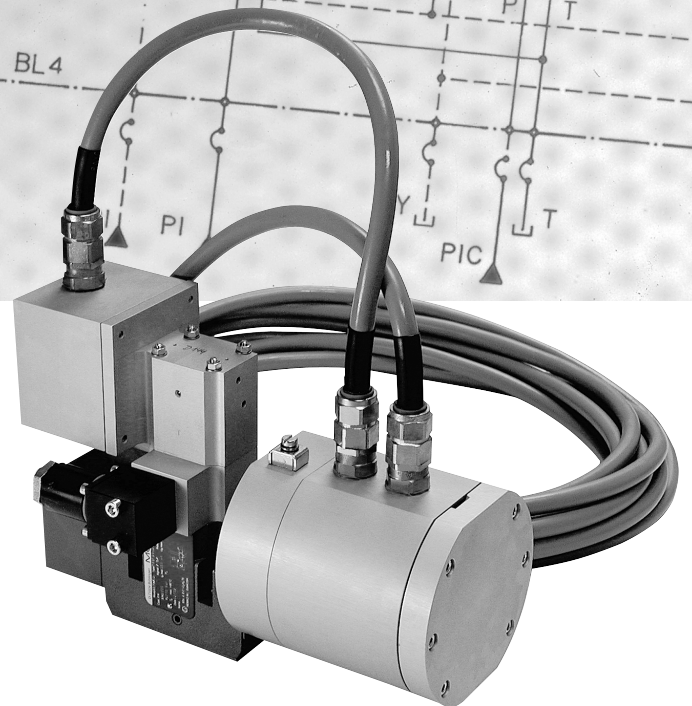
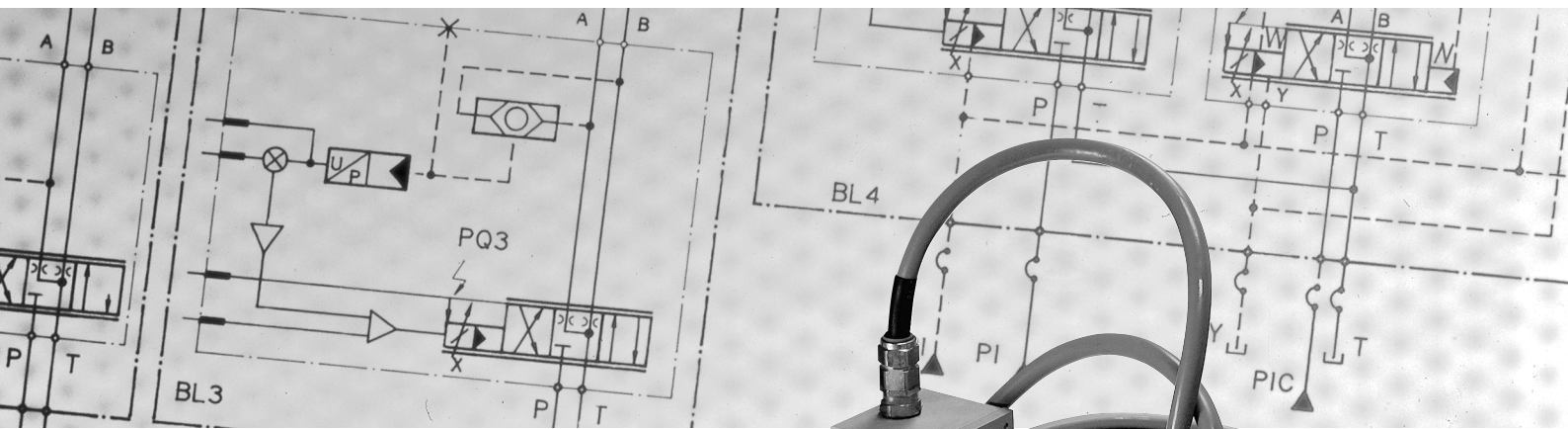


# MOOG



Servo and proportional valves  
with integrated electronics for  
areas with potentially explosive atmospheres  
D661K, D662K, D663K and D664K Series  
ISO 4401, sizes 05 to 08



## Operating Instructions

CA49305-001; Version 3.0, 10/07



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## 1 Safety Instructions

### 1.1 Warnings and symbols




Refers to special instructions and prohibitions to prevent damage




Refers to special instructions and prohibitions to prevent injury or property damage


### 1.2 Correct application

1.2.1  The permissible gas groups, which are part of the below identification, have been modified according to IEC 60079. Operation with other gases is not allowed!

Prior to starting-up the valve, it must be checked if the gas used is among the permissible gases.

1.2.2  The valves series D661K, D662K, D663K and D664K are electrical equipment for hazardous areas, type of protection "d" ("d" Flameproof enclosure to IEC 60079-1).

**Identification D661K/D662K/D663K/D664K Series:  
II 2G Ex d IIB+H<sub>2</sub> T5 Ta: 80°C  
Nemko 07ATEX1060, CE 0123.**

1.2.3  The valves are servo and proportional valves intended for position, velocity, pressure and force control in hydraulic control systems that operate with mineral oil based fluids. Using the valves for purposes other than those mentioned above is considered contrary to the intended use. The user bears entirely the risk of such misuse.

Correct application involves also observing the operating instruction and complying with the inspection and maintenance directives.

### 1.3 Organizational measures

1.3.1 We recommend to include this operating instruction into the maintenance plan of the machine/plant.

1.3.2 In addition to the operating instruction, observe also all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection. Instruct the operator accordingly.

1.3.3 All safety and danger prevention instructions of the machine/plant must meet the requirements of EN 982 and IEC 60079-0.

### 1.4 Selection and qualification of personnel



**Service work carried out by the user on explosion protection valves is prohibited, as intervention by third parties renders the explosion protection permit null and void.**

### 1.5 Safety instructions for specific operational phases

1.5.1 Take the necessary precautions to ensure that the valve is used only when in a safe and reliable state.

1.5.2 Check the valve at least once per working shift for obvious damage and defects (e.g., leakage or damaged cables). Report any changes to the responsible group/person immediately. If necessary, stop the machine immediately and secure it.

1.5.3 In the event of malfunction, stop the machine/plant immediately and secure it. Have any defects rectified immediately.


1.5.4 If the machine/plant is completely shut down for maintenance and repair work at the valve, it must be secured against inadvertent start up by:





- Locking the principal control elements and removing the key.
- attaching a warning sign to the main switch.

### 1.6 Safety instructions for the operation of hydraulic plants

1.6.1 Work on electrohydraulic equipment must be carried out only by personnel having special knowledge and experience in electrohydraulic controls.

1.6.2  Check all lines, hoses and fittings of the plant regularly for leaks and obvious damage. Repair damage immediately. Splashed oil may cause injury and fire.

1.6.3  Before removing the valve depressurize all system sections to be opened, pressure lines and accumulators of the hydraulic system in accordance with the specific instructions for the plant.

1.6.4  When handling oil, grease and other chemical substances, observe safety regulations valid for each product.

## 2 Description

Valves of the D66XK Series are servo and proportional valves with a Jetpipe pilot valve insensitive to dirt and electrical return of the spool position.

In servo valves, the control spool runs in a bushing, which is fitted into the body of the valve.

In proportional valves, the control spool runs directly in the valve body.

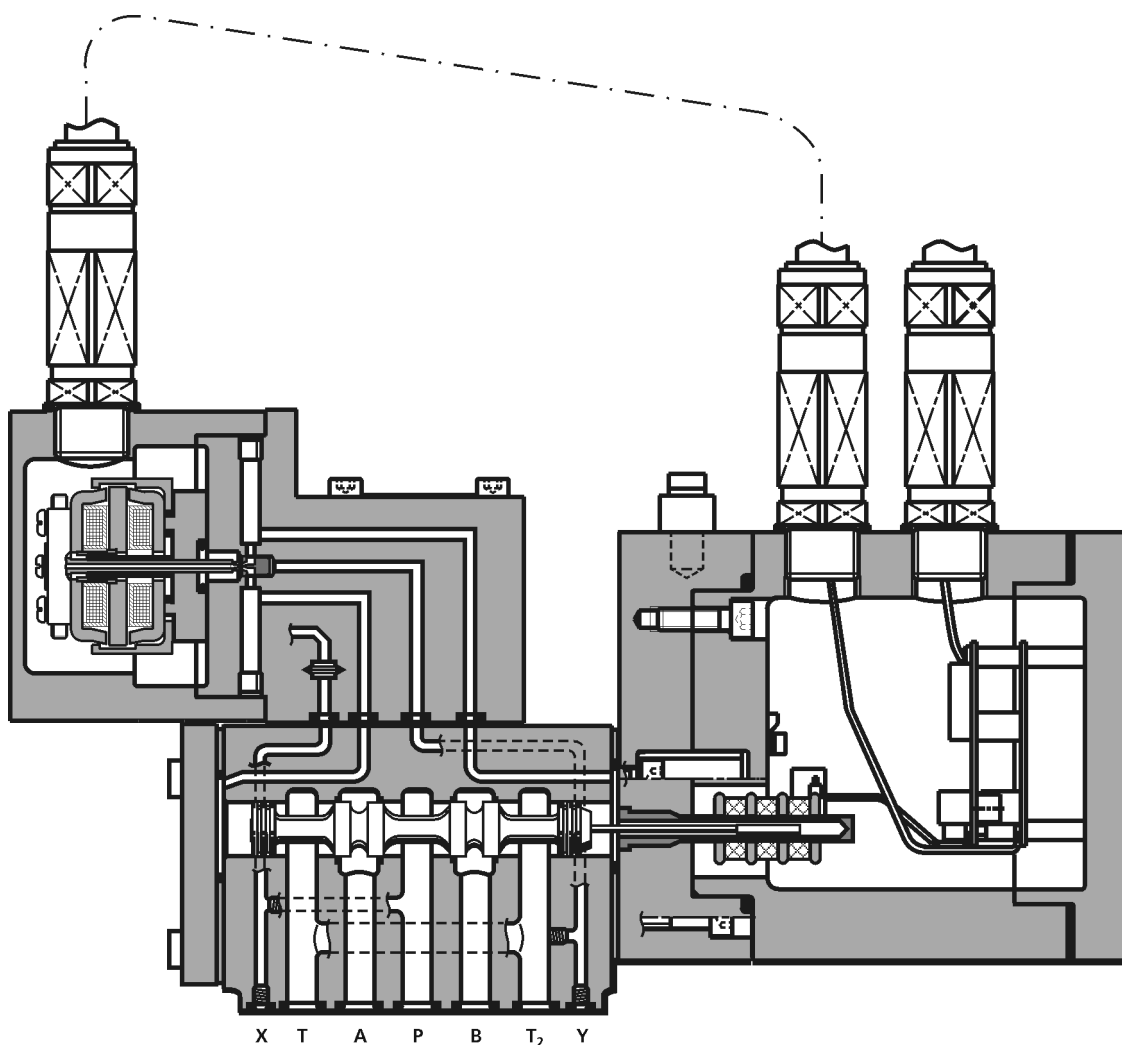
### 2.1 Design and funktion

#### 2.1.1 Servo and proportional valves

The D66XK Series valves are throttle valves for 2-, 3- and 4-way applications. 5-way applications are also possible with the D661K proportional valve.

These valves are suitable for electrohydraulic position, velocity, pressure or force control systems with high dynamic response requirements.

Proportional valve D661K Series



# D661K, D662K, D663K and D664K Series

## 2.1.1.1 General

All explosion protected servo and proportional valves are equipped with a D061K Jetpipe pilot valve.

The Jetpipe pilot valve essentially comprises a torque motor with a coil and armature, a Jetpipe and a receiver.

A current through the coil results in the anchor with the Jetpipe being extended. The extended fluid jet, which is bundled via the specific nozzle shape, impinges more on one of the two receiver bores than on the other one.

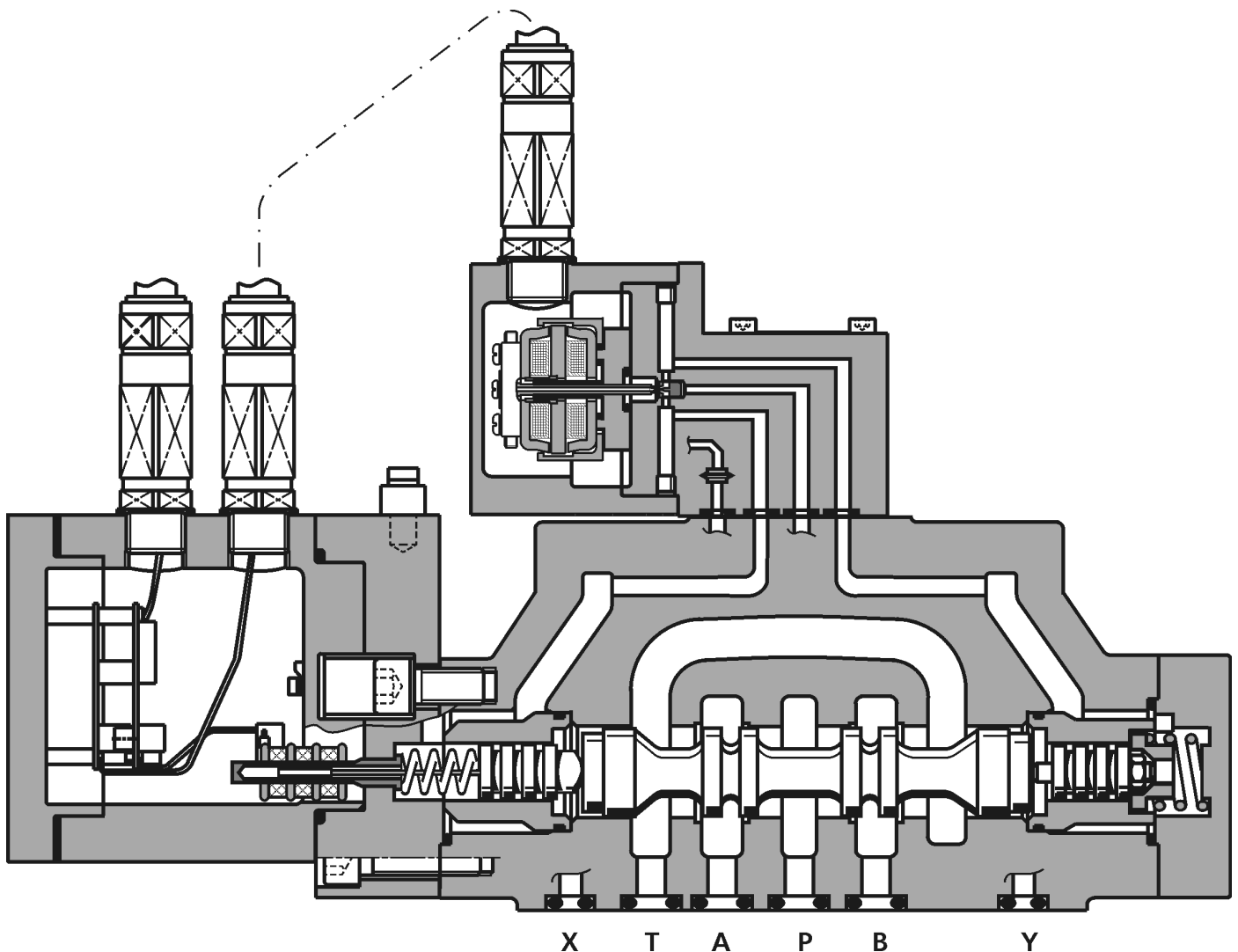
In this way, a pressure difference is generated in the control areas of the main stage. The resultant useful volume flow displaces the control spool of the main stage. The return to the tank is implemented via the ring area under the jet.

## 2.1.1.2 Operating principle of the two-stage valve

An electrical input signal (flow rate command) is applied to the integrated control amplifier, which drives a current through the coil of the pilot stage torquemotor. The thus deflected Jetpipe produces a pressure difference across the drive areas of the spool and effects its movement.

The position transducer which is excited via an oscillator measures the position of the spool (actual value, position voltage). This signal is then demodulated and fed back to the controller where it is compared with the command signal. The controller drives the torquemotor until the error between command signal and feedback signal is zero. Thus the position of the spool is proportional to the electric command signal.

**Proportional valve D662K Series**



# D661K, D662K, D663K and D664K Series

## 2.1.3 D66XK proportional valves in a fail safe version

For applications with proportional control valves where certain safety regulations are applicable, a defined metering spool position is needed in order to avoid potential damage.

**Therefore fail safe versions are offered as an option for the proportional valves.**

After external triggering this fail-safe function causes a defined metering spool position.

### 2.1.3.1 Mechanical fail safe version

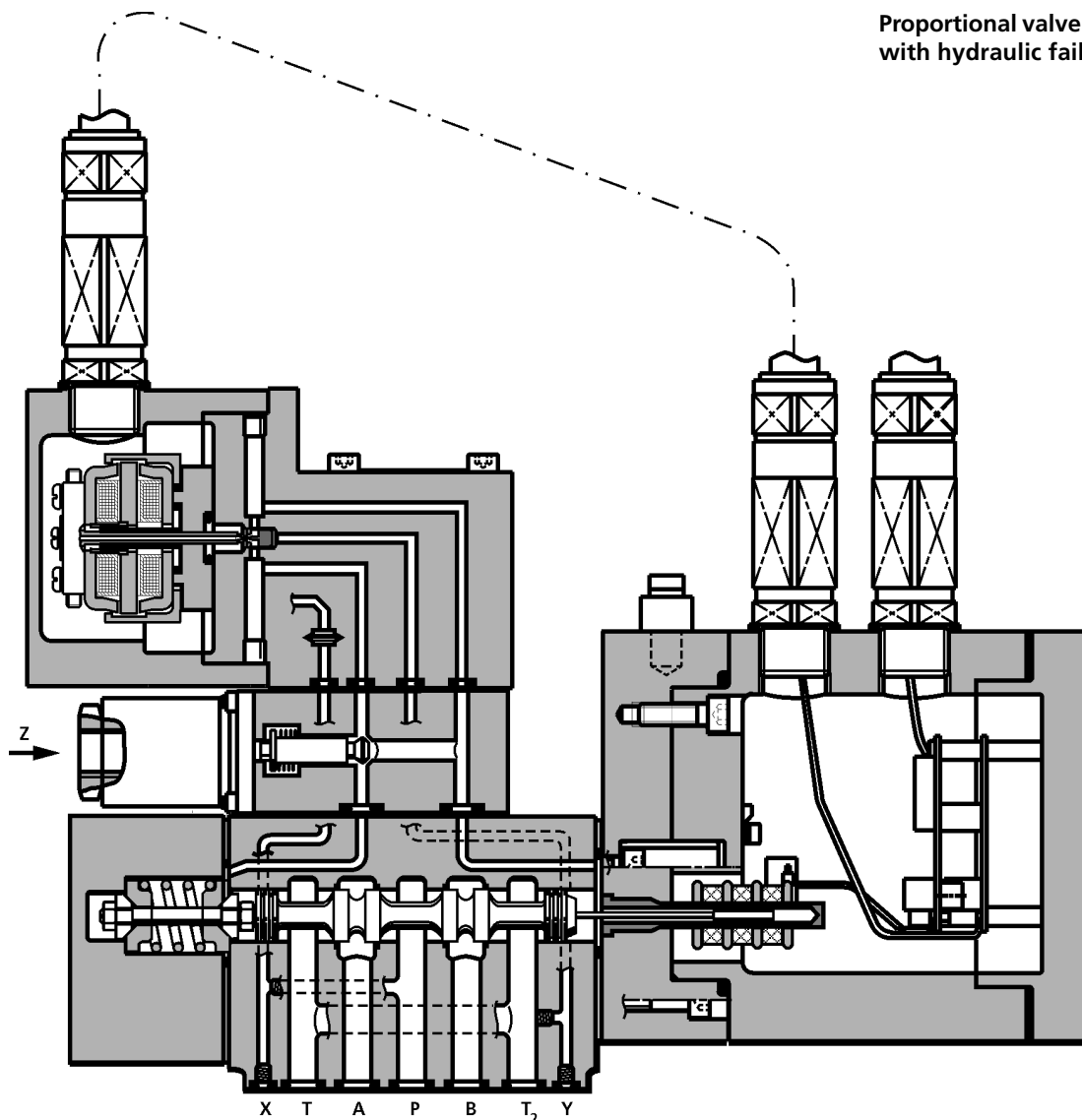
The safe position of the spool will be obtained after cut-off of pilot pressure X (external pilot connection) or operating pressure supply (internal pilot connection).

**See page 19 of the ordering information values for fail safe functions.**

### 2.1.3.2 Hydraulically operated fail safe version

In proportional valves, the two drive areas of the spool are short-circuited in order to move into the safe position via a 2/2-way solenoid poppet valve.

The spool in fail safe version **K** goes into the middle position after switching off pressure **Z** of the solenoid poppet valve. When the supply voltage of the valve electronics drops, but if the solenoid poppet valve is further supplied and the control pressure is available, the spool moves to a defined end position in version **H**.



Proportional valve D661K Series with hydraulic fail safe valve

## 3 Technical Data

### 3.1 Technical data of servo valve D661K Series

Model ... Type		D661K...3...	
<b>Mounting pattern</b>	ISO, with additional 2 <sup>nd</sup> T-port	ISO 4401-05-05-0-05	
<b>Valve version</b>		4-way 2-stage with bushing spool assembly	
<b>Pilot stage</b>	Jetpipe	Standard	
<b>Pilot connection</b>	Optional, internal or external	X and Y	
<b>Mass</b>		[kg] 5,7	
<b>Rated flow <math>Q_N</math></b>	(±10 %) at $\Delta p_N = 35$ bar per land	[l/min] <b>20 / 90</b>	<b>120 / 160 / 200</b>
<b>Maximum operating pressure <math>p_{max}</math></b>			
Main stage	ports P with X external, A, B	[bar]	350
	ports T, T <sub>2</sub> with Y internal	[bar]	20 % of pilot pressure, max. 100 bar
	ports T, T <sub>2</sub> with Y external	[bar]	350
Pilot stage	regular version	[bar]	210
	with dropping orifice (on request)	[bar]	350
<b>Response time<sup>1)</sup></b>	for 0 to 100 % stroke	[ms] <b>14</b>	<b>18</b>
<b>Threshold<sup>1)</sup></b>		[%]	< 0,1
<b>Hysteresis<sup>1)</sup></b>		[%]	< 0,5
<b>Null shift</b>	with $\Delta T = 55$ K	[%]	< 1,5      < 1,0
<b>Null leakage flow<sup>1)</sup></b>	total max. (~ critical lap)	[l/min]	3 / 4,5      4,5 / 4,5 / 4,5
<b>Pilot leakage flow<sup>1)</sup></b>	Pilot stage only	[l/min]	1,7      1,7
<b>Pilot flow<sup>1)</sup></b>	max, for 100 % step input	[l/min]	<b>1,7</b> <b>1,7</b>
<b>Temperature range</b>	Ambient	[°C]	-20 to 60
	Fluid	[°C]	-20 to 80
<b>Operating fluid<sup>2)</sup></b>		mineral oil based hydraulic fluid (DIN 51524, part 1 to 3), other fluids on request	
Viscosity	recommended	[mm <sup>2</sup> /s]	15 to 45
	allowable	[mm <sup>2</sup> /s]	5 to 400
<b>Cleanliness class</b>			
ISO 4406:1999	for normal operation for longer life <sup>3)</sup>	19 / 16 / 13 17 / 14 / 11	

<sup>1)</sup> At 210 bar pilot or operating pressure, fluid viscosity 32 mm<sup>2</sup>/s and fluid temperature of 40°C

<sup>2)</sup> The cleanliness of the hydraulic fluid greatly influences the functional safety and the wear and tear of the valve. In order to avoid malfunctions and increased wear and tear, we recommend filtering the hydraulic fluid accordingly.

<sup>3)</sup> For long life wear protection of metering lands

**For additional technical information , such as dimensions, ordering information etc. see the catalogue.**

# D661K Series

## 3.2 Technical Data Proportional valve D661K Series

Model ... Type		D661K...3...	D661K...8...
<b>Mounting pattern</b>	according to ISO (D661K Series with additional 2 <sup>nd</sup> T-port)	ISO 4401-05-05-0-05	ISO 4401-05-05-0-05
<b>Valve version</b>		4-way, 2x2-way, 5-way 2-stage, standard spool	4-way, 2x2-way, 5-way 2-stage, standard spool
<b>Pilot stage</b>	D061K Jetpipe	Standard	High Flow
<b>Pilot connection</b>	Optional, internal or external	X and Y	X and Y
<b>Mass</b>		[kg] 5,6	5,6
<b>Rated flow <math>Q_N</math></b>	( $\pm 10\%$ ) at $\Delta p_N = 5$ bar per land	[l/min] <b>30 / 60 / 80 / 2 x 80</b>	<b>30 / 60 / 80 / 2 x 80</b>
<b>Maximum operating pressure <math>p_{max}</math></b>			
Main stage	ports P, A, B	[bar] 350	350
	port T with Y internal	[bar] 20 % of pilot pressure, max. 100 bar	
	port T with Y external	[bar] 350	350
Pilot stage	regular version	[bar] 210	210
	with dropping orifice (on request)	[bar] 350	350
<b>Response time<sup>1)</sup></b>	for 0 to 100 % stroke	[ms] <b>28</b>	<b>18</b>
<b>Threshold<sup>1)</sup></b>		[%] < 0,1	< 0,1
<b>Hysteresis<sup>1)</sup></b>		[%] < 0,5	< 0,5
<b>Null shift</b>	with $\Delta T = 55$ K	[%] < 1,0	< 1,0
<b>Null leakage flow<sup>1)</sup></b>	total max. (~ critical lap)	[l/min] 3,5	4,4
<b>Pilot leakage flow<sup>1)</sup></b>	Pilot stage only	[l/min] 1,7	2,6
<b>Pilot flow<sup>1)</sup></b>	max, for 100 % step input	[l/min] <b>1,7</b>	<b>2,6</b>
<b>Temperature range</b>	Ambient	[°C] -20 to 60	-20 to 60
	Fluid	[°C] -20 to 80	-20 to 80
<b>Operating fluid<sup>2)</sup></b>		mineral oil based hydraulic fluid (DIN 51524, part 1 to 3), other fluids on request	
Viscosity	recommended	[mm <sup>2</sup> /s] 15 to 45	15 to 45
	allowed	[mm <sup>2</sup> /s] 5 to 400	5 to 400
<b>Cleanliness class</b>			
ISO 4406:1999	for normal operation		19 / 16 / 13
	for longer life <sup>3)</sup>		17 / 14 / 11

<sup>1)</sup> At 210 bar pilot or operating pressure, fluid viscosity 32 mm<sup>2</sup>/s and fluid temperature of 40°C

<sup>2)</sup> The cleanliness of the hydraulic fluid greatly influences the functional safety and the wear and tear of the valve. In order to avoid malfunctions and increased wear and tear, we recommend filtrating the hydraulic fluid accordingly.

<sup>3)</sup> For long life wear protection of metering lands

**For additional technical information, such as dimensions, ordering information etc. see the catalogue.**



Technical Data D662K, D663K and D664K Series

D662K..D..3...	D662K..D..8...	D663K..L..8...	D664K..L..8...
ISO 4401-07-07-0-05	ISO 4401-07-07-0-05	ISO 4401-08-08-0-05	ISO 4401-08-08-0-05
4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 2-stage, stub shaft spool
Standard	High Flow	High Flow	High Flow
X and Y	X and Y	X and Y	X and Y
11	11	19	19
150 / <b>250</b>	150 / <b>250</b>	<b>350</b>	<b>550</b>
350	350	350	350
350	20 % of pilot pressure, max. 100 bar	350	350
210	210	210	210
350	350	350	350
<b>44</b>	<b>28</b>	<b>37</b>	<b>48</b>
< 0,1	< 0,1	< 0,1	< 0,1
< 0,5	< 0,5	< 0,5	< 0,5
< 1,0	< 1,0	< 1,0	< 1,0
4,2	5,1	5,6	5,6
1,7	2,6	2,6	2,6
<b>1,7</b>	<b>2,6</b>	<b>2,2</b>	<b>2,6</b>
	-20 to 60		
	-20 to 80		
	mineral oil based hydraulic fluid (DIN 51524, part 1 to 3), other fluids on request		
	15 to 45		
	5 to 400		
	19 / 16 / 13		
	17 / 14 / 11		

## 4 Installation

### 4.1 General Information

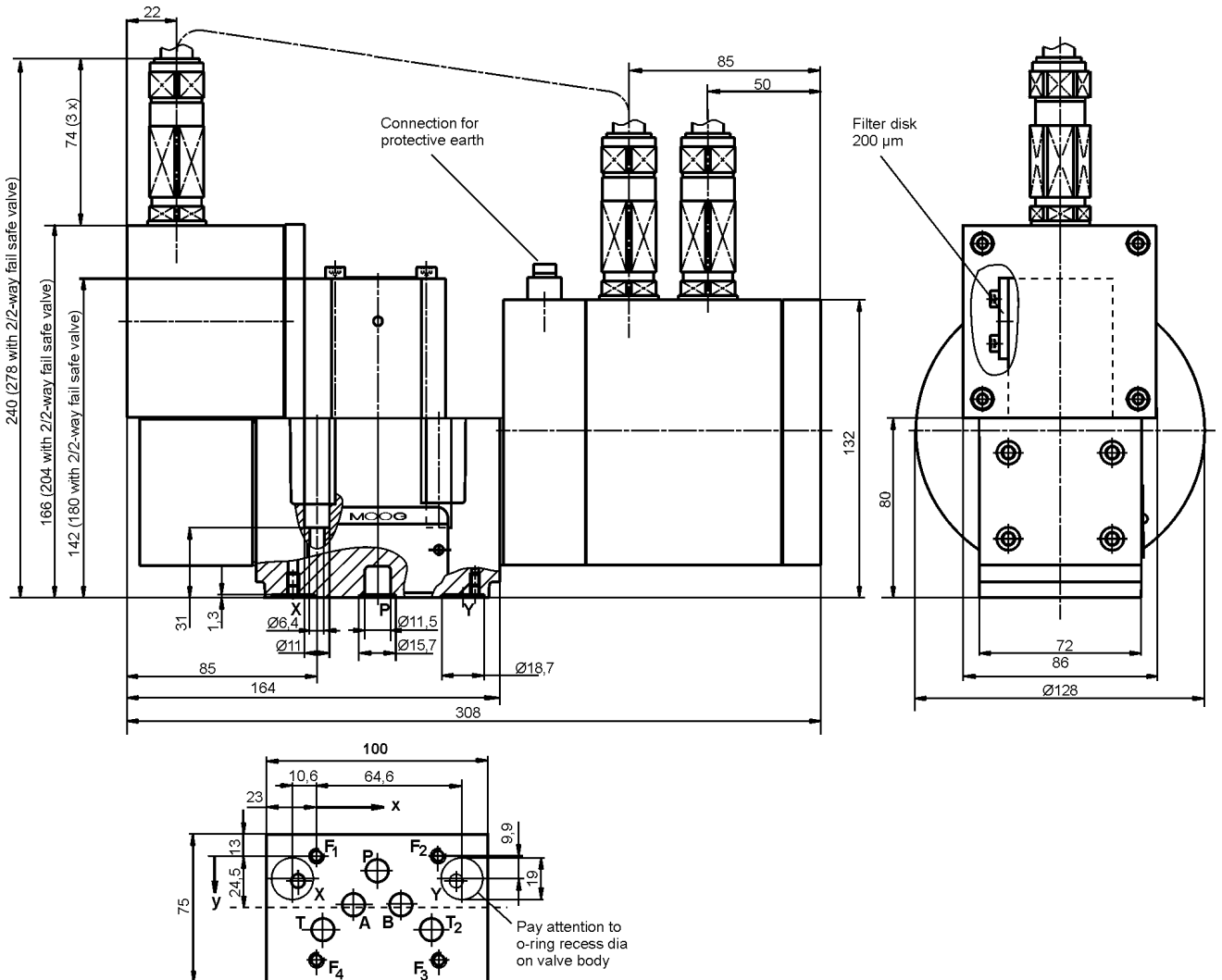
- 4.1.1 Compare model number and valve type with information from the hydraulic schematic or bill of material.
- 4.1.2 The valve can be mounted in any direction, fixed or movable.
- 4.1.3 Check mounting surface for flatness (0,02 mm for 100 mm) and surface roughness ( $R_a < 1 \mu\text{m}$ )
- 4.1.4 Pay attention to cleanliness of mounting surfaces and surroundings when installing the valve.
- 4.1.5 Use lint-free tissue to clean!
- 4.1.6 Before installation, remove protection plate from the valve and replace it when the valve removed.
- 4.1.7 Pay attention to correct position of ports and location of o-rings during installation.

- 4.1.8 Use socket head screws according to DIN EN ISO 4762 (hitherto DIN 912) for mounting, strength class 10.9, and tighten them diagonally according to following table. Torque tolerance  $\pm 10 \%$ .

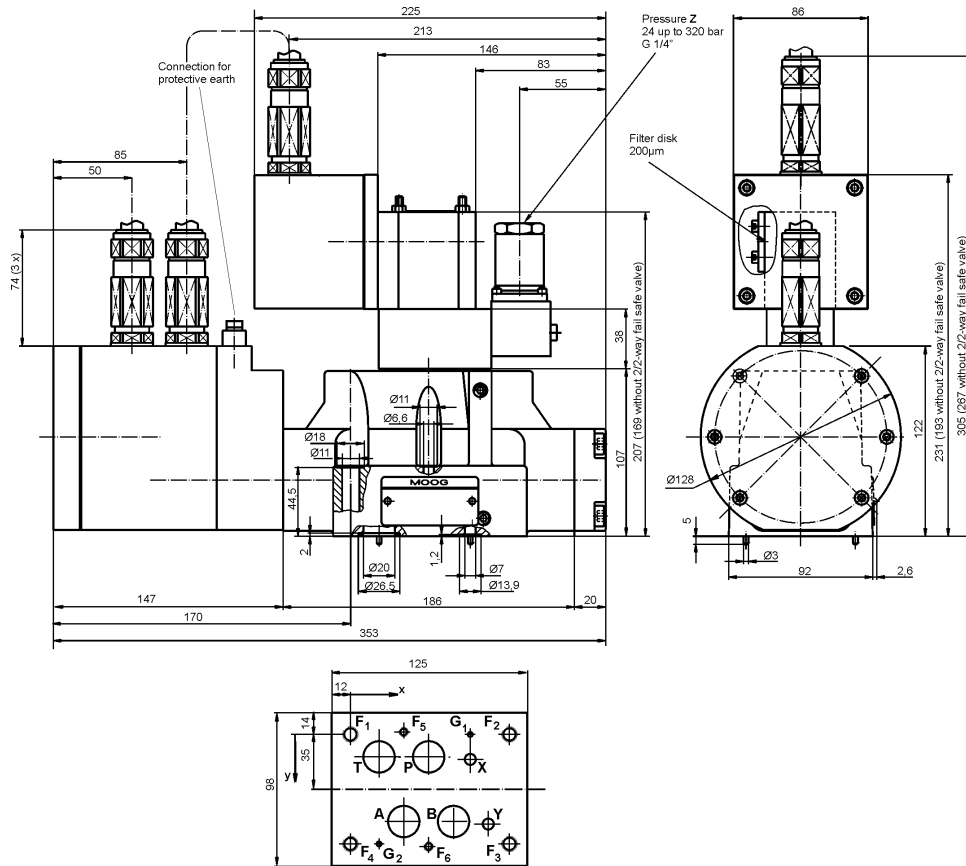
Series	Mounting pattern ISO 4401	Socket head screws	Qty.	Torque [Nm]
D661K...	05-05-0-05	M6 x 60	4	13
D662K...	07-07-0-05	M10 x 60	4	65
		M6 x 55	2	13
D663K...	08-08-0-05	M12 x 75	6	110
D664K...	08-08-0-05	M12 x 75	6	110

### 4.2 Dimensions

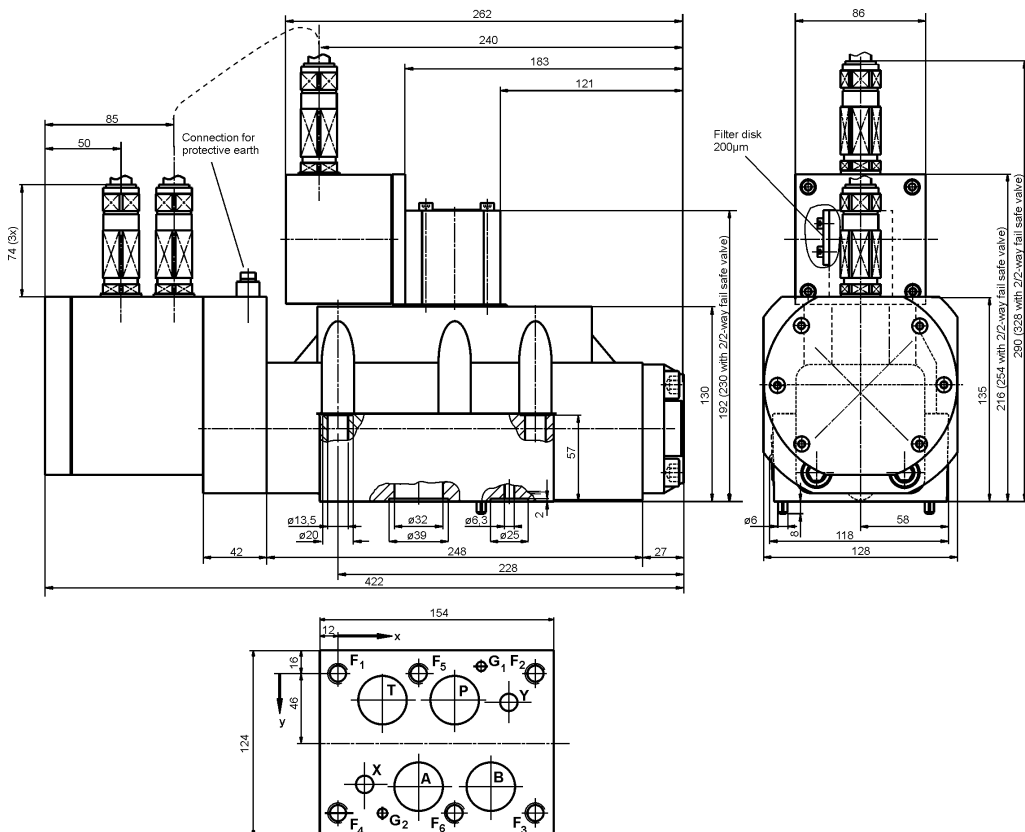
- 4.2.1 Proportional or Servo valves D661K Series shown without optional hydraulic fail safe valve



4.2.2 D662K Series with optional hydraulic fail safe valve



4.2.3 D663K and D664K Series shown without optional hydraulic fail safe valve



# D661K, D662K, D663K and D664K Series

## 4.3 Electronics information

### 4.3.1 Connection lead

Number of poles	Supply voltage 24 VDC
6+PE / 6+FE	X
11+PE	X



Please note information regarding input signals on the nameplate!

#### General requirements

- Supply 24 VDC, min. 18 VDC, max. 32 VDC.  
Current consumption max. 300 mA
- All signal lines, also those of external transducers, shielded.
- Shielding connected radially to  $\perp$  (0V), power supply side, and connected to the mating connector housing (EMC)
- EMC:** Meets the requirements of EN 61000-6-4:2007 and EN 61000-6-2:2006.
- Protective grounding lead  $\geq 0,75 \text{ mm}^2$
- Note: When making electric connections to the valve (shield, protective earth) appropriate measures must be taken to ensure that locally different earth potentials do not result in excessive ground currents.  
See also Technical Note TN 353.
- All connected electric circuits must be isolated from the main supply by safety isolation according to EN 61558-1 and EN 61558-2-6. Voltages must be limited to the safety extra low voltage range according to EN 60204-1. We recommend the use of SELV/PELV power supplies.

### 4.3.2 Valve electronics with supply voltage 24 Volt and 6+PE/6+FE-pole connecting lead

#### 4.3.2.1 Flow command input $\pm 10 \text{ mA}$ , floating

The spool stroke of the valve is proportional to  $I_4 = -I_5$ . 100 % valve opening P  $\blacktriangleright$  A and B  $\blacktriangleright$  T is achieved at  $I_4 = 10 \text{ mA}$ . At 0 mA command the spool is in centred position. The input flexible wire 4 and 5 are inverting. Either flexible wire 4 or 5 is used according to the required operating direction. The other flexible wire is connected to signal ground at cabinet side.

#### 4.3.2.2 Flow command input $\pm 10 \text{ V}$ , floating

The spool stroke of the valve is proportional to  $(U_4 - U_5)$ . 100 % valve opening P  $\blacktriangleright$  A and B  $\blacktriangleright$  T is achieved at  $(U_4 - U_5) = 10 \text{ V}$ . At 0 V command the spool is in centred position. The input stage is a differential amplifier. If only one command signal is available, flexible wire 4 or 5 is connected to signal ground at cabinet side, according to the required operating direction.

#### 4.3.2.4 Flow actual value output 4 to 20 mA

The actual spool position value can be measured at flexible wire 6 (see diagram on page 13). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P  $\blacktriangleright$  A and B  $\blacktriangleright$  T.

#### 4.3.2.4 Flow actual value output 2,5 to 13,5 V

The actual spool position value can be measured at flexible wire 6 (see diagram on page 13). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 2,5 to 13,5 V. The centred position is at 8 V. 13,5 V corresponds to 100 % valve opening P  $\blacktriangleright$  A and B  $\blacktriangleright$  T.

#### 4.3.2.5 Connection lead wiring - type code letter K/H (see sticker on the electronic housing)

**For valves with 6+PE/6+FE-pole connection lead**

Function	Current command	Voltage command
Supply	24 VDC (min. 18 VDC, max. 32 VDC) $I_{max.}: 300 \text{ mA}$	
Supply or signal ground	$\perp$ (0 V)	
Enabled <sup>1)</sup> Not enabled	$U_{3-2} > 8,5 \text{ VDC}$ $U_{3-2} < 6,5 \text{ VDC}$ $I_e = 1,2 \text{ mA}$ at 24 VDC	
Input rated command (differential)	Input command $I_{4-5}: 0$ to $\pm 10 \text{ mA}$ ( $R_e = 200 \Omega$ ) Input command (inverted) $I_{4-5}: 0$ to $\pm 10 \text{ mA}$ Inputs $U_{4-2}$ and $U_{5-2}$ for both signal types limited to: min. $-15 \text{ V}$ and max. $32 \text{ V}$	$U_{4-5}: 0$ to $\pm 10 \text{ V}$ $R_e: 10 \text{ k}\Omega$
Output actual value spool position	$I_{6-2} = 4$ to $20 \text{ mA}$ . At 12 mA spool is in centred position. $R_L = 100$ to $500 \Omega$ Signal code <b>D</b> : $U_{6-2} = 2,5$ to $13,5 \text{ V}$ . At 8 V spool is in centred position. $R_a = 500 \Omega$	
PE (protective earth) / FE (functional earth)		

<sup>1)</sup> With enable signal  $< 6,5 \text{ V}$  the spool moves into the defined position.

**4.3.3 Valve electronics with supply voltage 24 Volt and 11+PE-pole connecting lead**

**4.3.3.1 Flow command input ±10 mA, floating**

The spool stroke of the valve is proportional to  $I_4 = -I_5$ . 100 % valve opening P → A and B → T is achieved at  $I_4 = 10$  mA. At 0 mA command the spool is in centred position. The input flexible wire 4 and 5 are inverting. Either flexible wire 4 or 5 is used according to the required operating direction. The other flexible wire is connected to signal ground at cabinet side.

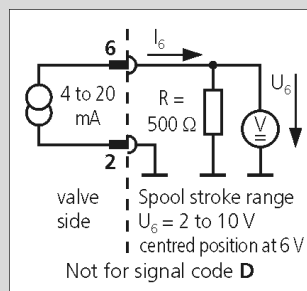
**4.3.3.2 Flow command input ±10 V, floating**

The spool stroke of the valve is proportional to  $(U_4 - U_5)$ . 100 % valve opening P → A and B → T is achieved at  $(U_4 - U_5) = 10$  V. At 0 V command the spool is in centred position. The input stage is a differential amplifier. If only one command signal is available, flexible wire 4 or 5 is connected to signal ground at cabinet side, according to the required operating direction.

**4.3.3.4 Flow actual value output 4 to 20 mA**

The actual spool position value can be measured at flexible wire 6 (see diagram on page 13). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P → A and B → T.

**Circuit diagram for measurement of actual value  $I_{6-2}$  (position of main spool)**



Please note "General requirements" on page 12.

**4.3.3.5 Connection lead wiring - type code letter Z (see sticker on the electronic housing)**

For valves with 11+PE-pole connection lead		
Function	Current command	Voltage command
Supply	24 VDC (min. 18 VDC, max. 32 VDC) $I_{max.}: 300$ mA	
Supply or signal ground	⊥ (0 V)	
Enabled <sup>1)</sup> Not enabled	$U_{3-2} > 8,5$ VDC $U_{3-2} < 6,5$ VDC	$I_e = 1,2$ mA at 24 VDC
Input rated command (differential)	Input command $I_{4-5}: 0$ to $\pm 10$ mA ( $R_e = 200 \Omega$ ) Input command (inverted) $I_{4-5}: 0$ to $\pm 10$ mA Inputs $U_{4-2}$ and $U_{5-2}$ for both signal types limited to: min. -15 V and max. 32 V	$U_{4-5}: 0$ to $\pm 10$ V $R_e: 10$ kΩ
Output actual value spool position	$I_{6-2} = 4$ to 20 mA. At 12 mA spool is in centred position. $R_l = 100$ to 500 Ω Signal code <b>D</b> : $U_{6-2} = 2,5$ to 13,5 V. At 8 V spool is in centred position. $R_s = 500 \Omega$	
Auxiliary signal	Spool position $I_{7-2} = 13$ to 3 V. At 8 V spool is in centred position. $R_a = 5$ kΩ	
Valve ready Supply ready	$U_{8-2} > 8,5$ VDC: Enable and supply ok $U_{8-2} < 6,5$ VDC: Not enabled or supply not ok	Output $I_{max.}: 20$ mA
not used		
not used		
Position error, logic	$U_{11-2} > 8,5$ VDC: safe position $U_{11-2} < 6,5$ VDC: not in safe position	Output $I_{max.}: 20$ mA
PE (protective earth)		

<sup>1)</sup> With enable signal < 6,5 V the spool moves into the defined position.

## 5 Setting up

This information is valid for new installations to be put into operation as well as for valve replacement.

### 5.1 Filling the hydraulic system



New oil is never clean. Therefore the system should generally be filled by using a filling filter. This fine mesh filter should at least comply with the following requirement:  
 $\beta_{10} \geq 75$  (10  $\mu\text{m}$  absolute).

### 5.2 Flushing the hydraulic system



Before the hydraulic system is put into operation for the first time (also after modifications) it has to be flushed carefully according to the instructions of the manufacturer of the machine/plant.

- 5.2.1 Before flushing suitable flushing elements have to be inserted in the pressure filters instead of the high pressure elements.
- 5.2.2 During flushing the operational temperature of the hydraulic system should be achieved. Observe temperature!
- 5.2.3 A flushing plate or, if the system allows, a directional valve should be mounted in place of the proportional valve. The P- and T-connections are flushed through the flushing plate. The user A- and B-connections can also be flushed by the directional valve.



Attention, the directional valve can lead to unpermissible movements in the load (i.e., with parallel drives), which may result in damage to the machine/plant. Instructions of the manufacturer have to be strictly observed. Minimum flushing time  $t$  can be calculated as follows:

$$t = \frac{V}{Q} \cdot 5$$

$V$  = content of reservoir [liter]  
 $Q$  = flow rate of the pump [l/min]  
 $t$  = flushing time [hours]

- 5.2.4 The flushing process can be considered completed when a system cleanliness of 19/16/13 according ISO 4406:1999 or better is achieved. A long life of the metering lands of the proportional valve can be expected for this cleanliness class.
- 5.2.5 Replace flushing elements in the pressure filters by suitable high pressure elements after flushing. Install proportional valve instead of flushing plate or directional valve.



### 5.3 Setting up

- 5.3.1 After setting up the valves, put the machine or system into operation, observing the operating instructions of the machine/plant manufacturer. Vent the system.
- 5.3.2 The safety directives of the machine/plant manufacturer must be observed (EN 954-1). In particular, the safety requirements to IEC 60079-1 and IEC 60079-7 apply.
- 5.3.3 The special safety requirements for machines such as injection moulding machines (EN 201), blow moulding machines (EN 422) and die casting machines (EN 869), to name a few, are important.
- 5.3.3 Observe the oil temperature.
- 5.3.4 Check the hydraulic system for external leaks.



## 6 Maintenance

Apart from a regular visual check for external leaks or damaged cables and a change of filter, no maintenance work is necessary on the series D661K to D664K valves.



**Explosion protected valves D661K.../D662K.../D663K... and D664K... must not be opened by the customer under any circumstances.**

**Unauthorized opening will invalidate the explosion-proof approval! Return failed valve to the factory.**

**These explosion protected valves can only be repaired at the Moog GmbH service office (see address on the back of the operating instructions).**

### 6.1 Filter replacement

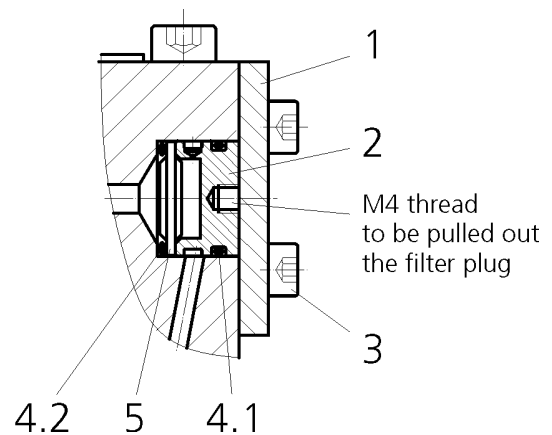
The built-in filter disk protects jet and receiver against coarse contaminants. With severe contamination the valve response will be reduced.



#### Replace filter!

Cleaning is useless and may be **dangerous!**

Before starting to work on the valve clean the external surface around the filter cover!



- 6.1.1 Dismantle the four hexagon socket screws (3) with the SW3 hexagon socket screw key and remove the filter cover (1).
- 6.1.2 Pull out the filter plug (2), which is now accessible, with the help of one of the screws (3) by means of the M4 thread.
- 6.1.3 Remove the filter disk (5) with a scriber or a fine screwdriver.



#### Do not reinsert used filter disks.

- 6.1.4 Check O-rings (4.1) and (4.2) and replace them if necessary. Pay attention to the correct material for the O-ring, NBR or FPM.
- 6.1.5 Insert the new filter disk. For this, firstly insert the O-ring (4.2), then the filter disk (5) in such a way that the side with the impression points towards the outside. Insert O-ring (4.1) in the filter plug with some **clean** grease and insert the filter plug (2) in the bore.
- 6.1.6 Assemble cover (1) with the four M4 hexagon socket screws (3) and tighten with a torque of **4,1 Nm**.
- 6.1.7 After putting the valve into operation, check it for external leaks.

## 7 Malfunctions – Causes and Troubleshooting

### 7.1 Leakage at the mounting surface of the valve

- Have all seals been installed at ports A, B, P, T, (T<sub>2</sub>), Y and X and are they ok?
- Have the mounting bolts been tightened correctly?



**Pay attention to the required torque!  
Tighten bolts diagonally!**

### 7.2 No hydraulic response of the valve

- Check all signals at the flexible wires.
- Is supply voltage present?
- Is electric input signal (command signal) present?
- Is the enable signal > 8,5 V at flexible wire 3 present?
- Is hydraulic pressure present?
- Check pilot supply. Do you need internal or external?
- If external, is pilot pressure present?
- Is the filter disk contaminated?

*With failsafe version:*

- Is the release pressure **Z** available on the 2/2-way solenoid valve?

### 7.3 Instability of the system, plant oscillates

- Check, whether output signal at flexible wire 6 is following exactly the command signal at flexible wire 4 or 5.  
If not, the electronics of the valve may be defective.
- Check filter disk for contamination.

### 7.4 With hydraulics ON valve goes hardover



- Has the fail safe directional seat valve been actuated?
- Pilot stage is contaminated.

**Send the valve back to the Moog GmbH service office for repairs.**

## 8 Declaration of conformity

A declaration of conformity as defined by machinery directive 89/392/EEC Annex II B and directive IEC 60079 is issued for servo and proportional valves D661K, D662K, D663K and D664K Series and is shown in this operating instructions.

## 9 Tools

### 9.1 Tools and ancillaries

The following tools are required for installation, start of operation, zeroing and changing filters:

#### 9.1.1 Installation of the valve

##### 9.1.1.1 To fit the valve:

Allan wrench SW 5 for D661K  
Allan wrench SW 5 and SW8 for D662K  
Allan wrench SW 10 for D663K and D664K

#### 9.1.2 Filter replacement

##### 9.1.3.1 For dismantling and fitting the filter cover: Allan wrench SW 3

##### 9.1.3.2 For dismantling the filter disk, a scribe or a fine electronic engineer's screwdriver is recommended.

##### 9.1.3.3 For inserting the O-ring on the filter cover and also in the installation of the O-rings on the assembly surface, **clean** grease is required.

Standard grease must not be used with valve models having EPDM seals. **Use special grease!**



MOOG GmbH Hanns-Klemm-Str. 28 71034 Böblingen	<b>MOOG</b> Division Industry
<b>Declaration of conformity</b>	
as defined by machinery directive 89/392/EEC Annex IIB and directive 94/9/EC (ATEX), Annex X	
Herewith we declare that the	
<b>Series of Servovalves D66xKxxxx</b>	
(detailed model & serial number is referenced on the delivery note)	
is intended to be incorporated into machinery or machinery parts, or assembled with other machinery or machinery parts to constitute machinery covered by this directive and must not be put into service until the machinery into which it is to be incorporated has been declared in conformance with the provisions of the directive as amended by 98/37/EC and directive 94/9/EC.	
The admission of the series is registered under: <b>Nemko 07ATEX1060</b> The monitoring body of the QM system is <b>TÜV Süd (0123)</b>	
Applied harmonized standards in particular:	
EN 982:1996	"Safety of machinery - Safety requirements for fluid power systems and their components hydraulics."
EN 61010-1:2001	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General Requirements
EN 61000-6-4:2007	Electromagnetic compatibility (EMC) Generic emission standard
EN 61000-6-2:2006	Electromagnetic compatibility (EMC) Generic immunity standard
EN 60079-0:2004	Electrical apparatus for potentially explosive atmospheres - General requirements.
EN 60079-1:2004	Electrical apparatus for potentially explosive atmospheres - Flameproof enclosures "d".
Moog GmbH Postfach 1670, D-71006 Böblingen Phone: 07031 622-0 Fax: 07031 622-100	
Harald Seiffer General Manager	Richard Kohse Quality Manager Representative for ATEX Directive 94/9/EC
Böblingen, 10.10.2007	
<small>g:\user\qat_\formqa\Qat079E EX Declaration of Conformity Exschutz D66xK.doc</small>	
<small>Rev. 1 / 10.10.2007</small>	

## 10 Spare Parts and Accessories

### 10.1 Spare parts Jetpipe pilot stage D061K

Part No.	Description	Pos. <sup>1)</sup>	Dimensions	Material	Qty.
-45122-004	O-ring, ports P, T, A, B		ID 12,4 x Ø 1,8	NBR Sh 85	4 pcs.
-42082-004	O-ring, ports P, T, A, B		ID 12,4 x Ø 1,8	FPM Sh 85	4 pcs.
A67999-200	Replaceable filter disk		200 µm nominal		1 pc.
-66117-013-015	O-ring, on filter stuffing and behind filter disk	4.1 and 4.2	ID 15,6 x Ø 1,8	NBR Sh 85	2 pcs.
A25163-013-015	O-ring, on filter stuffing and behind filter disk	4.1 and 4.2	ID 15,6 x Ø 1,8	FPM Sh 85	2 pcs.

<sup>1)</sup> see sketch chapter 6.1, Filter replacement, on page 14

### 10.2 Spare parts D661K

Part No.	Description	Dimensions	Material	Qty.
-45122-004	O-ring, ports P, T, A, B, T <sub>2</sub>	ID 12,4 x Ø 1,8	NBR Sh 85	5 pcs.
-42082-004	O-ring, ports P, T, A, B, T <sub>2</sub>	ID 12,4 x Ø 1,8	FPM Sh 85	5 pcs.
-45122-011	O-ring, ports X and Y	ID 15,6 x Ø 1,8	NBR Sh 85	2 pcs.
-42082-011	O-ring, ports X and Y	ID 15,6 x Ø 1,8	FPM Sh 85	2 pcs.

### 10.3 Spare parts D662K

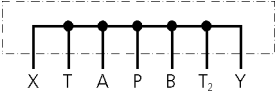

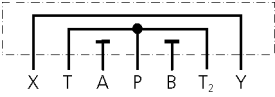
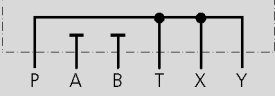
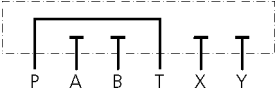
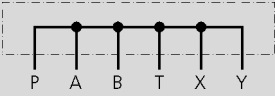
Part No.	Description	Dimensions	Material	Qty.
-45122-129	O-ring, ports P, T, A, B	ID 21,89x Ø 2,6	NBR Sh 85	4 pcs.
-42082-129	O-ring, ports P, T, A, B	ID 21,89x Ø 2,6	FPM Sh 85	4 pcs.
-45122-022	O-ring, ports X and Y	ID 10,82x Ø 1,8	NBR Sh 85	2 pcs.
-42082-022	O-ring, ports X and Y	ID 10,82x Ø 1,8	FPM Sh 85	2 pcs.

### 10.4 Spare parts D663K and D664K

Part No.	Description	Dimensions	Material	Qty.
-45122-113	O-ring, ports P, T, A, B	ID 34,6 x Ø 2,6	NBR Sh 85	4 pcs.
-42082-113	O-ring, ports P, T, A, B	ID 34,6 x Ø 2,6	FPM Sh 85	4 pcs.
-45122-195	O-ring, ports X and Y	ID 20,29x Ø 2,6	NBR Sh 85	2 pcs.
-42082-195	O-ring, ports X and Y	ID 20,29x Ø 2,6	FPM Sh 85	2 pcs.



**10.5 Accessories** (not included in delivery)

Part No.	Description		Dimensions/Notes	Qty.
A03665-060-060	Mounting bolts	D661K...	M6x60 DIN EN ISO 4762-10.9	4 pcs.
A03665-100-060	Mounting bolts	D662K...	M10x60 DIN EN ISO 4762-10.9	4 pcs.
A03665-060-055	Mounting bolts	D662K...	M6x55 DIN EN ISO 4762-10.9	2 pcs.
A03665-120-075	Mounting bolts	D663K...	M12x75 DIN EN ISO 4762-10.9	6 pcs.
A03665-120-075	Mounting bolts	D664K...	M12x75 DIN EN ISO 4762-10.9	6 pcs.
	Mounting manifolds	D661K...	see special data sheet	
B46891-001	Mounting manifold	D662K...		
A25855-009	Mounting manifold	D663K...		
A25855-009	Mounting manifold	D664K...		
B67728-001	Flushing plate	D661K...		
B67728-002	Flushing plate	D661K...		
B67728-003	Flushing plate	D661K...		
-76741	Flushing plate	D662K...		
-76047-001	Flushing plate	D663K... / D664K...		
-76047-002	Flushing plate	D663K... / D664K...		

# 11 Ordering Information

## 11.1 Servo valve D661K

Model number		Type designation																					
D661	<b>K</b> . . . . .	<b>G</b> . . . . .	<b>2</b> - . . . . .																				
<b>Specification status</b> <b>K</b> Explosion proof version		<b>Function code</b> <b>O</b> Not enable input. Flexible wire 3 not used. <b>A</b> Without enable signal applied the spool moves to adjustable centred position. <b>B</b> Without enable signal applied the spool moves into defined end position A $\blacktriangleright$ T oder B $\blacktriangleright$ T.																					
<b>Model designation</b> assigned at the factory		<b>Electric supply</b> <b>2</b> 24 VDC (18 to 32 VDC)																					
<b>Factory identification</b>		<b>Signals for 100 % spool stroke</b> <table border="1"> <thead> <tr> <th></th> <th>Command</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td><b>D</b></td> <td><math>\pm 10</math> V</td> <td>2 to 10 V</td> </tr> <tr> <td><b>M</b></td> <td><math>\pm 10</math> V</td> <td>4 to 20 mA</td> </tr> <tr> <td><b>X</b></td> <td><math>\pm 10</math> mA</td> <td>4 to 20 mA</td> </tr> </tbody> </table>			Command	Output	<b>D</b>	$\pm 10$ V	2 to 10 V	<b>M</b>	$\pm 10$ V	4 to 20 mA	<b>X</b>	$\pm 10$ mA	4 to 20 mA								
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<b>X</b>	$\pm 10$ mA	4 to 20 mA																					
<b>Valve version</b> <b>G</b> bushing		<b>Valve connection lead</b> <b>K</b> 6+PE-pole (protective earth) <sup>1)</sup> <b>H</b> 6+FE-pole (functional earth), mud resistant <sup>1)</sup>																					
<b>Rated flow</b> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2"><math>Q_N</math> [l/min] at <math>\Delta p_N</math></th> </tr> <tr> <th>70 bar</th> <th>10 bar</th> </tr> </thead> <tbody> <tr> <td><b>15</b></td> <td>40</td> <td>15</td> </tr> <tr> <td><b>30</b></td> <td>80</td> <td>30</td> </tr> <tr> <td><b>45</b></td> <td>120</td> <td>45</td> </tr> <tr> <td><b>60</b></td> <td>160</td> <td>60</td> </tr> <tr> <td><b>75</b></td> <td>200</td> <td>75</td> </tr> </tbody> </table>			$Q_N$ [l/min] at $\Delta p_N$		70 bar	10 bar	<b>15</b>	40	15	<b>30</b>	80	30	<b>45</b>	120	45	<b>60</b>	160	60	<b>75</b>	200	75	<b>Seal material</b> <b>N</b> NBR Standard <b>V</b> FPM optional Others on request	
	$Q_N$ [l/min] at $\Delta p_N$																						
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<b>15</b>	40	15																					
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<b>45</b>	120	45																					
<b>60</b>	160	60																					
<b>75</b>	200	75																					
<b>Maximum operating pressure</b> <b>B</b> 70 bar <b>F</b> 210 bar At $p_x \leq 210$ bar (X and Y external) operating pressure in ports P, A, B and T up to 350 bar allowed <b>K</b> 350 bar (with dropping orifice in pilot valve) <b>X</b> Special version		<b>Pilot connections</b> <table border="1"> <thead> <tr> <th></th> <th>Supply</th> <th>Return</th> <th></th> </tr> </thead> <tbody> <tr> <td><b>4</b></td> <td>internal</td> <td>internal</td> <td rowspan="4">Parameters of the control electronics are adapted to the pilot pressure. See operating pressure on the name-plate and in this ordering information.</td> </tr> <tr> <td><b>5</b></td> <td>external</td> <td>internal</td> </tr> <tr> <td><b>6</b></td> <td>external</td> <td>external</td> </tr> <tr> <td><b>7</b></td> <td>internal</td> <td>external</td> </tr> </tbody> </table>			Supply	Return		<b>4</b>	internal	internal	Parameters of the control electronics are adapted to the pilot pressure. See operating pressure on the name-plate and in this ordering information.	<b>5</b>	external	internal	<b>6</b>	external	external	<b>7</b>	internal	external			
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<b>5</b>	external	internal																					
<b>6</b>	external	external																					
<b>7</b>	internal	external																					
<b>Bushing spool type</b> <b>O</b> 4-way: critical lap, linear characteristic <b>S</b> 4-way: critical lap, curvilinear characteristic, $> Q_N = 80$ l/min <b>X</b> special bushing on request		<b>Spool position without electric supply</b> <b>O</b> undefined (no fail safe function)																					
<b>Pilot stage</b> <b>3</b> D061K Jetpipe Standard		<b>Mechanical fail safe versions</b> achieved at <b>A</b> P $\blacktriangleright$ B, A $\blacktriangleright$ T connected $p_x > 25$ bar <b>B</b> P $\blacktriangleright$ A, B $\blacktriangleright$ T connected $p_x > 25$ bar																					

<sup>1)</sup> Cable's length 3 m, other lengths on request

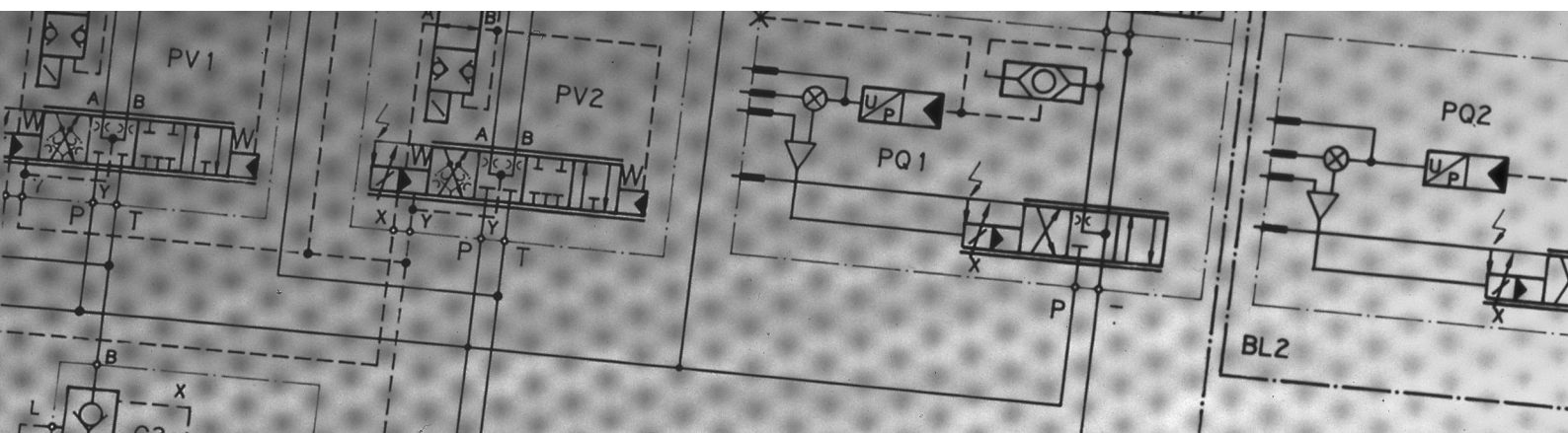
Options may increase price.  
All combinations may not be available.

Preferred configurations are highlighted.  
Technical changes are reserved.





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