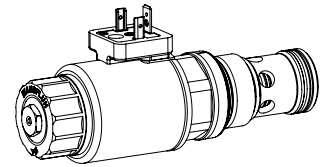


**Proportional 2-way flow control cartridge**

- ◆ direct operated, pressure compensated
- ◆  $Q_{max} = 80$  l/min
- ◆  $Q_{Nmax} = 80$  l/min
- ◆  $p_{max} = 350$  bar

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as screw-in cartridge for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (QN) or open position (QO) by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

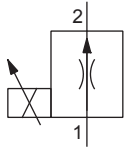
**TYPE CODE**

		Q <input type="checkbox"/> P PM33 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>																
Flow control valve																		
Normally closed	<input type="checkbox"/> N																	
Normally open	<input type="checkbox"/> O																	
Proportional																		
Screw-in cartridge M33 x 2																		
Nominal volume flow rate $Q_N$	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">normally closed</td> <td></td> <td style="text-align: right;">normally open</td> <td></td> </tr> <tr> <td style="text-align: right;">32 l/min</td> <td style="text-align: center;"><input type="checkbox"/> 32</td> <td style="text-align: right;">32 l/min</td> <td style="text-align: center;"><input type="checkbox"/> 32</td> </tr> <tr> <td style="text-align: right;">63 l/min</td> <td style="text-align: center;"><input type="checkbox"/> 63</td> <td style="text-align: right;">63 l/min</td> <td style="text-align: center;"><input type="checkbox"/> 63</td> </tr> <tr> <td style="text-align: right;">80 l/min</td> <td style="text-align: center;"><input type="checkbox"/> 80</td> <td></td> <td></td> </tr> </table>	normally closed		normally open		32 l/min	<input type="checkbox"/> 32	32 l/min	<input type="checkbox"/> 32	63 l/min	<input type="checkbox"/> 63	63 l/min	<input type="checkbox"/> 63	80 l/min	<input type="checkbox"/> 80			
normally closed		normally open																
32 l/min	<input type="checkbox"/> 32	32 l/min	<input type="checkbox"/> 32															
63 l/min	<input type="checkbox"/> 63	63 l/min	<input type="checkbox"/> 63															
80 l/min	<input type="checkbox"/> 80																	
Nominal voltage $U_N$	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">12 VDC</td> <td style="text-align: center;"><input type="checkbox"/> G12</td> </tr> <tr> <td style="text-align: right;">24 VDC</td> <td style="text-align: center;"><input type="checkbox"/> G24</td> </tr> <tr> <td style="text-align: right;">without coil</td> <td style="text-align: center;"><input type="checkbox"/> X5</td> </tr> </table>	12 VDC	<input type="checkbox"/> G12	24 VDC	<input type="checkbox"/> G24	without coil	<input type="checkbox"/> X5											
12 VDC	<input type="checkbox"/> G12																	
24 VDC	<input type="checkbox"/> G24																	
without coil	<input type="checkbox"/> X5																	
Slip-on coil	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Metal housing round</td> <td style="text-align: center;"><input type="checkbox"/> W</td> </tr> <tr> <td style="text-align: right;">Metal housing square</td> <td style="text-align: center;"><input type="checkbox"/> M</td> </tr> </table>	Metal housing round	<input type="checkbox"/> W	Metal housing square	<input type="checkbox"/> M													
Metal housing round	<input type="checkbox"/> W																	
Metal housing square	<input type="checkbox"/> M																	
Connection execution	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Connector socket EN 175301-803 / ISO 4400</td> <td style="text-align: center;"><input type="checkbox"/> D</td> </tr> <tr> <td style="text-align: right;">Connector socket AMP Junior-Timer</td> <td style="text-align: center;"><input type="checkbox"/> J</td> </tr> <tr> <td style="text-align: right;">Connector Deutsch DT04-2P</td> <td style="text-align: center;"><input type="checkbox"/> G</td> </tr> </table>	Connector socket EN 175301-803 / ISO 4400	<input type="checkbox"/> D	Connector socket AMP Junior-Timer	<input type="checkbox"/> J	Connector Deutsch DT04-2P	<input type="checkbox"/> G											
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Connector socket AMP Junior-Timer	<input type="checkbox"/> J																	
Connector Deutsch DT04-2P	<input type="checkbox"/> G																	
Sealing material	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">NBR</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">FKM (Viton)</td> <td style="text-align: center;"><input type="checkbox"/> D1</td> </tr> </table>	NBR	<input type="checkbox"/>	FKM (Viton)	<input type="checkbox"/> D1													
NBR	<input type="checkbox"/>																	
FKM (Viton)	<input type="checkbox"/> D1																	
Manual override																		
Design index (subject to change)																		

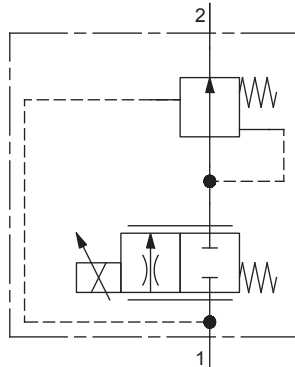
2.6-651

**SYMBOL**

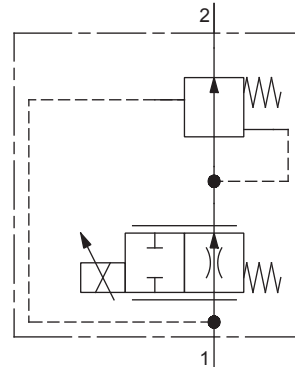
Simplified



Detailed QN...



Detailed QO...


**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,95 kg
MTTFd	150 years

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 80 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_N = 32 \text{ l/min}, 63 \text{ l/min}, 80 \text{ l/min}$ (QN) $Q_N = 32 \text{ l/min}, 63 \text{ l/min}$ (QO)
Hysteresis	≤ 6 % (QN); 10 % (QO) at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6...10} \geq 75$ , see data sheet 1.0-50

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S45 / 23 x 50 (Data sheet 1.1-180) M.S45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

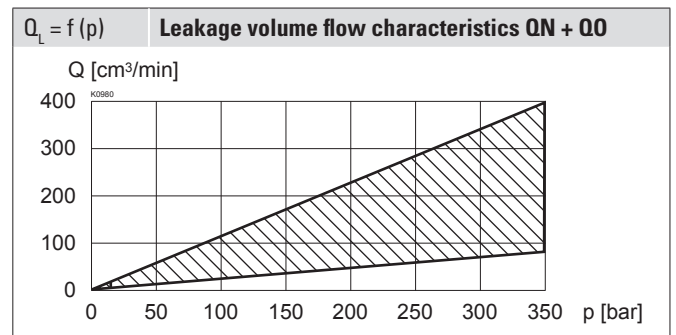
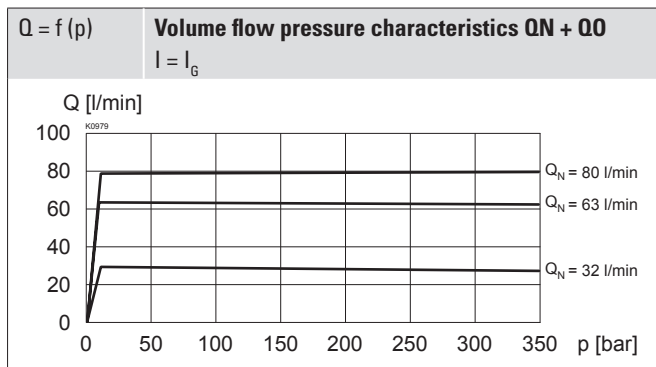
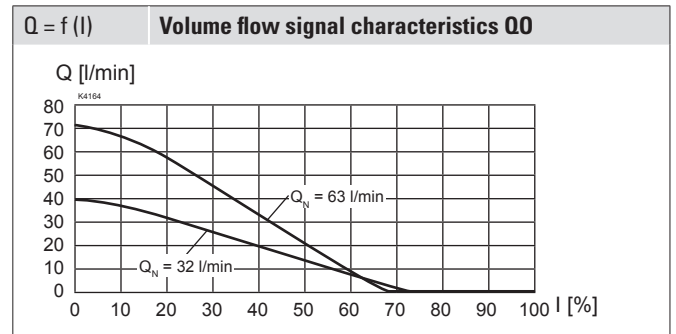
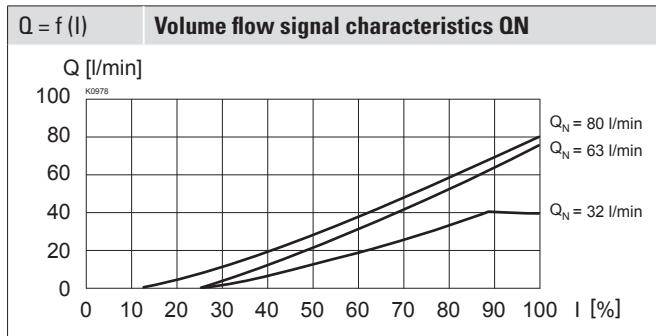
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_G = 1560 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_G = 780 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!**


Other electrical specifications see data sheet 1.1-180 (slip-on coil W) and 1.1-181 (slip-on coil M)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Flange body / sandwich plate	Data sheet 2.6-680
Threaded body	Data sheet 2.9-205
Proportional amplifier	Register 1.13
Mating connector black (B)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**SEALING MATERIAL**

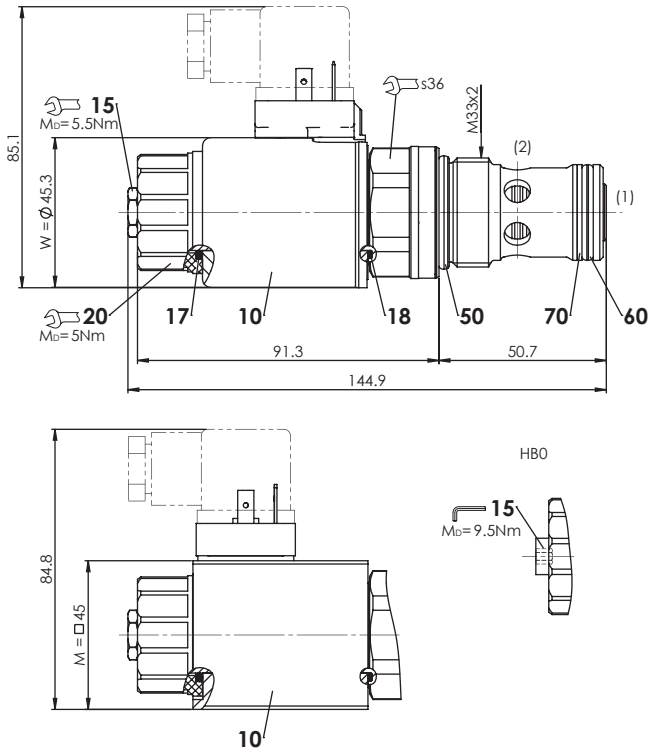
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

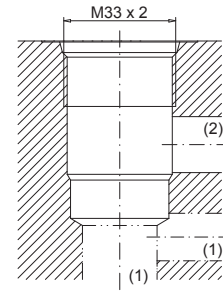
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	M <sub>D</sub> = 80 Nm Screw-in cartridge M <sub>D</sub> = 5 Nm knurled nut

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**PARTS LIST**

Position	Article	Description
10	206.12..	W.S45 / 23 x 50
	206.7...	M.S45 / 23 x 50
15	253.8000	HB4,5 manual override
	239.2033	HBO Screw plug
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	154.2701	Knurled nut M23 x 1,5 x 19,7
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
70	049.8297	Backup ring PTSM rd 22,1 x 26,6 x 1,4