HYDAC INTERNATIONAL

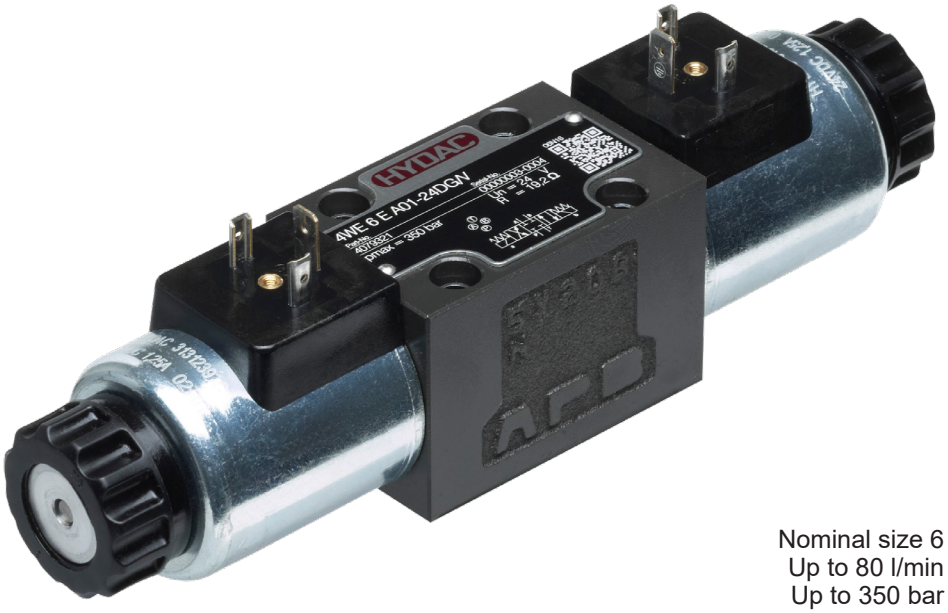
4/2 and 4/3 directional spool valve solenoid-operated, direct-acting 4WE 6

DESCRIPTION

HYDAC 4/2- and 4/3-directional spool valves of the 4WE 6 series are directional valves for oil hydraulic systems which are used to open and close flow paths. The valve operates by oil-immersed solenoid. During this process, the solenoid pushes the valve's control spool into the respective position to obtain the desired flow path.

TECHNICAL CHARACTERISTICS

- Direct-acting, solenoid-operated directional valve
- Interface according to DIN 24340 Form A6, ISO 4401-03
- Removable high-performance solenoid coil, no need to open the hydraulic system during replacement
- Coil rotatable by 360°, allows flexible installation
- Electrical connection available in several versions
- With concealed manual override, additional versions available
- Optionally available with extra corrosion protection in the form of zinc-nickel surface coating (A40)
- Optionally available with central connection via terminal box



Nominal size 6
Up to 80 l/min
Up to 350 bar

CONTENTS

MODEL CODE

4WE 6 D - OF A01-24 D G /V / _

Type
Solenoid-operated directional valve with 4 main ports, direct-acting

Nominal size
6

Spool symbol
See page 3

Version
Not specified = with return spring
-OF = without return spring, with detent (with D symbol only) [1]

Series
A01 = specified by the manufacturer
A40 = with zinc-nickel coating

Rated voltage of the solenoid coil [1]
12 = 12 VDC [3]
24 = 24 VDC [3]
96 = 96 VDC [2]
205 = 205 VDC [2]
110 = 110 VAC [2]
120 = 120 VAC [3]
230 = 230 VAC [2] [3]

Type of voltage
D = direct current (DC)
A = alternating current (AC) [2]

Electrical connection (for details, see page 8)
G = device plug, DIN EN 175301-803 A
L = single leads
L02 = single leads with suppressor diode
N = device plug, Deutsch
N01 = device plug, Deutsch with suppressor diode
O = device plug, M12
U = device plug, Junior Timer
U01 = device plug, Junior Timer with suppressor diode
X3 = terminal box (for details, see page 7)

Sealing material [1]
/N = NBR
/V = FKM (standard)

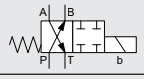
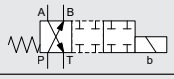
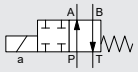
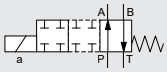
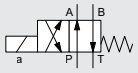
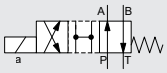
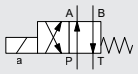
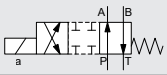
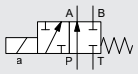
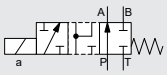
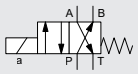
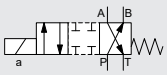
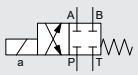
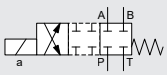
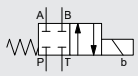
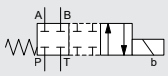
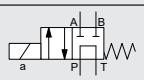
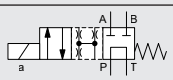
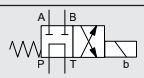
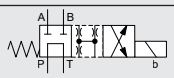
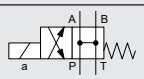
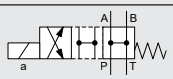
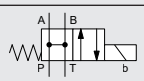
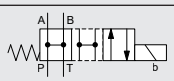
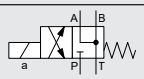
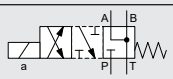
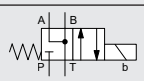
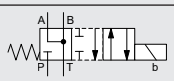
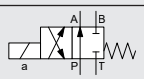
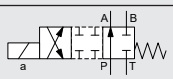
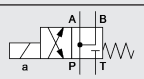
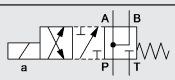
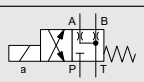
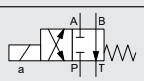
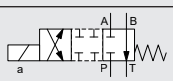
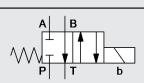
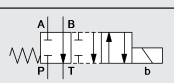
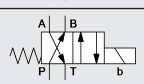
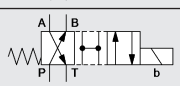
Manual override (for details, see page 8)
Not specified = with concealed manual override (standard)
/M1 = with manual override
/M2 = with covered manual override
/M4 = with knurled nut
/M5 = with mushroom head manual override (adjustable)
/M6 = with mushroom head manual override (non-adjustable)

Orifice insert [1]
Not specified = no orifice insert
/YXX = Y = port P, A, B, T
XX = diameter (e.g. 12 = 1.2 mm); preferred series: 0.8 mm, 1.0 mm, 1.2 mm

[1] Other versions on request
[2] Only in combination with the electrical connection G
[3] Can also be combined with the electrical connection X3

SPOOL TYPES / SYMBOLS

4/2-DIRECTIONAL SPOOL VALVES

Type	Basic symbol	With intermediate position
AE		
BE		
C		
D		
DT		
DB		
EA		
EB		
GA		
GB		
HA		
HB		
JA		
JB		
KA		
MA		
QA		
UA		
UB		
X		
Y		
YT		

With return spring

With detent (…-OF)

4/3-DIRECTIONAL SPOOL VALVES

Type	Basic symbol	With intermediate position
E		
F		
G		
H		
J		
JR		
K		
L		
M		
P		
Q		
R		
U		

FUNCTION

The solenoid-operated directional spool valves of the 4WE 6 type are used to control nominal flow and are made up of one valve casing (1) with an associated valve piston (2). Depending on the type, the valve is equipped with at least two return springs (3) and with one or two pole tubes (4) and solenoid coils (5) each.

The valve is hydraulically controlled by operating the valve piston using solenoids (5). A solenoid is a converter which converts electrical energy into mechanical energy. The energised solenoid causes the oil-immersed magnetic piston to make a linear stroke movement. The piston uses the guide rod (6) to move the valve piston into the desired position. This causes the nominal flow directions between the respective connections to be released or closed. To obtain the valves' optimum switching capacity, the pressure-tight chamber of the pole tube should always be filled with oil.

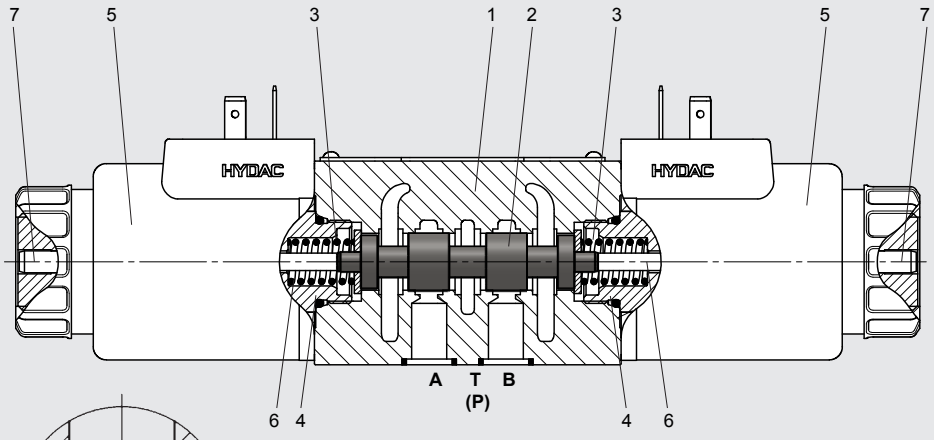
The valve spool is pushed back into the starting position by the appropriate return spring after de-energisation of the solenoid.

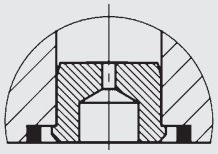
The manual override (7) enables valve operation without energising the solenoid.

Without return spring with detent "OF"

This variant describes the so-called impulse valve. This is a 4/2 directional valve with two solenoids and detent. The detents are used to lock the valve piston in the respective switching position. Permanently supplying the solenoids with power is not necessary, which contributes to energy-saving operation.

SECTION VIEW





Orifice insert
Used to choke nominal flows that are too high and outside of the valve's operating limits.

TECHNICAL DATA [1)]

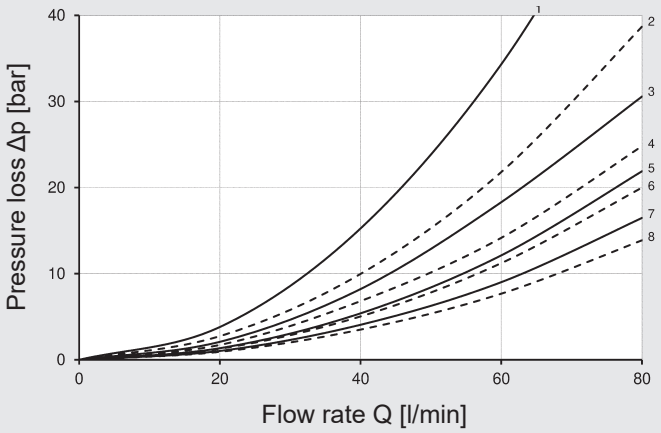
General specifications			
$MTTF_d$:		150–1200, according to DIN EN ISO 13849-1:2016; table C.1, confirmation of ISO 13849-2:2013; Tables C.1 and C.2	
Ambient temperature range:	[°C]	-20 to +60	
Installation position:		No restrictions	
Weight:	[kg]	1.5 with one solenoid; 2.0 with two solenoids	
Material:		Valve casing:	Cast iron
		Pole tube:	Steel
		Coil housing:	Steel
		Name plate:	Aluminium
Surface coating:		Valve casing:	Phosphate plated
		Pole tube:	Zn-coating
		Coil housing:	ZnNi-coating
hydraulic specifications			
Operating pressure:	[bar]	Port A, B, P:	p_{max} = 350
		Port T:	p_{max} = 210
Nominal flow:	[l/min]	See performance limits on page 5	
Operating fluid:		Hydraulic oil to DIN 51524 Part 1, 2 and 3	
Temperature range of operating fluid:	[°C]	-20 to +80 (for standard seal ring)	
Viscosity range:	[mm²/s]	10 to 500	
Permitted contamination level of operating fluid:		Class 20/18/15 according to ISO 4406	
Max. switching frequency:	[1/h]	15,000	
Manual override:		Up to approx. 50 bar tank pressure possible	
Sealing material:		FKM (standard), NBR	
Electrical specifications			
Switching time:	[ms]	Energised: approx. 20–70 De-energised: approx. 10–60	
Type of voltage:		Direct current	Alternating current
Rated voltage:	[V]	12, 24, 96, 205	110, 230
Voltage tolerance:	[%]	±10	
Nominal power:	[W]	30	
Duty cycle:	[%]	100	
Max. surface temperature of the coil:	[°C]	150	
Protection class according to DIN EN 60529:		With electrical connection "G"	IP65 [2)]
		With electrical connection "L"	IP65 [2)]
		With electrical connection "N"	IP65 / IP67 [2)]
		With electrical connection "O"	IP65 [2)]
		With electrical connection "U"	IP65 [2)]

[1)] See "Conditions and Instructions for Valves" in brochure 53.000
[2)] If installed correctly

PERFORMANCE CURVES

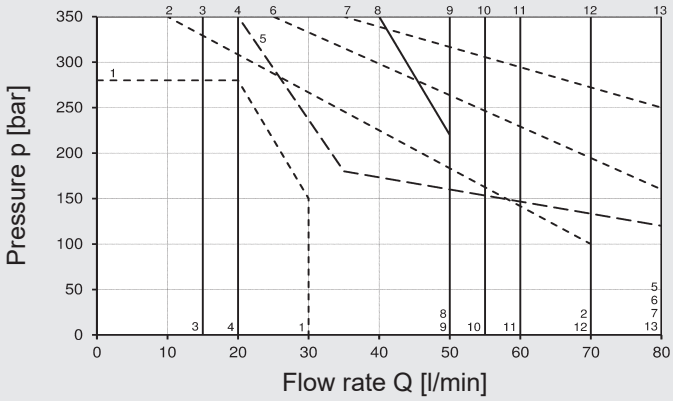
Pressure drop

Measured at ν = 35 mm²/s, T = 45 °C



Performance limits

Measured at ν = 30 mm²/s, T = 50 °C



Performance assignment to the associated spools:

Spool	Pressure drop					Power limits
	P→A	B→T	P→B	A→T	P→T	
AE	–	–	7	7	–	2
BE	7	7	–	–	–	2
C	8	8	8	8	–	10
D	8	7	8	7	–	12
DB	3	6	3	6	–	4
D–OF	8	7	8	7	–	13
DT	8	–	7	–	–	5
E, EA, EB	7	7	7	7	–	13
F	6	6	6	6	–	1
G, GA, GB	1	1	1	1	4	9
H, HA, HB	8	8	8	8	4	13
J, JA, JB	7	7	7	7	–	7
JR	–	–	2	8	–	6
K, KA	8	7	7	7	–	13
L	7	7	7	8	–	13
M, MA	8	5	8	5	–	13
P	6	6	6	6	–	4
Q, QA	7	7	7	7	–	11
R	–	–	3	6	–	8
U, UA, UB	7	8	7	7	–	13
X	8	8	8	8	–	10
Y	7	8	7	8	–	12
YT	7	–	8	–	–	3

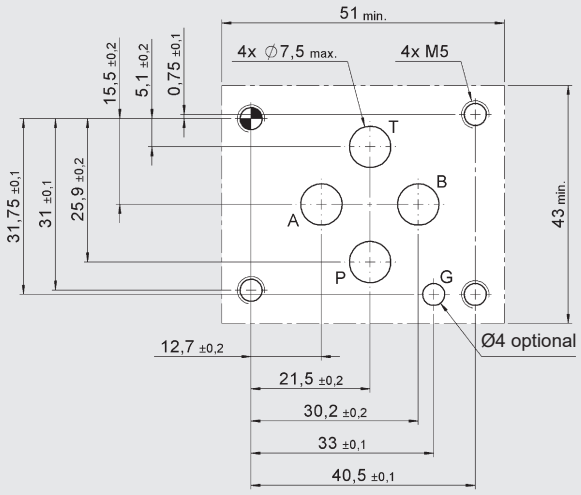
The power limits for directional valves were determined with solenoids at operating temperature and 10% undervoltage.

The specified power limits for directional valves are applicable to use with two nominal flow directions. In the case of only one flow direction, the power limits may be lower.

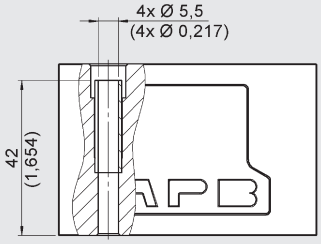
Reduction of switching capacity for coils G96/G205:
The max. permitted flow rate shown in the graph must be reduced by 10%. The switching times are extended.

DIMENSIONS

Interface to ISO 4401-03-02-0-05 (CETOP3)

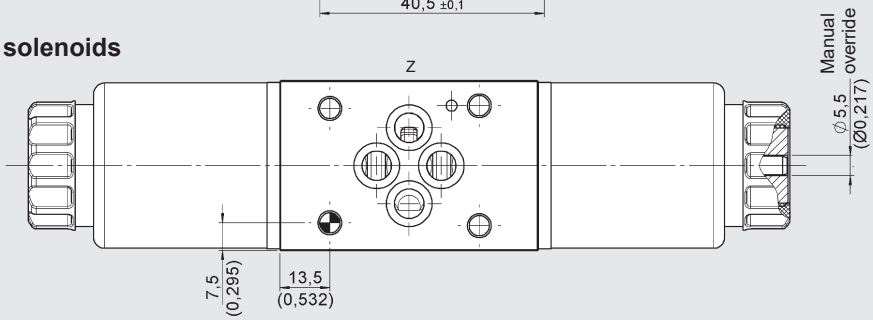


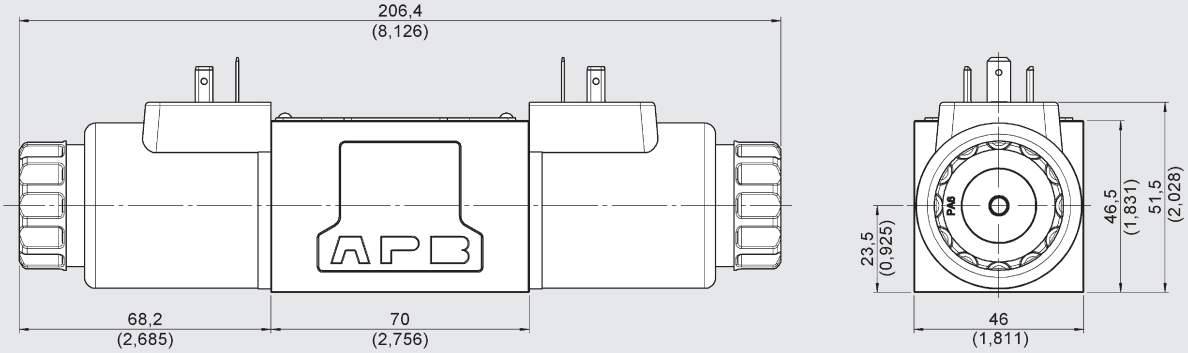
Clamping length



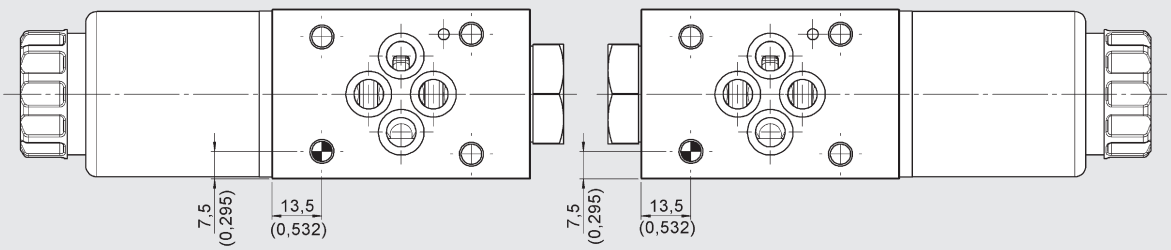
Fastening screws:
(not included in delivery)
DIN EN ISO 4762 – M5 x 50 – 10.9
Tightening torque: 7 Nm

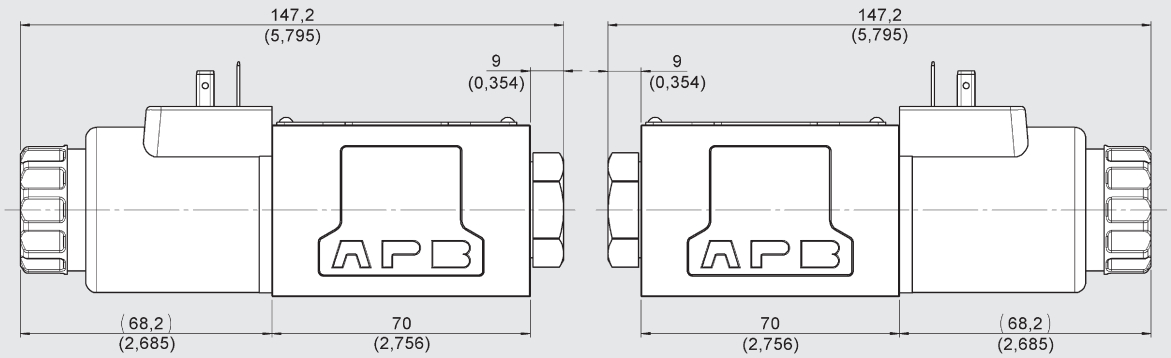
With two solenoids





With one solenoid

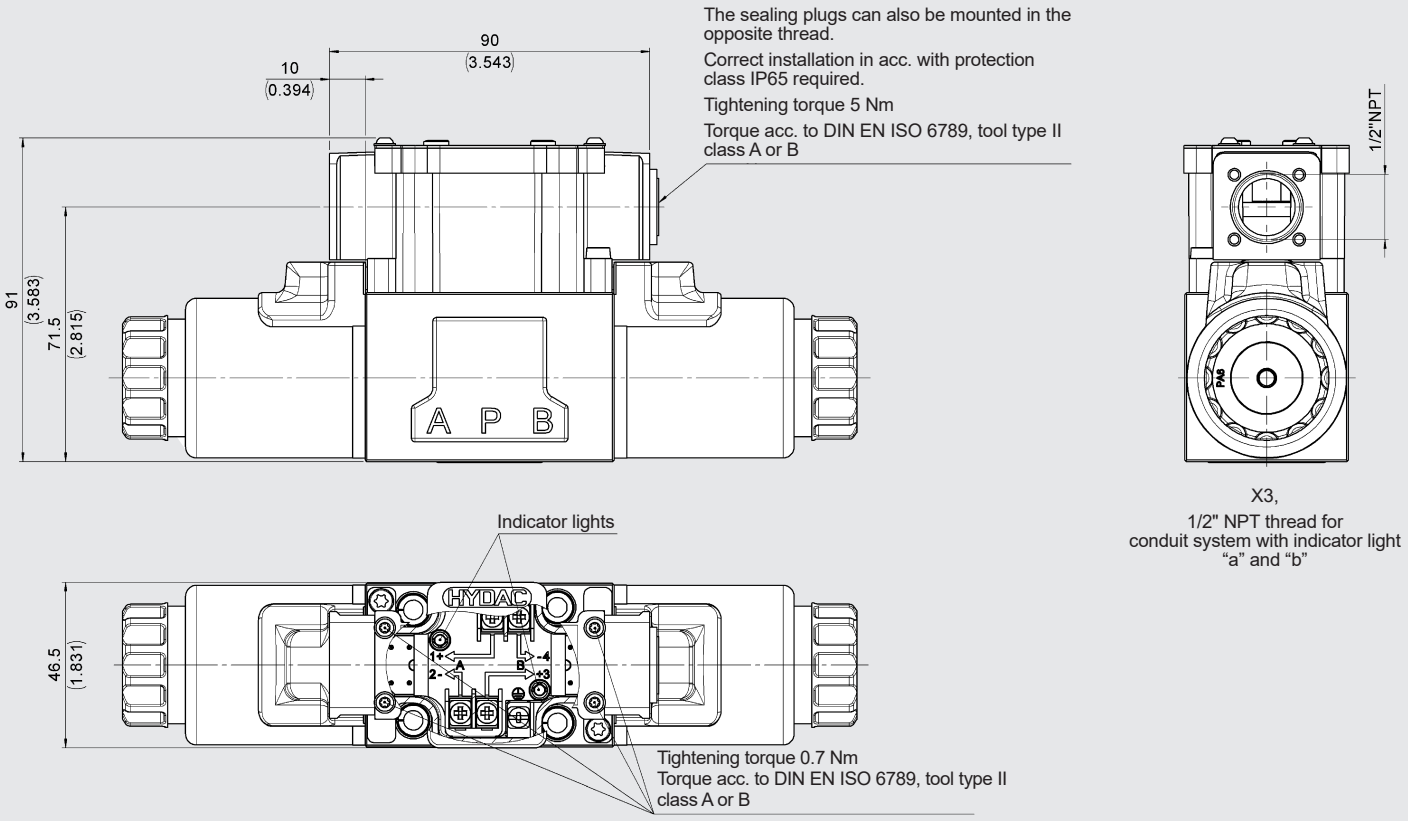




Valve with solenoid a

Valve with solenoid b

Terminal box



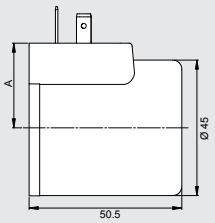
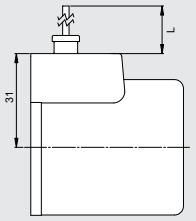
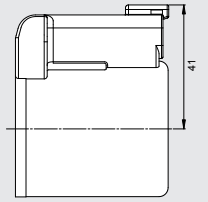
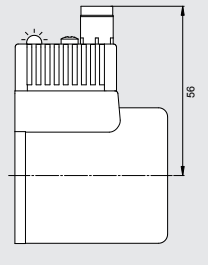
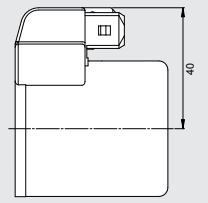
Pin assignment

Pin	Connection
1+	Solenoid “a”
2-	
3+	Solenoid “b”
4-	
⏚	Protective conductor

NOTICE:

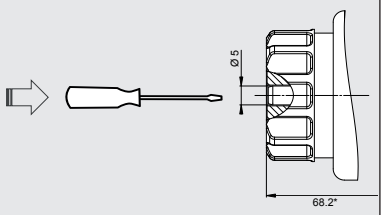
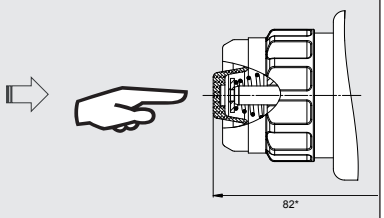
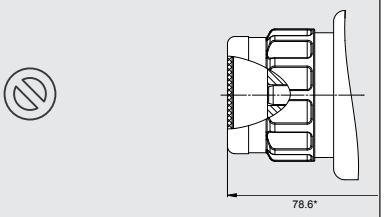
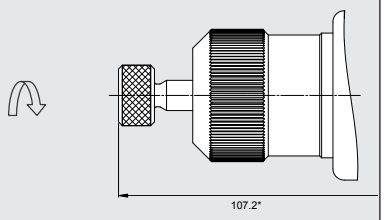
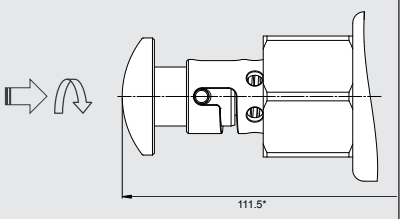
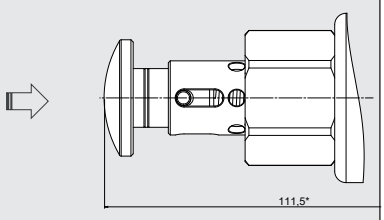
- During operation, the end cap must be closed. Avoid tightening the screws excessively.
- IP protection only when end cap closed and with suitable cable gland.
- Use fine-wire conductors with 0.75 mm², 1.0 mm² or 1.5 mm² with suitable wire end ferrules.
- Correct wiring of the protective conductor is required, with a cross section equal to or larger than the cross section of the supply conductor.
- Only suitable for permanently installed electric cables with strain relief.

ELECTRICAL CONNECTIONS

G Male connector DIN EN 175301-803 A		● IP65 ● A = 28 mm for direct current (DC) ● A = 30.7 mm for alternating current (AC)
L 2 single leads		● IP65 ● Standard single lead length L = 457 mm ● Optional with suppressor diode
N Device plug, Deutsch (DT04-2P)		● IP65 / IP67 ● Optional with suppressor diode
O Device plug M12		● IP65 ● With yellow LED as operation indicator ● Pin assignment
U Device plug Junior Timer (axial)		● IP65 ● Optionally with suppressor diode

Other versions on request

MANUAL OVERRIDES

Standard with concealed manual override		Operation with tool
M1 with manual override		Operation without tool with spring return
M2 With covered manual override		Manual override covered, operation only possible once the cap has been dismantled
M4 With knurled-head screw		Operation by turning the knurled-head screw
M5 With mushroom button (adjustable)		Operation by pressing, locking by subsequently turning the mushroom button
M6 With mushroom button (non-adjustable)		Operation by pressing the mushroom button

* Dimensions up to valve housing

The valve can also be operated manually. There are different forms of manual override available for this purpose.

The tank pressure should not exceed 50 bar. If the tank pressure is higher, the force required to operate the manual override increases accordingly.

For valves with two solenoids, simultaneous operation of both manual overrides is prohibited.

EQUIPMENT

	Designation	Part no.
Seal kits (4-part set)	9.25 x 1.78 80 Sh NBR	3492432
	9.25 x 1.78 80 Sh FKM	3120269
Fastening screws (4 pcs)	DIN EN ISO 4762 - M5 x 50 - 10.9	4312231
Solenoid coils	COIL 12DG -50-2345 -S	4244169
	COIL 12DN -50-2345 -S	4244170
	COIL 12DO -50-2345 -S	4250874
	COIL 24DG -50-2345 -S	4244171
	COIL 24DN -50-2345 -S	4244172
	COIL 24DO -50-2345 -S	4250885
	COIL 96DG -50-2345 -S	4244173
	COIL 110AG -50-2345 -S	4244174
	COIL 205DG -50-2345 -S	4244275
	COIL 230AG -50-2345 -S	4244276
Seal kit for solenoid coil	Nut open, O-ring	4317299
	Nut with folding cap, O-ring	4317301
	Nut with cap, O-ring	4317302
Male connector	Z4 standard 2-pole without PE	394287
	ZW4 incl. rectifier	394293
	Z4L incl. LED	394285
Manual overrides	M4 with knurled-head screw	4429328
	M5 with mushroom manual override (adjustable)	4373722
	M6 with mushroom manual override (non-adjustable)	4373490

Note

The information in this brochure relates to the operating conditions and applications described. For applications not described, please contact the relevant technical department.
Subject to technical modifications.

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