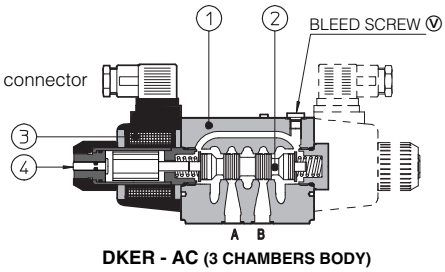
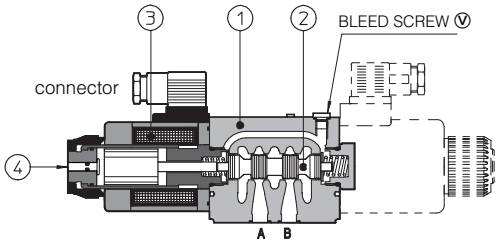
Solenoid directional valves type DKE and DKER

direct operated, ISO 4401 size 10



DKER - AC (3 CHAMBERS BODY)



DKE - DC (5 CHAMBERS BODY)

1 MODEL CODE

DKER – 1 63 1/2 /A - X 24 DC ** /*

Directional control valves ISO 4401 size 10
DKE = standard solenoids
DKER = high performances solenoids

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
Other configurations are available on request.

Spool type, see section 3

Synthetic fluids
WG =water glycol
PE= phosphate ester

Series number

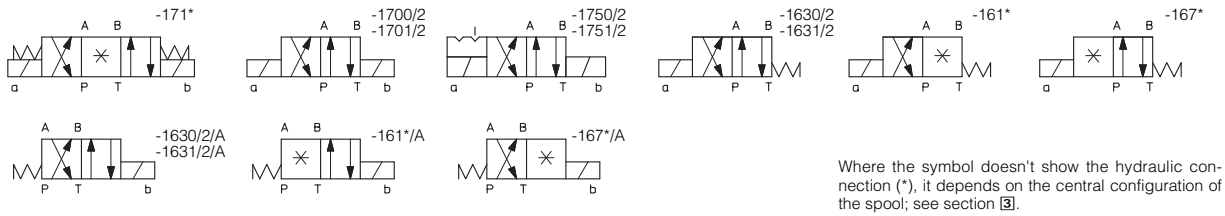
Voltage code, see section 6
00 = valve without coils

X = without connector
See note 2 at section 5 for available connectors, to be ordered separately
Coils with special connectors, see section 7
XJ = AMP junior Timer connector
XK = Deutsch connector (only DKE)
XS = Lead Wire connection (only DKE)

Options, see note 1 at section 5

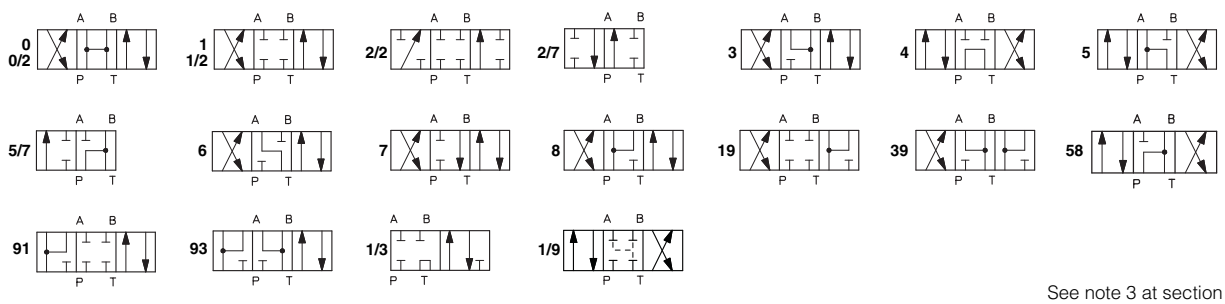
Note: configuration 63, 70 and 75 are available only with spools type 0/2, 1/2, 2/2, 2/7, 5/7 (2/7 and 5/7 only for configuration 63)

2 CONFIGURATION



Where the symbol doesn't show the hydraulic connection (*), it depends on the central configuration of the spool; see section 3.

3 SPOOLS - for intermediate passages, see tab. E001.



See note 3 at section 5.

Spool type, direct operated solenoid valves available in two different versions:

DKE basic version equipped with standard solenoids

DKER high performance version equipped with improved force solenoids certified according the North American standard **C UR US**

Configurations and construction
The valves are available in three or four way configurations and with two or three spool positions, see section 2.
The spools ② are interchangeable and they are available in a wide range of hydraulic configurations, see section 3.
The solenoids ③ have two different executions for AC or DC power supply and they are composed by:
- wet type screwed tube with integrated manual override pin ④ (the tube are different for AC and DC power supply).
- AC and DC coils see section 6

The coils are interchangeable for the same type of power supply AC or DC and they can be easily replaced without tools (they are not interchangeable between DKE and DKER)
The coils are fully encapsulated with the following temperature classes:
- class H for DC coils
- class F for AC coils

The valve body ① is 5 chambers type, for all DC versions and for AC version with option /F*. Standard AC version use 3 chambers type body.
The optimized internal flow paths, largely cored with extrawide channels to the tank port, ensure low pressure drops.

Options
The following optional devices are available for DKE and DKER:
- prolonged manual override protected with rubber cap for easy hand operation
- control devices of the valve switching time
- spool position monitor devices for safety applications
- external drain port Y for high tank pressure (only DC version)

Surface mounting ISO 4401 size 10
Max flow up to 120 l/min
Max pressure: 315 bar

4 MAIN CHARACTERISTICS OF DKE AND DKER DIRECTIONAL VALVES

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 $\sqrt{}^{04}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature		from -20°C to +70°C.
Fluid		Hydraulic oil as per DIN 51524 .... 535; for other fluids see section 1
Recommended viscosity		15 ÷ 100 mm²/s at 40°C (ISO VG 15 ÷ 100)
Fluid contamination class		ISO 19/16, achieved with in line filters at 25 μm value to $\beta_{25} \geq 75$ (recommended)
Fluid temperature		-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)
Flow direction		As shown in the symbols of tables 2 and 3
Operating pressure	**DKE**	Ports P, A, B: **315 bar**
For versions with proximity switches		Port T: **120 bar** for AC solenoids; **210 bar** for DC solenoids; **250 bar** for option /Y
(/FC, /FI and /FIE versions) port Y	**DKER**	Ports P,A,B: **315 bar**;
must be drained		Port T: **160 bar** for AC solenoid; **210 bar** for DC solenoids; **250 bar** for option /Y
Rated flow		See diagrams Q/Δp at section 8
Maximum flow		**120 l/min**, see operating limits at section 9

4.1 Coils characteristics

Insulation class	**H** (180°C) for DC coils **F** (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN563 and EN982 must be taken into account
Connector protection degree	IP 65
Relative duty factor	100%
Supply voltage and frequency	See electric feature 6
Supply voltage tolerance	± 10%
Certification (only for DKER)	**C UR US**

5 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 14.

L, L1, L2, L3, LR, see section 12 = device for switching time control (only for DC solenoids).

F * =5 chambers body for DC and AC versions with proximity switch for spool position monitoring: see tab. E110.

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 15.

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

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

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

3 Spools

- spools type **0/2, 1/2, 2/2, 2/7, 5/7** are only used for two position valves: single solenoid valves, type DKE*-163*/*; double solenoid valves type DKE*-170*/2 and DKE*-175*/2.
- 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 **1/3** (only for execution DKE(R)-1611/3/AY DC version) is particulary used as shut-off valve for safety applications, consult our technical office.
- 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 ELECTRIC FEATURES

External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption (2)	Code of spare coil DKE	Code of spare coil DKER
12 DC	**12 DC**	SP-666 or SP-667	36 W (DKE) 39 W (DKER)	SP-CAE-12DC	SP-CAER-12DC
14 DC	**14 DC**			SP-CAE-14DC	SP-CAER-14DC
24 DC	**24 DC**			SP-CAE-24DC	SP-CAER-24DC
28 DC	**28 DC**			SP-CAE-28DC	SP-CAER-28DC
110 DC	**110 DC**			SP-CAE-110DC	SP-CAER-110DC
125 DC	**125 DC**			-	SP-CAER-125DC
220 DC	**220 DC**			SP-CAE-220DC	SP-CAER-220DC
110/50/60 AC	**110/50/60 AC**		85 VA (DKE) 105 VA (DKER) (3)	SP-CAE-110/50/60AC (1)	SP-CAER-110/50/60AC (1)
230/50/60 AC	**230/50/60 AC**			SP-CAE-230/50/60AC (1)	SP-CAER-230/50/60AC (1)
115/60 AC	**115/60 AC**			SP-CAE-115/60AC	SP-CAER-115/60AC
230/60 AC	**230/60 AC**			SP-CAE-230/60AC	SP-CAER-230/60AC
110/50/60 AC	**110 DC**	SP-669	36 W (DKE) 39 W (DKER)	SP-CAE-110DC	SP-CAER-110DC
230/50/60 AC	**220 DC**			SP-CAE-220DC	SP-CAER-220DC

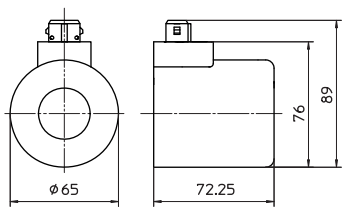
(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 80 VA for DKE and 90 VA for DKER.

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

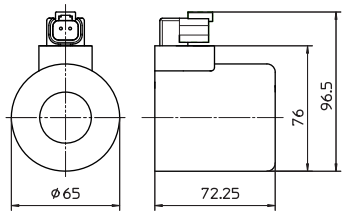
(3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 280 VA for DKE and 320 VA for DKER.

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

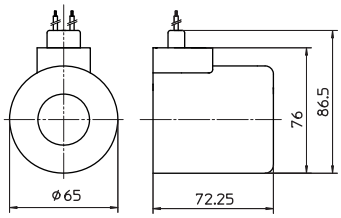
Options -XJ
Coil type SP-CAEJ, SP-CAERJ
AMP Junior Timer connector
Protection degree IP67



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



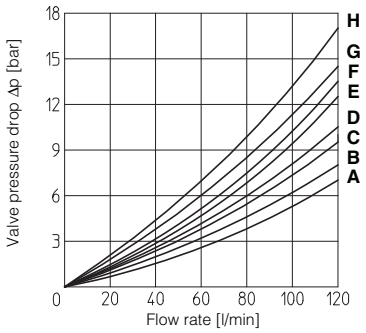
Options -XS
Coil type SP-CAES
Lead Wire connection
Cable lenght = 180 mm



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	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		
2/7	D			F		
5/7	B			A	E	
19	A	D	C			H

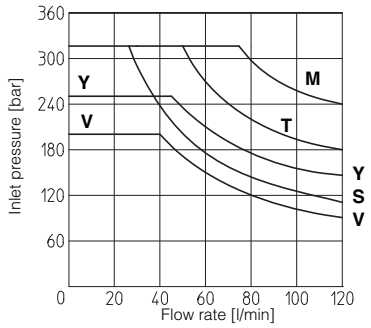
DKE, DKER



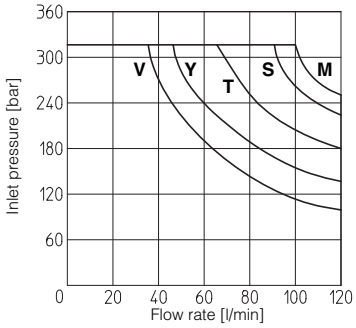
9 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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.

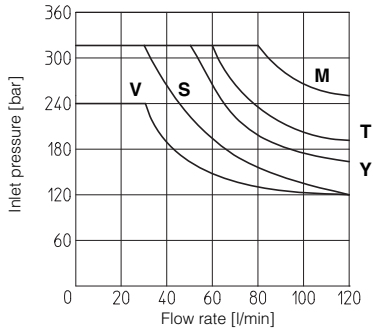
DKE - AC



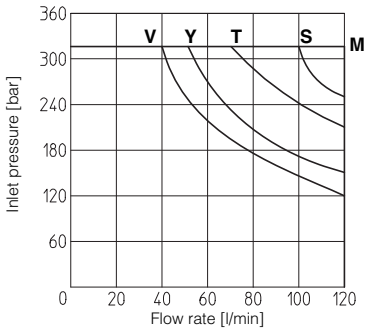
DKE - DC



DKER - AC



DKER - DC



DKE, DKER

Curve	Spool type AC	Spool type DC
M	0/1, 5/7, 1/3	0, 0/1, 1, 1/1, 3, 3/1, 1/2, 0/2, 8
S	2/7, 4, 5, 19	1/3, 5/7, 6, 7
Y	1, 1/2, 0/2	4, 5, 2/7
V	6, 7, 8, 2/2	2/2
T	0, 1/1, 3, 3/1	19

10 SWITCHING TIMES (average values in msec)

Valve	Switch-on AC	Switch-on DC	Switch-off AC	Switch-off DC
DKE / DKER + SP-666 / SP-667	40	60	25	35
DKE / DKER + SP-669	60	—	90	—
DKE-*/L* - DKER-*/L*	—	75÷150	—	45÷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.

11 SWITCHING FREQUENCY

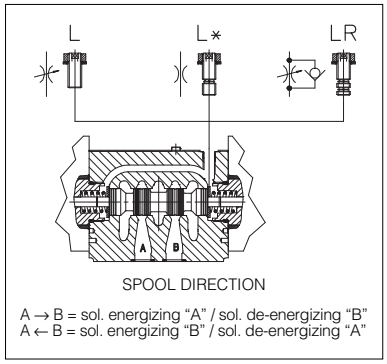
Valve	AC (cycles/h)	DC (cycles/h)
DKE / DKER + SP-666 / SP-667	7200	15000

12 DEVICES FOR SWITCHING TIME CONTROL

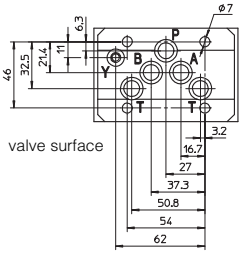
These devices are only available for DC valve version (5 chambers body) and can control the switching time and therefore reduce the coil hammering in the hydraulic circuit. The different types are available shown in the figure.
The functionality of the device time control depends on the type of regulating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

- **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)
  ØL1 = 1,25 mm; ØL2 = 1 mm; ØL3 = 0,75 mm;
- **LR**: controls and regulates the switching time in the B→A direction of the spool movement. The device does not control the switching time (standard time) in the opposite direction A→B of the spool movement.

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



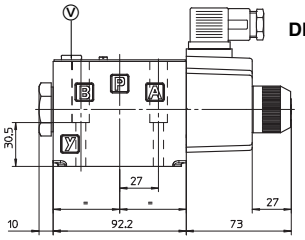
13 INSTALLATION DIMENSIONS [mm]

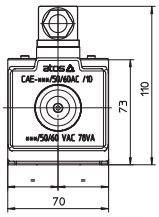


ISO 4401: 2005
Mounting surface according to 4401-05-05-0-05
(without X port, Y port optional)
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050 and 1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)
Ports Y: Ø = 5 mm

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
Y = DRAIN PORT (only for option /Y)
For the max pressures on ports, see section 4

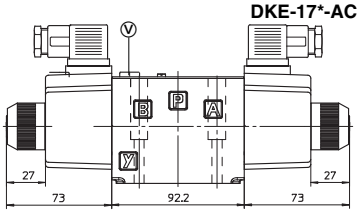
DKE-16*-AC





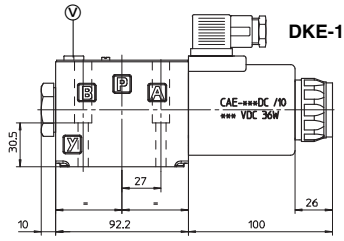
Mass: 3,6 kg

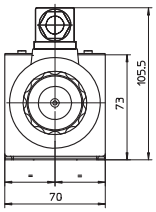
DKE-17*-AC



Mass: 4,3 kg

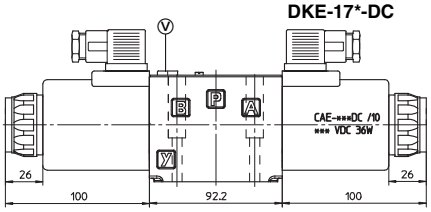
DKE-16*-DC





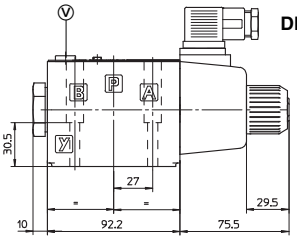
Mass: 4,2 kg

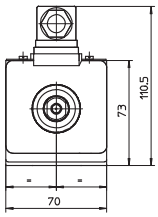
DKE-17*-DC



Mass: 5,7 kg

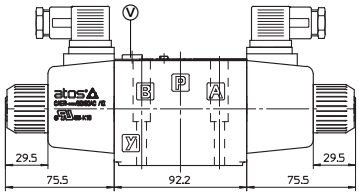
DKER-16*-AC





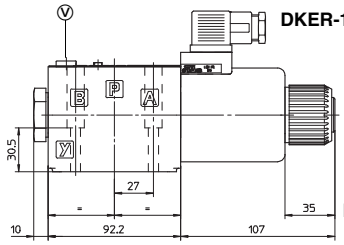
Mass: 3,6 kg

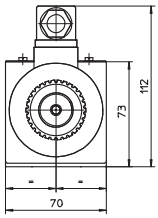
DKER-17*-AC



Mass: 4,3 kg

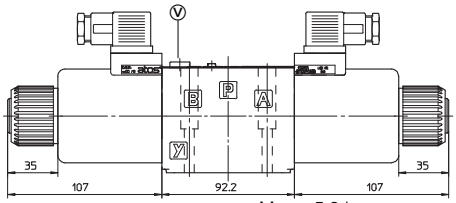
DKER-16*-DC





Mass: 4,4 kg

DKER-17*-DC

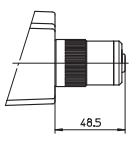


Mass: 5,9 kg

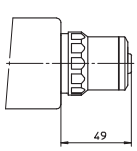
Overall dimensions refer to valves with connectors type SP-666

14 OPTION /WP

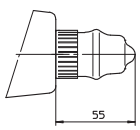
DKE-AC



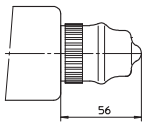
DKE-DC



DKER-AC



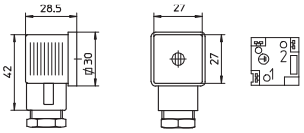
DKER-DC



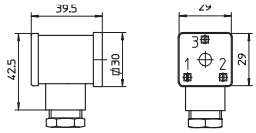
15 ELECTRIC CONNECTORS ACCORDING TO DIN 43650

The connectors must be ordered separately

SP-666, SP-667 (for AC or DC supply)



SP-669 (for AC supply)



CONNECTOR WIRING

SP-666, SP-667	SP-669
1 = Positive ⊕ 2 = Negative ⊖ ⏚ = Coil ground	1,2 = Supply voltage VAC 3 = Coil ground

SUPPLY VOLTAGES

SP-666	SP-667	
		110/50 AC
		110/60 AC
All voltages	24 AC or DC	115/60 AC
	110 AC or DC	230/50 AC
	220 AC or DC	230/60 AC

16 MOUNTING SUBPLATES

Model		Ports location	GAS Ports A-B-P-T (X-Y)	Ø Counterbore [mm] A-B-P-T (X-Y)	Mass [kg]
BA-308	(/Y)	Ports A, B, P, T (X, Y) underneath	1/2" (1/4")	30 (21,5)	2,5
BA-428	(/Y)	Ports A, B, P, T (X, Y) underneath	3/4" (1/4")	36,5 (21,5)	5,5
BA-434	(/Y)	Ports P, T, (X, Y) underneath; ports A, B on lateral side	3/4" (1/4")	36,5 (21,5)	8,5

The subplates are supplied with 4 fastening bolts M6x40. Also available are multi-station subplates and modular subplates. For further details see table K280.