

5 Operation and control

NOTICE



The device must not be started or operated outside the specifications!

After switching on the supply voltage the cooler starts to cool the cooling block. When switched off the contact between X2.1 and X2.2 is closed.

The target temperature is factory preset to 5 °C. The alarm limit is defined at +5/-2 K.

(Note deviating defaults with Modbus option enabled, see Modbus register table).

5.1 Status Signal via LEDs and Status Relay

LED green	LED red	Status	Condition internal	FF	Temperature	Description
OFF	OFF	X2.1, X2.2		Unit off		With the cooler switched off, the status output corresponds error status.
ON	OFF	X2.1, X2.3	OK	OK (*)	OK	Normal operation
OFF	Flashing f = 1 Hz	X2.1, X2.2	OK	OK (*)	Error	Overload / temperature outside the target range
OFF	ON	X2.1, X2.2	OK	Error	xxx	Moisture penetration
OFF	Flashing f = 5 Hz	X2.1, X2.2	Error	xxx	xxx	Various possible causes, contact Service.

OK No error

Error Error present

xxx Status not defined

f =... LED flash frequency

X2.1, X2.2... Markings on terminals

(*) Also applies if no moisture detector connected

If the red LED lights up during operation, please refer to chapter [“Troubleshooting”](#) [> page 19].

5.2 Using the Digital Interface

The digital interface on this device is a Modbus RTU protocol, which physically communicates via RS485 (2-wire). The cooler therefore takes on the role of the slave in communication.

The Modbus interface enables direct access to process and diagnostic data and parameters during operation.

5.3 Modbus Configuration

The settings listed below correspond to the default settings; with the interface active, the parameters can be adjusted.

Structure of a character:

1 start bit

8 data bits

1 parity bits (configurable)

1 stop bit (*)

Baudrate: 19200 bps (configurable)

Device ID: 10 (configurable)

(*) The length of a character is always 11 bits. If the interface is configured with 0 parity bits, the number of stop bits automatically changes to 2.

5.4 Modbus Communication

Communication via Modbus RTU is always initiated by the master (request). The slave (typically) responds to the request with a response. A Modbus RTU frame for a request/response always has the following structure:

Address field (A)	Function code (FC)	Data	CRC
1 byte	1 byte	1 ... 252 bytes	2 bytes

Register addresses and data are transferred in Big Endian format.

Every register stands for a 16 bit value, with the information represented in various data types. The data type and required function code are assigned to the respective registers in the following tables.

To read/write data types with sizes larger than an individual register, multiple registers must be addressed.

Supported function codes:

Function code (FC)	FC values
Read Holding Registers	3
Write Multiple Registers	16

Data types:

Description	Number of bytes	Number of registers
Float	4	2
Int16	2	1
UInt16	2	1
Int32	4	2
UInt32	4	2

5.5 Modbus Register

Description	FC	Address	Access	Data type	Default	Min	Max	Selection	Resolution	Unit
Cooling block temperature measurement	3	2000	R	Float	-	-	-	-	0.5	°C
Cooling block temperature status	3	2002	R	Uint32	-	-	-	Bit 0 := error Bit 1..15 := reserved Bit 16 := sensor not calibrated Bit 17 := initialization / measurement invalid Bit 18 := stabilization phase Bit 19 := load limit reached Bit 20 := measurement outside target range Bit 21..31 := not used		
Ambient temperature measurement	3	2004	R	Float	-	-	-	-	0.5	°C
Ambient temperature status	3	2006	R	Uint32	-	-	-	Bit 0 := error Bit 1..15 := reserved Bit 16 := sensor not calibrated Bit 17 := initialization / measurement invalid Bit 18..31 := not used		
Cooling block temperature setpoint	3, 16	5000	R/W	Float	5.0	3.0	15.0	-	0.5	°C
Positive alarm tolerance setpoint	3, 16	5002	R/W	Float	3.0	1.0	7.0	-	1.0	K
Negative alarm tolerance setpoint	3, 16	5004	R/W	Float	-3.0	-3.0	-1.0	-	1.0	K
Temperature difference Delta-T	3, 16	5008	R/W	Float	-15.0	-30.0	0.0	-	1.0	K
Enable/disable Delta T	3, 16	9001	R/W	Uint16	0	-	-	0 := normal operation 1 := Delta-T control	1	-
Signal store Moisture detector error	3, 16	9002	R/W	Uint16	2	-	-	1 := no 2 := yes	1	-
Signal store Moisture alarm	3, 16	9003	R/W	Uint16	1	-	-	1 := no 2 := yes	1	-
Sensitivity moisture detector 1	3, 16	9004	R/W	Uint16	0 1 (with moisture detector) 2 (without moisture detector)	-	-	0 := sensitivity low 1 := sensitivity high 2 := moisture detector inactive		
Modbus Baudrate selection	3, 16	9009	R/W	Uint16	3	-	-	1 := 4800 2 := 9600 3 := 19200	-	-

Description	FC	Address	Access	Data type	Default	Min	Max	Selection	Resolution	Unit
								4 := 38400 5 := 57600 6 := 115200		
Modbus Parity selection	3, 16	9010	R/W	Uint16	2	-	-	0 := none 1 := odd 2 := even	1	-
Modbus Device address selection	3, 16	9011	R/W	Uint16	10	1	247	-	1	-
TEST	3	9990	R	Uint32	12648430	-	-			
TEST_UINT16	3, 16	9992	R/W	Uint16	206	0	65535	-	1	-
TEST_INT16	3, 16	9993	R/W	Int16	-206	-32768	32767	-	1	-
TEST_UINT32	3, 16	9994	R/W	Uint32	2766	0	0xffffffff			
TEST_INT32	3, 16	9996	R/W	Int32	-2766	0x80000000	0x7fffffff			
TEST_Float	3, 16	9998	R/W	Float	-10.5					
Status register overview	3	10000	R	Uint16	0	-	-	Bit 0 := status information at Register 10001 Bit n := status information at Register 10000 + n + 1		
Condition code register 1	3	10001	R	Uint16	0	-	-	Bit 0 := device status Bit 1 := device in error status Bit 2 := set temperature range overrun Bit 3 := set temperature range underrun Bit 4 := Bit 5 := Bit 6 := moisture detector connected Bit 7 :=	-	-
Condition code register 2	3	10002	R	Uint16	0	-	-	Bit 0 := Bit 1 := Bit 2 := initialization phase Bit 3 := Delta-T active Bit 4 := Bit 5 := Bit 6 := FF1 moisture alarm Bit 7 :=	-	-
Condition code register 3	3	10003	R	Uint16	0			Bit 0 := Bit 1 := Bit 2 := Bit 3 := Bit 4 :=		

Description	FC	Address	Access	Data type	Default	Min	Max	Selection	Resolution	Unit
								Bit 5 := Bit 6 := Bit 7 :=		
Condition code register 4	3	10004	R	Uint16	0			Bit 0 := Bit 1 := Bit 2 := Bit 3 := Bit 4 := Bit 5 := Bit 6 := Bit 7 :=		
Error register 1	3	10005	R	Uint16	0			Bit 0 := Bit 1 := controller communication error Bit 2 := Bit 3 := controller configuration error Bit 4 := Bit 5 := Bit 6 := Bit 7 := gen. software error		
Error register 2	3	10006	R	Uint16	0			Bit 0 := Bit 1 := Bit 2 := Bit 3 := Bit 4 := Bit 5 := Bit 6 := Bit 7 :=		
Error register 3 - moisture detector 1	3	10007	R	Uint16	0			Bit 0 := Bit 1 := Bit 2 := cable break Bit 3 := Bit 4 := Bit 5 := Bit 6 := Bit 7 :=		
Error register 5 - PT100.1	3	10009	R	Uint16	0	-	-	Bit 0 := general error Bit 1 := short-circuit / temperature low Bit 2 := cable break / temperature high Bit 3 := measurement fluctuation Bit 4 :=		

Description	FC	Address	Access	Data type	Default	Min	Max	Selection	Resolution	Unit
Error register 6 - PT100.2	3	10010	R	Uint16	0	-	-	Bit 5 := Bit 6 := Bit 7 :=		
								Bit 0 := general error Bit 1 := short-circuit / temperature low Bit 2 := cable break / temperature high Bit 3 := measurement fluctuation Bit 4 := Bit 5 := Bit 6 := Bit 7 :=		
Utilisation controller 1	3	10017	R	Uint16	-	0	100		10	%
Device run time	3	10100	R	Float	-	0	-		6 min	h
Device restart / device reset	16	11000	W	Uint16	0	-	-	86 := device restart 17:= factory reset		
Reset moisture detector 1	16	11002	W	Uint16	170	-	-	-		

Example:

Register 5000 = 0x1388
Read block temperature set values

	A	FC	Start register HI	Start register LO	No. register HI	No. register LO		CRC	CRC
Request	0x0A (10)	0x03 (3)	0x13	0x88	0x00 (0)	0x02 (2)		0x41	0xDE
	A	FC	No. of byte	DATA 3	DATA 2	DATA 1	Data 0	CRC	CRC
Response	0x0A (10)	0x03 (3)	0x04	0x40	0xA0	0x00	0x00	0x55	0x11