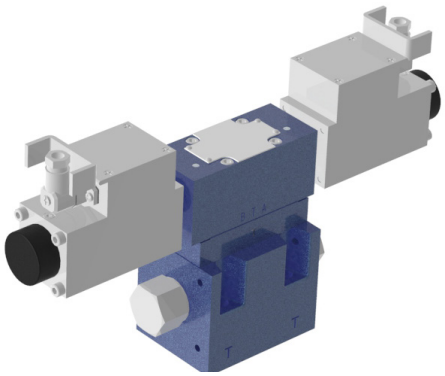
Pilot operated, proportional directional control valve, intrinsically safe ISAP10

NS 10 | p_{max} 35 MPa | Q_{max} 200 dm³/min | WK 434 030

PONAR wadowice

DATA SHEET - OPERATION MANUAL

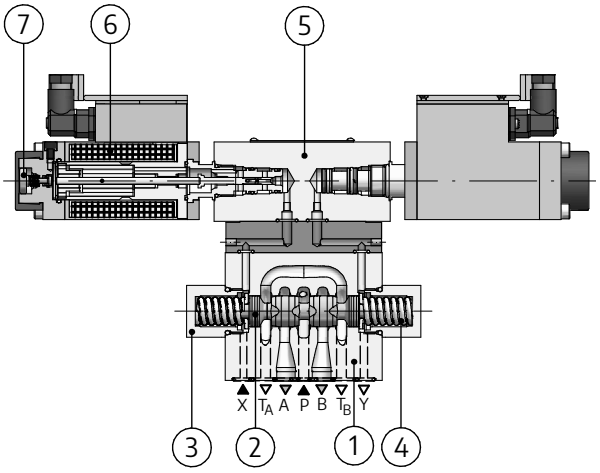
APPLICATION



Proportional, electrically pilot operated, intrinsically safe directional control valve, **ISAP10...** type is used to control the direction of hydraulic fluid flow, and the speed of receiver in the system, which enables direction change of actuator movement – most frequently cylinder piston rod or hydraulic motor, as well as options: start, stop. The value of hydraulic oil flow directed to the receiver is regulated by change of current supplied to the proportional solenoid coils. Valve is adapted to subplate mounting in any working position in hydraulic system. The valve is intended to work in an explosive atmosphere in underground minings (group I) and in machines working on the surface near flammable substances in the form of gases, vapours, mists (group II).

The valve has certificates of intrinsic safety: Ex IM1 Ex ia I Ma; Ex II 2G Ex ia IIA T3 Gb. It can work with an output intrinsically safe circuit „ia" or „ib" of max. parameters: Ui = 15 V, Ii = 2 A, Ci = 0, Li = 0.

DESCRIPTION OF OPERATION

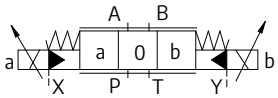


In the housing **1** there are: main hole and ports: P, T, A, B connected with the subplate connection of the housing **1**. Spool **2** is centred in neutral position by means of springs **4**. Directional valve is switched by shifting the spool **2** proportionally to the coil current. Various hydraulic diagrams depend on the spool **2** version, which causes configuration change of connections between ports P, T, A, B of the housing **1**.
The spool **2** is shifted from its neutral position, because acting of the pressure of the hydraulic fluid led by the pilot valve **5** into one of the covers chamber **3**. Intrinsically safe, proportional pilot valve **5** is controlled by means of proportional solenoids **6**. In case of lack of power supply, it is possible to manually shift the pilot valve **5** with manual overrides **7**.

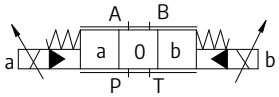
HYDRAULIC DIAGRAM

3-position directional control valves

ISAP10...



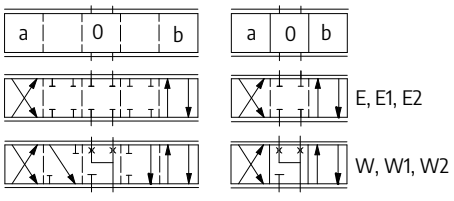
ISAP10...ET...



symbols of the spools

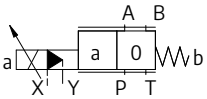
working and interim positions

working positions

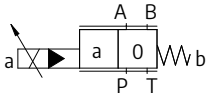


2-position directional control valves

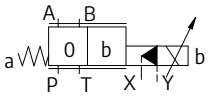
ISAP10...A...



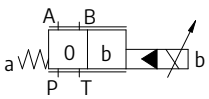
ISAP10...A...ET...



ISAP10...B...



ISAP10...B...ET...



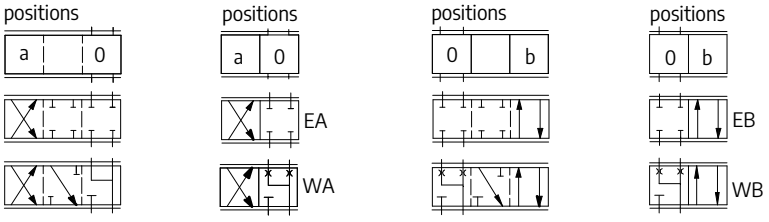
symbols of the spools

working and interim positions

working positions

working and interim positions

working positions



spool type	flow rate			
	P → A	P → B	A → T	B → T
E1, W1	Q	Q/2	Q	Q/2
E2, W2	Q/2	Q	Q/2	Q

TECHNICAL PARAMETERS

hydraulic fluid	mineral oil		
required fluid cleanliness	ISO 4406 class 20/18/15		
nominal fluid viscosity	37 mm^2/s at temperature 55°C		
viscosity range	2,8 ÷ 380 mm^2/s		
fluid temperature range (in a tank)	recommended 40 ÷ 55°C max. - 20 ÷ 70°C		
ambient temperature range T_a	- 20 ÷ 60°C		
max. operating pressure	ports P, A, B:	ISAP10...;	35 MPa
	port T:	ISAP10...T...; ISAP10...ET...	1 MPa
		ISAP10...; ISAP10...E...	25 MPa
	port Y:		1 MPa
operating pressure	port X:		2,5 ÷ 35 MPa
max. flow	200 dm^3/min		
control method	PWM 100Hz signal		
hysteresis	< 7%		
max. current of the solenoid coil I_{max}	0,3 A		
resistance of solenoid coil winding at the temperature of 20°C (without semiconductors)	20,2 Ω		
protection class	IP65		
operating position	optional		
weight	8,0 kg		

ASSEMBLY AND APPLICATION REQUIREMENTS

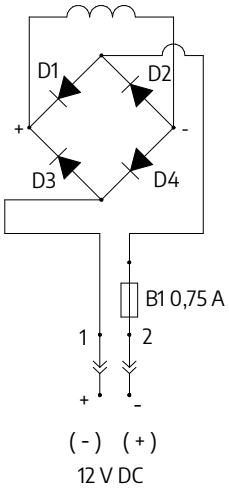
1. Electrical connection of the valve must be made according to electric diagrams placed on this page.
2. Electrical wires for valve connection shall meet requirements applied in the mining machinery.
3. Only skilled workers can connect or disconnect the valve to/from an electrical system.
4. During the operation one must maintain the recommended fluid viscosity and required filtration acc. to requirements defined in this Data Sheet - Operation Manual.
5. In order to ensure safe and failure-free operation of the valve, the following must be checked on regular basis: condition of the electrical connection, operation of the valve, cleanliness of the hydraulic fluid.
6. Solenoid plug shall precisely adhere to socket and shall be secured with thread bolt screwed securely in a place. The tightness and suitable clamp of cable in the plug gland shall be ensured.
7. In order to provide proper tightness of the valve connection to a hydraulic system, one should obey the dimensions of the cavity, sealing rings and valve operation parameters as specified in this Data Sheet - Operation Manual.
8. Any valve repair in operating condition is forbidden. A damaged valve must be returned to the producer for repair. The address of service is mentioned on last page of this Data Sheet - Operation Manual.
9. A person that operates the intrinsically safe valve must be thoroughly familiar with this Data Sheet - Operation Manual.

COMPLIANCE WITH DIRECTIVE 2014/34/UE

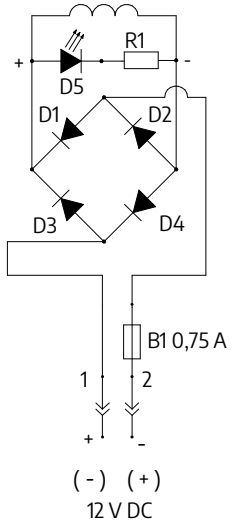
quality certificate	CE 1026 FTZU no FTZU 05 ATEX Q 013
inspection certificate	KOMAG 14ATEX0057X
intrinsic safety feature	Ex IM1 Ex ia I Ma Ex II 2G Ex ia IIA T3 Gb

ELECTRIC DIAGRAM

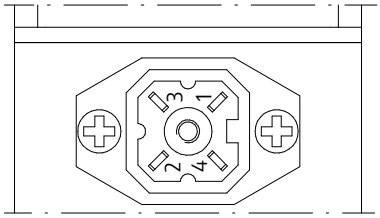
version ISAP10 ...N**...** without LED light signalling



version ISAP10 ...N**L**... with LED light signalling

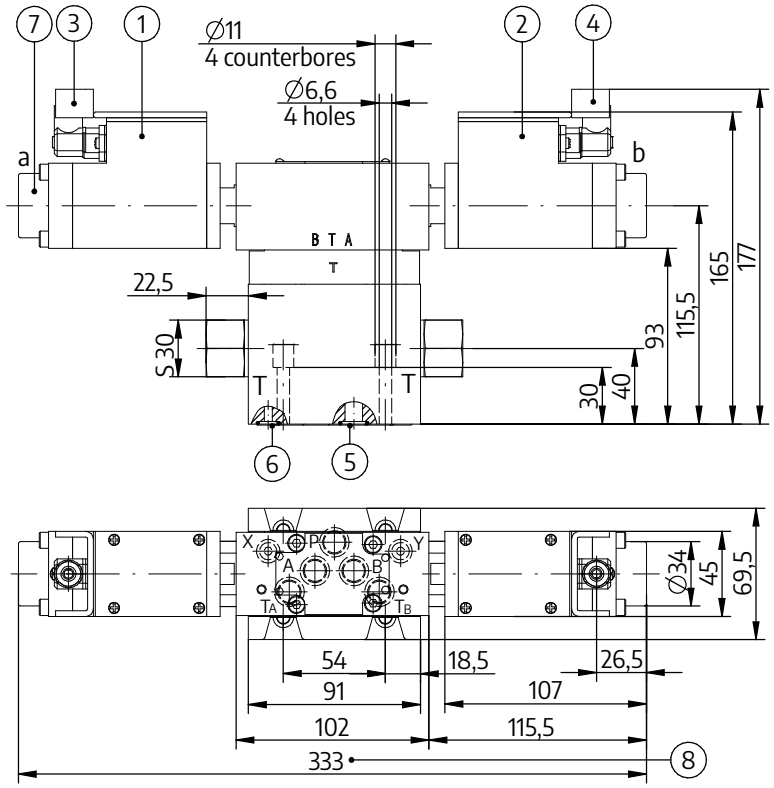


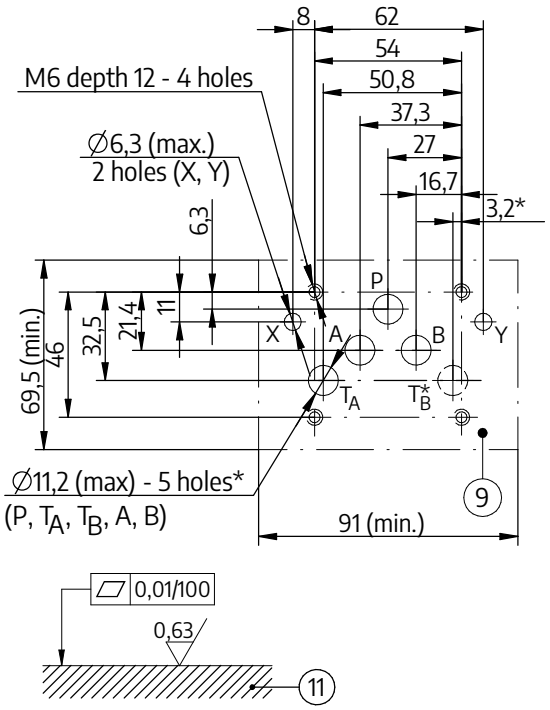
plan of solenoid coil electrical connection



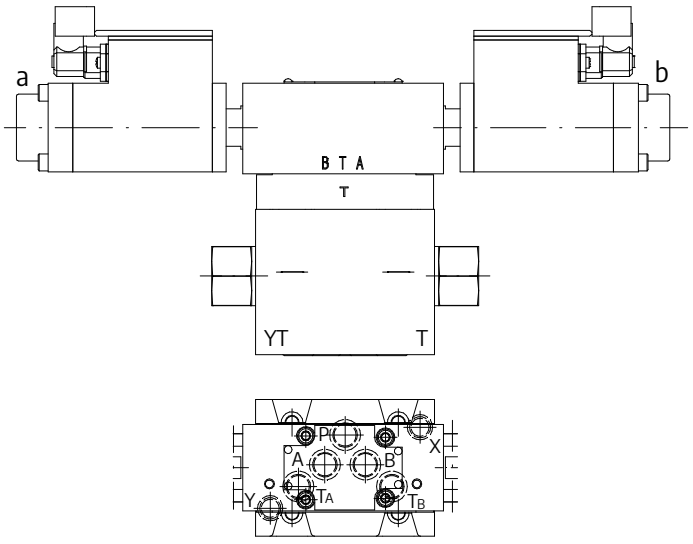
OVERALL AND CONNECTION DIMENSIONS

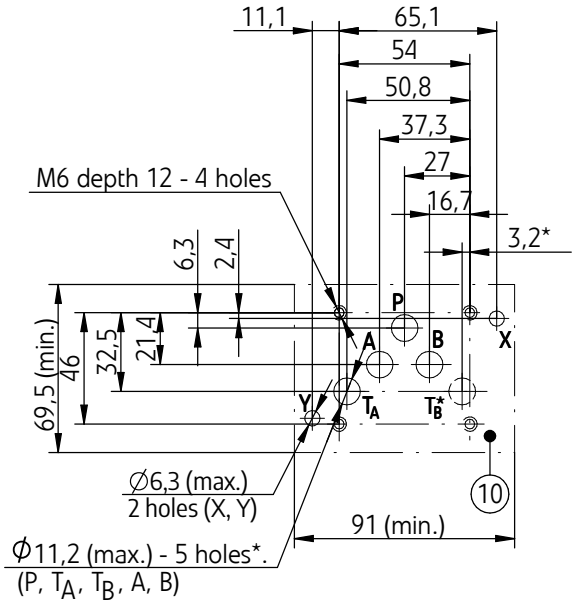
3-position version ISAP10...H...





3-position version ISAP10...PH...





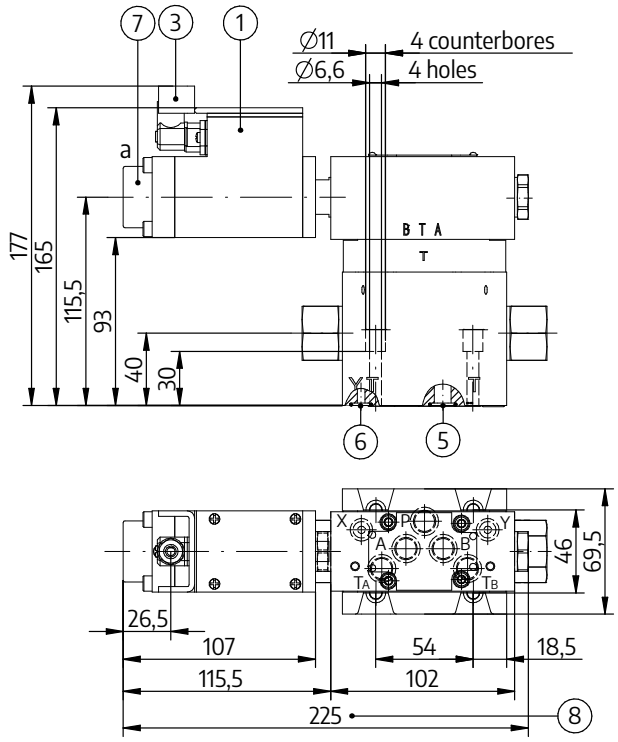
NOTE:
overall, connection dimensions and detail description of drawing as for version ISAP10...H...

1. a side solenoid
2. b side solenoid
3. a side plug – Hirschmann G4WIF type
4. b side plug – Hirschmann G4WIF type
5. o-ring 12,42 x 1,78 – 5 pcs/set (P, T_a, T_b, A, B)
6. o-ring 9,25 x 1,78 – 2 pcs/set (X, Y)
7. manual override
8. dimension of 3-position version ISAP10...H... with 2 a and b side solenoids – spool diagrams: E, E1, E2, W, W1, W2 acc. to page no. 1.
9. mounting holes configuration of subplate according to standard ISO 4401 mark ISO-4401-05-05-0-05 (CETOP R05), fixing screws M6 x 40 - 10.9 according to PN-EN ISO 4762 (PN/M-82302) - 4 pcs/set; ordered separately; tightening torque M_d = 15 Nm
10. mounting holes configuration of subplate according to standard CETOP; mark CETOP 4.2-4 P05 (CETOP P05); other details acc. to pt. 9.
11. required surface quality of the valve contact surface

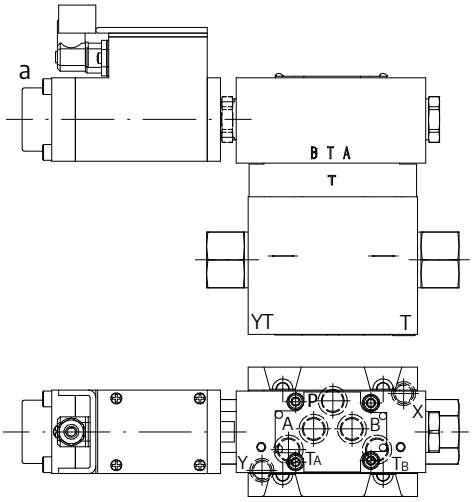
NOTE:
(*) – port T_B is optional (connection with one T port from the side of the ports A or B is sufficient - ports T_A and T_B are connected in the housing of directional spool valve.)

OVERALL AND CONNECTION DIMENSIONS

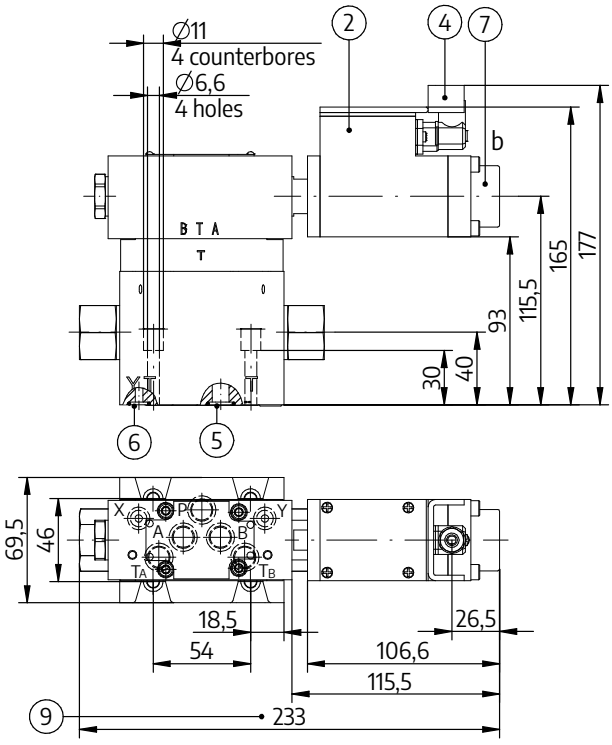
2-position version ISAP10...A...H...



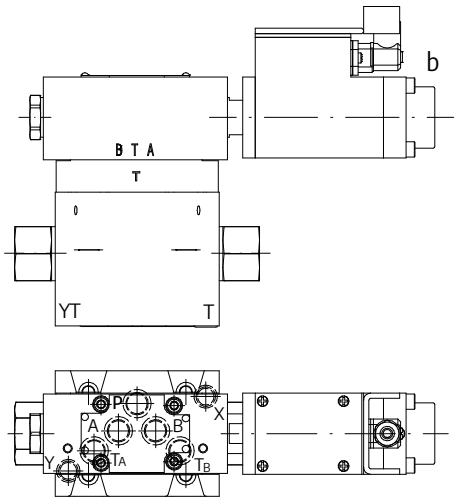
2-position version ISAP10...A...PH...



2-position version ISAP10...B...H...



2-position version ISAP10...B...PH...



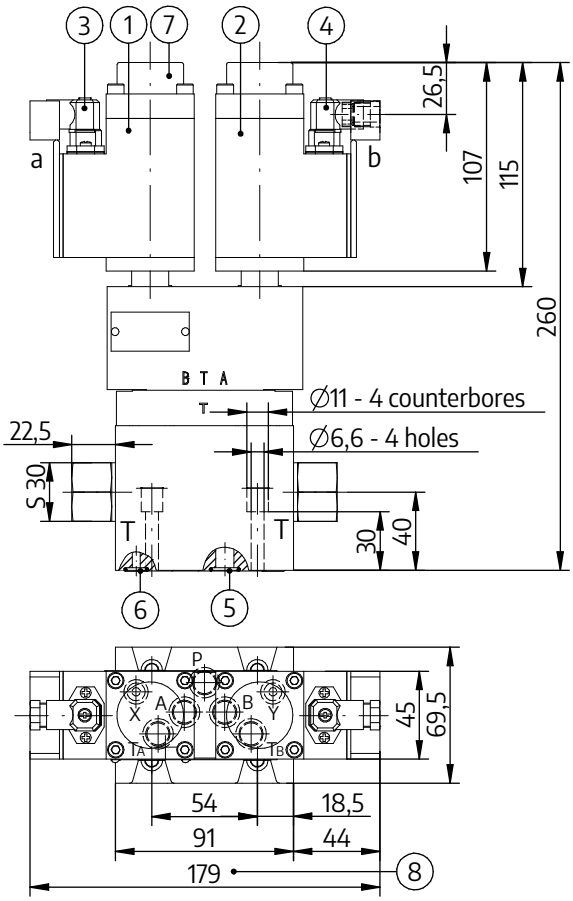
1. a side solenoid
2. b side solenoid
3. a side plug – Hirschmann G4WIF type
4. b side plug – Hirschmann G4WIF type
5. o-ring 12,42 x 1,78 – 5 pcs/set (P, T_a, T_b, A, B)
6. o-ring 9,25 x 1,78 – 2 pcs/set (X, Y)
7. manual override
8. dimension of 2-position version ISAP10...A...H... with 1 a side solenoid – spool diagrams: EA, WA acc. to page no. 1.
9. dimension of 2-position version ISAP10...B...H... with 1 b side solenoid – spool diagrams: EB, WB acc. to page no. 1.

NOTE:

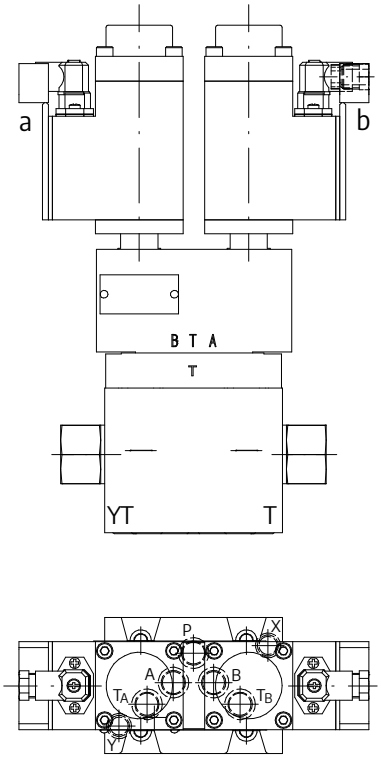
- (*) – port T_B is optional (connection with one T port from the side of the ports A or B is sufficient - ports T_A and T_B are connected in the housing of directional spool valve)
- holes configuration of subplate surface, mounting screws and tightening torque of screws for version: ISAP10...A...H...; ...B...H... as in 3-position ISAP10...H... version according to page no.3
- overall, connection dimensions and other detail description of drawings for versions ISAP10...A...PH; ...B...PH... as in versions ISAP10...A..H...; ...B...H...; holes configuration of subplate surface, mounting screws and tightening torque of screws acc. to 3-position version ISAP10...PH... acc. to page no.3

OVERALL AND CONNECTION DIMENSIONS

3-position version ISAP10...V...



3-position version ISAP10...PV...



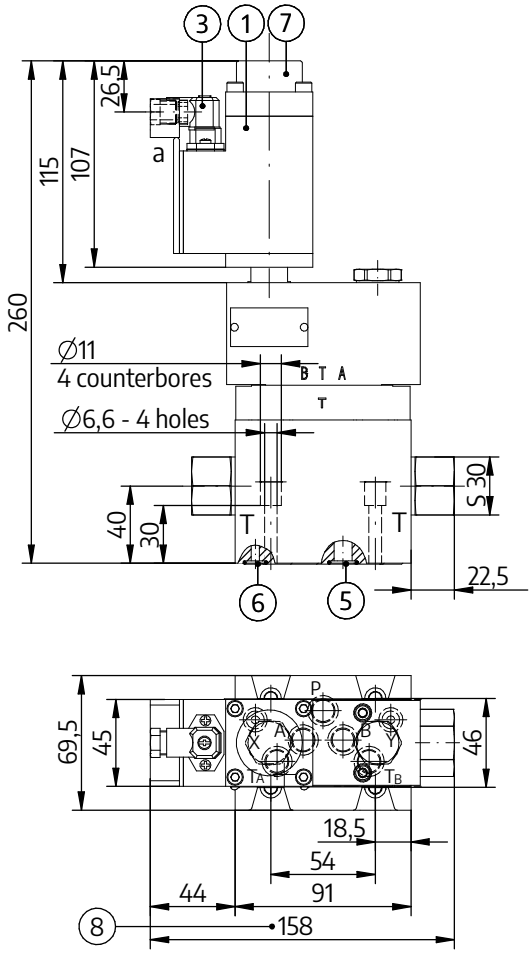
1. a side solenoid
2. b side solenoid
3. a side plug – Hirschmann G4WIF type
4. b side plug – Hirschmann G4WIF type
5. o-ring 12,42 x 1,78 – 5 pcs/set (P, T_a, T_b, A, B)
6. o-ring 9,25 x 1,78 – 2 pcs/set (X, Y)
7. manual override
8. dimension of 3-position version ISAP10...V... with 2 a and b side solenoids – spool diagrams: E, E1, E2, W, W1, W2 acc. to page no. 1.

NOTE:
holes configuration of subplate surface, mounting screws and tightening torque of screws for version: ISAP10...V...; as in ISAP10...H... version according to page no.3.

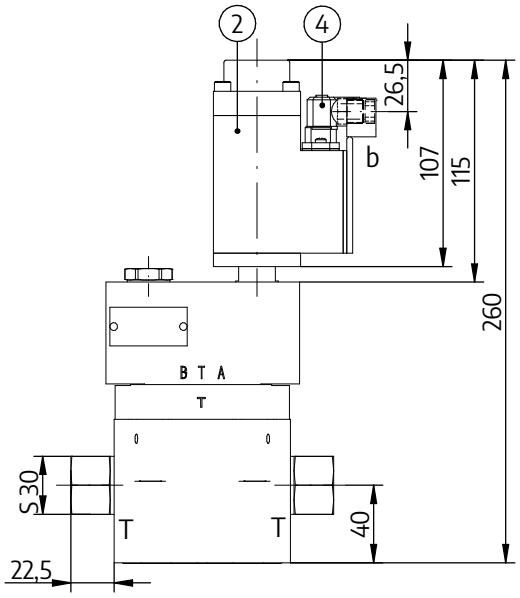
NOTE:
overall, connection dimensions and detail description of drawing for version ISAP10...PV... as for version ISAP10...V...

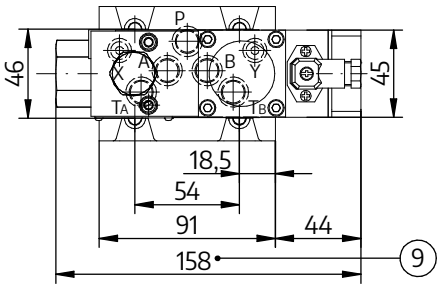
OVERALL AND CONNECTION DIMENSIONS

2-position version ISAP10...A...V...



2-position version ISAP10...B...V...



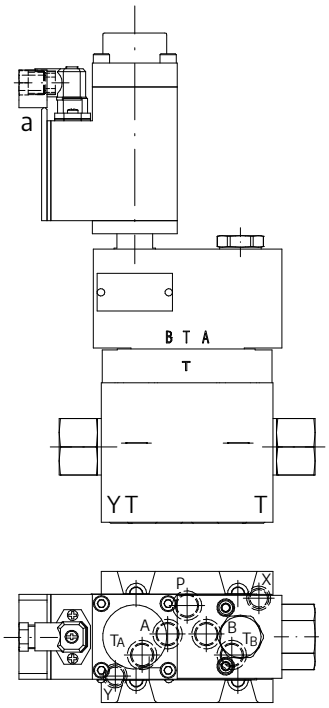


1. a side solenoid
2. b side solenoid
3. a side plug – Hirschmann G4WIF type
4. b side plug – Hirschmann G4WIF type
5. o-ring 12,42 x 1,78 – 5 pcs/set (P, T_a, T_b, A, B)
6. o-ring 9,25 x 1,78 – 2 pcs/set (X, Y)
7. manual override
8. dimension of 2-position version ISAP10...A...V... with 1 a side solenoid – spool diagrams: EA, WA acc. to page no. 1.
9. dimension of 2-position version ISAP10...B...V... with 1 b side solenoid – spool diagrams: EB, WB acc. to page no. 1.

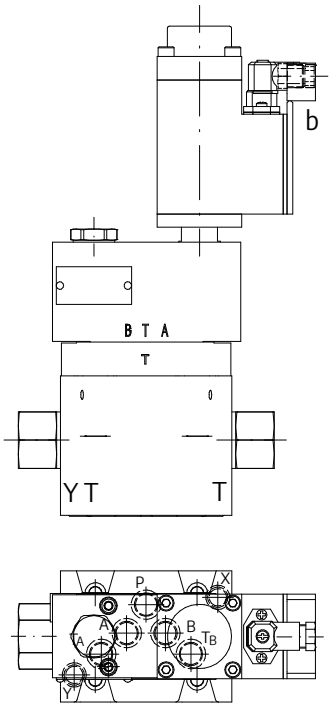
NOTE:
holes configuration and condition of subplate surface, mounting screws and tightening torque of screws as in ISAP10...H... version according to page no.3

OVERALL AND CONNECTION DIMENSIONS

2-position version ISAP10...A...PV...



2-position version ISAP10...B...PV...



NOTE:

- holes configuration and condition of subplate surface, mounting screws and tightening torque of screws as in ISAP10...PH... version according to page no.3
- overall, connection dimensions and other detail description of drawings as in versions ISAP10...A..V...; ...B...V... acc. to page no.5

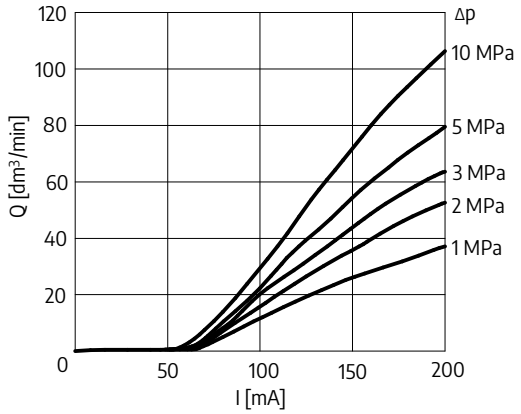
PERFORMANCE CURVES

measured at viscosity ν = 41 mm²/s and temp. t = 50°C

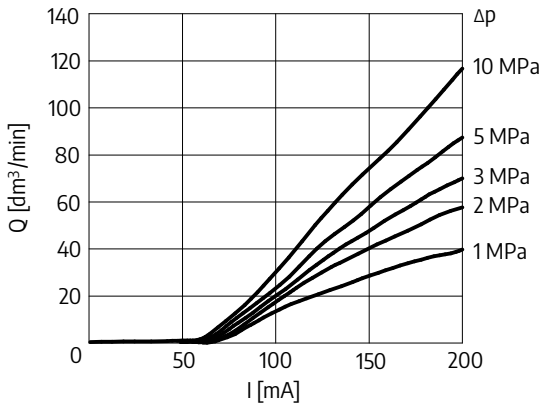
flow resistance curves in relation to control signal with constant values Δp

direction of flow P → A/B → T; P → B/A → T

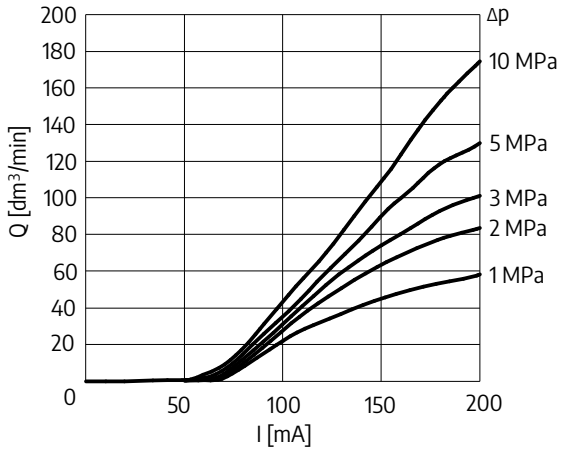
spool EQ 40



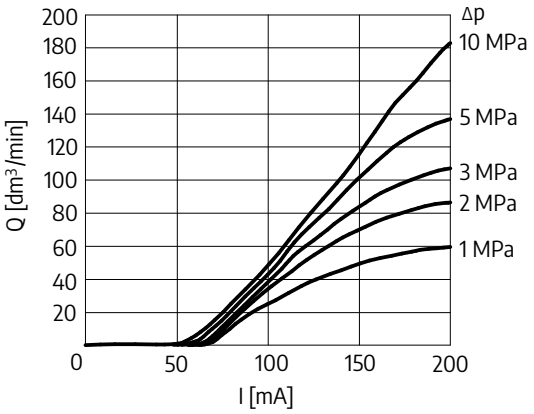
spool WQ 40



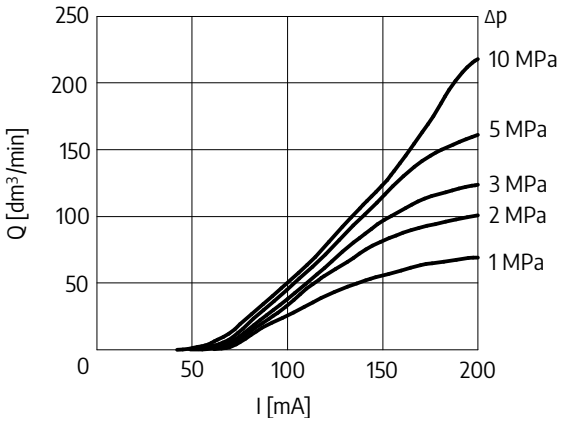
spool EQ 60



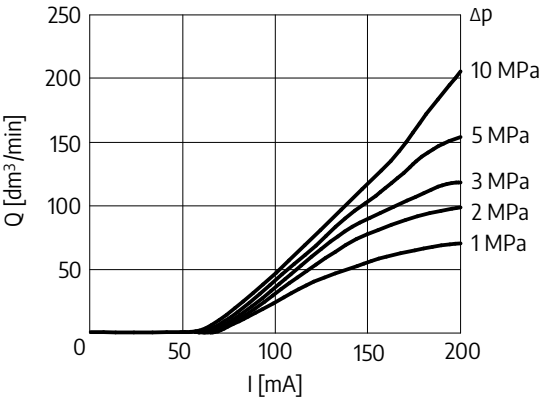
spool WQ 60



spool EQ 70



spool WQ 70



PILOT OIL SUPPLY AND PILOT OIL DRAIN

pilot oil supply (X) – external
pilot oil drain (Y) – external
version ISAP10.../...

In version ISAP10.../... the pilot flow is supplied from the external system through X port. Pilot flow is drained through independent Y port to the tank. Both hole screw plugs **3** and **4** in ports X, Y are mounted as presented in the drawing.

pilot oil supply (X) – internal
pilot oil drain (Y) – internal
version ISAP10.../...ET...

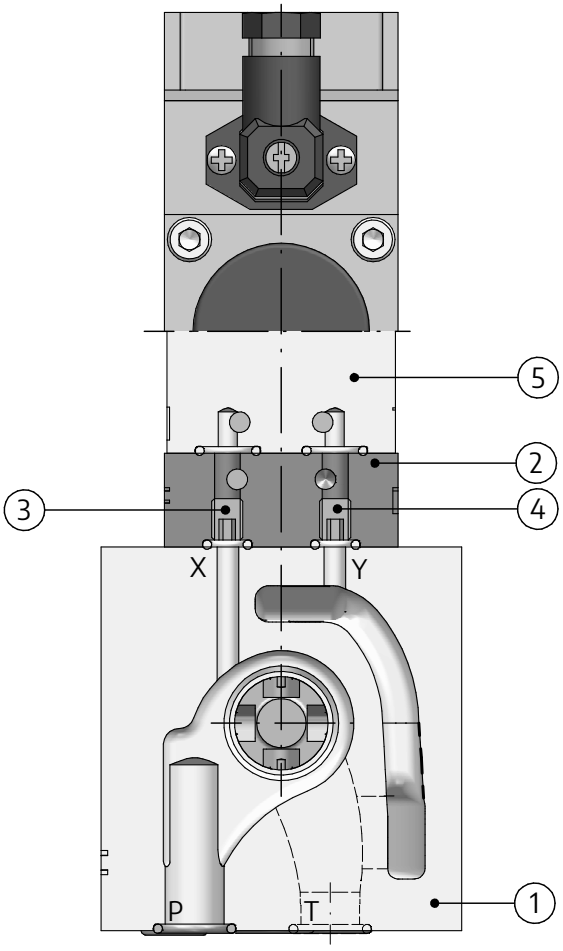
In version ISAP10.../...ET... the pilot flow is supplied internally from P port of the main directional valve. Pilot flow is drained internally by T port to the tank. Hole screw plugs **3** and **4** are dismounted. Ports X and Y in the subplate must be plugged.

pilot oil supply (X) – internal
pilot oil drain (Y) – external
version ISAP10.../...E...

In version ISAP10.../...E... the pilot flow is supplied internally from P port of the main directional valve. Pilot flow is drained through independent Y port to the tank. Hole screw plug **3** is dismounted, and hole screw plug **4** is mounted. Port X in the subplate must be plugged.

pilot oil supply (X) – external
pilot oil drain (Y) – internal
version ISAP10.../...T...

In version ISAP10.../...T... the pilot flow is supplied from the external system through X port. Pilot flow is drained internally by T port to the tank. Hole screw plug **3** is mounted, and hole screw plug **4** is dismounted. Port Y in the subplate must be plugged.



NOTE:
Screw plugs **3,4** can be accessed after dismounting of pilot valve **5** and plate **2** (4 mounting screws M5 x 70).

1. main directional valve
2. plate
3. hole screw plug M6 - 8.8 with socket S3 - pilot oil supply (X)
4. hole screw plug M6 – 8.8 with socket S3 - pilot oil drain (Y)
5. pilot valve

HOW TO ORDER

ISAP 10 – [ ] / [ ] – [ ] [ ] [ ] 12 N [ ] [ ] [ ] [ ] [ ]

1 2 3 4 5 6 7 8 9 10 11 12 13

1 nominal size
NS 10 = 10

2 series number
series 02 = 02
(02 ÷ 09) connection and installation dimensions unchanged

3 spool symbol
(spool symbols acc. to page 1)
3-position =
EQ, E1Q, E2Q, WQ, W1Q, W2Q
2-position = EAQ, EBQ, WAQ, WBQ

4 nominal flow by Δp = 1 MPa
40 dm³/min = 40
60 dm³/min = 60
70 dm³/min = 70

5 hydraulic connection
ISO4401-05-05-0-05 (CETOP R05) = Ø
CETOP 4.2-P05 (CETOP P05) = P

6 pilot valve working position
horizontal = H
vertical = V

7 solenoid coil
coil U = 12 V; I = 0,3 A = 12

8 manual override of solenoid
solenoid with manual override button = N

9 indicator of solenoid turn on
without LED indicator = Ø
with LED indicator = L

10 pilot oil supply and pilot oil drain
external supply, external drain = Ø
internal supply, external drain = E
internal supply, internal drain = ET
external supply, internal drain = T

11 electrical connection
plug Hirschmann G4WIF type = Ø

12 sealing
NBR (for fluids on mineral oil base) = Ø
FPM (for fluids on phosphate ester base) = V

13 further requirements = *
(to be agreed with the manufacturer)

Ø indicates that the box should be left blank.
The **symbols in bold** are the preferred versions available in short delivery time.

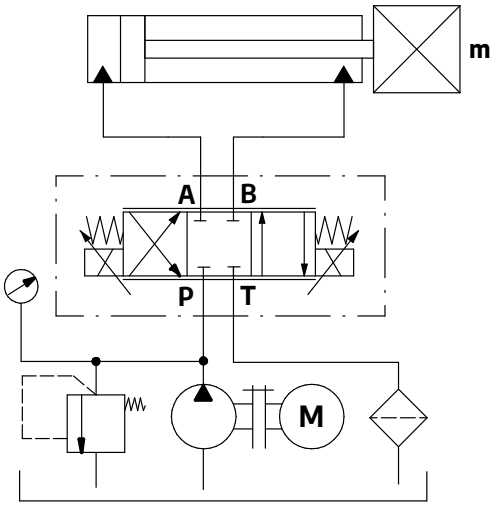
Coding example: **ISAP10-02/EQ-40H12N**

SUBPLATES AND MOUNTING SCREWS

Subplates must be ordered according to the data sheet:
- WK 496 520 - for version ISAP10...ET...
  subplate symbols: G67/01 - threaded connection: G½; G534/01 threaded connection: G¾
- WK 225 393 - for version ISAP10...; ISAP10...E...; ISAP10...T...
  subplate symbols: G540/01, G541/01 - threaded connection: X, Y - G¼, P, T, A, B - G¾

Subplate and mounting screws for valve assembly M6 x 40 – 10.9 in accordance with PN - EN ISO 4762 (PN/M-82302) 4 pcs/kit must be ordered separately. Tightening torque for screws M_d = 15Nm.

EXAMPLE OF APPLICATION in a hydraulic system



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