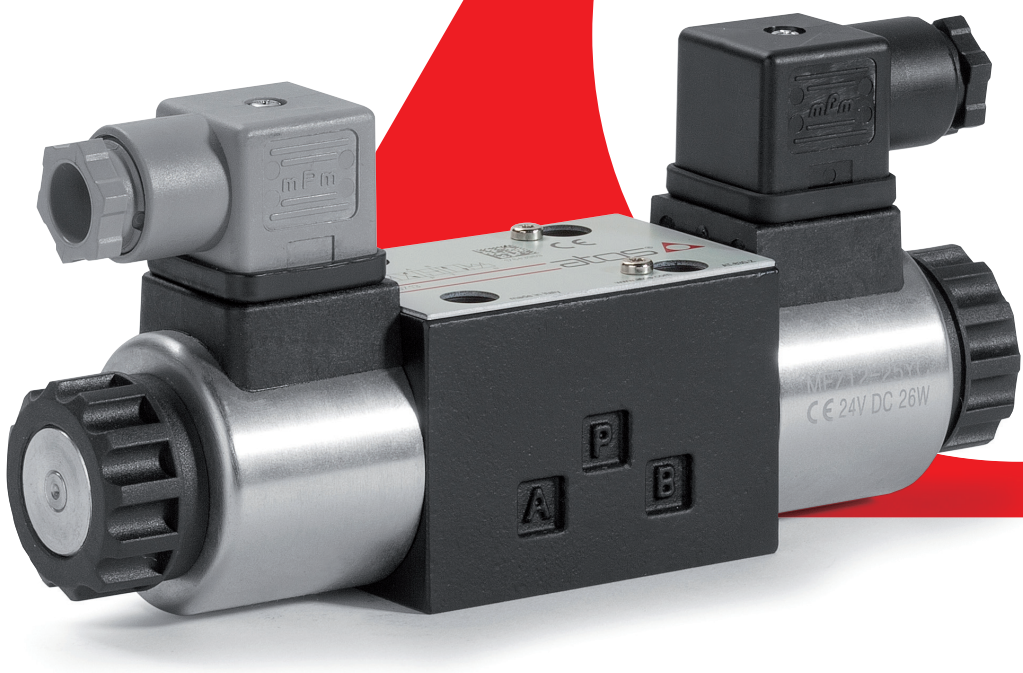
atos
the smart electrohydraulics

INDUSTRIAL
ELECTROHYDRAULICS

ATOS SHANGHAI CATALOG



atos

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 SHANGHAI

INDUSTRIAL

NEXT

ON-OFF VALVES

modulars

		Size	Qmax [l/min]	Table	Pag
SHMP, SKM	pressure relief, direct or piloted	06 ÷ 10	35 ÷ 120	D120/SH	122
SHG, SKG	pressure reducing, direct or piloted, 3 way	06 ÷ 10	50 ÷ 100	D140/SH	126
SHQ, SKQ	throttle, direct, reverse free flow	06 ÷ 10	80 ÷ 160	D160/SH	129
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FILTERS

		Port size	Qmax [l/min]	Table	Pag
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SFRS	return line, tank-top, threaded ports, Pmax 8 bar	G ½" ÷ 2" SAE 12 ÷ 32	750	LF050/SH	147
SFSS	suction, threaded ports, wire mesh	G ½" ÷ 3"	450	LF060/SH	159

EX-PROOF

ON-OFF VALVES

directional valves Ex-d

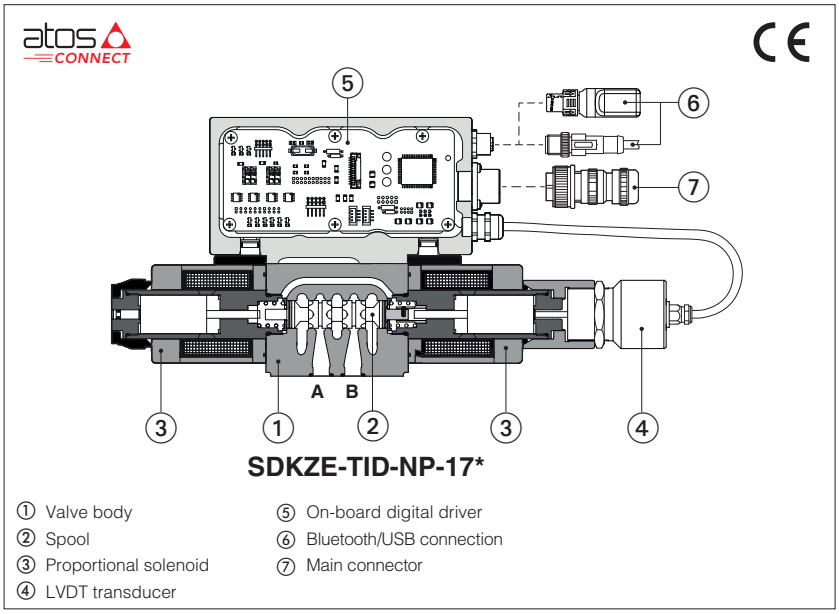
		Size	Qmax [l/min]	Table	Pag
SDHA/MA SDKA/MA	direct, subplate, DC solenoids, MA certification I Mb	06 ÷ 10	80 ÷ 120	EX120/SH	166
SDPHA/MA	piloted, subplate, DC solenoids, MA certification I Mb	16 ÷ 25	300 ÷ 700	EX130/SH	170

pressure valves Ex-d

SAGAM/MA	relief, piloted, subplate, DC solenoids, MA certification I Mb	10 ÷ 32	200 ÷ 600	EX140/SH	175

Digital proportional directional valves high performance

direct, with on-board driver, LVDT transducer and positive spool overlap



SDKZE-TID-NP-17*

① Valve body
② Spool
③ Proportional solenoid
④ LVDT transducer
⑤ On-board digital driver
⑥ Bluetooth/USB connection
⑦ Main connector

SDHZE-TID, SDKZE-TID

Digital high performances proportional directional valves, direct, with LVDT position transducer and positive spool overlap for directional controls and not compensated flow regulations.

TID on board digital driver performs the valve's hydraulic regulation according to the reference signal sent to the 7 pin main connector.

Bluetooth/USB connection is always present for valve settings via mobile App and Atos PC software.

The LVDT transducer grants high regulation accuracy and response sensitivity.
With de-energized proportional solenoids, the mechanical central position of the spool is performed by centering springs.

SDHZE:	**SDKZE**:
Size: **06** - ISO 4401	Size: **10** - ISO 4401
4/3 and 4/2 way	4/3 and 4/2 way
Max flow: **80 l/min**	Max flow: **180 l/min**
Max pressure: **350 bar**	Max pressure: **315 bar**

1 MODEL CODE

SDHZE	-	TID	-	NP	-	0	71	-	S	5	/	*	*	/	*	/	*

SDHZE = size 06
SDKZE = size 10

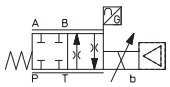
TID = on-board digital driver and LVDT transducer

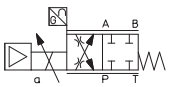
Fieldbus interfaces:
NP = Not present

Valve size ISO 4401:
0 = 06 **1** = 10

Configuration: **Standard** Option **/B**

51 =





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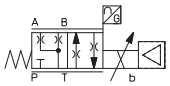

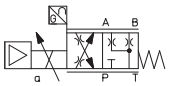

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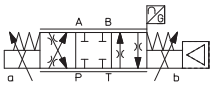

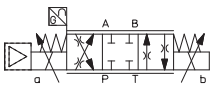

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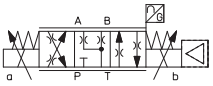
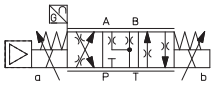




Seals material, see section [8]:
- = NBR
PE = FKM

Series number

Bluetooth option (2), see section [4]:
T = Bluetooth adapter supplied with the valve

Hydraulic options (2):
B = on-board digital driver, connectors and LVDT position transducer at side of port A

Electronic options (2):
I = current reference input and monitor 4÷20mA
J = current reference input 4÷20mA and voltage monitor ±10 VDC

Spool size:	**3** (L,S,D)	**5** (L,S,D)
SDHZE =	18	28
SDKZE =	45	75

Nominal flow (l/min) at Δp 10 bar P-T (see section [6])

Spool type, regulating characteristics, see section [9]:

L = linear **S** = progressive **D** = differential-progressive
P-A = Q, B-T = Q/2
P-B = Q/2, A-T = Q

(1) Reference and monitor signals only via CANopen (analog signals not available)
(2) Possible combined options: /BI, /BJ (/T Bluetooth adapter option can be combined with all other options)

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FS900** and in the user manuals included in the E-SW-SETUP programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS - see tech. table **GS500-SH**

Atos CONNECT mobile App

Free downloadable App for smartphones and tablets which allows quick access to valve main functional parameters and basic diagnostic information via Bluetooth, thus avoiding physical cable connection and significantly reducing commissioning time.
Atos CONNECT supports Atos digital valve drivers equipped with E-A-BTH adapter or with built-in Bluetooth. It does not support valves with p/Q control or axis controls.

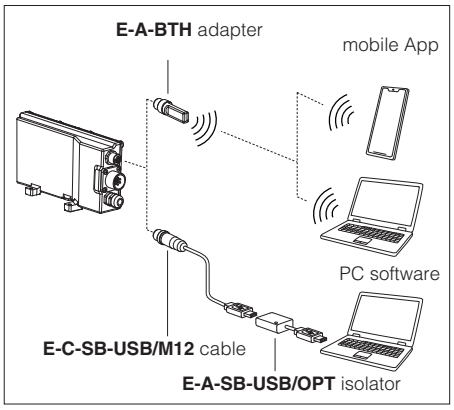
Download on the App Store GET IT ON Google Play

E-SW-SETUP PC software

Free downloadable software for PC allows to set all valve functional parameters and to access complete diagnostic information of digital valve drivers via Bluetooth/USB service port.
Atos E-SW-SETUP PC software supports all Atos digital valve drivers and it is available at www.atos.com in MyAtos area.

WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of E-A-SB-USB/OPT isolator adapter is highly recommended for PC protection

Bluetooth or USB connection



4 BLUETOOTH OPTION - see tech. table **GS500-SH**

T option adds Bluetooth® connectivity to Atos valve drivers thanks to E-A-BTH adapter, which can be left permanently installed on-board, to allow the Bluetooth connection with the valve drivers at any time. E-A-BTH adapter can also be purchased separately and used to connect with any supported Atos digital product.
Bluetooth connection to the valve can be protected against unauthorised access by setting a personal password. The adapter leds visually indicates the status of valve driver and Bluetooth connection.

WARNING: for the list of countries where the Bluetooth adapter has been approved, see tech. table **GS500-SH**
T option is not available for the Indian market, so the Bluetooth adapter must be ordered separately.

5 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	150 years, for further details see technical table P007
Ambient temperature range	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Surface protection	Zinc coating with black passivation (body), tin plating (driver housing)
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h
Vibration resistance	See technical table G004
Conformity	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

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 **(1)**		**L3, S3**	**D3**		**L5, S5**	**D5**		**L3, S3**	**D3**		**L5, S5**	**D5**	
Nominal flow Δp P-T **(2)**	[l/min]		P-A A-T	P-B B-T		P-A A-T	P-B B-T		P-A A-T	P-B B-T		P-A A-T	P-B B-T
	Δp= 10 bar	18	18	9	28	28	14	45	45	22	75	75	37
	Δp= 30 bar	30	30	15	50	50	25	80	80	40	130	130	65
	Max permissible flow	50	50	25	80	80	40	130	130	65	180	180	90
Leakage	[cm³/min]	<30 (at p = 100 bar); <135 (at p = 350 bar)						<80 (at p = 100 bar); <600 (at p = 315 bar)					
Response time **(3)**	[ms]	≤ 15						≤ 20					
Hysteresis		≤ 0,2 [% of max regulation]											
Repeatibility		± 0,1 [% of max regulation]											
Thermal drift		zero point displacement < 1% at ΔT = 40°C											

(1) For spool type **D*** the flow value is referred to Δp/2 per control edge
(2) For different Δp, the max flow is in accordance to the diagrams in section 9.2
(3) 0-100% step signal

7 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)
Max power consumption	50 W
Max. solenoid current	**SDHZE** = 2,6 A **SDKZE** = 3 A
Coil resistance R at 20°C	**SDHZE** = 3,1 Ω **SDKZE** = 3,2 Ω
Analog input signals	Voltage: range ±10 VDC (24 VMAX tollerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Monitor outputs	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function
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	IP66 / IP67 with mating connectors
Duty factor	Continuous rating (ED=100%)
Additional characteristics	Short circuit protection of solenoid's current supply; spool position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply
Communication interface	USB - Atos ASCII coding
Communication physical layer	not insulated - USB 2.0 + USB OTG
Recommended wiring cable	LiYCY shielded cables, see section 15

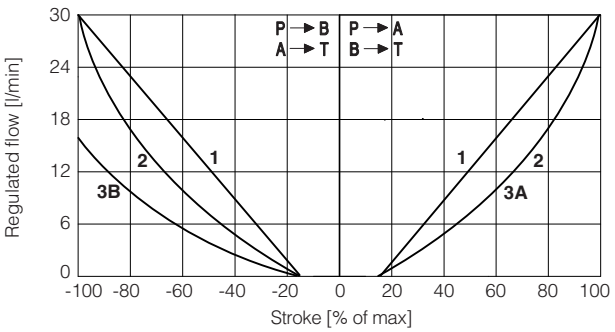
Note: a maximum time of 400 ms has to be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

8 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult Atos Technical Office

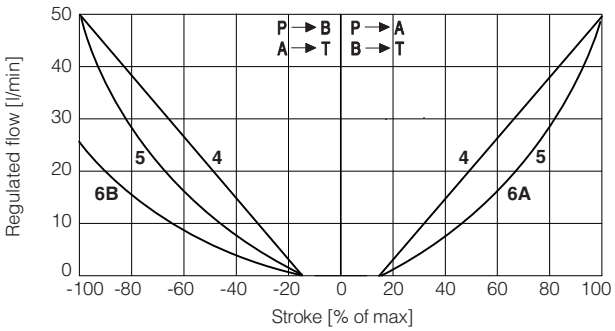
Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity		20÷100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 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	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR	HFC	

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

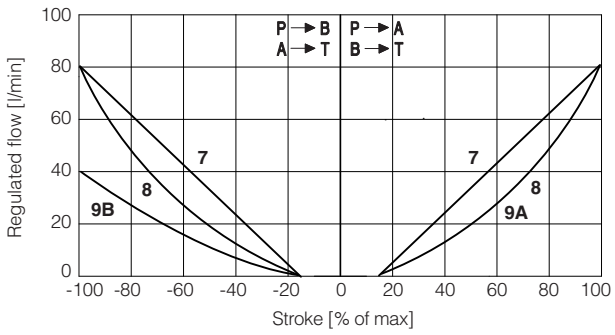
9.1 Regulation diagrams - values measure at Δp 30 bar P-T



SDHZE
1 = L3 **2** = S3 **3A** = D3 (P → A, A → T)
3B = D3 (P → B, B → T)

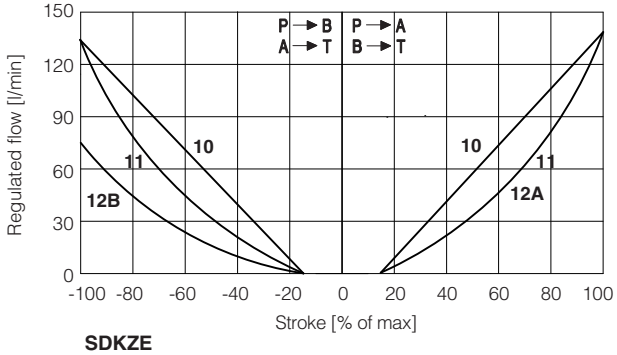


SDHZE
4 = L5 **5** = S5 **6A** = D5 (P → A, A → T)
6B = D5 (P → B, B → T)



SDKZE

7 = L3 **8** = S3 **9A** = D3 (P → A, A → T)
9B = D3 (P → B, B → T)



SDKZE

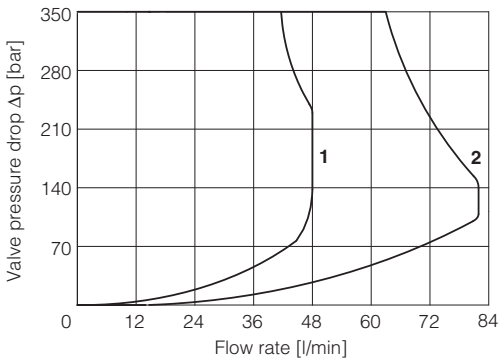
10 = L5 **11** = S5 **12A** = D5 (P → A, A → T)
12B = D5 (P → B, B → T)

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

Reference signal $\begin{matrix}0 \div +10\ V \\ 12 \div 20\ mA\end{matrix}$ } P → A / B → T Reference signal $\begin{matrix}0 \div -10\ V \\ 12 \div 4\ mA\end{matrix}$ } P → B / A → T

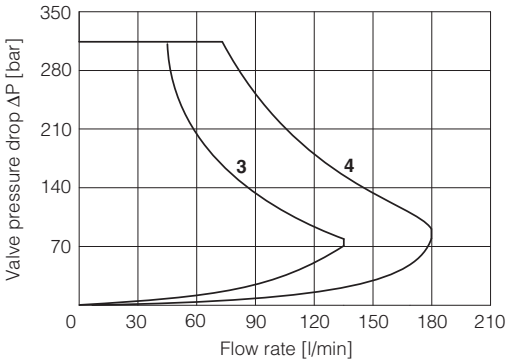
9.2 Operating limits

SDHZE



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

SDKZE



3 = spool S3, L3, D3 **4** = spool S5, L5, D5

10 HYDRAULIC OPTIONS

B = Configurations 51, 53: solenoid, on-board digital driver connections and LVDT transducer at side of port A.
Configurations 71, 73: on-board digital driver connections and LVDT transducer at side of port A.
For hydraulic configuration vs reference signal, see 9.1

11 ELECTRONIC OPTIONS

I = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard ±10 VDC.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

J = This option provides 4 ÷ 20 mA current reference and ±10 VDC voltage monitor signals.
The valve functioning is disabled in case of reference signal cable breakage.

12 POSSIBLE COMBINED OPTIONS

/BI, /BJ

Note: **/T** Bluetooth adapter option can be combined with all other options

13 POWER SUPPLY AND SIGNALS SPECIFICATIONS

13.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.

⚠ A safety fuse is required in series to the power supply: 2,5 A time lag fuse.

13.2 Flow reference input signal (Q_INPUT+)

The driver controls in closed loop the valve spool position proportionally to the external reference input signal.
Standard (voltage reference input): default is ±10 VDC and can be reconfigured via software, within a maximum range of ±10 VDC.
Options /I and /J (current reference input): default is 4 ÷ 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

13.3 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal proportional to the actual spool position of the valve; the monitor output signal can be software set to show other signals available in the driver.
Standard and option /J (voltage monitor output): default is ±10 VDC and can be reconfigured via software, within a maximum range of ±10 VDC.
Options /I and /J (current monitor output): default is 4 ÷ 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

Note:

monitor output signal must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, ISO 4413).

14 ELECTRONIC CONNECTIONS

14.1 Main connector signals - 7 pin (A1) (A2)

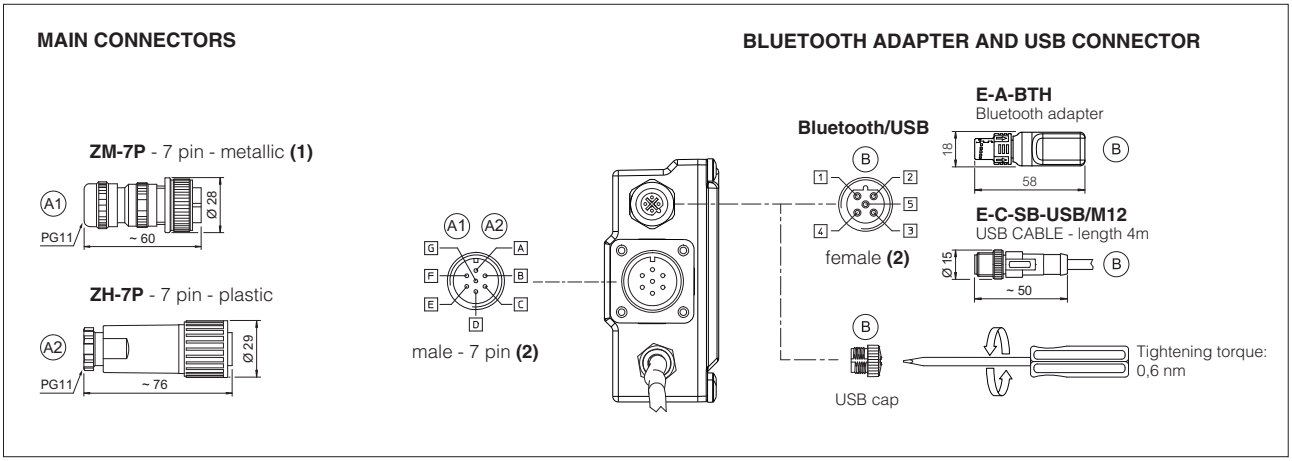
PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	**V+**	Power supply 24 VDC	Input - power supply
B	**V0**	Power supply 0 VDC	Gnd - power supply
C	**AGND**	Analog ground	Gnd - analog signal
D	**Q_INPUT+**	Flow reference input signal: ±10 VDC for standard, 4 ÷ 20 mA for /I and /J options	Input - analog signal
E	**INPUT-**	Negative reference input signal for Q_INPUT+	Input - analog signal
F	**Q_MONITOR**	Flow monitor output signal: ±10 VDC for standard and /J option, 4 ÷ 20 mA for /I option, referred to AGND	Output - analog signal
G	**EARTH**	Internally connected to driver housing	

14.2 USB connector - M12 5 pin (B)

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	**+5V_USB**	Power supply
2	**ID**	Identification
3	**GND_USB**	Signal zero data line
4	**D-**	Data line -
5	**D+**	Data line +

(1) Shield connection on connector housing is recommended

14.3 Connections layout

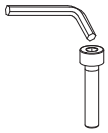


(1) use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** pin layout always referred to driver's view

15 CONNECTORS CHARACTERISTICS - to be ordered separately

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
CODE	(A1) **ZM-7P**	(A2) **ZH-7P**
Type	7pin female straight circular	7pin female straight circular
Standard	According to MIL-C-5015	According to MIL-C-5015
Material	Metallic	Plastic reinforced with fiber glass
Cable gland	PG11	PG11
Recommended cable	LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply)
Conductor size	up to 1 mm² - available for 7 wires	up to 1 mm² - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

16 FASTENING BOLTS AND SEALS

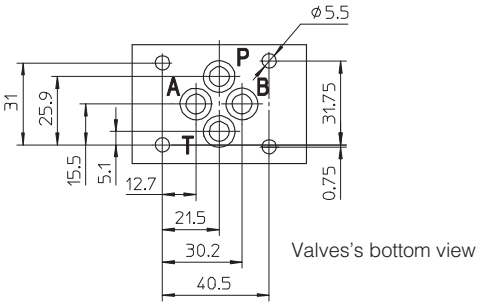
	SDHZE	SDKZE
	**Fastening bolts:** 4 socket head screws M5x30 class 12.9 Tightening torque = 8 Nm	**Fastening bolts:** 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm
	**Seals:** 4 OR 108 Diameter of ports A, B, P, T: Ø 7,5 mm (max)	**Seals:** 5 OR 2050 Diameter of ports A, B, P, T: Ø 11,2 mm (max)

17 INSTALLATION DIMENSIONS [mm]

SDHZE-TID-NP-*

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05

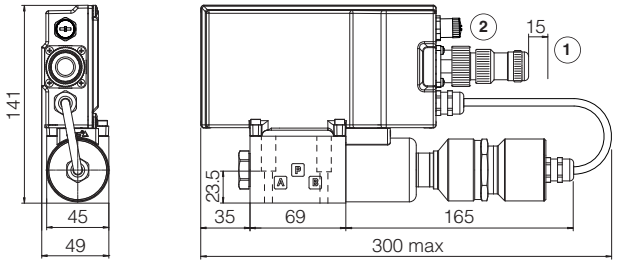
P, A, B, T = Ø 7,5 max



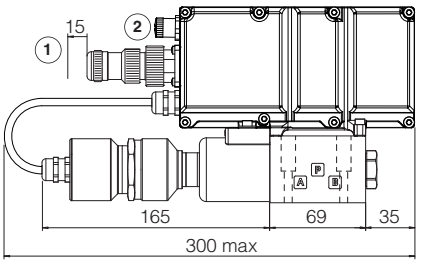
Valves's bottom view

Valve	Mass [kg]
SDHZE-05*	2,5
SDHZE-07*	3

SDHZE-TID-NP-05*



SDHZE-TID-NP-05*/B



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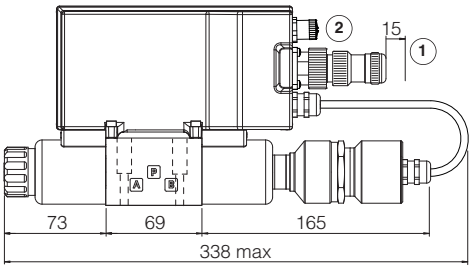
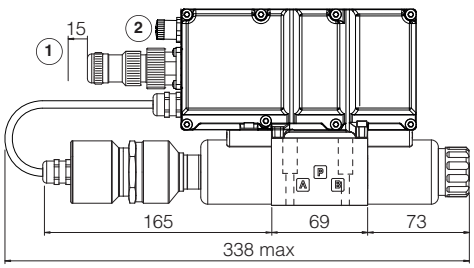


SDHZE-TID-NP-07*/B



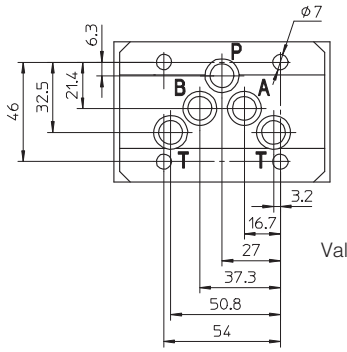
(1) = Space to remove the connectors

(2) = The dimensions of all connectors must be considered, see section 14.3

SDKZE-TID-NP-*

ISO 4401: 2000
Mounting surface: 4401-05-04-0-05

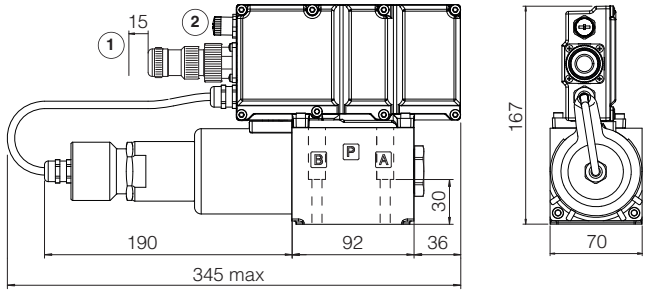
P, A, B, T = Ø 11,2 max



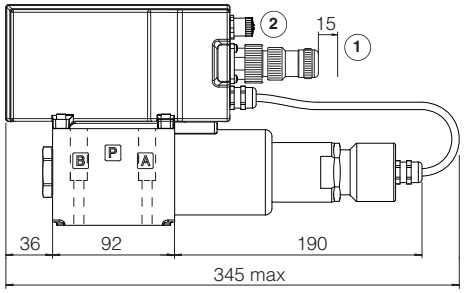
Valves's bottom view

Valve	Mass [kg]
SDKZE-15*	5,5
SDKZE-17*	7,1

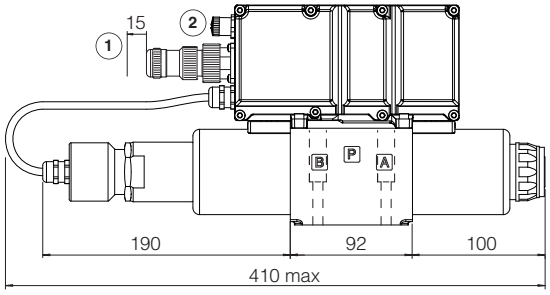
SDKZE-TID-NP-15*



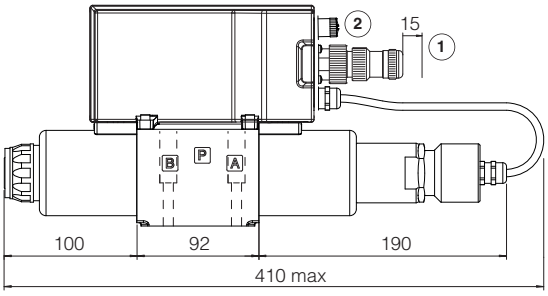
SDKZE-TID-NP-15*/B



SDKZE-TID-NP-17*



SDKZE-TID-NP-17*/B

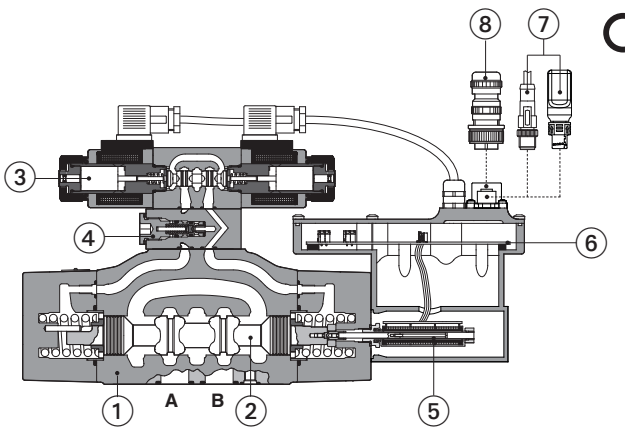


(1) = Space to remove the connectors

(2) = The dimensions of all connectors must be considered, see section 14.3

Digital proportional directional valves high performance

piloted, with on-board driver, LVDT transducer and positive spool overlap



SDPZE-TID-NP-271-*/G

① Valve body
② Main stage Spool
③ Pilot valve
④ Pilot pressure reducing (option /G)
⑤ Main stage LVDT transducer
⑥ On-board digital driver
⑦ Bluetooth/USB connection
⑧ Main connector

SDPZE-TID

Digital high performances proportional directional valves, piloted, with LVDT position transducer (main stage) and positive spool overlap for directional controls and not compensated flow regulations.

TID on board digital driver performs the valve's hydraulic regulation according to the reference signal sent to the 7 pin main connector.

Bluetooth/USB connection is always present for valve settings via mobile App and Atos PC software.

The LVDT transducer grants high regulation accuracy and response sensitivity.
With de-energized proportional solenoids, the mechanical central position of the spool is performed by centering springs.

Size: **16** ÷ **32** - ISO 4401
4/3 way with standard spools
4/4 way with regenerative spools
Max flow: **550** ÷ **1600 l/min**
Max pressure: **350 bar**

1 MODEL CODE

SDPZE	-	TID	-	NP	-	2	71	-	L	5	/	*	/	*	*	/	*

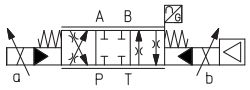
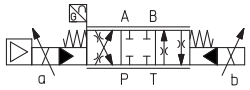
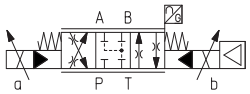
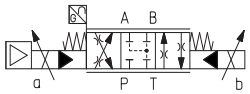
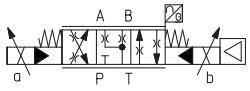
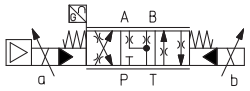
SDPZE: Proportional directional valve, piloted

TID = on-board digital driver and LVDT transducer

Fieldbus interfaces:
NP = Not present

Valve size ISO 4401:
2 = 16 **4** = 25 **6** = 32
For sizes 16 and 25, on board driver is assembled on LVDT housing, in horizontal position
For size 32 on board driver is assembled on pilot valve, in vertical position

Configuration:

	Standard	Option **/B**
71 =		
72 = (1)		
73 =		

Spool size:

	3	5	5	5
Spool type:	L, S, D	L, DL, S, D	L, S, D	L, S, D
Configuration:	71, 73	71, 73	71, 73	72
SDPZE-2 =	160	250	-	250
SDPZE-4 =	-	480	-	480
SDPZE-6 =	-	-	640	-

Nominal flow (l/min) at Δp 10 bar P-T (see section 7)

Hydraulic options (2) (3):
B = on-board digital driver, connection and LVDT transducer at side of port A of the main stage (side B of pilot valve)
D = internal drain
E = external pilot pressure
G = pressure reducing valve for piloting

Electronic options (2) :
I = current reference input and monitor 4÷20mA
J = current reference input 4÷20mA and voltage monitor ±10 VDC

Bluetooth option (2), see section 5 :
T = Bluetooth adapter supplied with the valve

Series number

Seals material, see section 9 :
- = NBR
PE = FKM

Spool type, regulating characteristics **(4)**, see section 10

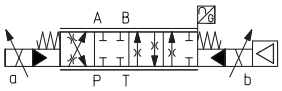
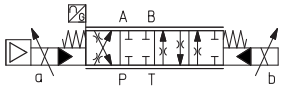
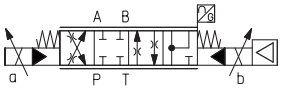
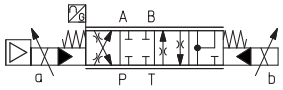
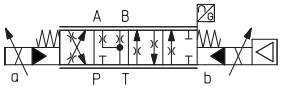
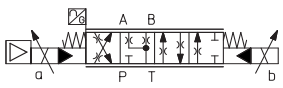
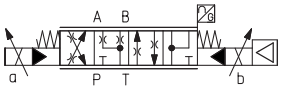
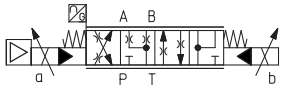
L = linear	**S** = progressive
DL = differential-linear	**D** = differential-progressive
P-A = Q, B-T = Q/2	P-A = Q, B-T = Q/2
P-B = Q/2, A-T = Q	P-B = Q/2, A-T = Q

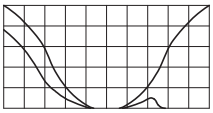
(1) Only for SDPZE sizes 2, 4, with spools L5, S5 or D5 see 9.4
(2) For possible combined options, see section 13
(3) Pilot and Drain configuration: standard configuration is internal pilot and external drain, other configurations on request
(4) For regenerative circuit select configuration 71 or 73 with specific spools D9 or L9, see section 2

2 SPOOLS SPECIFIC FOR REGENERATIVE CIRCUIT - for valve model code and options, see section 1

SDPZE	-	TID	-	NP	-	2	71 - L9	/	*	/	*	*	/	*

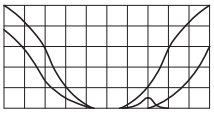
Configuration and spool:

	Standard	Option **/B**
71-D9		
71-L9		
73-D9		
73-L9		

D9 

For regenerative circuit (additional external check valve required)

see 10.1 - diagram 15

L9 

For regenerative circuit internal to the valve

see 10.1 - diagram 16

Spool type and size:	**D9**	**L9**
SDPZE-2 =	250	250
SDPZE-4 =	480	-
SDPZE-6 =	-	-

Nominal flow (l/min) at Δp 10 bar P-T

3 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FS900** and in the user manuals included in the E-SW-SETUP programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS - see tech. table **GS500-SH**

Atos CONNECT mobile App

Free downloadable App for smartphones and tablets which allows quick access to valve main functional parameters and basic diagnostic information via Bluetooth, thus avoiding physical cable connection and significantly reducing commissioning time.
Atos CONNECT supports Atos digital valve drivers equipped with E-A-BTH adapter or with built-in Bluetooth. It does not support valves with p/Q control or axis controls.

Download on the App Store

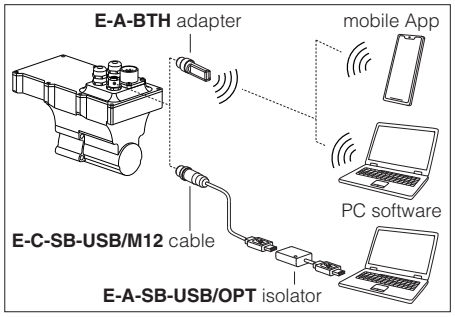
GET IT ON Google Play

E-SW-SETUP PC software

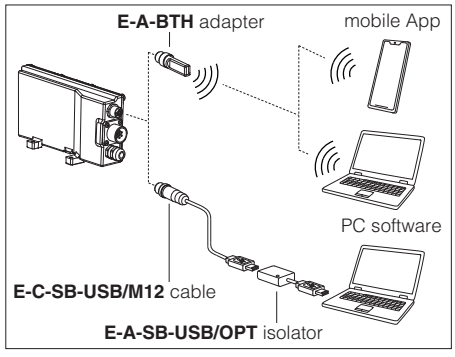
Free downloadable software for PC allows to set all valve functional parameters and to access complete diagnostic information of digital valve drivers via Bluetooth/USB service port.
Atos E-SW-SETUP PC software supports all Atos digital valve drivers and it is available at www.atos.com in MyAtos area.

WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of E-A-SB-USB/OPT isolator adapter is highly recommended for PC protection

Bluetooth or USB connection (SDPZE sizes 2, 4)



Bluetooth or USB connection (SDPZE size 6)



5 BLUETOOTH OPTION - see tech. table **GS500-SH**

T option adds Bluetooth® connectivity to Atos valve drivers thanks to E-A-BTH adapter, which can be left permanently installed on-board, to allow the Bluetooth connection with the valve drivers at any time. E-A-BTH adapter can also be purchased separately and used to connect with any supported Atos digital product.
Bluetooth connection to the valve can be protected against unauthorised access by setting a personal password. The adapter leds visually indicates the status of valve driver and Bluetooth connection.

WARNING: for the list of countries where the Bluetooth adapter has been approved, see tech. table **GS500-SH**
T option is not available for the Indian market, so the Bluetooth adapter must be ordered separately.

6 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, for further details see technical table P007
Ambient temperature range	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Surface protection	Zinc coating with black passivation (body), tin plating (driver housing)
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h
Vibration resistance	See technical table G004
Compliance	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

7 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

Valve model			**SDPZE-*-2**		**SDPZE-*-4**	**SDPZE-*-6**
Pressure limits		[bar]	ports **P, A, B, X** = 350; **T** = 250; **Y** = 10;			
Spool type and size **(1)**		standard	**L3, S3, D3**	**L5, DL5, S5, D5**		**L5, S5, D5**
		regenerative		**D9, L9**	**D9**	
Nominal flow Δp P-T **(2)**		[l/min]				
	Δp= 10 bar		160	250	480	640
	Δp= 30 bar		270	430	830	1100
	Max permissible flow		400	550	1000	1600
Piloting pressure		[bar]	min. = 25; max = 350			
Piloting volume		[cm³]	3,7		9,0	21,6
Piloting flow **(3)**		[l/min]	3,7		6,8	14,4
Leakage **(4)**	Pilot	[l/min]	0,1 / 0,3		0,2 / 0,5	0,9 / 2,8
	Main stage	[l/min]	0,2 / 0,6		0,3 / 1,0	1,0 / 3,0
Response time **(5)**		[ms]	≤ 70 (75)		≤ 75 (90)	≤ 110 (130)
Hysteresis			≤ 1 [% of max regulation]			
Repeatability			± 0,5 [% of max regulation]			
Thermal drift			zero point displacement < 1% at ΔT = 40°C			

(1) For spool type **D** and **DL** the flow value is referred to single path P-A (A-T) at Δp/2 per control edge. The flow P-B (B-T) is 50% of P-A (A-T)

(2) For different Δp, the max flow is in accordance to the diagrams in section 10.2

(3) With step reference input signal 0 ÷100 %

(4) At p = 100/350 bar

(5) 0-100% step signal see detailed diagrams in section 10.3; values in the brackets are referred to response time for valves with option /G

WARNING: for correct operation of the valve, the return lines Y (and T for /D version) must not be empty, we recommend installing a back pressure valve with a setting of approximately 2 bar.

8 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)
Max power consumption	50 W
Max. solenoid current	2,6 A
Coil resistance R at 20°C	3,1 Ω
Analog input signals	Voltage: range ±10 VDC (24 VMAX tollerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Monitor outputs	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function
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	IP66 / IP67 with mating connectors
Duty factor	Continuous rating (ED=100%)
Additional characteristics	Short circuit protection of solenoid's current supply; spool position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply
Communication interface	USB - Atos ASCII coding
Communication physical layer	not insulated - USB 2.0 + USB OTG
Recommended wiring cable	LiYCY shielded cables, see section 16

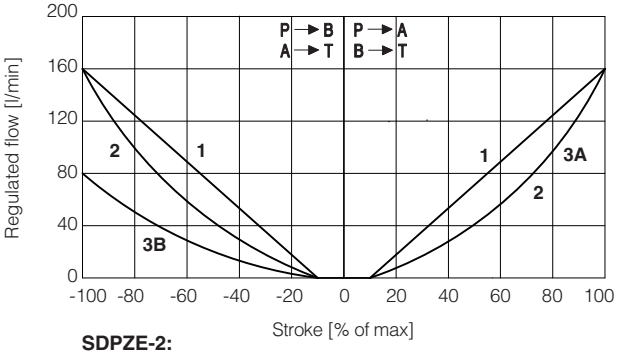
Note: a maximum time of 400 ms has to be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

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

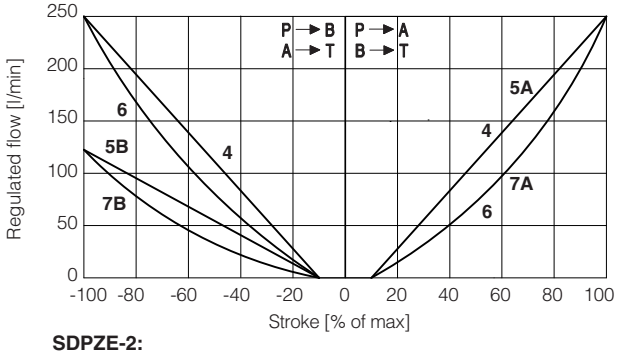
Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity		20÷100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 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	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR	ISO 12922
Flame resistant with water		NBR	HFC	

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

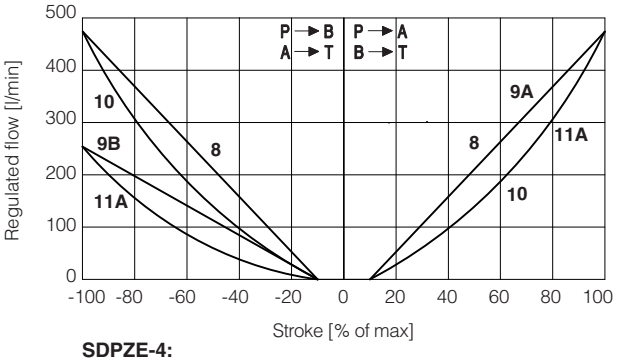
10.1 Regulation diagrams (values measure at p 10 bar P-T)



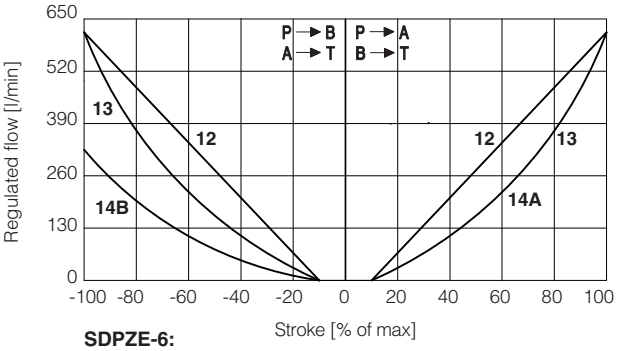
SDPZE-2:
1 = L3 **3A** = D3 (P → A, A → T)
2 = S3 **3B** = D3 (P → B, B → T)



SDPZE-2:
4 = L5 **5A** = DL5 (P → A, A → T) **7A** = D5 (P → A, A → T)
6 = S5 **5B** = DL5 (P → B, B → T) **7B** = D5 (P → B, B → T)



SDPZE-4:
8=L5 **9A**=DL5 (P → A, A → T) **11A**=D5 (P → A, A → T)
10=S5 **9B**=DL5 (P → B, B → T) **11B**=D5 (P → B, B → T)



SDPZE-6:
12 = L5 **14A** = D5 (P → A, A → T)
13 = S5 **14B** = D5 (P → B, B → T)

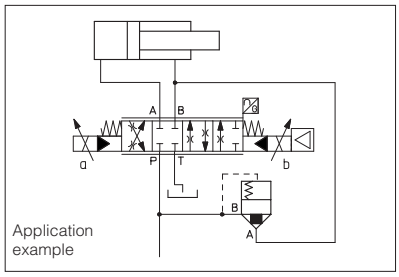
Note:
Hydraulic configuration vs. reference signal (standard and option /B)

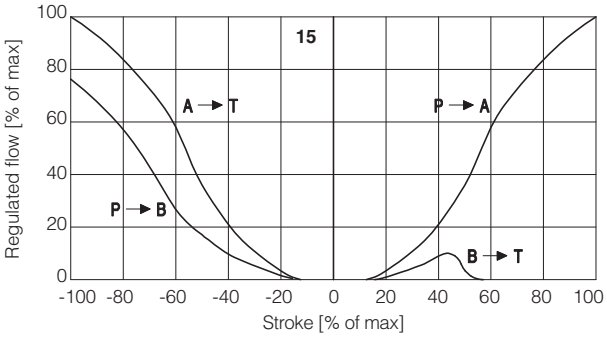
Reference signal 0 ÷ +10 V / 12 ÷ 20 mA } P → A / B → T

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

15 = differential - regenerative spool **D9**
(not available for valve size 32)

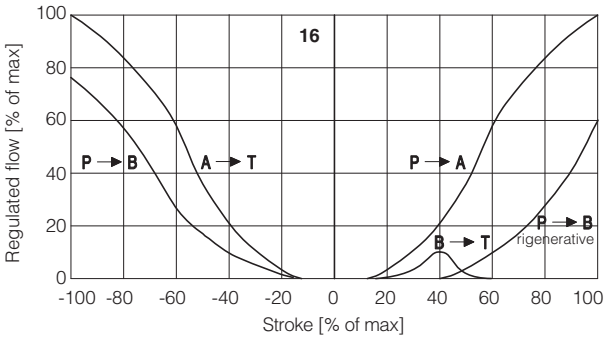
D9 spool type with a fourth position specific to regenerative circuit, performed by means of an additional external check valve.





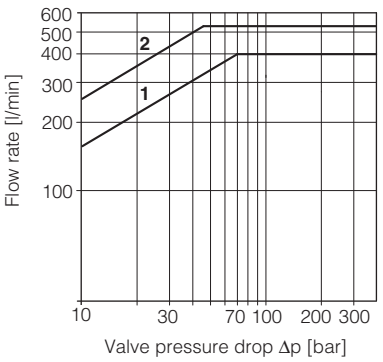
16 = linear - internal regenerative spool **L9**
(available only for valve size 16)

L9 spool type with a fourth position specific to perform a regenerative circuit internal to the valve.

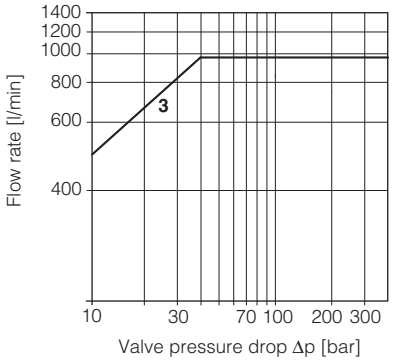


10.2 Operating diagrams

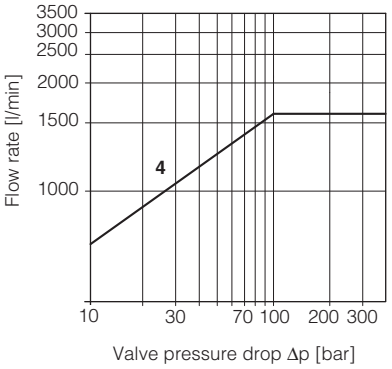
Flow /Δp diagram stated at 100% of spool stroke



SDPZE-2:
1 = spools L3, S3, D3
2 = spools L5, S5, D5, DL5, D9, L9



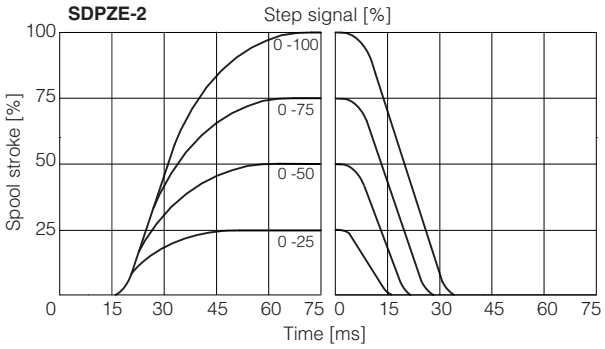
SDPZE-4:
3 = spools L5, S5, D5, DL5, D9

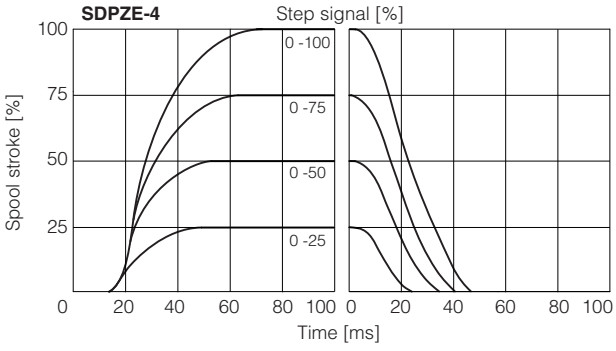


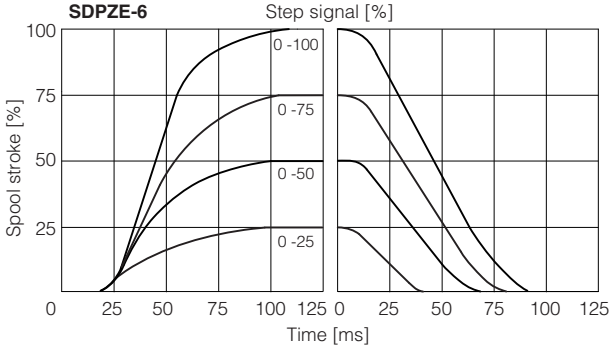
SDPZE-6:
4 = L5, S5, D5

10.3 Response time

The response times in below diagrams are measured at different steps of the reference input signal, with a pilot pressure 100 bar. 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.







10.4 Configuration 72

Only for **SDPZE** sizes **2** and **4** with spools **L5**, **S5** or **D5**: in central position the leakages P-A and P-B are drained to tank, avoiding the drift of cylinders with differential areas.

11 HYDRAULIC OPTIONS

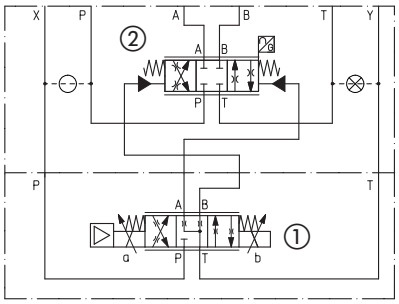
B = Configurations 71, 73: on-board digital driver connectors and LVDT transducer at side of port A of the main stage (side B of pilot valve).
For hydraulic configuration vs reference signal, see 10.1

D = Internal drain.
Pilot and drain configuration can be modified as shown in section 17.
The valve's standard configuration provides internal pilot and external drain.

E = External pilot (through port X).
Pilot and drain configuration can be modified as shown in section 17.
The valve's standard configuration provides internal pilot and external drain.

G = Pressure reducing valve installed between pilot valve and main body with fixed setting:
SDPZE-2, SDPZE-4 and SDPZE-6 = **40 bar**

Functional Scheme
example of configuration 71



① Pilot valve ② Main stage

12 ELECTRONIC OPTIONS

I = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard ±10 VDC.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

J = This option provides 4 ÷ 20 mA current reference and ±10 VDC voltage monitor signals.
The valve functioning is disabled in case of reference signal cable breakage.

13 POSSIBLE COMBINED OPTIONS

All combination possible (except **I** with **J**)

Note: **/T** Bluetooth adapter option can be combined with all other options

14 POWER SUPPLY AND SIGNALS SPECIFICATIONS

14.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.

⚠ A safety fuse is required in series to the power supply: 2,5 A time lag fuse.

14.2 Flow reference input signal (Q_INPUT+)

The driver controls in closed loop the valve spool position proportionally to the external reference input signal.
Standard (voltage reference input): default is ±10 VDC and can be reconfigured via software, within a maximum range of ±10 VDC.
Options /I and /J (current reference input): default is 4 ÷ 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

14.3 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal proportional to the actual spool position of the valve; the monitor output signal can be software set to show other signals available in the driver.
Standard and option /J (voltage monitor output): default is ±10 VDC and can be reconfigured via software, within a maximum range of ±10 VDC.
Options /I and /J (current monitor output): default is 4 ÷ 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

Note:
monitor output signal must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, ISO 4413).

15 ELECTRONIC CONNECTIONS

15.1 Main connector signals - 7 pin (A1) (A2)

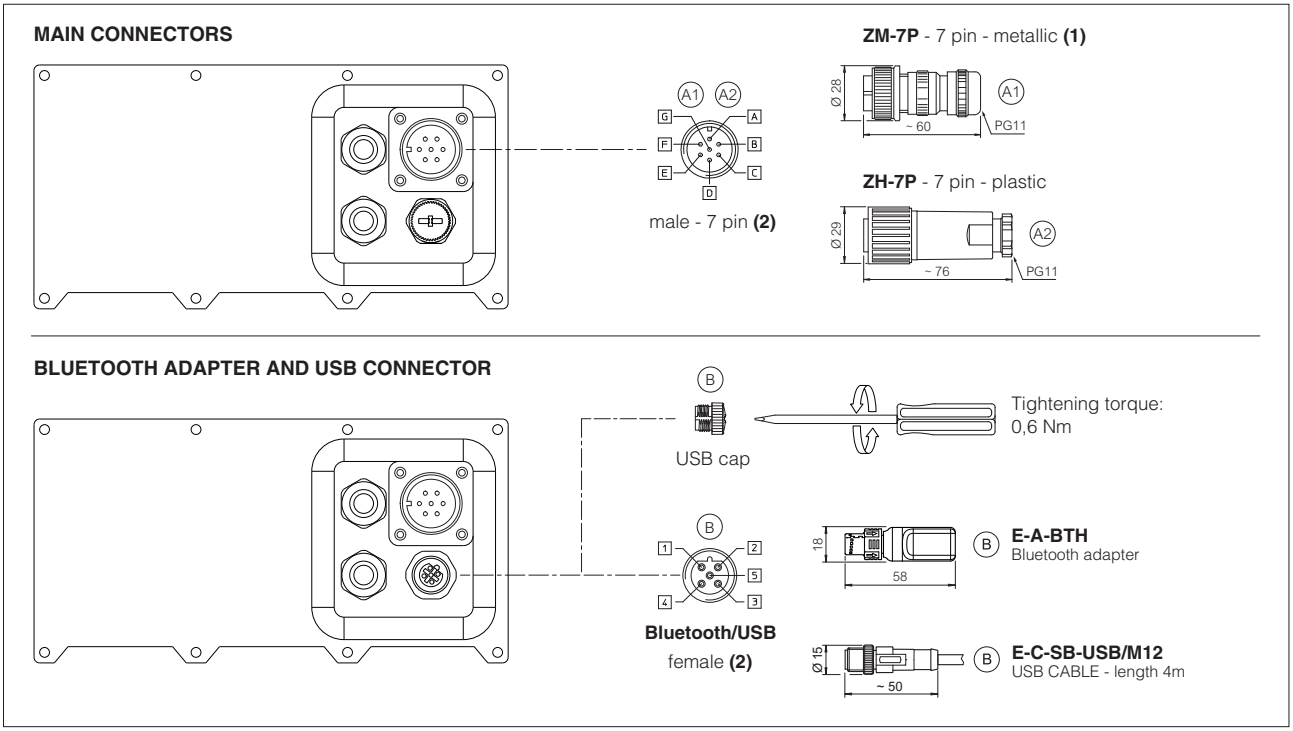
PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	**V+**	Power supply 24 VDC	Input - power supply
B	**V0**	Power supply 0 VDC	Gnd - power supply
C	**AGND**	Analog ground	Gnd - analog signal
D	**Q_INPUT+**	Flow reference input signal: ±10 VDC for standard, 4 ÷ 20 mA for /I and /J options	Input - analog signal
E	**INPUT-**	Negative reference input signal for Q_INPUT+	Input - analog signal
F	**Q_MONITOR**	Flow monitor output signal: ±10 VDC for standard and /J option, 4 ÷ 20 mA for /I option, referred to AGND	Output - analog signal
G	**EARTH**	Internally connected to driver housing	

15.2 USB connector - M12 5 pin (B)

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	**+5V_USB**	Power supply
2	**ID**	Identification
3	**GND_USB**	Signal zero data line
4	**D-**	Data line -
5	**D+**	Data line +

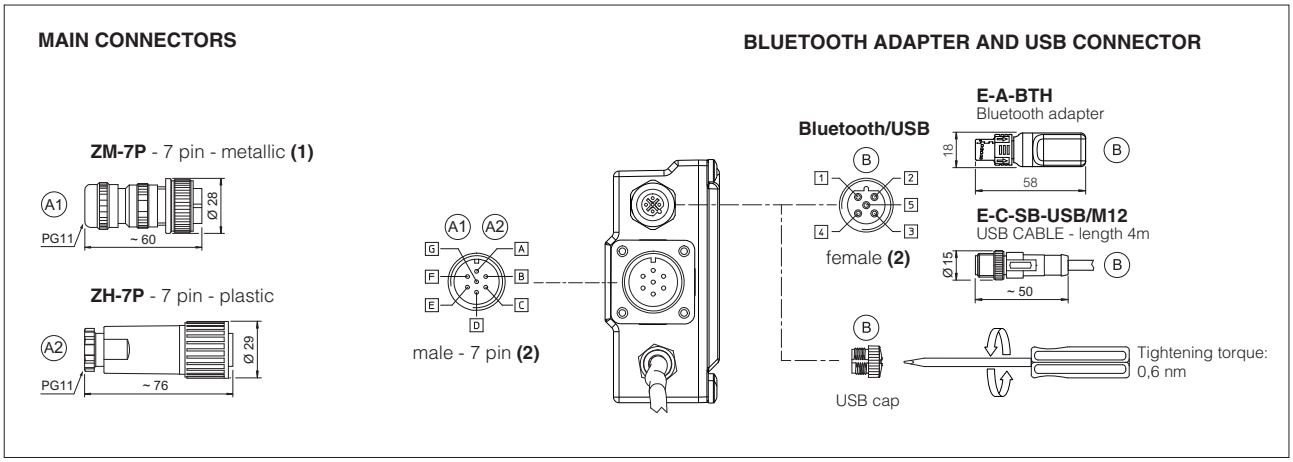
(1) Shield connection on connector housing is recommended

15.3 SDPZE-2 and SDPZE-4 connections layout



(1) use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** pin layout always referred to driver's view

15.4 SDPZE-6 connection layout



(1) use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** pin layout always referred to driver's view

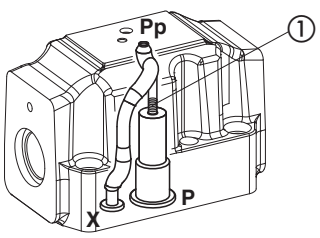
16 CONNECTORS CHARACTERISTICS - to be ordered separately

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
CODE	A1 ZM-7P	A2 ZH-7P
Type	7pin female straight circular	7pin female straight circular
Standard	According to MIL-C-5015	According to MIL-C-5015
Material	Metallic	Plastic reinforced with fiber glass
Cable gland	PG11	PG11
Recommended cable	LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm² max 20 m (logic and power supply) or LiYCY 7 x 1 mm² max 40 m (logic and power supply)
Conductor size	up to 1 mm² - available for 7 wires	up to 1 mm² - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

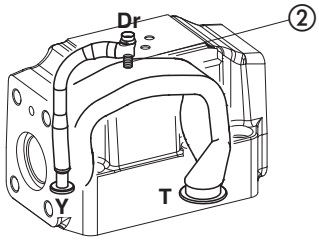
17 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

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

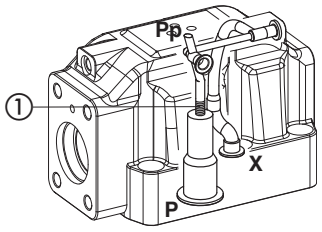


Drain channels

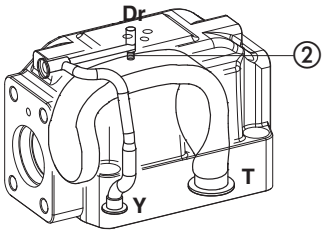


Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

SDPZE-4 Pilot channels

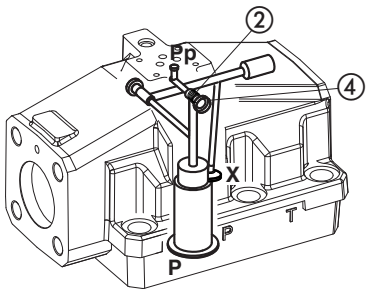


Drain channels



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.

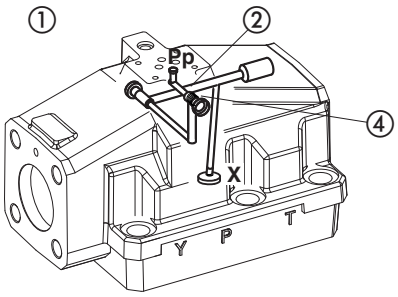
SDPZE-6 Pilot channels



Internal piloting:
plug SP-X325A in pos ②;

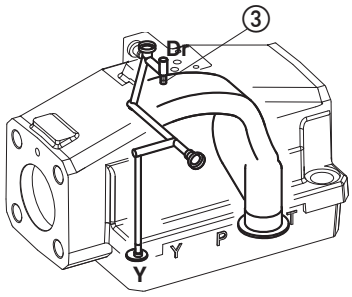
To reach the orifice ②, remove plug ④ = G 1/8”

Pilot channels



External piloting:
plug SP-X325A in pos ②;

Drain channels



Internal drain:
Without blinded plug SP-X300F ③;

External drain:
Add blinded plug SP-X300F ③.

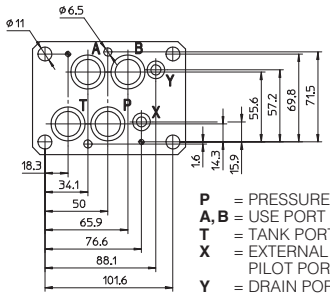
18 FASTENING BOLTS AND SEALS

Type	Size	Fastening bolts	Seals
SDPZE	**2** = 16	4 socket head screws M10x50 class 12.9 Tightening torque = 70 Nm 2 socket head screws M6x45 class 12.9 Tightening torque = 15 Nm	4 OR 130; Diameter of ports A, B, P, T: Ø 20 mm (max) 2 OR 2043 Diameter of ports X, Y: Ø = 7 mm (max)
	4 = 25	6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm	4 OR 4112; Diameter of ports A, B, P, T: Ø 24 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)
	6 = 32	6 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	4 OR 144; Diameter of ports A, B, P, T: Ø 34 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)

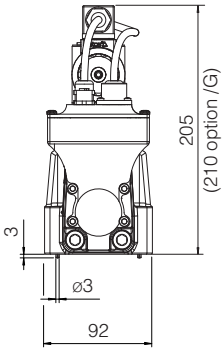
SDPZE-TID-NP-2*

ISO 4401: 2005
Size 16
Mounting surface: 4401-07-07-0-05

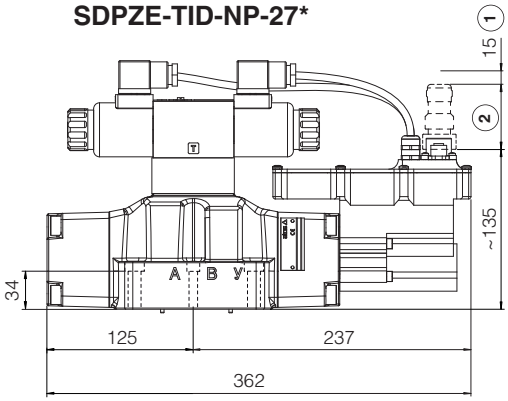
Valve's bottom view



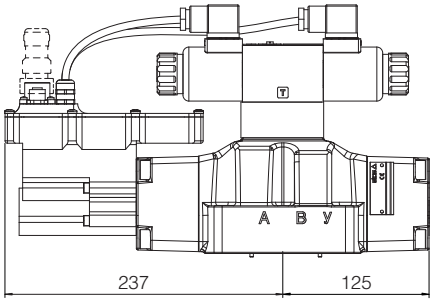
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT



SDPZE-TID-NP-27*



SDPZE-TID-NP-27*/B

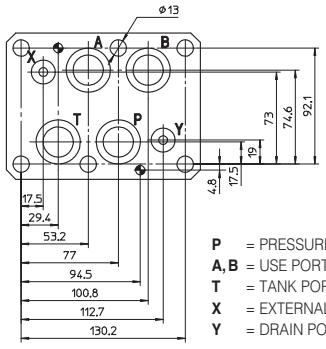


Mass [kg]	
SDPZE-*-27	14,8

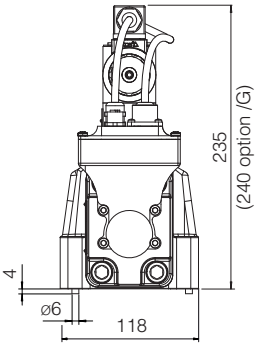
SDPZE-TID-NP-4*

ISO 4401: 2005
Size 25
Mounting surface: 4401-08-08-0-05

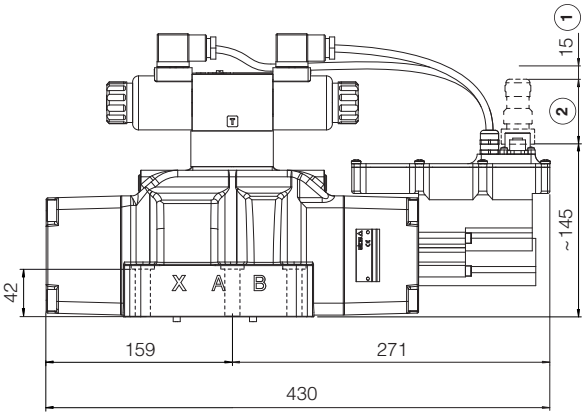
Valve's bottom view



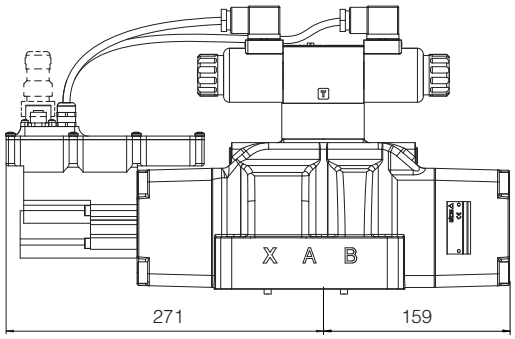
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT



SDPZE-TID-NP-47*



SDPZE-TID-NP-47*/B



Mass [kg]	
SDPZE-*-47	19,3

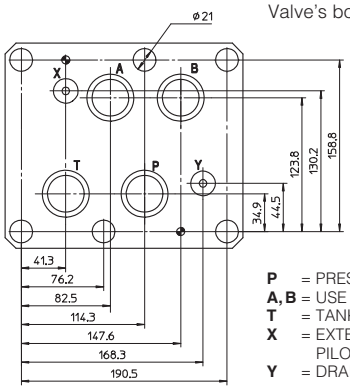
(1) = Space to remove the connectors

(2) = The dimensions of all connectors must be considered, see section 15.3

SDPZE-TID-NP-6*

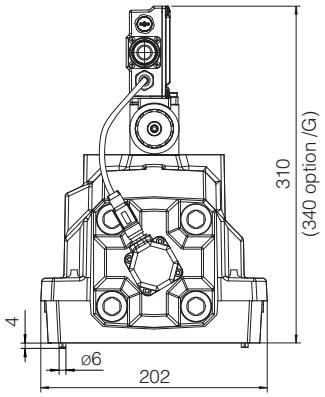
ISO 4401: 2005
Size 32
Mounting surface: 4401-10-09-0-05

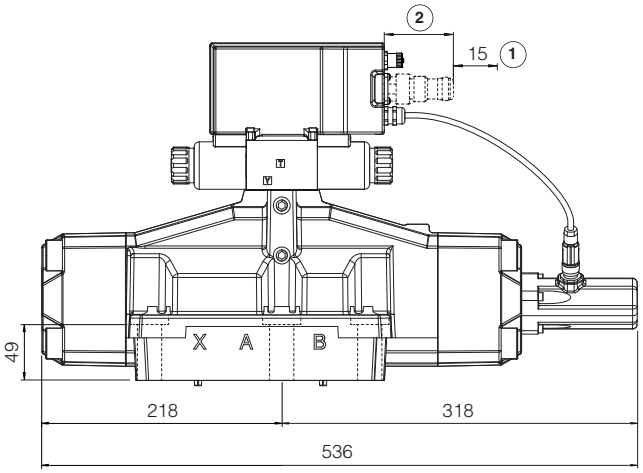
Mass [kg]	
SDPZE-*-67	43,3



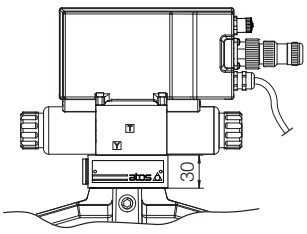
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

SDPZE-TID-NP-67*

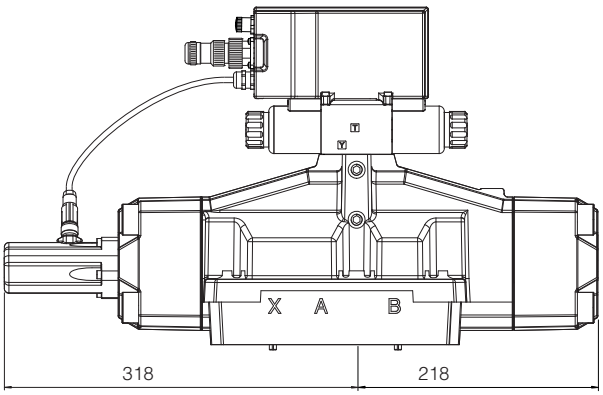




Option /G



SDPZE-TID-NP-67*/B

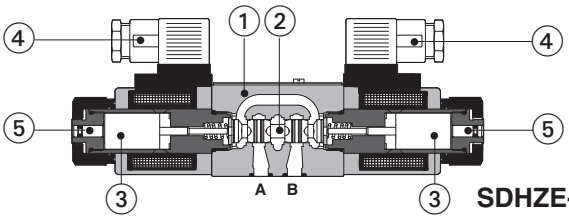


(1) = Space to remove the connectors

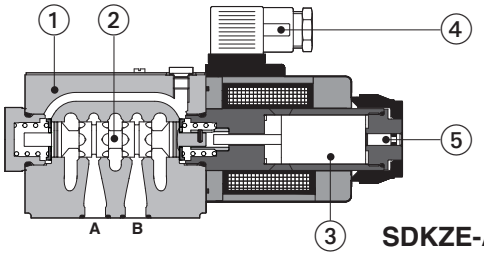
(2) = The dimensions of all connectors must be considered, see section 15.4

Proportional directional valves

direct, without transducer



SDHZE-A-07*



SDKZE-A-15*

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 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 **50** and **130 l/min**

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

1 MODEL CODE

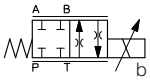
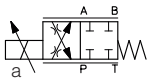
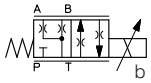
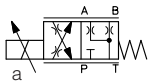
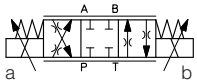
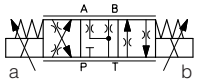
SDHZE	-	A	-	0	71	-	S	5	/	*	-	*	/	*	**	/	*

SDHZE = size 06
SDKZE = size 10

A = off-board drivers, see sect. 2

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

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

Series number

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

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
B = solenoid side of port A (only for valve configuration 51, 53)

Hand lever options (2)
MO = horizontal hand lever
MV = vertical hand lever

(1) Select coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24 VDC

(2) Only for **SDHZE** with spool type S3, S5, D3, D5, L3, L5

2 OFF-BOARD 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	2,7 A	3,3 A	1,3 A	2,5 A	3,1 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	**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)	1,9	6	20	32	45	60
at Δp = 30 bar (P-T)	3	10	30	44	80	105
at Δp = 70 bar (P-T)	5,2	15	36	50	120	130
Max permessible flow	see operating limits, section 7.2 and 8.2					
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

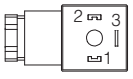
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C			
Recommended viscosity	20 ÷ 100 mm²/s - max allowed range 15 ÷ 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	
Max fluid contamination level — 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

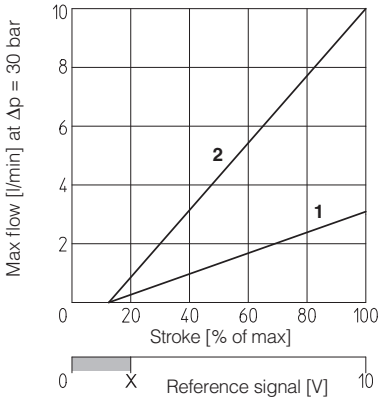
SOLENOID POWER SUPPLY CONNECTOR TYPE 666	
PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND

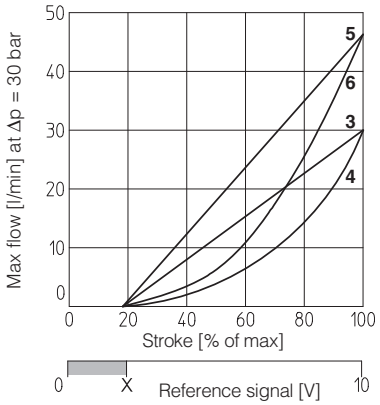


7 DIAGRAMS FOR SDHZE (based on mineral oil ISO VG 46 at 50 °C)

7.1 Regulation diagrams

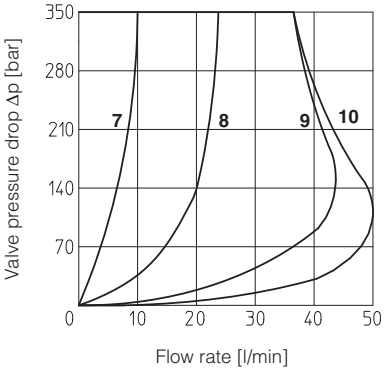
1 = linear spool L14
2 = linear spool L1
3 = linear spool L3
4 = progressive spool S3, D3
5 = linear spool L5
6 = progressive spool S5, D5





7.2 Operating limits

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

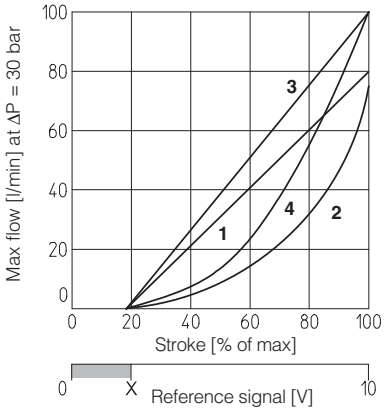


X = Threshold for bias activation depending to the valve type and amplifier type

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

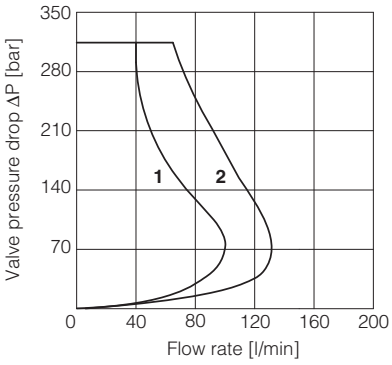
8.1 Regulation diagrams

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

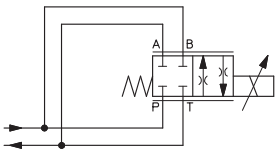


X = Threshold for bias activation depending to the valve type and amplifier type

9 OPERATION AS THROTTLE VALVE

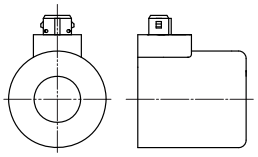
Single solenoid valves (SDHZE-A-051 - SDKZE-A-151) can be used as simple throttle valves:
Pmax = 210 bar

Max flow Δp= 30bar [l/min]	SPOOL TYPE					
	L14	**L1**	**L3**	**S3**	**L5**	**S5**
SDHZE	6	20	60		80	
SDKZE	-	-	120		150	

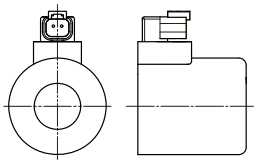


10 COILS WITH SPECIAL CONNECTORS

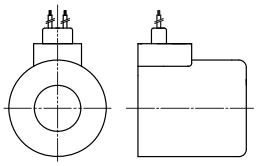
Options -J
Coil type COZEJ (SDHZE)
Coil type CAZEJ (SDKZE)
AMP Junior Timer connector
Protection degree IP67



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



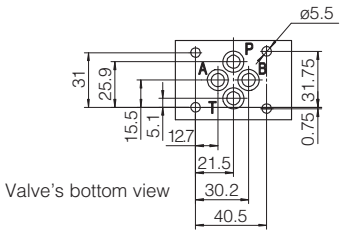
Options -S
Coil type COZES (SDHZE)
Coil type CAZES (SDKZE)
Lead Wire connection
Cable lenght = 180 mm



11 INSTALLATION DIMENSIONS FOR SDHZE and SDKZE [mm]

SDHZE

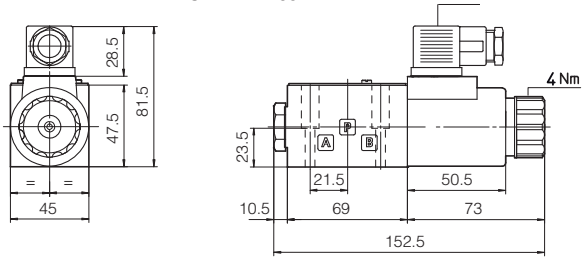
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)



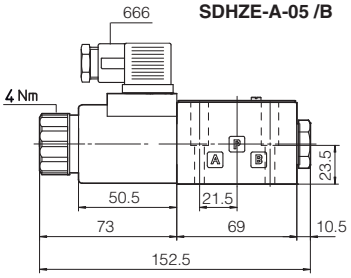
Valve's bottom view

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

SDHZE-A-05

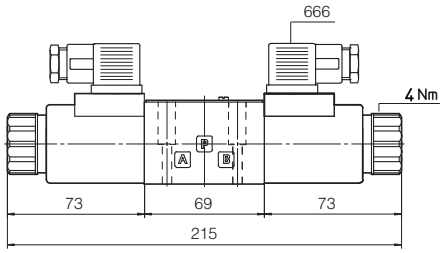


SDHZE-A-05 /B



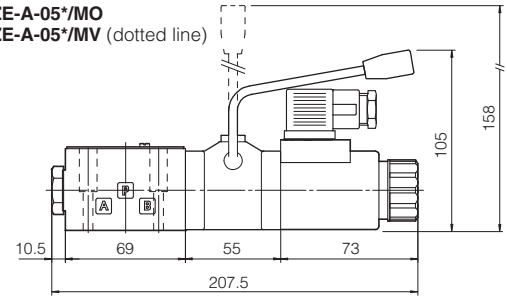
Mass: 1,5 kg

SDHZE-A-07



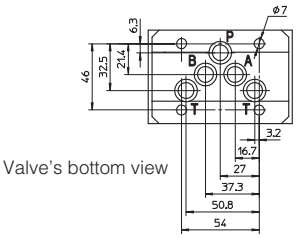
Mass: 2 kg

SDHZE-A-05*/MO
SDHZE-A-05*/MV (dotted line)



SDKZE

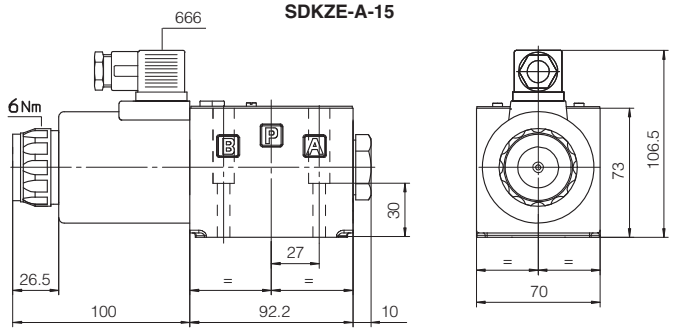
ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see table P005)
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050
Diameter of ports A, B, P, T: Ø 11,2 mm (max)



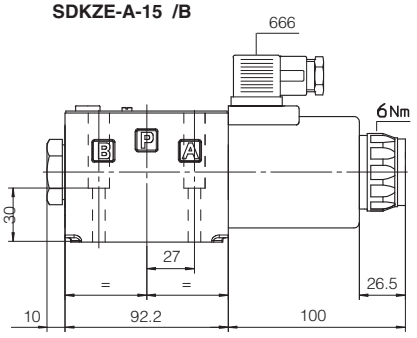
Valve's bottom view

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

SDKZE-A-15

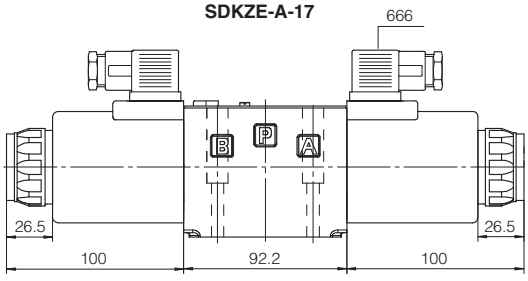


SDKZE-A-15 /B



Mass: 4,5 kg

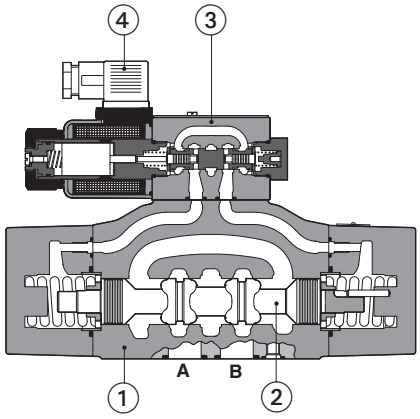
SDKZE-A-17



Mass: 6,1 kg

Two stage proportional directional valves

piloted, without transducer



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** ÷ **32**
Max flow: **550** and **1500 l/min**
Max pressure: **350 bar**

1 MODEL CODE for STANDARD SPOOLS

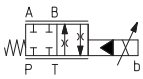
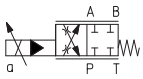
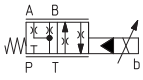
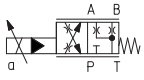
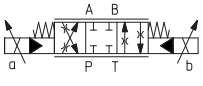
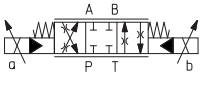
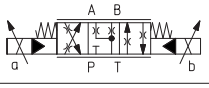
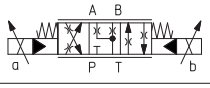
SDPZE	-	A	-	2	71	-	L	5	/	*	-	*	/	*	*	/	*

SDPZE — Pilot operated proportional directional valve

A = for off-board driver, see section [2]

Valve size - ISO 4401:
2 = 16 **4** = 25 **6** = 32

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

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

Series number

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

Spool size	**3** (L,S,D)	**5** (L,S,D)
SDPZE-2 =	160	250
SDPZE-4 =	-	480
SDPZE-6 =	-	640

Nominal flow (l/min) at Δp 10bar P-T

(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

2 OFF-BOARD 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}
Coil resistance R at 20°C	3,1 Ω	2,1 Ω	13,1 Ω
Max solenoid current	2,5 A	3,0 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-A-2**		**SDPZE-A-4**	**SDPZE-A-6**
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	640
Δp P-T	Δp = 30 bar		270	430	830	1100
Max permissible flow		[l/min]	400	550	900	1500
Piloting pressure		[bar]	min. = 25; max = 350 (option /G advisable for pilot pressure > 150 bar)			
Piloting volume		[cm^3]	3,7		9,0	21,6
Piloting flow **(2)**		[l/min]	3,7		6,8	14,4
Leakage **(3)**	Main stage	[l/min]	0,2/0,6		0,3/1,0	1,0/3,0
Response time **(4)** (0-100% step signal and pilot pressure 100 bar)		[ms]	≤ 100		≤ 120	≤ 180
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
Max fluid contamination level — 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	

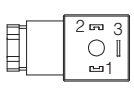
5 GENERAL NOTES

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

6 CONNECTIONS

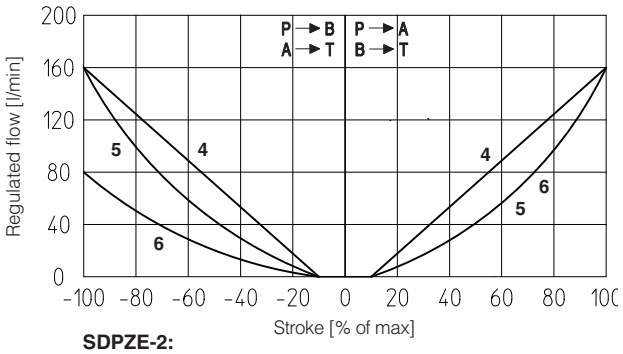
SOLENOID POWER SUPPLY CONNECTOR TYPE 666

PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND

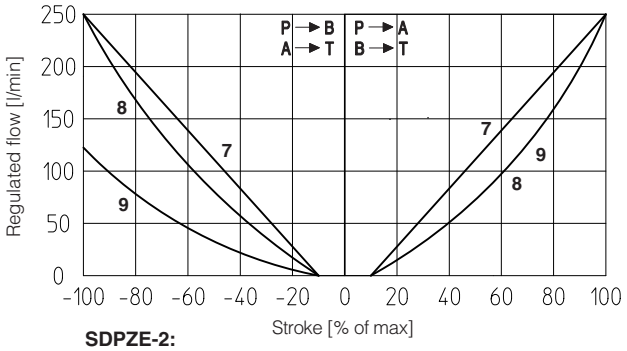


7 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

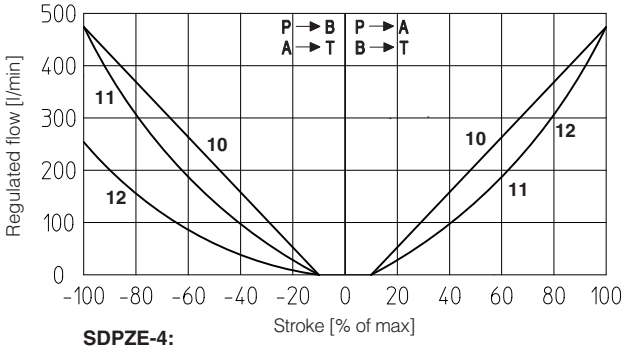
7.1 Regulation diagrams (values measure at Δp 10 bar P-T)



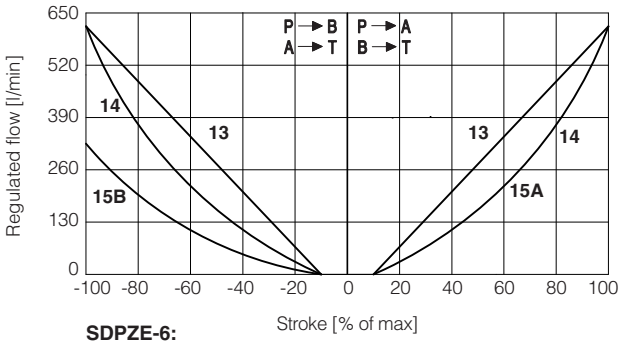
SDPZE-2:
4 = L3 **5** = S3 **6** = D3



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



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



SDPZE-6:
13 = L5 **14** = S5 **15A** = D5 (P → A, A → T)
15B = D5 (P → B, B → T)

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

Reference signal $\begin{matrix}0 \div +10\ V\\12 \div 20\ mA\end{matrix}\}$ P → A / B → T

Reference signal $\begin{matrix}0 \div -10\ V\\12 \div 4\ mA\end{matrix}\}$ P → B / A → T

7.2 Flow /Δp diagram

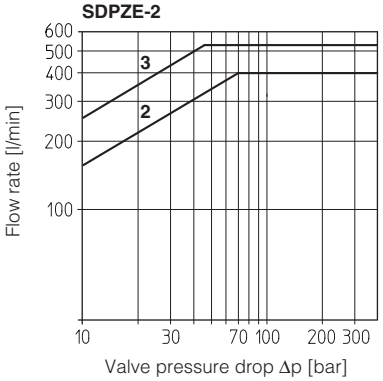
stated at 100% of spool stroke

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

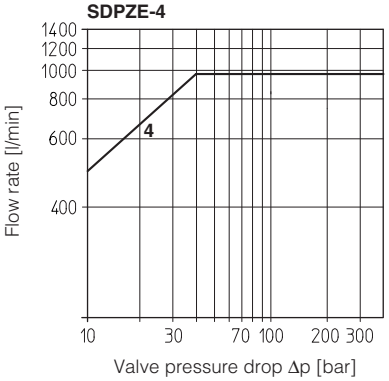
SDPZE-4:
4 = spools L5, S5, D5

SDPZE-6:
5 = spools L5, S5, D5

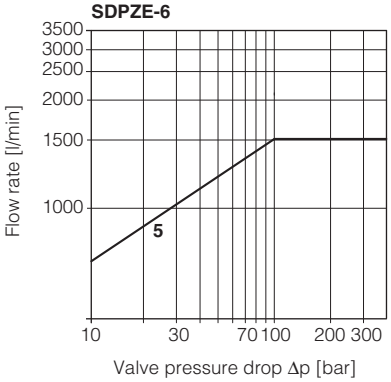
SDPZE-2



SDPZE-4

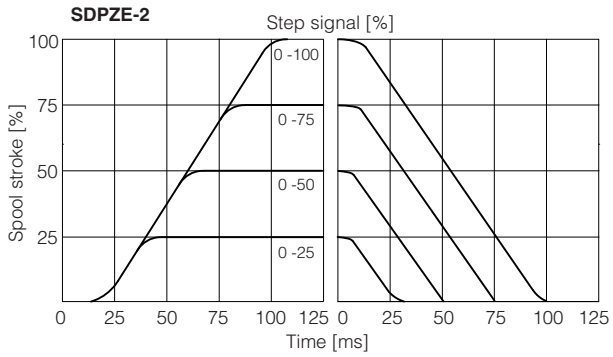


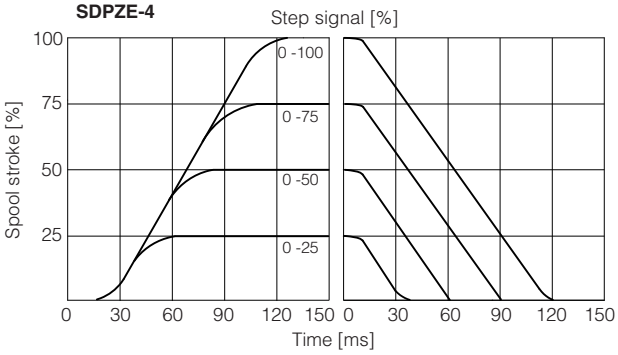
SDPZE-6

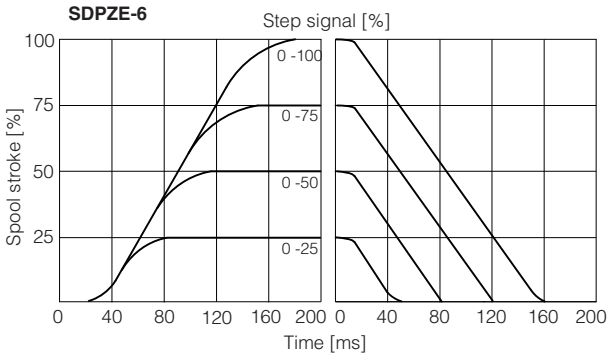


7.3 **Response time** (measured at pilot pressure = 100 bar)

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.

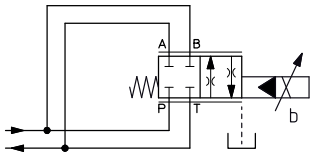






7.4 Operation as throttle valve

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



SDPZE-A-	251-L5	451-L5	651-L5
Max flow [l/min] Δp = 15 bar	860	1600	2200

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

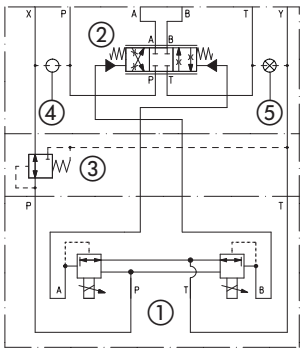
Pressure reducing valve installed between pilot valve and main body with fixed setting:

SDPZE-2 = 40 bar

SDPZE-4 and SDPZE-6 = 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

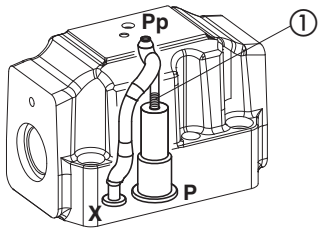


① Pilot valve
② Main stage
③ Pressure reducing valve
④ Plug to be added for external pilot trough port X
⑤ Plug to be removed for internal drain through port T

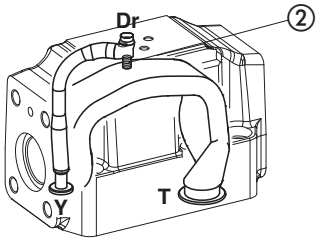
9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

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

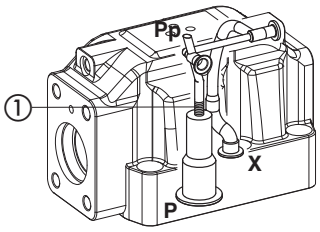


Drain channels

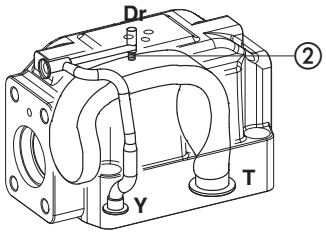


Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

SDPZE-4 Pilot channels

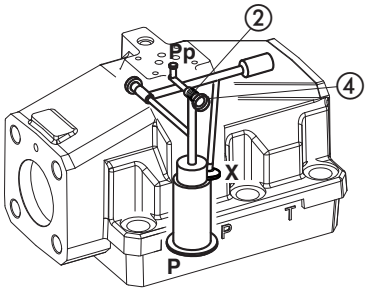


Drain channels



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.

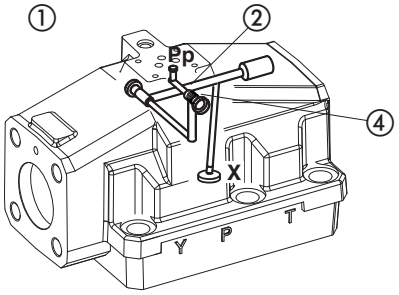
SDPZE-6 Pilot channels



Internal piloting:
plug SP-X325A in pos ②;

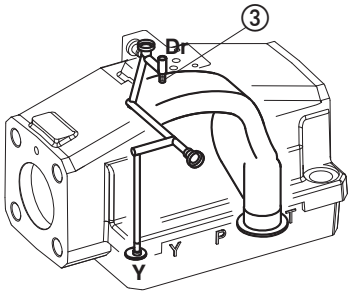
To reach the orifice ②, remove plug ④ = G 1/8”

Pilot channels



External piloting:
plug SP-X325A in pos ②;

Drain channels

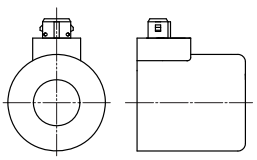


Internal drain:
Without blinded plug SP-X300F ③;

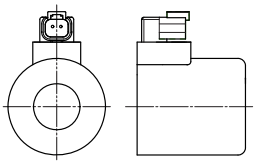
External drain:
Add blinded plug SP-X300F ③.

10 COILS WITH SPECIAL CONNECTORS

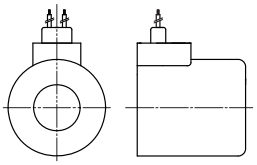
Options -J
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



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

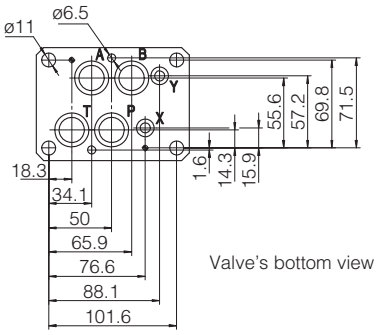


SDPZE-2*

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

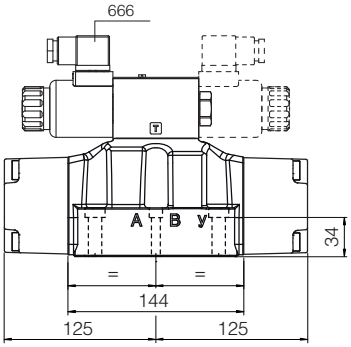


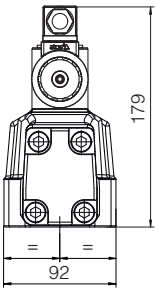
Valve's bottom view

Mass [kg]

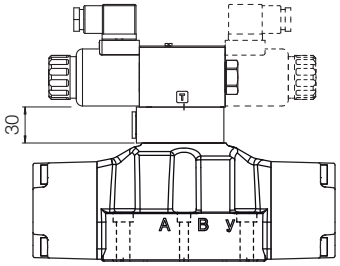
	A
SDPZE-*-25*	11,9
SDPZE-*-27*	12,8
Option /G	+0,9

SDPZE-A-2





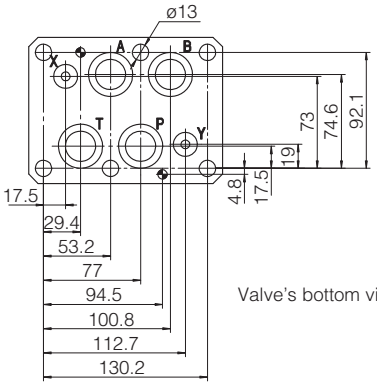
Option /G



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

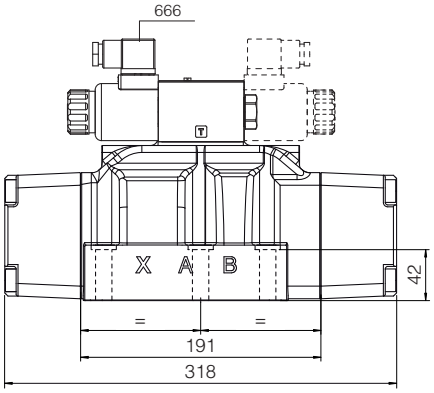


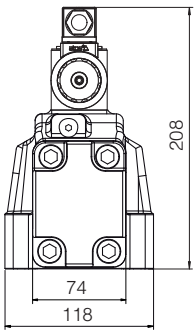
Valve's bottom view

Mass [kg]

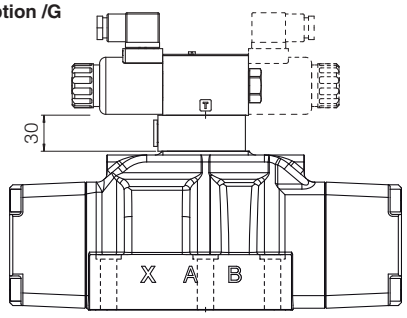
	A
SDPZE-*-45*	17,1
SDPZE-*-47*	18
Option /G	+0,9

SDPZE-A-4





Option /G



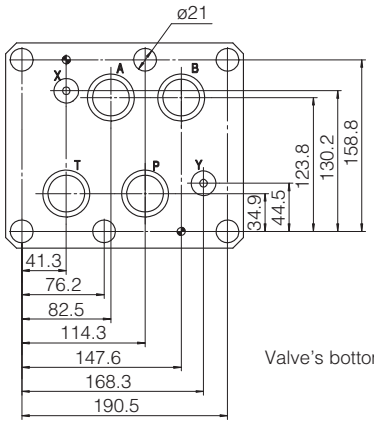
Dotted line = double solenoid version

SDPZE-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

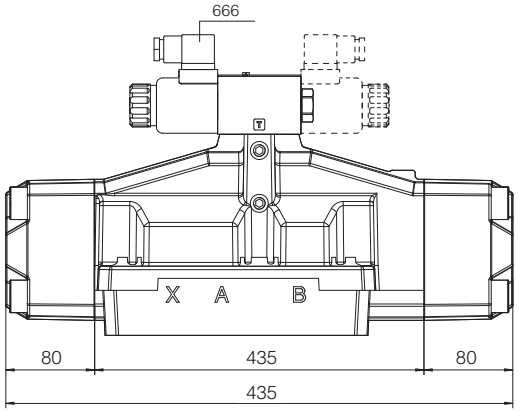
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

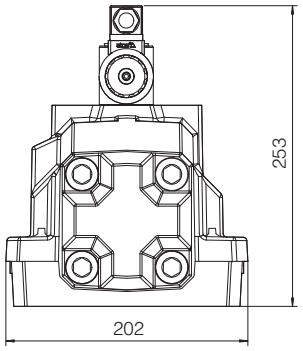


Valve's bottom view

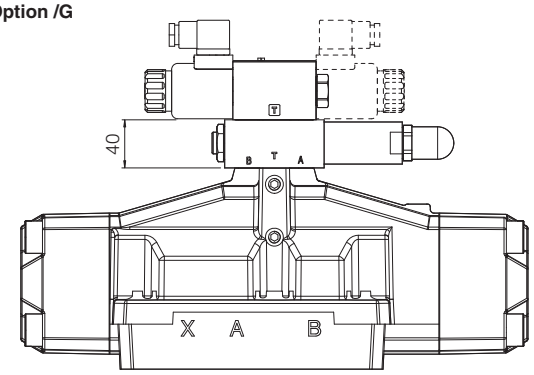
Mass [kg]

	A
SDPZE-*-65*	44
SDPZE-*-67*	44,5
Option /G	+1





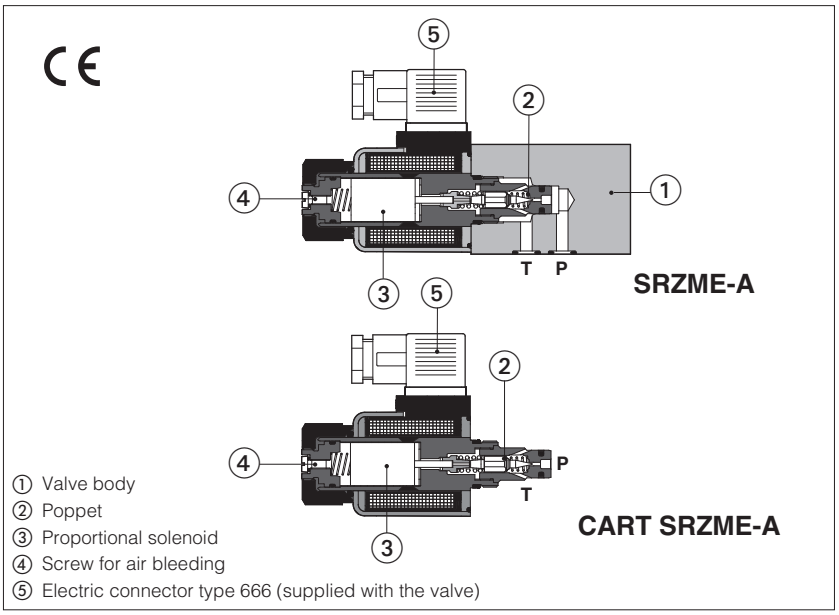
Option /G



Dotted line = double solenoid version

Proportional relief valves

directed, without transducer



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 = for off-board drivers, see section 2

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

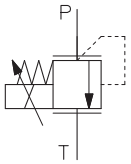
(1) select valve's coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24VDC

2 OFF-BOARD 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
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.

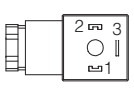
4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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).

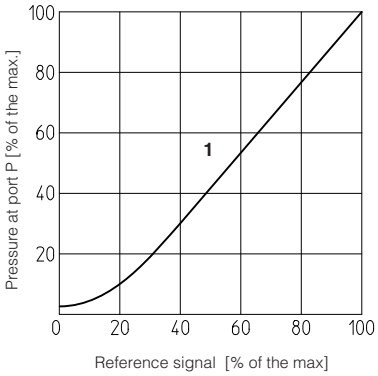
6 SOLENOID CONNECTIONS

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

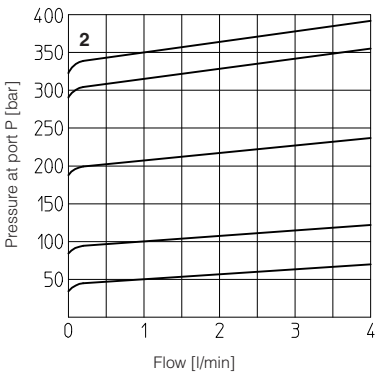
7 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

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.

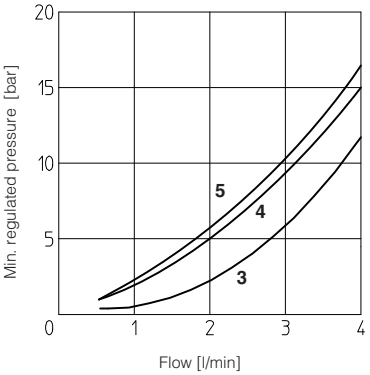


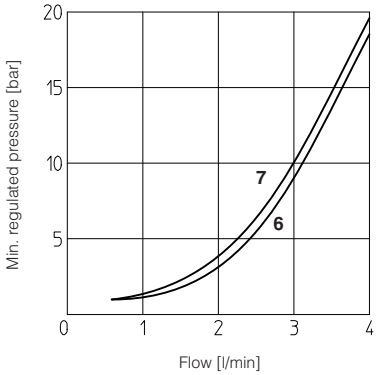
2 Pressure/flow diagrams
with reference signal set at Q = 1 l/min



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

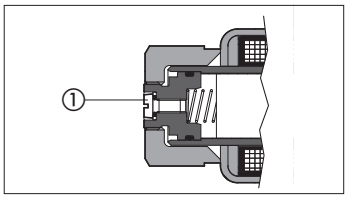
3 = pressure range: 50
4 = pressure range: 100
5 = pressure range: 210
6 = pressure range: 315
7 = pressure range: 350





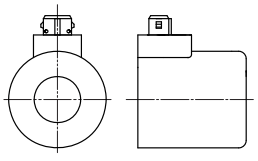
8 AIR BLEEDING

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.

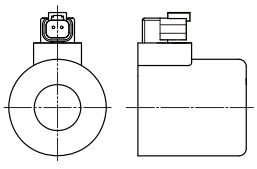


9 COILS TYPE WITH SPECIAL CONNECTORS

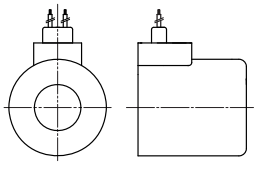
Options -J
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



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



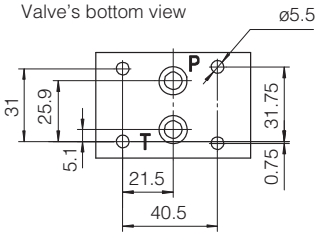
Options -S
Coil type COZES
Lead Wire connection
Cable lenght = 180 mm



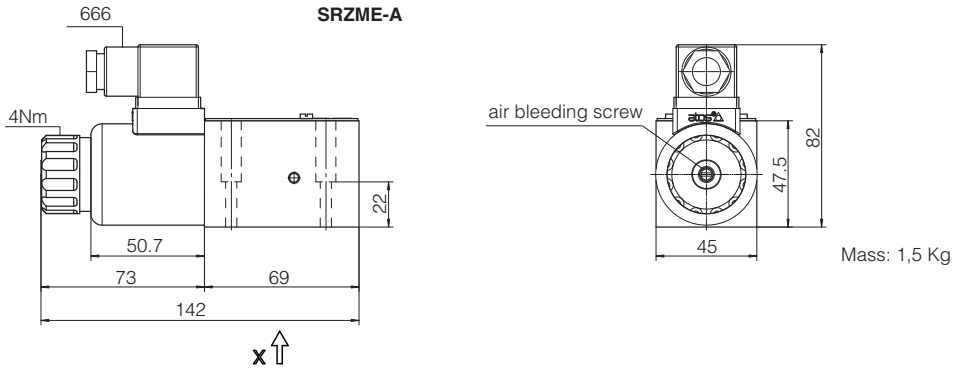
10 INSTALLATION DIMENSIONS [mm]

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

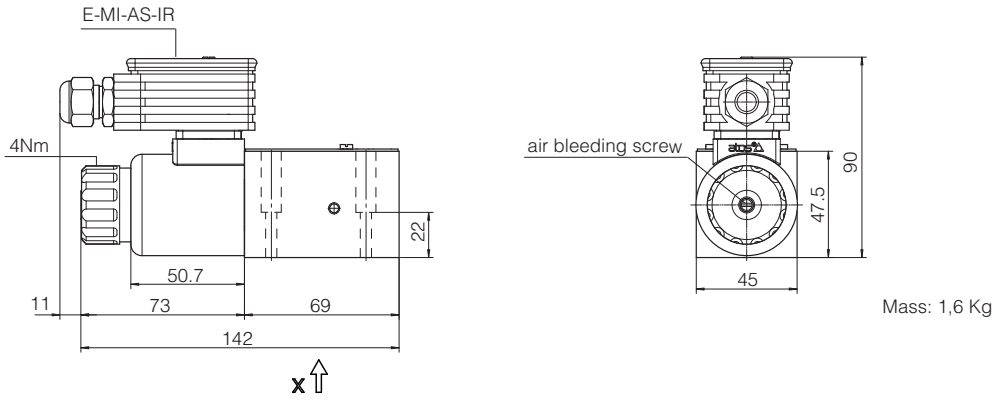


SRZME-A



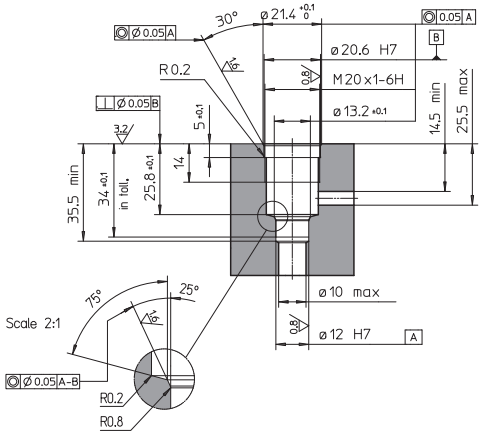
Mass: 1,5 Kg

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

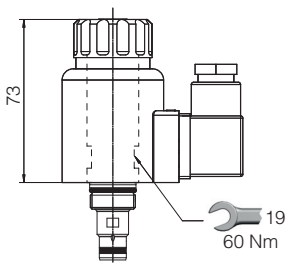


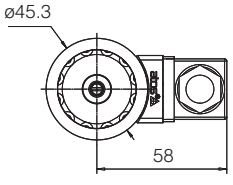
Mass: 1,6 Kg

Cavity dimensions
for **CART SRZME-A**



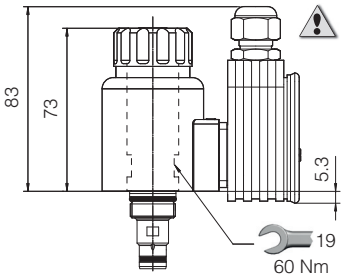
CART SRZME-A



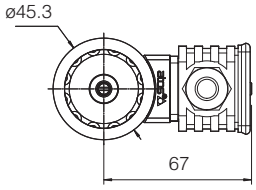


Mass: 0,6 Kg

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



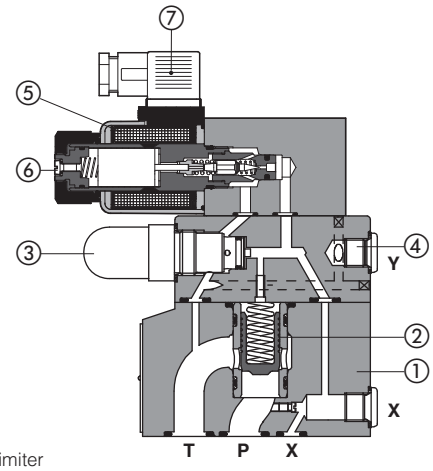
to be checked for eventual interference with the manifold surface



Mass: 0,7 Kg

Proportional relief valves

piloted, without transducer



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 = for off-board driver, see section 2

Valve size ISO 6264
10, 20, 32

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

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

Coils with special connectors, see section 12
- = 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

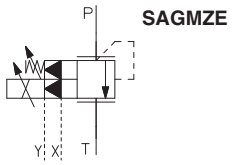
Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

(1) select valve's coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24VDC

2 OFF-BOARD 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
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.

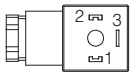
4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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

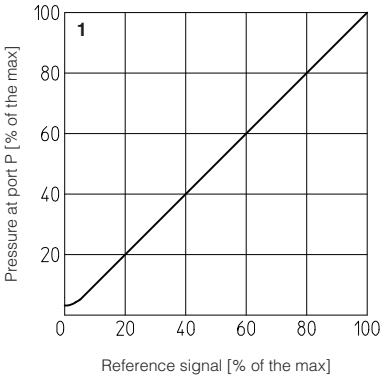
SAGMZE proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

6 SOLENOID CONNECTIONS

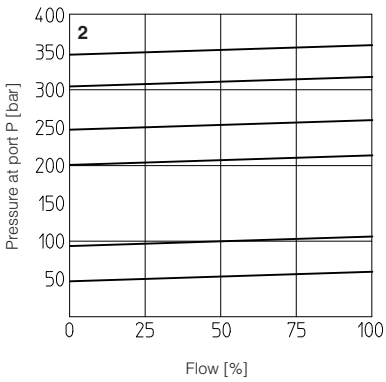
SOLENOID POWER SUPPLY CONNECTOR TYPE 666		
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	

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

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

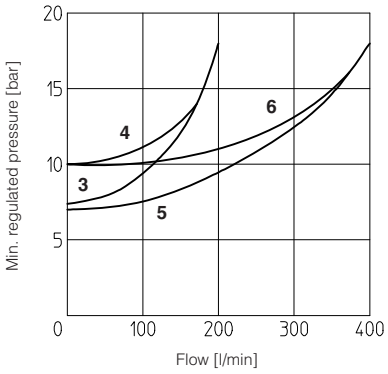


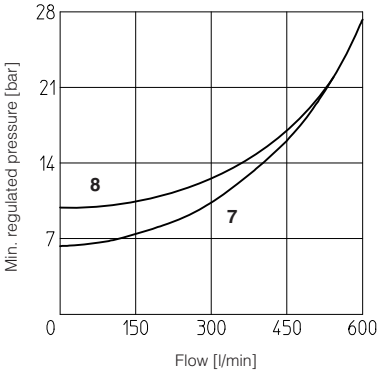
2 = Pressure/flow diagrams
with reference signal set at Q = 50 l/min



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

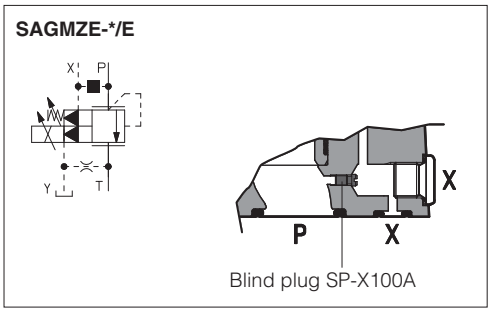




8 HYDRAULIC OPTIONS

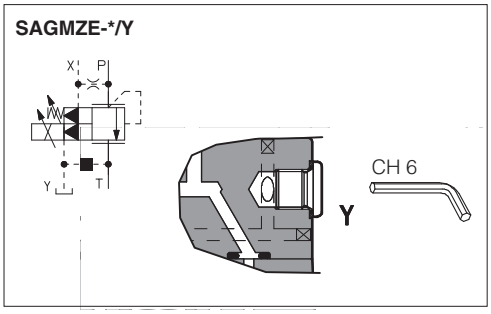
8.1 Option E

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

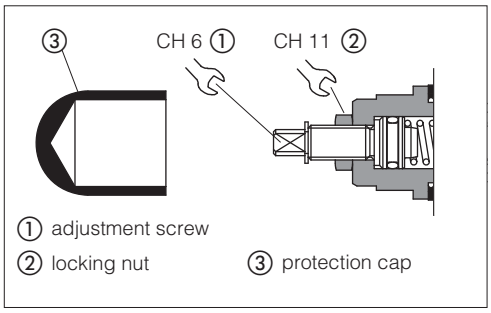
The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G ¼" available on the pilot stage body.



9 MECHANICAL PRESSURE LIMITER

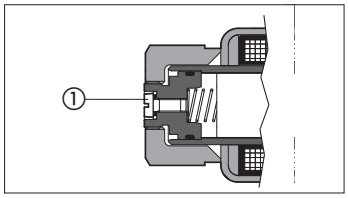
The SAGMZE are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).
At the first commissioning it must be set at a value lightly higher than the max pressure regulated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



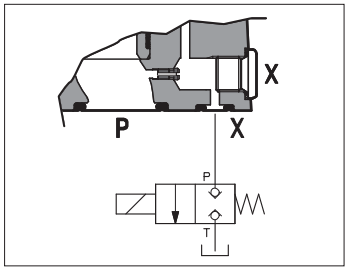
10 AIR BLEEDING

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.



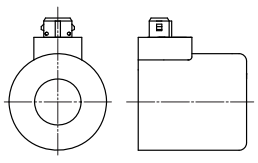
11 REMOTE PRESSURE UNLOADING

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.

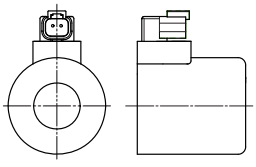


12 COILS TYPE WITH SPECIAL CONNECTORS

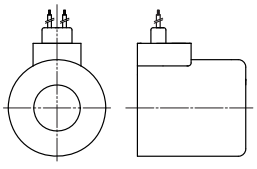
Options -J
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



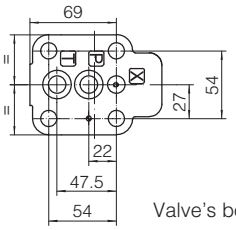
Options -K
Coil type COZEK
Deutsch connector, DT-04-2P male
Protection degree IP67



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



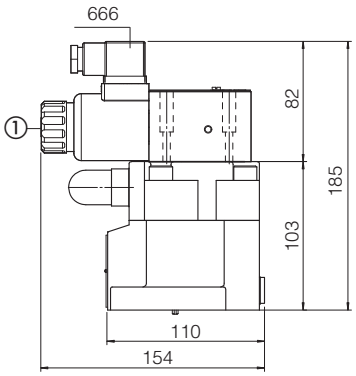
SIZE 10



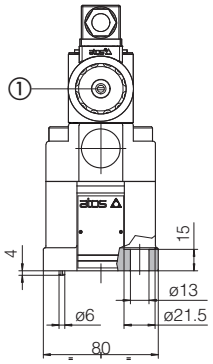
Valve's bottom view

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

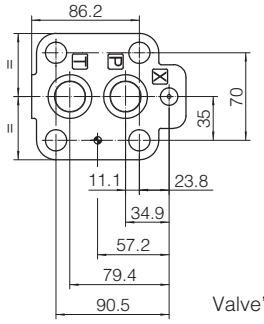
SAGMZE-A-10



Mass 5,4 Kg



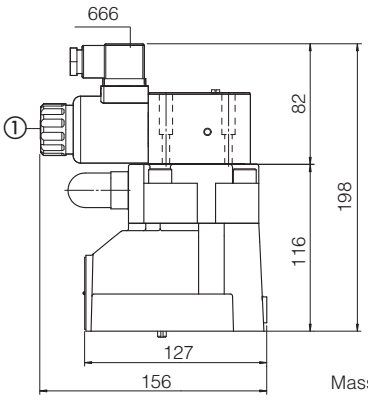
SIZE 20



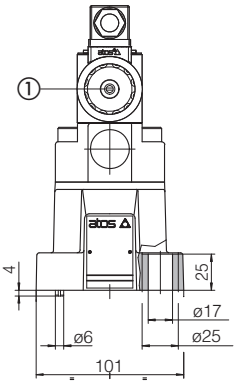
Valve's bottom view

ISO 6264: 2007
Mounting surface: 6264-08-13-1-97
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

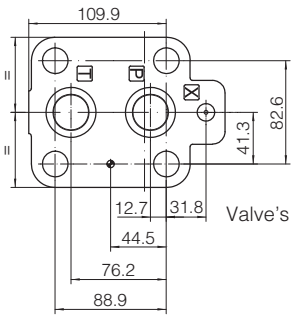


Mass 6,6 Kg



① = Screw for air bleeding

SIZE 32

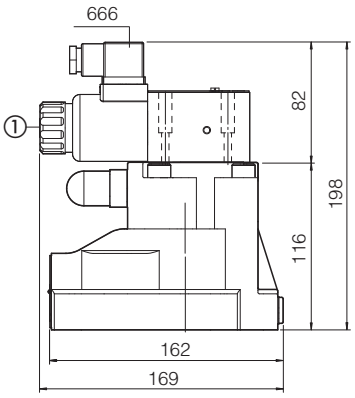


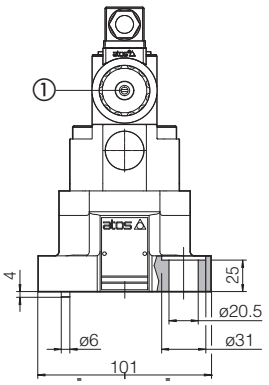
Valve's bottom view

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

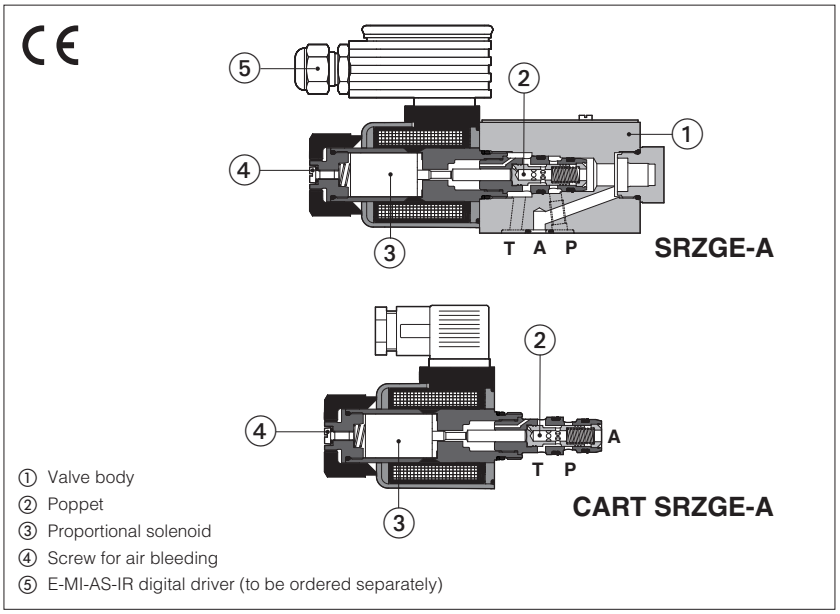




① = Screw for air bleeding

Proportional reducing valves

direct, without transducer



① Valve body
② Poppet
③ Proportional solenoid
④ Screw for air bleeding
⑤ E-MI-AS-IR digital driver (to be ordered separately)

SRZGE-A, CART SRZGE-A

Poppet type, direct, proportional pressure reducing valves for open loop pressure controls.

They operate in association with off-board driver, which supply the proportional valves with proper current to align the valve regulation to the reference signal supplied to the driver.

They are available in following executions:

SRZGE: subplate mounting, ISO 4401 size 06
CART SRZGE: M20 cartridge execution

Max flow: **12 l/min**

Max pressure: **350 bar**

For cavity dimensions see section 16

1 MODEL CODE

SRZGE	-	A	-	010	/	210	-	*	/	*	*	/	*

SRZGE
Proportional pressure reducing valve, direct
SRZGE = subplate mounting
CART SRZGE = cartridge execution

A = for off-board driver, see section 3

Configuration:
010 = reduced pressure on port A

Max regulated pressure:
32 = 32 bar
100 = 100 bar
210 = 210 bar

Coil voltage, see section 10 :
- = standard coil for 24 VDC Atos drivers
6 = optional coil for 12 VDC Atos drivers
18 = optional coil for low current drivers **(1)**

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

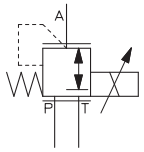
Series number

Seals material, see section 8 :
- = NBR
PE = FKM
BT = HNBR

(1) Select coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24 VDC

2 HYDRAULIC SYMBOL

SRZGE-A
CART SRZGE-A



3 OFF-BOARD ELECTRONIC DRIVERS

Drivers model	E-MI-AC-01F **(1)**		E-MI-AS-IR **(1)**		E-BM-AS-PS		E-BM-AES
Type	Analog		Digital				
Voltage supply (VDC)	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	plug-in to solenoid				DIN-rail panel		
Tech table	G010		G020		G030		GS050

(1) For **CART RZGE** the electronic driver may interfere with the manifold surface.
Please check the installation dimensions at section 16

4 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).

5 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	150 years, see technical table P007
Ambient temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h
Conformity	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULIC CHARACTERISTICS

Valve model	**SRZGE-A-010**
Max regulated pressure	32; 100; 210
Min. regulated pressure [bar]	0,8 (or actual value at T port)
Max. pressure at port P [bar]	350
Max. pressure at port T [bar]	210
Max. flow [l/min]	12
Response time 0-100% step signal **(1)** [ms] (depending on installation)	≤ 70
Hysteresis [% of the max pressure]	≤ 1,5
Linearity [% of the max pressure]	≤ 3
Repeatability [% of the max pressure]	≤ 2

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 3

(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

7 ELECTRICAL CHARACTERISTICS

Coil voltage 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
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%)		

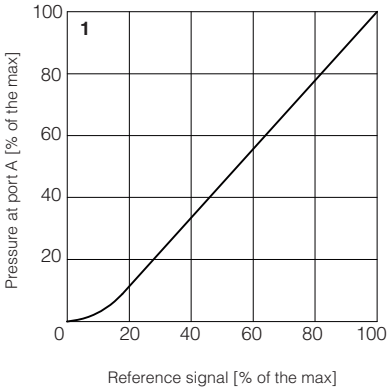
8 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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	

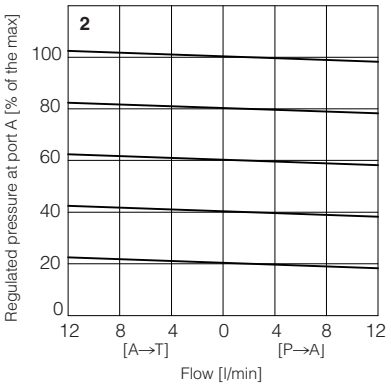
9 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

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

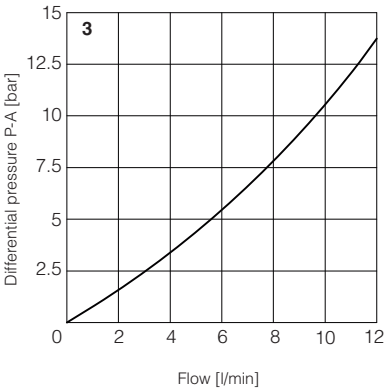


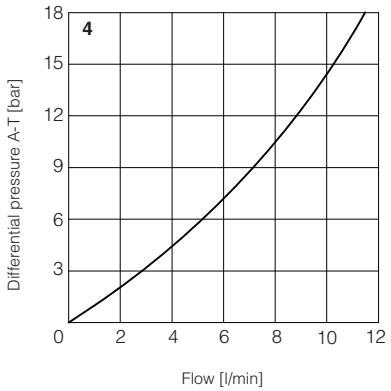
2 = Pressure/flow diagrams
with reference signal set at Q = 1 l/min



3-4 = Min. pressure/flow diagrams
with zero reference signal

3 = Pressure drops vs. flow P-A
4 = Pressure drops vs. flow A-T





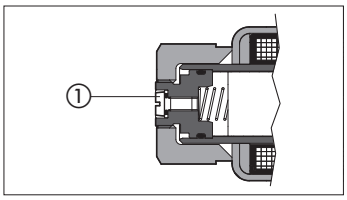
10 COIL VOLTAGE OPTIONS

6 = Optional coil to be used with Atos drivers with power supply 12 VDC.

18 = Optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 VDC.

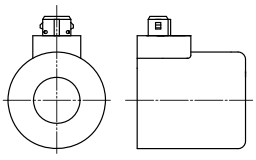
11 AIR BLEEDING

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.

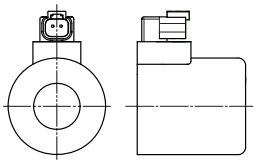


12 COILS WITH SPECIAL CONNECTORS

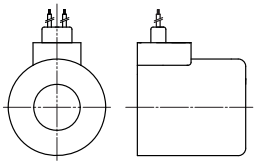
J option
Coil type COZEJ
AMP Junior Timer connector
Protection degree IP67



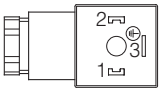
K option
Coil type COZEK
Deutsch connector, DT-04-2P male
Protection degree IP67



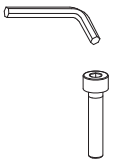
S option
Coil type COZES
Lead Wire connection
Cable lenght = 180 mm



13 SOLENOID CONNECTION

PIN	SIGNAL	TECHNICAL SPECIFICATION	Connector code 666
1	**COIL**	Power supply	
2	**COIL**	Power supply	
3	**GND**	Ground	

14 FASTENING BOLTS AND SEALS FOR SRZGE



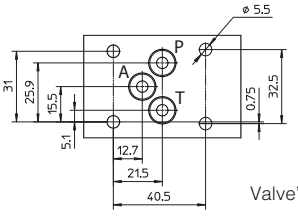
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm

Seals:
3 OR 108
Diameter of ports P, T, A: Ø 5 mm
Port B not used

15 INSTALLATION DIMENSIONS FOR SRZGE [mm]

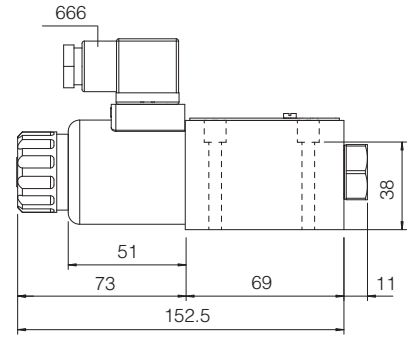
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
(without port B)

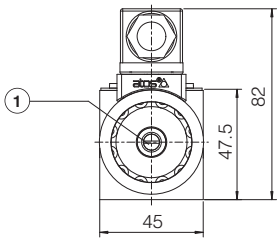
Mass [kg]	
SRZGE	1,5
SRZGE with E-MI-AS-IR	2,0



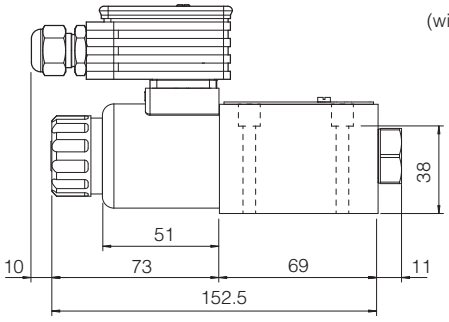
Valve's bottom view

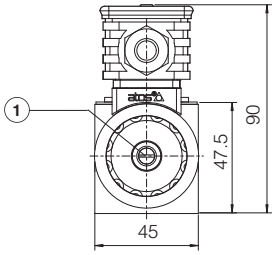
SRZGE-A





SRZGE-A
(with E-MI-AS-IRdigital driver)

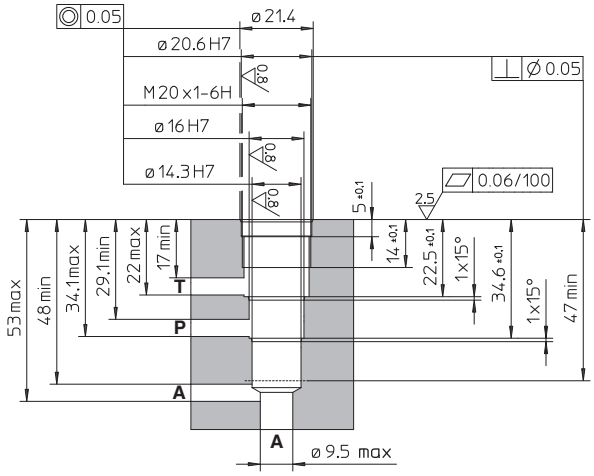




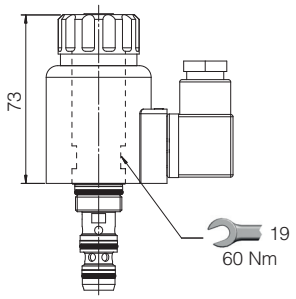
(1) = Air bleeding, see section 11

16 INSTALLATION DIMENSIONS FOR CART SRZGE [mm]

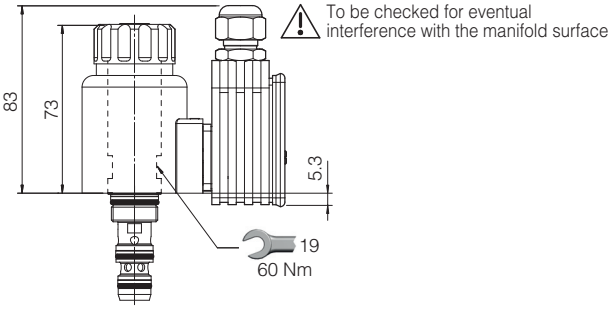
Cavity dimensions for **CART SRZGE-A**

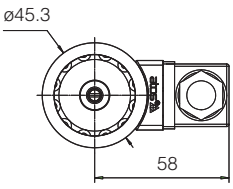


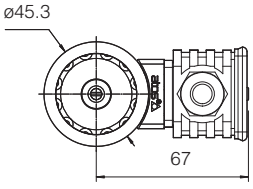
CART SRZGE-A



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



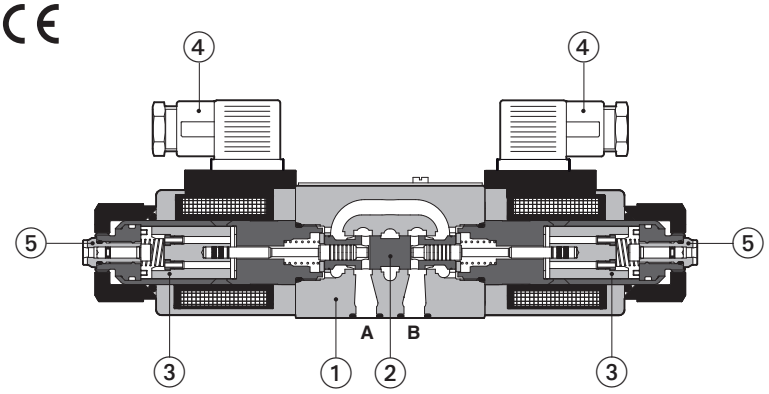




Mass [kg]	
CART SRZGE	0,6
CART SRZGE with E-MI-AS-IR	1,1

Proportional pressure reducing valves type SDHRZE

direct, without transducer



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 = for off-board driver, see section 2

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)

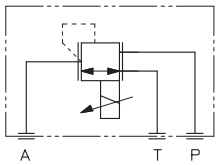
Coil options
see section 3 and 4:
- = standard coil for 24VDC Atos drivers
6 = optional coil for 12VDC Atos drivers
18 = optional coil for 24VDC low current drivers **(1)**

******: Series number

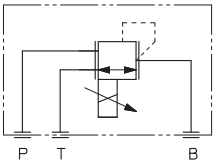
*****: Seals material, see sect. 5:
- = NBR
PE = FKM
BT = HNBR

(1) Select coil voltage **/18** in case of electronic drivers not supplied by Atos, with power supply 24 VDC

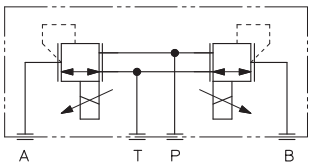
HYDRAULIC SYMBOLS



SDHRZE-A-010/25



SDHRZE-A-010/25/B



SDHRZE-A-012/25

2 OFF-BOARD 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 COIL OPTIONS

Coil voltage

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

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 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
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	

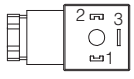
6 GENERAL NOTES

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

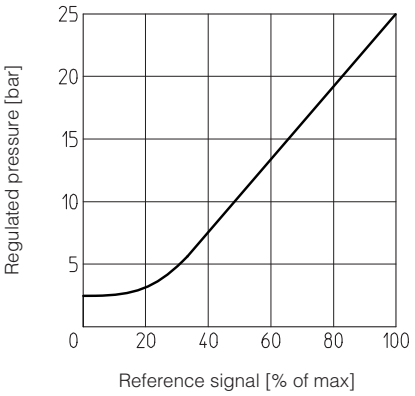
7 CONNECTIONS

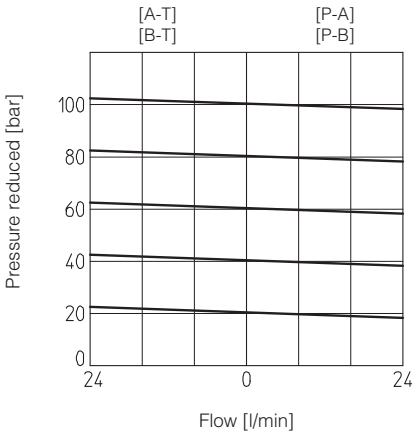
SOLENOID POWER SUPPLY CONNECTOR TYPE 666

PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND



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

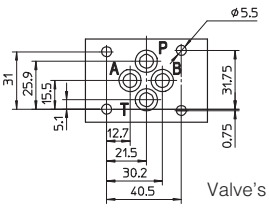




9 INSTALLATION DIMENSIONS FOR SDHRZE [mm]

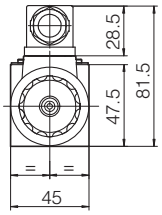
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05

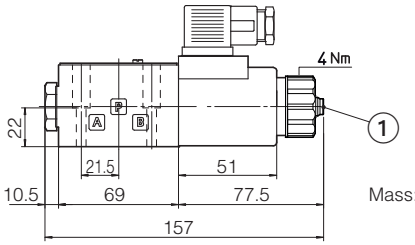
Fastening bolts: 4 socket head screws M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108;
Diameter of ports A, B, P, T: Ø 7,5 mm (max)



Valve's bottom view

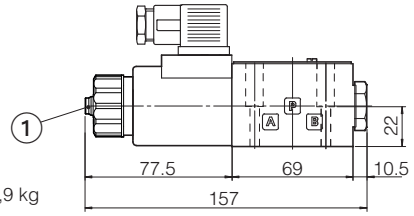
SDHRZE-A-010



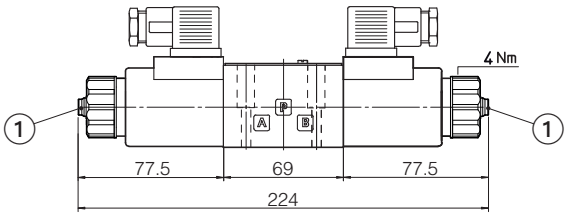


Mass: 1,9 kg

SDHRZE-A-010/B



SDHRZE-A-012

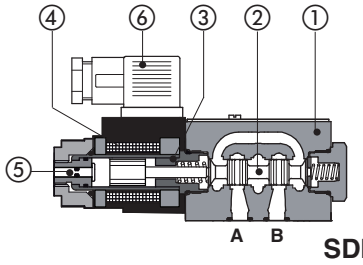


Mass: 2,6 kg

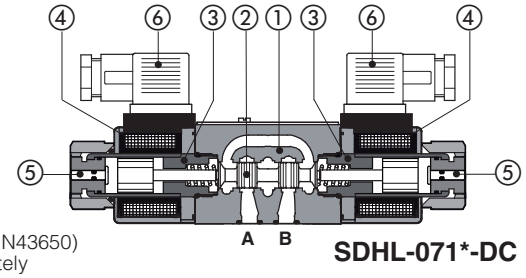
(1) screw for air bleeding

Solenoid directional valves type SDHL

direct, spool type, **compact execution**



SDHL-061*-AC



SDHL-071*-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 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.

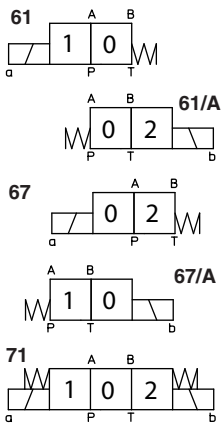
Mounting surface: **ISO 4401 size 06**
Max flow: **60 l/min**
Max pressure: **350 bar**

1 MODEL CODE

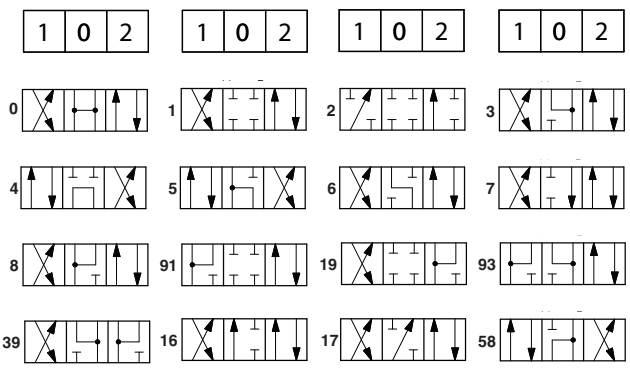
SDHL - 0	61	1	/A	-	X	24 DC	**	/*
Directional control valves size 06 compact execution	Valve configuration, see section 2 **61** = single solenoid, center plus external position, spring centered **63** = single solenoid, 2 external positions, spring offset **67** = single solenoid, center plus external 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, MO, MV, WP,** see section 6				**00-AC** = AC solenoids without coils **00-DC** = DC solenoids without coils **X** = without connector See section 11 for available connectors, to be ordered separately Coils with special connectors, see section 12 **XK** = Deutsch connector	Voltage code, see section 5	Series number	Seals material, see section 4: **-** = NBR **PE** = FKM

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

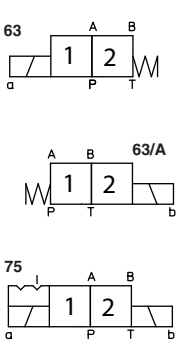
Configurations



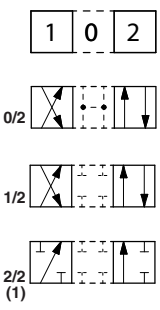
Spools



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)
MTTFd valves according to EN ISO 13849	150 years, 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	**60 l/min**, see Q/Δp diagram at section 7 and operating limits at section 8

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 coil voltage 5
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 COIL VOLTAGE

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil
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 DC	**110 DC**			COL-110DC
220 DC	**220 DC**			COL-220DC
110/50 AC (1)	**110/50/60 AC**		58VA (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.

6 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.
MV, MO = auxiliary hand lever positioned vertically (MV) or horizontally (MO).
Available for configuration: **61 - 63 - 71**, spools: **0 - 0/2 - 1 - 1P - 1/2 - 1/2P - 3 - 3P - 4 - 7**
WP = prolonged manual override protected by rubber cap.

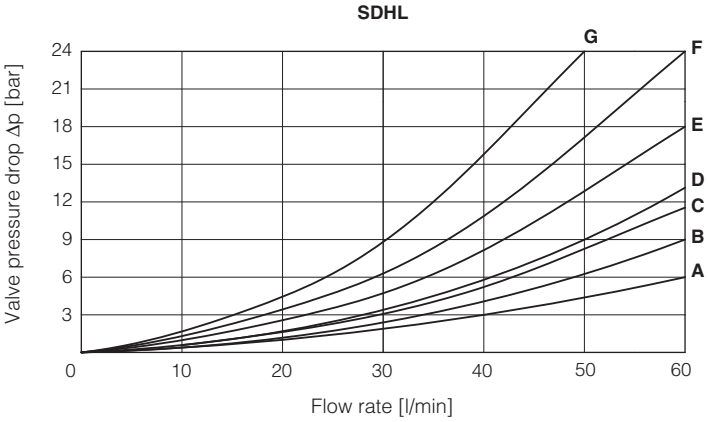
6.1 Accessories

WPD/SHL = (only for SDHL-***DC**) manual override with detent, to be ordered separatelly, see section 15

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

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

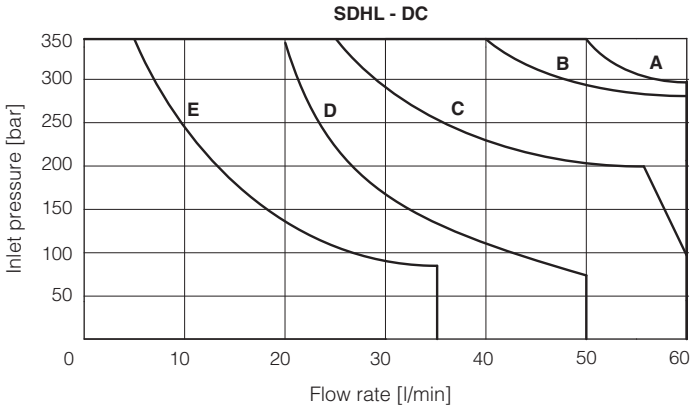
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	



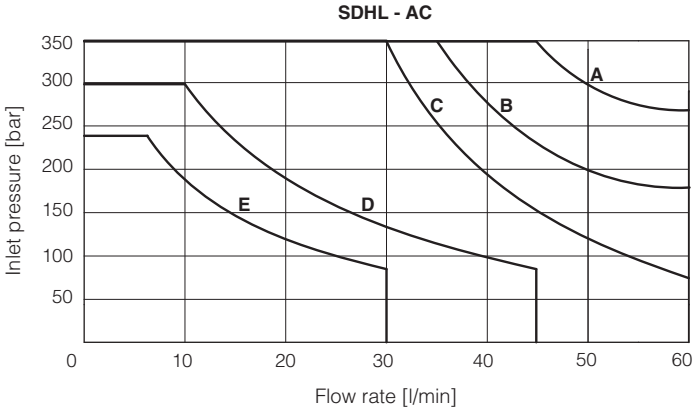
8 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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, 16, 17, 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, 16, 17, 4/8, 5, 5/1, 19, 39, 58, 58/1, 91, 93
E	2, 2/2



9 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.

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

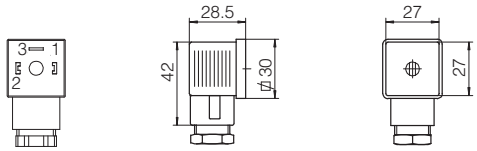
10 SWITCHING FREQUENCY

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

11 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

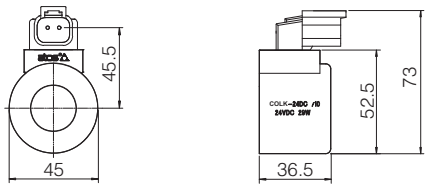
666, 667

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

SUPPLY VOLTAGES

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

12 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**

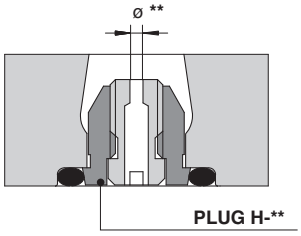
Note: For the electric characteristics refer to standard coils features - see section 5

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



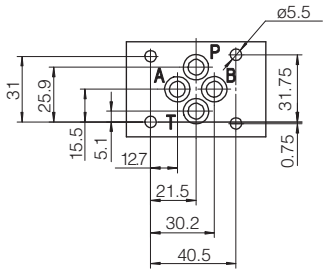
14 DIMENSIONS [mm]

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

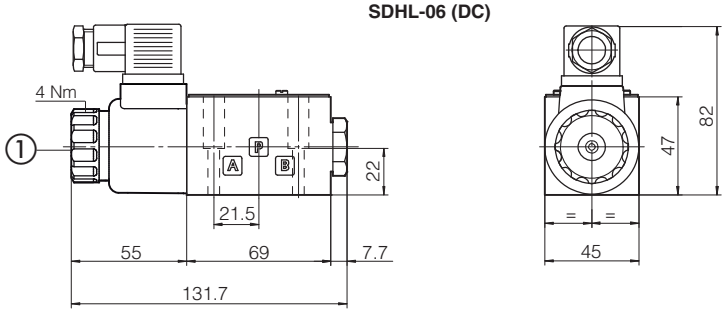
Mass (Kg)		
	DC	AC
SDHL-06	1,3	1,2
SDHL-07	1,6	1,4

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

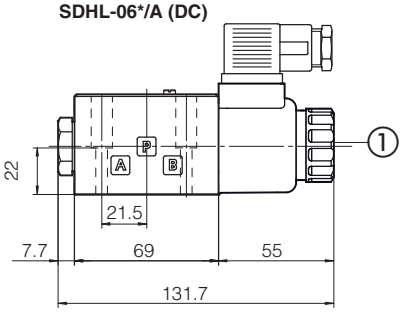
Valve's bottom view



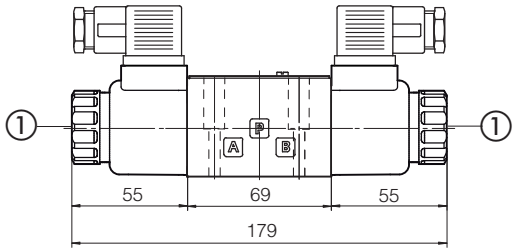
SDHL-06 (DC)



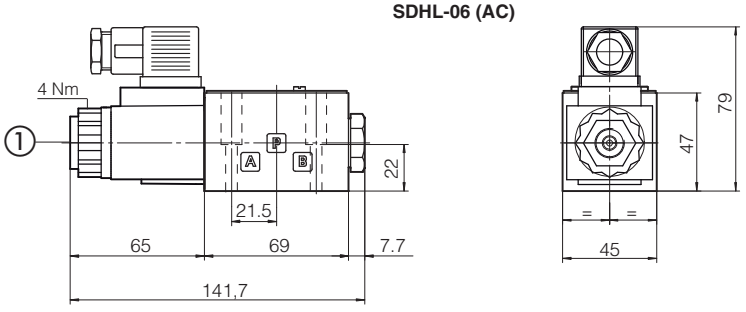
SDHL-06*/A (DC)



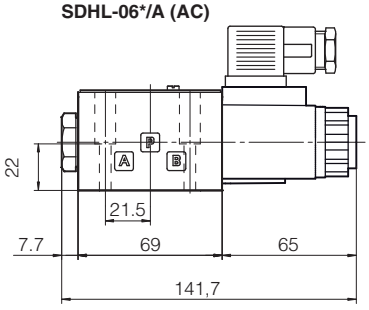
SDHL-07 (DC)



SDHL-06 (AC)



SDHL-06*/A (AC)



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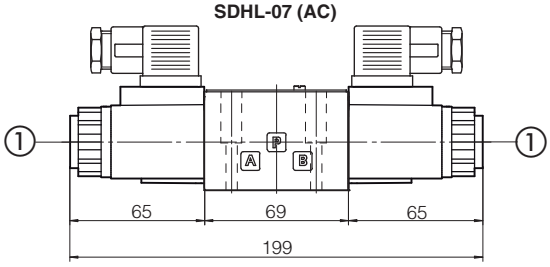


① Standard manual override PIN

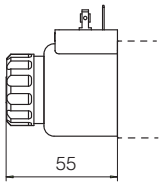
Overall dimensions are referred to valves with connector 666

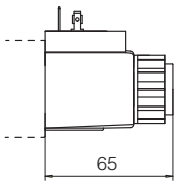
⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

15 MANUAL OVERRIDE

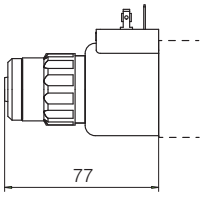
DC Solenoids | **AC Solenoid**

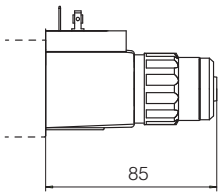
STD
execution



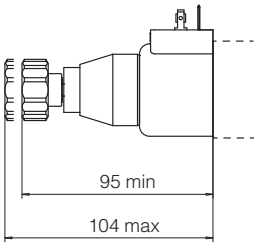


option / **WP**





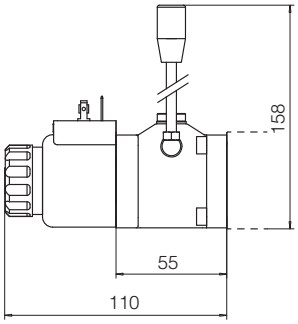
WPD/SHL
to be ordered
separately

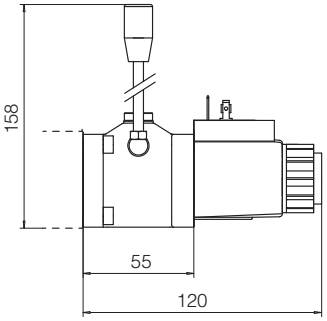


Not available
for AC version

option / **MV**

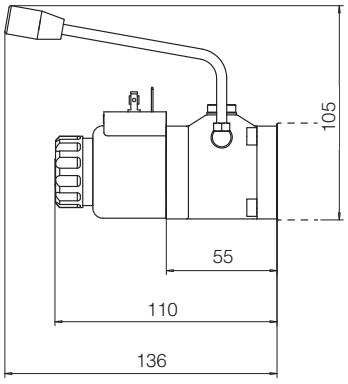
Mass:
+ 0,9 kg

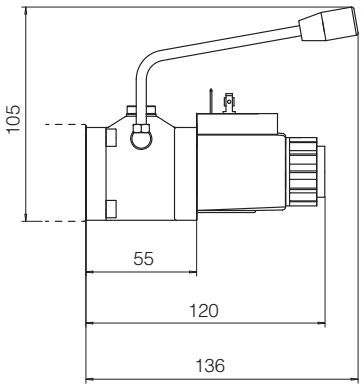




option / **MO**

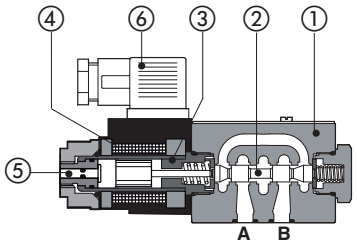
Mass:
+ 0,9 kg



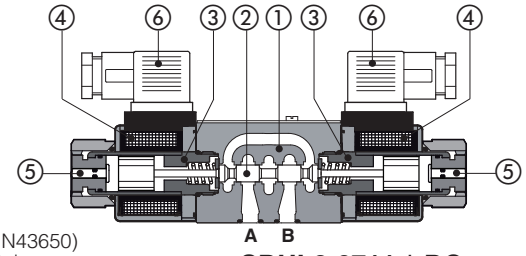


Solenoid directional valves type SDHL8

direct, spool type, **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

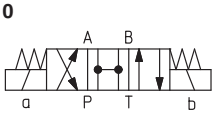
24 DC: Voltage code, see section [6]

******: Series number

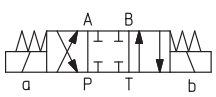
/*: Seals material, see section [4]:
- = NBR
PE = FKM

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

710



711



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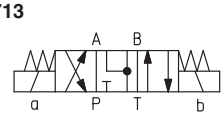
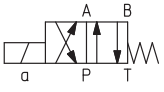
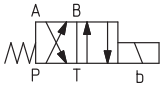


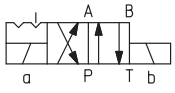
631/2



631/2A



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

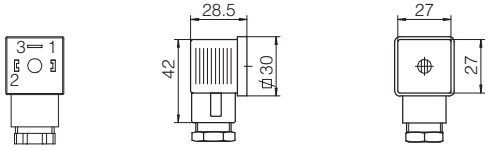
External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil SDHL
12 DC	**12 DC**	666 or 667	29 W	COL-12DC
14 DC	**14 DC**			COL-14DC
24 DC	**24 DC**			COL-24DC
28 DC	**28 DC**			COL-28DC
110/50 AC (1)	**110/50/60 AC**		58 VA (3)	COL-110/50/60AC
230/50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

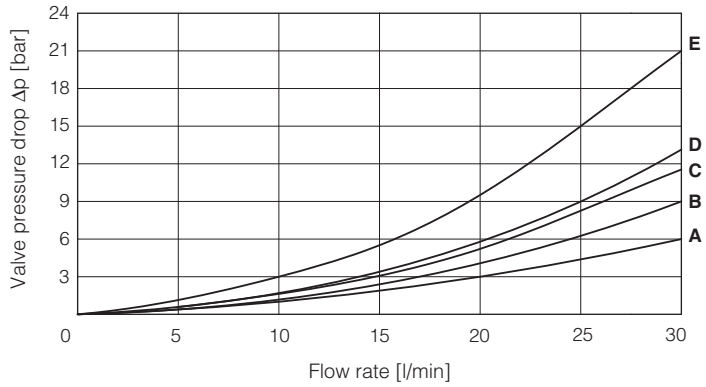
666 = standard connector IP-65, suitable for direct connection to electric supply source.

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

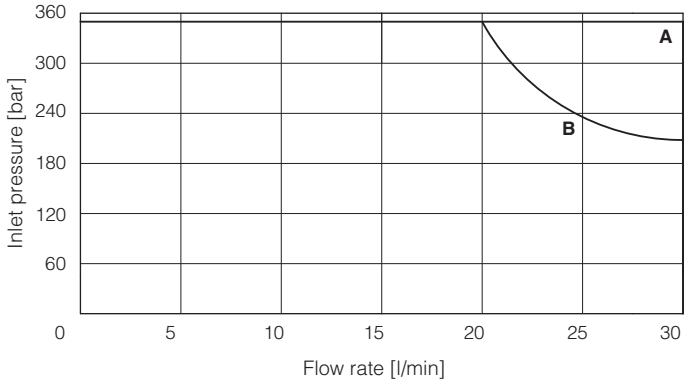
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T center	A→T B→T center
0	A	A	A	A	E	
1	C	C	B	B		
1/2	D	B	D	B		
3	C	C	A	A		E



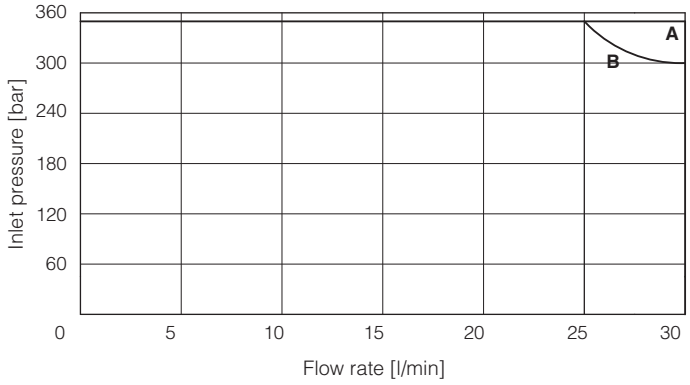
9 **OPERATING LIMITS** based on mineral oil ISO VG 46 at 50°C

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

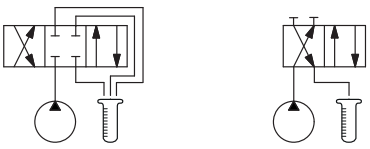


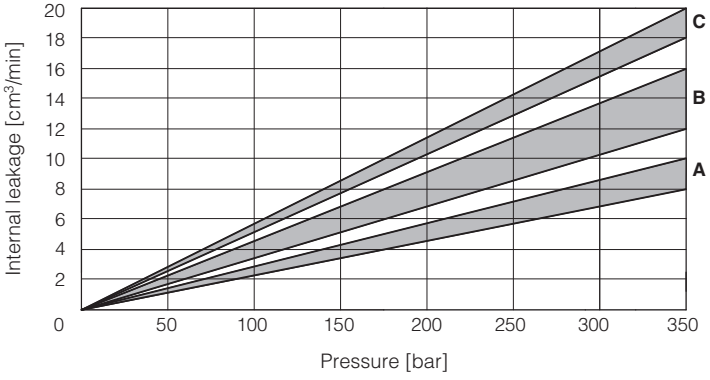
Curve	AC version, spool type
A	1, 1/2
B	0, 3



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.

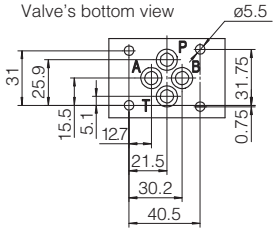
Switch-on AC	Switch-off AC	Switch-on DC	Switch-off DC
10-25	20-40	30-50	15-25

12 SWITCHING FREQUENCY

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

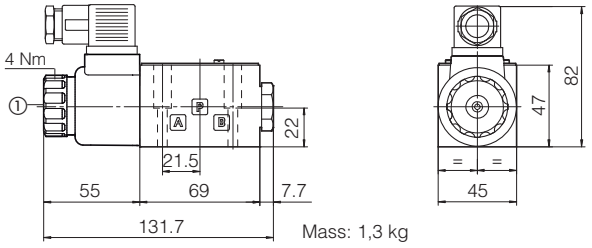
13 DIMENSIONS [mm]

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)



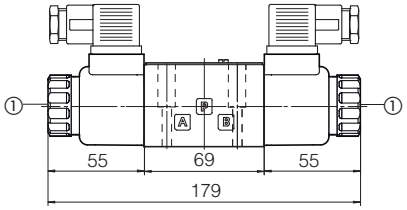
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDHL8-06(DC)



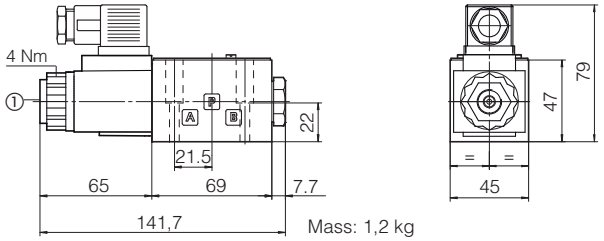
Mass: 1,3 kg

SDHL8-07(DC)



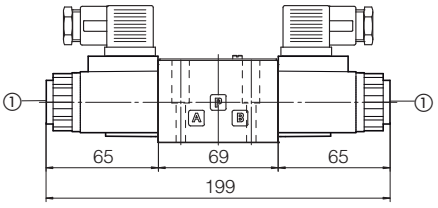
Mass: 1,6 kg

SDHL8-06(AC)



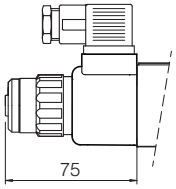
Mass: 1,2 kg

SDHL8-07(AC)

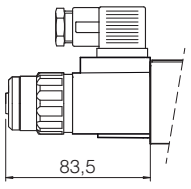


Mass: 1,4 kg

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

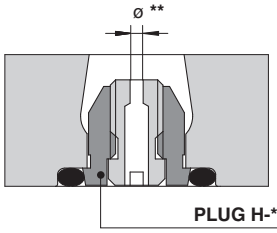
14 PLUG-IN RESTRICTOR (to be ordered separately)

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

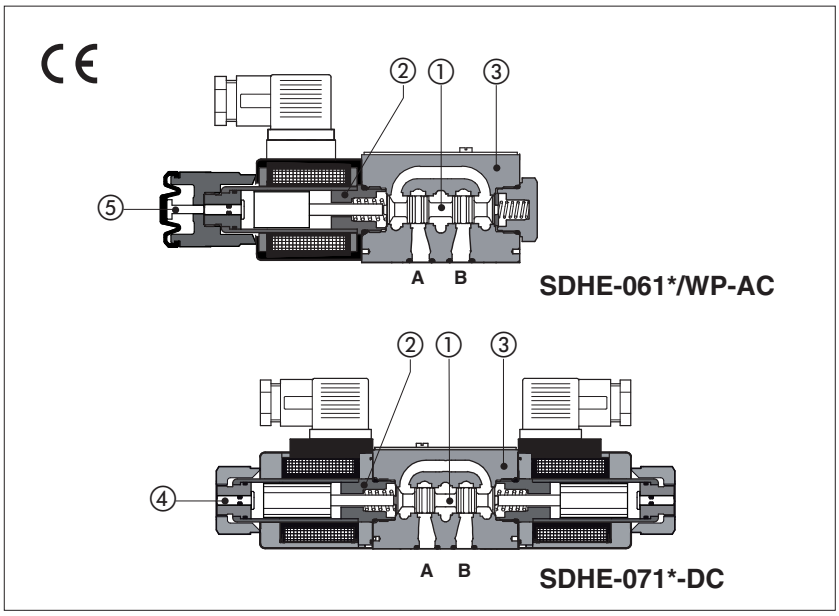
Example PLUG-H-**12** = orifice diameter **1,2 mm**
Other orifice dimensions are available on request



PLUG H-**

Solenoid directional valves type SDHE

direct, spool type, high flow



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 4 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.

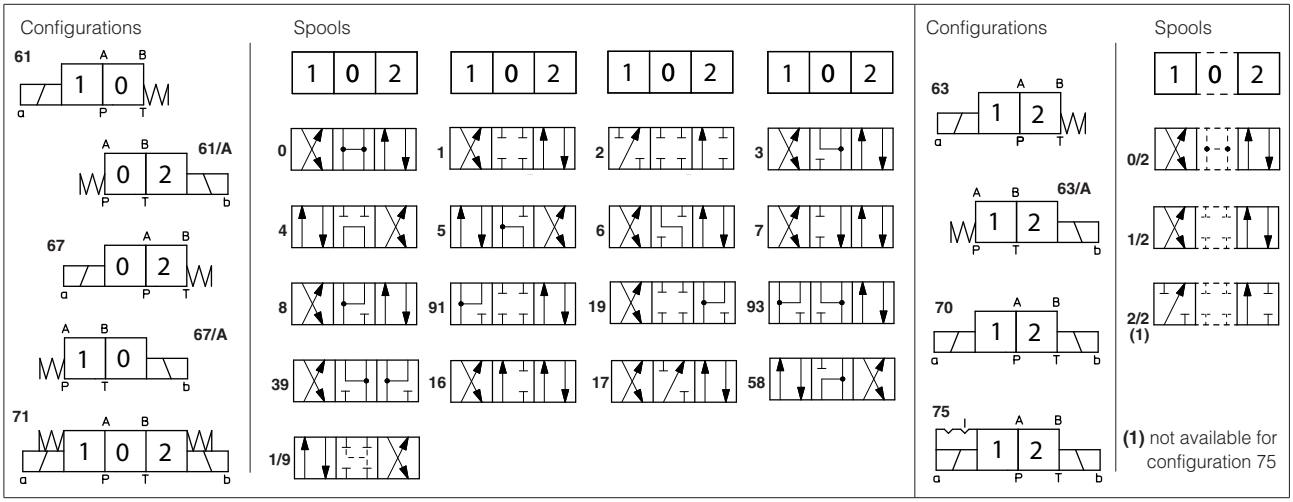
The valve body ③ is 3 chamber type made by shell-moulding casting with wide internal passages ensuring low pressure drops.

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	**	/*
Directional control valves size 06	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	Spool type, see section 2. Options: **A, MO, MV, WP, L***, see section 6.			**00-AC** = AC solenoids without coils **00-DC** = DC solenoids without coils **X** = without connector See section 11 for available connectors, to be ordered separately Coils with special connectors, see section 12 **XJ** = AMP Junior Timer connector **XK** = Deutsch connector **XS** = Lead Wire connection	Voltage code, see section 4	Series number	Seals material, see section 3: **-** = NBR **PE** = FKM **BT** = NBR low temp.

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



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)
MTTFd values according to EN ISO 13849	150 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
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	**80 l/min**, see operating limits at section 8

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 coil voltage 5
Supply voltage tolerance	± 10%
Certification	**cURus** North American Standard

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 NBR low temp. (/BT option) = -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, NBR low temp.	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, NBR low temp.	HFC	

5 COIL VOLTAGE

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil
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
230/50 AC	**230/50/60 AC**			COE-230/50/60AC
110/50 AC (1)	**110/50/60 AC**	669	30 W	COE-110RC
230/50 AC (1)	**230/50/60 AC**			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 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.
MV, MO = auxiliary hand lever positioned vertically (MV) or horizontally (MO).
Available for configuration: **61 - 63 - 71**, spools: **0 - 0/2 - 1 - 1P - 1/2 - 1/2P - 3 - 3P - 4 - 7**
WP = prolonged manual override protected by rubber cap.
L1, L2, L3 = (only for SDHE-DC) device for switching time control, installed in the valve solenoid.
For spools 4 and 4/8 only device L3 is available.

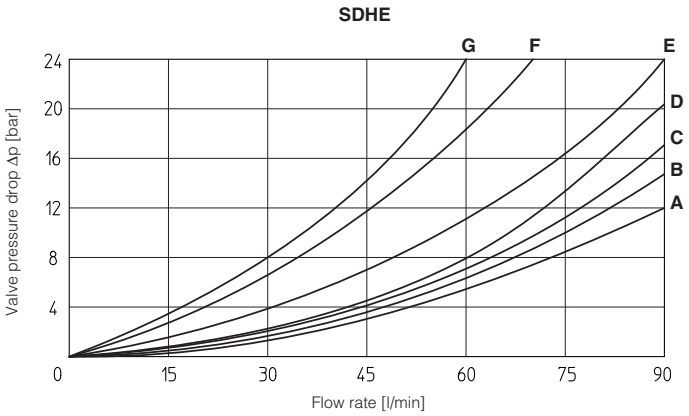
6.1 Accessories

WPD/SHE = (only for SDHE-*__DC__) manual override with detent, to be ordered separatelly, see section 15

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

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

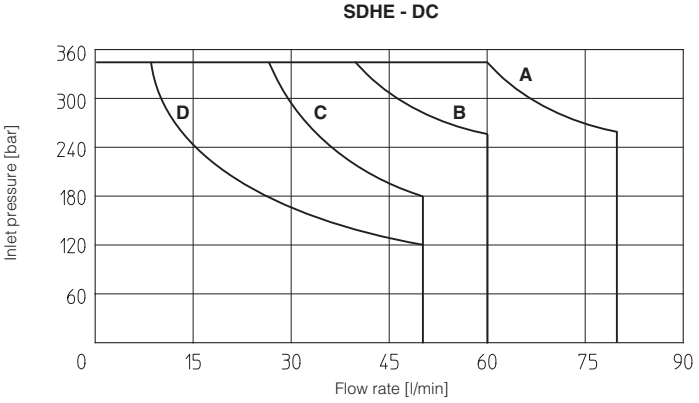
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1, 1/9	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	



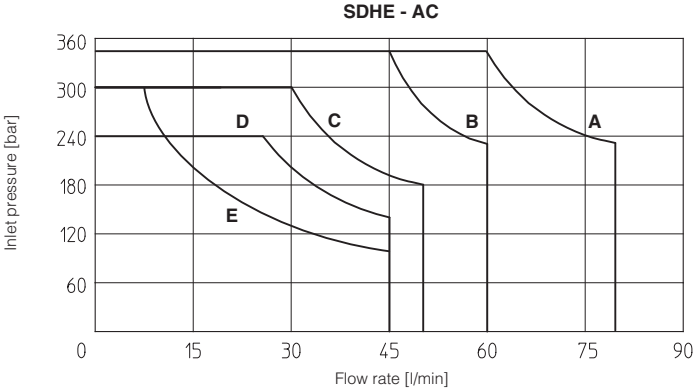
8 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value (Vnom - 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, 1, 1/2, 3, 8
B	0/2, 1/1, 6, 7, 1/9, 19
C	3/1, 4, 4/8, 5, 5/1, 16, 17, 19, 39, 58, 58/1, 91, 93
D	2, 2/2



Curve	AC version, spool type:
A	1, 1/2, 8
B	0, 0/1, 0/2, 1/1, 1/9, 3
C	3, 3/1, 6, 7
D	4, 4/8, 5, 5/1, 16, 17, 19, 39, 58, 58/1, 91, 93
E	2, 2/2



9 **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.

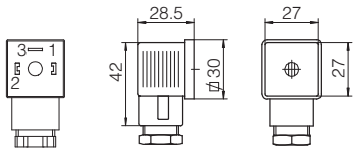
Valve	Switch-on AC	Switch-off AC	Switch-on DC	Switch-off DC
SDHE	10 - 25	20 - 40	30 - 50	15 - 25
SDHE-*/L1	—	—	60	60
SDHE-*/L2	—	—	80	80
SDHE-*/L3	—	—	150	150

10 **SWITCHING FREQUENCY**

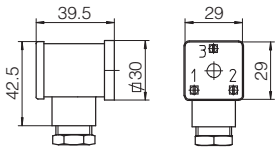
Valve	AC (cycles/h)	DC (cycles/h)
SDHE + 666 / 667	7200	15000

11 **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

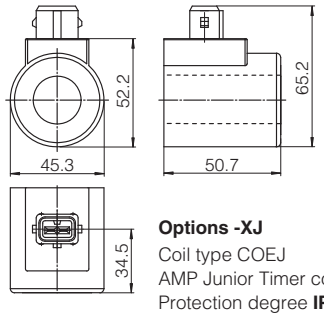
669
1,2 = Supply voltage V_{AC}
3 = Coil ground

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

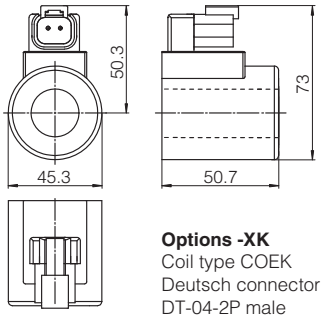
12 **COIL WITH SPECIAL CONNECTORS** only for voltage supply **12, 14, 24, 28 VDC**

AMP Junior timer connector



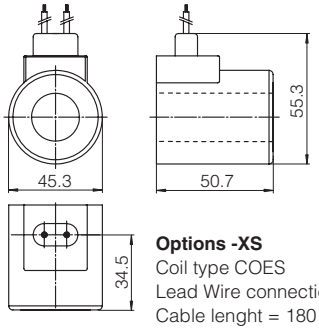
Options -XJ
Coil type COEJ
AMP Junior Timer connector
Protection degree **IP67**

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

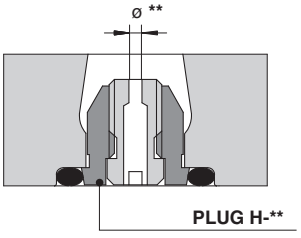
13 **PLUG-IN RESTRICTOR** (to be ordered separately)

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

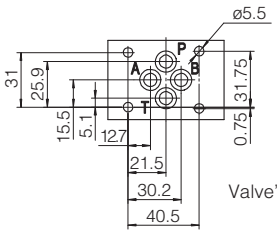
Example PLUG-H-**12** = orifice diameter **1,2 mm**
Other orifice dimensions are available on request



PLUG H-**

14 DIMENSIONS [mm]

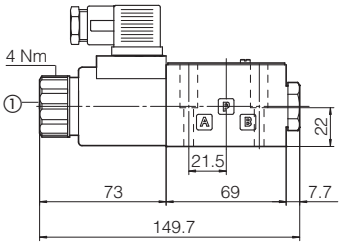
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

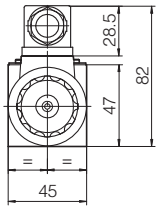


Valve's bottom view

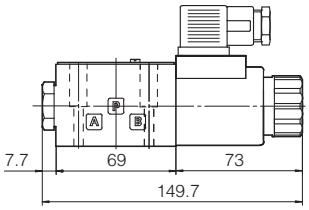
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

SDHE-06(DC)



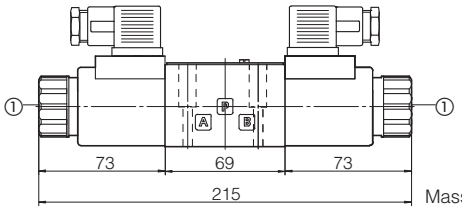


SDHE-06*A(DC)



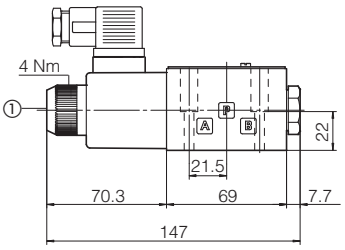
Mass: 1,5 kg

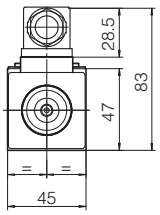
SDHE-07(DC)



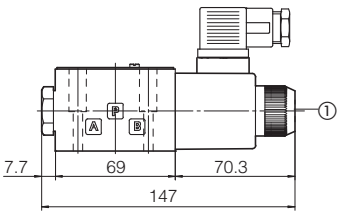
Mass: 2 kg

SDHE-06(AC)



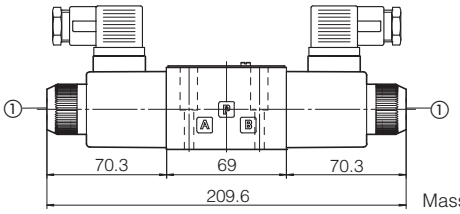


SDHE-07*/A(AC)



Mass: 1,4 kg

SDHE-07(AC)



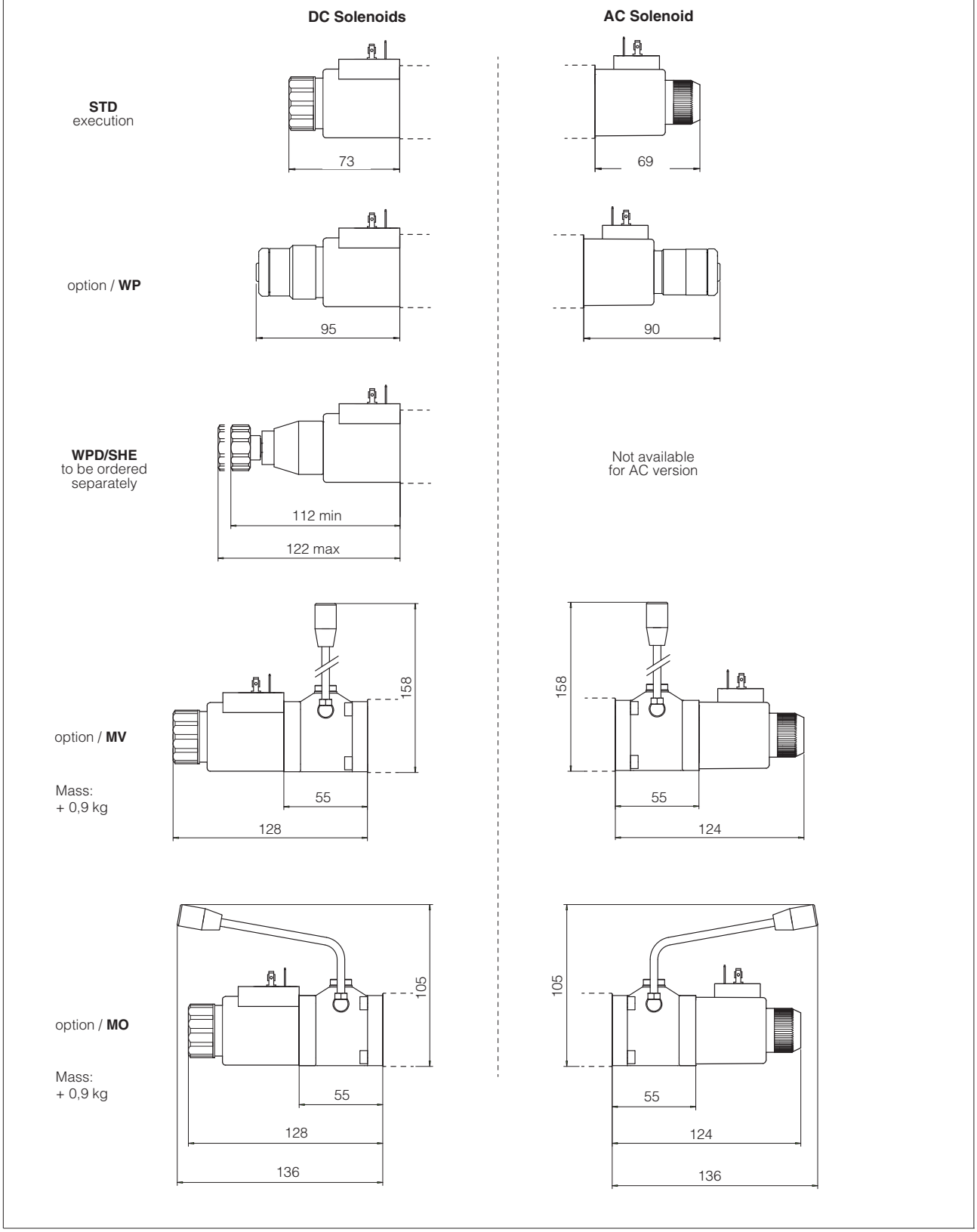
Mass: 1,8 kg

① Standard manual override PIN

Overall dimensions are referred to valves with connector 666

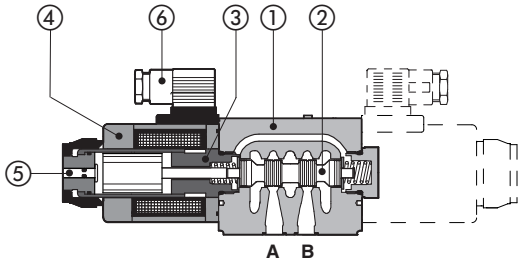
⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

15 MANUAL OVERRIDE



Solenoid directional valves type SDKL

directed, spool type



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.

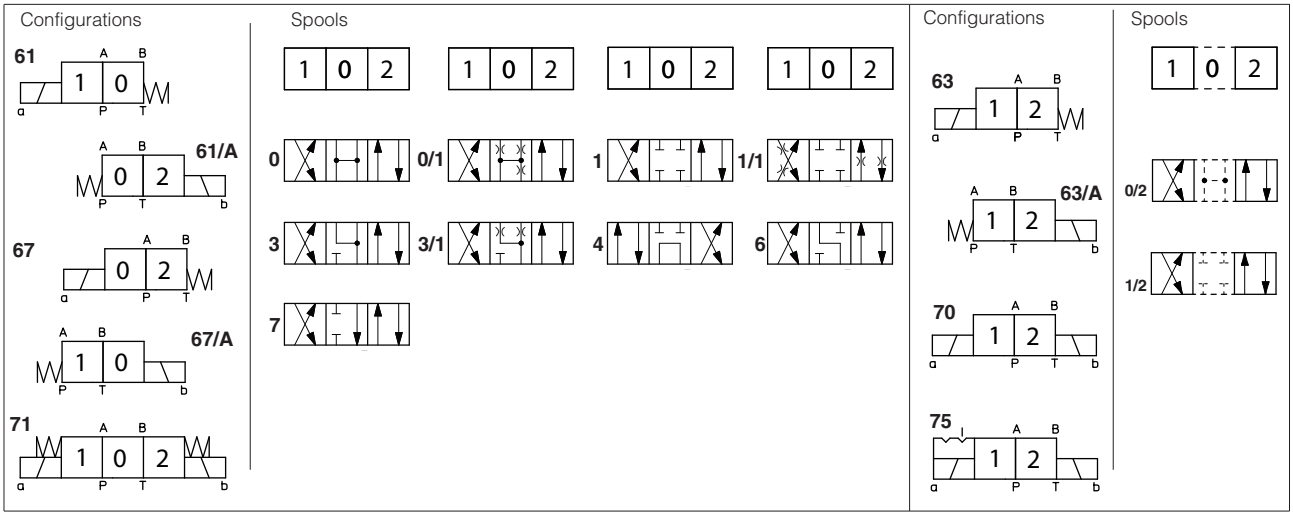
X = standard coil without connector

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)



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

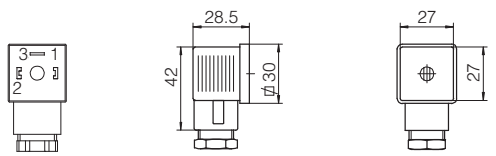
A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.
WP = prolonged manual override protected by rubber cap - see section 12.

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

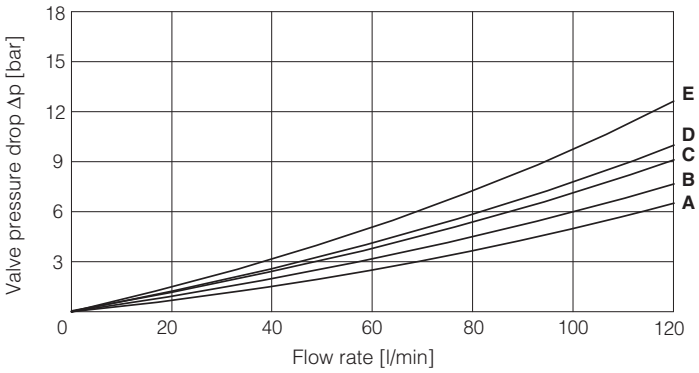
7 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

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 All voltages	**667** only for 24 DC

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

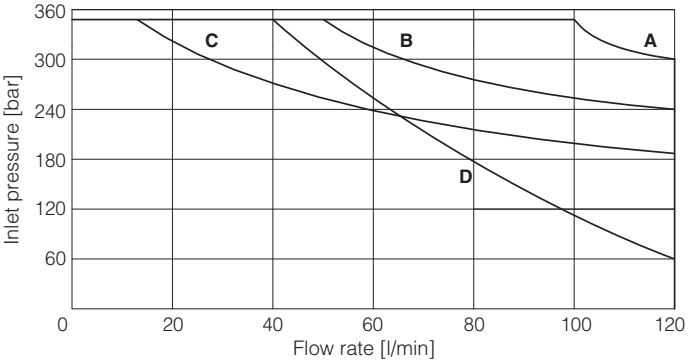
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1, 0/2	A	A	B	B	
1, 1/1, 6	A	A	D	C	
3, 3/1, 7	A	A	C	D	
4	B	B	B	B	E
1/2	B	C	C	B	



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

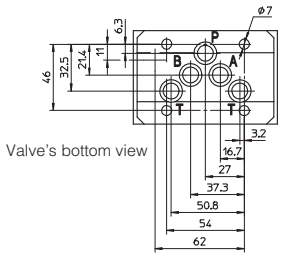
Test conditions:
- 50 l/min; 150 bar
- nominal supply voltage
- 2 bar of back pressure on port T
- mineral oil ISO VG 46 at 50°C

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

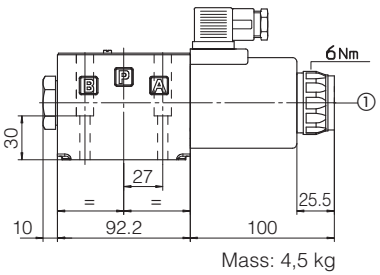
12 INSTALLATION DIMENSIONS [mm]



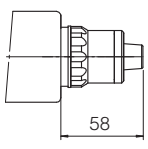
ISO 4401: 2005
Mounting surface according to 4401-05-05-0-05
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050 and 1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)
Ports Y: Ø = 5 mm

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

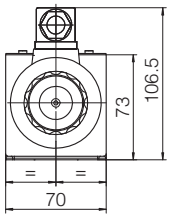
SDKL-16*-DC



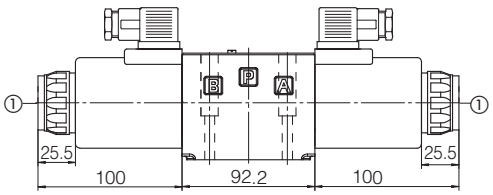
Mass: 4,5 kg



Option /WP



SDKL-17*-DC

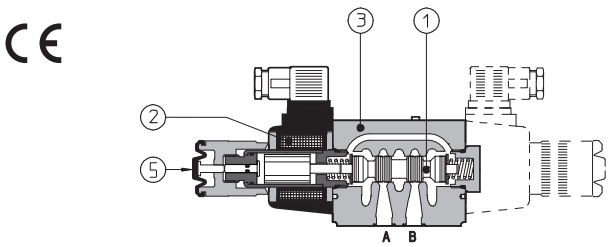


Mass: 6,1 kg

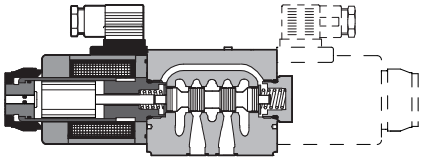
① Standard manual override PIN. The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

Solenoid directional valves type SDKE

direct, spool type



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**

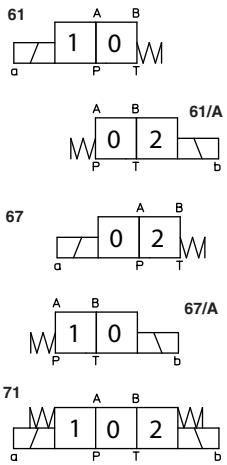
24 DC
Voltage code, see section 5

******
Series number

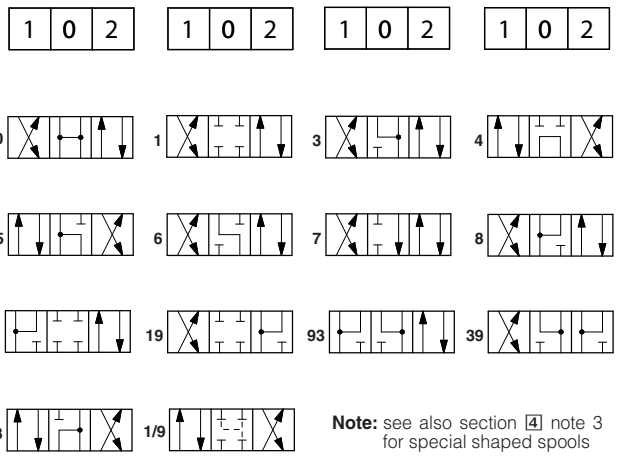
*****
Seals material, see section 4:
- = NBR
PE = FKM
BT = HNBR

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

Configurations

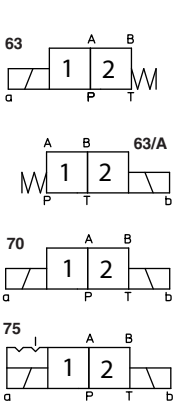


Spools

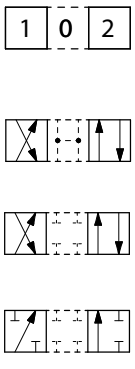


Note: see also section 4 note 3 for special shaped spools

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

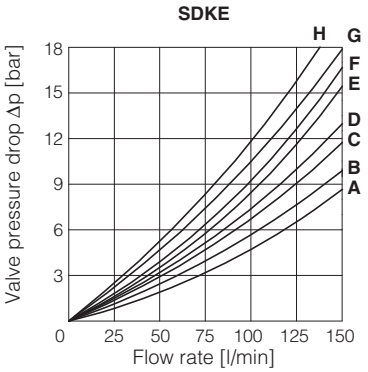
(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 90 VA

(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.

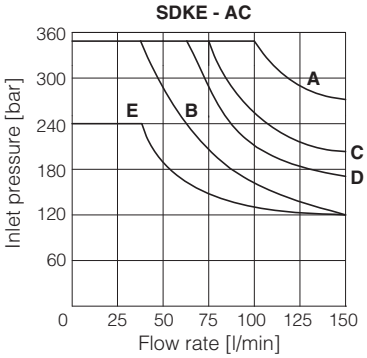
6 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

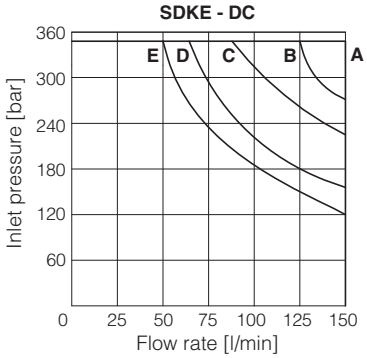
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T	B→A
0, 0/1, 0/2, 2/2	A	A	B	B		
1, 1/1, 1/9, 6, 8	A	A	D	C		
3, 3/1, 7	A	A	C	D		
4	B	B	B	B	F	
5, 58	A	B	C	C	G	
1/2	B	C	C	B		
19, 91	F	F	G	G		H
39, 93	F	F	G	G		H

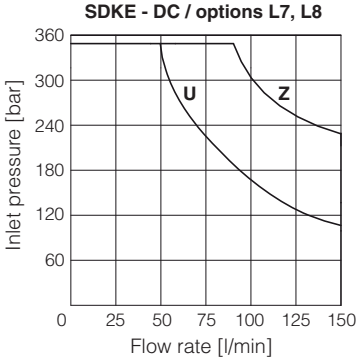


7 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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.

9 SWITCHING FREQUENCY

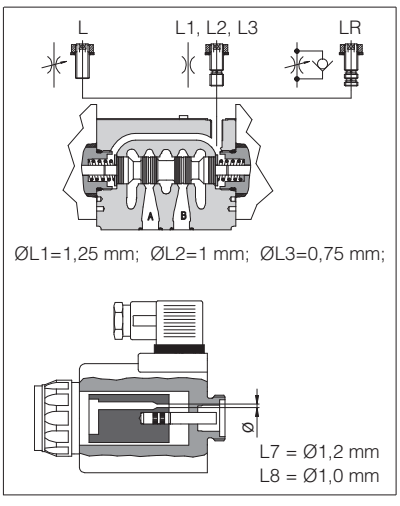
Valve	AC (cycles/h)	DC (cycles/h)
SDKE + 666 / 667	7200	15000

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.

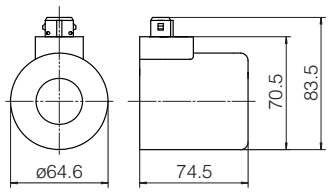
- **L**: controls and regulates the switching time in both moving directions of the spool: regulation is carried out by screwing/unscrewing the element itself (regulating choke);
- **L1/L2/L3**: controls the switching time in both moving directions of the spool by means of fixed calibrated restrictor (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.

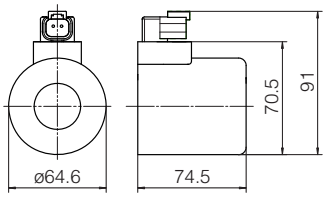


11 COILS TYPE CAE WITH SPECIAL CONNECTORS (only for 12DC, 14DC, 24DC and 28DC)

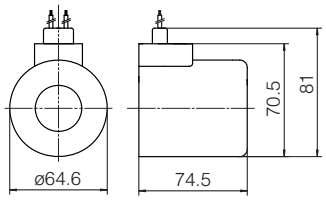
Options -XJ
Coil type CAEJ
AMP Junior Timer connector
Protection degree IP67
certified **cURus**



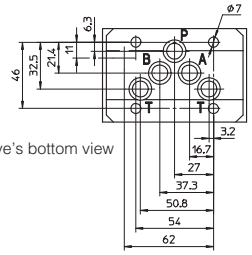
Options -XK
Coil type CAEK
Deutsch connector, DT-04-2P male
Protection degree IP67



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



12 INSTALLATION DIMENSIONS [mm]

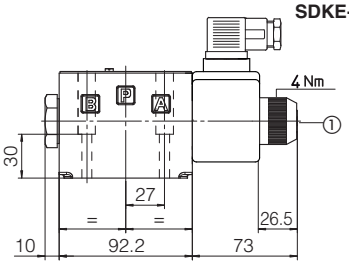


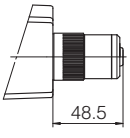
Valve's bottom view

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

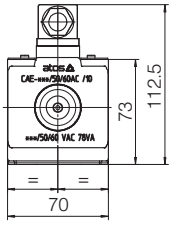
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
For the max pressures on ports, see section 3

SDKE-16*-AC

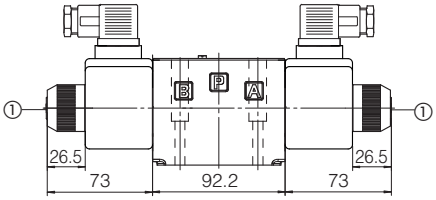




Option /WP



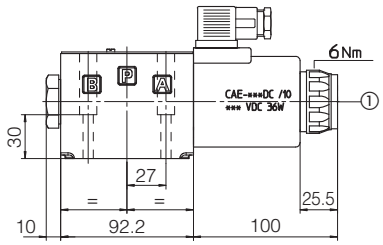
SDKE-17*-AC

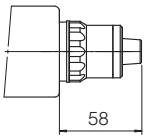


Mass: 3,9 kg

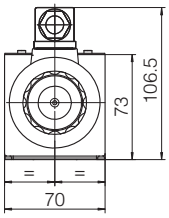
Mass: 4,7 kg

SDKE-16*-DC

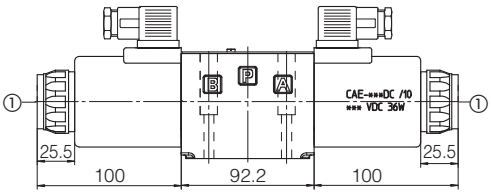




Option /WP



SDKE-17*-DC

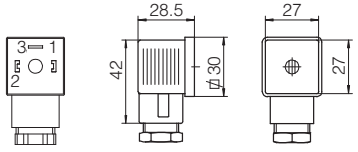
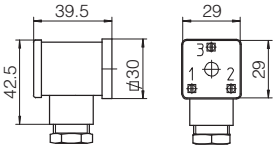


Mass: 4,5 kg

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

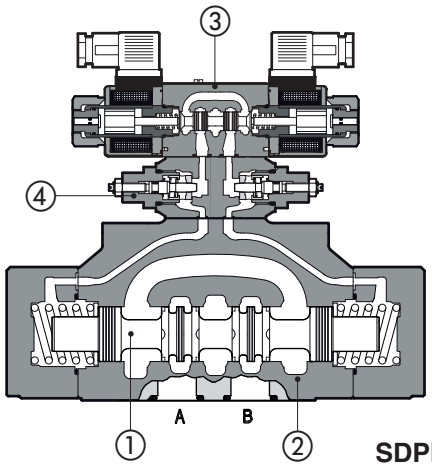
13 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

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 VAC 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

Solenoid directional valves type SDPHL

piloted, spool type



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	**	/	*

SDPH: Pilot operated directional control valve

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

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

61 / 63 / 67 / 71 / 75: 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 / 2 / 3 / 4 / 5 / 6 / 7 / 19 / 39 / 58 / 91 / 93 / 0/2 / 1/2 / 2/2: Spool type, see section 2

A / B: Options, see section 4

X = without connector
See section 10 for available connectors, to be ordered separately
XK = Deutsch connector

24 DC: Voltage code, see section 5

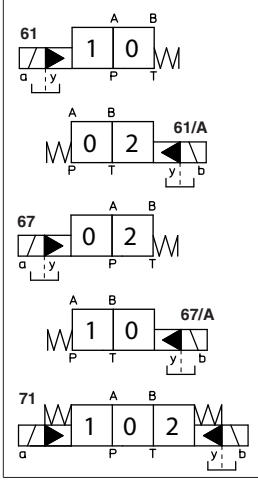
******: Series number

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

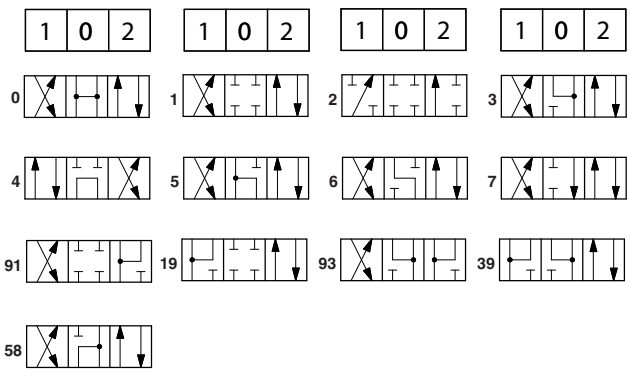
Note: SDPHL-* S PIL version without pilot solenoid valve available on request

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

Configurations

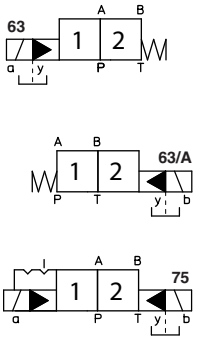


Spools

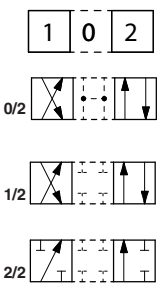


NOTES (see also section 4.2 for special shaped spools):

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%

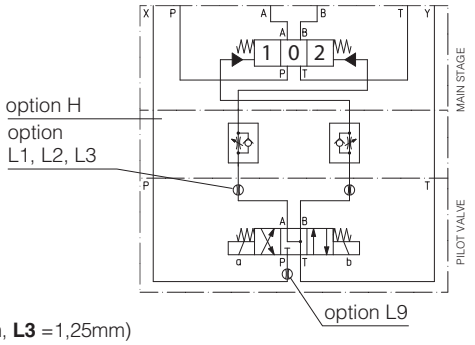
4 NOTES

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 4.3
/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

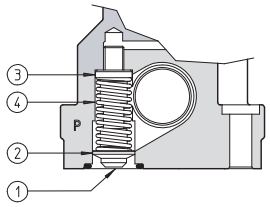
4.2 Special shaped spools

- 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

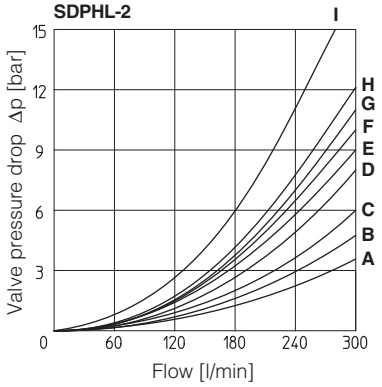
5 ELECTRIC FEATURES

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	29 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 DC	**110 DC**			COL-110DC	-
	220 DC	**220 DC**			COL-220DC	-
	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.

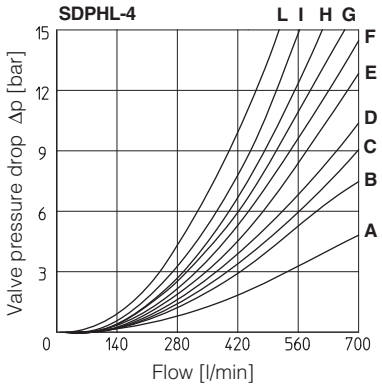
6 FLOW VERSUS PRESSURE DIAGRAMS Based on mineral oil ISO VG 46 at 50°C

SDPHL-2



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	-	-

SDPHL-4



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)

			Piloting pressure 70 bar		140 bar		250 bar	
Valve model	Configuration		Alternating current	Direct current	Alternating current	Direct current	Alternating current	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

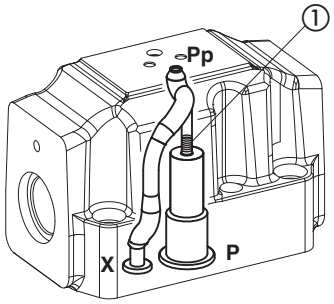
3) The response time is affected by elasticity of the hydraulic circuit, by variation of hydraulic characteristics and temperature.

9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

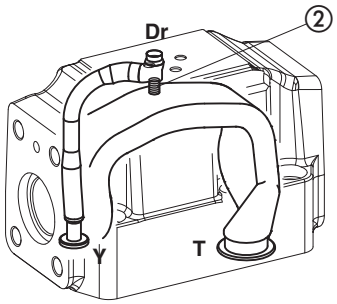
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external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

SDPHL-2

Pilot channels

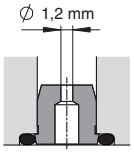


Drain channels



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.

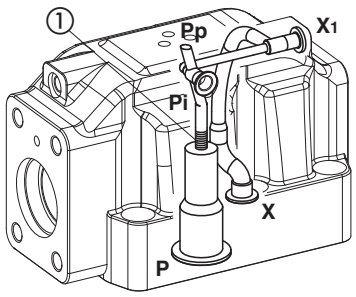
Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



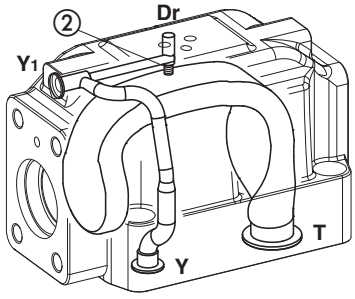
PLUG-12A

SDPHL-4

Pilot channels

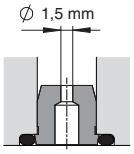


Drain channels



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

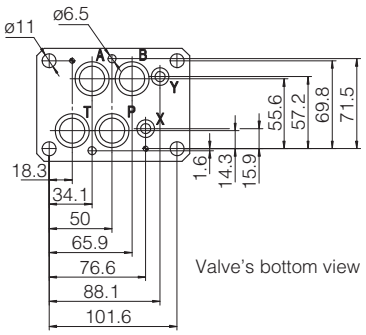
Connector code	Function
666	Connector IP65, suitable for direct connection to electric supply source
667	As 666 connector IP65 but with built-in signal led, suitable for direct connection to electric supply source

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

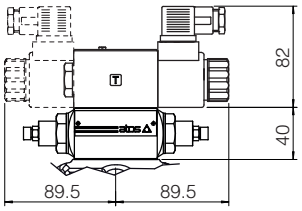
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



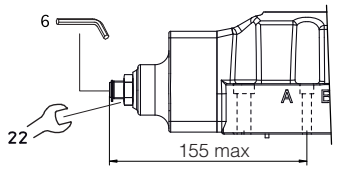
Valve's bottom view

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

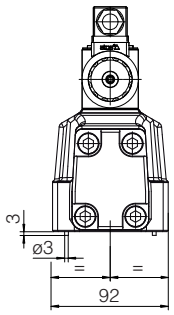
SDPHL-2*/H

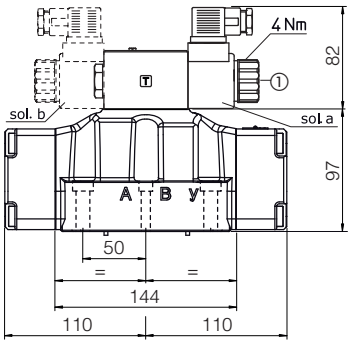


Stroke adjustment device for option /S



SDPHL-2*





Overall dimensions refer to valves with connectors type 666

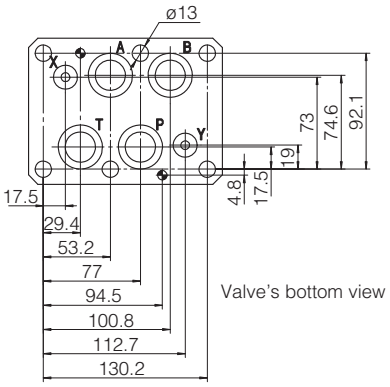
① Standard manual override PIN

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;

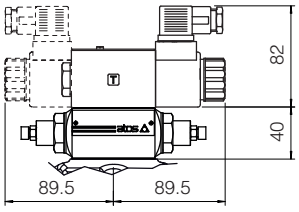
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

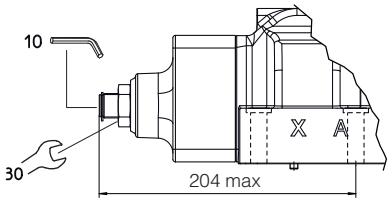


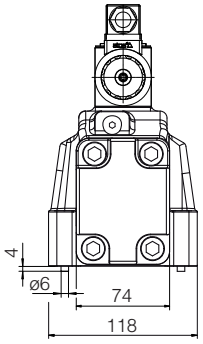
Valve's bottom view

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

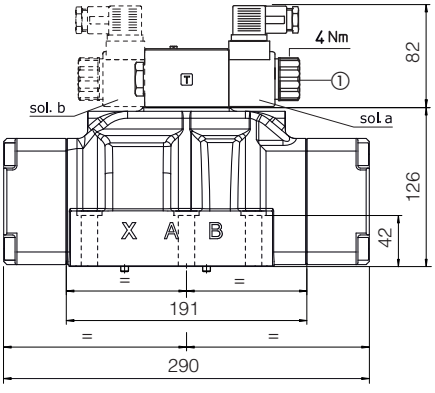
SDPHL-4*/H







SDPHL-4*

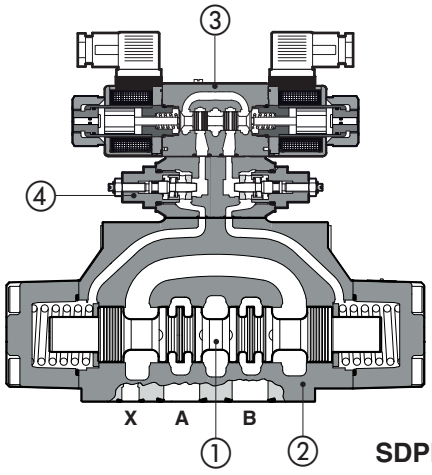


Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

Solenoid directional valves type SDPLHL

piloted, spool type, max pressure 280 bar



SDPLHL-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.
These valves are specifically designed for medium pressure applications such as in the plastics sector.
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 valves can be supplied with different options and special spools to best suit the application requirements, see section 4.

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 280 bar**

1 MODEL CODE

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

SDPLH: Pilot operated directional control valve, Pmax = 280 bar

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

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

61 63 67 71 75: 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
XK = Deutsch connector

24 DC: Voltage code, see section 5

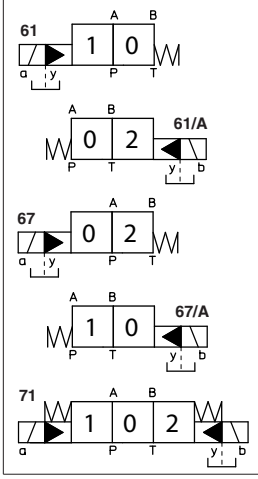
******: Series number

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

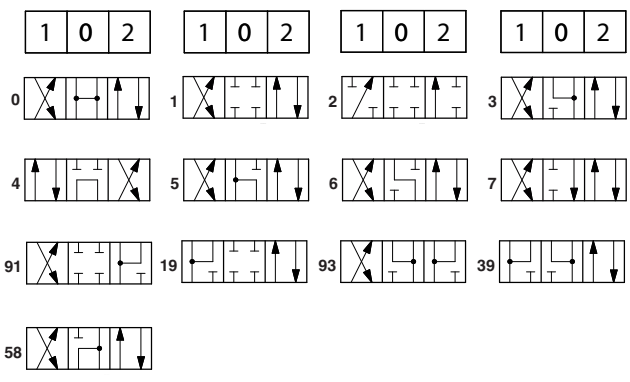
Note: SDPLHL-* S PIL version without pilot solenoid valve available on request

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

Configurations

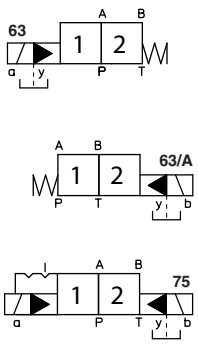


Spools

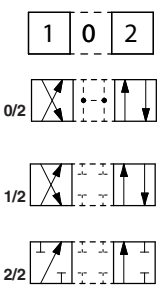


NOTES (see also section 4.2 for special shaped spools):

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 = **280 bar** T = **210 bar** for external drain (standard) T with internal drain (option /D) and port Y = **210 bar** SDPLHL (DC); **160 bar** SDPLHL (AC) Minimum pilot pressure = 8 bar		
Rated flow	See diagrams Q/Δp at section 6		
Maximum flow	SDPLHL-2: **300 l/min;** SDPLHL-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%

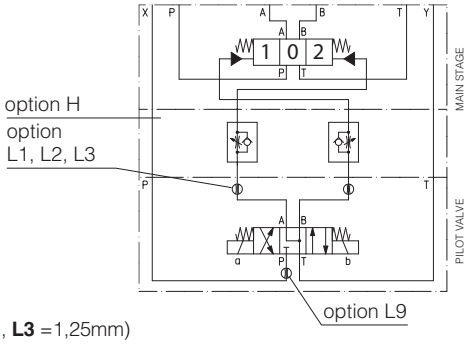
4 NOTES

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

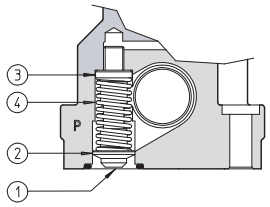
4.2 Special shaped spools

- 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
SDPLHL-2, SDPLHL-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

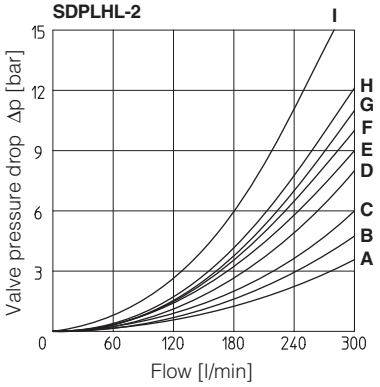
5 ELECTRIC FEATURES

Valve	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption **(2)**	Code of spare coil	
					X version	**XK** version
SDPLHL	12 DC	**12 DC**	666 or 667	29 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.

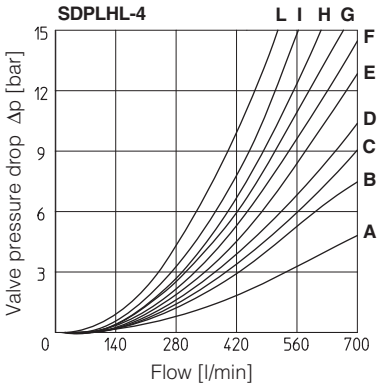
6 FLOW VERSUS PRESSURE DIAGRAMS Based on mineral oil ISO VG 46 at 50°C

SDPLHL-2



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	-
58	B	A	F	H	H
91	C	C	E	-	-
93	-	C	D	-	-

SDPLHL-4



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

SDPLHL-2

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**280**
	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

SDPLHL-4

Spool	**Inlet pressure** [bar]			
	70	**140**	**210**	**280**
	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
SDPLHL-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					
SDPLHL-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

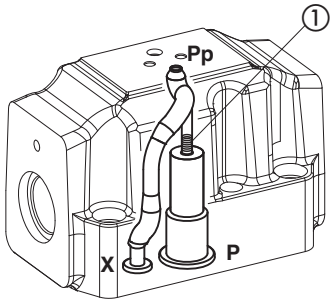
3) The response time is affected by elasticity of the hydraulic circuit, by variation of hydraulic characteristics and temperature.

9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

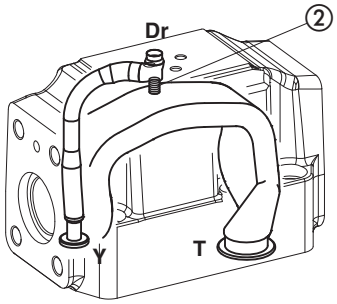
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external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

SDPLHL-2

Pilot channels

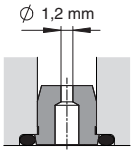


Drain channels



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.

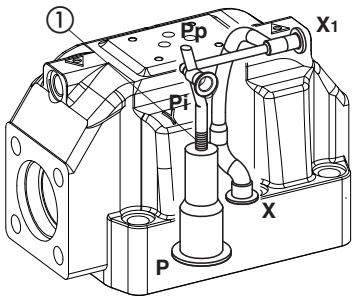
Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



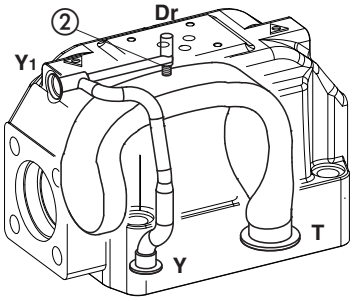
PLUG-12A

SDPLHL-4

Pilot channels

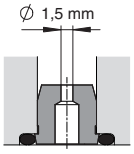


Drain channels



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

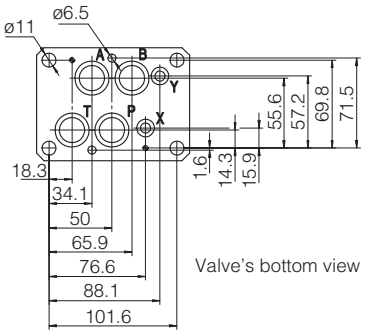
11 DIMENSIONS FOR SDPLHL-2 [mm]

SDPLHL-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

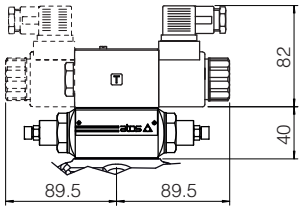
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

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

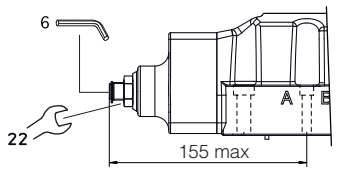


Valve's bottom view

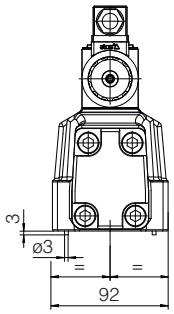
SDPLHL-2*/H

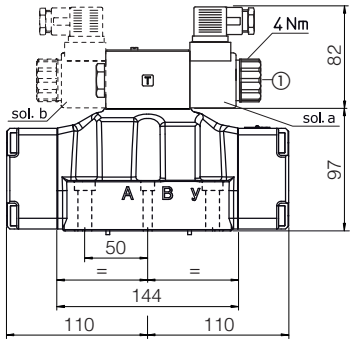


Stroke adjustment device for option /S



SDPLHL-2*





Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

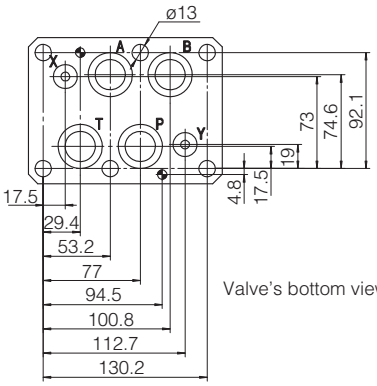
12 DIMENSIONS FOR SDPLHL-4 [mm]

SDPLHL-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;

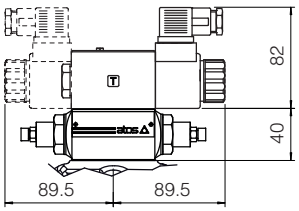
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

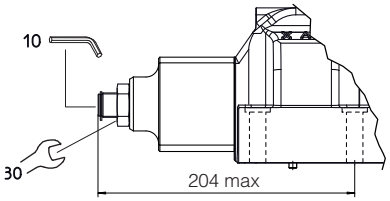
Mass (Kg)	
SDPLHL-46	17,2
SDPLHL-47	17,4
Option /S	+1,5
Option H	+1,0

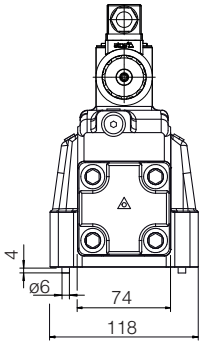


Valve's bottom view

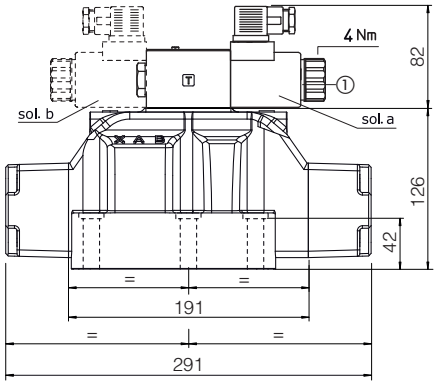
SDPLHL-4*/H







SDPLHL-4*

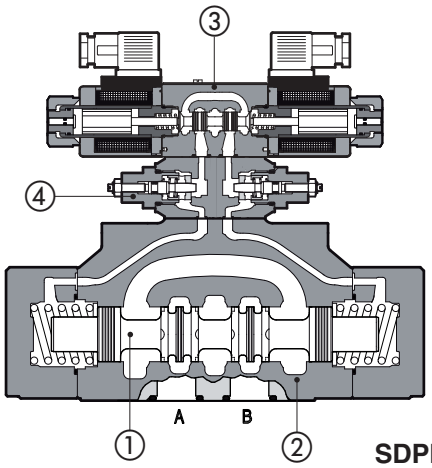


Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

Solenoid directional valves type SDPHE

piloted, spool type



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 SHE015) 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

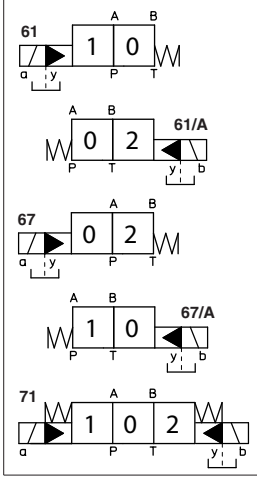
****** — Series number

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

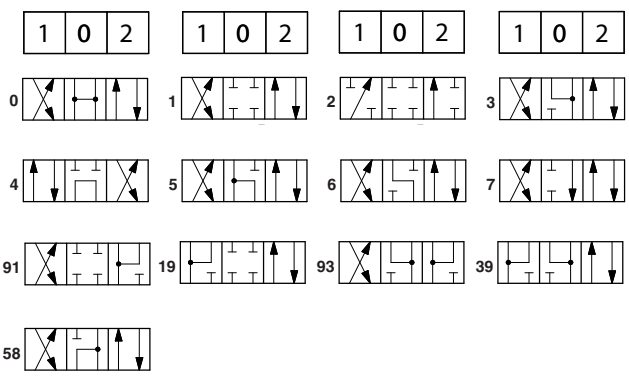
Note: SDPHE-* S PIL version without pilot solenoid valve available on request

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

Configurations

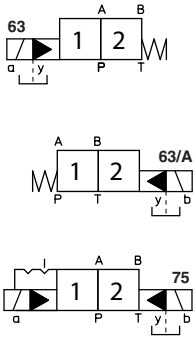


Spools

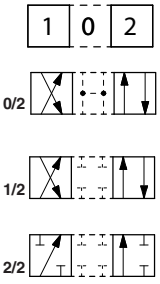


NOTES (see also section 4,2 for special shaped spools):
- For **DP*-6** are available only spools: **0, 1, 1/2, 2, 3, 4, 5, 58, 6, 7, 19, 91**

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

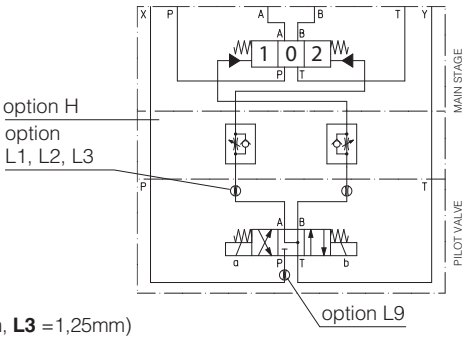
4 NOTES

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

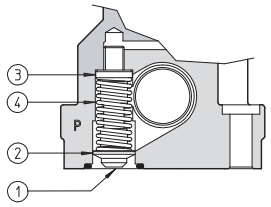
4.2 Special shaped spools

- 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.



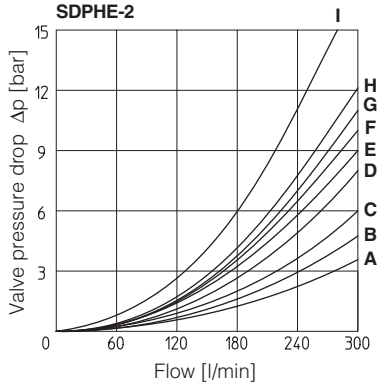
① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

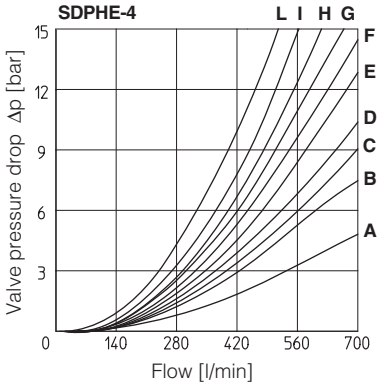
5 ELECTRIC FEATURES

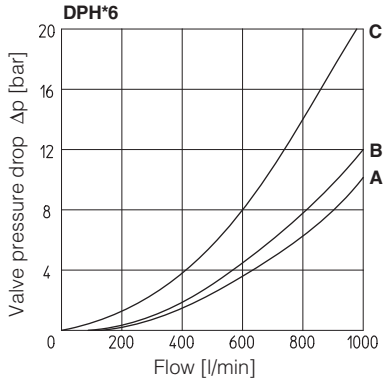
Valve	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption **(2)**	Code of spare coil
SDPHE	12 DC	**12 DC**	666 or 667	30 W	COE-12DC
	14 DC	**14 DC**			COE-14DC
	24 DC	**24 DC**			COE-24DC
	28 DC	**28 DC**			COE-28DC
	110 DC	**110 DC**			COE-110DC
	220 DC	**220 DC**			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.

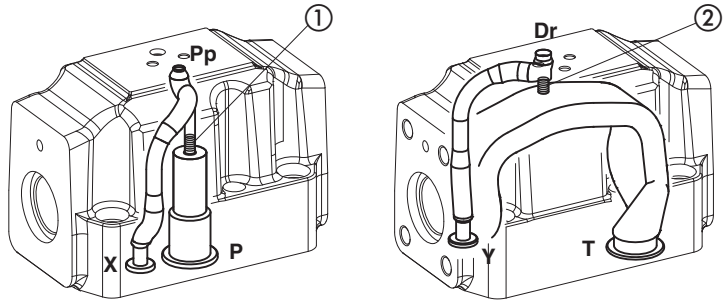
2) TEST CONDITIONS
- Nominal voltage supply DC (direct) and AC (alternating) with connector type SP-666. The use of other connectors can affect the switching time;
- 2 bar of counter pressure on port T;
- mineral oil: ISO VG 46 at 50°C

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

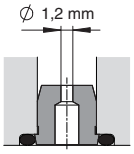
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external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

SDPHE-2 **Pilot channels** **Drain channels**



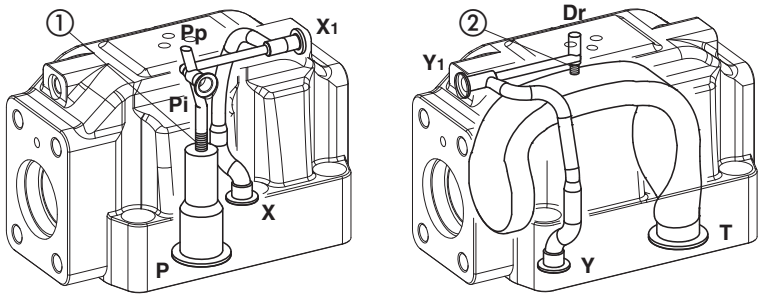
Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

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



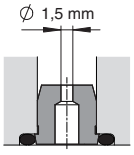
PLUG-12A

SDPHE-4 **Pilot channels** **Drain channels**



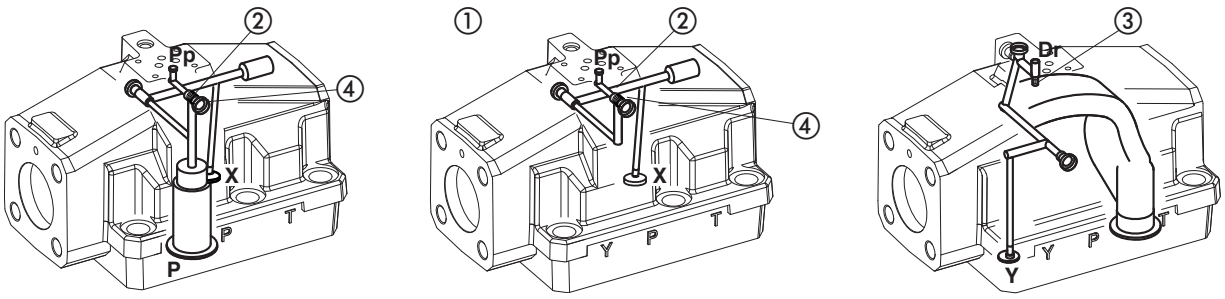
Internal piloting: Without blinded plug SP-X500F ①;
External piloting: Add blinded plug SP-X500F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

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** **Pilot channels** **Drain channels**



Internal piloting:
plug SP-X325A in pos ②;

External piloting:
plug SP-X325A in pos ②;

Internal drain:
Without blinded plug SP-X300F ③;

External drain:
Add blinded plug SP-X300F ③.

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

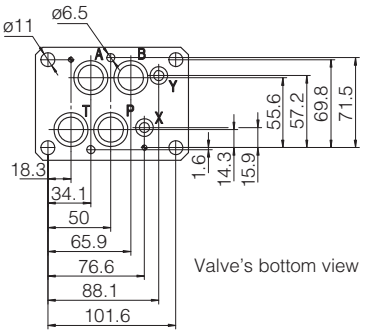
10 DIMENSIONS FOR SDPHE-2 [mm]

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

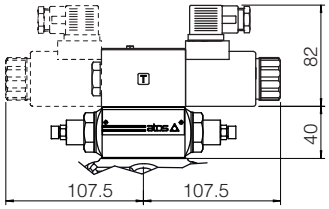
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

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

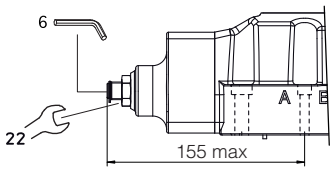


Valve's bottom view

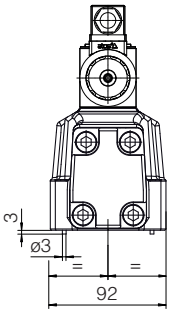
SDPHE-2*/H

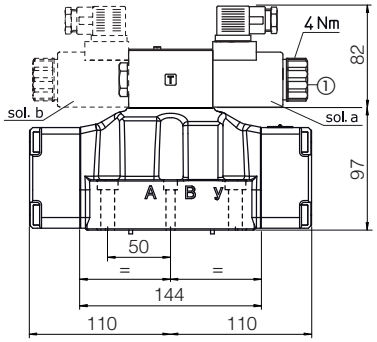


Stroke adjustment device for option /S



SDPHE-2*





Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

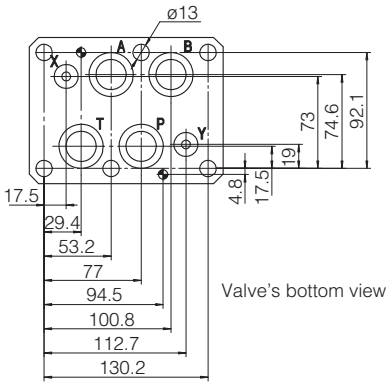
11 DIMENSIONS FOR SDPHE-4 [mm]

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;

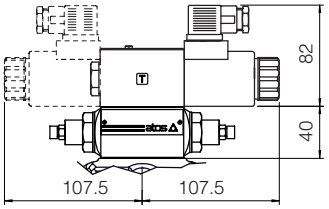
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

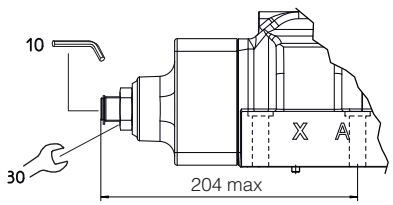
Mass (Kg)	
SDPHE-46	17,4
SDPHE-47	17,8
Option /S	+1,5
Option H	+1,0

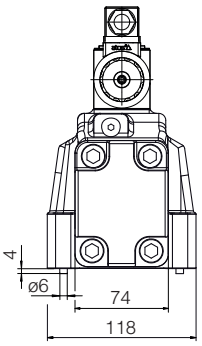


Valve's bottom view

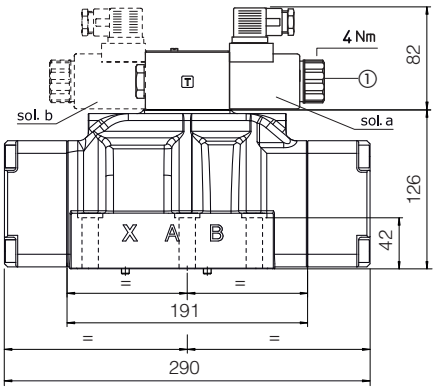
SDPHE-4*/H







SDPHE-4*



Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

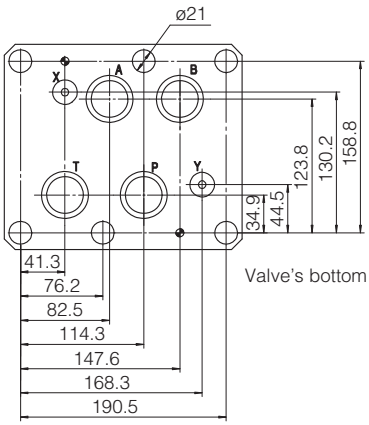
12 DIMENSIONS FOR DPH*-6 [mm]

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

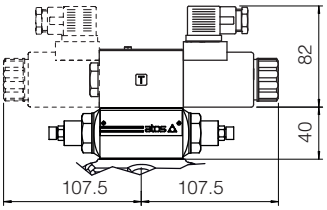
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



Valve's bottom view

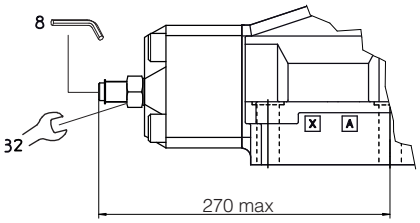
Mass (Kg)	
SDPHE-66	43,8
SDPHE-67	44,1
Option /S	+3,5
Option H	+1,0

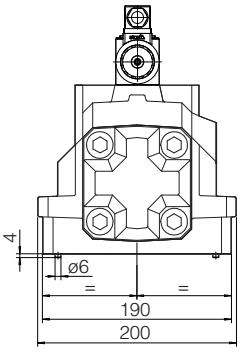
SDPHE-6*/H

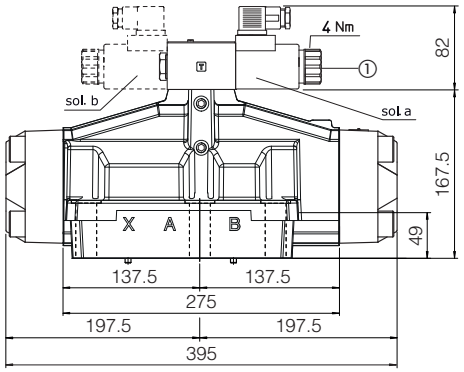


SDPHE-6*

Stroke adjustment device for option/S







Overall dimensions refer to valves with connectors type 666

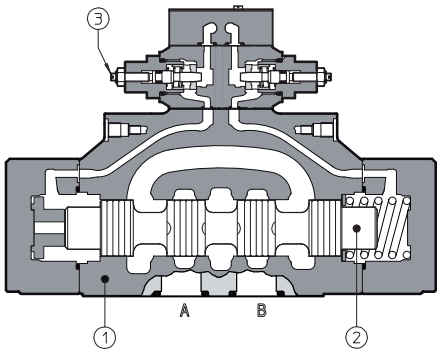
① Standard manual override PIN

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

Spool type



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.
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

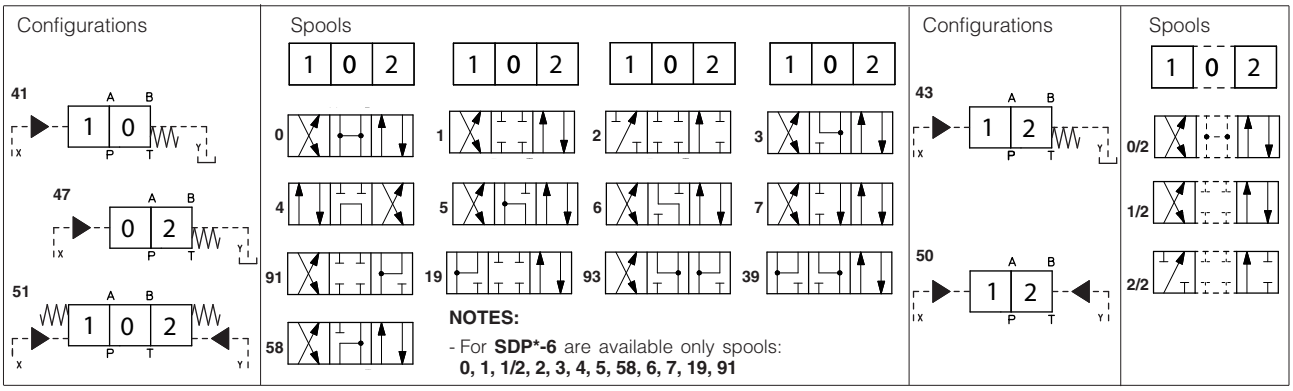
3
Spool type, see section 2

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

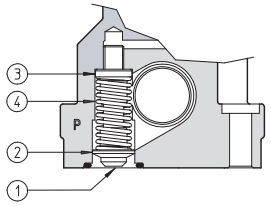
Assembly position / location	any position except for valves type SDP-*50 (without springs) that must be installed with their longitudinal axis horizontal		
Subplate surface finishing	roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further 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.

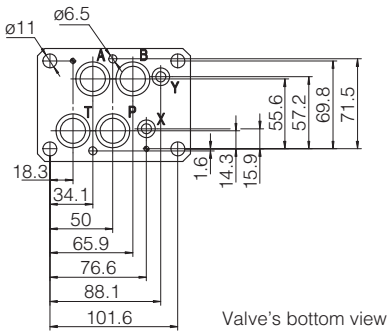


① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

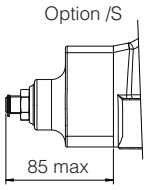
7 DIMENSIONS OF HYDRAULIC OPERATED VALVES ISO 4401 size 16, 25 and 32 [mm]

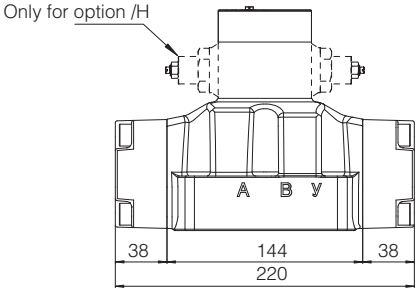
SDP-2

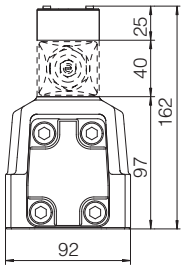
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4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



Valve's bottom view



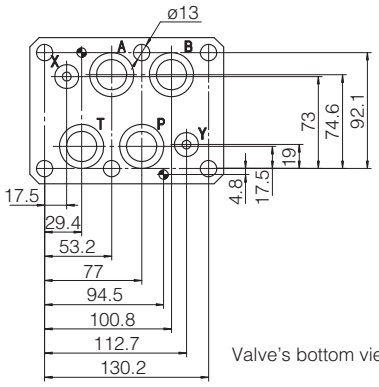




Mass: 10 Kg

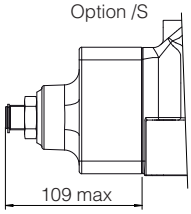
SDP-4

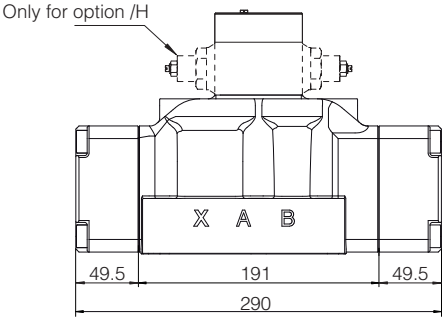
ISO 4401: 2005
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Diameter of ports A, B, P, T : Ø = 24
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4 OR 4112, 2 OR 3056

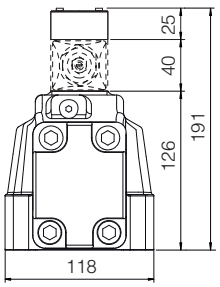


Valve's bottom view

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



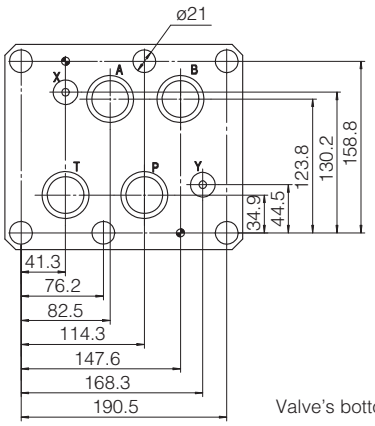




Mass: 16,5 Kg

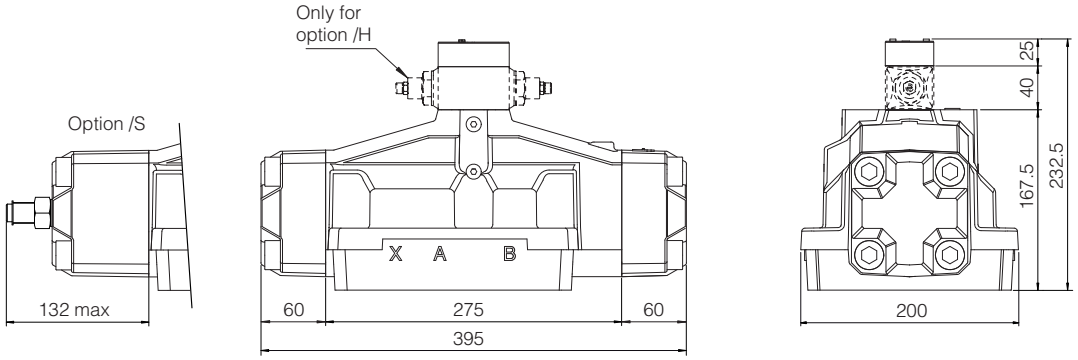
SDP-6

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

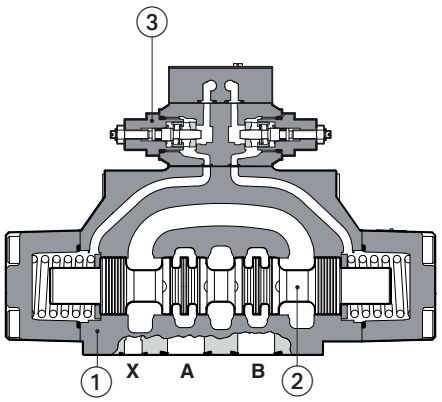
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT



Mass: 38 Kg

Hydraulic operated directional valves type SDPL

spool type, max pressure 280 bar



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

SDPL-4411/H

Spool type hydraulic operated directional valves available in three or four way configurations.
These valves are specifically designed for medium pressure applications such as in the plastics sector.
Mounting surface: **ISO 4401**
size 16, 25

SDPL-2 = size 16, flow up to 300 l/min
SDPL-4 = size 25, flow up to 700 l/min

Max pressure: **280 bar**

1 MODEL CODE

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

SDPL-2
Hydraulic operated directional control valve, Pmax = 280 bar
size:
SDPL-2 = 16
SDPL-4 = 25

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

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

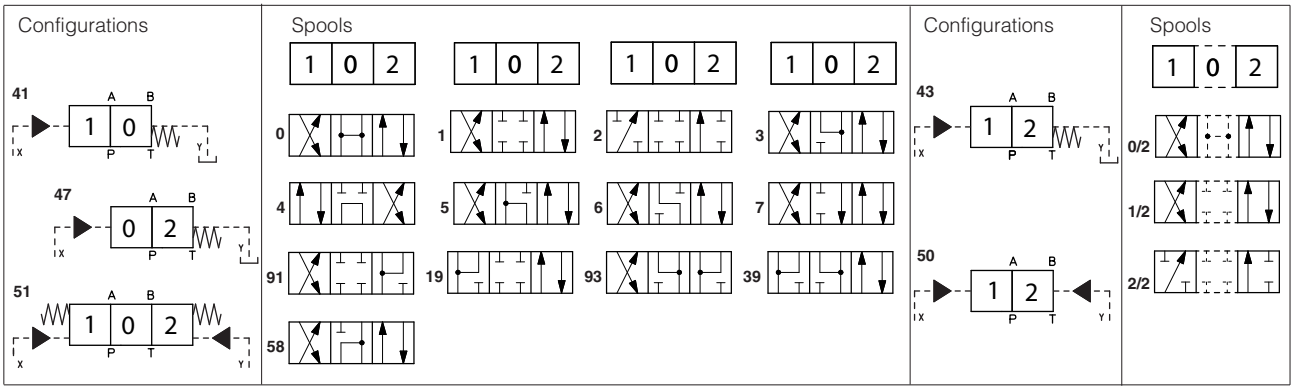
Spool type, see section 2

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

2 CONFIGURATIONS and SPOOLS valves type SDPL-*



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		SDPL-2	SDPL-4
Max recommended flow	[l/min]	300	700
Max pressure on port P, A, B	[bar]	280	
Max pressure on port T (also X, Y for SDPL)	[bar]	210	
Minimum pilot pressure	[bar]	4	
Max recommended pressure on piloting line	[bar]	210	

(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

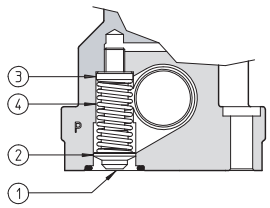
Assembly position / location	any position except for valves type SDPL-*50 (without springs) that must be installed with their longitudinal axis horizontal		
Subplate surface finishing	roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature range	standard execution = -30°C ÷ +70°C; /PE option = -20°C ÷ +70°C;		
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 Q/ΔP DIAGRAMS

SDPL-2	See note and diagrams on table SHE085 relating the SDPH*-2 valve from which SDPL-2* are derivated
SDPL-4	See note and diagrams on table SHE085 relating the SDPH*-4 valve from which SDPL-4* 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, 58, 9.** 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.

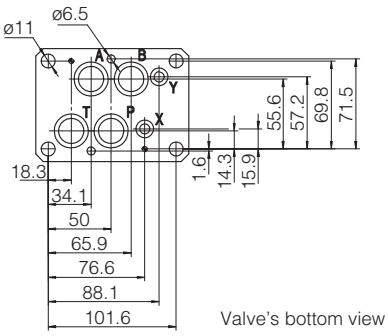


① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

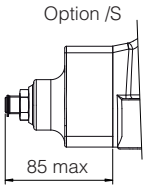
7 DIMENSIONS OF HYDRAULIC OPERATED VALVES ISO 4401 size 16, 25 and 32 [mm]

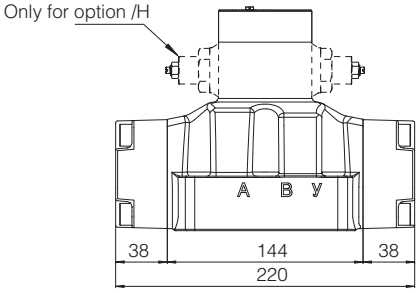
SDPL-2

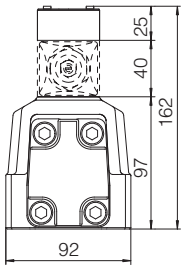
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4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



Valve's bottom view



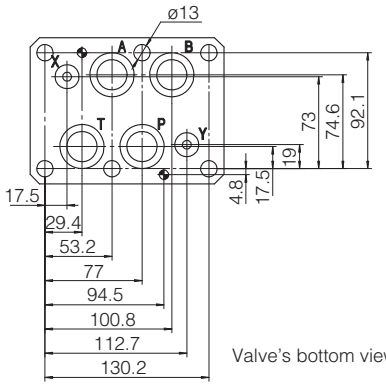




Mass: 10 Kg

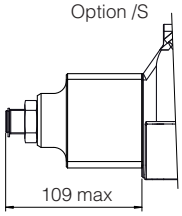
SDPL-4

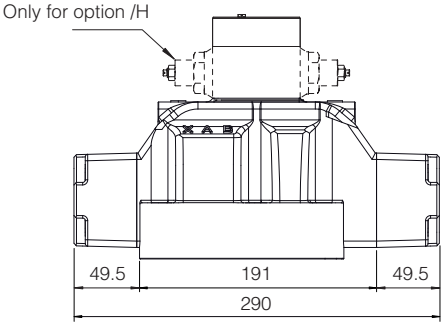
ISO 4401: 2005
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Diameter of ports A, B, P, T : Ø = 24
Diameter of ports X,Y: Ø = 7 mm
Diameter of port L: Ø = 5 mm
Seals: 4 OR 4112, 2 OR 3056

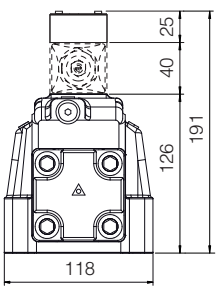


Valve's bottom view

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



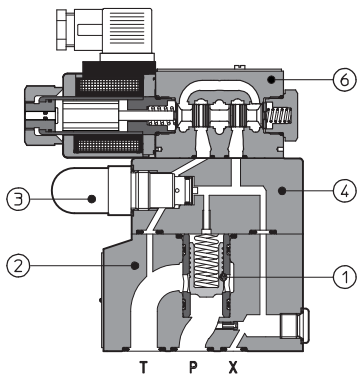




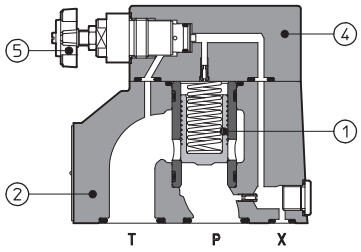
Mass: 16,5 Kg

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)**:

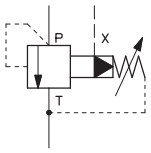
Series number

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

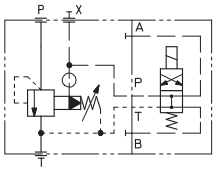
(1) Only for SAGAM with solenoid valve for venting and/or for the selection of the setting pressure

2 HYDRAULIC SYMBOLS

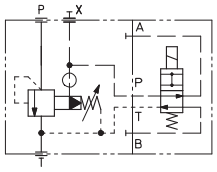
SAGAM



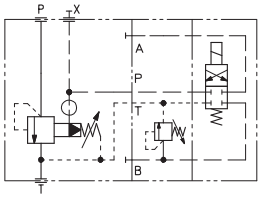
SAGAM-/10**



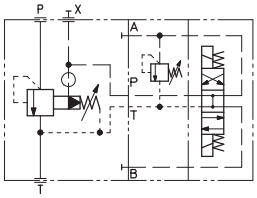
SAGAM-/11**



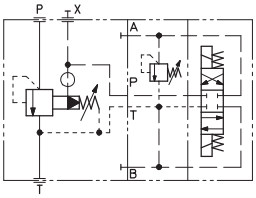
SAGAM-/22**



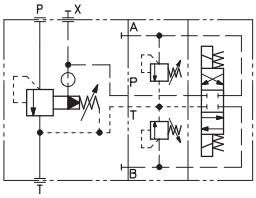
SAGAM-/20**



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

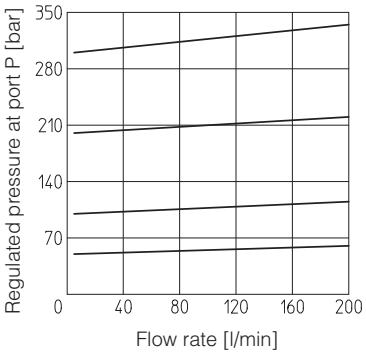
For other supply voltages available on request see technical tables E015, E018.
(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10 ÷ 15% and the power consumption is 55 VA (SDHL) and 58 VA (SDHE)
(2) Average values based on tests performed at 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

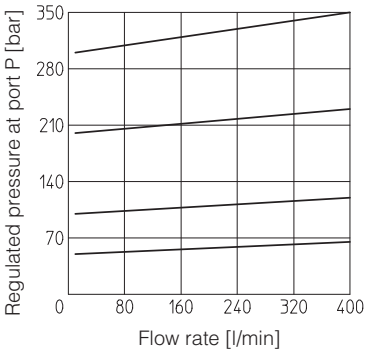
/E = external pilot
/V = regulating handwheel instead of grub screw protected by cap
/WP = prolunged manual override protected by rubber cap (only for SAGAM with pilot solenoid valve)
/Y = external drain (only for SAGAM with pilot solenoid valve)

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

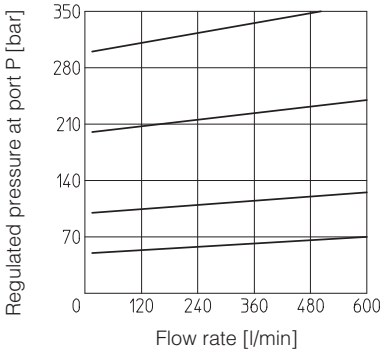
SAGAM-10



SAGAM-20

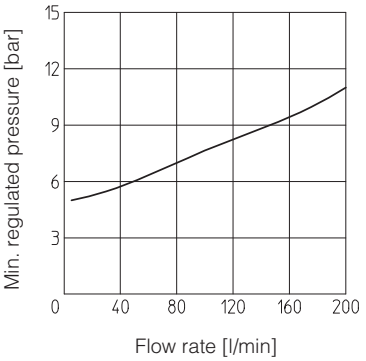


SAGAM-32

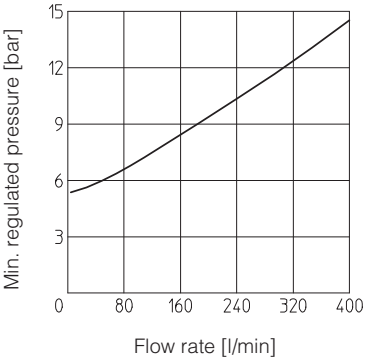


9 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

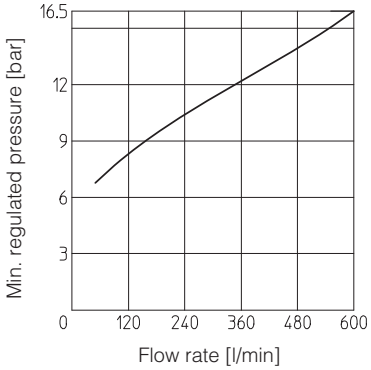
SAGAM-10



SAGAM-20



SAGAM-32



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

The connectors must be ordered separately

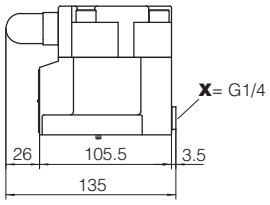
Code of connector	Function
666	Connector IP-65, suitable for direct connection to electric supply source
667	As 666 connector IP-65 but with built-in signal led, suitable for direct connection to electric supply source

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

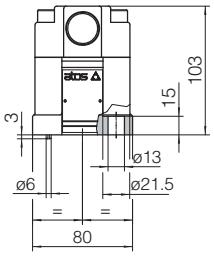
Seals, reccomended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 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	

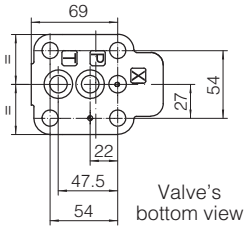
12 **DIMENSIONS [mm]**

SAGAM-10



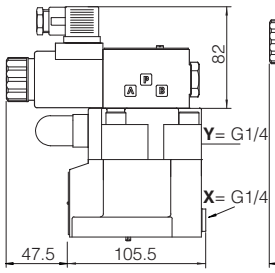
Mass: 3,6 Kg





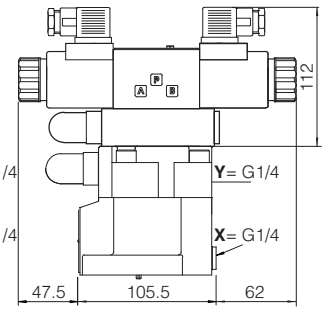
Valve's bottom view

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



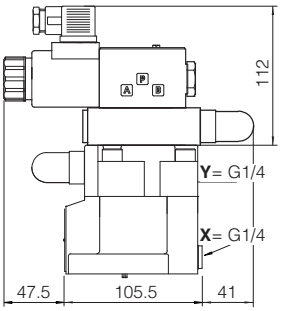
SAGAM-10/10/-EX**
SAGAM-10/11/-EX**

Mass: 5,1 Kg



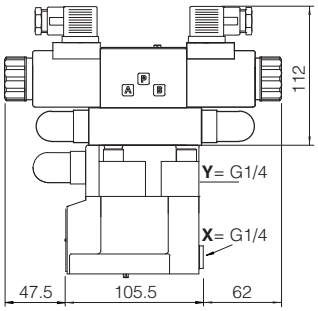
SAGAM-10/20/-EX**
SAGAM-10/21/-EX**

Mass: 6,2 Kg



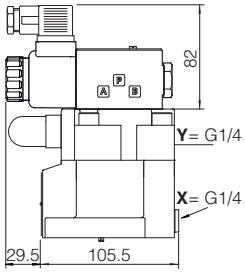
SAGAM-10/22/-EX**

Mass: 5,9 Kg



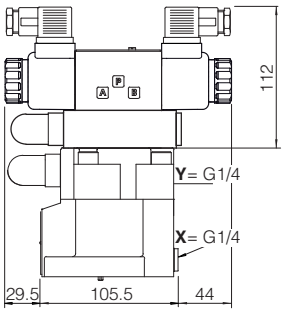
SAGAM-10/32/-EX**

Mass: 6,3 Kg



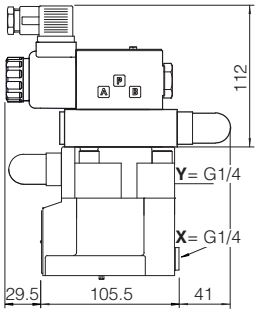
SAGAM-10/10/-LX**
SAGAM-10/11/-LX**

Mass: 4,8 Kg



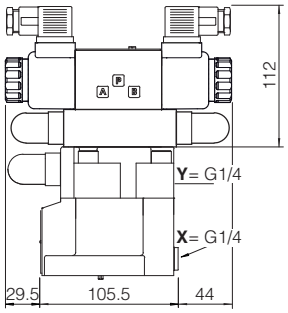
SAGAM-10/20/-LX**
SAGAM-10/21/-LX**

Mass: 5,6 Kg



SAGAM-10/22/-LX**

Mass: 5,6 Kg

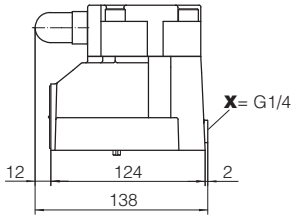


SAGAM-10/32/-LX**

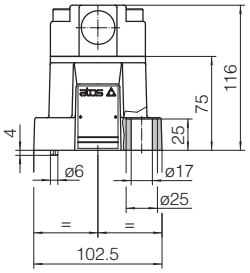
Mass: 5,7 Kg

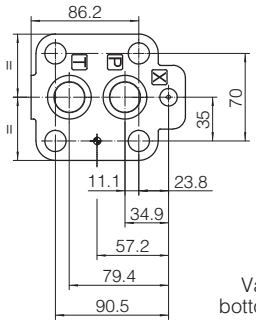
Overall dimensions refer to valves **DC** voltage, with connectors type 666

SAGAM-20



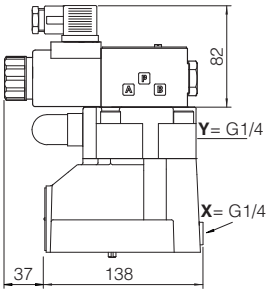
Mass: 4,8Kg





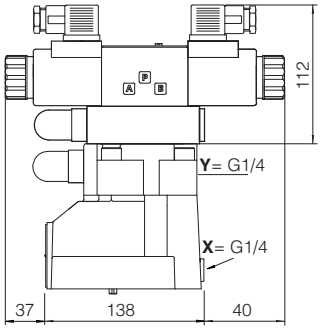
Valve's bottom view

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



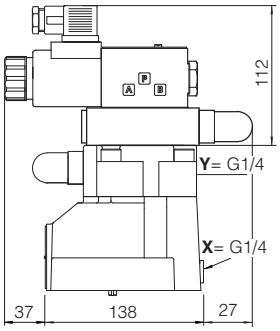
SAGAM-20/10/-EX**
SAGAM-20/11/-EX**

Mass: 6,3 Kg



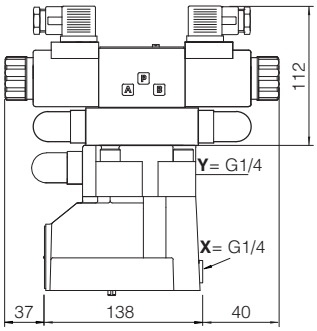
SAGAM-20/20/-EX**
SAGAM-20/21/-EX**

Mass: 7,4 Kg



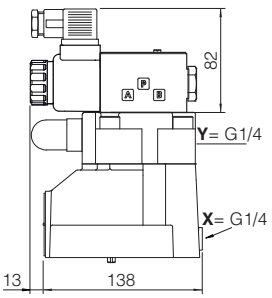
SAGAM-20/22/-EX**

Mass: 7,1 Kg



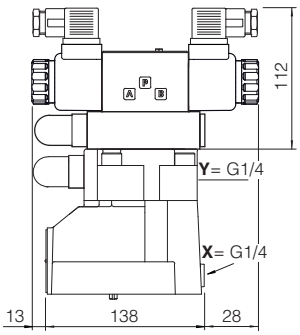
SAGAM-20/32/-EX**

Mass: 7,5 Kg



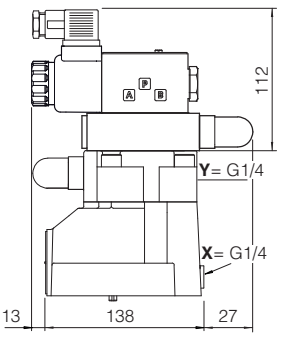
SAGAM-20/10/-LX**
SAGAM-20/11/-LX**

Mass: 6 Kg



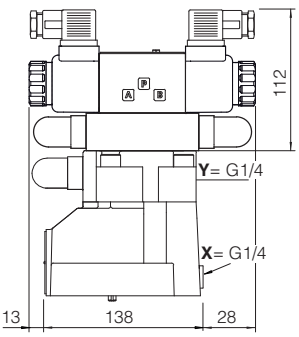
SAGAM-20/20/-LX**
SAGAM-20/21/-LX**

Mass: 6,8Kg



SAGAM-20/22/-LX**

Mass: 6,8 Kg

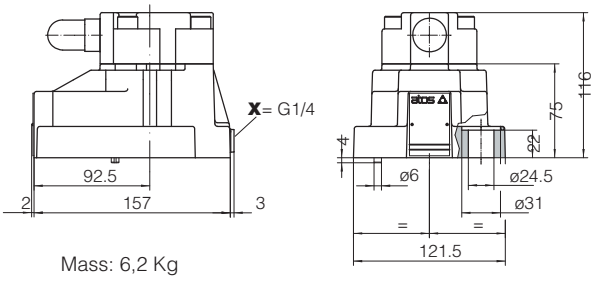


SAGAM-20/32/-LX**

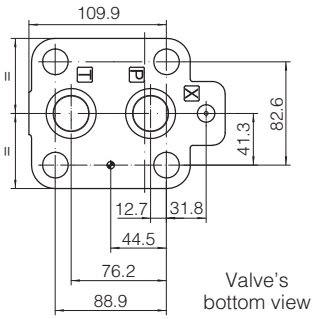
Mass: 7 Kg

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

SAGAM-32

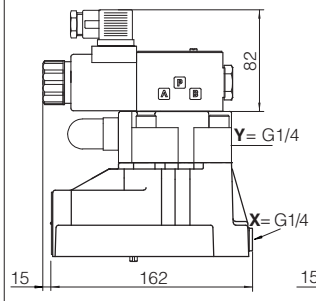


Mass: 6,2 Kg



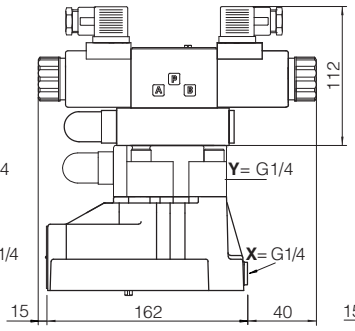
Valve's bottom view

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 = 28,5 mm
Ports X: Ø = 3,2 mm



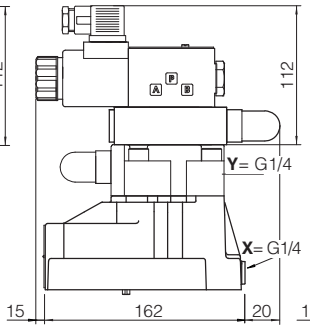
SAGAM-32/10/-EX**
SAGAM-32/11/-EX**

Mass: 7,7 Kg



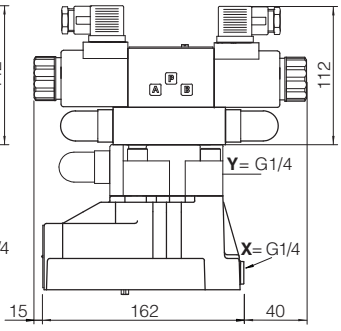
SAGAM-32/20/-EX**
SAGAM-32/21/-EX**

Mass: 8,8 Kg



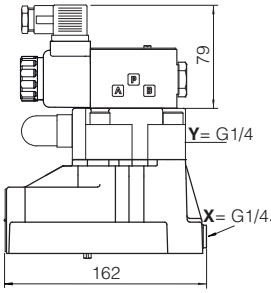
SAGAM-32/22/-EX**

Mass: 8,5 Kg



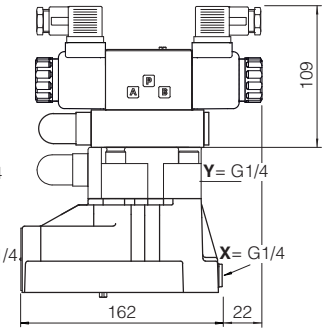
SAGAM-32/32/-EX**

Mass: 8,9 Kg



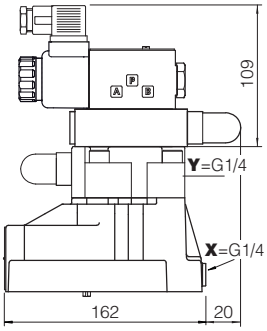
SAGAM-32/10/-LX**
SAGAM-32/11/-LX**

Mass: 7,4 Kg



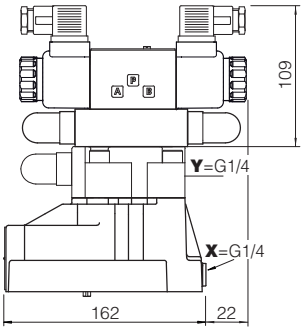
SAGAM-32/20/-LX**
SAGAM-32/21/-LX**

Mass: 8,2 Kg



SAGAM-32/22/-LX**

Mass: 8,2 Kg



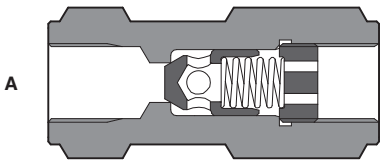
SAGAM-32/32/-LX**

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

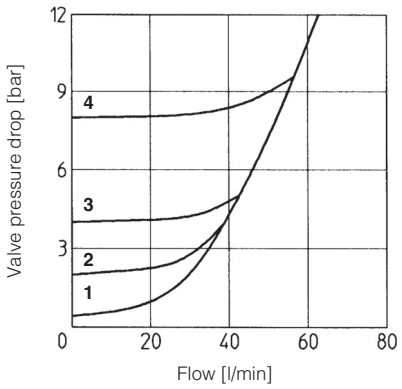
Hydraulic symbol					
Valve model	**SADR-06**	**SADR-10**	**SADR-15**	**SADR-20**	**SADR-25**
Max recommended flow [l/min]	40	80	150	300	360
Max pressure [bar]	400		350		

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

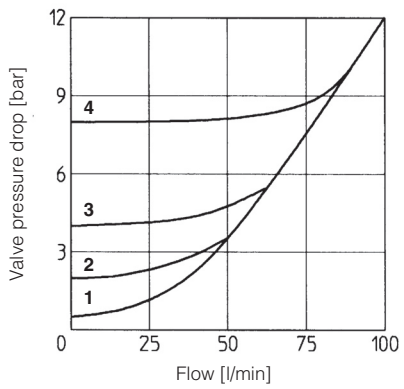
4 FLOW VERSUS PRESSURE DROP DIAGRAMS Based on based on mineral oil ISO VG 46 at 50°C

SADR-06



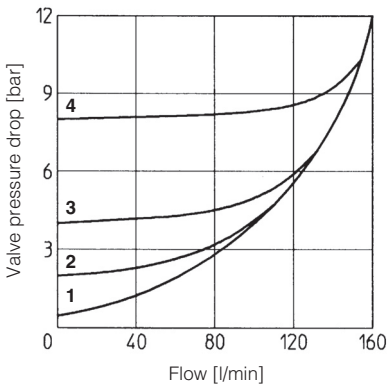
1 = SADR-06
2 = SADR-06/2
3 = SADR-06/4
4 = SADR-06/8

SADR-10



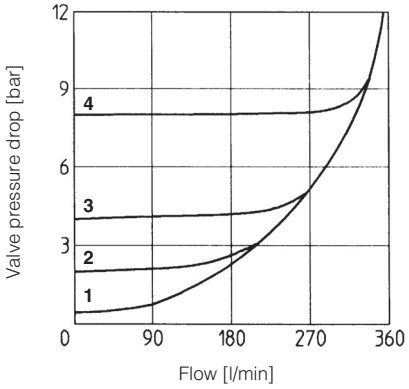
1 = SADR-10
2 = SADR-10/2
3 = SADR-10/4
4 = SADR-10/8

SADR-15



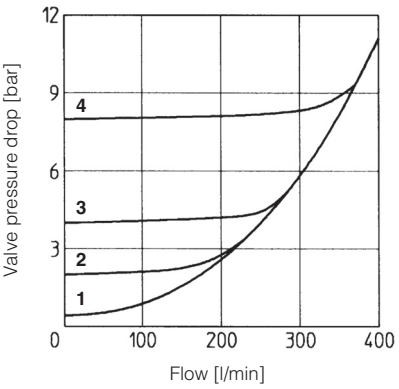
1 = SADR-15
2 = SADR-15/2
3 = SADR-15/4
4 = SADR-15/8

SADR-20



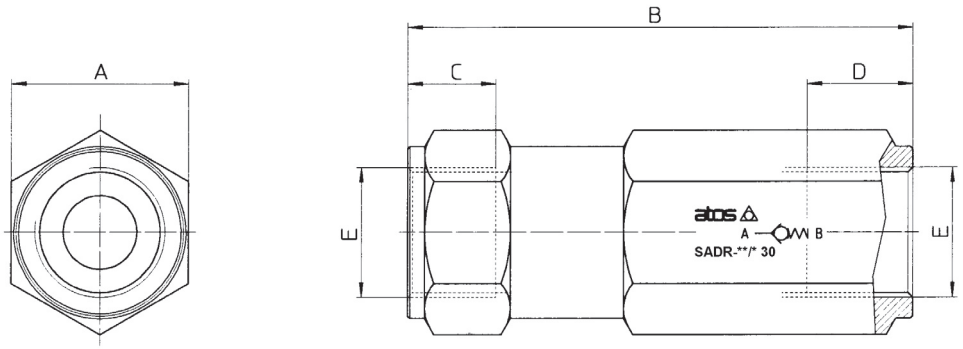
1 = SADR-20
2 = SADR-20/2
3 = SADR-20/4
4 = SADR-20/8

SADR-25



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

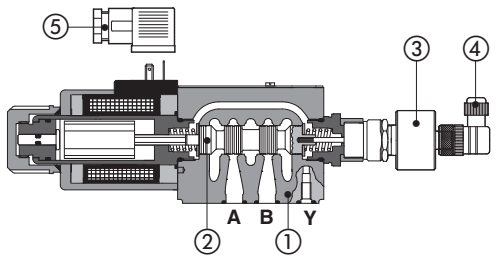
5 DIMENSIONS [mm]



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

Safety directional valves with spool position monitoring

On-off, direct operated



SDKE-16*/FV

① Body
② Spool
③ Inductive position switch **FV**
④ Sensor electric connector (supplied with the valve)
⑤ Coil electric connector (to be ordered separately)

Direct operated safety directional valves with spool position monitoring.

SDHE, size 06, high performances, for AC and DC supply with cURus certified solenoids

SDKE, size 10, for AC and DC supply with cURus certified solenoids

The valves are equipped with **FV** inductive position switch for the spool position monitoring, see section 1 and 11 for sensors availability and technical characteristics.

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

Max flow: **SDHE 80 l/min**
SDKE 150 l/min

Max pressure: **350 bar**

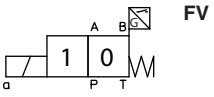
1 RANGE OF VALVE'S MODELS

Valve code	Size	Description	DC solenoids	AC solenoids
			Sensor type	
			/FV	/FV
SDHE-06	06	direct operated solenoid valves, on-off, single solenoid	•	•
SDHE-07	06	direct operated solenoid valves, on-off, double solenoid	•	
SDKE-16	10	direct operated solenoid valves, on-off, single solenoid	•	•
SDKE-17	10	direct operated solenoid valves, on-off, double solenoid	•	

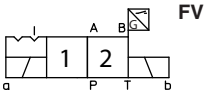
Notes:
FV = inductive position switch providing both NO and NC contacts to be wired on the electric connector
See section 11 for sensor's characteristics

1.1 FV switch configurations

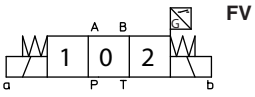
Single solenoid valves size 06 & 10 are provided with n° 1 FV switch for the spool position monitoring



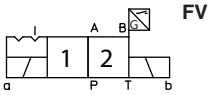
Double solenoid valves size 06 with detent are provided with n° 1 FV switch for the spool position monitoring



Double solenoid valves size 06 & 10 are provided with n° 1 FV switch for the spool position monitoring



Double solenoid valves size 10 with detent are provided with n° 1 FV switch for the spool position monitoring



For model code of SDHE safety valves, see section 2
For model code of SDKE safety valves, see section 4

2 MODEL CODE OF SDHE/FV

SDHE	-	0	63	1/2	/	A	/	FV	-	X	24DC	**	/	*

Directional control valve size 06
SDHE = max flow 80 l/min

Size ISO 4401
0 = size 06

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

Spool type, see section 3

Options, see section 8

Spool position monitor:
FV = inductive position switch (double contact)

X = without connector, see section 10 for available connectors, to be ordered separately

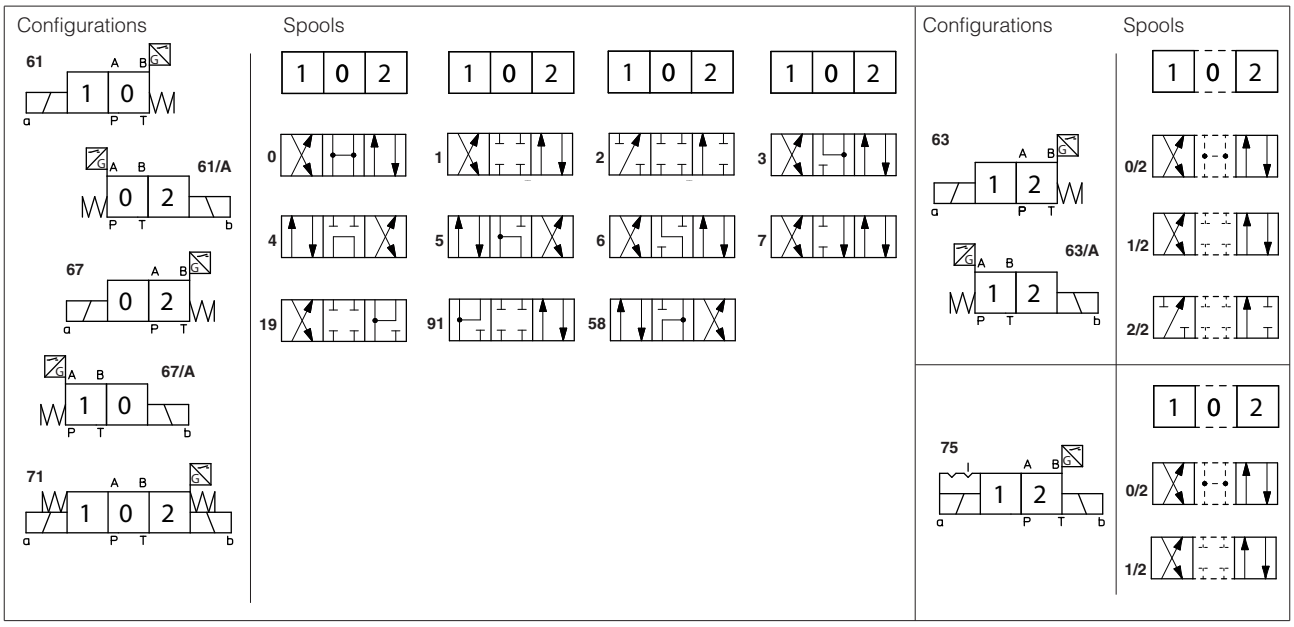
Voltage code, see section 9

Series number

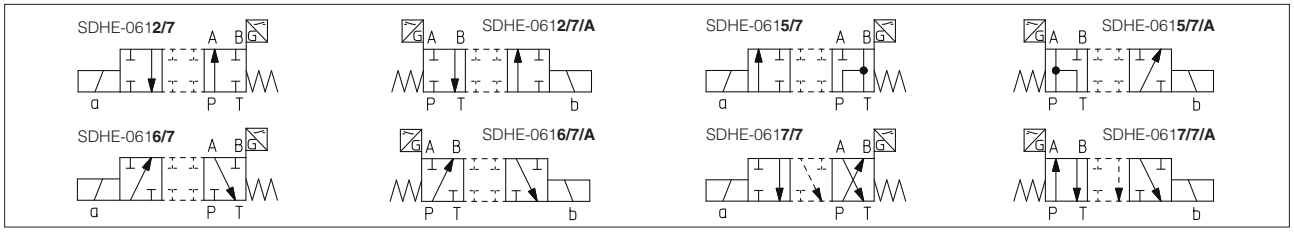
Seals material
see sect. 6, 7
- = NBR
PE = FKM

(1) the **FV** inductive position switch provides both NC and NO contacts

3 CONFIGURATIONS AND SPOOLS (representation according to ISO 1219-1)



3.1 Configuration for spool */7



3.2 Special shaped spools for SDHE

- 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.

4 MODEL CODE OF SDKE/FV

SDKE	-	1	63	1/2	/	A	/	FV	-	X	24DC	**	/	*

Directional control valve size 10

Size ISO 4401
1 = size 10

Valve configuration, see section 5
61 = single solenoid, central plus external position, spring centered
63 = single solenoid, 2 external positions, spring offset
67 = single solenoid, external plus central position, spring offset
Only for DC solenoid:
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent

Spool type, see section 5

Options, see section 8

X = without connector, see section 10 for available connectors, to be ordered separately

Voltage code, see section 9

Series number

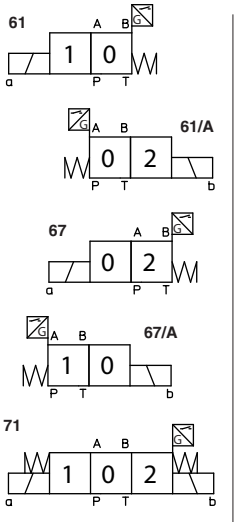
Seals material see sect. 6,7
- = NBR
PE = FKM

Spool position monitor:
FV = inductive position switch (double contact)

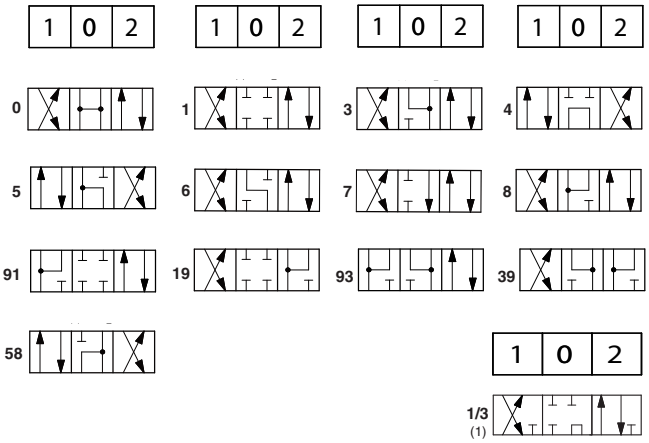
SDKE/FV are always provided with Y drain port
(1) the **FV** inductive position switch provides both NC and NO contacts

5 CONFIGURATIONS AND SPOOLS (representation according to ISO 1219-1)

Configurations

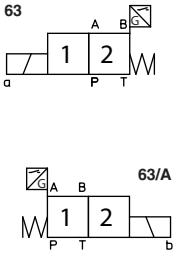


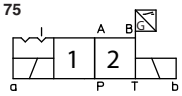
Spools



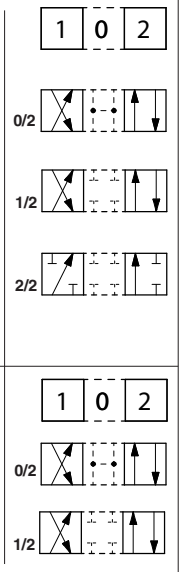
(1) only for SDKE-*DC, configuration 61 or 61/A

Configurations

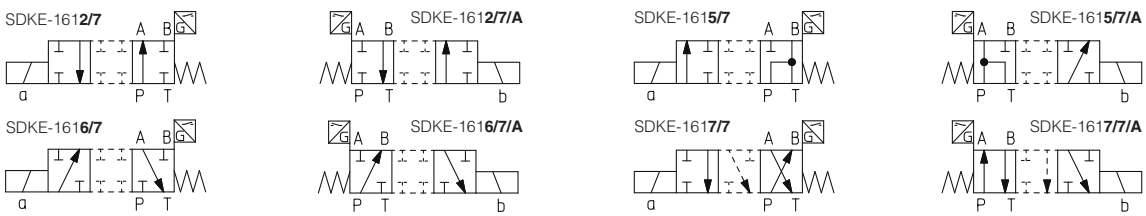




Spools



5.1 Configuration for spool */7



5.2 Special shaped spools for SDKE

- 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** 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.
- other types of spools can be supplied on request.

6 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
Conformity		CE to Low Voltage Directive 2014/35/EU CE to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006
Ambient temperature		**Standard** = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Flow direction		As shown in the symbols of table 3 and 5
Operating pressure	**SDHE**	P, A, B = **350 bar** T = **210 bar** (DC solenoid); **160 bar** (AC solenoid)
	SDKE	P, A, B = **350 bar** T = (with Y port not connected to tank) **210 bar** (DC solenoid); **120 bar** (AC solenoid) T = (with Y port drained to tank) **250 bar**
Rated flow		see diagrams Q/Δp at section 14
Maximum flow	**SDHE**	**80 l/min** see section 15
	SDKE	**150 l/min** see section 15

6.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils (all versions) **F** (155°C) for AC coils (SDHE, SDKE) 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 electric features 9
Supply voltage tolerance	± 10%
Certification	**cURus** North American standard

7 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	

8 OPTIONS

A = Single solenoid valves: solenoid mounted at side of port B. In standard versions the solenoid is mounted at side of port A.
Double solenoid valves SDHE/FV(DC), SDKE/FV(DC): FV inductive position switch mounted at side of port A. In standard versions the position switch is mounted at side of port B.

WARNING: the manual operation is not permitted for safety valves, than the valve is provided with solenoid blind rings to prevent the access to the manual override. The manual override protected by rubber cup (option /WP) is not available

WARNING: the inobservance of following prescriptions invalidates the certification and may represent a risk for personnel injury
Safety valves must be installed and commissioned only by qualified personnel
Safety valves must not be disassembled
The inductive position switch FV can be adjusted only by the valve's manufacturer or Atos authorized service centers
Valve's components cannot be interchanged
The valves must operate without switching shocks and spool vibrations

9 ELECTRIC FEATURES

9.1 COILS FOR SDHE/FV

External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil
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
230/50 AC	**230/50/60 AC**			COE-230/50/60AC
110/50 AC	**110RC**	669	30 W	COE-110RC
120/60 AC				
230/50 AC	**230RC**			COE-230RC
230/60 AC				

(1) In case of 60 Hz voltage frequency 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.

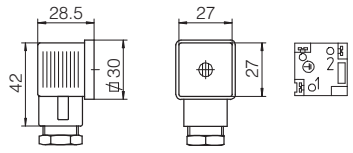
9.2 COILS FOR SDKE/FV VALVE

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

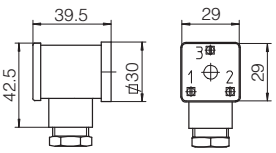
(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 90 VA
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

10 COILS 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	**669**
1 = Positive ⊕ 2 = Negative ⊖ ⏚ = Coil ground	1,2= Supply voltage VAC 3 = Coil ground

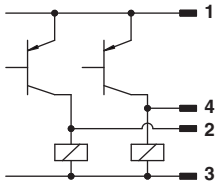
SUPPLY VOLTAGES

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

11 TECHNICAL CHARACTERISTICS OF INDUCTIVE PROXIMITY AND POSITION SWITCHES

Type of switch		**/FV** position switch
Supply voltage	[V]	20÷32
Ripple max	[%]	≤ 10
Max current	[mA]	400
Max peak pressure	[bar]	400
Mechanical life		virtually infinite
Switch logic		PNP

/FV scheme

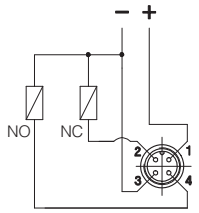


1 supply +24 VDC
2 output signal
3 GND
4 output signal

12 CONNECTING SCHEMES OF INDUCTIVE PROXIMITY AND POSITION SWITCHES - FV sensor's connector are always supplied with the valve

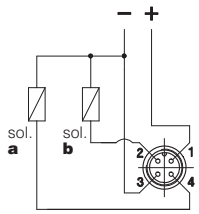
/FV (all valves) single solenoid	**/FV (all valves)** double solenoid	Connector type **ZBE-06**

Connector type **ZBE-06**
IP65

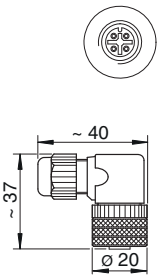


1 = supply +24 VDC
2 = output signal NC
3 = GND
4 = output signal NO

Connector type **ZBE-06**
IP65



1 = supply +24 VDC
2 = output signal sol.**b**
3 = GND
4 = output signal sol.**a**

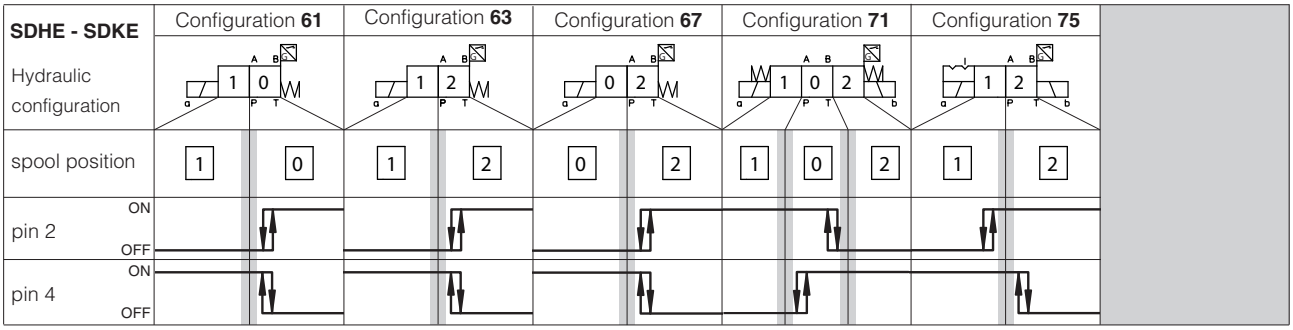


INTERNAL VIEW PINOUT

NOTE: the /FV position switch are not provided with a protective earth connection

13 STATUS OF OUTPUT SIGNAL

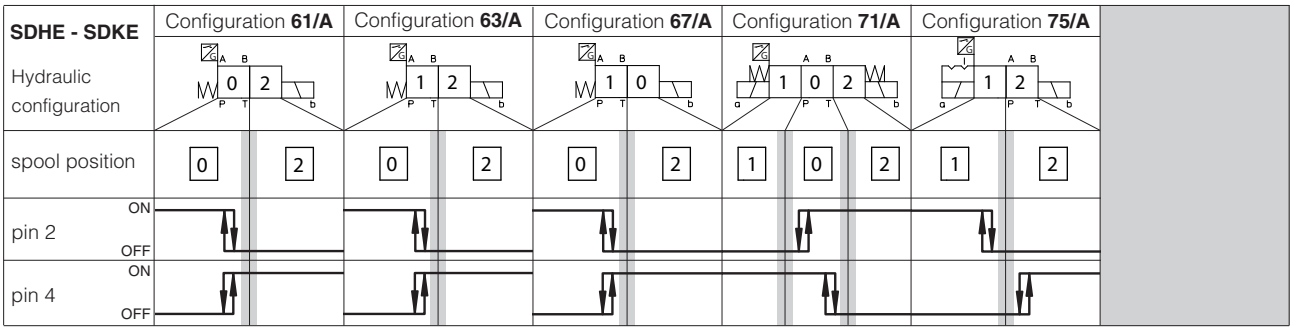
Signal status for standard version



Note: FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

= intermediate spool position corresponding to the hydraulic configuration change

Signal status for option /A



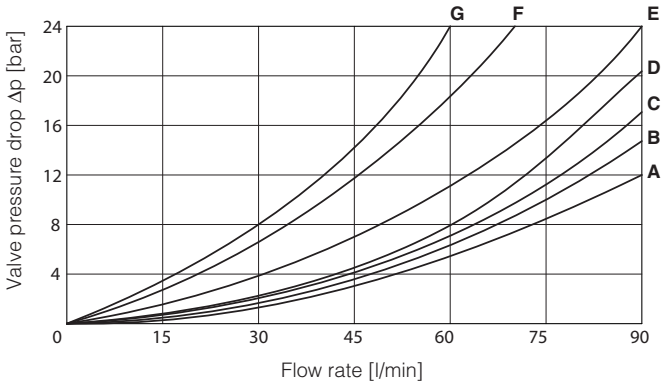
Note: FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

= intermediate spool position corresponding to the hydraulic configuration change

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

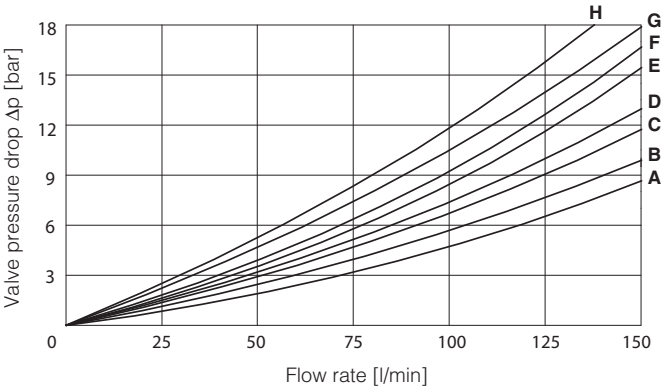
SDHE

Flow direction / Spool type	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			
2/7	E		E		
5/7	D	E		C	F
6/7		D	E		
7/7		F	F	F	



SDKE

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	E	E	G	G		H
39, 93	F	F	G	G		H
2/7	G			H		
5/7	D			C	G	
6/7		G	H			
7/7		H	H	H		



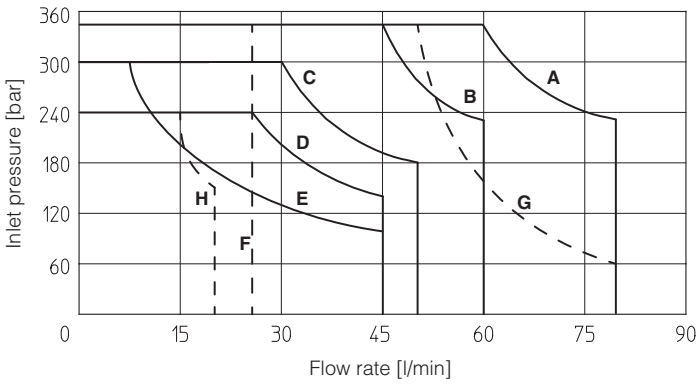
15 **OPERATING LIMITS** based on mineral oil ISO VG 46 at 50°C

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.

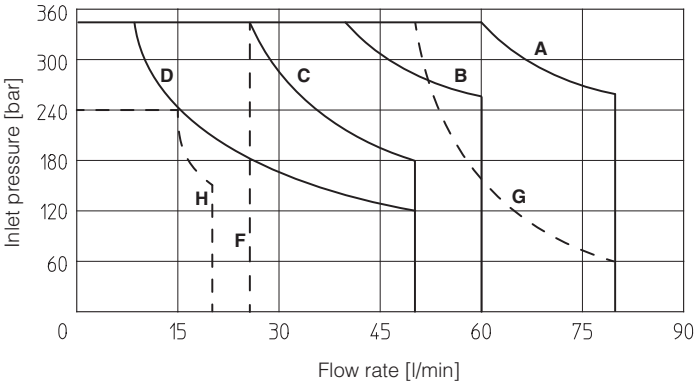
SDHE

Curve	Spool type	
	AC	DC
A	1,1/2	0, 0/1, 1, 1/2, 3
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, 58, 58/1, 91
D	4, 4/8, 5, 5/1, 19, 58, 58/1, 91	2, 2/2
E	2, 2/2	-
F	2/7, 6/7	2/7, 6/7
G	5/7	5/7
H	7/7	7/7

SDHE - AC



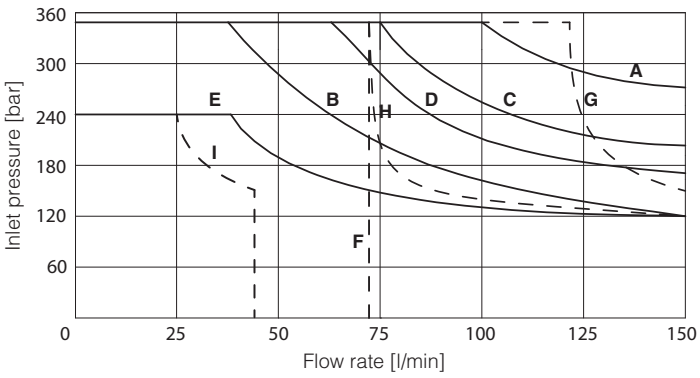
SDHE - DC



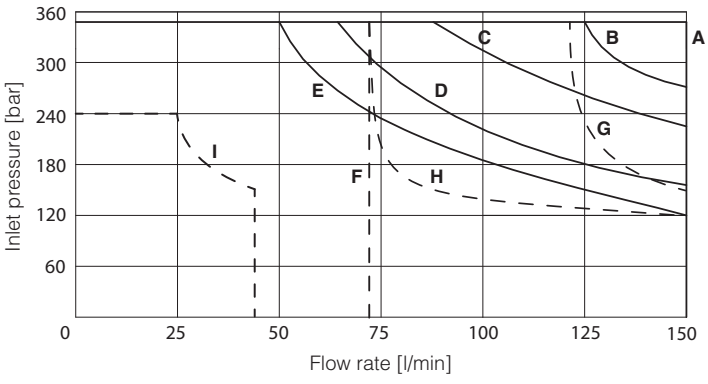
SDKE

Curve	Spool type	
	AC	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
F	2/7	2/7
G	5/7	5/7
H	6/7	6/7
I	7/7	7/7

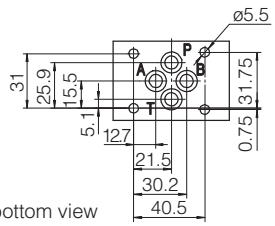
SDKE - AC



SDKE - DC



SDHE



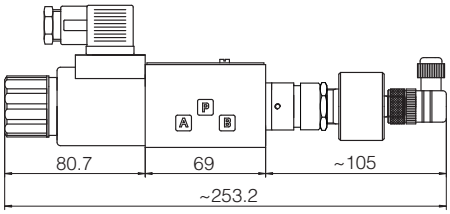
Valve's bottom view

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

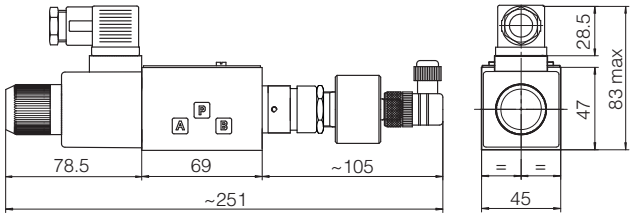
option /A
Single solenoid valves: solenoid mounted at side of port B.
Double solenoid valves SDHE/FV(DC): FV inductive position switch mounted at side of port A

SDHE-06*/FV (DC)



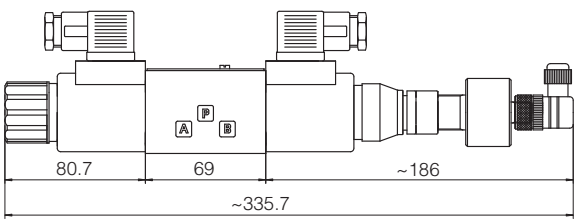
Mass: kg 1,95

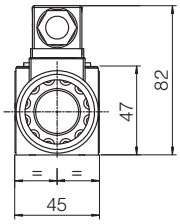
SDHE-06*/FV (AC)



Mass: kg 1,8

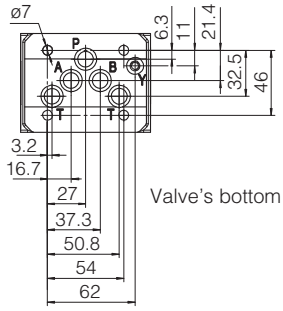
SDHE-07*/FV (DC)





Mass: kg 2,2

SDKE



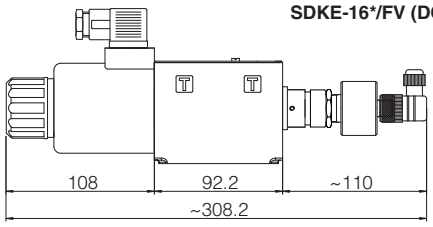
Valve's bottom view

ISO 4401: 2005
Mounting surface: 4401-05-05-0-05
(without port X)
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050. 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
Y = DRAIN PORT

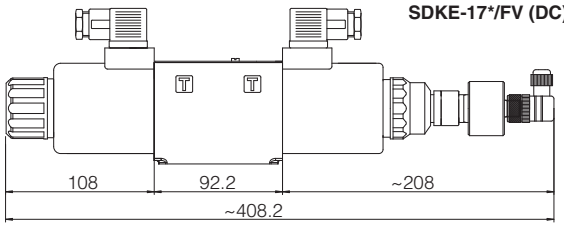
option /A
Single solenoid valves: solenoid mounted at side of port B.
Double solenoid valves SDKE/FV(DC): FV inductive position switch mounted at side of port A

SDKE-16*/FV (DC)



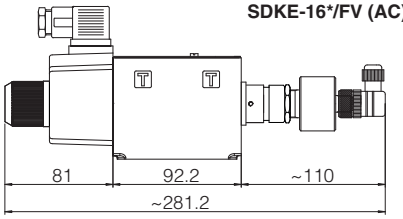
Mass: kg 4,4

SDKE-17*/FV (DC)



Mass: kg 5,9

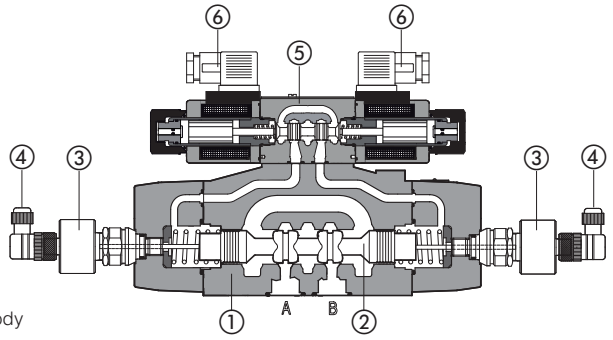
SDKE-16*/FV (AC)



Mass: kg 3,8

Safety directional valves with spool position monitoring

On-off, piloted



SDPHE-271*/FV

① Main body
② Main spool
③ Inductive position switch **FV**
④ Sensor electric connector (supplied with the valve)
⑤ Pilot solenoid valve
⑥ Coil electric connector (to be ordered separately)

Pilot operated safety directional valves with main spool position monitoring.
SDPHE high performances, for AC and DC supply, solenoid pilot valve ⑤ type SDHE with cURus certified solenoids, see tech. table **E015**

The valves are equipped with **FV** inductive position switch for the main spool position monitoring, see section 9 for sensor's technical characteristics.

Mounting surface: **ISO 4401, size 16, 25**
Max flow:**300, 700 l/min**
Max pressure: **350 bar**

1 MODEL CODE

SDPH	E	-	2	71	1	/	A	/	FV	X	24DC	**	/	*

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**, ISO 4401:
2 = 16 **4** = 25

71 — **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 — **Hydraulic options**, see section 5
A, **D**, **E**, **R**
Optional devices for main spool switching control, see section 6
H, **H9**, **L9**

FV — **Spool position monitor**
FV = inductive position switch (double contact)

X = without connector, see section 8 for available connectors, to be ordered separately

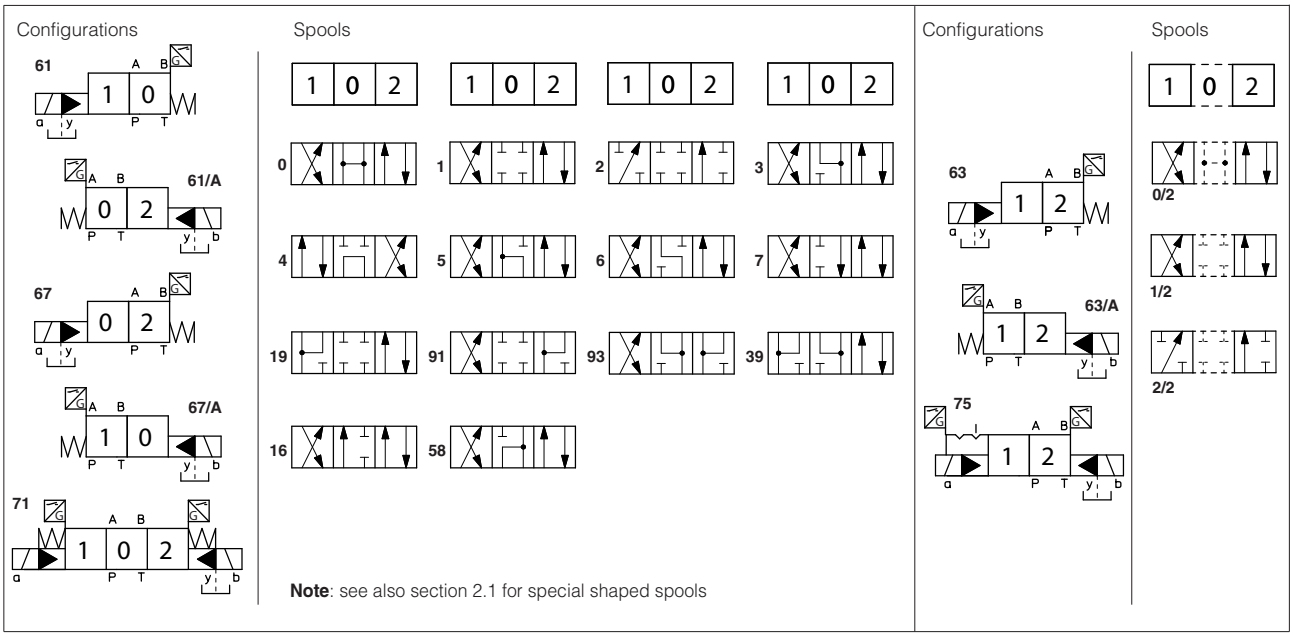
24DC — **Voltage code**, see section 7

****** — Series number

***** — Seals material see sect. 3,4
- = NBR
PE = FKM

Notes:
FV = inductive position switch providing both NO and NC contacts to be wired on the electric connector
The FV inductive position switch is directly connected to the valve main spool
In pilot operated valves only the main spool position is monitored; the pilot solenoid valve is not monitored

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



2.1 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, 5, 58, 6** and **7** are also available as **1/1, 4/8, 5/1, 58/1, 6/1** and **7/1** that are properly shaped to reduce water-hammer shocks during the switching.

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	75 years, for further details see technical table P007
Conformity	CE to Low Voltage Directive 2014/35/EU CE to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006
Ambient temperature	**Standard** = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
Operating pressure	P, A, B, X = **350 bar** (for pilot pressure see also option /L9 at section 6) T = **250 bar** for external drain (standard) T with internal drain (option /D) = **210 bar** SDPHE (DC); **160 bar** SDPHE (AC) Y = 0 bar Minimum pilot pressure for correct operation is **8 bar**
Maximum flow	SDPHE-2: **300 l/min;** SDPHE-4: **700 l/min** (see Q/Δp diagrams at section 12 and operating limits at section 13)

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 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 7
Supply voltage tolerance	± 10%
Certification	**cURus** North American standard

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 HYDRAULIC OPTIONS

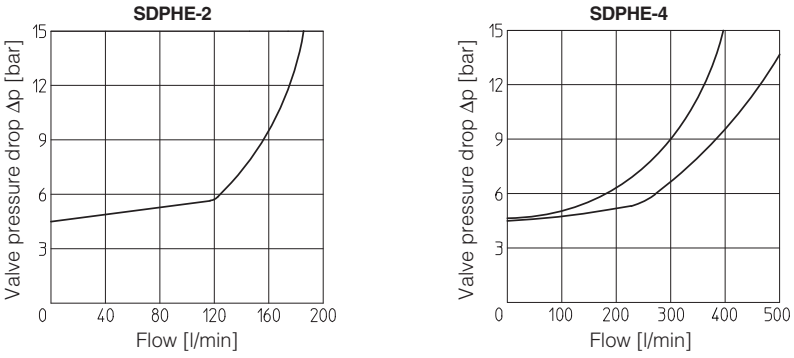
5.1 option /A = Solenoid mounted at side of port A of main body (only for single solenoid valves)
In standard version the solenoid is mounted at side of port B
For sensor position, see sect 16

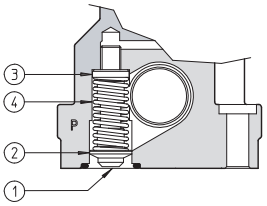
5.2 option /D = Internal drain (standard configuration is external drain)

5.3 option /E = External pilot pressure (standard configuration is internal pilot pressure)

5.4 option /R = Pilot pressure generator (4 bar on port P - not for DPH*-1)
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, 09, 90, 94, 49.**
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.

Pressure drop through the pilot pressure generator /R





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

Ordering code of spare pilot pressure generator

R/DP	-	*
Pilot pressure generator		Size: **2** for SDPHE-2 **4** for SDPHE-4

WARNING: the manual operation is not permitted for safety valves, than the valve is provided with solenoid blind rings to prevent the access to the manual override. The manual override protected by rubber cup (option /WP) is not available

WARNING: the inobservance of following prescriptions invalidates the certification and may represent a risk for personnel injury
Safety valves must be installed and commissioned only by qualified personnel
Safety valves must not be disassembled
The inductive position switch FV can be adjusted only by the valve's manufacturer or Atos authorized service centers
Valve's components cannot be interchanged
The valves must operate without switching shocks and spool vibrations

6 DEVICES FOR MAIN SPOOL SWITCHING CONTROL

Following options are suggested to reduce the hydraulic shocks at the valve operation

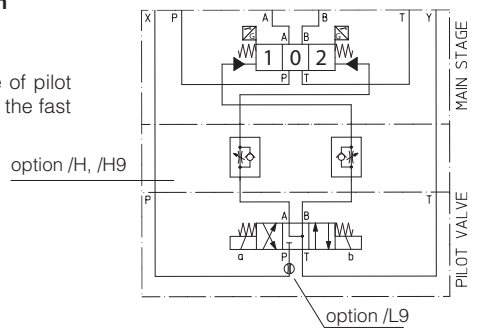
6.1 option /H = Adjustable chokes (meter-out to the pilot chambers of the main valve)

6.2 option /H9 = Adjustable chokes (meter-in to the pilot chambers of the main valve)

6.3 option /L9 = Plug with calibrated restictor in P port of pilot valve, suggested in case of pilot pressure higher than 210 bar or to limit the hydraulics shocks caused by the fast main spool switching

Plug code:
PLUG-12A ø1,2 mm for SDP*-2
PLUG-15A ø1,5 mm for SDP*-4

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

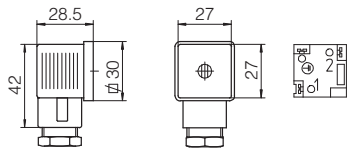
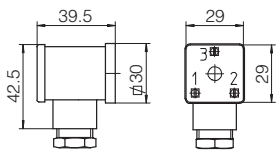


7 COIL VOLTAGE

Valve code	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil DHE
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	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

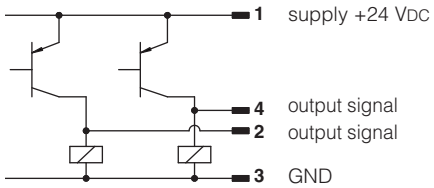
(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10 ÷15% and the power consumption is 52 VA.
(2) Average values based on tests preformed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the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

8 COILS 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 VAC 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

9 TECHNICAL CHARACTERISTICS OF FV INDUCTIVE POSITION SWITCH

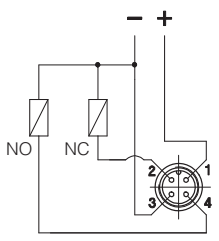
Type of switch		contactless inductive position switch with integrated amplifier
Supply voltage	[V]	20÷32
Ripple max	[%]	≤ 10
Max current	[mA]	400
Reaction time	[ms]	15
Max peak pressure	[bar]	400
Mechanical life		virtually infinite
Switch logic		PNP



10 CONNECTING SCHEME OF FV INDUCTIVE POSITION SWITCH

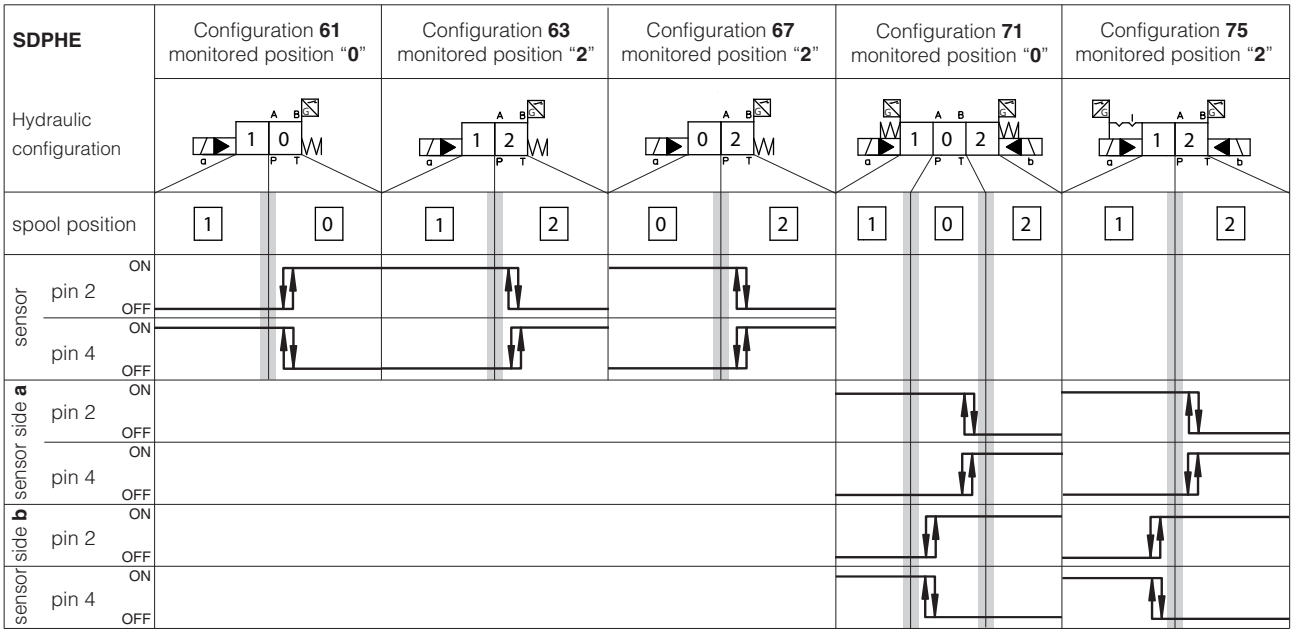
Connector type **ZBE-06** (supplied with the valve)

1 = supply +24 VDC
2 = output signal NC
3 = GND
4 = output signal NO



Note: the /FV position switch is not provided with a protective earth connection

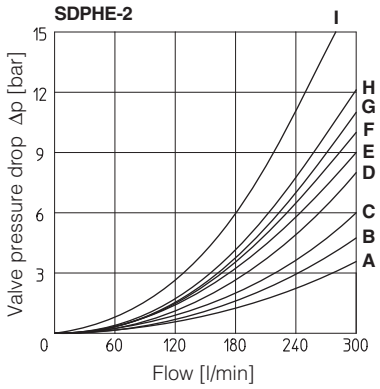
11 STATUS OF OUTPUT SIGNAL

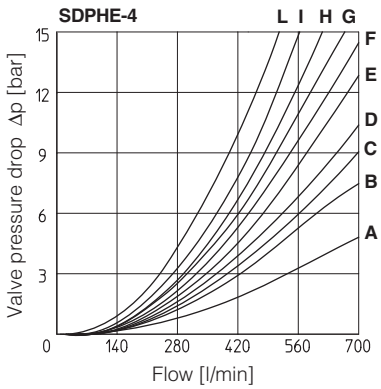


Note:
FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

= intermediate spool position corresponding to the hydraulic configuration change

12 Q/Δp DIAGRAMS based on mineral oil ISO VG 46 at 50°C





SDPHE-2

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

SDPHE-4

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, 5/1, 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
6/1	D	E	D	F	-
7/1	D	E	F	F	-
8	D	D	E	F	-
09	D	-	-	F	F
16	C	D	E	F	-
17	E	D	E	F	-
19	F	-	-	E	-
39	G	F	-	F	-
58	E	A	B	F	H
58/1	E	D	D	F	-
90	D	D	D	-	F
91	F	F	D		
93	-	G	D	-	-

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

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
16, 17, 56, *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
16, 17, 58, *9, 9*	500	500	500	450

14 SWITCHING TIMES (average values in m sec)

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

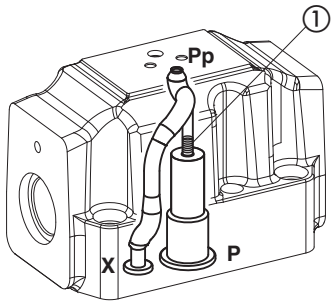
Piloting pressure		70 bar		140 bar		250 bar	
Valve model		Alternating current	Direct current	Alternating current	Direct current	Alternating current	Direct current
SDPHE-2	Switch ON	40÷55	55÷80	30÷45	50÷70	20÷35	40÷55
	Switch OFF	60÷95					
SDPHE-4	Switch ON	60÷95	80÷115	45÷75	60÷95	30÷50	45÷65
	Switch OFF	80÷130					

15 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

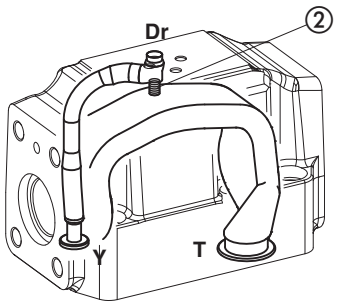
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external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

SDPHE-2

Pilot channels

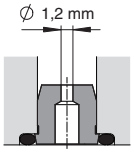


Drain channels



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.

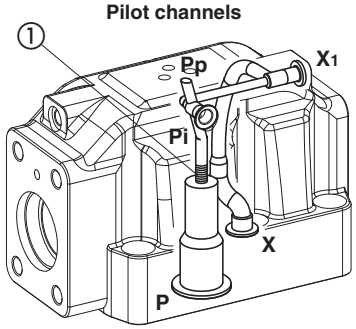
Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



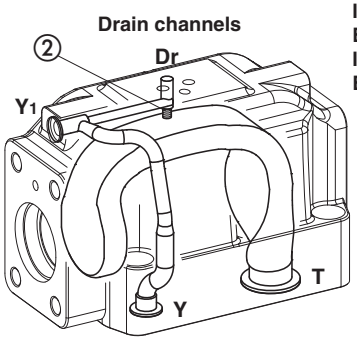
PLUG-12A

SDPHE-4

Pilot channels

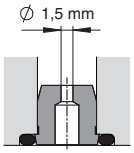


Drain channels



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

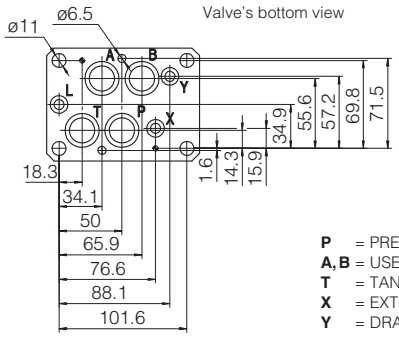


PLUG-15A

SDPHE-2*/FV

ISO 4401: 2005
Mounting surface: 4401-07-07-0-05

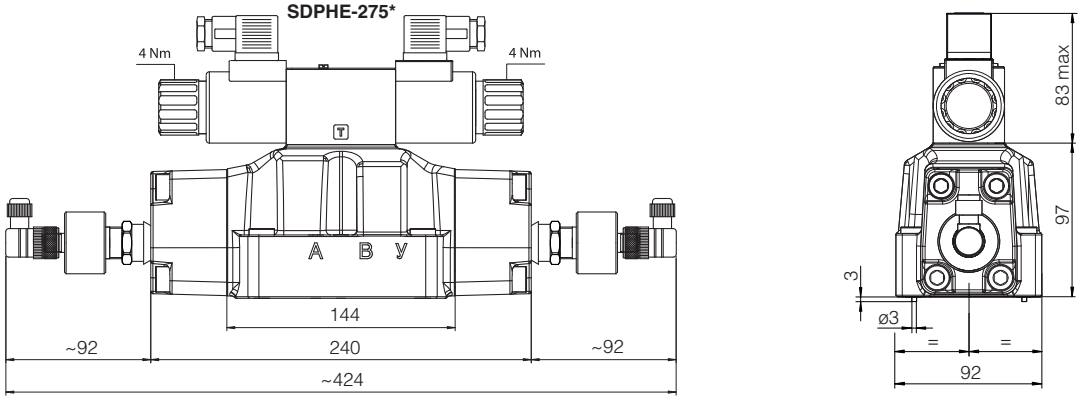
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043



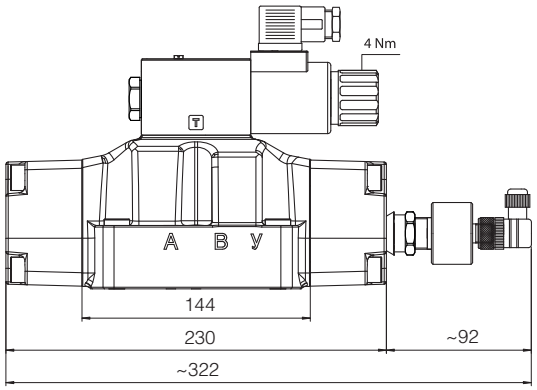
Mass (Kg)	
SDPHE-26	10,2
SDPHE-27	10,9
Option H, H9	+1,0

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

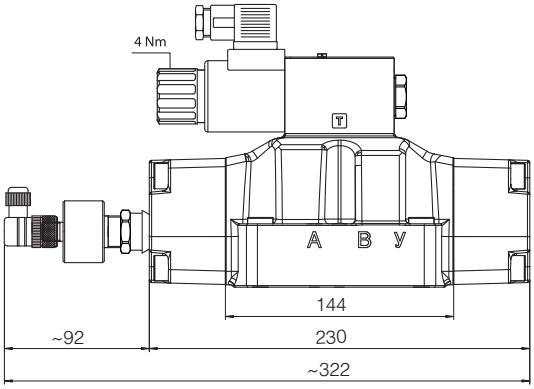
SDPHE-271*
SDPHE-275*



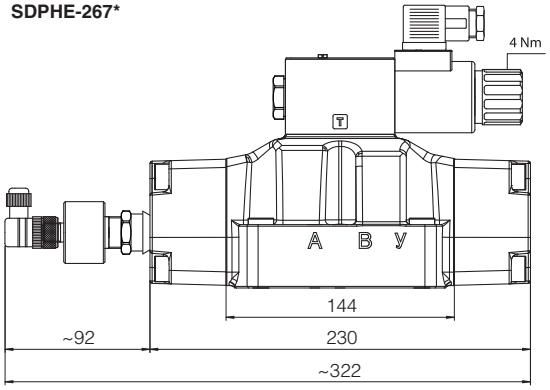
SDPHE-261*



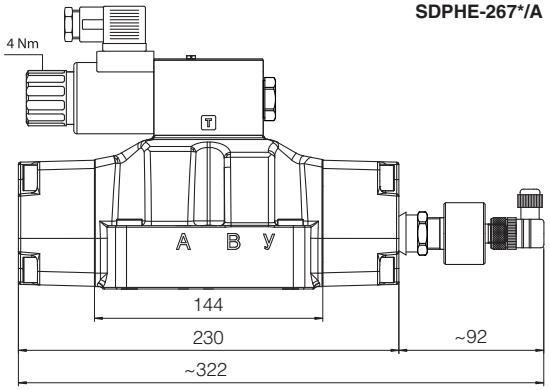
SDPHE-261*/A



SDPHE-263*
SDPHE-267*



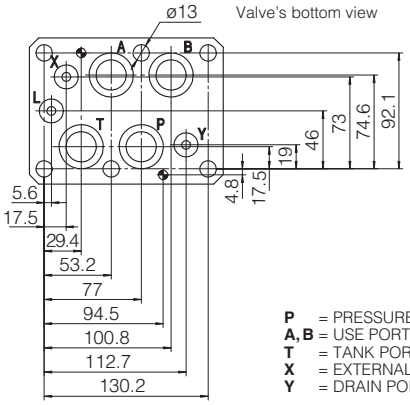
SDPHE-263*/A
SDPHE-267*/A



SDPHE-4*/FV

ISO 4401: 2005
Mounting surface: 4401-08-08-0-05

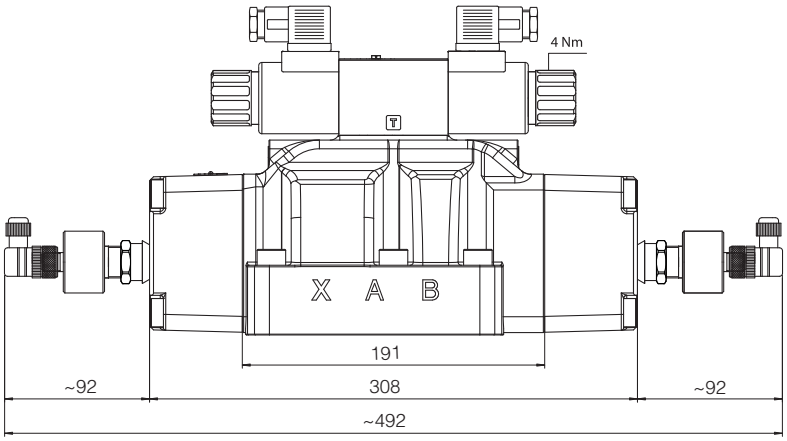
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 4112, 2 OR 3056

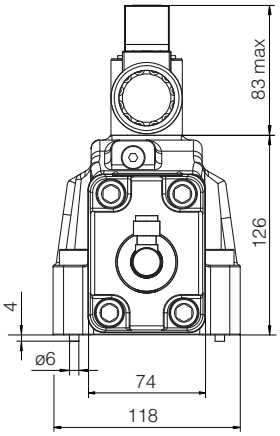


Mass (Kg)	
SDPHE-46	17,7
SDPHE-47	18,4
Option H, H9	+1,0

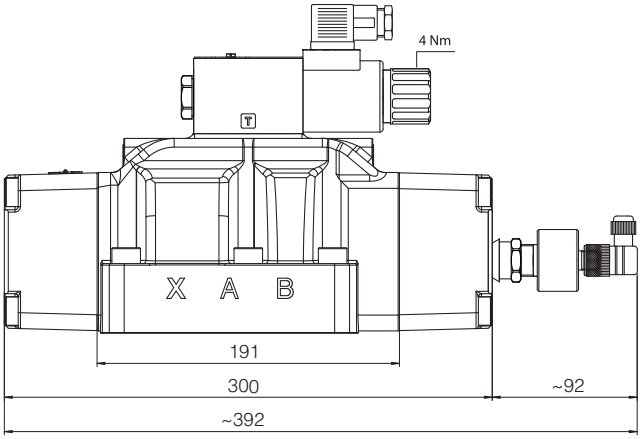
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

SDPHE-471*
SDPHE-475*

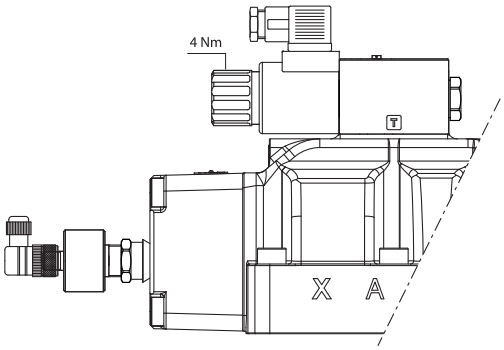




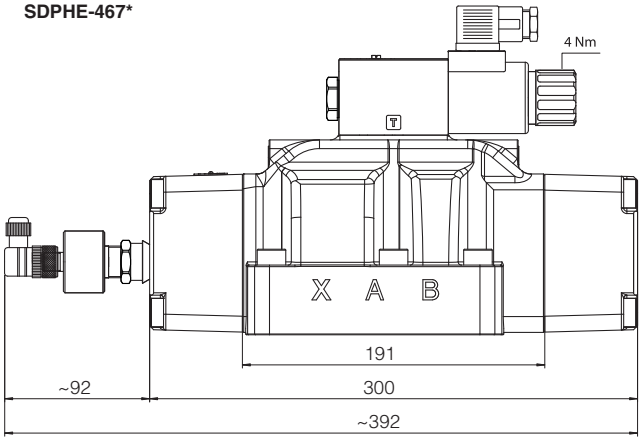
SDPHE-461*



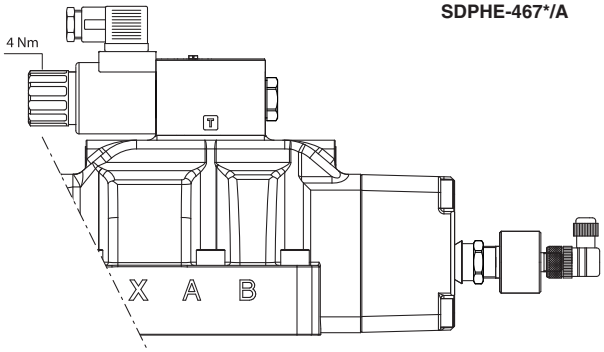
SDPHE-461*/A



SDPHE-463*
SDPHE-467*

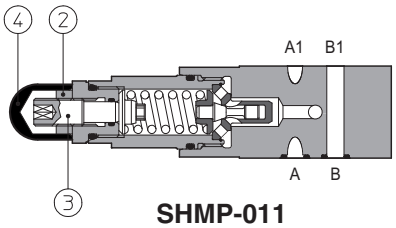


SDPHE-463*/A
SDPHE-467*/A

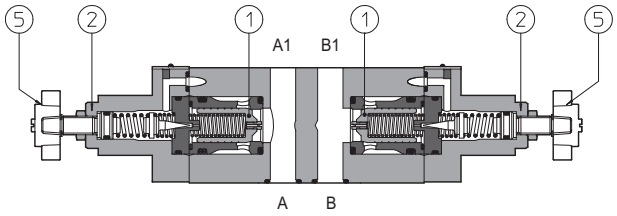


Modular relief valves type SHMP, SKM

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

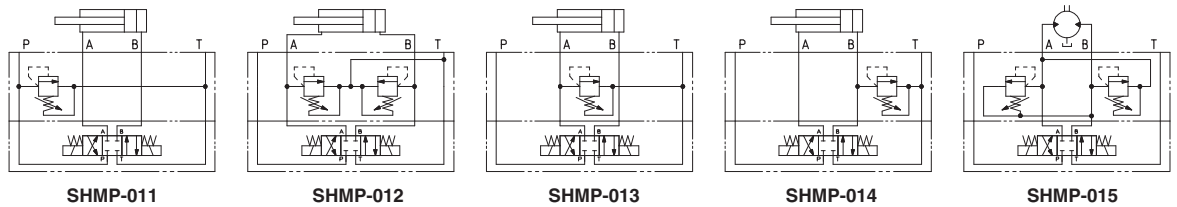
	SHMP:	SKM:
50 =	2÷ 50 bar	4÷ 50 bar
100 =	3÷100 bar	5÷100 bar
210 =	10÷210 bar	5÷210 bar
350 =	15÷350 bar	5÷350 bar

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

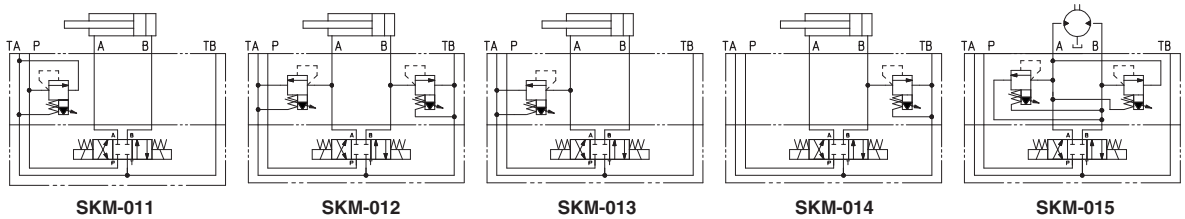
Series number

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

2 HYDRAULIC CONFIGURATION



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



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

3 GENERAL 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 /BT option = -40°C ÷ +70°C

4 HYDRAULIC CHARACTERISTICS

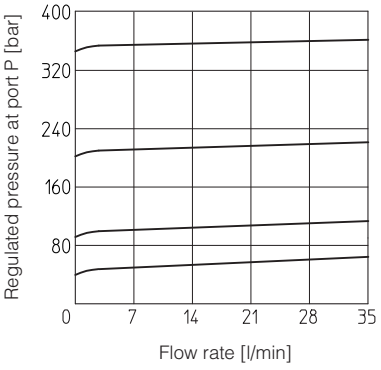
Valve model		**SHMP**	**SKM**
Max flow	[l/min]	35	120
Pressure range	[bar]	2÷50; 3÷100; 10÷210; 15÷350	4÷50; 5÷100; 5÷210; 5÷350

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

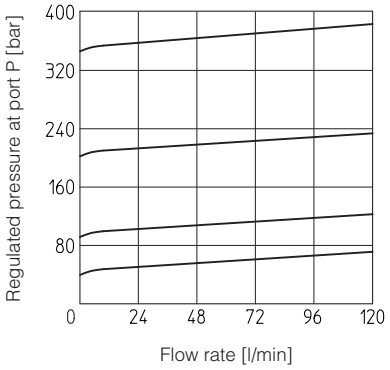
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option)= -20°C ÷ +80°C HNBR seals (/BT option)= -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 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	

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

SHMP

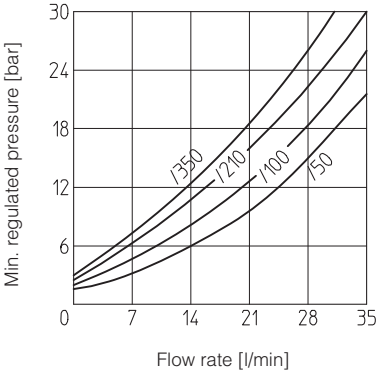


SKM

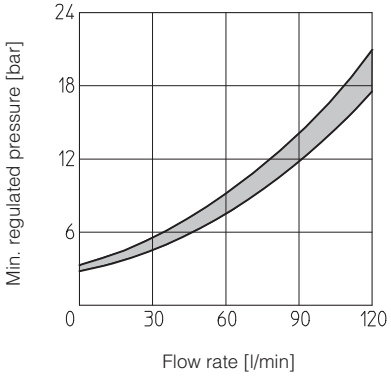


7 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS (Based on fluid viscosity of 25 mm²/s at 40°C)

SHMP

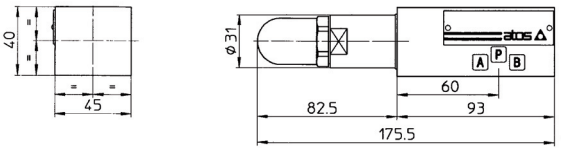


SKM



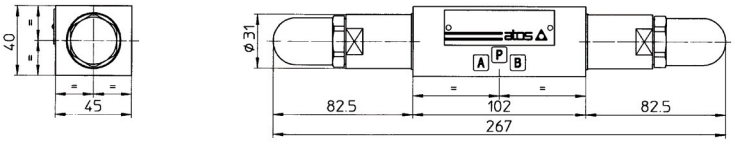
8 INSTALLATION DIMENSIONS OF SHMP VALVES [mm]

SHMP-011



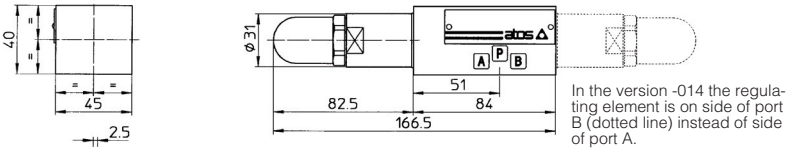
Mass: 1,4 Kg

SHMP-012



Mass: 1,7 Kg

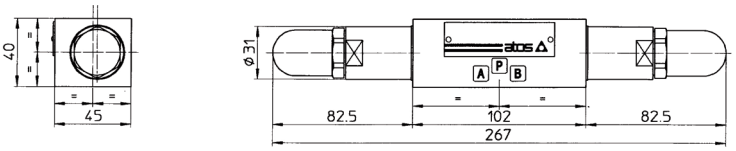
SHMP-013
SHMP-014



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

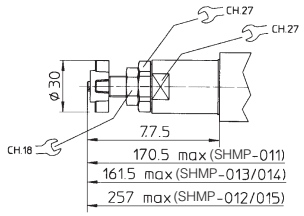
Mass: 1,2 Kg

SHMP-015

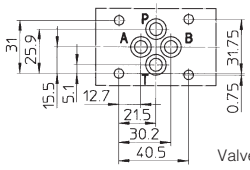


Mass: 1,7 Kg

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

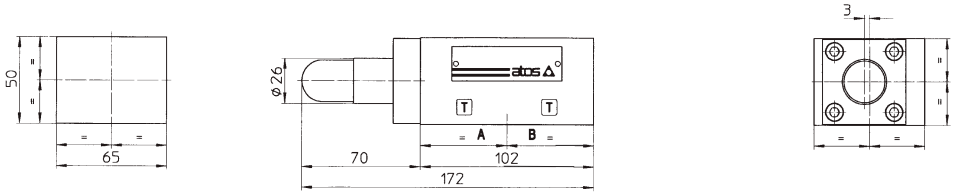


Valve's bottom view

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

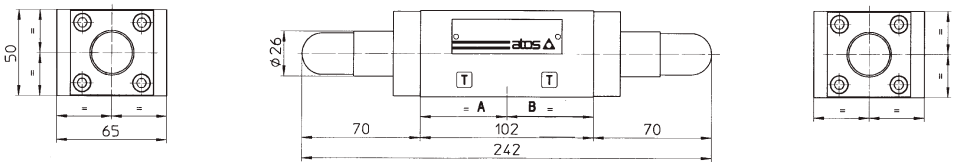
9 INSTALLATION DIMENSIONS OF SKM VALVES [mm]

SKM-011



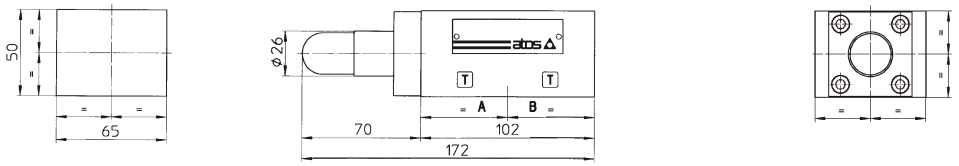
Mass: 2,5 Kg

SKM-012



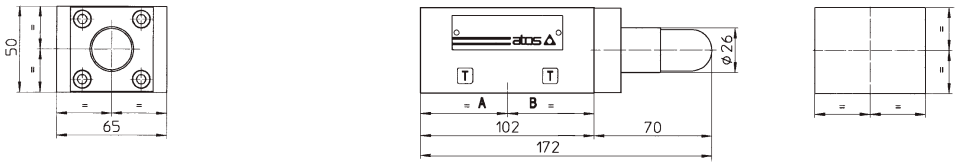
Mass: 2,8 Kg

SKM-013



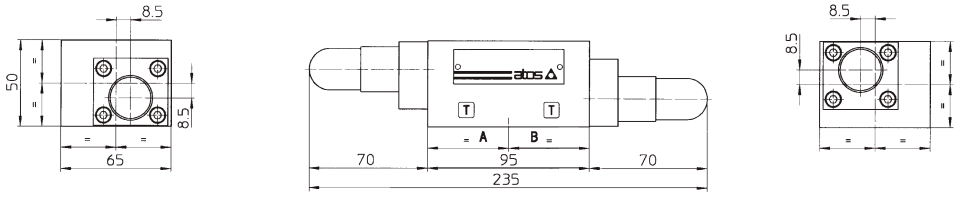
Mass: 2,5 Kg

SKM-014



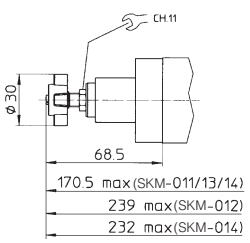
Mass: 2,5 Kg

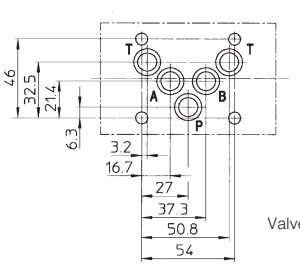
SKM-015



Mass: 2,5 Kg

Adjustement device for option /V





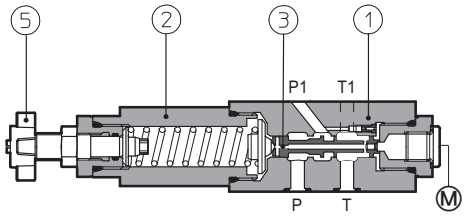
Valve's bottom view

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

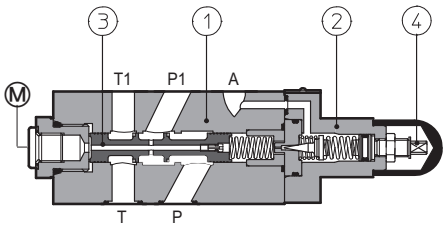
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

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

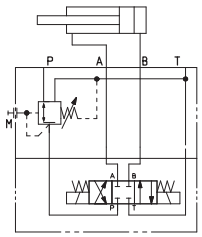
V
Options:
V = setting adjustment by handwheel instead of a grub screw protected by cap

******
Series number

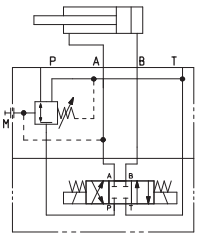
*****
Seals material, see sect. 3:
- = NBR
PE = FKM
BT = HNBR

2 HYDRAULIC CHARACTERISTICS

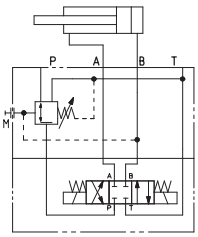
Hydraulic configuration



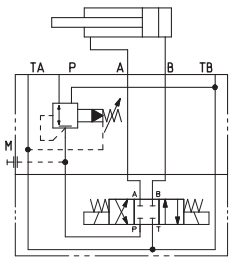
SHG-031



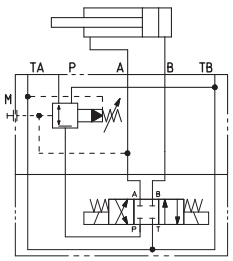
SHG-033



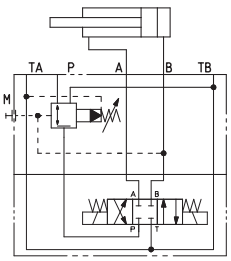
SKG-034



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

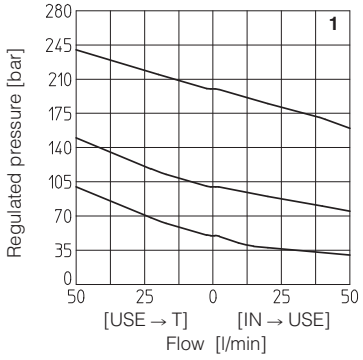
Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years (SHG) 75 years (SKG), for further details see technical table P007		
Ambient temperature	Standard execution = -30°C ÷ +70°C /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	

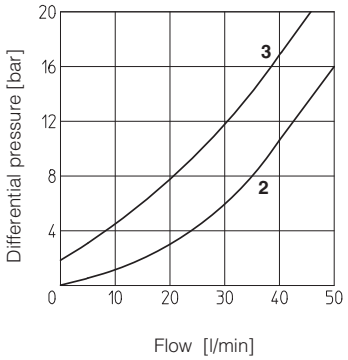
4 DIAGRAMS OF SHG-03* based on mineral oil ISO VG 46 at 50°C

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



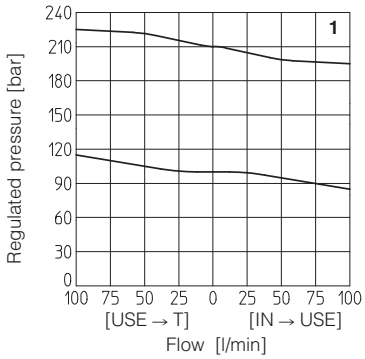


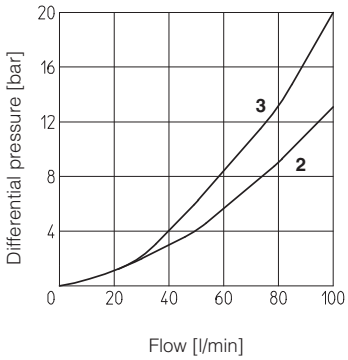
5 DIAGRAMS OF SKG-03* based on mineral oil ISO VG 46 at 50°C

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

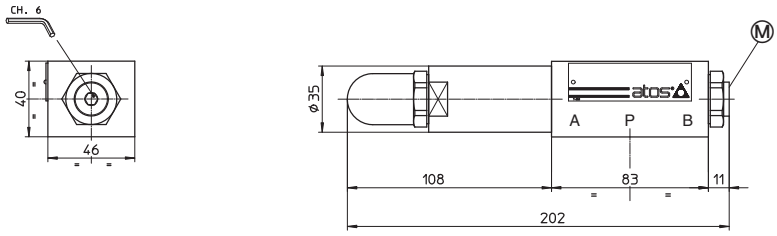
3 = differential pressure variation versus flow between use port and discharge port





6 INSTALLATION DIMENSIONS OF SHG-0 VALVES [mm]

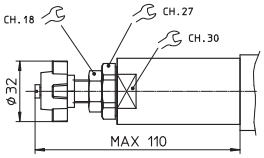
SHG-03*

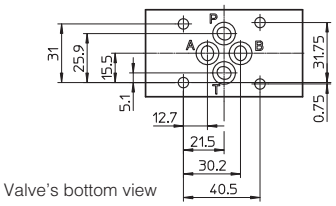


Ⓜ = Pressure gauge port = G 1/4"

Mass: 2,3 Kg

Adjustment device for option /V





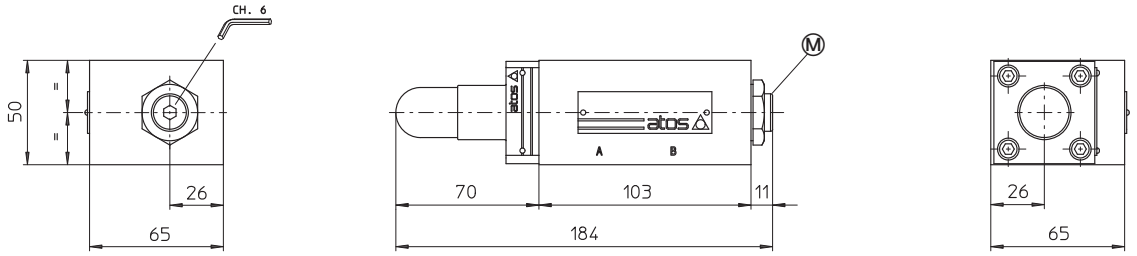
Valve's bottom view

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]

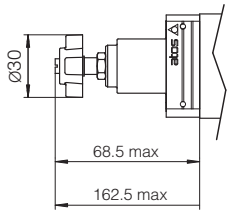
SKG-03*

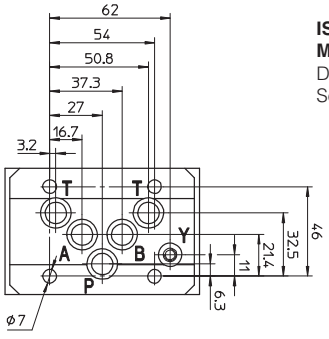


Ⓜ = Pressure gauge port = G 1/4"

Mass: 3,8 kg

Adjustment device for option /V





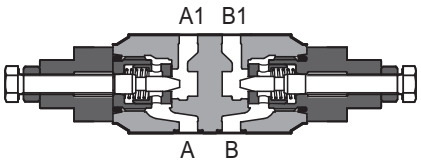
Valve's bottom view

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

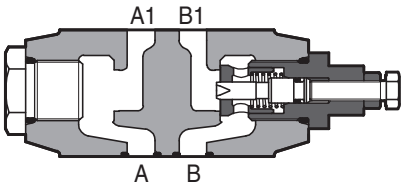
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

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

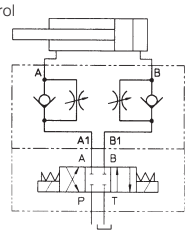
Series number

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

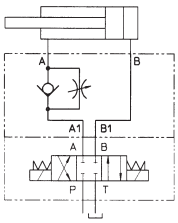
2 VALVE CONFIGURATION

Meter OUT control

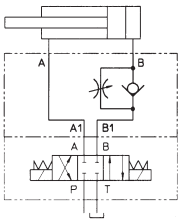
SHQ-012
SKQ-012



SHQ-013
SKQ-013

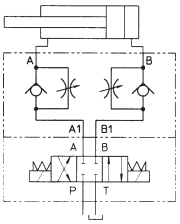


SHQ-014
SKQ-014

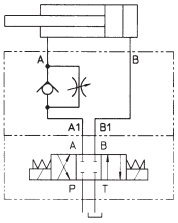


Meter IN control

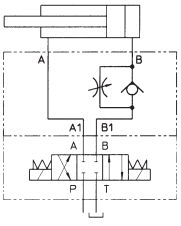
SHQ-022
SKQ-022



SHQ-023
SKQ-023



SHQ-024
SKQ-024

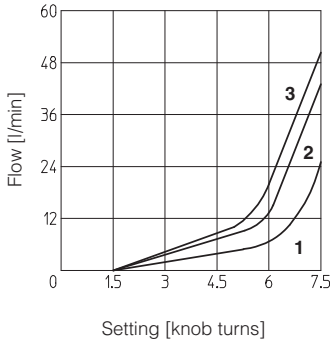


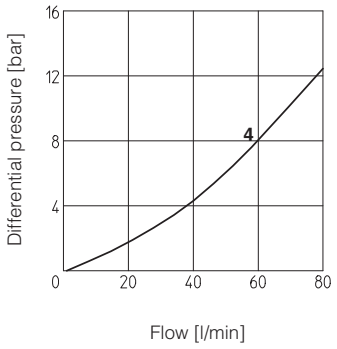
3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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

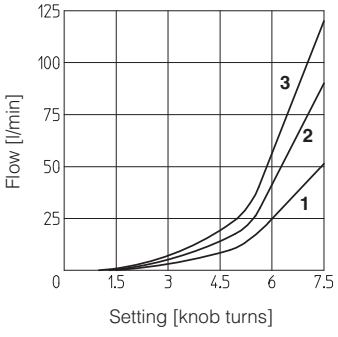
1 = Regulation diagram at Δp 10 bar
2 = Regulation diagram at Δp 30 bar
3 = Regulation diagram at Δp 50 bar
4 = Q/Δp diagram for free flow through the non-return valve

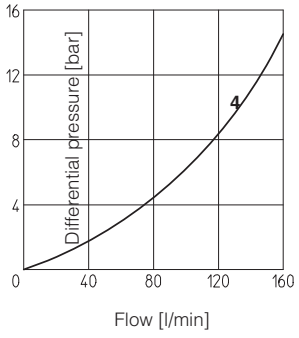




5 DIAGRAMS OF SKQ-0 based on mineral oil ISO VG 46 at 50°C

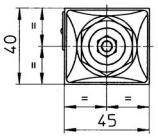
1 = Regulation diagram at Δp 10 bar
2 = Regulation diagram at Δp 30 bar
3 = Regulation diagram at Δp 50 bar
4 = Q/Δp diagram for free flow through the non-return valve

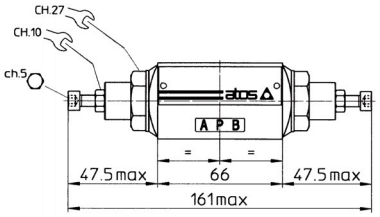




6 INSTALLATION DIMENSIONS OF SHQ-0 VALVES [mm]

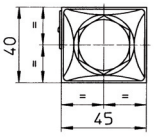
SHQ-012
SHQ-022

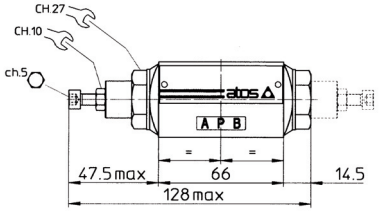




Mass: 1,1 Kg

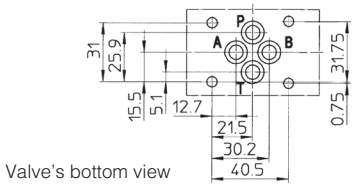
SHQ-013
SHQ-014
SHQ-023
SHQ-024





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



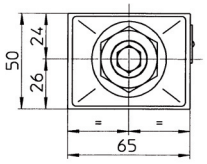
Valve's bottom view

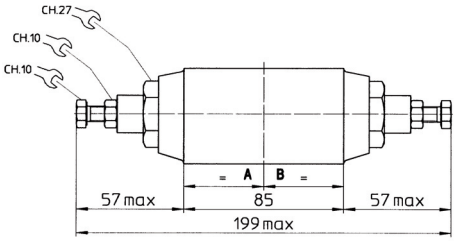
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Diameter of ports A, B, P, T: Ø = 7,5 mm (max)
Seals: 4 OR 108

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]

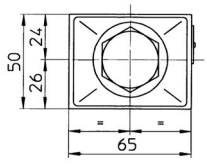
SKQ-012
SKQ-022

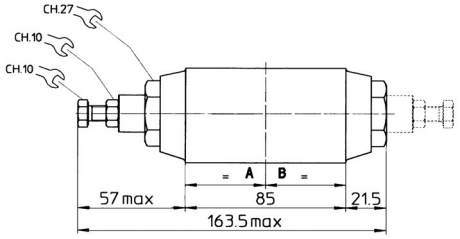




Mass: 2 Kg

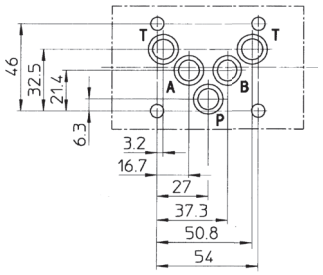
SKQ-013
SKQ-014
SKQ-023
SKQ-024





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

: 2,2 Kg



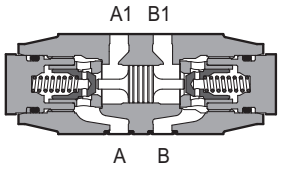
Valve's bottom view

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

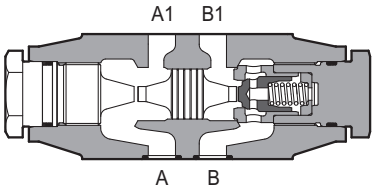
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.

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.)
2 = 2 bar
4 = 4 bar
8 = 8 bar

******

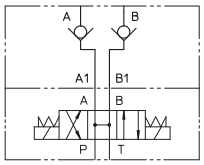
Series number

*****

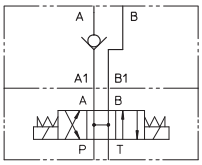
Seals material, see section 3:
- = NBR
PE = FKM
BT = HNBR

2 VALVE CONFIGURATION

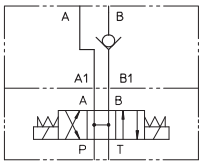
SHR-002
SKR-002



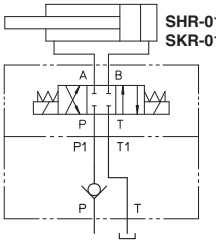
SHR-003
SKR-003



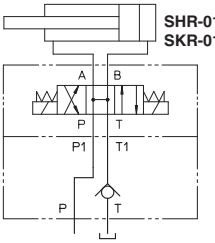
SHR-004
SKR-004



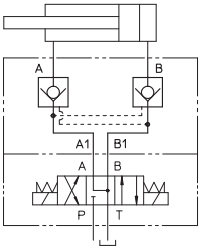
SHR-011
SKR-011



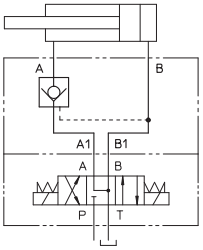
SHR-016
SKR-016



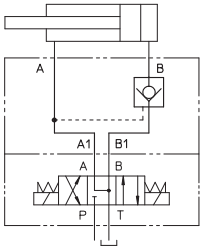
SHR-012
SKR-012



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	

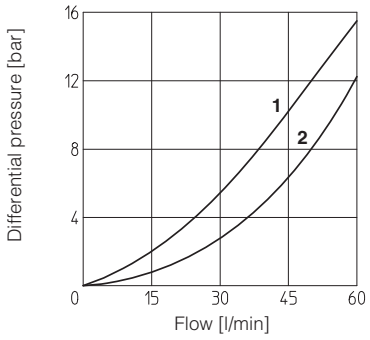
4 DIAGRAMS OF SHR-0 based on mineral oil ISO VG 46 at 50°C

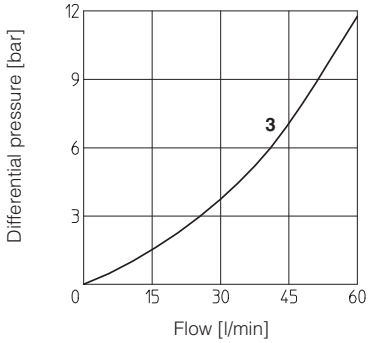
Flow through check valve:

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





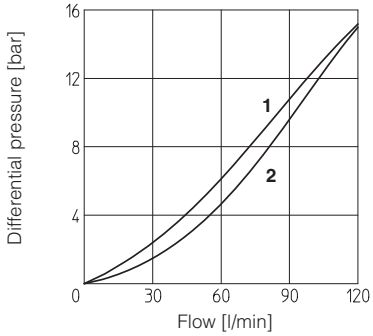
5 DIAGRAMS OF SKR-0 based on mineral oil ISO VG 46 at 50°C

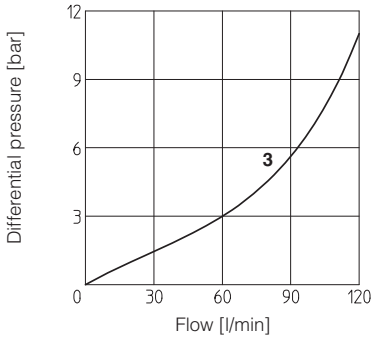
Flow through check valve:

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

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

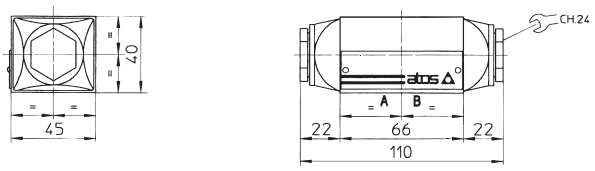
3 = SKR-011, SKR-016





6 INSTALLATION DIMENSIONS OF SHR-0 VALVES [mm]

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

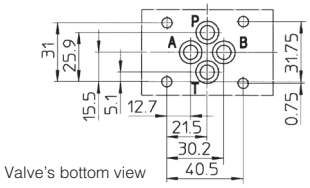


Mass: 1 Kg

SHR-011
SHR-016

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

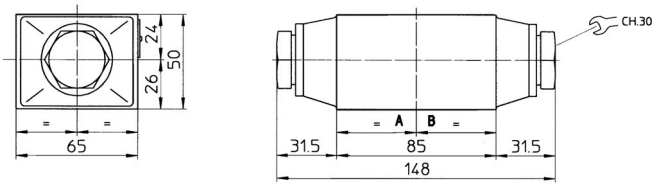


Valve's bottom view

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

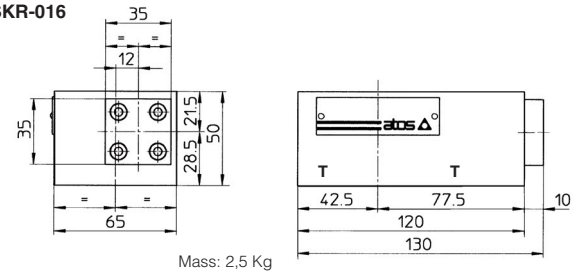
7 INSTALLATION DIMENSIONS OF SKR-0 VALVES [mm]

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



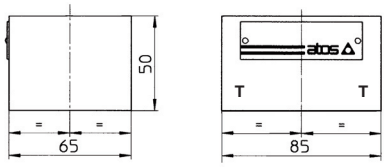
Massa: 2,3 Kg

SKR-016



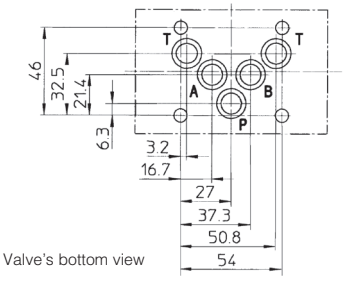
Mass: 2,5 Kg

SKR-011



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

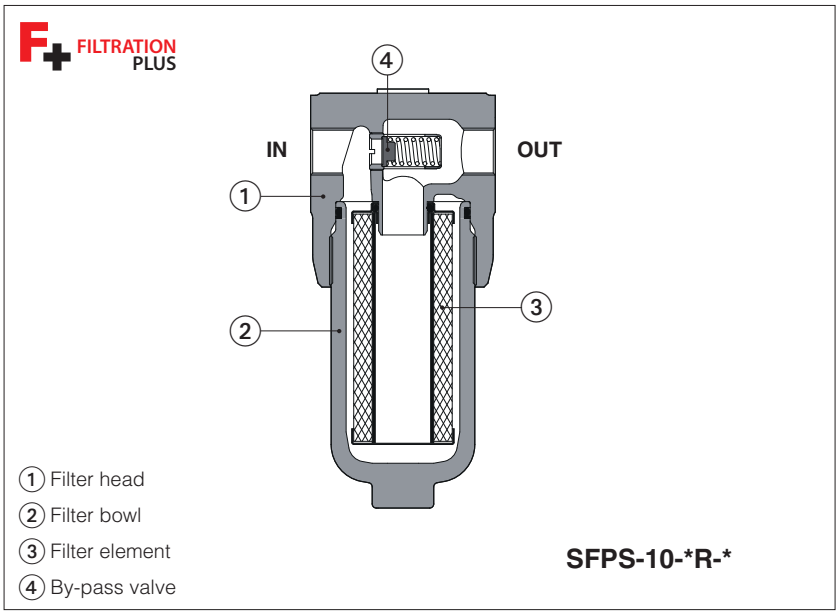


Valve's bottom view

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

In line filters, high pressure type SFPS

Threaded ports



SFPS
In line filters are designed for installation on the pressure line downstream the pump, to ensure a high cleanliness of the fluid circulating into the hydraulic system. They protect sensible components from contamination present in the working fluid and they are particularly recommended for systems with proportional valves.

- three head sizes
- port sizes: G1/2" to G1 1/2"
  SAE-16, SAE-20, SAE-24
- **Filtration Plus** microfiber elements ensure high efficiency, low pressure drop, high DHC and long lasting performance. Collapse pressure 21 bar for filters equipped with by-pass valve or 210 bar for filters without by-pass
- filtration rating 5 - 7 - 12 - 22 µm(c) (βx (c) >1000, ISO 16889).
- versions without or with by-pass valve with cracking pressure 6 bar.
- without or with differential clogging indicator

Max flow **450 l/min**
Max working pressure **420 bar**

1 MODEL CODE OF COMPLETE FILTERS

SFPS	-	10	-	A	-	F10	-	01	-	R	-	W	*	/	*

SFPS — In line filter, high pressure

Filter size (ports size):
10 = G1/2" ÷ G1" or SAE-16
20 = G1" ÷ G1 1/4" or SAE-20
30 = G1 1/4" ÷ G1 1/2" or SAE-24

Filter length:		Max flow [l/min] **(1)** SFPS-10	SFPS-20	SFPS-30
A	=	115	191	256
B	=	137	205	361
C	=	-	226	406
D	=	-		450

Filter element:
SN = only body, without filter element
F_+ microfibre filter element βx(c) >1000 - ISO 16889:
F03 = 5 µm (c) **F10** = 12 µm (c)
F06 = 7 µm (c) **F20** = 22 µm (c)
Filter element **F01** = 4 µm (c) available on request

Ports size:	SFPS-10	SFPS-20	SFPS-30
BSPP threaded:	**00** = G 1/2" **01** = G 3/4" **02** = G 1"	**02** = G 1" **03** = G 1 1/4"	**03** = G 1 1/4" **04** = G 1 1/2"
SAE J1926-1 threaded:	SFPS-10 **42** = SAE-16	SFPS-20 **43** = SAE-20	SFPS-30 **44** = SAE-24 (1 1/2")

By-pass valve see sect. 9:
R = by-pass valve with cracking pressure 6 bar (filter element SPSH-*-R with collapse pressure 21 bar)
N = without by-pass (filter element SPSH-*-N with collapse pressure 210 bar)

Differential clogging indicator see sect. 14 **(2)**:
W = without, indicator port with plastic plug **(3)**
P = without, indicator port with steel plug
L = electrical indicator with LED
M = electrical indicator without LED
V = visual indicator
see also note (4)

Seals material:
- = NBR
PE = FKM

Series number

Note: filters for use in potentially explosive atmosphere are available on request, contact Atos Technical Office

(1) Max flow rates are measured with: Δp 1 bar, filter element F20, largest port size, option -R, oil viscosity 32 mm²/s - see also section 6
In case of different conditions see section 10 for filter sizing

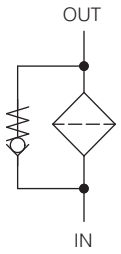
(2) The clogging indicator is supplied disassembled from the filter. The indicator port on filter head is plugged with plastic plug

(3) The plastic plug (option W) is factory assembled to prevent impurities from entering the filter through the clogging indicator port.
A clogging indicator must be fitted on the filter before commissioning. Do not install the filter with the plastic cap on the hydraulic system

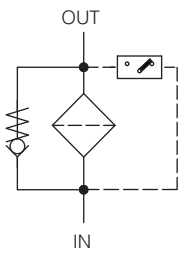
(4) Differential clogging indicator CID-E*-M/UL with cURus certification is available on request, see section 4

2 HYDRAULIC SYMBOLS (representation according to ISO 1219-1)

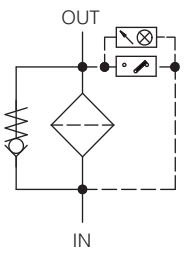
SFPS-*-**R-W**



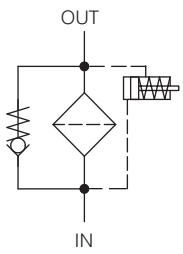
SFPS-*-**R-M**



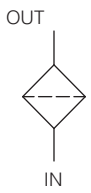
SFPS-*-**R-L**



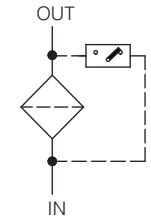
SFPS-*-**R-V**



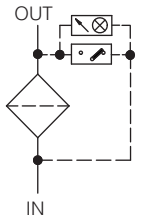
SFPS-*-**N-W**



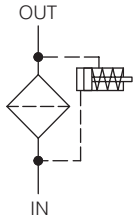
SFPS-*-**N-M**



SFPS-*-**N-L**



SFPS-*-**N-V**



3 MODEL CODE OF FILTER ELEMENTS - only for spare **(1)**

SPSH	-	**10**	-	**A**	-	**F10**	-	**R**	*****	/	*****

Spare filter element
for in line filter type SFPS

Filter element size:
10 = for SFPS-10
20 = for SFPS-20
30 = for SFPS-30

Filter element length:

for SFPS-10	for SFPS-20	for SFPS-30
A	**A**	**A**
B	**B**	**B**
	C	**C**
		D

Series number

Seals material:
- = NBR
PE = FKM

R = filter element with collapse pressure 21 bar, for filter SFPS-*-R with by-pass valve
N = filter element with collapse pressure 210 bar, for filter SFPS-*-N without by-pass valve

Microfibre filter element, βx(c) >1000 - ISO 16889:
F03 = 5 µm (c)
F06 = 7 µm (c)
F10 = 12 µm (c)
F20 = 22 µm (c)
Filter element **F01** = 4 µm (c) available on request

(1) Select the filter element according to the model code reported on the filter nameplate, see section 17

4 MODEL CODE OF DIFFERENTIAL CLOGGING INDICATORS - only for spare - see section 13 and 14

CID	-	E	05	-	M	*	/	*

Spare differential clogging indicator for in line filter

Type of indicator:
E = electrical
V = visual

Differential switching pressure:
05 = 5 bar for filters with by-pass valve
08 = 8 bar for filters without by-pass valve

Series number

Seals material:
- = NBR
PE = FKM

Optional LED - only for CID-E
L = with LED
M = without LED
M/UL = without LED, certified according to North American Standard cURus (available on request)

5 GENERAL CHARACTERISTICS

Assembly position / location		Vertical position with the bowl downward
Ambient temperature range		**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range		**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Materials	Filter head	Cast iron
	Filter bowl	Carbon steel
Surface protection		Zinc coating with black passivation
Corrosion resistance		Salt spray test (EN ISO 9227) > 600 h
Fatigue strength		min. 1 x 10^6 cycles at 420 bar
Compliance		Tested to NFPA T3.10.5.1, ISO 10771, ISO 3968 RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULICS CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C (viscosity 32mm²/s)

Filter size		SFPS-10						SFPS-20						SFPS-30							
Ports size code		00		01		02, 42		02			03, 43			03				04, 44			
Ports dimension		G1/2"		G3/4		G1", SAE-16		G1"			G1"1/4, SAE-20			G1"1/4				G1/"1/2, SAE-24			
Filter length		A	B	A	B	A	B	A	B	C	A	B	C	A	B	C	D	A	B	C	D
Max flow (l/min) at Δp= 1 bar Filter with by-pass **-R** (see note)	**F03**	36	56	40	62	43	73	73	84	105	80	93	118	88	164	213	259	91	172	226	277
	F06	48	69	53	79	61	98	100	112	135	112	127	154	127	225	277	330	132	239	297	356
	F10	63	79	72	92	86	120	135	148	170	154	170	195	183	275	321	380	193	295	347	414
	F20	78	87	90	101	115	137	166	178	196	191	205	226	240	333	373	412	256	361	406	450
Max flow (l/min) at Δp= 1 bar Filter without by-pass **-N** (see note)	**F03**	31	43	34	48	36	53	60	70	88	65	76	98	71	120	191	215	74	125	202	228
	F06	47	55	52	61	58	71	83	94	116	91	105	131	93	187	228	290	97	197	242	311
	F10	54	75	60	87	70	111	117	130	153	133	149	176	158	245	298	343	166	260	321	372
	F20	72	85	82	99	103	131	154	166	187	177	192	215	210	315	367	380	223	340	400	414
Max operating pressure [bar]		**420**																			
Burst pressure [bar]		**> 1260**																			

Note: Max flow rates are measured with Δp= 1 bar and viscosity 32mm²/s. In case of different conditions see section 10 for filter sizing

7 FILTER ELEMENTS

Material		Inorganic microfibre
Filtration rating as per ISO16889	**F03**	$\beta_{4,5\mu m\,(c)} \geq 1000$
	F06	$\beta_{7\mu m\,(c)} \geq 1000$
	F10	$\beta_{12\mu m\,(c)} \geq 1000$
	F20	$\beta_{22\mu m\,(c)} \geq 1000$
Filter element collapse pressure	**R** = for filter with by-pass valve	21 bar
	N = for filter without by-pass valve	210 bar

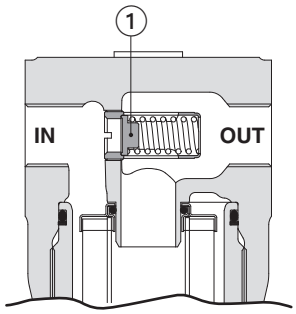
8 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -30°C ÷ +100°C, with HFC hydraulic fluids = +10°C ÷ +50°C FKM seals (/PE option) = -25°C ÷ +120°C		
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
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	

9 BY-PASS VALVE

Filter with by-pass valve - version **-R**

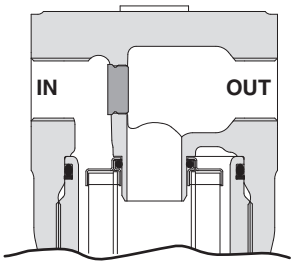
The filter with by-pass valve (1) is used in combination with filter elements SPSH-*-R with collapse pressure 21 bar.
The by-pass valve allows the oil flow to by-pass the filter element in particular conditions:
- it protects the filter element from pressure peaks that could be generated, especially at the cold system start-up. In these cases the valve opens only for the instant necessary to discharge the pressure peak, limiting the quantity of oil that bypasses the filter.
- it allows the free passage of the oil flow in case of completely clogged filter element (Δp > 6 bar).
  This situation should be carefully avoided, by means of a scheduled maintenance, otherwise the contaminated oil will pass to the clean side of the filter and then it will circulate in the hydraulic system.
  The filter element must be replaced before the clogging condition, at this purpose the use of a differential clogging indicator CID-V (visual, option V) or CID-E (electrical, options L or M) is highly recommended.



SFPS-*-R

Filter without by-pass valve - version **-N**

The filter version without by-pass is recommended when the hydraulic system must be absolutely protected by contamination, then avoiding the risk that the contaminant passes though the by-pass valve.
The filter without by pass must be used in combination with filter elements SPSH-N with high collapse pressure 210 bar



SFPS-*-N

10 FILTERS SIZING

For the filter sizing it is necessary to consider the Total Δp at the maximum flow at which the filter must work.
The Total Δp is given by the sum of filter head Δp plus the filter element Δp:

Total Δp = filter head Δp + filter element Δp

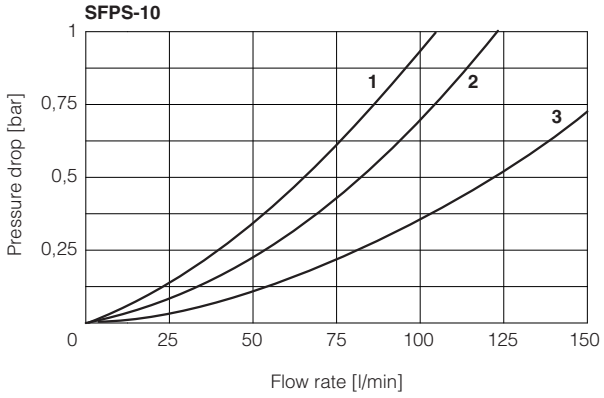
In the best conditions the total Δp should not exceed 1,0 bar
See below sections to calculate the Δp of filter head and Δp of the filter element

10.1 Q/Δp DIAGRAMS OF FILTER HEAD

The pressure drop of filter head mainly depends on the ports size and fluid density
In the following diagrams are reported the Δp characteristics of filter head based on mineral oil with density 0,86 kg/dm^3 and viscosity 30 mm^2/s

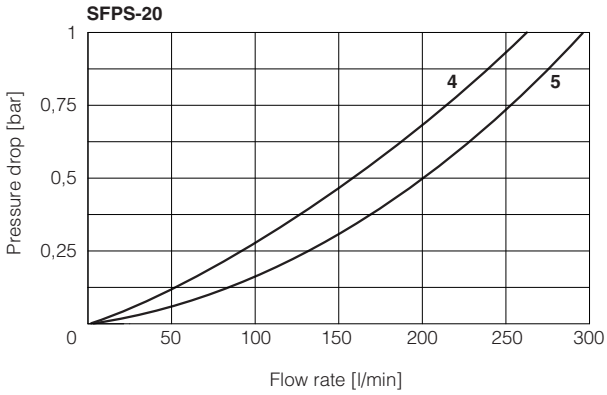
SFPS-10

1 = SFPS-10*** 00 (G 1/2")
2 = SFPS-10*** 01 (G 3/4")
3 = SFPS-10*** 02 (G 1")
SFPS-10*** 42 (SAE-16)



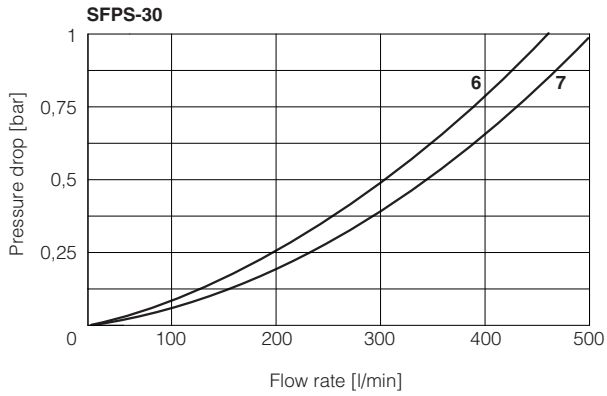
SFPS-20

4 = SFPS-20*** 02 (G 1")
5 = SFPS-20*** 03 (G 1¼")
SFPS-20*** 43 (SAE-20)



SFPS-30

6 = SFPS-30*** 03 (G 1¼")
7 = SFPS-30*** 04 (G 1½")
SFPS-30*** 44 (SAE-24)



10.2 FILTER ELEMENT Δp

The pressure drop through the filter depends to:
- size of filter element
- filtration rating
- fluid viscosity

The Δp of filter element is given by the formula:

$$\Delta p \text{ of filter element} = Q \times \frac{Gc}{1000} \times \frac{\text{Viscosity}}{32}$$

Q = working flow (l/min)

Gc = Gradient coefficient (mbar/(l/min)).
The Gc values are reported in the following table

Viscosity = effective fluid viscosity in the working conditions (mm²/s)

Gradient coefficient Gc of SPSH filter elements

Filter element size		**10**		**20**			**30**			
Filter element length		**A**	**B**	**A**	**B**	**C**	**A**	**B**	**C**	**D**
Filter element type	Filtration rating	**Gc** Gradient coefficient								
R for filter with bypass valve	**F03**	21.30	10.84	11.07	9.23	6.74	10.26	4.82	3.27	2.30
	F06	13.97	6.79	7.27	6.06	4.43	6.73	2.98	1.99	1.26
	F10	8.39	4.42	4.45	3.71	2.71	4.12	2.02	1.36	0.70
	F20	4.78	2.93	2.87	2.39	1.75	2.66	1.21	0.77	0.40
N for filter without bypass valve	**F03**	26.03	16.72	14.19	11.83	8.64	13.00	7.15	3.87	3.21
	F06	14.77	11.25	9.50	7.92	5.79	9.63	4.00	2.93	1.80
	F10	11.57	5.25	5.66	4.72	3.45	5.05	2.57	1.67	1.10
	F20	6.13	3.34	3.41	2.84	2.07	3.33	1.44	0.83	0.70

Example:

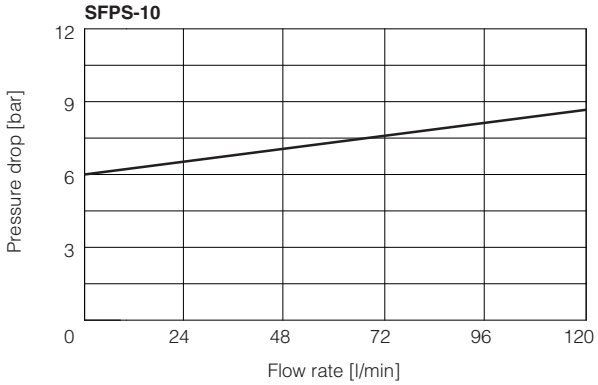
Calculation of Total Δp for filter type SFPS-10-B-F10-02-R at Q = 80 l/min and viscosity 46 mm²/s (filter element SPSH-10-B-F10-R)
Dp of filter head = 0,24 bar
Gr = 4,42 mbar/(l/min)

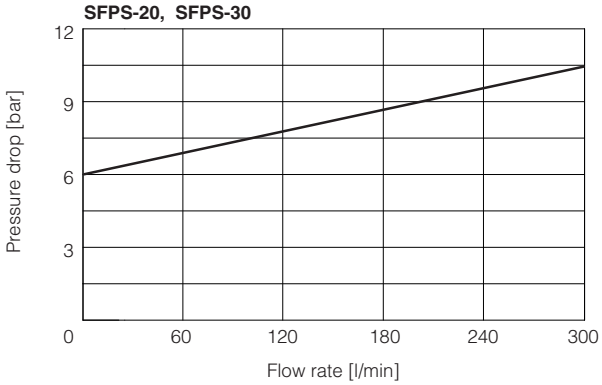
Filter element Δp = $80 \times \frac{4{,}42}{1000} \times \frac{46}{32} = 0{,}51$ bar

Total Δp = 0,24 + 0,51 = **0,75 bar**

11 **BY-PASS VALVE** - based on mineral oil ISO VG46 at 50°C (viscosity = 32 mm²/s)

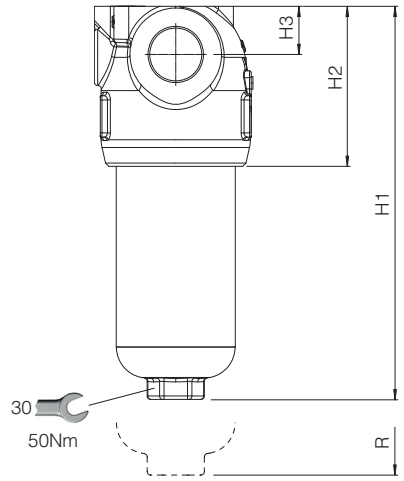
Q/Δp diagrams of flow through the by-pass valve

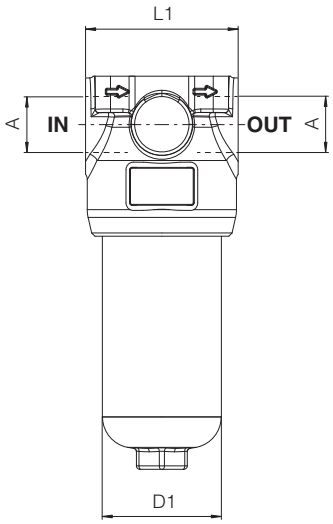


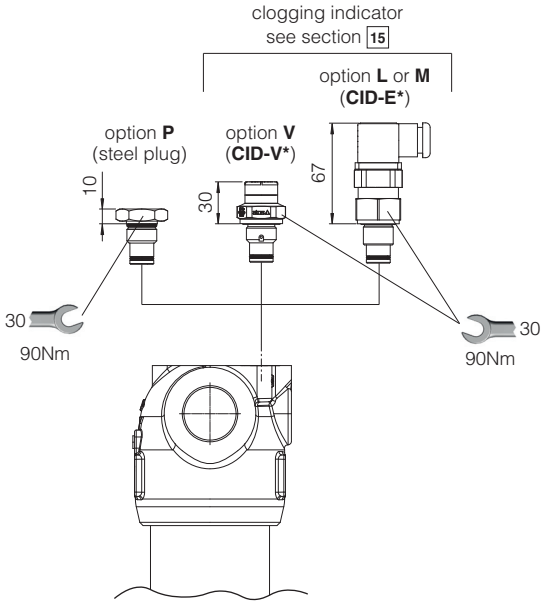


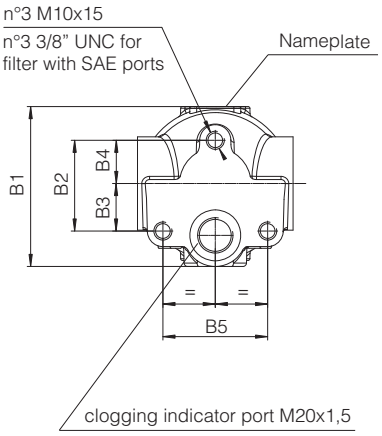
12 INSTALLATION DIMENSIONS OF SFPS FILTERS [mm]

SFPS -10





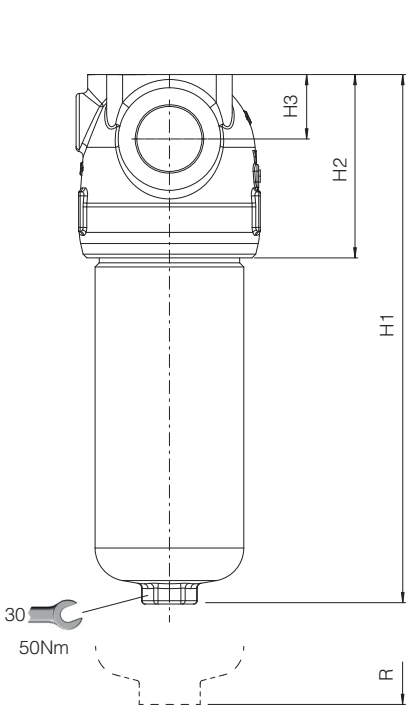


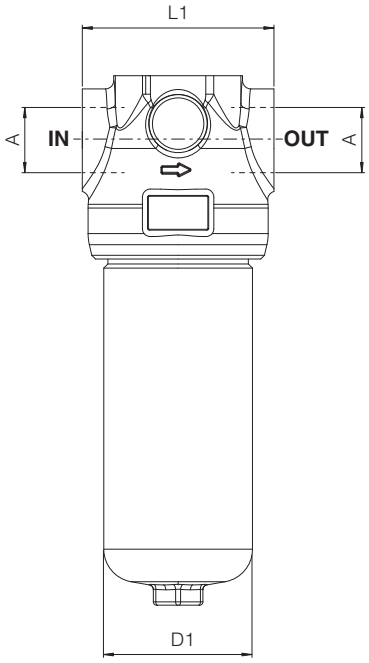


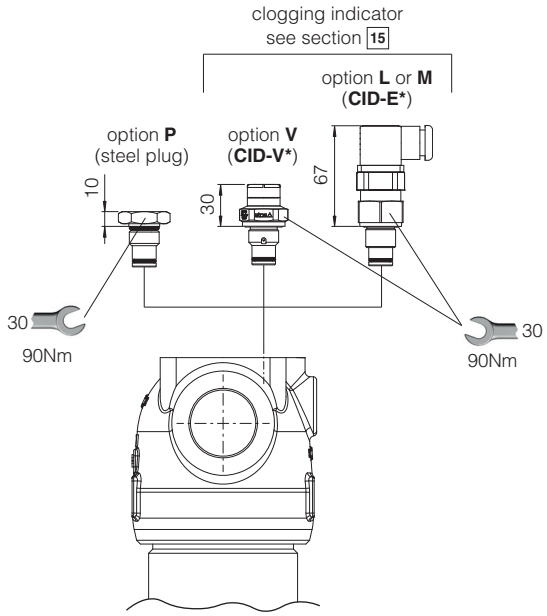
Code	A	B1	B2	B3	B4	B5	D1	H1	H2	H3	L1	R (element removal)	Mass (Kg)
SFPS-10-A	1/2" BSPP 3/4" BSPP 1" BSPP SAE-16 **(1)**	93.5	52.5	27.5	25	60.6	70	203	93	28	90	110	4
SFPS-10-B								296					5

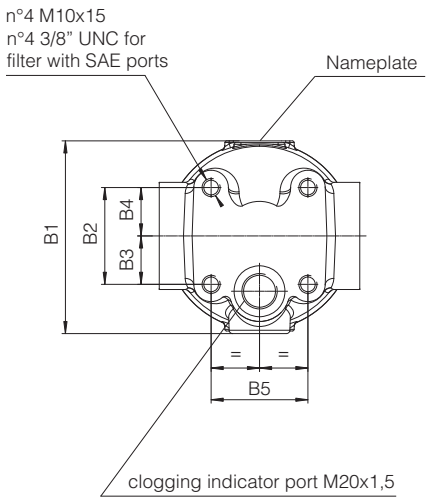
(1) SAE-16 thread size 1" 5/16-12-UN-2B

SFPS -20





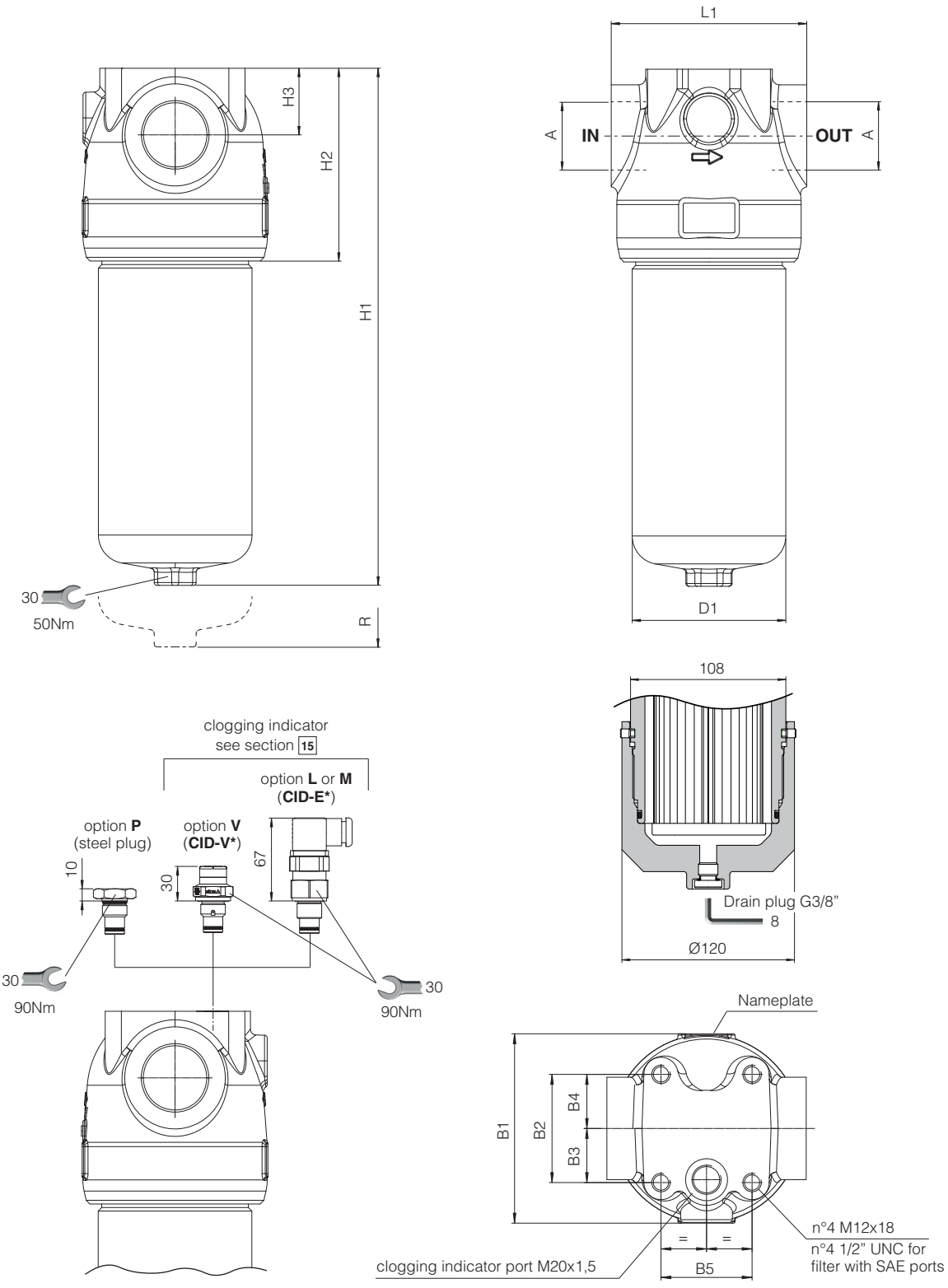




Code	A	B1	B2	B3	B4	B5	D1	H1	H2	H3	L1	R (element removal)	Mass (Kg)
SFPS-20-A	1" BSPP 1 1/4" BSPP SAE-20 **(1)**	111.5	56	28	28	56	90	261	111	39	116	120	7.4
SFPS-20-B								320					8.5
SFPS-20-C								390					9.9

(1) SAE-20 thread size 1" 5/8-12-UN-2B

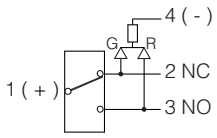
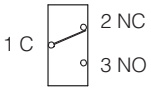
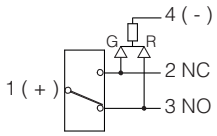
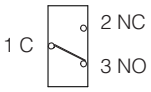
SFPS -30



Code	A	B1	B2	B3	B4	B5	D1	H1	H2	H3	L1	R (element removal)	Mass (Kg)
SFPS-30-A	1 1/4" BSPP 1 1/2 BSPP SAE-24 **(1)**	133.5	76	38	38	64	110	240.5	136	47	140	130	10.5
SFPS-30-B								333.5					13
SFPS-30-C								453.5					16.4
SFPS-30-D								552.5					19

(1) SAE-24 thread size 1" 7/8-12-UN-2B

13 CHARACTERISTICS OF DIFFERENTIAL CLOGGING INDICATORS

Model code		CID-E* ELECTRICAL		CID-V* VISUAL
Differential switching pressure	CID-E05, CID-V05	5 bar ± 10%		5 bar ± 15%
	CID-E08, CID-V08	8 bar ± 10%		8 bar ± 10%
Max pressure		450 bar		420 bar
Max differential pressure		200 bar		
Ambient temperature		-25°C ÷ +100°C		-25°C ÷ +80°C
Hydraulic connection		M20x1,5		
Duty factor		100%		
Mechanical life		1 x 10^6 operations		
Mass (Kg)		0,16		0,11
Electric connection		Electric plug connection as per DIN 43650 with cable gland type PG7		-
Power supply	CID-E05-L, CID-E08-L	24 VDC ± 10%		-
	CID-E05-M, CID-E08-M	14 VDC ÷ 30 VDC	125 VAC ÷ 250 VAC	-
Max current - resistive (inductive)		5 A (4 A) ÷ 4 A (3 A)	5 A (3 A) ÷ 3 A (2 A)	-
Protection degree to DIN EN 60529		IP65 with mating connector		-
Switching scheme		**CID-*-L**	**CID-*-M**	
	clean filter element			GREEN
	clogged filter element			RED

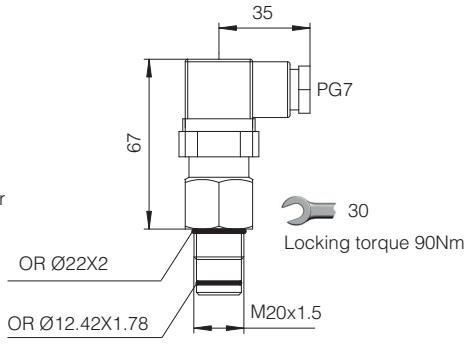
14 DIMENSIONS OF DIFFERENTIAL CLOGGING INDICATORS

ELECTRICAL INDICATOR

CID-E05-L
CID-E08-L

Electric connector
DIN 43650
Transparent
with internal Led

Led signal:
Green = clean filter element
Red = clogged filter element
(filter elements to be replaced)



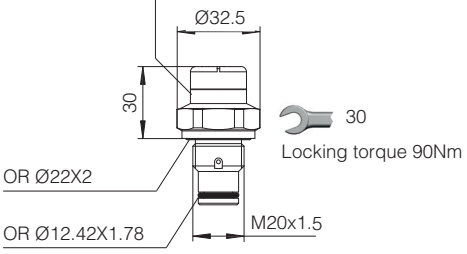
CID-E05-M
CID-E08-M
CID-E05-M/UL
CID-E08-M/UL

Electric connector
DIN 43650
Black colour

VISUAL INDICATOR

CID-V05
CID-V08

Visual signal:
Green = clean filter element
Red = clogged filter element
(filter elements to be replaced)



Note: the electrical connector can be oriented at steps of 90°

15 INSTALLATION AND COMMISSIONING

The max operating pressure of the system must not exceed the max working pressure of the filter (420 bar).
During the filter installation, pay attention to respect the flow direction, shown by the arrow on the filter head.
The filter should be preferably mounted with the bowl downward.
The filter should be properly secured using the threaded fixing holes on the filter head.
Make sure that there is enough space for the replacement of the filter element, see dimension "**R**" at section 12.
Never run the system without the filter element.

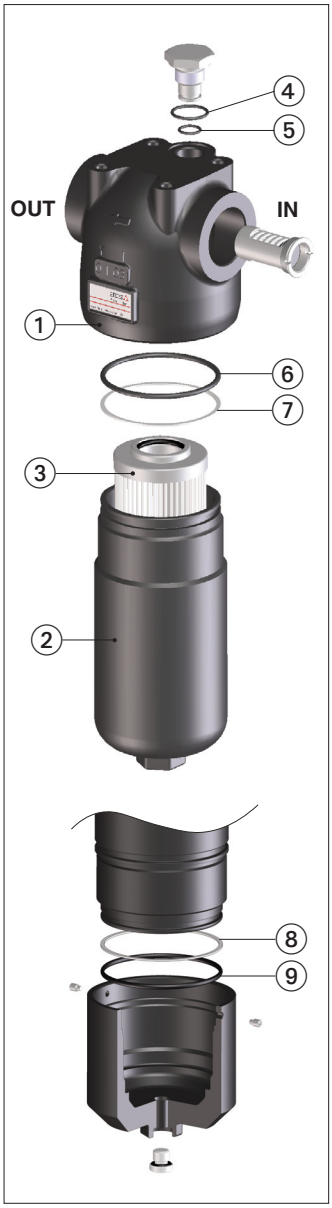
For filters ordered with clogging indicator:
- remove the plastic plug from the indicator port on the filter head
- install the clogging indicator and lock it at the specified torque

During the cold start up (fluid temperature lower than 30°C), a false clogging indicator signal can be given due to the high fluid viscosity.

16 MAINTENANCE

The filter element must be replaced as soon as the clogging indicator switches to highlight the filter clogged condition.
For filters without clogging indicator, the filter element must be replaced according to the system manufacturer's recommendations.
Select the new filter element according to the model code reported on the filter nameplate, see section 17.

For the replacement of the filter element, proceed as follow:
- releases the system pressure; the filter has no pressure bleeding device
- pay attention to the fluid and filter surface temperature. Always use suitable gloves and protection glasses
- unscrew the bowl ② from the filter head ① by turning counterclockwise (view from bottom side)
- remove the dirty filter element ③ pulling it carefully
- lubricate the seal of new filter element and insert it over the spigot in the filter head
- clean the bowl internally, check the o-ring ⑥ and replace it if damaged
- lubricate the o-ring, the threads and screw by hand the bowl to the filter head by turning clockwise (view from bottom side). Tighten at the recommended torque.



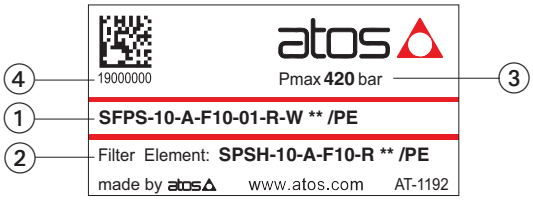
WARNING: The dirty filter elements cannot be cleaned and re-used. They are classified as "dangerous waste material", then they must be disposed of by authorized Companies, according to the local laws.

16.1 SEALS KIT

Filter type	Seal kit code (NBR)	Seal kit code (FKM)	Seal kit composition
SFPS-10	GUARN SFPS-10	GUARN SFPS-10 /PE	④+⑤+⑥+⑦
SFPS-20	GUARN SFPS-20	GUARN SFPS-20 /PE	④+⑤+⑥+⑦
SFPS-30	GUARN SFPS-30	GUARN SFPS-30 /PE	④+⑤+⑥+⑦+⑧+⑨ **(1)**

(1) Seals ⑧ and ⑨ are supplied in seal kit but used only for SFPS-30-D

17 FILTER IDENTIFICATION NAMEPLATE



① Model code of complete filter
② Model code of filter element
③ Max working pressure
④ Filter matrix code

17.1 IDENTIFICATION OF FILTER ELEMENT

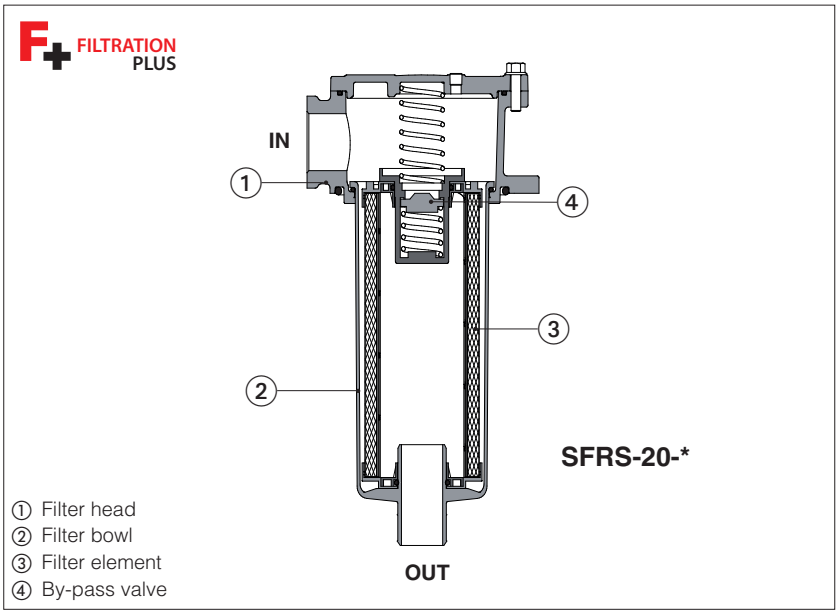
① Model code of filter element
② Filtration Plus identification

18 RELATED DOCUMENTATION

LF010	Fluid contamination
LF020	Filtration guidelines

Return line filters, tank-top type SFRS

Threaded ports



SFRS

Return filters are designed to ensure cleanliness of fluid back to the tank from contamination collected downstream of the hydraulic circuit.

They are specific for installation on the top of the hydraulic tank.

- four head sizes
- ports size: G1/2" to G2"
  SAE-12 to SAE-32
- by-pass valve with cracking pressure 3 bar
- **Filtration Plus** microfiber filter elements ensure low pressure drop, high DHC and long lasting performance,
- filtration rating 7 - 12 - 27 µm(c) (βx (c) >1000, ISO 16889)
- cellulose filter elements with filtration rating 10 or 25 µm (βx (c) >2, ISO 16889)
- without or with electrical or visual clogging indicators

Max flow **750 l/min**

Max working pressure **8 bar**

1 MODEL CODE OF COMPLETE FILTERS

SFRS	-	10	-	A	-	F10	-	00	-	R	-	W	**	/	*

SFRS: Return line filter

Filter size (ports size):
10 = G1/2" ÷ G3/4" or SAE-12
20 = G1/2" ÷ G1¼" or SAE-16
30 = G1" ÷ G1½" or SAE-24
40 = G1¼" ÷ G2" or SAE-32

Filter length:		Max flow [l/min] **(1)**			
		SFRS-10	SFRS-20	SFRS-30	SFRS-40
A	=	50	75	290	370
B	=	80	125	310	600
C	=	-	200	-	650
D	=	-	260	-	430 **(2)**
E	=	-	-	-	750

SN = only body, without filter element

F+ microfibre filter element, βx(c) >1000 - ISO 16889:
F06 = 7 µm (c)
F10 = 12 µm (c)
F25 = 27 µm (c)

Cellulose filter element, βx (c) >2 - ISO 16889:
C10 = 10 µm (c)
C25 = 25 µm (c)

Series number: **00**

Seals material:
- = NBR
PE = FKM

Clogging indicator see sect. 12 **(4)**:
W = without, indicator port plugged with steel plug
E = electrical indicator **(5)**
V = visual indicator

By-pass:
R = by-pass valve with cracking pressure 3 bar

Ports size:

BSPP threaded:

SFRS-10	SFRS-20	SFRS-30	SFRS-40
00 = G 1/2"	**00** = G 1/2"	**02** = G 1"	**03** = G 1 1/4"
01 = G 3/4"	**01** = G 3/4"	**03** = G 1 1/4"	**04** = G 1 1/2"
	02 = G 1"	**04** = G 1 1/2"	**05** = G 2"
	03 = G 1 1/4"		

SAE J1926-1 threaded **(3)**:

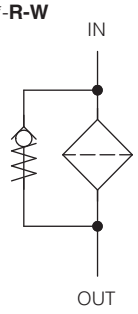
SFRS-10	SFRS-20	SFRS-30	SFRS-40
41 = SAE-12	**42** = SAE-16	**44** = SAE-24	**45** = SAE-32

Note: filters for use in potentially explosive atmosphere are available on request, contact Atos Technical Office

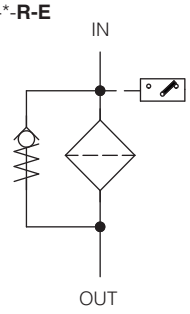
(1) Max flow rates are measured with: Δp 0,5 bar, filter element F25, largest port size, oil viscosity 32 mm²/s - see also section 6
In case of different conditions see section 9 for filter sizing
(2) Filters type SFRS-40-D has the same length to SFRS-40-B but it uses filter elements with smaller internal diameter
(3) Filters with SAE threaded ports are available on request
(4) The clogging indicator is supplied disassembled from the filter. The indicator port on filter head is factory plugged with steel plug
(5) Clogging indicator CIA-E/UL with cURus certification is available on request, see section 4

2 HYDRAULIC SYMBOLS (representation according to ISO 1219-1)

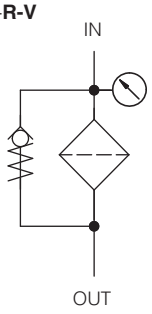
SFRS-*-**R-W**



SFRS-*-**R-E**



SFRS-*-**R-V**



3 MODEL CODE OF FILTER ELEMENTS - only for spare **(1)**

SPRS	-	10	-	A	-	F10	**	/	*

SPRS: Spare filter element for return line filter type SFRS

10: **Filter element size**:
10 = for SFRS-10
20 = for SFRS-20
30 = for SFRS-30
40 = for SFRS-40

A: **Filter element length**:

for SFRS-10	for SFRS-20	for SFRS-30	for SFRS-40
A	**A**	**A**	**A**
B	**B**	**B**	**B**
	C		**C**
	D		**D**
			E

F10: **Microfibre filter element**, βx(c) >1000 - ISO 16889:
F06 = 7 µm (c)
F10 = 12 µm (c)
F25 = 27 µm (c)
Cellulose filter element, βx (c) >2 - ISO 16889:
C10 = 10 µm
C25 = 25 µm

******: Series number

*****: Seals material:
- = NBR
PE = FKM **(2)**

(1) Select the filter element according to the model code reported on the filter nameplate, see section 17
(2) Filters with FKM seals are available on request
note: the spare filter element includes the by-pass valve

4 MODEL CODE OF CLOGGING INDICATORS - only for spare - see section 13 and 14

CIA	-	V	**

CIA: Clogging indicator for return line filter type SFRS

V: **Type of indicator**:
E = Electrical - pressure switch, switching pressure 2 bar
E/UL = As type E, certified according to North American Standard cURus (available on request)
V = Visual - pressure gauge, range 0 ÷ 10 bar **(1)**

******: Series number

(1) Visual clogging indicator with rear side connection **CIA-V/P** available on request

5 GENERAL CHARACTERISTICS

Assembly position / location		Vertical position with the bowl downward
Ambient temperature range		**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range		**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Materials	Filter head	Aluminium alloy
	Filter bowl	Nylon PA6 reinforced
Fatigue strength		min. 1 x 10^6 cycles at 0 ÷ 8 bar
Compliance		Tested to NFPA T3.10.5.1, ISO 10771, ISO 3968 RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULICS CHARACTERISTICS

SFRS-10, SFRS-20

Filter size		10				20															
Port size code		00		01, 41		00				01				02, 42				03			
Ports dimension		G1/2"		G3/4" SAE12		G1/2"				G3/4"				G1", SAE16				G1 1/4"			
Filter length		A	B	A	B	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max flow (l/min) at Δp 0,5 bar **-see note-**	F06	14	36	15	38	32	50	66	82	35	57	93	100	35	58	93	133	36	62	93	135
	F10	30	54	31	58	48	65	83	100	52	77	138	125	53	78	138	195	56	90	140	200
	F25	48	73	50	80	58	79	96	110	67	97	189	141	67	100	189	240	75	125	200	260
	C10	70	87	76	97	75	88	102	110	90	111	216	146	92	115	216	263	113	160	225	277
	C25	75	94	92	105	90	105	114	120	115	138	288	163	118	144	288	300	168	243	305	300
Max operating pressure		8 bar																			
Direction of filtration		See the arrow on the filter head																			

SFRS-30, SFRS-40

Filter size		30						40													
Port size code		02		03		04		03					04					05, 45			
Ports dimension		G1"		G1 1/4"		G1 1/2" SAE24		G1 1/4"					G1 1/2"					G2", SAE32			
Filter length		A	B	A	B	A	B	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Max flow (l/min) at Δp 0,5 bar **-see note-**	F06	180	190	175	185	180	190	203	286	310	233	430	210	300	330	240	460	210	310	338	245	500
	F10	250	260	250	270	270	280	314	429	492	353	540	340	478	565	374	607	340	500	594	387	640
	F25	265	275	280	293	290	310	340	495	525	386	590	370	570	611	412	708	370	600	650	430	750
	C10	280	290	311	315	326	330	365	515	546	401	606	400	597	642	430	732	400	630	679	446	780
	C25	330	355	380	390	400	409	473	594	640	495	648	536	714	782	540	790	536	750	800	564	800
Max operating pressure		8 bar																			
Direction of filtration		See the arrow on the filter head																			

Note: Max flow rates are measured with Δp= 0,5 bar and viscosity 32mm²/s. In case of different conditions see section 11
For a correct sizing of the filter, it is suggested not to exceed **750 l/min** to limit the maximum speed of the fluid in connecting pipes

7 FILTER ELEMENTS

Material		Inorganic microfibre FILTRATION PLUS	Cellulose
Filtration rating as per ISO16889	F06	$\beta_{06\mu m\,(c)} \geq 1000$	-
	F10	$\beta_{12\mu m\,(c)} \geq 1000$	-
	F25	$\beta_{27\mu m\,(c)} \geq 1000$	-
	C10	-	$\beta_{10\mu m\,(c)} \geq 2$
	C25	-	$\beta_{25\mu m\,(c)} \geq 2$

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

Seals, recommended fluid temperature	NBR seals (standard) = -25°C ÷ +100°C, with HFC hydraulic fluids = +10°C ÷ +50°C FKM seals (/PE option) = -25°C ÷ +100°C		
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
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	

9 FILTERS SIZING

For the filter sizing it is necessary to consider the Total Δp at the maximum flow at which the filter must work.
The Total Δp is given by the sum of filter head Δp plus filter bowl Δp plus the filter element Δp:

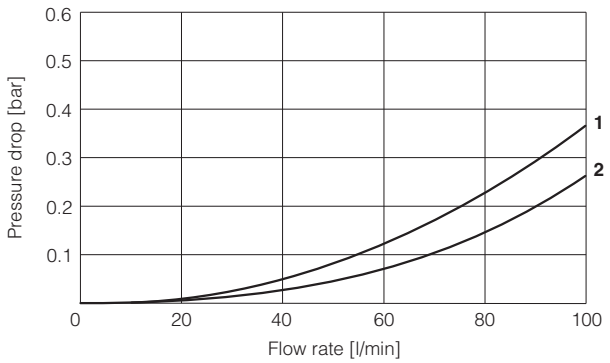
Total Δp = filter head Δp + filter bowl Δp + filter element Δp

In the best conditions the total Δp should not exceed 0,5 bar
See below sections to calculate the Δp of filter head and Δp of the filter element

9.1 Q/Δp DIAGRAMS OF FILTER HEAD + FILTER BOWL

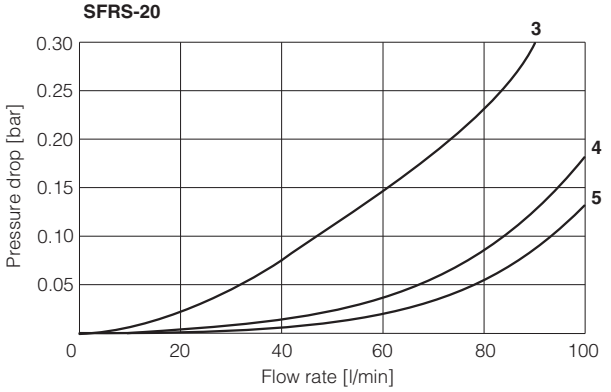
The pressure drop mainly depends on the ports size and fluid density
In the following diagrams are reported the Δp characteristics based on mineral oil with density 0,86 kg/dm^3 and viscosity 32 mm^2/s

SFRS-10



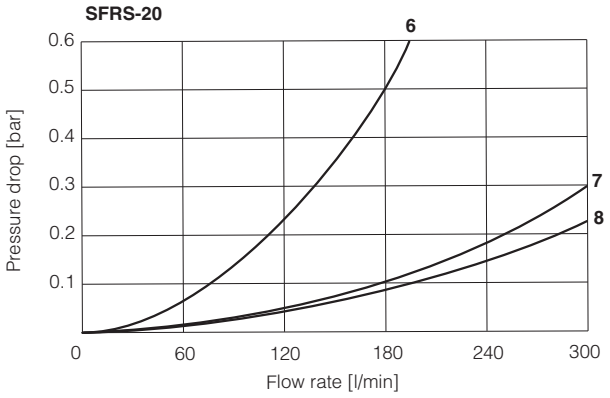
1 = SFRS-10-*-00 (G 1/2")
2 = SFRS-10-*-01 (G 3/4")
SFRS-10-*-41 (SAE-12)

SFRS-20



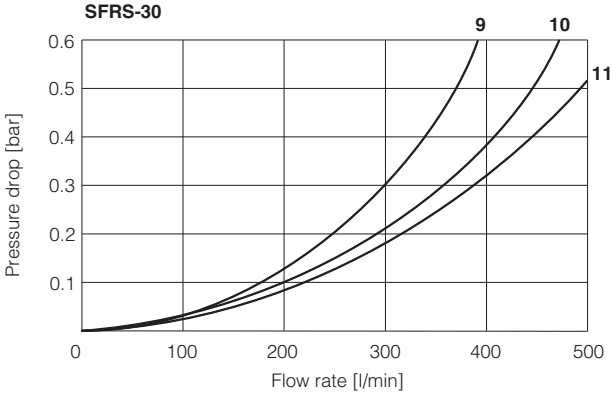
3 = SFRS-20-*-00 (G 1/2")
4 = SFRS-20-A-01 (G 3/4")
SFRS-20-B-01 (G 3/4")
5 = SFRS-20-A-02 (G 1")
SFRS-20-B-02 (G 1")
SFRS-20-A-42 (SAE-16)
SFRS-20-B-42 (SAE-16)

SFRS-20



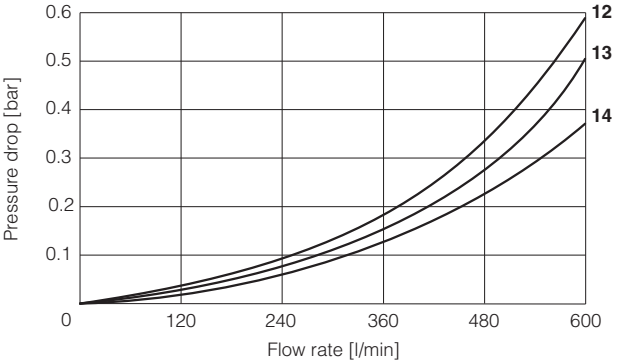
6 = SFRS-20-C-01 (G 3/4")
SFRS-20-D-01 (G 3/4")
8 = SFRS-20-*-03 (G 1 1/4")
7 = SFRS-20-C-02 (G 1")
SFRS-20-D-02 (G 1")
SFRS-20-C-42 (SAE-16)
SFRS-20-D-42 (SAE-16)

SFRS-30



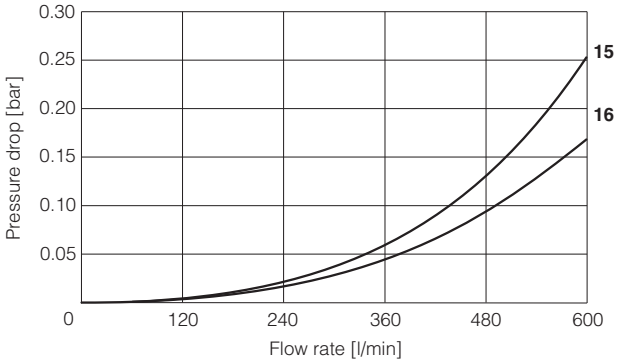
9 = SFRS-30-*-02 (G 1")
10 = SFRS-30-*-03 (G 1 1/4")
11 = SFRS-30-*-04 (G 1 1/2")
SFRS-30-*-44 (SAE-24)

SFRS-40



12 = SFRS-40-A-03 (G 1 1/4")
SFRS-40-D-03 (G 1 1/4")
13 = SFRS-40-A-04 (G 1 1/2")
SFRS-40-D-04 (G 1 1/2")
14 = SFRS-40-A-05 (G 2")
SFRS-40-D-45 (G 2")
SFRS-40-A-45 (SAE-32)
SFRS-40-D-45 (SAE-32)

SFRS-40



15 = SFRS-40-B-04 (G 1 1/2")
SFRS-40-C-04 (G 1 1/2")
SFRS-40-E-04 (G 1 1/2")
16 = SFRS-40-B-05 (G 2")
SFRS-40-C-05 (G 2")
SFRS-40-E-05 (G 2")
SFRS-40-B-45 (SAE-32)
SFRS-40-C-45 (SAE-32)
SFRS-40-E-45 (SAE-32)

9.2 FILTER ELEMENT Δp

The pressure drop through the filter depends to:
- size of filter element
- filtration rating
- fluid viscosity

The Δp of filter element is given by the formula:

$$\Delta p \text{ of filter element} = Q \times \frac{Gc}{1000} \times \frac{\text{Viscosity}}{32}$$

Q = working flow (l/min)

Gc = Gradient coefficient (mbar/(l/min)).
The Gc values are reported in the following table

Viscosity = effective fluid viscosity in the working conditions (mm²/s)

Gradient coefficient Gc of SFRS filter elements

Filter element size	10		20				30		40				
Filter element length	A	B	A	B	C	D	A	B	A	B	C	D	E
Filtration rating	**Gc** Gradient coefficient												
F06	33.84	12.28	13.85	7.80	5.09	3.34	2.43	2.25	2.40	1.49	1.32	1.80	0.80
F10	15.68	7.32	8.65	5.27	3.19	1.94	1.31	1.21	1.11	0.74	0.52	0.88	0.43
F25	8.81	4.28	6.32	3.60	2.06	1.26	1.10	1.00	0.96	0.51	0.42	0.71	0.24
C10	4.83	2.74	4.09	2.70	1.64	1.06	0.85	0.83	0.82	0.45	0.36	0.64	0.20
C25	4.13	2.06	2.52	1.41	0.82	0.42	0.39	0.35	0.34	0.23	0.12	0.26	0.10

Examples:

1) calculation of Total Δp for filter type SFRS-20-B-F10-02-R at Q = 50 l/min and viscosity 46 mm²/s (filter element SPRS-20-B-F10)
   Δp of filter head + filter bowl = 0,03 bar
   Gc = 5,27 mbar/(l/min)

Filter element Δp = $50 \times \frac{5{,}27}{1000} \times \frac{46}{32} = 0{,}379$ bar

Total Δp = 0,03 + 0,379 = **0,40 bar**

2) calculation of Total Δp of filter type SFRS-40-C-F25-05-R at Q = 500 l/min and viscosity 46 mm²/s (filter element SPRS-40-C-F25)
   Δp of filter head + filter bowl = 0,13 bar
   Gc = 0,42 mbar/(l/min)

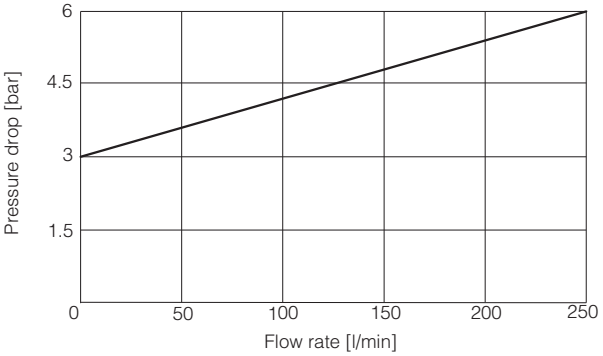
Filter element Δp = $500 \times \frac{0{,}42}{1000} \times \frac{46}{32} = 0{,}302$ bar

Total Δp = 0,13 + 0,302 = **0,43 bar**

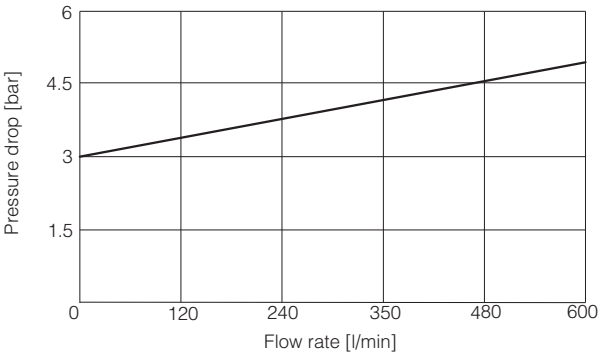
10 **BY -PASS VALVE** - based on mineral oil ISO VG46 at 50°C (viscosity = 32 mm²/s)

Q/Δp diagrams of flow trough the by pass valve

SFRS-10
SFRS-20

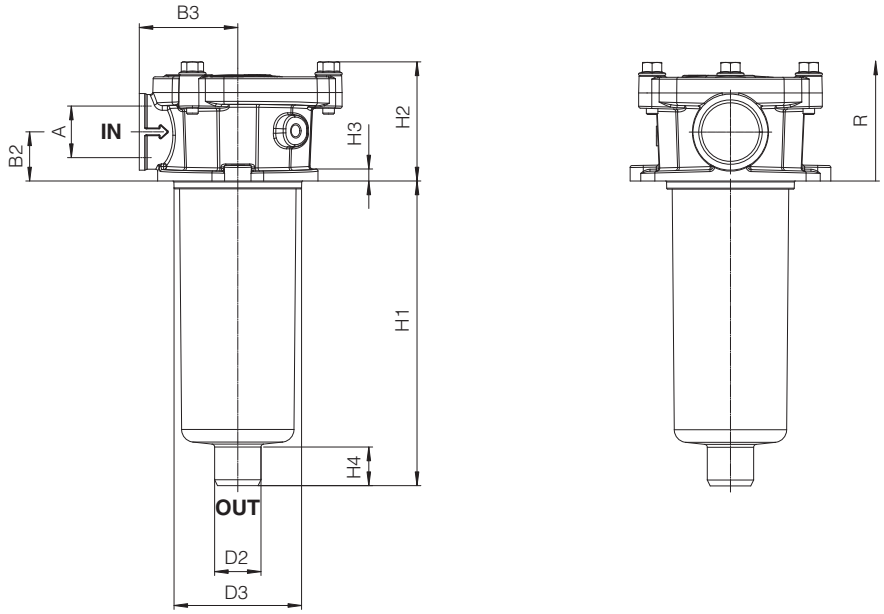


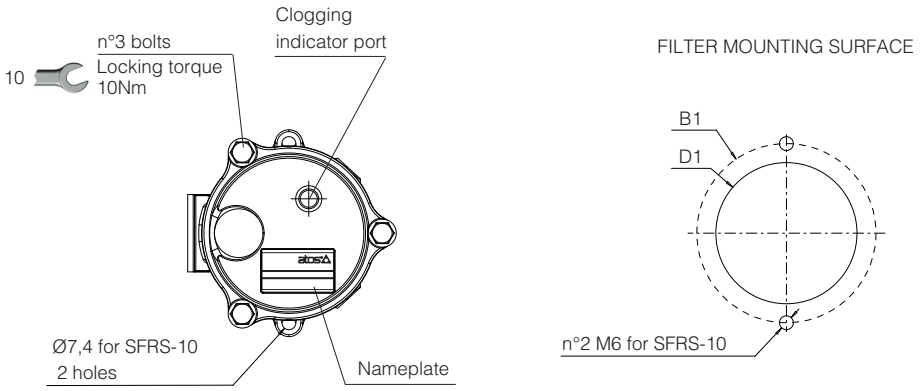
SFRS-30
SFRS-40



11 INSTALLATION DIMENSIONS OF SFRS FILTERS [mm]

SFRS-10

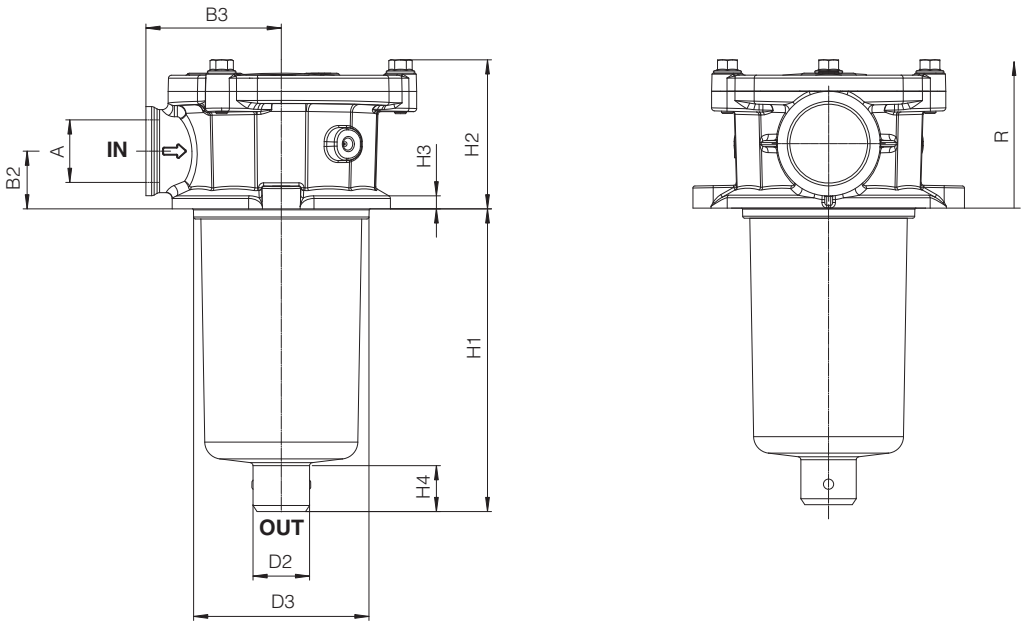


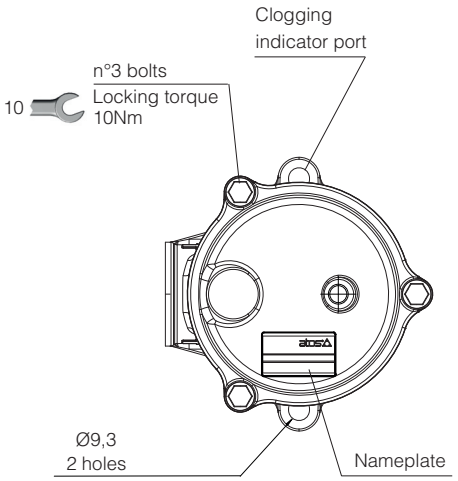


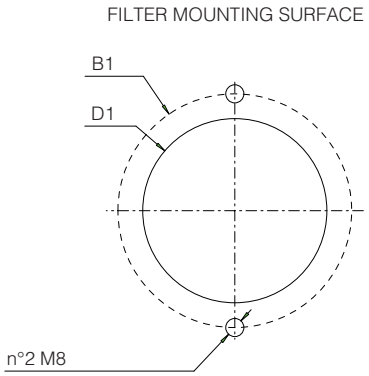
Code	A	B1	B2	B3	D1	D2	D3	H1	H2	H3	H4	R (element removal)	Mass (Kg)
SFRS-10-A	1/2" BSPP 3/4" BSPP SAE-12	89	25	51	67,5	24	67	82	60	8	22	150	0,45
SFRS-10-B								155				220	0,60

(1) SAE-12 thread size 1" 1/16-12-UN-2B

SFRS-20



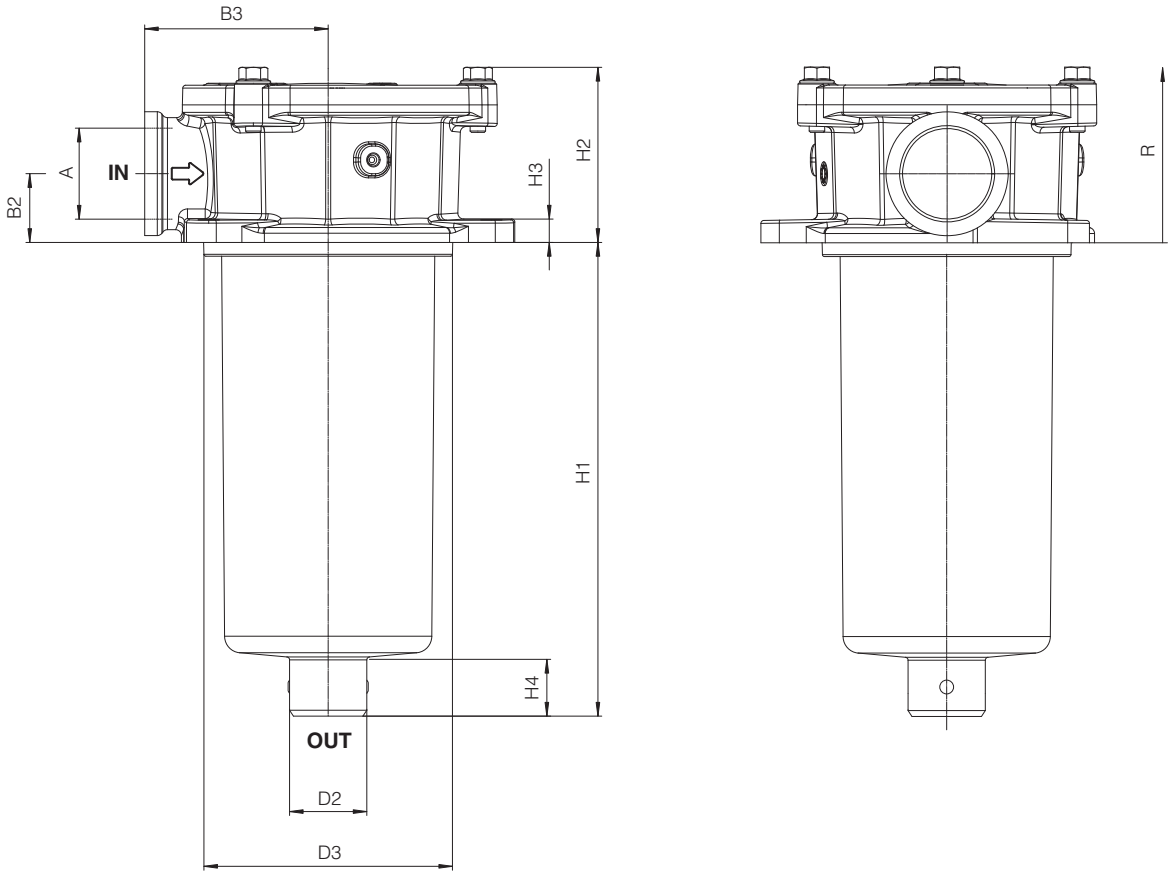


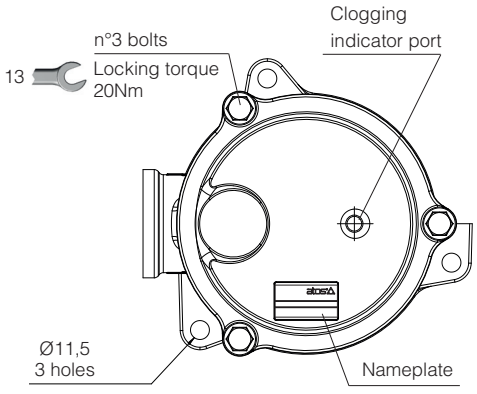


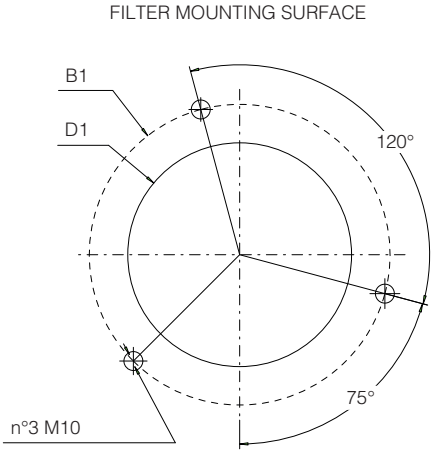
Code	A	B1	B2	B3	D1	D2	D3	H1	H2	H3	H4	R (element removal)	Mass (Kg)
SFRS-20-A	1/2" BSPP 3/4" BSPP 1" BSPP 1 1/4" BSPP SAE-16 **(1)**	115	28,5 **(2)**	67	88,5	40	87	92	73	11	24	170	0,80
SFRS-20-B								139				220	0,90
SFRS-20-C			32 **(3)**					219				295	1,10
SFRS-20-D								323				400	1,30

(1) SAE-16 thread size 1" 5/16-12-UN-2B
(2) For port size 1/2", 3/4", 1" and SAE-16
(3) For port size 1 1/4"

SFRS-30



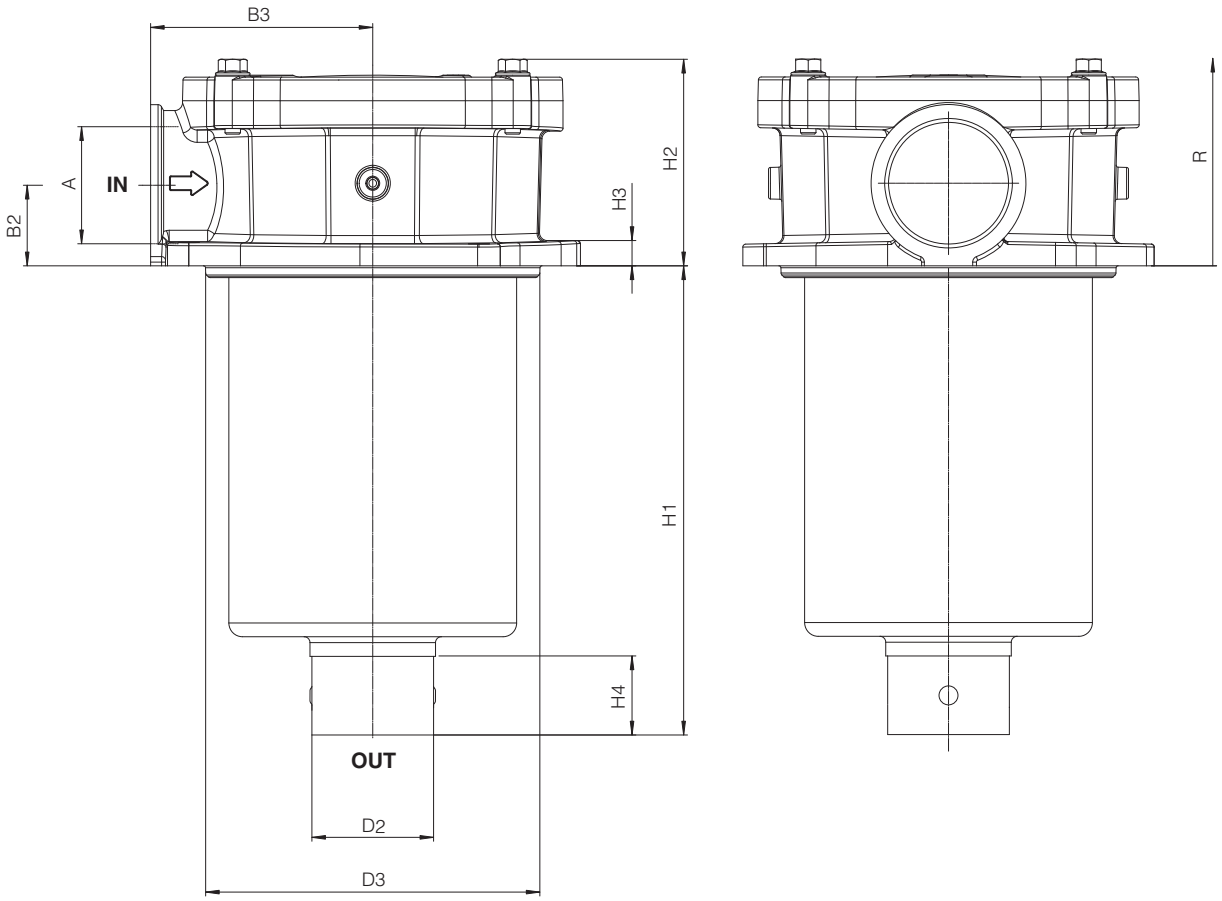


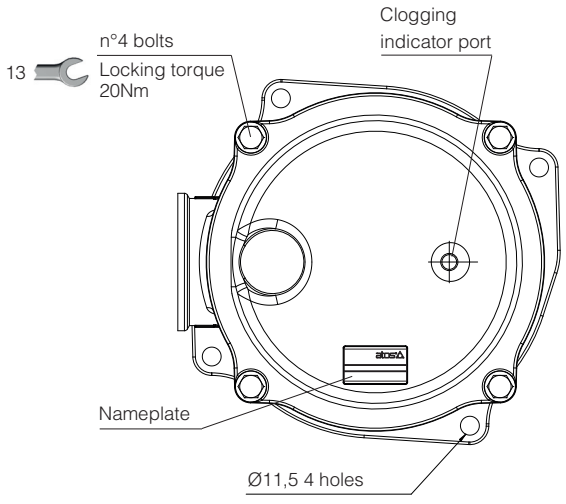


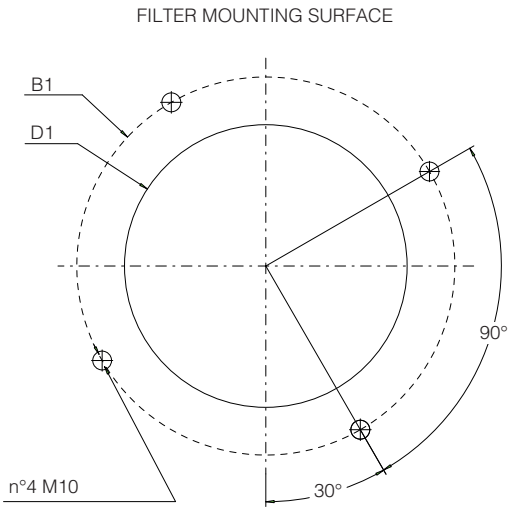
Code	A	B1	B2	B3	D1	D2	D3	H1	H2	H3	H4	R (element removal)	Mass (Kg)
SFRS-30-A	1" BSPP 1 1/4" BSPP 1 1/2" BSPP SAE-24 **(1)**	175	35	95	130	40	129	234	90	11	30	320	2,10
SFRS-30-B								263				360	2,40

(1) SAE-24 thread size 1" 7/8-12-UN-2B

SFRS-40







Code	A	B1	B2	B3	D1	D2	D3	H1	H2	H3	H4	R (element removal)	Mass (Kg)
SFRS-40-A	1 1/4" BSPP 1 1/2" BSPP 2" BSPP SAE-32 **(2)**	220	42	115	175	65	174	165	105	11	37	270	3,20
SFRS-40-B								224				330	3,60
SFRS-40-C								274				380	4,20
SFRS-40-D **(1)**								224				330	3,60
SFRS-40-E								424				530	4,00

(1) Filter type SFRS-40-D has the same length of SFRS-40-B but it uses filter elements with smaller internal diameter

(2) SAE-32 thread size 2" 1/2-12-UN-2B

12 ACCESSORIES - to be ordered separately

Following accessories can be assembled on return filters type SFRS-20, SFRS-30 and SFRS-40 (not available for SFRS-10) to avoid the foam or air/oil emulsion inside the tank caused by the return flow.

The discharge ending pipes **DSC-END-*** are used to extend the outlet port of the SFRS filters below the oil level in the tank.
They are available with length 250 (200 mm for SFRS-40) and 500 mm

The diffusers **DIFF-SFRS** are used in case of high flow rates to evenly distribute the return flow inside the tank.
They can be mounted directly on the filter bowl or using the connecting pipes **CONN-END-***, available with lengths of 250 (200 for SFRS-40) and 500 mm.

MODEL CODE OF DISCHARGE ENDING PIPES (1)

DSC-END	-	250	SFRS-20/30
Discharge ending pipe		**Pipe length** for **SFRS-20** and **SFRS-30**: 250 = 250 mm 500 = 500 mm **Pipe length** for **SFRS-40**: 200 = 200 mm 500 = 500 mm	**Filter type**: SFRS-20/30 = for SFRS-20 and SFRS-30 SFRS-40 = for SFRS-40

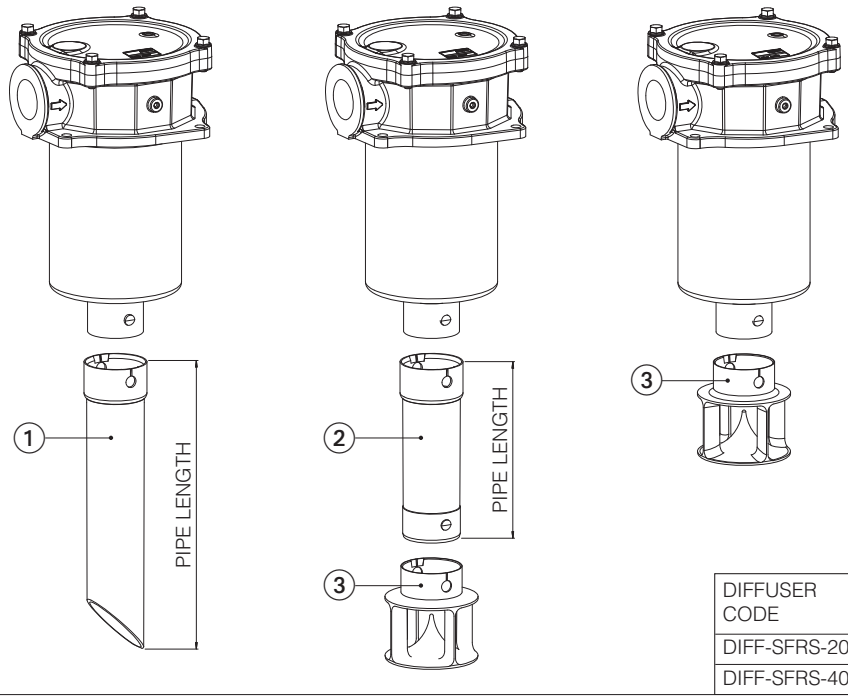
MODEL CODE OF CONNECTING ENDING PIPES (2)

CONN-END	-	250	SFRS-20/30
Connecting ending pipe		**Pipe length** for **SFRS-20** and **SFRS-30**: 250 = 250 mm **Pipe length** for **SFRS-40**: 200 = 200 mm (for SFRS-40) 500 = 500 mm (for SFRS-40)	**Filter type**: SFRS-20/30 = for SFRS-20 and SFRS-30 SFRS-40 = for SFRS-40

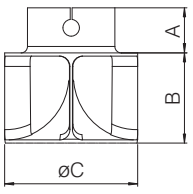
MODEL CODE OF DIFFUSERS (3)

DIFF	-	SFRS-20/30
Diffuser		**Filter type**: SFRS-20/30 = for SFRS-20 and SFRS-30 SFRS-40 = for SFRS-40

DISCHARGE ENDING PIPE **CONNECTING ENDING PIPE** **DIFFUSER**

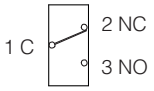


DIFFUSER DIMENSIONS

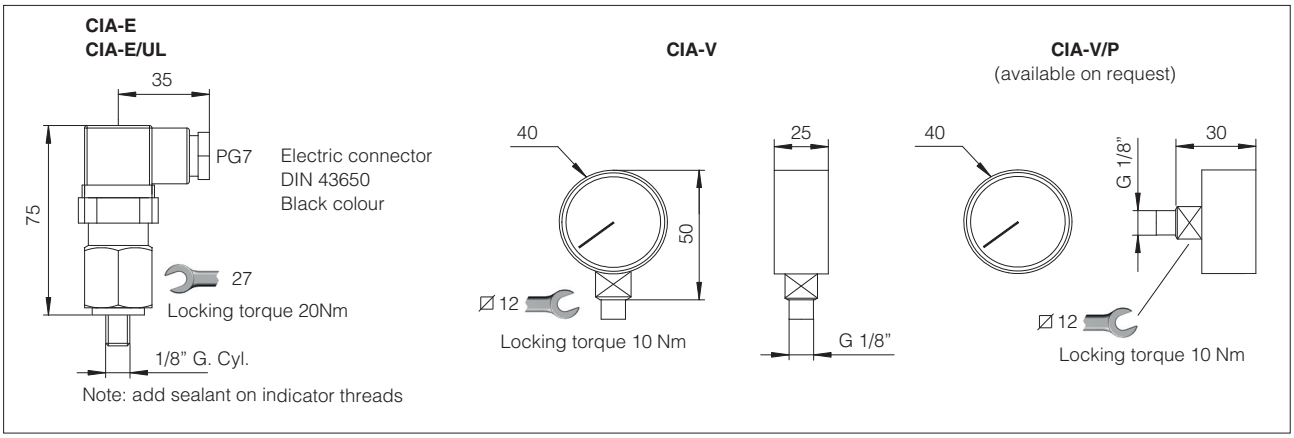


DIFFUSER CODE	DIMENSIONS		
	A	B	C
DIFF-SFRS-20, DIFF-SFRS-30	30	45	75
DIFF-SFRS-40	35	70	105

13 CHARACTERISTICS OF CLOGGING INDICATORS

Model code	CIA-E electrical		CIA-V visual
Switching pressure	2 bar		green sector = 0 ÷ 3 bar red sector = 3 ÷ 10 bar
Switching tolerance at 20°C	± 10% of switching pressure		-
Electric connection	Electric plug connection as per DIN 43650 with cable gland type PG7		-
Power supply	14 V_{DC} ÷ 30 V_{DC}	125 V_{AC} ÷ 250 V_{AC}	
Max current - resistive (inductive)	4 A (3 A) ÷ 3 A (2 A)	5 A (3 A) ÷ 3 A (2 A)	
Fluid temperature	-25°C ÷ +100°C		-25°C ÷ +100°C
Protection degree according to DIN 40050	IP65 with mating connector		-
Hydraulic connection	G1/8" BSP		G1/8" BSP
Duty factor	100%		100%
Mass (Kg)	0,16		0,04
Electric scheme / Hydraulic symbol	 The electric scheme shows the switch position in case of clean filter element		

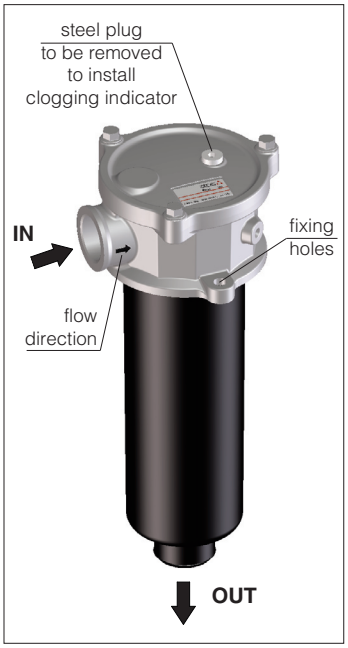
14 DIMENSIONS OF CLOGGING INDICATORS



15 INSTALLATION AND COMMISSIONING

Verify that the tank flange with the filter mounting surface is clean and free of scratches.
Install the filter on the tank cover using the fixing holes on the filter head.
Connect the IN port of the filter to the system return pipe.
The OUT port of the filter must end under the oil level to avoid foam or air/oil emulsion inside the tank.
At this purpose specific accessories as connecting pipes, discharge ending pipes ad flow diffusers can be fit on the filter OUT port see section 12
Make sure that there is enough space above the filter, for the replacement of the filter element, see dimension "R" at section 11
Never run the system without the filter element.

For filters ordered with clogging indicator, code E or V:
• remove the steel plug from the indicator port on the filter head
• install the clogging indicator and lock it at the specified torque
During the cold start up (fluid temperature lower than 30°C), a false clogging indicator signal can be given due to the high fluid viscosity.

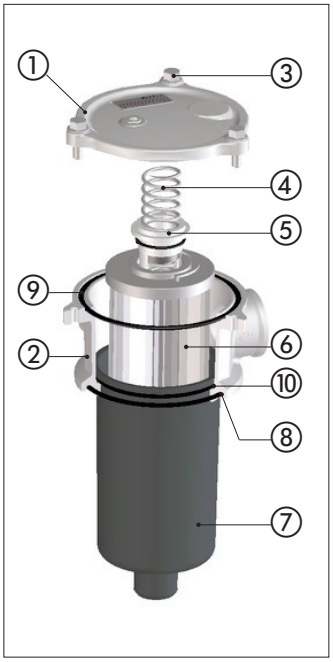


16 MAINTENANCE

The filter element must be replaced as soon as the clogging indicator switches to highlight the filter clogged condition
For filters without clogging indicator, the filter element must be replaced according to the system manufacturer's recommendations.
Select the new filter element according to the model code reported on the filter nameplate, see section 17

For the replacement of the filter element, proceed as follow:

- switch-off the system and make sure that there is no residual pressure in the filter line (i.e. pressurized tank); the filter has no pressure bleeding device
- pay attention to the fluid and filter surface temperature. Always use suitable gloves an protection glasses
- remove the cover ① from the filter head ② by releasing the bolts ③
- remove the spring ④ and the bowl ⑦
- remove the dirty filter element ⑥ pulling it upward carefully
- clean the bowl ⑦
- install the bowl ⑦ after having checked the good condition of the seal ⑧
- insert the new filter element over the spigot in the filter bowl; the filter element includes the by-pass valve ⑤
- install the spring ④
- mount the cover and lock the relevant bolts ③ after having checked the good condition of the seal ⑨



WARNING: The dirty filter elements cannot be cleaned and re-used. They are classified as "dangerous waste material", then they must be disposed of by authorized Companies, according to the local laws.

16.1 SEALS KIT

Filter type	Seal kit code (NBR)	Seal kit code (FKM)	Seal kit composition
SFRS-10	GUARN SFRS-10	GUARN SFRS-10 /PE	⑧+⑨+⑩
SFRS-20	GUARN SFRS-20	GUARN SFRS-20 /PE	⑧+⑨+⑩
SFRS-30	GUARN SFRS-30	GUARN SFRS-30 /PE	⑧+⑨+⑩
SFRS-40	GUARN SFRS-40	GUARN SFRS-40 /PE	⑧+⑨+⑩

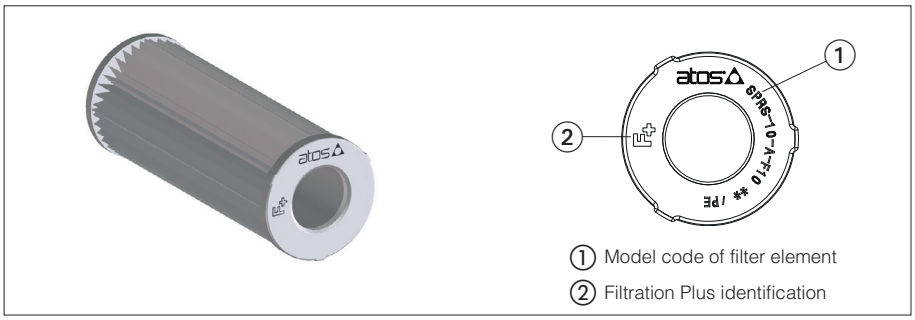
16.2 SPARE SPRING ④

Filter type	Seal kit code
SFRS-10	MO-1246
SFRS-20	MO-1247
SFRS-30	MO-1248
SFRS-40	MO-1249

17 FILTER IDENTIFICATION NAMEPLATE

① Model code of complete filter
② Model code of filter element
③ Filter matrix code

17.1 IDENTIFICATION OF FILTER ELEMENT



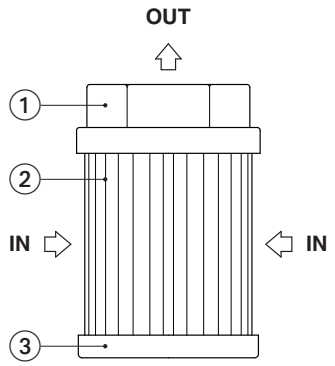
① Model code of filter element
② Filtration Plus identification

18 RELATED DOCUMENTATION

LF010	Fluid contamination
LF020	Filtration guidelines

Suction filters type SFSS

Threaded ports



SFSS-20-*

① Filter head
② Wire mesh
③ End cap

SFSS

Suction filters are designed to protect pumps from ingestion of solid particles and coarse contamination present in the oil tank, which may cause heavy damage and seizures.

They are designed to be screwed onto the pumps suction line.

SFSS filters are available with following features:

- four sizes with BSPP threaded ports, from 1/2" to 3 "
- wire mesh 125 µm (c)
- version without or with by-pass valve

Max flow **450 l/min**

1 MODEL CODE

SFSS	-	10	-	A	-	W125	-	00	-	N		**

Suction filter

Filter size:
10
20
30
40

Filter length:		Max flow [l/min] **(1)**			
		SFSS-10	SFSS-20	SFSS-30	SFSS-40
A	=	20	38	85	330
B	=	-	60	125	450
C	=	-	-	200	-

Filtration rating:
W125 = wire mesh 125 µm

By-pass:
N = without by-pass
R = by-pass valve, cracking pressure 0,35 bar

Series number

Port size:
BSPP threaded:

SFSS-10-A **00** = G 1/2"		
SFSS-20-A **01** = G 3/4"	SFSS-20-B **02** = G 1"	
SFSS-30-A **03** = G 1 1/4"	SFSS-30-B **04** = G 1 1/2"	SFSS-30-C **05** = G 2"
SFSS-40-A **06** = G 2 1/2"	SFSS-40-B **07** = G 3"	

(1) Max flow rates are performed in following conditions:
- clean filter element
- Δp = 0,015 bar
- mineral oil with viscosity 32 mm²/s

In case of different conditions see Q/Δp diagrams at section 6

2 HYDRAULIC SYMBOL (representation according to ISO 1219-1)

3 GENERAL CHARACTERISTICS

Assembly position / location		Any position
Differential collapse pressure [bar]		1
Ambient temperature range		-20°C ÷ +70°C
Storage temperature range		-20°C ÷ +80°C
Materials	Filter head	Nylon
	Filter end cap	Carbon steel, zinc plated
	Filter Mesh	Stainless steel AISI 304

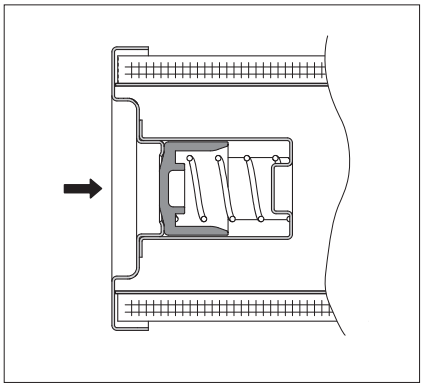
4 HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Recommended fluid temperature	-25°C ÷ +100°C, with HFC hydraulic fluids = +10°C ÷ +50°C	
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s	
Hydraulic fluid	**Classification**	**Ref. Standard**
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	HFDU, HFDR	ISO 12922
Flame resistant with water	HFC	

5 BY-PASS VALVE - version **-R**

The by-pass valve allows the oil flow to by-pass the suction filter when the pressure drop across the element exceeds 0,35 bar, so that to avoid the pump cavitation.

This may happens in particular conditions as:
- instantaneous high flow peaks
- filter mesh clogged by contamination



6 FILTER SIZING

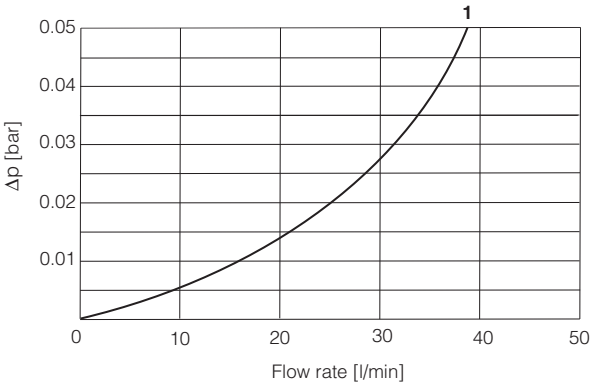
Suction filters must be largely sized to avoid the pumps cavitation. In the best conditions the Δp should not exceed 0.015 bar

6.1 Q/Δp DIAGRAMS

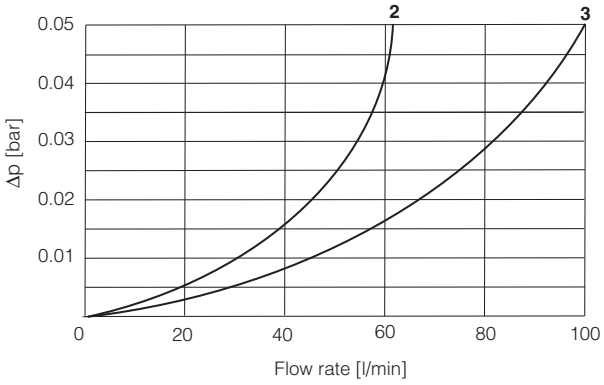
In following diagrams are reported the Δp characteristics of filter based on mineral oil with density 0,86 kg/dm² and viscosity 32 mm²/s.
in case of different viscosity the effective Δp_E is given by the formula:

$$\Delta p_E = \Delta p \times \frac{\text{viscosity}}{32}$$

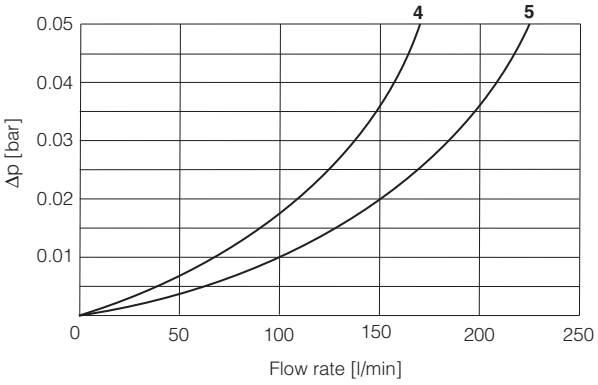
Δp_E = pressure drop calculated at the effective viscosity
Δp = pressure drop reported in the below diagrams
Viscosity = effective fluid viscosity in the working condition (mm²/s)



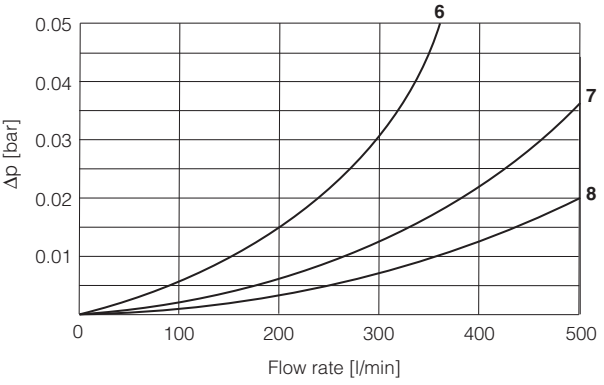
1 = SFSS-10-A



2 = SFSS-20-A
3 = SFSS-20-B

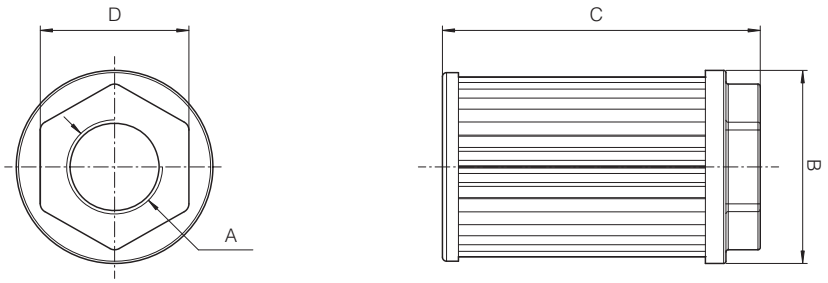


4 = SFSS-30-A
5 = SFSS-30-B



6 = SFSS-30-C
7 = SFSS-40-A
8 = SFSS-40-B

7 INSTALLATION DIMENSIONS OF SFSS FILTERS [mm]



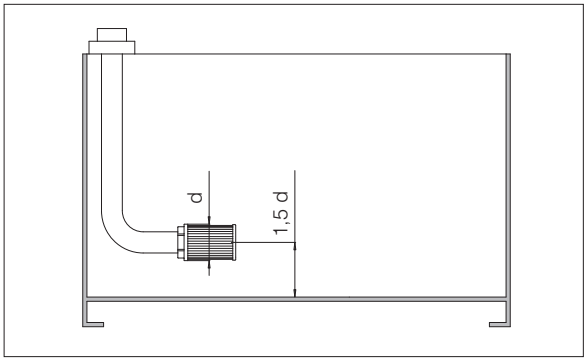
Code	A	B	C	D	Mass (Kg)
SFSS-10-A	1/2" BSPP	46	106	36	0,10
SFSS-20-A	3/4" BSPP	64	109	50	0,19
SFSS-20-B	1" BSPP		139		0,21
SFSS-30-A	1 1/4" BSPP	86		65	0,33
SFSS-30-B	1 1/2" BSPP		200		0,24
SFSS-30-C	2" BSPP		260	75	0,51
SFSS-40-A	2 1/2" BSPP	150	212	110	1,07
SFSS-40-B	3" BSPP		272		0,92

8 INSTALLATION AND COMMISSIONING

The suction filters SFSS must be generously sized to avoid pump cavitation.
The size of the OUT port of the SFSS filter must be equal to or greater than the corresponding suction port of the pump.

The SFSS filter must always remain below the oil level in the tank, in any operating condition.
During installation, a minimum distance must be observed between the filter and the bottom of the tank (see figure on the side) to avoid the possibility that the contaminant deposited on the bottom is sucked up.

The SFSS filter should be installed as far as possible from the return pipe. It is advisable to use separators inside the tank to keep the suction area separate from the area affected by the return flow.

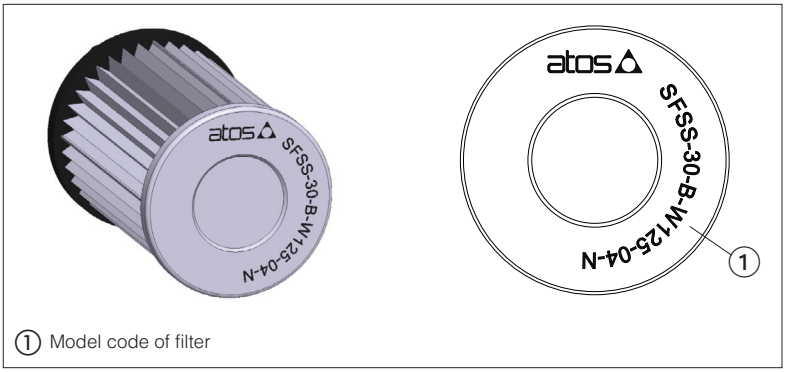


9 MAINTENANCE

The filter must be replaced according to the system manufacturer's recommendations

WARNING: The dirty filters cannot be cleaned and re-used. They are classified as "dangerous waste material", then they must be disposed of by authorized Companies, according to the local laws.

9.1 FILTER IDENTIFICATION



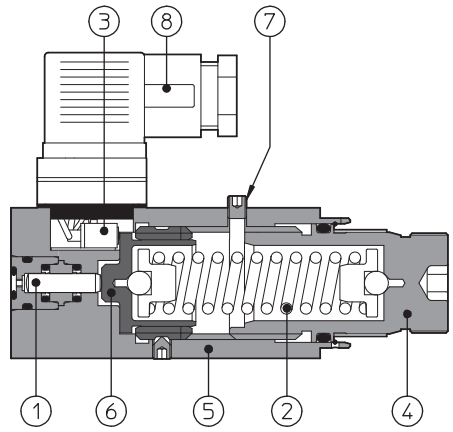
① Model code of filter

10 RELATED DOCUMENTATION

LF010	Fluid contamination
LF020	Filtration guidelines

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**

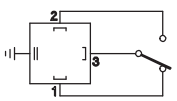
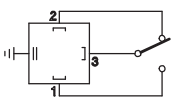
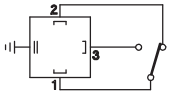
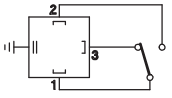
1 MODEL CODE

SMAP	-	160	/	E	**	/	*
Fixed differential pressure switch		Pressure range: **40** = 5 ÷ 40 bar **80** = 7 ÷ 80 bar **160** = 10 ÷ 160 bar **320** = 30 ÷ 320 bar **630** = 50 ÷ 630 bar		Options: **E** = Common electric contact connected to pin 1 (see section 3)	Series number		Seals material, see section 2: **-** = NBR **PE** = FKM

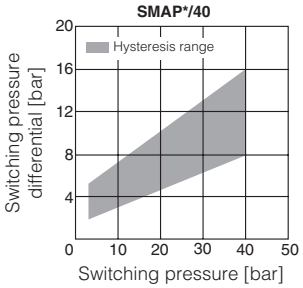
2 MAIN CHARACTERISTICS, SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

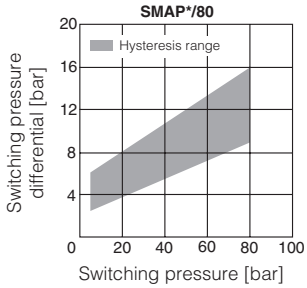
Assembly position / location	Any position		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
Ambient temperature	Standard execution = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C		
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC 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	

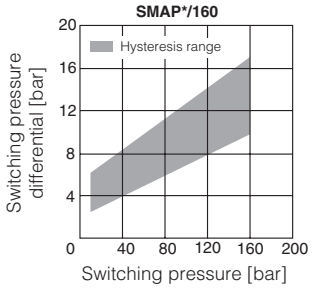
3 CHARACTERISTICS AND WIRING OF INTERNAL MICROSWITCH

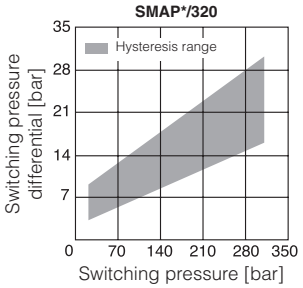
	Supply voltage [V]					Rest position	Pressure operated position
	125 AC	**250 AC**	**30 DC**	**250 DC**			
Max current resistive load [A]	7	5	5	0,2	**STD**		
Max current inductive load (Cos φ = 0,4) [A]	4	2	3	0,02			
Insulating resistance	≥100MΩ				**/E**		
Contact resistance	15 mΩ						
Electrical life-expectancy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

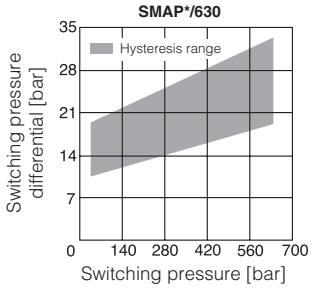
4 DIAGRAMS







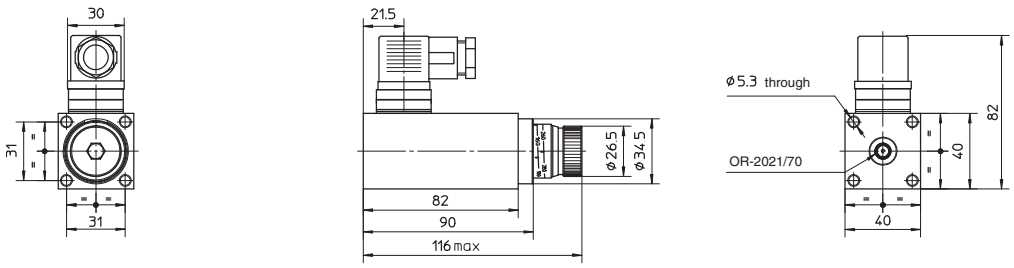




The diagrams show, the switching pressure difference (hysteresis) between the switching positions of the pressure switch electric contacts.

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

5 DIMENSIONS OF SMAP WITHOUT ADAPTORS [mm]

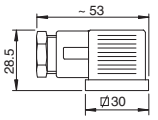
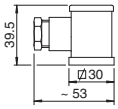
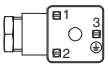


Fastening bolts:
4 socket head screws M5X90 supplied with the pressure switch

Electric connectors

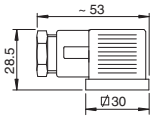
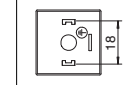
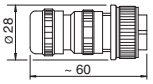
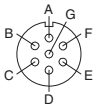
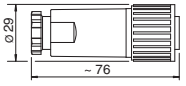
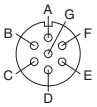
for on/off and proportional valves

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

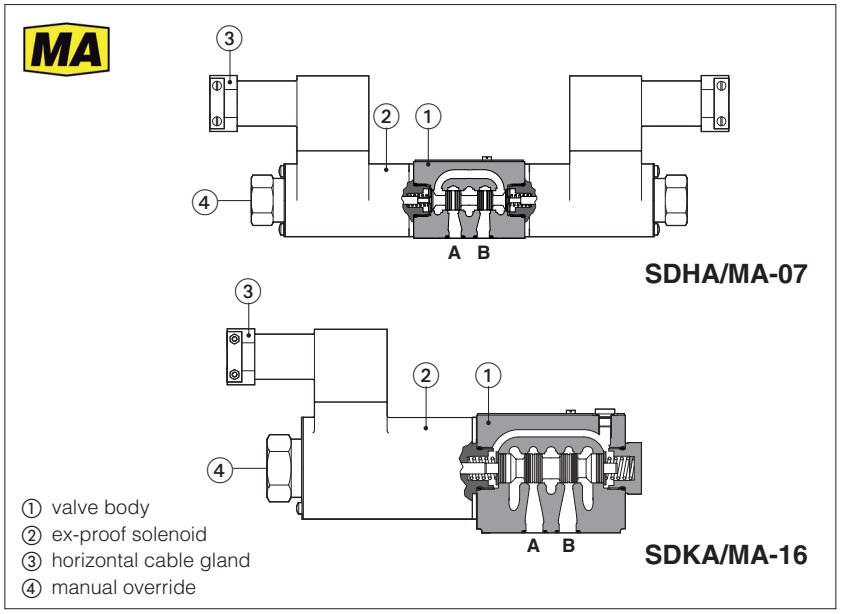
2 CONNECTORS FOR PROPORTIONAL VALVES

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
ZM-7P 	Female metallic connector - 7 pin: - main connector for integral electronic driver			PG11 ø 7 ÷ 9 mm	According to MIL-C-5015 Protection degree IP 67 EN 60529
ZH-7P 	Female plastic reinforced with fiber glass connector - 7 pin: - main connector for integral electronic driver			PG11 ø 8 ÷ 10 mm	According to MIL-C-5015 Protection degree IP 67 EN 60529

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

Ex-proof solenoid directional valves

on-off, direct, spool type - **MA certification**



SDHA/MA, SDKA/MA

On-off, spool type directional valves equipped with explosion-proof solenoids certified according to **MA** Chinese mining certification, protection mode:

Ex db I Mb for surface, tunnel or mine plants

The solenoids are provided with cable glands (horizontally oriented) for cable entrance and internal terminal board for power supply coils connections.

The solenoid case classified **Ex db** is designed to contain the possible explosion which could be caused by the presence of the gas mixture inside the housing, thus avoiding dangerous propagation in the external environment.

They are also designed to limit the external temperature according to the certified class to avoid the self ignition of the explosive mixture present in the environment.

SDHA/MA:	**SDKA/MA**:
Size: **06** - ISO 4401	Size: **10** - ISO 4401
Max flow: **80 l/min**	Max flow: **120 l/min**
Max pressure: **350 bar**	Max pressure: **315 bar**

1 MODEL CODE

SDHA	/	MA	-	0	63	1/2	/	A	24DC	**	**

SDHA = spool type - direct, size 06
SDKA = spool type - direct, size 10

Certification type:
MA = Ex-proof Ma Chinese mining certification

Valve size (ISO 4401)
0 = 06 for DHA **1** = 10 for DKA

Configuration, see section 2

Spool type, see section 2

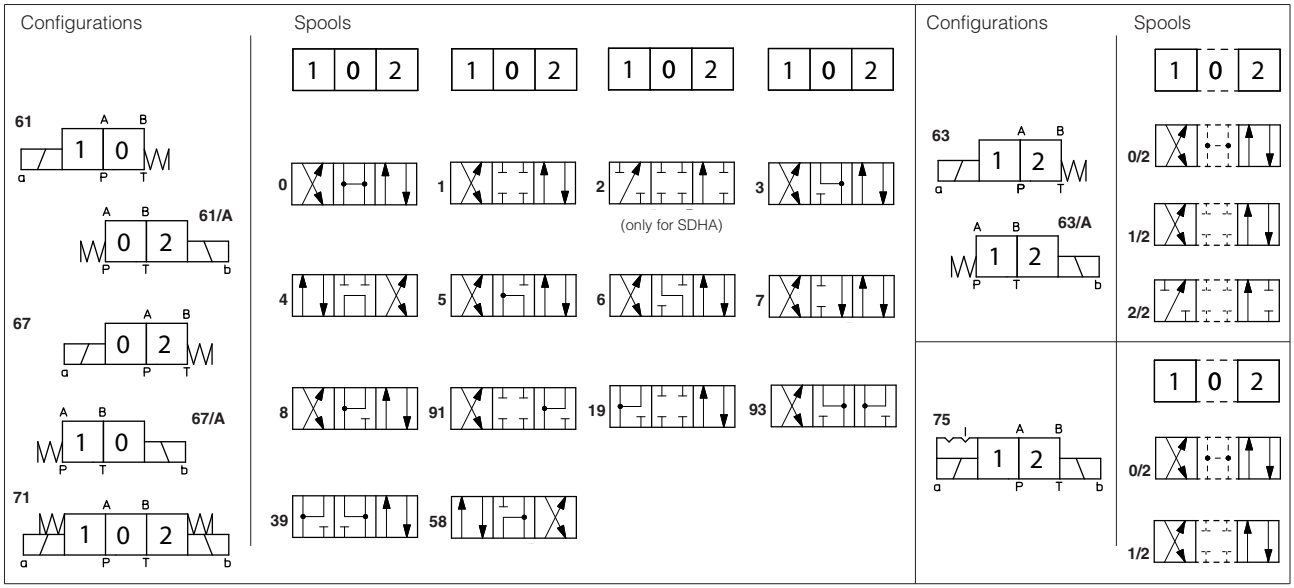
Option:
A = solenoid at side of port B (for single solenoid valves)

Voltage code, see section 5

Series number

Seals material, see sect. 6:
- = NBR
PE = FKM

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



SDHA spools **1, 3, 4**, **5** and **58** are also available as **1/1, 3/1, 4/8, 5/1** and **58/1.** They are properly shaped to reduce water-hammer shocks during the swiching.
SDKA spool **1** is also available as **1/1.** It is properly shaped to reduce water-hammer shocks during the swiching.

3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-db

4 HYDRAULIC CHARACTERISTICS

Operating pressure	**SDHA/MA**	P, A, B = **350 bar** T = **210 bar**
	SDKA/MA	P, A, B = **315 bar** T = **210 bar**
Maximuim flow	**SDHA/MA**	**80 l/min**
	SDKA/MA	**120 l/min**

5 ELECTRICAL CHARACTERISTICS

SOLENOID TYPE	ON/OFF	
Voltage code VDC ±10%	**12DC, 24DC, 110DC**	
Power consumption	16,5 W (SDHA)	18W (SDKA)
Protection degree	IP 65 to DIN EN 60529	
Duty factor	100%	

6 SEALS AND HYDRAULIC FLUID

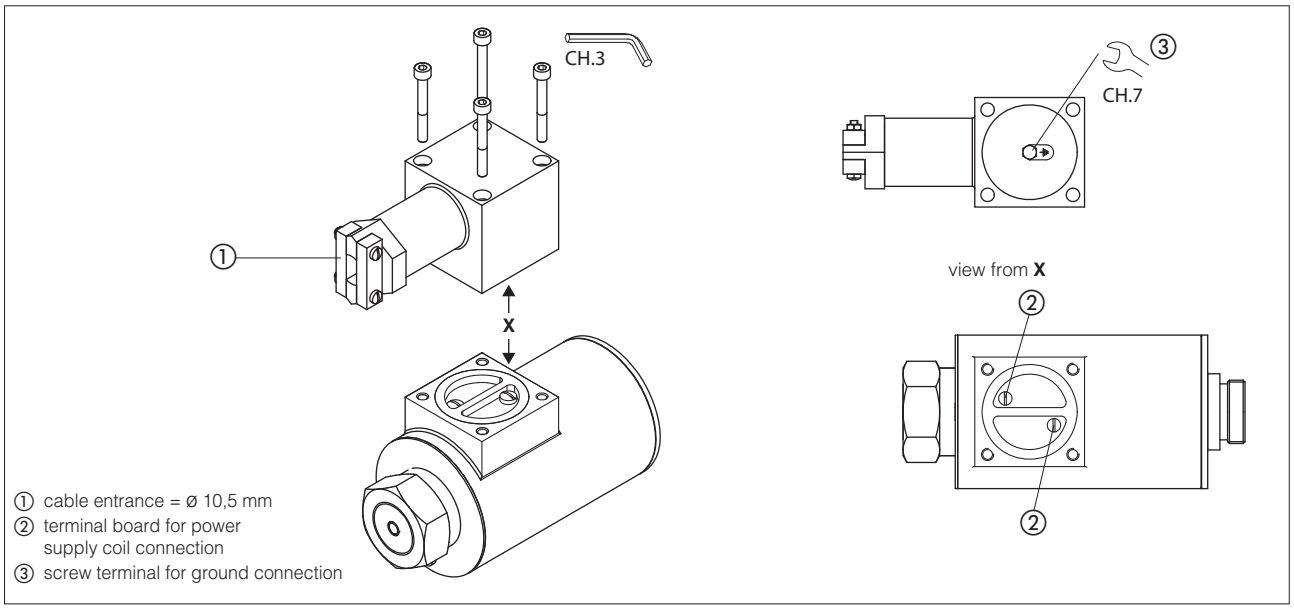
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

7 CERTIFICATION DATA

Valve type	SDHA**/MA**	SDKA**/MA**
Certification	MA mining	
Solenoid certified code	**DTBZ12 - 37 FYC**	**DTBZ9 - 90FYC**
Type examination certificate	CNEx 22.7656X	CNEx 22.7654X
Method of protection	Ex db I Mb	
Ambient temperature	≤ 135 °C	
Ambient temperature	-20 ÷ +40 °C	
Cable entrance:	cable entrance Ø =10.5mm	

⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

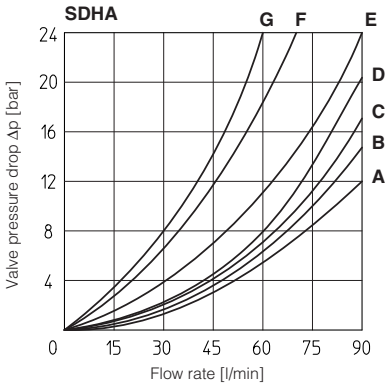
8 SOLENOID WIRING



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

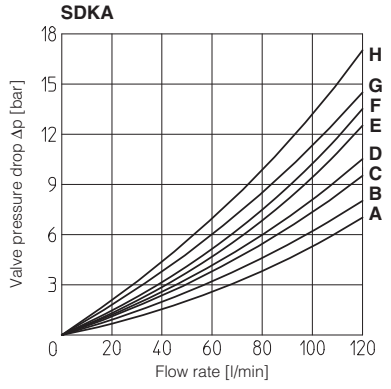
SDHA

Flow direction / Spool type	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 19, 91, 93, 39	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			



SDKA

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, 1/3, 6, 8	A	A	D	C		
3, 3/1, 7	A	A	C	D		
4	B	B	B	B	F	
5	A	B	C	C	G	
1/2	B	C	C	B		
19	A	D	C			H



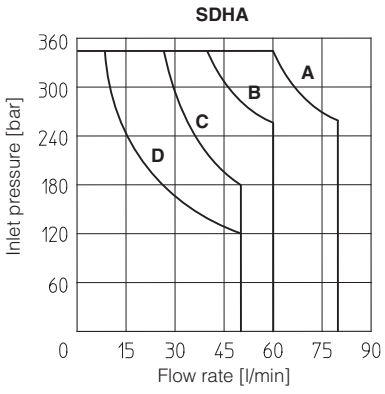
10 OPERATING LIMITS For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables

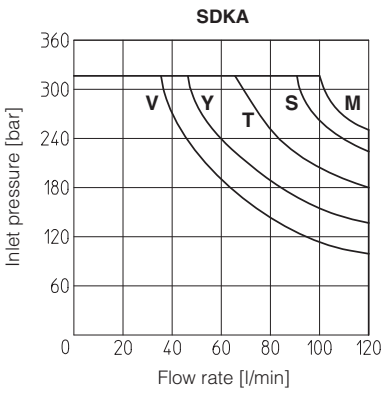
SDHA

A = Spools 0, 0/1, 1, 1/2, 3, 8
B = Spools 0/2, 1/1, 6, 7
C = Spools 3/1, 4, 4/8, 5, 5/1, 19, 39, 58, 58/1, 91, 93
D = Spools 2, 2/2

SDKA

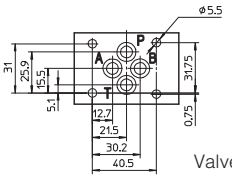
M = Spools 0, 0/1, 1, 1/1, 3, 3/1, 1/2, 0/2, 8
S = Spools 1/3, 6, 7
Y = Spools 4, 5
V = Spools 2/2
T = Spools 19





SDHA/MA

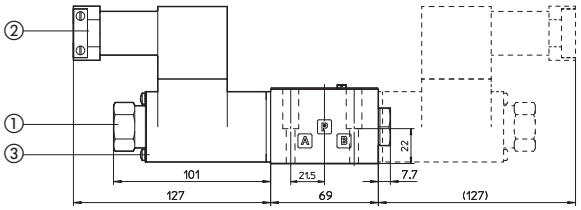
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

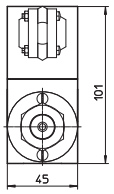


Valve's bottom view

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

SDHA/MA-06
SDHA/MA-07 (dotted line)



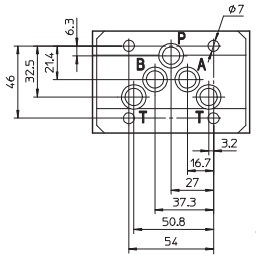


Mass:
SDHA/MA-06: 3,2 kg
SDHA/MA-07: 4,9 kg

① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding

SDKA/MA

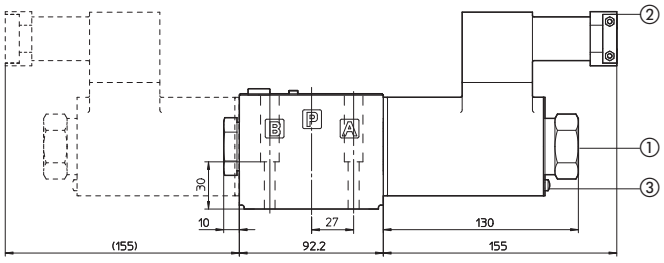
ISO 4401: 2005
Mounting surface according to 4401-05-05-0-05
(without X port, Y port optional)
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050 and 1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)
Ports Y: Ø = 5 mm

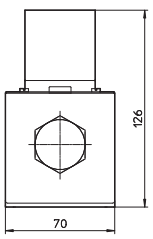


Valve's bottom view

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

SDKA/MA-16
SDKA/MA-07 (dotted line)



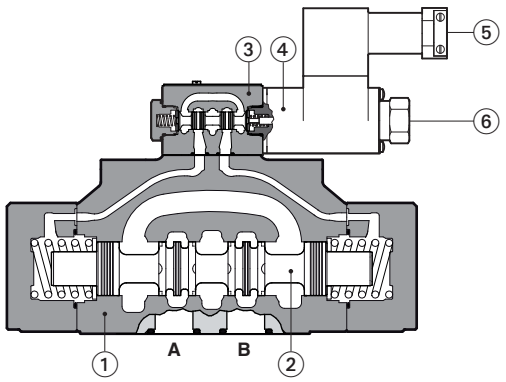


Mass:
SDKA/MA-16: 5,7 kg
SDKA/MA-17: 8,7 kg

① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding

Ex-proof solenoid directional valves

on-off, piloted, spool type - **MA certification**



SDPHA/MA-46

① main body
② main spool
③ pilot valve
④ ex-proof solenoid
⑤ horizontal cable gland
⑥ manual override

SDPHA/MA

On-off, spool type, piloted, directional valves equipped with explosion-proof solenoids certified according to **MA** Chinese mining certification, protection mode:

Ex db I Mb for surface, tunnel or mine plants

The solenoids are provided with cable glands (horizontally oriented) for cable entrance and internal terminal board for power supply coils connections.

The solenoid case classified **Ex db** is designed to contain the possible explosion which could be caused by the presence of the gas mixture inside the housing, thus avoiding dangerous propagation in the external environment.

They are also designed to limit the external temperature according to the certified class to avoid the self ignition of the explosive mixture present in the environment.

DPHA/MA-2:
Size: **16** - ISO 4401
Max flow: **300 l/min**
Max pressure: **350 bar**

DPHA/MA-4:
Size: **25** - ISO 4401
Max flow: **700 l/min**
Max pressure: **350 bar**

1 MODEL CODE OF PILOTED SOLENOID VALVES TYPE SDPHA

SDPHA	/	MA	-	2	63	1/2	-	A	24DC	**	/*

SDPHA = spool type - piloted

Certification type:
MA = Ex-proof Ma Chinese mining certification

Valve size (ISO 4401)
2 = 16 **4** = 25

Configuration, see section 2

Spool type, see section 2

Voltage code, see section 5

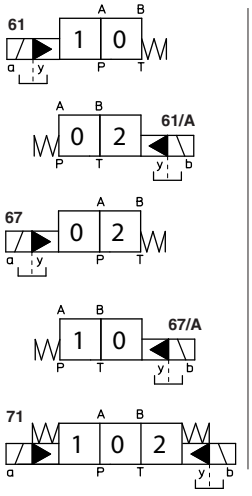
Series number

Seals material, see section 6:
- = NBR
PE = FKM

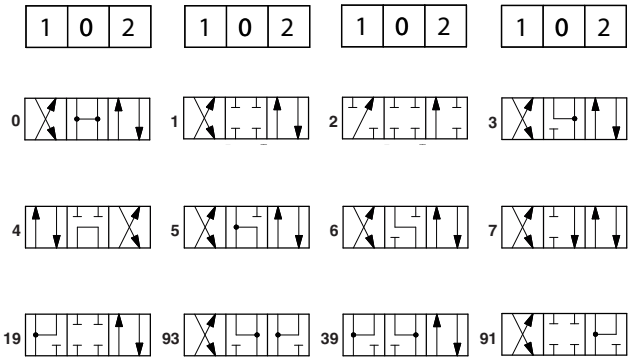
Options:
/A = Solenoid at side of port B (for single solenoid valves)
/D = Internal drain
/E = External pilot pressure
/H = Adjustable chokes (meter-out to the pilot chambers of the main valve)
/R = Pilot pressure generator (4 bar on port P)
/S = Main spool stroke adjustment

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

Configurations



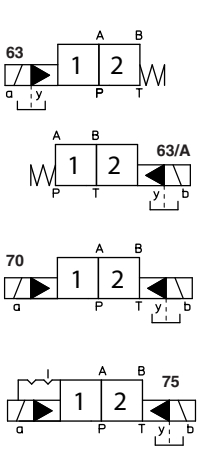
Spools



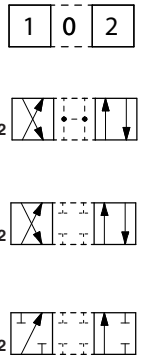
Spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.

Spools type **1** and **4** are also available as **1/1** and **4/8** that are properly shaped to reduce water-hammer shocks during the switching.

Configurations



Spools



3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-db

4 HYDRAULIC CHARACTERISTICS

Operating pressure	P, A, B, X = **350 bar** T = **250 bar** (standard) T = **210 bar** (option /D)
	Ports Y = 0 bar - Minimum pilot pressure for correct operation is 8 bar
Maximuim flow	SDPHA-2: **300 l/min;** SDPHA-4: **700 l/min;**

5 ELECTRICAL CHARACTERISTICS

SOLENOID TYPE	ON/OFF
Voltage code VDC ±10%	**12DC, 24DC, 110DC**
Power consumption	16,5 W
Protection degree	IP 65 to DIN EN 60529
Duty factor	100%

6 SEALS AND HYDRAULIC FLUID

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°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, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

7 CERTIFICATION DATA

Valve type	SDPHA**/MA**
Certification	MA mining
Solenoid certified code	**DTBZ12 - 37 FYC**
Type examination certificate	CNEx 22.7656X
Method of protection	Ex db I Mb
Ambient temperature	≤ 135 °C
Ambient temperature	-20 ÷ +40 °C
Cable entrance:	cable entrance Ø =10.5mm

⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

8 OPTIONS

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 8.1).

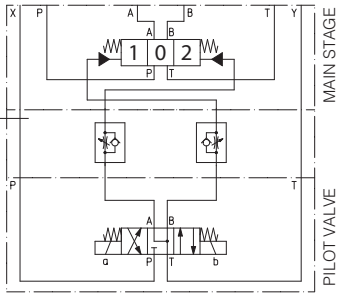
/S = Main spool stroke adjustment.

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).

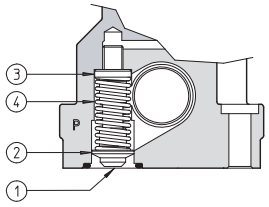
FUNCTIONAL SCHEME (config. 71)
example of switching control options

option H



8.1 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, 09, 90, 94, 49.** 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.

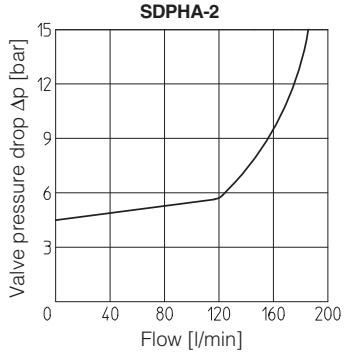


① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

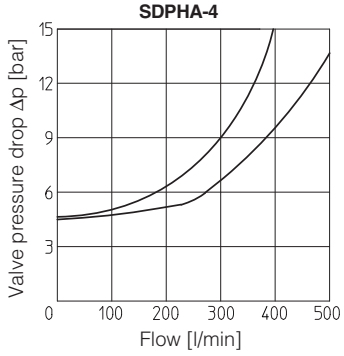
Ordering code of spare pilot pressure generator

R/DP	-	*
Pilot pressure generator		Size: **2** for SDPHA-2 **4** for SDPHA-4

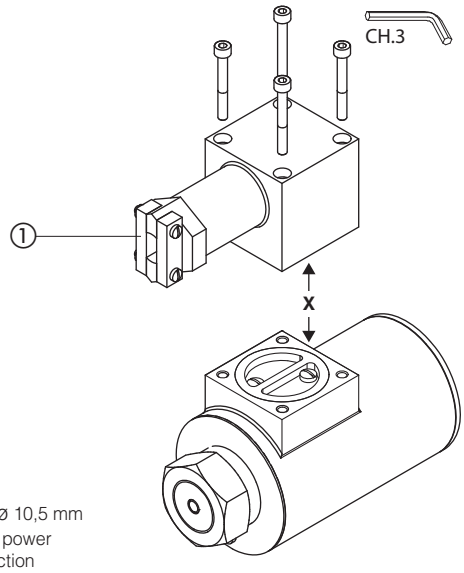
SDPHA-2

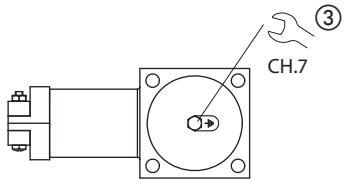


SDPHA-4

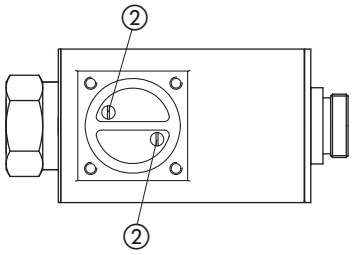


9 SOLENOID WIRING





view from **X**



① cable entrance = ø 10,5 mm
② terminal board for power supply coil connection
③ screw terminal for ground connection

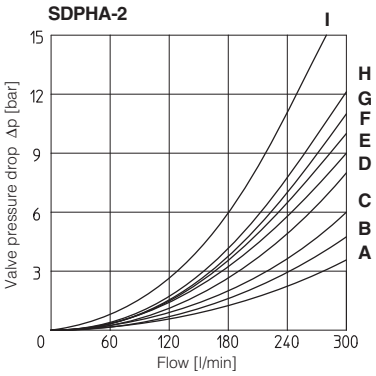
10 **Q/ΔP DIAGRAMS** based on mineral oil ISO VG 46 at 50°C

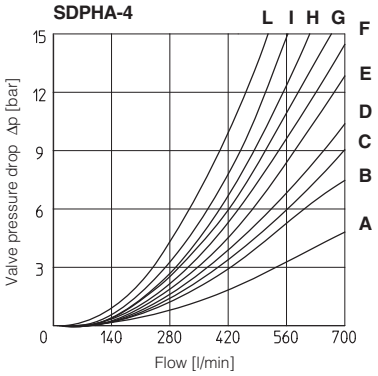
SDPHA-2

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	-
91	C	C	E	-	-
93	-	C	D	-	-

SDPHA-4

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, 5/1, 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	-
91	F	F	D		
93	-	G	D	-	-





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

SDPHA-2

Spool	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
0, 1, 3, 6, 7	300	300	300	250
2, 4, 4/8	300	300	240	140
5	260	220	180	100
0/1, 0/2, 1/2	300	250	210	180
19, 39, 91, 93	300	300	270	200

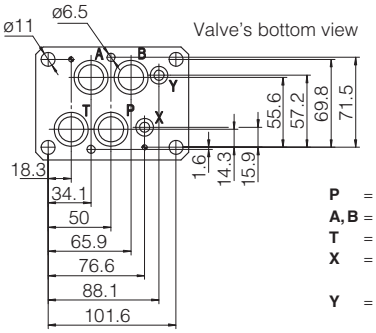
SDPHA-4

Spool	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
1, 6, 7	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
19, 39, 91, 93	500	500	500	450

SDPHA/MA-2

ISO 4401: 2005
Mounting surface: 4401-07-07-0-05

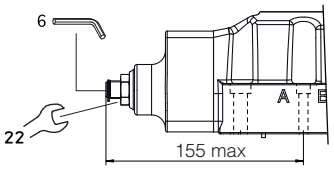
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043

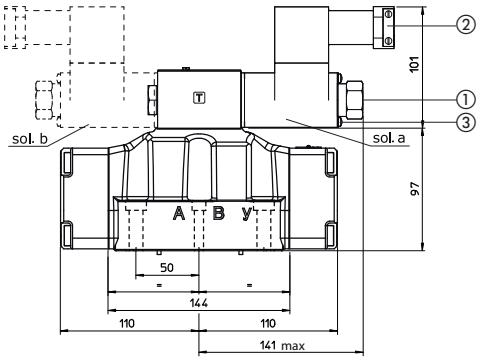


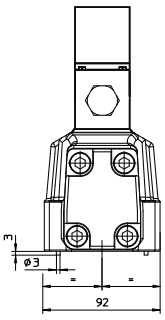
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

SDPHA/MA-26
SDPHA/MA-27 (dotted line)

Stroke adjustment device for option **/S**





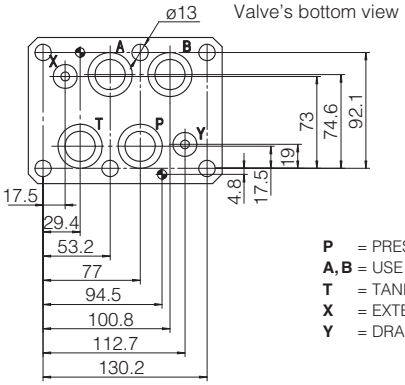


① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding

Mass:
SDPHA/MA-26: 10,8 kg
SDPHA/MA-27: 12,5 kg

SDPHA/MA-4

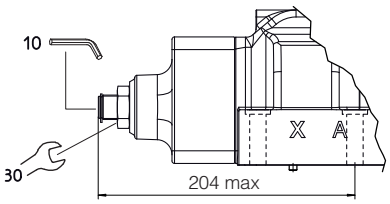
ISO 4401: 2005
Mounting surface: 4401-08-08-0-05 (see table P005)
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

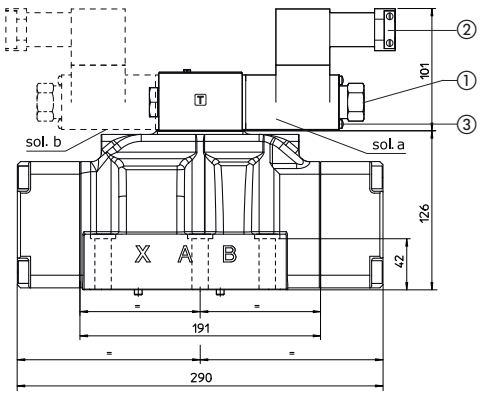


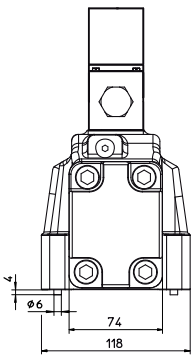
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

SDPHA/MA-46
SDPHA/MA-47 (dotted line)

Stroke adjustment device for option **/S**





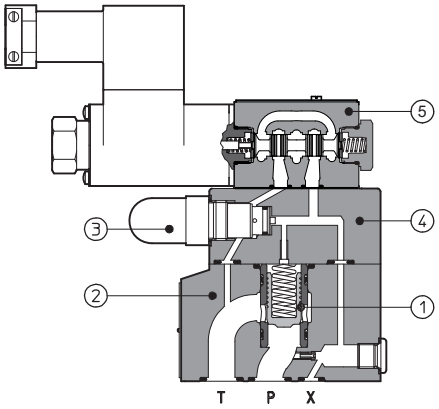


① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding

Mass:
SDPHA/MA-46: 19,4 kg
SDPHA/MA-47: 21,9 kg

Ex-proof pressure relief valves

piloted, subplate - **MA certification**



① main poppet
② valve main body
③ mechanical pressure limiter
④ cover
⑤ ex proof pilot valve

SAGAM/MA-10/10/**

SAGAM/MA

Pressure relief valves equipped with explosion-proof solenoid pilot valve for venting certified according to **MA** Chinese mining certification, protection mode:

Ex db I Mb for surface, tunnel or mine plants

The solenoids are provided with cable glands (horizontally oriented) for cable entrance and internal terminal board for power supply coils connections.

The solenoid case classified **Ex db** is designed to contain the possible explosion which could be caused by the presence of the gas mixture inside the housing, thus avoiding dangerous propagation in the external environment.

They are also designed to limit the external temperature according to the certified class to avoid the self ignition of the explosive mixture present in the environment.

SAGAM: pressure relief, subplate mounting
Size: **10, 20, 32** - ISO 6264
Max flow: **200, 400, 600 l/min**
Max pressure: **350 bar**

1 MODEL CODE OF PRESSURE RELIEF VALVES TYPE SAGAM

SAGAM	/	MA	-	20	/	1	0	/	210	-	*	/	24DC	**	/	*

SAGAM = pressure relief valve: subplate mounting

Certification type:
MA = Ex-proof Ma Chinese mining certification

Valve size: **10** (ISO 6264)
20 (ISO 6264)
32 (ISO 6264)

1 = one setting pressure

Valve configuration, see section 2
0 = venting with de-energized solenoid
1 = venting with energized solenoid

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

Option:
V = regulating handweel for pressure adjustment

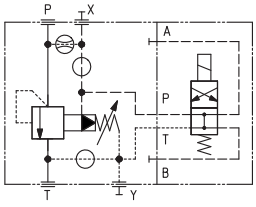
Voltage code, see section 5

Series number

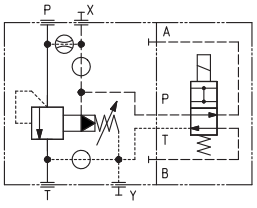
Seals material, see section 6:
- = NBR
PE = FKM

2 HYDRAULIC SYMBOL (representation according to ISO 1219-1)

SAGAM-/10**



SAGAM-/11**



3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-db

4 HYDRAULIC CHARACTERISTICS

Operating pressure	P, X = **350 bar**	T, Y = **210 bar**	
Maximuim flow	SAGAM/MA-10 = **200 l/min;**	SAGAM/MA-20 = **400 l/min;**	SAGAM/MA-32 = **600 l/min;**

5 ELECTRICAL CHARACTERISTICS

SOLENOID TYPE	ON/OFF
Voltage code VDC ±10%	**12DC, 24DC, 110DC**
Power consumption	16,5 W
Protection degree	IP 65 to DIN EN 60529
Duty factor	100%

6 SEALS AND HYDRAULIC FLUID

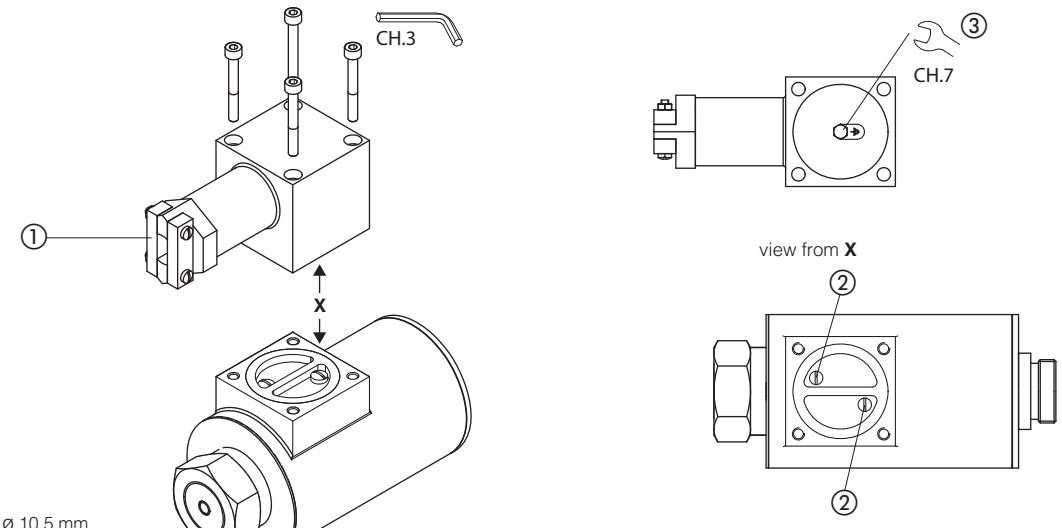
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

7 CERTIFICATION DATA

Valve type	SAGAM**/MA**
Certification	MA mining
Solenoid certified code	**DTBZ12 - 37 FYC**
Type examination certificate	CNEx 22.7656X
Method of protection	Ex db I Mb
Ambient temperature	≤ 135 °C
Ambient temperature	-20 ÷ +40 °C
Cable entrance:	cable entrance Ø =10.5mm

⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

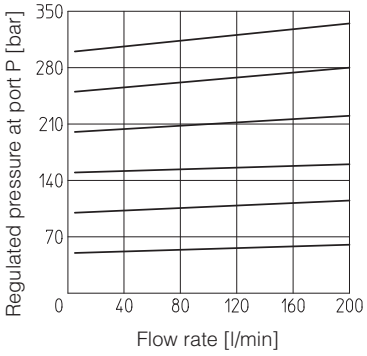
8 SOLENOID WIRING



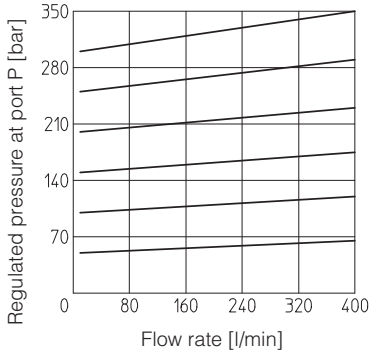
① cable entrance = ø 10,5 mm
② terminal board for power supply coil connection
③ screw terminal for ground connection

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

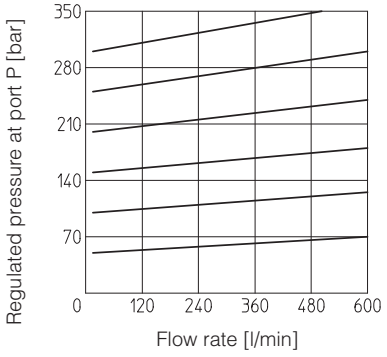
SAGAM-10



SAGAM-20

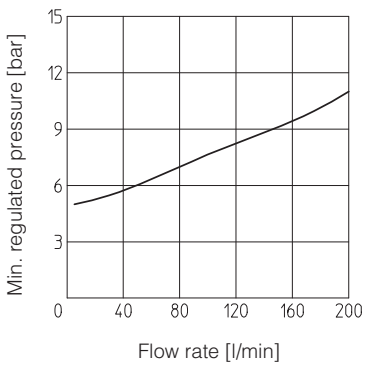


SAGAM-32

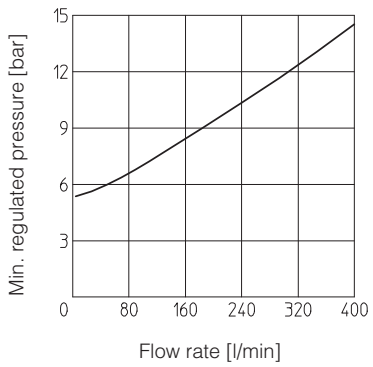


10 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

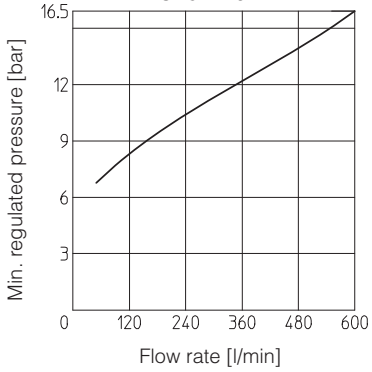
SAGAM-10



SAGAM-20

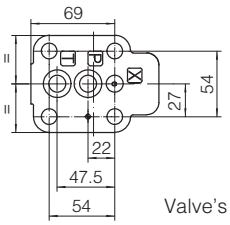


SAGAM-32

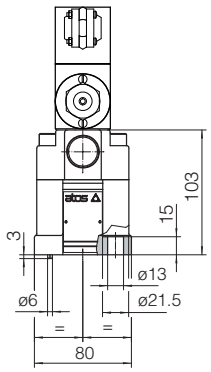


SAGAM/MA-10

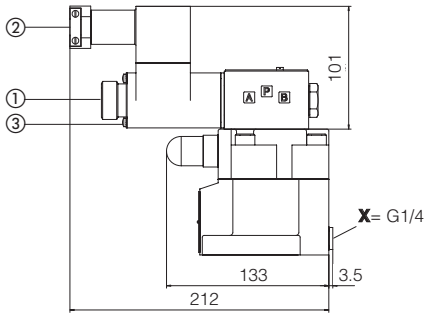
ISO 6264: 2007
Mounting surface: 6264-06-09-1-97
Fastening bolts:
4 socket head screws M12x35 class 12.9
Tightening torque = 125 Nm
Seals: 2 OR 123; 1 OR 109/70
Ports P, T: Ø = 14,5 mm
Ports X: Ø = 3,2 mm



Valve's bottom view



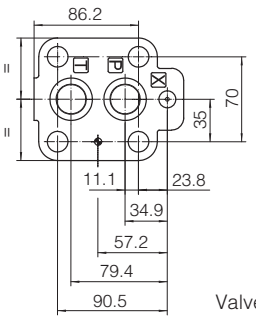
SAGAM/MA-10/**



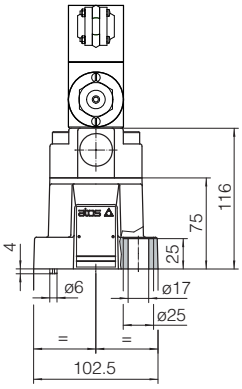
Mass: 5,1 Kg

SAGAM/MA-20

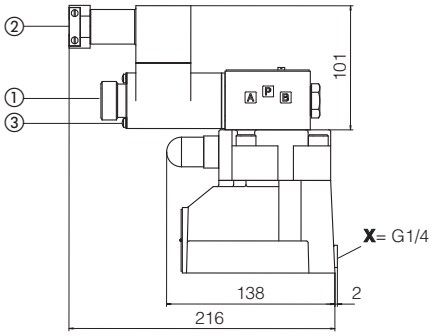
ISO 6264: 2007
Mounting surface: 6264-08-11-1-97
Fastening bolts:
4 socket head screws M16x50 class 12.9
Tightening torque = 300 Nm
Seals: 2 OR 4112; 1 OR 109/70
Ports P, T: Ø = 24 mm
Ports X: Ø = 3,2 mm



Valve's bottom view



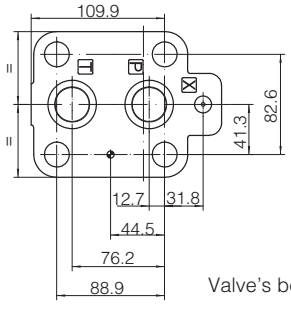
SAGAM/MA-20/**



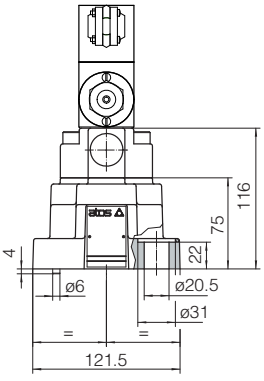
Mass: 6,3 Kg

SAGAM/MA-32

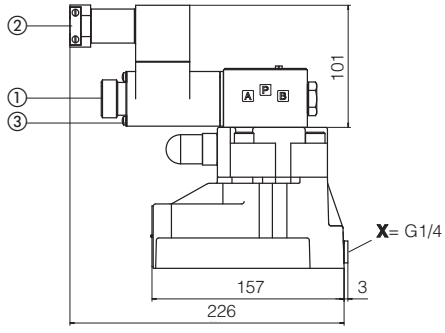
ISO 6264: 2007
Mounting surface: 6264-10-17-1-97
(with M20 fixing holes instead of standard M18)
Fastening bolts:
4 socket head screws M20x60 class 12.9
Tightening torque = 600 Nm
Seals: 2 OR 4131; 1 OR 109/70
Ports P, T: Ø = 28,5 mm
Ports X: Ø = 3,2 mm



Valve's bottom view



SAGAM/MA-32/**



Mass: 7,7 Kg

① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding


atos
the smart electrohydraulics

KTS/SH-24/E

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