Solenoid directional valves type DKE and DKER
direct operated, ISO 4401 size 10

Solenoids DKE and DKER are direct operated, ISO 4401 size 10.

Table E025-5/E

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 to the North American standard UL US

Configurations and construction:
The valves are available in three or four way configurations and with two or three spool positions, see section [3]. The spools are interchangeable and they are available in a wide range of hydraulic configurations, see section [3].

The solenoids have two different executions for AC or DC power supply and they are composed of:
- wet type screwed tube with integrated manual override pin (the tube are different for AC and DC power supply).
- AC and DC coils see section [3].

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 is 5 chambers type, for all DC versions and for AC version with option /F*. Standard AC version uses 3 chambers type body.

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

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

See note 3 at section [5].
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: $R_a = 0.01/100$ (ISO 1101)

Fluid temperature
-20°C +60°C (standard) and /WG seals -20°C +80°C (IP67 seals)

Flow direction
As shown in the symbols of tables [3] and [4]

Operating pressure
For versions with proximity switches
DKE
Ports P, A, B: 315 bar
Ports T: 120 bar for AC solenoids; 210 bar for DC solenoids; 250 bar for option /Y

Operating pressure
For versions with proximity switches
DKER
Ports P.A.B.: 315 bar;
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 [5]

Maximum flow
120 l/min, see operating limits at section [5]

4.1 Coils characteristics

Insulation class
H (180°C) for DC coils F (155°C) for AC coils

Connector protection degree
IP 65

Relative duty factor
100%

Supply voltage and frequency
See electric feature [5]

Relative duty factor
100%

Connectors
Deutsch connector, DT-04-2P male

Coil type
SP-CAEK

Options -XS
Coil type SP-CAES
Lead Wire connection

Cable length = 180 mm

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 = protected manual override protected by rubber cap - see section [5]
SP-WPD/KER-DC = (only for DKER-DC) manual override with detent, to be ordered separately, see tab. K.150
L, L1, L2, L3, LR, L7, L8 see section [2] = device for switching time control (only for DC solenoids).

L7 and L8 are available only for DKE with spool type 0/1, 1/1, 3/1, 4 and 5.
F =5 chambers body for DC and AC versions with proximity switch for spool position monitoring: see tab. E110.
F" = 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 [5]

SP-566 = standard connector IP-65 for direct connection to electric supply source.
SP-667 = as SP-666, but with built-in signal led.

3 Spools
- spools type 0/2, 1/2, 2/2 are only used for two position valves: single solenoid valves, type DKE*-163*/(1); double solenoid valves type DKE*-170*/2 and DKE*-175*/2.
- spools type 27 and 57 are used only for single solenoid valves, type DKE-163* (option /A not available).
- spools type 6 and 3 are also available as 01 and 31 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

<table>
<thead>
<tr>
<th>Internal supply voltage ±10%</th>
<th>Voltage code</th>
<th>Type of connector</th>
<th>Power consumption (W)</th>
<th>DKE</th>
<th>Code of spare coil</th>
<th>DKER</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 DC</td>
<td>12 DC</td>
<td>SP-666 or SP-667</td>
<td>36 W (DKE)</td>
<td>SP-CAE-12DC</td>
<td>SP-CAER-12DC</td>
<td></td>
</tr>
<tr>
<td>14 DC</td>
<td>14 DC</td>
<td>SP-666 or SP-667</td>
<td>39 W (DKER)</td>
<td>SP-CAE-14DC</td>
<td>SP-CAER-14DC</td>
<td></td>
</tr>
<tr>
<td>24 DC</td>
<td>24 DC</td>
<td>SP-666 or SP-667</td>
<td>SP-CAE-24DC</td>
<td>SP-CAE-24DC</td>
<td>SP-CAER-24DC</td>
<td></td>
</tr>
<tr>
<td>28 DC</td>
<td>28 DC</td>
<td>SP-666 or SP-667</td>
<td>SP-CAE-28DC</td>
<td>SP-CAE-28DC</td>
<td>SP-CAER-28DC</td>
<td></td>
</tr>
<tr>
<td>110 DC</td>
<td>110 DC</td>
<td>SP-666 or SP-667</td>
<td>SP-CAE-11DC</td>
<td>SP-CAE-11DC</td>
<td>SP-CAER-11DC</td>
<td></td>
</tr>
<tr>
<td>125 DC</td>
<td>125 DC</td>
<td>SP-666 or SP-667</td>
<td>-</td>
<td>SP-CAE-125DC</td>
<td>SP-CAER-125DC</td>
<td></td>
</tr>
<tr>
<td>220 DC</td>
<td>220 DC</td>
<td>SP-666 or SP-667</td>
<td>85 VA (DKE)</td>
<td>SP-CAE-220DC</td>
<td>SP-CAER-220DC</td>
<td></td>
</tr>
<tr>
<td>110/50/60 AC</td>
<td>110/50/60 AC</td>
<td>SP-669</td>
<td>105 VA (DKER)</td>
<td>SP-CAE-110/50/60AC (1)</td>
<td>SP-CAER-110/50/60AC (1)</td>
<td></td>
</tr>
<tr>
<td>230/50/60 AC</td>
<td>230/50/60 AC</td>
<td>SP-669</td>
<td>-</td>
<td>SP-CAE-230/50/60AC (1)</td>
<td>SP-CAER-230/50/60AC (1)</td>
<td></td>
</tr>
<tr>
<td>115/60 AC</td>
<td>115/60 AC</td>
<td>SP-669</td>
<td>36 W (DKE)</td>
<td>SP-CAE-115/60AC</td>
<td>SP-CAER-115/60AC</td>
<td></td>
</tr>
<tr>
<td>230/60 AC</td>
<td>230/60 AC</td>
<td>SP-669</td>
<td>39 W (DKER)</td>
<td>SP-CAE-230/60AC</td>
<td>SP-CAER-230/60AC</td>
<td></td>
</tr>
<tr>
<td>110/50/60 AC</td>
<td>110/50/60 AC</td>
<td>SP-669</td>
<td>36 W (DKER)</td>
<td>SP-CAE-110/50/60AC (2)</td>
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<tr>
<td>230/50/60 AC</td>
<td>230/50/60 AC</td>
<td>SP-669</td>
<td>39 W (DKER)</td>
<td>SP-CAE-230/50/60AC (2)</td>
<td>SP-CAER-230/50/60AC (2)</td>
<td></td>
</tr>
</tbody>
</table>

(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 length = 180 mm
**8 QAP DIAGRAMS** based on mineral oil ISO VG 46 at 50°C

Flow direction P—A P—B A—T B—T P—T B—A

<table>
<thead>
<tr>
<th>Spool type</th>
<th>0, 0/1, 0/2, 2/2</th>
<th>1, 1/1, 1/3, 6, 8</th>
<th>3, 3/1, 7</th>
<th>4</th>
<th>5</th>
<th>5/7</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

Flow rate [l/min] 0 20 40 60 80 100 120

Valve pressure drop ΔP [bar] 0 5 10 15 20 25 30

Flow rate [l/min] 0 10 20 30 40 50 60 70 80 90 100

**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.

**10 SWITCHING TIMES** (average values in msec)

<table>
<thead>
<tr>
<th>Valve</th>
<th>Switch-on AC</th>
<th>Switch-on DC</th>
<th>Switch-off AC</th>
<th>Switch-off DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DKE / DKER + SP-666 / SP-667</td>
<td>40</td>
<td>60</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>DKE / DKER + SP-669</td>
<td>60</td>
<td>—</td>
<td>90</td>
<td>—</td>
</tr>
<tr>
<td>DKE-<em>L</em> - DKER-<em>L</em></td>
<td>—</td>
<td>75-150</td>
<td>—</td>
<td>45-150</td>
</tr>
<tr>
<td>DKE-<em>L7</em> - DKER-<em>L8</em></td>
<td>—</td>
<td>100-150</td>
<td>—</td>
<td>100-150</td>
</tr>
</tbody>
</table>

**11 SWITCHING FREQUENCY**

<table>
<thead>
<tr>
<th>Valve</th>
<th>AC (cycles/h)</th>
<th>DC (cycles/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DKE / DKER + SP-666 / SP-667</td>
<td>7200</td>
<td>15000</td>
</tr>
</tbody>
</table>

**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.

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

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

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.
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

Overall dimensions refer to valves with connectors type SP-666

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