

USER MANUAL



PROSENSE DPM3-P SERIES

DIGITAL PANEL METER FREQUENCY / TACHOMETER / RATE / COUNTER / CHRONOMETER MODES

Models:

DPM3-P-H

DPM3-P-L

DPM3-P-A2R-H

DPM3-P-A2R-L



Scan or click the QR code for a series of Configuration and Programming videos for the ProSense DMP Series Panel Meters

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General Information

Package Contents

- DPM3-P Series digital panel meter
- Quick start guide
- Mounting panel accessories (a sealing gasket and 2 fixing clips)
- Wiring accessories (plug-in terminal block connectors and 2 key tools for wire insertion)
- 4 adhesive engineering unit label sheets

Recycling Instructions



This electronic instrument is covered by the 2012/19/UE 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 equipment from products put on the market after August 13, 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.

General Safety Considerations

All instructions and guidelines for the installation and manipulation that are present in this manual must be considered to ensure personal safety and to prevent damage to either the instrument or any equipment connected to it.

Safety of any equipment incorporated to this instrument is the responsibility of the system installer.

If this electronic indicator is used in a manner not specified by the manufacturer in this manual, the protection provided by the instrument may be impaired.

Symbols Identification



Warning: Potential risk of danger.

Read complete instructions when this symbol appears in order to know the potential risk and know how to avoid it.



Warning: Risk of electric shock.



Instrument protected by double isolation or reinforced isolation.

Maintenance

To ensure instrument accuracy, it is recommended to check its performance according to the technical specifications listed in this manual.

For front cover cleaning, just wipe with a damp cloth and neutral soap product. **DO NOT USE SOLVENTS!**

Technical Support

We strive to make our manuals the best in the industry. We rely on your feedback to let us know if we are reaching our goal. If you cannot find the solution to your particular application, or, if for any reason you need technical assistance, please call us at:

1-800-633-0405

Our technical support group will work with you to answer your questions. They are available Monday through Friday from 9:00 A.M. to 6:00 P.M. Eastern Time. We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company.

www.AutomationDirect.com

Agency Certifications

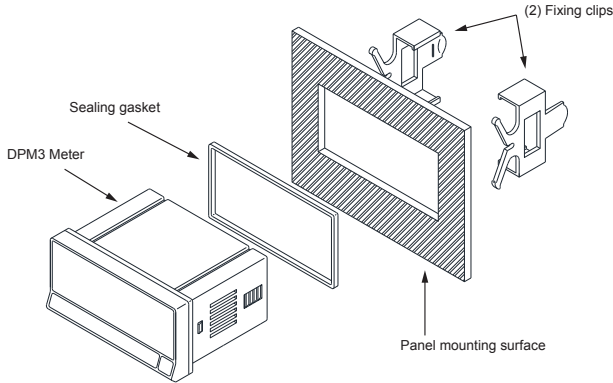


Device Description

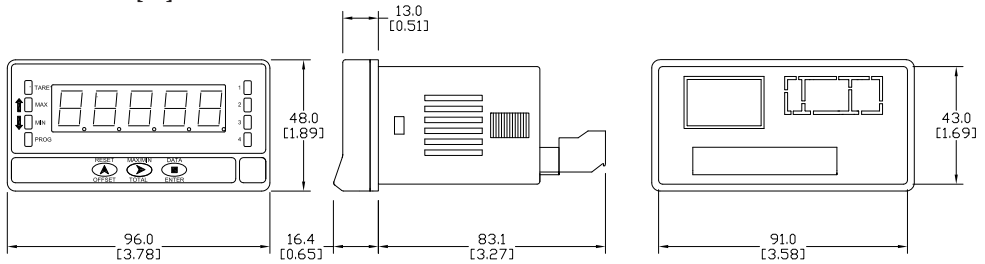
The ProSense DPM3-P series offers a simple, feature packed digital display for counter, chronometer, frequency, tachometer, rate, and pulse width modulated (PWM) applications. The DPM3-P has a 5-digit, 14mm character height, tri-color red, green or amber LED, accepts input from AC voltage, magnetic sensors, NPN/PNP sensors, NAMUR sensors, TTL/24V encoders, or switched contacts, and provides selectable sensor excitation voltages. Models are available with two SPDT relay outputs that can be set to activate on an increasing or decreasing input signal with hysteresis or time delay operation in tachometer, rate, and frequency modes as well as pulsed or latched operation in counter and chronometer modes. Additionally the display color can be set to change on relay operation. Models are also available with a 4-20mA analog output. The meter is powered from an external AC or DC power supply. The 1/8 DIN housing is easy to install in a panel and the meter face has an IP65 rating. Configuration parameters can be totally or selectively locked out to prevent unauthorized or accidental changes to the meter's operation. Other features include memory and reset of minimum (valley) and maximum (peak) display values, start/stop in chronometer mode or stop in counter mode, and display brightness adjustment. ProSense digital panel meters are backed by a 3 year warranty.

- 96 x 48mm 1/8 DIN
- 5 digit (-99999 to 99999) tri-color (red, green, amber) LED display
- Selectable decimal point
- Counter/Chronometer/Frequency/Tachometer (RPM/Rate/PWM) modes
 - AC voltage
 - Magnetic sensor
 - NAMUR sensor
 - NPN/PNP sensor
 - TTL/24V encoder
 - Switched contact
- AC or DC powered
- Optional 4-20mA analog output
- Optional (2) Form C SPDT
 - Activation on increasing or decreasing input signal
 - Hysteresis or time delay operation (frequency and tach modes)
 - Pulsed or latch operation (counter and chronometer modes)
 - Display color change on relay operation
- Total or selective configuration lock out
- Programmable functions include:
 - Minimum (valley) and maximum (peak) value memory
 - Minimum (valley) and maximum (peak) value reset
 - Start/Stop in chronometer mode or Stop in counter mode
- Display brightness adjustment
- 3 year warranty

Dimensions and Mounting



Dimensions mm [in]



Installation

To install the meter, prepare a 92mm x 45mm panel cut-out and slide the unit inwards making sure to place the sealing gasket between the front side panel and the front bezel.

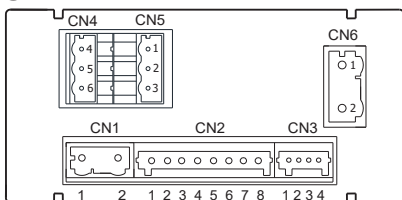
While holding the unit in place, put the fixing clips on both sides of the case and slide them through the guide tracks until they reach the panel at the rear side.

Press slightly to fasten the clips to the latching slots on the case and get the unit fully assembled and close fitted to achieve a good seal.

To remove the meter from the panel, pull the rear fixing clips latching tabs outwards until they are disengaged, then slide the fixing clips back over the case.

Installation	
Dimensions	96 x 48 x 83.1mm (1/8 DIN)
Panel Cutout	92 x 45mm (Max. panel thickness 10mm)
Case Material	Polycarbonate UL 94 V-0

Wiring Terminals



CN1			
AC Supply		DC Supply	
1	Line	1	VDC
2	Neutral	2	VDC

Polarity insensitive for DC power

CN3	
Logic Functions	
1	Common
2	Reset Process
3	Reset Totalizer
4	Hold

CN2	
Signal Inputs	
1	Not used
2	(+) 20V Excitation
3	(+) 8.2 V Excitation for NAMUR sensors
4	(-) Common excitation / signal
5	Signal B input
6	Signal A input
7	Not used
8	High voltage input (300VAC max.)

DPM3-P-A2R-H & DPM3-P-A2R-L

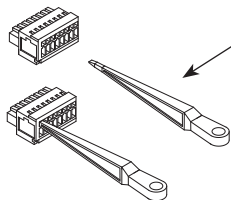
CN4		CN5	
Relay 2 SPDT		Relay 1 SPDT	
4	NO2	1	NO1
5	CM2	2	CM1
6	NC2	3	NC1

NO: Normally open, CM: Common, NC: Normally closed

CN6	
Analog Output	
1	(-) 4-20mA
2	(+) 4-20mA

Terminals					
Connector	CN1	CN2	CN3	CN4 & CN5	CN6
Wire cross section	0.08 to 2.5mm ² (28 to 12 AWG)	0.08 to 0.5mm ² (28 to 20 AWG)	0.08 to 0.5mm ² (28 to 20 AWG)	0.08 to 2.5mm ² (28 to 12 AWG)	0.08 to 2.5mm ² (28 to 12 AWG)
Strip length	8 to 9mm	5 to 6mm	5 to 6mm	8 to 9mm	8 to 9mm
Manufacturer	Wago 231-202/026-000	Wago 733-108	Wago 733-104	Wago 231-303/026-000	Wago 231-302/026-000
Cage clamp connection	Insertion tool or screwdriver with 0.5 mm x 3.0 mm blade	Insertion tool or screwdriver with 0.3 mm x 1.8 mm blade	Insertion tool or screwdriver with 0.3 mm x 1.8 mm blade	Insertion tool or screwdriver with 0.5 mm x 3.0 mm blade	Insertion tool or screwdriver with 0.5 mm x 3.0 mm blade

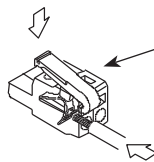
CN2 and CN3 Terminals



Insertion Tool (included with meter)

Insert wires into the proper terminal while using the insertion tool to open the clip inside the connector. Release the insertion tool to fix wire to the terminal.

CN1, CN4, CN5 and CN6 Terminals



Insertion Tool (included with meter)

Insert wires into the proper terminal while using the insertion tool to open the clip inside the connector. Release the insertion tool to fix wire to the terminal.

Refer to the instructions in this manual to preserve safety protections.



WARNING: If this instrument is not installed and used in accordance with these instructions, the protection provided against hazards may be impaired.

To meet the requirements of EN 61010-1 standard, where the unit is permanently connected to main supply, it is obligatory to install a circuit breaking device easily reach by the operator and clearly marked as the disconnecting device.

To guarantee electromagnetic compatibility, the following guidelines should be kept in mind:

- Power supply wires should be separately routed from signal wires and never run in the same conduit.
- Use shielded cable for signal wiring.
- Cables section should be $\geq 0.25 \text{ mm}^2$.

Before connecting signal wires, signal type and input range should be verified to be within the right limits. Do not connect simultaneously more than one input signal to the meter.

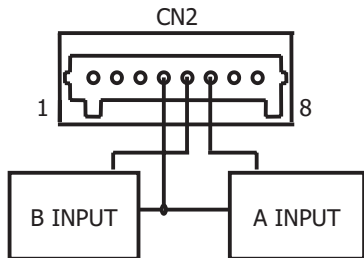


CAUTION: Connect only one input signal range to the meter. Hazardous signal levels may be present on unused inputs.

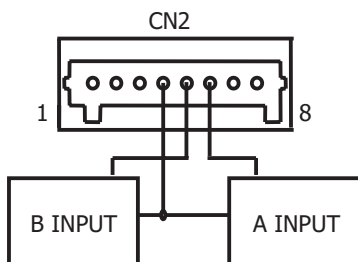
CAUTION: All outputs are optoisolated with respect to input signal and power supply. 2500Vrms for 1 minute to signal terminals (CN2) and relays terminals (CN3 or CN4) and 2500Vrms for 1 minute to signal terminals (CN1) and relays terminals (CN3 or CN4). Be certain that the ratings are not exceeded, voltages should be verified by a high-voltage meter before wiring the meter.

Wiring Examples

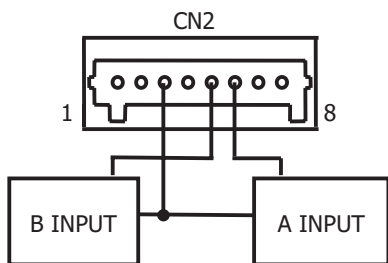
MAGNETIC SENSOR



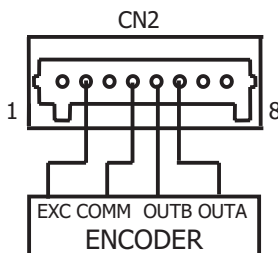
SWITCHED CONTACT



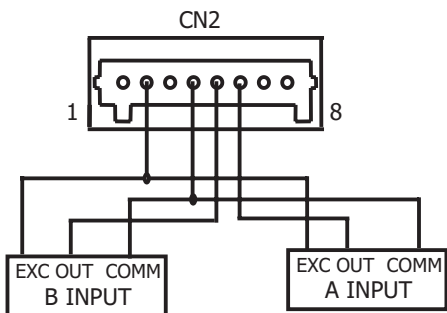
NAMUR SENSOR



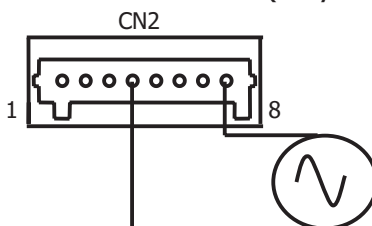
ENCODER



PNP/ NPN SENSOR

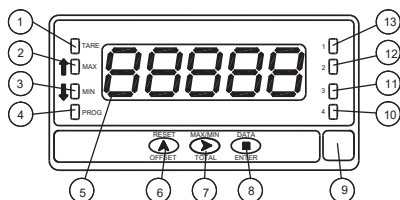


10- 300 Vac (only 1 input)



WARNING!:
Never connect a dangerous voltage
to PIN 4 of CN2 (input common).

Display and Keypad



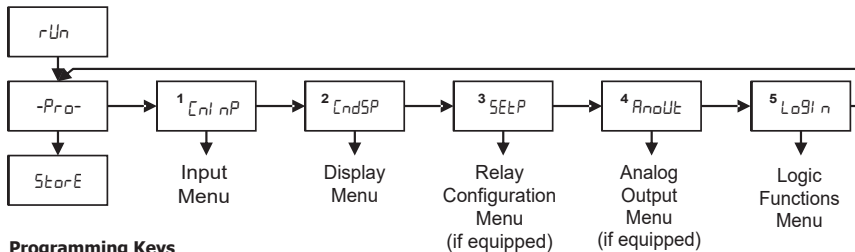
Programming Panel			
#	Description	Run Mode	Programming Mode
1	TARE	Indicates that there is an offset value programmed	---
2	MAX	Solid indicates rotation sense or count polarity; Blinking indicates visualization of a Max value	Indicates rotation sense (polarity)
3	MIN	Solid indicates rotation sense or count polarity; Blinking indicates visualization of a Min value	Indicates rotation sense (polarity)
4	PROG	---	Indicates programming mode
5	DISPLAY	Displays the input variable	Displays programming parameters
6	RESET/OFFSET KEY	In Tachometer mode reset of MAX/ MIN/ TOTAL (if present on display) In Counter mode Reset / OFFSET (starts measuring)	- To increase blinking digit value - Direct access to Setpoints value
7	MAX-MIN/TOTAL KEY	1 st push allows TOTALIZER visualization (if activated) 2 nd push allows Max visualization (only Tachometer) 3 rd push allows Min visualization (only Tachometer) Following push: back to current value.	To move blinking digit
8	ENTER KEY	To enter programming menu or to visualize parameters if programming is locked	- To step forward in programming menu - To validate programmed values - To exit programming menu
9	Free space for units label	---	---
10	LED Output 4	---	---
11	LED Output 3	---	---
12	LED Output 2	Activation Output 2	Programming output 2
13	LED Output 1	Activation Output 1	Programming output 1

Configuration

When power is applied to the meter, a display test begins automatically to check the function of the LED's and digits. Once this test is finished the display shows the internal software version and then the unit goes to **RUN** mode.

Configuration follows a structure composed of a number of menus and submenus. By pressing the **ENTER** key, the display show "**Pro**". Pressing the **SHIFT** key repeatedly provides access to the main menu level which includes menus for input configuration (**CnInP**), display configuration (**CndSP**), relay configuration if present (**SEtP**), analog output configuration if present (**AnoUt**), logic functions configuration (**LoGIn**). Press **ENTER** to access the submenus under each main menu.

If configuration has been totally locked-out, when pressing **ENTER** to access the main menu level, the display shows **dAtA** instead of **Pro**. This indicates that it is only possible to see programmed information and that it is not allowed to modify any parameter from the entire configuration. In this visualization mode, the meter automatically switches back to **RUN** mode after 15 seconds since the last key press.



Programming Keys

- ▣ **ENTER**: Vertical displacement.
- ▲ **UP**: Changes active digit.
- ▶ **SHIFT**: Horizontal displacement.

The progress through the programming routines is done by pressing **ENTER** key. In general, push **SHIFT** key a certain number of times to select an option and push **ENTER** key to validate the change and move forward to the next step of the program.

Programming numerical values

When the parameter is a numerical value, the display will show the first of the digit to be programmed blinking.

Digit selecting: Press repeatedly the **SHIFT** key to shift from left to right over all the display digits.

Changing the digit value: Press repeatedly the **UP** key to increase the value of blinking digit until it has the desired value.

The minus sign is programmed depending on the variable type. A variable that represents the value of an input will be able to take a value in the range -99999 to 99999, without taking into account the decimal point. When a digit is selected it shows values from (0) to (9), and then (-1), (-), and comes back to show values from 0 to 9. A variable that represents a display value

will be able to take a value in the range -99999 to 99999, without taking into account the decimal point. In these case the first digit shows 0, 1, -1, 2, 3 or -.

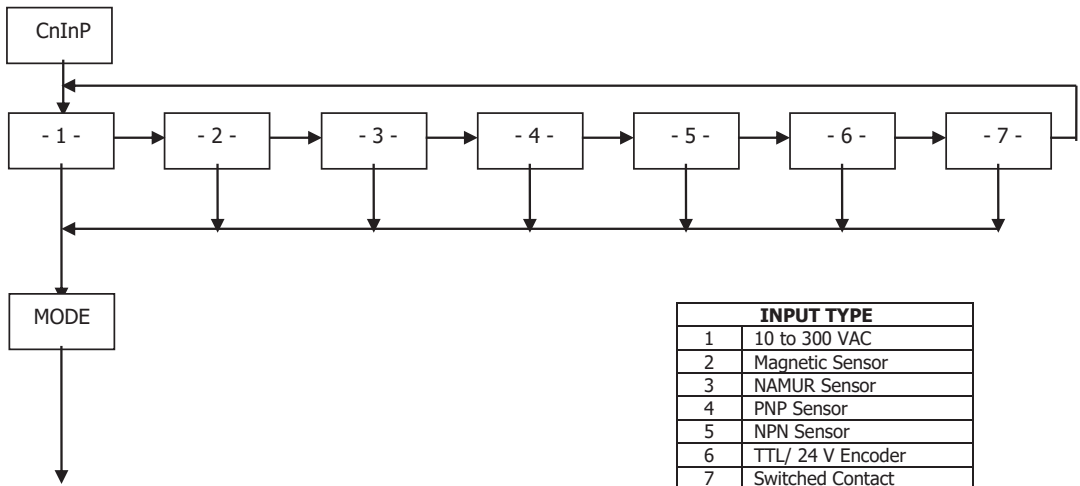
Completion of each submenu routine returns the meter to **Pro** mode. To save data entered or changed during configuration press the **ENTER** key while in **Pro** mode. **StorE** will be displayed for a few seconds while all of the configuration data is stored in memory. The meter will then return to **RUN** mode.

Input Configuration

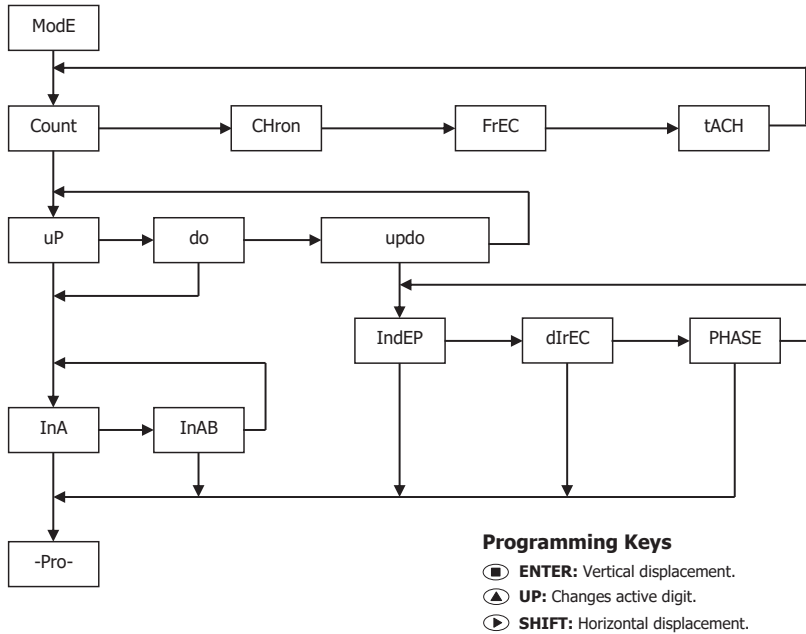
The figure below shows the input configuration menu. The Input Type table is used to correlate the integer assigned to that input type. After selecting the input type, the mode and its corresponding settings are selected.

Programming Keys

- ▣ **ENTER**: Vertical displacement.
- ▲ **UP**: Changes active digit.
- ▶ **SHIFT**: Horizontal displacement.



Counter Mode Programming Diagram



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 on the rising edge, except for type 5 (NPN) and type 7 (Switched contact) that detect the falling edge, and immediately update the value of the counter and the status of the alarms if existed.

The display refreshes every 100 ms.

In a power loss, the meter saves the count value reached internally.

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 totalizer option is enabled, there are PROC and TOTAL variables.

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 meter exceeds 99999, it shows oVEr, and when it falls below -99999, it shows -oVEr.

The positive sign is indicated by the red LED Up arrow located on the left side of the display and the negative sign is indicated by the red LED Down arrow located on the left side of the display.

The decimal point can be located in any of the digits of the display.

Total: The limits are 99999999 and -99999999. When the meter exceeds these limits the display shows the indications oVEr or -oVEr.

The negative sign, when the value has less than five digits, appears in the most significant digit of the display. The negative sign is indicated by the MIN LED.

When the total value has more than five digits, the display alternates the 4 digits high order part and the 4 digits low order part (the letters 'H' and 'L' in the auxiliary digit indicate which part is on display).

The decimal point can be located in any of the digits of the low part.

Counter Mode Programming

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

Counter Modes

uP: Up count

do: Down count

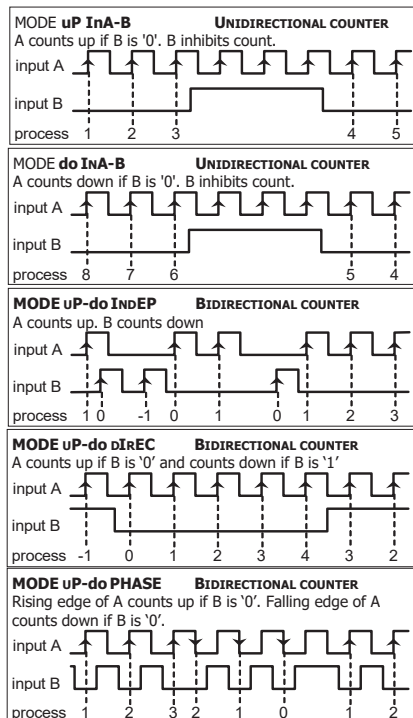
In-A: Allows count on A input regardless of input B

InA-B: Pulses applied at the A input are added or subtracted to the count display if the B input is at low level and being used as inhibited input

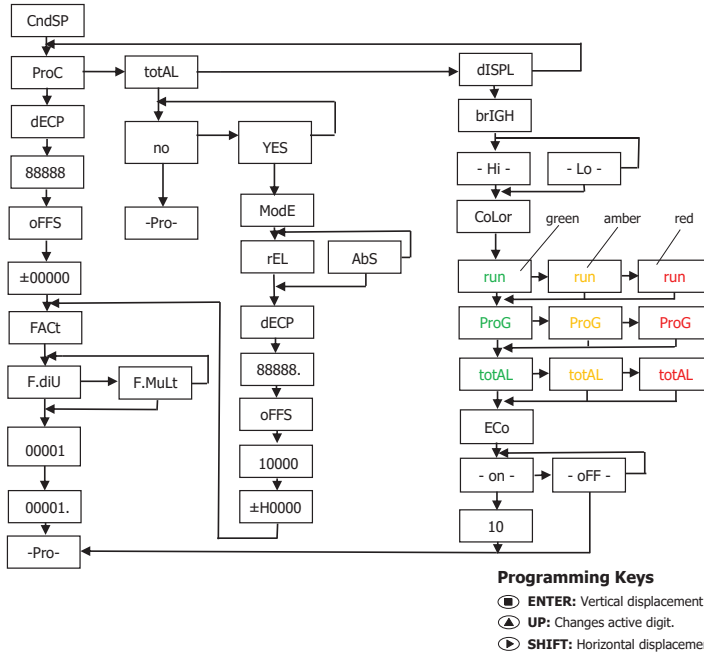
uP-do IndEP: Pulses applied at the A input are added to the count display while pulses at the B input are subtracted

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



Counter Mode Display Programming Diagram



Process Variable Options

Decimal Point

The decimal point indication helps to read the display in the desired engineering units. The decimal point has no real value, i.e. 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 length 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 the counter takes in a reset event. By default it is zero. Configurable in the menu ProC and **total**.

Multiplication / Division Factor

The Multiplication factor (**F.MuLt**) or divisor (**F.dIU**) is programmable from 0.0001 to 99999.

(It is not possible to program a factor = 0).

After programming the value including decimals, press **ENTER** and the intermittent decimal point will appear to place your position on the display.

Totalizer Option

The totalizer is optional and has a decimal point and multiplying factor independent of the partial counter. The totalizer indication range is from 99999999 to -99999999. The decimal point has a maximum of five positions, from digit 0 to 4. The multiplying factor is programmed in the same way as that of the partial counter (0.0001 to 99999). The totalizer has a programmable offset.

The number of inputs, mode and counting direction are those that have been selected for the partial counter. Each pulse increases exactly both counters, although the indication can vary from one to another if the multiplying factor is different.

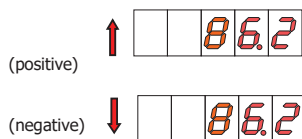
Totalizing Operating Modes: relative or absolute Relative (**rEL**): Same as partial counter operation. Absolute (**ABS**): Always add input impulses

Visualization of the Totalizer

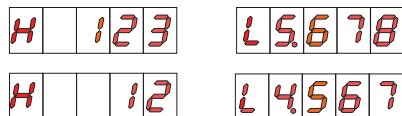
Pressing the TOTAL key, if it is activated, will present in the format indicated below the total value accumulated since the last reset.

Display Format (Totalizer)

When the value does not exceed five digits, the red LED will be ON next to the up arrow for positive or the red LED will be ON next to the down arrow for negative.



When the accumulated value exceeds four digits, the display alternates a 4 digit high order part (with the letter 'H' in the auxiliary digit) and a 4 digit low order part (indicated by the letter 'L' in the auxiliary digit).



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

Other Display Options

In the sub-menu (**dISPL**) the following display modes can be selected:

Brightness: Hi (normal luminosity) / **Lo** (low luminosity)

Color: It is possible to assign a different color to:

(run) process display

(totAL) display totalizer

(ProG) display programming

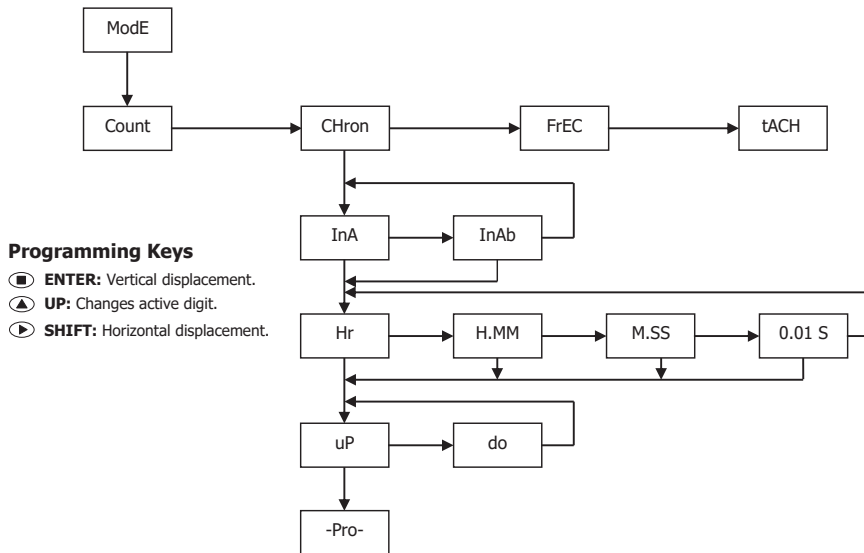
Selected by the **▶** key the desired color.

ECO: In ECO mode the display will turn off in the preset interval for energy saving.

If you select (On) when you press **⏻**, two digits appear with the time in minutes that it will take the display to go off if you have not acted on any key. This time can be modified up to 99m with the **▲** and **▶** keys.

To accept the value press **⏻** and we will return to Pro.

Chronometer Mode Programming Diagram



Chronometer Mode Display Programming

Same as Counter mode, except that:

- 1 - in PrOC> neither the decimal point nor the multiplying factor are activated
- 2 - in totAL> the sign LEDs of the offset are not activated
- 3 - in totAL> the counting mode rEL / AbS does not appear

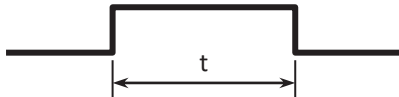
Chronometer Configuration

Inputs

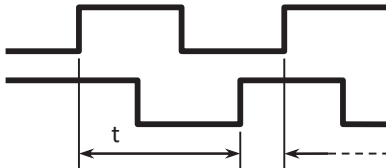
The meter has two inputs for the START and STOP signals that provide different types of time measurement.

There are two selectable operating modes:

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



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 quartz crystal 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 set to zero in a RESET operation.

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

The measured value, and the alarms if they exist, is updated in each minimum unit of the selected magnitude. Display refresh: every 100ms.

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.

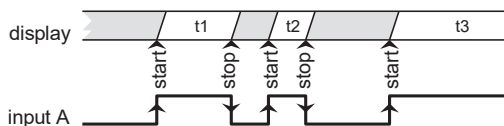
Offset

An offset value can be programmed for example to count down to zero from the preset time value.

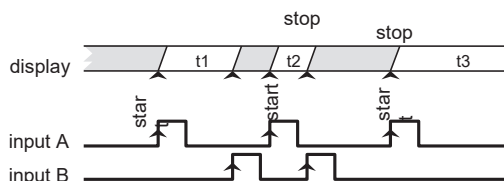
Run Mode Programming

Start and Stop modes Mode In-A

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



MODE In-AB START on rising edge of 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 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 value reaches 0, the display remains at zero.

Time Range

There are four selectable time ranges:

Hr 99999 h (hours)

H.MM 999 h 59 m (hours and minutes)

M.SS 999 m 59 s (minutes and seconds)

0.01-S 999.99 s (seconds with hundredths)

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).

In a scale change or power failure, the indicator saves the value registered on the display and also the fraction of time that was accumulated internally with the following resolutions:

Hr 1 second

H.MM 1 second

M.SS 0.1 second

0.01-S 0.01 second

Frequency and Tachometer Modes Configuration

Inputs

In frequency and tachometer modes 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 “Process Variable Options”).

Totalizer

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

Direction of Rotation Indication

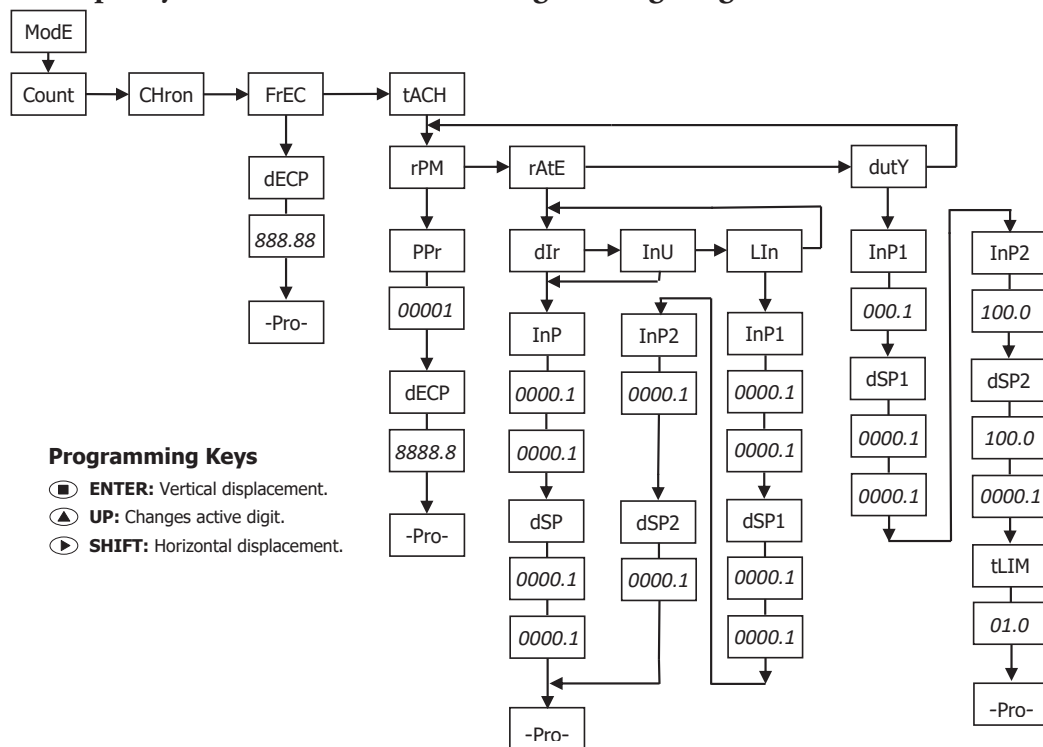
Direction sensing indication is a matter of simply setting the totalizer to read UP/DOWN direction (modes PHASE and dIREC).

The direction of rotation is denoted by the LED's MAX and MIN on the left of the display. LED MAX illuminates when the totalizer counts in the up direction, so it can be associated to a “positive” rate.

LED MIN 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.

Frequency and Tachometer Modes Programming Diagram



Programming Keys

- ▣ **ENTER:** Vertical displacement.
- ▲ **UP:** Changes active digit.
- ▶ **SHIFT:** Horizontal displacement.

Frequency and Tachometer Configurations

Frequency

To use this meter as frequency indicator, select directly the frequency input.

Decimal Point

The only parameter to select in this input menu is the position of the decimal point, which can be 0, 1 or 2.

Tachometer RPM

An indicator of angular speed expressed in revolutions per minute. The parameters to enter are the number of pulses per revolution and the decimal point.

PPR (Pulses per Revolution)

As PPR, the actual number of pulses provided by the sensor in one complete revolution must be programmed.

Decimal Point

The decimal point to be programmed in this step is the one that will be displayed which, combined with the Multiplication / Division factor, will allow the indication in units other than rpm, if necessary.

Tachometer Rate

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

Select Scale Direct, Reverse or Linear

Direct scaling. The frequency-display relationship is directly proportional, that is, the higher the frequency, the greater the display and the lower the frequency the lower the display. **Reversed scaling.** The frequency-display relationship is inversely proportional, that is, the higher frequency the smaller the display and vice versa.

Linear scaling. The scale is defined between two points, therefore it does not necessarily pass by zero.

Input Frequency. For scaling purposes, the input frequency can be any value within the display range. The decimal point can be placed in the digit 0, 1 or 2.

Desired Display. The value to be programmed in this step is the display value corresponding to the frequency programmed in the previous step.

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

Example of Scaling in Rate Mode:

Loaves of bread are transported on a conveyor belt and into 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 helps point out 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:

$\text{rpm} * \pi * \text{diameter} = 300 * \pi * 20 = 18849.6 \text{ cm/min}$ which is in m/s, 3.142m/s.

Parameters to Program:

Rate Mode:	Direct
Input Frequency:	30
Desired Display:	03142
Decimal Point:	03.142

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 bake 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)

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 $10 \times 60 = 600$ loaves per hour.

At a frequency of 30Hz, the daily production is $600 \times 24 = 14400$ loaves/day.

Parameters to Program:

Rate Mode: Direct
 Input Frequency: 30
 Desired Display: 14400
 Decimal Point: NO

Tachometer Duty (PWM)

In the DUTY configuration, the tachometer is able to present a display proportional to the cyclic relationship of the input signal (t on / t off)

Duty Mode Programming

The programming sequence is similar to that of any analog input, introducing a pair of values for the input (InP1 and InP2) to which correspond a pair of display values (dSP1 and dSP2).

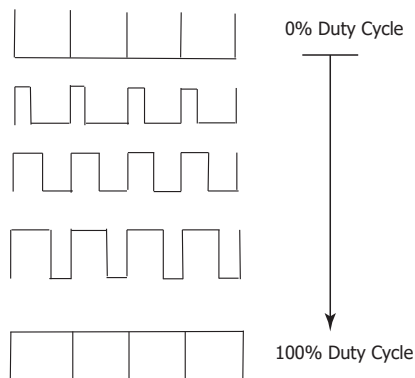
InP1 = Ton / toff value in point 1
 (programmable from 0 to 100.0%)

dSP1 = Display value for point 1 (programmable from 0 to 99999 plus decimal point position)

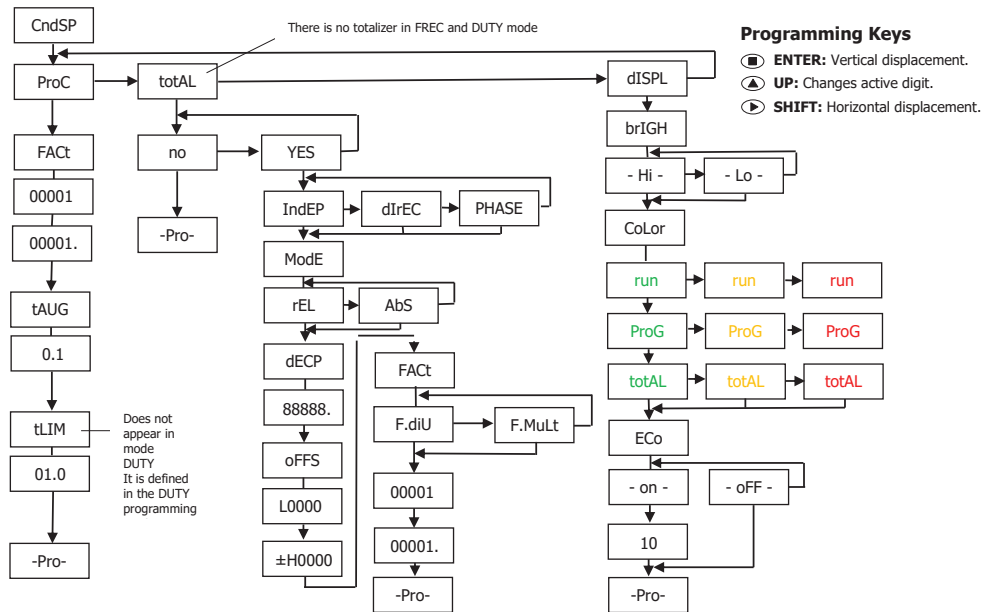
InP2 = Value of ton / toff in point 2
 (programmable from 0 to 100.0%)

dSP2 = Display value for point 2 (programmable from 0 to 99999)

Modulation of the cyclical relationship (duty cycle)



Frequency and Tachometer Modes Display Programming Diagram



Process Variable Options

The menu **ProC** in the module **CndSP** contains various parameters for scaling and filtering the display.

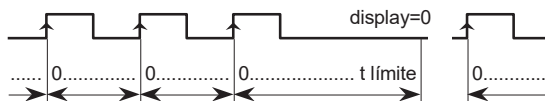
Scale Factor (FACT)

The scale factor is programmable between 0.0001 and 99999 and multiplies or divides depending on if it is higher or lower than 1

Time Limit

The time limit, programmable from 1 to 99.9 seconds, is the amount of time that the meter waits for at least one pulse 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 meter 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 0.1 Hz and with a time of 1s, frequencies under 1Hz).

Average Time (tAVG)

The meter can display all the readings at a rate of 10 per second (the display refreshes every 100ms) or an average of the readings made during a programmable time: the AVERAGE TIME.

The average time is programmable from 0 to 9.9 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 read out the average of about 100 readings

IMPORTANT: To have direction of rotation indication, it is necessary to activate the totalizer (option YES in total)

The positive sign indication occurs when the pulses that are applied to the device cause an increase in the counter, and the negative sign when the counter is decremented.

A change of direction of rotation is materialized in the display, that is, the MAX and MIN LEDs are exchanged, when at least two consecutive pulses are produced in the opposite direction to that indicated by the previous pulses.

Decimal Point

The situation of the decimal point facilitates the reading of the display in the desired engineering variables.

Its position has no value, that is, the digits to the right of the decimal are not, in principle, decimals, although it is possible to combine multiplying factor and decimal point of the display to obtain fractional measures.

Multiplication / Division Factor

The Multiplication / Division factor is programmable from 0.0001 to 99999. It has its own decimal point, which makes it possible to program any value within that range regardless of the position of the decimal on the display. When the factor is less than zero, it acts as a divisor, while if it is higher, it acts as a Multiplication.

Reset Key

The RESET key allows, in **Tachometer mode**, setting the Max and Min memories to the current value.

To set the MAX or MIN value to the current value, the value you want to reset must be showed on display and pressing on the reset key will erase this value.

To reset the **totalizer** it is necessary to recall the TOTAL variable on display pressing TOTAL key and then press RESET.

Clear to zero the variable present on display is carried out when releasing the RESET key; being then reinitiated the count, in **counter** mode or **chronometer**, from zero or offset.

The RESET key will not operate if in the program lock-out routine its corresponding step is activated.

Total, Max and Min Visualization

In **tachometer mode** one push on the MAX/ MIN key shows, when activated, the total value in the programmed color; next push shows the peak value with the flashing led MAX indicator; next push shows the valley value with the flashing led MIN indicator; another push brings us back to current value indication.

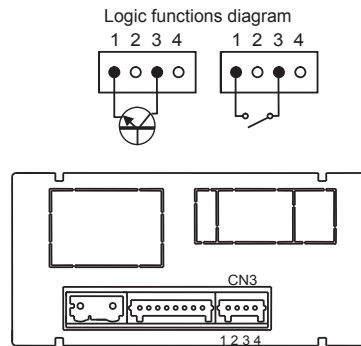
Logic Functions

The connector CN3 provides 3 optocoupled inputs that can be operated from external switches. Three different functions may be assigned to the inputs using the front panel keys. Each function is associated to a pin (PIN 2, PIN 3 or PIN 4) that is activated by applying an external switch closure with respect to PIN 1 or COMMON. Function assignments to the inputs are achieved through the programming of a number between 0 and 12 corresponding to one of the functions listed in the following table.

Factory Configuration

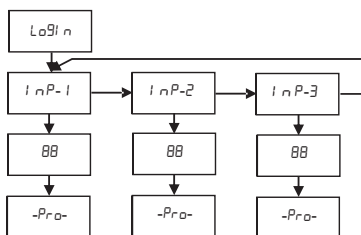
As shipped from the factory, the CN3 connector allows remote control of the PROCESS and TOTAL RESET functions as well as the HOLD function. When a HOLD is made, the display value remains frozen while the corresponding pin is activated. The HOLD state affects neither the meter internal operation nor the analog and relay outputs if present.

PIN (INPUT)	Factor Default Functions	Function
PIN 1	COMMON	
PIN 2 (INP-1)	RESET VARIABLES (ProC)	Function No. 3
PIN 3 (INP-2)	RESET VARIABLES (totAL)	Function No. 3
PIN 4 (INP-3)	HOLD	Function No. 6



The external electronics applied to the CN3 connector inputs must be capable of withstanding a potential of 40V / 20 mA present at all terminals with respect to COMMON. In order to guarantee the electromagnetic compatibility please refer to the connection instructions in the Wiring Terminal section.

Logic Functions Menu



Programming Keys

- ⏏ **ENTER**: Vertical displacement.
- ⬆ **UP**: Changes active digit.
- ⬇ **SHIFT**: Horizontal displacement.

If the selected function is number 03, the value of the variable to reset must be selected. Another digital input can be assigned to the same function but that acts on another variable, as has been done in the Factory programming: InP1 = Reset PROCESS, InP2 = reset TOTALIZER

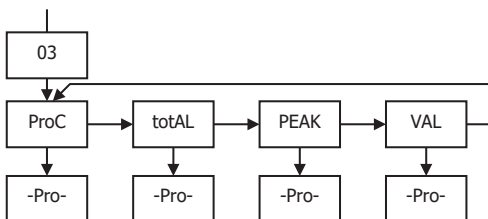


Table of programmable functions

- **No.:** Number to select the function.
- **Function:** Function name.
- **Description:** Description and characteristics of the function.
- **Activation by:**
 - Falling edge:** the function is activated applying a falling edge to the corresponding pin with respect to common.
 - Low level:** the function will remain activated as long as the corresponding pin is held at a low level.

No.	Function	Description	Activation By
0	Deactivated	None	None
1	OFFSET	Take the value of the display as offset	Falling edge
2	RESET OFFSET	Reset the offset memory	Falling edge
3	RESET VARIABLES	Resets the value of the variable (ProC, totAL, PEAK, VAL)	Falling edge
4	SEE VARIABLES	Displays the value of the variable (ProC, totAL, PEAK, VAL)	Low level
5	Deactivated	None	None
6	HOLD DISPLAY	Fix the display value	Low level
7	BRIGHTNESS	Changes the brightness of the display alternating between Hi and Lo	Low level
8	COLOR	Change the color of the display (RED, GREEN, AMBER)	Low level
9	SETPOINT / OFFSET VALUE	Presents the value to program in (OFFSEt, SET1, SET2) In this mode, the input also acts as an ENTER key	Falling edge
10	FALSE SETPOINTS	Simulates that the meter has an option of 4 setpoints installed	Low level
11	REMOTE KEYBOARD*	InP1 = ENTER, InP2 = SHIFT, InP3 = UP	Low level
12	START / STOP	Start / Stop Chronometer in A mode, or Stop Counter / Totalizer	Low level

* All 3 logic inputs must be programmed with function 11.

Configuration Lock Out

The meter is delivered with the programming not locked out, giving access to all the programming levels. Once completed the meter programming the following security measures are recommended:

1. Lock out the programming access to prevent from programmed parameters modifications.
2. Lock out Keypad functions to prevent from accidental modifications.
3. There are two lockout modes: selective and total. If the parameters are going to be readjusted frequently, make a selective lockout. If no adjustment is going to be made, make a total lockout. Keypad functions lockout is always possible.
4. The access to the lockout routine is allowed by entering a personalized. If the factory set code is changed it is recommended to write down your personalized code and keep it in a safe place.

TOTAL LOCKOUT

The access to the programming routines to read data is allowed even if all parameters are locked out totLC=1, 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-”.

PARTIAL 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- “.

Menus or submenus that can be locked out are:

- Relay 1 configuration (SEt 1). If present in meter.
- Relay 2 configuration (SEt 2). If present in meter.
- Input configuration (InPut).
- Display (diSP).
- Display color (CoLor).
- Relay setpoints value (SPVAL). If present in meter.
- Analog output configuration (Anout). If present in meter.
- Logic inputs configuration (LoGIIn).
- Reset of the process variable (rES P)
- Reset of the variable Totalizer (rES t)
- Direct access to MAX. and MIN values (MAHMn).

Lock-out menu diagram

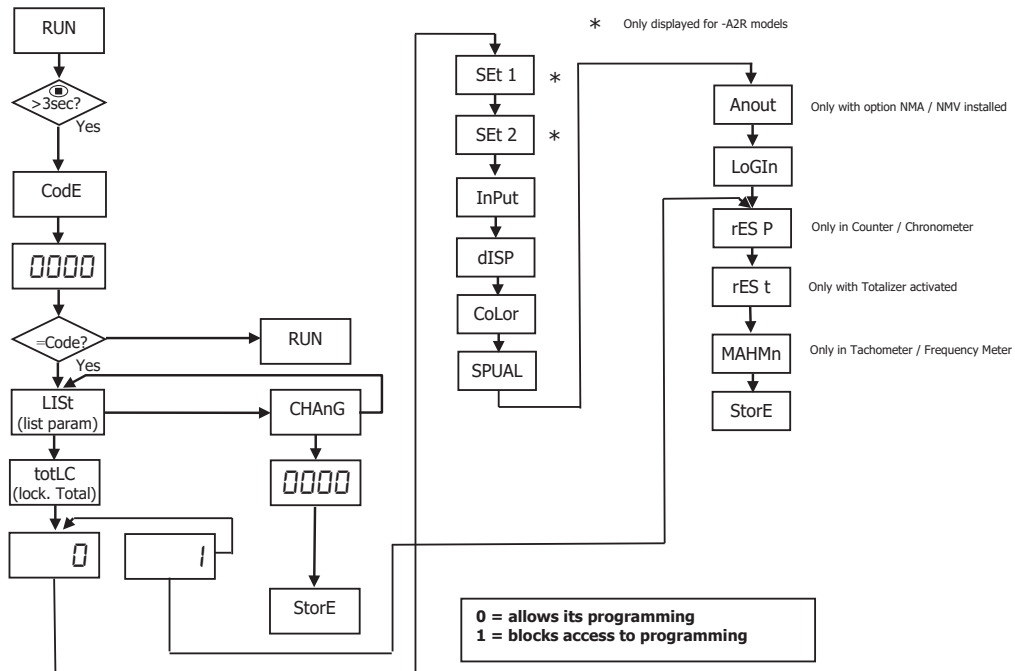
The following figure shows the lock-out menu. The access to this menu is accomplished from the run mode by pressing the **ENTER** key for 3 seconds, until the “**CodE**” indication appears. The meter is shipped from factory with the following default code: “**0000**”. Once this code is entered, the **LISt** indication will appear, from which lockout parameters will be entered. Accessing the “**CHAnG**” menu a new personal code is entered. Write down and keep this code in a safe place (**Do not count on your memory**).

If an incorrect code is entered, the meter will return automatically to the run mode. Total lockout programming is achieved by changing the “**totLC**” variable to 1, changing it to 0, will lead to the selective lockout of the programming variables. Programming each one of the parameters to 1 will activate the lockout, if they are set to 0 programming will be accessible. Though the programming is locked out, it remains possible to visualize the current programming.

The “**StorE**” indication informs that the modifications effectuated have been stored correctly.

Programming Keys

- ▣ **ENTER**: Vertical displacement.
- ▲ **UP**: Changes active digit.
- ▶ **SHIFT**: Horizontal displacement.



Output Options

All outputs are optoisolated with respect to input signal and power supply.

2500Vrms for 1 minute to signal terminals (CN2) and relays terminals (CN3 or CN4).

2500Vrms for 1 minute to power terminals (CN1) and relays terminals (CN3 or CN4).

Relay Configuration

Introduction

Some DPM3 models are equipped with 2 relays that can provide individual alarm and control capabilities. In frequency or tachometer modes the relays can be configured to function based on independent setpoint values within the full configured display range, time delay (in seconds), hysteresis (in counts of display) and selectable HI/LO/LO2 acting. If the Totalizer is active the relays can be configured to function in Independent, Reset, Stop, Clear, or Cascade Modes with HI or LO and pulsed or latched action.

In Counter or Chronometer modes the relays can be configured to function in Independent, Reset, Stop, Clear, or Cascade Modes with HI or LO and pulsed or latched action.

Alternatively Relay 2 can be set for Tracking Mode where SET2 acts as a notification that the value for SET1 is approaching. For example if SET1 is 10 and HI acting is selected a SET2 value of 3 would cause OUT2 to activate as the value increased to 7 and would remain active until it fell below the same value.

Description of Relay Operation

The relay outputs activate when the display value reaches the corresponding programmed relay setpoint value. The following relay operational parameters must also be set:

HI / LO / LO2 ACTING MODE.

In HI mode, the output activates when the display value exceeds the setpoint level and in LO mode, the output activates when the display value falls below the setpoint. LO2 behaves like LO mode but only after the value has risen above the setpoint on initial startup.

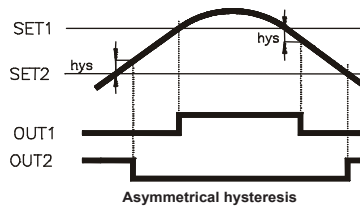
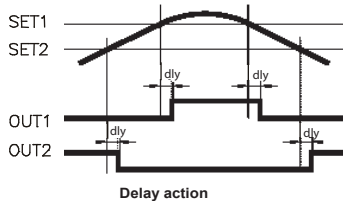
PROGRAMMABLE TIME DELAY or HYSTERESIS.

Each output action can be deferred by a programmable time delay or hysteresis level.

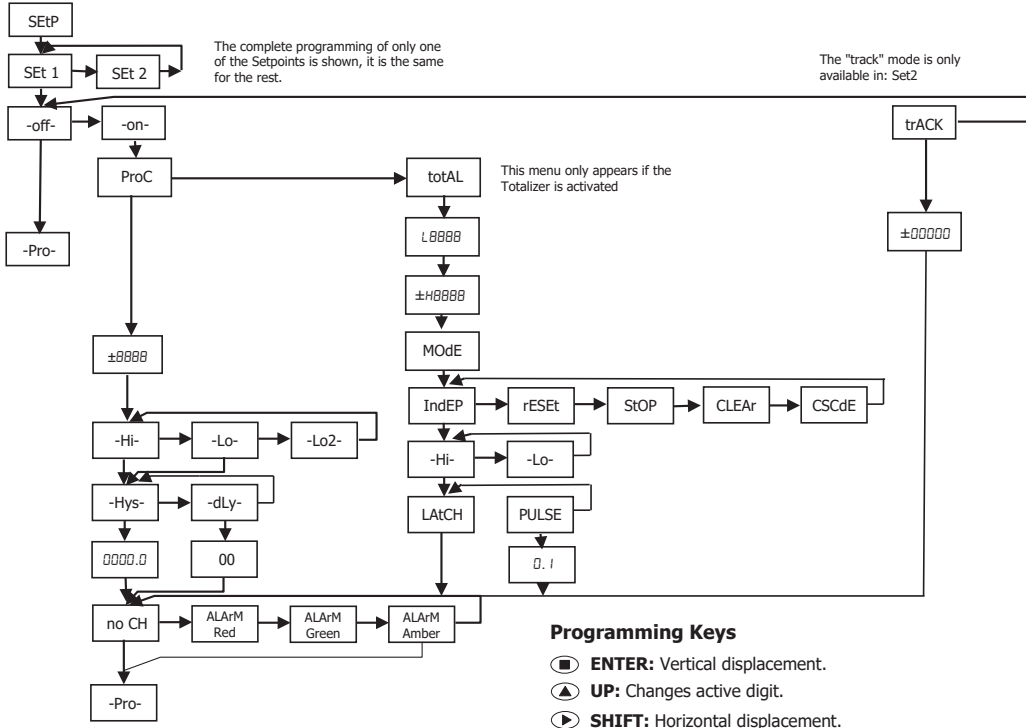
The time delay is the time that takes the output to activate after passing through the setpoint in the up or down direction, while the hysteresis band will be selected asymmetrical i.e. only acts on the output deactivation edge. The delay is programmable in seconds, from 0 to 99.

The hysteresis can be programmed, in counts, within the full display range. The decimal point appears in the same position as programmed in the display configuration module.

The figures show the time delay action (dly) and the hysteresis action (hys) of two alarms (SET1 and SET2) programmed to activate in HI mode (OUT1) and LO mode (OUT2)

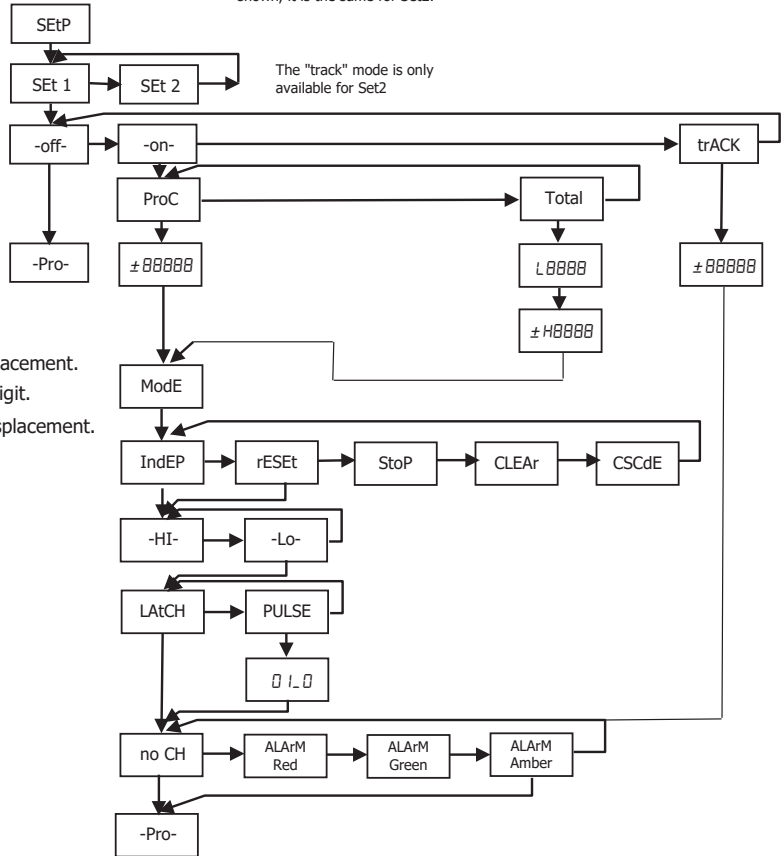


Relay Programming in Frequency or Tachometer Modes Diagram



Relay Programming in Counter or Chronometer Modes Diagram

The complete programming of only one of the Setpoints is shown, it is the same for Set2.

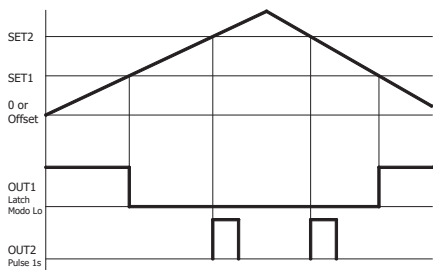
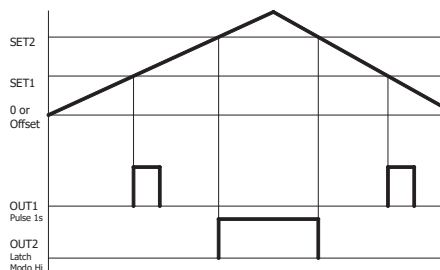


Programming Keys

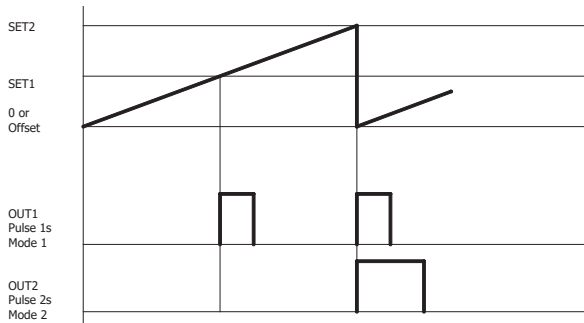
- ▣ **ENTER:** Vertical displacement.
- ▲ **UP:** Changes active digit.
- ▶ **SHIFT:** Horizontal displacement.

Description of Relay Operation in Counter or Chronometer Modes or with Active Totalizer in Frequency or Tachometer Modes

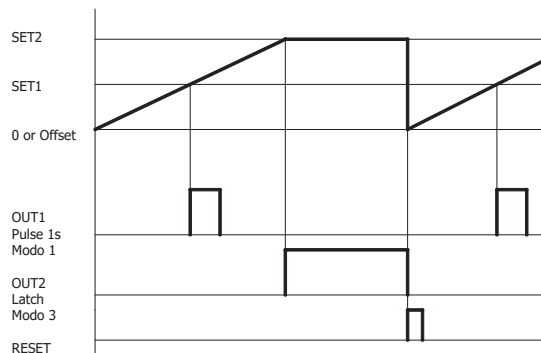
Mode 1 - IndEP: When the process or total counter arrives, (depending on the programming) at the set point value, the output is activated according to whether it is a pulse or a latch, whether it is lower or higher than the programmed value.



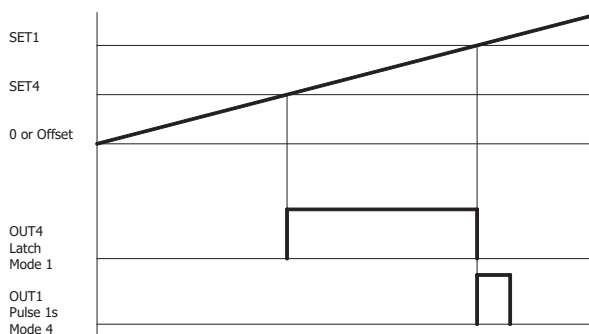
Mode 2 - Reset: The value of the variable to which the setpoint refers is set to zero (or the offset value) when the output is activated. In this mode, the output can not be programmed as a Latch



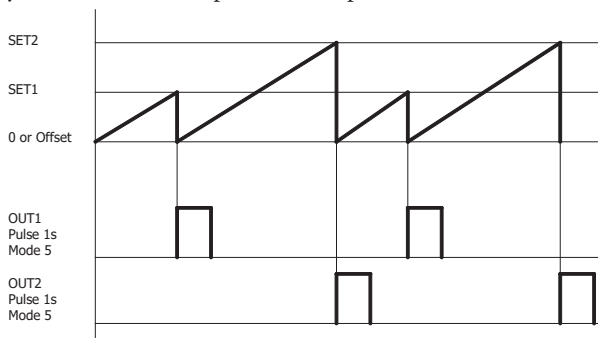
Mode 3 - Stop: The process counter or total (the one referred to the set point) if it is active is stopped when it reaches the setpoint. Counters are restarted when the counter to which the setpoint is referred is reset.



Mode 4 - Clear: The output is activated in latch or pulse mode when the setpoint is reached. The previous output is disabled in the order Set1, Set2, Set3, Set4.

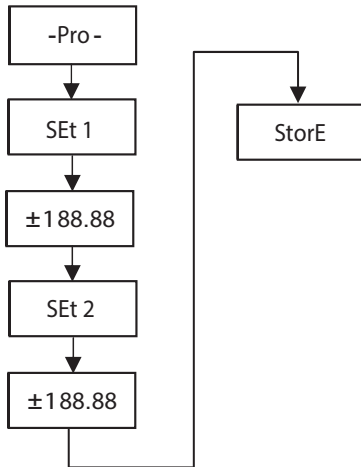


Mode 5 - Cascade: When the counter reaches the preset, the output is activated and the display is reset, then the operation is repeated with the following set points.



Direct access to the relay setpoints value programming

It is possible to directly access the relay setpoint values without the need to go through the programming menu just by pressing the **UP** key in **Pro** mode, as shown in diagram below. **Setpoints configured at “off” do not appear on the list”**.



Remember that the decimal point position is determined by what has been programmed during the meter input and display configuration.

Programming Keys

- ▣ **ENTER:** Vertical displacement.
- ▲ **UP:** Changes active digit.
- ▶ **SHIFT:** Horizontal displacement.

Analog output

Introduction

Some DPM3 models include an analog output (4-20 mA).

The output is optoisolated with respect to the signal input and the power supply.

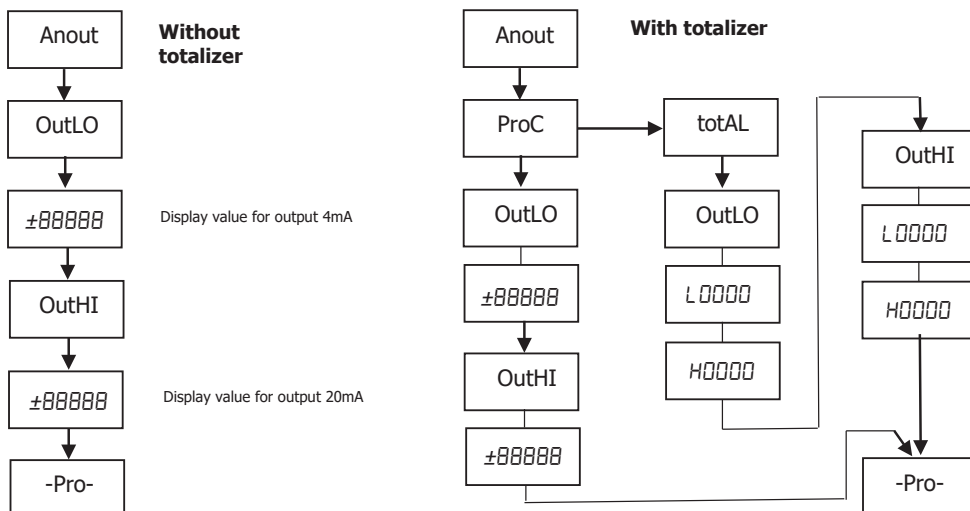
The meter provides a two terminal connector [(+) and (-)] that drives out a signal variation from 4mA to 20mA proportional to a user-defined display range.

The signal can be used to transmit display information to a variety of terminal equipment such as graphic recorders, controllers, remote displays or other devices that accept input data in analog form.

The display values producing the full scale output (**OUT-HI** and **OUT-LO**) are introduced via front-panel buttons.

The output signal can be set up for reverse action by programming the low display for the high output (**OUT-HI**) and the high display for the low output (**OUT-LO**).

Analog output menu diagram

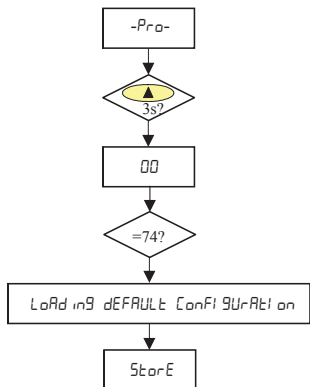


Programming Keys

- ▣ **ENTER:** Vertical displacement.
- ▲ **UP:** Changes active digit.
- ▶ **SHIFT:** Horizontal displacement.

Return to Factory Configuration

After accessing programming mode, **Pro** press and hold the up key for 3 seconds. Allows entering a code of access to the reset of the configuration parameters, this code is 74. When entering this code the meter shows the *LaPd nS dEFRAULt COnFi gURAtI on* legend, and then *StorE*, which means that they have been stored in the non volatile memory of the meter.



Factory configuration
 INPUT: Encoder /TTL (6), Count, uP-do, PHASE
 DISPLAY
 ProC no decimal
 Offset=0
 Multiplying factor= 1 no decimal
 Tot=YES no decimal
 Multiplication factor= 1 no decimal
 DISPLAY COLORS Run Mode: Green, Prog Mode.: Amber
 SETPOINTS
 Setpoint 1: 1000, Setpoint 2: 2000
 Mode: IndEP
 HI
 LAtCH
 Alarm Color: No Change
 ANALOG OUTPUT CONFIGURATION
 outHi: 1000
 outLo: 0000
 LOGIC FUNCTIONS PIN 2=function 3 (ProC)
 PIN 3=function 3 (totAL)
 PIN 4=function 6

Technical Specifications

Technical Specifications		
Tachometer/Frequency Mode	Maximum Frequency	20kHz (without totalizer) 8kHz (with totalizer) 1kHz (duty)
	Minimum Frequency	0.01 Hz
Counter Mode	Without totalizer	11kHz
	With totalizer	9kHz
AC Voltage Input	Range	10 to 300 VAC
Magnetic Sensor Input	Sensitivity	$V_{in} (AC) > 60\text{mVpp}$ for $f < 1 \text{ kHz}$ $> 120 \text{ mVpp}$ for $f > 1 \text{ kHz}$
NAMUR Sensor Input	R_C	3.3 k Ω
	I_{ON}	< 1mA DC
	I_{OFF}	> 3mA DC
NPN/PNP Sensors Input	R_C	3.3 k Ω
	Logic level "0"	< 2.4 VDC
	Logic level "1"	> 2.6 VDC
TTL/24V Encoder Input	Logic level "0"	< 2.4 VDC
	Logic level "1"	> 2.6 VDC
Switched Contact Input	V_C	5V (internal)
	R_C	3.9 k Ω
	F_C (auto selection of input type prog.)	20Hz with duty cycle 50% 10Hz with duty cycle 30%
Accuracy at 23°C \pm 5°C	Frequency / Tachometer	0.005%
	Chronometer	0.01%
	Temperature coefficient	50ppm / °C
	Warm-up time	5 minutes
Power Supply and Fuses	-H High Voltage: -L Low Voltage:	85-265 VAC 50/60 Hz or 100-300 VDC, (recommended fusing 0.5A/250V, 5mm x 20mm glass miniature or DIN 41661 equivalent) 22-53 VAC 50/60 Hz or 10.5 - 70 VDC, (recommended fusing 2A/250V, 5mm x 20mm glass miniature or DIN 41661 equivalent)
Power Consumption	5W, 8W for -A2R	
Sensor Excitations	8.2 VDC @ 30mA ; 20VDC (not stabilized) @ 100mA	

Technical Specifications Continued

Display	Type	5 LED digits 14mm (0.55") (Programmable color Red, Green, Amber)
	LEDs	8, functions and outputs status
	Decimal Point	Programmable
	Positive overflow indication	OvEr
	Negative overflow indication	-OvEr
	Counter display limits	Process -99999 to 99999
	Totalizer	-9999999 to 99999999
	Chronometer ranges	4, from 999.99s to 99999h
	Frequency ranges	0.01 Hz to 20kHz/10kHz (totalizer)
	Tachometer range	0 to 99999 (rpm), programmable (rate)
	Scale factor	Counter/Tach, programmable from 0.0001 to 99999
	Display update rate	Counter/Chronometer, 100ms Frequency/Tachometer, programmable 0.1 to 9.9 s
Relays -A2R Only	Maximum switching current (resistive load)	8A
	Maximum switching power	2000VA / 192W
	Maximum switching voltage	400VAC / 125VDC
	Contact rating	8A @ 250VAC / 24VDC
	Contact resistance	≤ 100mΩ at 6VDC @ 1A
	Contact type	SPDT
	Operate time	≤ 10ms
Analog Output -A2R Only	Type	4-20 mA Sourcing
	Maximum load	≤500Ω
	Resolution	13 bits
	Accuracy	0.1%FS ±1 bit
	Response time	50ms
	Thermal drift	0.5μA / °C
Environmental Conditions	Operating temperature	-10°C to +60°C (14°F to 140°F)
	Storage temperature	-25°C to +80°C (-13°F to 176°F)
	Relative humidity (non-condensing)	<95% @ 40°C (104°F)
	Maximum altitude	2000m
	Frontal protection degree	IP65
Environmental Air	No corrosive gases permitted	
Agency Approvals	CE	