750 ELECTRONIC FUEL VISCOSITY CONTROLLER
(Component of ViscoSense®, ViscoSense®2, Viscotherm® system)
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1. PREFACE

1.1 GENERAL

This manual contains instructions for installation, operation and maintenance (IOM) of the electronic controller supplied with a VAF ViscoSense®, ViscoSense®2 or Viscotherm® viscosity sensor. This manual supplements the IOM instructions for the ViscoSense®/ViscoSense®2 with interface box as published in Technical Information Bulletins TIB-756 (ViscoSense®), TIB-761 (ViscoSense®2) and Viscotherm Sensor/Electronic Transmitter Assembly, as published in TIB-739. These Manuals also include a functional description of viscosity control systems with ViscoSense®, ViscoSense®2 or Viscotherm®.

For IOM information of the control valve for steam or thermal oil supplied with your control system, refer to the separate manual supplied with the valve.

To ensure safe and correct installation and operation, read this manual completely before installing the equipment and starting operations.

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Or your local authorized VAF dealer.
Their addresses can be found on www.vaf.nl

1.2 SYMBOLS

The following symbols are used to call attention to specific types of information.

⚠️ A warning to use caution! In some instances, personal injury or damage to the instrument or control system may result if these instructions are not followed properly.

🔍 An explanation or information of interest.

1.3 COPYRIGHT

This Technical Manual is copyrighted with all rights reserved. While every precaution has been taken in the preparation of this manual, no responsibility for errors or omissions is assumed. Neither is any liability assumed for damages resulting from the use of the information contained herein. Specifications can be changed without notice.

ViscoSense®, ViscoSense®2 and Viscotherm® are registered trademarks of VAF Instruments B.V.
2. SYSTEM DESCRIPTION
2.1 TO RECORD NAMEPLATE DATA
Before installing a VAF viscosity control system, record all type and serial numbers as stamped on the viscosity sensor, controller and other system components.

Always quote the instrument serial number and the variant number when contacting the factory or local service representative.

The VAF electronic controller may be part of a complete VAF viscosity control system. For information and instructions covering the other components of this system, refer to the separate Technical Information Bulletins as supplied with these components.

For identification purposes it is recommended to record nameplate data of all viscosity control system components here.

<table>
<thead>
<tr>
<th>Component</th>
<th>Nameplate data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
2.2 SYSTEM DESCRIPTION

VAF viscosity control systems are, besides other applications, intended for use in fuel oil treatment systems to obtain a correct measurement and control of the fuel oil viscosity.

Figure 1 Recommended fuel viscosity control system installation, shows a typical fuel treatment system with return line from the engine. In this configuration, the degassing/mixing tank operates as a fuel buffer, ensuring gradual changes of viscosity which results in a more stable control of the viscosity. The viscosity sensor is used to measure the actual viscosity of the fuel oil. The signal from the sensor is compared to the setpoint of a viscosity controller, which regulates the output of the fuel heater via a control element (steam or thermal oil valve, or electric heater cabinet).

*Figure 1 Recommended fuel viscosity control system installation
Typical example of an automatic control system using steam or thermal oil heater*
2.3 SYSTEM COMPONENTS

VAF viscosity control system consists of:

- Viscosity measuring sensor
- Temperature measuring sensor
  - Standard for ViscoSense®, ViscoSense®2.
  - Optional for Viscotherm®
- Electronic viscosity signal converter
  - Interface box for ViscoSense®, ViscoSense®2.
  - Electronic differential pressure transmitter (DTP) for Viscotherm®
- Electronic viscosity controller
- Control valve for steam or thermal liquid (optional)
- Analogue viscosity indicator (optional)
- Viscosity recorder (optional)

2.3.1 Viscosity sensor

For operation information on your viscosity sensor refer to the Technical Information Bulletin (TIB) supplied with the sensor. For ViscoSense® with interface box refer to TIB-756, for ViscoSense®2 with interface box refer to TIB-761 and for Viscotherm Sensor/Electronic Transmitter Assembly, refer to TIB-739. These Manuals also include a functional description of viscosity control systems with ViscoSense®, ViscoSense®2 or Viscotherm®.

2.3.2 Viscosity controller

The viscosity controller is a microprocessor-based instrument with proportional and integrating control action. It is available in four types to match the specific requirements for different viscosity control systems.

2.3.2.1 One channel input, relays output
The input is the 4 .. 20 mA signal from the viscosity sensor electronics, representing the actual fuel viscosity.

The control action of the viscosity controller is performed by two relay contacts to open or close the valve in the steam or thermal liquid line.

Analogue input for temperature and analogue outputs for viscosity and temperature are available as an option.

2.3.2.2 One channel input, current output
The input is the 4 .. 20 mA signal from the viscosity sensor electronics, representing the actual fuel viscosity.

The control action of the viscosity controller is performed by a 4 .. 20 mA control signal to open or close the valve in the steam or thermal liquid line.
Analogue input for temperature and analogue outputs for viscosity and temperature are available as an option.

2.3.2.3 Two channel input, relays output
The inputs are the 4 .. 20 mA signal from the viscosity sensor electronics, representing the actual fuel viscosity and the 4 .. 20 mA signal from the temperature transmitter. The control action of the viscosity controller is performed by two relay contacts to open or close the valve in the steam or thermal liquid line.

2.3.2.4 Two channel input, current output
The inputs are the 4 .. 20 mA signal from the viscosity sensor electronics, representing the actual fuel viscosity and the 4 .. 20 mA signal from the temperature transmitter. The control action of the viscosity controller is performed by a 4 .. 20 mA control signal to open or close the valve in the steam or thermal liquid line.

2.3.3 Control valve for steam or thermal liquid
The control valve regulates the flow of steam or thermal liquid to the fuel heater. The valve actuator is driven by a bi-directional electric motor. In the event of an electric power failure the control valve remains in its last obtained position, thus enabling the system to remain on H.F.O., while maintaining the possibility of controlling the valve by means of the manual override. For thermal liquid the valve is equipped with a bellows seal. For IOM information of the control valve for steam or thermal oil supplied with your control system, refer to the separate manual supplied with the valve.

2.3.4 Analogue viscosity indicator
The viscosity controller displays the actual dynamic viscosity in mPa.s. The analog viscosity indicator can be used to obtain a read-out of the kinematic viscosity in cSt, degrees Engler or Sec.Redwood 1. The kinematic viscosity is calculated with a specific gravity of 0.99 at 15°C. The input signal for the indicator is the 4 .. 20 mA signal from the viscosity sensor electronics. The indicator can also be supplied with free adjustable alarm contacts. For further information refer to the instructions supplied with the instrument.

2.3.5 Viscosity recorder
For registration of the viscosity and optionally also the temperature of the fuel oil, a recorder can be installed. The input of the recorder is the 4 .. 20 mA signal from the viscosity sensor electronics. The recorder can also be supplied with free adjustable alarm contacts. For further information refer to the instructions supplied with the instrument.
3. TECHNICAL SPECIFICATION

3.1 CONTROLLER

General

Power supply 110….240V 48 .. 62 Hz
Fluctuations should not exceed ±10% of the normal voltage
Power consumption 20VA
Housing for panel mounting 96 x 96 mm
Operator controls Up/down push buttons, scroll button, auto/manual button
Operating temperature 0-50°C
Protection class DIN 40050, IP65 (facia only)
Electric connections Screw terminals, accept wire size 0.5..1.5 mm
(16 to 22Awg)
Weight 0.6 kg

Controls

Input Viscosity 4 .. 20 mA
Temperature (optional) 4 .. 20 mA (optional)
Output Contacts (standard) 2 relays, 2A/250 (standard)V
Current 4 .. 20 mA (optional)
Control action If measured value is higher than setpoint value, the ‘raise’ output
relay is activated to open control valve.
Alarm feature Non-latching band alarm, adjustable
1 potential-free SPDT contact, 2A/240 VAC rating (NC fail safe)
Read-out
- Display Fully graphic display
- Scale range 0…25 mPa.s /0…50 mPa.s (or as ordered)
- Alarm indication By means of one dedicated front panel LED.
- Output indication By means of bar indication
- Options Many variations available
4. INSTALLATION

4.1 SAFETY PRECAUTIONS

To ensure the safety of personnel and equipment:

- Always follow the safety and installation recommendations in this manual.
- Always use insulated tools when working on electrical installations.
- Ensure that local safety regulations are met when installing and operating the equipment.
- All personnel who operate and service the equipment should read this manual completely and make themselves acquainted with the equipment before installing or operating the equipment.

4.2 GENERAL INSTALLATION RECOMMENDATIONS

- Compare your process variables with the specifications. Make sure these are compatible!
- No special tools are required to install the VAF electronic viscosity controller. Ensure that your standard tools are fit for the job.
- Make sure that the working environment is clean.
- VAF electronic viscosity controller is a precision instrument. Handle it with care.

4.3 MECHANICAL INSTALLATION

4.3.1 VAF electronic viscosity controller

1. Before installation inspect the controller for any visible signs of damage caused during transport.

2. Install the VAF electronic viscosity controller in a suitable location, free from excessive vibrations, humidity and excessive temperature variations (refer to chapter 5 for dimension).

3. Push the housing from the front into the DIN-panel cut-out and secure from behind with the fastening devices supplied.

4. Allow sufficient space for installation of cables and for servicing.

4.3.2 Control valve

1. Install the valve in the steam or thermal oil line, upstream of the fuel heater, in accordance with the instruction manual supplied with the valve.

4.3.3 Analogue viscosity indicator (when supplied)

1. Install the indicator in a suitable location according to the instructions supplied with the instrument.
4.3.4 **Viscosity recorder**
(when supplied)

1. Install the recorder in a suitable location according to the instructions supplied with the instrument.

4.4 **ELECTRICAL INSTALLATION**

In order to maintain proper EMC protection a shielded cable should be used for all external signal connections such as: 4 .. 20 mA output signals and/or relay contacts. Recommended cable, twisted pair individually screened conductor 24 AWG 90.25mm2) stranded wire, overall PVC insulated. Wire cross section max. 1.5 mm2.

VAF electronic controller may be part of a complete VAF viscosity control system. It is available in four types to match the specific requirements for different viscosity control systems. Before connecting the controller to other system components thoroughly check the compatibility of all system parameters and signals. Connecting non compatible system components will lead to faulty operation and possible destruction of these components.

4.4.1 **VAF electronic viscosity controller**

1. Connect the 4 .. 20 mA input signal(s) for viscosity (and temperature) to the terminals on the back panel in accordance with chapter 4.5 electrical connection diagrams.

2. Connect the relais or 4 .. 20 mA output signal(s) for valve control to the terminals on the back panel in accordance with chapter 4.5 electrical connection diagrams.

   The control leads must be fused externally to protect the output relays.

3. Connect the cable for main power to the terminals on the back panel in accordance with chapter 4.5 electrical connection diagrams.

   Check power supply acc. to name plate and provide the correct supply to the electronic viscosity controller.

4. Make sure that all connectors are properly seated before starting operation.
4.4.2 Control valve
1. Connect the relais or 4 .. 20 mA input signal(s) for valve to the terminals on the back panel of the
controller in accordance with chapter 4.5 electrical connection diagrams and the directions in the
instruction manual supplied with the valve.
2. Connect the cable for main power supply as instructed in the instruction manual supplied with the
control valve.

4.4.3 Analogue viscosity indicator
(when supplied)
1. Connect the 4 .. 20 mA input signal for viscosity to the indicator following the instructions supplied
with the instrument.

4.4.4 Viscosity recorder
(when supplied)
1. Connect the 4 .. 20 mA input signal for viscosity to the recorder following in the instructions
supplied with the instrument.
4.5 ELECTRICAL CONNECTION DIAGRAMS

In order to guide you easier through the external connection diagrams, please find overview below.

<table>
<thead>
<tr>
<th>For Viscotherm® systems</th>
<th>Controllers</th>
<th>Output</th>
<th>Viscosity</th>
<th>Temperature</th>
<th>Drawing no.</th>
<th>Figure</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 channel with temperature read out</td>
<td>relay</td>
<td>yes</td>
<td>yes</td>
<td>0850-2101</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 channel with temperature read out</td>
<td>current</td>
<td>yes</td>
<td>yes</td>
<td>0850-2109</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 channel with temperature read out</td>
<td>relay</td>
<td>yes</td>
<td>no</td>
<td>0850-2103</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 channel with temperature read out</td>
<td>current</td>
<td>yes</td>
<td>no</td>
<td>0850-2114</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 channel relay yes yes</td>
<td>0850-2105</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 channel relay yes yes</td>
<td>0850-2112</td>
<td>7 Pot. Meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 channel</td>
<td>relay yes no</td>
<td>0850-2107</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 channel</td>
<td>relay yes no</td>
<td>0850-2116</td>
<td>9 Pot. Meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For ViscoSense®, ViscoSense®2 systems</th>
<th>Controllers</th>
<th>Output</th>
<th>Viscosity</th>
<th>Temperature</th>
<th>Drawing no.</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 channel with temperature read out</td>
<td>relay</td>
<td>yes</td>
<td>yes</td>
<td>0850-2102</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>1 channel with temperature read out</td>
<td>current</td>
<td>yes</td>
<td>yes</td>
<td>0850-2110</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>1 channel with temperature read out</td>
<td>relay</td>
<td>yes</td>
<td>no</td>
<td>0850-2104</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2 channel</td>
<td>relay yes yes</td>
<td>0850-2106</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 channel</td>
<td>current yes yes</td>
<td>0850-2111</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 channel</td>
<td>relay yes no</td>
<td>0850-2108</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensional drawing controller</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0850-1077-3</td>
<td>16</td>
</tr>
</tbody>
</table>
* Optional

Figure 2 VAF drawing 0850-2101
Figure 3 VAF drawing 0850-2109
Figure 4 VAF drawing 0850-2103
Figure 5 VAF drawing 0850-2114
Figure 6 VAF drawing 0850-2105
Figure 7 VAF drawing 0850-2112
Figure 8 VAF drawing 0850-2107
Figure 9 VAF drawing 0850-2116
* Optional

Figure 10 VAF drawing 0850-2102
Figure 11 VAF drawing 0850-2110
Figure 12 VAF drawing 0850-2104
Figure 13 VAF drawing 0850-2106

* SELECTABLE VIA MENU
Figure 14 VAF drawing 0850-2111
Figure 15 VAF drawing 0850-2108
5. DIMENSIONS

5.1 ELECTRIC VISCOSITY CONTROLLER

Figure 16 Dimensions of electronic viscosity controller (All dimensions in millimetres)
VAF drawing 0850-1077
6. OPERATING INSTRUCTIONS

6.1 NORMAL OPERATION

Switch on the controller. Following a brief self-test sequence, the controller will start up in AUTO mode and Operator Level 1. This section describes the operation of the controller in this level.

AUTO is the normal closed loop viscosity or temperature control mode which means that the output power is adjusted automatically by the controller in response to the measurement from the input sensor. In this mode the format of the display for a new instrument is shown below. It is called the HOME display.

<table>
<thead>
<tr>
<th>Indicator beacons (listed below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Variable (PV)</td>
</tr>
<tr>
<td>Setpoint (SP)</td>
</tr>
<tr>
<td>Message display</td>
</tr>
</tbody>
</table>

Current level of access
Indication shown
Lev1
Lev2
Config.

6.1.1 Beacon Display and Description

<table>
<thead>
<tr>
<th>Beacon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP1</td>
<td>Illuminates when output 1 is ON (normally heating)</td>
</tr>
<tr>
<td>OP2</td>
<td>Illuminates when output 2 is ON (normally cooling or alarm)</td>
</tr>
<tr>
<td>MAN</td>
<td>Illuminates when manual mode active</td>
</tr>
<tr>
<td>ALM</td>
<td>If an alarm occurs the red alarm beacon flashes. This is accompanied by a message showing the source of the alarm, for example ‘Boiler overheating’. To acknowledge press ( \text{\textcopyright} ) and ( \text{\textregistered} ). The message disappears. If the alarm condition is still present the beacon lights continuously. When cleared it will extinguish. A full description of the alarm operation is given in section 6.5.1.</td>
</tr>
<tr>
<td>RUN</td>
<td>Illuminates when programmer running – flashing indicates End</td>
</tr>
<tr>
<td>HLD</td>
<td>Illuminates when programmer held</td>
</tr>
</tbody>
</table>
6.2 THE OPERATOR BUTTONS

**A/MAN**
This button can be disabled

Manual operation means that the controller output power is adjusted by the user. The input sensor is still connected and reading the PV but the control loop is open. When pressed, this toggles between automatic and manual operation.

If the controller is in manual mode, 'MAN' light will be indicated

If the controller is powered down in Manual operation it will resume this mode when it is powered up again.

Press to select new PAGE headings (several menus)

Press to select a new parameter in the page

Press to decrease an analogue value, or to change the state of a digital value

Press to increase an analogue value, or to change the state of a digital value

6.3 OPERATION LEVELS AND CORRESPONDING OPERATION MENUS

6.3.1 Operational Level 1 (see par. 6.7.2 and 6.7.3)

a) HOME display
b) Set point Menu
c) Output Menu

d) Viscosity Channel Menu (Controlling parameters)
e) Temperature Channel Menu (Controlling parameters) (Optional)
f) Alarm Settings

6.3.3 Configuration Level

Factory configuration level only accessible by VAF Instruments B.V.
6.3.4 How to change from Level 1 to Level 2 and visa versa

From HOME display,
1. Press and hold down for a few seconds.
2. ACCESS display will now appear.
3. Press ▲▼ to change Level1 to Level2
4. After a few seconds a pass code is required.
5. Press ▲▼ to change pass code 0 to 2
6. The controller will after a few seconds automatically accept the pass code and jump back to the Home page.
7. The level of access is now changed from Level 1 to Level 2
8. To change back from Level 2 to Level 1 Press and hold down for a few seconds.
9. ACCESS display will now appear.
10. Press ▲▼ to change Level 2 to Level 1
11. After a few seconds the level of access will change from level2 to level1 and the controller will jump automatically back to the HOME display.

6.4 TO SET THE REQUIRED VISCOSITY OR TEMPERATURE (OPTIONAL) SETPOINT

From HOME display,
- Press 
- Press ▲▼ to choose required WSP (Working Set Point)
- Press ▲▼ to change WSP value.

WSP is the current Working SetPoint

A momentary press of either button will show the setpoint in use e.g. SP1. The new setpoint is accepted when the button is released and is indicated by a brief flash of the setpoint display.
6.4.1 Changing from viscosity control to temperature control (or visa versa)

ONLY AVAILABLE IF Controller is equipped with 2 channel inputs.

1. From HOME display
2. Change from operational Level 1 to Level 2 (see 6.3.4.)
3. Press \( \mathbb{3} \) to go to Setpoint menu
4. Press \( \mathbb{Q} \) to choose Contr. Strat. Option.
5. Press \( \mathbb{A} \) \( \mathbb{V} \) to change from None to Temp.\( \Delta \)C
6. The controller will load the Temperature Control parameters and jump back to the Setpoint menu page
7. Press \( \mathbb{3} \) and \( \mathbb{Q} \) simultaneously (Acknowledge)
8. Change from operational Level 2 to Level 1 (see 6.3.4.)
9. To change back from temperature control to viscosity control, follow steps 1 to 4
10. Press \( \mathbb{A} \) \( \mathbb{V} \) to change from None to V.mPa.s
11. Follow steps 6 to 8

Contr. strat. = Controller Strategy
6.5 TO SELECT MANUAL OPERATION

From HOME display,
1. Press A/MAN Button
2. Controller is now in Manual operation

Press button.

'Man OP' will be displayed
'MAN' beacon will be lit on
Bar graph for valve position

6.5.1 How to change controlling valve in manual operation

From Home Display
1. Make sure controller is in manual operation (see 6.5)
2. Press twice.
3. Output menu display will now appear.
4. Press to choose Valve Pos. % option
5. Press ▲▼ to open or close Controlling valve

The bar graph valve position and percent valve indication will change accordingly.
The controller will after a few seconds automatically jump back to the Home page or press and (Ack) simultaneously to go back to the Home Page Immediately.
6.6 ALARM INDICATION

If an alarm occurs it is indicated as follows:

- The red alarm (ALM) beacon in the top left of the display flashes.
- Alarm number is indicated together with the flashing ⚠.
- A default message or a pre-programmed message appears showing the source of the alarm.
- Invitation to acknowledge the new alarm.

Controller Alarms

<table>
<thead>
<tr>
<th>PVInput (SBreak)</th>
<th>Sensor break no input signal available</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnAlm1</td>
<td>Viscosity high or low alarm</td>
</tr>
<tr>
<td>AnAlm2</td>
<td>Temperature high or low alarm</td>
</tr>
</tbody>
</table>

6.6.1 To Acknowledge an Alarm

Press ☐ and ☐ (Ack) together.

The action, which now takes place, will depend on the type of latching, which has been configured

Non Latched Alarms

If the alarm condition is present when the alarm is acknowledged, the alarm beacon will be continuously lit. This state will continue for as long as the alarm condition remains. When the alarm condition disappears the indication will also disappear.
If a relay has been attached to the alarm output, it will de-energise when the alarm condition occurs and remain in this condition until the alarm is acknowledged **AND** it is no longer present. If the alarm condition disappears before it is acknowledged the alarm indication disappears as soon as the condition disappears.

**Automatic Latched Alarms**
The alarm continues to be active until both the alarm condition is removed **AND** the alarm is acknowledged. The acknowledgement can occur **BEFORE** the condition causing the alarm is removed.

**Manual Latched Alarms**
The alarm continues to be active until both the alarm condition is removed **AND** the alarm is acknowledged. The acknowledgement **can only occur AFTER** the condition causing the alarm is removed.

**6.7 CONTROLLER OPTIMIZATION**

**6.7.1 Manual optimization**
An optimum adaptation of the control parameters (P,I) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operation conditions.
Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information. The following information is for help purpose only:

P = proportional band Pb (%):
Lower value = longer impulses, more sensitive reaction
Higher value = shorter impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshoot: Pb too low;
- The set point is reached very slowly after initial exceeding: Pb too high.

I = integral action time Ti (min):
Lower value = shorter impulse gaps, faster balancing
Higher value = longer impulse gaps, slower balancing
Examples: the set value is reached very slowly without overshooting: Tn too high;
high initial overshoot followed by fading oscillation: Tn too low.
6.7.2 Parameter navigation diagram level 2

To access Level 2 see paragraph 6.3.4.

(BOLD and underlined indications are factory settings)
### 6.7.3 Parameter names

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set point Menu</strong></td>
<td></td>
</tr>
<tr>
<td>Viscosity Sp</td>
<td>Controlling set point (see par 6.4)</td>
</tr>
<tr>
<td>Temperature SP (optional)</td>
<td>Controlling set point (see par 6.4)</td>
</tr>
<tr>
<td>Contr. Strat (optional)</td>
<td>Controller Strategy. To set controller in Viscosity or Temperature control</td>
</tr>
<tr>
<td><strong>Output Menu</strong></td>
<td></td>
</tr>
<tr>
<td>Valve pos % or output %</td>
<td>Control valve indication in Automatic mode. Control valve indication and operation in Manual mode</td>
</tr>
<tr>
<td>Aut/Man Status</td>
<td>Operational status of controller</td>
</tr>
<tr>
<td>Travel Time</td>
<td>Travel Time of control valve from fully close to fully open in sec</td>
</tr>
<tr>
<td>OP on Time</td>
<td>Minimum ON time of output pulse</td>
</tr>
<tr>
<td><strong>Viscosity Channel</strong></td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>Proportional band (see par 6.7.1.)</td>
</tr>
<tr>
<td>Ti</td>
<td>Integral time (see par 6.7.1.)</td>
</tr>
<tr>
<td>Band Alarm</td>
<td>Indication of band alarm in units</td>
</tr>
<tr>
<td>Hysteres</td>
<td>Alarm 1 Hysteresis in units</td>
</tr>
<tr>
<td><strong>Temperature Channel (optional)</strong></td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>Proportional band (see par 6.7.1.)</td>
</tr>
<tr>
<td>Ti</td>
<td>Integral time (see par 6.7.1.)</td>
</tr>
<tr>
<td>Band Alarm</td>
<td>Indication of band alarm in units</td>
</tr>
<tr>
<td>Hysteres</td>
<td>Alarm 2 Hysteresis in units</td>
</tr>
<tr>
<td><strong>Alarm setting</strong></td>
<td></td>
</tr>
<tr>
<td>1: Dv Alarm</td>
<td>Band Alarm 1 setting in units</td>
</tr>
<tr>
<td>2: Dv Alarm (optional)</td>
<td>Band Alarm 2 setting in units</td>
</tr>
</tbody>
</table>
7. MAINTENANCE

7.1 ROUTINE MAINTENANCE

Under normal conditions the VAF electronic viscosity controller requires no maintenance.

“Normal” means;
- A clean operating environment
- Controller installed in accordance with the installation instructions given.
- Operation of the controller and related control system in accordance with this manual and other related publications
- Uninterrupted power supply at normal specified values.

When cleaning of the controller housing is required use a soft cloth and a non-aggressive fluid.
Prevent any moisture penetrating the controller.

7.2 CUSTOMER REPAIR RESTRICTION

In case of faults, repair work by the customer should be restricted to the externally accessible leads, connections and components the customer is expressly permitted to deal with himself. (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

7.3 REPAIR REMITANCE

For repair remittance remove Controller from sleeve by clicking the Latching ears from the panel.

Unplugging the Controller

The controller can be unplugged from its sleeve by easing the latching ears outwards and pulling it forward out of the sleeve. When plugging it back into its sleeve, ensure that the latching ears click back into place to maintain the IP65 sealing

In case of remittance please give precise details of the fault to reduce time and cost of repair.
8. TROUBLE SHOOTING

8.1 DIAGNOSTIC INFORMATION

The electronic viscosity controller has a provision for diagnostic indication. Failures and errors are displayed by a code. Refer to chapter 6.3 for explanation of the controller diagnostics codes.

8.2 GENERAL TROUBLE SHOOTING

**Viscosity signal too low** (May be indicated by wrong temperature of the fuel oil)

<table>
<thead>
<tr>
<th>Possible cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air entrapped in fuel oil system.</td>
<td>Vent the system at the bypass valve.</td>
</tr>
<tr>
<td>Viscosity signal remains at maximum value</td>
<td></td>
</tr>
<tr>
<td>Fuel too cold during start-up.</td>
<td>Check fuel line heat tracing and/or fuel heater.</td>
</tr>
<tr>
<td>Fuel too cold during normal system operation,</td>
<td>Increase output signal of viscosity controller to heat</td>
</tr>
<tr>
<td>due to insufficient heating.</td>
<td>exchanger. Consult factory if this does not solve the</td>
</tr>
<tr>
<td></td>
<td>problem.</td>
</tr>
<tr>
<td>No viscosity signal</td>
<td></td>
</tr>
<tr>
<td>Air entrapped in fuel oil system.</td>
<td>Vent the system at the bypass valve.</td>
</tr>
<tr>
<td>No electrical supply to viscosity sensor</td>
<td>Check mains supply.</td>
</tr>
<tr>
<td></td>
<td>Check fuses of control unit and/or power supply unit.</td>
</tr>
<tr>
<td></td>
<td>Check integrity of electrical connections.</td>
</tr>
<tr>
<td>Current loop connection broken.</td>
<td>Check electrical wiring of 4 .. 20 mA output signal.</td>
</tr>
<tr>
<td>Viscosity sensor malfunctioning</td>
<td>Contact VAF Instruments or nearest service representative for repair.</td>
</tr>
</tbody>
</table>

**No temperature signal**

<table>
<thead>
<tr>
<th>Possible cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No electrical supply to temperature transmitter</td>
<td>Check mains supply.</td>
</tr>
<tr>
<td></td>
<td>Check fuses of control unit and/or power supply unit.</td>
</tr>
<tr>
<td></td>
<td>Check integrity of electrical connections.</td>
</tr>
<tr>
<td>Current loop connection broken.</td>
<td>Check electrical wiring of 4 .. 20 mA output signal.</td>
</tr>
<tr>
<td>Temperature transmitter malfunctioning</td>
<td>Contact VAF Instruments or nearest service representative for repair.</td>
</tr>
</tbody>
</table>
9. WARRANTY CONDITIONS

1. Without prejudice to the restrictions stated hereinafter, the contractor guarantees both the soundness of the product delivered by him and the quality of the material used and/or delivered for it, insofar as this concerns faults in the product delivered which do not become apparent during inspection or transfer test, which the principal shall demonstrate to have arisen within 12 months from delivery in accordance with subarticle 1A exclusively or predominantly as a direct consequence of unsoundness of the construction used by the contractor or as a consequence of faulty finishing or the use of poor materials.

1A. The product shall be deemed to have been delivered when it is ready for inspection (if inspection at the premises of the contractor has been agreed) and otherwise when it is ready for shipment.

2. Articles 1 and 1a shall equally apply to faults which do not become apparent during inspection or transfer test which are caused exclusively or predominantly by unsound assembly/installation by the contractor. If assembly/installation is carried out by the contractor, the guarantee period intended in article 1 shall last 12 months from the day on which assembly/installation is completed by the contractor, with the understanding that in this case the guarantee period shall end not later than 18 months after delivery in accordance with the terms of subarticle 1A.

3. Defects covered by the guarantee intended under articles 1, 1a and 2 shall be remedied by the contractor by repair or replacement of the faulty component either on or off the premises of the contractor, or by shipment of a replacement component, this remaining at the discretion of the contractor. Subarticle 3A shall equally apply if repair or replacement takes place at the site where the product has been assembled/installed. All costs accruing above the single obligation described in the first sentence, such as are not restricted to shipment costs, travelling and accommodation costs or disassembly or assembly costs insofar as they are not covered by the agreement, shall be paid by the principal.

3A. If repair or replacement takes place at the site where the product has been assembled/installed, the principal shall ensure, at his own expense and risk, that:

   a. the employees of the contractor shall be able to commence their work as soon as they have arrived at the erection site and continue to do so during normal working hours, and moreover, if the contractor deems it necessary, outside the normal working hours, with the proviso that the contractor informs the principal of this in good time;

   b. suitable accommodation and/or all facilities required in accordance with government regulations, the agreement and common usage, shall be available for the employees of the contractor;

   c. the access roads to the erection site shall be suitable for the transport required;

   d. the allocated site shall be suitable for storage and assembly;

   e. the necessary lockable storage sites for materials, tools and other goods shall be available;

   f. the necessary and usual auxiliary workmen, auxiliary machines, auxiliary tools, materials and working materials (including process liquids, oils and greases, cleaning and other minor materials, gas, water, electricity, steam, compressed air, heating, lighting, etc.) and the measurement and testing equipment usual for in the business operations of the principal, shall be available at the correct place and at the disposal of the contractor at the correct time and without charge;
g. all necessary safety and precautionary measures shall have been taken and adhered to, and all measures shall have been taken and adhered to necessary to observe the applicable government regulations in the context of assembly/installation;

h. the products shipped shall be available at the correct site at the commencement of and during assembly.

4. Defects not covered by the guarantee are those which occur partially or wholly as a result of:

A. non-observance of the operation and maintenance instructions or other than foreseeable normal usage;

B. normal wear and tear;

C. assembly/installation by third parties, including the principal;

D. the application of any government regulation regarding the nature or quality of the material used;

E. materials or goods used in consultation with the principal;

F. materials or goods provided by the principal to the contractor for processing;

G. materials, goods, working methods and constructions insofar as are applied at the express instruction of the principal, and materials or goods supplied by or on behalf of the principal;

H. components obtained from third parties by the contractor insofar as that party has given no guarantee to the contractor.

5. If the principal fails to fulfil any obligation properly or on time ensuing from the agreement concluded between the principal and the contractor or any agreement connected to it, the contractor shall not be bound by any of these agreements to any guarantee regardless of how it is referred to. If, without previous written approval from the contractor, the principal commences disassembly, repair or other work on the product or allows it to be commenced, then every agreement with regard to guarantee shall be void.

6. Claims regarding defects must be submitted in writing as quickly as possible and not later than 14 days after the discovery of such. All claims against the contractor regarding faults shall be void if this term is exceeded. Claims pertaining to the guarantee must be submitted within one year of the valid complaint on penalty of invalidity.

7. If the contractor replaces components/products under the terms of his guarantee obligations, the replaced components/products shall become the property of the contractor.

8. Unless otherwise agreed, a guarantee on repair or overhaul work carried out by the contractor or other services shall only be given on the correctness of the manner in which the commissioned work is carried out, this for a period of 6 months. This guarantee only covers the single obligation of the contractor to carry out the work concerned once again in the event of unsound work. In this case, subarticle 3A shall apply equally.

9. No guarantee shall be given regarded the inspection conducted, advice given and similar matters.

10. Alleged failure to comply with his guarantee commitments on the part of the contractor shall not absolve the principal from his obligations ensuing from any agreement concluded with the contractor.

11. No guarantee shall be given on products which form a part of, or on work and services on, goods older than 8 years.
Revision 0506
4.5: Connection diagrams for Viscotherm changed: Transmitter supply module added.
More connection diagrams added.

Revision 0307
ViscoSense®2 added.

Revision 0111
Chapter 6.1.1
Removal of not applicable beacons for display

Revision 0711
House style change