

Digital Panel Meters Technical Information



Introduction

This section presents the full line of our digital panel meters with a general description of their working principles, main features and terminology used.

Working Principle

The main component in a digital meter is the Analog to Digital (A/D) converter. The digital indicator makes use of a special "Dual-slope" conversion technique. In a dual slope A/D converter, the unknown voltage (V_x) to be measured is applied to a capacitor creating an increasing slope as indicated in Fig. 1.

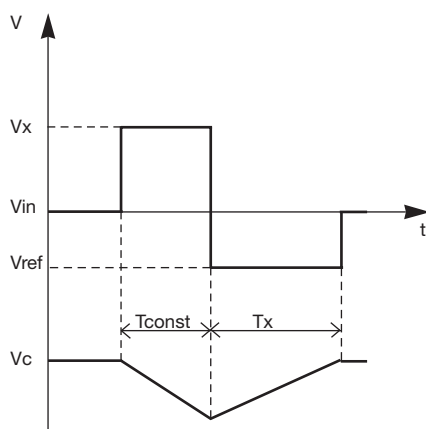


Fig. 1

Since the charging time (T) is kept constant by a time base, the voltage (V_c) across the capacitor is directly proportional to the value of the voltage signal (V_x). When the charging time is over, the capacitor is discharged through a constant voltage (V_{ref}), with opposite polarity, causing a decreasing slope. The discharging time is measured digitally, giving the value of the unknown voltage.

These converters provide a high degree of NMRR, thus ensuring correct measurements even with low-level signals. The sampling rate (no. of conversions per second) defines the measurement period over which the A/D circuit converts the input voltage. The typical sampling rate for these Digital Panel Meters is 4 times/second.

DI3 72 and DI3 DIN 3-dgt indicators

These are basic digital panel meters μ P-based for measuring main lines' electrical parameters, such as AC or DC current, voltage and frequency.

Housed in a DIN-rail mounting case (DI3 DIN) or in a standard 72 x 72 enclosure (DI3 72), these indicators perform a 3-digit measurement with a 0.5% accuracy.

For high current measurements, the multi-scale ammeters ensure maximum flexibility, enabling the user to connect the instrument to any current transformer or shunt rating 5 A/1 AAC or 60 mVDC.

The selectable primary current range, together with the programmable decimal point position, allows the same meter to be used for 13 different primary current values (from CT) and 15 different primary current values (from shunt).

The setting procedures are controlled by internal DIP switches, easily accessible from the front panel without removal of the panel meter.

LDI3, LDI35 3-dgt, 3-dgt with dummy zero, 3 1/2-dgt indicators and controllers

These digital panel indicators are DC or AC voltmeters, ammeters, ohmmeters, frequency meters, and thermometers.

All are housed in a standard 1/8-DIN plastic house, with a reduced depth of only 80 mm behind the panel. The shorter casing allows easy mounting operations and useful upgrading replacements of old equipment. All 48 x 96 mm houses are made of ABS, self-extinguishing according to UL 94-V0.

The meters are normally equipped with a screw-terminal connector. The front panel is removable from the meter to allow easy replacement of the label with the "engineering unit".

Furthermore, LDI35 is a new generation fully programmable μ P-based indicator or controller that allows, by means of the front keyboard, the selection of several working parameters like:

- The kind of read-out, 3-digits + dummy zero or 3 1/2-digits.
- The input range (mod. AV0, AV2, kind of probe for the temperature meter).
- The type of measurement AC or DC (AV2 model only).
- The scaling (electrical scale, displayed

- scale and decimal point position).
- The kind of setpoint control.
- The digital filtering.
- On request an IP 65 degree of protection is available to allow the instrument to be used in special environments.

LDI35 ammeters and voltmeters

With only two models (AV0, AV2) it is possible to cover most of the commonly used current and voltage measurement ranges.

LDI35 AV0 has been developed especially for process control applications, the five available input ranges in connection with the powerful scaling capability are the right measurement and displaying answers for the signals coming from signal transmitters like pressure, temperature, humidity etc. Besides, the excitation output 15 VDC/40 mA can also power these transmitters using a 2-, 3- or 4-wire system.

LDI35 AV2 with its AC/DC key-pad selection and the wide input ranges availability allows the management of all the signals coming from current transformers and voltage transformers as well. Furthermore the scaling capability and the read-out selection (3 1/2-dgt or 3-dgt + dummy zero) allow the user to display the measurement according to the primary of both CT and VT up to 9990 A or V.

LDI35 temperature controllers are designed for direct connection to the most common thermocouples and RTD's. They provide cold junction compensation and linearization with a read-out in $^{\circ}$ C or $^{\circ}$ F.

The resolution is 1° or 0.1° , selectable by means of key-pad depending on the scaling, type of sensor and input range. In addition to the standard "out-of-range" indications (over-range and under-range warnings), the temperature controllers can display a burn-out indication as diagnostic message of sensor anomaly. The up-scale or down-scale burn-out can also associate the activation of the alarm relay to the relevant display indication.

LDI3 frequency meters can measure an AC or a pulse input signal. The frequency meter display the number of cycles in a one-second time period (Hz).

Digital Panel Meters Technical Information (cont.)



Introduction (cont.)

MDI40 series µP-based controllers

A new revolutionary family of µP-based digital panel indicators/controllers has been created by Carlo Gavazzi to complete the existing wide range of digital panel meters. This family represents a "new generation" in the 48 x 96 mm range instruments being the result of the last ten-year experience of Carlo Gavazzi in the production of µP-based instruments. MDI40 will solve effectively the majority of the application problems in connection with measurement, control, and displaying of the most important electrical variables such as voltage and current, and physical variables, such as temperature. The electrical and mechanical features of MDI40 grant higher and better performances if compared with similar instruments in the market.

MDI40 gives you top quality features at low level price when compared with old generation, upper class and high-price instruments with similar features. MDI40 can in fact be used in a wide range of applications and allows at the same time specific and personalized measurement and control performances which were offered until today only by much more expensive instruments.

MDI40 can be mounted on the control panels of machinery, on electrical panels, in the industrial process and generally in all those industrial sectors where an accurate and reliable measurement is required together with an extended control of the measured variables.

MDI40 ammeter can be used to measure and manage "process signals" transmitted by local transmitters with outputs up to 20 mA for pressure, humidity, temperature measurements etc. or even to measure the signal transmitted by a current transformer.

MDI40 voltmeter, like MDI40 ammeter, allows to measure and manage both the process signals and the signals transmitted by a voltage transformer and obviously those measured by direct connection. MDI40A and MDI40V are equipped with a 15 V/40 mADC galvanically insulated excitation output for the 2-, 3-, or 4-wire power supply of the signal transmitters in the field. Furthermore, the possibility of equip-

ping these instruments with true RMS measurements, allows to manage those variables with many harmonics, and therefore distorted - variables which are more and more wide-spread in the industry. Normally these variables can be measured only very inaccurately with ordinary instruments, due to conditions such as inductive loads, inverters, switching power supplies, etc.

The MDI40 family is completed by the temperature measurement of thermocouples or thermoresistance signals. Thanks to the scaling expansion, it is possible to cover all the measurement ranges of the most common probes with a resolution up to 0.1°C/°F or, as it usually occurs, the standard 1°C/°F.

All the models of the new MDI40 family can be equipped with configurable analogue and/or serial RS 485 retransmission allowing an easy connection and processing of the field variable by means of PLC or personal computers.

The software filter satisfactory allows to solve the instability of the measured variable, especially when this variable varies cyclically first fast, and then slowly. Such a condition would normally neither allow a correct and effective management of the alarms nor a sufficient appreciation of the variable. Moreover, the software filter allows to expand the displayed scale over 10 times more than the electrical scale, while the displayed value remains constant.

WM1 µP-based energy meter

WM1-DIN is a 3-digit energy meter for the manual scrolling display of 8 different measurements (among the possible 12), to be carried out on single-phase or three-phase, balanced or unbalanced load systems (by means of **WATTSOFT** managing software). The µP and the front key-pad allow easy programming of all instrument settings.

WM1 makes it possible to monitor the power consumption of various types of users, such as offices, industrial plants, apartment buildings, camping sites, residential buildings, ports, tourist villages and so on. All you need to do is to connect the WM1 units, up to a maximum of 32 or 128 units

equipped with an RS485 serial interface, to a personal computer; the data transmitted to the instrument can be processed by means of **WATTSOFT**, a versatile, user-friendly software package.

EDM 35 Modular panel meter

The EDM 35 is a 3 1/2-digit, modular digital panel meter where input and output modules can be combined to suit many applications. Scaling and setpoints are fully programmable and the programming itself very user-friendly. Furthermore, the EDM 35 includes peak/valley function and password protection.

Additional interesting features of this product are:

- Programmable hysteresis and time delay (up to 2 setpoints).
- Data hold.
- Stock-saving - several ranges on each input module.
- Optional hardware lock of programming.

The housing is easy to mount and ensures a degree of protection of IP 65.

As a final note, it can easily be deduced that the "new generation" instruments by Carlo Gavazzi, that is the MDI40-, the LDI35-, the LDI3-, the WM - and the EDM35 series, are ideal for the industrial use, not only thanks to their electrical and software features, but also thanks to their solid front protection and the user-friendliness.

Digital Panel Meters

Technical Information (cont.)



Glossary

Accuracy

Is the largest error that is allowed under specific operating conditions. Expressed as percentage of the actual value plus the fluctuation (n° of digits) the indication. Acc. = $\pm x\%$ f.s. $\pm n$. dgt. Specifications for accuracy are valid at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

Display span

A specified display span (Lo-Hi) which corresponds to a specified electrical input range (LoE-HiE).

In a process meter, for direct read-out in engineering units the indication of 0-100 kg. (Lo-Hi) may correspond to an electrical input range of 4-20 mA (LoE-HiE).

In a temperature controller the display span defines the range of temperature (T1 to T2) at which the instrument may be set to control a specific process. For a standard "J"-type thermocouple controller, the display span can be set at 0°C to 100°C according to process requirements, while the instruments measuring range is -200°C to $+750^{\circ}\text{C}$.

Electrical input range

A specified signal range (LoE-HiE) at which the meter can be set. The 4 to 20 mA range is the electrical input range for a 20 mA input.

Hysteresis

In an ON-OFF controller it defines the difference between the two switching points.

It refers to the difference between the value at which the alarm switches on and the value at which the alarm switches off again.

Scaling

For direct read-out in engineering units, scaling is the capability of the meter to associate any desired value to the electrical input range.

Span adjustment

The adjustment of the maximum read-out, made either for scaling or calibrating an instrument.

SPDT

"Single pole, double throw" (with reference to the relay contact).

SPST

"Single pole, single throw" (with reference to relay contact).