PULSE METER
DIN RAIL MOUNTING

Device for the collection of pulses coming from: energy meters, water meters, gas meters, heat recorders, step count, people count, access count, piece count or any other count application equipped with a free relay count from potential or from an "Open Collector" (example: photocell or proximity sensor).

The pulses received on the 5 independent channels can be counted inside the device so that the totals are available to a "Master" Modbus requesting it.

The counting of every channel is STORED in appropriate dedicated registers, one for the totalization and the others to supply "Weighed" measures. During programming, through a provided software (updates available on the site), a "Weight" can be associated to every impulse, that is, the register increasing numerical quantity to every received pulse.

Example: if the water weight of 10m3 is associated to channel 1, at every received pulse the internal meter will increase by 10 meaning 0....10....20....30... In this way the "Master" Modbus which questions the device obtains an already coherent (real) number without having to numerically elaborate the measure. This function can be activated or deactivated and influences the performances of the instrument (see specifics).

The device is equipped with a permanent memory (EEPROM). For every channel it can be chosen whether to save the data permanently or to loose them when switching off (saving in the permanent memory occurs when switching the instrument off). When switching on again, the accumulators saved will be found intact. By lifting the small upper panel, access is gained to the settings of the MODBUS addresses (from 1 to 255) of the device through 8 microswitches.

Two leds make a simple diagnostic available:

- The red led flashes when it receives pulses on any one of the 5 channels. The duration of every flash and every pause is 100mSec. In case of simultaneous pulses from more channels or fast pulses, the flashing looses meaning it no longer follows the inputs flow but indicates in general that there is activity. This led is mainly used to verify the connections and instrument functioning.

- The yellow led flashes when the device, after having received a valid question in Modbus through the RS485 interface to the address programmed with the microswitches, answers with the requested data.

- ✓ Diagnostic: two led for the control of the insertion and the functioning
- ✓ Interface RS485 optoisolated at 3kV, protocol MODBUS RTU (Full Compliance) with 5 programmable speeds, up to 115200 bps.
- ✓ Inputs compatible with relay contact or static output (Open Collector) at very high speed
- ✓ Possibility to program counting with closed or open contact.
- ✓ Access password for the programming of the parameters/pre-set, totalizators and accumulators zeroing
- ✓ Input filters programmable with 100 microsec resolution.
- ✓ Possibility to permanently save the totalizators and accumulators (in EEPROM mode).
- ✓ Possibility to activate accumulators with programmable impulse weight from 0 to 9999.9999 (at fourth decimal).
- ✓ Possibility to block the totalizators and accumulators at maximum counting value (999.999.999 without subsequent zeroing)
- ✓ Free software that can be unloaded from the website with demo video.

SPECIFICATIONS

Power supply		230V 50/60 Hz
Self-consumption		2 VA
Galvanic insulation		inputs/power/output
Testing voltage		3 kV
Number of inputs		5
Type of inputs		Free contact (NPN)
Polarity		NO or NC (programmable bySoftware))
MAX. Resistance of contact		600 Ω
MAX. Residual voltage upon contact		1.5 V
Serial interface		RS485 (3kV insul.)
Serial communication protocol		Modbus RTU
Serial communication speed		9600-19200-38400-57600-115200 (programmable)
Serial communication parameters		8, N, 1 nessun no handshaking
Modbus address		1 - 255 through frontal minidip
Number of totalizators		5
Totalizator range		999999999 (9 digits)
Minimum duration tot impulses		55 microseconds (1)
MAX. Frequency tot impulses		9000 / sec (1)
Number of accumulators		5
Accumulator range		999999.9999 (9 integer + 4 decimals)
Minimum duration cont impulses.		500 microseconds (2)
MAX. Frequency cont impulses		1000 / sec (2)
Programmable filters		5, range from 0 to 25.5 millisec, resolution 100 microsec
Dimensions / weight		2 DIN modules / 0,30 Kg
Mechanical characteristics	Mounting:	DIN 50022
	Protection degree::	complete apparatus IP20/ frontal IP30
Environmental conditions	Nominal temperature:	0...+45 °C
	Range:	-5...+55 °C
	Storage temperature:	-10...+70 °C
	Humidity:	10...95 %
	Atmospheric pressure:	70...110 kPa
Standards	Safety:	EN 61010-1 CAT II
	Encloser protection degree (IP):	EN 60529
	Electromagnetic compatibility (immunity):	EN 61000-6-2
	Electromagnetic compatibility (emission):	EN 61000-6-4

(1) Duty cycle 50%, ACCUMULATORS=OFF, Filters=0=OFF

(2) Duty cycle 50%, Filters=0=OFF. When the ACCUMULATORS are ON, this limit is also applied to the TOTALIZATORS

After a few seconds from switching on, during which both leds are switched on, the instrument is able to acquire pulses simultaneously from 5 counting channels, which can be programmed singularly to accept contact NO or NC and each can be filtered from disturbances with a digital filter programmable from 0.0 to 25.5msec (resolution 100usec).

The valid pulses are always sent to the respective TOTALIZATORS, which count, increasingly, each single pulse (1:1).

The range of each totalizator is of one billion pulses (999,999,999) and it can be decided if once this limit is reached, the counting should block or if the totalizator should re-start from zero. It can also be decided whether the counting value of each totalizator should be permanently saved or whether it should be zeroed after switching off and switching on again.

The same pulses can be sent to the respective ACCUMULATORS, which can be customized so that they can count the weighed units in a different way from the single pulse. These accumulators represent the chosen quantity and have also a decimal part with resolution 1/10000. The counting range is one billion dot 9999 (999,999,999.9999). As for the totalizators, it can be decided whether to permanently save or not (singularly) the counting values.

The physical acquisition limit of the pulses is of 9000 imp/sec (9 KHz) for each channel.

This limit can be reached only on the TOTALIZATORS when:

1. The input filters are switched off (0.0msec)
2. The ACCUMULATORS are switched off
3. The incoming pulses have a duty cycle 50% (pulse time = pause time)
4. The serial communication is at maximum speed (115.200bps)

The calculation operations needed to elaborate the pulse and record it in weighed mode on the accumulators drastically effect the acquisition performances. The serial communication speed also influences the performances and in optimal conditions at 9600bps the maximum acquisition frequency is just above 2 KHz.

To be able to interact by sending configuration controls to the instrument or zeroing/pre-selection controls, it is COMPULSORY to supply the PASSWORD, which 'opens' a time window of 10 seconds during which the configuration can be amended (password included). If the password is not supplied, any writing access attempted is denied. In case an attempt to supply a wrong password is made, the instrument blocks any further access attempt for an hour. Even if switching the instrument off, this time is not zeroed. If the password is lost, there is no way to recover it or to bring the instrument back to the factory values. The instrument must be sent to the assistance for repair.

The factory PASSWORD is 0 (zero).

The values accepted are numerical and in the range 0 to 65535.

USE OF DIGITAL FILTERS

They can be applied to avoid that disturbance or mechanical contacts rebounds alter the counting. The filters have a resolution of 100usec per unit. To correctly measure them, the followings must be taken into account:

- The MINIMUM duration of the NOMINAL pulse to be recorded is that in the chosen state for the counting, meaning Normally Open or Normally Closed [Ton].
- The duration of the 'pause' between one pulse and another must be at least equal or greater than the duration of the pulse [Toff]. If not, the following argument no longer stands and the application of the filters can be 'experimental'.
- The maximum applicable filter to an input without loss of pulses is equal to [Ton] - 100usec.

It is however better, if the environment and the conditions allow it, not to equalise this value but to set one as low as possible respect to the 'disturbance' to be filtered. In fact, on the filter limits, if the incoming pulses haven't got a regular duration, it would risk loosing it.

In case of a wrong setting of the filters and consequent under-counting, the instrument does not supply any error indication.

USE OF ACCUMULATORS

They are normally kept switched off to maximise the instrument performances, which can better and more quickly manage its main function, meaning, to concentrate the counting of the single pulses from 5 lines at the same time and quickly communicate on the serial line. Infact, the 'weighing' of that totaliser, can very easily be made by the remote control unit, which surely has a higher calculating power.

However,in particular cases and when the acquisition of the pulses must not happen with elevated frequency (less than 1000imp/sec for each line), it is possible to singularly enable the accumulators and establish the pulse value for each of them.The value ("weight") of the pulse has an integer part which can be chosen between 0 and 9999 and a decimal part between 0.0000 and 0.9999.

When a meter is enabled, the decimal and integer part of the pulse weight is added to the counting value, which is also expressed with an integer part up to 999999999 and a decimal part between 0.0000 and
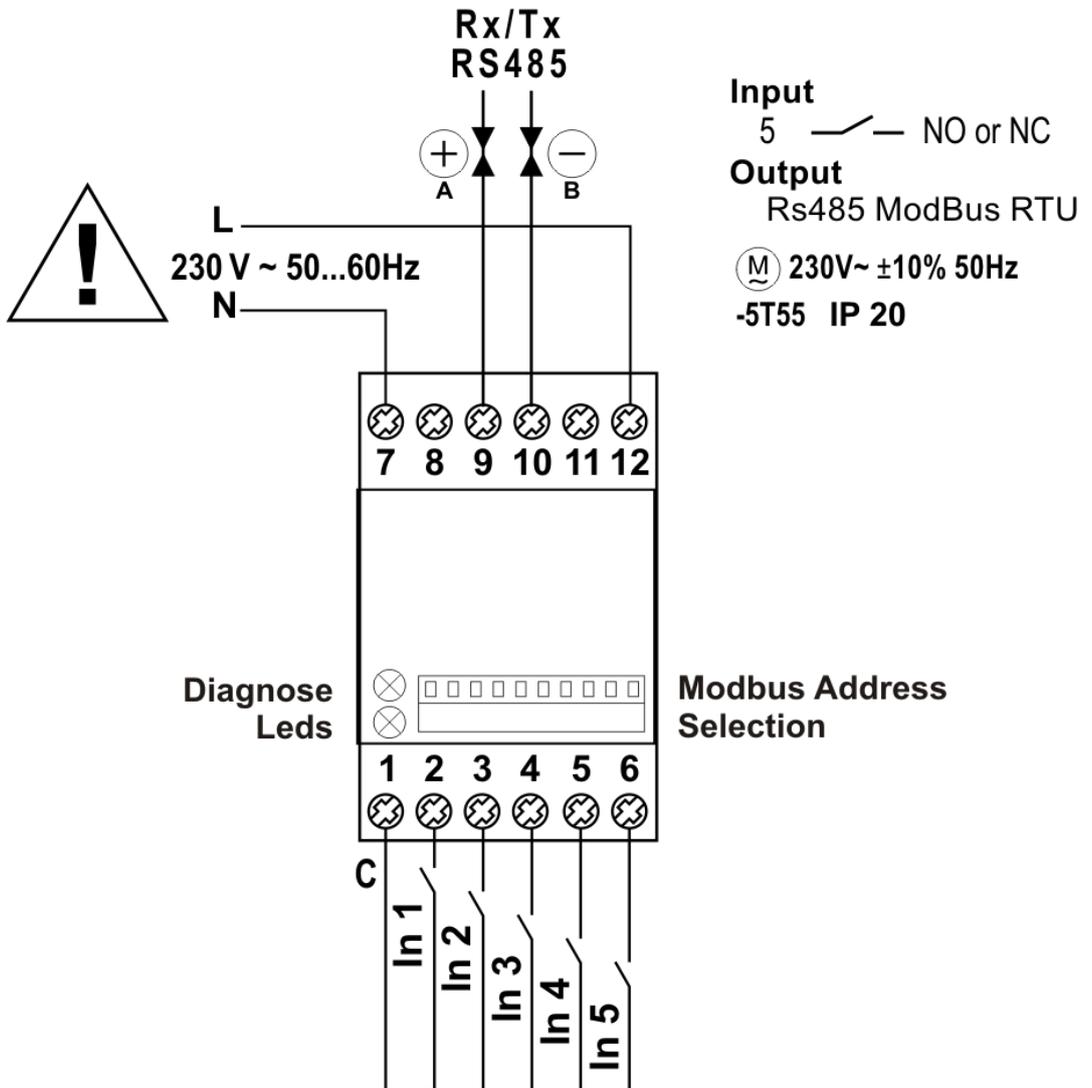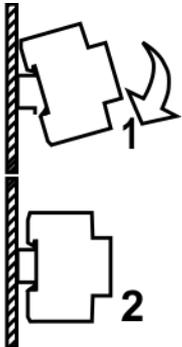
0.9999. As the 'load' of the calculation which the instrument has to carry out is not constant but it depends on the numbers and on how many accumulators it must manage, OVERLOAD flags for each measuring line have been introduced, which indicate the exceeded calculation capacity and also that part of the incoming pulses have been lost. In the presence of this indication, it must be known that both the totalizator and the counter of that channel have an incorrect number of pulses (lower).

MODBUS COMMUNICATION
The register map to connect the device to a PC is available on the website.

CE

**Rx/Tx
RS485**

(+) A   (−) B

Input
5 ⎯⁄⎯ NO or NC
Output
Rs485 ModBus RTU

(M) **230V~ ±10% 50Hz**

-5T55   IP 20

L
230 V ~ 50...60Hz
N

7 8 9 10 11 12

**Diagnose
Leds**

Modbus Address
Selection

1 2 3 4 5 6

C

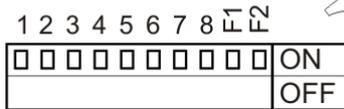In 1   In 2   In 3   In 4   In 5

LED GIALLO / YELLOW LED
Diagnostica Modbus: il led lampeggia quando i dati vegono inviati al dispositivo che ne ha fatto richiesta (master = PC)
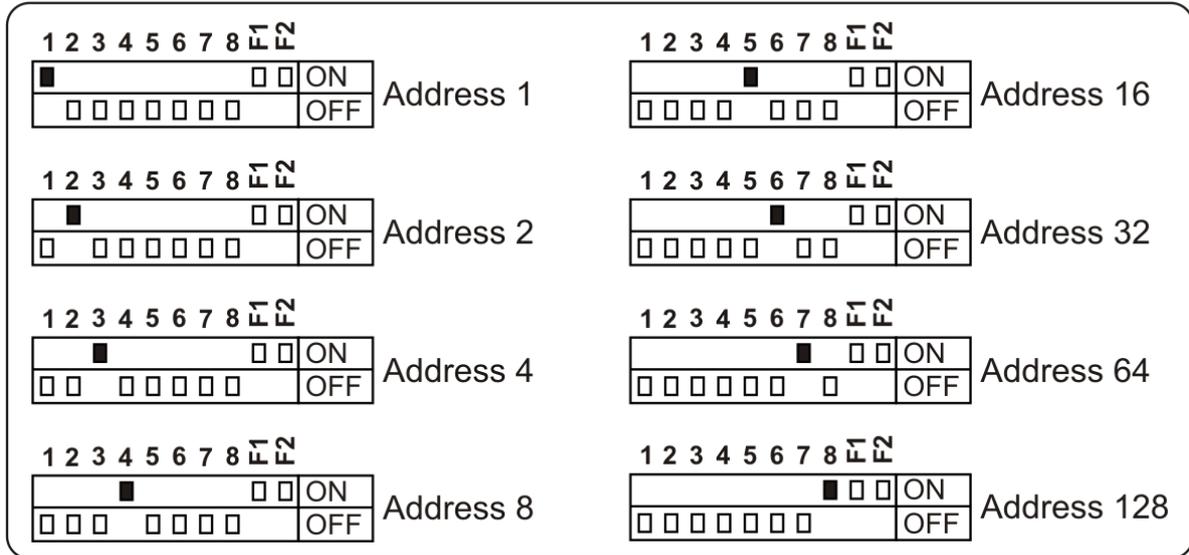Modbus Diagnose: flashes when data are sent to the master (PC)

LED ROSSO / RED LED
Diagnostica impulsi: il led lampeggia se il dispositivo rileva degli impulsi su almeno uno dei 5 canali.
Input Diagnose: flashed when there is at least one pulse over one of the 5 input channels.

MODBUS ADDRESS SELECTION (1…255)

1 2 3 4 5 6 7 8 F1 F2

| ON |
| OFF |

Ex:
Address 25 (=16+8+1) →
ON DIP5 + DIP4 + DIP1

1 2 3 4 5 6 7 8 F1 F2 — Address 1

1 2 3 4 5 6 7 8 F1 F2 — Address 2

1 2 3 4 5 6 7 8 F1 F2 — Address 4

1 2 3 4 5 6 7 8 F1 F2 — Address 8

1 2 3 4 5 6 7 8 F1 F2 — Address 16

1 2 3 4 5 6 7 8 F1 F2 — Address 32

1 2 3 4 5 6 7 8 F1 F2 — Address 64

1 2 3 4 5 6 7 8 F1 F2 — Address 128

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