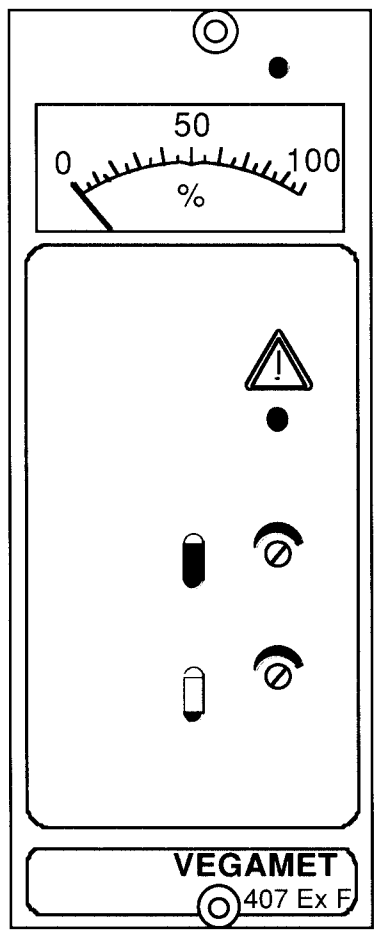
VEGAMET 407 EX F
VEGAMET 407 EX F(T)

TIB • Technical Information • Operating Instructions

Signal conditioning instrument

300
400
500
800



For continuous level measurements in hazardous areas (zone 0)

- approved as overfill protection acc. to WHG / VbF
- for connection of a capacitive electrode
- or a pressure sensor

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VEGA

Application

The signal conditioning instrument VEGAMET 407 Ex F or 407 Ex F(T) is used for level proportional indication (continuous level measurement).

The instruments in conjunction with suitable electrodes or pressure sensors are approved for continuous level measurement in hazardous areas (zone 0) and as overfill protection acc. to WHG or VbF.

Note!
For applications acc. to WHG or VbF or use in zone 0 the accompanying documents (test certificates, conformity or BVS-certificates) must be noted.

Configuration

The VEGAMET 407 Ex F or 407 Ex F(T) consists of:

- Plastic housing with plug-in socket (series 400)
- Electronics
- Relay output with floating changeover contact (fault signal)
- Front cover with:
  - mains control lamp
  - indicating instrument
  - signal lamp
  - potentiometer for full adjustment
  - potentiometer for empty adjustment
  - switch for current output 0/4 ... 20 mA (VEGAMET 407 Ex F has this switch on the back)

A measuring system consists of:

- Signal conditioning instrument VEGAMET 407 Ex F or 407 Ex F(T)
- Capacitive electrode with oscillator or pressure sensor with oscillator

Additional indicating instruments and auxiliary level switches can be connected to the current and voltage outputs.

Function

Level measurement with capacitive electrodes

a) **non-conductive products**
Electrode and container wall form a capacitor. The level changes the dielectric of the capacitor and therefore its capacitance.

b) **conductive products**
The fully insulated electrode and product form a capacitor. The level changes the size of the capacitor and therefore its capacitance.

In both cases a level proportional measuring current is generated in the oscillator from the capacitance change.

Fault monitoring

The integral fault monitoring detects short-circuit or line break of the measuring line as well as failures of the electronics in the transducer.

In case of failure the signal lamp lights and the output relay de-energises.

In addition more the output current increases to approx. 22 ... 24 mA and the voltage outputs take a value > 5 V.

Current output

VEGAMET 407 **Ex F**
The current output of VEGAMET 407 Ex F is non-floating with reference to the sensor input and voltage output, however is floating with reference to the mains connection.

VEGAMET 407 **Ex F(T)**
The current output of VEGAMET 407 Ex F(T) is floating.

Level measurement with pressure sensors

The diaphragm of the pressure sensor converts the hydrostatic pressure of the product into a linear movement. From the movement the sensor's capacitance is changed.

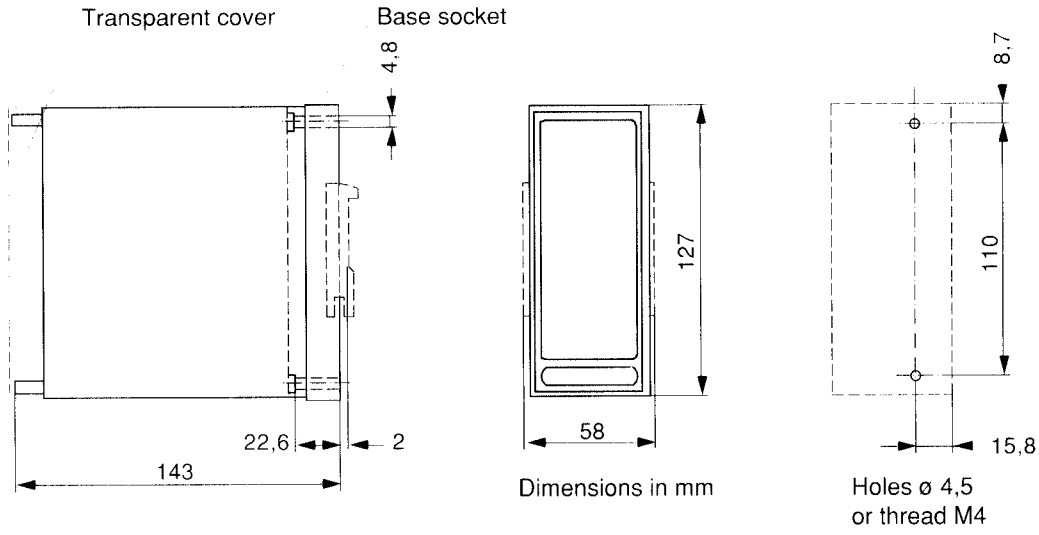
In the associated oscillator a level proportional current is generated from the capacitance change.

The VEGAMET 407 Ex F or 407 Ex F(T) evaluates this measuring current (see page 3)

Technical data

		Value	Tolerance	Frequency
Power supply				
	Standard	AC 220 V	+10 %, –15 %	50 / 60 Hz
		AC 230 V	+5 %, –10 %	
	Options	AC 110 V	+10 %	50 / 60 Hz
		130 V	–15 %	
		240 V		
		AC 24 V	+10 %	50 / 60 Hz
		42 V	–15 %	
Power consumption at U_N:		approx. 7 VA		
Electrode / pressure sensor line:	2-wire resistance per conductor	max. 45 Ohm		
Supply / signal current circuit for oscillator in flame proofing "intrinsically safety"		EEx ia II C		
Max. permissible outer capacitance		82 nF		
Max. permissible outer inductance		1 mH		
Oscillator				
Type 117 Ex	in flame proofing	EEx ia IIC T 6		
Type 117/4 A Ex	in flame proofing	EEx ia IIC T 4		
Type 127 Ex	in flame proofing	EEx ia IIB T 4		
Type 127 Ex B	in flame proofing	EEx ia IIB T 4		
Indication		Analog indication 0 ... 100 %		
Output 1	type	Current output		
	range	0 ... 20 mA or 4 ... 20 mA		
	load	max. 400 Ohm		
	floating	VEGAMET 407 Ex F(T)		
	Flame proofing (not for 407 Ex F(T)	EEx ib IIC		
	max. permissible outer capacitance	380 nF		
	max. permissible outer inductance	2 mH		
Output 2	type	Voltage output		
	range	0 ... -5 V		
	inner resistance	Ri = 1,2 kΩ		
	Flame proofing	EEx ib IIC		
	max. permissible outer capacitance	6,4 nF		
	max. permissible outer inductance	76 mH		
Output 3	type	Relay output		
	function	Fault signal		
	contact	1 spdt		
	relay data:			
	contact material	AgCdO	AgCdO and Au plated	
	min. turn-on voltage	12 V	10 mV	
	min. switching current	0,4 A	10 µA	
	max. turn-on voltage	AC 250 V, DC 60 V		
	max. switching current	AC 4 A, DC 4 A (up to 24 V DC)		
		DC 0,6 A (up to 60 V DC)		
	max. breaking capacitance	125 VA, 96 W		
Permissible ambient temperature on the housing		–20 ... +50°C / –4 ... 122°F		
Storage and transport temperature		–20 ... +70°C / –4 ... 158°F		
Housing	type	Plastic ABS light grey		
	protection	IP 40		
	dimensions	B = 53 mm, T = 143 mm, H = 127 mm		
Terminal size		for max. 1 x 1,5 mm²		
Weight (incl. base)		approx. 710 g		

Dimensional drawing



Dimensions in mm

Holes ø 4,5
or thread M4

Mounting

The base socket is equipped as a standard feature with

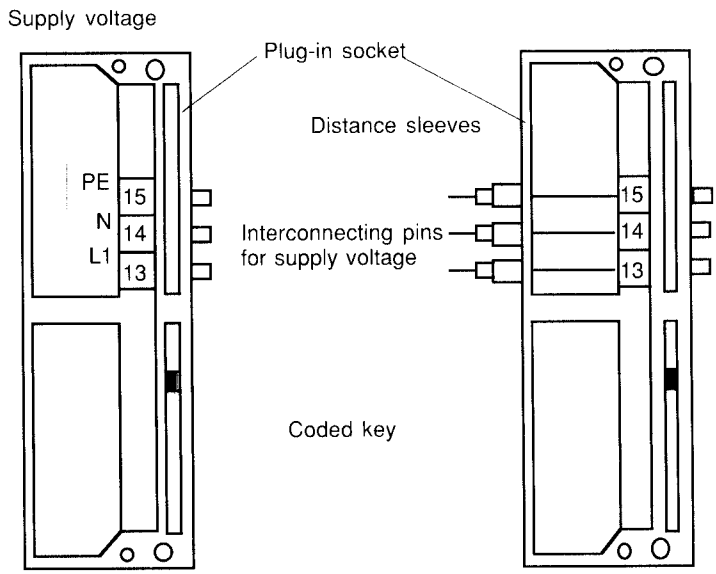
- field terminals
- interconnection pins
- spacers for installation of several instruments in a row
- coded key

When installed in a row the interconnection pins provide power and the spacers the distance of 5 mm between the instruments.

For mounting on standard rail (TS 35 mm) an adapter is attached to the instrument. The two screws located on the front are used to fasten the instrument on the plug-in socket.

For single mounting remove the interconnecting pins and connect the supply voltage directly. The coded key prevents other series 400 instruments being fitted.

Remove all interconnecting pins on the first base socket.



Beware:
The pins on terminals 13, 14 and 15 carry supply voltage.

Electrical connection

The electrical connections should be made on the mounting assembly in accordance with the diagram located on the back of the instrument.
The wiring (measuring line between VEGAMET and electrodes or pressure sensor) must be carried out acc. to the respective DIN VDE-regulations.

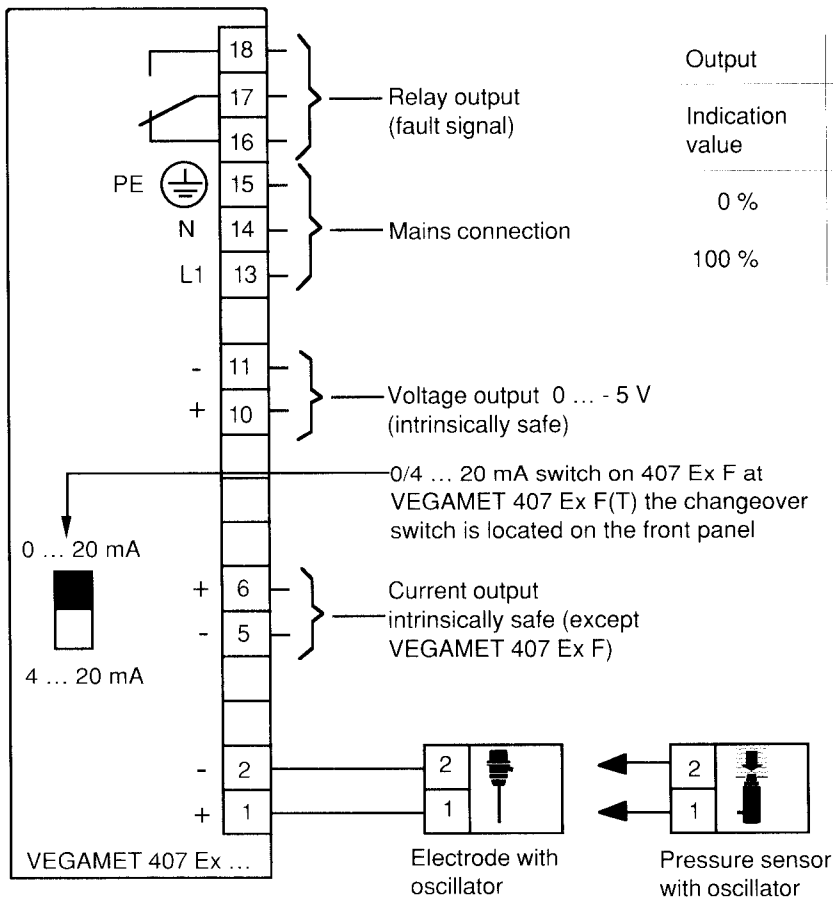
In particular VDE 0165 must be followed, e.g. the cables between transducer and signal conditioning instrument (intrinsically safe circuit) must be identified along the entire length. If covers or coatings are coloured, the colour must be light-blue.

In contrary to VEGAMET 407 Ex F non-approved instruments can be connected to the output 0/4 ... 20 mA of VEGAMET 407 Ex F(T).

Then a special wiring within the base socket is needed:
The **intrinsically** safe circuit is provided by interconnecting pins at 10 and 11 to the base socket (voltage output) or connected by the lateral opening on terminals 10 and 11. Lines for the **non-intrinsically** safe indication circuit (current output) are fed through the upper openings and over the two partitions to terminals 5 and 6.

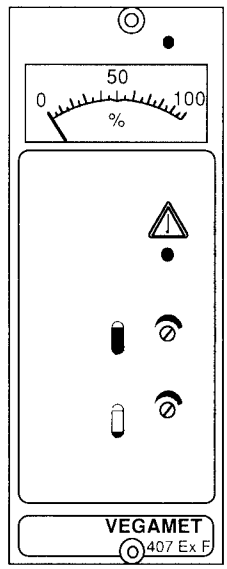
Protective measures:
If there is a danger of voltage spikes overvoltage arresters are recommended.
Note TIB "Overvoltage arresters" for connection.

The overvoltage arrester B 62 - 27 Ex 0 is recommended acc. to TRbF 100 for intrinsically safe circuits which lead e.g. into control systems in over or underground vessels (see page 7).



Output	1	2
Indication value	Current output	Voltage output
0 %	0/4 mA	0 V
100 %	+ 20 mA	– 5 V

- Switch on the mains supply, which **should comply with the voltage stated on the connection diagram.**
- Adjust changeover switch on the back of the instrument or on the front plate to the desired current output range 0 ... 20 mA or 4 ... 20 mA.
- Carry out adjustment as follows.



Screw

Mains control lamp

Indicating instrument

Signal lamp

Potentiometer for full adjustment

Potentiometer for empty adjustment

Screw

Adjustment

The full or empty adjustment is carried out by a spindle potentiometer. Overwinding is avoided by the slide clutch. Independent of the type of adjustment, the potentiometer for full adjustment must be turned clockwise by 22 turns at first. In practice three different methods are possible for empty / full adjustment:

a) Level in the vessel can be filled to the required min. level (= 0 %) and max. level (= 100 %)

Empty adjustment
- Reduce product to required min. level.
- Adjust with potentiometer for empty adjustment the indication of the instrument to 0 %.

Full adjustment
- Increase product to required max. level.
- Adjust with potentiometer for full adjustment the indication of the instrument to 100 %.

b) Level in the vessel can be filled to the required min. level (= 0 %) but only to a max. level < 100 %

Empty adjustment
- Reduce product to required min. level.
- Adjust with potentiometer for emtpy adjustment the indication of the instrument to 0 %.

Full adjustment
- Increase product to required max. level.
- Increase product to max. possible level and dip-check (e.g. 80 %).
- Adjust with the potentiometer for full adjustment the indication of the instrument to the checked value (in the example 80 %).

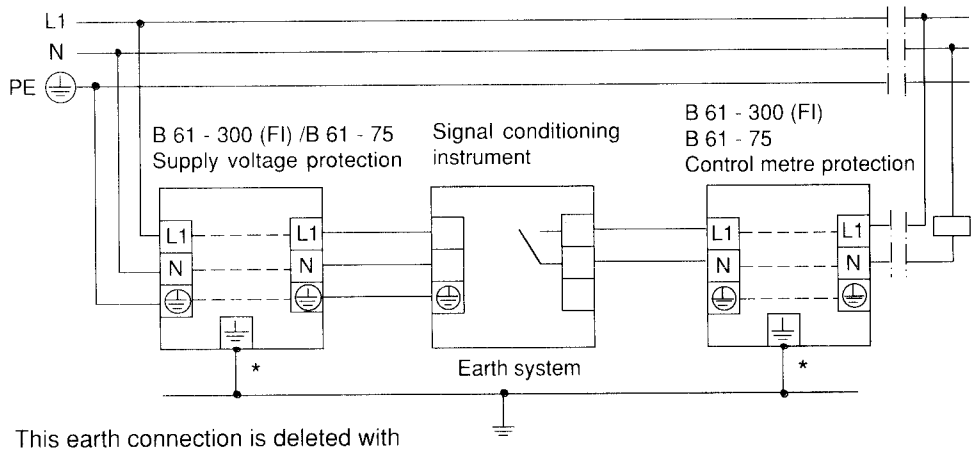
c) Level in the vessel can only be reduced to a min. level > 0 % and to a max. level ≤ 100 %

Empty adjustment
- Reduce product to min. possible level and dip-check (e.g. 20 %).
- Adjust with the potentiometer for empty adjustment the indication of the instrument to the checked value (e.g. 20 %).

Full adjustment
- Increase level to max. possible level and dip-check (e.g. 60 %).
- Calculate indication value to be adjusted: Max. level minus min. level = indicating value to be adjusted.
  In the example: 60 % - 20 % = 40 %
- Set with the potentiometer for full adjustment the indication of the instrument to the calculated value (in the example 40 %).
- Set with the potentiometer for empty adjustment the indication of the instrument to the actual level (max. level in the example 60 %).

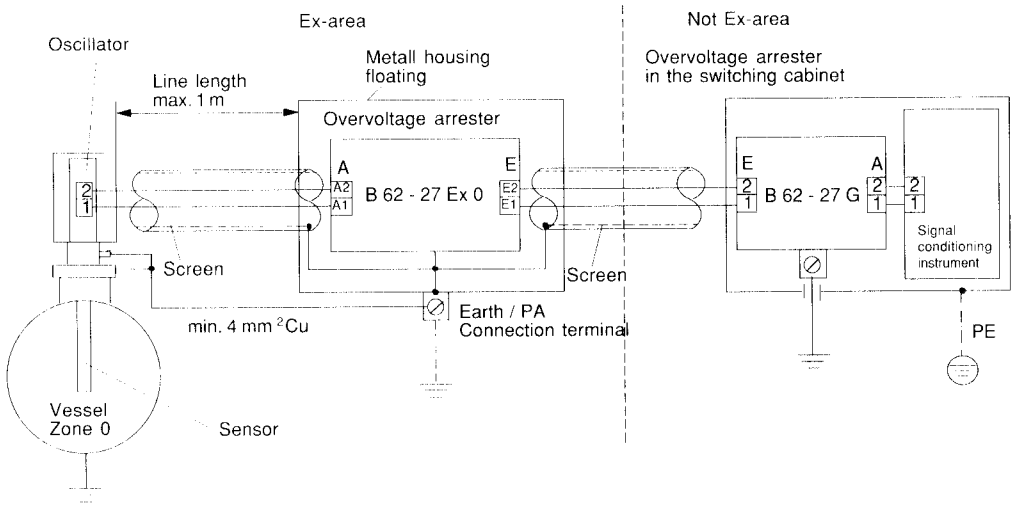
Connection diagrams of
overvoltage arresters

Supply voltage and control metre protection

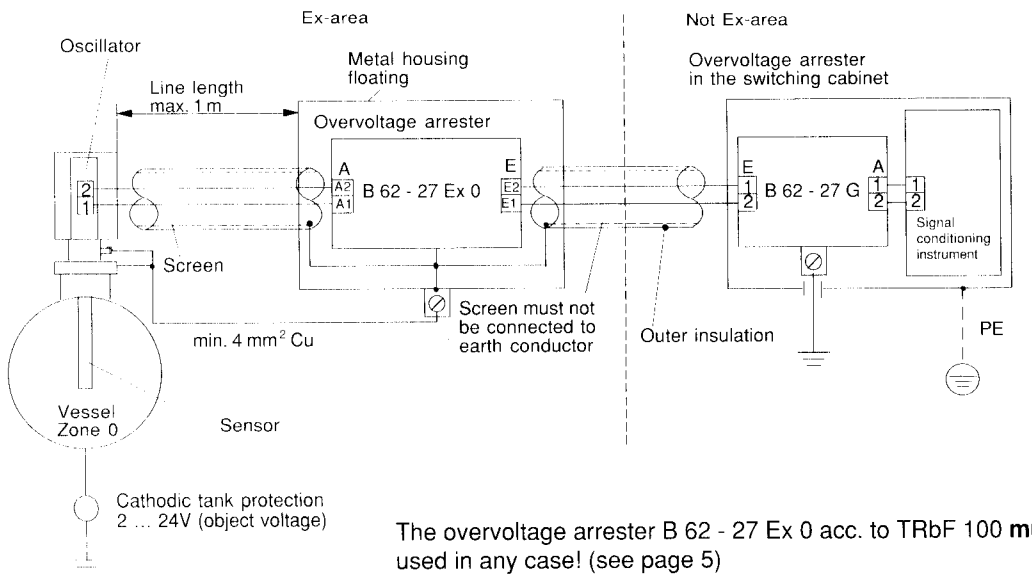


* This earth connection is deleted with overvoltage arrester B 61 - 300 FI

Measuring line protection



Cathodic tank protection (KKS)



The overvoltage arrester B 62 - 27 Ex 0 acc. to TRbF 100 **must** be used in any case! (see page 5)
For further information see TIB "Overvoltage arresters".

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