SERIES DFPLUS PILOT OPERATED OPERATION MANUAL

Proportional Directional Control Valve
Design > 50

WARNING — USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

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1. Introduction

The pilot operated directional control valve DFplus shows extremly high dynamics combined with high flow. It is the preferred choice for highest accuracy in positioning of hydraulic axis and controlling of pressure and velocity.

Driven by the patented VCD actuator the DFplus reaches the frequency response of real servo valves.

Scope of Installation Manual

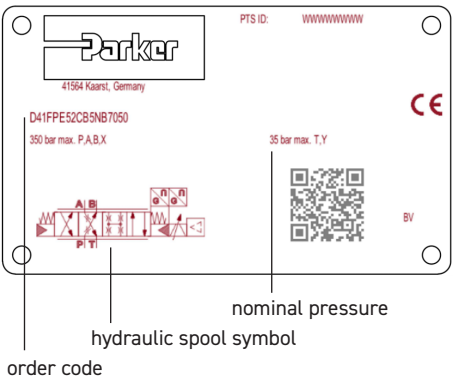
Valve series

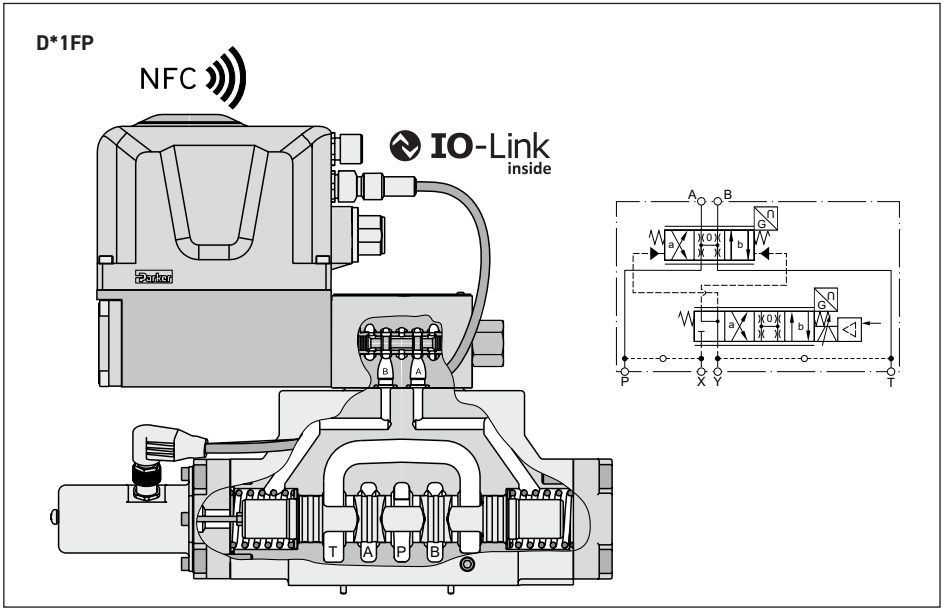
- D*1FP
- D*1FE

Related Documents

- Catalogue D*1FP
- Catalogue D*1FE

Name Plate



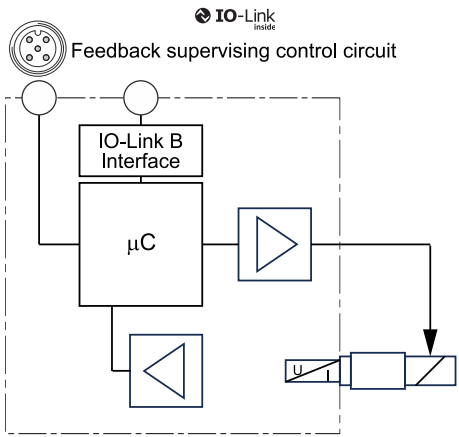


Characteristics of Valve Driver

The integral electronic driver combines all functions for optimal operation of the valve. Thanks to its excellent dynamic the valve is deployable within closed loop control applications. The most important features are:

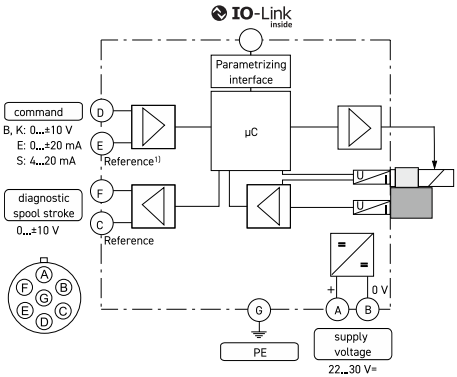
- high dynamic actuator with specially designed electronic driver
- closed loop controlled spool position
- constant current actuator control with overcurrent shutoff
- excellent properties for response sensitivity and temperature drift
- differential input stage with various command signal options
- diagnostic output for spool stroke
- meets relevant European EMC-standards
- IO-Link Class B version available

IO-Link Class B

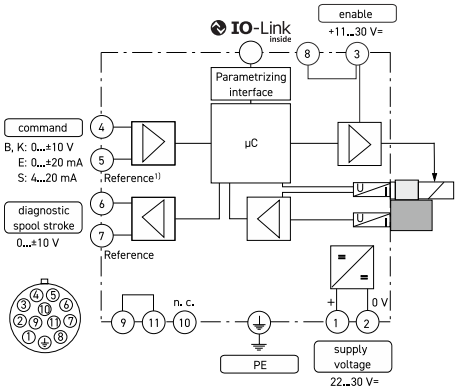


Block Diagram of Onboard Electronics

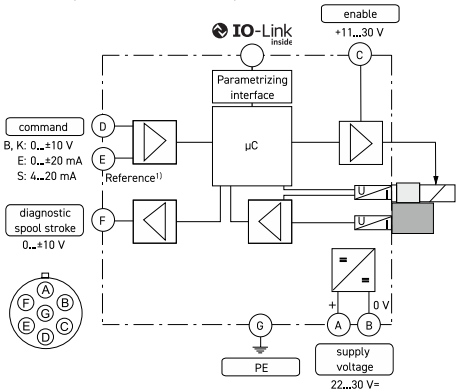
Code 0 (6+PE)



Code 5 (11+PE)



Code 7 (6+PE with enable)



1) Do not connect with supply voltage zero.

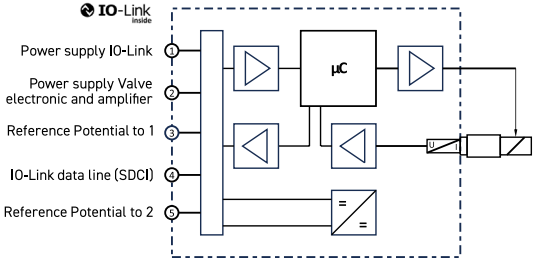
Technical Data

General					
Design		Servo proportional directional control valve, pilot operated			
Actuation		VCD-actuator			
Size		NG10 (CETOP 05)	NG16 (CETOP 07)	NG25 (CETOP 08)	NG32 (CETOP 10)
		D31	D41	D91	D111
Mounting Interface		DIN 24340 / ISO 4401 / CETOP RP121 / NFPA			
Mounting position		unrestricted			
Ambient temperature	[°C]	-20…+50			
$MTTF_D$ value	[years]	50			
Weight	[kg]	11.3	14.2	23.5	64.5
Vibration resistance	[g]	10 Sinus 5…2000 Hz acc. IEC 68-2-6 20 (RMS) Random noise 20…2000 Hz acc. IEC 68-2-36 15 Shock acc. IEC 68-2-27			
Hydraulic					
Max. operating pressure	[bar]	Internal pilot drain P, A, B, X 350; T, Y 35 External pilot drain P, A, B, T, X 350; Y 35			
Fluid		Hydraulic oil according to DIN 51524 ... 535, other on request			
Fluid temperature	[°C]	-20…+60 (NBR: -25…+60)			
Viscosity					
permitted	[cSt]/[mm2/s]	20…400			
recommended	[cSt]/[mm2/s]	30…80			
Filtration		ISO 4406; 18/16/13			
Interfaces					
IO-Link		IEC 61131-9			
NFC		ISO/IEC 15693 - NFC Forum Type 5 tag certified by the NFC Forum Frequency 13.56 MHz; -27.2 dBµA/m at 10 meters distance			
Electrical					
Duty ratio	[%]	100			
Protection class		IP65 in accordance with EN 60529 (with correctly mounted plug-in connector) 6 = Full protection against contact, dust tight 5 = Protection against water jets (nozzle) from any angle			
Supply voltage / ripple	[V]	24 nominal (tolerance range 22 ... 30), electric shut-off at < 19, ripple < 5 % eff., surge free			
Current consumption max.	[A]	3.5			
Pre-fusing	[A]	4.0 A medium lag			
Command		Depending on choosen signal type			
Voltage signal	[V]	10...0...-10, ripple <0.01 % eff., surge free			
impedance	[kOhm]	100			
Current signal	[mA]	20...0...-20, ripple <0.01 % eff., surge free			
impedance	[Ohm]	<250			
Current signal	[mA]	4...12...20, ripple <0.01 % eff., surge free <3.6 mA = disable, >3.8 mA = according to NAMUR NE43"			
impedance	[Ohm]	<250			
Current signal	[mA]	10...0...-10, ripple <0.01 % eff., surge free			
impedance	[Ohm]	<250			
Current signal	[mA]	50...0...-50, ripple <0.01 % eff., surge free			
impedance	[Ohm]	<250			
Input capacitance typ.	[nF]	1			
Differential input voltage max.	[V]	30 for terminal D and E against PE (terminal G) 11 for terminal D and E against 0 V (terminal B)			
Code 0					
Code 5	[V]	30 for terminal 4 and 5 against PE (terminal W) 11 for terminal 4 and 5 against 0 V (terminal 2)			
Code 7	[V]	30 for terminal D and E against PE (terminal G)			
Enable signal Code 5/7		acc. EN 61131-2; Type 3			
	[V]	Low -3...+5; High 11...30; input current 3 mA			
Diagnostic signal	[V]	+10…0…-10			
EMC		EN 61000-6-2, EN 61000-6-4			
Electrical connection Code 0/7		6 + PE acc. EN 175201-804			
Code 5		11 + PE acc. EN 175201-804			
Wiring min. Code 0/7	[mm²]	7 x 1.0 (AWG16) overall braid shield			
Code 5	[mm²]	8 x 1.0 (AWG16) overall braid shield			
Wiring length max.	[m]	50			

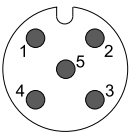
Technical Data IO-Link Class B

Electrical characteristics		
Duty ratio	[%]	100
Protection class		IP65 in accordance with EN 60529 (with correctly mounted plug-in connector) 6 = Full protection against contact, dust tight 5 = Protection against water jets (nozzle) from any angle
Directive		IO-Link Interface and System Specification Version 1.1.2
Valve amplifiers Supply voltage/ripple	[V]	24 V nominal (tolerance range 22 ... 30V), electric shut-off at < 19, ripple < 5 % eff., surge free
Valve amplifiers max. power consumption	[A]	3.5
Valve amplifiers Pre-fusing	[A]	4.0 medium lag
IO-Link Interface Supply voltage/ripple	[V]	24 V nominal (tolerance range 22 ... 30V), electric shut-off at < 19, ripple < 5 % eff., surge free
IO-Link Interface max. power consumption	[A]	1.2
Functional ground and screening		Provide via valve block
Required master port class		Class B
EMC		EN 61000-6-2, EN 61000-6-4
Electrical connection		M12 sensor/actuator connection line, 5-pole; M12 connector/bush, A-coded, without shield
Wiring min.	[mm²]	0.34 mm 2 for a cable length of up to 5 m
Wiring length max.	[m]	20

Block diagram



Pin	Signal	Signal – IO-Link B Class / viewing direction of the valve
1	L+	Voltage Supply IO-Link
2	P24	Voltage supply valve electronics and power part power consumption 4A
3	L-	Reference potential pin 1
4	C/Q	IO-Link data line (SDCI)
5	N24	Reference potential pin 2



Pin 3 and 5 are linked with each other in the valve electronics. The reference potentials L- and N24 of the two supply voltages must also be linked with each other on the power supply unit side.

2. Safety Instructions

Please read the operation manual before installation, start-up, service, repair or stocking! Disregard may result in damaging the valve or incorporated system parts.

Symbols

This manual uses symbols which have to be followed accordingly:

Instructions with regard to the warranty

Instructions with regard to possible damaging of the valve or linked system components

Helpful additional instructions

Service

Workings in the area of installation, commissioning, maintenance and repair of the valve may only be allowed by qualified personnel. These are persons which have, because of education, experience and instruction, sufficient knowledge on relevant directives and approved technical rules.

Important Details

Intended Usage

These operating instructions is valid for proportional directional control valves of the D*1FP series.

The D*1FP proportional directional control valve is a component intended for use in hydraulic systems that meet the safety requirements and rules according to DIN EN ISO 4413.

Any different or unintended use is to be considered as not intended. The manufacturer is not liable for warranty claims resulting from this.

Depending on the operating condition, there may be a risk of burns due to the surface temperature of the valve. For installation, observe DIN EN ISO 4413 section 5.2.6.2.

Common Instructions

Parker reserves the right for technical modifications of the described product. Illustrations and drawings within this manual are simplified representations. Due to improvement or modification of the product the illustrations might not match precisely with the described valve. The technical specifications and dimensions are not binding. No claims can be derived of it. Copyrights are reserved.

Liability

Parker does not assume liability for damage due to the following failures:

- incorrect mounting / installation
- improper handling
- lack of maintenance
- unintended usage

Do not disassemble the valve! In case of suspicion for a defect please contact Parker.

Storage

In case of temporary storage the valve must be protected against contamination, atmospheric exposure and mechanical damages. Each valve has been factory tested with hydraulic oil, resulting in protection of the internal parts against corrosion. Yet this protection is only ensured under the following conditions:

Storage period	Storage requirements
12 months	constant humidity < 60 % as well as constant temperature < 25 °C
6 months	varying humidity as well as varying temperature < 35 °C

Outdoor storage or within sea and tropical climate will lead to corrosion and might disable the valve!

3. Mounting / Installation

Scope of Supply

Please check immediately after receiving the valve, if the content is matching with the specified scope of supply. The delivery includes:

- valve
- operation manual

The central connector has to be ordered separately and is not included in the delivery.

☞ Please check the delivery immediately after receiving the shipment for apparent damages due to shipping. Report shipment losses at once to the carrier and the supplier!

Mounting

- Compare valve type (located on the name plate) with part list resp. circuit diagram.
- Unrestricted mounting position.
- Verify the mounting surface for the valve. Uneveness of 0.01 mm/100 mm, surface finish of 6.3 µm are tolerable values.

☞ Keep valve mounting surface and work environment clean!

- Remove protection plate from the valve mounting surface.
- Check the proper position of the valve ports and the O-rings.
- Mounting bolts:
  D31FP: 4 pcs. M6x40
  D41FP: 2 pcs. M6x55, 4 pcs. M10x60
  D91FP: 6 pcs. M12x75
  D111FP: 6 pcs. M20x90
  use property class 12.9, ISO 4762
- Bolt kits:
  D31FP: BK385, D41FP: BK320, D91FP: BK360, D111FP: BK 386
- Tighten the bolts crisscross with the following torque values:
  D31FP: 13.2 Nm, D41FP: 13.2/63 Nm,
  D91FP: 108 Nm, D111FP: 517 Nm

⚠ Insufficient condition of the valve mounting surface might create malfunction!
Incorrect mounting resp. bolt torque may result in abrupt leakage of pressure fluid on the valve ports.

Limits of Use

The valve may be operated within the determined limits only. Please refer to the "technical data" section as well as to the "characteristic curves" in the catalogue.

⚠ Follow the environmental conditions! Unallowable temperatures, shock load, aggresive chemicals exposure, radiation exposure, illegal electromagnetic emissions may result in operating trouble and may lead to failure! Follow the operating limits listed in the "specifications" table!

Pressure Fluids

The following rules applies for the operation with various pressure fluids:

⚠ This information serves for orientation and does not substitute user tests among the particular operating conditions. In particular, no liability for media compatibility may be derived out of it.

Mineral oil: usable without restriction.
HFC: choose the right seal option.

For operation with the following pressure fluids please consult Parker:

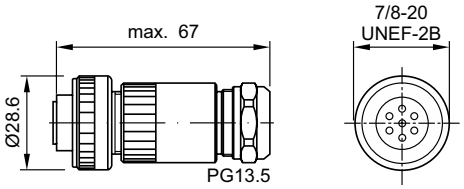
HFA	oil-in-water emulsion
HFB	water-in-oil emulsion
HFD	unhydrous fluids (Phosphor-Ester)

☞ For detailed information concerning pressure fluids note VDMA-document 24317 as well as DIN 51524 & 51502.

Special gaskets may be available depending on the utilized fluid.
In case of doubt please consult Parker.

Electrical Connection

The electrical connection of the valve takes place by one common cable, which is coupled to the integrated electronic driver by a central connector assembly.



The connection Code 0 as well as Code 7 requires a 6 + PE female connector EN 175201-804.

☞ The female connector has to be ordered separately under article nr. 5004072.

⚠ A female connector with metal housing is required! Plastic made models may create function problems due to insufficient EMC-characteristics.

The connecting cable has to comply to the following specification:

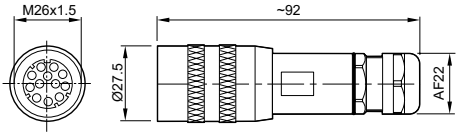
Cable type	control cable, flexible, 7 conductors, overall braid shield
Cross section	min. AWG16
Outer dimension	8...12 mm
Cable length	max. 50 m

☞ For cable lengths > 50 m consult Parker.

The connection cable is coupled to the female connector by solder joints.

Skinning lengths for the connecting cable:

The connection Code 5 requires a 11 + PE female connector EN 175201-804.



☞ The female connector has to be ordered separately under article nr. 5004711.

⚠ A female connector with metal housing is required! Plastic made models may create function problems due to insufficient EMC-characteristics.

The connecting cable has to comply to the following specification:

Cable type	control cable, flexible, 8 conductors, overall braid shield
Cross section	min. AWG16
Outer dimension	12...15 mm
Cable length	max. 50 m

☞ For cable lengths > 50 m consult Parker.

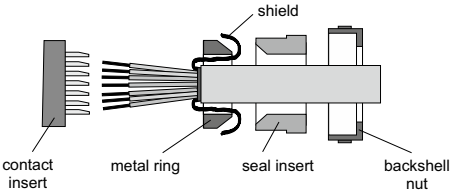
The connection cable is coupled to the female connector by crimp contacts.

Skinning lengths for the connecting cable:

☞ For the workmanlike termination of the crimp contacts the tool # 932 507-001 – supplier: Hirschmann – is required.

⚠ Do not disconnect cable socket under tension!

The shielding has to be assembled according the outline below:



The backshell nut of the cable gland has to be tighten with a suitable tool. The target value for the tightening torque is 4 Nm. Tighten the cap nut with a torque of approx. 5 Nm after attaching the female connector on the socket outlet.

Incomplete tightening of backshell nut resp. cap nut may result in automatic release of the connection as well as degradation of the water tightness.

Follow the "instructions for use" for installation of female connectors made by other kind of brands!

The cable connection to the female connector has to take place by qualified personnel! A short between individual conductors resp. to the connector housing , bad soldering as well as improper shield connection may result in malfunction and breakdown of the valve.

The mounting surface of the valve has to be carefully tied to the earth grounded machine frame. The earth ground wire from the valve connecting cable as well as the cable shield have to be tied to the protective earth terminal within the control unit. It is necessary to use a low ohmic potential connection between control unit and machine frame to prevent earth loops (cross section AWG 6).

Electrical Interfacing

Supply Voltage

The supply voltage for the valve has to cover the range of 22...30 V. The residual ripple may not exceed 5% eff.

The applied power supply must comply to the relevant regulations (DIN EN 61558) and must carry a CE-mark. The operating voltage for the valve must be free of inductive surges. Do not exceed the max. value of 30V! Non-observance of this rule may result in permanent damaging of the valve.

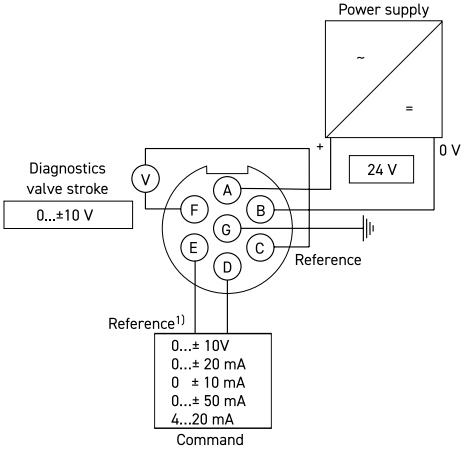
The increased inrush current of the valve should be considered when selecting the power supply. A stabilized power supply with overcurrent limiting feature should not be used. Due to the inrush current of the valve the current limit circuit may respond prematurely and create problems during energizing of the supply voltage.

The operation of the valve is blocked if the supply voltage polarity is interchanged.

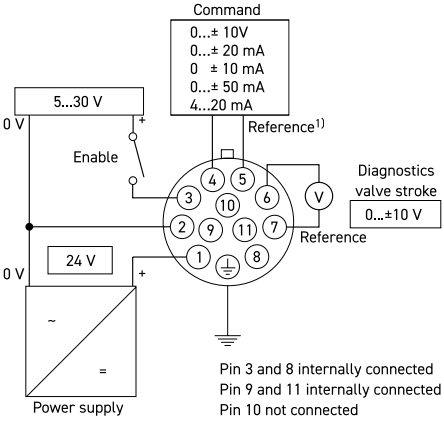
Each valve requires a separate pre-fuse of 4 Amp time lag. Non-observance of this instruction may create irreparable damage of valve resp. incorporated system parts.

Wiring

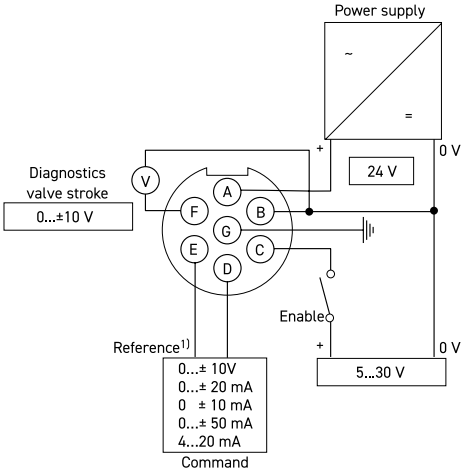
Code 0, 6 + PE acc. EN 175201-804



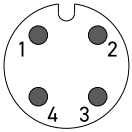
Code 5, 11 + PE acc. EN 175201-804



Code 7, 6 + PE acc. EN 175201-804 + enable



Pin assignment IO-Link (parametrizing) interface, M12 socket



PIN assignment acc. IEC 60974-5-2

- Pin 1: 24 VDC
- Pin 3: GND
- Pin 4: IO-Link Communication (C/Q)

[1] Do not connect with supply voltage zero.

Enable input (only for Code 5 / 11+PE as well as Code 7 / 6+PE)

A signal voltage enables the actuator drive of the valve. Continuous operation of the valve requires a permanent voltage 11...30 V (i.e. the supply voltage). In case of disabling the signal the valve will reach its power down position spring-actuated independently from the command signal value.

The enable function represents no safety arrangement against unwanted valve operation in terms of rules for accident prevention!

Command signal input

The spool stroke behaves proportional to the command signal amplitude.

The command input signal needs to be filtered as well as free of inductive surges and modulations. Due to the sensitivity of the valve a high signal quality is recommended, this will prevent malfunction.

Incorrect signal amplitude levels may disturb the functionality and can damage the valve.

The option 4...20 mA uses the "3.6 mA" condition as breakdown-information. This means the presence of an evaluable failure information if the input signal line is interrupted. In this case the actuator drive will be switched off. The drive will switch on when the input signal reaches a value of 3.8 mA, it switches off when the command falls below 3.6 mA. This determination follows the NAMUR-specification NE43.

NAMUR is an association of users of process control technology.

Diagnostics output

At the diagnostic output, voltage or current information about the operating status of the valve can be measured.

The output may drive a load of max. 5 mA. Exceeding of this limit leads to malfunction.

Code command signal	Command signal	Function	VCD actuator	Diagnostic signal
B	0...+10 V		on	0...-10 V
	0...-10 V		on	0...+10 V
	Overload		off	Red LED
E	0...+20 mA		on	0...-10 V
	0...-20 mA		on	0...+10 V
	Overload		off	Red LED
K	0...+10 V		on	0...+10 V
	0...-10 V		on	0...-10 V
	Overload		off	Red LED
S	4...12 mA		on	0...-10 V
	12...20 mA		on	0...+10 V
	0...3,6 mA		off	Cable break, Red LED
	Overload		off	Red LED

Valve error is visible by the signal color of the 360° LED (page 18). Error and error type is readable by ProPXD software or IO-Link connection.

- Parameter list page 14
- Error code list page 17

4. Operating Instructions

Preferred Hydraulic Initial State

For valves with zero lap spools, distinction must be made between hydraulic neutral position and power-down position. Neutral position is taken at neutral input signal, corresponding to zero position of the hydraulic symbol. When the valve is switched off – no supply voltage, no enable, current signal (code S) < 3,8 mA – zero lap valves take the power down position (approx. 10 % opening) according to the ordering code. For valves with overlap spools, neutral position and power down position are the same (zero position).

Supply pressure must be ensured before valve is energized.

Spool Position at Power Down/Center Position

⚠ For valves with zero lap spools, distinction must be made between hydraulic neutral position and power-down position. Neutral position is taken at neutral input signal, corresponding to zero position of the hydraulic symbol. When the valve is switched off – no supply voltage, no enable, current signal (code S) < 3,8 mA – zero lap valves take the power down position (approximately 10 % opening) according to the ordering code. For valves with overlap spools, neutral position and power down position are the same (zero position).

⚠ Supply pressure must be ensured before valve is energized.

Solenoid Current Monitoring

If the actuator current time interval exceeds 10 seconds, the actuator is switched off to prevent overheating. For normal operating conditions this state will not reached, but it may occur with a contaminated sluggish valve.

⚠ In this case the reason for the contamination should be rectified (hydraulic fluid exchange, filtration review, valve flushing).

The overcurrent shutoff condition may be resetted by the actions below:

Code 0: Temporary disconnection of the supply voltage.

Code 5: Temporary disconnection of the enable signal.

Code 7: Temporary disconnection of the enable signal.

☞ The shutoff of the VCD actuator due the overload will be indicated by LED.

Temperatur monitoring

The prortional directional control valves have internal temperature monitoring of the valve electronics.

☞ When an overtemperature is reached, the valve switches off automatically.
A restart is only possible again when the temperature of the valve electronics is within the operating temperature range.

5. Interface and Parameter

IO-Link Interface

IO-Link communication takes place via the externally accessible M12 interface.

The IO-Link interface allows an external access to the available valve parameters via an IO-Link master or via the ProPxD software.

Parker IO-LINK MASTER USB order no. 40983544 (Parameter overview in the operating instructions)

NFC Interface

The NFC interface allows a wireless access to valve data via the Parker App PDC (available free of charge in the **App Store** or **Google Play Store**).

NFC communication may only be used for maintenance purposes by trained personnel.

⚠ The valve may have hot surfaces. There is a risk of burn injury. Before using NFC radio communication, ensure that the valve has cooled down sufficiently.

ProPxD Parameterizing Software

The ProPxD software allows quick and easy setting of the digital valve electronics. Individual parameters as well as complete settings can be viewed, changed and saved via the comfortable user interface. Parameter sets saved in the non-volatile memory can be loaded to other valves of the same type or saved for documentation purposes.

The PC software can be downloaded free of charge at www.parker.com/isde – see page "Support" or directly at www.parker.com/propxd.

(IO-Link Master USB is required)

IO-Link interface

Valve Parameter - read + write

Please note: Certain combinations of parameters can lead to inappropriate reactions in the application. Further information on the parameters can be found in the IO-Link operating instructions

Index	Name	Description	read / write	Data type	Min	Max	Unit	Value	De-fault
16	Vendor name	Vendor name	Read						
17	Vendor text	Vendor text	Read						
18	Product name	Product name	Read						
19	Product IODD	Product IODD	Read						
20	Product text	Product text	Read						
21	Serial number	Serial number	Read						
22	Hardware Revision	Hardware Revision	Read						
23	Firmware Revision	Firmware Revision	Read						
24	Application specific tag	Application specific tag	Write						
25	Function tag	Function tag	Write						
26	Location tag	Location tag	Write						
64	Valve type	Valve family (Parker ident.) If type is unknown update the firmware to the last working version	Read	uint8				vorgesteuert	2
65	Production date code - E-board		Read	string[2]					
66	Hersteller Code - E-Board		Read	string[50]					
67	Hardware version - E-board		Read	string[8]					
85	CRC Calkulation	calculate checksums	Write	uint8					
86	Checksum	Checksum over active parameters (user changed)	read	uint32	0				0
87	Checksum default parameter setting	Checksum over default parameters (manufacture setting)	read	uint32	0				0
88	Checksum total parameter setting	Checksum overall parameters (supplied setting)	read	uint32	0				0
96	Device local	Indicates the source of the control word acting on the device state machine	Read+ Write	uint8				0: Control word wie bus 1: Control word locally	1
97	Device mode	Device mode(setpoint input)	Read+ Write	uint8				0: Setpoint input via bus 1: Setpoint input locally	2
100	Hold setpoint	Internal setpoint in device state HOLD	Read+ Write	float32	-100	100			0
101	Enable behaviour	Determines enable/disable reaction of state machine	Read+	uint8				0: NONE 1: INIT 2: DISABLE 3: HOLD	2
256	Demand signal analog input type	Selection of the analog demand signal type	Read+ Write	uint8				0: 0… 10V 1: ±10V 2: 4…12…20mA 3: 4…20mA 4: ±10mA 5: ±20mA 6: ±50mA	1
257	Demand signal analog factorisation	Set the demand signal to a range example: Actual value 0 - 8V Input signal range 0 – 10 V; 257 = 125% = Input 5V à 6.25 V	Read+ Write	float32	-200	200	%		100
258	Demand signal analog cable break	Analog demand signal cable break detection	Read+ Write	boolean				false: Off true: On	false
264	Diagnostic A output signal type	Set the diagnostic output A signal type	Read+ Write	uint8					1

Index	Name	Description	read / write	Data type	Min	Max	Unit	Value	De-fault
268	Diagnosis A Measuring Point	Diagnosis A measuring point	Read+ Write	uint8				1: ACTUAL POSITION 2: SETPOINT INTERN 3: SETPOINT EXTERN 4: SETPOINT BUS 5: DMD VALUE 6: CMD PILOTSTAGE 7: CMD MAINSTAGE 11: ACTUAL POS PILOTSTAGE 12: ACTUAL POS MAINSTAGE 13: ACTUAL CURRENT 14: ACTUAL TEP CON-TROLER 15: ACTUAL TEMP LVDT 16: ACTUAL VOLTAGE SUPPLY 23: ACTUAL VEL MAINSTAGE 24: ACTUAL VEL MAIN-STAGE FILTERED 31: ACTUAL VEL PILOT-STAGE 32: ACTUAL VEL PILOT-STAGE FILTERED	1
276	Zero Point Setting	Setting the Zero Point Shift = Offset To compensate for tole-rances.“	Read+ Write	float32	-30	30	%		0
277	MIN Overlap Comp On/Off	Activate/Deactivate MIN overlap compensation	Read+ Write	boolean				false: Off true: On	false
278	MIN A-Kanal	Setting of the minimum signal stroke with positive setpoint signal > 0.1%. To adjust the input signal span to the drive working range.	Read+ Write	float32	0	49	%		0
279	MIN B-Kanal	Setting of the minimum signal stroke at negative setpoint signal > -0.1%. To adjust the input signal span to the drive working range.	Read+ Write	float32	0	49	%		0
280	MAX A-Kanal	Setting of the maximum signal stroke when the setpoint signal is positive.	Read+ Write	float32	51	100	%		100
281	MAX B-Kanal	Setting of the maximum signal stroke when the setpoint signal is negativ.	Read+ Write	float32	51	100	%		100
284	Rampen Typ	Selection of the ramp type	Read+ Write	uint8				0: no ramps 3: linear ramps (4 climbs)	0
285	Quadrant I Ramp Time Upwards	Setting the time for the setpoint change / setpoint build-up	Read+ Write	uint16	0	32500	ms		0
286	Quadrant I Ramp Time Down	Setting the time for the setpoint change / setpoint reduction	Read+ Write	uint16	0	32500	ms		0
289	Quadrant III Ramp Time Upwards	Setting the time for the setpoint change / setpoint build-up	Read+ Write	uint16	0	32500	ms		0
290	Quadrant III Ramp Time Down	Setting the time for the setpoint change / setpoint reduction	Read+ Write	uint16	0	32500	ms		0
295	LED Ring ON/OFF	Ein- oder Abschalten des RGB LED Rings	Read+ Write	boolean				false: AUS true: EIN	true
541	4-20 mA Diagnose Invertierung	Einstellung der Polarität des 4-20mA Diagnoseausgangs. Zur Anpassung an nach-geschaltete Überwachungs-systeme.	Lesen+ Schreiben	boolean				false: AUS true: EIN	false

Index	Name	Description	read / write	Data type	Min	Max	Unit	Value	De-fault
800	Operating Time Days	Daily counter in which the device is in operation	Read+ Write	uint16	0	65535	d		0
801	Operating Time Hours	Hour counter in which the device is in operation	Read	uint16	0	24	h		0
802	Operating Time Minutes	Minute counter in which the device is in operation	Read	uint16	0	60	min		0
803	Operating Time Overall Minutes	Total minute counter in which the device is in operation	Read	uint32	0	4294967295	min		0
805	On Off Cycles	Counter how often the device was switched on off	Read	uint32	0	4294967295			0
810	Device Supply Voltage Actual	Actual applied supply voltage of the device	Read	float32	0	50	V		0
811	Device Supply Voltage Max	Maximum applied supply voltage of the device	Read	float32	0	50	V		0
812	Device Supply Voltage Avg	Average supply voltage of the device	Read	float32	0	50	V		24.0
813	Device Current Actual	Actual current consumption of the device	Read	float32	0	10	A		0
814	Device Current Max	Maximum current consump-tion that occurred on the device	Read	float32	-10	10	A		0
815	Device Current Avg	Average current consumption of the device	Read	float32	-10	10	A		0
816	Device Power Actual	Actual consumed power by the device	Read	float32	0	500	W		0
817	Device Power Max	Maximum power consumption that occurred on the device	Read	float32	0	500	W		0
818	Device Power Avg	Average power consumption of the device	Read	float32	0	500	W		1.0
819	Actuator Current Actual	Actual current consumption of the device	Read	float32	0	20	A		0
820	Actuator Current Max	Maximum current consump-tion that occurred on the actuator	Read	float32	0	20	A		0
821	Actuator Current Avg	Average current consumption of the actuator	Read	float32	0	20	A		0
822	Power stage Voltage Actual	Actual voltage on the Power stage	Read	float32	0	50	V		0
823	Power stage Voltage Max	Maximum voltage that occur-red on the Power stage	Read	float32	0	50	V		0
824	Power stage Voltage Avg	Average voltage on the Power stage	Read	float32	0	50	V		24.0
825	Power stage Current Actual	Actual current consumption of the Power stage	Read	float32	0	10	A		0
826	Power stage Current Max	Maximum current that occur-red on the Power stage	Read	float32	-10	10	A		0
827	Power stage Current Avg	Average current consumption of the Power stage	Read	float32	-10	10	A		0
828	Power stage Power Actual	Actual consumed power by the Power stage	Read	float32	0	500	W		0
829	Power stage Power Max	Maximum power that occurred on the Power stage	Read	float32	0	500	W		0
830	Power stage Power Avg	Average power consumption of the Power stage	Read	float32	0	500	W		0.5
831	Temperature In Housing Actual	Actual temperature in housing	Read	int16	-50	200	°C		0
832	Temperature In Housing Min	Minimum temperature that occurred in housing	Read	int16	-50	200	°C		100
833	Temperature In Housing Max	Maximum temperature that occurred in housing	Read	int16	-50	200	°C		0
834	Temperature In Housing Avg	Average temperature that occurred in housing	Read	int16	-50	200	°C		40
835	Temperature MCU Actual	Actual temperature of the MCU	Read	int16	-50	200	°C		0
836	Temperature MCU Min	Minimum temperature that occurred at the MCU	Read	int16	-50	200	°C		100

Index	Name	Description	read / write	Data type	Min	Max	Unit	Value	De-fault
837	Temperature MCU Max	Maximum temperature that occurred at the MCU	Read	int16	-50	200	°C		0
838	Temperature MCU Avg	Average temperature that occurred at the MCU	Read	int16	-50	200	°C		40
839	Temperature Amplifier Actual	Actual temperature at the power amplifier	Read	int16	-50	200	°C		0
840	Temperature Amplifier Min	Minimum temperature that occurred at the amplifier	Read	int16	-50	200	°C		100
841	Temperature Amplifier Max	Maximum temperature that occurred at the amplifier	Read	int16	-50	200	°C		0
842	Temperature Amplifier Avg	Average temperature that occurred at the amplifier	Read	int16	-50	200	°C		40
843	Temperature Power Supply Actual	Actual temperature at the power supply	Read	int16	-50	200	°C		0
844	Temperature Power Supply Min	Minimum temperature that occurred at the power supply	Read	int16	-50	200	°C		100
845	Temperature Power Supply Max	Maximum temperature that occurred at the power supply	Read	int16	-50	200	°C		0
846	Temperature Power Supply Avg	Average temperature that occurred at the power supply	Read	int16	-50	200	°C		40
847	Pilot Position Min	Minimum pilot position that occurred	Read	float32	-200	200	%		0
848	Pilot Position Max	Maximum pilot position that occurred	Read	float32	-200	200	%		0
849	Pilot Position Avg	Average pilot position during operation	Read	float32	-200	200	%		0
850	Main Spool Position Min	Minimum main spool position that occurred	Read	float32	-200	200	%		0
851	Main Spool Pilot Position Max	Maximum main spool position that occurred	Read	float32	-200	200	%		0
852	Main Spool Pilot Position Avg	Average main spool position during operation	Read	float32	-200	200	%		0
853	Command Min	Minimum command that occurred	Read	float32	-200	200	%		0
854	Command Max	Maximum command that occurred	Read	float32	-200	200	%		0
855	Command Avg	Average command during operation	Read	float32	-200	200	%		0
856	Main Stage Fail Safe Position	Main-stage fail-safe position	Read	float32	-120	120	%		0
857	Pilot Fail Safe Position	Pilot fail-safe position	Read	float32	-120	120	%		0
858	Movement Pilot Mio	Total movement distance of the pilot, 1=1Million 100% stroke	Read	uint16					0
859	Movement Main Stage Mio	Total movement distance of the main-stage, 1=1Million 100% stroke	Read	uint16					0
860	Movement Pilot	Total movement distance of the pilot, 1=100% stroke	Read	uint16					0
861	Movement Main Stage	Total movement distance of the main-stage, 1=100% stroke	Read	uint16					0
1184	Control Word Intern	Internal control word to control the device state machine	Read	uint16	0	65535			
1185	Status Word	Status word of the device state machine	Read	uint16	0	65535			
1186	Setpoint Extern	External setpoint value (analogue)	Read						
1187	Setpoint Intern	Internal setpoint value (digital)	Read						
1188	Demand Value	Demand value (processed setpoint value)	Read	float32	-120	120	%		
1189	Command Pilot Stage	Command signal for position of pilot spool	Read						
1190	Command Main Stage	Command signal for position of main spool	Read	float32	-120	120	%		

Index	Name	Description	read / write	Data type	Min	Max	Unit	Value	De-fault
1191	Command Current	Command signal for current control	Read	float32	-120	120	%		
1192	Command PWM	Command signal for PWM output	Read	float32	-120	120	%		
1193	Test signal	Test signal for device mode Test	Read	float32	-120	120	%		
1194	Actual Pilot Position	Actual position of the pilot stage	Read	float32	-120	120	%		
1195	Actual Main Position	Actual position of the main stage	Read	float32	-100	100	%		
1200	Position Ctrl Main Uv	Output signal of main spool position V-controller	Read	float32	-10000	10000	%		
1201	Position Ctrl Main Err	Main spool position control error	Read	float32	-200	200	%		
1202	Actual Velocity Main Stage	Main spool velocity	Read	float32	-200	200	%		
1203	Actual Velocity Main Stage Filtered	Main spool velocity filtered	Read	float32	-200	200	%		
1204	Position Ctrl Pilot Output	Output signal of pilot spool position controller	Read	float32	-100	100	%		
1205	Position Ctrl Pilot Ub	Output signal of pilot spool position bypass controller	Read	float32	-30	30	%		
1206	Position Ctrl Pilot Up	Output signal of pilot spool position P-controller	Read	float32	-10000	10000	%		
1207	Position Ctrl Pilot Ui	Output signal of pilot spool position I-controller	Read	float32	-100	100	%		
1208	Position Ctrl Pilot Uv	Output signal of pilot spool position V-controller	Read	float32	-10000	10000	%		
1209	Position Ctrl Pilot Err	Pilot spool position control error	Read	float32	-200	200	%		
1210	Actual Velocity Pilot Stage	Pilot spool velocity	Read	float32	-200	200	%		
1211	Actual Velocity Pilot Stage Filtered	Pilot spool velocity filtered	Read	float32	-200	200	%		
1212	Current Ctrl Output	Output signal of current controller	Read	float32	-100	100	%		
1213	Current Ctrl Ub	Output signal of current bypass controller	Read	float32	-30	30	%		
1214	Current Ctrl Up	Output signal of current P-controller	Read	float32	-10000	10000	%		
1215	Current Ctrl Ui	Output signal of current I-controller	Read	float32	-100	100	%		
1216	Current Ctrl Err	Current control error	Read	float32	-10000	10000	%		

Error Codes

Error Code		Kurzbeschreibung	Anmerkung
0	No ERROR	no error	The device has not detected any error since the last Power-On or reset
4	UB HBRIDGE	Ventilverstärker ohne Versorgungsspannung	
5	H BRIDGE UV WARN	Actuator under voltage warning	The supply voltage of the actuator is too low.
6	H BRIDGE OV WARN	Actuator over voltage warning	The supply voltage of the actuator is too high.
7	SIGNAL UV WARN	CPU under voltage warning	The supply voltage of the processor electronics is too low.
8	SIGNAL OV WARN	CPU over voltage warning	The supply voltage of the processor electronics is too high.
9	SIGNAL OV WARN	Temperature in housing too low -20°C	
10	TEMP INHOUSING TOO HIGH	Temperature in housing too high 85°C	
11	TEMP INHOUSING EXCEEDED	Temperature in housing exceeded 95°C	
12	TEMP INHOUSING FALLEN BELOW	Temperature in housing fallen below -30°C	
13	TEMP MCU TOO LOW	Electronics temperature too low (< –20 °C)	
14	TEMP MCU TOO LOW	Electronics temperature too high (> 110 °C)	
15	TEMP MCU EXCEEDED	Electronics temperature exceeded (> 120 °C)	The unit temperature exceeded dangerously the permissible range.
16	OVERCURRENT ACTUATOR	Actuator over current	The current consumption of the actuator is too high.
19	TEMP MCU FALLEN BELOW	Prozessortemperatur unter -30°C	
21	BUS INVALID DATA	Invalid data set over bus communication.	Invalid data via bus communication. The process data was set to „invalid“ by the bus master.
22	10V REF WARN 10V	Reference voltage outside the range 4%	Reference voltage outside the range 4%
23	10V REF RANGE 10V	Reference voltage outside the range 10%	Reference voltage outside the range 10%
24	2.5V REF WARN 2.5V	Reference voltage outside the range 4%	Reference voltage outside the range 4%
25	2.5V REF RANGE 2.5V	Reference voltage outside the range 40%	Reference voltage outside the range 40%
26	CMD CABLE BREAK	Command signal cable break/short circuit	The wiring of command signal is short-circuited or interrupted.
27	ANALOG INPUT 1 BREAK	Analog input 1 supply cable break/short circuit	The wiring at analogue input 1 is short-circuited or interrupted.
28	MAIN STAGE CABLE BREAK	Main stage supply cable break/short circuit	The wiring on analogue input 2 is short-circuited or interrupted.
29	TEMP LVDT TOO LOW	LVDT - oil temperature too low -20°C	LVDT - oil temperature too low -20°C
30	TEMP LVDT TOO HIGH	LVDT - oil temperature too high 75°C	LVDT - oil temperature too high 75°C
31	TEMP LVDT EXCEEDED	LVDT -oil temperature exceeded 85°C	LVDT - oil temperature exceeded 85°C
32	TEMP LVDT FALLEN BELOW	LVDT -oil temperature fallen below -30°C	LVDT - oil temperature fallen below -30°C
33	TEMP H BRIDGE TOO LOW	Temperature amplifier too low -20°C	
34	TEMP H BRIDGE TOO HIGH	Temperature amplifier too high 85°C	
35	TEMP H BRIDGE EXCEEDED	Temperature amplifier exceeded 95°C	
36	TEMP H BRIDGE FALLEN BELOW	Temperature amplifier fallen below -30°C	
37	TEMP POWERSUPPLY TOO LOW	Temperature power supply too low -20°C	
38	TEMP POWERSUPPLY TOO HIGH	Temperature power supply too high 85°C	
39	TEMP POWERSUPPLY EXCEEDED	Temperature power supply exceeded 95°C	
40	TEMP POWERSUPPLY FALLEN BELOW	Temperature power supply fallen below -30°C	
41-50		Internal error	

Error Code		Kurzbeschreibung	Anmerkung
51	WATCHDOG	Software reset (watchdog) occurred	The watchdog has triggered, and the firmware has been restarted.
52-66		Internal error	
67	PILOT FAILSAFE	Pilot Fail-Safe monitoring	The valve spool has left the fail-safe range.
69-69		Internal error	
70	MAIN STAGE SENSOR POWER	Main-stage sensor missing/defective	
71-74		Internal error	
83	DRV L1 VDS	Actuator driver - Overcurrent Protection	The overcurrent protection of the Actuator driver has been activated Contact Parker for more Information.
84	DRV H1 VDS	Actuator driver FET H1 Overcurrent Protection	The overcurrent protection of the Actuator driver has been activated Contact Parker for more Information.
85	DRV L2 VDS	Actuator driver FET L2 Overcurrent Protection	The overcurrent protection of the Actuator driver has been activated Contact Parker for more Information.
86	DRV H2 VDS	Actuator driver FET H2 Overcurrent Protection	The overcurrent protection of the Actuator driver has been activated Contact Parker for more Information.
91	DRV TSD	Actuator driver Thermal Shutdown	The overtemperature shutdown of the Actuator driver has been activated.
93	FAULT_I2C_POWER_HBRIDGE	No or faulty I2C communication with power monitor of actuator driver	No or faulty I2C communication with power monitor of actuator driver.
94	FAULT_ I2C _POWER_SIGNAL	No or faulty I2C communication with power monitor of CPU electronics	No or faulty I2C communication with power monitor of CPU electronics.
95	FAULT_ I2C _TEMP_H_BRIDGE	No or faulty i2C communication with temperature sensor 0	No or faulty I2C communication with temperature sensor 0.
96	FAULT_ I2C _TEMP_POWERSUPPLY	No or faulty I2C communication with temperature sensor 1	No or faulty I2C communication with temperature sensor 1.
97	FAULT_ I2C _TEMP_INHOUSING	No or faulty I2C communication with temperature sensor 2	No or faulty I2C communication with temperature sensor 2.
118	FAULT_ZERO_DAC	Zero point DAC I2C communication fault	Zero point DAC I2C communication fault
119	FAULT_ I2C _TIMEOUT	I2C general fault	Internal I2C communication is disturbed.

LED Flashing Signals

The device status is indicated by an LED with two color fields. Different device states are indicated by the color combinations and the flashing frequency.

Example for position field 1 and 2

Device status	LED field 1		LED field 2		Error
	Colour	Flash frequency	Colour	Flash frequency	
Normal					
Activ	Green	Permanent	Green	Permanent	
Disabled	Green	1 Hz	Green	1 Hz	Error codes
On Hold	Green	0,5 Hz	Green	0,5 Hz	Error codes
Warning					
Activ	Yellow	Permanent	Yellow	Permanent	
Disabled	Yellow	1 Hz	Yellow	1 Hz	Error codes
Error					
Activ	Rot	Permanent	Rot	Permanent	
Disabled	Rot	1 Hz	Rot	1 Hz	Error codes
Normal + Active IO-Link Communication					
Activ	Blue	Permanent	Green	Permanent	
Disabled	Blue	1 Hz	Green	1 Hz	Error codes
On Hold	Blue	0,5 Hz	Green	0.5 Hz	Error codes
Warning + Active IO-Link Communication					
Activ	Blue	Permanent	Yellow	Permanent	
Disabled	Blue	1 Hz	Yellow	1 Hz	Error codes

Error codes	
Flash frequency	**Desription**
1x + Break	External supply voltage too high or too low
2x + Break	Internal power supply fault
3x + Break	Analog input error
4x + Break	Analog Output Error
5x + Break	Control error monitoring – deviation too large
6x + Break	Power consumption of the electronics too high
7x + Break	Error - external communication
8x + Break	Errors – internal communication
9x + Break	Internal temperature too high or too low
10x + Break	Internal error

Air Bleeding of Hydraulic System

During initial startup, after an oil change as well as after the opening of lines or valves the hydraulic system must be air bleeded.

Filter

The function and lifetime of the valve are strongly affected by the cleanliness of the fluid.

Purity level class of 18/16/13 acc. ISO4406 is required.

Flushing

It is recommended to flush the pipelines by short circuiting the pressure and return lines. This prevents the installation dirt from entering the valve.

6. Trouble Shooting

Basis of troubleshooting is always a systematic approach.

⚠ For suspect of a sluggish spool the valve may be flushed with clean pressure fluid.

⚠ Troubleshooting in a hydraulic system requires detailed knowledge about function and construction of the system. Therefore the work may exclusively be performed by qualified personnel.

malfunction at hydraulic load runtime										
- generally no function										
- high frequent oscillation										
- low frequent oscillation										
- one way operation only										
- speed variations at unchanging command										
- different speeds depending on travel direction										
- speed too low										
- drifting without command										
- poor dynamic										
possible reasons for malfunction									**corrective actions**	
X									hydraulic pump resp. motor defective	replace hydraulic pump resp. motor
X		X	X	X	X		X		drive overloaded	reduce pressure resp. speed, increase valve size
X		X	X	X	X	X	X		valve contaminated	clean pressure fluid, filter / flush valve
				X		X		X	hydraulic fluid too viscous / too cold	change fluid grade, provide operational temperature
X		X	X						too low oil level within tank	refill pressure fluid
				X	X	X			filter contaminated	replace filter
X		X				X	X	X	supply voltage too low	keep supply voltage range
	X								supply voltage carries too much ripple	reduce ripple
X			X			X			command signal too low	increase command signal
	X								command signal carries too much ripple	reduce ripple
			X		X				center position adjustment incorrect	check center position adjustment
X	X			X		X	X		contacts of central connector contaminated	clean contacts / replace plug
X									feed cable interrupted	fix feed cable
X	X	X	X	X		X	X		wiring sequence incorrect	correct wiring sequence
	X						X		feed cable without shielding	change cable grade
X									pilot pressure to low or failed	increase pilot pressure to min. 20 bar
		X				X	X		pilot pressure to low	increase pilot pressure to min. 20 bar
								X	pilot pressure to low	increase pilot pressure to min. 20 bar

7. Accessories / Spare Parts

Accessories

The following accessories are available for the valve series DFplus pilot operated:

Bolt kit

D31FP	ordering code BK385
D41FP	ordering code BK320
D81/91FP	ordering code BK360
D111FP	ordering code BK386

Female connection

Code 0: 6+PE	ordering code 5004072
Code 5: 11-PE	ordering code 5004711
Code 7: 6-PE	ordering code 5004072

Spare Parts

Seal kit NBR

D31FP	ordering code SK-D31FP
D41FP	ordering code SK-D41FP
D81FP	ordering code SK-D81FP
D91FP	ordering code SK-D91FP
D111FP	ordering code SK-D111FP

Please direct technical product enquiries to:

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