Explosion proof Pilot operated proportional directional valves

HD-Type 4WRZ.../FB

NG 10 to 32 Up to 350 bar Up to 1600 L/min

Contents

Function and configuration	02-03
Ordering code	04
Symbols	05
Technical data	06
Electrical connections, plug-in connectors	07
Integrated electronics	07
Characteristic curves	08-11
Unit dimensions	12-15

Features

- Pilot operated proportional directional valve to control the direction and magnitude of a flow
- Operation is by proportional solenoids with central thread and detachable coil
- For subplate mounting: Porting pattern to ISO 4401 and DIN 2430
- Spring centered control spool
- 4WRZE: Integrated electronics (OBE) with voltage input or current input (A1 resp. F1)
- 4WRZ: associated control electronics (separate order)

Function and configuration

· Pilot valve type 3DREP 6...

The pilot valve is a proportional solenoid operated 3-way pressure reducing valve. It is used to convert an electrical input signal into a proportional pressure output signal and is used on all 4WRZ...valves.

The proportional solenoids are controllable DC wet pin solenoids with central thread and detachable coil. The solenoid is optionally controlled by external electronics

Design:

The valve basically consists of:

- Housing (1)
- Control spool (2) with pressure measuring spools (3 and 4)
- Solenoids (5 and 6) with central thread

Work principle

 When the solenoids (5 and 6) are in the deenergized condition, the control spool (2) is held by compression springs in the central position

 Direct operation of the control spool (2) by energizing a proportional solenoid, e.g. energization of solenoid "a" (5). Pressure measuring spool (3) and control spool (2) are shifted to the left in proportion to the electrical input signal; Connection from P to B and A to T through the orifice-like cross sections with progressive flow characteristics; De-energization of the solenoid (5), control spool (2) is returned to the central position by the compression spring, In the central position, ports A and B are open to T, i.e. the hydraulic fluid can flow to the tank without any restrictions.

 Manual override, optional, with the help of it, the control spool (2) can be moved without requiring the energization of the solenoid.

Notes:

Type 3DREP 6: Draining of the tank line must be prevented. In the case of a corresponding installation situation, a pre-load valve is to be installed (pre-load pressure approx. 2 bar).

Pilot valve with two spool positions (Type 3DREP 6...B...)

In principle, the function of this valve version corresponds to that of the valve with three spool positions. However, this 2-position valve is provided with solenoid "a" (5) only. Instead of the 2nd proportional solenoid, a plug screw (7) is fitted.



Type 3DREP6...

Function and configuration

• Pilot operated proportional directional valves Type 4WRZ...

Valves of type 4WRZ... are pilot operated 4-way directional valves with operation by proportional solenoids. They control the direction and magnitude of a flow.

Design:

The valves basically consist of:

A pilot valve (9) with proportional solenoids (5 and 6), control spool (2) and orifice plugs (15)
A main valve (10) with main spool (11) and centering spring (12)

Work principle

 When the solenoids (5 and 6) are de-energised, the main spool (11) is held by centering springs (12) in the central position.

- Operation of the main spool (11) through the pilot valve (9), the main spool is moved proportionally, depending on the spool position, flow from P to A and B to T(R) or P to B and A to T(R).

e.g. by energising solenoid "b" (6), the control

spool (2) is shifted to the right, pilot oil is fed through the pilot valve (9) into the pressure chamber (13) and moves the main spool (11) in proportion to the electrical input signal; Connection from P to A and B to T through orifice-like cross-sections with progressive flow characteristics.

De-energization of the solenoid (6), the control spool (2) and main spool (11) are returned to the central position.

– Pilot oil supply to the pilot valve internally via port P or externally via port X.

- With the help of an optional manual override the control spool (2) can be moved without requiring the energization of the solenoid.

Notes:

For system pressures above 100bar the type D3 pilot pressure reducing module(14) must be fitted between pilot valve (9) and main valve (10).



Ordering code

Huade Hydraulic Further information Technology For external electronics= No code Nominal size 10 =10 Nominal size 16 =16 Nominal size 25 =25 Spool symbols explosion proof Image: Spool symbols E1- Image: Spool symbols Image: Spool symbols Image: Spool symbols E1- Image: Spool symbols Image: Spool symbols Image: Spool symbols E1- Image: Spool symbols Image: Spool symbols Image: Spool symbols Image: Spool symbo	HD	4WRZ		7X/ 6E		/FB	V *	
TechnologyV = FKM No code = NBRNormial size 10=10Normial size 16=16Normial size 25=25Spool symbols $A = B$ $\Box = D = P = T$ $\Box = D = P = T$ $\Box = D = T = T$ $\Box = D = P = T$ $\Box = D = T = T$ $\Box = D = P = T$ $\Box = D = T = T$ $\Box = D = P = T$ $\Box = D = T = T$ $\Box = D = P = T$ $\Box = D = T = T = T$ $\Box = D = P = T$ $\Box = D = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T = T$ $\Box = D = T = T$ $\Box = D = T = T = T = T = T = T = T = T = T$	Huade Hydraulic							
For external electronics= No codeNominal size 10=10Nominal size 16=16Nominal size 25=25Spool symbols A, B $\Box = D$	Technology						L	in plain text
Nominal size 10= 10Nominal size 16= 16Nominal size 25= 25Spool symbols $A = B$ $\Box = D = P$ $\Box = D = D = D = D = D$ $\Box = D = D = D$ $\Box = D = D = D = D = D = D = D$ $\Box = D = D = D = D$ $\Box = D = D = D = D = D = D = D = D = D = $	For external electronics	No code					No co	
Nominal size 16= 16Nominal size 25= 25Nominal size 32= 32Spool symbols $\mathbb{A} = \mathbb{B}$ $\mathbb{Q} = \mathbb{Q} = \mathbb{Q}$ $\mathbb{Q} = \mathbb{Q} = \mathbb{Q}$ $\mathbb{Q} = \mathbb{Q} = \mathbb{Q}$ $\mathbb{Q} = \mathbb{Q}$ $\mathbb{Q} = \mathbb{Q} = \mathbb{Q}$ \mathbb							No code=	
Nominal size 10 25 Nominal size 25 25 Spool symbols explosion proof Image: Spool symbol size 32 32 Spool symbols explosion proof Image: Spool symbol size 32 =32 Image: Spool symbol size 32 =25 Image: Spool symbol size 32 =25 Image: Spool symbol size 32 =23 Image: Spool symbol s							D3=With pre	
Nominal size 32 =32 Spool symbols explosion proof Image: Spool symbol by the symbol								
A B explosion proof Image: Constraint of the synthesis of the synthesynthesis of the synthesis of the synthesis o								, , , , , , , , , , , , , , , , , , , ,
\bullet \bullet \bullet \bullet \bullet \bullet \blacksquare <	Spool symbols							
Image: Second		b					explosion	proof
Image: Description of the second s		■ =E ■ E1-				4WRZ:		
Image: Description of the second s		± =E3-						
Image: Constraint of the second se						No code		
A B B B B B B B C B B B C B C B B B B B C B C B C B C B C B C B C C C <td></td> <td>T</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		T						
Image: Constraint of the second se		<u>_</u> =W9-				-		
Image: Constraint of the second se						E-		
XI: +I-1 XI: +I-1 =EA Pilot oil drain internal XI: +I-1 XI: +I-1 =W6A T= Pilot oil supply external VI: +I-1 XI: +I-1 =W6A Pilot oil drain internal						ET=		
XIIII =W6A Pilot oil drain internal		=EA					Pilo	t oil drain internal
(for type (MPH only performance))		14/04				T=		
Transitional symbols (for type 4WRH only possible with No code)		=VV6A				10 .		
	Transitional symbo	s				(for type	e 4WRH only po	ssible with No code)
N9 ¹⁾ = With protected hand override			-		1	1 ⁹ 1)=	With protec	ted hand override
Nominal flow in L/min at a valve pressure differential AP=10bar Electronic contral supply voltage		t a valve pressure					lectronic cont	ral supply voltage
$G24^{11} = 9$		for size 10			G24	⁽⁾ =	Power sup	ply voltage 24VDC
100= 150= for size16 GE^{-1} = Proportional solenoid with removable coil		for size16		66	¹⁾ =	Proportion	nal solenoid w	ith removable coil
220= 325= for size25				171-				Sorios 70~ 79
360= 520= for size32 L/X= Series L70~L79 (L70 to L79,unchanged installation and connection dimensions)	360= 520=	for size32			,unchan	ged installat	ion and conne	

Note: With symbols E1- and W8-:

$P \rightarrow A: q_{v max}$	$B \rightarrow T: q_{v/2}$
$P \rightarrow B: q_{v/2}$	$A \rightarrow T: q_{v max}$

With symbols E3- and W9-: $P \rightarrow A$: $q_{v max}$ $B \rightarrow T$: closed $P \rightarrow B$: $q_{v/2}$ $A \rightarrow T$: $q_{v max}$

With spools W6-, W8-, W9- and W6A in the neutral position, there is a connection from A to T and B to T with approx. 2% of the relevant nominal cross-section.

1) Omitted for 4WRZ without pilot valve.

Symbols(simplified)

With electrohydraulic operation and for external electronics

Type 4WRZ...-L7X/...

$$A_{L} = A_{L} = B_{L}$$

 $A_{L} = B_{L} = A_{L}$
 $A_{L} = B_{L} = A_{L}$
 $A_{L} = B_{L} = A_{L}$
 $A_{L} = B_{L}$
 $A_{L} = B_{L}$
 $A_{L} = A_{L}$
 A

Type 4WRZ...-L7X/...E...

Type 4WRZ...-L7X/...ET...

Type 4WRZ...-L7X/...T...

X=external Y=external

X=external Y=external

X=external Y=external

X=external Y=external Type 4WRZ...A-L7X/... a A B a A b Xi y P T

Type 4WRZ...A-L7X/...E...

Type 4WRZ...A-L7X/...ET...

Type 4WRZ...A-L7X/...T...

Technical data

General			
Valve type		WRZ	
Installation			optional, preferably horizontal
Storage temperature range °C		-20 to +80	
Ambient terr	nperature range	°C	-20 to +70
	NG10	kg	7.8
Weight	NG16	kg	13.4
	NG25	kg	18.2
	NG32	kg	42.2

Hydraulic (measured with HLPAG.p=100bar : 40 $^\circ$ C \pm 5 $^\circ$ C)								
Nominal size					10	16	25	32
Oneveting	-Pilot valve		ot oil supply	bar	30 to 100 bar			
Operating pressure	-Filot valve	Internal pilo	ot oil supply	bar	100 to 350 with "D3" only			
pressure	-Main valve			bar	up to 315	up to 350	up to 350	up to 350
Return flow	-Port T (port (external pil			bar	up to 315	up to 250	up to 250	up to 150
pressure	-Port T(inter	nal pilot oil	drain)	bar	up to 30	up to 30	up to 30	up to 30
	-Port Y			bar	up to 30	up to 30	up to 30	up to 30
Pilot oil volume input signal 0- 100 % cm ³					1.7	4.6	10	26.5
Pilot oil flow in port X and Y with a stepped input signal 0- 100 %			L/min	3.5	5.5	7	15.9	
Flow of the main valve			L/min	up to 170	up to 460	up to 870	up to 1600	
Hydraulic fluid					Mineral oil (HL, HLP) to DIN 51524 Further fluids on enquiry!			
Hydraulic fluid temperature range °C				°C	-20 to +80 (preferably +40 to +50)			
Viscosity range mm ² /s				mm ² /s	20 to 380 (preferably 30 to 46)			
Maximum permissible degree of conta Degree of pressure fluid is to NAS 1638 or ISO 44					A filter with a minimum retention rate of $\beta x \ge 75$ is recommended			
contamination	- Pilot valve	NAS 1638 class 7				x=5		
	- Main valve	valve NAS 1638 class 9			x=15			
Hysteresis				%	≤ 6			

Electrical				
Valve type			WRZ	
Type of protect	ion of the valve to EN 60529		IP65 with cable socket mounted and locked	
Voltage type			DC	
Command value overlap %		15		
Max. current A		1.5		
Solenoid coil Cold value at 20°C		Ω	4.8	
resisance	Max. warm value	Ω	7.2	
Duty %		100		
Coil temperature °C		up to 150		
Valve protection to EN 60529		IP65 with mounted and fixed plug-in connector		

Control electronics					
External amplifier for type WRZ VT-VSPA2-1-L2X/					
Command	-Voltage input "A1"	V	±10		
value signal	-Current input "F1"	mA	4 to 20		

Electrical connections, plug-in connectors

nominal dimensions in mm

·For type 4WRZ...L7X

Connections on the component plug

Plug-in connector to DIN EN 175301-803 or ISO 4400



Connections on the plug-in connector





50L/min nominal flow at a 10 bar valve pressure differential



1 ∆p=10bar constant

2 ∆p=20bar constant

3 ∆p=30bar constant

4 ∆p=50bar constant

5 ∆p=100bar constant

∆p=Valve pressure differential (inlet pressure p_ minus load pressure p, minus return pressure p₊)





Transient function with a stepped form of electrical input signal P_{st} = 50bar





100L/min nominal flow at a 10 bar valve pressure differential





 $1 \Delta p=10 \text{bar constant} \\ 2 \Delta p=20 \text{bar constant} \\ 3 \Delta p=30 \text{bar constant} \\ 4 \Delta p=50 \text{bar constant} \\ 5 \Delta p=100 \text{bar constant} \\ \end{cases}$

$$\begin{split} & \Delta p \text{=Valve pressure differential} \\ & (inlet pressure p_p minus load pressure p_L minus return pressure p_T) \end{split}$$

Transient function with a stepped form of electrical input signal P_{st} = 50bar





220L/min nominal flow at a 10 bar valve pressure differential





1 ∆p=10bar constant

- 2 ∆p=20bar constant
- 3 ∆p=30bar constant
- $4 \Delta p=50 bar constant$ $5 \Delta p=100 bar constant$

 $\begin{array}{l} \Delta p = Valve \ pressure \ differential \\ (inlet \ pressure \ p_{_{p}} \ minus \ load \\ pressure \ p_{_{L}} \ minus \ return \\ pressure \ p_{_{T}}) \end{array}$

Transient function with a stepped form of electrical input signal P_{st}= 50bar





360L/min nominal flow at a 10 bar valve pressure differential





 Δp =10bar constant Δp =20bar constant Δp =30bar constant Δp =50bar constant Δp =100bar constant

 $\begin{aligned} &\Delta p = Valve \ pressure \ differential \\ (inlet \ pressure \ p_p \ minus \ load \\ pressure \ p_L \ minus \ return \\ pressure \ p_T) \end{aligned}$

Transient function with a stepped form of electrical input signal P_{st} = 50bar



(Dimensions in mm)

NG 10









1 Main valve

- 2 Pilot valve
- 3 Proportional solenoid "a"
- 4 Proportional solenoid "b"
- 5 Cable socket "A"
- 6 Cable socket "B"
- 7 Cover for valves with one solenoid
- 8 Nameplate for pilot valve
- 9 Name plate for main valve
- 10 Pressure reducing valve "D3"
- 11 Identical seal rings for ports A, B, P and T) $(R-ring 13 \times 1.6 \times 2 \text{ or } 0-ring 12 \times 2)$
- 12 Identical seal rings for ports X and Y)

valve mounting surface

0.8

Valve fixing screws:

The following valve fixing screws are recommended: -4 GB/T 70.1-M6×40-10.9 - Tightening torque M_A=15.5Nm±10%



NG 16









- 1 Main valve
- 2 Pilot valve
- 3 Proportional solenoid "a"
- 4 Proportional solenoid "b"
- 5 Cable socket "A"
- 6 Cable socket "B"
- 7 Cover for valves with one solenoid
- 8 Nameplate for pilot valve
- 9 Nameplate for main valve
- 10 Pressure reducing valve "D3"
- 11 Identical seal rings for ports A, B, P and T) (R-ring 22.53×2.3×2.62 or O-ring 22×2.5)
- 12 Identical seal rings for ports X and Y) (R-ring 12×2×2 or O-ring 10×2)



Valve fixing screws

The following valve fixing screws are recommended:

- 4 GB/T 70.1-M10×60-10.9
- Tightening torque M_A=15.5Nm±10%
- 2 GB/T 70.1-M6×55-10.9

- Tightening torque M_A =15.5Nm±10%

0.01/100mm

0.8/

对安装底面的要求

NG 25









- 2 Pilot valve
- 3 Proportional solenoid "a"
- 4 Proportional solenoid "b"
- 5 Cable socket "A"
- 6 Cable socket "B"
- 7 Cover for valves with one solenoid
- 8 Nameplate for pilot valve
- 9 Nameplate for main valve
- 10 Pressure reducing valve "D3"
- 11 Identical seal rings for ports A, B, P and T (R-ring 27.8×2.6×3 or O-ring 27×3)
- 12 Identical seal rings for ports X and Y R-rin 19×3×3 or O-ring 19×3)

Valve fixing screws

The following valve fixing screws are recommended:

- 6 GB/T 70.1 M12×60-10.9
- Tightening torque $M_A\!\!=\!\!130Nm\!\pm\!20\%$



Required surface finish of the valve mounting surface



NG 32











- 1 Main valve
- 2 Pilot valve
- 3 Proportional solenoid "a"
- 4 Proportional solenoid "b"
- 5 Cable socket "A"
- 6 Cable socket "B"
- 7 Cover for valves with one solenoid
- 8 Nameplate for pilot valve
- 9 Nameplate for main valve
- 10 Pressure reducing valve "D3"
- 11 Identical seal rings for ports A, B, P and T $(R-ring 42.5 \times 3 \times 3 \text{ or } O-ring 42 \times 3)$
- 12 Identical seal rings for ports X and Y (R-ring $19 \times 3 \times 3$ or O-ring 19×3)

Installation Dimensions . 6×M20 Mounting surface Φ6.5H12 Φ10max Φ34(P) X:Y 200 4 5 28 S 41.5 20. 76 <u>Ф38max</u> 82.5 A;B;T 114 147 23

Valve fixing screws

The following valve fixing screws are recommended:

- 6 GB / T 70.1 M20×60 10.9
- Tightening torque $M_A = 430 \text{Nm} \pm 20\%$