Panel Meters and Controllers
Controller for Pulse Signals
Type MDI 40 TF

CARLO GAVAZZI

- **4-dgt multi-range µP-based controller**
- **2 independent measuring channels**
- **For rate, speed, frequency and period measurements**
- **Ranges from 0.001Hz to 50kHz/20µs to 1000s**
- **Programmable time base from 0.1 to 999.9s**
- **Programmable pre-scaler from 9999 x 10^{-9} to 9999 x 10^{9}**
- **Special calculation functions**
- **NPN, PNP, NAMUR, TTL, Pick-up, free of voltage contacts and AC signal inputs**
- **2 independent alarm setpoints**
- **Alarm for over-range, up-alarm, down-alarm, down alarm with disabling at power-on, up/down-alarm with latch**
- **Degree of protection: IP 65**
- **Optional analogue output (20 mA/10 VDC)**
- **Optional serial RS 485 output**
- **MODBUS, JBUS protocol.**

Product Description

4-dgt multi-range µP-based controller for rate, speed, frequency and period measurements.
Scaling and setpoints are fully programmable by user-friendly key-pad. The MDI 40 TF includes peak/ valley function and password protection. The housing is easy to mount and ensures a degree of protection of IP 65.

Ordering Key

MDI40TF1D2AXXIX

Model
Measurement
Power supply
Setpoints
Signal Output
Engineering unit
Option

Type Selection

Measurements

TF1: 0.001 Hz to 500 Hz
0.1 Hz to 50 kHz
for DC signals:
PNP, NPN
NAMUR, TTL,
free of voltage
contacts, voltages
up to 30 VDC

TF2: 0.001 Hz to 500 Hz
0.1 Hz to 50 kHz
for AC signals:
pick-up,
voltages up to
500 VAC

[1] On request

Power supply

A: 24 VAC, -15% +10%, 50/60 Hz [1]
B: 48 VAC, -15% +10%, 50/60 Hz [1]
C: 115 VAC, -15% +10%, 50/60 Hz [1]
D: 230 VAC, -15% +10%, 50/60 Hz (standard)
E: 120 VAC, -15% +10%, 50/60 Hz [1]
F: 240 VAC, -15% +10%, 50/60 Hz [1]
3: 9 to 32 VDC with galvanic insulation [1]
6: 40 to 150 VDC with galvanic insulation [1]

Signal output

X: None
A: Analogue: from 0 to 20 mA /from 0 to 10 V
R: Serial: RS 485 unidirectional
S: Serial: RS 485 bidirectional
W: Analogue (A) + serial (R)
Y: Analogue (A) + serial (S)

Options

IX: Degree of protection IP 65 (standard)
XT: Tropicalization + IP 65[1]

Input Specifications

Number of inputs	2 independent measuring channels
Rated input	
Frequency	0.001 Hz to 500 Hz (ON signal min. time duration: 500 µs) 0.1 Hz to 50 kHz (ON signal min. time duration: 9 µs)
Period	20 µs to 10 s (ON signal min. time duration: 9 µs) 2 ms to 1000 s (ON signal min. time duration: 500 µs)
Accuracy (@ 18 to 23°C)	
Frequency measurement	±0.001% rdg ± 3 dgt
Temperature drift	± 100 ppm/°C
Time base	Programmable from 0.1 to 999.9 s
Response time	Time base + ≤ 200 ms
Display	7-segment LED, h: 14.2 mm
Max. and min. indication	
DC	Max. 9999 min. -1999
AC	Max. 9999 min. 0
Type of input	
NPN (DC)	Signal level: ON < 2 VDC, OFF open collector (current leakage ≤ 1 mA)
PNP (DC)	Signal level: ON > 10 VDC, OFF open collector (current leakage ≤ 1 mA)

Input Specifications (cont.)

NAMUR (DC)	Signal level: ON ≤ 1 mADC, OFF ≥ 2.2 mADC
TTL (DC)	Signal level: ON > 4 VDC, OFF≤ 2 VDC
Free of voltage Contact (DC)	Input load: ON < 1 kΩ, OFF > 20 kΩ
Pick-up (AC)	Signal level: ON > 2 VAC, OFF < 1 VAC
Voltage (AC)	Up to 100 VAC, signal level: ON > 2 VAC, OFF < 1 VAC Up to 500 VAC, signal level: ON > 9 VAC, OFF < 6 VAC
Auxiliary commands	Available on the back screw terminal One input selectable as: display HOLD command or key-pad disabling
Activation time	Programmable from 20 ms to 255 ms
Key-pad	4 keys: “S” for menu selection; “UP” and “DOWN” for value programming/function selection; “F” for special functions.

Output Specifications

Alarms	
Number of setpoints	2 independent (standard)
Alarm types	Over-range, up alarm, down alarm, down alarm with disabling at power-on, up alarm with latch, down alarm with latch
Setpoint adjustment	0 to 100% of the displayed range
Limits of setpoint adjustment	Programmable minimum and maximum values
Hysteresis	0 to 100% of the displayed range
On-time delay	0 to 255 s
Off-time delay	0 to 255 s
Relay status	Normally energized/de-energized
Output type	
Contact	2 x SPST
Rating	5 A, 250 VAC/VDC, 40 W / 1200 VA, 130.000 cycles
Min. response time	≤ 400 ms, filter excluded, set-point on-time delay: “0”
Insulation	See the relevant table
Excitation output	
Voltage	15 VDC non-stabilized/40 mA max. (60 mA @ 12 VDC)
Insulation	100 V_{rms} output to measuring input 4000 V_{rms} output to AC supply input 500 V_{rms} output to DC supply input
Analogue output	
Range	0 to 20 mADC, 0 to 10 VDC
Scaling factor	Programmable within the whole range of the signal output; it allows the management of all values from 0 to 20 mA/ from 0 to 10 V
Accuracy	± 0.3% f.s.
Response time (@ 25°C)	≤ 500 ms
Temperature drift	± 200 ppm/°C
Load: 20 mA output	≤ 500 Ω
10 V output	≥ 10 kΩ
Insulation	By means of optocouplers, see the relevant table
Serial output	
Type	RS 485
Multidrop	Unidirectional (std), bidirectional (on request)
Connections	2 or 4 wires, max. distance 1200 m, termination and/or line biasing directly on the instrument
Addresses/protocol	255, selectable by key-pad/ MODBUS, JBUS
Data (unidirectional)	
Dynamic (reading only)	Measurement, data hold of minimum value, data hold of maximum value, alarm status
Static (reading only)	All programming data
Data (bidirectional, on request)	
Dynamic (reading only)	Measurement, data hold of minimum value, data hold of maximum value, alarm status
Static (reading/writing)	All programming data, min./ max. data hold reset, reset of alarm set-points with latch
Data format	1-start bit, 8-data bit, no parity, 1 stop bit
Baud-rate	1200, 2400, 4800 and 9600 bauds selectable
Insulation	By means of optocouplers, see the relevant table

CARLO GAVAZZI

Software Functions

Scaling parameters	
Pulses per revolution	Programmable and independent per channel from 1 to 9999
Prescaler	Programmable and independent per channel from 9999 x10^{-9} to 9999 x10^{9}
Management of the input signals	Channel A: Fa*PS1 / Pu1 Channel B: Fb*PS2 / Pu2 Where: Fa and Fb are the frequency signals Pu1 and Pu2 are the pulses per revolution PS1 and PS2 are the prescalers
Operating mode	Rate-meter Tacho-meter Frequency-meter Period-meter
Single channel	A 1/A
Dual channel	A-B,(A-B)*100; [(A-B)/B]*100 A/B, A/B*100; [B/(A+B)]*100 "A" with rotation sensing on channel B (max. 10kHz, duty-cycle 50%)
Peak and valley values	Automatic storage (RAM only) of the min. and max. value measured from the last reset
Password	Numeric code of max. 3 digits; 3 protection levels of the programming data
1st level	Password "0", no protection.
2nd level	Password from 1 to 127, all data are protected
3rd level	Password for 128 to 255, all data protected except for the setpoints
Range selection	0.001 to 500Hz 0.1Hz to 50kHz
Display parameters	
Operating mode	The position of the decimal point can be selected according to the needed read-out. The low and high limits of the scale are programmable and may be connected to the over-range alarms and, if available, to the part of the scale that has to be retransmitted by means of an analogue output.
Decimal point position	Programmable within the displaying range
Displayed scale	Programmable within the whole displaying range
Diagnostics	The display flashes when the limits of the displayed range are exceeded, the data are updated up to the maximum read-out
Over range	EEE (AC)
Under range	- EE (DC)
Filter	
Filter operating range	From 0 to 9999
Filtering coefficient	From 1 to 255

Supply Specifications

AC supply	230 VAC, -15%+10%, 50/60 Hz (standard) 24 VAC, 48 VAC, 115 VAC, 120 VAC, 240 VAC, -15%+10%, 50/60 Hz (on request)
Insulation	See the relevant table
DC supply	9 to 32 VDC, galvanic insulation, max. inrush current: ≤ 1.2 A/200 ms (on request) 40 to 150 VDC, galvanic insulation, max. inrush current: ≤ 0.8 A/200 ms (on request)
Insulation	see the relevant table
Power consumption	5 VA (basic instrument), 8 VA max. with signal output

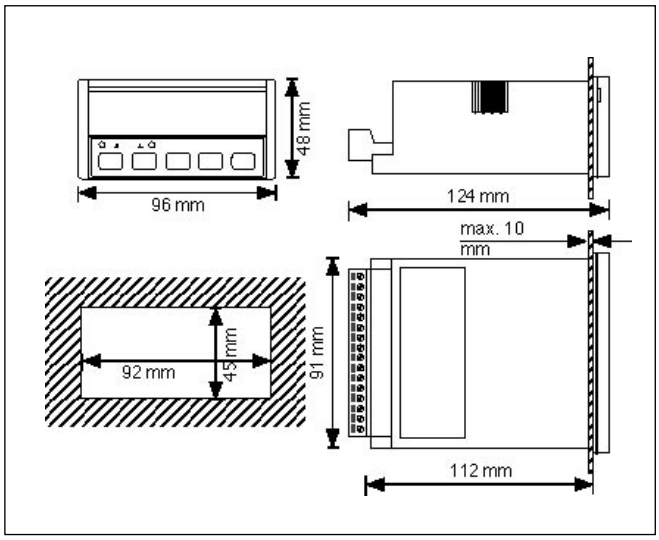
General Specifications

Operating temperature	0 to 50°C (32 to 122°F) (R.H. < 90% non-condensing)
Storage temperature	-10 to 60°C (14 to 140°F) (R.H. < 90% non-condensing)
Insulation reference voltage	300 V_{rms} to ground, cat. III
Dielectric strength	4000 V_{rms} for 1 minute
EMC	IEC 801-2, IEC 801-3, IEC 801-4 (level 3), EN 50 081-1, EN 50 082-1
Safety standards	EN 61010-1, IEC 1010-1, VDE 0411
Connector	Screw-type, detachable
Housing	
Dimensions	1/8 DIN, 48 x 96 x 124 mm
Material	ABS, self-extinguishing: UL 94 V-0
Degree of protection	IP 65 (standard)
Weight	Approx. 520 g (Signal output and packing included)
CE-marking	Yes

Insulation Table

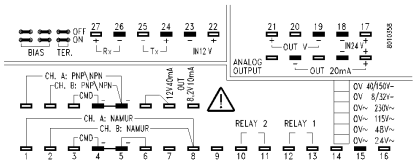
	AC Supply	Meas. Input	RL1 output	RL2 ouput	Anal. output	DC Supply	RS-485
AC Supply	---	4KV	4KV	4KV	4KV	---	4kV
Input	4KV	---	2KV	2KV	500V	2kV	500V
RL1 output	4KV	2KV	---	2KV	2KV	2kV	2kV
RL2 output	4KV	2KV	2KV	---	2KV	2kV	2kV
Analogue output	4KV	500V	2KV	2KV	---	2kV	500V
DC Supply	---	2kV	2kV	2kV	2kV	---	2kV
RS-485	4kV	500V	2kV	2kV	500V	2kV	---

Dimensions

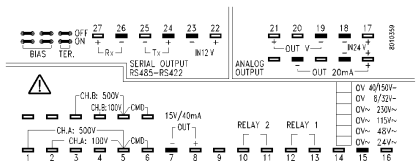


Terminal Board

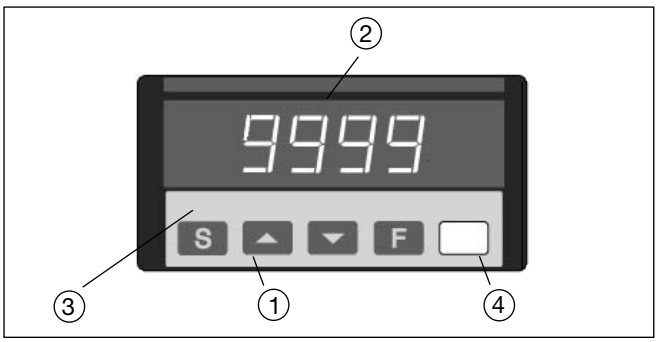
(TF1) NPN/PNP/NAMUR (DC type) input connections



(TF2) PICK-UP (AC type) input connections



Front Panel Description



1. **Key-pad**
   Set-up and programming procedures are easily controlled by the 4 pushbuttons.

   "S"
   - Selection key to select programming function (instrument configuration) or measurement and alarm detection.

   " ▲ " and " ▼ "
   - Up and down keys for increasing or decreasing programming values.
   - Selecting programming functions and instrument configuration together with the "S" key.

   "F"
   - Special function key to exit from the programming procedure and for alarm latch reset (those selected with latch function)

2. **Display**
   4-digit (maximum read-out 9999).

   Alphanumeric indication by means of 7-segment display for:
   - Displaying of the measured value, over-range and programming indications.
   - Indication of programming parameters.

3. **LED**
   - "1" and "2" LED indicators for alarm conditions

4. **Engineering unit**
   Screen for interchangeable unit label available on the set of engineering unit labels supplied with the MDI (engineering unit label to be inserted by customer).

RPS	RPM	RPH	MPH	ms	sec
min	h	Hz	kHz	%	rad
mm/s	cm/s	m/s	mm/min	cm/min	m/min
cm^3	m^3	km/h	m/h	cm/h	mm/h
mm^3	kg/m^3	g/cm^3	l/s	l/min	l/h
m^3/s	m^3/min	m^3/h	t/h	kg	% speed