9510

User Manual

Single sensor controller
To manage one MIVI sensor with its 9000 transducer

Original version

SOFRASER
Pioneering viscometry since 1972

REF.: 390/5

IMPORTANT

When using a 9510 device to control one MIVI+9000,
THE OFFSET ADJUSTMENT IN THE AIR
MUST BE THE FIRST TASK COMPLETED.

The offset adjustment procedure is detailed in *§ 3.7 - Offset*.

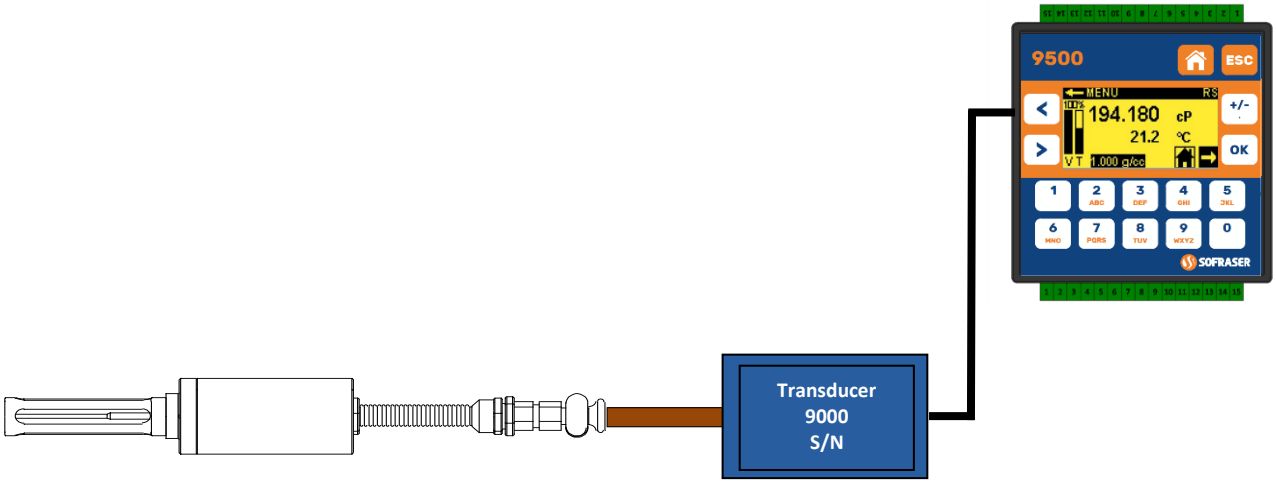
- clean and dry the vibrating rod of the viscometer in order to make it neat and dry;
- be sure the process is empty. The rod must be vibrating in the air;
- install the sensor on the process and fix it with its 4 screws;
- power on the device and wait 15 minutes;
- enter the “Settings” menu in the 9510 device, choose the “Offset” function and follow the instructions in order to complete the zero adjustment in the air;
- when the message telling the operation was successful appears, the zero adjustment in the air has been made.

TABLE OF CONTENT

1. General presentation

Before using the device, pay good attention to the MIVI and 9000 technical manuals (REF.: 379 and 381) in order to ensure a proper installation of the sensor and its transmitter.

The 9510 is an accessory controller that is to be connected to the 9000 transducer of the MIVI sensor in order to add numerous functions to the whole system.



The 9510 electronic device has been designed in order to control 1 MIVI sensor. This means the MIVI's transducer 9000 and the 9510 are connected in a RS-485 serial loop as shown in the scheme just above.

2.9510 technical characteristics

The 9510 processor should be considered as one OPLC with its four external modules.

OPLC
Operator Panel Programmable Logic Controller

2.1 Mechanical characteristics

Dimensions behind the collar:	89.2 x 89.2 x 58 mm;
Colar dimensions:	96 x 96 x 6.2 mm;
Cut-out for assembly on panel:	92 x 92 mm. Thickness ≤ 5mm;
Weight:	about 0.35 kg;
Mountings (Tightness):	Panel mounted (IP 65/NEMA1) DIN-rail mounted (IP20 / NEMA4X)
Operational temperature:	0 °C to 45 °C.

2.2 Display and keyboard

Screen:	LCD Display
Display type:	Graphic STN LCD
Display resolution:	128 x 64 pixels
Backlight:	LED, yellow green, software controlled
Keyboard:	Alpha-numeric keypad with 16 keys

2.3 Power supply and battery

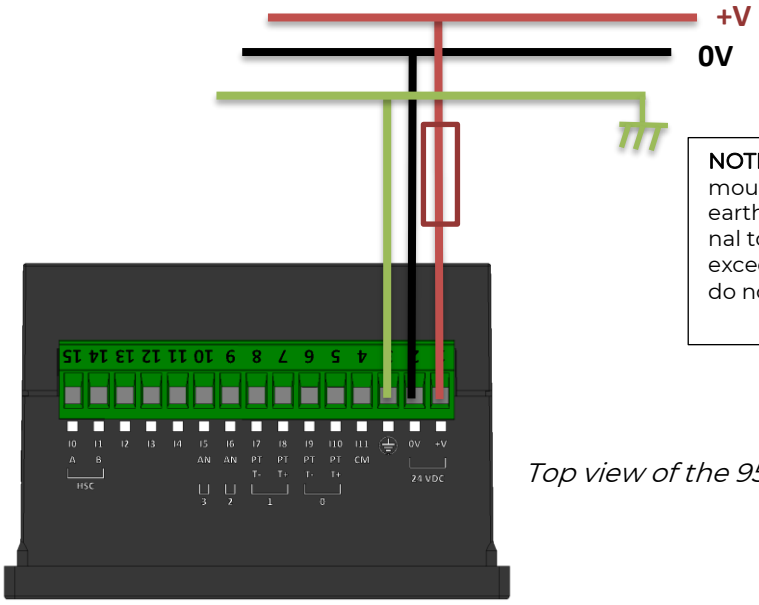
The processor requires a 24 VDC (± 2.4 V) stabilized and filtered power supply (not provided by SOFRASER). Preferably, use the same power supply than the transducer 9000's one.

The battery lifespan is 7 years typical at 25 °C, battery back-up for RTC and system data, including variable data.

2.4 9510 connection blocks

This version proposes only the serial communication.

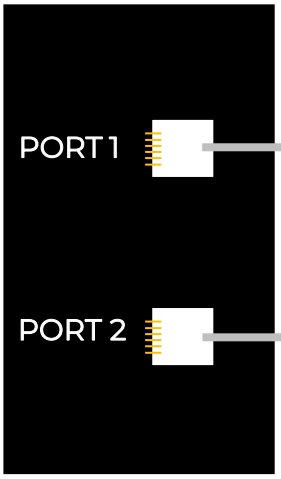
The colours codes used and the name of these connection blocks are taken again for each connection diagram.



NOTE: To avoid electromagnetic interference, mount the controller in a metal panel/cabinet and earth the power supply. Earth the power supply signal to the metal using wire whose length does not exceed 10cm. If your conditions do not permit this, do not earth the power supply.

Top view of the 9510

Front view



RJ-12 plug for RS-485 MODBUS external communication
§ 2.6.1

RJ-12 plug for RS-485 connection to MIVI sensor and 9000 transducer
§ 2.5 and § 2.6.1

Left view of the 9510

Bottom view of the 9510

2.4.1 Analog & Digital inputs

These inputs are not used on the 9510 device.

2.4.2 Output relays

7 Normally Opened (NO) output relays are available. They are allocated as described in the following table:

Relay reference	Description
O0	Viscosity alarm (Low threshold)
O1	Viscosity alarm (High threshold)
O2	Temperature alarm (Low threshold)
O3	Temperature alarm (High threshold)
O4	Watchdog
O5	PID control
O6	PID control (mirror)

- Normal functioning:

The coils of the relay are under tension and the contact is closed.

- In case of anomaly:

The coils are not under tension and the contact is opened: measurements out of set point, processor power supply is turned off...

- Power cut-out:

Relays O0 to O3:	3 A maximum per relay, 250VAC or 30VDC
Common:	8 A maximum (Common is not located, refer to the plugging chart)
Relays O4 to 06:	3 A maximum per relay, 250VAC or 30VDC
Common:	8 A maximum (Common is not located, refer to the plugging chart)

- Minimal charge: 1mA for 5VDC
- Relays lifespan: 100 000 operations at the maximum charge
- Response time: 10 ms (typical)

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 electromagnetic phenomena.

Relay O4 is used as a watchdog (RS failure, Out of range Viscosity or Temperature, Battery low, RAM failure).

2.4.3 Analog outputs

2 analog outputs are available. Their resolution is 12 bits.

Analog outputs type: current output 4-20 mA.

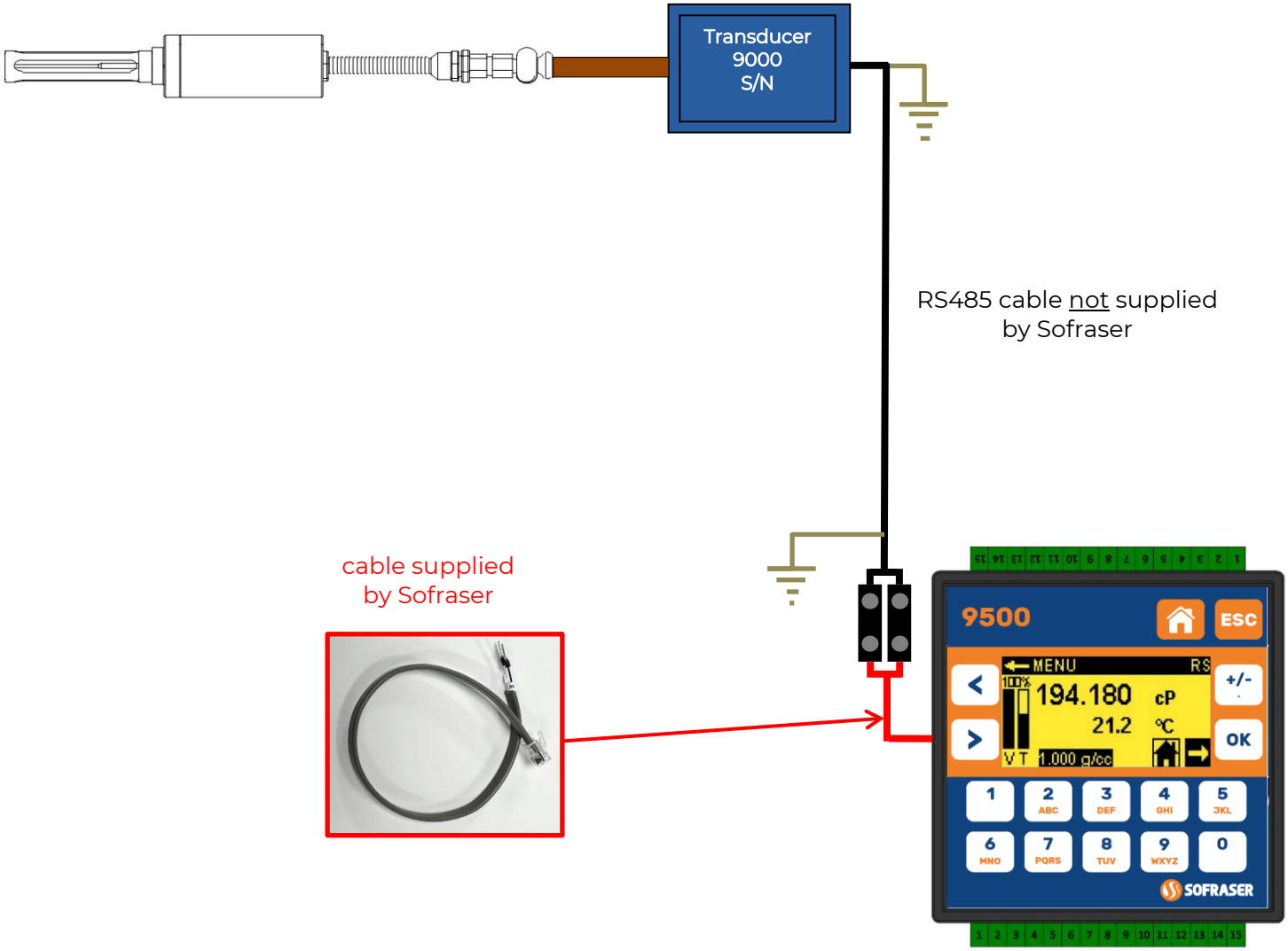
The analog outputs can be allocated to the user's specifications (viscosity, temperature or set point).

2.5 Connections to be done by the user

When the 9510 processor is ready for action, the user only has to plug the serial RS-485 communication cable, connected to the 9000 transducer, on PORT 2.

A cable for industrial environment, foil or braid shielded and connected to ground earth on both sides, with twisted pair of wires, needs to be used to link the items. This cable is not provided by Sofraser as its length depends of the on-site configuration.

The 30 cm long RS-485 cable that is delivered with the 9510 is only dedicated to the check of the equipment at receipt and in safe EM environment. If used for final installation, to use its RJ12 plug, the cable must be shortened to the minimum length that allows connection to the industrial extension cable (a few centimeters).



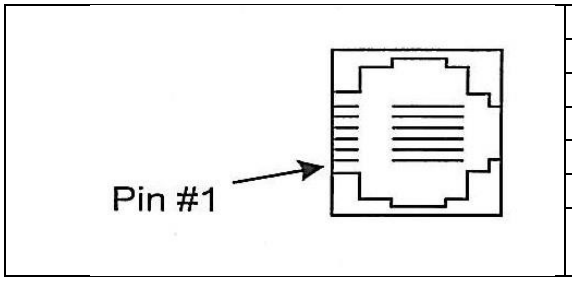
The internal termination resistance of the 9510 is activated. Check that the termination resistance at the end of the RS485 loop, on the 9000 transducer, is also activated.

2.6 Serial communication

2.6.1 Wirings

PORT 1 is the RS-485 port dedicated to communication with external DCS or Scada. The type of the port is RJ-12.

	PORT 1	*PORT 2*	*Voltage limits*
Baud rates	9600 bps	Reserved to transducer 9000 connection	-7V to +12V



Pin number	*Function*
1	A signal +
2	-
3	-
4	-
5	-
6	B signal -

- Turn off power before making communication connections.
- Do not connect the controller directly to a telephone or a telephone line.
- Use shielded, twisted pair cables.
- Minimize the length of the connection cables. The length should not exceed 1200 m.
- Do not cross A and B signals: positive terminals must be wired to +, and negative terminals to -.
- The RS485 serial port is not isolated. If the controller is used with a non-isolated external device, avoid potential voltage that exceeds ± 10V.To avoid damaging the system, all non-isolated device ports should relate to the same ground signal.
- Signals are linked to the processor's ground, this is the same ground used by the power supply.

2.6.2 Modbus communication protocol

The goal is to read viscosity, set point and Pt100 values using RS-485 communication.

The Modbus slave address can be set up by pressing Home button until reaching the SYSTEM INFO menu. There you can choose the Slave Address of the unit thanks to the keyboard and press OK to validate.

The 9510 has to be powered off and back on before any modification of the Slave Address is taken into account.

COM port characteristics:

Speed: 9600 bits/s Number of bits: 8 Parity: none Stop bit: 1

- S: send from the console to the OPLC
- R: response from the OPLC to the console
- Amplitude: signal read before correction, offset and without linearization
- Coil: signal which is an image of the sensor inner temperature
- Viscosity: viscosity calculated in cP
- Set point: set point for the viscosity in cP
- Pt100: value in Celsius degrees of the temperature read by the probe (if there is one)

Note 1: all the data sent or received are in Hexadecimal.

Note 2: the data of 2 words or bigger (4 bytes or more) received from the 9510 are in Endianness format. It has to be taken into account before doing the conversion to Decimal value.

Generic frame format:

S = SN 03 XX XX YY YY <CRC-16>

R = SN 03 AA {DATA} <CRC-16>

SN: slave number **03**: reading function

XX XX: starting point for the address to be read **YY YY**: number of words to be read

AA: number of bytes read **DATA**: content of the asked address

<CRC-16>: checksum Modbus RTU on 16 bits

List of addresses:

Data	Address in Hexadecimal	Number of words	Multiplied factor of the data received
Viscosity	0x 14 3C	2 words (4 bytes)	1, 10, 100 or 1000 (see table below)
Temperature	0x 00 21	1 word (2 bytes)	10
Set point	0x 01 F4	1 word (2 bytes)	10
Density coefficient	0x 00 1F	1 word (2 bytes)	1 000
Frequency	0x 15 A0	2 words (4 bytes)	100
Amplitude	0x 00 04	1 word (2 bytes)	1
Coil	0x 00 07	1 word (2 bytes)	1
Offset	0x 00 09	1 word (2 bytes)	10

The viscosity value read through the RS-485 is the viscosity displayed on the 9510 multiplied by a factor which depends of the viscosity range of the unit.

Therefore, the viscosity read through the RS-485 has to be divided by the corresponding factor described in the table below:

Full scale range	Multiplied factor
0 to 10 mPa.s	1 000
11 to 100 mPa.s	100
101 to 5000 mPa.s	10
5001 mPa.s and above	1

Example 1: to read the viscosity on a unit at a slave address 17 (11 in Hexadecimal), with a full scale range of 100 000 mPa.s and which displays a viscosity of 72 583 mPa.s

S = 11 03 14 3C 00 02 03 67
R = 11 03 04 1B 87 00 01 9C FF

11: slave number
14 3C: viscosity address
04: number of bytes read
03: reading function
00 02: number of words
1B 87 00 01: viscosity value in Endianness format (so the data to convert is 00 01 1B 87 = 72 583 in Decimal and the multiplied factor is 1 then 72 583 / 1 = 72 583 mPa.s)
03 67: checksum (can be calculated automatically depending on the PLC/software used)
9C FF: checksum of response frame

Example 2: to read the viscosity on a unit at a slave address 1 (01 in Hexadecimal), with a full scale range of 100 mPa.s and which displays a viscosity of 14.92 mPa.s

S = 01 03 14 3C 00 02 01 F7
R = 01 03 04 05 D4 00 00 BA C7

01: slave number
14 3C: viscosity address
04: number of bytes read
03: reading function
00 02: number of words
05 D4 00 00: viscosity value in Endianness format (so the data to convert is 00 00 05 D4 = 1 492 in Decimal and the multiplied factor is 100 then 1 492 / 100 = 14.92 mPa.s)
01 F7: checksum (can be calculated automatically depending on the PLC/software used)
BA C7: checksum of response frame

Example 3: to read the temperature on a unit at a slave address 5 (05 in Hexadecimal) which displays a temperature of 21.3 °C

S = 05 03 00 21 00 01 D5 84
R = 05 03 02 00 D5 88 1B

05: slave number
00 21: temperature address
02: number of bytes read
03: reading function
00 01: number of words
00 D5: temperature value in Hexadecimal and converted to Decimal gives 213.
The multiplied factor is 10 so 213 / 10 = 21.3 °C
D5 84: checksum (can be calculated automatically depending on the PLC/software used)
88 1B: checksum of response frame

2.7 Standards and Class

List of the device generic standards:

Low Voltage Directive	EN 61131-2	Power supply 24 VDC-not submitted
EMC Immunity	EN 61000-6-2	Electro-statical discharges Radio-frequency Burst quick transients
EMC Emission	EN 61000-6-3 EN 61000-6-4	Radio-frequency
Process variable	CEI 751	Pt100
Protection	CEI 529	IP 65 on front panel mounted IP 20 on DIN-rail mounted
Size	CEI 473	Front panel : 96 * 96 mm Cut-out : 92 * 92 mm
Climatic conditions	Storage	-20 to 60°C 5 to 90% HR non-condensing
	Work	0 to 45°C 5 to 90% HR non-condensing

2.8 Wastes handling

Within the framework of the directive 2002/96-CE application, commonly named directive DEEE, relating to the wastes of electric and electronic equipments, SOFRASER considers taking in charge the equipments arriving at the end of the lifetime.

Do not throw the equipment to the dustbin. If the user does not have the means to take in charge the wastes of our electronic equipments, he should return these equipments to our factory with a signed letter confirming that it is an equipment that has to be destroyed/recycled.

2.9 Safety considerations

- Do not touch wires while the processor is ON.
- A non-isolated power supply can be used provided that the 0V is connected to the frame.
- In the event of mounting on a metal panel, standard safety considerations require that the power supply should be earthed to avoid electrocution.
- Do not connect either the “Neutral” or “Line” signal of the 110/220VAC to the device’s 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.
- Double-check all wiring before turning on the power supply.
- Do not use tin on the stripped wire that might cause the strand to break.
- Install at maximum distance from high-voltage cables and power equipment.
- To avoid damaging the wire, do not exceed a maximum torque of 0.5 Nm (0.05 kgf.m).
- We recommend using crimp terminals for wiring. Use 26-14 AWG wire for all wiring purposes.
- To maximize the system performances, avoid electromagnetic interferences by mounting the processor on a metal panel and earthing the power supply.

3.9510 operating functions

3.1 Sensor and transducer detection

At start:

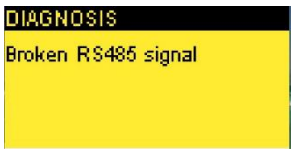
After every new start the 9510 processor initializes its COM port and sends frames to the transducer. If a transducer is connected, the 9510 processor displays the hereunder main screen. The RS message is blinking about every 2 seconds and indicates that the two devices are linked together and correctly communicating.

If the transducer is not connected or not powered when starting the 9510, then it displays:

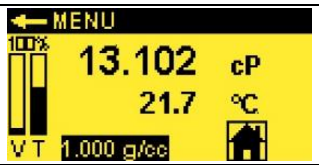
Unplug the RJ connector from port 2, power the transducer 9000 and plug the connector again, the 9510 will automatically restart.

It is possible to access to the menu even if there is no transducer connected by pressing the 'ESC' key.

Hereunder screen shows the message in case of failure. Press "OK" to access to the Diagnosis screen.



3.2 Navigation

Where	Screen	Button	Action
Main screen			Display the system information
Main screen		'◂'	Back to the main menu
Main menu		'◂' or '▸'	Move on the screen
Main menu		'OK'	Confirm / Select
Main menu		'◂' or '▸'	Move on the screen
Anywhere			Back to the main screen

Anywhere		ESC	Back to the previous screen
Anywhere		'+/-'	Change sign when entering values
Below the bright screen			Type values

For a good use of the buttons hold the pressure for half a second at least.

3.3 Security codes

The security codes limit the access to some functions of the processor in order to protect data and parameters

4 security codes, CODE 0 to CODE 3, are defined and must be typed when the screen asking a code appear.

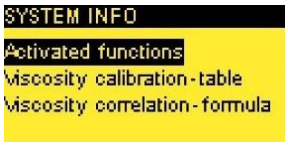
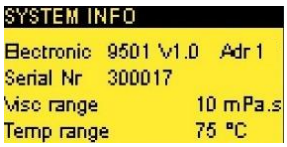
CODE 0		Manufacturer only. Highest security.
CODE 1		Cannot be modified, reserved to after-sales service.
CODE 2		**1111** (By default) – Editable. This code gives access to the blocks "Settings" and "Parameters"
CODE 3		**1111** (By default) – Editable. This code gives access to the functions of Viscosity and Temperature units choice and of viscosity corrections activation

Communicated codes are indicated in the Technical manual (Specific notes and manufacturing parameters).

To change a code, refer to §4.5 (PARAMETERS / SECURITY CODES) of this manual.

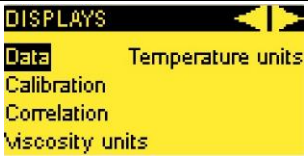
3.4 System information

The security codes limit the access to some functions of the processor in order to protect data and parameters

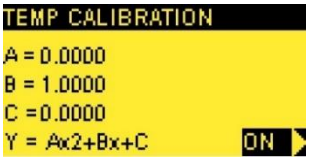
Press 	Display the activated functions (user calibration, correlation, filters)	
Press 	Display the software version, the slave address of 9510 processor (settable), the Serial Number of the connected sensor and transducer, viscosity and temperature ranges.	

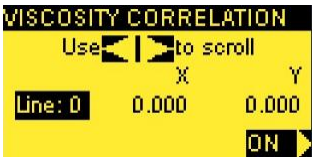
Press ESC to return to the main screen.

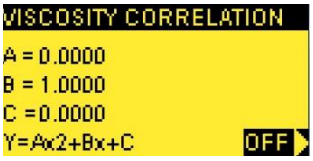
3.5 Displays

<table>
<tr><td colspan="3">Block “DISPLAY” Menu
The purpose of this menu is to make some changes on the values or items mainly displayed on the main page. These adjustments can only be enabled or disabled from this menu.
To reach this menu select DISPLAY in the main menu and Enter Code 3</td><td> 
</td></tr>
<tr><td rowspan="6">“ DISPLAY”</td><td colspan="2">“DATA”

Instant values display creen used for after-sale service purposes.</td><td> 
</td></tr>
<tr><td colspan="2">“CALIBRATION”

On-site re-calibration by user check and activation.
Change of these values is described in §3.8.</td><td> 
</td></tr>
<tr><td rowspan="2">“ CALIBRATION”</td><td>“VISCOSITY CALIBRATION”
Press ‘OK’, to enable/disable the calibration. When it is indicated “ON” in the bottom right corner the calibration is disabled. “OFF” means the calibration is enabled. Use the arrows to check each of the 9 lines.
See §3.4 for status confirmation.</td><td> 
</td></tr>
<tr><td>“TEMPERATURE CALIBRATION”
Press ‘OK’, to enable/disable the calibration. When it is indicated “ON” in the bottom right corner the calibration is disabled. “OFF” means the calibration is enabled.
See §3.4 for status confirmation.</td><td> 
</td></tr>
<tr><td colspan="2">“CORRELATION”
It is possible to enable or disable a correlation with all the measured viscosity and temperature values.
The viscosity correlation can be of 2 types: a 10-points table (By Table) or a second-order formula (By Formula).
Only one viscosity correlation can be enabled AT A TIME. If you activate a new correlation, it will automatically disable the previous one.
The correlation, which is activated, is displayed on the ACTIVATED FUNCTIONS view (see §3.4).</td><td> 
</td></tr>
<tr><td rowspan="2">“ CORRELATION”</td><td>“VISCOSITY CORRELATION” BY TABLE

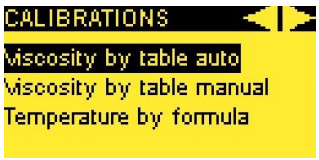
Press ‘OK’, to enable/disable the calibration. When it is indicated “OFF” the calibration is disabled. “ON” means the calibration is enabled.
See §3.4 for status confirmation.</td><td> 
</td></tr>
<tr><td>“VISCOSITY CORRELATION” BY FORMULA

Press ‘OK’, to enable/disable the calibration. When it is indicated “OFF” the calibration is disabled. “ON” means the calibration is enabled.
See §3.4 for status confirmation.</td><td> 
</td></tr>
</table>

" DISPLAY"

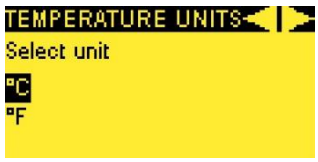
"VISCOSITY UNITS"

The user has the choice in between 6 different viscosity units: mPa.s, cP, Po, Pa.s, cSt or St. To choose the new viscosity unit, it is enough to select it with the arrows and to press 'OK'. The change is automatically done.



"TEMPERATURE UNITS"

The user has the choice in between 2 different temperature units: °C or °F.
To choose the new temperature unit, it is enough to select it with the arrows and to press 'OK'. The change is automatically done.



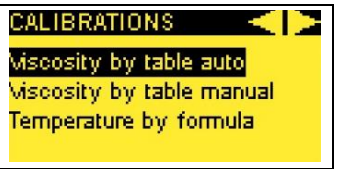
When the viscosity or the temperature unit is changed, an automatic warning message is displayed to think to change the thresholds as appropriate (For Alarms – Outputs – Bargraphs see §3.7 SETTINGS)

3.6 Calibration

Block "CALIBRATIONS" Menu

On-site re-calibration by user.
Caution: this on-site calibration is only valid when the 9510 is always connected to the same sensor.

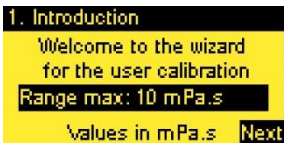
Enter Code 2

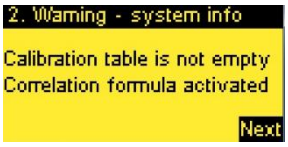


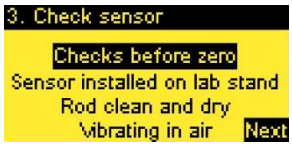
" CALIBRATION"

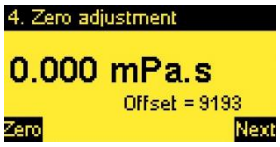
"VISCOSITY BY TABLE AUTO"

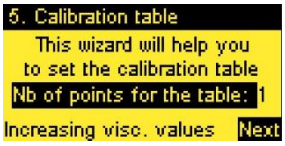
'AUTO' is to select the wizard that assists the user to proceed to his on-site calibration when needed. Follow the instructions. It is possible to use up to 9 standard oils but it is usually sufficient to use only 2.

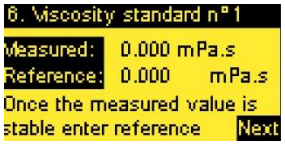


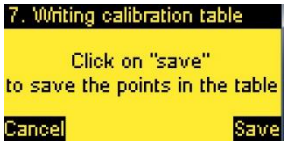


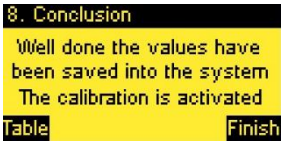






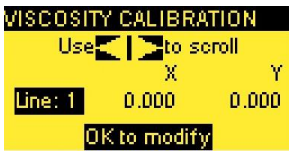






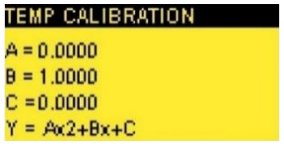
"VISCOSITY BY TABLE MANUAL"

It is possible to calibrate the sensor with up to 9 standard oils and to enter each point manually.
For each measurement, on each line, enter the measured value under X and the expected value under Y.



"TEMPERATURE BY FORMULA"

After the measurements made with a calibrated thermometer, use Excel or equivalent to obtain a second degree polynomial fit. Enter the parameters in this menu.



3.7 Settings

Block "SETTINGS" Menu

The purpose of this menu is to fix the adjustments that are then selectable from the "Display" menu. Some settings – such as the zero adjustment in the air – have a direct and essential influence on the measurements. These settings must be done by taking great care of the modifications that will hence be enabled for the measurements

To reach this menu Enter Code 2

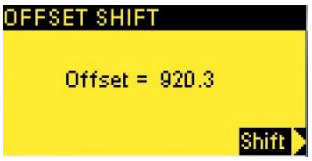
" SETTINGS"

! "OFFSET"!

Viscosity is calculated starting from the amplitude corrected with offset. So, if the offset is not adjusted correctly, the viscosity value will be false.
Air is used as reference fluid in order to adjust the raw signals during the installation.
The offset adjustment must be done:

- **At each new installation of the sensor on the process**
- **At each observation of the signal drift in the air.**
- **Each time the information is indicated on the "Diagnosis" view.**

The stages to follow to proceed to the offset adjustment are describes below:
STEP 1: Clean the sensor rod and make sure that it is clean and dry.
STEP 2: Make sure that the process is empty so that the sensor is vibrating in the air during the adjustment, i.e. that the rod is not immersed.
STEP 3: Install the sensor using the fastening screws. Switch on the electronic device. Wait 15 minutes to permit the sensor to be thermally stable.
STEP 4: Reach "offsets" function. Touch "AUTO shift". Touch "Validate" to take into account the offset adjustment.
STEP 5: *The offset adjustment is successful:* Press on  or 
The offset adjustment has failed: Start again / Ignore 



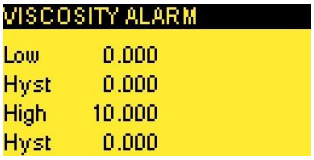
"ALARMS"

To define level of alarm for viscosity and / or temperature
It is it possible to set LOW and HIGH thresholds and hysteresis of viscosity and temperature alarms.
Once validated, the modified value will immediately be taken into consideration.

" ALARMS"

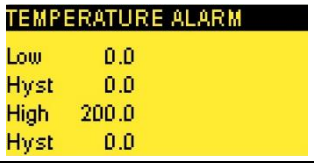
"VISCOSITY ALARM"

Indicate the required value on the line which the cursor blinks
Press 'OK' to move to the next line.
Press 'OK' to validate all values and to go back to the alarm menu



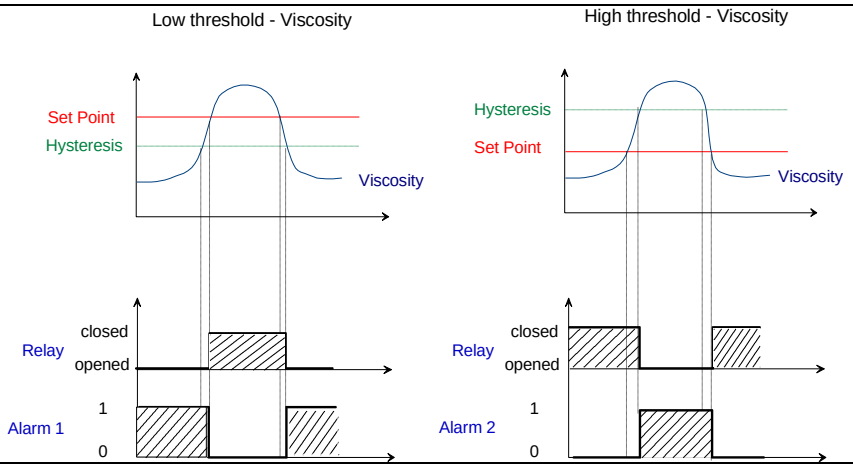
"TEMPERATURE ALARM"

Indicate the required value on the line which the cursor blinks
Press 'OK' to move to the next line.
Press 'OK' to validate all values and to go back to the alarms menu



" SETTINGS"

" ALARMS"

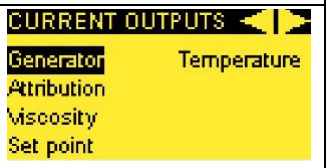


"CURRENT OUTPUTS"

" CURRENT OUTPOUTS"

"GENERATOR"

Enter Code 1 = > Accessible only for after sales service purposes

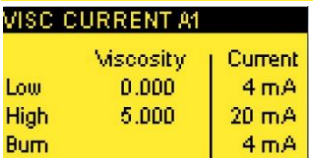


"ATTRIBUTION"

Press ' ◂ ' to change attribution of analog output A0.
Press ' ▸ ' to change attribution of analog output A1.
It is possible to choose viscosity, set point or temperature for each analog output.

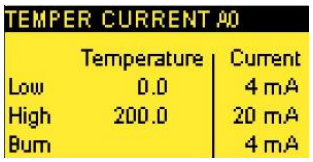
"VISCOSITY"

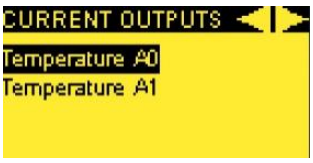
Minimal physical viscosity value: 0.0 cP
Value of the current output for the minimal physical value: 4mA
Maximum physical viscosity value: 999 999.9 cP
Value of the current output for the maximum physical value: 20mA
Burn: Value of the current output in the event of rupture of the measurement signal.
It can be changed.



"TEMPERATURE"

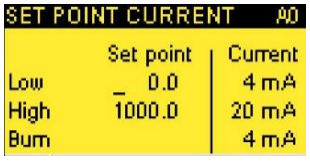
Minimal physical temperature value: -50.0 °C
Value of the current output for the minimal physical value: 4mA
Maximum physical temperature value: 300°C
Value of the current output for the maximum physical value: 20mA
Burn: Value of the current output in the event of rupture of the measurement signal.
It can be changed.

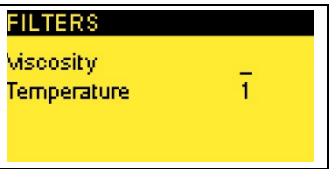




"SET POINT"

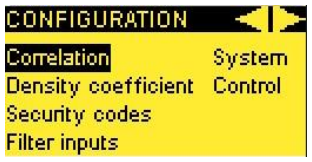
Minimal physical viscosity value of the set point: 0.0 cP
Value of the current output for the minimal physical value: 4mA
Maximum physical viscosity value: 999 999.9 cP Value of the current output for the maximum physical value: 20mA
Burn: Value of the current output in the event of rupture of the measurement signal.
It can be changed.

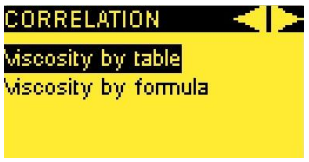


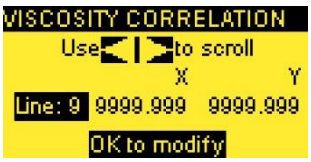
" SETTINGS"	"FILTERS" The user can activate/deactivate the filter. To disable the filter enter '0'. To enable the filter, enter a value >0 (Typ. Between 1 and 1000). The higher the value, the stronger the filtering.	
	"PT100" Press '◂' or '▸' to select with or without PT 100 and 'OK' to confirm "Pt100" enable / disable Pt100: - With Pt100: makes it possible to activate all displays and functions related to the temperature. - Without Pt100: when the temperature measurement is not available or when the user prefers to work without temperature indication. It cancels all displays (bargraphs, graphs, instantaneous measurements) and will block the access to all the functions related to the temperature (temperature unit, temperature alarms, current outputs, ...)	
	"BARGRAPHS" Bargraphs are displayed on the main screen. The bargraphs scales require to be modified during a change of viscosity or temperature unit in order to remain in coherence with the range of the physical units. Only the upper limit of bargraphs can be modified.	

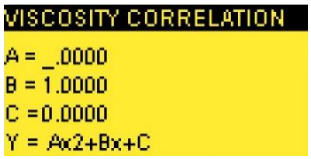
3.8 Configuration

<table>
<tr><td colspan="3">Block “CONFIGURATION” Menu

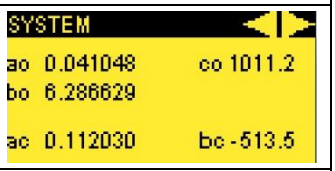
Enter Code 2</td><td> 
</td></tr>
<tr><td rowspan="6">“ CONFIGURATION”</td><td colspan="2">“CORRELATION” (VISCOSITY)

It is possible to correlate the measured viscosity (in cP), starting from the calibrated value, to the expected viscosity of a product, usually made at different conditions like in a lab. This function enables to take into account the effects of non-Newtonian behaviour. This correlation is done by table or by formula (equation of second order)</td><td> 
</td></tr>
<tr><td rowspan="2">“ CORRELATION”</td><td>“VISCOSITY BY TABLE”

Press ‘OK’ to modify / confirm</td><td> 
</td></tr>
<tr><td>“VISCOSITY BY FORMULA”

This adjustment is done by equation of second order.</td><td> 
</td></tr>
<tr><td colspan="2">“DENSITY COEFFICIENT”

To change the value: Enter the value of density and confirm
The default value is 1.000 g/cc</td><td> 
</td></tr>
<tr><td colspan="2">“SECURITY CODES”
To change Security codes 2 et 3
CODE 3 = 1111 – Editable. This code gives access to the functions of Viscosity and Temperature units choice and of viscosity corrections activation.
Code 2 = 1111 – Editable. This code gives access to the blocks “Settings” and “Parameters”.</td><td> 
</td></tr>
<tr><td colspan="2">“SYSTEM”

Display all the parameters that have been downloaded from the 9000 transducer associated to the sensor.</td><td> 
</td></tr>
<tr><td colspan="2">“FILTERS INPUTS”
Enter Code 1 – After-sales service only</td><td></td></tr>
<tr><td colspan="2">“CONTROL”
Enter Code 0 – Factory only</td><td></td></tr>
</table>

3.9 PID control (Optional)

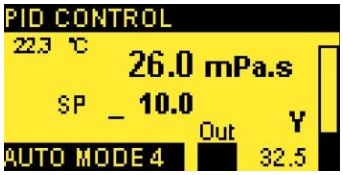
<table>
<tr><td colspan="2">Block “PID CONTROL” Menu

The purpose of this menu is to configure the PID control.

To reach this menu Enter Code 2</td><td> 
</td></tr>
<tr><td rowspan="2">“ PID CONTROL”</td><td>“PID configuration”
Here you can adjust the parameters of the PID control such as:
- Proportional band (0 to 100%)
- Integral time (1 to 9999 s)
- Derivate time (0 to 9999 s)
- Time of cycle (1 to 9999 s)
Once you have validate all these parameters by OK, you can also choose if the PID has a Direct action or Reverse action thanks to button ‘ ▸ ’.</td><td> 
</td></tr>
<tr><td>“PID limits”

Here you can adjust the minimum and maximum values for the set point (Process value) and for the Control value.</td><td> 
</td></tr>
</table>

A specific screen for PID can be accessed by pressing ‘**+/-**‘ button when you are on the main screen.

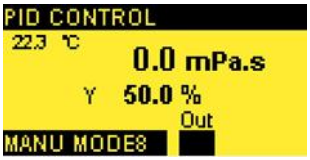


On this screen, you can directly enter the set point value with the keyboard and press OK. Once validated, the set point is automatically taken into account and the PID starts running (AUTO MODE) and the control value (Y) adapts automatically in function of the PID configuration.

The status messages (or MODE) are described in the table below:

Value	Message
>= 0	Status is OK.
-1	Proportion band zero.
-2	Input range is invalid (Process Value input).
-3	Output range is invalid (Control Value output).
-4	Integral has reached maximum of 100,000. PID will not allow the Integral value to increase any further.
-6	Set Point less than Input low range or Set Point more than Input high range.
-11	Noise is more than 5% of Input range.

You can switch to manual mode by pushing button ESC from this PID screen. A new window will appear on which you can enter directly a control value (Y between 0 to 100%).



Once the new Y value validated by OK, the status changes to MANU MODE.

Push ESC button to move back to previous screen or  for the main screen.

4. Troubleshooting

The hereunder table lists all the reasonable malfunctioning and some advices in order to analyze them and to fix them:

Observed malfunctioning	Checking advice
The screen does not light on when we turn on the power supply.	Check the wiring connections and the power supply of the equipment.
The sensor is not vibrating but the screen lights on.	Check that the transducer is connected to a 24 VDC stabilized and filtered power supply. Double-check all connections.
The sensors is vibrating but the OPLC does not process any data.	Check the RS-485 cable all over the line, the "Diagnosis" window on the OPLC should help to locate the breaking point. Check that the slave address of your 9000 transducer is 16 (see 9000 transducer specific notes). If address is not 16, contact your Sofraser Distributor.
RS message is blinking on Main screen No RS message on Main Screen	The blinking indicates that 9510 processor and 9000 transducer are linked together and correctly communicating. The absence of the blinking RS message indicates a break on communication between 9510 processor and 9000 transducer. Check connections, power supply, presence of termination resistor and transducer detection.
Buttons don't work	When using the buttons, hold the pressure about half a second at least.
The alarm relays do not switch as expected	Check the wiring connections and the low and high alarm settings (§ 3.7).
The 4/20 current outputs do not provide the expected signals.	Check the wiring connections and the power supply of the equipment. Use "Generator" feature to confirm the good working of the outputs (§ 3.7). Check the attribution of the outputs, then the settings of each output.
The PID controller feature cannot be reached	PID controller feature is optional. Please contact your Sofraser Distributor.
RS485 communication between my laptop/DCS and 9510 processor doesn't work	Check the settable slave address of your 9510 processor (§ 2.6).