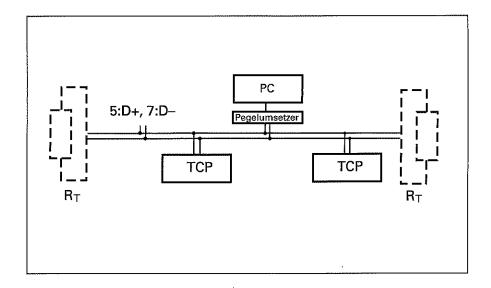
Pfeiffer Vacuum-Protokoll Pfeiffer Vacuum Protocol



Schnittstelle RS 232, RS 485 Interface RS 232, RS 485



PM 800 488 BN/C (0309)

1. Pfeiffer Vacuum Protocol

The Pfeiffer Vacuum Protocol is in ASCII format which means that all data bytes are representable symbols with an ASCII code \geq 32* with the exception of the telegram final symbol carriage return (CR, 13). The transmitted telegrams are located, without exception, within the following frameworks:

٦

7

| Genera | Protocol | : |
|--------|----------|---|
|--------|----------|---|

| Adress Action | Parameter Number Data Length Data Checksum CR |
|-------------------|---|
| Adress: | Adress of the unit addressed or answering, for example "042": The addresses are distinguished as follows: • Individual addresses: Only specific component is addressed. • Group addresses: All components of a group, for example all TCM 1601. • Global address: Address "000", all Pfeiffer Vacuum components are addressed. |
| Action: | "00" = Read parameter "10" = Describe parameter |
| Parameter number: | Number of the relevant parameter, for example "303". |
| Data length: | For example "06" for six symbols, corresponds to the length of the field "Data". |
| Data: | Data in ASCII format. Format and size of the data are guided by the following considerations: |
| | Transmission of values ⇒ <u>2.1 master telegrams and 3. data formats</u> Data request ⇒ <u>2.2 slave telegrams and 3. data formats</u> Error messages ⇒ <u>2.2 slave telegrams</u> |
| Checksum: | The sum of all ASCII symbols up to preceding checksum modulo 256 (decimal), for example sum = 786. 786 modulo 256 = $18 \Rightarrow$ Checksum = "018" (converted into ASCII string). |
| CR: | Carriage return (ASCII symbol 13). |

As a result of the master/slave behaviour, data exchange always proceeds on the pattern: Master transmits (either position request or request). Slave answers (confirmation or transmission of data/error messages):

2. Telegrams

2.1 Master-Telegrams

The component accepting the communication (master, for example PC) can send two different telegrams:

| Posi | <u>itíon r</u> | eques | st: | | | | | | | | | | | | | | | | |
|---------|------------------------|-------|-----|------|-------|---------|-------|--------|--------|----|-----|----|--------|----|----|----|--------|----|----|
| a1 | a2 | a3 | 1 | 0 | п1 | n2 | п3 | d1 | d2 | 3 | - | D | ata | | | c1 | c2 | c3 | CR |
| | Addres: requ | | Ac | tion | Parar | neter N | umber | Data I | _ength | | | D | ata | | | С | hecksu | m | CR |
| a1 | a2 | a3 | 0 | 0 | n1 | n2 | п3 | 0 | 2 | 11 | ? | c1 | c2 | c3 | CR | | | | |
| Address | | | Ac | tion | Parar | neter N | umber | Data I | ength | Da | ata | C | hecksu | ım | CR | | | | |

2.2. Slave-Telegrams

The slave component (for example, Pfeiffer drive unit) cannot independently begin a communication and only answers when it is addressed with a valid individual address. Components which are addressed via the group or global address do not answer. The following telegrams are possible:

*all terms decimal

| a1 | a2 | a3 | 1 | 0 | n1 | n2 | n3 | d1 | d2 | | | D | ata | | | c1 | c2 | c3 | CR |
|---|--|--|---|---|--|---|--|--|--|-------------|---------------|-----------------------|----------------------------------|------------------|-------------------|------------------|---|----------------------------|--|
| | Address | s | Ac | tion | Paran | l neter N | umber | Data | length | | | D | ata | | | L | hecksu | l m | CR |
| Con | firmat | tion o | f the i | receiv | ed po | sitio | n requ | Jest (I | positi | /e res | pons | e to " | Positi | on re | quest | ·"): | | | |
| a1 | a2 | a3 | 1 | 0 | n1 | n2 | n3 | d1 | d2 | | · | | ata | | , I | c1 | c2 | c3 | CR |
| | Address | 5 5 | Ac | tion | Paran | neter N | umber | Data | length | L | | Di | ata | | | C | i hecksu | m m | CR |
| A co | nfirm | ation | of the | e rece | eived | posit | ion re | aues | t mea | ins oi | nly at | first | that th | ne tele | egran | n tran | smitt | ed by | , the r |
| | been heck, | | | | | | | | | | | ent p | ermits | an a | lterat | ion, t | his wi | ill be | execl |
| | | | | | | | • | | ile he | liant | 5161. | | | | | | | | |
| a1 | paran a2 | a3 | | | n1 | n2 | nessa | age): | 6 | N | 0 | <u> </u> | D | Е | F | c1 | c2 | c3 | CR |
| | Address | 1 | Act | | | neter Ni | | | length | | | | ata | | | | hecksu | | CR |
| | | | | | | | | | • | | | | ara | | | Ŭ | HECKSU | | υn |
| a1 | a2 | a3 | ta are | outs 0 | n1 | n2 | n3 | rang | je (er i 6 | or me | essag | e): A | N | G | E | c1 | c2 | ദ | CR |
| | Address | | | tion | | neter N | | | lenath | - | | 1 | ata | | <u> </u> | <u> </u> | hecksu | | CR |
| | | | | | | | | | | 61a | | | | | | | HIGUNSU | | ON |
| L og i a1 | a2 | a3 | exan | | ne wi | n2 | or an | | reada | | | o er, e | G G | iessa | ge: c | c1 | c2 | c3 | CR |
| | Address | | Aci | tion | Paran | neter N | umber | Data | length | | | <u> </u> | ata | | | <u> </u> | hecksu | | CR |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | r aran | | | | | | | | | | | • | | | |
| 2.3. | Teleç | | | nples | 5 | | | | | | | | | | | - | | | |
| 2.3. Rea | ding t | he ac | ctual i | nples | 5 | | | | | | | | | | | ~ | | | |
| 2.3. Rea mas | ding t ter ⇒ | he ad slave | tual i | nples rotatio | s on sp | eed: | | <u>F</u> | 2 | | 2 | | 1 | 2 | CR | - | | | |
| 2.3. Rea mas | ding t ter ⇔ 2 | he ao slave 3 | tual i | n ples otatio | s on sp 3 | eed: | 9 | 0 | 2 Ienath | | ? | 1 | 1 | 2 | CR | | | | |
| 2.3. Rea mas | ding t ter ⇒ | he ac slave 3 | otual i 0 Act | n ples otatio | s on sp 3 | eed: | 9 | 0 | 2 length | | ? ata | | 1 hecksu | | CR CR | | | | |
| 2.3. Rea mas | ding t ter ⇒ 2 Address | he ac slave 3 | otual i 0 Act | n ples otatio | s on sp 3 | eed: | 9 | 0 | | | | | | | | 0 | 3 | 7 | CR |
| 2.3. Rea mas | ding t ter ⇔ 2 Address e ⇔ m | he ac slave 3 aster 3 | o O Act | otatic | 3 Paran 3 | eed: 0 neter Ni | 9 umber 9 | 0 Data 0 | length | Da |) ata | 0 | hecksu | n | CR | 0 | | 7 | CR |
| 2.3. Rea mas | ding t ter ⇒ 2 Address e ⇒ m 2 | he ad slave 3 aster 3 | o Act Act | otatic otatic ion 0 ion | 3 Paran 3 Paran | eed: 0 neter Ni 0 neter Ni | 9 umber 9 umber | 0 Data 0 Data | length 6 length | Da O |) ata | 0 | hecksur 6 | n | CR | 0 | 3 | 7 | |
| 2.3. Rea 1 slav | ding t ter ⇔ 2 Address e ⇔ m 2 Address | he ac slave 3 aster 3 the n | o Act Act Act | otatic otatic ion 0 ion | 3 Paran 3 Paran | eed: 0 neter Ni 0 neter Ni | 9 umber 9 umber | 0 Data 0 Data | length 6 length | Da O |) ata | 0 | hecksur 6 | n | CR | 0 | 3 | 7 | |
| 2.3. Rea 1 slav | ding t ter ⇔ 2 Address e ⇔ m 2 Address | he ac slave 3 aster 3 the n | o Act Act Act | otatic otatic ion 0 ion | 3 Paran 3 Paran | eed: 0 neter Ni 0 neter Ni | 9 umber 9 umber | 0 Data 0 Data | length 6 length | Da O |) ata | 0 | hecksur 6 | n | CR | 0 | 3 | 7 | |
| 2.3. Rea 1 slave 1 Adju mas | ding t ter ⇔ 2 Address e ⇔ m 2 Address sting ter ⇔ | he ac slave aster 3 the n slave | o Act Act Act | onples rotation ion ion num s | 3 Paran 3 Paran tart-u 7 | eed: 0 neter Ni neter Ni ip tim | 9 umber 9 umber e to 1 | 0 Data 0 Data 12 min | length 6 length nutes | 0 | ata 0 | 0 0 0 | hecksur 6 ata | n 3 | CR 3 | 0 | 3 hecksu | 7 m 8 | CR |
| 2.3. Rea 1 slav 1 Adju mas | ding t ter ⇒ 2 Address e ⇒ m 2 Address sting ter ⇒ 0 | the n slave aster 3 the n slave | ctual r 0 Act 1 Act naxim | onples rotation ion ion num s | 3 Paran 3 Paran tart-u 7 | eed: 0 neter Ni 0 up tim 0 | 9 umber 9 umber e to 1 | 0 Data 0 Data 12 min | length 6 length nutes 6 | 0 | ata 0 | 0 0 0 | hecksur 6 ata 0 | n 3 | CR 3 | 0 | 3 hecksu 1 | 7 m 8 | CR CR |
| 2.3. Rea 1 slav 1 Adju mas | ding t ter \Rightarrow 2 Address e \Rightarrow m 2 Address isting ter \Rightarrow 0 Address | the n slave aster 3 the n slave | ctual r 0 Act 1 Act naxim | onples rotation ion ion num s | 3 Paran 3 Paran tart-u 7 | eed: 0 neter Ni 0 up tim 0 | 9 umber 9 umber e to 1 | 0 Data 0 Data 12 min | length 6 length nutes 6 | 0 | ata 0 | 0 0 0 | hecksur 6 ata 0 | n 3 | CR 3 | 0 | 3 hecksu 1 | 7 m 8 | CR CR |
| 2.3. Rea 1 slave 1 Adju mas 0 | ding t ter \Rightarrow 2 Address e \Rightarrow m 2 Address isting ter \Rightarrow 0 Address \Rightarrow ma | the action of th | atual r 0 Act Act Act | ion 0 ion 0 ion 0 ion | 3 Paran 3 Paran tart-u 7 Paran 7 | eed: 0 neter Ni 10 10 10 11 11 11 11 11 11 11 | 9 umber e to 1 0 umber | 0 Data 0 Data 2 mii 0 Data 0 | length 6 length nutes 6 length | 0 0 | ata 0 0 | 0 D: D: D: | hecksur 6 ata 0 ata | n 3 1 | CR 3 2 | 0 0 0 | 3 hecksu 1 hecksu | 7 m 8 m | CR CR CR |
| 2.3. Rea 1 slav 1 Adju nas 0 Swit | ding t ter ⇔ 2 Address e ⇔ m 2 Address ter ⇒ 0 Address ching ching | the ac slave aster 3 the n slave 1 ster: 1 | o Act Act Act Act Act | ion 0 ion 0 ion 0 ion 0 ion | 3 Paran 3 Paran tart-u 7 Paran 7 | eed: 0 neter No 0 neter No 0 0 | 9 umber e to 1 0 umber | 0 Data 0 Data 2 mii 0 Data 0 | length 6 length nutes 6 length 6 | 0 0 | ata 0 0 | 0 D: D: D: | 6 ata 0 ata | n 3 1 | CR 3 2 | 0 0 0 | 3 hecksu hecksu | 7 m 8 m | CR CR CR CR |
| 2.3. Rea mas 1 slave 0 slave 0 Swit | ding t ter \Rightarrow 2 Address e \Rightarrow m 2 Address ter \Rightarrow 0 Address ching ter \Rightarrow | the ac slave aster 3 the n slave 1 ster: 1 ster: 1 | atual r 0 Act 1 Act 1 Act 1 Act | ion 0 ion 0 ion 0 ion 0 ion 0 ion | 3 Paran 3 Paran tart-u 7 Paran 7 Paran | eed: 0 neter Ni 0 neter Ni 0 neter Ni | 9 umber e to 1 0 umber 0 umber | 0 Data 0 Data 12 min 0 Data 0 Data | length 6 Iength 6 Iength 6 Iength | 0 | ata 0 0 | 0 D: 0 D: | 6 ata 0 ata | n 3 1 | CR 3 2 | 0 0 0 0 | 3 hecksu 1 hecksu 1 hecksu | 7 m 8 m | CR CR CR CR CR |
| 2.3. Rea 1 slave 1 Adju mas 0 Switt mas 0 | ding t ter ⇔ 2 Address e ⇔ m 2 Address sting ter ⇔ 0 Address ching ter ⇒ 4 | the ac slave 3 aster 3 the n slave 1 3 on th slave 2 | 1 Act Act Act Act | ion 0 ion 0 ion 0 ion 0 ion 0 ion | 3 Paran 3 Paran tart-u 7 Paran 7 Paran 0 | eed: 0 neter No 0 neter No 0 neter No 2 | 9 umber e to 1 umber 0 umber 3 | 0 Data 0 Data 2 mii 0 Data 0 Data 0 | length 6 length nutes 6 length 6 length | 0 0 | ata 0 0 | 0 0 0 0 0 | 6 ata 0 ata 0 ata | n 3 1 | CR 3 2 | | 3 hecksu hecksu hecksu | 7 m 8 m 4 | CR CR CR CR CR CR |
| 2.3. Rea 1 slav 1 Adjt nas 0 Swit | ding t ter \Rightarrow 2 Address e \Rightarrow m 2 Address ter \Rightarrow 0 Address ching ter \Rightarrow | the ac slave 3 aster 3 the n slave 1 3 ster: 1 3 on th slave 2 | atual r 0 Act 1 Act 1 Act 1 Act | ion 0 ion 0 ion 0 ion 0 ion 0 ion | 3 Paran 3 Paran tart-u 7 Paran 7 Paran 0 | eed: 0 neter Ni 0 neter Ni 0 neter Ni | 9 umber e to 1 umber 0 umber 3 | 0 Data 0 Data 2 mii 0 Data 0 Data 0 | length 6 Iength 6 Iength 6 Iength | 0 | ata 0 0 | 0 0 0 0 0 | 6 ata 0 ata | n 3 1 | CR 3 2 | | 3 hecksu 1 hecksu 1 hecksu | 7 m 8 m 4 | CR CR CR CR CR |
| 2.3. Rea 1 slav 1 Adjt 0 Swit nas 0 | ding t ter ⇔ 2 Address e ⇔ m 2 Address sting ter ⇒ 0 Address ching ter ⇒ 4 Address | the ac slave 3 aster 3 the n slave 1 3 ster: 1 3 on th slave 2 | 1 Act Act Act Act | ion 0 ion 0 ion 0 ion 0 ion 0 ion | 3 Paran 3 Paran tart-u 7 Paran 7 Paran 0 | eed: 0 neter No 0 neter No 0 neter No 2 | 9 umber e to 1 umber 0 umber 3 | 0 Data 0 Data 2 mii 0 Data 0 Data 0 | length 6 length nutes 6 length 6 length | 0 | ata 0 0 | 0 0 0 0 0 | 6 ata 0 ata 0 ata | n 3 1 | CR 3 2 | | 3 hecksu hecksu hecksu | 7 m 8 m 4 | CR CR CR CR CR CR |
| 2.3. Rea <u>mas</u> 1 1 Adju <u>mas</u> 0 Swit <u>mas</u> 0 Swit | ding t ter \Rightarrow 2 Address e \Rightarrow m 2 Address ter \Rightarrow 0 Address ching ter \Rightarrow 4 Address \Rightarrow ma \Rightarrow | he ac slave 3 aster 3 the n slave 1 3 ster: 2 | atual r 0 Act 1 Act 1 Act 1 Act | ion 0 ion 0 ion 0 ion 0 ion 0 ion 0 ion 0 ion 0 ion | 5 Dn Sp 3 Paran 3 Paran tart-u 7 Paran 7 Paran 0 Paran 0 Paran | eed: 0 neter No 0 neter No 0 neter No 2 neter No | 9 umber e to 1 0 umber 0 umber 3 umber | 0 Data 0 Data 12 min 0 Data 0 Data 0 Data 0 | length 6 Iength 6 Iength 6 Iength 6 Iength | 0 0 0 | ata 0 0 | | 6 ata 0 ata 1 ata | n 3 1 1 | CR 3 2 2 | | 3 hecksu 1 hecksu 2 hecksu | 7 m 8 m 4 m | CR CR CR CR CR CR CR |

3. Data Formats _____

Depending on the content of the parameter, the data field can present various formats. The following data types are possible:

| Data type | Description | Size in symbols | Examples |
|-----------------|--|--------------------|---|
| 0 - boolean_old | true / false in the form six zeros (ASCII 48) or ones (ASCII 49) | 6 | 000000 corresponds to false 111111 corresponds to true |
| 1 - u_integer | pre-symbol-less integer number with six positions (leading zeros) | 6 | 000042 123456 001200 |
| 2 - u_real | fixed comma number with four positions before and two after the comma standardised to 0.01 (leading zeros) | 6 | 001570 corresponds to 15,70 000020 corresponds to 0,2 |
| 3 - u_expo | positive exponential number (leading zeros) | 6 | 1.2E-2 corresponds to 1,2x10 ⁻² 0005E8 corresponds to 5x10 ⁸ |
| 4 - string | optional symbol chain with ASCII symbols ≥ 32 (decimal) | 6 | hallo! TC_600 hgnrfx |
| 5 - vector | several parameter numbers n with values starting with the number of the following parameters (two positions) | n | 02001000000702120 |
| 6 - boolean_new | true/false in the form of a zero (ASCII 48) or one (ASCII 49) | 1 | 0 corresponds to false 1 corresponds to true |
| 7 - u_short_int | pre-symbol-less integer number with three positions (leading zeros | 3 | 123 042 007 |
| 9 - tms_old | TMS control status, first three bytes boolean, last three bytes u-short-int | 6 | 000037 control off, temp = 37°C 111119 control on, temp = 119°C |
| 10 - u_expo_new | Positive exponential number; the first four numbers includes the mantissa multiplied with 1000, the last both the exponent with Offset 20 | 6 | 100023 corresponds to 1.000E3 456711 corresponds to 4.567E-9 |
| 11 - string16 | any character string with ASCII-codes ≥ 32 (decimal) | 16 | BrezelBier&Wurst 0123456789ABCDEF |
| 12 - string8 | any character string with ASCII-codes ≥ 32 (decimal) | 8 | Pfeiffer 01234567 >Vacuum< |

9

t_n

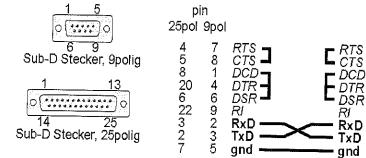
4. General Information On The Serial Interface .

The configuration of the serial interface topology, cables and plugs etc. is, for the most part, user specific. However, the following sections will serve as a useful aid.

4.1. RS 232

The Serial Interface RS 232 was originally designed as a modem connection and has at its disposal therefore many more signals than are required in many applications without modem. As a rule, the two data cables TxD and RxD related to mass are sufficient.

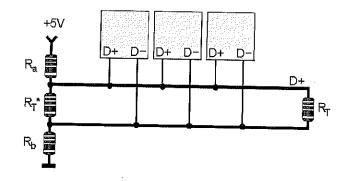
However, some other signal cables must also be provided with defined levels so as not to simulate current signals on the RS232 driver component where



applications without modem are involved. With this type of serial interface only a point to point connection from precisely two components is possible. Illustration 1 shows an example of an RS232 connection. The use of shielded cable is recommended. The bus terminal resistances are often integrated in the driver components. The normal plugs are Sub-D 9 pole or 25 pole.

4.2. RS 485

The RS 485 Serial Interface allows up to 32 components to be connected with each other via two cables whereby never more than one component is able to transmit at any one time. All components are connected with the D+ cable via their D+ connection (or DO/RI) and their Dconnection (or DO/RI) via the D- cable. Because several components can be connected to the bus, normally no bus terminal resistances are integrated in the driver components. These have to be connected to the two furthest ends of the



bus. The values of the resistances are determined by the wave impedance of the cable in use. To ensure optimal bus driver functioning, the inactive bus must be maintained at a voltage range of 200 mV (logical 1) via external wiring.

For practical purposes the resistance values are in the range $R_a=R_b=680 \Omega_{,,} R_T=120 \Omega_{,}$ and $R_T^*=130 \Omega_{,}$ for transposed, shielded, two wire cables (see illustration 2). With respect to bus topology a main cable with the shortest possible dead end feeder is recommended.