

# COMMUNICATION PROTOCOL

EN

Translation of the Original

## TPG 366

MaxiGauge®, Total pressure measurement and control unit for ActiveLine gauges

**PFEIFFER**  **VACUUM**

## Product identification

→ Operating manual for MaxiGauge TPG 366, BG 5501 BEN


## Validity

This document is valid for products with the article numbers

PT G28 770 (TPG 366, MaxiGauge)

The article numbers (P/N) can be found on the rating plate.

This document is based on firmware version V010300.

If the device is not functioning as described, check that your device is equipped with this firmware version (→  32).

We reserve the right to make technical changes without prior notice.

## Proper use

The serial interface permits the operation of the TPG 366 via a computer or a terminal.



## Brand

MaxiGauge® Pfeiffer Vacuum GmbH  
FullRange® Pfeiffer Vacuum GmbH

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The symbol (→  XY) is used for page references in the text, and the symbol (→  [Z]) is used for references to other documents given in the list of references.

# 1 Mnemonics protocol

The serial interface permits communication of the TPG 366 with a computer. A terminal can also be connected for test purposes.

When switched on, the device begins continuous transmission of the measured value at an intervals 1 second. When the first character is sent to the device, the automatic measured value transmission stops, but can be re-started using the command **COM** after any parameter changes have been made (→ 8).

It should be noted that for commands containing channel-specific parameters, the number of values must match the number of channels.

Example: Send: **OFC** [a,b,c,d,e,f]

## 1.1 Installation

→ Operating manual for MaxiGauge TPG 366, BG 5501 BEN

## 1.2 Data transmission

The exchange of information is carried out bidirectionally, i.e. data and control commands can be exchanged in both directions.

Configuration of the interface

→ Operating manual for MaxiGauge TPG 366, BG 5501 BEN

Data format

1 start bit, 8 data bits, no parity bit, 1 stop bit, no hardware handshake

Definitions

The following abbreviations and symbols are used:

Symbol	Meaning	Dec	Hex
HOST	Computer or terminal		
[...]	Elements not compulsorily specified		
ASCII	American Standard Code for Information Interchange		
<ETX>	END OF TEXT (CTRL C) Reset of the interface	3	03
<CR>	CARRIAGE RETURN Return	13	0D
<LF>	LINE FEED Line feed	10	0A
<ENQ>	ENQUIRY Request for data transmission	5	05
<ACK>	ACKNOWLEDGE Positive feedback	6	06
<NAK>	NEGATIVE ACKNOWLEDGE Negative feedback	21	15

"Send": Transfer from the HOST to the TPG 366.

"Receive": Transfer from the TPG 366 to the HOST.

Flow control

The HOST must wait for receipt of acknowledgment (<ACK><CR><LF> oder <NAK><CR><LF>) after each ASCII string.

The input buffer of the HOST must have a capacity of at least 32 bytes.

### 1.3 Communication protocol

Send format

The messages are sent in the form of mnemonics (command codes) and parameters as ASCII strings to the TPG 366. All mnemonics comprise three ASCII characters.

Spaces are ignored. <ETX> (CTRL C) clears the input buffer in the TPG 36x.



Do not transmit any LINE FEEDS (<LF>) via the RS-485 half duplex line for fear they could cause data collisions on the bus.

The use of LINE FEED is generally allowed for other interfaces (USB, Ethernet), but should be avoided for reasons of time.

Send protocol

HOST	TPG 366	Explanation
Mnemonics [and parameters] <CR>[<LF>]	—————>	Receives message with "End message"
<—————	<ACK><CR><LF>	Positive confirmation of a received message

Receive format

On request via mnemonics, the TPG 366 transmits the measurement data or parameters in the form of ASCII strings to the HOST.

<ENQ> must be sent as a request for transmission of an ASCII string. Repeated sending of <ENQ> exports other strings, in accordance with the last selected mnemonic.

<ENQ> without a valid request sends the ERROR word.

Receive protocol

HOST	TPG 366	Explanation
Mnemonics [and parameters] <CR>[<LF>]	—————>	Receives message with "End message"
<—————	<ACK><CR><LF>	Positive confirmation of a received message
<ENQ>	—————>	Request for data transmission
<—————	Measured values or parameters <CR><LF>	Sends data with "End message"
	:	:
<ENQ>	—————>	Request for data transmission
<—————	Measured values or parameters <CR><LF>	Sends data with "End message"


Error handling

Entered strings are checked on the TPG 366. In the event of an error, negative confirmation <NAK> is issued.

Error detection protocol

HOST	TPG 366	Explanation
Mnemonics [and parameters] <CR>[<LF>]	—————>	Receives message with "End message"
***** Transmission or programming error *****		
<—————	<NAK><CR><LF>	Negative confirmation of a received message
Mnemonics [and parameters] <CR>[<LF>]	—————>	Receives message with "End message"
<—————	<ACK><CR><LF>	Positive confirmation of a received message

## 1.4 Mnemonics Table

			→ 
<b>ADC</b>	A/D Converter test	A/D converter test	29
<b>AYT</b>	Are you there?	Device identification	34
<b>BAL</b>	Backlight	Backlighting	21
<b>BAU</b>	Transmission rate (USB)	Transmission rate for serial interface (USB)	21
<b>CAL</b>	Calibration factor	Calibration factor	15
<b>CDA</b>	Calibration date	Re-calibration date	29
<b>CID</b>	Channel identifier	Sensor name	15
<b>CFx</b>	Calibration factor gauge 1 ... 6	Calibration factor of gauge 1 ... 6	16
<b>COM</b>	Continuous mode of measurement values	Continuous output of measured values	8
<b>CPR</b>	Combined pressure (linear gauges)	Combined measuring range (linear gauges)	9
<b>DAT</b>	Date	Date	28
<b>DCB</b>	Display control bar graph	Bar graph display	22
<b>DCC</b>	Display control contrast	Display contrast	23
<b>DCD</b>	Display resolution	Display resolution	16
<b>DCS</b>	Display control screensaver	Screensaver	23
<b>DGS</b>	Degas	Degas	17
<b>DIS</b>	Display test	Display test	30
<b>EEP</b>	EEPROM test	EEPROM test	30
<b>EPR</b>	FLASH test	FLASH test	30
<b>ERA</b>	Error relay allocation	Error relay allocation	24
<b>ERR</b>	Error status	Error status	10
<b>ETH</b>	Ethernet configuration	Ethernet configuration	34
<b>EVA</b>	Measurement range end value	Measuring range end value	24
<b>FIL</b>	Measurement value filter	Measured value filter	17
<b>FMT</b>	Number format (measurement value)	Number format (measurement output)	24
<b>FSR</b>	Measurement range (linear gauges)	Measuring range (linear gauges)	18
<b>GAS</b>	Gas type correction	Gas type correction	18
<b>HDW</b>	Hardware version	Hardware version	30
<b>IOT</b>	I/O test	I/O test	31
<b>LCM</b>	Start/stop data logger	Start/stop data logger	28
<b>LNG</b>	Language (display)	Language (user interface)	25
<b>LOC</b>	Keylock	Input lock	31
<b>MAC</b>	Ethernet MAC address	Ethernet MAC address	32
<b>NAD</b>	Node (device) address for RS485	Node address (device address for RS485)	25
<b>OFC</b>	Offset correction (linear gauges)	Offset correction (linear gauges)	19
<b>OFD</b>	Offset display (linear gauges)	Offset display (linear gauges)	19
<b>PNR</b>	Firmware version	Firmware version	32
<b>PRn</b>	Measurement data and status for gauges 1 ... 6	Pressure and status for gauges 1 ... 6	10
<b>PRE</b>	Pirani range extension	Pirani range extension	25
<b>PRO</b>	Protocol serial interface	Protocol for serial interface	26
<b>PRX</b>	Measurement data and status for all gauges	Pressure and status for all gauges	11
<b>PUC</b>	Penning underrange control	Measuring underrange control	26
<b>RES</b>	Reset	Device re-start	12
<b>RHR</b>	Operating hours	Operating hours	32
<b>SAV</b>	Save parameters (EEPROM)	Save default values (EEPROM)	26
<b>SCx</b>	Gauge 1 ... 6 control	Control for gauge 1 ... 6	20
<b>SCM</b>	Save/load parameters (USB)	Save/read parameters (USB)	29

<b>SEN</b>	Gauge on/off	Switch gauge on/off	13
<b>SPx</b>	Switching function 1 ... 6	Switching function 1 ... 6	14
<b>SPS</b>	Switching function status	Switching function status	14
<b>TAI</b>	Test A/D converter, ID resistance	Test A/D converter, ID resistance	32
<b>TAS</b>	Test A/D sensor	Test A/D converter measured value inputs	32
<b>TID</b>	Gauge identification	Gauge identification	13
<b>TIM</b>	Time	Time	28
<b>TKB</b>	Operator key test	Operator key test	33
<b>TLC</b>	Torr lock	Torr lock	33
<b>TMP</b>	Inner temperature of the unit	Inner device temperature	33
<b>UNI</b>	Pressure unit	Pressure unit	27
<b>WDT</b>	Watchdog control	Watchdog malfunction	34

## 1.5 Measuringmode

### 1.5.1 COM - Continuous measured value output

Send: **COM** [,a] <CR><LF>

	Description
a	Mode, a = 0 -> 100 ms 1 -> 1 s (default) 2 -> 1 minute

Receive: <ACK><CR><LF>

The continuous measured value output directly follows <ACK> at the required time interval

Receive: b,sx.xxxxEsxx,b,sx.xxxxEsxx,b,sx.xxxxEsxx,  
b,sx.xxxxEsxx,b,sx.xxxxEsxx,b,sx.xxxxEsxx <CR><LF>

	Description
b	Status of the gauge, b = 0 -> Measuring data OK 1 -> Measuring range underrange 2 -> Measuring range overrange) 3 -> Sensor error 4 -> Sensor switched off (IKR, PKR, IMR, PBR) 5 -> No gauge (output: 5,2.0000E-2 [hPa]) 6 -> Identification error
sx.xxxxEsxx	Measured value gauge <sup>1)</sup> [current unit of measurement] (s = algebraic sign)



<sup>1)</sup> Values always in exponential form.

The third and fourth decimal places is always 0 for logarithmic gauges.



### 1.5.2 CPR - Combined measuring range (linear gauges)

If multiple linear gauges with different fullscales (F.S.) are connected to the TPG 366, this command is used to combine the various measuring ranges into one measuring range. This means that the pressure in this combined measuring range can be determined with the best possible accuracy.

If the pressure is greater than the fullscale of the gauge with smaller fullscale, there is a switchover to the gauge with larger fullscale.

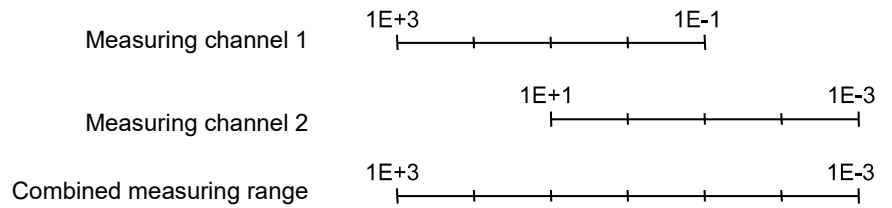
If only one linear gauge is connected, the measured value from that gauge is output.

If no linear gauge is connected, 1000 hPa is output as the measured value and the parameters a and b are on "0"

Example

Measuring channel 1: linear gauge, 1000 hPa F.S.

Measuring channel 2: linear gauge, 10 hPa F.S.



Send command: CPR,1,2,0 or  
 CPR,1,2 or  
 CPR,2,1

Send: **CPR** [a,b,c] <CR>[<LF>]

	Description
a	Measuring channel of the selected gauge, a = 0 → no linear gauge connected 1 → Measuring channel 1 2 → Measuring channel 2 3 → Measuring channel 3 4 → Measuring channel 4 5 → Measuring channel 5 6 → Measuring channel 6
b	Measuring channel of the selected gauge
c	Measuring channel of the selected gauge

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,sx.xxxxEsxx

	Description
a	Measuring channel of the selected gauge
b	Measuring channel of the selected gauge
c	Measuring channel of the selected gauge
sx.xxxxEsxx	Combined measured value <sup>1)</sup> [current unit of measurement] (s = algebraic sign)



<sup>1)</sup> Values always in exponential form.

### 1.5.3 ERR - Error status

Send: **ERR** <CR>[<LF>] Error status  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: aaaa <CR><LF>

	Description
aaaa	error status, aaaa = 0000 → no error 1000 → ERROR (see display on front panel) 0100 → NO HWR (hardware not installed) 0010 → PAR (non-permitted parameters) 0001 → SYN (wrong syntax)



The error status is cleared on export, but is issued again if the error remains or if there is a further error.

### 1.5.4 PRn - Pressure of gauge 1 ... 6

Send: **PRn** <CR>[<LF>]

	Description
n	Measured value, n = 1 → Gauge 1 2 → Gauge 2 3 → Gauge 3 4 → Gauge 4 5 → Gauge 5 6 → Gauge 6

Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a,sx.xxxxEsxx <CR><LF>

	Description
a	Status, a = 0 → Measuring data OK 1 → Measuring range underrange 2 → Measuring range overrange 3 → Sensor error 4 → Sensor switched off (IKR, PKR, IMR, PBR) 5 → No gauge (output: 5.2.0000E-2 [hPa]) 6 → Identification error
sx.xxxxEsxx	Measured value <sup>1)</sup> [current unit of measurement] (s = algebraic sign)



<sup>1)</sup> Values always in exponential form.  
 The third and fourth decimal places is always 0 for logarithmic gauges.

### 1.5.5 PRX - Pressure of gauges 1 ... 6

Send: **PRX** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a,sx.xxxxEsxx,a,sx.xxxxEsxx,a,sx.xxxxEsxx,  
 a,sx.xxxxEsxx,a,sx.xxxxEsxx,a,sx.xxxxEsxx <CR><LF>

	Description
a	Gauge status, a = 0 → Measuring data OK 1 → Measuring range underrange 2 → Measuring range overrange) 3 → Sensor error 4 → Sensor switched off (IKR, PKR, IMR, PBR) 5 → No gauge (output: 5,2.0000E-2 [hPa]) 6 → Identification error
sx.xxxxEsxx	Measured value gauge <sup>1)</sup> [current unit of measurement] (s = algebraic sign)



<sup>1)</sup> Values always in exponential form.  
 The third and fourth decimal places is always 0 for logarithmic gauges.

### 1.5.6 RES - Device restart

Send: **RES** [,a] <CR><LF>

	Description
a	a = 1 → Re-start of the device and return to measuring mode

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: b[,b][,b][...] <CR><LF>

	Description
b	List of current error messages, b = 0 → no error 1 → Watchdog has triggered 2 → One or more tasks not completed 3 → FLASH error 4 → RAM error 5 → EEPROM error 6 → DISPLAY error 7 → A/D converter error 8 → UART error 9 → Gauge 1 error (e.g. wire break, no supply) 10 → Gauge 1 identification error 11 → Gauge 2 error (e.g. wire break, no supply) 12 → Gauge 2 identification error 13 → Gauge 3 error (e.g. wire break, no supply) 14 → Gauge 3 identification error 15 → Gauge 4 error (e.g. wire break, no supply) 16 → Gauge 4 identification error 17 → Gauge 5 error (e.g. wire break, no supply) 18 → Gauge 5 identification error 19 → Gauge 6 error (e.g. wire break, no supply) 20 → Gauge 6 identification error

### 1.5.7 SEN - Switching gauges on/off

Send: **SEN** [,a,b,c,d,e,f] <CR><LF>

	Description
a	Gauge 1, a = 0 → no change 1 → switch off gauge 2 → switch on gauge
b	Gauge 2
⋮	⋮
f	Gauge 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Gauge 1 status, a = 0 → Gauge cannot be switched on/off 1 → Gauge is switched off 2 → Gauge is switched on
b	Gauge 2 status
⋮	⋮
f	Gauge 6 status

### 1.5.8 TID - Gauge identification

Send: **TID** <CR><LF> Gauge identification

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Identification Gauge 1, a = TPR/PCR (Pirani Gauge or Pirani Capacitance Gauge) IKR (Cold Cathode Gauge 10 <sup>-9</sup> and 10 <sup>-11</sup> ) PKR (FullRange® CC Gauge) PBR (FullRange® BA Gauge) IMR (Pirani / High Pressure Gauge) CMR/APR (linear gauge) noSENSOR (no gauge) noIDENT (no identification)
b	Identification Gauge 2
⋮	⋮
f	Identification Gauge 6

## 1.6 Switching function-parameter group

### 1.6.1 SPS - Switching function status

Send: **SPS** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Switching function status 1, a = 0 → off 1 → on
b	Switching function 2 status
⋮	⋮
f	Switching function 6 status

### 1.6.2 SP1 ... SP6 - Switching - function 1 ... 6

Send: **SPx** [,a,x.xxxxEsxx,y.yyyyEsyy] <CR>[<LF>]

	Description
x	Switching function, x = 1 → Switching function 1 2 → Switching function 2 3 → Switching function 3 4 → Switching function 4 5 → Switching function 5 6 → Switching function 6
a	Switching function allocation, a = 0 → Switched off 1 → Switched on 2 → Measuring channel 1 3 → Measuring channel 2 4 → Measuring channel 3 5 → Measuring channel 4 6 → Measuring channel 5 7 → Measuring channel 6
x.xxxxEsxx	lower threshold value <sup>1)</sup> [current unit of measurement] (default = gauge-dependent) (s = algebraic sign)
y.yyyyEsyy	upper threshold value <sup>1)</sup> [current unit of measurement] (default = gauge-dependent) (s = algebraic sign)



<sup>1)</sup> The entered number format is not relevant. This is always converted internally into a floating point format.

Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a,x.xxxxEsxx,y.yyyyEsyy <CR><LF>

	Description
a	Switching function allocation
x.xxxxEsxx	lower threshold value [current unit of measurement] (s = algebraic sign)
y.yyyyEsyy	upper threshold value [current unit of measurement] (s = algebraic sign)

## 1.7 Gauges controlgroup

### 1.7.1 CAL - calibration factor

Prerequisite: The "GAS" parameter is set to "7" (other gases) (→ 18).  
Except for linear gauges.

The calibration factor is effective in the entire measuring range of the gauge.

Send: **CAL** [,a.aaa,b.bbb,c.ccc,d.ddd,e.eee,f.fff] <CR>[<LF>]

	Description
a.aaa	Calibration factor for gauge 1, 0.100 ... 10.000 (default = 1.000)
b.bbb	Calibration factor for gauge 2
⋮	⋮
f.fff	Calibration factor for gauge 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a.aaa,b.bbb,c.ccc,d.ddd,e.eee,f.fff <CR><LF>

	Description
a.aaa	Calibration factor for gauge 1
⋮	⋮
f.fff	Calibration factor for gauge 6

### 1.7.2 CID - Sensor name

Name of the sensor (max. 8 characters). Only capital letters, numbers and underlines permitted.

Send: **CID** [,aaaaaaaa,bbbbbbbb,cccccccc,dddddddd,eeeeeeee,ffffff] <CR>[<LF>]

	Description
aaaaaaaa	Name of sensor 1
⋮	⋮
ffffff	Name of sensor 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: aaaaaaaaa,bbbbbbbb,cccccccc,dddddddd,eeeeeeee,ffffff <CR><LF>

	Description
aaaaaaaa	Name of sensor 1
⋮	⋮
ffffff	Name of sensor 6

### 1.7.3 CF1 ... CF6 - Calibration factor for gauges 1 to 6

Send: **CFx** [,a.aaa] <CR>[<LF>]

	Description
x	Calibration factor for gauge x = 1 → Gauge 1 2 → Gauge 2 3 → Gauge 3 4 → Gauge 4 5 → Gauge 5 6 → Gauge 6
a.aaa	Calibration factor for gauge x, 0.100 ... 10.000 (default = 1.000)

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a.aaa <CR><LF>

	Description
a.aaa	Calibration factor for gauge x

### 1.7.4 DCD - Display resolution

Send: **DCD** [,a,b,c,d,e,f] <CR>[<LF>]

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Number of points on measuring channel 1, a = 0 → AUTO (default) 1 → One point 2 → Two points 3 → Three points 4 → Four points
b	Number of points on measuring channel 2
⋮	⋮
f	Number of points on measuring channel 6

The display is reduced by one decimal place for PCR gauges in the pressure range  $p < 1.0E-4$  hPa and activated PrE (→ 25).



### 1.7.5 DGS - Degas

Send: **DGS** [,a,b,c,d,e,f] <CR>[<LF>]

	Description
a	Degas gauge 1, a = 0 → Degas off (default) 1 → Degas on (3 minutes)
b	Degas gauge 2
⋮	⋮
f	Degas gauge 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Degas status of gauge 1
⋮	⋮
f	Degas status of gauge 6

### 1.7.6 FIL - Measured value filter

Send: **FIL** [,a,b,c,d,e,f] <CR>[<LF>]

	Description
a	Filter for gauge 1, a = 0 → Filter switched off 1 → fast 2 → normal 3 → slow
b	Filter for gauge 2
⋮	⋮
f	Filter for gauge 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Filter time constant for gauge 1
⋮	⋮
f	Filter time constant for gauge 6

### 1.7.7 FSR - Measuring range (linear gauges)

Send: **FSR** [,a,b,c,d,e,f] <CR><LF>

	Description
a	Measuring range end value for gauge 1, a = 0 → 0.01 hPa 1 → 0.1 hPa 2 → 1 hPa 3 → 10 hPa 4 → 100 hPa 5 → 1000 hPa (default) 6 → 2000 hPa 7 → 5000 hPa 8 → 10000 hPa 9 → 50000 hPa
b	Measuring range end value for gauge 2
⋮	⋮
f	Measuring range end value for gauge 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Measuring range end value for gauge 1
⋮	⋮
f	Measuring range end value for gauge 6

### 1.7.8 GAS - Gas correction

Send: **GAS** [,a,b,c,d,e,f] <CR><LF>

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Gas correction for gauge 1, a = 0 → Nitrogen / air (default) 1 → Argon 2 → Hydrogen 3 → Helium 4 → Neon 5 → Krypton 6 → Xenon 7 → Other gas Enter calibration factor for other gases via command "CAL" (→ 15)
b	Gas correction for gauge 2
⋮	⋮
f	Gas correction for gauge 6

### 1.7.9 OFC - Offset correction (linear gauges)

Send: **OFC** [,a,b,c,d,e,f] <CR>[<LF>]

	Description
a	Offset correction gauge 1, a = 0 → Off (default) 1 → On 2 → Determine offset value and switch on offset correction
b	Offset correction gauge 2
⋮	⋮
f	Offset correction gauge 6

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Offset correction gauge 1
⋮	⋮
f	Offset correction gauge 6

### 1.7.10 OFD - Offset display (linear gauges)

Send: **OFD** [,sa.aaaaEsaa,sa.aaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa] <CR>[<LF>]

	Description
sa.aaaaEsaa	Offset gauge <sup>1)</sup> , [current unit of measurement] (default = 0.0000E+00) s = algebraic sign



<sup>1)</sup> The entered number format is not relevant. This is always converted internally into a floating point format.

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: sa.aaaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa,sa.aaaaEsaa <CR><LF>

	Description
sa.aaaaEsaa	Offset gauge <sup>1)</sup> (s = algebraic sign)

## 1.8 Gauges controlgroup

### 1.8.1 SC1 ... SC6 - Control for gauges 1 to 6

Send: **SCx** [,a,b,c.ccEscc,d.ddEsdd] <CR><LF>

	Description
x	Controlled gauge, x = 1 → Gauge 1 2 → Gauge 2 3 → Gauge 3 4 → Gauge 4 5 → Gauge 5 6 → Gauge 6
a	Gauge switch-on type, a = 0 → Manual (default) 1 → Warm start 2 → External 3 → Via measuring channel 1 4 → Via measuring channel 2 5 → Via measuring channel 3 6 → Via measuring channel 4 7 → Via measuring channel 5 8 → Via measuring channel 6
b	Gauge switch-off type, b = 0 → Manual (default) 1 → Self-monitoring 2 → External 3 → Via measuring channel 1 4 → Via measuring channel 2 5 → Via measuring channel 3 6 → Via measuring channel 4 7 → Via measuring channel 5 8 → Via measuring channel 6
c.ccEscc	Switch-on value (s = algebraic sign)
d.ddEsdd	Switch-off value (s = algebraic sign)

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c.ccEscc,d.ddEsdd <CR><LF>

	Description
a	Gauge switch-on type
b	Gauge switch-off type
c.ccEscc	Switch-on value (s = algebraic sign)
d.ddEsdd	Switch-off value (s = algebraic sign)

## 1.9 General parameters-group

### 1.9.1 BAL - Backlighting

Send: **BAL** [,a] <CR><LF>

	Description
a	Backlighting in percent, a = 0 ... 100 100% is full brightness

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Backlighting

### 1.9.2 BAU - Transmission rate for serial interface (USB)

Send: **BAU** [,a] <CR><LF>

	Description
a	Transmission rate, a = 0 → 9600 Baud (default) 1 → 19200 Baud 2 → 38400 Baud 3 → 57600 Baud 4 → 115200 Baud



Baud rate setting for RS485 interface:

With the "MNEMONIC 3 CHAR" protocol setting, the baud rate is set according to the "BAUDRATE USB" parameter.

With the "AUTOMATIC" or "PFEIFFER VACUUM" protocol setting, the baud rate is fixed at 9600 and cannot be changed.



When changing over, the response is sent with the changed Baud rate already.

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: x <CR><LF>

	Description
a	Transmission rate

## 1.9.3 DCB - Bar graph display

Send: DCB [,a,b] &lt;CR&gt;&lt;LF&gt;

	Description
a	<p>Measuring channel, a =</p> <p>0 → Measuring channel 1</p> <p>1 → Measuring channel 2</p> <p>2 → Measuring channel 3</p> <p>3 → Measuring channel 4</p> <p>4 → Measuring channel 5</p> <p>5 → Measuring channel 6</p>
b	<p>Bar graph display, b =</p> <p>0 → Off (default)</p> <p>1 → Bar graph across entire measuring range of the gauge</p> <p>2 → Bar graph across entire measuring range of the gauge, high display</p> <p>3 → Bar graph across entire measuring range of the gauge and switch point threshold value</p> <p>4 → Bar graph over a decade according to current measured value</p> <p>5 → Bar graph over a decade according to current measured value, high display</p> <p>6 → Bar graph over a decade according to current measured value and switch point threshold value</p> <p>7 → <math>p = f(t)</math>, auto-scaled, 0.2 second/pixel            For each measuring channel, a measured value is stored in the table every 200 ms and the last 100 measured values (=100 pixels) are displayed auto-scaled.            The data range displayed corresponds to a recording duration of 20 seconds.</p> <p>8 → <math>p = f(t)</math>, auto-scaled, 1 second/pixel            For each measuring channel, a measured value is stored in the table every second and the last 100 measured values (=100 pixels) are displayed auto-scaled.            The data range displayed corresponds to a recording duration of 100 seconds.</p> <p>9 → <math>p = f(t)</math>, auto-scaled, 6 seconds/pixel            For each measuring channel, a measured value is stored in the table every 6 seconds and the last 100 measured values (=100 pixels) are displayed auto-scaled.            The data range displayed corresponds to a recording duration of 10 minutes.</p> <p>10 → <math>p = f(t)</math>, auto-scaled, 1 minute/pixel            For each measuring channel, a measured value is stored in the table every minute and the last 100 measured values (=100 pixels) are displayed auto-scaled.            The data range displayed corresponds to a recording duration of 100 minutes.</p> <p>11 → <math>p = f(t)</math>, auto-scaled, 30 minutes/pixel            For each measuring channel, a measured value is stored in the table every 30 minutes and the last 100 measured values (=100 pixels) are displayed auto-scaled.            The data range displayed corresponds to a recording duration of 50 hours.</p> <p>12 → For the selected measuring channel the sensor type and the sensor name are displayed.</p> <p>13 → For the selected measuring channel the sensor type and the assigned switch points are displayed.</p>

Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a,b <CR><LF>

	Description
a	Measuring channel
b	Bar graph display

### 1.9.4 DCC - Display contrast

Send: **DCC** [,a] <CR>[<LF>]

	Description
a	Contrast in percent, a = 0 ... 100 100% is full contrast

Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a <CR><LF>

	Description
a	Contrast

### 1.9.5 DCS - Screensaver

Send: **DCS** [,a] <CR>[<LF>]

	Description
a	Screensaver, a = 0 → Off (default) 1 → After 10 minutes 2 → After 30 minutes 3 → After 1 hour 4 → After 2 hours 5 → After 8 hours 6 → Switches the backlighting off completely after 1 minute

Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a <CR><LF>

	Description
a	Screensaver

### 1.9.6 ERA - Error relay allocation

Send: **ERA** [,a] <CR>[<LF>]

	Description
a	Error relay switch response, a = 0 → Switches with all errors (default) 1 → Device errors only 2 → Sensor 1 error and device error 3 → Sensor 2 error and device error ⋮ 7 → Sensor 6 error and device error

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Error relay switch response

### 1.9.7 EVA - Measuring range end value

Send: **EVA** [,a] <CR>[<LF>]

	Description
a	Measuring range end value display, a = 0 → With a measuring range underrun- or -overrun, UR or OR is displayed (default) 1 → With a measuring range underrun- or -overrun, the corresponding measuring range end value is displayed

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Measuring range end value

### 1.9.8 FMT - Number format (measured value output)

Send: **FMT** [,a] <CR>[<LF>]

	Description
a	Number format (measurement output), a = 0 → Floating point number, if displayable (default) 1 → Exponential display x.xEsy 2 → Exponential display x.xsy

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Number format



### 1.9.9 LNG - Language (user interface)

Send: **LNG** [,a] <CR>[<LF>]

	Description
a	Language, a = 0 → English (default) 1 → German 2 → French

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Language

### 1.9.10 NAD - Node address (device address) for RS485

Send: **NAD** [,a] <CR>[<LF>]

	Description
a	Device address, a = 1 ... 24 (1 = default)

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Device address

### 1.9.11 PRE - Pirani-range expansion

Send: **PRE** [,a] <CR>[<LF>]

	Description
a	Pirani-range expansion, a = 0 → Off (default) 1 → On

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Pirani-range extension



Only TPR/PCR gauges, measuring range up to  $5 \times 10^{-5}$  hPa.

### 1.9.12 PRO - Protocol for serial interface

Send: **PRO** [,a] <CR>[<LF>]

	Description
a	Protocol for serial interfaces, a = 0 → Automatic detection (default) 1 → Pfeiffer Vacuum protocol 2 → Mnemonics protocol

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Protocol for serial interfaces

### 1.9.13 PUC - Measuring underrange control

Send: **PUC** [,a] <CR>[<LF>]

	Description
a	Measuring underrange control, a = 0 → Off (default) 1 → On

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Measuring underrange control

### 1.9.14 SAV - Save default values (EEPROM)

Send: **SAV** [,a] <CR>[<LF>]

	Description
a	Save the parameters on the EEPROM, a = 0 → Save default parameters (default) 1 → Save user parameters (user)

Receive: <ACK><CR><LF>

### 1.9.15 UNI - Unit of measurement

Send: **UNI** [,a] <CR>[<LF>]

	Description
a	Unit of measurement, a =
	0 → mbar/bar
	1 → Torr
	2 → Pascal
	3 → Micron
	4 → hPascal (default)
	5 → Volt

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Pressure unit

## 1.10 Data logger parameters group



This group is only available when a USB memory stick with FAT file system (FAT32) is plugged in. Use memory sticks with ≤32 GB.

### 1.10.1 DAT - Date

Send: **DAT** [,yyyy-mm-dd] <CR>[<LF>]

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: yyyy-mm-dd <CR><LF>

	Description
yyyy-mm-dd	Date in the format yyyy-mm-dd

### 1.10.2 LCM - Start/stop data logger



For further processing of the recorded measurement data (eg with Excel), pay attention to the corresponding decimal separator (comma or dot).

Send: **LCM** [,a,b,c,ddddddd] <CR>[<LF>]

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,ddddddd <CR><LF>

	Description
a	Data logger command, a = 0 → Stop / recording stopped 1 → Start / recording running 2 → Delete / delete measuring data file from USB memory stick
b	Save interval, b = 0 → Recording interval 1/s 1 → Recording interval 1/10 s 2 → Recording interval 1/30 s 3 → Recording interval 1/60 s 4 → Recording interval: For measured value changes ≥1% 5 → Recording interval: For measured value changes ≥5%
c	Decimal separator, c = 0 → , (comma) 1 → . (point)
ddddddd	File name (max. 7 characters)

### 1.10.3 TIM - Time

Send: **TIM** [,hh:mm] <CR>[<LF>]

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: hh:mm <CR><LF>

	Description
hh:mm	Time in the format hh:mm [24 hours]

## 1.11 Setup group



This group is only available when a USB memory stick with FAT file system (FAT32) is plugged in. Use memory sticks with ≤32 GB.

### 1.11.1 SCM - Save/reset parameters (USB)

Send: **SCM** [,a,bb] <CR><LF>  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a <CR><LF>

	Description
a	Setup parameters, a = 0 → Save process complete (read only) 1 → Save process running (read only) 2 → Save parameters from USB memory stick to the device 3 → USB memory stick is formatted 4 → Parameter files (extension .CSV) are deleted from the USB memory stick
bb	Number in file name (0 ... 99)

## 1.12 Test parameters group

(for service technicians)

### 1.12.1 ADC - A/D converter test

Send: **ADC** <CR><LF>  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: aa.aaaa,bb.bbbb,cc.cccc,dd.dddd,ee.eeee,ff.ffff <CR><LF>

	Description
aa.aaaa	A/D converter channel 1 measuring signal [0.0000 ... 11.0000 V]
⋮	⋮
ff.ffff	A/D converter channel 6 measuring signal [0.0000 ... 11.0000 V]

### CDA – Re-calibration

Send: **CDA** [,yyyy-mm-dd] <CR><LF>  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: yyyy-mm-dd <CR><LF>

	Description
yyyy-mm-dd	Date of the next re-calibration. When the date is reached, a warning is displayed.

### 1.12.2 DIS - Display test

Send: **DIS** [,a] <CR><LF>

	Description
a	Display test, a = 0 -> Stop test - display matches operating mode (default) 1 -> Start test - all LEDs on

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: x <CR><LF>

	Description
a	Display test status

### 1.12.3 EEP - EEPROM test

Test of the parameter memory.

Send: **EEP** <CR><LF>

Receive: <ACK><CR><LF>

Send: <ENQ> starts the test (duration <1 s)



Do not repeat the test continuously (EEPROM service life).

Receive: aaaa <CR><LF>

	Description
aaaa	Error word

### 1.12.4 EPR - FLASH test

Test of the program memory.

Send: **EPR** <CR><LF>

Receive: <ACK><CR><LF>

Send: <ENQ> starts the test (very short)

Receive: aaaa,bbbbbbbb <CR><LF>

	Description
aaaa	Error word
bbbbbbbb	Checksum (Hex)

### 1.12.5 HDW - Hardware version

Send: **HDW** <CR><LF>

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: aaaaaa <CR><LF>

	Description
aaaaaa	Hardware version, e.g. 010100

### 1.12.6 IOT - I/O test

**Vorsicht**

Caution: Relays switch independently of pressure  
Starting the test program can result in unintended results on connected control units.

Prevent the triggering of incorrect control commands or messages.  
Unplug the connected measurement and control cables.

Send: **IOT** [,a,bb] <CR>[<LF>]

	Description
a	Status test, a = 0 → Test stopped 1 → Test running
bb	Status of relay (in hex format), bb = 00 → All relays off 01 → Switch function relay 1 on 02 → Switch function relay 2 on 04 → Switch function relay 3 on 08 → Switch function relay 4 on 10 → Switch function relay 5 on 20 → Switch function relay 6 on 40 → Error relay on 7F → All relays on

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,bb <CR><LF>

	Description
a	Status I/O test
bb	Status of relay

Example: 24 = relay switch functions 3 and 6 on

### 1.12.7 LOC - Input lock

Send: **LOC** [,a] <CR>[<LF>]

	Description
a	Input lock, a = 0 → Off (default) 1 → On

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Input lock status

**1.12.8 MAC - Ethernet MAC address**

Send: **MAC** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: aa-aa-aa-aa-aa-aa <CR><LF>

	Description
aa-aa-aa-aa-aa-aa	Ethernet MAC address of the device: 00-A0-41-xx-xx-xx

**1.12.9 PNR - Firmware version**

Send: **PNR** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: aaaaaa <CR><LF>

	Description
aaaaaa	Firmware version, e.g. 010100

**1.12.10 RHR - Operating hours**

Send: **RHR** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a <CR><LF>

	Description
a	Operating hours, e.g. 24 [hours]

**1.12.11 TAI - Test A/D converter, ID resistance**

Send: **TAI** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ> starts the test (very short)  
 Receive: a.aa,b.bb,c.cc,d.dd,e.ee,f.ff <CR><LF>

	Description
a.aa	Identification resistance of gauge 1 [kOhm]
⋮	⋮
f.ff	Identification resistance of gauge 6 [kOhm]

**1.12.12 TAS - Test A/D converter measured value inputs**

Send: **TAS** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a.aaa,a.aaa,a.aaa,a.aaa,a.aaa,a.aaa <CR><LF>

	Description
a.aaa	Measurement voltages for gauges 1 ... 6



### 1.12.13 TKB - Operator keys test

Send: **TKB** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: abcd <CR><LF>

	Description
a	Key 1, a = 0 → Not pressed 1 → Pressed
b	Key 2, b = 0 → Not pressed 1 → Pressed
c	Key 3, c = 0 → Not pressed 1 → Pressed
d	Key 4, d = 0 → Not pressed 1 → Pressed

### 1.12.14 TLC - Torr lock

Send: **TLC** [,a] <CR>[<LF>]

	Description
a	Torr lock, a = 0 → Off (default) 1 → On

Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: a <CR><LF>

	Description
a	Torr lock status

### 1.12.15 TMP - Inner temperature of device

Inner temperature of the TPG 36x.

Send: **TMP** <CR>[<LF>]  
 Receive: <ACK><CR><LF>  
 Send: <ENQ>  
 Receive: aa <CR><LF>

	Description
aa	Temperature (±2 °C) [°C]

### 1.12.16 WDT - Watchdog malfunction

Send: **WDT** [,a] <CR>[<LF>]

	Description
a	Watchdog malfunction, a = 0 -> Manual error acknowledgment 1 -> Automatic error acknowledgment <sup>1)</sup> (default)



<sup>1)</sup> If the watchdog has tripped, the error is automatically acknowledged and cleared after 2 seconds.

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a <CR><LF>

	Description
a	Watchdog malfunction

## 1.13 Other

### 1.13.1 AYT - Device identification

Send: **AYT** <CR>[<LF>]

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,b,c,d,e <CR><LF>

	Description
a	Designation of the measuring device, e.g. TPG366
b	Article number of the measuring device, e.g. PTG28770
c	Serial number of the measuring device, e.g. 44990000
d	Firmware version of the measuring device, e.g. 010100
e	Hardware version of the measuring device, e.g. 010100

### 1.13.2 ETH - Ethernet configuration

Send: **ETH** [,a,bbb.bbb.bbb.bbb,ccc.ccc.ccc.ccc,ddd.ddd.ddd.ddd] <CR>[<LF>]

Receive: <ACK><CR><LF>

Send: <ENQ>

Receive: a,bbb.bbb.bbb.bbb,ccc.ccc.ccc.ccc,ddd.ddd.ddd.ddd <CR><LF>

	Description
a	DHCP (dynamic host configuration protocol), a = 0 -> Static 1 -> Dynamic
bbb.bbb.bbb.bbb	IP address
ccc.ccc.ccc.ccc	Subnet address
ddd.ddd.ddd.ddd	Gateway address

## 1.14 Example Mnemonics



"Send (S)" and "Receive (E)" relate to the host.

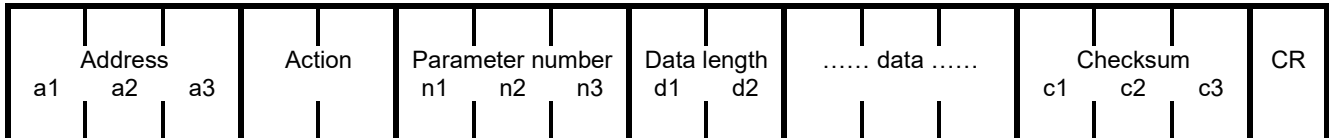
S: <b>TID</b> <CR> [<LF>]	Call of the gauge identification
E: <ACK> <CR> <LF>	Positive feedback
S: <ENQ>	Query
E: TPR/PCR,CMR <CR> <LF>	Output of the gauge types
S: <b>SEN</b> <CR> [<LF>]	Call of the gauge status conditions
E: <ACK> <CR> <LF>	Positive feedback
S: <ENQ>	Query
E: 0.0 <CR> <LF>	Output of the gauge status conditions
S: <b>SP1</b> <CR> [<LF>]	Call of the parameters of the switching function 1
E: <ACK> <CR> <LF>	Positive feedback
S: <ENQ>	Query
E: 2,1.0000E-09,9.0000E-07 <CR> <LF>	Output of the threshold values
S: <b>SP1</b> ,2,6.80E-3,9.80E-3 <CR> [<LF>]	Change in the threshold values of switching function 1
E: <ACK> <CR> <LF>	Positive feedback
S: <b>FOL</b> ,1,2 <CR> [<LF>]	Change in the filtering (syntax error)
E: <NAK> <CR> <LF>	Negative feedback
S: <ENQ>	Query
E: 0001 <CR> <LF>	Output of the ERROR word
S: <b>FIL</b> ,1,2 <CR> [<LF>]	Change in the filtering
E: <ACK> <CR> <LF>	Positive feedback
S: <ENQ>	Query
E: 1.2 <CR> <LF>	Output of the filter stages

## 2 Pfeiffer Vacuum protocol

### 2.1 Telegram frame

The Pfeiffer Vacuum protocol uses ASCII format. In other words, all data bytes are displayable characters with an ASCII code between 32 and 127 with the exception of the telegram end character carriage return (CR, ASCII 13).

The transmitted telegrams are located in a frame designed as follows, without exceptions:



#### Address

Address of the triggered device or responding device (slave), e.g. "042".

A separate address is assigned to the controller and to each measuring channel ("aab"):

- aa: Address of the controller [1 ... 24] (factory setting: 01)
- b: Channel number {1, 2, 3, 4, 5, 6}

Ranges for measuring channel addresses: 011 ... 246 (factory setting: 011 for channel 1, 012 for channel 2, 013 for channel 3, etc.).

Parameters independent of the measuring channel (e.g. device address, operating hours) are triggered via the channel number b = 0 (e.g. "200" for controller 20).

#### Action

"00" = Read parameters (from master to slave).

"10" = Write parameters (from master to slave), or transmit queried parameter value (from slave to master), or confirm written parameter value (from slave to master).

#### Parameter number

Number of the affected parameter, e.g. "303".

#### Data length

E.g. "06" for 6 characters, corresponds to the length of the "Data" field.

#### Data

Data in the corresponding data type (→ 38).

#### Checksum

Total of all ASCII characters up to before checksum modulo 256 (decimal). E.g. total = 786, 786 modulo 256 = 18. I.e. checksum = "018" (converted into ASCII string).

#### CR

carriage return (ASCII character 13) = telegram end.

Due to the master/slave response, data exchange always runs according to the schema: master sends (either control command or query), slave answers (acknowledgment or sending of data/error messages).

## 2.2 Telegrams

### 2.2.1 master telegrams

The device undertaking the communication (master, e.g. PC) can send three different telegrams.

Read parameters:

a1	a2	a3	0	0	n1	n2	n3	0	2	=	?	c1	c2	c3	CR
----	----	----	---	---	----	----	----	---	---	---	---	----	----	----	----

Write parameters:

a1	a2	a3	1	0	n1	n2	n3	d1	d2	.....data.....	c1	c2	c3	CR
----	----	----	---	---	----	----	----	----	----	----------------	----	----	----	----

### 2.2.2 slave telegrams

The slave device cannot start any communication itself, and only answers when it is triggered with a valid individual address. The following telegrams are possible:

Data response / control command understood:

a1	a2	a3	1	0	n1	n2	n3	d1	d2	.....data.....	c1	c2	c3	CR
----	----	----	---	---	----	----	----	----	----	----------------	----	----	----	----

The control command is valid and is processed by the slave. The sent data is used, and the telegram therefore looks exactly the the same as the control command.

Error message:

a1	a2	a3	1	0	n1	n2	n3	0	6	N	O	_	D	E	F	c1	c2	c3	CR
										-	R	A	N	G	E				
										-	L	O	G	I	C				

- "NO\_DEF" Parameter number does not exist
- "\_RANGE" Data outside the permitted range
- "\_LOGIC" Logical access error, e.g. writing of a read-only parameter

## 2.3 Data types

Depending on the content of the parameters, the data field can have different formats. The following data types are possible:

Data type	Description	Length	Example
0 – boolean_old	False / true in the form of six zeros (ASCII 48) or ones (ASCII 49)	6	000000 = false 111111 = true
1 – u_integer	Six-digit integer without algebraic sign (leading zeros)	6	000042 123456 001200
2 – u_real	Fixed number of decimal points with four digits before the point and two after the point, normalized to 0.01 (leading zeros)	6	001570 = 15.70 000020 = 0.2
4 – string	Any character string with ASCII characters $\geq 32$ (decimal)	6	Hallo! TC_600
6 – boolean_new	False / true in the form of one zero (ASCII 48) or ones (ASCII 49)	1	0 = false 1 = true
7 – u_short_int	Three-digit integer without algebraic sign (leading zeros)	3	123 042 007
10 – u_expo_new	Positive exponential number. The first four digits contain the mantissa multiplied by 1000, and the last two contain the exponents with an offset of 20	6	100023 = 1.000E3 456711 = 4.567E-9
11 – string16	String	16	44991234 PT G28 770

## 2.4 Parameters

Sub-address xx0 = measuring channel of independent parameters  
 xx1 = measuring channel 1 parameter  
 xx2 = measuring channel 2 parameter  
 ⋮  
 xx6 = measuring channel 6 parameter

Display Display on Pfeiffer Vacuum control unit

Access type R = read, W = write

# corresponds to ASCII 32~ corresponds to ASCII 127

Parameter no.	Sub-address	Designation	Description	Data type	Access type	Unit	Min. value	Max. value
008	xx0	Keys locked	0: Keys enabled 1: Keys locked	0	RW	####	000000	111111
040	xx1	Degas Sensor 1	W0/1: Deactivate/activate DeGas R:0/1: Status (0: not active, 1: active) DeGas deactivates automatically after the relevant time elapses	6	RW	####	0	1
	xx2	Degas Sensor 2						
	xx3	Degas Sensor 3						
	xx4	Degas Sensor 4						
	xx5	Degas Sensor 5						
	xx6	Degas Sensor 6						
041	xx1	Gauge 1 on/off	0: off 1: on 3: switch on/off via gauge on subsequent channel:  Gauge on channel 1 via gauge on channel 2 Gauge on channel 2 via gauge on channel 3 Gauge on channel 3 via gauge on channel 4 Gauge on channel 4 via gauge on channel 5 Gauge on channel 5 via gauge on channel 6 Gauge on channel 6 via gauge on channel 1	7	RW	####	000	003
	xx2	Gauge 2 on/off						003
	xx3	Gauge 3 on/off						003
	xx4	Gauge 4 on/off						003
	xx5	Gauge 5 on/off						003
	Xx6	Gauge 6 on/off						003
045	xx0	Configuration of relay 1	9: always passive 10: always active 19: Sensor 1 threshold value underrun 20: Sensor 2 threshold value underrun 21: Sensor 3 threshold value underrun 22: Sensor 4 threshold value underrun 23: Sensor 5 threshold value underrun 24: Sensor 6 threshold value underrun The sensor 1/2/3/4/5/6 threshold value is only accessible via the display, or MNE protocol (SPx)	7	RW	####	009	24
046	xx0	Configuration of relay 2						
047	xx0	Configuration of relay 3						
048	xx0	Configuration of relay 4						
066	xx0	Configuration of relay 5						
067	xx0	Configuration of relay 6						
303	xx0	TPG error						
	xx1	Sensor 1 error	XXX stands for the error or warning number (e.g. "Err042)					
	xx2	Sensor 2 error						
	xx3	Sensor 3 error	"Wm036" = device not calibrated					
	xx4	Sensor 4 error	"Err107" = sensor error /hardware faulty					
	xx5	Sensor 5 error						
	xx6	Sensor 6 error						
312	xx0	Firmware version TPG366	E.g. "010100": first firmware version	4	R	####	#####	~~~~~
314	xx0	TPG366 operating hours	Remains the same when the max. value is reached (where applicable <999999)	1	R	h###	000000	999999
349	xx0	TPG366 device name	"TPG366"	4	R	####	#####	~~~~~
	xx1	Sensor 1 device name	"TPR###" or					
	xx2	Sensor 2 device name	"IKR###" or					
	xx3	Sensor 3 device name	"PKR###" or					
	xx4	Sensor 4 device name	"PBR###" or					
	xx5	Sensor 5 device name	"IMR###" or					
	xx6	Sensor 6 device name	"CMR###" or "PCR" or "APR" or "noSENS" or "noID##"					
354	xx0	TPG hardware version	E.g. "010100": first hardware version	4	R	####	#####	~~~~~
355	xx0	Serial number	E.g. "44991234"	11	R	####	#####	~~~~~
388	xx0	Order number	E.g. "PT G28 770"	11	R	####	#####	~~~~~
730	xx1	Sensor 1 switch-on threshold	Range 1E-5 ... 1 hPa Pressure always in hPa, regardless of the unit used on the display	10	RW	hPa#	100015	100020
	xx2	Sensor 2 switch-on threshold						
	xx3	Sensor 3 switch-on threshold						
	xx4	Sensor 4 switch-on threshold						
	xx5	Sensor 5 switch-on threshold						
	xx6	Sensor 6 switch-on threshold						

Parameter no.	Sub-address	Designation	Description	Data type	Access type	Unit	Min. value	Max. value
732	xx1	Sensor 1 switch-off threshold	Range 1E-5 ... 1 hPa Pressure always in hPa, regardless of the unit used on the display	10	RW	hPa#	100015	100020
	xx2	Sensor 2 switch-off threshold						
	xx3	Sensor 3 switch-off threshold						
	xx4	Sensor 4 switch-off threshold						
	xx5	Sensor 5 switch-off threshold						
	xx6	Sensor 6 switch-off threshold						
740	xx1	Sensor 1 actual pressure value	R supplies current pressure value (000000: underrange, 999999: overrange) W writes the offset value (this is taken from the current pressurevalue) Pressure always in hPa, regardless of the unit used on the display	10	RW	hPa#	000000	999999
	xx2	Sensor 2 actual pressure value						
	xx3	Sensor 3 actual pressure value						
	xx4	Sensor 4 actual pressure value						
	xx5	Sensor 5 actual pressure value						
	xx6	Sensor 6 actual pressure value						
742	xx1	Sensor 1 correction value	0.10 ... 10.00, or analogue display	2	RW	####	000010	001000
	xx2	Sensor 2 correction value						
	xx3	Sensor 3 correction value						
	xx4	Sensor 4 correction value						
	xx5	Sensor 5 correction value						
	xx6	Sensor 6 correction value						
797	xx0	TPG device address	{010, 020, 030, ... 240}	1	RW	####	000010	000240



## Appendix

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