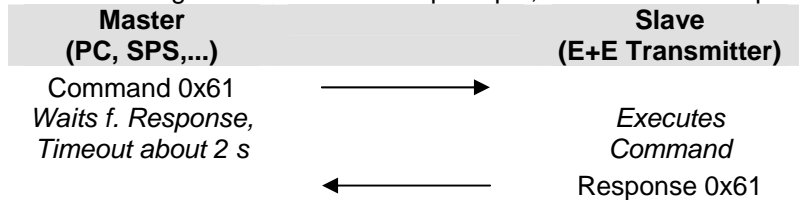


## EE31 Protocol Description

for Serial Communication (RS232, RS485)

RS232 Interface with 9k6 Baud, no Parity, 8 Databits, 1 Stopbit (9600 8N1), no Handshake.

Communication works according to the Master/Slave principle, the Transmitter represents the Slave:



The command and data structure consists of:

- ⇒ Network-Address of Transmitter (2 Bytes)
- ⇒ Command (1 Byte)
- ⇒ Data length (1 Byte)
- ⇒ Data (x Bytes) (on Responses the first data byte carries a status info)
- ⇒ CRC (1 Byte), **CRC-Calculation: (Addr+Cmd+Length+Data1...DataN) MOD 0x100.**

**A communication example is shown below command description 0x61.**

Legend of field identifiers for following command descriptions:

- [A]** ... Transmitter-Address, 0 = Broadcast-Address („to all“) or constant value if no RS485 interface
- [B]** ... Command
- [L]** ... Length (Count of following data bytes – without CRC byte)
- [D]** ... Data (on Responses the first data byte is listed as **[S]** = status info)
- [C]** ... CRC

Responses carry a status info **[S]**: **<ACK>** = 0x06, **<NAK>** = 0x15

ACK means command successfully executed, **on NAK an error code follows:**

Errorcode	Meaning
0xEC	No calibration data
0xED	EEPROM defect
0xEE	Humidity sensor/probe failure (C < 100pF)
0xEF	Humidity sensor/probe failure (C > 600pF)
0xF0	Velocity sensor/probe failure ( < min)
0xF1	Velocity sensor/probe failure ( > max)
0xF2	CO2 sensor/probe failure ( < min)
0xF3	CO2 sensor/probe failure ( > max)
0xF9	Communication temporarily not possible (BUSY)
0xFA	Temperature sensor/probe failure (R < 500 Ohm)
0xFB	Temperature sensor/probe failure (R > 1800 Ohm)
0xFC	Parameter wrong/not valid
0xFD	Command is locked (permanently or has to be activated specifically)
0xFE	Command is unsupported (old Firmware?)
0xFF	CRC error

Data types, which consist of two or more bytes (int, float), are arranged in **Little Endian Byte Order** (Intel x86, least significant byte first, then upwards until most significant byte, e.g. 16-bit Integer value decimal: **16** ⇒ hex: 0x**0010** ⇒ sending order: 0x**10** 0x**00**).

Information concerning **Data type float**: IEEE single-precision 32-bit floating point type, IEEE 754-1985. See: [http://en.wikipedia.org/wiki/IEEE\\_754](http://en.wikipedia.org/wiki/IEEE_754)

### Command 0x61: Output serial number

Request to send the Transmitter serial number.

**Command:** [A][B][L][C]

Field	Value	Type	Byte	Description
[A]		WORD	2	Address of Transmitter
[B]	0x61	BYTE	1	Command
[L]	0x00	BYTE	1	Count of following data bytes (no parameters)
[C]		BYTE	1	CRC

**Response:** [A][B][L][S][D][C]

Field	Value	Type	Byte	Description
[A]		WORD	2	Address of Transmitter
[B]	0x61	BYTE	1	Command
[L]		BYTE	1	Count of following data bytes
[S]		BYTE	1	<ACK> or <NAK>
[D]		Text16 BYTE	16 1	[S] = <ACK>: Serial number [S] = <NAK>: Error code
[C]		BYTE	1	CRC

### Communication example:

You want to read the Transmitter serial number ("0407/P22009.0007") with Command 0x61.

You send the following byte sequence (all given as Hex values) to the Transmitter:

Address	Cmd (0x61)	Count data bytes = 0	CRC
00 00	61	00	61

The Transmitter responds with:

Address	Cmd	# Bytes	ACK	Text	CRC
00 00	61	11	06	30 34 30 37 2F 50 32 32 30 30 39 2E 30 30 30 37	B4

The Text-Bytes have to be interpreted according to the ASCII character code chart (see <http://en.wikipedia.org/wiki/ASCII>, section „ASCII printable characters“):

0x30 = „0“, 0x34 = „4“, 0x30 = „0“, 0x37 = „7“, 0x2F = „/“, 0x50 = „P“ → „0407/P“ etc.

### Command 0x64: Output software version

Request to send the Transmitter Firmware version.

**Command:** [A][B][L][C]

Field	Value	Type	Byte	Description
[A]		WORD	2	Address of Transmitter
[B]	0x64	BYTE	1	Command
[L]	0x00	BYTE	1	Count of following data bytes (no parameters)
[C]		BYTE	1	CRC

**Response:** [A][B][L][S][D][C]

Field	Value	Type	Byte	Description
[A]		WORD	2	Address of Transmitter
[B]	0x64	BYTE	1	Command
[L]		BYTE	1	Count of following data bytes
[S]		BYTE	1	<ACK> or <NAK>
[D]		BYTE	1	[S] = <ACK>: Major version (dec.) [S] = <NAK>: Error code
[D]		BYTE	1	[S] = <ACK>: Minor version (dec.)
[D]		BYTE	1	[S] = <ACK>: Revision number (dec.)
[C]		BYTE	1	CRC

## Command 0x67: Output measurement values

Request to send specific measurement values.

**Command:** [A][B][L][D][C]

Field	Value	Type	Byte	Description
[A]		WORD	2	Adresse of Transmitter
[B]	0x67	BYTE	1	Command
[L]		BYTE	1	Count of following data bytes
[D]		BYTE	1	Index for measurement value no. 1
:				
[D]		BYTE	1	Index for measurement value no. n
[C]		BYTE	1	CRC

**Response:** [A][B][L][S][D][C]

Field	Value	Type	Byte	Description
[A]		WORD	2	Address of Transmitter
[B]	0x67	BYTE	1	Command
[L]		BYTE	1	Count of following data bytes
[S]		BYTE	1	<ACK> or <NAK>
[D]		BYTE	1	[S] = <ACK>: Physical unit (0 = metric; 1 = non metric) [S] = <NAK>: Error code
[D]		Float	4	[S] = <ACK>: Measurement value no. 1
:				[S] = <ACK>:
[D]		Float	4	[S] = <ACK>: Measurement value no. n
[C]		BYTE	1	CRC

### Index table of measurement values (0xFF = invalid):

Index	Name	Unit	Description
0	Temperature <b>T</b>	°C ; °F	Depending on SI/US
1	Humidity <b>F</b>	%RH	
2	Water vapour partial pressure <b>e</b>	mbar/hPa ; psi	Depending on SI/US
3	Dew point temperature <b>Td</b>	°C ; °F	Depending on SI/US
4	Wet bulb temperature <b>Tw</b>	°C ; °F	Depending on SI/US
5	Absolute humidity <b>dv</b>	g/m <sup>3</sup> ; gr/f <sup>3</sup>	Depending on SI/US
6	Mixture ratio <b>r</b>	g/kg ; gr/lb	Depending on SI/US
7	Enthalpy <b>h</b>	kJ/kg ; lbf/lb	Depending on SI/US
8	Dew point temperature <b>Td</b> or Frost point temperature <b>Tf</b>	°C ; °F	Depending on SI/US Temp. > 0 °C → <b>Td</b> Temp. < 0 °C → <b>Tf</b>
13	Water activity <b>aw</b>	1	
14	Water content <b>x</b>	ppm	

	Datum	Unterschrift
erstellt:	06.03.2007	Karl Jahn
geprüft:	06.03.2007	Helmut Giritzer
freigegeben:	08.03.2007	Enzenhofer I.

Änderungsgrund: Befehl 0x67, Index 13 und 14 hinzugefügt.