TECHNICAL MANUAL

MC 315 Weight Indicator wit serial outputs, fiber optics, IN/OUT

Software version PATX02

PAVONESYSTEMS

TABLE OF CONTENTS

PRECAUTIONS ..... P. 2

INTRODUCTION ..... P. 3

TECHNICAL CHARACTERISTICS ..... P. 5

INSTALLATION ..... P. 6

FRONT PANEL OF THE UNIT..... ..... P. 14

USE OF THE KEYBOARD ..... P. 15

DISPLAY INFO ..... P. 18

OPERATING FUNCTIONS ..... P. 19

CONFIGURATION ..... P. 23

SET-UP MENU DIAGRAM ..... P. 27

CONFIGURATION PARAMETERS ..... P. 28

CALIBRATION ..... P. 28

SERIAL OUTPUT PARAMETERS ..... P. 35

INPUT/OUTPUT PARAMETERS ..... P. 44

WEIGHING PARAMETERS ..... P. 48

FILTER PARAMETERS ..... P. 50

SET-UP OF FUNCTIONAL FEATURES ..... P. 52

DATE AND TIME ADJUSTMENT ..... P. 55

UPLOAD/DOWNLOAD FUNCTION ..... P. 56

ACCESS DISPLAY ..... P. 57

ALIBI MEMORY CONSULTATION ..... P. 58

SERIAL COMMUNICATION PROTOCOLS ..... P. 59

TROUBLESHOOTING ..... P. 84

Rel ID 20190201 SW 0.5

PRECAUTIONS

READ this manual BEFORE using or maintaining the unit.

FOLLOW these instructions carefully.

STORE this manual for future reference.

WARNING

This manual uses words and explanatory images to help the operator understand the prescriptions and fundamental criteria for the installation and appropriate use of the unit.

Installation, maintenance, and repairs should only be performed by specialized operators after reading and understanding this manual. “Specialized operators” means the staff that, having the necessary professional training and expertise, were expressly authorized by the plant’s safety Manager to perform installation.

Power the unit within the voltage limits specified in the characteristics.

The user is responsible to ensure that installation complies with the applicable rules in force.

Any attempt to dismantle or modify the unit shall make the relevant guarantee null and void and release Pavone Sistemi from any and all liabilities, except where expressly authorized.

The installation and maintenance of this unit should only be performed by qualified staff.

Utmost care should be taken when performing checks, tests, and adjustments with the unit switched on.

Power connections should only be performed when the unit is switched off.

Any failure to comply with the above precautions may imply risks.

DO NOT ALLOW untrained staff to operate, clean, inspect, repair, or tamper with this unit.

The unit bears the following ATEX mark:

II2(1) G Ex ia [ia IIC Ga] IIC T4 Ga (Ta: -10°C ÷ +40°C)

II2(1) D Ex ia [ia IIC Da] IIC T135°C Db X (Ta: -10°C ÷ +40°C)

The unit was approved for specific usage locations: do not install or use the unit in locations other than the specified ones.

The safety of the weighing system is only ensured if installed and used according to the provisions contained herein.

Do not open the unit when switched on, do not disconnect the cables when switched on, do not open in explosive atmospheres.

Do not cover the unit with materials subject to potential electrostatic charge.

Clean the unit with moist cloths and anti-static products.

All peripheral devices connected with the unit, if installed and operated in the same location, should be marked at least II 1 GD.

Do not connect the unit with modules that are not provided for by the certification; this affects the intrinsic safety of the unit (with subsequent loss of the Ex approval). Please refer to Pavone Sistemi srl for additional information.

INTRODUCTION

The MC 315 is a weighing unit designed and manufactured in accordance with directive 2014/34/EU, fit for use in locations with potentially explosive atmospheres in compliance with norms EN 60079-0:2018, EN 60079-11:2012, and EN 60079-26:2015.

Operation is allowed in zones 1, 21, and 2, 22 (1, 2 for gases, 21, 22 for powders) as per Directive ATEX 2014/34/EU.

Operation in zones subject to the risk of explosion is safe because the indicator uses low energy, which is not sufficient to trigger explosions either with power sparkles or with excess temperatures (class T4).

The weighing terminal features a centralized CPU, a LED display, a membrane keyboard, and a separate power pack, which should be located in a safe zone or placed in a separately ATEX-certified enclosure when installed in a dangerous zone; such power pack is made up of a dedicated AL-AX power unit or an AL-BX battery pack.

The unit can be placed on a table or hung on the wall by means of an optional bracket.

The display ensures easy reading of weight, unit status, configuration parameters, and errors.

The multi-function 21-key keyboard ensures smooth performance of the following functions: ZERO, TARE, GROSS/NET switching, weight set point set-up, configuration, and calibration, both theoretical and actual.

The optical fiber connection allows to convey to a safe zone the information required to calculate, via the S3xx interface, the analogue voltage or current output, IN-OUT, RS232, and RS485, without using any Zener barriers.

Two RS485 serial ports with ASCII or MODBUS protocol allow remote connection for a maximum of 32 addressable devices, both in a safe and in a dangerous zone, using specific Zener barriers.

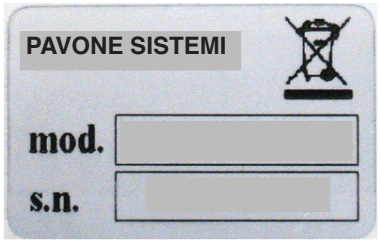
Two optoinsulated inputs are also available and can be connected with devices both in a dangerous and in a safe zone, as well as 6 photorelay outputs that can be connected with devices in a dangerous zone.

Available versions:

- MC 315: weight indicator with optical fiber output, 2 RS485 serial ports. Supports the ASCII and Modbus RTU continuous protocols. Two inputs and 6 outputs.
- MC 315/X: version with XXXXX.
- MC 315/XXX: XXXXXXXXXXXXX.

NAMEPLATE OF THE UNIT

It is important to communicate this information when inquiring about the unit, alongside the number of the software application and version stated on the cover of the manual and displayed when the unit is switched on.



WARNING

The procedures described below should be performed by specialized staff.

All connections should be performed when the unit is switched off.

TECHNICAL CHARACTERISTICS

Power	100 ÷ 250 VAC with AL-AX certified power unit or 6V battery via AL-BX barrier (in safe zones)
Max absorption	2 W
Insulation	Class III
Operating temperature	-10°C ÷ +50°C (max. steam-free humidity 85%)
Storage temperature	-20°C ÷ +60°C
Weight display	Red 6-digit 7-segment LEDs (h 20 mm)
LEDs	8 LED indicators 5mm
Keyboard	membrane, 20 keys + ON/OFF
Dimensions	237 mm x 169 mm x 113 mm (l x h x d)
Mounting	Table-top, wall-mount, or column (with bracket)
Enclosure material	Stainless steel
Connections	Removable terminal pads with pitch 3.81 screws
Load cell power supply	Max 4 350Ω cells in parallel, protected from short circuits
Input sensitivity	0.02 μV min.
Linearity	< 0.01% of full scale
Thermal drift	< 0.002% of full scale / C°
Internal resolution	24 bits
Weight display resolution	Up to 999.999 divisions of maximum capacity
Measurement field	–3,9 mV/V to +3,9 mV/V
Weight acquisition frequency	50 Hz
Digital filter	Can be selected on 10 level
Number of weight decimals	0 to 4 decimals
Zero point and full scale calibration	Automated (theoretical) or executable from keyboard
Logical outputs	6 photorelays max 24 Vdc / 100 mA each
Logical inputs	2 optoinsulated at 12÷24 Vdc PNP (external supply)
Serial port (No. 2)	RS485
Max. cable length	200m
Serial protocols	ASCII, Modbus RTU
Full duplex fiber optic port	Data transmission to S318 circuit board in safe zones
Max. cable length	50m
Cable type	Duplex cable with 1 mm Plastic Fiber optics (e.g. COP-1002-HD)
Microcontroller:	ARM Cortex M0+ 32 bit, 256KB Flash resettable on-board from USB.
Data storage	256 Kbytes expandable to 1024 Kbytes
Compliance with norms	EN61000-6-2, EN61000-6-3, EN61010-1 EN60079-0, EN60079-11, EN60079-26

INSTALLATION

OVERVIEW

The MC 315 is a multifunction unit contained in a stainless steel enclosure, fit for use in zones subject to the risk of explosion as per Directive ATEX 2014-34-EU, in accordance with norms EN 60079-0 and EN 60079-11 Ex-I (Intrinsic Safety).

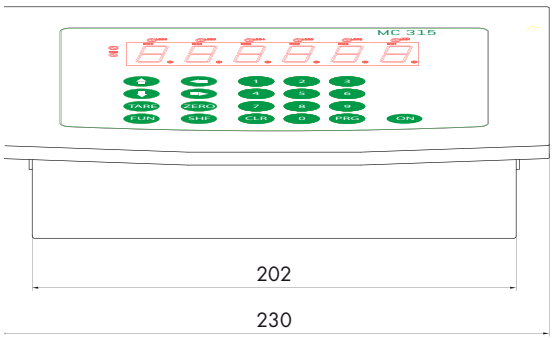
The MC 315 should not be soaked in water, splashed with water, and cleaned or washed with solvents.

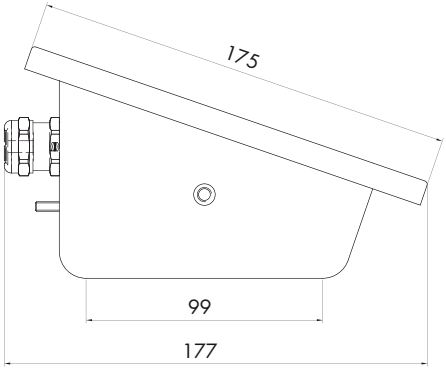
Do not expose the unit to high temperatures or direct sun light.

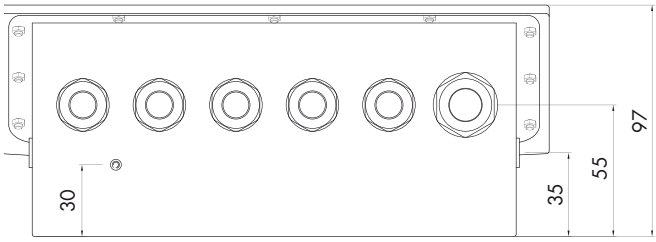
Do not install the unit near power equipment (engines, inverters, contactors, etc.) or equipment that does not comply with EC norms for electromagnetic compatibility.

Follow the guidelines in the unit safety manual and the reference ATEX norms.

DIMENSIONS







POWER INSTALLATION

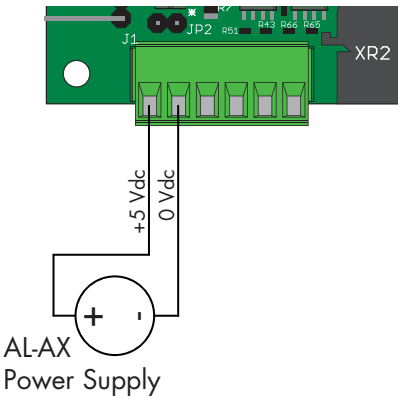
Cables are fed into the enclosure through six separately "II2G Ex e"-certified cable glands arranged across the back wall.

The eligible models are selected by Pavone Sistemi: in case of damage and decay, they should be replaced by Pavone Sistemi.

Unused cable glands should always be closed with the appropriate supplied separable plug, which restores protection degree IP66.

Cables used with cable glands should be selected in accordance with EN60079-14 and should be round, compact, full extruded, and non-hygroscopic.

The internal power connection of the MC 315 indicator is performed with removable terminal pads with pitch 3.81 screws.



AL-AX
Power Supply

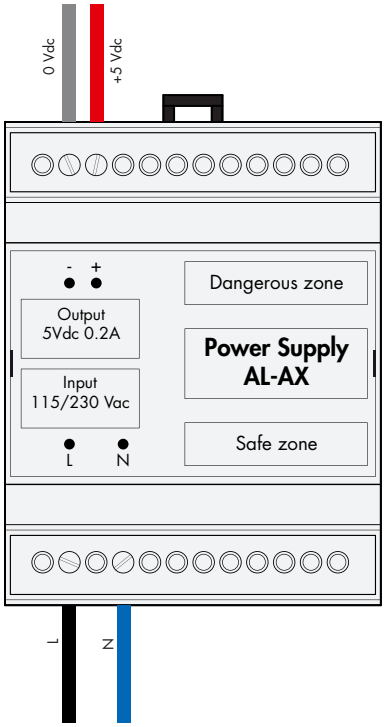
POWER SUPPLY OF THE UNIT

The circuit board is powered via an AL-AX certified power unit (100 ÷250 VAC / 5VDC) or a 6V battery via AL-BX barrier. Both the power unit and the battery should be located in a safe zone or, if located in a Dangerous Zone, should be contained within a separately certified ATEX enclosure.

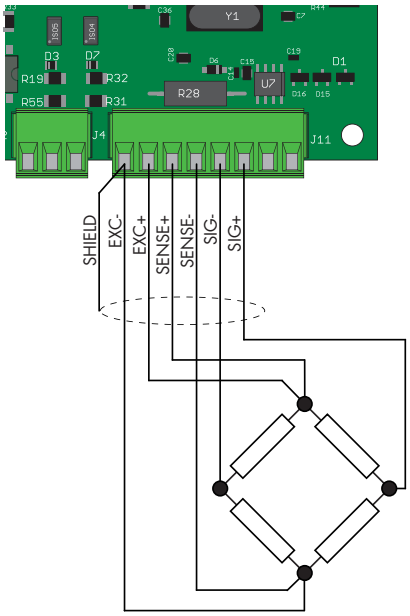
The unit is powered through terminals 1 and 2 of connector J1. The power cable should be fed separately from other cables.

Ensure that appropriate grounding is available.

Power supply voltage: 5 VCC ±15%, max 2W



115/230 Vac
Power Supply



LOAD CELL CONNECTION

The cells' cable should not be fed together with other cables, but should follow its own separate path.

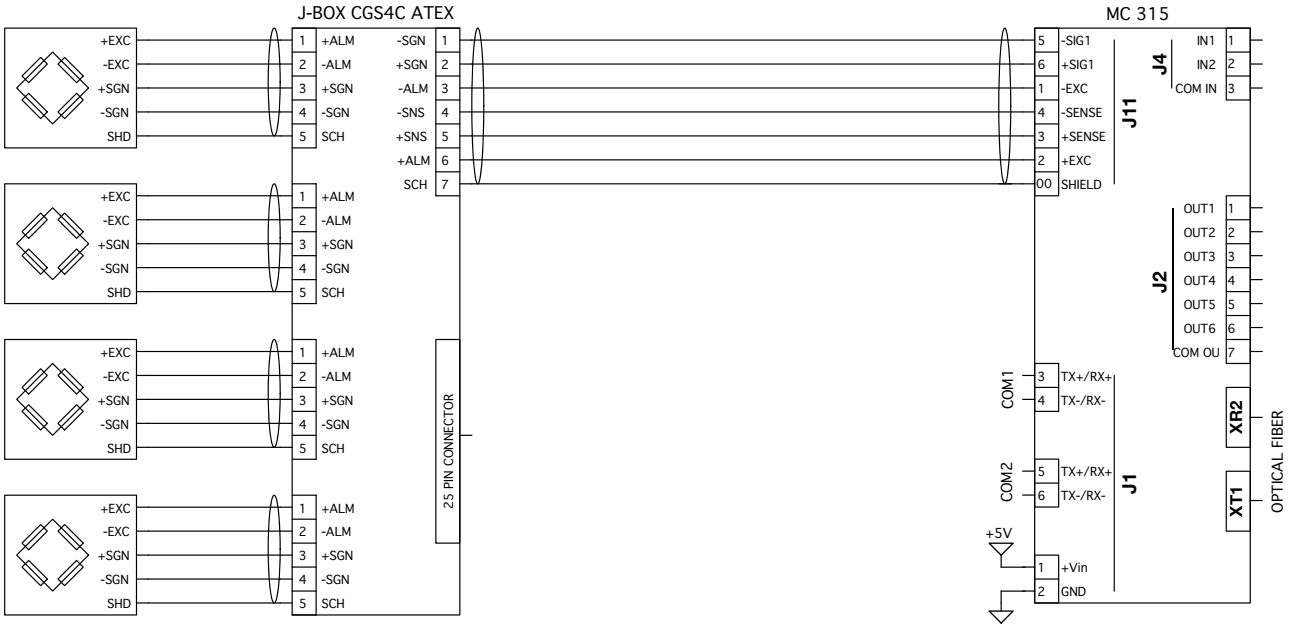
Up to 4 350-ohm cells can be connected in parallel with the unit. The cells' power supply voltage is 3.3 VCC, with protection from temporary short circuits.

The measurement field of the unit provides for using load cells with maximum 3.9 mV/V sensitivity.

The load cells' cable should be connected with terminals 1 to 6 of connector J11. In case of 4-conductor cell cable, bridge terminal 1 with 4 and terminal 2 with 3.

Connect the cells' cable shield with terminal 1 of connector J11.

If two or more load cells are used, use specific junction boxes (CEM4/E ATEX or CSG4/C ATEX), connected as shown below.



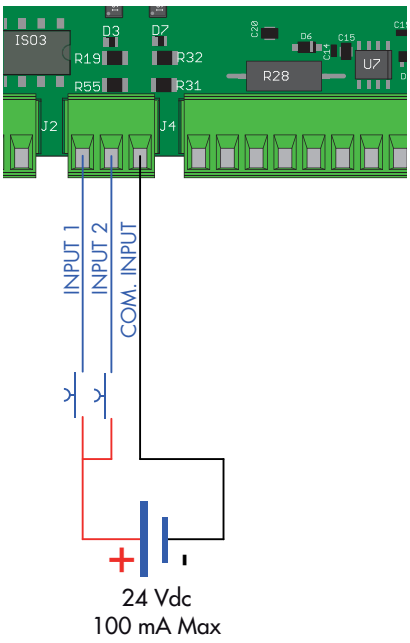
LOGICAL INPUT CONNECTION

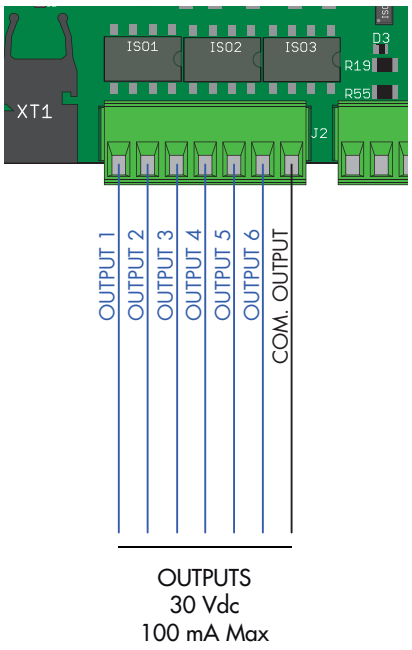
Logical inputs are insulated from the unit by means of optoinsulators with minimum inner distance of 0.5 mm. This allows to connect inputs located both in a safe and in a dangerous zone.

- The connection cables of the logical inputs should not be fed together with power or supply cables.
- The connection cable should be as short as possible.

Logical input enabling requires a 7 to 24 VDC voltage. The common inputs should be connected with the negative having the same voltage.

NUM.	Terminal Board J4
1	Input 1
2	Input 2
3	Common Input





LOGICAL OUTPUT CONNECTION

The 6 logical outputs are based on a Photorelay (clean contact) with a common. The capacity of each contact is 100 mA / 30VDC. When the output is enabled, the contact closes (contact NA).

- The location that hosts to the unit can be normally subject to strong magnetic fields and electrical noises caused by other appliances. Therefore ordinary measures should be taken to prevent any impact thereof on the typical signals of a high-precision electronic device (filters on contactors, diodes on 24 Vdc relays, etc.).

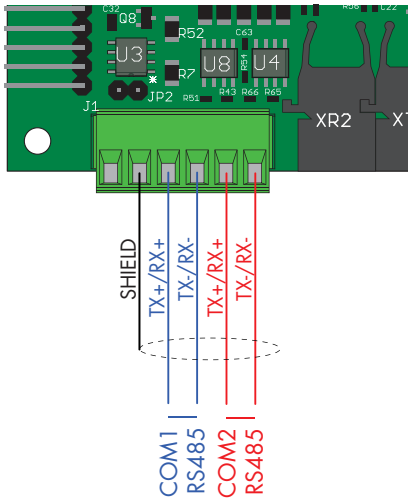
The outputs are designed to drive devices through a dangerous zone. For use with devices in a safe zone, an optical fiber connection or a specific barrier can be used.

Output connection is shown below:

NUM.	Terminal board J2
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Common Output

SERIAL COMMUNICATION

RS485



Serial connections for distances up to 200m can be performed via the RS485 serial interface. The RS485 serial connection is of the 2-thread type and allows to connect up to 32 devices with one MASTER unit (personal computer, PLC, etc.) via one twisted and shielded cable.

The cable shield should be connected with terminal 2 of connector J1.

The cable should not be fed together with power cables.

A RS485 barrier must be used to connect the MC 315 (in a dangerous zone) with a PC or other devices in a safe zone. Several models are available on sale, including the D1061S by GM International.

NUM.	Morsettiera J1	
2		SHIELD
3	COM1	TX+/RX+
4		TX-/RX-
5	COM2	TX+/RX+
6		TX-/RX-

OPTICAL FIBER CONNECTION

The use of optical fiber communication systems in dangerous zones offers some advantages in terms of galvanic isolation and use of low energy.

Galvanic isolation makes it unnecessary to use a barrier, which would be anyway required between the dangerous and the safe zone in case of, for example, RS232 or RS485 communication or analogical output, even if the signals come from an intrinsically safe unit.

The use of diffused-light LEDs, as for the interfaces on this unit, complies with the ATEX norms and, specifically, with norm EN 60079-28.

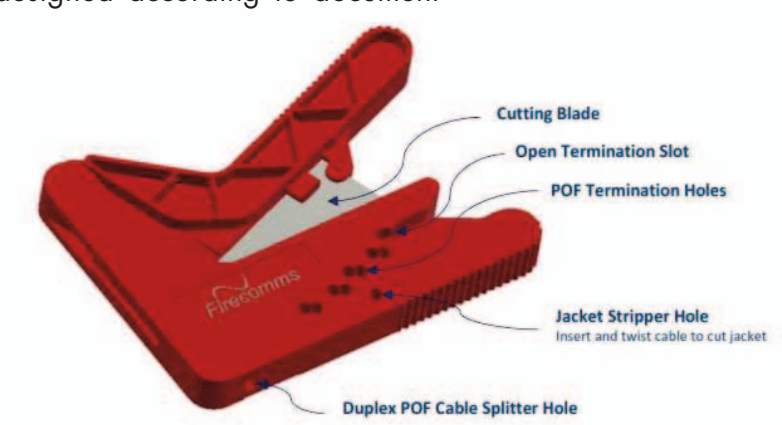
Two-way optical fiber communication allows to send and receive data in a safe zone to/from the S318 circuit board; such data is then switched to Fieldbus, RS485, RS232, analogical outputs, in-out.

The requested cable is a Duplex cable with two fibres inside the same sheath, with 1mm Plastic Optical Fiber (e.g. COP-1002-HD).

The fiber terminal should be designed according to document "AV02-0460EN _DS_HFBR-453xZ_2015-06-18.PDF"

by AVAGO/BROADCOM, and using connectors of the HFBR-453xZ series.

The use of two different colours for the TX and RX, is recommended, e.g. HFBR-4531Z (black) for the TX and HFBR-4533Z (blue, see photo on the right) for the RX.



The optical fiber could reach a maximum length of 100m (as from the characteristics) with a very accurate finish, as specified in the above-mentioned document.

If the finish is not ascertained, a maximum length of 50m is recommended.

The fibers can also be cut with an appropriate cutter (see figure).

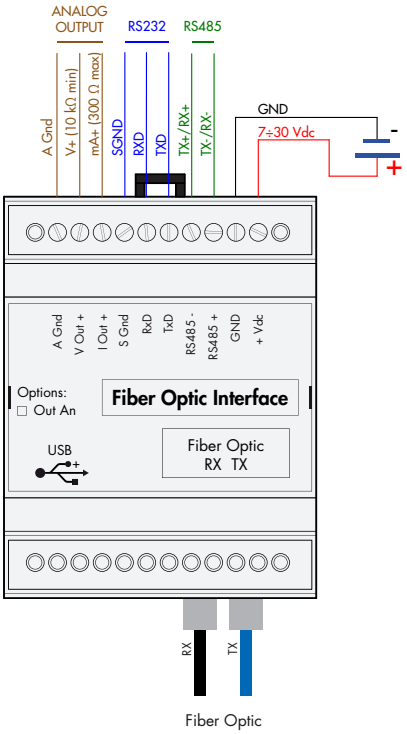
S318 CIRCUIT BOARD

The Optical Fiber interface board is contained in a plastic enclosure with DIN 35mm guide. Its size is 70x90x58mm (LxHxD). While the board should be powered at the typical voltage rate of 24 VDC, voltage values between 7 and 30 VDC are also accepted.

The base version of the board features a RS232 serial port and a RS485 serial port. It is also available with analogical voltage or current output as an option.

As an alternative to the RS485 serial port, any of the following FIELDBUS options can be used: Profibus DP, Profinet, Ethercat, or Ethernet IP.

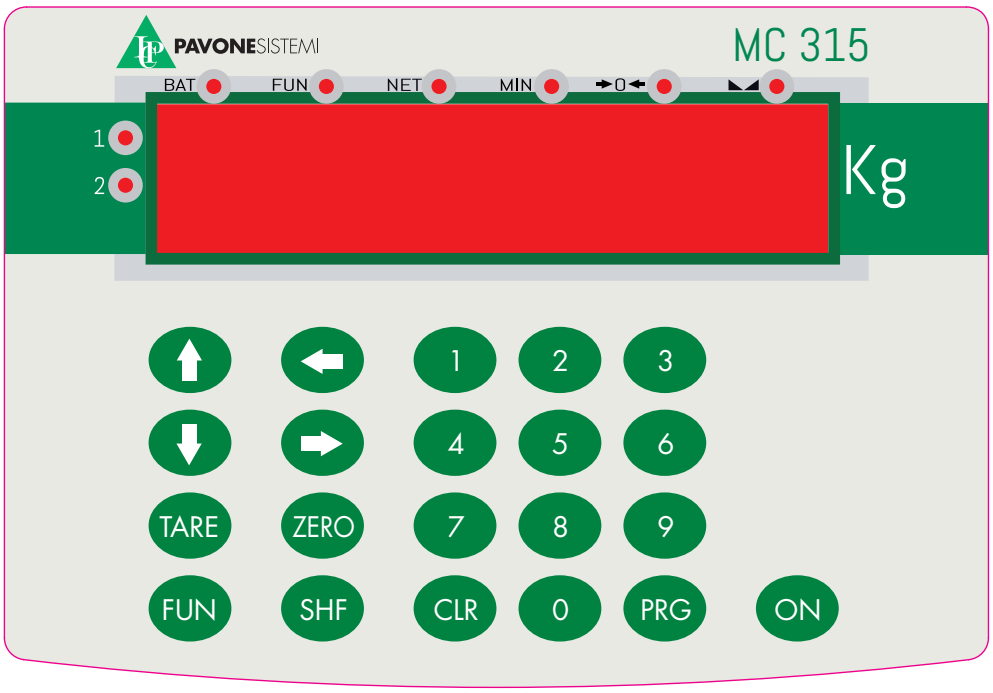
The configuration of the serial ports, of the analogical output and of the Fieldbus (if any) is performed directly by the MC 315 unit.



FRONT PANEL OF THE UNIT

The MC 315 has a bright 6-digit display, 8 status LEDs, and 21 keys for easy operation. In the operating mode, the display shows the weight, and the LEDs indicate the weight and set point status.

The set-up parameters are easy to access and adjust using the front keys to select, change, and confirm the new values.



DISPLAY

The 6-digit display usually shows the scale weight. Based on the different set-up processes, the display is used to set up the parameters to be saved, i.e. messages about the current operation mode, and therefore ensure smooth user operation and set-up of the unit.

LEDS

The 6 status LEDs above the display have the following functions:

BAT	Battery operation / battery low (flashing)
FUN	Function key enabled
NET	Net weight display (entered tare)
MIN	Gross weight below the set zero band
>0<	Zero point (gross weight < 0,25 e)
◣◢	Stable weight

There are 2 LEDs on the left side of the display:

1	Multirange field 1
2	Multirange field 2. (1 + 2) = Multirange field 3.

USE OF THE KEYBOARD

The unit is set up and controlled via the 21-key keyboard. Set-up menus are usually managed by pressing the arrow keys to scroll the items and the PRG key to access the relevant sub-menu or programmable parameter.

The ON key allows to switch the unit on and off.

KEY	FUNCTIONS DURING WEIGHT DISPLAY
ZERO	Displayed value zeroing (gross weight).
TARE	Automated Tare function
FUN + TARE	Manual Tare function; this function is only accessible when no automated tare is entered (*).
FUN + CLR	Tare clear. (*)
FUN + SHF	Switch displayed weight (net/gross). (*)
FUN + 1	Access to set-point value set-up menu (*)
FUN + 2	Cell channel switching. (*)
FUN + 3	Serial weight transmission via On Demand protocol. In case of metric operation, weight is saved in the alibi memory; weight and the weighing ID code are transmitted via the On Demand protocol. (*)
PRG	(Hold) Access to set-up menu.

*) Certain operating functions are performed by pressing the FUN key and an operating key in sequence (e.g. the TARE key for manual tare set-up) The sequence should be completed within 2 seconds from pressing the FUN key; during this time, the FUN status LED remains on.

KEY	FUNCTION WHEN BROWSING THROUGH THE SET-UP MENU
↑	Selects the next menu.
↓	Selects the previous menu.
→	Accesses the relevant sub-menu or set-up or confirms the selected parameter.
←	Exits from the set-up menu or returns to the higher level.

KEY	FUNCTION WHEN SETTING UP NUMERIC VALUES
0 … 9	Writes the selected value (a digit is added on the right).
CLR	Delete last digit.
CLR	(Holds) Resets set-up.
PRG	Ends entry and saves the value
←	Exits without saving changes

KEY	FUNCTION WHEN SETTING UP PROPOSED VALUES
↑	Selects the higher value.
↓	Selects the lower value.
PRG	Confirms and saves the displayed value.
←	Exits without saving changes.

EXITING THE SET-UP MENU

Press the ← key to return to the main menu. Press the ← key again. "StorE?" is displayed.

Press the PRG key to save the entries and return to weight display.

DISPLAY INFO

PAtH02
rEU. 04

When the unit is switched on, a display test is performed; the software ID and the relevant version are then displayed. Such codes should be communicated in case of support request.

When the set-up procedure is not under way, the display shows the measured weight in kg. The following messages appear in certain conditions:

ERROR REPORTING

The following error codes may appear on the display in the operating mode.

Fixed message

0-L	No load cell signal, or signal falls outside the mV/V measurement field.
- - - - - -	Overload. The weight applied to the load cells exceeds the maximum capacity of the weighing system by over 9 divisions.
- - - - - -	Underload. This message appears when the measured weight is negative below the displayable value.

Flashing message, alternating with the measured weight

no-CAL	Weight calibration not performed, flashing message (alternating with the measured weight).
LoW.U in	Power supply too low in case of operation with power unit, flashing message (alternating with the measured weight).
E.F ibEr	Communication error with the S318 optical fiber interface board. This error is only displayed in case of communication timeout and when the interface is enabled (analogical output option enabled, COM3 protocol enabled, or COM4 protocol enabled).
No CoN	Fieldbus network disconnected.
E-F.bus	Fieldbus interface connection error.

OPERATING FUNCTIONS

After calibration, the display shows the current weight when switched on next.

The possible operations that can be performed from the keyboard when weight is displayed are described below.

KEY	FUNCTIONS DURING WEIGHT DISPLAY
ZERO	Display value zeroing (gross weight).
TARE	Automated Tare function.
FUN + TARE	Manual Tare function; this function is only accessible if no automated tare is entered (*).
FUN + CLR	Tare clear. (*)
FUN + SHF	Switch displayed weight (net/gross). (*)
FUN + 1	Access to set point value set-up menu (*)
FUN + 2	Cell channel switching. (*)
FUN + 3	Serial weight transmission via On Demand Protocol. In case of metric operation, weight is saved in the alibi memory; weight and the weighing ID code are transmitted via the On Demand protocol. (*)
PRG	(Hold) Access to set-up menu.

(*) Some operating functions are performed by pressing the FUN key and an operation key in sequence (for example, the TARE key to perform manual tare programming). The sequence must be completed within 2 seconds after pressing the FUN key, during this period the FUN status LED remains on.

ZEROING

The gross weight reset command is used to correct minor zero shifts of the weighing system during regular operation. These zero shifts are usually due to thermal drifts or material residues accumulating on the weighing system in time.

The gross weight reset command is not executed if any of the following conditions occurs:

- Unstable weight (with weight stability control enabled). In this case the reset command is only effective if weight is stabilized within 3 seconds, or if the weight stability control is disabled ("MOTION" parameter = zero)
- Gross weight exceeding (in positive or negative terms) the number of divisions set in the "0 BAND" parameter, when the self-zero set point is not set.

After the unit is switched off, the zero value acquired by zeroing gross weight is saved, in case of FREE operating mode selected and AUTO ZERO function deactivated.

While gross weight can be zeroed multiple times, the number of divisions zeroed each time is summed up. Therefore when the total exceeds the limit set in the "0 BAND" parameter, no zeroing can be performed. In this case, Zero point calibration should be performed.

Setting up the automated zero parameter upon switch-on (AUTO 0) reduces (or annuls, in case of "AUTO 0" > "0 BAND") the scope of action of the zero command.

AUTO-TARE

Autotare is not performed under the following conditions:

Unstable weight (the weight does not stabilize within 3 seconds of the reset command).

Gross weight equal to or greater than the maximum capacity of the weighing system.

After the unit is switched off, the AUTO TARE value is saved, only in case of FREE operating mode selected and AUTO ZERO function deactivated.

ON-DEMAND TRANSMISSION

Serial transmission via the on-demand protocol is performed if the following conditions are in place:

- Stable weight (within 3 seconds from command).
- Weight changed by about 20 divisions since the last transmission performed (weight delta).
- Gross weight below maximum capacity.
- Only in case of METRIC operation, gross weight should be equal or lower than minimum weighing (20 divisions).
- Only in case of METRIC operation, net and gross weight should be positive and not null.

WEIGHING SAVING

Weighing is saved in the alibi memory if the following conditions are in place:

- METRIC operation.
- Alibi memory option available in the unit.
- Stable weight (within 3 seconds from command).
- Weight changed by about 20 divisions since the last weighing performed (weight delta).
- Gross weight is equal to or lower than minimum weighing (20 divisions) and lower than maximum capacity.
- Net and gross weight are positive and not null.

WEIGHT SET POINT SET-UP

The set-up value SET POINTs are compared against weight to drive the relevant logical output. The comparator is selected in the logical input/output set-up procedure (see the corresponding section).

Press the FUN key to access Set point set-up; the FUN LED turns on; press key 1 within 2 seconds during weight display.

MESSAGGE	DESCRIPTION	DEFAULT	RANGE	FIELDBUS ADDR.
SEtP. 1	Sets the value of Setpoint 1	0	0÷Capacity	201(MSB) 202(LSB)
SEtP. 2	Sets the value of Setpoint 2	0	0÷Capacity	203 (MSB) 204 (LSB)
SEtP. 3	Sets the value of Setpoint 3	0	0÷Capacity	205 (MSB) 206 (LSB)
SEtP. 4	Sets the value of Setpoint 4	0	0÷Capacity	207 (MSB) 208 (LSB)
SEtP. 5	Sets the value of Setpoint 5	0	0÷Capacity	209 (MSB) 210 (LSB)
SEtP. 6	Sets the value of Setpoint 6	0	0÷Capacity	211 (MSB) 212 (LSB)

The set-up value set points are compared against weight to drive the relevant logical output. The comparator is selected in the set point set-up procedure.

When weight cannot be measured or is out of scale, all the outputs are disabled (open or closed contact according to MODE set-up, see the corresponding section).

In the set point set-up phase, both outputs are disabled. If the saved value set point is 0, the relevant output is never enabled, whatever the selected set point set-up.

CONFIGURATION

OVERVIEW

All the functions of the MC 315 can be enabled and adjusted by accessing a simple set-up menu, shown on the following page. All the functions selected or enabled are saved even if the unit is switched off.

The MC 315 is pre-configured with default parameters. The "Default" values of each parameter are shown on the following pages.

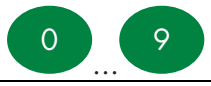
After first field installation, certain parameters need to be adjusted in order to ensure appropriate weight display (theoretical calibration).

This feature can be requested upon purchasing the MC 315.

The values in the set-up menu can be adjusted using the front keys.

KEY	FUNCTION WHILE SETTING UP THE MAIN MENU
	Selects the next menu.
	Selects the previous menu.
	Accesses the relevant sub-menu or the set-up or confirmation of the selected parameter.
	Exits the set-up menu or returns to the higher level.

KEY	FUNCTION WHILE SETTING UP PROPOSED VALUES
	Selects the higher value.
	Selects the lower value.
	Confirms and saves the displayed value.
	Exits without saving changes.

KEY	FUNCTION WHILE SETTING UP NUMERIC VALUES
	Writes the selected value (a digit is added on the right).
	Delete the last digit.
	(Hold) Resets set-up.
	Ends entry and saves the value.
	Exits without saving changes.

CHANGING AND ENTERING PARAMETERS:

The menu access procedure depends on the selected operation mode: FREE or METRIC.

ACCESSING THE MENU IN CASE OF FREE OPERATION.

In case of FREE operation, the operator can modify all the parameters of the unit.

ACCESSING THE MENU IN CASE OF METRIC OPERATION.

In case of METRIC operation, weighing parameter set-up and weight calibration set-up can only be performed by the staff authorized by the rules in force via password-protected access or by calibration-bridge enabling. If the calibration bridge is ON, no password is required to access (the procedure is described below).


Refer to the **password** table to carry out this procedure.

Id	The operator's ID is requested to access the menu. The timed message "ID" is displayed, and code entry is then requested.
0001	Enter the authorized operator's ID, corresponding to the number in the password table, and press the PRG key to confirm. If the value 0000 is confirmed or the procedure is annulled by pressing the CLR button, access to the set-up menu is limited (weighing parameter set-up and weight calibration set-up cannot be accessed).
Cod.123	A random 3-digit number appears on the display. Identify the corresponding password (4 digits) in the table and press the PRG key to access password set-up.
1234	Enter the password identified in the table and press the PRG key to confirm. If the value 0000 is confirmed, access to the set-up menu is limited (weighing parameter set-up and weight calibration set-up cannot be accessed).


Each access by the authorized staff is recorded in the memory of the last 5 accesses, available for consultation.


Switch on the unit with the calibration enabling bridge in the CALIBRATION position to access the set-up menu directly (if the calibration bridge is enabled, the set-up menu cannot be exited).

SET-UP MENU

SUBMENU	NAME
ConSt	Load cell data set-up menu with subsequent theoretical calibration of the unit. (*) (***)
CAL 1br	Calibration procedure with sample weights. (*) (***)
PArAM	Measurement parameter set-up procedure. (*)
SEr 1AL	Serial communication port operation parameter set-up menu.
In-Out	Logical Input/Output mode and parameter set-up menu.
FUnCt	Function menu (uploading and downloading of set-up parameters, password set-up for access to the set-up menu of the unit).
tESt	Hardware testing functions of the unit.
AnALoG	Analogical output set-up (only if the analogical output is configured)(*)
ACCESS	Display of the last 5 authorized staff accesses (**)
AL 1MEM	Alibi memory consultation (**)

(*) The weighing parameters and the calibration functions refer to the cell channel that is enabled upon accessing the set-up menu of the unit. The enabled cell can be switched over by using the relevant function key.

(**) These menu items are only displayed in case of METRIC operation.

(***) These menu items are only displayed in case of FREE operation or in case of access of the authorized staff via password (in case of METRIC operation).

SET-UP MENU DIAGRAM

MENU
ConSt
CAL ibr
PArAM
SEr iAL
In-Out
Funct
tESt
AnALoG
ACCESS
AL iMEn

MENU	SUBMENU
ConSt	CAPAC
	SEnS It
	rESoL
	PrLoAd
	UnnG 1
	UnnG 2

MENU	SUBMENU
PArAM	FILtEr
	uSE
	SYS FS
	Not ion
	Auto-0
	0-trAC
	0-bAnd
	G-CAL
	G-uSE

MENU	SUBMENU
SEr iAL	C1Prot
	C1bAud
	C1FrAM
	C2Prot
	C2bAud
	C2FrAM
	C3Prot
	C3bAud
	C3FrAM
	C4Prot
	C4bAud
	C4FrAM
	AddrES

MENU	SUBMENU
In-Out	Fun In1
	Fun In2
	ModE 1
	HYSt 1
	ModE 2
	HYSt 2
	ModE 3
	HYSt 3
	ModE 4
	HYSt 4
	ModE 5
	HYSt 5
	ModE 6
	HYSt 6

MENU	SUBMENU
FUnCt	PASS''
	dnLoAd
	uPLoAd

MENU	SUBMENU
tESt	SiGnAL
	hi rES
	PSuPPL
	InPut
	OutPut
	CoM 1
	CoM 2
	FibEr

MENU	SUBMENU
AnALoG	rAnGE
	ModE
	An 0
	An FS
	0 Adj.
	FS Adj.

MENU	SUBMENU
ACCESS	ACC-01
	ACC-02
	ACC-03
	ACC-04
	ACC-05

MENU	SUBMENU
AL iMEn	SEE.MEn

CONFIGURATION PARAMETERS

All the configurable parameters are described on the following pages. For the purpose of describing each parameter, if applicable, the fieldbus address corresponding to such parameter is specified. If the parameter is of the selectable type, the value to be entered into the register for the desired selection is specified in "[ ]".

WEIGHT CONSTANTS MENU

This menu can only be accessed in case of FREE operation or of METRIC operation with access of the authorized staff via password.

CAPAC LOAD CELL CAPACITY [1103-1104]

Defines the value corresponding to the sum of the nominal capacity of the load cells expressed in kg. In case of systems with one load cell and "N" fixed supports, enter the cell's capacity value for the total number of supports. This figure is the full-scale value of the weighing system. Following a change of the parameter's value, theoretical weight calibration is recalculated.

Values: 1 to 999999
Default: 0

SEnSIt LOAD CELL SENSITIVITY [1105]

Set the value corresponding to the average load cell sensitivity in mV/V. Values between 0.0 and 4 mV/V are accepted. If no value is set, 2mV/V is assumed.

Following a change of the sensitivity value, theoretical weight calibration is performed.

Values: 0.0000 to 4.0000 mV/V
Default: 2.0000

rESoL DIVISION VALUE [1101÷1102]

The value of an individual division in kg. The ratio of the system's capacity to the division value represents system resolution (number of divisions).

Following a change of the division value, if the system's capacity is not modified, weight calibration is automatically adjusted.

Selectable values:
0.0001 - 0.0002 - 0.0005
0.001 - 0.002 - 0.005
0.01 - 0.02 - 0.05
0.1 - 0.2 - 0.5
1 -2 - 5
10 - 20 - 50
Default: 1
Note: Division value setting via Modbus occurs differently than via the unit. Please refer to addresses 1101 and 1102 in the Modbus register table.

PrLoAd FIXED TARE OF THE WEIGHING SYSTEM [1106-1107]

Fixed tare value set-up in the weighing system.

Values: 0 to Capacity Value
Default: 00000

MrnG 1 MULTIRANGE 1 [1108-1109]

First multirange field capacity set-up in case of 2 or 3-field multirange

Values: 0 to Capacity Value
Default: 00000

MrnG 1 MULTIRANGE 2 [1110-1111]

Second multirange field capacity set up in case of 3-field multirange

Values: 0 to Capacity Value
Default: 00000

CALIBRATION MENU

The calibration method described herein should be implemented using sample bulks and/or a product pre-weighed on a sample scale.

Always perform zero point calibration before calibrating the full scale.

During calibration the display shows the weight alternating with the word CAL.

WARNING: If the unit is switched off without exiting the set-up menu, the set-up is not saved.

NOTE: If the system shows logical errors after calibration, ensure that the weighed structure is completely free of mechanical constraints.

ZERO POINT CALIBRATION ZERO

This step should be performed when the scale is empty (including the fixed tare) and weight is stable. System zero is calibrated by pressing the 0 key.

The displayed weight is zeroed and the display shows CAL alternating with 0. This step can be repeated several times.

FULL-SCALE CALIBRATION TARE

Place the sample weight on the scale before performing this step and wait for stabilization; the display shows a weight value.

Press the TARE key to adjust the displayed weight. The display shows 0. Enter the real value of the weight placed on the scale using the numeric keys. Press the PRG key to adjust weight. The display shows CAL alternating with the real weight value entered.

Full-Scale calibration can always be repeated.

Press and hold the PRG key to return to the CaL Ibr menu.

LINEARIZATION PROCEDURE FUN

Up to 5 linearization points can be saved on the positive scale. The progressive number of the linearized points is shown on the display as a flashing value (alternating with weight).

The linearization procedure can be discontinued and then resumed; the linearized points are not cleared when the function is restarted.

Press the CLR key for 2 seconds to clear all the linearization points.

The linearization points can be entered at random (not necessarily from the lowest to the highest weight).

Press the TARE key to set the value of the loaded and stabilized sample weight. Upon confirming the value by pressing the PRG key, the system automatically shifts to the next point.

The process ends automatically when the fifth linearization point is set. Less than 5 points can be saved.

Press the exit key ← to end the procedure.

AN EXAMPLE OF CONFIGURATION/CALIBRATION

Theoretical Full Scale calibration of the MC 315 is performed by setting up the above parameters. This procedure must be completed with zero point calibration as described below. The procedure ensures good system accuracy if no mechanical issues exist (max. error <1% F.S.).

When the rESOLU selection is modified, full-scale calibration is automatically recalculated. No selections incompatible with the calibration parameters or with the saved calibration are accepted.

A tank needs to be weighed. Its empty weight is 750 kg and its capacity is 1,000lt. It contains a product with a specific gravity of 1.3 kg/ dm3 whose weight is to be read with a 0.2 kg display resolution.

Before starting configuration, ensure that the load cells are duly connected with the unit and that the tank is empty. Then set the parameters.

Use:

No. 3 load cells with a 1000 Kg capacity

Sensitivity: 2.0015, 2.0008, and 1.9998 mV/V respectively (mean value= 2.0007 mV/V)

Select the following values for the configuration parameters:

L.C. CAP = 3000

L.C. SEn = 2.0007

SYSt.FS = 1500

dEAd L. = 0

rESoLU = 0.2

Ensure that the value displayed in the SIGNAL parameter of the TEST menu matches with the tare of the system according to the following proportion:

3000 : 2.0007 = 750 : X

where X is the signal's value in mV/V corresponding to the theoretical value of the empty tank's weight. The value should be approximately 0.5 mV/V.

You can now proceed with calibration as described in the section below, or exit the configuration menu while saving the entered data.

The unit should display the value corresponding to the weight of the empty tank (e.g. 756.8).

You can now access the configuration menu again to enter the value of weight read in the dEAd L parameter and enter the value 756.8.

Exit the configuration menu again while saving the data.

For more accuracy, place sample weights or some pre-weighed material on a certified scale and calibrate as described in the next section.

EXITING THE CALIBRATION MENU

To exit the CAL Ib menu, press the 

key until StorE? appears.

Press the  key to store the new calibration and exit the set-up menu.

WEIGHING PARAMETERS

FILtEr WEIGHT FILTER VALUE [1208]

Low filter values speed up weight updating to the detriment of stability. High filter values slow down weight updating and make it more stable.

Factor (Hz)	Settling Time (mS)	Freq ADC (Hz)	Nr of reading	Monotony Time (mS)	Oscillation time (mS)	Oscillation range (div)
F0	100	50	5	20	4000	10
F1	300	50	15	40	3000	12
F2	500	50	25	80	2500	16
F3	700	50	35	100	2000	20
F4	900	50	45	240	1500	25
F5	1100	50	55	240	1500	25
F6	1300	50	65	300	1500	25
F7	1500	50	75	400	1500	25
F8	1700	50	85	500	1200	30
F9	1900	50	95	600	1000	30

Value *Variation*
F0 *High-speed weight reading, low stability*
F9 *Low-speed weight reading, high stability*
Default: *F5*

uSE UNIT OPERATION *

Unit operation mode selection. When shifting from FREE to METRIC operation, setting confirmation requires the password-based authentication of the authorized staff.

Value *Variation*
Free *Free operation. [0]*
Trade *METRIC operation. [1]*
Default: *Free*

SYS FS SYSTEM FULL SCALE * [1201-1202]

Maximum system capacity set-up, expressed in the weight division value.

Value: *0 to Cell capacity.*
Default: *Cell capacity*

MotIon WEIGHT STABILITY* [1203]

This parameter defines the number of divisions required to consider weight as stable.

A high number of divisions allows the indicator to quickly record weight stability, which is required to execute the tare and print commands.

Value from 0 to 4
Default: *2*

AUto-0 AUTO-ZERO UPON SWITCH-ON [1204-1205]

This parameter defines the value of the maximum weight that can be zeroed when the unit is switched on. Such operation corresponds to zero-point calibration of the system and is only performed if weight is stable and below the set-up value.

Value: 0 to capacity. Default: 0

0-trAC ZERO TRACKING* [1206]

Set-up of the zero tracking value in divisions per second. This function consists in executing automated zero-point calibration when weight changes slowly in time, as controlled by this parameter. Select NONE to disable this function. The maximum weight resettable from this function is 2% of system capacity (parameter SYS FS)

Value	*Variation*
0	*Control excluded*
1	*0.5 div/sec*
2	*1 div/sec*
3	*2 div/sec*
4	*3 div/sec*

Default: 0

0-bAnd ZERO BAND* [1207]

This parameter defines the number of divisions that can be zeroed by pressing the front zero key or via the associated Input.

Value: 0 to 200.

Default: 100

G-CAL GRAVITY IN THE PLACE OF CALIBRATION [1209-1210]

Set-up of the gravity value in the place of calibration. (**)

Values: 9.70000 to 9.84000

Default: 0

G-uSE GRAVITY IN THE PLACE OF USE [1211-1212]

Set-up of the gravity value in the place where the unit is used. (**)

Values: 9.70000 to 9.84000

Default: 0

(*) These parameters are only used in case of FREE operation or in case of METRIC operation with calibration bridge enabled.

(**) Following a change of these values, weight calibration is adjusted according to the entered acceleration and gravity parameters. This function is only executed if both parameters, "G-CAL" and "G-USE", are set to a value other than 0.

SERIAL COMMUNICATION PARAMETERS

This menu allows to configure the serial ports and the communication parameters. The unit has three independent serial ports:

COM1 and COM2 always with the RS485 interface; COM3, which uses fiber optics to connect various devices in a safe zone.

C 1Prot. COM1 PROTOCOL

Defines the usage mode of the COM1 serial port:

Selectable values:

None: *Serial communication disabled*

Contin: *Continuous transmission of the weight string. Can be used, among other things, to drive a weight repeater. See the relevant section for details.*

on deM: *A weight string is transmitted when the operator presses the relevant front key or via Input. The command is only executed if weight is stable. Weight should vary by at least 20 divisions between two subsequent transmissions.*

Autom: *A weight string is automatically transmitted when weight stabilizes on a value above minimum weighing (20 divisions).*

Slave: *ASCII Protocol. See the relevant section for details.*

Default: Slave

C 1bAud. COM1 BAUD RATE

Defines the baud rate of the COM1 serial port.

The value should be set to the same value as the PC/PLC or the remote display.

Selectable values:

1200; 2400; 4800; 9600; 19200; 38400; 57600; 115200

Default: 9600

C 1FrAM COM1 PROTOCOL

Frame type. In case of SLAVE protocol, the 7-bit (E-7-1 and O-7-1) data format cannot be selected:

Selectable values:

n-8-1; n-8-2; E-7-2; E-8-1; o-7-2; o-8-1

Default: n-8-1

C2Prot COM2 PROTOCOL

Defines the usage mode of the COM2 serial port:

Selectable values:

None: *Serial communication disabled*

Contin: *Continuous transmission of the weight string. Can be used, among other things, to drive a weight repeater. See the relevant section for details.*

on deM: *A weight string is transmitted when the operator presses the relevant front key or via Input2. The command is only executed if weight is stable. Weight should vary by at least 20 divisions between two subsequent transmissions.*

Autom: *A weight string is automatically transmitted when weight stabilizes on a value above minimum weighing (20 divisions).*

Slave: *ASCII Protocol. See the relevant section for details.*

Modbus: *MODBUS RTU protocol. See the relevant section for details.*

Default: Slave

C2bAud. COM2 BAUD RATE

Defines the baud rate of the COM2 serial port.

The value should be set to the same value as the PC/PLC or the remote display.

Selectable values:

1200; 2400; 4800; 9600; 19200; 38400; 57600; 115200

Default: 9600

C2FrAM COM2 PROTOCOL

Frame type. In case of SLAVE or MODBUS protocol, the 7-bit (E-7-1 and O-7-1) data format cannot be selected:

Selectable values:

n-8-1; n-8-2; E-7-2; E-8-1; o-7-2; o-8-1

Default: n-8-1

C3Prot. COM3 PROTOCOL

Defines the usage mode of the RS232 serial port on an external S318 optical fiber interface:

Selectable values:

None: *Serial communication disabled*

Contin: *Continuous transmission of the weight string. Can be used, among other things, to drive a weight repeater. See the relevant section for details.*

Slave: *ASCII protocol. See the relevant section for details.*

Modbus: *MODBUS RTU protocol. See the relevant section for details.*

on deM: *A weight string is transmitted when the operator presses the relevant front key or via Input 2. The command is only executed if weight is stable. Weight should vary by at least 20 divisions between two subsequent transmissions.*

Default: Slave

C3bAud. COM3 BAUD RATE

Defines the baud rate of the RS232 serial port on an external S318 optical fiber interface.

The value should be set to the same value as the PC/PLC or the remote display.

Selectable values:

1200; 2400; 4800; 9600; 19200; 38400; 57600; 115200

Default: 9600

C3FrAM COM3 PROTOCOL

Frame type. In case of SLAVE or MODBUS protocol, the 7-bit (E-7-1 and O-7-1) data format cannot be selected:

Selectable values:

n-8-1; n-8-2; E-7-2; E-8-1; o-7-2; o-8-1

Default: n-8-1

C4Prot. COM4 PROTOCOL

Defines the usage mode of the RS485 serial port on an external S318 optical fiber interface:

Selectable values:

None: *Serial communication disabled*

Contin: *Continuous transmission of the weight string. Can be used, among other things, to drive a weight repeater. See the relevant section for details.*

Slave: *ASCII protocol. See the relevant section for details.*

Modbus: *MODBUS RTU protocol. See the relevant section for details.*

on deM: *A weight string is transmitted when the operator presses the relevant front key or via Input 2. The command is only accepted if weight is stable. Weight should vary by at least 20 divisions between two subsequent transmissions.*

Default: Slave

C4bAud. COM4 BAUD RATE

Defines the baud rate of the RS485 serial port on an external S318 optical fiber interface.

The value should be set to the same value as the PC/PLC or the remote display.

Selectable values:

1200; 2400; 4800; 9600; 19200; 38400; 57600; 115200

Default: 9600

C4ForM COM3 PROTOCOL

Frame type. In case of SLAVE or MODBUS protocol, the 7-bit (E-7-1 and O-7-1) data format cannot be selected:

Selectable values:

n-8-1; n-8-2; E-7-2; E-8-1; o-7-2; o-8-1

Default: n-8-1

AddrES COMMUNICATION ADDRESS

Communication address of the unit:

Values: 1 to 32 Default: 1

COM 4 PARAMETERS WITH A PROFINET / ETHERCAT IN PLACE

EnFbuS. FIELDBUS ENABLING

Enabling of PROFINET / ETHERCAT field bus; if OFF, no error messages concerning Fieldbus communication are displayed:

Selectable values:

OFF; ON

Default: OFF

inP.rEG. INPUT AREA SIZE

Input area size for field bus (value in Bytes).

Selectable values:

32, 64, 96, 128

Default: 128

out.rEG. OUTPUT AREA SIZE

Output area size for field bus (value in Bytes).

Selectable values:

32, 64, 96, 128

Default: 128

AddrES COMMUNICATION ADDRESS

Communication address of the unit:

Values: 1 to 32

Default: 1

In case of PROFINET field Bus, the XML configuration file "GSDML-V2.3-HILSCHER- NIC 50-RE PNS 32-20160122.xml" is provided. The size of the input and output areas set in the PLC (possible selections: 32, 64, 96 o 128 byte) should match with the size of the input and output areas selected in the unit ("INP.REG." and "OUT.REG." parameters).

The units are supplied with the "Profinet Name" parameter not configured and with IP address 0.0.0.0.

In case of ETHERCAT field Bus: the units should be connected ring-wise (as per EtherCAT specification); please refer to the installation manual for use of the INPUT and OUTPUT ports.

Four different XML configuration files are provided:

"Hilscher NIC 50-RE ECS V2.2 32 Byte.xml" (input area 32 bytes, output area 32 bytes).

"Hilscher NIC 50-RE ECS V2.2 64 Byte.xml" (input area 64 bytes, output area 64 bytes).

"Hilscher NIC 50-RE ECS V2.2 96 Byte.xml" (input area 96 bytes, output area 96 bytes).

"Hilscher NIC 50-RE ECS V2.2 128 Byte.xml" (input area 128 bytes, output area 128 bytes).

The file corresponding to the size of the input and output areas selected in the unit should be imported into the PLC (e.g., if InP.rEG.=128 and oUt.rEG.=128 is set in the unit, file "Hilscher NIC 50-RE ECS V2.2 128 Byte.xml" should be imported into the PLC). Multiple files of different sizes can be imported, but in this case the automated search and configuration function of the network devices cannot be executed.

COM 4 PARAMETERS WITH AN ETHERNET IP IN PLACE

EnFbuS. FIELDBUS ENABLING

Enabling of ETHERNET IP fieldbus; if OFF, no error messages concerning Fieldbus communication are displayed:

Selectable values:

OFF; ON

Default: OFF

iP IP ADDRESS

ETHERNET protocol IP address.

Values: 0.0.0.0 to 255.255.255.255

Default: 0.0.0.0

SubnEt SUBNET MASK

ETHERNET protocol Subnet Mask.

Values: 0.0.0.0 to 255.255.255.255

Default: 0.0.0.0

inP.rEG. INPUT AREA SIZE

Input area size for field bus (value in Bytes).

Selectable values:

32, 64, 96, 128

Default: 128

out.rEG. OUTPUT AREA SIZE

Output area size for field bus (value in Bytes).

Selectable values:

32, 64, 96, 128

Default: 128

AddrES COMMUNICATION ADDRESS

Communication address of the unit:

Values: 1 to 32

Default: 1

In case of ETHERNET IP fieldBus, the EDS configuration file "HILSCHER NIC 50-RE EIS V1.1.EDS" is provided. The size of the input and output areas set in the PLC (input area default 128 bytes, output area default 128 bytes) should match with the size of the input and output areas selected in the unit ("INP. REG." and "OUT.REG." parameters).

COM 4 PARAMETERS WITH PROFIBUS IN PLACE

EnFbuS. FIELDBUS ENABLING

Enabling of PROFIBUS fieldbus; if OFF, no error messages concerning Fieldbus communication are displayed:

Selectable values:

OFF; ON

Default: OFF

Addr.IP PROFIBUS ADDRESS

Setting-up of the address used in the PROFIBUS protocol.

Value: 0 to 126

Default:01

inP.rEG. INPUT AREA SIZE

Input area size for field bus (value in Bytes).

Selectable values:

32, 64, 96, 128

Default: 128

outrEG. OUTPUT AREA SIZE

Output area size for field bus (value in Bytes).

Selectable values:

32, 64, 96, 128

Default: 128

AddrES COMMUNICATION ADDRESS

Communication address of the unit:

Values: 1 to 32

Default: 1

In case of Profibus field Bus, the GSD configuration file "hms_1810.gsd" is provided. The size of the input and output areas set in the PLC (input area default 128 bytes, output area default 128 bytes) should match with the size of the input and output areas selected in the unit ("INP.REG." and "OUT. REG." parameters).

INPUT/OUTPUT PARAMETERS

Fun1 n.1 INPUT 1 FUNCTION
Selection of the function associated with input 1. [1301]

Selectable values:
Zero: *Performs zero-point calibration. [0]*
Tare: *Performs auto-tare. [1]*
Del.Tar: *Deletes the tare. [2]*
Send: *On-demand data transmission. (**) [3]*
Default: Zero

FUn1 n.2 INPUT 2 FUNCTION
Selection of the function associated with input 2. [1302]

Selectable values:
Zero: *Performs zero-point calibration. [0]*
Tare: *Performs auto-tare. [1]*
Del.Tar: *Deletes the tare. [2]*
Send: *On-demand data transmission. (**) [3]*
Default: Zero

ModE 1 Set point 1 OPERATION MODE
Select 4 subsequent operation criteria of set point 1: [1303]

Compare with net weight, gross, weight, or peak. In the latter case, comparison occurs with the last acquired peak value, even if the peak function is not enabled.

NET The relay output is enabled in the Net Weight mode. [0]
GROSS The relay output is enabled in the Gross Weight mode. [1]
Default: GROSS

Select the output status whether normally open or closed: [1304]

n.oPEn Relay 1 is normally open. [0]
n.CLoSE Relay 1 is normally closed. [1]
Default: n. oPEn.

Select whether positive or negative values should be compared: [1305]
PoSIt.. The output operates with positive weight. [0]
nEGAt. The output operates with negative weight. [1]
ALL: The output operates both with positive and with negative weight. [2]
Default: PoSIt

Select whether stable only or both stable and unstable weight values should be compared: [1306]

norMAL Output 1 is enabled with unstable weight. [0]
StAbLE Output 1 is enabled with stable weight. [1]
Default: norMAL

nodE 2 SET POINT 1 OPERATION MODE

Select 4 subsequent operation criteria of set point 1: [1308]

Compare with net weight, gross, weight, or peak. In the latter case, comparison occurs with the last acquired peak value, even if the peak function is not enabled.

NET *The relay output is enabled in the Net Weight mode. [0]*

GROSS *The relay output is enabled in the Gross Weight mode. [1]*

Default: GROSS

Select the output status whether normally open or closed: [1309]

n.oPEn *Relay 1 is normally open. [0]*

n.CLoSE *Relay 1 is normally closed. [1]*

Default: n. oPEn.

Select whether positive or negative values should be compared: [1310]

PoSIt.. *The output operates with positive weight. [0]*

nEGAt. *The output operates with negative weight. [1]*

ALL: *The output operates both with positive and with negative weight. [2]*

Default: *PoSIt*

Select whether stable only or both stable and unstable weight values should be compared: [1311]

norMAL *Output 1 is enabled with unstable weight. [0]*

StAbLE *Output 1 is enabled with stable weight. [1]*

Default: *norMAL*

HYSt. 2 SET POINT 2 HYSTERESIS [1313]

Hysteresis value vs. the set value set point.

Value: 0 to Capacity

Default: 2

SAME PARAMETERS FOR SET POINTS UP TO 6

FUNCTIONAL FEATURES SET-UP

PASSW. PASSWORD SET-UP [1001]

Setting of the password to access the set-up menu of the unit. If set, password entry is always requested to access the set-up menu. Set this parameter to 0 to disable this function.

Value: 0000 to 9999.

Default: 0000 (no Password)

dnLoAd. DOWNLOAD FUNCTION

Set-up data export procedure via COM1 RS485. (*)

uPLoAd. UPLOAD FUNCTION

Set-up data import procedure via COM1 RS485. (*)

(*) These functions are only displayed in case of FREE operation or in case of METRIC operation with calibration bridge enabled.

DOWNLOAD / UPLOAD SET-UP

Data transfer occurs on the COM1 RS485 communication port. Data is transmitted in the CSV format, as shown below.

<address> ";" <value> CR LF

Where:

<address> :	4-ASCII digit field with the Modbus address of the relevant parameter. All the set-up parameters of the unit shown in the Modbus registers table are available (see section "MODBUS COMMUNICATION PROTOCOL").
<value> :	8-ASCII digit field with right-side alignment of the value parameter (without non-significant zeros and without decimal points).

The data upload function awaits receipt of a file in the above format, whereas the download function sends data on the communication port without waiting for handshake operations; the receiving unit should be in the position to receive data when the function is enabled.

Partial data transmission can be performed. The transmitted file can contain only some of the parameters received with the download function. Downloading and uploading can be performed using the TeraTerm open source PC application.

TEST MENU

MENU	MESSAGGE	DESCRIPTION	TYPE
tESt	SIGnAL	Displays the unit input signal in mV/V	Dis.
	HI rES.	Displays weight with a 10-fold resolution vs. the set one.	Dis.
	PSuPPL.	Displays the power supply measured by the unit.	Dis.
	InPut	Logical input testing procedure (see specific description).	Test.
	oUtPut	Logical output testing procedure (see specific description).	Test.
	CoM 1	RS485 COM1 serial port testing procedure (see specific description).	Test.
	CoM 2	RS485 COM2 serial port testing procedure (see specific description).	Test.
	FibEr	COM3/COM4 optical fiber serial port testing procedure (see specific description).	Test.

(*) Load cell tests refer to the channel enabled when accessing the set-up menu of the unit. Use the relevant function key to switch the active cell.

INPUT TEST FUNCTIONS

After accessing the Input test function, the message in 00 is displayed, where 00 depends on the status of logical input, as per the following table:

VALUE	MEANING
In 00	No input enabled
In 01	Input 1 enabled
In 10	Input 2 enabled
In 11	Inputs 1 & 2 enabled

OUTPUT TEST FUNCTIONS

After accessing the Output test function, the message out 0 is displayed, where 0 depends on the status of logical output, as per the following table. The output to be enabled is selected using the numeric keys.

	VALUE	MEANING
0	out 0	No logical output is enabled.
1	out 1	Logical output 1 is enabled, all the other outputs are disabled.
2	out 2	Logical output 2 is enabled, all the other outputs are disabled.
3	out 3	Logical output 3 is enabled, all the other outputs are disabled.
4	out 4	Logical output 4 is enabled, all the other outputs are disabled.
5	out 5	Logical output 5 is enabled, all the other outputs are disabled.
6	out 6	Logical output 6 is enabled, all the other outputs are disabled.

COM1/COM2/OPTICAL FIBER TEST FUNCTIONS

After accessing the test function of the relevant COM port, the following message is displayed:

00r.00C

The test consists in transmitting the string received from the relevant serial line (echo) and displaying the number of strings received and the number of characters received in the last string.

00r	= Number of strings received.
00C	= Number of characters received in the last string.

Press the CLR key to clear the counters of the strings and characters received.

ANALOGICAL OUTPUT PARAMETERS (OPTIONAL)

This menu is only displayed if the optional analogical output is configured.

rAnGE. ANALOGICAL OUTPUT RANGE [1506]

Select the analogical output field.

Selectable values:
0÷10 Vdc [0]
0÷5 Vdc [1]
4÷20 mA [2]
0÷20 mA [3]
Default: 0÷10 Vdc

nodE. ANALOGICAL OUTPUT OPERATION MODE [1505]

Select the value to be associated with the analogical output, corresponding to net weight, gross weight, or peak value.

Selectable values:
NET [0]
GROSS [1]
Default: NET

An 0. ANALOGICAL OUTPUT ZERO VALUE [1501-1502]

Analogical value to be subtracted, referred to the analogical output's full scale.

An FS. FULL SCALE [1503-1504]

The weight corresponding to the full scale of the analogical output.

Selectable value: 0 to Capacity
Default: Capacity

OF Adj. ZERO OFFSET ADJUSTMENT

Measure the analogical output value with a tester to perform zero-point calibration.

Use the  and  keys to adjust the analogical output. Press and hold the key for quick change.

Press the 

key to return to the menu.

FS.Adj. FULL SCALE OFFSET ADJUSTMENT

Measure the analogical output value with a tester to calibrate the Full Scale (FS).

Use the  and  keys to adjust the analogical output. Press and hold the key for quick change.

Press the 

key to return to the ANALOG menu.

This procedure is available to the user for adjustment, for each selectable range. In case of full reset of the setup memory (with PC configuration), factory calibration values are restored.

ACCESS DISPLAY

This menu is only displayed in case of METRIC operation.

SUBMENU	MESSAGE	NAME	DESCRIPTION	TYPE
ACCESS	ACC-01	Access 01	Procedure to display the last access of the authorized staff.	Spc
	ACC-02	Access 02	Procedure to display the last access but one of the authorized staff.	Spc
	ACC-03	Access 03	Procedure to display the last access but two of the authorized staff.	Spc
	ACC-04	Access 04	Procedure to display the last access but three of the authorized staff.	Spc
	ACC-05	Access 05	Procedure to display the last access but four of the authorized staff.	Spc

ACCESS DISPLAY PROCEDURE

Press PRG to enter: the operator code used to access unit set-up and the progressive number of accesses are displayed as described below:

Id.0000

The ID code used for access is shown on the display (password table). If access occurred via calibration bridge, the identification code 0000 is displayed.

Press PRG to continue with the display of the progressive number of the access.

Pr.0000

The progressive number of the access is shown on the display (this value increases at each access and is never zeroed). Press PRG to exit the access display procedure.

ALIBI MEMORY CONSULTATION

This menu is only displayed in case of METRIC operation.

SUBMENU	MESSAGE	NAME	DESCRIPTION	TYPE	RANGE
AL .MEM	SEE.MEM.	Consult alibi memory	Procedure for consulting the weighings saved in the Alibi memory.	Spc	0÷959999

In case of METRIC operation and alibi memory enabled:

- Each weighing performed is saved in the alibi memory.
- Each weighing is attributed an ID code valued between 0 and 959999
- The weighing ID code is transmitted on the serial port upon weighing.

ALIBI MEMORY CONSULTATION PROCEDURE

000000
Enter the ID code of the weighing and confirm by pressing PRG.

0.000
The net weight is shown on the display, associated with the requested ID code. Press the ZERO key to exit the alibi memory consultation procedure.

no Cod.
If the requested ID code is not included in the alibi memory, the timed message “NO COD” is displayed.

SERIAL COMMUNICATION PROTOCOLS

CONTINUOUS ASCII AND MANUAL PROTOCOL

Continuous transmission is performed at the weight update frequency, in accordance with the serial transmission baud rate. On-demand transmission can be performed using the specific function key or via logical input.

In case of FREE operation, the string is transmitted with the Continuous and On-Demand protocols:

STX	<status>	<net>	ETX	<chksum>	EOT

In case of METRIC operation, the string is transmitted with On-Demand protocols:

STX	<status>	<net>	weighing ID	ETX	<chksum>	EOT

where:

STX (start of text) = 0x02h

ETX (end of text) = 0x03h

EOT (end of transmission) = 0x04.

<status> = character encoded according to the following table (bit = 1 if condition TRUE):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	1	Tare entered	Zero band	Stable weight	Zero point

<net> = 8-ASCII digit field with the weight value aligned on the right side without non-significant zeros, with any decimal points and negative mark.

In conditions of overweight, the field's value is "^^^^^^^^".

In conditions of negative weight above 99999, the field's value is " ".

In conditions of weight reading error, the field's value is " O-L ".

<weighing ID> = 7-ASCII digit field with the ID code of the weighing aligned on the right (without non-significant zeros).

<chksum> = string data control sum. It is calculated by executing the exclusive OR (XOR) of all the digits from STX (or <Addr>) to ETX, the latter excluded; the result of the XOR is broken down in 2 digits, considering the 4 upper bits (first digit) and the 4 lower bits (second digit) separately; the 2 digits obtained are then ASCII-encoded;

(example: XOR = 5Dh; <csum> = "5Dh", i.e. 35h and 44h).

SLAVE PROTOCOL

LIST OF THE AVAILABLE COMMANDS:

1. Net weight query.
2. Auto-tare command.
3. Tare clear command.
4. Semi-automated zero command.
5. Weight set point setting.
6. Set set point query.
7. Command for set point saving in permanent memory.
8. Logical output enabling.
9. Logical inputs status query.
10. Weighing execution command.

The device connected with the unit (typically a personal computer) performs MASTER functions and is the only device capable to start a communication procedure.

The communication procedure should always include the transmission of a string by the MASTER, followed by a response from the concerned SLAVE.

COMMAND FORMAT DESCRIPTION:

The double quote marks (inverted commas) enclose constant characters (observe upper and lower cases); the symbols < and > enclose variable numeric fields. The Field <Addr> represents the unit ID. In case of communication on the RS485 port, it is obtained by summing up 80h and the address value of the unit (example: with address 3, <Addr> = 80h + 03h = 83h).

1. NET WEIGHT QUERY

Master: <Addr> "N" EOT

MC 315: <Addr> "N" <status> <net> ETX <chksum> EOT or <Addr> NAK EOT

2. AUTO-TARE COMMAND

Master: <Addr> "A" EOT

MC 315: <Addr> "A" ACK EOT or <Addr> NAK EOT

3. TARE-CLEAR COMMAND

MASTER: <Addr> "DT" EOT

MC 315: <Addr> "D" ACK EOT or <Addr> NAK EOT

4. SEMI-AUTOMATED ZERO COMMAND

Master: <Addr> "Z" EOT

MC 315: <Addr> "Z" ACK EOT or <Addr> NAK EOT

5. WEIGHT Set point SETTING

Master: <Addr> "S" <index> <set point> ETX <csum> EOT

MC 315: <Addr> "S" ACK EOT or <Addr> NAK EOT

The value set points should be lower than the full-scale parameter.

6. SET Set point QUERY

Master: <Addr> "R" <index> <set point> EOT

MC 315: <Addr> "R" <index> <set point> ETX <csum> EOT or <Addr> NAK EOT

7. PERMANENT Set point STORAGE COMMAND

Master: <Addr> "E" EOT

MC 315: <Addr> "E" ACK EOT or <Addr> NAK EOT

8. LOGICAL OUTPUTS ENABLING

Master: <Addr> "U" <outputs> EOT

MC 315: <Addr> "U" ACK EOT or <Addr> NAK EOT


All setpoint values should be set to 0 in order to use this function.

9. LOGICAL INPUTS STATUS QUERY

Master: <Addr> "I" EOT

MC 315: <Addr> "I" <inputs> ETX <csum> EOT or <Addr> NAK EOT

where:

In case of communication error, or command not recognized by MC 315, the latter will reply with the following string:

MC 315: <Addr> NAK EOT

<index>: Single ASCII digit corresponding to the set point number ("1" to "6").

<set point>: Formatted as the <net> field (see continuous protocol).

<outputs>: 2 ASCII digits encoded as from the following table (big = 1 if output enabled).

1st digit

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	output 4	output 3	output 2	output 1

2nd digit

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	0	0	output 6	output 5

<inputs>: single ASCII digit encoded as from the following table (bit = 1 if input enabled).

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	0	0	input 2	input 1

10. WEIGHING EXECUTION COMMAND

This command is only available in case of METRIC operation. Conditions for possible use include:

- Stable weight.
- Weight changed by at least 20 divisions (weight delta) since the last weighing performed.
- Gross weight is equal to or higher than minimum weighing (20 divisions) and lower than maximum capacity.
- Net and gross weight are positive and not null.

Master: <Addr> "P" EOT

MC 315: <Addr> "P" <status> <net> <weighing ID> ETX <chksum> EOT

or <Addr> NAK EOT

MODBUS RTU PROTOCOL

The addresses in the table below follow the standard routing specified in the reference guide of the Modicom PI-MBUS-300. An abstract is provided below to ensure smooth user-unit communication.

"All data addresses in Modbus messages are referenced to zero. The first occurrence of a data item is addressed as item number zero. For example:

The coil known as 'coil 1' in a programmable controller is addressed as coil 0000 in the data address field of a Modbus message.

Coil 127 decimal is addressed as coil 007E hex (126 decimal).

Holding register 40001 is addressed as register 0000 in the data address field of the message. The function code field already specifies a 'holding register' operation. Therefore the '4XXXX' reference is implicit."

Execute the MAKE – BACKUP function to confirm a new value entry in E2prom. If such function is not executed, the value prior to the change is restored when the MC 315 is switched off.

Unless otherwise specified, numeric values (such as addresses, codes, and data) are expressed as decimal values.

The MODBUS RTU II protocol is only available on COM2 RS485.

COMMUNICATION ERROR MANAGEMENT

Communication strings are controlled via CRC (Cyclical Redundancy Check). In case of communication error, the slave does not reply with a string. The master should consider a timeout for response receipt. If no response is received, the master should assume that a communication error has occurred.

MANAGEMENT OF ERRORS IN THE DATA RECEIVED

If a string is duly received but is not executable, the slave replies with an EXCEPTION RESPONSE according to the following table.

CODE	DESCRIPTION
1	ILLEGAL FUNCTION (The function is invalid or not supported)
2	ILLEGAL DATA ADDRESS (The specified data address is no longer available)
3	ILLEGAL DATA VALUE (The received data has an invalid value)

SUPPORTED FUNCTIONS:

FUNCTION	DESCRIZIONE
01	READ COIL STATUS (Logical output status reading)
02	READ INPUT STATUS (Logical input status reading)
03	READ HOLDING REGISTERS (Programmable register reading)
04	READ INPUT REGISTERS ("Read-only" register reading)
05	FORCE SINGLE COIL (Single output status writing)
06	PRESET SINGLE REGISTER (Writing of a pre-set register)
15	FORCE MULTIPLE COILS (Multiple output writing)
16	PRESET MULTIPLE REGISTERS (Multiple register writing)
Funct + 80h	EXCEPTION RESPONSE

MODBUS PROTOCOL HOLDING REGISTERS LIST

The unit's parameters that can be read or set via the communication interfaces available thereon, based on hardware configuration, are listed in the following table.

Type-R registers are the readable ones, whereas W-type registers are the writeable ones.

In case of Modbus TCP protocol, the unit's address ("Unit Identifier" field) should always be FFh.

If a fieldbus (other than the Modbus) is used, the input area will only contain the R or R/W registers, and the output area will only contain the W or R/W registers.

The registers' size is 16 bits.

Addr	Holding Register	R/W	Notes
0001	Status Register	R	See relevant table.
0002	Gross weight (MSB)	R	INT. value - Most significant word
0003	Gross weight (LSB)	R	INT. value - Least significant word
0004	Net weight (MSB)	R	INT. value - Most significant word
0005	Net weight (LSB)	R	INT. value - Least significant word
0006	Digital Inputs	R	See relevant table.
0007	Digital Outputs	R	
0101	Net weight at last weighing performed (MSW)	R	INT. value - Most significant word
0102	Net weight at last weighing performed (LSW)	R	INT. value - Least significant word
0103	Code of last weighing performed (MSW)	R	INT. value - Most significant word
0104	Code of last weighing performed (LSW)	R	INT. value - Least significant word
0105	Cell of last weighing performed	R	INT. value - 0 to 1 (0 = cell channel A, 1 = cell channel B)
0201	Set-Point 1, channel A (MSW)	R/W	INT. value - Most significant word
0202	Set-Point 1, channel A (LSW)	R/W	INT. value - Least significant word
0203	Set-Point 2, channel A (MSW)	R/W	INT. value - Most significant word
0204	Set-Point 2, channel A (LSW)	R/W	INT. value - Least significant word
0205	Set-Point 3, channel A (MSW)	R/W	INT. value - Most significant word
0206	Set-Point 3, channel A (LSW)	R/W	INT. value - Least significant word
0207	Set-Point 4, channel A (MSW)	R/W	INT. value - Most significant word
0208	Set-Point 4, channel A (LSW)	R/W	INT. value - Least significant word
0209	Set-Point 5, channel A (MSW)	R/W	INT. value - Most significant word
0210	Set-Point 5, channel A (LSW)	R/W	INT. value - Least significant word
0211	Set-Point 6, channel A (MSW)	R/W	INT. value - Most significant word
0212	Set-Point 6, channel A (LSW)	R/W	INT. value - Least significant word
0251	Set-Point 1, channel B (MSW)	R/W	INT. value - Most significant word
0252	Set-Point 1, channel B (LSW)	R/W	INT. value - Least significant word
0253	Set-Point 2, channel B (MSW)	R/W	INT. value - Most significant word
0254	Set-Point 2, channel B (LSW)	R/W	INT. value - Least significant word
0255	Set-Point 3, channel B (MSW)	R/W	INT. value - Most significant word
0256	Set-Point 3, channel B (LSW)	R/W	INT. value - Least significant word
0257	Set-Point 4, channel B (MSW)	R/W	INT. value - Most significant word
0258	Set-Point 4, channel B (LSW)	R/W	INT. value - Least significant word
0259	Set-Point 5, channel B (MSW)	R/W	INT. value - Most significant word
0260	Set-Point 5, channel B (LSW)	R/W	INT. value - Least significant word
0261	Set-Point 6, channel B (MSW)	R/W	INT. value - Most significant word
0262	Set-Point 6, channel B (LSW)	R/W	INT. value - Least significant word
0501	Data Register (MSB)	W	INT. value - Most significant word (See relevant table)

0502	Data Register (LSB)	W	INT. value - Least significant word (See relevant table)
0503	Command Register	W	See relevant table.
1101	(*) Weight division value, channel A	R/W	See relevant table.
1102	(*) Decimals, channel A	R/W	
1103	(*) Load cell capacity, channel A (MSW)	R/W	INT. value - Most significant word
1104	(*)Load cell capacity, channel A (LSW)	R/W	INT. value - Least significant word
1105	(*) Load cell sensitivity, channel A	R/W	INT. value
1106	(*) Fixed tare, channel A (MSW)	R/W	INT. value - Most significant word
1107	(*)Fixed tare, channel A (LSW)	R/W	INT. value - Least significant word
1108	(*) Multirange 1, channel A (MSW)	R/W	INT. value - Most significant word
1109	(*) Multirange 1, channel A LSW)	R/W	INT. value - Least significant word
1110	(*) Multirange 2, channel A (MSW)	R/W	INT. value - Most significant word
1111	(*) Multirange 2, channel A (LSW)	R/W	INT. value - Least significant word
1151	(*) Weight division value, channel B	R/W	See relevant table.
1152	(*) Decimals, channel B	R/W	See relevant table.
1153	(*) Load cell capacity, channel B (MSW)	R/W	INT. value - Most significant word
1154	(*) Load cell capacity, channel B (LSW)	R/W	INT. value - Least significant word
1155	(*) Load cell sensitivity, channel B	R/W	INT. value
1156	(*) Fixed tare, channel B (MSW)	R/W	INT. value - Most significant word
1157	(*) Fixed tare, channel B (LSW)	R/W	INT. value - Least significant word
1158	(*) Multirange 1, channel B (MSW)	R/W	INT. value - Most significant word
1159	(*) Multirange 1, channel B LSW)	R/W	INT. value - Least significant word
1160	(*) Multirange 2, channel B (MSW)	R/W	INT. value - Most significant word
1161	(*) Multirange 2, channel B (LSW)	R/W	INT. value - Least significant word
1201	(*) Full Scale, channel A (MSW)	R/W	INT. value - Most significant word
1202	(*)Full Scale, channel A (LSW)	R/W	INT. value - Least significant word
1203	(*) Weight stability, channel A	R/W	See correspondence in section “weighing parameters”
1204	(*) Auto-zero upon switch-on, channel A (MSW)	R/W	INT. value - Most significant word
1205	(*)Auto-zero upon switch-on, channel A (LSW)	R/W	INT. value - Least significant word
1206	(*) Zero tracking, channel A	R/W	See correspondence in section “weighing parameters”
1207	(*) Resettable divisions, channel A	R/W	INT. value
1208	Filter factor	R/W	See correspondence in section “weighing parameters”
1209	(*) Calibration gravity (MSW)	R/W	INT. value - Most significant word
1210	(*) Calibration gravity (LSW)	R/W	INT. value - Least significant word
1211	(*) Use gravity (MSW)	R/W	INT. value - Most significant word
1212	(*) Use gravity (LSW)	R/W	INT. value - Least significant word
1251	(*) Full Scale, channel B (MSW)	R/W	INT. value - Most significant word
1252	(*) Full Scale, channel B (LSW)	R/W	INT. value - Least significant word
1253	(*) Weight stability, channel B	R/W	See correspondence in section “weighing parameters”
1254	(*) Auto-zero upon switch-on, channel B (MSW)	R/W	INT. value - Most significant word
1255	(*) Auto-zero upon switch-on, channel B (LSW)	R/W	INT. value - Least significant word
1256	(*) Zero tracking, channel B	R/W	See correspondence in section “weighing parameters”
1257	(*) Resettable divisions, channel B	R/W	INT. value
1301	Input 1 function	R/W	See correspondence in section “weighing parameters”
1302	Input 2 function	R/W	See correspondence in section “weighing parameters”

1303	Output 1 mode - Function	R/W	See correspondence in section “serial port parameters”
1304	Output 1 mode - Logical	R/W	See correspondence in section “serial port parameters”
1305	Output 1 mode - Polarity	R/W	See correspondence in section “serial port parameters”
1306	Output 1 mode - Stability	R/W	See correspondence in section “serial port parameters”
1307	Output 1 hysteresis, channel A	R/W	INT. value
1308	Output 1 hysteresis, channel B	R/W	INT. value
1309	Output 2 mode - Function	R/W	See correspondence in section “serial port parameters”
1310	Output 2 mode - Logical	R/W	See correspondence in section “serial port parameters”
1311	Output 2 mode - Polarity	R/W	See correspondence in section “serial port parameters”
1312	Output 2 mode - Stability	R/W	See correspondence in section “serial port parameters”
1313	Output 2 hysteresis, channel A	R/W	INT. value
1314	Output 2 hysteresis, channel B	R/W	INT. value
1315	Output 3 mode - Function	R/W	See correspondence in section “serial port parameters”
1316	Output 3 mode - Logical	R/W	See correspondence in section “serial port parameters”
1317	Output 3 mode - Polarity	R/W	See correspondence in section “serial port parameters”
1318	Output 3 mode - Stability	R/W	See correspondence in section “serial port parameters”
1319	Output 3 hysteresis, channel A	R/W	INT. value
1320	Output 3 hysteresis, channel B	R/W	INT. value
1321	Output 4 mode - Function	R/W	See correspondence in section “serial port parameters”
1322	Output 4 mode - Logical	R/W	See correspondence in section “serial port parameters”
1323	Output 4 mode - Polarity	R/W	See correspondence in section “serial port parameters”
1324	Output 4 mode - Stability	R/W	See correspondence in section “serial port parameters”
1325	Output 4 hysteresis, channel A	R/W	INT. value
1326	Output 4 hysteresis, channel B	R/W	INT. value
1327	Output 5 mode - Function	R/W	See correspondence in section “serial port parameters”
1328	Output 5 mode - Logical	R/W	See correspondence in section “serial port parameters”
1329	Output 5 mode - Polarity	R/W	See correspondence in section “serial port parameters”
1330	Output 5 mode - Stability	R/W	See correspondence in section “serial port parameters”
1331	Output 5 hysteresis, channel A	R/W	INT. value
1332	Output 5 hysteresis, channel B	R/W	INT. value
1333	Output 6 mode - Function	R/W	See correspondence in section “serial port parameters”
1334	Output 6 mode - Logical	R/W	See correspondence in section “serial port parameters”
1335	Output 6 mode - Polarity	R/W	See correspondence in section “serial port parameters”
1336	Output 6 mode - Stability	R/W	See correspondence in section “serial port parameters”
1337	Output 6 hysteresis, channel A	R/W	INT. value
1338	Output 6 hysteresis, channel B	R/W	INT. value

(*) These registers can only be modified in case of FREE operation or in case of METRIC operation with calibration bridge enabled.

TABLE A - STATUS REGISTER ENCODING (ADDR. 0001)

BIT	15	14	13	12	11	10	9	8
Description	N.U.	N.U.	N.U.	N.U.	Execute backup	Multirange (00= Disabled; 01= Field 1; 10= Field 2; 11= Field 3)		Non-calibrated

BIT	7	6	5	4	3	2	1	0
Description	Weight delta	Weight error	Over-load	Under-load	Entered tare	Zero band	Stable weight	Zero point

TABLE B – INPUT ENCODING (ADDR. 0006)

BIT	15÷2	1	0
Description	Not used	IN2 Enable	IN1 Enable

TABLE C – OUTPUT ENCODING (ADDR. 0007)

BIT	15÷6	5	4	3	2	1	0
Description	Not used	Out 6 Enable	Out 5 Enable	Out 4 Enable	Out 3 Enable	Out 2 Enable	Out 1 Enable

WARNING: bits 15 to 4 are not managed and are always worth 0.

TABLE D – DIVISION VALUE ENCODING AND DECIMALS

ADDRESS	DESCRIPTION	ACCEPTED VALUES
1101	Division values	1 - 2 - 5 - 10 - 20 - 50
1102	Number of decimals	0 - 1 - 2 - 3 - 4

TABLE E - COMMAND REGISTER (ADDR. 0503) / DATA REGISTER (ADDR. 0501÷0502) ENCODING

REGISTER VALUE	COMMAND REGISTER FUNCTION	DATA REGISTER FUNCTION
0x0001	Semi-automated zero	
0x0002	Auto-tare	
0x0003	Pre-set tare	Tare value in Data Register MSB and LSB
0x0004	Clear tare	
0x0005	Zero calibration (**)	
0x0006	Full Scale calibration (**)	Sample weight value in MSB and LSB
0x0007	Data saving in permanent memory	
0x0008	Channel switching	Cell channel in Data Register MSB and LSB (0 = cell channel A, 1 = cell channel B)
0x0009	Weighing execution command	
0x3FFF	Output Data Area enabling (*)	

(*) The unit's parameters managed in the Fieldbus Output Data Area are not modified until this command is executed. Upon unit switch-on, the Output Data Area is completely reset, the master Fieldbus must read the setting values from the Input Data Area and copy them into the relevant registers of the Output Data Area; it then must send the enabling command to the Command Register. Otherwise all the settings adjusted in the Output Data Area would be reset upon switch-on.

(**) This function is only available in case of FREE operation or in case of METRIC operation with calibration bridge enabled.

EXAMPLES

ZERO CALIBRATION

In conditions of empty and stable scale, write the hexadecimal value 0005 in the Command Register (0503). Write the hexadecimal value 0007 in the Command Register for permanent saving of the new Zero value.

FULL SCALE CALIBRATION

Place the sample weight on the scale, for example 1256 Kg.

Write the hexadecimal value of sample weight 04E8 in the Data Register (0501 and 0502). Write the hexadecimal value 0006 in the Command Register (0503).

The Command Register and the Data Register can be written in at the same time using the multiple register writing function.

Write the hexadecimal value 0007 in the Command Register for permanent saving of the new Full Scale value.

FIELDBUS PROTOCOL

The input area registers (written by the unit and read by the master), shared by all the PROFIBUS, PROFINET, ETHERCAT, ETHERNET/IP fieldbuses, are listed in the following table.

The registers' size is 16 bits. The input area is updated at a fixed frequency of 125 Hz (80 Hz in case of PROFIBUS fieldbus).

The size of the Input area configured in the master fieldbus should match with the size configured in the unit.

INPUT DATA AREA

Bytes	Register address	INPUT AREA REGISTER	Notes
1-2	0	Status Register	See relevant table.
3-4	1	Gross weight (MSW)	INT. value - Most significant word
5-6	2	Gross weight (LSW)	INT. value - Least significant word
7-8	3	Net weight (MSW)	INT. value - Most significant word
9-10	4	Net weight (LSW)	INT. value - Least significant word
11-12	5	Digital inputs	See relevant table.
13-14	6	Digital outputs	See relevant table.
15-16	7	Monitor register	This value corresponds to the equivalent register in the output area.
17-18	8	Net weight of last weighing performed (MSW)	INT. value - Most significant word
19-20	9	Net weight of last weighing performed (LSW)r	INT. value - Least significant word
21-22	10	Code of last weighing performed (MSW)	INT. value - Most significant word
23-24	11	Net weight of last weighing performed (LSW)	INT. value - Least significant word
25-26	12	Cell of last weighing performed	INT. value - Da 0 a 1 (0 = cell channel A, 1 = cell channel B)
27-28	13	Set-Point 1, channel A (MSW)	INT. value - Most significant word
29-30	14	Set-Point 1, channel A (LSW)	INT. value - Least significant word
31-32	15	Set-Point 2, channel A (MSW)	INT. value - Most significant word
33-34	16	Set-Point 2, channel A (LSW)	INT. value - Least significant word
35-36	17	Set-Point 3, channel A (MSW)	INT. value - Most significant word
37-38	18	Set-Point 3, channel A (LSW)	INT. value - Least significant word
39-40	19	Set-Point 4, channel A (MSW)	INT. value - Most significant word
41-42	20	Set-Point 4, channel A (LSW)	INT. value - Least significant word
43-44	21	Set-Point 5, channel A (MSW)	INT. value - Most significant word
45-46	22	Set-Point 5, channel A (LSW)	INT. value - Least significant word
47-48	23	Set-Point 6, channel A (MSW)	INT. value - Most significant word
49-50	24	Set-Point 6, channel A (LSW)	INT. value - Least significant word
51-52	25	Set-Point 1, channel B (MSW)	INT. value - Most significant word
53-54	26	Set-Point 1, channel B (LSW)	INT. value - Least significant word
55-56	27	Set-Point 2, channel B (MSW)	INT. value - Most significant word
57-58	28	Set-Point 2, channel B (LSW)	INT. value - Least significant word
59-60	29	Set-Point 3, channel B (MSW)	INT. value - Most significant word
61-62	30	Set-Point 3, channel B (LSW)	INT. value - Least significant word

63-64	31	Set-Point 4, channel B (MSW)	INT. value - Most significant word
65-66	32	Set-Point 4, channel B (LSW)	INT. value - Least significant word
67-68	33	Set-Point 5, channel B (MSW)	INT. value - Most significant word
69-70	34	Set-Point 5, channel B (LSW)	INT. value - Least significant word
71-72	35	Set-Point 6, channel B (MSW)	INT. value - Most significant word
73-74	36	Set-Point 6, channel B (LSW)	INT. value - Least significant word
75-76	37	Weight division value, channelA	See relevant table.
77-78	38	Decimals, channel A	See relevant table.
79-80	39	Load cell capacity, channel A (MSW)	INT. value - Most significant word
81-82	40	Load cell capacity, channel A (LSW)	INT. value - Least significant word
83-84	41	Load cell sensitivity, channel A	INT. value
85-86	42	Fixed tare, channel A (MSW)	INT. value - Most significant word
87-88	43	Fixed tare, channel A (LSW)	INT. value - Least significant word
89-90	44	Multirange 1, channel A (MSW)	INT. value - Most significant word
91-92	45	Multirange 1, channel A LSW)	INT. value - Least significant word
93-94	46	Multirange 2, channel A (MSW)	INT. value - Most significant word
95-96	47	Multirange 2, channel A (LSW)	INT. value - Least significant word
97-98	48	Weight division value, channel B	See relevant table.
99-100	49	Decimals, channel B	See relevant table.
101-102	50	Load cell capacity, channel B (MSW)	INT. value - Most significant word
103-104	51	Load cell capacity, channel B (LSW)	INT. value - Least significant word
105-106	52	Load cell sensitivity, channel B	INT. value
107-108	53	Fixed tare, channel B (MSW)	INT. value - Most significant word
109-110	54	Fixed tare, channel B (LSW)	INT. value - Least significant word
111-112	55	Multirange 1, channel B (MSW)	INT. value - Most significant word
113-114	56	Multirange 1, channel B LSW)	INT. value - Least significant word
115-116	57	Multirange 2, channel B (MSW)	INT. value - Most significant word
117-118	58	Multirange 2, channel B (LSW)	INT. value - Least significant word

READING EXAMPLE

Read address 3 to 6 of the Input Area to read gross weight from the MC 315.

Read bytes 7 to 10 of the Input Area to read net weight.

If the unit's display shows a gross weight value of 12351 the relevant bytes will read:

	Byte 3	**Byte 4**	**Byte 5**	**Byte 6**
Hex	00	00	30	3F

The output area registers (written by the master and acquired by the unit), shared by all the PROFIBUS, PROFINET, ETHERCAT, ETHERNET/IP fieldbuses, are listed in the following table.

The registers' size is 16 bits. The registers written by the master in the output area are read by the unit at a fixed frequency of 125 Hz (80 Hz in case of PROFIBUS fieldbus).

The size of the Output area configured in the master fieldbus should match with the size configured in the unit.

OUTPUT DATA AREA

Byte	Register address	OUTPUT AREA REGISTER	Notes
1-2	0	Command Register	See relevant table.
3-4	1	Data Register (MSB)	INT. value - Most significant word (See relevant table)
5-6	2	Data Register (LSB)	INT. value - Least significant word (See relevant table)
7-8	3	Monitor register	This value is copied in the equivalent register of the input area.
9-10	4	Set-Point 1, channel A (MSW)	INT. value - Most significant word
11-12	5	Set-Point 1, channel A (LSW)	INT. value - Least significant word
13-14	6	Set-Point 2, channel A (MSW)	INT. value - Most significant word
15-16	7	Set-Point 2, channel A (LSW)	INT. value - Least significant word
17-18	8	Set-Point 3, channel A (MSW)	INT. value - Most significant word
19-20	9	Set-Point 3, channel A (LSW)	INT. value - Least significant word
21-22	10	Set-Point 4, channel A (MSW)	INT. value - Most significant word
23-24	11	Set-Point 4, channel A (LSW)	INT. value - Least significant word
25-26	12	Set-Point 5, channel A (MSW)	INT. value - Most significant word
27-28	13	Set-Point 5, channel A (LSW)	INT. value - Least significant word
29-30	14	Set-Point 6, channel A (MSW)	INT. value - Most significant word
31-32	15	Set-Point 6, channel A (LSW)	INT. value - Least significant word
33-34	16	Set-Point 1, channel B (MSW)	INT. value - Most significant word
35-36	17	Set-Point 1, channel B (LSW)	INT. value - Least significant word
37-38	18	Set-Point 2, channel B (MSW)	INT. value - Most significant word
39-40	19	Set-Point 2, channel B (LSW)	INT. value - Least significant word
41-42	20	Set-Point 3, channel B (MSW)	INT. value - Most significant word
43-44	21	Set-Point 3, channel B (LSW)	INT. value - Least significant word
45-46	22	Set-Point 4, channel B (MSW)	INT. value - Most significant word
47-48	23	Set-Point 4, channel B (LSW)	INT. value - Least significant word
49-50	24	Set-Point 5, channel B (MSW)	INT. value - Most significant word
51-52	25	Set-Point 5, channel B (LSW)	INT. value - Least significant word
53-54	26	Set-Point 6, channel B (MSW)	INT. value - Most significant word
55-56	27	Set-Point 6, channel B (LSW)	INT. value - Least significant word
57-58	28	(*) Weight division value, channel A	See relevant table.
59-60	29	(*) Decimals, channel A	See relevant table.
61-62	30	(*) Load cell capacity, channel A (MSW)	INT. value - Most significant word
63-64	31	(*)Load cell capacity, channel A (LSW)	INT. value - Least significant word
65-66	32	(*)Load cell sensitivity, channel A	INT. value
67-68	33	(*) Fixed tare, channel A (MSW)	INT. value - Most significant word

69-70	34	(*)Fixed tare, channel A (LSW)	INT. value - Least significant word
71-72	35	(*) Multirange 1, channel A (MSW)	INT. value - Most significant word
73-74	36	(*) Multirange 1, channel A LSW)	INT. value - Least significant word
75-76	37	(*) Multirange 2, channel A (MSW)	INT. value - Most significant word
77-78	38	(*) Multirange 2, channel A (LSW)	INT. value - Least significant word
79-80	39	(*) Weight division value, channel B	See relevant table.
81-82	40	(*) Decimali, canale B	See relevant table.
83-84	41	(*) Load cell capacity, channel B (MSW)	INT. value - Most significant word
85-86	42	(*) Load cell capacity, channel B (LSW)	INT. value - Least significant word
87-88	43	(*) Load cell Sensitivity, channel B	INT. value.
89-90	44	(*) Fixed tare, channel B (MSW)	INT. value - Most significant word
91-92	45	(*) Fixed tare, channel B (LSW)	INT. value - Least significant word
93-94	46	(*) Multirange 1, channel B (MSW)	INT. value - Most significant word
95-96	47	(*) Multirange 1, channel B LSW)	INT. value - Least significant word
97-98	48	(*) Multirange 2, channel B (MSW)	INT. value - Most significant word
99-100	49	(*) Multirange 2, channel B (LSW)	INT. value - Least significant word

(*) These registers can only be modified in case of FREE operation or in case of METRIC operation with calibration bridge enabled.

WRITING EXAMPLES

Follow the example below to write the set-up parameters:

Write the value HEX 3FFF in bytes 1-2 (Command Register) to open the internal writing area of the MC 315.

Example: The MC 315 is set with factory values. The values of Cell Capacity, Cell sensitivity, and division are to be changed to 15000, 2.9965, and 2 respectively.

Capacity	Byte 17	Byte 18	Byte 19	Byte 20
Hex	00	00	3A	98

Sensitivity	Byte 21	Byte 22
Hex	75	0D

Division	Byte 23	Byte 24
Hex	00	0A

Save the data by writing the value HEX 7 in Bytes 1-2.

NOTE: The MC 315 does not accept values equal to the existing one.

The internal writing area of the MC 315 does not need to be enabled for Zero-point Calibration.

Zero-point calibration

In empty scale conditions, write the value Bex 4 in the Command Register. The new zero value is acquired.

Full Scale calibration:

Load a known weight onto the system, write the relevant value in the Data Register (bite 3 to 6) and write the value Hex in the Command Register. The weight value will be saved and automatically shown on the display.

TROUBLESHOOTING

ISSUE	POSSIBLE CAUSE	SOLUTION
The display shows the message O-L	The acquired weight cannot be measured because the cell is absent or wrongly connected	Check cell connections
The display shows the high dash on the upper display	The acquired weight cannot be shown because it exceeds the available digits or cell capacity	Use set-up parameters compatible with system characteristics.
The number of decimals is wrong	The right division value was not selected.	Select the right division value in the main menu.
The unit remains off	The power supply is not as requested	Check the input of the AL-AX power unit or of the AL-BX.
Weight display is stuck	The load cell does not work correctly or was not correctly connected	Use a multimeter and measure 3.3Vdc between EXC+ and EXC- and a lower value between SENSE+ and SENSE- (the greater the distance between the unit and the load cells, the lower the SENSE voltage) and check the millivolt variation between SGN+ and SGN- when the cell is loaded or unloaded.
The inputs and/or outputs do not work correctly	Cabling or software set-up errors	Use the Test I/O function to check the appropriate operation of inputs and outputs and the set-up of the relevant software.
Serial communication does not work correctly	Installation was not performed correctly. The selected serial interface operation mode is wrong	Check connections as described in the installation manual. Select the appropriate settings.
The semi-automated zero function does not work.	Gross weight exceeds the action limit of the semi-automated zero. Weight is not stabilized.	Calibrate weight to restore the zero. Wait for weight stabilization or adjust the weight filter parameter.
The semi-automated tare function does not work.	Gross weight is negative or exceeds the maximum capacity value. Weight is not stabilized.	Check gross weight. Wait for weight stabilization or adjust the weight filter parameter.

PAVONESYSTEMS

PAVONE SISTEMI S.R.L.
Via Tiberio Bianchi, 11/13/15, 20863 Concorezzo (MB)
T 039 9162656 **F** 039 9162675 **W** en.pavonesistemi.it
Industrial Electronic Weighing Systems since 1963