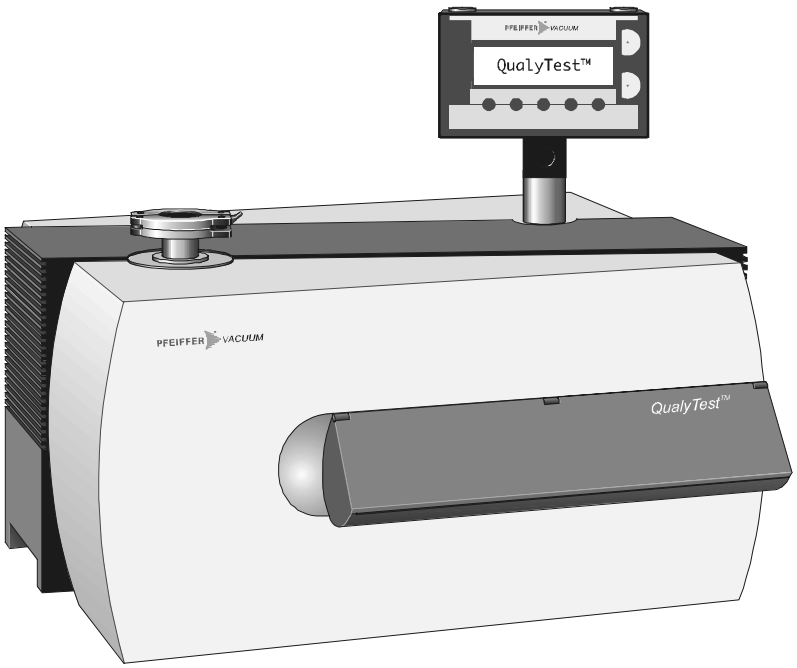
PFEIFFER VACUUM

QualyTest™
QualyTest™ Select
QualyTest™ Dry
QualyTest™ Dry+

Helium leak detector

HLT 260
HLT 265
HLT 270
HLT 275



CE

Product identification

→ 🕮 QualyTest™ BG 805 263 BE / A

Validity

This document applies to products with part number

QualyTest™

BG Z08 000	(HLT 260, 230 VAC, with rotary vane pump UNO 005 A)
BG Z08 001	(HLT 260, 120 VAC, with rotary vane pump UNO 005 A)
BG Z08 002	(HLT 260, 100 VAC, with rotary vane pump UNO 005 A)

QualyTest™Select

BG Z08 020	(HLT 265, 100 … 230 VAC, with customer supplied roughing pump)

QualyTest™Dry

BG Z08 010	(HLT 270, 230 VAC, with diaphragm pump MVP 035)
BG Z08 011	(HLT 270, 120 VAC, with diaphragm pump MVP 035)
BG Z08 012	(HLT 270, 100 VAC, with diaphragm pump MVP 035)

QualyTest™Dry+

BG Z08 015	(HLT 275, 230 VAC, with Cart for QualyTest™ and scroll pump 600 DS)
BG Z08 016	(HLT 275, 100 … 120 VAC, with Cart for QualyTest™ and scroll pump 600 DS)

The part numbers can be found on the nameplate.

This document is based on the firmware versions

2.9	(Basic unit MC 68)
2.9	(Removable control display RC 260)

If the unit does not function as described check that your unit is equipped with these firmware versions (→ 🕮 QualyTest™ BG 805 263 BE / A).

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

Intended use

This document describes the communication protocol for operating the QualyTest™ via the RS232C serial interface.

Contents

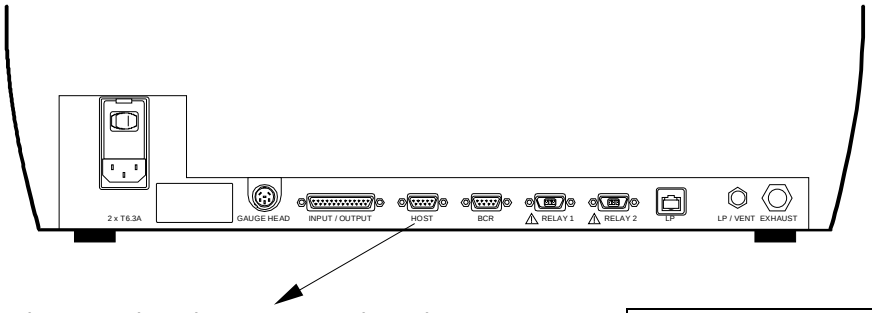
For cross-references to pages within this manual the symbol (→ 🗎 XY) is used, for references to other documents the symbol (→ 🕮 [Z]).

1 RS232C interface

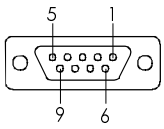
The HOST interface is used for communication between the QualyTest™ and a computer. A terminal can be connected for test purposes.

1.1 Connection

HOST connector



View toward QualyTest™



HOST

D subminiature connector
9 poles, female

Pin assignment

Pin 1:	Not used
Pin 2:	TXD
Pin 3:	RXD
Pin 4:	Not used
Pin 5:	GGND
Pin 6:	Not used
Pin 7:	Not used
Pin 8:	Not used
Pin 9:	Not used

Housing: screening

Note

To ensure EMC, use screened cables only.

1.2 Configuration

Use the QualyTest™ default values for normal operation:

Baud rate:	9600
Number of bits:	8 data bits, 1 stop bit
Parity:	none

For other settings:

→ 🕮 QualyTest™ BG 805 263 BE / A, Section "Setup/Interfaces/Host".

After switching on, the equipment designation is displayer and the self-test is performed.
After completing the self-test the message ”QualyTest™” is dixplayed.
To the interface “Host” will be sent:

QualyTest Host, Version V2.9

1.3 Abbreviations and symbols

Symbol	Explanation
HOST	Computer or terminal
ASCII	American Standard Code for Information Interchange
ENQ	ASCII 05_h
Transmit	Data transfer from HOST to QualyTest™
Receive	Data transfer from QualyTest™ to HOST

2 Protocol

2.1 Communication

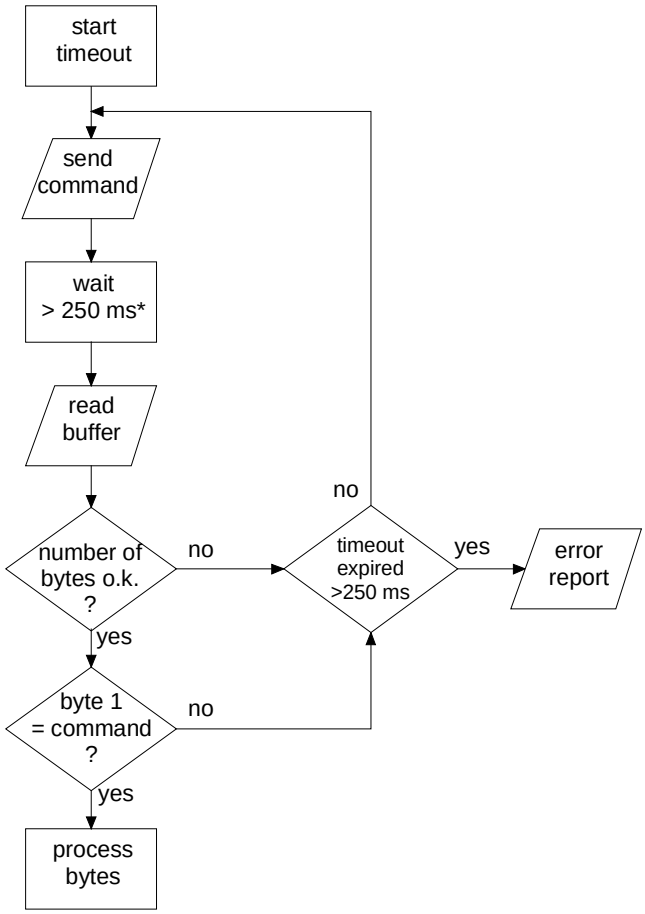
HOST QualyTest™

ENQ + Command code + parameters ——————>

<—————— Command code + parameters

Command codes → 🗎 6, Examples → 🗎 11

Flow diagram (suggested)



* Reading of measuring values (command code:2; leak rate) is possible every 50 ms!

2.2 Error handling

All command strings received are verified in the QualyTest™:

- If o.k. the command code is echoed
- If not o.k. the QualyTest™ transmits a negative acknowledgment <FF_h>

2.3 Data types

Data format:

FLOAT	4 bytes, according to IEEE 754 ($\pm 10^{\pm 38}$)
LONGINT	4 bytes, signed integer LSB … MSB
INTEGER	2 bytes, signed integer L-Byte, H-Byte (–32768 … 32767)
BYTE	1 byte, signed integer (–128 … +127)
UBYTE	1 byte, unsigned integer (0 … 255)
BOOL	1 byte, 0 = FALSE, otherwise TRUE

3 Command codes

3.1 General

Dec	Hex		Description	Data format / Comment
10	0A	CurrentState	Supplies information on state	Byte 0 State (BYTE): 0 Init 1 Preparing vacuum system 2 Ready to start 3 Pumping for measuring 5 Stopped 6 Calibrating 7 Error 8 Preparing MS 10 Measuring Counter Flow 11 Measuring Twin-Flow™ low 12 Measuring Twin-Flow™ high Byte 1 Error No. / Warning No. (BYTE): → 🕮 QualyTest™ BG 805 263 BE / A
11	0B	ResetError	Acknowledges current error	
12	0C	ResetWarning	Acknowledges a warning	Byte 1 Warning No. (BYTE)
13	0D	GetErrorHistory	Error history	Transmit: (BYTE) Byte 0 Entry No. (0 … 9, 0 = most recent error) Receive: Byte 0 Entry No. (0 … 9, 0 = most recent error) Byte 1 Error No. / Warning No. (0 = no error or warning) Byte 2 Year: 0 … 99 Byte 3 Month: 1 … 12 Byte 4 Day: 1 … 31 Byte 5 Hour: 0 … 23 Byte 6 Minute: 0 … 59
20	14	GetEvents	Polls for events and resets their flags	Byte 0 General events (BYTE): Bit 0 Start Bit 1 Stop Bit 2 Barcode received Bit 3 ZERO Bit 4 ZERO Reset Bit 5 … 7 – Byte 1 Pos. Slope at digital input: Bit 0 … 7 = DI0 … DI7 (BYTE) Byte 2 State of DIP switches of MC68: Bits 0 … 3 = S1-1 … S1-4 (BYTE) Bits 4 … 7 = S2-1 … S2-4
21	15	GetBCRData	Supplies the BCR string	Transmit: (BYTE) Byte 0 Index (0 … 31) of the first character requested Receive: (BYTE) Byte 0 Index of the first character (0 … 31) Byte 1 … 8 ASCII Codes of barcode starting from index
22	16	SetExtPressSensor	Selects external sensor for P2 measurement	Byte 0 External sensor (BOOL, true)
23	17	ExtPressSensorActive	Supplies information on active sensor	Byte 0 External sensor (BOOL, true) Internal sensor (false)

Dec	Hex		Description	Data format / Comment
50		TurboInfo	Supplies information on turbo pump	Byte 0 … 1 Rotational speed in Hz (INTEGER) Byte 2 … 3 Current in mA (INTEGER) Byte 4 Rotational speed >1300 Hz (BOOL)
56	38	SetDateTime	Sets date and time	Byte 0 Day (BYTE) 1 … 31 Byte 1 Month (BYTE) 1 … 12 Byte 2 Year (BYTE) 0 … 99 Byte 3 Hours (BYTE) 0 … 23 Byte 4 Minutes (BYTE) 0 … 59 Byte 5 Seconds (BYTE) 0 … 59
57	39	GetDateTime	Supplies date and time	→ SetDateTime
59	3B	GetUpTime	Supplies operating hours of basic unit	Byte 0 … 3 Operating time in minutes (LONGINT)

3.2 Configuration

Dec	Hex		Description	Data format / Comment
3	03	SetMeasureFilter	Sets measurement filter setting	Byte 0 Filter type (BYTE): 1 High 2 Ultra 3 Median low 4 Median high 5 None
100	64	GetMeasureFilter	Supplies filter setting	→ SetMeasureFilter
102	66	SetMeasMode	Sets measurement mode	Byte 0 Measurement mode (BYTE): 0 Sniff 1 Vacuum
103	67	GetMeasMode	Supplies measuring mode	→ SetMessMode
104	68	SetMassType	Sets mass to be measured	Byte 0 Mass (BYTE): 1 H_2 2 ^3He 3 ^4He
105	69	GetMassType	Supplies mass to be measured	→ SetMassType
106	6A	SetToDefault	Sets basic unit to default values	Byte 0 … 2 Code (CHARS), "HLT" = 72, 76, 84
112	70	GetValveValues	Supplies pressure thresholds and state of interlocks	Byte 0 … 1 Pressure p2 in 1/10 mbar for Counter Flow measurement (INTEGER) 0 … 250 Byte 2 Pressure p2 in 1/10 mbar for Twin-Flow™ low measurement (BYTE) 0 … 50 Byte 3 Pressure p2 in 1/10 mbar for Twin-Flow™ high measurement (BYTE) 0 … 5 Byte 4 Twin-Flow™ low interlock (BOOL) Byte 5 Twin-Flow™ high interlock (BOOL) Byte 6 Vent on stop (BOOL)
113	71	SetValveValues	Sets pressure thresholds and interlocks	→ GetValveValues
114	72	SetVentUser	Switches relay V6 for venting the vacuum system	Byte 0 =255 (BOOL) Valve V6 is opened (only in "Ready to start" state)
115	73	GetVentUserDone	Indicates whether the vacuum system has been vented	Byte 0 =255 (BOOL) Manual venting completed (only if "Vent on stop" = "no")

Dec	Hex		Description	Data format / Comment
120	78	GetAnaOut	Supplies parameters of analog outputs	Byte 0 Full scale exponent LIN_LEAK and LOG_LEAK (BYTE) Byte 1 Mode LIN_LEAK (BYTE) 0 Leak rate 1 Voltage of ext. Compact Gauge Byte 3 Number of decades LOG_LEAK (BYTE)
121	79	SetAnaOut	Sets parameters of analog outputs	→ GetAnaOut
122	7A	GetRelayMode	Supplies mode of relays K1, K2	Byte 0 Mode K1 (BYTE) Byte 1 Mode K2 (BYTE) 0 Off 1 Start 2 Stop 3 Start/Stop 4 Ready 5 Setpoint 6 On 7 Warn limit LR 8 Pressure setpoint
123	7B	SetRelayMode	Sets mode of relays K1, K2	→ GetRelayMode
126	7E	GetFlowLimits	Supplies limit values of gas flow measurement	Byte 0 … 1 lower limit (INTEGER) 0 … 20 Byte 2 … 3 upper limit (INTEGER) 0 … 50
127	7F	SetFlowLimits	Sets limit values for gas flow measurement	→ GetFlowLimits
128	80	GetZeroMode	Supplies the zero mode	Byte 0 Zero mode (BYTE) 1 Enabled 2 Enabled with start 3 Disabled
129	81	SetZeroMode	Sets the zero mode	→ GetZeroMode

3.3 Measurement

Dec	Hex		Description	Data format / Comment
0	0	StopMeasure	Brings the basic unit back to the "Ready to start" state	
19	13	StartMeasure	Starts measurement mode	
2	2	Leakrate	Supplies current leak rate	Byte 0 … 3 Leak rate in mbar l/s with mass factor "Gas" (FLOAT) Byte 4 Warning limit reached (BOOL) Byte 5 Leak setpoint reached (BOOL) Byte 6 Zero is active (BOOL)
4	4	LeakRateActualUnit	Supplies current leak rate (with user-defined factor) using the same unit of measurement as in the display	Byte 0 … 3 Leakrate (FLOAT) in same unit as on display
5	5	Zero	Suppresses current background	
6	6	ZeroReset	Disables background suppression	
7	7	Pressure	Supplies pressure data	Byte 0 … 3 Pressure p1 in mbar (FLOAT) Byte 4 … 7 Pressure p2 in mbar (FLOAT)
8	8	GetSetpoints	Supplies leak setpoint data	Byte 0 … 3 Leak setpoint in mbar l/s (FLOAT) Byte 4 Warning limit in % (BYTE)
9	9	SetSetpoints	Sets leak setpoint data	→ GetSetpoints
14	0E	SetPressTrigger	Sets setpoint value (for relays) of external gauge	Byte 0 … 3 Setpoint value in mbar (FLOAT)
15	0F	GetPressTrigger	Supplies setpoint value of external gauge	→ SetPressTrigger

Dec	Hex		Description	Data format / Comment
16	10	ExternalPressure	Supplies data of external pressure measurement	Byte 0 … 3 Pressure in mbar (FLOAT) Byte 4 Gauge type (BYTE): 0 No external gauge 1 TPR 2 IKR9 (meas. limit 10^{-9} mbar) 3 IKR11 (meas. limit 10^{-11} mbar) 4 PKR 5 LIN 6 Reserve 7 No identification Byte 5 Full scale exponent of linear gauge (BYTE)
17	11	SetExternalPressureFS	Sets full scale of linear gauges	Byte 0 Full scale exponent of linear gauge (BYTE)
18	12	GetSnifferprobeFlow	Supplies information on gas flow of sniffer line	Byte 0 … 1 Gas flow in sccm (INTEGER)

3.4 Calibration

Dec	Hex		Description	Data format / Comment
151	97	StartCalibration	Starts calibration with current settings	
152	98	SetTestLeakLocation	Sets location of test leak	Byte 0 255 = Test leak internal (BOOL)
153	99	GetTestLeakInfo	Supplies information on test leak	Byte 0 255 = Test leak internal (BOOL) Byte 1 … 4 Value of external test leak in mbar l/s (FLOAT) Byte 5 … 8 Value of internal test leak in mbar l/s (FLOAT)
154	9A	GetCalState	Supplies state of calibration	Byte 0 State of calibration (BYTE) 1 Waiting "Connect calibrated leak!" 2 Pumping down 3 Measuring Twin-Flow™ high No. 1 4 Mass adjust 5 Measuring Twin-Flow™ high No. 2 6 Measuring Twin-Flow™ low 7 Measuring Counter Flow 8 Waiting "Close calibrated leak!" 9 Background Twin-Flow™ high 10 Background Twin-Flow™ low 11 Background Counter Flow 12 Waiting "Calibration result"
155	9B	AcknowledgeCal	Confirms calibration states of GetCalState 1/8/12	
156	9C	GetCalCF	Supplies calibration factors	In 'GetCalState 12' state, the new factors are supplied, otherwise, the current factors. Byte 0 … 3 CF Twin-Flow™ high (FLOAT) Byte 4 … 7 CF Twin-Flow™ low (FLOAT) Byte 8 … 11 CF Counter Flow (FLOAT)
157	9D	SetTestLeakValue	Sets value of test leak	Byte 0 … 3 Value in mbar l/s (FLOAT)

Dec	Hex		Description	Data format / Comment
158	9E	CalibrationHistory	Calibriation history	Transmit: (BYTE) Byte 0 Entry No. (0 … 9, 0 = most recent) Receive: Byte 0 Entry No. (0 … 9, 0 = most recent) Byte 1 Year: 0 … 99 (BYTE) Byte 2 Month: 1 … 12 (BYTE) Byte 3 Day: 1 … 31 (BYTE) Byte 4 Hour: 0 … 23 (BYTE) Byte 5 Minute: 0 … 59 (BYTE) Byte 6 CF High / 10: 0 … 255 (UBYTE) Byte 7 CF Low / 10: 0 … 255 (UBYTE) Byte 8 CF Counter Flow /10: 0 … 255 (UBYTE) Byte 9 Mass: 2, 3, 4 (BYTE) Byte 10 Test leak internal (BOOL) Byte 11 Sniffing mode (BOOL)

3.5 Special commands

Dec	Hex		Description	Data format / Comment
200	C8	SwitchTestLeak	Opens or closes the valve of the internal test leak	Byte 0 Open (BOOL)
202	CA	GetSpectrometerInfo	Supplies information on mass spectrometer	Byte 0 Active filament (BYTE): 1 Fil1 2 Fil2 3 no filament active Byte 1 … 2 Anode potential in V (INTEGER) Byte 3 … 4 Cathode potential in V (INTEGER) Byte 5 … 6 Suppressor potential in V (INTEGER) Byte 7 … 10 Ion current in A (FLOAT) Byte 11 Preamplifier range (BYTE) 0 … 3 ; min … max. sensitivity Byte 12 Postamplifier range (BYTE) 0 … 3 ; min … max. sensitivity
207	CF	GetTCVersion	Supplies firmware version of TC 600 turbo pump controller	Byte 0 … 6 Version string of turbo pump controller (CHAR) Format XX.YYYY
210	D2	SetPort	Set port	Byte 0 Port: (BYTE) 0 BCR 1 Host Byte 1 Baud rate: (BYTE) 0 1200 1 2400 2 4800 3 9600 4 19200 Byte 2 Parity: (BYTE) 0 no 1 odd 2 even Byte 3 Stop bits: (BYTE) 0 1 1 1.5 2 2

Dec	Hex		Description	Data format / Comment
211	D3	GetPort	Supplies port settings	→ SetPort
212	D4	GetPrinterPort	Supplies printer port location	Byte 0 Port: (BYTE) 0 = BCR 1 = HOST
213	D5	SetPrinterPort	Sets printer port location	→ GetPrinterPort
214	D6	PrintText	Prints information at printer port	Byte 0 … 9 ASCII codes to be printed

3.6 Examples

Note

Bytes are represented in hexadecimal format.
Conversion between different number formats → Appendix B.

StartMeasure

HOST	QualyTest™	Explanation
05 **13**	>	StartMeasure
<	**13**	Positive acknowledgement of command

GetUpTime

HOST	QualyTest™	Explanation
05 **3B**	>	GetUpTime
<	**3B** 00 00 06 B7	Runtime MSB LSB = 00 00 06 B7 = 1719_d minutes ÷ 60 = 28.65 hours

Input error

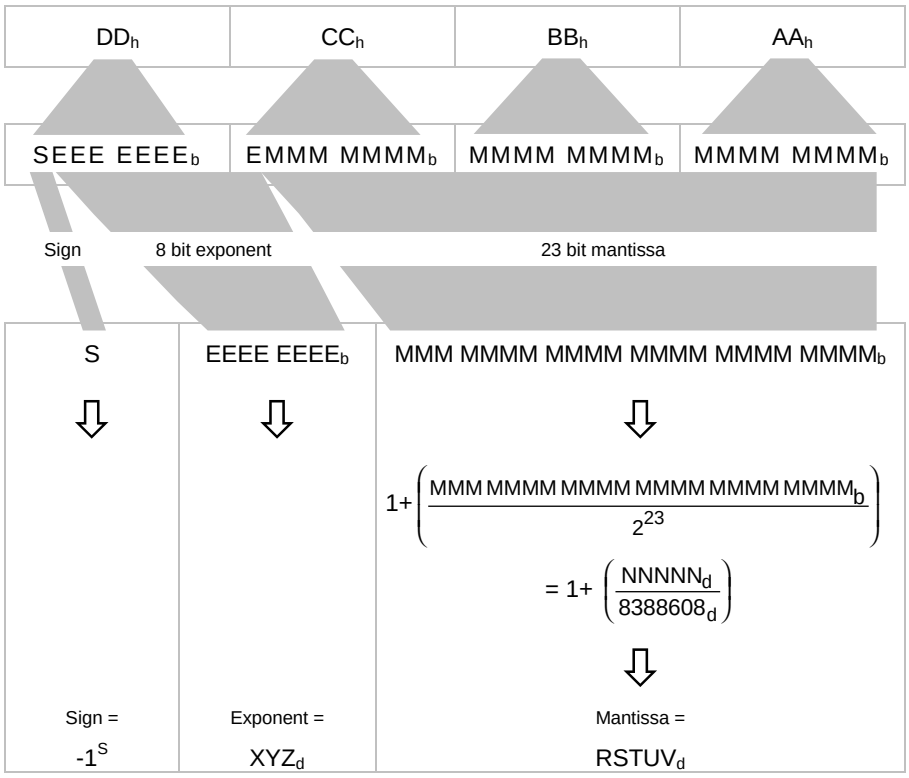
HOST	QualyTest™	Explanation
05 **4C C8**	>	Input error (non existent command code)
<	**FF**	Negative acknowledgment

Appendix

A: Conversion of a floating number according to IEEE 754

Number received: $AA\ BB\ CC\ DD_h$ (4 byte, floating format)

1. Reverse the sequence of the HEX words
2. Separate into bytes
3. Calculate



Converted number:

$$\text{Sign} \times 2^{(\text{Exponent}-127)} \times \text{Mantissa}$$

Legend:

XX_h	Hexadecimal number (Base = 16)
XX_d	Decimal number (Base = 10)
XX_b	Binary number (Base = 2)

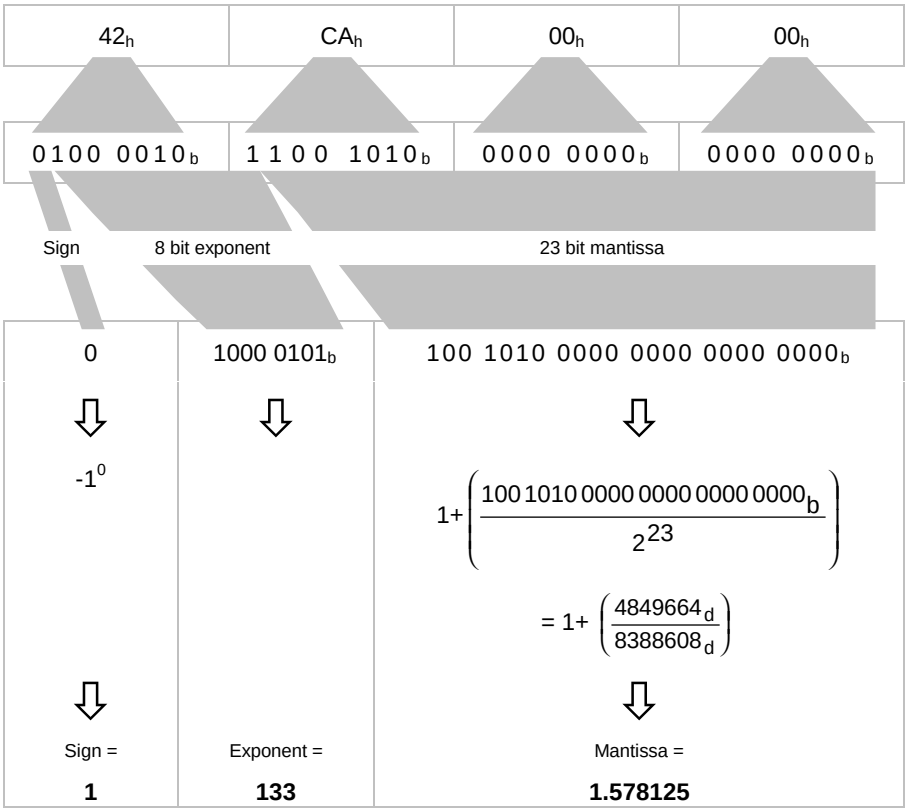
Example

Number received

$00\ 00\ CA\ 42_h$ (4 byte, floating format)

1. Reverse the sequence of the HEX words

2. Separate into bytes



3. Calculate

Sign	Exponent	Mantissa
0	$1000\ 0101_b$	$100\ 1010\ 0000\ 0000\ 0000\ 0000_b$
-1^0		$1+\left(\frac{100\,1010\,0000\,0000\,0000\,0000_b}{2^{23}}\right)$
		$= 1+\left(\frac{4849664_d}{8388608_d}\right)$
Sign =	Exponent =	Mantissa =
1	**133**	**1.578125**

Converted number

$$1 \times 2^{(133-127)} \times 1.578125 = 101$$

B: Conversion table

DEC	HEX	Binär	ASCII
0	0	0000 0000	NUL
1	1	0000 0001	SOH
2	2	0000 0010	STX
3	3	0000 0011	ETX
4	4	0000 0100	EOT
5	5	0000 0101	ENQ
6	6	0000 0110	ACK
7	7	0000 0111	BEL
8	8	0000 1000	BS
9	9	0000 1001	HT
10	A	0000 1010	LF
11	B	0000 1011	VT
12	C	0000 1100	FF
13	D	0000 1101	CR
14	E	0000 1110	SO
15	F	0000 1111	SI
16	10	0001 0000	DLE
17	11	0001 0001	DC1
18	12	0001 0010	DC2
19	13	0001 0011	DC3
20	14	0001 0100	DC4
21	15	0001 0101	NAK
22	16	0001 0110	SYSN
23	17	0001 0111	ETB
24	18	0001 1000	CAN
25	19	0001 1001	EM
26	1A	0001 1010	SUB
27	1B	0001 1011	ESC
28	1C	0001 1100	FS
29	1D	0001 1101	GS
30	1E	0001 1110	RS
31	1F	0001 1111	US
32	20	0010 0000	SP
33	21	0010 0001	!
34	22	0010 0010	"
35	23	0010 0011	#
36	24	0010 0100	$
37	25	0010 0101	%
38	26	0010 0110	&
39	27	0010 0111	'
40	28	0010 1000	(
41	29	0010 1001	)
42	2A	0010 1010	*
43	2B	0010 1011	+
44	2C	0010 1100	,
45	2D	0010 1101	-
46	2E	0010 1110	.
47	2F	0010 1111	/
48	30	0011 0000	0
49	31	0011 0001	1
50	32	0011 0010	2
51	33	0011 0011	3
52	34	0011 0100	4
53	35	0011 0101	5
54	36	0011 0110	6
55	37	0011 0111	7
56	38	0011 1000	8
57	39	0011 1001	9
58	3A	0011 1010	:
59	3B	0011 1011	;
60	3C	0011 1100	<
61	3D	0011 1101	=
62	3E	0011 1110	>
63	3F	0011 1111	?

DEC	HEX	Binär	ASCII
64	40	0100 0000	@
65	41	0100 0001	A
66	42	0100 0010	B
67	43	0100 0011	C
68	44	0100 0100	D
69	45	0100 0101	E
70	46	0100 0110	F
71	47	0100 0111	G
72	48	0100 1000	H
73	49	0100 1001	I
74	4A	0100 1010	J
75	4B	0100 1011	K
76	4C	0100 1100	L
77	4D	0100 1101	M
78	4E	0100 1110	N
79	4F	0100 1111	O
80	50	0101 0000	P
81	51	0101 0001	Q
82	52	0101 0010	R
83	53	0101 0011	S
84	54	0101 0100	T
85	55	0101 0101	U
86	56	0101 0110	V
87	57	0101 0111	W
88	58	0101 1000	X
89	59	0101 1001	Y
90	5A	0101 1010	Z
91	5B	0101 1011	[
92	5C	0101 1100	\
93	5D	0101 1101	]
94	5E	0101 1110	^
95	5F	0101 1111	_
96	60	0110 0000	`
97	61	0110 0001	a
98	62	0110 0010	b
99	63	0110 0011	c
100	64	0110 0100	d
101	65	0110 0101	e
102	66	0110 0110	f
103	67	0110 0111	g
104	68	0110 1000	h
105	69	0110 1001	i
106	6A	0110 1010	j
107	6B	0110 1011	k
108	6C	0110 1100	l
109	6D	0110 1101	m
110	6E	0110 1110	n
111	6F	0110 1111	o
112	70	0111 0000	p
113	71	0111 0001	q
114	72	0111 0010	r
115	73	0111 0011	s
116	74	0111 0100	t
117	75	0111 0101	u
118	76	0111 0110	v
119	77	0111 0111	w
120	78	0111 1000	x
121	79	0111 1001	y
122	7A	0111 1010	z
123	7B	0111 1011	{
124	7C	0111 1100	|
125	7D	0111 1101	}
126	7E	0111 1110	~
127	7F	0111 1111	DEL

DEC	HEX	Binär	ASCII
128	80	1000 0000	
129	81	1000 0001	
130	82	1000 0010	
131	83	1000 0011	
132	84	1000 0100	
133	85	1000 0101	
134	86	1000 0110	
135	87	1000 0111	
136	88	1000 1000	
137	89	1000 1001	
138	8A	1000 1010	
139	8B	1000 1011	
140	8C	1000 1100	
141	8D	1000 1101	
142	8E	1000 1110	
143	8F	1000 1111	
144	90	1001 0000	
145	91	1001 0001	
146	92	1001 0010	
147	93	1001 0011	
148	94	1001 0100	
149	95	1001 0101	
150	96	1001 0110	
151	97	1001 0111	
152	98	1001 1000	
153	99	1001 1001	
154	9A	1001 1010	
155	9B	1001 1011	
156	9C	1001 1100	
157	9D	1001 1101	
158	9E	1001 1110	
159	9F	1001 1111	
160	A0	1010 0000	
161	A1	1010 0001	
162	A2	1010 0010	
163	A3	1010 0011	
164	A4	1010 0100	
165	A5	1010 0101	
166	A6	1010 0110	
167	A7	1010 0111	
168	A8	1010 1000	
169	A9	1010 1001	
170	AA	1010 1010	
171	AB	1010 1011	
172	AC	1010 1100	
173	AD	1010 1101	
174	AE	1010 1110	
175	AF	1010 1111	
176	B0	1011 0000	
177	B1	1011 0001	
158	B2	1011 0010	
179	B3	1011 0011	
180	B4	1011 0100	
181	B5	1011 0101	
182	B6	1011 0110	
183	B7	1011 0111	
184	B8	1011 1000	
185	B9	1011 1001	
186	BA	1011 1010	
187	BB	1011 1011	
188	BC	1011 1100	
189	BD	1011 1101	
190	BE	1011 1110	
191	BF	1011 1111	

DEC	HEX	Binär	ASCII
192	C0	1100 0000	
193	C1	1100 0001	
194	C2	1100 0010	
195	C3	1100 0011	
196	C4	1100 0100	
197	C5	1100 0101	
198	C6	1100 0110	
199	C7	1100 0111	
200	C8	1100 1000	
201	C9	1100 1001	
202	CA	1100 1010	
203	CB	1100 1011	
204	CC	1100 1100	
205	CD	1100 1101	
206	CE	1100 1110	
207	CF	1100 1111	
208	D0	1101 0000	
209	D1	1101 0001	
210	D2	1101 0010	
211	D3	1101 0011	
212	D4	1101 0100	
213	D5	1101 0101	
214	D6	1101 0110	
215	D7	1101 0111	
216	D8	1101 1000	
217	D9	1101 1001	
218	DA	1101 1010	
219	DB	1101 1011	
220	DC	1101 1100	
221	DD	1101 1101	
222	DE	1101 1110	
223	DF	1101 1111	
224	E0	1110 0000	
225	E1	1110 0001	
226	E2	1110 0010	
227	E3	1110 0011	
228	E4	1110 0100	
229	E5	1110 0101	
230	E6	1110 0110	
231	E7	1110 0111	
232	E8	1110 1000	
233	E9	1110 1001	
234	EA	1110 1010	
235	EB	1110 1011	
236	EC	1110 1100	
237	ED	1110 1101	
238	EE	1110 1110	
239	EF	1110 1111	
240	F0	1111 0000	
241	F1	1111 0001	
242	F2	1111 0010	
243	F3	1111 0011	
244	F4	1111 0100	
245	F5	1111 0101	
246	F6	1111 0110	
247	F7	1111 0111	
248	F8	1111 1000	
249	F9	1111 1001	
250	FA	1111 1010	
251	FB	1111 1011	
252	FC	1111 1100	
253	FD	1111 1101	
254	FE	1111 1110	
255	FF	1111 1111	(Error)

Original: German BG 805 264 BD / B (0007)
bg805264be/ b

Pfeiffer Vacuum GmbH
Berliner Strasse 43
D–35614 Asslar
Deutschland
Tel +49 (0) 6441 802-0
Fax +49 (0) 6441 802-202
info@pfeiffer-vacuum.de

www.pfeiffer-vacuum.de