GEFRAN

40F 96

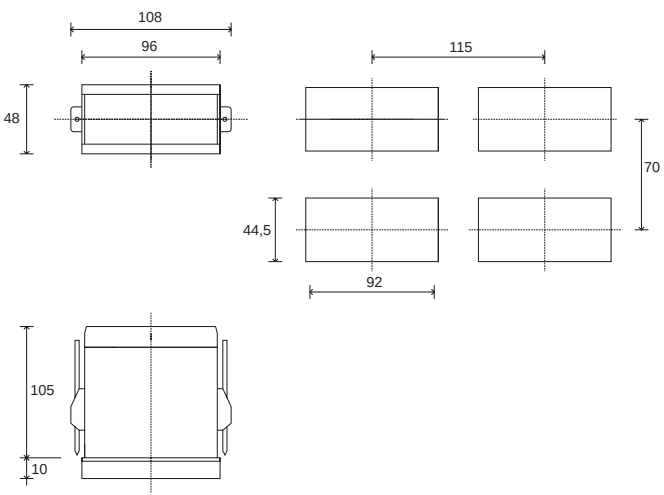
CONFIGURABLE FREQUENCY INDICATOR - INTERCEPTOR

USER'S MANUAL

SOFTWARE VERSION **1.0x**
code **81671B** / edition **06** - **03/08**

1 • INSTALLATION

• Dimensions and cut-out: Panel mounting



For correct and safe installation, follow the instructions and observe the warnings contained in this manual.

***Panel mounting*:**
Fix the device with the bracket provided before making any electrical connections.
To mount two or more devices side by side, use the cut-out dimensions shown above.

***CE MARKING*:** EMC (electromagnetic compatibility) conformity to EEC Directive 89/336/CEE with reference to the generic Standard EN50082-2 (immunity in industrial environments) and EN50081-1 (emission in residential environments). BT (low voltage) conformity to Directive 73/23/CEE as modified by Directive 93/68.
***MAINTENANCE*:** Repairs must be done out only by trained and specialized personnel. Cut power to the device before accessing internal parts.
Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene, etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.
***SERVICE*:** GEFRAN has a service department. The warranty excludes defects caused by any use not conforming to these instructions.

2 • TECHNICAL SPECIFICATIONS

Display	4 digit red LED's, digit height 14mm
Keys	3 mechanical keys (Raise, Lower, F)
Accuracy	0.1% in autorange mode ± 1 digit with fixed f.s.
Main input	- mechanical contact, no voltage, configurable in opening/closing, 100Hz filter insertable from configuration - from logic control under voltage with amplitude 0.5...30 Vdc, 6 mA max, for proximity PNP or NPN (inductive or capacitive), encoder or NAMUR 2 or 3 wires - maximum frequency of input signal with duty cycle 50% settable 1, 2, 3, 4, 10, 20, 40, 100 KHz - from alternate control 30...500V peak, 1 mA max. maximum frequency 10KHz minimum frequency 0.5Hz in sinusoidal mode
Scale limits	-1999...9999 (settable decimal point) Can be converted into engineering units by inserting a multiplier or divisor (for example, for display / intercept of rpm)
Sensor or transducer power supply	5Vdc, 12 Vdc, 120mA max 24 Vdc ± 10%, 50mA max filtered only
Alarms (set points)	Maximum of three configurable alarms: absolute, deviation, symmetrical deviation. Adjustable hysteresis
Alarm masking	- exclude on power-up - latch reset from key and/or external contact - insert delay filter (DON, DBI, DOF, DFO) - set minimum intervention time
Relay contact	NO (NC) 5A, 250V a cosφ=1
Logic output	type D 11Vdc, Rout = 220Ω (6V/20mA)
Triac output (option)	20...240Vac ±10%, 3A max. Snubberless, inductive and resistive load $I^2t = 128A^2S$
Logic input	Ri = 5,6KΩ (24V, 4mA), 1500V isolation
Logic input functions	configurable for alarm memory reset, hold, flash, zero, selection of max., min. peak value, peak-peak
Analog retransmission (option)	4 to 20mA, max. 150 Ω load
Power supply (switching)	(standard) 100...240Vac/dc ±10% max 11,5VA (optional) 11...27Vac/dc ±10% max 9VA 50/60Hz
Fuse (inside device, not operator serviceable)	100 to 240Vac/dc - type T - 500mA - 250V 11 to 27Vac/dc - type T - 1.25A - 250V
Faceplate protection	IP65
Working / Storage temperatures	0 to 50°C / -20 to 70°C
Relative humidity	20 to 85%, non-condensing
Environmental conditions of use	for internal use only, altitude up to 2000m
Installation	Panel mounting, extractable from front
Weight	320g for the complete version

EMC conformity has been tested with the following connections

FUNCTION	CABLE	LENGTH USED
Input	1 mm^2	3 m
Power supply cable	1 mm^2	1 m
Relay output cables	1 mm^2	3,5 m

3 • DESCRIPTION OF FACEPLATE

Flashing LED:
When frequency of input signal exceeds value set for parameter PS

PV display: Indication of process variable
•• Indication of 'HI' or 'Lo' out of range
•• Display of configuration messages

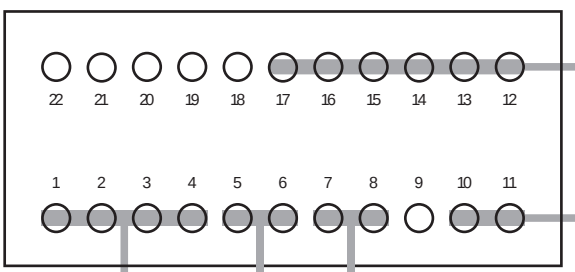
"Raise" and "Lower" keys:
These keys are used for any operation that requires a numerical parameter to be raised or lowered. ••The speed of change is proportional to the time the key is pressed. •• The operation is not cyclic: once the maximum (minimum) limit is reached, there will be no further increase (decrease) of the value, even if the key remains pressed.
The keys can be configured to perform reset, hold, display of the peak value, etc. as determined by the 't.U.' and 't.d.' parameters on the 'In' menu.

Indication of output states:
OUT 1 (Alarm 1); OUT 2 (Alarm 2);
OUT 3 (Alarm 3)

Label with engineering units

Function key:
Gives access to different configuration stages ••
Confirms any parameter changes

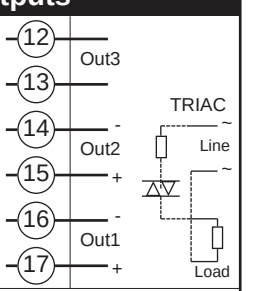
4 • CONNECTIONS



• Outputs

Generic user-configurable outputs

- relay 5A/250Vac
- logic 6V/20mA, Rout = 220Ω (for Out 1, Out 2)
- Triac 20...240Vac ±10% 3A max.

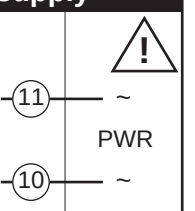


• Power supply

Standard:
100 to 240Vac/dc ±10%

Optional:
11 to 27Vac/dc ±10%

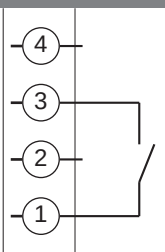
50/60Hz, 8VA max.



• Inputs

• Mechanical contact

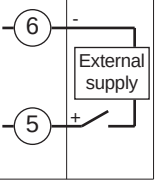
Mechanical contact no voltage max. 100 Hz.



• Logic input

Isolated digital input 1500V

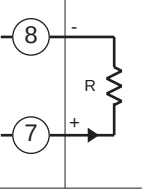
Ri = 5,6KΩ (24V, 4mA)



• Retransmission output

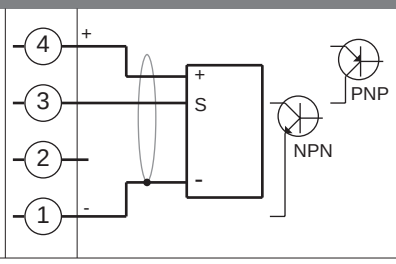
Analog output for retransmission

4 to 20mA, Rmax. 150Ω



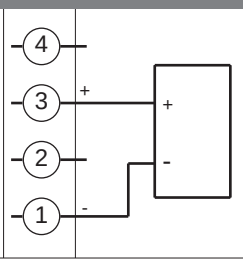
• Limit switch 3 wires /logic control

Inductive or capacitive proximity NPN or PNP Input with sensitivity 0.5...30V, 6mA max



• Limit switch 2 wires

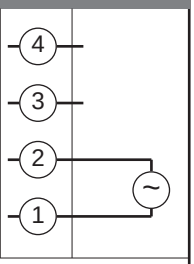
Proximity NAMUR 12V



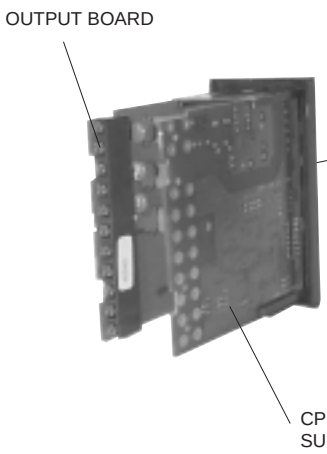
• Generator: AC

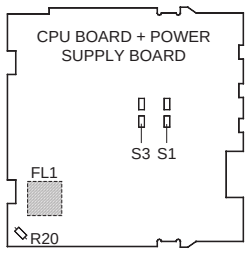
Signal from voltage generator 30...500V peak, 1 mA max.

To isolate the input, remove FL1 and R20 from base



Device structure: identification of boards

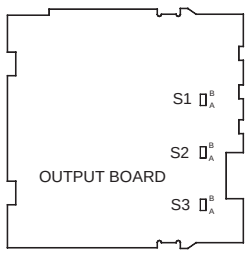




FL1, R20 on component side are to be removed to obtain isolation in case of high voltage AC input

Sensor power supply

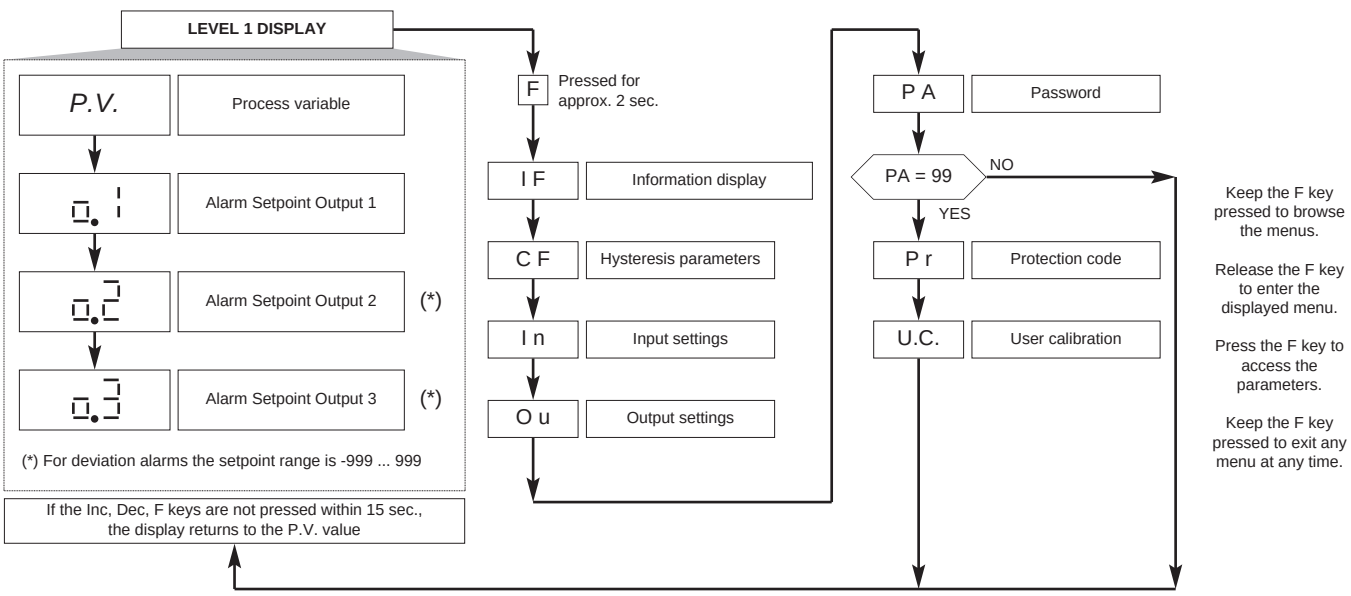
	S1	S3
5V	ON	OFF
12V	OFF	ON
24V	OFF	OFF



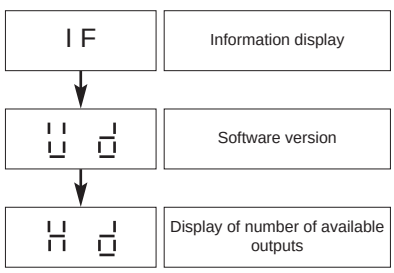
S1 = Status of Out 1 relay
S2 = Status of Out 2 relay
S3 = Status of Out 3 relay

A = Direct
B = Inverse

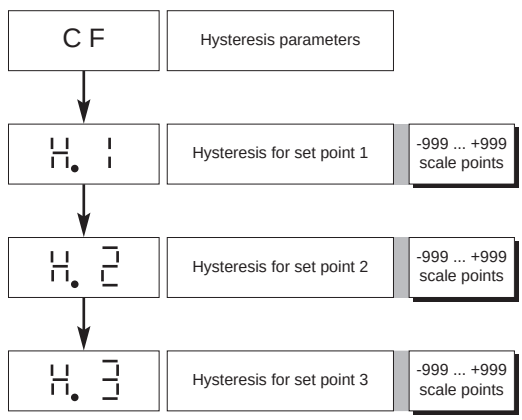
5 • PROGRAMMING and CONFIGURATION



• Information display



• Configuration parameters



• Input parameters

In — Input settings

I.P — Input configuration

0	Frequency - input NPN
1	Frequency - input PNP
2	AC input

F.P — Frequency meter operating mode

0	Normal frequency value
1	Settable sampling time
2	Normal frequency value with fixed full scale
3	Sampling time settable with fixed full scale

F.F — With FP = 0 or 2: Period corresponds to minimum frequency in input
With FP = 1 or 3: Sampling time,
TC = 0 update after 32 sec.
0.0 ... 10.0sec

PS.S — Selection of full scale frequency

	Max. frequency in input	Prescaler ratio
0	1KHz	1
1	2KHz	2
2	4KHz	4
3	10KHz	2
4 (*)	20KHz	4
5 (*)	40KHz	8
6 (*)	80KHz	16
7 (*)	100KHz	32

+8 enable MU, dE parameters
(*) value shown indicates frequency /10 see application example

MU — Multiplier — 1 ... 255

dEC — Divisor — 1 ... 255

F.I — Main input filter — ON / OFF
ON = 100Hz filter

dP — Decimal point position for full scale

dP	Format
0	XXXX
1	XXX.X
2	XX.XX
3	X.XXX

Determines full scale of retransmitted output and alarms
N.B.: valid only for frequencies with fixed full scale; automatic shift of Dp for higher frequencies

d.I — Selection of digital input 1
r.U — Raise key function (active only in P.V.selection)
r.d — Lower key function (active only in P.V.selection)

0	None
1	Zero
2	Hold
3	Flash
4	Max. peak display
5	Min. peak display
6	Delta peak display
7	Peak memory reset
8	Zero + peak memory reset
9	Alarms reset
10	Peak + alarms reset
11	Zero + alarms reset
12	Peak + zero + alarms reset
13	Output status OUT1
14	Output status OUT2
15	Output status OUT3

LoL — Low limit for the alarms set point — -1999 ... 9999

HiL — High limit for the alarms set point — -1999 ... 9999

• Output parameters

Ou — Output settings

On — Number of outputs — 0 to 3

1.t — Alarm type 1
2.t — Alarm type 2
3.t — Alarm type 3

	1. t - 2. t - 3. t		
Value	Direct (max.) Inverse (min.)	Absolute Relative to previous	Normal Symmetrical (window)
0	Direct	Absolute	Normal
1	Inverse	Absolute	Normal
2	Direct	Relative	Normal
3	Inverse	Relative	Normal
4	Direct	Absolute	Symmetrical
5	Inverse	Absolute	Symmetrical
6	Direct	Relative	Symmetrical
7	Inverse	Relative	Symmetrical

+8 to disable on power-up until first alarm
+16 to memorize
+32 to filter with F.O. mode (output filter mode)

F.O — Output filter mode

0	not active: calculated status is sent directly to relay
1	On delay (DON)
2	delay activation from time of deactivation of output (DBI)
3	Off delay (DOF)
4	Delay for activation only at power-up (DPO)

+ 8 time base max. 99 min (default = 99 sec)

r.d — delay for F.O. — 0 to 99 min or sec

t.M — Minimum output pulse — 0 to 99 sec
Disabled by setting value 0
Displayed if associated with at least one output

LSr — Minimum scale analog repeat output — -1999 ... 9999

HSr — Maximum scale analog repeat output — -1999 ... 9999

• Protection

Pr — Protection code

Value	Displayed parameters	Modifiable parameters
0	o.1, o.2, o.3	o.1, o.2, o.3
1	o.1, o.2	o.1, o.2
2	o.1	o.1
3	o.1	none

+4 to disable In and Ou pages
+8 to disable Cf page
+32 base configuration (the following parameters will not be displayed:
In: FI, L_L, H_L
Ou: On [forced to no. outputs present])

• User Calibration

U. C.

U.C.	CPU F Function
1	analog retransmission output

CAL — Calibration of minimum (*)
CAH — Calibration of maximum (*)

(*) when U.C. = 1 press keys Δ ∇ to calibrate analog output

• HOLD function

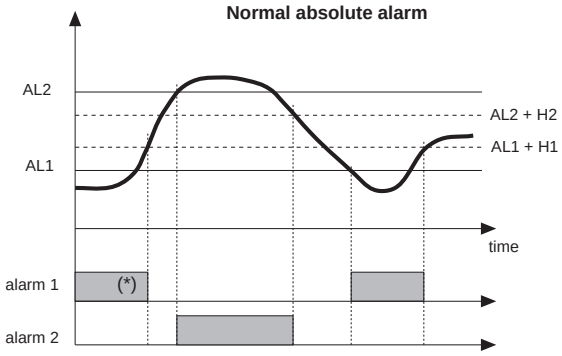
The input value and alarms are frozen while the logic input is active.
With the logic input active, a reset turns OFF both the relay outputs and the alarms latch.

• FLASH function

Input value is sampled; state of alarms is not transferred to outputs; outputs are “frozen”.
When the logic input is active the input value is “frozen” and the outputs are updated according to the calculated alarms state, including the ones latched.

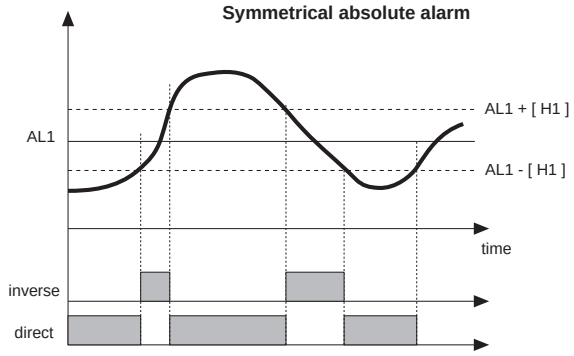
6 • ALARMS

Normal absolute alarm



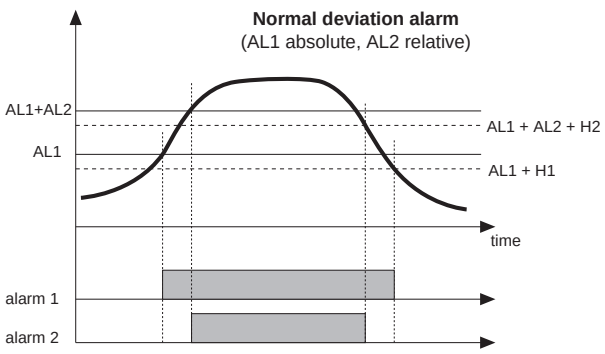
For AL1 inverse absolute alarm (min.) with positive H1, 1 t = 1
(*) = OFF if disabling on power-on exists
For AL2 direct absolute alarm (max) with negative H2, 2 t = 0

Symmetrical absolute alarm



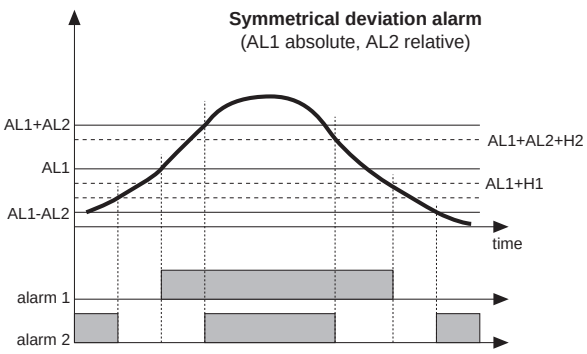
For AL1 inverse absolute, symmetrical alarm with hysteresis H1, 1 t = 5
For AL1 direct absolute, symmetrical alarm with hysteresis H1, 1 t = 4

Normal deviation alarm
(AL1 absolute, AL2 relative)



For AL1 direct absolute alarm (max) with negative H 1, 1 t = 0
For AL2 direct relative alarm (max) with negative H2, 2 t = 2

Symmetrical deviation alarm
(AL1 absolute, AL2 relative)

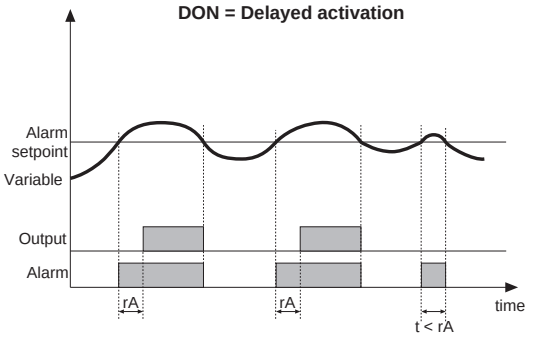


For AL1 direct absolute alarm (max) with negative H1, 1 t = 0
For AL2 symmetrical deviation alarm H2, 2 t = 6

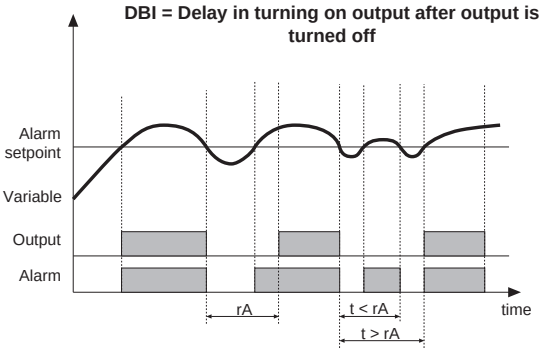
• Filter - outputs with reference to parameters F.0 and r.A

The diagrams refer to a normal absolute alarm with hysteresis H = 0

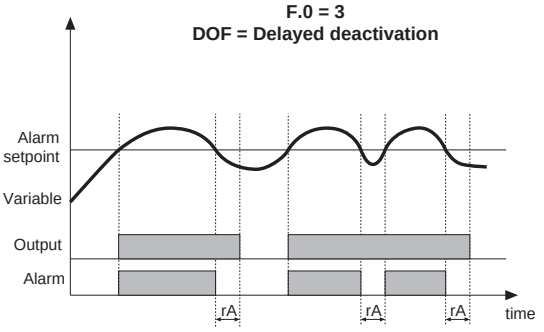
F.0 = 1
DON = Delayed activation



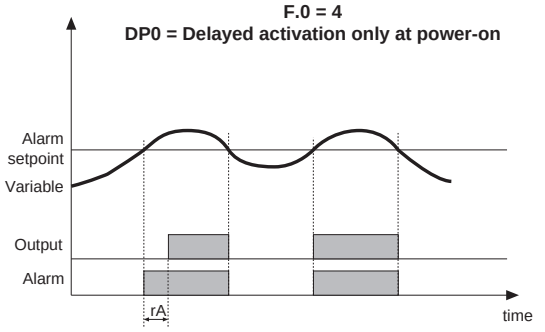
F.0 = 2
DBI = Delay in turning on output after output is turned off



F.0 = 3
DOF = Delayed deactivation

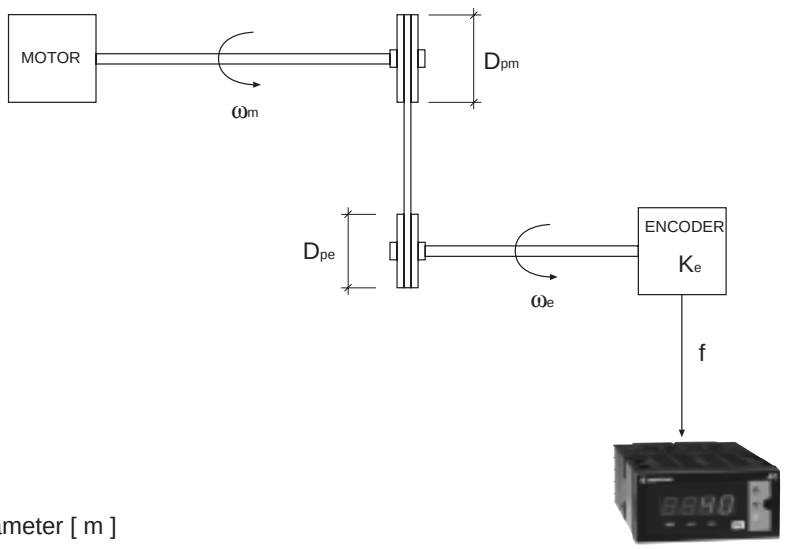


F.0 = 4
DP0 = Delayed activation only at power-on



Applicative example

Configure the instrument to show motor axle speed in rpm, connected to an encoder as per the diagram.



D_{pe} = encoder pulley diameter [m]

D_{pm} = motor pulley diameter [m]

ω_e = encoder angular velocity [rpm]

ω_m = motor angular velocity [rpm]

K_e = number of pulses per encoder rev [clock / rev]

$$\tau = \frac{\omega_e}{\omega_m} = \frac{D_{pm}}{D_{pe}} = \text{drive ratio}$$

$$f = \text{frequency in input to instrument [Hz]} \cdot \omega_e \cdot \frac{1}{60} \cdot K_e$$

K_s is defined as multiplicative constant of instrument:

$$\text{Value shown [rpm]} = K_s \cdot f = K_s \cdot \frac{1}{60} \cdot \omega_m \cdot \frac{D_{pm}}{D_{pe}} \cdot K_e$$

$K_s = \frac{K_s \text{ numerator}}{K_s \text{ denominator}}$

$M_U = K_s \text{ numerator} \cdot fs$

$d_E = K_s \text{ denominator}$

where:
fs = full scale [KHz] (can be chosen from 1, 2, 4, 10, 20, 40, 100KHz according to max. frequency in input)
M_U = multiplier
d_E = divisor

These parameters can be set on the “In” menu

EXAMPLE 1

D_{pm} = 80 mm (motor pulley diameter)

D_{pe} = 160 mm (encoder pulley diameter)

K_e = 250 clock / rev = number of pulses per encoder rev

ω_m maximum = 3000 rpm

Maximum frequency at input of the instrument must be determined to define full scale fs.

$f_{max} = \frac{1}{60} \cdot (\omega_m \text{ maximum}) \cdot \frac{D_{pm}}{D_{pe}} \cdot Ke = 6250 \text{ Hz}$

fs = 10 KHz (value of parameter P.S corresponding to a full scale of 10KHz is 11)

$K_s = \frac{60 \cdot D_{pe}}{K_e \cdot D_{pm}} = \frac{60 \cdot 160}{250 \cdot 80} = \frac{12}{25} = \frac{K_s \text{ numerator}}{K_s \text{ denominator}}$

After reducing the function to minimum terms, determine M_U and d_E (numerator and denominator):
P.S = 3, M_U = 120, d_E = 25

EXAMPLE 2

To show the rpms of a wheel with 250 pulses/rev, with max. frequency less than 1 kHz, set
FP = 0, P.S = 8 (full scale 1 KHz), M_U = 6, d_E = 25

EXAMPLE 3

For applications requiring greater precision of frequency value (with max. full scale 500 Hz), you can set a sampling time greater than one second.
To show the frequency in pulses/second with fixed scale, with one decimal figure and with sampling time at a constant 5 sec, set FP=3, tc =5.0 sec, P.S = 8 (full scale 1 KHz), M_U = 1, d_E = 5, d_P = 1

EXAMPLE 4

Calculation of frequency displayed (F.v.) with a proximity input
With a full scale of 20KHz, the assigned prescaler ratio is 4; therefore the value shown is:

$F.v. = \frac{\text{Input Frequency}}{\text{Prescaler Ratio}} \cdot \frac{Mu}{dE}$

es.: Ps = 12 (Fmax. 20KHz)
Prescaler Ratio = 4
Mu = 3
dE = 7

$F.v. = \frac{\text{Input Frequency}}{4} \cdot \frac{3}{7} = 214{,}2$

7 • ACCESSORIES

• RS323 interface cable for configuration

N.B.: the PC configuration cable is supplied with the programming software.
WARNING: make the connection with the device powered and with inputs and outputs disconnected.

• ORDER CODE

COD. **1108200**	Cable + Floppy

ORDER CODE

40F 96 4 □□ □□ □ □ □

Sensor power supply	
5Vdc, 120mA	0 5
12Vdc, 120mA	1 2
24Vdc, 50mA	2 4

Output 1, Output 2	
Relay, Relay	R R
Relay, Static D2	R D
Triac, None	T 0

Power supply	
0	11 to 27Vac/dc
1	100 to 240Vac/dc

Digital input / Retransmission output	
0	None
1	Digital input
3	Digital input + Retransmission output 4...20mA on max 150Ω

Output 3	
0	None
R	Relay

Kindly contact GEFRAN for information on available codes.

• WARNINGS

WARNING: this symbol indicates danger.
It is seen near the power supply circuit and near high-voltage relay contacts.

Read the following warnings before installing, connecting or using the device:

• follow instructions precisely when connecting the device.

• always use cables that are suitable for the voltage and current levels indicated in the technical specifications.

• the device has no ON/OFF switch: it switches on immediately when power is turned on. For safety reasons, devices permanently connected to the power supply require a two-phase disconnecting switch with proper marking. Such switch must be located near the device and must be easily reachable by the user. A single switch can control several units.

• if the device is connected to electrically NON-ISOLATED equipment (e.g. thermocouples), a grounding wire must be applied to assure that this connection is not made directly through the machine structure.

• if the device is used in applications where there is risk of injury to persons and/or damage to machines or materials, it MUST be used with auxiliary alarm units. You should be able to check the correct operation of such units during normal operation of the device.

• before using the device, the user must check that all device parameters are correctly set in order to avoid injury to persons and/or damage to property.

• the device must NOT be used in inflammable or explosive environments. It may be connected to units operating in such environments only by means of suitable interfaces in conformity to local safety regulations.

• the device contains components that are sensitive to static electrical discharges. Therefore, take appropriate precautions when handling electronic circuit boards in order to prevent permanent damage to these components.

***Installation*:** installation category II, pollution level 2, double isolation

• power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.

• install the instrumentation separately from the relays and power switching devices

• do not install high-power remote switches, contactors, relays, thyristor power units (particularly if “phase angle” type), motors, etc... in the same cabinet.

• avoid dust, humidity, corrosive gases and heat sources.

• do not close the ventilation holes; working temperature must be in the range of 0...50°C.

If the device has faston terminals, they must be protected and isolated; if the device has screw terminals, wires should be attached at least in pairs.

• *Power*: supplied from a disconnecting switch with fuse for the device section; path of wires from switch to devices should be as straight as possible; the same supply should not be used to power relays, contactors, solenoid valves, etc.; if the voltage waveform is strongly distorted by thyristor switching units or by electric motors, it is recommended that an isolation transformer be used only for the devices, connecting the screen to ground; it is important for the electrical system to have a good ground connection; voltage between neutral and ground must not exceed 1V and resistance must be less than 6Ohm; if the supply voltage is highly variable, use a voltage stabilizer for the device; use line filters in the vicinity of high frequency generators or arc welders; power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.

• *Input and output connections*: external connected circuits must have double insulation; to connect analog inputs (TC, RTD) you have to: physically separate input wiring from power supply wiring, from output wiring, and from power connections; use twisted and screened cables, with screen connected to ground at only one point; to connect adjustment and alarm outputs (contactors, solenoid valves, motors, fans, etc.), install RC groups (resistor and capacitor in series) in parallel with inductive loads that work in AC *(Note: all capacitors must conform to VDE standards (class x2) and support at least 220 VAC. Resistors must be at least 2W)*; fit a 1N4007 diode in parallel with the coil of inductive loads that operate in DC.

GEFRAN spa will not be held liable for any injury to persons and/or damage to property deriving from tampering, from any incorrect or erroneous use, or from any use not conforming to the device specifications.