



## Solenoids

### CHARACTERISTICS

Coil winding isolation class	H
Protection class in acc. EN 60529	IP65/67, with corresponding cable gland and correct installation
Relative duty factor	100% DF, combined with armature tube and valve
Reference temperature	Execution L9: -25...+40°C (operation as T1...T6/T80°C) -25...+90°C (operation as T1...T4/T130°C) Execution L15 / L12: -25...+70°C (operation as T1...T4/T130°C) Execution L21: -25...+50°C (operation as T1...T4/T130°C)
Housing	Steel housing, zinc-/nickel-coated
Relative duty factor	max. 95% (not dew-forming)
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 400 hours
Maximum operating voltage	Nominal voltage +10%
Nominal frequency	in acc. with name plate ±2%
Standard nominal voltages	U <sub>N</sub> = 12 VDC U <sub>N</sub> = 24 VDC U <sub>N</sub> = 115 VAC U <sub>N</sub> = 230 VAC Other nominal voltages in the ranges of 12–230 VDC and 24–230 VAC on request
Standard nominal powers	P <sub>N</sub> = 9 W P <sub>N</sub> = 15 W P <sub>N</sub> = 21 W

### OPERATION SECURITY



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent.

In case of non-observance, no liability can be assumed.

A corresponding fuse in accordance with its design current has to be connected in series as short-circuit protection for every solenoid coil.

### INSTALLATION

For stack assembly please observe the remarks in the operating instructions.

	12 VDC			
Nominal power (W)	9	12	15	21
Nominal resistance (Ω)	16,5	13,5	9,9	7,1
Recommended calculation voltage for fuse inserts (mA)	1600	2000	2'500	4'000
Limiting current (mA) (Proportional function)	610	720	960	1'230
	24 VDC			
Nominal power (W)	9	12	15	21
Nominal resistance (Ω)	64	49,2	38,5	27,5
Recommended calculation voltage for fuse inserts (mA)	800	800	1'250	2'000
Limiting current (mA) (Proportional function)	300	370	450	600
	115 VAC			
Nominal power (W)	9	12	15	21
Nominal resistance (Ω)	1'180	869	700	500
Recommended calculation voltage for fuse inserts (mA)	200	200	315	400
	230 VAC			
Nominal power (W)	9	12	15	21
Nominal resistance (Ω)	4'750	3'370	2'850	2'050
Recommended calculation voltage for fuse inserts (mA)	100	100	160	200

### ACCESSORIES

– The operating instructions incl. the EC declaration of conformity for solenoid coils of the type MKY45/18 x 60 is supplied in German, English and French (download under [www.wandfluh.com](http://www.wandfluh.com))

– EC-type examination certificate: PTB 07 ATEX 1023 (download under [www.wandfluh.com](http://www.wandfluh.com))

– EC-declaration of conformity (download under [www.wandfluh.com](http://www.wandfluh.com))

– Recognition of production quality assurance PTB 07 ATEX Q006 (download under [www.wandfluh.com](http://www.wandfluh.com))

Part number:

**HYDROMA**

HYDRAULICKÉ SYSTÉMY

**HIDROMA  
SYSTEMS**

UKŁADY HYDRAULICZNE

**HYDROMA**

ГИДРАВЛИЧЕСКИЕ СИСТЕМЫ

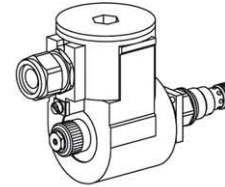
**Proportional  
pressure relief valves**

**Proportional pressure relief valve  
Screw-in cartridge**

- Pilot operated
- $Q_{max} = 100$  l/min
- $p_{max} = 400$  bar
- $p_{Nmax} = 350$  bar

**M22x1,5**  
ISO 7789

 **II 2 G**  
**EEx d II C**



**DESCRIPTION**

Pilot operated proportional pressure relief valve as a screw-in cartridge with a thread M22x1,5 for cavity according to ISO 7789. Activated with explosion proof solenoid. The cartridge body made of steel is galvanized and therefore rust-protected.

**EEEx:** in accordance with European standards EN 50014, EN 50018

**d:** flameproof enclosure

**Groupe II C:** (gas group II A, II B)

for all applications except mining

**Zone 1:** (and 2) explosive mixtures present intermittently

**EC-type examination certificate:**

Execution T4: PTB 98 ATEX 1009

Execution T6: PTB 98 ATEX 1008

**FUNCTION**

When the operating pressure set by the proportional solenoid is reached, the main spool opens and connects the protected line with the return line to the tank. The back pressure in T (2) influences the pressure in P (1). This pilot operated proportional pressure relief valve can be adjusted very sensitively and is suitable for large volume flows and high pressures. To control the valve Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable elegant, comfortable solutions to problems. Installation of the screw-in cartridge in control blocks as well as in the Wanfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini, NG6 and NG10 types. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

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**TYPE CODE**

Pressure relief valve	B	V	B	PM22	-		-	G24	/		#	
Pilot operated												
Proportional explosion proof, execution EEx d II C												
Screw-in cartridge M22x1,5												
Standard nominal pressure range:	$p_N = 20$ bar	<input type="text" value="20"/>	$p_N = 200$ bar	<input type="text" value="200"/>	$p_N = 63$ bar	<input type="text" value="63"/>	$p_N = 250$ bar	<input type="text" value="250"/>	$p_N = 100$ bar	<input type="text" value="100"/>	$p_N = 350$ bar	<input type="text" value="350"/>
	$p_N = 160$ bar	<input type="text" value="160"/>										
Standard nominal voltage	$U_N = 24$ VDC	<input type="text" value="G24"/>										
Execution:	T1...T4	<input type="text" value="T4"/>										
	T1...T6	<input type="text" value="T6"/>	(on request)									
Design-Index (Subject to change)												

• Data sheet is valid from design-index # 2 on

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure relief valve
Construction	Screw-in cartridge for cavity according to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Admissible ambient temp. *:	
Execution T4	-20...+40 °C
Execution T6 (on request)	-20...+90 °C (operation as T1...T4) -20...+40 °C (operation as T5/T6)
Mounting position	any, preferably horizontal
Fastening torque	$M_D = 50$ Nm for screw-in cartridge
Weight	$m = 2,2$ kg

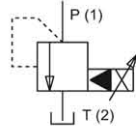
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Admissible fluid temp. *:	(at inlet and at outlet)
Execution T4	-20...+40 °C
Execution T6 (on request)	-20...+70 °C (operation as T1...T4) -20...+40 °C (operation as T5/T6)
Peak pressure	$p_{max} = 400$ bar $p_{Tmax} = p_p + 20$ bar
Nominal pressure ranges	$p_N = 20$ bar, $p_N = 63$ bar $p_N = 100$ bar, $p_N = 160$ bar $p_N = 200$ bar, $p_N = 250$ bar $p_N = 350$ bar
Volume flow range	$Q = 0,3...100$ l/min
Leakage volume flow	see characteristics
Repeatability	$\leq 3\%$ **
Hysteresis	$\leq 4\%$ **
	** with optimal dither signal

\* Deviating pressure medium - or ambient temperatures are possible for special arrangements after checking and authorisation by a responsible inspector. Measures for the prevention of the exceeding of the admissible solenoid surface - and internal temperatures can be: a good ventilation, low ambient temperatures (for higher pressure medium temperatures), limitation of the maximum possible power supply voltage, a short switching-on duration, installation on large heat dissipating blocks, etc. The responsibility in all cases lies with the operator, resp. with his inspector.

## Proportional pressure relief valves

### SYMBOL



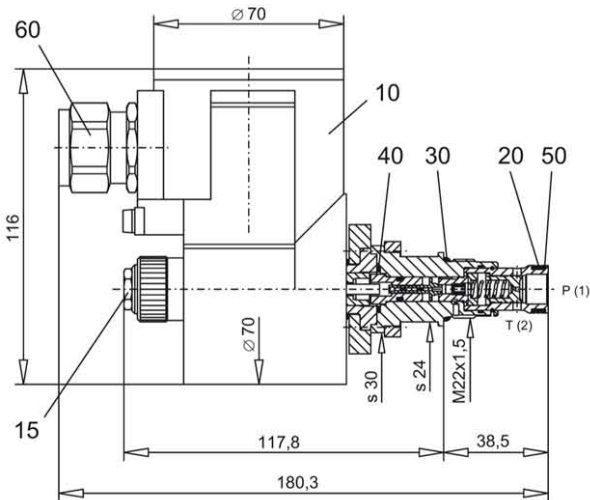
### ELECTRICAL SPECIFICATIONS

Construction	Proportional solenoid, wet pin push type, pressure tight
Standard nominal voltage	$U_N = 24$ VDC wired with VDR
Limiting current	T4: $I_G = 450$ mA T6: $I_G = 260$ mA (on request)
Relative duty factor	100% ED
Protection class	IP 65 acc. to EN 60 529
Connection/Power supply	Through cable entry for cable $\varnothing 11...14$ mm (acc. to EN 50014)
Temperature class:	T1...T4
Execution T4	T1...T4
Execution T6	T1...T6 (on request)
Performance limit:	
Execution T4	11,7 W at $I_G = 450$ mA
Execution T6	6 W at $I_G = 260$ mA (on request)

### START-UP

Information concerning the installation and commissioning is contained in the operating instructions supplied together with the solenoid coil.

### DIMENSIONS / SECTIONAL DRAWING



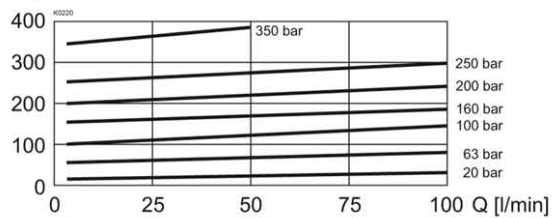
### PARTS LIST

Position	Article	Description
10	207.5293	Slip-on coil 2A67W EExd II C T4
15	253.8000	Plug with integrated manual override HB4,5
20	160.2140	O-ring ID 14,00x1,78
30	160.2188	O-ring ID 18,77x1,78
40	049.3177	Back-up ring RD 14,6x17,5x1,4
50	111.1080	Cable entry brass M20

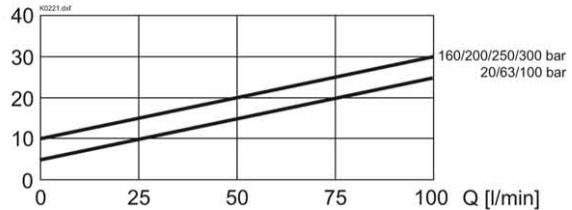
### CHARACTERISTICS (T6 on request)

oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

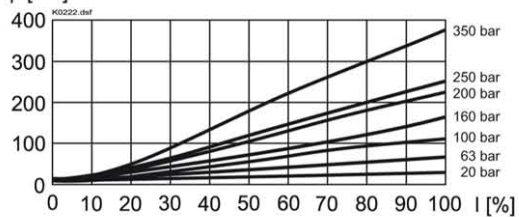
$p = f(Q)$  Pressure volume flow characteristics  
(Maximum adjustable pressure)



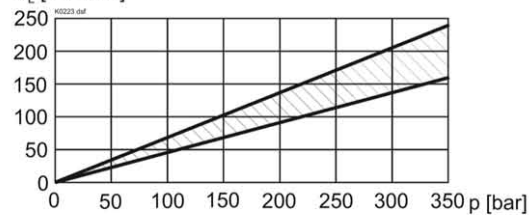
$p = f(Q)$  Pressure volume flow characteristics  
(Minimum adjustable pressure)



$p = f(I)$  Pressure signal characteristics  
( $Q = 10$  l/min)



$Q_L = f(p)$  Leakage volume flow characteristics



### ACCESSORIES

Cartridge built into flange- or sandwich body  
Flange body/sandwich plate register 2.3  
Proportional amplifier register 1.13

Cavity drawing ISO 7789-22-02-0-98  
and cavity tools see data sheet 2.13-1003

Technical explanation see data sheet 1.0-100E

Part number:

**HYDROMA**

HYDRAULICKÉ SYSTÉMY

**HIDROMA  
SYSTEMS**

UKŁADY HYDRAULICZNE

**HYDROMA**

ГИДРАВЛИЧЕСКИЕ СИСТЕМЫ

**Proportional  
pressure relief valves**

**Proportional pressure relief valve  
Screw-in cartridge**

- Direct operated
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$
- $p_{Nmax} = 315 \text{ bar}$

**DESCRIPTION**

Direct operated proportional pressure relief valve as a screw-in cartridge with a thread M22x1,5 for cavity according to ISO 7789. Activated with explosion proof solenoid. The cartridge body made of steel is zinc coated for corrosion protection.

**EEEx:** in accordance with European standards EN 50014, EN 50019, EN 50028

**e:** increased safety

**m:** encapsulation

**Group II:**

for all applications except mining

**Zone 1 / 21** (and 2 / 22):

explosive mixtures present intermittently

**EC-type examination certificate:**

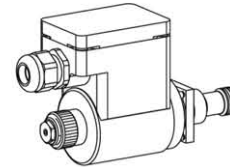
PTB 01 ATEX 2129 X

**M22x1,5**

ISO 7789



**II 2 G / II 2 D  
EEx em II**



**FUNCTION**

The valve limits the pressure in port P (1) and relieves the volume flow to tank port T (2). The back pressure in T (2) influences the pressure in P (1). When the operating pressure set by the proportional solenoid is reached, the poppet spool opens and connects the protected line to the tank T (2). These pressure relief valves are built according to the differential spool principle and are therefore very sensitive adjustable over the whole pressure range and also suitable for systems with extremely low minimum pressures. Wandfluh proportional amplifiers are available to control the proportional pressure relief valve (register 1.13).

**APPLICATION**

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable elegant, comfortable solutions to problems. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini and NG6 types. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

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**TYPE CODE**

	B	D	C	PM22	-		-	G24	/	T4	#	
Pressure relief valve												
Direct operated												
Proportional explosion proof, execution EExemII												
Screw-in cartridge M22x1,5												
Standard nominal pressure ranges:												
$p_N = 20 \text{ bar}$												20
$p_N = 100 \text{ bar}$												100
$p_N = 200 \text{ bar}$												200
$p_N = 315 \text{ bar}$												315
Standard nominal voltage:												
												$U_N = 24 \text{ VDC}$
Execution T1...T4												
Design-Index (Subject to change)												

• Data sheet is valid from design-index # 2 on

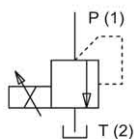
**GENERAL SPECIFICATIONS**

Description	Direct operated proportional pressure relief valve
Construction	Screw-in cartridge for cavity to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Admissible ambient temperature *	-20...+40 °C
Mounting position	any, preferably horizontal
Fastening torque	$M_b = 50 \text{ Nm}$ for screw-in cartridge
Weight	$m = 1,1 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Admissible fluid temperature *	-20...+40 °C (at inlet and at outlet)
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure ranges	$p_N = 20 \text{ bar}, p_N = 100 \text{ bar}, p_N = 200 \text{ bar}, p_N = 315 \text{ bar}$
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$
Max. volume flow	$Q_{max} = 25 \text{ l/min}$ for $p_N = 20/100/200 \text{ bar}$ $Q_{max} = 20 \text{ l/min}$ for $p_N = 315 \text{ bar}$
Leakage volume flow	see characteristics
Repeatability	$\leq 1,5 \% **$
Hysteresis	$\leq 3 \% **$
	** at optimal dither signal

**SYMBOL**



\* Deviating pressure medium - or ambient temperatures are possible for special arrangements after checking and authorisation by a responsible inspector. Measures for the prevention of the exceeding of the admissible solenoid surface - and internal temperatures can be: a good ventilation, low ambient temperatures (for higher pressure medium temperatures), limitation of the maximum possible power supply voltage, a short switching-on duration, installation on large heat dissipating blocks, etc. The responsibility in all cases lies with the operator, resp. with his inspector.

## Proportional pressure relief valves

### ELECTRICAL SPECIFICATIONS

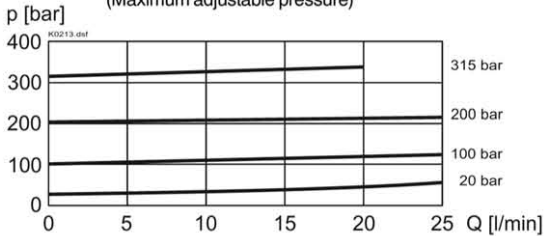
Construction	Proportional solenoid, wet pin push type, pressure tight
Standard nominal voltage	$U_N = 24$ VDC DC = Ripple 20 %; wired with VDR
Limiting current	$I_G = 585$ mA
Relative duty factor	100 % DF
Protection class	IP65 / IP67 acc. to EN 60 529
Connection/Power supply	Through cable entry for cable diameter 6...12 mm
Execution T4:	II 2 G EEx em II T4 (for gas) II 2 D IP65 T130°C (for dust)
Performance limit	$P_G = 17$ W

### START-UP

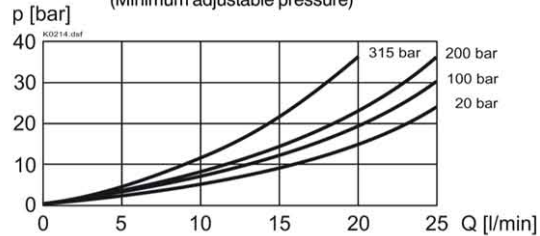
1. In the power supply for each solenoid a fuse of an appropriate rating (max. 3 times  $I_B$  of solenoid, DIN 41571 or IEC 127) respectively a motor circuit breaker with electromagnetic and thermal interruption must be installed. The fuse may be located in the power supply unit for the solenoid or between power supply and solenoid. The voltage rating for the fuse must be equal or higher than the one for the solenoid.
2. The solenoid coils must only be operated on the valve belonging to them. More information concerning the installation and commissioning is contained in the operating instructions supplied together with the solenoid coil.

### CHARACTERISTICS oil viscosity $\nu = 30$ mm<sup>2</sup>/s

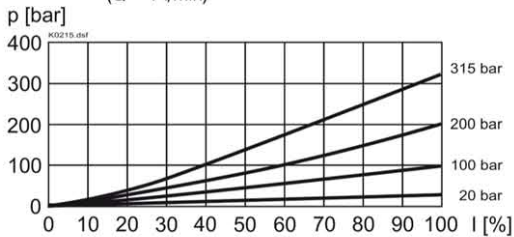
$p = f(Q)$  Pressure volume flow characteristics  
(Maximum adjustable pressure)



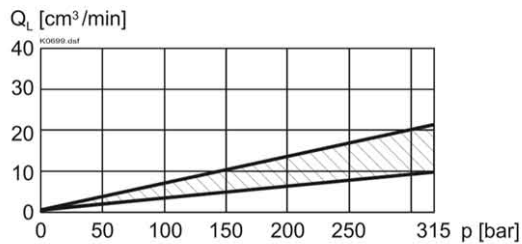
$p = f(Q)$  Pressure volume flow characteristics  
(Minimum adjustable pressure)



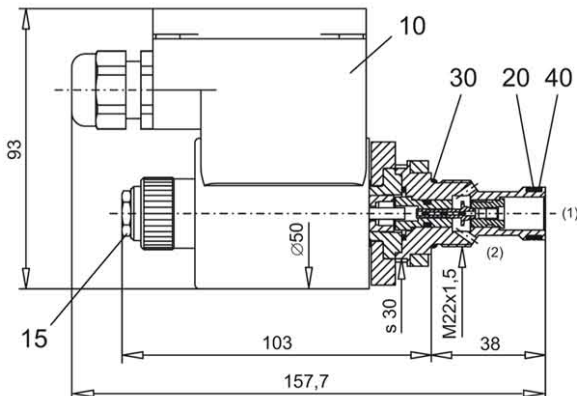
$p = f(I)$  Pressure adjustment characteristics  
( $Q = 1$  l/min)



$Q_L = f(p)$  Leakage volume flow characteristics



### DIMENSIONS / SECTIONAL DRAWINGS



### PARTS LIST

Position	Article	Description
10	207.5286	Slip-on coil 2A52W EExem II T4
15	253.8000	Plug with integrated manual override HB4,5
20	160.2140	O-ring ID 14,00x1,78
30	160.2188	O-ring ID 18,77x1,78
40	049.3177	Back-up ring RD 14,6x17,5x1,4

### ACCESSORIES

Cartridge built into flange- or sandwich body  
Flange- /sandwich plate register 2.3  
Proportional amplifier register 1.13

Cavity drawing ISO 7789-22-02-0-98 data sheet 2.13-1003  
and cavity tools see

Technical explanation see data sheet 1.0-100E

Part number:

**HYDROMA**

HYDRAULICKÉ SYSTÉMY

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**HYDROMA**

ГИДРАВЛИЧЕСКИЕ СИСТЕМЫ

**Proportional  
pressure relief valves**

**Proportional pressure relief valve**

**Screw-in cartridge**

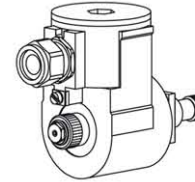
- Direct operated
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$
- $p_{Nmax} = 315 \text{ bar}$

**M22x1,5**

ISO 7789



**II 2 G  
EEx d II C**



**DESCRIPTION**

Direct operated proportional pressure relief valve as a screw-in cartridge with a thread M22x1,5 for cavity according to ISO 7789. Activated with explosion proof solenoid. The cartridge body made of steel is zinc coated for corrosion protection.

**EEx:** in accordance with European standards EN 50014, EN 50018

**d:** flameproof enclosure

**Group II C:** (gas group II A, II B)

for all applications except mining

**Zone 1:** (and 2) explosive mixtures present intermittently

**EC-type examination certificate:**

Execution T4: PTB 98 ATEX 1009

Execution T6: PTB 98 ATEX 1008

**FUNCTION**

The valve limits the pressure in port P (1) and reliefs the volume flow to tank port T (2). The back pressure in T (2) influences the pressure in P (1). When the operating pressure set by the proportional solenoid is reached, the poppet spool opens and connects the protected line to the tank T (2). These pressure relief valves are built according to the differential spool principle and are therefore very sensitive adjustable over the whole pressure range and also suitable for systems with extremely low minimum pressures. Wandfluh proportional amplifiers are available to control the proportional pressure relief valve (register 1.13).

**APPLICATION**

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable elegant, comfortable solutions to problems. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini and NG6 types. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

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ACCESSORIES .....	2

**TYPE CODE**

	B	D	B	PM22	-		-	G24	/		#	
Pressure relief valve												
Direct operated												
Proportional explosion proof, execution EEx d II C												
Screw-in cartridge M22x1,5												
Standard nominal pressure range:	$p_N = 20 \text{ bar}$	<input type="checkbox"/>	$p_N = 100 \text{ bar}$	<input type="checkbox"/>	$p_N = 200 \text{ bar}$	<input type="checkbox"/>	$p_N = 315 \text{ bar}$	<input type="checkbox"/>				
Standard nominal voltage:	$U_N = 24 \text{ VDC}$											
Execution:	T1...T4	<input type="checkbox"/>	T4	<input type="checkbox"/>	T5...T6	<input type="checkbox"/>	T6	<input type="checkbox"/>	(on request)			
Design-Index (Subject to change)												

• Data sheet is valid from design-index # 2 on

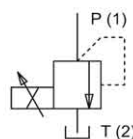
**GENERAL SPECIFICATIONS**

Description	Direct operated proportional pressure relief valve
Construction	Screw-in cartridge for cavity according to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Admissible ambient temp. *:	
Execution T4	-20...+40 °C
Execution T6 (on request)	-20...+90 °C (operation as T1...T4) -20...+40 °C (operation as T5/T6)
Mounting position	any, preferably horizontal
Fastening torque	$M_D = 50 \text{ Nm}$ for screw-in cartridge
Weight	$m = 2,2 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B 6...10 ≥ 75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Admissible fluid temp. *:	(at inlet and at outlet)
Execution T4	-20...+40 °C
Execution T6 (on request)	-20...+70 °C (operation as T1...T4) -20...+40 °C (operation as T5/T6)
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure ranges	$p_N = 20 \text{ bar}$ , $p_N = 100 \text{ bar}$ , $p_N = 200 \text{ bar}$ , $p_N = 315 \text{ bar}$
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$
Max. volume flow	$Q_{max} = 25 \text{ l/min}$ for $p_N = 20/100/200 \text{ bar}$ $Q_{max} = 20 \text{ l/min}$ for $p_N = 315 \text{ bar}$
Leakage volume flow	see characteristics
Repeatability	≤ 1,5 % at optimal dither signal
Hysteresis	≤ 3 % at optimal dither signal

**SYMBOL**



\* Deviating pressure medium - or ambient temperatures are possible for special arrangements after checking and authorisation by a responsible inspector. Measures for the prevention of the exceeding of the admissible solenoid surface - and internal temperatures can be: a good ventilation, low ambient temperatures (for higher pressure medium temperatures), limitation of the maximum possible power supply voltage, a short switching-on duration, installation on large heat dissipating blocks, etc. The responsibility in all cases lies with the operator, resp. with his inspector.

## Proportional pressure relief valves

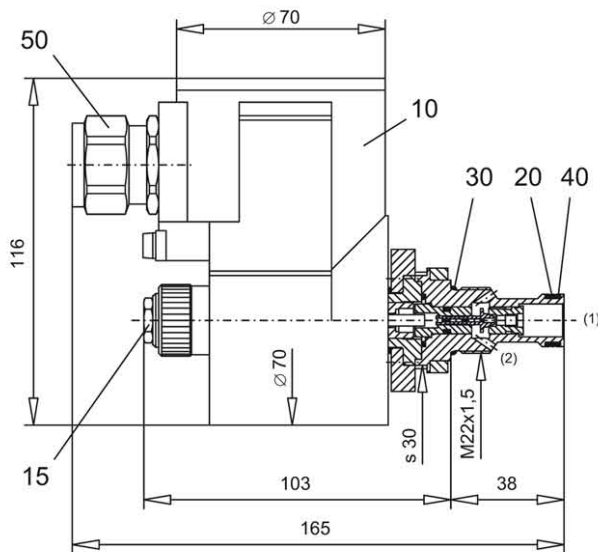
### ELECTRICAL SPECIFICATIONS

Construction	Proportional solenoid, wet pin push type, pressure tight
Standard nominal voltage	$U_N = 24$ VDC wired with VDR
Limiting current	T4: $I_G = 450$ mA T6: $I_G = 260$ mA (on request)
Relative duty factor	100 % ED
Protection class	IP 65 acc. to EN 60 529
Connection/Power supply	Through cable entry for cable $\varnothing 11 \dots 14$ mm (acc. to EN 50014)
Temperature class:	T1...T4
Execution T4	T1...T4
Execution T6	T1...T6 (on request)
Performance limit:	
Execution T4	11,7 W at $I_G = 450$ mA
Execution T6	6 W at $I_G = 260$ mA (on request)

### START-UP

Information concerning the installation and commissioning is contained in the operating instructions supplied together with the solenoid coil.

### DIMENSIONS / SECTIONAL DRAWING



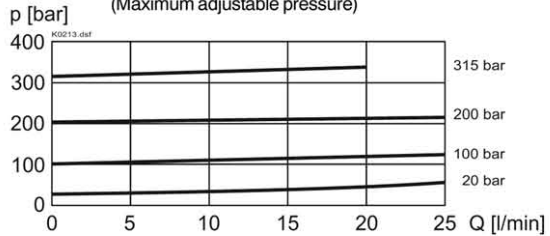
### PARTS LIST

Position	Article	Description
10	207.5293	Slip-on coil 2A67W EExd IIC T4
15	253.8000	Plug with integrated manual override HB4,5
20	160.2140	O-ring ID 14,00x1,78
30	160.2188	O-ring ID 18,77x1,78
40	049.3177	Back-up ring RD 14,6x17,5x1,4
50	111.1080	Cable entry brass M20

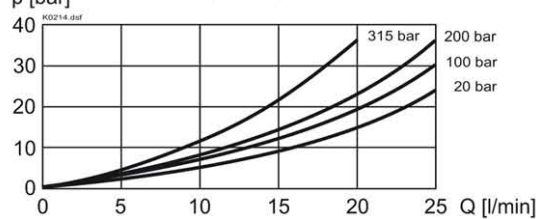
### CHARACTERISTICS (T6 on request)

oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

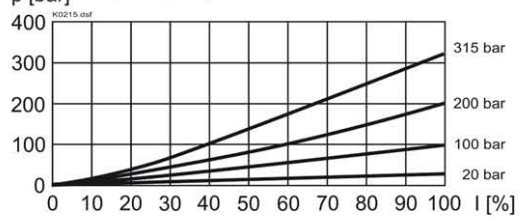
$p = f(Q)$  Pressure volume flow characteristics  
(Maximum adjustable pressure)



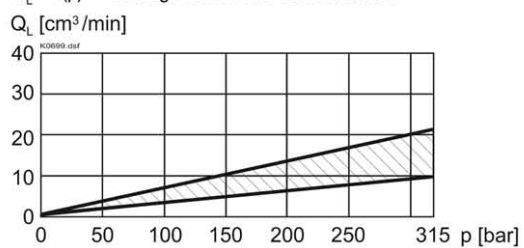
$p = f(Q)$  Pressure volume flow characteristics  
(Minimum adjustable pressure)



$p = f(I)$  Pressure signal characteristics  
( $Q = 1$  l/min)



$Q_L = f(p)$  Leakage volume flow characteristics



### ACCESSORIES

Cartridge built into flange- or sandwich body

Flange- /sandwich plate register 2.3  
Proportional amplifier register 1.13

Cavity drawing ISO 7789-22-02-0-98  
and cavity tools see

data sheet 2.13-1003

Technical explanation see data sheet 1.0-100E



Part number:

**HYDROMA**

HYDRAULICKÉ SYSTÉMY

**HIDROMA  
SYSTEMS**

UKŁADY HYDRAULICZNE

**HYDROMA**

ГИДРАВЛИЧЕСКИЕ СИСТЕМЫ

**Proportional  
pressure relief valves**

**Proportional pressure relief valve**

**Screw-in cartridge**

- Direct operated
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$
- $p_{Nmax} = 315 \text{ bar}$

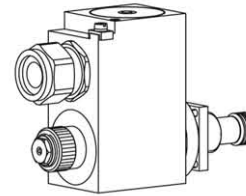
**M22x1,5**

ISO 7789



II 2 G Ex d II C

II 2 D Ex tD A21 IP65



**DESCRIPTION**

Direct operated proportional pressure relief valve as a screw-in cartridge with a thread M22x1,5 for cavity according to ISO 7789. Activated with Wandfluh-explosion-proof-solenoid. The cartridge body made of steel is zinc coated for corrosion protection.

The solenoid spool is zinc-/ nickel-coated. Solenoid coil in accordance with directive 94/9/EC (ATEX) for explosion-hazard zones.

**Ex:** In accordance with European standards EN 60079-0, EN 60079-1 (gas) EN 61241-0, EN 61241-1 (dust)

**d:** Flameproof enclosures

**tD:** Protection by enclosure

**Device group II:** For all explosion-hazard zones, except mining

**Gas group IIC:** Gas groups IIA + IIB included

**Device category 2G:** For zones 1 and 2 (gas)

**Device category 2D:** For zones 21 and 22 (dust)

**Zones:** 1/21 and 2/22

**EC-type examination certificate:**

PTB 07 ATEX 1023

**FUNCTION**

The valve limits the pressure in port P (1) and relieves the volume flow to tank port T (2). The back pressure in T (2) influences the pressure in P (1). When the operating pressure set by the proportional solenoid is reached, the poppet spool opens and connects the protected line to the tank T (2). These pressure relief valves are built according to the differential spool principle and are therefore very sensitive adjustable over the whole pressure range and also suitable for systems with extremely low minimum pressures. Wandfluh proportional amplifiers are available to control the proportional pressure relief valve (register 1.13).

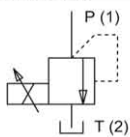
**APPLICATION**

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable elegant, comfortable solutions to problems. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini and NG6 types. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

Pressure relief valve	B	D	B	PM22	-	-	-	-	#
Direct operated									
Proportional explosion proof, execution Ex d II C									
Screw-in cartridge M22x1,5									
Execution:	L12	L6							
Nominal pressure range $p_N$ :	20	16							
[bar]	100	80							
	200	160							
	315	250							
Standard nominal voltage $U_N$ :	12 VDC	G12							
	24 VDC	G24							
Execution:	12W	L12		Ambient temp. by:					
	6W	L6		70°C					
				40°C or 90°C					
Design-Index (Subject to change)									

**SYMBOLS**



**GENERAL SPECIFICATIONS**

Description	Direct operated proportional pressure relief valve
Construction	Screw-in cartridge for cavity according to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Admissible ambient temp.	Execution L12 -20...+70°C (operation as T1...T4/T130°C) Execution L6 -20...+40°C (operation as T1...T6/T80°C) -20...+90°C (operation as T1...T4/T130°C)
Mounting position	any, preferably horizontal
Fastening torque	$M_D = 50 \text{ Nm}$ for screw-in cartridge
Weight	$m = 2,2 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Admissible fluid temp.	Execution L12 -20...+70°C (operation as T1...T4/T130°C) Ausführung L6 -20...+40°C (operation as T1...T6/T80°C) -20...+70°C (operation as T1...T4/T130°C)
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure ranges	Execution L12: $p_N = 20 \text{ bar}, 100 \text{ bar}, 200 \text{ bar}, 315 \text{ bar}$ Execution L6: $p_N = 16 \text{ bar}, 80 \text{ bar}, 160 \text{ bar}, 250 \text{ bar}$ With the version L6 for ambient temperatures up to 90°C (L6/90°C) $p_N$ is not reached (see characteristics)
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$
Max. volume flow	$Q_{max} = 25 \text{ l/min}$ für $p_N \leq 200 \text{ bar}$ $Q_{max} = 20 \text{ l/min}$ für $p_N > 200 \text{ bar}$
Leakage volume flow	see characteristics
Hysteresis	L12/70°C: $\leq 5\%$ L6/40°C: $\leq 6\%$ L6/90°C: $\leq 7\%$ * at optimal dither signal



## Proportional pressure relief valves

### ELECTRICAL SPECIFICATIONS

Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	$U_N = 12\text{VDC}, 24\text{VDC}$	
Limiting current	12VDC	24VDC
	L12/70 °C $I_G = 710\text{ mA}$	355 mA
	L6/40 °C $I_G = 410\text{ mA}$	202 mA
Voltage tolerance	+ 10% of rated voltage	
	Relative duty factor 100% DF	
Protection class	IP65/IP67 acc. to EN60529	
Connection/Power supply	Through cable gland for cable $\varnothing 11...14\text{ mm}$	
Temperature class (acc. to EN 60079-0)	Execution L12: T1...T4 Execution L6: T1...T6	
Performance limit	$U_N \cdot I_G$	
For further electrical characteristics, refer to the data sheet of the solenoid coil: 1.1-183		

### SECURITY OPERATED



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent.  
In case of non-observance, no liability can be assumed.

### INSTALLATION

Tightening torque of the coil fixing nut  $M_D = 15\text{ Nm}$ . Installation in battery arrangement: Please observe the remarks in the operating instructions.

### DESIGNATION

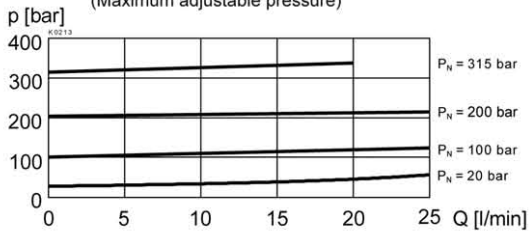
Execution L6:	II 2 G Ex d IIC T6	$T_a = -25...40^\circ\text{C}$
	II 2 D Ex tD A21 IP65 T80 °C	
	II 2 G Ex d IIC T4	$T_a = -25...90^\circ\text{C}$
Execution L12:	II 2 D Ex tD A21 IP65 T130 °C	
	II 2 G Ex d IIC T4	$T_a = -25...70^\circ\text{C}$
	II 2 D Ex tD A21 IP65 T130 °C	

### CHARACTERISTICS

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

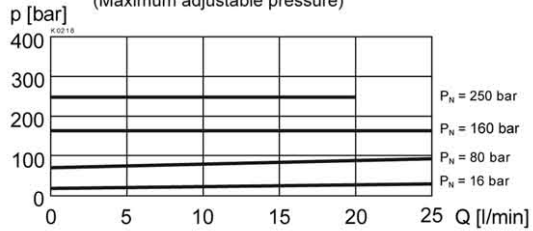
Execution L12/70 °C (measured at 70 °C)

$p = f(Q)$  Pressure volume flow characteristics  
(Maximum adjustable pressure)

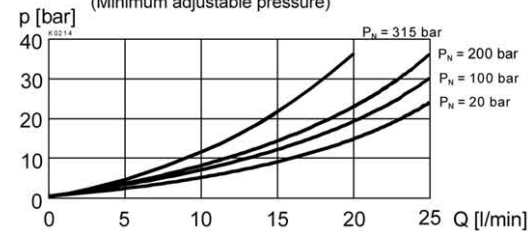


Execution L6/40 °C (measured at 40 °C)  
L6/90 °C (measured at 90 °C)

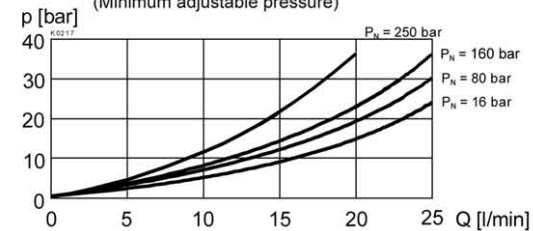
$p = f(Q)$  Pressure volume flow characteristics  
(Maximum adjustable pressure)



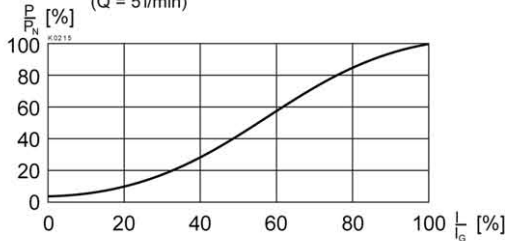
$p = f(Q)$  Pressure volume flow characteristics  
(Minimum adjustable pressure)



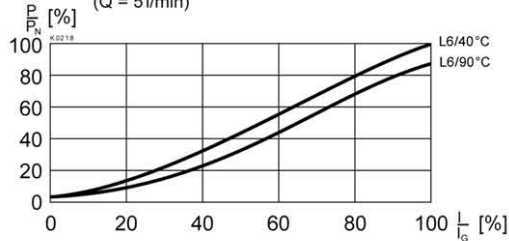
$p = f(Q)$  Pressure volume flow characteristics  
(Minimum adjustable pressure)



$p = f(I)$  Pressure signal characteristics  
( $Q = 5\text{ l/min}$ )



$p = f(I)$  Pressure signal characteristics  
( $Q = 5\text{ l/min}$ )

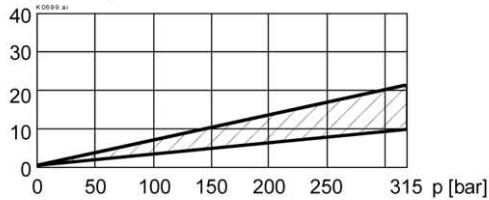


**Proportional  
pressure relief valves**

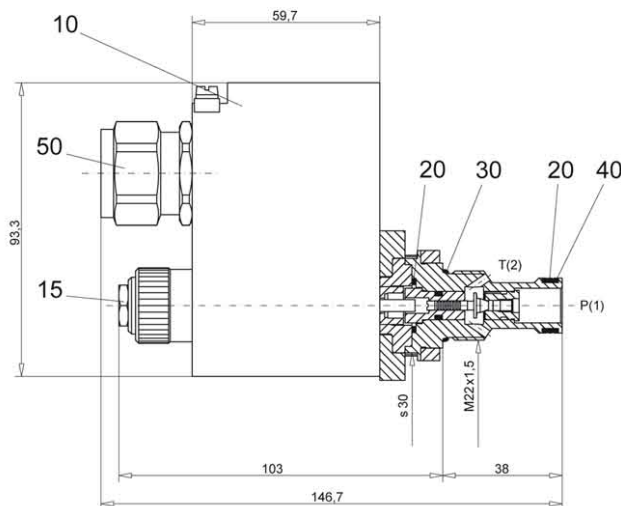
Execution L12/70°C  
L6/40°C  
L6/90°C

$Q_L = f(p)$  Leakage volume flow characteristics

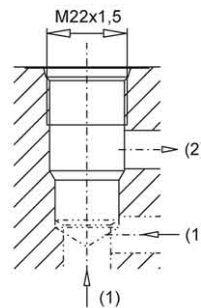
$Q$  [cm<sup>3</sup>/min]



**DIMENSIONS/SECTIONAL DRAWING**



Cavity drawing acc. to  
ISO 7789-22-02-0-98



For detailed cavity drawing and  
cavity tools see data sheet 2.13-1003

Dimensions of the solenoid coil,  
refer to data sheet 1.1-183

**PARTS LIST**

Position	Article	Description
10	263.6...	Slip-on coil MKY45/18x60-...
15	253.8000	Plug with integrated manual override HB4,5
20	160.2140	O-ring ID 14,00x1,78
30	160.2188	O-ring ID 18,77x1,78
40	049.3177	Back-up ring RD 14,6x17,5x1,4
50	111.1080	Cable gland brass M20

**ACCESSORIES**

Cartridge built into flange- or sandwich body

Flange- /sandwich plate

Proportional amplifier

register 2.3

register 1.13

Technical explanation see data sheet 1.0-100

Part number:

**HYDROMA**

HYDRAULICKÉ SYSTÉMY

**HIDROMA  
SYSTEMS**

UKŁADY HYDRAULICZNE

**HYDROMA**

ГИДРАВЛИЧЕСКИЕ СИСТЕМЫ

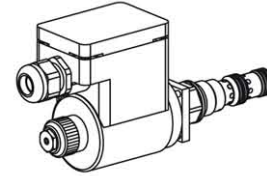
*Proportional-  
pressure reducing valves*

**Proportional pressure reducing valve  
Screw-in cartridge**

- Pilot operated
- $Q_{max} = 60$  l/min
- $p_{max} = 400$  bar
- $p_{N red max} = 350$  bar

**M22x1,5**  
ISO 7789

**Ex II 2 G / II 2 D**  
**EEx em II**



**DESCRIPTION**

Pilot operated proportional pressure reducing valve as a screw-in cartridge with a thread M22x1,5 for cavity according to ISO 7789. Activated with explosion proof solenoid. The cartridge body made of steel is zinc coated for corrosion protection.

**EEx:** in accordance with European standards EN 50014, EN 50019, EN 50028

**e:** increased safety  
**m:** encapsulation

**Group II:**

for all applications except mining

**Zone 1 / 21** (and 2 / 22):

explosive mixtures present intermittently

**EC-type examination certificate:**

PTB 01 ATEX 2129 X

**FUNCTION**

The proportional pressure regulating valve controls the pressure in port A (1). Proportionally to the solenoid current solenoid force and pressure in port A (1) rise. The valve functions practically independently of pressure in port P (2). A pressure rise in Port A (1) above the set pressure e.g. due to an active oil consumer, will be prevented by relieving excess volume flow to tank via port T (3). With deneergised solenoid the volume flow passes freely from port P to the consumer port A. Design specific a minimum adjustable pressure according characteristic curve cannot be underpassed. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable elegant, comfortable solutions to problems. Installation of the screw-in cartridge in control blocks as well as in the Wanfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini, NG6 and NG10 types. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**CONTENT**

GENERAL SPECIFICATIONS.....1  
HYDRAULIC SPECIFICATIONS .....1  
SYMBOL.....1  
ELECTRICAL SPECIFICATIONS.....2  
START-UP .....2  
CHARACTERISTICS.....2  
DIMENSIONS/  
SECTIONAL DRAWINGS.....2  
PARTS LIST .....2  
ACCESSORIES.....2

**TYPE CODE**

Pressure reducing valve	M	V	C	PM22	-		-	G24	/	T4	#	
Pilot operated												
Proportional explosion proof, execution EEx em II												
Screw-in cartridge M22x1,5												
Standard nominal pressure range $p_{N red}$ :	20 bar	20	200 bar	200								
	63 bar	63	250 bar	250								
	100 bar	100	350 bar	350								
	160 bar	160										
Standard nominal voltage:	$U_N = 24$ VDC											
Execution T1...T4												
Design-Index (Subject to change)												

• Data sheet is valid from design-index #2 on

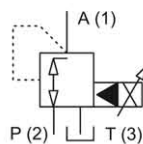
**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure reducing valve
Construction	Screw-in cartridge for cavity to ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Admissible ambient temperature *	-20...+40 °C
Mounting position	any, preferably horizontal
Fastening torque	$M_D = 50$ Nm for screw-in cartridge
Weight	$m = 1,1$ kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Admissible fluid temperature *	-20...+40 °C (at inlet and at outlet)
Peak pressure	$p_{max} = 400$ bar
Nominal pressure range:	$p_{N red} = 20$ bar, 63 bar, 100 bar, 160 bar, 200 bar, 250 bar, 350 bar
Volume flow range	$Q = 0...60$ l/min
Pilot- and leakage volume flow	see characteristics
Repeatability	$\leq 1,5$ % **
Hysteresis	$\leq 4$ % ** ** at optimal dither signal

**SYMBOL**



\* Deviating pressure medium - or ambient temperatures are possible for special arrangements after checking and authorisation by a responsible inspector. Measures for the prevention of the exceeding of the admissible solenoid surface - and internal temperatures can be: a good ventilation, low ambient temperatures (for higher pressure medium temperatures), limitation of the maximum possible power supply voltage, a short switching-on duration, installation on large heat dissipating blocks, etc. The responsibility in all cases lies with the operator, resp. with his inspector.

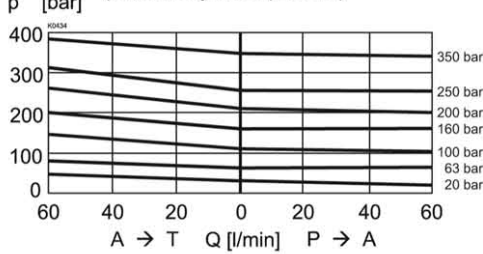
## Proportional-pressure reducing valves

### ELECTRICAL SPECIFICATIONS

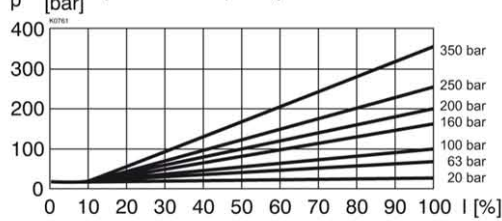
Construction	Proportional solenoid, wet pin push type, pressure tight
Standard nominal voltage	$U_N = 24$ VDC DC = Ripple 20 %; wired with VDR
Limiting current	$I_G = 585$ mA
Relative duty factor	100 % DF
Protection class	IP65 / IP67 acc. to EN 60 529
Connection/Power supply	Through cable entry for cable diameter 6...12 mm
Execution T4:	II 2 G EEx em II T4 (for gas) II 2 D IP65 T130°C (for dust)
Performance limit	$P_G = 17$ W

### CHARACTERISTICS oil viscosity $\nu = 30$ mm<sup>2</sup>/s

$p_{red} = f(Q)$  Pressure volume flow characteristics  
(Maximal adjustable pressure)



$p_{red} = f(I)$  Pressure adjustment characteristics  
[at  $Q = 0$  l/min (static)]

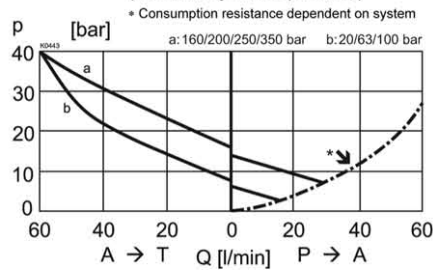


### START-UP

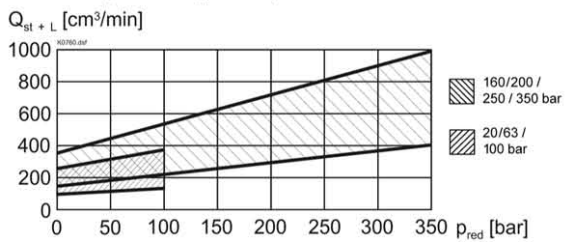
1. In the power supply for each solenoid a fuse of an appropriate rating (max. 3 times  $I_B$  of solenoid, DIN 41571 or IEC 127) respectively a motor circuit breaker with electromagnetic and thermal interruption must be installed. The fuse may be located in the power supply unit for the solenoid or between power supply and solenoid. The voltage rating for the fuse must be equal or higher than the one for the solenoid.

2. The solenoid coils must only be operated on the valve belonging to them. More information concerning the installation and commissioning is contained in the operating instructions supplied together with the solenoid coil.

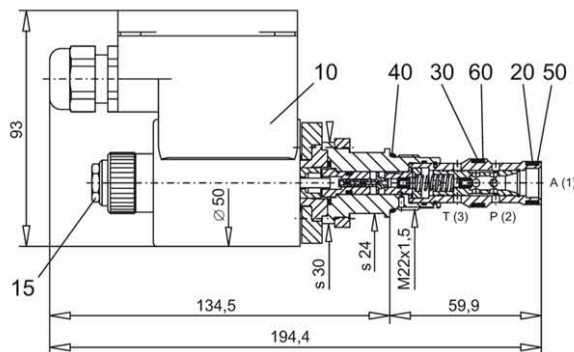
$p_{red} = f(Q)$  Pressure volume flow characteristics  
(Minimal adjustable pressure)



$Q_{st+L} = f(p)$  Pilot- and leakage volume flow characteristic [A (1) → T (3)]  
(Pressure in P (2) = 350 bar)



### DIMENSIONS / SECTIONAL DRAWINGS



### PARTS LIST

Position	Article	Description
10	207.5286	Slip-on coil 2A52W EExem II T4
15	253.8000	Plug with integrated manual override HB4,5
20	160.2140	O-ring ID 14,00x1,78
30	160.2156	O-ring ID 15,60x1,78
40	160.2188	O-ring ID 18,77x1,78
50	049.3176	Back-up ring RD 14,1x17x1,4
60	049.3196	Back-up ring RD 16,1x19x1,4

### ACCESSORIES

Cartridge built into flange- or sandwich body	
Flange body/sandwich plate	register 2.3
Proportional amplifier	register 1.13
Cavity drawing ISO 7789-22-04-0-98	
and cavity tools see	data sheet 2.13-1004
Technical explanation see data sheet 1.0-100E	