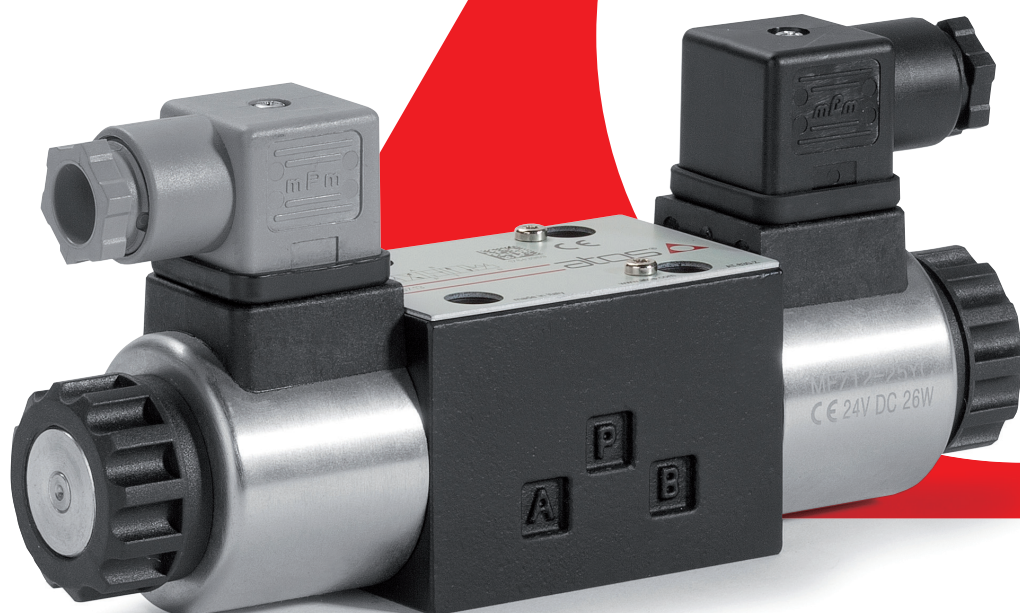


# INDUSTRIAL ELECTROHYDRAULICS

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## ATOS SHANGHAI CATALOG







● **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





## INDUSTRIAL

### PROPORTIONAL VALVES

#### high performance directional valves, positive overlap with LVDT transducer

		Size	Qmax [l/min]	Table	Pag
SDHZE-TID	direct, subplate, on-board driver	06 ÷ 10	80 ÷ 180	FS150/SH	5
SDKZE-TID					
SDPZE-TID	piloted, subplate, on-board driver	16 ÷ 32	550 ÷ 1600	FS159/SH	13

#### directional valves, positive overlap without transducer

SDHZE-A	direct, subplate, off-board driver	06 ÷ 10	50 ÷ 130	F150/SH	23
SDKZE-A					
SDPZE-A	piloted, subplate, off-board driver	16 ÷ 32	550 ÷ 1500	F170/SH	27

#### pressure valves, without transducer

SRZME-A	relief, direct, subplate, off-board driver	06	4	F005/SH	35
CART SRZME-A	relief, direct, screw-in cartridge, off-board driver	M20			
SAGMZE-A	relief, piloted, subplate, off-board driver	10 ÷ 32	200 ÷ 600	F030/SH	39
SRZGE-A	reducing, direct, subplate, off-board driver	06	12	F012/SH	45
CART SRZGE-A	reducing, direct, screw-in cartridge, off-board driver	M20			
SDHRZE-A	3 way reducing, direct, subplate, off-board driver	06	24	F050/SH	51

#### accessories

CONNECTORS	for on-off and proportional valves			K800/SH	177
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### ON-OFF VALVES

#### directional valves, solenoid operated

SDHL	direct, subplate, AC or DC compact solenoids	06	60	E018/SH	55
SDHL8	direct, subplate, AC or DC compact solenoids, low leakage	06	30	E050/SH	61
SDHE	direct, subplate, AC or DC solenoids	06	80	E015/SH	65
SDKL	direct, subplate, DC solenoids	10	120	E028/SH	71
SDKE	direct, subplate, AC or DC solenoids	10	150	E025/SH	75
SDPHL	piloted, subplate, AC or DC compact solenoids, Pmax 350 bar	16 ÷ 25	300 ÷ 700	E100/SH	79
SDPLHL	piloted, subplate, AC or DC compact solenoids, Pmax 280 bar	16 ÷ 25	300 ÷ 700	E080/SH	85
SDPHE	piloted, subplate, AC or DC solenoids	16 ÷ 32	300 ÷ 1000	E085/SH	91

#### directional valves, hydraulic operated

SDP	subplate, Pmax 350 bar	16 ÷ 32	300 ÷ 1000	E225/SH	97
SDPL	subplate, Pmax 280 bar	16 ÷ 25	300 ÷ 700	E228/SH	101

#### pressure valves

SAGAM	relief, piloted, subplate, optional solenoid pilot valve	10 ÷ 32	200 ÷ 600	C066/SH	105
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#### check valves

SADR	direct, in-line, leak-free	G ¼" ÷ 1"	40 ÷ 360	C406/SH	111
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#### safety valves, with spool position monitor

SDHE/FV, SDKE/FV	directional, direct, subplate, AC or DC solenoids	06 ÷ 10	80 ÷ 150	EY010/SH	113
SDPHE/FV	directional, piloted, subplate, AC or DC solenoids	16 ÷ 25	300 ÷ 700	EY030/SH	123

		Size	Qmax [l/min]	Table	Pag
<b>ON-OFF VALVES</b>					
<b>modulars</b>					
SHMP, SKM	pressure relief, direct or piloted	06 ÷ 10	35 ÷ 120	D120/SH	<b>131</b>
SHG, SKG	pressure reducing, direct or piloted, 3 way	06 ÷ 10	50 ÷ 100	D140/SH	<b>135</b>
SHQ, SKQ	throttle, direct, reverse free flow	06 ÷ 10	80 ÷ 160	D160/SH	<b>139</b>
SHR, SKR	check, direct or piloted, leak-free	06 ÷ 10	60 ÷ 120	D180/SH	<b>143</b>
<b>accessories</b>					
SMAP	manual pressure switch with fixed differential switching pressure			D250/SH	<b>175</b>
CONNECTORS	for on-off and proportional valves			K800/SH	<b>177</b>

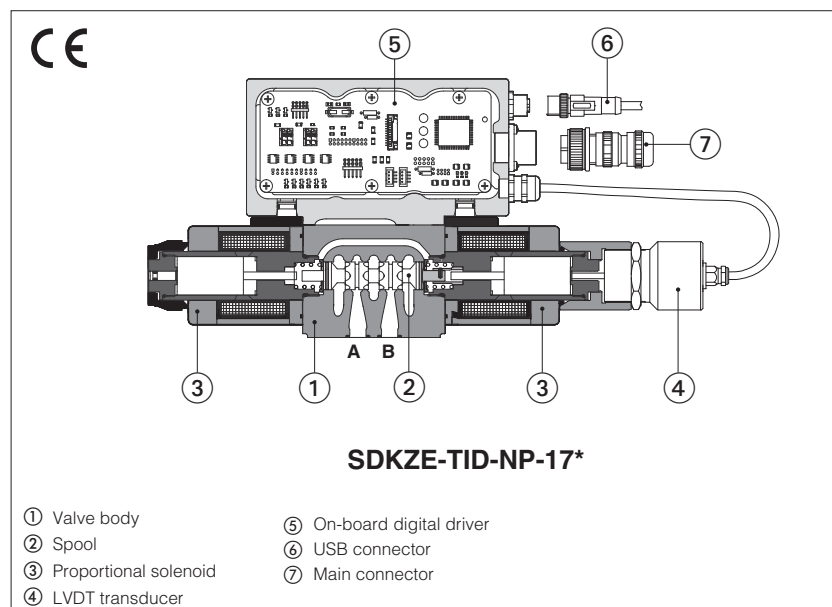
		Port size	Qmax [l/min]	Table	Pag
<b>FILTERS</b>					
SFPS	in line, threaded ports, Pmax 420 bar	G ½" ÷ 1 ½" SAE 16 ÷ 24	450	LF032/SH	<b>147</b>
SFRS	return line, tank-top, threaded ports, Pmax 8 bar	G ½" ÷ 2" SAE 12 ÷ 32	750	LF050/SH	<b>159</b>
SFSS	suction, threaded ports, wire mesh	G ½" ÷ 3"	450	LF060/SH	<b>171</b>

## EX-PROOF

		Size	Qmax [l/min]	Table	Pag
<b>ON-OFF VALVES</b>					
<b>directional valves Ex-d</b>					
SDHA/MA SDKA/MA	direct, subplate, DC solenoids, MA certification I Mb	06 ÷ 10	80 ÷ 120	EX120/SH	<b>179</b>
SDPHA/MA	piloted, subplate, DC solenoids, MA certification I Mb	16 ÷ 25	300 ÷ 700	EX130/SH	<b>183</b>
<b>pressure valves Ex-d</b>					
SAGAM/MA	relief, piloted, subplate, DC solenoids, MA certification I Mb	10 ÷ 32	200 ÷ 600	EX140/SH	<b>189</b>

# Digital proportional directional valves high performance

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



## 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.

The software setting of functional parameters can be performed via USB port.

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:

Size: **06** - ISO 4401

4/3 and 4/2 way

Max flow: **80 l/min**

Max pressure: **350 bar**

### SDKZE:

Size: **10** - ISO 4401

4/3 and 4/2 way

Max flow: **180 l/min**

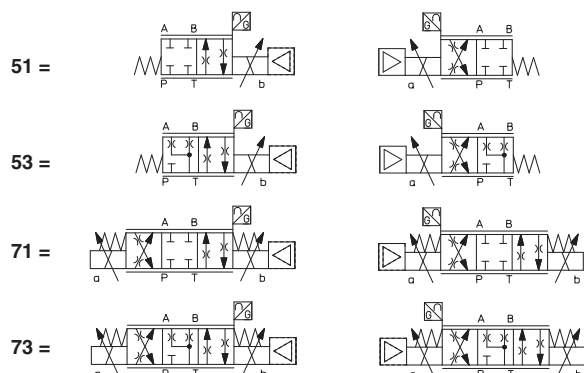
Max pressure: **315 bar**

## 1 MODEL CODE

SDHZE	-	TID	-	NP	-	0		71	-	S		5	/	*	-	*	/	*	
SDHZE = size 06 SDKZE = size 10																Series number		Seals material, see section 7 : - = NBR PE = FKM	
TID = on-board digital driver and LVDT transducer																			
Fieldbus interfaces, USB port always present:																			
NP = Not present																			
Valve size ISO 4401: 0 = 06    1 = 10																			
																		</	

### Configuration: Standard

### Option /B



### Spool size:

	3 (L,S,D)	5 (L,S,D)
SDHZE =	18	28
SDKZE =	55	85

Nominal flow (l/min) at  $\Delta p$  10 bar P-T

### 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

## 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 the user manuals included in the E-SW-\* programming software.

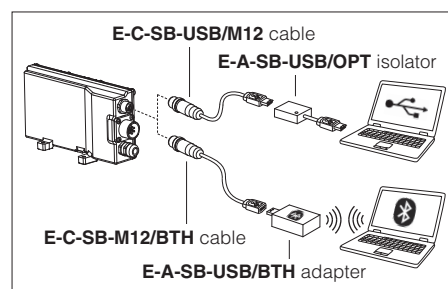
### 3 VALVE SETTINGS AND PROGRAMMING TOOLS

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW-BASIC programming software connected via USB port to the digital driver, see tech. table **GS500-SH**.

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

**WARNING:** see tech table **GS500-SH** for the list of countries where the Bluetooth adapter has been approved

### USB or Bluetooth connection



### 4 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index: $R_a \leq 0,8$ , recommended $R_a 0,4$ – Flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	<b>Standard</b> = $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$ / <b>PE</b> option = $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$
Storage temperature range	<b>Standard</b> = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$ / <b>PE</b> option = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$
Surface protection	Zinc coating with black passivation (body), tin plating (driver housing)
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

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

Valve model	SDHZE							SDKZE						
Pressure limits [bar]	ports <b>P, A, B</b> = 350; <b>T</b> = 210							ports <b>P, A, B</b> = 315; <b>T</b> = 210						
Spool type <b>(1)</b>	<b>L3, S3</b>	<b>D3</b>		<b>L5, S5</b>		<b>D5</b>		<b>L3, S3</b>	<b>D3</b>		<b>L5, S5</b>		<b>D5</b>	
Nominal flow Δp P-T <b>(2)</b> [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	55	50	28	85	75	50	
	Δp= 30 bar	30	30	15	50	50	25	100	100	50	150	130	90	
Max permissible flow	50	50	25	80	80	40		130	130	65	180	180	125	
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 <b>(3)</b> [ms]	≤ 15							≤ 20						
Hysteresis	≤ 0,2 [% of max regulation]													
Repeatability	± 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  $\Delta p/2$  per control edge

**(2)** For different  $\Delta p$ , the max flow is in accordance to the diagrams in section 8.2

**(3)** 0-100% step signal

### 6 ELECTRICAL CHARACTERISTICS

Power supply	Nominal : +24 VDC Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % VPP)
Max power consumption	50 W
Max. solenoid current	<b>SDHZE</b> = 2,6 A <b>SDKZE</b> = 3 A
Coil resistance R at 20°C	<b>SDHZE</b> = 3,1 $\Omega$ <b>SDKZE</b> = 3,2 $\Omega$
Analog input signals	Voltage: range $\pm 10$ VDC (24 VMAX tollerant) Current: range $\pm 20$ mA Input impedance: $R_i > 50$ k $\Omega$ Input impedance: $R_i = 500$ $\Omega$
Monitor outputs	Output range: voltage $\pm 10$ VDC @ max 5 mA current $\pm 20$ mA @ max 500 $\Omega$ 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 occurring 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 <b>13</b>

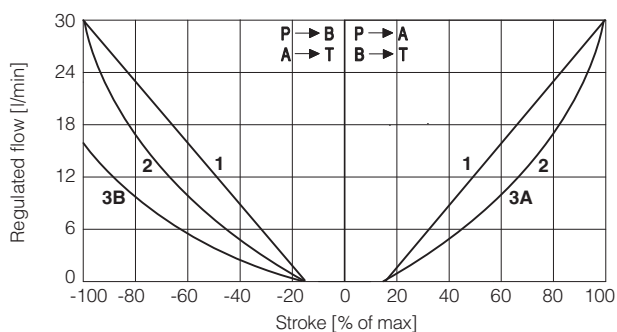
**Note:** a maximum time of 400 ms has to be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

**7 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 longer life	ISO4406 class 18/16/13 NAS1638 class 7 ISO4406 class 16/14/11 NAS1638 class 5	see also filter section at www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	

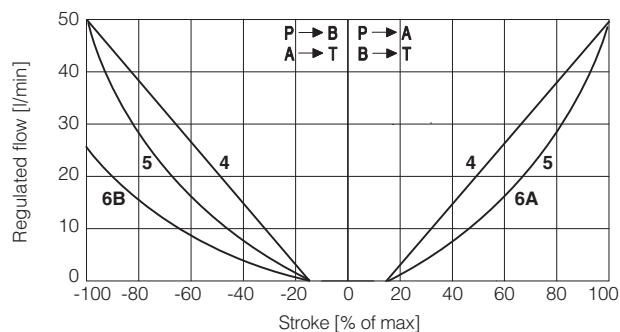
**8 DIAGRAMS** (based on mineral oil ISO VG 46 at 50 °C)

**8.1 Regulation diagrams** - values measure at  $\Delta p$  30 bar P-T



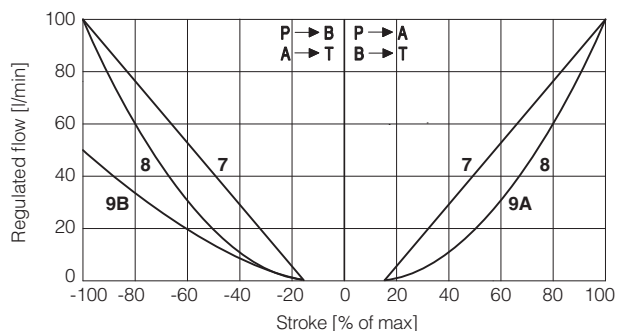
**SDHZE**

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



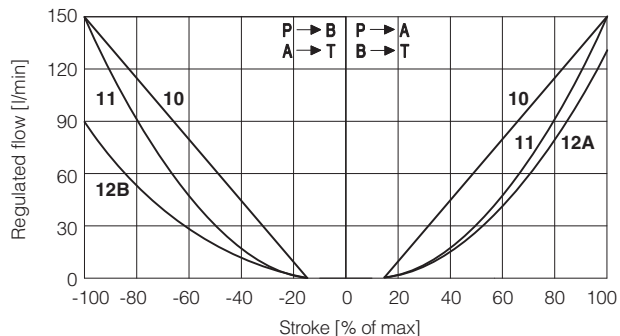
**SDHZE**

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)

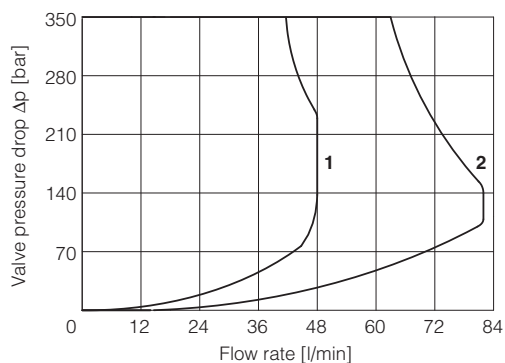
**Note:** Hydraulic configuration vs. reference signal for configuration 71 and 73 (standard and option /B)

Reference signal  $\begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \left. \vphantom{\begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix}} \right\} P \rightarrow A / B \rightarrow T$

Reference signal  $\begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \left. \vphantom{\begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix}} \right\} P \rightarrow B / A \rightarrow T$

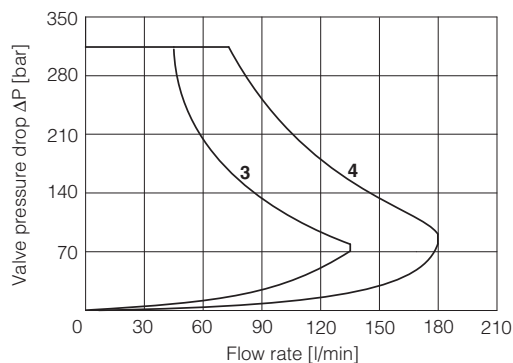
**8.2 Operating limits**

**SDHZE**



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

**SDKZE**



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

## 9 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 8.1

## 10 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.

## 11 POWER SUPPLY AND SIGNALS SPECIFICATIONS

### 11.1 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.

### 11.2 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.  
*Option /I (current reference input):* default is 4 ÷ 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

### 11.3 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 (voltage monitor output):* default is ±10 VDC and can be reconfigured via software, within a maximum range of ±10 VDC.  
*Option /I (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).

## 12 ELECTRONIC CONNECTIONS

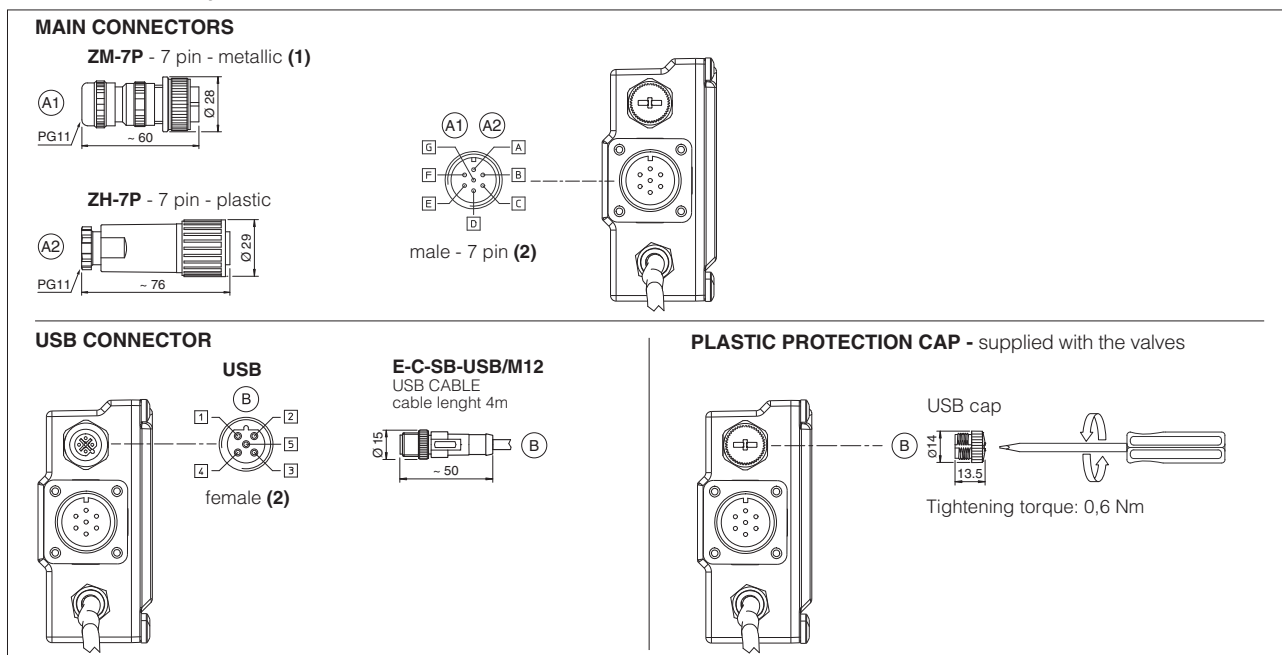
### 12.1 Main connector signals - 7 pin (A1)

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 maximum range ±10 Vdc for standard, 4 ÷ 20 mA for /I option	Input - analog signal
E	INPUT-	Negative reference input signal for Q_INPUT+	Input - analog signal
F	Q_MONITOR	Flow monitor output signal: ±10 Vdc maximum range, referred to AGND ±10 Vdc for standard, 4 ÷ 20 mA for /I option	Output - analog signal
G	EARTH	Internally connected to driver housing	

### 12.2 Communication connectors (B)

(B) USB connector - M12 - 5 pin always present		
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 +

## 12.3 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

## 13 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 mm <sup>2</sup> max 20 m (logic and power supply) or LiYCY 7 x 1 mm <sup>2</sup> max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm <sup>2</sup> max 20 m (logic and power supply) or LiYCY 7 x 1 mm <sup>2</sup> max 40 m (logic and power supply)
Conductor size	up to 1 mm <sup>2</sup> - available for 7 wires	up to 1 mm <sup>2</sup> - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

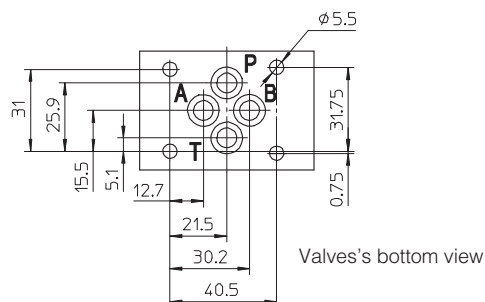
## 14 FASTENING BOLTS AND SEALS

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

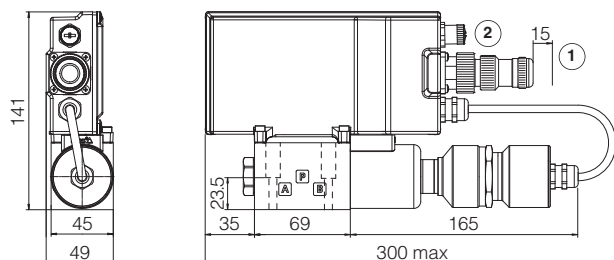
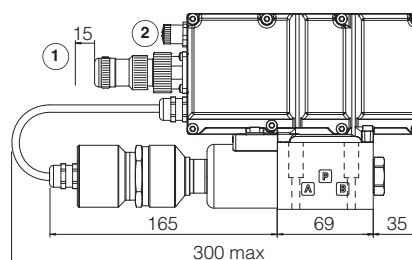
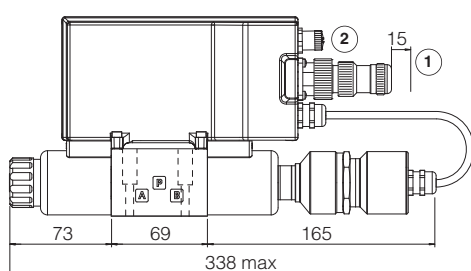
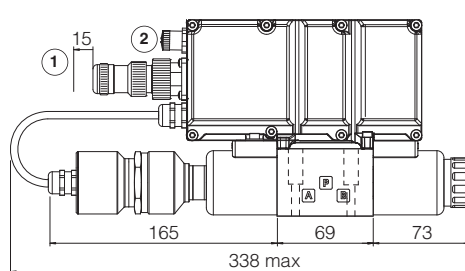
**SDHZE-TID-NP-\***

ISO 4401: 2000

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

P, A, B, T =  $\varnothing$  7,5 max

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

**SDHZE-TID-NP-05\*****SDHZE-TID-NP-05\*/B****SDHZE-TID-NP-07\*****SDHZE-TID-NP-07\*/B**

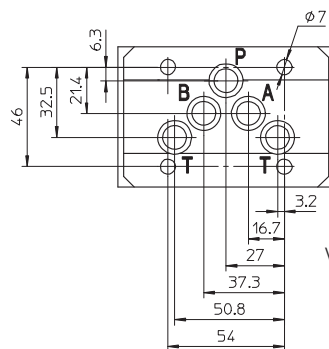
① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 12.3



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

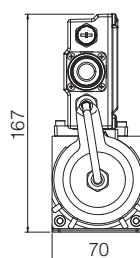
**P, A, B, T = Ø 11,2 max**



Valves's bottom view

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

Technical drawing of the 345 max pump assembly. The drawing shows the pump unit with dimensions: 190 (main body length), 92 (motor length), and 36 (motor width). The total length is labeled as 345 max. The motor has a 30mm diameter. The pump unit has a 15mm diameter inlet. The motor is labeled with 'P', 'A', and 'B' terminals. The pump unit is labeled with '1' and '2' terminals. The drawing also shows the pump unit with a 15mm diameter inlet and a 30mm diameter outlet.



Technical drawing of the 3000 series solenoid valve. The drawing shows the valve body with a solenoid coil on the left. Dimensions are indicated: 15 for the coil height, 190 for the coil length, 92 for the valve body width, and 100 for the valve body length. The total length is 410 max. The valve body has ports labeled P, B, and A. The coil is labeled 1 and 2.

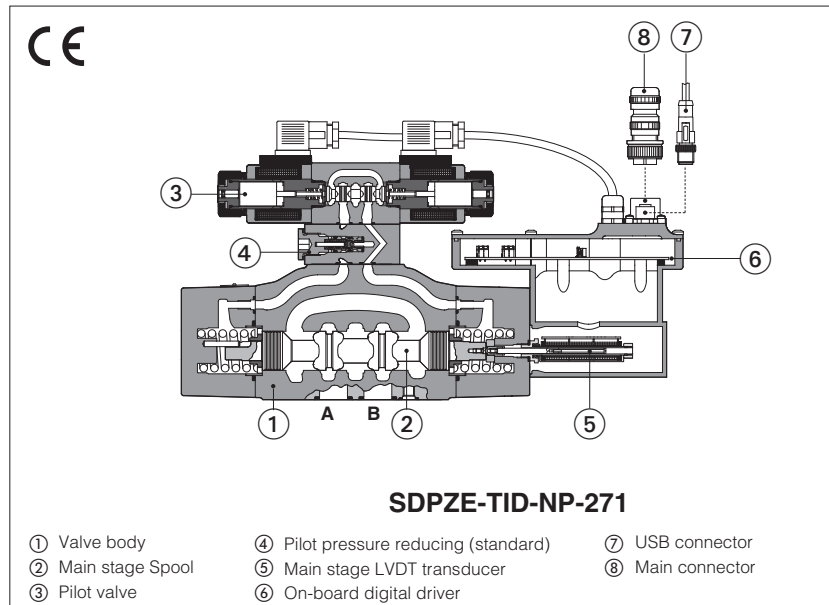
Technical drawing of the 1000W motor unit. The drawing shows the motor assembly with a mounting bracket. Dimensions are indicated: 100 (width of the motor body), 92 (width of the mounting bracket), 190 (width of the motor body including the mounting bracket), and 410 max (total width including the mounting bracket). Connection points are labeled: 1 (power input), 2 (grounding), and 15 (speed control). The motor body is marked with 'P', 'B', and 'A'.

- ① = Space to remove the connectors
- ② = The dimensions of all connectors must be considered, see section 12.3



# Digital proportional directional valves high performance

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



## 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.

The software setting of functional parameters can be performed via USB port.

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**

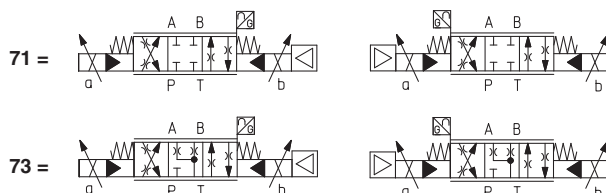
## 1 MODEL CODE OF STANDARD SPOOLS

SDPZE	TID	NP	2	71	L	5	*	*	*
Proportional directional valve, piloted	TID = on-board digital driver and LVDT transducer	Fieldbus interfaces, USB port always present: 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					Series number	Seals material, see sect. 8: - = NBR PE = FKM
<b>Hydraulic options</b> , see section 10 (2): <b>B</b> = on-board digital driver, connection and LVDT transducer at side of port A of the main stage (side B of pilot valve) <b>Electronic options</b> , see section 11: <b>I</b> = current reference input and monitor 4÷20mA									<b>Spool size:</b> 3 (L,S,D)    5 (L,DL,S,D) SDPZE-2 =        160        250 SDPZE-4 =        -        480 SDPZE-6 =        -        640 Nominal flow (l/min) at Δp 10 bar P-T

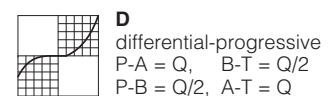
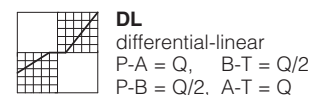
## Configuration:

### Standard

### Option /B



## Spool type, regulating characteristics (1):



(1) Spool for regenerative circuit, see section 2

(2) Pilot and Drain configuration: standard configuration is internal pilot and external drain, other configurations on request

## 2 MODEL CODE OF SPOOLS FOR REGENERATIVE CIRCUIT - for valve model code and options, see section 1

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

**Configuration and spool:**

**Standard**

**Option /B**

**D9**

For regenerative circuit  
(additional external check  
valve required)  
see 9.1 - diagram 19

**L9**

For regenerative circuit  
internal to the valve  
see 9.1 - diagram 20

Spool size:	D9	L9
SDPZE-2 =	250	250
SDPZE-4 =	480	-

Nominal flow (l/min) at  $\Delta p$  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 the user manuals included in the E-SW-\* programming software.

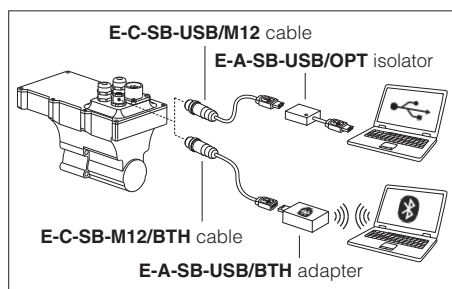
## 4 VALVE SETTINGS AND PROGRAMMING TOOLS

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW-BASIC programming software connected via USB port to the digital driver, see tech. table **GS500-SH**.

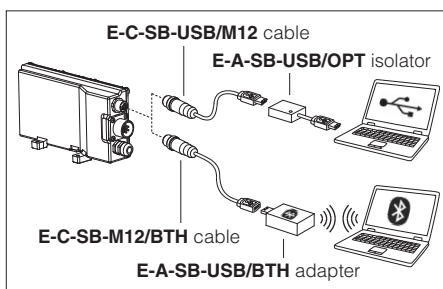
**WARNING:** drivers **USB port is not isolated!** For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection

**WARNING:** see tech table **GS500-SH** for the list of countries where the Bluetooth adapter has been approved

### USB or Bluetooth connection for sizes 16 and 25



### USB or Bluetooth connection for size 32



## 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	75 years, see technical table P007
Ambient temperature range	<b>Standard</b> = -20°C ÷ +60°C <b>/PE option</b> = -20°C ÷ +60°C
Storage temperature range	<b>Standard</b> = -20°C ÷ +70°C <b>/PE option</b> = -20°C ÷ +70°C
Surface protection	Zinc coating with black passivation (body), galvanic treatment (driver housing)
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h
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

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

Valve model	SDPZE-*-2		SDPZE-*-4	SDPZE-*-6
Pressure limits [bar]	ports <b>P, A, B, X</b> = 350; <b>T</b> = 250; <b>Y</b> = 10;			
Spool type <b>(1)</b>	standard	<b>L3, S3, D3</b>	<b>L5, DL5, S5, D5</b>	<b>L5, S5, D5</b>
	regenerative		<b>D9, L9</b>	<b>D9</b>
Nominal flow $\Delta p$ P-T <b>(2)</b> [l/min]	$\Delta p = 10$ bar	160	250	480
	$\Delta p = 30$ bar	270	430	830
	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 <b>(3)</b> [l/min]	3,7		6,8	14,4
Leakage <b>(4)</b>	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 <b>(5)</b> [ms]	$\leq 75$		$\leq 90$	$\leq 120$
Hysteresis	$\leq 1$ [% of max regulation]			
Repeatability	$\pm 0,5$ [% of max regulation]			
Thermal drift	zero point displacement < 1% at $\Delta T = 40^\circ C$			

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

**(2)** For different  $\Delta p$ , the max flow is in accordance to the diagrams in section 9.2

**(3)** With step reference input signal  $0 \div 100\%$

**(4)** At  $p = 100/350$  bar

**(5)** 0-100% step signal see detailed diagrams in section 9.3

## 7 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % VPP)
Max power consumption	50 W
Max. solenoid current	2,6 A
Coil resistance R at 20°C	3,1 $\Omega$
Analog input signals	Voltage: range $\pm 10$ VDC (24 VMAX tollerant) Input impedance: $R_i > 50 k\Omega$ Current: range $\pm 20$ mA Input impedance: $R_i = 500 \Omega$
Monitor outputs	Output range: voltage $\pm 10$ VDC @ max 5 mA current $\pm 20$ mA @ max 500 $\Omega$ 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 occurring 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 14

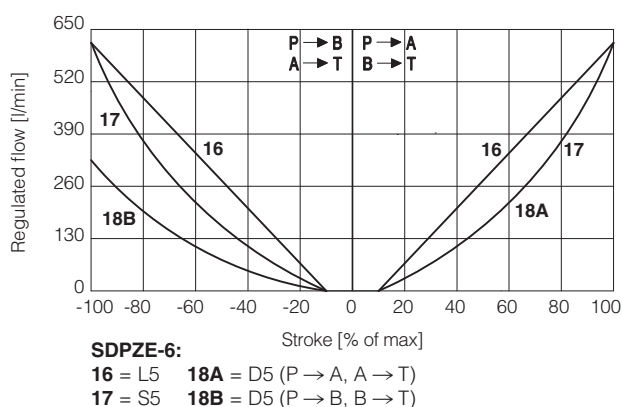
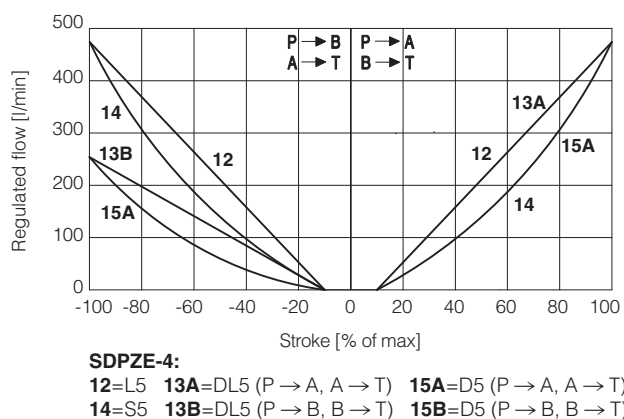
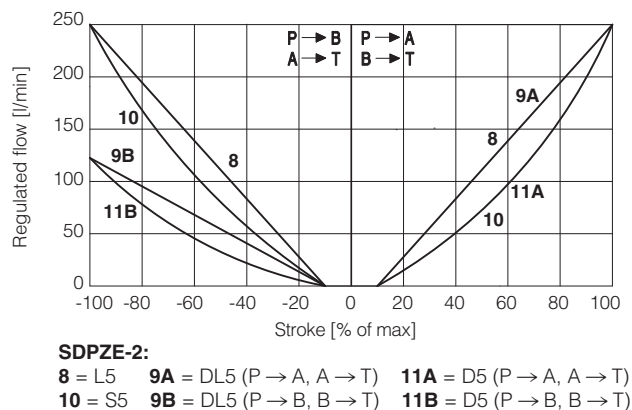
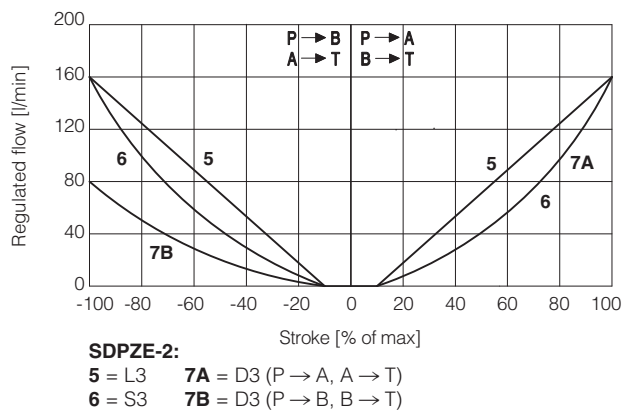
**Note:** a maximum time of 400 ms has to be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

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

Seals, recommended fluid temperature	NBR seals (standard) = $-20^\circ C \div +60^\circ C$ , with HFC hydraulic fluids = $-20^\circ C \div +50^\circ C$ FKM seals (/PE option) = $-20^\circ C \div +80^\circ C$		
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	
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDR, 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 p 10 bar P-T)



#### Note:

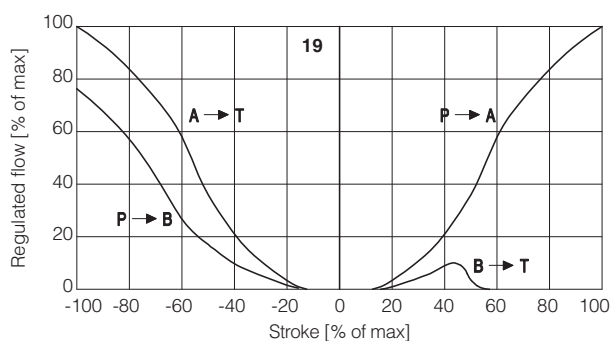
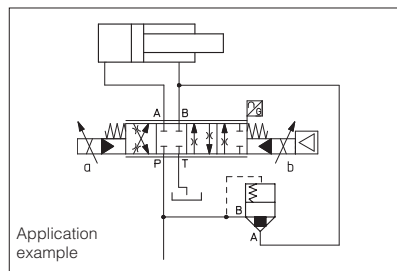
Hydraulic configuration vs. reference signal (standard and option /B)

Reference signal  $\begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \left. \vphantom{\begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix}} \right\} P \rightarrow A / B \rightarrow T$

Reference signal  $\begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \left. \vphantom{\begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix}} \right\} P \rightarrow B / A \rightarrow T$

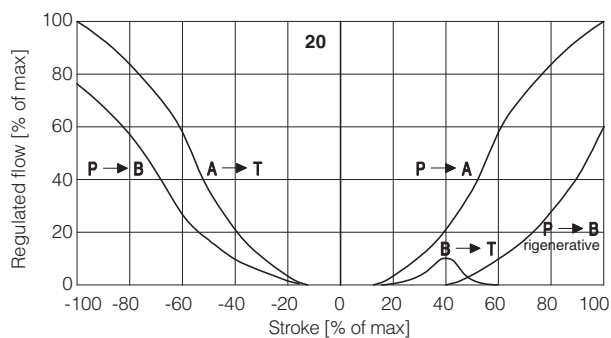
**19** = differential - regenerative spool **D9**  
(not available for valve size 32)

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



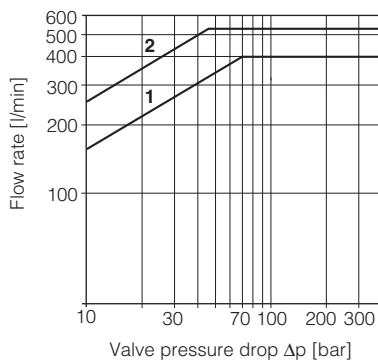
**20** = linear - internal regenerative spool **L9**  
(available only for valve size 16)

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



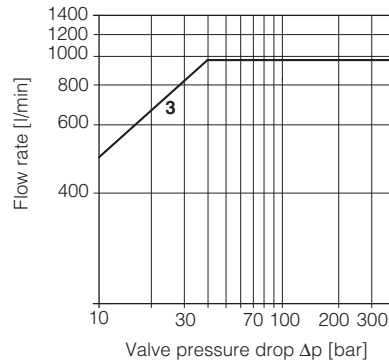
## 9.2 Operating diagrams

**Flow / $\Delta p$  diagram** stated at 100% of spool stroke



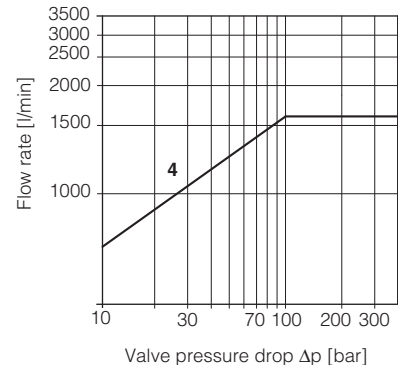
### SDPZE-2:

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



### SDPZE-4:

- 3** = spools L5, S5, D5, DL5, D9



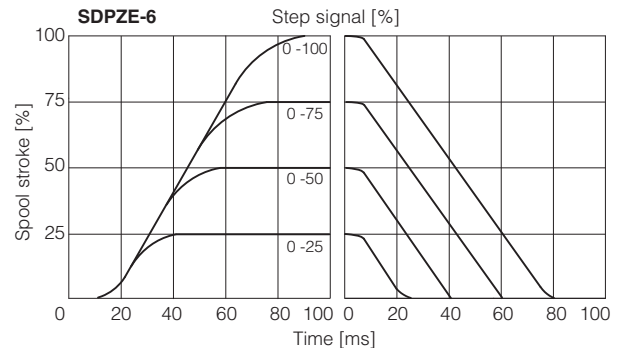
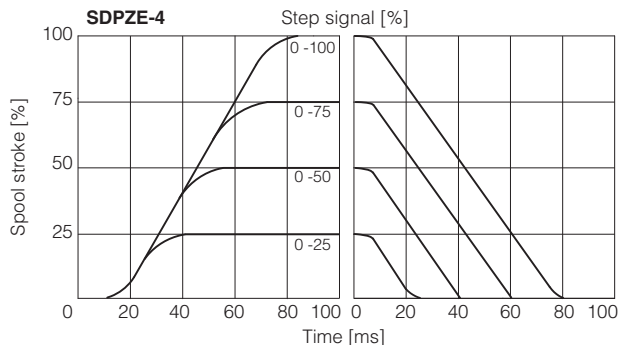
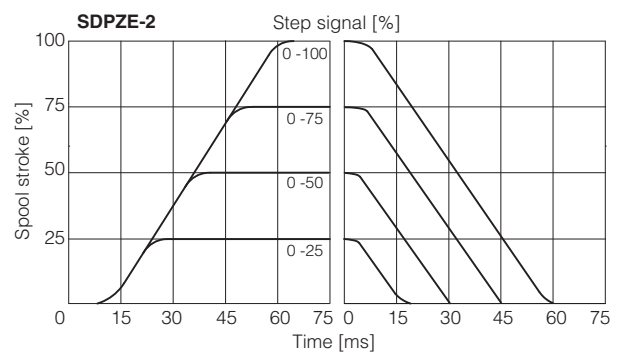
### SDPZE-6:

- 4** = L5, S5, D5

## 9.3 Response time

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.

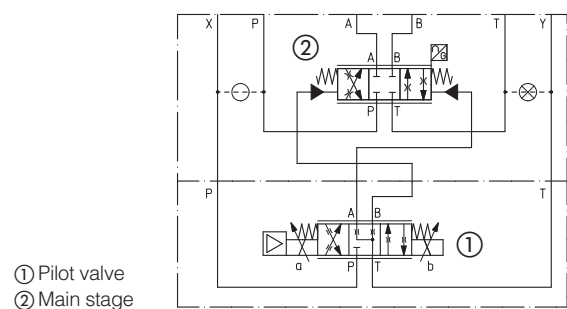


## 10 HYDRAULIC OPTIONS

**B** = Configurations 71, 73: on-board digital driver connections and LVDT transducer at side of port A of the main stage (side B of pilot valve).  
 For hydraulic configuration vs reference signal, see 9.1

### Functional Scheme

example of configuration 71



## 11 ELECTRONIC OPTIONS

**I** = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard  $\pm 10$  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.

## 12 POWER SUPPLY AND SIGNALS SPECIFICATIONS

### 12.1 Power supply (V+ and V0)

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



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

### 12.2 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  $\pm 10$  Vdc and can be reconfigured via software, within a maximum range of  $\pm 10$  Vdc.

*Option /I (current reference input):* default is  $4 \div 20$  mA and can be reconfigured via software, within a maximum range of  $\pm 20$  mA.

### 12.3 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 (voltage monitor output):* default is  $\pm 10$  Vdc and can be reconfigured via software, within a maximum range of  $\pm 10$  Vdc.

*Option /I (current monitor output):* default is  $4 \div 20$  mA and can be reconfigured via software, within a maximum range of  $\pm 20$  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).

## 13 ELECTRONIC CONNECTIONS

### 13.1 Main connector signals - 7 pin (A1)

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: $\pm 10$ Vdc maximum range $\pm 10$ Vdc for standard, $4 \div 20$ mA for /I option	Input - analog signal
E	INPUT-	Negative reference input signal for Q_INPUT+	Input - analog signal
F	Q_MONITOR	Flow monitor output signal: $\pm 10$ Vdc maximum range, referred to AGND $\pm 10$ Vdc for standard, $4 \div 20$ mA for /I option	Output - analog signal
G	EARTH	Internally connected to driver housing	

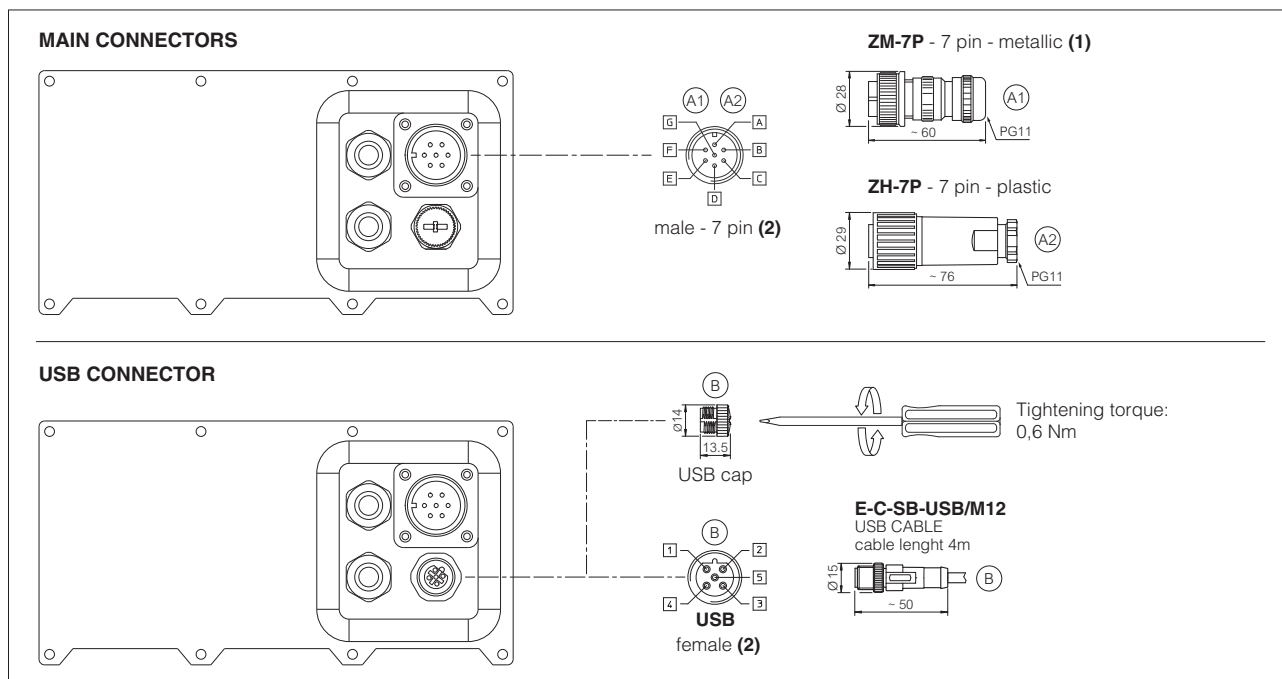
### 13.2 Communication connectors (B)

(B) USB connector - M12 - 5 pin always present		
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 +



### 13.3 Connections layout

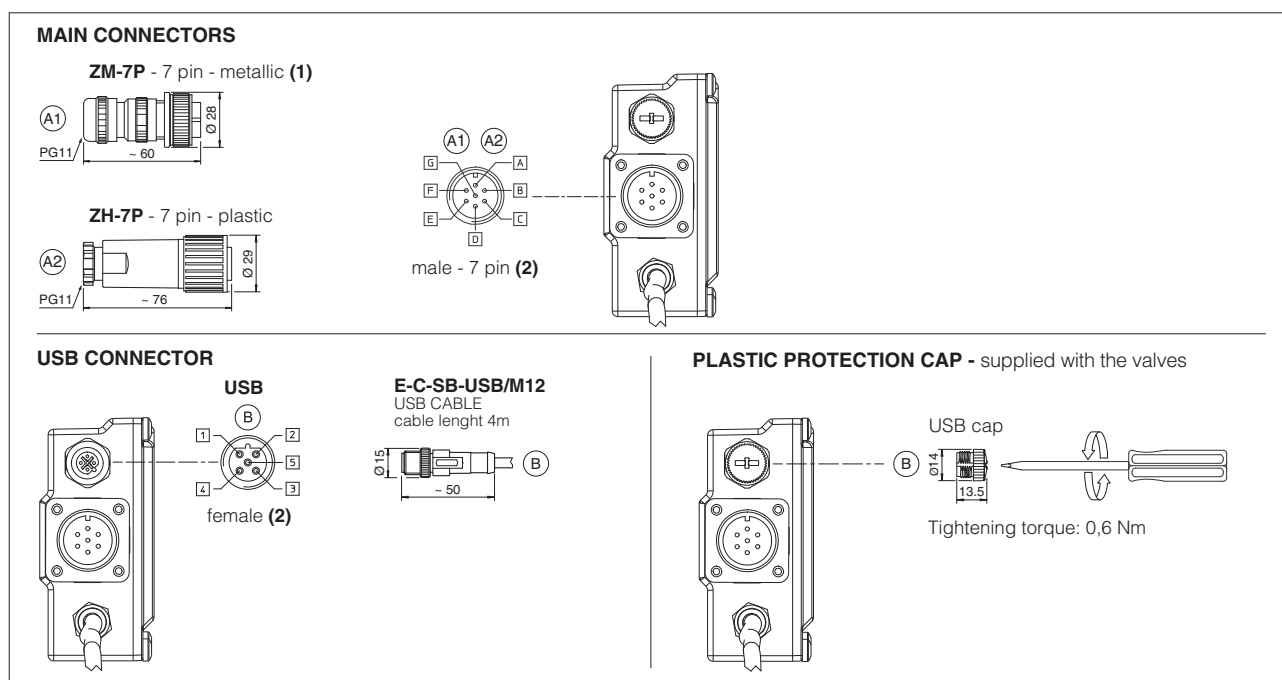
#### Connection layout for sizes 16 and 25



(1) use of metallic connectors is strongly recommended in order to fulfill EMC requirements

(2) pin layout always referred to driver's view

#### Connection layout for size 32



(1) use of metallic connectors is strongly recommended in order to fulfill EMC requirements

(2) pin layout always referred to driver's view

#### 14 CONNECTORS CHARACTERISTICS - to be ordered separately

CONNECTOR TYPE	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 mm <sup>2</sup> max 20 m (logic and power supply) or LiYCY 7 x 1 mm <sup>2</sup> max 40 m (logic and power supply)	LiYCY 7 x 0,75 mm <sup>2</sup> max 20 m (logic and power supply) or LiYCY 7 x 1 mm <sup>2</sup> max 40 m (logic and power supply)
Conductor size	up to 1 mm <sup>2</sup> - available for 7 wires	up to 1 mm <sup>2</sup> - available for 7 wires
Connection type	to solder	to solder
Protection (EN 60529)	IP 67	IP 67

## 15 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)

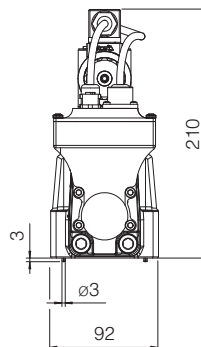
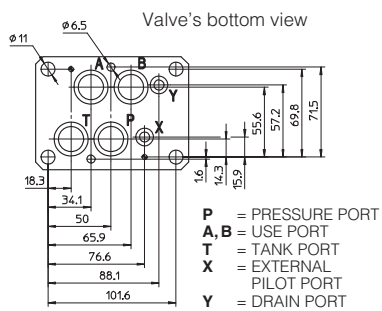
## 16 INSTALLATION DIMENSIONS [mm]

### SDPZE-TID-NP-2\*

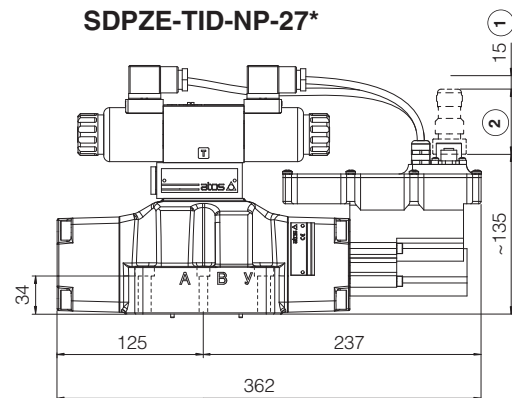
ISO 4401: 2005

Size 16

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

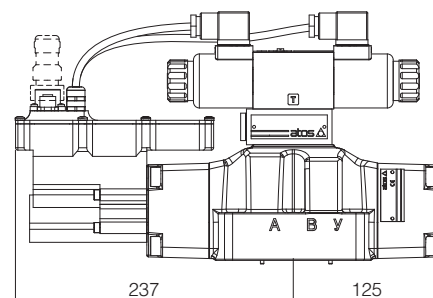


### SDPZE-TID-NP-27\*



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

### SDPZE-TID-NP-27\*/B



① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 13.3

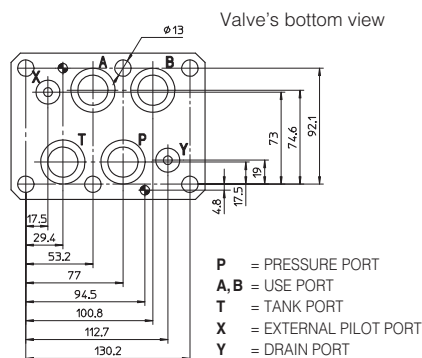
## SDPZE-TID-NP-4\*

ISO 4401: 2005

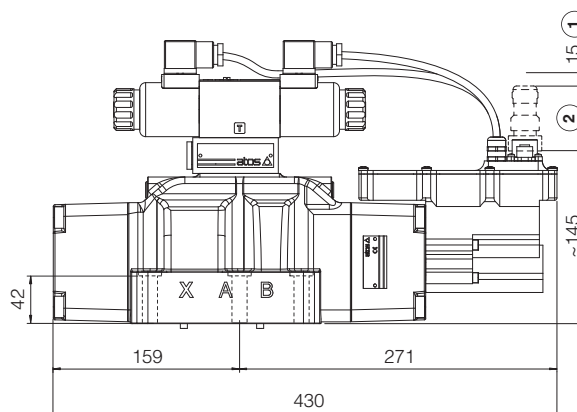
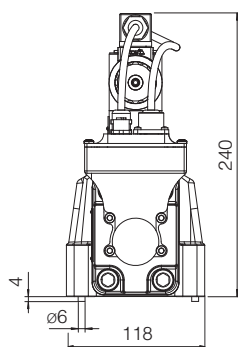
Size 25

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

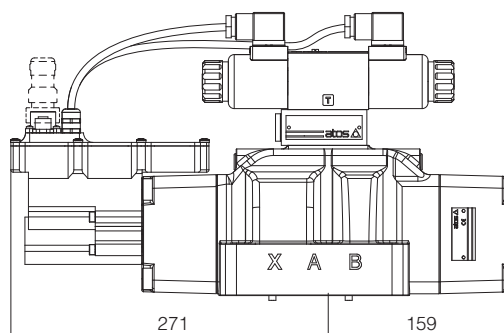
Mass [kg]	
SDPZE-*-47	19,3



## SDPZE-TID-NP-47\*



## SDPZE-TID-NP-47\*/B



① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 13.3

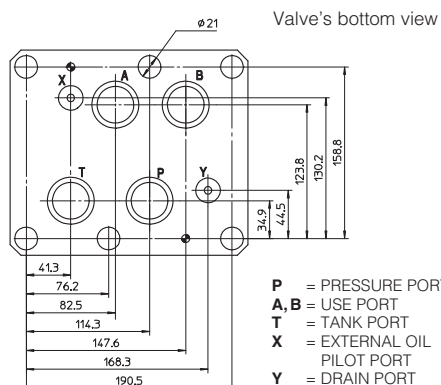
## SDPZE-TID-NP-6\*

ISO 4401: 2005

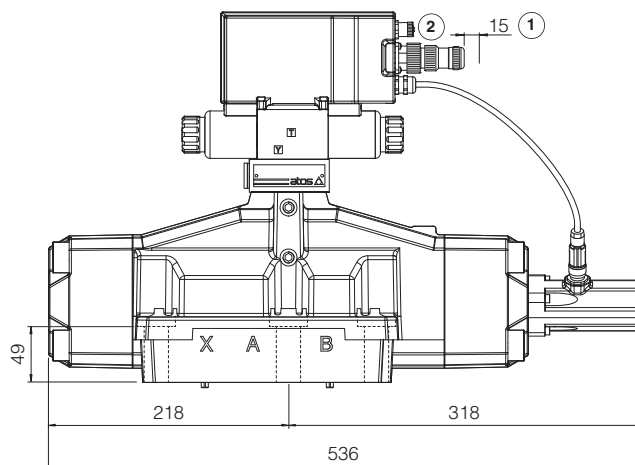
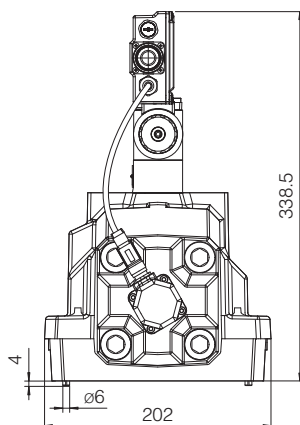
Size 32

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

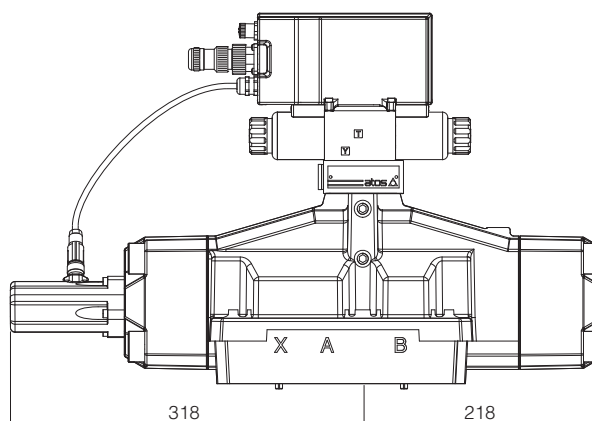
Mass [kg]	
SDPZE-*-67	43,3



## SDPZE-TID-NP-67\*



## SDPZE-TID-NP-67\*/B

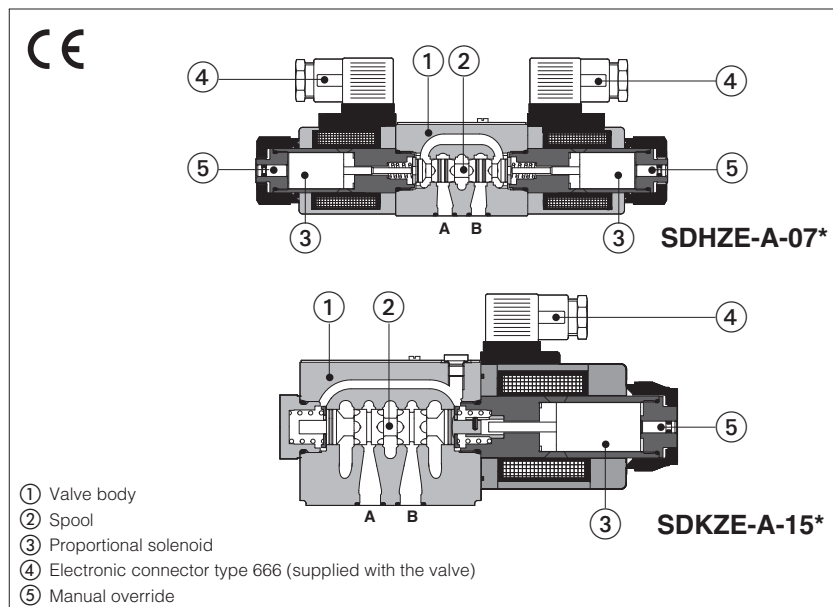


① = Space to remove the connectors

② = The dimensions of all connectors must be considered, see section 13.3

# Proportional directional valves

direct, without transducer



## 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

<b>SDHZE</b>	-	<b>A</b>	-	<b>0</b>	<b>71</b>	-	<b>S</b>	<b>5</b>	/	<b>*</b>	-	<b>*</b>	/	<b>*</b>	<b>**</b>	/	<b>*</b>															
<div><div><b>SDHZE</b> = size 06 <b>SDKZE</b> = size 10</div><div><b>A</b> = off-board drivers, see sect. 2</div><div><b>Valve size</b> - ISO 4401 <b>0</b> = size 06 (SDHZE) <b>1</b> = size 10 (SDKZE)</div></div>																																
<div><div><b>Configuration:</b><div><div><b>Standard</b></div><div><b>Option /B</b></div></div><div><div>51 = </div><div>53 = </div><div>71 = </div><div>73 = </div></div><div><div></div><div></div><div></div><div></div></div></div></div>																																
<div><div><b>Spool type</b> - regulating characteristics: <b>L</b> = linear <b>S</b> = progressive <b>D</b> = differential-progressive</div><div></div><div><div>P-A = Q,    B-T = Q/2 P-B = Q/2,    A-T = Q</div></div></div>																																
<div><div><b>Seals material, see section 4:</b> - = NBR <b>PE</b> = FKM <b>BT</b> = HNBR</div><div>Series number</div></div>																																
<div><div><b>Coil option (only for -A execution)</b> see section 2 and 3: - = standard coil for 24V<sub>DC</sub> Atos drivers <b>6</b> = optional coil for 12V<sub>DC</sub> Atos drivers <b>18</b> = optional coil for 24V<sub>DC</sub> low current drivers (1)</div><div><div>Coils with special connectors, see section 10 - = omit for standard DIN connector <b>J</b> = AMP Junior Timer connector <b>K</b> = Deutsch connector <b>S</b> = Lead Wire connection</div></div></div>																																
<div><div><b>Hydraulic options</b> <b>B</b> = solenoid side of port A (only for valve configuration 51, 53)</div><div><div><b>Hand lever options (2)</b> <b>MO</b> = horizontal hand lever <b>MV</b> = vertical hand lever</div></div></div>																																
<div><div><b>Spool size:</b></div><div><table><tr><td></td><td><b>14 (L)</b></td><td><b>1 (L)</b></td><td><b>3 (L,S,D)</b></td><td><b>5 (L,S,D)</b></td></tr><tr><td>SDHZE =</td><td>1</td><td>4,5</td><td>17</td><td>28</td></tr><tr><td>SDKZE =</td><td>-</td><td>-</td><td>45</td><td>60</td></tr></table></div><div>Nominal flow (l/min) at Δp 10 bar P-T</div></div>																			<b>14 (L)</b>	<b>1 (L)</b>	<b>3 (L,S,D)</b>	<b>5 (L,S,D)</b>	SDHZE =	1	4,5	17	28	SDKZE =	-	-	45	60
	<b>14 (L)</b>	<b>1 (L)</b>	<b>3 (L,S,D)</b>	<b>5 (L,S,D)</b>																												
SDHZE =	1	4,5	17	28																												
SDKZE =	-	-	45	60																												

(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	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +70°C, <b>/BT</b> option = -40°C ÷ +60°C					
Storage temperature range	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +80°C, <b>/BT</b> option = -40°C ÷ +70°C					
Coil code	<b>SDHZE</b>			<b>SDKZE</b>		
	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 occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account					
Protection degree to DIN EN60529	<b>IP 65</b> (with connectors 666 correctly assembled)					
Duty factor	Continuous rating (ED=100%)					

Valve model	SDHZE				SDKZE	
Pressure limits [bar]	ports <b>P, A, B</b> = 350; <b>T</b> = 210				ports <b>P, A, B</b> = 315; <b>T</b> = 210	
Spool type and size	<b>L14</b>	<b>L1</b>	<b>S3, L3, D3</b>	<b>S5, L5, D5</b>	<b>S3, L3, D3</b>	<b>S5, L5, D5</b>
Nominal flow <b>(1)</b> [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 permissible flow	see operating limits, section 7.2 and 8.2					
Response time <b>(2)</b> [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 constant the regulated flow under different load conditions, Atos modular pressure compensators are available at www.atos.com (see KT table D150).

(1) For different  $\Delta p$ , the max flow is in accordance to the diagrams in sections 7.2 and 8.2

(2) 0-100% step signal

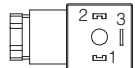
## 4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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

## 5 GENERAL NOTES

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

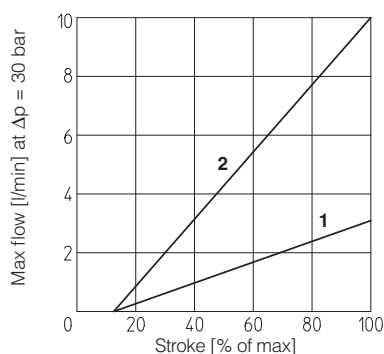
## 6 CONNECTIONS

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

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

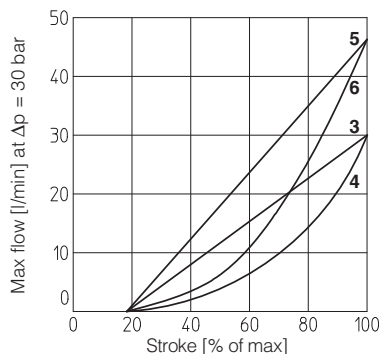
### 7.1 Regulation diagrams

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



0 X Reference signal [V] 10

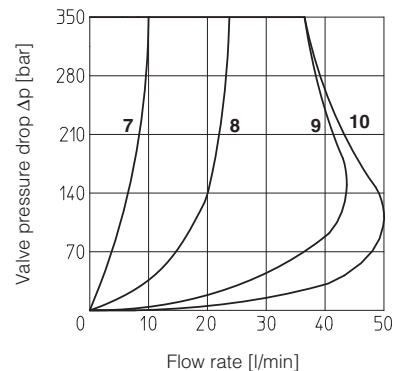
X = Threshold for bias activation depending to the valve type and amplifier type



0 X Reference signal [V] 10

### 7.2 Operating limits

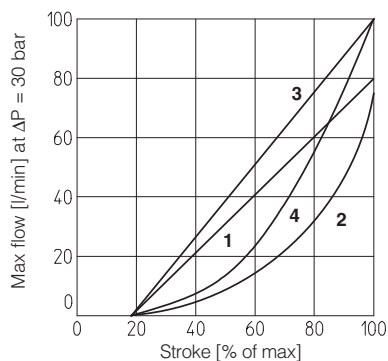
7 = spool L14      9 = spool L3, S3, D3  
8 = spool L1      10 = spool L5, S5, D5



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

### 8.1 Regulation diagrams

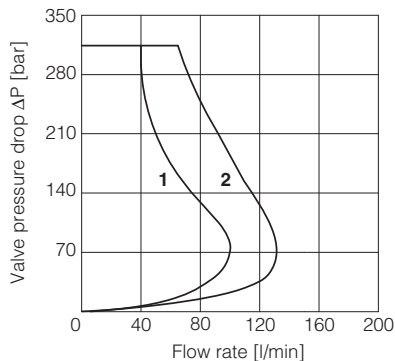
1 = linear spool L3  
2 = progressive spool S3, D3  
3 = linear spool L5  
4 = progressive spool S5, D5



0 X Reference signal [V] 10

### 8.2 Operating limits

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

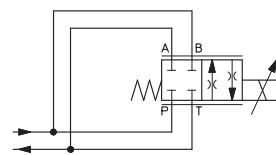


X = Threshold for bias activation depending to the valve type and amplifier type

## 9 OPERATION AS THROTTLE VALVE

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

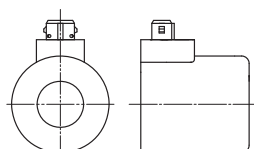
Max flow Δp= 30bar [l/min]	SPOOL TYPE					
	L14	L1	L3	S3	L5	S5
SDHZE	6	20	60	80		
SDKZE	-	-	120	150		



## 10 COILS WITH SPECIAL CONNECTORS

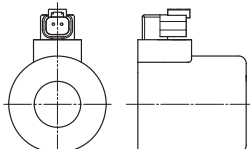
### Options -J

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



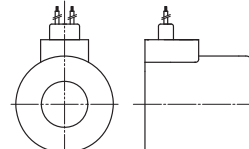
### Options -K

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 length = 180 mm



# 11 INSTALLATION DIMENSIONS FOR SDHZE and SDKZE [mm]

## SDHZE

ISO 4401: 2005

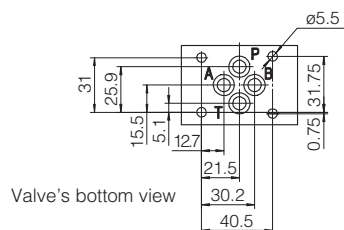
Mounting surface: 4401-03-02-0-05

Fastening bolts: 4 socket head screws M5x30 class 12.9

Tightening torque = 8 Nm

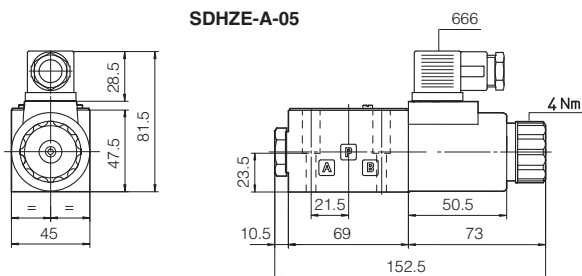
Seals: 4 OR 108

Ports P,A,B,T:  $\varnothing = 7.5$  mm (max)

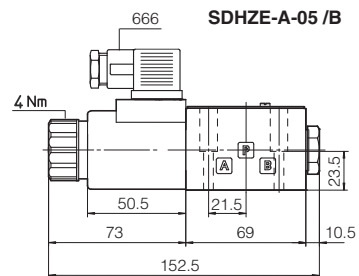


P = PRESSURE PORT  
A, B = USE PORT  
T = TANK PORT

## SDHZE-A-05

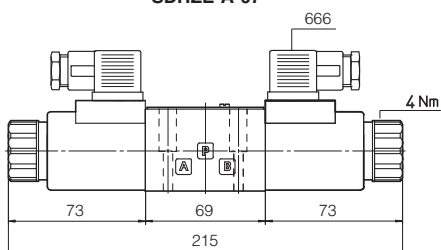


## SDHZE-A-05 /B



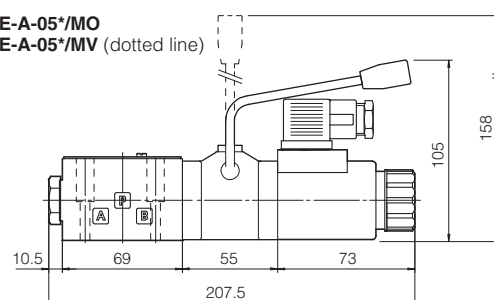
Mass: 1,5 kg

## SDHZE-A-07



Mass: 2 kg

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



## SDKZE

ISO 4401: 2005

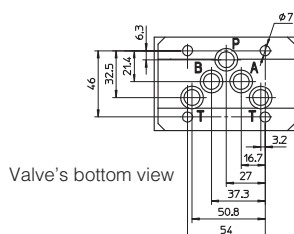
Mounting surface: 4401-05-04-0-05 (see table P005)

Fastening bolts: 4 socket head screws M6x40 class 12.9

Tightening torque = 15 Nm

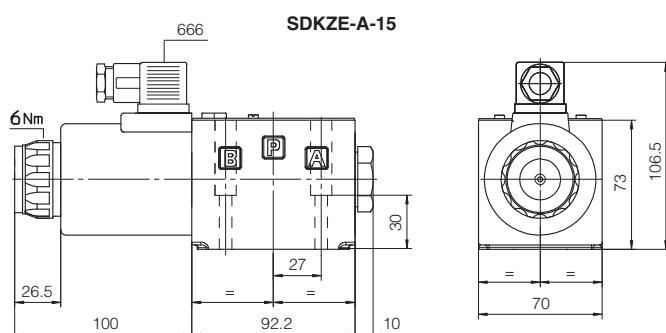
Seals: 5 OR 2050

Diameter of ports A, B, P, T:  $\varnothing 11,2$  mm (max)

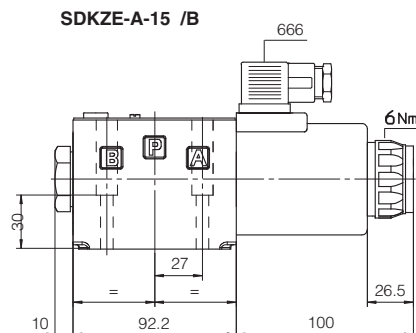


P = PRESSURE PORT  
A, B = USE PORT  
T = TANK PORT

## SDKZE-A-15

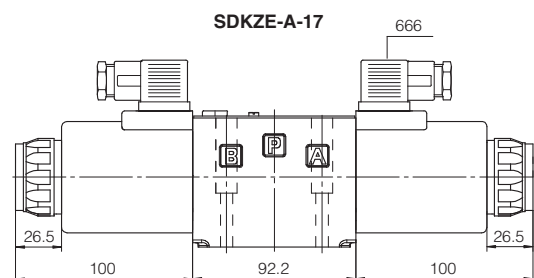


## SDKZE-A-15 /B



Mass: 4,5 kg

## SDKZE-A-17

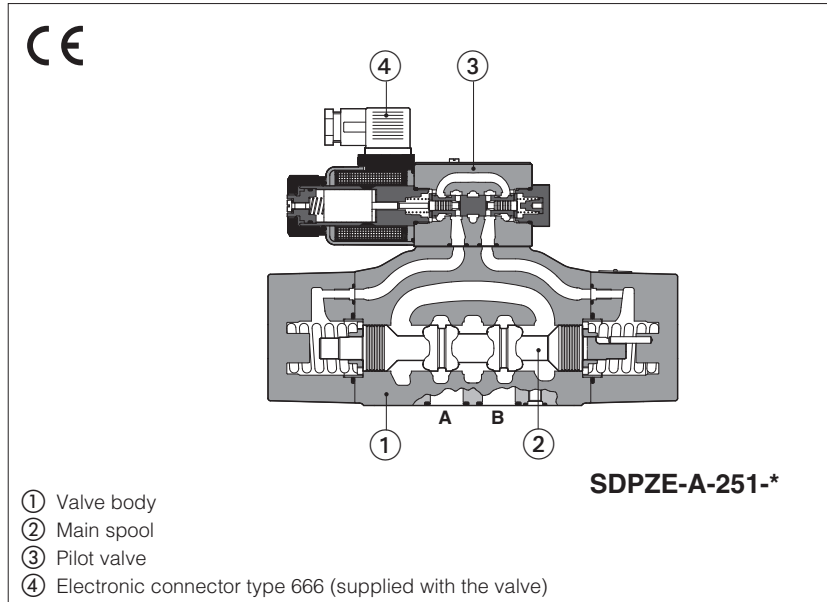


Mass: 6,1 kg



## Two stage proportional directional valves

piloted, without transducer



### SDPZE-A

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 drivers, 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 V<sub>DC</sub> or 24 V<sub>DC</sub>) 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	/	*	-	*	/	*	/	*
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 =																	

Seals material, see sect. 4:

- = NBR
- PE = FKM
- BT = HNBR

Series number

Coil voltage, see section 2, 3:

- = standard coil for 24V<sub>DC</sub> Atos drivers
- 6 = optional coil for 12V<sub>DC</sub> 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 51 and 53
- D = internal drain
- E = external pilot pressure
- G = pressure reducing valve for piloting

Spool type - regulating characteristics:			
L = linear	S = progressive	D = differential-progressive	
			P-A = Q,    B-T = Q/2 P-B = Q/2,    A-T = Q

Spool size	3 (L,S,D)	5 (L,S,D)
SDPZE-2 =	160	250
SDPZE-4 =	-	480
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 24V<sub>DC</sub>

## 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	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +70°C; <b>/BT</b> option = -40°C ÷ +60°C		
Storage temperature range	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +80°C; <b>/BT</b> option = -40°C ÷ +70°C		
Coil code	<b>Standard</b> standard coil to be used with Atos drivers with power supply 24Vdc	<b>option /6</b> optional coil to be used with Atos drivers with power supply 12 Vdc	<b>option /18</b> 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	3,0 A	1,2 A
Insulation class	H (180°) Due to the occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account		
Protection degree to DIN EN60529	<b>IP 65</b> (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 <b>P, A, B, X</b> = 350; <b>T</b> = 250 (10 for option /D); <b>Y</b> = 10;			
Spool type	<b>L3, S3, D3</b>	<b>L5, S5, D5</b>		
Nominal flow [l/min]				
(1) $\Delta p = 10$ bar	160	250	480	640
$\Delta p$ P-T $\Delta p = 30$ 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 [cm³]	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  $\Delta p$ , 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

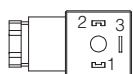
## 4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation longer life	ISO4406 class 18/16/13 NAS1638 class 7 ISO4406 class 16/14/11 NAS1638 class 5	see also filter section at www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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

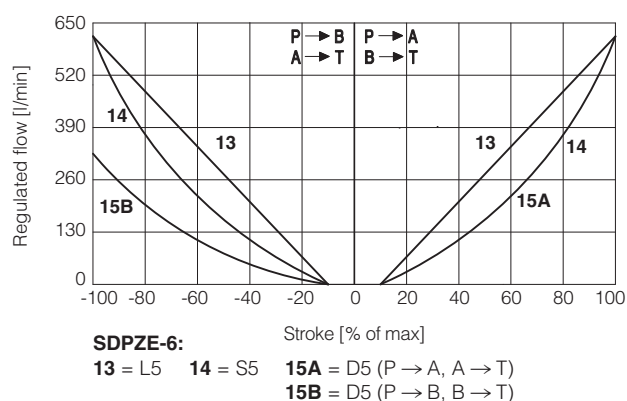
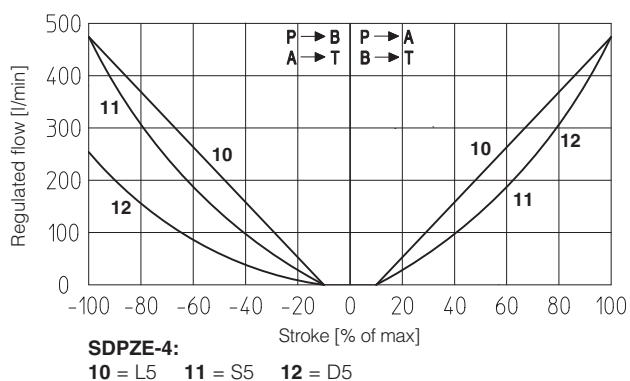
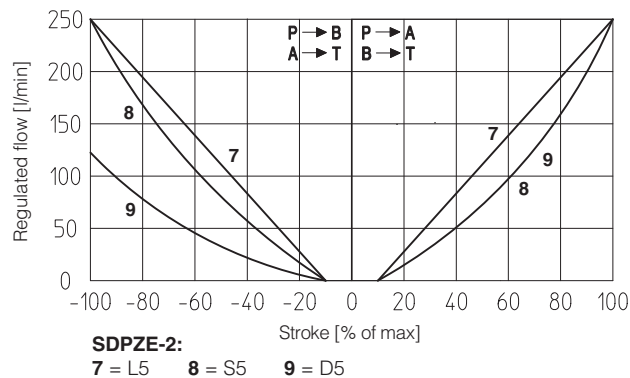
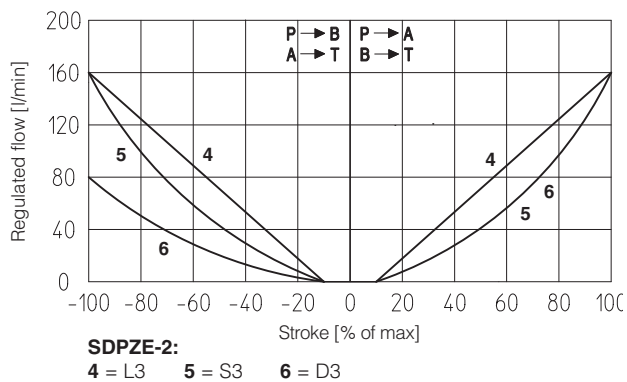
SDPZE-A\* proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

## 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 $\Delta p$ 10 bar P-T)



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

Reference signal  $\left. \begin{array}{l} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{array} \right\} P \rightarrow A / B \rightarrow T$

Reference signal  $\left. \begin{array}{l} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{array} \right\} P \rightarrow B / A \rightarrow T$

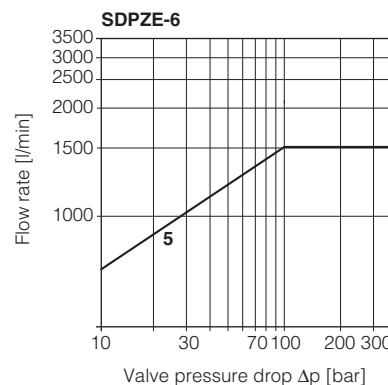
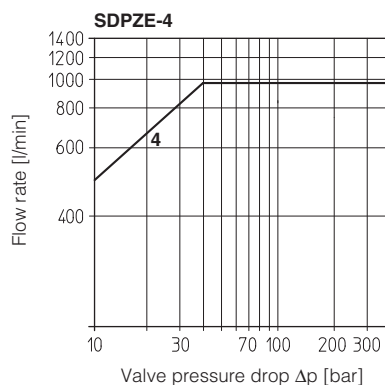
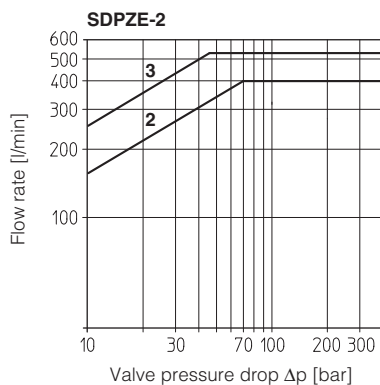
### 7.2 Flow / $\Delta p$ diagram

stated at 100% of spool stroke

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

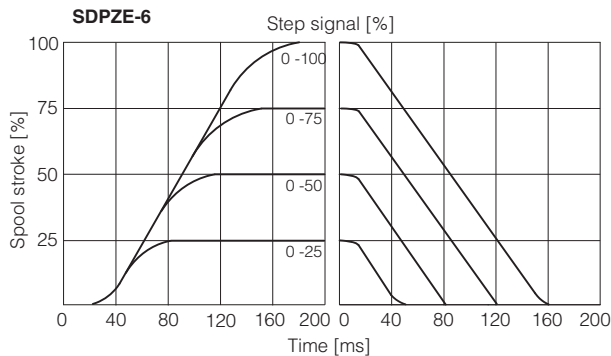
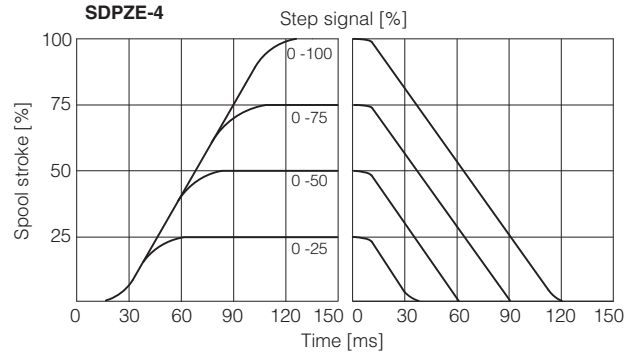
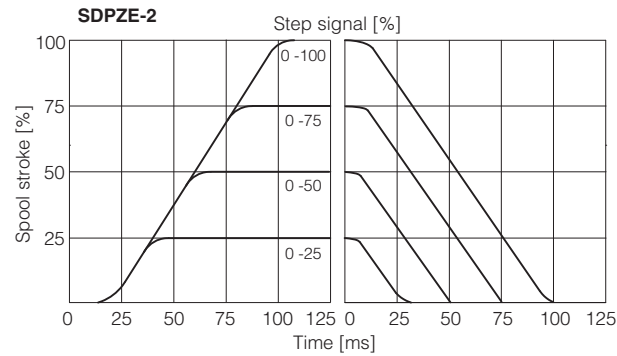
**SDPZE-4:**  
4 = spools L5, S5, D5

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



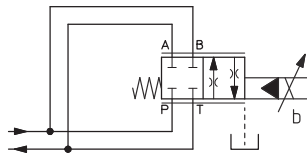
### 7.3 Response time (measured at pilot pressure = 100 bar)

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]	860	1600	2200
$\Delta p = 15$ bar			

## 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:

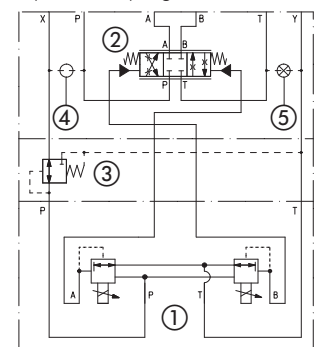
SDPZE-2 = 40 bar

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

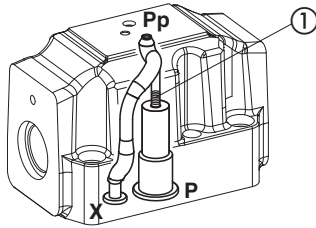


- ① Pilot valve
- ② Main stage
- ③ Pressure reducing valve
- ④ Plug to be added for external pilot through port X
- ⑤ Plug to be removed for internal drain through port T

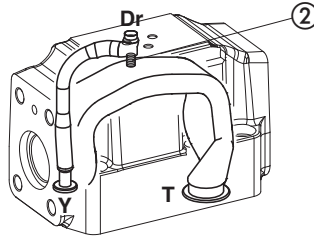
## 9 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

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

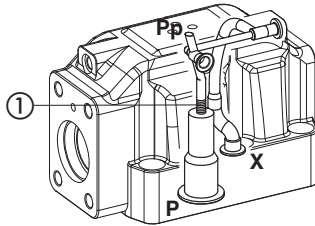


Drain channels

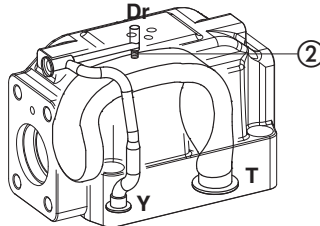


**Internal piloting:** Without blinded plug SP-X300F ①;  
**External piloting:** Add blinded plug SP-X300F ①;  
**Internal drain:** Without blinded plug SP-X300F ②;  
**External drain:** Add blinded plug SP-X300F ②.

**SDPZE-4** Pilot channels

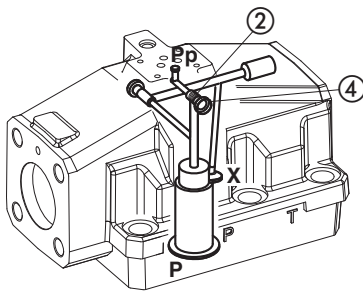


Drain channels

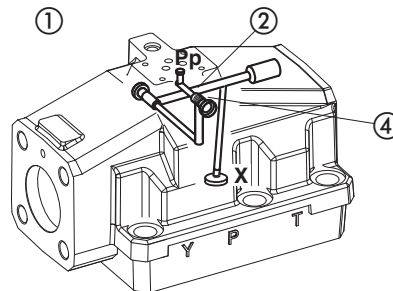


**Internal piloting:** Without blinded plug SP-X500F ①;  
**External piloting:** Add blinded plug SP-X500F ①;  
**Internal drain:** Without blinded plug SP-X300F ②;  
**External drain:** Add blinded plug SP-X300F ②.

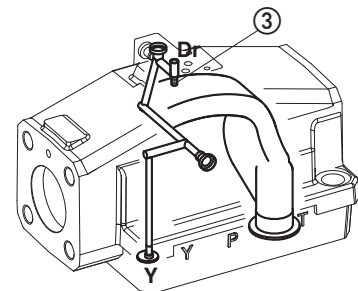
**SDPZE-6** Pilot channels



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;

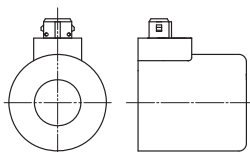
To reach the orifice ②, remove plug ④ = G 1/8"

**External drain:**  
Add blinded plug SP-X300F ③.

## 10 COILS WITH SPECIAL CONNECTORS

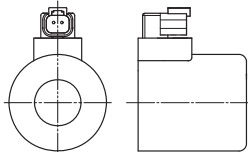
### Options -J

Coil type COZEJ  
AMP Junior Timer connector  
Protection degree IP67



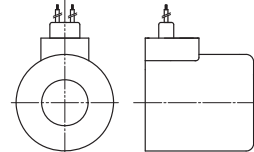
### Options -K

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

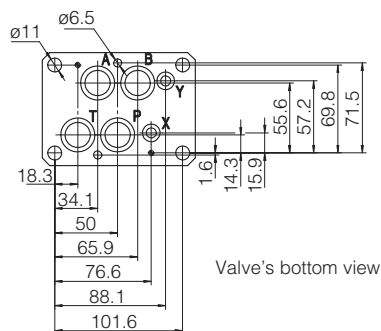
Tightening torque = 70 Nm

2 socket head screws M6x45 class 12.9

Tightening torque = 15 Nm

Diameter of ports A, B, P, T:  $\varnothing = 20$  mm;Diameter of ports X, Y:  $\varnothing = 7$  mm;

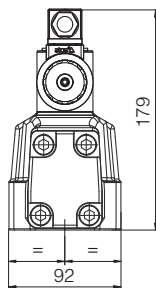
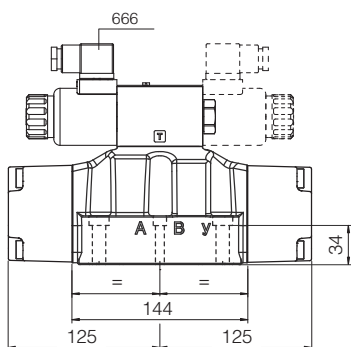
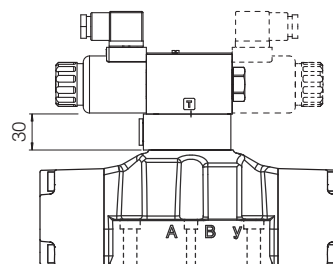
Seals: 4 OR 130, 2 OR 2043

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

Valve's bottom view

**Mass [kg]**

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

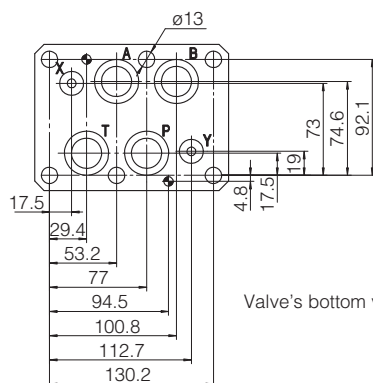
**SDPZE-A-2****Option /G****SDPZE-4\*****ISO 4401: 2005****Mounting surface: 4401-08-08-0-05**

Fastening bolts:

6 socket head screws M12x60 class 12.9

Tightening torque = 125 Nm

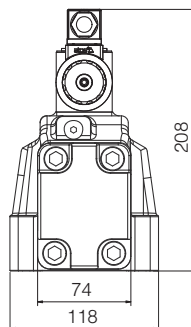
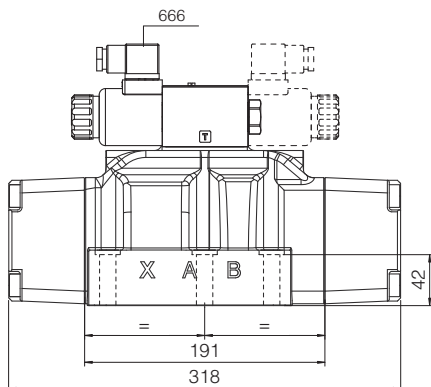
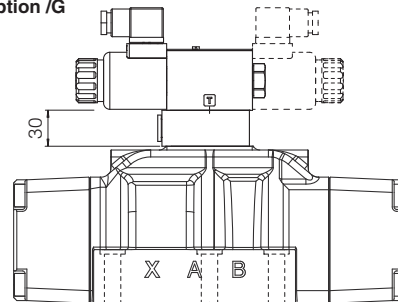
Seals: 4 OR 4112; 2 OR 3056

Diameter of ports A, B, P, T:  $\varnothing = 24$  mm;Diameter of ports X, Y:  $\varnothing = 7$  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]**

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

**SDPZE-A-4****Option /G**

Dotted line = double solenoid version

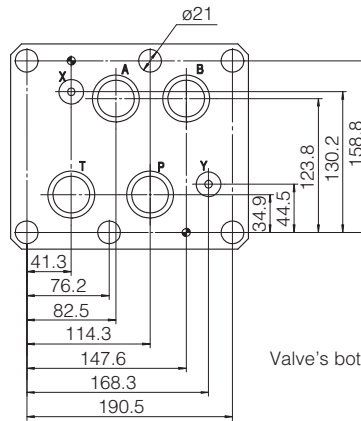
**SDPZE-6\***

**ISO 4401: 2005**

**Mounting surface: 4401-10-09-0-05**

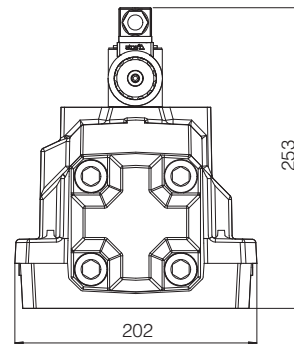
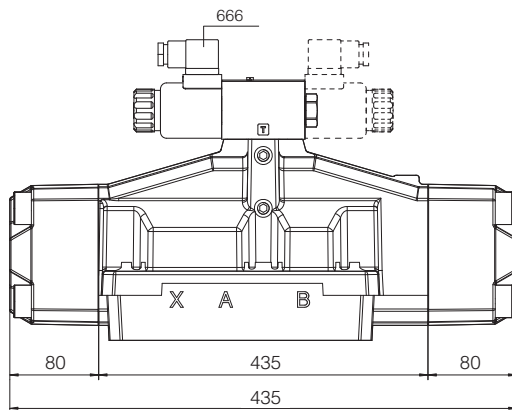
Fastening bolts:  
6 socket head screws M20x80 class 12.9  
Tightening torque = 600 Nm  
Diameter of ports A, B, P, T:  $\varnothing = 34$  mm;  
Diameter of ports X, Y:  $\varnothing = 7$  mm;  
Seals: 4 OR 144, 2 OR 3056

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

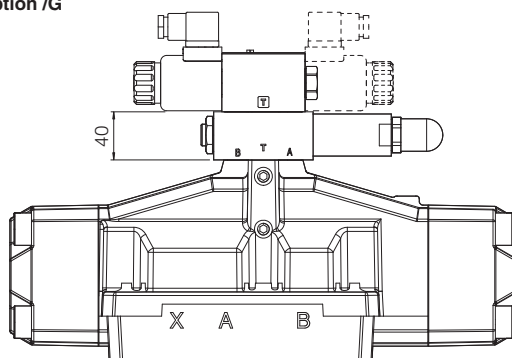


**Mass [kg]**

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



**Option /G**



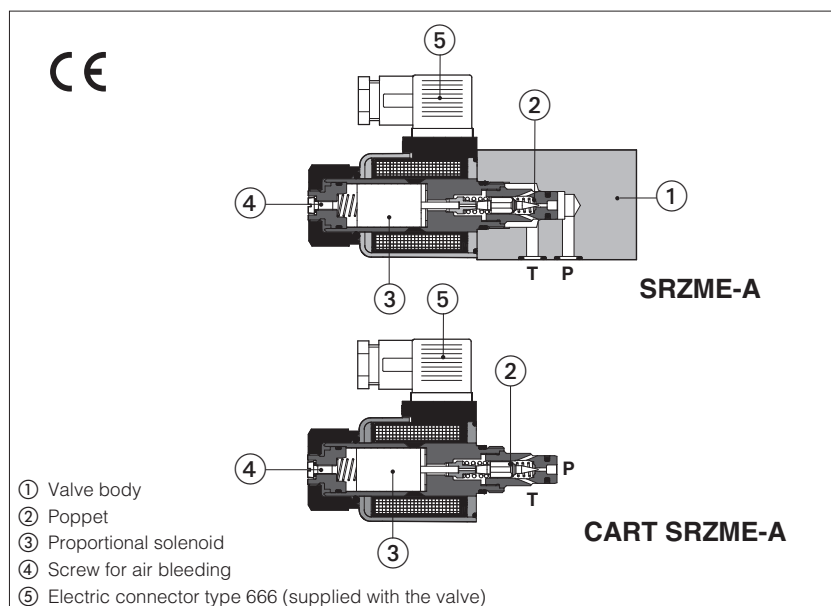
Dotted line = double solenoid version





# Proportional relief valves

directed, without transducer



## 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

<b>SRZME</b>	-	<b>A</b>	-	<b>010</b>	/	<b>315</b>	-	*	/	*	**	/	*
<p>Proportional pressure relief valve</p> <p><b>SRZME</b> = subplate mounting</p> <p><b>CART SRZME</b> = cartridge execution</p> <p><b>A</b> = for off-board drivers, see section 2</p> <p><b>Configuration:</b></p> <p><b>010</b> = regulation on port P, discharge in T</p> <p><b>Max regulated pressure:</b></p> <p><b>50</b> = 50 bar</p> <p><b>100</b> = 100 bar</p> <p><b>210</b> = 210 bar</p> <p><b>315</b> = 315 bar</p> <p><b>350</b> = 350 bar</p> <p><b>Coil voltage</b> see section 2 and 3:</p> <p>- = standard coil for 24V<sub>DC</sub> Atos drivers</p> <p><b>6</b> = optional coil for 12V<sub>DC</sub> Atos drivers</p> <p><b>18</b> = optional coil for low current drivers (1)</p> <p><b>Coils with special connectors</b>, see section 9</p> <p>- = omit for standard DIN connector</p> <p><b>J</b> = AMP Junior Timer connector</p> <p><b>K</b> = Deutsch connector</p> <p><b>S</b> = Lead Wire connection</p> <p>Seals material, see section 4:</p> <p>- = NBR</p> <p><b>PE</b> = FKM</p> <p><b>BT</b> = HNBR</p> <p>Series number</p>													

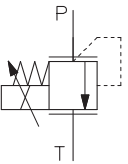
(1) select valve's coil voltage /18 in case of electronic drivers not supplied by Atos, with power supply 24V<sub>DC</sub>

## 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 (V <sub>DC</sub> )	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			
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	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +70°C; <b>/BT</b> option = -40°C ÷ +60°C		
Storage temperature range	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +80°C; <b>/BT</b> option = -40°C ÷ +70°C		
Coil code	<b>Standard</b> standard coil to be used with Atos drivers with power supply 24Vdc	option <b>/6</b> optional coil to be used with Atos drivers with power supply 12 Vdc	option <b>/18</b> 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)	<b>IP 65</b> (with connectors 666 correctly assembled)		
Duty factor	Continuous rating (ED=100%)		

Max regulated pressure	[bar]	<b>50</b>	<b>100</b>	<b>210</b>	<b>315</b>	<b>350</b>
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 <b>(1)</b> (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.

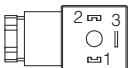
### 4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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 longer life	ISO4406 class 18/16/13 ISO4406 class 16/14/11	NAS1638 class 7 NAS1638 class 5 see also filter section at www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLDPD	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).

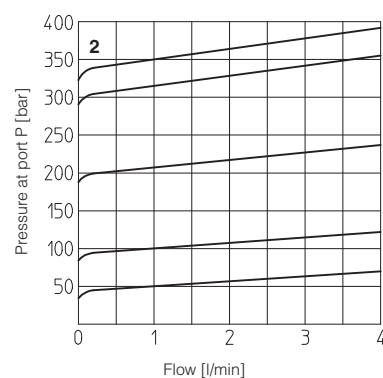
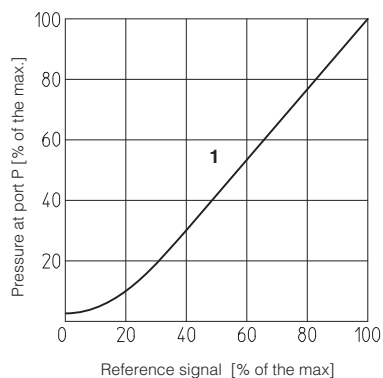
### 6 SOLENOID CONNECTIONS

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)

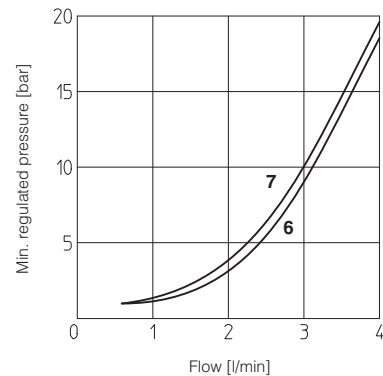
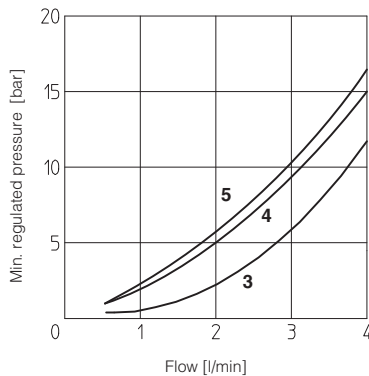
### 1 Regulation diagrams with flow rate $Q = 1$ l/min

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



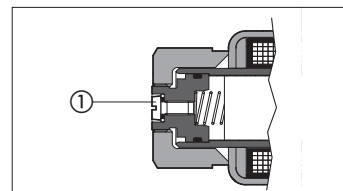
### 3-7 Min. pressure/flow diagrams with zero reference signal

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



## 8 AIR BLEEDING

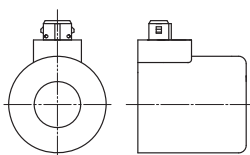
At the first valve commissioning the air eventually trapped inside the solenoid must be bled-off through the screw ① located at the rear side of the solenoid housing. The presence of air may cause pressure instability and vibrations.



## 9 COILS TYPE WITH SPECIAL CONNECTORS

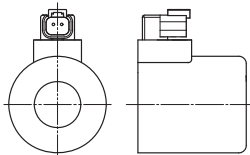
### Options -J

Coil type COZEJ  
AMP Junior Timer connector  
Protection degree IP67



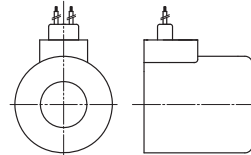
### Options -K

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



### Options -S

Coil type COZES  
Lead Wire connection  
Cable length = 180 mm



ISO 4401: 2005

Mounting surface: 4401-03-02-0-05  
(without ports A and B)

Fastening bolts:

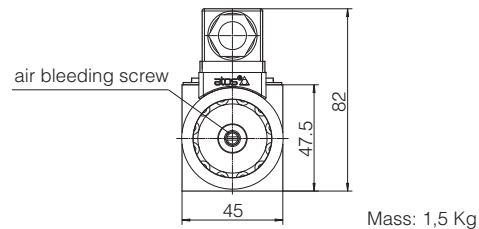
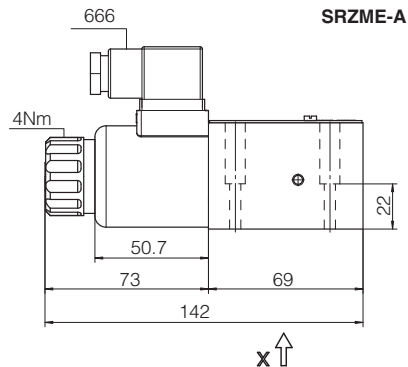
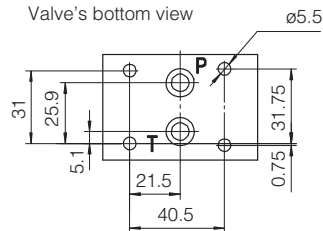
4 socket head screws M5X50 class 12.9

Tightening torque = 8 Nm

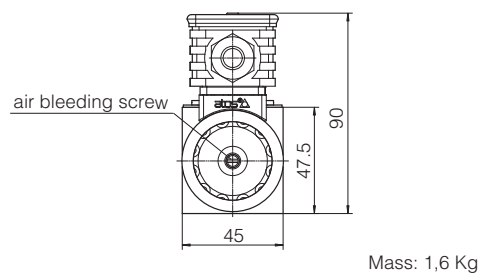
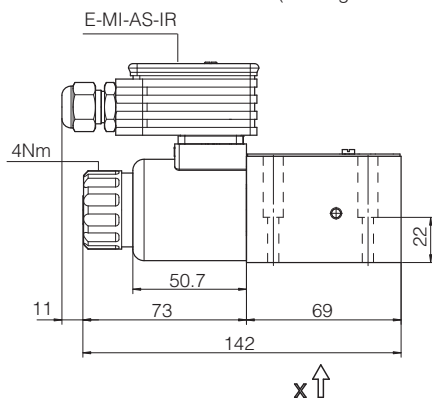
Seals: 2 OR 108

Ports P, T:  $\varnothing = 5$  mm

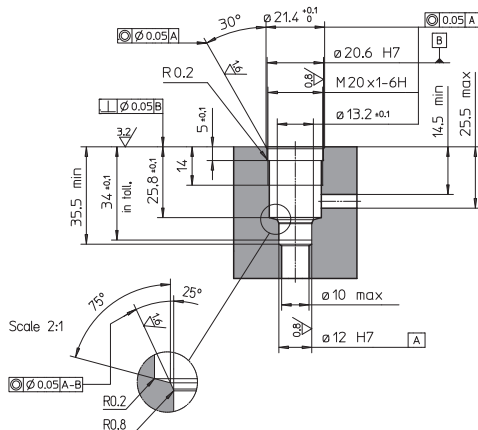
Valve's bottom view



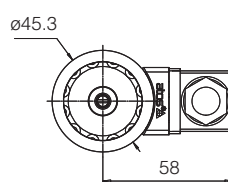
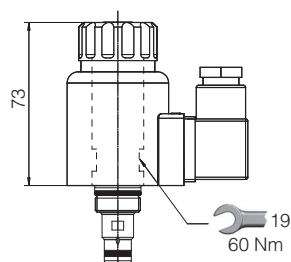
**SRZME-A**  
(with digital driver E-MI-AS-IR)



Cavity dimensions  
for **CART SRZME-A**

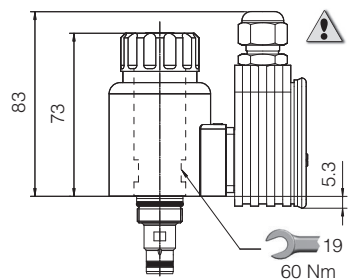


**CART SRZME-A**

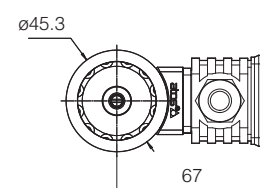


Mass: 0,6 Kg

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



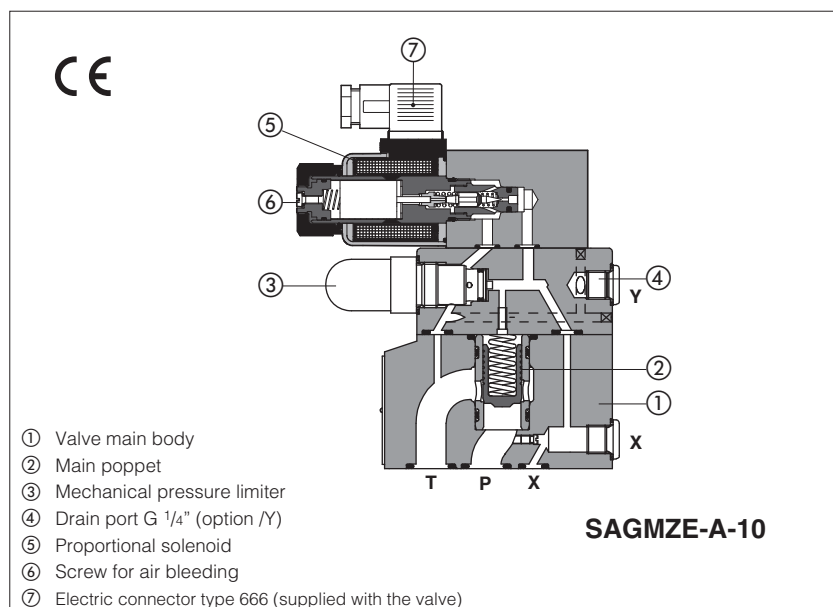
⚠ to be checked for eventual interference  
with the manifold surface



Mass: 0,7 Kg

# Proportional relief valves

piloted, without transducer



## SAGMZE-A

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

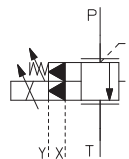
<b>SAGMZE</b>	-	<b>A</b>	-	<b>10</b>	/	<b>315</b>	/	<b>*</b>	-	<b>*</b>	/	<b>*</b>	<b>**</b>	/	<b>*</b>
<p>Proportional pressure relief valve pilot operated</p> <p><b>A</b> = for off-board driver, see section 2</p> <p><b>Valve size ISO 6264</b> <b>10, 20, 32</b></p> <p><b>Max regulated pressure:</b>  <b>50</b> = 50 bar      <b>210</b> = 210 bar      <b>350</b> = 350 bar  <b>100</b> = 100 bar      <b>315</b> = 315 bar</p> <p><b>Hydraulic options</b>, see section 8  <b>E</b> = external pilot  <b>Y</b> = external drain (only pipe connection G 1/4")</p> <p><b>Seals material</b>, see section 4:  <b>-</b> = NBR  <b>PE</b> = FKM  <b>BT</b> = HNBR</p> <p>Series number</p> <p><b>Coil voltage</b>, see section 2 and 3:  <b>-</b> = standard coil for 24VDC Atos drivers  <b>6</b> = optional coil for 12VDC Atos drivers  <b>18</b> = optional coil for low current drivers (1)</p> <p><b>Coils with special connectors</b>, see section 12  <b>-</b> = omit for standard DIN connector  <b>J</b> = AMP Junior Timer connector  <b>K</b> = Deutsch connector  <b>S</b> = Lead Wire connection</p>															

(1) select valve's coil voltage /18 in case of electronic drivers not supplied by Atos, with power supply 24V<sub>DC</sub>

## 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 <sub>DC</sub> )	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	 <b>SAGMZE</b>		
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	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +70°C; <b>/BT</b> option = -40°C ÷ +60°C		
Storage temperature range	<b>Standard</b> and <b>/PE</b> = -20°C ÷ +80°C; <b>/BT</b> option = -40°C ÷ +70°C		
Coil code	<b>Standard</b> standard coil to be used with Atos drivers with power supply 24Vdc	<b>option /6</b> optional coil to be used with Atos drivers with power supply 12 Vdc	<b>option /18</b> 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)	<b>IP 65</b> (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) [ms] (depending on installation)	≤ 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.

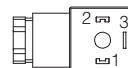
### 4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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 longer life	ISO4406 class 18/16/13 NAS1638 class 7 ISO4406 class 16/14/11 NAS1638 class 5	see also filter section at www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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).

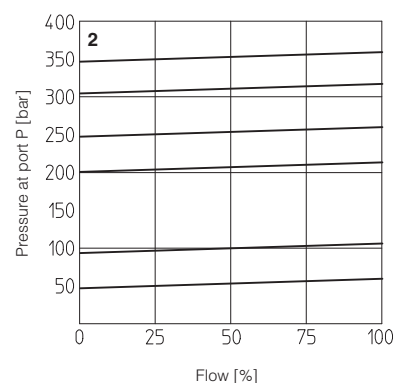
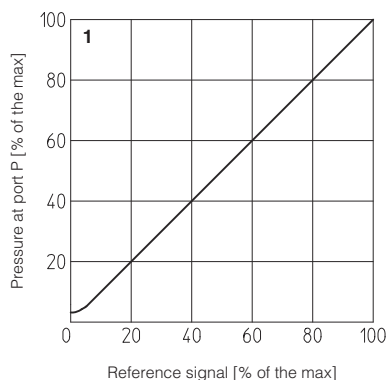
### 6 SOLENOID CONNECTIONS

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

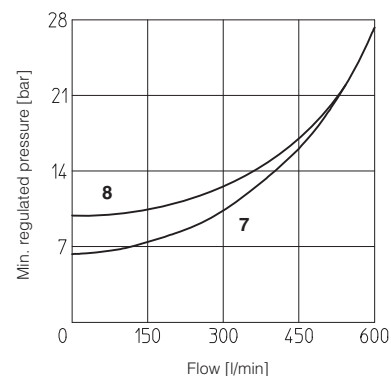
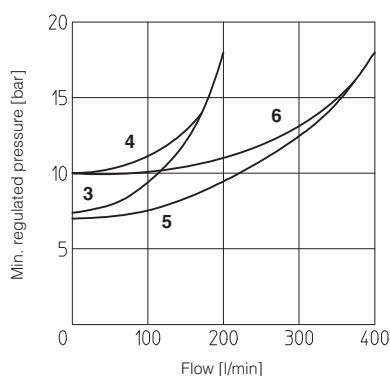
4 = SAGMZE-A-10/350

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



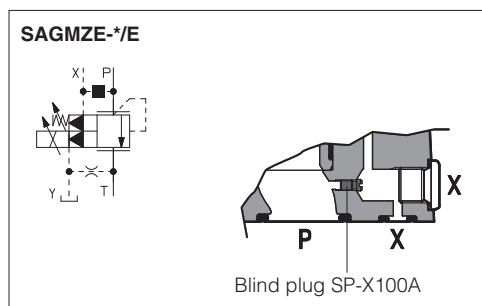
## 8 HYDRAULIC OPTIONS

### 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.

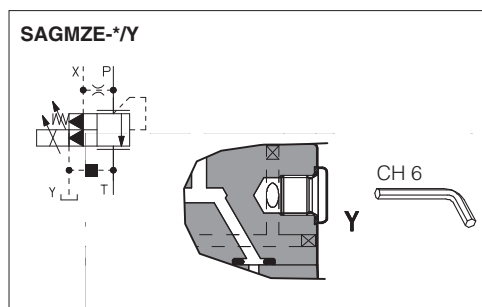
The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G 1/4").



### 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 1/4" available on the pilot stage body.



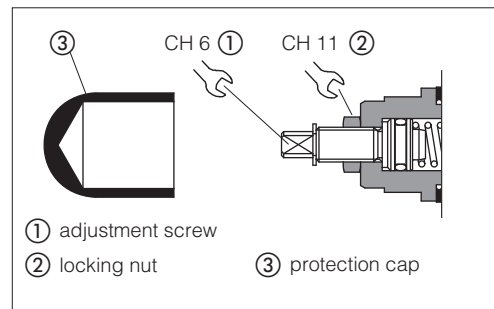
## 9 MECHANICAL PRESSURE LIMITER

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:

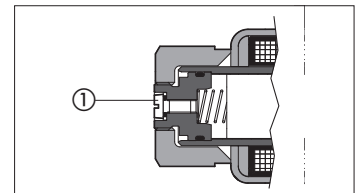
- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max 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.

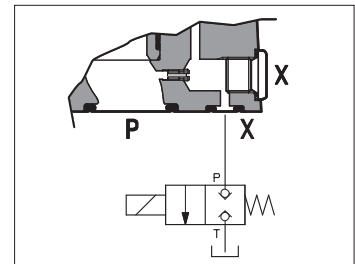
The presence of air may cause pressure instability and vibrations.



## 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).

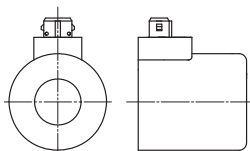
This function can be used in emergency to unload the system pressure by-passing the proportional control.



## 12 COILS TYPE WITH SPECIAL CONNECTORS

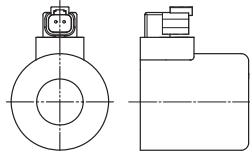
### Options -J

Coil type COZEJ  
AMP Junior Timer connector  
Protection degree IP67



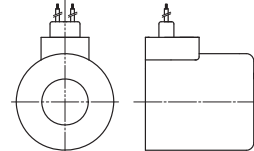
### Options -K

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



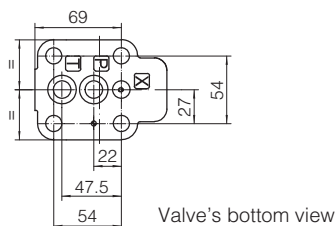
### Options -S

Coil type COZES  
Lead Wire connection  
Cable length = 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

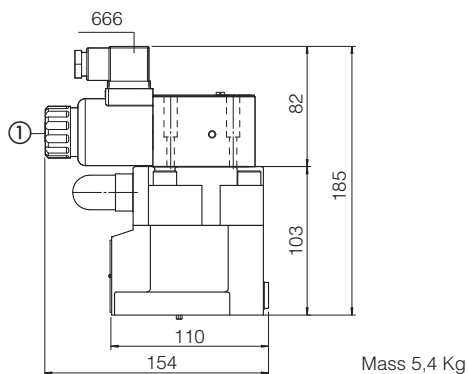
Tightening torque = 125 Nm

Seals: 2 OR 123; 1 OR 109/70

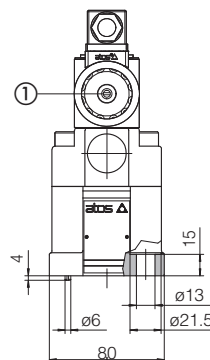
Ports P, T:  $\varnothing = 14,5$  mm

Ports X:  $\varnothing = 3,2$  mm

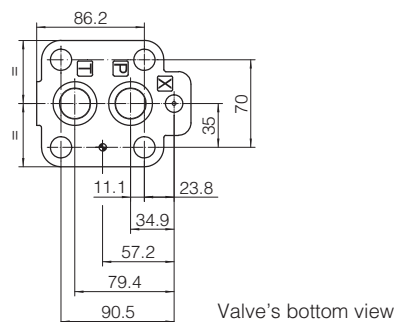
### SAGMZE-A-10



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

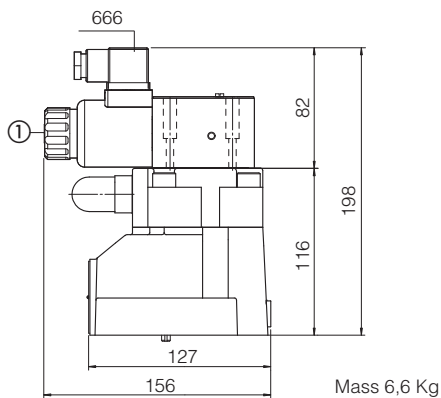
Tightening torque = 300 Nm

Seals: 2 OR 4112, 1 OR 109/70

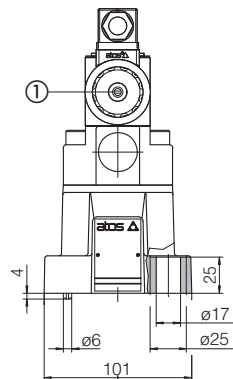
Ports P, T:  $\varnothing = 24$  mm

Port X:  $\varnothing = 3,2$  mm

### SAGMZE-A-20

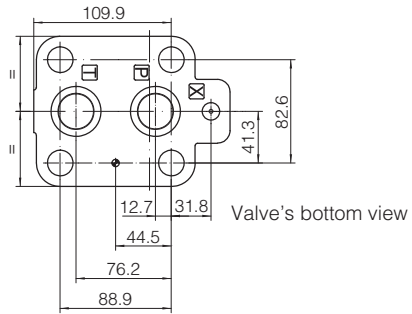


Mass 6,6 Kg



① = Screw for air bleeding

## SIZE 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

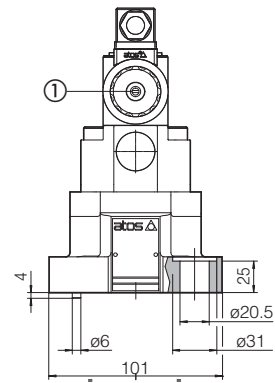
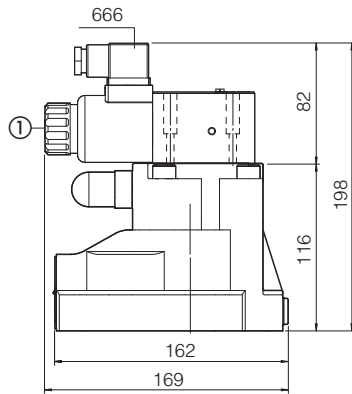
Seals: 2 OR 4131, 1 OR 109/70

Ports P, T:  $\varnothing = 28$  mm

Port X:  $\varnothing = 3,2$  mm

Mass 8 Kg

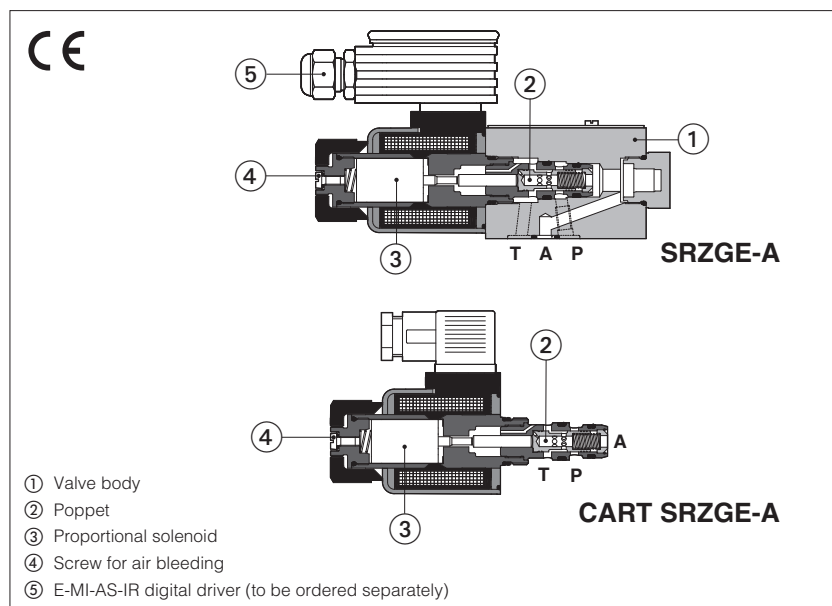
### SAGMZE-A-32



① = Screw for air bleeding

# Proportional reducing valves

direct, without transducer



## 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**

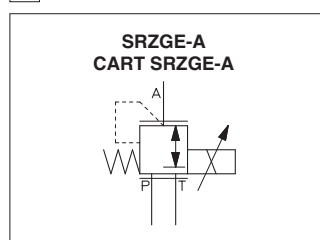
For cavity dimensions see section **16**

## 1 MODEL CODE

<b>SRZGE</b>	-	<b>A</b>	-	<b>010</b>	/	<b>210</b>	-	<b>*</b>	/	<b>*</b>	-	<b>*</b>	/	<b>*</b>
<p>Proportional pressure reducing valve, direct</p> <p><b>SRZGE</b> = subplate mounting <b>CART SRZGE</b> = cartridge execution</p> <p><b>A</b> = for off-board driver, see section <b>3</b></p> <p><b>Configuration:</b> <b>010</b> = reduced pressure on port A</p> <p><b>Max regulated pressure:</b> <b>32</b> = 32 bar <b>100</b> = 100 bar <b>210</b> = 210 bar</p>														
<p><b>Seals material</b>, see section <b>8</b>:</p> <p>- = NBR <b>PE</b> = FKM <b>BT</b> = HNBR</p> <p>Series number</p> <p><b>Coil voltage</b>, see section <b>10</b>:</p> <p>- = standard coil for 24 Vdc Atos drivers <b>6</b> = optional coil for 12 Vdc Atos drivers <b>18</b> = optional coil for low current drivers <b>(1)</b></p> <p><b>Coil with special connectors</b>, see section <b>12</b>:</p> <p>- = omit for standard DIN connector <b>J</b> = AMP Junior Timer connector <b>K</b> = Deutsch connector <b>S</b> = Lead Wire connection</p>														

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

## 2 HYDRAULIC SYMBOL



## 3 OFF-BOARD ELECTRONIC DRIVERS

Drivers model	E-MI-AC-01F <b>(1)</b>		E-MI-AS-IR <b>(1)</b>		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: $Ra \leq 0,8$ , 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	<b>Standard</b> = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$ <b>/PE</b> option = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$ <b>/BT</b> option = $-40^{\circ}\text{C} \div +60^{\circ}\text{C}$
Storage temperature range	<b>Standard</b> = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ <b>/PE</b> option = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ <b>/BT</b> option = $-40^{\circ}\text{C} \div +70^{\circ}\text{C}$
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	<b>SRZGE-A-010</b>
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 <b>(1)</b> [ms] (depending on installation)	$\leq 70$
Hysteresis [% of the max pressure]	$\leq 1,5$
Linearity [% of the max pressure]	$\leq 3$
Repeatability [% of the max pressure]	$\leq 2$

**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

	<b>Standard</b> standard coil to be used with Atos drivers with power supply 24Vdc	option <b>/6</b> optional coil to be used with Atos drivers with power supply 12 Vdc	option <b>/18</b> optional coil to be used with elec- tronic drivers not supplied by Atos, with power supply 24 Vdc
Coil voltage code			
Coil resistance R at 20°C	3,1 $\Omega$	2,1 $\Omega$	13,1 $\Omega$
Max. solenoid current	2,5 A	3 A	1,2 A
Insulation class	H (180°) Due to the occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account		
Protection degree to DIN EN60529	<b>IP 65</b> (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

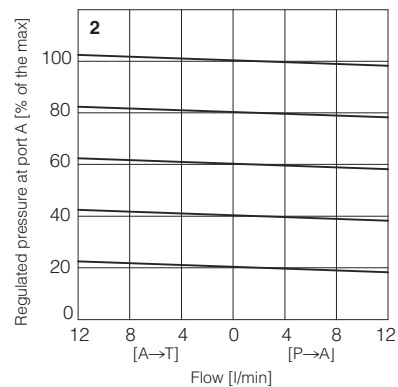
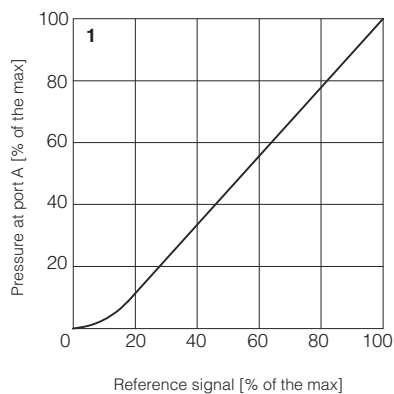
Seals, recommended fluid temperature	NBR seals (standard) = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ , with HFC hydraulic fluids = $-20^{\circ}\text{C} \div +50^{\circ}\text{C}$ FKM seals (/PE option) = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ HNBR seals (/BT option) = $-40^{\circ}\text{C} \div +60^{\circ}\text{C}$ , with HFC hydraulic fluids = $-40^{\circ}\text{C} \div +50^{\circ}\text{C}$		
Recommended viscosity	20 ÷ 100 mm <sup>2</sup> /s - max allowed range 15 ÷ 380 mm <sup>2</sup> /s		
Max fluid contamination level	normal operation longer life	ISO4406 class 18/16/13 NAS1638 class 7 ISO4406 class 16/14/11 NAS1638 class 5	see also filter section at www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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 $Q = 1 \text{ l/min}$

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

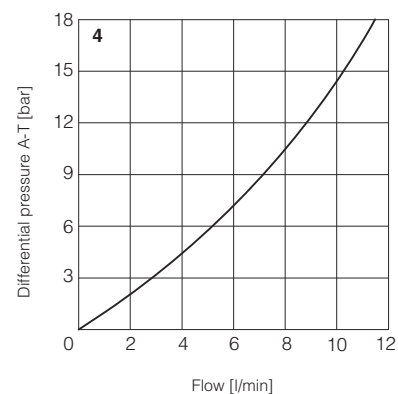
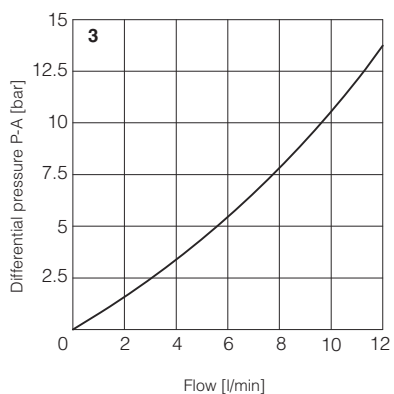
### 2 = Pressure/flow diagrams with reference signal set at $Q = 1 \text{ l/min}$



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

**3 =** Pressure drops vs. flow P-A

**4 =** Pressure drops vs. flow A-T



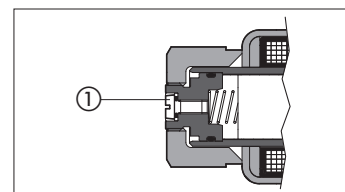
## 10 COIL VOLTAGE OPTIONS

**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

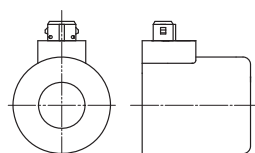
At the first valve commissioning the air eventually trapped inside the solenoid must be bled-off through the screw ① located at the rear side of the solenoid housing. The presence of air may cause pressure instability and vibrations.



## 12 COILS WITH SPECIAL CONNECTORS

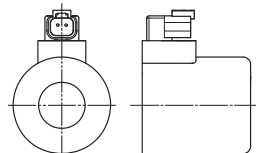
### J option

Coil type COZEJ  
AMP Junior Timer connector  
Protection degree IP67



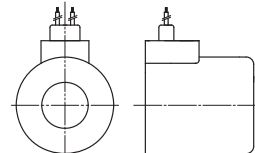
### K option

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



### S option

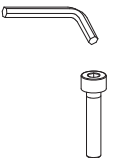

Coil type COZES  
Lead Wire connection  
Cable length = 180 mm



## 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

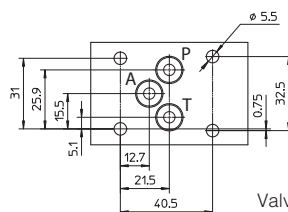
	<p><b>Fastening bolts:</b> 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>
	<p><b>Seals:</b> 3 OR 108 Diameter of ports P, T, A: Ø 5 mm Port B not used</p>

## 15 INSTALLATION DIMENSIONS FOR SRZGE [mm]

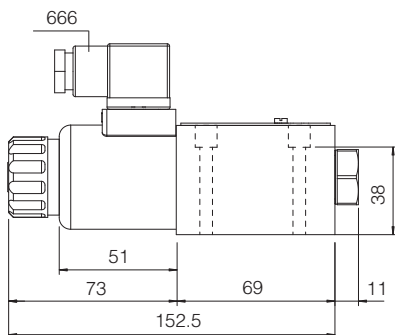
ISO 4401: 2005

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

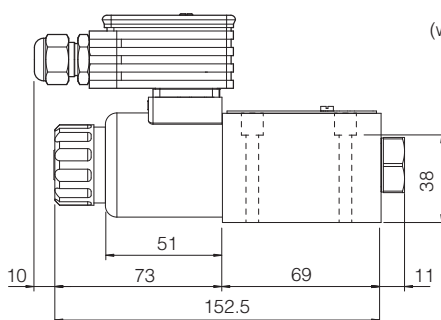
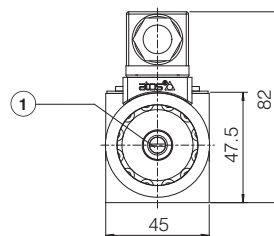
Mass [kg]	
SRZGE	1,5
SRZGE with E-MI-AS-IR	2,0



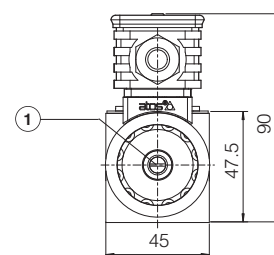
Valve's bottom view




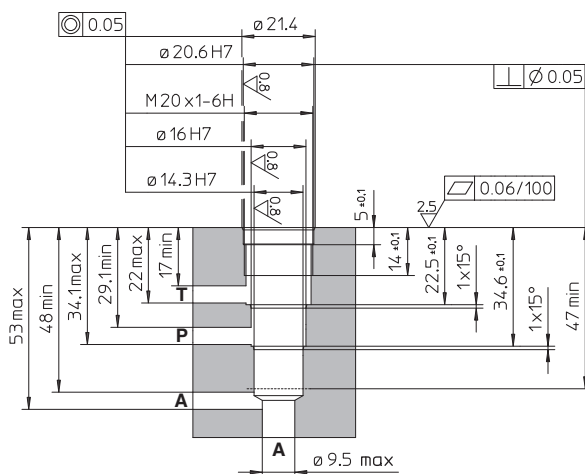
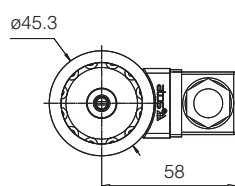
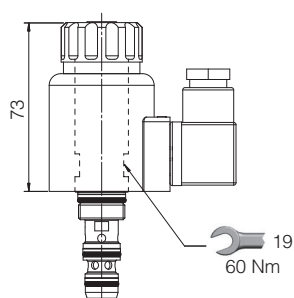
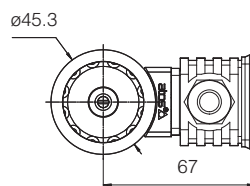
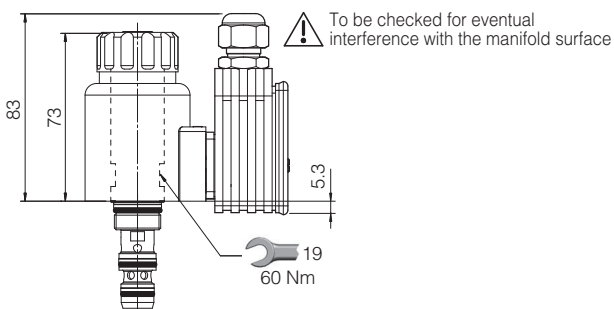
SRZGE-A



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



① = Air bleeding, see section 11 

Cavity dimensions for **CART SRZGE-A**

**CART SRZGE-A**

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


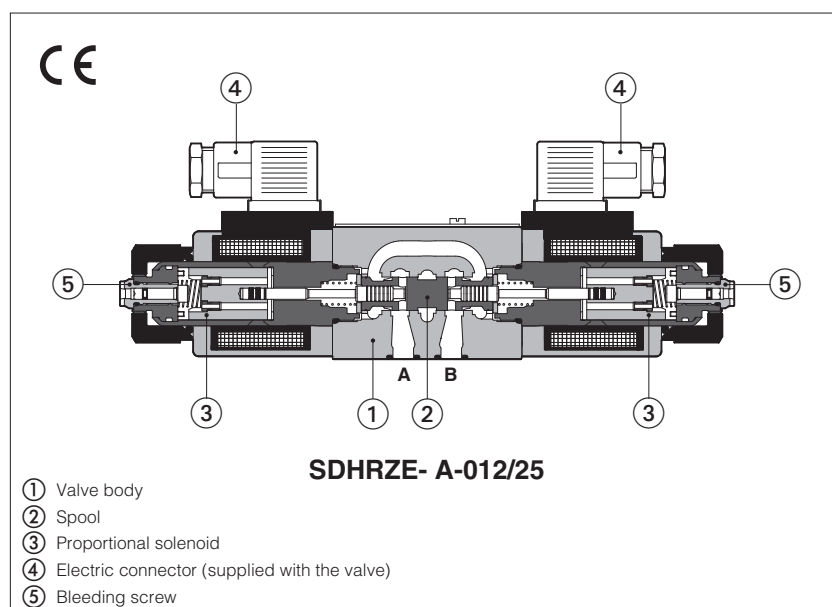
Mass [kg]	
CART SRZGE	0,6
CART SRZGE with E-MI-AS-IR	1,1





# Proportional pressure reducing valves type **SDHRZE**

direct, without transducer



## SDHRZE-A

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

They operate in 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 V<sub>dc</sub> or 24 V<sub>dc</sub>) 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**

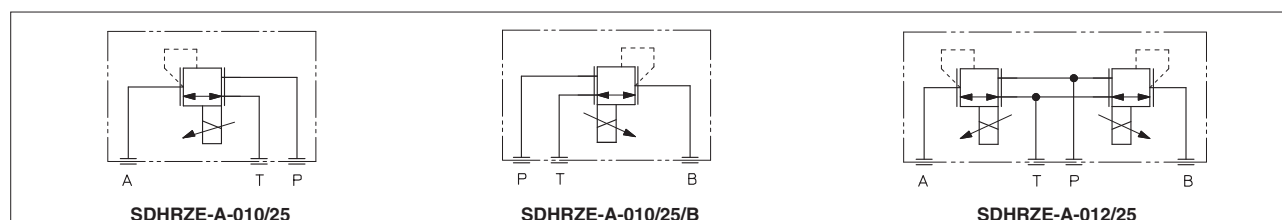
Max regulated pressure: **25 bar**

## 1 MODEL CODE

<b>SDHRZE</b>	-	<b>A</b>	-	<b>010</b>	/	<b>25</b>	/	<b>*</b>	/	<b>*</b>	/	<b>**</b>	/	<b>*</b>
Proportional pressure reducing valve size 06												Series number		Seals material, see sect. [5]: - = NBR <b>PE</b> = FKM <b>BT</b> = HNBR
<b>A</b> = for off-board driver, see section [2]														
<b>Configuration:</b> <b>010</b> = reduced pressure on port A (port B for option /B) <b>012</b> = reduced pressure on port A and B														
<b>Regulated pressure:</b> <b>25</b> = reduced pressure range 3÷25 bar														
<b>Coil options</b> see section [3] and [4]: - = standard coil for 24V <sub>dc</sub> Atos drivers <b>6</b> = optional coil for 12V <sub>dc</sub> Atos drivers <b>18</b> = optional coil for 24V <sub>dc</sub> low current drivers (1)														
<b>Hydraulic option</b> <b>B</b> = reduced pressure on port B, solenoid side of port A (only for valve configuration 010)														

(1) Select coil voltage /18 in case of electronic drivers not supplied by Atos, with power supply 24 V<sub>dc</sub>

## HYDRAULIC SYMBOLS



## 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 <sub>dc</sub> )	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	<b>Standard</b> and <b>/PE</b> option = -20°C ÷ +70°C; <b>/BT</b> option = -40°C ÷ +60°C		
Storage temperature	<b>Standard</b> and <b>/PE</b> option = -20°C ÷ +80°C; <b>/BT</b> option = -40°C ÷ +70°C		
Coil code	<b>Standard</b> standard coil to be used with Atos drivers with power supply 24Vdc	<b>option /6</b> optional coil to be used with Atos drivers with power supply 12 Vdc	<b>option /18</b> 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) <b>(1)</b> [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 <b>(2)</b> (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

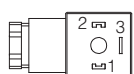
### 5 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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 longer life	ISO4406 class 18/16/13 NAS1638 class 7 ISO4406 class 16/14/11 NAS1638 class 5	see also filter section at www.atos.com or KTF catalog
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFUD, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

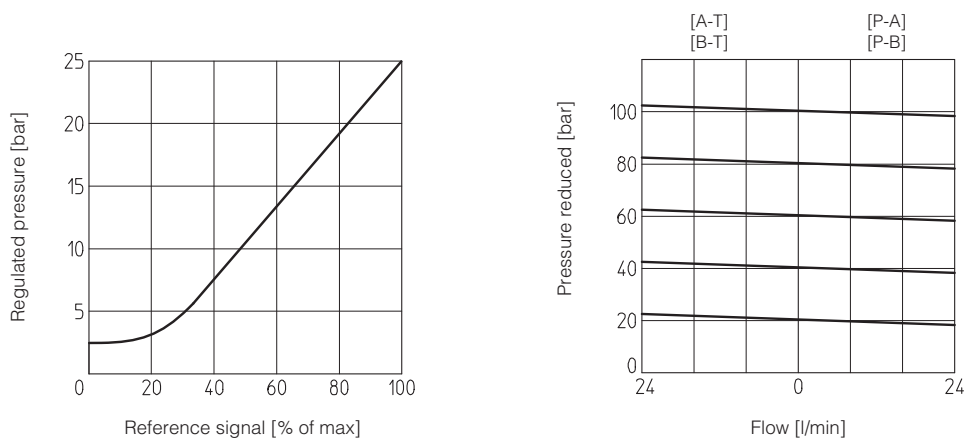
### 6 GENERAL NOTES

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**

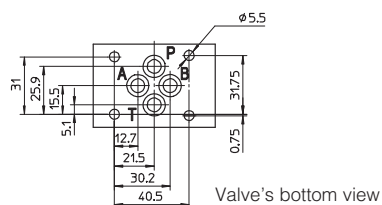
**Mounting surface: 4401-03-02-0-05**

Fastening bolts: 4 socket head screws M5x30 class 12.9

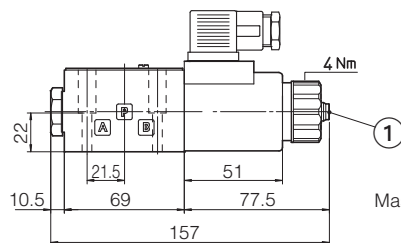
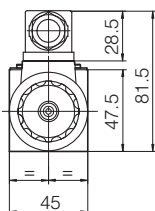
Tightening torque = 8 Nm

Seals: 4 OR 108;

Diameter of ports A, B, P, T:  $\varnothing 7,5$  mm (max)

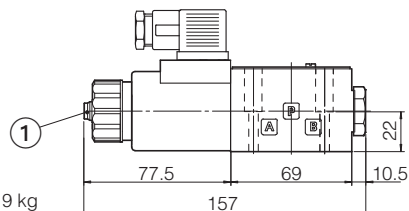


**SDHRZE-A-010**

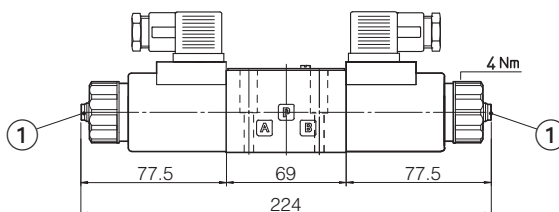


Mass: 1,9 kg

**SDHRZE-A-010/B**



**SDHRZE-A-012**



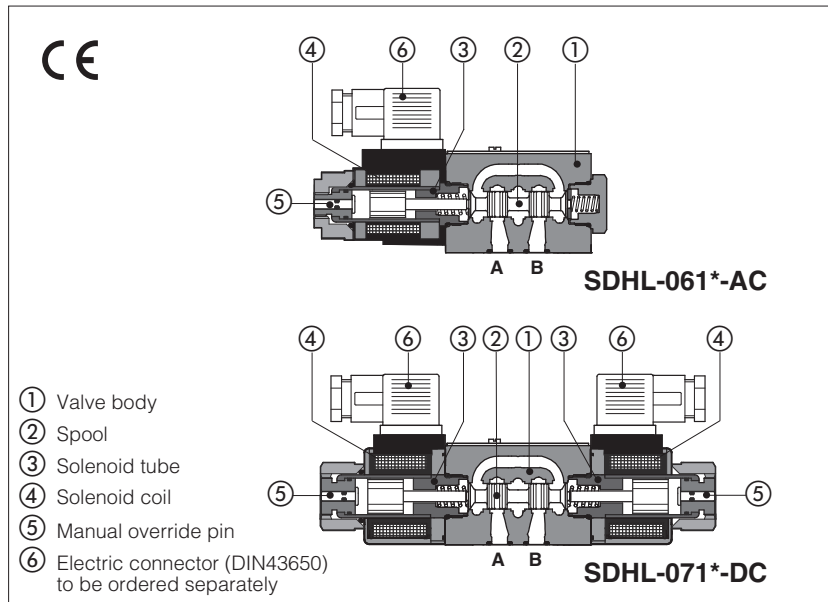
Mass: 2,6 kg

① screw for air bleeding



# Solenoid directional valves type SDHL

direct, spool type, **compact execution**



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								Seals material, see section 4: - = NBR <b>PE</b> = FKM
Valve configuration, see section 2							Series number	
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							Voltage code, see section 5	
Spool type, see section 2.								
Options: <b>A, MO, MV, WP</b> , see section 6								
								X = without connector See section 11 for available connectors, to be ordered separately Coils with special connectors, see section 12 XK = Deutsch connector

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

Configurations	Spoos	Configurations	Spoos
<p>61</p> <p>61/A</p> <p>67</p> <p>67/A</p> <p>71</p>	<p>1 0 2</p>	<p>63</p> <p>63/A</p> <p>75</p>	<p>1 0 2</p> <p>(1) not available for configuration 75</p>

### 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	<b>Standard</b> execution = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
<b>Operating pressure</b>	Ports P,A,B: <b>350</b> bar; Port T <b>210</b> bar for DC version; <b>160</b> bar for AC version
<b>Maximum flow</b>	<b>60 l/min</b> , see Q/Δp diagram at section 7 and operating limits at section 8

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (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		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	<b>12 DC</b>	666 or 667	29W	COL-12DC
14 DC	<b>14 DC</b>			COL-14DC
24 DC	<b>24 DC</b>			COL-24DC
28 DC	<b>28 DC</b>			COL-28DC
110 DC	<b>110 DC</b>			COL-110DC
220 DC	<b>220 DC</b>			COL-220DC
110/50 AC (1)	<b>110/50/60 AC</b>		58VA (3)	COL-110/50/60AC
230/50 AC (1)	<b>230/50/60 AC</b>			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).

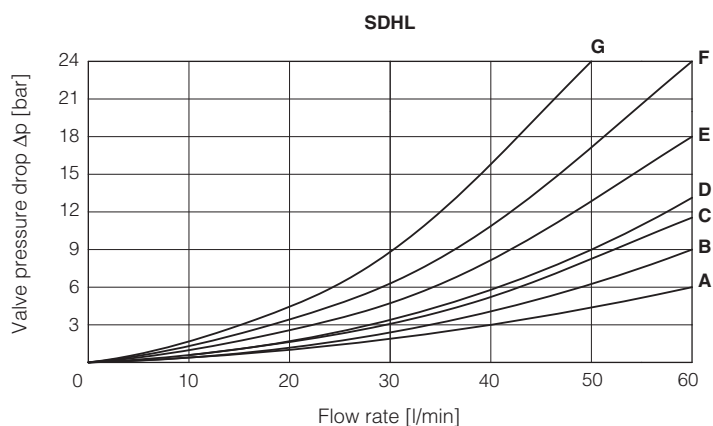
Available for configuration: **61 - 63 - 71**, spools: **0 - 0/2 - 1 - 1P - 1/2 - 1/2P - 3 - 3P - 4 - 7**

**WP** = prolonged manual override protected by rubber cap.

⚠ 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

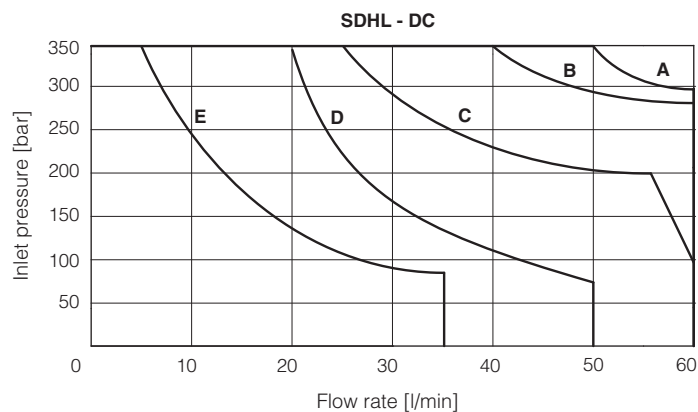
Flow direction Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	



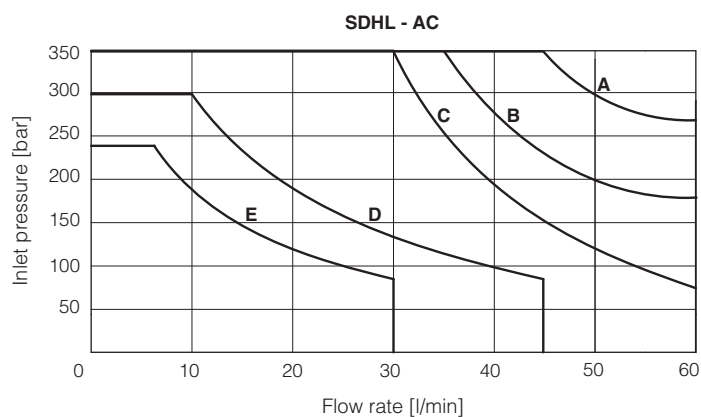
**8 OPERATING LIMITS** based on mineral oil ISO VG 46 at 50°C

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

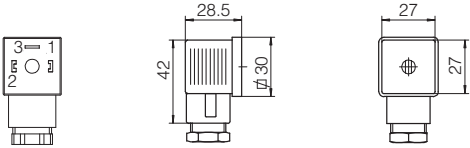
## 10 SWITCHING FREQUENCY

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

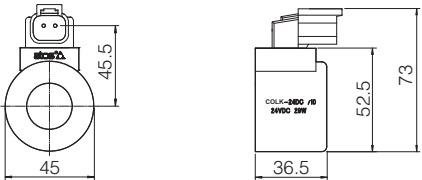
## 11 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

**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	
		<b>666, 667</b> 1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground	
		SUPPLY VOLTAGES	
		<b>666</b> All voltages	<b>667</b> 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 V<sub>DC</sub>

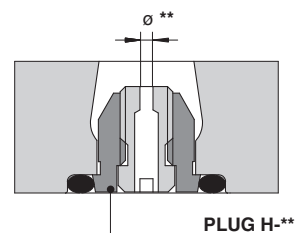
		<b>Deutsch connector DT-04-2P</b>  <b>Options -XK</b> Coil type COLK, Deutsch connector DT-04-2P male Protection degree <b>IP67</b>  Note: For the electric characteristics refer to standard coils features - see section 5
---	--	--

## 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 in 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:

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





# 14 DIMENSIONS [mm]

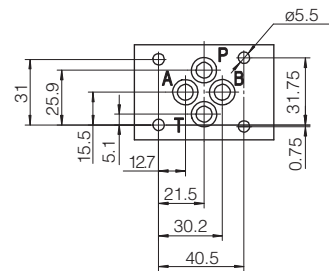
ISO 4401: 2005

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

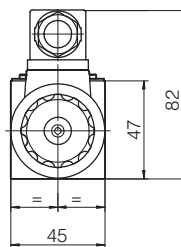
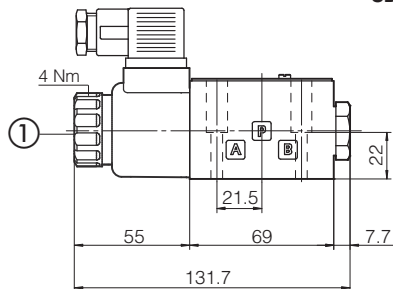
Mass (Kg)		
	DC	AC
SDHL-06	1,3	1,2
SDHL-07	1,6	1,4

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

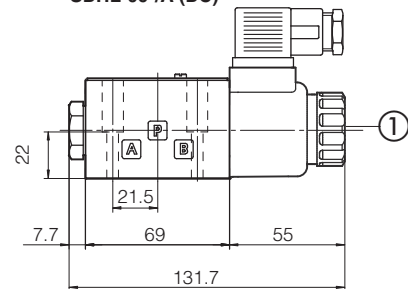
Valve's bottom view



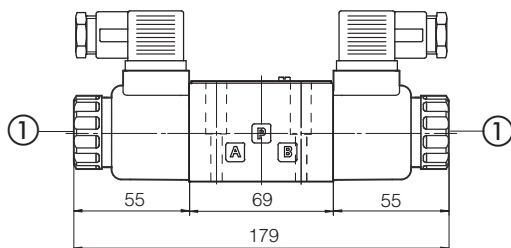
SDHL-06 (DC)



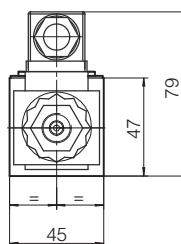
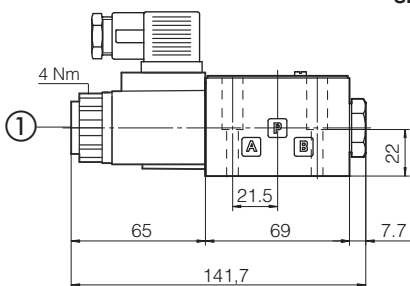
SDHL-06\*/A (DC)



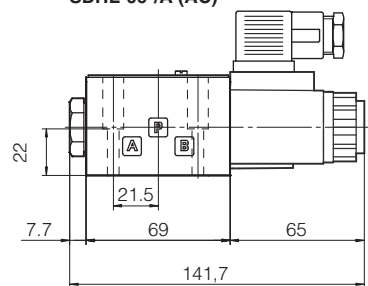
SDHL-07 (DC)



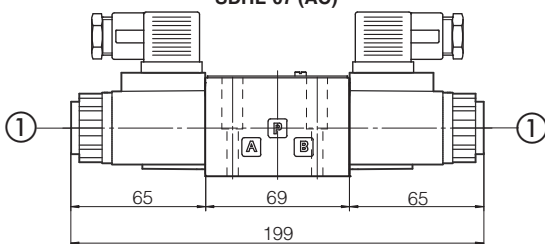
SDHL-06 (AC)



SDHL-06\*/A (AC)



SDHL-07 (AC)



① Standard manual override PIN

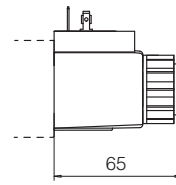
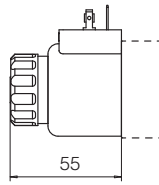
Overall dimensions are referred to valves with connector 666

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

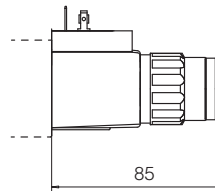
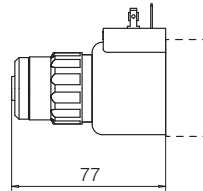
**DC Solenoids**

**AC Solenoid**

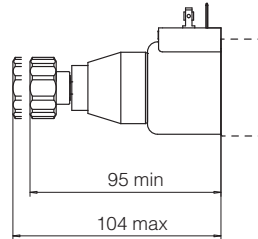
**STD**  
execution



option / **WP**



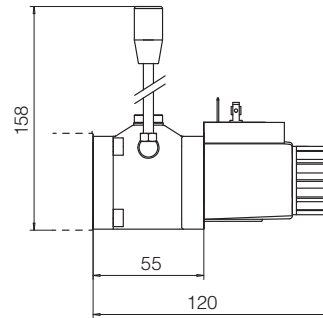
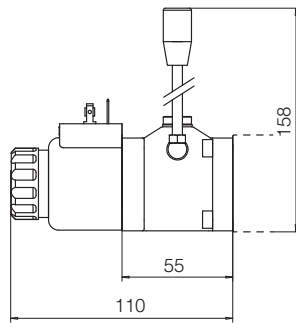
**WPD/SHL**  
to be ordered  
separately



Not available  
for AC version

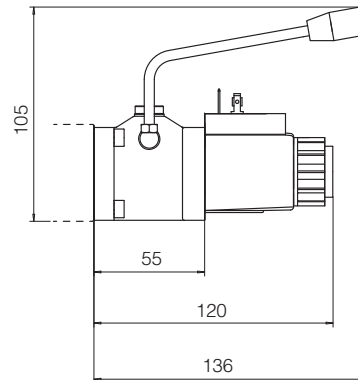
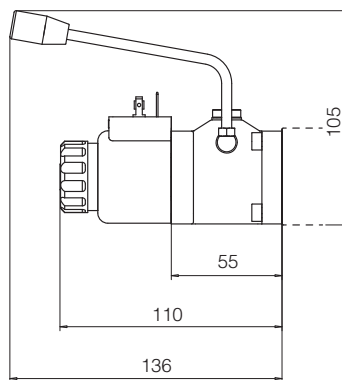
option / **MV**

Mass:  
+ 0,9 kg



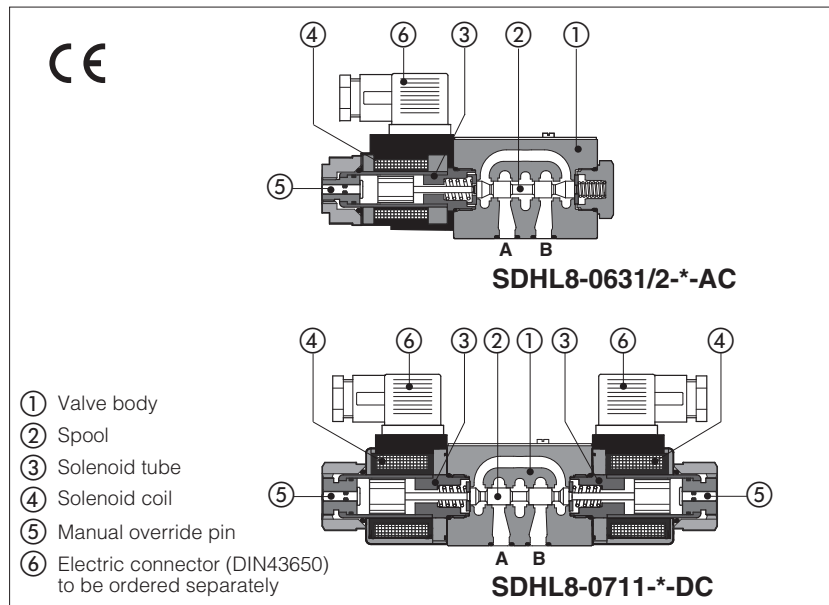
option / **MO**

Mass:  
+ 0,9 kg



# Solenoid directional valves type SDHL8

direct, spool type, **low leakage, compact execution**



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**

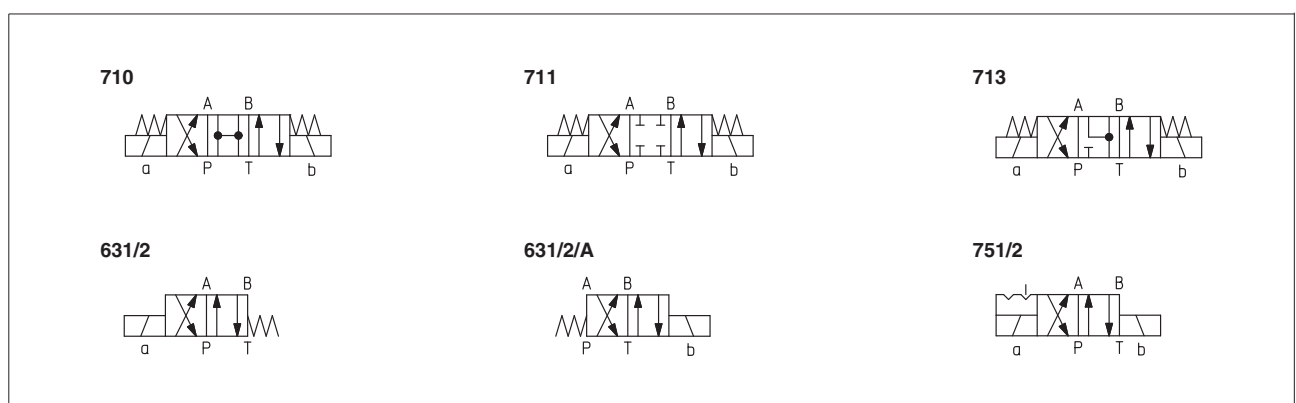
Max flow: **30 l/min**

Max pressure: **350 bar**

## 1 MODEL CODE

SDHL8 - 0	71	1	/WP	-	X	24 DC	**	/*
Directional control valves size 06 low leakage, compact execution								Seals material, see section 4: - = NBR PE = FKM
Valve configuration, see section 2 <b>63</b> = single solenoid, 2 external positions, spring offset <b>71</b> = double solenoid, 3 positions, spring centered <b>75</b> = double solenoid, 2 external positions, with detent								Series number
Spool type, see section 2.								
Options: <b>A</b> , <b>WP</b> , see section 5								
								Voltage code, see section 6
								X = without connector See section 7 for available connectors, to be ordered separately

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



### 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	<b>Standard</b> execution = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
<b>Operating pressure</b>	Ports P,A,B: <b>350</b> bar; Port T <b>210</b> bar for DC version; <b>160</b> bar for AC version
<b>Maximum flow</b>	<b>30 l/min</b> , see Q/Δp diagram at section 8 and operating limits at section 9

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (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		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLDP	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

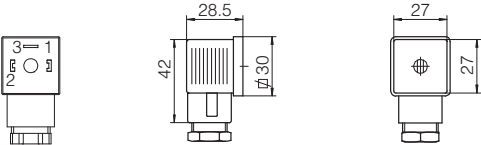
### 6 ELECTRIC FEATURES

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

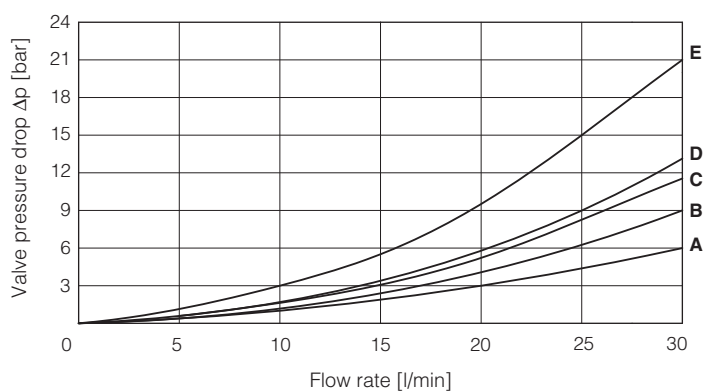
### 7 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

**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	
		<b>666, 667</b> 1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground	
		<b>SUPPLY VOLTAGES</b>	
		<b>666</b> All voltages	<b>667</b> 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

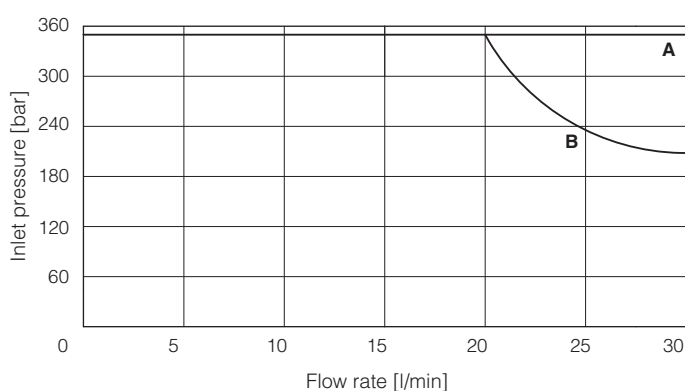
Flow direction Spool type	P→A	P→B	A→T	B→T	P→T center	A→T B→T center
0	A	A	A	A	E	
1	C	C	B	B		
1/2	D	B	D	B		
3	C	C	A	A		E



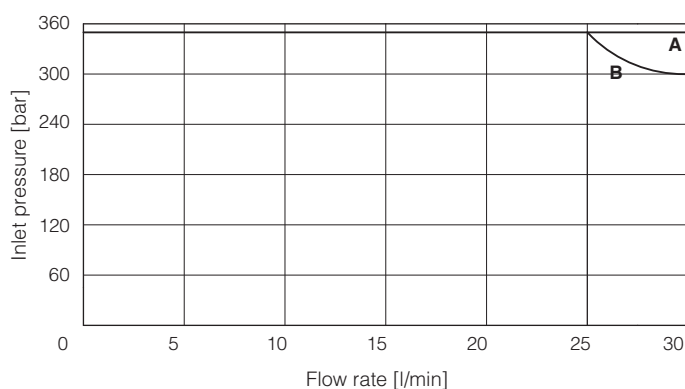
# 9 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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

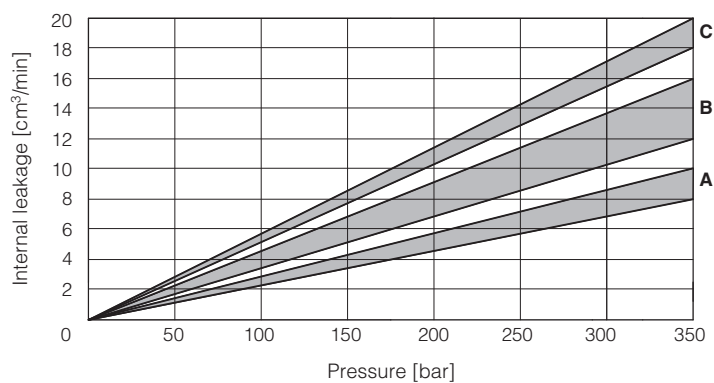
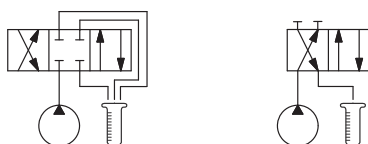


Curve	AC version, spool type
A	1, 1/2
B	0, 3



# 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

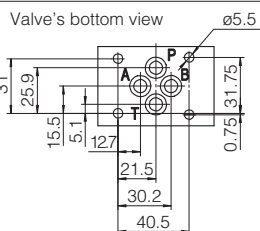
**13 DIMENSIONS [mm]****ISO 4401: 2005****Mounting surface: 4401-03-02-0-05**

Fastening bolts: 4 socket head screws:  
 M5x30 class 12.9

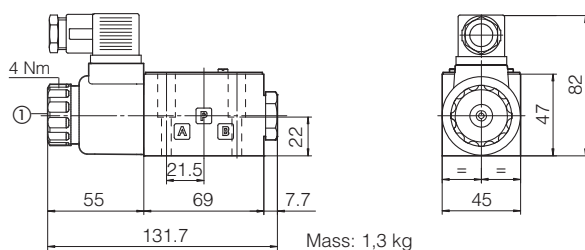
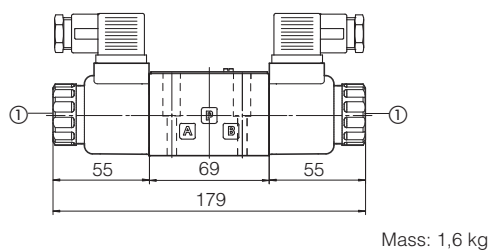
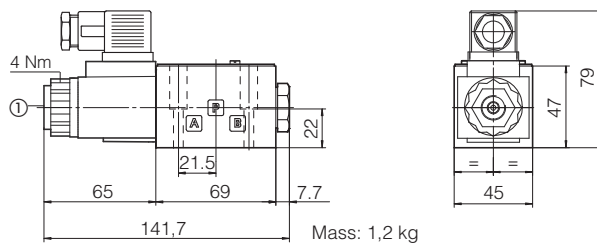
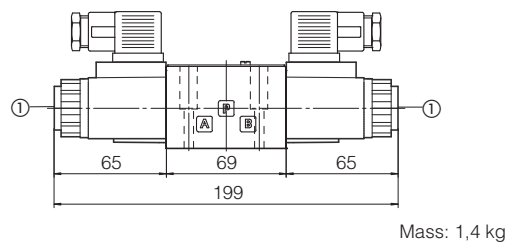
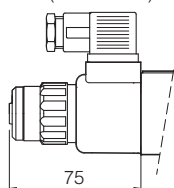
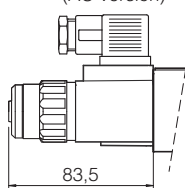
Tightening torque = 8 Nm

Seals: 4 OR 108

Ports P,A,B,T:  $\varnothing = 7.5$  mm (max)



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

**SDHL8-06(DC)****SDHL8-07(DC)****SDHL8-06(AC)****SDHL8-07(AC)****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 in case of particular conditions as long flexible hoses or the presence of accumulators which could cause at the valve switching instantaneous high flow peaks over the max valve's operating limits.

Ordering code:

**PLUG H**

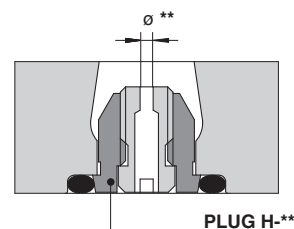
-

**\*\***

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

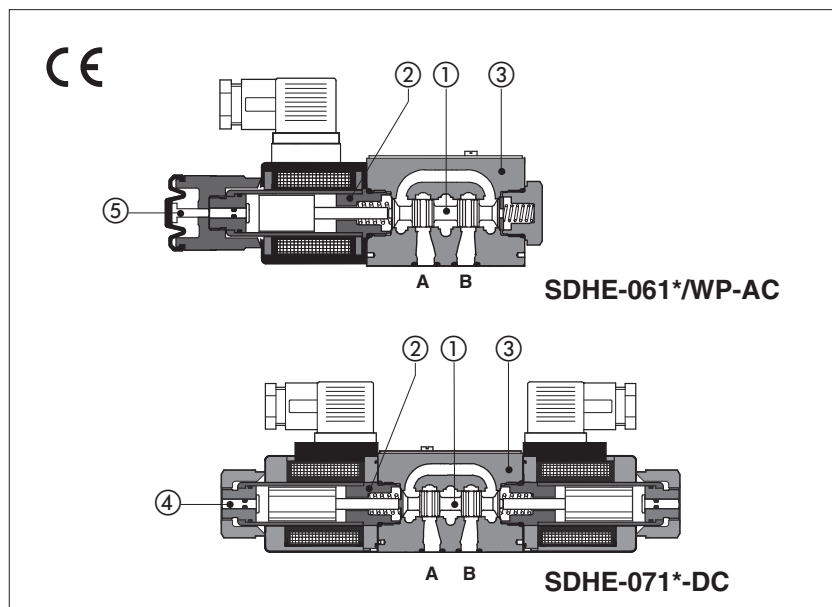
Example PLUG-H-**12** = orifice diameter **1,2 mm**

Other orifice dimensions are available on request



# Solenoid directional valves type SDHE

direct, spool type, high flow



Spool type, two or three position direct operated valves with high performance threaded solenoids certified according to 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

<b>SDHE - 0</b>	<b>61</b>	<b>1</b>	<b>/A</b>	<b>-</b>	<b>X</b>	<b>24 DC</b>	<b>**</b>	<b>/*</b>
Directional control valves size 06							Series number	Seals material, see section ③: - = NBR <b>PE</b> = FKM <b>BT</b> = NBR low temp.
Valve configuration, see section ②								
<b>61</b> = single solenoid, center plus external position, spring centered								
<b>63</b> = single solenoid, 2 external positions, spring offset								
<b>67</b> = single solenoid, center plus external position, spring offset								
<b>70</b> = double solenoid, 2 external positions, without spring								
<b>71</b> = double solenoid, 3 positions, spring centered								
<b>75</b> = double solenoid, 2 external positions, with detent								
Spool type, see section ②.								
Options: <b>A, MO, MV, WP, L*</b> , see section ⑥.								
							Voltage code, see section ④	
								<b>00-AC</b> = AC solenoids without coils <b>00-DC</b> = DC solenoids without coils <b>X</b> = without connector See section ① for available connectors, to be ordered separately Coils with special connectors, see section ② <b>XJ</b> = AMP Junior Timer connector <b>XK</b> = Deutsch connector <b>XS</b> = Lead Wire connection

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

Configurations	Spools	Configurations	Spools
<b>61</b>  <b>61/A</b>  <b>67</b>  <b>67/A</b>  <b>71</b> 	                    	<b>63</b>  <b>63/A</b>  <b>70</b>  <b>75</b> 	    <p><b>(1)</b> not available for configuration 75</p>

### 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 switching.
- 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	<b>Standard</b> = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C <b>/BT</b> option = -40°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
<b>Operating pressure</b>	Ports P,A,B: <b>350</b> bar; Port T <b>210</b> bar for DC version; <b>160</b> bar for AC version
<b>Maximum flow</b>	<b>80 l/min</b> , see operating limits at section 8

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils; <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (with connectors 666, 667, 669 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See coil voltage 5
Supply voltage tolerance	± 10%
Certification	<b>cURus</b> 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		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	<b>12 DC</b>	666 or 667	30 W	COE-12DC
14 DC	<b>14 DC</b>			COE-14DC
24 DC	<b>24 DC</b>			COE-24DC
28 DC	<b>28 DC</b>			COE-28DC
110 DC	<b>110 DC</b>			COE-110DC
220 DC	<b>220 DC</b>			COE-220DC
110/50 AC	<b>110/50/60 AC</b>	669	58 VA (3)	COE-110/50/60AC
230/50 AC	<b>230/50/60 AC</b>			COE-230/50/60AC
110/50 AC (1)	<b>110/50/60 AC</b>		30 W	COE-110RC
230/50 AC (1)	<b>230/50/60 AC</b>			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 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 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.

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

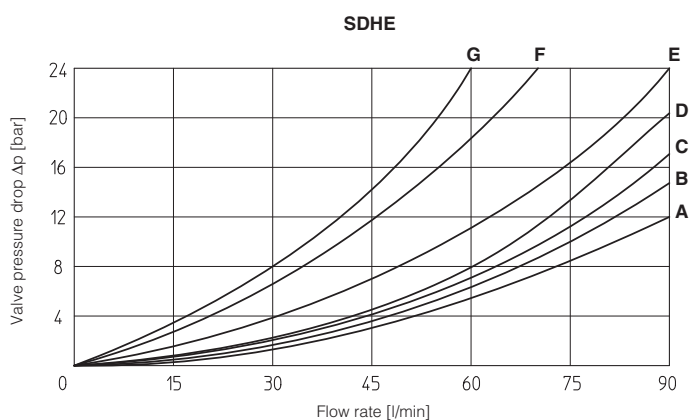
**L1, L2, L3** = (only for SDHE-DC) device for switching time control, installed in the valve solenoid.

For spools 4 and 4/8 only device L3 is available.



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

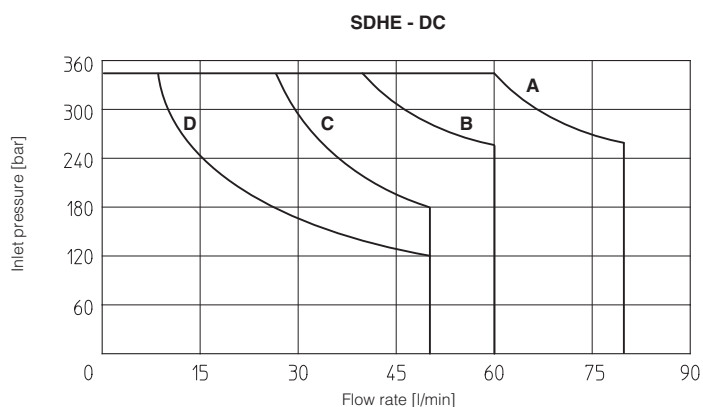
Flow direction Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1, 1/9	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	



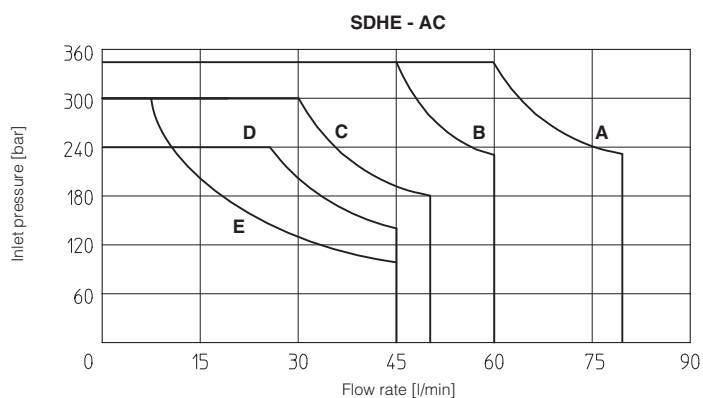
**8 OPERATING LIMITS** based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value ( $V_{nom} - 10\%$ ). 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, 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

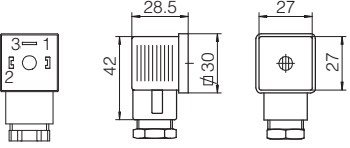
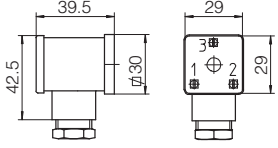
The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

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

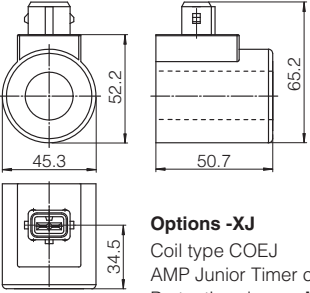
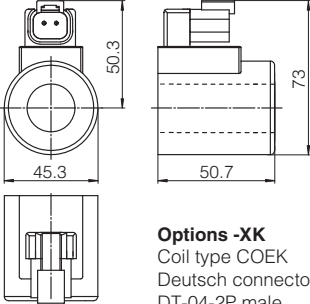
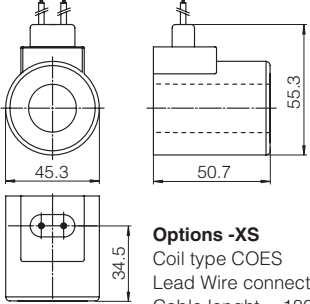
**10 SWITCHING FREQUENCY**

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	
		<b>666, 667</b> 1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground	<b>669</b> 1,2 = Supply voltage V <sub>AC</sub> 3 = Coil ground
		SUPPLY VOLTAGES	
<b>666</b> All voltages	<b>667</b> 24 AC or DC 110 AC or DC 220 AC or DC	<b>669</b> 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	Deutsch connector DT-04-2P	Lead Wire connection
 <p><b>Options -XJ</b>            Coil type COEJ            AMP Junior Timer connector            Protection degree <b>IP67</b></p>	 <p><b>Options -XK</b>            Coil type COEK            Deutsch connector            DT-04-2P male            Protection degree <b>IP67</b></p>	 <p><b>Options -XS</b>            Coil type COES            Lead Wire connection            Cable length = 180 mm</p>

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 in 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**

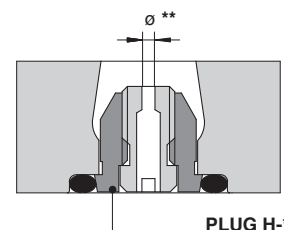
-

**\*\***

**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

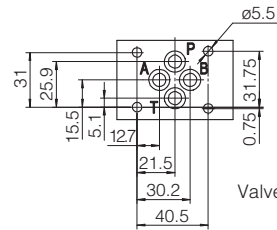
Fastening bolts: 4 socket head screws:

M5x30 class 12.9

Tightening torque = 8 Nm

Seals: 4 OR 108

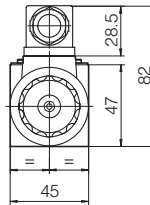
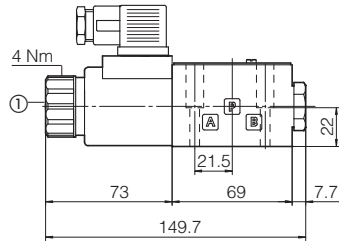
Ports P,A,B,T:  $\varnothing = 7.5$  mm (max)



Valve's bottom view

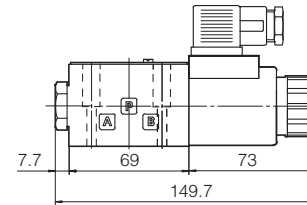
**P** = PRESSURE PORT  
**A, B** = USE PORT  
**T** = TANK PORT

**SDHE-06(DC)**

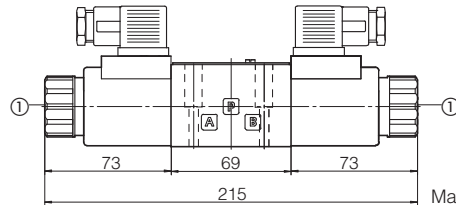


Mass: 1,5 kg

**SDHE-06\*A(DC)**

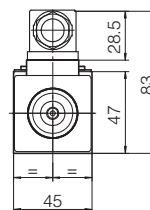
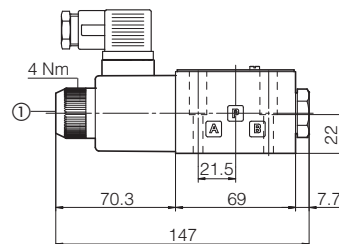


**SDHE-07(DC)**



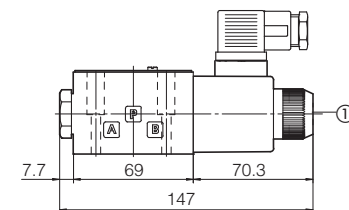
Mass: 2 kg

**SDHE-06(AC)**

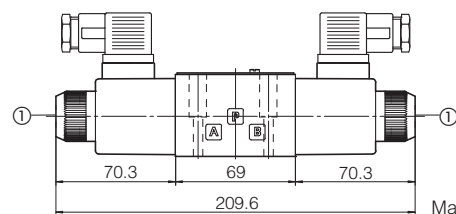


Mass: 1,4 kg

**SDHE-07\*A(AC)**



**SDHE-07(AC)**



Mass: 1,8 kg

① Standard manual override PIN

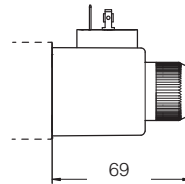
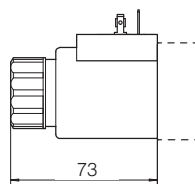
Overall dimensions are referred to valves with connector 666

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

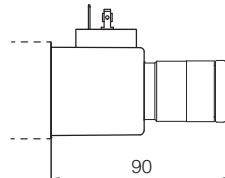
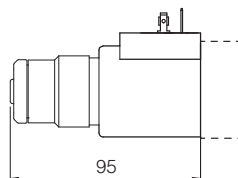
### DC Solenoids

### AC Solenoid

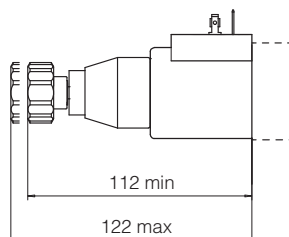
**STD**  
execution



option / **WP**



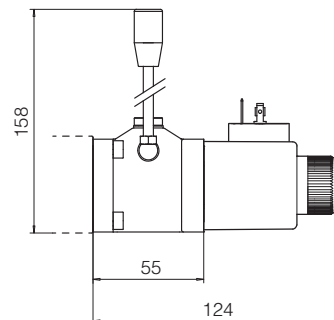
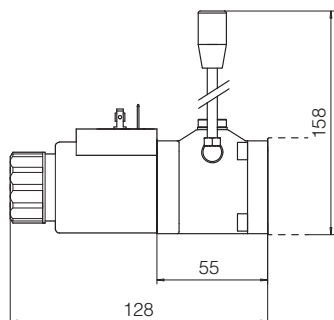
**WPD/SHE**  
to be ordered  
separately



Not available  
for AC version

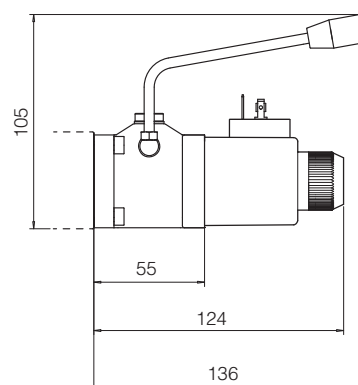
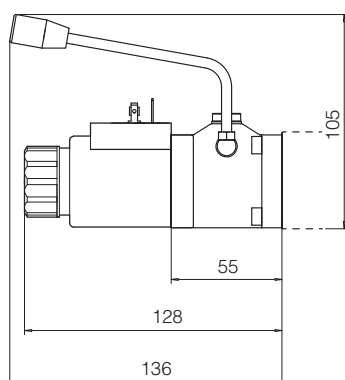
option / **MV**

Mass:  
+ 0,9 kg



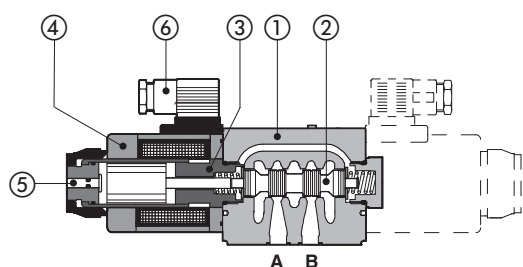
option / **MO**

Mass:  
+ 0,9 kg



# Solenoid directional valves type **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**

Solenoid directional valves size 10 light 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
- 70** = double solenoid, 2 external positions, without springs
- 71** = double solenoid, 3 positions, spring centered
- 75** = double solenoid, 2 external positions, with detent

Spool type, see section ②.

Options, see note 1 at section ④.

**61**

**1**

**A**

**X**

**24 DC**

**\*\***

**\***

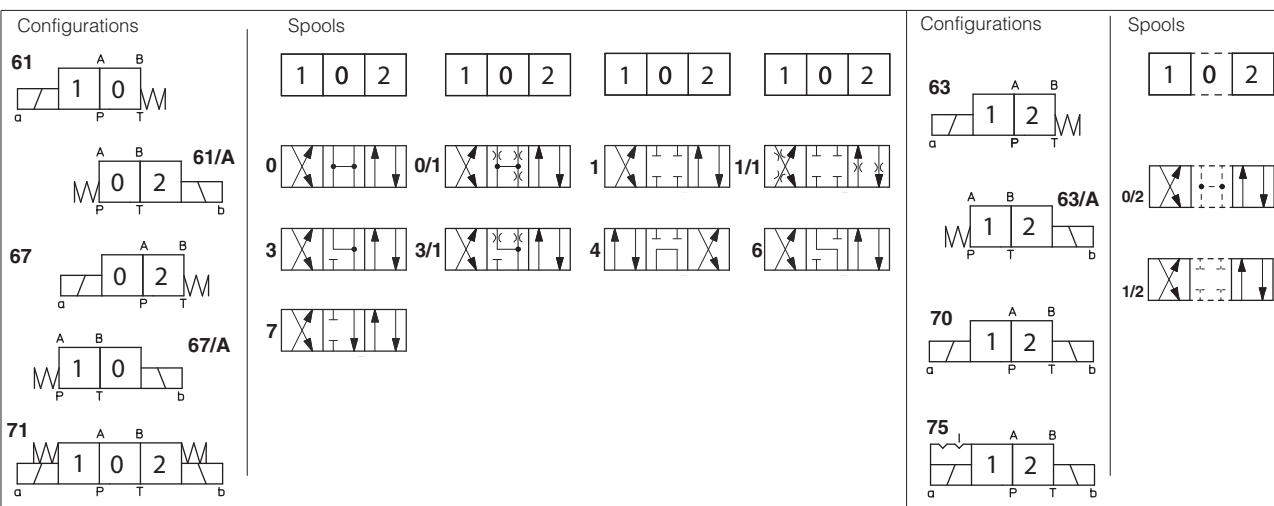
Seals material, see section ④:  
- = NBR  
**PE** = FKM

Series number

Voltage code, see section ⑥

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

## 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 CHARACTERISTICS

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	<b>Standard</b> execution = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
<b>Operating pressure</b>	Ports P,A,B: <b>350</b> bar; Port T <b>210</b> bar;
Rated flow	See diagrams Q/Δp at section 8
<b>Maximum flow</b>	<b>120 l/min</b> , see operating limits at section 9

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) Due to the occurring 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	<b>IP 65</b> (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		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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

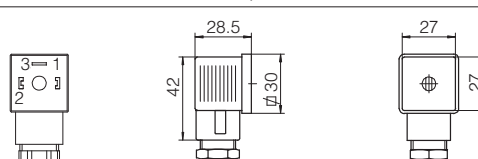
**A** = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.  
**WP** = prolonged manual override protected by rubber cap - see section 12.

### 6 ELECTRIC FEATURES

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

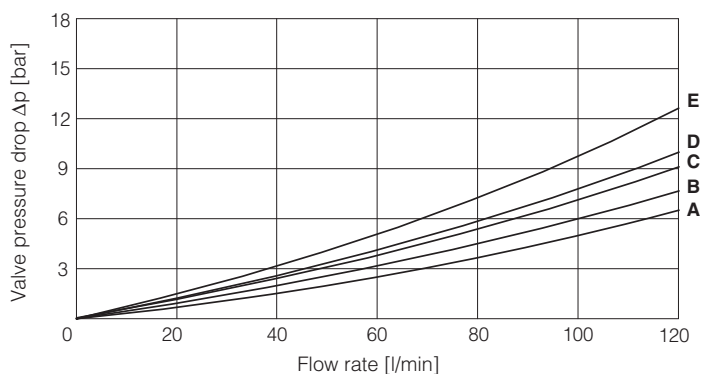
### 7 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately)

**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	
			<b>666, 667</b> 1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground	
			SUPPLY VOLTAGES	
			<b>666</b> All voltages	<b>667</b> only for 24 DC

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

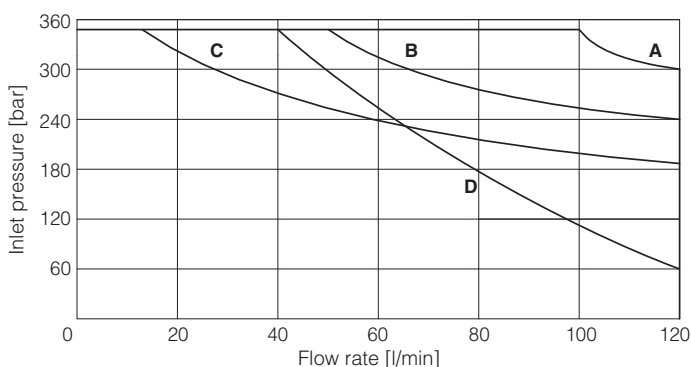
Flow direction Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1, 0/2	A	A	B	B	
1, 1/1, 6	A	A	D	C	
3, 3/1, 7	A	A	C	D	
4	B	B	B	B	E
1/2	B	C	C	B	



# 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.  $P \rightarrow A$  and  $B \rightarrow T$ ). 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:

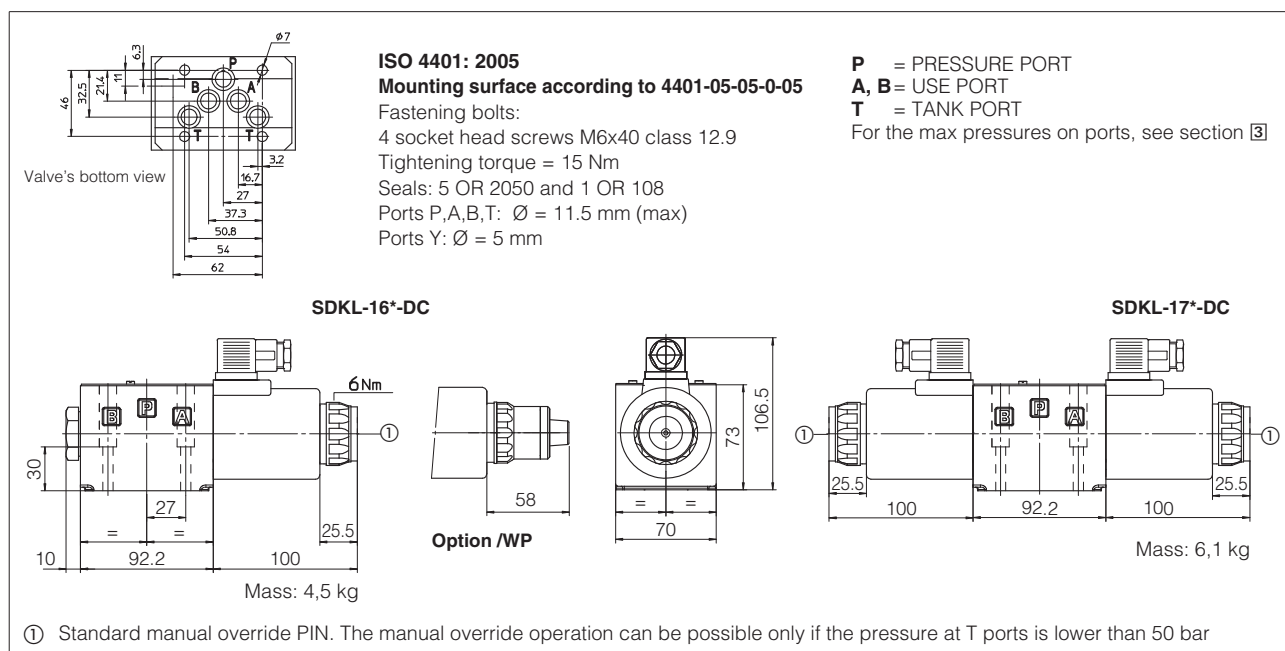
- 50 l/min; 150 bar
- nominal supply voltage
- 2 bar of back pressure on port T
- mineral oil ISO VG 46 at 50°C

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]

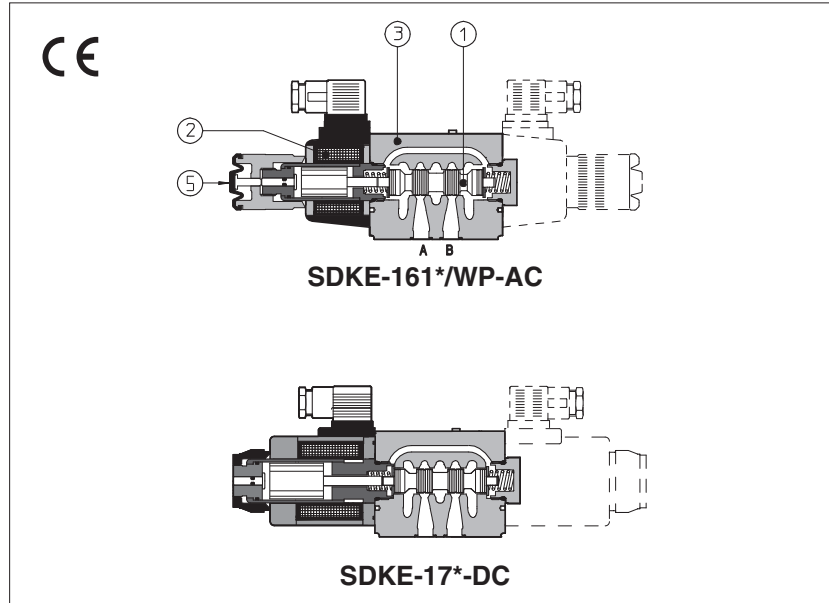






# Solenoid directional valves type **SDKE**

direct, spool type



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

<b>SDKE - 1</b>	<b>61</b>	<b>1</b> / <b>A</b>	<b>X</b>	<b>24 DC</b>	<b>**</b> / <b>*</b>
Directional control valves size 10					Seals material, see section ④: - = NBR <b>PE</b> = FKM <b>BT</b> = HNBR
Valve configuration, see section ②					Series number
<b>61</b> = single solenoid, center plus external position, spring centered <b>63</b> = single solenoid, 2 external positions, spring offset <b>67</b> = single solenoid, center plus external position, spring offset <b>70</b> = double solenoid, 2 external positions, without springs <b>71</b> = double solenoid, 3 positions, spring centered <b>75</b> = double solenoid, 2 external positions, with detent					Voltage code, see section ⑤
Spool type, see section ②.					
Options, see note 1 at section ④.					
					<b>00-AC</b> = AC solenoids without coils <b>00-DC</b> = DC solenoids without coils <b>X</b> = standard coil without connector <b>XUL</b> = coils certified <b>cURus</b> without connector See section ③ for available connectors, to be ordered separately Coils with special connectors, see section ①① <b>XJ</b> = AMP Junior Timer connector, certified <b>cURus</b> <b>XK</b> = Deutsch connector <b>XS</b> = Lead Wire connection, certified <b>cURus</b>

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

<p>Configurations</p> <p><b>61</b></p> <p><b>61/A</b></p> <p><b>67</b></p> <p><b>67/A</b></p> <p><b>71</b></p>	<p>Spools</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>0</p> <p>1</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>91</p> <p>19</p> <p>93</p> <p>39</p> <p>58</p> <p>1/9</p> <p><b>Note:</b> see also section ④ note 3 for special shaped spools</p>	<p>Configurations</p> <p><b>63</b></p> <p><b>63/A</b></p> <p><b>70</b></p> <p><b>75</b></p>	<p>Spools</p> <p>1 0 2</p> <p>0/2</p> <p>1/2</p> <p>2/2</p>
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**3 MAIN CHARACTERISTICS, 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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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		
<b>Operating pressure</b>	Ports P,A,B: <b>350</b> bar; Port T <b>210</b> bar for DC version ( <b>250</b> bar with option /Y); <b>160</b> bar for AC version		
Rated flow	See diagrams Q/Δp at section 6		
<b>Maximum flow</b>	<b>150 l/min</b> , see operating limits at section 7		

**3.1 Coils characteristics**

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (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)	<b>cURus</b> 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 - I<sub>max</sub> 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	<b>12 DC</b>	666 or 667	36 W	CAE-12DC
14 DC	<b>14 DC</b>			CAE-14DC
24 DC	<b>24 DC</b>			CAE-24DC
28 DC	<b>28 DC</b>			CAE-28DC
110 DC	<b>110 DC</b>			CAE-110DC
220 DC	<b>220 DC</b>			CAE-220DC
110/50/60 AC	<b>110/50/60 AC</b>		100 VA (3)	CAE-110/50/60AC (1)
230/50/60 AC	<b>230/50/60 AC</b>			CAE-230/50/60AC (1)
110/50/60 AC	<b>110 DC</b>	669	36 W	CAE-110DC
230/50/60 AC	<b>220 DC</b>			CAE-220DC

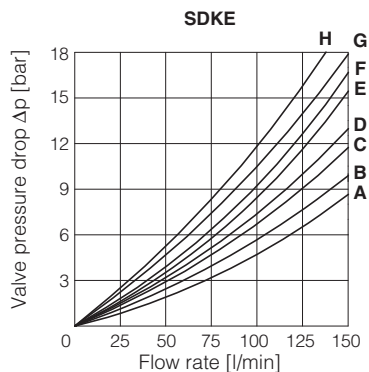
(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 90 VA

(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.

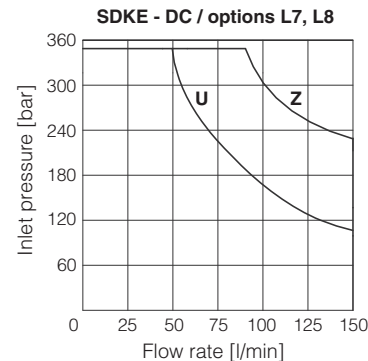
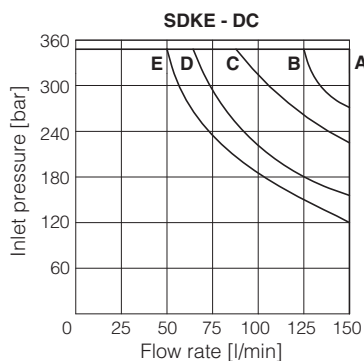
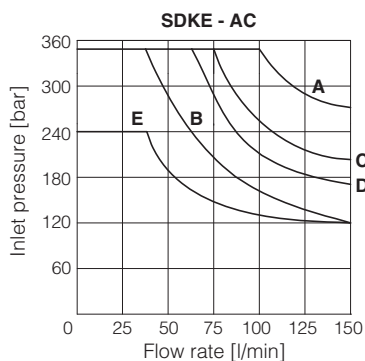
## 6 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

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	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

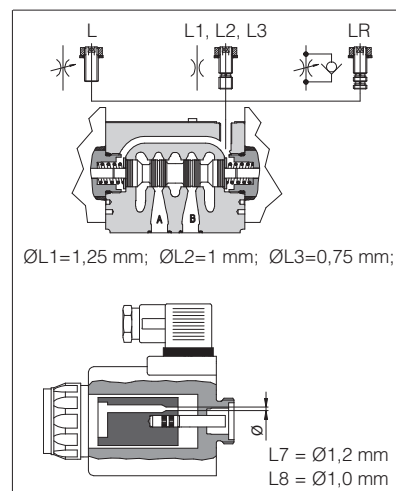
Valve	AC (cycles/h)	DC (cycles/h)
SDKE + 666 / 667	7200	15000

## 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  $\varnothing L1 = 1,25$  mm;  $\varnothing L2 = 1$  mm;  $\varnothing L3 = 0,75$  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.

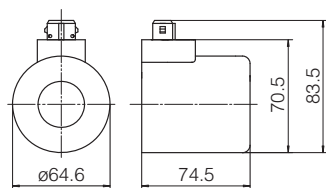
For a correct operation of the switching time control, the passage in which the control device is installed must be completely filled with oil.



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

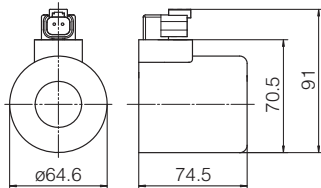
### Options -XJ

Coil type CAEJ  
AMP Junior Timer connector  
Protection degree IP67  
certified cURus



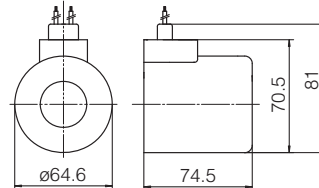
### Options -XK

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

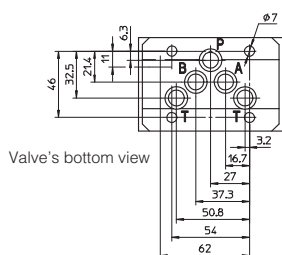


### Options -XS

Coil type CAES  
Lead Wire connection  
Cable length = 180 mm  
certified cURus



## 12 INSTALLATION DIMENSIONS [mm]



Valve's bottom view

### ISO 4401: 2005

#### Mounting surface according to 4401-05-05-0-05

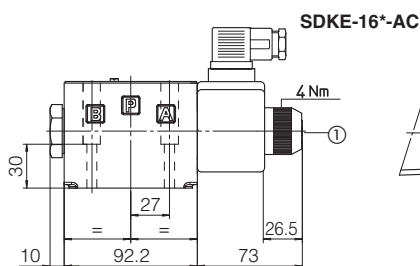
Fastening bolts:  
4 socket head screws M6x40 class 12.9  
Tightening torque = 15 Nm  
Seals: 5 OR 2050 and 1 OR 108  
Ports P,A,B,T: Ø = 11.5 mm (max)  
Ports Y: Ø = 5 mm

P = PRESSURE PORT

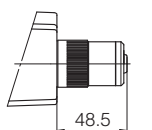
A, B = USE PORT

T = TANK PORT

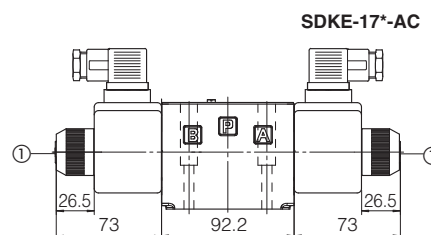
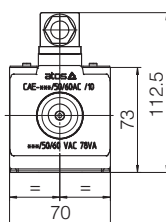
For the max pressures = section 3



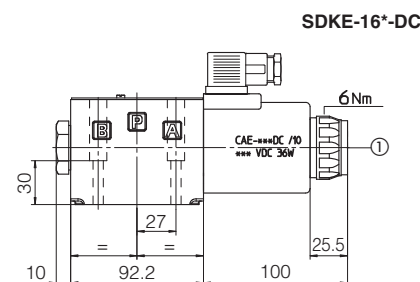
Mass: 3,9 kg



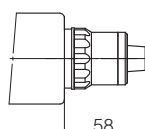
Option /WP



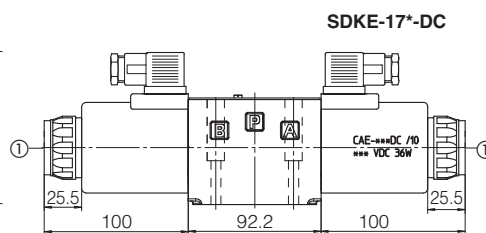
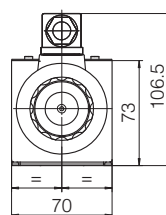
Mass: 4,7 kg



Mass: 4,5 kg



Option /WP



Mass: 6,1 kg

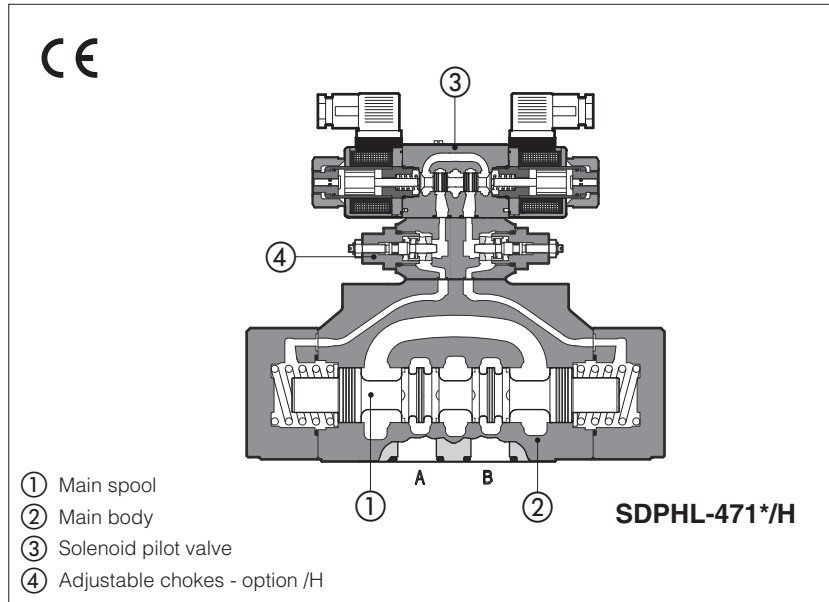
① Standard manual override PIN. The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

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

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

# Solenoid directional valves type **SDPHL**

piloted, spool type



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

<b>SDPH</b>	<b>L</b>	<b>-</b>	<b>2</b>	<b>61</b>	<b>1</b>	<b>/</b>	<b>A</b>	<b>-</b>	<b>X</b>	<b>24 DC</b>	<b>**</b>	<b>/</b>	<b>*</b>
Pilot operated directional control valve											Series number		Seals material, see section 3: - = NBR <b>PE</b> = FKM
Solenoid pilot valve: <b>L</b> = SDHL compact execution, AC and DC supply													
Valve size: <b>2</b> = 16 <b>4</b> = 25													Voltage code, see section 5
Valve configuration, see section 2 <b>61</b> = single solenoid, center plus external position, spring centered <b>63</b> = single solenoid, 2 external positions, spring offset <b>67</b> = single solenoid, center plus external position, spring offset <b>71</b> = double solenoid, 3 positions, spring centered <b>75</b> = double solenoid, 2 external positions, with detent													<b>X</b> = without connector See section 10 for available connectors, to be ordered separately <b>XK</b> = Deutsch connector
Spool type, see section 2													Options, see section 4

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

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

Configurations	Spools	Configurations	Spools
<b>NOTES</b> (see also section 4.2 for special shaped 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	<b>Standard</b> = -30°C ÷ +70°C; <b>/PE</b> 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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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		
<b>Operating pressure</b>	P, A, B, X = <b>350 bar</b> T = <b>250 bar</b> for external drain (standard) T with internal drain (option /D) and port Y = <b>210 bar</b> SDPHL (DC); <b>160 bar</b> SDPHL (AC) Minimum pilot pressure = 8 bar		
Rated flow	See diagrams Q/Δp at section 6		
<b>Maximum flow</b>	SDPHL-2: <b>300 l/min</b> ; SDPHL-4: <b>700 l/min</b> ; (see rated flow at section 6 and operating limits at section 7)		

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (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

#### 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 restrictor 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

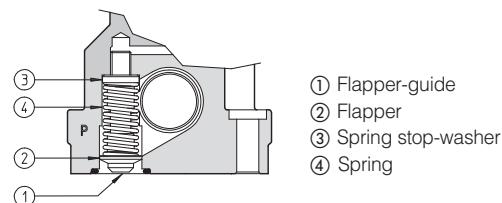
- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.

- 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\*).

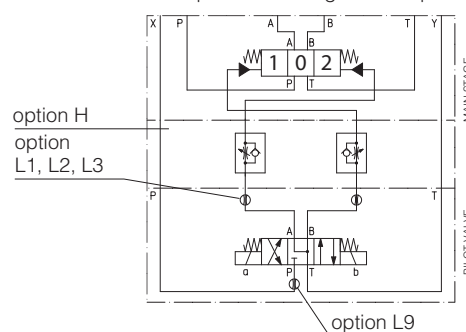
Shaped spool availability	0/1	3/1	1/1	4/8
SDPHL-2, SDPHL-4	•	•	•	•

#### 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.



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



## 5 ELECTRIC FEATURES

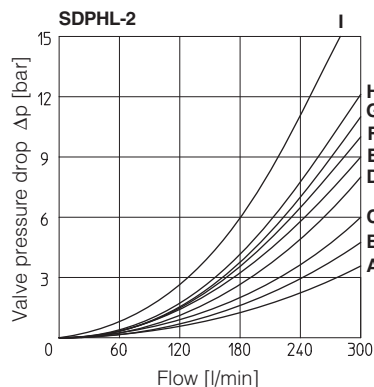
Valve	External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption (2)	Code of spare coil	
					X version	XK version
SDPHL	12 DC	12 DC	666 or 667	29 W	COL-12DC	COLK-12DC
	14 DC	14 DC			COL-14DC	COLK-14DC
	24 DC	24 DC			COL-24DC	COLK-24DC
	28 DC	28 DC			COL-28DC	COLK-28DC
	110 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

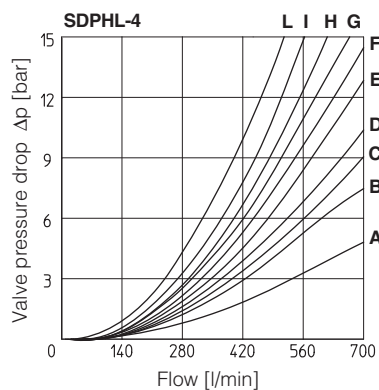
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.

(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



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



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

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

### SDPHL-2

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

### SDPHL-4

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



## 8 SWITCHING TIMES (average values in m sec)

Valve model	Configuration		70 bar		Piloting pressure 140 bar		250 bar	
			Alternating current	Direct current	Alternating current	Direct current	Alternating current	Direct current
<b>SDPHL-2</b>	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					
<b>SDPHL-4</b>	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 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
<b>666</b>	Connector IP65, suitable for direct connection to electric supply source
<b>667</b>	As 666 connector IP65 but with built-in signal led, suitable for direct connection to electric supply source

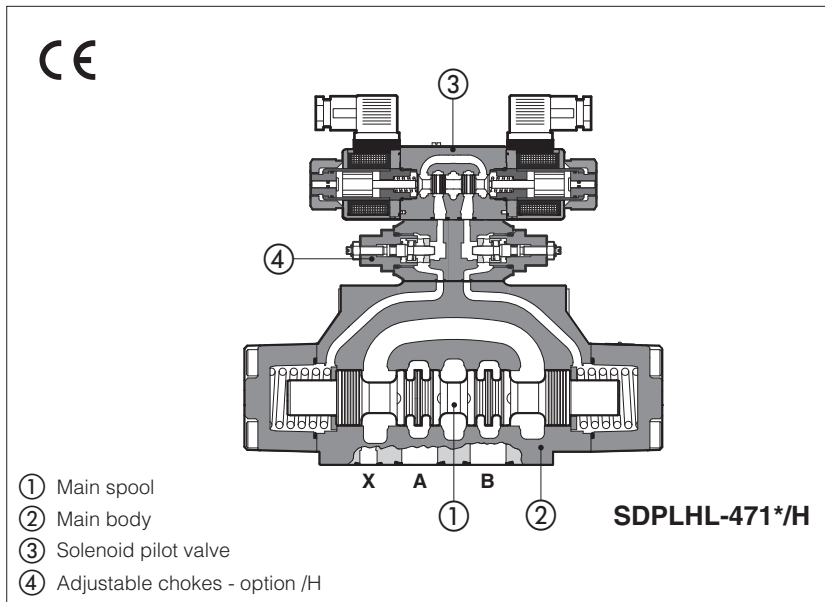






## Solenoid directional valves type SDPLHL

piloted, spool type, max pressure 280 bar



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

Pilot operated directional control valve,  
Pmax = 280 bar

Solenoid pilot valve:

**L** = SDHL compact execution, AC and DC supply

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

Valve configuration, see section 2

**61**= single solenoid, center plus external position, spring centered

**63**= single solenoid, 2 external positions, spring offset

**67**= single solenoid, center plus external position, spring offset

**71**= double solenoid, 3 positions, spring centered

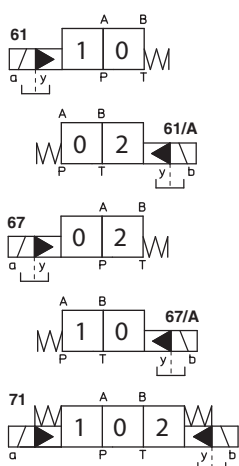
**75=** double solenoid, 2 external positions, with detent

Spool type, see section [2](#)

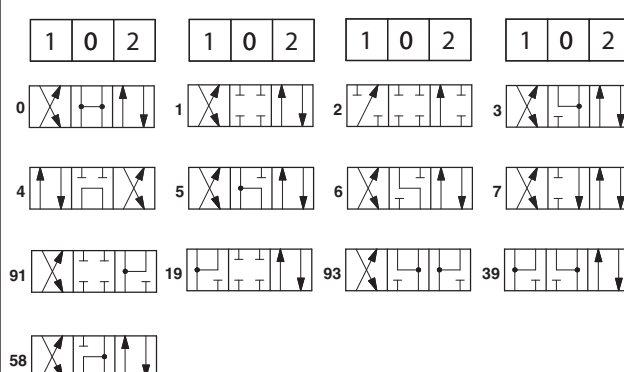
**Note:** SDPLHL-\* S PIL version without pilot solenoid valve available on request.

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

## Configurations

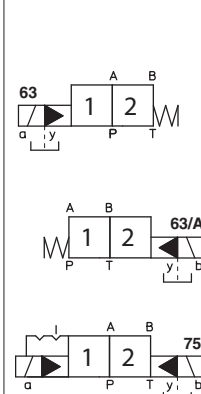


## Spools

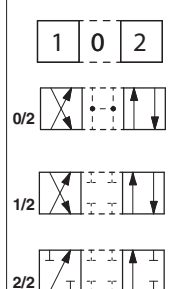


**NOTES** (see also section 4.2 for special shaped spools):

## 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	<b>Standard</b> = -30°C ÷ +70°C; <b>/PE</b> 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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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		
<b>Operating pressure</b>	P, A, B, X = <b>280 bar</b> T = <b>210 bar</b> for external drain (standard) T with internal drain (option /D) and port Y = <b>210 bar</b> SDPLHL (DC); <b>160 bar</b> SDPLHL (AC) Minimum pilot pressure = 8 bar		
Rated flow	See diagrams Q/Δp at section 6		
<b>Maximum flow</b>	SDPLHL-2: <b>300 l/min</b> ; SDPLHL-4: <b>700 l/min</b> ; (see rated flow at section 6 and operating limits at section 7)		

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (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

#### 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 restrictor 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

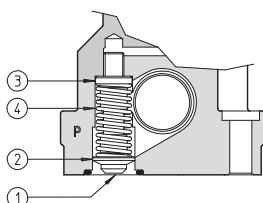
- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.

- 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	•	•	•	•

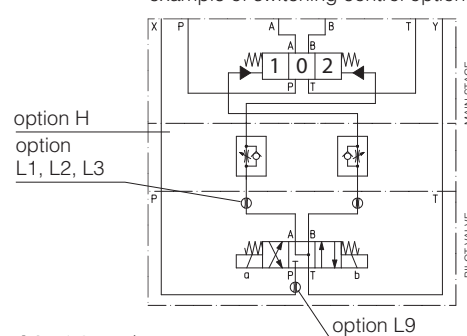
#### 4.3 Pilot pressure generator (option /R)

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

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



## 5 ELECTRIC FEATURES

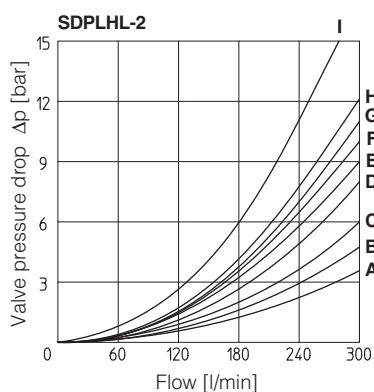
Valve	External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption (2)	Code of spare coil	
					X version	XX version
SDPLHL	12 DC	12 DC	666 or 667	29 W	COL-12DC	COLK-12DC
	14 DC	14 DC			COL-14DC	COLK-14DC
	24 DC	24 DC			COL-24DC	COLK-24DC
	28 DC	28 DC			COL-28DC	COLK-28DC
	110/50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

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10÷15% and the power consumption is 58 VA

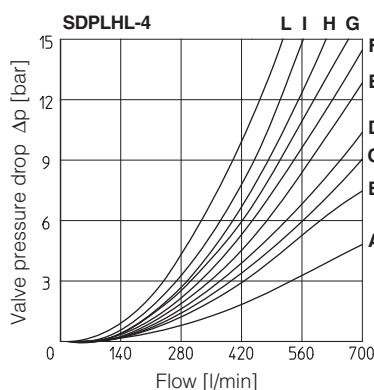
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.

(3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 150 VA.

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



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



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

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

### 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		140 bar		250 bar	
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 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
<b>666</b>	Connector IP65, suitable for direct connection to electric supply source
<b>667</b>	As 666 connector IP65 but with built-in signal led, suitable for direct connection to electric supply source

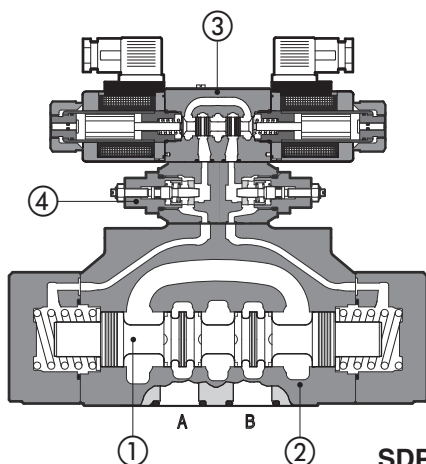






# Solenoid directional valves type SDPHE

piloted, spool type



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

**SDPHE-471\*/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**

Pilot operated directional control valve

Solenoid pilot valve:

**E** = SDHE for AC and DC supply, high performances with **cURus** certified solenoids

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

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

**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

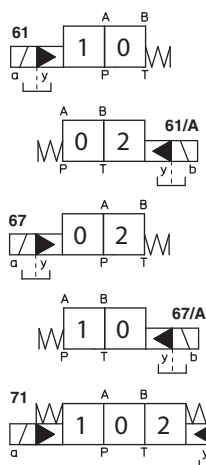
**XS** = Lead Wire connection

Options, see section 4

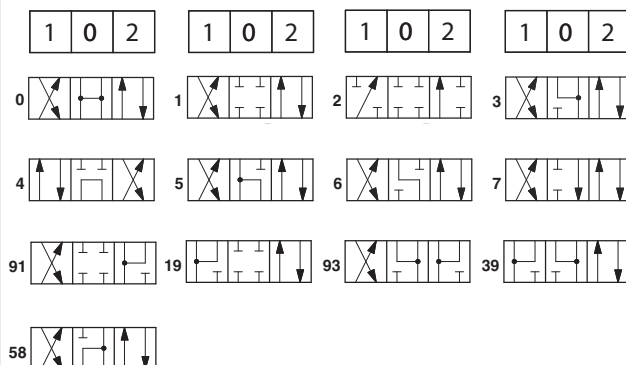
**Note:** SDPHE-\* S PIL version without pilot solenoid valve available on request

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

### Configurations



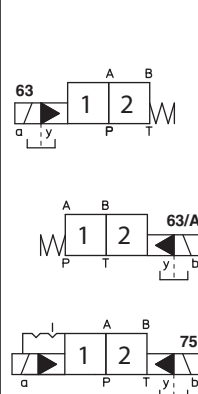
### Spoos



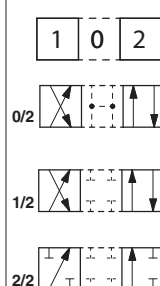
**NOTES** (see also section 4,2 for special shaped spools):

- For **DP\*-6** are available only spools: **0, 1, 1/2, 2, 3, 4, 5, 58, 6, 7, 19, 91**

### Configurations



### Spoos



### 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	<b>Standard</b> = -30°C ÷ +70°C; <b>/PE</b> option = -20°C ÷ +70°C; <b>/BT</b> 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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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		
<b>Operating pressure</b>	P, A, B, X = <b>350 bar</b> T = <b>250 bar</b> for external drain (standard) T with internal drain (option /D) and port Y = <b>210 bar</b> SDPHE (DC); <b>160 bar</b> SDPHE (AC) Minimum pilot pressure = 8 bar		
Rated flow	See diagrams Q/Δp at section 6		
<b>Maximum flow</b>	SDPHE-2: <b>300 l/min</b> ; SDPHE-4: <b>700 l/min</b> ; SDPHE-6: <b>1000 l/min</b> (see rated flow at section 6 and operating limits at section 7)		

#### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (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

#### 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 restrictor 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

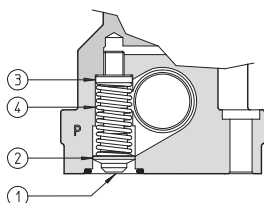
- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.

- 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	-	•	•	•

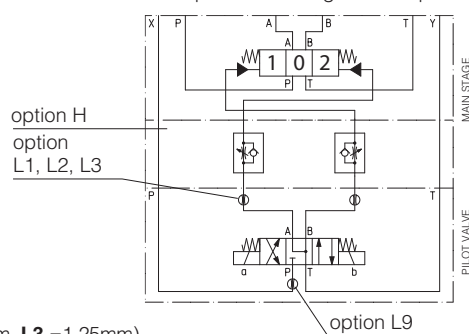
#### 4.3 Pilot pressure generator (option /R)

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

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



## 5 ELECTRIC FEATURES

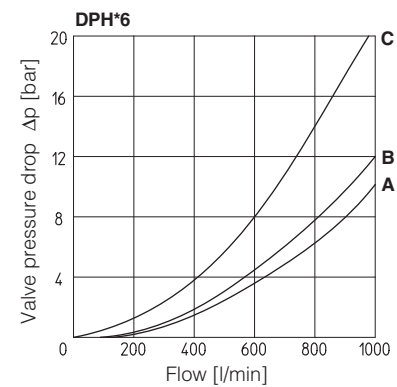
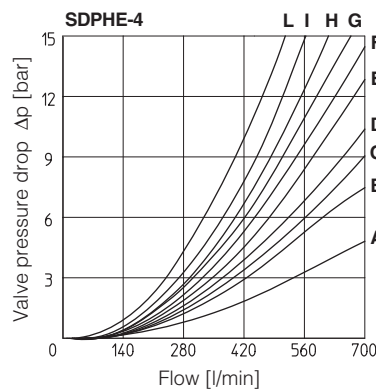
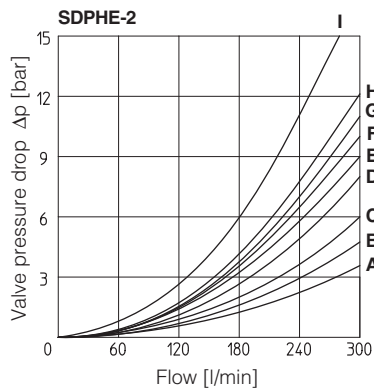
Valve	External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption <b>(2)</b>	Code of spare coil
SDPHE	12 DC	<b>12 DC</b>	666 or 667	30 W	COE-12DC
	14 DC	<b>14 DC</b>			COE-14DC
	24 DC	<b>24 DC</b>			COE-24DC
	28 DC	<b>28 DC</b>			COE-28DC
	110 DC	<b>110 DC</b>			COE-110DC
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

(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
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
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
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)

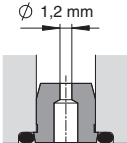
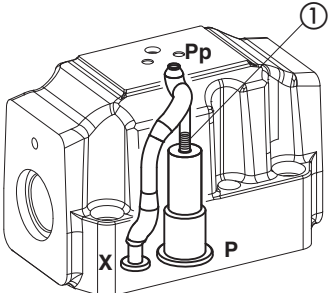
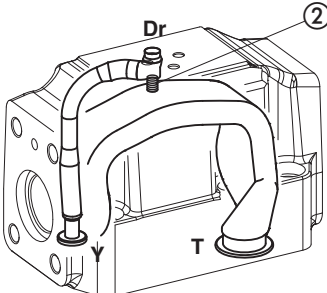
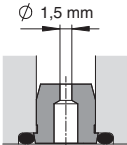
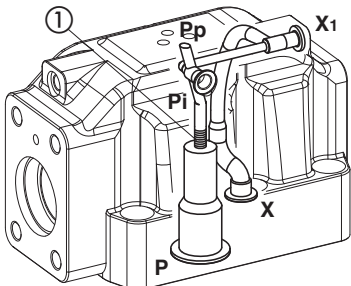
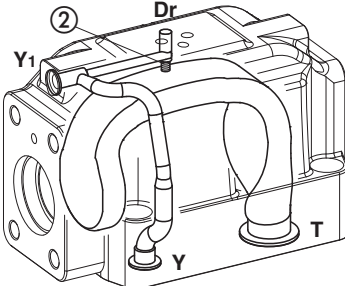
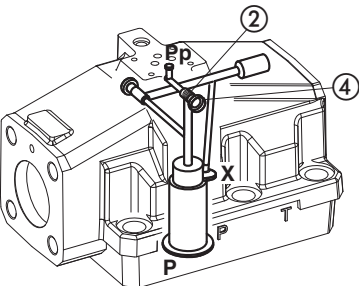
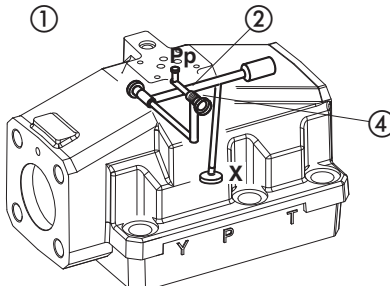
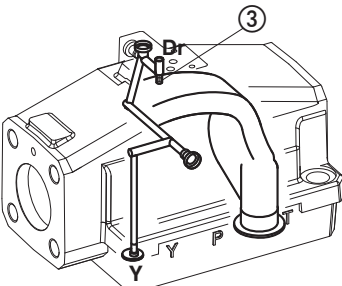
Valve model	Configuration		Piloting pressure					
			70 bar		140 bar		250 bar	
			Alternating current	Direct current	Alternating current	Direct current	Alternating current	Direct current
SDPHE-2	71, 61, 67, 61*/A, 67*/A	Switch ON	40	55	30	50	20	40
		Switch OFF	60					
	63, 63*/A	Switch ON	55	80	45	70	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

<b>SDPHE-2 Pilot channels</b>		<b>Drain channels</b>		<b>Internal piloting:</b> Without blinded plug SP-X300F ①; <b>External piloting:</b> Add blinded plug SP-X300F ①; <b>Internal drain:</b> Without blinded plug SP-X300F ②; <b>External drain:</b> Add blinded plug SP-X300F ②.  <b>Option L9</b> This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve	 PLUG-12A
					
<b>SDPHE-4 Pilot channels</b>		<b>Drain channels</b>		<b>Internal piloting:</b> Without blinded plug SP-X500F ①; <b>External piloting:</b> Add blinded plug SP-X500F ①; <b>Internal drain:</b> Without blinded plug SP-X300F ②; <b>External drain:</b> Add blinded plug SP-X300F ②.  <b>Option L9</b> This option provides a calibrated restrictor PLUG-H-15A (Ø 1,5 mm) in the P port of the pilot valve	 PLUG-15A
					
<b>SDPHE-6 Pilot channels</b>		<b>Pilot channels</b>		<b>Drain channels</b>	
					
<b>Internal piloting:</b> plug SP-X325A in pos ②;  To reach the orifice ②, remove plug ④ = G 1/8" Note: valve body is different from internal and external piloting		<b>External piloting:</b> plug SP-X325A in pos ②;		<b>Internal drain:</b> Without blinded plug SP-X300F ③; <b>External drain:</b> Add blinded plug SP-X300F ③.	

## 10 DIMENSIONS FOR SDPHE-2 [mm]

### SDPHE-2\*

ISO 4401: 2005

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

Fastening bolts:

4 socket head screws M10x50 class 12.9

Tightening torque = 70 Nm

2 socket head screws M6x45 class 12.9

Tightening torque = 15 Nm

Diameter of ports A, B, P, T:  $\varnothing = 20$  mm;

Diameter of ports X, Y:  $\varnothing = 7$  mm;

Seals: 4 OR 130, 2 OR 2043

P = PRESSURE PORT

A, B = USE PORT

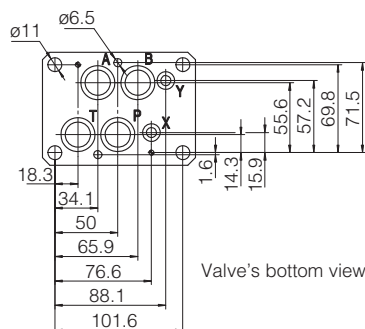
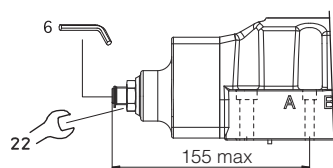
T = TANK PORT

X = EXTERNAL OIL

PILOT PORT

Y = DRAIN PORT

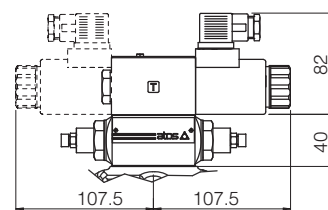
Stroke adjustment  
device for option /S



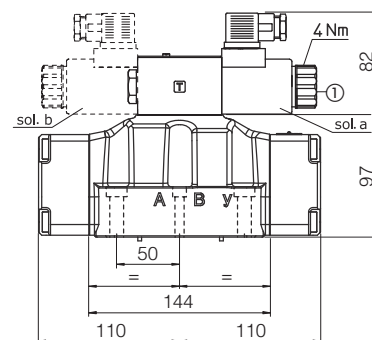
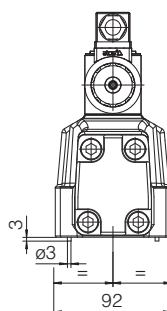
Valve's bottom view

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

### SDPHE-2\*/H



### 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:  $\varnothing = 24$  mm;

Diameter of ports X, Y:  $\varnothing = 7$  mm;

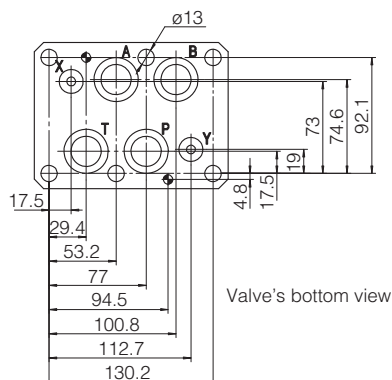
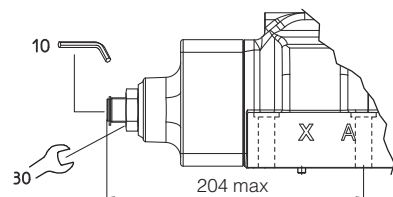
P = PRESSURE PORT

A, B = USE PORT

T = TANK PORT

X = EXTERNAL OIL PILOT PORT

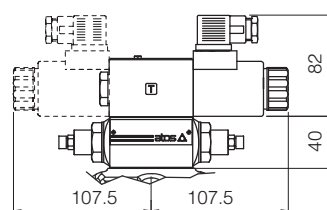
Y = DRAIN PORT



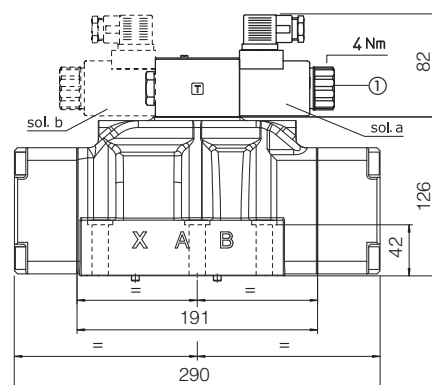
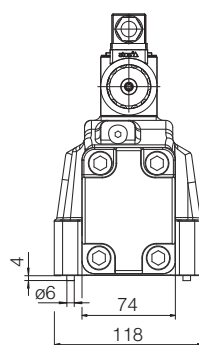
Valve's bottom view

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

### SDPHE-4\*/H



### SDPHE-4\*



Overall dimensions refer to valves with connectors type 666

① Standard manual override PIN

## 12 DIMENSIONS FOR DPH\*-6 [mm]

### SDPHE-6\*

ISO 4401: 2005

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

Fastening bolts:

6 socket head screws M20x80 class 12.9

Tightening torque = 600 Nm

Diameter of ports A, B, P, T:  $\varnothing = 34$  mm;

Diameter of ports X, Y:  $\varnothing = 7$  mm;

Seals: 4 OR 144, 2 OR 3056

**P** = PRESSURE PORT

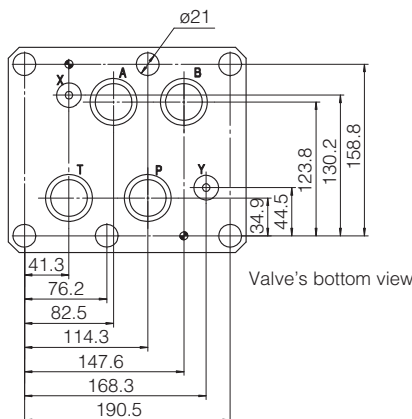
**A, B** = USE PORT

**T** = TANK PORT

**X** = EXTERNAL OIL

PILOT PORT

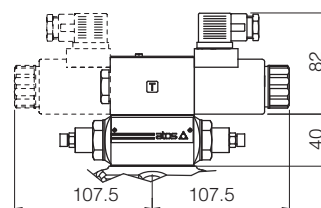
**Y** = DRAIN PORT



Valve's bottom view

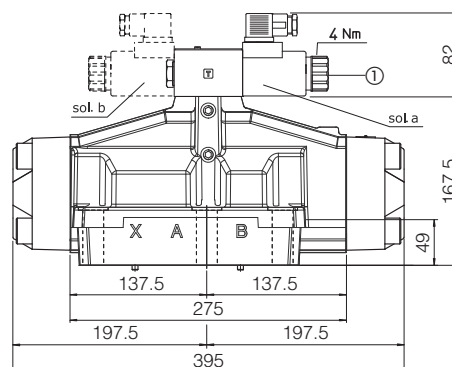
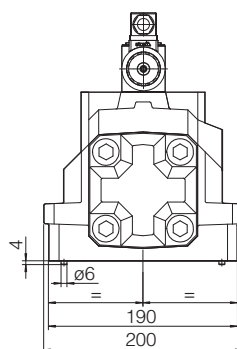
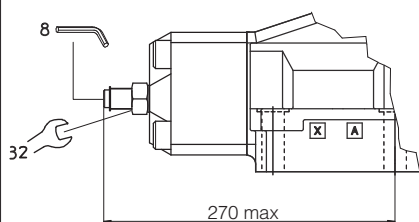
Mass (Kg)	
SDPHE-66	43,8
SDPHE-67	44,1
Option /S	+3,5
Option H	+1,0

### SDPHE-6\*/H



### SDPHE-6\*

Stroke adjustment device for option/S



Overall dimensions refer to valves with connectors type 666

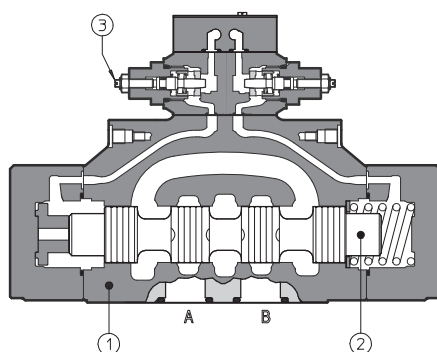
① Standard manual override PIN

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

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

# Hydraulic operated directional valves type SDP

Spool type



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

**SDP-4411/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**

Hydraulic operated directional control valve, size:

**SDP-2** = 16

**SDP-4** = 25

**SDP-6** = 32

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

**4**

**1**

**3**

**/**

**H**

**\*\***

Series number

**\***

Seals material, see section 4:

- = NBR

**PE** = FKM

**BT** = HNBR

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

Spool type, see section 2

## 2 CONFIGURATIONS and SPOOLS valves type SDP-\*

Configurations	Spools	Configurations	Spools
<p>41</p> <p>47</p> <p>51</p>	<p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p>	<p>43</p> <p>50</p>	<p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p>

### NOTES:

- For **SDP\*-6** are available only spools:  
**0, 1, 1/2, 2, 3, 4, 5, 58, 6, 7, 19, 91**

### 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

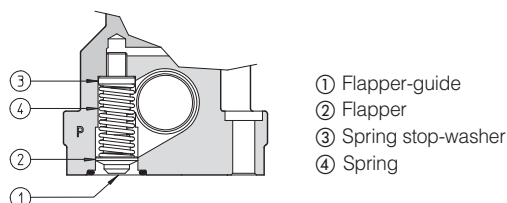
Assembly position / location	any position except for valves type SDP-*50 (without springs) that must be installed with their longitudinal axis horizontal		
Subplate surface finishing	roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further 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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

### 5 Q/ΔP DIAGRAMS

<b>SDP-2</b>	See note and diagrams on table SHE085 relating the SDPH*-2 valve from which SDP-2* are derived
<b>SDP-4</b>	See note and diagrams on table SHE085 relating the SDPH*-4 valve from which SDP-4* are derived
<b>SDP-6</b>	See note and diagrams on table SHE085 relating the SDPH*-6 valve from which SDP-6* are derived

### 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.





### 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

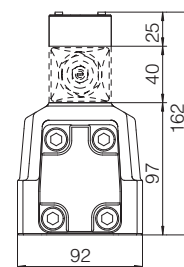
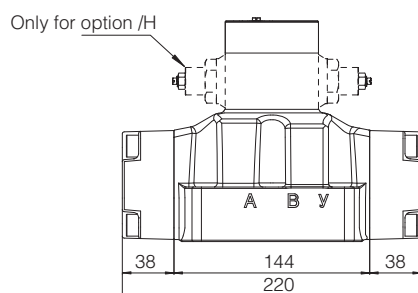
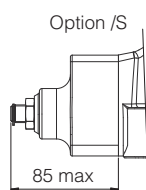
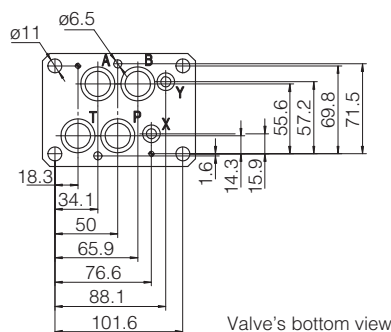
Tightening torque = 15 Nm

Diameter of ports A, B, P, T:  $\varnothing = 20$

Diameter of ports X, Y:  $\varnothing = 7$  mm

Diameter of port L:  $\varnothing = 5$  mm

Seals: 4 OR 130, 2 OR 2043



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

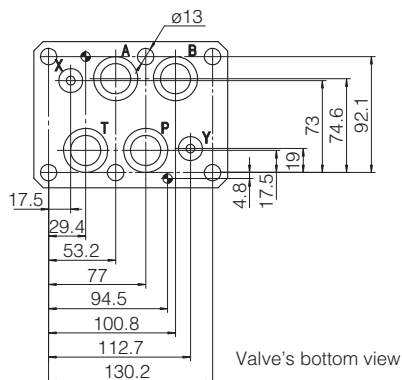
Tightening torque = 125 Nm

Diameter of ports A, B, P, T:  $\varnothing = 24$

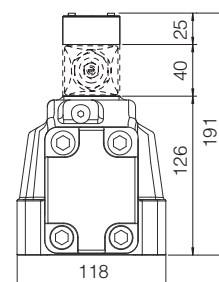
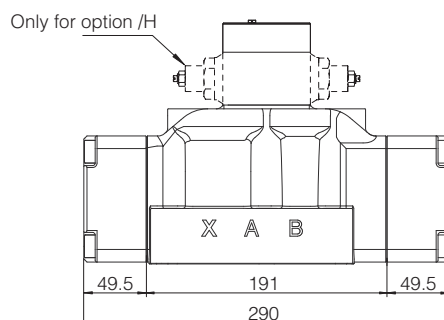
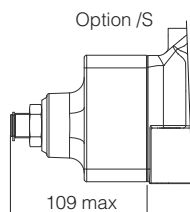
Diameter of ports X, Y:  $\varnothing = 7$  mm

Diameter of port L:  $\varnothing = 5$  mm

Seals: 4 OR 4112, 2 OR 3056



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

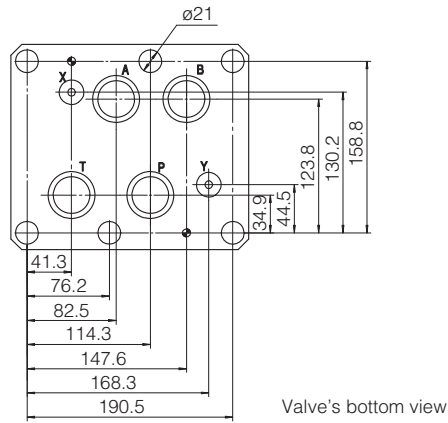
Tightening torque = 600 Nm

Diameter of ports A, B, P, T :  $\varnothing = 34$  mm

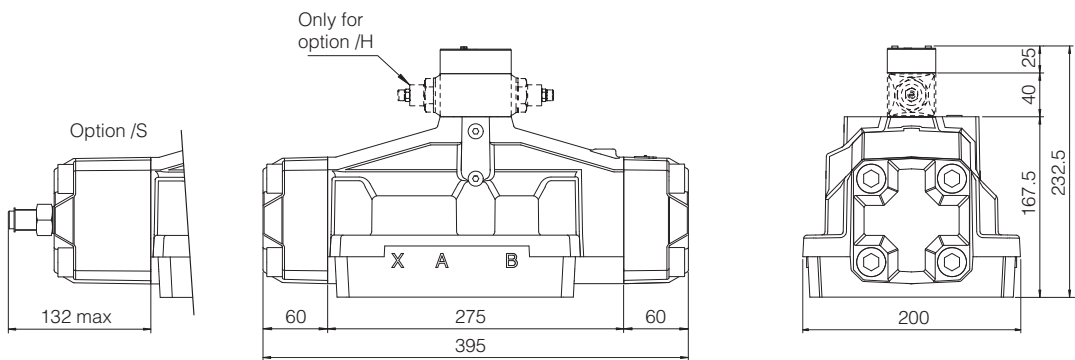
Diameter of ports X, Y:  $\varnothing = 7$  mm

Diameter of port L:  $\varnothing = 5$  mm

Seals: 4 OR 144, 2 OR 3056



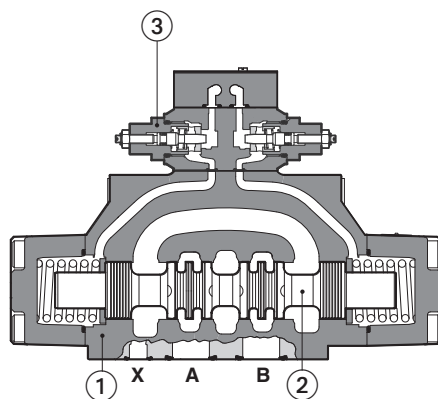
P = PRESSURE PORT  
A, B = USE PORT  
T = TANK PORT  
X = EXTERNAL OIL PILOT PORT  
Y = DRAIN PORT



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**

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

**4**

**1**

**3**

**/**

**H**

**\*\***

Series number

**\***

Seals material, see section 4:

- = NBR  
**PE** = FKM

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

Spool type, see section 2

## 2 CONFIGURATIONS and SPOOLS valves type SDPL-\*

Configurations	Spools	Configurations	Spools
<p>41</p> <p>47</p> <p>51</p>	<p>1 0 2</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>91</p> <p>19</p> <p>93</p> <p>39</p> <p>58</p>	<p>43</p> <p>50</p>	<p>1 0 2</p> <p>1/2</p> <p>2/2</p>

### 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		<b>SDPL-2</b>	<b>SDPL-4</b>
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

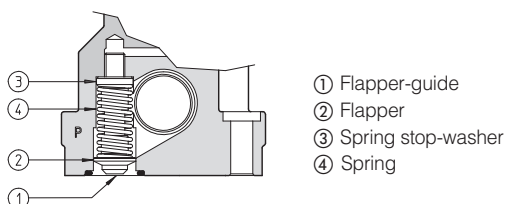
Assembly position / location	any position except for valves type SDPL-*50 (without springs) that must be installed with their longitudinal axis horizontal		
Subplate surface finishing	roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
MTTFd values according to EN ISO 13849	150 years, for further 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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

### 5 Q/ΔP DIAGRAMS

<b>SDPL-2</b>	See note and diagrams on table SHE085 relating the SDPH*-2 valve from which SDPL-2* are derived
<b>SDPL-4</b>	See note and diagrams on table SHE085 relating the SDPH*-4 valve from which SDPL-4* are derived

### 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.



### 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

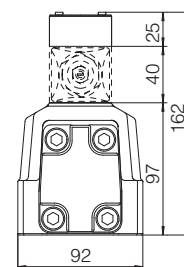
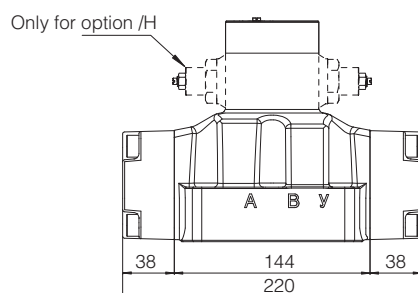
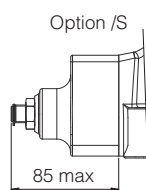
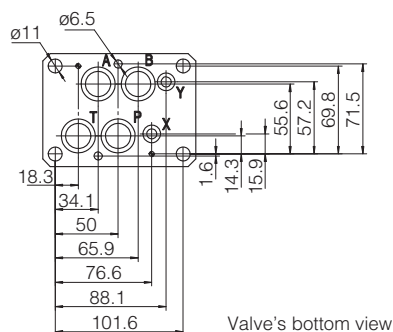
Tightening torque = 15 Nm

Diameter of ports A, B, P, T:  $\varnothing = 20$

Diameter of ports X, Y:  $\varnothing = 7$  mm

Diameter of port L:  $\varnothing = 5$  mm

Seals: 4 OR 130, 2 OR 2043



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

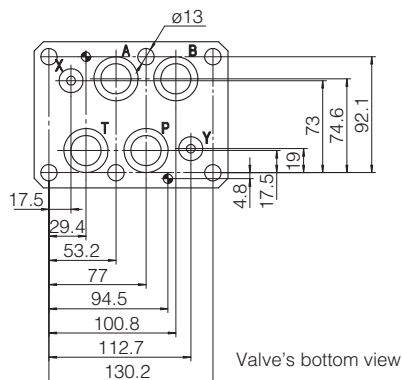
Tightening torque = 125 Nm

Diameter of ports A, B, P, T:  $\varnothing = 24$

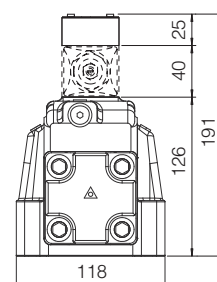
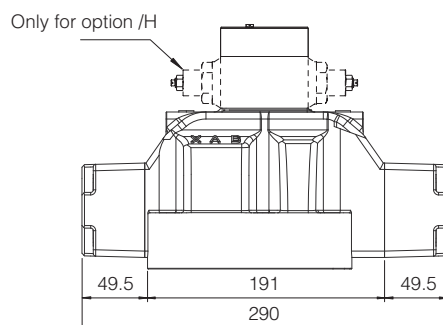
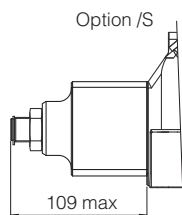
Diameter of ports X, Y:  $\varnothing = 7$  mm

Diameter of port L:  $\varnothing = 5$  mm

Seals: 4 OR 4112, 2 OR 3056



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

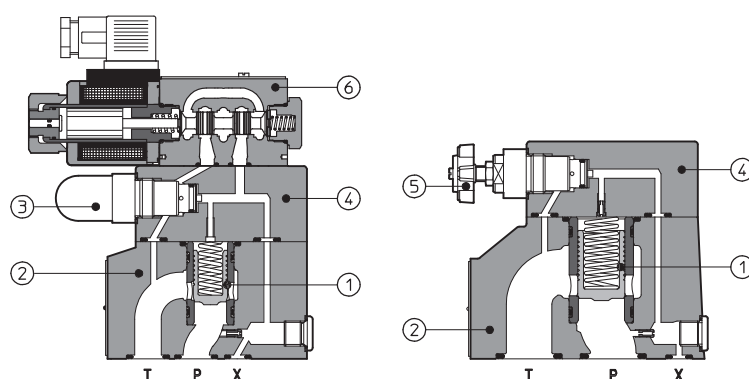


Mass: 16,5 Kg



## 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**

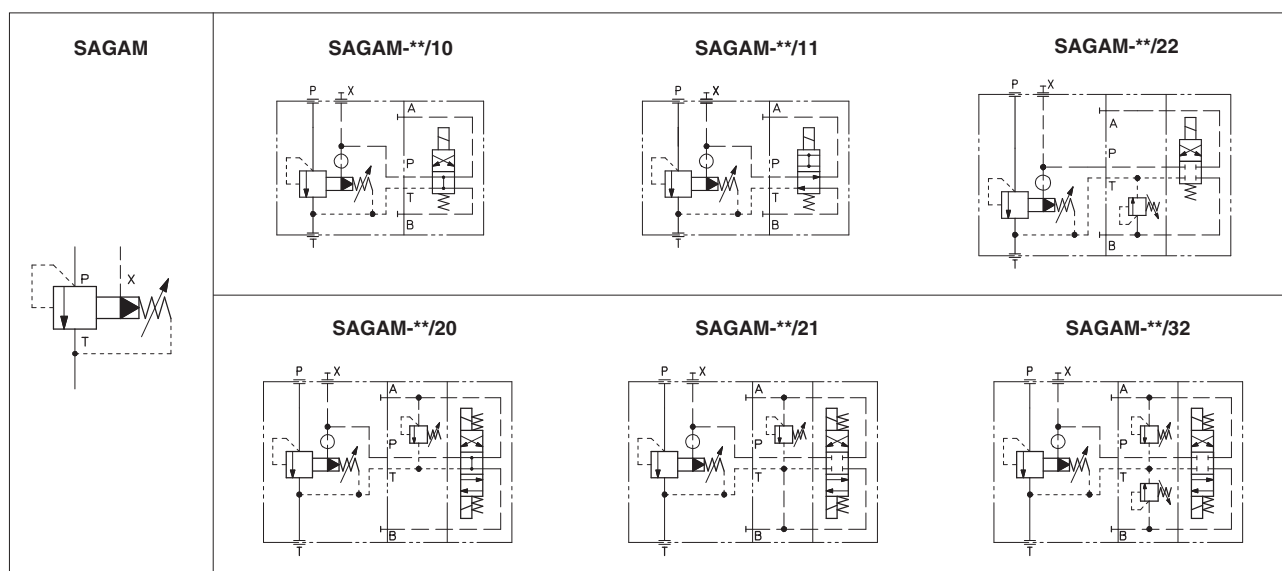
Max pressure up to **350 bar**

### 1 MODEL CODE

SAGAM	-	20	/	10	/	210	/	100/100	V	-	E	X	24DC	**	/	*
<p><b>SAGAM</b> = pressure relief valve subplate mounting</p> <p>Size: <b>10 20 32</b></p> <p>Setting pressure and venting option:            - = one setting pressure without option  <b>10</b> = one setting pressure with venting, with de-energized solenoid  <b>11</b> = one setting pressure with venting, with energized solenoid  <b>20</b> = two setting pressure with venting, with de-energized solenoid  <b>21</b> = two setting pressure with venting, with energized solenoid  <b>22</b> = two setting pressure without venting  <b>32</b> = three setting pressure without venting</p> <p>Setting: see section 4 for available setting</p> <p>Pressure range of second/third setting (1):  <b>50</b> = 4÷50 bar      <b>100</b> = 6÷100 bar  <b>210</b> = 7÷210 bar      <b>350</b> = 8÷350 bar</p>																
<p>Seals material, see section 11:            - = NBR  <b>PE</b> = FKM  <b>BT</b> = HNBR</p> <p>Series number</p> <p>Voltage code, see section 6 (1):</p> <p><b>X</b> = without connector (1):            See section 10 for available connectors, to be ordered separately  <b>-00-AC</b> = AC solenoid valve without coils  <b>-00-DC</b> = DC solenoid valve without coils</p> <p>Solenoid venting valve (1):  <b>E</b> = SDHE for AC and DC supply, with cURus certified solenoids  <b>L</b> = SDHL for AC and DC supply, compact execution</p> <p>Options, see section 7  <b>E V WP Y</b></p>																

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

## 2 HYDRAULIC SYMBOLS



## 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	<b>Standard</b> = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C <b>/BT</b> option = -40°C ÷ +70°C
Storage temperature range	<b>Standard</b> = -30°C ÷ +80°C <b>/PE</b> option = -20°C ÷ +80°C <b>/BT</b> 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	<b>H</b> (180°C) for DC coils; <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (with connectors correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See section 6
Supply voltage tolerance	± 10%
Certification	<b>cURus</b> 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	<b>12 DC</b>	666 or 667	30W	29W	COE-12DC	COL-12DC
14 DC	<b>14 DC</b>				COE-14DC	COL-14DC
110 DC	<b>110 DC</b>				COE-110DC	COL-110DC
220 DC	<b>220 DC</b>				COE-220DC	COL-220DC
110/50 AC (1)	<b>110/50/60 AC</b>	666 or 667	58VA (3)	58VA (3)	COE-110/50/60AC	COL-110/50/60AC
230/50 AC (1)	<b>230/50/60 AC</b>		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

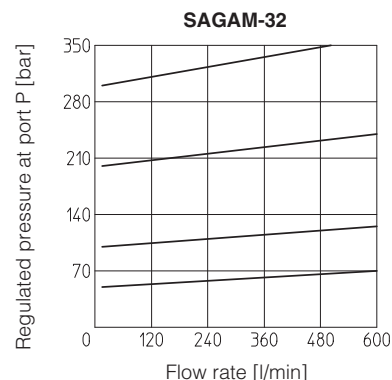
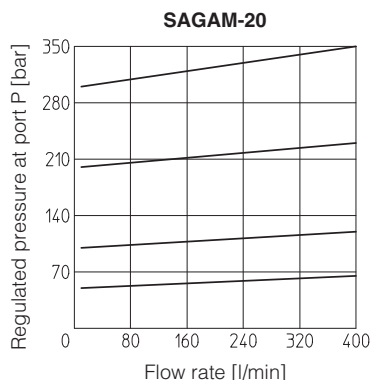
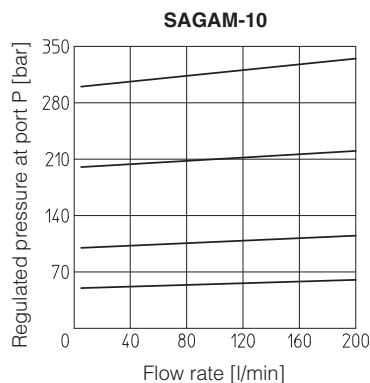
/E = external pilot

/V = regulating handwheel instead of grub screw protected by cap

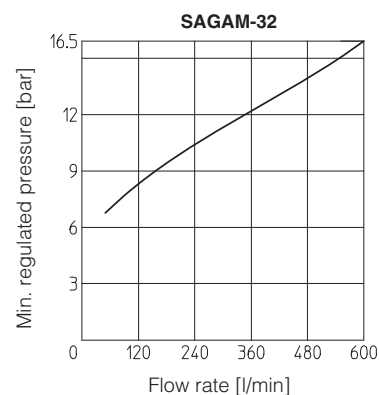
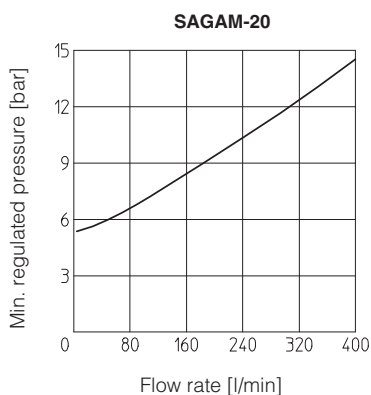
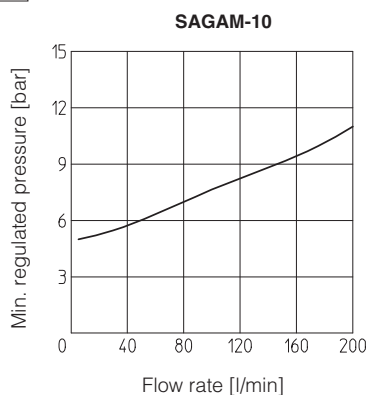
/WP = prolonged manual override protected by rubber cap (only for SAGAM with pilot solenoid valve)

/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



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



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

The connectors must be ordered separately

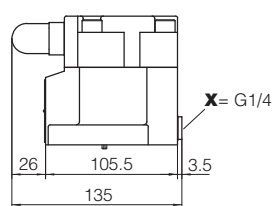
Code of connector	Function
<b>666</b>	Connector IP-65, suitable for direct connection to electric supply source
<b>667</b>	As 666 connector IP-65 but with built-in signal led, suitable for direct connection to electric supply source

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

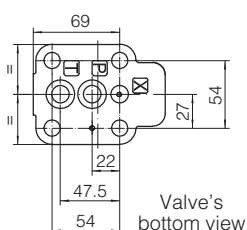
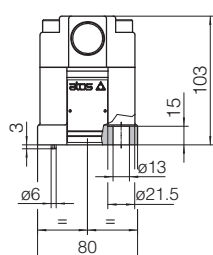
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at <a href="http://www.atos.com">www.atos.com</a> 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	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

**12 DIMENSIONS [mm]**

**SAGAM-10**



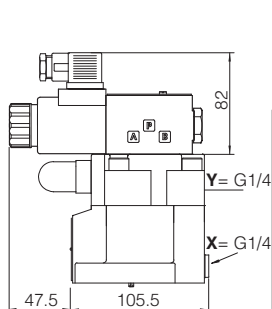
Mass: 3,6 Kg



**ISO 6264: 2007**

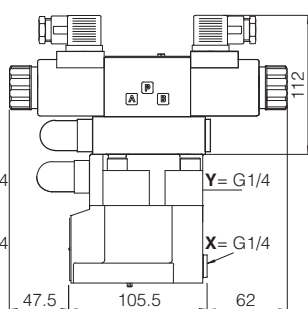
**Mounting surface: 6264-06-09-1-97**

Fastening bolts:  
4 socket head screws  
M12x35 class 12.9  
Tightening torque = 125 Nm  
Seals: 2 OR 123; 1 OR 109/70  
Ports P, T: Ø = 14,5 mm  
Ports X: Ø = 3,2 mm



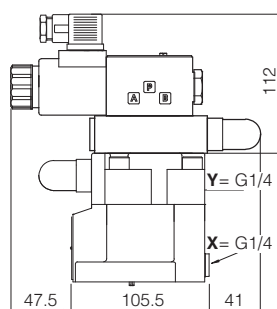
**SAGAM-10/10/\*\*-EX  
SAGAM-10/11/\*\*-EX**

Mass: 5,1 Kg



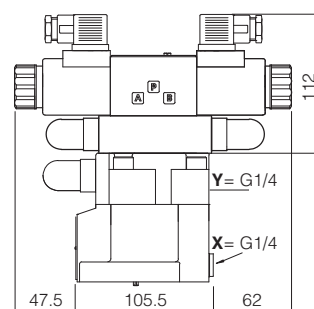
**SAGAM-10/20/\*\*-EX  
SAGAM-10/21/\*\*-EX**

Mass: 6,2 Kg



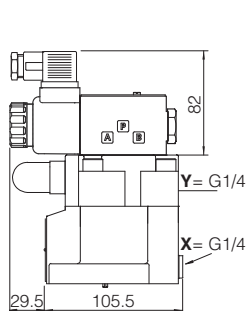
**SAGAM-10/22/\*\*-EX**

Mass: 5,9 Kg



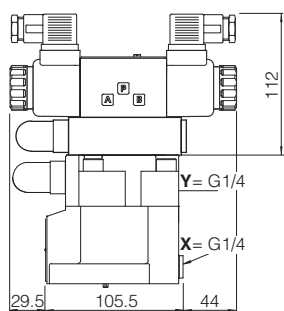
**SAGAM-10/32/\*\*-EX**

Mass: 6,3 Kg



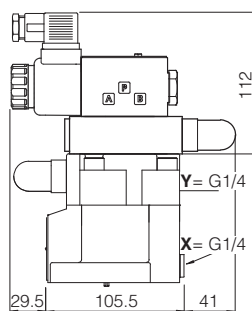
**SAGAM-10/10/\*\*-LX  
SAGAM-10/11/\*\*-LX**

Mass: 4,8 Kg



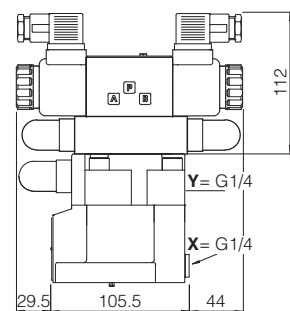
**SAGAM-10/20/\*\*-LX  
SAGAM-10/21/\*\*-LX**

Mass: 5,6 Kg



**SAGAM-10/22/\*\*-LX**

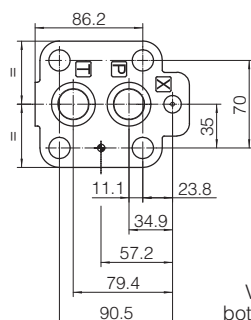
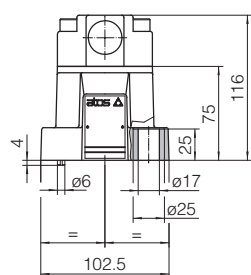
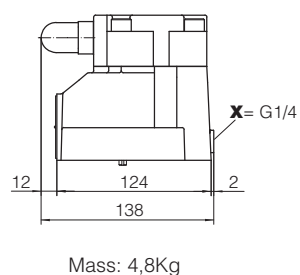
Mass: 5,6 Kg



**SAGAM-10/32/\*\*-LX**

Mass: 5,7 Kg

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



Valve's  
bottom view

**ISO 6264: 2007**

Mounting surface: 6264-08-11-1-97

Fastening bolts:

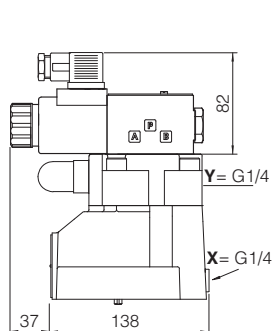
4 socket head screws M16x50 class 12.9

Tightening torque = 300 Nm

Seals: 2 OR 4112; 1 OR 109/70

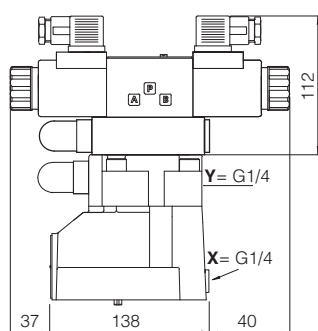
Ports P, T:  $\varnothing = 24$  mm

Ports X:  $\varnothing = 3,2 \text{ mm}$



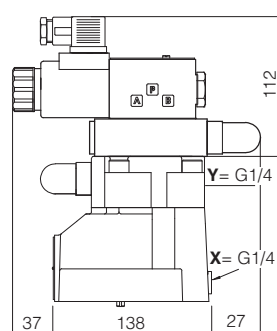
SAGAM-20/10/\*\*-EX  
SAGAM-20/11/\*\*-EX

Mass: 6,3 Kg



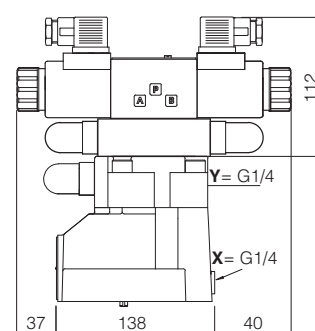
SAGAM-20/20/\*\*-EX  
SAGAM-20/21/\*\*-EX

Mass: 7,4 Kg



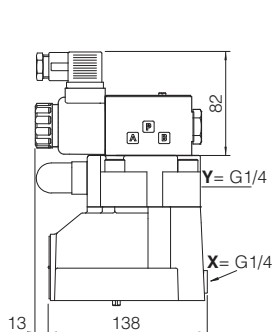
**SAGAM-20/22/\*\*-EX**

Mass: 7,1 Kg



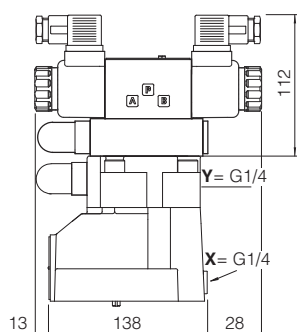
**SAGAM-20/32/\*\*-EX**

Mass: 7,5 Kg



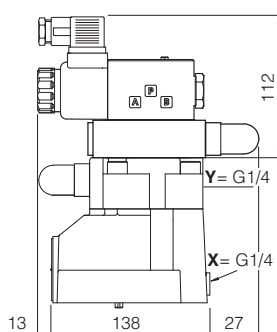
**SAGAM-20/10/\*\*-LX**  
**SAGAM-20/11/\*\*-LX**

Mass: 6 Kg



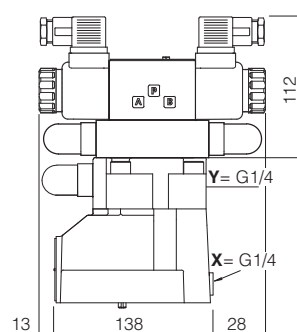
**SAGAM-20/20/\*\*-LX**  
**SAGAM-20/21/\*\*-LX**

Mass: 6,8Kg



**SAGAM-20/22/\*\*-LX**

Mass: 6,8 Kg

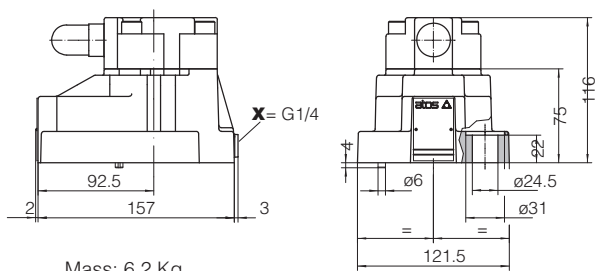


**SAGAM-20/32/\*\*-LX**

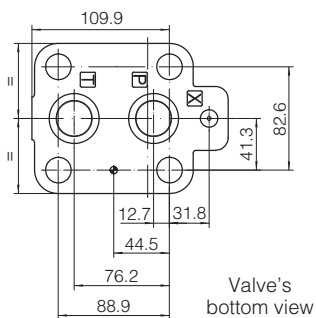
Mass: 7 Kg

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:

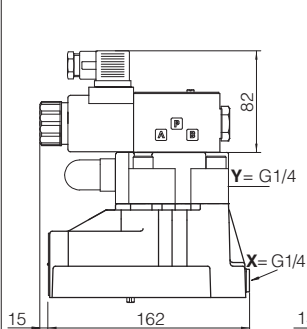
4 socket head screws M20x60 class 12.9

Tightening torque = 600 Nm

Seals: 2 OR 4131; 1 OR 109/70

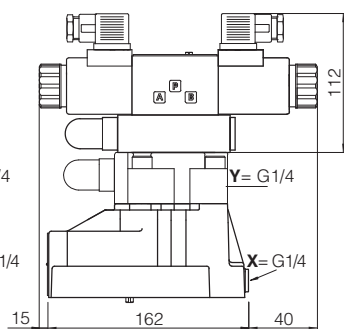
Ports P, T:  $\varnothing = 28,5$  mm

Ports X:  $\varnothing = 3,2$  mm



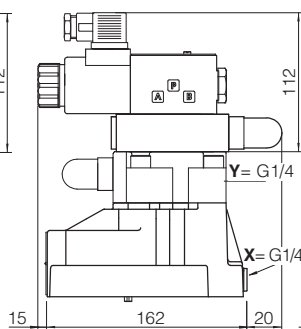
**SAGAM-32/10/\*\*-EX  
SAGAM-32/11/\*\*-EX**

Mass: 7,7 Kg



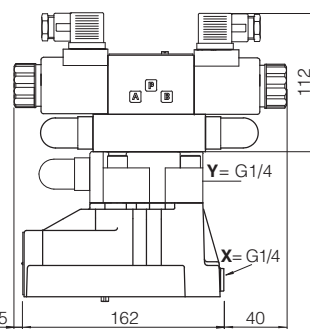
**SAGAM-32/20/\*\*-EX  
SAGAM-32/21/\*\*-EX**

Mass: 8,8 Kg



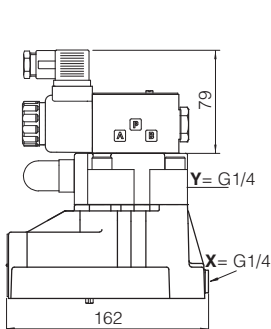
**SAGAM-32/22/\*\*-EX**

Mass: 8,5 Kg



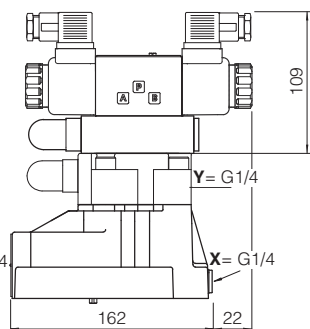
**SAGAM-32/32/\*\*-EX**

Mass: 8,9 Kg



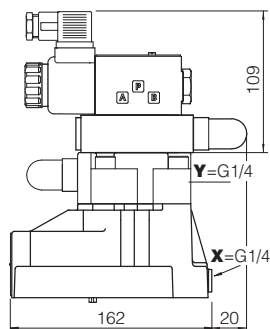
**SAGAM-32/10/\*\*-LX  
SAGAM-32/11/\*\*-LX**

Mass: 7,4 Kg



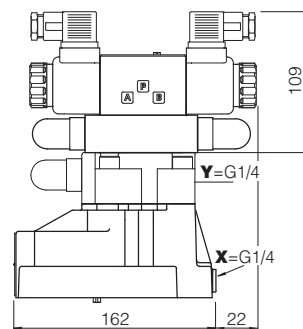
**SAGAM-32/20/\*\*-LX  
SAGAM-32/21/\*\*-LX**

Mass: 8,2 Kg



**SAGAM-32/22/\*\*-LX**

Mass: 8,2 Kg



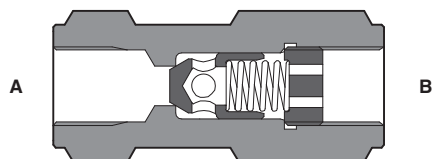
**SAGAM-32/32/\*\*-LX**

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

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

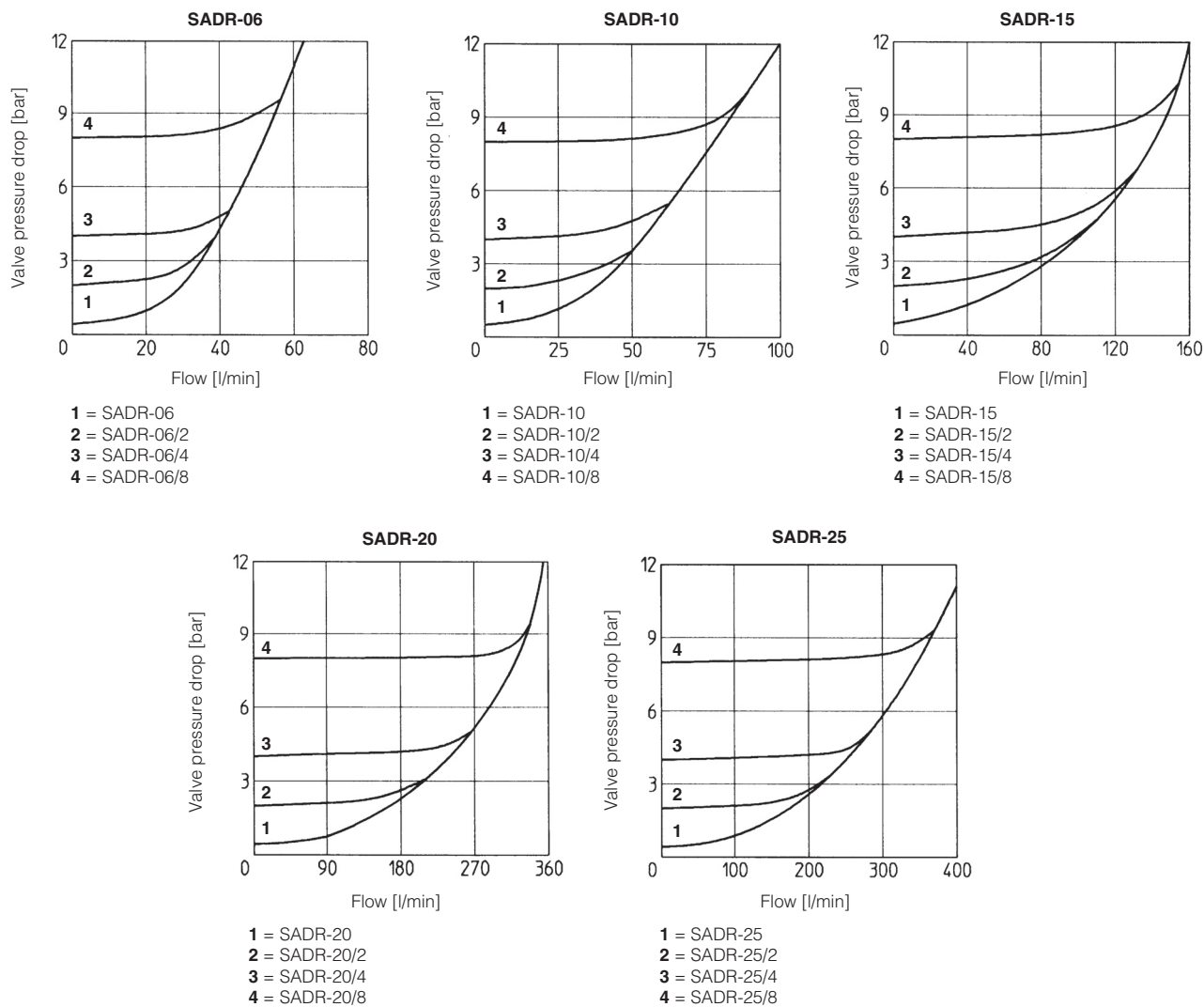
### 2 HYDRAULIC CHARACTERISTICS

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

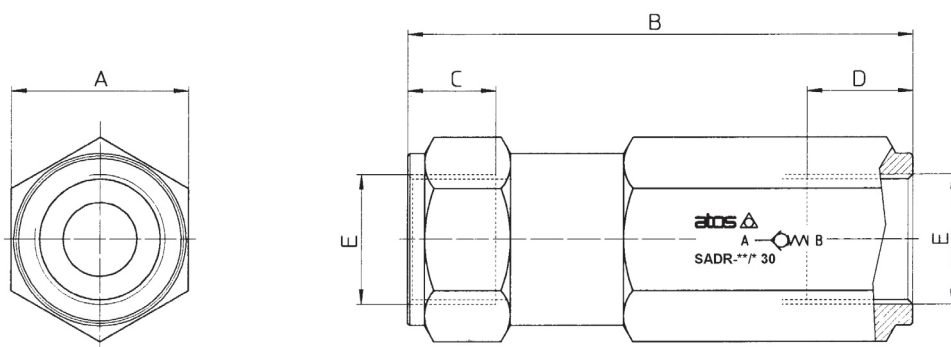
### 3 MAIN CHARACTERISTICS OF CHECK VALVES TYPE SADR

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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog
Fluid temperature	-20 ÷ +80°C
Flow direction	As shown in the symbol at section <a href="#">2</a>
Rated flow	See diagrams Q/Δp at section <a href="#">4</a>

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



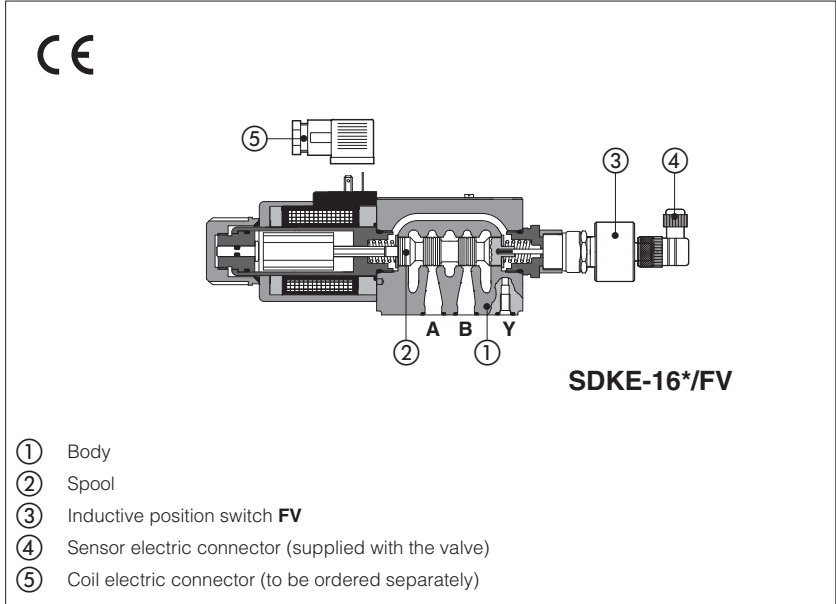
#### 5 DIMENSIONS [mm]



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

# Safety directional valves with spool position monitoring

On-off, direct operated



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**

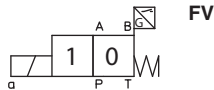
## 1 RANGE OF VALVE'S MODELS

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

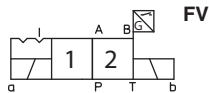
**Notes:**  
**FV** = inductive position switch providing both NO and NC contacts to be wired on the electric connector  
 See section 11 for sensor's characteristics

### 1.1 FV switch configurations

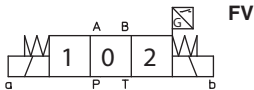
Single solenoid valves size 06 & 10 are provided with n° 1 FV switch for the spool position monitoring



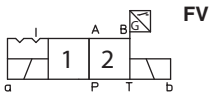
Double solenoid valves size 06 with detent are provided with n° 1 FV switch for the spool position monitoring



Double solenoid valves size 10 with detent 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 <b>SDHE</b> = max flow 80 l/min  <b>Size</b> ISO 4401 <b>0</b> = size 06  <b>Valve configuration</b> , see section 3 <b>61</b> =single solenoid, central plus external position, spring centered <b>63</b> =single solenoid, 2 external positions, spring offset <b>67</b> =single solenoid, external plus central position, spring offset Only for DC solenoid: <b>71</b> =double solenoid, 3 positions, spring centered <b>75</b> =double solenoid, 2 external positions, with detent  <b>Spool type</b> , see section 3  <b>Options</b> , see section 8									Seals material see sect. 6, 7 - = NBR <b>PE</b> = FKM  Series number
									<b>Voltage code</b> , see section 9  <b>X</b> = without connector, see section 10 for available connectors, to be ordered separately  <b>Spool position monitor:</b> <b>FV</b> = inductive position switch (double contact)

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

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

Configurations	Spoils	Configurations	Spoils
<b>61</b>  <b>61/A</b>  <b>67</b>  <b>67/A</b>  <b>71</b> 	          	<b>63</b>  <b>63/A</b>  <b>75</b> 	      

### 3.1 Configuration for spool \*/7

<b>SDHE-0612/7</b> 	<b>SDHE-0612/7/A</b> 	<b>SDHE-0615/7</b> 	<b>SDHE-0615/7/A</b> 
<b>SDHE-0616/7</b> 	<b>SDHE-0616/7/A</b> 	<b>SDHE-0617/7</b> 	<b>SDHE-0617/7/A</b> 

### 3.2 Special shaped spools for SDHE

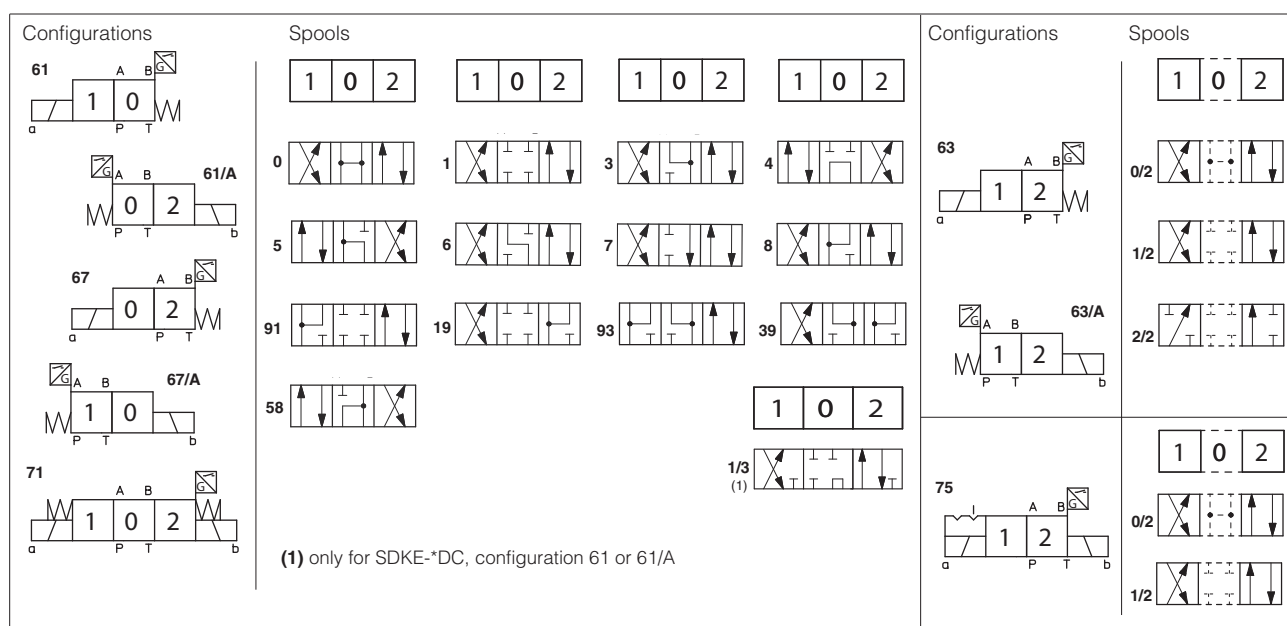
- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1**, **4**, **5** and **58** are also available as **1/1**, **4/8**, **5/1** and **58/1**.  
They are properly shaped to reduce water-hammer shocks during the swithcing.
- 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.



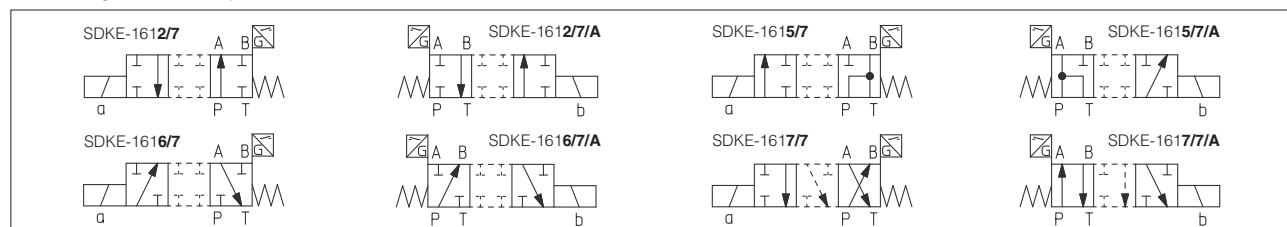
#### 4 MODEL CODE OF SDKE/FV

<b>SDKE</b>	-	<b>1</b>	<b>63</b>	<b>1/2</b>	/	<b>A</b>	/	<b>FV</b>	-	<b>X</b>	<b>24DC</b>	<b>**</b>	/	<b>*</b>
Directional control valve size 10														
<b>Size</b> ISO 4401 1 = size 10														
<b>Valve configuration</b> , see section 5 <b>61</b> =single solenoid, central plus external position, spring centered <b>63</b> =single solenoid, 2 external positions, spring offset <b>67</b> =single solenoid, external plus central position, spring offset Only for DC solenoid: <b>71</b> =double solenoid, 3 positions, spring centered <b>75</b> =double solenoid, 2 external positions, with detent														
<b>Spool type</b> , see section 5														
<b>Options</b> , see section 8														
<b>SDKE/FV are always provided with Y drain port</b> <b>(1)</b> the <b>FV</b> inductive position switch provides both NC and NO contacts														
<b>Seals material</b> see sect. 6,7 - = NBR PE = FKM														
Series number														
<b>Voltage code</b> , see section 9														
<b>X</b> = without connector, see section 10 for available connectors, to be ordered separately														
<b>Spool position monitor:</b> <b>FV</b> = inductive position switch (double contact)														

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



##### 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	<b>Standard</b> = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 3 and 5
<b>Operating pressure</b>	<b>SDHE</b> P, A, B = <b>350 bar</b> T = <b>210 bar</b> (DC solenoid); <b>160 bar</b> (AC solenoid)
	<b>SDKE</b> P, A, B = <b>350 bar</b> T = (with Y port not connected to tank) <b>210 bar</b> (DC solenoid); <b>120 bar</b> (AC solenoid) T = (with Y port drained to tank) <b>250 bar</b>
<b>Rated flow</b>	see diagrams Q/Δp at section 14
<b>Maximum flow</b>	<b>SDHE</b> <b>80 l/min</b> see section 15
	<b>SDKE</b> <b>150 l/min</b> see section 15

### 6.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils (all versions) <b>F</b> (155°C) for AC coils (SDHE, SDKE) Due to the occurring 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	<b>IP 65</b> (with connectors correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 9
Supply voltage tolerance	± 10%
Certification	<b>cURus</b> 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		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDD, 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

### 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		669	100 VA (3)
230/50/60 AC	230/50/60 AC	CAE-230/50/60AC (1)		
110/50/60 AC	110 DC	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

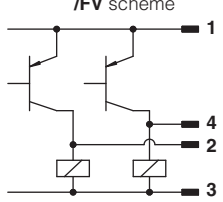
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.

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

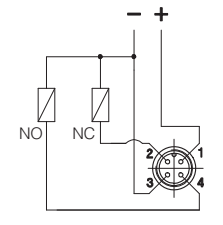
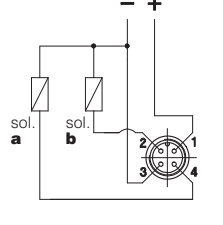
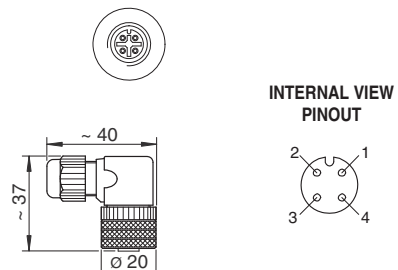
## 10

<p><b>666, 667</b> (for AC or DC supply)</p>  <p>Dimensions: 28.5, 27, 42, 30, 27</p> <p>Pinout: 1 (Positive), 2 (Negative), 3 (Coil ground)</p>	<p><b>669</b> (for AC supply)</p>  <p>Dimensions: 39.5, 29, 42.5, 30, 29</p> <p>Pinout: 1 (Positive), 2 (Negative), 3 (Coil ground)</p>	<p><b>CONNECTOR WIRING</b></p> <p><b>666, 667</b></p> <p>1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground</p> <p><b>669</b></p> <p>1,2 = Supply voltage VAC 3 = Coil ground</p>
<p><b>SUPPLY VOLTAGES</b></p>		
<p><b>666</b></p> <p>All voltages</p>	<p><b>667</b></p> <p>24 AC or DC 110 AC or DC 220 AC or DC</p>	<p><b>669</b></p> <p>110/50 AC 110/60 AC 230/50 AC</p>

# 11 TECHNICAL CHARACTERISTICS OF INDUCTIVE PROXIMITY AND POSITION SWITCHES

Type of switch	/FV position switch	 <p>1 supply +24 VDC 2 output signal 3 GND 4 output signal</p>
Supply voltage [V]	20÷32	
Ripple max [%]	≤ 10	
Max current [mA]	400	
Max peak pressure [bar]	400	
Mechanical life	virtually infinite	
Switch logic	PNP	

# 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 <b>ZBE-06</b>
<p>Connector type <b>ZBE-06</b> IP65</p>  <p>1 = supply +24 VDC 2 = output signal NC 3 = GND 4 = output signal NO</p>	<p>Connector type <b>ZBE-06</b> IP65</p>  <p>1 = supply +24 VDC 2 = output signal sol.b 3 = GND 4 = output signal sol.a</p>	 <p>INTERNAL VIEW PINOUT</p>

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

# 13 STATUS OF OUTPUT SIGNAL

## Signal status for standard version

SDHE - SDKE	Configuration 61	Configuration 63	Configuration 67	Configuration 71	Configuration 75	
Hydraulic configuration						
spool position	1 0	1 2	0 2	1 0 2	1 2	
pin 2	ON	ON	ON	ON	ON	
pin 2	OFF	OFF	OFF	OFF	OFF	
pin 4	ON	ON	ON	ON	ON	
pin 4	OFF	OFF	OFF	OFF	OFF	

**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

SDHE - SDKE	Configuration 61/A	Configuration 63/A	Configuration 67/A	Configuration 71/A	Configuration 75/A	
Hydraulic configuration						
spool position	0 2	0 2	0 2	1 0 2	1 2	
pin 2	ON	ON	ON	ON	ON	
pin 2	OFF	OFF	OFF	OFF	OFF	
pin 4	ON	ON	ON	ON	ON	
pin 4	OFF	OFF	OFF	OFF	OFF	

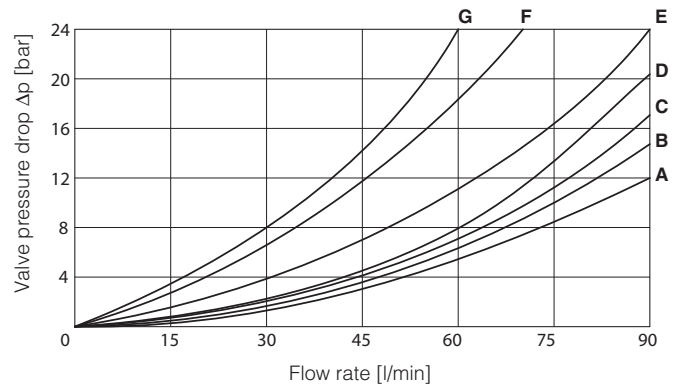
**Note:** FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

 = intermediate spool position corresponding to the hydraulic configuration change

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

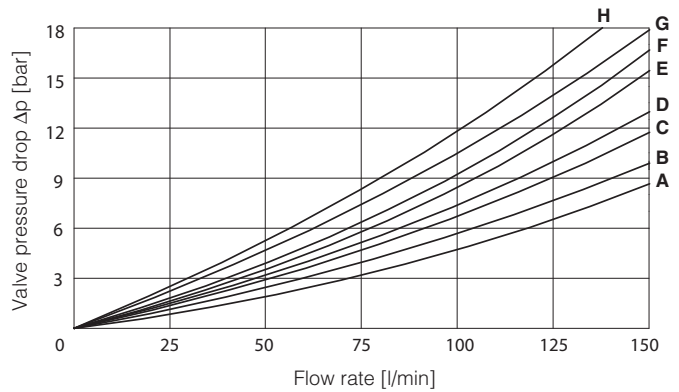
**SDHE**

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		



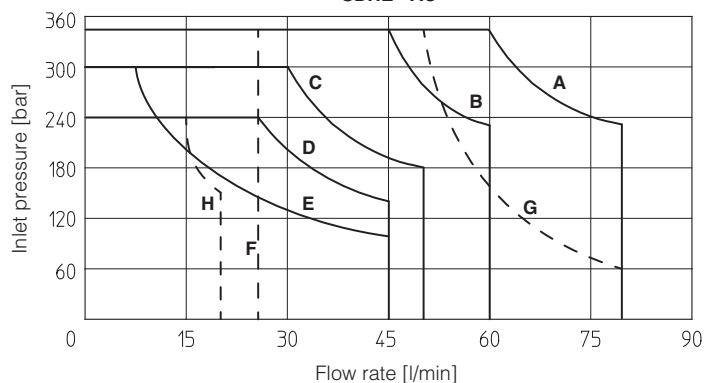
**15 OPERATING LIMITS** based on mineral oil ISO VG 46 at 50°C

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.

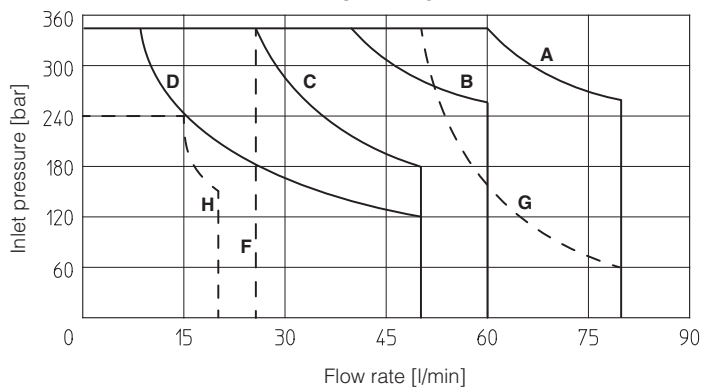
**SDHE**

Curve	Spool type	
	AC	DC
<b>A</b>	1, 1/2	0, 0/1, 1, 1/2, 3
<b>B</b>	0, 0/1, 0/2, 1/1, 1/9, 3	0/2, 1/1, 6, 7, 1/9, 19
<b>C</b>	3, 3/1, 6, 7	3/1, 4, 4/8, 5, 5/1, 19, 58, 58/1, 91
<b>D</b>	4, 4/8, 5, 5/1, 19, 58, 58/1, 91	2, 2/2
<b>E</b>	2, 2/2	-
<b>F</b>	2/7, 6/7	2/7, 6/7
<b>G</b>	5/7	5/7
<b>H</b>	7/7	7/7

**SDHE - AC**



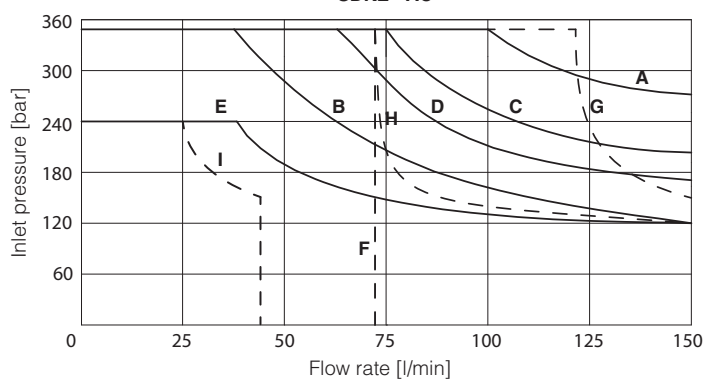
**SDHE - DC**



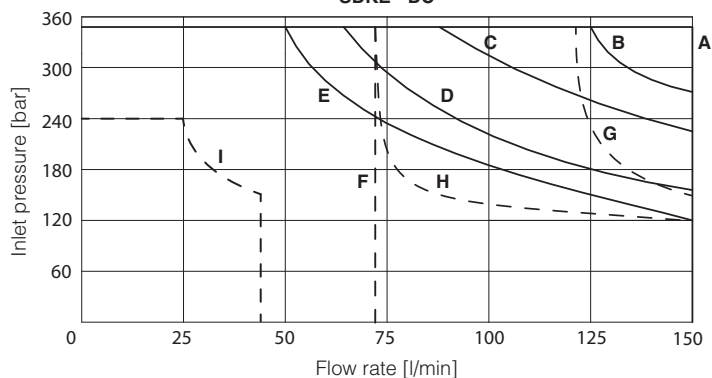
**SDKE**

Curve	Spool type	
	AC	DC
<b>A</b>	0/1	0, 0/1, 1, 1/1, 3, 3/1, 1/2, 0/2, 8
<b>B</b>	4, 5, 19, 91	6, 7
<b>C</b>	0, 1/1, 3, 3/1	19, 91
<b>D</b>	1, 1/2, 0/2	4, 5
<b>E</b>	6, 7, 8, 2/2	2/2
<b>F</b>	2/7	2/7
<b>G</b>	5/7	5/7
<b>H</b>	6/7	6/7
<b>I</b>	7/7	7/7

**SDKE - AC**

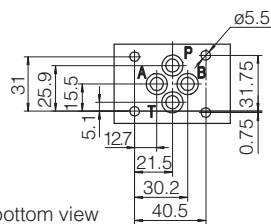


**SDKE - DC**



16 DIMENSIONS FOR SDHE/FV and SDKE/FV VALVES [mm]

## 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:  $\varnothing = 7.5$  mm (max)

P = PRESSURE PORT

A, B = USE PORT

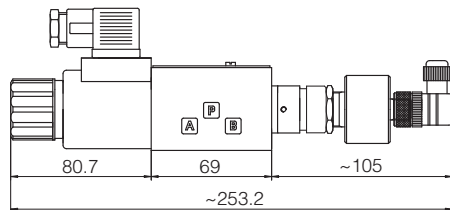
T = TANK PORT

### option /A

Single solenoid valves: solenoid mounted at side of port B.

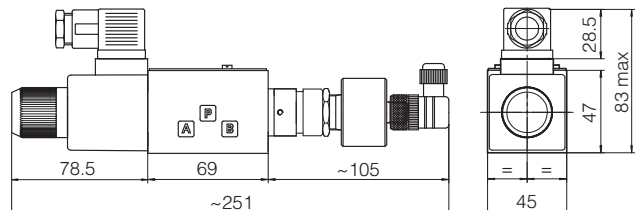
Double solenoid valves SDHE/FV(DC): FV inductive position switch mounted at side of port A

## SDHE-06\*/FV (DC)



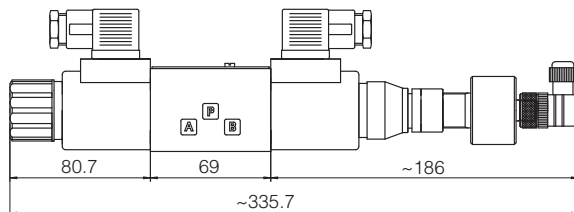
Mass: kg 1,95

## SDHE-06\*/FV (AC)

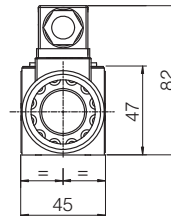


Mass: kg 1,8

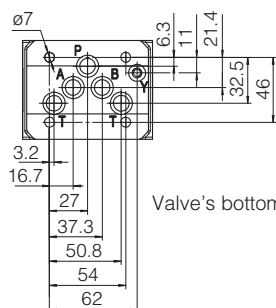
## SDHE-07\*/FV (DC)



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:  $\varnothing = 11.5$  mm (max)

Ports Y:  $\varnothing = 5$  mm

P = PRESSURE PORT

A, B = USE PORT

T = TANK PORT

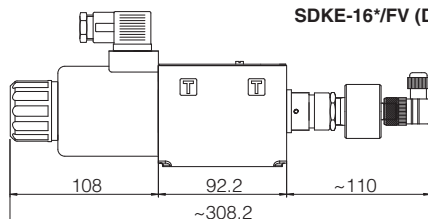
Y = DRAIN PORT

### option /A

Single solenoid valves: solenoid mounted at side of port B.

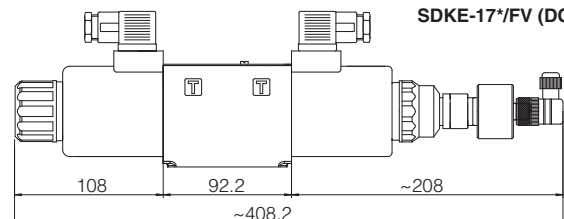
Double solenoid valves SDKE/FV(DC): FV inductive position switch mounted at side of port A

## SDKE-16\*/FV (DC)



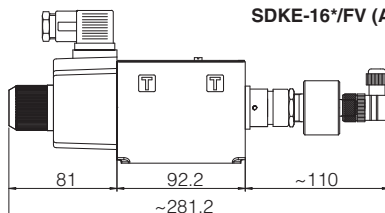
Mass: kg 4,4

## SDKE-17\*/FV (DC)



Mass: kg 5,9

## SDKE-16\*/FV (AC)



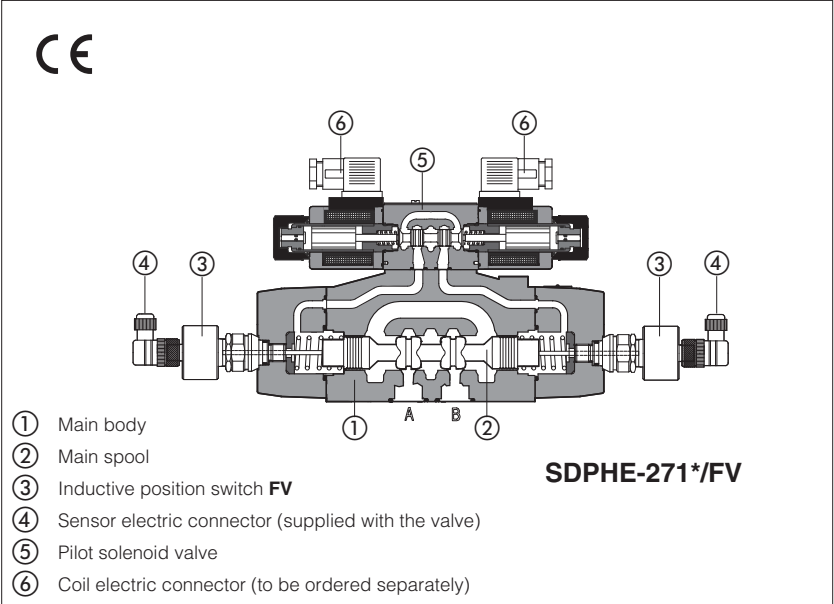
Mass: kg 3,8





**Safety directional valves with spool position monitoring**

On-off, piloted



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 ⑦ 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**

<b>SDPH</b>	<b>E</b>	-	<b>2</b>	<b>71</b>	<b>1</b>	/	<b>A</b>	/	<b>FV</b>	<b>X</b>	<b>24DC</b>	<b>**</b>	/	<b>*</b>
Pilot operated directional control valve														Seals material see sect. ③,④ - = NBR <b>PE</b> = FKM
<b>Solenoid pilot valve:</b> <b>E</b> = SDHE for AC and DC supply, high performances with <b>cURus</b> certified solenoids														Series number
<b>Valve size, ISO 4401:</b> <b>2</b> = 16 <b>4</b> = 25														<b>Voltage code</b> , see section ⑦
<b>Valve configuration</b> , see section ②: <b>61</b> = single solenoid, center plus external position, spring centered <b>63</b> = single solenoid, 2 external positions, spring offset <b>67</b> = single solenoid, center plus external position, spring offset <b>71</b> = double solenoid, 3 positions, spring centered <b>75</b> = double solenoid, 2 external positions, with detent														<b>X</b> = without connector, see section ⑧ for available connectors, to be ordered separately
<b>Spool type</b> , see section ②														<b>Spool position monitor</b> <b>FV</b> = inductive position switch (double contact)
														<b>Hydraulic options</b> , see section ⑤ <b>A, D, E, R</b> Optional devices for main spool switching control, see section ⑥ <b>H, H9, L9</b>

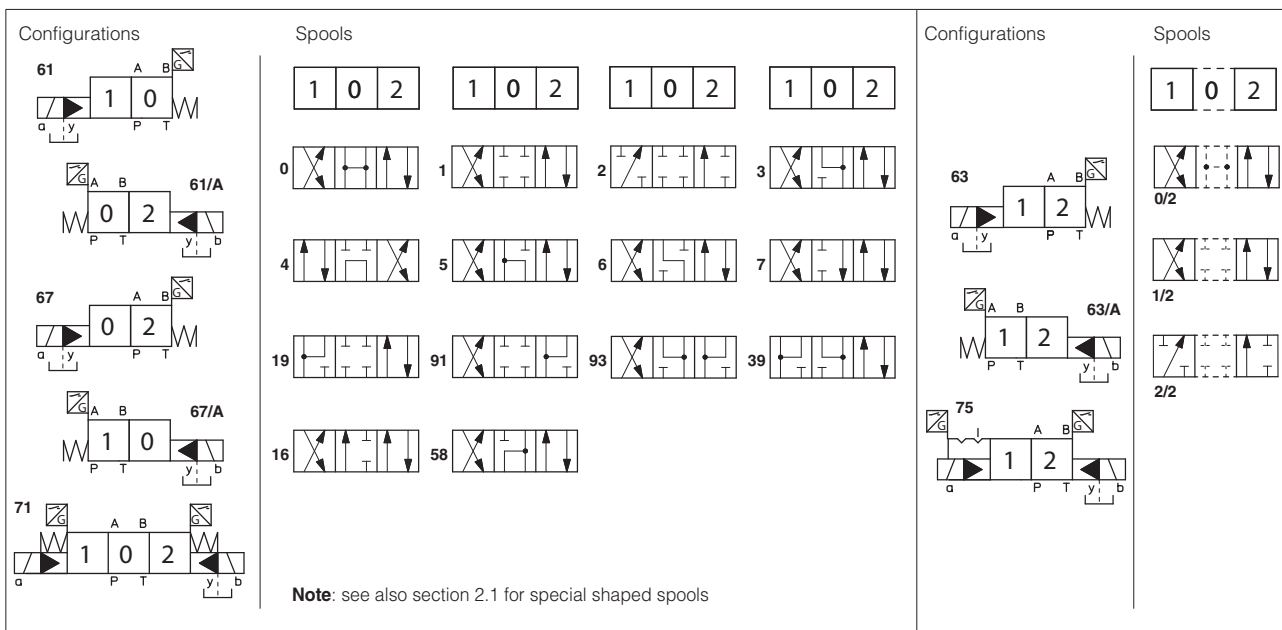
**Notes:**

**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	<b>Standard</b> = -30°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 2
<b>Operating pressure</b>	P, A, B, X = <b>350 bar</b> (for pilot pressure see also option /L9 at section 6) T = <b>250 bar</b> for external drain (standard) T with internal drain (option /D) = <b>210 bar</b> SDPHE (DC); <b>160 bar</b> SDPHE (AC) Y = 0 bar Minimum pilot pressure for correct operation is <b>8 bar</b>
<b>Maximum flow</b>	SDPHE-2: <b>300 l/min</b> ; SDPHE-4: <b>700 l/min</b> (see Q/Δp diagrams at section 12 and operating limits at section 13)

### 3.1 Coils characteristics

Insulation class	<b>H</b> (180°C) for DC coils <b>F</b> (155°C) for AC coils Due to the occurring 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	<b>IP 65</b> (with connectors correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 7
Supply voltage tolerance	± 10%
Certification	<b>cURus</b> 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 <a href="http://www.atos.com">www.atos.com</a> 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 <sup>[16]</sup>

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

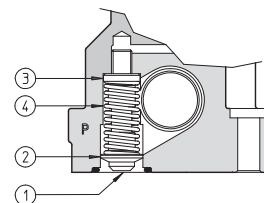
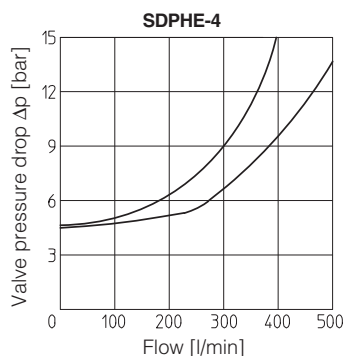
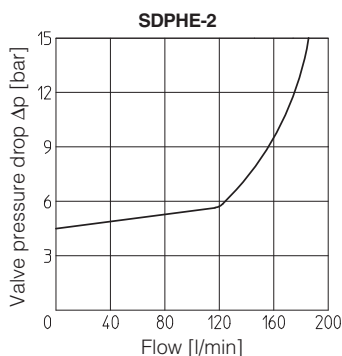
**5.3 option /E** = External pilot pressure (standard configuration is internal pilot pressure)

**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

<b>R/DP</b>	-	<b>*</b>
Pilot pressure generator		Size: <b>2</b> for SDPHE-2 <b>4</b> 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)

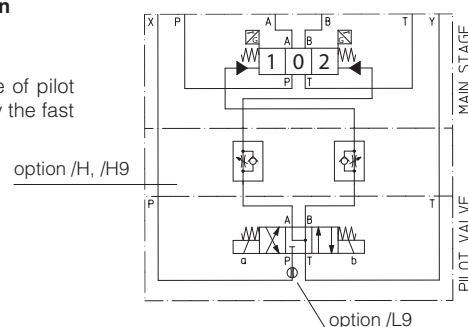
**6.3 option /L9** = Plug with calibrated restrictor in P port of pilot valve, suggested in case of pilot pressure higher than 210 bar or to limit the hydraulics shocks caused by the fast main spool switching

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

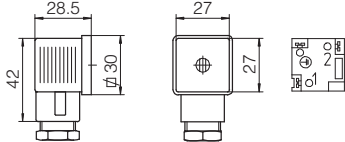
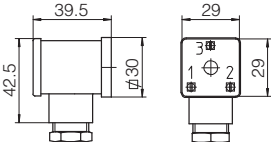
Valve code	External supply nominal voltage $\pm 10\%$	Voltage code	Type of connector	Power consumption (2)	Code of spare coil DHE
SDPHE	12 DC	<b>12 DC</b>	666 or 667	30 W	COE-12DC
	14 DC	<b>14 DC</b>			COE-14DC
	24 DC	<b>24 DC</b>			COE-24DC
	28 DC	<b>28 DC</b>			COE-28DC
	110 DC	<b>110 DC</b>			COE-110DC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

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by  $10 \pm 15\%$  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.

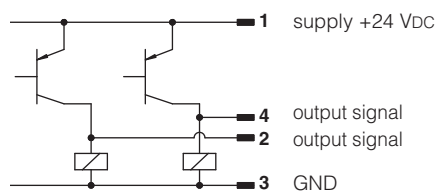
(3) When solenoid is energized, the inrush current is approx 3 times the holding current.

## 8 COILS ELECTRIC CONNECTORS according to din 43650 (to be ordered separately)

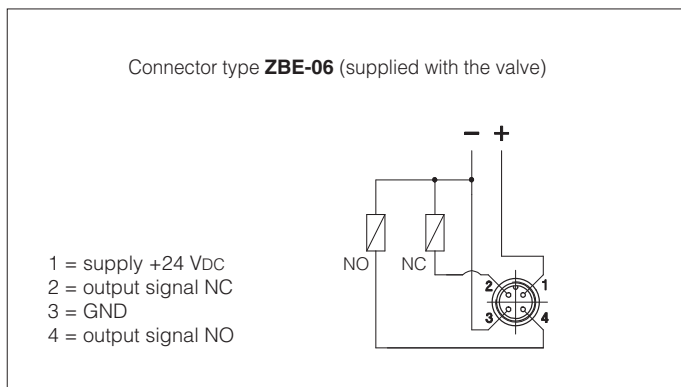
666, 667 (for AC or DC supply)	669 (for AC supply)	CONNECTOR WIRING		
		<b>666, 667</b> 1 = Positive $\oplus$ 2 = Negative $\ominus$ $\oplus$ = Coil ground		<b>669</b> 1,2= Supply voltage VAC 3 = Coil ground
		SUPPLY VOLTAGES		
		<b>666</b> All voltages	<b>667</b> 24 AC or DC 110 AC or DC 220 AC or DC	<b>669</b> 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 [%]	$\leq 10$	
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



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

## 11 STATUS OF OUTPUT SIGNAL

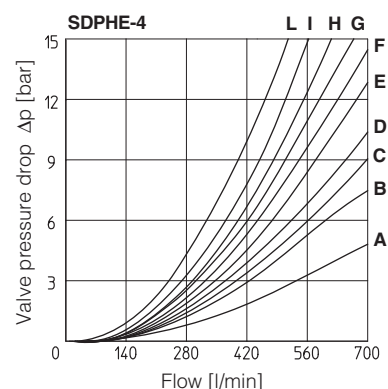
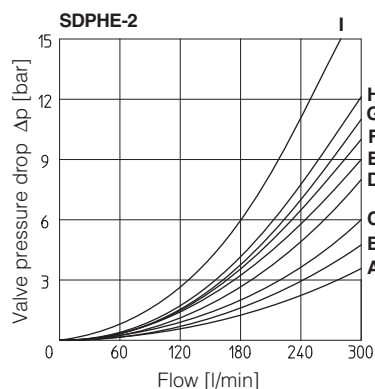
SDPHE	Configuration 61 monitored position "0"	Configuration 63 monitored position "2"	Configuration 67 monitored position "2"	Configuration 71 monitored position "0"	Configuration 75 monitored position "2"
Hydraulic configuration					
spool position	1 0	1 2	0 2	1 0 2	1 2
sensor	pin 2 ON				
	pin 2 OFF				
pin 4	ON				
	OFF				
sensor side a	pin 2 ON				
	pin 2 OFF				
pin 4	ON				
	OFF				
sensor side b	pin 2 ON				
	pin 2 OFF				
pin 4	ON				
	OFF				

### 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**

Flow direction	P→A	P→B	A→T	B→T	P→T
Spool type					
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**

Flow direction	P→A	P→B	A→T	B→T	P→T
Spool type					
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
<b>SDPHE-2</b>	Switch ON	40 ÷ 55	55 ÷ 80	30 ÷ 45	50 ÷ 70	20 ÷ 35	40 ÷ 55
	Switch OFF	60 ÷ 95					
<b>SDPHE-4</b>	Switch ON	60 ÷ 95	80 ÷ 115	45 ÷ 75	60 ÷ 95	30 ÷ 50	45 ÷ 65
	Switch OFF	80 ÷ 130					

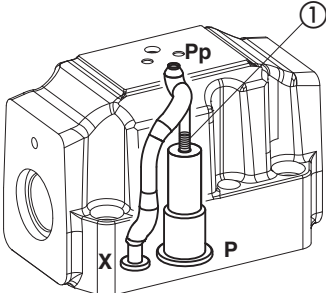
- 15 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS**

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.

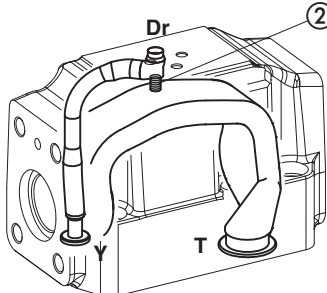
**Standard valves configuration provides internal pilot and external drain**

#### SDPHE-2

##### Pilot channels



##### Drain channels



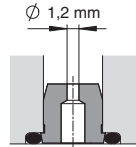
**Internal piloting:** Without blinded plug SP-X300F ①;

**External piloting:** Add blinded plug SP-X300F ①;

**Internal drain:** Without blinded plug SP-X300F ②;

**External drain:** Add blinded plug SP-X300F ②.

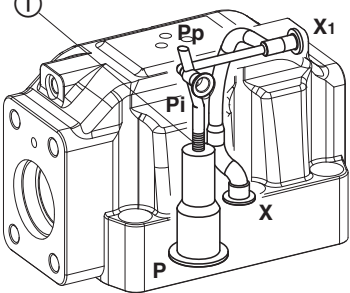
**Option L9**  
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



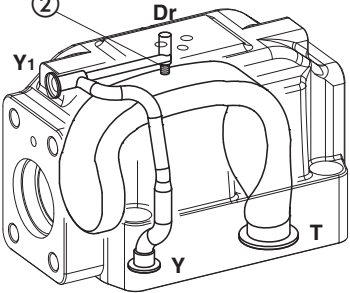
PLUG-12A

#### SDPHE-4

##### Pilot channels



##### Drain channels



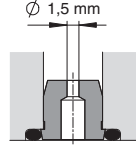
**Internal piloting:** Without blinded plug SP-X500F ①;

**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 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

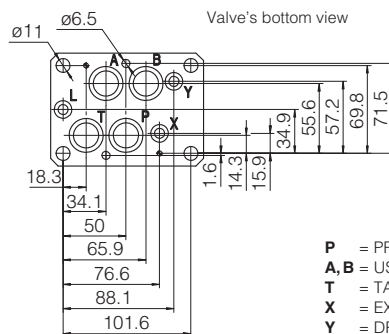
2 socket head screws M6x45 class 12.9

Tightening torque = 15 Nm

Diameter of ports A, B, P, T:  $\varnothing = 20$  mm;

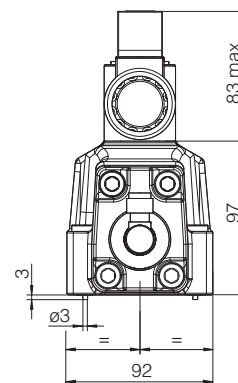
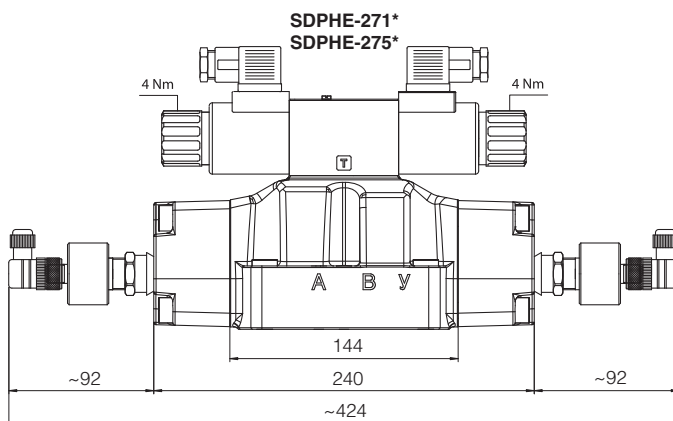
Diameter of ports X, Y:  $\varnothing = 7$  mm;

Seals: 4 OR 130, 2 OR 2043

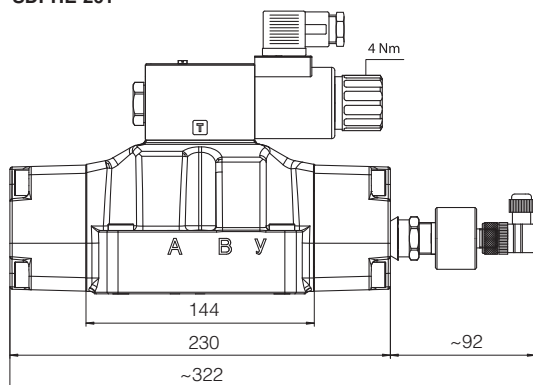


Mass (Kg)	
SDPHE-26	10,2
SDPHE-27	10,9
Option H, H9	+1,0

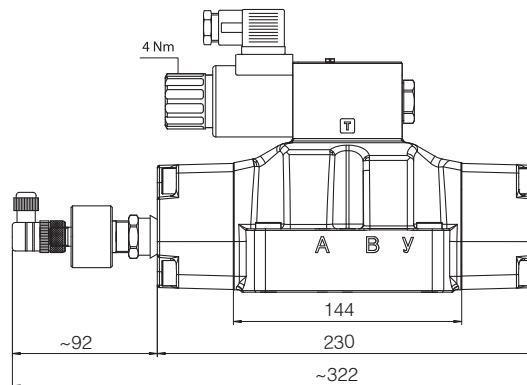
P = PRESSURE PORT  
A, B = USE PORT  
T = TANK PORT  
X = EXTERNAL OIL PILOT PORT  
Y = DRAIN PORT



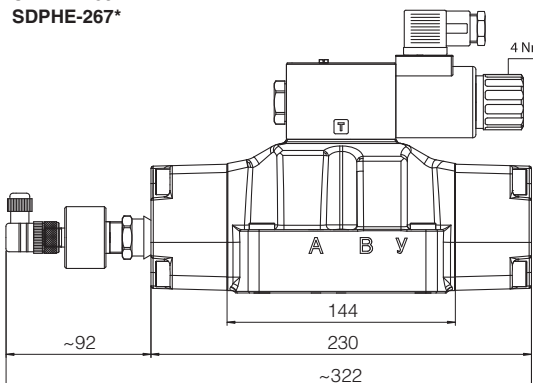
## SDPHE-261\*



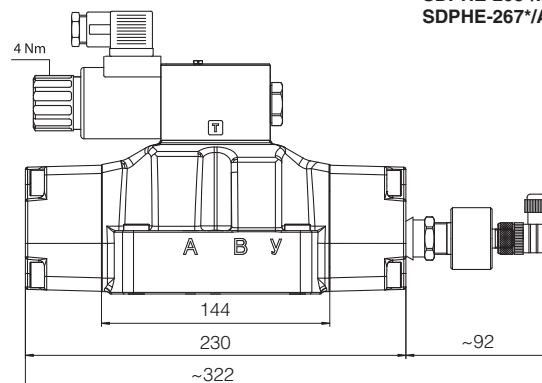
## SDPHE-261\*/A



## 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:

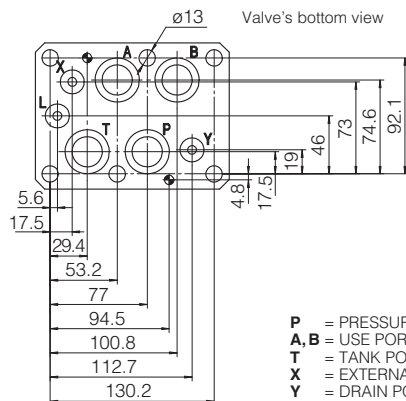
6 socket head screws M12x60 class 12.9

Tightening torque = 125 Nm

Diameter of ports A, B, P, T:  $\varnothing = 24$  mm;

Diameter of ports X, Y:  $\varnothing = 7$  mm;

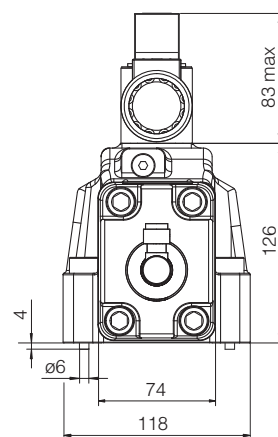
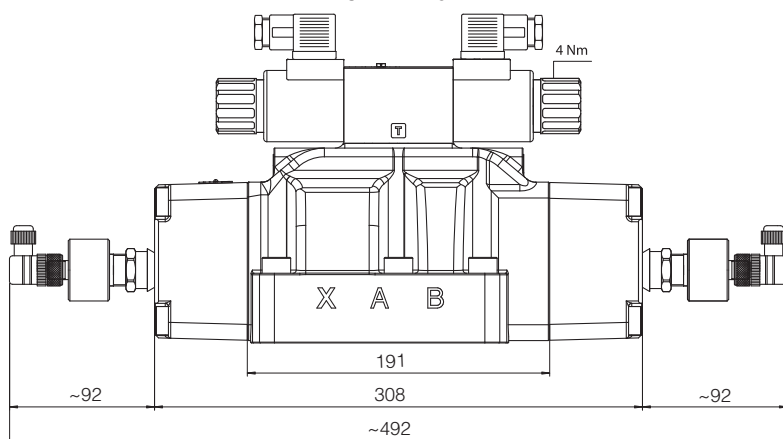
Seals: 4 OR 4112, 2 OR 3056



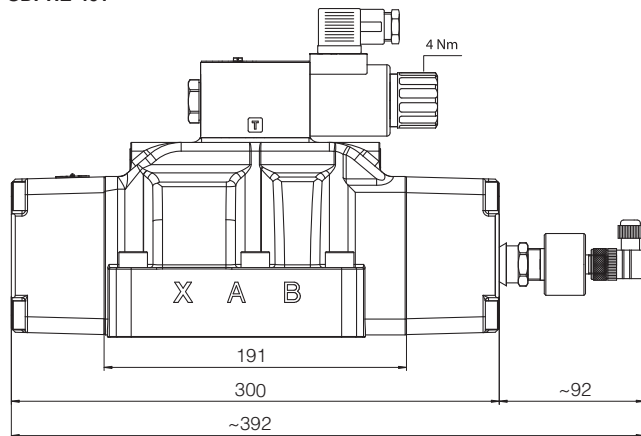
P = PRESSURE PORT  
A, B = USE PORT  
T = TANK PORT  
X = EXTERNAL OIL PILOT PORT  
Y = DRAIN PORT

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

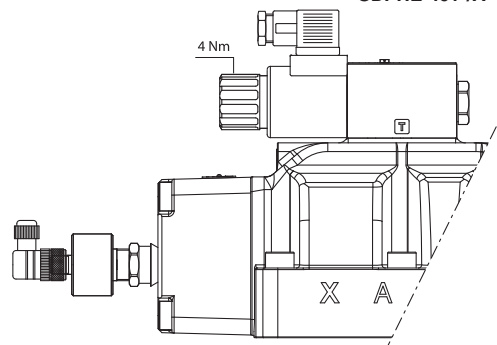
SDPHE-471\*  
SDPHE-475\*



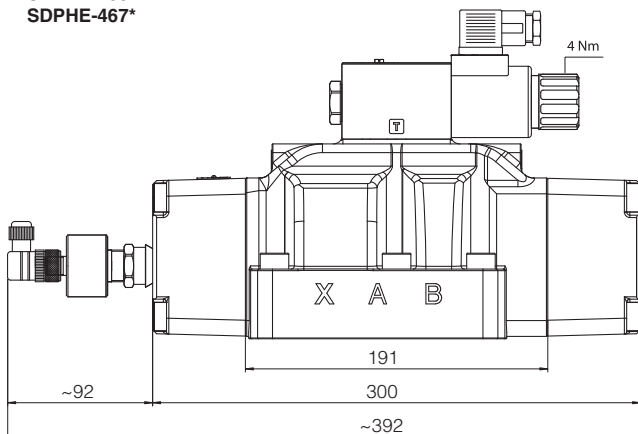
SDPHE-461\*



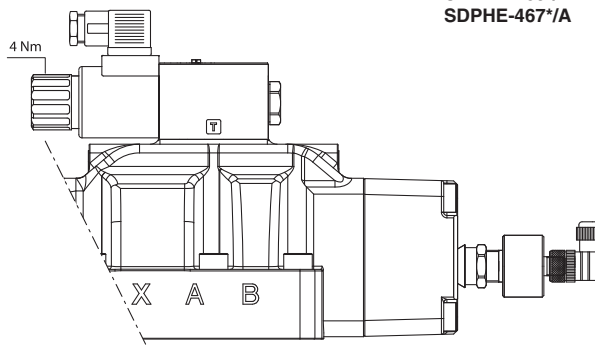
SDPHE-461\*/A



SDPHE-463\*  
SDPHE-467\*



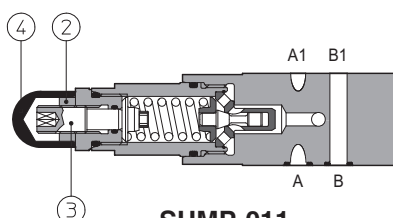
SDPHE-463\*/A  
SDPHE-467\*/A



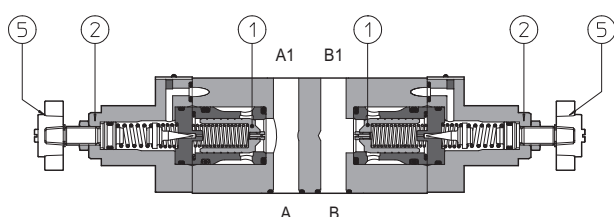


# Modular relief valves type SHMP, SKM

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, discharge 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

Series number

Seals material, see section 5:

- = NBR

**PE** = FKM

**BT** = HNBR

Options:

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

Pressure range

**SHMP:**

**50** = 2÷ 50 bar

**100** = 3÷ 100 bar

**210** = 10÷210 bar

**350** = 15÷350 bar

**SKM:**

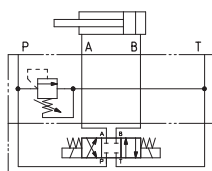
**50** = 4÷ 50 bar

**100** = 5÷ 100 bar

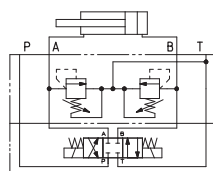
**210** = 5÷210 bar

**350** = 5÷350 bar

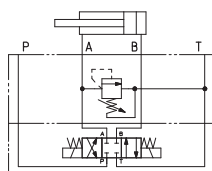
## 2 HYDRAULIC CONFIGURATION



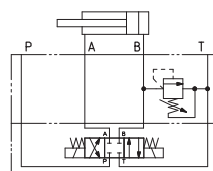
SHMP-011



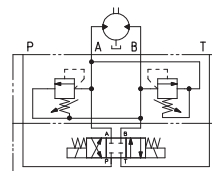
SHMP-012



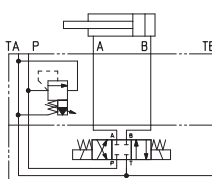
SHMP-013



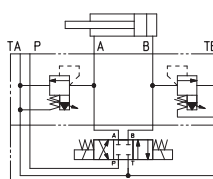
SHMP-014



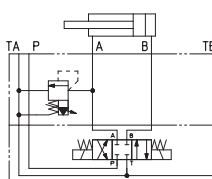
SHMP-015



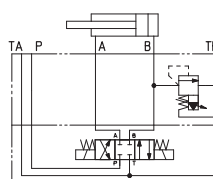
SKM-011



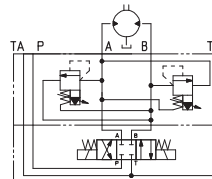
SKM-012



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

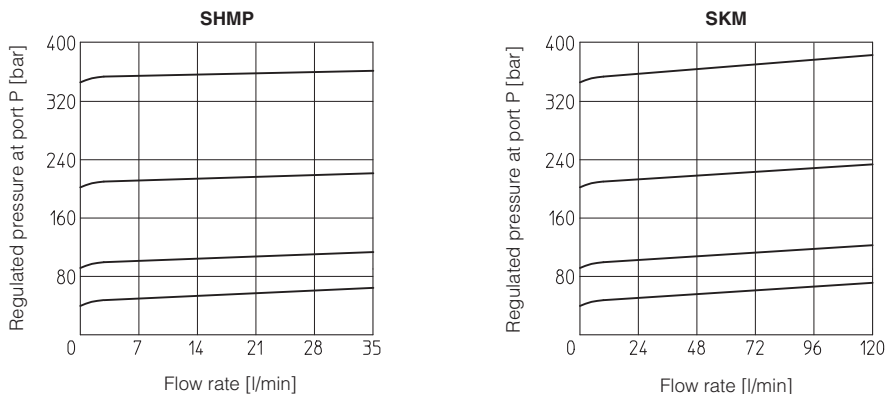
### 4 HYDRAULIC CHARACTERISTICS

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

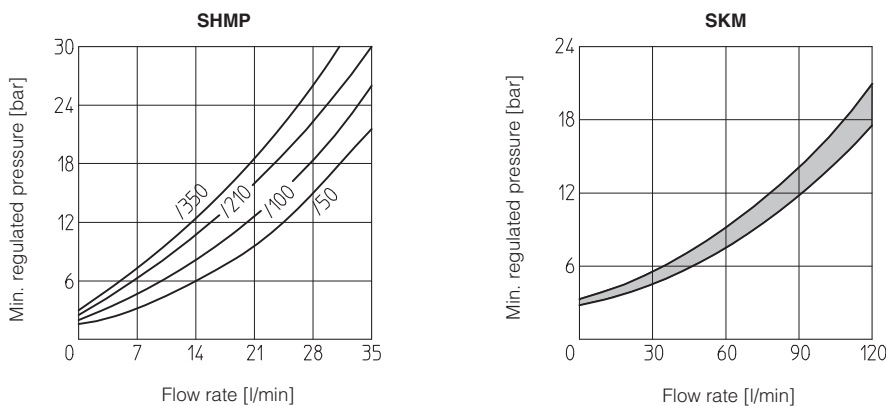
### 5 SEALS and HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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 <a href="http://www.atos.com">www.atos.com</a> 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	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

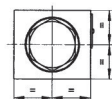
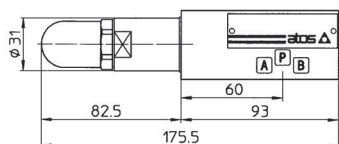
### 6 REGULATED PRESSURE VERSUS FLOW DIAGRAMS (Based on mineral oil ISO VG 46 at 50°C)



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

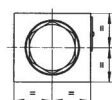
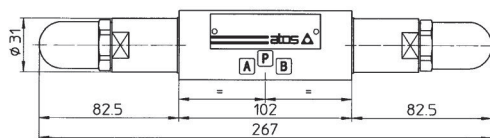
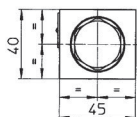


SHMP-011

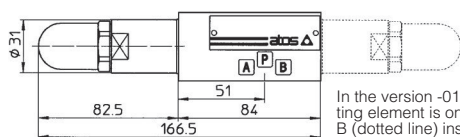
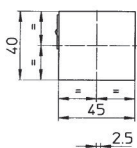


Mass: 1,4 Kg

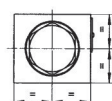
SHMP-012



Mass: 1,7 Kg

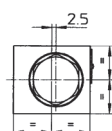
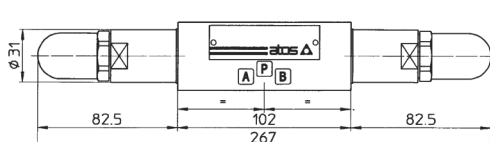
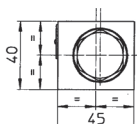
SHMP-013  
SHMP-014


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



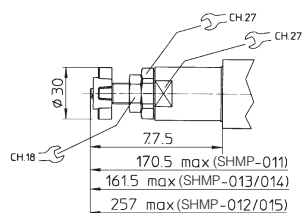
Mass: 1,2 Kg

SHMP-015



Mass: 1,7 Kg

#### Adjustment device for option /V

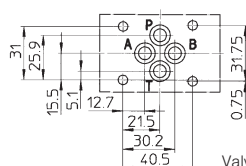


#### ISO 4401: 2005

##### Mounting surface: 4401-03-02-0-05

Diameter of ports A, B, P, T:  $\varnothing = 7,5$  mm

Seals: 4 OR 108

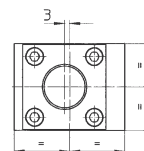
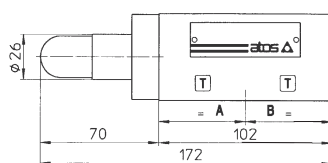
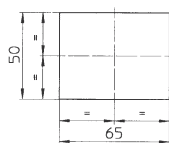


Valve's bottom view

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

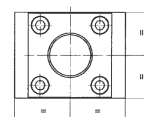
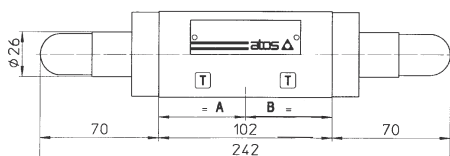
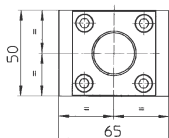
# 9 INSTALLATION DIMENSIONS OF SKM VALVES [mm]

SKM-011



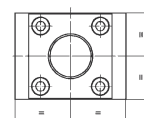
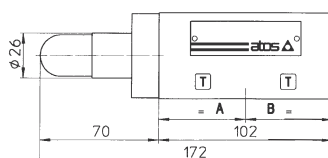
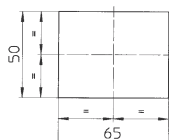
Mass: 2,5 Kg

SKM-012



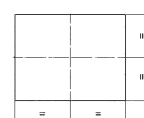
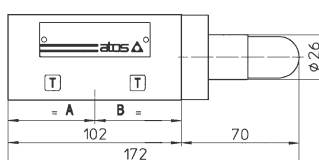
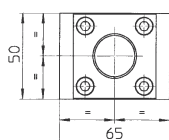
Mass: 2,8 Kg

SKM-013



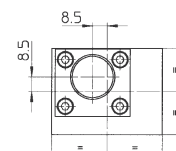
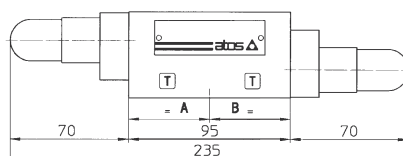
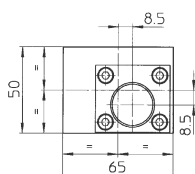
Mass: 2,5 Kg

SKM-014



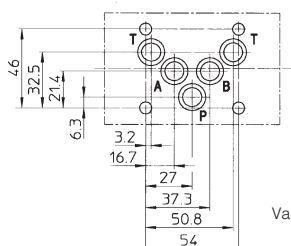
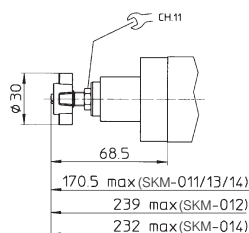
Mass: 2,5 Kg

SKM-015



Mass: 2,5 Kg

Adjustment device for option /V



Valve's bottom view

ISO 4401: 2005

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

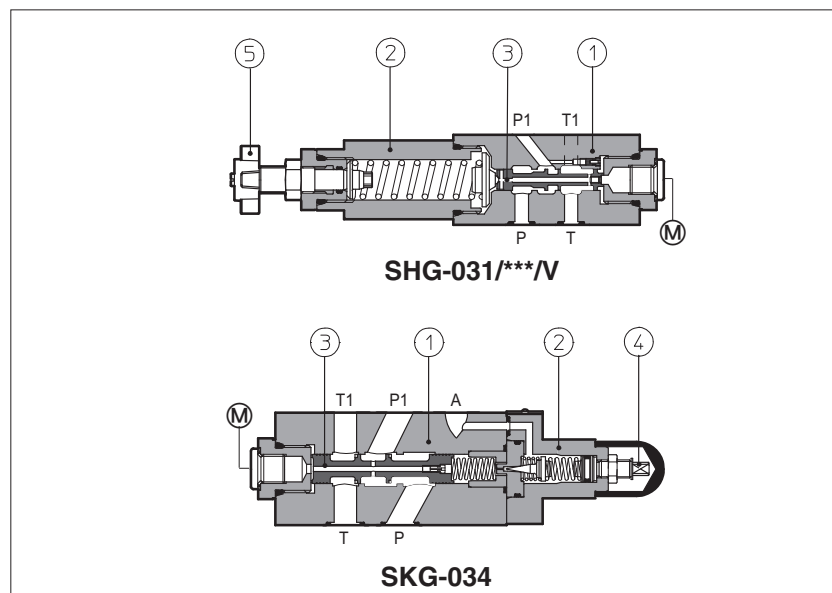
Diameter of ports A, B, P, T:  $\varnothing = 11,2$  mm

Seals: 5 OR 2050

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

# Modular reducing valves type SHG, SKG

spool type, ISO 4401 sizes 06 and 10



**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**

Modular pressure reducing valve, size:

**SHG-0** = 06

**SKG-0** = 10

**31**

/

**210**

/

**V**

**\*\***

Series number

**\***

Seals material, see sect. ③:

**-** = NBR

**PE** = FKM

**BT** = HNBR

Options:

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

Configuration, see section ②

three way:

**31** = reduced pressure on P port

**33** = reduced pressure on A port

**34** = reduced pressure on B port

Pressure range

**SHG**

**32** = 3 - 32 bar

**50** = 2 - 50 bar

**75** = 10 - 75 bar

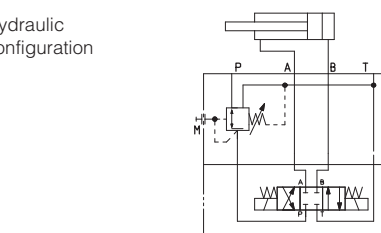
**SKG**

**100** = 7 - 100 bar

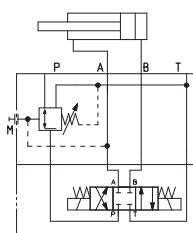
**210** = 8 - 210 bar

## 2 HYDRAULIC CHARACTERISTICS

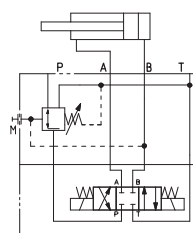
Hydraulic configuration



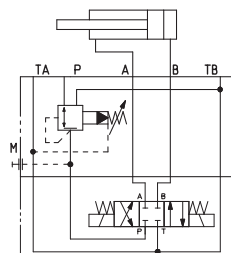
SHG-031



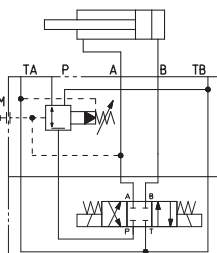
SHG-033



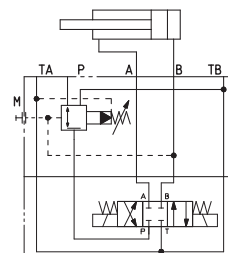
SKG-034



SKG-031



SKG-033



SKG-034

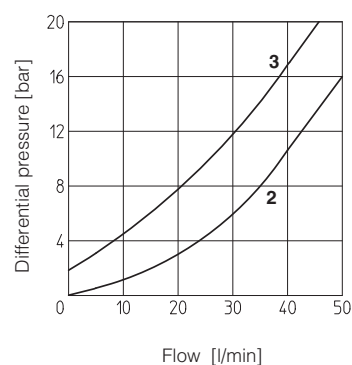
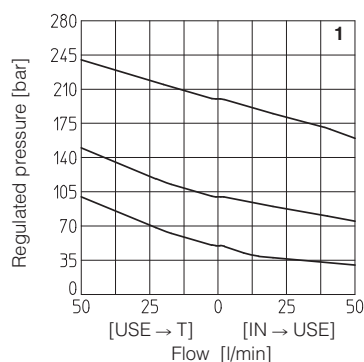
Valve model	SHG-03*/32	SHG-03*/50	SHG-03*/75	SHG-03*/100	SHG-03*/210	SKG-03*/100	SKG-03*/210
Max flow [l/min]	50					100	
Pressure range [bar]	3 ÷ 32	2 ÷ 50	10 ÷ 75	20 ÷ 100	50 ÷ 210	7 ÷ 100	8 ÷ 210
Max inlet pressure [bar]	350					315	
Max pressure on port T [bar]	160					160	

**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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	

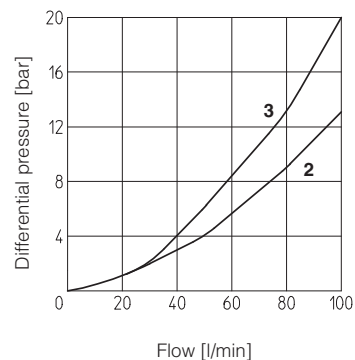
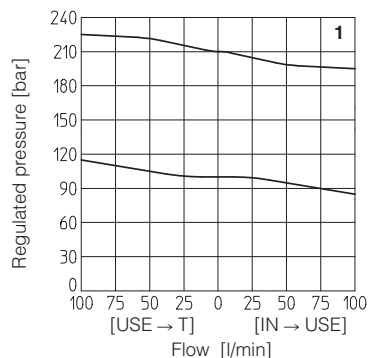
**4 DIAGRAMS OF SHG-03\*** based on mineral oil ISO VG 46 at 50°C

- 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



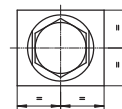
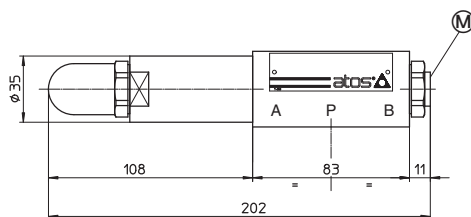
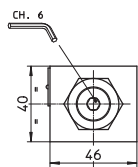
**5 DIAGRAMS OF SKG-03\*** based on mineral oil ISO VG 46 at 50°C

- 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]

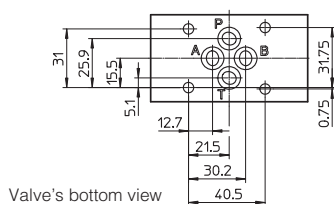
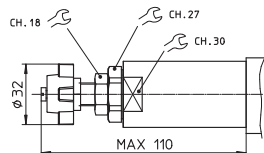
### SHG-03\*



Ⓜ = 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

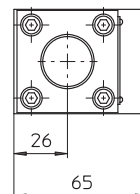
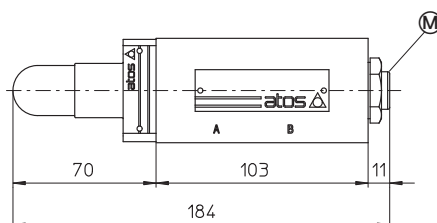
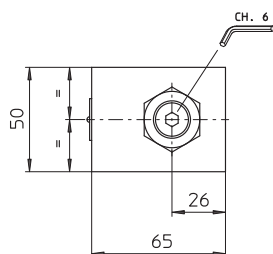
Diameter of ports A, B, P, T:  $\varnothing = 7,5$  mm

Seals: 4 OR 108

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

## 7 INSTALLATION DIMENSIONS OF SKG-0 VALVES [mm]

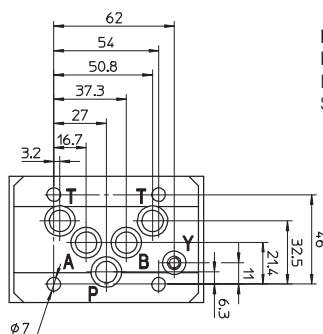
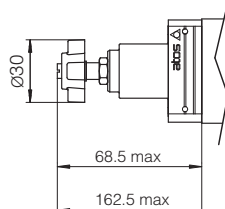
### SKG-03\*



Ⓜ = 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:  $\varnothing = 11,2$  mm

Seals: 5 OR 2050

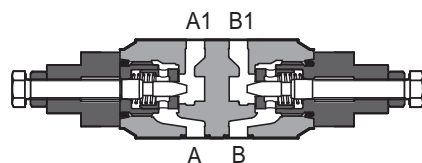
Fastening bolts: n° 4 socket head screws M6. The length depends on number and type of modular elements associated.



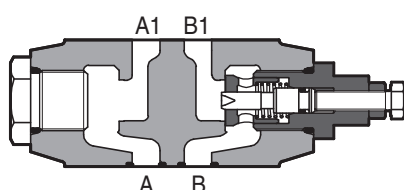


# Modular throttle valves type SHQ, SKQ

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 adjustment 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

Seals material, see section 3:

- = NBR

**PE** = FKM

**BT** = HNBR

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

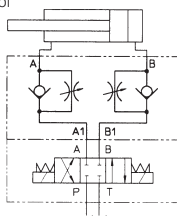
**24** = single, acting on port B

Series number

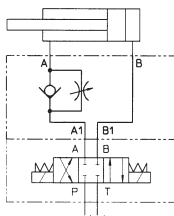
## 2 VALVE CONFIGURATION

Meter OUT control

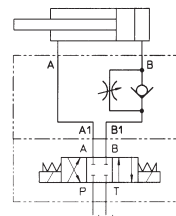
**SHQ-012**  
**SKQ-012**



**SHQ-013**  
**SKQ-013**

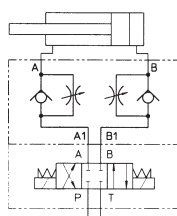


**SHQ-014**  
**SKQ-014**

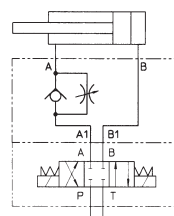


Meter IN control

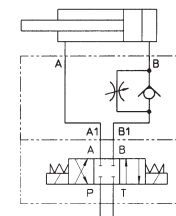
**SHQ-022**  
**SKQ-022**



**SHQ-023**  
**SKQ-023**



**SHQ-024**  
**SKQ-024**

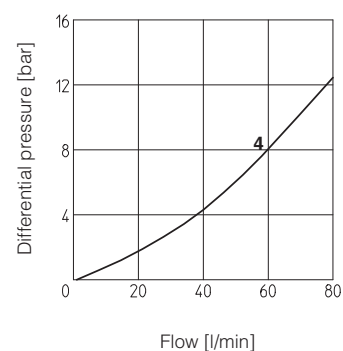
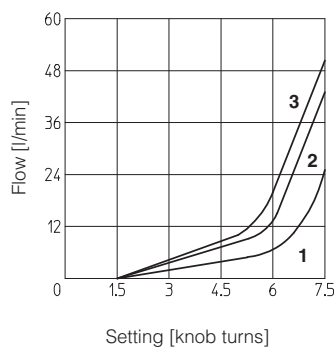


**3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUID** - for other fluids not included in below table, consult our technical office

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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	

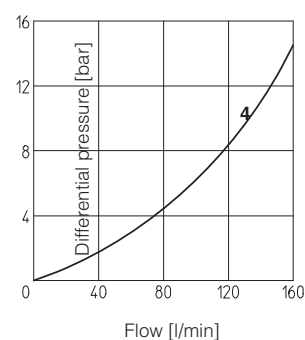
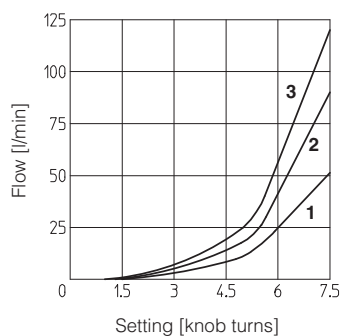
**4 DIAGRAMS OF SHQ-0** based on mineral oil ISO VG 46 at 50°C

- 1** = Regulation diagram at  $\Delta p$  10 bar  
**2** = Regulation diagram at  $\Delta p$  30 bar  
**3** = Regulation diagram at  $\Delta p$  50 bar  
**4** = Q/ $\Delta p$  diagram for free flow through the non-return valve



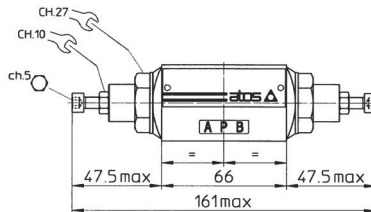
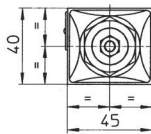
**5 DIAGRAMS OF SKQ-0** based on mineral oil ISO VG 46 at 50°C

- 1** = Regulation diagram at  $\Delta p$  10 bar  
**2** = Regulation diagram at  $\Delta p$  30 bar  
**3** = Regulation diagram at  $\Delta p$  50 bar  
**4** = Q/ $\Delta p$  diagram for free flow through the non-return valve



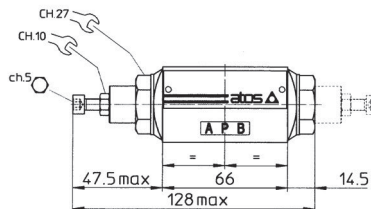
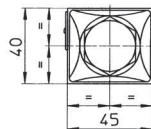
## 6 INSTALLATION DIMENSIONS OF SHQ-0 VALVES [mm]

SHQ-012  
SHQ-022



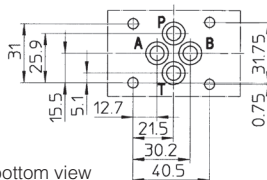
Mass: 1,1 Kg

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

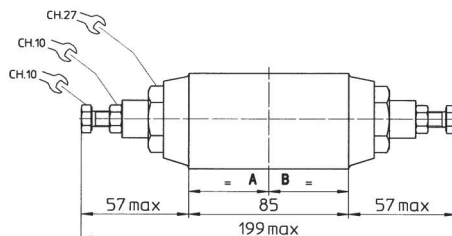
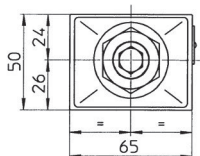
Mounting surface: 4401-03-02-0-05

Diameter of ports A, B, P, T:  $\varnothing = 7,5$  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.

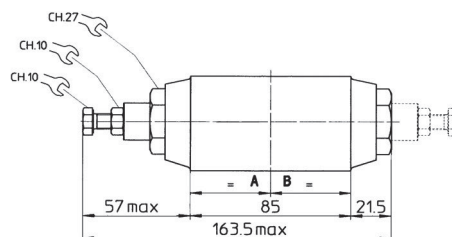
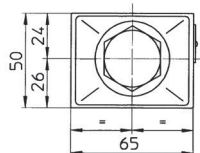
## 7 INSTALLATION DIMENSIONS OF SKQ-0 VALVES [mm]

SKQ-012  
SKQ-022



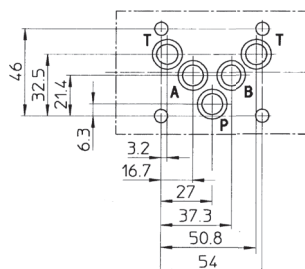
Mass: 2 Kg

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

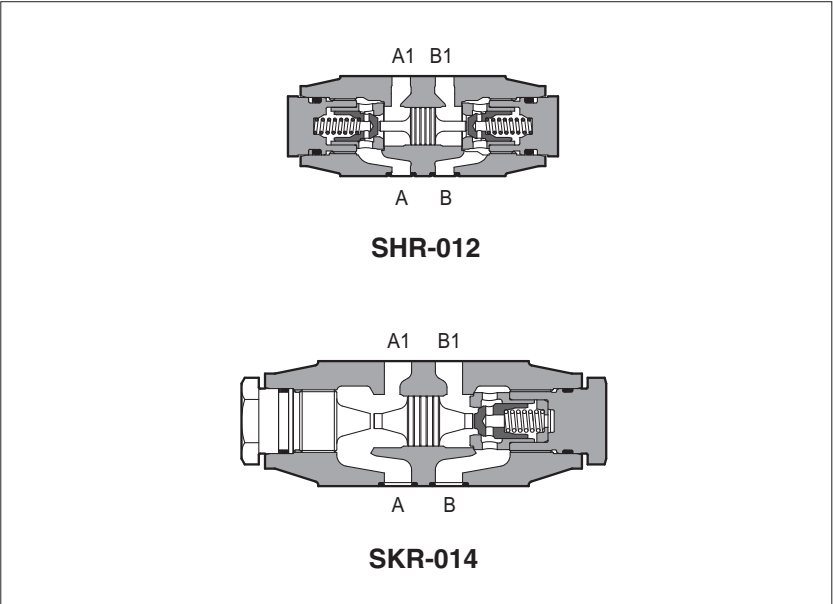
Diameter of ports A, B, P, T:  $\varnothing = 11,2$  mm (max)  
Seals: 5 OR 2050

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

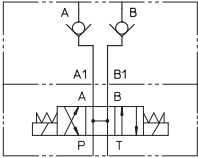
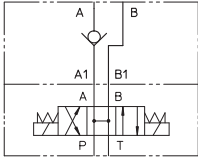
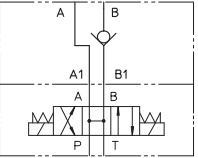
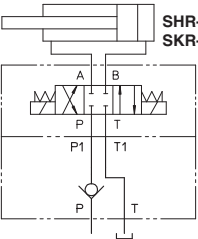
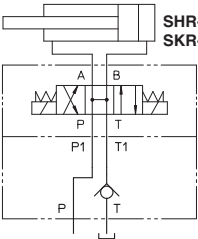
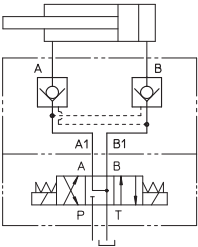
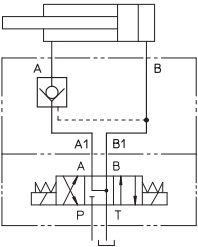
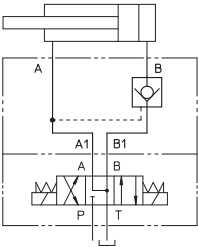
**SHR-0** = size 06: flow up to 60 l/min, pressure up to 350 bar.

**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.

<b>1</b>	<b>MODEL CODE</b>					
	<b>SHR-0</b>	<b>12</b>	<b>/</b>	<b>4</b>	<b>**</b>	<b>*</b>
	Modular check valve, size: <b>SHR-0</b> = 06 <b>SKR-0</b> = 10					Seals material, see section 3: - = NBR <b>PE</b> = FKM <b>BT</b> = HNBR
	Configuration, see section 2 direct operated: <b>02</b> = double, acting on port A and B <b>03</b> = single, acting on port A <b>04</b> = single, acting on port B <b>11</b> = single, acting on port P <b>16</b> = single, acting on port T pilot operated: <b>12</b> = double, acting on port A and B <b>13</b> = single, acting on port A <b>14</b> = single, acting on port B				Series number	
				Spring cracking pressure: - = 0,5 bar (std.) <b>4</b> = 4 bar <b>2</b> = 2 bar <b>8</b> = 8 bar		

## 2 VALVE CONFIGURATION

<b>SHR-002</b> <b>SKR-002</b>	<b>SHR-003</b> <b>SKR-003</b>	<b>SHR-004</b> <b>SKR-004</b>	<b>SHR-011</b> <b>SKR-011</b>	<b>SHR-016</b> <b>SKR-016</b>
				
<b>SHR-012</b> <b>SKR-012</b>	<b>SHR-013</b> <b>SKR-013</b>	<b>SHR-014</b> <b>SKR-014</b>		
				
The pilot pressure applied through 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.				
<b>VALVE TYPE</b>	<b>AREA RATIO</b>			
SHR	3,3:1			
SKR	3,3:1			

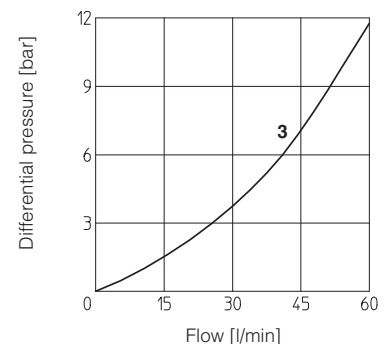
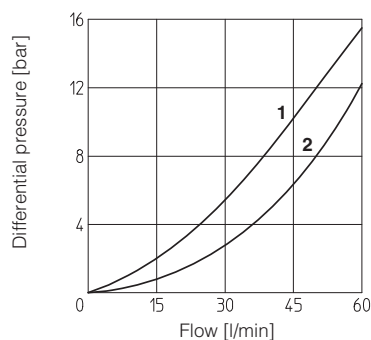
**3 MAIN CHARACTERISTICS, SEALS and HYDRAULIC FLUID** - for other fluids not included in below table, consult our technical office

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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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:

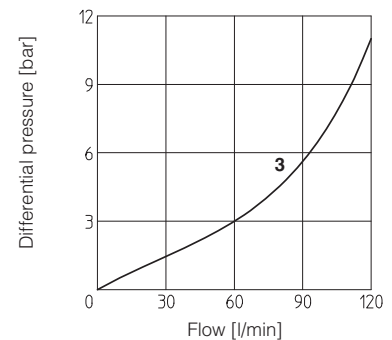
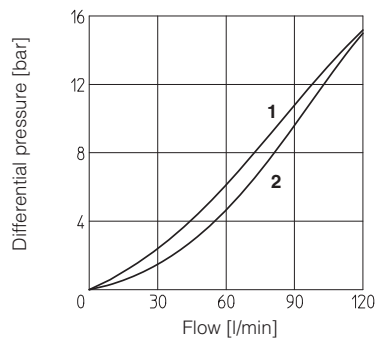
- 1** = A→A<sub>1</sub>; B→B<sub>1</sub> of  
SHR-012, SHR-013, SHR-014
- 2** = A<sub>1</sub>→A; B<sub>1</sub>→B of  
SHR-012, SHR-013, SHR-014
- 3** = SHR-011, SHR-016



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

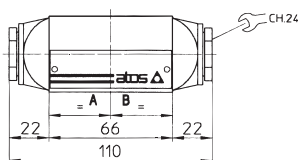
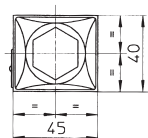
Flow through check valve:

- 1** = A→A<sub>1</sub>; B→B<sub>1</sub> of  
SKR-012, SKR-013, SKR-014
- 2** = A<sub>1</sub>→A; B<sub>1</sub>→B of  
SKR-012, SKR-013, SKR-014
- 3** = SKR-011, SKR-016



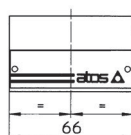
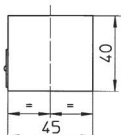
## 6 INSTALLATION DIMENSIONS OF SHR-0 VALVES [mm]

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



Mass: 1 Kg

SHR-011  
SHR-016



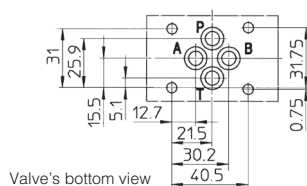
Mass: 0,7 Kg

ISO 4401: 2005

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

Diameter of ports A, B, P, T:  $\varnothing = 7,5$  mm (max)

Seals: 4 OR 108

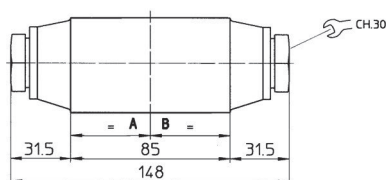
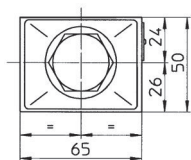


Valve's bottom view

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

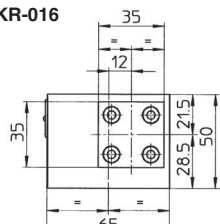
## 7 INSTALLATION DIMENSIONS OF SKR-0 VALVES [mm]

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

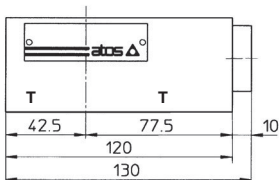


Massa: 2,3 Kg

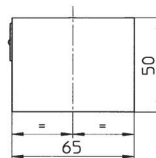
SKR-016



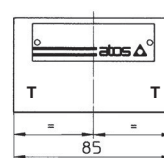
Mass: 2,5 Kg



SKR-011



Mass: 1,7 Kg

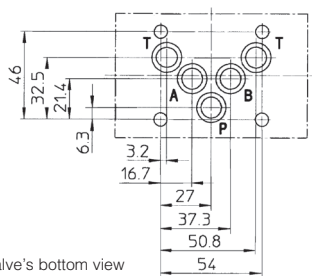


ISO 4401: 2005

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

Diameter of ports, A, B, P, T:  $\varnothing = 11,2$  mm (max)

Seals: 5 OR 2050



Valve's bottom view

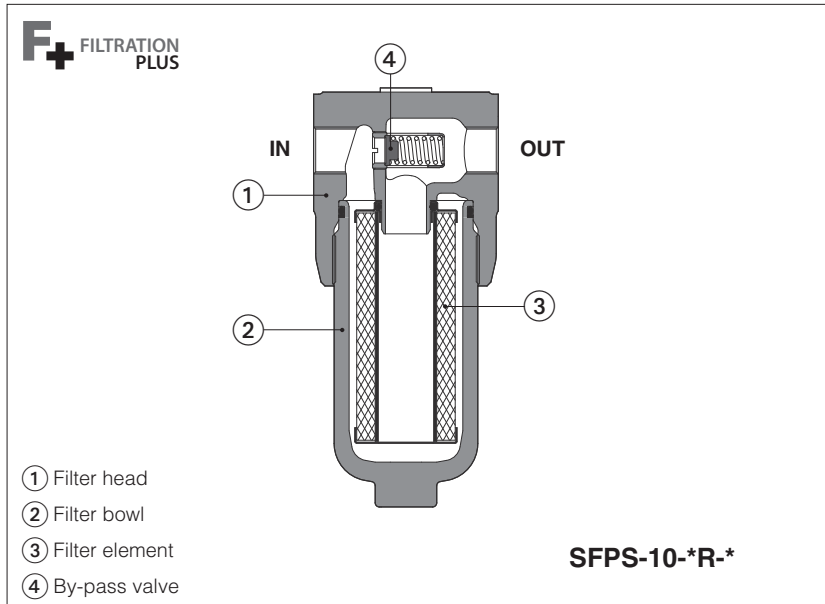
Fastening bolts: n° 4 socket head screws M6. The lenght depends on number and type of modular elements associated.





# 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  $\mu\text{m(c)}$  ( $\beta_x(c) > 1000$ , 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**

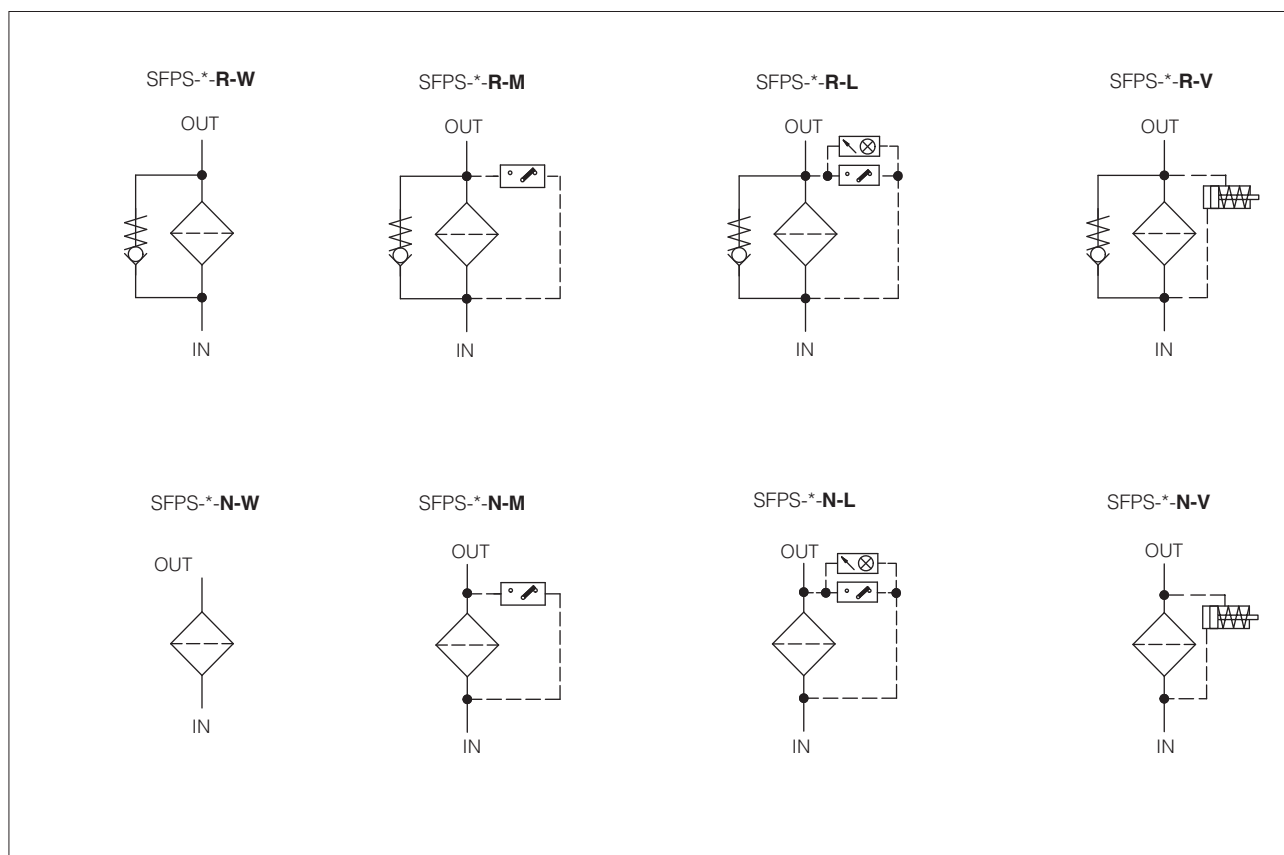
## 1 MODEL CODE OF COMPLETE FILTERS

SFPS	-	10	-	A	-	F10	-	01	-	R	-	W	*	/	*
In line filter, high pressure															
<b>Filter size</b> (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															Seals material: - = NBR <b>PE</b> = FKM
<b>Filter length:</b>															Series number
		SFPS-10		SFPS-20		SFPS-30									
<b>A</b> =		115		191		256									
<b>B</b> =		137		205		361									
<b>C</b> =		-		226		406									
<b>D</b> =		-		-		450									
<b>Filter element:</b> <b>SN</b> = only body, without filter element <b>F+</b> microfiber filter element $\beta_x(c) > 1000$ - ISO 16889: <b>F03</b> = 5 $\mu\text{m(c)}$ <b>F10</b> = 12 $\mu\text{m(c)}$ <b>F06</b> = 7 $\mu\text{m(c)}$ <b>F20</b> = 22 $\mu\text{m(c)}$ Filter element <b>F01</b> = 4 $\mu\text{m(c)}$ available on request															
<b>Ports size:</b>		SFPS-10		SFPS-20		SFPS-30									
BSPP		00 = G 1/2"		02 = G 1"		03 = G 1 1/4"									
threaded:		01 = G 3/4"		03 = G 1 1/4"		04 = G 1 1/2"									
		02 = G 1"													
SAE J1926-1		SFPS-10		SFPS-20		SFPS-30									
threaded:		42 = SAE-16		43 = SAE-20		44 = SAE-24 (1 1/2")									
<b>By-pass valve</b> see sect. 9:															
<b>R</b> = by-pass valve with cracking pressure 6 bar (filter element SPSH-*R with collapse pressure 21 bar)															
<b>N</b> = without by-pass (filter element SPSH-*N with collapse pressure 210 bar)															

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

- (1) Max flow rates are measured with:  $\Delta p$  1 bar, filter element F20, largest port size, option -R, oil viscosity 32 mm<sup>2</sup>/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)



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

SPSH	-	10	-	A	-	F10	-	R	/	*
Spare filter element for in line filter type SFPS										Seals material: - = NBR <b>PE</b> = FKM
<b>Filter element size:</b> <b>10</b> = for SFPS-10 <b>20</b> = for SFPS-20 <b>30</b> = for SFPS-30								<b>R</b> = filter element with collapse pressure 21 bar, for filter SFPS-*-R with by-pass valve <b>N</b> = filter element with collapse pressure 210 bar, for filter SFPS-*-N without by-pass valve		
<b>Filter element length:</b> for SFPS-10      for SFPS-20      for SFPS-30 <b>A</b> <b>A</b> <b>A</b> <b>B</b> <b>B</b> <b>B</b> <b>C</b> <b>C</b> <b>D</b> <b>D</b>						<b>Microfibre filter element, <math>\beta_{x(c)} &gt; 1000</math> - ISO 16889:</b> <b>F03</b> = 5 $\mu\text{m}$ (c) <b>F06</b> = 7 $\mu\text{m}$ (c) <b>F10</b> = 12 $\mu\text{m}$ (c) <b>F20</b> = 22 $\mu\text{m}$ (c) Filter element <b>F01</b> = 4 $\mu\text{m}$ (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	*	/	*
<p>Spare differential clogging indicator for in line filter</p> <p><b>Type of indicator:</b>  <b>E</b> = electrical  <b>V</b> = visual</p> <p><b>Differential switching pressure:</b>  <b>05</b> = 5 bar for filters with by-pass valve  <b>08</b> = 8 bar for filters without by-pass valve</p>						<p>Series number</p>		<p>Seals material:  - = NBR  <b>PE</b> = FKM</p>
					<p><b>Optional LED</b> - only for CID-E</p> <p><b>L</b> = with LED  <b>M</b> = without LED  <b>M/UL</b> = without LED, certified according to North American Standard cURus (available on request)</p>			

**5 GENERAL CHARACTERISTICS**

Assembly position / location	Vertical position with the bowl downward
Ambient temperature range	<b>Standard</b> = -20°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Storage temperature range	<b>Standard</b> = -20°C ÷ +80°C <b>/PE</b> 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 <sup>6</sup> 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 32mm<sup>2</sup>/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 32mm<sup>2</sup>/s. In case of different conditions see section 10 for filter sizing

## 7 FILTER ELEMENTS **F+** FILTRATION PLUS

Material		Inorganic microfibre
Filtration rating as per ISO16889	<b>F03</b>	$\beta_{4,5\mu m (c)} \geq 1000$
	<b>F06</b>	$\beta_{7\mu m (c)} \geq 1000$
	<b>F10</b>	$\beta_{12\mu m (c)} \geq 1000$
	<b>F20</b>	$\beta_{22\mu m (c)} \geq 1000$
Filter element collapse pressure	<b>R</b> = for filter with by-pass valve	21 bar
	<b>N</b> = 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) = $-30^{\circ}\text{C} \div +100^{\circ}\text{C}$ , with HFC hydraulic fluids = $+10^{\circ}\text{C} \div +50^{\circ}\text{C}$ FKM seals (/PE option) = $-25^{\circ}\text{C} \div +120^{\circ}\text{C}$		
Recommended viscosity	15 ÷ 100 mm <sup>2</sup> /s - max allowed range 2.8 ÷ 500 mm <sup>2</sup> /s		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

## 9 BY-PASS VALVE

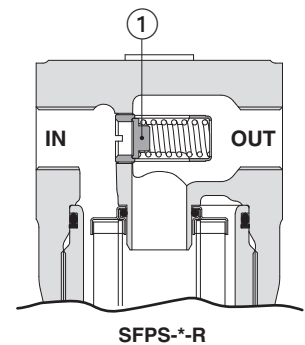
### Filter with by-pass valve - version -R

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 ( $\Delta p > 6$  bar).

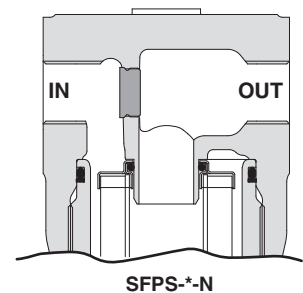
This situation should be carefully avoided, by means of a scheduled maintenance, otherwise the contaminated oil will pass to the clean side of the filter and then it will circulate in the hydraulic system. The filter element must be replaced before the clogging condition, at this purpose the use of a differential clogging indicator CID-V (visual, option V) or CID-E (electrical, options L or M) is highly recommended.



### 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 through 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



## 10 FILTERS SIZING

For the filter sizing it is necessary to consider the Total  $\Delta p$  at the maximum flow at which the filter must work.

The Total  $\Delta p$  is given by the sum of filter head  $\Delta p$  plus the filter element  $\Delta p$ :

$$\text{Total } \Delta p = \text{filter head } \Delta p + \text{filter element } \Delta p$$

In the best conditions the total  $\Delta p$  should not exceed 1,0 bar

See below sections to calculate the  $\Delta p$  of filter head and  $\Delta p$  of the filter element

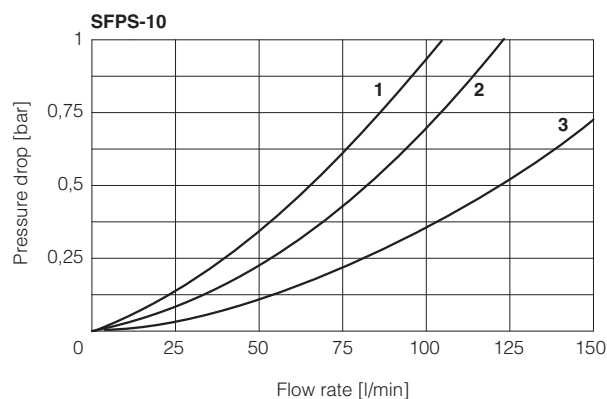
### 10.1 Q/ $\Delta p$ DIAGRAMS OF FILTER HEAD

The pressure drop of filter head mainly depends on the ports size and fluid density

In the following diagrams are reported the  $\Delta p$  characteristics of filter head based on mineral oil with density  $0,86 \text{ kg/dm}^3$  and viscosity  $30 \text{ mm}^2/\text{s}$

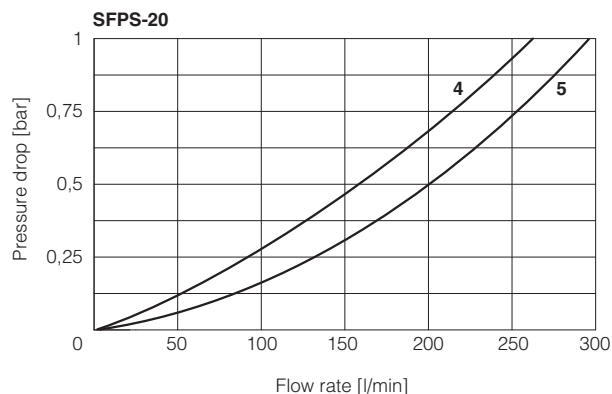
#### SFPS-10

- 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)



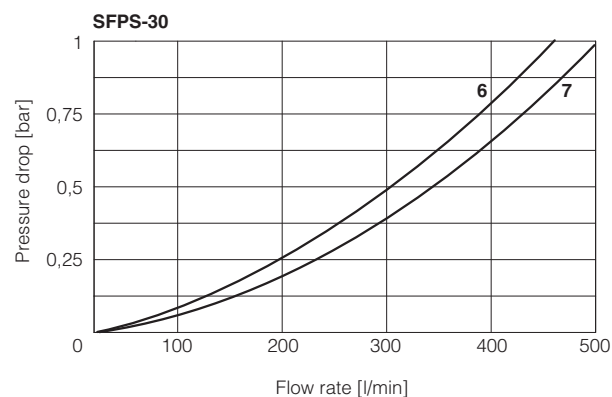
#### SFPS-20

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



#### SFPS-30

- 6 = SFPS-30\*\*\* 03 (G 1 1/4")
- 7 = SFPS-30\*\*\* 04 (G 1 1/2")  
SFPS-30\*\*\* 44 (SAE-24)



## 10.2 FILTER ELEMENT $\Delta p$

The pressure drop through the filter depends to:

- size of filter element
- filtration rating
- fluid viscosity

The  $\Delta p$  of filter element is given by the formula:

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

**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 (mm<sup>2</sup>/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								
<b>R</b> for filter with bypass valve	<b>F03</b>	21.30	10.84	11.07	9.23	6.74	10.26	4.82	3.27	2.30
	<b>F06</b>	13.97	6.79	7.27	6.06	4.43	6.73	2.98	1.99	1.26
	<b>F10</b>	8.39	4.42	4.45	3.71	2.71	4.12	2.02	1.36	0.70
	<b>F20</b>	4.78	2.93	2.87	2.39	1.75	2.66	1.21	0.77	0.40
<b>N</b> for filter without bypass valve	<b>F03</b>	26.03	16.72	14.19	11.83	8.64	13.00	7.15	3.87	3.21
	<b>F06</b>	14.77	11.25	9.50	7.92	5.79	9.63	4.00	2.93	1.80
	<b>F10</b>	11.57	5.25	5.66	4.72	3.45	5.05	2.57	1.67	1.10
	<b>F20</b>	6.13	3.34	3.41	2.84	2.07	3.33	1.44	0.83	0.70

#### Example:

Calculation of Total  $\Delta p$  for filter type SFPS-10-B-F10-02-R at Q = 80 l/min and viscosity 46 mm<sup>2</sup>/s (filter element SPSH-10-B-F10-R)

**Dp** of filter head = 0,24 bar

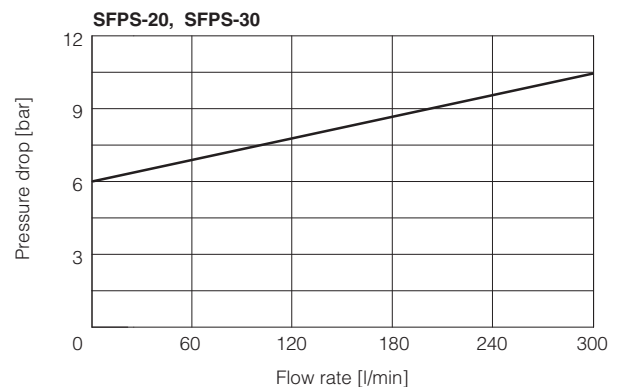
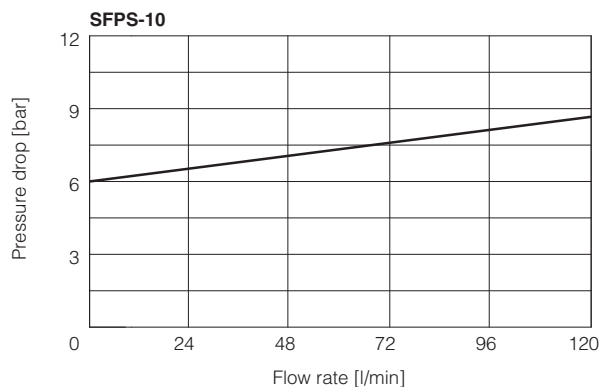
**Gr** = 4,42 mbar/(l/min)

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

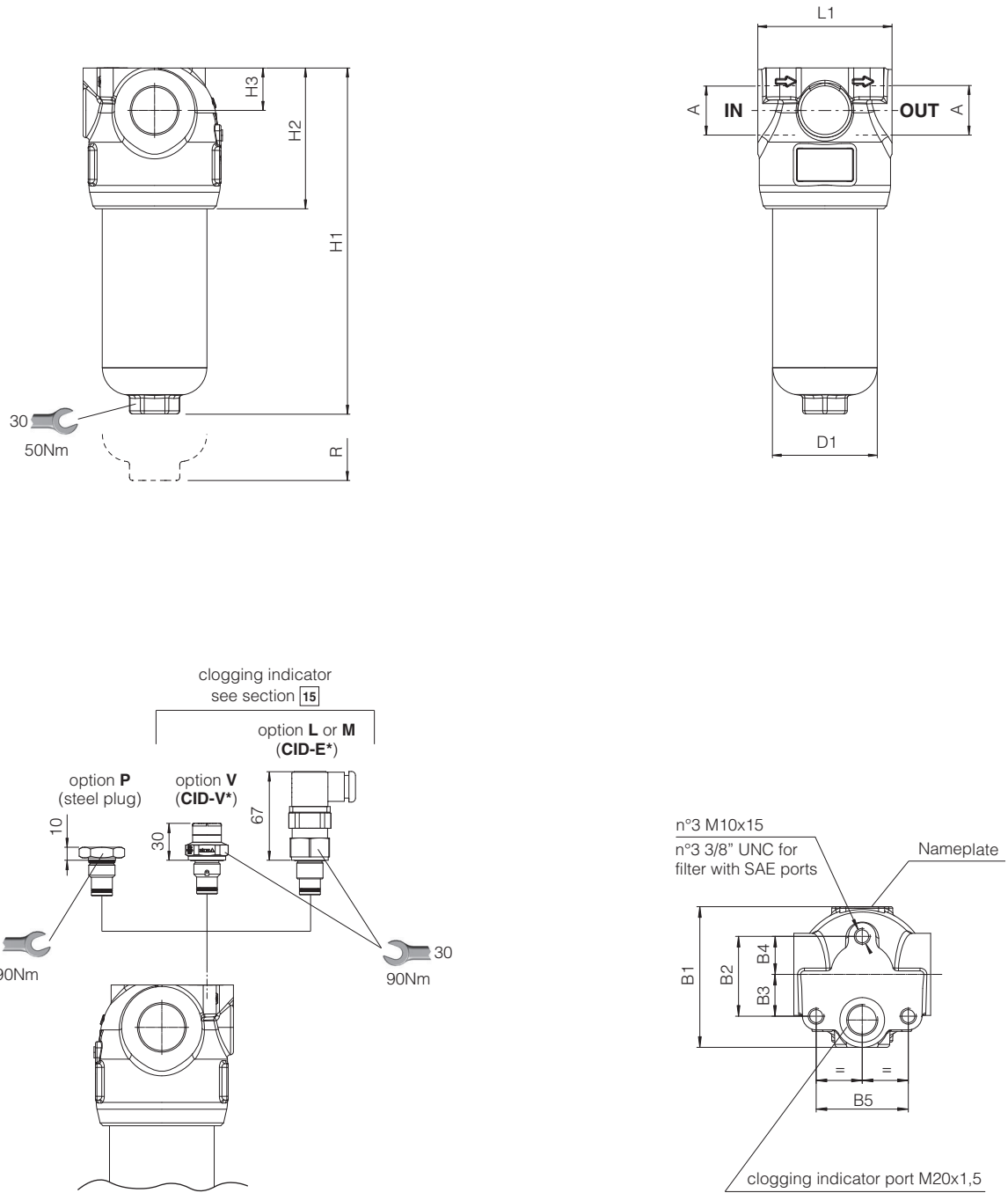
**Total  $\Delta p$**  = 0,24 + 0,51 = **0,75 bar**

## 11 BY-PASS VALVE - based on mineral oil ISO VG46 at 50°C (viscosity = 32 mm<sup>2</sup>/s)

Q/ $\Delta p$  diagrams of flow through the by-pass valve



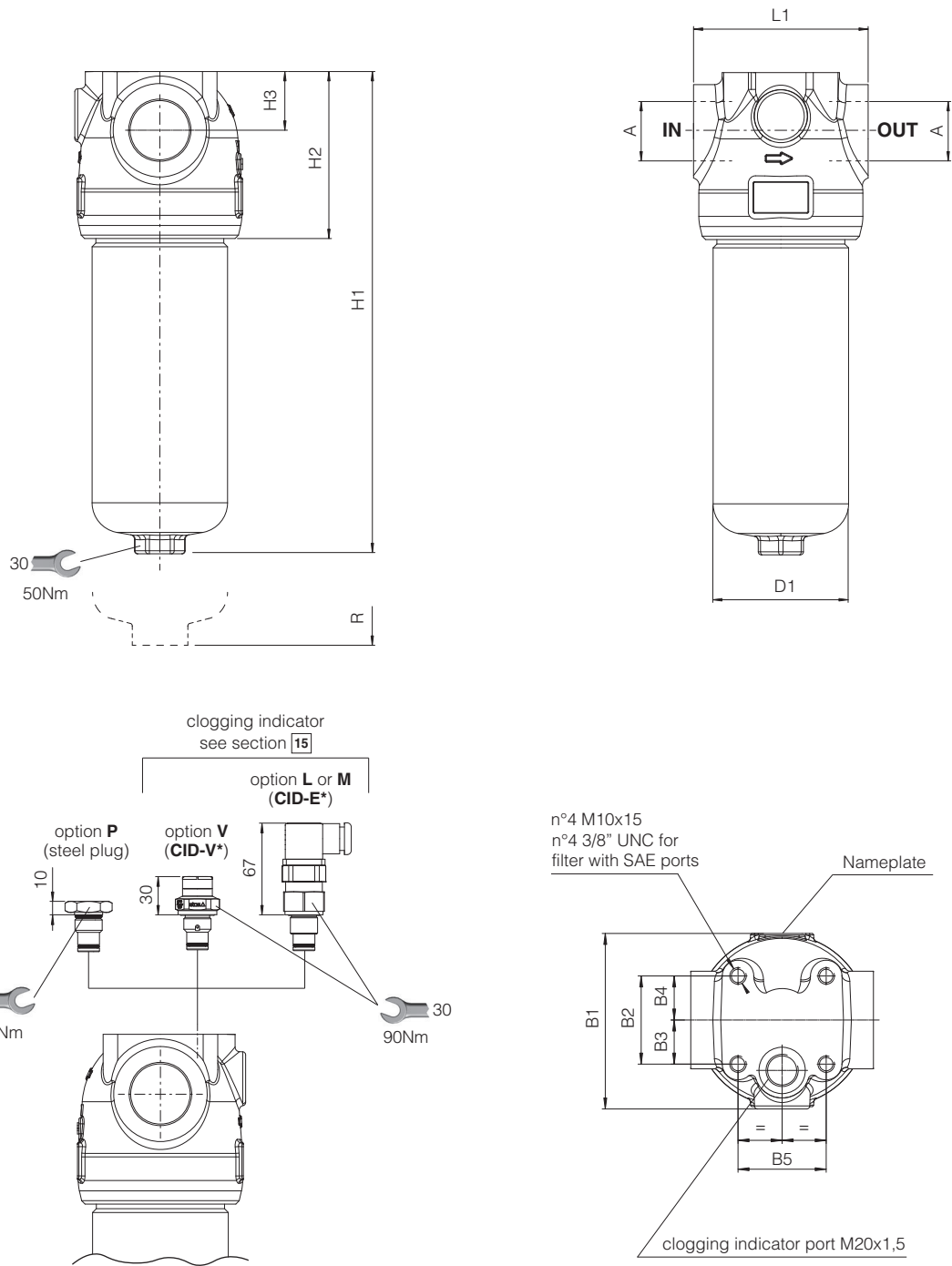
# SFPS -10



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

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

## SFPS -20

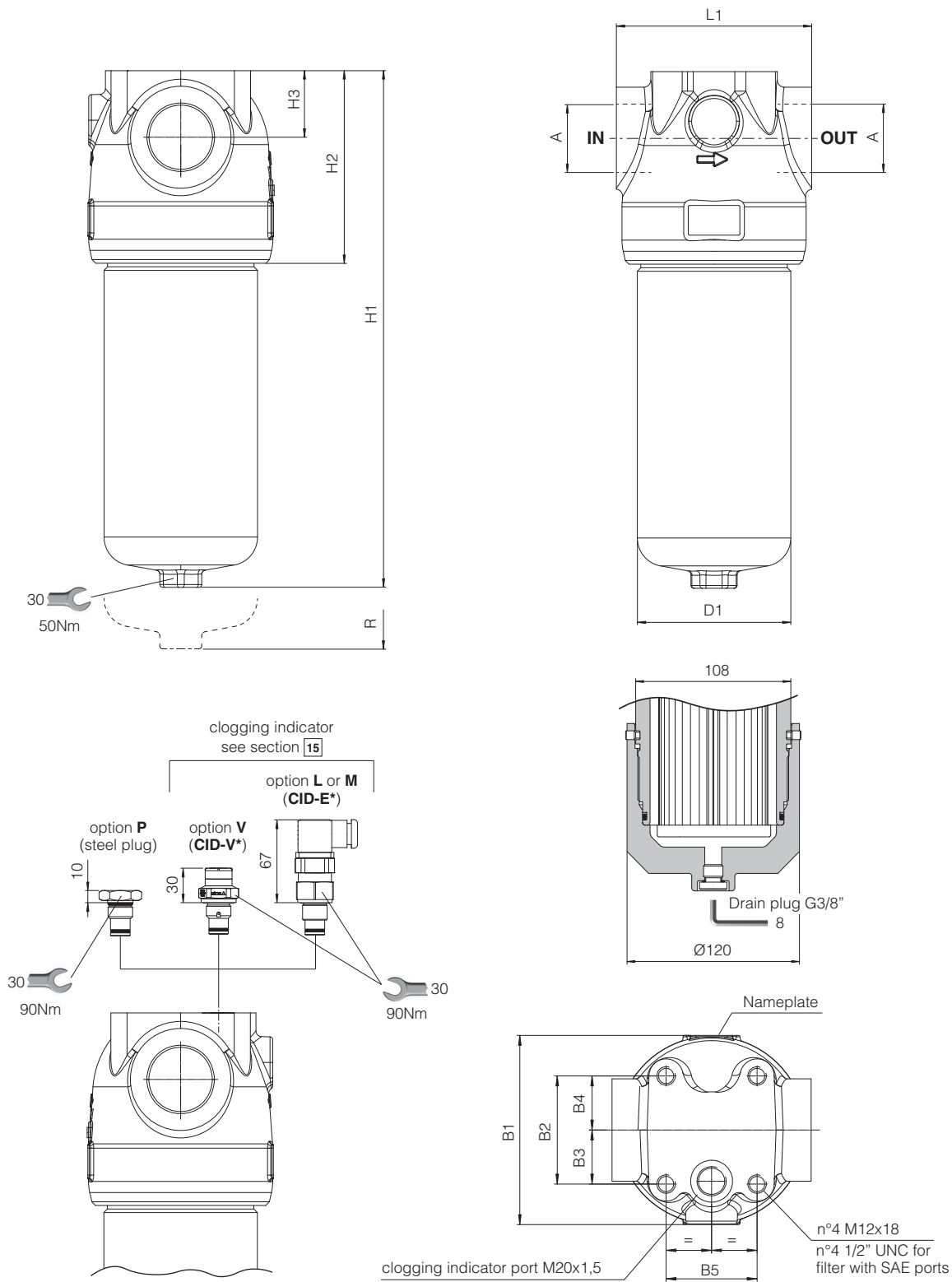


Code	A	B1	B2	B3	B4	B5	D1	H1	H2	H3	L1	R (element removal)	Mass (Kg)
SFPS-20-A	1" BSPP 1 1/4" BSPP SAE-20 <b>(1)</b>	111.5	56	28	28	56	90	261	111	39	116	120	7.4
SFPS-20-B								320					8.5
SFPS-20-C								390					9.9

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



SFPS -30



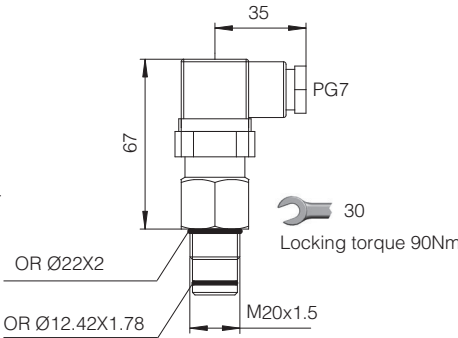
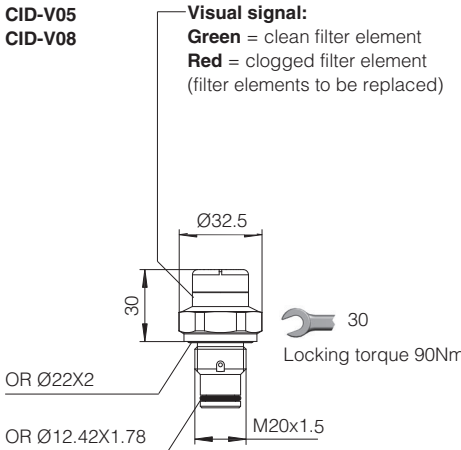
Code	A	B1	B2	B3	B4	B5	D1	H1	H2	H3	L1	R (element removal)	Mass (Kg)
SFPS-30-A	1 1/4" BSPP 1 1/2 BSPP SAE-24 (1)	133.5	76	38	38	64	110	240.5	136	47	140	130	10.5
SFPS-30-B								333.5					13
SFPS-30-C								453.5					16.4
SFPS-30-D								552.5					19

(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 $\pm$ 10%	5 bar $\pm$ 15%
	CID-E08, CID-V08	8 bar $\pm$ 10%	8 bar $\pm$ 10%
Max pressure		450 bar	420 bar
Max differential pressure		200 bar	
Ambient temperature		-25°C $\div$ +100°C	-25°C $\div$ +80°C
Hydraulic connection		M20x1,5	
Duty factor		100%	
Mechanical life		1 x 10 <sup>6</sup> 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 V <sub>DC</sub> $\pm$ 10%	
	CID-E05-M, CID-E08-M	14 V <sub>DC</sub> $\div$ 30 V <sub>DC</sub>	125 V <sub>AC</sub> $\div$ 250 V <sub>AC</sub>
Max current - resistive (inductive)		5 A (4 A) $\div$ 4 A (3 A)	5 A (3 A) $\div$ 3 A (2 A)
Protection degree to DIN EN 60529		IP65 with mating connector	
Switching scheme		<p><b>CID-*L</b></p>	<p><b>CID-*M</b></p>
	clean filter element		GREEN
	clogged filter element		RED

### 14 DIMENSIONS OF DIFFERENTIAL CLOGGING INDICATORS

ELECTRICAL INDICATOR		VISUAL INDICATOR	
<p><b>CID-E05-L</b> <b>CID-E08-L</b></p> <p>Electric connector DIN 43650 Transparent <b>with internal Led</b></p> <p><b>CID-E05-M</b> <b>CID-E08-M</b> <b>CID-E05-M/UL</b> <b>CID-E08-M/UL</b></p> <p>Electric connector DIN 43650 Black colour</p>		<p><b>CID-V05</b> <b>CID-V08</b></p> <p><b>Visual signal:</b> <b>Green</b> = clean filter element <b>Red</b> = clogged filter element (filter elements to be replaced)</p>	
<p><b>Led signal:</b> <b>Green</b> = clean filter element <b>Red</b> = clogged filter element (filter elements to be replaced)</p> 			
<p>Note: the electrical connector can be oriented at steps of 90°</p>			

## 15 INSTALLATION AND COMMISSIONING

The max operating pressure of the system must not exceed the max working pressure of the filter (420 bar).

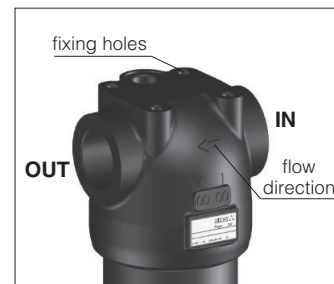
During the filter installation, pay attention to respect the flow direction, shown by the arrow on the filter head.

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.

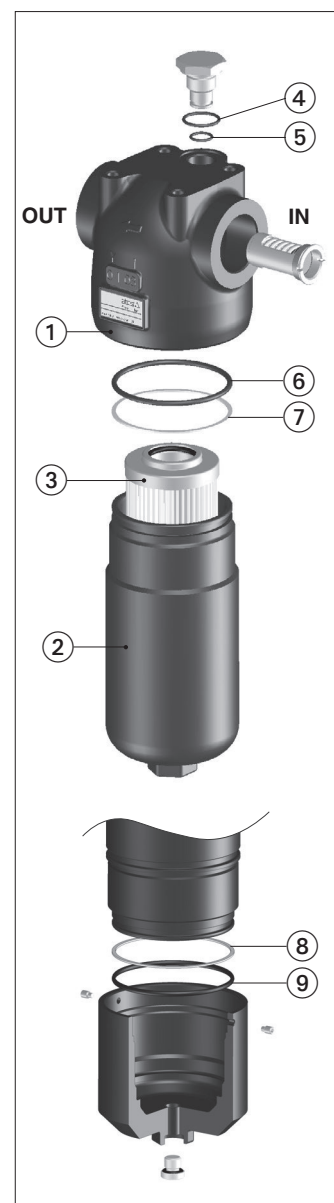


**WARNING:** The dirty filter elements cannot be cleaned and re-used. They are classified as "dangerous waste material", then they must be disposed of by authorized Companies, according to the local laws.

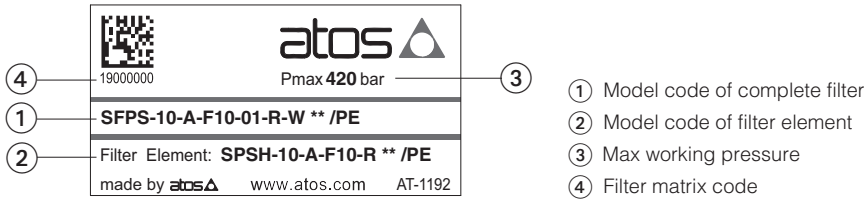
### 16.1 SEALS KIT

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)

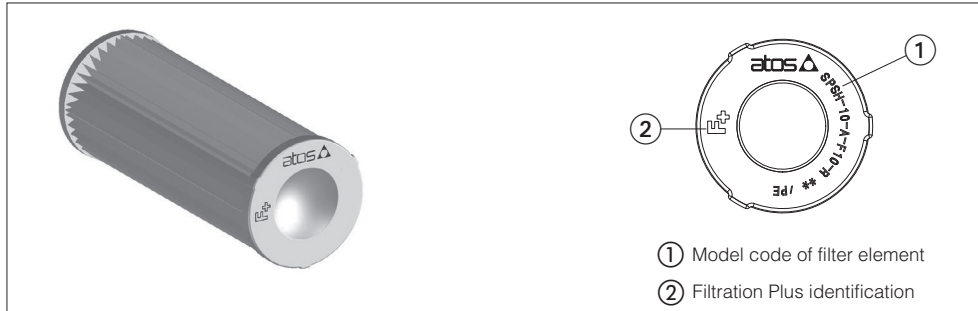
(1) Seals (8) and (9) are supplied in seal kit but used only for SFPS-30-D



## 17 FILTER IDENTIFICATION NAMEPLATE



### 17.1 IDENTIFICATION OF FILTER ELEMENT

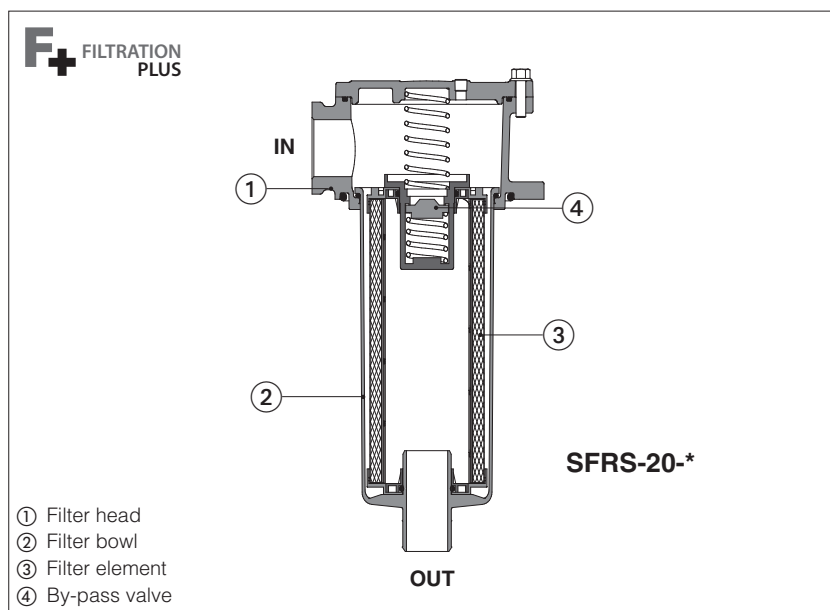


## 18 RELATED DOCUMENTATION

<b>LF010</b>	Fluid contamination
<b>LF020</b>	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)  
(β<sub>x</sub> (c) >1000, ISO 16889)
- cellulose filter elements with filtration rating 10 or 25 µm (β<sub>x</sub> (c) >2, ISO 16889)
- without or with electrical or visual clogging indicators

Max flow **750 l/min**

Max working pressure **8 bar**

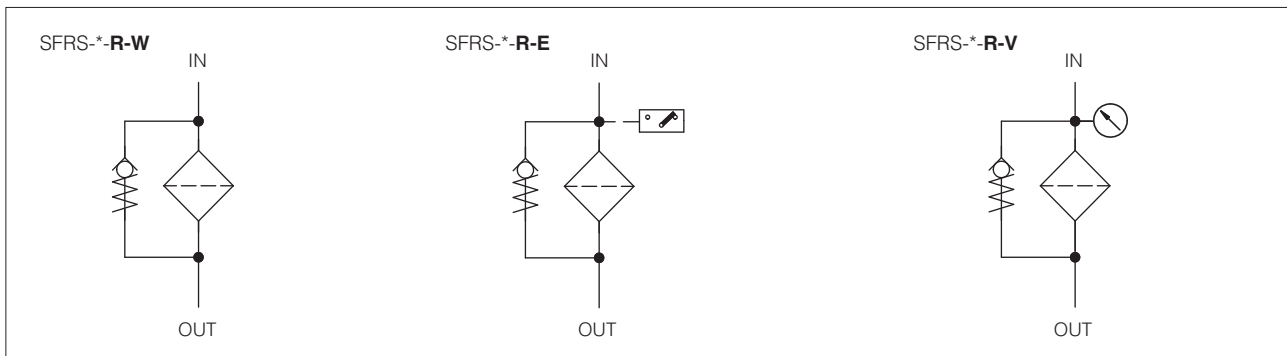
## 1 MODEL CODE OF COMPLETE FILTERS

SFRS	-	10	-	A	-	F10	-	00	-	R	-	W	**	/	*
Return line filter													Series number		Seals material: - = NBR <b>PE</b> = FKM
<b>Filter size (ports size):</b> <b>10</b> = G1/2" ÷ G3/4" or SAE-12 <b>20</b> = G1/2" ÷ G1 1/4" or SAE-16 <b>30</b> = G1" ÷ G1 1/2" or SAE-24 <b>40</b> = G1 1/4" ÷ G2" or SAE-32															
<b>Filter</b> Max flow [l/min] <b>(1)</b> <b>length:</b> SFRS-10   SFRS-20   SFRS-30   SFRS-40 <b>A</b> =    50            75            290          370 <b>B</b> =    80            125          310          600 <b>C</b> =    -            200          -            650 <b>D</b> =    -            260          -            430 <b>(2)</b> <b>E</b> =    -            -            -            750															
<b>SN</b> = only body, without filter element <b>F+ microfibre filter element</b> , β <sub>x</sub> (c) >1000 - ISO 16889: <b>F06</b> = 7 µm (c) <b>F10</b> = 12 µm (c) <b>F25</b> = 27 µm (c) <b>Cellulose filter element</b> , β <sub>x</sub> (c) >2 - ISO 16889: <b>C10</b> = 10 µm (c) <b>C25</b> = 25 µm (c)															
<b>Clogging indicator</b> see sect. <b>[12]</b> <b>(4)</b> : <b>W</b> = without, indicator port plugged with steel plug <b>E</b> = electrical indicator <b>(5)</b> <b>V</b> = visual indicator															
<b>By-pass:</b> <b>R</b> = by-pass valve with cracking pressure 3 bar															
<b>Ports size:</b> BSPP threaded: SFRS-10            SFRS-20            SFRS-30            SFRS-40 <b>00</b> = G 1/2" <b>00</b> = G 1/2" <b>02</b> = G 1" <b>03</b> = G 1 1/4" <b>01</b> = G 3/4" <b>01</b> = G 3/4" <b>03</b> = G 1 1/4" <b>04</b> = G 1 1/2" <b>02</b> = G 1" <b>04</b> = G 1 1/2" <b>05</b> = G 2" <b>03</b> = G 1 1/4"															
SAE J1926-1 threaded <b>(3)</b> : SFRS-10            SFRS-20            SFRS-30            SFRS-40 <b>41</b> = SAE-12 <b>42</b> = SAE-16 <b>44</b> = SAE-24 <b>45</b> = 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 mm<sup>2</sup>/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)



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

<b>SPRS</b>	-	<b>10</b>	-	<b>A</b>	-	<b>F10</b>	-	<b>**</b>	/	<b>*</b>																								
Spare filter element for return line filter type SFRS								Series number		Seals material: - = NBR <b>PE</b> = FKM (2)																								
<b>Microfibre filter element, <math>\beta_x(c) &gt; 1000</math> - ISO 16889:</b> <b>F06</b> = 7 $\mu\text{m}$ (c) <b>F10</b> = 12 $\mu\text{m}$ (c) <b>F25</b> = 27 $\mu\text{m}$ (c) <b>Cellulose filter element, <math>\beta_x(c) &gt; 2</math> - ISO 16889:</b> <b>C10</b> = 10 $\mu\text{m}$ <b>C25</b> = 25 $\mu\text{m}$																																		
<b>Filter element length:</b> <table><tr><td>for SFRS-10</td><td>for SFRS-20</td><td>for SFRS-30</td><td>for SFRS-40</td></tr><tr><td><b>A</b></td><td><b>A</b></td><td><b>A</b></td><td><b>A</b></td></tr><tr><td><b>B</b></td><td><b>B</b></td><td><b>B</b></td><td><b>B</b></td></tr><tr><td></td><td><b>C</b></td><td></td><td><b>C</b></td></tr><tr><td></td><td><b>D</b></td><td></td><td><b>D</b></td></tr><tr><td></td><td></td><td></td><td><b>E</b></td></tr></table>											for SFRS-10	for SFRS-20	for SFRS-30	for SFRS-40	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>		<b>C</b>		<b>C</b>		<b>D</b>		<b>D</b>				<b>E</b>
for SFRS-10	for SFRS-20	for SFRS-30	for SFRS-40																															
<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>																															
<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>																															
	<b>C</b>		<b>C</b>																															
	<b>D</b>		<b>D</b>																															
			<b>E</b>																															

(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

<b>CIA</b>	-	<b>V</b>	-	<b>**</b>
Clogging indicator for return line filter type SFRS				Series number
<p><b>Type of indicator:</b>  <b>E</b> = Electrical - pressure switch, switching pressure 2 bar  <b>E/UL</b> = As type E, certified according to North American Standard cURus (available on request)  <b>V</b> = Visual - pressure gauge, range 0 ÷ 10 bar (1)</p>				

(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	<b>Standard</b> = -20°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Storage temperature range	<b>Standard</b> = -20°C ÷ +80°C <b>/PE</b> option = -20°C ÷ +80°C
Materials	Filter head: Aluminium alloy
	Filter bowl: Nylon PA6 reinforced
Fatigue strength	min. 1 x 10 <sup>6</sup> 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 <b>-see note-</b>	<b>F06</b>	14	36	15	38	32	50	66	82	35	57	93	100	35	58	93	133	36	62	93	135
	<b>F10</b>	30	54	31	58	48	65	83	100	52	77	138	125	53	78	138	195	56	90	140	200
	<b>F25</b>	48	73	50	80	58	79	96	110	67	97	189	141	67	100	189	240	75	125	200	260
	<b>C10</b>	70	87	76	97	75	88	102	110	90	111	216	146	92	115	216	263	113	160	225	277
	<b>C25</b>	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 <b>-see note-</b>	<b>F06</b>	180	190	175	185	180	190	203	286	310	233	430	210	300	330	240	460	210	310	338	245	500
	<b>F10</b>	250	260	250	270	270	280	314	429	492	353	540	340	478	565	374	607	340	500	594	387	640
	<b>F25</b>	265	275	280	293	290	310	340	495	525	386	590	370	570	611	412	708	370	600	650	430	750
	<b>C10</b>	280	290	311	315	326	330	365	515	546	401	606	400	597	642	430	732	400	630	679	446	780
	<b>C25</b>	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  $\Delta p = 0,5$  bar and viscosity  $32 \text{ mm}^2/\text{s}$ . 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 <b>F+</b> FILTRATION PLUS	Cellulose
Filtration rating as per ISO16889	<b>F06</b>	$\beta_{06\mu\text{m (c)}} \geq 1000$	-
	<b>F10</b>	$\beta_{12\mu\text{m (c)}} \geq 1000$	-
	<b>F25</b>	$\beta_{27\mu\text{m (c)}} \geq 1000$	-
	<b>C10</b>	-	$\beta_{10\mu\text{m (c)}} \geq 2$
	<b>C25</b>	-	$\beta_{25\mu\text{m (c)}} \geq 2$

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

Seals, recommended fluid temperature	NBR seals (standard) = $-25^\circ\text{C} \div +100^\circ\text{C}$ , with HFC hydraulic fluids = $+10^\circ\text{C} \div +50^\circ\text{C}$ FKM seals (/PE option) = $-25^\circ\text{C} \div +100^\circ\text{C}$		
Recommended viscosity	$15 \div 100 \text{ mm}^2/\text{s}$ - max allowed range $2.8 \div 500 \text{ mm}^2/\text{s}$		
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

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

$$\text{Total } \Delta p = \text{filter head } \Delta p + \text{filter bowl } \Delta p + \text{filter element } \Delta p$$

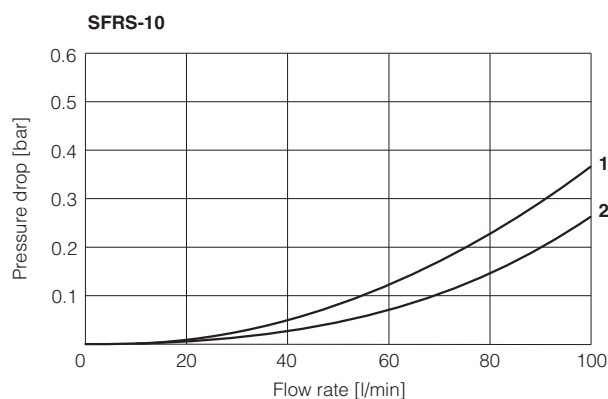
In the best conditions the total  $\Delta p$  should not exceed 0,5 bar

See below sections to calculate the  $\Delta p$  of filter head and  $\Delta p$  of the filter element

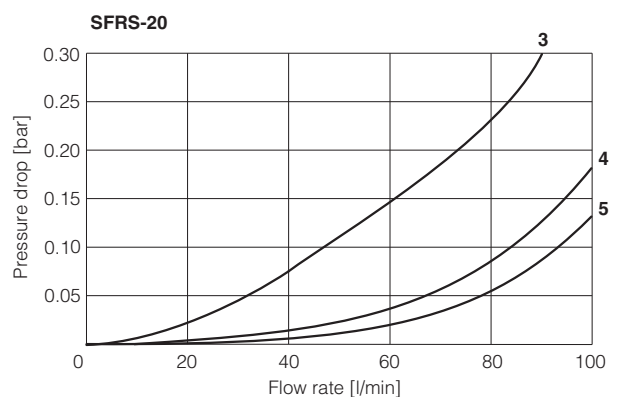
### 9.1 Q/ $\Delta p$ DIAGRAMS OF FILTER HEAD + FILTER BOWL

The pressure drop mainly depends on the ports size and fluid density

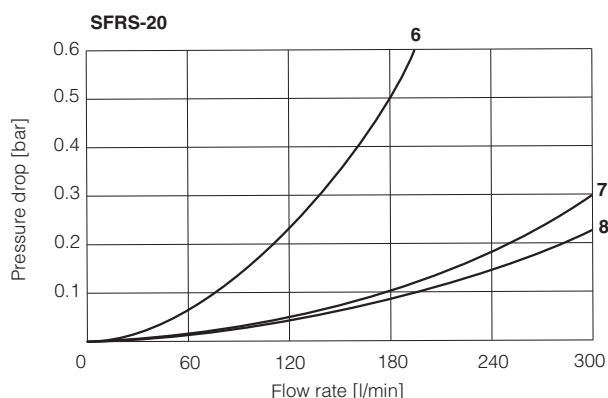
In the following diagrams are reported the  $\Delta p$  characteristics based on mineral oil with density 0,86 kg/dm<sup>3</sup> and viscosity 32 mm<sup>2</sup>/s



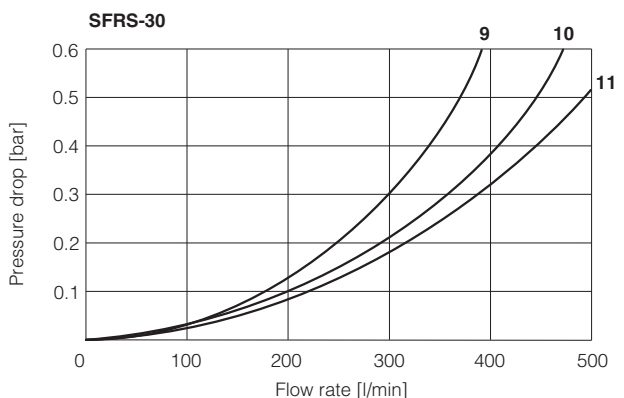
1 = SFRS-10-\*00 (G 1/2") 2 = SFRS-10-\*01 (G 3/4")  
SFRS-10-\*41 (SAE-12)



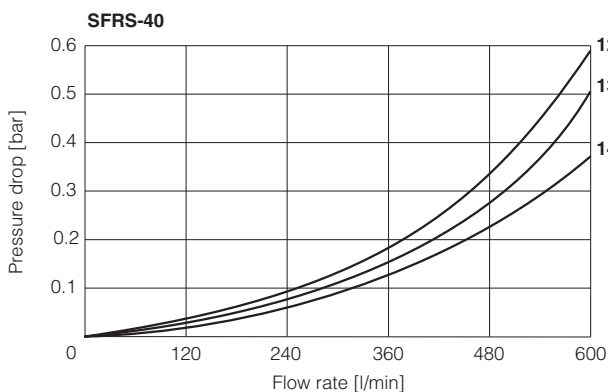
3 = SFRS-20-\*00 (G 1/2") 5 = SFRS-20-A-02 (G 1")  
4 = SFRS-20-A-01 (G 3/4") SFRS-20-B-02 (G 1")  
SFRS-20-B-01 (G 3/4") SFRS-20-A-42 (SAE-16)  
SFRS-20-B-42 (SAE-16)



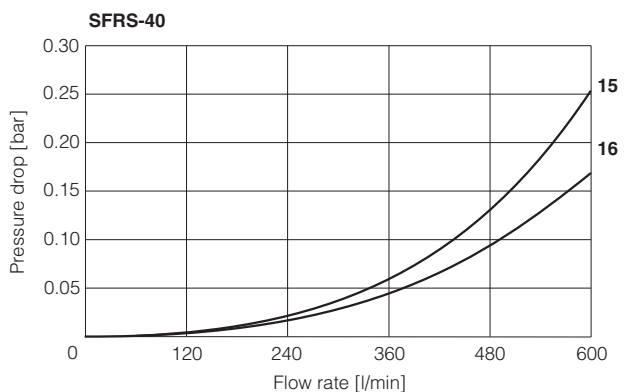
6 = SFRS-20-C-01 (G 3/4") 7 = SFRS-20-C-02 (G 1")  
SFRS-20-D-01 (G 3/4") SFRS-20-D-02 (G 1")  
8 = SFRS-20-\*03 (G 1 1/4") SFRS-20-C-42 (SAE-16)  
SFRS-20-D-42 (SAE-16)



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



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



15 = SFRS-40-B-04 (G 1 1/2") 16 = SFRS-40-B-05 (G 2")  
SFRS-40-C-04 (G 1 1/2") SFRS-40-C-05 (G 2")  
SFRS-40-E-04 (G 1 1/2") 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 $\Delta p$

The pressure drop through the filter depends to:

- size of filter element
- filtration rating
- fluid viscosity

The  $\Delta p$  of filter element is given by the formula:

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

**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 (mm<sup>2</sup>/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												
<b>F06</b>	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
<b>F10</b>	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
<b>F25</b>	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
<b>C10</b>	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
<b>C25</b>	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  $\Delta p$  for filter type SFRS-20-B-F10-02-R at Q = 50 l/min and viscosity 46 mm<sup>2</sup>/s (filter element SPRS-20-B-F10)

$\Delta p$  of filter head + filter bowl = 0,03 bar

**Gc** = 5,27 mbar/(l/min)

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

$$\text{Total } \Delta p = 0,03 + 0,379 = \mathbf{0,40 \text{ bar}}$$

- 2) calculation of Total  $\Delta p$  of filter type SFRS-40-C-F25-05-R at Q = 500 l/min and viscosity 46 mm<sup>2</sup>/s (filter element SPRS-40-C-F25)

$\Delta p$  of filter head + filter bowl = 0,13 bar

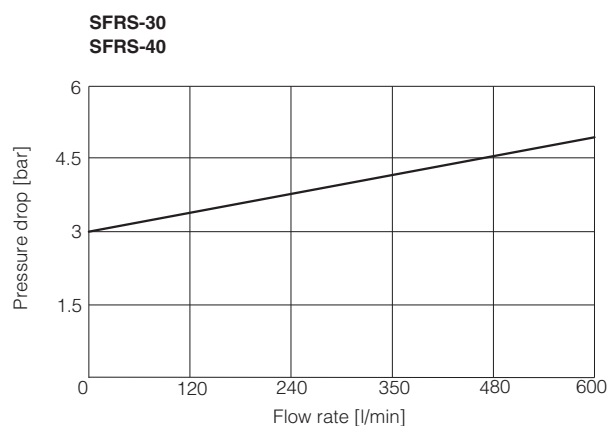
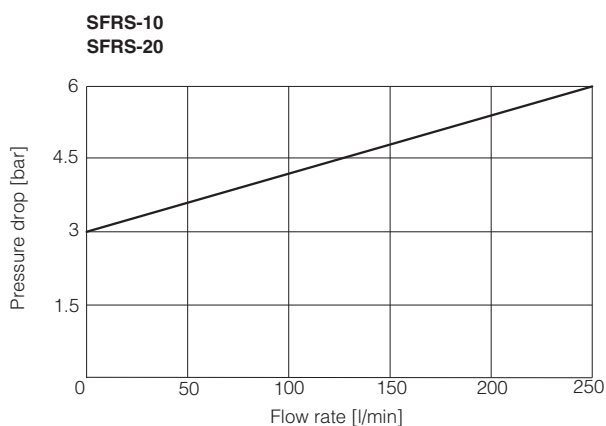
**Gc** = 0,42 mbar/(l/min)

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

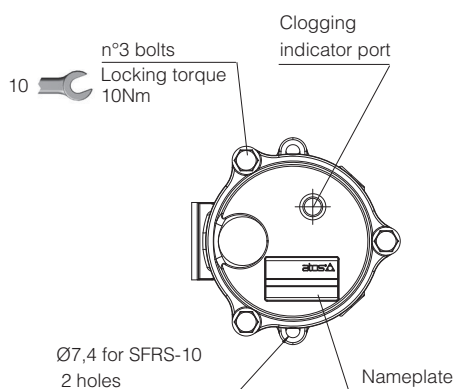
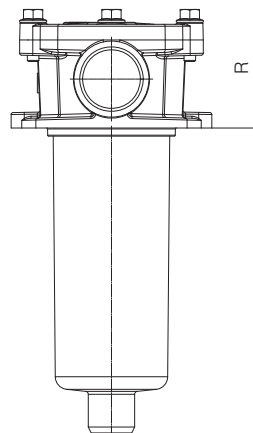
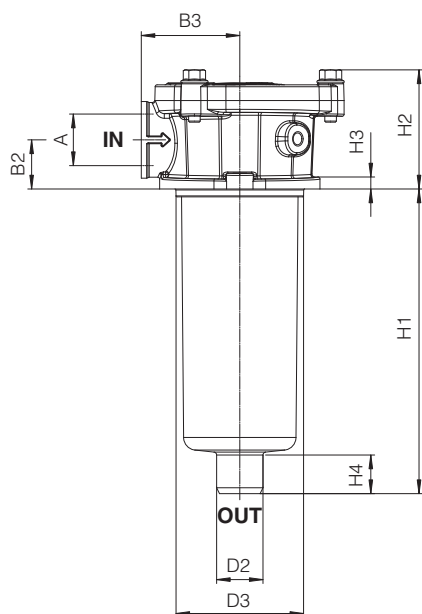
$$\text{Total } \Delta p = 0,13 + 0,302 = \mathbf{0,43 \text{ bar}}$$

## 10 BY -PASS VALVE - based on mineral oil ISO VG46 at 50°C (viscosity = 32 mm<sup>2</sup>/s)

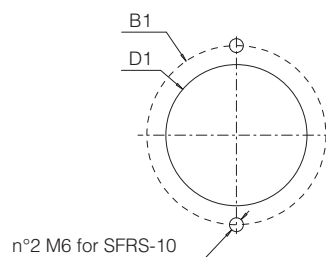
Q/ $\Delta p$  diagrams of flow trough the by pass valve



# SFRS-10



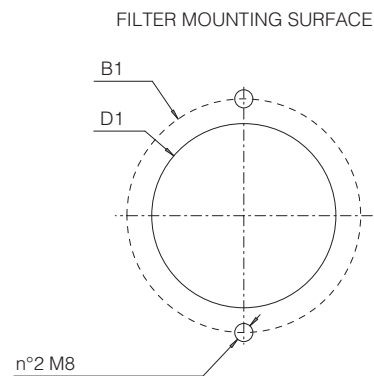
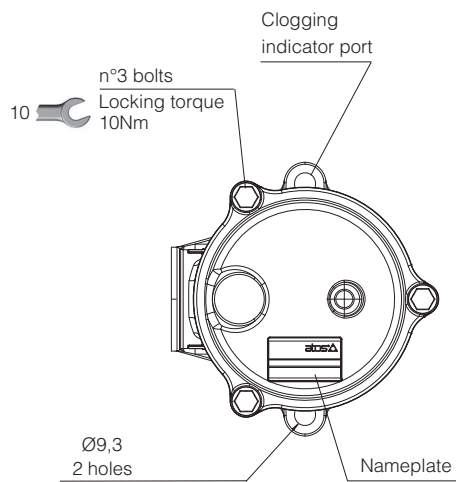
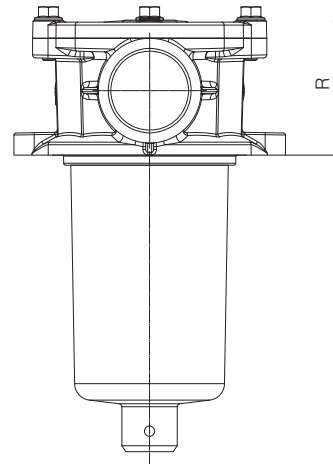
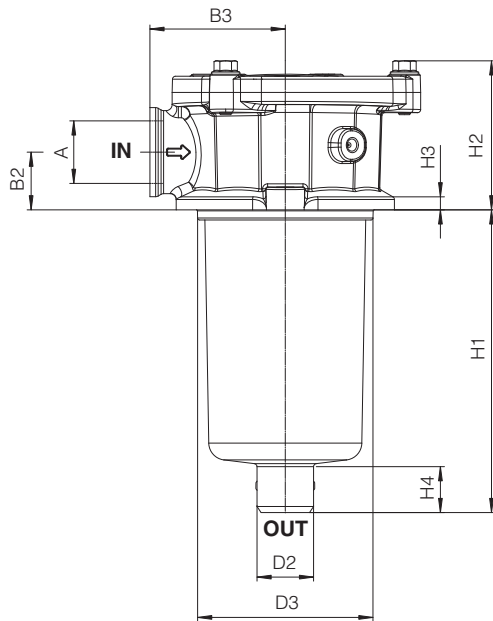
## FILTER MOUNTING SURFACE



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

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

## SFRS-20



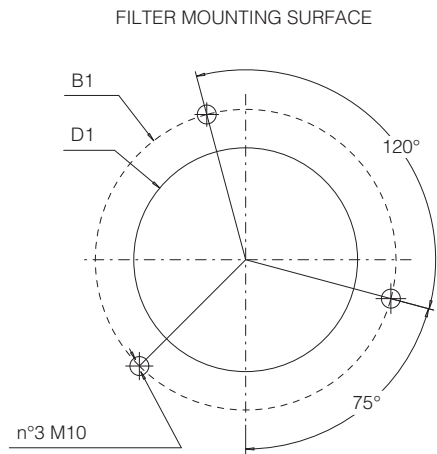
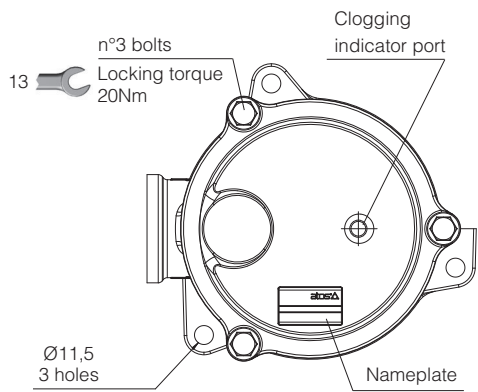
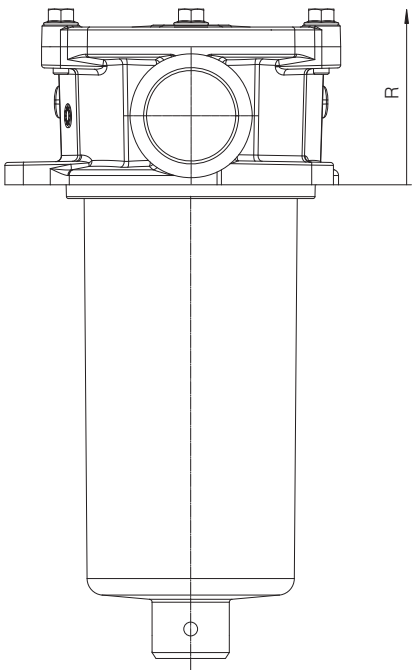
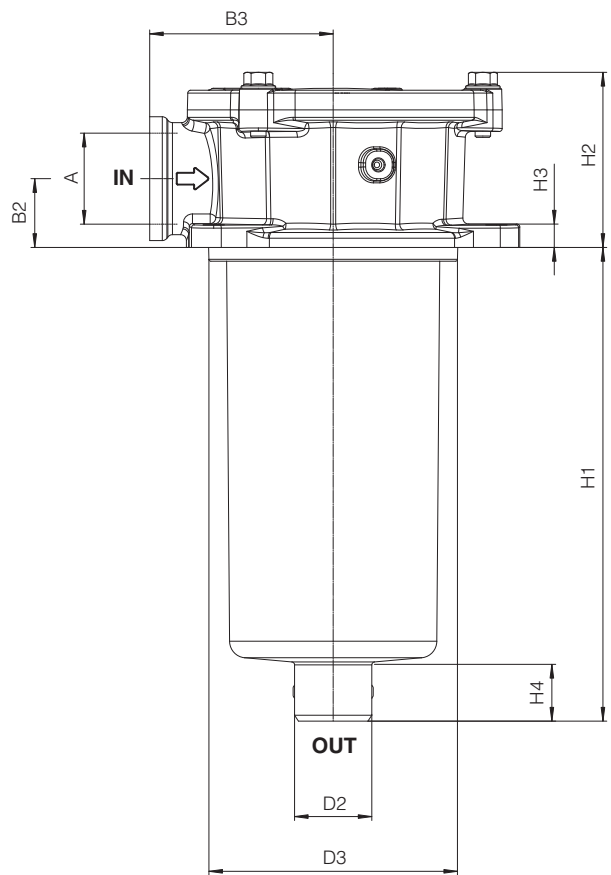
Code	A	B1	B2	B3	D1	D2	D3	H1	H2	H3	H4	R (element removal)	Mass (Kg)
SFRS-20-A	1/2" BSPP	115	28,5	67	88,5	40	87	92	73	11	24	170	0,80
SFRS-20-B	3/4" BSPP		(2)					139				220	0,90
SFRS-20-C	1" BSPP		32					219				295	1,10
SFRS-20-D	1 1/4" BSPP SAE-16 (1)		(3)					323				400	1,30

(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"

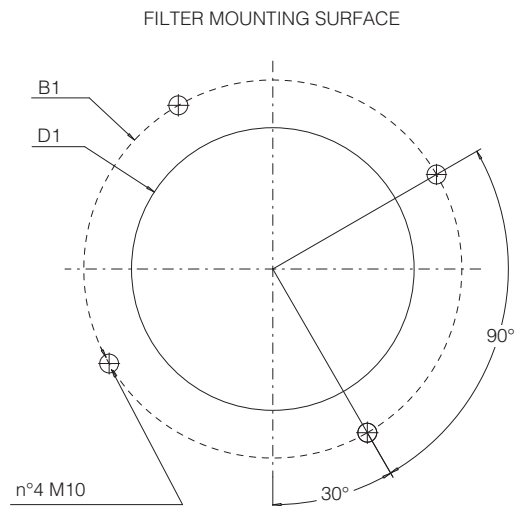
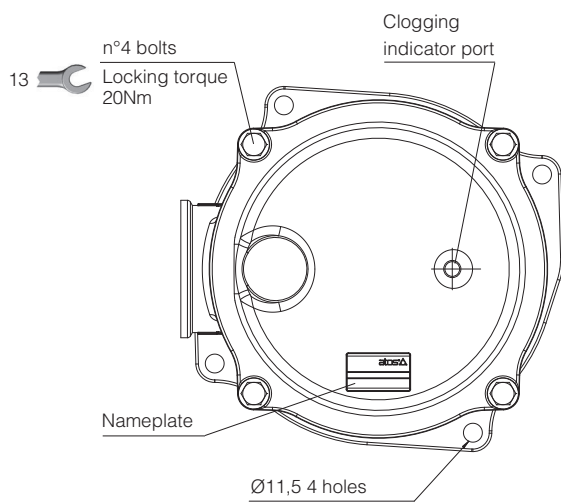
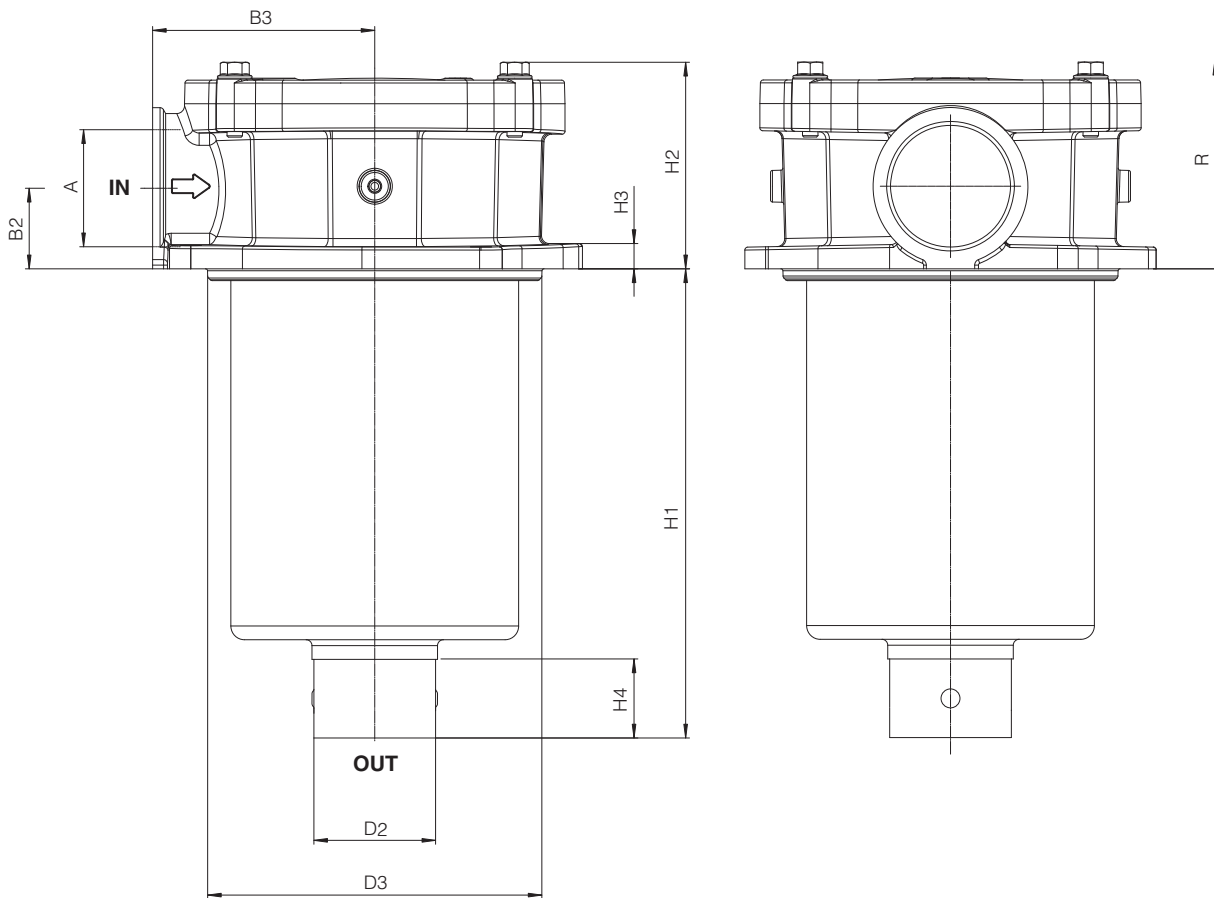
SFRS-30



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

(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		<b>Pipe length for SFRS-20 and SFRS-30:</b> 250 = 250 mm 500 = 500 mm  <b>Pipe length for SFRS-40:</b> 200 = 200 mm 500 = 500 mm	<b>Filter type:</b> 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		<b>Pipe length for SFRS-20 and SFRS-30:</b> 250 = 250 mm  <b>Pipe length for SFRS-40:</b> 200 = 200 mm (for SFRS-40) 500 = 500 mm (for SFRS-40)	<b>Filter type:</b> SFRS-20/30 = for SFRS-20 and SFRS-30 SFRS-40 = for SFRS-40

### MODEL CODE OF DIFFUSERS ③

DIFF	-	SFRS-20/30
Diffuser		<b>Filter type:</b> SFRS-20/30 = for SFRS-20 and SFRS-30 SFRS-40 = for SFRS-40

**DISCHARGE ENDING PIPE**

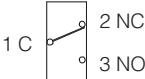

**CONNECTING ENDING PIPE**

**DIFFUSER**

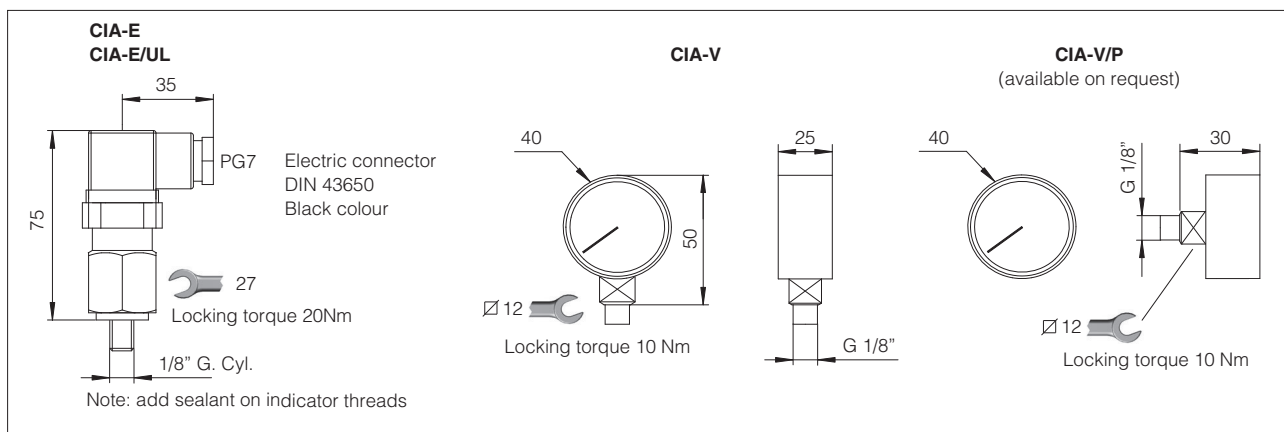
**DIFFUSER DIMENSIONS**

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 <sub>DC</sub> ÷ 30 V <sub>DC</sub>	125 V <sub>AC</sub> ÷ 250 V <sub>AC</sub>	
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	 <p>The electric scheme shows the switch position in case of clean filter element</p>		

### 14 DIMENSIONS OF CLOGGING INDICATORS



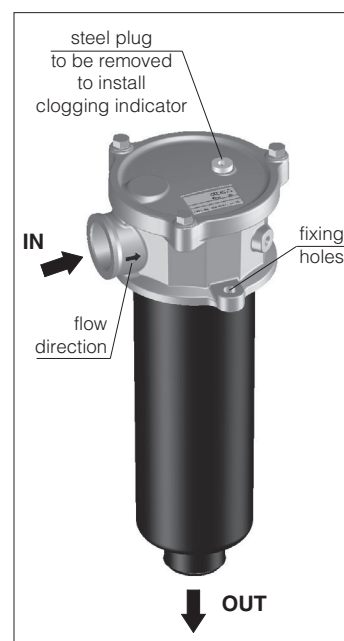
### 15 INSTALLATION AND COMMISSIONING

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 and 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.

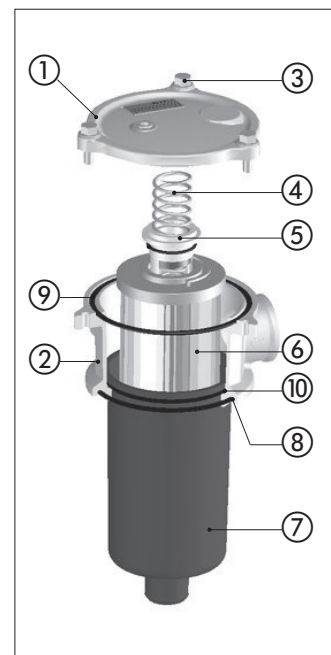
Select the new filter element according to the model code reported on the filter nameplate, see section 17

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 and 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

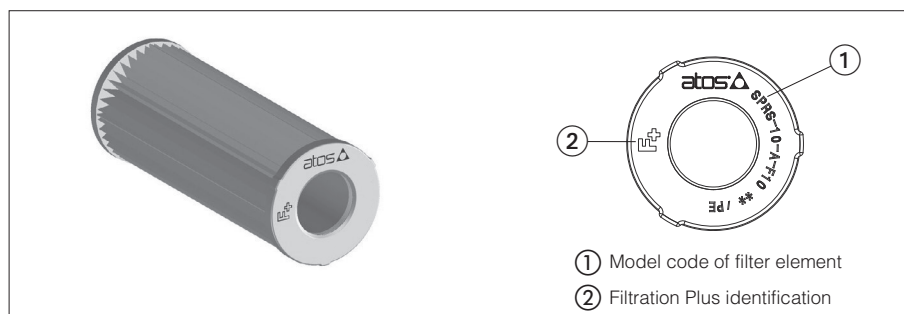
Filter type	Seal kit code
SFRS-10	MO-1246
SFRS-20	MO-1247
SFRS-30	MO-1248
SFRS-40	MO-1249

## 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

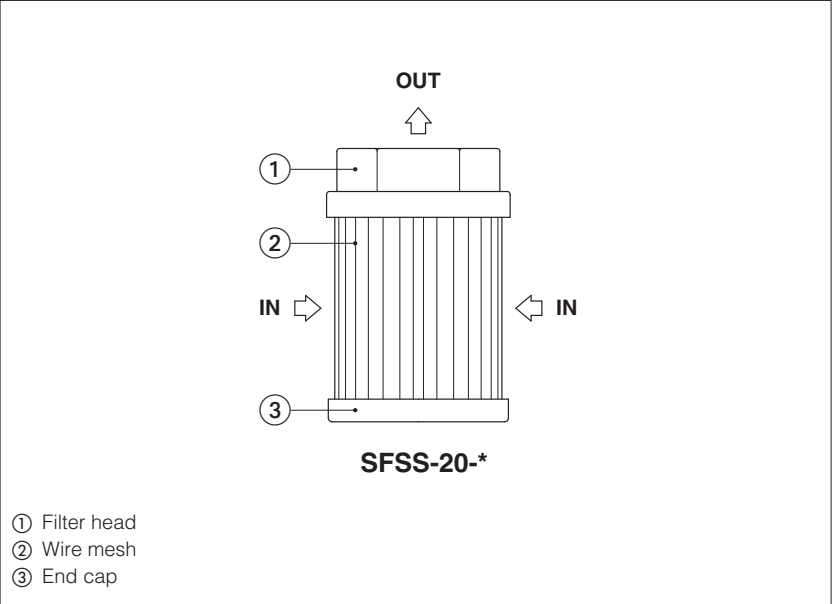
## 18 RELATED DOCUMENTATION

<b>LF010</b>	Fluid contamination
<b>LF020</b>	Filtration guidelines



# Suction filters type **SFSS**

Threaded ports



**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		Series number										
Filter size:												
10												
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(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

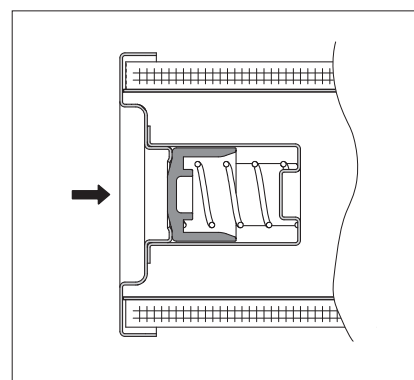
Recommended fluid temperature	-25°C ÷ +100°C, with HFC hydraulic fluids = +10°C ÷ +50°C	
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s	
<b>Hydraulic fluid</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	HFDR, 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  $\Delta p$  should not exceed 0.015 bar

### 6.1 Q/ $\Delta p$ DIAGRAMS

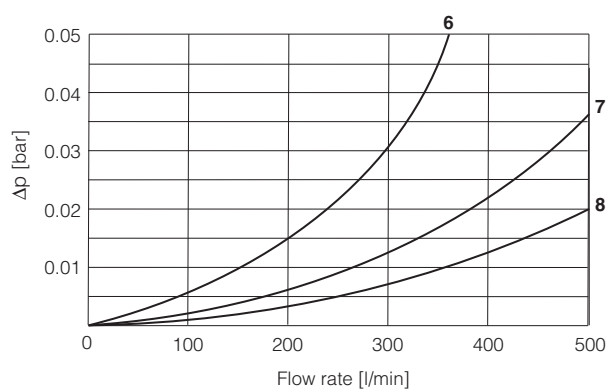
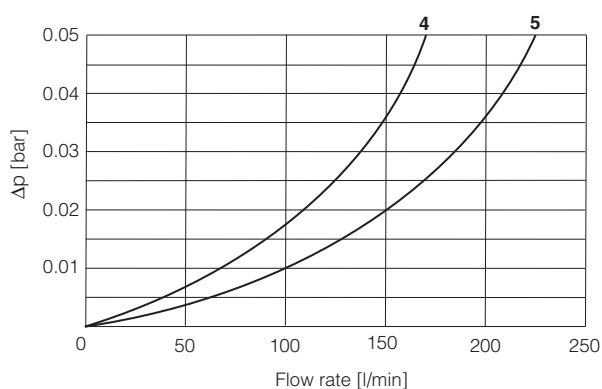
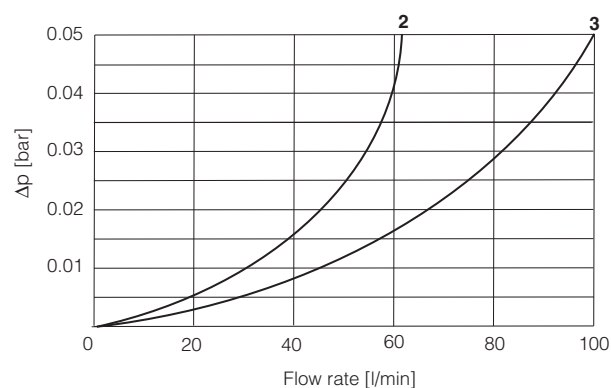
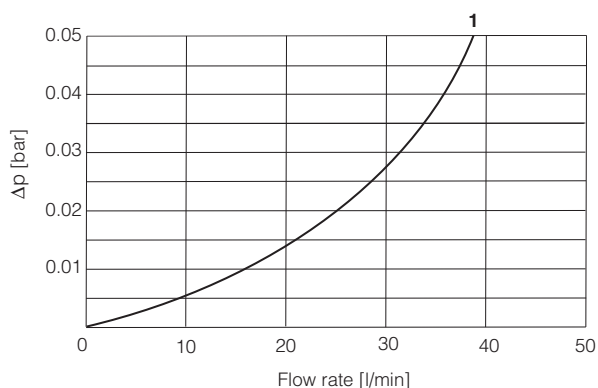
In following diagrams are reported the  $\Delta p$  characteristics of filter based on mineral oil with density 0,86 kg/dm<sup>3</sup> and viscosity 32 mm<sup>2</sup>/s. in case of different viscosity the effective  $\Delta p_E$  is given by the formula:

$$\Delta p_E = \Delta p \times \frac{\text{viscosity}}{32}$$

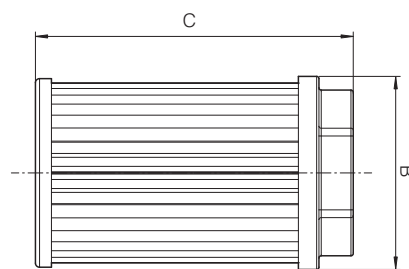
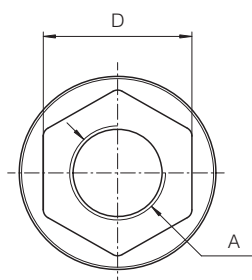
$\Delta p_E$  = pressure drop calculated at the effective viscosity

$\Delta p$  = pressure drop reported in the below diagrams

Viscosity = effective fluid viscosity in the working condition (mm<sup>2</sup>/s)



## 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	200	65	0,33
SFSS-30-B	1 1/2" BSPP				0,24
SFSS-30-C	2" BSPP				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

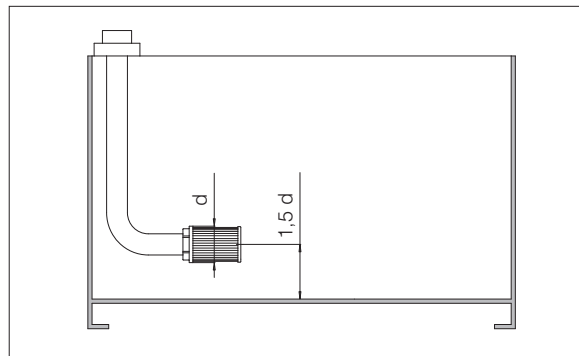
The suction filters SFSS must be generously sized to avoid pump cavitation.

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.



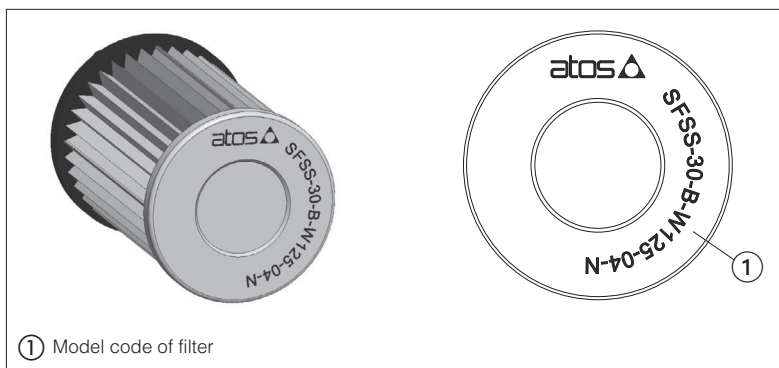
## 9 MAINTENANCE

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

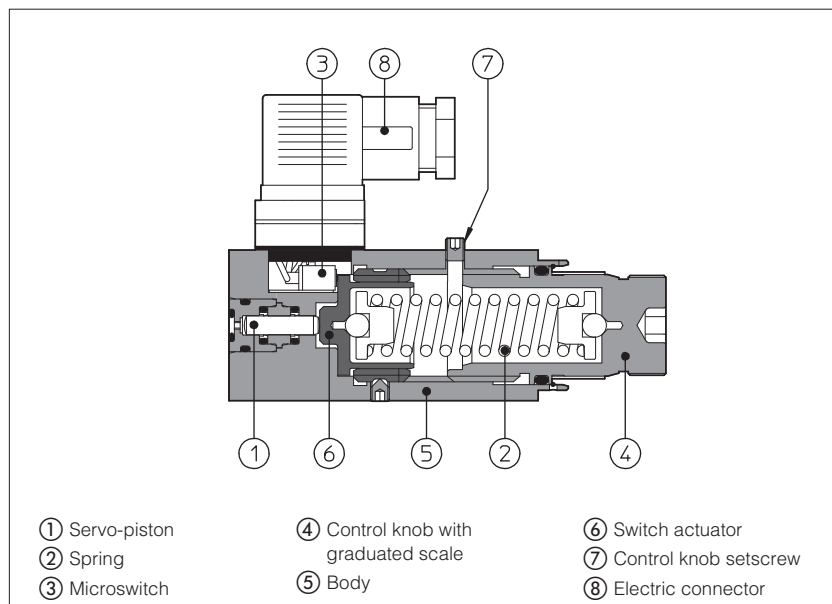


## 10 RELATED DOCUMENTATION

- LF010 Fluid contamination
- LF020 Filtration guidelines

## Pressure switches type SMAP

with fixed switching pressure differential and microswitch with gold plated contacts



**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

<b>SMAP</b>	-	<b>160</b>	/	<b>E</b>	<b>**</b>	/	<b>*</b>
Fixed differential pressure switch					Series number		Seals material, see section 2: - = NBR <b>PE</b> = FKM
Pressure range:	<b>160</b> = 10 ÷ 160 bar						
	<b>40</b> = 5 ÷ 40 bar	<b>320</b> = 30 ÷ 320 bar					
	<b>80</b> = 7 ÷ 80 bar	<b>630</b> = 50 ÷ 630 bar					
				Options: <b>E</b> = Common electric contact connected to pin 1 (see section 3)			

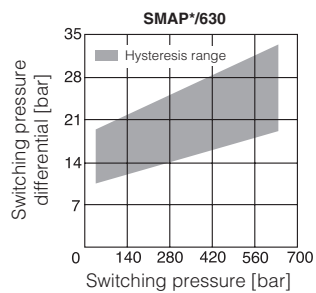
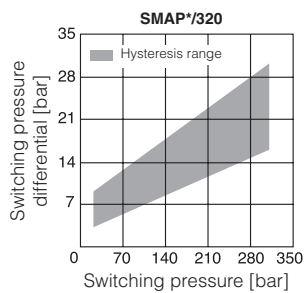
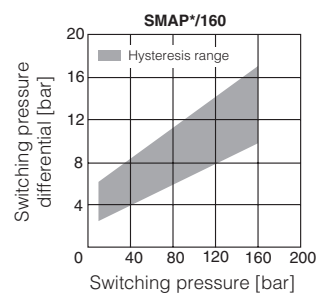
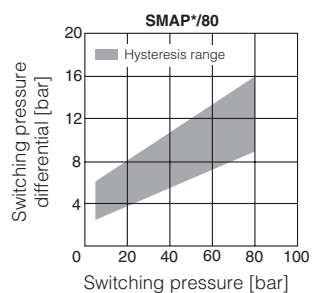
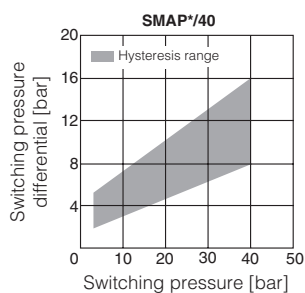
### 2 MAIN CHARACTERISTICS, SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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						

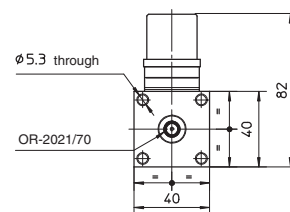
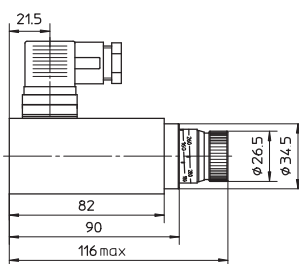
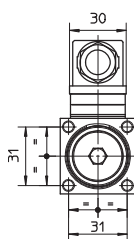
#### 4 DIAGRAMS



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

⚠ The switching pressure differential may increase depending on the deterioration of the fluid contamination class.

#### 5 DIMENSIONS OF SMAP WITHOUT ADAPTORS [mm]





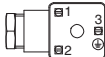

Fastening bolts:

4 socket head screws M5X90 supplied with the pressure switch

# Electric connectors



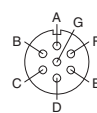

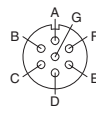

for on/off and proportional valves

## 1 CONNECTORS FOR ON/OFF VALVES

CODE AND DIMENSIONS	APPLICATION	INTERNAL VIEW PINOUT (1)	FRONT VIEW	CABLE GLAND Ø CABLE	REFERENCE RULES
<b>666</b> (black) <b>666/A</b> (grey) <hr/> <b>667-24</b> <b>667-110</b> <b>667-220</b>	Female plastic connector - 3 pin: - standard coil connector for on/off valves <hr/> 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
<b>669</b> (black) <b>669/A</b> (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
<b>666</b> (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
<b>ZM-7P</b>	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
<b>ZH-7P</b>	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

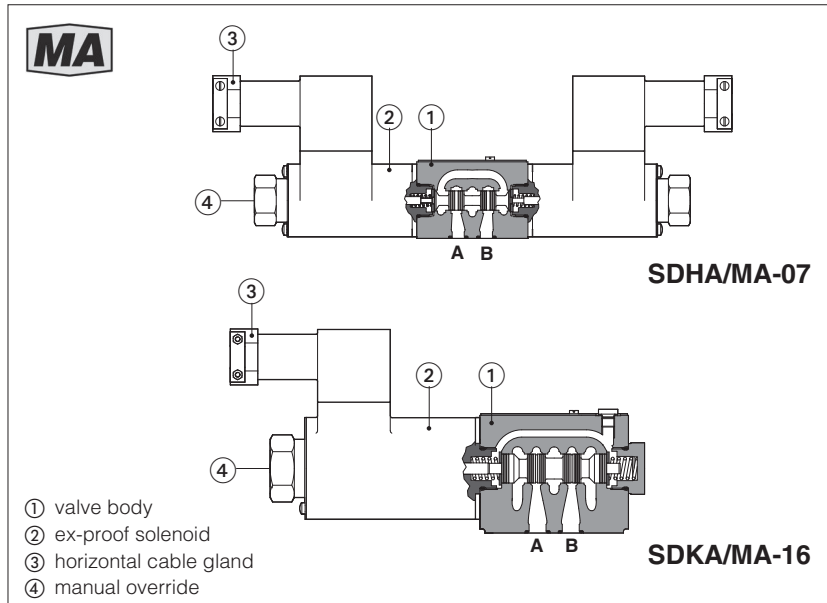
(1) the wiring of electrical terminals has to be made according to specific valve's technical table





# 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:

Size: **06** - ISO 4401

Max flow: **80 l/min**

Max pressure: **350 bar**

### SDKA/MA:

Size: **10** - ISO 4401

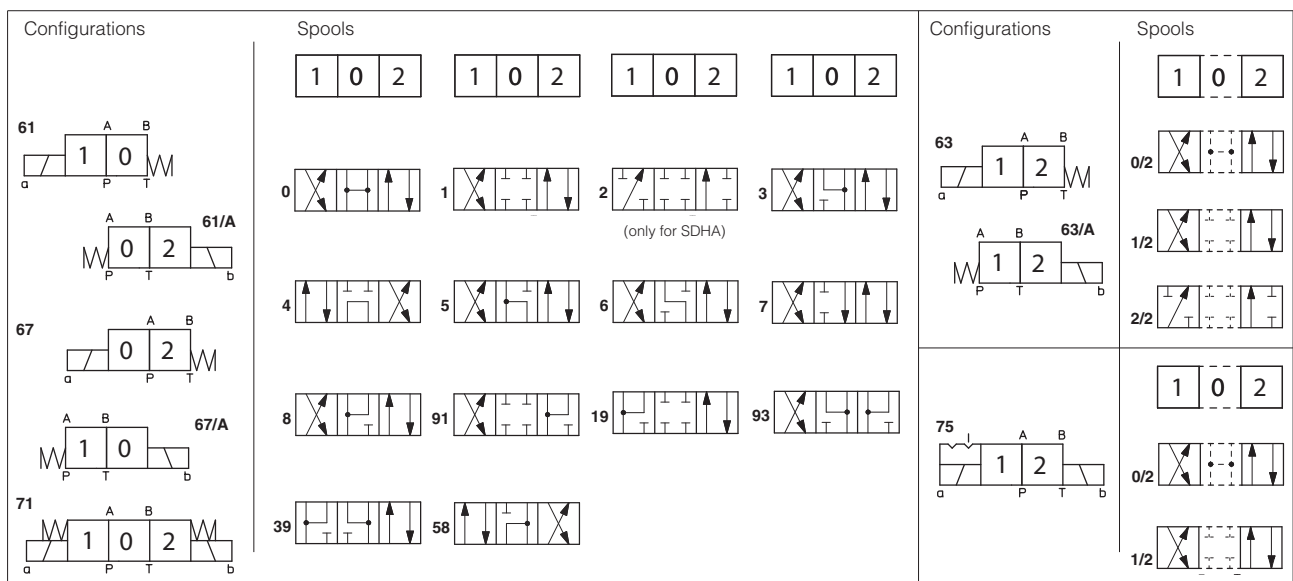
Max flow: **120 l/min**

Max pressure: **315 bar**

## 1 MODEL CODE

<b>SDHA</b>	/	<b>MA</b>	-	<b>0</b>	<b>63</b>	<b>1/2</b>	/	<b>A</b>	<b>24DC</b>	<b>**</b>	<b>**</b>
<b>SDHA</b> = spool type - direct, size 06 <b>SDKA</b> = spool type - direct, size 10  <b>Certification type:</b> <b>MA</b> = Ex-proof Ma Chinese mining certification  <b>Valve size</b> (ISO 4401) <b>0</b> = 06 for DHA <b>1</b> = 10 for DKA  <b>Configuration</b> , see section [2]  <b>Spool type</b> , see section [2]										Seals material, see sect. [6]: - = NBR <b>PE</b> = FKM  Series number	
										<b>Voltage code</b> , see section [5]	
<b>Option:</b> <b>A</b> = solenoid at side of port B (for single solenoid valves)											

## 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 switching.  
**SDKA** spool **1** is also available as **1/1**. It is properly shaped to reduce water-hammer shocks during the switching.

### 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	<b>Standard</b> = -20°C ÷ +70°C <b>/PE option</b> = -20°C ÷ +70°C
Storage temperature range	<b>Standard</b> = -20°C ÷ +80°C <b>/PE option</b> = -20°C ÷ +80°C
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-db

### 4 HYDRAULIC CHARACTERISTICS

<b>Operating pressure</b>	<b>SDHA/MA</b>	P, A, B = <b>350 bar</b>	T = <b>210 bar</b>
	<b>SDKA/MA</b>	P, A, B = <b>315 bar</b>	T = <b>210 bar</b>
<b>Maximum flow</b>	<b>SDHA/MA</b>	<b>80 l/min</b>	
	<b>SDKA/MA</b>	<b>120 l/min</b>	

### 5 ELECTRICAL CHARACTERISTICS

<b>SOLENOID TYPE</b>	ON/OFF		
<b>Voltage code</b> VDC    ±10%	<b>12DC, 24DC, 110DC</b>		
Power consumption	16,5 W (SDHA)	18W (SDKA)	
Protection degree	IP 65 to DIN EN 60529		
Duty factor	100%		

### 6 SEALS AND HYDRAULIC FLUID

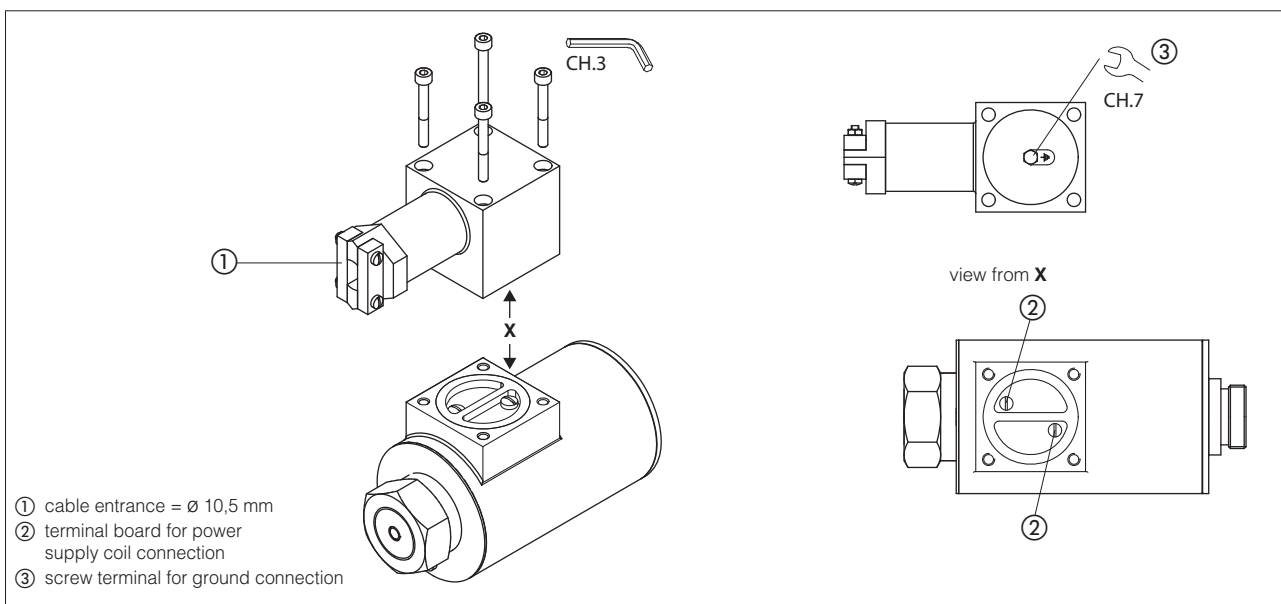
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15    NAS1638 class 9, see also filter section at <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
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	<b>SDHA/MA</b>	<b>SDKA/MA</b>
Certification	MA mining	
Solenoid certified code	<b>DTBZ12 - 37 FYC</b>	<b>DTBZ9 - 90FYC</b>
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

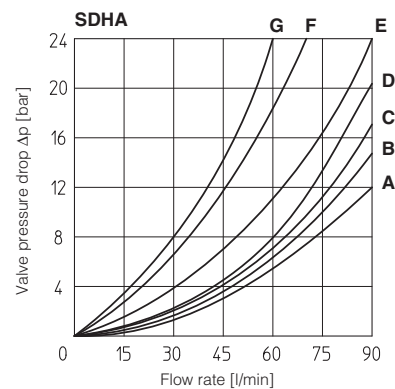
## 8 SOLENOID WIRING



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

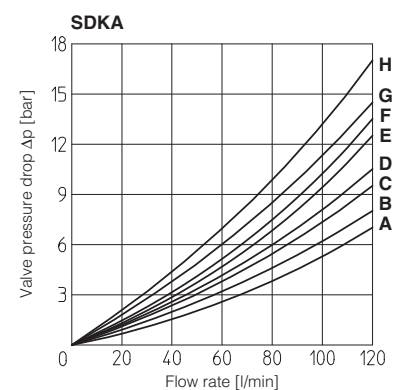
### SDHA

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

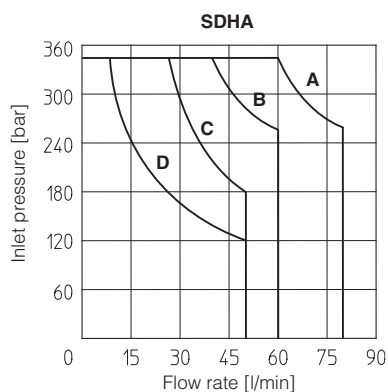
Flow direction Spool type	P→A	P→B	A→T	B→T	P→T	B→A
0, 0/1, 0/2, 2/2	A	A	B	B		
1, 1/1, 1/3, 6, 8	A	A	D	C		
3, 3/1, 7	A	A	C	D		
4	B	B	B	B	F	
5	A	B	C	C	G	
1/2	B	C	C	B		
19	A	D	C			H



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

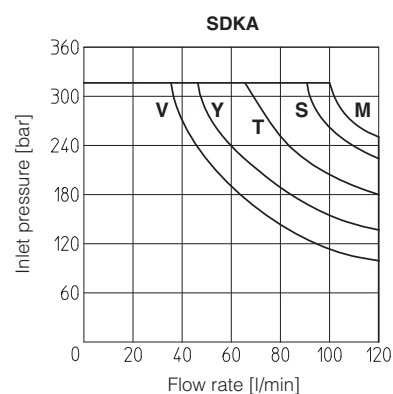
### SDHA

**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

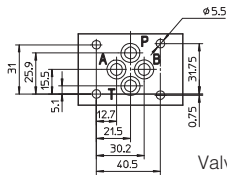
Fastening bolts: 4 socket head screws:

M5x30 class 12.9

Tightening torque = 8 Nm

Seals: 4 OR 108

Ports P, A, B, T:  $\varnothing = 7.5$  mm (max)

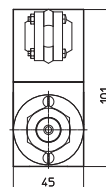
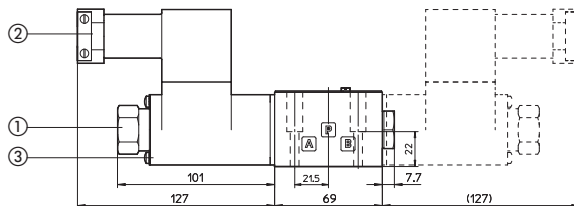


Valve's bottom view

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 =  $\varnothing 10,5$  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:

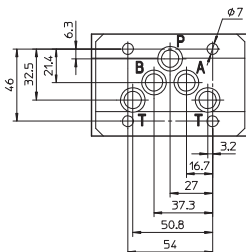
4 socket head screws M6x40 class 12.9

Tightening torque = 15 Nm

Seals: 5 OR 2050 and 1 OR 108

Ports P, A, B, T:  $\varnothing = 11.5$  mm (max)

Ports Y:  $\varnothing = 5$  mm

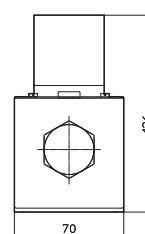
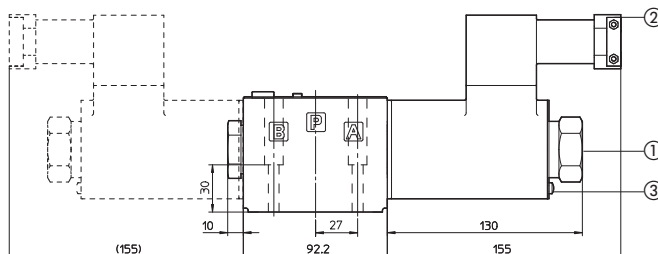


Valve's bottom view

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

SDKA/MA-16

SDKA/MA-07 (dotted line)



Mass:

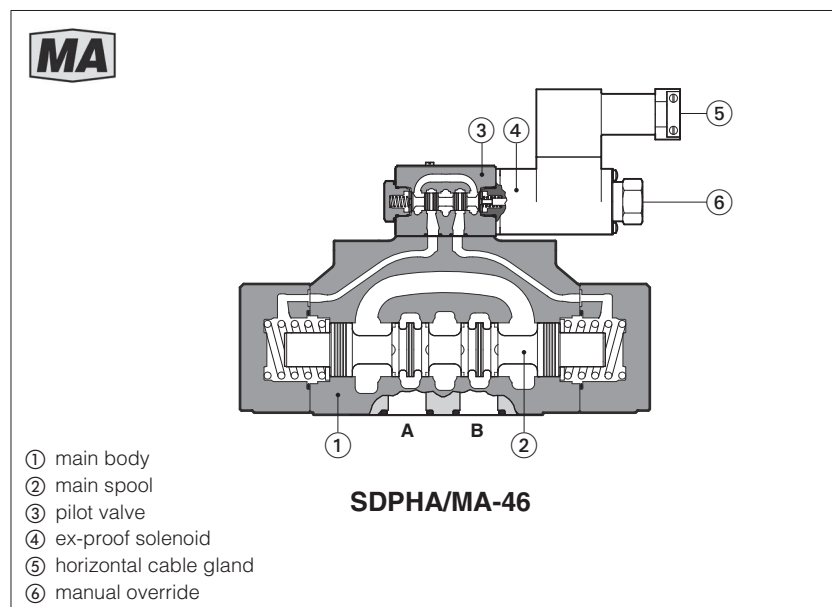
SDKA/MA-16: 5,7 kg

SDKA/MA-17: 8,7 kg

- ① manual override
- ② horizontal cable gland, cable entrance =  $\varnothing 10,5$  mm
- ③ screw terminal for additional equipotential grounding

# Ex-proof solenoid directional valves

on-off, piloted, spool type - **MA** certification



## 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

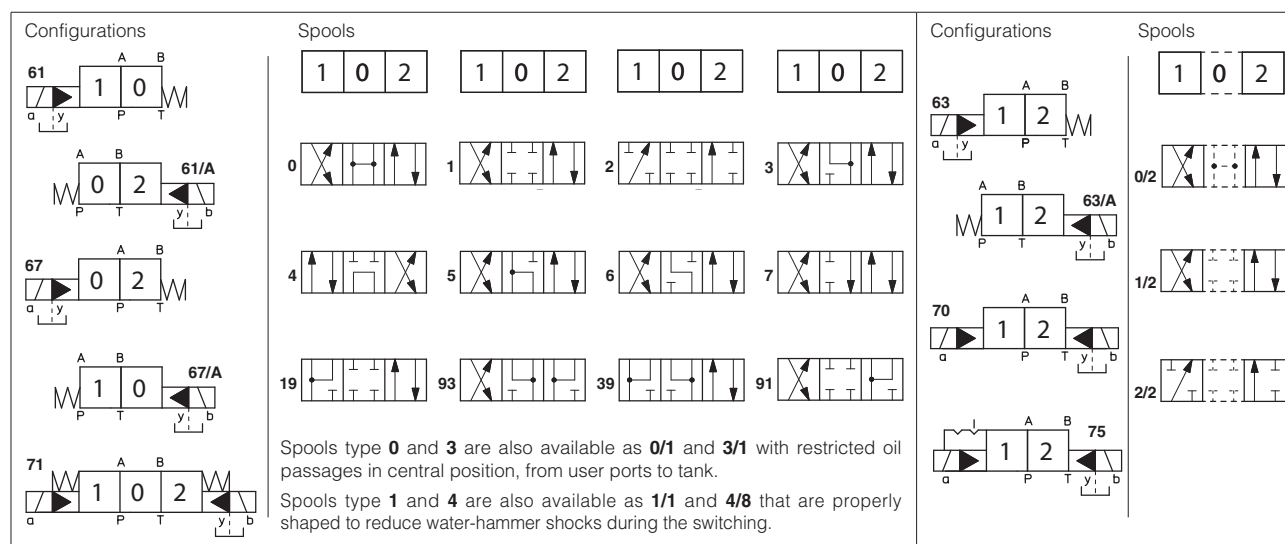
Max flow: **700 l/min**

Max pressure: **350 bar**

## 1 MODEL CODE OF PILOTED SOLENOID VALVES TYPE SDPHA

<b>SDPHA</b>	/	<b>MA</b>	-	<b>2</b>	<b>63</b>	<b>1/2</b>	-	<b>A</b>	<b>24DC</b>	<b>**</b>	<b>/*</b>
<p><b>SDPHA</b> = spool type - piloted</p> <p><b>Certification type:</b> <b>MA</b> = Ex-proof Ma Chinese mining certification</p> <p><b>Valve size (ISO 4401)</b> <b>2</b> = 16    <b>4</b> = 25</p> <p><b>Configuration</b>, see section 2</p> <p><b>Spool type</b>, see section 2</p> <p><b>Options:</b>  <b>/A</b> = Solenoid at side of port B (for single solenoid valves)  <b>/D</b> = Internal drain  <b>/E</b> = External pilot pressure  <b>/H</b> = Adjustable chokes (meter-out to the pilot chambers of the main valve)  <b>/R</b> = Pilot pressure generator (4 bar on port P)  <b>/S</b> = Main spool stroke adjustment         </p> <p><b>Seals material, see section 6:</b>  <b>-</b> = NBR  <b>PE</b> = FKM         </p> <p><b>Voltage code</b>, see section 5</p>											

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



### 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	<b>Standard</b> = -20°C ÷ +70°C <b>/PE</b> option = -20°C ÷ +70°C
Storage temperature range	<b>Standard</b> = -20°C ÷ +80°C <b>/PE</b> option = -20°C ÷ +80°C
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-db

### 4 HYDRAULIC CHARACTERISTICS

<b>Operating pressure</b>	P, A, B, X = <b>350 bar</b> T = <b>250 bar</b> (standard) T = <b>210 bar</b> (option /D)
	Ports Y = 0 bar - Minimum pilot pressure for correct operation is 8 bar
<b>Maximum flow</b>	SDPHA-2: <b>300 l/min;</b> SDPHA-4: <b>700 l/min;</b>

### 5 ELECTRICAL CHARACTERISTICS

<b>SOLENOID TYPE</b>	ON/OFF
<b>Voltage code</b> VDC ±10%	<b>12DC, 24DC, 110DC</b>
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 <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

### 7 CERTIFICATION DATA

Valve type	SDPHA/MA
Certification	MA mining
Solenoid certified code	<b>DTBZ12 - 37 FYC</b>
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

## Options

In standard version, solenoid is mounted at side of port B.

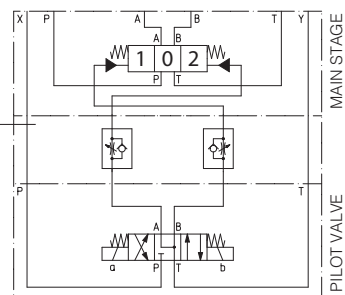
**/E** = External pilot pressure (standard configuration is internal pilot pressure).

**/R** = Pilot pressure generator (4 bar on port P - see section 8.1).

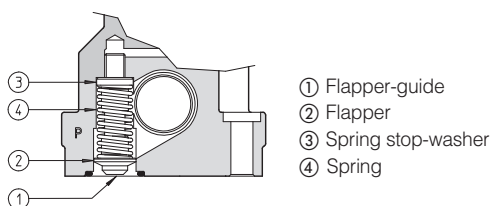
**/S** = Main spool stroke adjustment.

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

option H

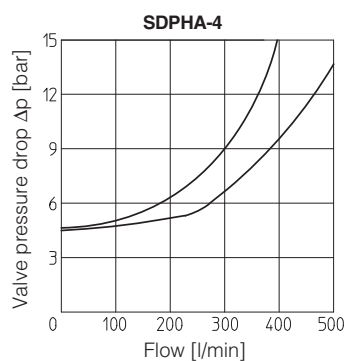
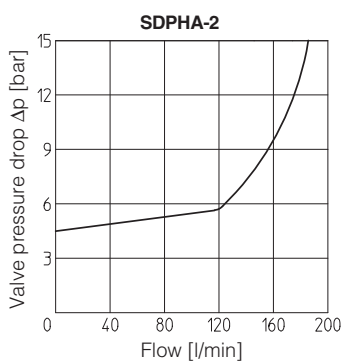


The device **/R** generates an additional pressure drop, in order to ensure the minimum pilot pressure, for correct operation of the valves with internal pilot and fitted with spools type **0, 0/1, 4, 4/8, 5, 58, 09, 90, 94, 49**. The device **/R** has to be fitted when the pressure drop in the valve, verified on flow versus pressure diagrams, is lower than the minimum pilot pressure value.



Ordering code of spare pilot pressure generator

<b>R/DP</b>	-	<b>*</b>
Pilot pressure generator		Size: <b>2</b> for SDPHA-2 <b>4</b> for SDPHA-4



① cable entrance = Ø 10,5 mm  
 ② terminal board for power supply coil connection  
 ③ screw terminal for ground connection

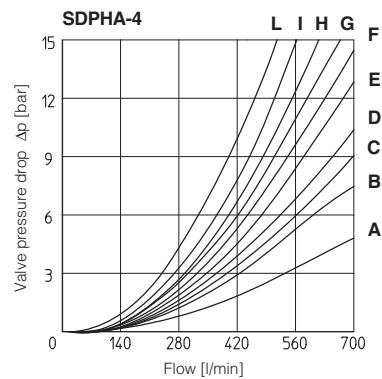
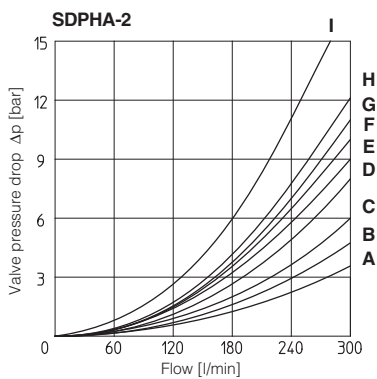
**10 Q/ΔP DIAGRAMS** based on mineral oil ISO VG 46 at 50°C

**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

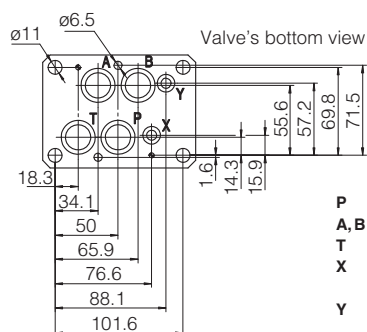
Tightening torque = 70 Nm

2 socket head screws M6x45 class 12.9

Tightening torque = 15 Nm

Diameter of ports A, B, P, T:  $\varnothing = 20$  mm;Diameter of ports X, Y:  $\varnothing = 7$  mm;

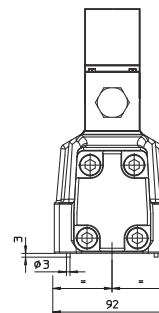
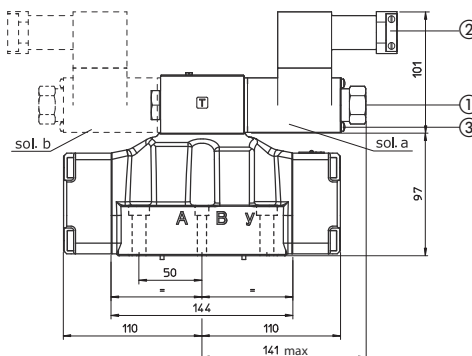
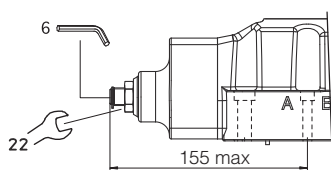
Seals: 4 OR 130, 2 OR 2043



**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 =  $\varnothing 10,5$  mm
- ③ screw terminal for additional equipotential grounding

Mass:  
 SDPHA/MA-26: 10,8 kg  
 SDPHA/MA-27: 12,5 kg

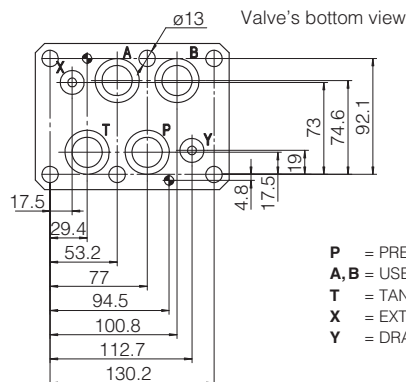
**SDPHA/MA-4****ISO 4401: 2005****Mounting surface: 4401-08-08-0-05** (see table P005)

Fastening bolts:

6 socket head screws M12x60 class 12.9

Tightening torque = 125 Nm

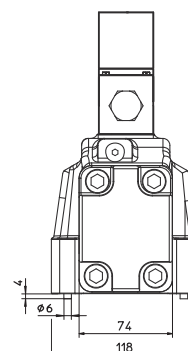
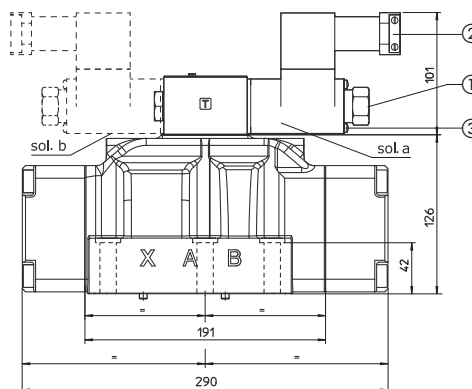
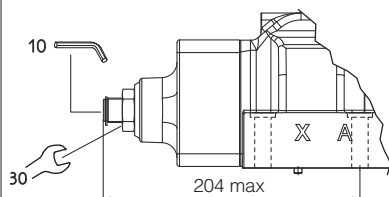
Seals: 4 OR 4112; 2 OR 3056

Diameter of ports A, B, P, T:  $\varnothing = 24$  mm;Diameter of ports X, Y:  $\varnothing = 7$  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



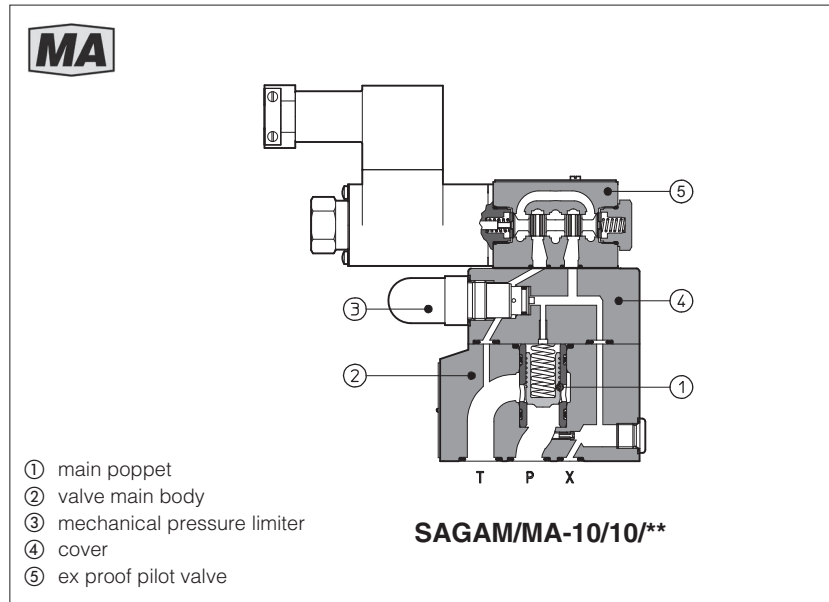
- ① manual override
- ② horizontal cable gland, cable entrance =  $\varnothing 10,5$  mm
- ③ screw terminal for additional equipotential grounding

Mass:  
 SDPHA/MA-46: 19,4 kg  
 SDPHA/MA-47: 21,9 kg



# Ex-proof pressure relief valves

piloted, subplate - **MA certification**



## 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

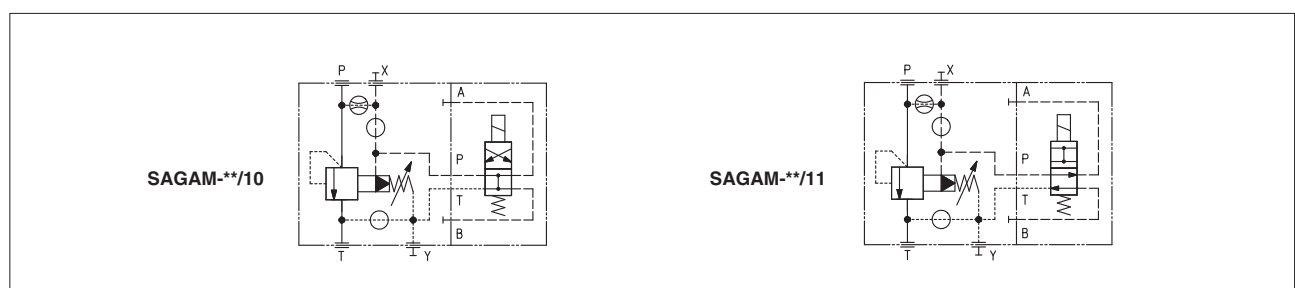
Max flow: **200, 400, 600 l/min**

Max pressure: **350 bar**

## 1 MODEL CODE OF PRESSURE RELIEF VALVES TYPE SAGAM

SAGAM	/	MA	-	20	/	1	0	/	210	-	*	/	24DC	**	/	*
<p><b>SAGAM</b> = pressure relief valve: subplate mounting</p> <p><b>Certification type:</b> <b>MA</b> = Ex-proof Ma Chinese mining certification</p> <p><b>Valve size:</b> <b>10</b> (ISO 6264) <b>20</b> (ISO 6264) <b>32</b> (ISO 6264)</p> <p><b>1</b> = one setting pressure</p> <p>Valve configuration, see section 2 <b>0</b> = venting with de-energized solenoid <b>1</b> = venting with energized solenoid</p> <p>Max regulated pressure: <b>50</b> = 50 bar      <b>210</b> = 210 bar <b>100</b> = 100 bar      <b>350</b> = 210 bar</p>																
														<p>Seals material, see section 6: - = NBR <b>PE</b> = FKM</p>		
														<p>Series number</p>		
														<p><b>Voltage code</b>, see section 5</p>		
														<p><b>Option:</b> <b>V</b> = regulating handwheel for pressure adjustment</p>		

## 2 HYDRAULIC SYMBOL (representation according to ISO 1219-1)



### 3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, $R_a \leq 0,8$ recommended $R_a 0,4$ - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	<b>Standard</b> = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$ <b>/PE</b> option = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$
Storage temperature range	<b>Standard</b> = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ <b>/PE</b> option = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-db

### 4 HYDRAULIC CHARACTERISTICS

<b>Operating pressure</b>	P, X = <b>350 bar</b> T, Y = <b>210 bar</b>
<b>Maximum flow</b>	SAGAM/MA-10 = <b>200 l/min</b> ;    SAGAM/MA-20 = <b>400 l/min</b> ;                      SAGAM/MA-32 = <b>600 l/min</b> ;

### 5 ELECTRICAL CHARACTERISTICS

<b>SOLENOID TYPE</b>	ON/OFF
<b>Voltage code</b> VDC $\pm 10\%$	<b>12DC, 24DC, 110DC</b>
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) = $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$ , with HFC hydraulic fluids = $-20^{\circ}\text{C} \div +50^{\circ}\text{C}$ FKM seals (/PE option) = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$		
Recommended viscosity	15÷100 mm <sup>2</sup> /s - max allowed range 2.8 ÷ 500 mm <sup>2</sup> /s		
Max fluid contamination level	ISO4406 class 20/18/15    NAS1638 class 9, see also filter section at <a href="http://www.atos.com">www.atos.com</a> or KTF catalog		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

### 7 CERTIFICATION DATA

Valve type	SAGAM/MA
Certification	MA mining
Solenoid certified code	<b>DTBZ12 - 37 FYC</b>
Type examination certificate	CNEx 22.7656X
Method of protection	Ex db I Mb
Ambient temperature	$\leq 135^{\circ}\text{C}$
Ambient temperature	$-20 \div +40^{\circ}\text{C}$
Cable entrance:	cable entrance $\varnothing = 10.5\text{mm}$

 **WARNING:** service work performed on the valve by the end users or not qualified personnel invalidates the certification

Technical drawing of a motor assembly showing exploded and assembled views with callouts 1, 2, and 3.

Exploded view (top left): Shows the motor housing with a cable entrance (1) and a terminal board (2) for power supply coil connection. A screw terminal (3) is shown for ground connection. A CH.3 screwdriver is indicated for the terminal board.

Assembled view (bottom left): Shows the motor housing with the terminal board (2) and screw terminal (3) installed. A double-headed arrow labeled 'X' indicates the direction of assembly.

View from X (bottom right): Shows the motor housing from the perspective of the terminal board. Callouts 1, 2, and 3 point to the cable entrance, terminal board, and screw terminal, respectively. A CH.7 screwdriver is indicated for the terminal board.

Legend:

- ① cable entrance =  $\varnothing 10,5$  mm
- ② terminal board for power supply coil connection
- ③ screw terminal for ground connection

The figure consists of three subplots, each showing the regulated pressure at port P [bar] on the y-axis versus the flow rate [l/min] on the x-axis for a different SAGAM model. The y-axis for all plots ranges from 0 to 350 bar, with major grid lines every 70 bar. The x-axis for SAGAM-10 ranges from 0 to 200 l/min, for SAGAM-20 from 0 to 400 l/min, and for SAGAM-32 from 0 to 600 l/min. Each plot contains six curves, representing different pressure settings, which all show a linear increase in pressure with flow rate.

Flow rate [l/min]	Curve 1 (Top)	Curve 2	Curve 3	Curve 4	Curve 5	Curve 6 (Bottom)
0	290	260	220	150	100	50
200	330	290	240	170	120	70

Flow rate [l/min]	Curve 1 (Top)	Curve 2	Curve 3	Curve 4	Curve 5	Curve 6 (Bottom)
0	290	260	220	150	100	50
400	350	300	250	180	130	80

Flow rate [l/min]	Curve 1 (Top)	Curve 2	Curve 3	Curve 4	Curve 5	Curve 6 (Bottom)
0	290	260	220	150	100	50
600	350	300	250	180	130	80

The figure consists of three separate line graphs, each representing a different SAGAM model: SAGAM-10, SAGAM-20, and SAGAM-32. All three graphs share the same axes: the vertical axis (y-axis) is labeled 'Min. regulated pressure [bar]' and the horizontal axis (x-axis) is labeled 'Flow rate [l/min]'. The y-axis for all three has major grid lines at 3, 6, 9, 12, and 15. The x-axis for SAGAM-10 ranges from 0 to 200 l/min with major grid lines every 40 units. The x-axis for SAGAM-20 ranges from 0 to 400 l/min with major grid lines every 80 units. The x-axis for SAGAM-32 ranges from 0 to 600 l/min with major grid lines every 120 units. Each graph shows a single black curve that starts at a minimum regulated pressure of approximately 5 bar at zero flow rate and increases linearly as the flow rate increases.

Flow rate [l/min]	SAGAM-10 Min. regulated pressure [bar]	SAGAM-20 Min. regulated pressure [bar]	SAGAM-32 Min. regulated pressure [bar]
0	5.0	5.0	5.0
40	5.8	-	-
80	6.6	6.0	-
120	7.4	6.8	7.5
160	8.2	7.6	8.5
200	9.0	8.4	9.5
240	-	9.2	10.5
280	-	10.0	11.5
320	-	10.8	12.5
360	-	11.6	13.5
400	-	12.4	14.5
480	-	-	13.5
560	-	-	12.5
600	-	-	11.5

## SAGAM/MA-10

ISO 6264: 2007

Mounting surface: 6264-06-09-1-97

Fastening bolts:

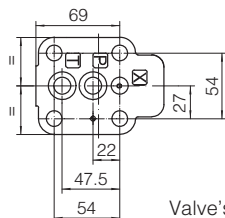
4 socket head screws M12x35 class 12.9

Tightening torque = 125 Nm

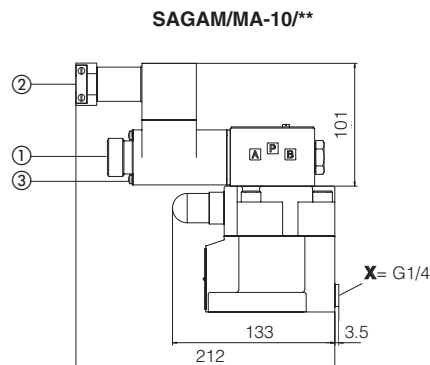
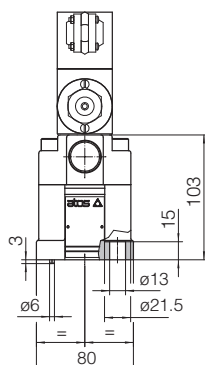
Seals: 2 OR 123; 1 OR 109/70

Ports P, T:  $\varnothing = 14,5$  mm

Ports X:  $\varnothing = 3,2$  mm



Valve's bottom view



Mass: 5,1 Kg

## SAGAM/MA-20

ISO 6264: 2007

Mounting surface: 6264-08-11-1-97

Fastening bolts:

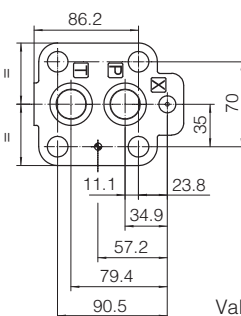
4 socket head screws M16x50 class 12.9

Tightening torque = 300 Nm

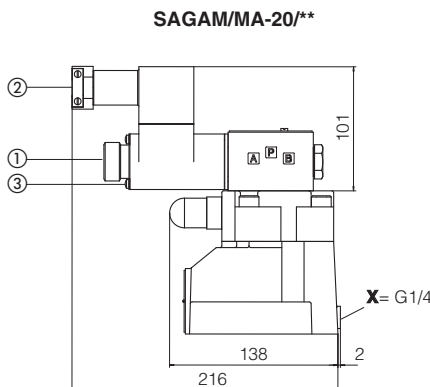
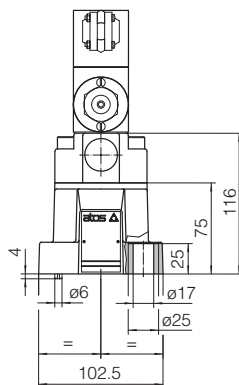
Seals: 2 OR 4112; 1 OR 109/70

Ports P, T:  $\varnothing = 24$  mm

Ports X:  $\varnothing = 3,2$  mm



Valve's bottom view



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:

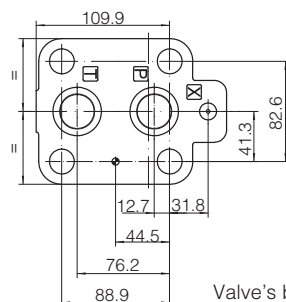
4 socket head screws M20x60 class 12.9

Tightening torque = 600 Nm

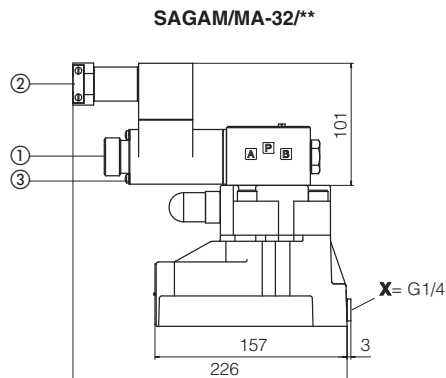
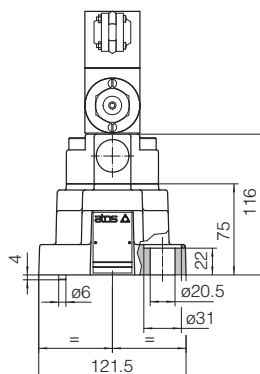
Seals: 2 OR 4131; 1 OR 109/70

Ports P, T:  $\varnothing = 28,5$  mm

Ports X:  $\varnothing = 3,2$  mm



Valve's bottom view



Mass: 7,7 Kg

① manual override

② horizontal cable gland, cable entrance =  $\varnothing 10,5$  mm

③ screw terminal for additional equipotential grounding













## Worldwide Sales Organization

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### Atos Hydraulics (Shanghai) Co. Ltd

China - 440 Xiaonan Road, Fengxian Dist., Shanghai

Phone +86 21 6045 5002 - Fax +86 21 6045 5130

[info.sh@atos.com.cn](mailto:info.sh@atos.com.cn)

### Headquarters

Italy - 21018 Sesto Calende

[info@atos.com](mailto:info@atos.com) - [www.atos.com](http://www.atos.com)