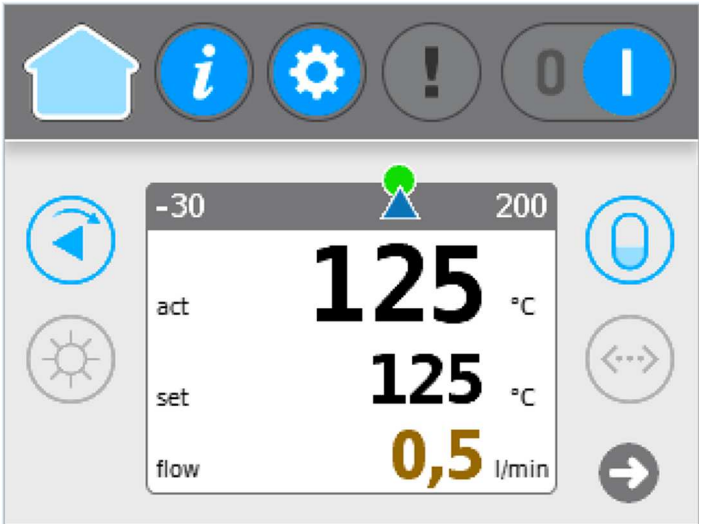
Elotech Standard Protocol

Interface description / network protocol

for Single R8400 SBC-T



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1 Content

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2 Interface, general description

The microprocessor-based controller of the SBC-T series is optionally available with a serial interface (RS-485 or TTY 0/20 mA).
This operates in half duplex mode.
The interface allows the SBC-T devices (here called: slaves) to be monitored and controlled on a common bus (multipoint interface) by a higher level computer (here called: master).
The communication is always controlled by the master.

The controller operates as a slave with its own address. The address has to be programmed in the menu “setup: interface” with the parameter “interface address” of the slave.

If the controller detects transmission errors or plausibility errors (such as range limit exceeding) it does not accept this data. The previously existing, valid data will remain.

All data are transferred in a hexadecimal, ASCII-coded format.

Test criteria:

1. Only ASCII-Codes from 0...9 or A...F ?
   Except for start and stop character.
2. Data format (Parity) O.K. ?
3. Check sum O.K. ?

RS 485-interface data:	Number of drivers/receivers:	32
	transmission mode:	symmetric
	Max. wire length:	1200 m
Protocol:	Elotech Standard	

3 Interface Parameters

The following parameters have to be programmed in the menu „setup: interface“ of the SBC-T -control. See also SBC-T manual.

3.1 interface address :

1 .... 255 (factory setting: 1)
The master addresses the slave at this address.
Each slave has its own address.

3.2 baud rate :

The baud rate refers to the transmission speed at which one bit is transmitted from the transmitter to the receiver.
1 baud = 1 bit / s

Setting:
- 1,2 kBaud
- 2,4 kBaud
- 4,8 kBaud
- 9,6 kBaud (factory setting)
- 19,2 kBaud
- 38,4 kBaud

3.3 data format:

Setting:	format:		
	7E1	7 Data bit, Parity: Even, 1 Stop bit	(factory setting)
	7O1	7 Data bit, Parity: Odd, 1 Stop bit	
	7E2	7 Data bit, Parity: Even, 2 Stop bit	
	7O2	7 Data bit, Parity: Odd, 2 Stop bit	
	7N2	7 Data bit, Parity: None, 2 Stop bit	
	8E1	8 Data bit, Parity: Even, 1 Stop bit	
	8O1	8 Data bit, Parity: Odd, 1 Stop bit	
	8N1	8 Data bit, Parity: None, 1 Stop bit	
	8N2	8 Data bit, Parity: None, 2 Stop bit	

3.3.1 Start bit:

At the beginning of the transmission a start bit (log. 0) is transmitted. It´s purpose is to inform the receiver of the start of a data word (synchronization of the data exchange).

3.3.2 data bit:

The start bit is followed by 7 or 8 data bits. Starting with the least significant bit.

3.3.3 Paritybit:

The next bit is the parity bit. It is calculated from the check sum of all data bit and enables the receiver to recognize transmission errors.
EVEN - Parity: The number of the ones transmitted (including the parity bit) must be even.
ODD - Parity: The number of the ones transmitted (including the parity bit) must be odd.
NONE - Parity: There is no parity-bit calculated and transmitted.

3.3.4 Stop bit:

The transmission of a data word is concluded with 1 or 2 stop bit (log. 1).
This serves to establish a minimum distance between two immediately successive data words.

EXAMPLE (7E1) :	1 Start bit	7 Data bit	Parity (EVEN)	1 Stop bit
Data word:		111 1100		
Transmission:	0	0011 111	1	1

BEISPIEL (8O1) :	1 Start bit	8 Data bit	Parity (ODD)	1 Stop bit
Data word:		1111 1100		
Transmission:	0	0011 1111	1	1

4 Data Transmission / Protocol

All data (Hex-Byte) are transmitted in ASCII-format (text characters).

Permitted ASCII characters: 30H ... 39H, 41H ...46H, 0AH, 0DH

E. g.: Hex-Byte **2F**H -> "**2**" complies to 32H (ASCII)
"**F**" complies to 46H (ASCII)

Two ASCII characters are thus required for each hex byte.
The only exceptions are:
The start character: (OAH = line feed, LF) and
The end character: (ODH = carriage return, CR).

The instruction or parameter transfer is executed in both directions by means of defined data blocks.

4.1 Terms

Start character:	Introduces the transfer of a data block.	(1 ASCII)
	All characters in front of the start character are ignored.	
Device address:	Designates a specific device (slave)	(2 ASCII)
Constant:	Always: 30H, 31H (place holder)	(2 ASCII)
Instruction code:	"Tells" the device (slave) what it must do.	(2 ASCII)
Parameter code:	Designates each individual parameter that can	(2 ASCII)
	be called	
Parameter group code *):	some parameters are combined to a group	(2 ASCII)
	(e. G.: The feedback parameters P, I, D and the cycle time).	
	All this parameters can be read with one instruction.	
	See also the following page.	
Parameter value:	States the value of a parameter.	(6 ASCII)
Response:	Acknowledge or error message	(2 ASCII)
Check sum:	the two´s complement of the sum of all the	(2 ASCII)
	hex bytes of a data block without the start and the end characters.	
	Serves the purpose of recognizing transmission errors.	
End character:	Finishes the transmission of a data block.	(1 ASCII)

***) TAKE CARE If parameter group codes are used:**

1. It is possible to get up to 16 parameters in one parameter group.
   Please use a buffer of min. 138 bytes to receive all bytes.
2. There is no constant length of parameter groups
   It depends on configuration and type and the software-version of the device.
3. The number of the received parameters (N) will be calculated as follows:

$$N = \frac{\text{Number of received bytes} - 7\ \text{byte} - 3\ \text{byte}}{8\ \text{byte}}$$

   Start sequence = 7 byte
   End sequence = 3 byte
4. The sequence of the parameters is changeable. But this is not very critical, because all parameters are defined with it's own parameter code.

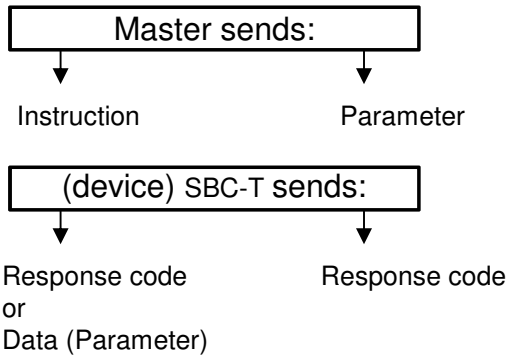
5 Instruction and Response

The master (computer) can issue the following instructions to the slave (controller):

- Send parameter: Instruction code 10 H (see)
- Send parameter group: Instruction code 15 H (see)
- Accept parameter: Instruction code 20 H (see **Fehler! Verweisquelle konnte nicht gefunden werden.**)
- Accept parameter and store with power fail protection: Instruction code 21 H (see)
  Take care:
  The EEPROM / E^2ROM permits max. 100.000 write cycles.

Provided, that the slave understood the instruction, it always responds by sending a complete data block.
The typical interval between master instruction and slave response (time-out) is typically 50 ms.
The slave repeats the received instruction code.

5.1 Instruction



5.2 Response (with error code)

00 H - acknowledge, no error (Instruction executed)
02 H - Check sum error
03 H - Procedure error
04 H - Non-compliance with specified range
05 H - The constant is not 30H, 30H or 30H, 31H
06 H - The addressed parameter is a read-only parameter

FEH - Error during writing into the power fail storage

6 Parameter values

The parameter value is composed of three data bytes:
2 data byte (mantissa), 1 data byte (exponent).

Examples:	Dec.	Hex.	Mantissa	Exp.	ASCII
Process value (°C):	215	00D7	00D7	00	30 30 44 37 30 30
Set point (°C):	230	00E6	00E6	00	30 30 45 36 30 30
Output ratio, "cooling" (%)	-16	FFF0	FFF0	00	46 46 46 30 30 30
Set point ramp (K/min.):	2,2	0016	0016	FF	30 30 31 36 46 46
	The parameter value is calculated as follows: Dec.:2,2 = 22 x 10 Exp. -1 Hex.: = 0016 (Mantissa) = FF (Exponent= - 1)				
Status word	1	0001	0001	00	30 30 30 31 30 30

Negative Mantissa / negative exponent: Built binary two´s complement.

7 Check sum

The checksum is formed by subtracting the hex data of a data block (without start- and end characters) from 00H (two´s complement of the sum). Carry overs are disregarded.

Example:

Device address = 14dec.:	0E	00 - 0E = F2
Constant:	01	F2 - 01 = F1
Operation code:	10	F1 - 10 = E1
Parameter code:	10	E1 - 10 = D1
Parameter value:	00C8.00	D1 - 00 = D1 D1 - C8 = 09 09 - 00 = 09
Check sum:	09	

8 Parameter codes

X = Existing **O** = Optional

Param.-Code (HEX)	Parameter	Menu	Display	Attribute	R8400
0x01	Device type		8400	ro	**X**
0x02	Software version	Info	SW: xx/xx	ro	**X**
0x04	Operating hours	Info	Value is limited to 65535 h	ro	**X**
0x10	Actual process value	Expert and cockpit	actual value	ro	**X**
0x12	Act. return temperature	Expert	from process temp.	ro	**X**
0x14	Act. film-temperature	Expert	film temperature	ro	**X**
0x15	Actual flow-through	Expert and cockpit	flow	ro	**O**
0x16	Act. pressure	Expert and cockpit	press. to process	ro	**O**
0x1b	°C-°F-1/10°C	Parameter basic	temperature unit	rw	**X**
0x20	Act. Set point	Expert and cockpit	setpoint	ro	**X**
0x21	Set point 1	Parameter temperature + analogue	1st setpoint	rw	**X**
0x22	Set point 2	Parameter temperature + analogue	2nd setpoint	rw	**X**
0x2b	Set point-limitation min.	Parameter temperature + analogue	lower setpoint limit		
0x2c	Set point-limitation max.	Parameter temperature + analogue	upper setpoint limit	rw	**X**
0x2e	Set point ramp (falling)	Parameter temperature + analogue	setpoint ramp decreasing	rw	**X**
0x2f	Setpoint ramp (raising)	Parameter temperature + analogue	setpoint ramp increasing	rw	**X**
0x33	Pre-flow-alarm value (external)	Parameter Alarms	Cascade control	rw	**O**
0x34	Alarm Limit Conf.	Parameter Alarms	Limit alarm configuration	rw	**X**
0x38	Alarm value 1	Device function	alarm limit	rw	**X**
0x39	Film alarm	Parameter Alarms	alarm film temperature	rw	**X**
0x3b	Flow through alarm	Parameter Alarms	alarm flow	rw	**O**
0x3c	Back flow alarm value	Parameter Alarms	from process limit	rw	**X**
0x3e	Pressure alarm, high	Parameter Alarms	alarm pressure high	rw	**X**
0x3f	Pressure alarm, low	Parameter Alarms	alarm pressure low	rw	**X**
0x40	P- band (P) heating	Parameter temperature + analogue	XP- heating	rw	**X**

Param.-Code (HEX)	Parameter	Menu	Display	Attribute	R8400
0x41	Rate time (D) (heating)	Parameter temperature + analogue	TV- heating	rw	**X**
0x42	Reset time (I) (heating)	Parameter temperature + analogue	TN- heating	rw	**X**
0x43	Cycle time (heating)	Parameter temperature + analogue	hyst. switch heating/cooling	rw	**X**
0x46	Dead band (neutral zone)	Parameter temperature + analogue	switch cycle time heating	rw	**X**
0x50	P-band (P) (cooling)	Parameter temperature + analogue	XP- cooling	rw	**X**
0x51	Rate time (D) (cooling)	Parameter temperature + analogue	TV- cooling	rw	**X**
0x52	Reset time (I) (cooling)	Parameter temperature + analogue	TN- cooling	rw	**X**
0x53	Cycle time (cooling)	Parameter temperature + analogue	switch cycle time cooling	rw	**X**
0x59	Hysteresis 2point cooling, off	Parameter temperature + analogue	switch off hyst. cooling	rw	**O** 2PK
0x5a	Hysteresis 2point cooling, on	Parameter temperature + analogue	switch on hyst. cooling	rw	**O** 2PK
0x60	Act. output ratio	Expert	regulation ratio	ro	**X**
0x64	Output ratio: limitation heating	Parameter temperature + analogue	regulation ratio heating	rw	**X**
0x69	Output ratio: limitation cooling	Parameter temperature + analogue	regulation ratio cooling	rw	**X**
0x70	Status word 1		-	ro	**X**
0x78	Status word 2		-	rw	**X**
0x85	Adjustment lock	Parameter basic	access lock	rw	**X**
0x87	Scale: Linear In/ Outputs (high range)	Parameter temperature + analogue	act. value output: upper value	rw	**X**
0x88	Auto tune		self-optimization	rw	**X**
0x89	Scale: Linear In-/Outputs (low range)	Parameter temperature + analogue	act. value output: lower value	rw	**X**
0x8f	Device: on / off		-	rw	**X**
0x90	Interlock	Parameter basic	reclosing lockout	rw	**X**
0x93	Cool down temperature	Parameter device	shut down temperature	rw	**X**
0xa0	Aqua timer	Parameter device	aqua timer	rw	**X**
0xa1	Change time	Parameter device	draining time	rw	**X**
0xa2	System stopper temperature	Parameter temperature + analogue	system closing temperature	rw	**X**
0xa3	Alarm: delta T	Parameter device	alarm Δ T	rw	**X**
0xa9	Aqua timer: Start time	Parameter device	aqua timer start time	rw	**X**

9 Parameter groups

X = Existing **O** = Optional

Parameter	**Display** *Menu:* *Text*	**Parameter-Code (HEX)**	**Parameter-Code (DEZ)**	**R8400**
Group 0		**0x00**	**0**	
Software version	Info: manufacturer: SW: xx/xx	0x02	2	**X**
Type of device	8401	0x01	1	**X**
Group 1		**0x01**	**1**	
Actual Process value	Expert and cockpit	0x10	16	**X**
°C -°F - 1/10°C	Parameter basic	0x1b	27	**X**
Act. return temperature	Expert and cockpit	0x12	18	**X**
Act. film-temperature	Expert	0x14	20	**X**
Actual flow-through	Expert and cockpit	0x15	21	**O**
Act. pressure	Expert	0x16	22	**O**
Group 2		**0x02**	**2**	
Setpoint 1		0x21	33	**X**
Setpoint 2	Parameter temperature + analogue	0x22	34	**X**
Setpoint limitation, max.	Parameter temperature + analogue	0x2c	44	**X**
Setpoint limitation, min.	Parameter temperature + analogue	0x2b		
Setpoint ramp (rising)	Parameter temperature + analogue	0x2f	47	**X**
Setpoint ramp (falling)	Parameter temperature + analogue	0x2e	46	**X**
Actual Setpoint	Expert	0x20	32	**X**

Parameter	**Display** *Menu:* ***Text***	**Parameter-Code (HEX)**	**Parameter-Code (DEZ)**	**R8400**
Group 3		**0x03**	**3**	
Alarm value 1	Gerätefunktionen	0x38	56	**X**
Flow-alarm	Parameter alarms	0x3b	59	**O**
High-alarm pressure	Parameter alarms	0x3e	62	**O**
Low-alarm pressure	Parameter alarms	0x3f	63	**O**
Film alarm value	Parameter alarms	0x39	57	**X**
From process alarm value	Parameter alarms	0x3c	60	**X**
Pre-flow alarm value: (external)	Parameter alarms	0x33	51	**X**
Group 4		**0x04**	**4**	
Proportional-range (P) heating	Parameter temperature + analogue	0x40	64	**X**
Rate time (D) heating	Parameter temperature + analogue	0x41	65	**X**
Reset time (I) heating	Parameter temperature + analogue	0x42	66	**X**
Dead band	Parameter temperature + analogue	0x46	70	**X**
Cycle time (heating)	Parameter temperature + analogue	0x43	67	**X**
Group 5		**0x05**	**5**	
Proportional-range (P) cooling	Parameter temperature + analogue	0x50	80	**X**
Rate time (D) cooling	Parameter temperature + analogue	0x51	81	**X**
Reset time (I) cooling	Parameter temperature + analogue	0x52	82	**X**
Cycle time (cooling)	Parameter temperature + analogue	0x53	83	**X**
Hysteresis, 2point, cooling off	Parameter temperature + analogue	0x5a	90	**O** 2PK
Hysteresis, 2point, cooling on	Parameter temperature + analogue	0x59	89	**O** 2PK

Parameter	Display *Menu:* ***Text***	Parameter-Code (HEX)	Parameter -code (DEZ)	R8400
Group 6		**0x06**	**6**	
Act. output ratio	Expert	0x60	96	**X**
Output ratio limitation: heating	Parameter temperature + analogue	0x64	100	**X**
Output ratio limitation: cooling	Parameter temperature + analogue	0x69	105	**X**
Group 7		0x07	7	
Status Word 1	-	0x70	112	**X**
Status Word 2	-	0x78	120	**X**
Group 10 (0x0a)		**0x0a**	**10**	
Actual Process Value	Expert and cockpit	0x10	16	**X**
Actual Setpoint	Expert and cockpit	0x20	32	**X**
Actual Output Ratio	Expert	0x60	96	**X**
Status Word 1	-	0x70	112	**X**

10 Configuration Code

Parameters with functions like „OFF“ or „on“ or logic pre settings will be operated via a code number. The first code number is always 0. Others see below.
Take care to the corresponding operation manual of the device.

Parameter	Display	Parameter-Code (HEX)	Parameter -code (DEZ)	Attribute	R8400
access lock		0x85	133	rw	**X**
Code:		Behaviour:			
0	off	No parameter lock			
1	Only unit on/off enabled	All Parameters without button On/Off are locked			
2	Only on/off and setpoint enabled	All Parameters without setpoint and button On/Off are locked			
Self - optimization		0x88	136	rw	**X**
Code:		Behaviour:			
0	off	Auto tune off			
1	on	Start auto tune			

11 Status words

Each device has two status words.
Each word has 8 bit.

Status word 1, Parameter code 70H
Monitors alarm warnings or errors.

7 6 5 4 3 2 1 0 :	Bit 0 = 1	➔ System error
Bit	Bit 1 = 1	➔ Sensor error
	Bit 2 = x	➔ No function
	Bit 3 = 1	➔ reset-control. If a reset was triggered during operation, this bit will be set to "1". The device automatically resets bit 3=0, if the status word 1 has been read once by the master.
	Bit 4 = 1	➔ Overall alarm (collecting alarm) „on" (Out 7)
	Bit 5 = 1	➔ Alarm 1 „on" (limit comparator, temperature)
	Bit 6 = 1	➔ Alarm 2 „on" (film temperature)
	Bit 7 = 1	➔ Setpoint ramp function active

Status word 2, Parameter code 78H
Read/write-parameter.

7 6 5 4 3 2 1 0 :	Bit 0 = 0	➔ Device operation „local"
	Bit 0 = 1	➔ Device operation „remote" (Must be set to "1", if you like to write into the power fail storage)
	Bit 1 = 0	➔ No function
	Bit 1 = 1	➔ No function
	Bit 2 = 0	➔ Auto tune „off"
	Bit 2 = 1	➔ Auto tune „on"
	Bit 3 = 0	➔ SBC-T „off"
	Bit 3 = 1	➔ SBC-T „on"
	Bit 4 = 0	➔ No function
	Bit 4 = 1	➔ No function
	Bit 5 = 0	➔ Setpoint 1 „off"
	Bit 5 = 1	➔ Setpoint 1 „active"
	Bit 6 = 0	➔ Setpoint 2 „off"
	Bit 6 = 1	➔ Setpoint 2 „active"
	Bit 7 = 0	➔ Setpoint external / analogue „off"
	Bit 7 = 1	➔ Setpoint external / analogue „active"

12 Data Block Structure

Master sends „Instruction“, Instruction code: 10H, 15H

Start →	**0A** →	**xx xx** →	**30 31** →	**xx xx** →	**xx xx** →	**xx xx** →	**0D** →	End
	LF	Device-address	Constant code	Instruction-code	Param.-	Check-sum	CR	

Master sends "Parameter", Instruction code: 20H, 21H

Start →	**0A** →	**xx xx** →	**30 31** →	**xx xx** →	**xx xx** →	**xx xx xx xx**	**xx xx** →	**xx xx** →	**0D** →	End
	LF	Device-address	Constant	Instruction-code	Param.-code	Mantissa	Exp.	Check-sum	CR	

Slave sends „Response“ to master:

Start →	**0A** →	**xx xx** →	**30 31** →	**xx xx** →	**xx xx** →	**xx xx** →	**0D** →	End
	LF	Device-address	Constant	Response-code = Instruction-code	Response e.g. Error-code	Check-sum	CR	

Slave sends „Parameter“ or „Parameter group“ to master (Data transfer)

Start →	**0A** →	**xx xx** →	**30 31** →	**xx xx** →				
	LF	Device-address	Constant	Response code = Instruction code				
→	**xx xx** →	**xx xx xx xx**	**xx xx** →					
	Param.-code 1	Mantissa Parameter value 1	Exp.					
→	**xx xx** →	**xx xx xx xx**	**xx xx** →	**xx xx** →	**0D** →	End		
	Param.-code n	Mantissa Parameter value n	Exp.	Check-sum	CR			

xx : 1 character ASCII

13 Typical Transmission Examples

13.1 Transmission example, Instruction code 10 H

The device No.(address) 5 is called to send a parameter (process value, 10 H) to the master.

Master to SBC-T:	Dec.	Hex		ASCII (Hex)
Start character				0A
SBC-T address:	5	05	➔	30 35
Constant:		01	➔	30 31
Instruction: Send Parameter:		10	➔	31 30
Parameter code (actual value):		10	➔	31 30
Check sum:		DA	➔	44 41
End character:				0D

Transmission to controller: 0A 30 35 30 31 31 30 31 30 44 41 0D

SBC-T to master:	Dec.	Hex		ASCII
Start character				0A
SBC-T address:	5	05	➔	30 35
Constant:		01	➔	30 31
Instruction: Send Parameter (repeats instruction)		10	➔	31 30
Parameter code (actual value):		10	➔	31 30
Parameter value:	225	00E1.00	➔	30 30 45 31 30 30
Check sum:		F9	➔	46 39
End character:				0D

Transmission to master: 0A 30 35 30 31 31 30 31 30 30 30 45 31 30 30 46 39 0D

13.2 Transmission example, Instruction code 15 H

The device No.12 should send the parameter group 0AH to the master.

Master to SBC-T:	Dec.	Hex		ASCII (Hex)
Start character				0A
SBC-T address:	12	0C	➔	30 43
Constant:		01	➔	30 31
Instruction: Send parameter group:		15	➔	31 35
Parameter group code (0AH):		0A	➔	30 41
Check sum:		D4	➔	44 34
End character:				0D

Transmission to SBC-T: 0A 30 43 30 31 31 35 30 41 44 34 0D

SBC-T to Master:	Dec.	Hex		ASCII
Start character				0A
SBC-T address:	12	0C	➔	30 43
Constant:		01	➔	30 31
Instruction: Send parameter group (repeats instruction):		15	➔	31 35
1. Parameter code , actual value:		10	➔	31 30
Parameter value	248	00F8.00	➔	30 30 46 38 30 30
2. Parameter code , setpoint:		20	➔	32 30
Parameter value	250	00FA.00	➔	30 30 46 41 30 30
3. Parameter code , actual Output Ratio:		60	➔	36 30
Parameter value	42	002A.00	➔	30 30 32 41 30 30
4. Parameter code, Status word 1:		70		37 30
Parameter value	00	0000.00	➔	30 30 30 30 30 30
Check sum:		C2	➔	43 32
End character:				0D

Transmission to master:

0A 30 43 30 31 31 35 31 30 30 30 46 38 30 30 32 30 30 30 46 41 30 30
36 30 30 30 32 41 30 30 37 30 30 30 30 30 30 30 43 32 0D

13.3 Transmission example, Instruction code 20 H

The device No.27 gets the instruction:
"Take over the parameter "XP- heating" (prop.-band-heating, Parameter code: 40H) into the RAM.

Master to SBC-T:	Dec.	Hex		ASCII
Start character:				0A
SBC-T address:	27	1B	➔	31 42
Constant:		01	➔	30 31
Instruction code:		20	➔	32 30
Parameter code (XP- heating):		40	➔	34 30
Parameter value:	5	0005.00	➔	30 30 30 35 30 30
Check sum:		7F		37 46
End character:				0D

Transmission to SBC-T: 0A 31 42 30 31 32 30 34 30 30 30 30 35 30 30 37 46 0D

SBC-T to Master:	Dec.	Hex		ASCII
Start character				0A
SBC-T address:	27	1B	➔	31 42
Constant:		01	➔	30 31
Instruction code (repeats instruction):		20	➔	32 30
Response* (acknowledged) :		00	➔	30 30
Check sum:		C4	➔	43 34
End character:				0D

Transmission to master: 0A 31 42 30 31 32 30 30 30 43 34 0D

* If the device has understood the instruction issued by the master, it acknowledges with the response 00 H (acknowledge).

In case of transmission or other errors, the device responds with the appropriate error code.

13.4 Transmission example, Instruction code 21 H

The device No.2 gets the instruction:
"Take over the parameter SP1 (Setpoint 1, Parameter code: 21H) and store it power fail.

Master to SBC-T:	Dec.	Hex		ASCII
Start character				0A
SBC-T address:	2	02	➔	30 32
Constant:		01	➔	30 31
Instruction code:		21	➔	32 31
Parameter code (setpoint 1):		21	➔	32 31
Parameter value:	80	0050.00	➔	30 30 35 30 30 30
Check sum:		6B	➔	36 42
End character:				0D

Transmission to SBC-T: 0A 30 32 30 31 32 31 32 31 30 30 35 30 30 30 36 42 0D

SBC-T to master:	Dec.	Hex		ASCII
Start character				0A
SBC-T address:	2	02	➔	30 32
Constant:		01	➔	30 31
Instruction code (repeats instruction) :		21	➔	32 31
Response * (acknowledged):		00	➔	30 30
Check sum:		DC	➔	44 43
End character:				0D

Transmission to master: 0A 30 32 30 31 32 31 30 30 44 43 0D

* If the device has understood the instruction issued by the master, it acknowledges with the response 00 H (acknowledge).
In case of transmission or other errors, the device responds here with the appropriate error code.

14 Error Messages

00 H - acknowledge (no error)

02 H - Check sum error

03 H - Procedure error

The device (SBC-T) reports „procedure error“ if unknown instruction or parameter codes or parameter group codes are stated.

04 H - Non - compliance with specified range

The slave reports „non-compliance with specified range“ in the following instances:
E.g.: Configured measuring and controlling range: 0 ... 400°C and the master wishes to edit 430°C.

05 H - The constant is not 30H,30H or 30H,31H

06 H - Parameter is an only read parameter

The slave (SBC-T) reports „parameter is only read parameter“ if a read parameter is to be edited via the master.
E. g.:
1. The master wishes to specify the output ratio (parameter 60H).
2. The master wishes to send status word 1 (parameter 70H) to the slave.
3. The master wishes to edit the actual process value (e.g. temperature).
4. The master wishes to edit the current setpoint (parameter 20H). Edit SP1 or SP2.

FE H - Error power fail storage

15 Disclaimer of liability

We have checked the contents of the document for conformity with the hardware and software described. Nevertheless, we are unable to preclude the possibility of deviations so that we are unable to assume warranty for full compliance. The information given in the publication is, however, reviewed regularly. Necessary amendments are incorporated in the following editions. We would be pleased to receive any improvement proposals which you may have.
This document may not be passed on nor duplicated, nor may its contents be used or disclosed unless expressly permitted.

Note: Only in interface technology trained personnel following the safety regulations may do the interface connections.

It is essential, that the user has well experience in installing a serial interface.