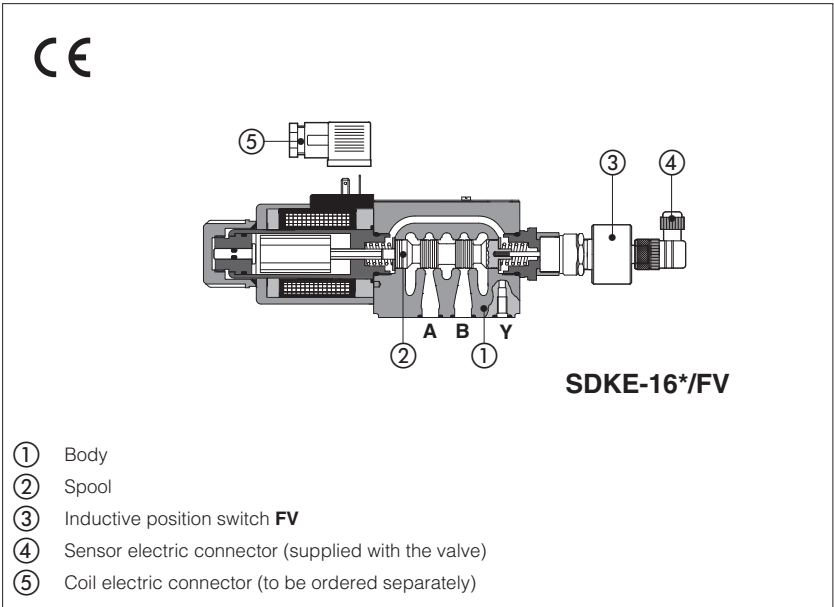


Safety directional valves with spool position monitoring

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 **I** and **II** for sensors availability and technical characteristics.

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

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

SDKE 150 l/min

Max pressure: **350 bar**

1 RANGE OF VALVE'S MODELS

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

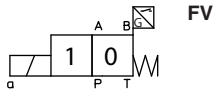
Notes:

FV = inductive position switch providing both NO and NC contacts to be wired on the electric connector

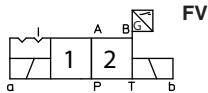
See section **II** for sensor's characteristics

1.1 FV switch configurations

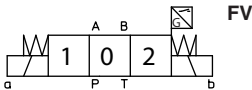
Single solenoid valves size 06 & 10 are provided with n° 1 FV switch for the spool position monitoring



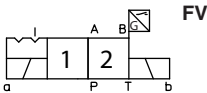
Double solenoid valves size 06 with detent are provided with n° 1 FV switch for the spool position monitoring



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



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



For model code of **SDHE** safety valves, see section **2**

For model code of **SDKE** safety valves, see section **4**

2 MODEL CODE OF SDHE/FV

SDHE	-	0	63	1/2	/	A	/	FV	-	X	24DC	**	/	*
Directional control valve size 06 SDHE = max flow 80 l/min Size ISO 4401 0 = size 06 Valve configuration , see section 3 61 =single solenoid, central plus external position, spring centered 63 =single solenoid, 2 external positions, spring offset 67 =single solenoid, external plus central position, spring offset Only for DC solenoid: 71 =double solenoid, 3 positions, spring centered 75 =double solenoid, 2 external positions, with detent Spool type , see section 3 Options , see section 8														
Seals material see sect. 6, 7 - = NBR PE = FKM Series number Voltage code , see section 9 X = without connector, see section 10 for available connectors, to be ordered separately Spool position monitor: FV = 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
61 61/A 67 67/A 71 	1 0 2 0 1 2 3 4 5 6 7 19 91 58 	63 63/A 75 	1 0 2 0/2 1/2 2/2 1 0 2 0/2 1/2

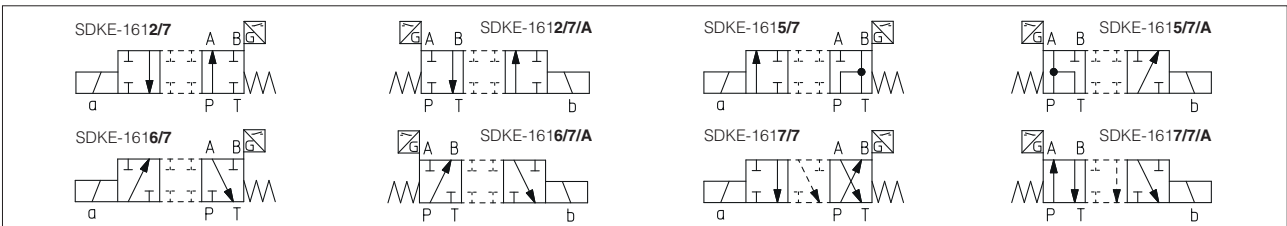
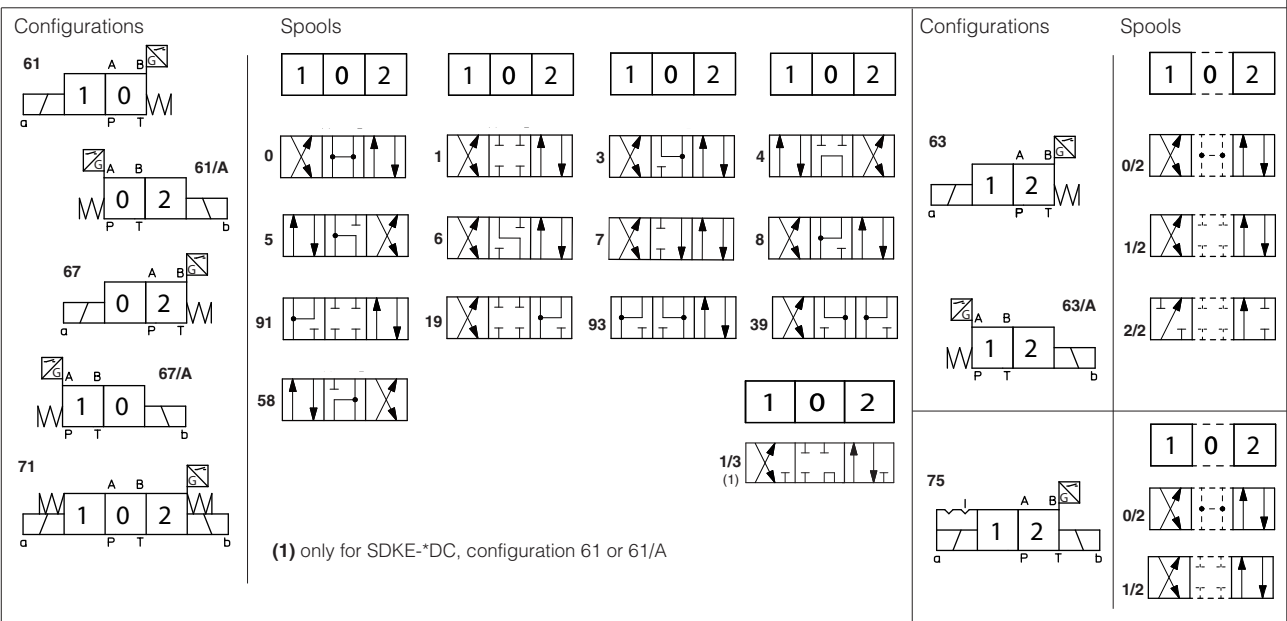
3.1 Configuration for spool */7

SDHE-0612/7 	SDHE-0612/7/A 	SDHE-0615/7 	SDHE-0615/7/A
SDHE-0616/7 	SDHE-0616/7/A 	SDHE-0617/7 	SDHE-0617/7/A

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 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.

SDKE	-	1	63	/	1/2	/	A	/	FV	-	X	24DC	**	/	*
Directional control valve size 10															Seals material see sect. [6], [7] - = NBR PE = FKM
Size ISO 4401 1 = size 10															Series number
Valve configuration , see section [5] 61 =single solenoid, central plus external position, spring centered 63 =single solenoid, 2 external positions, spring offset 67 =single solenoid, external plus central position, spring offset Only for DC solenoid: 71 =double solenoid, 3 positions, spring centered 75 =double solenoid, 2 external positions, with detent														Voltage code , see section [9]	
Spool type , see section [5]															X = without connector, see section [10] for available connectors, to be ordered separately
Options , see section [8]															Spool position monitor: FV = inductive position switch (double contact)



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

6 MAIN CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Conformity	CE to Low Voltage Directive 2014/35/EU CE to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006
Ambient temperature	Standard = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C
Flow direction	As shown in the symbols of table 3 and 5
Operating pressure	SDHE P, A, B = 350 bar T = 210 bar (DC solenoid); 160 bar (AC solenoid)
	SDKE P, A, B = 350 bar T = (with Y port not connected to tank) 210 bar (DC solenoid); 120 bar (AC solenoid) T = (with Y port drained to tank) 250 bar
Rated flow	see diagrams Q/Δp at section 14
Maximum flow	SDHE 80 l/min see section 15
	SDKE 150 l/min see section 15

6.1 Coils characteristics

Insulation class	H (180°C) for DC coils (all versions) F (155°C) for AC coils (SDHE, SDKE) Due to the 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	IP 65 (with connectors correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 9
Supply voltage tolerance	± 10%
Certification	cURus North American standard

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HF DU, HF DR	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				COE-230RC
230/50 AC	230RC			
230/60 AC				

(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 58 VA.

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

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

9.2 COILS FOR SDKE/FV VALVE

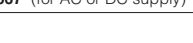
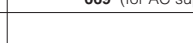
External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption (2)	Code of spare coil
12 DC	12 DC	666 or 667	36 W	CAE-12DC
14 DC	14 DC			CAE-14DC
24 DC	24 DC			CAE-24DC
28 DC	28 DC			CAE-28DC
110 DC	110 DC			CAE-110DC
220 DC	220 DC		CAE-220DC	
110/50/60 AC	110/50/60 AC		100 VA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

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

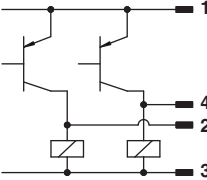
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.

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

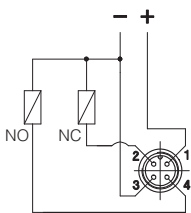
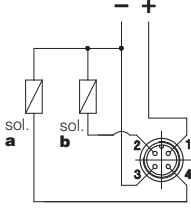
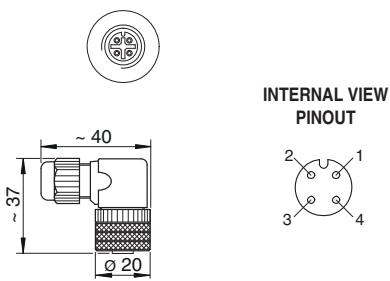
10 COILS ELECTRIC CONNECTORS - according to din 43650 (to be ordered separately)

666, 667 (for AC or DC supply)		669 (for AC supply)	CONNECTOR WIRING	
			<p>666, 667</p> <p>1 = Positive ⊕ 2 = Negative ⊖ ⊕ = Coil ground</p>	<p>669</p> <p>1,2 = Supply voltage VAC 3 = Coil ground</p>
			SUPPLY VOLTAGES	
<p>666</p> <p>All voltages</p>		<p>667</p> <p>24 AC or DC 110 AC or DC 220 AC or DC</p>	<p>669</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 ZBE-06
<p>Connector type ZBE-06 IP65</p>  <p>1 = supply +24 VDC 2 = output signal NC 3 = GND 4 = output signal NO</p>	<p>Connector type ZBE-06 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

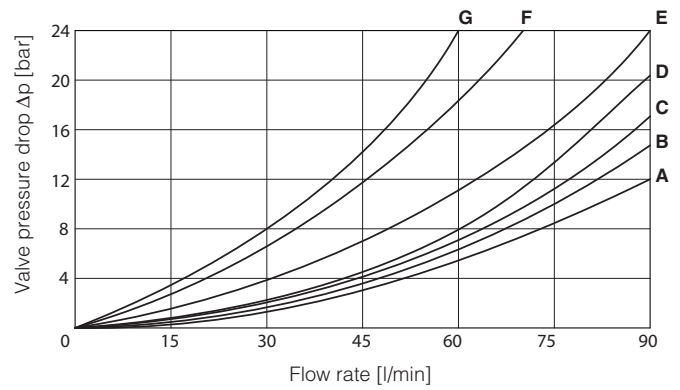
Note: FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

 = intermediate spool position corresponding to the hydraulic configuration change

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

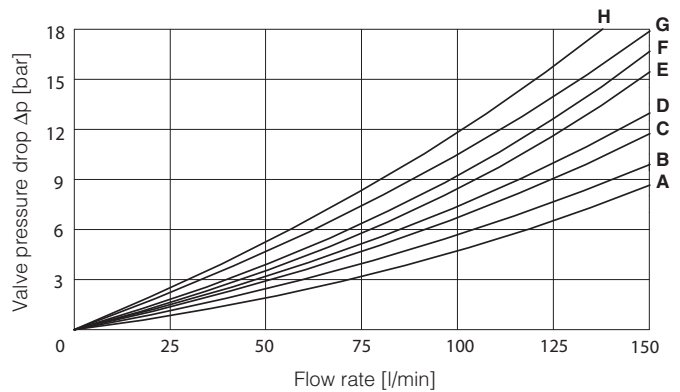
SDHE

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		



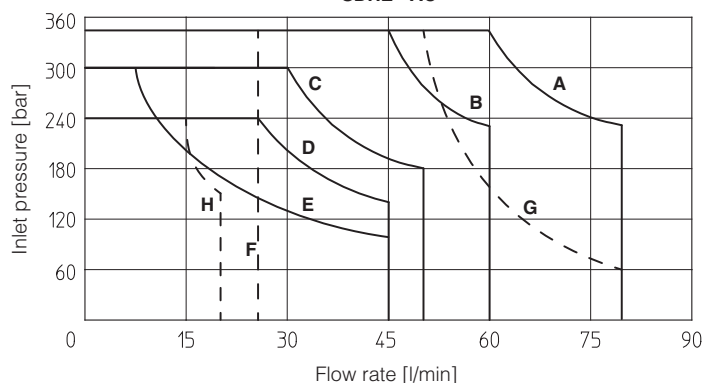
15 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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.

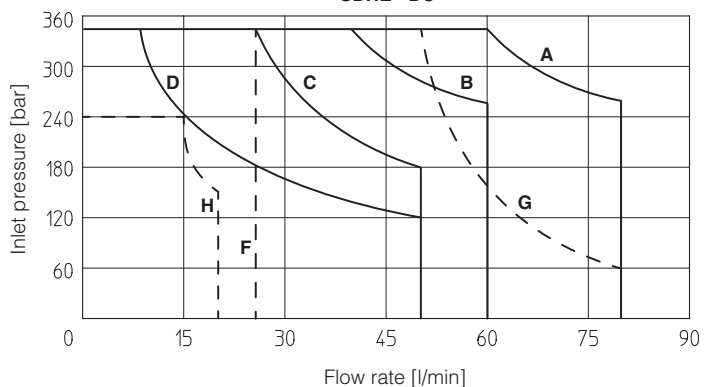
SDHE

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

SDHE - AC



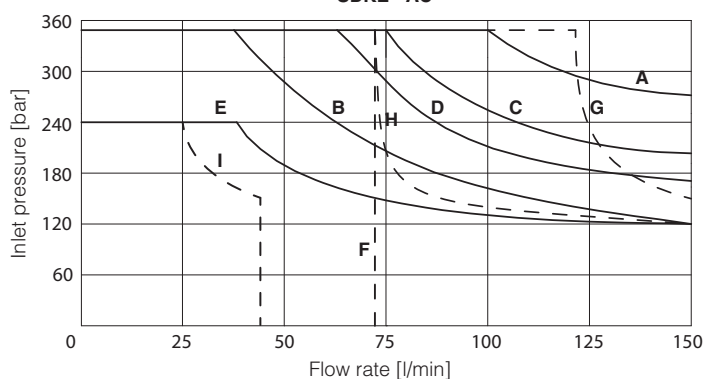
SDHE - DC



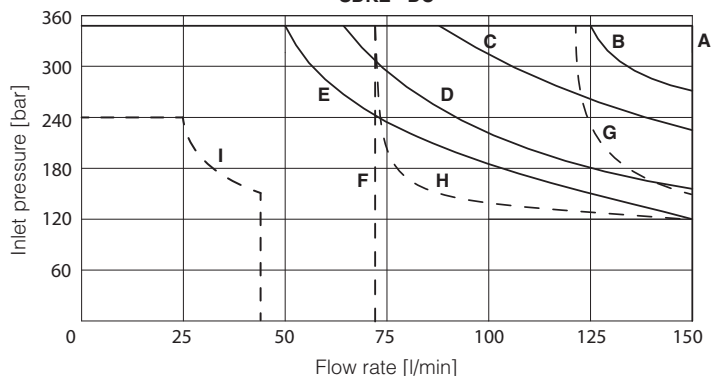
SDKE

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

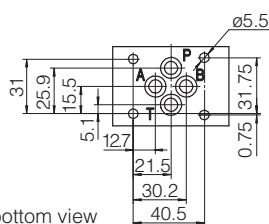
SDKE - AC



SDKE - DC



SDHE



Valve's bottom view

ISO 4401: 2005

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

Fastening bolts:

4 socket head screws: M5x30 class 12.9

Tightening torque = 8 Nm

Seals: 4 OR 108

Ports P,A,B,T: Ø = 7.5 mm (max)

P = PRESSURE PORT

A, B = USE PORT

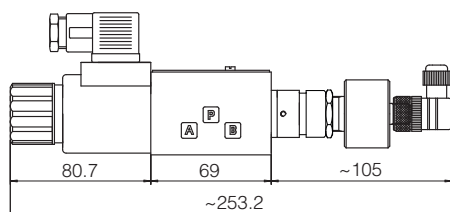
T = TANK PORT

option /A

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

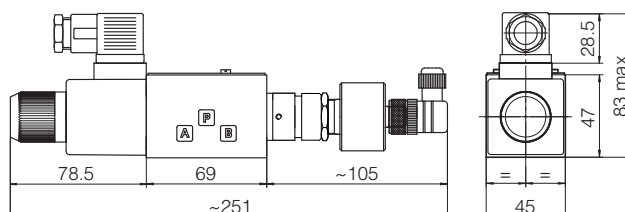
Double solenoid valves SDHE/FV(DC): FV inductive position switch mounted at side of port A

SDHE-06*/FV (DC)



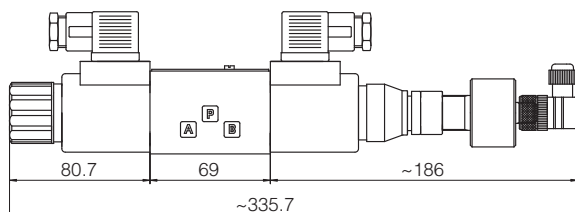
Mass: kg 1,95

SDHE-06*/FV (AC)

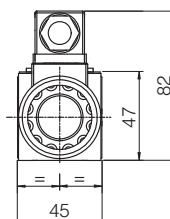


Mass: kg 1,8

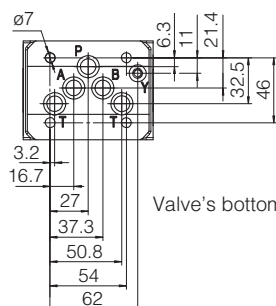
SDHE-07*/FV (DC)



Mass: kg 2,2



SDKE



Valve's bottom view

ISO 4401: 2005

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

(without port X)

Fastening bolts:

4 socket head screws M6x40 class 12.9

Tightening torque = 15 Nm

Seals: 5 OR 2050. 1 OR 108

Ports P,A,B,T: Ø = 11.5 mm (max)

Ports Y: Ø = 5 mm

P = PRESSURE PORT

A, B = USE PORT

T = TANK PORT

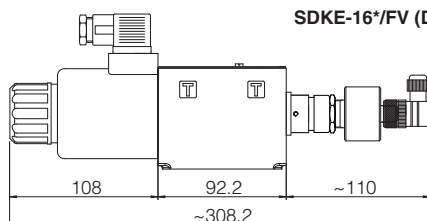
Y = DRAIN PORT

option /A

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

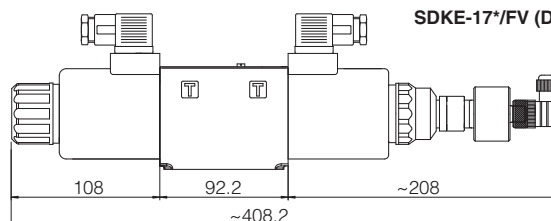
Double solenoid valves SDKE/FV(DC): FV inductive position switch mounted at side of port A

SDKE-16*/FV (DC)



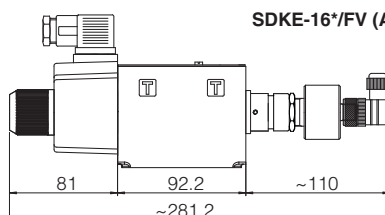
Mass: kg 4,4

SDKE-17*/FV (DC)



Mass: kg 5,9

SDKE-16*/FV (AC)



Mass: kg 3,8