

## Technical Description

### Level Switch Type T-20\_.F...

#### Measuring transducer

Typ KR-163... ; ET-52.; ET-580; ET-R... ; XR-... ; KR-168...; KR-268...;  
OAA-100...; OAA-200...; OAA-300...; OAA-500...

## 1. Design of the overfull cut-out device

The overfull cut-out device consists of the level switch (1), which works according to the float principle, and a separate measuring transducer (2) (KR-163..., KR-268..., XR-...; OAA-100...) or a level switch (1) with integrated measuring transducer (2) (ET-520...; ET-521; ET-522; ET-580) or a level switch FR (1,2) (float – magnetic switch) which provide a binary switch signal at the output.

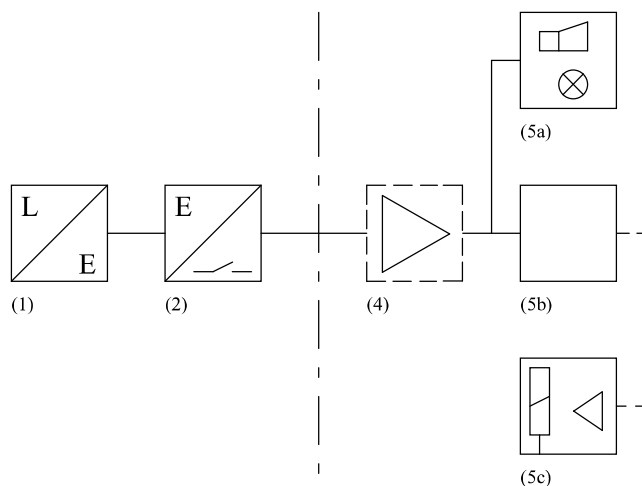
This binary signal can be delivered directly or indirectly via a signal amplifier (4), to the alarm device (5a) or the control device (5b) with its control element (5c).

In the case of overfull cut-out devices which consist of the level switch (1) with downstream alarm signal (OAA-200...; OAA-300... resp. OAA-500...) the measuring transducer (2) and alarm device (5a) are also integrated.

The untested system parts of the overfull cut-out device, such as signal amplifier (4), the alarm device (5a) or the control device (5b) with the control element (5c) must conform with the requirements of Sections 3 and 4 of the approval principles (German ZG-ÜS) for overfull cut-out devices.

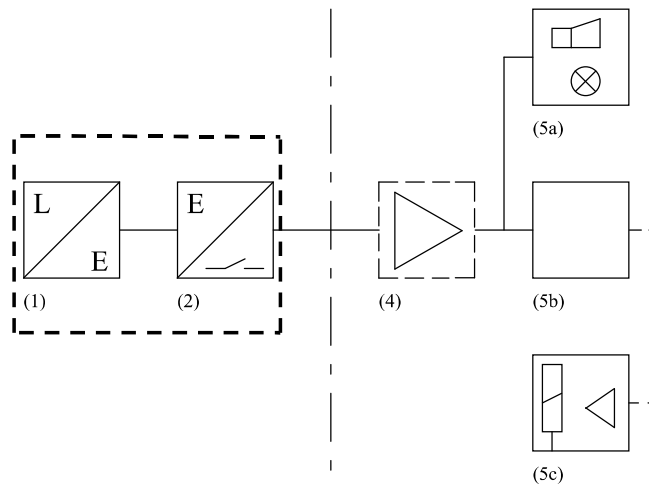
### 1.1 Schematic design of the overfull cut-out device

#### 1.1.1 Level switch (1), separate measuring transducer (2)



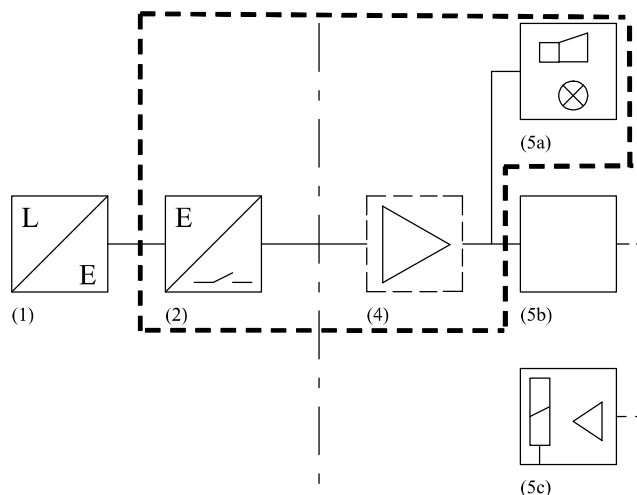
- |      |                      |                             |
|------|----------------------|-----------------------------|
| (1)  | Level switch         | (immersible magnetic probe) |
| (2)  | Measuring transducer |                             |
| (4)  | Signal amplifier     |                             |
| (5a) | Alarm device         | (with horn and signal lamp) |
| (5b) | Control device       |                             |
| (5c) | Control element      |                             |

### 1.1.2 Level switch (1) with integrated measuring transducer (2)



- (1) Level switch (immersible magnetic probe)
- (2) Measuring transducer integrated
- (4) Signal amplifier
- (5a) Alarm device (with horn and signal lamp)
- (5b) Control device
- (5c) Control element

### 1.1.3 Level switch (1) with integrated measuring transducer (2) und integrated alarm device (5a)



- (1) Level switch (immersible magnetic probe)
- (2) Measuring transducer integrated
- (4) Signal amplifier integrated
- (5a) Alarm device integrated (with horn and signal lamp)
- (5b) Control device
- (5c) Control element

## 1.2 Function description

The float of the level switch rests below the set switch point on a stop ring and actuates the reed contacts located in the guide tube with the permanent magnets installed in the float. When the float is raised by the rising liquid level, the reed contact (s) opens (t) and triggers the alarm.

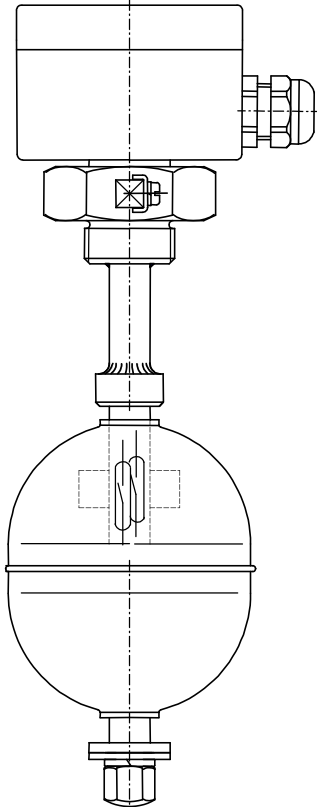


Fig.: Level switch

In addition to the float for the overfull cut-out device (**F-contact**) further floats below the response level can record the level for general ICA purposes either punctual or continuously. Reed contacts can be used as individual make contacts, break contacts or changeover contacts for this purpose. If the level is to be recorded continuously, several reed contacts are used so that they function as "tap" of a resistor chain.

The **F-contact** consists of two reed contacts arranged in parallel, which are series connected.

Line monitoring between the **F-contact** and the associated measuring transducer is conducted by the valuation of the electric circuit resistance. In the operational state of the level switch, the circuit resistance is approx. 1 kΩ, in the case of overfull alarm approx. 12 kΩ. Circuit resistances of << 1 kΩ or >> 12 kΩ are rated as line error.

The **FR-contact** consists of a reed contact with a series-connected contact protection resistor.

The overfull cut-out device works according to the quiescent current principle, i.e. in the event of a fault, the contact for the connection of the signaling and control devices is opened.

For the use in explosion-prone areas only devices intended for this purpose may be used. The pertinent safety regulations regarding the erection and operation of electrical systems in Ex-area must be complied with.

| Signalling Table OAA-100 ...      |                  |            |     |
|-----------------------------------|------------------|------------|-----|
|                                   |                  | OAA 100-A3 |     |
|                                   |                  | green      | red |
| <b>LED</b>                        |                  |            |     |
| <b>Mains OFF</b>                  |                  | ●          | ●   |
| <b>Operation</b>                  |                  | ☀          | ●   |
| <b>Line error</b>                 | <b>Channel 1</b> | ☀ ●        | ☀   |
| <b>Line error acknowledged</b>    | <b>Horn Off</b>  | ☀ ●        | ☀ ● |
| <b>Filling alarm</b>              | <b>Channel 1</b> | ☀          | ☀   |
| <b>Filling alarm acknowledged</b> | <b>Horn Off</b>  | ☀          | ☀ ● |

LED off: ●, LED on: ☀, LED flashes: ☀ ●.

### Signalling Table OAA-200 ...

| LED                                    | Channel LED, 3<br>coloured | Summary<br>alarm | Horn |
|----------------------------------------|----------------------------|------------------|------|
| Mains OFF, resp. no sensor connected   | ●                          | ●                | Off  |
| Operation, sensor connected            | green ☀                    | ●                | Off  |
| Line error                             | red ☀                      | ☀ ●              | On   |
| Line error acknowledged                | red ☀ ●                    | ☀ ●              | Off  |
| Filling alarm, Leak alarm              | yellow ☀                   | ☀ ●              | On   |
| Filling alarm, Leak alarm acknowledged | yellow ☀ ●                 | ☀ ●              | Off  |
| Error rectified                        | green ☀ ●                  | ☀ ●              | Off  |
| Rectified error acknowledged           | green ☀                    | ●                | Off  |

LED off: ●, LED on: ☀, LED flashes: ☀ ●.

### Signalling Table OAA-300 ...

| LED                                    | Channel LED, 3<br>coloured | Summary<br>alarm | Horn |
|----------------------------------------|----------------------------|------------------|------|
| Mains OFF, resp. no sensor connected   | ●                          | ●                | Off  |
| Operation, sensor connected            | green ☀                    | ●                | Off  |
| Line error                             | red ☀                      | ☀ ●              | On   |
| Line error acknowledged                | red ☀ ●                    | ☀ ●              | Off  |
| Error rectified                        | green ☀ ●                  | ☀ ●              | Off  |
| Rectified error acknowledged           | green ☀                    | ●                | Off  |
| Filling alarm, Leak alarm              | yellow ☀                   | ☀ ●              | On   |
| Filling alarm, Leak alarm acknowledged | yellow ☀ ●                 | ☀ ●              | Off  |
| Error rectified                        | green ☀ ●                  | ☀ ●              | Off  |
| Rectified error acknowledged           | green ☀                    | ●                | Off  |

LED off: ●, LED on: ☀, LED flashes: ☀ ●.

### Signalling Table OAA-500 ...

| LED                                    | Channel LED, 3<br>coloured | Summary<br>alarm | Horn |
|----------------------------------------|----------------------------|------------------|------|
| Mains OFF, resp. no sensor connected   | ●                          | ●                | Off  |
| Operation, sensor connected            | green ☀                    | ●                | Off  |
| Line error                             | red ☀                      | ☀ ●              | On   |
| Line error acknowledged                | red ☀ ●                    | ☀ ●              | Off  |
| Filling alarm, Leak alarm              | yellow ☀                   | ☀ ●              | On   |
| Filling alarm, Leak alarm acknowledged | yellow ☀ ●                 | ☀ ●              | Off  |
| Error rectified                        | green ☀ ●                  | ☀ ●              | Off  |
| Rectified error acknowledged           | green ☀                    | ●                | Off  |

LED off: ●, LED on: ☀, LED flashes: ☀ ●.

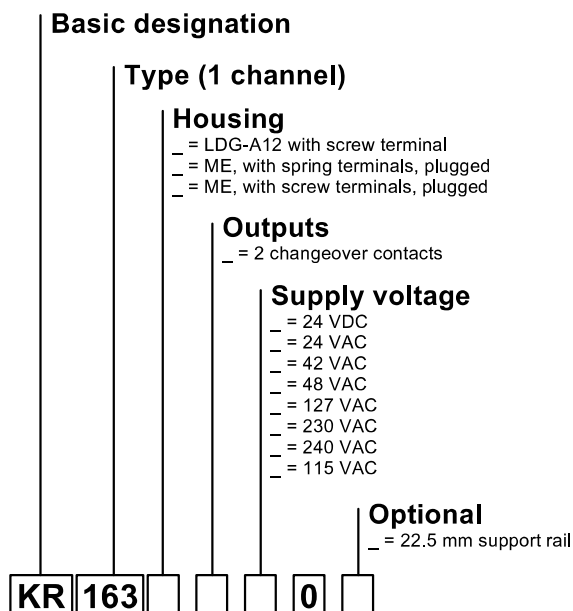
| Signalling Table |                 |     |                        |        |     |                |     |
|------------------|-----------------|-----|------------------------|--------|-----|----------------|-----|
| LED              | KR-163 / ET-580 |     | KR-168 / -268 / XR-... |        |     | ET- 520../-521 |     |
|                  | green           | red | green                  | yellow | red | green          | red |
| Mains OFF        | ●               | ●   | ●                      | ●      | ●   | ●              | ●   |
| Operation        | ☼               | ●   | ☼                      | ●      | ●   | ☼              | ●   |
| Line error       | ●               | ☼   | ☼                      | ☼      | ☼   | ●              | ☼   |
| Filling alarm    | ☼               | ☼   | ☼                      | ☼      | ●   | ☼              | ☼   |

LED off: ●, LED on: ☼

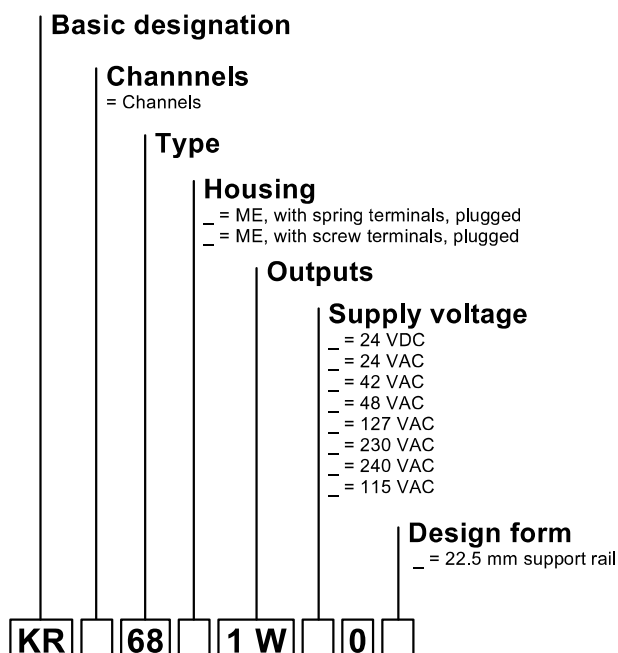
### 1.3 Type key

#### 1.3.1 Measuring transducer (2)

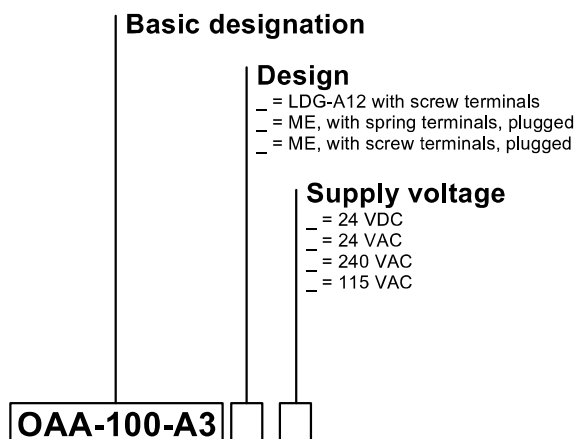
##### 1.3.1.1 Measuring transducer KR-163...



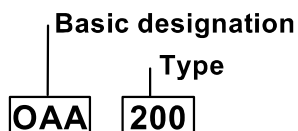
##### 1.3.1.2 Measuring transducer KR-168... resp. KR-268...



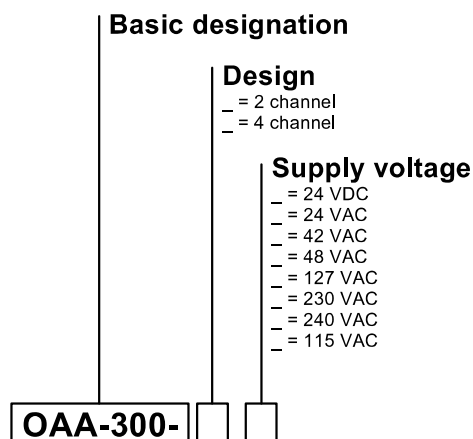
### 1.3.1.3 Measuring transducer OAA-100-A3...



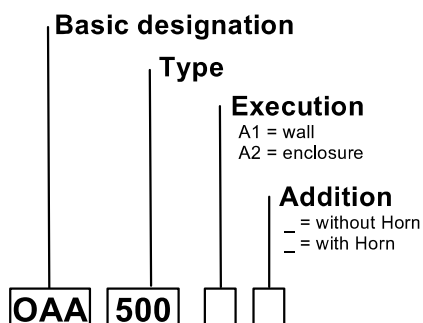
### 1.3.1.4 Measuring transducer OAA-200-...



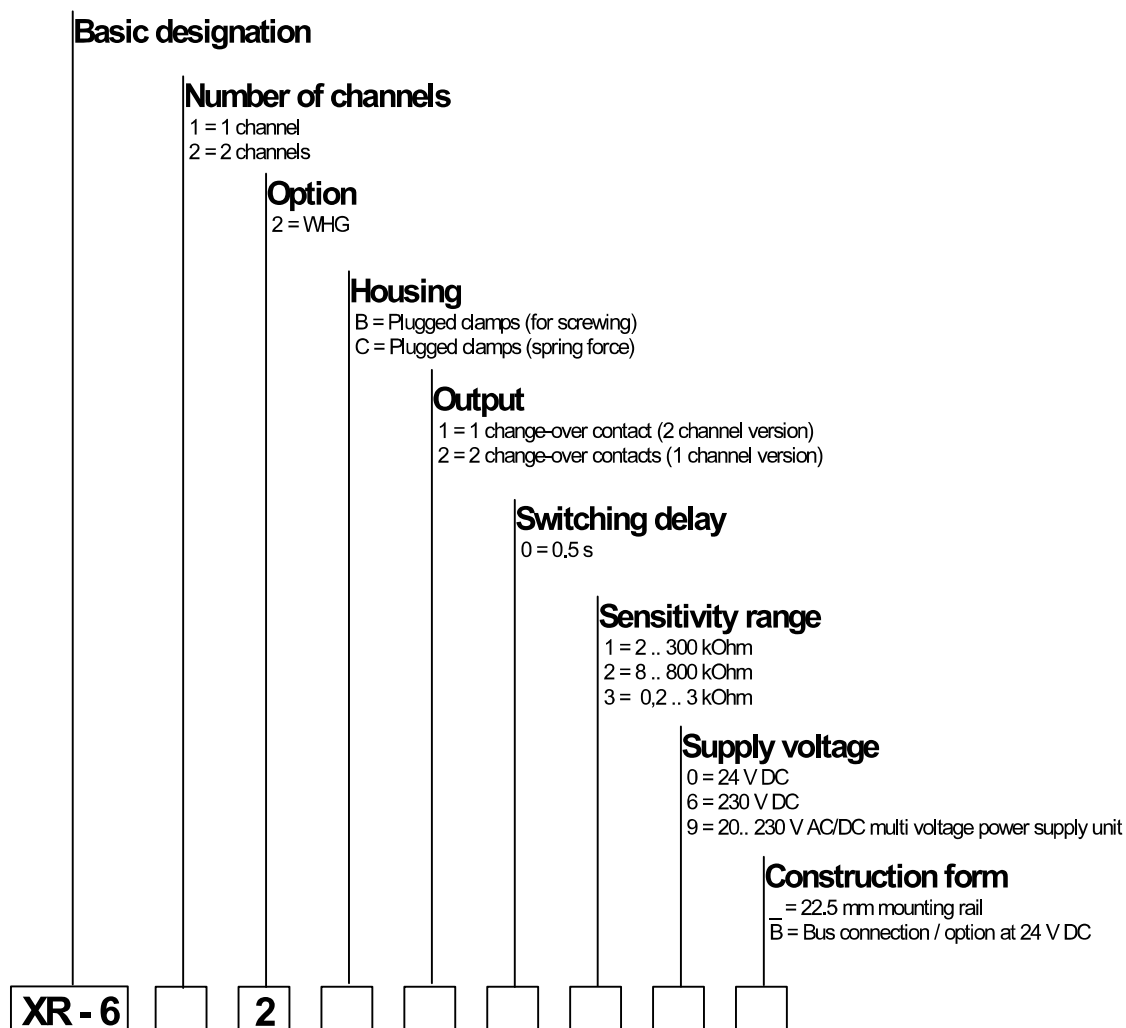
### 1.3.1.5 Messumformer OAA-300-...



### 1.3.1.6 Measuring transducer OAA-500-...



### 1.3.1.7 Measuring transducer Series XR-...



## 1.3.2 Level switch (1)

### 1.3.2.1 Level switch T 20x F

#### Basic designation

##### Guide tube

- \_ = Ø 10 mm for PP 40
- \_ = Ø 16 mm for PE 52, PP 52, PVC 52
- \_ = Ø 20 mm for PE 78, PP 78, PVC 78

##### Safety function

- F = Overfull cut-out
- FR = Overfull cut-out (no Ex-version)

##### Material screw connector + Guide tube

- \_ = PE
- \_ = PP (Note: Ø 10 only in PP)
- \_ = PVC
- \_ = PVDF
- \_ = PE-EL (electrically conducting)
- \_ = PP-EL (electrically conducting)
- \_ = PVC-EL (electrically conducting)

##### Connection thread

- \_ = G 1"
- \_ = G1.1/4"
- \_ = G1.1/2"
- \_ = G2"
- \_ = G3"
- \_ = Cap nut G2.3/4"
- \_ = Cap nut S 100 x 8
- \_ = Flange

##### Design

- \_ = adjustable
- \_ = firm welded

##### Additional switch contacts

- \_ = without (only F-contact)
- \_ = 1 ... 5 contacts / without F-contact
- \_ = continuous measuring chain

##### Floater material

- \_ = PE
- \_ = PP
- \_ = PVC
- \_ = PVDF

##### Connection

- \_ = Polyester connector housing
- \_ = Aluminium connector housing
- \_ = PE connector housing / Alternative PE-EL (electr. conducting)
- \_ = PP connector housing / Alternative PP-EL (electr. conducting)
- \_ = PVC connector housing / Alternative PVC-EL (electr. conducting)
- \_ = Plug connection
- \_ = Unconnected cable end

##### Length

- \_ = LF-dimensions in mm

##### Option

- \_ = Ex

T20



### 1.3.2.2 Level switch T 20x F - 24V

#### Basic designation

##### Guide tube

- \_ = Ø 10 mm for PP-40
- \_ = Ø 16 mm for PE 52, PP 52, PVC 52
- \_ = Ø 20 mm for PE 78, PP 78, PVC 78

##### Safety function

F = Overfull cut-out

##### Material screw connector + Guide tube

- \_ = PE
- \_ = PP (Note: Ø 10 only in PP)
- \_ = PVC
- \_ = PVDF
- \_ = PE-(electrically conducting)
- \_ = PP-EL (electrically conducting)
- \_ = PVC-EL (electrically conducting)

##### Connection thread

- \_ = G 1"
- \_ = G1.1/4"
- \_ = G1.1/2"
- \_ = G2"
- \_ = G3"
- \_ = Cap nut G2.3/4"
- \_ = Cap nut S 100 x 8
- \_ = Flange

##### Design

- \_ = adjustable
- \_ = firm welded

##### Float material

- \_ = PE
- \_ = PP
- \_ = PVC
- \_ = PVDF

##### Connection

- \_ = Polycarbonate connector housing
- \_ = PE connector housing / Alternative PE-EL (electr. conducting)
- \_ = PP connector housing / Alternative PP-EL (electr. conducting)
- \_ = PVC connector housing / Alternative PVC-EL (electr. conducting)
- \_ = plug connection

##### Length

- \_ = LF-dimensions in mm

##### Optional

- \_ = ET-52x (KR-24V)
- \_ = ET-...

T20

### 1.3.2.3 Level switch T 20x F Ex

## Basic designation

## Guide tube

3 = 15 mm for float VA76 u. VA90  
4 = 12 mm for float VA44 bis VA60  
9/0 = 18 mm for float VA10  
4/0 = 12 mm float VA60 (Kabelschw.)  
5/0 = 8 mm for float VA27... 40 + PP19 (unconn. cable end)  
7/0 = 8 mm for float VA27... 40 + PP19 ((unconn. cable end.))

## Safety function

F = Overfull cut-out

## Connection thread

- \_ = cyl. pipe thread 1/8" ... 3.1/2"
- \_ = conical pipe thread 1/8" ... 3.1/2"
- \_ = Flange
- \_ = Special designs according to customer requirement

## Design

— = adjustable  
— = firm welded

### Additional switch contacts

\_ = Number of contacts (1 ... 5 contacts / without F-contact)  
 \_ = continuous measuring chain

### Number of floaters

         = Number1 (1 .. n)

## Floater design

- \_ = Ball, stainless steel, VA 27
- \_ = Ball, stainless steel, VA 40
- \_ = Ball, stainless steel, VA 50
- \_ = Ball, stainless steel, VA 60
- \_ = Ball, stainless steel, VA 10
- \_ = Oval, stainless steel, VA 76
- \_ = Oval, stainless steel I, VA 90
- \_ = Cylinder, stainless steel VA 30
- \_ = Cylinder, stainless steel, VA 44 bzw. VA 44L
- \_ = Cylinder, Polypropylene, PP 19 (only for IIA resp. IIB)

## Connection

- \_ = Polyester connection housing
- \_ = Aluminium connection housing
- \_ = Unconnected cable end (with spec: reed contacts or PCB)

## Explosion protection

— = ATEX II 1 G Ex ia IIC / IIB T 6 resp.  
II 1/2 G Ex ia IIC / IIB T 6

## Length

— = LF-dimensions in mm

T20

### 1.3.2.4 Level switch T 20x F / Metal

#### Basic designation

##### Guide tube

- 1 = 15 mm for float VA76 and VA90
- 2 = 12 mm for float VA44 to VA60
- 9 = 18 mm for float VA10
- 5 = 8 mm for float VA27.. 40
- 6 = 8 mm for float VA27.. 40 (bent)
- 7 = 8 mm for float VA27.. 40 (long thread)

##### Safety function

- F = Overfull cut-out
- FR = Overfull cut-out (no Ex-version)

##### Connection thread

- \_ = cyl. pipe thread 1/8" ... 3.1/2"
- \_ = conical pipe thread 1/8" ... 3.1/2"
- \_ = Flange
- \_ = Special designs according to customer requirement

##### Design

- \_ = adjustable
- \_ = firm welded

##### Additional switch contacts

- \_ = Number of contacts (1 ... 5 contacts / without F-contact)
- \_ = continuous measuring chain

##### Number of floaters

- \_ = Numberl (1 .. n)

##### Floater design

- \_ = Ball, stainless steel, VA 27
- \_ = Ball, stainless steel, VA 40
- \_ = Ball, stainless steel, VA 50
- \_ = Ball, stainless steel, VA 60
- \_ = Ball, stainless steel, VA 10
- \_ = Oval, stainless steel, VA 76
- \_ = Oval, stainless steel I, VA 90
- \_ = Cylinder, stainless steel VA 30
- \_ = Cylinder, stainless steel, VA 44 bzw. VA 44L

##### Connection

- \_ = Polyester connection housing
- \_ = Aluminium connection housing
- \_ = Unnconnected cable end
- \_ = Plug connection

##### Length

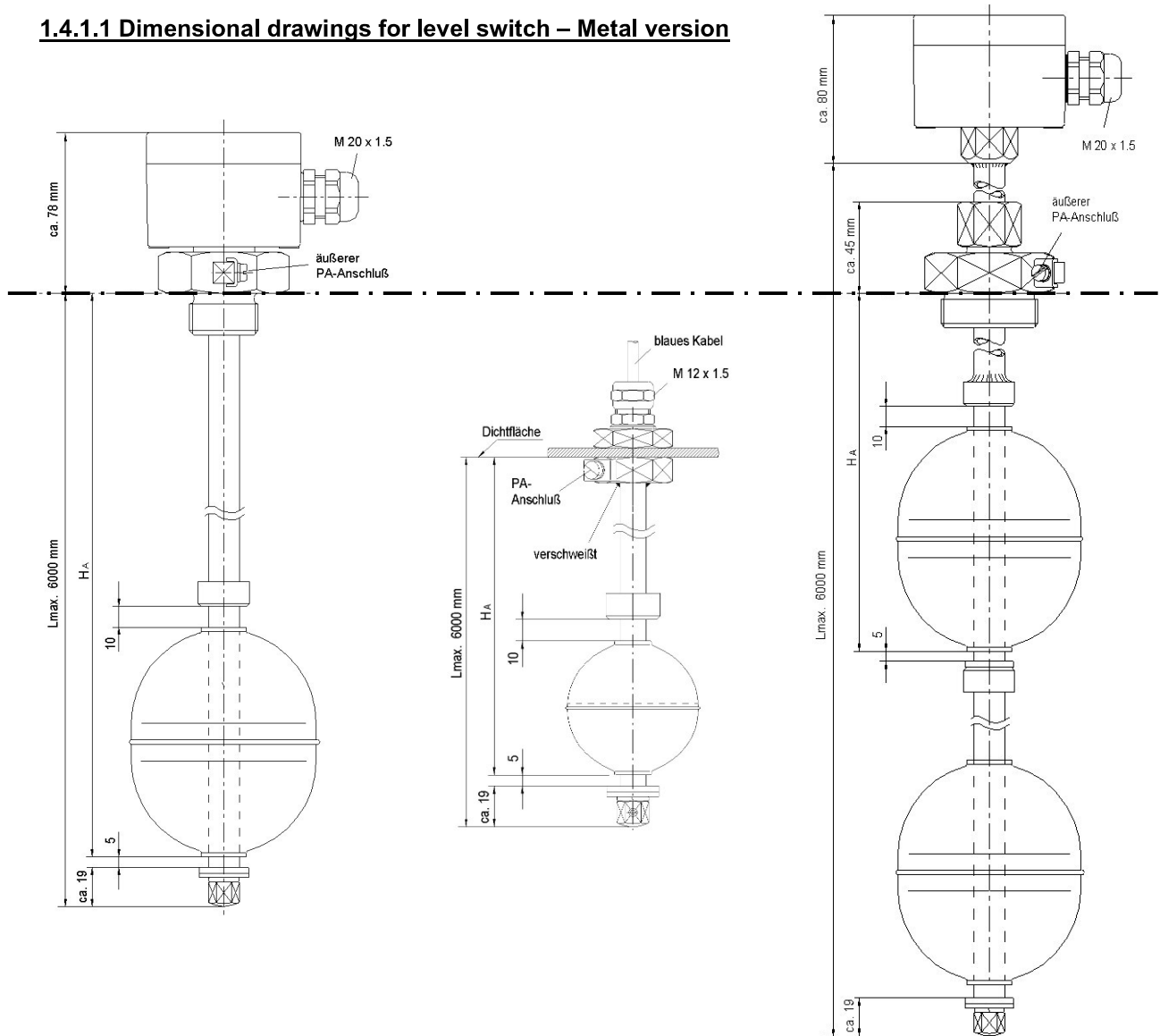
- \_ = LF-dimensions in mm

T20

## 1.4 Dimensional drawings

### 1.4.1 Dimensional drawings level switch (1)

#### 1.4.1.1 Dimensional drawings for level switch – Metal version



**fixed version:**

T-201 / T-202 / T-203 / T-204 /  
T-209 / T-209/0

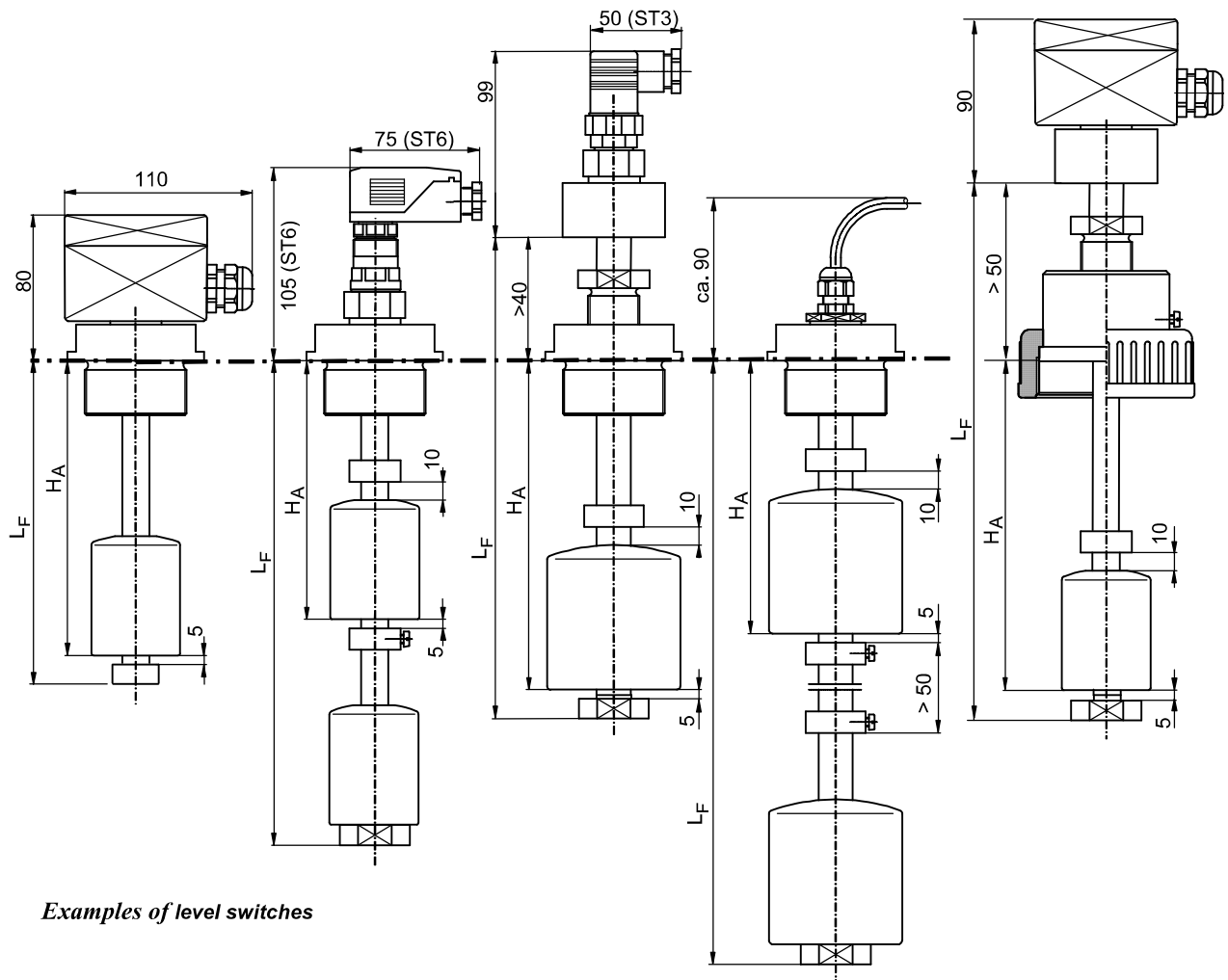
**unconnected cable end version:**

T-204/0 bzw. T-205/0 / T-207/0

**adjustable version:**

T-201 / T-202 / T-203 / T-204

### 1.4.1.2 Dimensional drawings for level switch – Plastic version



*Examples of level switches*

**T200.F..**  
with jack

and  
lower stop

**T200.F..**  
Plug connection

Two floaters  
with another contact

**T208.F..**  
Plug connection

Adjustable  
version

**T208.F..**  
Cable connection with  
two floaters

and continuous  
Section of  
measurement

**T200.F..**  
Adjustable version.

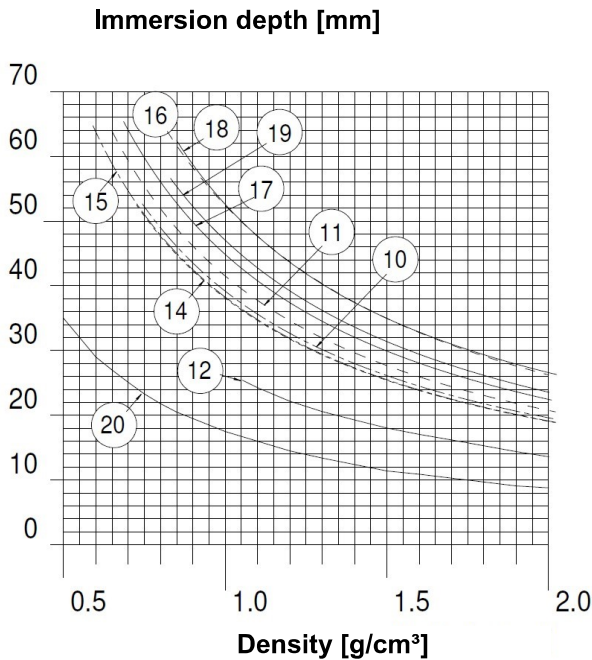
Jack with cap nut  
G 2 3/4"

**L<sub>F</sub>** = Guide tube length (max. 6000 mm)

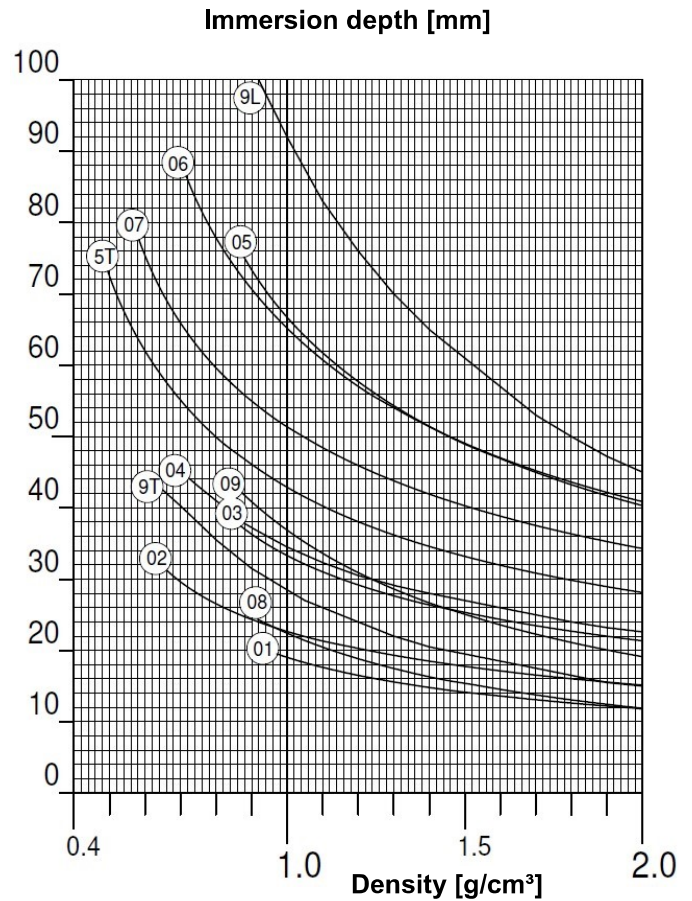
**H<sub>A</sub>** = Response length

## 1.4.2 Dimensions and immersion depth of the floaters

### 1.4.2.1 Plastic floater



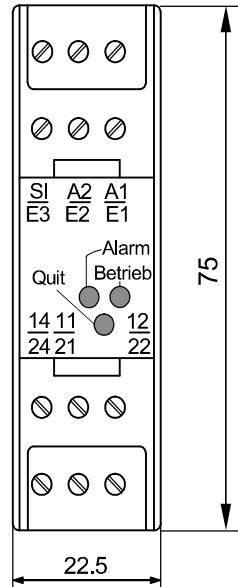
### 1.4.2.2 Metal floater



### 1.4.2.3 Physical data for the floaters

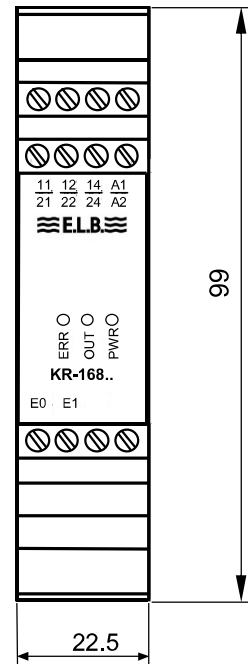
| Floater type |       | Dimensions   | Material | max. pressure (bar) | min. density (g/cm³) |
|--------------|-------|--------------|----------|---------------------|----------------------|
| 01           | VA27  | 29 x 28 mm   | 1.4571   | 15                  | 0,81                 |
| 02           | VA40  | 43 x 42 mm   | 1.4571   | 16                  | 0,60                 |
| 03           | VA50  | 52 x 52 mm   | 1.4571   | 20                  | 0,75                 |
| 04           | VA60  | 63 x 62 mm   | 1.4571   | 20                  | 0,65                 |
| 05           | VA76  | 80 x 96 mm   | 1.4571   | 20                  | 0,81                 |
| 5T           | TI76  | 80 x 96 mm   | 3.7035   | 15                  | 0,50                 |
| 06           | VA90  | 94 x 110 mm  | 1.4571   | 20                  | 0,67                 |
| 07           | VA10  | 105 x 102 mm | 1.4571   | 20                  | 0,54                 |
| 08           | VA30  | 27 x 31 mm   | 1.4571   | 10                  | 0,78                 |
| 09           | VA44  | 44 x 52 mm   | 1.4571   | 15                  | 0,76                 |
| 9T           | TI44  | 44 x 52 mm   | 3.7025   | 15                  | 0,65                 |
| 9L           | VA44L | 44 x 132 mm  | 1.4571   | 10                  | 0,73                 |
| 10           | PE52  | Ø 52 x 63 mm | PE       | 6                   | 0,72                 |
| 11           | PE78  | Ø 78 x 80 mm | PE       | 6                   | 0,60                 |
| 12           | PP19  | Ø 19 x 31 mm | PP       | unpressurised       | 1.06                 |
| 14           | PP52  | Ø 52 x 65 mm | PP       | 6                   | 0,72                 |
| 15           | PP78  | Ø 78 x 80 mm | PP       | 6                   | 0,59                 |
| 16           | PT78  | Ø 80 x 80 mm | PTFE     | 6                   | 0,79                 |
| 17           | PV78  | Ø 78 x 80 mm | PVC      | 6                   | 0,63                 |
| 18           | PV55  | Ø 55 x 65 mm | PVC      | 6                   | 0,82                 |
| 19           | PF52  | Ø 52 x 65 mm | PVDF     | 6                   | 0,83                 |
| 20           | PP40  | Ø 40 x 38 mm | PP       | unpressurised       | 0,46                 |

### 1.4.3 Dimensional drawings for measuring transducers (2)



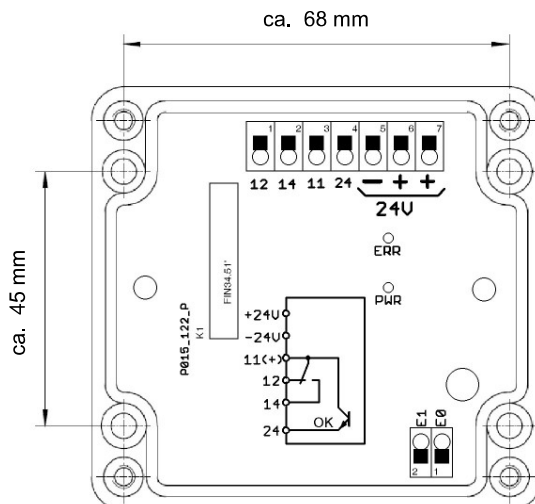
Housing for types:

OAA-100-A3-...



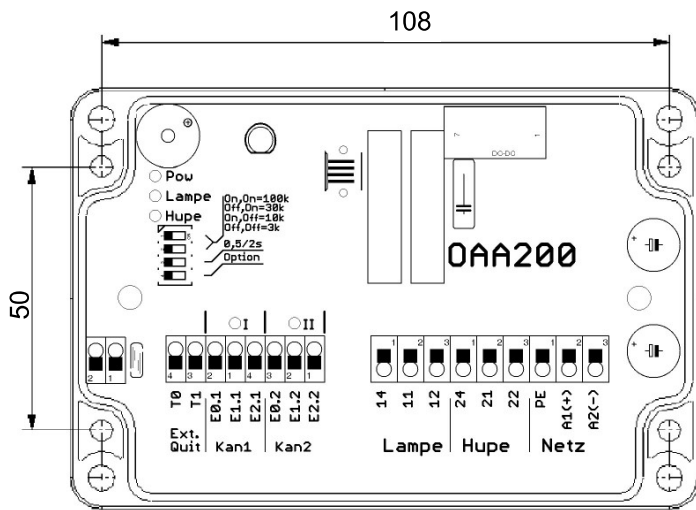
Housing for types:

XR-...  
KR-163...  
KR-168/B/...  
KR-268/B/...  
KR-163/B/...



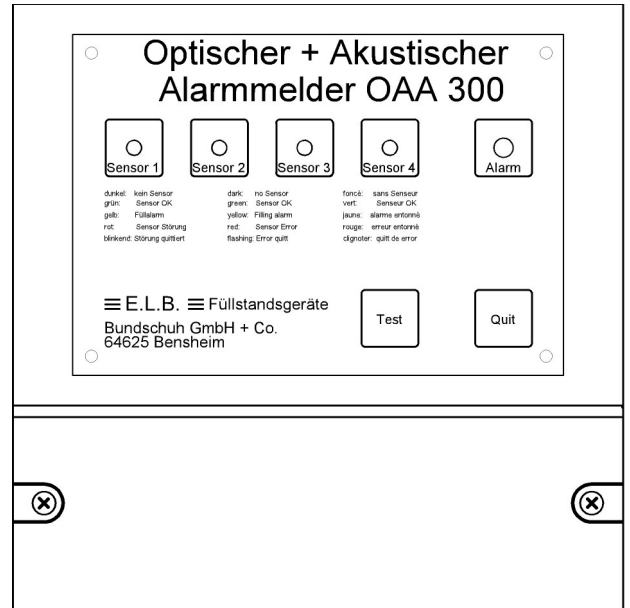
Housing dimensions ET-520a:

75 mm x 80 mm

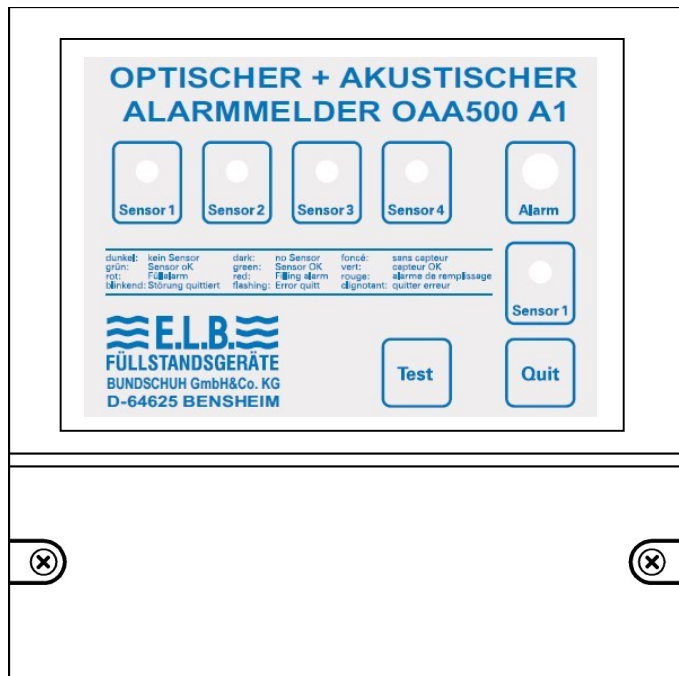


**Housing dimensions:**

120 mm x 80 mm x 57 mm



**Housing dimensions** 170 x 165 x 85 mm



**Housing dimensions:**

137 mm x 186 mm (without cable glands) x 103 mm



**Housing dimensions:**

86 mm x 70 mm x 60 mm



#### 1.4.4 Technical data for level switch (1)

|                                                        |                                                                                                                                                                                                                                |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connection <sup>(a)</sup>                              | of suitable material,<br>Cable connection or plug                                                                                                                                                                              |
| Protective type accord. to DIN EN 60529                | IP 65 (jack) resp. IP 68 (guide pipe)                                                                                                                                                                                          |
| Mounting type                                          | Screw-in thread: G 1/8" ... G 3 1/2"                                                                                                                                                                                           |
| Guide tube length                                      | max. 6 m                                                                                                                                                                                                                       |
| Operating pressure                                     | see floater                                                                                                                                                                                                                    |
| Density of liquid                                      | see floater                                                                                                                                                                                                                    |
| Switching hysteresis                                   | typ. 2 mm                                                                                                                                                                                                                      |
| Switch point tolerance                                 | max. 5 mm                                                                                                                                                                                                                      |
| Resistance value level switch (F-contact):             |                                                                                                                                                                                                                                |
| Operational conditions                                 | approx. 1 kΩ                                                                                                                                                                                                                   |
| Overfill alarm                                         | approx. 12 kΩ                                                                                                                                                                                                                  |
| Switching time                                         | approx. 20 ms                                                                                                                                                                                                                  |
| Level switch (FR-contact):                             |                                                                                                                                                                                                                                |
| Operational conditions                                 | approx. 47 Ω (contact protective resistor)                                                                                                                                                                                     |
| Overfill alarm                                         | approx. ∞ (contact opened)                                                                                                                                                                                                     |
| Switching time                                         | approx. 20 ms                                                                                                                                                                                                                  |
| Permiss. filling material temperature <sup>(b)</sup> : | -20°C ... +150°C (T-205/0 resp. T-207/0: max. 100°C)<br>(Version with PP-19: max. 90°C)<br>-20°C ... +80°C (T-200.F with installed measuring transducer)<br>-20°C ... +90°C (Plastic version T-200 / T-208)<br>-20°C ... +60°C |
| Ambient temperature:                                   | -20°C ... +60°C                                                                                                                                                                                                                |

<sup>(a)</sup> For Ex Applications: observe permissible Ex-Data according to Ex-certificate

<sup>(b)</sup> For Ex Applications: observe permissible temperature range according to Ex-certificate

#### 1.4.5 Technical data for measuring transducer (2):

| Type                                | ET-520.. / ET-521                               | ET-522             |
|-------------------------------------|-------------------------------------------------|--------------------|
| <b>Mains supply:</b>                |                                                 |                    |
| Rated operat. voltage               | 24 (20 ... 35) VDC                              | 24 (20 ... 35) VDC |
| On request: (± 10 %)                |                                                 |                    |
| Rated frequency                     |                                                 |                    |
| Power consumption                   |                                                 |                    |
| On request:                         |                                                 |                    |
| Power consumption                   | ≤ 1 W                                           | ≤ 1 W              |
| <b>Output:</b>                      |                                                 |                    |
| Output relay                        | 1 potential-free<br>changeover-contact          | Breaker or maker   |
| Switching voltage                   | max. 250 VAC<br>max. 150 VDC                    | max. 24 VDC        |
| Switching current                   | max. cos φ = 1 ⇒ 3 A<br>max. cos φ = 0.7 ⇒ 1 A  | max. 200 mA DC     |
| Switching power                     | max. 500 VA / W<br>(30VDC) 10 W                 | ≤ 5 W              |
| Optocoupler                         | 1 pot.fr. semi-cond. sw<br>max. 30 VDC / 100 mA |                    |
| <b>Input:</b>                       |                                                 |                    |
| Open circuit voltage                | < 10 V                                          | < 10 V             |
| Short-circuit current               | < 10 mA                                         | < 5 mA             |
| Switching delay                     | < 0.5 s                                         |                    |
| Operating temperatur.               | -20 ... + 60°C                                  | -20 ... + 60°C     |
| Protecting type acc.<br>to EN 60529 | IP 65                                           | IP 65              |

| Type                                     | ET-580                                  | KR-163..                                       | KR-268.. bzw. KR-168x..                             | XR-...                                  | FR (ET-R...) |
|------------------------------------------|-----------------------------------------|------------------------------------------------|-----------------------------------------------------|-----------------------------------------|--------------|
| <b><u>Mains supply:</u></b>              |                                         |                                                |                                                     |                                         |              |
| Rated operating voltage                  | 20 .. 230 V AC/DC                       | 230 VAC (+10% / -15%)                          | 230 VAC (+10% / -15%)                               | 20 .. 230VAC/DC                         | 24 V (± 10%) |
| On request:<br>(± 10 %)                  |                                         | 24; 42; 48; 110;<br>115; 127; 240; VAC         |                                                     | 24 V DC<br>230 V AC                     |              |
| Rated frequency                          |                                         | 48 ... 62 Hz                                   | 48 ... 62 Hz                                        | max. 62 Hz                              |              |
| Power consumption                        |                                         | ≤ 3 VA                                         | ≤ 3 VA                                              | ≤ 2 VA / W                              | ≤ 0.4 W      |
| On request:                              |                                         | 24 (20...35) VDC                               | 24 (20...35) VDC                                    |                                         |              |
| Power consumption                        | ≤ 1 W                                   | ≤ 2 W                                          | ≤ 2 W                                               |                                         |              |
| <b><u>Output:</u></b>                    |                                         |                                                |                                                     |                                         |              |
| Output relay                             | 2 potential-free<br>changeover-contacts | 2 potential-free<br>changeover-contacts        | per Output: 1 potential-free<br>changeover-contacts | 2 potential-free<br>changeover-contacts |              |
| Switching voltage                        | max. 250 V AC/DC                        | max. 250 VAC<br>max. 150 VDC                   | max. 250 VAC<br>max. 150 VDC                        | max. 250 V                              | max. 24 V    |
| Switching current                        | max. 5 A                                | max. cos φ = 1 ⇒ 3 A<br>max. cos φ = 0.7 ⇒ 1 A | max. cos φ = 1 ⇒ 3 A<br>max. cos φ = 0.7 ⇒ 1 A      | max. 5 A                                | max. 80 mA   |
| Switching power                          | max. 500 VA / W<br>(30VDC) 10 W         | max. 1250 VA / W<br>(30VDC/5A) 150 W           | max. 500 VA / W<br>(30VDC) 10 W                     | max. 100 VA ;<br>max. 50 W              | max. 2 W     |
| <b><u>Input:</u></b>                     |                                         |                                                |                                                     |                                         |              |
| Open circuit voltage                     | < 10 V                                  | 8.6 ... 9.6 V                                  | 8.6 ... 9.6 V                                       | max. 14.8 VDC                           |              |
| Short-circuit current                    | < 5 mA                                  | 8.2 ... 10.2 mA                                | 8.2 ... 10.2 mA                                     | max. 5.6 mA                             |              |
| Switching delay                          |                                         | < 0.5 s                                        | < 0.5 s                                             | einst. 0.5 / 2 / 2.5 / 10 s             |              |
| Operating temperature                    | -20 ... + 60 °C                         | -20 ... + 60 °C                                | -20 ... + 60 °C                                     | -20 ... + 60 °C                         |              |
| Protective type according<br>to EN 60529 | IP 00                                   | IP 20                                          | IP 20                                               | Clamps: IP 20<br>Housing: IP 40         |              |

| Type                                  | OAA-100-A3..                         | OAA-200..                            | OAA-300..                            | OAA-500..                              |
|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|----------------------------------------|
| <b>Mains supply:</b>                  |                                      |                                      |                                      |                                        |
| Rated operat. voltage                 | 230 VAC (+10%/-15%)                  | 24 .. 230 V AC/DC                    | 230 VAC (+10%/-15%)                  | 42...253 VAC<br>20 ...60 VDC           |
| On request: (± 10 %)                  | 24; 115; 240 VAC                     |                                      | 24; 115; 240; VAC                    |                                        |
| Rated frequency                       | 48 ... 62 Hz                         |                                      | 48 ... 62 Hz                         | 48 ... 62 Hz                           |
| Power consumption                     | ≤ 1 VA / W                           | max. 2 VA / W                        | ≤ 3 VA                               | ≤ 3 VA / W                             |
| On request:                           | 24 (20...35) VDC                     |                                      | 24 (20...35) VDC                     |                                        |
| Power consumption                     | ≤ 2 W                                |                                      | ≤ 3 W                                |                                        |
| <b>Output:</b>                        |                                      |                                      |                                      |                                        |
| Output relay                          | 2 potential-free changeover-contacts | 2 potential-free changeover-contacts | 6 potential-free changeover-contacts | 2 potential-free changeover-contacts   |
| Switching voltage                     | max. 250 VAC<br>max. 150 VDC         | max. 250 V AC/DC                     | max. 250 VAC<br>max. 150 VDC         | max. 250 VAC<br>max. 115 VDC           |
| Switching current                     | max. 3 A                             | max. 5 A                             | max. 3 A                             | max. 3 A                               |
| Switching power                       | max. 500 VA / W<br>(30VDC/5A) 150 W  | max. 1250 VA<br>max. 50 W            | max. 500 VA / W<br>(30VDC/5A) 150 W  | max. 500 VA / W<br>(30VDC) 10 W        |
| Optocoupler                           |                                      |                                      |                                      |                                        |
| <b>Input:</b>                         |                                      |                                      |                                      |                                        |
| Open circuit voltage.                 | < 10 V                               | max. 3.3 VAC                         | < 10 VDC                             | < 24 VDC                               |
| Short-circuit current                 | < 10 mA                              | max. 1 mA                            | < 10 mA                              | < 20 mA                                |
| Switching delay                       | < 0.5 s                              |                                      | < 0.5 s                              | < 0.5 s                                |
| Operating temperature                 | -20 ... + 60°C                       | -20 ... + 60°C                       | -20 ... + 60°C                       | -20 ... + 60°C                         |
| Protective type according to EN 60529 | IP 20                                | Housing IP 65                        | Gehäuse IP 65                        | Version A1: IP 65<br>Version A2: IP 20 |

## 2. Materials of the level switch

The parts of the level switch which come into contact with the liquid, its vapours or condensate, are manufactured of stainless austenitic steel.

In special cases, titanium or Hastelloy can also be used.

Media-resitant plastic materials are used for the plastic versions T-200.F resp. T-208.F.

## 3. Application areas of the level switch

The level switches (including those with integrated switching amplifier) are suitable for use in containers with pressures up to 20 bar.

The following ranges regarding the filling material temperatures are possible:

- Metal immersible probes T-20...: -20°C ... +150°C  
(T-205/0 resp. T-207/0: -20°C ... +100°C / to +90°C with version with PP-19)
- Plastic versions T-20...: -20°C ... +90°C
- Version with integrated switching amplifier T-20.F D(24V) -20°C ... +80°C

- Version with integrated switching amplifier T-20.FR -20°C ... +80°C

The level switches are suitable for use in storage liquids whose viscosity does not exceed 150 mm<sup>2</sup>/s (e.g. olive oil approx. 120 mm<sup>2</sup>/s) and whose solid material diameter is < 200 µm (information about media density can be found in 1.4.2).

## **4. Malfunction messages, Error messages**

### **4.1 Malfunction messages, Error messages**

Disconnection or short-circuit of the signal line between the level switch (1), T-20\_.F... and the measuring transducer (2), as well as power failure effect – due to the quiescent current principle employed - a drop of the output changeover contacts of the measuring transducer (2) to "Alarm position".

If the response level is reached, it is indicated on the measuring transducer (2) by the red LED and the power indicator (green LED) extinguishes in the case of line disconnection resp. short-circuit.

At T20\_.FR, an interruption of the signal line causes an interruption of the connection line or the reaching of the response level. The evaluation is carried out in the downstream signaling device (eg. PLC).

## **5. Installation and connection information**

### **5.1 Installation of the level switch**

The level switches are suitable for vertical installation from the top (except T-206). It may be necessary to dismantle the floaters when installing the level switch.

#### **In this case you must proceed as follows:**

(Explanation for level switch with one floater)

1. Remove tapered dowel pin (only for EX-version)
2. Take out cap nut, spring ring, washer, and buffer washer (⇒ Ex-metal version) **or** only unscrew the bottom stop (⇒ Metal resp. plastic version)
3. Remove floater from pipe
4. Insert level switch in screw opening
5. Slide floater back over the guide pipe (curvature to top! Pay attention to "TOP")
6. Re-attach buffer washer, washer, spring ring and cap nut in the sequence as before on the guide tube or only screw stop back on (see 2.)
7. Assemble tapered dowel pin in original position (only with EX-version)
8. Screw in screw connection with sealing tape

When removing the stop rings in the case of level switches with several floaters, mark their positions on the guide tube.

When sliding back onto the tube, the stop rings must be arrested in their original positions by tightening the locking screws.

**Attention:** In the case of the EX-version attention must be paid that the buffer washers are re-positioned correctly (to avoid sparking)!

## 5.2 Connection of the level switch with switching amplifier

When connecting the switching amplifier **KR-...** resp. **XR-...** please proceed according to the connection diagram. The signal line must be connected to terminals 1 and 2 (terminal 1 to E0 resp. terminal 2 to E1), which are marked additionally with an “F”, in general on the level switch. The measuring transducers must be installed with observance of the max. permissible line resistance ( $\leq 50 \Omega$ ) of the signal line. Provide over-current protection, such as a fuse (250mA) or circuit breaker, to limit fault currents on supply wiring.

The alarm devices and / or control devices must be connected to the potential-free output contacts as required.

KR-163/A/.., KR-163/B/...(Fig. 1):

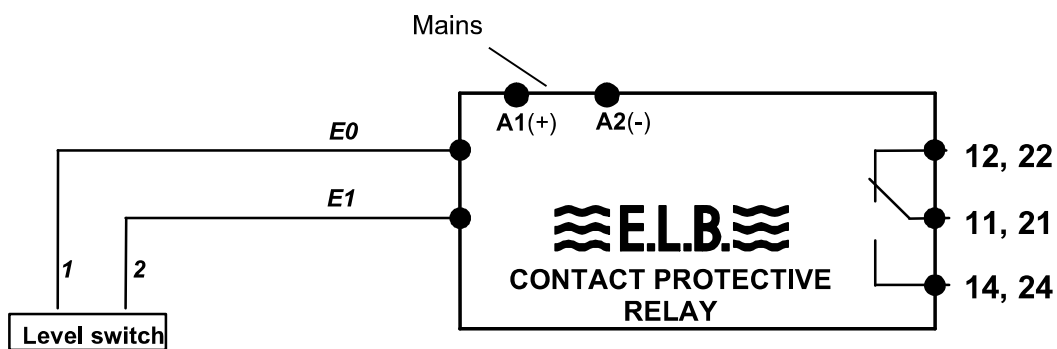
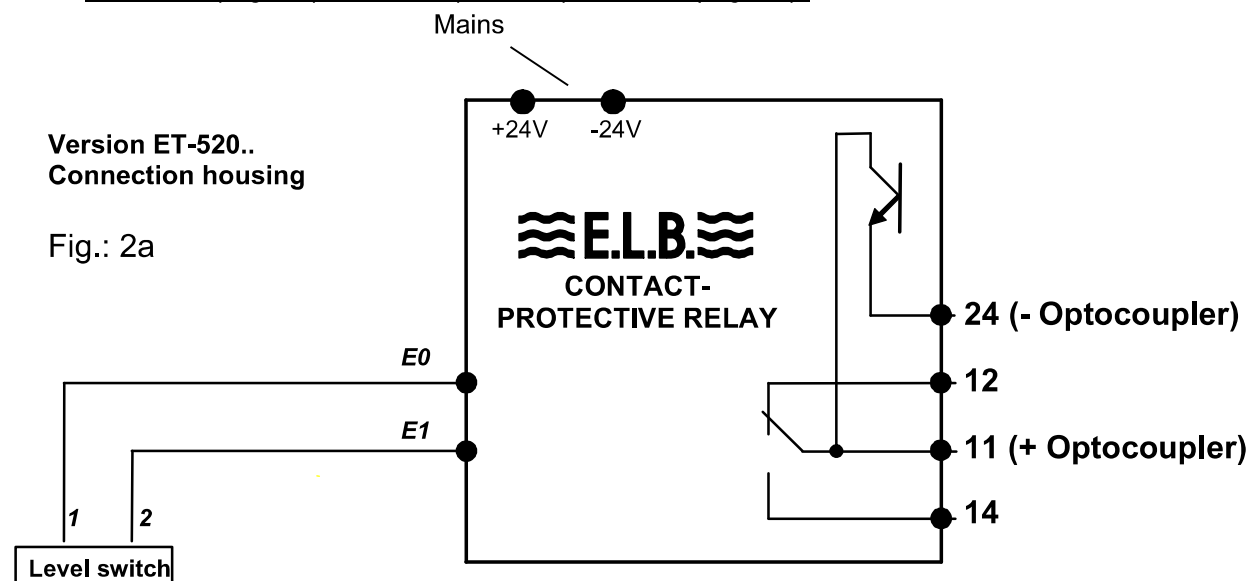


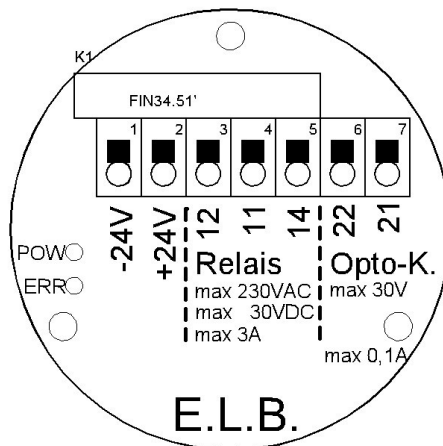
Fig.: 1

ET- 520.. (Fig. 2a), ET-521 (Abb. 2b), ET-522 (Fig. 2c):



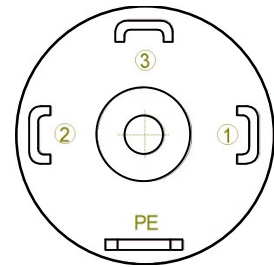
Version ET-520..  
Connection housing

Fig.: 2a



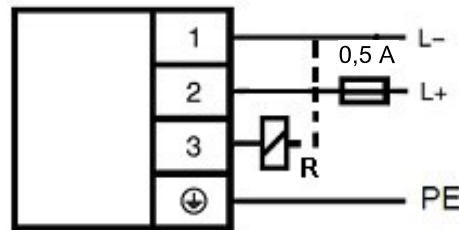
**Version ET- 521**  
**Connection housing**

Fig.: 2b



**Version ET- 522**  
**1-Channel Version**

Fig.: 2c



ET - 580 (Fig. 3):

The mains connection (20 ... 230 V) of the transducer ET-580 is to be put on clamp 1 („+“) and clamp 2 („-“).

change over switch 1: clamp 3 = NC  
clamp 4 = COM  
clamp 5 = NO

change over switch 2: clamp 6 = NC  
clamp 7 = COM  
clamp 8 = NO

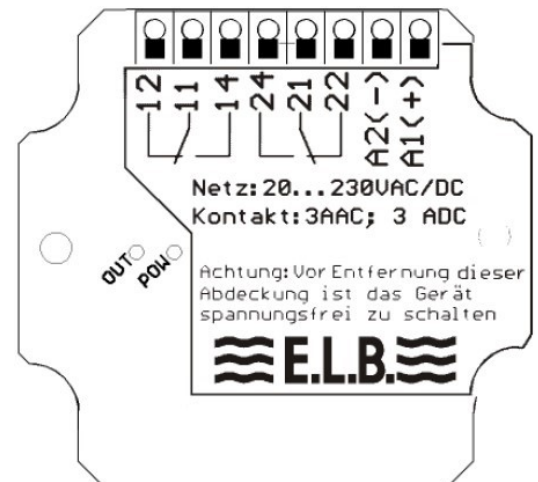


Fig.: 3

KR-168 / B 1-Channel Version (Fig. 4):

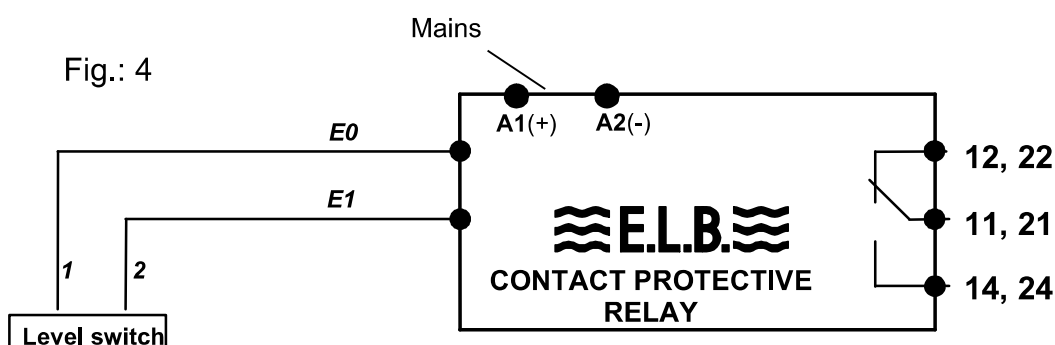


Fig.: 4

KR-268 / B 2-Channel Version (Fig. 5):

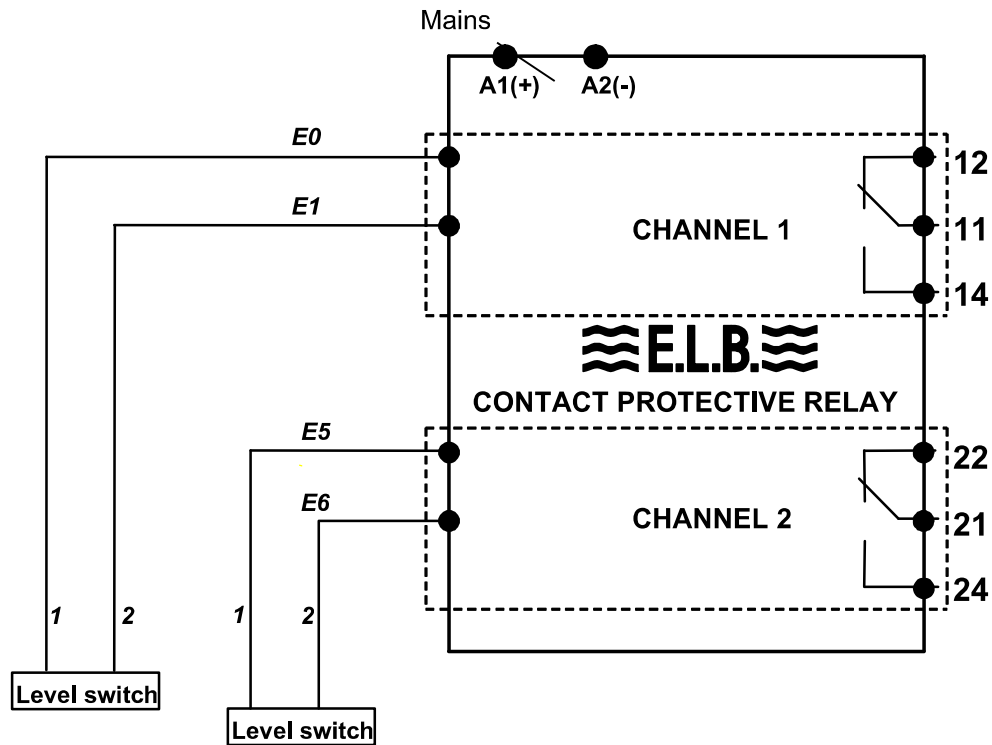


Fig.: 5

XR-... (Fig. 6):

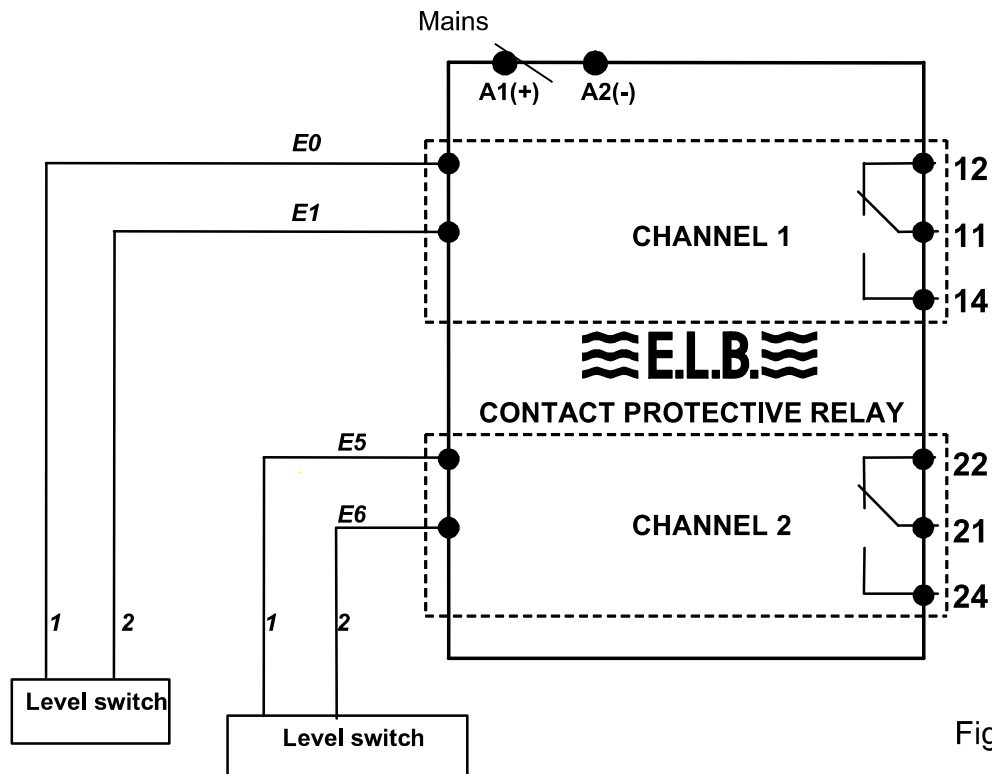


Fig.: 6

FR [ET-R...] (Fig. 7):

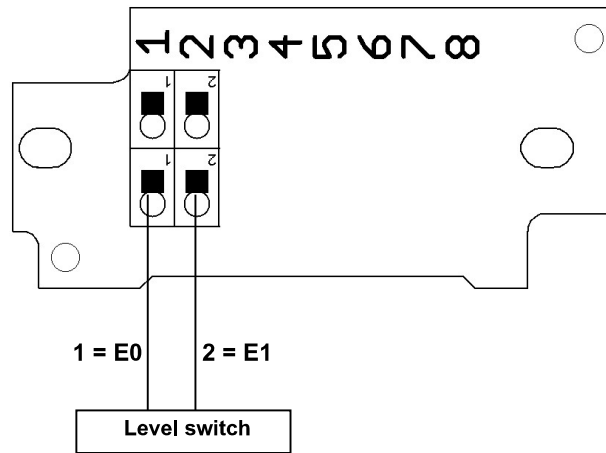


Fig.: 7

OAA 100-A3 (Fig.8)

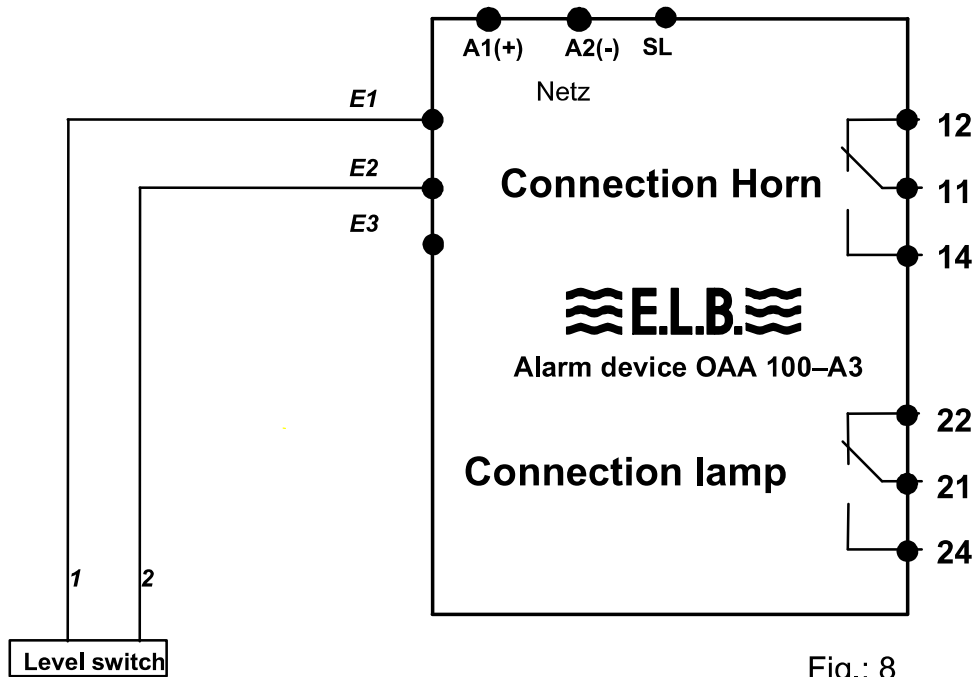


Fig.: 8



OAA-200... Optical and Acoustic Warning Device (Fig. 9):

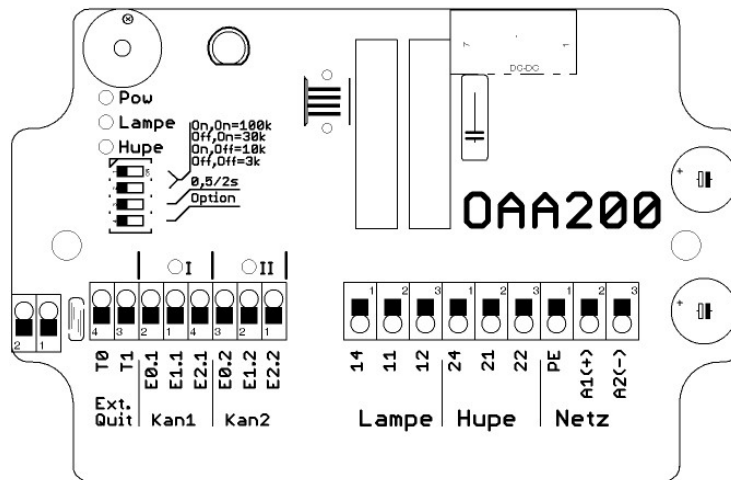


Fig.: 9

**Terminal assignment OAA-200**

| The mains connection     | PE                       | A2 = L ( + ) | A1 = N ( - ) |
|--------------------------|--------------------------|--------------|--------------|
| Output relay lamp        | 11 = COM                 | 12 = NC      | 14 = NO      |
| Output relay horn        | 21 = COM                 | 22 = NC      | 24 = NO      |
| Channel 1                |                          | E 0.1        | E 1.1        |
| Channel 2                |                          | E 0.2        | E 1.2        |
| Input ext. acknowledgem. | TO, T1 pot.-free contact |              |              |

If the alarm is on, the horn can be turned off by pressing the side button. Further alarm messages turn the horn again. The collective interference lamp cannot be turned off with the side button until there are no more alarm messages left. The alarm can be acknowledged externally also by means of a potential-free contact.

OAA-300 Optical and Acoustic Warning Device (Fig. 10):

**Mains**

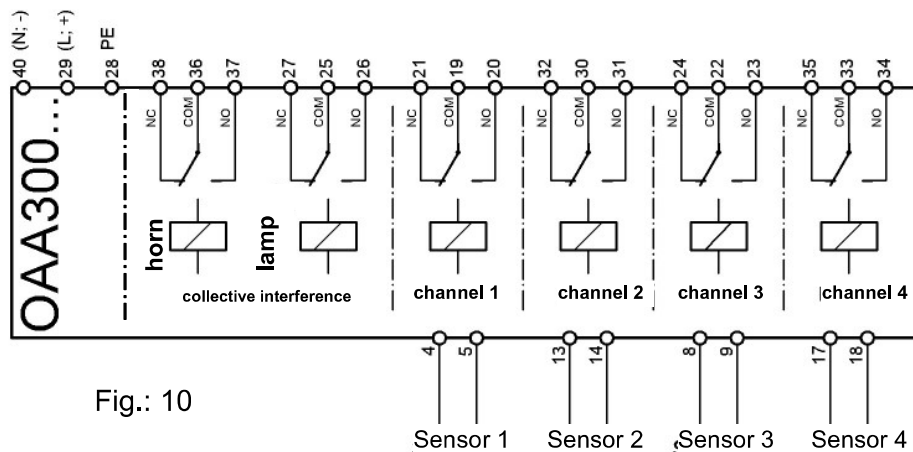


Fig.: 10

Sensor 1      Sensor 2      Sensor 3      Sensor 4

| Terminal assignment OAA-300 |                         |              |              |  |
|-----------------------------|-------------------------|--------------|--------------|--|
|                             |                         |              |              |  |
| The mains connection        | 28, 39 = PE             | 29 = L ( + ) | 40 = N ( - ) |  |
| Output relay Channel 1      | 19 = COM                | 20 = NO      | 21 = NC      |  |
| Output relay Channel 2      | 30 = COM                | 31 = NO      | 32 = NC      |  |
| Output relay Channel 3      | 22 = COM                | 23 = NO      | 24 = NC      |  |
| Output relay Channel 4      | 33 = COM                | 34 = NO      | 35 = NC      |  |
| Output relay horn           | 36 = COM                | 37 = NO      | 38 = NC      |  |
| Output relay lamp           | 25 = COM                | 26 = NO      | 27 = NC      |  |
|                             |                         |              |              |  |
| Sensor 1                    |                         | 4 = E0       | 5 = E1       |  |
| Sensor 2                    |                         | 13 = E0      | 14 = E1      |  |
| Sensor 3                    |                         | 8 = E0       | 9 = E1       |  |
| Sensor 4                    |                         | 17 = E0      | 18 = E1      |  |
| Input ext. acknowledgem.    | 1, 10 pot.-free contact |              |              |  |

If the alarm is on, the horn can be turned off by pressing the *Quit* button. Further alarm messages turn the horn again. The collective interference lamp cannot be turned off with the *Quit* button until there are no more alarm messages left. The alarm can be acknowledged externally also by means of a potential-free contact.

OAA-500-... Optical and Acoustic Warning Device (Fig. 11, 12):

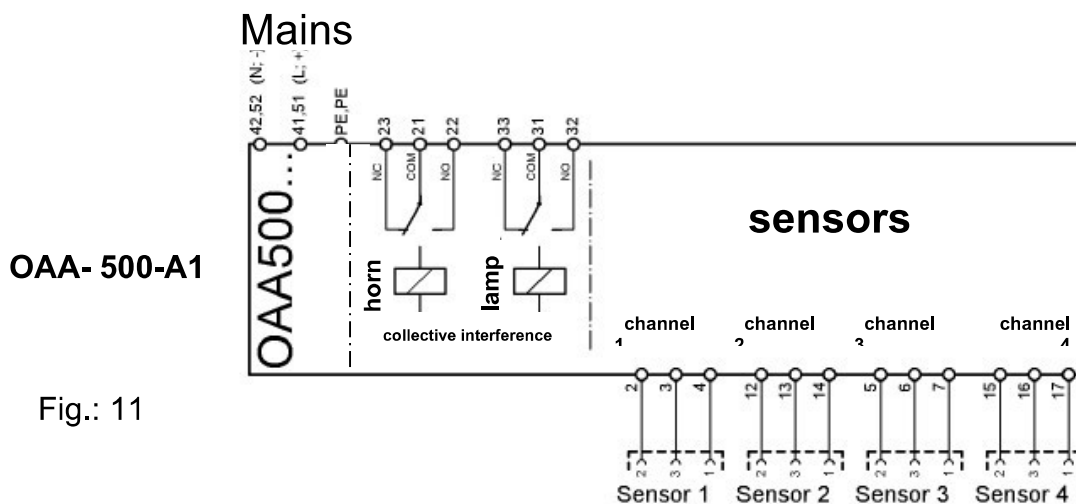


Fig.: 11

| Terminal assignment OAA-500-A1 |                            |                     |                  |
|--------------------------------|----------------------------|---------------------|------------------|
| The mains connection           | PE                         | 41, 51 = L ( + )    | 42, 52 = N ( - ) |
| Output relay lamp              | 31 = COM                   | 32 = NO             | 33 = NC          |
| Output relay horn              | 21 = COM                   | 22 = NO             | 23 = NC          |
|                                |                            |                     |                  |
| Sensor 1                       | 2 = + 12 VDC               | 3 = Input (12 VDC)  | 4 = GND ( - )    |
| Sensor 2                       | 12 = + 12 VDC              | 13 = Input (12 VDC) | 14 = GND ( - )   |
| Sensor 3                       | 5 = + 12 VDC               | 6 = Input (12 VDC)  | 7 = GND ( - )    |
| Sensor 4                       | 15 = + 12 VDC              | 16 = Input (12 VDC) | 17 = GND ( - )   |
| Input ext. acknowledgem.       | 1, 11 pot.-free NO-contact |                     |                  |

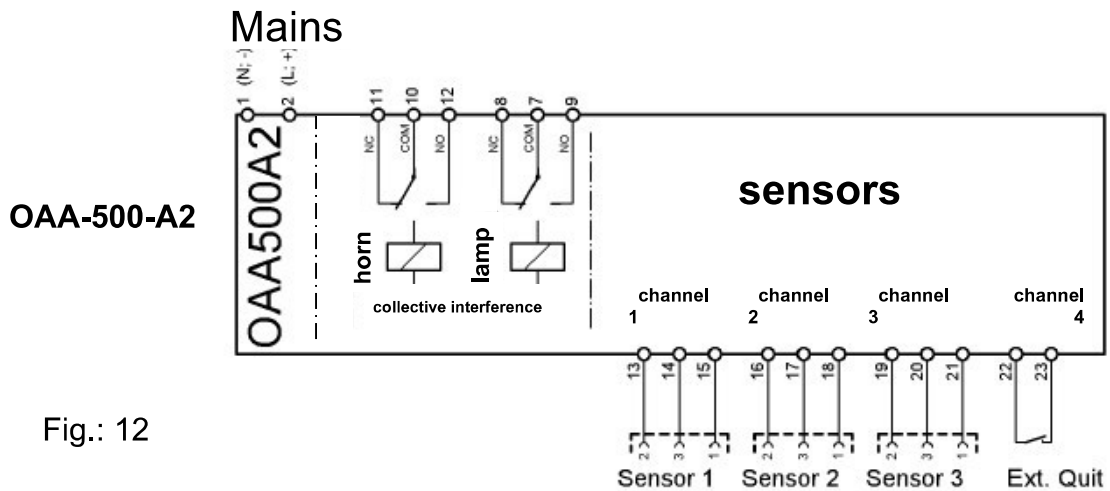


Fig.: 12

**Terminal assignment OAA-500-A2**

|                                 |                             |                     |                |
|---------------------------------|-----------------------------|---------------------|----------------|
| <b>The mains connection</b>     |                             | 2 = L ( + )         | 1 = N ( - )    |
| <b>Output relay lamp</b>        | 7 = COM                     | 9 = NO              | 8 = NC         |
| <b>Output relay horn</b>        | 10 = COM                    | 12 = NO             | 11 = NC        |
|                                 |                             |                     |                |
| <b>Sensor 1</b>                 | 13 = + 12 VDC               | 14 = Input (12 VDC) | 15 = GND ( - ) |
| <b>Sensor 2</b>                 | 16 = + 12 VDC               | 17 = Input (12 VDC) | 18 = GND ( - ) |
| <b>Sensor 3</b>                 | 19 = + 12 VDC               | 20 = Input (12 VDC) | 21 = GND ( - ) |
| <b>Input ext. acknowledgem.</b> | 22, 23 pot.-free NO-contact |                     |                |

## 6. Setting information

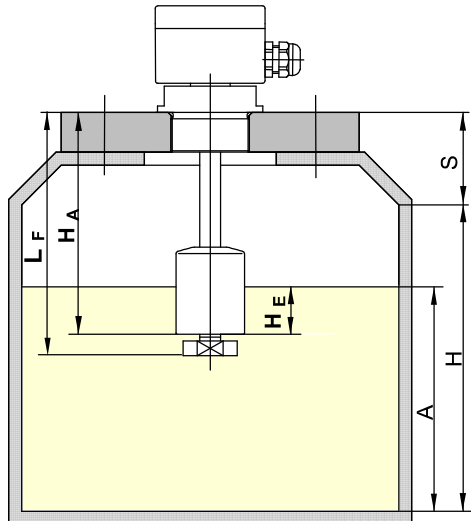


Diagram to determine the response length  $H_A$

Corresponding with the permissible container filling degree, and with the help of the approval principles for overfull cut-out devices, ( German ZG-ÜS) the liquid level, which corresponds with the response level of the overfull cut-out device, must be determined. The tailing quantity as well as the switching resp. closing delay times must be taken into consideration here.

The response length of the level switch can be determined as follows from these:

$$H_A = (H - A) + S + H_E$$

- $H_A$  = Response length
- $H$  = Container height
- $A$  = Response height
- $S$  = Nozzle, resp., flange height above the container
- $H_E$  = Immersion depth of the float  
(see diagram page 15)

fixed version

$$L_F = (H + S) - A + H_E + 20 \text{ mm}$$

adjustable version

$$L_F \geq (H + S) - A + H_E + 70 \text{ mm}$$

The response length  $H_A$  is fixed in the plant according to customer requirements and must be determined before placing the order. Level switches with adjustable screw-in part allow subsequent re-adjustment to a certain degree on site.

## 7. Operating instructions

When used as intended, the overfull cut-out device, consisting of the level switch T-20\_.F... and the measuring transducer (2) KR-16..., KR-26..., XR..., OAA 100..., OAA 200..., OAA 300..., OAA 500... or the level switch T-20\_.FR...(1,2) (ET-5... or float – magnetic switch) works maintenance-free. The system parts of the overfull cut-out device must have indicating, resp. control devices connected downstream. The output contacts are used for this purpose.

Before the set-to-work, all equipment parts of the overfull cut-out device must be checked for correct connection and function.

The general Operating Instructions of the used equipment must be observed.

## 8. Recurrent inspection

The good working order of the overfull cut-out device must be checked in appropriate periods but at least once a year. It is the responsibility of the operator to select the type of inspection and the intervals in the stated time frame.

The inspection test must be conducted so that the faultless functioning of the overfull cut-out device in cooperation with all components is proven. This is guaranteed during approach of the response height within the scope of a filling process. If a filling up to the response height is not practical, the level switch must be brought to respond with a suitable simulation of the filling level or the physical measuring effect. If the good working order of the level switch/measuring transducers can be identified in another manner (exclusion of function-inhibiting errors), the inspection test can also be conducted by simulating the corresponding output signal. Further information about the inspection test methods can be found, e.g. the guideline VDI/VDE 2180, sheet 4.