GEFRAN

40B96

POSITION, FORCE and PRESSURE INDICATOR-INTERCEPTOR with INPUT for STRAIN-GAUGE and POTENTIOMETER

CE

INSTRUCTIONS FOR USE AND WARNINGS

Software Version 3.2x

code **81652G** / Edit. **07** - **04-2011**

GENERAL INDEX

☞ *The contents of each section are summarized immediately following the section heading*

Graphic symbols used

To distinguish between the type and importance of the information provided in these instructions for use, graphic symbols have been used as a reference to make interpreting the information clearer.

Indicates the contents of the various manual sections, the general warnings, notes, and other points to which the reader's attention should be drawn.

Indicates a suggestion based on the experience of the GEFRAN Technical Staff, which could prove especially useful under given circumstances

Indicates a particularly delicate situation that could affect the safety and correct working operation of the instrument, or a rule that must be strictly observed to avoid dangerous situations

Indicates a reference to Detailed Technical Documents available on the GEFRAN web site **www.gefran.com**

Indicates a condition of risk for the safety of the user, due to the presence of dangerous voltages at the points shown

AL.2 In the programming and configuration flows for the controller, indicates **all** the parameters that can be set in the configuration.

1 • PRELIMINARY INSTRUCTIONS

This section contains information and warnings of a general nature which should be read before proceeding with instrument installation, configuration and use.

General Description

GEFRAN series 40B96 digital controllers have been designed for temperature control in any applications involving heating or cooling processes. They represent an exclusive combination of performance, reliability and applicational flexibility. In particular, this new line of Gefran temperature controllers is the ideal solution for application in sectors where performance and service continuity are important, including:

• extrusion lines
• presses for rubber
• test benches
• honing machines
• processing plant for the food industry
• weighing
• manostat
• positioner
• motopotentiometer
• etc.

The 40B96 series interceptors are made on an extremely versatile hardware and software platform, that allows the most suitable I/O composition for the plant to be chosen from a series of options, up to a maximum of:

- variable input
- digital input
- transmitter power supply
- analog retransmission output
- a maximum of 4 outputs
- RS485 interface

Alarm unit in basic version

- 1 input that allows connection of most popular sensor types
• potentiometer with 100 ohm minimum resistance
• load cells with autoranging sensitivity from 1.5 to 3.3 mV/V
• strain-gauge pressure probes
accuracy better than 0.2% f.s.

- output for sensor or transmitter power supply
• 1.2 Vdc for potentiometer
• 5Vdc, 10Vdc max 120 mA for strain-gauge
• 15Vdc, 24Vdc max 50 mA for transmitter

- 2 standard outputs: one relay type and the other relay/logic, or
1 triac output

- display **functions** with setting of engineering scale and possible linearization, settable decimal point position, sampling time from 30 to 120 msec

- trip point values can be set in a range differing from scale limits, different modalities, hysteresis settable in scale points or time, with or without latch.

- service **serial line** for configuration via PC (Winstrum)

Options

- 3rd relay output

- 4th relay output (alternative to analog retransmission output)

- 1 digital input

- 1 analog retransmission output in current 0/4…20mA or voltage 0…10V (alternative to 4th relay output)

- RS485 optically isolated **serial interface**

Operator Interface

All the operator interface devices are concentrated on the controller faceplate, suitably protected by a membrane in Lexan that guarantees IP65 level protection.

- 3 buttons to be used for manual configuration/selection
- 1 red five-digit displays (Process Variable)
- 4 red LEDs for status indication of same number of relay/logic outputs

Electrical Interface

All connection terminals (power supply, inputs, outputs, options) are grouped together on the back of the instrument.

For technical specifications and performance details refer to Section 5 “Technical Specifications”.

Preliminary Warnings

The following preliminary warnings should be read before installing and using the series 40B ceptor . This will allow the controller to be put vice more quickly and will avoid certain problems nay mistakenly be interpreted as malfunctions or ns of the interceptor.

• Immediately after unpacking the controller, make a note of the order code and the other identification data given on the label affixed to the outside of the container and copy them to the table below.

These details must always be kept close at hand and referred to the personnel involved in the event of help from Gefran Customer Service Assistance.

SN:	.....	(Serial no.)
CODE:	.....	(Finished product code)
TYPE:	.....	(Order Code)
SUPPLY:	.....	(Type of electrical power supply)
VERS:	.....	(Software version)

- Check also that the controller is complete and has not been damaged at all during transit, and that the package contains not only the instrument and these Instructions for Use, but also the two brackets for fixing to the panel and the dust protection seal - see: Installation with Panel Fixing in Section 2.

  Any inconsistencies, omissions or evident signs of damage should be reported immediately to your Gefran sales agent.
- Check that the order code corresponds with the configuration requested for the application the controller is needed for, referring to Section 7: “Technical - Commercial Information”.
  - No. and Type of Inputs/Outputs available
  - Presence of the necessary options and accessories
  - Mains voltage supply

Ex: 40B – 24 – RR – 00 – 1 – 2 – 1

Model 40B96 alarm unit

24 V output for transmitter power supply

Output 1 - Relay; Output 2 - Relay,

Output 3 - none

Digital Input - no analog retransmission

RS485 Digital Communication

Power supply 100...240Vac/dc

- Before installing the series 40B96 instrument on the control panel of the machine or host system, refer to the paragraph “Dimensions and Cut-out” in Section 2 “Installation and Connection”.
- Where configuration by PC is provided for, make sure the interface RS232 cable is available and the CD- ROM containing the WINSTRUM software. For the order code refer to Section 7 “Technical - Commercial Information”..

ıd/or system integrators who wish to know more ɜ concepts of serial communication between standard PC and/or Gefran Industrial PC and Gefran Programmable Instruments , can access the various technical reference Documents in crobat format available in the Download section ɛfran Web Site **www.gefran.com** including:

- Serial Communication
- MODBus Protocol

In the same Download section of the Gefran Web Site **www.gefran.com** the reference s available in Adobe Acrobat format.

In the event of presumed instrument malfunction, before contacting Gefran Technical Service Assistance, refer to the Troubleshooting Guide given in Section 6 “Maintenance”, and if necessary refer to the F.A.Q. Section (Frequently Asked Questions) on the Gefran Web Site **www.gefran.com**

2 • INSTALLATION AND CONNECTION

This section contains the instructions necessary for correct installation of the 40B96 instrument into the machine control panel or the host system and for correct connection of the interceptor power supply, inputs, outputs and interfaces.

Before proceeding with installation read the following warnings carefully!
Remember that lack of observation of these warnings could lead to problems of electrical safety and electromagnetic compatibility, as well as invalidating the warranty.

Electrical power supply

• the instrument is NOT equipped with an On/Off switch: the user must provide a two-phase disconnecting switch that conforms to the required safety standards (CE marking), to cut off the power supply upstream of the instrument.
The switch must be located in the immediate vicinity of the instrument and must be within easy reach of the operator.
One switch may control more than one instrument.
• if the instrument is connected to NOT isolated electrical equipment (e.g. thermocouples), the earth connection must be made with a specific conductor to prevent the connection itself from coming directly through the machine structure.
• if the instrument is used in applications with risk of damage to persons, machinery or materials, it is essential to connect it up to auxiliary alarm equipment.
It is advisable to make sure that alarm signals are also triggered during normal operation.
The instrument must NOT be installed in flammable or explosive environments; it may be connected to equipment operating in such atmospheres only by means of appropriate and adequate types of interface, conforming to the applicable safety standards.

Notes Concerning Electrical Safety and Electromagnetic Compatibility:

CE MARKING:
The instrument conforms to the European Directives 2004/108/CE and 2006/95/CE with reference to the generic standards: **EN 61000-6-2** (immunity in industrial environment) **EN 61000-6-3** (emission in residential environment) **EN 61010-1** (safety).
Series 40B96 interceptor are mainly designed to operate in industrial environments, installed on the switchboards or control panels of productive process machines or plants.
As regards electromagnetic compatibility, the strictest generic standards have been adopted, as indicated in the table below.

EMC conformity has been tested with the following connections.

Function	Cable type	Length
Power supply cable	1mm^2	1m
Relay output cables	1mm^2	3.5m
Serial connection wire	0,35mm^2	3.5m
Input	1mm^2	3m

EMC Emission		
Generic standards, emission standard for residential commercial and light industrial environments	EN 61000-6-3	
Emission enclosure	EN 61000-6-3	Gruppo1 Classe B
Emission AC mains	EN 61000-6-3	Gruppo1 Classe B
Radiated emission	EN 61326 CISPR 16-2	Classe B
EMC Immunity		
Generic standards, immunity standard for industrial environments	EN 61000-6-2	
Immunity ESD	EN 61000-4-2	4 kV contact discharge level 2 8 kV air discharge level 3
Immunity RF interference	EN 61000-4-3 /A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Immunity conducted disturbance	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz- 80 MHz (level 3)
Immunity burst	EN 61000-4-4	2 kV power line (level 3) 2 kV I/O signal line (level 4)
Immunity pulse	EN 61000-4-5	Power line-line 1 kV (level 2) Power line-earth 2 kV (level 3) Signal line-earth 1 kV (level 2)
Immunity Magnetic fields	EN 61000-4-8	100 A/m (level 5)
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,
LVD Safety		
Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1	

Advice for Correct Installation for EMC

Instrument power supply

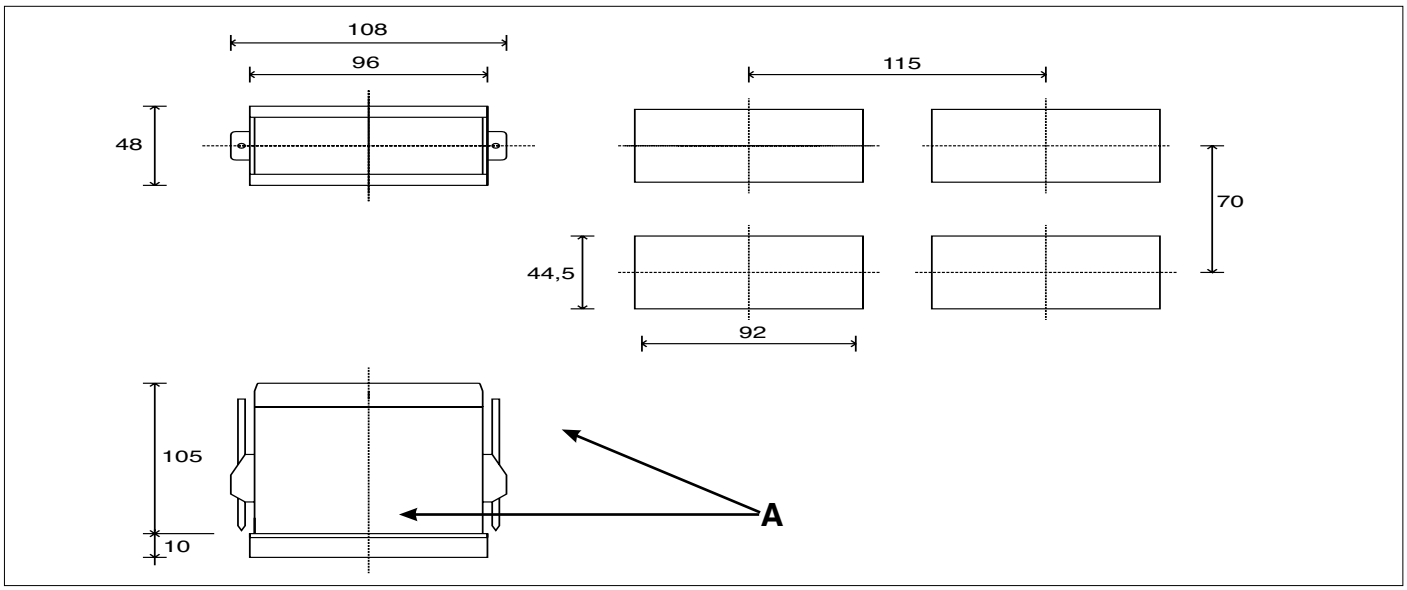
- The power supply to the electronic equipment on the switchboards must always come directly from an isolation device with a fuse for the instrument part.
- The electronic instruments and electromechanical power devices such as relays, contactors, solenoid valves, etc., must always be powered by separate lines.
- When the electronic instrument power supply is strongly disturbed by the commutation of transistor or power units or motors, an isolation transformer should be used for the controllers only, earthing the screen.
- It is essential that the plant has a good earth connection:
  - the voltage between neutral and earth must not be <1V
  - the Ohmic resistance must be <6Ω;
- If the mains voltage fluctuates strongly, use a voltage stabilizer.
- In the proximity of high frequency generators or arc welders, use adequate mains filters.
- The power supply lines must be separate from the instrument input and output ones.

Inputs and outputs connection

- The externally connected circuits must be doubly isolated.
- To connect the analogue inputs the following is necessary:
  - physically separate the input cables from those of the power supply, the outputs and the power connections.
  - use woven and screened cables, with the screen earthed in one point only
- To connect the regulating and alarm outputs (contactors, solenoid valves, motors, fans, etc.), fit RC groups (resistance and condensers in series) in parallel to the inductive loads that operate in Alternating Current.
  (Note: all the condensers must conform to VDE (class X2) standards and withstand a voltage of at least 220V AC. The resistances must be at least 2W).
- Fit a 1N4007 diode in parallel with the coil of the inductive loads that operate in Direct Current.

GEFRAN S.p.A. declines all responsibility for any damage to persons or property caused by tampering, neglect, improper use or any use which does not conform to the characteristics of the instrument and to the indications given in these Instructions for Use.

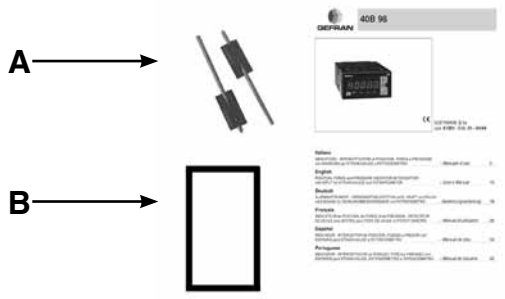
Dimensions and cut-out



Installation with panel mounting

As well as the actual instrument and these instructions for use, the package also contains:

- 2 panel fixing brackets (**A**)
- 1 protective seal against dust and water spray (**B**)



Fit the instrument to the panel as shown in the figure.

Warnings and instructions for mounting to the panel

Instructions for installation category II, pollution level 2, double isolation.

- only for low power supply: supply from Class 2 or low voltage limited energy source.
- the power supply lines must be separate from the controller input and output ones
- group the instruments together keeping them separate from the powered part of the relay
- do not install high-power remote switches, contactors, relays, thyristor power units (especially the “phase angle” type), motors, etc. in the same switchboard
- avoid dust, humidity, corrosive gasses and heat sources
- do not block the ventilation holes: the working temperature must be between 0...50°C
- surrounding air: 50°C
- use 60/75°C copper (Cu) conductor only, wire size range 2x No 22 - 14AWG, Solid/Stranded
- use terminal tightening torque 0.5N m

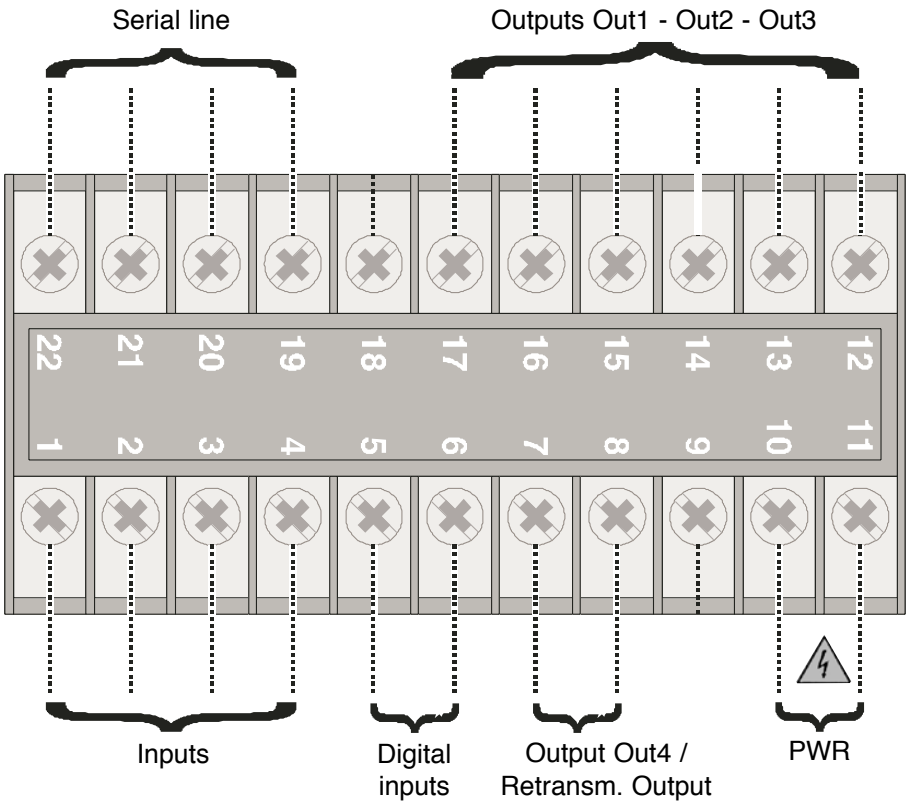
Nominal ambient conditions

Altitude	Up to 2000m
Working/storage temperature	0..50°C/-20...70°C
Non condensing relative humidity	20...85%

Before supplying the Controller with power, make sure that the mains voltage is the same as that shown in the last number of the order code.

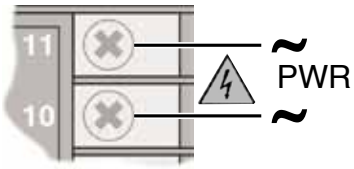
Ex:
40B96-5 – xx – xx – xx – x – x – 1 = 100..240Vac/dc
40B96-5 – xx – xx – xx – x – x – 0 = 11..27Vac/dc

Electrical Connections



Always make the connections using cable types suitable for the voltage and current limits given in Section 5 - Technical Specifications.
If the instrument has faston terminals these must be protected and isolated.
If it has screw terminals, the wires must be attached, at least in pairs

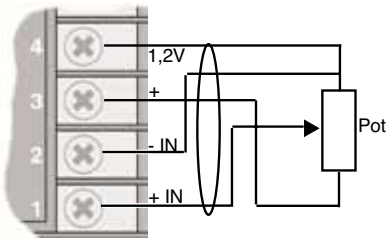
Power Supply



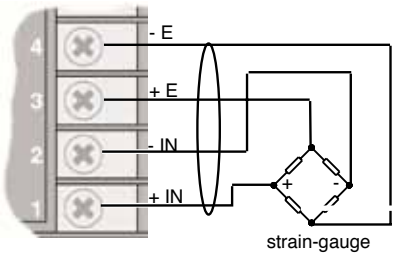
Standard:	100...240Vac/dc ±10%
Optional:	11...27Vac7dc ±10%
Power:	max 8VA; 50/60 Hz

Inputs

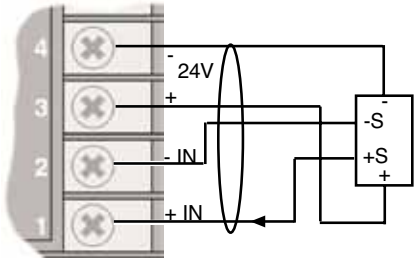
Potentiometer input



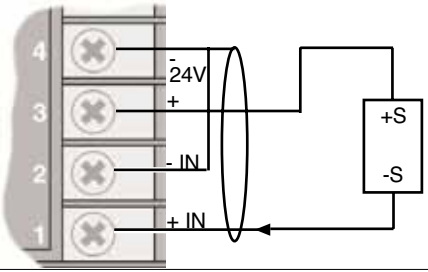
4-wires strain gauge input



20mA input transmitter only for model 40B96-5-24-...



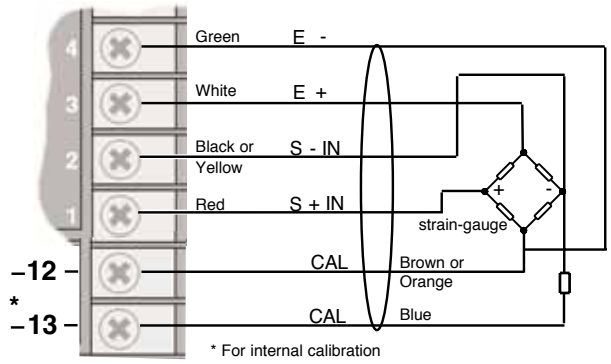
Terminal 2 (IN -) can be connected to terminal 4 in case of 3-wire transmitter 0-20mA.
Configure probe type: tP=0
It needs of re-calibration 0-20mA (U.C=2)



4-20mA.
2 wires transmitter input
Configure probe type: tP=0

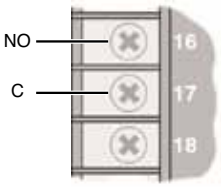
Inputs

Strain gauge input 6 wires to connect to Melt transducers



Outputs Out1, Out 2, Out3 — User configurable generic outputs

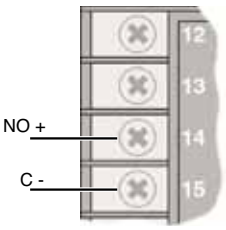
Outputs Out 1



- Relay 5A cosφ = 1 250Vac/30Vdc

- Triac 20...240Vac, max. 1A ± 10%

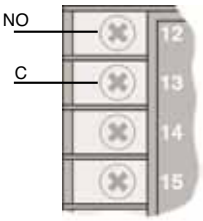
Outputs Out 2
(absent on Out1 and of Triac type)



- Relay 5A cosφ = 1 250Vac/30Vdc

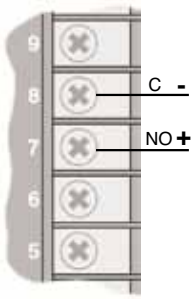
- Logic 24V 10V a 20mA

Outputs Out 3



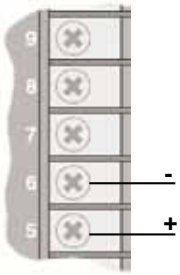
- Relay 5A cosφ = 1 250Vac/30Vdc

Outputs Out 4 / Retransmission output — User configurable generic outputs

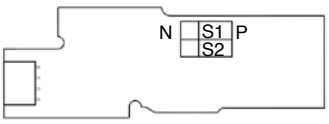


- Relay 5A cosφ = 1 250Vac/30Vdc
- Analogue 0...10V, 0/4...20mA
- 0/2...10V (S1-ON), 0/4...20mA (S1-OFF)
  S1 is a jumper on the board for continuous or analogic output

Digital inputs — User configurable generic inputs

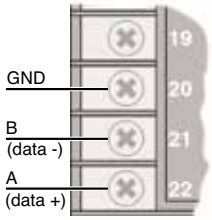


- Digital input 24V 5mA (Jumpers S1, S2 in position P) or from non-powered terminal (Jumpers S1, S2 in position N)



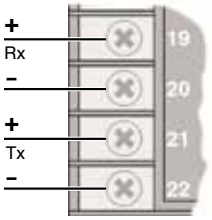
Serial line

Modbus 2 wires (Standard)



RS485 isolated serial line

Modbus 4 wires / Cencal

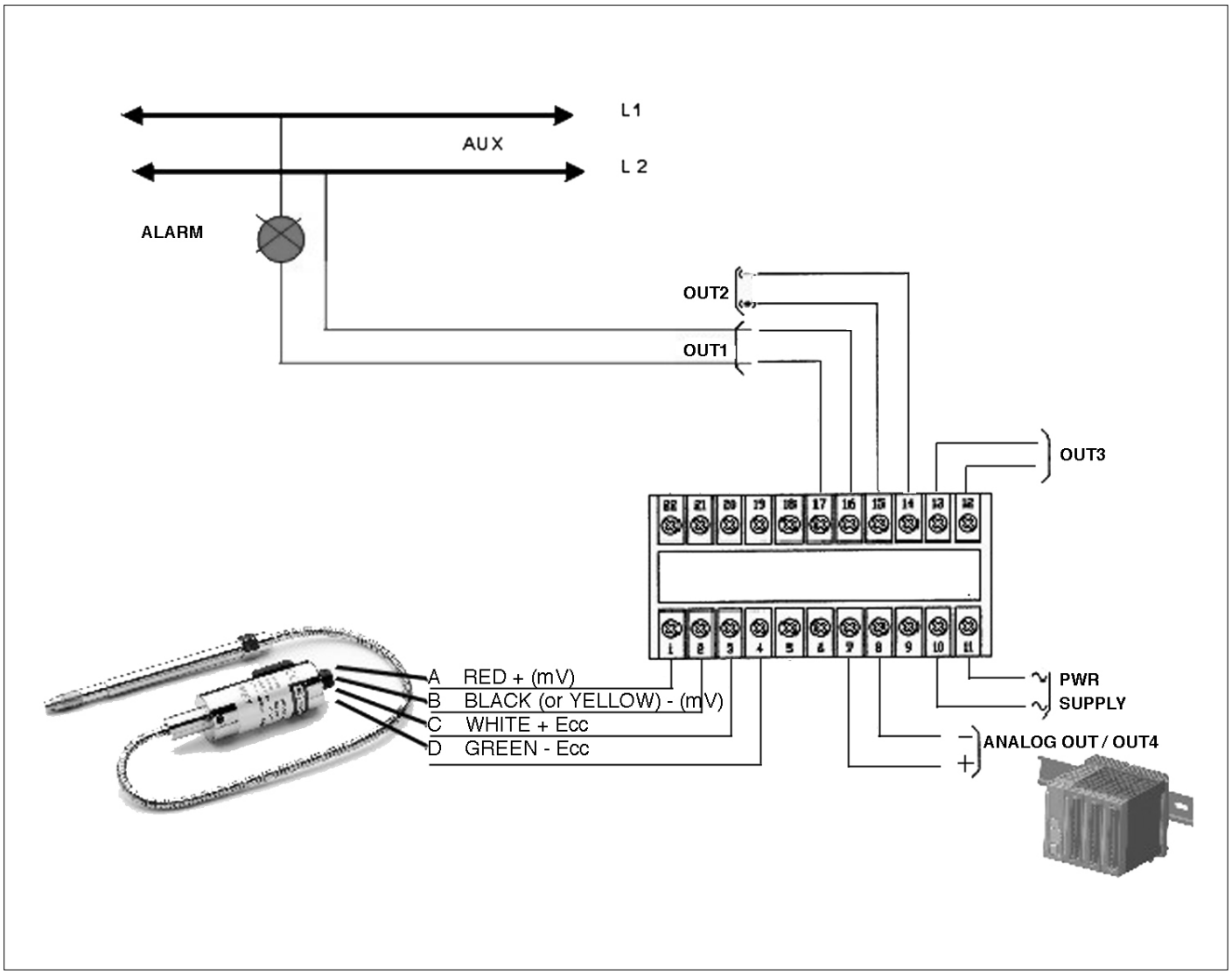


RS485 isolated serial line

For Modbus 4 wires/Cencal configuration see technical sheet of the serial board.

Example of Connection with Input from Melt Sensor

Analog retransmission of pressure value, logic and relay alarm outputs



3 • FUNCTIONS

This section illustrates the functions and operating modes of the displays, the indicator lights and the buttons that make up the operator interface of series 1200/1300 controllers. It is therefore an essential requirement for programming and configuring the controllers correctly.

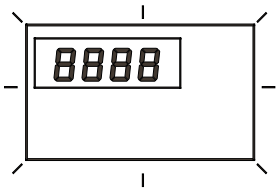
Operator Interface

ID	Symbol	Function
1	40000	Shows the process variable, the menu identification, the parameters identification and the error codes
2	△ ▽	**Inc**reases/**Dec**reases the value of the parameter displayed until the max/ min. value is reached. Held down: progressively increases the speed of increasing/decreasing the value displayed.
	F	Used to move between the various menus and parameters of the instrument. △ ▽ s the value of the current parameter (or parameter edited using) and selects the next parameter..
3	OUT1 OUT2 OUT3 OUT4	Output status indicators
4	bar	Position where to apply the label with united ingegneristica

General Operating Notes

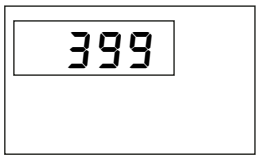
Switching on and using the intrument

Self-diagnostics



- Immediately after switching on the instrument carries out a self-diagnostic test. During the test, all the display segments and the 4 indicator lights will flash, when finished, enters normal work mode (Level 1) and displays variable value.

Normal Working - Level 1

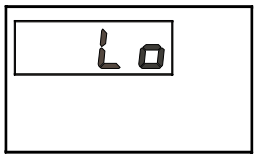


Displays the value of the Process Variable.

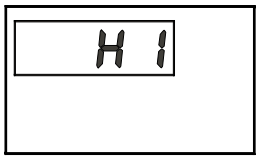
- By pressing briefly F it is possible to see in sequence (and if necessary edit) the significant values that condition the way the instrument works in Level 1 (Thresholds of interception)
- Keeping F pressed down for 3 seconds we enter the Programming/Configuration menu - see Navigation in the instrument Menus for further details..

Errors while working

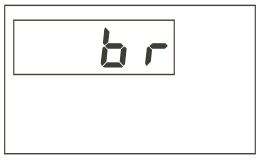
In the event of errors during normal working:



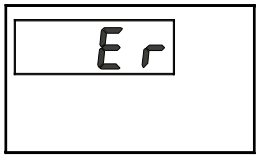
Lo process variable < min. scale limit (param. LS in the In)



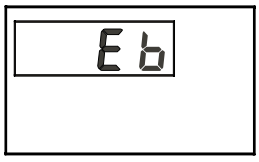
H I process variable > max. scale limit (param. HS in the In)



br broken probe or input values higher than maximum limits



Er input values lower than minimum limits

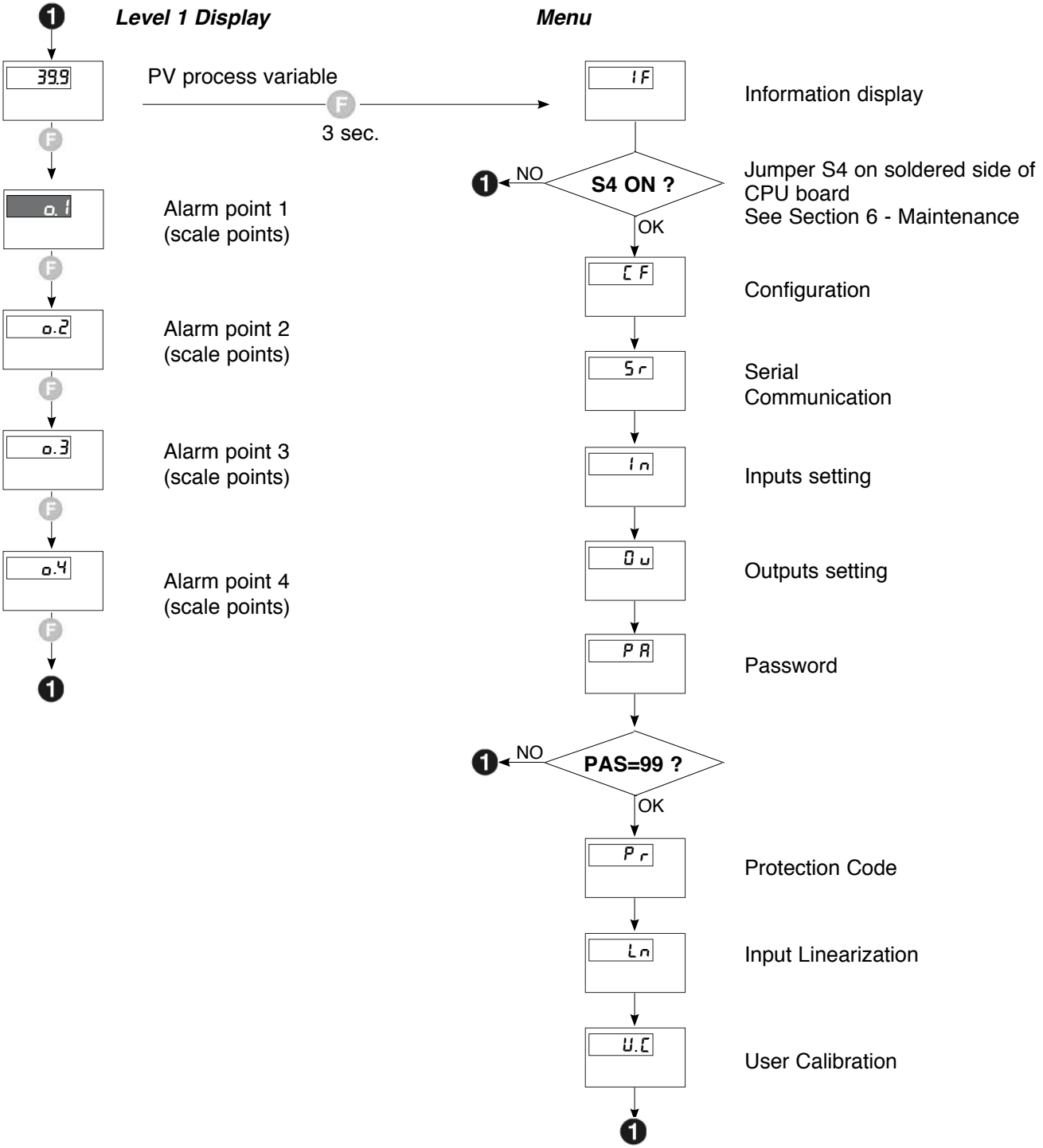


Eb Probe power supply failure (function enabled via parameters (C.I. on In menu)

To solve the problem, refer to the paragraph: Troubleshooting Guide in Section 6 Maintenance

Navigating through the instrument Menu

Keep F pressed down to scroll through the menus in sequence and release it when the required menu appears.
Press F to access the parameters of the selected menu.



If the keys △ ▽ , F are not pressed within approx. 15 seconds, the display returns to level 1

The parameters and menus not significant for a given configuration are NOT displayed

4 • CONFIGURATION / PROGRAMMING

This section contains the instructions necessary to configure the instrument according to the needs of the application..

Optimal working operation of the 40B96 in the field of application it is intended for depends largely on correct configuration and programming of the relevant control parameters.
The flexibility and high performance level of these instruments is in fact based on the numerous parameters that can be programmed directly by the user with the buttons on the control panel, or transferred from a PC, in the form of configuration files, by means of the RS485 interface available as an option.

Configuration
Access to all the configuration / programming menus and to all the parameters available in configuration, allows every detail of the Controller to be configured, to satisfy all application requirements.

Correct setting of the parameters involved in the configuration presumes a high level of knowledge regarding of use problems and techniques, and so it is recommended that these parameters are not changed unless the user is fully aware of the consequences, that otherwise form incorrect settings.

It is the user's responsibility to check that the parameters are set correctly before putting the instrument into service, in order to avoid damage to persons or property.

*For any doubts or clarification needed, please visit the Web Site **www.gefran.com** and if necessary contact the Gefran Customer Care service..*

The following pages describe one by one the various menus and show for each parameter the concise description of the function performed, any default values and the range of values that can be set.

Supplementary notes on consulting the Configuration/ Programming pages
To set some particularly complex parameters certain tables or detailed explanatory notes must be referred to.
These tables or explanatory notes are shown directly on the right of the page next to the parameter in question.

Application notes
The detailed explanations of certain functioning modes or special techniques the result Gefran's lengthy experience in the field of temperature control are instead contained at the end of the Configuration/ Programming. Section and can represent a valuable reference tool for the user.
Where necessary, in the configuration / programming flows the appropriate referrals to these Application Notes are provided.

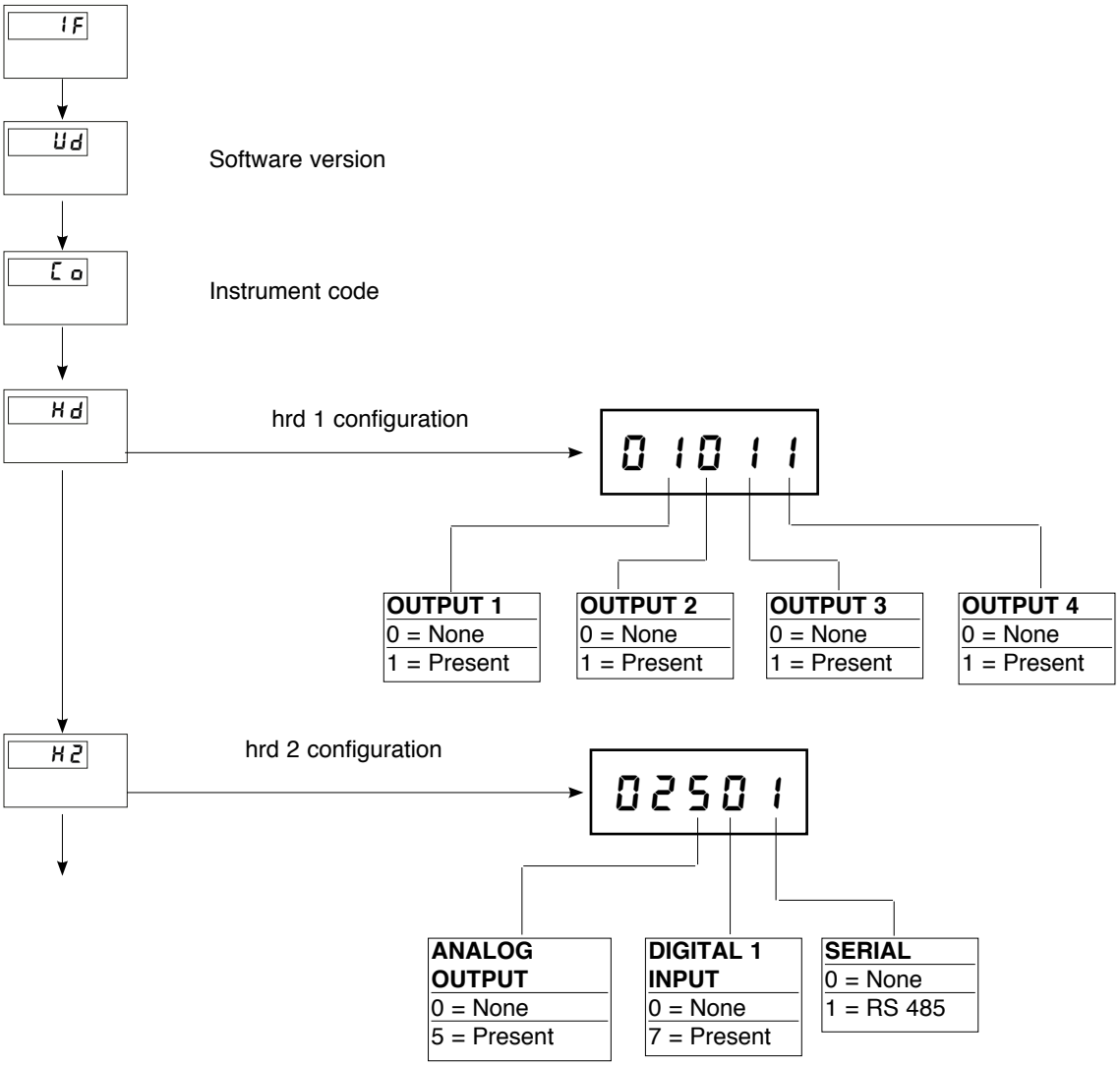
Password: PA
When scrolling through the menu (keeping F pressed down), following the diS menu, the word PA appears.
Access to the next menus is only possible if the PA = 99, parameter is set to 99 by pressing ▲ ▼ .
Having set the value to 99, press F and keep it pressed down to access the next menus.

Protection code: Pr
The Pr parameter is used to enable or disable the display and/or the possibility of editing certain parameters. For further details refer to the description of the Pr parameter in the configuration flows.

Jumper S4 on CPU Board
The absence of jumper S4 on the CPU board of the instrument prevents access to all the menus when the hardware configuration of the instrument does not require the pre-set parameters to be changed.
This jumper is engaged or disengaged during production and normally does not need to be modified by the final user.
For further information, refer to Section 6 - Maintenance.

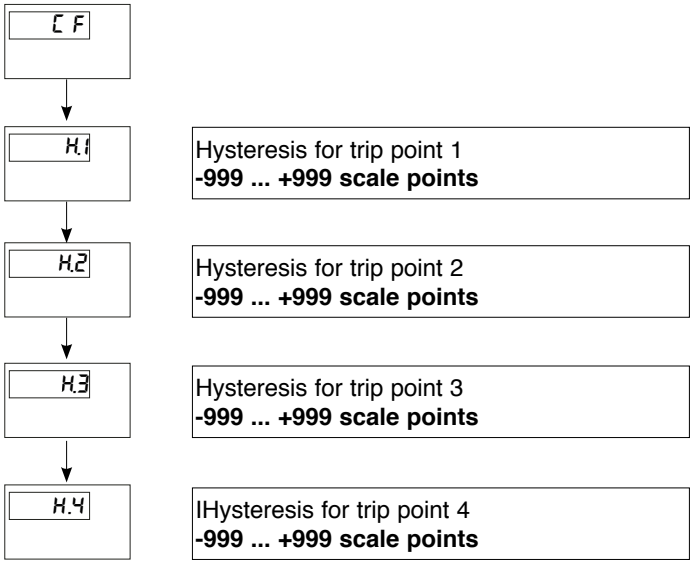
IF Information display — Programming configuration

This menu provides information on the status and hardware configuration of the instrument (number and type of inputs/ outputs, software version, etc.).



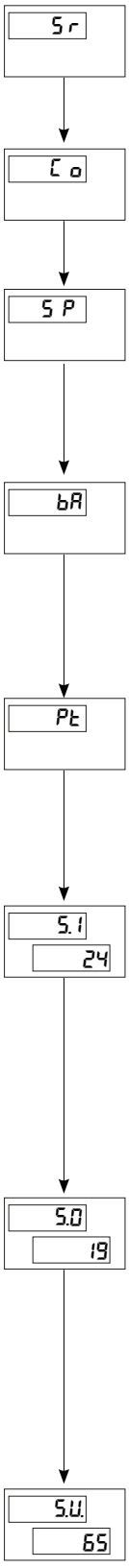
CF Configuration

This menu makes it possible to configure the interception parameters.



Sr Serial communication

This menu makes it possible to configure the various parameters that control serial communication between the instrument and the supervisor.



Instrument identification code

[0 ... 247]

Serial interface protocol

[0 ... 1]

SP	**Serial protocol**
0	CENCAL Gefran
1	MODBUS RTU

Select Baudrate

[0 ... 4]

bA	**Baudrate**
0	1200
1	2400
2	4800
3	9600
4	19200

Parity selection

[0 ... 2]

Pt	**Parity**
0	No parity
1	Odd
2	Even

Virtual instrument inputs

[0 ... 63]

Inputs	**IN**	**PV**	**o.4**	**o.3**	**o.2**	**o.1**
Bit	5	4	3	2	1	0
Ex.	0	1	1	0	0	0

Set code 24 on 5.1 in to manage PV and **o.4** alarm, via serial line

Virtual instrument outputs

[0 ... 31]

Outputs	**OUTW**	**OUT4**	**OUT3**	**OUT2**	**OUT1**
Bit	4	3	2	1	0
Ex.	1	0	0	1	1

Set code 19 in 5.0 to manage OUT1, 2 and W outputs via serial line

Virtual instrument user interface

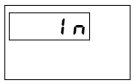
[0 ... 127]

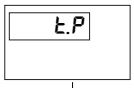
Interf		**KEYB**		**DIS**	**LED OUT4**	**LED OUT3**	**LED OUT2**	**LED OUT1**
Bit	7	6	5	4	3	2	1	0
Ex	0	1	0	0	0	0	0	

1 If you want to control KEYB interface elements and OUT1 LED via serial line, set S.U to 65

In Input settings

This menu makes it possible to configure the parameters for the instrument input signals.

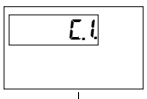




Probe type, signal and main input scale

tP	Probe type	Signal polarization	Main inputs scale limits		
0	Potent/4-20mA (*)	Positive (ex. 0/1V)	-1999/9999	-19990/99990	-1999/28000
1	Potent./4-20mA (*)	Positive (ex. 0/1V)	Linear custom	Linear custom	Linear custom
2	Strain gauge	Positive (ex. 0/10mV)	-1999/9999	-19990/99990	-1999/28000
3	Strain gauge	Symmetrical (ex.-10/+10mV)	-1999/9999	-19990/99990	-1999/28000

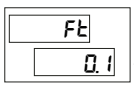
(*) 20mA Inputs: only for model 40B96-5-24-...
in case of input 0-20mA it is necessary to proceed to the calibration to two points 0 and 20mA (U.C = 2)



Select sampling time (resolution)

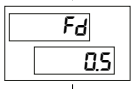
	For Strain gauge with Sensor power supply control (Eb)	For potentiometer	Resolution
0	120ms	120ms	> 14bit (campionamento Eb 240ms)
1	120ms	60ms	> 14bit; 16000 points (sampling Eb 120msec)
2	60ms	30ms	> 13bit; 8000 points (samplingEb 60msec)
3	30ms	15ms	> 12bit; 4000 points (sampling Eb 30msec)

+4 to disable filter (average of the last eight values sampled)
Strain gauge only
+8 disables Eb (sampling time is halved)
N.B.: maximum sampling frequency and minimum intercept time is obtained with code 15 (15 msec, 11bit resolution, filter off)



Digital filter on input
[0.0 ... 20.0] sec

If set to “0”, the medium filter on the sample value is excluded

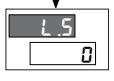


Digital filter on input display
[0 ... 9.9] punti scala

Decimal point position for input scale

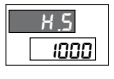
DP	Format
0	xxxxx
1	xxxx.x
2	xxx.xx
3	xx.xxx

+4 to display Lo below value L.S -(H.S - L.S) /256
(only for TP = 0 or 2)
+8 select input scale -19990/99990
(value of least significant digit set to 0)
+16 select input scale -1999/28000



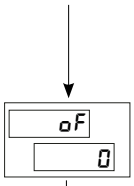
Minimum limit of main input scale and retransmission analog output

Min... Max value associated with the input selected with the tP parameter



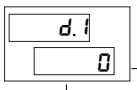
Maximum limit of main input scale and retransmission analog output

Min... Max value associated with the input selected with the tP parameter

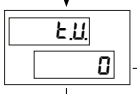


Offset correction of main input

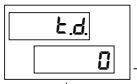
[-999 ... +999] scale points



Select function of digital input

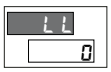


Raise key function (active only in P.V.selection)



Lower key function (active only in P.V.selection)

d. i. - t. u. - t. d.	
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 /***check CAL***
14	Output status OUT2 /***check CAL***
15	Output status OUT3 /***check CAL***
16	Output statusOUT4 / ***check CAL***
17	KEYLOCK (d.I. only)
18	access to U.CAL for the selected input probe type (t.U. and t.d. only)
19	OFFSET (t.U. and t.d. only)



Lower Limit for Alarm trip point setting

L.S ... H.S

Upper Limit for Alarm trip point setting

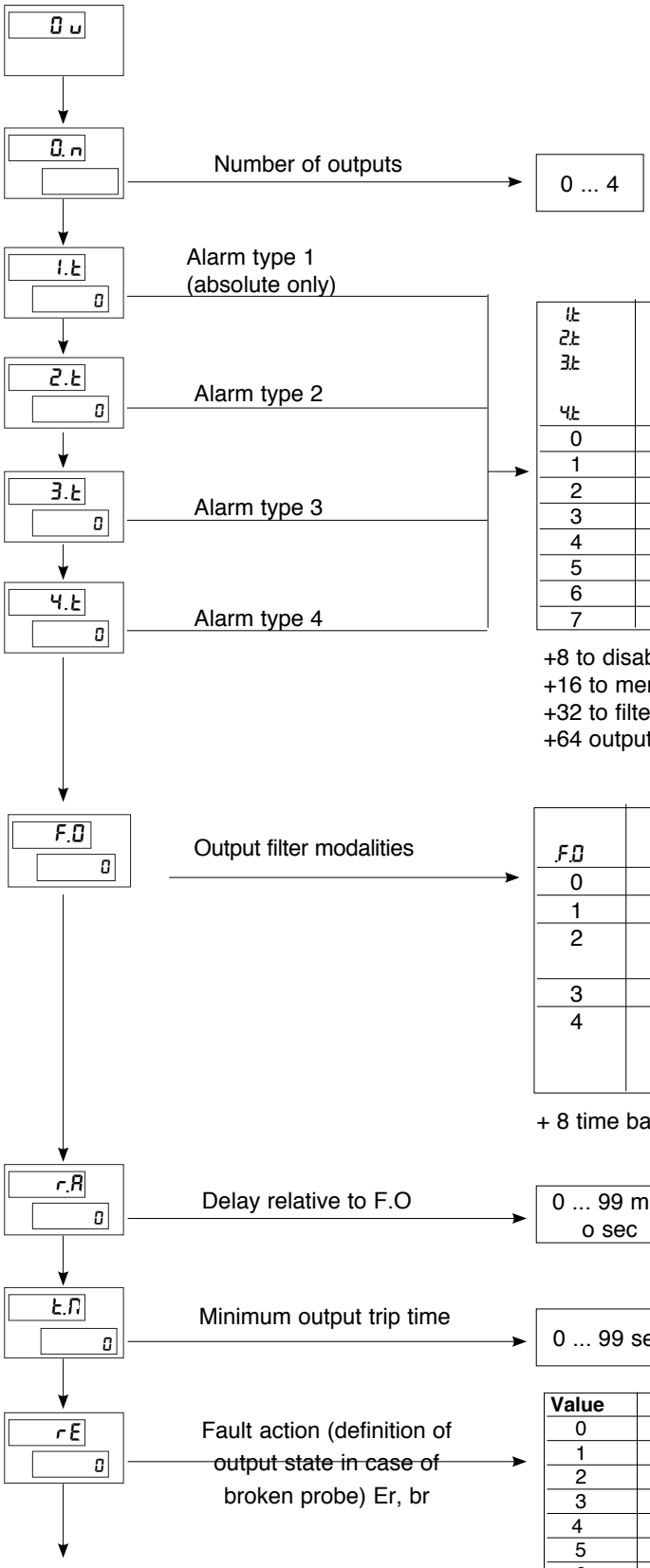
L.S ... H.S

Note 1
If you configure the “direct access to potentiometer calibration menu (tP=0 or 1)” function with parameters t.U. = 18 (t.d. = 18), the calibration procedure is as follows:
- keep the raise (lower) key pressed until you see C.L.
- release the key. Mechanically bring the potentiometer to minimum stroke position.
- confirm with the F key. C.H. will appear on the display.
- mechanically bring the potentiometer to maximum stroke position.
- keep the F key pressed to exit the procedure and return to normal display

Note 2
If you configure the “direct access to parameter o.F” function (offset correction of display) with parameters t.U. = 19 (t.d.=19), the calibration procedure is as follows:
- keep the raise (lower) key pressed until you see o.F.
- when the F key is released, the display will alternate between o.F and the previously set o.F value.
- set the offset value you want by means of the raise/lower keys.
- keep the F key pressed to exit the procedure and return to normal display.

Output settings

This menu makes it possible to configure the parameters of the instrument outputs.



Value	Direct (high limit) Inverse (low limit)	Absolute or Relative to previous absolute	Normal or Symmetric (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

1t 2t 3t 4t	**Direct (high limit) Inverse (low limit)**	**Absolute or Relative to previous absolute**	**Normal or Symmetric (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)
+64 output for calibration of 6 wire probe (Phase 2)

F.O	**Functions**
0	inactive, calculated state is shown directly on relays
1	delayed activation (DON)
2	delayed activation of output from time output is deactivated (DBI)
3	delayed deactivation (DOF)
4	delayed activation only when instrument is switched on (DPO)

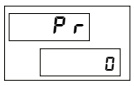
+ 8 time basis 99 min max. (default = 99 sec)

Disabled by setting 0.
Displayed if assigned to at least one output

Value	**Out 1**	**Out 2**	**Out 3**	**Out 4**
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Pr Protection code

This menu makes it possible to enable/disenable the display and/or modification of specific parameters



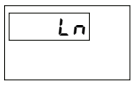
Protection code

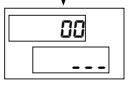
Pr	Displayed	Modifiable
0	o1 o2 o3 o4	o1 o2 o3 o4
1	o1 o2	o1 o2
2	o1	o1
3	o1	none

By adding the following figures to the value in the table it is possible to enable a series of supplementary functions:
+4: to disable In, Ou
+8: to disable CF, Sr
+16: to enable maintenance of reset latch at power-off
+32: base configuration (the following parameters will not be displayed: In: Ft, Fd, oF, L.L, H.L
Ou: On [forced to no. outputs present], rE
Ft, Fd, oF remain at set value
L.L, H.L are forced to L.S, H.S
+64: Virtual instrument.
+128: All pages access disabled, except PA (Password)

Ln Input linearization

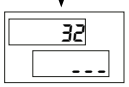
This menu makes it possible to carry out custom linearization for the main input.
Only if t.P = Linear Custom





Step 0 (beginning of scale value)
Display limits: (range within LS...HS)
[-1999 ... 9999 x 4 digit -19999...28000 x 5 digit]

.....

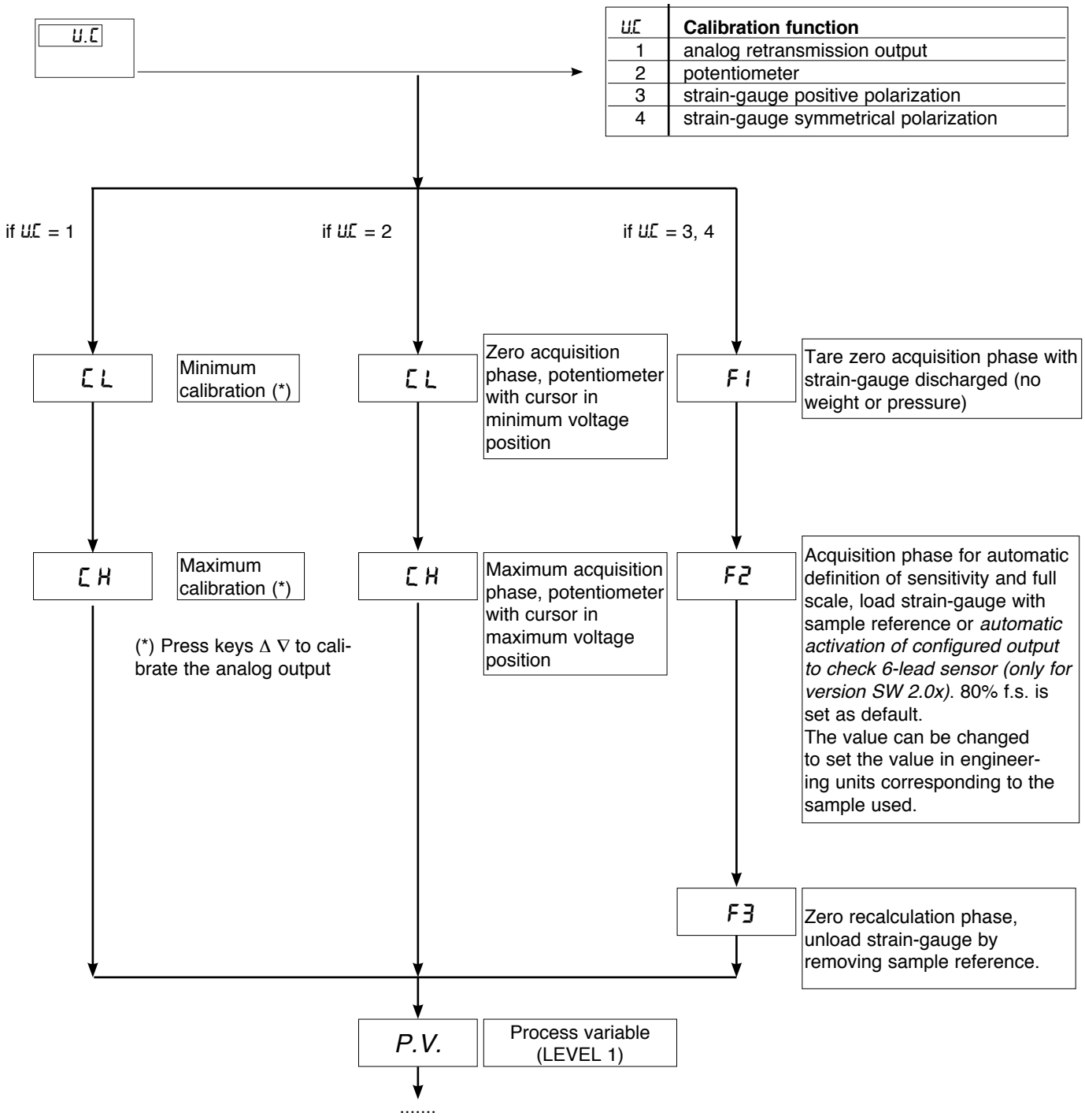


Step 32 (full scale value)
Display limits:
[-1999 ... 9999 x 4 digit -19999...28000 x 5 digit]

The “n” step value corresponds to input:
mV beginning scale + n* mV
mV = (mV full scale - mV beginning scale) / 32

u.C User calibration

This menu makes it possible to carry out user calibration.



Note: between the calibration phases some seconds could be requested to elaborate data.

Eb Function

The standard device is produced with parameter C.I.= 8,
with sampling time of 120 msec and Eb function disabled.
The Eb function lets you detect if the probe power supply is interrupted. This function is valid for probe currents > 20mA (8mA in version 2.0x)

Example:

- probe voltage 10V
- strain-gauge resistance 350Ω
- current = $\frac{V}{R} = \frac{10}{350} \cong 28mA$

or for three probes connected in parallel

- probe voltage 10V
- strain-gauge resistance 350Ω
- corrente = $\frac{V}{R} = \frac{10}{\frac{350}{3}} = \frac{30}{350} \cong 85mA$

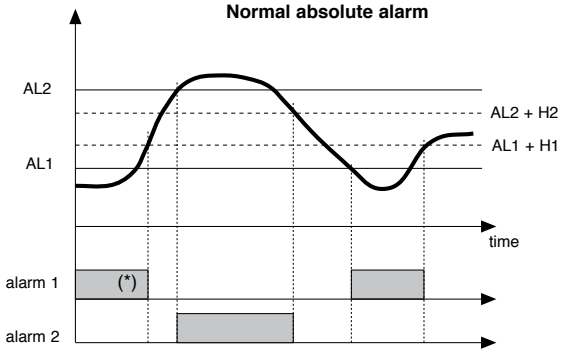
HOLD function

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.

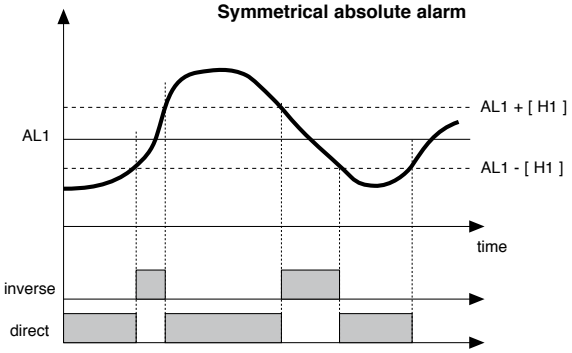
FLASH function

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.

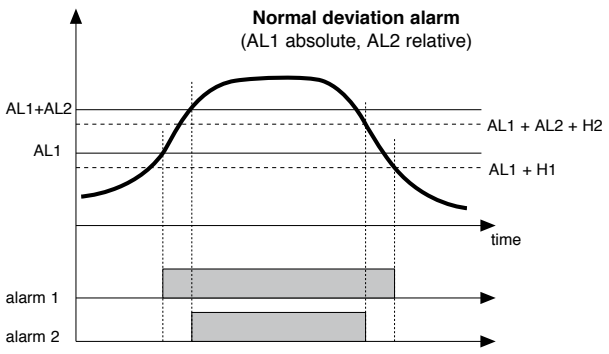
Alarms (Interceptions)



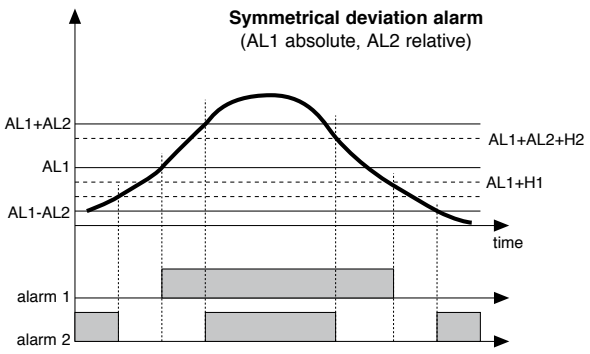
For AL1 inverse absolute alarm (min.) with positive H1, 1 t = 1
(*) = OFF if disabling on power-on exists
For AL2 direct absolute alarm (max) with negative H2, 2 t = 0



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



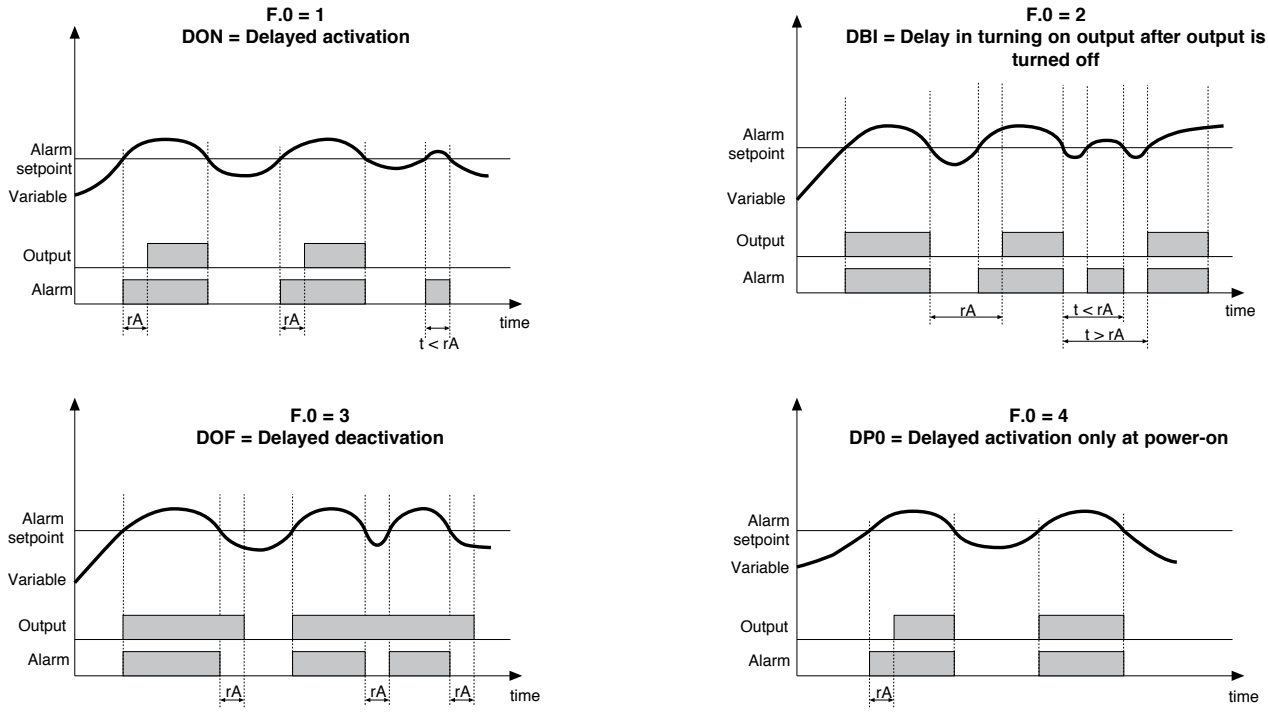
For AL1 direct absolute alarm (max) with negative H 1, 1 t = 0
For AL2 direct relative alarm (max) with negative H2, 2 t = 2



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



UCAL: strain-gauge calibration

a) Positive signal polarization
Suppose we test a probe (load cell) with sensitivity of 2mV/V, powered at 10V.
The input signal range is 0 to 20mV. From unloaded to loaded cell you should see a value from 0 to 1000.
Set scale limits: L.S. = 0; H.S. = 1000. Calibration procedure: U.C. = 3.
Phase F1: unload the cell (equal to applying input voltage of 0mV). Wait 2 seconds for the signal to stabilize. Press key F.
Phase F2: load the cell with a sample weight: for example, 80% of total weight (equal to applying input voltage of 80% of 20mV (2mV*10V) = 16mV). On display, set a value equal to 80% of H.S. = 800.
Press key F.
Phase F3: unload the cell (equal to applying input voltage of 0mV). Wait 2 seconds for the signal to stabilize. Press key F (calibration finished).

b) Suppose we test a probe (force sensor) with sensitivity of 2mV/V, powered at 10V.
The input signal range is -20mV to 20mV. From maximum compression to maximum traction you should see a value from -1000 to 1000. Set scale limits: L.S. = -1000; H.S. = 1000.
Calibration procedure: U.C. = 4.
Phase F1: do not apply any traction or compression to the sensor (equal to applying input voltage of 0mV).
Wait 2 seconds for the signal to stabilize. Press key F.
Phase F2: apply compression equal to 80% of total compression
(equal to applying input voltage of 80% of 20mV (2mV*10V) = 16mV). On display, set a value equal to 80% of H.S. = 800.
Press key F.
Phase F3: do not apply any traction or compression to the sensor (equal to applying input voltage of 0mV).
Wait 2 seconds for the signal to stabilize. Press key F (calibration finished).

Virtual Instrument

Management of the virtual instrument via serial is activated with the Pr parameter.

By setting the S.I, S.o and S.U parameters, you can enable writing of a few variables from the serial line to set input values, output state, LED state, and the value shown on displays.

You have to enable alarm limits when the write operations are continuous and you don't have to keep the last value in EPROM (applications requiring continuous variations of interceptions).

Enabling the PV input lets you exclude local acquisition of the input, replacing it with the value written in the VALUE_F register.

Enabling digital input lets you set the state of this input, for example, to perform the zero setting with writing of the appropriate bit in the V_IN_OUT register.

In analog mode, you can set the ON/OFF state of outputs OUT1, ..., OUT4 by writing the bit in the V_IN_OUT register; the value of analog output OUTW in the VALUE_W register; the state of LEDs OUT1,..., OUT4 by means of the bits in the V_X_LEDS register.

* To use the Display resources for setting a value on the display and Keyboard to simulate key pressure, you also have to set bit 7 of the STATUS6_W register (Modbus address 345 / Cencal 690). This bit is reset at every power-up.

The following table shows the register addresses:

Parameter	bit	Resource enabled	Image register address		Format	Register name
			Modbus	Cencal		
S.I	0	Alarm limit o.1	341	682	word	Interception 1
	1	Alarm limit o.2	342	684	word	Interception 2
	2	Alarm limit o.3	343	686	word	Interception 3
	3	Alarm limit o.4	302	604	word	Interception 4
	4	PV input	347	694	word	VALUE_F
	5	IN digital input	344	688	word, bit 4	V_IN_OUT
S.o	0	Output OUT1	344	688	word, bit 0	V_IN_OUT
	1	Output OUT2	344	688	word, bit 1	V_IN_OUT
	2	Output OUT3	344	688	word, bit 2	V_IN_OUT
	3	Output OUT4	344	688	word, bit 3	V_IN_OUT
	4	Output OUTW	307	614	word	VALUE_W
S.U	0	Led OUT1	351	702	word, bit 0	V_X_LEDS
	1	Led OUT2	351	702	word, bit 1	V_X_LEDS
	2	Led OUT3	351	702	word, bit 2	V_X_LEDS
	3	Led OUT4	351	702	word, bit 3	V_X_LEDS
	4	* Display high thousands	321	642	word	ADD1
	4	* Display high hundreds	322	644	word	ADD2
	4	* Display high tens	323	646	word	ADD3
	4	* Display high units	324	648	word	ADD4
	4	* Display high tens of thousands	325	650	word	ADD5
	6	* Keyboard F key	320	640	word, bit 0	NEW_TAST
	6	* Keyboard DOWN key	320	640	word, bit 1	NEW_TAST
	6	* Keyboard UP key	320	640	word, bit 3	NEW_TAST

5 • TECHNICAL SPECIFICATIONS

This section contains a list of the Technical Specifications for the 40B96 instrument.

Display	5 red digits, digit height 14mm (5 digits)
Keys	3 mechanical type (NC, DEC, F)
Accuracy	0.2% f.s. ±1 digit a temperatura ambiente di 25°C t.s. 120msec
Thermal drift	0,005% f.s. / °C
Resolution	function of settable sampling time: >14bit, t.s. 120msec with sensor power control if strain gauge >13bit, t.s. 30msec (60msec with strain gauge power control) >12bit, t.s. 15msec (30msec with strain gauge power control)
Main input	differential input for - from strain-gauge 350Ω (for pressure, force, etc.) sensitivity 5mV/V with strain-gauge power max 15V, (7.5mV/V con power supply max. 10V-15mV/V with power supply max 5V), positive or symmetrical polarization, calibration with automatic calibration of sensitivity, possible signaling of interrupted sensor power supply - from potentiometer with power supply 1.2V, ≥ 100Ω - 0...20/4...20mA transmitter with 24Vdc supply (Ri = 50Ω)
Linear scale range	-1999...9999 (with 4 digits),-1999...28000 (with 5 digits) settable decimal point; a 32 section linearization can be inserted
Alarms (interception)	max 4 configurable alarm types: absolute, deviation, symmetrical deviation. Hysteresis setting
Alarm masking	options: - exclusion at switch-on - latch, reset from key and/or contact - insertion of delay filter (DON,DBI,DOF,DPO) - activation of minimum time on trip
Relay contact	NO (NC), 5A, 250V/30Vdc cosφ=1
Logic output	24V ±10% (10V min / 20mA)
Triac output load	20...240Vac ±10%, 1A max, snubberless, inductive and resistive I^2t = 128A
Fault settings	Alarm states can be configured in probe fault condition
Sensor power	1,2Vdc for potentiometer > 100Ω 5Vdc, 10Vdc, max 120mA (for strain-gauge) 15Vdc, 50mA max. 24Vdc ± 10% non stabilized 50mA, (100mA max for the 0...20/4...20mA transmitter input model only)
Analogue retransmission	10V/20mA Rload max 500Ω resolution 12 bit
Digital inputs	Ri = 4,7KΩ (24V, 5mA) or from terminal not supplied.
Serial interface (option)	RS485, isolated
Baudrate	1200, 2400, 4800, 9600, 19200
Protocol	Gefran CENCAL / MODBUS
Power supply (switching type)	(standard) 100...240Vac/dc ±10% max 18VA (optional) 11...27Vac/dc ±10% max 11VA 50/60Hz
Faceplate protection	IP65
Working / Storage temperature range	0...50°C / -20...70°C
Relative humidity	20...85% Ur non-condensing
Environmental working conditions	for indoor use, altitudes up to 2000m
Installation	panel, removable faceplate
Installation specifications	installation category II, pollution level 2, double isolation
Weight	160 g complete version

6 • MAINTENANCE

This section gives the information and the necessary warnings for routine maintenance of the instrument and contains a Troubleshooting Guide which should before seeking help from the Gefran Customer Assistance, in the event of instrument malfunction.

If installed and configured correctly according to the instructions and the recommendations provided in Sections 2 and 4 of these Instructions for use, the instrument will work normally without any need for maintenance, apart from the usual operations of cleaning the faceplate, and if necessary the internal parts of the instrument.

To gain access to the inside of the instrument (for example for cleaning or to check the jumpers) just undo the screw at the bottom of the faceplate and take out the instrument without having to disconnect the cables.

Make sure that the power is turned off upstream of the instrument however.

Remember that the 40B96 interceptor is not equipped with an ON/OFF switch.

Cleaning the Instrument

To clean the faceplate and the case use only a cloth dampened in water or ethyl alcohol.

Do not use hydrocarbon-based solvents (trichiorethylene, petrol, etc.).

Do not use compressed air to remove dust from the electronic circuit boards, if necessary use a clean brush with soft bristles.

Repairs

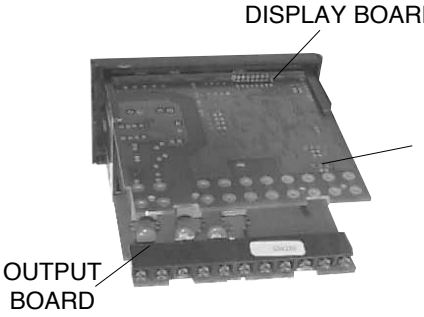
Repairs to the 40B96 instrument must only be carried out by qualified technicians, properly trained and authorized by Gefran. Any attempts at repair or modification of the instrument hardware characteristics by unauthorized personnel will invalidate the warrantya.

Checking the jumpers

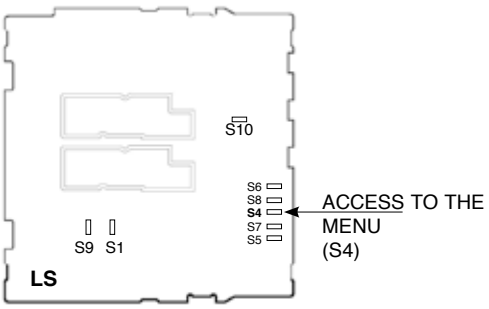
The solders side of the CPU board contains the jumper S4 which enables (if on) access to the controller menus.

The instrument contains components which are sensitive to electrostatic discharge, so the relevant precautions must be taken when handling the electronic circuit boards contained in it, in order to avoid permanent damage to components themselves.

Device structure: identification of boards



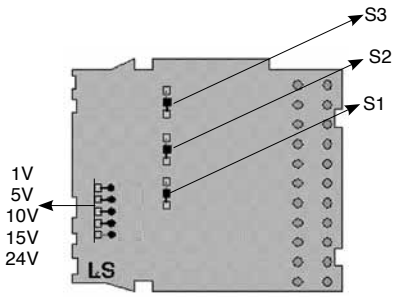
CPU BOARD + POWER SUPPLY BOARD



Jumper S4 is normally closed. To change its state, the connection has to be removed. This operation must be done by trained technical personnel.

OUTPUT BOARD

Power supply selection
Sensor or Transmitter



	Jumper	Direct		Inverse	
		A	**B**	**A**	**B**
OUT1	S1	ON	OFF	OFF	ON
OUT2	S2	ON	OFF	OFF	ON
OUT3	S3	ON	OFF	OFF	ON

You can select output state to have direct or reverse mode.
Jumper S1, S2 and S3 are normally closed in position A. To change their state, the connection has to be removed.
This operation must be done by trained technical personnel.

Example in case of relay output:
- Direct mode: energized relay and related closed contact correspond to active trip point.
- Reverse mode: de-energized relay and related open contact correspond to active trip point.

Symptom	Cause and Recommended remedy
The instrument display and Led do not come on	Instrument power supply problem. Check that power is being supplied to terminals 10-11. make sure the power supply corresponds with the one stated in the order code: 40B96 5 xx – xx – xx – x.x – 1 = 100..240Vac/dc 40B96 5 xx – xx – xx – x.x – 0 = 11..27Vac/dc
The characters shown on the display are incomplete or illegible	Possible fault with one of the display segments. Check that all the segments are working properly by switching the instrument off and then on again. When it is switched on again a self-diagnostic test is performed that checks intermittent start up of all the segments (displays the value 8888). If one or more segments do not light up contact your Gefran dealer.
When pressing down F none of the configuration menus can be accessed	If the problem appears during the first installation, it probably means that the hardware configuration doesn't allow changing of the default parameters beyond the alarm setpoint value. (Parameter change is enabled by jumper S4 on the CPU board). If on the other hand the problem occurs on a instrument that previously gave access to the configuration parameters, this probably means that there is a false contact on the jumper S4. In this case check the continuity of the jumper referring to the previous paragraph.
When pressing down F not all of the parameters and/or configuration menus can be accessed	Access to some menus and/or parameters is protected by a password (PA) and a code (PR) that limits configuration mode. To set the password and the protection code correctly refer to Section 4 "Configuration/ Programming".
Instead of the process variable the PV display shows one of the following: Lo - Hi - br - Er - Eb	In the first four cases it means that an input error has been found (for details refer to Section 3 - Functions). In the last case, it means probe power supply failure. This function has to be enabled via parameter c.I. on the In menu.

7 • TECHNICAL/COMMERCIAL INFORMATION

This section contains information regarding the instrument order codes and the main accessories available.

As stated in the Preliminary Warnings of these Instructions for Use, correct interpretation of the instrument order code allows the hardware configuration to be identified immediately and so it is essential to quote the order code each time the Gefran Customer Care Service is contacted for assistance with any problems.

Order code – 40B96 alarm unit

40B 96 5 □□ □ □ □ □ □ □

NR. DIGITS	
5	5

TRANSMITTER POWER SUPPLY	
1,2Vdc potentiometer	0 1
5Vdc	0 5
10Vdc	1 0
15Vdc	1 5
24Vdc (only for 20mA input) *	2 4
All ***	99

OUT 1, OUT 2	
Relay, Relay	R R
Relay, Logic	R D
Triac, None	T O

OUT 3, OUT 4	
None	0 0
Relay, None	R 0
Relay, Relay **	R R

POWER SUPPLY	
0	11...27Vac/dc
1	100...240Vac/dc

SERIAL LINE	
0	None
2	RS 485

DIGITAL INPUT / RETRANSMISSION OUTPUT	
0	None
1	Digital input
2	0/4...20mA (0...10V) retansmision output **
3	Both **

* Specific model for use with transmitter 20mA (es for position magnetostrittive sensor) excludes Output 3, Output 4 and retransmission, all the other models have potentiometer/strain-gauge configurable input

** Out 4 alternative to retransmission output

*** Selectable (standard = 24Vdc)

For information on the availability of codes please contact your Gefran dealer.

ACCESSORIES

• RS232 / TTL interface for GEFRAN instrument configuration

N.B. RS232 interface for PC configuration is supplied with the WINSTRUM programming software. Make connection with instrument powered but with inputs and outputs disconnected.

• ORDER CODE

WSK-0-0-0	Cable interface + CD Winstrum

Side insertion cable

APPENDIX

The appendix contains the list of all the abbreviations of parameters which appear in the various configuration/programming menus with the respective default values and meanings.
The CONF column can be used to indicate the user's modified values with respect to the default configuration, on the basis of application requirements.

Display	Default	CONF	Acronym	Description
Level 1				
o.1	40		Output 1	Setting of alarm setpoint (Scale points)
o.2	50		Output 2	Setting of alarm setpoint (Scale points
o.3	60		Output 3	Setting of alarm setpoint (Scale points)
o.4	70		Output 4	Setting of alarm setpoint (Scale points)
Menu 1F				
Ud	3.20		UPdate	Software version identification
Co	1		Code	Instrument code identification
.Hd			Conf Hardware 1	Hardware outputs configuration
.H2			Conf Hardware 2	Hardware inputs configuration
Menu CF				
H.1	-1		HYsteresis 1	Hysteresis for setpoint 1
H.2	-1		HYsteresis 2	Hysteresis for setpoint 2
H.3	-1		HYsteresis 3	Hysteresis for setpoint 3
H.4	-1		HYsteresis 4	Hysteresis for setpoint 4
Menu Sr				
Co	1		Instrument Code	Instrument identification code
S.P	1		Serial Protocol	Serial interface protocol
bA	4		bAudrate	Baudrate selection
Pt	0		PArity	Parity selection
S.1	0		S. Input	Virtual instrument inputs
S.o	0		S. Output	Virtual instrument outputs
S.U	0		S. User Interface	Virtual instrument user interface
Menu In				
tP	0		type of Probe	Probe type, signal, enable linearization, etc.
C 1	0		Sample time	Select sampling time
Ft	0.1		FiLter time	Digital filter on input
Fd	0.5		FiLter display	Digital filter on display
dP.	0		Decimal point	Decimal point position for input scale
L.S	0		Low Scale	Minimum limit input scale
H.S	1000		High Scale	Maximum limit input scale
oF	0		oFfSet	Offset correction of main input
d.1	0		Digital input	Digital input function
tU	0		UP key	Raise key function
t.d	0		DOWN key	Lower key function
L.L	0		Low Limit	Lower limit for setting SP and absolute alarms
H.L	1000		High Limit	Upper limit for setting SP and absolute alarms

Display	Default	CONF	Acronym	Description
Menu Ou				
On	0		Output number	Number of trip point outputs
1t	0		Output type 1	Trip point type for Out 1
2t	0		Output type 2	Trip point type for Out 2
3t	0		Output type 3	Trip point type for Out 3
4t	0		Output type 4	Trip point type for Out 4
FO	0		Output filter	Filter mode on trip points
rA	0		Output delay	Trip point delay
tM	0		Minimum type	Minimum output trip point time
rE	0		Fault action	Definition of output states with broken sensor

Menu Ln - Input linearization 00 – 32

N°	Default	CONF	N°	Default	CONF	N°	Default	CONF	N°	Default	CONF	N°	Default	CONF
.00	0		.07	219		.14	437		.21	656		.28	875	
.01	31		.08	250		.15	469		.22	687		.29	906	
.02	62		.09	281		.16	500		.23	719		.30	937	
.03	94		.10	312		.17	531		.24	750		.31	969	
.04	125		.11	344		.18	562		.25	781		.32	1000	
.05	156		.12	375		.19	594		.26	812				
.06	187		.13	406		.20	625		.27	844				