
FLOW METER TOTAL AND INSTANT WITH PULSE INPUT , ANALOG OUTPUT, RS485 MODBUS RTU

- ❑ Two measurement display (selectable by pressing UP):
 - ⇨ flow rate
 - ⇨ total flow
- ❑ Two counting inputs: static; reed
- ❑ Wide range of acquisition from 0,001 Hz to 10.000 Hz
- ❑ Parametrization:
 - ⇨ Independent for each of the two measures
 - ⇨ Simple based on the type of measurement desired: Hz; RPM; m/1°; pcs/hour; m³/h; etc.
- ❑ 6 digits display; maximum display scale 0...999999
- ❑ Analog output proportional to the instantaneous flow rate
- ❑ RS 485 MODBUS RTU BUS
- ❑ Selectable resolution: x0,01; x0,1 x1; x10; x100
- ❑ Hold and peak-hold inputs
- ❑ Totalizer reset from the keypad or remote input



1.0 SAFETY PRECAUTION

Before using the instrument read the warnings supplied with the product (see 3.1 Packaging list) ad all is indicated below.

The instrument is a electronic component and you don't have to be esteemed it a machine. For these reason the instrument doesn't fulfil machine compliance.

If the instrument is utilised as a part of a machine, it can't work if the entire machine doesn't properly compliance.

The instrument marking doesn't dispense the customer to fulfil the law obligations relatives the entire machine.

Preventively make sure that the instrument model matches with the appropriate power supply voltage. Insert a adequate protection on power supply circuits; we recommend a 100 mA fuse protection with medium retard intervention.

The instrument is exempt to fulmination phenomenon (internal "surge" protection).



Preventively make sure that the instrument model matches with the appropriate power supply voltage (see 3.6 paragraph).

2.0 GENERAL DESCRIPTION

Flow indicator (total, instantaneous) with analog and serial output.

The selection of reading, instantaneous or total, is done by the UP button.

At power ON the reading is designed for reading total, pressing the UP switch to the instantaneous.

Pressing again will return you to the total capacity.

2.1 INSTANTANEOUS FLOW

In this mode, the device is suitable for the detection of period / frequency selectable reading for the following measurements:

- direct reading (acquisition period, range 0.01 ... 1000 Hz)
- RPM
- production (second, minute, hour)
- flow rate
- transfer rate
- high frequency (frequency acquisition, range 1 ... 10 kHz)

Acquisition range 0.001 ... 10000 Hz display has 6 digits with maximum display value 999999.

Selectable resolution x0.01, x0.1, x1, x10, x100.

2.2 TOTAL FLOW

The configuration of reading is independent of the instantaneous, you can set:

- pulse value (pulses / liter, liters / pulse)
- decimal point
- enable reset button front

3.0 PREPARATION FOR USE

3.1 PACKAGING LIST

Inside the package are:

- user manual (this document)
- warnings (Safety Precautions and notes)
- device
- two fixing brackets
- terminal connections from 12 +12 pin (inserted on the device)

3.2 INITIAL SET UP

The device is adapted for panel mounting.

It is necessary to make on the panel a cut of 92x45 millimeter (92 in width, 45 height). The maximum permitted panel thickness is 4 millimeters.

3.3 ASSEMBLY AND INSTALLATION

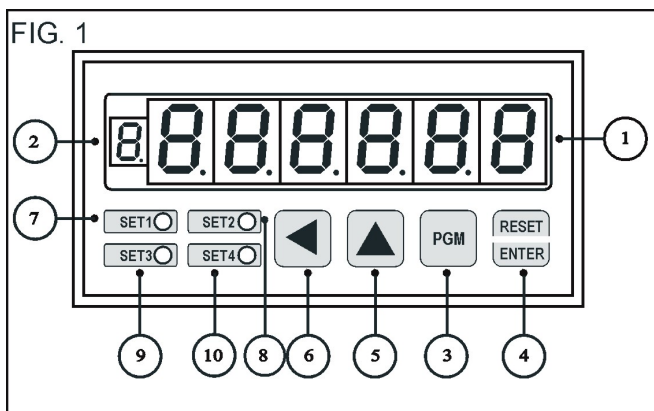
To insert the device in the panel.

To insert the stirrups delivered in equipment in the appropriate buttonholes, one to right and one on the left of the device, to put them in tension , turn the hinge with the aid of a screwdriver (cut or cross, 4 millimeter).

For connections, refer to the diagrams below.

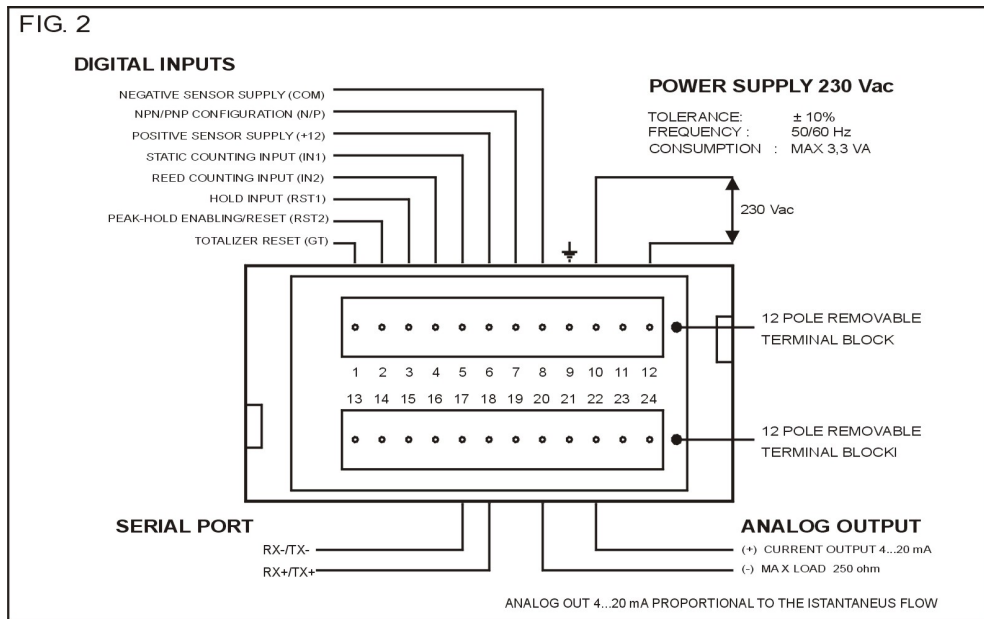
Connect only in the absence of power.

3.4 FRONT VIEW



- 1= 6-digit reading indicator (character high 12.5 mm).
- 2= 9 millimetres display for show the label of parameter during programming
- 3= PGM programming access key.
- 4= Dual function RESET/ENTER key:
used for reset during normal operation,
enter data during programming.
- 5= Dual function UP arrow key:
Istantanous/total reading setting,
enter data during programming.
- 6= SHIFT arrow key to move the selected digit
- 7= not enabled
- 8= not enabled
- 9= not enabled
- 10= not enabled

3.5 REAR VIEW AND CONNECTIONS



3.6 POWER SUPPLY



Preventively make sure that the instruments model matches with the appropriate power supply voltage.

Model	Power supply	Notes
G2X10TDH70	230 Vac	Tolerance: $\pm 10\%$

All data are stored in a E²PROM static memory therefore they are kept with power off.

3.7 ELECTRICAL CONNECTIONS

Two removable 12 + 12 pole terminal blocks are provided at the rear of the instrument for electrical connections (see Figure 2) (in brackets are the terminal numbers).

3.7.1 POWER SUPPLY

Four power supply version are available in function of code the instrument:

230 Vac to terminals 0 (12) e 230 (10)

Connect ground to associated terminal (⚡)(9)

3.7.2 DIGITAL INPUTS

NPN inputs: connect terminal N/P (7) to terminal +12 (6) (see figures 3 and 4)

PNP inputs: connect terminal N/P (7) to terminal COM (8) (see figures 5 and 6)

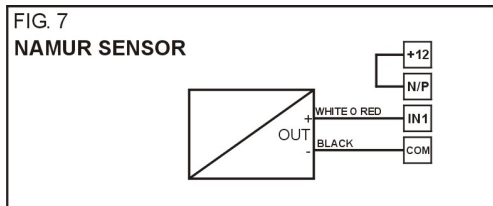
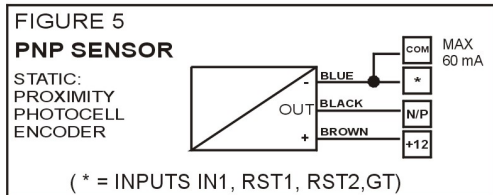
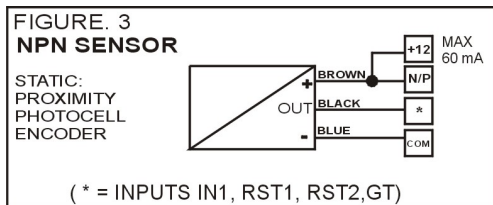
Fast static sensor (10 KHz max):
 Positive = +12
 Negative = COM
 Output = IN1

Slow input for clean mechanical contacts (10 Hz max):
 NPN: contact between IN2 and COM
 PNP: contact between IN2 and +12

Hold input (when hold contact is closed, reading is held regardless of input variable):
 NPN: contact between RST1 and COM
 PNP: contact between RST1 and +12

Peak-hold input (when hold contact is closed, reading records peak value reached by input variable and maintains display until contact is re-opened):
 NPN: contact between RST2 and COM
 PNP: contact between RST2 and +12

Total counter zeroing input (when hold contact is closed, total counter is zeroing)
 NPN: contact between GT and COM
 PNP: contact between GT and +12



3.7.3 ANALOG OUTPUT

Output 4...20 mA: mA+(22) = current output - positive
mA-(21) = current output - negative

3.7.4 SERIAL PORT

TX+/RX+ (18) = BUS+

TX-/RX - (17) = BUS-

Termination resistor not available.

3.8 FUNCTION TEST

Apply power supply.

The display is on, show "H59td" for one second and after show the accumulated total.

4.0 INSTRUCTION FOR THE OPERATION

After the start up operation the instrument is ready.

4.1 PROGRAMMING

Two menu levels are available:

- counter (access code 210)

- frequency indicator (access code 210210)

To access configuration press PGM key. Display will show "C 000000", while units will flash. To access programming, enter pass code "210" or "210210" and confirm with PGM.

If the wrong number is entered it is will not be accepted; when the ENTER or PGM keys are pressed the display will show the count again.

To enter numbers, press the two arrows: the UP arrow changes the number shown on the flashing display, while the SHIFT arrow changes the flashing digit.

After each configuration programming step, either presse PGM key to go on to the next programming step, or press ENTER to return to variable display.

4.1.1 TOTALIZER CONFIGURATION WITH "210" CODE

Parameter description	Message displayed	Range		Default value
		Min	Max	
Encoder pulses per revolution (or divider)	E	1	999999	(1)
Reading with one encoder revolution (or multiplier)	L	1	999999	(1)
RESET ENTER key function	F	0	2	(0)
input selection (IN1/IN2)	c	0	1	(0)
decimal point	d	0	5	(0)
Displayng at power_on	n	0	1	(0)
Totalizer offset	Offset	0	999999	(0)

E CODE

Set the number of encoder pulses (or desired divider)

Number must be between 1 and 999999.

L CODE

Set the reading desired with one encoder revolution (or desired multiplier).

Number must be between 1 and 999999.

F CODE

Select function of the front RESET/ENTER key:

0 = frontal key disabled

1 = frontal key enabled for reset totalizer or load the offset value

c CODE

Select the desired input by entering one of the following numbers:

0 = fast input (IN1: 1 KHz max)

1 = slow input (IN2: 10 Hz max)

d CODE

Select the desired decimal point entering one of the following numbers:

0 = No decimal point 999999

1 = One decimal place 99999.9

2 = Two decimal places 9999.99

3 = Three decimal places 999.999

4 = Four decimal places 99.9999

5 = Five decimal places 9.99999

n CODE

Select the variable to be displayed when the device is turned on:

0 = total flow

1 = instantaneous flow

CODE "OFFSET"

Set the desired offset number.

Number must be between 0 to 999999. Display automatically shows decimal points on the basis of configuration.

4.1.2 FREQUENCY METER CONFIGURATION WITH 210210 CODE

Parameter description	Message displayed	Range		Default value	Note
		Min	Max		
Time-out	t	0	999	(0)	*
Activation time-out	A	0	1	(0)	*
Display update (filter)	u	0	4	0	*
Time base	u	0,001	999,999	(1,000)	**
Analog output start of scale	Out IS	0	999999	(0)	/
Analog output end of scale	Out FS	0	999999	(1000)	/
Baud rate	Baud	0	6	(6)	
Peripheral address	Add	1	247	(1)	
Parity	Pr	0	2	(0)	
Resolution / decimal Point	P	0	2	(0)	/
Analog output in hold case	H	0	1	(0)	/
Type of reading	i	0	4	(0)	/

* : parameter available if "i" (type of reading) is different from 4

** : parameter available if "i" (type of reading) is equal to 4

Depending on the type of acquisition choice by means of the parameter "i", are required the following parameters:

- If "i" = 0 (period meter):

there are other parameters to be set

- If "i" = 1 (RPM):

References for round	r	1	999999	1	/
Fixed zeros	O	0	2	0	/

- If "i" = 2 (production counter, flow meter):

Riferences for round / pulses per liter	r	1	999999	1	/
Fixed zeroes	O	0	2	0	/
Unit of time	U	0	2	0	/
Reading ratio / pulses per liter	L	1	999999	1	/

- If "i" = 3 (linear speed):

Riferences for round	r	1	999999	1	/
Fixed zeroes	O	0	2	0	/
Unit of time	U	0	2	0	/
Diameter of the roller	d	0.01	9999.99	0.01	/
Unit of space	S	0	3	0	/

- If "i" = 4 (frequency meter):

Pulses/round	r	1	999999	1	/
Multiplier	L	1	999999	1	/

t CODE

Set the time after Which the reading is zero. The parameter "t" is available if you September the parameter "i" is not 4. The set value is Expressed in seconds and in September the scale from 0 to 999 seconds (the default is 0 to 0.5 seconds). Use this parameter to select the tradeoff between time zero and the machine speed.

Example:

wanting to read a minimum speed of 1800 pieces / hour and having one reference to each piece, we have that the minimum interval between a pulse and the next is 2 seconds.

The value of time-out must be at least three seconds.

If the machine were to crash, and then there are no more input pulses, the existing reading would remain for three seconds before to bring itself to zero.

A CODE

Select the type of time-out desired setting one of the following numbers:

0 = normal time-out

1 = active time-out

With timeout active and in the absence of input pulses, the reading drops progressively moving towards zero, with increasing time since the last pulse.

u CODE

Program "u" has two mode operating modes, depending on the type of reading and thus on the operating mode (see program "i").

Program "i" set to 0,1,2,3.

Set the display update time by entering one of the following numbers:

0 = 0,75 seconds

1 = 1,50 seconds

2 = 2,25 seconds

3 = 3,00 seconds

4 = 3,75 seconds

Program "i" set to 4.

Set frequency meter sampling time.

Value may be selected from 0.001 and 999.999 seconds.

Out IS CODE

Program display reading to be associated with start of analog output scale (start of analog output scale is 0 volt for the voltage output or 4 mA for the current output).

Out FS CODE

Program display reading to be associated with end of analog output scale (end of analog output scale is 10 volt for the voltage output or 20 mA for the current output).

Example - wanting to set 0 ... 400 RPM = 4 ... 20 mA, you must set the following values:

"Out IS" = 0

"Out FS" = 400

Add CODE

Set the station address; the number must range from 1 to 247.

Baud rate - CODE

7 baud-rate values are available.

The choice must be carried out by evaluating master unit operating characteristics.

To select the baud-rate required, set one of the following numbers:

0 = 300

1 = 600

2 = 1200

3 = 2400

4 = 4800

5 = 9600

6 = 19200

Prt CODE

Configure the parity of serial port. Select one of follow number:

0 = none

1 = even

2 = odd

P CODE

Program "P" has two operating modes, depending on the type of reading and thus on the operating mode (see program "I").

Program "I" set to 0,1,2,3

Select the desired degree of reading accuracy:

0 = 0...999999

1 = 0...999999.9

2 = 0...9999.99

Program "I" set to 4

Select decimal point position (for a imaginary rading):

0 = 0...999999

1 = 0...999999.9

2 = 0...9999.99

H CODE

Select the behavior of the analog compared to hold (hold is that peak-hold) setting one of the following numbers:

0 = analog output produces a value proportional to the value on the display.

1 = analog output produces a value proportional to the input variable

i CODE

Select the desired type of reading by entering one of the following numbers:

- 0 = Frequency meter (period meter sensing)
- 1 = Rev counter (period meter sensing)
- 2 = Production counter (period meter sensing)
- 3 = Unit length meter (period meter sensing)
- 4 = Frequency meter (frequency meter sensing)

In period meter sensing mode, the unit measures the distance between one switch signal edge and the next for the selected input (IN1 or IN2).

Sampling takes place with an accuracy of 800 nanoseconds.

It is non advisable to use this operating mode af frequency above 1 KHz.

Where higher frequencies must be read, select reading 4 to enable frequency meter mode.

In this case, the unit counts the pulses reaching the enabled input (IN1 or IN2) during the sampling period set for program "u". The display update rate is 0.5 seconds if the programmed value is less than or equal to 0.5 seconds, or equal to the programmed value plus 0...0.5 seconds if the programmed value exceeds 0.5 seconds.

r CODE

Set number of roller or shaft references per revolution.

Number must be between 1 and 999999.

O CODE

To prevent display hunting between the least significant digits (particulary for systems with unstable speeds), displayed digits can be blocked at zero in either the units place or in both the units place and thens place.

Enter one of the follwing numbers:

- 0 = No fixed zero
- 1 = One fixed zero
- 2 = Two fixed zeroes

U CODE

Enter one of the follwing numbers:

- 0 = Measurement takes place per second (e.g. meters/second)
- 1 = Measurement takes place per minute (e.g. meters/minute)
- 2 = Measurement takes place per hour (e.g. meters/hour)

L CODE

This code is present only for production counter and frequency meter reading modes. Together with code "r" is used to obtain reading ratios other unity the two variables are linked by the following formula:

$$A) \quad V = \text{Fin} \times \frac{L}{r}$$

Where: V = Value shown on display

Fin = Input frequency

L = Value set for program L

r = Value set for program r

Note that if production counter reading is enabled, program "U" will produce a result expressed per second; per minute or per hour:

$$B) \quad V = \text{Fin} \times \frac{L}{r} \times 1 \text{ (se } U = 0)$$

$$C) \quad V = \text{Fin} \times \frac{L}{r} \times 60 \text{ (se } U = 1)$$

$$D) \quad V = \text{Fin} \times \frac{L}{R} \times 3600 \text{ (se } U = 2)$$

d CODE

Enter the diameter of the roller whose surface speed is to be measured. Measurements are accurate to the nearest hundredth. Number must be between 0.01 and 9999.99 millimeters.

S CODE

Select the unit of length with which surface speed is to be measured by entering one of the following numbers:

0 = readings in meters

1 = readings in decimeters

2 = readings in centimeters

3 = readings in millimeters

4.2 MODBUS RTU PROTOCOL

The device is a SLAVE unit and can communicate (via the serial port) with a MASTER device.

The protocol format is based on a "Query/Response" structure; the master may execute a number of queries addressed to different instruments on the serial line; the instruments respond to the query by a message containing the identification address and the required data.

The maximum delay time between the query and the response is fixed at 500 mS.

The communication baud rate is programmable: 300, 600, 1200, 2400, 4800, 9600, 19200 baud

The slave instruments address can range from 1...to 247

ERROR CONTROL

The MODBUS protocol ensures the validity of data on the line by means of a "Cyclic Redundance Check" type control.

The CRC is added behind every message; should the instrument receive a message with an invalid CRC, the query is eliminated and there is no response to the master instrument

STRUCTURE OF ENABLED COMMANDS

Enabled commands are:

03 : Read register

03 - Read Register

To read the instrument registers, the master must send a query as follows:

ADDRESS | 03 | START_REG | N_REG | CRC |

where :

Address : Identification address (UID) of slave instrument (range 1...247)
03 : MODBUS Read Register command
START_REG : Register address (16 bit) from which reading shall start.
The top part of the address must be sent first (ex. for the 520 address, bytes 02 and 08 must be sent)
N_REG : Number of sequential registers to be read
(16 bit datum of which the top part is sent first and the bottom part is sent later)
CRC : 16 bit check marker

The slave instrument replies to this query with a message as follows:

ADDRESS | 03 | BYTE | DATA | CRC |

where :

Address : Identification address (UID) of slave instrument (range 1...247)
03 : MODBUS Read Register Command
BYTE : Number of bytes composing the DATA message;
the number of bytes, which is always twice the number of registers requested
DATA : Value of the registers requested, from the first to the last of the sequence, 16 bit
data of which the top part is sent first and the bottom part is sent later
CRC : 16 bit check marker

ERROR MESSAGES

The slave instrument which cannot make the query required, sends an error message as follows:

ADDRESS | EXCEPTION | ERROR | CRC

where:

Address : Identification address (UID) of slave instrument (range 1...247)
EXCEPTION : MODBUS command requested + 128 (ex. 131 = error on query with
03command)
ERROR : Type of error
CRC : 16 bit check marker

Error types can be:

1 = Invalid Function Code : Replies to a command different from 03 or 16
2 = Invalid Address Field : Replies to an attempt to enter an address that is different from those
specified in the profile
3 = Invalid Data Field : Replies to a request of writing one or more registers with an out-of-
range datum
4 = Query Processing Failure: Indicates an internal error

REGISTER ADDRESSES (ModBus Profile)

REGISTER NAME	DECIMAL ADDRESS	RANGE		FUNCTION REGISTER	TYPE	NOTES
		MIN	MAX			
Istantaneous flow (HI)	1	0	999999	Istantaneous flow	R	[1]
Istantaneous flow (LO)	2				R	
Total flow (HI)	3	0	999999	Total flow	R	/
Total flow (LO)	4				R	
Offset (HI)	5	0	999999	Valore del parametro	R/W	/
Offset (LO)	6	0	999999	OFFSet (offset totalizzatore)	R/W	/
Offset load	7	12345	12345	Caricamento offset	W	[2]
Trade Mark	120	50	50	Trade mark	R	/
Unit type	121	10024	10024	Unit type	R	/
Protocol rev.	122	0	0	Protocol rev.	R	/
Firmware rev.	123	100	100	Firmware rev.	R	[3]

R = read only register

R/W = read/write only register

W = write only register

[1] = A + OFL condition transmit 1000000

[2] = used 12345 password to load offset value

[3] = (1.00) firmware revision

4.3 MANUAL COMMAND

The device has the following manual command (see Fig. 1):

PGM key.

RESET/ENTER key

UP (arrow) key

SHIFT (arrow) key

4.4 REMOTE COMMAND

There are in this device the following remote command:

- digital inputs
- analog outputs
- serial port

4.4.1 DIGITAL INPUTS

Impedance: 2200 ohm

Choose from terminal block type of input: NPN or PNP.

Range voltage applicable: 10...30 Vdc

Low logic level 0: 0...1V

High logic level 1: 10...30Vdc

maximum length cables: 3 meters.

4.4.2 ANALOG OUTPUT

See figure 2. There are two digital optoisolate output:

By connection mode you can choose between: 4...20 mA or 0...10V output;

You can't use both in the same time.

Maximum load for current output: 0 ...250 ohm.

Minimum load for current voltage: 500 ohm.

Distance max for the connection 3 m.

4.4.3 RS485 SERIAL PORT

input/output for RS485 serial network

Communications protocol: MODBUS RTU

Units that can be integrated into a network: 127

Address that can be set within the range 1...247

Programmable Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200

Configuration of master unit: 8 bit data; parity none; 1 stop bit

4.5 PERIODIC CALIBRATION

The device does not need of a periodic calibration.

4.6 MAINTENANCE

The device does not have any parts that require maintenance.

5.0 TECHNICAL SPECIFICATIONS

5.1 GENERAL SPECIFICATIONS

Only the full values of tolerances or limits are guaranteed values. The values without tolerances are given purely by way of indication.

PACKAGE

Suitable for panel mounting - frontal dimensions 48x96 mm

Cutout dimensions 45x92 mm

Weight 450 g, ac models (300 g, dc model)

Depth 100 mm over connecting terminal

Protection level IP54

Connection by two removable screw terminal blocks 12+12 pole

DIGITAL INPUTS

Five optocoupled digital inputs, all configurable as NPN or PNP

Dual counting input:

IN1 from NPN or PNP sensor

IN2 from reed contact

RST1 = HOLD input

RST2 = PEAK-HOLD input (habilitation / reset)

GT = zeroing input

Applicable voltage 10...30 Vdc

Impedance: 2200 ohm

Sensor power supply 12 Vdc stabilized

Maximum counting frequency: Period meter operation: 1 KHz (see "I" program)

 Frequency meter operation: 10 KHz (see "I" program)

Statique input (IN1) or mechanical contact (IN2) selection

SENSOR POWER SUPPLY

Voltage 12 V (stabilized)

Maximum current 60 mA max.

ANALOG OUTPUT

Analog output: proportional to the flow rate with 0...10V or 4...20mA signal

Output impedance: in current up to 250 ohm

 in tension min 500 ohm

Selection: output related to variable direct or to displayed variable
(choice of behavior in case of hold and peak-hold).

Resolution: 2000 points

Accuracy: 0,1% ± 1 point

Linearity: 0,1% ± 1 point

RS485 SERIAL PORT

input/output for RS485 serial network

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Units that can be integrated into a network: 127

Address that can be set within the range 1...247

Programmable Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200

Configuration of master unit: 8 bit data; parity none; 1 stop bit

INDICATOR

6+1digit display

Max. display scale 0...999999

Out of scale: OFL

POWER SUPPLY

Power supply: 230 Vac

Frequency (AC): 50/60 Hz

Tolerance $\pm 10\%$

E²prom static memory with power off.

Max consumption 3,3 VA (3,3 W)

5.2 AMBIENTAL CONDITIONS

5.2.1 Temperature

Operating temperature $-10...+50^{\circ}\text{C}$

5.2.2 Humidity

Relative humidity 0...95% not condensing

5.2.3 EMC (ELECTROMAGNETIC COMPATIBILITY)

According to guideline:	2014/30/UE	
	EN61000-6-2	(industrial environment immunity)
	EN61000-6-4	(industrial emission)

5.2.4 ELECTRICAL SAFETY

According to guideline:	2014/35/UE	(Low-tension)
	EN61010-1	

5.3 STORAGE

Storage temperature $-20...60^{\circ}\text{C}$;

Relative humidity up to 95 hot condensing.

A dry, dust-free environment is recommended

Avoid exposure to corrosive acid vapors

Do not wash the products with water

Prevent liquids from entering into the internal circuits

5.4 ACCESSORIES AND OPTION

There isn't any optional for this device.

5.5 POINTS SALE AND ATTENDANCE

5.5.1 GUARANTEE

The device is covered by a guarantee for production defects, valid for 12 months from the date of consignment. The guarantee does not cover devices that have been tampered with, improperly repaired or used in a manner that does not conform to the instructions for use

For assistance regulations, see the "General Assistance Conditions".

5.5.2 ASSISTANCE

All assistance operations must be carried out by the manufacturer or by an authorized representative. Pack the instrument carefully, enclose both a brief description and a full description of the nature of the malfunction with the package, and send to the manufacture.