

ELOTECH
INDUSTRIELELEKTRONIK

**Manual:
Data Transfer**

Profibus DP



**Single Basic Controller
SBC-T Type: R8400...**

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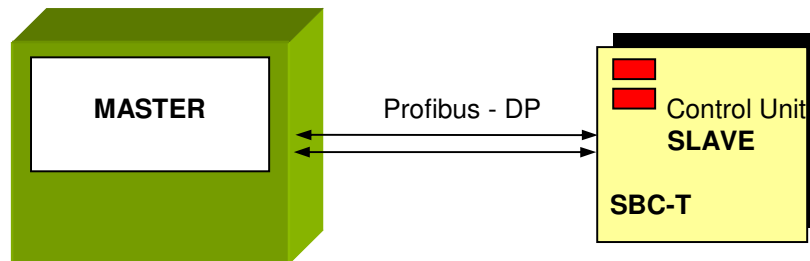
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We have checked the contents of the document for conformity with the hardware and software described. Nevertheless, we are unable to preclude the possibility of deviations so that we are unable to assume warranty for full compliance. The information 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.

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1. Interface, general

The “basic control touch unit” **SBC-T** (slave) is equipped with a PROFIBUS DP interface. The interface is electrically isolated by the rest of the device circuit.



The PROFIBUS -interface allows the slave to be monitored and controlled by a PROFIBUS master. The data transfer between the slave and master takes place with the aid of the PROFIBUS-DP -protocol acc. to EN 50170.

The communication is always controlled by the PROFIBUS-DP master. The address of the slave has to be programmed in the configuration level of the slave.

If there are transmission or other errors detected by the slave, it doesn't accept this data. The old parameter values are still valid.

Slave adjustments:

Unit address: The address of the slave 1...125 has to be adjusted into the communication menu. See parameter „address“.

baud rate: 93,75 kBaud ... 12 MBaud (with automatically detection)

Please take attention to the manual of the slave (SBC-T).

GDS - data file:

Will be delivered by Single Temperiertechnik, Hochdorf (Germany).
Internet: www.single-temp.de

1.1 Connection guide

Note: Only in PROFIBUS- technology trained personnel following the safety regulations may do the PROFIBUS - connections.
It is essential, that one has well experience in installing a profibus device.
See also the FAQ – list.

You will require the following components to connect the slave:

- Connector for Profibus connection to the slave
- PROFIBUS cable (this cable is generally already installed on site!)
- GSD file
- Project planning tool for the PROFIBUS- Master.

It is essential, that you perform the following during connecting in order to ensure that the slave operates correctly:

PROFIBUS- Connections: Connect the slave with the PROFIBUS.

PROFIBUS – Adjustments: Adjust the following parameters (slave):

Parameter „protocol“ to „Profibus DP“

Parameter „address“ to the required Profibus address. (Default address is 2)

Parameter „baud rate“ No adjustment possible.

The baud rate will detected and monitored automatically.

Display: „ndt“ = no baud rate detected.

Diagnostic displays:

The following diagnostic informations will be displayed in the parameter „Status“:

“Data Exchange”:	The slave is in the data-exchange-modus. The communication is OK. The data-exchange with the master takes place.
“Wait Parameter”:	The bus is detected. The slave is waiting until the master has programmed the slave. This happens automatically.
“No Connection”	The slave is not correct connected to the bus. E.g.: - Maybe there is a wiring error. - The master is not active. - The protocol isn't selected in the right way.
“DP HW-Err”:	Hardware error of the slave. No communication possible. Please return the slave. The controller-function of the slave itself is further possible.

2. Parameter transmission

The Communication:

The master sends it's data to the slave.

After this, the slave sends an answer to the PROFIBUS DP - master.

This takes place cyclic and will be controlled by the master.

The configuration of the slave takes place with the help of the GSD- file.

The following modules are available for the slave:

- | | |
|--|--------------------------------------|
| 1. Process reflection: | Module: „SBC Process Data“ |
| 2. Configuration channel: | Module: „Parameter Channel“ |
| 3. Process reflection and Configuration channel: | Module: „SBC Process Data+Parameter“ |

2.1 Process reflection

Parameter transfer according to the process reflection module:

2.1.1 From master to slave:

Transfer of Setpoint 1 and Control word

Byte 1	Byte 2	Byte 3
Setpoint High Byte	Setpoint Low Byte	Control word

Setpoint: The parameter value consists out of 2 data bytes.

<u>Example:</u>	<u>Dec.</u>	<u>Hex.</u>	<u>High-Byte</u>	<u>Low-Byte</u>
Setpoint (°C):	230	00E6	00	E6

(Means 230°C or 230°F – see parameter list, parameter “CF”)

Transmission of the data value takes place without decimal point.

If measuring range is with decimal point: e.g. 150 means 15,0

If measuring range is without decimal point: e.g. 150 means 150

Control word:	Bit 0: slave „on“ or „off“	1 = on
	Bit 1: slave „cool down“ and „off“	1 = on
	Bit 2: sensor internal/external	1 = external
	Bit 3: suction mode	1 = on
	Bit 4*: evacuating mode	1 = on
	Bit 5: 2 nd . setpoint	1 = on
	Bit 6*: auto tuning	1 = on
	Bit 7: ---	---

*to Bit 4 "evacuating mode":

The change from "0" to "1" causes a unique shape emptying.

To re-trigger an evacuation, the bit must temporarily be set to "0".

After completion of the mold evacuation the status is as "device off and evacuation off" reported.

*Bit 6 „Auto tuning“:

The changing from „0“ to „1“ forces one auto tuning action.
 Before starting another auto tuning function, set bit 6 first to „0“ again.
 If Bit 6 is set on „0“ the running auto tuning circle stops.

2.1.2 From slave to master: Transfer of the process data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Status-Instruction	actual process temperature High Byte	actual process temperature Low Byte	from process / external sensor temperature High Byte	from process / external sensor temperature Low Byte

Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
flow High Byte	flow Low Byte	pressure High Byte	pressure Low Byte	0x00	0x00

Byte 12	Byte 13	Byte 14	Byte 15	Byte 16	Byte 17
film-temperature High Byte	film-temperature Low Byte	Controller output 0x9C...0x64	Alarms 1	Alarms 2	Status

Definition „Status Instruction“ : Indicates, if a range error has been detected, when writing the setpoint.
 0 = setpoint value OK.
 1 = setpoint value faulty

Definition „Alarms 1“ :

- Bit 0 = collecting alarm
- Bit 1 = alarm 1
- Bit 2 = ---
- Bit 3 = alarm pump (motor protection)
- Bit 4 = alarm filling level
- Bit 5 = alarm flow transducer and through-flow
- Bit 6 = system error
- Bit 7 = auto-tune error

Definition „Alarms 2“ :

- Bit 0 = ---
- Bit 1 = ---
- Bit 2 = alarm film temperature
- Bit 3 = alarm sensor breakage (act. sensor)
- Bit 4 = alarm pressure
- Bit 5 = alarm delta T (monitoring the difference between pre- and backflow)
- Bit 6 = ---
- Bit 7 = ---

Definition „Status“ :

- Bit 0 = slave on / off
- Bit 1 = slave „cool down“ and „out“
- Bit 2 = sensor internal or external
- Bit 3 = suction mode
- Bit 4 = evacuating mode
- Bit 5 = 2nd. setpoint
- Bit 6 = auto tuning
- Bit 7 = hand- or remote-operation

1 = on
 1 = on
 1 = external
 1 = on
 1 = on
 1 = on
 1 = on
 1 = hand

2.1.3 From master to slave:

Example; transfer of setpoint 1 and control word

Parameter "unity" should be set to "°C" (not "°F", no decimal point).

Byte 1 + 2: The setpoint 50°C should be send to the slave.
Setpoint: 50 decimal = 0x0032 hexadecimal as a 16 Bit integer-value

Byte 3: The slave should be switched „on“ (Bit 0 = 1).

Byte 1	Byte 2	Byte 3
Setpoint High Byte	Setpoint Low-Byte	Control word
0x00	0x32	0x01

Answer from slave to master: Transmission of the process reflection

The slave sends the following parameter-values:

Byte 1:	status instruction	The last instruction was OK.
Byte 2 + 3:	actual value:	55(decimal) = 0x0037 hexadecimal as a 16 Bit integer-value
Byte 4 + 5:	back-flow or ext. temp.:	(only if available) 50 (decimal) = 0x0032(hex.)
Byte 6 + 7:	flow:	(only if available) 0 (decimal) = 0x0000 (hex.)
Byte 8 + 9:	pressure:	(only if available) 0 (decimal) = 0x0000 (hex.)
Byte 10 +11:	---	0x00
Byte 12 + 13:	film temperature:	100 (decimal) = 0x0064 (hex.)
Byte 14:	Output ratio	-33 (decimal) = 0xDF hexadecimal as a 8 Bit integer-value
Byte 15:	alarms 1	no alarm
Byte 16:	alarms 2	collecting-alarm is active
Byte 17:	status	the slave is switched „on“

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Status-Instruction	Actual Process temperature High Byte	Actual Process temperature Low Byte	from process / external sensor temperature High Byte	from process / external sensor temperature Low Byte
0x00	0x00	0x37	0x00	0x32

Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
flow High Byte	flow Low Byte	pressure High Byte	pressure Low Byte		
0x00	0x00	0x00	0x00	0x00	0x00

Byte 12	Byte 13	Byte 14	Byte 15	Byte 16	Byte 17
film-temperature High Byte	film-temperature Low Byte	Controller output	Alarms 1	Alarms 2	Status (read)
0x00	0x64	-100...+100 0xDF	0x00	0x04	0x01

2.2 Configuration channel

With the help of the configuration channel each parameter can be addressed individually. The PROFIBUS DP- master is able to read all available data and to change all write- data.

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

Terms

Instruction-code	[BC]:	"tells"the device, what to do	(1 Byte)
Parameter-code	[PC]:	designates each individual parameter of the slave	(1 Byte)
Parameter-value	[PW]:	shows the value of a parameter	(3 Byte)

Parameter values

Instruction-code	[BC]:	0x10, 0x20, 0x21
Parameter-code	[PC]:	0x00...0xFF
Parameter-value	[PW]:	16 bit integer, real numerical value PWH and PWL and comma PWK
Parameter-value High-Byte	[PWH]	
Parameter-value Low- Byte	[PWL]	
Comma, decimal point)	[PWK]	

2.2.1 Configuration of the parameters via the configuration channel.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Current number	Always:	Instruction code	Always:	Parameter-code	Parameter-value	Parameter-value	decimal point
0x00 ... 0xFF	0x01	BC 0x10, 0x20 or 0x21	0x00	0x00 ... 0xFF	PWH High-Byte	PWL Low-Byte	Comma PWK 0x00 ... 0xFF

Byte 1

Current Number: For every new task the master should pre-set a current number. This number will be repeated from the slave with each answer. So it is possible to find out which instructions and which answers are belonging together.

Byte 2: Always 0x01

Byte 3

Instruction code, BC: 0x10 : Read parameter
 0x20 : Write parameter
 0x21 : Write parameter and store with power fail protection
 Take care: The EAROM or EEPROM of the slave permits max. 1.000.000 write cycles.

Byte 4: Always 0x00

Byte 5**Parameter code, PC: Enquiry:**

addresses the parameter, which should be configured.

Answer:

If the read-proceeding to the slave was OK., than, in the answer of the slave, byte 5 shows the parameter-code PC.

If the write-proceeding to the slave was OK., than, in the answer of the slave, byte 5 shows the value 00H (acknowledge).

If the communication was not OK., the following error-warnings are shown in byte 5:

- 03 H - Procedure error (instruction code not valid)
Unit is not into remote operation.
- 04 H - Non-compliance with specified range (value to low or to high)
- 05 H - Byte 2 \neq 0
- 06 H - The addressed parameter is a read-only parameter
- 08 H - Parameter-code not valid
- 09 H - It is not possible, to execute the instruction
(e.g., the auto tuning can't be started)
- FEH - Error, writing into the power fail storage not possible
- FFH - General error

Byte 6, 7 and 8**Parameter value:**

The parameter value comprises three data bytes:

2 data byte (PWH and PWL), 1 data byte (PWK, decimal point).

Byte 6: Parameter value **PWH**

Byte 7: Parameter value **PWL**

Byte 8: Comma (decimal point) **PWK**

Examples:	Dec.	Hex.	PWH	PWL	PWK
Process value (°C):	215	00D7	00	D7	00
Setpoint (°C):	230	00E6	00	E6	00
Output ratio, cooling (%)	-16	FFF0	FF	F0	00
Setpoint ramp (°C/min):	2,2	0016	00	16	FF

The parameter value is calculated as follows:

Dec.: 2,2 = 22 with one decimal point

Hex.: = 0016 (PWH PWL)

= 01 (comma / decimal point)

Negative data values:

Built binary two's complement.

2.2.2 Parameter codes (Tab 1)

Parameter	Parameter code	Attribute	Others
Cockpit			
1. Setpoint	0x21	RW	
Expert			
control (temperature)	0x10	RO	
film temperature	0x14	RO	
from process / external temp.	0x12	RO	
regulation control	0x60	RO	
flow	0x15	RO	
pressure	0x16	RO	
Device functions			
value limit alarm	0x38	RW	
Leakage stop action	0xA7	RW	
pump overrun	0xD4	RW	cooling before off
pump control on/off	0xB3	RW	as of software V48/18
auto tune	0x88	RW	
Basic			
language	0xD9	RW	
unity	0x1B	RW	
key lock	0x85	RW	
pressure metering	0xE5	RW	optional
flow metering	0xE6	RW	optional
Device parameters			
filling	0xD0	RW	
direct cooling	0x94	RW	
shut down temperature	0x93	RW	
draining time	0xA1	RW	
selection of set value	0xD6	RW	optional
aqua timer start time	0xA9	RW	
aqua timer	0xA0	RW	
max. filling duration	0xB0	RW	
re closing lockout	0x90	RW	emergency off
external sensor	0xD7	RW	optional on=1 off=0
Temperature parameter			
set value 2	0x22	RW	
regulation ratio heating	0x64	RW	
regulation ratio cooling	0x69	RW	
XP - heating	0x40	RW	
TV - heating	0x41	RW	
TN - heating	0x42	RW	
XP - cooling	0x50	RW	
TV - cooling	0x51	RW	
TN - cooling	0x52	RW	
dead area between heat/cool	0x46	RW	
switch cycle time heating	0x43	RW	
switch cycle time cooling	0x53	RW	
maximum set value	0x2C	RW	
minimum set value	0x2B	RW	
system closing temperature	0xA2	RW	
setpoint ramp increasing	0x2F	RW	
setpoint ramp decreasing	0x2E	RW	

hysteresis cooling on	0x5A	RW	only if cooling 2 level active
hysteresis cooling off	0x59	RW	only if cooling 2 level active
offset internal sensor	0xAB	RW	
offset film temp. sensor	0xAF	RW	
offset backrun or ext. sensor	0xAD	RW	
analog value 4..20mA/0..10V	0x84	RW	
Flow metering offset	0x8E		
Alarms			
configuration alarm output	0x34	RW	
film temp. limit	0x39	RW	
alarm flow	0x3B	RW	
alarm pressure too high	0x3E	RW	
Communication			
protocol	-		
address	-		
baud rate	-		only serial
baud rate	-		only Profibus
data format	-		
Status	-		
Pump control			
pump control mode	0xB1	RW	as of software V48/18
fix value	0xB2	RW	as of software V48/18
fix flow rate	0xE7	RW	optional (as of software V36/17)
deviation dT	0xB4	RW	as of software V48/18
XP flow	0xB5	RW	as of software V48/18
TV flow	0xB6	RW	as of software V48/18
TN flow	0xB7	RW	as of software V48/18

Parameter code (Tab 2)

Other parameters:			
Parameter	Parameter code	Attribute	Others
act. process temperature value	0x10	RO	
act. set point	0x20	RO	
device on / off	0x8f	RW	
Device type	0x01	RO	
software version	0x02	RO	

2.2.3 Transmission example: Configuration channel, Instruction code: 10 H

The slave is asked, to send the parameter „Process value, 10 H“ to the master.
The process value is 225 °C. 225 (Decimal) = 0xE1 (Hex)

Master to slave:	Dec.	Hex
Current number:	1	0x01
Always:	1	0x01
Send parameter:	16	0x10
Always:	0	0x00
Parameter code (process value):	16	0x10
Parameter value (High-Byte):	0	0x00
Parameter value (Low -Byte):	0	0x00
Comma / decimal point:	0	0x00

Transmission to slave: 0x01, 0x01 0x10, 0x00, 0x10, 0x00, 0x00, 0x00, 0x00

Slave to master:	Dec.	Hex
Current number of instruction:	1	0x01
Always:	1	0x01
Send parameter:	16	0x10
Always:	0	0x00
Parameter code (process value):	16 *)	0x10
Parameter value (High-Byte):	0	0x00
Parameter value (Low -Byte):	225	0xE1
Comma / decimal point:	0	0x00

Transmission to master: 0x01, 0x01 0x10, 0x00, 0x10, 0x00, 0xE1, 0x00

*) Repetition of the parameter code (PC = 16), because the read-process was OK.

2.2.4 Transmission example: Configuration channel, Instruction code: 20 H

The slave gets the instruction:
"Overtake parameter XP-heating (parameter code: 40H, parameter value: 5,0 %)
and store into the RAM".

Master to slave:	Dec.	Hex
Current number:	2	0x02
Always:	1	0x01
Instruction code:	32	0x20
Always:	0	0x00
Parameter code:	64	0x40
Parameter value (High-Byte):	0	0x00
Parameter value (Low -Byte):	50	0x32
Comma / decimal point:	1	0x01

Transmission to slave: 0x02, 0x01, 0x20, 0x00, 0x40, 0x00, 0x32, 0xFF

Slave to master:	Dec.	Hex
Current number of instruction:	2	0x02
Always:	1	0x01
Instruction code:	32	0x20
Always:	0	0x00
Parameter code (Prop-band, heating):	0 *)	0x00
Parameter value (High-Byte):	0	0x00
Parameter value (Low -Byte):	0	0x00
Comma / decimal point:	0	0x00

Transmission to master: 0x02, 0x01, 0x20, 0x00, 0x00, 0x00, 0x00, 0x00

*) If the slave has understood the instruction of the master, it answers always with the parameter code (PC) = 00, because the writing-process was OK.
If there are transmission or other errors the slave answers with the corresponding error code.

2.2.5 Transmission example: Configuration channel, Instruction code: 21 H

The slave gets the instruction:

"Overtake parameter setpoint 1 = 200°C (parameter code: 21H) and store power fail safe into the EEPROM".

Master to slave:	Dec.	Hex
Current number:	3	0x03
Always:	1	0x01
Instruction code:	33	0x21
Always:	0	0x00
Parameter code (SP1):	33	0x21
Parameter value (High-Byte):	0	0x00
Parameter value (Low -Byte):	200	0xC8
Comma / decimal point:	0	0x00

Transmission to slave: 0x03, 0x01, 0x21, 0x00, 0x21, 0x00, 0xC8, 0x00

Slave to master:	Dec.	Hex
Current number of instruction:	3	0x03
Always:	1	0x01
Instruction code:	33	0x21
Always:	0	0x00
Parameter code:	0 *)	0x00
Parameter value (High-Byte):	0	0x00
Parameter value (Low -Byte):	0	0x00
Comma / decimal point:	0	0x00

Transmission to master: 0x03, 0x01, 0x21, 0x00, 0x00, 0x00, 0x00, 0x00

- *) If the slave has understood the instruction of the master, it answers always with the parameter code (PC) = 00, because the writing-process was OK.
If there are transmission or other errors the slave answers with the corresponding error code.

2.3 Process reflection and Configuration channel

It is possible, to transmit process reflection and configuration channel simultaneously
In this case the bytes of the configuration channel have to be fit together with the process reflection.

Master to slave:

Byte 1	Byte 2	Byte 3
Setpoint High Byte	Setpoint Low Byte	Control word

Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
Current number	always: 0x01	Instruction code BC	always: 0x00	Parameter-code PC	Parameter-value PWH High Byte	Parameter-value PWL Low Byte	Comma / decimal point: PWK

Slave to master:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Status-Instruction	Actual Process temperature High Byte	Actual Process temperature Low Byte	from process / external sensor temperature High Byte	from process / external sensor temperature Low Byte

Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
flow High Byte	flow Low Byte	pressure High Byte	pressure Low Byte	0x00	0x00

Byte 12	Byte 13	Byte 14	Byte 15	Byte 16	Byte 17
film-temperature High Byte	film-temperature Low Byte	Controller output	Alarms 1	Alarms 2	Status (read)

Byte 18	Byte 19	Byte 20	Byte 21	Byte 22	Byte 23	Byte 24	Byte 25
Current number	always: 0x01	Instruction code BC	always: 0x00	Parameter-code PC	Parameter-value PWH High Byte	Parameter-value PWL Low Byte	Comma / decimal point: PWK