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User Manual
version 1.16

TLB

COMMUNICATION PROTOCOLS

SYMBOLS

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

Caution! Risk of electric shock.

Caution! This operation must be performed by skilled personnel.

Pay particular attention to the following instructions.

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)

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

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

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

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

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

CONTINUOUS WEIGHT TRANSMISSION TO REMOTE DISPLAYS PROTOCOL

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

- *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 RIP6100, RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrIPn*: communication with RIP6100, RIP675, RIP6125C series remote displays

The instrument sends the following string to the remote display:
&Nxxxxxx<u>Lyyyyyy</u>\ckckCR

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

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

- *MOdU60*: communication compatible with instruments series W60000, WL60 Base, WT60 Base, TLA600 Base
- *MOd tD*: communication compatible with TD RS485 instruments

Captions:

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

1. SETPOINT PROGRAMMING

Warning: the new values of setpoint are active immediately.

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

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

Possible instrument responses:

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

Example: to set 500 in the setpoint no. 3, the PC must transmit the following command:
$01000500C47(Cr)

1.1. SETPOINT STORAGE IN EEPROM MEMORY

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

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

Possible instrument responses:

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

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

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

where: **j** = a.....to read setpoint 1
j = b.....to read setpoint 2
j = c.....to read setpoint 3
j = 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 Ed the gross weight will be read.
To read the points, set the FS_tEO parameter equal to 50000

Possible instrument responses:

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

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

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

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

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

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

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

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

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

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

4. SWITCHING FROM GROSS TO NET WEIGHT

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

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

5. SWITCHING FROM NET TO GROSS WEIGHT

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

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

6. READING OF DECIMALS AND DIVISION NUMBER

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

Possible instrument responses:

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

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

7. TARE ZERO-SETTING

The PC transmits the 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 condition:
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 actual 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 ASCII string: **$aasxxxxxxckckCR**

where **: s**.....calibration command (115 ASCII)
xxxxxx.....6 characters to indicate the value of sample weight (negative values are not allowed).

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 ASCII string: **$aaKEYckckCR**

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

10. KEYPAD UNLOCK

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

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

11. DISPLAY AND KEYPAD LOCK

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

MODBUS-RTU PROTOCOL

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

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

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

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

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

MODBUS-RTU DATA FORMAT

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

FUNCTIONS SUPPORTED IN MODBUS

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

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

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

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

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

FUNCTION 3: Read holding registers (READ PROGRAMMABLE REGISTERS)

QUERY

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

Tot. byte = 8

RESPONSE

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

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

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

FUNCTION 16: Preset multiple registers (WRITE MULTIPLE REGISTERS)

QUERY

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

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

RESPONSE

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

Tot. byte = 8

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

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

COMMUNICATION ERROR MANAGEMENT

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

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

EXCEPTIONAL RESPONSE

Address	Function	Code	2 byte
A	Funct + 0x80		CRC

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

LIST OF AVAILABLE REGISTERS

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

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

Register	Description	Saving in EEPROM	Access
40001	Firmware version	-	R
40002	Instrument type	-	R
40003	Year of manufacture	-	R
40004	Serial number	-	R
40005	Program type	-	R
40006	COMMAND REGISTER	NO	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	SETPOINT 1 H	Only after command 99 of the Command Register	R/W
40018	SETPOINT 1 L		R/W
40019	SETPOINT 2 H		R/W
40020	SETPOINT 2 L		R/W
40021	SETPOINT 3 H		R/W
40022	SETPOINT 3 L		R/W
40023	HYSTERESIS 1 H		R/W
40024	HYSTERESIS 1 L		R/W
40025	HYSTERESIS 2 H		R/W
40026	HYSTERESIS 2 L		R/W
40027	HYSTERESIS 3 H		R/W
40028	HYSTERESIS 3 L		R/W
40029	INPUTS	-	R
40030	OUTPUTS	NO	R/W
40037	Sample weight for instrument calibration H	Use with command 101 of the Command Register	R/W
40038	Sample weight for instrument calibration L		R/W
40043	Weight value corresponding to ZERO of the analog output H	Only after command 99 of the Command Register	R/W
40044	Weight value corresponding to ZERO of the analog output L		R/W
40045	Weight value corresponding to the full scale of the analog output H		R/W
40046	Weight value corresponding to the full scale of the analog output L		R/W
40073	Preset tare H	Use with command 130 of the Command Register	R/W
40074	Preset tare L		R/W

CAUTION: At the time of writing, the setpoints, hysteresis values, the analog output zero and full scale values are saved to the RAM and will be lost upon the next power-off; to store them permanently to the 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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

INPUTS REGISTER (40029) (read only)

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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 2 status
Bit 2	OUTPUT 3 status 3
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	

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**).

DIVISIONS 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	Coefficient effect on the read gross weight
0	Kilograms	No effect
1	Grams	No effect
2	Tons	No effect
3	Pounds	No effect
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
98		**99**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

ANALOG OUTPUT SETTING

Write the weight into registers “Weight value corresponding to the Full Scale of the analog output H” (40045) and “Weight value corresponding to the Full Scale of the analog output L” (40046), otherwise write the weight into registers “Weight value corresponding to ZERO of the analog output H” (40043) and “Weight value corresponding to ZERO of the analog output L” (40044). After writing the value, send the command 99 from the Command Register to save it to EEPROM memory.

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 40037-40038.
- To save the first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

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).

In order to correctly set a sample weight of negative value, it is necessary to consider the registers “Sample weight for instrument calibration” (40037–40038) as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the values indicated in the table in the registers “Sample weight for instrument calibration”.

REGISTER	***DESCRIPTION***	***VALUE***	
		HEX	***DECIMAL***
40037	Sample weight for instrument calibration H	0xFFFF	-1
40038	Sample weight for instrument calibration L	0xFFC8	-56

COMMUNICATION EXAMPLES

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

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

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

The instrument will respond with the string:

h01 h10 h00 h10 h00 h02 h40 h0D

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

EXAMPLE 2

Command for multiple writing of registers (command 16, h10 hexadecimal).

Assuming that we wish to write two setpoint values on the instrument, at 2000 (setpoint 1: 40017-40018) and 3000 (setpoint 2: 40019-40020) 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 L	**hC0**
Datum 1 H	**h00**	CRC16 H	**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 L	**hB0**		
CRC16 H	**hA2**		

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

h01 h03 h00 h07 h00 h04 hF5 hC8

The instrument will respond with the string:

h01 h03 h08 h00 h00 h0F hA0 h00 h00 h0B hB8 hB3 h30

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**	Byte count	**h08**
Address of the first register L	**h07**	Datum 1 H	**h00**
Number of registers H	**h00**	Datum 1 L	**h00**
Number of registers L	**h04**	Datum 2 H	**h0F**
CRC16 L	**hF5**	Datum 2 L	**hA0**
CRC16 H	**hC8**	Datum 3 H	**h00**
		Datum 3 L	**h00**
		Datum 4 H	**h0B**
		Datum 4 L	**hB8**
		CRC16 L	**hB3**
		CRC16 H	**h30**

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

CANOPEN

TECHNICAL SPECIFICATIONS AND CONNECTIONS

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

Status LED indications (red)	off .....Stopped status blinking (fast) .....Operational status blinking (slow).....Pre-Operational status on .....Bootup status

Terminals legend	10 .....CAN GND 11 .....CAN L 12 .....CAN SHLD 13 .....CAN H 14 .....NC

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

INSTRUMENT SETUP

↵ + ☒ → CAnOPn

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

In order to apply the changes, press ☒ until the display shows CAnOPn.

PC/PLC SETUP

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

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

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

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

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling		

****)** 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.

Setpoint Reading/Writing

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

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

Preset tare

Write the preset tare value through the command 88 “Write preset tare”.
Send the command 130 “Enable preset tare” to enable the preset tare.

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

DEVICENET

TECHNICAL SPECIFICATIONS AND CONNECTIONS

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

Status LED indications (red)	off .....Stopped status blinking (fast) .....Operational status blinking (slow).....Pre-Operational status on .....Bootup status

Terminals legend	10 .....CAN V - 11 .....CAN L 12 .....CAN SHLD 13 .....CAN H 14 .....CAN V +

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

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

INSTRUMENT SETUP

[↵] + [✕] → dEUnEt

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

In order to apply the changes, press [✕] until the display shows dEUnEt.

PC/PLC SETUP

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

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

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

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

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling		

****)** 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.

Setpoint Reading/Writing

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

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

Preset tare

Write the preset tare value through the command 88 “Write preset tare”.
Send the command 130 “Enable preset tare” to enable the preset tare.

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

CC-LINK

TECHNICAL SPECIFICATIONS AND CONNECTIONS

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

Status LED indications (red)	off .....timeout/reset on .....CC-LINK OK

Terminals legend	10 .....CCL DA 11 .....CCL DB 12 .....CCL DG 13 .....CCL SLD 14 .....CCL FG

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

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

INSTRUMENT SETUP

[↵] + [✕] → CCLI nH

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

In order to apply the changes, press [✕] until the display shows CCLI nH.

PC/PLC SETUP

The instrument works as Remote Device Station in a CC-LINK network and occupies 3 stations.
Load the csp file attached to the instrument to the CC-LINK *master* development system.
Insert and configure the TLBCC-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	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

****)** 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.

Setpoint Reading/Writing

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

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

Preset tare

Write the preset tare value through the command 88 “Write preset tare”.
Send the command 130 “Enable preset tare” to enable the preset tare.

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

ETHERNET TCP/IP

TECHNICAL SPECIFICATIONS

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

Link LED indications	off .....Ethernet link not established amber .....10 Mb/s green .....100 Mb/s
Activity LED indications	off .....Ethernet activity not detected 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

[↵] + [✕] → EtHnEt

- I PAddr (default: 10.2.0.170): set instrument IP address
- SUbnEt (default: 255.255.255.0): set instrument Subnet Mask
- GAtUAY (default: 0.0.0.0): set Gateway address of Ethernet network

In order to apply the changes, reboot the instrument.

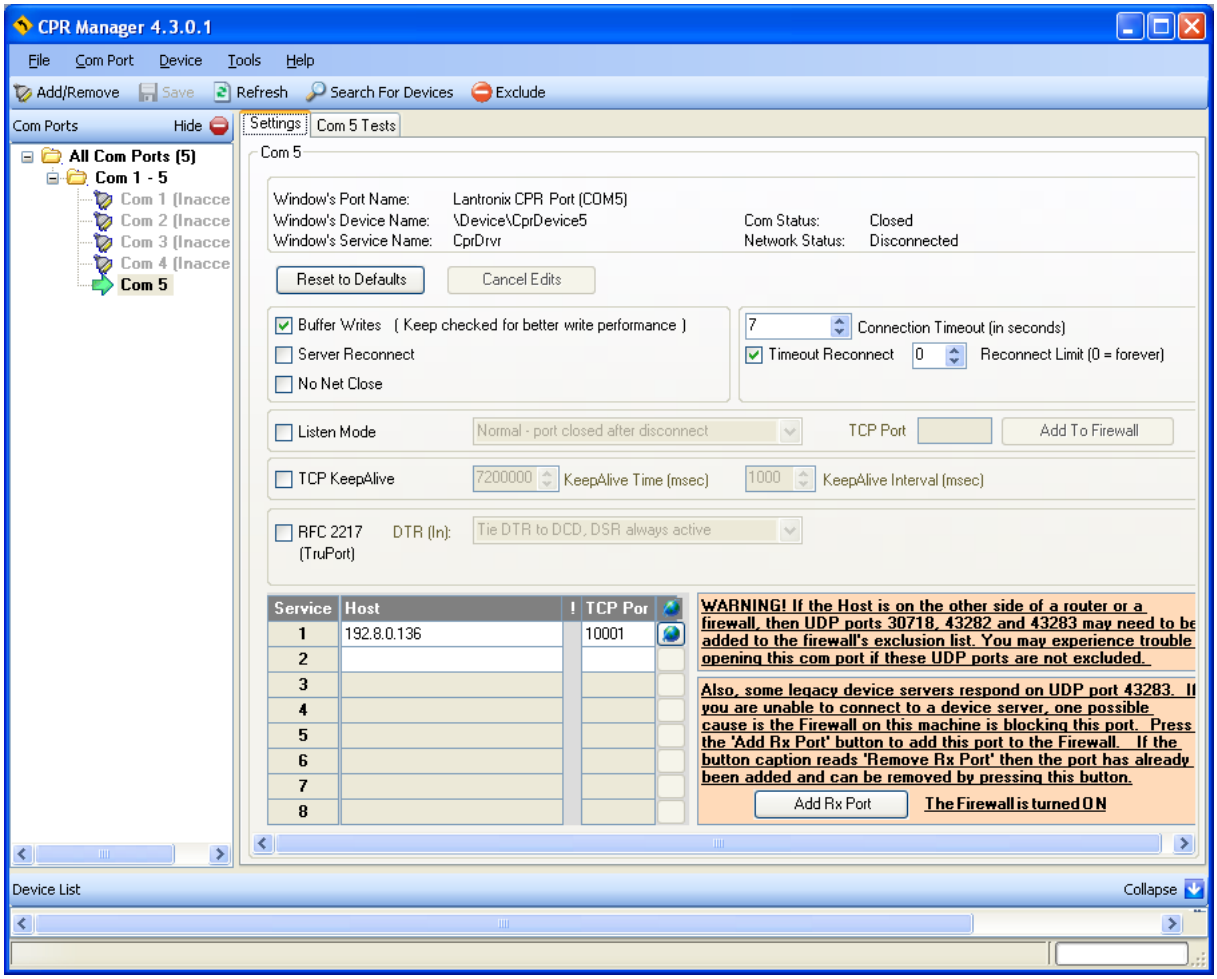
- nOdE: select communication protocol
  - nOnE: it disables any type of communication
  - ModbUS: MODBUS-RTU protocol; address: 1 (default)
  - ASCII : ASCII bidirectional protocol; address: 1
    - nOdU60
    - nOd td
  - CONtI n: continuous weight transmission protocol, at the frequency set in HErt2 item (from 10 to 300)
    - nOd t
    - nOd td
  - rI P: continuous weight transmission protocol to RIP5/20/60, RIP50SHA, RIPLED series remote displays; the remote display shows the net weight or gross weight according to its settings
  - HdrI P: continuous weight transmission protocol to RIP6100, RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings

- HdrI Pn: continuous weight transmission protocol to RIP6100, RIP675, RIP6125C series remote displays, when the remote display is set to gross weight:
  - if the instrument displays the gross weight, the remote display shows the gross weight
  - if the instrument shows the net weight, the remote display shows the net weight alternated with the message nEt
- UEbSru: see section **WEBSITE**

  - HErt2: maximum transmission frequency (10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 100 – 200 – 300; default: 10); to be set when the CONtI n transmission protocol is selected
    Maximum setting frequency (**HErt2**):
    - 20 Hz with minimum baud rate 2400 baud
    - 40 Hz with minimum baud rate 4800 baud
    - 80 Hz with minimum baud rate 9600 baud
    - 100 Hz with minimum baud rate 19200 baud
    - 200 Hz with minimum baud rate 38400 baud
    - 300 Hz with minimum baud rate 38400 baud
  - dELAY: delay in milliseconds which elapses before the instrument replies (from 0 to 200 ms; default: 0)

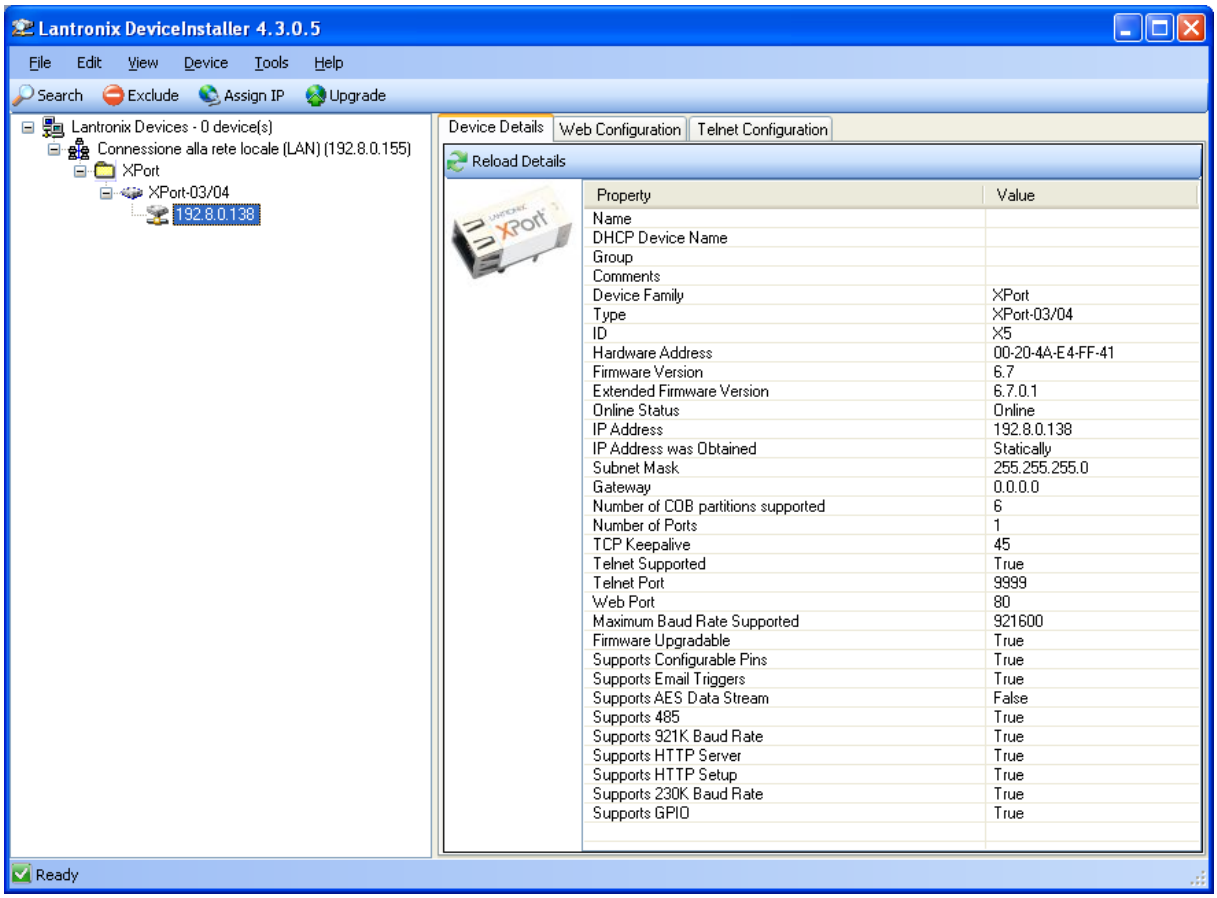
PC SETUP

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.

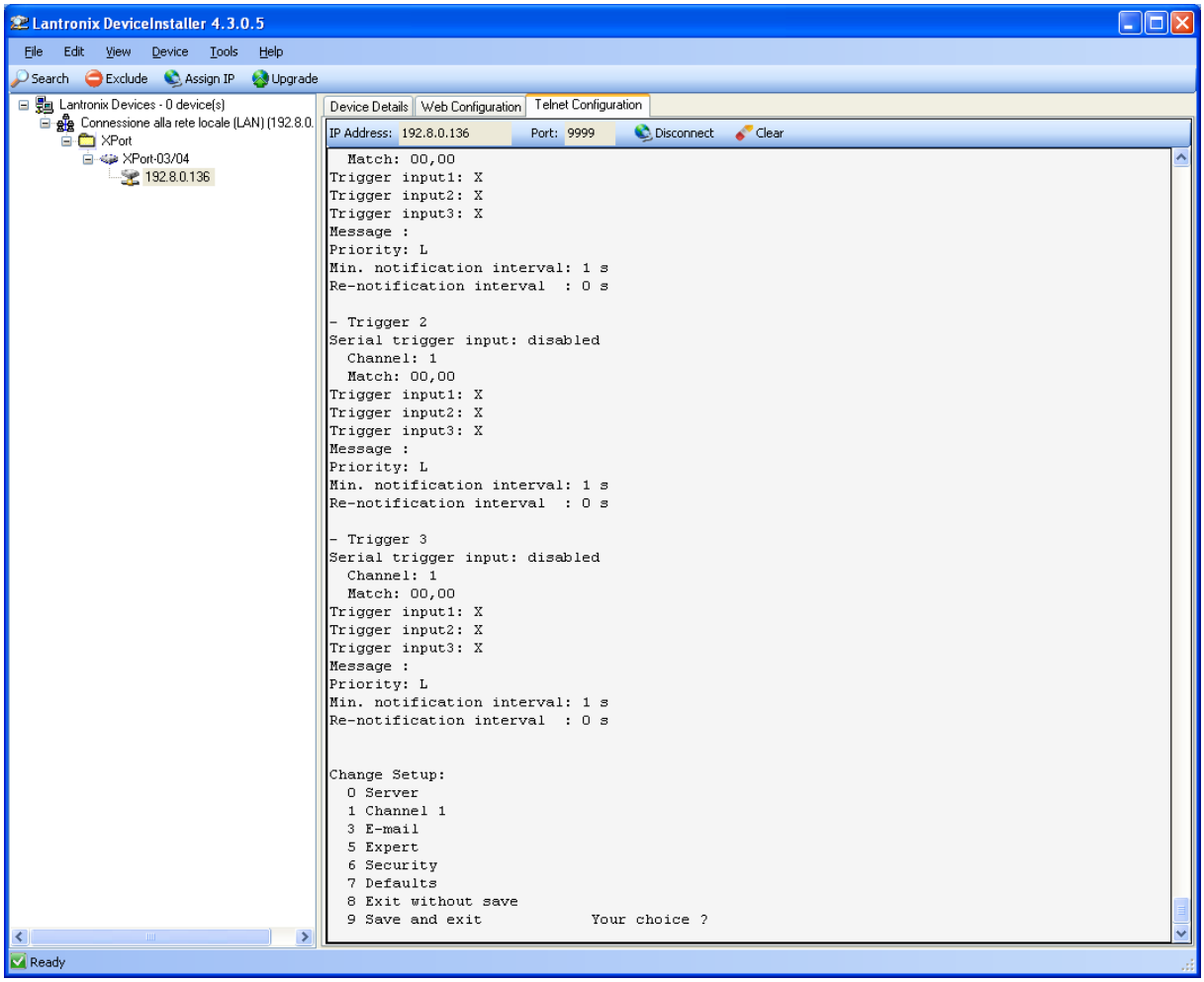


Use the just created virtual COM port to communicate with the instrument, using the protocol selected on it.
Alternatively connect to the instrument using a socket (e.g.: Winsock) on port 10001.

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:

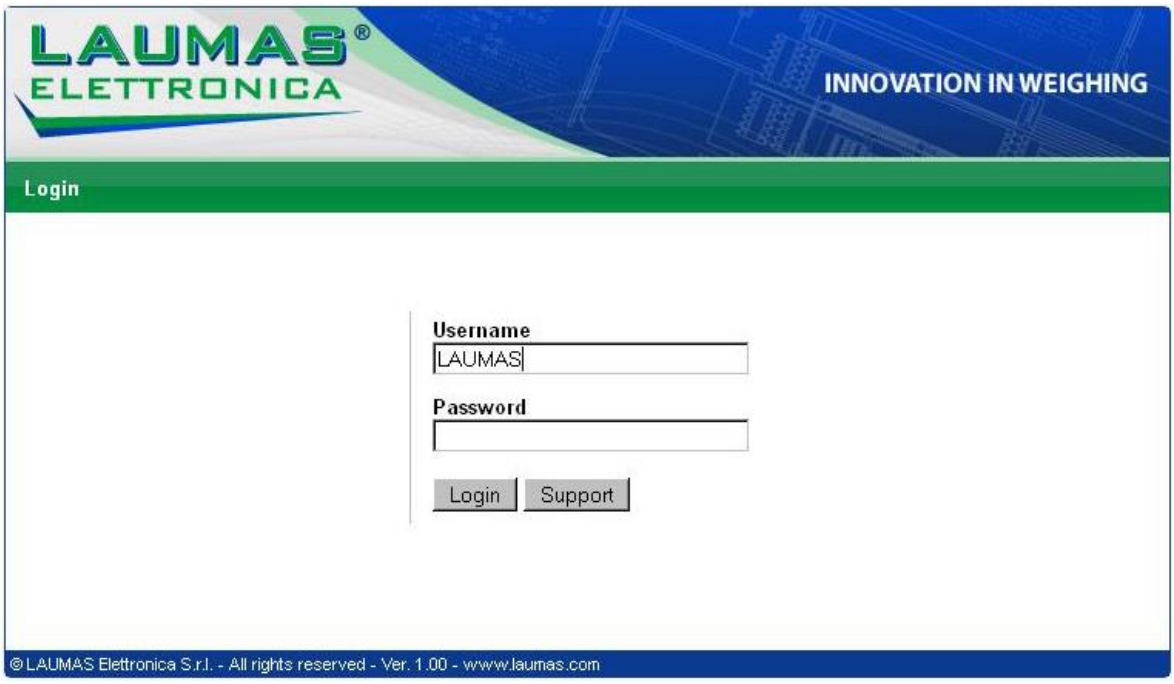


Select the found device and click on Telnet Configuration tab; click on Connect, and then press Enter on keyboard.



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 *UEb5ru* 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:

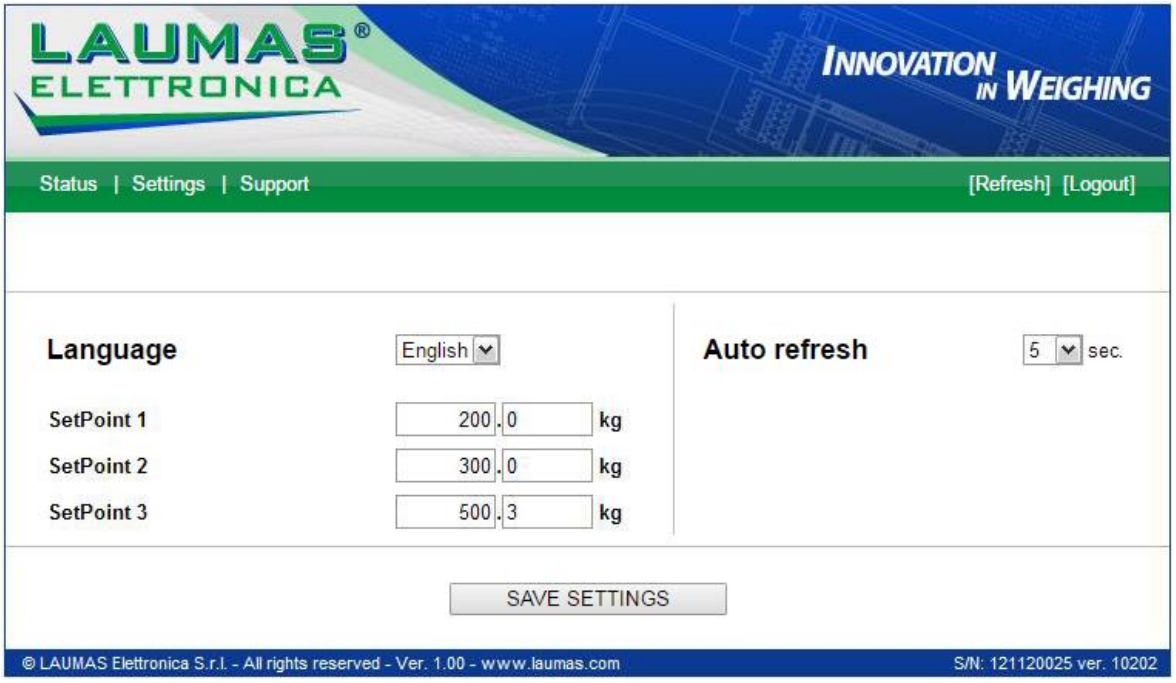
In case of incorrect parameter setting, the "INSTRUMENT DATA READING ERROR" message is displayed.

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.

Click on Settings to enter the instrument configuration page:



In the configuration page you can:

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

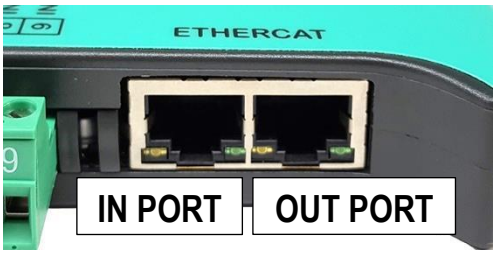
ETHERCAT

TECHNICAL SPECIFICATIONS

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

Link/activity LED indications (green)	off .....Ethernet link not established on .....Ethernet link established blinking .....Ethernet activity detected
Status LED indications (red)	blinking (fast) .....Bus OK blinking (slow).....Bus error

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



PC/PLC SETUP

The instrument works as *slave* in an ETHERCAT network.
Load the xml file attached to the instrument to the ETHERCAT *master* development system.
Insert and configure the TLBETHERCAT in an existing project.

The Ethernet over EtherCAT (EoE) protocol is not supported.

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	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

****)** 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.

Setpoint Reading/Writing

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

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

Preset tare

Write the preset tare value through the command 88 “Write preset tare”.
Send the command 130 “Enable preset tare” to enable the preset tare.

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

ETHERNET/IP

TECHNICAL SPECIFICATIONS

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

Link LED indications (green)	off.....Ethernet link not established on.....Ethernet link established
Activity LED indications (amber)	off.....Ethernet activity not detected blinking .....Ethernet activity detected
Status LED indications (red)	blinking (fast) .....Bus OK blinking (slow).....Bus error

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

INSTRUMENT SETUP

[↵] + [☒] → EtHnEt

- 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
- I PAddr (default: 10.2.0.170): set instrument IP address
- SUbnEt (default: 255.255.255.0): set instrument Subnet Mask
- GAtUAY (default: 0.0.0.0): set Gateway address of Ethernet network

In order to apply the changes, press [☒] until the display shows EtHnEt.

The instrument works as *adapter* in an Ethernet/IP network.
Use one of the following communication types.

CLASS 1 CONNECTION (implicit messages)
Refer to one of the following procedures to configure the communication with the instrument:

- load the eds file attached to the instrument to the Ethernet/IP *scanner* development system (see table “32-BIT RUN/IDLE HEADER” for the output data interface);
- use a generic Ethernet/IP module: configure it with the parameters of the table “Parameters for class 1 communication” and choose the real-time transfer format from instrument to scanner (Target to Originator – T2O) between “32-BIT RUN/IDLE HEADER” and “PURE DATA” (see the respective tables for the output data interface).

Parameters for class 1 communication			
Assembly	**Assembly Instance**	**Size [Byte] 32-bit run/idle header**	**Size [Byte] Pure data**
Input	101	18	22
Output	100	8	8
Configuration	128	0	0

CLASS 3 CONNECTION (explicit messages)
Manually generate the request to be sent to the PLC using the parameters shown in the table “Manual settings for communication” (see table “PURE DATA” for the output data interface).

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

The data exchanged by the instrument are:

32-BIT RUN/IDLE HEADER

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

PURE DATA

Output Data from instrument (reading)	Addresses input assembly
Ethernet/IP Header* [4 byte]	0x0000-0x0003
Gross Weight [4 byte]	0x0004-0x0007
Net Weight [4 byte]	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

* registers used by the ETHERNET/IP *scanner* to manage the communication.

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

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

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 Ethernet/IP *scanner* takes control of all the outputs, whatever their setting.

STATUS REGISTER

Bit 0	Load cell error	**Bit 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

****)** 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.

Setpoint Reading/Writing

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

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

Preset tare

Write the preset tare value through the command 88 “Write preset tare”.
Send the command 130 “Enable preset tare” to enable the preset tare.

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

MODBUS/TCP

TECHNICAL SPECIFICATIONS

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

Link LED indications	off .....No link amber .....10 Mb/s green .....100 Mb/s
Activity LED indications	off .....No activity amber .....Half Duplex green .....Full Duplex

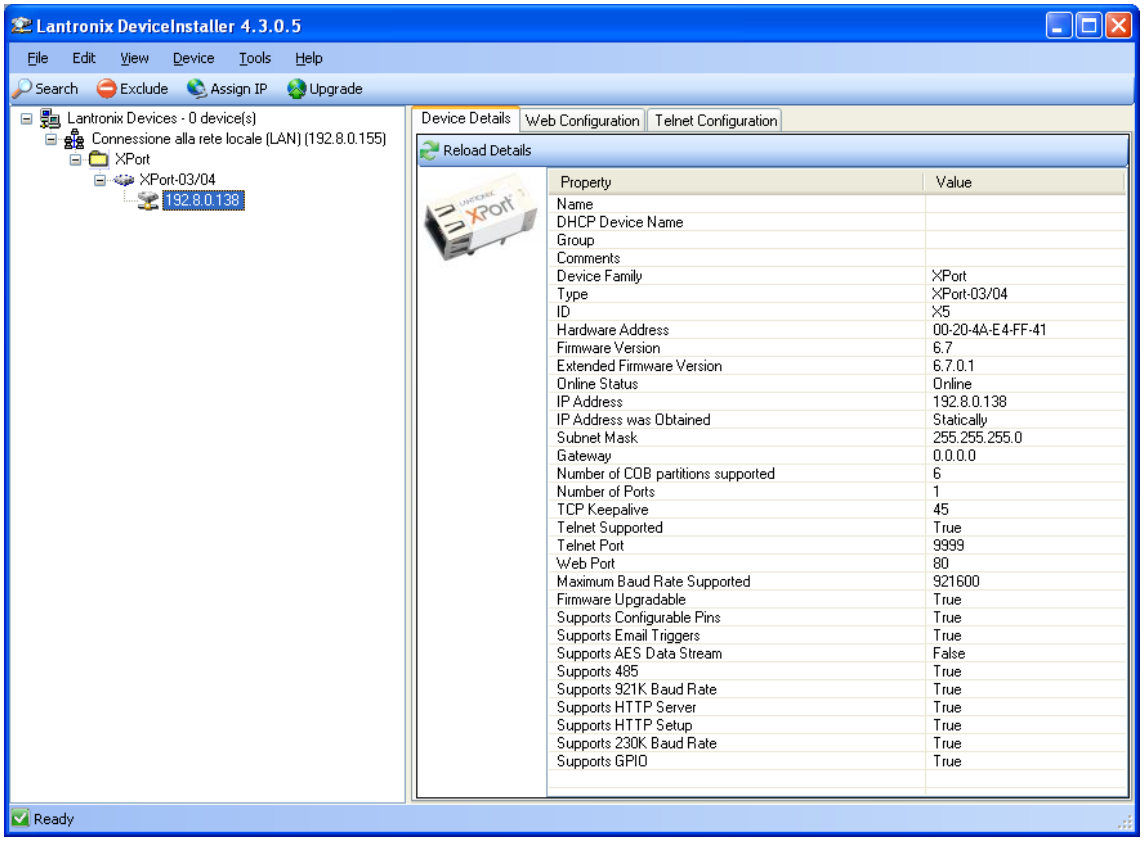
The instrument features a Modbus/TCP port that allows to exchange the weight and the main parameters with a Modbus/TCP *master*.

PC/PLC SETUP

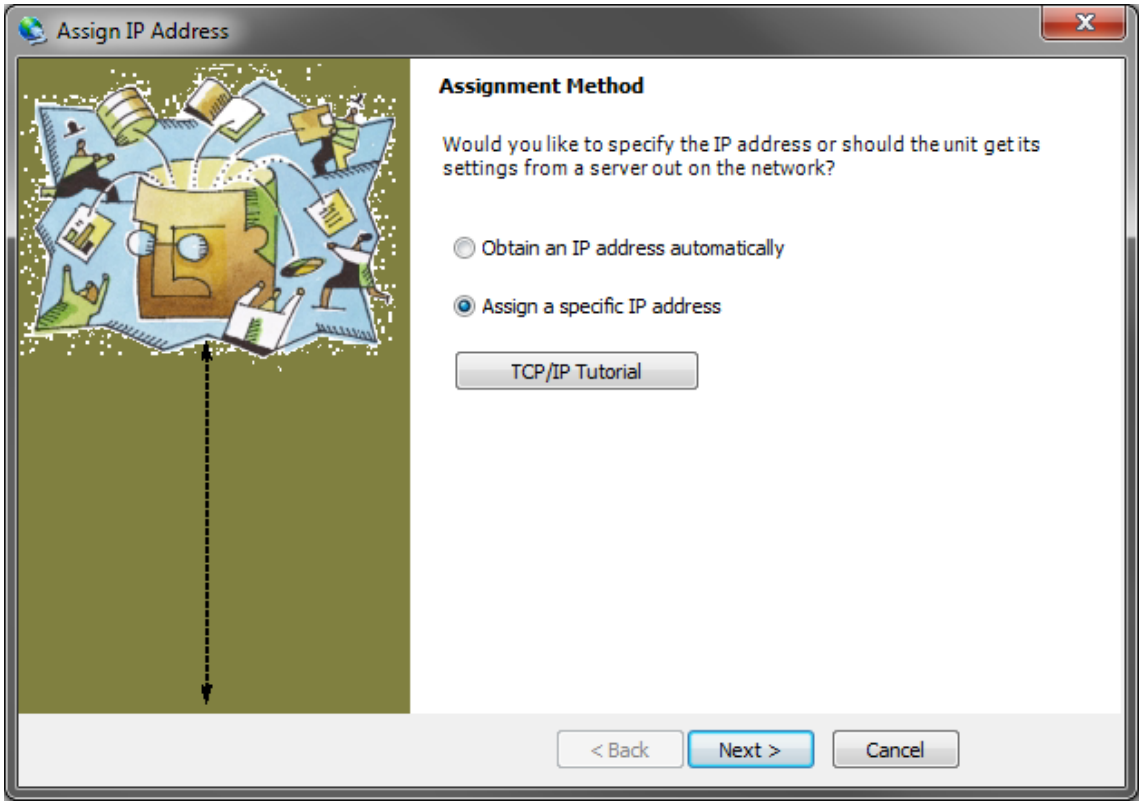
The instrument works as *slave* in a Modbus/TCP network.

IP ADDRESS SETTING

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



Select the device found and click on Assign IP.



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

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

POWERLINK

TECHNICAL SPECIFICATIONS

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

Link/activity LED indications (green)	off .....Ethernet link not established on .....Ethernet link established blinking .....Ethernet activity detected
Status LED indications (red)	blinking (fast) .....Bus OK blinking (slow).....Bus error

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

INSTRUMENT SETUP

[↵] + [✕] → ETHnET

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

PC/PLC SETUP

The instrument works as *slave* in a POWERLINK network.
Load the xdd file attached to the instrument to the POWERLINK *master* development system.
Insert and configure the TLBPOWERLINK 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	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

****)** 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.

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

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

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

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

PROFIBUS-DP

TECHNICAL SPECIFICATIONS

Baud rate	Up to 12 Mb/s
Addresses	1÷125

Status LED indications (red)	blinking (fast) .....Bus OK blinking (slow).....Bus error

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

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

INSTRUMENT SETUP

[↵] + [✕] → PrOFI

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

PC/PLC SETUP

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

NAME	DESCRIPTION	R/W	SIZE
Gross Weight	Gross weight	R	4 byte
Net Weight	Net weight	R	4 byte
Peak Weight	Peak weight	R	4 byte
Setpoint 1	Setpoint 1	R/W*	4 byte / 4 byte
Setpoint 2	Setpoint 2	R/W*	4 byte / 4 byte
Setpoint 3	Setpoint 3	R/W*	4 byte / 4 byte
Hysteresis 1	Setpoint 1 hysteresis	R/W*	4 byte / 4 byte
Hysteresis 2	Setpoint 2 hysteresis	R/W*	4 byte / 4 byte
Hysteresis 3	Setpoint 3 hysteresis	R/W*	4 byte / 4 byte
Division	Divisions	R	2 byte
Unit	Units of measure	R	2 byte
Visualization Coefficient	Display coefficient	R	4 byte
Inputs	Inputs status	R	2 byte
Outputs	Outputs status	R/W	2 byte / 2 byte

Status Register	Status register	R	2 byte
Command Register	Command register	W	2 byte
Sample Weight	Sample weight	R/W*	4 byte / 4 byte
Preset Tare	Preset tare (use with command 130 of the Command Register)	R/W	4 byte / 4 byte

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

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

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

- To set 0, write the conventional hexadecimal value hex 80000000 to the register (the most significant bit set to 1 and the other to 0).
- To set the values correctlyn use the Division module; example: if you want to set a setpoint to 100 kg and the scale verification division (e) is 0.001, set the setpoint value to 100000 (weight value with three decimals but without decimal point).
- If from PLC you set a value out of the permitted interval (from 0, not included, to full scale) the value is ignored and the bit 13 “Writing error” rises in the Status Register.

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

PRESET TARE

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

DIVISION

The value of the register read by Profibus corresponds to the division of the instrument (parameter dIVIS).

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

UNITS OF MEASURE

The value of the register read by Profibus corresponds to the unit of measure used by the instrument (parameter UnIt).

Unit of measure value	Unit of measure description	Coefficient effect on the read gross weight
0	Kilograms	No effect
1	Grams	No effect
2	Tons	No effect
3	Pounds	No effect
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

DISPLAY COEFFICIENT: contains the COEFF parameter value expressed as integer number, with four decimal figures, but without decimal point.

Example: if the module contains 12000, the COEFF parameter value is 1.2000.

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	Writing error
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
98		**99**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

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

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the content of the "Sample weight" module as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two's complement.
Example: to set the sample weight to -56 kg, enter the values indicated in the table in the "Sample weight" module.

MODULE	***VALUE***	
	HEX	***DECIMAL***
Sample weight	0xFFFF FFC8	-56

PROFINET-IO

TECHNICAL SPECIFICATIONS

Port	2x RJ45 100Base-TX

Link LED indications (green)	off.....Ethernet link not established on.....Ethernet link established
Activity LED indications (amber)	off.....Ethernet activity not detected blinking .....Ethernet activity detected
Status LED indications (red)	blinking (fast) .....Bus OK blinking (slow).....Bus error

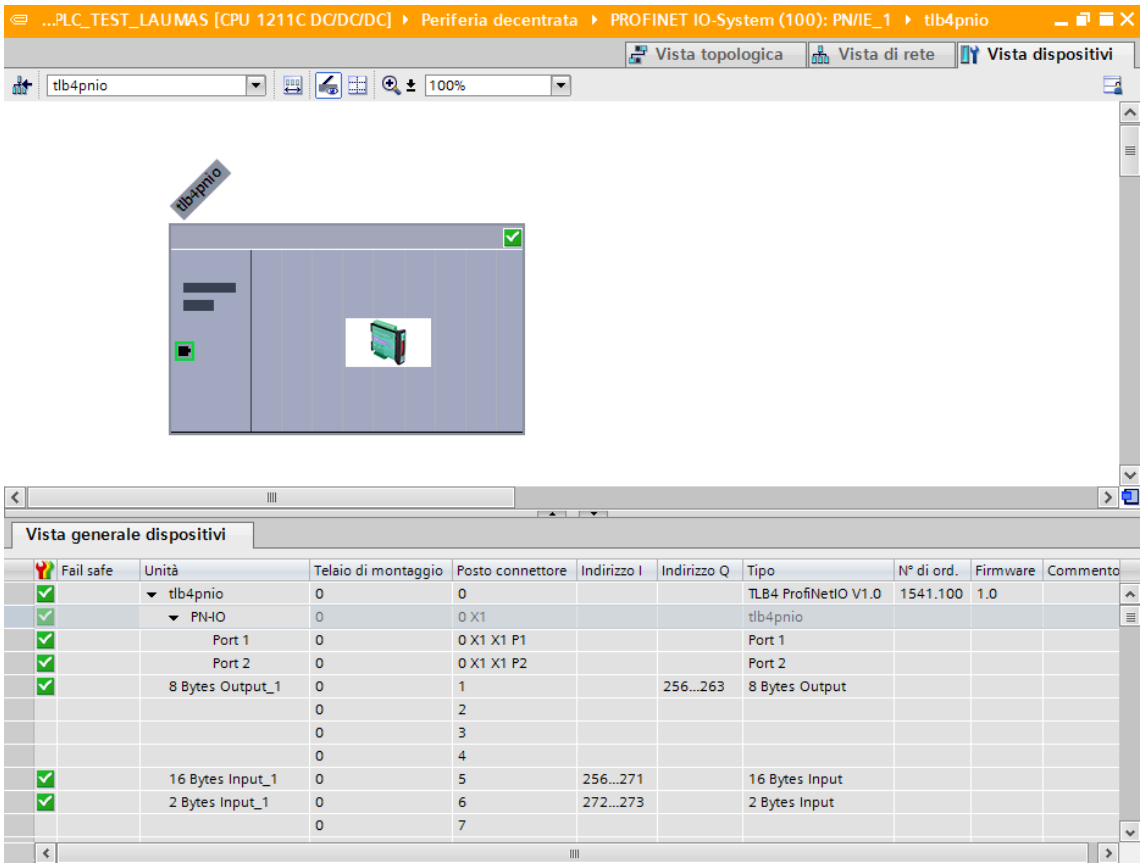
The instrument features a Profinet-IO dual port that allows to exchange the weight and the main parameters with a Profinet-IO *controller*.

INSTRUMENT SETUP

↵ + ✕ → EtHnEt

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

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



The data exchanged by the instrument are:

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

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

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

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

****)** 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.

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

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

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

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

SERCOSIII

TECHNICAL SPECIFICATIONS

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

Link/activity LED indications (green)	off .....Ethernet link not established on .....Ethernet link established blinking .....Ethernet activity detected
Status LED indications (red)	blinking (fast) .....Bus OK blinking (slow).....Bus error

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

INSTRUMENT SETUP

[↵] + [✕] → EtHnEt

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

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

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

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

* registers used by the SERCOSIII *master* to manage the communication.

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

DIGITAL INPUTS STATUS

Bit 0	INPUT 1 status
Bit 1	INPUT 2 status
Bit 2	
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	
Bit 4	
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		**Bit 11**	
Bit 4		**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 8**	Net weight negative sign
Bit 1	AD converter malfunction	**Bit 9**	Peak weight negative sign
Bit 2	Maximum weight exceeded by 9 divisions	**Bit 10**	Net display mode
Bit 3	Gross weight higher than 110% of full scale	**Bit 11**	Weight stability
Bit 4	Gross weight beyond 999999 or less than -999999	**Bit 12**	Weight within ±¼ of a division around ZERO
Bit 5	Net weight beyond 999999 or less than -999999	**Bit 13**	
Bit 6		**Bit 14**	
Bit 7	Gross weight negative sign	**Bit 15**	

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
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**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Save first sample weight for calibration
102**	Sample Weight reading	**103****	Sample Weight writing
104	Real calibration cancellation	**106**	Add sample weight for calibration
130	Preset tare enabling	**131**	

****)** 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.

Setpoint reading/writing

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

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

Preset tare

Write the preset tare value through the command 88 “Write preset tare”.
Send the command 130 “Enable preset tare” to enable the preset tare.

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 first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

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

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set a sample weight of negative value, it is necessary to consider the Exchange Register as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two’s complement.
Example: to set the sample weight to -56 kg, enter the value indicated in the table in the Exchange Register.

REGISTER	***VALUE***	
	HEX	***DECIMAL***
Exchange Register	0xFFFF FFC8	-56

[↵] + [✕] → 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, 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 [↵] 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.

Default: input 1 = 2Er0 input 2 = nE-L0

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.
- C0nt1 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 C0nt1 n is set in the item SEr1 AL**).
- C0EFF: 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.

On our website www.laumas.com there are videos on the guidelines for correct installation of weighing systems and video tutorials on configuring our transmitters and weight indicators.

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