Pressure-reducing valve type CDK

Product documentation

Screw-in valve

Operating pressure p_{max}:	500 bar
Flow rate Q_{max}:	22 lpm

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HAWE HYDRAULIK

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Contents

1 Overview pressure control valve type CDK

Pressure reducing valves are a type of pressure control valve. They maintain a largely constant outlet pressure even at a variable (higher) inlet pressure.
Valve type CDK is a screw-in valve, and can be used in control blocks. The bore-holes required for mounting are easy to create. All versions oil-tight when closed.

Screw-in valve

Version with connection block for direct pipe connection

Features and benefits:

- Zero leakage in closed state

Intended applications:

- General hydraulic systems
- Jigs
- Test benches

Design:

- Type CDK 3 - standard version, can be used for all applications.
- Type CDK 32 - version with low pressure dependence on changing pump inlet pressure and for usage at low pressure settings.
- Type CDK 35 - version with low flow resistance, however with higher pressure dependence on changing pump inlet pressures.

Version with connection blocks:

- For pipe connection (without/with pressure-limiting valve)
- For manifold mounting (without/with pressure-limiting valve)
- For manifold mounting (without/with pressure-limiting valve) with adapter plate for pipe connection

2 Available versions, main data

2.1 Screw-in valve

Circuit symbol:

NOTE
Flow direction A → P not shown, see item "Flow direction" in Chapter 3.1, "General"

Sample order:

CDK 3 - 2 R - 200

Pressure setting (bar) Pressure control valve *

Adjustment "Table 2"

Basic type and pressure range "Table 1"

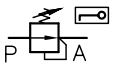
* If there is no specified pressure setting, the valve will be set at the factory to the maximum value in the pressure range in question

Table 1 Basic type and pressure range

Type	Volumetric flow rate Q_{max} (lpm)	Pressure range p_A from ... to (bar)							
		-08	-081	-1	-11	-2	-21	-5	-51
CDK 3	12	50 ... 450	50 ... 500	30 ... 300	30 ... 380	20 ... 200	20 ... 250	15 ... 130	15 ... 165
CDK 3K*		55 ... 310	-	30 ... 200	-	20 ... 140	-	15 ... 90	-
CDK 32	6	30 ... 450	30 ... 500	18 ... 300	18 ... 380	12 ... 200	12 ... 250	8 ... 130	8 ... 165
CDK 32K*	6	30 ... 310	-	18 ... 200	-	12 ... 140	-	8 ... 90	-
CDK 35	22	110 ... 450	110 ... 500	70 ... 300	70 ... 380	50 ... 200	50 ... 250	30 ... 130	30 ... 165
CDK 35K*	22	110 ... 310	-	70 ... 200	-	50 ... 140	-	30 ... 90	-

* Short version, available "fixed" only

Table 2 Adjustment

Identifier	Description	Circuit symbol
No designation	Fixed, can be adjusted using tool	
R	Can be adjusted by hand, with lock nut (not for type CDK 3.K)	
H	Rotating grip with lock (not for type CDK 3.K)	

2.2 Versions with individual connection block for pipeline connection

Sample order:

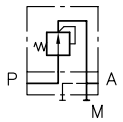
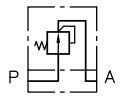
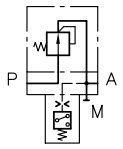
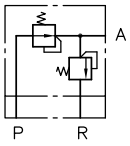
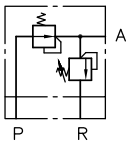
CDK 3 - 5 R CDK 35 - 2	**- 1/4** **- 1/4 SR**	**- DG 365**	- 100 - 200	**/250**

Pressure setting (bar) Pressure relief valve

Version with pressure switch "Table 4"

Versions with individual connection block "Table 3"

Table 3 Versions with individual connection block

Identifier	Description	Connection	Circuit symbol
- 1/4	Pipe connection	G 1/4 (BSPP)	
- 9/16-18 UNF		9/16-18 UNF	
- 1/4-18 NPTF		1/4-18 NPTF	
- 1/2		G 1/2 (BSPP)	
- 1/4 - DG..	Pipe connection, pressure switch in the load line	G 1/4 (BSPP)	
- 9/16-18 UNF - DG..		9/16-18 UNF	
- 1/4-18 NPTF - DG..		1/4-18 NPTF	
- 1/4 S	Pipe connection, pressure-limiting valve, fixed, tool adjustable	G 1/4 (BSPP)	
- 1/4 SR	Pipe connection, pressure-limiting valve, manually adjustable, with lock nut	G 1/4 (BSPP)	

NOTE
Connection M with reduced flow.

Table 4 Versions with pressure switch

Coding	Setting range (bar)
- DG 33	200 ... 700
- DG 34	100 ... 400
- DG 35	40 ... 210
- DG 36	4 ... 12
- DG 364	4 ... 50
- DG 365	12 ... 170

2.3 Versions with individual connection block for plate mounting

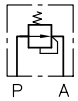
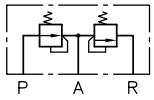
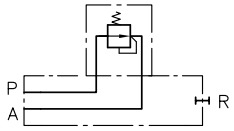
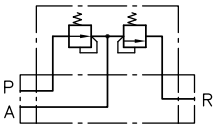
Sample order:

CDK 35 - 5 R	**- SP**	- 100/300	**- 1/4**

Adapter plate "Table 5"

Connection block "Table 5"

Table 5 Connection block version

Identifier	Description	Circuit symbol
P	Plate mounting	
SP	Plate mounting, pressure relief valve, fixed, can be adjusted using tool	
P - ... - 1/4	Plate mounting	
SP - ... /... - 1/4	Plate mounting, pressure relief valve, fixed, can be adjusted using tool, with adapter plate for pipeline connection	

3 Parameters

3.1 General

General information

Designation	Directly piloted 2-way pressure control valve
Design	Ball seated valve
Model	Screw-in valve, valve for pipe connection, manifold mounting valve
Material	▪ Screw-in valve, long: steel, ZnNi-coated ▪ Screw-in valve, short: steel, galvanised ▪ Connection blocks: steel, ZnNi-coated or galvanised ▪ Functioning internal parts, tempered and ground
Tightening torque	See Chapter 4, "Dimensions"
Installation position	As desired
Ports	▪ P = input (pump side or primary side) ▪ A = Load (secondary side) ▪ M = pressure gauge connection ▪ R = Tank connection Markings apply to hydraulic schematics and assembly plans only. The markings are not stamped onto the valve housing. The ports are stamped on the versions for pipe connection and versions for manifold mounting. The markings can be found in the schematic overviews or the dimension diagrams in Chapter 4, "Dimensions".
Flow direction	P → A: Pressure control function A → P: Only possible if the pressure on the pump side is lower than the load pressure. **NOTE** In the case of flow rates of A → P with more than $Q_{P \rightarrow A\ max}$ or if pressure surges or pressure pulsations are to be expected, a separate bypass check valve is to be provided.
Hydraulic fluid	Hydraulic oil: according to part 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity limits: min. approx. 4, max. approx. 1500 mm²/s opt. operation 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	Ambient: approx. -40 ... +80°C, Fluid: -25 ... +80°C, Note the viscosity range! Start temperature: down to -40°C is permissible (observe start viscosities!), as long as the steady-state temperature is at least 20K higher during subsequent operation. Biologically degradable pressure fluids: Observe manufacturer's specifications. By consideration of the compatibility with seal material not over +70°C.

Pressure and flow rate

Operating pressure

- On the pump side $p_{P\ max}$ = 500 bar
- On the consumer side $p_{A\ max}$, see the table of basic types in Chapter 2, "Available versions, main data"
- Return $p_R \leq 20$ bar

Pressure dependence

The pressure ratio as designed causes a slight change to the actual pressure p_A in conjunction with a variable pump pressure p_P.

Type	Pressure range (bar)			
	-08 -081	-1 -11	-2 -21	-5 -51
CDK 3	± 1.3	± 0.9	± 0.6	± 0.4
CDK 32	± 0.7	± 0.45	± 0.3	± 0.23
CDK 35	± 2.7	± 1.7	± 1.2	± 0.8

p_p ± 10 bar results in a pressure change for A of p_A

Flow rate

$Q_{P\rightarrow A\ max}$	= 6 lpm	(CDK 32)
	= 12 lpm	(CDK 3)
	= 22 lpm	(CDK 35)
$Q_{A\rightarrow P\ max}$	= 25 lpm	See note in Chapter 3, "Parameters"

Characteristics

Oil viscosity approx. 60 mm²/s
p_A - $Q_{P\rightarrow A}$ - characteristics

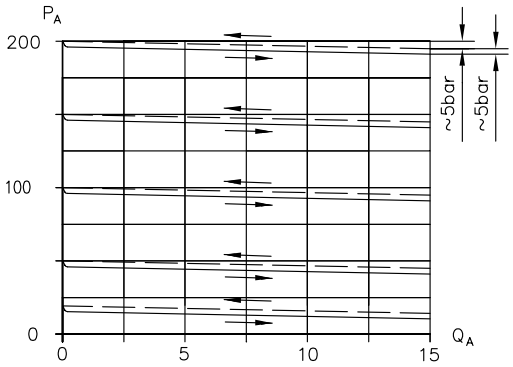
The pressure setting applies for $Q_{P\rightarrow A} \rightarrow 0$ lpm. If Q > 0, i.e. the connected consumer is moving, the secondary pressure p_A drops slightly.
The pressure p_A is set according to the information in the order at $p_P \approx 1.1\ p_A$.

CAUTION

Risk of injury on overloading components due to incorrect pressure settings!

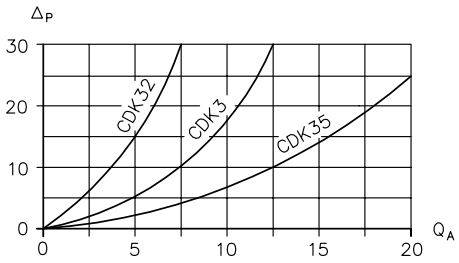
Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump and the valves.
- Always monitor the pressure gauge when setting and changing the pressure.



Q_A flow rate (lpm); p_A outlet pressure (bar)

Δp-Q characteristics P→A or A→P



Q_A flow rate (lpm); Δp flow resistance (bar)

NOTE

For this purpose, please observe the additional information under the point "Flow direction".

Weight

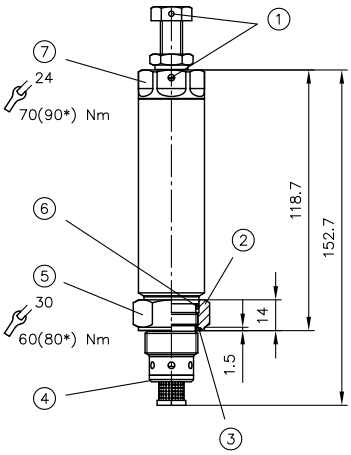
Screw-in valve	**Type**	
	CDK..	= 0.7 kg
Version with single connection block	**Identifier**	
	- 1/4	= 1.3 kg
	- 9/16-18 UNF	= 1.3 kg
	- 1/4-18 NPTF	= 1.3 kg
	- 1/4 - DG..	= 1.6 kg
	- 1/4 S(SR)	= 1.6 kg
	- P	= 1.1 kg
	- SP	= 1.6 kg
	- P-../..-1/4	= 1.5 kg
	- SP-../..-1/4	= 2.0 kg

4 Dimensions

All dimensions in mm, subject to change.

4.1 Screw-in valve

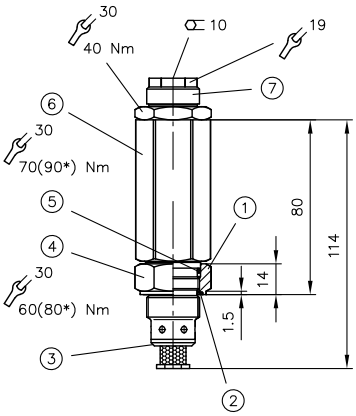
CDK 3..



* CDK3.–08.

1 Sealing option
2 Stopper
3 KANTSEAL DKAR00021-N90 NBR 90 Sh 23.52x26.88x1.68
4 Sealing edge
5 Sealing nut
6 O-ring 21.95x1.78 (21.89x2.62) AU 90 S
7 Valve housing

CDK 3.K



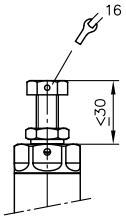
* CDK3.–08.

1 Stopper
2 KANTSEAL DKAR00021-N90 NBR 90 Sh 23.52x26.88x1.68
3 Sealing edge
4 Sealing nut
5 O-ring 21.95x1.78 (21.89x2.62) AU 90 S
6 Valve housing
7 Adjusting screw

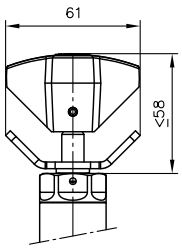
NOTE
For this purpose, please also read the information on threads and on making the mounting hole in Chapter 5.2, "Assembly information". Type CDK 3.K: Do not unscrew the adjusting screw **7** beyond the red marker ring.

Adjustment

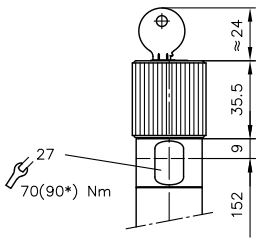
No designation



Marking **R**



Marking **H**



* CDK3.–08.

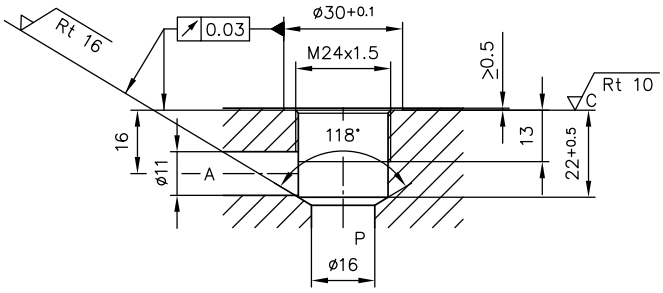
4.2 Mounting hole

Location for sealing (inlet to outlet): at the contact area between the facial sealing edge of the tapped journal of the valve housing and the stepped shoulder of the tapping hole of the location thread.

The stepped shoulder is depicted with the normal 118° drill tip angle for steel.

Therefore reaming of the hole and bevels to help the seals slip in are not necessary.

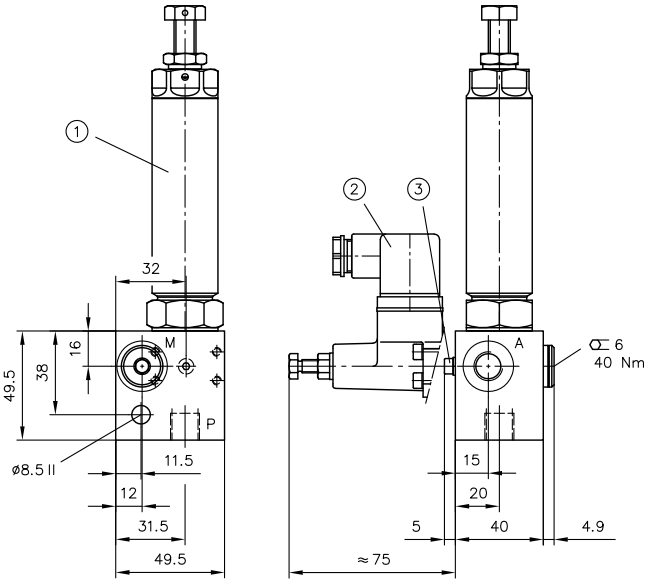
The sealing of the attached valve and its fixing at the manifold body are made by a sealing nut with a fitting seal and an O-ring. Additionally the passage between port A and T is sealed at the screwin port and the internal piston.



Counterbore $0.5^{+0.2}$ (max. $\varnothing 30^{+0.1}$), exclusively required for pressures at A in excess of 100 bar.

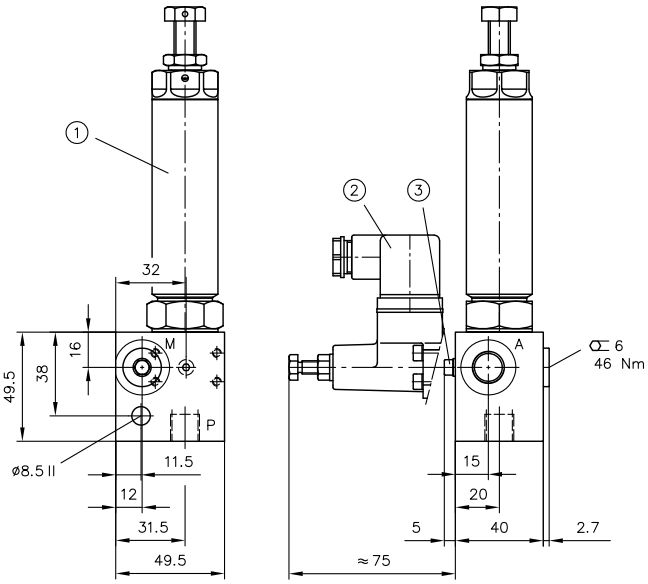
4.3 Version with single connection block for pipe connection

CDK 3..- 1/4
CDK 3..- 1/4 - DG..



Coding	Connections P, A, M	
- 1/4 - 1/4 - DG..	G 1/4 (BSPP)	ISO 228-1

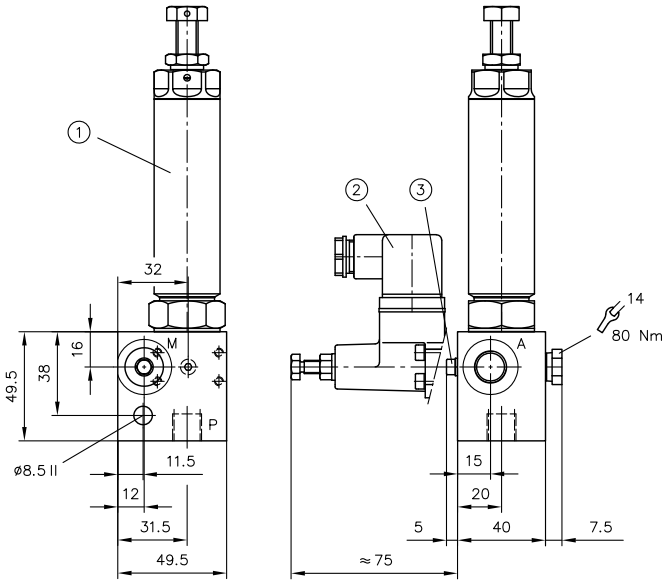
CDK 3..- 9/16-18 UNF
CDK 3..- 9/16-18 UNF - DG..



Coding	Connections P, A, M	
- 9/16-18 UNF - 9/16-18 UNF-DG..	9/16-18 UNF	ANSI B1.1, SAE-6

1 Screw-in valve, as per Chapter 4.1, "Screw-in valve"
2 Pressure switch DG 3.. as per D 5440
3 Without DG 3.. (can be retrofitted here)

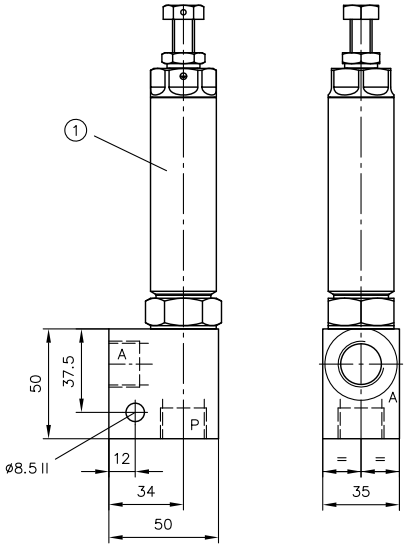
CDK 3..- 1/4-18 NPTF
CDK 3..- 1/4-18 NPTF - DG..



Coding	Connections P, A, M	
- 1/4-18 NPTF - 1/4-18 NPTF-DG..	1/4-18 NPTF	ANSI B1.20.3

1 Screw-in valve, as per Chapter 4.1, "Screw-in valve"
2 Pressure switch DG 3.. as per D 5440
3 Without DG 3.. (can be retrofitted here)

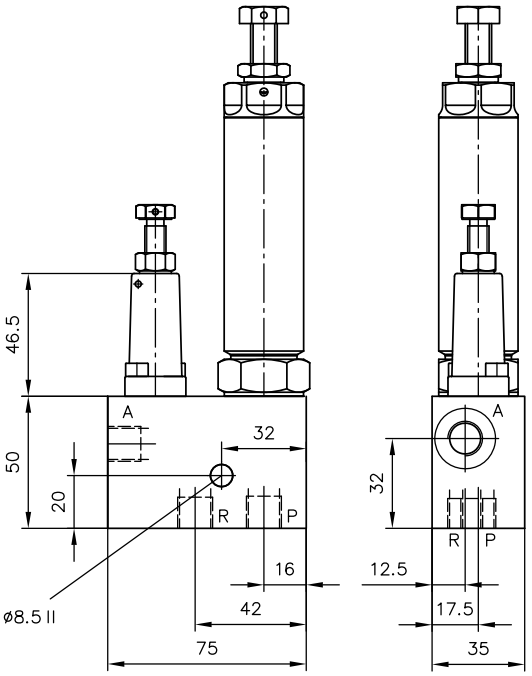
CDK 3..- 1/2



Coding	Connections P, A	
- 1/2	G 1/2 (BSPP)	ISO 228-1

1 Screw-in valve, as per Chapter 4.1, "Screw-in valve"

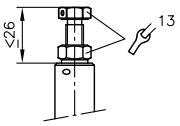
CDK 3..- 1/4 S
CDK 3..- 1/4 SR



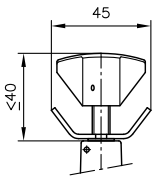
Coding	Connections P, A, R	
- 1/4 S - 1/4 SR	G 1/4 (BSPP)	ISO 228-1

Adjustment

Fixed

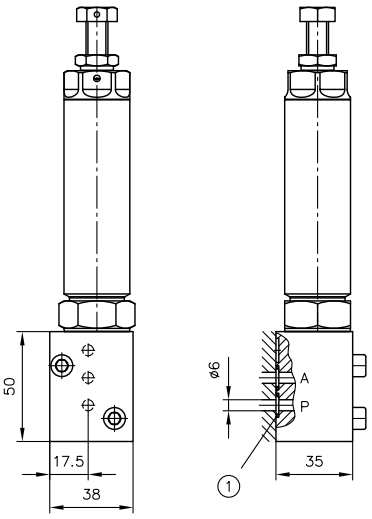


Adjustable

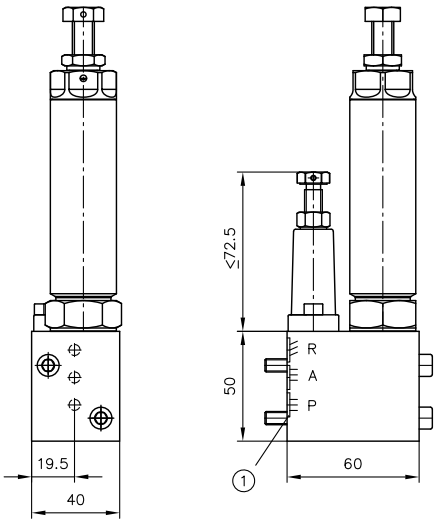


4.4 Version with connection block for manifold mounting

CDK 3 - .. - P



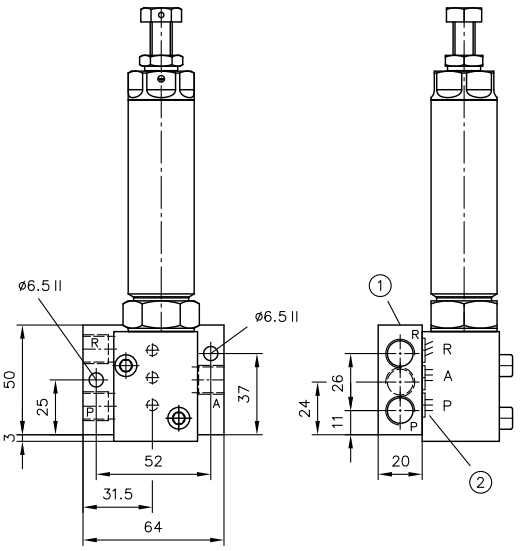
CDK 3 - .. - SP



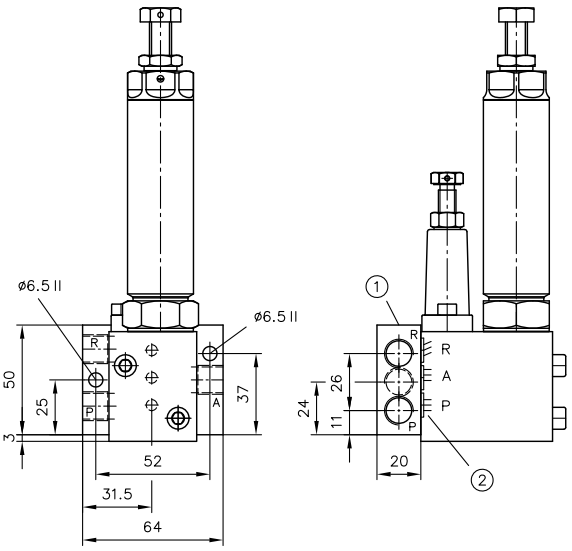
1 Sealing with O-rings 7.65x1.78 NBR 90 Sh

For this purpose, note the hole pattern in Chapter 4.5, "Base plate hole pattern".

CDK 3(32, 35) - .. - P - .. - 1/4



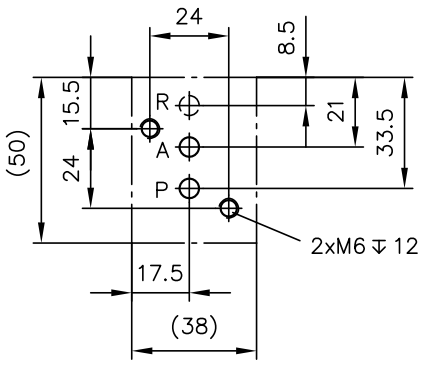
CDK 3(32, 35) - .. - SP - .. - 1/4



1 Adapter plate (connection block for pipe connection)
2 Sealing with O-rings 7.65x1.78 NBR 90 Sh

Identifier	Connections P, A, R	
- P .. - SP ..	G 1/4 (BSPP)	ISO 228-1

4.5 Base plate hole pattern

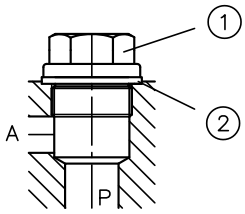


The hole pattern corresponds to that of type ADM 11 P as per D 7120. The O-ring counterbore for the drain port R (or L) is present but is only required for type CDK..-SP.

4.6 Tapped plugs

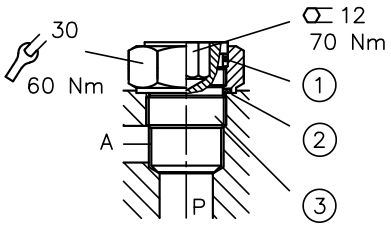
The mounting holes can be sealed with tapped plugs if necessary; for example, if the assembly of standardised basic bodies is to be carried out with or without screw-in valves as required.

Passage open



1 Tapped plug M24x1.5 DIN 910
2 Sealing ring A25x30x2 DIN 7603-Cu

Passage closed



1 O-ring 21.95x1.78 AU 90 Sh
2 KANTSEAL DKAR00021-N90 NBR 90 Sh 23.52 x 26.88 x 1.68
3 Tapped plug and locking tapped plug complete order no.. 7710 029

5 Assembly, operation and maintenance recommendations

5.1 Intended use

This valve is intended exclusively for use in hydraulic applications (fluid technology).

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

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 qualified personnel.
- The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
- All components must be suitable for the operating conditions in the event of application in an assembly.
- The operating and maintenance manual of 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 dismounting (in particular in combination with hydraulic accumulators).

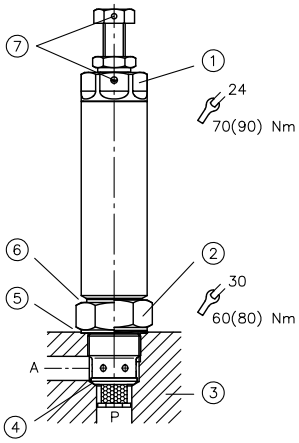
⚠ **DANGER**

Risk to life caused by sudden movement of the hydraulic drives when dismantled incorrectly!

Risk of serious injury or death.

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

5.2.1 Screwing in the screw-in valve



1. Before screwing in the valve, loosen the lock nut and sealing nut until the travel stop.
2. Screw in the valve and tighten with the specified torque. The metallic sealing of the inlet to the outlet is formed between the facial sealing edge of the valve and the shoulder of the stepped hole in the basic body.
3. Tighten lock nut and sealing nut with specified torque.

1 Valve housing *
2 Lock nut and sealing nut *
3 Basic body
4 Sealing edge
5 Locking
6 Stopper
7 Sealing option

* Values in brackets apply to pressure ranges of type CDK 3.-08 (-81)

5.2.2 Setting the pressure

If there is no specified pressure setting, the valve will be set at the factory to the maximum value in the pressure range in question.

Guideline values for pressure adjustment

Pressure adjustment Pressure control valve		Pressure adjustment Pressure control valve		Pressure adjustment Pressure relief valve	
Identifier	Δp/revolution (bar/R)	Identifier	Δp/revolution (bar/R)	Pressure range (bar)	Δp/revolution (bar/R)
08	37	081	46	... 500	100
1	25	11	31	... 315	55
2	16	21	20	... 160	19
5	10	51	12	... 80	9.5

CAUTION

Risk of injury on overloading components due to incorrect pressure settings!

Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump and the valves.
- Always monitor the pressure gauge when setting and changing the pressure.

5.2.3 Creating the mounting hole

See description in Chapter 4.2, "Mounting hole".

5.2.4 Making base plate

The hole pattern corresponds to that of type ADM 11 P as per D 7120. The O-ring counterbore for the drain port R (or L) is present but is only required for type CDK..-SP.

See hole pattern in Chapter 4.5, "Base plate hole pattern"

5.3 Operating instructions

Note product configuration and pressure / flow rate

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

NOTE

- 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.

CAUTION

Risk of injury on overloading components due to incorrect pressure settings!
Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump and the valves.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

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

Examples of fine contamination include:

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

NOTE

New hydraulic fluid from the manufacturer does not necessarily have the required level of purity.
The hydraulic fluid must be filtered during filling.

Pay attention to the cleanliness level of the hydraulic fluid to maintain faultless operation.
(Also see cleanliness level in Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 Oil recommendations

5.4 Maintenance information

Check that the product is securely fastened in the mounting hole at regular intervals, but at least once per year.

Conduct a visual inspection at regular intervals, but at least once per year, to check if the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the device surface of dust deposits and dirt at regular intervals, but at least once per year.

6 Other information

6.1 Planning information

The pressure reducing valve is zero-leakage when closed. The pressure may therefore change if the product is used in control circuits with long pressure holding periods without switching. For example, this is the case in control circuits in which pallets are clamped separately.

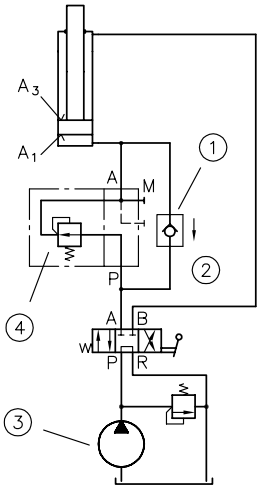
The pressure may increase if the temperature increases (e.g. in the event of sun exposure) or if influenced by additional external loads. When the pump is switched off: The pressure can drop if the temperature falls (e.g. cooling down at night) or if loads are removed.

These effects are particularly noticeable with short, rigid pipe connections. Hose lines and additional volume (e.g. AC 13 miniature accumulator in accordance with D 7571) help to compensate such (negative) pressure fluctuations.

The ratio of thermal expansion coefficient to coefficient of compressibility (theoretically 1:10, i.e. $\Delta T = 1K \rightarrow \Delta p \approx 10$ bar) is based on the fact described above. As consumers, pipe lines and hose lines will yield, in reality (based on experience) a ratio of approx. 1:1 can be assumed.

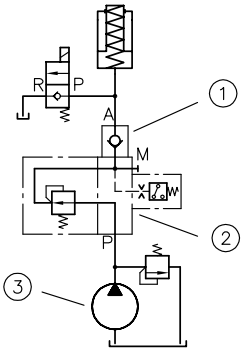
6.2 Application examples

Example of a version
with large flow rates $Q_{A \rightarrow P}$
Example: Q_P = 15 lpm [formula]



1 E.g. type RK 2G in accordance with D 7445
2 Q_{ret} = 45 l/min
3 Q_P = 15 l/min
4 Type CDK 3-2-1/4

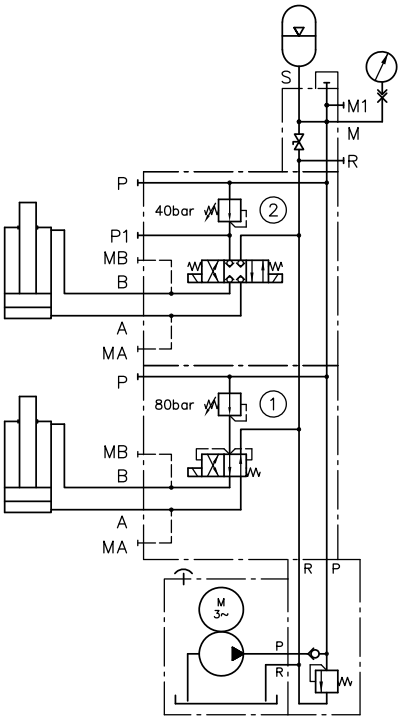
Example of a version
with undesired return flow



1 E.g. type RK 1E in accordance with D 7445
(shown here screwed into
connection A of the CDK 3 valve)
2 Type CDK 3- 2-1/4-DG 34

Use in valve bank
Type BVH 11 (D 7788 BV)

KA 28 1 S K/ Z 2.7
- AX 14 - 5/150
- BVH 11 W/CZ5/80/GM
- BVH 11 G/CZ5/40/GM
- 82 - AC1002/50/3A
- X 24



1 CDK 3-5 - 80
2 CDK 3-5 - 40

Further information

Additional versions

- Pressure-reducing valve type CLK: D 7745 L
- Pressure-reducing valve type DK, DZ and DLZ: D 7941
- Pressure-reducing valve type ADM: D 7120
- Pressure valve type CMV, CMVZ, CSV and CSVZ: D 7710 MV
- Pressure-controlled shut-off valve type CNE: D 7710 NE
- Throttle valve and shut-off valve CAV: D 7711
- Check valve type CRK, CRB and CRH: D 7712
- Pressure-dependent shut-off valve type CDSV: D 7876
- Throttle valve and throttle check valve type CQ, CQR and CQV: D 7713

Application

- Valve bank (directional seated valve) type VB: D 7302
- Valve bank (directional seated valve) type BWN and BWH: D 7470 B/1
- Valve bank (nominal size 6) type BA: D 7788
- Valve bank (directional seated valve) type BVH: D 7788 BV
- Intermediate plate type NZP: D 7788 Z

D 7745 - 12-2020-1.10

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