

PRODUCT BULLETIN **772** Series V92 Model VC Electronic Component System



Viscotherm® is a registered trade mark of VAF Instruments B.V.

Introduction

Series V92 Model VC Electronic Component System is an in-line automatic control system for the viscosity of heavy fuel oil for use with steam or thermal oil operated fuel heaters. The system consists of the following basic components:

- Viscotherm® sensor
- electronic differential pressure transmitter
- electronic viscosity controller
- electric control valve
- power supply unit
- starter box

As optional extras the following panel instruments are available:

- analog viscosity indicator
- viscosity recorder

The benefits of accurate viscosity control

Viscosity control of fuel oil for combustion engines is a necessity because of unpredictable quality of fuel. Prevention of engine damage and reduction of maintenance, next to efficiency improvement, are essential to the financial bottom line.

Your advantage

Designed to save time and raw material in-line measurement of viscosity will give you the possibility to optimise your process and instantly obtain the required quality of final product. No samples have to be taken and bulky mixing vessels are no longer necessary.

Why VAF Instruments

Guaranteed reliability

You expect a company to demonstrate its trust and its commitments to its clients by guaranteeing the quality of its products. You can expect more from VAF products. We give a standard two year guarantee on all our products, the longest and most comprehensive guarantee in the maritime industry.

 VAF INSTRUMENTS

 reliability and innovation

TO BE REALLY SURE

Applications

- Viscosity control of intermediate and heavy fuel oils used for main and auxiliary diesel engines on board ships.
- Viscosity control in oil-fired power plants and other industrial applications using heavy or intermediate fuel oils.

Features

- Viscotherm~ is constructed to NACE and CE standards.
- ISO 9001:2000 quality assurance certification.
- Continuous on-line viscosity control.
- Resistant against line pulsations.
- Long term accuracy and reproducibility.
- Leak proof drive through magnet coupling.
- Type approval certificates from all major classification authorities.
- Service facilities in more than 40 countries in principal harbours, industrial and shipbuilding areas of the world.

System arrangement

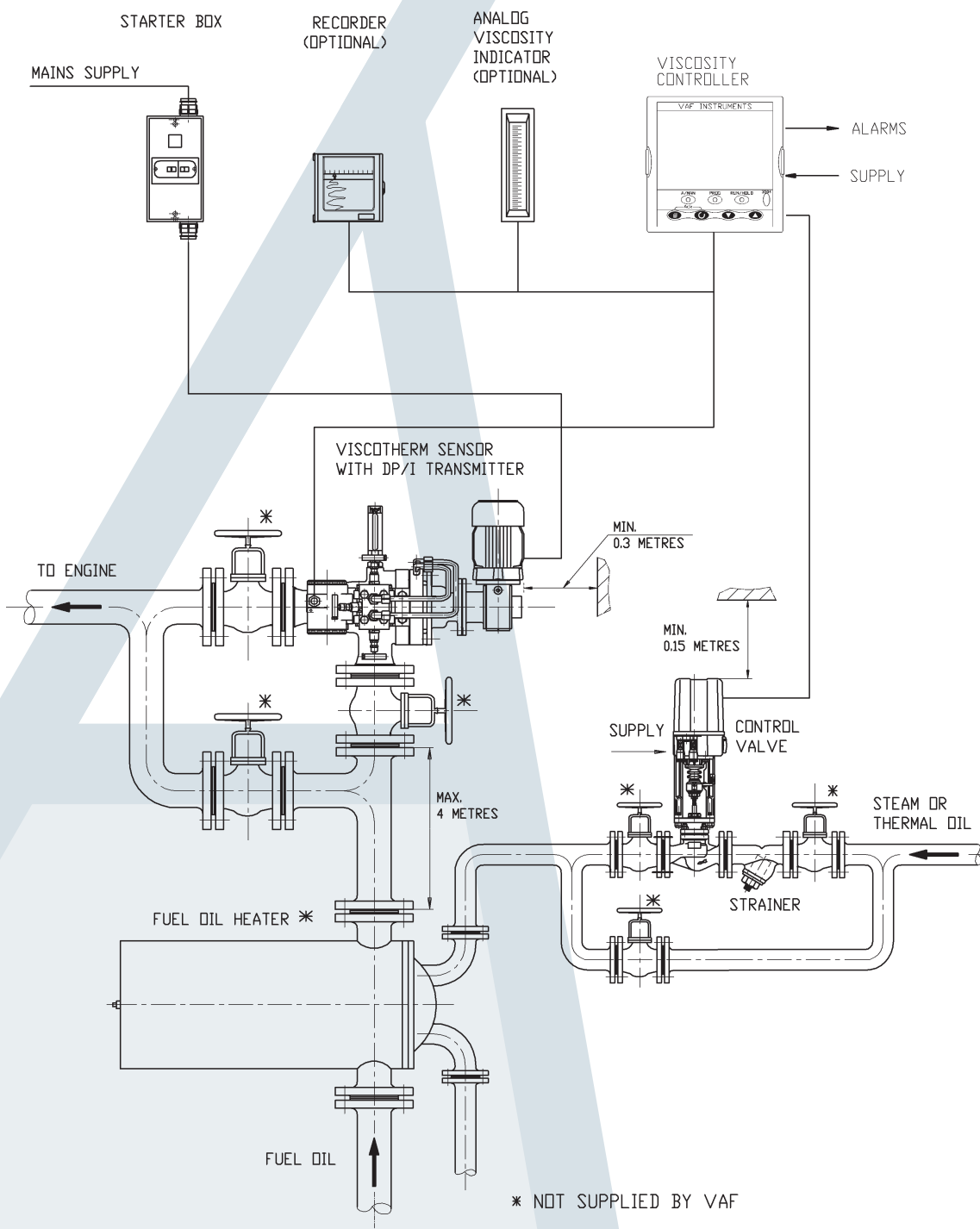


Fig. 2, System arrangement

System description

Sensor

Viscotherm® is a capillary type of viscosity instrument and measures the dynamic viscosity of Newtonian fluids. The sensor consists of a housing (4) in which the measuring element, a capillary tube assembly (2,3) is mounted together with a gear pump (9). An electric motor (6) with reduction gear (7) drives the pump such that a continuous and constant flow through the capillary tubes is achieved. The laminar flow through the measuring capillary creates a pressure differential which is proportional to the dynamic viscosity of the fuel oil. A magnetic coupling (8) prevents both leakage and overload of the electric motor in the event of an obstructed pump.

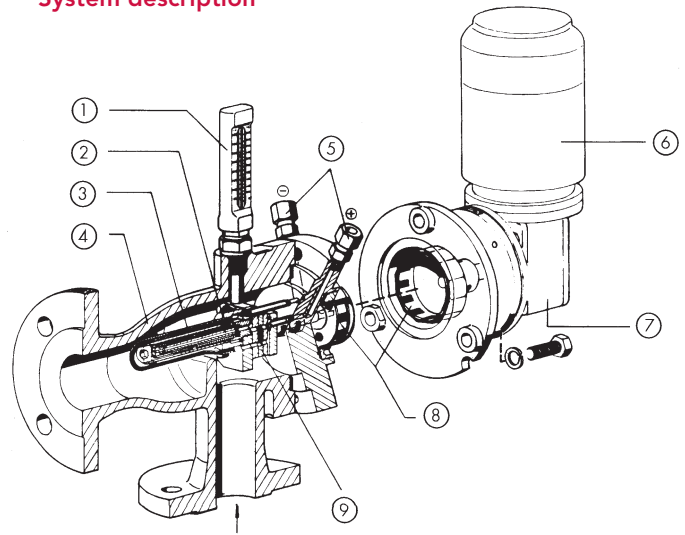


Fig. 3, Exploded view of Viscotherm® sensor

The capillary assembly consists of a measuring capillary in a resilient stainless steel housing (3) and a stainless steel damping capillary (2) which compensates for pressure waves in the fuel lines.

Pressure taps (5) are provided to connect the inlet and outlet of the measuring capillary to a differential pressure transmitter via a valve manifold. The manifold is used to isolate the differential pressure transmitter connections and to equalize the differential pressure across the transmitter. An optional thermometer (1) indicates the actual fuel temperature.

Differential pressure transmitter

The electronic differential pressure transmitter (DPT) converts the differential pressure measured across the capillary assembly into a proportional 4-20 mA control signal.

The DPT can be supplied in three basic configurations:

- mounted and piped in position 1, to the left side of the Viscotherm sensor as seen from the electric motor,
- mounted and piped in position 2, to the right side of the Viscotherm sensor
- not installed to the sensor, to accommodate installation by the customer.

The required configuration to be specified on the purchase order.



Fig. 4, Electronic Controller

Viscosity controller and control valve

The viscosity controller receives the 4-20 mA linear signal from the DPT. To obtain the setpoint viscosity value the controller will modulate the control valve to the position required to control the amount of steam or thermal liquid to the fuel heater. The controller can be supplied with analog or relay output.

Starter box and power supply

The starter box is used for on/off switching of the Viscotherm sensor motor. The power supply unit provides the required supply for the transmitter, the controller and the control valve.

Recorder and indicator

The viscosity recorder and the remote analog viscosity indicator are standard options providing auxiliary functions. These instruments are furnished only when specifically ordered.



Fig. 5, Control valve for steam

SENSOR

Technical specification

Viscotherm® sensor

Viscosity range	: 0-25 mPa s and 0-50 mPa s are standard. See 'Ordering Information' for other ranges.
Flange connections	: DN 50 (2"), DIN PN 40 bar is standard. DIN PN 100, ANSI and JIS flanges at extra cost. See 'Ordering Information'.
Materials	
Body	: Steel ASTM A2 1 6.WCB
Capillary assembly	: Steel and stainless steel; stn.stl/glass from range 0-200 mPa·s
Gear pump	: Stainless steel
Temperature	: Fuel oil max. 200°C (392°F); ambient max. 60°C (140°F)
Fuel flow rate	: Max. 35 cu.m/h
Response time	: Approx. 1 minute
Accuracy	: Better than +/- 2%, provided that mains power frequency is a constant 50 or 60 Hz.
Electric motor	
Supply voltage	: See 'Ordering Information'
Insulation class	: VDE 0530, Class F. Tropical insulation acc. Lloyds Register of Shipping.
Protection class	: IP55; ex-proof motors IP44.
Power consumption	: 50 VA (AC motors, not ex-proof); 90 VA 1220/380 VAC, 3 ph, ex-proof and DC motors); 120 VA 11 10/190 VAC, 3 ph, ex-proof motors)
Weightsensor/DPT ass'y	: 32 kilos

Differential pressure transmitter

Output signal	: 4 - 20 mA DC
Supply voltage	: 10.5 to 45 VDC
Protection class	: IEC IP67 and NEMA 4X
Max. load resistance	: 600 at 24 VDC 1533 Q at 45 VDC supply voltage.
Temperature effect	: Zero shift +/- 0.5% / 55°C between limits of -40 and 85°C (-40 and 185°F). Total effect +/- 1 % at upper range limit.
Temperature limits	: Ambient -40 to 85°C (-40 to 185°F); process -40 to 100°C (-40 to 212°F); storage -40 to 90°C (-40 to 194°F).
Max. relative humidity	: 100%
Single sided pressure overload	: +/- 0.4% / 14 MPa (140 bar; 2,000 psi)
Materials	
Process cover	: 316 stainless steel
Wetted sensor body	: 316 stainless steel
Non-wetted parts	: Low copper die-cast aluminium alloy electronics housing, finished with epoxy-polyurethane double coating.
Diaphragm	: 316L stainless steel
Manifold	: 303/316 stainless steel
Filling liquid	: Silicone oil
Manifold block	: 2 isolating valves, 1 pressure equalising valve
Weight, incl. manifold	: 5 kilos

CONTROLLER

General

Power supply	: 110...240 V, 48...62 Hz. (fluctuations should not exceed +/- 10% of the nominal voltage).
Power consumption	: 20 VA
Housing for panel mounting	: 96 x96 mm
Operator controls	: Up/down push buttons, scroll button auto/manual button
Ambient 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 22 Awg)
Weight	: 0.6 kg

Controls

Input	
Viscosity	: 4...20 mA
Temperature	: 4...20 mA (optional)
Output	
Contacts	: 2 relays, 2A/250 V (standard)
Control action	: If measured value is higher than setpoint value, the 'raise' output relay is activated to open control valve
Current	: 4...20 mA (optional)
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.

Control valve

For selection of the suitable control valve please consult VAF Instruments B.V.

Starter box

Type	: Switch with thermal overload protection
Housing material	: ABS
Protection class	: IP65
Power supply	: Same as electric motor of Viscotherm sensor
Powerconsumption	: Max. 90 VA
Mounting	: Wall mounting
Ambienttemperature	: Max. 55°C (131°F)
Weight	: 0.4 kilos

Power supply unit

Supply voltage	: 110, 220, 240 VAC +/- 10%, 50/60 Hz
Output voltage, N° 1	: 220 VAC, 50/60 Hz, 20 VA; fused 200 mA
N° 2	: 24 VDC +/- 10%, 2 W, fused 200 mA
Protection class	: IP65
Housing material	: ABS
Ambienttemperature	: Max. 55°C (131°F)
Weight	: 1 kilo

Viscosity recorder (option)

Type	: 144x144 mm strip chart recorder
Supply voltage	: 110, 220 or 240 VAC, 50/60 Hz
Input signal	: 4-20 mA from DPTransmitter
Protection class	: IP54
Chart roll	: Length 15 metres, DIN standard, 120 mm overall width, 100 mm calibrated width; direct reading in viscosity units {specify when ordering}.
Chartspeed	: 6 cms/h
Optional extra	: Free usable adjustable high and low alarm contacts. Contacts do not act on system alarm.
Weight	: 6 kilos

Analog remote viscosity indicator (option)

Type	: Moving coil
Inputsignal	: 4 - 20 mA
Reading units	: 0 -50 cSt, 0-7°E, 0-220 sR1, 0-100%
Accuracyclass	: 1.5% of full scale.
Protection class	: IP40
Materials	
Housing	: Synthetic
Window	: Antistatic treated synthetic
Alarm contacts	: Available as option. Normally opened or normally closed. Contact rating 220 V, 2A
Weight	: 0.4 kilos

Dimensions (mm)

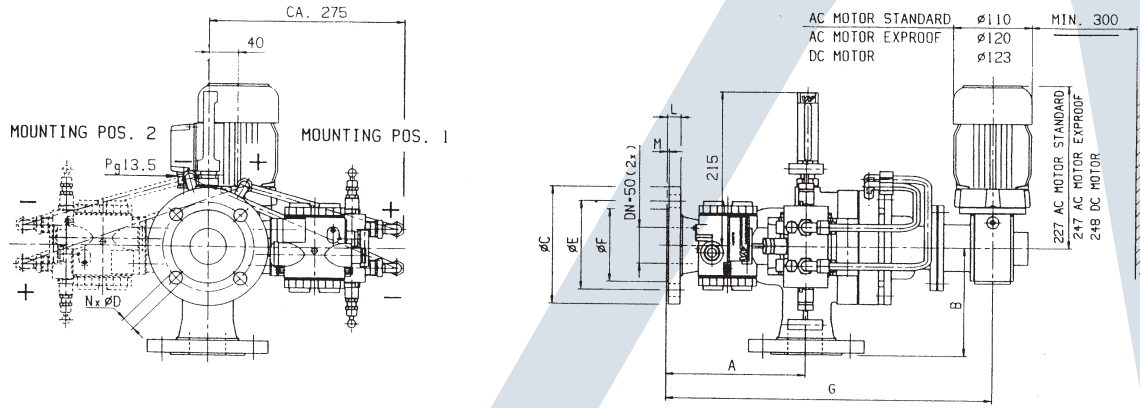


Fig. 6, Viscotherm Sensor/Differential Pressure Transmitter assembly

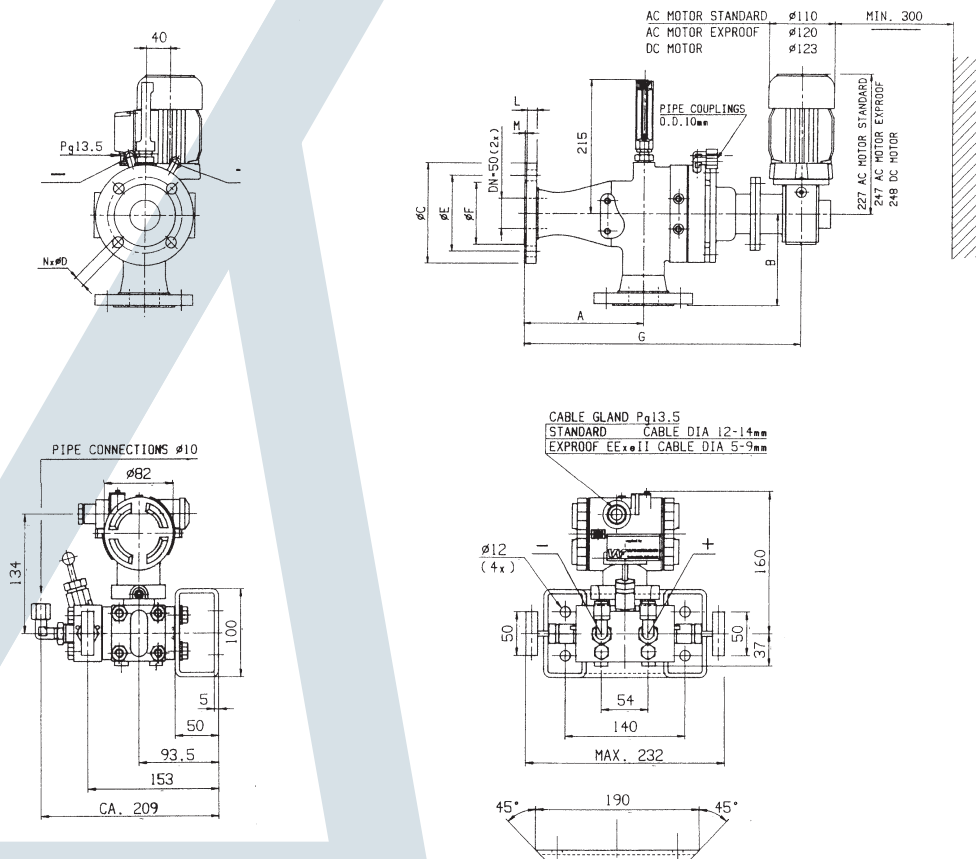
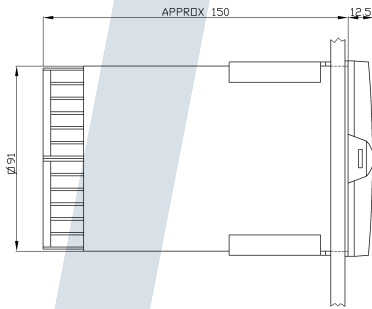
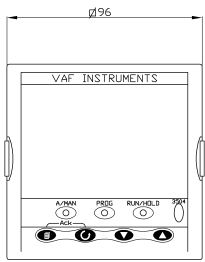
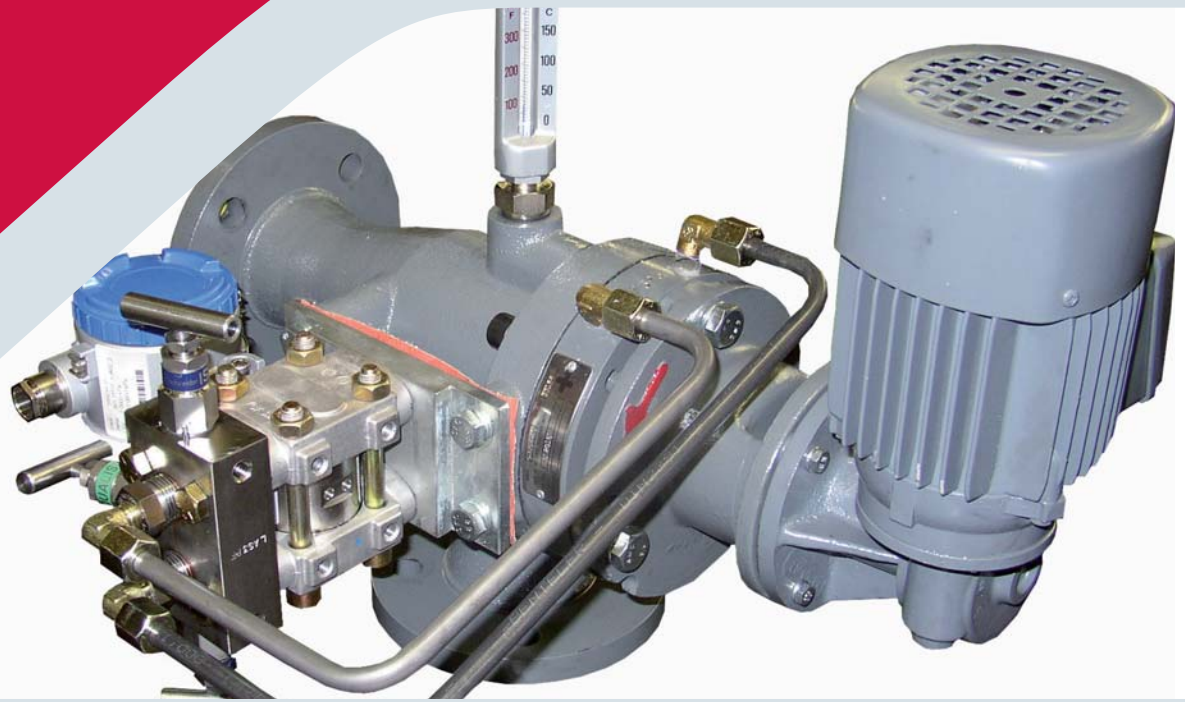


Fig. 7, Separate Viscotherm Sensor and Differential Pressure Transmitter

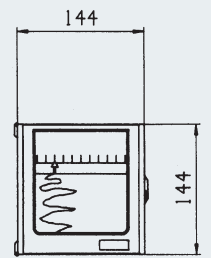
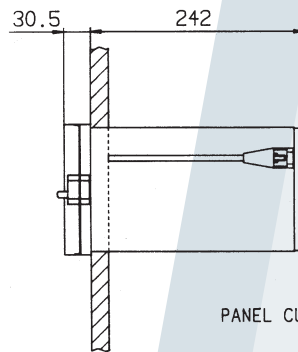
Flange rating	Max. working pressure	A	B	C	Nx0D	E	F	G	L	M
DIN PN 16/25/40	40 bar	200	150	165	4x18	125	102	463	20	3
ANSI 150RF	20 bar	200	150	152	4x19	121	92	463	20	1.6
ANSI 300RF	52 bar	203	150	165	8x19	127	92	466	23	1.6
JIS 10K	10 bar	200	150	155	4x19	120	100	463	16	2
JIS 16/20K	16/20 bar	200	150	155	8x19	120	100	463	16	2
JIS 30K	30 bar	203	153	165	8x19	130	105	466	23	2
DIN PN 64	64 bar	210	160	180	4x22	135	102	473	26	3
DIN PN 100	100 bar	210	160	195	4x26	145	102	473	28	3
DIN PN 100 DIN 2512N	100 bar	210	160	195	4x26	145	102	473	28	3
ANSI 600RF	104 bar	220	170	165	8x19	127	92	483	32	6.5
JIS 10K-65A	10 bar	210	160	175	4x19	140	120	473	20	2
JIS 16/20K-65A	16/20 bar	210	160	175	8x19	140	120	473	20	2

**VAF INSTRUMENTS
TO BE REALLY SURE**



PANEL CUT-OUT $92^{+0.8} \times 92^{+0.8}$

Fig. 8, Viscosity controller



PANEL CUT OUT $138^{+1} \times 138^{+1}$

Fig. 9, Optional viscosity recorder

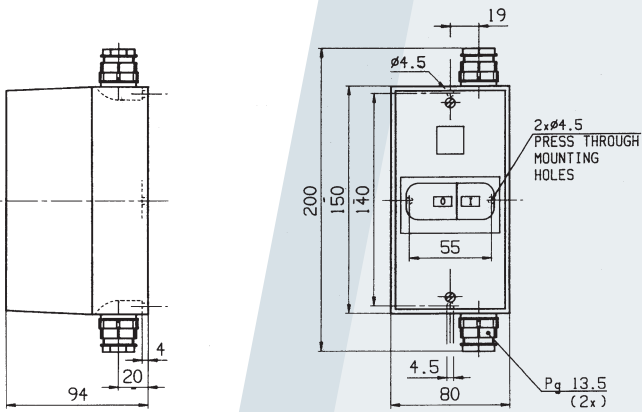
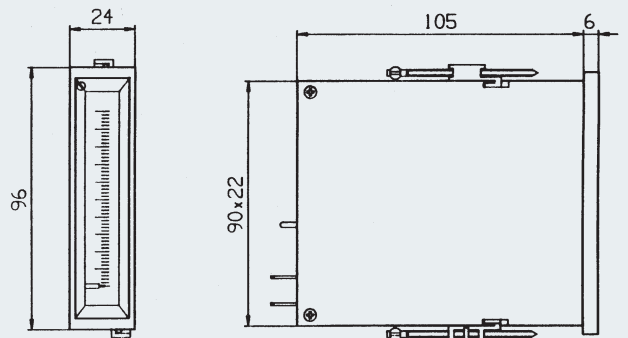


Fig. 10, Starter box



PANEL CUT OUT $90.5^{+0.5} \times 22.2^{+0.3}$

Fig. 11, Optional Analog Viscosity Indicator

Please supply the following data when ordering a Viscotherm® system or asking for a quotation. (tick as required).

1. Basic system designation: Viscotherm® Series V92 Model VC

2. Fuel connections and flange rating

- | | | | |
|--|---|---|---|
| <input type="checkbox"/> DN 50 mm, PN 40 bar | <input type="checkbox"/> DN 50 mm, PN 100 bar | <input type="checkbox"/> 2" ANSI 150 RF | <input type="checkbox"/> 2" ANSI 300 RF |
| <input type="checkbox"/> 2" ANSI 600 RF | <input type="checkbox"/> 2" JIS 1 OK | <input type="checkbox"/> 2" JIS 16K | |

Ordering information

3. Viscosity range

- | | | |
|---|---|---|
| <input type="checkbox"/> 0 -25 mPa's *) | <input type="checkbox"/> 0 -50 mPa's *) | <input type="checkbox"/> 0 - 100 mPa's |
| <input type="checkbox"/> 0 -200 mPa's | <input type="checkbox"/> 0 -500 mPa's | <input type="checkbox"/> 0 -1.000 mPa's |

*) Standard for HFO installations

4. Scale reading of controller and optional analog indicator and recorder

- | | | |
|--------------------------------|--------------------------------------|--------------------------|
| <input type="checkbox"/> mPa's | <input type="checkbox"/> centistokes | <input type="checkbox"/> |
|--------------------------------|--------------------------------------|--------------------------|

5. Electric motor for Viscotherm® sensor

- | | | |
|---|---|---|
| <input type="checkbox"/> 110/190 VAC, 3 ph *) | <input type="checkbox"/> 220/380 VAC, 3 ph *) | <input type="checkbox"/> 240/415VAC, 3 ph *) |
| <input type="checkbox"/> 250/440 VAC, 3 ph *) | <input type="checkbox"/> 277/480 VAC, 3 ph *) | |
| <input type="checkbox"/> 110 VAC, 1 ph | <input type="checkbox"/> 220/240 VAC, 1 ph | <input type="checkbox"/> 110 VDC |
| Frequency of AC motor | <input type="checkbox"/> 50 Hz | <input type="checkbox"/> 60 Hz L |
| Protection class | <input type="checkbox"/> IP55 | <input type="checkbox"/> IP 44 ex.proof (motors marked with *) only |

6. Mounting position of differential pressure transmitter (refer to System Description or figure 6)

- | | | |
|--|--|--|
| <input type="checkbox"/> mounting position 1 | <input type="checkbox"/> mounting position 2 | <input type="checkbox"/> DPT not mounted to sensor |
|--|--|--|

7. Electric control valve

- | | | |
|--------------------|---------------------------------------|---|
| Heating medium | <input type="checkbox"/> steam | <input type="checkbox"/> thermal liquid L |
| Body material | <input type="checkbox"/> ductile iron | <input type="checkbox"/> steel |
| Flange connections | <input type="checkbox"/> DIN | <input type="checkbox"/> ANSI |
| | | <input type="checkbox"/> JIS |

Nominal diameter of available piping: _____

Inlet pressure (bar): _____

Nominal flowrate, (for steam in kg/h, for thermal liquid in cu.m./h): _____

Allowable pressure drop across valve (max. 1 bar): _____

Specific gravity (thermal liquid only, water=1.0): _____

8. Optional extras

- | | Required | Not required |
|--|--------------------------|--------------------------|
| Remote viscosity indicator | <input type="checkbox"/> | <input type="checkbox"/> |
| Remote viscosity indicator with alarm contacts | <input type="checkbox"/> | <input type="checkbox"/> |
| Viscosity recorder | <input type="checkbox"/> | <input type="checkbox"/> |
| Viscosity recorder with alarm contacts | <input type="checkbox"/> | <input type="checkbox"/> |
| Factory calibration certificate | <input type="checkbox"/> | <input type="checkbox"/> |
| Inspection by classification bureau | <input type="checkbox"/> | <input type="checkbox"/> |
| | Inspection by: | |
| Tagging of all system components, paper tags | <input type="checkbox"/> | <input type="checkbox"/> |
| stainless steel tags | <input type="checkbox"/> | <input type="checkbox"/> |



Specifications subject to change without notice. Agents and distributors in more than 50 countries

Represented by:

H. HERMANN EHLERS GMBH

**Fördern - Messen - Regeln - Dosieren - Verdichten
Ingenieurbüro - Werksvertretungen**

