHK 44

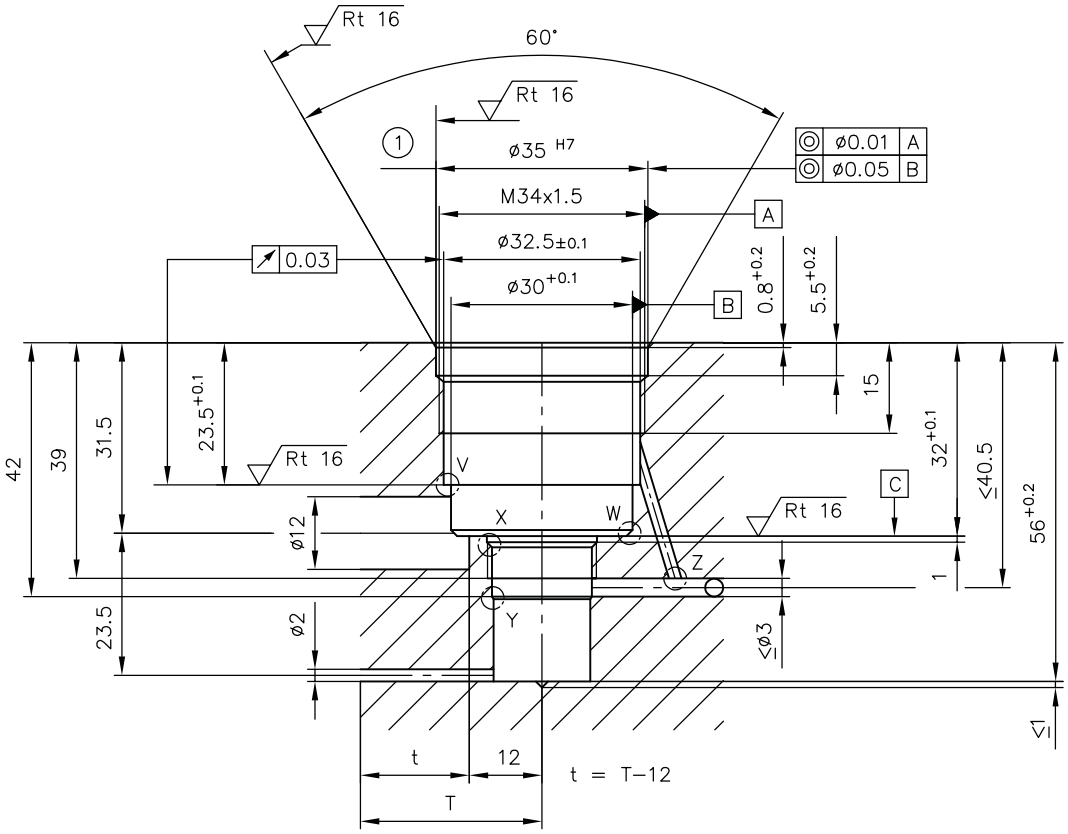


1 Consumer port V
2 Control port S
3 Connecting hole Y must meet the surface line between the specified depths.

* **NOTICE**
When assembling the connection fittings, hold the hexagonal spring housing in place!

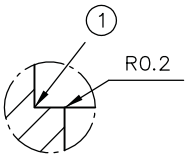
	Port (ISO 228-1)
F	G 3/4

Mounting hole



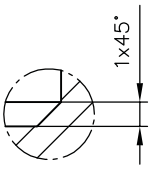
1 Reaming depth 5

Detail for **V**

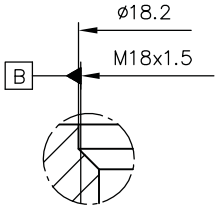


1 sharp-edged

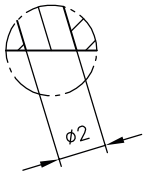
Detail for **W**



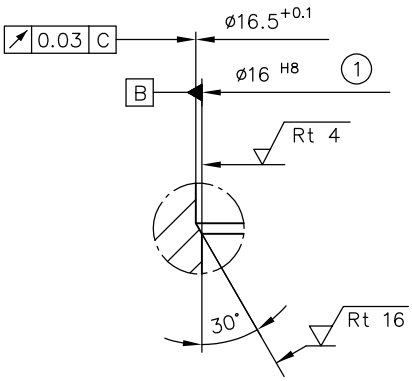
Detail for **X**



Detail for **Z**

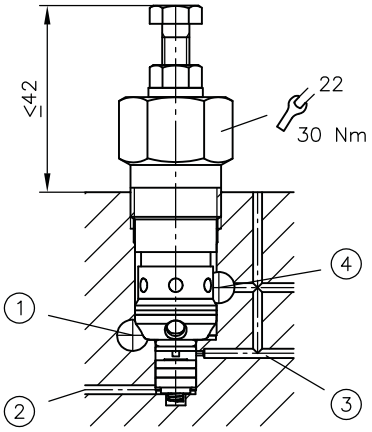


Detail for **Y**



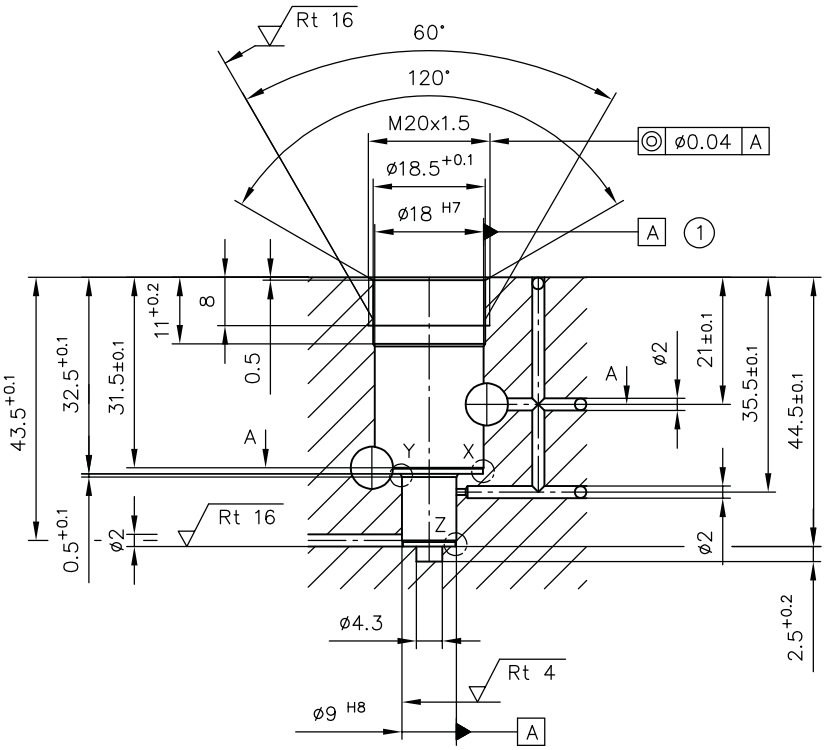
1 Reaming depth 55

LHK 20 V

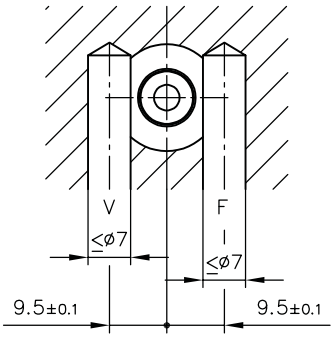


1 Consumer port V
2 Control port S
3 Connecting hole Y
4 Consumer port F

Mounting hole

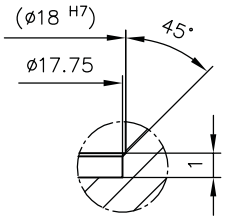


Partial cut **A**

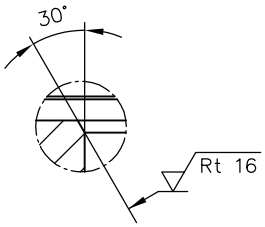


1 Do not damage the fit due to the thread!

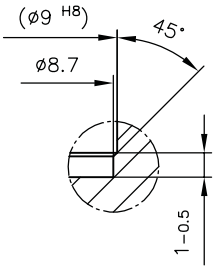
Detail for **X**



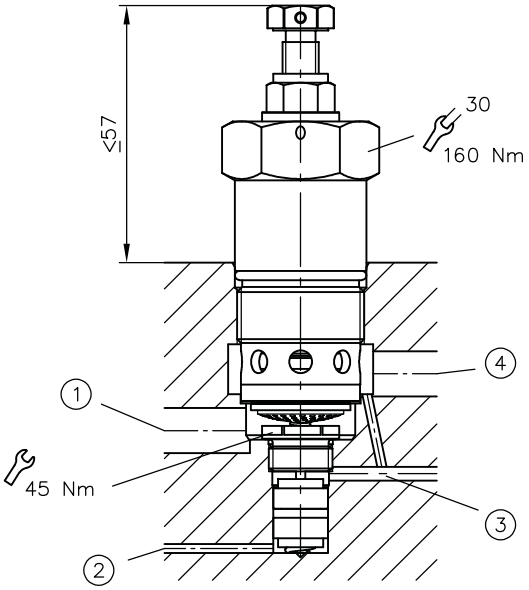
Detail for **Y**



Detail for **Z**

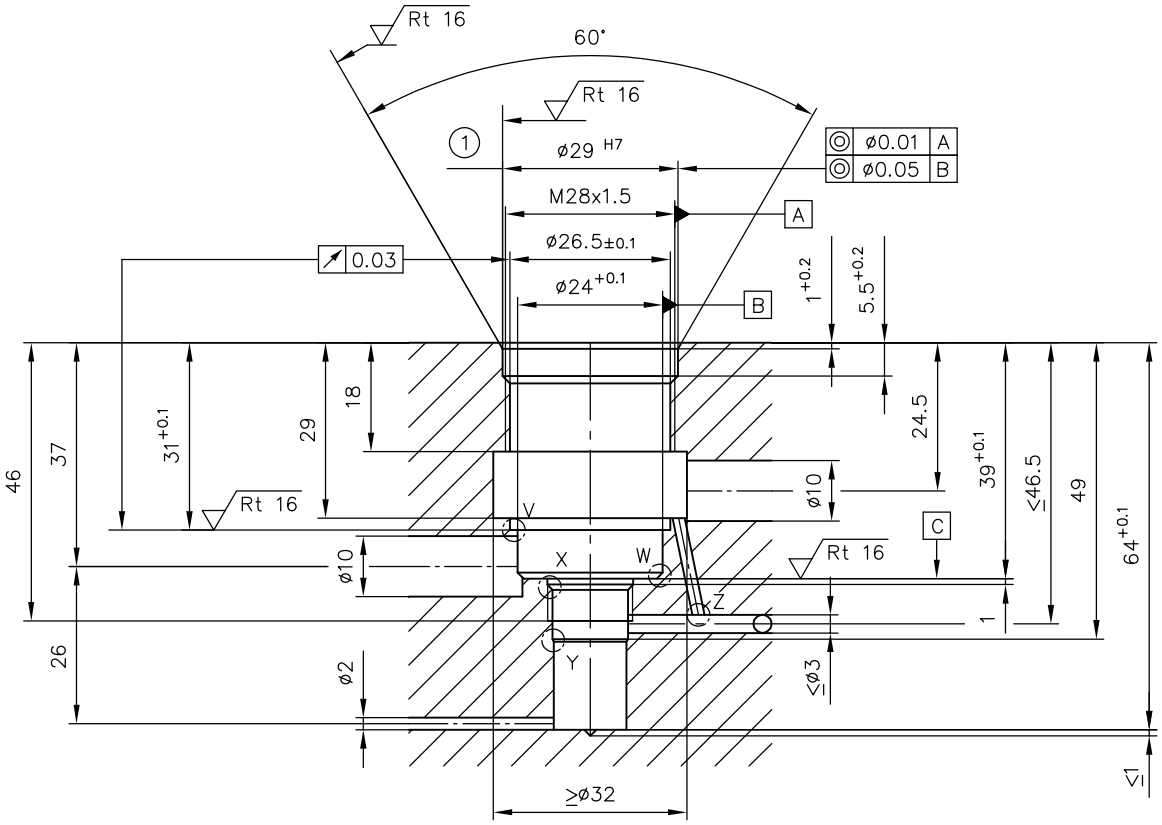


LHK 30 V



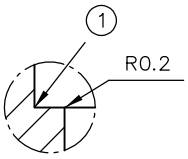
1 Consumer port V
2 Control port S
3 Connecting hole Y
4 Consumer port F

Mounting hole



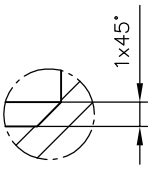
1 Reaming depth 5

Detail for **V**

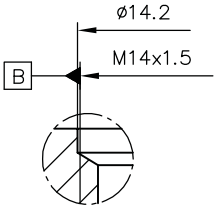


1 sharp-edged

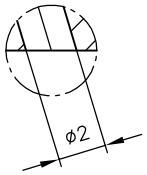
Detail for **W**



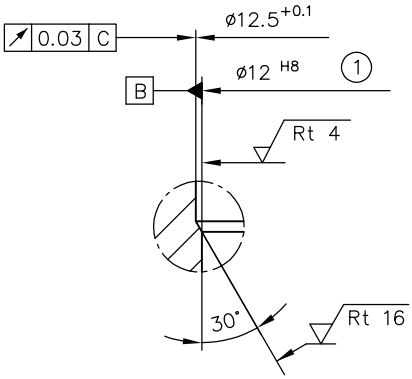
Detail for **X**



Detail for **Z**

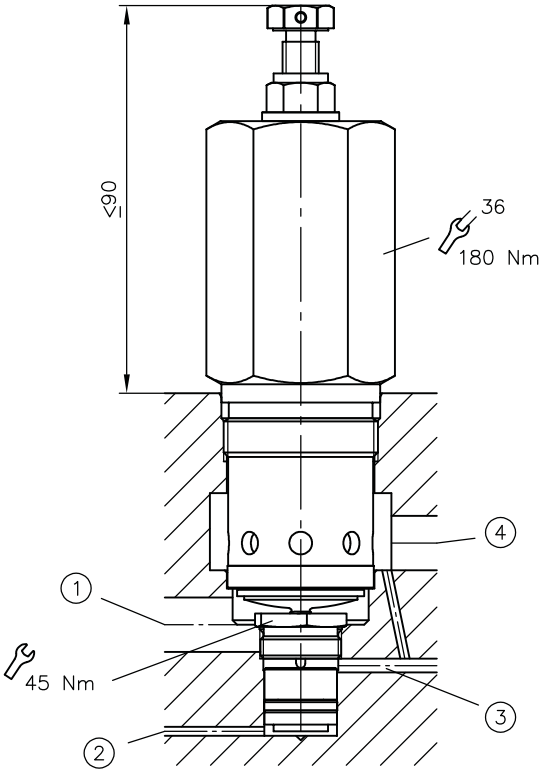


Detail for **Y**



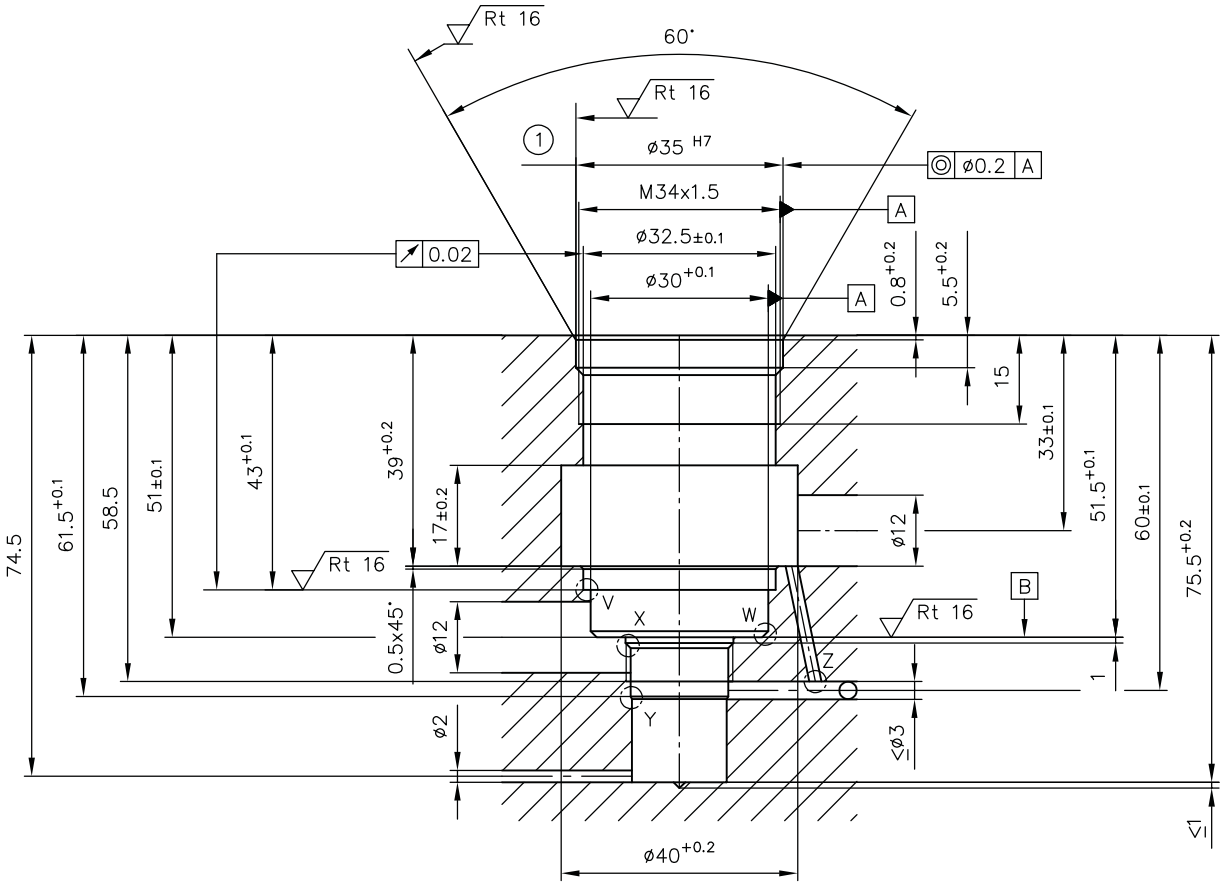
1 Reaming depth 63

LHK 40 V



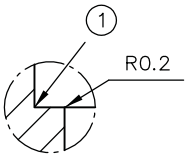
1 Consumer port V
2 Control port S
3 Connecting hole
4 Consumer port F

Mounting hole

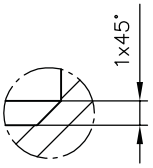


1 Reaming depth 5

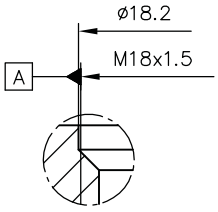
Detail for **V**



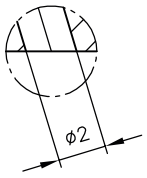
Detail for **W**



Detail for **X**

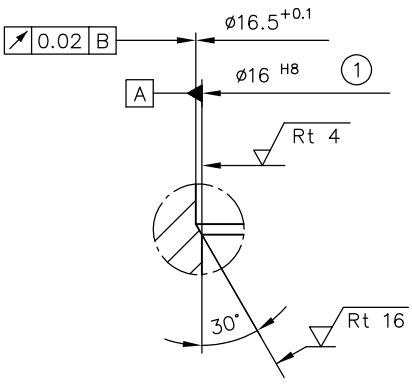


Detail for **Z**



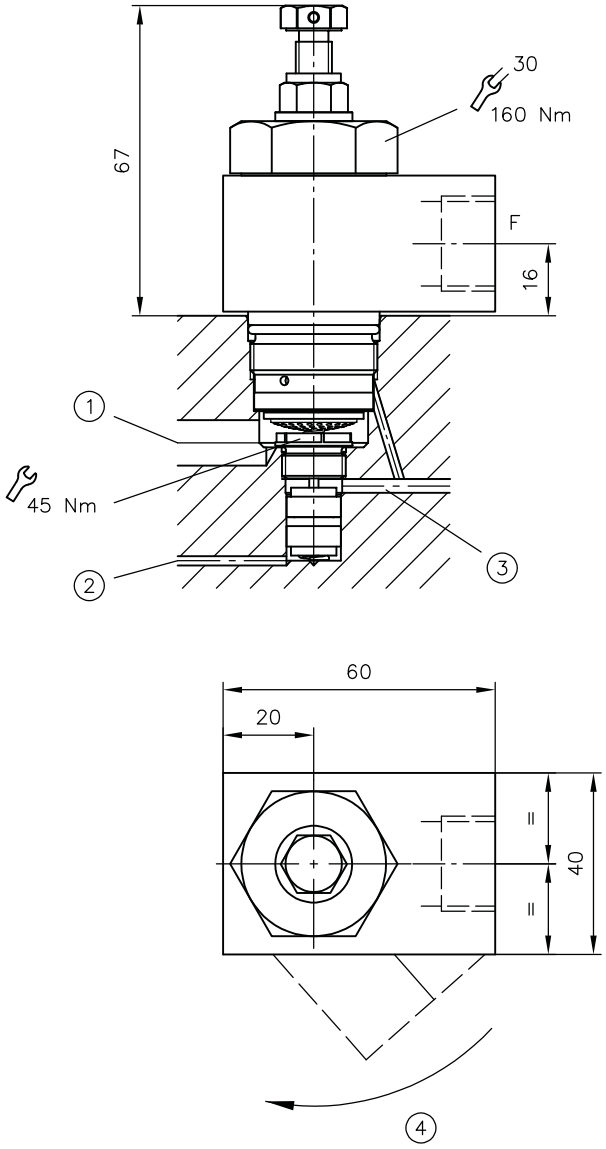
1 sharp-edged

Detail for **Y**



1 Reaming depth 74.5

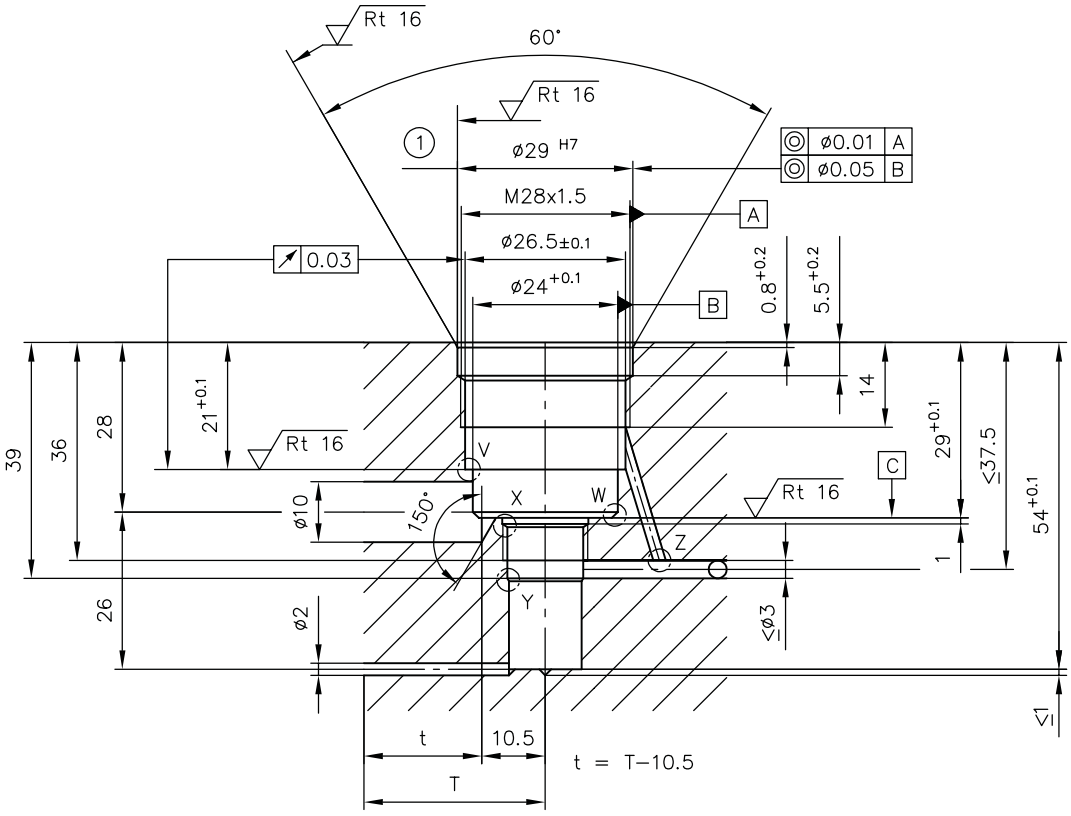
LHK 33 S



1 Consumer port V
2 Control port S
3 Connecting hole Y
4 can be swivelled 360° (cannot be used for combination with double-valve housings -21... and -25..., as the swivel part dimensions are too large)

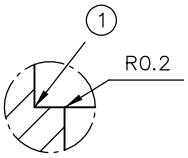
	Port (ISO 228-1
F	G 1/2

Mounting hole



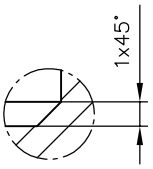
1 Reaming depth 5

Detail for **V**

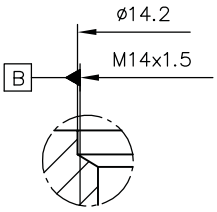


1 sharp-edged

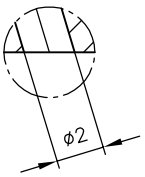
Detail for **W**



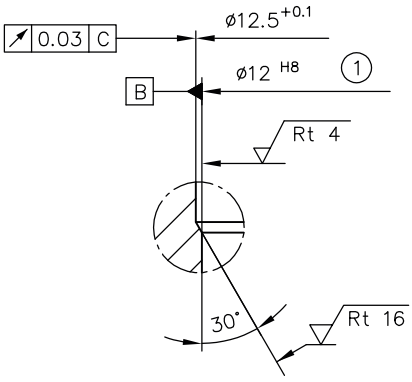
Detail for **X**



Detail for **Z**



Detail for **Y**



1 Reaming depth 53-0.5

5 Installation, operation and maintenance information

Observe the document B 5488 “General operating instructions for assembly, commissioning, and maintenance.”

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ► All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ► The product must only be assembled and put into operation by specialist personnel.
- ► The product must only be operated within the specified technical parameters described in detail in this document.
- ► All components must be suitable for the operating conditions when using an assembly.
- ► The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
   ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).

⚠ **DANGER**

Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

- ► Depressurise the hydraulic system.
- ► Perform safety measures in preparation for maintenance.

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTICE

- ► Read the documentation carefully before usage.
- ► The documentation must be accessible to the operating and maintenance staff at all times.
- ► Keep documentation up to date after every addition or update.

⚠ **DANGER**

Risk of serious injury or death.

Protect load-holding valves from external influences and forces, otherwise the fastening screws or spring housing may come loose. This can cause the load to drop suddenly.

⚠ WARNING

Overloading components due to incorrect pressure settings.

Risk of serious injury or death.

- Pay attention to the maximum operating pressure of the pump and the valves.
- Only trained personnel are permitted to set and change the pressure and they must always monitor the pressure gauge when doing so.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.

Damage to the product is possible.

- ► Filter new hydraulic fluid to a high quality when filling.
- ► Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 oil recommendations

5.4 Maintenance information

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

6 Other information

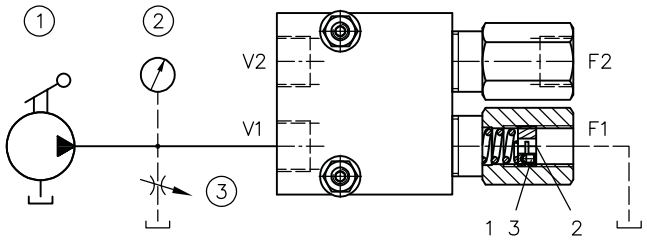
6.1 Pressure setting

WARNING

Overloading components due to incorrect pressure settings.

Risk of serious injury or death.

- Pay attention to the maximum operating pressure of the pump and the valves.
- Only trained personnel are permitted to set and change the pressure and they must always monitor the pressure gauge when doing so.



1 Hand-pump test bench
2 Pressure gauge
3 Bypass throttle valve required in the case of a motor pump test bench!
Set pump to idle circulation via opened throttle valve, then slowly close throttle valve until the load-holding valve just barely responds (avoid larger flow rates, as the valve will otherwise squeak).

Setting the pressure:

1. Undo the headless screw (anti-adjustment guard of **2**)
2. Adjust the washer with hex wrench
   = pressure increases
   = pressure drops
3. After making the setting:
   Re-tighten the headless screw **1**

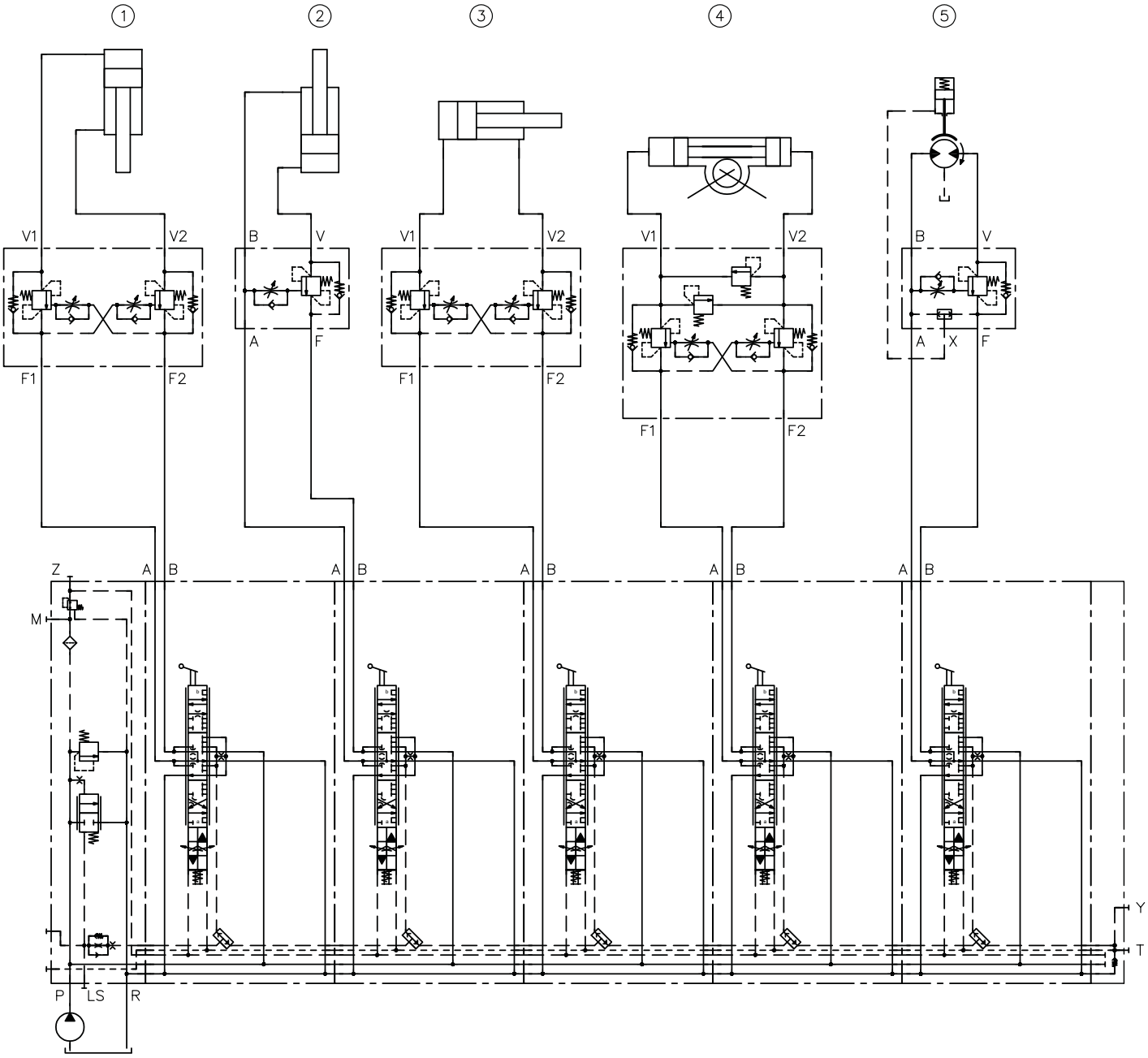
The specified pressure change values per revolution or per millimetre of adjustment travel at the washer in port F (F1 and F2) are only rough indicative values for approximately finding the desired operating pressure.

Type	Pressure p_{max} (bar)	Pressure change approx.	
		per revolution (bar/rev)	per mm of travel (bar/mm)
LHK 20	200	18	18
LHK 21	200	55	45
LHK 22	200	24	18
	400	100	75
LHK 30	130	22	17
	320	24	19
	360	30	24
LHK 32	130	46	36
	320	62	46
LHK 33 LHK 337	130	63	36
	320	85	46
	360	87	48
LHK 40	130	31	25
	350	47	38
LHK 43 LHK 44	160	45	25
	350	70	38

Type	Pressure p_{max} (bar)	Pressure change approx.	
		per revolution (bar/rev)	per mm of travel (bar/mm)
LHK 447	200	72	40
	400	112	60

6.2 Circuit examples

Simplified, typical crane control



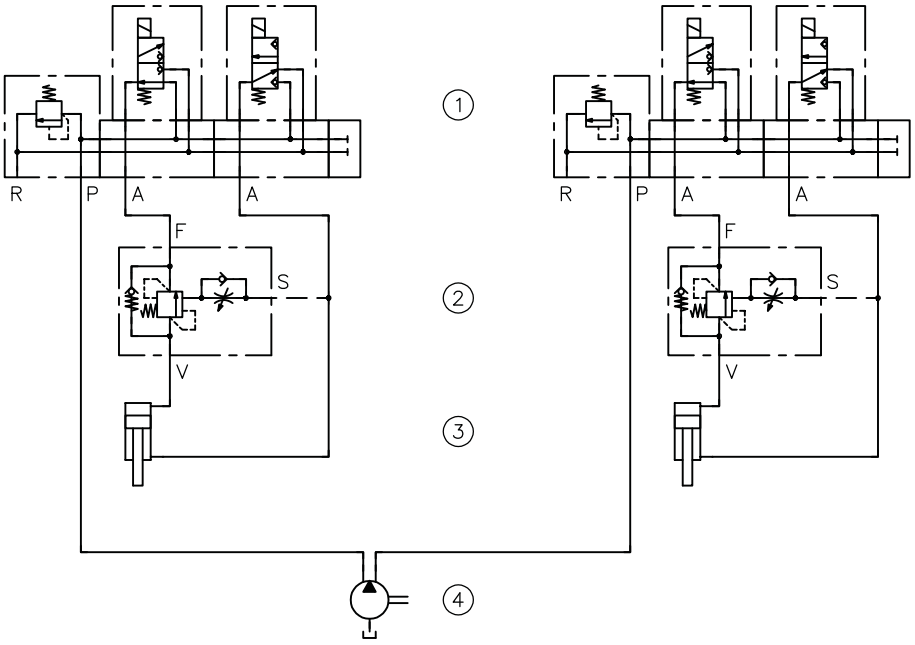
PSL 41/200 - 3	-31 0 40/25 / EA -31 0 63/40 / EA -31 0 25/16 / EA -31 0 16/16 / EA -31 0 63/63 / EA -E4 - G 24

1 Support cylinder
2 Lifting cylinder
3 Extension cylinder
4 Slewing gear
5 Winch

Proportional directional spool valve type PSL as per D 7700-3

Synchronous system

The load only acts in one direction. The lifting takes place simultaneously by means of the two sub-delivery flow streams of the pump; the lowering takes place against the load-holding valves, whereby the synchronization is again achieved via the continuous delivery of the subflows.



1 Valve banks e.g. type VB as per D 7300 and D 7302 or type BWH as per D 7470 A/1 and D 7470 B/1

2 Load-holding valves
e.g. LHK 33 G-11-... compensates for load differences during lowering to such an extent that the pump always encounters counter-pressure and the two subflows can fill the annular chambers evenly.

3 Lifting equipment with double-acting cylinders

4 Dual-circuit pump with two sub-delivery flow streams of equal size as per D 6010 D

Synchronous control systems in the version shown here are only a sensible choice if the demands on accuracy are not too high, and if disturbances in the synchronisation of the two delivery flow streams (e.g. incorrect switching of a solenoid valve, failure of a pump element due to contamination, etc.) are detected and the possible misalignment until switch-off does not result in danger to operating personnel and/or the system. Even during undisturbed operation, the synchronisation accuracy is influenced by factors such as the volume elasticity of the oil, the lines (especially hose lines = hose expansion), etc., depending on the load distribution. There is therefore basically no factory guarantee on the synchronization function of such systems.

6.3 Notes on directional spool valve control systems

If multiple directional spool valves are arranged in the hydraulic circuit (directional spool valve banks), then any time any consumer is actuated, oil from the pressurised P gallery can leak into the consumer outputs of non-actuated spools. Pressure can gradually build up in the connected load lines (“leakage oil pressure”) which is ultimately sufficient to release the LHK valve, meaning that the cylinder begins to creep. For this reason, valve banks connected in series (e.g. type SKH as per D 7230) cannot generally be combined with load-holding valves. In practice, only spools in a parallel circuit are usually used for such control systems. In this configuration, any leakage oil pressure at the consumer ports of the individual spool will be far less pronounced and will depend mainly on the fitting tolerance and the overlap length; additionally, since the leakage oil migrates to the return outlet, this pressure is usually not sufficient to release the load-holding valve on account of its high setting. Furthermore, the practice has been introduced of installing consumer ports with a throttle relief or a direct connection to the return duct instead of completely blocked consumer ports in the neutral position, so that any leakage oil that has migrated is immediately drained away and does not reach the control line of the load-holding valve; see Chapter 6.2, "Circuit examples" with proportional directional valve type PSL as per D 7700 ff. At the same time, the closing movement of the load-holding valve will not be hindered as a result of this when the directional spool valve is quickly returned to the neutral position, since the oil from the control chamber does not need to be pushed back against the slide leakage gap.

References

Additional versions

- Load-holding valve type OSCA-D: D 7920 D
- Load-holding valve type LHT: D 7918
- Load-holding valve type LHDV: D 7770
- Load-holding valve type CLHV: D 7918-VI-C
- Load-holding valve type CLHV: D 7918-VI-PIB

D 7100 02-2025-1.0

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