atos
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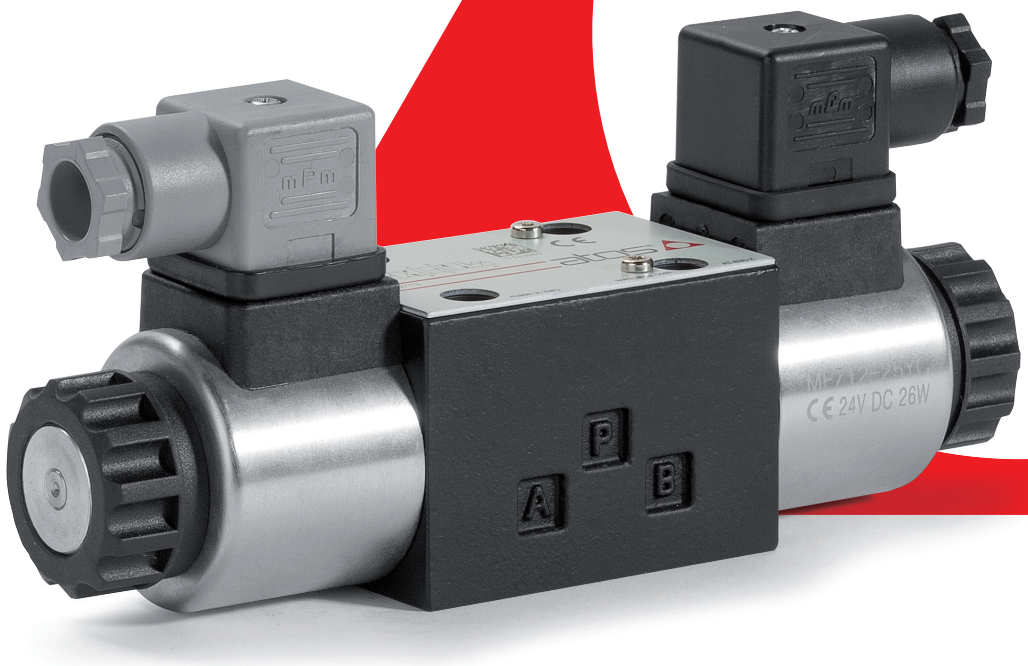
INDUSTRIAL
ELECTROHYDRAULICS

ATOS NORTH AMERICA CATALOG



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the smart electrohydraulics

First class facilities
high level of automation
with in-line process control

Know-how
from the design to the production
of the finished product

Full product range
standard, customized, ex-proof,
stainless steel, safety certified

Advanced technology
thanks to long lasting
investments in R&D

Quality first
according to ISO 9001, including
automotive sector methods

Sales & service
worldwide network of experienced
engineers, oriented to customer care

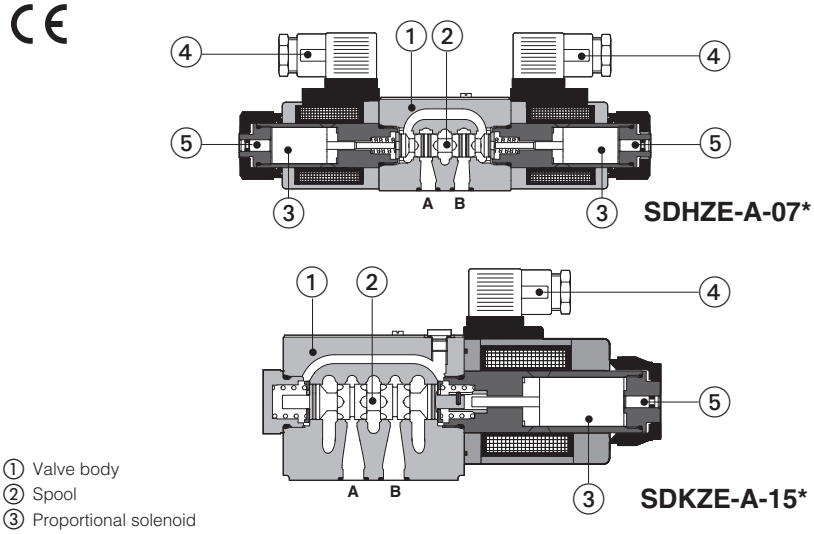
Professional team
to quickly meet every
customer need

INDEX

ATOS NORTH AMERICA

Proportional directional valves

direct operated, open loop



① Valve body
② Spool
③ Proportional solenoid
④ Electronic connector type 666 (supplied with the valve)
⑤ Manual override

SDHZE-A, **SDKZE-A**

Direct operated proportional directional valves without position transducer and with positive spool overlap for open loop directional controls and not compensated flow regulations

They operate in association with electronic drivers, see section 2, which supply the proportional valves with proper current to align the valve regulation to the reference signal.

The spools are available with linear **L**, progressive **S** or differential **D** flow characteristics.
The valve body is 3 chambers type for SDHZE and SDKZE.
The solenoid coils are available with different nominal resistances depending to the voltage supply to the driver (12 VDC or 24 VDC) and to the electronic driver characteristics, see section 2 and 3.

Mounting surface: **ISO 4401**

Size: **06** and **10**

Max flow: up to **70** and **160 l/min**

Max pressure: **350 bar** (SDHZE)
315 bar (SDKZE)

1 MODEL CODE

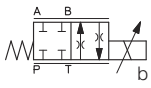
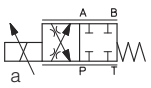
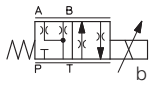
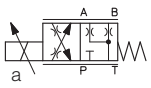
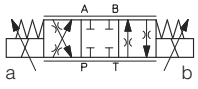
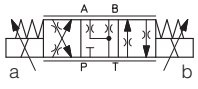
SDHZE	-	A	-	0	71	-	S	5	/	*	-	*	/	*	**	/	*

SDHZE = size 06
SDKZE = size 10

A = open loop

Valve size - ISO 4401
0 = size 06 (SDHZE)
1 = size 10 (SDKZE)

Configuration:

	Standard	Option **/B**
51 =		
53 =		
71 =		
73 =		

Spool type - regulating characteristics:

L = linear 

S = progressive 

D = differential-progressive 
P-A = Q, B-T = Q/2
P-B = Q/2, A-T = Q

Spool size:

	14 (L)	**1** (L)	**3** (L,S,D)	**5** (L,S,D)
SDHZE =	1	4,5	17	28
SDKZE =	-	-	45	60

Nominal flow (l/min) at Δp 10 bar P-T

Hydraulic options
B = solenoid side of port A (only for valve configuration 5)

Coils with special connectors, see section 10
- = omit for standard DIN connector
J = AMP Junior Timer connector
K = Deutsch connector
S = Lead Wire connection

Coil option (only for -A execution)
see section 2 and 3:
- = standard coil for 24V$_{DC}$ Atos drivers
6 = optional coil for 12V$_{DC}$ Atos drivers
18 = optional coil for 24V$_{DC}$ low current drivers **(1)**

Series number

Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

(1) select valve's coil voltage **/18** in case of electronic drivers not supply by Atos, with power supply 24V$_{DC}$ and with max current limited to 1A.

2 ELECTRONIC DRIVERS - see www.atos.com or KTI industrial master catalog

Drivers model	E-MI-AC		E-MI-AS-IR		E-BM-AS-PS		E-BM-AES
Type	analog		digital		digital		digital
Voltage supply (V_{DC})	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	DIN 43650 plug-in to solenoid				DIN-rail panel		
Data sheet	G010		G020		G030		GS050

3 MAIN CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

Assembly position	Any position					
Subplate surface finishing	Roughness index, Ra 0,4 flatness ratio 0,01/100 (ISO 1101)					
MTTFd valves according to EN ISO 13849	150 years, for further details see KT technical table P007					
Ambient temperature range	**Standard** and **/PE** = -20°C ÷ +70°C, **/BT** option = -40°C ÷ +60°C					
Storage temperature range	**Standard** and **/PE** = -20°C ÷ +80°C, **/BT** option = -40°C ÷ +70°C					
Coil code	**SDHZE**			**SDKZE**		
	standard	option /6	option /18	standard	option /6	option /18
Coil resistance R at 20°C	3,1 Ω	2,1 Ω	13,1 Ω	3,2 Ω	2,1 Ω	13,7 Ω
Max. solenoid current	2,5 A	3 A	1,2 A	2,2 A	2,65 A	1 A
Insulation class	H (180°) Due to the occuring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account					
Protection degree to DIN EN60529	**IP 65** (with connectors 666 correctly assembled)					
Duty factor	Continuous rating (ED=100%)					

Valve model	**SDHZE**				**SDKZE**	
Pressure limits [bar]	ports **P, A, B** = 350; **T** = 210				ports **P, A, B** = 315; **T** = 210	
Spool type and size	**L14**	**L1**	**S3, L3, D3**	**S5, L5, D5**	**S3, L3, D3**	**S5, L5, D5**
Nominal flow **(1)** [l/min]						
at Δp = 10 bar (P-T)	1	4,5	18	28	45	60
at Δp = 30 bar (P-T)	1,7	8	30	50	80	105
at Δp = 70 bar (P-T)	3	12	45	70	120	160
Response time **(2)** [ms]	< 30				< 40	
Hysteresis [%]	5 [% of max regulation]					
Repeatability [%]	± 1 [% of max regulation]					

Notes: above performance data refer to valves coupled with Atos electronic drivers, see section 2.
the flow regulated by the directional proportional valves is not pressure compensated, thus it is affected by the load variations.To keep costant the regulated flow under different load conditions, Atos modular pressure compensators are available at www.atos.com (see KT table D150).

(1) For different Δp, the max flow is in accordance to the diagrams in sections 7.2 and 8.2

(2) 0-100% step signal

4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

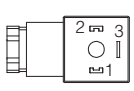
Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity		20 ÷ 100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at www.atos.com or KTF catalog	
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR, HNBR	HFC	

5 GENERAL NOTES

SDHZE and SDKZE proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

6 CONNECTIONS

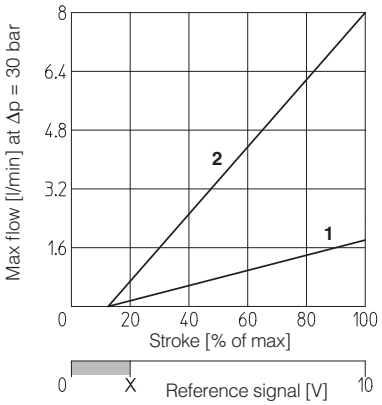
SOLENOID POWER SUPPLY CONNECTOR TYPE 666	
PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND

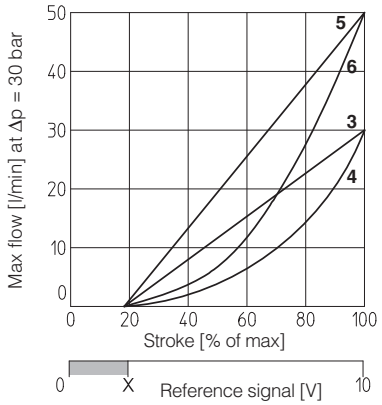


7 DIAGRAMS FOR SDHZE (based on mineral oil ISO VG 46 at 50 °C)

7.1 Regulation diagrams

1 = linear spool L14
2 = linear spool L1
3 = linear spool L3
4 = progressive spool S3, D3
5 = linear spool L5
6 = progressive spool S5, D5

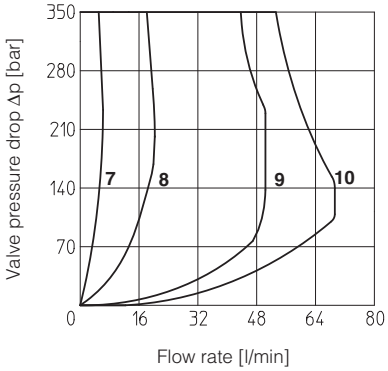




X = Threshold for bias activation depending to the valve type and amplifier type

7.2 Operating limits

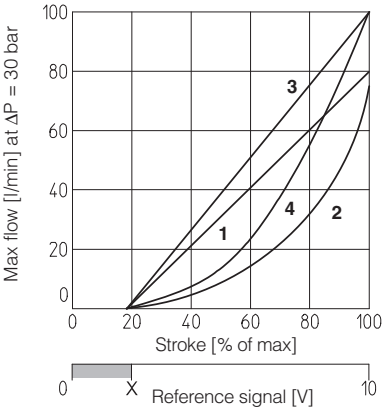
7 = spool L14
8 = spool L1
9 = spool L3, S3, D3
10 = spool L5, S5, D5



8 DIAGRAMS FOR SDKZE (based on mineral oil ISO VG 46 at 50 °C)

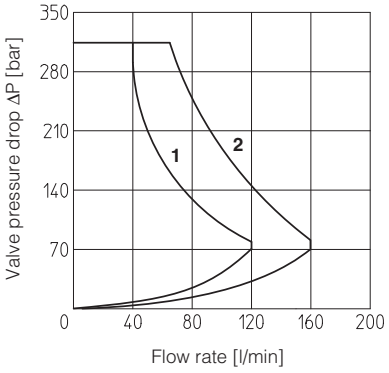
8.1 Regulation diagrams

1 = linear spool L3
2 = progressive spool S3, D3
3 = linear spool L5
4 = progressive spool S5, D5



8.2 Operating limits

1 = spool L3, S3, D3
2 = spool L5, S5, D5

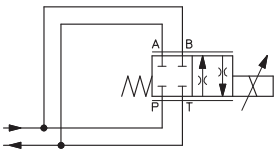


X = Threshold for bias activation depending to the valve type and amplifier type

9 OPERATION AS THROTTLE VALVE

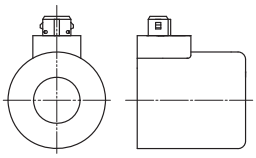
Single solenoid valves (SDHZE-A-051 - SDKZE-A-151) can be used as simple throttle valves:
Pmax = 210 bar

Max flow Δp= 30bar [l/min]	SPOOL TYPE					
	L14	**L1**	**L3**	**S3**	**L5**	**S5**
SDHZE	4	16	60		100	
SDKZE	-	-	120		150	

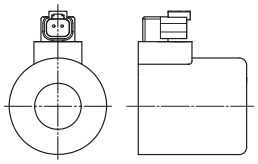


10 COILS WITH SPECIAL CONNECTORS

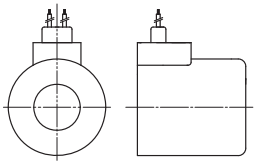
Options -J
Coil type COZEJ (SDHZE)
Coil type CAZEJ (SDKZE)
AMP Junior Timer connector
Protection degree IP67



Options -K
Coil type COZEK (SDHZE)
Coil type CAZEK (SDKZE)
Deutsch connector, DT-04-2P male
Protection degree IP67



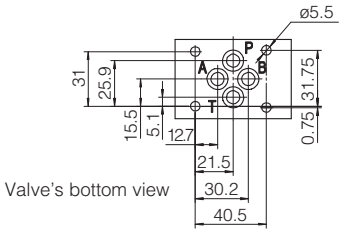
Options -S
Coil type COZES (SDHZE)
Coil type CAZES (SDKZE)
Lead Wire connection
Cable lenght = 180 mm



11 INSTALLATION DIMENSIONS FOR SDHZE and SDKZE [mm]

SDHZE

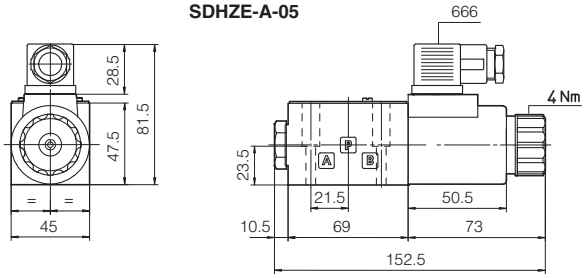
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)



Valve's bottom view

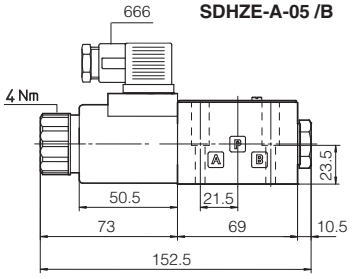
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDHZE-A-05

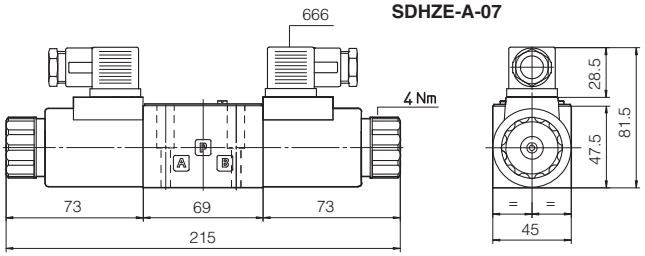


Mass: 1,5 kg

SDHZE-A-05 /B



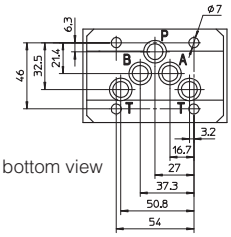
SDHZE-A-07



Mass: 2 kg

SDKZE

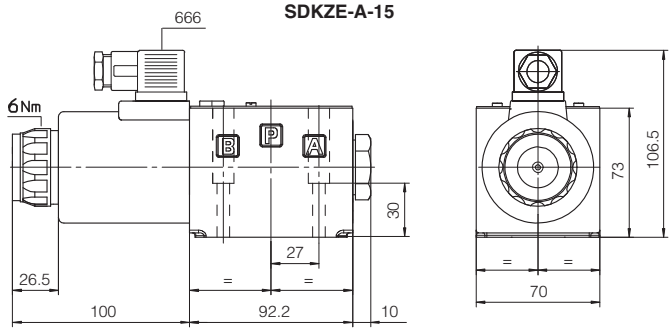
ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see table P005)
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050
Diameter of ports A, B, P, T: Ø 11,2 mm (max)



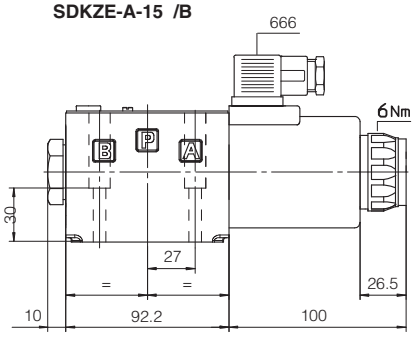
Valve's bottom view

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDKZE-A-15

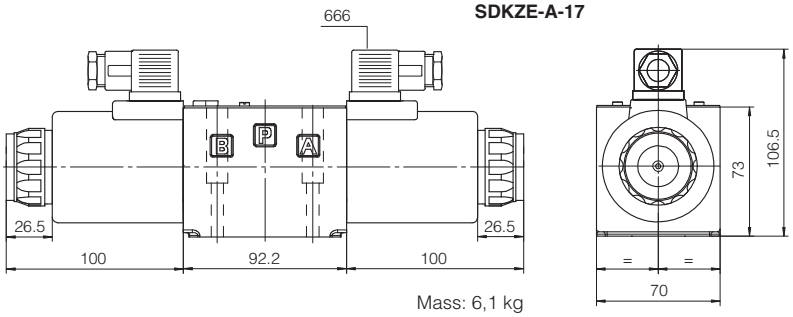


SDKZE-A-15 /B



Mass: 4,5 kg

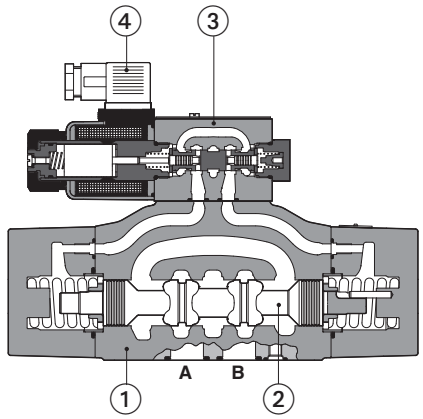
SDKZE-A-17



Mass: 6,1 kg

Two stage proportional directional valves

pilot operated, open loop



SDPZE-A-251-*

① Valve body
② Main spool
③ Pilot valve
④ Electronic connector type 666 (supplied with the valve)

SDPZE-A

Pilot operated proportional valves without position transducer and with positive spool overlap, for open loop directional controls and not compensated flow regulations.

They operate in association with electronic derivers, see section 2, which supply the proportional valve with proper current to align the valve regulation to the reference signal.

The solenoid coils are available with different nominal resistances depending to the voltage supply to the driver (12 VDC or 24 VDC) and to the electronic driver characteristics, see section 2 and 3.

Mounting surface: **ISO 4401**
Size: **16** and **25**
Max flow: **550** and **900 l/min**
Max pressure: **350 bar**

1 **MODEL CODE for STANDARD SPOOLS**

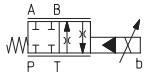
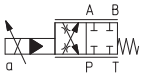
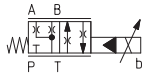
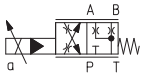
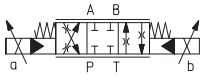
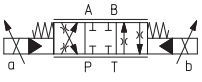
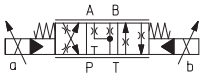
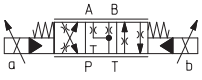
SDPZE	-	A	-	2	71	-	L	5	/	*	-	*	/	*	*	/	*

SDPZE — Pilot operated proportional directional valve

A = open loop - available separated driver see section 2

Valve size - ISO 4401:
2 = 16 **4** = 25

Configuration:

	Standard	Option **/B**
51 =		
53 =		
71 =		
73 =		

Spool type - regulating characteristics:

L = linear 

S = progressive 

D = differential-progressive 
P-A = Q, B-T = Q/2
P-B = Q/2, A-T = Q

Spool size — **3** (L,S,D) — **5** (L,S,D)

SDPZE-2 =	160	250
SDPZE-4 =	-	480

Nominal flow (l/min) at Δp 10bar P-T

Series number

Seals material, see sect. 4:
- = NBR
PE = FKM
BT = HNBR

Coil voltage, see section 2, 3:
- = standard coil for 24VDC Atos drivers
6 = optional coil for 12VDC Atos drivers
18 = optional coil for low current drivers **(2)**

Coils with special connectors, see section 10
- = omit for standard DIN connector
J = AMP Junior Timer connector
K = Deutsch connector
S = Lead Wire connection

Hydraulic options, see sect. 8:
B = solenoid at side of port B of the main stage (side A of pilot valve) **(1)** - only for configuration 51and 53
D = internal drain
E = external pilot pressure
G = pressure reducing valve for piloting

(1) In standard configuration the solenoid (config. 51 and 53) is at side A of the main stage (side B of pilot valve)
(2) Select valve's coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24VDC and with max current limited to 1A.

2 ELECTRONIC DRIVERS - see www.atos.com or KTI industrial master catalog

Drivers model	E-MI-AC		E-MI-AS-IR		E-BM-AS-PS		E-BM-AES
Type	analog		digital		digital		digital
Voltage supply (V_{DC})	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	DIN 43650 plug-in to solenoid				DIN-rail panel		
Data sheet	G010		G020		G030		GS050

3 MAIN CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007		
Ambient temperature range	**Standard** and **/PE** = -20°C ÷ +70°C; **/BT** option = -40°C ÷ +60°C		
Storage temperature range	**Standard** and **/PE** = -20°C ÷ +80°C; **/BT** option = -40°C ÷ +70°C		
Coil code	**Standard** standard coil to be used with Atos drivers with power supply 24V_{DC}	option **/6** optional coil to be used with Atos drivers with power supply 12 V_{DC}	option **/18** optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 V_{DC} and max current limited to 1A
Coil resistance R at 20°C	3,1 Ω	2,1 Ω	13,1 Ω
Max. solenoid current	2,5 A	3 A	1,2 A
Insulation class	H (180°) Due to the occuring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account		
Protection degree to DIN EN60529	**IP 65** (with connectors 666 correctly assembled)		
Duty factor	Continuous rating (ED=100%)		

Valve model		**SDPZE-*-2**		**SDPZE-*-4**
Pressure limits	[bar]	ports **P, A, B, X** = 350; **T** = 250 (10 for option /D); **Y** = 10;		
Spool type		**L3, S3, D3**	**L5, S5, D5**	
Nominal flow	[l/min]			
(1)	Δp = 10 bar	160	250	480
Δp P-T	Δp = 30 bar	270	430	830
Max permissible flow	[l/min]	400	550	900
Piloting pressure	[bar]	min. = 25; max = 350 (option /G advisable for pilot pressure > 150 bar)		
Piloting volume	[cm^3]	3,7		9,0
Piloting flow **(2)**	[l/min]	3,7		6,8
Leakage **(3)**	Main stage [l/min]	0,2/0,6		0,3/1,0
Response time **(4)** (0-100% step signal and pilot pressure 100 bar)	[ms]	< 100		< 120
Hysteresis		≤ 5 [% of max regulation]		
Repeatability		± 1 [% of max regulation]		

Notes: above performance data refer to valves coupled with Atos electronic drivers, see section 2.
(1) for different Δp, see section 7.2 **(2)** with step reference input signal 0 ÷100 %
(3) at P = 100/350 bar **(4)** see detailed diagrams in section 7.3

4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

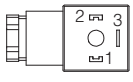
Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity		20 ÷ 100 mm^2/s - max allowed range 15 ÷ 380 mm^2/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7		see also filter section at www.atos.com or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR, HNBR	HFC	

5 GENERAL NOTES

SDPZE-A* proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

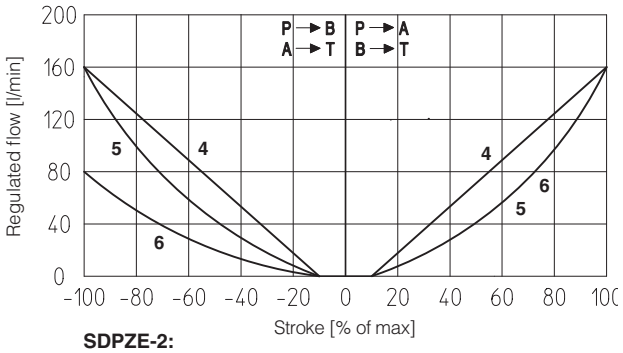
6 CONNECTIONS

SOLENOID POWER SUPPLY CONNECTOR TYPE 666	
PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND

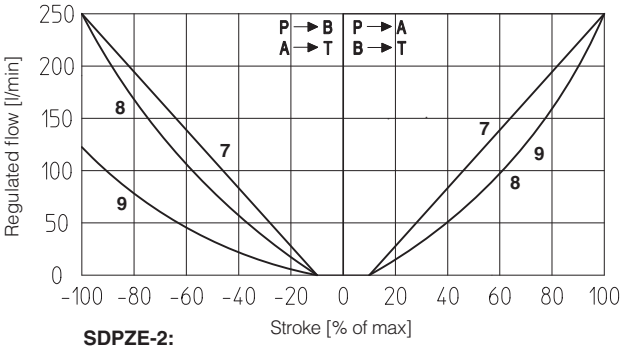


7 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

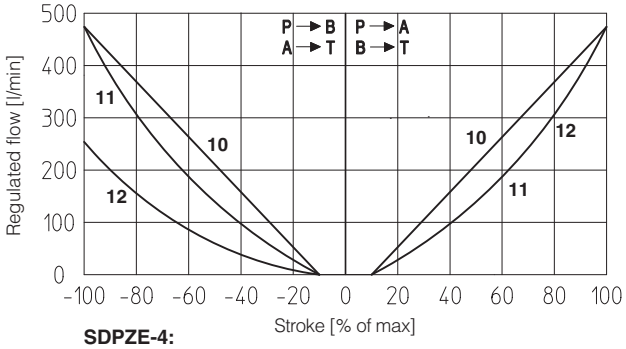
7.1 Regulation diagrams (values measure at Δp 10 bar P-T)



SDPZE-2:
4 = L3 **5** = S3 **6** = D3



SDPZE-2:
7 = L5 **8** = S5 **9** = D5



SDPZE-4:
10 = L5 **11** = S5 **12** = D5

Note: Hydraulic configuration vs. reference signal for configuration 71 and 73 (standard and option /B)

Reference signal 0 ÷ +10 V / 12 ÷ 20 mA } P → A / B → T

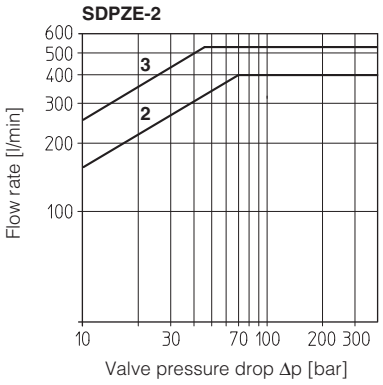
Reference signal 0 ÷ - 10 V / 12 ÷ 4 mA } P → B / A → T

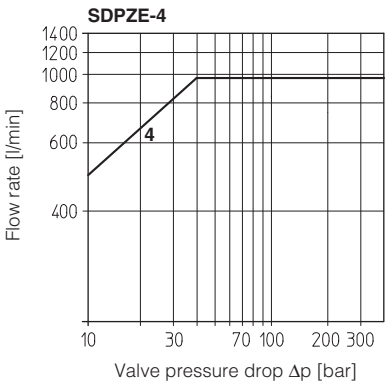
7.2 Flow /Δp diagram

stated at 100% of spool stroke

SDPZE-2:
2 = spools L3, S3, D3
3 = spools L5, S5, D5

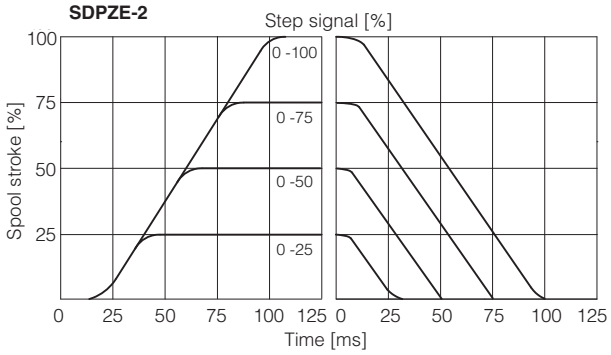
SDPZE-4:
4 = spools L5, S5, D5

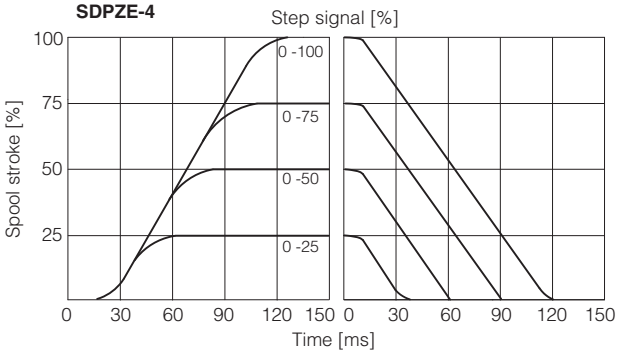




7.3 Response time (measured at pilot pressure = 100 bar)

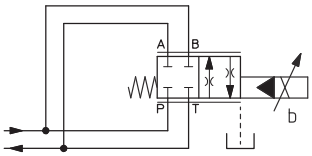
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.





7.4 Operation as throttle valve

Single solenoid valves (*51) can be used as simple throttle valves:
Pmax = 250 bar



SDPZE-A-*	251-L5	451-L5
Max flow [l/min] Δp = 15 bar	860	1600

8 HYDRAULIC OPTIONS

8.1 Option /B

SDPZE-A-*5* = solenoid at side of port B of the main stage. Only for config. 51 and 53

8.2 Options /E and /D

Pilot and drain configuration can be modified as shown in section 9
The valve's standard configuration provides internal pilot and external drain.
For different pilot / drain configuration select:

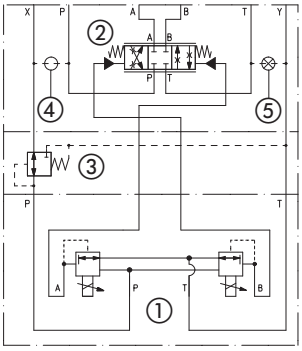
Option /E External pilot (through port X).

Option /D Internal drain.

8.3 Option /G

Pressure reducing valve installed between pilot valve and main body with fixed setting:
SDPZE-2 = 40 bar
SDPZE-4 = 100 bar
It is advisable for valves with internal pilot in case of system pressure higher than 150 bar.

FUNCTIONAL SCHEME
example of configuration 7*
3 positions, spring centered

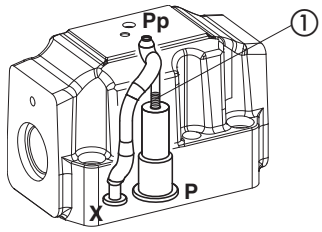


① Pilot valve
② Main stage
③ Pressure reducing valve
④ Plug to be added for external pilot trough port X
⑤ Plug to be removed for internal drain through port T

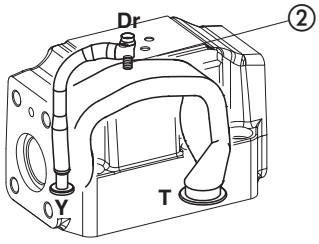
9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

SDPZE-2 Pilot channels

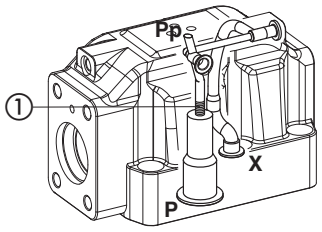


Drain channels

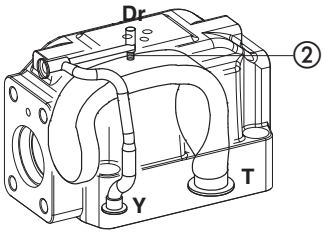


Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

SDPZE-4 Pilot channels



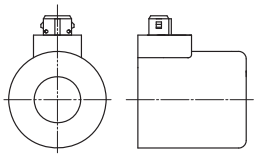
Drain channels



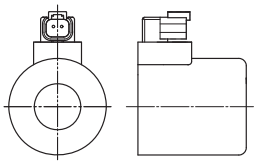
Internal piloting: Without blinded plug SP-X500F ①;
External piloting: Add blinded plug SP-X500F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

10 COILS WITH SPECIAL CONNECTORS

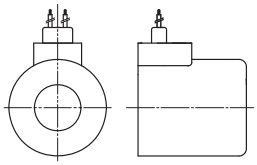
Options -J
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



Options -K
Coil type COZEK
Deutsch connector, DT-04-2P male
Protection degree IP67



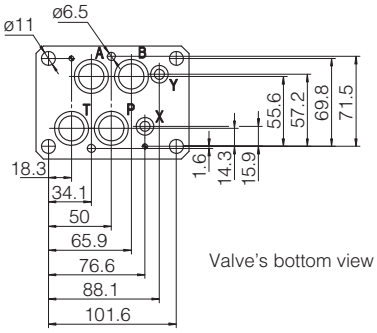
Options -S
Coil type COZES
Lead Wire connection
Cable lenght = 180 mm



SDPZE-2*

ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

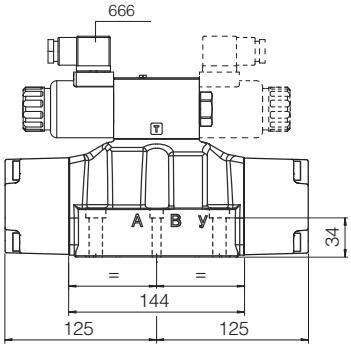


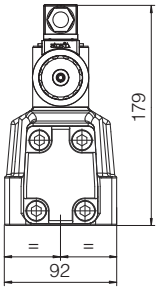
Valve's bottom view

Mass [kg]

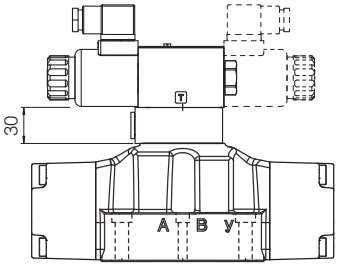
	A
SDPZE-*-25*	11,9
SDPZE-*-27*	12,8
Option /G	+0,9

SDPZE-A-2





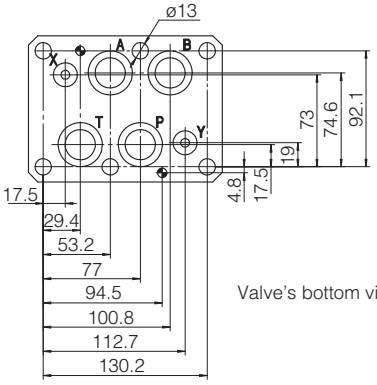
Option /G



SDPZE-4*

ISO 4401: 2005
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

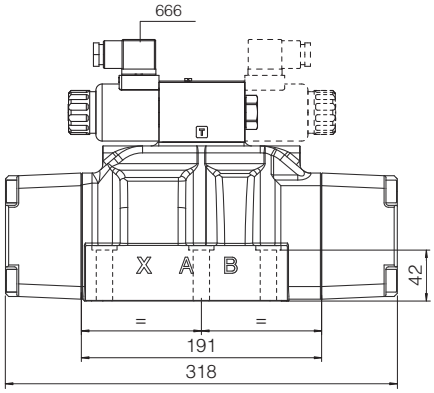


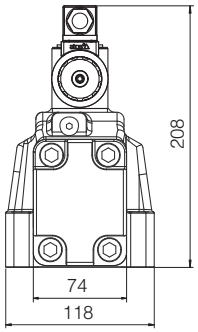
Valve's bottom view

Mass [kg]

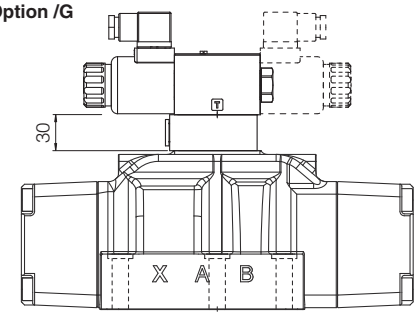
	A
SDPZE-*-45*	17,1
SDPZE-*-47*	18
Option /G	+0,9

SDPZE-A-4





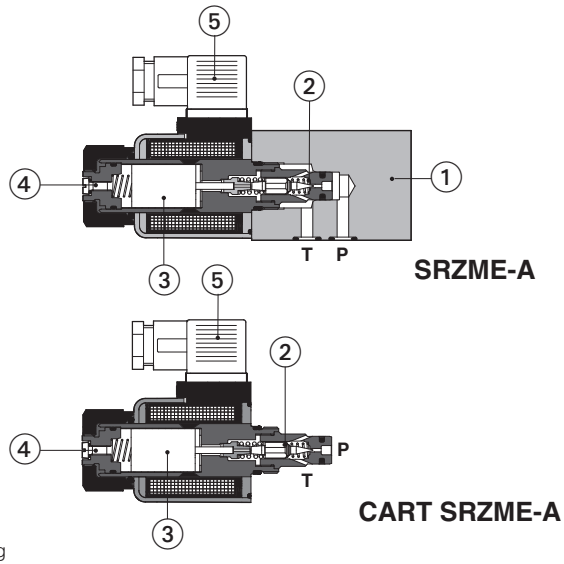
Option /G



Dotted line = double solenoid version

Proportional relief valves

direct operated, ISO 4401 size 06 subplate mounting or M20 screw-in cartridge execution



① Valve body
② Poppet
③ Proportional solenoid
④ Screw for air bleeding
⑤ Electric connector type 666 (supplied with the valve)

SRZME-A, CART SRZME-A
Poppet type direct operated proportional relief valves for pressure open loop controls, available in following executions:

SRZME: subplate mounting, ISO size 06

CART SRZME: M20 cartridge execution

They operate in association with electronic drivers, see section 2, which supply the proportional valves with proper current to align the valve regulation to the reference signal.

The solenoid coils are available with different nominal resistances depending to the voltage supply to the electronic driver (12 VDC or 24 VDC) and to the driver characteristics, see section 2 and 3.

Mounting surface SRZME: **ISO 4401 size 06**

Cavity CART SRZME: see section 10

Max flow = **4 l/min**
Max pressure = **350 bar**

1 MODEL CODE

SRZME	-	A	-	010	/	315	-	*	/	*	**	/	*

SRZME
Proportional pressure relief valve
SRZME = subplate mounting
CART SRZME = cartridge execution

A = open loop pressure control

Configuration:
010 = regulation on port P, discharge in T

Max regulated pressure:
50 = 50 bar
100 = 100 bar
210 = 210 bar
315 = 315 bar
350 = 350 bar

Coils with special connectors, see section 9
- = omit for standard DIN connector
J = AMP Junior Timer connector
K = Deutsch connector
S = Lead Wire connection

Coil voltage see section 2 and 3:
- = standard coil for 24VDC Atos drivers
6 = optional coil for 12VDC Atos drivers
18 = optional coil for low current drivers **(1)**

Series number

Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

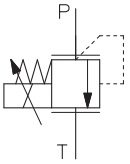
(1) select valve's coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24VDC and with max current limited to 1A.

2 ELECTRONIC DRIVERS - see www.atos.com or KTI industrial master catalog

Drivers model	E-MI-AC **(1)**		E-MI-AS-IR **(1)**		E-BM-AS-PS		E-BM-AES
Type	analog		digital		digital		digital
Voltage supply (VDC)	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	DIN 43650 plug-in to solenoid				DIN-rail panel		
Data sheet	G010		G020		G030		GS050

(1) for **CART SRZME** the electronic driver may interfere with the manifold surface. Please check the installation dimensions at section 10

3 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C)

Hydraulic symbols	 **SRZME-A** **CART SRZME-A**		
Assembly position / location	Any position		
Subplate surface finishing (SRZME)	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature range	**Standard** and **/PE** = -20°C ÷ +70°C; **/BT** option = -40°C ÷ +60°C		
Storage temperature range	**Standard** and **/PE** = -20°C ÷ +80°C; **/BT** option = -40°C ÷ +70°C		
Coil code	**Standard** standard coil to be used with Atos drivers with power supply 24VDC	option **/6** optional coil to be used with Atos drivers with power supply 12 VDC	option **/18** optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 VDC and max current limited to 1A
Coil resistance R at 20°C	3,1 Ω	2,1 Ω	13,1 Ω
Max. solenoid current	2,5 A	3 A	1,2 A
Protection degree (CEI EN-60529)	**IP 65** (with connectors 666 correctly assembled)		
Duty factor	Continuous rating (ED=100%)		

Max regulated pressure	[bar]	**50**	**100**	**210**	**315**	**350**
Min. regulated pressure	[bar]	see min. pressure / flow diagrams at sect. 7				
Max. pressure at port P	[bar]	350				
Max. pressure at port T	[bar]	210				
Max. flow	[l/min]	4				
Response time 0-100% step signal **(1)** (depending on installation)	[ms]	≤ 70				
Hysteresis	[% of the max pressure]	≤ 1,5				
Linearity	[% of the max pressure]	≤ 3				
Repeatability	[% of the max pressure]	≤ 2				

Notes: above performance data refer to valves coupled with Atos electronic drivers, see section 2.

(1) Average response time values; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response.

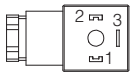
4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity		20 ÷ 100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7		see also filter section at www.atos.com or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR, HNBR	HFC	

5 GENERAL NOTES

SRZME-A and CART SRZME proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

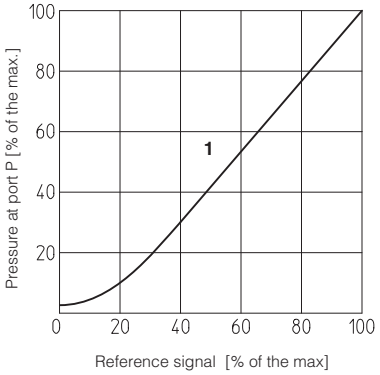
6 SOLENOID CONNECTIONS

SOLENOID POWER SUPPLY CONNECTOR TYPE 666		
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	

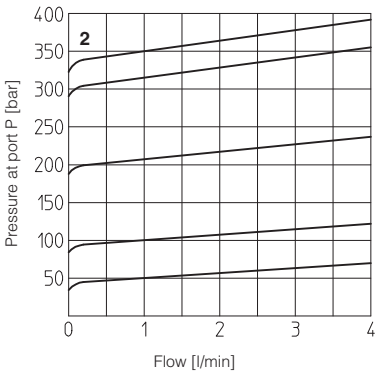
7 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

1 Regulation diagrams
with flow rate Q = 1 l/min

Note:The presence of counter pressure at port T can affect the effective pressure regulation.

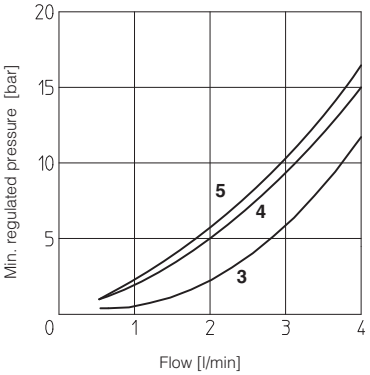


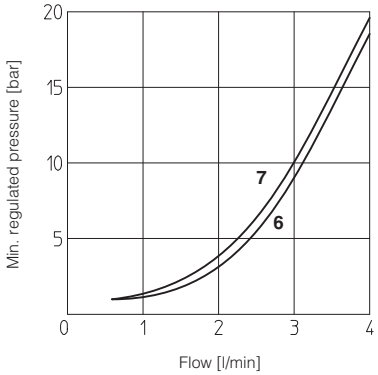
2 Pressure/flow diagrams
with reference signal set at Q = 1 l/min



3-7 Min. pressure/flow diagrams
with zero reference signal

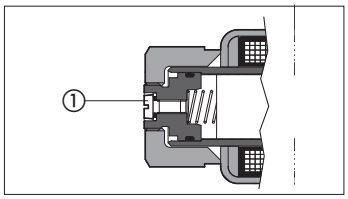
3 = pressure range: 50
4 = pressure range: 100
5 = pressure range: 210
6 = pressure range: 315
7 = pressure range: 350





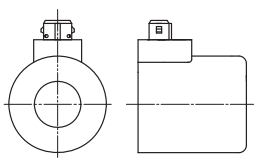
8 AIR BLEEDING

At the first valve commissioning the air eventually trapped inside the solenoid must be bled-off through the screw ① located at the rear side of the solenoid housing.
The presence of air may cause pressure instability and vibrations.

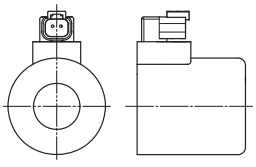


9 COILS TYPE WITH SPECIAL CONNECTORS

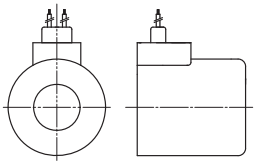
Options -J
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



Options -K
Coil type COZEK
Deutsch connector, DT-04-2P male
Protection degree IP67



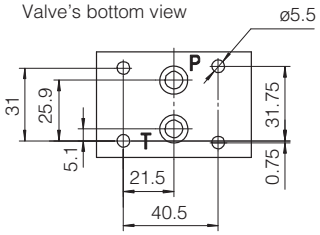
Options -S
Coil type COZES
Lead Wire connection
Cable lenght = 180 mm



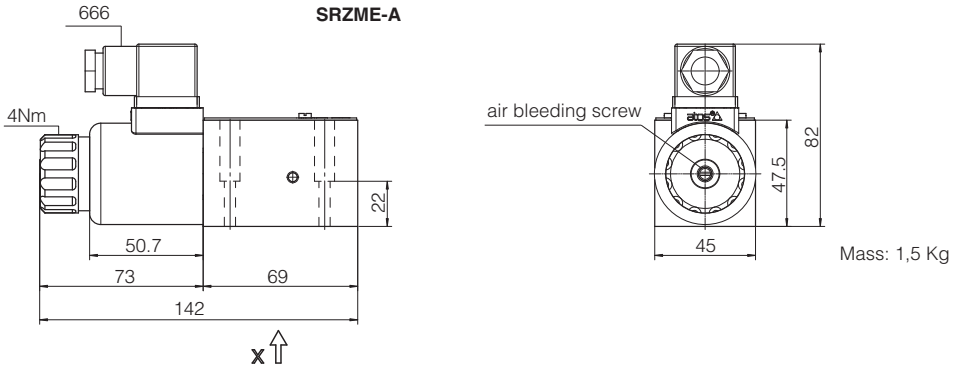
10 INSTALLATION DIMENSIONS [mm]

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05 (see table P005)
(without ports A and B)
Fastening bolts:
4 socket head screws M5X50 class 12.9
Tightening torque = 8 Nm
Seals: 2 OR 108
Ports P, T: Ø = 5 mm

Valve's bottom view

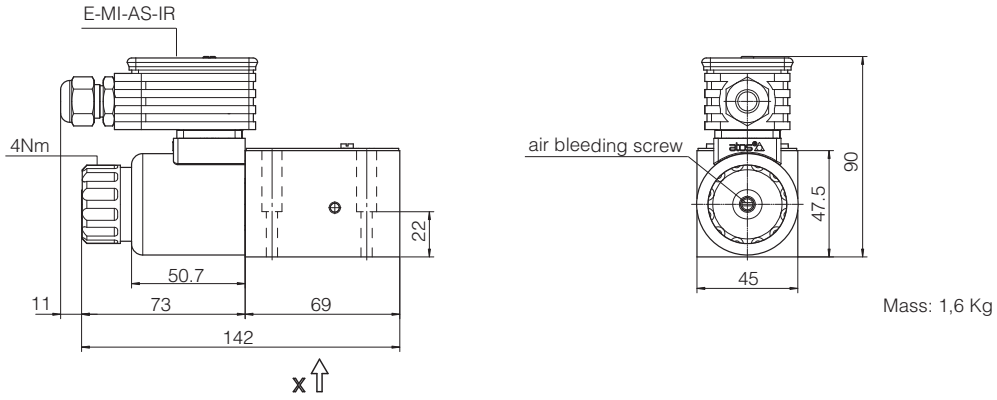


SRZME-A



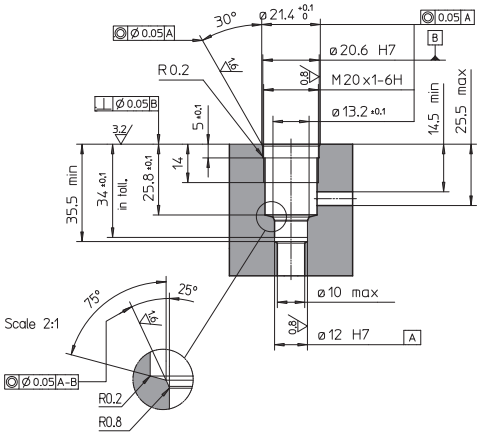
Mass: 1,5 Kg

SRZME-A
(with digital driver E-MI-AS-IR)

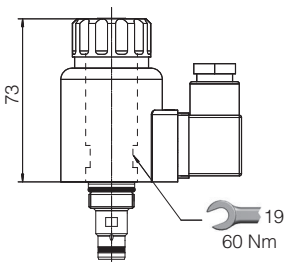


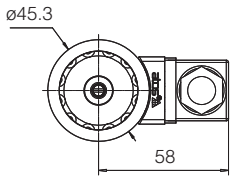
Mass: 1,6 Kg

Cavity dimensions
for **CART SRZME-A**



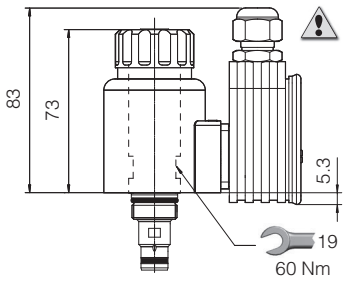
CART SRZME-A



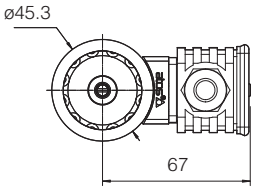


Mass: 0,6 Kg

CART SRZME-A
(with digital driver E-MI-AS-IR)



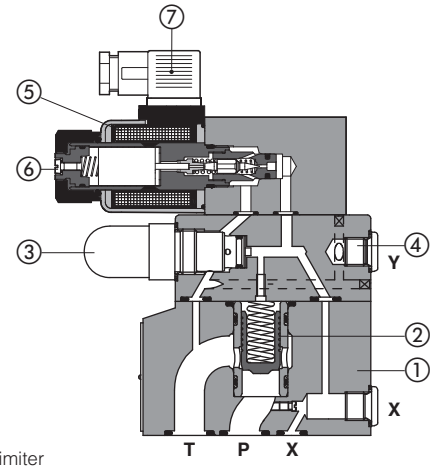
to be checked for eventual interference with the manifold surface



Mass: 0,7 Kg

Proportional relief valves

pilot operated, open loop



SAGMZE-A-10

① Valve main body
② Main poppet
③ Mechanical pressure limiter
④ Drain port G 1/4" (option /Y)
⑤ Proportional solenoid
⑥ Screw for air bleeding
⑦ Electric connector type 666 (supplied with the valve)

SAGMZE-A
Poppet type, pilot operated proportional relief valves for pressure open loop controls.

They operate in association with electronic drivers, see section 2, which supply the proportional valves with proper current to align the valve regulation to the reference signal.

The solenoid coils are available with different nominal resistances depending to the voltage supply to the electronic driver (12 VDC or 24 VDC) and to the driver characteristics, see section 2 and 3.

Mounting surface: **ISO 6264**

Size: **10, 20, 32**
Max flow: **200, 400, 600 l/min**
Max pressure: **350 bar**

1 MODEL CODE

SAGMZE	-	A	-	10	/	315	/	*	-	*	/	*	**	/	*

SAGMZE: Proportional pressure relief valve pilot operated

A = open loop pressure control

Valve size ISO 6264
10, 20, 32

Max regulated pressure:
50 = 50 bar **210** = 210 bar **350** = 350 bar
100 = 100 bar **315** = 315 bar

Hydraulic options, see section 8
E = external pilot
Y = external drain (only pipe connection G 1/4")

Coil voltage, see section 2 and 3:
- = standard coil for 24VDC Atos drivers
6 = optional coil for 12VDC Atos drivers
18 = optional coil for low current drivers **(1)**

Coils with special connectors, see section 12
- = omit for standard DIN connector
J = AMP Junior Timer connector
K = Deutsch connector
S = Lead Wire connection

Series number

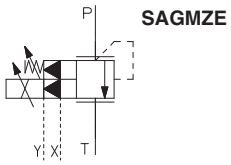
Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

(1) select valve's coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24VDC and with max current limited to 1A.

2 ELECTRONIC DRIVERS - see www.atos.com or KTI industrial master catalog

Drivers model	E-MI-AC		E-MI-AS-IR		E-BM-AS-PS		E-BM-AES
Type	analog		digital		digital		digital
Voltage supply (VDC)	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	DIN 43650 plug-in to solenoid				DIN-rail panel		
Data sheet	G010		G020		G030		GS050

3 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C)

Hydraulic symbols			
Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007		
Ambient temperature range	**Standard** and **/PE** = -20°C ÷ +70°C; **/BT** option = -40°C ÷ +60°C		
Storage temperature range	**Standard** and **/PE** = -20°C ÷ +80°C; **/BT** option = -40°C ÷ +70°C		
Coil code	**Standard** standard coil to be used with Atos drivers with power supply 24VDC	option **/6** optional coil to be used with Atos drivers with power supply 12 VDC	option **/18** optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 VDC and max current limited to 1A
Coil resistance R at 20°C	3,1 Ω	2,1 Ω	13,1 Ω
Max. solenoid current	2,5 A	3 A	1,2 A
Protection degree (CEI EN-60529)	**IP 65** (with connectors 666 correctly assembled)		
Duty factor	Continuous rating (ED=100%)		

Valve size		**10**	**20**	**32**
Max regulated pressure		50; 100; 210; 315; 350		
Min. regulated pressure	[bar]	see min. pressure / flow diagrams at sect. 7		
Max. pressure at port P	[bar]	350		
Max. pressure at port T	[bar]	210		
Max. flow	[l/min]	200	400	600
Response time 0-100% step signal **(1)** (depending on installation)	[ms]	≤ 120	≤ 135	≤ 150
Hysteresis	[% of the max pressure]	≤ 0,5		
Linearity	[% of the max pressure]	≤ 1,0		
Repeatability	[% of the max pressure]	≤ 0,2		

Notes: above performance data refer to valves coupled with Atos electronic drivers, see section 2.

(1) Average response time values; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response.

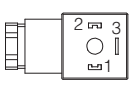
4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity		20 ÷ 100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7		see also filter section at www.atos.com or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR, HNBR	HFC	

5 GENERAL NOTES

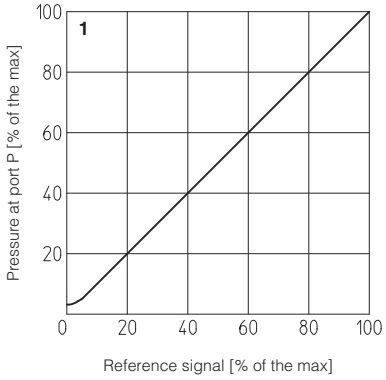
SAGMZE proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

6 SOLENOID CONNECTIONS

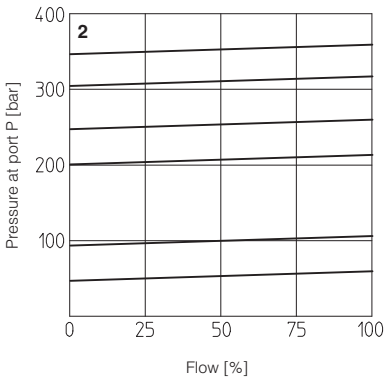
SOLENOID POWER SUPPLY CONNECTOR TYPE 666		
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	

7 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

1 = Regulation diagrams
with flow rate Q = 50 l/min

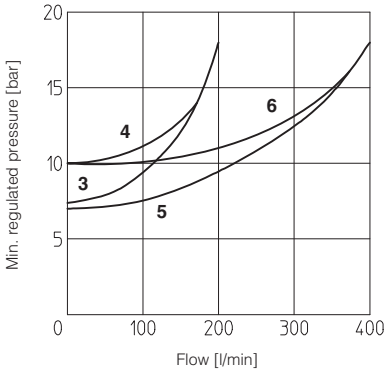


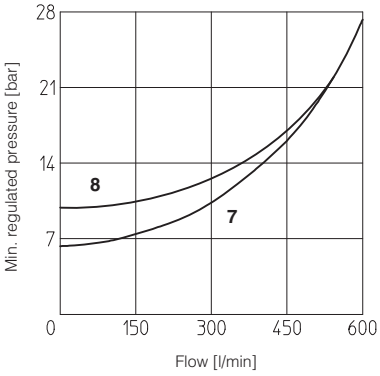
2 = Pressure/flow diagrams
with reference signal set at Q = 50 l/min



3-8 = Min. pressure/flow diagrams
with zero reference signal

3 = SAGMZE-A-10/50, 100, 210, 315
4 = SAGMZE-A-10/350
5 = SAGMZE-A-20/50, 100, 210, 315
6 = SAGMZE-A-20/350
7 = SAGMZE-A-32/50, 100, 210, 315
8 = SAGMZE-A-32/350

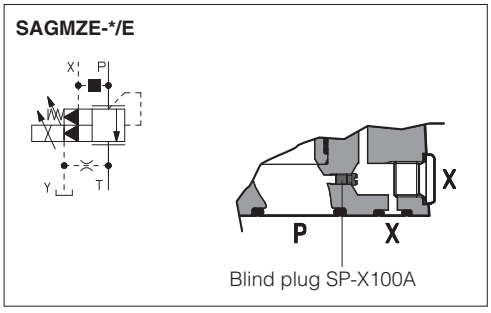




8 HYDRAULIC OPTIONS

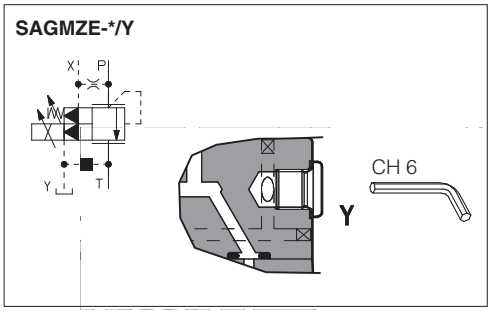
8.1 Option E

External pilot option to be selected when the pilot pressure is supplied from a different line respect to the P main line.
With option E the internal connection between port P and X of the valve is plugged.
The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G ¼").



8.2 Option Y

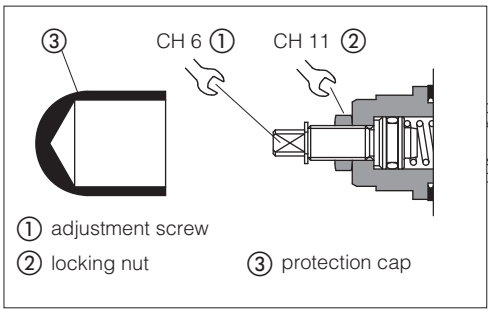
The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G ¼" available on the pilot stage body.



9 MECHANICAL PRESSURE LIMITER

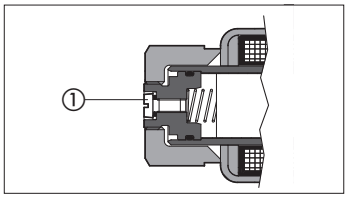
The SAGMZE are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).
At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.
For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



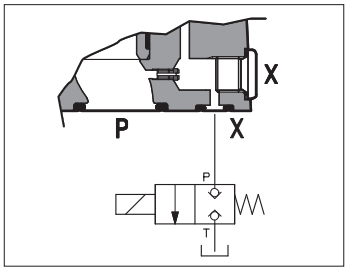
10 AIR BLEEDING

At the first valve commissioning the air eventually trapped inside the solenoid must be bled-off through the screw ① located at the rear side of the solenoid housing.
The presence of air may cause pressure instability and vibrations.



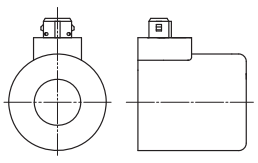
11 REMOTE PRESSURE UNLOADING

The **P** main line can be remotely unloaded by connecting the valve X port to a solenoid valve as shown in the below scheme (venting valve).
This function can be used in emergency to unload the system pressure by-passing the proportional control.

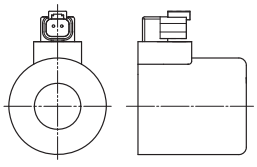


12 COILS TYPE WITH SPECIAL CONNECTORS

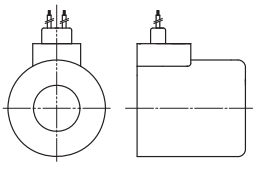
Options -J
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



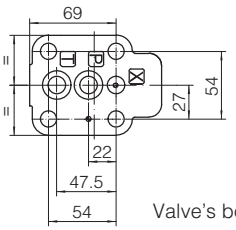
Options -K
Coil type COZEK
Deutsch connector, DT-04-2P male
Protection degree IP67



Options -S
Coil type COZES
Lead Wire connection
Cable lenght = 180 mm



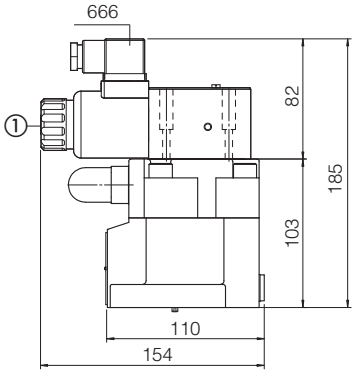
SIZE 10



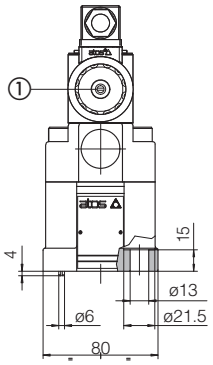
Valve's bottom view

ISO 6264: 2007
Mounting surface: 6264-06-09-1-97
Fastening bolts:
4 socket head screws M12x35 class 12.9
Tightening torque = 125 Nm
Seals: 2 OR 123; 1 OR 109/70
Ports P, T: Ø = 14,5 mm
Ports X: Ø = 3,2 mm

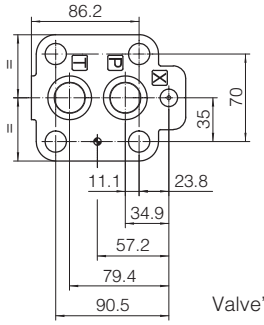
SAGMZE-A-10



Mass 5,4 Kg



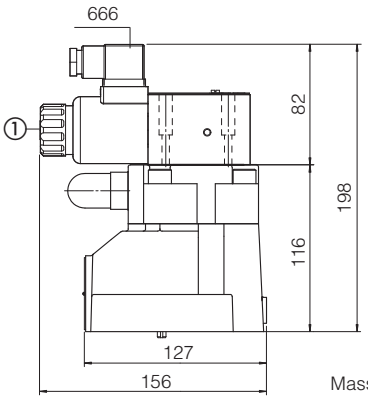
SIZE 20



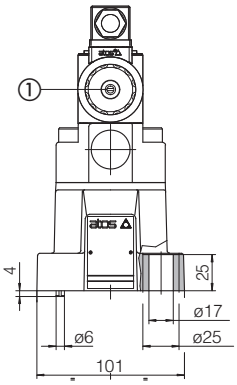
Valve's bottom view

ISO 6264: 2007
Mounting surface: 6264-08-13-1-97
(see table P005)
Fastening bolts: 4 socket head screws
M16x50 class 12.9
Tightening torque = 300 Nm
Seals: 2 OR 4112, 1 OR 109/70
Ports P, T: Ø = 24 mm
Port X: Ø = 3,2 mm

SAGMZE-A-20

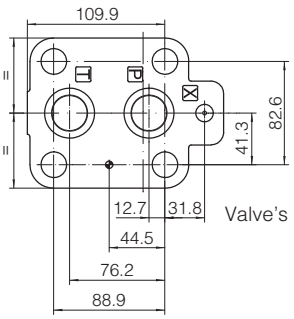


Mass 6,6 Kg



① = Screw for air bleeding

SIZE 32

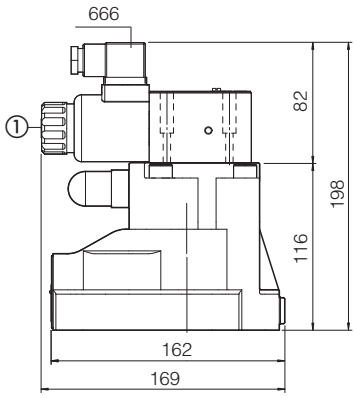


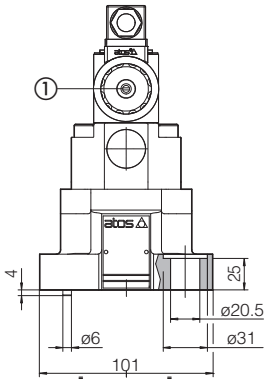
Valve's bottom view

ISO 6264: 2007
Mounting surface: 6264-10-17-1-97
(with M20 fixing holes instead of standard M18)
Fastening bolts: 4 socket head screws
M20x60 class 12.9
Tightening torque = 600 Nm
Seals: 2 OR 4131, 1 OR 109/70
Ports P, T: Ø = 28 mm
Port X: Ø = 3,2 mm

Mass 8 Kg

SAGMZE-A-32

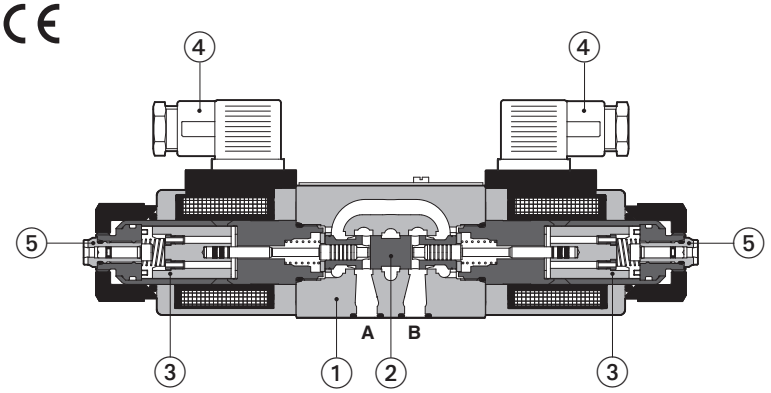




① = Screw for air bleeding

Proportional pressure reducing valves type SDHRZE

direct operated, ISO 4401 size 06



SDHRZE- A-012/25

① Valve body
② Spool
③ Proportional solenoid
④ Electric connector (supplied with the valve)
⑤ Bleeding screw

SDHRZE-A

3 way, direct operated proportional pressure reducing valves, size 06.

They operate is association with electronic drivers, see section 2, which supply the proportional solenoids with proper current to align the pressure regulation to the reference signal.

Technical characteristics
They provide the pressure reduction on ports A, or B or A and B, depending on the valve model. The direct execution performs low internal leakages, fast response and low hysteresis.
The solenoid coils are plastic encapsulated with insulation class H and they are available with different nominal resistances depending to the voltage supply (12 VDC or 24 VDC) and to the electronic driver type, see section 2 and 3

Typical applications
Pressure reduction in low flow systems
Pilot stage of pilot operated valves

Mounting surface: **ISO 4401 size 06**
Max flow: **24 l/min**
Max pressure: **315 bar**
Max regulated pressure: **25 bar**

1 MODEL CODE

SDHRZE	-	A	-	010	/	25	/	*	-	*	/	*	**	/	*

SDHRZE: Proportional pressure reducing valve size 06

A = open loop pressure control

Configuration:
010 = reduced pressure on port A (port B for option /B)
012 = reduced pressure on port A and B

Regulated pressure:
25 = reduced pressure range 3÷25 bar

Hydraulic option
B = reduced pressure on port B, solenoid side of port A (only for valve configuration 010)

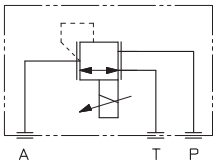
Coil options
see section 3 and 4:
- = standard coil for 24VDC Atos drivers
6 = optional coil for 12VDC Atos drivers
18 = optional coil for 24VDC low current drivers

Coils with special connectors, see section 10
- = omit for standard DIN connector
J = AMP Junior Timer connector
K = Deutsch connector
S = Lead Wire connection

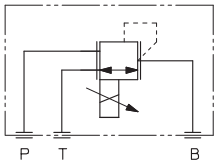
Series number

Seals material, see sect. 5:
- = NBR
PE = FKM
BT = HNBR

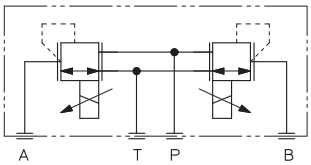
HYDRAULIC SYMBOLS



SDHRZE-A-010/25



SDHRZE-A-010/25/B



SDHRZE-A-012/25

2 ELECTRONIC DRIVERS - see www.atos.com or KTI industrial master catalog

Drivers model	E-MI-AC		E-MI-AS-IR		E-BM-AS-PS		E-BM-AES
Type	analog		digital		digital		digital
Voltage supply (V_{DC})	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	DIN 43650 plug-in to solenoid				DIN-rail panel		
Data sheet	G010		G020		G030		GS050

3 COIL OPTIONS

Coil voltage

Option /6 optional coil to be used with Atos drivers with power supply 12 V_{DC}

Option /18 optional coil to be used with electronic drivers not supplied by Atos

4 MAIN CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

Assembly position / location	Any position		
Subplate surface finishing (RZME)	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd valves according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature	**Standard** and **/PE** option = -20°C ÷ +70°C; **/BT** option = -40°C ÷ +60°C		
Storage temperature	**Standard** and **/PE** option = -20°C ÷ +80°C; **/BT** option = -40°C ÷ +70°C		
Coil code	**Standard** standard coil to be used with Atos drivers with power supply 24V_{DC}	option **/6** optional coil to be used with Atos drivers with power supply 12 V_{DC}	option **/18** optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 V_{DC} and max current limited to 1A
Coil resistance R at 20°C	3,1 Ω	2,1 Ω	13,1 Ω
Max. solenoid current	2,5 A	3 A	1,2 A
Protection degree (CEI EN-60529)	IP65		
Duty factor	Continuous rating (ED=100%)		

Max regulated pressure (Q=1 l/min) [bar]	25
Min. regulated pressure (Q=1 l/min) **(1)** [bar]	3
Max. pressure at port P [bar]	315
Max. pressure at port T [bar]	210
Max. flow [l/min]	24
Response time 0-100% step signal **(2)** (depending on installation) [ms]	≤ 45
Hysteresis [% of the max pressure]	≤ 1,5
Linearity [% of the max pressure]	≤ 3
Repeatability [% of the max pressure]	≤ 2

Notes: above performance data refer to valves coupled with Atos electronic drivers, see section 2

(1) Min pressure value to be increased of T line pressure

(2) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response

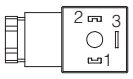
5 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity		20 ÷ 100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7		see also filter section at www.atos.com or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR, HNBR	HFC	

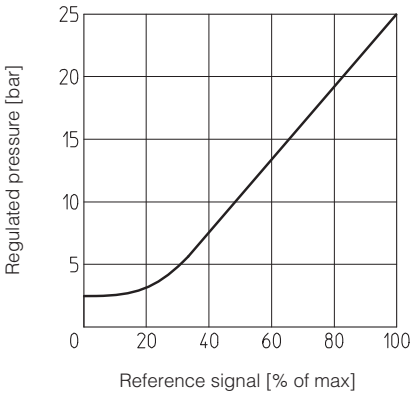
6 GENERAL NOTES

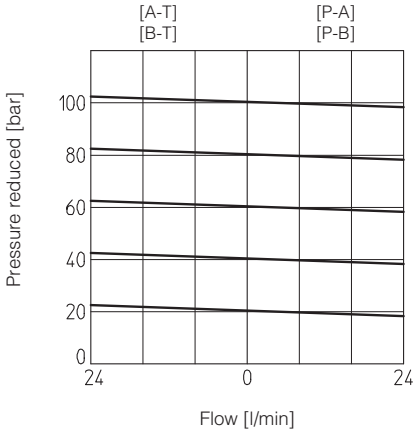
SDHRZE proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

7 CONNECTIONS

SOLENOID POWER SUPPLY CONNECTOR TYPE 666		
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	

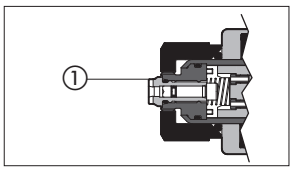
8 DIAGRAMS based on mineral oil ISO VG 46 at 50°C





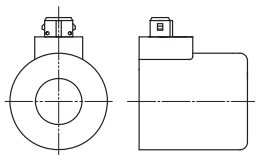
9 AIR BLEEDING

At the first valve commissioning the air eventually trapped inside the solenoid must be bled-off though the screw ① located at the rear side of the solenoid housing.
The presence of air may cause pressure instability and vibrations.

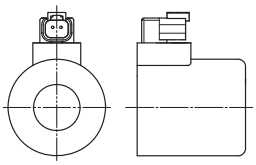


10 COILS WITH SPECIAL CONNECTORS

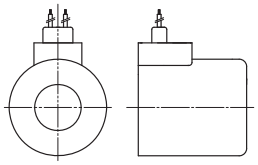
J option
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



K option
Coil type COZEK
Deutsch connector, DT-04-2P male
Protection degree IP67



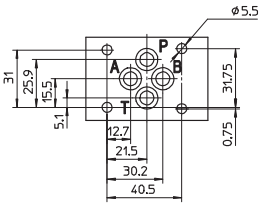
S option
Coil type COZES
Lead Wire connection
Cable lenght = 180 mm



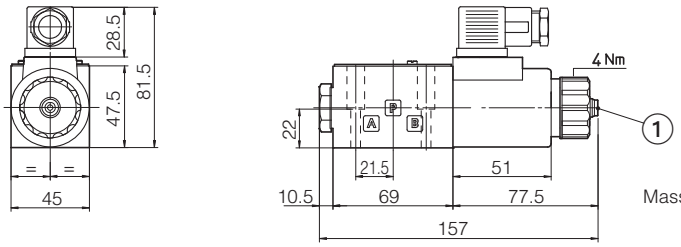
11 INSTALLATION DIMENSIONS FOR SDHRZE [mm]

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05

Fastening bolts: 4 socket head screws M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108;
Diameter of ports A, B, P, T: Ø 7,5 mm (max)

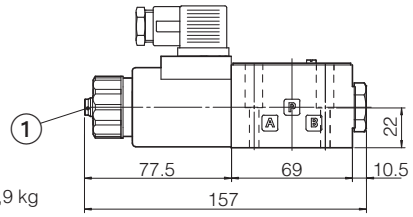


SDHRZE-A-010

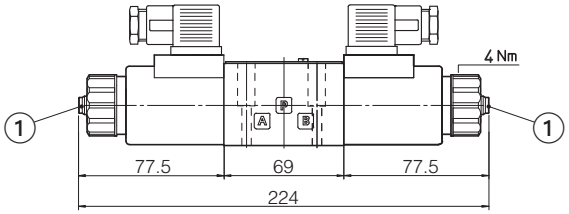


Mass: 1,9 kg

SDHRZE-A-010/B



SDHRZE-A-012

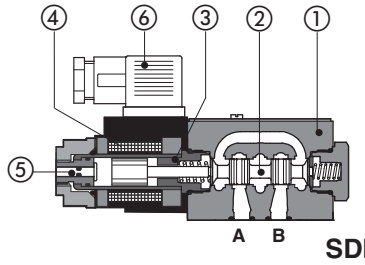


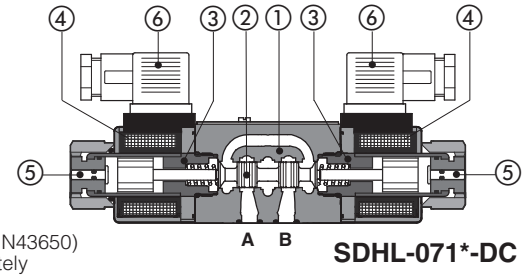
Mass: 2,6 kg

(1) screw for air bleeding

Solenoid directional valves type SDHL

direct operated, ISO 4401 size 06, **compact execution**





① Valve body
② Spool
③ Solenoid tube
④ Solenoid coil
⑤ Manual override pin
⑥ Electric connector (DIN43650) to be ordered separately

Spool type, two or three position direct operated valves size 06 in compact execution with reduced solenoids dimensions, ideal for applications in mini power packs, mobile and agricultural machines.

Solenoids are made by:
- wet type screwed tube ③, different for AC and DC power supply, with integrated manual override pin ⑤
- interchangeable coils ④, specific for AC or DC power supply, easily replaceable without tools - see section 5 for available voltages

Standard coils protection **IP65**

Wide range of interchangeable spools ②, see section 2.
The valve body ① is 3 chamber type made by shell-moulding casting with wide internal passages ensuring low pressure drops.

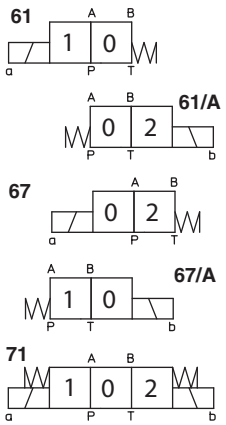
Mounting surface: **ISO 4401 size 06**
Max flow: **60 l/min**
Max pressure: **350 bar**

1 MODEL CODE

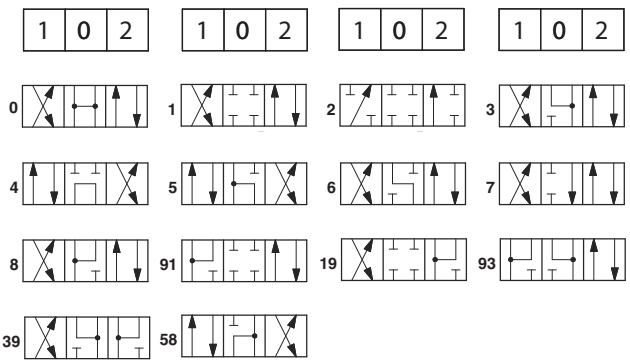
SDHL - 0	61	1	/A	-	X	24 DC	**	/*
Directional control valves size 06 compact execution	Valve configuration, see section 2 **61** = single solenoid, center plus external position, spring centered **63** = single solenoid, 2 external positions, spring offset **67** = single solenoid, center plus external position, spring offset **71** = double solenoid, 3 positions, spring centered **75** = double solenoid, 2 external positions, with detent	Spool type, see section 2. Options: **A**, **WP**, see section 5			**X** = without connector See section 7 for available connectors, to be ordered separately Coils with special connectors, see section 8 **XK** = Deutsch connector	Voltage code, see section 6	Series number	Seals material, see section 4: **-** = NBR **PE** = FKM

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)

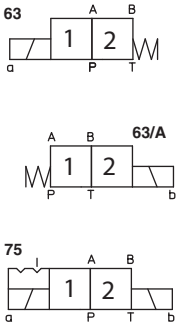
Configurations



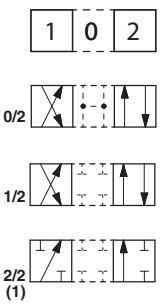
Spools



Configurations



Spools



(1) not available for configuration 75

2.1 Special spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4**, **5** and **58** are also available as **1/1, 4/8, 5/1** and **58/1.** They are properly shaped to reduce water-hammer shocks during the swiching.
- spools type **1, 1/2, 3, 8** are available as **1P, 1/2P, 3P, 8P** to limit valve internal leakages.
- Other types of spools can be supplied on request.

3 MAIN CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	**Standard** execution = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
Operating pressure	Ports P,A,B: **350** bar; Port T **210** bar for DC version; **160** bar for AC version
Maximum flow	**60 l/min**, see Q/Δp diagram at section 9 and operating limits at section 10

3.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric feature 6
Supply voltage tolerance	± 10%

4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

5 OPTIONS

Options

A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.

WP = prolonged manual override protected by rubber cap.

⚠ The manual override operation can be possible only if the pressure at T port is lower than 50 bar

6 ELECTRIC FEATURES

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil SDHL
12 DC	**12 DC**	666 or 667	29W	COL-12DC
14 DC	**14 DC**			COL-14DC
24 DC	**24 DC**			COL-24DC
28 DC	**28 DC**			COL-28DC
110/50 AC (1)	**110/50/60 AC**		58 VA (3)	COL-110/50/60AC
230/50 AC (1)	**230/50/60 AC**			COL-230/50/60AC

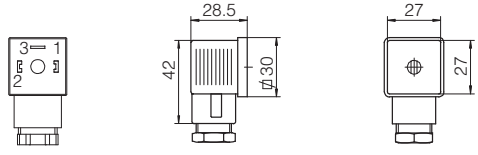
(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10 ÷15% and the power consumption is 52 VA.
(2) Average values based on tests preformed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

7 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

666 = standard connector IP-65, suitable for direct connection to electric supply source.

667 = as 666, but with built-in signal led.

666, 667 (for AC or DC supply)



CONNECTOR WIRING

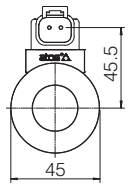
666, 667

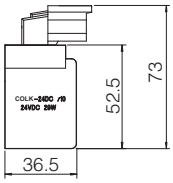
1 = Positive ⊕
2 = Negative ⊖
⏚ = Coil ground

SUPPLY VOLTAGES

666	**667**
All voltages	24 AC or DC 110 AC or DC 220 AC or DC

8 COILS WITH SPECIAL CONNECTORS only for voltage supply 12, 14, 24, 28 VDC





Deutsch connector DT-04-2P

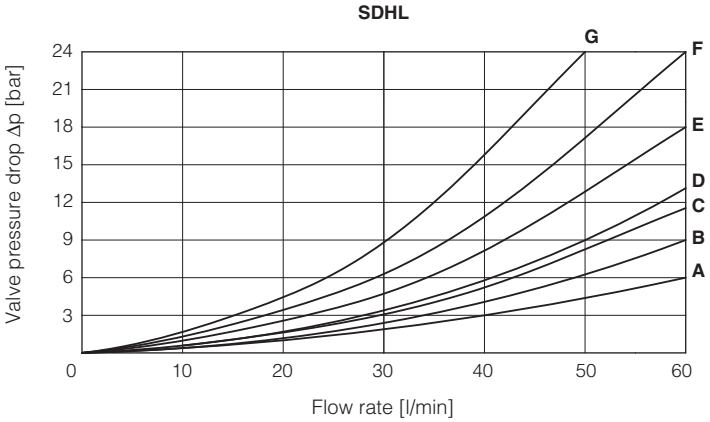
Options -XK

Coil type COLK, Deutsch connector DT-04-2P male
Protection degree **IP67**

Note: For the electric characteristics refer to standard coils features - see section 6

9 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

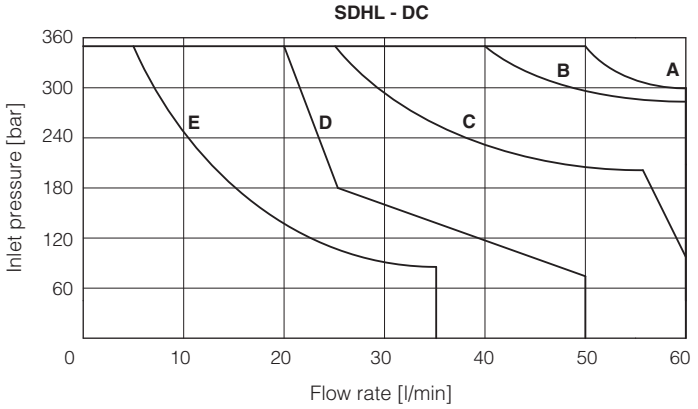
Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	



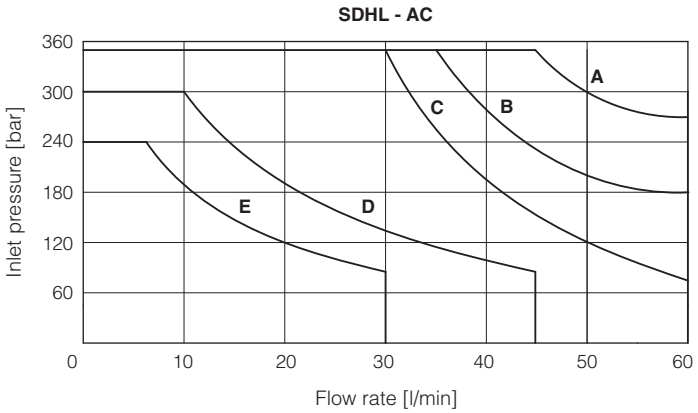
10 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value (V_{nom} - 10%). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.

Curve	DC version, spool type:
A	0, 0/1, 0/2, 1/2, 8
B	1, 1/1
C	3, 3/1, 6, 7
D	4, 4/8, 5, 5/1, 19, 39, 58, 58/1, 91, 93
E	2, 2/2



Curve	AC version, spool type:
A	0, 0/1, 0/2, 1/2, 8
B	1, 1/1
C	3, 3/1, 6, 7
D	4, 4/8, 5, 5/1, 19, 39, 58, 58/1, 91, 93
E	2, 2/2



11 SWITCHING TIMES (average values in msec)

Valve	Switch-on AC	Switch-off AC	Switch-on DC	Switch-off DC
SDHL	10 - 25	20 - 40	30 - 50	15 - 25

Test conditions: - 20 l/min; 150 bar
- nominal voltage
- 2 bar of counter pressure on port T
- mineral oil: ISO VG 46 at 50°C

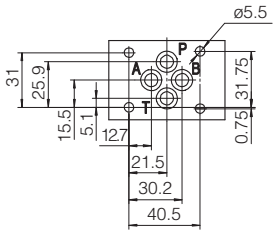
The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

12 SWITCHING FREQUENCY

Valve	AC (cycles/h)	DC (cycles/h)
SDHL + 666 / 667	7200	15000

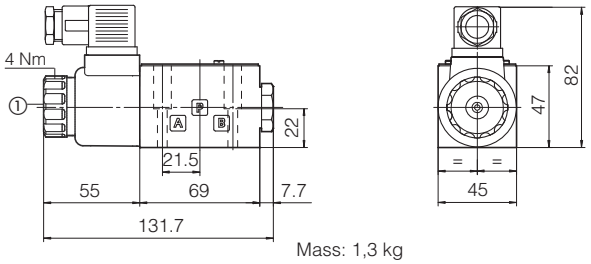
13 DIMENSIONS [mm]

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)



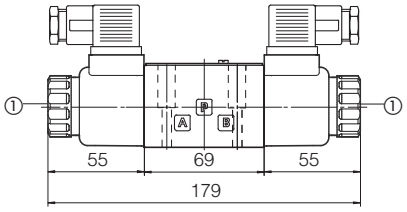
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDHL-06(DC)



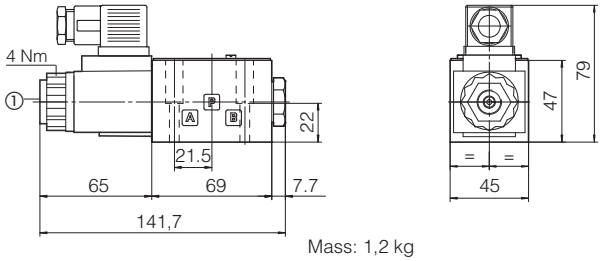
Mass: 1,3 kg

SDHL-07(DC)



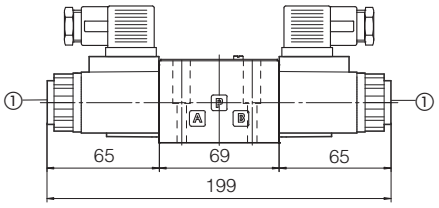
Mass: 1,6 kg

SDHL-06(AC)



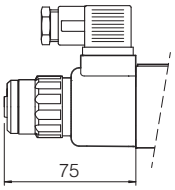
Mass: 1,2 kg

SDHL-07(AC)

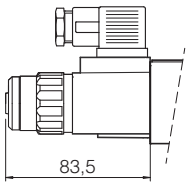


Mass: 1,4 kg

Option /WP
(DC version)



Option /WP
(AC version)



① Standard manual override PIN

⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

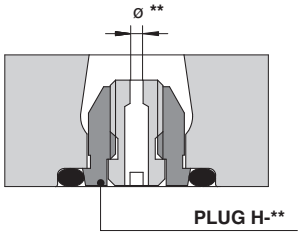
Overall dimensions refer to valves with connector 666

14 PLUG-IN RESTRICTOR (to be ordered separately)

The use of plug-in restrictors in valve's ports P or A or B may be necessary is case of particular conditions as long flexible hoses or the presence of accumulators which could cause at the valve switching instantaneous high flow peaks over the max valve's operating limits.

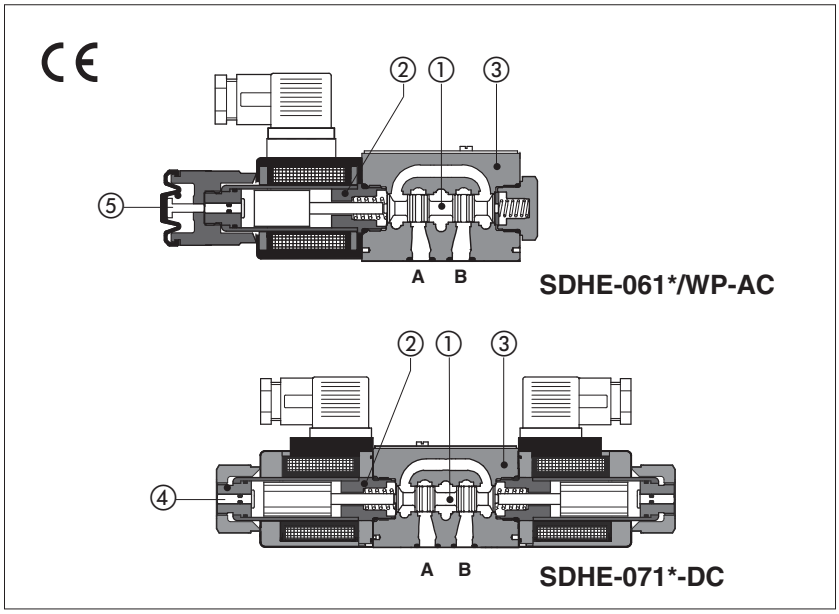
Ordering code: **PLUG H** - ******

08, 10, 12, 15 calibrated orifice diameter in tenths of mm
Example PLUG-H-**12** = orifice diameter **1,2 mm**
Other orifice dimensions are available on request



Solenoid directional valves type SDHE

direct operated, high performances, ISO 4401 size 06



Spool type, two or three position direct operated valves with high performance threaded solenoids certified according the North American standard **cURus**.

Solenoids ② are made by:

- wet type screwed tube, different for AC and DC power supply, with integrated manual override pin ④
- interchangeable coils, specific for AC or DC power supply, easily replaceable without tools - see section 5 for available voltages

Standard coils protection **IP65** optional coils with IP67 AMP Junior Timer, Deutsch or lead wire connections.

Wide range of interchangeable spools ①, see section 2.

The valve body ③ is 3 chamber type made by shell-moulding casting with wide internal passages ensuring low pressure drops.

Mounting surface: **ISO 4401 size 06**
Max flow: **80 l/min**
Max pressure: **350 bar**

1 MODEL CODE

SDHE - 0	61	1	/A	-	X	24 DC	**	/*

SDHE - 0: Directional control valves size 06

61: Valve configuration, see section 2
61 = single solenoid, center plus external position, spring centered
63 = single solenoid, 2 external positions, spring offset
67 = single solenoid, center plus external position, spring offset
70 = double solenoid, 2 external positions, without spring
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent

1: Spool type, see section 2.

/A: Options, see note 1 at section 4.

X: **00-AC** = AC solenoids without coils
00-DC = DC solenoids without coils
X = without connector
See section 14 for available connectors, to be ordered separately
Coils with special connectors, see section 11
XJ = AMP Junior Timer connector
XK = Deutsch connector
XS = Lead Wire connection

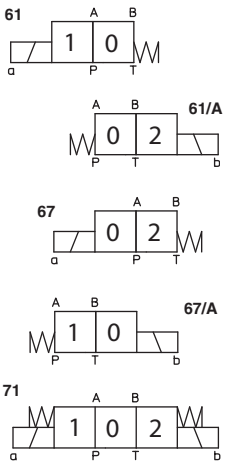
24 DC: Voltage code, see section 5

******: Series number

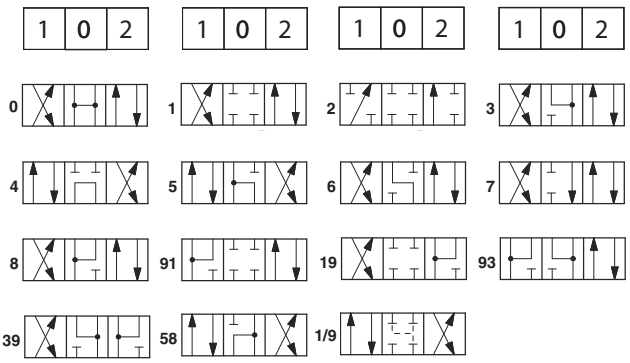
/*: Seals material, see section 3:
- = NBR
PE = FKM
BT = HNBR

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)

Configurations

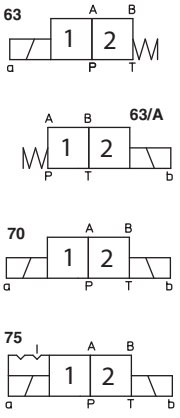


Spools

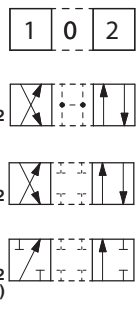


Note: see also section 4 note 3 for special shaped spools

Configurations



Spools



(1) not available for configuration 75

3 MAIN CHARACTERISTICS, SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	
Flow direction	As shown in the symbols of table 2		
Operating pressure	Ports P,A,B: **350** bar; Port T **210** bar for DC version; **160** bar for AC version		
Rated flow	See diagrams Q/Δp at section 6		
Maximum flow	**80 l/min**, see operating limits at section 7		

3.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils; **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667, 669 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric feature 5
Supply voltage tolerance	± 10%
Certification	**cURus** North American Standard

4 NOTES

1 Options

A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.

WP = prolonged manual override protected by rubber cap.

⚠ The manual override operation can be possible only if the pressure at T port is lower than 50 bar - see section 12.

L1, L2, L3 = (only for SDHE-DC) device for switching time control, installed in the valve solenoid, see section 9. For spools 4 and 4/8 only device L3 is available.

2 Type of electric/electronic connector DIN 43650, to be ordered separately

666 = standard connector IP-65, suitable for direct connection to electric supply source.

667 = as 666, but with built-in signal led.

669 = with built-in rectifier bridge for supplying DC coils by alternate current (AC 110V and 230V - Imax 1A).

3 Spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4**, **5** and **58** are also available as **1/1, 4/8, 5/1** and **58/1.** They are properly shaped to reduce water-hammer shocks during the swiching.
- spools type **1, 1/2, 3, 8** are available as **1P, 1/2P, 3P, 8P** to limit valve internal leakages.
- Other types of spools can be supplied on request.

5 ELECTRIC FEATURES

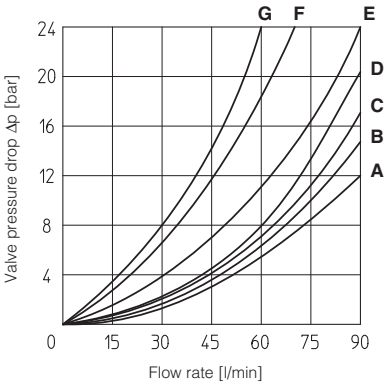
External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil SDHE
12 DC	**12 DC**	666 or 667	30 W	COE-12DC
14 DC	**14 DC**			COE-14DC
24 DC	**24 DC**			COE-24DC
28 DC	**28 DC**			COE-28DC
110 DC	**110 DC**			COE-110DC
220 DC	**220 DC**			COE-220DC
110/50 AC	**110/50/60 AC**		58 VA (3)	COE-110/50/60AC (1)
230/50 AC	**230/50/60 AC**			COE-230/50/60AC (1)
110/50 AC - 120/60 AC	**110 RC**	669	30 W	COE-110RC
230/50 AC - 230/60 AC	**230 RC**			COE-230RC

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10 ÷15% and the power consumption is 52 VA.
(2) Average values based on tests preformed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

6 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1, 1/9	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	

SDHE

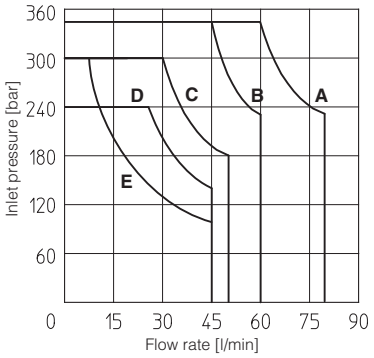


7 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

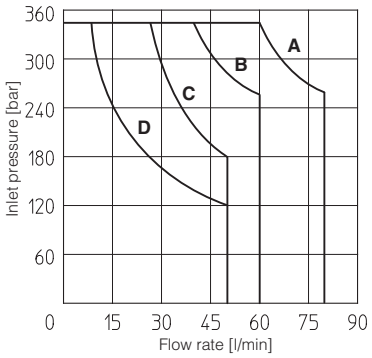
The diagrams have been obtained with warm solenoids and power supply at lowest value (V_{nom} - 10%). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.

Curve	Spool type AC	Spool type DC
A	1, 1/2, 8	0, 0/1, 1, 1/2, 3, 8
B	0, 0/1, 0/2, 1/1, 1/9, 3	0/2, 1/1, 6, 7, 1/9, 19
C	3, 3/1, 6, 7	3/1, 4, 4/8, 5, 5/1, 19, 39, 58, 58/1, 91, 93
D	4, 4/8, 5, 5/1, 19, 39, 58, 58/1, 91, 93	2, 2/2
E	2, 2/2	-

SDHE - AC



SDHE - DC



8 SWITCHING TIMES (average values in msec)

Test conditions: - 36 l/min; 150 bar
- nominal voltage
- 2 bar of counter pressure on port T
- mineral oil: ISO VG 46 at 50°C

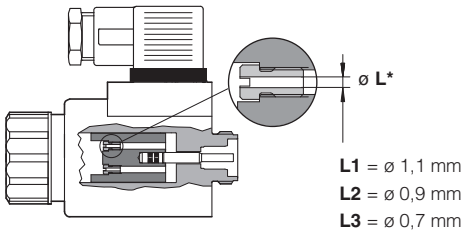
The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

Valve	Switch-on AC	Switch-off AC	Switch-on DC	Switch-off DC
SDHE	10 - 25	20 - 40	30 - 50	15 - 25
SDHE-*/L1	—	—	60	60
SDHE-*/L2	—	—	80	80
SDHE-*/L3	—	—	150	150

9 DEVICES FOR THE SWITCHING TIME CONTROL

These devices are used to control the valve's switching time (only for DC version) and therefore reduce the hammering shocks in the hydraulic circuit.

Options L1, L2, L3 control the switching time in both moving directions of the valve spool by means of calibrated restrictors installed in the solenoid anchor.



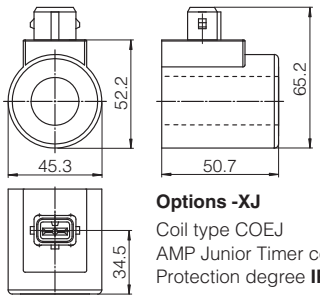
L1 = ø 1,1 mm
L2 = ø 0,9 mm
L3 = ø 0,7 mm

10 SWITCHING FREQUENCY

Valve	AC (cycles/h)	DC (cycles/h)
SDHE + 666 / 667	7200	15000

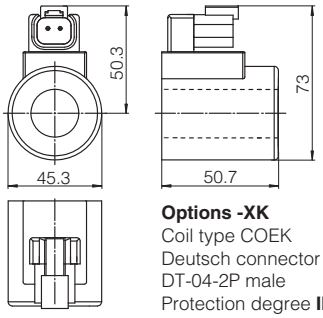
11 COIL WITH SPECIAL CONNECTORS only for voltage supply 12, 14, 24, 28 VDC

AMP Junior timer connector



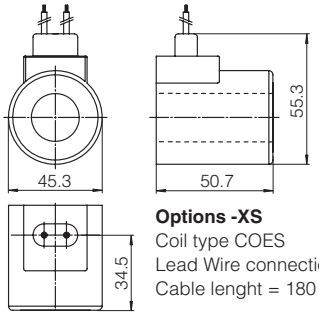
Options -XJ
Coil type COEJ
AMP Junior Timer connector
Protection degree **IP67**

Deutsch connector DT-04-2P



Options -XK
Coil type COEK
Deutsch connector
DT-04-2P male
Protection degree **IP67**

Lead Wire connection

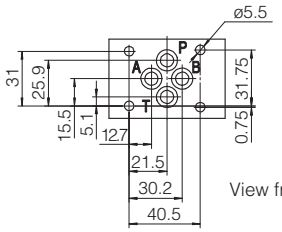


Options -XS
Coil type COES
Lead Wire connection
Cable lenght = 180 mm

Note: for the electric characteristics refer to standard coils features - see section 5

12 DIMENSIONS [mm]

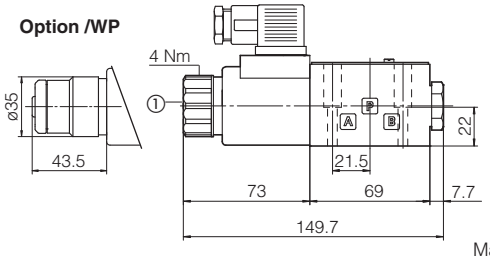
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)



View from X

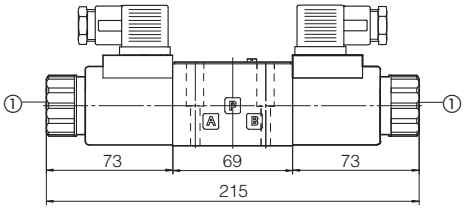
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDHE-06(DC)



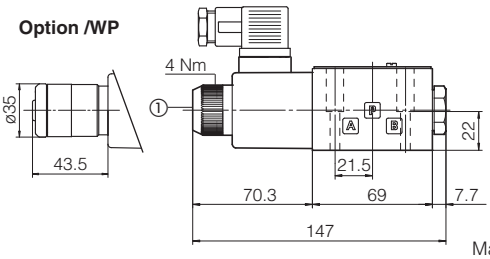
Mass: 1,5 kg

SDHE-07(DC)



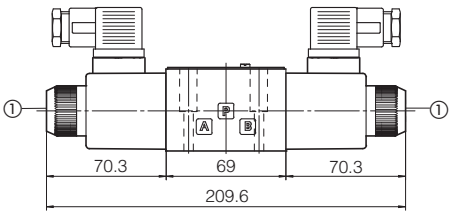
Mass: 2 kg

SDHE-06(AC)



Mass: 1,4 kg

SDHE-07(AC)



Mass: 1,8 kg

① Standard manual override PIN

⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

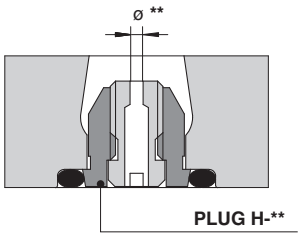
Overall dimensions refer to valves with connector 666

13 PLUG-IN RESTRICTOR (to be ordered separately)

The use of plug-in restrictors in valve's ports P or A or B may be necessary is case of particular conditions as long flexible hoses or the presence of accumulators which could cause at the valve switching instantaneous high flow peaks over the max valve's operating limits.

Ordering code: **PLUG H** - ******

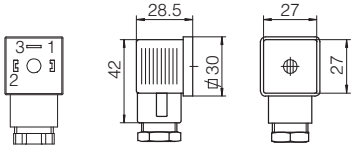
08, 10, 12, 15 calibrated orifice diameter in tenths of mm
Example PLUG-H-**12** = orifice diameter **1,2 mm**
Other orifice dimensions are available on request



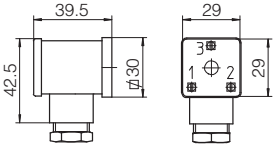
PLUG H-**

14 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

666, 667 (for AC or DC supply)



669 (for AC supply)



CONNECTOR WIRING

666, 667
1 = Positive ⊕
2 = Negative ⊖
⊕ = Coil ground

669
1,2 = Supply voltage V_{AC}
3 = Coil ground

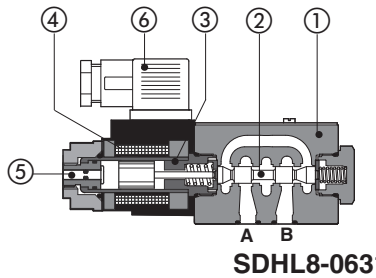
SUPPLY VOLTAGES

666	**667**	**669**
All voltages	24 AC or DC 110 AC or DC 220 AC or DC	110/50 AC 110/60 AC 230/50 AC 230/60 AC

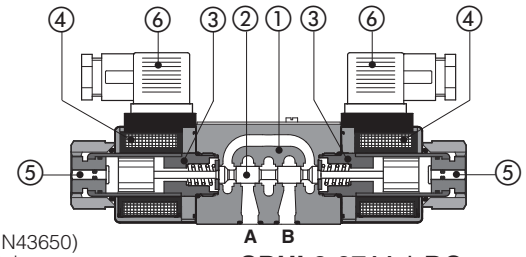
Note: for electronic connectors type **E-SD**, see tab. K500

Solenoid directional valves type SDHL8

direct operated, ISO 4401 size 06, **low leakage, compact execution**



SDHL8-0631/2-*-AC



SDHL8-0711-*-DC

① Valve body
② Spool
③ Solenoid tube
④ Solenoid coil
⑤ Manual override pin
⑥ Electric connector (DIN43650) to be ordered separately

Spool type, two or three position direct operated solenoid valves size 06 **in low leakage and compact execution** with reduced solenoids dimensions, ideal for hydraulic systems assisted by accumulators.

They are equipped with spool diameter 8mm accurately coupled to the body granting very low internal leakages, see section [10]

Solenoids are made by:
- wet type screwed tube ③, different for AC and DC power supply, with integrated manual override pin ⑤
- interchangeable coils ④, specific for AC or DC power supply, easily replaceable without tools - see section [6] for available voltages

Mounting surface: **ISO 4401 size 06**
Max flow: **30 l/min**
Max pressure: **350 bar**

[1] MODEL CODE

SDHL8 - 0	71	1	/WP	-	X	24 DC	**	/*

SDHL8 - 0: Directional control valves size 06 low leakage, compact execution

71: Valve configuration, see section [2]
63 = single solenoid, 2 external positions, spring offset
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent

1: Spool type, see section [2].

/WP: Options: **A**, **WP**, see section [5]

X = without connector
See section [7] for available connectors, to be ordered separately

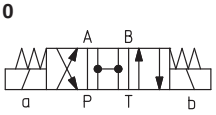
24 DC: Voltage code, see section [6]

******: Series number

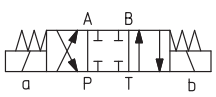
/*: Seals material, see section [4]:
- = NBR
PE = FKM

[2] CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)

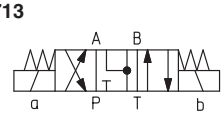
710



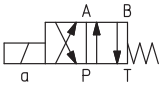
711



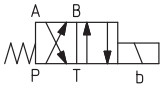
713



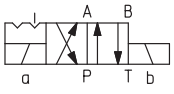
631/2



631/2/A



751/2



3 MAIN CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** execution = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
Operating pressure	Ports P,A,B: **350** bar; Port T **210** bar for DC version; **160** bar for AC version
Maximum flow	**30 l/min**, see Q/Δp diagram at section 8 and operating limits at section 9

3.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric feature 6
Supply voltage tolerance	± 10%

4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

5 OPTIONS

Options

A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.

WP = prolonged manual override protected by rubber cap.

⚠ The manual override operation can be possible only if the pressure at T port is lower than 50 bar

6 ELECTRIC FEATURES

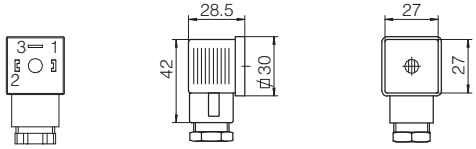
External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil SDHL
12 DC	**12 DC**	666 or 667	29 W	COL-12DC
14 DC	**14 DC**			COL-14DC
24 DC	**24 DC**			COL-24DC
28 DC	**28 DC**			COL-28DC
110/50 AC (1)	**110/50/60 AC**		58 VA (3)	COL-110/50/60AC
230/50 AC (1)	**230/50/60 AC**			COL-230/50/60AC

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10 ÷15% and the power consumption is 52 VA.
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

7 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

666 = standard connector IP-65, suitable for direct connection to electric supply source.
667 = as 666, but with built-in signal led.

666, 667 (for AC or DC supply)



CONNECTOR WIRING

666, 667

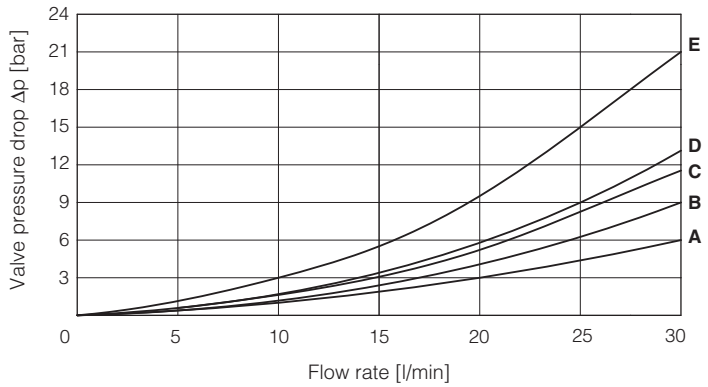
1 = Positive ⊕
2 = Negative ⊖
⏚ = Coil ground

SUPPLY VOLTAGES

666	**667**
All voltages	24 AC or DC 110 AC or DC 220 AC or DC

8 **Q/ΔP DIAGRAMS** based on mineral oil ISO VG 46 at 50°C

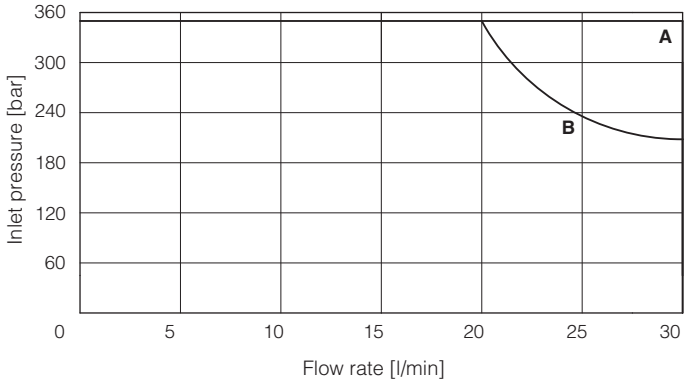
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T center	A→T B→T center
0	A	A	A	A	E	
1	C	C	B	B		
1/2	D	B	D	B		
3	C	C	A	A		E



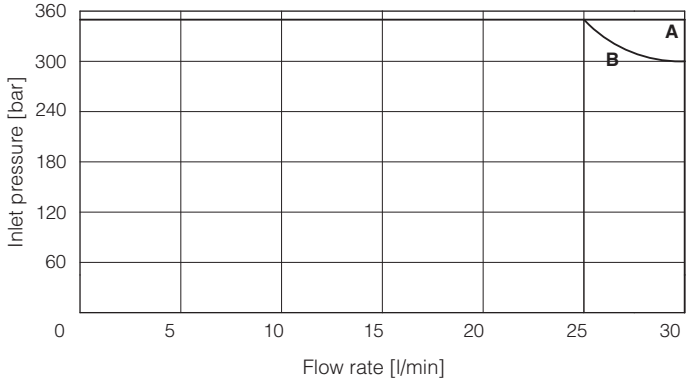
9 **OPERATING LIMITS** based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value (V_{nom} - 10%). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.

Curve	DC version, spool type
A	1, 3
B	0, 1/2

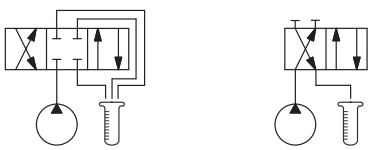


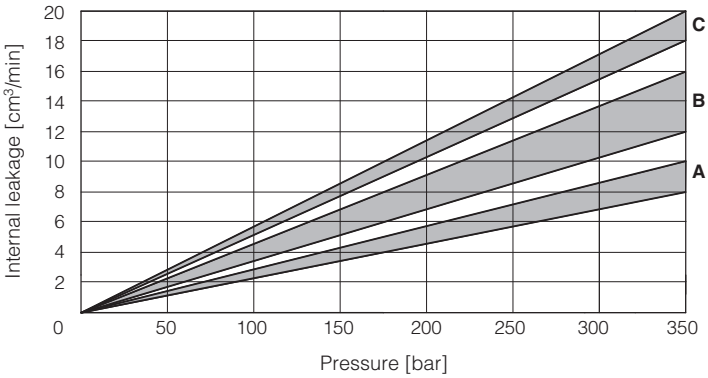
Curve	AC version, spool type
A	1, 1/2
B	0, 3



10 **INTERNAL LEAKAGES** based on mineral oil at viscosity 15 cSt

Spool type	center pos.	P→A B→T	P→B A→T
0		C	C
1	C	B	B
1/2		A	A
3	C	B	B





11 SWITCHING TIMES (average values in msec)

Test conditions: - 20 l/min; 150 bar
- nominal voltage
- 2 bar of counter pressure on port T
- mineral oil: ISO VG 46 at 50°C

The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

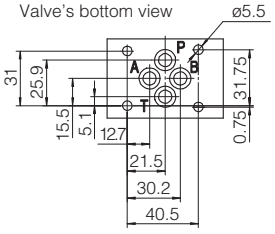
Switch-on AC	Switch-off AC	Switch-on DC	Switch-off DC
10-25	20-40	30-50	15-25

12 SWITCHING FREQUENCY

AC (cycles/h)	DC (cycles/h)
7200	15000

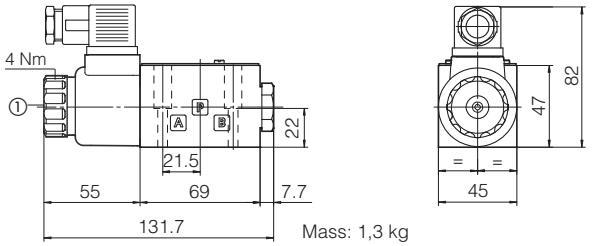
13 DIMENSIONS [mm]

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)



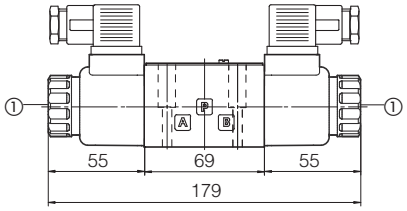
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDHL8-06(DC)



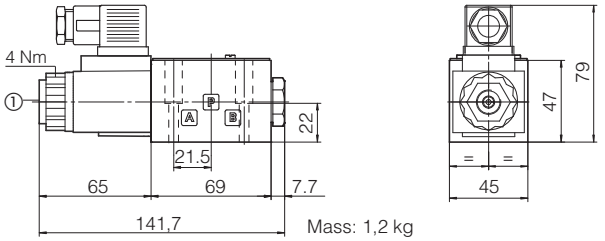
Mass: 1,3 kg

SDHL8-07(DC)



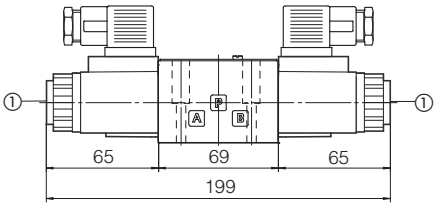
Mass: 1,6 kg

SDHL8-06(AC)



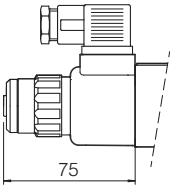
Mass: 1,2 kg

SDHL8-07(AC)

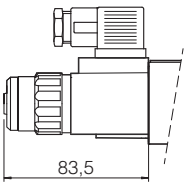


Mass: 1,4 kg

Option /WP
(DC version)



Option /WP
(AC version)



① Standard manual override PIN

⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

Overall dimensions refer to valves with connector 666

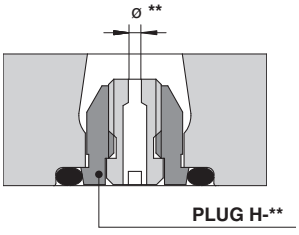
14 PLUG-IN RESTRICTOR (to be ordered separately)

The use of plug-in restrictors in valve's ports P or A or B may be necessary is case of particular conditions as long flexible hoses or the presence of accumulators which could cause at the valve switching instantaneous high flow peaks over the max valve's operating limits.

Ordering code: **PLUG H** - ******

08, 10, 12, 15 calibrated orifice diameter in tenths of mm

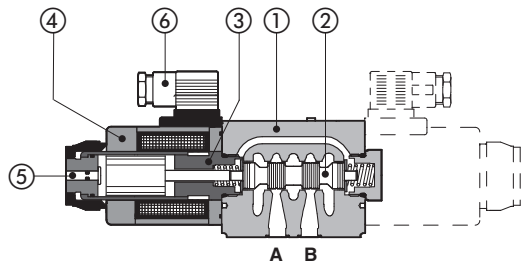
Example PLUG-H-**12** = orifice diameter **1,2 mm**
Other orifice dimensions are available on request



PLUG H-**

Solenoid directional valves type SDKL

direct operated, spool type, ISO 4401 size 10



SDKL-16*-DC

① Valve body
② Spool
③ Solenoid tube
④ Solenoid coil
⑤ Manual override pin
⑥ Electric connector (DIN43650) to be ordered separately

Spool type, two or three position direct operated valves size 10.

Wet type solenoids are made by:
- screwed tube ③, with integrated manual override pin ⑤
- interchangeable coils ④, specific for DC power supply, easily replaceable without tools - see section 6 for available voltages. Coils protection **IP65**.

Interchangeable spools ②, see section 2.

The valve body ① is 5 chamber type, made by shell-moulding casting with wide internal passages ensuring low pressure drops.

Mounting surface: **ISO 4401 size 10**
Max flow: **120 l/min**
Max pressure: **350 bar**

1 MODEL CODE

SDKL - 1	61	1	/	A	-	X	24 DC	**	/	*

SDKL - 1: Solenoid directional valves size 10 light execution

61: Valve configuration, see section 2
61 = single solenoid, center plus external position, spring centered
63 = single solenoid, 2 external positions, spring offset
67 = single solenoid, center plus external position, spring offset
70 = double solenoid, 2 external positions, without springs
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent

1: Spool type, see section 2.

A: Options, see note 1 at section 4.

X: **00-DC** = DC solenoids without coils
X = standard coil without connector

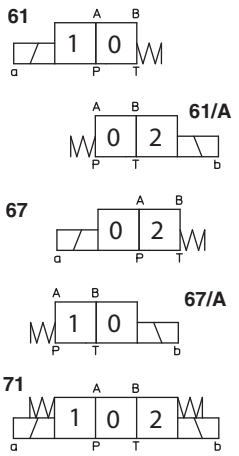
24 DC: Voltage code, see section 6

******: Series number

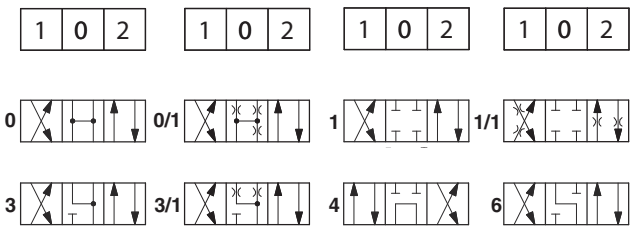
*****: Seals material, see section 4:
- = NBR
PE = FKM

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)

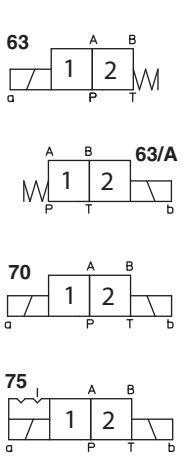
Configurations



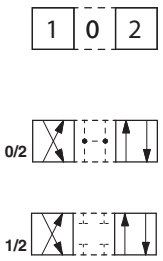
Spools



Configurations



Spools



2.1 Special spools
- spools type **0/1** and **3/1** have restricted oil passages in central position, from user ports to tank.
- spool type **1/1** is properly shaped to reduce the water-hammer shocks during the switching.

3 MAIN CHARACTERISTCS

Assembly position / location	Any position for all valves except for type - 170* (without springs) that must be installed with horizontal axis if operated by impulses
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** execution = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
Operating pressure	Ports P,A,B: **350** bar; Port T **210** bar;
Rated flow	See diagrams Q/Δp at section 8
Maximum flow	**120 l/min**, see operating limits at section 9

3.1 Coils characteristics

Insulation class	**H** (180°C) Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric feature 6
Supply voltage tolerance	± 10%

4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

5 OPTIONS

A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.
WP = prolonged manual override protected by rubber cap - see section 12.

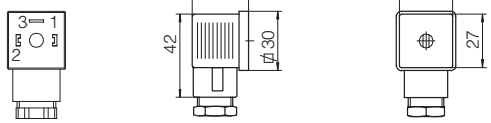
6 ELECTRIC FEATURES

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption	Code of spare coil
12 DC	**12 DC**	666	38 W	CAL-12DC
24 DC	**24 DC**	or		CAL-24DC
28 DC	**28 DC**	667		CAL-28DC

7 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

666 = standard connector IP-65 for direct connection to electric supply source.
667 = as 666, but with built-in signal led.

666, 667



CONNECTOR WIRING

666, 667

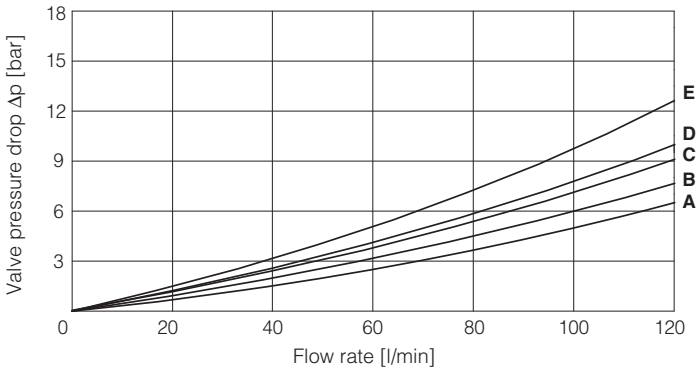
1 = Positive ⊕
2 = Negative ⊖
⏚ = Coil ground

SUPPLY VOLTAGES

666	**667**
All voltages	only for 24 DC

8 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

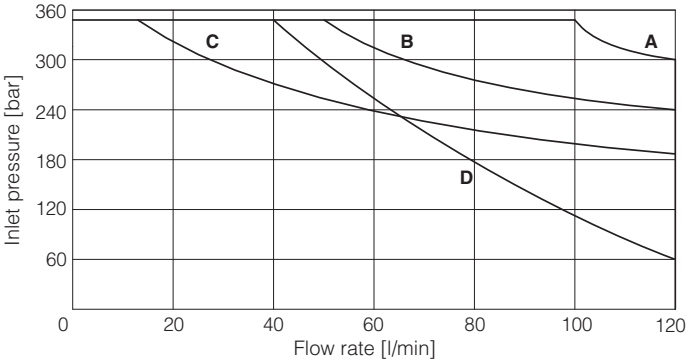
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1, 0/2	A	A	B	B	
1, 1/1, 6	A	A	D	C	
3, 3/1, 7	A	A	C	D	
4	B	B	B	B	E
1/2	B	C	C	B	



9 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value (V_{nom} - 10%). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.

Curve	Spool type
A	0/2, 1/1, 1/2, 3/1
B	1, 3
C	0, 0/1, 6, 7
D	4



10 SWITCHING TIMES (average values in msec)

Valve	Switch-on	Switch-off
SDKL + 666 / 667	60	35

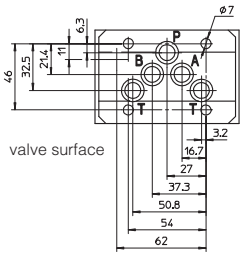
Test conditions:
- 50 l/min; 150 bar
- nominal supply voltage
- 2 bar of back pressure on port T
- mineral oil ISO VG 46 at 50°C

The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

11 SWITCHING FREQUENCY

Valve	DC (cycles/h)
SDKL + 666 / 667	15000

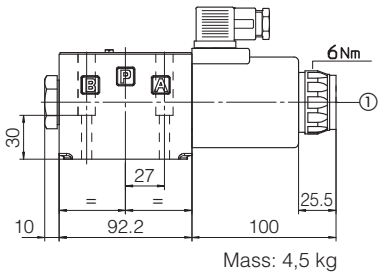
12 INSTALLATION DIMENSIONS [mm]



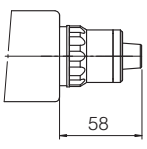
ISO 4401: 2005
Mounting surface according to 4401-05-05-0-05
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050 and 1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)
Ports Y: Ø = 5 mm

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
For the max pressures on ports, see section 3

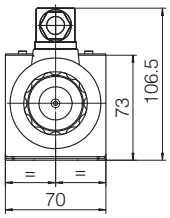
SDKL-16*-DC



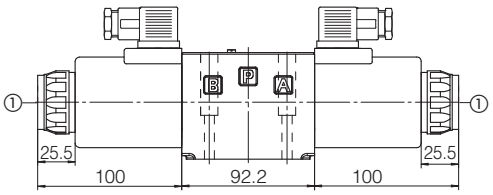
Mass: 4,5 kg



Option /WP



SDKL-17*-DC

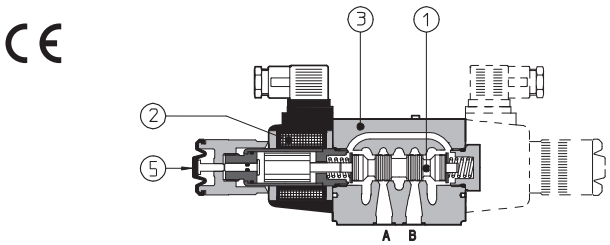


Mass: 6,1 kg

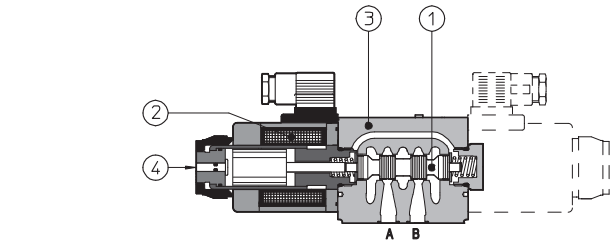
① Standard manual override PIN. The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

Solenoid directional valves type SDKE

direct operated, ISO 4401 size 10



SDKE-161*/WP-AC



SDKE-17*-DC

Spool type, two or three position direct operated valves with threaded solenoids.

Solenoids ② are made by:

- wet type screwed tube, different for AC and DC power supply, with integrated manual override pin ①
- interchangeable coils, specific for AC or DC power supply, easily replaceable without tools - see section 5 for available voltages

Standard coils protection **IP65**.

Optional coils are available with **IP67** AMP Junior Timer, Deutsch, lead wire connections (options XJ, XK, XS) or with North American Standard Certification **cURus**, without connector (option XUL).

Wide range of interchangeable spools ①, see section 2.

The valve body ③ is 5 chamber type for DC version and 3 chamber type for AC version. It is made by shell-moulding casting with wide internal passages ensuring low pressure drops

Mounting surface: **ISO 4401 size 10**
Max flow: **150 l/min**
Max pressure: **350 bar**

1 MODEL CODE

SDKE - 1	61	1	/	A	-	X	24 DC	**	/	*

SDKE - 1
Directional control valves size 10

61
Valve configuration, see section 2
61 = single solenoid, center plus external position, spring centered
63 = single solenoid, 2 external positions, spring offset
67 = single solenoid, center plus external position, spring offset
70 = double solenoid, 2 external positions, without springs
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent

1
Spool type, see section 2.

A
Options, see note 1 at section 4.

X
00-AC = AC solenoids without coils
00-DC = DC solenoids without coils
X = standard coil without connector
XUL = coils certified **cURus** without connector
See section 13 for available connectors, to be ordered separately
Coils with special connectors, see section 11
XJ = AMP Junior Timer connector, certified **cURus**
XK = Deutsch connector
XS = Lead Wire connection, certified **cURus**

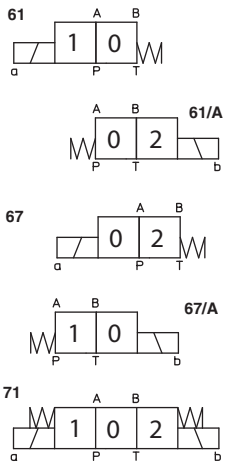
24 DC
Voltage code, see section 5

******
Series number

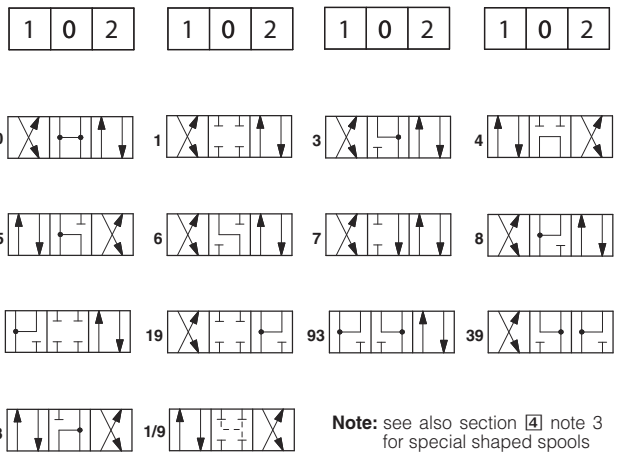
*****
Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)

Configurations

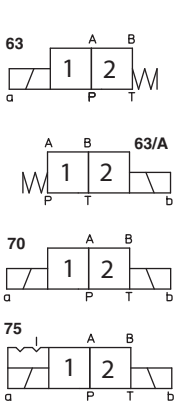


Spools

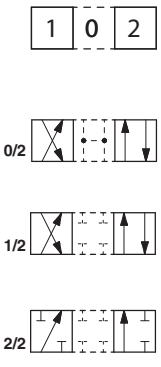


Note: see also section 4 note 3 for special shaped spools

Configurations



Spools



3 MAIN CHARACTERISTCS, SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Assembly position / location	Any position for all valves except for type - 170* (without springs) that must be installed with horizontal axis if operated by impulses		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	
Flow direction	As shown in the symbols of table 2		
Operating pressure	Ports P,A,B: **350** bar; Port T **210** bar for DC version (**250** bar with option /Y); **160** bar for AC version		
Rated flow	See diagrams Q/Δp at section 6		
Maximum flow	**150 l/min**, see operating limits at section 7		

3.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667, 669 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric feature 5
Supply voltage tolerance	± 10%
Certification (only for XUL coils)	**cURus** North American Standard

4 NOTES

1 Options

A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.
WP = prolonged manual override protected by rubber cap - see section 12.
L, L1, L2, L3, LR, L7, L8 see section 10 = device for switching time control (only for DC solenoids).
L7 and L8 are available only for spool type 0/1, 1/1, 3/1, 4 and 5.
Y = external drain, only for DC version, to be selected if the pressure at T port is higher than the max allowed limits.

2 Type of electric connectors DIN 43650, to be ordered separately - see section 13.
666 = standard connector IP-65 for direct connection to electric supply source.
667 = as 666, but with built-in signal led.
669 = with built-in rectifier bridge for supplying DC coils by alternate current (AC 110V and 230V - Imax 1A).

3 Spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spool type **1** is also available as **1/1**, properly shaped to reduce the water-hammer shocks during the switching.
- spool type **1/9** has closed center in rest position but it avoids the pressurization of A and B ports due to the internal leakages.

5 ELECTRIC FEATURES

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil
12 DC	**12 DC**	666 or 667	36 W	CAE-12DC
14 DC	**14 DC**			CAE-14DC
24 DC	**24 DC**			CAE-24DC
28 DC	**28 DC**			CAE-28DC
110 DC	**110 DC**			CAE-110DC
220 DC	**220 DC**			CAE-220DC
110/50/60 AC	**110/50/60 AC**		100 VA (3)	CAE-110/50/60AC (1)
230/50/60 AC	**230/50/60 AC**			CAE-230/50/60AC (1)
110/50/60 AC	**110 DC**	669	36 W	CAE-110DC
230/50/60 AC	**220 DC**			CAE-220DC

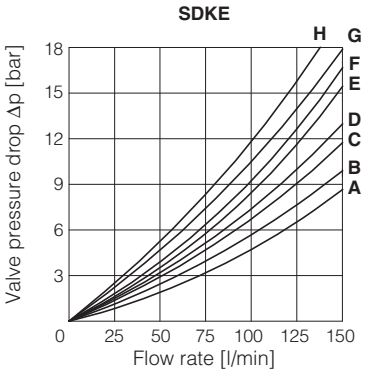
(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 90 VA

(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.

(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

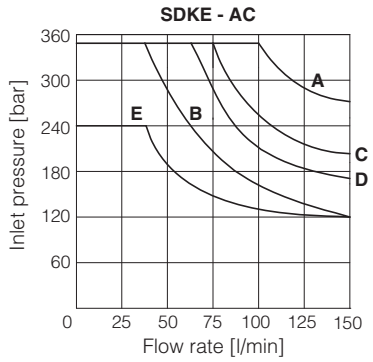
6 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

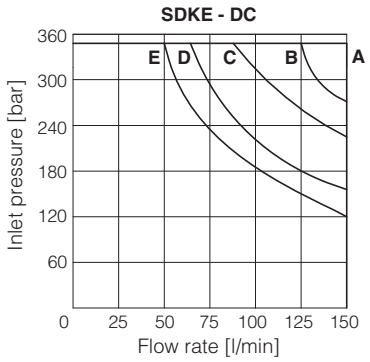
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T	B→A
0, 0/1, 0/2, 2/2	A	A	B	B		
1, 1/1, 1/9, 6, 8	A	A	D	C		
3, 3/1, 7	A	A	C	D		
4	B	B	B	B	F	
5, 58	A	B	C	C	G	
1/2	B	C	C	B		
19, 91	F	F	G	G		H
39, 93	F	F	G	G		H

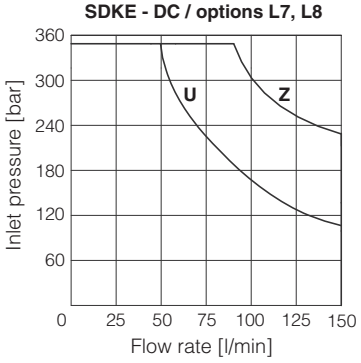


7 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value (V_{nom} - 10%). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.







Curve	Spool type AC	Spool type DC
A	0/1	0, 0/1, 1, 1/1, 3, 3/1, 1/2, 0/2, 8
B	4, 5, 19, 91	6, 7
C	0, 1/1, 3, 3/1	19, 91
D	1, 1/2, 0/2	4, 5
E	6, 7, 8, 2/2	2/2
U	-	4, 5
Z	-	0/1, 1/1, 3/1

8 SWITCHING TIMES (average values in msec)

Valve	Switch-on AC	Switch-on DC	Switch-off AC	Switch-off DC
SDKE + 666 / 667	40	60	25	35
SDKE + 669	60	—	90	—
SDKE-*/L7 - SDKE-*/L8	—	100÷150	—	100÷150

Test conditions:

- 50 l/min; 150 bar
- nominal supply voltage
- 2 bar of back pressure on port T
- mineral oil ISO VG 46 at 50°C

The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

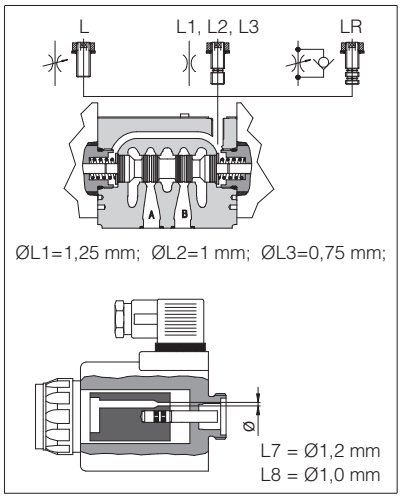
Valve	AC (cycles/h)	DC (cycles/h)
SDKE + 666 / 667	7200	15000

10 DEVICES FOR SWITCHING TIME CONTROL

These devices are only available for DC valve version (5 chambers body) and can control the switching time and therefore reduce the coil hammering in the hydraulic circuit. The different types are available shown in the figure.

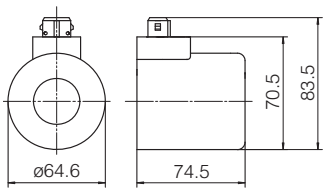
- **L**: controls and regulates the switching time in both moving directions of the spool: regulation is carried out by screwing/unscrewing the element itself (regulating choke);
- **L1/L2/L3**: controls the switching time in both moving directions of the spool by means of fixed calibrated restrictor (gauged flow). The restrictor is positioned in the valve's body ØL1 = 1,25 mm; ØL2 = 1 mm; ØL3 = 0,75 mm;
- **LR**: controls and regulates the switching time in the B→A direction of the spool movement. The device does not control the switching time (standard time) in the opposite direction A→B of the spool movement.
- **L7/L8**: controls the switching time in both moving directions of the spool by means of fixed calibrated restrictor (gauged flow). The restrictor is installed in the solenoid's anchor.

For a correct operation of the switching time control, the passage in which the control device is installed must be completely filled with oil.

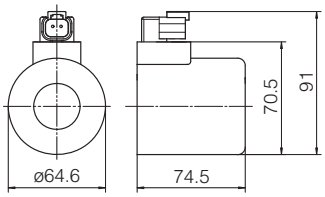


11 COILS TYPE CAE WITH SPECIAL CONNECTORS (only for 12DC, 14DC, 24DC and 28DC)

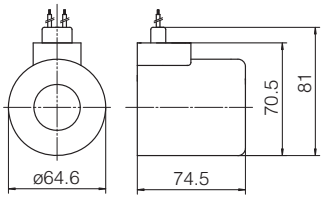
Options -XJ
Coil type CAEJ
AMP Junior Timer connector
Protection degree IP67
certified **cURus**



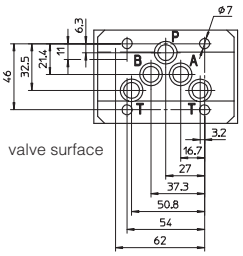
Options -XK
Coil type CAEK
Deutsch connector, DT-04-2P male
Protection degree IP67



Options -XS
Coil type CAES
Lead Wire connection
Cable lenght = 180 mm
certified **cURus**



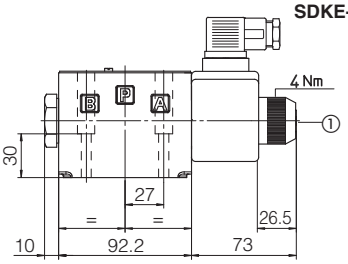
12 INSTALLATION DIMENSIONS [mm]

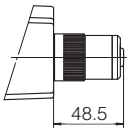


ISO 4401: 2005
Mounting surface according to 4401-05-05-0-05
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050 and 1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)
Ports Y: Ø = 5 mm

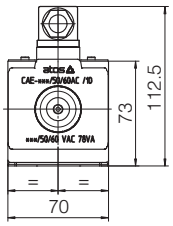
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
For the max pressures on ports, see section 3

SDKE-16*-AC



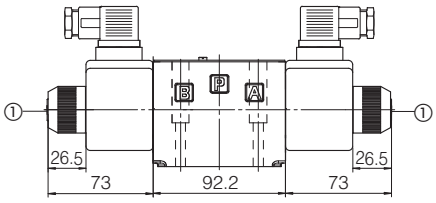


Option /WP



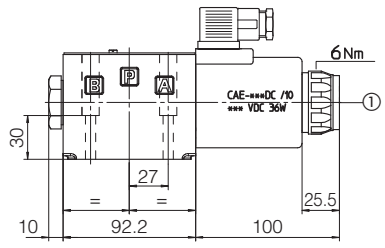
Mass: 3,9 kg

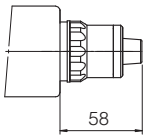
SDKE-17*-AC



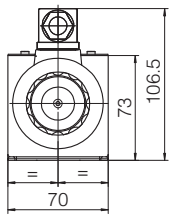
Mass: 4,7 kg

SDKE-16*-DC



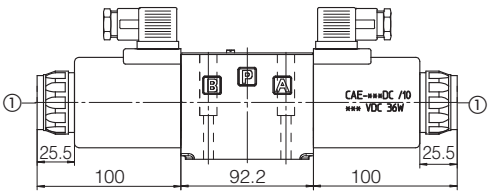


Option /WP



Mass: 4,5 kg

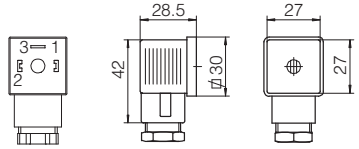
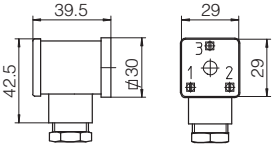
SDKE-17*-DC



Mass: 6,1 kg

① Standard manual override PIN. The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

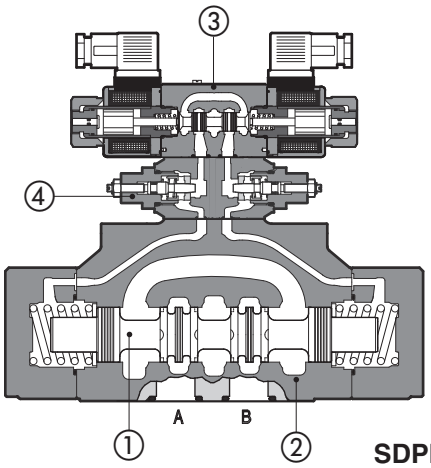
13 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

666, 667 (for AC or DC supply)	**669** (for AC supply)	**CONNECTOR WIRING**	
		**666, 667** 1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground	**669** 1,2 = Supply voltage V_{AC} 3 = Coil ground
		SUPPLY VOLTAGES	
		666 All voltages	**667** 24 AC or DC 110 AC or DC 220 AC or DC
			669 110/50 AC 110/60 AC 230/50 AC 230/60 AC

Note: for electronic connectors type **E-SD**, see tab. K500

Solenoid directional valves type SDPHL

pilot operated, ISO 4401 size 16 and 25



SDPHL-471*/H

① Main spool
② Main body
③ Solenoid pilot valve
④ Adjustable chokes - option /H

Spool type, pilot operated directional solenoid valves available in three or four way configurations.
They are operated by a directional valve ③ type SDHL (see technical table E018) equipped with threaded solenoids for AC or DC power supply.
Spools ① are fully interchangeable and they are available in a wide range of hydraulic configurations.
The valve body is made by shell-moulding castings ② machined by transfer lines and then cleaned by thermal deburring. Optimized flow paths largely cored with extrawide channels to tank ensures low pressure drops.

Valves can be supplied with following optional devices:
- Option /H, adjustable chokes for the valve's switching times control ④;
- Option /S, main spool stroke adjustment.

Rugged execution suitable for outdoor use.
Mounting surface: **ISO 4401 size 16, 25**
Max flow **up to 300 and 700 l/min.**
Pressure **up to 350 bar**

1 MODEL CODE

SDPH	L	-	2	61	1	/	A	-	X	24 DC	**	/	*

Pilot operated directional control valve

Solenoid pilot valve:
L = SDHL compact execution, AC and DC supply

Valve size: **2** = 16 **4** = 25

Valve configuration, see section 2
61= single solenoid, center plus external position, spring centered
63= single solenoid, 2 external positions, spring offset
67= single solenoid, center plus external position, spring offset
71= double solenoid, 3 positions, spring centered
75= double solenoid, 2 external positions, with detent

Spool type, see section 2

Series number

Seals material, see section 3:
- = NBR
PE = FKM

Voltage code, see section 5

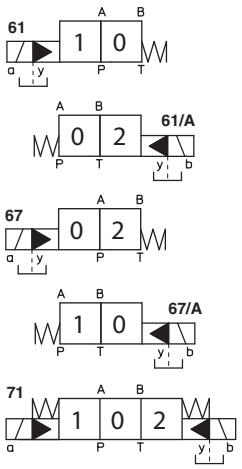
X = without connector
See section 11 for available connectors, to be ordered separately
XK = Deutsch connector

Options, see section 4

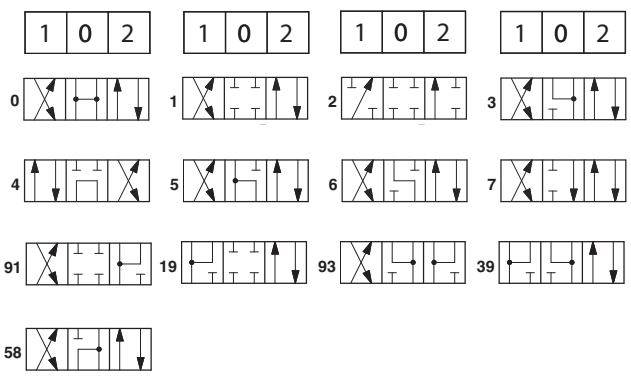
Note: SDPHL-* S PIL version without pilot solenoid valve available on request

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1, for functional scheme, see section 4)

Configurations

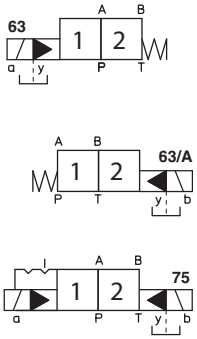


Spools

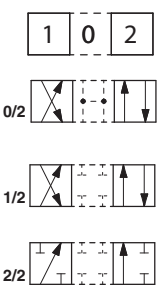


NOTES (see also section 4,2 for special shaped spools):
- For **SDPHL-6** are available only spools: **0, 1, 1/2, 2, 3, 4, 5, 58, 6, 7, 19, 91**

Configurations



Spools



3 MAIN CHARACTERISTICS, SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Assembly position / location	Any position for all valves except for type -*70 (without springs) that must be installed with horizontal axis if operated by impulses.		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007		
Ambient temperature	**Standard** = -30°C ÷ +70°C; **/PE** option = -20°C ÷ +70°C;		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	
Flow direction	As shown in the symbols of table 2		
Operating pressure	P, A, B, X = **350 bar** T = **250 bar** for external drain (standard) T with internal drain (option /D) and port Y = **210 bar** SDPHL (DC); **160 bar** SDPHL (AC) Minimum pilot pressure = 8 bar		
Rated flow	See diagrams Q/Δp at section 6		
Maximum flow	SDPHL-2: **300 l/min;** SDPHL-4: **700 l/min;** (see rated flow at section 6 and operating limits at section 7)		

3.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 5
Supply voltage tolerance	± 10%

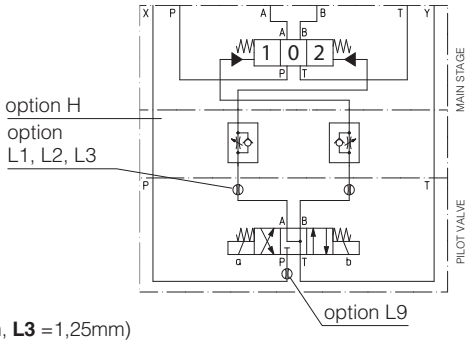
4 NOTES

4.1 Options

/A = Solenoid mounted at side of port A of main body (only for single solenoid valves). In standard version, solenoid is mounted at side of port B.
/D = Internal drain (standard configuration is external drain)
/E = External pilot pressure (standard configuration is internal pilot pressure).
/R = Pilot pressure generator (4 bar on port P) see section 4.2
/S = Main spool stroke adjustment.
/WP = Prolonged manual override protected by rubber cap.

⚠ The manual override operation can be possible only if the pressure at T port is lower than 50 bar

FUNCTIONAL SCHEME (config. 71)
example of switching control options



Devices for main spool switching control and to reduce the hydraulic shocks at the valve operation

/H = Adjustable chokes (meter-out to the pilot chambers of the main valve).
/L1, /L2, /L3 = calibrated restrictors on A and B ports of the pilot valve: **L1** =0,8mm, **L2** =1mm, **L3** =1,25mm)
/L9 = plug with calibrated restictor in P port of pilot valve - see section 9
Suggested for pilot pressure higher than 210 bar or to limit the hydraulics shocks caused by the fast main spool switching

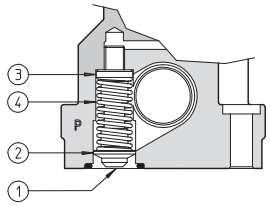
4.2 Special shaped spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4** are also available as **1/1** and **4/8** that are properly shaped to reduce water-hammer shocks during the switching (to use with option /L*).

Shaped spool availability	0/1	3/1	1/1	4/8
SDPHL-2, SDPHL-4	•	•	•	•

4.3 Pilot pressure generator (option /R)

The device **/R** generates an additional pressure drop, in order to ensure the minimum pilot pressure, for correct operation of the valves with internal pilot and fitted with spools type **0, 0/1, 4, 4/8, 5, 58.** The device **/R** has to be fitted when the pressure drop in the valve, verified on flow versus pressure diagrams, is lower than the minimum pilot pressure value.



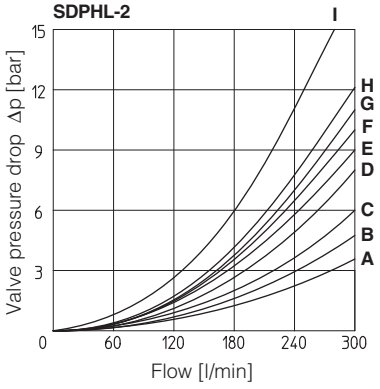
① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

5 ELECTRIC FEATURES

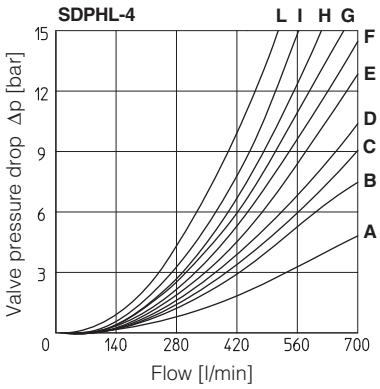
Valve	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption **(2)**	Code of spare coil	
					X version	**XK** version
SDPHL	12 DC	**12 DC**	666 or 667	30 W	COL-12DC	COLK-12DC
	14 DC	**14 DC**			COL-14DC	COLK-14DC
	24 DC	**24 DC**			COL-24DC	COLK-24DC
	28 DC	**28 DC**			COL-28DC	COLK-28DC
	110/50 AC	**110/50/60 AC**		58 VA **(3)**	COL-110/50/60AC **(1)**	-
	230/50 AC	**230/50/60 AC**			COL-230/50/60AC **(1)**	-

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10÷15% and the power consumption is 58 VA
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 150 VA.

6 FLOW VERSUS PRESSURE DIAGRAMS Based on mineral oil ISO VG 46 at 50°C



Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0/2, 1, 3, 6, 7	A	A	D	A	-
1/1, 1/2	B	B	D	E	-
0	A	A	D	E	C
0/1	A	A	D	-	-
2	A	A	-	-	-
2/2	B	B	-	-	-
3/1	A	A	D	D	-
4	C	C	H	I	F
4/8	C	C	G	I	F
5	A	B	F	H	G
19	C	-	-	G	-
39	C	-	-	H	-
49	-	D	-	-	-
58	B	A	F	H	H
91	C	C	E	-	-
93	-	C	D	-	-



Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
1	B	B	B	D	-
1/1	D	E	E	F	-
1/2	E	D	B	C	-
0	D	C	D	E	F
0/1, 3/1, 6, 7	D	D	D	F	-
0/2	D	D	D	E	-
2	B	B	-	-	-
2/2	E	D	-	-	-
3	B	B	D	F	-
4	C	C	H	L	L
5	A	D	D	D	H
19	F	-	-	E	-
39	G	F	-	F	-
58	E	A	B	F	H
91	F	F	D		
93	-	G	D	-	-

7 OPERATING LIMITS For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables

SDPHL-2

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**350**
	Flow rate [l/min]			
0, 1, 3, 6, 7, 8	300	300	300	300
2, 4, 4/8	300	300	240	140
5	260	220	180	100
0/1, 0/2, 1/2	300	250	210	180
58, *9, 9*	300	300	270	200

SDPHL-4

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**350**
	Flow rate [l/min]			
1, 6, 7, 8	700	700	700	600
2, 4, 4/8	500	500	450	400
5, 0/1, 0/2, 1/2	600	520	400	300
0, 3	700	700	600	540
58, *9, 9*	500	500	500	450

8 SWITCHING TIMES (average values in m sec)

Valve model	Configuration		Piloting pressure 70 bar Alternating current	70 bar Direct current	140 bar Alternating current	140 bar Direct current	250 bar Alternating current	250 bar Direct current
SDPHL-2	71, 61, 67, 61*/A, 67*/A	Switch ON	40	55	30	50	20	40
		Switch OFF	60					
	63, 63*/A	Switch ON	55	80	45	70	35	55
		Switch OFF	95					
SDPHL-4	71, 61, 67, 61*/A, 67*/A	Switch ON	60	80	45	60	30	45
		Switch OFF	80					
	63, 63*/A	Switch ON	95	115	75	95	50	65
		Switch OFF	130					

Notes:

1) For configuration 75, times of switching ON and switching OFF are the same: this value is equal to time of switch ON of configuration 63.

2) TEST CONDITIONS
- Nominal voltage supply DC (direct) and AC (alternating) with connector type SP-666. The use of other connectors can affect the switching time;
- 2 bar of counter pressure on port T;
- mineral oil: ISO VG 46 at 50°C

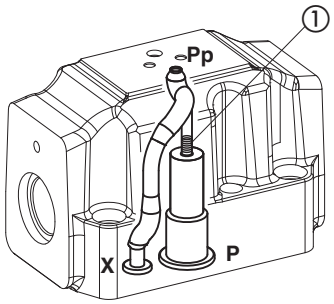
3) The response time is affected by elasticity of the hydraulic circuit, by variation of hydraulic characteristics and temperature.

9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

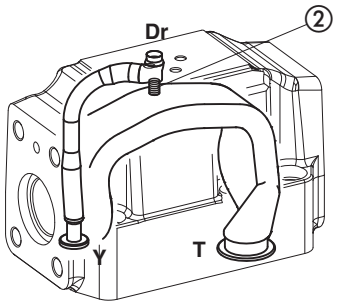
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

SDPHL-2

Pilot channels

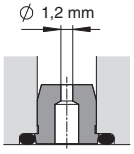


Drain channels



Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

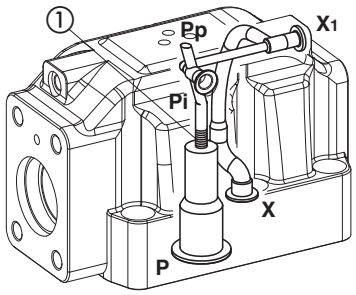
Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



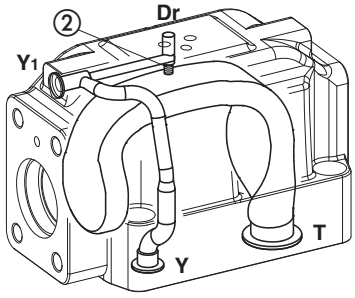
PLUG-12A

SDPHL-4

Pilot channels

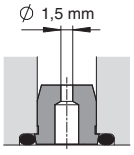


Drain channels



Internal piloting: Without blinded plug SP-X500F ①;
External piloting: Add blinded plug SP-X500F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

Option L9
This option provides a a calibrated restrictor PLUG-H-15A (Ø 1,5 mm) in the P port of the pilot valve



PLUG-15A

10 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 - the connectors must be ordered separately

Connector code	Function
666	Connector IP65, suitable for direct connection to electric supply source
667	As 666 connector IP65 but with built-in signal led, suitable for direct connection to electric supply source

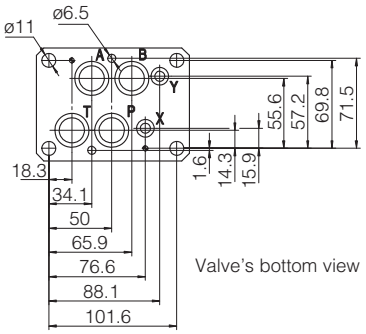
11 DIMENSIONS FOR SDPHL-2 [mm]

SDPHL-2*

ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043

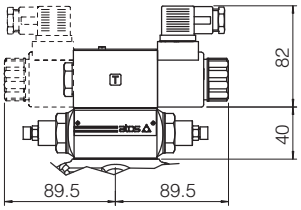
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

Mass (Kg)	
SDPHL-26	9,7
SDPHL-27	9,9
Option /S	+1,0
Option H	+1,0

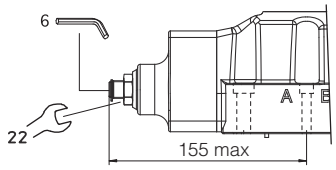


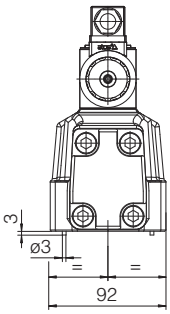
Valve's bottom view

SDPHL-2*/H

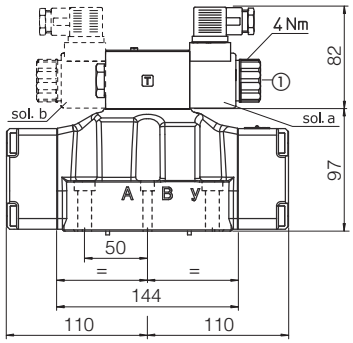


Stroke adjustment device for option /S





SDPHL-2*



Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

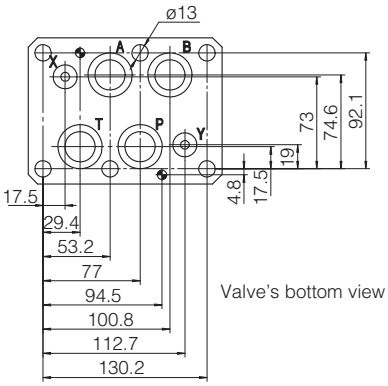
12 DIMENSIONS FOR SDPHL-4 [mm]

SDPHL-4*

ISO 4401: 2005
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

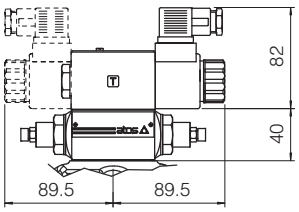
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

Mass (Kg)	
SDPHL-46	17,2
SDPHL-47	17,4
Option /S	+1,5
Option H	+1,0

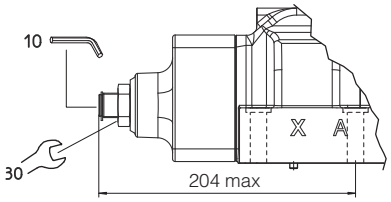


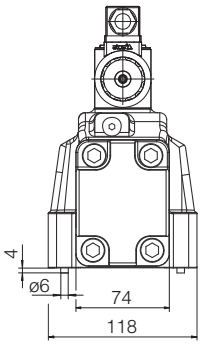
Valve's bottom view

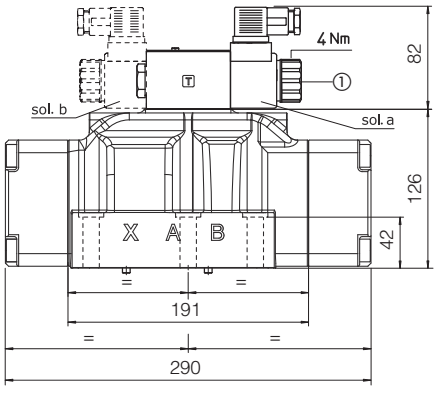
SDPHL-4*/H



SDPHL-4*





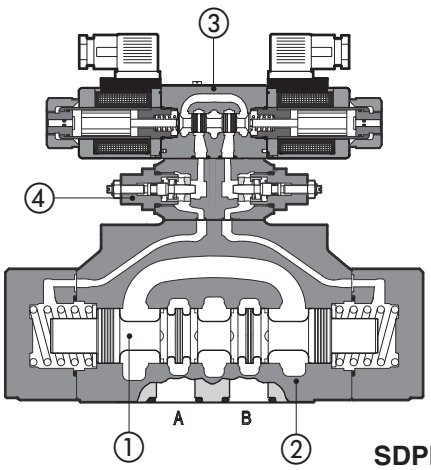


Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

Solenoid directional valves type SDPHE

pilot operated, ISO 4401 size 16, 25 and 32



SDPHE-471*/H

① Main spool
② Main body
③ Solenoid pilot valve
④ Adjustable chokes - option /H

Spool type, pilot operated directional solenoid valves available in three or four way configurations.
They are operated by a directional valve ③ type SDHE (see technical table E015) equipped with threaded solenoids for AC or DC power supply and certified according to North American Standard **cURus**.
Spools ① are fully interchangeable and they are available in a wide range of hydraulic configurations.
The valve body is made by shell-moulding castings ② machined by transfer lines and then cleaned by thermal deburring. Optimized flow paths largely cored with extrawide channels to tank ensures low pressure drops.

Valves can be supplied with following optional devices:
- Option /H, adjustable chokes for the valve's switching times control ④;
- Option /S, main spool stroke adjustment.

Rugged execution suitable for outdoor use.

Mounting surface: **ISO 4401 size 16, 25, 32**
Max flow **up to 300, 700 and 1000 l/min.**
Pressure **up to 350 bar**

1 MODEL CODE

SDPH	E	-	2	61	1	/	A	-	X	24 DC	**	/	*

SDPH — Pilot operated directional control valve

E — Solenoid pilot valve:
E = SDHE for AC and DC supply, high performances with **cURus** certified solenoids

2 — Valve size: **2** = 16 **4** = 25 **6** = 32

61 — Valve configuration, see section 2:
61 = single solenoid, center plus external position, spring centered
63 = single solenoid, 2 external positions, spring offset
67 = single solenoid, center plus external position, spring offset
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent

1 — Spool type, see section 2

A — Options, see section 4

X — **X** = without connector
See section 11 for available connectors, to be ordered separately
00-AC = AC solenoid valve without coils
00-DC = DC solenoid valve without coils
XJ = AMP Junior Timer connector
XK = Deutsch connector
XS = Lead Wire connection

24 DC — Voltage code, see section 5

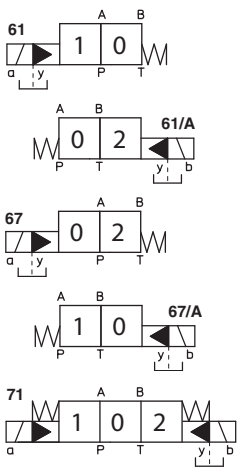
****** — Series number

***** — Seals material, see section 3:
- = NBR
PE = FKM
BT = HNBR

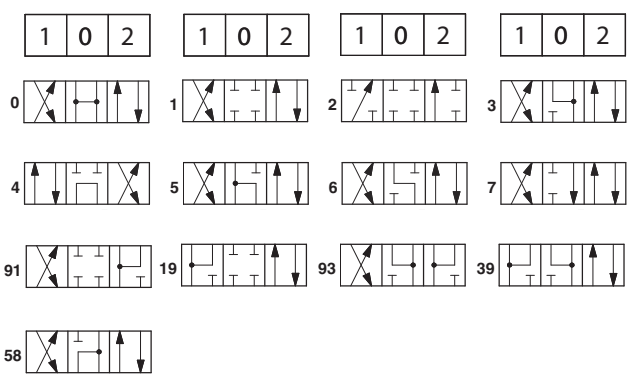
Note: SDPHE-* S PIL version without pilot solenoid valve available on request

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1, for functional scheme, see section 4)

Configurations

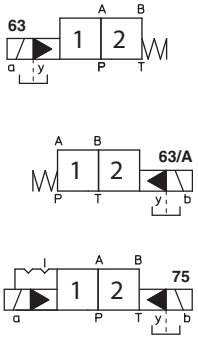


Spools

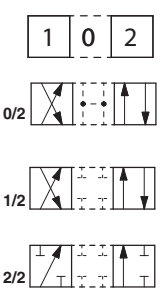


NOTES (see also section 4,2 for special shaped spools):
- For **DP*-6** are available only spools: **0, 1, 1/2, 2, 3, 4, 5, 58, 6, 7, 19, 91**

Configurations



Spools



3 MAIN CHARACTERISTICS, SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Assembly position / location	Any position for all valves except for type -*70 (without springs) that must be installed with horizontal axis if operated by impulses.		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007		
Ambient temperature	**Standard** = -30°C ÷ +70°C; **/PE** option = -20°C ÷ +70°C; **/BT** option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	
Flow direction	As shown in the symbols of table 2		
Operating pressure	P, A, B, X = **350 bar** T = **250 bar** for external drain (standard) T with internal drain (option /D) and port Y = **210 bar** SDPHE (DC); **160 bar** SDPHE (AC) Minimum pilot pressure = 8 bar		
Rated flow	See diagrams Q/Δp at section 6		
Maximum flow	SDPHE-2: **300 l/min;** SDPHE-4: **700 l/min;** SDPHE-6: **1000 l/min** (see rated flow at section 6 and operating limits at section 7)		

3.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors 666, 667 or 669 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 5
Supply voltage tolerance	± 10%
Certification	**cURus** North American standard

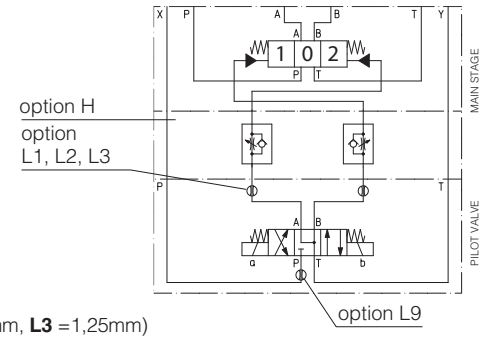
4 NOTES

4.1 Options

/A = Solenoid mounted at side of port A of main body (only for single solenoid valves). In standard version, solenoid is mounted at side of port B.
/D = Internal drain (standard configuration is external drain)
/E = External pilot pressure (standard configuration is internal pilot pressure).
/R = Pilot pressure generator (4 bar on port P) see section 4.2
/S = Main spool stroke adjustment.
/WP = Prolonged manual override protected by rubber cap.

⚠ The manual override operation can be possible only if the pressure at T port is lower than 50 bar

FUNCTIONAL SCHEME (config. 71)
example of switching control options



Devices for main spool switching control and to reduce the hydraulic shocks at the valve operation

/H = Adjustable chokes (meter-out to the pilot chambers of the main valve).
/L1, /L2, /L3 = calibrated restrictors on A and B ports of the pilot valve: **L1** =0,8mm, **L2** =1mm, **L3** =1,25mm)
/L9 = plug with calibrated restictor in P port of pilot valve - see section 9
Suggested for pilot pressure higher than 210 bar or to limit the hydraulics shocks caused by the fast main spool switching

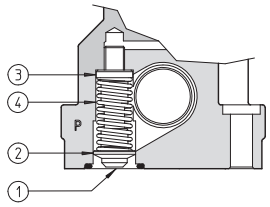
4.2 Special shaped spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4** are also available as **1/1** and **4/8** that are properly shaped to reduce water-hammer shocks during the switching (to use with option /L*).

Shaped spool availability	0/1	3/1	1/1	4/8
SDPHE-2, SDPHE-4	•	•	•	•
SDPHE-6	-	•	•	•

4.3 Pilot pressure generator (option /R)

The device **/R** generates an additional pressure drop, in order to ensure the minimum pilot pressure, for correct operation of the valves with internal pilot and fitted with spools type **0, 0/1, 4, 4/8, 5, 58.** The device **/R** has to be fitted when the pressure drop in the valve, verified on flow versus pressure diagrams, is lower than the minimum pilot pressure value.



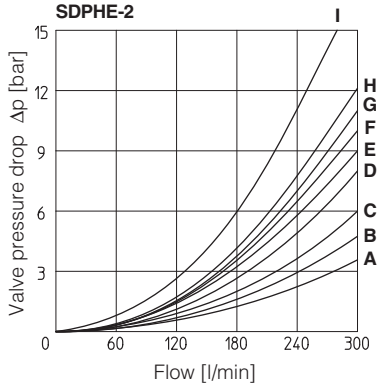
① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

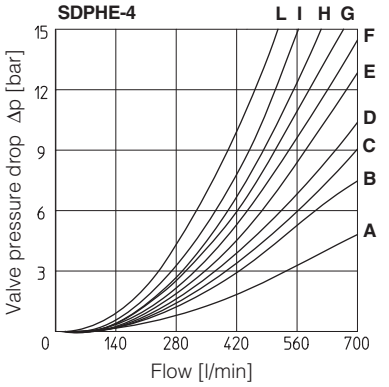
5 ELECTRIC FEATURES

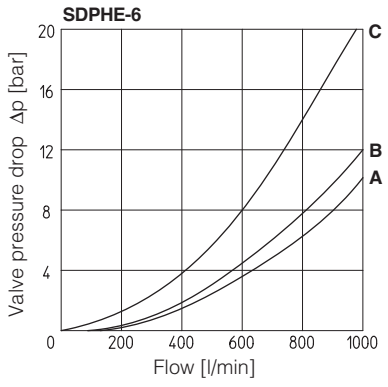
Valve	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption **(2)**	Code of spare coil
SDPHE	12 DC	**12 DC**	666 or 667	30 W	COE-12DC
	14 DC	**14 DC**			COE-14DC
	24 DC	**24 DC**			COE-24DC
	28 DC	**28 DC**			COE-28DC
	110 DC	**110 DC**			COE-110DC
	220 DC	**220 DC**			COE-220DC
	110/50 AC	**110/50/60 AC**		58 VA **(3)**	COE-110/50/60AC **(1)**
	230/50 AC	**230/50/60 AC**			COE-230/50/60AC **(1)**
	110/50 AC 120/60 AC	**110RC**	669	30 W	COE-110RC
	230/50 AC 230/60 AC	**230RC**			COE-230RC

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10÷15% and the power consumption is 58 VA
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 150 VA.

6 FLOW VERSUS PRESSURE DIAGRAMS Based on mineral oil ISO VG 46 at 50°C







Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0/2, 1, 3, 6, 7	A	A	D	A	-
1/1, 1/2	B	B	D	E	-
0	A	A	D	E	C
0/1	A	A	D	-	-
2	A	A	-	-	-
2/2	B	B	-	-	-
3/1	A	A	D	D	-
4	C	C	H	I	F
4/8	C	C	G	I	F
5	A	B	F	H	G
19	C	-	-	G	-
39	C	-	-	H	-
49	-	D	-	-	-
58	B	A	F	H	H
91	C	C	E	-	-
93	-	C	D	-	-

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
1	B	B	B	D	-
1/1	D	E	E	F	-
1/2	E	D	B	C	-
0	D	C	D	E	F
0/1, 3/1, 6, 7	D	D	D	F	-
0/2	D	D	D	E	-
2	B	B	-	-	-
2/2	E	D	-	-	-
3	B	B	D	F	-
4	C	C	H	L	L
5	A	D	D	D	H
19	F	-	-	E	-
39	G	F	-	F	-
58	E	A	B	F	H
91	F	F	D		
93	-	G	D	-	-

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0	A	A	B	B	B
1	A	A	A	B	-
3	A	-	A	B	-
4	A	A	C	C	C

7 OPERATING LIMITS For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables

SDPHE-2

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**350**
	Flow rate [l/min]			
0, 1, 3, 6, 7, 8	300	300	300	300
2, 4, 4/8	300	300	240	140
5	260	220	180	100
0/1, 0/2, 1/2	300	250	210	180
58, *9, 9*	300	300	270	200

SDPHE-4

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**350**
	Flow rate [l/min]			
1, 6, 7, 8	700	700	700	600
2, 4, 4/8	500	500	450	400
5, 0/1, 0/2, 1/2	600	520	400	300
0, 3	700	700	600	540
58, *9, 9*	500	500	500	450

SDPHE-6

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**350**
	Flow rate [l/min]			
1, 3, 6, 7,	1000	950	850	700
0	950	900	800	650
1/2, 2, 4, 5	850	800	700	450
58, 19/91	950	850	650	450

8 SWITCHING TIMES (average values in m sec)

Valve model	Configuration		Piloting pressure 70 bar Alternating current	70 bar Direct current	140 bar Alternating current	140 bar Direct current	250 bar Alternating current	250 bar Direct current
SDPHE-2	71, 61, 67, 61*/A, 67*/A	Switch ON	40	55	30	50	20	40
		Switch OFF	60					
	63, 63*/A	Switch ON	55	80	45	70	35	55
		Switch OFF	95					
SDPHE-4	71, 61, 67, 61*/A, 67*/A	Switch ON	60	80	45	60	30	45
		Switch OFF	80					
	63, 63*/A	Switch ON	95	115	75	95	50	65
		Switch OFF	130					
SDPHE-6	71, 61, 67, 61*/A, 67*/A	Switch ON	70	95	55	70	40	55
		Switch OFF	150					
	63, 63*/A	Switch ON	115	145	95	110	70	90
		Switch OFF	280					

Notes:

1) For configuration 75, times of switching ON and switching OFF are the same: this value is equal to time of switch ON of configuration 63.

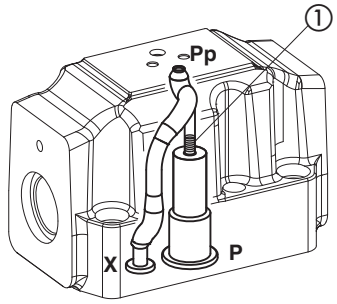
2) TEST CONDITIONS
- Nominal voltage supply DC (direct) and AC (alternating) with connector type SP-666. The use of other connectors can affect the switching time;
- 2 bar of counter pressure on port T;
- mineral oil: ISO VG 46 at 50°C

3) The response time is affected by elasticity of the hydraulic circuit, by variation of hydraulic characteristics and temperature.

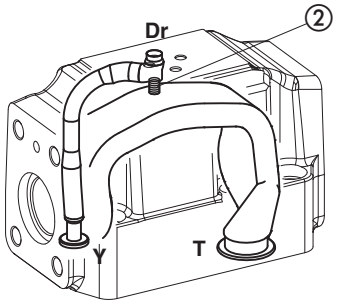
9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

SDPHE-2 **Pilot channels**

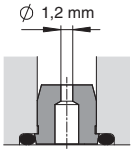


Drain channels



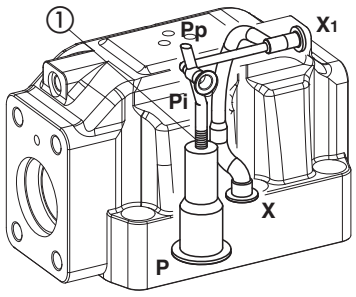
Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve

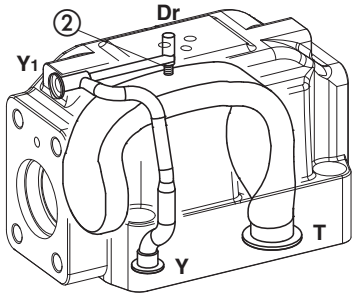


PLUG-12A

SDPHE-4 **Pilot channels**

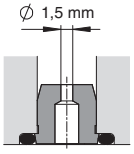


Drain channels



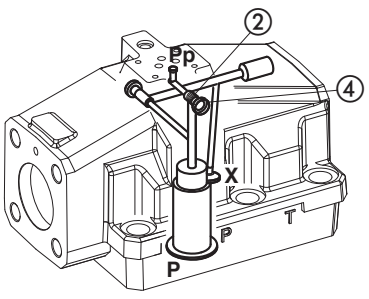
Internal piloting: Without blinded plug SP-X500F ①;
External piloting: Add blinded plug SP-X500F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

Option L9
This option provides a a calibrated restrictor PLUG-H-15A (Ø 1,5 mm) in the P port of the pilot valve



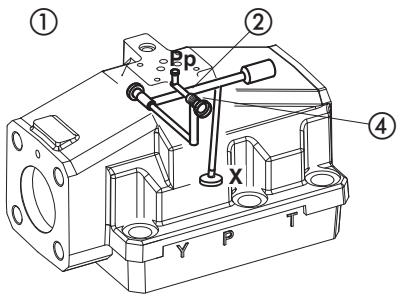
PLUG-15A

SDPHE-6 **Pilot channels**



Internal piloting:
plug SP-X325A in pos ②;

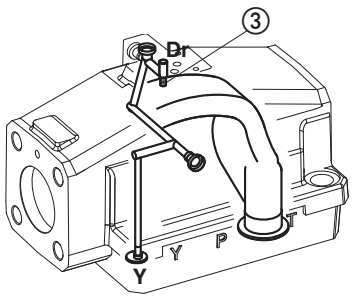
Pilot channels



External piloting:
plug SP-X325A in pos ②;

To reach the orifice ②, remove plug ④ = G 1/8"
Note: valve body is different from internal and external piloting

Drain channels



Internal drain:
Without blinded plug SP-X300F ③;

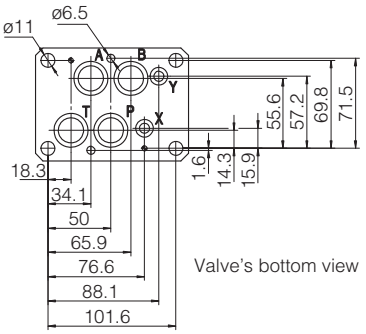
External drain:
Add blinded plug SP-X300F ③.

10 DIMENSIONS FOR SDPHE-2 [mm]

SDPHE-2*

ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043

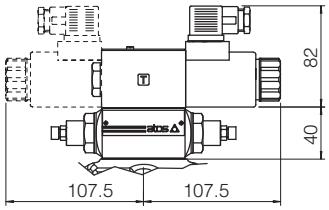
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



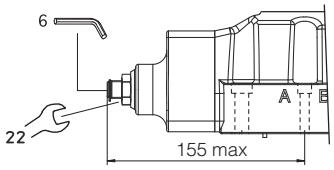
Valve's bottom view

Mass (Kg)	
SDPHE-26	9,9
SDPHE-27	10,3
Option /S	+1,0
Option H	+1,0

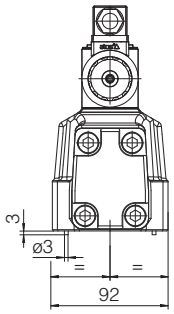
SDPHE-2*/H

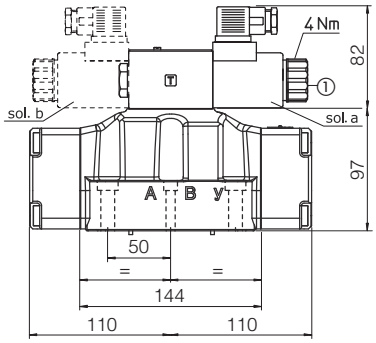


Stroke adjustment device for option /S



SDPHE-2*





Overall dimensions refer to valves with connectors type 666

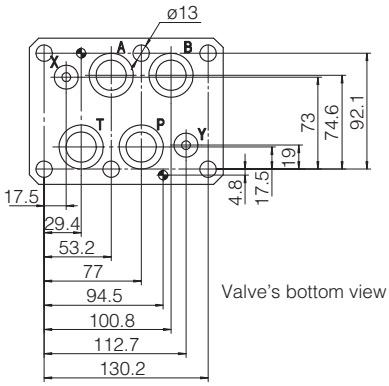
① Standard manual override PIN

11 DIMENSIONS FOR SDPHE-4 [mm]

SDPHE-4*

ISO 4401: 2005
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

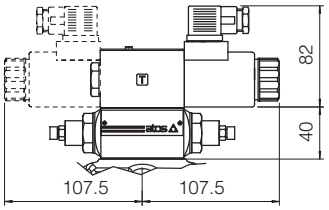
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



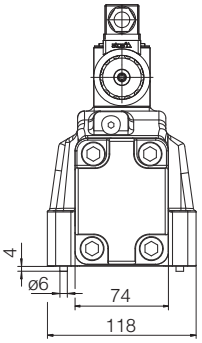
Valve's bottom view

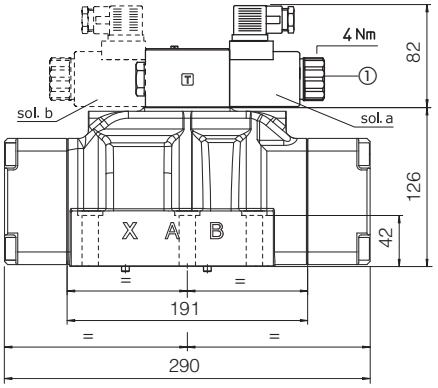
Mass (Kg)	
SDPHE-46	17,4
SDPHE-47	17,8
Option /S	+1,5
Option H	+1,0

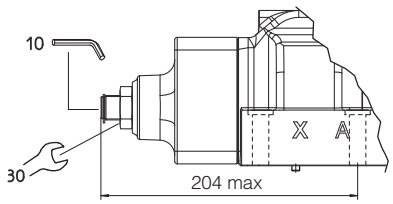
SDPHE-4*/H



SDPHE-4*







Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

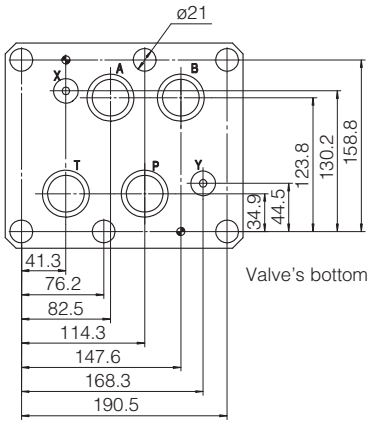
12 DIMENSIONS FOR DPH*-6 [mm]

SDPHE-6*

ISO 4401: 2005
Mounting surface: 4401-10-09-0-05

Fastening bolts:
6 socket head screws M20x80 class 12.9
Tightening torque = 600 Nm
Diameter of ports A, B, P, T: Ø = 34 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 144, 2 OR 3056

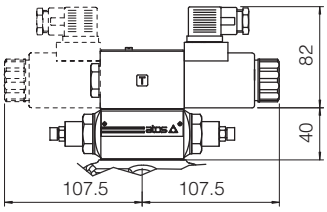
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



Valve's bottom view

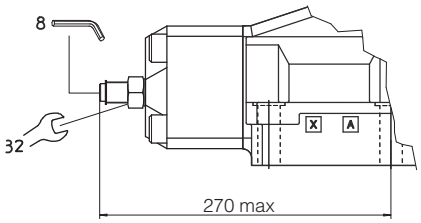
Mass (Kg)	
SDPHE-66	43,8
SDPHE-67	44,1
Option /S	+3,5
Option H	+1,0

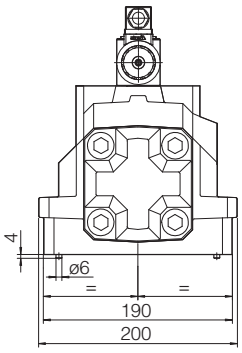
SDPHE-6*/H

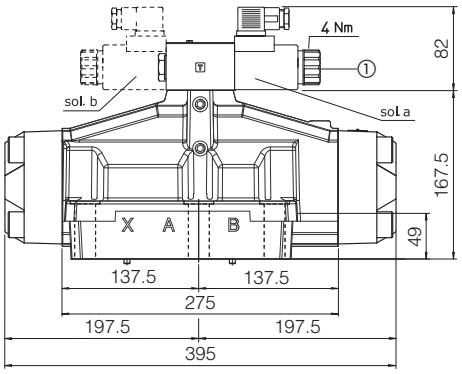


SDPHE-6*

Stroke adjustment device for option/S







Overall dimensions refer to valves with connectors type 666

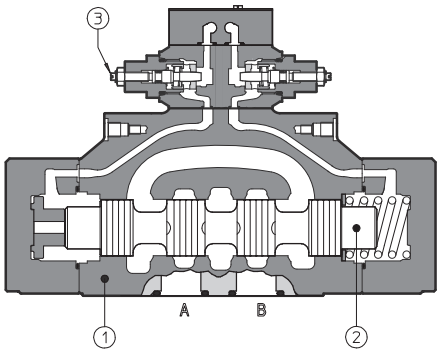
① Standard manual override PIN

13 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 - the connectors must be ordered separately

Connector code	Function
666	Connector IP65, suitable for direct connection to electric supply source
667	As 666 connector IP65 but with built-in signal led, suitable for direct connection to electric supply source
669	With built-in rectifier bridge for supplying DC coils by alternating current (AC 110V and 230V - Imax 1A)

Hydraulic operated directional valves type SDP

ISO 4401 size 16, 25 and 32



SDP-4411/H

① Main body
② Spool
③ Adjustable chokes (option /H)

Spool type hydraulic operated directional valves in three or four way, two or three position, designed to operate in oil hydraulic systems.
Available with single or double hydraulic actuator.

Mounting surface: **ISO 4401**
size 16, 25, 32

SDP-2 = size 16, flow up to 300 l/min
SDP-4 = size 25, flow up to 700 l/min
SDP-6 = size 32, flow up to 1000 l/min

Max pressure: **350 bar**

1 MODEL CODE

SDP-2	4	1	3	/	H	**	/	*

SDP-2 Hydraulic operated directional control valve, size:
SDP-2 = 16
SDP-4 = 25
SDP-6 = 32

4 Type of actuator:
4 = single actuator
5 = double actuator

1 Valve configuration, see section 2 :
0 = free, without springs
1 = spring centered, without detent
3 = spring offset external position
7 = center and external positions

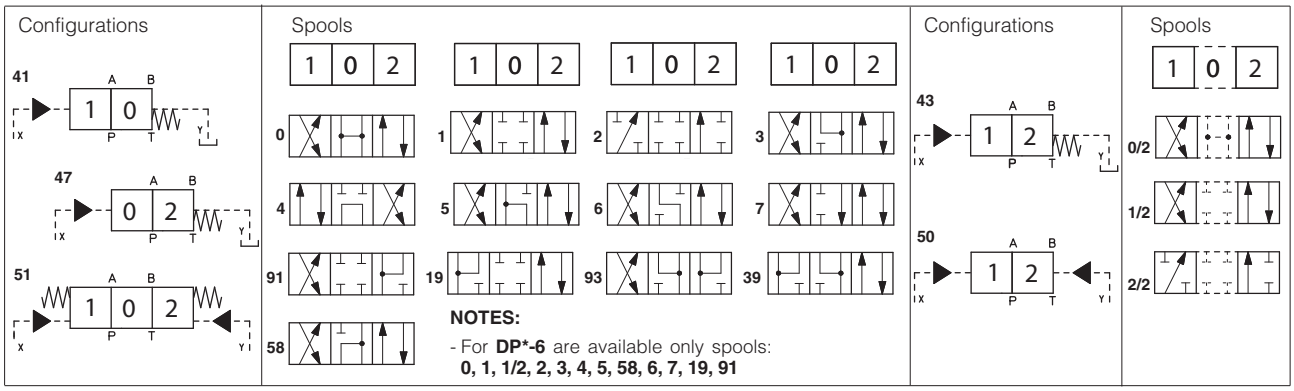
3 Spool type, see section 2

H Options:
/H = adjustable chokes for controlling the main spool shifting time (meter-out to the pilot chambers of the main valve)
/R = pilot pressure generator (4 bar on port P)
/S = main spool stroke adjustment

****** Series number

***** Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

2 CONFIGURATIONS and SPOOLS valves type SDP-*



Special shaped spools
- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1** and **4** are also available as **1/1** and **4/8** are properly shaped to reduce water-hammer shocks during the switching.

3 HYDRAULIC CHARACTERISTICS

Valve model		SDP-2	SDP-4	SDP-6
Max recommended flow	[l/min]	300	700	1000
Max pressure on port P, A, B	[bar]	350		
Max pressure on port T (also X, Y for SDP)	[bar]	250		
Minimum pilot pressure	[bar]	4		
Max recommended pressure on piloting line	[bar]	250		

(1) The max pressure on port T has to be not over 50% of pilot pressure

4 MAIN CHARACTERISTICS, SEALS AND FLUIDS - for other fluids not included in below table, consult our technical office

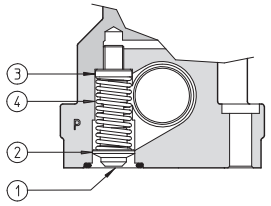
Assembly position / location	any position except for valves type SDP-*50 (without springs) that must be installed with their longitudinal axis horizontal		
Subplate surface finishing	roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature range	standard execution = -30°C ÷ +70°C; /PE option = -20°C ÷ +70°C; /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

5 Q/ΔP DIAGRAMS

SDP-2	See note and diagrams on table SHE085 relating the SDPH*-2 valve from which SDP-2* are derivated
SDP-4	See note and diagrams on table SHE085 relating the SDPH*-4 valve from which SDP-4* are derivated
SDP-6	See note and diagrams on table SHE085 relating the SDPH*-6 valve from which SDP-6* are derivated

6 PILOT PRESSURE GENERATOR (option /R)

The device **/R** generates an additional pressure drop, in order to ensure the minimum pilot pressure, for correct operation of the valves with internal pilot and fitted with spools type **0, 0/1, 4, 4/8, 5, 589.** The device **/R** has to be fitted when the pressure drop in the valve, verified on flow versus pressure diagrams, is lower than the minimum pilot pressure value.

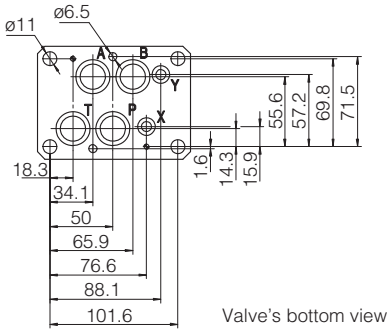


① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

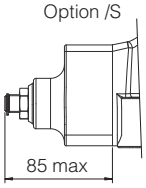
7 DIMENSIONS OF HYDRAULIC OPERATED VALVES ISO 4401 size 16, 25 and 32 [mm]

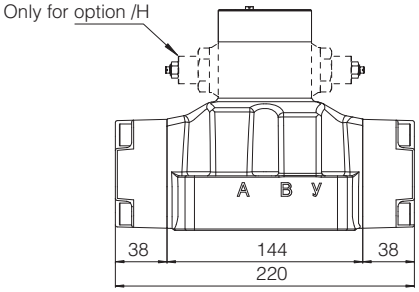
SDP-2

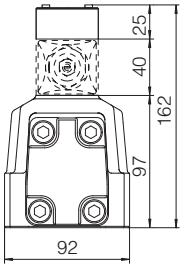
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4 OR 130, 2 OR 2043



Valve's bottom view



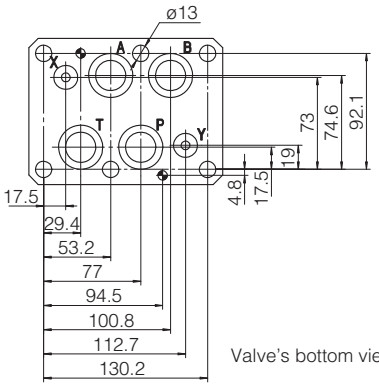




Mass: 10 Kg

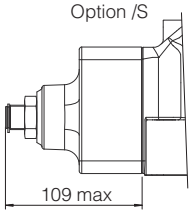
SDP-4

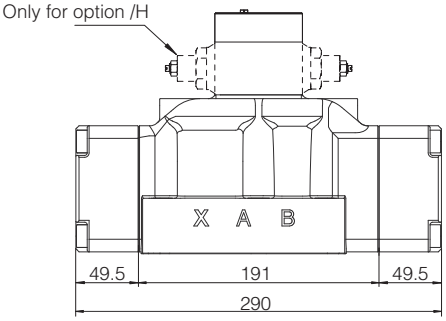
ISO 4401: 2005
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Diameter of ports A, B, P, T : Ø = 24
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4 OR 4112, 2 OR 3056

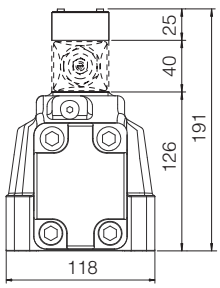


Valve's bottom view

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



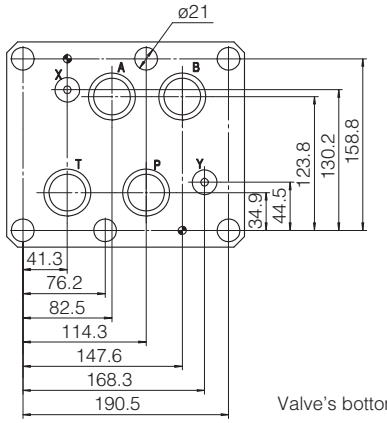




Mass: 16,5 Kg

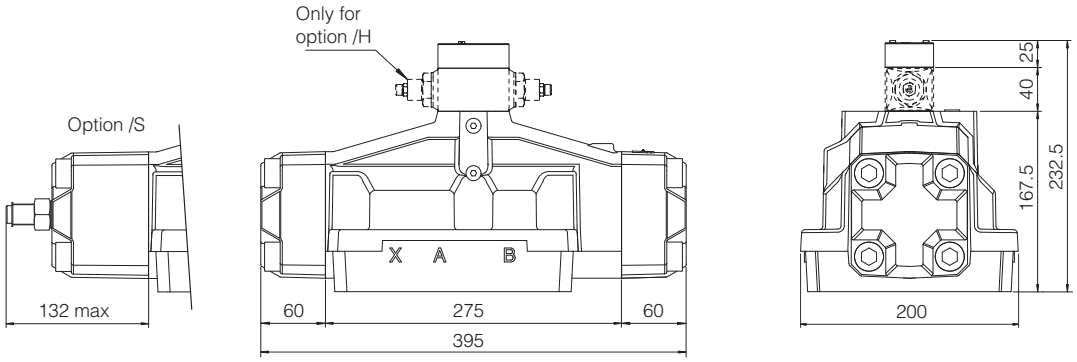
SDP-6

ISO 4401: 2005
Mounting surface: 4401-10-09-0-05
(port L optional)
Fastening bolts:
6 socket head screws M20x80 class 12.9
Tightening torque = 600 Nm
Diameter of ports A, B, P, T : Ø = 34 mm
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4 OR 144, 2 OR 3056



Valve's bottom view

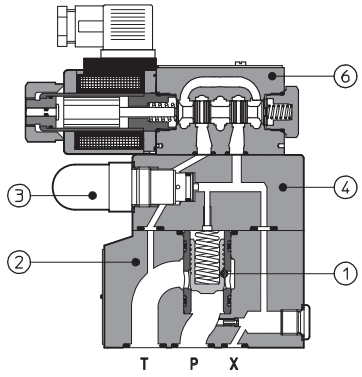
P = PRESSURE PORT
A, B= USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



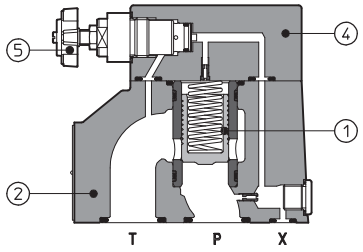
Mass: 38 Kg

Pressure relief valves type SAGAM

two stage, subplate mounting - ISO 6264 size 10, 20 and 32



SAGAM-10/11...-E



SAGAM-20/..../V

SAGAM are two stage pressure relief valves with balanced poppet, designed to operate in oil hydraulic systems.

In standard versions the piloting pressure of the poppet ① of the main stage ② is regulated by means of a grub screw protected by cap ③ in the cover ④.

Optional versions with setting adjustment by handwheel ⑤ instead of the grub screw are available on request.

Clockwise rotation increases the pressure.

SAGAM can be equipped with a SDHE pilot solenoid valve ⑥ for venting or for different pressure setting.

Mounting surface: **ISO 6264 size 10, 20** and **32**
Max flow: **200, 400** and **600 l/min**
Max pressure up to **350 bar**

1 MODEL CODE

SAGAM	-	20	/	10	/	210	/	100/100	V	-	E	X	24DC	**	/	*

SAGAM = pressure relief valve subplate mounting

Size:
10 20 32

Setting pressure and venting option:
- = one setting pressure without option
10 = one setting pressure with venting, with de-energized solenoid
11 = one setting pressure with venting, with energized solenoid
20 = two setting pressure with venting, with de-energized solenoid
21 = two setting pressure with venting, with energized solenoid
22 = two setting pressure without venting
32 = three setting pressure without venting

Setting: see section 4 for available setting

Pressure range of second/third setting **(1)**:
50 = 4÷50 bar
100 = 6÷100 bar
210 = 7÷210 bar
350 = 8÷350 bar

Options, see section 7
E V WP Y

Solenoid venting valve **(1)**:
E = SDHE for AC and DC supply, with **cURus** certified solenoids
L = SDHL for AC and DC supply, compact execution

X = without connector **(1):**
See section 10 for available connectors, to be ordered separately
-00-AC = AC solenoid valve without coils
-00-DC = DC solenoid valve without coils

Voltage code, see section 6 **(1)**:

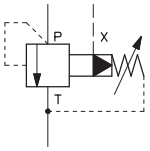
Series number

Seals material, see section 11:
- = NBR
PE = FKM
BT = HNBR

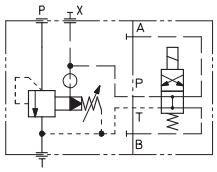
(1) Only for SAGAM with solenoid valve for venting and/or for the selection of the setting pressure

2 HYDRAULIC SYMBOLS

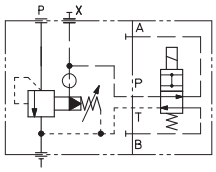
SAGAM



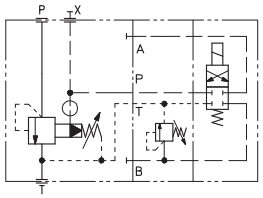
SAGAM-/10**



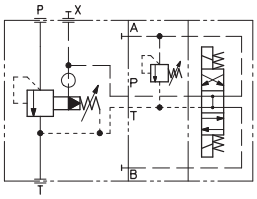
SAGAM-/11**



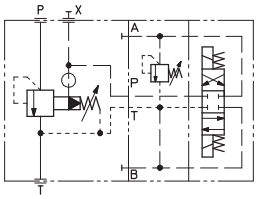
SAGAM-/22**



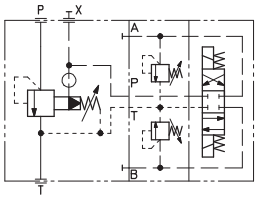
SAGAM-/20**



SAGAM-/21**



SAGAM-/32**



3 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years
Ambient temperature range	**Standard** = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -30°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +80°C
Surface protection	Body: zinc coating with black passivation Coil: zinc nickel coating (DC version) plastic incapsulation (AC version)
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h

4 HYDRAULIC CHARACTERISTICS

Valve model	**SAGAM-10**	**SAGAM-20**	**SAGAM-32**
Setting [bar]	50;	100; 210;	350
Pressure range [bar]	4÷50;	6÷100; 7÷210;	8÷350
Max pressure [bar]	Ports P, X = 350 Ports T, Y = 210 (without pilot solenoid valve) For version with pilot solenoid valve, see technical tables E015 and E018		
Max flow [l/min]	200	400	600

5 ELECTRICAL CHARACTERISTICS (for SAGAM with pilot solenoid valve)

Insulation class	**H** (180°C) for DC coils; **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	**IP 65** (with connectors correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See section 6
Supply voltage tolerance	± 10%
Certification	**cURus** North American standard - only for SDHE pilot valve

6 COIL VOLTAGE

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	-EX Power consumption (2)	-LX Power consumption (2)	Code of spare coil -EX	Code of spare coil -LX
12 DC	**12 DC**	666 or 667	30W	29W	COE-12DC	COL-12DC
14 DC	**14 DC**				COE-14DC	COL-14DC
110 DC	**110 DC**				COE-110DC	COL-110DC
220 DC	**220 DC**				COE-220DC	COL-220DC
110/50 AC (1)	**110/50/60 AC**	666 or 667	58VA (3)	58VA (3)	COE-110/50/60AC	COL-110/50/60AC
230/50 AC (1)	**230/50/60 AC**		58VA (3)		COE-230/50/60AC	COL-230/50/60AC

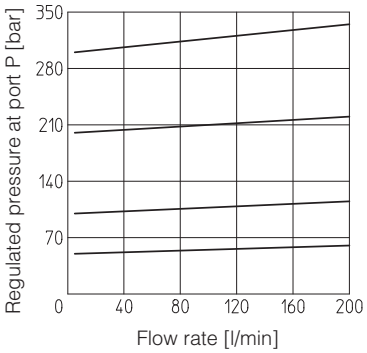
For other supply voltages available on request see technical tables E015, E018.
(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10 ÷ 15% and the power consumption is 55 VA (SDHL) and 58 VA (SDHE)
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

7 OPTIONS

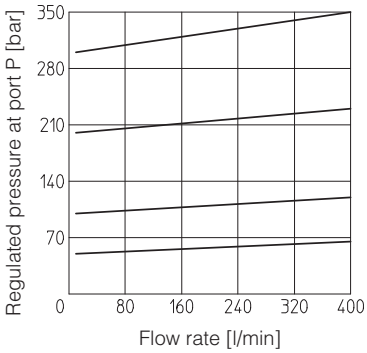
/E = external pilot
/V = regulating handwheel instead of grub screw protected by cap
/WP = prolunged manual override protected by rubber cap (only for SAGAM with pilot solenoid valve)
/Y = external drain (only for SAGAM with pilot solenoid valve)

8 REGULATED PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

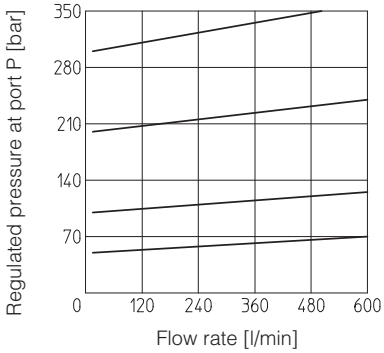
SAGAM-10



SAGAM-20

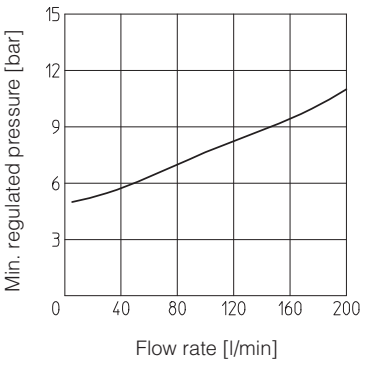


SAGAM-32

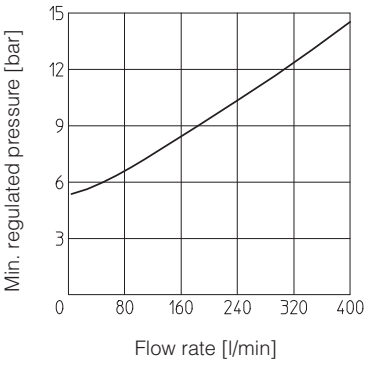


9 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

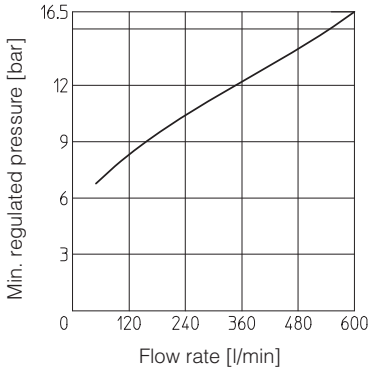
SAGAM-10



SAGAM-20



SAGAM-32



10 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 FOR SAGAM WITH SOLENOID VALVE

The connectors must be ordered separately

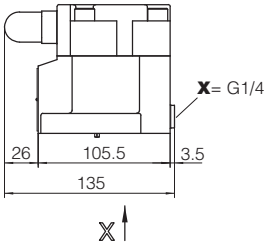
Code of connector	Function
666	Connector IP-65, suitable for direct connection to electric supply source
667	As 666 connector IP-65 but with built-in signal led, suitable for direct connection to electric supply source

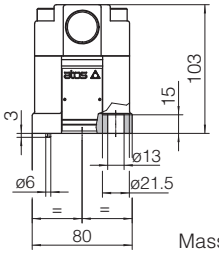
11 **SEALS AND HYDRAULIC FLUID** - for other fluids not included in below table, consult our technical office

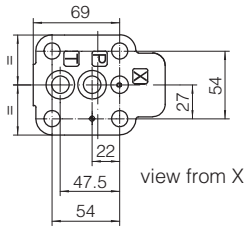
Seals, reccomended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

12 **DIMENSIONS [mm]**

SAGAM-10

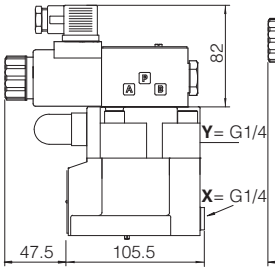






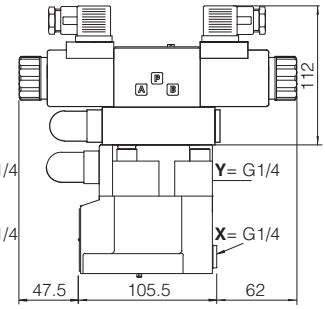
Mass: 3,6 Kg

ISO 6264: 2007
Mounting surface: 6264-06-09-1-97
Fastening bolts:
4 socket head screws
M12x35 class 12.9
Tightening torque = 125 Nm
Seals: 2 OR 123; 1 OR 109/70
Ports P, T: Ø = 14,5 mm
Ports X: Ø = 3,2 mm



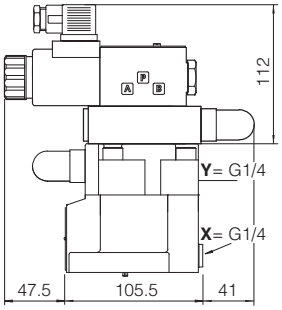
SAGAM-10/10/-EX**
SAGAM-10/11/-EX**

Mass: 5,1 Kg



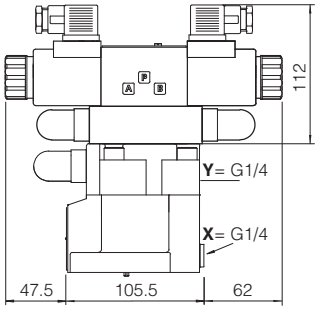
SAGAM-10/20/-EX**
SAGAM-10/21/-EX**

Mass: 6,2 Kg



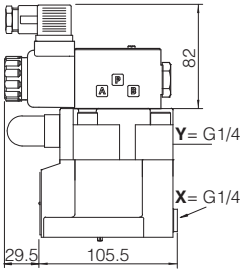
SAGAM-10/22/-EX**

Mass: 5,9 Kg



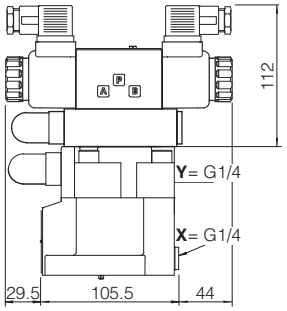
SAGAM-10/32/-EX**

Mass: 6,3 Kg



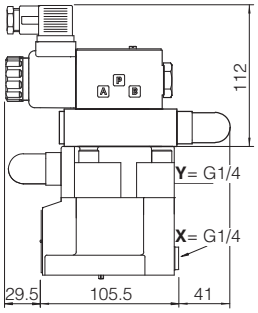
SAGAM-10/10/-LX**
SAGAM-10/11/-LX**

Mass: 4,8 Kg



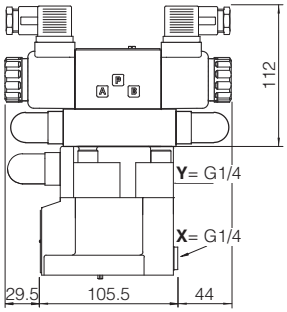
SAGAM-10/20/-LX**
SAGAM-10/21/-LX**

Mass: 5,6 Kg



SAGAM-10/22/-LX**

Mass: 5,6 Kg

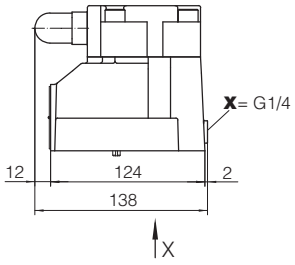


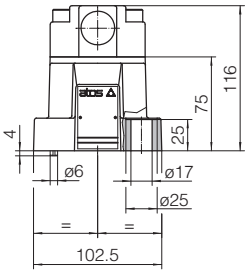
SAGAM-10/32/-LX**

Mass: 5,7 Kg

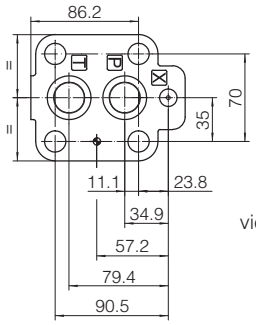
Overall dimensions refer to valves **DC** voltage, with connectors type 666

SAGAM-20



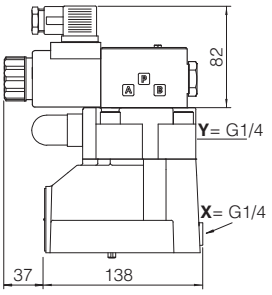


Mass: 4,8Kg



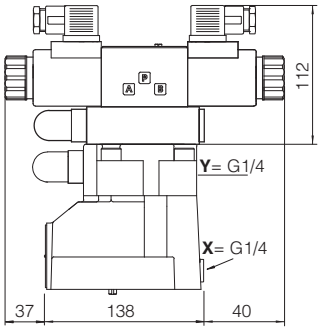
view from X

ISO 6264: 2007
Mounting surface: 6264-08-11-1-97
Fastening bolts:
4 socket head screws M16x50 class 12.9
Tightening torque = 300 Nm
Seals: 2 OR 4112; 1 OR 109/70
Ports P, T: Ø = 24 mm
Ports X: Ø = 3,2 mm



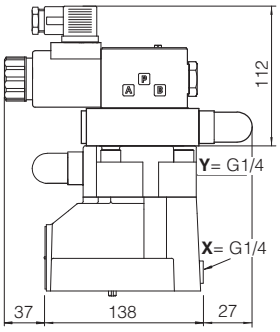
SAGAM-20/10/-EX**
SAGAM-20/11/-EX**

Mass: 6,3 Kg



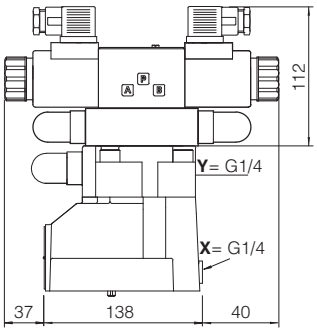
SAGAM-20/20/-EX**
SAGAM-20/21/-EX**

Mass: 7,4 Kg



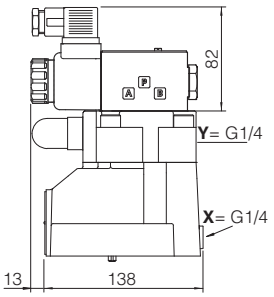
SAGAM-20/22/-EX**

Mass: 7,1 Kg



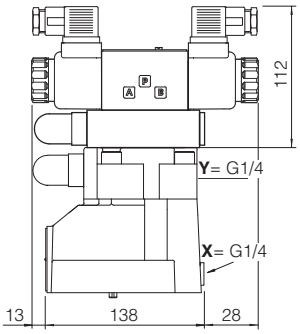
SAGAM-20/32/-EX**

Mass: 7,5 Kg



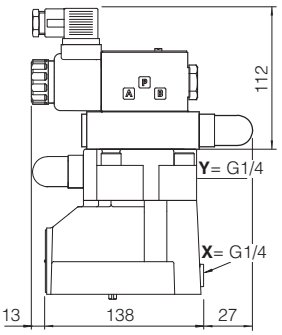
SAGAM-20/10/-LX**
SAGAM-20/11/-LX**

Mass: 6 Kg



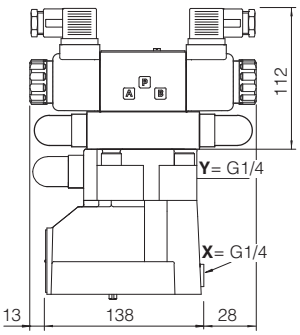
SAGAM-20/20/-LX**
SAGAM-20/21/-LX**

Mass: 6,8Kg



SAGAM-20/22/-LX**

Mass: 6,8 Kg

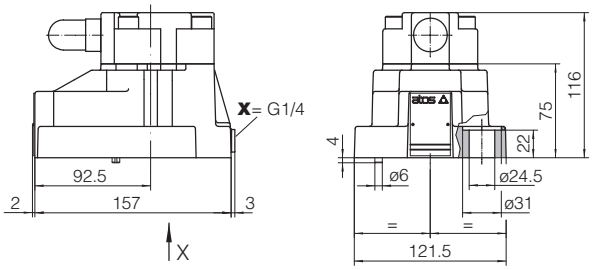


SAGAM-20/32/-LX**

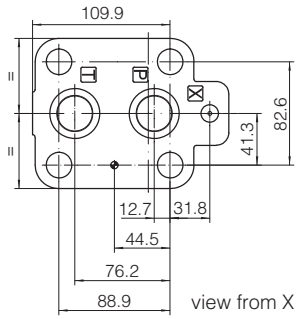
Mass: 7 Kg

Overall dimensions refer to valves **DC** voltage, with connectors type 666

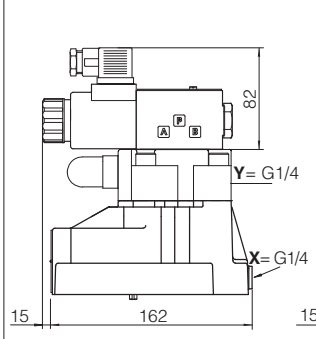
SAGAM-32



Mass: 6,2 Kg

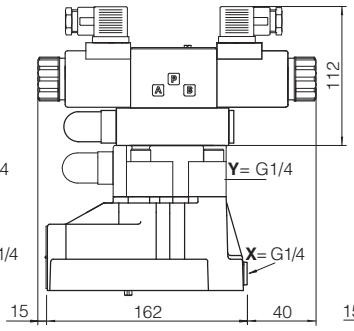


ISO 6264: 2007
Mounting surface: 6264-10-17-1-97
(with M20 fixing holes instead of standard M18)
Fastening bolts:
4 socket head screws M20x60 class 12.9
Tightening torque = 600 Nm
Seals: 2 OR 4131; 1 OR 109/70
Ports P, T: Ø = 28,5 mm
Ports X: Ø = 3,2 mm



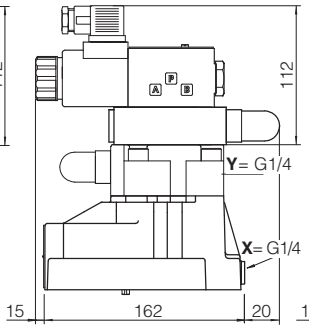
SAGAM-32/10/-EX**
SAGAM-32/11/-EX**

Mass: 7,7 Kg



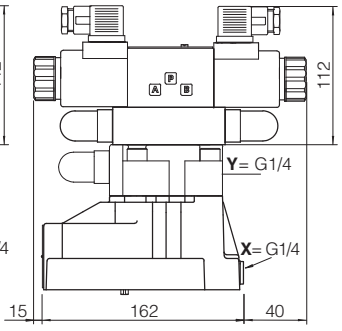
SAGAM-32/20/-EX**
SAGAM-32/21/-EX**

Mass: 8,8 Kg



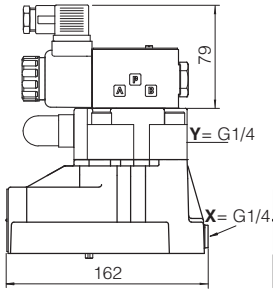
SAGAM-32/22/-EX**

Mass: 8,5 Kg



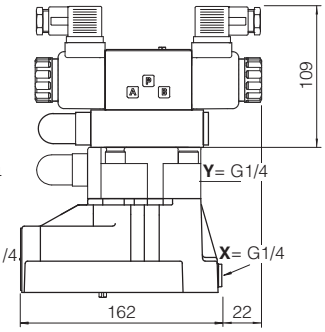
SAGAM-32/32/-EX**

Mass: 8,9 Kg



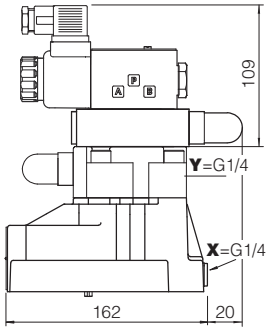
SAGAM-32/10/-LX**
SAGAM-32/11/-LX**

Mass: 7,4 Kg



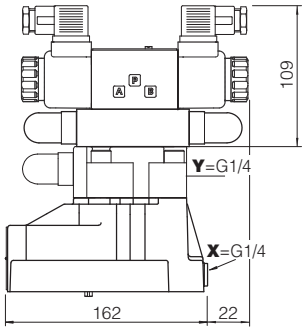
SAGAM-32/20/-LX**
SAGAM-32/21/-LX**

Mass: 8,2 Kg



SAGAM-32/22/-LX**

Mass: 8,2 Kg



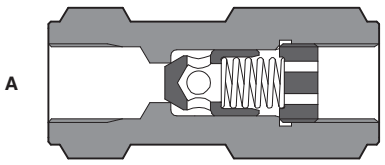
SAGAM-32/32/-LX**

Mass: 8,4 Kg

Overall dimensions refer to valves **DC** voltage, with connectors type 666

Check valves type SADR

in-line mounting - from G 1/4" to G 1" threaded ports



SADR-10

SADR are direct operated check valves for in-line mounting available with port size from 1/4" to 1" GAS.

They are designed to operate in hydraulic systems with hydraulic mineral oil or synthetic fluids having similar lubricating characteristics.

Flow up to **360 l/min**
Pressure up to **400 bar**

1 MODEL CODE

SADR	-	10	/	4	**
Check valve in-line mounting		Size/threated connections: **06** = G 1/4" **10** = G 3/8" **15** = G 1/2" **20** = G 3/4" **25** = G 1"		Cracking pressure: - = 0,5 bar **/2** = 2 bar **/4** = 4 bar **/8** = 8 bar	Series number

2 HYDRAULIC CHARACTERISTICS

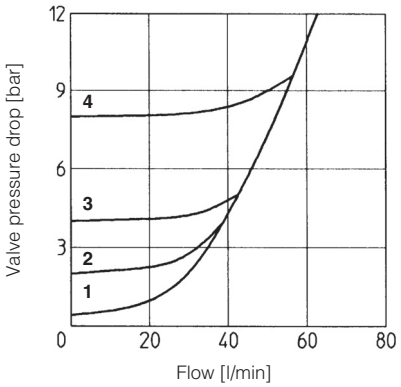
Hydraulic symbol					
Valve model	**SADR-06**	**SADR-10**	**SADR-15**	**SADR-20**	**SADR-25**
Max recommended flow [l/min]	40	80	150	300	360
Max pressure [bar]	400		350		

3 MAIN CHARACTERISTICS OF CHECK VALVES TYPE SADR

Assembly position / location	Any position
Fluid	Hydraulic oil as per DIN 51524 ... 535;
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog
Fluid temperature	-20 ÷ +80°C
Flow direction	As shown in the symbol at section 2
Rated flow	See diagrams Q/Δp at section 4

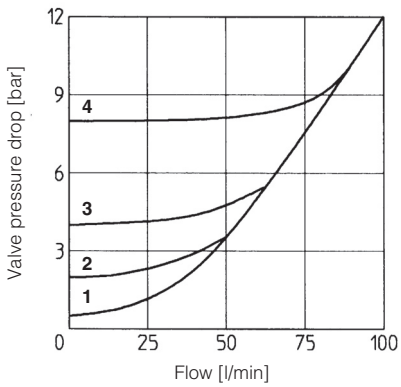
4 FLOW VERSUS PRESSURE DROP DIAGRAMS Based on based on mineral oil ISO VG 46 at 50°C

SADR-06



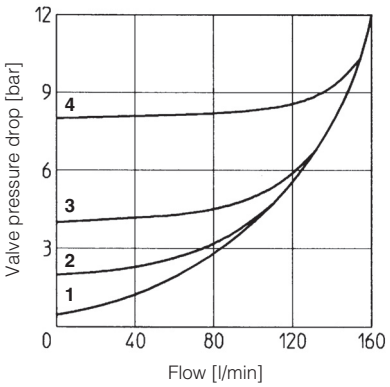
1 = SADR-06
2 = SADR-06/2
3 = SADR-06/4
4 = SADR-06/8

SADR-10



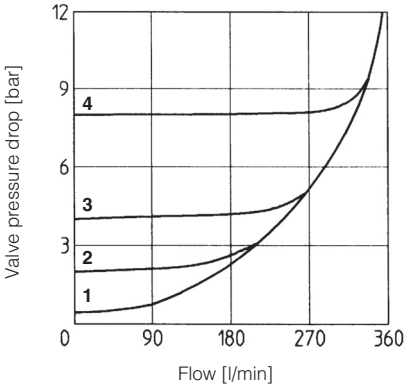
1 = SADR-10
2 = SADR-10/2
3 = SADR-10/4
4 = SADR-10/8

SADR-15



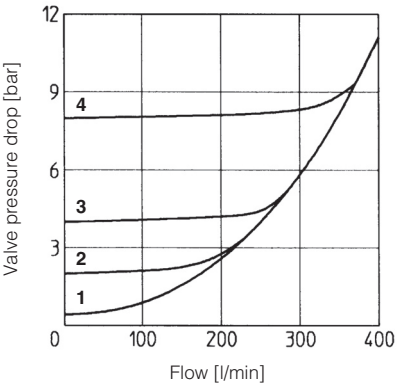
1 = SADR-15
2 = SADR-15/2
3 = SADR-15/4
4 = SADR-15/8

SADR-20



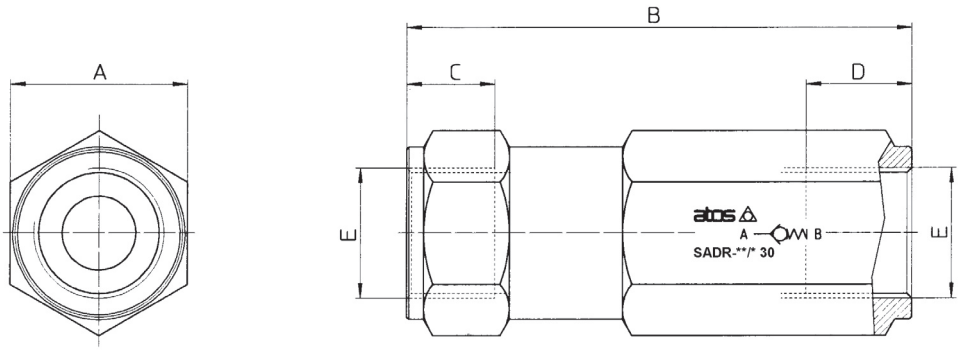
1 = SADR-20
2 = SADR-20/2
3 = SADR-20/4
4 = SADR-20/8

SADR-25



1 = SADR-25
2 = SADR-25/2
3 = SADR-25/4
4 = SADR-25/8

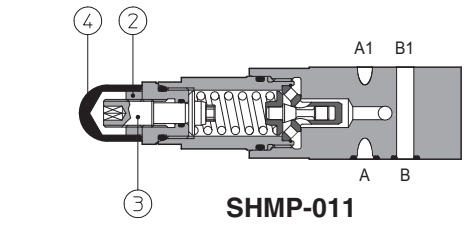
5 DIMENSIONS [mm]



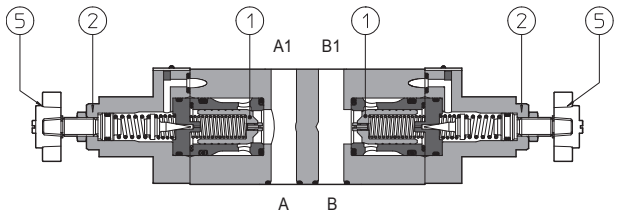
Model	A	B	C	D	E	Mass [kg]
SADR - 06	22	67	12	13	G 1/4”	0,2
SADR - 10	27	70	12	13	G 3/8”	0,4
SADR - 15	32	82,5	14	17	G 1/2”	0,6
SADR - 20	36	102,5	16	21,5	G 3/4”	0,9
SADR - 25	46	120	18	24,5	G 1”	2,1

Modular relief valves type SHMP, SKM

ISO 4401 sizes 06 and 10



SHMP-011



SKM-012/*/V**

SHMP are direct operated pressure relief valves, size 06.
SKM are double stage pressure relief valves size 10 with balanced poppet ①.

The pressure adjustment is operated by loosening the locking nut ② and turning the screw ③ protected by cap ④. Optional versions with setting adjustment by handwheel ⑤ instead of the screw are available on request.
Clockwise rotation increases the pressure.

Valve size and max flow:

SHMP = size 06, max flow: 35 l/min

SKM = size 10, max flow: 120 l/min

Mounting surface: **ISO 4401 size 06, 10**
Max pressure: up to **350 bar**

1 MODEL CODE

SHMP	-	011	/	210	/	V	**	/	*

Modular pressure relief valve size:
SHMP = 06
SKM = 10

Configuration, see section 2
011 = single on port P, dicharge to port T
012 = double on ports A and B, discharge to port T
013 = single on port A, discharge to port T
014 = single on port B, discharge to port T
015 = double on ports A and B, with the relieved pressure cross-discharged

Pressure range

	SHMP:	SKM:
50 =	2÷ 50 bar	4÷ 50 bar
100 =	3÷100 bar	5÷100 bar
210 =	10÷210 bar	5÷210 bar
350 =	15÷350 bar	5÷350 bar

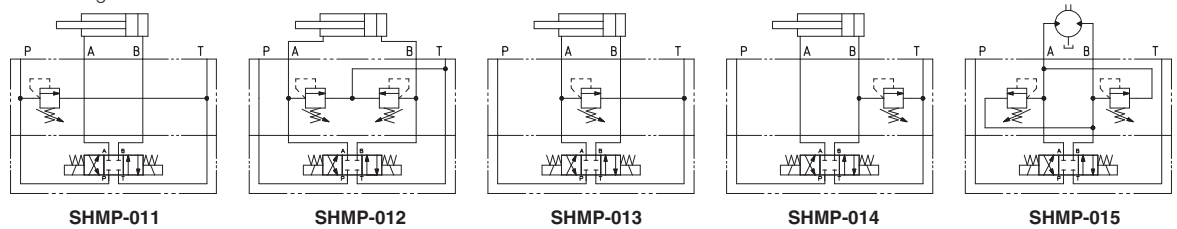
Series number

Options:
V = setting adjustment by handwheel instead of a grub screw protected by cap

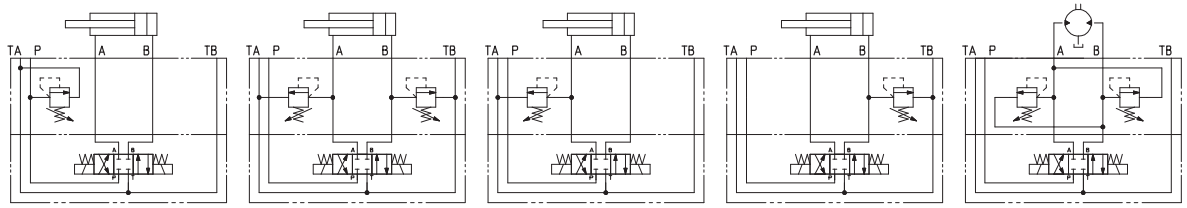
Seals material, see section 3:
- = NBR
PE = FKM
BT = HNBR

2 HYDRAULIC CHARACTERISTICS

Hydraulic configuration



SHMP-011 **SHMP-012** **SHMP-013** **SHMP-014** **SHMP-015**



SKM-011 **SKM-012** **SKM-013** **SKM-014** **SKM-015**

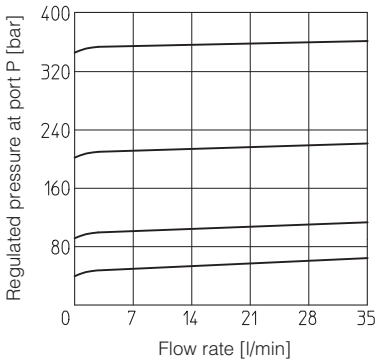
Valve model		SHMP	SKM
Max flow	[l/min]	35	120
Pressure range	[bar]	2÷50; 3÷100; 10÷210; 15÷350	4÷50; 5÷100; 5÷210; 5÷350

3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

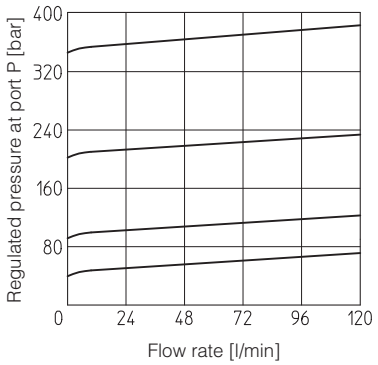
Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years (SHMP), 75 years (SKM), for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FSKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FSKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FSKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

4 REGULATED PRESSURE VERSUS FLOW DIAGRAMS (Based on mineral oil ISO VG 46 at 50°C)

SHMP

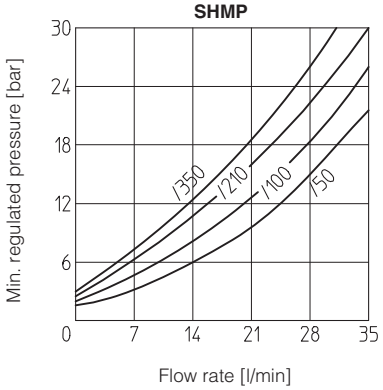


SKM

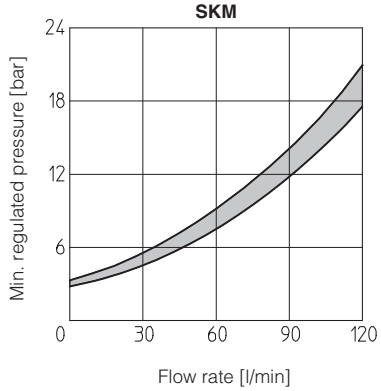


5 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS (Based on fluid viscosity of 25 mm²/s at 40°C)

SHMP

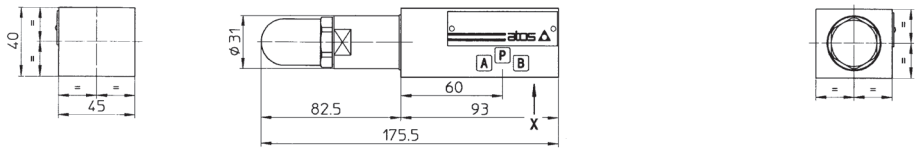


SKM



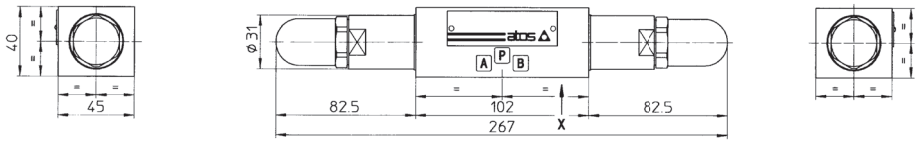
6 INSTALLATION DIMENSIONS OF SHMP VALVES [mm]

SHMP-011



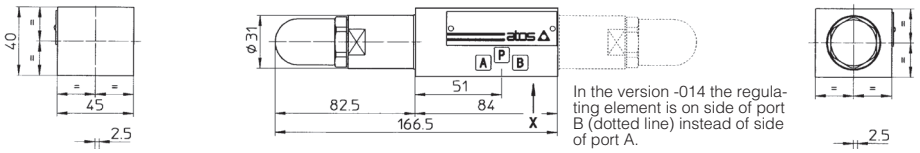
Mass: 1,4 Kg

SHMP-012



Mass: 1,7 Kg

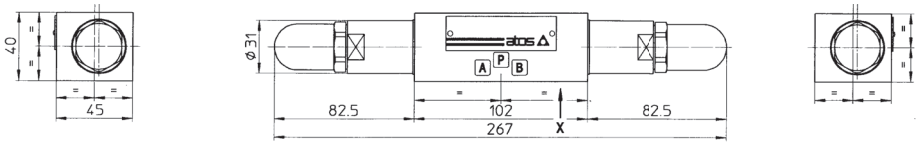
SHMP-013
SHMP-014



In the version -014 the regulating element is on side of port B (dotted line) instead of side of port A.

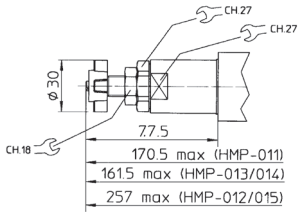
Mass: 1,2 Kg

SHMP-015

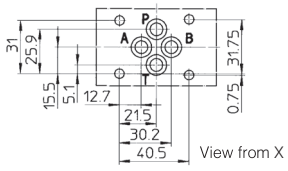


Mass: 1,7 Kg

Adjustment device for option /V



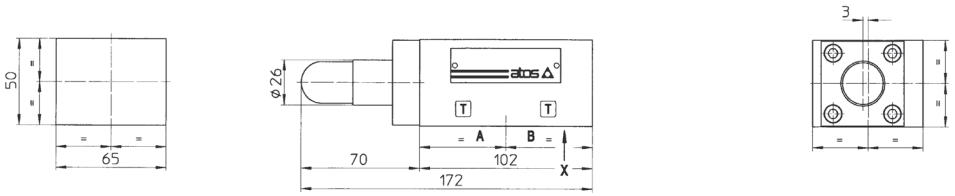
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Diameter of ports A, B, P, T: Ø = 7,5 mm
Seals: 4 OR 108



Fastening bolts: n° 4 socket head screws M5. The lenght depends on number and type of modular elements associated.

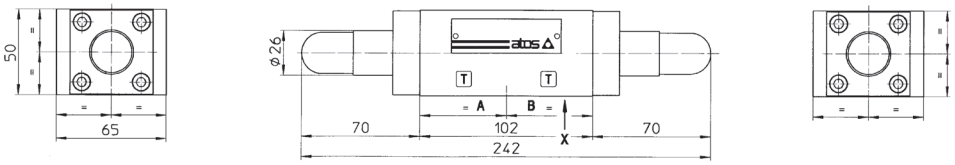
7 INSTALLATION DIMENSIONS OF SKM VALVES [mm]

SKM-011



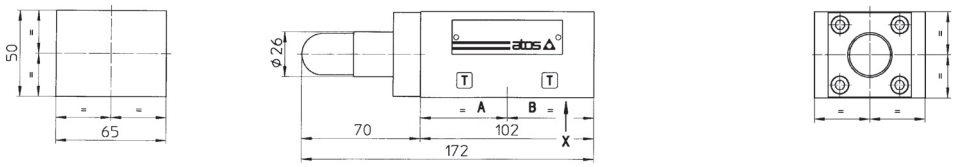
Mass: 2,5 Kg

SKM-012



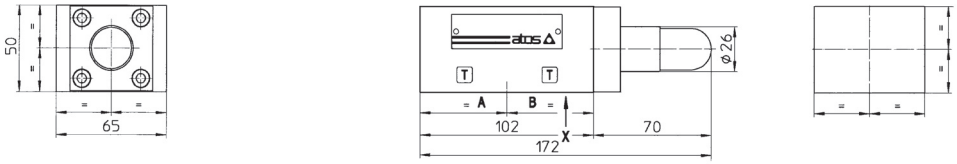
Mass: 2,8 Kg

SKM-013



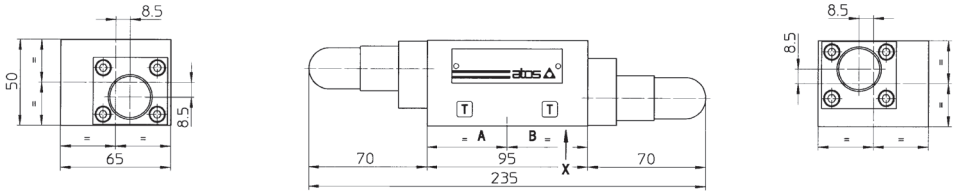
Mass: 2,5 Kg

SKM-014



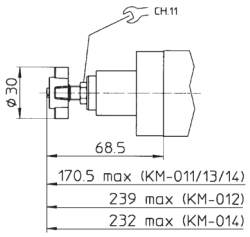
Mass: 2,5 Kg

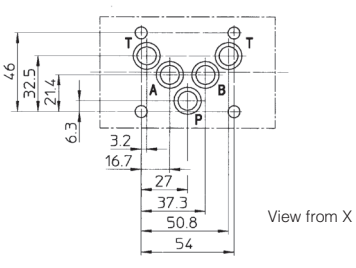
SKM-015



Mass: 2,5 Kg

Adjustement device for option /V



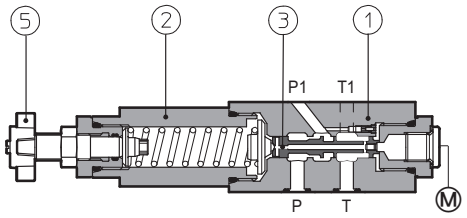


ISO 4401: 2005
Mounting surface: 4401-05-04-0-05
Diameter of ports A, B, P, T: Ø = 11,2 mm
Seals: 5 OR 2050

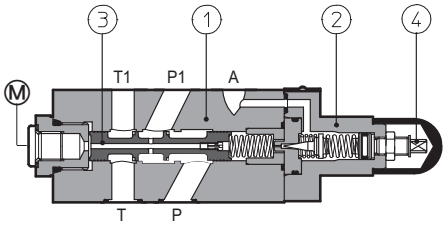
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

Modular reducing valves type SHG, SKG

spool type, ISO 4401 sizes 06 and 10



SHG-031/*/V**



SKG-034

SHG and **SKG** are pressure reducing valves, spool type ③, designed to operate in oil hydraulic systems.
SHG are direct, three way valves;
SKG are double stage ① ②, three way valves;
Clockwise rotation increases the pressure.

Valve size and max flow:

SHG = size 06 flow up to 50 l/min;
SKG = size 10 flow up to 100 l/min;

Mounting surface:
ISO 4401 size 06 and **10**

Max pressure: **350 bar** for SHG
315 bar for SKG

1 MODEL CODE

SHG-0	31	/	210	/	V	**	/	*

SHG-0
Modular pressure reducing valve, size:
SHG-0 = 06
SKG-0 = 10

31
Configuration, see section 2
three way:
31 = reduced pressure on P port
33 = reduced pressure on A port
34 = reduced pressure on B port

210
Pressure range
SHG
32 = 3 - 32 bar
50 = 2 - 50 bar
75 = 10 - 75 bar
100 = 20 - 100 bar
210 = 50 - 210 bar
SKG
100 = 7 - 100 bar
210 = 8 - 210 bar

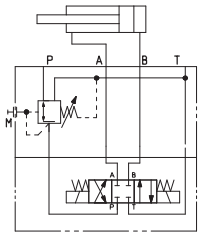
V
Options:
V = setting adjustment by handwheel instead of a grub screw protected by cap

******
Series number

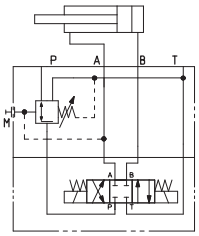
*****
Seals material, see sect. 3:
- = NBR
PE = FKM
BT = HNBR

2 HYDRAULIC CHARACTERISTICS

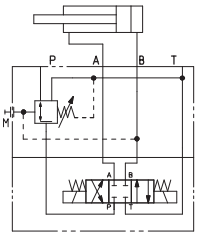
Hydraulic configuration



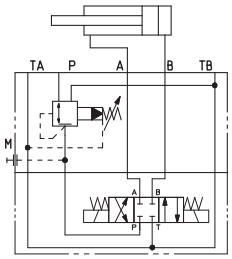
SHG-031



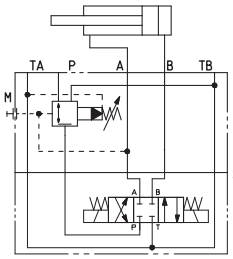
SHG-033



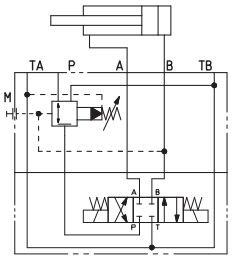
SKG-034



SKG-031



SKG-033



SKG-034

Valve model		SHG-03*/32	SHG-03*/50	SHG-03*/75	SHG-03*/100	SHG-03*/210	SKG-03*/100	SKG-03*/210
Max flow	[l/min]	50					100	
Pressure range	[bar]	3 ÷ 32	2 ÷ 50	10 ÷ 75	20 ÷ 100	50 ÷ 210	7 ÷ 100	8 ÷ 210
Max inlet pressure	[bar]	350					315	
Max pressure on port T	[bar]	160					160	

3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

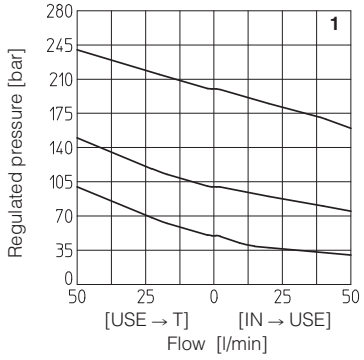
Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years (SHG), 75 years (SKG), for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

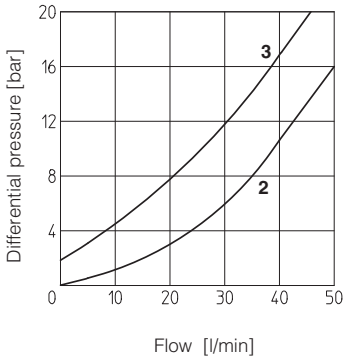
4 DIAGRAMS OF SHG-03* based on mineral oil ISO VG 46 at 50°C

1 = regulated pressure variation versus flow:
- between use port and discharge port
- between inlet port and use port

2 = differential pressure variation versus flow between inlet port and use port

3 = differential pressure variation versus flow between use port and discharge port



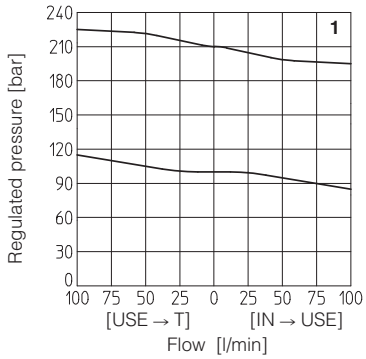


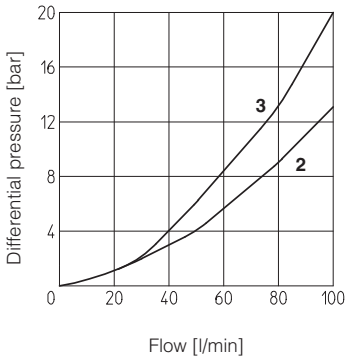
5 DIAGRAMS OF SKG-03* based on mineral oil ISO VG 46 at 50°C

1 = regulated pressure variation versus flow:
- between use port and discharge port
- between inlet port and use port

2 = differential pressure variation versus flow between inlet port and use port

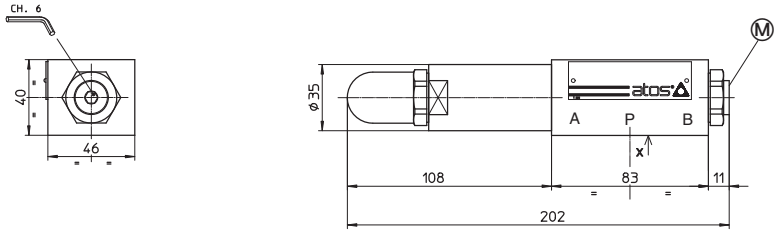
3 = differential pressure variation versus flow between use port and discharge port





6 INSTALLATION DIMENSIONS OF SHG-0 VALVES [mm]

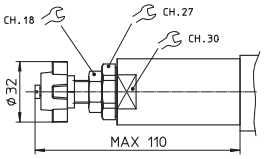
SHG-03*

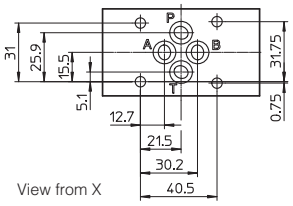


Ⓜ = Pressure gauge port = G 1/4"

Mass: 2,3 Kg

Adjustment device for option /V



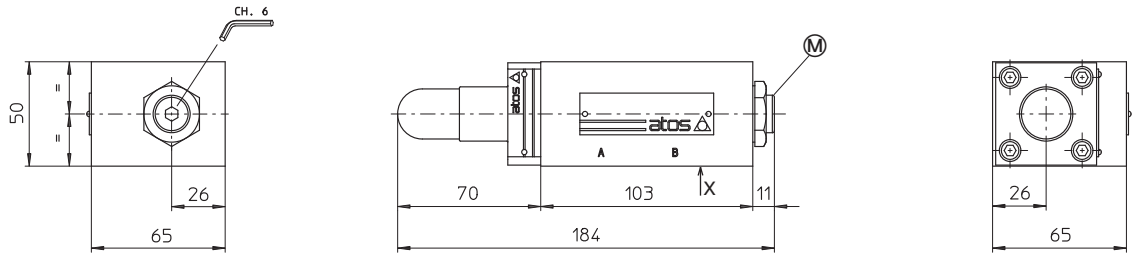


ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Diameter of ports A, B, P, T: Ø = 7,5 mm
Seals: 4 OR 108

Fastening bolts: n° 4 socket head screws M5. The lenght depends on number and type of modular elements associated.

7 INSTALLATION DIMENSIONS OF SKG-0 VALVES [mm]

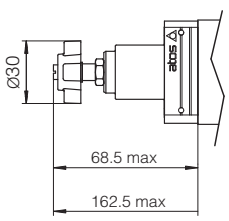
SKG-03*

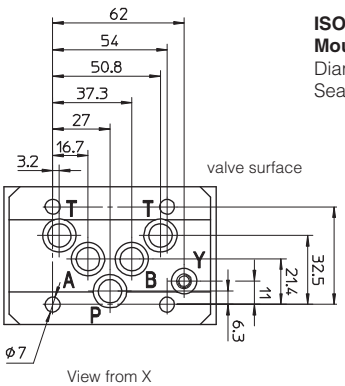


Ⓜ = Pressure gauge port = G 1/4"

Mass: 3,8 kg

Adjustment device for option /V



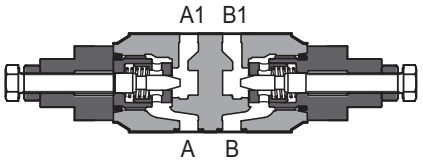


ISO 4401: 2005
Mounting surface: 4401-05-04-0-05
Diameter of ports A, B, P, T: Ø = 11,2 mm
Seals: 5 OR 2050

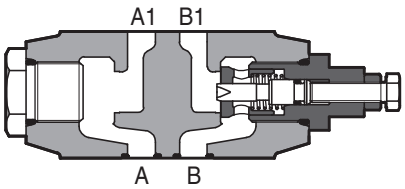
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

Modular throttle valves type SHQ, SKQ

flow control, ISO 4401 sizes 06 and 10



SHQ-012



SKQ-014

SHQ and **SKQ** are flow throttling valves, not compensated, and with check valve to allow free reverse flow.
The flow adjustement is performed by turning the setting screw.
Clockwise rotation increases the throttling (passage reduced).

Valve size and max flow:
SHQ-0 = size 06, flow up to 80 l/min
SKQ-0 = size 10, flow up to 160 l/min

Mounting surface:
ISO 4401 size 06 and **10**

Max pressure: **350 bar** (SHQ)
315 bar (SKQ)

1 MODEL CODE

SHQ-0	13	**	/	*

Modular flow control valve, size:
SHQ-0 = 06
SKQ-0 = 10

Configuration, see section 2
meter OUT control:
12 = double, acting on port A and B
13 = single, acting on port A
14 = single, acting on port B

meter IN control:
22 = double, acting on port A and B
23 = single, acting on port A
24 = single, acting on port B

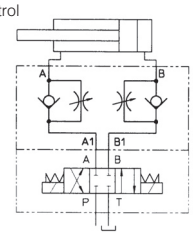
Series number

Seals material, see section 3:
- = NBR
PE = FKM
BT = HNBR

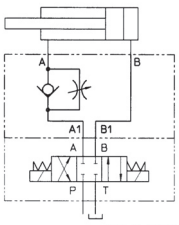
2 VALVE CONFIGURATION

Meter OUT control

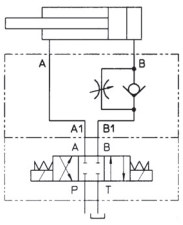
SHQ-012
SKQ-012



SHQ-013
SKQ-013

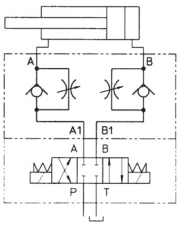


SHQ-014
SKQ-014

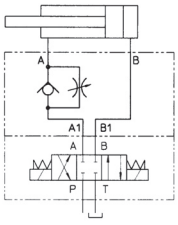


Meter IN control

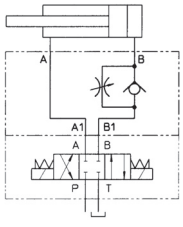
SHQ-022
SKQ-022



SHQ-023
SKQ-023



SHQ-024
SKQ-024

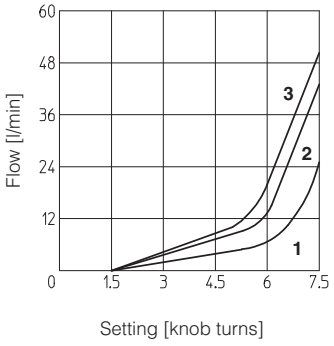


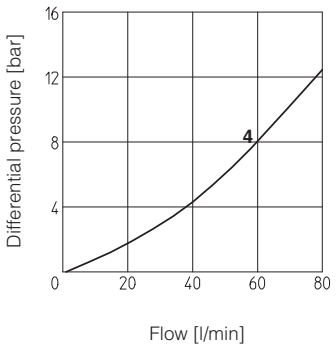
3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm^2/s - max allowed range 2.8 ÷ 500 mm^2/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

4 DIAGRAMS OF SHQ-0 based on mineral oil ISO VG 46 at 50°C

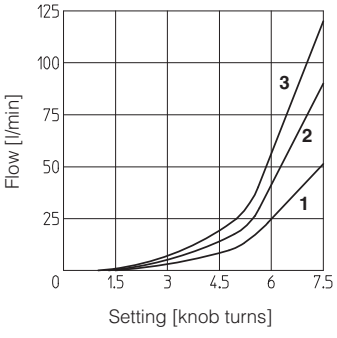
1 = Regulation diagram at Δp 10 bar
2 = Regulation diagram at Δp 30 bar
3 = Regulation diagram at Δp 50 bar
4 = Q/Δp diagram for free flow through the non-return valve

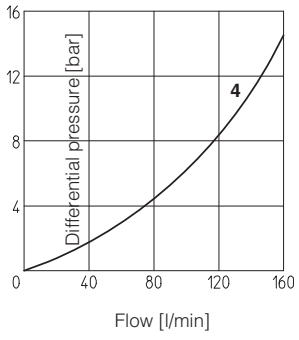




5 DIAGRAMS OF SKQ-0 based on mineral oil ISO VG 46 at 50°C

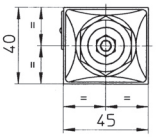
1 = Regulation diagram at Δp 10 bar
2 = Regulation diagram at Δp 30 bar
3 = Regulation diagram at Δp 50 bar
4 = Q/Δp diagram for free flow through the non-return valve

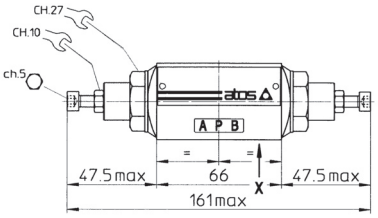




6 INSTALLATION DIMENSIONS OF SHQ-0 VALVES [mm]

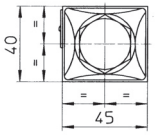
SHQ-012
SHQ-022

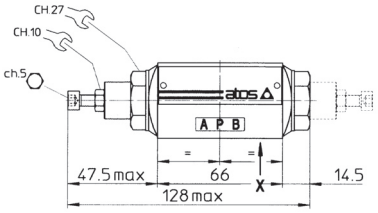




Mass: 1,1 Kg

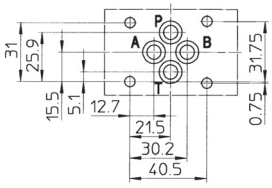
SHQ-013
SHQ-014
SHQ-023
SHQ-024





In version -014 and -024 the regulating element is on side of port B (dotted line) instead of side of port A.

Mass: 1,2 Kg

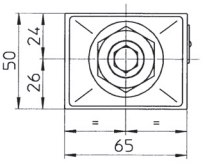


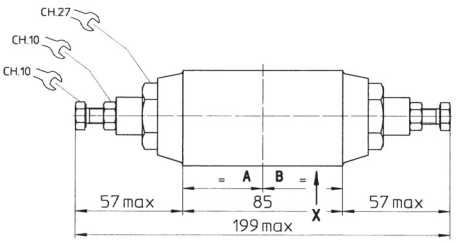
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Diameter of ports A, B, P, T: Ø = 7,5 mm (max)
Seals: 4 OR 108

Fastening bolts: n° 4 socket head screws M5. The lenght depends on number and type of modular elements associated.

7 INSTALLATION DIMENSIONS OF SKQ-0 VALVES [mm]

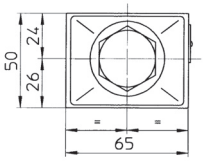
SKQ-012
SKQ-022

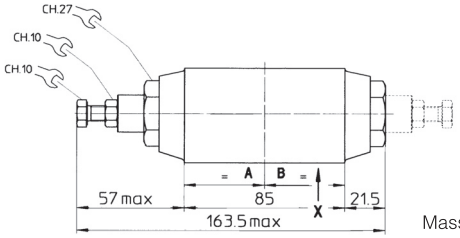




Mass: 2 Kg

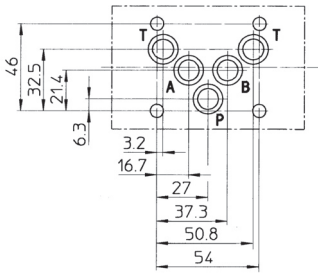
SKQ-013
SKQ-014
SKQ-023
SKQ-024





In version -014 and -024 the regulating element is on side of port B (dotted line) instead of side of port A.

Mass: 2,2 Kg

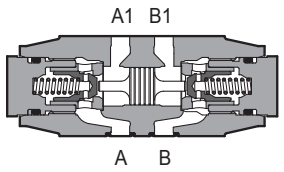


ISO 4401: 2005
Mounting surface: 4401-05-04-0-05
Diameter of ports, A, B, P, T: Ø = 11,2 mm (max)
Seals: 5 OR 2050

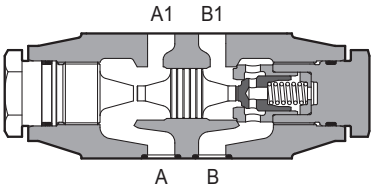
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

Modular check valves type SHR, SKR

direct or pilot operated, ISO 4401 sizes 06 and 10



SHR-012



SKR-014

SHR, SKR are check valves available in direct or pilot operated models.

SHR-0 = size 06: flow up to 60 l/min, pressure up to 350 bar.

SKR-0 = size 10: flow up to 120 l/min, pressure up to 315 bar.

Valves are designed to operate in hydraulic systems with hydraulic mineral oil or synthetic fluid having similar lubricating characteristics.

1 MODEL CODE

SHR-0	12	/	4	**	/	*

SHR-0

Modular check valve, size:
SHR-0 = 06
SKR-0 = 10

12

Configuration, see section 2
direct operated:
02 = double, acting on port A and B
03 = single, acting on port A
04 = single, acting on port B
11 = single, acting on port P
16 = single, acting on port T

pilot operated:
12 = double, acting on port A and B
13 = single, acting on port A
14 = single, acting on port B

4

Spring cracking pressure:
– = 0,5 bar (std.) **4** = 4 bar
2 = 2 bar **8** = 8 bar

******

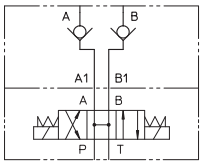
Series number

*****

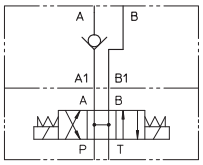
Seals material, see section 3:
- = NBR
PE = FKM
BT = HNBR

2 VALVE CONFIGURATION

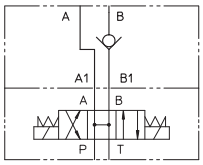
SHR-002
SKR-002



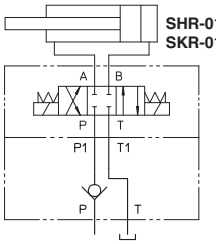
SHR-003
SKR-003



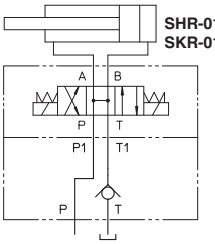
SHR-004
SKR-004



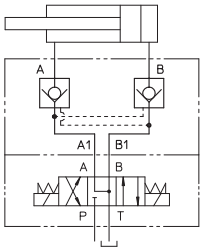
SHR-011
SKR-011



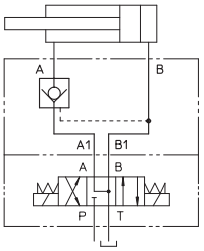
SHR-016
SKR-016



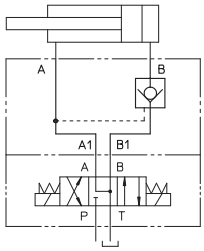
SHR-012
SKR-012



SHR-013
SKR-013



SHR-014
SKR-014



The pilote pressure applied tshrough ports A or B opens the valve acting on ports B and A, respectively.
The minimum pilot pressure is a function of the area ratio, see the following table.

VALVE TYPE	AREA RATIO
SHR	3,3:1
SKR	3,3:1

3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

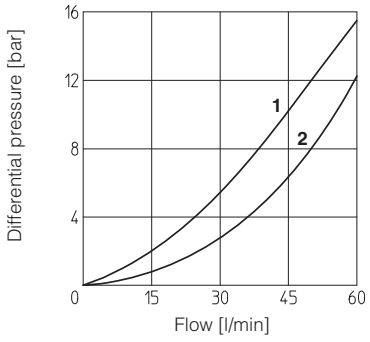
4 DIAGRAMS OF SHR-0 based on mineral oil ISO VG 46 at 50°C

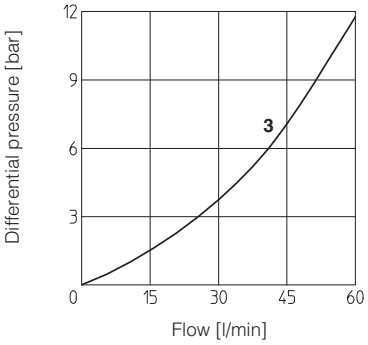
Flow through check valve:

1 = A→A1; B→B1 of SHR-012, SHR-013, SHR-014

2 = A1→A; B1→B of SHR-012, SHR-013, SHR-014

3 = SHR-011, SHR-016





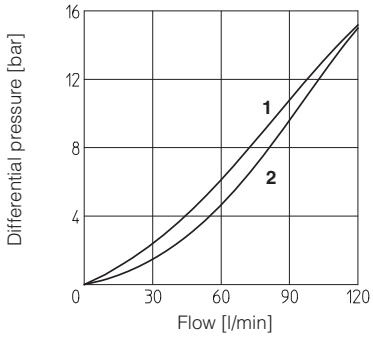
5 DIAGRAMS OF SKR-0 based on mineral oil ISO VG 46 at 50°C

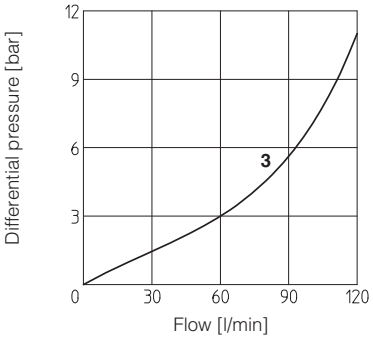
Flow through check valve:

1 = A→A1; B→B1 of SKR-012, SKR-013, SKR-014

2 = A1→A; B1→B of SKR-012, SKR-013, SKR-014

3 = SKR-011, SKR-016

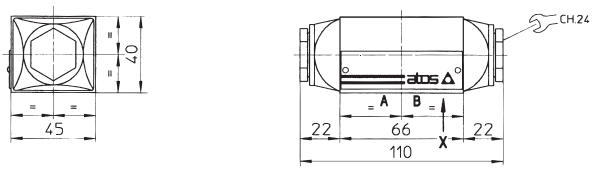




6 INSTALLATION DIMENSIONS OF SHR-0 VALVES [mm]

SHR-002
SHR-003
SHR-004
SHR-012
SHR-013
SHR-014

LATERAL VIEW



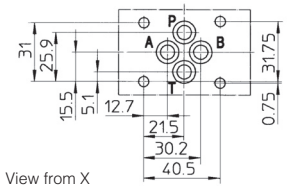
Mass: 1 Kg

SHR-011
SHR-016

LATERAL VIEW

Mass: 0,7 Kg

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Diameter of ports A, B, P, T: Ø = 7,5 mm (max)
Seals: 4 OR 108



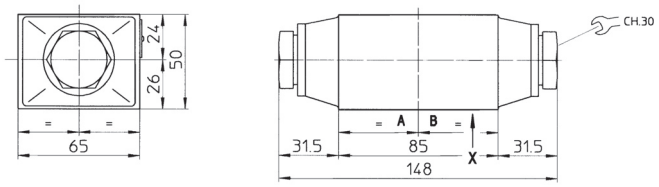
View from X

Fastening bolts: n° 4 socket head screws M5. The lenght depends on number and type of modular elements associated.

7 INSTALLATION DIMENSIONS OF SKR-0 VALVES [mm]

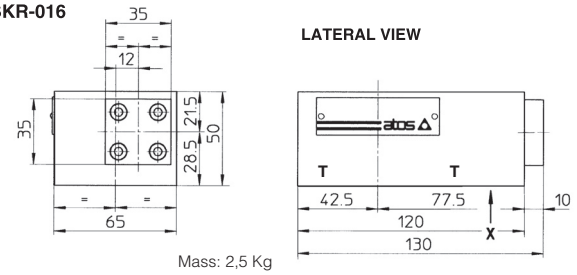
SKR-012
SKR-002
SKR-003
SKR-004
SKR-013
SKR-014

LATERAL VIEW



Massa: 2,3 Kg

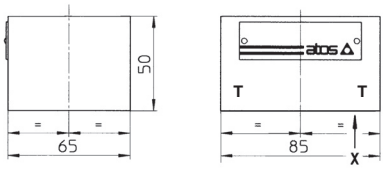
SKR-016



Mass: 2,5 Kg

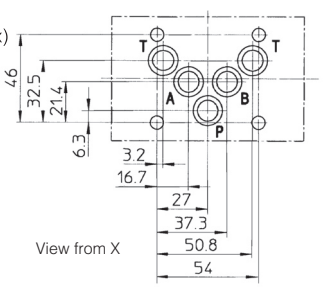
SKR-011

LATERAL VIEW



Mass: 1,7 Kg

ISO 4401: 2005
Mounting surface: 4401-05-04-0-05
Diameter of ports, A, B, P, T: Ø = 11,2 mm (max)
Seals: 5 OR 2050

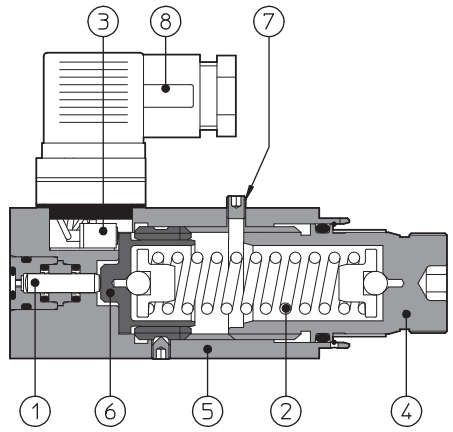


View from X

Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

Pressure switches type SMAP

with fixed switching pressure differential and microswitch with gold plated contacts



① Servo-piston
② Spring
③ Microswitch
④ Control knob with graduated scale
⑤ Body
⑥ Switch actuator
⑦ Control knob setscrew
⑧ Electric connector

SMAP are hydro-electric pressure switches with fixed switching pressure differential. The mechanical microswitch with gold plated contacts grants high reliability and long life service.

The microswitch changes its status when the pressure in the hydraulic circuit reaches the switching value set on the adjusting knob.The microswitch returns to the original rest position when the pressure in the hydraulic circuit drops below the nominal fixed switching pressure differential (hysteresis). The electric connector provides both NC or NO contacts.
The pressure in the circuit operates the piston ① acting against the adjustable spring ②; once the pressure setting is reached, the piston ⑥ actuates the microswitch ③.
The pressure switching value is selectable by a graduated adjusting knob ④.

Clockwise rotation increases the setting pressure.

Max pressure: **630 bar**

1 MODEL CODE

SMAP	-	160	/	E	**	/	*

SMAP: Fixed differential pressure switch

160: Pressure range:
40 = 5 ÷ 40 bar
80 = 7 ÷ 80 bar
160 = 10 ÷ 160 bar
320 = 30 ÷ 320 bar
630 = 50 ÷ 630 bar

E: Options:
E = Common electric contact connected to pin 1 (see section 3)

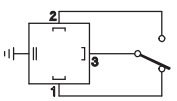
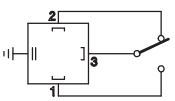
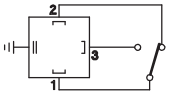
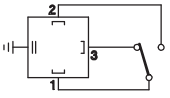
******: Series number

*****: Seals material, see section 2:
- = NBR
PE = FKM

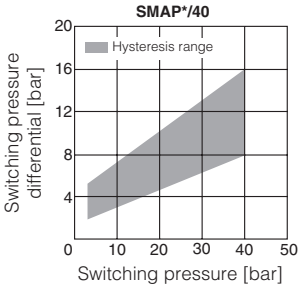
2 MAIN CHARACTERISTICS, SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

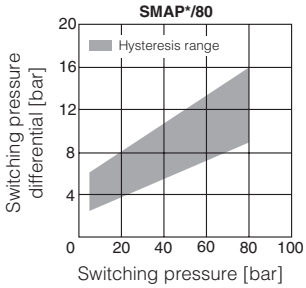
Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

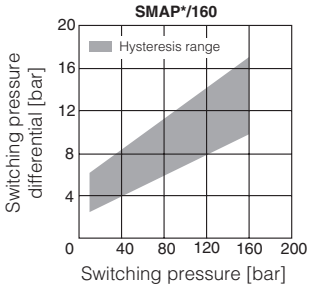
3 CHARACTERISTICS AND WIRING OF INTERNAL MICROSWITCH

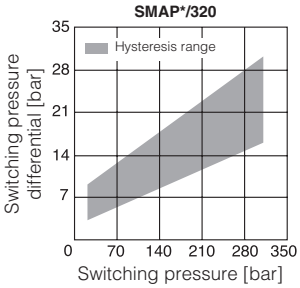
	Supply voltage [V]					Rest position	Pressure operated position
	125 AC	**250 AC**	**30 DC**	**250 DC**			
Max current resistive load [A]	7	5	5	0,2	**STD**		
Max current inductive load (Cos φ = 0,4) [A]	4	2	3	0,02			
Insulating resistance	≥100MΩ				**/E**		
Contact resistance	15 mΩ						
Electrical life-expectancy	≥1.000.000 switchings						
Mechanical life-expectancy	≥10.000.000 switchings						

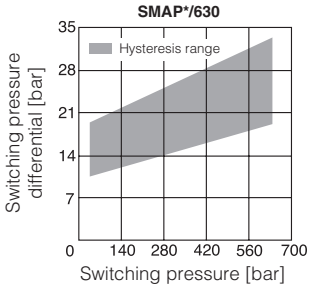
4 DIAGRAMS







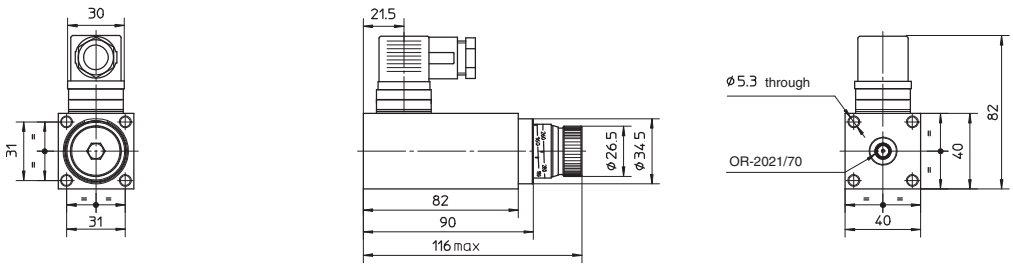




The diagrams show, the switching pressure difference (hysteresis) between the switching positions of the pressure switch electric contacts.

⚠ The switching pressure differential may increased depending to the deterioration of the fluid contamination class.

5 DIMENSIONS OF SMAP WITHOUT ADAPTORS [mm]

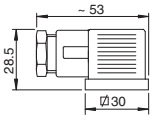
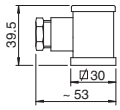
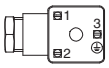


Fastening bolts:
4 socket head screws M5X90 supplied with the pressure switch

Electric connectors

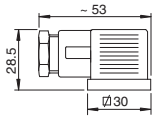
for on/off and proportional valves

1 CONNECTORS FOR ON/OFF VALVES

CODE AND DIMENSIONS	APPLICATION	INTERNAL VIEW PINOUT (1)	FRONT VIEW	CABLE GLAND Ø CABLE	REFERENCE RULES
666 (black) **666/A** (grey) **667-24** **667-110** **667-220** 	Female plastic connector - 3 pin: - standard coil connector for on/off valves Female plastic connector - 3 pin: - standard coil connector for on/off valves with built-in led			PG11 ø 8 ÷ 10 mm	DIN 43650-A/ISO 4400 Protection degree IP 65 EN 60529
669 (black) **669/A** (grey) 	Female plastic connector - 3 pin: - optional electronic connector for on/off valves with built-in rectifier bridge for supplying DC coils by AC current			PG11 ø 8 ÷ 10 mm	DIN 43650-A/ISO 4400 Protection degree IP 65 EN 60529

(1) the wiring of electrical terminals has to be made according to specific valve's technical table

2 CONNECTORS FOR PROPORTIONAL VALVES

CODE AND DIMENSIONS	APPLICATION	INTERNAL VIEW PINOUT (1)	FRONT VIEW	CABLE GLAND Ø CABLE	REFERENCE RULES
666 (black) 	Female plastic connector - 3 pin: - standard coil connector for proportionals valves			PG11 ø 8 ÷ 10 mm	DIN 43650-A/ISO 4400 Protection degree IP 65 EN 60529

(1) the wiring of electrical terminals has to be made according to specific valve's technical table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