

P R O D U C T B U L L E T I N

760

Series V12 Pneumatic System

Quality

VAF Instruments demonstrates its trust in its products by giving a standard two year guarantee. This longest and most comprehensive guarantee in the maritime industry is our commitment to our clients and reflects the constant quality of our products.

Registered trade marks:

1. Viscotherm®
2. ViscoSense®
(Latest generation)

Introduction

Series V12 Pneumatic Viscotherm® is an in-line automatic control System for the viscosity of heavy fuel oil for use with steam or thermal oil operated fuel heaters.

System components

- Viscotherm® sensor
- pneumatic differential pressure transmitter
- pneumatic viscosity control station
- pneumatic control valve
- airfilter-regulator

As optional extras can be supplied:

- viscosity recorder
- remote analog viscosity indicator
- alarm pressure switch
- starter box or on/off switch for electric motor of sensor

If no automatic control but only viscosity indication is needed, a system can be offered consisting of Viscotherm® sensor, differential pressure transmitter, remote analog viscosity indicator and airfilter-regulator.

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.

Reliability

With nearly 50 years of experience and over 40.000 systems sold, VAF Instruments B.V. is the world wide market leader for in-line viscosity measurement and control systems. The rugged design of the VAF Viscotherm® has proven to be a reliable system in the demanding environment on board ships and in power plants.

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 diesel engines on heavy or intermediate fuel oils.

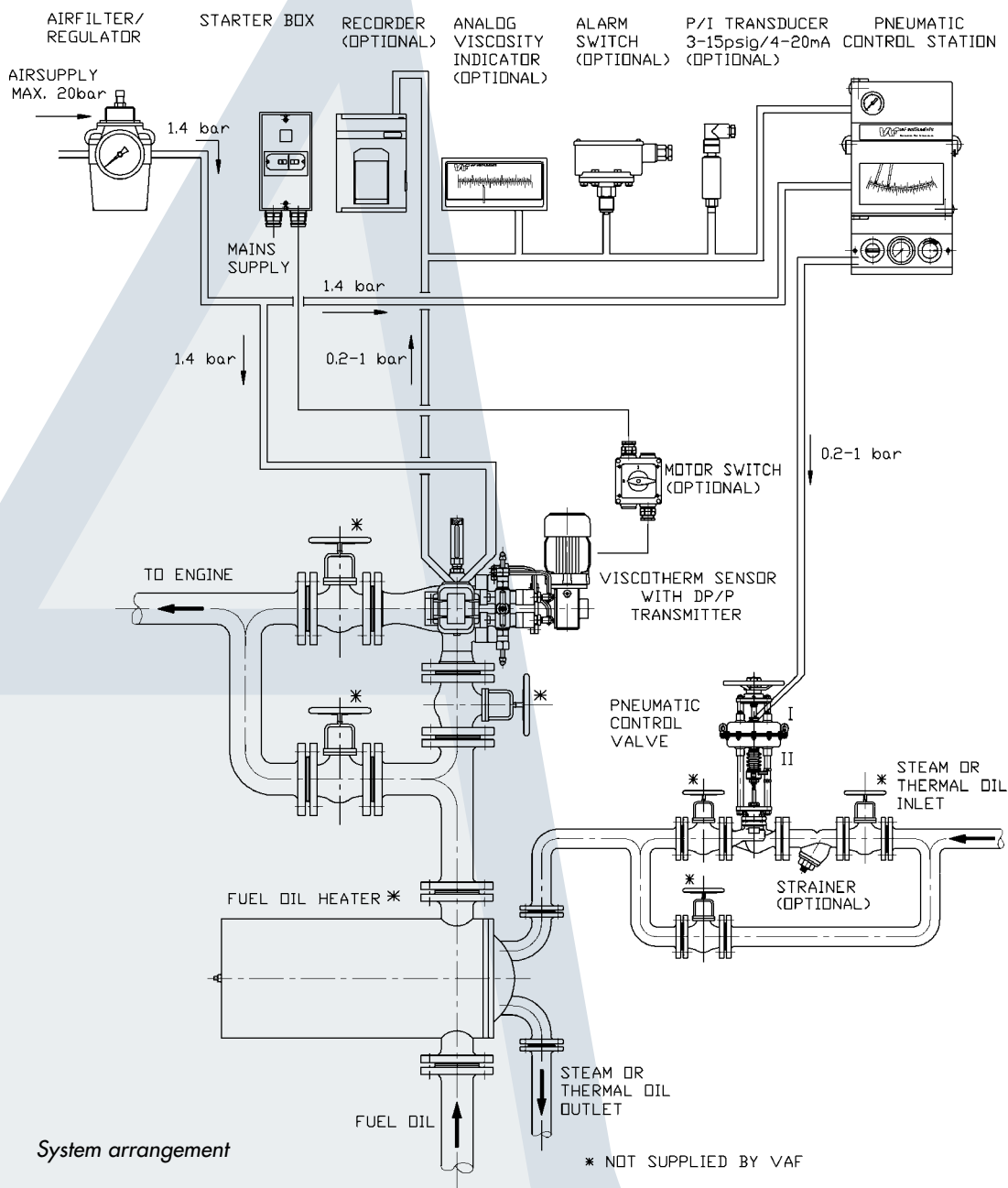
User benefits

- Optimizes burning efficiency and fuel consumption.
- Reduces engine maintenance/overhaul costs.
- Provides better emission control to minimize air pollution.

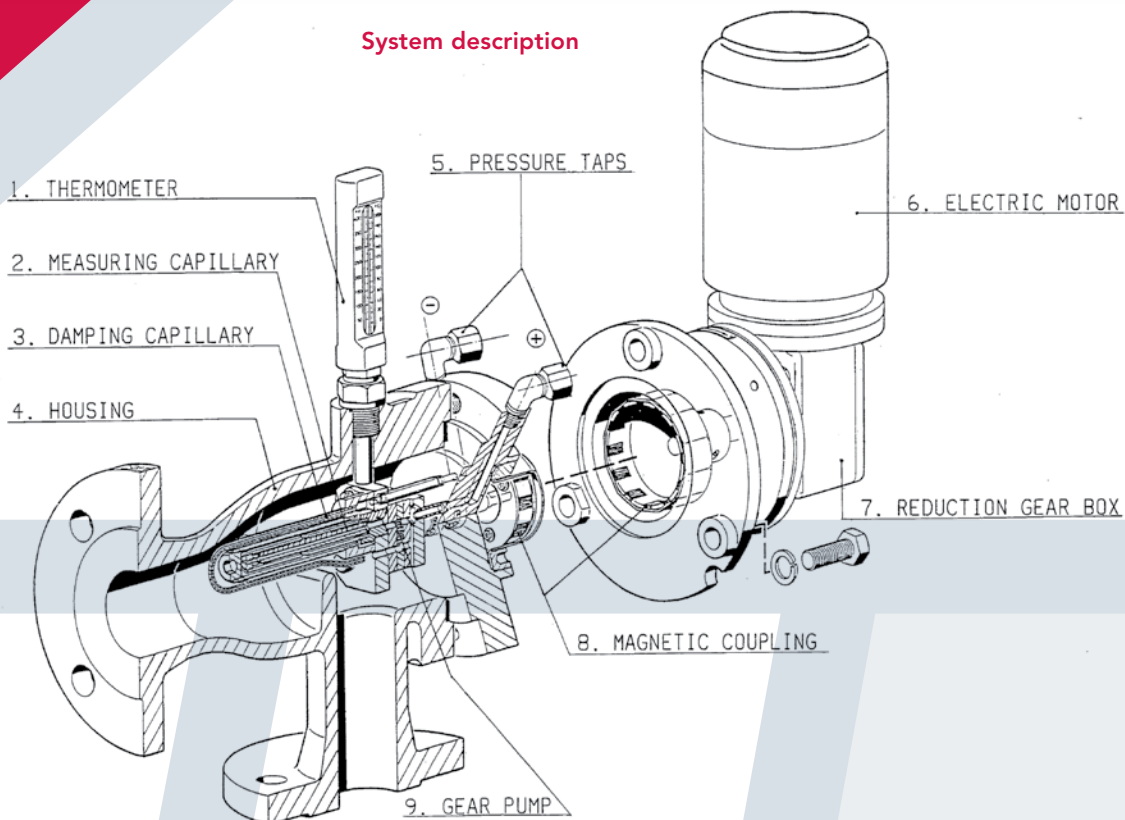
Features

- Viscotherm® is constructed to 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.
- Special stainless steel capillary reduces possibility of clogging.
- Type approval certificates from all major classification authorities.
- Service facilities in principal harbours, industrial and shipbuilding areas of the world.
- Ex version available.

System arrangement



System description



Exploded view of Viscotherm® sensor

Sensor

The Viscotherm® 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. As the flow through the capillaries is also laminar, the pressure differential across the capillaries is directly proportional to the viscosity of the fuel oil.

The capillary tube assembly consists of a measuring capillary (2) in a resilient stainless steel housing and a stainless steel damping capillary (3) to compensate for undue pressure waves in the fuel lines. A thermometer (1) indicates the actual fuel temperature.

Two pressure taps (5) are provided to connect the differential pressure developed across the capillaries to the differential pressure transmitter. A magnetic coupling (8) between the electric motor and the gear pump provides a leak free power transmission and prevents overload of the electric motor in the event of an obstructed pump.

Differential pressure transmitter

The pneumatic differential pressure transmitter (DPT) converts the differential pressure measured across the capillary assembly into a proportional 0.2-1.0 bar (3-15 psi) signal.

The DPT can be supplied in three basic configurations:

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

The configuration can be adapted to the requirements of the customer.

Viscosity control station and control valve

The viscosity control station receives the 0.2-1.0 bar (3-15 psi) signal from the differential pressure transmitter and compares this signal with the desired (setpoint) viscosity value. Any deviation between the actual viscosity and the desired viscosity results in a corrective air signal to the control valve, to control the amount of steam or thermal oil to the fuel heater.

Airfilter-regulator

The airfilter-regulator provides regulated air supply to the differential pressure transmitter, the control station and the (optional) analog viscosity indicator.



Viscosity control station

Options

Viscosity recorder

For registration of the viscosity of the fuel oil a recorder can be ordered as optional extra. The input of the recorder is the 0.2-1.0 bar signal from the differential pressure transmitter.

Analog viscosity indicator

The remote indicator is used to provide viscosity indication in the control room or on the bridge.

Alarm pressure switch

The non-indicating pressure switch is pneumatically connected to the viscosity control signal from the differential pressure transmitter and has two micro-switches to signalize low and high viscosity levels via the ship's alarm system.

Starter box and motor switch

Starter box and motor switch are used for on-off control of the electric motor of the Viscotherm® sensor. The motor switch is a simple on-off switch for installation close to the sensor. The starter box is equipped with a thermal relay for protection of the electric motor.

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") PN 40 bar is standard. DIN PN 100, ANSI and JIS flanges available as option. See "Ordering Information".
Materials	
Housing	: Ductile iron
Inner parts	: Stainless steel
Temperature	
Fuel oil	: Max. 180°C. Max. 200°C if dP Transmitter is installed separate from sensor.
Ambient	: Max. 60°C
Fuel flow rate	: Max. 35 m ³ /h
Response time	: Max. 1 minute
Accuracy	: Better than +/- 2% (if frequency of supply power is a constant 50 or 60 Hz).
Electric motor	
Supply voltage	: See "Ordering Information".
Insulation class	: Class F. Tropical insulation acc. Lloyds Register of Shipping.
Protection class	: IP 55; EExe-proof motor IP55 (option).
Power consumption	: 50 VA (not ex-proof AC motors), 120 VA (110/190 VAC, 3 ph ex-proof), 90 VA (220...480 VAC, ex-proof motors; DC motors).
Weight	: 32 kilos, incl. dP Transmitter.



Differential pressure transmitter

Sensor/transmitter assembly

Input	: 0-0.5 bar
Output	: 0.2-1.0 bar (3-15 psi)
Air supply	: 1.4 bar (20 psi), regulated
Air consumption	: 14.5 NI/min
Ambient temperature	: -40 to 120°C
Materials	
Housing, manifold	: Cadmium plated carbon steel
Diaphragm	: Stainless steel 316 Ti (W. Nr. 1.4571)
Filling liquid	: Glycerin
Temperature influence	: < 0.05% per °C
Max. static pressure	: 10 MPa (100 bar; 1.500 psi)
Single-sided overload pressure protection	: 10 MPa (100 bar; 1.500 psi)
Manifold block	: 2 isolating valves, 1 equalising valve
Weight, incl. manifold	: 14 kilos

Viscosity control station

Measuring element	: Metal bellows
Input and output air signal	: 20-100 kPa (0.2-1.0 bar; 3-15 psi)
Supply air pressure	: 140 kPa (1.4 bar; 20 psi)
Input air connection	: 1 /4" NPT female
Process connections	: 6 mm pipe couplings
Static air consumption	: 3 NI/min
Control mode	: PI (proportional + reset), automatic or manual operation
Control action	: Reverse (standard) or direct
Proportional band	: 2-200% (factory adjusted to 35 %)
Reset time	: 0.03 - 5 minutes (factory adjusted to 5 minutes)
Control accuracy	: 1% of full scale
Standard viscosity scales	: 0-25 mPa.s/0-110 sR1, 0-25 mPa.s/0-25 cSt, 0-25 mPa.s/0-3.5°Engler, 0-50 mPa.s/0-220 sR1, 0-25 mPa.s/0-50 cSt, 0-50 mPa.s/0-7°Engler, 0-100%
Max. static working pressure	: 100 kPa (1 bar; 15 psi)
Pneumatic relay	: Non-bleed type
Materials measuring element	: Bronze and brass
Encasing	: Die-cast aluminium
Protection class	: IP65, tropically resistant
Mounting	: Wall or flush panel
Ambient temperature	: -40 to 100°C
Weight	: 3.5 kilos



Control valve

Refer to ordering information (point 7) on the back of this product bulletin.

Airfilter-regulator

Supplied with wall mounting bracket and output pressure gauge.	
Input	: Max. 20 bar (300 psi)
Regulated output	: 0-2.5 bar (0-35 psi)
Air output capacity	: Max. 34 Nm ³ /h
Materials	
Housing	: Die-cast aluminium
Diaphragm	: Nylon reinforced Buna-N
Filter element	: Sintered stainless steel
Filter mesh width	: 0.005 mm
Ambient temperature	: -50 to 65°C
Weight	: 0.58 kilos



Viscosity recorder (option)

Type	: 1-pen strip-chart recorder
Mounting	: Wall or panel
Measuring element	: Tombak bellows
Input air signal	: 0.2-1.0 bar (3-15 psi)
Encasing material	: Die-cast aluminium with blue enamel finish; spray and dustproof to IP55
Chart drive	: 7-day spring-wound or electric clock for 24 V-50 Hz supply (110 or 220 VAC on request)
Recording paper	
Reading units	: 0-100% = 0...mPa.s, 0-220 sec. Redw. 1, 0-7°E, 0-50 cSt
Paper width	: 120 mm wide strip chart (100 mm effective recording width)
Recording speed	: 20 mm/h, giving 6 hours visible recording
Recording capacity	: 1 month per chart roll
Ambient temperature	: -15 to 65°C
Weight	: 8 kilos

Analog viscosity indicator (option)

Type	: Edge scale manometer
Mounting	: Flush panel
Measuring element	: Bourdon tube
Input air signal	: 0.2-1.0 bar (3-15 psi)
Materials	
Measuring element	: CuSn
Encasing	: Steel
Reading units	: Same as control station. See "Ordering Information".
Accuracy class	: 1% F.S.
Protection class	: IP55
Contact rating	: 50 VDC/2A; 250 VAC/3A
Weight	: 1.2 kilos



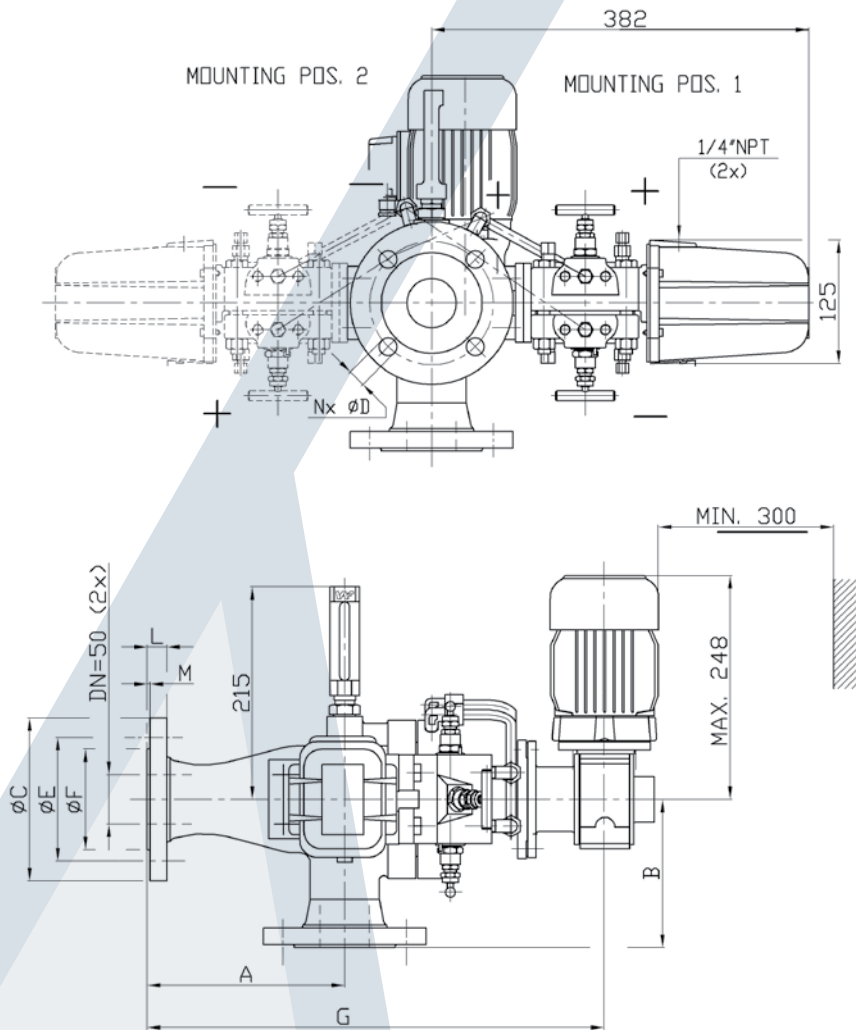
Alarm pressure switch (option)

Max. pressure	: 15 psi (1 bar)
Range of adjustment	: 0.2-1.0 bar (3-15 psi)
Housing	: Zinc diecasting
Pressure connection	: Brass
Cover	: Steel
Gasket	: Neoprene
Diaphragm	: Beryllium copper
Net weight	: 0,9 kg
Electric rating	: Max. 5A at 250V

Starter box and motor switch (option)

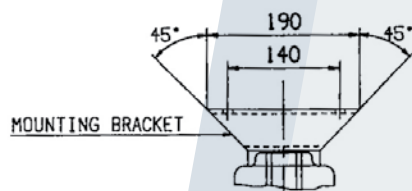
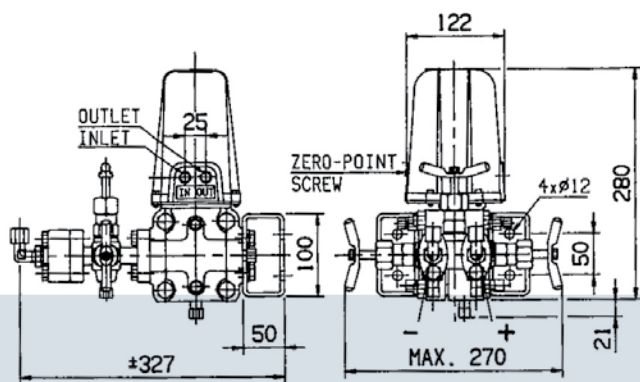
Type	: On-off switch for electric motor of Viscotherm® sensor
Mounting	: Wall or post
Protection class	: IP65
Operating voltage	: Same as electric motor of sensor
Ambient temperature	: Max. 55°C
Starter box only:	
Motor protection	: Thermal relay
Switching current	: 0.40 - 0.63 A (220V..480 VAC, 3 ph)
	: 0.63 - 1.0 A (220/240...480 VAC, 3ph)
	: 1.60 - 2.50 A (110 VAC, 1 ph)
Weight	: 0.4 kilos



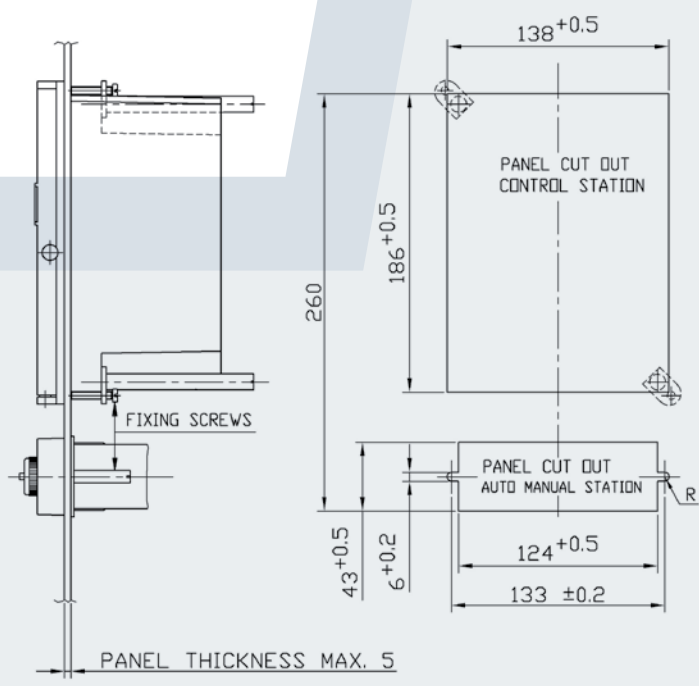
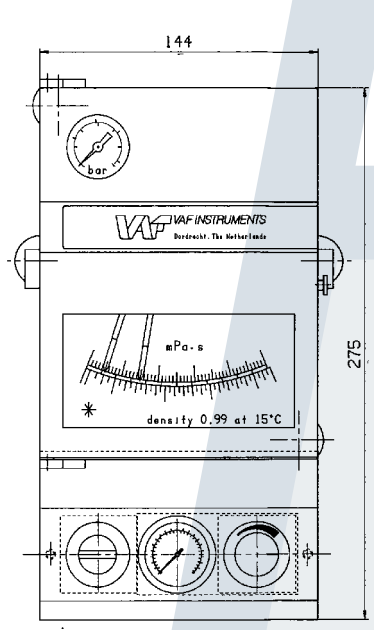


Flange rating	Max. working pressure	A	B	C	Nx0D	E	F	G	L	M
DIN PN 16/25/40	16/25/40 bar	200	150	165	4x18	125	102	463	20	3
DIN PN 100	100 bar	210	160	195	4x26	145	102	473	28	3
ANSI 150RF	20 bar	200	150	152	4x19	121	92	463	20	1.6
ANSI 300RF	52 bar	203	150	165	8x19	127	92	466	23	1.6
ANSI 600RF	104 bar	220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

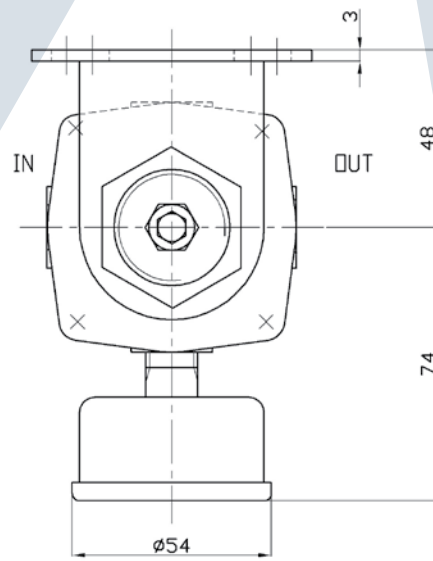
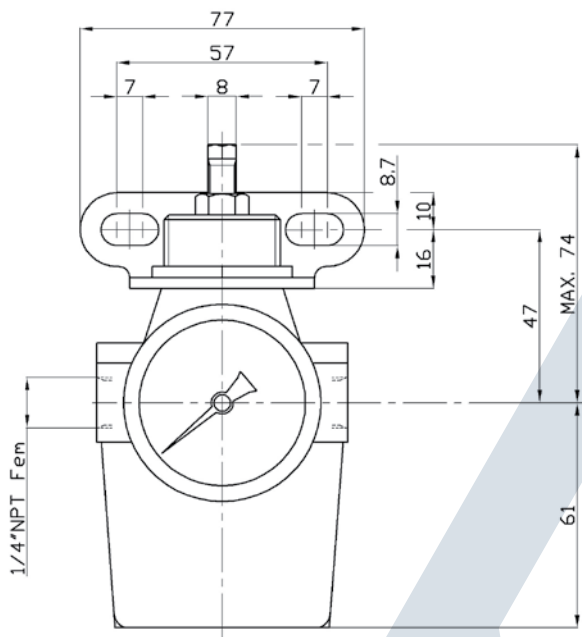
Viscotherm® Sensor and Differential Pressure Transmitter Assembly



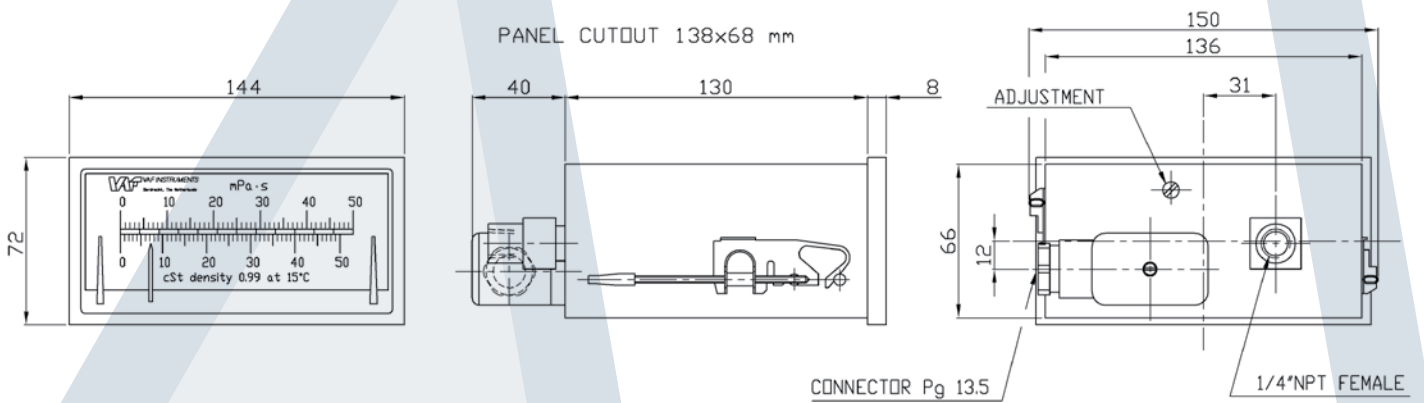
Separate differential pressure transmitter



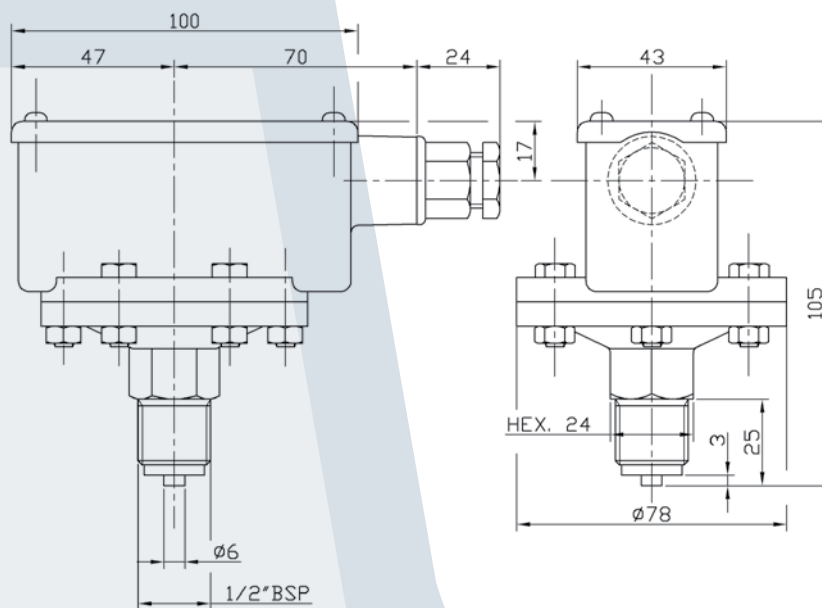
Viscosity control station



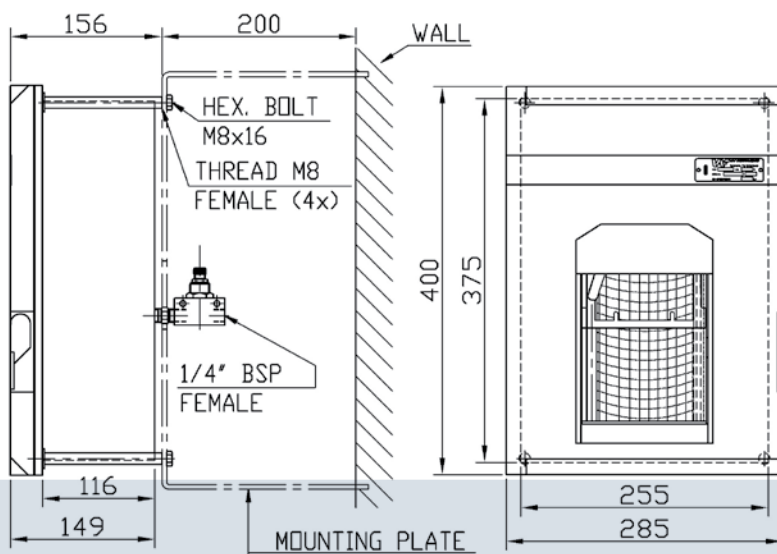
Airfilter-regulator



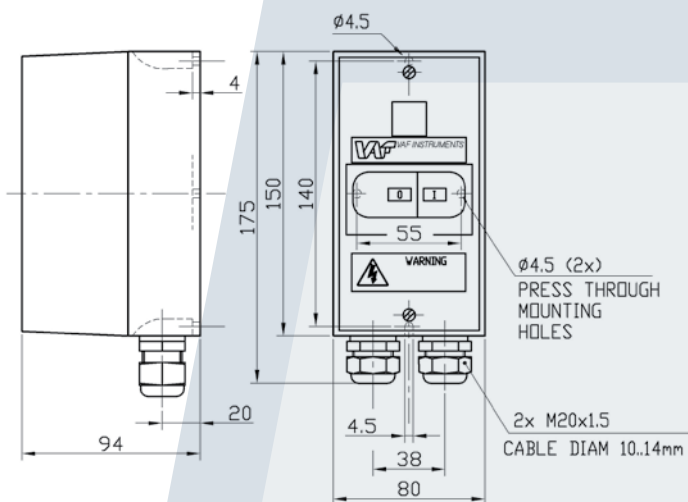
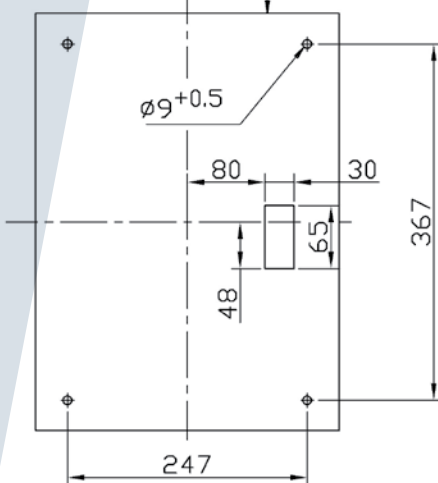
Analog viscosity indicator



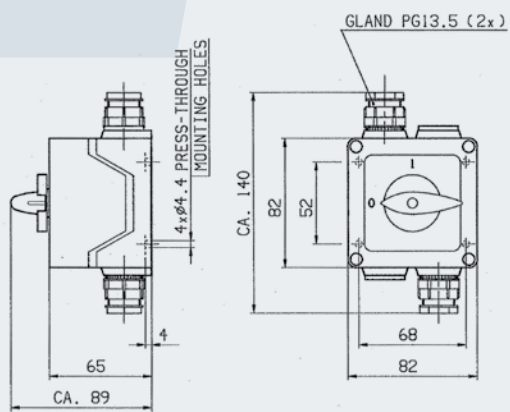
Alarm pressure switch



Recorder



Starter-box



Motor-switch

Ordering information

Please supply following data when ordering a Viscotherm® system, or when asking for a quotation:
 - (Tick as required).

1. Basic system designation: Series V12 Pneumatic Viscotherm® System.

Variants:

- Automatic control system (complete all sections on this page).
- Viscosity indication only (complete all sections, except 7).

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 600 RF |
| <input type="checkbox"/> 2" ANSI 150 RF | <input type="checkbox"/> 2" ANSI 300 RF | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> 2" JIS 10K | <input type="checkbox"/> 2" JIS 16K | |

3. Viscosity range

- | | | |
|---------------------------------------|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> 0-25 mPa.s*) | <input type="checkbox"/> 0-100 mPa.s | <input type="checkbox"/> 0-500 mPa.s |
| <input type="checkbox"/> 0-50 mPa.s*) | <input type="checkbox"/> 0-200 mPa.s | <input type="checkbox"/> 0-1000 mPa.s |
- *) Standard for HFO installations

4. Scale reading of control station, optional analog indicator and recorder

- | | | | |
|---|--|---|---------------------------------|
| <input type="checkbox"/> 0-50 mPa.s/0-220 sR1 | <input type="checkbox"/> 0-50 mPa.s/0-50 cSt | <input type="checkbox"/> 0-50 mPa.s/0-7° Engler | <input type="checkbox"/> 0-100% |
| <input type="checkbox"/> 0-25 mPa.s/0-110 sR1 | <input type="checkbox"/> 0-25 mPa.s/0-25 cSt | <input type="checkbox"/> 0-25 mPa.s/0-3.5° Engler | |

5. Electric motor for Viscotherm® sensor

- | | | |
|---|--|----------------------------------|
| <input type="checkbox"/> 220...480 VAC, 50/60 Hz, 3 ph | <input type="checkbox"/> 220/240 VAC, 50/60 Hz, 1 ph | <input type="checkbox"/> 110 VDC |
| <input type="checkbox"/> 110/190 VAC, 50/60 Hz, 3 ph | <input type="checkbox"/> 110 VAC, 50/60 Hz, 1 ph | <input type="checkbox"/> 220 VDC |
| <input type="checkbox"/> 220 ...480 VAC, 50/60 Hz, 3 ph, EExe II T3 | <input type="checkbox"/> 110/190 VAC, 50/60 Hz, 3 ph, EExe II T3 | |

6. Mounting position of differential pressure transmitter (refer to system description or dimensional drawing of sensor)

- Mounting position 1 Mounting position 2 DPT not mounted to sensor

7. Pneumatic control valve

- | | | | |
|--------------------|-----------------------------------|---------------------------------------|------------------------------|
| Heating medium | <input type="checkbox"/> Steam | <input type="checkbox"/> Thermal oil | |
| Flange type | <input type="checkbox"/> DIN | <input type="checkbox"/> ANSI | <input type="checkbox"/> JIS |
| Optional handwheel | <input type="checkbox"/> Required | <input type="checkbox"/> Not required | |

Nominal diameter of available piping: _____

Nominal flowrate (for steam in kg/h, for thermal oil in m³/h): _____

Inlet pressure (bar): _____

Allowable pressure drop across valve _____

(max.1 bar): _____

Specific gravity of thermal oil (water = 1.0): _____

8. Optional extras

- | | | |
|---|--|--|
| <input type="checkbox"/> Remote analog viscosity indicator | <input type="checkbox"/> With alarm contacts | <input type="checkbox"/> Without alarm contacts |
| <input type="checkbox"/> Recorder | <input type="checkbox"/> Spring drive | <input type="checkbox"/> Electric drive, _____ Volts _____ (AC/DC) |
| <input type="checkbox"/> Alarm pressure switch | | |
| <input type="checkbox"/> Starter box for electric motor | | |
| <input type="checkbox"/> Motor switch | | |
| <input type="checkbox"/> Calibration graph showing differential pressure versus viscosity | | |
| <input type="checkbox"/> Tagging | <input type="checkbox"/> paper tags | <input type="checkbox"/> stn. stl. tags |
| <input type="checkbox"/> Inspection by Classification Authority (specify name): _____ | | |

9. Name: _____ Place and date: _____



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

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