KOSMOS SERIE

CODE: 30727031 EDITION: 28-06-2007

INSTRUCTIONS MANUAL
COUNTER - TOTALIZER
TACHOMETER - TOTALIZER
FREQUENCY METER
CHRONOMETER
PART 1 / 2

MODEL ALPHA-D

MODBUS-RTU PROTOCOL COMPATIBLE

MTS Messtechnik Schaffhausen GmbH
CH-8260 Stein am Rhein
Telefon +41 52-672 50 00
Messen Prüfen Automatisieren www.mts.ch

DITEL

INTRODUCTION TO THE KOSMOS SERIES

This catalogue does not constitute a formal agreement. All information given in this manual is subject to change without notice.

The KOSMOS SERIES brings a new philosophy in digital panel instrumentation which is expressed by multipurpose, modular-concept devices providing a rich array of basic functions and advanced capabilities.

With a fully MODULAR DESIGN, it is possible to implement a wide variety of applications by only adding the adequate options.

Intelligence within allows the meter to recognize the options installed and ask for the necessary parameters to properly function within desired margins. The basic instrument without output options omits these data in the program routines.

The instrument's CALIBRATION is made at the factory eliminating the need for adjustment potentiometers.
Any circuit or option that may need any adjust incorporates a memory where calibration parameters are stored, making it possible the optional cards be totally interchangeable without need of any subsequent adjust.

Custom CONFIGURATION for specific applications can be made quickly and easily through five front panel keys, following structured choice menus aided by display prompts at each programming step.

Other features of the KOSMOS family include :

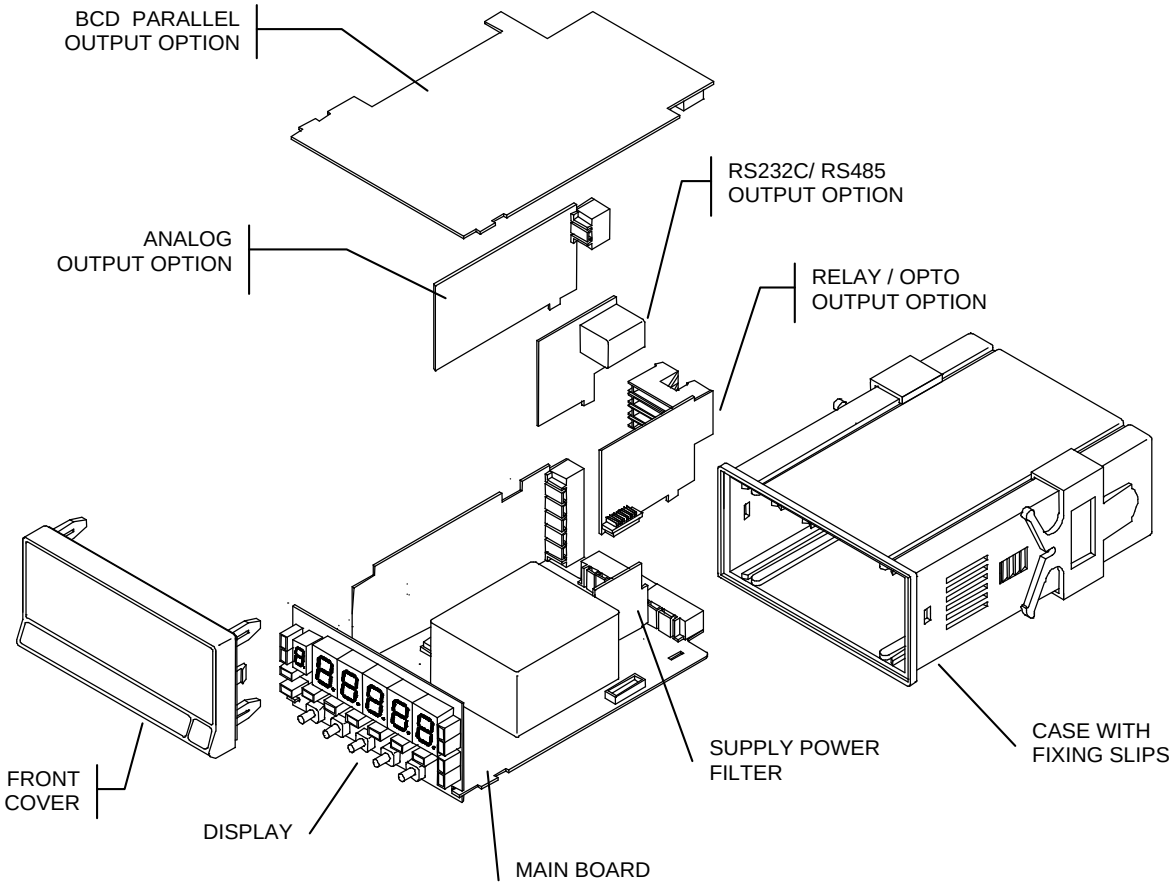
- CONNECTIONS via plug-in terminal blocks without screws and CLEMP-WAGO clips cable retention system.
- DIMENSIONS
  Models ALPHA & BETA 96x48x120 mm DIN 43700
  Models MICRA & JR/JR20 96x48x60 mm DIN 43700
- CASE MATERIAL UL-94 V0-rated polycarbonate.
- PANEL INSTALLATION by means of single part fingertip without screws.

To guarantee the meter's technical specifications, it is advised to check its calibration at periodical intervals according to the ISO9001 standards for the particular application operating criteria. Calibration should be performed at the factory or in a qualified laboratory.

INDEX

SECTION Page.

SECTION Page


BCD PARALLEL
OUTPUT OPTION
RS232C/ RS485
OUTPUT OPTION
ANALOG
OUTPUT OPTION
RELAY / OPTO
OUTPUT OPTION
FRONT
COVER
DISPLAY
MAIN BOARD
SUPPLY POWER
FILTER
CASE WITH
FIXING SLIPS

1. GENERAL INFORMATION

1.1. Introduction to Model Alpha-D

The KOSMOS Model ALPHA-D is a five-digit meter that offers count, time, frequency and rate measurement capabilities. It has two signal channels that accept inputs from a variety of standard sensors, pulse generators and AC signals. The unit main functions include :

PROCESS COUNTER
Unidirectional **UP** counter, **DOWN** counter and bidirectionnal **UP/DOWN**

- Remote and front-panel reset
- Decimal point indication
- Reset may load a count value (OFFSET), programmable or entered from the display
- Multiplier/Divider factor from 0.00001 to 99999
- Programmable low frequency debounce filter (20 Hz)
- Key-lock for RESET and OFFSET functions

TOTALIZER COUNTER

- Selectable totalizer with separate decimal point and scale factor
- Count display from 99999999 to -9999999 (8 digits or 7 digits with sign)
- Selectable 4 positions decimal point
- Input configuration and count mode is the same as selected for the process counter
- Alternating display of high order 3 digits and low order 5 digits
- No offset possibility
- Programmable low frequency debounce filter (20 Hz)
- Key-lock for the RESET function
- Remote and front-panel reset
- Decimal point indication
- Scale factor from 0.00001 to 99999 independent from the process factor

BATCH COUNTER

- Selectable batch counter that increments one unit each time the process counter reaches a user-programmed level between 1 and 99999.

CHRONOMETER / TIMER

- Five time ranges from hundredths of second to 9999.9 hours
- Remote and front-panel reset
- Reset may load a count value (OFFSET), programmable or entered from the display
- Programmable low frequency debounce filter (20 Hz)
- Key-lock for RESET and OFFSET functions
- Counts UP or DOWN

FREQUENCY METER / TACHOMETER

Measures frequency, rpm, rate, flow and time.

- Easy and quickly scaling method
- Decimal point indication
- Scale factor programmable from 0.0001 to 9999
- Display update time programmable from 0.1 to 9.9s
- User programmable measuring times and averaging to adapt the meter to any type of signal
- Peak and Valley readings detection

TACHOMETER WITH DIRECTION INDICATION

- The ALPHA-D senses direction of rotation and indicates polarity of the signal by means of LED's A and B. This function requires to program the totalizer for up/down PHASE or DIREC mode.
- The setpoints can be used to indicate direction or to be referred to negative or positive rate values. (for example, this can be used to control the start of an engine in the proper direction).

TACHOMETER WITH TOTALIZER COUNTER

- The totalizer has the same scaling facilities as for the counter configuration thus allowing to have two simultaneous informations of the same signal, for example speed and flow.

29 programmable logic functions operated at the rear connector enhance the functionnality of the meter and allow to control basic operations remotely.

In addition 36 commands through the serial port are available to allow reading and changing the setpoint values, request the display and reset to zero, etc...

Special software capabilities are program lock-out for individual menus or the entire program parameters, as well as the return to the factory configuration.

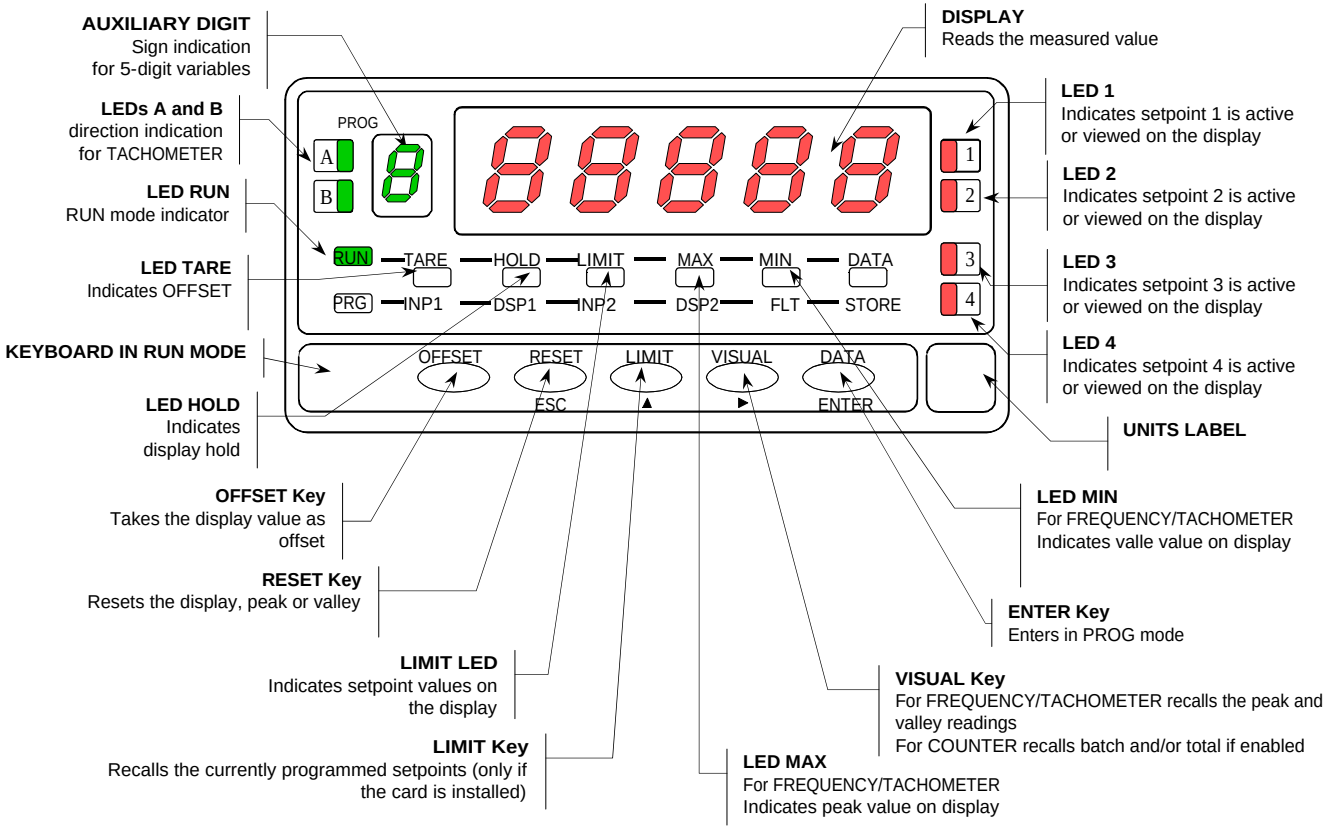
The basic instrument is a soldered assembly composed of main board, display and keyboard module and the input signal board.

Optionally, model ALPHA-D can be equipped with output cards for digital or analog control and communication (see figure in page 5). Each option has independent connectors that are brought out at the rear of the instrument. Each option has a separate programming module to configure relating parameters, which is activated when the card is installed.

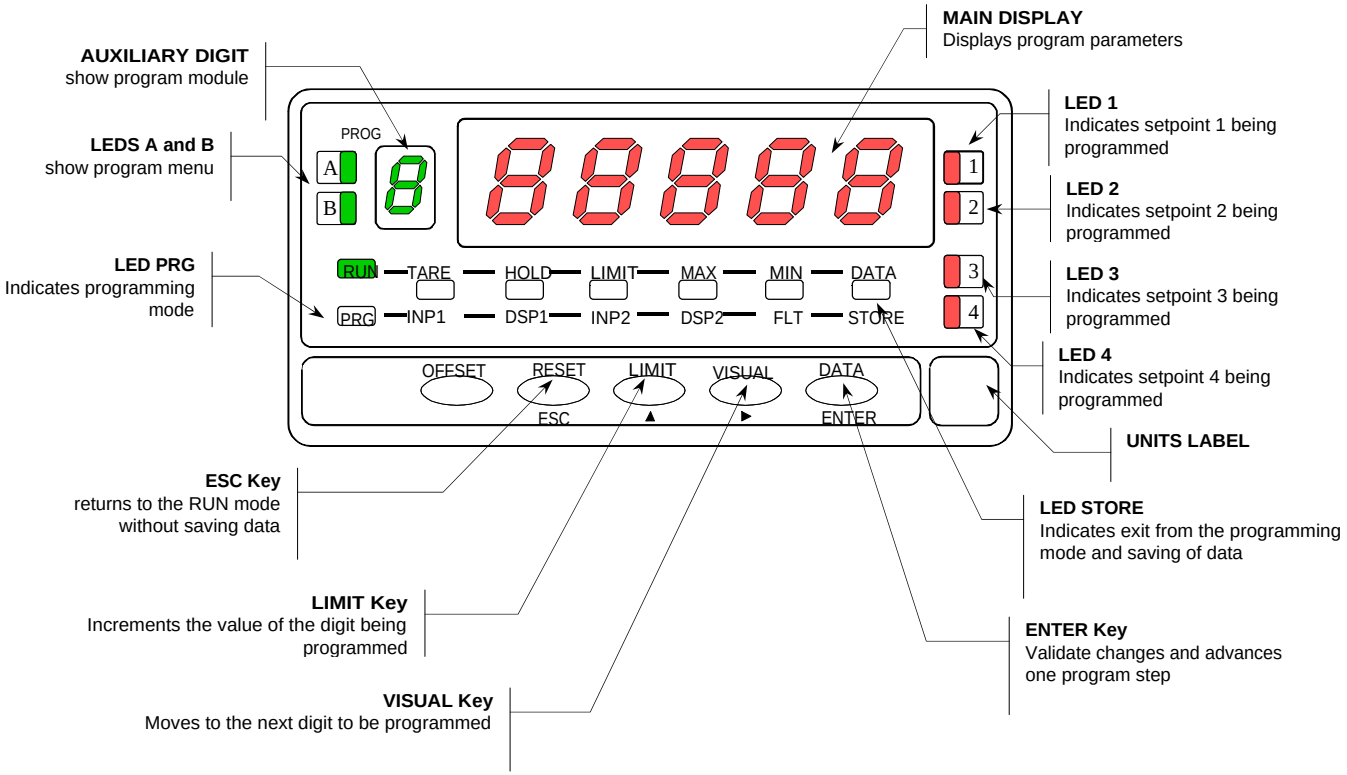
This instrument conforms the following community standards: 89/336/CEE y 73/23/CEE
Warning: Refer to the instructions manual to preserve safety protections.

1.2. Front-Panel Description

1.2.1. Operation in RUN Mode



1.2.2. Operation in PROG Mode



2. GETTING STARTED

2.1. Hardware Configuration

PACKING CONTENTS

- ❑ Instructions manual in English with Declaration of Conformity.
- ❑ The digital panel meter Alpha-D.
- ❑ Accessories for panel mounting (sealing gasket and fixing clips).
- ❑ Accessories for wiring connections (removable block connectors and fingertip key).
- ❑ Wiring label collated on bottom of the instrument case.
- ❑ Set of several engineering units to stick on front panel.
- ✓ **Check the packing contents before manipulating the instrument.**

POWER SUPPLY (pages 11 and 12)

- ❑ The instruments with 115/230V AC power supply, are set by default for a supply voltage of 230V (USA market 115V AC).
- ❑ The instruments with 24/48V AC power supply, are set by default for a supply voltage of 24V.
- ❑ The instruments with 10-30V DC power supply operate from any supply voltage from 10 to 30V DC without need for making changes.
- ✓ **See the wiring label indications on bottom of the instrument before connection to the power source.**

TYPE OF INPUT (page 13)

- ❑ At the factory, the two inputs of the instrument are configured for TTL/24V.
- ❑ The input connector provides two excitation voltages to power external sensors, 24V or 8V.

- ✓ **Before wiring the sensor to the input connector, verify the position of the two DIP-switch blocks of the input card located on the left side of the meter. Connect the sensors according to the schematics on page 14.**

PROGRAM LOCK-OUT (pages 47 and 48)

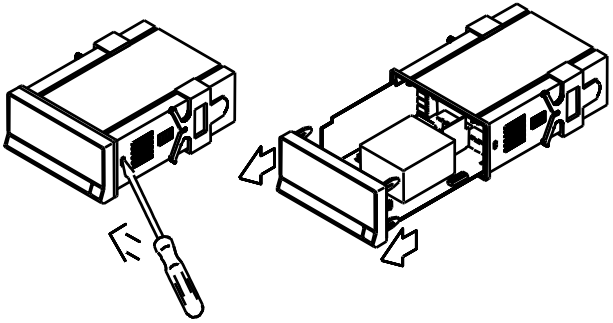
The program parameters lock-out is made in a software routine that allows blocking the access to change data in its entirety or in groups of parameters with specific functions.

- ❑ The instrument is shipped from the factory with all program parameters enabled to user modifications.
- ❑ The lock-out routine is entered after writing a security code that is set at the factory to '0000'.

¡Attention! Write down and keep safe your security code. If you lost it, you can restore it to 0000 as explained in page 42.

2.2. Power Supply. Connectors

To access hardware configuration, remove the meter from the case as shown in figure 11.1.



115/ 230 V AC: The instruments with 115/230 V AC power are shipped from the factory for 230V AC (USA market 115V AC), see figure 11.2. To change supply voltage to 115V AC, set jumpers as indicated in table 11.1. The wiring label should be modified to match new setups.

24/ 48 V AC: The instruments with 24/48V AC power supply are shipped from the factory for 24V AC, see figure 11.2. To change supply voltage to 48V AC, set jumpers as indicated in table 11.1. The wiring label should be modified to match new setups.

Table 11.1: Jumper Settings.

Pin	1	2	3	4	5
230V AC	-	▬		▬	
115V AC	▬		▬		-
48V AC	-	▬		▬	
24V AC	▬		▬		-

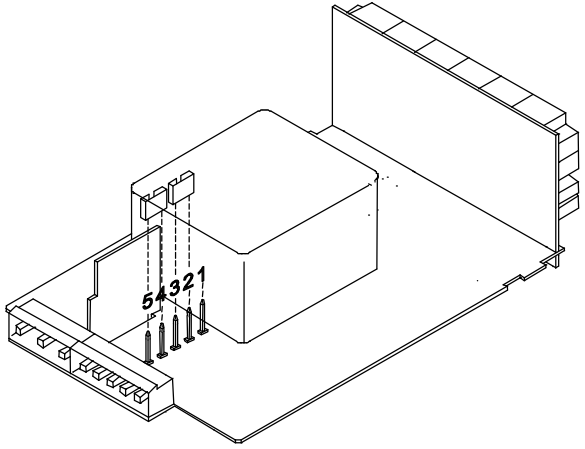
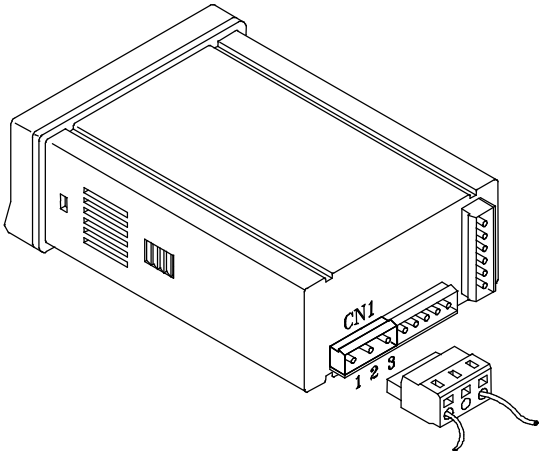


fig. 11.2 : Jumper Location

POWER SUPPLY CONNECTION



AC VERSIONS
PIN 1 - PHASE AC
PIN 2 - GND (GROUND)
PIN 3 - NEUTRAL AC

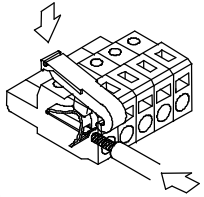
DC VERSIONS
PIN 1 - POSITIVE DC
PIN 2 - Not connected
PIN 3 - NEGATIVE DC

INSTALLATION
To meet the requirements of the directive EN61010-1, where the unit is permanently connected to the mains supply it is obligatory to install a circuit breaking device easy reachable to the operator and clearly marked as the disconnecting device.
WARNING
In order to guarantee electromagnetic compatibility, the following guidelines for cable wiring must be followed:

- Power supply wires must be routed separated from signal wires. Never run power and signal wires in the same conduit.
- Use shielded cable for signal wiring and connect the shield to ground of the indicator (pin2 CN1).
- The cable section must be ≥0.25 mm^2

If not installed and used according to these instructions, protection against hazards may be impaired.

CONNECTORS



To perform wiring connections, remove the terminal block from the meter's connector, strip the wire leaving from 7 to 10 mm exposed and insert it into the proper terminal while pushing the fingertip down to open the clip inside the connector as indicated in the figure.
Proceed in the same manner with all pins and plug the terminal block into the corresponding meter's connector.
Each terminal accept cables of section between 0.08 mm^2 and 2.5 mm^2 (AWG 26 ÷ 14).
The terminal blocks are supplied with removable funnels into each terminal to allow proper fastening for cable sections of <0.5 mm

2.3. Input Configuration. Connections

Set up the switches to configure the input before connecting any sensor to the instrument.
The 5-position DIP switches on the solder side of the input card are to conform the characteristics of the sensor being used. SW1 if for input A and SW2 for input B. The upper position is "ON".
The main sensor must be connected to input A.

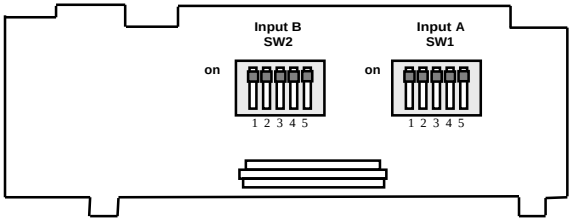
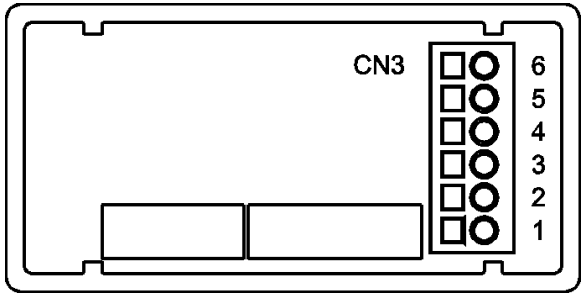


fig.13.1 : input card external side

Table 13.1. switch1 and switch2 positions

Sensor type	sw.1	sw.2	sw.3	sw.4	sw.5
Magnetic pickup	-	-	-	-	ON
NAMUR	-	ON	-	ON	ON
TTL/24V (encoder)	-	ON	ON	-	-
NPN type	ON	ON	-	-	-
PNP type	-	ON	-	ON	-
Contact closure	ON	ON	ON	-	ON
10-600V AC	-	-	-	-	-

CN3 CONNECTOR

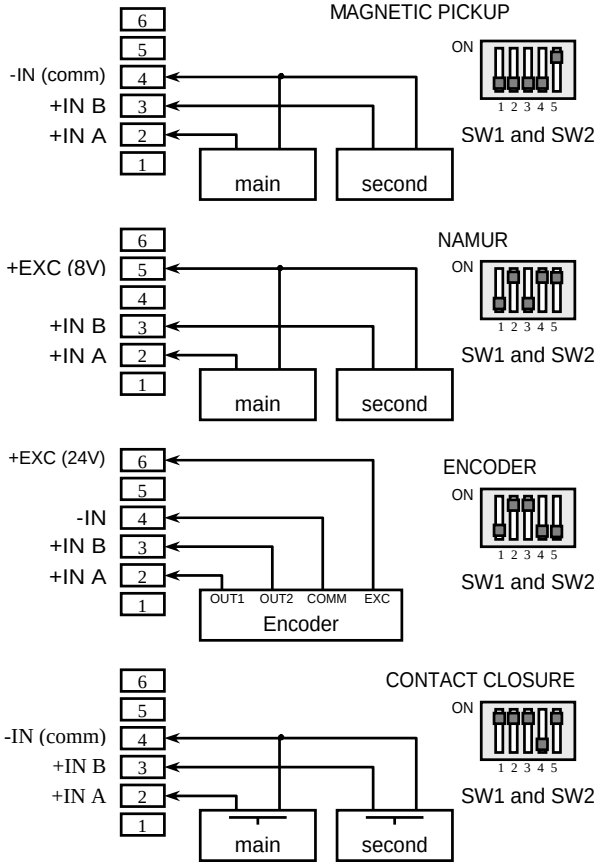


PIN 6 **+ EXC. 24V** (excitation supply)
PIN 5 **+EXC. 8V** (excitation supply)
PIN 4 **-IN** (common inputs A, B and HI)
PIN 3 **+IN B** (positive input B)
PIN 2 **+IN A** (positive input A)
PIN 1 **IN HI** (10-600V AC)

When using two sensors, connect the main sensor to the A input and the second sensor (which determines the count direction) to the B input.

When only one input is used, the sensor must be connected to input A. The input B should be connected to the common pin (PIN 4 of CN3).
(see examples of wiring connections on page 14)

EXAMPLES OF WIRING CONNECTIONS



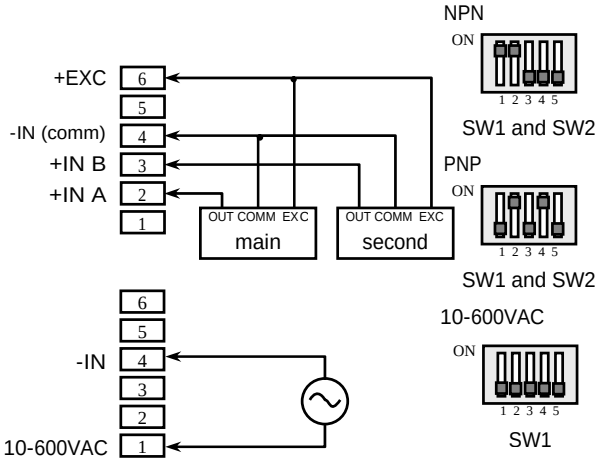


Fig.14.1 : Counting edge depending of input

Type of signal input	In A	In B logic level	up counter	do counter
TTL, PNP, NAMUR	↑	= 0 =open	n=n+1	n=n-1
		=1	inhibit	inhibit
NPN, Contact closure	↓	=0	n=n+1	n=n-1
		=1 =open	inhibit	inhibit

Note: If the A input is set up for contact closure and the B input is not to be used, **the B input must be configured for TTL (ENCODER).**

2.4. The Program Routines

Access to the programming mode

When power is applied to the instrument, the display briefly illuminates all segments and LED's then shows the software version before entering in the normal mode. Press ENTER to enter in the programming mode. The display shows the indication "-Pro-" (fig. 15.1).

Exit from the programming mode without saving data

From any program step press ESC. In a few moments the meter will exit from the programming mode, restore the previous configuration and return to the normal operation. Any parameter change made before exiting in this mode is discarded.

Save changes in the programming data

To exit from the program mode and save the changes in the memory, you should reach the last phase of a module. From the last step of the routine, a push of ENTER illuminates the LED STORE while the new configuration is saved in the memory. After, the instrument returns to the run mode.

Guidelines on programming instructions

The programming software is divided into 6 modules. Each module is organized in several independently accessible menus and each menu contains a list of parameters necessary to configure a specific function of the meter.

From the -Pro- stage, press repeatedly ▶ to cycle around the available modules. Modules 3, 4 and 5 appear only when corresponding output options are installed. Press ENTER to access selected module.

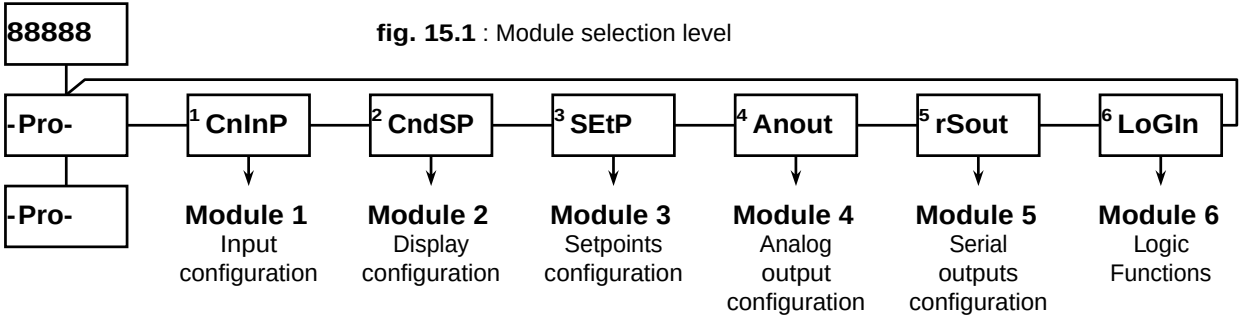


fig. 15.1 : Module selection level

Access to the program parameters

All parameters concerning a particular feature of the meter are grouped into separate modules and menu lists to provide easy access to modify specific parameters without need to pass through all the program routines.

Navigate through the program routines

The progress through the programming routines is mainly achieved by use of the ENTER key.
In general, the operations to be made at each step are to press ▶ a number of times to scroll among available options and press ENTER to validate the choice and advance to the next program phase.
At any program step, a press of ESC returns the meter to the run mode without saving data.

Indications

The configuration of the instrument is made up of numerical values and selectable options. Selectable options are arranged in choice lists menus.
Available options menus are in English style notation describing the function they are used for.
In some cases, especially when programming a sequence of numerical entries, it will be necessary to look at the diagrams contained in this manual to guide through the different menus.
If you are lost at any program step, press ESC and start over.

Numerical values

When a parameter consists of a numerical entry, the display shows the value with the most significant digit in flash.
To program a new value:
Change the flashing digit value by repeatedly pressing the ▲ key to scroll around 0 to 9 until it takes desired value.
Move to the next digit to the right by pressing ▶. The active digit goes in flash.
Repeat these operations until the desired value is registered on the display and press ENTER.

Some parameters support negative numbers. In such cases the negative sign is programmed according to configuration.

- Five-digit variables have the minus sign in the auxiliary digit (green), that can be '0' or '-'.
- Eight-digit variables have the minus sign in the most significant digit of the high order part of the number and is set by incrementing it from 9 to 0.
- In frequency/tachometer mode, the "sign" that represents direction of rotation is programmed in the two LED's on the upper, left side of the display; LED A for positive and LED B for negative.

Choice lists

When the parameter belongs to a choice list, use the ▶ key to edit available options until desired one appears on the display, then press ENTER

3. COUNTER CONFIGURATION

INPUTS

The counter has two inputs, the A input receives the pulses to count, and the B input serves to inhibit the count or to change the count direction, except in case of bidirectional counter **IndEP** where the second input is also used to count pulses.

PULSE MEASUREMENT

The pulses applied to the input are detected in the rising edge and immediately update the value of the counter and the setpoints status if the card is installed. The display updates every 10ms. In a power failure or disconnection from the supply source, the instrument keeps the count values.

VARIABLES

The main variable of the counter is the PROCESS variable, that is the number of pulses registered from the last reset operation.

If the batch function and/or the totalizer option are enabled, the counter reads two more variables; BATCH and TOTAL.

The BATCH variable registers the number of times that the variable PROCESS is reset.

The TOTAL variable counts the total number of pulses received, independently of the reset operations that may take place in the process display.

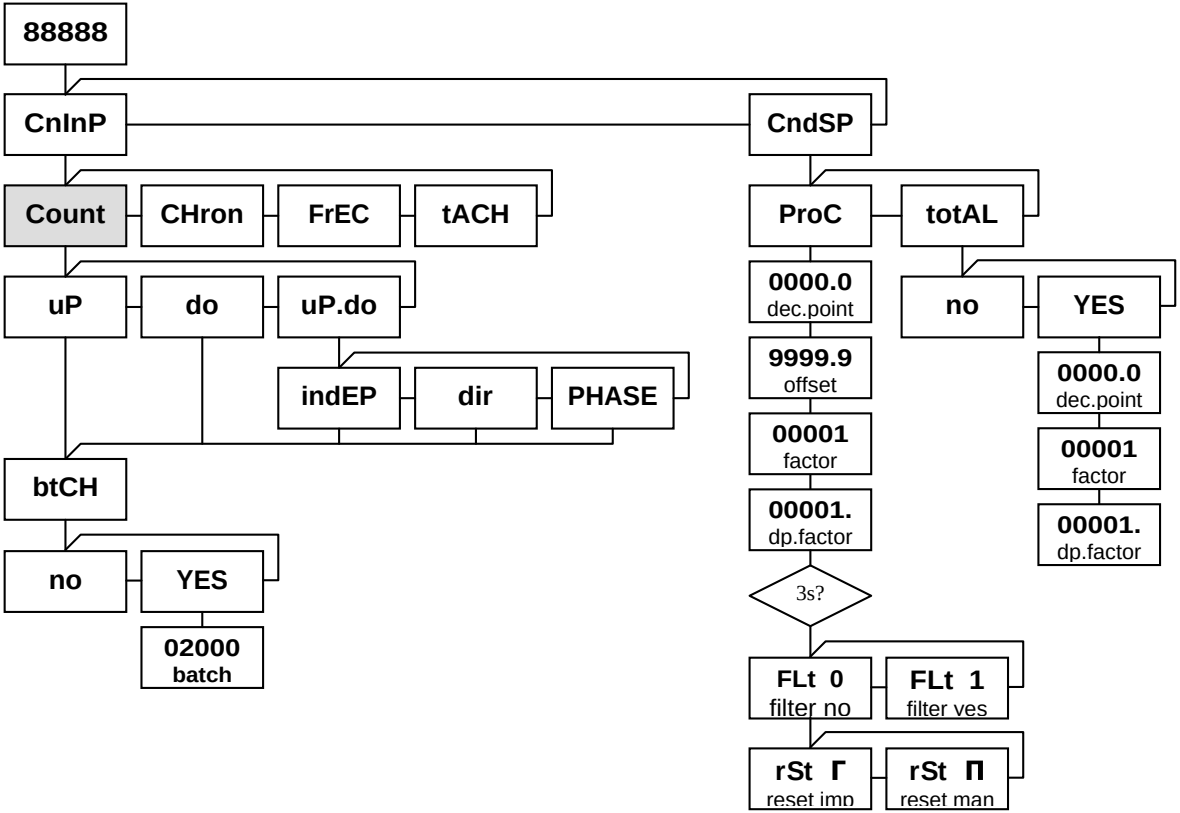
DISPLAY

Process: The limits of the display are 99999 and -99999. When the instrument exceeds 99999, it shows OVER, and when it falls below -99999, it shows UNDER.
The negative sign is indicated in the green auxiliary digit.
The decimal point can be located in anyone of the digits of the display, and it has not value, that is, the display always shows the whole part of the measurement.

Batch: The range of the display is from 0 to 99999, one count above the maximum makes the display show OVER. The variable BATCH has no decimal point nor sign indications.

Total: The limits of the display are 99999999 and -9999999. When the instrument exceeds these limits the display shows the indications OVER or UNDER.
The negative sign, when the value has less than five digits, appears in the most significant digit of the display.
When the total value has more than five digits, the display alternates the 3 digits high order part and the 5 digits low order part (the letters 'H' and 'L' in the auxiliary digit indicate which part is on display). The negative sign appears in the first of the 3 digits of the high part. The decimal point can be located in anyone of the digits of the low part, and it does not have value, the display shows the whole part of the measurement.

Programming Diagram for COUNTER configuration



3.1. Input Setup

The input setup is available on the 'CnInp' module which allows configuration of the count mode and batch operation.

3.1.1. Count Modes

The software provides setup for five different count modes:

uP

Pulses applied at the A input increment the count display. A high level at the B input inhibits count operation.

do

Pulses applied at the A input decrement the count display. A high level at the B input inhibits count operation.

uP-do IndEP

Pulses applied at the A input are added to the count display while pulses at the B input are substracted.

uP-do dIrEC

When B input is at low level, the pulses applied at the A input increment the count. When B input is at high level, the pulses at the A input decrement the count.

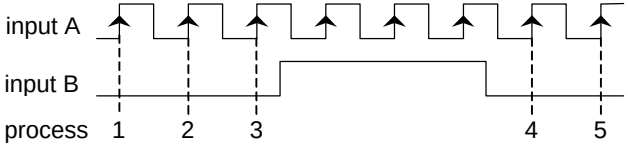
uP-do PHASE

The rising edges at the A input increment the count if the B iinput is at low level. The falling edges at the A input decrement the count if the B input is at low level.

Uni-directionnal counters:

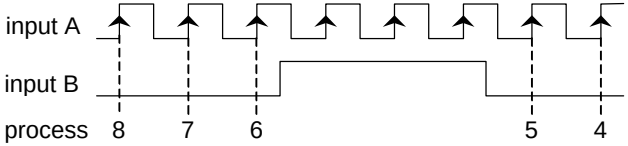
MODE uP

A counts up if B is '0'. B inhibits count.



MODE do

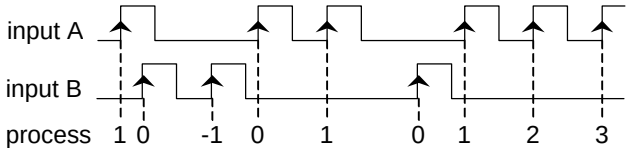
A counts down if B is '0'. B inhibits count.



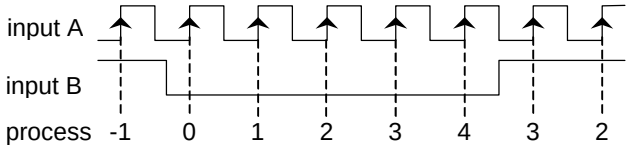
For uni-directional modes, when the input B is not used, it should be connected to the common negative, (CN3 PIN 4), to prevent the effects of noise or signal counts induced from channel A.

Bi-directionnal counters:

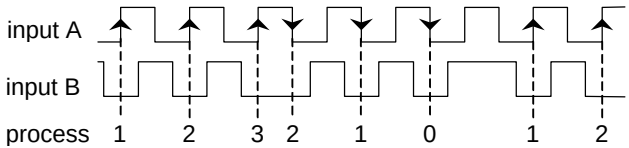
MODE UP-DO INDEP
A counts up. B counts down.



MODE UP-DO DIREC
A counts up if B is '0' and counts down if B is '1'



MODE UP-DO PHASE
Rising edge of A counts up if B is '0'. Falling edge of A counts down if B is '0'.



3.1.2. Batch Counter Option

The BATCH counter records the number of times that the process counter reaches a programmed level, the BATCH LEVEL. The batch function supports any available count mode.
Typical applications are those that require counting packets of a fixed process quantity, for example, boxes of twelve bottles. The process counter monitors the number of bottles within the current batch. The batch counter monitors the number of filled boxes. Optionally, the totalizer can be used to keep count of the total bottles per cycle, or day.

The batch level is programmable from 1 to 99999.
When the process counter reaches this level, the meter automatically resets the process and increments the batch counter in one unit.

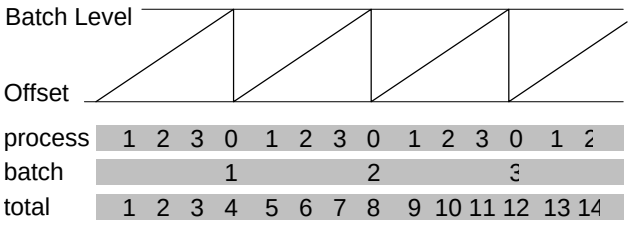
The batch variable is integer and positive, although it can be associated to a negative or down counter. It has no decimal point nor scaling possibility.

Setpoints are referred to the batch counter in two ways:
1. The control output activates when the batch display reaches the setpoint value, or
2. The control output activates each time the batch is incremented in one unit.
Selection is available from the setpoint configuration module (digit 4 of the menu 3B ModE, see page 61).

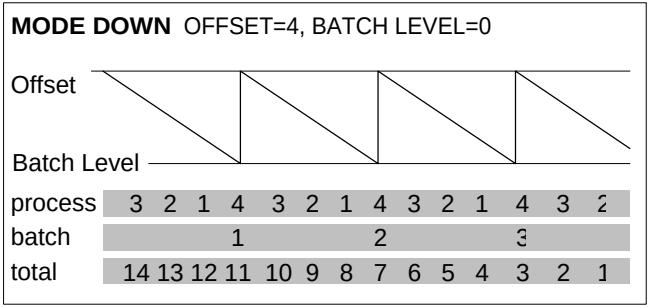
BATCH OPERATING MODE

When the process count reaches the batch level, the process value is automatically set to offset and the batch value is incremented in one unit.
For a proper operation, the batch level should be higher than the offset in UP mode, and lower than the offset in DOWN mode.

MODE UP OFFSET=0, BATCH LEVEL=4

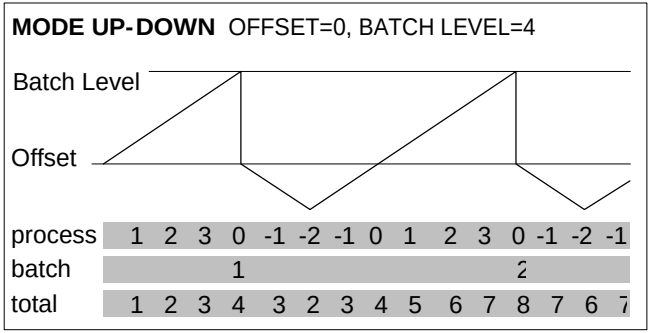


MODE DOWN OFFSET=4, BATCH LEVEL=0

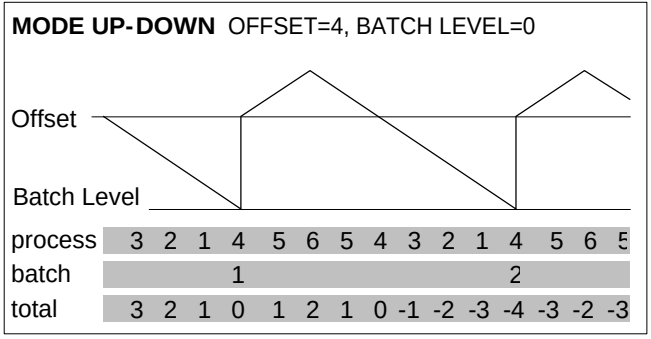


For UP/DOWN modes, if the bath level is over the offset, the batch operation takes place when the process count rises above this level in the up direction. Otherwise, if the batch level is below the offset, the batch operation is performed when the process count falls below this level in the down direction.

MODE UP-DOWN OFFSET=0, BATCH LEVEL=4



MODE UP-DOWN OFFSET=4, BATCH LEVEL=0



3.2. Scaling Setup

3.2.1. Options of the Process Variable

In the menu **ProC** of the **CndSP** module are encountered the parameters relating the PROCESS variable measurement, -Decimal Point, Offset, Multiplier Factor-, and selection of Input Filter and Reset Key Operation.

DECIMAL POINT
The decimal point indication helps to read the display in the desired engineering units.
The decimal point has not real value, that is the digits to the right of the decimal point are not actually decimals. To read values with resolution to the desired decimal places is achieved by a combination of decimal point and scaling factor.
For example, suppose a system that provides 100 pulses per 2 meters length of a material. To display legth in meters and centimeters, you should program a factor of 2 (1 pulse = 2 cms) and place the decimal point to the third digit.

OFFSET
OFFSET is the value that takes the counter in a reset event.
By default it is zero in UP and UP/DOWN configurations, and 99999 in DOWN mode.

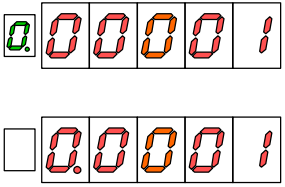
There are two modes to enter the OFFSET value: To program it in the ProC menu, or to take it directly from the display by means of the OFFSET key or the corresponding logical function at the rear connector (see page 41).

The OFFSET is applied to the variable PROCESS exclusively. To take the OFFSET from the display value, this must be set to read the process variable. Accordingly, to reset the OFFSET from the front panel keys, the process variable must be present on the display.

When the OFFSET is different from the default value, the LED TARE is active while in the run mode.

SCALE FACTOR

The scale factor is programmable from 0.00001 to 99999.
Individual decimal point location makes possible to program any value within this range independently from the main decimal point of the display.
Any number below 1 acts like a divisor while a number above 1 acts like a multiplier. (It is not possible to program a factor=0).
To program a scale factor with 5 decimal places, the decimal point must be located in the auxiliary digit as shown in the figure:



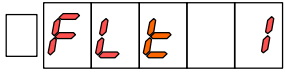
While viewing/programming the scale factor, the number '0' appears in the auxiliary digit when the decimal point is set to this position, in any other case the digit is blanked.

3.2.2. Input Filter and Reset Key Mode

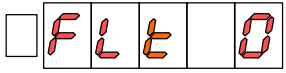
The access to configure these options is achieved by holding the ENTER key for 3s after programming the decimal point of the display (see diagram page 18).

DEBOUNCE FILTER

The meter provides a software selectable low frequency filter which is applied to the counter inputs A and B and limits the input frequency to 20Hz.
This option is useful to reduce the effects of signal noise or contact debounce when the input to the meter is applied by means of switching contacts or mechanical systems.



To enable the filter, select the option **FLt 1** (the frequency will be limited to 20Hz).



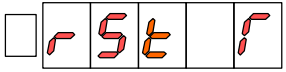
To disable this option select **FLt 0**.

RESET KEY MODES

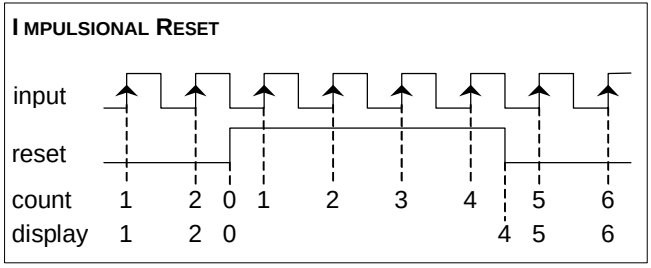
The RESET key resets to zero (or to the offset value) the variable being displayed.

The meter allows selection between two reset modes:

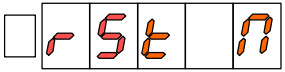
IMPULSIONAL Reset:



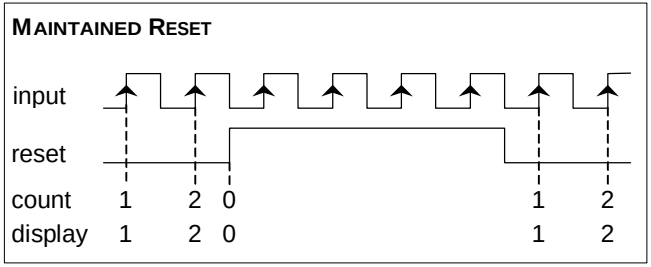
The reset operation occurs when the RESET key is depressed, but the counter internal operation does not stop. When the key is released, the display shows the count value reached internally.



MAINTAINED Reset



The reset operation takes place at the moment the RESET key is depressed, and the internal count and outputs operation are held to the reset value until the key is released.



The RESET key operation can be disabled by software independently for the various count displays in the program lock-out routines (see pages 47 and 48).

3.2.3. Totalizer Option

The totalizer facility can be enabled and disabled by software.
The totalizer counter shares the same input setup, count mode and count direction as the process counter but provides separate decimal point and scaling factor.
Each pulse received at the input increment or decrement the process and total counters exactly, although the display value may vary from one to another according to individual scaling factor and reset operations.

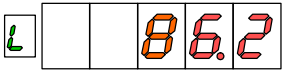
The limits of the display are -9999999 and 99999999 (7 digits with minus sign or 8 digits).

The decimal point can be set to five decimal places.
The scaling factor is programmable between 0.00001 and 99999 as for the process counter.
The totalizer has no possibility to load a user selected display value in a reset event.

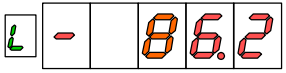
DISPLAY FORMAT

When the total value is between -9999 and 99999, it is shown on the display with the letter 'L' in the auxiliary digit. The negative sign appears in the most significan digit.

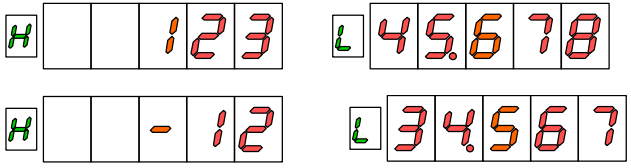
(positive)



(negative)



when the accumulated value exceeds from five digits (or four digits plus negative sign), the display alternates a 3 digit high order part (with the letter 'H' in the auxiliary digit) and a 5 digit low order part (indicated by the letter 'L' in the auxiliary digit). For negative values the sign appears in the most significant digit of the high order part.

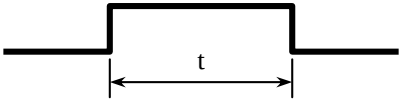


(the switching between high and low order parts takes place at a rate of approximately 2s each part).

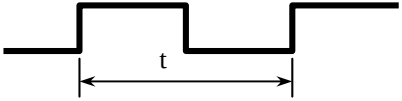
4. CHRONOMETER CONFIGURATION

INPUTS
The meter has two inputs for the START and STOP signals that provide different types of time measurement according to input setup (see page 28 "Start and Stop Modes").
There are three selectable operating modes:

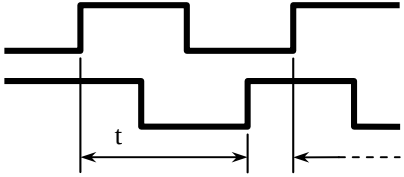
mode In-A, that allows to measure the width of a pulse,



mode In-AA, to measure the period of a signal,



and **mode In-AB**, that is used to measure the difference between two signals



MEASURE
Time measurement is initiated on a rising edge of the START input. This starts up an internal counter which is controlled by a high precision crystal quarz clock.

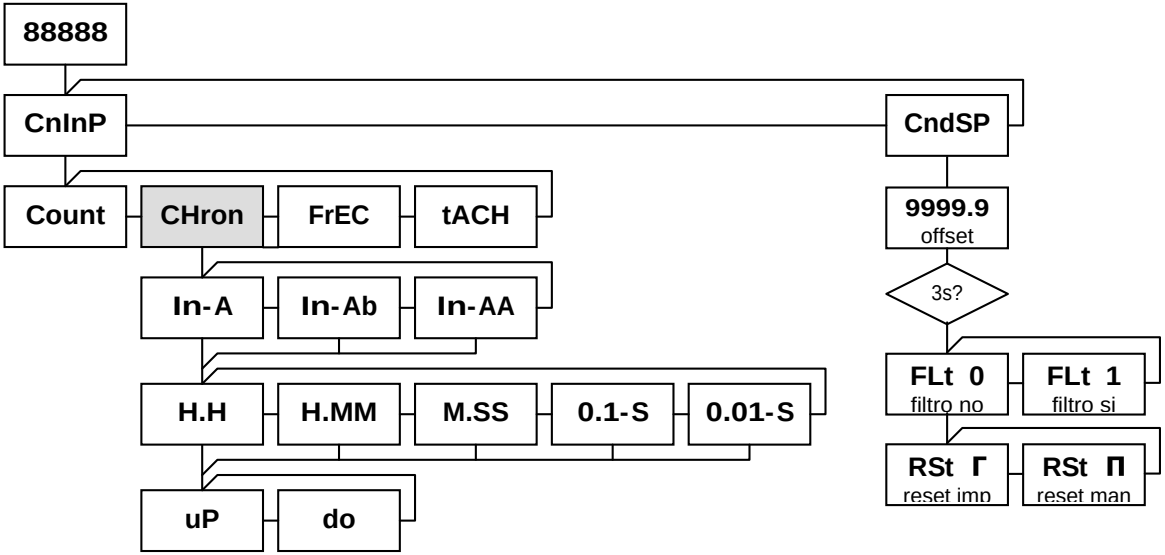
The STOP signal suspends the internal count keeping the value of the counter to the START of following time measurement cycle.
The counter is missed to zero in a RESET operation.

In a disconnection from the power source, the instrument saves the count value reached internally.

DISPLAY
The display can not be scaled, it only reads time in the units selected according to the programmed time range.
The decimal point appears at a fixed position according to time range.

The process variable and the outputs are updated at each increment of the minimum readable unit.
The display updates each 10ms.

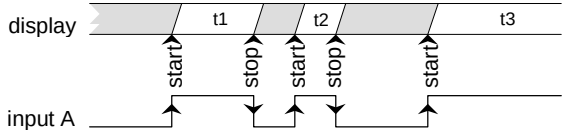
Programming Diagram for CHRONOMETER Mode



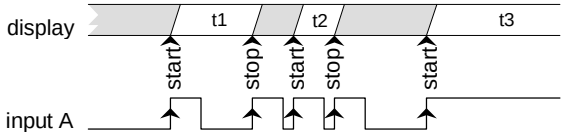
4.1. Input Setup

START AND STOP MODES

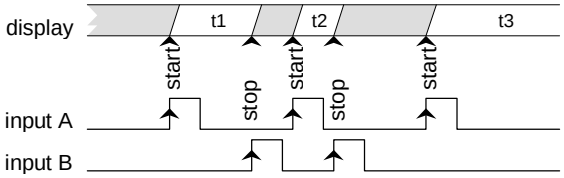
MODE In-A START on rising edge of input A.
STOP on falling edge of input A.



MODE In-AA START on rising edge of input A.
STOP on next rising edge if input A.



MODE In-AB START on rising edge if input A.
STOP on rising edge of input B.



UP or DOWN DIRECTION

uP : The meter acts as a stopwatch. It counts up the time elapsed between the START and STOP signals.
When accumulated value exceeds from 99999, the display reads OVER.

do : The meter acts as a timer. It counts down from a user programmed offset to zero (a setpoint may be used to perform any function at this point).
A reset operation sets the timer to the offset value, the START signal initiates the timing count. When accumulated value reaches 0, the next decrement makes the display read UNDER.

TIME RANGE

There are five selectable time ranges:

H.H	9999.9 h (resolution 0.1 hours)
H.MM	999 h 59 m (resolution 1 minute)
M.SS	999 m 59 s (resolution 1 second)
0.1-S	9999.9 s (resolution 0.1 second)
0.01-S	999.99 s (resolution 0.01 second)

The decimal point appears in the position according to the programmed time range.
(In a power failure, the meter saves the time value and the internal count value).

4.2. Display Setup

4.2.1. Options of the Process Variable

OFFSET
OFFSET is the value that takes the display in a reset event.
By default it is zero in UP mode, and 9999.9 or 999.59 in DOWN mode.
Programming a defined OFFSET is essential to use the chronometer in timer mode (down direction). The OFFSET is the preset time value from where the instrument counts down to zero.

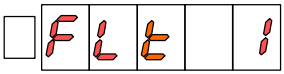
There are two modes to enter the OFFSET value: To program it in the ProC menu, or to take it directly from the display by means of the OFFSET key or the corresponding logical function at the rear connector (see page 41).

When the OFFSET is different from the default value, the LED TARE is active while is in the run mode.

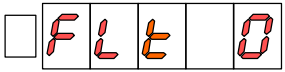
4.2.2. Input Filter and Reset Key Mode Options

The access to configure these options is achieved by holding the ENTER key for 3s after programming the offset value (see diagram page 27).

DEBOUNCE FILTER
The meter provides a software selectable low frequency filter which is applied to the chronometer inputs A and B and limits the input frequency to 20Hz.
This option is useful to reduce the effects of signal noise or contact debounce when the input to the meter is applied by means of switching contacts or mechanical systems.



To enable the filter, select the option **FLt 1** (the frequency will be limited to 20Hz).

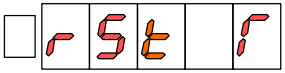


To disable this option select **FLt 0**.

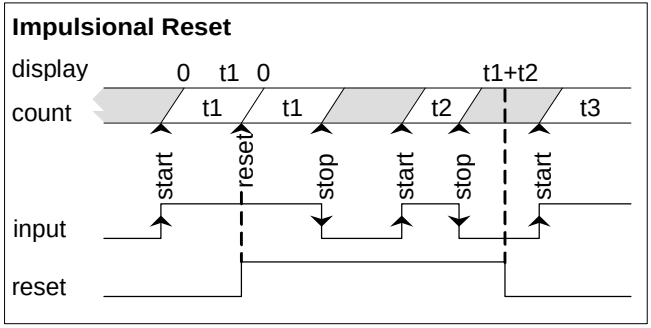
RESET KEY

The RESET key sets the chronometer display to zero (or to the offset value).

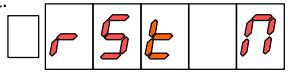
The meter allows selection between two reset modes
IMPULSIONAL Reset:



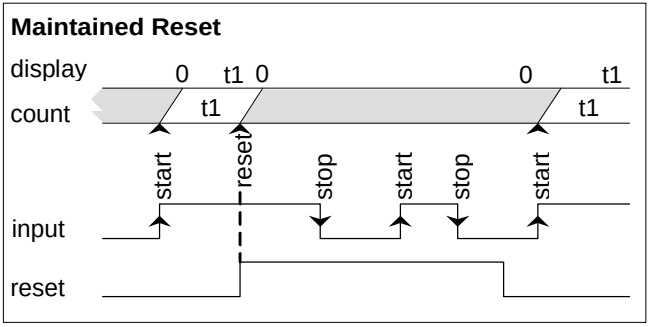
The reset operation occurs when the RESET key is depressed, but the meter's internal operation does not stop. When the key is released, the display shows the time value reached internally.



MAINTAINED Reset:



The reset operation takes place at the moment the RESET key is depressed, and the internal time value and outputs operation are held to the reset value until the key is released.



The RESET key operation can be inhibit by software in the program lock-out routines (see pages 47 and 48).

5. FREQUENCY METER / TACHOMETER CONFIGURATION

INPUTS
In frequency/tachometer mode both inputs of the meter are used. The signal providing frequency/rate and count information must be issued to the A input. A second signal may be applied to the B input to control direction of rotation or polarity of the signal.

MEASURE
The method of calculating rate is based in measuring the period of the signal, that is, the time elapsed between two consecutive rising edges. The period is converted into a high precision frequency value and scaled to read desired units.

DISPLAY
The meter allows the user to change some parameters to fit the particular application needs, such as to reduce or extend the number of signal cycles of each reading, the time limit, the display rate and averaging (see "Options of the Process Variable" in pages 36 and 37).

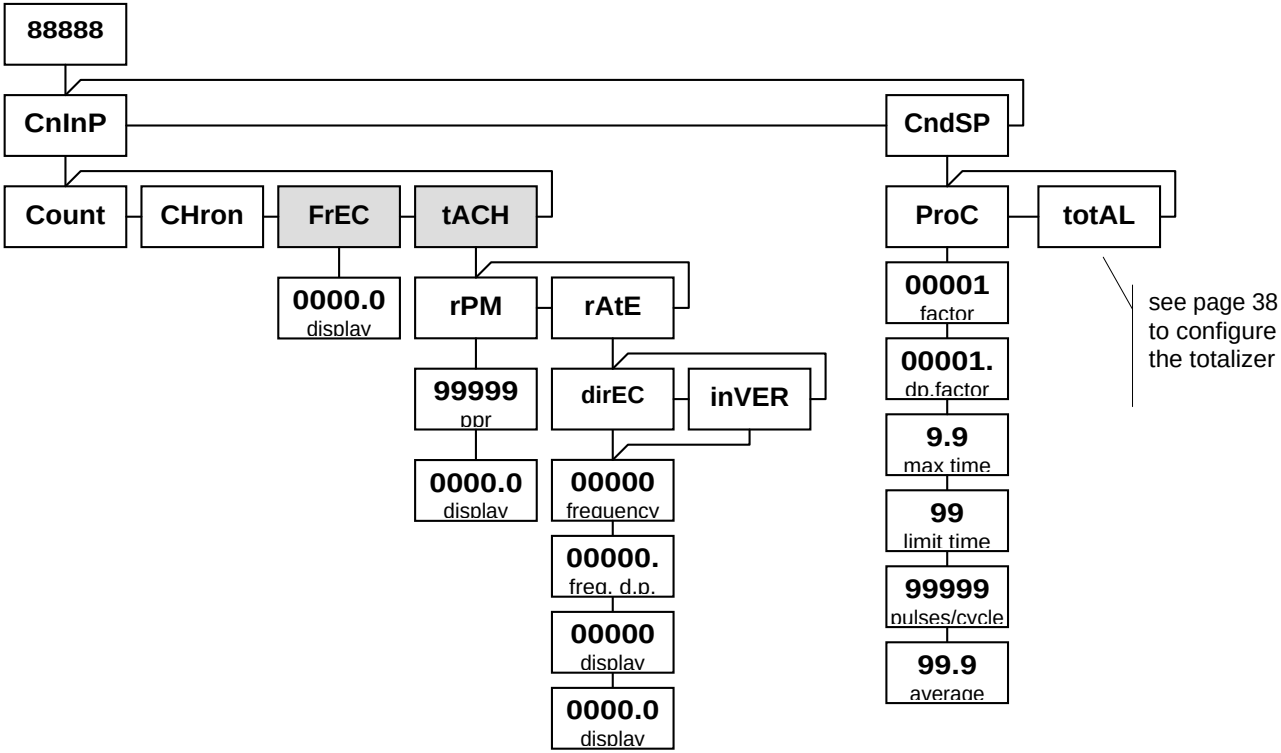
TOTALIZER
If enabled, the totalizer accumulates the number of pulses received at the input providing two simultaneous informations for example flow rate and product quantity for a given process.

DIRECTION OF ROTATION INDICATION
Direction sensing indication is a matter of simply setting the totalizer to read UP/DOWN direction (modes PHASE and dIrEC).

The direction of rotation is denoted by the LED's A and B on the left of the display. LED A illuminates when the totalizer counts in the up direction, so it can be associated to a "positive" rate.
LED B illuminates when the totalizer counts down, which may be associated to a "negative" rate.

A change in the polarity of rate is recognized when the meter receives at least two consecutive pulses in the opposite direction of the one of the previous pulses.

Programming routines for TACHOMETER



5.1. Input Setup

CONFIGURATIONS
The different configurations allow measurement of almost any process quantity based in frequency calculation.

5.1.1. Frequency meter
Para utilizar como indicador de frecuencia, la forma directa es seleccionar la entrada frecuencímetro.

This configuration is to use the indicator for frequency measurement.

DECIMAL POINT
In this configuration the only parameter to program is the decimal point position, that can be 0, 1 or 2.
The decimal point position limits the maximum and minimum readable frequencies; With 2 decimal places, the max frequency will be 999.99Hz and the min 0.01Hz. With 1 decimal place, the frequency limits are 9999.9Hz and 0.1Hz. With no decimal places, the max frequency is limited according to the configuration (see technical specifications in page 51) and the minimum is 1Hz.

5.1.2. Tachometer for RPM
In this configuration the meter reads rotational rate in revolutions per minute (RPM).
The tachometer is configured by entering the number of pulses per revolution and the decimal point location.

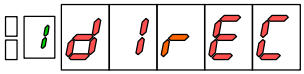
PPR (PULSES PER REVOLUTION)
The PPR parameter is the actual number of pulses that a sensor connected to a wheel gives to the input of the meter in a rotation of the wheel.
The method of measurement is based in calculating the time necessary for the system to produce a complete rotation of the wheel, therefore, by default each reading extends over the programmed number of pulses.

DECIMAL POINT
The decimal point location, in combination with a suitable scale factor allows the display reading be expressed into other units different from RPM if desired.

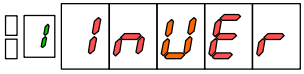
5.1.3. Tachometer Rate

In this configuration the meter can be easily scaled to read direction, speed, flow or time directly in the desired units by entering only two parameters: Input Frequency and Desired Display.

DIRECT OR REVERSED SCALING



Direct scaling. The relationship between frequency and display is directly proportional, that is, the higher the frequency, the greater the display. This will be the mode to chose in most applications.



Reversed scaling. The relationship between frequency and display is reversed, that is, the higher the frequency, the lower the display. A typical application of this mode is explained in the example of page 35.

The scaling procedure consists of entering a display value corresponding to an input value. A straigth line plotted from this point to zero (input=0, display=0) establishes a linear relationship between fequency and display.

INPUT FREQUENCY

For scaling purposes, the input frequency value can be programmed within all range of the display (the frequency limits are given in page 51 of the present manual).

The input frequency can be programmed with 0, 1 or 2 decimal places. The decimal point position has value, for example, a frequency value of 200Hz can be programmed as 200, 200.0 or 200.00

DESIRED DISPLAY

In this phase it is programmed the display value corresponding to the programmed input frequency.

The decimal point can be located in any of the digits of the display to help reading the display in the desired units.

EXAMPLE OF SCALING IN RATE MODE

Loaves of bread are transported in a conveyor belt and introduced in a continuous baking oven. The belt is attached to a turning shaft of 20cms that gives 6 pulses per revolution. The average time necessary for a loaf to be baked is 15min and 30s and it has been determined that, to achieve this time, the rate of the turning shaft must be kept to 300rpm.
This example allows exposing some capabilities of the rate meter configuration.

The rate of the turning shaft is 300 revolutions per minute, which is equal to 5 revolutions per second.
If the turning shaft makes 5 complete revolutions in one second and each revolution drives out 6 pulses, the total number of pulses per second is 30. The input frequency is then 30Hz.

Rate of the conveyor belt (m/s)

The rate of the conveyor belt at the specified frequency is:
rpm * π * diameter = 300 * π * 20 = 18849.6 cm/min which is in m/s, 3.142m/s.
PARAMETERS TO PROGRAM :

RATE MODE:	**DIRECT**
INPUT FREQUENCY:	**30**
DESIRED DISPLAY:	**03142**
DECIMAL POINT:	**03.142** (m/s)

Baking Time (min)

It is required to monitor the baking time knowing that, at the specified frequency of 30Hz, the time taken for each loaf to be baked is 15min 30s.
When rate (and frequency) grows, the baking time is reduced proportionally. The rate meter must then be programmed for reverse mode
PARAMETERS TO PROGRAM :

RATE MODE:	**INVERSE**
INPUT FREQUENCY:	**30**
DESIRED DISPLAY:	**00155**
DECIMAL POINT:	**0015.5** (min)

The time values must be programmed in decimal notation.
In the preceding example, a baking time of 15min 30s has been introduced as a display value of 15.5 (15 minutes and a half).

Daily Production (loaves/day)

It has been determined that, in the specified conditions, the bread loaves are baked at an average of 10 loaves per minute. The baking oven works 12 hour per day and it is required to monitor the production of loaves per day.
Ten loaves per minute is equivalent to 10x60=600 loaves per hour.
At a frequency of 30Hz, tha daily production is 600x24=14400 loaves/day.
PARAMETERS TO PROGRAM :

RATE MODE:	**DIRECT**
INPUT FREQUENCY:	**30**
DESIRED DISPLAY:	**14400**
DECIMAL POINT:	**NO**

5.2. Display Setup

5.2.1. Options of the Process Variable

The menu **ProC** in the module **CndSP** contains various parameters for scaling and filtering the display -Scale Factor, Max and Min Times, Averaging..-.

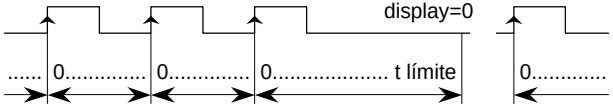
SCALE FACTOR
The scale factor is programmable between 0.0001 and 9999.

UPDATE TIME
The update time, programmable from 0.1s to 9.9s, is the time interval at which the display is updated.
The programed value does not affect the internal measurement speed, -which depends on signal frequency-, nor the outputs update rate.

A reduction of the update time allows the display respond more quickly to the input variations. An increase of the update time can help to get more stable readings.

TIME LIMIT
The time limit, programmable from 1 to 99 seconds, is the amount of time that the meter waits for at least one pulse is produced at the input before it is considered to be zero.

The time limit is initialized at the reception of each input pulse. If no more pulses are detected before the time limit runs out, the display is forced to zero.

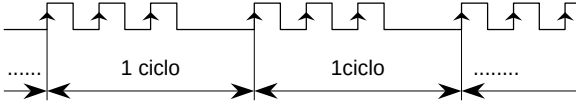


Decreasing the limit time makes the instrument respond more quickly to the zero condition when the system stops.
Nevertheless, this reduction also will cut the lowest frequencies (for example: with a time limit of 10s, it would be impossible to see frequencies under 0.1Hz and with a time of 1s, frequencies under 1Hz).

PULSES PER CYCLE (PPC)
The frequency measurement method is based in calculating the period of the signal.

For **rate** measurement, period is taken between two consecutive rising edges, which corresponds to a programming of PPC=00001.

If pulses supplied by the sensor are not at regular intervals (see figure), the reading may be different depending on the period being measured, thus resulting in a fluttering display. To solve this situation, the PULSES/CYCLE parameter should be programmed to 3. This extends each reading over 3 input periods.



For **RPM** measurement, period is calculated on a complete revolution according to the programmed number of pulses per revolution (PPR).
If the number of pulses is high, the time taken by the meter to calculate one reading may be excessive for some applications. In this case, if pulses are supplied at regular intervals, this time can be shortened by setting the PPC parameter to a lower number.

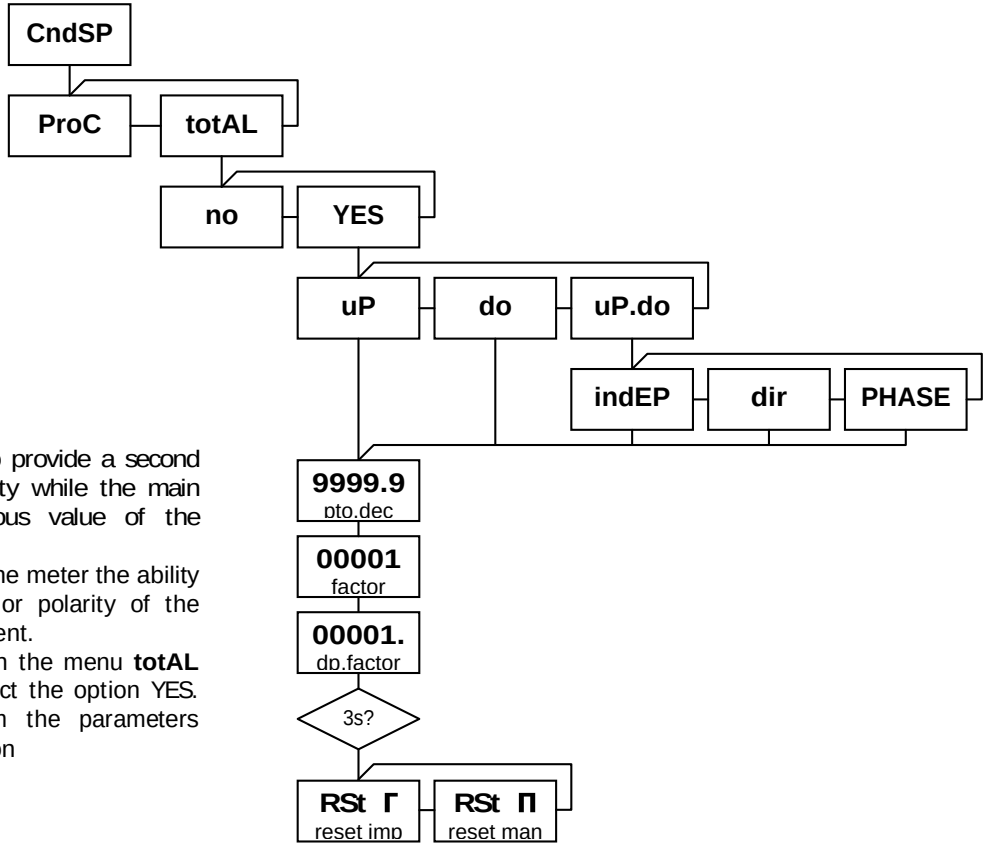
AVERAGE TIME
The average time is a time interval in seconds during which all readings calculated from the input are averaged.

The average time is programmable from 0 a 99.9 seconds.
To disable this feature program 0.

When the display presents unwanted variations, due to that the input signal is not regular, the programming of the average time for a larger value may help stabilize the display.

The average time can be calculated for a desired number of readings knowing the signal frequency.
Example : With a setup of 0.1s, if the input signal frequency is of approx. 10Hz or less, the meter will only take one reading per each 0.1s making no average. With an input signal of approx. 100Hz, the meter will be able to collect and average about 10 readings in 0.1s. If the input signal is of approx. 1000Hz, the display will readout the average of about 100 readings.

5.2.2. Totalizer Option in Tachometer Mode



The totalizer's main utility is to provide a second display to read product quantity while the main display reads the instantaneous value of the variable being measured.
Furthermore, this option gives the meter the ability to sense direction of rotation or polarity of the signal in rate or flow measurement.
To enable the totalizer, enter in the menu **totAL** of the module **CndSP** and select the option YES. This gives access to program the parameters relating the totalizer configuration

COUNT MODES

The totalizer has five counting modes:

uP Up counter: Pulses applied at the A input increment the count display. A high level at the B input inhibits count operation.

do Down counter: Pulses applied at the A input decrement the count display. A high level at the B input inhibits count operation.

For uni-directional modes, when the input B is not used, it should be connected to the common negative, (CN3 PIN 4), to prevent from variations due to signal noise.

uP-do IndEP Bidirectionnal counter. Pulses applied at the A input are added to the count display while pulses at the B input are substracted.

uP-do dIrEC Bidirectionnal counter. When B input is at low level, the pulses applied at the A input increment the count. When B input is at high level, the pulses at the A input decrement the count.

uP-do PHASE Bidirectionnal counter. The rising edges at the A input increment the count if the B iinput is at low level. The falling edges at the A input decrement the count if the B input is at low level

IMPORTANT: **Direction sensing indication is achieved by selecting one of the bidirectionnal count modes PHASE or dIrEC.**

"Positive sign" indication occurs when the pulses applied to the instrument increase the counter while "negative sign" indication occurs when the input pulses decrement the counter.

A change in the polarity of rate is recognized when the meter receives at least two consecutive pulses in the opposite direction of the one of the previous pulses.

DECIMAL POINT

The decimal point indication helps to read the display in the desired engineering units.

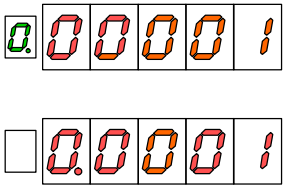
The decimal point has not real value, that is the digits to the right of the decimal point are not actually decimals. To read values with resolution to the desired decimal places is achieved by a combination of decimal point and scaling factor.

SCALE FACTOR

The scale factor is programmable from 0.00001 to 99999.

Individual decimal point location makes possible to program any value within this range independently from the decimal point of the display. Any number below 1 acts like a divisor while a number above 1 acts like a multiplier. (It is not possible to program a factor=0).

To program a scale factor with 5 decimal places, the decimal point may be set in the auxiliary digit, as shown in the figure:



When viewing/programming the scale factor, the number '0' in the auxiiary digit appears when the decimal point is in that position, any other case it is blank.

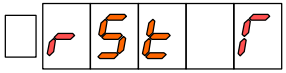
RESET KEY MODE

The RESET key clears the totalizer value to zero (it may be also used to clear peak and valley registers, see page 41).

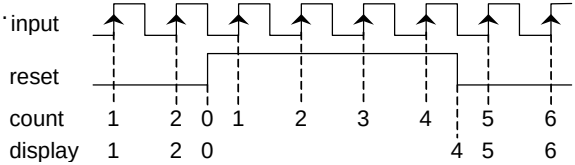
To be able to reset the totalizer by the front panel key, it is necessary to call the TOTAL variable to the display by means of the VISUAL key and press RESET.

The reset key operation for the totalizer display can be disabled by software (not for peak and valley variables) in the program lock-out routine (see pages 47 and 48).

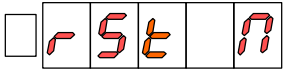
The RESET key can be configured for two modes:
IMPULSIONAL reset



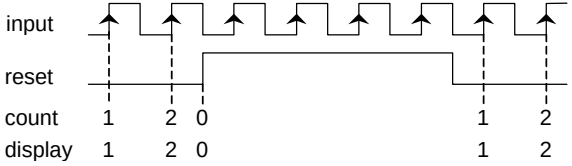
The reset operation occurs when the RESET key is depressed, but the counter internal operation does not stop. When the key is released, the display shows the count value reached internally.



MAINTAINED reset:



The reset operation takes place at the moment the RESET key is depressed, and the internal count and outputs operation are held to the reset value until the key is released.



6. FRONT KEY AND REAR CONNECTOR FUNCTIONS. LOCK-OUT

6.1. Front Key Functions

OFFSET KEY
When the display variable is a PROCESS magnitude, a push of this key takes the current display value as offset.
Offset is the value to which the process counter or the chonometer display are set when a reset event occurs.

This function is disabled for batch, totalizer or frequency/tachometer displays.

RESET + OFFSET KEYS

A combination of "RESET" and "OFFSET" restores the default offset to the memory.
To be able to reset the offset from the counter, the PROCESS variable must be present on the display.

The method is as follows:

3. Hold the "OFFSET" key and press "RESET".
4. Release first "RESET" and then "OFFSET"

The LED TARE indicator turns off after completion of the reset offset operation.

RESET KEY
Clears to zero the variable present on display.

If the instrument is in **chronometer** mode, or in **counter** mode and the PROCESS variable is on display, the reset operation sets the display to the offset value.

If the instrument is in **frequency** or **tachometer** mode and the currently displayed variable is the peak or valley readings, a reset operation update the peak or valley register with the current value of the process variable (frequency, speed or flow).

LIMIT KEY
Recalls the current setpoint values to the display. The first push of LIMIT calls the setpoint number 1 with LED's "LIMIT" and "1" (number of the setpoint) indications.
A subsequent push advance to the next setpoint value and a push from the last setpoint returns to the run mode.

If no key is depressed for approximately 15 seconds the meter automatically switches into the run mode.

When the setpoints are referred to the total display and the value exceeds 5 digits (or 4 digits and minus sign), the display alternates the low order 5 digits and the high order 3 digits with the letters 'L' and 'H', respectively, in the auxiliary digit.
If the setpoint value is of 5 digits or less and is referred to the totalizer, it is shown on the display with the letter 'L' in the auxiliary digit.
The decimal point and sign indications appear according to the variable to which the setpoint is referred.

VISUAL KEY
It allows to view the different variable displays that handles the meter in a specific application.
If no changed, the selected variable is held on the display until the instrument is disconnected form the power source. By default, when the instrument is powered up, the display shows the PROCESS variable.
In **counter** configuration, when the batch counter and/or totalizer counter are enabled, the first push shows the batch variable with the letter 'b' in the auxiliary digit. the next push shows the totalizer value with the letter 'L' in the auxiliary digit (If the value has more than 5 digits the display alternates low part (letter 'L') and high part (letter 'H') from the total. A subsequent push returns to the process display.

In **chronometer** configuration, the VISUAL key is disabled

In **frequency meter** and **tachometer** configurations, if the totalizer is activated, the first push shows the total count with the letter 'L' in the auxiliary digit and, if it has more than five digits, the display alternates the low order part ('L') and the high order part ('H') of the value.
One push from the total display or the process display recalls the peak value and illuminates the LED MAX, a new push shows the valley value with the LED MIN indicator.
The last push returns to the process display (frequency, flow, speed..).

ENTER KEY
A momentary push of the ENTER key gives access to the programming mode.

ENTER KEY (3s)
Gives access to the program lock-out routine. Hold ENTER for approximately 3s, at the end of which the meter prompts the indication '- - - -' to enter the security code.

RESET + ENTER (3s)
A press of 3s of both RESET and ENTER restores the factory settings to the memory of the instrument.
Press RESET first, then ENTER and hold both until the LED STORE illuminates to indicate that the operation has succeeded

6.2. Remote Logic Functions

6.2.1. Configurations

The rear connector CN2 provides 4 user programmable opto-coupled inputs that can be operated from external contacts or logic levels supplied by an electronic system. Four different functions may be added to the functions available from the front-panel keys. Each function is associated to one of the CN2 connector pins (PIN 1, PIN 2, PIN 4 and PIN 5) and is activated by applying a falling edge or a low level pulse to the corresponding pin with respect to common (PIN 3).
Each pin can be assigned one of the 29 functions listed on the following pages.

FACTORY DEFAULT CONFIGURATION

PIN (INPUT)	Function	Number
PIN 1 (INP-1)	RESET COMB	Function nº 7
PIN 2 (INP-2)	HOLD	Function nº 9
PIN 3	COMMON	-
PIN 4 (INP-4)	OFFSET	Function nº 1
PIN 5 (INP-5)	VISUAL	Function nº 6

If the user programs a '0' (no function) to all input pins, they are automatically set to the default configuration.

The external electronics (fig.43.2) applied to the CN2 connector must be capable of withstanding 40 V and 20 mA present at all terminals with respect to COMMON. In order to guarrantee the electromagnetic compatibility, please refer to the instructions given on page 12.

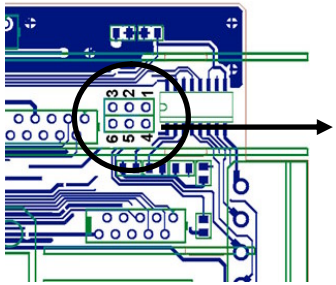


Fig.43.1

CN2 LOGIC
3 2 1 J1
6 5 4 J2

CN2 type of input
PNP J1 (2-3) J2 (5-6)
NPN J1 (1-2) J2 (4-5)

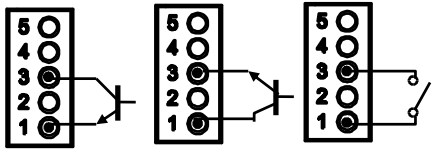


Fig.43.2. Examples of PNP, NPN and contact switch wiring.

6.2.2. Table of Functions

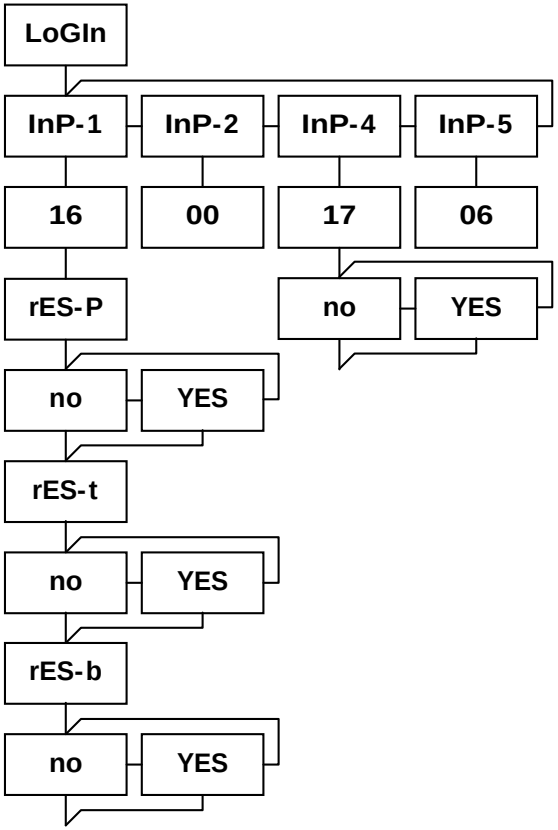
Definition of the column ACTION
Edge : The function is active when a negative edge is applied to the corresponding pin referred to common.
Level : The function is active as long as the corresponding pin is held at a low level with respect to common.
Definition of the column APPLICATION
Meter configurations in which the function is enabled

Nº	Function	Description	Action	Application
0	-	No function	-	-
1	OFFSET	Takes the currently displayed value as offset and saves it to the memory. Offset is the value that takes the display in a reset operation	Edge	Counter+ Chrono
2	RESET OFFSET	Clears the offset from the memory	Edge	Counter+ Chrono
3	PEAK	Presents the peak reading on the display	Level	Freq/Tach
4	VALLEY	Presents the valley reading on the display	Level	Freq/Tach
5	RESET PEAK & VALLLEY	Clears the peak or valley readings (the one shown in the display) from the memory	Edge	Freq/Tach
6	VISUAL	Same fuction as the VISUAL key	Edge	All
7	-	No function	-	-
8	HOLD1	Holds the display	Level	All
9	HOLD2	Holds the display and the outputs operation	Level	All
10	HOLD1+RESET (*)	Sets and holds the display to the current internal count value and resets the counter. The meter's internal operation is not stopped (RESET key disables hold)	Edge	Counter+ Freq/Tach
11	HOLD2+RESET (*)	Same function as hold1+ reset but also the outputs are updated and held at each function activation (RESET key disables hold)	Edge	Counter+ Freq/Tach
12	RESET COUNT	Resets the process counter and holds the process display to zero as long as the action is active. The meter continues to function internally	Edge	Counter

13	RESET TOTAL	Resets the totalizer counter and holds the total display to zero as long as the function is active. The meter continues to function internally	Edge	Counter+ Freq/Tach
14	RESET BATCH	Resets the batch counter and holds the batch display to zero as long as the function is active. The meter continues to function internally	Edge	Counter
15	STOP	The counter stops as long as the function is active	Level	Counter+ Freq/Tach
16	STOP+RESET (*)	Stops the counter as long as the function is active and resets the count value when the action is deactivated	Level	Counter+ Freq/Tach
17	PRINT PROCESS (**)	Prints the value of the process variable (count, time, frequency or rate depending on configuration)	Edge	All
18	PRINT TOTAL(**)	Prints the value of the totalizer counter	Edge	All
19	PRINT BATCH(**)	Prints the value of the batch counter	Edge	Counter
20	PRINT SET1 (**)	Prints the value and the state of the setpoint 1	Edge	All
21	PRINT SET2 (**)	Prints the value and the state of the setpoint 2	Edge	All
22	PRINT SET3 (**)	Prints the value and the state of the setpoint 3	Edge	All
23	PRINT SET4 (**)	Prints the value and the state of the setpoint 4	Edge	All
24	FALSE SETPOINTS	Allows programming and operation of four setpoints without setpoint card installed	Level	All
25	RESET LATCH	Resets the setpoint latched outputs	Edge	All
26	ANA ZERO	Puts the analog output to the zero state (0V or 4mA)	Level	All
27	ANA PEAK	The analog output follows the peak value	Level	Freq/Tach
28	ANA VALLEY	The analog output follows the valley value	Level	Freq/Tach
29	SETS INHIBIT	Deactivates the setpoints and inhibits control operations	Level	All

(*) The RESET functions marked with an asterisk, include selection of which variables are affected by the function.
(**) The PRINT functions include selection of whether to print an additional block of time and date or not.
A choice data set in one of these functions is applied to all functions of the same type

6.2.3. Logic Functions Program Routine



Logic functions are programmed in the '**6 LoGI n**' module. There are four menus corresponding to each of the four inputs on rear connector CN2 :
InP-1 : Input pin 1
InP-2 : Input pin 2
InP-4 : Input pin 4
InP-5 : Input pin 5
The input pin 3 is the common pin.
Each input menu shows a number from 0 to 29 corresponding to the previously programmed function.
To change this value press repeatedly ▲ until desired number appears on the display and press ENTER to store the data and exit from the program mode.
After programming one input, the meter exits from the program mode so you will have to enter again in module '**6 LoGI n**' and repeat these operations to program each input.
Some functions require additional data to be set, this is the case of the RESET functions marked (*) and the PRINT functions marked (**) in the table. The diagram on the left shows both cases for function nº16 (STOP+RESET) and function nº17 (PRINT PROCESS). The first one opens a choice list to select which variables may be affected by the reset operation (supposing the meter is a counter with process -P, total -t and batch -b variables). The PRINT function offers selection of whether time and date may be printed with the variable or not.

6.3. Program Parameters and Keyboard Functions Lock-Out

The instrument is supplied with all software programming parameters accessible to operator's modifications. After completing the software configuration, it is recommended to protect configuration settings by the following steps:

5. Lockout programming parameters to prevent from accidental or unauthorized modifications.

6. Lockout keyboard functions to prevent from accidental or unauthorized modifications.

7. There are two modes to lock-out the program parameters; total or selective. If some parts of the program have to be adjusted at a later time, make a selective lock. If you don't need to make changes, make a total lock.

8. The access to the lockout routine is allowed by entering a safety code. At factory this code is set to **0000**. We recommend to change this code, to write it down and keep in a safe place.

TOTAL LOCKOUT

The access to the programming routines to view data is allowed even if all parameters are locked out, but **it won't be possible to enter or modify data**. In this case, when entering in the programming mode, the display shows the indication -dAtA- instead of -Pro-.

SELECTIVE LOCKOUT

When only some parameters are locked out, all configuration data can be read but **only non-protected parameters can be modified**. In such case, when entering in the programming mode, the display shows the indication -Pro-.

KEYBOARD FUNCTIONS LOCKOUT

Reset and Offset function keys can be disabled by software.

When the Offset function key is disabled, the reset of the offset is also denied on the front panel.

When in counter configuration, if there is more than one variable, the reset function key can be disabled independently for each variable (PROCESS, TOTAL and BATCH).

The lock-out programming routine is entered by depressing the ENTER key for 3 seconds and introducing a security code. This gives access to either the parameter list or to change the code if desired. If the user opts for changing the code, the unit asks for the new one and returns to the normal operation. The old code is replaced with the user selected one, that will be asked next time this routine is entered.

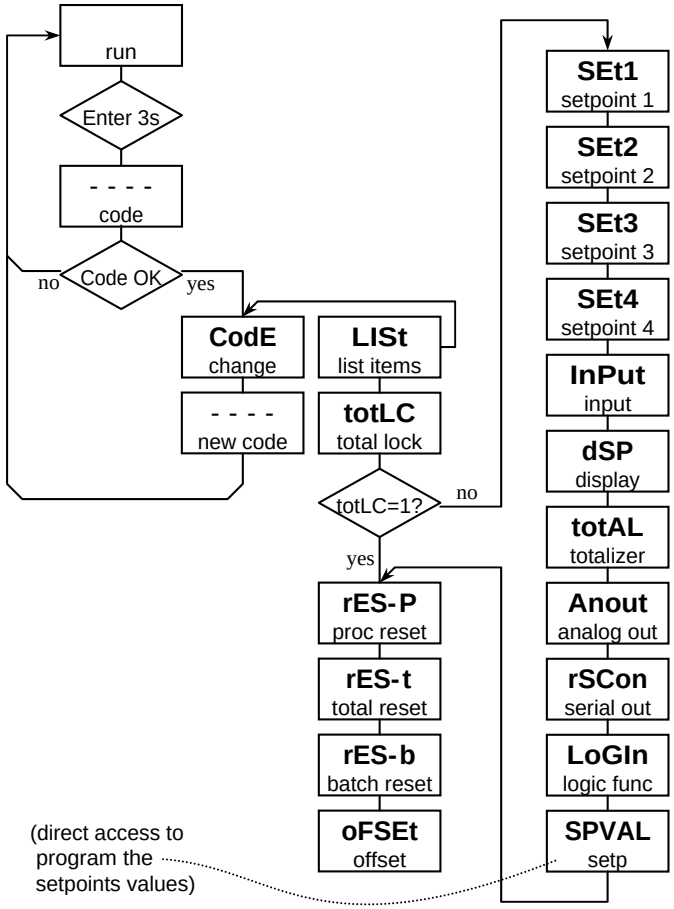
When the user enters the parameter list, each parameter is denoted by a 1-second flag indicator followed by a display of a blinking digit that allows setting a '**1**' to lock this item, or a '**0**' to free it. Use the ▲ key to change the value.

There are two ways to lock-out the program; One is to lock everything, which is accomplished by setting a '1' in the '**tot-LC**' parameter (the remaining parameters are skipped except the key functions lockout).

The second is to individually lock some parts of the program menus leaving free those parts which are more liable to have changes during normal operation.

The figure shows the flag indications for parameters that can be locked individually. Those that refer to optional outputs only appear if the corresponding option is installed.

Accordingly, the RESET and OFFSET keys menus are omitted if these fuctions are not available for the meter configuration.



7. SPECIFICATIONS

7.1. Output Options

Optionally, model Alpha-D can incorporate one or several output options for communications or control including :

COMMUNICATION

RS2	Serial RS232C
RS4	Serial RS485

CONTROL

ANA	Analogue 4-20 mA, 0-10 V
2RE	2 SPDT relays 8A
4RE	4 SPST relays 5A*
4OP	4 open-collector NPN outputs
4OPP	4 open-collector PNP outputs

All options are opto-isolated with respect to the input signal and the main supply.

* from nº O5397

The options are supplied with a specific instructions manual describing characteristics, installation, wiring connections and programming. The output cards are easily installed on the meter's main board by means of plug-in connectors and each one activates its own programming module that provides complete software configuration of the output.
Additional capabilities of the unit with output options :

- Control and processing of limit values via ON/OFF logic outputs (2 relays, 4 relays, 4 NPN outputs or 4 PNP outputs) or proportional output (4-20 mA or 0-10 V).
- Communication, data transmission and remote programming via serial interface.

For more detailed information on characteristics, applications, mounting and programming, please refer to the specific manual supplied with each option

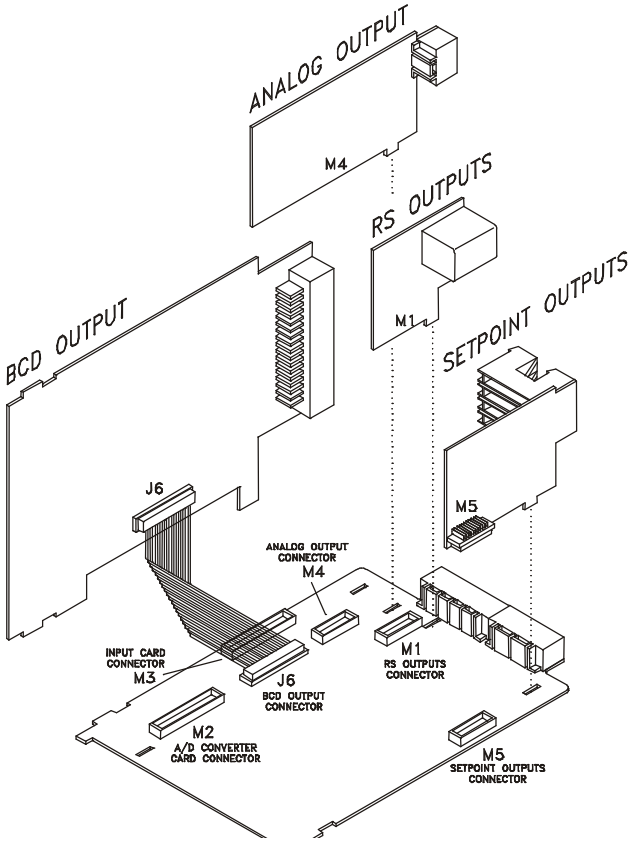
The figure shows the main circuit board locations of the available output options. Each plug-in location can accept only one card from a particular function type.

The options 2RE, 4RE, 4OP and 4OPP are for setpoint control and only one of them can be installed in the M5 location.
The options RS2 and RS4 are for communication and only one of them can be installed in the M1 location.
The ANA option provides selectable 0-10V and 20mA analog output and is installed in the M4 location.

Up to three output options can be present at a time and operate simultaneously:

- ANALOGUE,
- RS232C or RS485 (one of them),
- 2 RELAYS, 4 RELAYS or 4 OPTOS (one of them).

The BCD output is exclusive and it does not allow any of the others. This option is attached to the main circuit board by means of a 18-pin FLAT cable.



7.2. Technical Specifications

INPUT SIGNAL

Frequency meter and Tachometer
Frequency Limits
MIN frequency 0.01Hz
MAX frequency without totalizer..... 40KHz
MAX frequency with totalizer 10KHz

Counter
MAX count rate (*)
UP or DOWN mode 22KHz
Bidirectionnal Phase or Direc mode 21KHz
Bidirectionnal Indep mode..... 12KHz
(*) Reduce approx. 5KHz if the totalizer is enabled and approx. 2KHz more if the setpoint option is installed and operative.

EXCITATION .....8V/24V DC @ 30mA
20V ±5 Vdc @ 60 mA (max ambient temp. 50ºC)

INPUT FILTER for count and chrono
(programmable)
Fc 20Hz
MIN pulse width 30ms

INPUTS (2 CHANELS)
MAGNETIC PICKUP
Sensitivity ..... Vin (AC) > 120mVeff

NAMUR
Rc 1K
Ion ..... < 1mA DC
Ioff..... > 3mA DC

TTL/24V DC (encoder)
Logic levels ..... "0" < 2.4V DC, "1" > 2.6V DC

NPN or PNP
Rc ..... 1K (incorporated)
Logic levels ..... "0" < 2.4V DC, "1" > 2.6V DC

CONTACT CLOSURE
Vc..... 5V
Rc 3.9K
Fc (programmable)..... 20Hz

HIGH VOLTAGE INPUT (1 CHANNEL)
Voltage limits 10 to 600V AC

MEMORY

Non-volatile E2PROM retains all programming data and count value when power is removed or interrupted.

DISPLAY

Type .....5 digits red 14mm + 1 digit green 8mm
LED's .....14, control and status indication
Decimal Point .....programmable
Sign .....automatic s/configuration
Positive overflow indication ..... OvEr
Negative overflow indication..... UndEr

Counter display limits.....Process -99999 to 99999
Batch 0 to 99999
Total -9999999 to 99999999
Chonometer ranges .....5, from 999.99s to 9999.9h
Frequency ranges ....0.01 Hz to 40KHz/10KHz(totalizer)
Tachometer range .....0 to 99999(rpm), programmable(rate)
Scale factor
Counter.....programmable from 0.00001 to 99999
Freq/Tach ..... programmable from 0.0001 to 9999

Display update rate
Counter..... 10ms
Chronometer 10ms
Frecuency/Tachometer..... programmable 0.1 to 9.9s

POWER

ALPHA-D..... 115/230V AC (±10%) 50/60Hz
ALPHA-D1.....10-30V DC
ALPHA-D2.....24/48V AC (±10%) 50/60Hz

Consumption..... 5W (without options), 10W max

ACCURACY

Frecuency/Tachometer 0,005%
Temperature coefficient.....50ppm/°C
Warm up time ..... 5 minutes

AMBIENT

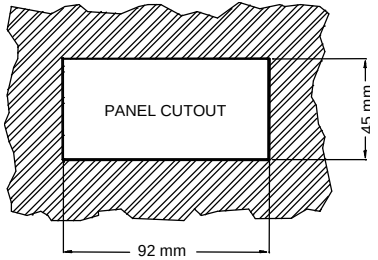
Indoor use
Operating temp.....-10ºC to 60ºC
Storage temperature ..... -25°C to +85°C
Relative humidity (non condensing)..... < 95% at 40ºC
Max altitude 2000m

MECHANICAL

Dimensions ..... 96x48x120mm (DIN 43700)
Panel cutout..... 92x45mm
Weight..... 600g
Case material .....Polycarbonate (UL 94 V-0)
Front Sealed IP65

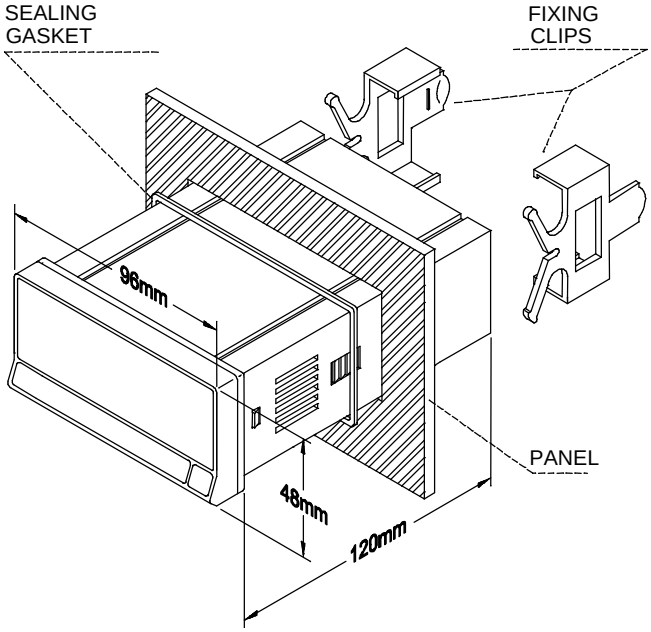
7.3. Dimensions and Mounting

To mount the instrument into the panel, make a cutout of 92x45mm. Slide the sealing gasket over the instrument's case to the bezel and insert the instrument through the panel cutout from the front.



Place the fixing clips on both sides of the case and push them over the rear until they touch the panel.
Apply pressure to engage the tabs on the fixing clips to the slots of the case.

To remove the instrument from the panel, pull outwards the fixing clips from the rear tabs to disengage and slide them back over the case.



CLEANING: The font cover should be cleaned only with a soft cloth soaked in neutral soap products.
DO NOT USE SOLVENTS

The instruments are warranted against defective materials and workmanship for a period of three years from date of delivery.

If a product appears to have a defect or fails during the normal use within the warranty period, please contact the distributor from which you purchased the product.

This warranty does not apply to defects resulting from action of the buyer such as mishandling or improper interfacing.

The liability under this warranty shall extend only to the repair of the instrument. No responsibility is assumed by the manufacturer for any damage which may result from its use.

All the DITEL products benefit from an unlimited and unconditional warranty of THREE (3) years from the date of their purchase. Now you can extend this period of warranty up to FIVE (5) years from the product commissioning, only by fulfilling a form.

Fill out the form in our website:
http://www.ditel.es/warranty

7.5. Declaration of Conformity

Manufacturer : DITEL - Diseños y Tecnología S.A.

Address : Travessera de les Corts, 180
08028 Barcelona
ESPAÑA

Declares, that the product :

Description : Digital panel multifunction meter

Model : **ALPHA-D**

Conforms with the directives : EMC 89/336/CEE
LVD 73/23/CEE

Applicable Standards : **EN50081-1** Generic emission
EN55022/CISPR22 Class B

Applicable Standards : **EN50082-1** Generic immunity
IEC1000-4-2 Level 3 Criteria B
Air Discharge 8kV
Contact Discharge 6kV

IEC1000-4-3 Level 2 Criteria A
3V/m 80..1000MHz

IEC1000-4-4 Level 2 Criteria B
1kV Power Lines
0.5kV Signal Lines

Applicable Standars : **EN61010-1** Generic Safety
IEC1010-1 Installation Category II
Transient Voltages <2.5kV
Pollution Degree 2
Conductive pollution excluded
Insulation Type
Enclosure : Double
Inputs/Outputs : Basic

Date: 8 December 2003
Signed: José M. Edo
Position: Technical Manager

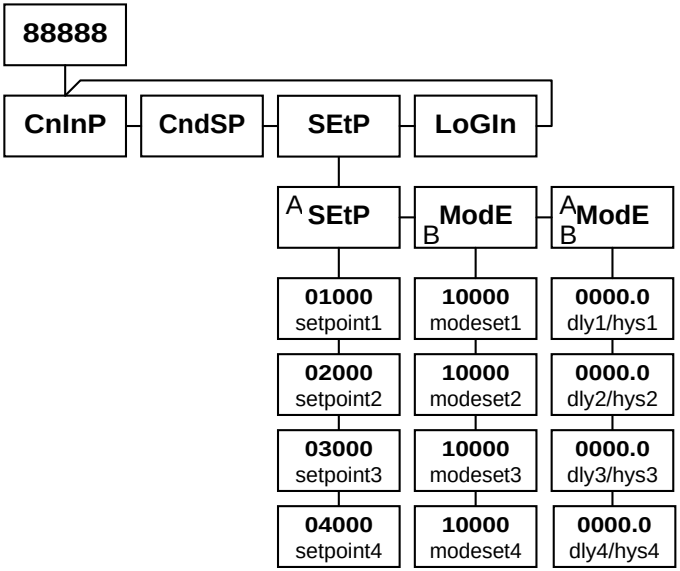
ANNEXES

Index

ANNEXE A. SETPOINTS

Program Routines

The **SEtP** programming module is identical whatever may be the meter's configuration, although some options have different applications. This annexe is divided in two parts; A1 for counter/chronometer and A2 for frequency/tachometer.



The diagram represents the module '**SetP**' that includes 3 menus:
3A SetP: Setpoint numerical values
3B ModE: Setpoint operating modes
3AB ModE: Pulse width, delay or hysteresis numerical values.

(In the diagram, there are four steps per each menu that correspond to each of the four setpoints. If the meter has only two setpoints -2RE option-, the two last steps of each menu are omitted)

DIRECT ACCESS TO PROGRAM SETPOINT VALUES
The instrument has a direct access from the run mode to program the values of the setpoints. The access is obtained pressing key ENTER to enter -Pro- and key LIMIT to call the setpoints list. The number of the setpoint being programmed is indicated by the corresponding LED on the right of the display. The changes made in this routine are transferred automatically to the menu A SetP and stored in the memory.

A.1. Counter / Chronometer Configuration

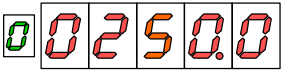
A.1.1. Setpoint Values Programming

IMPORTANT: The setpoint values are programmed according to the variable to which they are referred, taking from this the number of digits, the position of the decimal and the position of the sign, thus **is necessary to program first, before the setpoint value, the digits that determine the control mode in menu 3B ModE**

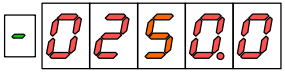
COUNTER

When the setpoint is referred the **PROCESS** variable, that is to the partial count, the sign is programmed in the auxiliary digit and the value in the five digits of the display. The decimal point is located in the position programmed for the PROCESS variable

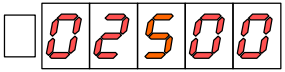
Positive



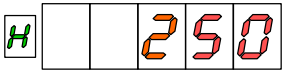
Negative

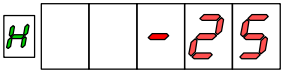


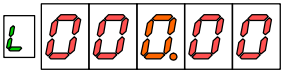
When the setpoint is referred to the **BATCH** variable, that is to the batch counter, it has no sign, since it is always positive, and no decimal point.

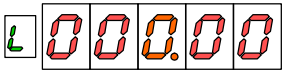


When the setpoint is referred the the **TOTAL** variable, that is to the totalizer, the value is programmed in two steps; First the high part, of three digits, where first one can be a minus sign. Later the low part, of five digits with the decimal point in the position of the totalizer.



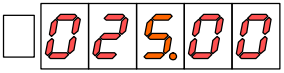






CHRONOMETER

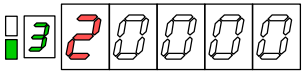
In the chronometer configuration, the setpoint is programmed referred to the only variable it has, **PROCESS**, without sign and with the decimal point located according to the selected scale



A.1.2. Programming the Control Mode

The menu "**3B ModE**" allows programing all parameters relating the setpoints control mode.
The control mode is defined by 5 digits, each one representing a particular function for the setpoint.
The digits are numbered 1 to 5, from left to right.

DIGIT 1 ON-OFF SELECTION



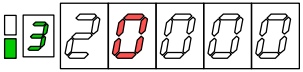
0 = disabled
No operation

1 = pulse
The output activates when the setpoint is reached and deactivates after a programmable time out value between 0000.1 and 9999.9 s

2 = latch
The output is active when the display reaches the setpoint and deactivates when display falls below the setpoint level.

3 = rscom
The output activation and deactivation is controlled by a command received via the serial port (see commands on page 68)

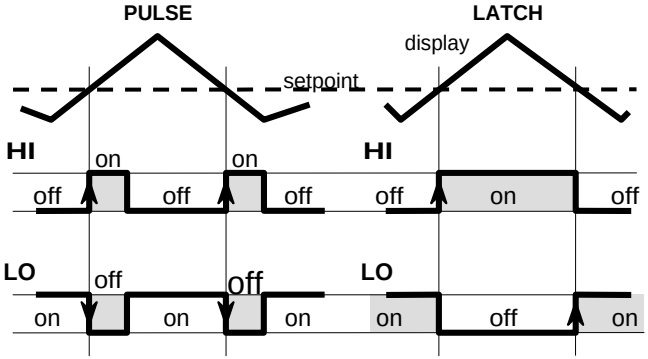
DIGIT 2 HI-LO SELECTION



0 = HI
The output activates when the setpoint is reached

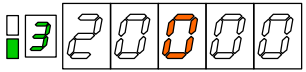
1 = LO
The output deactivates when the setpoint is reached

SUMMARY OF MODES ON-OFF/ HI-LO



(▲: alarm activation edge where the reset, stop and clear functions are active)

DIGIT 3 FUNCTION



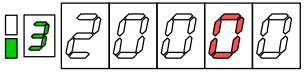
0=**no**
No function

1=**reset**
When the output activates the variable compared with the setpoint is set to zero or the offset value.
(When this function is selected, the digit 1 cannot be set for latched operation -option 2-)

2=**stop**
The output activation disables pulse count on both inputs and holds all counter displays.
If the setpoint is programmed for timed output (pulse), after the time delay the meter continues the normal operation.
If the setpoint is programmed for latched mode, the meter restarts when the user resets the variable referred by the setpoint.

3=**clear**
When activated, the output of the preceding setpoint is reset to the OFF state.
(The setpoint preceding the number1 is number 4)

DIGIT 4 REFERENCE VARIABLE



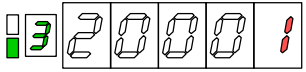
0=**process**
Setpoint referred to the process variable, that is to the partial count in counter mode or to the chronometer time display

1=**batch**
Setpoint referred to the batch variable. This option cannot be set if the batch counter is disabled or in chronometer mode

2=**total**
Setpoint referred to the total variable. This option cannot be set if the totalizer counter is disabled or in chronometer mode

3=**batch indication**
Setpoint used for batch indication. The output is active every time a batch event is performed, that is each time the batch variable is incremented in one unit. This option cannot be set if the batch counter is disabled or in chronometer mode

DIGIT 5 ALARM INDICATION

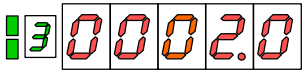


0=**LED**
The alarm activation is acknowledged in the display by the right side LED indicator corresponding to the setpoint number associated to such alarm

1=**LED+BLINK**
The alarm activation illuminates the corresponding LED indicator and also flashes all the digits of the display.
This option is suitable for use in installations where the LED indicator is insufficiently readable due to room brightness or distance to the operator's eye.

A.1.3. Time Delay for Timed Outputs

When the setpoint is programmed for pulse output (digit 1, option 1 in previous section), the "**3AB ModE**" menu allows programming the amount of time, in seconds, that the output will be active.



The decimal point location denotes that the time value can be programmed with a resolution of tenths (figure shows a 2s programming).

If this parameter is set to zero, the pulse duration is not guaranteed. It may vary from a few milliseconds to approximately 20ms.

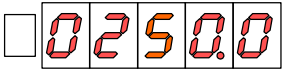
A.2. Frequency meter / Tachometer Configuration

A.2.1. Programming the Setpoint Values

IMPORTANT: The setpoint values are programmed according to the variable to which they refer, taking from this the number of digits, the position of the decimal and the position of the sign, thus **is necessary to program first, before the setpoint value, the digits that determine the control mode in menu 3B ModE.**

PROCESS VARIABLE WITHOUT SIGN.

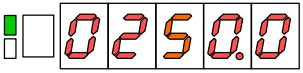
For applications where the variable is read without polarity indication, the setpoint value has not "sign" indication and is programmed in the five digits of the display with the decimal point according to the process variable.



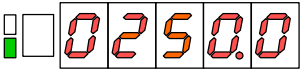
PROCESS VARIABLE WITH SIGN

For applications involving sensing of polarity or direction of rotation, the LED's A and B are used to set the sign of the setpoint.

If the setpoint value is programmed with the **LED A**, the output will activate each time the display reaches this value, **both in positive and in negative direction**



If the setpoint value is programmed with the **LED B**, the output will activate when the display reaches this value **exclusively in the negative direction.**



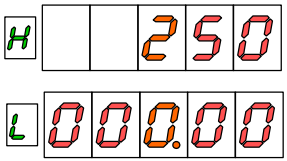
INDICATOR OF NEGATIVE DIRECTION

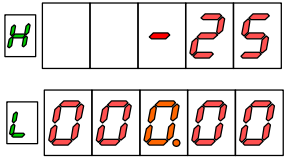
The setpoints configured for negative direction indication (according to the settings in the control mode digits in menu 3B ModE, see next section digit 4) do not need to be programmed for a specific numerical value.

In this mode, the setpoint is used to control polarity or direction of rotation by changing the state of the control output whenever the polarity of the variable being measured is changed.

TOTAL VARIABLE

A setpoint referred to the totalizer is programmed in two steps; first the high order 3 digits, where the first one can be a minus sign. Then the low order 5 digits with the decimal point in the position of the totalizer display.

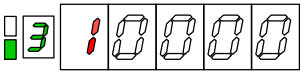




A.2.2. Programming the Operating Mode

The menu "**3B ModE**" allows programing all parameters relating the setpoints operating mode.
The control mode is defined by 5 digits, each one representing a particular function of the setpoint.
The digits are numbered 1 to 5, from left to right

DIGIT 1 ON-OFF SELECTION



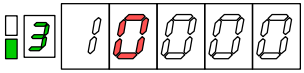
0=disabled
No operation

1=normal
The output activates when the display reaches the setpoint and deactivates when it falls below the setpoint

2=latch
The output activates and latches when the display reaches the setpoint and remains active although the alarm condition dissapears. A 'RESET LATCH' signal at rear connector (see page 45, function nº25) unlocks the latched outputs

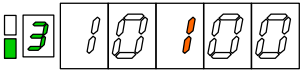
3=rscom
The output activation and deactivation is controlled by a command received via the serial port (see commands on page 68)

DIGIT 2 HI-LO SELECTION



0=HI
The output activates when the setpoint is reached
1=LO
The output deactivates when the setpoint is reached

DIGIT 3 DELAY-HYSTERESIS

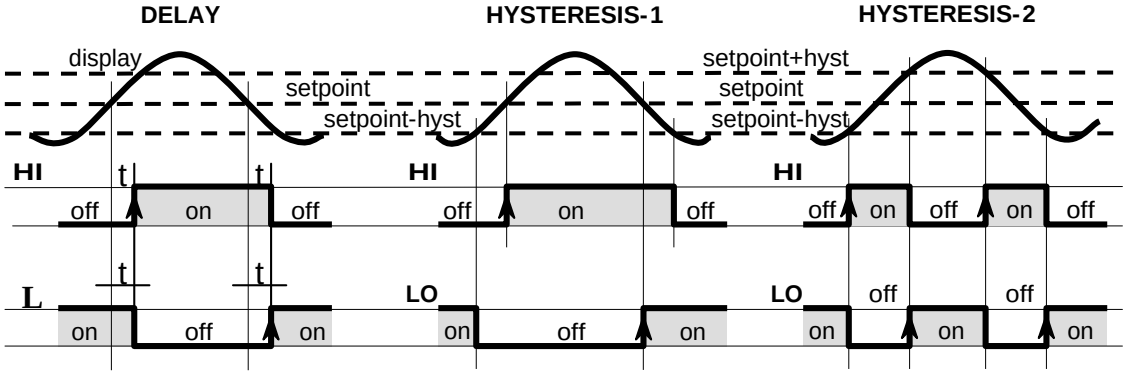


0=delay
The output activation and deactivation occurs after a programmable time delay from the setpoint is reached

1=hysteresis-1
The output activates on the setpoint and deactivates a number of display counts (hysteresis value) below the setpoint

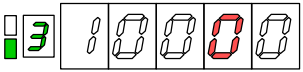
2=hysteresis-2
The output activates a number of display counts (hysteresis value) below the setpoint and deactivates the same number of counts above the setpoint

SUMMARY OF MODES HI-LO / DELAY-HYSTERESIS



(▲: Output activation edge where the latch setpoints are latched)

DIGIT 4 REFERENCE VARIABLE



0=process
Setpoint referred to the process variable, that is, to the instantaneous value for frequency, rate, flow, etc..

1=track
Used as a pre-alarm or security alarm of the preceding setpoint. The value of a tracking setpoint is the amount of display counts with respect to the preceding setpoint, that the pre-alarm activates before main alarm condition is set.

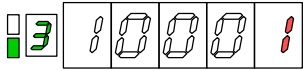
2=total
Setpoint referred to the totalizer display (see configuration of the other digits in pages 60, 61 and 62)

3=peak
Setpoint referred to the peak variable

4=valley
Setpoint referred to the valley variable

5=sign
Setpoint referred to the polarity of the process variable. The output activates when the polarity or direction or rotation of the variable is negative

DIGIT 5 ALARM INDICATION



0 = LED

The alarm activation is acknowledged in the display by the right side LED indicator corresponding to the setpoint number associated to such alarm

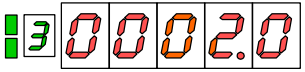
1 = LED+BLINK

The alarm activation illuminates the corresponding LED indicator and also flashes all the digits of the display.

This option is suitable for use in installations where the LED indicator is insufficiently readable due to room brightness or distance to the operator's eye

A.2.3. Delay or Hysteresis Values

"**3AB ModE**" menu allows programming the time delay in seconds, or hysteresis value in counts of display that the output will be active.



When programming time delay, the decimal point is located to the fourth digit so the value can be set with a resolution of tenths (figure shows a 2s programming).

When programming hysteresis value, the decimal point appears in the same position as in the setpoint reference variable.

ANNEXE B. SERIAL OUTPUTS RS232C or RS485

B.1. List of Commands

DATA REQUEST

DITEL	ISO	Information issued
I	0I	State of the logic inputs
P	0P	Peak reading
V	0V	Valley reading
T	0T	Offset value
D	0D	Present display Value
Z	0Z	Totalizer value
X	0X	Batch number
C	0C	Type of input (configuration)
L1	L1	Setpoint1 value
L2	L2	Setpoint2 value
L3	L3	Setpoint3 value
L4	L4	Setpoint4 value

MODIFICATION OF DATA

DITEL	ISO	Parameter
M1	M1	Change setpoint1 in memory
M2	M2	Change setpoint2 in memory
M3	M3	Change setpoint3 in memory
M4	M4	Change setpoint4 in memory
S1	S1	Change setpoint1 without saving
S2	S2	Change setpoint2 without saving
S3	S3	Change setpoint3 without saving
S4	S4	Change setpoint4 without saving

COMMAND

DITEL	ISO	MODBUS	Command
n	0n	n	Reset latched setpoint outputs
p	0p	p	Reset peak
v	0v	v	Reset valley
r	0r	r	Reset offset
t	0t	t	Take display value as offset
d	0d	d	Reset process counter
z	0z	z	Reset totalizer counter
x	0x	x	Reset batch counter
a1	a1	a1	Activate setpoint1
a2	a2	a2	Activate setpoint2
a3	a3	a3	Activate setpoint3
a4	a4	a4	Activate setpoint4
d1	d1	d1	Desactivate setpoint1
d2	d2	d2	Desactivate setpoint2
d3	d3	d3	Desactivate setpoint3
d4	d4	d4	Desactivate setpoint4

B.2. Address of the Variables in the Memory

PROGRAMMING DATA (READ/WRITE)

ISO	MODBUS	Variable	Meaning
0	0	SETPOINT 1	Sign
1			Digit 6
2	1		Digit 5
3			Digit 4
4	2		Digit 3
5			Digit 2
6	3		Digit 1
7			Digit 0
8	4	SETPOINT 2	Sign
9			Digit 6
10	5		Digit 5
11			Digit 4
12	6		Digit 3
13			Digit 2
14	7		Digit 1
15			Digit 0
16	8	SETPOINT 3	Sign
17			Digit 6
18	9		Digit 5
19			Digit 4
20	10		Digit 3
21			Digit 2
22	11		Digit 1
23			Digit 0

24	12	SETPOINT 4	Sign
25			Digit 6
26	13		Digit 5
27			Digit 4
28	14		Digit 3
29			Digit 2
30	15		Digit 1
31			Digit 0
32	16	MODE SETPOINT 1	COUNT: 0=off, 1=pulse, 2=latch, 3=rscom FREQ: 0=off, 1=on, 2=latch, 3=rscom
33			0=hi, 1=lo
34	17		COUNT: 0=no, 1=reset, 2=stop, 3=clear FREQ: 0= delay, 1=hysteresis-1, 2=hysteresis-2
35			COUNT: 0=process, 1=batch, 2=total, 3=lotes FREQ: 0= process, 1=track, 2=total, 3=peak, 4=valley, 5=sign
36	18		0=LED, 1=LED+blink
37		MODE SETPOINT 2	COUNT: 0=off, 1=pulse, 2=latch, 3=rscom FREQ: 0=off, 1=on, 2=latch, 3=rscom
38	19		0=hi, 1=lo
39			COUNT: 0=no, 1=reset, 2=stop, 3=clear FREQ: 0= delay, 1=hysteresis-1, 2=hysteresis-2
40	20		COUNT: 0=process, 1=batch, 2=total, 3=lotes FREQ: 0= process, 1=track, 2=total, 3=peak, 4=valley, 5=sign
41			0=LED, 1=LED+blink

42	21	MODE SETPOINT 3	COUNT: 0=off, 1=pulse, 2=latch, 3=rscom FREQ: 0=off, 1=on, 2=latch, 3=rscom
43			0=hi, 1=lo
44	22		COUNT: 0=no, 1=reset, 2=stop, 3=clear FREQ: 0= delay, 1=hysteresis-1, 2=hysteresis-2
45			COUNT: 0=proceso, 1=batch, 2=total, 3=lotes FREQ: 0= process, 1=track, 2=total, 3=peak, 4=valley, 5=signo
46	23		0=LED, 1=LED+blink
47		MODE SETPOINT 4	COUNT: 0=off, 1=pulse, 2=latch, 3=rscom FREQ: 0=off, 1=on, 2=latch, 3=rscom
48	24		0=hi, 1=lo
49			COUNT: 0=no, 1=reset, 2=stop, 3=clear FREQ: 0= delay, 1=hysteresis-1, 2=hysteresis-2
50	25		COUNT: 0=proceso, 1=batch, 2=total, 3=lotes FREQ: 0= process, 1=track, 2=total, 3=peak, 4=valley, 5=sign
51			0=LED, 1=LED+blink
52	26	DELAY / HYSTERESIS SETPOINT 1	Digit 4
53			Digit 3
54	27		Digit 2
55			Digit 1
56	28		Digit 0
57		DELAY / HYSTERESIS SETPOINT 2	Digit 4
58	29		Digit 3
59			Digit 2
60	30		Digit 1
61			Digit 0

62	31	DELAY / HYSTERESIS SETPOINT 3	Digit 4
63			Digit 3
64	32		Digit 2
65			Digit 1
66	33		Digit 0
67		DELAY / HYSTERESIS SETPOINT 4	Digit 4
68	34		Digit 3
69			Digit 2
70	35		Digit 1
71			Digit 0
72	36	ANALOG OUTPUT LO	Sign
73			Digit 4
74	37		Digit 3
75			Digit 2
76	38		Digit 1
77			Digit 0
78	39	ANALOG OUTPUT HI	Sign
79			Digit 4
80	40		Digit 3
81			Digit 2
82	41		Digit 1
83			Digit 0
84	42	ANALOG OUTPUT TYPE	0=Vdc, 1=Idc
85		INPUT CONFIGURATION	0=counter, 1=chronometer, 2=frequency meter, 3=tachometer
86	43	COUNTER DIRECTION	0=up, 1=down, 2=up/down
87		BIDIRECTIONAL MODE	0=indep, 1=direc, 2=phase

88	44	CHRONO MODE	0=A↑ start A↓ stop (In-A), 1=A↑ start B↑ stop (In-AB), 2=A↑ start A↑ stop (In-AA)
89		CHRONO DIRECTION	0=up, 1=down
90	45	TACH MODE	0=rpm, 1=rate
91		RATE DIRECTION	0=direct, 1=inverse
92	46	CHRONO UNITS	0=9999.9h (H.H), 1=999h59min (H.MM), 2=999min59s (M.SS), 3=9999.9s (0.1-S), 4=999.99s (0.01-S)
93		DISPLAY DEC.POINT	0=88888, 1=8888.8, 2=888.88, 3=88.888, 4=8.8888
94	47	PROC FACTOR DP	0=88888, 1=8888.8, 2=888.88, 3=88.888, 4=8.8888, 5=0.88888
95		PROCESS FACTOR	Digit 4
96	48		Digit 3
97			Digit 2
98	49		Digit 1
99			Digit 0
100	50	TOTAL FACTOR DP	0=88888, 1=8888.8, 2=888.88, 3=88.888, 4=8.8888, 5=0.88888
101		TOTAL FACTOR	Digit 4
102	51		Digit 3
103			Digit 2
104	52		Digit 1
105			Digit 0
106	53	TOTAL DEC POINT	0=88888, 1=8888.8, 2=888.88, 3=88.888, 4=8.8888
107		TOTALIZER	0=no, 1=yes

108	54	FREQ.DEC.POINT	0=88888, 1=8888.8, 2=888.88
109		INPUT FREQUENCY	Digit 4
110	55		Digit 3
111			Digit 2
112	56		Digit 1
113			Digit 0
114	57	DESIRED DISPLAY	Digit 4
115			Digit 3
116	58		Digit 2
117			Digit 1
118	59		Digit 0
119		BATCH	0=no, 1=yes
120	60	BATCH LEVEL	Digit 4
121			Digit 3
122	61		Digit 2
123			Digit 1
124	62		Digit 0
125		FILTER + RESET	bit 0 type of reset : 0=impulsional, 1 maintained bit 1 filter : 0=no, 1=yes
126	63	COUNTER OFFSET	Sign
127			Digit 4
128	64		Digit 3
129			Digit 2
130	65		Digit 1
131			Digit 0

132	66	CHRONOMETER OFFSET	Digit 4
133			Digit 3
134	67		Digit 2
135			Digit 1
136	68		Digit 0
137		PULSES PER REVOLUTION	Digit 4
138	69		Digit 3
139			Digit 2
140	70		Digit 1
141			Digit 0
142	71	PULSES PER CYCLE	Digit 4
143			Digit 3
144	72		Digit 2
145			Digit 1
146	73		Digit 0
147		AVERAGE TIME	Digit 2
148	74		Digit 1
149			Digit 0
150	75	TIME LIMIT	Digit 1
151			Digit 0
152	76	UPDATE TIME	Digit 1
153			Digit 0
154	77	SECURITY CODE	Digit 3
155			Digit 2
156	78		Digit 1
157			Digit 0

158	79	SOFT LOCK 1	bit 0 =setpoint 1 bit 1 =setpoint 2 bit 2 =setpoint 3 bit 3 =setpoint 4
159		SOFT LOCK 2	bit 0 =input bit 1 =display bit 2 =totalizer bit 3 =total lock-out
160	80	SOFT LOCK 3	bit 0 =analog output bit 1 =serial output bit 2 =logic inputs bit 3 =setpoint values (direct programming)
161		SOFT LOCK 4	bit 0 =reset key for process count bit 1 =reset key for total count bit 2 =reset key for batch count bit 3 =offset key operations
162	81	LOGIC FUNCTION CN2.1	0 to 29
163		LOGIC FUNCTION CN2.2	0 to 29
164	82	LOGIC FUNCTION CN2.4	0 to 29
165		LOGIC FUNCTION CN2.5	0 to 29
166	83	PRINT TIME/DATE + RESET VARIABLE	bit 0 =print date time bit 1 =reset process bit 2 =reset total bit 3 =reset batch
167		RESERVED	-
168	84	ADDRESS UNITS	0 to 9
169		ADDRESS TENS	0 to 9
170	85	RESERVED	-
171		BAUD RATE	1=1200, 2=2400, 3=4800, 4=9600, 5=19200
172	86	DELAY TIME RS485	1=30ms, 2=60ms, 3=100ms, 4=300ms, 5=no delay
173		PROTOCOL	1=ditel, 2=iso 1745, 3=modbus

DYNAMIC VARIABLES (READ ONLY)

MODBUS	Variable	Meaning	Format
98	Peak	Internal peak reading	Floating (2 word)
100	Valley	Internal peak reading	Floating (2 word)
102	Frequency	Internal frequency/tachometer measurement value	Floating (2 word)
104	Process Count	Internal process count	Integer (2 word)
106	Totalizer Count	Internal total count	Integer (2 word)
108	Setpoint1	setpoint 1 value	Integer (2 word)
110	Setpoint2	setpoint 2 value	Integer (2 word)
112	Setpoint3	setpoint 3 value	Integer (2 word)
114	Setpoint4	setpoint 4 value	Integer (2 word)
116	ProcesS Scale Factor	Scale factor for process display	Integer (2 word)
118	Totalizer Scale Factor	Scale factor for total display	Integer (2 word)
120	Setpoints and Logic Inputs Status (0=deactivated, 1=activated)	bit 0 = setpoint 1 bit 1 = setpoint 2 bit 2 = setpoint 3 bit 3 = setpoint 4 bit 4 = logic input 1 bit 5 = logic input 2 bit 6 = logic input 4 bit 7 = logic input 5	Byte
	Output Options (0=not installed, 1=installed)	bit 0 = 2RE bit 1 = 4RE bit 2 = RS2 bit 3 = RS4 bit 4 = - bit 5 = BCD bit 6 = ANA bit 7 = -	Byte

121	Version	'D'	Byte
		first version number	Byte
122		second version number	Byte
		third version number	Byte
123	Digits of the display	digit 0 (LSB)	Byte
		digit 1	Byte
124		digit 2	Byte
		digit 3	Byte
125		digit 4	Byte
		digit 5 (MSB)	Byte
126		digit 6 (LED's) bit 0 =SET 3 bit 1 =PROG bit 2 =RUN bit 3 =SET 2 bit 4 =SET 1 bit 5 =B bit 6 =A bit 7 =SET 4	Byte
		digit 7 (LED's) bit 0 = - bit 1 =STORE bit 2 =MIN bit 3 =MAX bit 4 =LIMIT bit 5 =HOLD bit 6 =TARE bit 7 = -	Byte

127	Over Process	0=no, 1=over	Byte
	Over Batch	0=no, 1=over	Byte
128	Over Total	0=no, 1=over	Byte
	Over Display Process	0=no, 1=over	Byte
129	Over Display Batch	0=no, 1=over	Byte
	Over Display Total	0=no, 1=over	Byte
130	-		
131	Batch Display	Batch counter display value	Integer (2 word)
133	Peak Display	Peak display value	Floating (2 word)
135	Valley Display	Valley display value	Floating (2 word)
137	Frequency Display	Frequency meter or tachometer display value	Floating (2 word)
139	Process Display	Process counter display value	Integer (2 word)
141	Total Display	Totalizer counter display value	Integer (2 word)
143	Offset	Offset value	Integer (2 word)

INSTRUCTIONS FOR THE RECYCLING

This electronic instrument is covered by the **2002/96/CE** European Directive so, it is properly marked with the crossed-out wheeled bin symbol that makes reference to the selective collection for electrical and electronic equipment which indicates that at the end of its lifetime, the final user cannot dispose of it as unsorted municipal waste.

In order to protect the environment and in agreement with the European legislation regarding waste of electrical and electronic equipments from products put on the market after 13 August 2005, the user can give it back, without any cost, to the place where it was acquired to proceed to its controlled treatment and recycling.

DISEÑOS Y TECNOLOGIA, S.A.
Polígono Industrial Les Guixeres
C/ Xarol 8 C
08915 BADALONA-SPAIN
Tel : +34 - 93 339 47 58
Fax : +34 - 93 490 31 45
E-mail : dtl@ditel.es

www.ditel.es