

# TECHNICAL MANUAL



## MC 353 Flow Rate Controller for belt weigher

Software version 1.9

## SYMBOLS

Following are the symbols used throughout the manual to call reader's attention:



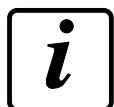
Warning! Electric shock risk



Warning! This operation shall be carried out by qualified staff.



Pay special attention to the following points.



Further details.

## WARNINGS

This manual provides texts and pictures to inform the operator about all prescriptions and criteria necessary for installing and using this instrument.

The equipment shall be installed only by qualified personnel that must have read this manual. With the expression "qualified personnel" is meant the personnel that has been trained and thus expressly authorised to carry out the installation by the person in charge for the system safety.

Power the instrument with a voltage value within the limits specified in the features.

The user must make sure that the installation is carried out in compliance with the relevant rules in force.

Please contact the nearest Assistance Centre for every fault you find. Any attempt of disassembly or change that has not been previously authorised will null and void the warranty and will release the Manufacturer from any responsibility.

The purchased instrument has been designed and produced to be used in the weighing and metering processes thus any improper use will release the Manufacturer from any responsibility.

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- CE DECLARATION OF CONFORMITY -



☐ ELECTROMAGNETIC COMPATIBILITY DIRECTIVE  
2004/108/EC

☐ EN61000-6-2, EN61000-6-3, EN61010-1, EN45501 STANDARDS

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ELECTRONIC IDENTIFICATION	
Electronic commercial denomination:	"Metering control electronic instrument"
Model:	"MC353"
Protection class:	"IP 65"

It is forbidden to start-up the electronic equipment provided with certification before the electric panel it is going to be integrated or assembled has been declared conforming with the Directives requirements.

CERTIFICATION

WE, THE UNDERSIGNED OF THIS DOCUMENT, DECLARE UNDER OUR OWN RESPONSIBILITY THAT THE CONCERNED ELECTRONIC EQUIPMENT IS CONFORMING WITH THE ITALIAN LAW AND THUS WITH THE ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 2004/108/EC AS WELL AS THE EN61000-6-2, EN61000-6-3, EN61010-1, EN45501 STANDARDS.

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POSITION: sole director

ISSUE DATE: 03/02/2012

SIGNATURE:

## 1 - INTRODUCTION

The MC353 can operate as follows according to its set-up:

### FLOW RATE TRANSMITTER

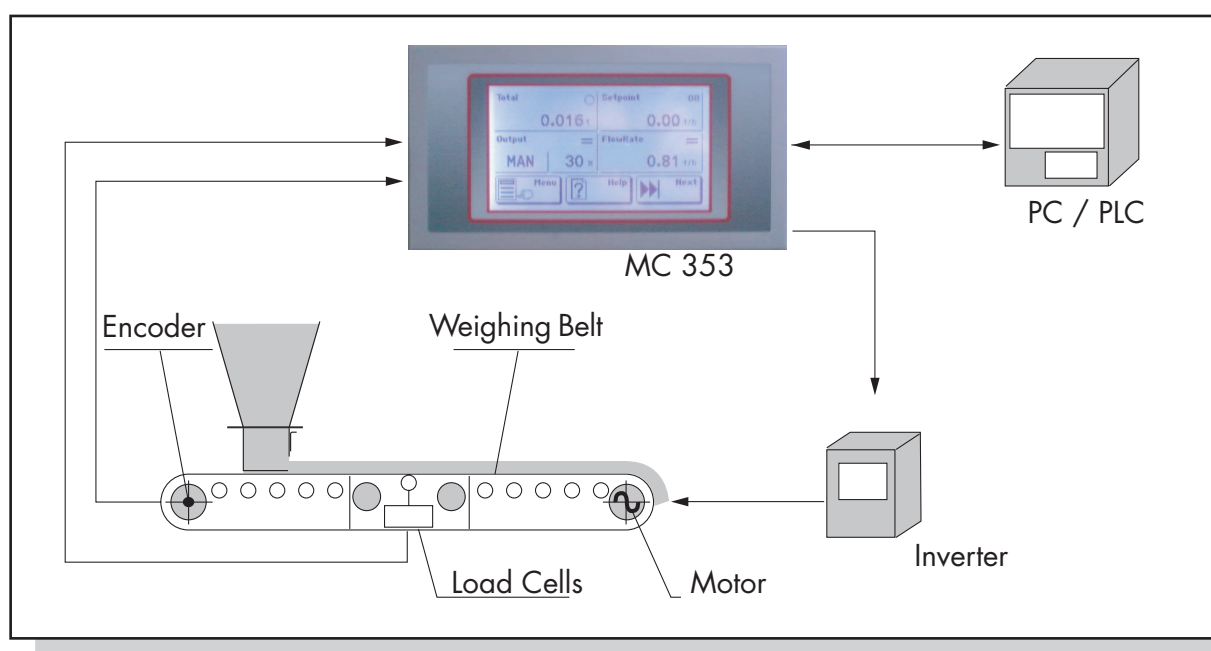
The instrument, thanks to the weight (load cells) and the speed (encoder) signal when it receives the run input, calculates an instantaneous flow rate which is then transmitted externally through a configurable analogue output (0÷10 V, 0÷5 V, 0÷20 mA, 4÷20 mA).

It is also possible to receive the following outputs:

- Weight totalization output;
- Conveyed weight preset output;
- Conveyed weight set output;
- Serial communication protocol, Ethernet included.
- Generic alarm output;
- Flow rate equal to 0 output;
- Conveyed weight reset input;
- USB device communication port;
- Optional USB HOST port with USB pen drive interface.

### FLOW RATE CONTROLLER

The MC 353 control unit is configured with P.I. (instantaneous flow rate) regulator; it processes the weight and speed variables to get the instantaneous hourly flow rate and the totalized weight. Furthermore it acts as flow rate self-regulator.



The picture shows how the instrument controls the system adjustment ring.

The external supervisor transmits the work set-up (that can be set also through the keyboard) through the serial communication to the MC353 control unit; the latter, according to the calculated flow rate value, controls directly (through analogue output) the inverter frequency of the motor where the weighing system has been installed.

The MC353 control unit has the following features:

- Weight totalization output;
- Conveyed weight total preset and set output;
- Generic alarm output;
- Flow rate out of tolerance alarm output;
- Flow rate output equal to 0;
- Retroaction analogue output ( $0\div 10V$ ;  $0\div 5V$ ,  $0\div 20\text{ mA}$ ;  $4\div 20\text{ mA}$ );
- Flow rate proportional optional analogue output;
- Optional analogue input for setting-up the flow rate;
- Inputs for the selection of 15 preset set points;
- Conveyed weight reset input;
- Selection of the instrument state from manual to automatic and vice versa by means of the keyboard, from the instrument rear side through external contact, and by means of serial communication protocol;
- Serial communication protocol, Ethernet included;
- Optional USB HOST port with USB pen drive interface.

## 1.1 - OTHER FUNCTIONS OF MC353

### MASTER-SLAVE OPERATION

This instrument can operate as slave, thus acquiring the flow rate setpoint in continuous duty, through analogue input ( $0 \div 10V$  /  $4 \div 20mA$ ) or digital input (RS485). The flow rate setpoint is updated according to the current input: the flow rate setpoint is divided and it represents the input scale end (100%). In case the current setpoint is set to 0, the setpoint will correspond to the input percentage value of the system maximum flow rate.

The instrument can also operate as master by transmitting the instantaneous flow rate through the optional analogue output or digital transmission (RS485) for the direct connection to instruments in SLAVE operation.

### PARAMETERS THAT CAN BE SET

It is possible to set the operation parameters through the touch screen user interface; all parameters are organised on 3 levels with independent access criteria.

All parameters that can be set are listed in a table and clearly identified with a numerical code (address). The parameters reading and writing access is available on the communication port with supervisor (Rs422 / RS485 / Ethernet, optional), through the ModBus RTU protocol. Furthermore the parameters reading and setting can be carried out by sharing files in CSV format on the COM2 communication port (Rs232 or USB) or directly on USB pen drive connected to the USB Host port (optional).

For operation details see the relevant paragraphs.

### DATA IMPORT / EXPORT

To facilitate the data set-up and acquisition in a format that can be used with standard informatic systems the instrument is provided with files transfer functions (TXT or CSV). It features especially a reading/writing (even partial) of the memory parameters from CSV files and a data logger procedure to acquire operation parameters.

To customise the instrument it is possible to set the setpoint names, create Help pages and load the image displayed upon switching-on (BMP file).

If the instrument is provided with a USB Host option, the import and export of the files mentioned above can occur directly on USB pen drive.



## 1.2 - TECHNICAL FEATURES

## STRUCTURAL FEATURES

Front panel	Made of aluminium with polycarbonate screen Protection class: IP 65 Overall dimensions: 196 mm x 105 mm (l x h) Panel front projection: 5 mm
Assembly	Built-in panel front. Drilling template 187 mm x 97 mm (l x h) Fixing by means of 4 metallic threaded rods 3 mm rubber seal along all perimeter
Rear panel	Stainless steel coating Overall dimensions: 186 mm x 95 mm (l x h) Embedding depth: 70 mm (terminal boards included)
Connections	5.08 / 7.5 mm pitch screw terminal board Standard USB connectors (Host / Device) RJ45 standard Ethernet connector

## POWER SUPPLY

Power supply	24 Vdc ( $\pm 15\%$ )
Max. absorption	10W
Installation category	Cat. II
Temperatures	Operation temperature: $-10\text{ }^{\circ}\text{C} \div +50\text{ }^{\circ}\text{C}$ (85% humidity without condensate) Storage temperature: $-20\text{ }^{\circ}\text{C} \div +60\text{ }^{\circ}\text{C}$

## DISPLAY

Display	5.2" LCD (118 mm x 58 mm visual area) (l x h) Graphic (240x128 pixel) Monochromatic (b/w) with high contrast Backlit with white leds, adjustable intensity
Touch screen	4 wires resistive, suitable for use with gloves and buzzer

## LOAD CELLS INPUT

No. of channels	2 input channels for load cells. Acquisition at intervals or simultaneously at low frequency
Cells supply	5 Vdc / 120mA (max. 8 350 Ohm cells in parallel) Protected against short circuit
Input sensitivity	0.02 microV min
Linearity	< 0.01% of the scale end
Temperature warmup drift	< 0.0003% of the scale end / °C
Internal resolution	24 bit (16.777.216 points)
Weight resolution	Up to 600,000 divisions on the flow rate
Measure field	7.8 mV/V bipolar
Acquisition frequency	From 12.5Hz to 250Hz
Digital filter	Adjustable from 0.2Hz to 50Hz

## ANALOGUE I/O

No. of channels	2 opto-isolated analogue outputs (1 optional) 1 analogue input (optional)
Resolution	Analogue output: 16 bit Analogue input: 24 bit
Measure field	Outputs: 0÷5V, 0÷10V, 0÷20mA, 4÷20mA Input: 0÷5V, 0÷10V, 4÷20mA
Output impedance	Voltage: 10KΩ min, current 300Ω max
Output linearity	< 0.03% of the Full Scale
Output temperature warmup drift	< 0.001% of the Full Scale / °C

## ENCODER INPUT

No. of channels	1 2-phase incremental encoder input (up-down, A-B). As an alternative there are 2 pulse-counting inputs
Power supply	24Vdc (100mA max)
Acquisition frequency	2 KHz max

## LOGIC I/O

No. of channels	6 opto-isolated logic outputs (clean contact) 6 opto-isolated logic inputs (PNP)
Output power	30 Vdc max / 60 mA each
Input voltage	12 ÷ 24Vdc (external supply)
Additional I/O	Up to 4 external modules with 4 in. / 8 out. each (16 in. / 32 out. in total)

## COMMUNICATION PORTS

No. of channels	3 independent communication ports (not changed-over)
COM1 interfaces	Rs422 / RS485 / Ethernet (option)
COM2 interfaces	Rs232 / RS485 / USB Device (Virtual Com Port)
COM3 interfaces	Rs232 (only transmission for printer or repetitor, 9600 baud).
Wire length	15 m (Rs232), 1000 m (RS485)
Baud rates	From 1200 m to 115200 bit/sec
Ethernet protocols	TCP/IP, UDP, ARP, ICMP, ModBus/TCP
USB Host (optional)	USB pen drive interface with FAT16/32 file system management
DP Profibus (optional)	It can be implemented with an external module

## CPU

Micro-controller	RISC 32 bit, 44 MHz
Code memory	Flash 256K Bytes, it can be set on-board (Rs232, USB)
Data memory	1088 Kbytes standards, it can be expanded up to 2113 Kbytes
Clock / calendar	Integrated with a rechargeable buffer battery

## CONFORMITY WITH STANDARDS

Standards	EN61000-6-2, EN61000-6-3, EN61010-1, EN45501
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## 2 - MC353 INSTALLATION

### 2.1 - INSTALLATION WARNINGS AND INDICATIONS



Upon installation it is necessary to arrange after and near the equipment a main switch for an omnipolar cut-off with contact minimum opening of 3 mm.

For cleaning the instrument make use of a cloth slightly soaked in pure alcohol for both the container and the display.

During the cleaning the instrument must be OFF.



Environmental pollution level: 2

#### INSTRUMENT ASSEMBLY



- Only qualified personnel shall carry out the following procedures.
- All connections shall be made with instrument OFF.

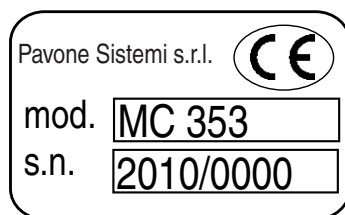
The instrument shall be assembled in an opening with a 187 x 97 mm drilling template and shall be fixed by means of the 4 threaded tie rods supplied together with the instrument.



- Consider that the instrument depth with extractable terminal blocks fitted is of 70 mm, and it is necessary to keep place enough for all connections.
- Do not install the instrument near power equipment (motors, inverters, contactors, etc.) or any equipment non-conforming with the Electromagnetic Compatibility EC Standards.
- The load cells connection cable shall have a maximum length of 140 mt/mm2.
- The Rs232 serial line shall have a maximum length of 15 meters (EIA RS-232-C Standards).
- All warnings concerning all peripheral devices connections shall be duly followed.

The installation environment can be subject to strong magnetic fields and electric interferences due to present machinery; it is thus recommended to take all precautions so as to prevent them from affecting the typical signals of a precision electronic equipment (filters on remote control switches, diodes on 24 Vdc relays, etc.)

#### INSTRUMENT IDENTIFICATION PLATE



In case of information or indications request concerning the instrument it is important to report such data along with the programme number and version that are printed on the manual cover and displayed upon instrument switching-on.

## 2.2 - INSTRUCTIONS FOR A CORRECT INSTALLATION OF THE LOAD CELLS AND THE MICROPROCESSOR SYSTEMS



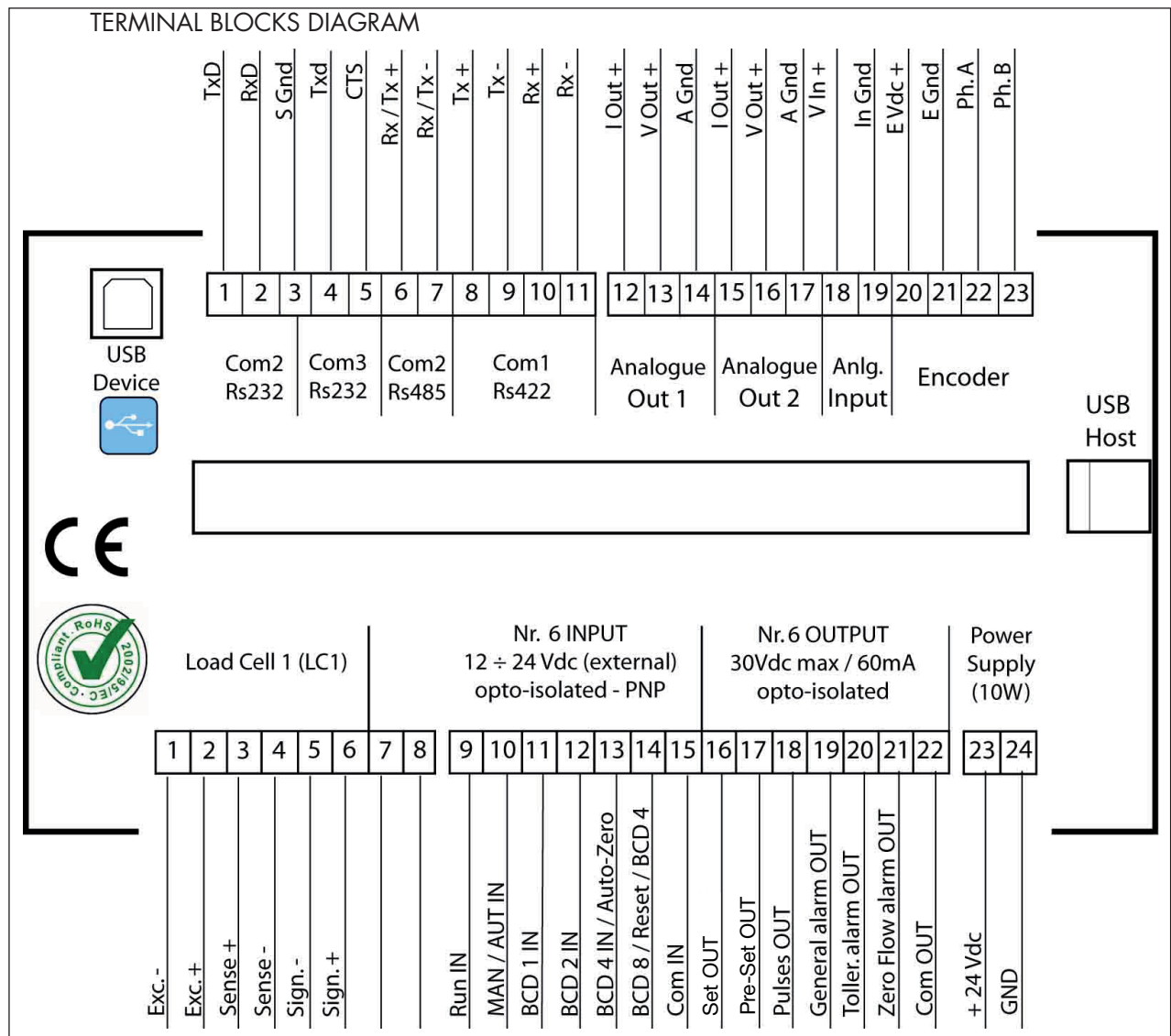
1. Do not carry out weldings with load cells fitted.
2. Use a copper conductor to connect the load upper support plate with the lower one, then connect both upper plates with the earth line.
3. Use watertight fittings and sheaths to protect the cells wires.
4. Use a watertight connection box and a terminal board with cable clamp to connect the cells in parallel.
5. All "shielded" cables for signal amplifiers or cells connection extensions shall be inserted alone in the cable conduit or in a tube as far away as possible from the power cables.
6. The amplifier or cells cable shall be inserted in the panel from one side or the other and it should be connected directly to the instrument terminal block without being interrupted by additional terminal blocks or passing through cable conduits with other wires.
7. Use "RC" filters on the coils of remote control switches and the solenoid valves controlled by the micro-processor.
8. In case of condensate inside the equipment it is recommended to always keep them powered.
9. The electric panel installer shall provide all instrument electric protections (fuses, door lock switch, etc.).
10. It is recommended to connect the housing of the instrument to the protective earth (possibility to use the set screws of the control unit).

## 2.3 - ELECTRIC CONNECTIONS



Only qualified personnel shall carry out the procedures described below. All connections shall be made with instrument OFF.

## TERMINAL BLOCKS DIAGRAM



## LOAD CELL CONNECTION (CONTACTS 1÷6 LOWER TERMINAL BLOCK)



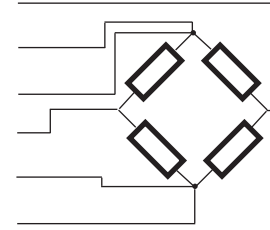
- The cell cable shall not be inserted together with other cables (for eg. outputs connected with remote control switches or supply cables), it must be routed in its own path.
- Any cable extension connection shall be carefully shielded, respecting the colour code and using the cable type supplied by the manufacturer. The extension connections shall be made through welding or support terminal blocks or connection box supplied as optional.
- The cell cable shall have a number of conductors not higher than those used (4 or 6). In case of a 4-conductors cable connect the reference wires by making a jumper across the relevant poles of the supply cables.

It is possible to connect up to maximum 8 350 Ohm cells in parallel to the instrument. The cells supply voltage is of 5 Vdc and is protected against temporary short circuit. The instrument measurement field foresees the use of load cells with sensitivity from 1 mV/V to 5 mV/V.

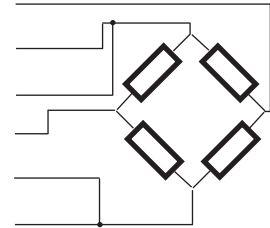
NUM.	Lower terminal block (pitch 5.08 mm)
1	Cell supply -
2	Cell supply +
3	Reference cell +
4	Reference cell -
5	Signal cell -
6	Signal cell +

SIGNAL -  
POWER SUPPLY +  
REFERENCE +  
SIGNAL +  
REFERENCE -  
POWER SUPPLY

#### 6 WIRES CELL CONNECTION



#### 4 WIRES CELL CONNECTION



Note: to use the 4-wires technique make a jumper across terminal 3 and terminal 2, terminal 4 and terminal 1.

The cell cable SHIELD must be connected with terminal 1 ( CELL SUPPLY -).

#### LOGIC INPUTS AND OUTPUTS (CONTACTS 9-22 LOWER TERMINAL BLOCK)



The 6 logic inputs are electrically isolated by the instrument through optoisolators.

The logic inputs connection cables must not be inserted together with power or supply cables and you have to use a cable as short as possible.

The inputs are active when a voltage of 12 / 24 Vdc is applied (PNP logic).

The 6 logic outputs feature a photorelay (clean contact) with a common contact. The capacity of each contact is of 60 mA / 30Vdc .

NUM.	Lower terminal block (pitch 5.08 mm)
9	IN 1 - Run
10	IN 2 - Man / Aut
11	IN 3 - BCD1
12	IN 4 - BCD2
13	IN 5 - BCD4 / Auto 0
14	IN 6 - BCD8 / Reset
15	Input common connector

NUM.	Lower terminal block (pitch 5.08 mm)
16	OUT 1 - Set
17	OUT 2 - Pre-Set
18	OUT 3 - Tot. pulse
19	OUT 4 - General alarm
20	OUT 5 - Flow rate alarm
21	OUT 6 - Flow rate = 0
22	Output common connector

IN1 - Run static input. Close this contact to enable instrument begin and maintain programmed operations (weighing, flow regulation, alarms etc.). Input must be kept closed during dosing; open the contact to stop operations.

IN2 - Manual selection (open) / automatic (closed). The selection through the keyboard has the priority over the selection of this input. When a selection that does not correspond to the input state is changed through the keyboard, to commute the selection with this input it is necessary to first set the selection according to what had been done by the keyboard, and then commute it in the desired position. For example: with the input set to AUTO, it is possible to commute it to MAN through the keyboard. To restore the automatic operation using the input it is necessary to first set the input to MAN and then to AUTO.

IN3 - Bit 1 setpoint selection with BCD coding. The selection is shown on the display. When all inputs are open the system keeps the last selected combination (even if you switch off the instrument).

IN4 - Bit 2 setpoint selection with BCD coding. The selection is shown on the display. When all inputs are open the system keeps the last selected combination (even if you switch off the instrument).

IN5 - The function of this input can be selected: the input (closed by pulses) can control the belt homing remote procedure. Otherwise you can have the function combined with inputs 3, 4 and 6 for selecting the setpoint with BCD coding. (inp. 5 = bit 4). To start AUTOZERO procedure, close input 1027 (parameter INPUT FUNCTION 5 = "belt reset mode"); the above procedure can be activated only when 3028 RUN STATUS is STOP. Then, set 3028 RUN STATUS = RUN and keep it that way during the whole duration of the procedure. The duration of the procedure depends upon the time settings of parameter 0132 BELT LAP TIME, so please wait until this time elapse. During this period, if there are any anomalies, will be indicated by the alarm output. If, during AUTOZERO procedure duration, no alarm is raised, you can safely assume that the procedure has successfully ended. Now you can set again 3028 RUN STATUS = STOP.

IN6 - The function of this input can be selected: the input (closed by pulses) can control the conveyed total reset, with receipt print if the printer is suitably set. Otherwise you can have the function combined with inputs 3, 4 and 5 for selecting the setpoint with BCD coding. (inp. 6 = bit 8 if inp. 5 = bit 4; inp. 6 = bit 4 if inp. 5 is selected to control the belt homing procedure).

*NOTE: inputs are activated only if activation time exceeds 500 msec.*



OUT1 - Total Set reached. This output is active when the total conveyed product exceeds the set value, anticipated of the set flying material. If the set value is zero, this output is never excited.

The output is disabled when the total conveyed product is reset.

OUT2 - Total PreSet reached. This output is active when the total conveyed product exceeds the SET value - PRESET value. If the set value is zero, this output is never excited. The output is disabled when the total conveyed product exceeds the SET value - PRESET value. If the set value is zero this output is not excited. The output is disabled when the total conveyed product is reset.

OUT3 - Totalization pulse. This output is excited by pulses (0.5 sec.) each time that the quantity of product that is conveyed is equal to the set value, max. 1 impulse per second (1 Hz)

OUT4 - Functioning alarm. This output is activated when at least one of the scheduled alarms occurs (except alarm 3). You can program this function. OUT4 is deactivated automatically when function is one again normal. Output is active during RUN or always according to parameter's 1030 settings.

OUT 5 - Instantaneous flow rate out of tolerance. During belt's RUN (only in automatic mode), this output is active if instantaneous flow rate exceeds the set limit. OUT5 is deactivated automatically when function is one again normal, i.e when flow rate is within tolerance. You can program this function.

OUT6 - Null flow rate alarm (AI 3). During the belt movement this output is active when the null flow rate alarm (minimum weight or encoder signal missing) is triggered according to the conditions defined by the 1022 parameter selections.

**INSTRUMENT POWER SUPPLY (CONTACTS 23-24, LOWER TERMINAL BLOCK)**

The instrument is supplied by the 2-pole terminal block with 7.5 mm pitch.

The supply cable shall be inserted separately from other supply cables featuring a different voltage, from the load cell, encoder and logic and analogue input/output cables.

NUM.	Lower terminal block (pitch 7.5 mm)
23	+ 24Vdc
24	GND

POWER SUPPLY: 24Vdc +/-15%

POWER: 10W

*Note: verify that GND (pin 24) is grounded*

**COM2 - USB DEVICE PORT (REAR USB FEMALE CONNECTOR)**

- Specification 2.0 compliant; full-speed 12Mbps -



**WARNING:** when using this connection it is not possible to use an RS485 and RS232 interface, shared on the same COM2 communication port.

Use this communication port to interface directly with a PC or through a USB port.

For the connection use a USB standard cable.



To connect the instrument through the USB device port it is necessary to install on the PC the suitable driver for the used operative system. Follow specific instructions for the installation.

**COM2 - RS232 SERIAL PORT (CONTACTS 1÷3, UPPER TERMINAL BLOCK)**

**WARNING:** when using this connection it is not possible to use an RS485 interface and the USB device port, shared on the same COM2 communication port.



To make a serial connection use a shielded cable having care to connect to earth the screen to only one of the two sides. In case the cable has more conductors than those used connect the screen to the free conductors.

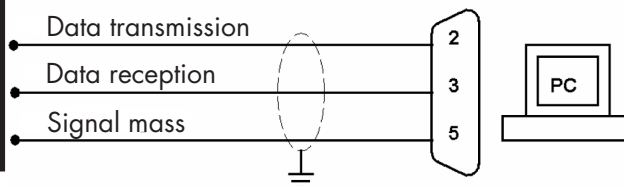
The serial connection cable shall have a maximum length of 15 metres (EIA RS-232-C Standards), if it is longer it is necessary to use the instrument Rs422 interface.

- The cable shall not be inserted together with other cables (for eg. outputs connected with remote control switches or supply cables), it must be possibly routed in its own path.

The PC used for the connection shall be compliant with the EN 60950 Standard.

Following is the drawing of the connection with 9-pole PC connector:

NUM.	Upper terminal block (pitch 5.08 mm)
1	TX
2	RX
3	GND



**COM3 - RS232 SERIAL PORT (CONTACTS 3÷6, UPPER TERMINAL BLOCK)**

This communication port is only provided with data transmission functions with fixed communication parameters. The units that can be connected are a repetition printer or display that shall feature an RS232 serial interface.

Speed: 9600 bps

Word length: 8 bit.

Start bit: 1 bit. Parity bit: 0 bit. Stop bit: 1 bit.

Handshaking: DTR protocol.

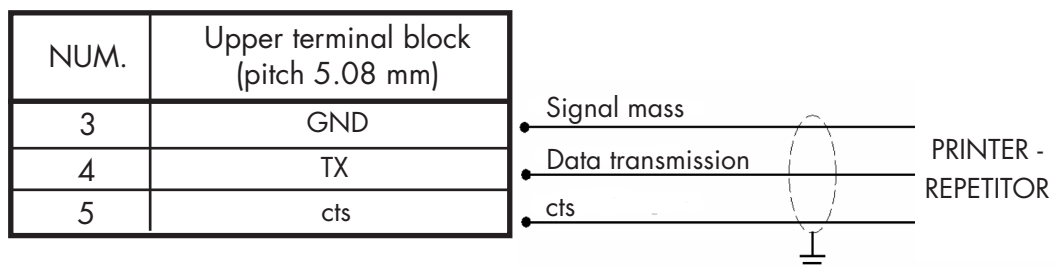


Refer to the printer or repetitor manual to select the communication parameters according to the transmission.



To make a serial connection use a shielded cable having care to connect to earth the screen to only one of the two sides. In case the cable has more conductors than those used connect the screen to the free conductors.

The serial connection cable length shall not exceed 15 meters (EIA RS-232-C Standards).

**COM2 - RS485 SERIAL PORT (CONTACTS 6-7, UPPER TERMINAL BLOCK)**

**WARNING:** when using this connection it is not possible to use an RS232 interface and the USB communication device port, shared on the same COM2 communication port.

Through the RS485 serial interface it is possible to carry out serial connections for long distances.

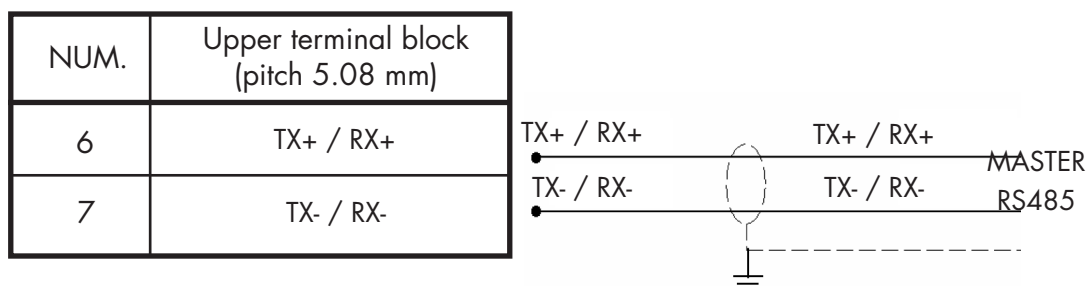
This type of connection allows to connect more units to one MASTER using one single serial line. The maximum number of connected units is 32.



The serial connection cable type shall be suitable for RS485 serial communications with 1 twisted pair and the relevant shielding.

- The cable shall not be inserted together with other cables (for eg. outputs connected with remote control switches or supply cables), it must be possibly routed in its own path.

Set the terminal line resistors as specified in the following paragraph.



### COM1 - RS422/485 SERIAL PORT (CONTACTS 8÷11, UPPER TERMINAL BLOCK)

Through the RS422/RS485 serial interface it is possible to carry out serial connections for long distances. This type of connection allows also to connect more instruments to one MASTER unit (personal computer, PLC, etc.), using only one serial line and thus just one MASTER serial port.

The maximum number of connected instruments is 32. Obviously also the master unit shall be equipped with an RS485 or RS422 serial interface, otherwise it can be supplied as optional.

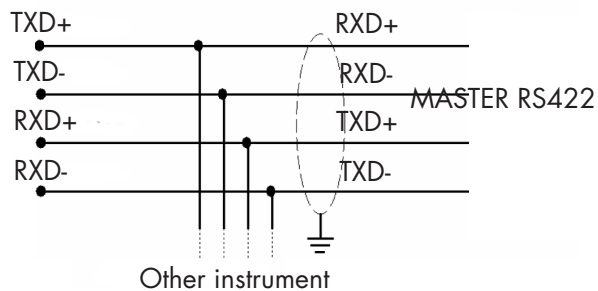
The serial connection cable type shall be suitable for serial communication with 2 conductor twisted pairs for RS422, or 1 twisted pair for RS485 and the relevant shielding.

- The cable shall not be inserted together with other cables (for eg. outputs connected with remote control switches or supply cables), it must be possibly routed in its own path.

Set the terminal line resistors as specified in the following paragraph.



NUM.	Upper terminal block (pitch 5.08 mm)
8	TXD+
9	TXD-
10	RXD+
11	RXD-



For the RS485 connection connect in parallel TXD + with RXD+ and TXD- with RXD-.

### TERMINAL RESISTORS RS485 AND RS422

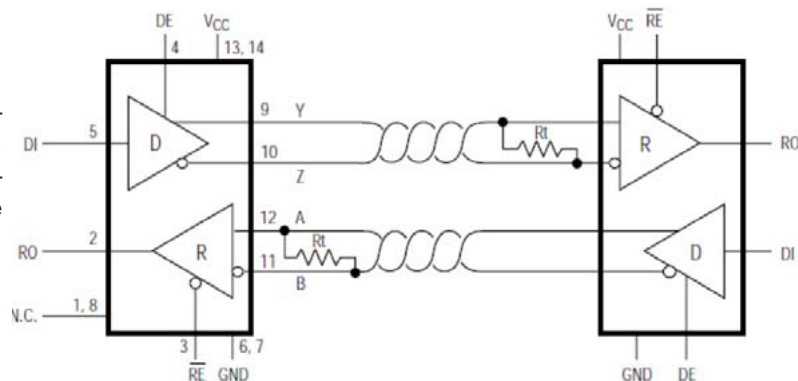
Data bus transmission on RS485 / RS422 connection is differential type, i.e. signal is the result of tension difference between the 2 wires composing the bus. RS485 / RS422 transmitters provide an output (under load) of  $\pm 2-3$  V between output A and B; receivers recognize output levels up to  $\pm 200$  mV as a valid signal.

This technique provides excellent disturb immunity even with long cable runs.

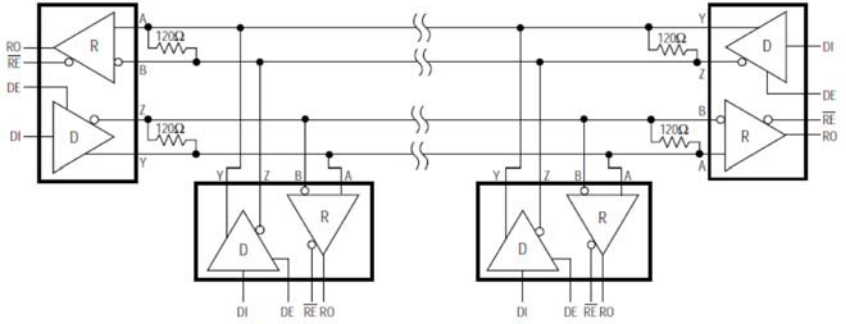
To minimize reflections, transmitter must have the possibility to insert the polarizing resistance while first and last network line element should be equipped with a terminal line resistor, connected in parallel to the line.

Typically, terminal line resistors must have resistance values between 120 and 560 ohm.

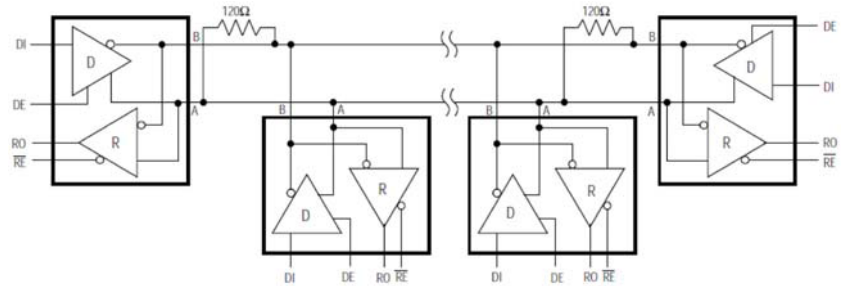
In case of connections with double pairs RS422 and two nodes, resistances should be near the further receiver while value can be low up to 120 Ohm (see figure)



In case of connections with double pairs RS422 and more nodes, same 120 Ohm value is indicated at the figure, but this is valid for very long lines (hundreds of meter). If line is considerably shorter, resistance value must raise because impedance at 120 Ohm would be very low, 60 Ohm (not counting the receivers load). It would be better to use resistances in the ~250 Ohm range.



Same considerations apply to the RS485 connection. Use 250 Ohm resistances for lines not very long.



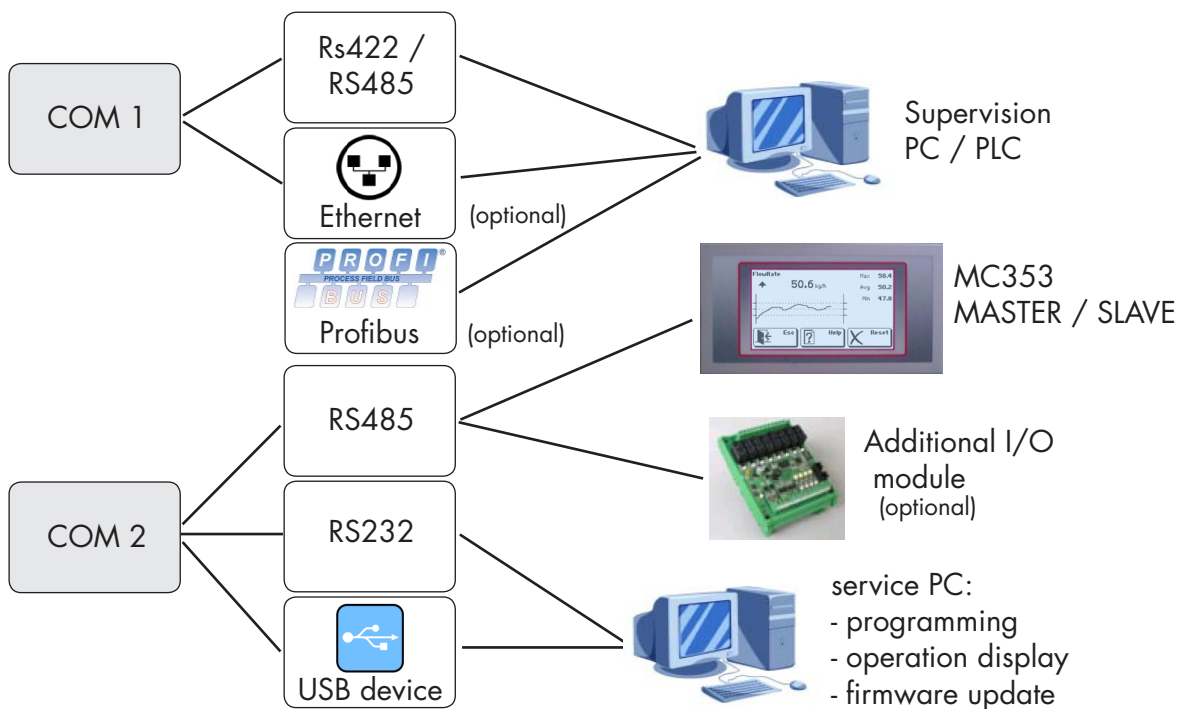
## COMMUNICATION PORTS SUMMARY

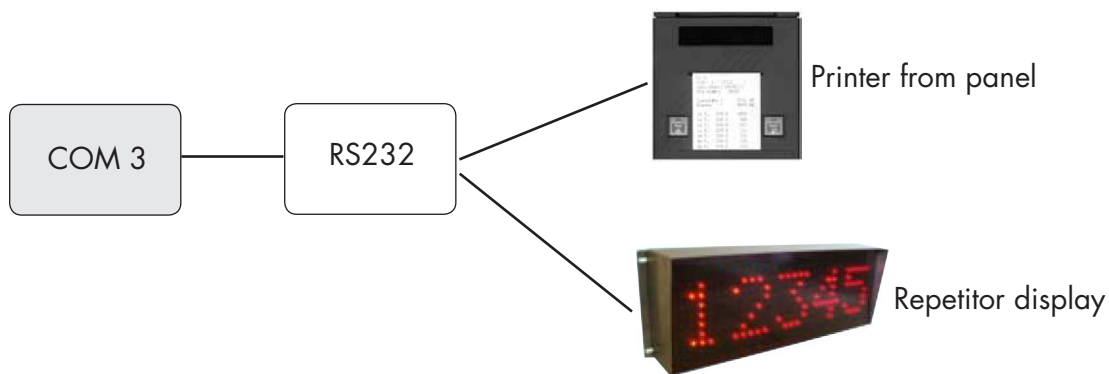
The instrument is equipped with three independent communication ports: COM1, COM2, COM3. COM1 has 2 possible interfaces (that can be used alternatively): RS422/RS485, Ethernet or Profibus (optional).

COM2 has 3 interfaces (that can be used alternatively): RS232, USB device, RS485.

COM3 has an RS232 interface with only transmission functions and CTS management.

Following is a diagram with all possible connections:





### MAIN ANALOGUE OUTPUT (CONTACTS 12÷14, UPPER TERMINAL BLOCK)

The instrument is provided with a current and a voltage analogue output.

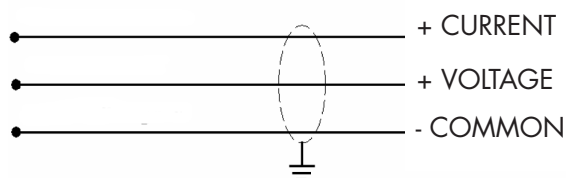
Features:

- Voltage analogue output: range from 0 to 10 Volts or from 0 to 5 Volts, minimum load 10KOhm;
  - Current analogue output: range from 0 to 20 mA or from 4 to 20 mA. The maximum load is 300Ohm.
- For the connection use a shielded cable having care to connect to earth the screen to only one of the two sides.



The analogue transmission is particularly sensitive to the electromagnetic interferences and thus we recommend that the cables are as short as possible and that they follow an independent path.

NUM.	Upper terminal block (pitch 5.08 mm)
12	+ mA
13	+ Volt
14	GND



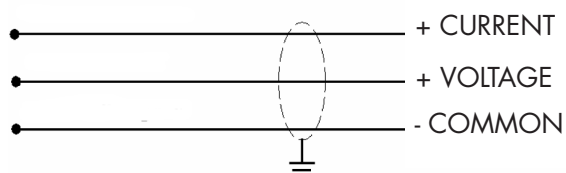
### OPTIONAL ANALOGUE OUTPUT (CONTACTS 15÷17, UPPER TERMINAL BLOCK)

The instrument can have a second optional analogue output with the same features of the serial one.

Features:

- Voltage analogue output: range from 0 to 10 Volts or from 0 to 5 Volts, minimum load 10 KOhm;
- Current analogue output: range from 0 to 20 mA or from 4 to 20 mA. The maximum load is 300 Ohm.

NUM.	Upper terminal block (pitch 5.08 mm)
15	+ mA
16	+ Volt
17	GND

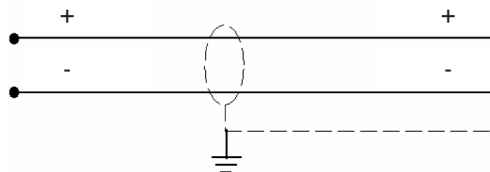


**OPTIONAL ANALOGUE INPUT (CONTACTS 18÷19, UPPER TERMINAL BLOCK)**

It is possible to have an analogue input as optional with measurement field 0÷5V, 0÷10V, 0÷20mA, or 4÷20 mA. The measurement field shall be chosen during the order stage and can not be selected by the instrument.

The ADC has a 24 bit resolution.

NUM.	Upper terminal block (pitch 5.08 mm)
18	+ Volt / + mA
19	GND

**ENCODER INPUT (CONTACTS 20÷23, UPPER TERMINAL BLOCK)**

Connection for 2-phase encoder with 24 Vdc power supply.



- The encoder cable shall not be inserted together with other cables (for eg. outputs connected with remote control switches or supply cables), it must be routed in its own path.
- Any cable extension connection shall be carefully shielded, respecting the colour code and using the cable type supplied by the manufacturer. The extension connections shall be made through welding or support terminal blocks.

The maximum frequency of the encoder signals acquisition is of 2 KHz. Fit the encoder so as to avoid exceeding such work frequency. Example: if the encoder resolution is of 10000 pulses / rev. the rotation speed shall not exceed 12 rpm.

The encoder acquisition is of the up-down type (counting in both rotation senses). For this reason both phase cables (A and B). The rotation sense is automatically detected by the instrument.

NUM.	Upper terminal block (pitch 5.08 mm)
20	24 Vdc suppl. encoder
21	GND suppl. encoder
22	Encoder phase A
23	Encoder phase B

**USB OTG OPTION**

This optional interface allows to directly connect a USB pen drive for reading and writing files according to the FAT16/32 standard FAT files system.

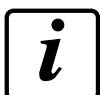
Features:

USB connections: Mass storage device

Communication modes: USB specification 1.1 and 2.0

Pen drive maximum capacity: 2 GB

To facilitate the insertion of the USB pen drive it is possible to transfer to panel front side the connector (USB "A" female type) through the special accessory upon request (see side picture).



## ETHERNET OPTION

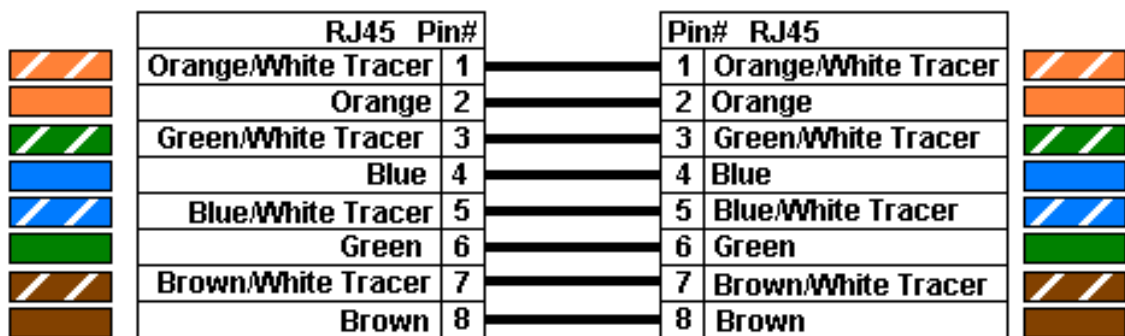
### Features:

Transmission speed	10 Mbps
Network	Compatible with networks 10/100/1000 Base-T
Ethernet protocols	TCP/IP, UDP, ARP, ICMP, ModBus/TCP
Communication mode	TCP server
LED indicators (2)	Presence of Ethernet line and communication / diagnosis
Buffer dimension	256 byte
Connection Timeout	Min 30 seconds - Max 90 seconds
Link Timeout (disconnected cable)	30 seconds

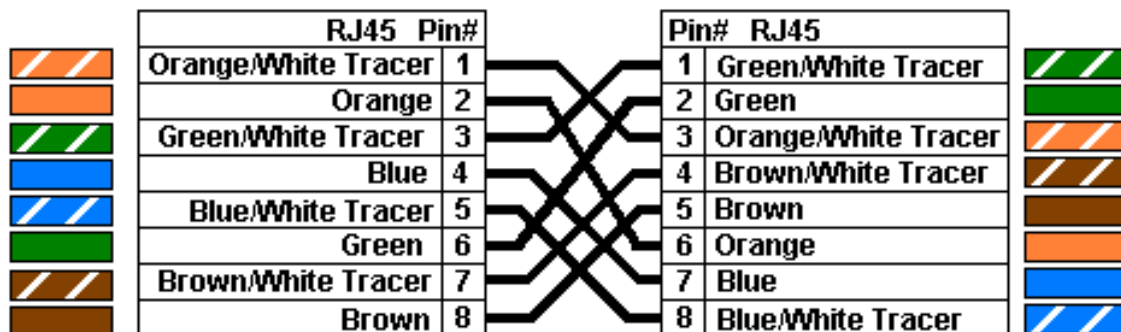


- The RJ45 ethernet connection cable has a variable length which depends on the cable type. One Cat5 standard shielded cable can have a maximum length of nearly 180 m.
- It is possible to connect the ethernet communication port directly to the PC without passing through other network devices (routers, switches, hubs, lan-bridges or other), but it is necessary to use special RJ45 cables called "crossover".
- Usually cables are of the "direct" type, and they allow a connection to network devices such as routers or hubs, but not to directly connect the two PCs (even if currently there are network boards with auto-sensing technology that recognise the cable and the connection type thus allowing PC-PC direct connections even without using crossover cables).
- Following are the diagrams of the two mentioned cable types and the relevant connection diagram.
- The cable shall not be inserted together with other cables (for eg. outputs connected with remote control switches or supply cables), it must be possibly routed in its own path.

"Direct" cable diagram



"Crossed" cable diagram



WARNING: for the Ethernet interface configuration please refer to the specific manual.



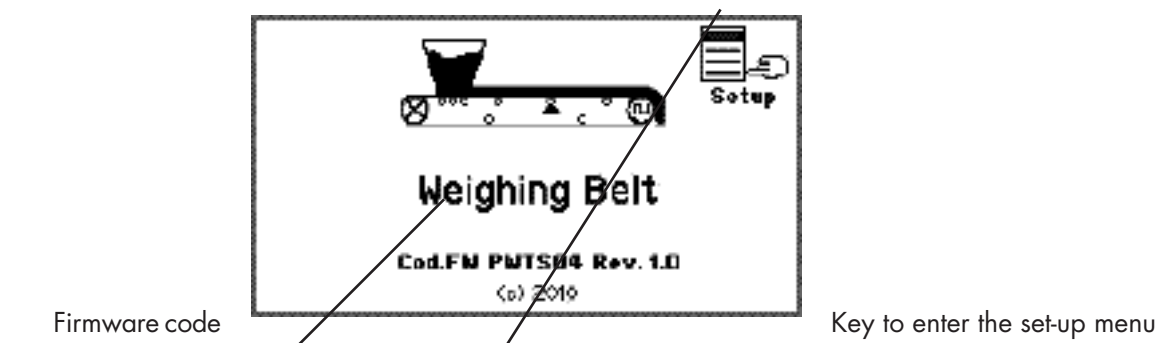
## 3 - MC353 STRUCTURE AND PARAMETERS

### 3.1 - PARAMETERING GENERAL FEATURES

#### ELECTRONIC SWITCHING-ON

Upon switching-on the display temporarily shows an introduction window, with the indication of the firmware code and version.

Press set-up during this stage to enter the set-up menu.



It is important to report the firmware code in case of information or indications request regarding the instrument.

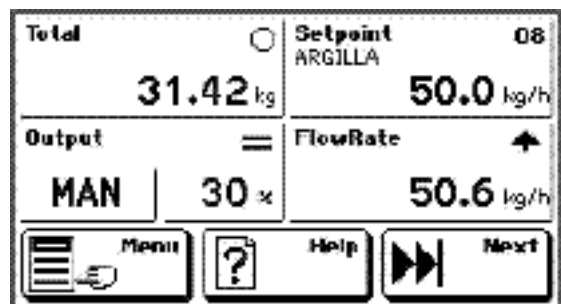
#### DATA GENERAL DISPLAY

The general display window is divided into 4 sections, each one dedicated to one measure or one parameter.

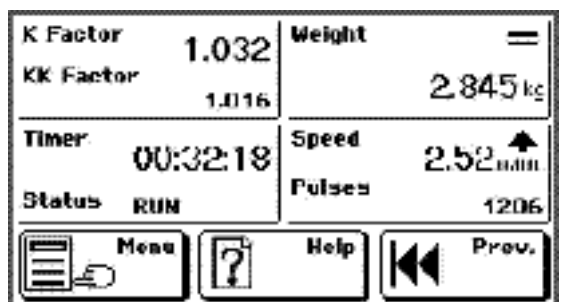
The window is divided into 2 pages that can be viewed with the Next and Prev keys.

This is the standard display during the operation and in stop conditions. According to the case press one section to enter one dedicated window with further details.

In the lower side are 3 "touch" keys with a contextual function.



	Next	It changes the base window display from page 1 to page 2.
	Prev.	It changes the base window display from page 2 to page 1.
	Help	It displays the contextual Help window that can be set.
	Menu	This allows you to enter the user menu for setting the parameters



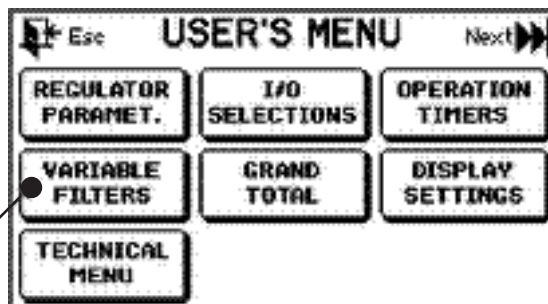
## CONTROL AND PARAMETERS MENU MODE

The menu widows are divided into 2 types: control menu and parameter menu according to the context and the data set-up menu structure.

One control menu can be made up of 1 to 9 items per window. In case the controls are more than 9 they are subdivided into more pages.

Press the key with the control description to activate it.

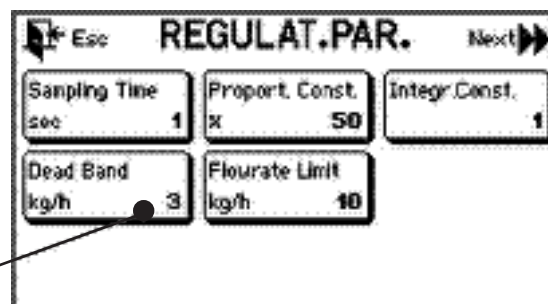
Control description





One parameter menu can be made up of 1 to 9 items per window. In case the controls are more than 9 they are subdivided into more pages.

Press the key with the parameter description to get access to its set-up.

Parameter with relative unit of measurement and value



-  **Next** It allows you to enter the next page of the menu (items > 9).
-  **Esc** It allows to quit the menu and go back to the upper level of the general window.

## PARAMETERS SET-UP MODE

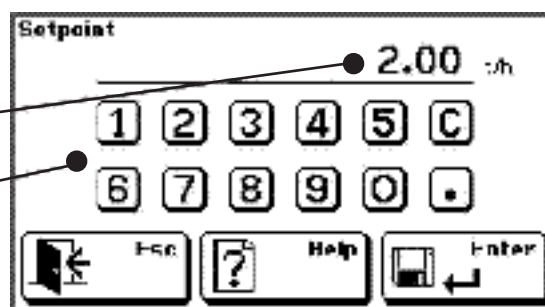
The parameters set-up procedures are divided into 2 types: set-up of numerical parameters and selection of parameters with preset value.

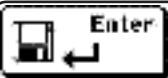
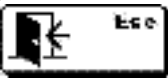

Current value

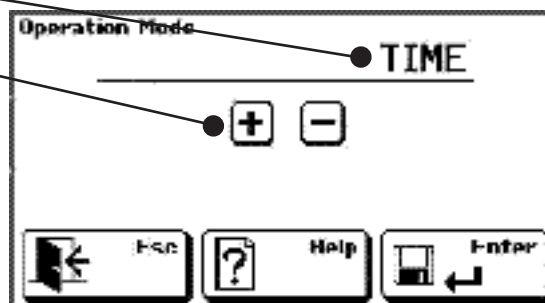
Composition keys

Current selection

Selection keys



-  **Enter** Conferma il valore corrente e lo memorizza.
-  **Esc** Abbandona la programmazione scartando la modifica.
-  **Help** Visualizza la schermata di Help contestuale, programmabile.

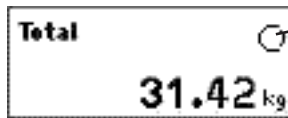


## 3.2 - MC353 DISPLAYS

**SECTION 1: TOTAL**

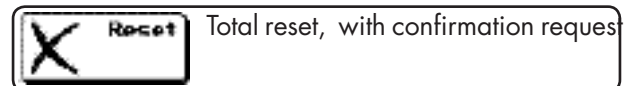
In the main window press the "Total" section to enter the detailed window concerning the instantaneous hourly flow rate, where additional information are reported.

Totalization pulse state (it becomes dark when active).



The graphic bar and the percentage value on the right side indicate that the conveyed total product proportion according to the set total setpoint.

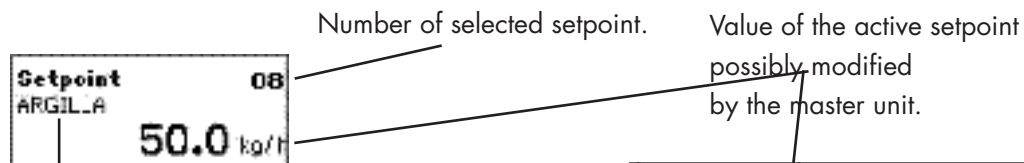
Set	Conveyed total weight setpoint. When the total reaches this value the relevant output is activated.
Preset	When less than this value is missing to reach the setpoint, the relevant output is activated.
Queue	Output activation advance with respect with the setpoint value



If the total setpoint management function is not selected press any section of the main window to directly reset the total, with confirmation request.

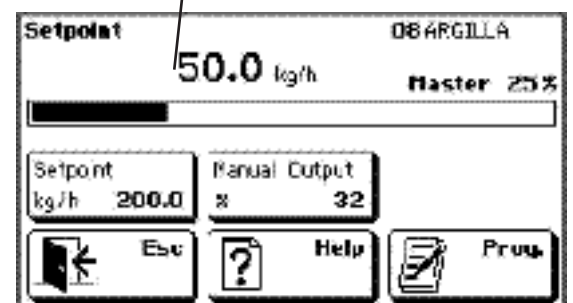
**SECTION 2: SET POINT**

In the main window press the section to access the detailed windows of the flow rate setpoint, where you enter also the setpoint values set-up.



Name of the selected setpoint that can be set by the user.

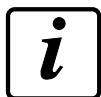
The graphic bar and the percentage value on the right side indicate the proportion of the active setpoint value with respect to the scale end, or to the setpoint whole value in case the setpoint change input is activated by the master.



Setpoint	Flow rate setpoint value that can be selected.
Output manual	Theoretic adjustment percentage manual output linked with the setpoint.



With this you enter the 15 setpoint set-up menu. Upon confirmation of the setpoint values you enter the relevant manual output value.



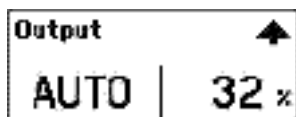
#### TECHNICAL NOTE: MANUAL OUTPUT LINKED WITH THE SETPOINT

To each setpoint is associated one adjustment manual output percentage.

- When one setpoint value is set or changed, an associated manual output value is suggested which is calculated proportionally according to the scale end value; it is then possible to change the suggested value.
- When you select a new setpoint the associated manual output value is taken as adjustment starting value (both AUTO and MAN).
- When during the operation you change from AUTO to MAN, the output current value is saved in the manual output parameter associated with the Setpoint.

### SECTION 3: MAN / AUTO OUTPUT

The output section can indicate whether the value calculated by the MC 353 in automatic mode for the adjustment output, or the value calculated in manual mode by the user.



Output trend (up, down, stable)

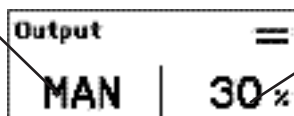
Press the AUTO section to change the MAN operation. The current output is acknowledged in the manual operation.

If the input state is set to AUTO (closed) a confirmation request is required on the relevant window.

In case of manual operation the section is divided into 2 "touch" areas.

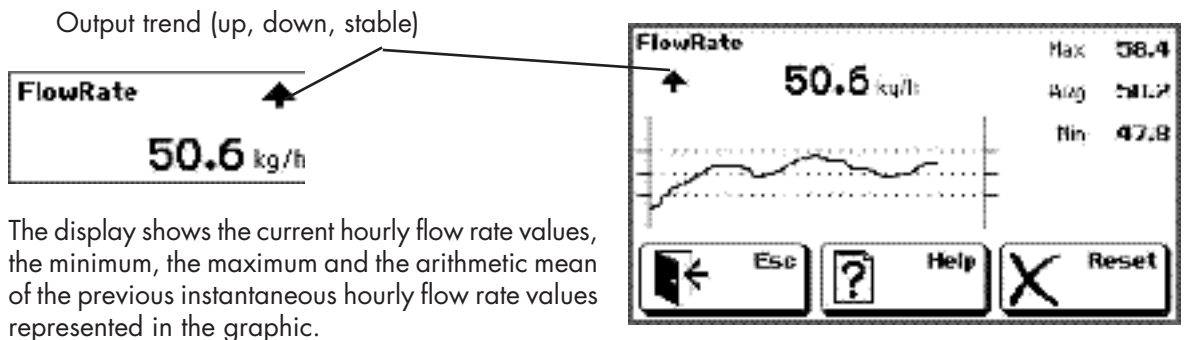
Press left on MAN to change to AUTO, with any confirmation window according to the selection input state.

Press right on the output value to access the value change function and to keep the manual operation.



## SECTION 4: HOURLY FLOW RATE

In the main window press the section to enter the detailed window concerning the instantaneous hourly flow rate, where additional information are reported.



### TECHNICAL NOTE: HOURLY FLOW RATE GRAPHIC REPRESENTATION

The graphic shows up to 150 values of hourly flow rate calculated during the operation according to the set sampling time. If the sampling time is of 3 sec. the graphic represents up to 7 minutes and a half of operation. When the graphic is completed the last third (50 values) are drawn at the beginning and the representation goes on from that moment.

The Max, Min and mean values refer to the values on the graphic.

The central reference line refers to the current flow rate setpoint, whereas the hatched lines above and under the central one represent the setpoint tolerance.

	Esc	It quits the window and displays the main screen.
	Reset	It draws the graphic and recalculates the data on the last 50 values.
	Help	It displays the contextual Help window that can be set.

## SECTION 5: CORRECTION FACTORS

K Factor	1.032
KK Factor	1.016

This section displays the correction factors applied to calculate the hourly flow rate and the following data. Factor K is determined with the belt calibration procedure.

Another KK correction coefficient can be set by the serial line through the described protocols. Such KK coefficient is applied additionally to the K general coefficient.

## SECTION 6: CURRENT WEIGHT

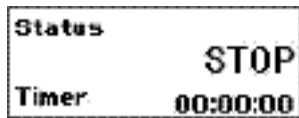
Weight	=
	2.845 kg



This section displays the detected current weight. During the run the display shows also the weight trend (up, down or stable).

In case of non-connected load cells or faults in the connection cables, the writing NO CONN (not connected) appears instead of the measure.

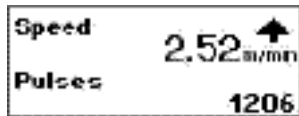
## SECTION 7: STATE AND TIMER



This display shows a message that indicates the instrument operation state, and one timer (hours:minutes:seconds) relevant to the run time, that is reset upon run start. The state message in the general window indicates the STOP and RUN conditions whereas in other procedures it can assume the following data:

Belt cal.	belt calibration procedure in progress
System test	System test procedure in progress
Reset waiting	Belt homing procedure (preparation)
Reset in progress	Belt homing procedure (execution)
Simulation	Operation simulation procedure in progress

## SECTION 8: ENCODER SPEED AND PULSES



This section displays the belt instantaneous speed value (in mm/min) and calculated at each sampling period according to the pulses acquired by the encoder and the belt sizing parameters. Pulse value refers to the counting during the sampling period.

During the operation the display shows also the speed trend with respect to the previous values (up, down, stable).

### 3.3 - SET-UP MENU LEVELS

The parameters that can be set are organised in 3 different levels: User, Technician and set-up.

For each level it is possible to enable one access password for the menu.

A change of the could parameters can jeopardise the machine operation and thus we recommend it to be carried out only by qualified personnel and anyway after having read the manual.

#### USER MENU - ( MENU )

It contains the functions and parameters that can be usually modified by the operator according to the working needs.

It is possible to enter the user menu by pressing the relevant key in the base general window.



This allows you to enter the user menu for parameters's setting.



During the run with this procedure you enter directly the adjustment parameters and not the user menu that is not available with running instrument.

#### TECHNICAL MENU - ( MENU -> TECHNICAL MENU )

It contains the test functions and the set-up relevant to the machine type and the operation mode; usually it must be used in the starting stage (recommended for qualified personnel).

It will only be possible to enter the User Menu and select the suitable TECHNICAL MENU control only with stopped metering.

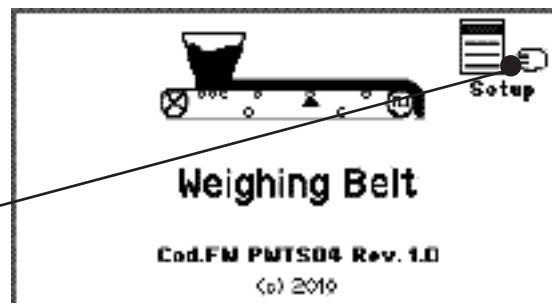
#### SET-UP MENU - (ACCESS RECOMMENDED ONLY FOR QUALIFIED PERSONNEL)

It contains the instrument set-up functions/parameters, the modification of the parameters is usually reserved to the supplier.

The access to the set-up occurs upon switching-on when the introduction window is displayed.



Press set-up to access the relevant menu.



### PARAMETERS SET-UP MENU - SET-UP LEVELS PROTECTION

It is possible to associate to each level a protection password that can be set through the technical menu, and it will be required to enter the relevant menu.

If you set 0 as password the access to the menu is free, thus the password request is disabled.

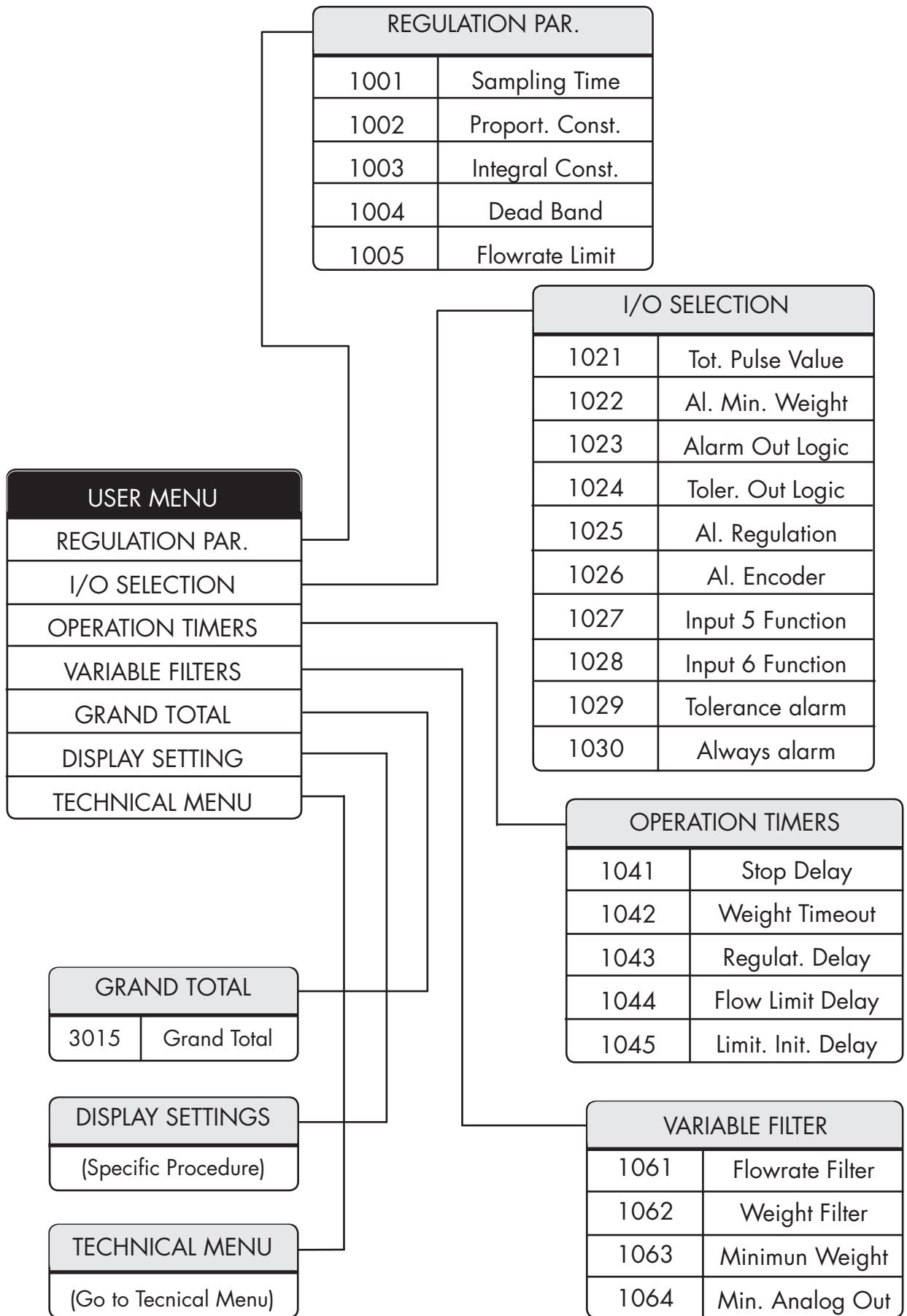
From the TECHNICAL MENU select LEVEL PROTECTION; from here it is possible to determine the Touch Screen protection level and any set-up of the 3 passwords (4-digit passwords).

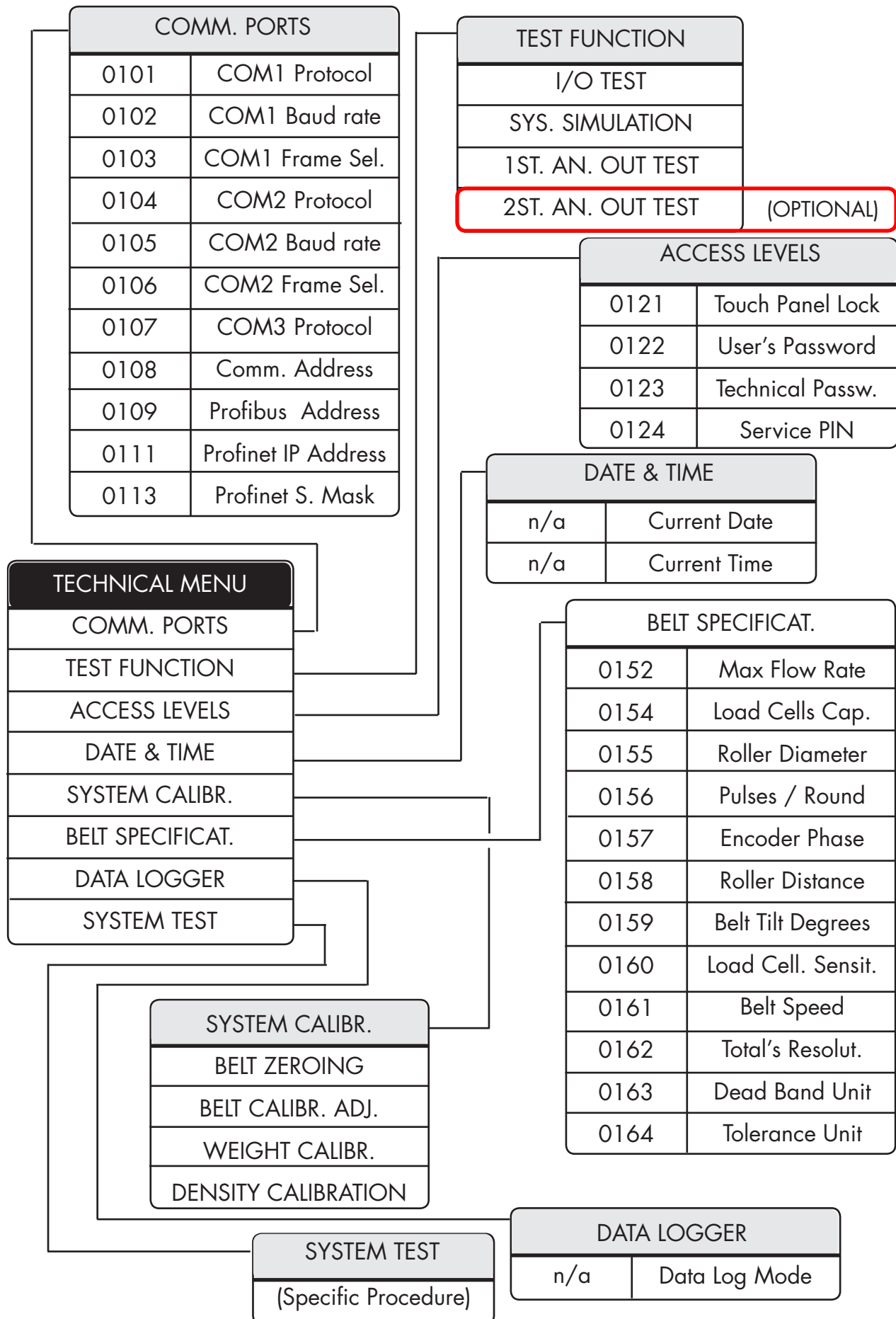
The block level can be selected among the 3 following modes:

FREE	Free access to the sections of the general window and to the user menu without password.
LOW LEVEL	Free access to the general window sections, but a password is required (if set) to enter the user menu.
HIGH LEVEL	Denied access to the general window sections and a password is required (if set) to enter the user menu. Free access to the general window sections and to the user menu without password.

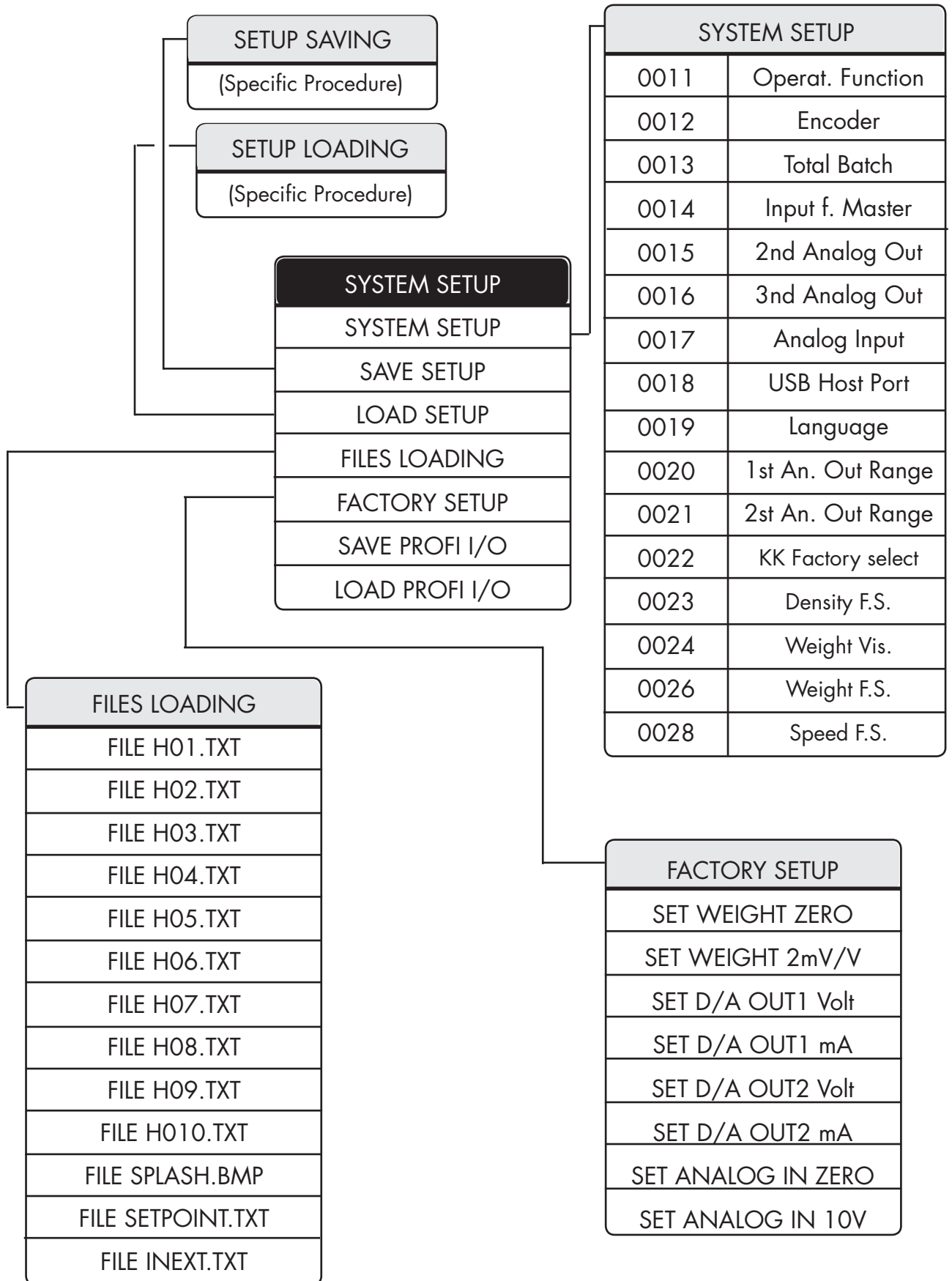


## 3.4 - PARAMETERS TABLES



**TECHNICAL MENU - PARAMETERS LIST**


## SET-UP MENU - PARAMETERS LIST



## 3.5 - LIST OF PARAMETERS TO BE SET

Addr.	Name	Decription	Unit	Menù	
0011	Operat. Function	Operating mode sel. (transmitter/adjuster)	Logic	System Setup	Level 1 - SYSTEM
0012	Encoder	System encoder availability sel. (no/yes)	Logic		
0013	Total Batch	Totalization function with setpoint check sel. (no/yes)	Logic		
0014	Input f. Master	Capacity setpoint adj. Master input sel. (no/serial/analogue)	Select		
0015	2nd Analog Out	Selection of optional analogue output activation ( no / flow rate / density);	Logic		
0016	3th Analog Out	Selection of optional 3rd analogue output activation ( no / density);	Logic		
0017	Analog Input	Additional analogue input availability sel. (no/yes)	Logic		
0018	USB Host Port	USB Host port availability for memory key sel. (no/yes)	Select		
0019	Language	Messages language sel.	Select		
0020	1st An.Out Range	Main analogue output range sel. (0÷5V/0÷10V/0÷20mA/4÷20mA)	Select		
0021	2nd An. Out Range	Optional analogue output 2A range sel. (0÷5V/0÷10V/0÷20mA/4÷20mA)	Select		
0022	Sel. factor KK	Abilitation selection about KK factor (false/true)	Select		
0023	FS density	Density full scale	kg/dm3		
0024	Weight selection	Weigh visualization selection (weigh, weigh/meter)	Select		
0026	FS Weight	Weigh full scale for 3rd analogue output (kg or kg/min, to be selected)	kg-kg/m		
0028	FS Speed	Speed full scale for 3rd analogue output	m/min		
0101	COM1 Protocol	COM1 protocol sel. (none/ModbusRTU/Ascii/Profibus)	Select	Comm. Ports	Level 2 - TECHNICAL
0102	COM1 Baud rate	COM1 baud rate sel. (1200/2400/4800/9600/19200/38400/57600)	Select		
0103	COM1 Frame Sel.	COM1 data frame format sel. (N81/N82/E81/O81/E72/O72/E71)	Select		
0104	COM2 Protocol	COM2 protocol sel. (none/monitor/master/slave)	Select		
0105	COM2 Baud rate	COM2 baud rate sel. (1200/2400/4800/9600/19200/38400/57600)	Select		
0106	COM2 Frame Sel.	COM2 data frame format sel. COM2 (N81/N82/E81/O81/E72/O72/E71)	Select		
0107	COM3 Protocol	COM3 protocol sel. (none/printer/repeater)	Select		
0108	Comm. Address	Serial communication address	Number		
0109	Comm. Profibus	Profibus communication address	Number		
0111	Profinet IP	Address mod. Profinet (32 bit, 8 bit for each IP address field)	Number	Access Level	
0113	Profinet Sn.M.	Address Subnetmask mod. Profinet (32 bit, 8 bit for each IP address field)	Number		
0121	Touch Panel Lock	Touch panel block level sel. (none/low/high)	Select		
0122	User Password	User's programming menu access password	Code		
0123	Technical Passw.	Engineer's programming menu access password	Code	System Calibr.	
0124	Service PIN	Setup menu access service password	Code		
0131	Operation Mode	Belt reset mode sel. (time/length)	Select		
0132	Belt Lap Time	Belt complete rotation time for reset procedure	sec		
0133	Belt Lap Lenght	Belt complete rotation length for reset procedure	cm	Belt Specification	
0134	Tare Weight	Belt tare	kg		
0135	Max Remote Tare	Max resettable weight value from input or serial	kg		
0141	K Factor	Correction factor for capacity acknowledgement	Coeff.		
0143	KK Factor	Additional correction factor for capacity acknowledgement	Coeff.		
0152	Max Flow Rate	System sized hourly max. capacity	kg/h		
0154	Load Cells Cap.	System load cells total nominal capacity	kg		
0155	Roller Diameter	Diameter of roller encoder is fitted onto	cm		
0156	Pulses / Round	Encoder nominal resolution	°		
0157	Encoder Phase	Encoder phases acknowledgement system (x1/x2x/x4)	p/s/round		
0158	Roller Distance	Rollers gap on weighing bridge	Select		
0159	Belt Tilt	Belt inclination in degrees	cm		
0160	Load Cells Sens.	Load cells average sensitivity	mV/V		
0161	Belt Speed	Belt fixed theoretical speed, if the encoder is disabled	m/min		
0162	Total's Resolution	Total conveyed weight resolution compared to capacity unit (10x/100x)	Select		
0163	Dead Band Unit	Adjustment deadband measurement unit selection (kg/h / %)	Select		
0164	Tolerance Unit	Capacity tolerance measurement unit selection (kg/h / %)	Select		
0182	Effective Max Flow	Max. hourly flow rate calculated proportionally to test valuesystem test	kg/h	Test	

1001	Sampling Time	Hourly capacity sampling time	sec	Regulation Parameters	Level 1 - USER			
1002	Proport. Constant	Adjustment algorithm proportionality constant	%					
1003	Integral Constant	Adjustment algorithm integration constant	Coeff.					
1004	Dead Band	Capacity gap around the Set where adjustment does not occur	kg/h					
1005	Flowrate Limit	Capacity Setpoint tolerance	kg/h					
1006	Dead Band %	Capacity gap around the Set where adjustment does not occur %	%					
1007	Flowrate Limit %	Capacity Setpoint tolerance %	%					
1021	Tot. Pulse Value	Totalized weight corresponding to output pulse	kg	I/O Selection		Level 1 - USER		
1022	Alarm Min.Weight	Min. weight alarm enable sel. (disabled/no capacity/min. weight)	Select					
1023	Alarm Out Logic	Alarm output operation logic sel. (NA/NC)	Select					
1024	Toler. Out Logic	Output operation logic sel. outside capacity tolerance (NA/NC)	Select					
1025	Alarm Regulation	Adjustment alarm enable sel. (no/yes)	Logic					
1026	Alarm Encoder	Encoder alarm enable sel. (no/yes)	Logic					
1027	Input 5 Function	Logic input No.5 function sel. (Setpoint sel./belt reset)	Select					
1028	Input 6 Function	Logic input No.6 function sel. (Setpoint sel./belt reset)	Select	Operation Time			Level 1 - USER	
1029	Tolerance Alarm	Selection to activate the out of tolerance alarm (no/yes)	Select					
1030	Always Alarm	Selection to activate permanently the alarms, even when not in RUN (no/yes)	Select					
1041	Stop Delay	Run stop delay	sec					
1042	Weight Timeout	Max. time period where weight can be constant	sec					
1043	Regulation Delay	Adjustment enable delay upon run start	sec					
1044	Flow Limit Delay	Capacity output enable delay outside tolerance limits	sec					
1045	Limit Init. Delay	Capacity tolerance control delay upon run start	sec	Variable Filters				Level 1 - USER
1061	Flowrate Filter	Hourly capacity filter factor	Coeff.					
1062	Weight Filter	Weight filter factor	Coeff.					
1063	Minimun Weight	Min. detected weight to calculate a hourly capacity	kg					
1064	Min. Analog Out	Adjustment min. value	%	SET-POINT				
2002	SET	Conveyed product total setpoint	kg					
2004	Pre-SET	Conveyed product total preset	kg					
2006	Flying	Conveyed product weight flight	kg					
2041	Setpoint 1	Capacity setpoint No. 1	kg/h					
2042	Manual Out Set 1	Percentage output associated with Setpoint No.1	%					
2043	Setpoint 2	Capacity setpoint No. 2	kg/h					
2044	Manual Out Set 2	Percentage output associated with Setpoint No.2	%					
2045	Setpoint 3	Capacity setpoint No. 3	kg/h					
2046	Manual Out Set 3	Percentage output associated with Setpoint No.3	%					
2047	Setpoint 4	Capacity setpoint No. 4	kg/h					
2048	Manual Out Set 4	Percentage output associated with Setpoint No.4	%					
2049	Setpoint 5	Capacity setpoint No. 5	kg/h					
2050	Manual Out Set 5	Percentage output associated with Setpoint No.5	%					
2051	Setpoint 6	Capacity setpoint No. 6	kg/h					
2052	Manual Out Set 6	Percentage output associated with Setpoint No.6	%					
2053	Setpoint 7	Capacity setpoint No. 7	kg/h					
2054	Manual Out Set 7	Percentage output associated with Setpoint No.7	%					
2055	Setpoint 8	Capacity setpoint No. 8	kg/h					
2056	Manual Out Set 8	Percentage output associated with Setpoint No.8	%					
2057	Setpoint 9	Capacity setpoint No. 9	kg/h					
2058	Manual Out Set 9	Percentage output associated with Setpoint No.9	%					
2059	Setpoint 10	Capacity setpoint No. 10	kg/h					
2060	Manual Out Set 10	Percentage output associated with Setpoint No.10	%					
2061	Setpoint 11	Capacity setpoint No. 11	kg/h					
2062	Manual Out Set 11	Percentage output associated with Setpoint No.11	%					
2063	Setpoint 12	Capacity setpoint No. 12	kg/h					
2064	Manual Out Set 12	Percentage output t associated with Setpoint No.12	%					
2065	Setpoint 13	Capacity setpoint No. 13	kg/h					
2066	Manual Out Set 13	Percentage output associated with Setpoint No.13	%					

2067	Setpoint 14	Capacity setpoint No. 14	kg/h		
2068	Manual Out Set14	Percentage output associated with Setpoint No.14	%		
2069	Setpoint 15	Capacity setpoint No. 15	kg/h		
2070	Manual Out Set15	Percentage output associated with Setpoint No.15	%		
3011	Flowrate	Instant read, calibrated and filtered capacity	kg/h	Read only reg.	
3013	Total	Conveyed product total weight	kg		
3015	Grand Total	Overall total	kg		
3016	Setpoint	Current Setpoint value	kg/h		
3017	Alarm Code	Alarm code (*)	Select		
3018	Input	Status of logic input (1=close, 0=open) (bit0=IN1, ..., bit5=IN6)	Code		
3019	Output	Status of logic output (1=active, 0=inactive) (bit0=OUT1, ..., bit5=OUT6)	Code		
3021	Speed	Belt current speed	m/min		
3023	Actual weight	Actual net weight	kg		
3024	Analog Out 1	Main analogue output current value	%		
3025	Analog Out 2	Additional analogue output current value	%		
3026	Analog Input	Analogue input current value	%		
3027	Tests Status	Status (no/test1-O/belt calibre./syst. test./standby zeroing /belt zeroing/dac/simul)	Select		
3028	Run Status	Run status (stop/run)	Logic		
3029	Flowrate Decim.	Number of decimal digits of capacity values	Numer.		
3030	Total Decimals	Number of decimal digits of conveyed product total weight	Numer.		
3031	Weight Decimals	Number of decimal digits of detected weight values	Numer.		
3033	Weigh / meter	Weigh / meter current value	kg/m		
3034	Density	Density actual value	kg/dm <sup>3</sup>		
3035	System ready	System ready, then stopped and no alarms (true, false)	Numer.		
4011	Num. Set	Active Setpoint number	Numer.	Current	
4012	Auto / Man	Operating mode sel. (automatic/manual)	Select		
4013	Manuale Out	Manual analogue output value	%		
4014	Setpoint Variation	Capacity Setpoint variation percentage for slave operation	%		
4015	Specific weight	Weight parameter for density calculation	kg/dm <sup>3</sup>		
4016	Input IO 1	Mod. ext. IO n.1: logic state input (1=close, 0=open) (bit0=IN1, ..... bit3=IN6) (1*)	Code		
4017	Output IO 1	Mod. ext. IO n.1: logic state out.(1=active, 0=none) (bit0=OUT1, ..... bit7=OUT8)	Code		
4018	Input IO 2	Mod. ext. IO n.2: logic state input (1=close, 0=open) (bit0=IN1, ..... bit3=IN6)	Code		
4019	Output IO 2	Mod. ext. IO n.2: logic state out. (1=active, 0=none) (bit0=OUT1, ..... bit7=OUT8)	Code		
5001	Command reg.	Oper. control adj. from serial (none/total reset/belt reset/save data)	Select	CMD	
5002	Run comm. reg.	Control adj. and run IN priority (bit 15=priority / bit 0=status IN)	Numer.		
7001	Test Register	Profibus network connection test registry	Numer.	Test	

(\*): (no/regulation/encoder/minimum weight/weight error/fix weight/tolerance alarm/error IN EXT)

(1\*): BIT15=1 if module communication fail timeout occurs.

(2\*): NULL=0, TOTAL RESET=1, RESET BELT=2, SAVE DATA=3.

NOTE: The MODBUS-RTU specifications foresee that the 40001 register is allocated the address 0000.

In Modbus, the fixed selectable options of the relevant parameters are indicated within brackets in the description in increasing order: (0 / 1 / 2 / 3 / etc...).

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**TECHNICAL NOTES: GENERAL TOTAL**

The general total counts the conveyed total weight separately from the standard total (lower level). The reset of such values is independent.

The total setpoint output control can not be connected with the general total.

For both totalizers the max value that can be counted is 99999999 (8 digits), and after this value it is reset. For both totalizers the weight resolution can be selected between 10x and 100x with respect to the weight unit used for the hourly flow rate.

**TECHNICAL NOTES ABOUT THE BELT SPECIFICATIONS****TECHNICAL NOTE: MAXIMUM HOURLY FLOW RATE**

The set-up of this value determines also the indicated hourly flow rate resolution even though the instrument uses a resolution 10 times higher. The unit of measurement of the hourly flow rate can be deduced from the following table.

The maximum hourly value is also used as analogue output scale end, both the adjustment one and the optional one for the transmission. Such value can be adjusted with the MACHINE TEST procedure.

Max. flow rate	1÷50	51÷500	501÷5000	5001÷50000	50001÷500000	500001÷5000000
Flow rate resolution	0.01 kg/h	0.1kg/h	1 kg/h	0.01 t/h	0.1 t/h	1 t/h
Weigh resolution	0.000 kg	0.00kg	0.0kg	0.000 t	0.00 t	0.0 t



The instrument does not accept maximum hourly flow rate values that determine a ratio with the load cells unit of measurement lower than 20 or higher than 50000.

**TECHNICAL NOTE: LOAD CELL FLOW RATE**

The setting up of this value determines also the weight unit of measurement that can be deduced by the following table.

The load cells flow rate value, together with the set sensitivity, is processed to get the weight theoretic adjustment, which is calculated again at the menu output when one of these two parameters has been modified.

1÷10	51÷100	501÷1000	5001÷10000	50001÷100000
0.001	0.01	0.1	1	10
11÷20	101÷200	1001÷2000	10001÷20000	
0.002	0.02	0.2	2	
21÷50	201÷500	2001÷5000	20001÷50000	
0.005	0.05	0.5	5	

The side table indicates the units of measurement calculated by the system according to the installed load cells max. flow rate.

More in detail the first square shows the total cells load, whereas in the lower part is indicated the relative unit of measurement (value in kg).



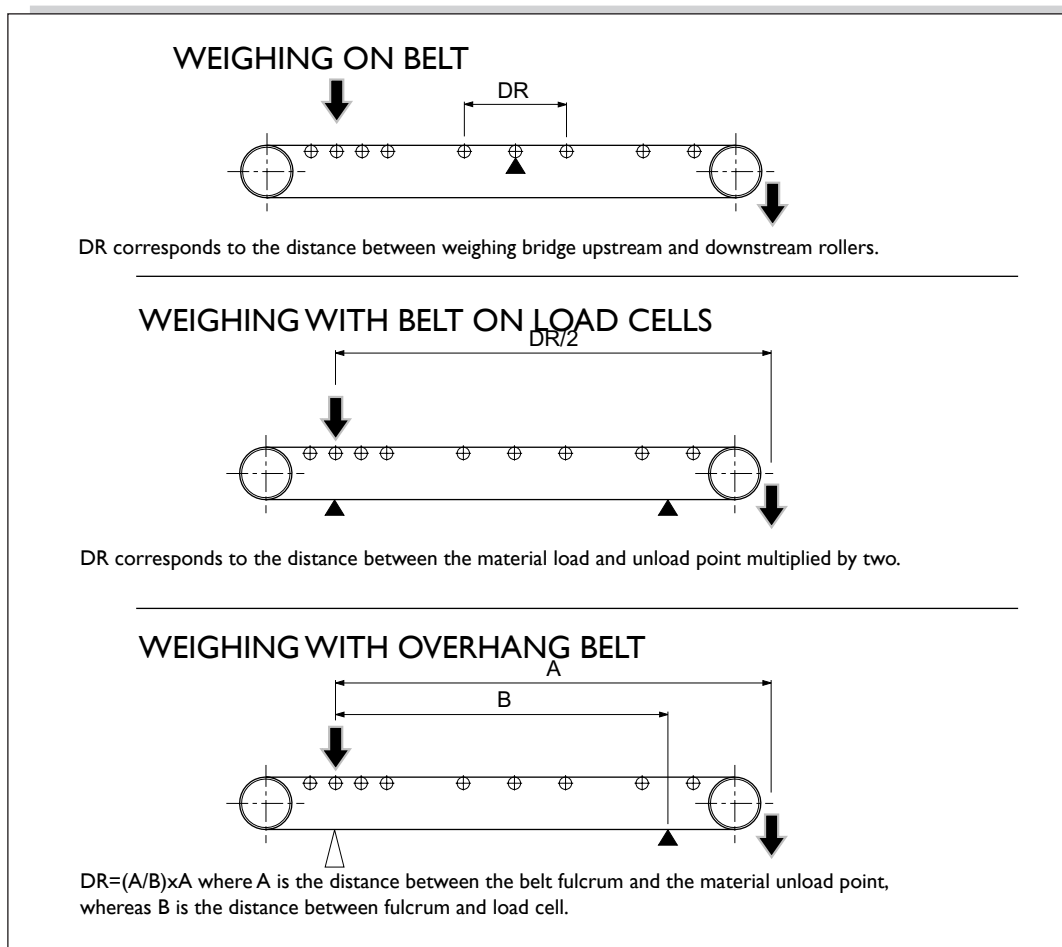
The instrument does not accept values of the load cells flow rate that determine a ratio between a max. hourly flow rate and load cells unit of measurement lower than 20 or higher than 50000.





### TECHNICAL NOTE: ROLLERS DISTANCE

The rollers distance (DR) is measured in different ways according to the type of belt the weighing bridge is installed on. The following picture shows a summary of the different types with relevant identification mode of the parameter.



### TECHNICAL NOTE: BELT INCLINATION

The set-up of this value affects the saved weight adjustment by compensating the load cells response. It is possible to set the inclination degree after having adjusted the belt in horizontal position (or having carried out the theoretic adjustment), or proceed with the sample weight adjustment after having set the inclination degree.

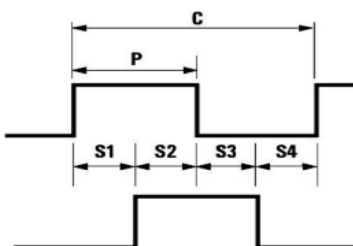
The detected weight is calculated according to the belt inclination:

$$\text{COMPENSATED WEIGHT} = \text{DETECTED WEIGHT} / \cos(\text{angle})$$



### TECHNICAL NOTE: ENCODER ACQUISITION

The encoder acquisition occurs in 2 phases (A and B), with rotation sense control. The phases connection does not matter since the instrument detects the prevailing rotation sense.



The encoder nominal resolution can be increased (2x or 4x) according to the phases acquisition modes, as shown in the following pictures:

C : 1x

P : 2x

S : 4x

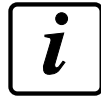


## TECHNICAL NOTES ABOUT THE SYSTEM SET-UP



### TECHNICAL NOTE: MASTER INPUT

This selection enables the flow rate setpoint continuous change function by one master. According to the selected value, this change can occur through COM2 (RS485) serial line or through analogue input. In the latter case the instrument must be provided with an analogue input optional board. The set flow rate setpoint value corresponds to the master input scale end (digital 1000 value or analogue input scale end) and is modified in proportion to the input.



### TECHNICAL NOTE: USB HOST PORT

The activation of the USB Host port implies the presence inside the instrument of the optional board which allows to interface one USB pen drive for saving and loading files. When this function is active the LOAD set-up, SAVE set-up and LOAD FILES operations are automatically addressed to this port and are no longer available on the COM2 line. The DATA LOGGER operation is, on the contrary, selectable between the 2 communication ports.



### TECHNICAL NOTE: OTHER SELECTIONS

The other set-up menu selections must meet some compatibility requirements, otherwise upon the parameters menu output the display shows the error page. The requirements are as follows:

When selecting Operative Function = TRANSMITTER you must have 2nd Analogue Output = NO.

When selecting Operative Function = TRANSMITTER you must have Master Input = NO.

When selecting Master Input = ANALOGUE you must have Master Input = YES

The "TOTALIZATION" selection indicates the total setpoint use, and relevant parameters with set and total preset outputs management.



### TECHNICAL NOTE: 2<sup>ND</sup> ANALOGUE OUTPUT

The activation of the second analogue output implies the application of the optional board in the instrument.

In this configuration, during the run the second analogue output is in proportion to the current hourly flow rate and its scale end is the system maximum flow rate.

## USER MENU TECHNICAL NOTES



### TECHNICAL NOTES: OPERATIVE TIMES

- Stop delay: the time at the end of the run, (input 1 opening) when the instrument continues totalizing the product even if it does not adjust the flow rate.

- Weight timeout: maximum time in which the weight during the belt movement can keep the same value before triggering the relevant alarm.

- Adjustment delay: delay, with respect to the run start, during which the instrument does not adjust the flow rate and keeps the starting output value.

- Tolerance delay: flow rate tolerance alarm activation delay. The alarm is activated only after that the flow rate remains out of tolerance for at least this time.

- Start tolerance delay: delay, with respect to the run start, during which the instrument does not control the instantaneous flow rate tolerance.



### TECHNICAL NOTES: VARIABLE FILTERS

- Minimum weight: under this threshold the flow rate is considered null.

- Minimum analogue output: below this analogue output minimum percentage value it is not possible to start the belt.

### 3.6 - LIST OF PARAMETERS PRIOR TO COMMISSIONING

For correct working conditions of the weighing system, the main parameters to check and enter before start are explained.

Par.	Name	Description	Value
0152	Max flow rate	Maximum flow rate of the system expressed in Kg/h. Programming of this parameter determines the scale and flow rate unit of measurement (see page 37), the same value corresponds also to the Scale End analogical output exit in case it works as a TRANSMITTER.	
0154	Load cells capacity	Sum of the system load cells flow rate. E.g.: if there are 2 load cells with nominal flow rate of 50 Kg, set 100. Programming this parameter also determines the weight unit of measurement (see page 37).	
0155	Roller diametere	Diameter of the encoder roller expressed in cm.	
0156	Pulses / round	Number of revolution pulses of the encoder. Refer to encoder ratings (normally 1000 Pulses/Rev) Parameter visible only if 0012=YES.	
0157	Encoder phase	Through this parameter it is possible to increase the encoder resolution X1, X2, X4 (see technical note). Generally use X1, in case of very slow belts use X2 or bigger.	
0158	Roller distance	Measure in cm to detect on the weighing system. Since the method to measure this distance varies depending on the type of weighing belt, refer to the diagram on page 38 on how to obtain the correct measurement.	
0159	Belt tilt	Inclination of weighing belt (Max. 30°). Programming this parameter acts on the weight setting in the memory ,compensating the load cells response. The weight is calculated according to the belt inclination: $\text{CALCULATED WEIGHT} = \text{DETECTED WEIGHT}/\cos(\text{angle})$	
0160	Load cells sens.	Sensitivity of load cells expressed in mV/V . Refer to cells ratings (normally 2 mV/V).	
0161	Belt speed	Belt speed expressed in m/min . The parameter is visible and must be set only if the encoder is not present (parameter 0012=NO).	
0162	Total's resolution	The totalizator resolution can be increased with regards to the hour flow rate resolution 10X or 100X. Set resolution will have an influence both on the general as on the standard total.	
0163	Dead band unit	Selection of DEAD BELT parameter management unit of measurement between absolute and percentage value.	
0164	Tolerance unit	Selection of FLOW RATE TOLERANCE parameter management unit of measurement between absolute and percentage value.	
1001	Sampling time	Time base in which the instrument performs flow rate and total calculations. Flow rate is updated when each sampling time expires. We recommend setting low values in case of totalizers where flow rate constancy is not important.	

Par.	Name	Description	Value
1002	Proport. constant	Regulation parameter (not visible in case of TRANSMITTER). It is the ratio between instant flow rate variation and speed regulation analogical signal variation.	
1003	Integral constant	Regulation parameter, speed signal correction intervenes each time it reaches the set number of samples in this constant. E.g.: If Sampling Time= 3 seconds Integral Const.= 2 corrections will take place every 6 seconds.	
1004	Dead band	Non intervention regulation belt (expressed based in the selected unit in N°0163). Regulation does not intervene if the instantaneous flow rate detected is between the range Set Point Dead Belt and Set Point + Dead Belt.	
1005	Flowrate limit	Parameter which determines the activation of the out of tolerance alarm OUT 5. If detected instantaneous flow rate diverges from the one set in the Set-Point by a value higher than the one set in the constant, the relative alarm is activated.	
1021	Tot. pulse value	Totalization pulse, each time the total weight reaches a multiple of the value set in this constant, the relative output OUT 3 is activated.	
1022	Alarm min. weight	Selects the activation mode of the Null flow rate output alarm (OUT 6) between: NULL FLOW RATE= output is activated if during the run there is no flow rate detected due to weight = 0 (product missing) or speed = 0 (absence of encoder pulses); MIN. WEIGHT=output is activated if during the run there is speed >0 (encoder pulses present) detected weight is under the minimum values.	
1023	Alarm out logic	The logic of output alarms OUT 4 and OUT 5 can be selected between NO (normally opened) and NC (normally closed). In case of NC output is raised only after having closed the RUN input (IN 9).	
1024	Toler. out logic		
1025	Alarm regulation	Impossible regulation can be included or excluded from the general alarm activation causes (OUT 4) through this parameter.	
1026	Alarm encoder	Possible absence of encoder pulses during run (IN RUN active) can be included or excluded from the general alarm activation causes (OUT 4) through this parameter.	
1027	Input 5 function	Multifunction Input can be selected between: Set Point selection or Belt Homing procedure activation.	
1028	Input 6 function	Multifunction Input can be selected between: Set Point or Totalizator and Print control reset selection (if present).	
1041	Stop delay	Time activated after opening of input RUN (IN 9) during which the instrument continues to totalize the product, even without flow rate regulations. It is not possible to start the run before expiration of such time.	

Par.	Name	Description	Value
1042	Weight timeout	Maximum time in which the weight transmitted from the load cells during the run can keep the same value before generating its alarm (OUT 4).	
1043	Regulation delay	Delay, with respect to the run start, during which the instrument does not adjust the flow rate and keeps the starting output value.	
1044	Flow limit delay	Delay of the flow rate Tolerance alarm. The alarm is activated only after the flow rate remains out of tolerance for at least this time.	
1045	Limit init. delay	Delay with respect to the run start during which the instrument does not control the instantaneous flow rate tolerance.	
1061	Flowrate filter	Digital filter on the instantaneous flow rate reading. Set value refers to the number of consecutive samplings with which the mean is calculated.	
1062	Weight filter	Weight signal filter, to reduce oscillation increase the value.	
1063	Minimum weight	Net weight detected from load cells is below which the flow rate is considered null. Since the function of this parameter is that of covering possible tare differences generated by the belt in diverse points, we recommend setting it only after having performed the zeroing and detected the maximum displayed deviation.	
1064	Min. analog out	Minimum analogue output percentage below which it is not possible to start the belt; if during the run the calculated analogue value goes under this threshold the minimum value is kept in output.	

## 4 - INSTRUMENT PROCEDURE

### 4.1 - INSTRUMENT COMMISSIONING PROCEDURE



For correct working conditions of the instrument, keep to the following steps.  
Only qualified personnel shall carry out the procedures described below.



1. Install the instrument and connect the terminal boards as shown in the diagram in the manual.

2. Only after being certain of the cabling made, supply power to the instrument and verify INPUT / OUTPUT using also the TEST FUNCTIONS.

Check also weight and speed readings. Weight value shall be positive and shall increase when some pressure is exerted onto the weighing bridge, while speed value shall correspond to the belt speed and vary proportionally.

3. Parameter the instrument according to installation specifications, usually it is not necessary to access SET-UP MENU parameters since it has already been configured as requested by the customer.

However, it is necessary to set the following parameter groups in the TECHNICAL MENU:

- Belt Specifications;
- Communication ports.

and in the USER MENU:

- Select I/O.

4. Perform a SYSTEM CALIBRATION after DYNAMIC BELT HOMING following the DYNAMIC BELT CALIBRATION.

Only if it is not possible to make a test with the product, perform the WEIGHT SAMPLE TEST CALIBRATION.

5. Start the system and adjust "operating" parameters:

- Adjustment Parameters;
- Operative Times;
- Variable Filters.

## 4.2 - IN-OUT TEST PROCEDURE

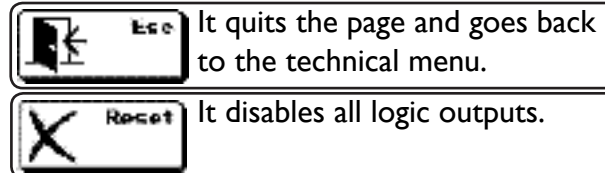
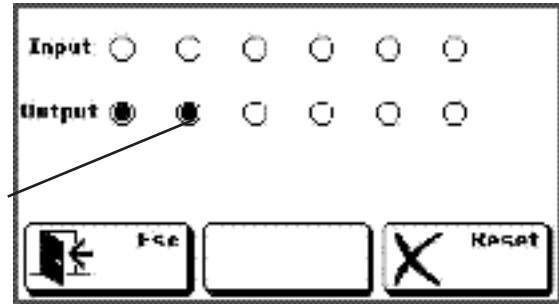
TECHNICAL MENU -> TEST FUNCTIONS -> IN/OUT TEST

This procedure allows to display the logic outputs and inputs state and force the outputs state from the touch screen.



Press the output luminous button to change (ON/OFF) the state.

1 . . . . . 6 from left to right.



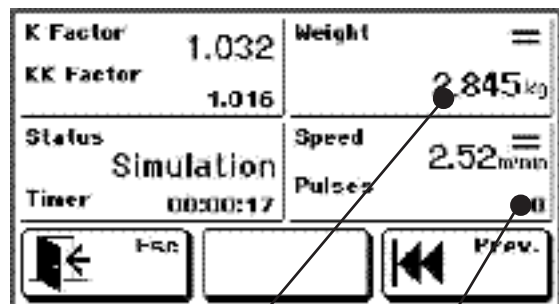
## 4.3 - SIMULATION PROCEDURE

TECHNICAL MENU -> TEST FUNCTIONS -> SIMULATION

In the simulation procedure, the belt current weight and speed are not acquired by the relevant transducer (load cells and encoder) but they are simulated and determined by the operator through the numeric value set up through the touch screen.

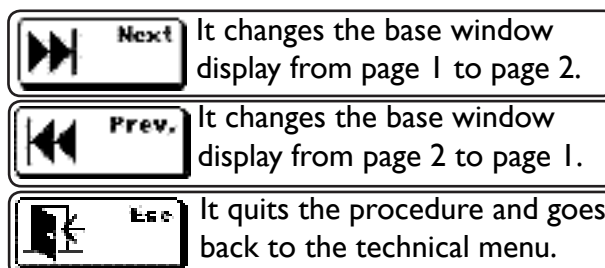
The other part of the operation is the operative one with the control of run, logic and analogue I/O.

It is possible to simulate the operation without connecting load cells and encoder.



Press the weight section to set the value.

Press the speed section to set the value.



## 4.4 - MACHINE TEST PROCEDURE

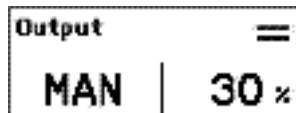
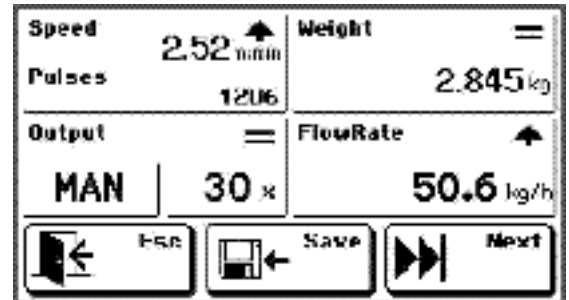
## TECHNICAL MENU -&gt; MACHINE TEST

Through this procedure it is possible to define one precise correspondence between the flow rate and the speed adjustment analogue output signal.

In correspondence to a speed value within 20% and 80% it is possible to save the real flow rate value; this allows to assume already from the first start the speed value corresponding to the required setpoint and to speed up the adjustment.

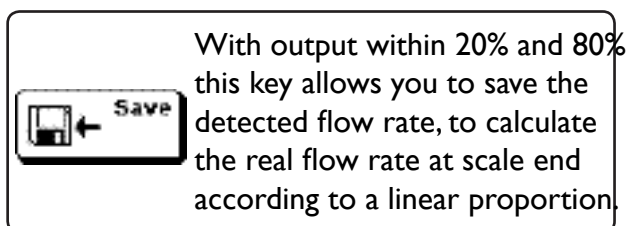
This procedure is not compulsory because usually the maximum speed is associated with the value saved in the Maximum Flow Rate and shall not be performed if the instrument is set as Transmitter.

During the test no adjustment is carried out and the I/O are not managed. It is furthermore necessary to make sure that the passing product is constant and that the working conditions are the standard ones.

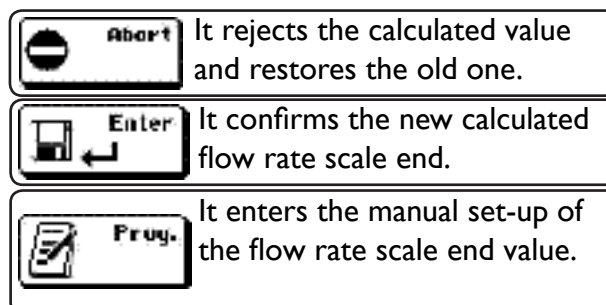
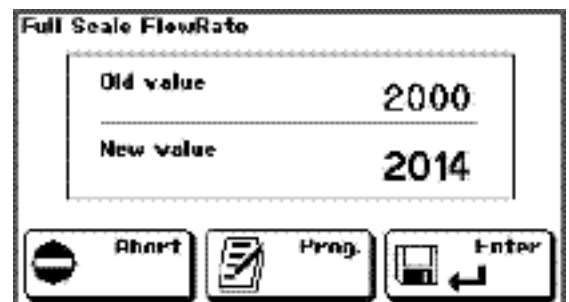


Set the speed value in manual mode (20% ÷ 80%).

Start the belt and make sure the product is constant.



After saving the current hourly flow rate the display shows the value corresponding to the calculated scale end and the previous value.



## 5 - SYSTEM CALIBRATION



The weighing belt calibration is a fundamental stage to get a correct measure and shall always be carried out; it is furthermore necessary to repeat it periodically and each time you carry out mechanical adjustments on the belt.

The calibration consists of two phases:

- 1) Zero calibration that allows to acquire the system tare and can be carried out both with moving belt (recommended procedure) and with stopped belt;
- 2) scale end calibration that can be carried out both with a product (recommended procedure) and with a sample weight.

Note: before proceeding with the calibration make sure to have correctly set the flow rate parameters of cells, sensitivity, maximum flow rate and belt inclination (parameters 0154, 0160, 0152, 0159).

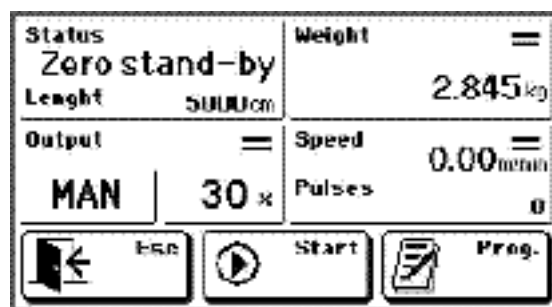
### 5.1 - BELT HOMING DYNAMIC PROCEDURE

TECHNICAL MENU -> SYSTEM CALIBRATION -> BELT HOMING

This procedure allows to reset the weighing system tare with moving belt.

The procedure duration is determined by the time/length values set in the relevant parameter (we recommend a value corresponding to one complete cycle).

At the end of the procedure the zero calibration is automatically saved by considering the mean of all sampled weights.

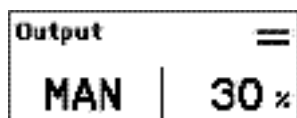


During the zero calibration stage the belt must move empty (without product).



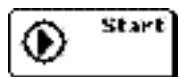
Press the PROG key to enter the set-up menu and enter the values corresponding to one complete cycle of the belt through the parameters (operative mode, cycle time or length).

Note: this operation shall be carried out only the first time since the parameters remain in memory.



Only in case the instrument is set as regulator you shall set the speed at which you want to carry out the test by means of the special control.

Check that the belt is completely empty.



It starts the weight reset procedure; to do this you will be asked to enter a password (if set).

Once the reset procedure is started the system waits for the run input closure and, when it detects the belt movement through the encoder, it measures the belt cycle time or length. The measure that remains at the end of the procedure is displayed as decreasing in the state section. It is possible to interrupt at any time the procedure by the touch screen without modifying the weight calibration. At the end of the reset tare value is displayed in the relevant menu of the parameters.



It quits the procedure and goes back to the technical menu.





The reset procedure can also be activated by a remote control using the saved parameters only in stop conditions. The control can be transmitted by the serial line (5001 parameter), or by the logic input (input 5). The procedure modes are the same of the manual one but with set maximum resettable value (0135); at the end the general window is restored.

## 5.2 - BELT CALIBRATION DYNAMIC PROCEDURE

TECHNICAL MENU -> SYSTEM CALIBRATION-> BELT CALIBRATION

This procedure calibrates the belt with product by getting a K correction factor.

During the test a certain quantity of product is conveyed on the belt (the product could be recovered at outfeed and weighed on the static balance) and the correspondence between real and calculated weight is checked.

<b>Total</b> <span>○</span>		<b>Setpoint</b> <b>08</b>
31.42 kg		50.0 kg/h
<b>Output</b>	=	<b>FlowRate</b> <span>↑</span>
MAN	30 %	50.6 kg/h
Menu	Calib.	Next

The K factor is calculated by the instrument as a ratio between the total weight calculated by the same and the one actually conveyed detected and set by the operator.

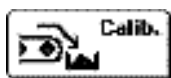
<b>Total</b> <span>○</span>
31.42 kg

Before starting the test, reset all values by pressing the relevant section.

<b>Output</b>	=
MAN	30 %

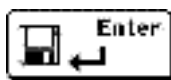
Only in case the instrument is set as regulator you shall set the speed at which you want to carry out the test.

Start the belt by closing the run input and pass the quantity of product necessary for the test and then stop the belt.



It enters the real conveyed weight set-up in case the value does not correspond to the one calculated by the instrument.

After setting up the detected real weight the display shows the calculated K correction factor and the previous value.



It confirms the correction value.



It rejects the value and restores the previous one.

Calibration Factor	
Old value	1.000
New value	1.014
Abort	Help
Enter	

Note: during the calibration test it is necessary to follow the rule below:

if you start with empty belt you must finish with empty belt, if you start with full belt you must finish with full belt.

### CORRECTION FACTOR MANUAL CALCULATION AND SET-UP

This function allows to manually set the "correction factor"; this is useful when you have production data and you wish to correct the calibration without carrying out a specific test.

The new correction factor (K) shall be calculated as follows:

$$K = K1 \times \text{REAL TOTAL} / \text{CALCULATED TOTAL}$$

Where :

CALCULATED TOTAL = value of calculated weight displayed by the instrument

REAL TOTAL = value of weight actually conveyed on the belt

K1 = correction factor saved in the instrument during the test

<b>K Factor</b>	<b>1.032</b>
<b>KK Factor</b>	<b>1.016</b>

In page 2 of the belt calibration window it is possible to see the saved K factor and to enter directly the set-up of the previous calculated value by pressing the relevant section.

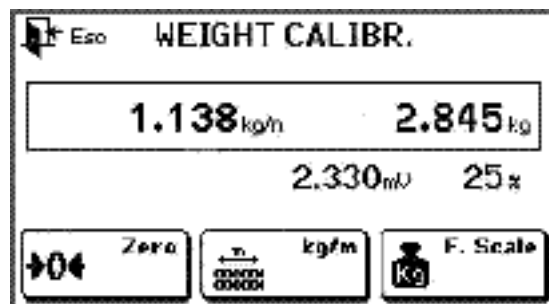
If enabled, it will be programmed in sequence the KK factor.

## 5.3 - ZERO STATIC CALIBRATION AND WITH SAMPLE WEIGHT

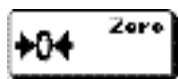
TECHNICAL MENU -> SYSTEM CALIBRATION -> WEIGHT CALIBRATION

This procedure shall be used in case it is not possible to carry out the reset with moving belt or the calibration of belt with product.

The detected weight is first of all determined by the nominal flow rate parameters and the cell sensitivity (parameters 0154 and 0160); furthermore the calibration is influenced by the belt inclination (parameter 0159).



### ZERO CALIBRATION



With this key you start the ZERO CALIBRATION; make sure that the belt is empty (without product) and the weight is stable, then press the key to save the detected value as system tare.

### CALIBRATION WITH SAMPLE WEIGHT OR CHAINS

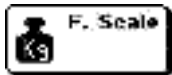
Once the zero value has been saved it is possible to check/calibrate the system by using one sample weight (knowing its total weight) or chains (knowing the weight per meter).

For this procedure it is necessary to put the weight or the chains in the weighing area and check the weight displayed on the instrument. In case of significant differences proceed with the calibration.



With this key you enter the sample weight loaded on the belt (in Kg/m) usually made up of chains placed on the whole weighing area whose weight per meter is known.

OR



It allows to enter the sample weight loaded on the belt (in Kg); usually one roller placed near the load cells axis.

#### 5.4 - MC 353 OPERATION ALARMS

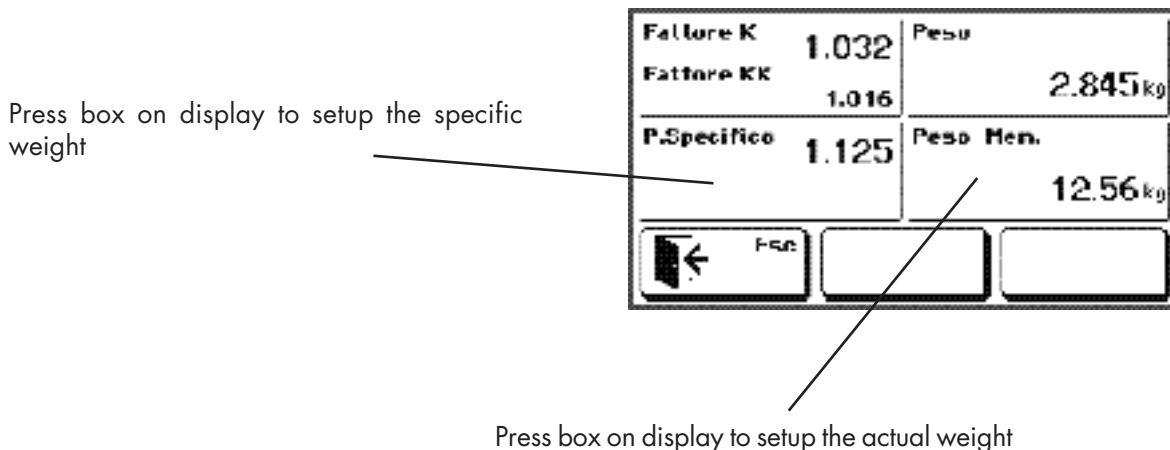
During RUN the following alarms may occur, shown in the display's dedicated area, up to the right, with a blinking icon, beyond the activation of the relevant output. All alarms deactivate automatically when the cause ceases to exist and normal function is established, but blinking icon still stays on until manual RESET occurs (press the dedicated virtual button) or until the next RUN START (except out-of-tolerance alarm which ceases automatically by itself). The alarms linked with an external input module are active if each input is associated with an alphanumeric description (they have low priority; among them the highest priority goes to input 1 on module 1 while the least goes to input 4 on module 2).



Cod.	Description	Priority	Activation	Active in STOP	Module	Message
1	Adjustment impossible: scale end output insufficient for obtaining the required hourly flow rate.	9	Par. I025	NO	4	Adjustment al.
2	No encoder signal after 3 consecutive sampling periods.	4	Par. I026	NO	4	Encoder al.
3	According to the activation parameter selection there are different activation conditions. FLOW RATE 0: null hourly flow rate for speed=0, or weight lower than the minimum one. MIN.WEIGHT: weight lower than the minimum one with moving belt (null hourly flow rate).	3	Par. I022	NO	6	Min. weight al. or Encoder al.
4	Load cell signal missing or out of scale.	2	ALWAYS	Par. I030	4	Load cell al.
5	Weight on the belt stuck on a fixed value for the set time.	5	Par. I042	NO	4	Fixed weight al.
6	Profibus module connection error	6	Profibus Protecoll selected	Par. I030	4	Err. Profibus
7	Profibus communication CRC error	7			4	CRC Profibus
8	Profibus network connection error	8			4	NoCom. Profibus
9	Power supply <20Vdc	1	ALWAYS	Par. I030	4	Alr.VDC
10	Tolleranza Alarm	10	Par. I029	NO	5	Alr. toll.

## 5.5 - DENSITY CALIBRATION PROCEDURE

Density calibration consist in programming parameter Specific Weight and register a weight value for "Peso Mem". These values are used for actual density calculation according the formula indicated at the next chapter.



### DENSITY CALCULATION

Density parameter is calculated according the actual weight detection, based upon the following formula:

$$\text{WEIGHTmem} : \text{PS} = \text{actualWEIGHT} : \text{D}$$

Where:

- WEIGHTmem: calibration weight value recorded during density calibration phase;
- PS: specific weight;
- actualWEIGHT: actual detected weight;
- D: calculated density.

Density is transmitted to the 3rd analogue output (\*). To enable data transmission, set, through "SYSTEM SETUP" the parameter "3rd ANALOGUE OUTPUT" = YES. Also, set parameter "FS DENSITY" at the value you wish to associate to the upper limit of the analogue output.

Density, specific weigh and full scale density are expressed in kg/dm3 units with 3 decimals and upper value 2000 kg/dm3 (\*) 3rd analogue output is a serial data transmission to a D/A converter (code SW P12043) which receives digital data to convert to analogue output (tension or current depending upon D/A converter's configuration). Further details on the specific manual.

Serial transmission is held on COM3 (parameters 9600, N81, frequency 5Hz). Transmitted string:

STX A <value> ETX <chk> EOT



<value> 5 numeric digits for density, related to the full scale according the formula:

$$\text{Density} : \text{FSdensity} = \text{<value>} / 10000$$

When the 3<sup>rd</sup> analogue output is active, parameter "protocollo COM3" is forced to NUL

## 6 - ADDITIONAL FUNCTIONS OF MC 353

### 6.1 - DATA LOGGER

#### TECHNICAL MENU -> DATA LOGGER

This function can be enabled by the technical menu and allows to continuously record run operative data to analyse the system behaviour over time. The provided data are the following:

Actual time of the sampling period in ms	TTTTT (5 car.)
Instantaneous hourly flow rate	FFFFFF (6 car.)
Belt speed in cm/min	SSSSSS (6 car.)
Number of encoder counted pulses	PPPPPPPP (8 car.)
Detected weight	WWWWWWWW (7 car.)
Manual / automatic operation selectio	M (1 car.)
Analogue output value in percentage	RRR (3 car.)
Alarm code	A (1 car.)

When each sampling period elapses one data record is sent in the following format (CSV compatible).

TTTTT	;	FFFFFF	;	SSSSSS	;	PPPPPPPP	;	WWWWWWWW	;	M	;	RRR	;	A	CR	LF
-------	---	--------	---	--------	---	----------	---	----------	---	---	---	-----	---	---	----	----

In the technical menu it is possible to activate the Data Logger function to transmit the data record in data stream on COM2 (with USB, RS232 or R485 interface). These data are available for a PC application that stores it in a file for a future analysis, displays it on a monitor screen or shows it in graphic format to highlight the trend over time.

If a the USB Host option is available the data records can be directly saved in a CSV file that is automatically named logxxx.csv, where instead of x you will find a progressive number. At the file start and end the system adds a line with current date and time. In this case the USB pen drive shall be inserted during the data logging operation.

If you selected the data logger operation on USB file, it is automatically disabled after 3600 records, to avoid having files with a great amount of data in case the function is forgotten active.

### 6.2 - SAVE AND LOAD SET-UP

#### set-up MENU -> SAVE set-up / LOAD set-up

With the set-up files saving and loading operations (available in the set-up menu) all parameters that can be set can be transferred from the instrument memory to a PC or a USB memory support and vice versa.

This function can be used to save a copy of the parameters, to store the set-up of one system instrument, to duplicate the same set-up on more instruments, to receive the set-up files of a remote system through the web for technical reasons.

The data transfer occurs on the COM2 communication port (RS485, RS232 or USB device). In case the USB Host option is available and set, the file transfer occurs directly on the USB (pen drive) memory support.

The transferred data are those indicated in the parameters table and identified with the univocal address.

The file format is CSV, made up of one table with one parameter per line and 2 columns indicating the parameter address and value.

<address>	;	<value>	CR	LF
-----------	---	---------	----	----

In case of transfer on COM2 the load function waits to receive one file whereas the saving function sends data directly to the communication port without waiting handshake operations: the receiving unit must be able to receive data when the control is activated.

In case of transfer on USB pen drive, the memory support shall be entered before the activation of the saving and loading controls. The transferred file has a fixed name: set-up.csv.

The data loading could also be partial, i.e. the table can contain only some parameters (or even just one) and they must not be compulsorily ordered as in the table created by the instrument with the saving operation.



This offers an alternative system for setting up the parameters.

## 6.2 - FILE LOADING

set-up MENU -> FILES LOADING

The file loading operation (available in the set-up menu) allows to set the instrument so as to customise some functions. The display shows a control menu and each control corresponds to one file to be loaded in the instrument.

There are 10 contextual Help text files available that can be transferred from the instrument memory to the PC or a USB memory support and vice versa.

H01.TXT	Help text waiting for controls of the main window
H02.TXT	Help text in numeric data set-up
H03.TXT	Help text in selectable data set-up
H04.TXT	Help text for warning or confirmation windows
H05.TXT	Help text in the total section
H06.TXT	Help text in the setpoint section
H07.TXT	Help text in the hourly flow rate section
H08.TXT	Help text in confirmation of the calculated K correction factor
H09.TXT	Help text in the default zero weight calibration function
H10.TXT	Help text in the default 2mV/V weight calibration function
SPLASH.BMP	Image displayed upon instrument switching-on
SETPOINT.TXT	Names associated with the setpoints
INEXT.TXT	Descriptions associated to logic inputs of external modules

The files loading occurs on the COM2 communication port (RS485, RS232 or USB device). In case the USB Host option is available and set, the file loading occurs directly on the USB (pen drive) memory support.

The Help texts are ascii files with max. length of 300 characters.

The splash.bmp file shall necessary be a black and white bitmap file (1 bit of colour depth), with fixed dimensions 120 x 40.

The setpoint.txt file is a text constituted by 1 to 15 text lines corresponding to setpoints from 1 to 15. Each setpoint name can feature maximum 10 characters.

File inext.txt is a text file composed of 1 to 8 text lines, corresponding to descriptions assigned to inputs from 1 to 8 (4 + 4) on the two external I/O modules. Each description can be composed by up to 16 characters (we recommend to check the visualization on the display, which may vary according to the used characters).

In case of loading from COM2 the loading function waits to receive one file.

In case of loading from USB pen drive, the memory support shall be inserted before the activation of the loading controls.

### 6.3 - RECEIPT PRINT ( OPTIONAL PRINTER )

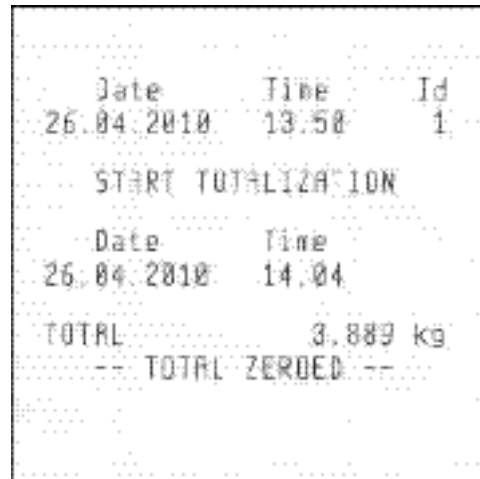
When the input 6 set for total reset is closed and the printer is selected a receipt like the one shown in the picture will be released.

Date and time of the last reset (new totalization start) and the current date and time are reported. The instrument serial address is indicated at the top right.

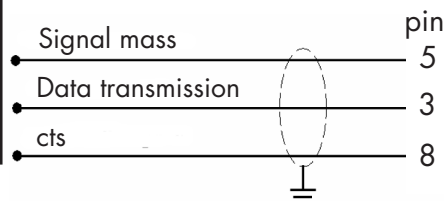
The printer shall use a 56/57 mm paper reel with RS232 interface.

In case the printer is not connected or it is off the total is not reset.

The printer DTR signal must be connected to the instrument CTS signal.



NUM.	Upper terminal block (pitch 5.08 mm)
3	GND
4	TX
5	CTS



PRINTER  
mod. SP 190



### 6.4 - ANALOGUE MODULE ( OPTIONAL )

MC 353 instrument can handle up to 3 external analogue modules. Transmittable data may be density, speed and weigh (or weigh per meter)

Full scale reference can be set through page "SYSTEM SETUP" (parameters "FS Speed", "FS Weigh", "FS Density").

For further details see the specific manual.

### 6.5 - RELAY MODULE ( OPTIONAL )

Relay module MOD-RELE', connected through COM2 (RS485) to the MC 353 instruments, can handle an additional 8 outputs and 4 inputs.

Each MC 353 instrument can be connected to a total of 2 relay modules at the same time, handling this way up to 16 outputs and 8 inputs.

**INPUTS:** Relay module, through serial port, transmits status of inputs to MC 353 instrument. The input status is converted to specific registry status of inputs on the ModBus/Profibus registry.

It is possible to program the instrument so the status of a certain input on the relay module may generate a general alarm on MC 353 instrument.

ON status of inputs does not involves other operating procedures on the instrument.

**OUTPUT:** status of module's output is determined by the ModBus/Profibus registry, transmitted to the PC/PLC by MC 353 instrument.

For further details see the specific manual.

## 7 - SERIAL COMMUNICATION AND PROTOCOLS

### 7.1 - ASCII COMMUNICATION PROTOCOL

Baud rate and format data according to the selection on the TECHNICAL MENU.

RS485 interface with 2 twisted pairs.

The communication protocol requires always the transmission of a string by the PC with the address of the control receiver instrument and a response string by the receiving instrument. The delay of the response string can be of 15 ms.

The following parameters are common in the strings description below:

ADDR = receiver address (80h + address number; for eg. address 1: to = 81h)

ETX = end of text (03h)

EOX = end of text (04h)

ACK = acknowledgement (06h)

NAK = NO acknowledgement (15h)

<CC> = check sum calculated from ADDR to ETX excluded; they are 2 ASCII characters of the hexadecimal notation resulted from the characters XOR operation.

<CMD>= control identification constituted by one ASCII character (one capital letter).

#### ASCII PROTOCOL CONTROLS LIST

- A) FLOW RATE SETPOINT SET-UP
- A) FLOW RATE SETPOINT READING
- C) SETPOINT SELECTION
- D) SETPOINT TOLERANCE SET-UP
- E) SET-UP TOLERANCE READING
- F) CONVEYED TOTAL SETPOINT SET-UP
- G) CONVEYED TOTAL SETPOINT READING
- H) CONVEYED TOTAL SETPOINT RESET
- I) MANUAL / AUTOMATIC SELECTION
- J) ADJUSTMENT PARAMETERS SET-UP
- K) ADJUSTMENT PARAMETERS READING

The controls are available in all conditions of the instrument except for the controls A, D, F, J, O during the set-up of the relevant parameters through the keyboard:

- The control A is not available in case you are setting-up the setpoint corresponding to the transmitt done through the keyboard.
- The control D is not necessary in case you are setting-up the tolerance through keyboard.
- The control F is not necessary in case you are setting-up the conveyed total through keyboard.
- The control J is not necessary in case you are setting-up one adjustment parameter through the keyboard corresponding to on of those transmitted.
- The control O is not necessary in case the instrument is in the run condition or a data set-up procedure is in progress.

In case of unavailability the instrument will send a suitable response control.



- L) INSTRUMENT STATE READING
- M) SYSTEM MAX. FLOW RATE READING
- MO) PERCENTAGE CHANGE OF THE FLOW RATE SETPOINT (from WTLW)
- N) PRODUCT CORRECTION COEFFICIENT SET-UP
- O) RESET FUNCTION OF MOVING BELT
- P) INSTANTANEOUS ANALOGUE OUTPUT PERCENTAGE READING
- M) SYSTEM MAX. FLOW RATE READING
- MO) PERCENTAGE CHANGE OF THE FLOW RATE SETPOINT ( from WTLW)
- N) PRODUCT CORRECTION COEFFICIENT SET-UP
- O) RESET FUNCTION OF MOVING BELT
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- The control A is not available in case you are setting-up the setpoint corresponding to the transmitt done through the keyboard.
- The control D is not necessary in case you are setting-up the tolerance through keyboard.
- The control F is not necessary in case you are setting-up the conveyed total through keyboard.
- The control J is not necessary in case you are setting-up one adjustment parameter through the keyboard corresponding to one of those transmitted.
- The control O is not necessary in case the instrument is in the run condition or a data set-up procedure is in progress.

In case of unavailability the instrument will send a suitable response control.

#### COMMUNICATION STRINGS FORMAT

All strings transmitted to the MC 353 have the following format; also the MC 353 response strings have the same format except the error one, the not available control string and the acknowledgement one.

String type	ADDR	<CMD>	<data>	ETX	<CC>	EOT
Acknowledgement string				ADDR	<CMD>	ACK EOT
Communication error or unacceptable data string				ADDR	NAK	EOT
Not available control string				ADDR	"#"	EOT

According to the system maximum flow rate value the instrument determines automatically the flow rate unit of measurement, the resolution, the totalizator decimals described in the table under chapter 3.7.

## A) Flow rate setpoint set-up

The PC transmits: ADDR "A" <N> <XXXX> ETX <CC> EOT

Where :

<N> = number of setpoint (from "1" to "9" and from "A" to "F" for set point from 10 to 15)

<XXXX> = flow rate set point without decimal point

The MC 353 answers: ADDR "A" ACK EOT

## B) Flow rate setpoint reading

The PC transmits: ADDR "B" <N> <XXXX> ETX <CC> EOT

Where :

<N> = number of setpoint (from "1" to "9" and from "A" to "F" for set point from 10 to 15)

The MC 353 answers: ADDR "B" <N> <XXXX> ETX <CC> EOT

Where :

<XXXX> = flow rate setpoint

## C) Setpoint selection

The PC transmits: ADDR "C" <N> <XXXX> ETX <CC> EOT

Where :

<N> = number of setpoint (from "1" to "9" and from "A" to "F" for set point from 10 to 15)

The MC 353 answers: ADDR "C" ACK EOT

## D) Setpoint tolerance set-up

The PC transmits: ADDR "D" <N> <XXXX> ETX <CC> EOT

Where :

<XXXX> = set point tolerance without decimal point

The MC 353 answers: ADDR "D" ACK EOT

## E) Setpoint tolerance reading

The PC transmits: ADDR "E" <N> <XXXX> ETX <CC> EOT

The MC 353 answers: ADDR "E" <N> <XXXX> ETX <CC> EOT

Where :

<XXXX> = set point tolerance without decimal point

## F) Preset and flight conveyed total setpoint set-up

The PC transmits: ADDR "F" <XXXXXXXX> <PPPPPP> <VVVVVV> ETX <CC> EOT

Where :

<XXXX> = total set point without decimal point

<PPPPPP> = total preset without decimal point

<VVVVVV> = total flight without decimal point

The MC 353 answers: ADDR "F" ACK EOT

## G) Conveyed total setpoint reading

The PC transmits: ADDR "G" <N> <XXXX> ETX <CC> EOT

The MC 353 answers: ADDR "G" <XXXXXXXX> <PPPPPP> <VVVVVV> ETX <CC> EOT

Where :

<XXXX> = total setpoint

<PPPPPP> = total preset without decimal point

<VVVVVV> = total flight without decimal point

## H) Conveyed total setpoint reset

The PC transmits: ADDR "H" <N> <XXXX> ETX <CC> EOT

The MC 353 answers: ADDR "H" ACK EOT

## I) Manual / automatic selection

The PC transmits: ADDR "I" <N> <XXX> ETX <CC> EOT

Where :

<N> = ("A" = automatic, "M" = manual)

<XXX> = output value in manual mode (from 0% to 100%)

- with <N> = "A" : <XXX> = "000"

- with <N> = "M" : <XXX> from 0 to 100 it selects the instrument in manual mode with manual analogue output equal to <XXX>.

- with <N> = "M" : <XXX> higher than 100 it selects manual mode by keeping the analogue output already existing.

The MC 353 answers: ADDR "I" ACK EOT

If it is possible to select in manual mode (in case of external regulator) it answers with NAK.

## J) Adjustment parameters set-up

The PC transmits: ADDR "J" <PPP> <XX> <BBBB> ETX <CC> EOT

Where :

<PPP> = proportional constant from 0 to 250.

<XX> = constant integration from 1 to 10.

<BBBB> = absolute value of dead belt.

The MC 353 answers: ADDR "J" ACK EOT

## K) Adjustment parameters reading

The PC transmits: ADDR "K" <N> <XXXX> ETX <CC> EOT

The MC 353 answers: ADDR "K" <PPP> <XX> <BBBB> ETX <CC> EOT

Where :

<PPP> = proportional constant from 0 to 250.

<XX> = constant integration from 1 to 10.

<BBBB> = absolute value of dead belt.

## L) Instrument state reading

The PC transmits: ADDR "L" <N> <XXXX> ETX <CC> EOT

The MC 353 answers: ADDR "L" <M> <F> <PPPP> <XXXXXXXX> ETX <CC> EOT

Where :

<M> = (run state = "1" or stopped belt = "0")

<F> = operation type (A = automatic, M = manual)

<PPPP> = instantaneous flow rate

<XXXXXXXX> = partial total

## M) System max. flow rate reading

The PC transmits: ADDR "M" <N> <XXXX> ETX <CC> EOT

The MC 353 answers: ADDR "M" <XXXX> ETX <CC> EOT

Where :

<XXXXXXXX> = 6 characters of max. flow rate in kg/h

## M0) Flow rate setpoint percentage change

The PC or the WTLW transmits: ADDR\_0 "M" <XXXX> ETX <CC> EOT

This string shall contain the address 0 to be recognised. The MC 353 does not transmit any string neither in case of performed control nor in case of error. The percentage value received is related to the maximum flow rate value.

Where :

<XXXX> = max. flow rate thousandths

## N) PRODUCT CORRECTION COEFFICIENT SET-UP (KK)

The PC transmits: ADDR "N" <XXXX> ETX <CC> EOT

Where :

<XXXX> = correction coefficient without decimal point

The MC 353 answers: ADDR "N" ACK EOT

## O) RESET FUNCTION OF MOVING BELT

The PC transmits: ADDR "O" <XXX> <Y> <ZZZZ> ETX <CC> EOT

Where :

<XXX> = output value in manual mode (from 0% to 100%)

<Y> = selection of belt cycle time "T" or length "L"

<ZZZZ> = belt cycle time in seconds or belt length in cm

The MC 353 answers: ADDR "O" ACK EOT

## P) INSTANTANEOUS ANALOGUE OUTPUT PERCENTAGE READING

The PC transmits: ADDR "P" ETX <CC> EOT

The MC 353 answers: ADDR "P" <XXXX> ETX <CC> EOT

Where :

<XXX> = 3 characters of instantaneous analogue output percentage

## 7.2 - MODBUS COMMUNICATION PROTOCOL

The complete list of MODBUS controls and protocol addresses are reported in the table at pages 34, 35 and 36.



NOTE: The MODBUS-RTU specifications foresee that the 40001 register is allocated the address 0000.

Master's timeout duration for each query sent must be at least 25 ms. At this time add query's transmission time and the response time. Both depend upon the baud rate.

Master must be able to resume functioning after a communication fault (unknown string or framing error)

### MODBUS/PROFIBUS REGISTERS NOTES

5001 Command Reg: program registry with the corresponding value according to the command you want to issue:

- 1 = reset total
- 2 = reset belt
- 3 = save data

5002 RUN Command Reg: program registry with the corresponding value according to the command you want to issue:

bit15 indicates protocol command priority against logic input 01 for run (1=run is piloted by protocol, 0=run is piloted by logic input);

bit0 indicated command status (1=run, 0=stop)

i.e: by programming the value 0x8001, instrument is in RUN (bit0 = 1) and ignores status of logic input (bit15 = 1).

3018 - input status:

bit15-6	bit5	bit4	bit3	bit2	bit1	bit0	
—		in6	in5	in4	in3	in2	in1 (0 = open, 1 = close)

3019 - output status:

bit15-6	bit5	bit4	bit3	bit2	bit1	bit0	
—		out6	out5	out4	out3	out2	out1 (0 = not active, 1 = active)

3030/3031: based on the value of the registers 3030 and 3031 can be identified units and no. decimal of data flow and total. For coding use the following table:

Register value	1	2	3	4	5	6
Decimal no.	1	2	3	1	2	3
Measure Unit	kg - kg/h	kg - kg/h	kg - kg/h	T - T/h	T - T/h	T - T/h

## 7.3 - PROFIBUS-DP / PROFINET IO COMMUNICATION PROTOCOL OPTIONAL MODULE

PROFIBUS interface may be installed either internally or externally to the instrument (in later case module S125 is used, connected through COM 1 serial port Rs422)

PROFINET interface is internally installed only.

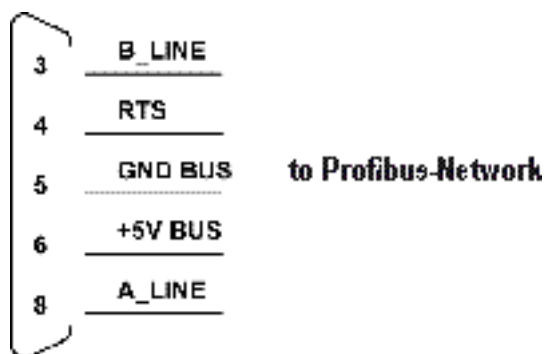
Connection between MC 353 and Profibus-CONV module:

Profibus-CV		MC 353	
		(COM1 RS422)	
	pin		nr.
TXD-	7	RXD-	11
TXD+	9	RXD+	10
RXD-	6	TXD-	9
RXD+	4	TXD+	8
GND	/	GND	/



Power supply	12/24Vcc (+/-5%)
Consumption	2W (80mA max)
Working temperature	-10°C ÷ +40°C
Humidity	max 85% condensate free
Storage temperature	-20°C ÷ +50°C
Dimension	71 x 90 x 58 mm
Mounting	Omega/DIN rail
IP protection	IP40
RS422 max lenght	500m
Profibus max lenght	Network dependent

Regardless mounting position, communication between the instrument and PROFIBUS or PROFINET interfaces uses ModBus RTU serial protocol. Address (slave ModBus) of the module is fixed at 01, communication baud rate is fixed at 38400 bit/s and forced upon selection of protocol PROFIBUS or PROFINET on COM1.





## ERROR MANAGEMENT (Ref. Par. OPERATING ALARMS)

[Err. PROFIBUS] Communication failure error between Modbus and S125 module :

after 5 consecutive communication time-outs. A communication reset is automatically executed, but if it fails the error is displayed and you can manually reset the error by pressing the RESET push-button.

[NoCom. PROFIBUS] Off-Line PROFIBUS network error: for example in case of failed connection of S125 module with the Profibus network. This error is automatically muted upon standard connection reset.

[CRC PROFIBUS] CRC error in Modbus communication.

The timeout on module answer is fixed at 100mS.

## RESET PROCEDURE FOR EXTERNAL MODULE (S125)

As no hardware reset line is available, module shall be switched off and on after the following operations:

- module first connection to the instrument;
- following changes of PROFIBUS address.

When the module is internal, such procedure is automatically handled by the software.

INPUT and OUTPUT AREA MANAGEMENT: module's default setting is a fixed configuration of input and output areas. Programmable parameters are identified and listed on a list included in module's manual. Eventually, through a specific application (PWIN 75) is possible to configure I/O areas of PROFIBUS DP and PROFINET IO field buses, in order to obtain an ordered list of parameters to meet application specifications. The GSD, GSDML files and PWIN 75 application are available in our web site under the 'download' area.

## INPUT DATA AREA - Parameter reading

- INPUT AREA SIZE = 128 bytes [64 Registers]

The INPUT DATA AREA page is selected by writing the corresponding value inside the command register, as per the following table:

COMMAND REGISTER Table	
Value	Command
01	Selection INPUT DATA AREA page 1
02	Selection INPUT DATA AREA page 2

## OUTPUT DATA AREA - Parameter writing

- OUTPUT AREA SIZE = 64 bytes [32 Registers]

- Single parameter programming: write the value inside the general programming registers H and L, then write the address corresponding to the parameter to be programmed inside the command register (address of the L part in case of 4-byte parameters).

Ex. Programming of a 50 value in the "Manual Out" parameter: write 0 in bytes 2-3, write 50 in bytes 4-5, then write 4013 in bytes 0-1 (command register). This, of course, applies also to the command register: write the command value in bytes 2-3 and 4-5, then write 5001 in registers 0-1.

To code registries 5001, 5002, 3018, 3019 follow instructions provided in page 61.

EXAMPLE (programming registry 5001 to send command of total reset):

write to bytes 2-3 of OutputDataArea value 0;

write to bytes 4-5 of OutputDataArea value 1;

write to bytes 0-1 of OutputDataArea value 5001.

- Programming of the whole OUTPUT DATA AREA: write the desired values in the corresponding registers, then write the command for the programming of the whole AREA in the command register, based on the following command register reference table.
- The OUTPUT DATA AREA page is automatically selected based on the value written in the command register.
- Parameters programming is effective only if the instrument is in the basic mask displaying mode.

NOTE: by writing on command register the 7FFFh command, the customization of output area is enabled. All the following registries (depending upon the chosen configuration) are directly accessible.

Table COMMAND REGISTER	
Value	Command
4010	Total programming OUTPUT DATA AREA page 1
2040	Total programming OUTPUT DATA AREA page 2
2000	Total programming OUTPUT DATA AREA page 3
1000	Total programming OUTPUT DATA AREA page 4
1040	Total programming OUTPUT DATA AREA page 5
150	Total programming OUTPUT DATA AREA page 6
10	Total programming OUTPUT DATA AREA page 7
5000	Total programming OUTPUT DATA AREA page 8
32767	Enabling the custom output area

## INPUT DATA AREAS

INPUT DATA AREA [01] - Continua pag. successiva		
Address	Variables	Map. bytes
6001	Input page number	0-1
3011	Flowrate	2-3
3012	Total H	4-5
3013	Total L	6-7
3014	Grand Total H	8-9
3015	Grand Total L	10-11
3016	Setpoint	12-13
3017	Alarm Code	14-15
3018	Input	16-17
3019	Output	18-19
3020	Speed H	20-21
3021	Speed L	22-23
3022	Current Weight H	24-25
3023	Current Weight L	26-27
3024	Analog Out 1	28-29
3025	Analog Out 2	30-31
3026	Analog Input	32-33



INPUT DATA AREA [01]		
Address	Variables	Mapp. bytes
3027	Test Status	34-35
3028	Run Status	36-37
3029	Flow rate decimals	38-39
3030	Total decimals	40-41
3031	Weight decimals	42-43
4011	Num. Set	44-45
4012	Auto / Man	46-47
4013	Manual Out	48-49
4014	Var. Setpoint	50-51
2041	Setpoint 1	52-53
2042	Manual Out Set 1	54-55
2043	Setpoint 2	56-57
2045	Setpoint 3	58-59
2047	Setpoint 4	60-61
2049	Setpoint 5	62-63
2051	Setpoint 6	64-65
2053	Setpoint 7	66-67
2055	Setpoint 8	68-69
2057	Setpoint 9	70-71
2059	Setpoint 10	72-73
2061	Setpoint 11	74-75
2063	Setpoint 12	76-77
2065	Setpoint 13	78-79
2067	Setpoint 14	80-81
2069	Setpoint 15	82-83
2001	Total Set H	84-85
2002	Total Set L	86-87
2003	Total Preset H	88-89
2004	Total Preset L	90-91
2005	Total Flying H	92-93
2006	Total Flying L	94-95
1001	Sampling Time	96-97
1002	Proportional Constant	98-99
1003	Cost. Integrale	100-101
1004	Dead Band	102-103
1005	Flowrate Limit	104-105
1006	Dead Band %	106-107
1007	Flowrate Limit %	108-109

INPUT DATA AREA [01]		
Address	Variables	Mapp. bytes
1041	Stop Delay	110-111
1042	Timeout Peso	112-113
1043	Regolation Delay	114-115
1044	Flow Limit Delay	116-117
1045	Limit Init Delay	118-119
1063	Min.Weight	120-121
5002	Run Command Reg.	122-123
7001	Test Register	124-125

INPUT DATA AREA [02]		
6001	Input page number	0-1
11	Operat. Function	2-3
131	Operating mode	4-5
132	Revolution time	6-7
133	Revolution length	8-9
134	Tare	10-11
135	Max. remote tare	12-13
141	K factor	14-15
143	KK factor	16-17
151	Max. Flowrate H	18-19
152	Max Flowrate L	20-21
163	Dead Band Unit	22-23
164	Tolerance Unit	24-25
181	Real Max. Flowrate H	26-27
182	Real Max. Flowrate L	28-29
7001	Test Register	30-31
3032	Weigh / meter H	32-33
3033	Weigh / meter L	34-35
3034	Density	36-37
3035	System Ready	38-39
4015	Specific gravity	40-41
4016	Module IO EXT. 1 INPUT	42-43
4017	Module IO EXT. 1 OUTPUT	44-45
4018	Module IO EXT. 2 INPUT	46-47
4019	Module IO EXT. 2 OUTPUT	48-49

## OUTPUT DATA AREAS

OUTPUT DATA AREA [01]		
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
4011	Set number	8-9
4012	Auto / Man	10-11
4013	Manual Out	12-13
4014	Var. Setpoint	14-15
4015	Specific gravity	16-17
4016	Module IO ext. 1 INPUT	18-19
4017	Module IO ext. 1 OUTPUT	20-21
4018	Module IO ext. 2 INPUT	22-23
4019	Module IO ext. 2 OUTPUT	24-25

OUTPUT DATA AREA [02]		
Address	Variables	Mapp. bytes
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
2041	Setpoint 1	8-9
2042	Manual Out Set 1	10-11
2043	Setpoint 2	12-13
2045	Setpoint 3	14-15
2047	Setpoint 4	16-17
2049	Setpoint 5	18-19
2051	Setpoint 6	20-21
2053	Setpoint 7	22-23
2055	Setpoint 8	24-25
2057	Setpoint 9	26-27
2059	Setpoint 10	28-29
2061	Setpoint 11	30-31
2063	Setpoint 12	32-33
2065	Setpoint 13	34-35
2067	Setpoint 14	36-37
2069	Setpoint 15	38-39

OUTPUT DATA AREA [03]		
Address	Variables	Mapp. bytes
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
2001	Total Set H	8-9
2002	Total Set L	10-11
2003	Total Preset H	12-13
2004	Total Preset L	14-15
2005	Total Flying H	16-17
2006	Total Flying L	18-19

OUTPUT DATA AREA [04]		
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
1001	Sampling Time	8-9
1002	Proportional Constant	10-11
1003	Cost. Integrale	12-13
1004	Dead Band	14-15
1005	Flowrate Limit	16-17
1006	Dead Band %	18-19
1007	Flowrate Limit %	20-21

OUTPUT DATA AREA [05]		
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
1041	Stop Delay	8-9
1042	Timeout Peso	10-11
1043	Regulation Delay	12-13
1044	Flow Limit Delay	14-15
1045	Limit Init Delay	16-17
1063	Min.Weight	18-19

OUTPUT DATA AREA [06]		
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
151	Max Flowrate H	8-9
152	Max Flowrate L	10-11
163	Dead Band Unit	12-13
164	Tolerance Unit	14-15
181	Real Max. Flowrate H	16-17
182	Real Max. Flowrate L	18-19

OUTPUT DATA AREA [07]		
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
11	Operat. Function	8-9
131	Operating mode	10-11
132	Revolution time	12-13
133	Revolution length	14-15
134	Tare	16-17
135	Max. remote tare	18-19
141	K factor	20-21
143	KK factor	22-23

OUTPUT DATA AREA [08]		
5001	Command Register	0-1
-	General register for H parameter programming	2-3
-	General register for L parameter programming	4-5
7001	Test Register	6-7
5002	Run command Reg.	8-9



#### PROFIBUS / PROFINET CONNECTION TEST PROCEDURE

Profibus Master (E.g. PLC) may verify connection of the instrument to Profibus network by the following procedure:

1. Master writes a value (e.g. counter) on Test Register Out (bytes 6-7 of Output Area);
2. Instrument copies that value to Test Register In of Input Area;

Master verifies that the value read from input Area is the same value written at position 1

## CUSTOM MAPPING OF INPUT AND OUTPUT AREAS

It is possible to configure the PROFIBUS DP and PROFINET IO field buses I/O areas, to obtain an ordered list of parameters according to the specific needs of the system.

This configuration is done using a specific utility (PCWIN 75) connected to the RS232/USB port COM2 of the instrument (communication parameters selectable).

The configurator PCWIN75 presents a user-friendly graphical environment through which compose the areas of I / O: at each register can be associated with one parameter selected from a down list menu.

It is possible to customize up to 2 pages of INPUT and 1 page of OUTPUT.

The application can be downloaded in ns. website.

## PROGRAMMING AREAS I / O (PC -> Touchscreen)

Through LOAD PROFI IO function, accessible from the setup menu when turned on, the touch screen is enabled to receive the configuration.

Proceed with the submission of data by pressing the SEND button in the dialog of the configurator.

## READING AREAS I / O (PC <- Touchscreen)

Set your PC to receive data by pressing the GET in the mask in the Configurator.

Using the SAVE PROFI IO function, accessible from the Setup Menu when turned on, the touch screen will proceed with sending the configuration currently in memory.

## RESTORE THE AREAS OF I / O TO DEFAULT

By entering the password in 1012 function (FACTORY SETUP) accessible from Setup Menu when turned on, you can restore the areas of INPUT to the default values or those in the following pages. This operation will also lead to the cancellation of the customized OUTPUT .

## COMPATIBILITY WITH PREVIOUS SW VERSIONS

Full compatibility with older software is ensured.

- Area of INPUT: thanks to the function that forces the configuration to default values
- Area OUTPUT: compatibility is guaranteed, because the meaning of the area registers always depends on the value of the command register.

## DETAILS MAPPING

- Area of INPUT: The first register of the Input always identifies the page number, the next 63 registers are customizable. And it is possible but not mandatory to define up to two customized virtual pages.
- Area OUTPUT: The first register of the Output is always the Command Register.

Is maintained the logic according to which the value of the Command Register identifies the meaning of the subsequent 63 registers available. A new command "activation area custom Output" (7FFFh) is set: until the Command Register contains this command, the 63 following registers are directly accessible and match the custom parameters defined by the user. You can define only one single page of customized output.

## 7.4 - SUPERVISION FUNCTIONS

The supervision functions by one PC/PLC are carried out through the COM1 communication port (RS422 / RS485 or optional Ethernet ).

The communication protocol used is MODBUS RTU, with records that can be set whose addresses are listed in the parameters table and they shall be added the value 40000.

Following are the ModBus supported functions:

- READ HOLDING ADJ
- PRESET SINGLE ADJ
- PRESET MULTIPLE ADJ



Some parameters feature 32 bits and thus they are made up of one couple of 2 records with consecutive address. Near is the concerned parameters list. All other parameters feature 16 bits (1 modbus record).

Address	Parameter
0151	Max Flow Rate (HIGH WORD)
0152	Max Flow Rate (LOW WORD)
0153	Load Cells Flow Rate (HIGH WORD)
0154	Load Cells Flow Rate. (LOW WORD)
0181	Effective Max Flow Rate (HIGH WORD)
0182	Effective Max Flow Rate (LOW WORD)
2001	Total Set (HIGH WORD)
2002	Total Set (LOW WORD)
2003	Total Preset (HIGH WORD)
2004	Total Preset (LOW WORD)
2005	Total Flying (HIGH WORD)
2006	Total Flying (LOW WORD)
3012	Total Value (HIGH WORD)
3013	Total Value (LOW WORD)
3014	Grand Total (HIGH WORD)
3015	Grand Total (LOW WORD)
3020	Belt Speed (HIGH WORD)
3021	Belt Speed (LOW WORD)



At the end of the parameter set-up it is necessary to send the '3' control to the command register (address 5001) to save in the permanent memory the applied changes before switching off the instrument.

## 7.5 - MASTER / SLAVE COMMUNICATION PROTOCOL

The instrument can be configured to operate as master of other instruments or as slave. In the first case the detected hourly flow rate percentage with respect to the scale end is transmitted continuously to the slaves which adjust the flow rate setpoint according to the received percentage.

This function can be implemented with RS485 serial connection on COM2 by suitably setting the 0104 parameter.

The communication string is sent to the frequency of 10 Hz, by using the communication parameters set for the COM2 port that shall be the same on all instruments.

STX	"M"	XXXXXX.X	ETX	CC	EOT
-----	-----	----------	-----	----	-----

Flow rate percentage value with 1 decimal      XXXXXX.X      (8 car.)

Control checksum      CC      (2 car.)



It is possible to connect a repetitor (RIPH20, RIPH60, RIPH100, RIPH160) in parallel with the slaves to display the transmitted value.

## SCHEDULE



Using the MODBUS-RTU and ASCII in which the instrument acts as a SLAVE, consider that:

- MASTER timeout for each transmitted query must be submitted for at least 25 ms; at this time, add also the transmission time of the query and the time of receipt of the response, which depends on the baud rate.
- The MASTER must be able to resume operation after a communication error (string not recognized or framing error).

## 7.6 - REPETITOR TRANSMISSION PROTOCOL

Communication string is sent to the frequency of 5 Hz, fixed communication parameters (9600, N-8-1) in Rs232 on the port COM3.

STX	"M"	F	PPPPPPP	TTTTTTT	ETX	CC	EOT
-----	-----	---	---------	---------	-----	----	-----

Run state ('1' running; '0' stopped)

Operation ( 'M' manual; 'A' automatic )

Displayed flow rate

Displayed total

Control checksum



It is possible to connect a repetitor to the instrument (RIPH20, RIPH60, RIPH100, RIPH160) to display the transmitted value. 7.6 - REPETITOR TRANSMISSION PROTOCOL



## 8 - TROUBLESHOOTING

### 8.1 - TROUBLESHOOTING

Hereinafter is a list of the most frequent questions and answers relating to problems which may arise upon MC 353 electronics installation and operation.

Anyway, should you have further doubts or problems, contact the technical service.

Question	Possible cause	Possible solution
Belt turns but instrument does not display any flow rate value	<ul style="list-style-type: none"> <li>- Instrument does not receive the run input</li> <li>- Load cell does not issue a correct signal to instrument</li> <li>- Encoder does not send pulses to instrument</li> </ul>	<p>1- Press COST 3 times, and check that in the input line the first digit is at 1). In case of negative output, check wiring harness and operating logic</p> <p>2- Check the signal coming from the load cell (displayed on weight box); it shall be positive and, when exerting a pressure on the weighing bridge, it has to increase. Using a tester, measure the value in millivolts between S+ and S-: it shall be between 0 and 10mV. If necessary, check cell wiring harness, its correct installation, and also check that the weighing system has been mechanically released.</p> <p>3- Check correct coupling between belt drum and encoder shaft. Check also that shaft is turning.</p>
The instrument displays ALL-ADJUSTMENT	- Adjustment impossible (instrument cannot reach the set SET-POINT)	4- Check that the material on the weighing system is suitable to the selected SET-POINT. Should this not be the case, change the height of the extraction gate, if any. Check that motor speed range allows achieving the required flow rate.

The instrument displays ALL-ENCODER	<ul style="list-style-type: none"> <li>- Encoder does not send pulses to instrument</li> </ul>	3- Check correct coupling between belt drum and encoder shaft. Check also that shaft is turning.
The instrument displays ALL-MIN.WEIGHT	<ul style="list-style-type: none"> <li>- No material</li> <li>- Zero setting error</li> <li>- Locked load cells</li> </ul>	<p>5- Check for the presence of material on the weighing system</p> <p>6- Execute or repeat the ZERO setting</p> <p>7- Operate on the block positioned under load cells so as to leave a gap of a few millimetres for the cell to bend and thus give a correct weight</p>
The instrument displays ALL-LOAD CELL	<ul style="list-style-type: none"> <li>- Problems due to load cells</li> <li>- A value too low has been set in the WEIGHT TIMEOUT parameter</li> </ul>	<p>See points 2 and 7</p> <p>8- Check and increase the time set in WEIGHT TIMEOUT parameter</p>
The instrument receives the run input, but belt does not turn	<ul style="list-style-type: none"> <li>- Instrument analogue output (if set as an adjuster) does not correctly transmits the signal to drive or inverter</li> <li>- Wrong work data set on the instrument</li> <li>- Mechanical problems</li> <li>- Electrical problems</li> </ul>	<p>9- Check that the analogue output adopted by the instrument corresponds to the one pre-set in the driver. Check wiring harness.</p> <p>10- Check that (in case instrument is in MANUAL mode) the percentage set on the instrument does not correspond to the M00% value. If working in AUTOMATIC mode, make sure that a flow rate value has been entered in the selected SET POINT</p> <p>11- Check that drive roller adheres to belt, thus transferring the motion.</p> <p>12- Check for motor correct operation, and check that it turns in the correct direction</p>

Instrument cannot keep the set SET POINT and continues entering an OUT-OF-TOLERANCE alarm	<ul style="list-style-type: none"> <li>- Wrong flow rate adjustment and tolerance parameters</li> <li>- Conveyed material is not extracted continuously</li> </ul>	<p>13- Try to change adjustment (proportional and integration) and flow rate tolerance parameters</p> <p>14- Create on belt a layer of material as even as possible</p>
Hourly flow rate and the weight displayed by the instrument do not correspond to the real ones	<ul style="list-style-type: none"> <li>- Wrong parameters entered in the instrument</li> <li>- Instrument has not been calibrated correctly</li> </ul>	<p>15- Check the parameters relating to speed acquisition and flow rate calculation</p> <p>16- Check point 17, and repeat or make calibration with some material</p>
Belt is empty, but instrument displays a flow rate	<ul style="list-style-type: none"> <li>- AUTOZERO has not been carried out correctly, or some belt conditions have changed</li> </ul>	<p>17- Repeat or make the ZERO setting function with the belt empty. Check the MIN. WEIGHT parameter</p>

**- SCHEDA DI CONFIGURAZIONE E COLLAUDO MC 353 -**  
**- MC 353 CONFIGURATION AND TEST FORM -**

Cliente (customer):		Commessa (job):			
Impianto (system):		Nazione (country):			
Release:	Funzionamento (appliance for): <b>REGOLATORE (FLOW REGULATION)</b> <b>TOTALIZZATORE (FLOW TOTALIZATION)</b>				
S/n:					
Uscita analogica 1 (analogic output 1):		0÷20mA	4÷20mA	0÷10V	
Uscita analogica 2 (analogic output 2):		NO	0÷20mA	4÷20mA	0÷10V
Ingresso analogico (analogic input):		NO	0÷20mA	4÷20mA	0÷10V
USB Host:	NO (No)	SI' (Yes)	Ingresso MASTER (MASTER input):		
Ethernet:	NO (No)	SI' (Yes)	NO (No)		
Profibus (*):	NO (No)	SI' (Yes)	Seriale (serial)	Analogico (analog)	

(\*) : modulo esterno (external module)

Addr.	Name	Value	Unit	Menu	Addr.	Name	Value	Unit	Menu
0101	COM1 Protocol		Select	Communication Port	0163	Dead Band Unit		Select	Regulation Parameters
0102	COM1 Baud rate		Select		0164	Tolerance Unit		Select	
0103	COM1 Frame Sel.		Select		0181	Effective Max Flow		kg/h	
0104	COM2 Protocol		Select		1001	Sampling Time		sec	
0105	COM2 Baud rate		Select		1002	Proport. Constant		%	
0106	COM2 Frame Sel.		Select		1003	Integral Constant		Coeff.	
0107	COM3 Protocol		Select		1004	Dead Band		kg/h	
0108	Comm. Address		Number		1005	Flowrate Limit		kg/h	
0109	Comm. Profibus		Number	Protection Level	1006	Dead Band %		%	I/O Selection
0121	Touch Panel Lock		Select		1007	Flowrate Limit %		%	
0122	User Password		Code		1021	Tot. Pulse Value		kg	
0123	Technical Passw.		Code		1022	Alarm Min.Weight		Select	
0124	Service PIN		Code	System Calibration	1023	Alarm Out Logic		Select	Operative Times
0131	Operation Mode		Select		1024	Toler. Out Logic		Select	
0132	Belt Lap Time		sec		1025	Alarm Regulation		Logic	
0133	Belt Lap Length		cm		1026	Alarm Encoder		Logic	
0134	Tare Weight		kg		1027	Input 5 Function		Select	
0135	Max Remote Tare		kg		1028	Input 6 Function		Select	
0141	K Factor		Coeff.		1029	Toler Alarm		Select	
0143	KK Factor		Coeff.		1030	Alarm Always ON		Select	
0152	Max Flow Rate		kg/h	Belt Specific	1041	Stop Delay		sec	Variable Filters
0154	Load Cells Cap.		kg		1042	Weight Timeout		sec	
0155	Roller Diameter		cm		1043	Regulation Delay		sec	
0156	Pulses / Round		°		1044	Flow Limit Delay		sec	
0157	Encoder Phase		pls/round		1045	Limit Init. Delay		sec	
0158	Roller Distance		Select		1061	Flowrate Filter		Coeff.	
0159	Belt Tilt		cm		1062	Weight Filter		Coeff.	
0160	Load Cells Sens.		mV/V		1063	Minimum Weight		kg	
0161	Belt Speed		m/min	Level 2 - TECHNICAL	1064	Min. Analog Out		%	Grand Total
0162	Total's Resolution		Select		2002	SET		kg	
					2004	Pre-SET		kg	
					2006	Flying		kg	

Test I/O analog:	OK
Test software:	OK

Note:


MC 353 - DATA 06/02/2012





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