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User Manual
version 1.04

TLM8

COMMUNICATION PROTOCOLS

Protocols for instruments
CE-M APPROVED EN45501:2015-2014/31/UE-OIML R76:2006

KEY TO SYMBOLS

Below are the symbols used in the manual to draw the reader's attention:

Caution! High Voltage.

Caution! This operation must be performed by skilled workers.

Read the following indications carefully.

Further information.

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CONTINUOUS FAST WEIGHT TRANSMISSION PROTOCOL

This protocol allows the continuous transmission of the weight at high update frequencies. Up to 300 strings per second are transmitted with a minimum transmission rate of 38400 baud.
Following communication modes availables (see section **SERIAL COMMUNICATION SETTINGS** in instrument manual):

- *MOd t*: communication compatible with TX RS485 instruments
- *MOd td*: communication compatible with TD RS485 instruments

If *MOd t* is set, the following string is transmitted to PC/PLC:
xxxxxxCRLF

where: **xxxxxx**.....6 characters of gross weight (48 ÷ 57 ASCII)
CR.....1 character return to the start (13 ASCII)
LF.....1 character on new line (10 ASCII)

In case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45).

If *St bIt* = *YES* (see section **SERIAL COMMUNICATION SETTING** in instrument manual), the following string is transmitted to PC/PLC:

yxxxxxxCRLF

where: **y**.....1 character of weight stability identification (S=weight stable, N=weight not stable)

In case of error or alarm, the 6 characters of the weight are substituted by the messages found in the table of the ALARMS section (see the instrument manual).

If mOd td is set, the following string is transmitted to PC/PLC:
&TzzzzzzPzzzzzz\ckckCR

where: **&**.....1 initial string character (38 ASCII)
T.....1 character of gross weight identification
P.....1 character of gross weight identification
zzzzzz.....6 characters of gross weight (48 ÷ 57 ASCII)
****.....1 character of separation (92 ASCII)
ckck.....2 ASCII control characters or calculated considering the characters included between "&" and "\" excluded. The control value is obtained executing the XOR operation (exclusive OR) for the 8 bit ASCII codes of the characters considered. Therefore, a character expressed in hexadecimal is obtained with 2 numbers that may assume values from "0" to "9" and from "A" to "F". "**ckck**" is the ASCII code of the two hexadecimal digits
CR.....1 character of end string (13 ASCII)

In case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45).
In case of error or alarm, the 6 characters of the gross weight are substituted by the messages found in the table of the ALARMS section (see the instrument manual).

FAST TRANSMISSION VIA EXTERNAL CONTACT: it's possible to transmit the weight, just once, even closing an input for no more than a second (see **OUTPUTS AND INPUTS CONFIGURATION** and **SERIAL COMMUNICATION SETTINGS** sections in instrument manual).

CONTINUOUS WEIGHT TRANSMISSION TO REMOTE DISPLAYS PROTOCOL

This protocol allows the continuous weight transmission to remote displays. The communication string is transmitted 10 times per second.
Following communication modes availables (see **SERIAL COMMUNICATION SETTINGS** section in instrument manual):

- *rI P*: communication with RIP5/20/60, RIP50SHA, RIPLED series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrI P*: communication with RIP6100, RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrI Pn*: communication with RIP6100, RIP675, RIP6125C series remote displays

The instrument sends the following string to the remote display:
&NxxxxxxLyyyyyy\ckckCR

where: **&**.....1 initial string character (38 ASCII)
N.....1 character of net weight identification (78 ASCII)
xxxxxx.....6 characters of net weight or PEAK if present (48 ÷ 57 ASCII)
L.....1 character of gross weight identification (76 ASCII)
yyyyyy.....6 characters of gross weight (48 ÷ 57 ASCII)
\.....1 character of separation (92 ASCII)
ckck.....2 ASCII checksum characters calculated considering the characters between "**&**" and "****" excluded. The checksum value is obtained from the calculation of XOR (exclusive OR) of the 8-bit ASCII codes of the characters considered. This obtains a character expressed in hexadecimals with two digits that can have the values from "0" to "9" and from "A" to "F". "**ckck**" is the ASCII code of the two hexadecimal digits
CR.....1 character of end string (13 ASCII)

In case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45).
If *HdrI P* has been set, the decimal point at the position shown on the instrument's display can also be transmitted. In this case, if the value exceeds 5 digits, only the 5 most significant digits are transmitted, while if the value is negative, no more than the 4 most significant digits are transmitted. In both cases, however, the decimal point shifts consistently with the value to display.
If *HdrI Pn* has been set, in addition to what stated in *HdrI P* protocol, the instrument transmits the prompt *nEt* every 4 seconds in the gross weight field, if on the instrument, it has been carried out a net operation (see **SEMI-AUTOMATIC TARE (NET/GROSS)** section in instrument manual).
In case of weight value is under -99999, the minus sign "-" is sent alternated with the most significant figure.
In case of error or alarm, the 6 characters of the gross weight and net weight are substituted by the messages found in the table of the ALARMS section (see the instrument manual).

ASCII BIDIRECTIONAL PROTOCOL

The instrument replies to the requests sent from a PC/PLC.
It is possible to set a waiting time for the instrument before it transmits a response (see *dELAY* parameter in the **SERIAL COMMUNICATION SETTINGS** section in the instrument manual).
Following communication modes availables (see **SERIAL COMMUNICATION SETTINGS** section in instrument manual):

- *nOdU60*: communication compatible with instruments series W60000, WL60 Base, WT60 Base, TLA600 Base
- *nOd td*: communication compatible with TD RS485 instruments

Captions:

$.....Beginning of a request string (36 ASCII)
& or **&&** .....Beginning of a response string (38 ASCII)
aa.....2 characters of instrument address (48 ÷ 57 ASCII)
!.....1 character to indicate the correct reception (33 ASCII)
?.....1 character to indicate a reception error (63 ASCII)
#.....1 character to indicate an error in the command execution (23 ASCII)
ckck:.....2 ASCII characters of Check-Sum (for further information, see section **CHECK-SUM CALCULATION**)
CR.....1 character for string end (13 ASCII)
****.....1 character of separation (92 ASCII)

1. SETPOINT PROGRAMMING

Warning: the new values of setpoint are active immediately.

The PC transmits the ASCII string: **$aaxxxxxxyckckCR**

where: **xxxxxx**.....6 characters for the setpoint value (48 ÷ 57 ASCII)
y = A .....set the value in the setpoint 1
y = B .....set the value in the setpoint 2
y = C.....set the value in the setpoint 3
y = D.....set the value in the setpoint 4
y = E .....set the value in the setpoint 5

Possible instrument responses:

- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- **ff** parameter exceeds the maximum allowable: **&aa#\ckckCR**

Example: to set 500 in the setpoint no. 4, the PC must transmit the following command:
$01000500D70(Cr)

1.1. SETPOINT STORAGE IN EEPROM MEMORY

The setpoint are stored in the RAM memory and lost upon instrument power off. It is necessary to send a special command to save them permanently in the EEPROM memory. Please note that the writing number allowed in the EEPROM memory is limited (about 100000).

The PC transmits the ASCII string: **$aaMEMckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

2. READING WEIGHT, SETPOINT AND PEAK (IF PRESENT) FROM PC

The PC transmits the ASCII string: **$aajckckCR**

where: **j** = a.....to read setpoint 1
j = b.....to read setpoint 2
j = c.....to read setpoint 3
j = d.....to read setpoint 4
j = e.....to read setpoint 5
j = t.....to read gross weight
j = n.....to read net weight
j = p .....to read the gross weight peak if the ASCII parameter is set as MODBUS; if, instead, the ASCII parameter is set on MOd td the gross weight will be read. **To read the points, set the FS_tEO parameter equal to 50000**

Possible instrument responses:
- correct reception: **&aaxxxxxxj\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- In case of peak not configured: **&aa#CR**

where: **xxxxxx**.....6 characters of the required weight value

Notes: in case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45). In case of weight value is under -99999, the minus sign "-" is sent alternated with the most significant figure.

Error messages:
in case of an instrument alarm for exceeding 110% of the full scale or 9 divisions above the value of the parameter MASS, the instrument sends the string:
&aassO-Lst\ckck

in case of faulty connection of the load cells or of another alarm, the instrument sends:
&aassO-Fst\ckck

where: **s**.....1 separator character (32 ASCII – space)

Generally refer to the **ALARMS** section (see the instrument manual).

3. SEMI-AUTOMATIC ZERO (WEIGHT ZERO-SETTING FOR SMALL VARIATIONS)

The PC transmits the ASCII string: **$aaZEROckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- the current weight is over the maximum resettable value: **&aa#CR**

4. SWITCHING FROM GROSS TO NET WEIGHT

The PC transmits the ASCII string: **$aaNETckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

5. SWITCHING FROM NET TO GROSS WEIGHT

The PC transmits the ASCII string: **$aaGROSSckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

6. READING OF DECIMALS AND DIVISION NUMBER

The PC transmits the ASCII string: **$aaDckckCR**

Possible instrument responses:

- correct reception: **&aaxy\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

where: **x**.....number of decimals
y = 3.....for division value = 1
y = 4.....for division value = 2
y = 5.....for division value = 5
y = 6.....for division value = 10
y = 7.....for division value = 20
y = 8.....for division value = 50
y = 9.....for division value = 100

7. KEYPAD LOCK (BLOCK THE ACCESS TO THE INSTRUMENT)

The PC transmits the ASCII string: **$aaKEYckckCR**

Possible instrument responses:

- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

8. KEYPAD UNLOCK

The PC transmits the ASCII string: **$aaFREckckCR**

Possible instrument responses:

- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

9. DISPLAY AND KEYPAD LOCK

The PC transmits the ASCII string: **$aaKDISckckCR**

Possible instrument responses:

- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

10. CHECK-SUM CALCULATION

The two ASCII characters (**ckck**) are the representation of a hexadecimal digit in ASCII characters. The check digit is calculated by executing the operation of XOR (exclusive OR) of 8-bit ASCII codes of only the string underlined.

The procedure to perform the calculation of check-sum is the following:

- Consider only the string characters highlighted with underlining
- Calculate the exclusive OR (XOR) of 8-bit ASCII codes of the characters

Example:

character	decimal ASCII code	hexadecimal ASCII code	binary ASCII code
0	48	30	00110000
1	49	31	00110001
t	116	74	01110100
XOR =	117	75	01110101

- The result of the XOR operation expressed in hexadecimal notation is made up of 2 hexadecimal digit (that is, numbers from 0 to 9 and/or letters from A to F). In this case the hexadecimal code is 0x75.
- The checksum is made up of the 2 characters that represent the result of the XOR operation in hexadecimal notation (in our example the character "7" and the character "5").

MODBUS-RTU PROTOCOL

The MODBUS-RTU protocol allows the management of the reading and writing of the following registries according to the specifications found on the reference document for this **Modicon PI-MBUS-300** standard**.**

To select the MODBUS-RTU communication see **SERIAL COMMUNICATION SETTINGS** section in instrument manual.

Check if the *master* MODBUS-RTU in use (or the development tool) requires the disclosure of registers based on 40001 or 0. In the first case the registers numbering corresponds to the one in the table; in the second case the register must be determined as the value in the table minus 40001. E.g.: the register 40028 shall be reported as 27 (= 40028-40001).

Certain data, when specifically indicated, will be written directly in the EEPROM type memory. This memory has a limited number of writing operations (100000), therefore it is necessary to pay particular attention to not execute useless operations on said locations. The instrument in any case makes sure that no writing occurs if the value to be memorised is equal to the value in memory.

The numerical data found below are expressed in decimal notation; if the prefix 0x is entered the notation will be hexadecimal.

MODBUS-RTU DATA FORMAT

The data received and transmitted by way of the MODBUS-RTU protocol have the following characteristics:
- 1 start bit
- 8 bit of data, *least significant bit* sent first
- Settable parity bit
- Settable stop bit

FUNCTIONS SUPPORTED IN MODBUS

Among the commands available in the MODBUS-RTU protocol, only the following are utilised for management of communication with the instruments; other commands could be incorrectly interpreted and generate errors or blocks of the system:

FUNCTIONS	DESCRIPTION
03 (0x03)	READ HOLDING REGISTER (READ PROGRAMMABLE REGISTERS)
16 (0x10)	PRESET MULTIPLE REGISTERS (WRITE MULTIPLE REGISTERS)

Interrogation frequency is linked to the communication speed set (the instrument stands by for at least 3 bytes before starting calculations an eventual response to the interrogation query). The dELAY parameter present in the **SERIAL COMMUNICATION SETTING** section in the instrument

manual, allows the instrument to respond with a further delay and this directly influences the number of interrogations possible in the unit of time.
For additional information on this protocol refer to the general technical specifications PI_MBUS_300.

In general queries and answers toward and from one slave instrument are composed as follows:

FUNCTION 3: Read holding registers (READ PROGRAMMABLE REGISTERS)

QUERY

Address	Function	1st register address	No. registers	2 byte
A	0x03	0x0000	0x0002	CRC

Tot. byte = 8

RESPONSE

Address	Function	No. bytes	1st register	2nd register	2 byte
A	0x03	0x04	0x0064	0x00C8	CRC

Tot. byte = 3+2*No. registers+2

where: No. registers ..number of Modbus registers to write beginning from the address no. 1
No. byte .....number of bytes of the following data

FUNCTION 16: Preset multiple registers (WRITE MULTIPLE REGISTERS)

QUERY

Address	Function	1st reg. add.	No. reg.	No. bytes	Val.reg.1	Val.reg.2	2 byte
A	0x10	0x0000	0x0002	0x04	0x0000	0x0000	CRC

Tot. byte = 7+2*No. registers+2

RESPONSE

Address	Function	1st reg. address	No. reg.	2 byte
A	0x10	0x0000	0x0002	CRC

Tot. byte = 8

where: No. registers ..number of Modbus registers to read beginning from the address no. 1
No. byte .....number of bytes of the following data
Val.reg.1 .....contents of the register beginning from the first

The response contains the number of registers modified beginning from the address no. 1.

COMMUNICATION ERROR MANAGEMENT

The communication strings are controlled by way of the CRC (Cyclical Redundancy Check).
In case of communication error the slave will not respond with any string. The master must consider a time-out for reception of the answer. If it does not receive an answer it deduces that there has been a communication error.

In the case of the string received correctly but not executable, the slave responds with an EXCEPTIONAL RESPONSE. The "Function" field is transmitted with the msb at 1.

EXCEPTIONAL RESPONSE

Address	Function	Code	2 byte
A	Funct + 0x80		CRC

CODE	DESCRIPTION
1	ILLEGAL FUNCTION (the function is not valid or is not supported)
2	ILLEGAL DATA ADDRESS (the specified data address is not available)
3	ILLEGAL DATA VALUE (the data received has an invalid value)

LIST OF AVAILABLE REGISTERS

The MODBUS-RTU protocol implemented on this instrument can manage a maximum of 32 registers read and written in a single query or response.

R.....the register may only be read
W.....the register may only be written
R/W .....the register may be both read and written
H.....high half of the DOUBLE WORD containing the number
L .....low half of the DOUBLE WORD containing the number

Register	Description	Saving in EEPROM	Access
40001	Firmware version	-	R
40002	Instrument type	-	R
40003	Year of manufacture	-	R
40004	Serial number	-	R
40005	Program type	-	R
40006	COMMAND REGISTER	NO	R/W
40007	STATUS REGISTER	-	R
40008	GROSS WEIGHT H	-	R
40009	GROSS WEIGHT L	-	R
40010	NET WEIGHT H	-	R
40011	NET WEIGHT L	-	R
40012	PEAK WEIGHT H	-	R
40013	PEAK WEIGHT L	-	R

40014	Divisions and Units of measure	-	R
40015	Coefficient H	-	R
40016	Coefficient L	-	R
40017	INPUTS	-	R
40018	OUTPUTS	NO	R/W
40019	SETPOINT 1 H	Only after command 99 of the Command Register	R/W
40020	SETPOINT 1 L		R/W
40021	SETPOINT 2 H		R/W
40022	SETPOINT 2 L		R/W
40023	SETPOINT 3 H		R/W
40024	SETPOINT 3 L		R/W
40025	SETPOINT 4 H		R/W
40026	SETPOINT 4 L		R/W
40027	SETPOINT 5 H		R/W
40028	SETPOINT 5 L		R/W
40039	HYSTERESIS 1 H	YES	R/W
40040	HYSTERESIS 1 L		R/W
40041	HYSTERESIS 2 H		R/W
40042	HYSTERESIS 2 L		R/W
40043	HYSTERESIS 3 H		R/W
40044	HYSTERESIS 3 L		R/W
40045	HYSTERESIS 4 H		R/W
40046	HYSTERESIS 4 L		R/W
40047	HYSTERESIS 5 H		R/W
40048	HYSTERESIS 5 L		R/W
40051	REGISTER 1	NO	R/W
40052	REGISTER 2	NO	R/W
40053	REGISTER 3	NO	R/W
40054	REGISTER 4	NO	R/W
40055	REGISTER 5	NO	R/W
40056	REGISTER 6	NO	R/W
40057	REGISTER 7	NO	R/W
40058	REGISTER 8	NO	R/W
40059	REGISTER 9	NO	R/W
40060	REGISTER 10	NO	R/W
40061	REGISTER 11	NO	R/W
40062	REGISTER 12	NO	R/W
40063	REGISTER 13	NO	R/W
40064	REGISTER 14	NO	R/W
40065	Sample weight for instrument calibration H	Use with command 101 of the Command Register	R/W
40066	Sample weight for instrument calibration L		R/W
40067	Weight value corresponding to ZERO of the analog output H	YES	R/W
40068	Weight value corresponding to ZERO of the analog output L		R/W
40069	Weight value corresponding to the full scale		R/W

	of the analog output H		
40070	Weight value corresponding to the full scale of the analog output L		R/W
40073	Preset tare H	Use with command 130 of the Command Register	R/W
40074	Preset tare L		R/W
40075	Approval status	-	R
40076	Qualified access via protocol	-	R
40080	Password seed	-	R
40081	Identification code / Password	NO	R/W
40082	Alibi memory identification number H	NO	R/W
40083	Alibi memory identification number L	NO	R/W
40084	Weight read from the alibi memory H	-	R
40085	Weight read from the alibi memory L	-	R
40086	Tare read from the alibi memory H	-	R
40087	Tare read from the alibi memory L	-	R
40088	Decimals read from the alibi memory	-	R
40089	Unit of measure read from the alibi memory	-	R
40090	Type of data read from the alibi memory	-	R

WARNING: at the time of writing the setpoint values are saved to RAM (they will be lost upon the next power-off); to store them permanently to EEPROM so that they are maintained at power-on, the 99 command of the Command Register must be sent.

STATUS REGISTER (40007)

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

INPUTS REGISTER (40017)
(read only)

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	
Bit 8	
Bit 9	
Bit 10	
Bit 11	
Bit 12	
Bit 13	
Bit 14	
Bit 15	

OUTPUTS REGISTER (40018)
(read/write)

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	
Bit 8	
Bit 9	
Bit 10	
Bit 11	
Bit 12	
Bit 13	
Bit 14	
Bit 15	

The output status can be read at any time but can be set (written) only if the output has been set as *PLC* (see section **OUTPUTS AND INPUTS CONFIGURATION**); otherwise, the outputs will be managed according to the current weight status with respect to the relevant setpoint.

DIVISIONS AND UNITS OF MEASURE REGISTER (40014)

This register contains the current setting of the scale verification division (parameter *E* or *E 1* for multi-interval or multiple range instruments) and of the units of measure (parameter *Un it*).

H Byte	**L Byte**
Unit of measure	Scale verification division

Use this register together with the Coefficient registers to calculate the value displayed by the instrument.

Least significant byte (L Byte)

Scale verification division value	Divisor	Decimals
0	100	0
1	50	0
2	20	0
3	10	0
4	5	0
5	2	0
6	1	0
7	0.5	1
8	0.2	1
9	0.1	1
10	0.05	2
11	0.02	2
12	0.01	2
13	0.005	3
14	0.002	3
15	0.001	3
16	0.0005	4
17	0.0002	4
18	0.0001	4

Most significant byte (H Byte)

Unit of measure value	Unit of measure description
0	Kilograms
1	Grams
2	Tons

APPROVAL STATUS REGISTER (40075)

This register contains information about the approval status of the instrument.

Bit 0	Multiple range approved instrument	**Bit 2**	Alibi memory enabled
Bit 1	Multi-interval approved instrument	**Bit 3**	Approved instrument*

*If Bit 3=1, Bit 0=0 and Bit 1=0, the instrument is single interval approved.

QUALIFIED ACCESS VIA PROTOCOL REGISTER (40076)

If the qualified access by protocol procedure has been performed correctly, the content of this register is 1, otherwise is 0 (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER (40006)

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	The points of the eight channels are distributed into the exchange registers from 1 to 8, in low resolution (16 bit, the lower 8 bit are lost)	**25**	The points of channels 1-2-3-4 are allocated into exchange registers from 1 to 8. Exchange register 1: channel 1 H Exchange register 2: channel 1 L Exchange register 3: channel 2 H Exchange register 4: channel 2 L Etc.
26	The points of channels 5-6-7-8 are allocated into exchange registers from 1 to 8. Exchange register 1: channel 5 H Exchange register 2: channel 5 L Exchange register 3: channel 6 H Exchange register 4: channel 6 L Etc.	**27**	Cancels commands 24-25-26
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
130	Preset tare enabling	**131**	Reserved

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported in the exchange registers, as shown in the following table.

Output Data from instrument (Reading)	Register
Channel 1 reading divisions – Low Res [2 byte]	40051
Channel 2 reading divisions – Low Res [2 byte]	40052
Channel 3 reading divisions – Low Res [2 byte]	40053
Channel 4 reading divisions – Low Res [2 byte]	40054
Channel 5 reading divisions – Low Res [2 byte]	40055
Channel 6 reading divisions – Low Res [2 byte]	40056
Channel 7 reading divisions – Low Res [2 byte]	40057
Channel 8 reading divisions – Low Res [2 byte]	40058

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported in the exchange registers, as shown in the following table.

Output Data from instrument (Reading)	Registers
Channel 1 reading divisions – High Res [4 byte]	40051-40052
Channel 2 reading divisions – High Res [4 byte]	40053-40054
Channel 3 reading divisions – High Res [4 byte]	40055-40056
Channel 4 reading divisions – High Res [4 byte]	40057-40058

Mode: 4x divisions HiRes (ch 5-8)

Send command 26 to Command Register so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported in the exchange registers, as shown in the following table.

Output Data from instrument (Reading)	Registers
Channel 5 reading divisions – High Res [4 byte]	40051-40052
Channel 6 reading divisions – High Res [4 byte]	40053-40054
Channel 7 reading divisions – High Res [4 byte]	40055-40056
Channel 8 reading divisions – High Res [4 byte]	40057-40058

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

ANALOG OUTPUT SETTING

Write the weight into registers “Weight value corresponding to the full scale of the analog output H” (40069) and “Weight value corresponding to the full scale of the analog output L” (40070), otherwise write the weight into registers “Weight value corresponding to ZERO of the analog output H” (40067) and “Weight value corresponding to ZERO of the analog output L” (40068).

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via Modbus, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the “Identification code/Password” register;
- send the command 120 to the Command Register;
- read the password seed in the “Password seed” register;
- enter the password read in the password table in the “Identification code/Password” register;
- send the command 121 to the Command Register;
- if the operation is successfully completed the “Password seed” register is set to zero;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system and send its value to the registers 40065-40066.
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the two sample weight registers are set to zero.

In order to correctly set the sample weight, consider the value of the Division register (40014). Example: to set the sample weight to 100 kg and the division is 0.001, then the value to enter is 100000 (100 / 0.001 = 100000).

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the "Alibi memory identification number" register (40082 - 40083) increases and the stored values can be read in the 40084 ÷ 40090 registers; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the "Alibi memory overwrite" bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the "Alibi memory identification number" register;
- send the command 111 to the Command Register;
- read the data from the 40084 ÷ 40090 registers:
  - "Weight read from the alibi memory" register (40084 - 40085): gross weight or net weight (check the "Net weight" bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
  - "Tare read from the alibi memory" register (40086 - 40087): when the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
  - "Decimals read from the alibi memory" register (40088): number of decimals to apply to weight values;
  - "Unit of measure read from the alibi memory" register (40089): unit of measure code (see table in **DIVISIONS AND UNITS OF MEASURE REGISTER** section for the codes legend);
  - see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** (40090) for a description of the same-named register; use this register to check if the weight reading refers to a net weight and if the tare reading is a preset tare;
- if the requested value does not exist, all the registers from 40084 to 40090 will be set to zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER (40090)

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

COMMUNICATION EXAMPLES

The numerical data below are expressed in hexadecimal notation with prefix h.

EXAMPLE 1
Command for multiple writing of registers (command 16, h10 hexadecimal):
Assuming that we wish to write the value 0 to the register 40017 and the value 2000 to the register 40018, the string to generate must be:

h01 h10 h00 h10 h00 h02 h04 h00 h00 h07 hD0 hF1 h0F

The instrument will respond with the string:

h01 h10 h00 h10 h00 h02 h40 h0D

Query field name	hex	Response field name	hex
Instrument address	**h01**	Instrument address	**h01**
Function	**h10**	Function	**h10**
Address of the first register H	**h00**	Address of the first register H	**h00**
Address of the first register L	**h10**	Address of the first register L	**h10**
Number of registers H	**h00**	Number of registers H	**h00**
Number of registers L	**h02**	Number of registers L	**h02**
Byte count	**h04**	CRC16 L	**h40**
Datum 1 H	**h00**	CRC16 H	**h0D**
Datum 1 L	**h00**		
Datum 2 H	**h07**		
Datum 2 L	**hD0**		
CRC16 L	**hF1**		
CRC16 H	**h0F**		

EXAMPLE 2
Command for multiple writing of registers (command 16, h10 hexadecimal):
Assuming that we wish to write two setpoint values on the instrument, at 2000 (setpoint 1: 40019-40020) and 3000 (setpoint 2: 40021-40022) respectively, the string must be sent:

h01 h10 h00 h12 h00 h04 h08 h00 h00 h07 hD0 h00 h00 h0B hB8 h49 h65

The instrument will respond with the string:

h01 h10 h00 h12 h00 h04 h61 hCF

Query field name	hex	Response field name	hex
Instrument address	**h01**	Instrument address	**h01**
Function	**h10**	Function	**h10**
Address of the first register H	**h00**	Address of the first register H	**h00**
Address of the first register L	**h12**	Address of the first register L	**h12**
Number of registers H	**h00**	Number of registers H	**h00**
Number of registers L	**h04**	Number of registers L	**h04**
Byte count	**h08**	CRC16 L	**h61**
Datum 1 H	**h00**	CRC16 H	**hCF**
Datum 1 L	**h00**		
Datum 2 H	**h07**		
Datum 2 L	**hD0**		
Datum 3 H	**h00**		
Datum 3 L	**h00**		
Datum 4 H	**h0B**		
Datum 4 L	**hB8**		
CRC16 L	**h49**		
CRC16 H	**h65**		

EXAMPLE 3
Multiple commands reading for registers (command 3, h03 hexadecimal):
Assuming that we wish to read the gross weight value (in the example 4000) and net weight value (in the example 3000), reading from address 40008 to address 40011 must be performed by sending the following string:

h01 h03 h00 h07 h00 h04 hF5 hC8

The instrument will respond with the string:

h01 h03 h00 h07 h00 h00 h0F hA0 h00 h00 h0B hB8 h37 h11

Query field name	**hex**	**Response field name**	**hex**
Instrument address	**h01**	Instrument address	**h01**
Function	**h03**	Function	**h03**
Address of the first register H	**h00**	Address of the first register H	**h00**
Address of the first register L	**h07**	Address of the first register L	**h07**
Number of registers H	**h00**	Datum 1 H	**h00**
Number of registers L	**h04**	Datum 1 L	**h00**
CRC16 L	**hF5**	Datum 2 H	**h0F**
CRC16 H	**hC8**	Datum 2 L	**hA0**
		Datum 3 H	**h00**
		Datum 3 L	**h00**
		Datum 4 H	**h0B**
		Datum 4 L	**hB8**
		CRC16 L	**h37**
		CRC16 H	**h11**

For additional examples regarding the generation of correct control characters (CRC16) refer to the manual **Modicon PI-MBUS-300.**

CANOPEN

TECHNICAL SPECIFICATIONS AND CONNECTIONS

Baud rate [kb/s]	10, 20, 50, 125, 250, 500, 800, 1000
Node ID	1÷127

Terminals legend	47 .....CAN GND 46 .....CAN L 45 .....CAN SHLD 44 .....CAN H 43 .....NC

The instrument features a CANopen port that allows to exchange the weight and the main parameters with a CANopen *master*.

INSTRUMENT SETUP

ENTER + ESC → CAnOPn

- Addr (default: 1): set the instrument address in the CANopen network
- bAUd (default: 10 kb/s): set the instrument baud rate in the CANopen network
- SWAP (default: nO): it allows to select the reading/writing of the byte in LITTLE-ENDIAN or BIG-ENDIAN mode
  - YES: BIG ENDIAN
  - nO: LITTLE ENDIAN

In order to apply the changes, turn the instrument off, wait for 10 seconds and turn it back on.

The instrument works as *slave* in a synchronous CANopen network (activate the SYNC object on the network master).
Load the eds file attached to the instrument to the CANopen *master* development system.
When configuring CANopen Guard Time and Lifetime Factor, set values 100 ms and 4.
The data exchanged by the instrument are:

Output Data from instrument (Reading)	Index	Sub-Index	Data type	Addresses
Gross Weight [4 byte]	4100	01	UNSIGNED32	0x0000-0x0003
Net Weight [4byte]	4100	02	UNSIGNED32	0x0004-0x0007
Exchange Register [4 byte]	4101	01	UNSIGNED32	0x0008-0x000B
Status Register [2 byte]	4101	02	UNSIGNED16	0x000C-0x000D
Digital Inputs status [1 byte]	4101	03	UNSIGNED8	0x000E
Digital Outputs status [1 byte]	4101	04	UNSIGNED8	0x000F

Input Data to instrument (Writing)	Index	Sub-Index	Data type	Addresses
Command Register [2 byte]	4000	01	UNSIGNED16	0x0000-0x0001
Digital Outputs Command [2 byte]	4000	02	UNSIGNED16	0x0002-0x0003
Exchange Register [4 byte]	4000	03	UNSIGNED32	0x0004-0x0007

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading**
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – Low Res [2 byte]	0x0000-0x0001
Channel 2 reading divisions – Low Res [2 byte]	0x0002-0x0003
Channel 3 reading divisions – Low Res [2 byte]	0x0004-0x0005
Channel 4 reading divisions – Low Res [2 byte]	0x0006-0x0007
Channel 5 reading divisions – Low Res [2 byte]	0x0008-0x0009
Channel 6 reading divisions – Low Res [2 byte]	0x000A-0x000B
Channel 7 reading divisions – Low Res [2 byte]	0x000C-0x000D
Channel 8 reading divisions – Low Res [2 byte]	0x000E-0x000F

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 2 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 3 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 4 reading divisions – High Res [4 byte]	0x000C-0x000F

Mode: 4x divisions HiRes (ch 5-8)

Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 5 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 6 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 7 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 8 reading divisions – High Res [4 byte]	0x000C-0x000F

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**" so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

DEVICENET

TECHNICAL SPECIFICATIONS AND CONNECTIONS

Baud rate [kb/s]	125, 250, 500
Addresses	1÷63

Terminals legend	47 .....CAN V - 46 .....CAN L 45 .....CAN SHLD 44 .....CAN H 43 .....CAN V +

It is necessary to activate the termination resistance on the two devices located at the ends of the network closing the jumper.

The instrument features a DeviceNet port that allows to exchange the weight and the main parameters with a DeviceNet *master*.

INSTRUMENT SETUP

ENTER + ESC → dEUnEt

- Addr (default: 1): set the instrument address in the DeviceNet network
- bAUd (default: 125 kb/s): set the instrument baud rate in the DeviceNet network
- SWAP (default: nO): it allows to select the reading/writing of the byte in LITTLE-ENDIAN or BIG-ENDIAN mode
  - YES: BIG ENDIAN
  - nO: LITTLE ENDIAN

In order to apply the changes, turn the instrument off, wait for 10 seconds and turn it back on.

PC/PLC SETUP

The instrument works as *slave* in a DeviceNet network.
Load the eds file attached to the instrument to the DeviceNet *master* development system.
The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses
Gross Weight [4 byte]	0x0000-0x0003
Net Weight [4byte]	0x0004-0x0007
Exchange Register [4 byte]	0x0008-0x000B
Status Register [2 byte]	0x000C-0x000D
Digital Inputs status [1 byte]	0x000E
Digital Outputs status [1 byte]	0x000F

Input Data to instrument (Writing)	Addresses
Command Register [2 byte]	0x0000-0x0001
Digital Outputs Command [2 byte]	0x0002-0x0003
Exchange Register [4 byte]	0x0004-0x0007

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading **	**123**	Identification code/Password reading **
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – Low Res [2 byte]	0x0000-0x0001
Channel 2 reading divisions – Low Res [2 byte]	0x0002-0x0003
Channel 3 reading divisions – Low Res [2 byte]	0x0004-0x0005
Channel 4 reading divisions – Low Res [2 byte]	0x0006-0x0007
Channel 5 reading divisions – Low Res [2 byte]	0x0008-0x0009
Channel 6 reading divisions – Low Res [2 byte]	0x000A-0x000B
Channel 7 reading divisions – Low Res [2 byte]	0x000C-0x000D
Channel 8 reading divisions – Low Res [2 byte]	0x000E-0x000F

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 2 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 3 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 4 reading divisions – High Res [4 byte]	0x000C-0x000F

Mode: 4x divisions HiRes (ch 5-8)

Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 5 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 6 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 7 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 8 reading divisions – High Res [4 byte]	0x000C-0x000F

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**" so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

CC-LINK

TECHNICAL SPECIFICATIONS AND CONNECTIONS

Baud rate	156 k, 625 k, 2500 k, 5 M, 10 M
Addresses	1÷64

CC-LINK status led indications	on.....CC-LINK OK

Terminals legend	47 .....CCL DA 46 .....CCL DB 45 .....CCL DG 44 .....CCL SLD 43 .....CCL FG

To activate the termination resistance of CC-LINK network close the related jumper.

The instrument features a CC-LINK port that allows to exchange the weight and the main parameters with a CC-LINK *master*.

INSTRUMENT SETUP

ENTER + ESC → CCLI nH

- Addr (default: 1): set the instrument address in the CC-LINK network
- bAUd (default: 156 kb/s): set the instrument baud rate in the CC-LINK network

In order to apply the changes, press ESC until the display shows CCLI nH.

PC/PLC SETUP

The instrument works as *Remote Device Station* in a CC-LINK network and occupies 3 stations.
Load the csp file attached to the instrument to the CC-LINK *master* development system.
Insert and configure the TLM8CC-LINK in an existing project.
The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses
Gross Weight [4 byte]	Wr0000 – Wr0001
Net Weight [4byte]	Wr0002 – Wr0003
Exchange Register [4 byte]	Wr0004 – Wr0005
Status Register [2 byte]	Wr0006
Digital Inputs status [2 byte]	Wr0007
Digital Outputs status [2 byte]	Wr0008
-	Wr0009-Wr000B

Input Data to instrument (Writing)	Addresses
Command Register [2 byte]	Ww0000
Digital Outputs Command [2 byte]	Ww0001
Exchange Register [4 byte]	Ww0002-Ww0003
-	Ww0004-Ww000B

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – Low Res [2 byte]	Wr0000
Channel 2 reading divisions – Low Res [2 byte]	Wr0001
Channel 3 reading divisions – Low Res [2 byte]	Wr0002
Channel 4 reading divisions – Low Res [2 byte]	Wr0003
Channel 5 reading divisions – Low Res [2 byte]	Wr0004
Channel 6 reading divisions – Low Res [2 byte]	Wr0005
Channel 7 reading divisions – Low Res [2 byte]	Wr0006
Channel 8 reading divisions – Low Res [2 byte]	Wr0007
Status Register [2 byte]	Wr0008
-	Wr0009-Wr000B

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – High Res [4 byte]	Wr0000-Wr0001
Channel 2 reading divisions – High Res [4 byte]	Wr0002- Wr0003
Channel 3 reading divisions – High Res [4 byte]	Wr0004- Wr0005
Channel 4 reading divisions – High Res [4 byte]	Wr0006-Wr0007
Status Register [2 byte]	Wr0008
-	Wr0009-Wr000B

Mode: 4x divisions HiRes (ch 5-8)
Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 5 reading divisions – High Res [4 byte]	Wr0000-Wr0001
Channel 6 reading divisions – High Res [4 byte]	Wr0002- Wr0003
Channel 7 reading divisions – High Res [4 byte]	Wr0004- Wr0005
Channel 8 reading divisions – High Res [4 byte]	Wr0006-Wr0007
Status Register [2 byte]	Wr0008
-	Wr0009-Wr000B

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**" so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

ETHERNET TCP/IP

TECHNICAL SPECIFICATIONS

Port	RJ45 10Base-T or 100Base-TX (auto-detect)

Link led indications (RJ45 – left side)	off.....No link amber .....10 Mb/s green .....100 Mb/s
Activity led indications (RJ45 – right side)	off.....No activity amber .....Half Duplex green .....Full Duplex

The instrument features an ethernet TCP/IP port that allows to exchange the weight and the main parameters in an ethernet network, for example with a PC.

INSTRUMENT SETUP

ENTER + ESC → *EtHnEt*

- *I PAddr* (default: 192.8.0.141): set instrument IP address
- *SUbnEt* (default: 255.255.255.0): set instrument Subnet Mask
- *GAtUAY* (default: 192.8.0.111): set Gateway address of Ethernet network
- *MOdE*: select communication protocol.
  - *nOnE*: it disables any type of communication (default).
  - *ModbUS*: MODBUS-RTU protocol; possible addresses: from 1 to 99.
  - *ASCII* : ASCII bidirectional protocol; possible addresses: from 1 to 99.
    - *MOdU60*
    - *MOd td*
  - *CONtI n*: continuous weight transmission protocol, at the frequency set in *HErt2* item (from 10 to 200).
    - *MOd t*
    - *MOd td*
  - *rI P*: continuous weight transmission protocol to RIP5/20/60, RIP50SHA, RIPLED series remote displays; the remote display shows the net weight or gross weight according to its settings.
  - *HdrI P*: continuous weight transmission protocol to RIP6100, RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings.
  - *HdrI Pn*: continuous weight transmission protocol to RIP6100, RIP675, RIP6125C series remote displays, when the remote display is set to gross weight:
    - if the instrument displays the gross weight, the remote display shows the gross weight.
    - if the instrument shows the net weight, the remote display shows the net weight alternated with the message *nEt*.

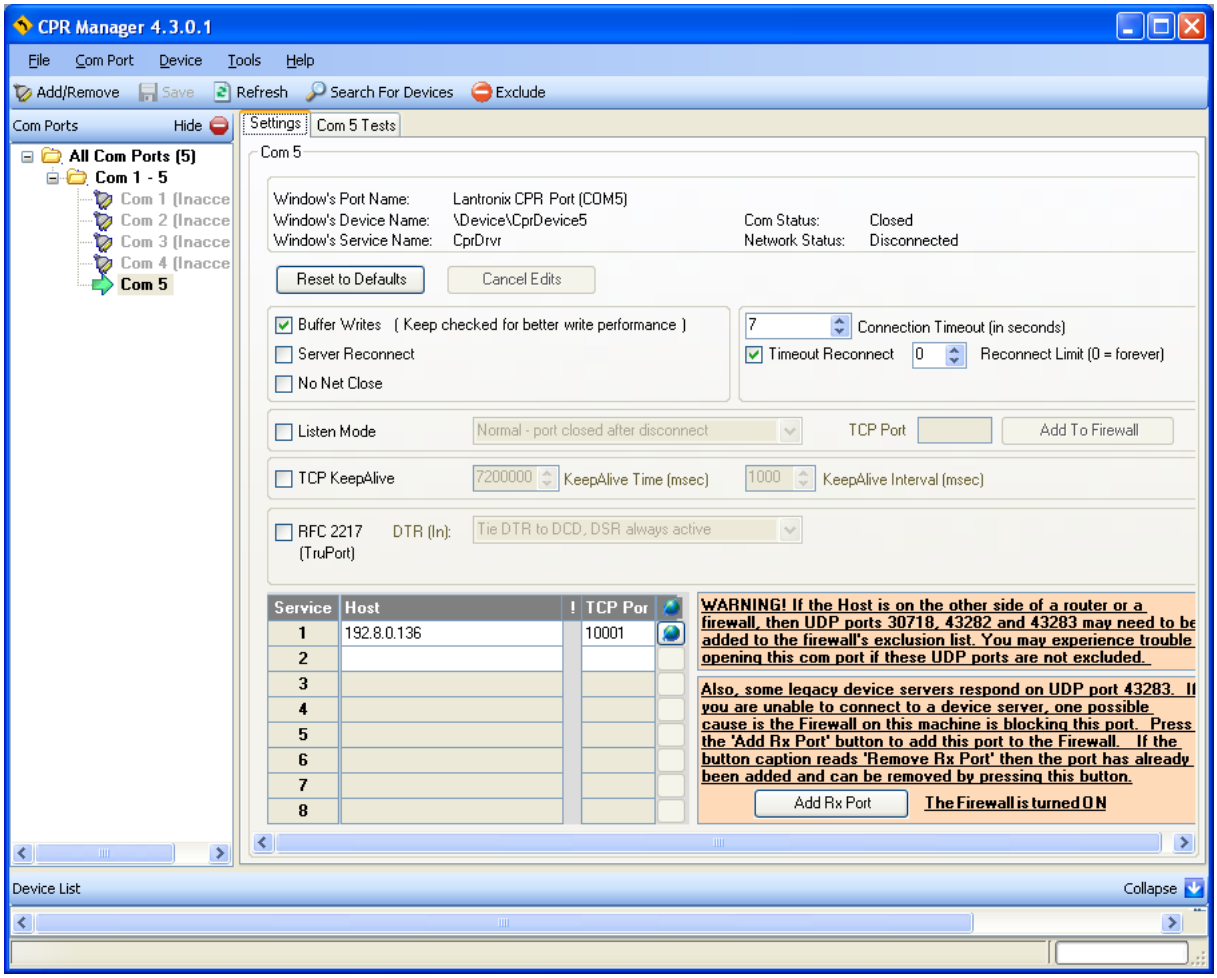
- UEbSru: see section **WEBSITE**.

  - Addr: instrument address (from 1 to 99; default: 1).
  - HErtZ: maximum transmission frequency (10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 100 – 200; default: 10); to be set when the CONtI n transmission protocol is selected.
  - dELAY: delay in milliseconds which elapses before the instrument replies (from 0 to 200 ms; default: 0).

In order to apply the changes, turn the instrument off, wait for 10 seconds and turn it back on.

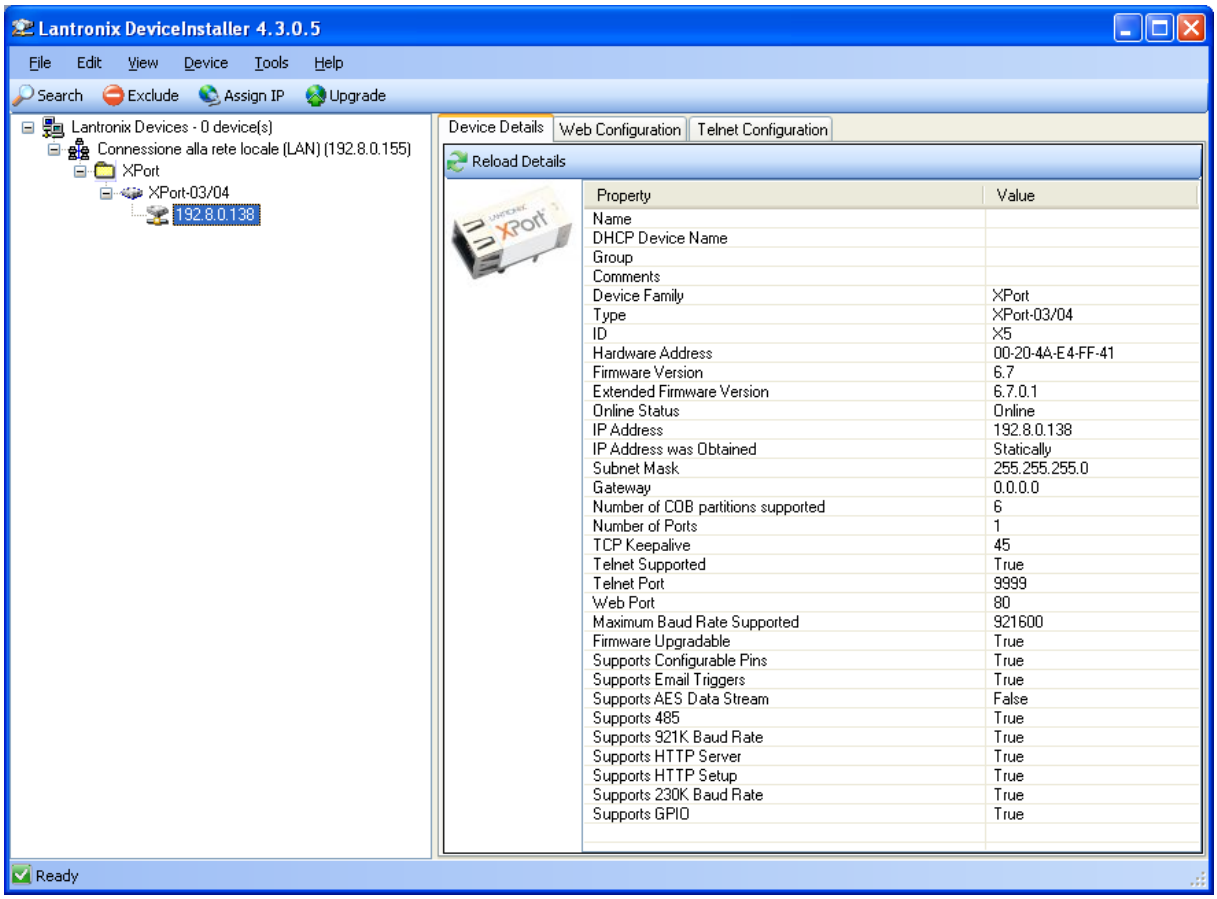
PC SETUP

A PC can be connected, by a virtual serial port, to the instrument via ethernet TCP/IP.
To install the virtual COM port, use the CPR Manager included in the supply: run file *CPR.exe* on CD, add a serial port, set an IP address (host) and a TCP port (10001), then save.

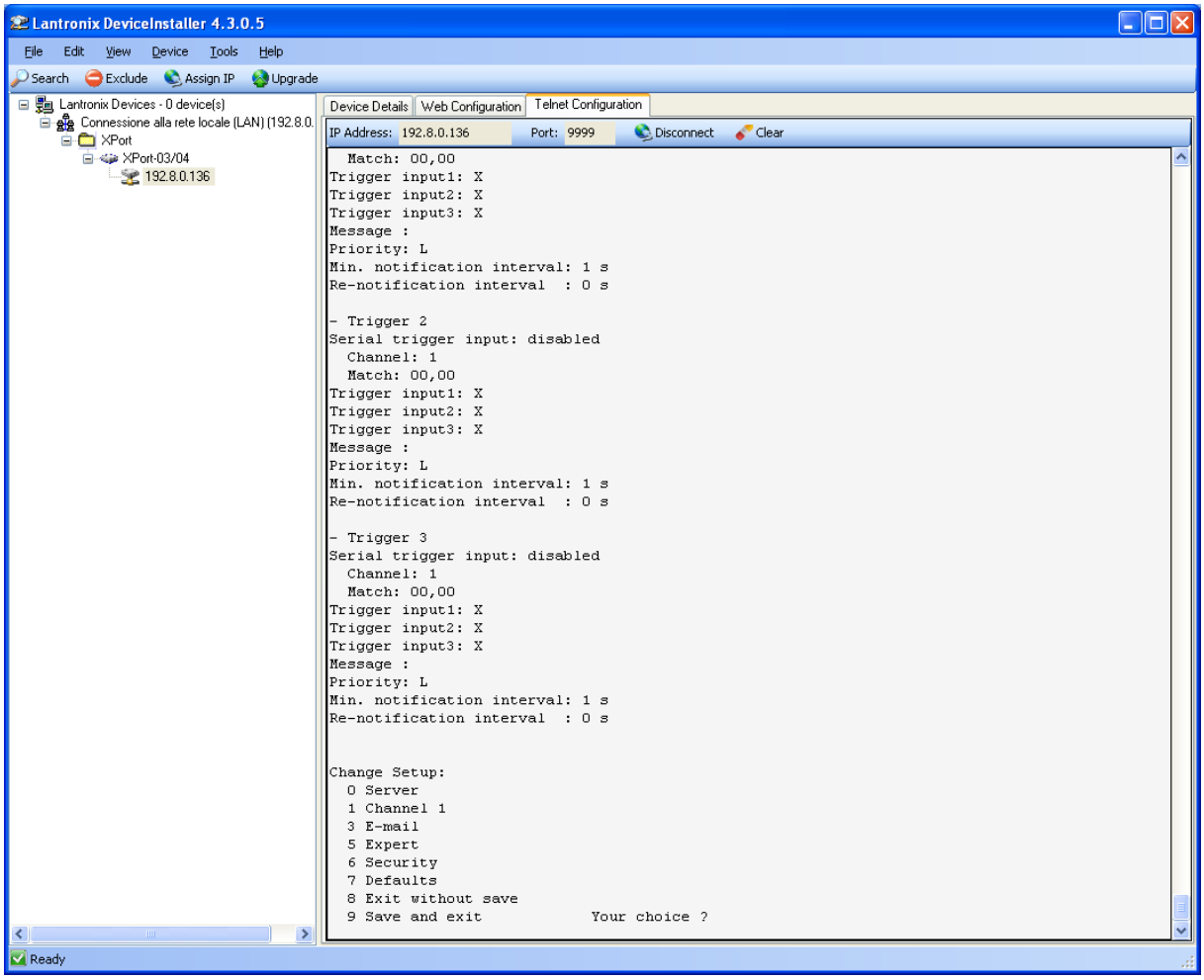


Use the just created virtual COM port to communicate with the instrument, using the protocol selected on it.
Alternatively connect to the instrument using a socket (e.g.: Winsock) on port 10001.

To verify the ethernet configuration of the instrument, you can install the application Lantronix DeviceInstaller on a PC with Microsoft Windows operating system (run file *DevInst.exe* on CD). Connect PC and instrument via LAN (point-to-point or through hub/switch), run the application and click on Search:

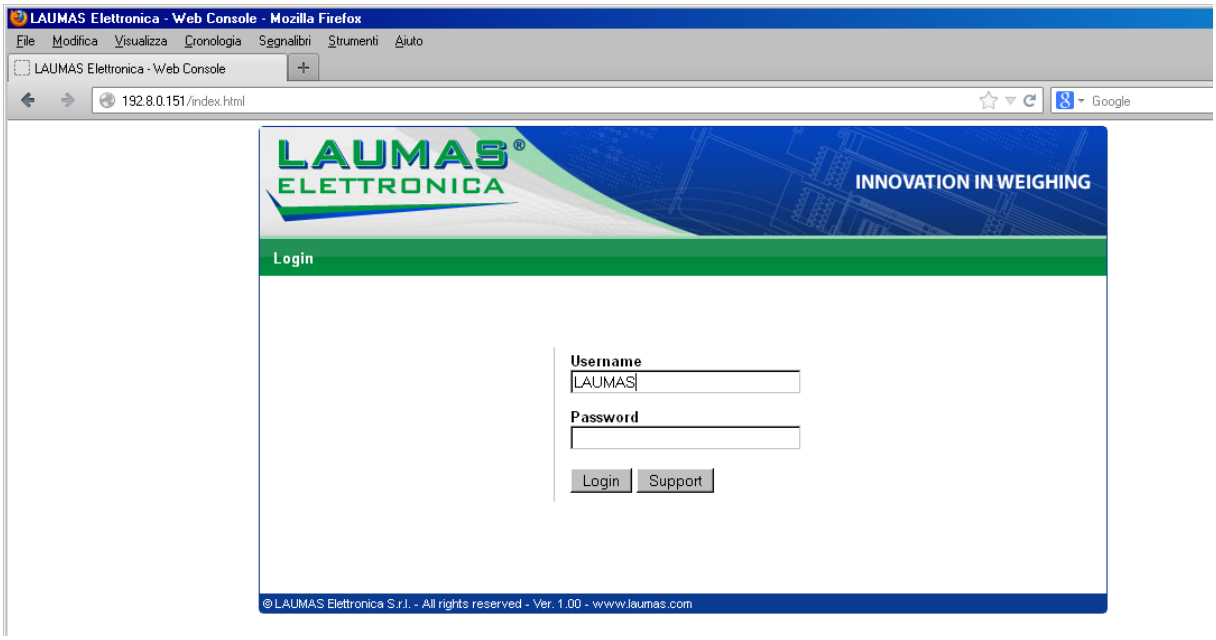


Select the found device and click on Telnet Configuration tab; click on Connect, and then press Enter on keyboard.



Press 0 to change server settings: change only the 4 fields of IP address and confirm the other parameters by pressing Enter. Set a static IP address.

Set *WEbSrU* operation mode (into *EtHnEt* menu on the instrument) and restart the instrument to apply changes. Open your web browser and point to the instrument address to be monitored; it will open the following page:



Enter the “LAUMAS” user name and the password supplied with the instrument in respective fields, then press Login to enter the status page:

In case of incorrect parameter setting, the “INSTRUMENT DATA READING ERROR” message is displayed.

The instrument status page shows the gross and net weight read, the setpoint values set and allows you to send the main commands (Tare, Zero setting, E2PROM saving, etc.); it also shows instrument status, including possible anomalies:

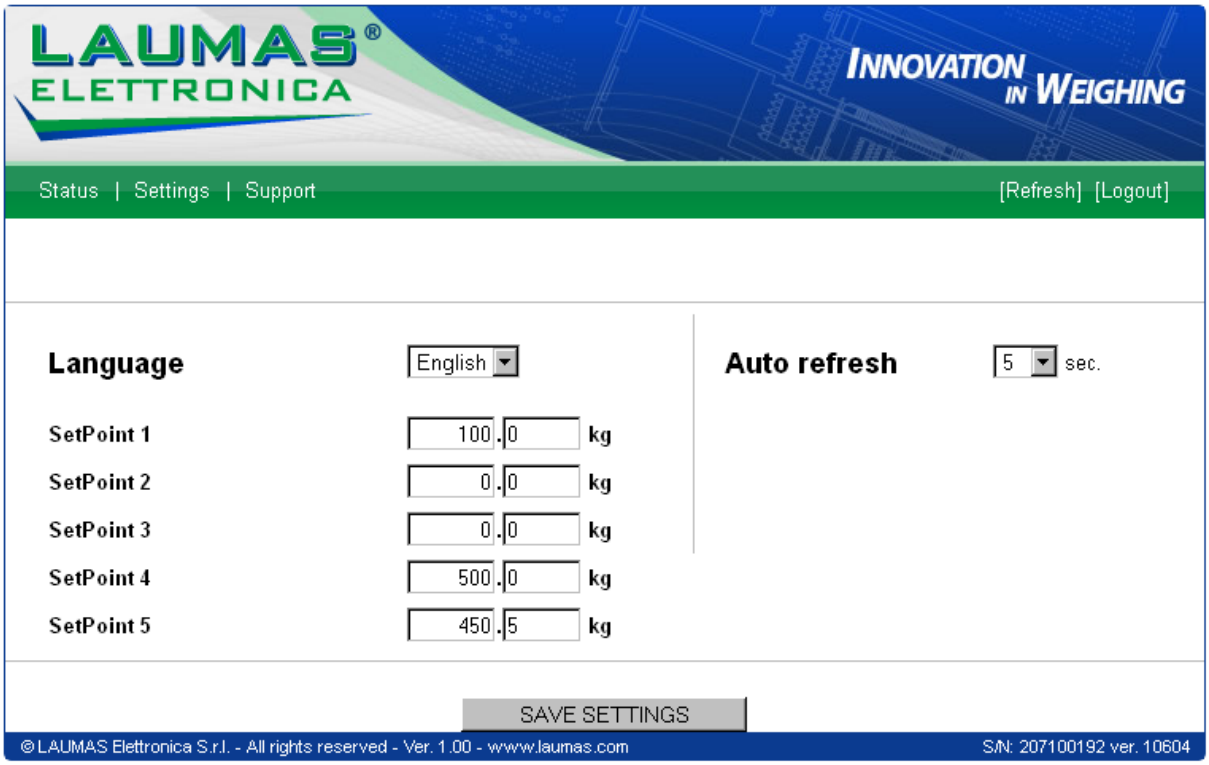
ErCell:..... load cell error
ErAD:..... instrument converter error
>9div:..... weight exceeds maximum weight by 9 divisions
>110%..... weight exceeds 110% of full scale
GrOver..... gross weight over 999999
NetOver..... net weight over 999999
Net..... instrument shows the net weight
Stab ..... weight is stable
ZERO ..... weight is zero

Number of decimals and unit of measure are read by the instrument; if outputs are set in PLC mode, click on related icons to do a remote status check.

The screen to be displayed is selected through the drop down menu:

SetPoint:..... setpoint values
Load Distr.:.. percentage load distribution
mV: ..... current response signal of each load cell expressed in mV
mV zero: ..... response signal of each load cell, stored during zero setting, expressed in mV
Points:..... current response signal of each load cell expressed in converter points

Click on Settings to enter the instrument configuration page:



In the configuration page you can:

- set language and page refresh time: by pressing SAVE SETTINGS data are saved on the instrument and will be used for subsequent accesses;
- set setpoint: by pressing SAVE SETTINGS the new values are sent to the instrument and activated, but will be lost at instrument restart or power off; to permanently save setpoint values, press E2PROM Save in status page.

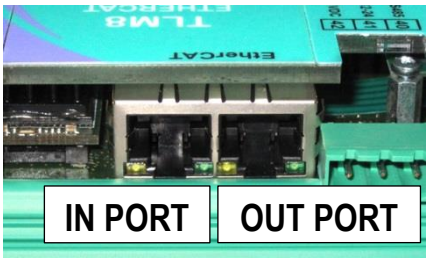
ETHERCAT

TECHNICAL SPECIFICATIONS

Port	2x RJ45 10Base-T or 100Base-TX (auto-detect)

Link led indications	off.....No link green (fixed).....Link green (blinking).....Activity

The instrument features an ETHERCAT dual port that allows to exchange the weight and the main parameters with an ETHERCAT *master*.



PC/PLC SETUP

The instrument works as *slave* in an ETHERCAT network.
Load the xml file attached to the instrument to the ETHERCAT *master* development system.
Insert and configure the TLM8ETHERCAT in an existing project.
The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses
Gross Weight [4 byte]	0x0000-0x0003
Net Weight [4byte]	0x0004-0x0007
Exchange Register [4 byte]	0x0008-0x000B
Status Register [2 byte]	0x000C-0x000D
Digital Inputs status [2 byte]	0x000E-0x000F
Digital Outputs status [2 byte]	0x0010-0x0011

Input Data to instrument (Writing)	Addresses
Command Register [2 byte]	0x0000-0x0001
Digital Outputs Command [2 byte]	0x0002-0x0003
Exchange Register [4 byte]	0x0004-0x0007

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to PLC mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – Low Res [2 byte]	0x0000-0x0001
Channel 2 reading divisions – Low Res [2 byte]	0x0002-0x0003
Channel 3 reading divisions – Low Res [2 byte]	0x0004-0x0005
Channel 4 reading divisions – Low Res [2 byte]	0x0006-0x0007
Channel 5 reading divisions – Low Res [2 byte]	0x0008-0x0009
Channel 6 reading divisions – Low Res [2 byte]	0x000A-0x000B
Channel 7 reading divisions – Low Res [2 byte]	0x000C-0x000D
Channel 8 reading divisions – Low Res [2 byte]	0x000E-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 2 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 3 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 4 reading divisions – High Res [4 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: 4x divisions HiRes (ch 5-8)
Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 5 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 6 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 7 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 8 reading divisions – High Res [4 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**" so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

ETHERNET/IP

TECHNICAL SPECIFICATIONS

Port	2x RJ45 10Base-T or 100Base-TX (auto-detect)

Link led indications	off.....No link green (fixed).....Link
Activity led indications	off.....No activity amber (blinking) .....Activity

The instrument features an Ethernet/IP dual port that allows to exchange the weight and the main parameters with an Ethernet/IP *scanner*.

INSTRUMENT SETUP

ENTER + ESC → EtHnEt

- SWAP (default: no): it allows to select the reading/writing of the byte in LITTLE-ENDIAN or BIG-ENDIAN mode
  - YES: BIG ENDIAN
  - no: LITTLE ENDIAN
- I PAddr (default: 192.8.0.141): set instrument IP address
- SUbnEt (default: 255.255.255.0): set instrument Subnet Mask
- GAtWAY (default: 192.8.0.111): set Gateway address of Ethernet network

In order to apply the changes, press ESC until the display shows EtHnEt.

The instrument works as *adapter* in an Ethernet/IP network.
Refer to one of the following procedures to configure the communication with the instrument:
- load the eds file attached to the instrument to the Ethernet/IP *scanner* development system;
- using a generic Ethernet/IP module, open a class 1 I/O connection with the following settings:

Settings for class 1 communication		
Assembly	**Assembly Instance**	**Size (16-bit)**
Input	101	9
Output	100	4
Configuration	128	0

- If explicit messages are used and PLC supports class 3 connections (with appropriate interface), insert the data shown on table “Settings for class 1 communication”.
- If explicit messages are used and PLC needs data read/write messages to be constructed manually, see table “Manual settings for communication”. The arrays dimensions of exchanged data are the same as those reported on table “Settings for class 1 communication” (see “size” column, Assembly “Input” and “Output” rows).

Manual settings for communication		
Field	**Read**	**Write**
Service	0x0E	0x10
Class	0x04	0x04
Instance	0x65	0x64
Attribute	0x03	0x03
Data	NO	Byte array to be written

The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses – input assembly
Gross Weight [4 byte]	0x0000-0x0003
Net Weight [4 byte]	0x0004-0x0007
Exchange Register [4 byte]	0x0008-0x000B
Status Register [2 byte]	0x000C-0x000D
Digital Inputs status [2 byte]	0x000E-0x000F
Digital Outputs status [2 byte]	0x0010-0x0011

Input Data to instrument (Writing)	Addresses – output assembly
Command Register [2 byte]	0x0000-0x0001
Digital Outputs Command [2 byte]	0x0002-0x0003
Exchange Register [4 byte]	0x0004-0x0007

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the *scanner* Ethernet/IP takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – Low Res [2 byte]	0x0000-0x0001
Channel 2 reading divisions – Low Res [2 byte]	0x0002-0x0003
Channel 3 reading divisions – Low Res [2 byte]	0x0004-0x0005
Channel 4 reading divisions – Low Res [2 byte]	0x0006-0x0007
Channel 5 reading divisions – Low Res [2 byte]	0x0008-0x0009
Channel 6 reading divisions – Low Res [2 byte]	0x000A-0x000B
Channel 7 reading divisions – Low Res [2 byte]	0x000C-0x000D
Channel 8 reading divisions – Low Res [2 byte]	0x000E-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 2 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 3 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 4 reading divisions – High Res [4 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: 4x divisions HiRes (ch 5-8)
Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 5 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 6 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 7 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 8 reading divisions – High Res [4 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x00111

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**" so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

MODBUS/TCP

TECHNICAL SPECIFICATIONS

Port	RJ45 10Base-T or 100Base-TX (auto-detect)

Link led indications (RJ45 – left side)	off.....No link amber .....10 Mb/s green .....100 Mb/s
Activity led indications (RJ45 – right side)	off.....No activity amber .....Half Duplex green .....Full Duplex

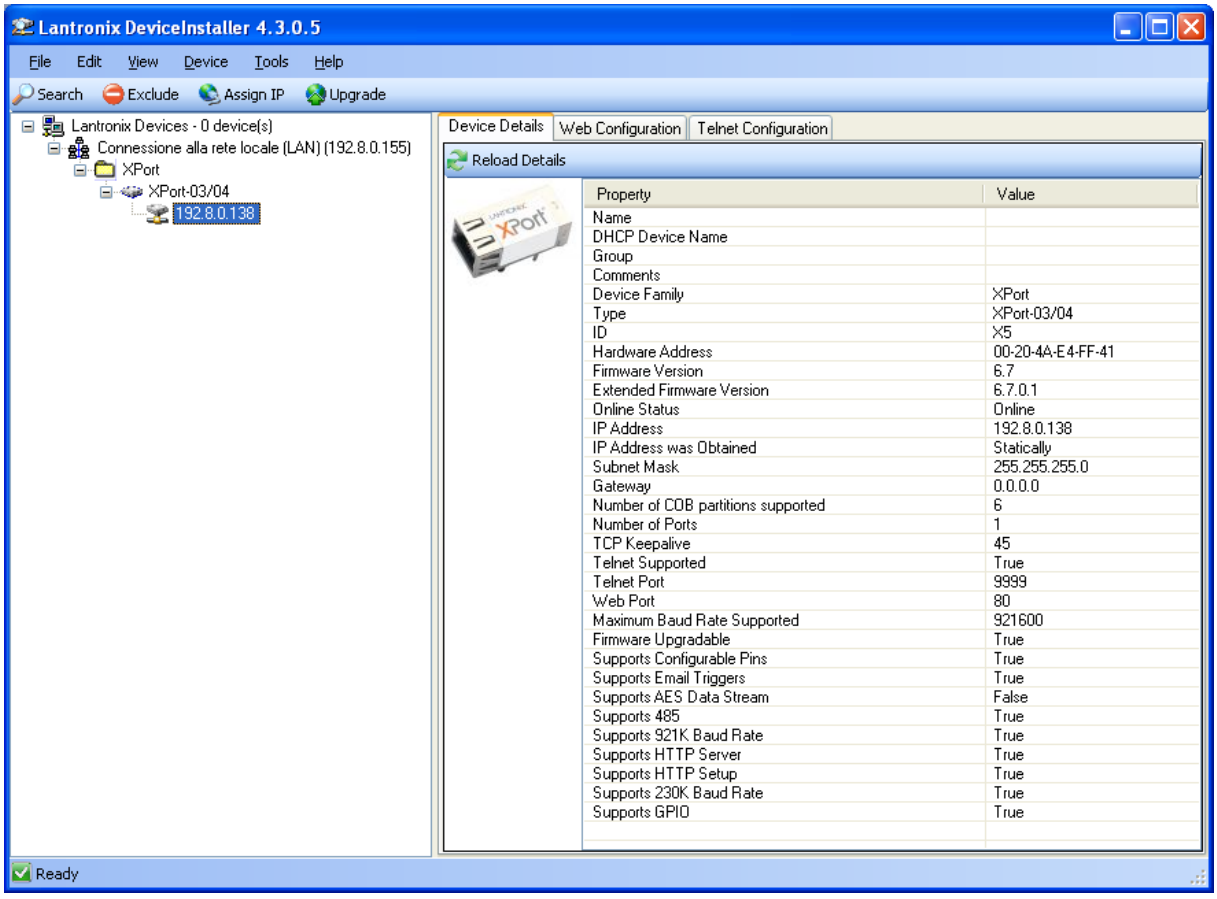
The instrument features a Modbus/TCP port that allows to exchange the weight and the main parameters with a Modbus/TCP *master*.

PC/PLC SETUP

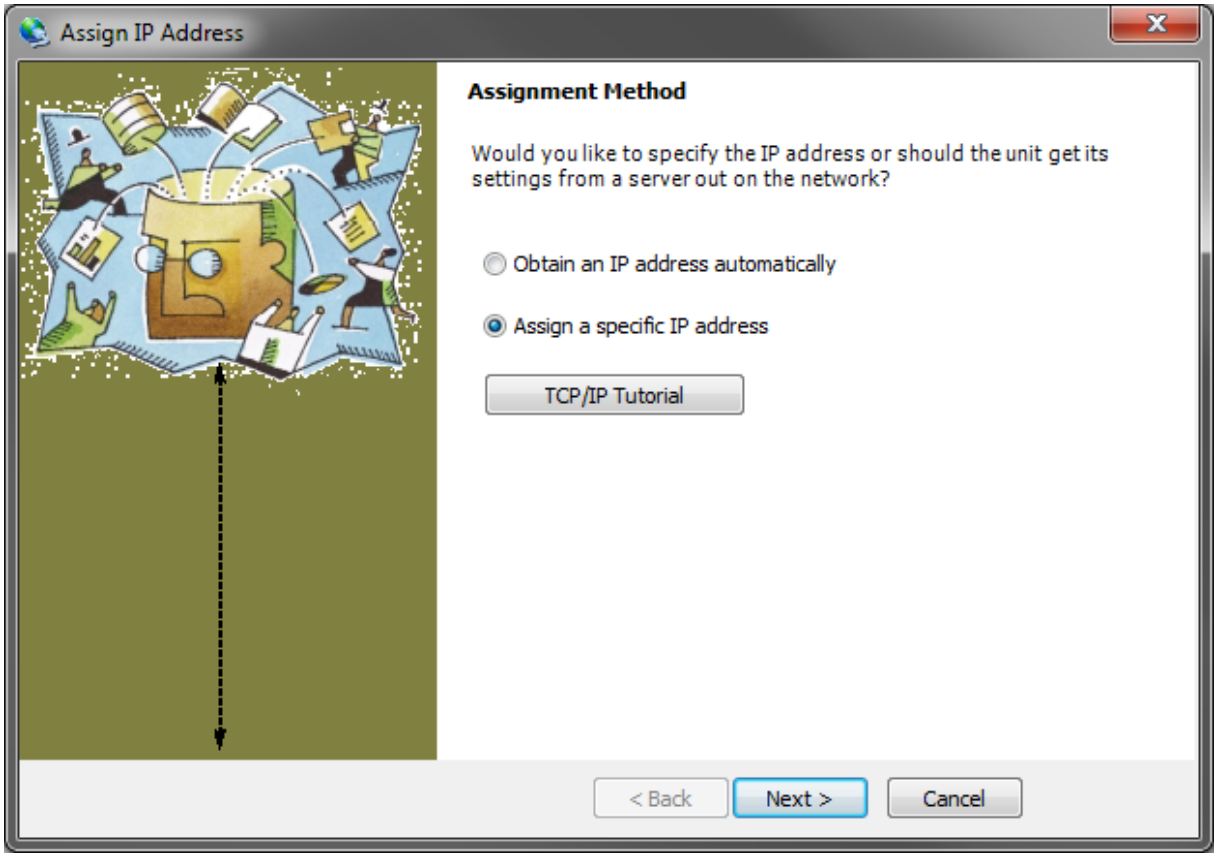
The instrument works as *slave* in a Modbus/TCP network. Use port 502 for the communication.

IP ADDRESS SETTING

Install the Lantronix DeviceInstaller application on a PC with Microsoft Windows operating system (run the *DEVINST.exe* file on the CD). Connect the PC to the instrument via LAN (point-to point or by hub/switch), run the application and click on Search:



Select the device found and click on Assign IP.



Select Assign a specific IP address, enter the desired values and click on Assign; wait for the procedure to complete (no need to restart the instrument).

Modbus/TCP commands and registers are the same as ModbusRTU protocol: for details see section **MODBUS-RTU PROTOCOL**.

POWERLINK

TECHNICAL SPECIFICATIONS

Port	2x RJ45 10Base-T or 100Base-TX (auto-detect)
Addresses	1÷239

Link led indications	off.....No link green (fixed).....Link green (blinking).....Activity

The instrument features a POWERLINK dual port that allows to exchange the weight and the main parameters with a POWERLINK *controller*.

INSTRUMENT SETUP

ENTER + ESC → EtHnEt

- nOdEI d (default: 1): set the instrument address

In order to apply the changes, press ESC until the display shows EtHnEt.

PC/PLC SETUP

The instrument works as *slave* in a POWERLINK network.
Load the xdd file attached to the instrument to the POWERLINK *master* development system.
Insert and configure the TLM8POWERLINK in an existing project.
The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses
Gross Weight [4 byte]	0x0000-0x0003
Net Weight [4byte]	0x0004-0x0007
Exchange Register [4 byte]	0x0008-0x000B
Status Register [2 byte]	0x000C-0x000D
Digital Inputs status [2 byte]	0x000E-0x000F
Digital Outputs status [2 byte]	0x0010-0x0011

Input Data to instrument (Writing)	Addresses
Command Register [2 byte]	0x0000-0x0001
Digital Outputs Command [2 byte]	0x0002-0x0003
Exchange Register [4 byte]	0x0004-0x0007

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – Low Res [2 byte]	0x0000-0x0001
Channel 2 reading divisions – Low Res [2 byte]	0x0002-0x0003
Channel 3 reading divisions – Low Res [2 byte]	0x0004-0x0005
Channel 4 reading divisions – Low Res [2 byte]	0x0006-0x0007
Channel 5 reading divisions – Low Res [2 byte]	0x0008-0x0009
Channel 6 reading divisions – Low Res [2 byte]	0x000A-0x000B
Channel 7 reading divisions – Low Res [2 byte]	0x000C-0x000D
Channel 8 reading divisions – Low Res [2 byte]	0x000E-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 1 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 2 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 3 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 4 reading divisions – High Res [4 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: 4x divisions HiRes (ch 5-8)
Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
Channel 5 reading divisions – High Res [4 byte]	0x0000-0x0003
Channel 6 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 7 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 8 reading divisions – High Res [2 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x0011

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**" so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

PROFIBUS-DP

TECHNICAL SPECIFICATIONS

Baud rate	Up to 12 Mb/s
Addresses	1÷99

Profibus status led indications	slow blinking.....Profibus error fast blinking.....Profibus OK

It is necessary to activate the termination resistance on the two devices located at the ends of the network.

The instrument features a Profibus-DP port that allows to exchange the weight and the main parameters with a Profibus-DP *master*.

INSTRUMENT SETUP

ENTER + ESC → *PrOFI*

- *Addr* (default: 1): set the instrument address in the Profibus network

In order to apply the changes, turn the instrument off, wait for 10 seconds and turn it back on.

PC/PLC SETUP

The instrument works as *slave* in a Profibus-DP network
Load the gsd file attached to the instrument to the Profibus-DP development system.
Insert and configure the TLM8PROFIBUS in an existing project.
Usable software modules are:

NAME	DESCRIPTION	R/W	SIZE
TLM8 Gross Weight	Gross Weight	R	4 byte
TLM8 Net Weight	Net Weight	R	4 byte
TLM8 Peak Weight	Peak Weight	R	4 byte
TLM8 Set-Point 1	Setpoint 1	R/W*	4 byte / 4 byte
TLM8 Set-Point 2	Setpoint 2	R/W*	4 byte / 4 byte
TLM8 Set-Point 3	Setpoint 3	R/W*	4 byte / 4 byte
TLM8 Set-Point 4	Setpoint 4	R/W*	4 byte / 4 byte
TLM8 Set-Point 5	Setpoint 5	R/W*	4 byte / 4 byte
TLM8 Hysteresis 1	Setpoint 1 Hysteresis	R/W*	4 byte / 4 byte
TLM8 Hysteresis 2	Setpoint 2 Hysteresis	R/W*	4 byte / 4 byte
TLM8 Hysteresis 3	Setpoint 3 Hysteresis	R/W*	4 byte / 4 byte

TLM8 Hysteresis 4	Setpoint 4 Hysteresis	R/W*	4 byte / 4 byte
TLM8 Hysteresis 5	Setpoint 5 Hysteresis	R/W*	4 byte / 4 byte
TLM8 Division/Unit	Divisions and Units of Measure	R	2 byte
TLM8 VisualCoeff	Display coefficient	R	4 byte
TLM8 Inputs	Inputs status	R	2 byte
TLM8 Outputs	Outputs status	R/W	2 byte / 2 byte
TLM8 Status Reg	Status register	R	2 byte
TLM8 Command Reg	Command register	W	2 byte
TLM8 Sample Weight	Sample weight	R/W*	4 byte / 4 byte
TLM8 ZeroAn Weight	Zero Weight-Analog Output	R/W*	4 byte / 4 byte
TLM8 FSAn Weight	Full Scale Weight-Analog Output	R/W*	4 byte / 4 byte
TLM8 Divisions 1**	Channel 1 divisions	R	4 byte
TLM8 Divisions 2**	Channel 2 divisions	R	4 byte
TLM8 Divisions 3**	Channel 3 divisions	R	4 byte
TLM8 Divisions 4**	Channel 4 divisions	R	4 byte
TLM8 Divisions 5**	Channel 5 divisions	R	4 byte
TLM8 Divisions 6**	Channel 6 divisions	R	4 byte
TLM8 Divisions 7**	Channel 7 divisions	R	4 byte
TLM8 Divisions 8**	Channel 8 divisions	R	4 byte
TLM8 Password Seed	Password seed	R	2 byte
TLM8 Password	Identification code	R/W	2 byte / 2 byte
TLM8 Alibi ID	Alibi memory identification number	R/W	4 byte / 4 byte
TLM8 Weight Alibi	Weight read from alibi memory	R	4 byte
TLM8 Tare Alibi	Tare read from alibi memory	R	4 byte
TLM8 Dec Alibi	Decimals read from alibi memory	R	2 byte
TLM8 Unit Alibi	Unit of measure read from alibi memory	R	2 byte
TLM8 Status Alibi	Status read alibi memory	R	2 byte
TLM8 Preset Tare	Preset tare (use with command 130 of the Command Register)	R/W	4 byte / 4 byte

***)** 0x00000000 value in writing is ignored. To reset the value, write out 0x80000000.

****)**

Input signal on single channel	Reading divisions
0 mV	0
10 mV	2000000
-10 mV	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.
See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points in modules "TLM8 Divisions 1" to "TLM8 Divisions 8", are to be considered NOT approved.

GROSS WEIGHT, NET WEIGHT, PEAK WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.
To find out the decimal figures use the Division module; example: if the read net weight is 100000 and the scale verification division (e) is 0.001, the real weight value is 100.000 kg.

SETPOINT, HYSTERESIS: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point.

- to set 0, write the conventional hexadecimal value hex 80000000 to the register (the most significant bit set to 1 and the other to 0).
- to set the values correctlyn use the Division module; example: if you want to set a setpoint to 100 kg and the scale verification division (e) is 0.001, set the setpoint value to 100000 (weight value with three decimals but without decimal point).

The setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 “Save data in EEPROM” of the Command Register.

ZERO WEIGHT – ANALOG OUTPUT: it’s the weight value to which the zero of the analog output is associated.

FULL SCALE WEIGHT – ANALOG OUTPUT: it’s the weight value to which the full scale of the analog output is associated.

PRESET TARE

- Set the desired value in the “Preset Tare” module.
- Send command 130 “Preset tare enabling” to the Command Register.

DIVISION AND UNITS OF MEASURE MODULE

This module contains the current setting of the scale verification division (parameter *E* or *E I* for multi-interval or multiple range instruments) and of the units of measure (parameter *Unl t*).

H Byte	L Byte
Unit of measure	Scale verification division

Use this module together with the Display coefficient module to calculate the value displayed by the instrument.

Least significant byte (L Byte)

Scale verification division value	Divisor	Decimals
0	100	0
1	50	0
2	20	0
3	10	0
4	5	0
5	2	0
6	1	0
7	0.5	1
8	0.2	1
9	0.1	1
10	0.05	2
11	0.02	2
12	0.01	2
13	0.005	3
14	0.002	3
15	0.001	3
16	0.0005	4
17	0.0002	4
18	0.0001	4

Most significant byte (H Byte)

Unit of measure value	Unit of measure description
0	Kilograms
1	Grams
2	Tons

DISPLAY COEFFICIENT: contains the *COEFF* parameter value expressed as positive integer number, including 4 decimal figures, but without decimal point.
Example: if the module contains 12000, the *COEFF* parameter value is 1.2000.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
130	Preset tare enabling	**131**	Reserved

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

NB: to give a command to the instrument, reset to 0 the Command Register first and then give the desired command. This procedure allows to give the required command to the instrument just once. To give more consecutive commands, you must clear the Command Register first and then write the desired command on the Command Register.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) by the “Identification code” module;
- send the command 120 to the Command Register;
- read the password seed in the “Password seed” module;
- enter the password read in the password table by the “Identification code” module;
- send the command 121 to the Command Register;
- if the operation is successfully completed the “Password seed” module is set to zero;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system and send its value to the “Sample weight” module.
- Send zero to the “Sample weight” module.
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the sample weight read is set to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” module increases and the stored values can be read; see the next section for more information about these modules. If printing is enabled, the stored weight value will be printed.
The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To recall a stored value from the alibi memory:
- send the identification number of the value to recall by the “Alibi memory identification number” module;
- send the command 111 to the Command Register;
- Use proper commands to read recalled data:
  - “Weight read from the alibi memory” module: gross weight or net weight (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross).
  - “Tare read from the alibi memory” module: when the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight.
  - “Decimals read from the alibi memory” module: number of decimals to apply to weight values.
  - “Unit of measure read from the alibi memory” module: unit of measure code (see table in **DIVISIONS AND UNITS OF MEASURE REGISTER** section for the codes legend)
  - to check if the weight reading refers to a net weight and if the tare reading is a preset tare, use the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**.

If the requested value does not exist, all previous modules are set to zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Data contained in the “Status Alibi” module:

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

PROFINET-IO

TECHNICAL SPECIFICATIONS

Port	2x RJ45 100Base-TX

Link led indications	off.....No link green (fixed).....Link
Activity led indications	off.....No activity amber (blinking) .....Activity

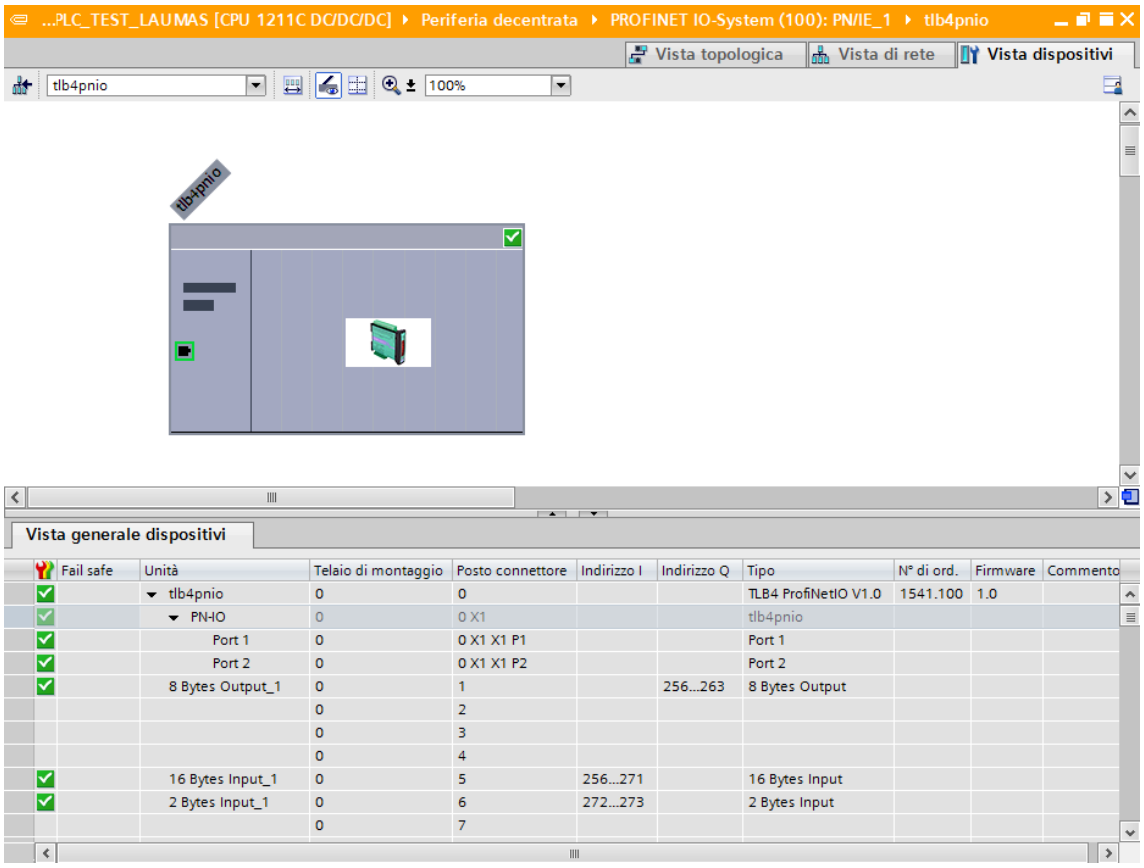
The instrument features a Profinet-IO dual port that allows to exchange the weight and the main parameters with a Profinet-IO *controller*.

INSTRUMENT SETUP

ENTER + ESC → EtHnEt

- SWAP (default: no): it allows to select the reading/writing of the byte in LITTLE-ENDIAN or BIG-ENDIAN mode
  - YES: LITTLE ENDIAN
  - no: BIG ENDIAN

The instrument works as *device* in a Profinet-IO network.
Load the gsdml file attached to the instrument to the Profinet-IO *controller* development system.
Insert and configure the TLM8PROFINETIO in an existing project.
Assign a name to the device (function *Assign Device Name*) using the following characters: lower case letters (a-z), numbers (0-9), minus character (-).
Set at least 8 ms as Profinet's I/O refresh time.



The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses	Type
Gross Weight [4 byte]	0x0000-0x0003	16 byte input
Net Weight [4 byte]	0x0004-0x0007	
Exchange Register [4 byte]	0x0008-0x000B	
Status Register [2 byte]	0x000C-0x000D	
Digital Inputs status [2 byte]	0x000E-0x000F	
Digital Outputs status [2 byte]	0x0010-0x0011	2 byte input

Input Data to instrument (Writing)	Addresses	Type
Command Register [2 byte]	0x0000-0x0001	8 byte output
Digital Outputs Command [2 byte]	0x0002-0x0003	
Exchange Register [4 byte]	0x0004-0x0007	

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to *PLC* mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses	Type
Channel 1 reading divisions – Low Res [2 byte]	0x0000-0x0001	16 byte input
Channel 2 reading divisions – Low Res [2 byte]	0x0002-0x0003	
Channel 3 reading divisions – Low Res [2 byte]	0x0004-0x0005	
Channel 4 reading divisions – Low Res [2 byte]	0x0006-0x0007	
Channel 5 reading divisions – Low Res [2 byte]	0x0008-0x0009	
Channel 6 reading divisions – Low Res [2 byte]	0x000A-0x000B	
Channel 7 reading divisions – Low Res [2 byte]	0x000C-0x000D	
Channel 8 reading divisions – Low Res [2 byte]	0x000E-0x000F	
Status Register [2 byte]	0x0010-0x0011	2 byte input

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses	Type
Channel 1 reading divisions – High Res [4 byte]	0x0000-0x0003	16 byte input
Channel 2 reading divisions – High Res [4 byte]	0x0004-0x0007	
Channel 3 reading divisions – High Res [4 byte]	0x0008-0x000B	
Channel 4 reading divisions – High Res [4 byte]	0x000C-0x000F	
Status Register [2 byte]	0x0010-0x0011	2 byte input

Mode: 4x divisions HiRes (ch 5-8)
Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses	Type
Channel 5 reading divisions – High Res [4 byte]	0x0000-0x0003	16 byte input
Channel 6 reading divisions – High Res [4 byte]	0x0004-0x0007	
Channel 7 reading divisions – High Res [4 byte]	0x0008-0x000B	
Channel 8 reading divisions – High Res [4 byte]	0x000C-0x000F	
Status Register [2 byte]	0x0010-0x0011	2 byte input

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**", so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

SERCOSIII

TECHNICAL SPECIFICATIONS

Port	2x RJ45 10Base-T or 100Base-TX (auto-detect)
Addresses	0÷511

Link led indications	off.....No link green (fixed).....Link green (blinking).....Activity

The instrument features a SERCOSIII dual port that allows to exchange the weight and the main parameters with a SERCOSIII *master*.

INSTRUMENT SETUP

ENTER + ESC → EtHnEt

- Addr (default: 1): set the instrument address

In order to apply the changes, press ESC until the display shows EtHnEt.

PC/PLC SETUP

The instrument works as *slave* in a SERCOSIII network.
Load the sddml file attached to the instrument to the SERCOSIII *master* development system.
Insert and configure the TLM8SERCOSIII in an existing project.
The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses
AT Connection Control [2 byte]	0x0000-0x0001
AT IO Status [2 byte]	0x0002-0x0003
Gross Weight [4 byte]	0x0004-0x0007
Net Weight [4byte]	0x0008-0x000B
Exchange Register [4 byte]	0x000C-0x000F
Status Register [2 byte]	0x0010-0x0011
Digital Inputs status [2 byte]	0x0012-0x0013
Digital Outputs status [2 byte]	0x0014-0x0015

Input Data to instrument (Writing)	Addresses
MDT Connection Control [2 byte]	0x0000-0x0001
MDT IO Control [2 byte]	0x0002-0x0003
Command Register [2 byte]	0x0004-0x0005
Digital Outputs Command [2 byte]	0x0006-0x0007
Exchange Register [4 byte]	0x0008-0x000B

AT Connection Control, **AT IO Status**, **MDT Connection Control** and **MDT IO Control** are registers used by the SERCOSIII *master* to manage the communication.

GROSS WEIGHT, NET WEIGHT: the weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the Status Register to obtain information about sign and possible errors on the weight.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	INPUT 3 status
Bit 3	
Bit 4	
Bit 5	
Bit 6	
Bit 7	

Bit = 1: high input; Bit = 0: low input

DIGITAL OUTPUTS STATUS

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 2 status
Bit 2	OUTPUT 3 status
Bit 3	OUTPUT 4 status
Bit 4	OUTPUT 5 status
Bit 5	
Bit 6	
Bit 7	

DIGITAL OUTPUTS COMMAND

It allows to control the outputs set to PLC mode (see section **OUTPUTS AND INPUTS CONFIGURATION**):

Bit 0	OUTPUT 1 status	**Bit 8**	
Bit 1	OUTPUT 2 status	**Bit 9**	
Bit 2	OUTPUT 3 status	**Bit 10**	
Bit 3	OUTPUT 4 status	**Bit 11**	
Bit 4	OUTPUT 5 status	**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	Force outputs

Bit = 1: output is closed; Bit = 0: output is open

Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	Weight below -20e
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	Research in progress (alibi)
Bit 14	Alibi memory overwrite
Bit 15	Load cells references not connected

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
24	Mode: 8x divisions LowRes	**25**	Mode: 4x divisions HiRes (ch 1-4)
26	Mode: 4x divisions HiRes (ch 5-8)	**27**	Mode: standard
80	Alibi memory identification number reading**	**81**	Alibi memory identification number writing**
82	Weight reading from alibi memory**	**83**	Tare reading from alibi memory**
84	Decimals reading from alibi memory**	**85**	Unit of measure reading from alibi memory**
86	Alibi memory status reading**	**87**	Preset tare reading**
88	Preset tare writing**	**89**	
90	Setpoint 1 reading**	**91**	Setpoint 2 reading**
92	Setpoint 3 reading**	**93**	Setpoint 1 writing**
94	Setpoint 2 writing**	**95**	Setpoint 3 writing**
98		**99**	Save data in EEPROM
100*	TARE WEIGHT ZERO SETTING for calibration	**101***	Sample weight storage for calibration
102	Sample Weight reading**	**103**	Sample Weight writing**
110	Weight storage in alibi memory	**111**	Alibi memory value reading
120	Identification code sending for qualified access	**121**	Password sending for qualified access
122	Password seed reading**	**123**	Identification code/Password reading
124*	Identification code/Password writing	**125**	
130	Preset tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**

***)** To use these commands a qualified access is required (see section **ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS**).

****)** The instrument features two Exchange Registers (one for reading and one for writing), which must be used together with the Command Register in order to access these values. These are the procedures to follow:

- READING: send the desired datum reading command (e.g.: 90 for "Setpoint 1 reading") to the Command Register and read the content of the Exchange Register.
- WRITING: write the value that you want to set in the Exchange Register and send the desired datum writing command (e.g.: 93 for "Setpoint 1 writing") to the Command Register.

If it is necessary to execute the same command twice consecutively, send command 0 between the first command and the following one.

READING DIVISIONS WITH SIGN OF EACH WEIGHTING CHANNEL (commands 24, 25, 26, 27 of Command Register)

Input signal on single channel	Low resolution	High resolution
0 mV	0	0
10 mV	8000	2000000
-10 mV	-8000	-2000000

Only the points of each connected load cell are transmitted, without any filter applied; the calculation of the weight value and the zeroing and calibration operations are carried out by the customer.

Mode: 8x divisions LowRes

Send command 24 to Command Register to modify the instrument "**Output Data**" so that the divisions values in low resolution (16 bit) of channels 1 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
AT Connection Control [2 byte]	0x0000-0x0001
IO Status [2 byte]	0x0002-0x0003
Channel 1 reading divisions – Low Res [2 byte]	0x0004-0x0005
Channel 2 reading divisions – Low Res [2 byte]	0x0006-0x0007
Channel 3 reading divisions – Low Res [2 byte]	0x0008-0x0009
Channel 4 reading divisions – Low Res [2 byte]	0x000A-0x000B
Channel 5 reading divisions – Low Res [2 byte]	0x000C-0x000D
Channel 6 reading divisions – Low Res [2 byte]	0x000E-0x000F
Channel 7 reading divisions – Low Res [2 byte]	0x0010-0x0011
Channel 8 reading divisions – Low Res [2 byte]	0x0012-0x0013
Status Register [2 byte]	0x0014-0x0015

Mode: 4x divisions HiRes (ch 1-4)

Send command 25 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 1 to 4 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
AT Connection Control [2 byte]	0x0000-0x0001
IO Status [2 byte]	0x0002-0x0003
Channel 1 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 2 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 3 reading divisions – High Res [4 byte]	0x000C-0x000F
Channel 4 reading divisions – High Res [4 byte]	0x0010-0x0013
Status Register [2 byte]	0x0014-0x0015

Mode: 4x divisions HiRes (ch 5-8)
Send command 26 to Command Register to modify the instrument "**Output Data**" so that the divisions values in high resolution (24 bit) of channels 5 to 8 are reported, as shown in the following table.

Output Data from instrument (Reading)	Addresses
AT Connection Control [2 byte]	0x0000-0x0001
IO Status [2 byte]	0x0002-0x0003
Channel 5 reading divisions – High Res [4 byte]	0x0004-0x0007
Channel 6 reading divisions – High Res [4 byte]	0x0008-0x000B
Channel 7 reading divisions – High Res [4 byte]	0x000C-0x000F
Channel 8 reading divisions – High Res [2 byte]	0x0010-0x0013
Status Register [2 byte]	0x0014-0x0015

Mode: standard
Send command 27 to Command Register to modify the instrument "**Output Data**", so that the original data are reported.

See section **USE AND CALIBRATION OF CONVERTER POINTS** to find an example of calibration performed by using the divisions.

All applications and information coming from the use of the converter points, as explained in this section, are to be considered NOT approved.

Setpoint Reading/Writing
The setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

Setpoint are stored to RAM and lost upon instrument power off; to save them in EEPROM, so that they are maintained upon instrument power on, it is necessary to send the command 99 "Save data in EEPROM" of the Command Register.

Preset tare
Write the preset tare value through the command 88 "Write preset tare".
Send the command 130 "Enable preset tare" to enable the preset tare.

ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS

To access to modification of legally relevant parameters and be able to change the instrument calibration via protocol, apply the following procedure (a customer password table, supplied by the manufacturer to authorised service centres only, is required):

- write your identification code (user password) in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 120 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content;
- write the password read from the password table in the Exchange Register and send command 124 “Identification code/Password writing“ to Command Register;
- send the command 121 to the Command Register;
- send command 122 “Password seed reading” and read the Exchange Register content, if the datum read is zero the operation is successfully completed;
- access to legally relevant parameters is disabled at instrument power off.

WARNING: the instrument configuration must be done when the plant is in standby condition.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

To access this register/command a qualified access is required (see section ACCESS TO LEGALLY RELEVANT PARAMETERS COMMANDS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system, write its value into the Exchange Register and send the command 103 “Sample Weight writing” to the Command Register;
- To save the value send the command 101 “Sample weight storage for calibration” to the Command Register.

If the operation is successfully completed, the command 102 “Sample Weight reading” returns a value equal to zero.

ALIBI MEMORY OPERATION CONTROLS

SAVING A WEIGHT IN ALIBI MEMORY

To save a weight in alibi memory send the command 110 to the Command Register. If the operation is successfully completed, the “Alibi memory identification number” register increases and the stored values can be read; see the next section for more information about these registers. If printing is enabled, the stored weight value will be printed.

The alibi memory is used in a circular mode: once reached the memory end, the system starts from the beginning by overwriting the first record; the “Alibi memory overwrite” bit of the Status Register is enabled until the following saving in the alibi memory.

READING OF VALUES STORED IN ALIBI MEMORY

To know the identification number of the last value stored:

- send command 80 “Alibi memory identification number reading”;
- read the Exchange Register content.

To recall a stored value from the alibi memory:

- write the identification number of the value to recall in the Exchange Register and send command 81 “Alibi memory identification number writing” to Command Register;
- send the command 111 to the Command Register;
- send command 82 “Weight reading from alibi memory” and read the Exchange Register content, (check the “Net weight” bit in the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER** to determine whether it is net or gross);
- send command 83 “Tare reading from alibi memory” and read the Exchange Register content: if the value is equal to zero, it means that you are reading a gross weight, otherwise you are reading a net weight;
- send command 84 “Decimals reading from alibi memory” and read the Exchange Register content: it indicates the number of decimals to apply to weight values;
- send command 85 “Unit of measure reading from alibi memory” and read the Exchange Register content: it represents the unit of measure code (see table in **UNITS OF MEASURE REGISTER** section for the codes legend);
- send command 86 “Alibi memory status reading” and read the Exchange Register content: it indicates if the weight reading refers to a net weight and if the tare reading is a preset tare (see the table **TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER**).

If the requested value does not exist, all the values read with the previous commands are zero.

TYPE OF DATA READ FROM THE ALIBI MEMORY REGISTER

Bit 0	The read weight is a net weight	**Bit 8**	
Bit 1	The read tare is a preset tare	**Bit 9**	
Bit 2		**Bit 10**	
Bit 3		**Bit 11**	
Bit 4		**Bit 12**	
Bit 5		**Bit 13**	
Bit 6		**Bit 14**	
Bit 7		**Bit 15**	

UNITS OF MEASURE REGISTER

Value	Description
0	Kilograms
1	Grams
2	Tons

USE AND CALIBRATION OF CONVERTER POINTS

When the instrument is connected to a system, it can be used to read the weight directly from the protocol or, alternatively, the weight can be calculated by the PC or PLC system to which the instrument is connected. In the latter case, the calibration can be performed as follows: if the transmitter sends e.g. 6500 divisions (converter points) when the tank is empty, and after putting a sample weight of 10000 kg it sends 49833 divisions, in order to find out the weight you will simply need to subtract from the divisions read those relative to the empty tank and then divide the result by a constant given by the following calculation:

(49833-6500)/10000=4,333

so, if the PC or PLC receives 40000 divisions, the weight will be given by:

(40000-6500)/4,333=7731 kg

OUTPUTS AND INPUTS CONFIGURATION

MENU + ESC → *OUt-1 n*:

OUTPUTS

The outputs are set by default as follows: *OPEn* / *SEt* / *GrOSS* / *POSnEG* / *OFF*.

Possible operation modes:

- *OPEn* **(normally open)**: the relay is de-energised and the contact is open when the weight is lower than the programmed setpoint value; it closes when the weight is higher than or equal to the programmed setpoint value.
- *CLOSE* **(normally closed)**: the relay is energised and the contact is closed when the weight is lower than the programmed setpoint value; it opens when the weight is higher than or equal to the programmed setpoint value.

- *SEt*: the contact will switch on the basis of weight, according to setpoint (see **SETPOINT PROGRAMMING** section in the instrument manual).
- *PLC*: the contact will not switch on the basis of weight, but is controlled by remote protocol commands.
- *StAbLE*: relay switching occurs when the weight is stable.
- *ALArM*: relay switching occurs when one of the following alarms is triggered: *ErCEL*, *ErCELr*, *ErCEL I*, *Er OL*, *Er Ad*, *------*, *Er OF*; the operation mode is forced to *CLOSE* (normally closed).

If the operation mode SEt is selected, the following options are also active:

- GroSS: the contact will switch on the basis of gross weight.
- nEt: the contact will switch on the basis of net weight (If the net function is not active, the contact will switch on the basis of gross weight).

- POSnEG: relay switching occurs for both positive and negative weight values.
- POS: relay switching occurs for positive weight values only.
- nEG: relay switching occurs for negative weight values only.

By confirming with ENTER the setpoint operation can be set to the value 0:

- OFF: relay switching will not occur if the setpoint value is 0.
- On:
  - Setpoint = 0 and relay switching = POSnEG, relay switching occurs when the weight is 0; the relay will switch again when the weight is different from zero, taking hysteresis into account (both for positive and for negative weights).
  - Setpoint = 0 and relay switching = POS, relay switching occurs for a weight higher than or equal to 0, the relay will switch again for values below 0, taking hysteresis into account.
  - Setpoint = 0 and relay switching = nEG, relay switching occurs for a weight lower than or equal to 0, the relay will switch again for values above 0, taking hysteresis into account.

INPUTS

Default: input 1 = 2Er0 input 2 = nE-LO input 3 = PEAH

Possible operation modes:

- nE-LO (NET/GROSS): by closing this input for no more than one second, it's making an operation of SEMI-AUTOMATIC TARE and the display will show the net weight. To display the gross weight again, hold the NET/GROSS input closed for 3 seconds.
- 2Er0: by closing the input for no more than one second, the weight is set to zero (see **WEIGHT ZERO-SETTING FOR SMALL VARIATIONS (SEMI-AUTOMATIC ZERO)** section in the instrument manual).
- PEAH: keeping the input closed the maximum weight value reached remains on display. Opening the input the current weight is displayed.
- PLC: closing the input no operation is performed, the input status may however be read remotely by way of the communication protocol.
- CONtI n: closing the input for max one second the weight is transmitted over the serial connection according to the fast continuous transmission protocol only once (**only if CONtI n is set in the item SEr I AL**).
- COEFF: when the input is closed the weight is displayed based on the set coefficient (see setting of the units of measure and coefficient), otherwise the weight is displayed.
- Pr I ntr: when the input is closed the data are sent for printing if in the communication protocol of either serial port the parameter Pr I ntr is set.