instruments

MIVI 8001

Technical Manual

Ref : 128-41/5

Quality system certified

AFAQ ISO 9001 VERSION 2000

SOFRASER
ZI, 15 rue Nobel
45700 Villemandeur - France
info@sofraser.com - www.sofraser.com
+33 (0) 238 85 77 12 - Fax +33 (0) 238 85 99 65

IMPORTANT

BEFORE STARTING THE PROCESS, PROCEED TO THE OFFSET IN AIR ADJUSTMENT.

IT MEANS THAT THE ROUGH SIGNAL WILL BE SHIFTED TO THE REFERENCE "900" :

1. CLEAN AND DRY THE SENSOR ROD.
2. BE SURE THE PROCESS IS EMPTY.
3. INSTALL THE SENSOR ON THE PROCESS AND FIX IT WITH ITS 4 SCREWS.
4. ON VIEW #1, PRESS SIMULTANEOUSLY [▲] + [R/L] + [↵] KEYS DURING APPROXIMATELY 3 SECONDS.
   "900" MUST BE INDICATED ON THE RED DISPLAY UNTIL THE THREE KEYS ARE PRESSED.
5. CHECK THE RED DISPLAY INDICATES "0" AS VISCOSITY VALUE.
6. PRESS CONTINEOUSLY [R/L] KEY AND CHECK THAT THE RED DISPLAY INDICATES 900 ± 0.5.

   OTHERWISE, REPEAT STEP #4.

TABLE OF CONTENT

1. General presentation

1.1. The sensor

Each sensor is matched with its own electronics. Before switching on, be sure that serial numbers at the sensor and the electronics identification plates are corresponding.
The operation principle of the equipment makes that the provided viscosity information is relative: in the same fluid, at the same conditions the information is the same. But for 2 rheologically different fluids the response can be different (despite it is perfectly repeatable).
The sensor active part is protected by an stainless tube which must not be removed.
The sensor is fixed upon its mounting flange by means of the provided 4 long screws.
See the detailed leaflet, § 2.

1.2. The processor

Its functions:

- Powers the sensor;
- Processes the sensor's information;
- Displays and transmits the process information : viscosity, temperature, sensor's frequency, outputs states …

It is composed of three software modes:

- **« USER» Mode :**

Used for the working mode, it allows:
- Visualizing viscosity, temperature and outputs states (relays, digital link,…);
- Adjusting the offset in air;
- Accessing to ADAPTATION and CONFIGURATION modes;

See detailed leaflet, § 5.

- **« ADAPTATION » Mode:**

Allows adjusting the functioning parameters as:
- The table of linearization (Re-calibration and thermal drift compensation);
- Hysteresis and thresholds alarms values;
- Scale of bargraphs;
- Filtering parameters of inputs and outputs;

See detailed leaflet, § 7.

- **« CONFIGURATION » Mode:**

Allows defining:
- The inputs parameters ;
- The alarm types;
- The outputs parameters (relays, analogs, digital);

See detailed leaflet, § 6.

1.3. Checking the equipment at the receipt

a- At first, check the supply conformity with the ordered equipment, mainly the presence of the parts necessary for the equipment mounting. Those to be used at the process will be given to the concerned department, for the installation preparation.
b- Place the sensor on a soft foam plate, connect it to the 8001 module (see § 3.11), and then switch on. The vibration appears at the rod, and the indication (display and output) is close to the minimal required values. When touching the rod, the information has to increase.

In case of subnormal operation, check as follows :

- The power supply, the connections, and the cables.
- The good condition of the vibrating rod (no bending on knock damages).

Consult your Distributor.

1.4. Checking the equipment when placed at the process

Before filling the network check that the viscosity information is stable (vibrating rod in air). If not, check the strength of the sensor fitting, then rotate the sensor of 90° (4 possible positions). Choose the position where the information is the most stable.
Locate this position, in order to restore it when the sensor is removed – put in place.
Adjust the offset in air, at room temperature. When possible, note the viscosity information when a cleaning or rinsing solution is flowing.
If the original calibration is convenient, one of the 2 above mentioned values can be taken as reference for periodic control of the equipment operation each time that the same conditions will occur (rod in air, or in the cleaning solution). Such an operation can be assimilated to a self-checking.
If the original calibration has been modified the reference values will be of course those obtained with the new calibration.

1.5. Periodic checking

Conformity to regulations relative to Quality Insurance implicates a periodic control of the measuring equipment used in the manufacturing operations, taking in consideration (or correcting) their drift in time.
It is proved that this equipment drift is negligible. However, it is good to check their aspect and their response once a year, at the same time as the other process equipment.
A fast test is many times available, when the sensor active part is in air, or immersed in a cleaning or rinsing solution. As long as these values stay similar, we can say that the sensor operation is right among its whole range (if no intermediate re-programming occurred).

1.5.1. Adjusting the mounting offset in air

The sensor active part must be clean and dry.
Press simultaneously the following keys of the device's front panel :

Be sure before you stop pushing the keys that the red display indicates "900".
The upper display (red one) must indicate "0" when you stop pushing the keys.

1.5.2. Modification of the previous calibration

The device has been programmed in order to answer to your needs. These features programming steps are noticed on the features specification pages at the end of this document.
At first, be sure that the modification is necessary, and not consecutive of a non coherent comparative information (different measuring conditions, bad standards, inaccurate or wrong laboratory measurements,…).
To re-calibrate the viscometer, measure several viscosities of standard oils and then, transfer the values in the table n°2 of the electronic processor. Refer to the User Manual 8001 to know each steps of a re-calibration.

1.6. Directives and standards

1.6.1. European Directive ATEX

MIVI sensors are in agreement with 94/9/EC directive (ATEX) for equipments installed in explosive gas atmospheres or in presence of combustible dust :

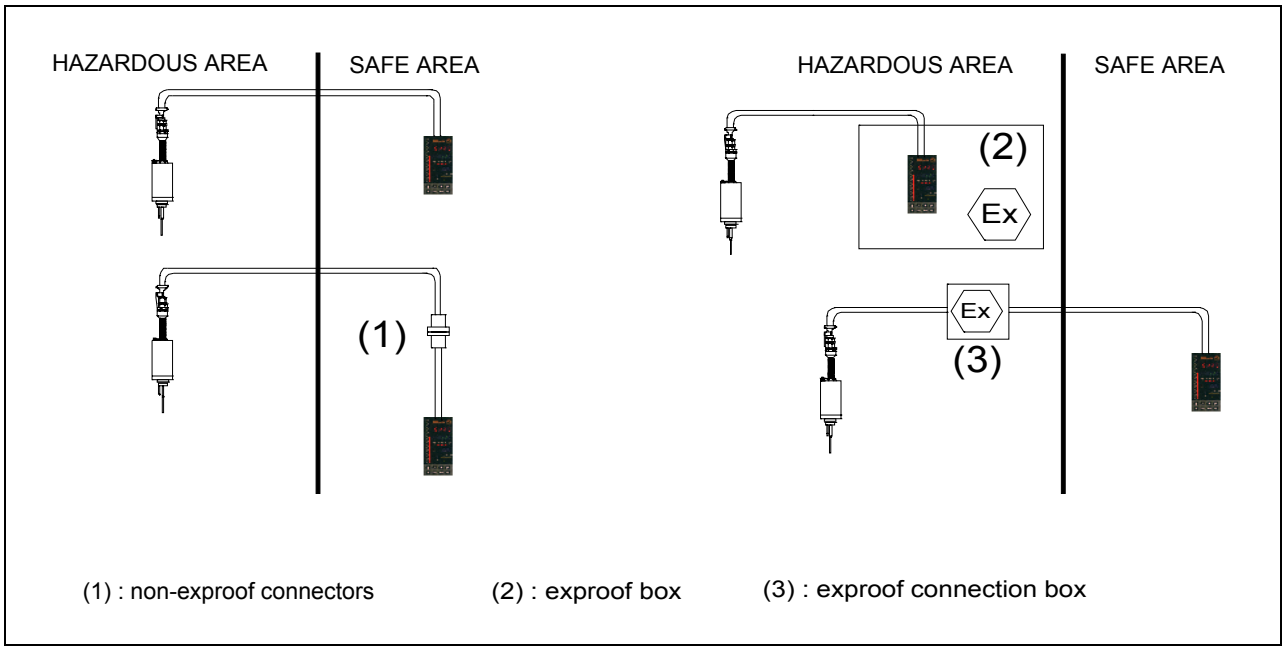
Ex II 2G (gas)

Ex II 2D (dust)

Ex d IIC T1 to T6 : gas
Ex tD A21 IP67 T75°C, T90°C, T125°C, T190°C, T290°C, T300°C : dust
Be sure the sensor's certification is in accordance with the security level required on your process location : Area classification, equipments group, protection method, gas type, temperature codes…
Area classification and equipments installation rules are detailed into IEC 7910 and EN 60079 standards for gas or EN 61241 standards for dust.
To always keep the maximum security level of the viscometer, don't open it. Furthermore, we advice to install the sensor with the cable gland orientated to the floor.
Check periodically information indicated on the sensor's identification plate are still visible.

1.6.2. Installation in hazardous area

Here are the possible ways to install MIVI sensors in hazardous area.



IMPORTANT : Always connect the sensor's body (screw on the top of the body) to the ground.

1.6.3. European Pressure Equipment Directive

Up to 60 bars, MIVI sensors are in agreement with the article 3.3 of the PED 97/23/EC. In case of higher pressure, sensors are certified one by one.
The mounting flange is an accessory to be welded on the process line. It means it can not be individually certified but with the whole process line.

1.6.4. EMC and low voltage directive

MIVI 8001 is in agreement with EMC specifications detailed into 89/336/EEC (modified by 92/31/EEC and 93/68/EEC).
8001 processor is also in agreement with the low voltage directive 73/23/EEC (modified by 93/68/EEC).
MIVI sensors have been designed and manufactured according to the electrical safety rules.

2. The MIVI sensor

2.1. Various models

- General purpose sensors
- Sanitary sensors (special design for no retention areas).
- Ex-proof sensors (ATEX, FM or JIS approvals).
- High-pressure sensors up to 150 bars (reinforced fitting).
- Special models, according to the requirements (in design and material).
- When required, a temperature probe can be incorporated to the MIVI sensor.

2.2. Sensor installation

It operates at any position, even upside down. Its active part has to be permanently immersed in the fluid (low part of the network or reactor). If the fluid temperature varies widely and fast, choose the upside down or horizontal position, in order to allow a convenient air convection among the sensor body.

It is screwed to its mounting flange by means of 4 screws M6X100 (or 8 screws M8 for high pressures). The mounting flange has to be welded close to the device generating the viscosity variations (heater, mixer, reactor, etc…). Retention, high flow velocities, strong vibrations and high magnetic fields have to be avoided.

According to the application the mounting flange material can be :

- ➢ Stainless steel Z3CND 17/11-02 (316L).
- ➢ Carbon steel XC38
- ➢ Other materials, according to the requirement.

2.2.1. Elbow mounting

The flange is welded on a right angle tee as indicated in fig.1.

- The minimal pipe diameter is of 32 mm.
- The flange and the pipe axes have to be superjacent.
- The flow direction is as indicated on fig.1 (unless for fibrous fluids where the flow is inverted and the rod protector removed.

A free area of at least 150 mm length is necessary.

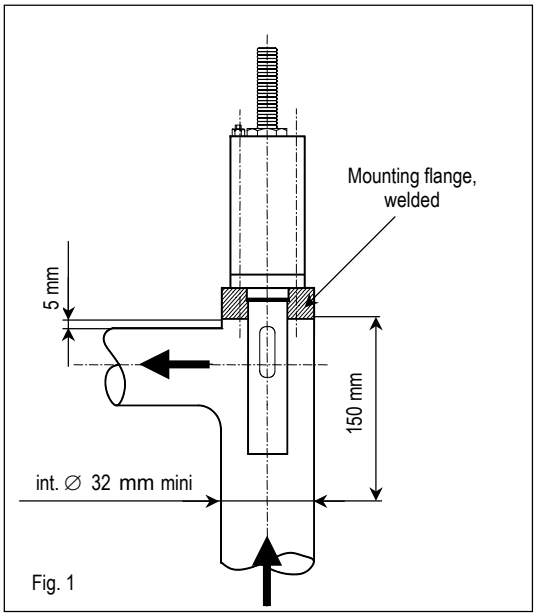


Fig. 1

2.2.2. Plane side mounting

- The flange is welded as indicated on fig.2.
- The free area around the vibrating rod has to be at least ∅ 40, 150 mm length.
- In order to avoid parasitic vibrations, the plate where the flange is welded must be thicker than 5 mm.

2.2.3. On pot mounting, for small flow rates, or pilot plant

See fig.3.

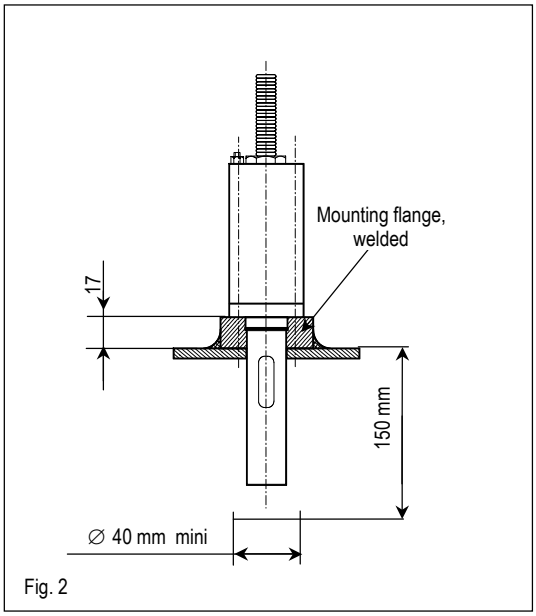


Fig. 2

2.2.4. Special mountings

The small sensor size allows numerous personalization of its fitting according to the user's requirements. Consult your Distributor.

2.2.5. Replacement cap

Each mounting flange is provided with the corresponding cap and its accessories (screws and gaskets). It allows the installation working when the sensor has to be removed.

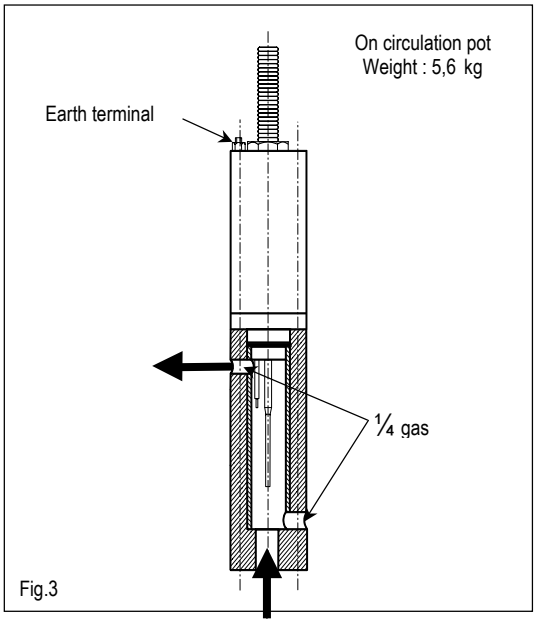


Fig.3

2.3. Practical advices

Torque at the mounting screws: 9 N.m ± 1 at the M6×100 screws, or 22 N.m ± 1 at the M8 screws (for the high pressure design).

Notes:

Each sensor is equipped with a guard tube in order to protect the vibrating rod. In most cases, it is designed according to the application, and has not to be removed, unless when it disturbs the sensor operation: on pot mounting, sanitary use, very viscous and fibrous fluids, where a replacement ring is used.

WARNING ! In this case, the mounting / removing of the sensor must be made with precaution, in order to avoid to bend the vibrating rod.

A ring, with the same dimensions of the protector's base must be placed on the head of the sensor in order to maintain the O-ring.

IMPORTANT :

- As soon as the sensor is removed, screw immediately its guard tube.
- IP 67 rightness is only obtained when firmly screwing either the cable connectors, their replacing caps, and the cable glands.
- The minimal bending radius at the flexible pipe (electric outlet) is of 100 mm. Less radius can generate leakage, then failure.

2.4. Checking

In case of subnormal operation, check the following points:

- Electrical connections (connectors, cables, power supply…)
- Remove the sensor from the process and clean it
- Check that the vibrating rod is not bent.
  When powered, check with the finger that the vibration is existing at the rod end. At this moment, the viscosity information has to increase.

2.5. Sensors wiring

Wire	Color
1	Blue
3	Brown
3	Transparent
4	Black
26	Green
25	Yellow
24	Red

General purpose sensors

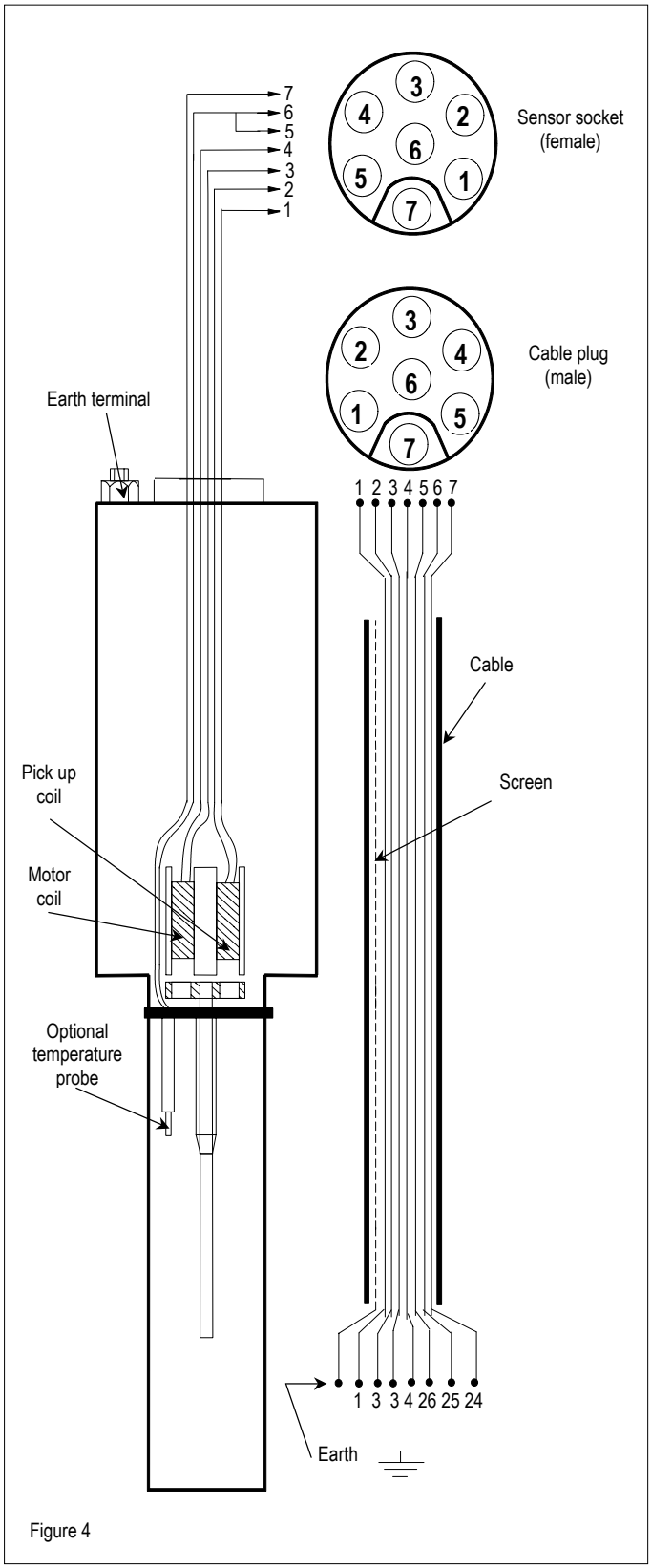


Figure 4

Exproof sensors

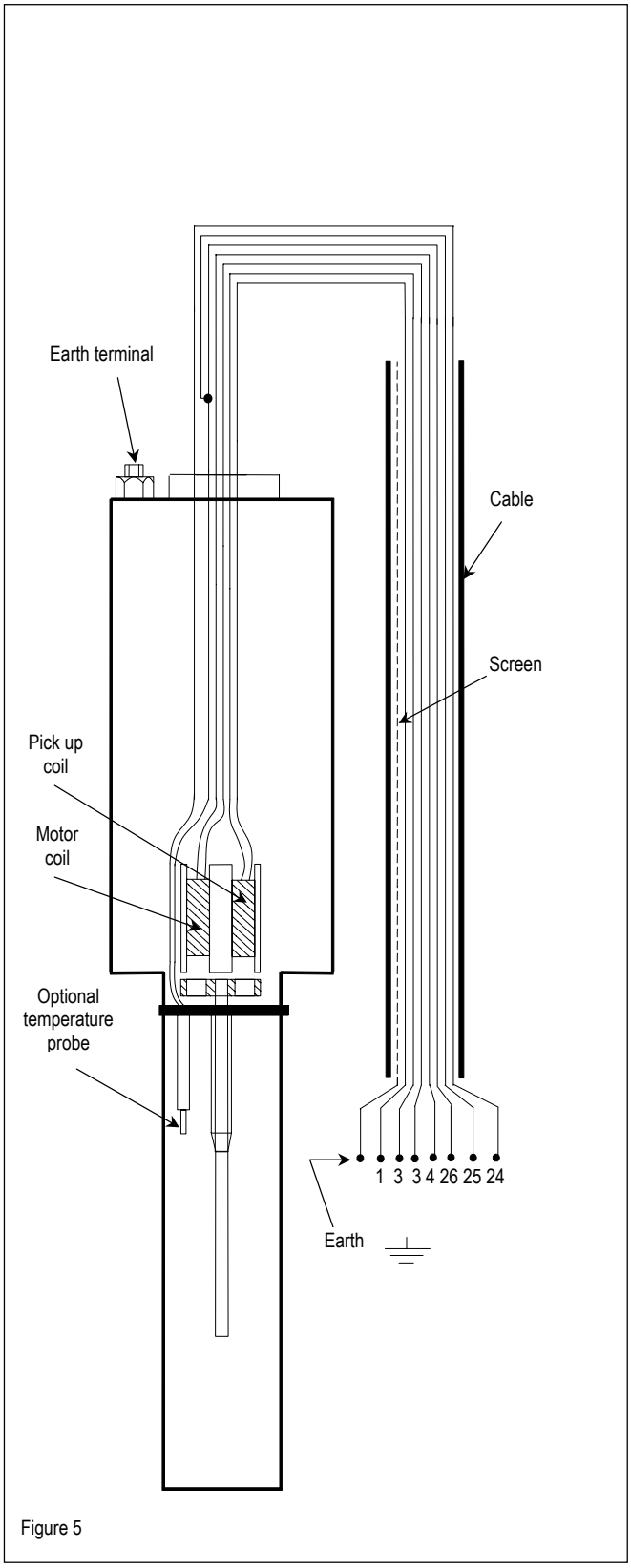


Figure 5

2.6. Models and dimensions

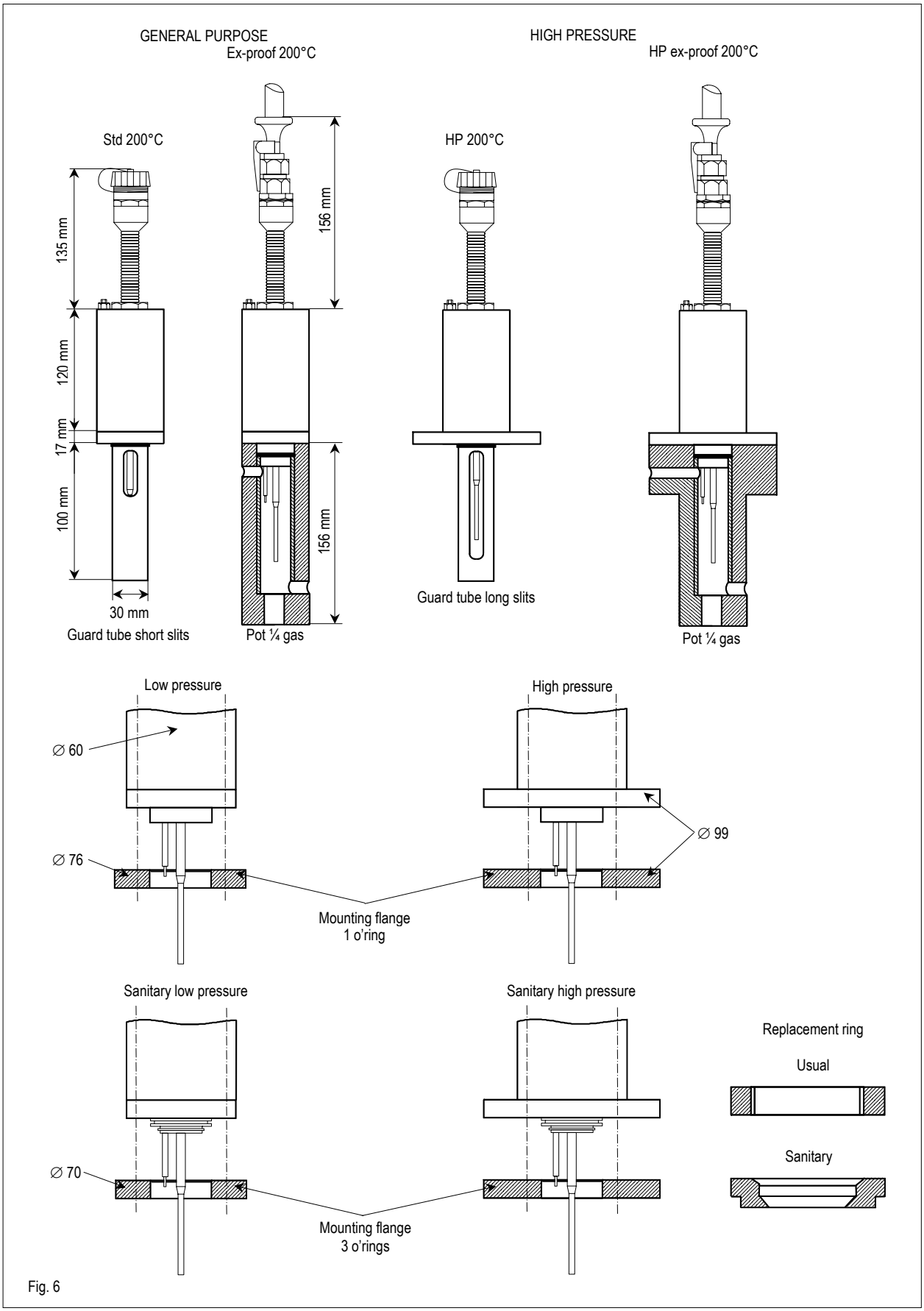
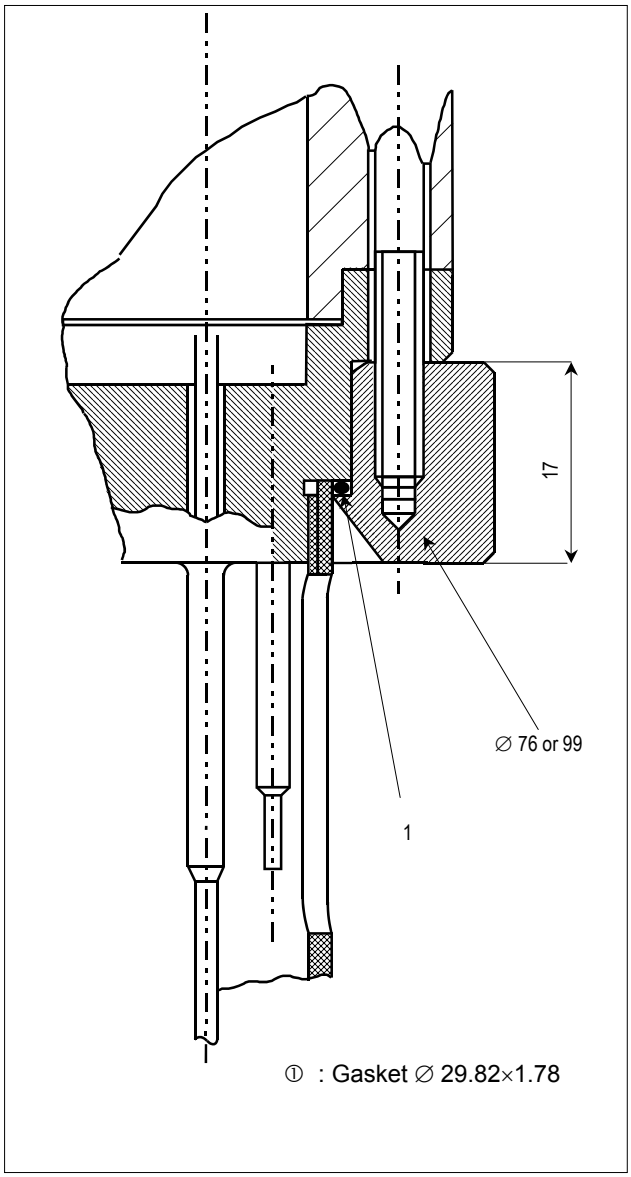
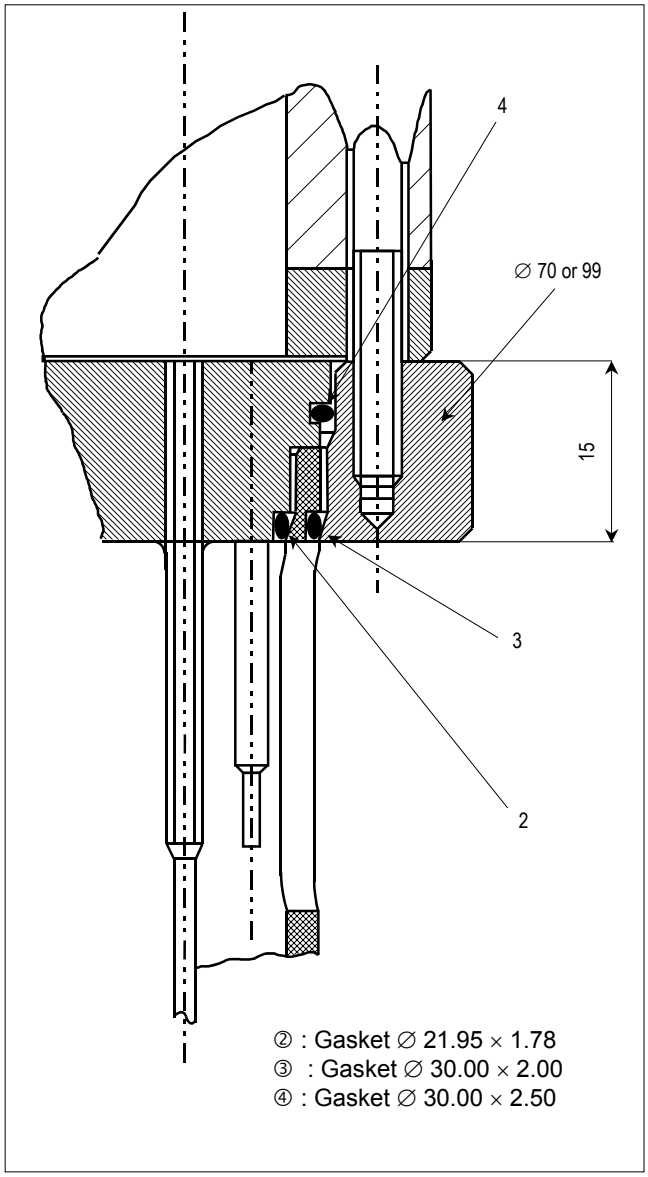


Fig. 6

2.7. Tightness



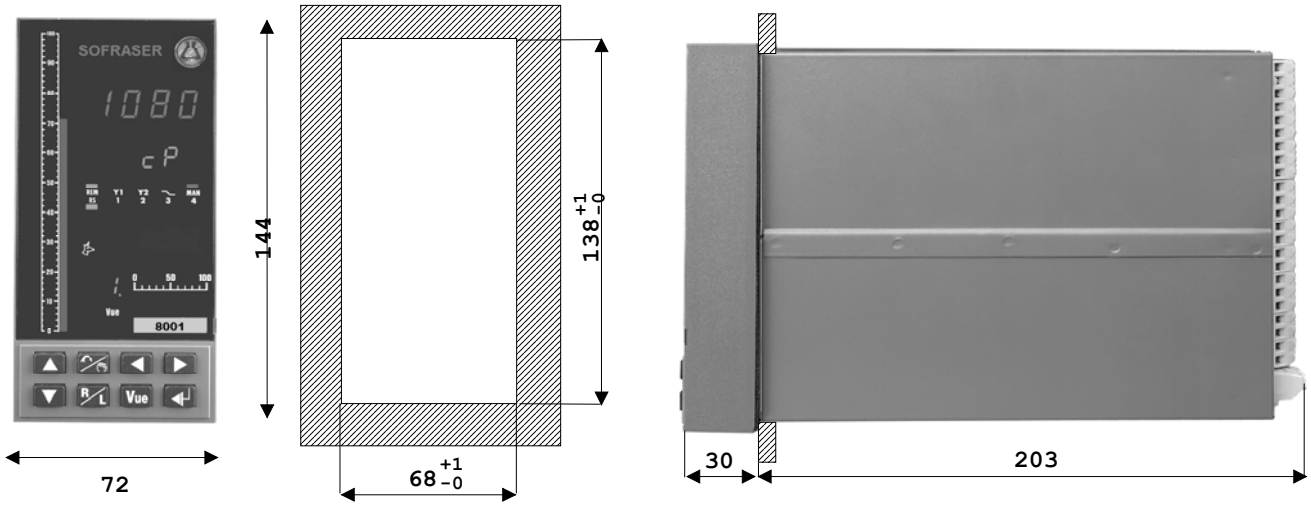


Material : Viton, PTFE, EPDM, Silicone, etc. … on request.

3. The processor

3.1. Mechanical characteristics

Dimensions : 72 x 144 x 203 mm behind the collar.
Cut-out : 68 x 138 mm.
Weight : 1,8 Kg environ.
Metallic casing.
Removable drawer.
Protection IP 54 on front panel. IP20 on rear panel.
Screw terminals : 2,5 mm^2 max.



3.2. Power supply

Standard power supply : 80..265 Vac - 100..380 Vdc C / 50-60 Hz
Optional power supply : 21-60 Vac-dc / 50-60 Hz
Consumption lower than 25 VA.

3.3. Display

Cyclic display on 2 channels :

View n°1	View n°2
Viscosity	Temperature

- 7-segment display :
  - 4 digits, height 10 mm, red for the process variables.
  - 6 digits, height 7,6 mm, green for the rod's frequency display, the physical units, etc.
  - 1 digit, height 7,6 mm, green for the view number.
- Bargraph : red, 50 points, for the measurements.
- 4 red LED (programmable alarms lights).
- 1 green LED (transmission of digital data).

3.4. Universal analog inputs

They are all referenced to the same potential and isolated at 500 Veff from all the other signals.

Temperature	**Sensor Pt 100 Ω** 3-wire mode	-50 à 300°C R_{ligne} = 20 Ω max, $0{,}5.10^{-4}/\Omega$
Viscosity/Thermal Drift Compensation	**Voltage**	0-1 V
Accuracy	0,1% of the scale on the linear 0,12% of the scale on the RTD and the resistance	
Temperature drift	All the inputs 100 ppm/°C	
Sampling	100 ms	
Rejection	Common Mode 120 dB to 250 Vac; serial mode 50 dB	

We advise you to connect the logic inputs with shielded cables.

3.5. Logic inputs

3 physical logic inputs are available EI3 to EI5.
They can be driven by contact free from potential or by an open collector. The polarization voltage **24V** is internal, the polarization current is 5mA.

1 ⇒ Closed contact
Voltage between –0,6V and 10V

0 ⇒ Open contact (impedance ≥ 3.3 kΩ)
Voltage between 16V and 30V

The logic inputs are referenced to the same potential and galvanically isolated from all the other potentials at 500 Veff.
We advise you to connect the logic inputs with shielded cables.

3.6. Standard outputs (Relays 1 and 2)

The units has in standard 2 relays (250 Vac or 30 Vdc, 1 A). The internal protection networks allows a leakage current of 1 mA for 250 Vac.
If these relays are used to commute some inductive charge, we advise you to add some RC networks to the charge terminals (preferably) or to the contacts terminals. They will then lessen the electro-magnetical phenomena.

3.7. Viscosity current output (slot n°4)

It is a 4-20 mA or a 0-20 mA current output. The output resolution is 12 bits. The maximum load resistance is 750 Ω.
It is isolated from the rest of the device up to 500 Vac. Accuracy : ±0,1%. See § 3.11 for the connections.

WARNING : The current output must not be connected to any external power supply. In this case, the current output will be damaged.

3.8. Supervisor digital RS

MODBUS SLAVE Protocol RS485/422 (2 or 4 wires) Baud rate from 300 to 19200 bauds.

3.9. Watchdog

The device owns a system that controls the functioning of the microprocessor board. When it is wrong, the corresponding output is de-energized (contact opening) and the ***"watchdog"*** light on the front panel is on. When everything is OK, this output is energized (the contact is present).
The watchdog output is a relay type one (250 Vac, 1 A). The internal protection networks allow a leakage current of 1 mA for 250 Vac.

3.10. Option outputs (slots N° 1 to 3)

3 option slots are available and accept all the boards described below :

3.10.1. 1 relay output board

The output relay is a changeover one.
Power cut-out : 1 A, 250 Vac or 30 Vdc.

3.10.2. 2-relay output board

The output relays are normally open at rest with a common point.
Power cut-out : 1 A, 250 Vac or 30 Vdc.

3.10.3. 2- safety relay output board

Identical to the 2-relay output board, but a security avoids the two contacts to be simultaneously activated, even the two relays are driven this way.

3.10.4. Current output board

It is a 4-20 mA or a 0-20 mA current output. The output resolution is 12 bits. The maximum load resistance is 750 Ω.
It is isolated from the rest of the device up to 500 Vac.
Accuracy : ±0,1%.

WARNING : The current output must not be connected to any external power supply. In this case, the current output will be damaged.

3.10.5. Voltage output board

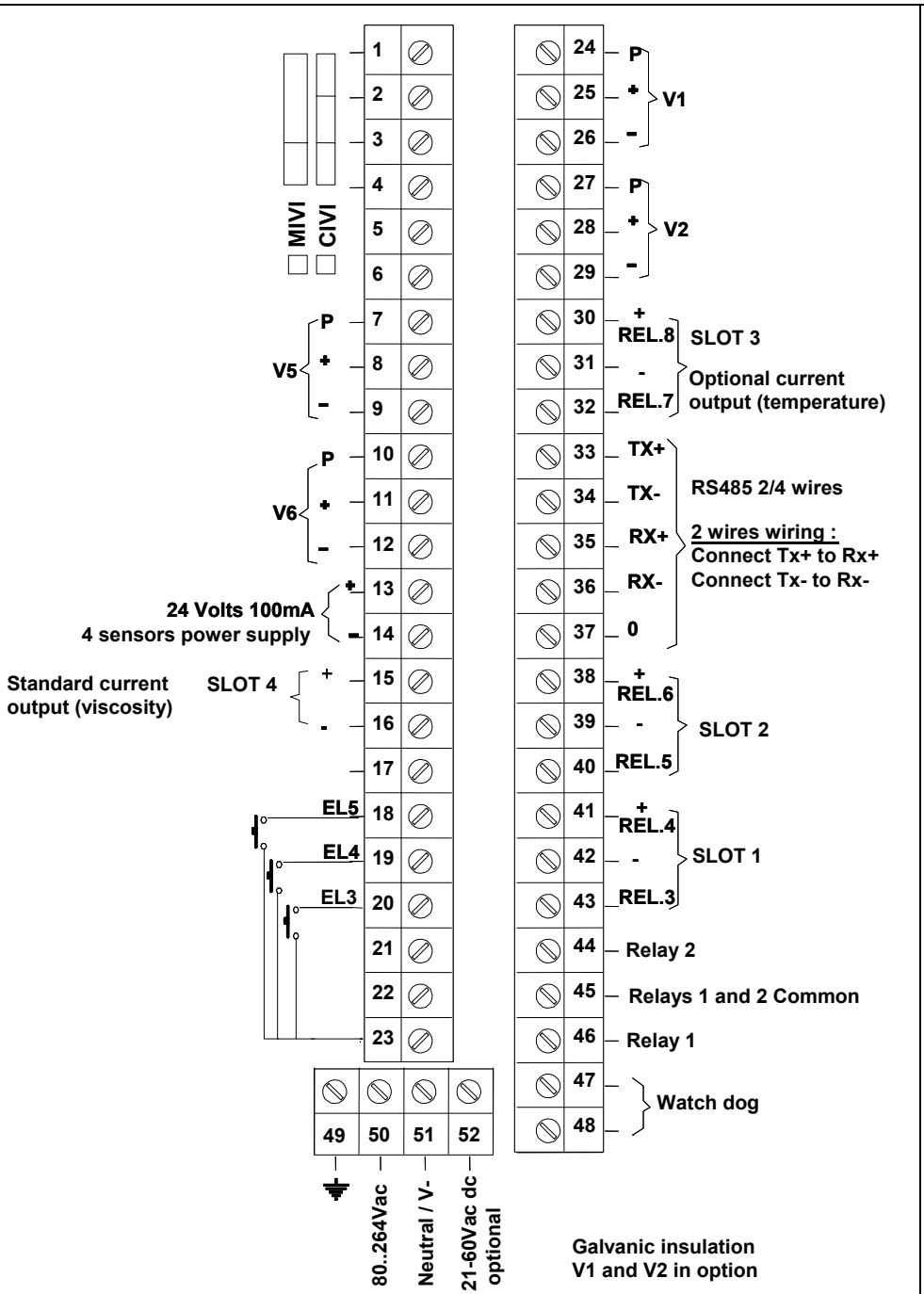
It is a 0-5 V, 1-5 V, 0-10 V or 2-10 V voltage output. The output resolution is of 12 bits. The output is protected against the short-circuits, 35 mA max.
It is isolated from the rest of the device up to 500 Vac.
Accuracy : ±0,1%.

3.10.6. RS485/422 or RS232 board

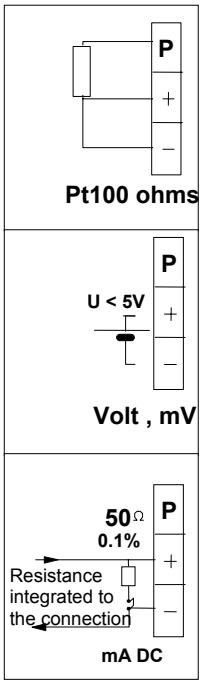
- MODBUS SLAVE Protocol RS485/422 (2 or 4 wires) Baud rate from 300 to 19200 bauds.
- MODBUS SLAVE Protocol RS232 (3 wires) Baud rate from 300 to 19200 bauds.

Don't use RS232 and RS485 simultaneously (see § 6.6.3)

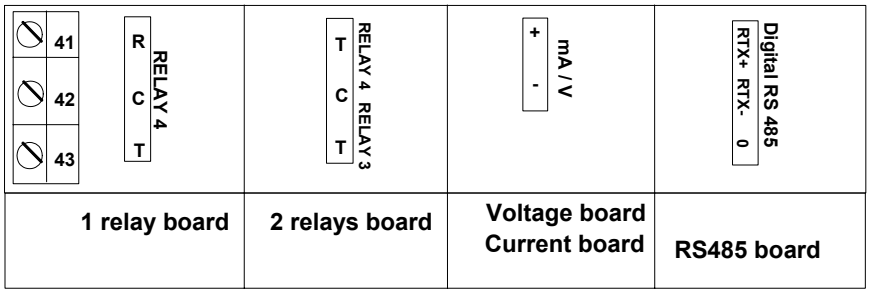
3.11. Connections



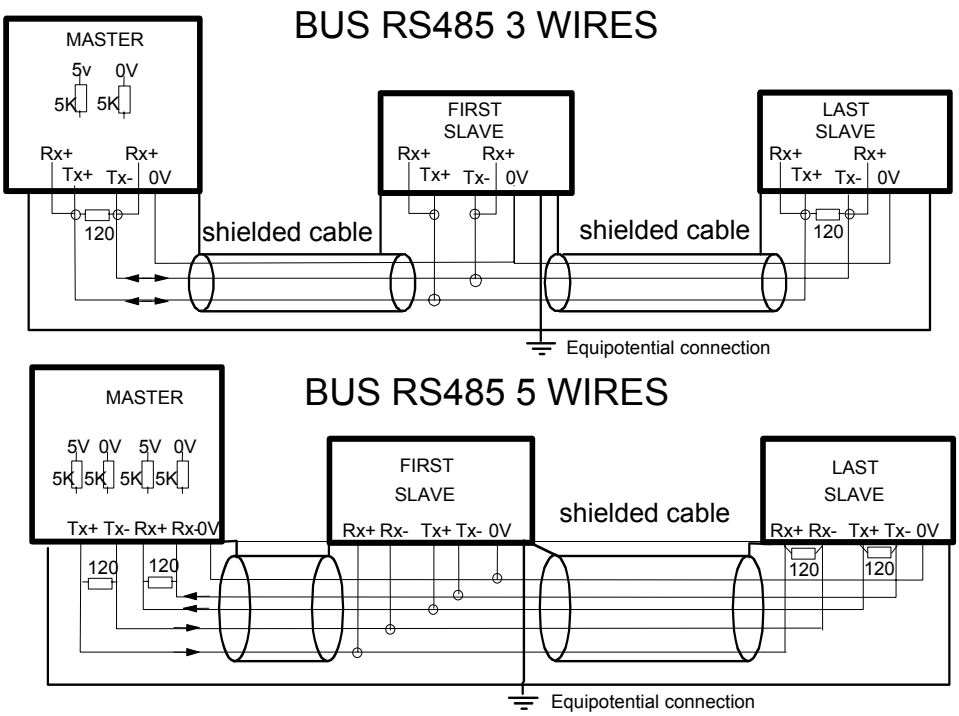
Inputs wiring



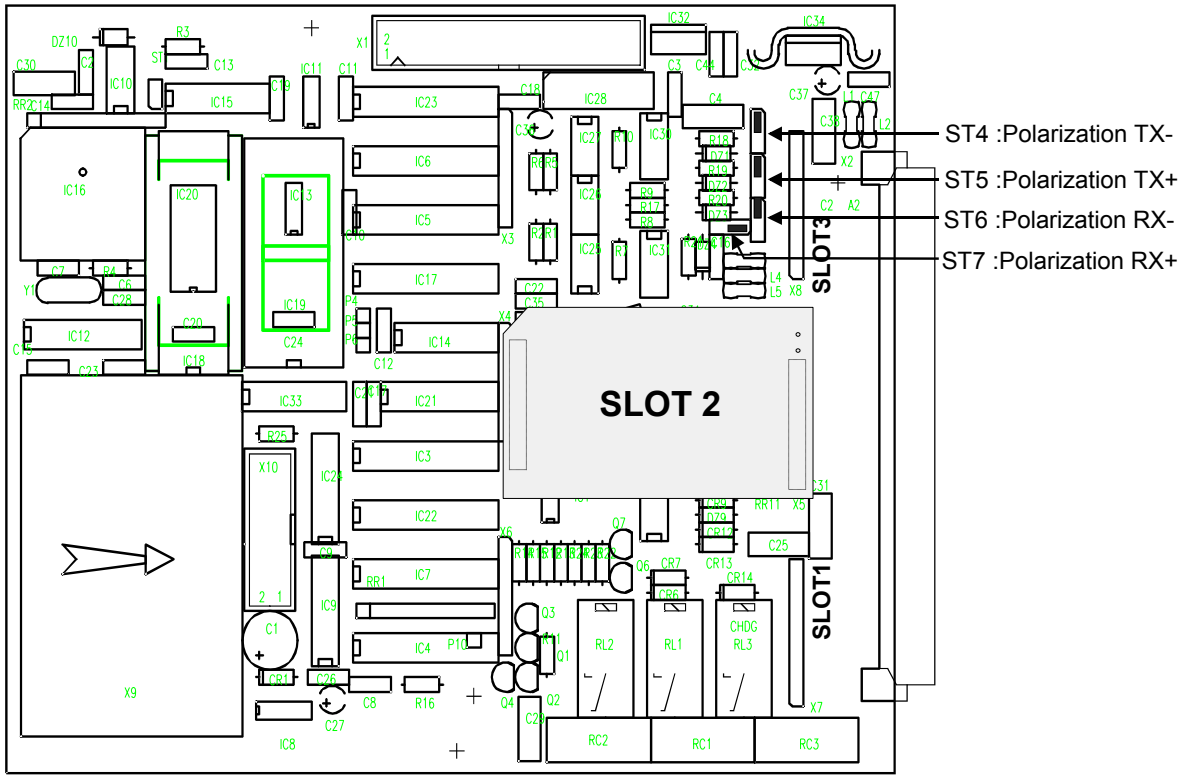
Slots wiring : Example SLOT1



RS422/485 Wiring



The braid of the shielded cable can be connected to the earth of each network is correctly meshed.
To improve the site equipotentiality, you may have to connect each device with a 2,5 mm² cable.



The polarizations are performed with 5 kΩ resistances (at 5 Volts for the + and at 0 for the -).
Then, you have to set the jumpers as shown above. On delivery, the polarizations are not performed.

Connection advises :

The casing earth and the neighbor grounds must be connected between each other through short links and strong sections (big cables).
To secure a good on site equi-potentiality, you have to multiply the interconnections (ground meshing).
Separate if possible the relay zones from the signals processing zones.
All the analog and logic signals must be connected with a standard leaked cable (twisted internal wires and leakage with metallic braid).

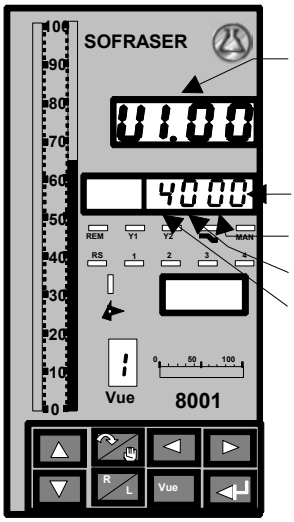
3.12. General information

List of the device generic standards :

Security	EN 61010-1	Insulation zones : 250 Vac
CEM Immunity	EN 50082-2	Electro-statical discharge Radio-frequency *Burst quick transients*
CEM Emission	EN 50081-1	Radio-frequency
Process variable	CEI 584 CEI 751	Thermocouples RTD
MODBUS digital RS	CNOMO E04.80.130.N April 1995	Communication with supervisor
Control	CNOMO E04.81.125.N July 1995	Controller of physical variable cascade or dual-loop
Protection	CEI 529	IP 54 on front panel and IP 20 on the rear panel
Size	CEI 473	Front panel : 72 * 144 mm Cut-out : 68 * 138 mm
Mechanical sturdiness	EN 60068-2-32	Fall : 0.5 m
Climatic conditions	Storage	-20 to 70°C 5 to 95% HR without condensation
	Work	0 to 50°C 5 to 90% HR without condensation

4. Material configuration

When turning on the device, the controller checks all its options and displays its material configuration.



Software version

Slot1= unused
Slot2= unused
Slot3= unused
Slot4= 0/4..20 mA output

Option board	*Recognition code*
WITHOUT	0
1 RELAY	2
2 RELAYS	3
CURRENT	4
2 RELAYS S	5
RS232 or RS485	6
VOLTAGE	7

Casing replacing :

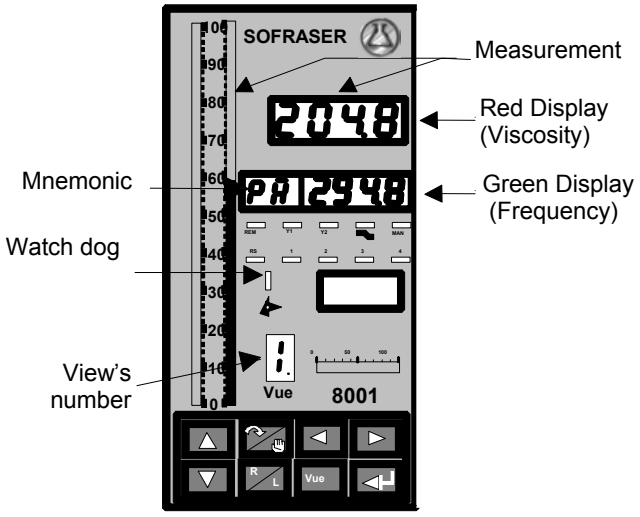
The moving front panel of the electronic device enables :
- To access to the smart card reader in order to re-configure the device (see points 1 & 2 below);
- To dismantle the drawer in order to configure the digital output (points 1 to 6).

Lift up before pulling

1. Lift up the front panel then, pull it up to the stop.
2. Revolve it so as to accede to the extraction screw.
3. Unscrew totally this screw.
4. Extract the drawer by pulling up the front panel.
5. Insert the new drawer.
6. Totally screw the screw.

5. User Mode

The USER mode accepts up to two display views (VUE).
These views can display the measurements (red display) and the physical units or parameter (green display). The units can be adjusted in User mode by pressing simultaneously VUE and ▲.



LED functions :

RS : Indicates the answer to a MODBUS order (if configured).
1, 2, 3 ,4 : Alarm or program LEDS

KEYS FUNCTIONS

Operating functions :

▲ ▼ Increments or decrements a value

↵ Validation and next parameter

Unused

VUE Change of view or cyclic display if you press during a while

▲ & R/L & ↵ enables to adjust the "offset in air" of the sensor.

Other functions

Access : Pressing **simultaneously** two keys

VUE & ↵ Back to ***CONFIGURATION*** *mode*

VUE & ▼ Go to ***ADAPTATION*** *mode*

VUE & ▲ Access to the change of ***VIEW Tag*** *when it is displayed*.

▲ & ▼ Change of the ***decimal point*** *of the current parameter* on the green display.

▲ & ↵
▼ & ↵ Increases or decreases brightness

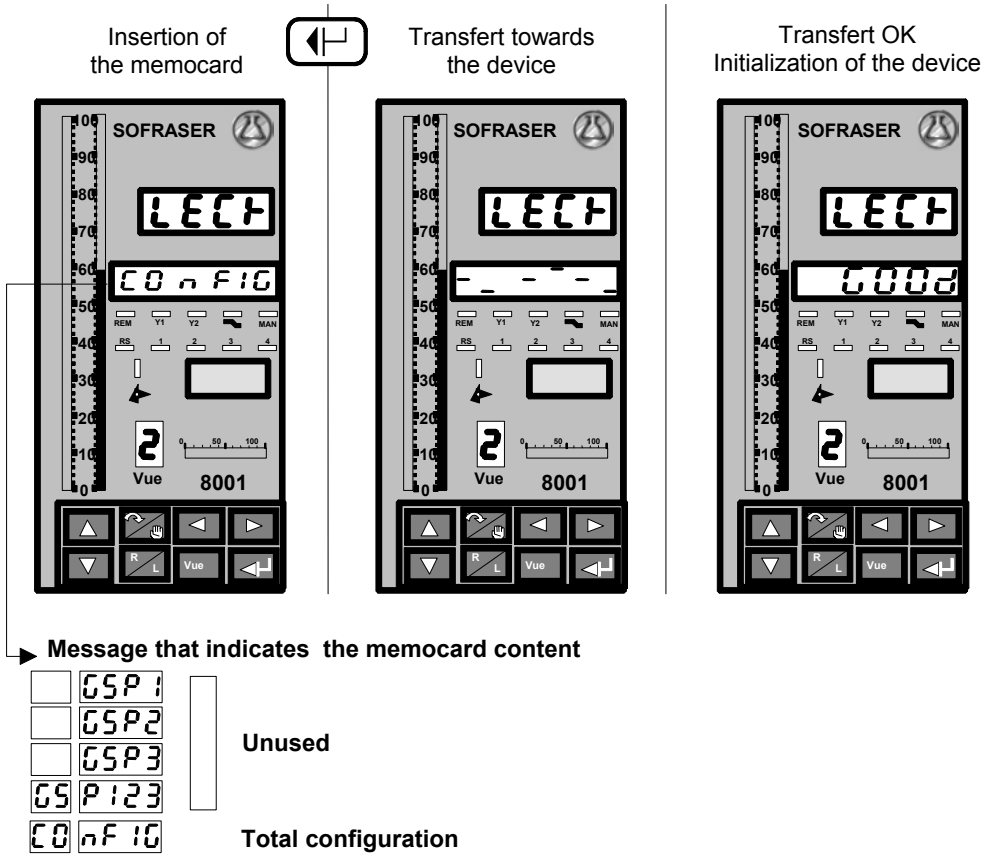
5.1. Restoration of the configuration from the MEMOCARD

Lift up before pulling

1. Lift up the front panel **then** pull it up to the stop.
2. Revolve the panel to insert the memocard.

On a memocard, you can store the whole configuration.

Once you insert the memocard, the front panel displays the following message :



The transfer lasts about 20 seconds and then the device starts up.
To store the device configuration on the memocard, please refer to § 7.6.1.

5.2. Adjustment of the brightness of the front panel

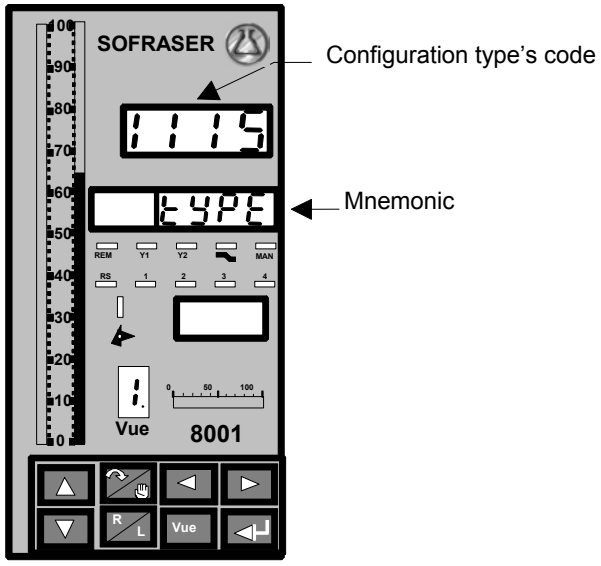
and and increases or decreases the ***brightness.***

The brightness level is saved on the memory card.

6. Configuration Mode

6.1. Access to the configuration

When you are in USER Mode, you go to the CONFIGURATION mode pressing simultaneously on the keyboard ↵ and VUE keys.
If the device is locked, enter the security code (provided to the production manager) then validate.
The device re-starts in CONFIGURATION mode and displays "TYPE" on the green display and the configuration type's code on the red display.



Key Function for the code :

VUE Change of digit
↵ Code validation
▲ and ▼ Modification of the flashing digit

Key function for the analog value :

▼ ▲ Change the decimal point position
VUE or ↵ Validation and next parameter
▲ and ▼ Modification of the value

6.2. Configuration type "TYPE"

DIGIT N° 1	DIGIT N° 2	DIGIT N° 3	DIGIT N° 4
1	1	1	5
Others configurations must not be used			

6.3. Inputs N° 1 to 6 "Entr.n"

They are defined in manufacture (see configuration codes below) :
- Input n°1 : Temperature ;
- Inputs n°3 and 4 : Viscosity and thermal drift compensation;
- Inputs n° 2, 5 and 6 : Unused.

Entr.1	Entr.2	Entr.3	Entr.4	Entr.5	Entr.6
Temperature	Unused	Viscosity	Thermal Drift compensation	Unused	
4.0.0.1	**5.1.0.1**	**5.2.0.1**	**5.2.0.1**	**5.1.0.1**	**51.0.1**
Others configurations must not be used					

You adjust the decimal point position by pressing ***simultaneously*** on the ⇑ and ⇓ keys.
The value adjustment is done on the sensor range :

- Low range MES._
- High range MES.-

6.4. Software alarm N° 1 to 4 "ALRM.n"

This device owns 4 software alarms.
If an alarm is declared as inactive, the following alarm(s) will also be inactive.

VISCOSITY		TEMPERATURE		
ALRM.1 High threshold	ALRM.2 Low threshold	ALRM.3 High threshold	ALRM.4 Low threshold	ALRM.5 Inactive
8.0.0.1	**8.1.0.2**	**8.0.0.3**	**8.1.0.4**	**1.0.0.0**
Others configurations must not be used				

6.5. Relays outputs 1 and 2 "REL.n"

The standard outputs are the two constantly present relays in the device.

STANDARD OUTPUT			
Digit N° 1	Digit N° 2 ***(Relay function)***	Digit N° 3	Digit N° 4 ***(Action sense)***
1	0 Alarm 1 1 Alarm 2 2 Alarm 3 3 Alarm 4	0	0 Positive logic 1 Negative logic
Others configurations must not be used			

Positive Logic : Relay is closed when alarm is on
Negative Logic: Relay is opened when alarm is on

6.6. Outputs (slots 1 to 4)

6.6.1. Current or voltage board "OUT.n"

The codes of this table only appear if an analog output board has been installed on the slot N° n. The memories OUT.n° are allocated as follows :

- OUT N° 4 : VISCOSITY;
- OUT N° 3 : TEMPERATURE (option);
- OUT N° 1 & 2 : Free

ANALOG OUTPUT OUT N° n			
Digit N° 1	Digit N° 2	Digit N° 3	Digit N° 4
7	0	0 4-20 mA or 2-10 V 1 0-20 mA or 0-10 V	0
Others configurations must not be used			

Definition of the output zoom :

- Minimum output N° n OUT.

It is the minimum physical value (in cP, Pa.s, °C …) corresponding to the minimum current output (when it is at 4 mA for a 4-20 mA).
Adjustable on the whole display range.

- Minimum output N° n OUT.-

It is the maximum physical value (in cP, Pa.s, °C…) corresponding to the maximum current output (when it is at 20 mA for a 4-20 mA).
Adjustable on the whole display range.

6.6.2. Relay board "REL.n"

This table only appears if a 1-relay board or a 2-relay board is present on the slot N° n.
The configuration table is the same than in § 6.5.
If a 2-relay board is present, you have to configure 2 tables.

6.6.3. RS Link "RS.n"

In standard, 8001 electronics have a RS485 output (RS.5)

Digit N° 1	Digit N° 2	Digit N° 3	Digit N° 4
Baud rate	***Protocol***	***Mode***	***Range RS***
1 300 2 600 3 1200 4 2400 5 4800 6 9600 7 19200	0 MODBUS slave	5 RTU 8 bits without parity 1 stop 6 RTU 8 bits parity even 1 stop 7 RTU 8 bits parity odd 1 stop 8 RTU 8 bits without parity 2 stop	0 Value of the WORD between 0 and 65535 1 Value of the WORD between 0 and 32767 2 Value of the WORD between 0 and 4095 3 Value of the WORD between 0 and 16383
Others configurations must not be used			

IMPORTANT:
You can not use simultaneously the standard RS485 output and an optional RS232 output.
To use the RS232 output, don't use the RS485 link.
To use the RS485 output when a RS232 is installed, configure the RS232 output with the following code "1.0.0.0".

6.6.4. Slave address "Adr"

Configure the slave address of the device from 1 to 255 for RS485 link, and adr=1 for RS232 link.

6.7. Display

6.7.1. Display 1 block "AFFI.1"

Digit N° 1	Digit N° 2	Digit N° 3	Digit N° 4
2	0	0 1 second 1 2 seconds 2 4 seconds 3 8 seconds 4 16 seconds — Commutation period	0
Others configurations must not be used			

Views' allocation :
The views n°1 and 2 are respectively dedicated to the viscosity and the temperature measurements.

View with parameter :
A view with a parameter enables you to visualize an additional parameter of your choice.
A parameter that can only be displayed is identified by the mnemonic "*Pa*".
Example : on view n°1, display of the rod's frequency.

Commutation period :
It defines the presence time of each view on cyclic display.

6.7.2. Display 2 block "AFFI.2"

Digit N° 1	Digit N° 2	Digit N° 3	Digit N° 4
0 Without 1 With	0	0	0

***With** RS LED :* the LED is ON each time the device answers a MODBUS order.

6.8. Change to User mode "UTIL"

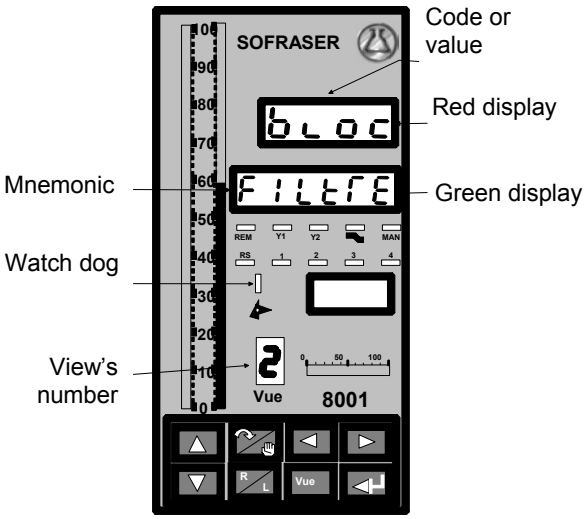
To leave the configuration, press on ↵ when the message "MODE" (higher display) and "UTIL" (lower display) appear. The device starts up and goes to the user mode.
Pressing any key will enable you to start again configuring.

7. Adaptation Mode

The ADAPTATION mode allows the adjustment of various parameters such as the filtering values, the alarms, the tables of linearization, etc. These adjustments are done in real time without interrupting the device processing.

7.1. Access to the ADAPTATION mode

To go from the USER mode to the ADAPTATION one, press simultaneously the two keys ▼ and VUE.
Act the same way if you want to go back to the USER mode.
The various parameters are gathered in function Blocks.



KEYS FUNCTIONS

Selection of the parameter block

▲ ▼ Selects the parameter Block

↵ Accedes to the parameters of the selected Block

VUE Accedes to the Blocks associated to the different views

VUE and ▼ Back to USER mode (press simultaneously)

In the selection of the parameter and adjustment block

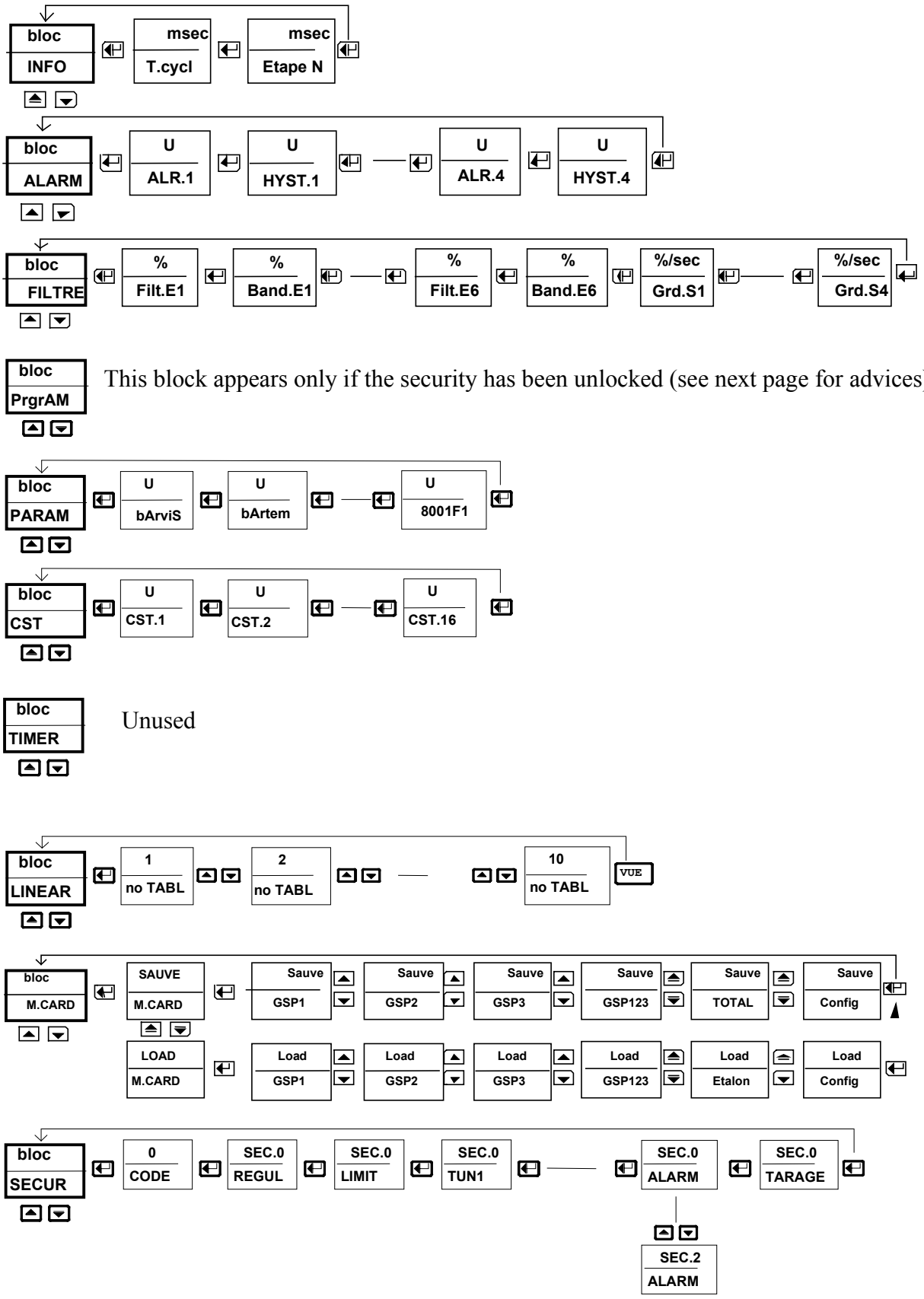
▲ ▼ Adjustment of a parameter value

▲ and ▼ Change the ***decimal point*** position of the adjusted parameter (press simultaneously)

↵ **Validates** the adjusted parameter and displays the next one.

VUE and ▼ Back to USER mode (press simultaneously)

7.2. ADAPTATION blocks diagrams



Back to USER mode : VUE and ▼ simultaneously.

Notes :
- All blocks, except « INFO » and « SECUR », can be protected (see § 7.7.2) and so can appear or not in the diagram described above.
- The block « M.CARD » appears only if the memory card is inserted.

Warning ! The programs which enable the functioning of the device are contained into the block « PROGRAM ». Thus, all modifications can induce a dysfunction of the device. So, it is advised to not enter into this block.
In case of a configuration error, reconfigure the device with the memory card (see § 5.1) or contact your distributor.

7.3. Alarm Block "ALARME"

Whatever the current view is, this block appears.
The **ALARME** code appears on the lower display.
Pressing the key ↵, you scroll through the following values (n = 1 to 4):

ALR.1 : This variable represents the alarm N° 1 threshold.
This variable is adjustable within the selected measurement range.

HYS.1 : HYS.1 adjustable on the whole measurement range (in engineering unit).

The device can drive up to four alarms (as much ALR.n and HYS.n to be adjusted).

The thresholds that control some programs variables are entered according to the display limits. In this case, pressing simultaneously on the two keys ⇑ and ⇓, you change the decimal point position.

REMIND : Alarms 1 and 2 → Viscosity
Alarms 3 and 4 → Temperature (see § 6.4).

7.4. Filter block "FILTRE"

Whatever the current view is, this block appears.
The FILTRE code appears on the lower display.
You can define a filter for each measuring input (see § 6.3).
Pressing the key ↵, you scroll through the following values (n = 1 to 6) :

TAU.En "First order" type filter.
Adjustment of the power from 0 to 100%.

BAND.En Adjustable from 0 to 100%. The filtering will be active only in the defined band on each side of the current process variable.
Any instantaneous variation of the process variable higher than the band will not be affected by any filtering.
The filtering power is linear within the band (at 0 on the band limit and at the maximum to the point).

REMIND : See § 6.3 for the inputs.

GRD.Sn Limitation of the evolution speed of the installed analog outputs (see §6.6).
Adjustable from 0.1 to 100%/seconds (inactive above 99%).

REMIND : See § 6.6 for the outputs.

Viscosity	Temperature
TAU.E3, BAND.E3, GRD.S4	TAU.E1, BAND.E1, GRD.S3

7.5. Cycle information block "INFO"

This block gives the following information :
- **T.cyc** Effective cycle time of the device in msec.
- **Etap.1 to 14** Effective time of each phase in msec.

7.6. Memocard block "MCARD"

This block appears if a memocard has been inserted in the device. For its insertion, please see § 5.1.

7.6.1. Save : From the device to the Memocard

We advise you to save the total configuration of the device linked to each working site.
This board restores the device configuration in case of failure.
It is possible to save :

GSP1 **GSP2** **GSP3** **GSP123**	**UNUSED**
TOTAL	**All the device parameters** + the calibration parameters. We advise you to save these data for each device.

7.6.2. Load : from the Memocard to the device

It is possible to load :

GSP1 **GSP2** **GSP3** **GSP123**	**UNUSED**
CONFIG	All the device parameters but no calibration ones.
ETALON	Analog outputs calibration.

7.7. Security block "SECUR"

Whatever the current view is, this block appears.
This block enables you to adjust the locking of the device configuration mode and of each block of the device adaptation mode.

7.7.1. Global locking "GLOBAL"

SEC.0 Without any locking.
SEC.1 Locking of the change to the configuration.
In the 8001 electronics, the levels SEC.1, SEC.2, SEC.3 and SEC.4 are equivalent.

7.7.2. Adaptation blocks locking "REGU"…"PLG.HOR"

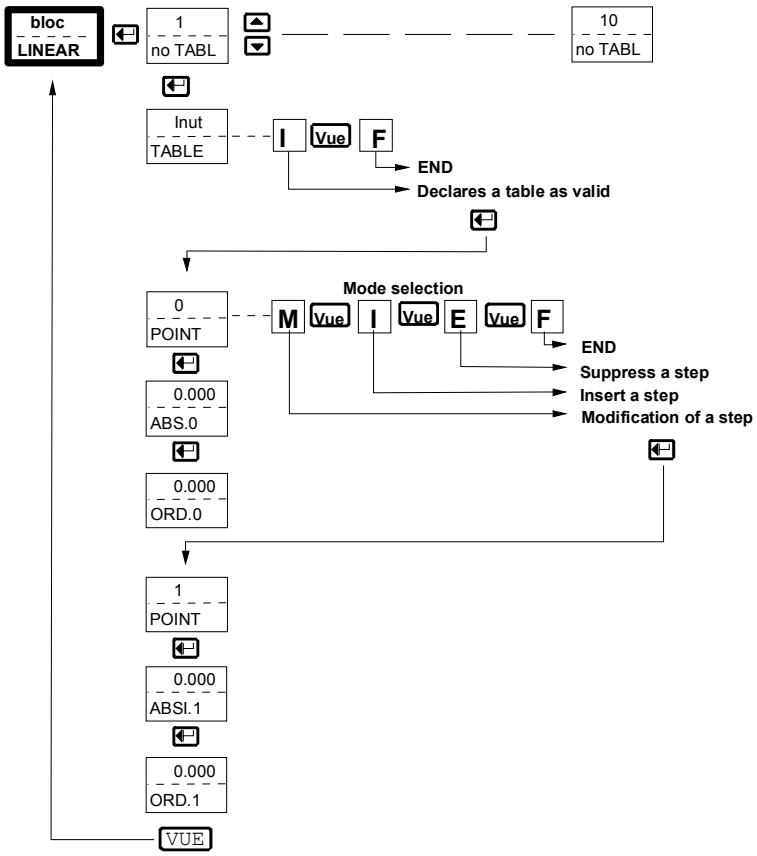
Each block of the ADAPTATION mode can be :
SEC.0 Visible and changeable.
SEC.1 Visible and not changeable.
SEC.2 Invisible.

7.8. Linearization block "LINEAR"

This block contains two manufacture programmed tables.
They are located as follows :

- Table #1 : Thermal drift compensation (do not modify);
- Table #2 : User calibration table.

Setting of a table :



If you want to calibrate the sensor, use table #2 :

- X values (abscissas) = displayed viscosities
- Y values (ordinates) = standard oils viscosities

The **TOTAL** number of segments available is 80 which can be allocated to the two tables.

7.9. Timer block "TIMER"

This block is not used in this electronic type.

7.10. Constants block "CONST"

The constants are used through the programs and must not be modified.
Validation and change to the next parameter : ↵.

7.11. Parameters block "PARAM"

Some of the parameters are adjustable constants :
- « barvis » : maximum scale for viscosity's bargraph (in viscosity unit).
- « bartem » : maximum scale for temperature's bargraph (in °C unit).
- **All the other parameters must not be modified !**

You can change the decimal point position pressing simultaneously on the two keys ⇑ and ⇓.

You can adjust the identifier on six digits pressing simultaneously on the two keys VUE and ⇓ :

VUE	Go to the next digit.
⇑ & ⇓	Change the letter or the figure.

Validation and go to the next parameter : ↵.

7.12. Program block "PRGRAM"

Warning !
The programs which enable the functioning of the device are contained into the block « PROGRAM ». Thus, all modifications can induce a dysfunction of the device. So, it is advised to not enter into this block.
In the event of a handling error, reconfigure the device with the memory card (see § 5.1) or contact your distributor.

8. Digital Communication

8.1. MODBUS slave and addressing

The MODBUS slave enables you to connect the unit to a MODBUS master supervisor.
The supervisor initializes the dialogue and must ask the good question to the device.
The acknowledged MODBUS commands are :

- Function 1 and 2 Reading BIT
- Function 5 and 15d Writing BIT
- Function 3 and 4 Reading WORD
- Function 6 and 16d Writing WORD

8.2. Slicing of the bit memory that can be addressed

Bit 0000h to 07FFh ⇒ CNOMO reading function 1 or 2, writing : 5, 15 (0Fh)
Bit 0800h to 7FFFh ⇒ Reading function 1 or 2, writing : 5, 15 (0Fh)
Word F080h to F7F0h ⇒ Reading function 3 or 4, writing : 6, 16 (10h)

CNOMO BITS			
Addresses (hexa)		***r/w***	***Observations***
Bit	***Word***		
0005		r	CNOMO Alarm 1 (AL1)
STANDARDS BITS			
Addresses (hexa)		***r/w***	***Observations***
Bit	***Word***		
0810-0812	F081 b8 ⇒ b14	r	EL: Logic inputs
0820-0825	F082 b8 ⇒ b13	r	RUPT: = 1 if process variable is out of its scale ±3%
0840-084B	F084 b8 ⇒ b11	r	Alarms status
0850-0859	F085 b8 ⇒ b1	rw	REL: Relays status 1 to 10
0860-0863	F086 b8 ⇒ b11	rw	LED: Lights status 1 to 4
0870	F087 b8	rw	AFFBLO: 1 blocked display 0 cyclic display
0871-0872	F087 b2 ⇒ b1	rw	VIEW1 to VIEW 2 : 1 display on the view n The writing forces the locking of the display on the view n

8.3. Slicing of the word memory (16 bits)

Word address : 0000h to 07FFh ⇒ CNOMO MODBUS function of reading 3 or 4, writing : 6, 16 (10h).
Word address : 0800h to F080h ⇒ MODBUS function of reading 3 or 4, writing : 6, 16 (10h).

A word is a register of 16 bits. According to the configuration (digit N° 4 table RS.n) this word resolution is 16, 15, 14 or 13 bits. This word represents a value between a minimum and a maximum.

Example : Reading of the process variable N° 1 (min scale = 0 and max_scale = 100.0 cP).

r/w Parameter that can be read or written.
r Parameter that can be read.

CNOMO WORDS			
Addresses (hexa)	**r/w**	**Observations**	**WORD Scale**
000B	r	CNOMO Min Scale (pd = 1 without decimal, pd = 10 one decimal ... pd = 1000 three decimals)	* PD
000C	r	CNOMO Max Scale	* PD
000D	rw	CNOMO Threshold alarm 1	* PD
0079	r	CNOMO Manufacturer brand	Most significant bit : 13d
007A	r	CNOMO Units type	Most significant bit : 20d
0912-0915	rw!	THRESHOLD : alarms threshold 1 to 4. If the threshold is declared : limited writing(*) Extent according to the configuration min/max process variable	
0922-0931	rw	CONST: Program constants	(-999.0/9999)
0932	rw*	Max. for viscosity bargraph	(-999.0/9999)
0933	rw	Max. for temperature bargraph	
0942	rw	Viscosity analog output	(Min/Max scale)
0943	rw	Temperature analog output	(Min/Max scale)
0946	r	Minimum for viscosity output scale	(-999/9999)
0947	r	Minimum for temperature output scale	(-999/9999)
094A	r	Maximum for viscosity output scale	(-999/9999)
095B	r	Maximum for temperature output scale	(-999/9999)
094F	rw	Viscosity measurement	(-999/9999)
0950	rw	Temperature measurement	(-999/9999)
0959	rw	Sensor's frequency	(AFFR_/AFFR-)
0963	rw	Minimum frequency = AFFR_	(-999/9999)
096D	rw	Maximum frequency = AFFR-	(-999/9999)
098F	rw	Global locking. Automatically goes back to its initial value if the unit has not received any order.	Entire number (0-4)
0993	rw	Locking ALARM block (strong weight of the word) and FILTRE block (weak weight of the word). Automatically goes back to its initial value if the unit has not received any order for one minute.	Entire number (0-2)
0995	rw	Locking PARAM block (strong weight of the word) and CONST block (weak weight of the word). Automatically goes back to its initial value if the unit has not received any order for one minute.	Entire number (0-2)
0997	rw	Locking M.CARD block (strong weight of the word) and HORLOG block (weak weight of the word). Automatically goes back to its initial value if the unit has not received any order for one minute..	Entire number (0-2)

The stored values in relative value to the addresses 0800H to 09FFH can be reached in absolute value (IEEE = 2 registers). You have to apply the conversion formula below so as to determine their address.

! According to the configuration, the parameter can be saved in a EEPROM (100000 writtings) or in NOVRAM (unlimited writings).

* Parameter is saved in EEPROM and can only be written 100000 times. The other ones have an unlimited writing times.

DOUBLE WORD IN IEEE FORMAT			
Addresses (hexa)	***r/w***	***Observations***	***WORD Scale***
6000-61FF	--	For the variables: **addr** = 0800-08FFh **addr IEEE** = (**addr** - 800h) * 2 + 6000h	---
6200-63FF	--	For the variables: **addr** = 0900-09FFh **addr IEEE** = (**addr** - 900h) * 2 + 6200h E.g. : Process variable V2 = 25°C Address = 6202H = 25090d 25°C IEEE = 41C8H 0000H or 16840d 0000d	---

Particular Orders :

Addresses (hexa)	***r/w***	***Observations***	***WORD Scale***
E202	w	Writing of the hour in BCD (Binary coded decimal) on 4 registers : AAH-SEC: Min-hour: DAY-DATE: MONTH - YEAR E.g. : 16H45mn00sec/Wednesday 17/january 1996: AA00 4516 0417 0196	
E203	w	Reset unit writing in one register 55AA	
2000-200B	r	Totalizator N° 1: MSB 2000 and LSB 2001 Totalizator N° 6: MSB 200A and LSB 200B ... Totalizator N° 1 to 6 in BCD on two registers E.g. : If the totalizator N° 1 counts 012345 the registers to the addresses 2000h and 2001h will be equal to 0001h and 2345h (9029d) respectively.	

Reading of bits in WORD function : The word is sliced in 16 bits.

@Word = (@Bit/16)	**Word**															
+F000h	**MSB byte**								**LSB byte**							
Bit N° of the Word	15	14	13	12	10	11	9	8	7	6	5	4	3	2	1	0
Offset @Bit	+7	+6	+5	+4	+3	+2	+1	+0	+15	+14	+13	+12	+11	+10	+9	+8

Example:
When you read a word in the address F090h, the bit N° 8 of the word will represent the Auto-Manu value of the loop N° 1 (address bit 0900h).

Definition of IEEE standard : The IEEE standard allows the transmission of data in engineering unit, without having to declare the scale minimum and maximum.

2nd Word (@n+1)	**1st Word (@n)**	**2nd Word (@n+1)**		
Bit N° of Word	15 ... 0	15	14 ... 7	6 ... 0
IEEE Value	Fraction	Sign	Exponent	Fraction
Bit N° of IEEE	15 ... 0	31	30 ... 23	22 ... 16

9. Specific notes and manufacturing parameters

9.1. Configuration Mode

ELECTRONIC 8001 N°.....			Page 1/4	
Access code = 8031				
Mnemonic	**Code or Value**	**Mnemonic**	**Code or Value**	
			Without Temperature	***With Temperature***
Type :	1115	**ALRM.n**		
Entr.n		ALRM.1:	8001	
Entr. 1 :	4001	ALRM.2 :	8102	
Mes .- :	-50	ALRM.3 :	1000	8003
Mes._ :	300	ALRM.4 :		8104
Entr. 2 :	5101	ALRM.5 :		1000
Mes .- :	0.000	**REL.n**		
Mes._ :	5000	REL.1 :	1000	
Entr. 3 :	5201	REL.2 :	1200	
Mes .- :	0.000	**OUT.n**		
Mes._ :	1000	OUT.3 :	Option (Temperature)	
Entr. 4 :	5201	Out._ :		
Mes .- :	0.000	Out. - :		
Mes._ :	1000	OUT.4 :	7000	
Entr. 5 :	5101	Out._ :		
Mes .- :	0.000	Out. - :		
Mes._ :	5000	RS.5 :	6071	
Entr. 6 :	5101	Adr :	1	
Mes .- :	0.000	AFF.1 :	2000	
Mes._ :	5000	AFF.2 :	2000	

9.2. Adaptation Mode

ELECTRONIC 8001 N°.....					Page 2/4	
BLOCK	**CODE OR VALUE**					
ALARME		***Without Temperature***	***With Temperature***		***Without Temperature***	***With Temperature***
	Seuil.1 :	9999	9999	Hyst.1 :	0.000	0.000
	Seuil.2 :	0.000	0.000	Hyst.2 :	0.000	0.000
	Seuil.3 :		300	Hyst.3 :		0.000
	Seuil.4 :		-50	Hyst.4 :		0.000
FILTRE	Tau E1 :	50		band.E1 :	10	
	Tau E2 :	50		band.E2 :	10	
	Tau E3 :	50		band.E3 :	10	
	Tau E4 :	50		band.E4 :	10	
	Tau E5 :	50		band.E5 :	10	
	Tau E6 :	50		band.E6 :	10	
	Grd S1 :			Grd S2 :		
	Grd S3 :	50		Grd S4 :	50	
PRGRAM	**DO NOT MODIFY**					
PARAM	Barvis :			Bartem :		
	y0 :			a :		
	b :					
CONST	Const.1 :			Const.15 :	-111	
	Const.16 :	900				
TIMER	**UNUSED**					
LINEAR	**SEE TABLES BELOW**					
SECUR	**CODE = 369**					
	Global :	1		Regul :	2	
	Limite :	2		Tune 1 :	2	
	Tune 2 :	2		Ges.Gsp :	2	
	Def.Gsp :	2		Alarme :	0	
	Filtre :	0		Tarage :	2	
	Prgram :	2		Param :	0	
	Const :	1		Timer :	2	
	Linear :	0		M.card :	1	
	Horloge :	2		Plg.hor :	2	
INFO	**UNUSED**					

ELECTRONIC 8001 N°……			Page 3/4	
TABLE N° 1 : THERMAL DRIFT COMPENSATION				
Point 0	abs.00		ord.00	
Point 1	abs.01		ord.01	
Point 2	abs.02		ord.02	
Point 3	abs.03		ord.03	
Point 4	abs.04		ord.04	
Point 5	abs.05		ord.05	
Point 6	abs.06		ord.06	
Point 7	abs.07		ord.07	
Point 8	abs.08		ord.08	
Point 9	abs.09		ord.09	
Point 10	abs.10		ord.10	
TABLE N° 2 : SENSOR'S RE-CALIBRATION				
Point 0	abs.00	0	ord.00	0
Point 1	abs.01	9999	ord.01	9999
Point 2	abs.02	9999	ord.02	9999
Point 3	abs.03	9999	ord.03	9999
Point 4	abs.04	9999	ord.04	9999
Point 5	abs.05	9999	ord.05	9999
Point 6	abs.06	9999	ord.06	9999
Point 7	abs.07	9999	ord.07	9999
Point 8	abs.08	9999	ord.08	9999
Point 9	abs.09	9999	ord.09	9999
Point 10	abs.10	9999	ord.10	9999

Note :

The table N°2 has been adjusted with a gain equal to 1 and an offset equal to 0.
If you want to re-calibrate the sensor, you have to modify the table's points following the procedure described in the User Manual § 4.

ELECTRONIC 8001 N°……			Page 4/4
Simulator Position N°		Transmitter's outputs measurements	
		Viscosity Output	Compensation Output
1	390,2 mV		
2	325 mV		
3	259,9 mV		
4	194,7 mV		
5	129,5 mV		
6	65,1 mV		
Injected Signal Frequency : …… Hz			

Matched sensor MIVI N°……. Range ……

Sensor Frequency : ……Hz

Capacitors : ……..nF

Date :

Visa :

10. Error messages

Message	Display	Meaning	Action
ERR.1	Green	Hardware configuration is different from the software configuration. In this case, boards which are not well configured are ignored.	Change missing boards or the software configuration
-111	Red	Offset in the air must be adjusted	See § 1.5.1.
Flashing Display	Red	Measurement is higher than the maximum value configured (±3% of the configured scale)	Check the sensor, wirings and the configuration.