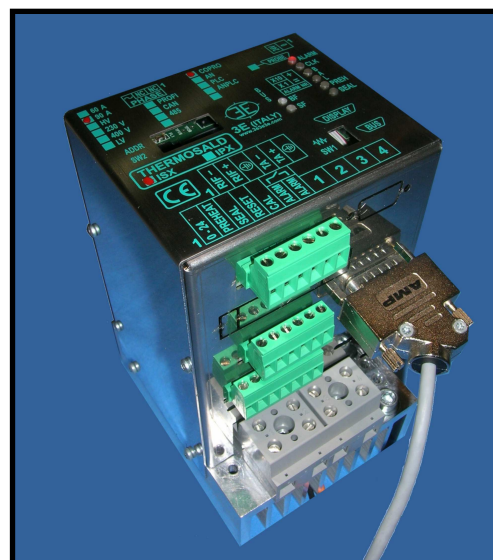


**THERMOREGULATOR for PULSE WELDING**

# THERMOSALD ISX



- BUS ETHERNET PHYSICAL SUPPORT
- USED PROTOCOL: PROFINET



**PROFINET  
(V5)  
(ENGLISH)**

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# 1 GENERAL INFORMATION

## 1.1 Revisions of this manual

<i>Rev.: 0</i>	<i>Date: 12/07/2013</i>	<i>Profinet Stack V1.0</i>	<i>ISX Software &gt;=V4.5</i>
<i>Rev.: 1</i>	<i>Date: 13/09/2013</i>	<i>Profinet Stack V1.1</i>	<i>ISX Software &gt;=V4.5</i>
<i>Rev.: 2</i>	<i>Date: 13/09/2013</i>	<i>Profinet Stack V1.1</i>	<i>ISX Software &gt;=V5.0</i>
<i>Rev.: 3</i>	<i>Date: 04/12/2013</i>	<i>Profinet Stack V1.1</i>	<i>ISX Software &gt;=V5.0</i>
<i>Rev.: 4</i>	<i>Date: 10/06/2014</i>	<i>Profinet Stack V1.1</i>	<i>ISX Software &gt;=V5.1</i>

## 1.2 Information on this document

This document describes the functions of 3E's PROFINET interface developed on the THERMOSALD ISX thermoregulator.

To continue reading this document, you need to know the basic functions of the PROFINET communication.

For the PROFINET communication, the THERMOSALD ISX thermoregulator uses a PROFINET HMS-ANYBUS communication module.

## 1.3 Reference documents

USE AND INSTALLATION MANUAL of thermoregulator THERMOSALD ISX - IPX code 3ES100\_MDU\_V4\_EN (English) and following versions.

## 1.4 Definitions

THERMOSALD ISX	Pulse thermoregulator, model THERMOSALD ISX, manufactured by 3E Srl.
DEVICE ADDRESS	Device unit address
INPUT / OUTPUT	As per PROFINET specification, inputs/outputs are the controller inputs/outputs

## 2 PROFINET COMMUNICATION

### 2.1 Hardware interface

The thermoregulator THERMOSALD ISX can communicate simultaneously with a PC supervisor and a PLC via a double ETHERNET RJ45 communication port.

### 2.2 Protocol

PROFINET IO RT with cyclical exchange.

### 2.3 Communication parameters

The device supports a maximum communication speed of 100 Mbps.

### 2.4 PROFINET warning LEDs

With HMS-ANYBUS module

LED NS	LED MS	Meaning
ON (green)	x	Communication with IO Controller established IO Controller in RUN
Flashing (green)	x	Communication with IO Controller established IO Controller in STOP
OFF (green)	x	No communication with IO Controller (e.g. connector not plugged in)
x	ON (green)	Normal operation
x	Flashing (green)	Diagnostics available
x	OFF	Module not initialized (e.g. module not powered or in 'INIT' state)
x	ON (Red)	Module in error, 'EXCEPTION' state
x	1 Flashing (Red)	Configuration error
x	2 Flashings (Red)	IP address not set
x	3 Flashings (Red)	Profinet name error
x	4 Flashings (Red)	Internal error

### 2.5 PROFINET interface

A single or 2 Ethernet ports can be connected.

### 2.6 IP address and PROFINET name

The IP address and the PROFINET name need to be set via software through the Controller configuration tool or using the SIEMENS PRIMARY SETUP TOOL as described in the following chapter 4.

### 3 PROFINET TELEGRAMS (DATA EXCHANGE)

Once parameterized and configured, device THERMOSALD ISX-HMS starts to exchange the data-exchange cyclical telegrams.

#### 3.1 DESCRIPTION OF THE TELEGRAMS

**CONTROLLER PLC → DEVICE THERMOSALD ISX-HMS**

OUTPUT	Description	Notes
00	Code	03 - Read code 06 - Write code
01	ADDR_HI	See paragraph 5 for the list of possible values
02	ADDR_LO	
03	DATA_HI	
04	DATA_LO	
05	COMMANDS_HI	
06	COMMANDS_LO	

**BYTE 5  
COMMANDS-HI**

bit 7	Reserved	
bit 6	Reserved	
bit 5	Reserved	
bit 4	Reserved	
bit 3	Master reset	(level)
bit 2	Current loop on	(level)
bit 1	Weld on	(level)
bit 0	Pre-heat on	(level)

**BYTE 6  
COMMANDS-LO**

bit 7	Save calibration data	(pulse > 50ms)
bit 6	Emergency test	(level)
bit 5	Burn-in off	(pulse > 50ms)
bit 4	Burn-in on	(pulse > 50ms)
bit 3	Read data from eeprom	(not active from V5.1)
bit 2	Save data in eeprom	(not active from V5.1)
bit 1	Calibration	(pulse > 50ms)
bit 0	Reset alarms	(pulse > 50ms)

**DEVICE THERMOSALD ISX-HMS → CONTROLLER PLC**

INPUT (BYTE)	Description	Notes
00	Echo to PLC Code 03/06	Echo of sent commands (to check that the commands have been accepted)
01	Echo to PLC ADDR_HI	
02	Echo to PLC ADDR_LO	
03	Echo to PLC NULL/DATA_HI	
04	Echo to PLC NULL/DATA_LO	
05	RUN T. TEMPERATURE H (word signed, byte 05 Hi, byte 06 LO)	Runtime values of matching variables
07	RUN T. ALARM (word)	
09	RUN T. ISX STATUS (byte)	
10	I Run Time leff. (word)	
12	Rx100 Run Time Resistance(word)	
14	V Run Time Veff. (word)	
16	P Run Time P.eff. (word)	
18	Steady Work Cond. % (word)	
20	I0 Calibration leff. (word)	
22	R0x100Calibration Resist.(word)	
24	V0 Calibration Veff. (word)	
26	P0 Calibration P.eff. (word)	
28	Calibration Temperature (word)	
30	Max. Seal. Temperature (word)	
32	Set Pre. Heat Temperature (word)	
34	Set Seal Temperature (word)	

0	1	2	3	4	5	6
Code	ADDR_H	ADDR_L	Data_HI	Data_LO	Comman ds_HI	Comman ds_LO

**Output Telegram**  
(from Controller to Device)

0	1	2	3	4	5 ... 35
Code	ADDR_H	ADDR_L	Dato_HI	Dato_LO	Dati runtime (see table)

**Input Telegram**  
(from Device to Controller)

### 3.2 LIST OF PARAMETERS DISPLAYED IN THE WEB PAGES (The parameters 11-23 can be seen from stack V1.1)

- 1 Code
- 2 Address
- 3 Data
- 4 Command
- 5 Code Echo
- 6 Address Eco
- 7 Data Echo
- 8 Run Time Temperature
- 9 Run Time Alarm
- 10 Run Time State
- 11 I Run Time Ieff.
- 12 Rx100 Run Time Resistance
- 13 V Run Time Veff.
- 14 P Run Time P.eff.
- 15 Steady Work Cond. %
- 16 I0 Calibration Ieff.
- 17 R0x100Calibration Resistance
- 18 V0 Calibration Veff.
- 19 P0 Calibration P.eff.
- 20 Calibration Temperature
- 21 Max. Seal. Temperature
- 22 Set Pre. Heat Temperature
- 23 Set Seal Temperature

## 4 APPLICATION INTERFACE AND STARTUP

### 4.1 General Description

All the PARAMETERS listed in paragraph 5 can be read and/or written with a simple procedure.

All the RUN TIME data listed in paragraph 5 can be read in real time.

### 4.2 STARTUP

#### 4.2.1 PC and PLC connection in a local network

Connect the PC to the THERMOSALD ISX thermoregulator and to the PLC via 2 Ethernet cables.

Carry out the following operations that are given only as an example:

- Open network communication (small icon)
- Connection to the local network (LAN)
- Proprieties
- Internet Protocol version 4 (TCP/IP V4)
- Use the following address 192.168.0.100

#### 4.2.2 GSD file installation

Install the GSD file supplied with the installation PACKAGE in the PLC.

#### 4.2.3 Setup PROFINET of the thermoregulator THERMOSALD ISX – ANYBUS

Carry out the following operations given only as an example:

Launch the SIEMENS PRIMARY SETUP TOOL (PST) program.

- Menu SETTINGS -> Set PG/PC interface  
(PC interface. e.g. Intel 82579 LM GIGABIT NETWORK CONNECTION ISO.1)
- Menu NETWORK -> BROWSE Find the network units  
Select device ABCC-PRT(2 port) 192.168.0.55  
Assign ETHERNET interface 192.168.000.055  
255.255.255.000
- Load Assign to device
- Menu UNIT -> Assign name to device -> hms1 (confirm)

#### 4.2.4 How to display the data exchanged between PLC and ISX – ANYBUS as a Web page

Launch INTERNET EXPLORER

Write the THERMOSALD thermoregulator address 192.168.0.55

The WEB PAGE of the thermoregulator ABCC-PRT (2-port) is displayed on the PC.

Select PARAMETER DATA

Press F5 to update data

### 4.3 Data exchange through read/write protocol

#### 4.3.1 Reading and writing the parameters

Refer to the lists in paragraph 5, for the location of the parameter addresses, and to the EXCHANGE SIGNALS in paragraph 3 for the inputs & outputs to be used.

Read: write code 03 at output 00, the address of the parameter at outputs 01 and 02. The thermoregulator responds code 03 at input 00, the address of the parameter at inputs 01 and 02 and the value of the parameter at inputs 03 and 04.

Write: write code 06 at output 00, the address of the parameter at outputs 01 and 02 and the value of the parameter to write at outputs 03 and 04. The thermoregulator responds code 06 at input 00, the address of the parameter at inputs 01 and 02 and the value of the parameter at inputs 03 and 04.

#### **4.3.2 Command codes**

Refer to the lists in paragraph 5, for the location of the parameter addresses, and to the EXCHANGE SIGNALS in paragraph 3 for the inputs & outputs to be used.

It is advisable to pass commands in bits directly to the HI COMMANDS and LO COMMANDS output bytes, bytes 05 and 06 of the Output telegram (Controller outputs). Refer to paragraph 3.1 DESCRIPTION OF THE TELEGRAMS.

Any Command Code can also be written, with the same write procedure of any parameter, to 0505H hexadecimal address.

Write code 06 at output 00, hexadecimal address 0505H at outputs 01 and 02 and the value of the command code at outputs 03 and 04. The thermoregulator responds code 06 at input 00, hexadecimal address 0505H at inputs 01 and 02 and the value of the command code at inputs 03 and 04.

#### **4.3.3 Reading of RUN TIME data**

Refer to the lists in paragraph 5, for the location of the parameter addresses, and to the EXCHANGE SIGNALS in paragraph 3 for the inputs & outputs to be used.

RUN TIME DATA of common use can be read directly from byte 05 to byte 35 of the Input telegram (Controller Inputs). Refer to paragraph 3.1 DESCRIPTION OF THE TELEGRAMS.



## 5 LISTS

- Default values are outlined in the "USE AND MAINTENANCE MANUAL"
- All exchanged data are words (2 bytes)
- Data are read with code 03 and written with codes 06
- N.U. means: do not use

MACHINE DATA	HEX ADDRESS		
0-Temp. ramp degrees/100ms	00 00H	[ xxx ]	(R/W)
1- KV Gain	00 01H	[ xxx ]	(R/W)
2- KINT Gain (x10)	00 02H	[ xx.x ]	(R/W)
3- Final KINT threshold	00 03H	[ xxx ]	(R/W)
4- Partial short circuit factor ( x10 )	00 04H	[ xx.x ]	(R/W)
5- Mode Configuration	00 05H	[ 000 pulse weld]	(R/W)
6- Display Configuration	00 06H	[ 000 analog	(R/W)
		001 analog+panel	(R/W)
		002 panel or FIELDBUS]	(R/W)
7- Rated current	00 07H	[ xx.x ]	(R/W)
8- KD derivative gain	00 08H	[ xxx ]	(R/W)
9- Alarm Disable 1	00 09H	[ xxx ]	(R/W)
10- PROFINET-P1 enable	00 0AH	[ 021= PROFINET ]	(R)
11-	00 0BH	[ xxx ]	Fieldbus not used
12-1=Master reset done	00 0CH	[ xxx ]	(R)
13- Alarm disable 2	00 0DH	[ xxx ]	(R/W)
14- Temperature coefficient (PPM)	00 0EH	[ xxx ]	(R/W)
15- Units per degree	00 0FH	[ xxx ]	(R)
16-Primary	00 10H	[ xxx ]	(R)
17- Low voltage	00 11H	[ xxx ]	(R)
18- Plc enable	00 12H	[ xxx ]	(R/W)
19-Password	00 13H	[ xxx ]	(R/W)
20- Key password (1-9999)	00 14H	[ 000=Disabled	(R/W)
		001=Partial	
		002=Total]	
21- THERMOSALD Model	00 15H	[ 010=Thermosald ISX]	(R)
22-	00 16H	[ xxx ]	not used
23- I2T - I rms max for 1 sec.	00 17H	[ xxx ]	(R/W)
24- Temperature probe enable	00 18H	[ xxx ]	(R/W)
25-Tmargin_read (v4.4)	00 19H	[ xxx ]	(R/W)
26- Initial KINT threshold (v4.4)	00 1AH	[ xxx ]	(R/W)
27- Fs KINT threshold (v4.4)	00 1BH	[ xxx ]	(R/W)
28-	00 1CH	[ xxx ]	Not used
<b>SETTING DATA</b>			
256- Burn-in number of cycles	01 00H	[ xxx ]	(R/W)
257-Language	01 01H	[ xxx ]	(R/W)
258- Calibration temperature (°C)	01 02H	[ xxx ]	(R/W) (*A)
259- 0 = °C / 1 = ° F	01 03H	[ xxx ]	(R/W)
260- Temperature Burn-in (°C)	01 04H	[ xxx ]	(R/W)
261- Heating Time Burn-in (sec.)	01 05H	[ xxx ]	(R/W)
262-Max. weld temperature (°C)	01 06H	[ xxx ]	(R/W) (*A)

263- Max. weld time ( x 10)	01 07H	[ xx.x ]	(R/W)
264- Cooling gradient during bal. (degrees/10sec.)	01 08H	[ xxx ]	(R/W)
265- Warn66 displayed time (sec.)	01 09H	[ xxx ]	(R/W)
266- Weld temperature increase	01 0AH	[ xxx ]	(R/W)
267- Increase no. of welds	01 0BH	[ xxx ]	(R/W)
268- Set end-of-weld temperature	01 0CH	[ 0 / 1 ]	(R/W)
269- Set Preheat. Temp. (°C)	01 0DH	[ xxx ]	(R/W) (*A)
270- Set seal temperature (°C)	01 0EH	[ xxx ]	(R/W) (*A)
271-	01 0FH	[ N.U.]	Fieldbus not used
272-	01 10H	[ N.U.]	Fieldbus not used
273-	01 11H	[ N.U.]	Fieldbus not used
274-	01 12H	[ N.U.]	Fieldbus not used
275-	01 13H	[ N.U.]	Fieldbus not used
276- Weld delay timer (x 100)	01 14H	[ x.xx ]	(R/W)
277- Bars closing timer (x 100)	01 15H	[ x.xx ]	(R/W)
278- Weld timer (x 100)	01 16H	[ x.xx ]	(R/W)
279- Cooling timer (x 100)	01 17H	[ x.xx ]	(R/W)
280- Weld range timer ( x 100)	01 18H	[ x.xx ]	(R/W)
281- Set temperature in page 1	01 19H	[ x.xx ]	(R/W)
282- Set% band to ground for all.69	01 1AH	[ x.xx ]	(R/W)
283- Set current loop value	01 1BH	[ x.xx ]	(R/W)
284- Increase time to restore (time in seconds)	01 1CH	[ x.xx ]	(R/W)

#### STARTUP DATA

512- Software release units (ASCII)	02 00H	[ xxx ]	(R)
513- Software release tenths (ASCII)	02 01H	[ xxx ]	(R)
514- Ohms x mm <sup>2</sup> / mt (x 1000)	02 02H	[ xxx ]	(R/W)
515- Band length (mm)	02 03H	[ xxx ]	(R/W)
516- Band thickness(mm x 100)	02 04H	[ x.xx ]	(R/W)
517- Wire diameter (mm x 100)	02 05H	[ x.xx ]	(R/W)
518- Band width (mm x 100)	02 06H	[ xx.x ]	(R/W)
519- Amperes/mm <sup>2</sup> (A / mm <sup>2</sup> )	02 07H	[ xxx ]	(R/W)
520- No. of bands in parallel (u)	02 08H	[ xxx ]	(R/W)
521- No. of bands in series (u)	02 09H	[ xxx ]	(R/W)
522- Duty cycle (x 10)	02 0AH	[ xx.x ]	(R/W)
523- I <sub>t</sub> I rms theoretical full wave	02 0BH	[ xxx ]	(R)
524- R <sub>tx100</sub> Theoretical resistance	02 0CH	[ x.xx ]	(R)
525- V <sub>t</sub> V rms theoretical full wave	02 0DH	[ xxx ]	(R)
526- P <sub>t</sub> P rms theoretical full wave	02 0EH	[ xxx ]	(R)
527- I <sub>0</sub> I rms calibration full wave	02 0FH	[ xxx ]	(R) (*B)
528- R <sub>0x100</sub> calibration resistance	02 10H	[ x.xx ]	(R) (*B)
529- V <sub>0</sub> V rms calibration full wave	02 11H	[ xxx ]	(R) (*B)
530- P <sub>0</sub> P rms power Calibration	02 12H	[ xxx ]	(R) (*B)
531- I rms max for alarm 90 (A)	02 13H	[ xxx ]	(R)

## RUN TIME DATA

<b>768-</b> Current temperature (°C)	<b>03 00H</b>	[ xxx ]	(R)	(*A)
<b>769-</b> Alarm/warning number (u)	<b>03 01H</b>	[ xxx ]	(R)	(*A)
<b>770-I</b> I rms runtime full wave	<b>03 02H</b>	[ xx.x ]	(R)	(*B)
<b>771-Rx100</b> Resistance runtime	<b>03 03H</b>	[ x.xx ]	(R)	(*B)
<b>772-V</b> V rms runtime full wave	<b>03 04H</b>	[ xxx ]	(R)	(*B)
<b>773-P</b> P rms runtime full wave	<b>03 05H</b>	[ xxx0 ]	(R)	(*B)
<b>774-</b> Thermoregulator status	<b>03 06H</b>	[ xxx ]	(R)	(*A)
Status 000 [0x00]		Power off		
Status 017 [0x11]		Not Calibrated		
Status 096 [0x60]		Balancing		
Status 100 [0x64]		Current loop		
Status 112 [0x70]		Pre-heat		
Status 128 [0x80]		Weld		
Status 136 [0x88]		Master reset in progress		
Status 153 [0x99]		Calibration in progress		
Status 154 [0x9A]		Wait for scaling		
Status 170 [0xAA]		Burn-in in progress		
Status 187 [0xBB]		Wait for coprocessor calibration		
Status 238 [0xEE]		Alarm		
<b>775-</b> I rms runtime	<b>03 07H</b>	[ xxx ]	(R)	
<b>776-</b> Active temperature probe	<b>03 08H</b>	[ xxx ]	(R)	
<b>777-</b> Bar temperature probe	<b>03 09H</b>	[ xxx ]	(R)	
<b>778-</b> Steady working conditions % (updated every 10 seconds)	<b>03 0AH</b>	[ xxx ]	(R)	(*B)

(\*A) Data needed to be handled in the fieldbus interface

(\*B) Data recommended to be handled in the fieldbus interface

**1285-COMMANDS  
(WRITE CODE 06 ONLY)  
It is advisable  
to use the commands  
on word at paragraph 3.1**

**05 05H COMMAND CODES (DECIMALS)**

Reset alarms = <b>14</b>	(W) (*B)
Calibration = <b>15</b>	(W) (*B)
Burn-in on = <b>18</b>	(W)
Burn-in off = <b>19</b>	(W)
Emergency test = <b>20</b>	(W)
Save calibration data = <b>26</b>	(W)
Pre-heat on = <b>31</b>	(W)
Pre-heat off = <b>32</b>	(W)
Weld on = <b>33</b>	(W)
Weld off = <b>34</b>	(W)
Current loop on = <b>35</b>	(W)
Current loop off = <b>36</b>	(W)
Master reset = <b>99</b>	(W)

Not active commands from V5.1 software

Save data to eeprom = <b>16</b>	(W) (*B)
Read data from eeprom = <b>17</b>	(W) (*B)
Save coprocessor data = <b>27</b>	(W)
Disable coprocess. alarms = <b>28</b>	(W)

NOTE: command 26 "save calibration data" allows you to store the data of the last calibration; it is advisable to use this command after the machine's first startup in order to store calibration data after factory testing. This figure, compared with RUN TIME data, will be used later to make a remote diagnosis of the machine.