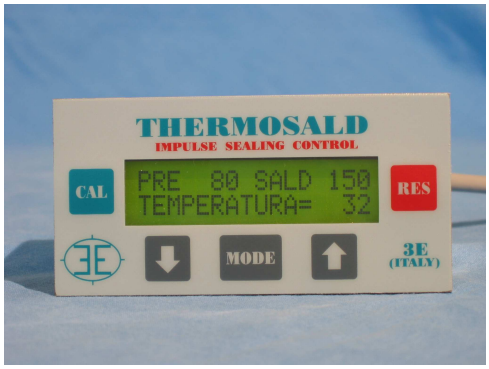
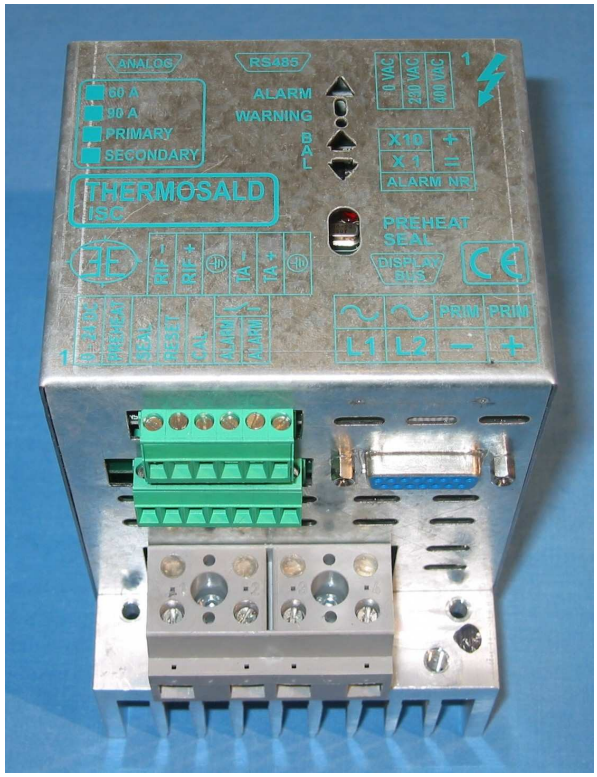
TEMPERATURE CONTROLLER FOR IMPULSE SEALING

THERMOSALD
ISC





- **INTERFACE WITH SUPERVISOR UP TO 255 UNITS**
- **INTERFACE WITH 3E PANNEL UP TO 255 UNITS**
- **READ/WRITE ALL FUNCTIONAL VARIABLES**
- **CHANGE ADDRESS DEVICE**
- **CHANGE COMUNICATION PARAMETERS**
- **ENABLE/DISABLE/CHANGE CHECKSUM**

RS485 MODBUS
(ENGLISH)

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1 GENERAL

1.1 Document revision

Edition	Description
Feb. 2004	First issue
Mar. 2004	Second issue
May 2004	third issue
Sept.2004	fourth issue

1.2 About this document

This document decribes the functionalities of the 3E MODBUS drivers, released for use with thermoregulators THERMOSALD ISC.
It is assumed that the basic operating functions of a master/slave comunication profile are known.

1.3 Reference documentation

“Modicon Modbus Protocol Reference Guide”, PI-MBUS-300, Rev.J

1.4 Definitions

THERMOSALD ISC	Impulse Thermoregulator model ISC by 3E
PROTOCOL TIME OUT	Maximum time allowed between a request and a response.
IDLE CHAR BEFORE TX	Number of characters silent before and after A string of useful character
DEVICE ADDRESS	Number of the slave device address

2 MODBUS COMUNICATION

2.1 Hardware interface

The Thermosald ISC can comunicate with a supervisor through its serial port CN5 (RS485).
CN5 is a 9 pin female connector (CN5/3=channel A+ ; CN5/8= channel B-)
NOTE FOR CONNECTION TO SIEMENS: A+ must be connected to B+ of Siemens; B- must be connected to A- of Siemens (+ to +, - to -)

2.2 Trasmission Mode

The driver support the **Modbus RTU SLAVE** format (Remote Terminal Unit)
The "Modbus RTU SLAVE" driver is intended for use with Modbus Master devices and can map a memory area that can be accessed by the master.
Format for each byte in RTU mode is:

Coding System:	8 bit binary protocol
Bits per Byte:	1 start bit
	8 data bits, least significant bit sent first
	2 stop bit,no parity
Error chech Field:	Cyclical Redundancy Check (CRC)

2.3 Communication parameters

Parameter	**Range**	**Default**
(Machine data)		
TRASMISSION RATE	9600-19200-28800 -38400-48000 -57600	9600
DEVICE ADDRESS	1-255	1
(Setting data)		
PARITY	none	none
STOP BIT	1,2	2
IDLE CHAR BEFORE TX	0-100 [ms]	10 (ms)
	Silent Time before useful characters And after useful characters. The total time between the last character Transmitted by master and the first character Replied by slave will be 2 x idle char.	
PROTOCOL TIMEOUT	1-50 [1=100ms,10=1sec.]	10
ERROR CHECK	0=disable	
	1=en.Modbus RTU/CRC	1
	2=en. XOR	

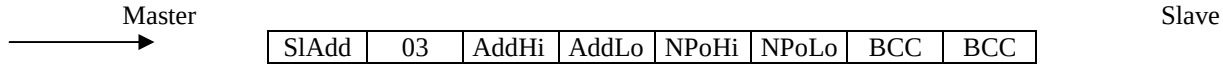
3 MODBUS PROTOCOL

3.1 Supported function codes

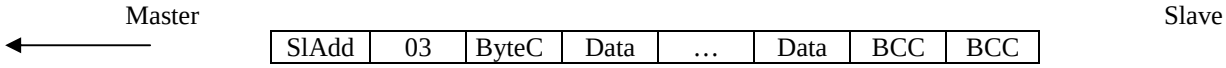
FC03 read 1 or n registers

This command allow the user to read 1 or multiple registers

Query:



Response:

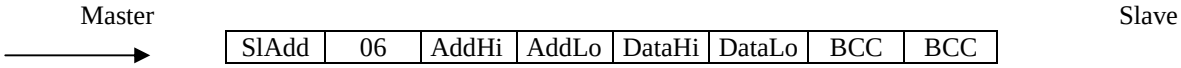


SlAdd: slave address
AddHi: starting address high
AddLo: starting address low
NPoHi: no. of points high
NPoLo: no. of points low
ByteC: byte count, number of data bytes
Data: data bytes
BCC: checksum

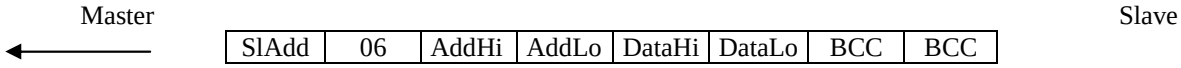
FC06 write 1 register

This command allow the user to write 1 register

Query:



Response:

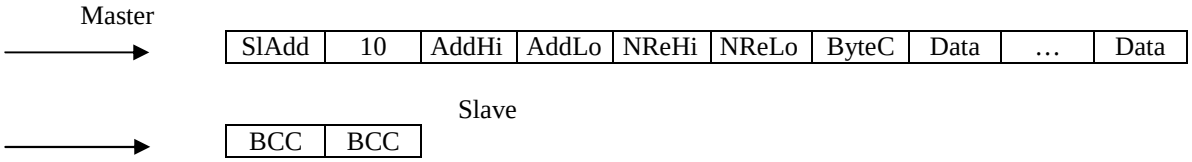


SlAdd: slave address
AddHi: starting address high
AddLo: starting address low
NPoHi: no. of points high
NPoLo: no. of points low
ByteC: byte count, number of data bytes
Data: data bytes
BCC: checksum

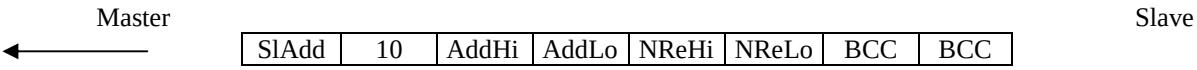
FC16 (10 Hex) write n registers

This command allow the user to write multiple registers

Query:



Response:



SlAdd: slave address
AddHi: starting address high
AddLo: starting address low
NReHi: no. of registers high
NReLo: no. of registers low
ByteC: byte count, number of data bytes
Data: data bytes
BCC: checksum

4 APPLICATION INTERFACE AND START UP

4.1 General

- The RS485 serial interface implemented on the THERMOSALD ISC slave unit allow the supervisor to read or write all the functional variables of the thermoregulator: MACHINE DATA, SETTING DATA, RUN TIME DATA, SERVICE DATA.
- The RS485 serial interface allow the supervisor to output command to the THERMOSALD ISC slave unit.
- Comunication parameters can be changed by supervisor and they will be active after a save command.

4.2 Set Address parameter

The supervisor can change the address of the slave unit writing the MACHINE DATA "device address" with the device address value 1-255. At the end of the operation, after a save command, the new address will be active, and the unit will reply with the new address.
0 is broadcasting address.

4.3 Set slave unit on/off - Baudrate

The supervisor can enable/disable the slave unit and select baud rate writing the MACHINE DATA "serial rs485 enabled" with the value 0-6. At the end of the operation, after a save comand, the new data will be active, and the unit will reply with the new data. If it would be selected "serial rs485 enabled =0" the unit will not comunicate forever, untill a change of parameter "serial rs485 enabled >0" will be done by dedicated "3E MULTILANGUAGE PANNEL" or after a new master reset of the unit.

4.4 Set other trasmission parameters

It's possible change all trasmission parameters writing in the SETTING DATA; they will be active only after the save command, to allow the comunications during modify.

4.5 Read/Write Address

See the following lists for the address locations of the parameters.

4.6 Command Code

See the following lists for the Command Code.

4.7 START UP

NOTE: THE BUS 485 WHEN DON'T TRASMIT MUST HAVE THE VOLTAGE A+ ALWAYS HIGHER THEN VOLTAGE B- (A+ - B- > 200mV)

Connections

1 - disconnect the rs485 connection
2 - power on the thermoregulator
3 – the thermoregulator output from factory after a MASTER RESET, if You like repeat the MASTER RESET pressing at the same time external input command RESET+CALIBRATING for 6 seconds.

4 - select the DEFAULT rs485 parameters on the supervisor; if checksum modbus standard is too difficult to calculate it's possible to change from supervisor with commands CODE=80 or 81 or 82 (see later).
5 - connect the first thermoregulator
6 - the connection must be running
7 – if more thermoregulators must be connected change Address number of the first unit
8 - connect another thermoregulator and repeat from point 6

9 - Any thermoregulator will be in the state uncalibrated
will be the Run Time Data THERMOREGULATOR STATE=17 (0x11)

Calibrating
10 – SELECT A THERMOREGULATOR and GIVE A CALIBRATING COMMAND (set ADDRS 05 05 = 15)
will be the Run Time Data THERMOREGULATOR STATE=153 (0x99) – calibrating in progress

11 - At the end of the calibrating
will be the Run Time Data THERMOREGULATOR STATE=096 (0x60) – Balancing

12 - The thermoregulator now is Ready to work. Calibrate the next thermoregulator repeat from point 10.

13 - Set the pre-heating and sealing Temperatures and give the pre-heating and sealing commands.

5 LISTS

- default value on the “USE AND MAINTEINANCE MANUAL”
- all the data are words (2 bytes)
- data can be read by Modbus code 03, can be written by code 06, 16

MACHINE DATA	**HEX ADDRESS**		
0-Heating increase gradi/10ms	**00 00H**	[xxx]	(R/W)
1-Proportional gain KV	**00 01H**	[xxx]	(R/W)
2-Integral gain KINT (x10)	**00 02H**	[xx.x]	(R/W)
3-Operatine limit KINT	**00 03H**	[xxx]	(R/W)
4-Partial short circuit factor (x10)	**00 04H**	[xx.x]	(R/W)
5-Hot bar selection	**00 05H**	[xx.x]	(R/W)
6-Configuration pannel 0=analog input 1=analog+pannel 2=pannel	**00 06H**	[xx.x]	(R/W)
7-nominale current	**00 07H**	[xx.x]	(R/W)
8-derivative gain KD	**00 08H**	[xxx]	(R/W)
9-alarm 1 disabled	**00 09H**	[xxx]	(R/W)
10-serial rs485 enabled	**00 0AH**	[000 Disable 001=Enable 9600 Baud, 002=Enable 19200 Baud, 003=Enable 28800 Baud, 004=Enable 38400 Baud, 005=Enable 48000 Baud, 006=Enable 57600 Baud]	(R/W)
11-serial rs485 address number	**00 0BH**	[1-255,0=Broadcasting,Default=1]	(R/W)
12-Master reset executed	**00 0CH**	[xxx]	(R)
13-alarm 2 disabled	**00 0DH**	[xxx]	(R/W)
14-heating factor(don’t change)	**00 0EH**	[xxx]	(R)
15-initial temperature(don’t change)	**00 0FH**	[xxx]	(R)
16-Primary transforner version	**00 10H**	[xxx]	(R)
17-Low voltage version	**00 11H**	[xxx]	(R)

SETTING DATA			
256-Burn-in Number of cycles	**01 00H**	[xxx]	(R/W)
257-Language	**01 01H**	[xxx]	(R/W)
258-Calibrating temperature (°C)	**01 02H**	[xxx]	(R/W)
259-00C = °C / 00F = °F	**01 03H**	[xxx]	(R/W)
260-Burn-in Temperature (°C)	**01 04H**	[xxx]	(R/W)
261-Burn-in hot time (sec.)	**01 05H**	[xxx]	(R/W)
262-Max sealing temperature (°C)	**01 06H**	[xxx]	(R/W)
263-Max seal time (x 10) (alarm 85)	**01 07H**	[xx.x]	(R/W)
264-Temperature gradient (degrees/10sec.)	**01 08H**	[xxx]	(R/W)
265-Warn66 time visualization(sec.)	**01 09H**	[xxx]	(R/W)
266-Enable comp.with cold structure	**01 0AH**	[xxx]	(R/W)
267-Temperature with cold structure	**01 0BH**	[xxx]	(R/W)

268-Structure temperature	**01 0CH**	[xxx]	(R/W)
269-Pre-heat Temperature (℃)	**01 0DH**	[xxx]	(R/W)
270-Sealing Temperature (℃)	**01 0EH**	[xxx]	(R/W)
271-Parity	**01 0FH**	[0=none / 1=odd / 2=even]	(R/W)
272-Stop Bit	**01 10H**	[0 / 1 / 2]	(R/W)
273-Protocol Time out	**01 11H**	[1-50 (1=100ms,50=5sec.)]	(R/W)
274-Idle char before TX	**01 12H**	[0 – 100(1=10ms,100=1sec.)]	(R/W)
275-Error Check	**01 13H**	[0=Disable 1=Enable CRC Modbus 2=Enable XOR Checksum]	(R/W)

SERVICE DATA

512-Release software unità	**02 00H**	[xxx]	(R/W)
513-Release software decimi	**02 01H**	[xxx]	(R/W)
514-Ohm x mmq / mt (x 1000)	**02 02H**	[xxx]	(R/W)
515-Sealing band length (mm)	**02 03H**	[xxx]	(R/W)
516-Sealing band thick (mm x 100)	**02 04H**	[x.xx]	(R/W)
517-Diametro filo (mm x 100)	**02 05H**	[x.xx]	(R/W)
518-Sealing band large (mm x 10)	**02 06H**	[xx.x]	(R/W)
519-Ampere / mmq (A / mmq)	**02 07H**	[xxx]	(R/W)
520-Nr. Seal bands in parallel (u)	**02 08H**	[xxx]	(R/W)
521-Nr. Seal bands in serie (u)	**02 09H**	[xxx]	(R/W)
522-Duty cycle (x 10)	**02 0AH**	[xx.x]	(R/W)
523-I eff.full wave theoret. (A)	**02 0BH**	[xxx]	(R)
524-Resistance theoret.(ohm x 100)	**02 0CH**	[x.xx]	(R)
525-V. eff. full wave theoret. (V)	**02 0DH**	[xxx]	(R)
526-Pow.eff.full wave theoret. (VA)	**02 0EH**	[xxx]	(R)
527-I eff. full wave calibration(A)	**02 0FH**	[xxx]	(R)
528-Resistance calibrat.(ohm x 100)	**02 10H**	[x.xx]	(R)
529-V. eff. full wave calibration (V)	**02 11H**	[xxx]	(R)
530-Pow.eff.full wave calibration(VA)	**02 12H**	[xxx]	(R)
531-I short circuit theoret. (A)	**02 13H**	[xxx]	(R)

RUN TIME DATA

768-Temperature run time (℃)	**03 00H**	[xxx]	(R)
769-Number allarm/warning (u)	**03 01H**	[xxx]	(R)
770-Current eff. full wave (A x 10)	**03 02H**	[xx.x]	(R)
771-Resistance (ohm x 100)	**03 03H**	[x.xx]	(R)
772-Voltage eff. full wave (volts)	**03 04H**	[xxx]	(R)
773-Pow.eff.full wave (VA/10)	**03 05H**	[xxx0]	(R)
774-Stato termoregolatore	**03 06H**	[xxx]	(R)

State 000 [0x00]	Power off
State 017 [0x11]	Uncalibrated
State 096 [0x60]	Balancing-waiting state
State 112 [0x70]	Pre-heat
State 128 [0x80]	Sealing
State 136 [0x88]	Master reset in progress
State 153 [0x99]	Calibrating in progress
State 170 [0xAA]	Burn-in in progress
State 238 [0xEE]	Alarm

1285-COMAND ADDRESS (ONLY WRITE CODE 06)	**05 05H**	**COMAND CODES (DECIMALS)**
		Alarm reset = **14** (W)
		Calibrating = **15** (W)
		Save data into eeprom = **16** (W)
		Read data from eeprom = **17** (W)
		Burn-in on = **18** (W)
		Burn-in off = **19** (W)
		Emergency test = **20** (W)
		Save data for diagnostic = **26** (W)
		Disable checksum= **80 (*)** (W)
		Enable checksum RTU/CRC= **81 (*)**(W)
		Ensable checksum XOR= **82 (*)**(W)
		Master reset = **99** (W)

NOTE: the command 26 “save data for diagnostic” copy the run time data for diagnostic to the service data for diagnostic (calibration) and save all data to eeprom; this command is to do at the end of the first calibration.

(*) As soon as the checksum command is received immediately the unit apply the command.
(**) In the case of a PROFACE panel program 1-1286 to address 0-1285