Peltier-Controller TC0806

Operation-Manual

Version 1.04E as of Oktober. 27 2006

Inhalt

1. Overview

1.1 Application

The **Peltier-Controller TC0806** is a temperature indicator with controlling function and DC-voltage output for driving small low voltage Peltier Elements. It has a housing for panel mount according to DIN 43700.

1.2 About this Document

This document is valid for instruments starting from FW-Version **V100.20 of 14.3.2006**. The included operation manual for the program "TCCOM for Windows" is described in a separate document.

1.3 Scope of Supply

To the scope of supply belongs:

- Controller TC0806
- 2 brackets
- 1 Connector Sauro CIF, grid 5.08 mm, 4-poles
- 1 or 2 Connector(s) Sauro CTF, grid 3.81mm, 8-poles (1 connector when choosing RS232-cable option)
- this manual TC0806 (as PDF file on CD)
- CD with:
  - TCCOM for Windows
  - Manual TCCOM for Windows (as PDF file)

Optional accessories:

- 2.0m long interface cable with 9-pole DSUB-plug and connector Sauro CTF, grid 3.81mm, 8-poles

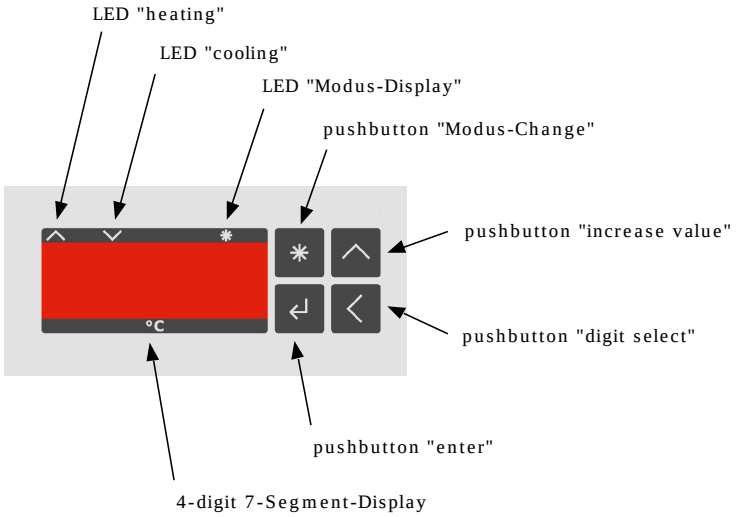
2. Connections and User Interface

2.1 Overview

The user interface is located on the visible front of the Instrument. The connection of the instrument is made using 3 Connectors on the rear of the controller. The instrument will be installed via its two snap clamps with fastening screws.

2.2 Display and Keypad

The instrument has a 4-digits 7-segments display. The temperature indication range is -75.0... +175.0. The nominal temperature range is -50.0... +150.0. The unused decimal points are used for displaying the operation modes.



Picture 1: View of the front panel

Function of the 3 LEDs:

LED “Heating”	Controller heats
LED “Cooling”	Controller cools
LED “Mode display”	Programming mode and other special displays

The 4 Keys have the following functions:

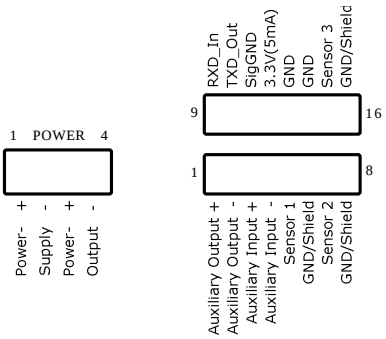
Key „Mode switch“	changes the operation mode Short pushing shows the actual preset value
Key “increase value”	increases the value of the selected digit Pushing during nominal mode shows the value of the sensor #2, if programmed
Key „“Enter“	stores the value or selects a new program
Key ”Digit select“	changes the activated digit Pushing in nominal mode shows the value of the senor #3, if programmed

The function details are described under the chapter “Firmware”.

2.3 In- and Outputs

2.3.1 Overview

The connection is made with 3 socket connectors on the rear side of the instrument.



Picture 2: View of the terminals

The connection will be made via a 4-pole connector with a grid of 5.08 mm for voltage supply and power output. Two 8 pole frame connector with a grid of 3.81mm make the connection for the signal voltages with the following pin allocation:

Voltage supply and power output

Pin configuration	1	Voltage supply (plus)
	2	Voltage supply (minus)
	3	Power output (plus)
	4	Power output (minus)

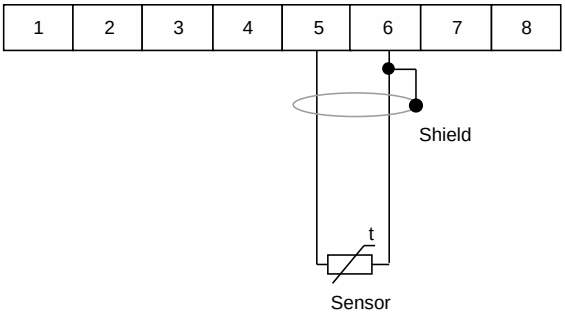
Signal voltages:

Pin configuration	1	Auxiliary output (plus)
	2	Auxiliary output (minus)
	3	Auxiliary input (plus)
	4	Auxiliary input (minus)
	5	Sensor 1
	6	GND / Shield
	7	Sensor 2
	8	GND / Shield
	9	RS232-interface, RXD_In
	10	RS232-interface, TXD_Out
	11	RS232-interface, GND
	12	3.3V voltage (for further options do not use!)
	13	GND
	14	GND
	15	Sensor 3
	16	GND / Shield

2.3.2 Sensor Input

The sensor input is configured for Pt1000 resistive temperature sensors exclusively. The measuring current is about 0.75 mA

Input voltage range	500.. 1040mV
Resistance range	700 .. 1670 Ohm (or - 75.0 ... 175.0 °C)
Measuring system	2-wire technique



Picture 3: Wiring of the sensor, example shown for sensor #2

Because of the 2-wire measuring principle the resistance of the wires is not compensated. This creates the following errors:

- Consistently elevated indication value
- Variable error as a result of the temperature changes in the sensor cable and its coefficient

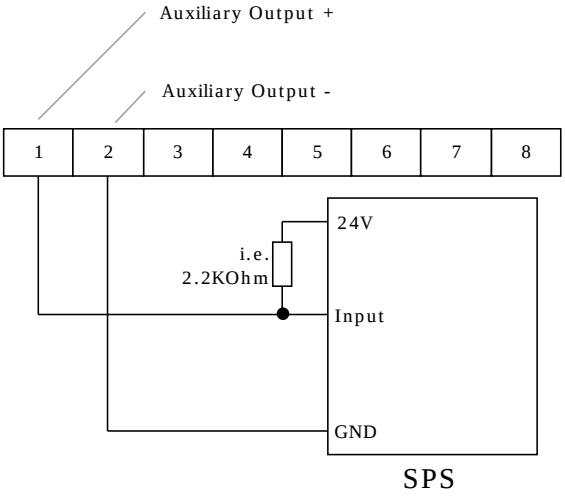
Sensor leads with larger cross section of 0.5 mm2 or 0.75 mm2 reduces the influences of the variables. A resistance of the sensor wire of 0.39 Ohm corresponds to an average error of 0.1°C of the displayed temperature.

2.3.3 Auxiliary Output

The Instrument is equipped with a digital output, which can be used for monitoring the operation status. Depending on the configuration the output will be activated at:

- "OK"-Function, the temperature is balanced, that means within the programmed temperature-tolerance-range.
- "Alarm"-Function, the temperature deviates significantly, that means the temperature is beyond the programmed temperature-Alarm-limits

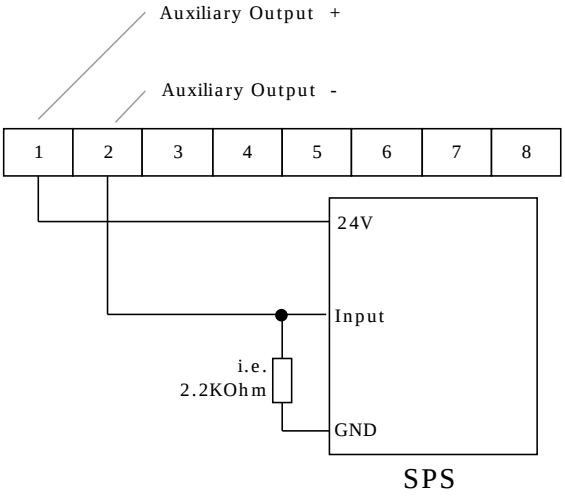
Voltage rating	max. 30V
Output current	max. 100 mA
Overload protection	limited protection against spikes
Type	NPN-Transistor
Minimum voltage	< 2V in „on" position



Picture 4: Wiring of a SPS to the auxiliary output (LOW-active)

As an example the wiring above shows the link to the input of a SPS. Less than 2 V at the SPS input means an activated auxiliary output.

The wiring below shows another option of the link to the input of a SPS. Now, > 22 V at the SPS input means an activated auxiliary output.



Picture 5: Wiring of a SPS at the auxiliary output (HIGH-active)

2.3.4 Auxiliary Input

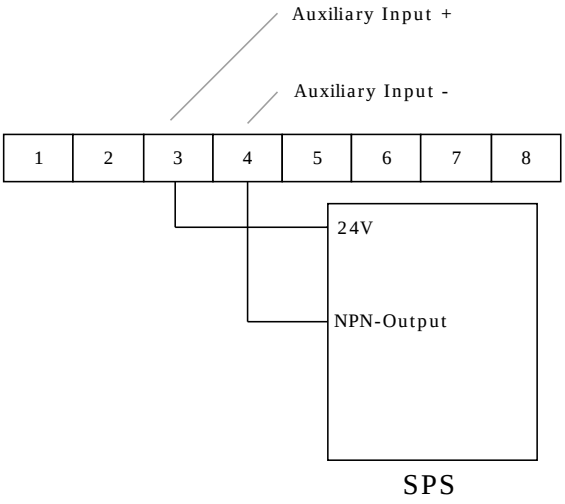
The instrument is equipped with a digital input, by which the power output can be optionally switched on and off. According to the configuration is valid:

- "OFF"-Function, in case of an activated input the power output will be off.
  (this option is default to make the instrument working without using the auxiliary input)
- "ON"-Function, only with activated input the power output will be on

Voltage rating	max. 30V
Input resistance	ca. 1KOhm
Voltage for "ON"	> 5V
Voltage for „OUT"	< 1V

The input works independently from polarity. An operation with AC current is not allowed because the power output would be modulated.

The wiring below shows the activation by a NPN-output of a SPS. With a switched-on NPN output (=LOW) the auxiliary input is activated.



Picture 6: Wiring of a SPS at the auxiliary input

2.3.5 Power Output

The power output supplies a DC current to drive the Peltiers. The polarity will be dynamically switched by the controller, thus it can be heated and cooled.

Output voltgage	in the range +/- 1.0V to +/- 8.0 V programmable
Output current	max. 6 A
Overload protection	Overcurrent limitation
Connecting cable	recommended AWG (wire size) depending on the Peltier current and lead length 0.75 ... 2.5 mm2

The connection marking „output+“ and „output –“ relates to the polarity of the output voltage during cooling process!

Please observe the correct polarity. If the Peltier cools, and it should heat (or inverse) the polarity has to be changed.

2.3.6 Voltage Supply

Voltage supply	12... 13.8V DC voltage
Current consumption	depends on the output current and the ratio of the operation voltage to the output voltage, max 6A
Protection	internal melting fuse > may only be replaced by the manufacturer – once the housing has been opened, the guarantee will be void
Connecting cable	recommended cross section depending on the current and cable length 0.75... 2.5 mm2

Regarding EMV compatibility (electrical noise) in case of long cable twisted leads are recommended.

2.3.7 Serial Interface according to RS232C

The interface supports a simple protocol with software-handshake, it means only signals RXD and TXD are present

The interface is used for internal adjustments and diagnostics.

It can be used by the customer for remote control, e.g. by a superior processing control or together with the “TCCOM for Windows” program.

The interface has the following data format:

Data format	8 data-, 2 stop bits
Parity	none
Baud rate	firm 9600 Baud

The interface signals are connected to the connector:

Pin allocation	9	RXD (from PC)
	10	TXD (to the PC)
	11	GND

For connecting the TC0806 to a PC a special interface cable with DSUP-bushing and plug Sauro CTF, grid 3.81 mm, 8-poles of 2.0 m length is available as an option.

3. Operation Description

3.1 General

The instrument has two basic operation modes, the so called “Normal Mode” and the “Configuration Mode”. After switched on the controller is in the Normal Mode.

Short pressing of the “mode key” indicates the actual set value.

Pressing the key “increase value” indicates in the normal mode the value of the sensor #2, if it is enabled in the configuration.

Pressing the key “digit selection” indicates in the normal mode the value of the sensor #3, if it is enabled in the configuration.

Long pressing the „mode key“ forces the controller to turn into the configuration mode.

3.2 Power on

When the controller is switched-on the test display appears (all segments and decimal points are illuminated). First of all the instrument searches a valid configuration in the internal EEPROM. If this fails, the controller shows the error E100 and is not operational. The error E100 can be eliminated by reprogramming the basic configuration with TCCOM for Windows to restore the factory setting. **For the “how to make” please contact the factory.**

All outputs are inactive after having switched-on.

3.3 Normal mode

In the normal mode the temperature of the sensor #1 will be consistently measured and displayed. The “Mode key” is being checked. The controller processes the actual temperature and the set temperature and then sets the voltage at the power output.

If configured the values of the sensors #2 and #3 will be evaluated and compared with the temperature-limit value #2 or #3. If the temperature of the sensors surpasses the appropriate limit value, the controller will be switched off and indicates an error. The typical application of this is the protection of the Peltiers Elements against over temperature.

The LED „Heating“ and LED „Cooling“ are flashing, if the temperature is beyond the alarm range.

The LED „Heating“ and LED „Cooling“ are consistently switched on, if the temperature is between the tolerance- and alarm range.

The LED „Heating“ and „Cooling“ are switched off, if the temperature is within the tolerance range.

The LED-display and the adjustment of the tolerance- or alarm range have no influence on the function of the controller.

3.4 Display of set value

For this you need to press the „Mode key“ till the LED „Mode display“ flashes. Then the key can be released. The instrument indicates for 3 seconds the set value. Then the instrument turns automatically to the Display of the actual value.

3.5 Display the value of sensor 2

For this you need to press the key “increase value “. Now, the instrument for 3 seconds indicates the sensor 2 value. Then the instrument returns automatically to the display of the actual value.

3.6 Display the value of sensor 3

For this you need to press the key „Digit selection“. Now, the instrument for 3 seconds indicates the sensor 2 value. Then the instrument automatically returns to the Display of the actual value.

3.7 Setting of the configuration values

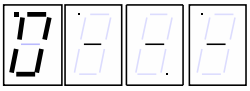
For this you need to press the „Mode key“ till the LED „Mode display“ flashes and then hold it till the instrument further switches to configuration mode.

Please note, that not all internal values can be programmed using the keys. Certain values are only programmable with the configuration programm over the serial interface. In this chapter only the values alterable via the keys are described.

The description below uses the following conventions:

Fat signs:	Segment flashing
normal	Segment consistent on
grey	Segment off

Step 1 – Switch over to the configuration mode
- press the „Mode key“
- the LED “Mode display“ starts to flash
- keep pressing till the display jumps:

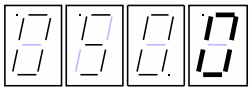


- the first digit flashes and indicates which value can be changed
- the LED “Heating” and LED “Cooling” continue to indicate the state of the controller output
- now, a timeout is running, which returns to the normal mode, if no key is pressed

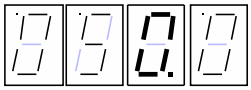
Step 2 – selection of the value to be altered
The following options are offered:
- press key „input“ to accept the selection and to proceed with changing its value
- press key „increase value“ to select another configuration item
- press „Mode key“ to exit the configuration mode immediately

(the key „digit selection“ is ineffective in this state)

Step 3 – adjust value
- you have selected the value to be altered with the key „increase value“ and the key „input“
- the display now displays the presently programmed value, in this example the set temperature

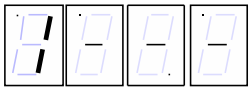


- it indicates the set temperature (in this example 50.0 °C)
- the last digit flashes
- now there are the following options:
  - press the key “increase value” to change the flashing digit (0..9, 0...)
  - press the key “digit selection” to select another digit



- with the keys „increase value“ and „digit selection“ select the desired value

Step 4 – confirm or reject value
- press key “input” to confirm the selected value
- Display generally flashes
- after release of the key “input” the value is transferred to the non volatile memory
- the display monitors again, which value can be changed, see step 2



- press „Mode key“ to exit immediately the configuration mode without changing the actual value

Display of the first digit and its meaning:

Display	Meaning
0	set value
1	range of tolerance
2	range of alarm
3	filter time constant
4	function auxiliary input
5	function auxiliary output
6	P
7	I
8	D
9	IL
U	max. value of the output voltage
o	temperature correction (offset)
r	temperature ramp of the set value
C	temperature limit value sensor #2 (Cool = cold side)
H	temperature limit value sensor #3 (Hot = warm side)

3.8 Special value indications

3.8.1 Set value

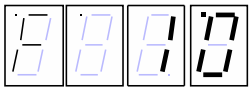
The selectable range is -99.0 ... 199.9, while the nominal range is -50.0 ... 150.0. Thus the highest digit only changes between 0 .. 1 .. - (minus symbol).

3.8.2 Tolerance and alarm range

- the range is 0.0 .. 9.9
- the display is in 1/10°

3.8.3 Filter

- “F” for Filter is displayed in the left most digit

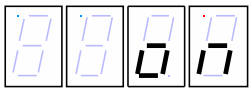


- Digit 0 and 1 show the time constants in seconds 1 - 2 - 5 - 10 - 20 - 50 - 1 ..

3.8.4 Auxiliary Input

The auxiliary input can be optionally used to switch-on or to switch-off the output. Standard is switch-off, to get the instrument working without external connection.

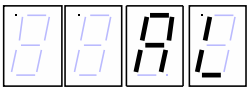
Display “OFF” corresponds to the switch-off function, that is if the control input is activated the output will be switched-off.



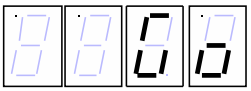
Display „on“ corresponds to the switch-on function, that is if the control input is activated, the output will be switched-on.

3.8.5 Auxiliary Output

The auxiliary output has two operation modes:



- “AL” corresponds to the Alarm function, it means if temperature is outside of the alarm range the auxiliary output is activated



- “Go” corresponds to the good function, it means if temperature is within the tolerance range the auxiliary output is activated

3.8.6 Parameter

The parameter adjustment displays at the left most digit a code letter (in the example a “P” for the proportional value KP):

Meaning of the code letter:

P:	Controlling parameter KP
I:	Controlling parameter KI
d:	Controlling parameter KD

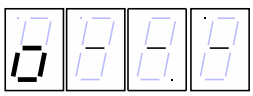
The maximum value is in each case 63.

L: Controlling parameter IL (Integration limit), maximum value 999
The displayed value is internally multiplied by 10! Using TCCOM the internal used value is displayed (thus 10 times)

U: Maximum value of the output voltage (U = symbol for voltage), value span 1.0 .. 8.0 [V], in excess of the value the display turns to zero and it needs to be re-adjusted. A value equal to zero in fact switches off the power output. Values between 0 and 1.0 V are not allowed. .

3.8.7 Temperature Adjustment

The left most digit displays the code letter “o”:



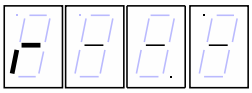
After pressing the key “input” the actual measured real temperature is displayed. For correction the desired actual value must be selected. This can be achieved for example by a reference temperature instrument, or there is an ice bath as a reference.

With it the tolerance of the sensor or of the measuring setup can be compensated.

There is no possibility by means of the keys to get the original configuration re-adjusted. Only by means of the configuration program the correction value can be reset to zero.

3.8.8 Temperature Setvalue Ramp

The left most digit displays the code letter “r”:



After pressing the key “input” the actual programmed value of the temperature ramp is displayed. In the example 6.0° per minute.

This means, that the internal set value will be recalculated continuously to achieve a ramp of 6.0° per minute until the value of the nominal set temperature is reached.

A selected value of 0.0 will suspend the ramp function, that means a change of the nominal set temperature is immediately effective. Thus the actual set temperature is always equal to the nominal set temperature.

The nominal set value is the value, which is displayed when shortly pressing the mode key.

The „actual set value“ is an internal value, which is interpolated from the ramp selection, the nominal set value and the prehistory.

When switched-on the ramp starts at the actual temperature, the actual set temperature is equal the actual temperature for the time being. In all other cases the starting point is the actual (internal) set temperature.

3.8.9 Temperature Limits for Sensor 2 and 3

The selectable range is -99.0 ... 199.9, while the nominal range is -50.0 ... 150.0. The highest digit changes only between 0 .. 1 .. – (minus symbol)

The value -99.9 suspends the function. Then the temperature value will not be displayed and also not evaluated. The function of the appropriate display keys are set off the function.

3.9 Host Mode

When the instrument receives characters over its serial interface, they will be decoded and recognized commands executed. Temperature value acquisition, display and the controller will continue to be performed.

There is no visualisation on the display of the access via the interface. Changed values will only be effective after the command u 0 0 has been sent. This happens automatically if TCCOM for Windows is used, but needs to be noted when using your own communication program.

In case of uncertainties, if all values have been saved, it is recommendable to switch-off and switch-on the instrument after changing the configuration.

3.10 Exceeding Measurement Range

If the actual value falls below -75.0°C or exceeds +175°C the instrument goes to a temporary error state. The display flashes “9999”. The power output is switched off. The instrument further checks the measure value. If the value returns to the allowed range, the instrument will revert to normal operation.

Please note, that the specification is is guaranteed only in the nominal range of -50.0 ... +150.0°C.

3.11 Error Display

Non fatal errors are displayed as Ennn not flashing for 5 seconds from the detection, thereafter the instrument will revert to the normal operation. If the error continues it will be redisplayed immediately. Fatal errors are consistently displayed.

Error number	Meaning	error cause / elimination
Non fatal errors		
E001	General error	Various causes > contact manufacturer
E002	Writing error of the EEPROM	Writing of a configuration value has failed > repeat configuration step > contact manufacturer
E003	Over current error of the power output	Short circuit at the power output, broken Peltier-Element > check wiring / correct > check Peltier-Element / exchange > possibly contact manufacturer
E004	Controller overheated	Inside temperature of the controller too high Ambient temperature too high, controller is exposed to direct sun radiation Output overloaded > excessive external heat to be avoided > remove overload
E005	Temperature limit value 2	The measured value of sensor #2 is higher than the selected limit value.
E006	Temperature limit value 3	The measured value of sensor #3 is higher than the selected limit value.
E007	Range error sensor 2	The measured value of sensor #2 is outside of the allowed range (< -75.0 °C respectively > 175 °C)
E008	Range error sensor 3	The measured value of sensor #3 is outside of the allowed range (< -75.0 °C respectively > 175 °C)
E010	Watchdog has responded	electronic noise or program error > to be ignored if appears once > contact manufacturer
fatal errors		
E100	EEPROM contains no valid configuration	supply voltage loss during a configuration process > switch-off / switch-on > re-configure (only possible with TCCOM and valid configuration data file) > contact manufacturer
E200	Stack error	electronic noise or program error > to be ignored if appears once > contact manufacturer

3.12 Communication

3.12.1 Overview

The below mentioned information may be used for the implementation to write customized control-software. Otherwise they can be ignored.

WARNING: A wrong usage of the commands described in the following can completely inhibit the function of the Peltier-Controller TC0806, wired components may be destroyed or the instrument itself. Excessive currents and temperatures may occur – risk of fire hazard !

3.12.2 Block format

A simple ASCII-protocol is used for communication. To simplify the control program “TCCOM.EXE” has been developed and is included with the controller. It is also possible, even though less comfortable, to use a simple terminal program.

Synchronisation	*
Command (only Master)	<address> _ <command> _ <parameter> _ <value>§
Acknowledge (only Slave)	. / ? / #
Answer (only Slave)	<value> §

The message components are defined as follows:

address	A..Z (at present only A)
command	a..z (at present only d, r, u, w)
parameter	0..65535 (no leading zeros, negative figures will be transferred to positive figures, and then accordingly interpreted “typecast”).
value	0..65535 (no leading zeros, negative figures will be transferred to positive figures, and then accordingly interpreted “typecast”).

3.12.3 Allowed characters

*	Interruption from Master (for Synchronisation)
A..Z	address
a..z	commands
_	(underline) is separate sign between values
§	end of the message, ASCII [15]
.	Quittance “OK”
?	Quittance “unknown / incomplete command sequence”
#	internal error

3.12.4 Protocol

Each communication is started by the Master (PC) by sending “*” for synchronsiation. The slave (TC0806) reacts by transiting to idle state.

Now the master sends address and command (in our example “A_r_0_0”). After each sign the received sign will be sent back from the slave (echo). [15] represents the end of the message “§”.

Now the slave executes the command. In case of success it sends a “.”. At commands the communication is then completed. If the commend was a request the response will follow immediately (in our example “65394”. [15] represents the end of the message „§“.

15:46 ----------> r_50_0
15:46 > A_r_50_0
15:46 > *A
15:46 < A
15:46 > _
15:46 < _
15:46 > r
15:46 < r
15:46 > _
15:46 < _
15:46 > 5
15:46 < 5
15:46 > 0
15:46 < 0
15:46 > _
15:46 < _
15:46 > 0

15:46 < 0
15:46 > [15]
15:46 < [15]
15:46 < .
15:46 < . (OK)
15:46 < 65394[15]
15:46 < 65394
15:46 ----------< -142

Picture 7: Excerpt of a logfile (fat corresponds to data exchange, normal „Highlevel“-Information)

3.12.5 Debug Mode

With the command d_1_0 the TC0806 is switched into the Debug-Mode. Now the module is sending contiuously internal values till to the receipt of a command d_0_0. The data will be recorded by TCCOM for Windows and for example being displayed with the function “Recorder”.

A Instruction set

WARNING: A wrong usage of the commands described in the following can completely inhibit the function of the Peltier-Controller TC0806, wired components may be destroyed or the instrument itself. Excessive currents and temperatures may occur – risk of fire hazard !

Read/Write Commands r_ .. _ / w_ .. _	Parameter	Strukture	Data	Index	Description
0	cfgTable	setValue	--		
1	0	cfgTable	tolRange	--	
2	0	cfgTable	alarmRange	--	
3	0	cfgTable	filter	--	
4	0	cfgTable	cfg	--	xi x0 xxxx i = InputMode o = outputMode
5	0	cfgTable	KP	--	
6	0	cfgTable	KI	--	
7	0	cfgTable	KD	--	
8	0	cfgTable	IL	--	
9	0	cfgTable	Votlage limit	--	
10	0	cfgTable	offset	--	
11	0	cfgTable	setValRamp	--	
12	0	cfgTable	Temperature limit value 2	--	
13	0	cfgTable	Temperature limit value 3	--	
14	0	cfgTable	Temperature limit value 4	--	not used
15	0	cfgTable	Temperature-Offset 2	--	factory adjustment, do not change!
16	0	cfgTable	Temperature-Offset 3	--	factory adjustment, do not change!
17	0	cfgTable	Temperature-Offset 4	--	factory adjustment, do not change!
18	0	cfgTable	Config 1	--	internal, factory adjustment, absolutely do not change!
19	0	cfgTable	Config 2	--	internal factory adjustment, absolutely do not change
20	0	cfgTable	Config 3	--	internal factory adjustment, absolutely do not change!
21	0	cfgTable	Config 4	--	internal factory adjustment, absolutely do not change!
22	0	cfgTable	Config 5	--	internal factory adjustment, absolutely do not change!
23	0	cfgTable	Config 6	--	internal factory adjustment, absolutely do not change!
24	0	cfgTable	ofCorrVal	--	internal factory adjustment, absolutely do not change!
25	0	cfgTable	ofRefTemp	--	internal factory adjustment, absolutely do not change!
26	0	cfgTable	gnCorVal	--	internal factory adjustment, absolutely do not change!
27	0	cfgTable	gnRefTemp	--	internal factory adjustment, absolutely do not change!
28	0	cfgTable	gnRefVal	--	internal factory adjustment, absolutely do not change!
29	0	cfgTable	linTable	0	internal factory adjustment, absolutely do not change!
30	0	cfgTable	linTable	1	internal factory adjustment, absolutely do not change!
31	0	cfgTable	linTable	2	internal factory adjustment, absolutely do not change!
32	0	cfgTable	linTable	3	internal factory adjustment, absolutely do not change!
33	0	cfgTable	linTable	4	internal factory adjustment, absolutely do not change!
34	0	cfgTable	linTable	5	internal factory adjustment, absolutely do not change!

Read/Write Commands r_ .. _ / w_ .. _	Parameter	Strukture	Data	Index	Description
35	0	cfgTable	linTable	6	internal factory adjustment, absolutely do not change!
36	0	cfgTable	linTable	7	internal factory adjustment, absolutely do not change!
37	0	cfgTable	linTable	8	internal factory adjustment, absolutely do not change!
38	0	cfgTable	linTable	9	internal factory adjustment, absolutely do not change!
39	0	cfgTable	linTable	10	internal factory adjustment, absolutely do not change!
40	0	EEData	setValue	--	
41	0	EEData	tolRange	--	
42	0	EEData	alarmRange	--	
43	0	EEData	filter	--	
44	0	EEData	cfg	--	
45	0	EEData	KP	--	
46	0	EEData	KI	--	
47	0	EEData	KD	--	
48	0	EEData	IL	--	
49	0	EEData	Voltage limit	--	
50	0	EEData	offset	--	
51	0	EEData	setValRamp	--	
52	0	EEData	Temperature-limit value 2	--	
53	0	EEData	Temperature-limit value 3	--	
54	0	EEData	Temperature-limit value 4	--	not used
55	0	EEData	Temperature-Offset 2	--	factory adjustment, do not change!
56	0	EEData	Temperature-Offset 3	--	factory adjustment, do not change!
57	0	EEData	Temperature-Offset 4	--	factory adjustment, do not change!
58	0	EEData	Config 1	--	internal factory adjustment, absolutely do not change!
59	0	EEData	Config 2	--	internal factory adjustment, absolutely do not change!
60	0	EEData	Config 3	--	internal factory adjustment, absolutely do not change!
61	0	EEData	Config 4	--	internal factory adjustment, absolutely do not change!
62	0	EEData	Config 5	--	internal factory adjustment, absolutely do not change!
63	0	EEData	Config 6	--	internal factory adjustment, absolutely do not change!!
64	0	EEData	ofCorrVal	--	internal factory adjustment, absolutely do not change!
65	0	EEData	ofRefTemp	--	internal factory adjustment, absolutely do not change!
66	0	EEData	gnCorVal	--	internal factory adjustment, absolutely do not change!
67	0	EEData	gnRefTemp	--	internal factory adjustment, absolutely do not change!
68	0	EEData	gnRefVal	--	internal factory adjustment, absolutely do not change!
69	0	EEData	linTable	0	internal factory adjustment, absolutely do not change!
70	0	EEData	linTable	1	internal factory adjustment, absolutely do not change!
71	0	EEData	linTable	2	internal factory adjustment, absolutely do not change!
72	0	EEData	linTable	3	internal factory adjustment, absolutely do not change!
73	0	EEData	linTable	4	internal factory adjustment, absolutely do not change!

Read/Write Commands r_ .. _ / w_ .. _	Parameter	Strukture	Data	Index	Description
74	0	EEData	linTable	5	internal factory adjustment, absolutely do not change!
75	0	EEData	linTable	6	internal factory adjustment, absolutely do not change!
76	0	EEData	linTable	7	internal factory adjustment, absolutely do not change!
77	0	EEData	linTable	8	internal factory adjustment, absolutely do not change!
78	0	EEData	linTable	9	internal factory adjustment, absolutely do not change!
79	0	EEData	linTable	10	internal factory adjustment, absolutely do not change!
100	0	intData	rawValue	--	only reading
101	0	intData	linValue	--	only reading
102	0	intData	actValue	--	only reading
103	0	intData	actP	--	only reading
104	0	intData	actI	--	only reading
105	0	intData	actD	--	only reading
106	0	--	FWVersion	--	only reading
107	0	--	actChipTemp	--	only reading
110	0	--	outputSetVal	--	for internal purpose – do not use !!
111	0	--	Over current limit	--	for internal purpose – do not use !!
120	0	--	Value Sensor 1	--	only reading
121	0	--	Value Sensor 2	--	only reading
122	0	--	Value Sensor 3	--	only reading
150	0	--	Test-voltage	--	switches off the controller and set the output voltage value (+/- 0...127 corresponds to +/- 0... 100% of the configurated output voltage)
151	0	--	Test-minimum temperature	--	in case of underflow of the value by the actual temperature of the sensor #1 the output load will be switched off (only in test mode)
151	0	--	Test-maximum temperature	--	in case of overflow of the value by the actual temperature of the sensor #1 the output load will be switched off (only in test mode

For all read commands the parameter is always 0, for write commands the desired value has to be declared.

The meaning of the structure-column:

cfgTable — internal configuration data structure, a change of these values is only valid till to the next switch-off and switch-on of the instrument.

EEData — same values as cfgTable, however the values will be permanently stored in EEPROM, thus are also valid after the next switch-off and switch-on of the instrument

Attention:

An excessive number of changes of these values can cause that the maximum allowed number of writing cycles are exceeded! Thereafter the instrument “forgets” the values at the switch-off.

Values from the EEData must be transferred by the command u_0_0 in cfgData to be effective !

intData — internal data structure for variable values