



Bulletin MSG11-5715-713/UK

# Operation Manual Series TDC

Design > 15



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## 2-Way High Performance Proportional Throttle Valve

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Operation Manual

1. Introduction

Parker TDC 2-way high performance proportional throttle valves have an integral electronics and require only one single electrical common cable for the control system. Different flow sizes are available to achieve an optimal adaption for different applications.

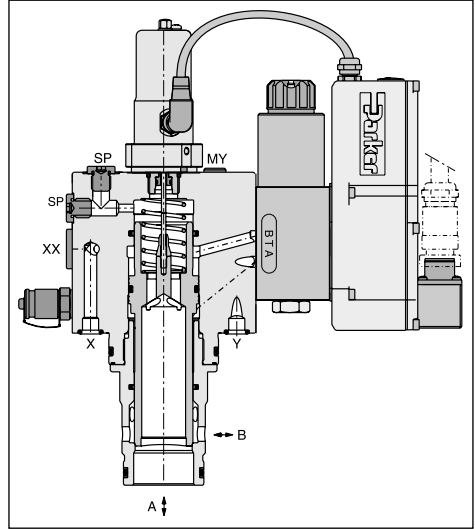
Characteristics of Valve Driver

The described integral electronics driver combines all necessary functions for the optimal operation of the valve.

The most important features are:

- excellent properties for response sensitivity and temperature drift
- differential input stage with various command signal options
- diagnostic output for spool stroke
- standard central connection
- compatible to the relevant European EMC-standards

TDC040



Ordering code

<b>TDC</b>		<b>E</b>	<b>S</b>		<b>9</b>	<b>C</b>	<b>2</b>			<b>0</b>	
2-way high performance proportional throttle valve	Nominal size	Slip-in cartridge	Standard dynamics for controlled applications	Flow characteristics	Nominal flow	Flow direction B → A A → B	Pilot oil (supply external, drain external)	Seal	Command signal	Standard electronics	Design series (not required for ordering)

Code	Nominal size
025	NG25
032	NG32
040	NG40
050	NG50

Code	Flow characteristics
7	progressive
9	linear

Code	Command signal
B	0...+10 V
E	0...+20 mA

Code	Seal
N <sup>1)</sup>	NBR
V	FPM

<sup>1)</sup> For HFC fluids suitable.

Please order plug separately.

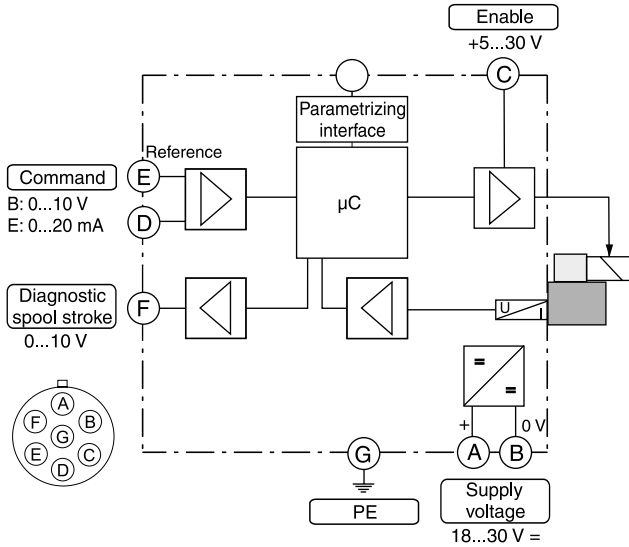
## Technical data

General			
Design	Proportional throttle valve with LVDT and integrated electronics, slip-in cartridge according to ISO 7368		
Nominal size	DIN	<b>NG25</b>	<b>NG32</b>
Mounting position	unrestricted		
Ambient temperature	[°C]	-20...+60	
Weight	[kg]	11	13
Vibration resistance	[g]	15	26
		10 sinus 5...2000 Hz acc. IEC 68-2-6 10 (RMS) random noise 20...2000 Hz acc. IEC 68-2-36 15 shock acc. IEC 68-2-27	
Hydraulic			
Max. operating pressure	[bar]	Ports A, B, X and SP up to 350, XX observe accumulator pressure rating; port Y: max. 210	
Fluid	Hydraulic oil according to DIN 51524		
Fluid temperature	[°C]	-20...+60 (NBR: -25...+60)	
Viscosity recommended	[cSt] / [mm²/s]	30 ... 80	
permitted	[cSt] / [mm²/s]	20 ... 400	
Filtration	ISO 4406; 18/16/13		
Flow direction	B to A / A to B		
Pilot pressure	[bar]	must be as high as system pressure	
Pilot oil	supply	external via X	
	drain	external via Y	
Leakage in pilot valve at 100 bar	[ml/min]	<400	
Electrical			
Duty ratio	[%]	100	
Protection class	IP65 in accordance with EN 60529 (with correctly mounted plug-in connector)		
Supply voltage / ripple	[V]	DC 18 ... 30, electric shut-off at < 17, ripple < 5 % eff., surge free	
Current consumption max.	[A]	2.0	
Pre-fusing	[A]	2.5 A medium lag	
Input signal			
Code B	Voltage	[V]	0...+10, ripple < 0,01 % eff., surge free
	Impedance	[kOhm]	100
Code E	Current	[mA]	0...+20, ripple < 0,01 % eff., surge free
	Impedance	[Ohm]	< 250
Differential input max.	[V]	30 for terminal D and E against PE (terminal G) 11 for terminal D and E against 0V (terminal B)	
Adjustment ranges	Min.	[%]	0...50
	Max.	[%]	50...100
	Ramp	[s]	0...32.5
Enable signal	[V]	5...30	
Diagnostic signal	[V]	0...+10 / +12.5 error detection, rated max. 5 mA	
EMC	EN 61000-6-2, EN 61000-6-4		
Electrical connection	6 + PE acc. EN 175201-804		
Wiring min.	[mm²]	7 x 1.0 (AWG16) overall braid shield	
Wiring length max.	[m]	50	

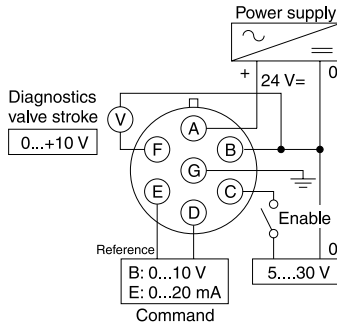
1) If valves with onboard electronics are used in safety-related parts of control systems, in case the safety function is requested, the valve electronics voltage supply is to be switched off by a suitable switching element with sufficient reliability.

Operation Manual

Block circuit diagram electronics



Connection diagrams electronics



## 2. Safety Instructions

Please read the operation manual before installation, startup, service, repair or stocking! Paying no attention 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. This means persons which have, because of education, experience and instruction, sufficient knowledge on relevant directives and approved technical rules.

## 3. Important Details

### Intended Usage

This operation manual is valid for 2-way high performance proportional throttle valves series TDC. Any different or beyond it usage is deemed to be as not intended. The manufacturer is not liable for warranty claims resulting from this.

### Common Instructions

We reserve the right for technical modifications of the described product. Illustrations and drawings within this manual are simplified representations. Due to further development, improvement and modification of the product the illustrations might not match precisely with the described valve. The technical specifications and dimensions are not binding. No claim may result out of it. Copyrights are reserved.

### Liability

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

- incorrect mounting / installation
- improper handling
- lack of maintenance
- operation outside the specifications



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 core 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!

## 4. 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!


## Operation Manual

### Mounting

- Compare valve type (located on the name plate) with part list resp. circuit diagram.
- The valve may be mounted fix or movable in any direction.
- Verify the mounting surface for the valve. Unevenness 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: use property class 12.9, ISO 4762

 Insufficient condition of the valve mounting surface might create malfunction!  
Incorrect mounting resp. bolt torque may

result in abrupt leakage of hydraulic fluid on the valve ports.



Y-port has always to be tied directly and separately to tank!

### 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 Parker catalogue HY11-3500/UK "Hydraulic Valves Industrial Standard".




Follow the environmental conditions! Unallowable temperatures, shock load, aggressive 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!

### Available Bolt Kits

Size	Ordering no.	Mounting bolt	Torque
TDC025	BK504	4 pcs. M12x100	108 Nm
TDC032	BK529	4 pcs. M16x100	264 Nm
TDC040	BK481	4 pcs. M20x110	517 Nm
TDC050	BK481	4 pcs. M20x110	517 Nm

### 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. Particularly no liability for media compatibility may be derived out of it.

Mineral oil: usable without restriction.

For operation with the following pressure fluids please consult Parker:

HFA	Oil-in-water emulsion
HFB	Water-in-oil emulsion
HFC	Aqueous solution (glycols)
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.

### Installation recommendation (NG40, NG50)

An insufficient pilot oil supply (e.g. due to long distances and/or small diameters) can negatively influence the dynamics of the TDC valve.

To avoid this, an accumulator can be connected to port XX at the valve body of the TDC. A short-term undersupply with pilot oil can be compensated via this accumulator.

Nominal size	Required accumulator volume	
	1 stroke close	2 stroke close and open
TDC040	0.01	0.02
TDC050	0.013	0.03

The required accumulator size is dependent on the pilot oil pressure.

Please also consider the Parker accumulator product range and the Parker Accumulator Sizing Software.



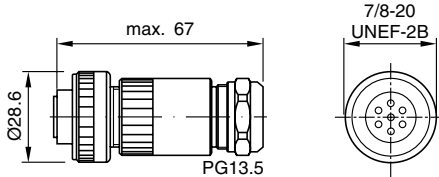
## Operation Manual

### Electrical Connection

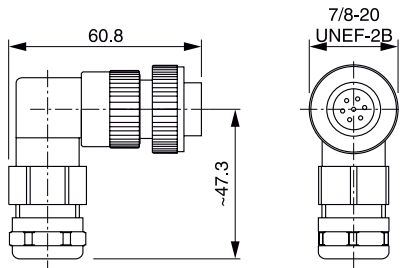
The electrical connection of the valve takes place by one common cable, which is coupled to the integrated electronic driver by a central connector assembly.

The connection requires a 6 + PE female connector EN 175201-804.

Female connector (ordering no. 5004072)



Angled female connector (ordering no. 5005160)



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

**⚠** Do not disconnect cable socket under tension!

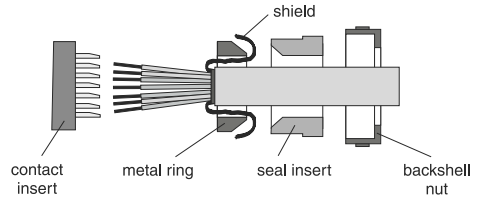
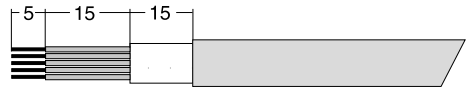
The connecting cable has to comply to the following specification:

Cable type	control cable, flexible, 7 conductors, overall braid shield
Cross section	min. 1.0 mm <sup>2</sup> (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.

Stripping lengths for the connecting cable:



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

**⚠** Incomplete tightening of backshell nut respectively cap nut may result in undesired release of the connection as well as degradation of the water tightness.

When using female connectors of other manufacturers, the relevant regulations must be observed.

**⚠** The cable may only be connected to the female connector by authorized and 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 connected 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).


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### Electrical interfacing


#### Supply voltage:


The supply voltage for the valve has to cover the range of 18...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 30 V. Non-observance of this rule may result in permanent damaging of the valve.

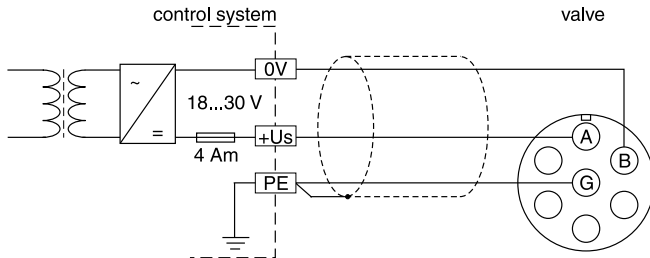
 The increased inrush current of the valve should be considered when selecting the

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 (rating: s. techn. data). Non-observance of this instruction may create irreparable damage of valve resp. incorporated system parts.


#### Wiring diagram of supply voltage (6 + PE)



#### Enable input

A signal voltage enables the actuator drive of the valve. Continuous operation of the valve requires a permanent voltage 5...30 V (i.e. the supply voltage). In case of disabling the signal the valve will reach its hydraulic default (power down) position in no time independently from the command signal value. At the same time the position controller output will be clamped. In case of restarting the enable signal, the valve spool takes its position always out of the power down. Preferable the enable signal should be switched on together with the hydraulic pressure supply. This forces the actuator drive into drop out


condition when the hydraulic system is switched off, and it avoids needless heating of the actuator.


 The enable function represents no safety arrangement against unwanted valve operation in terms of rules for accident prevention! To block the valve function under all conditions, more advanced steps are necessary, i.e. the installation of additional safety check valves.


## Command signal input

The command signal for the valve will be connected to the pins D and E of the difference signal input of the electronic driver. The spool stroke behaves proportional to the command signal amplitude. Different versions of command signal processing are available, depending on the valve type. These are described below:

For the function description is assumed as signal reference (0V): pin E

 Details are shown from the technical specifications.

 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.

## Diagnostics output

A diagnostics signal is available. Its voltage represents the operating condition of the valve.



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

## Valve sizes NG25 to NG50

Code command signal	Command signal	Diagnostic signal
B	0...+10 V	0...+10 V
	0...-10 V	0...-10 V
E	0...+20 mA	0...+10 V
	0...-20 mA	0...-10 V

Operation Manual

5. Operating Instructions

**⚠ Attention!** Supply pressure must be ensured before valve is energized!

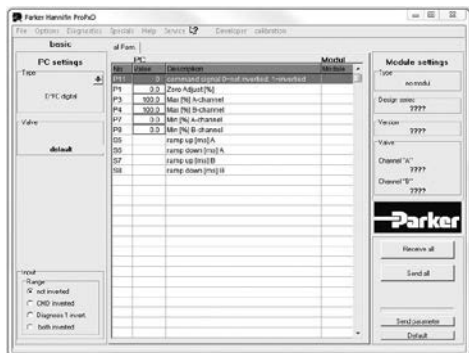
To reach the closed position in case of valve electronic failure, pilot pressure is required.

ProPxD parametrizing 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 printed out for documentation purposes.

See [www.parker.com/isde](http://www.parker.com/isde) section "Support" or directly at [www.parker.com/propxd](http://www.parker.com/propxd) for free software download.

Parametrizing connection



Hardware requirements

- PC with operating system from Windows® XP upwards
- Interface RS232C
- display resolution min. 800 x 600
- connection cable between PC and electronic module
- storage requirement approx. 40 MB

**👉** If your PC has no serial interface according to RS232 standard, you require in addition an USB-RS232 adapter for connection to the USB interface.

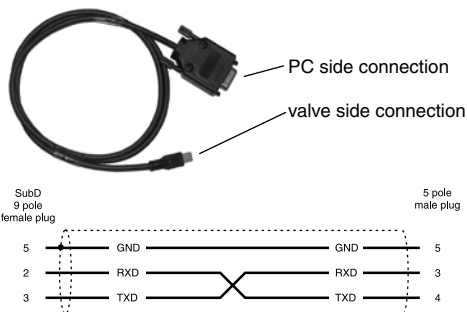
Cable specification

The cable which is required for the connection of the valve electronic to a PC may be ordered under code 40982923. The cable has to be inserted between an unused serial port of the PC and the 5pole socket connector of the valve electronic (parametrizing connector).

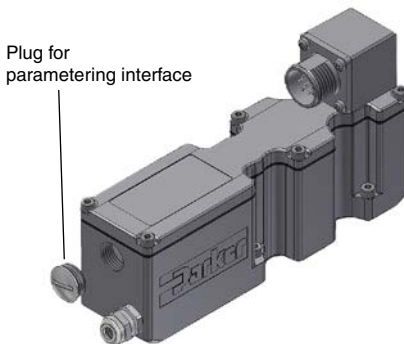
**⚠ Attention!** The valve electronic provides no USB interface, but can only be parametrized via an RS232 - connection. Therefore the usage of USB standard cables is permitted and may result in damaging of valve resp. PC.

Parametrizing cable

Ordering code: 40982923



Parametering interface



**⚠ Attention!** The cover plug has to be re-installed after completion of the parametrizing work.

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### Program installation

Please check before installation if the above hardware requirements are met. If your PC has already stored an older version of the “ProPxD” program, it has to be deinstalled by using the Windows® system control feature.

Program installation sequence:

- terminate the execution of other programs
- execute the file “setup.exe”
- follow the instructions on the screen

Answer the question, if an older version should be overwritten, with “ok”. During the installation you may change destination drive resp. installation path, if needed. Please answer “ok” if at the end of the installation the program reports any system information. After successful installation the desktop display shows the ProPxD icon for starting the program.

### Software operating

Brief instruction for first startup:

- Connect the valve electronic to the supply voltage.
- Connect the valve electronic to a PC via the parametrizing cable.
- Start the operating program.
- After displaying the program resp. data base version a program window opens and the connected valve will be automatically identified (possibly a manual identification via the button “Receive all” is necessary).
- Select the desired version via the menu “Options/Optionen” with the menu item “Language/Sprache”.
- The valve specific default parameters are already available within the parameter table.
- Individual parameters may be selected via mouse or the arrow buttons at the center of the program screen.
- Parameter changes are possible via mouse or the arrow buttons on the bottom left within the program screen, also the parameter values may be edited via the keyboard.
- Modified parameters will be stored via the “Enter” key or via the button “Update list”.
- Parameters have to be nonvolatile stored on the valve via the button “save parameter”.
- The chosen parameters may be optionally stored on the PC via the “File”-menu with the menu item “Save as”, data retrieving is always possible via the function “Load file”

### Extended functions

The user software is shared into 2 parameter ranges:

- basic mode
- expert mode

For normal startup the basic mode is absolutely sufficient. It permits the setting of all application specific parameters to match the valve function with the task setting. In case of special applications the valve parameters may be adapted via the expert mode. The operating mode may be selected from the “Options”- menu and remains after terminating and re-start of the program.



Changing of expert parameters is only permitted for qualified personnel. Incorrect settings may lead to malfunction! In case of parameter changes shut the drive down!

The expert mode is protected by a pass word request. The name is “parker”. The button “Send parameter” appears in the “Expert”-operating mode. This button transmits only the setting of one single parameter to the connected valve. Thus a quick tuning of single parameters is permitted during the setup.



A horizontal bar graph readout between the communication buttons shows the data transfer state.



Because the ProPxD program has also offline (i.e. without connection to the valve) functionality, a manual pre-selection of the parameters is possible. After selection of the valve type via the menu “Options” the parameters may be set and stored for later transmission. Note the design series while selection of the valve!

The “File” menu provides the functions “Printer setup”, “Print preview” and “Print”. The print preview includes the option for parameter set storage as text file (format.txt) prior to further processing. The “Options” menu provides also the selection of the RS232C interface port via the menu item “Port”. Via the menu item “Load file” previously stored parameter sets may be loaded.

Individual description of additional expert parameters

Parameter	Function	Unit	Parameter Range	Default Setting
E17 type of command signal device	Adjustment of the command signal option. To match the command signal input to the input signal mode.	–	1, 2, 3, 5	depending on valve
E25 MIN operating threshold	Adjustment of the MIN operating threshold. To match the response sensitivity for the MIN-stroke step.	–	0-200	100
P5 Dither amplitude	Adjustment of dither amplitude. To reduce the influence of solenoid friction.	%	0.0 - 15.0	depending on valve
P6 Dither frequency	Adjustment of dither frequency. To match the dither signal to the valve dynamic.	Hz	0 - 300	depending on valve
P1 Zero adjust	Adjustment of zero position shifting (offset). To compensate asymmetries.	%	-90 - +90	0.0
P3 MAX A	Adjustment of maximum signal span for positive output signal. To match the command signal span to the valve operating range.	%	50.0 - 100.0	depending on valve
P4 MAX B	Adjustment of maximum signal span for negative output signal. To match the command signal span to the valve operating range.	%	50.0 - 100.0	depending on valve
P7 MIN A	Adjustment of stroke step for valve side A at 0.1% command signal. To compensate for the overlap of the valve spool.	%	0.0 - 50.0	depending on valve
P8 MIN B	Adjustment of stroke step for valve side B at 0.1% command signal. To compensate for the overlap of the valve spool.	%	0.0 - 50.0	depending on valve
S5 ramp accel. A	Adjustment of ramp rate for increasing of the negative signal polarity. To avoid switching noise.	ms	0 - 32500	0
S6 ramp decel. AB A	Adjustment of ramp rate for decreasing of the negative signal polarity. To avoid switching noise.	ms	0 - 32500	0
S7 ramp accel. B	Adjustment of ramp rate for increasing of the positive signal polarity. To avoid switching noise.	ms	0 - 32500	0
S8 ramp decel. AB B	Adjustment of ramp rate for decreasing of the positive signal polarity. To avoid switching noise.	ms	0 - 32500	0
J12 Errorhandling	Adjustment of the handling by detecting a fault. For the alignment of the valve reaction at fault diagnosis	–	0, 255, 768, 1023	0

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### 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 bled.

### 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. ISO 4406 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. At first the following questions have to be checked:

- Are there practical experiences with similar failures?
- Have system adjustments been changed?

Afterwards starting of troubleshooting by means of a priority list of the most likely reasons.



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



Troubleshooting in a hydraulic system requires in either case a systematic approach. The work may exclusively be performed by qualified personnel, as it requires detailed knowledge about function and construction of the system. Reversals or disassemblies may not be taken imprudently! Prior to the works it has to be clarified, if the system has been operated properly until the failure occurred.

malfunction at hydraulic load runtime						
- generally no function						
- high frequent oscillation						
- low frequent oscillation						
- speed variations at unchanging command						
- different speeds depending on travel direction						
- speed too low						
- drifting without command						
possible reasons for malfunction					corrective actions	
X					hydraulic pump resp. motor defective	replace hydraulic pump resp. motor
X	X	X	X	X	drive overloaded	reduce pressure resp. speed, increase valve size
X	X	X	X	X	valve contaminated	clean pressure fluid, filter / flush valve
		X	X		hydraulic fluid too viscous / too cold	change fluid grade, provide operational temperature
X	X				too low oil level within tank	refill pressure fluid
		X	X	X	filter contaminated	clean resp. replace filter
X	X		X	X	supply voltage too low	keep supply voltage range
	X				supply voltage carries too much ripple	reduce ripple
X			X		command signal too low	increase command signal
	X				command signal carries too much ripple	reduce ripple
			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	wiring sequence incorrect	correct wiring sequence
X				X	feed cable without shielding	change cable grade

## Other applicable standards / rules

- 2006/42/EC  
Machinery Directive
- 2014/95/EG  
Low Voltage Directive
- ISO 4406:1999-12  
Hydraulic fluid power - Fluids - Method for coding the level of contamination by solid particles
- ISO 4401:2005-07  
Hydraulic fluid power - Four port directional control valves - mounting surfaces
- DIN EN 60204-1/A1:2009-10; VDE 0113-1/A1:2009-10  
Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- DIN EN 60529:2014-09; VDE 0470-1:2014-09  
Degrees of protection provided by enclosures (IP code)
- DIN EN 61000-4-2/3/4/6/8  
Electromagnetic compatibility
- DIN 51524-1:2006-04  
Pressure fluids - HL hydraulic oils - Part 1: Minimum requirements
- DIN 51525-2:2006-04  
Pressure fluids - HLP hydraulic oils - Part 2: Minimum requirements

## 7. Accessories

The following accessories are available for the valve series TDC:

Female connector 6+PE ordering code 5004072

Mounting bolts see table on page 9.

## TDC spare parts / seal kits

Valve	NBR	FPM
TDC025	SK-TDP025EN30	SK-TDP025EV30
TDC032	SK-TDP032EN30	SK-TDP032EV30
TDC040	SK-TDP040EN30	SK-TDP040EV30
TDC050	SK-TDP050EN30	SK-TDP050EV30

Please direct technical product enquiries to:

### Parker Hannifin

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