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User Manual
version 1.01

TLM8

COMMUNICATION PROTOCOLS

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 **SERIAL COMMUNICATION SETTINGS** section 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)

The first character from the left takes on the value "-" (minus sign - ASCII 45) in case of negative weight.
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 (or exclusive) 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)

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

- *rIP*: communication with RIP5/20/60, RIP50SHA, RIPLED series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrIP*: communication with RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrIPn*: communication with 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 (or exclusive) 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 on the left acquires the value "-" (minus sign - ASCII 45).
If *HdrIP* 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 *HdrIPn* has been set, in addition to what stated in *HdrIP* 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 following 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 volatile 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 following 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 following 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 bd the gross weight will be read. **To read the points, set the FS_bEO 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 on the left acquires 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 following ASCII string: **$aaZEROckckCR**

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

4. COMMUTATION OF GROSS WEIGHT TO NET WEIGHT

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

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

5. COMMUTATION OF NET WEIGHT TO GROSS WEIGHT

The PC transmits the following 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 following 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. TARE ZERO-SETTING

The PC transmits the following ASCII string: **$aazckckCR**

where: **z** .....command of weight zero-setting (122 ASCII)

Possible instrument responses:

- correct reception: **&aaxxxxxxt\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- the gross weight is not displayed on the instrument: **&aa#CR**

where: **xxxxxx**.....6 characters to indicate the required weight value
t .....character to indicate the weight (116 ASCII)

Example: zeroing the weight of the instrument with address 2:
For the calibration you have to make sure that the system is unloaded or that the instrument measures a signal equal to the mV in the same situation:
query: **$02z78(Cr)**
response: **&02000000t\76(Cr)**

If the zeroing works correctly the instrument sends the zeroed weight value (“000000”).

The calibration values are stored permanently in the EEPROM memory and the number of allowed writings is limited (about 100000).

8. REAL CALIBRATION (WITH SAMPLE WEIGHT)

After the tare zero-setting, this function allow the operator to check the calibration obtained by using sample weights and correct automatically any change between the displayed value and the correct one.

Load onto the weighing system a sample weight, which must be at least 50% of the Full Scale, or make so that that the instrument measures a corresponding mV signal.

The PC transmits the following ASCII string: **$aasxxxxxxckckCR**

where: **s** .....calibration command (115 ASCII)
xxxxxx.....6 characters to indicate the value of sample weight

Possible instrument responses:
- correct reception: **&aaxxxxxxt\ckckCR**
- incorrect reception or full scale equal to zero: **&&aa?\ckckCR**

where: **t** .....character of gross weight identification (116 ASCII)
xxxxxx.....6 characters to indicate the value of current weight

In case of correct reception, the read value has to be equal to the sample weight.

Example: calibration of the instrument no. 1 with a sample weight of 20000 kg:
query: **$01s02000070(Cr)**
response: **&01020000t\77(Cr)**
In case of correct calibration, the read value has to be “020000”.

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

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

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

10. KEYPAD UNLOCK

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

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

11. DISPLAY AND KEYPAD LOCK

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

Possible instrument responses:

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

12. 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 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 operation and XOR 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		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
40050	INSTRUMENT STATUS	-	R
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	Only after command 99 of the “Command Register”	R/W
40068	Weight value corresponding to ZERO		R/W

	of the analog output L		
40069	Weight value corresponding to the Full Scale of the analog output H		R/W
40070	Weight value corresponding to the Full Scale of the analog output L		R/W
40073	Preset Tare H	Use with command 103 of the “Command Register”	R/W
40074	Preset Tare L		R/W
40080			
40081			
40082			
40083			
40084			
40085			
40086			
40087			
40088			
40089			
40090			

WARNING: at the time of writing, setpoints and hysteresis 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	
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
Bit 14	
Bit 15	Load cells references not connected

INPUTS REGISTER (40029)
(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 (40030)
(read/write)

Bit 0	OUTPUT 1 status
Bit 1	OUTPUT 1 status
Bit 2	OUTPUT 1 status
Bit 3	OUTPUT 1 status
Bit 4	OUTPUT 1 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.

DIVISION AND UNITS OF MEASURE REGISTER (40014)

This register contains the current setting of the divisions (parameter *dIUI5*) and of the units of measure (parameter *UnIt*).

H Byte	**L Byte**
Unit of measure	Division

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

Least significant byte (L Byte)

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	Utilisation of the coefficient with the different units of measure settings compared to the gross weight detected
0	Kilograms	No active
1	Grams	No active
2	Tons	No active
3	Pounds	No active
4	Newton	Multiplies
5	Litres	Divides
6	Bar	Multiplies
7	Atmospheres	Multiplies
8	Pieces	Divides
9	Newton Metres	Multiplies
10	Kilogram Metres	Multiplies
11	Other	Multiplies

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 equalized 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 equalized 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 equalized points of channels 5-6-7-8	**27**	Cancels commands 24-25-26

	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.		
98		**99**	Saving data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Sample weight storage for calibration
110	Current weight storage and printing	**111**	
120		**121**	
130	Preset Tare enabling	**131**	Reserved
9999	Reset (reserved)		

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

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). Once the value has been written, save it to EEPROM by sending command 99 from Command Register.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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).

COMMUNICATION EXAMPLES

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

EXAMPLE 1
Command for multiple writing of registers (hexadecimal command 16, h10):
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	**h04**	Number of registers L	**h04**
Byte Count	**h08**	CRC16 H	**hC0**
Datum 1 H	**h00**	CRC16 L	**h0F**
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 H	**hB0**		
CRC16 L	**hA2**		

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

h01 h10 h00 h10 h00 h04 h08 h00 h00 h07 hD0 h00 h00 h0B hB8 hB0 hA2

The instrument will respond with the string:

h01 h10 h00 h10 h00 h04 hC0 h0F

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	**h04**	Number of registers L	**h04**
Byte Count	**h08**	CRC16 H	**hC0**
Datum 1 H	**h00**	CRC16 L	**h0F**
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 H	**hB0**		
CRC16 L	**hA2**		

EXAMPLE 3
Multiple commands reading for registers (hexadecimal command 3, h03):
Assuming that we wish to read the two gross weight values (in the example 4000) and net weight values (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 h08 h00 h00 hF hA0 h00 h00 h0B hB8 h12 h73

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	**h08**
Address of the first register L	**h07**	Address of the first register L	**h00**
Number of registers H	**h00**	Datum 1 H	**h00**
Number of registers L	**h04**	Datum 1 L	**h00**
CRC16 H	**hF5**	Datum 2 H	**h0F**
CRC16 L	**hC8**	Datum 2 L	**hA0**
		Datum 3 H	**h00**
		Datum 3 L	**h00**
		Datum 4 H	**h0B**
		Datum 4 L	**hB0**
		CRC16 H	**h12**
		CRC16 L	**h73**

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, 25, 50, 100, 125, 250, 500, 800, 1000
Addresses	1÷99

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

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

Any changes will be effective the next time the instrument is started.

PC/PLC SETUP

The instrument works as a slave device in a CANopen network.
Load the eds file (e.g.: *TLM8CNP.eds*) 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)	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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

Send command 24 to "Command Register" to modify the instrument "**Output Data**", so that the low resolution (16 bit) values of all 8 channels divisions 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 high resolution (24 bit) values of the first 4 channels divisions 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 high resolution (24 bit) values of the second 4 channels divisions 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

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

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register”.
- WRITING: write the value to be set in the “Exchange Register” and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

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.

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
- SUAP (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

Any changes will be effective the next time the instrument is started.

PC/PLC SETUP

The instrument works as a slave device in a DeviceNet network.
Load the eds file (e.g.: *TLM8DNT.eds*) 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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

Send command 24 to "Command Register" to modify the instrument "**Output Data**", so that the low resolution (16 bit) values of all 8 channels divisions 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 high resolution (24 bit) values of the first 4 channels divisions 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 high resolution (24 bit) values of the second 4 channels divisions 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

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

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.

- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register”.
- WRITING: write the value to be set in the “Exchange Register” and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

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 device port that allows to exchange the weight and the main parameters with a CC-LINK controller.

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

PC/PLC SETUP

The instrument works as Remote Device Station in a CC-LINK network and occupies 3 stations.
Load the csp file (e.g.: *NIC10-CCS_3.csp*) 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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

Send command 24 to "Command Register" to modify the instrument "**Output Data**", so that the low resolution (16 bit) values of all 8 channels divisions 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 high resolution (24 bit) values of the first 4 channels divisions 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 high resolution (24 bit) values of the second 4 channels divisions 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.

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.
- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register".
- WRITING: write the value to be set in the "Exchange Register" and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

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

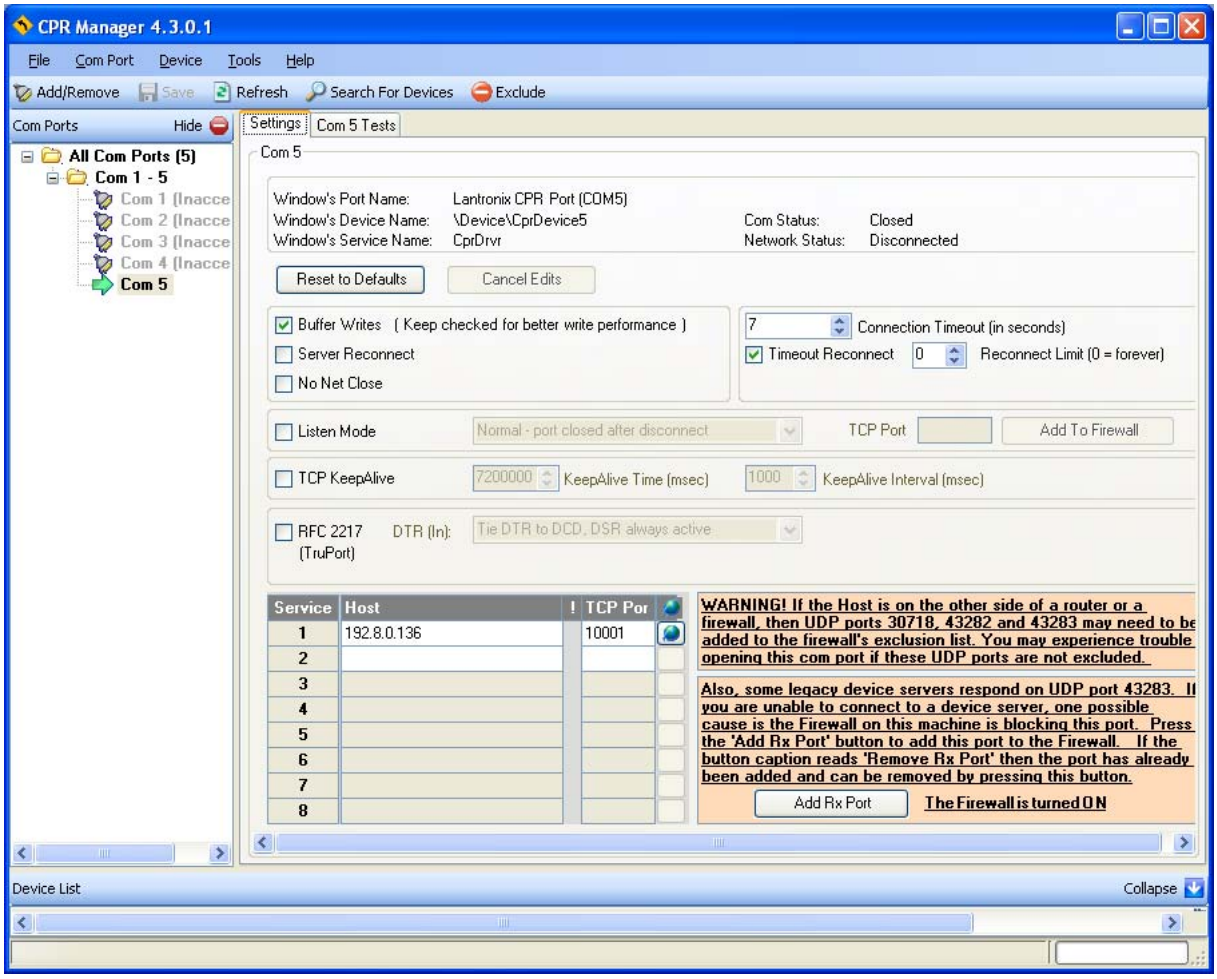
ENTER + ESC → EtHnEt

- 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
- nOdE: select communication protocol (see section **SERIAL COMMUNICATION SETTING** in the instrument manual)

Any changes will be effective the next time the instrument is started.

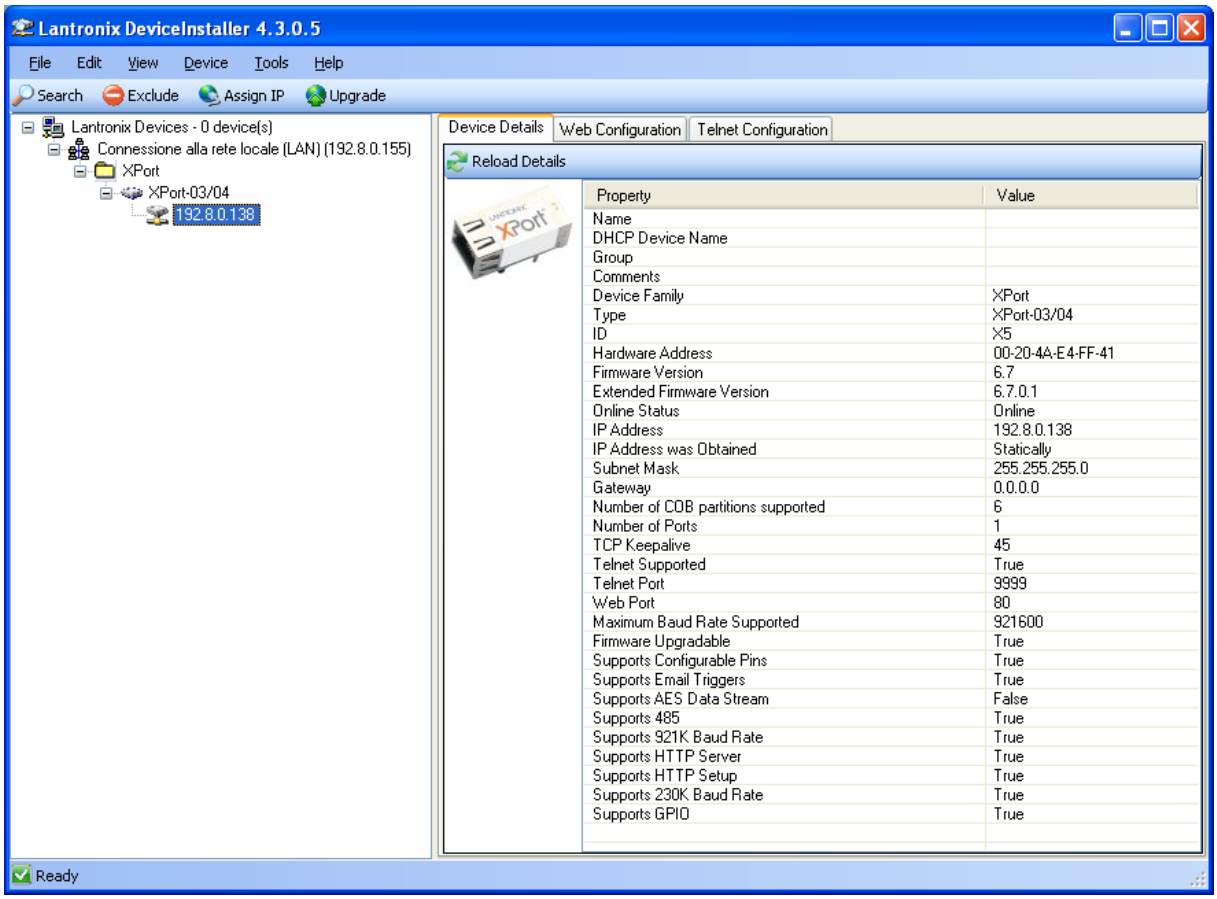
PC SETUP

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.

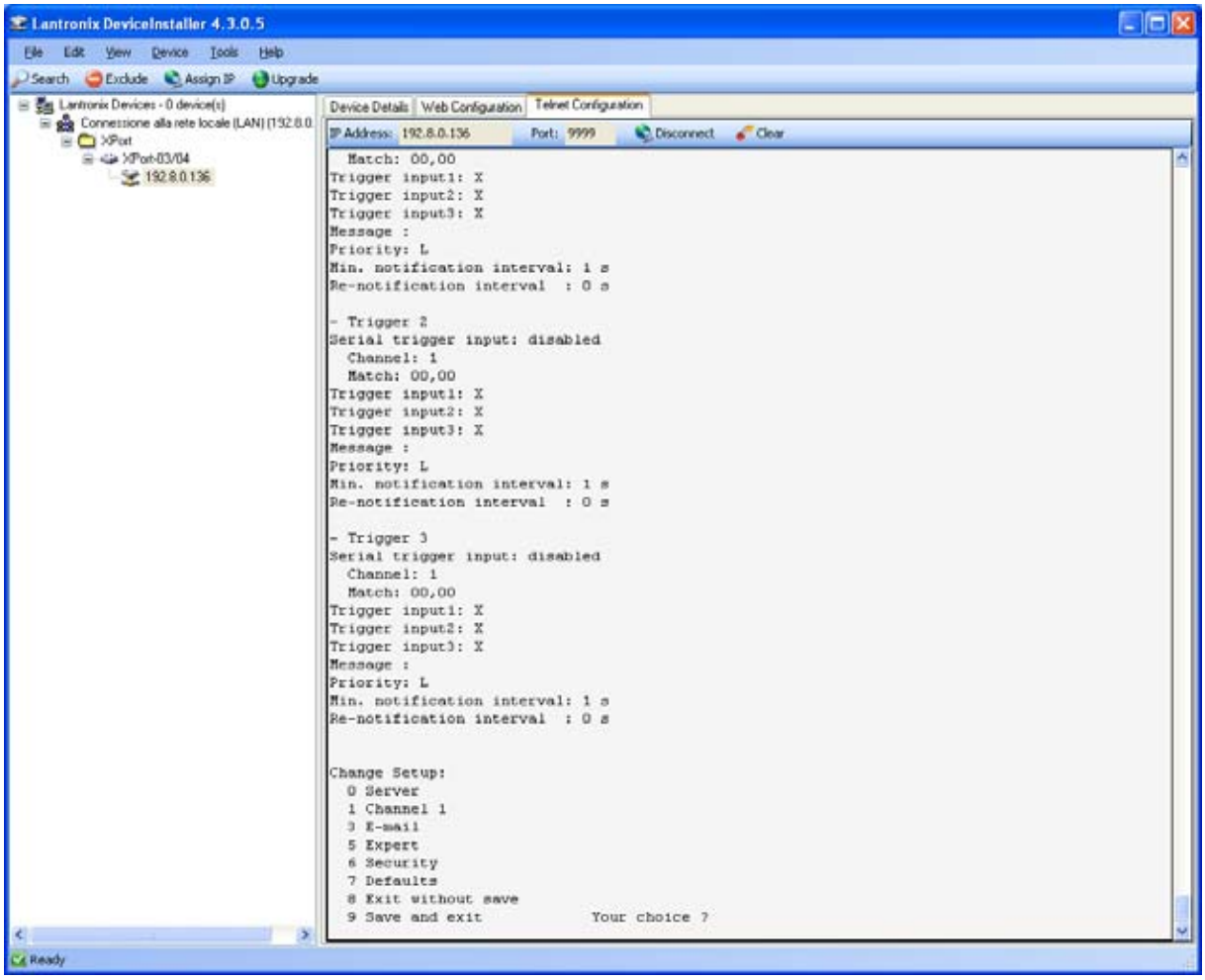


Use the just created virtual COM port to communicate with the instrument, using the protocol selected on it.
Alternatively connect to the instrument using a socket (e.g.: Winsock) on port 10001.

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:

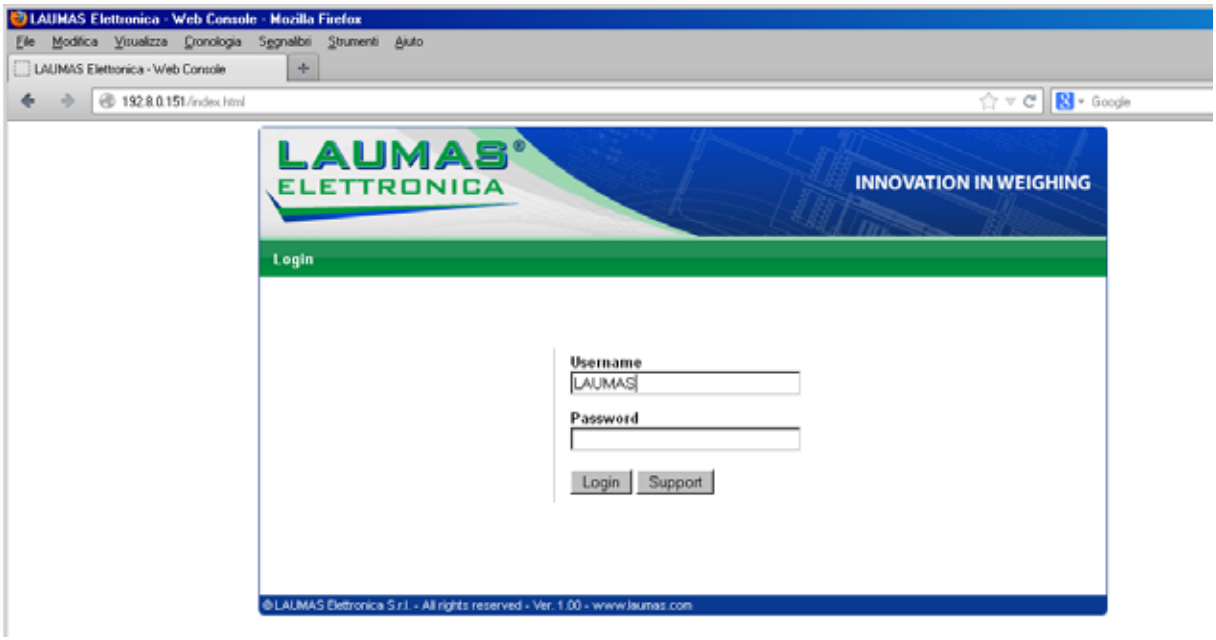


Select the found device and click on Telnet Configuration tab; click on Connect, and then press Enter on keyboard.

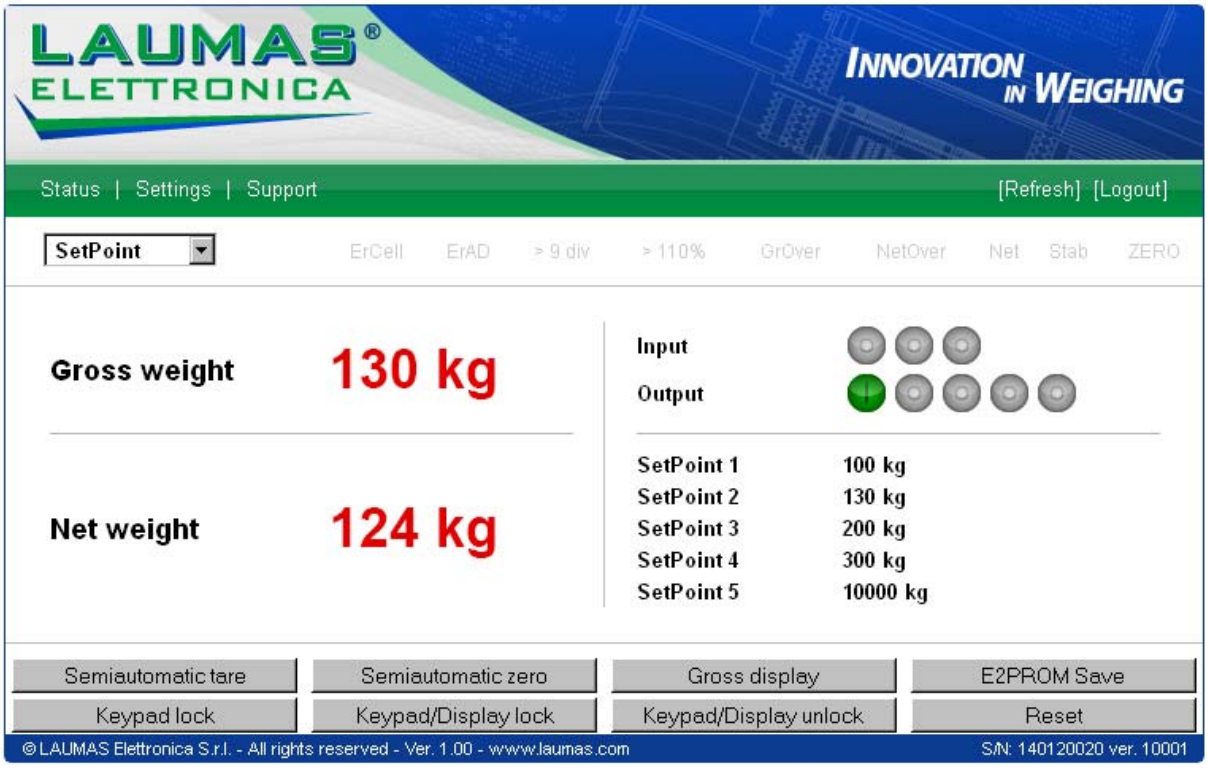


Press 0 to change server settings: change only the 4 fields of IP address and confirm the other parameters by pressing Enter. Set a static IP address.

Set *UEbSru* 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:

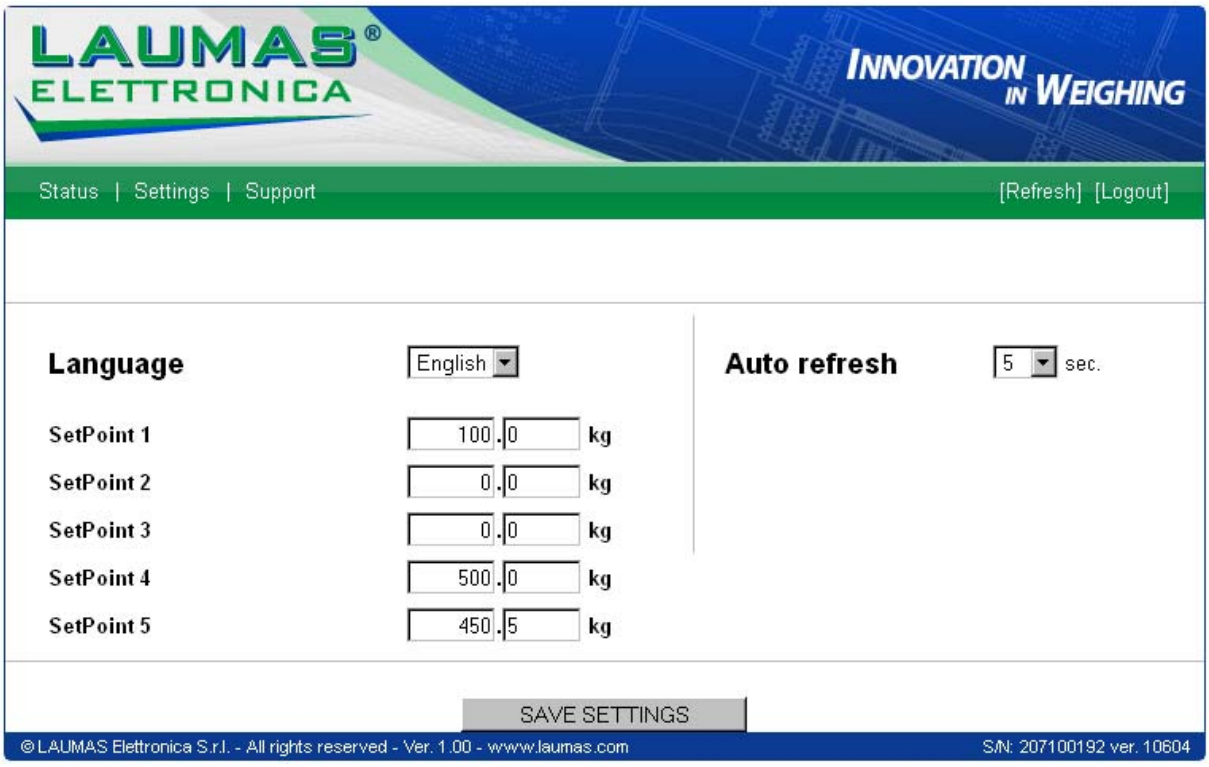
ErCell: ..... load cell error
ErAD: ..... instrument converter error
>9div: ..... weight exceeds maximum weight by 9 divisions
>110% ..... weight exceeds 110% of full scale
GrOver ..... gross weight over 999999
NetOver ..... net weight over 999999
Net ..... instrument shows the net weight
Stab..... weight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

The instrument features an ETHERCAT slave port that allows to exchange the weight and the main parameters with an ETHERCAT controller.

PC/PLC SETUP

The instrument works as a slave device in an ETHERCAT network.
Load the xml file (e.g.: *TLM8ETHERCAT Vx.x.xml*) 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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

Send command 24 to "Command Register" to modify the instrument "**Output Data**", so that the low resolution (16 bit) values of all 8 channels divisions 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 high resolution (24 bit) values of the first 4 channels divisions 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 high resolution (24 bit) values of the second 4 channels divisions 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.

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.
- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register".
- WRITING: write the value to be set in the "Exchange Register" and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

ETHERNET/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/IP device port that allows to exchange the weight and the main parameters with an Ethernet/IP scanner.

INSTRUMENT SETUP

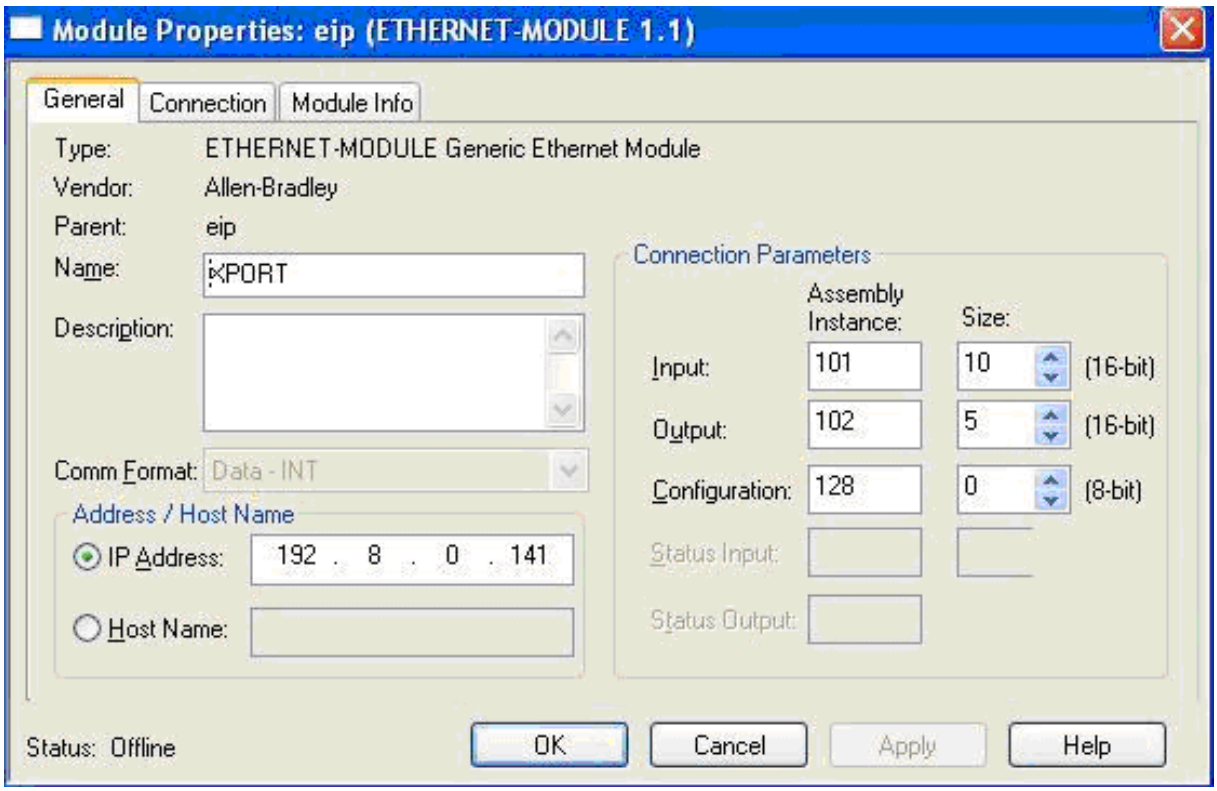
ENTER + ESC → EtHnEt

- 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

Any changes will be effective the next time the instrument is started.

The instrument works as a slave device in an Ethernet/IP network.
Load the eds file (e.g.: *TLM8EIP.eds*) attached to the instrument to the Ethernet/IP scanner development system.
It can be opened a class 1 I/O connection with the following settings:

Assembly Instance = 101; Size = 10
Assembly Instance = 102; Size = 5
Assembly Instance = 128; Size = 0



The data exchanged by the instrument are:

Output Data from instrument (Reading)	Addresses
Internal Status [2 byte]	0x0000-0x0001
Gross Weight [4 byte]	0x0002-0x0005
Net Weight [4 byte]	0x0006-0x0009
Exchange Register [4 byte]	0x000A-0x000D
Status Register [2 byte]	0x000E-0x000F
Digital Inputs status [2 byte]	0x0010-0x0011
Digital Outputs status [2 byte]	0x0012-0x0013

Input Data to instrument (Writing)	Addresses
Write Enable [2 byte]	0x0000-0x0001
Command Register [2 byte]	0x0002-0x0003
Digital Outputs Command [2 byte]	0x0004-0x0005
Exchange Register [4 byte]	0x0006-0x0009

INTERNAL STATUS: if different from zero it indicates an internal error, so data from instrument are not reliable; if equal to zero, it indicates that the instrument works properly and data are reliable.

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.

WRITE ENABLE: write 0x0000 in this register to disable data writing on the instrument; write 0xFFFF to enable it.

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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

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

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

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

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

Output Data from instrument (Reading)	Addresses
Internal Status [2 byte]	0x0000-0x0001
Channel 1 reading divisions – High Res [4 byte]	0x0002-0x0005
Channel 2 reading divisions – High Res [4 byte]	0x0006-0x0009
Channel 3 reading divisions – High Res [4 byte]	0x000A-0x000D
Channel 4 reading divisions – High Res [4 byte]	0x000E-0x0011
Status Register [2 byte]	0x0012-0x0013

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

Output Data from instrument (Reading)	Addresses
Internal Status [2 byte]	0x0000-0x0001
Channel 5 reading divisions – High Res [4 byte]	0x0002-0x0005
Channel 6 reading divisions – High Res [4 byte]	0x0006-0x0009
Channel 7 reading divisions – High Res [4 byte]	0x000A-0x000D
Channel 8 reading divisions – High Res [4 byte]	0x000E-0x0011
Status Register [2 byte]	0x0012-0x0013

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

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.
- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register".
- WRITING: write the value to be set in the "Exchange Register" and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

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

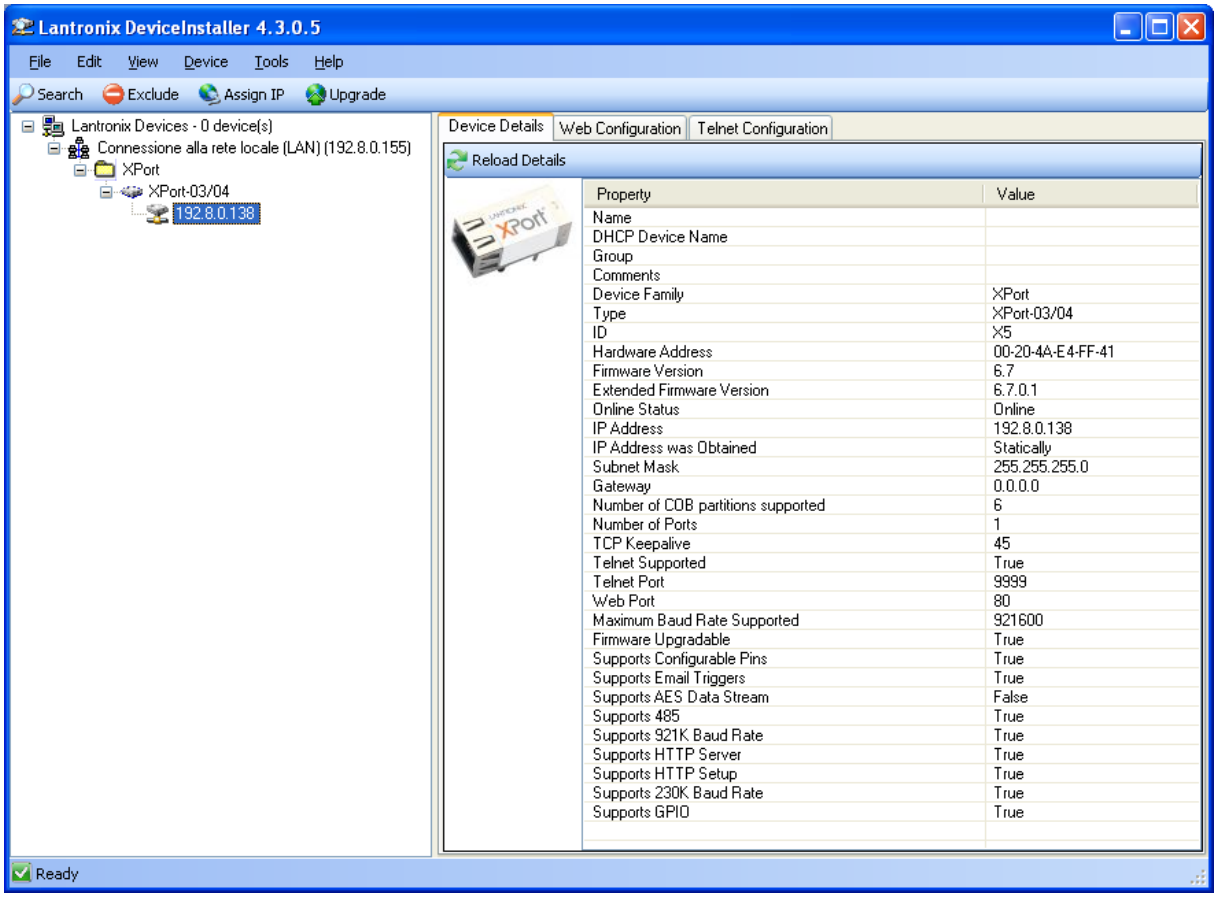
The instrument features a Modbus/TCP slave port that allows to exchange the weight and the main parameters with a Modbus/TCP master.

PC/PLC SETUP

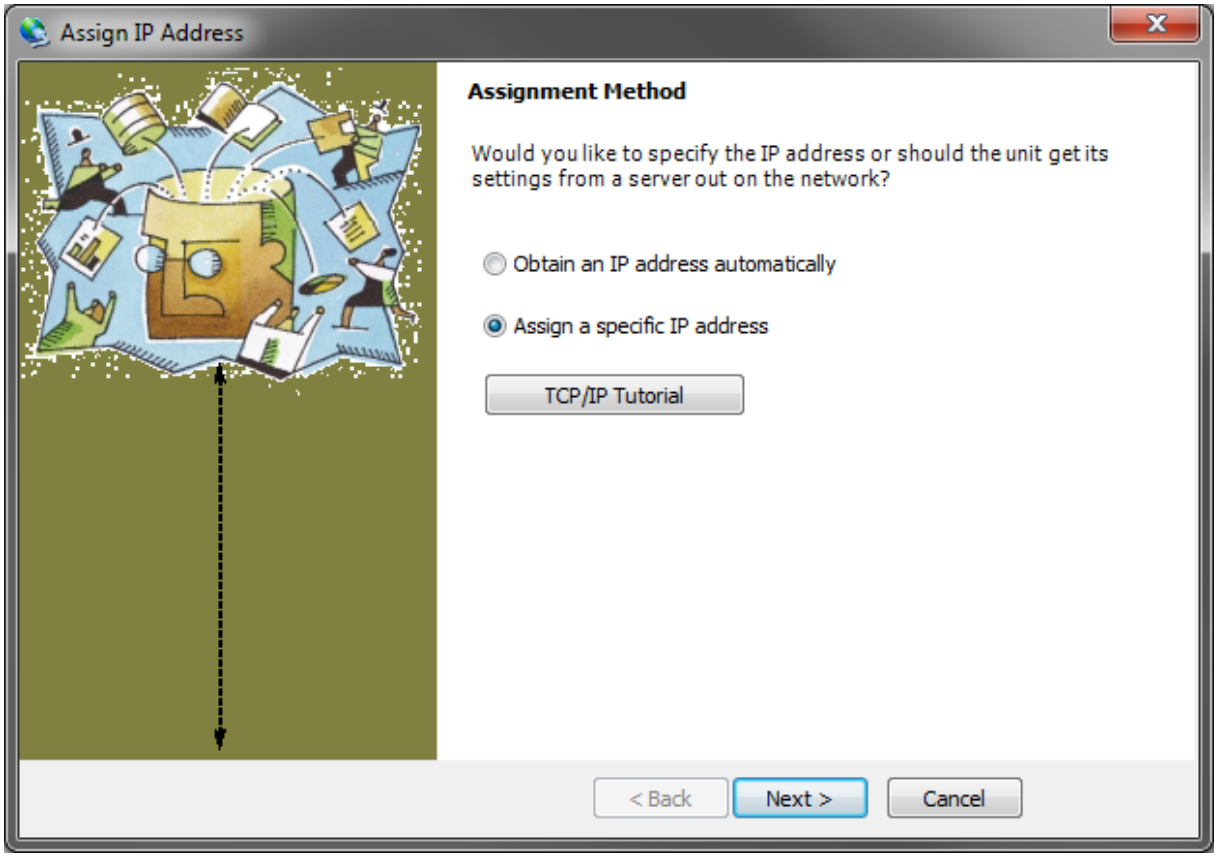
The instrument works as a slave device in a Modbus/TCP network.

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÷127

The instrument features a POWERLINK slave 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

PC/PLC SETUP

The instrument works as a slave device in a POWERLINK network.
Load the xdd file (e.g.: *TLM8POWERLINK.xdd*) 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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

Send command 24 to "Command Register" to modify the instrument "**Output Data**", so that the low resolution (16 bit) values of all 8 channels divisions 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 high resolution (24 bit) values of the first 4 channels divisions 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 high resolution (24 bit) values of the second 4 channels divisions 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.

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.
- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register".
- WRITING: write the value to be set in the "Exchange Register" and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

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 slave 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

Any changes will be effective the next time the instrument is started.

PC/PLC SETUP

Load the file gsd file (e.g.: *LAU_0BBC.gsd*) 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

***)** 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

Setpoints, hysteresis, Zero and Full Scale weight of analog output 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.

DIVISION AND UNITS OF MEASURE MODULE

This module contains the current setting of the divisions (*dIvIS* parameter) and of the units of measure (*Unit* parameter).

H Byte	L Byte
Unit of measure	Division

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

Least significant byte (L Byte)

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	Utilisation of the coefficient with the different units of measure settings compared to the gross weight detected
0	Kilograms	No active
1	Grams	No active
2	Tons	No active
3	Pounds	No active
4	Newton	Multiplies
5	Litres	Divides
6	Bar	Multiplies
7	Atmospheres	Multiplies
8	Pieces	Divides
9	Newton Metres	Multiplies
10	Kilogram Metres	Multiplies
11	Coefficient	Multiplies

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	
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
Bit 14	
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**	Saving data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Sample weight storage for calibration
110	Current weight storage and printing	**111**	
120		**121**	
130	Preset Tare enabling	**131**	Reserved
9999	Reset (reserved)		

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.

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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

PROFINET-IO

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 Profinet-IO device port that allows to exchange the weight and the main parameters with a Profinet-IO controller

INSTRUMENT SETUP

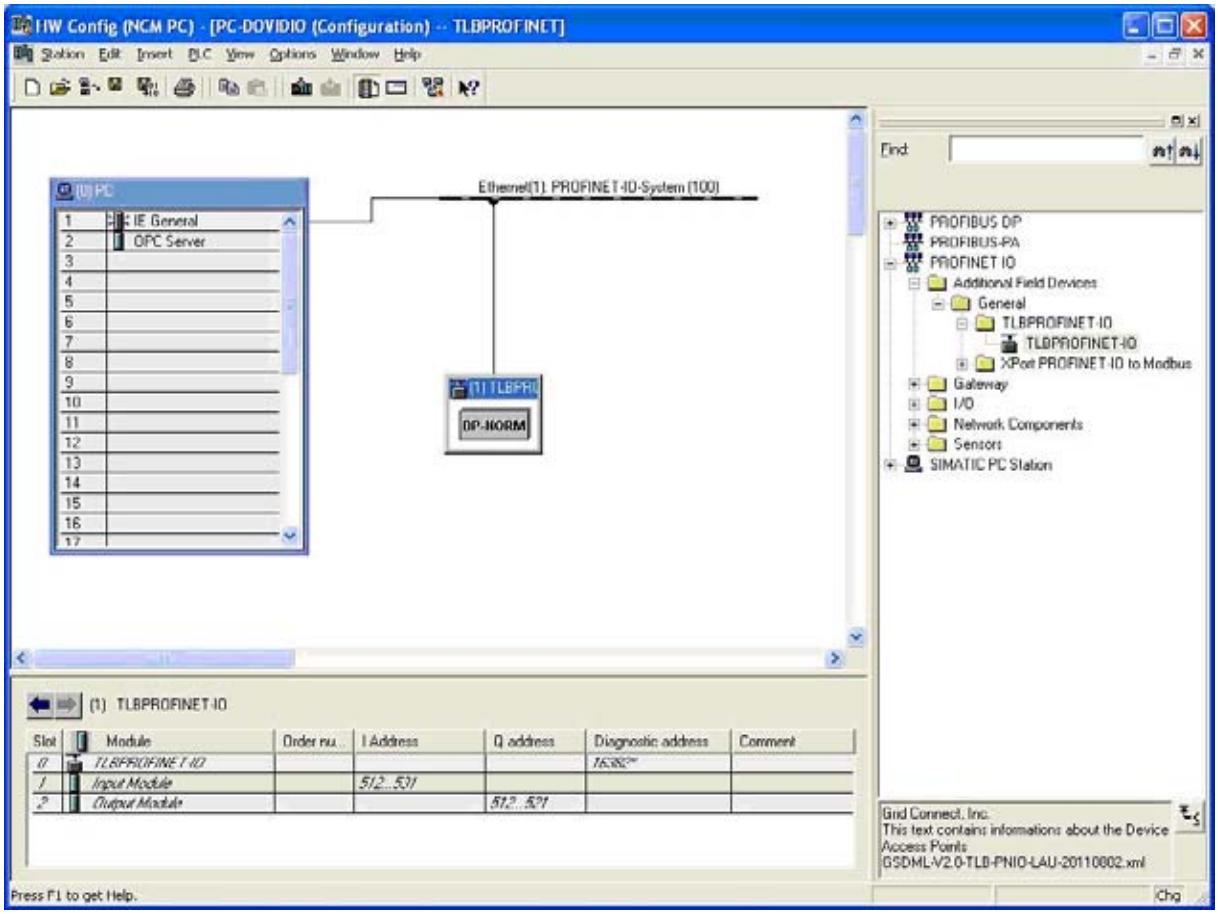
ENTER + ESC → *EtHnEt*

- *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
- *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

Any changes will be effective the next time the instrument is started.

PC/PLC SETUP

The instrument works as a slave device in a Profinet-IO network.
Load the gsdml file (e.g.: *GSDML-V2.0-TLM8PNIO-LAU-20121212.xml*) 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
Internal Status [2 byte]	0x0000-0x0001
Gross Weight [4 byte]	0x0002-0x0005
Net Weight [4 byte]	0x0006-0x0009
Exchange Register [4 byte]	0x000A-0x000D
Status Register [2 byte]	0x000E-0x000F
Digital Inputs status [2 byte]	0x0010-0x0011
Digital Outputs status [2 byte]	0x0012-0x0013

Input Data to instrument (Writing)	Addresses
Write Enable [2 byte]	0x0000-0x0001
Command Register [2 byte]	0x0002-0x0003
Digital Outputs Command [2 byte]	0x0004-0x0005
Exchange Register [4 byte]	0x0006-0x0009

INTERNAL STATUS: if different from zero it indicates an internal error, so data from instrument are not reliable; if equal to zero, it indicates that the instrument works properly and data are reliable.

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.

WRITE ENABLE: write 0x0000 in this register to disable data writing on the instrument; write 0xFFFF to enable it.

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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

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

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

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

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

Output Data from instrument (Reading)	Addresses
Internal Status [2 byte]	0x0000-0x0001
Channel 1 reading divisions – High Res [4 byte]	0x0002-0x0005
Channel 2 reading divisions – High Res [4 byte]	0x0006-0x0009
Channel 3 reading divisions – High Res [4 byte]	0x000A-0x000D
Channel 4 reading divisions – High Res [4 byte]	0x000E-0x0011
Status Register [2 byte]	0x0012-0x0013

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

Output Data from instrument (Reading)	Addresses
Internal Status [2 byte]	0x0000-0x0001
Channel 5 reading divisions – High Res [4 byte]	0x0002-0x0005
Channel 6 reading divisions – High Res [4 byte]	0x0006-0x0009
Channel 7 reading divisions – High Res [4 byte]	0x000A-0x000D
Channel 8 reading divisions – High Res [4 byte]	0x000E-0x0011
Status Register [2 byte]	0x0012-0x0013

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

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.
- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register".
- WRITING: write the value to be set in the "Exchange Register" and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

SERCOSIII

TECHNICAL SPECIFICATIONS

Port	2x RJ45 10Base-T or 100Base-TX (auto-detect)
Addresses	1÷511

INSTRUMENT SETUP

ENTER + ESC → *EtHnEt*

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

PC/PLC SETUP

The instrument works as a slave device in a SERCOSIII network.
Load the sddml file (e.g.: *TLM8SERCOSIII.xml*) 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
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
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	
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
Bit 14	
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		**81**	
82		**83**	
84		**85**	
86		**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**	Saving 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	Current weight storage and printing	**111**	
120		**121**	
122		**123**	
124		**125**	
130	Preset Tare enabling	**131**	
150	Setpoint 4 reading**	**151**	Setpoint 5 reading**
160	Setpoint 4 writing**	**161**	Setpoint 5 writing**
9998		**9999**	Reset (reserved)

****)** 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

Mode: 8x divisions LowRes

Send command 24 to "Command Register" to modify the instrument "**Output Data**", so that the low resolution (16 bit) values of all 8 channels divisions 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 high resolution (24 bit) values of the first 4 channels divisions 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 high resolution (24 bit) values of the second 4 channels divisions 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.

Setpoint reading/writing:
The Setpoint are weight values expressed as positive integer numbers, include decimal figures but without decimal point.
- READING: send to the Command Register the reading command of the required setpoint and read the content of the "Exchange Register".
- WRITING: write the value to be set in the "Exchange Register" and send to the Command Register the writing command in the required setpoint.

Setpoints 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.

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- 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.

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-L0 input 3 = PEAH

Possible operation modes:

- nE-L0 (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.
- Cont 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 Cont n is set in the item SEr1 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.
- Pr1 ntr: when the input is closed the data are sent for printing if in the communication protocol of either serial port the parameter Pr1 ntr is set.