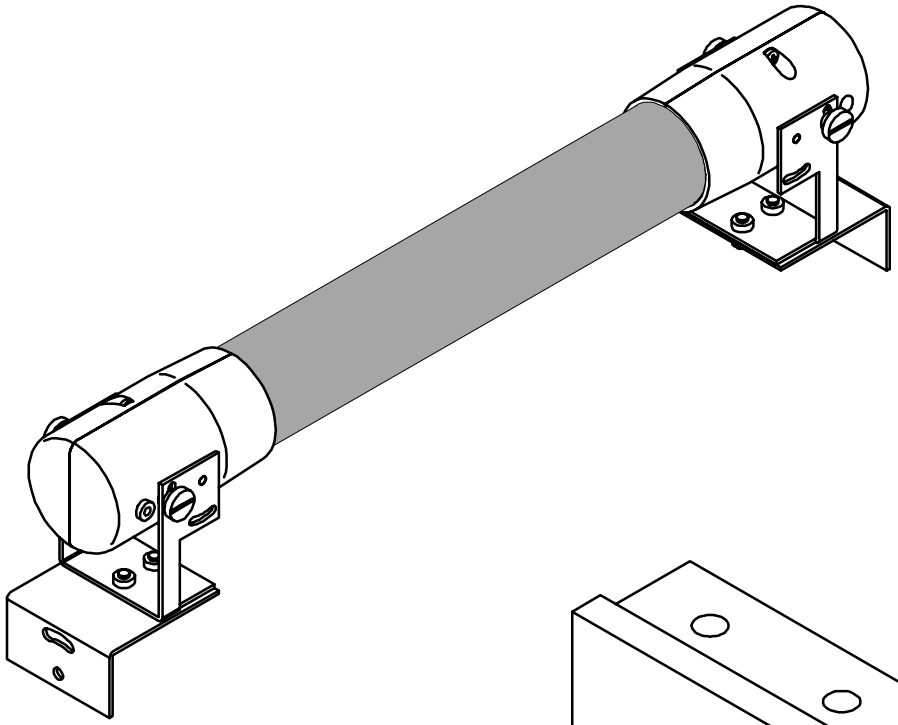
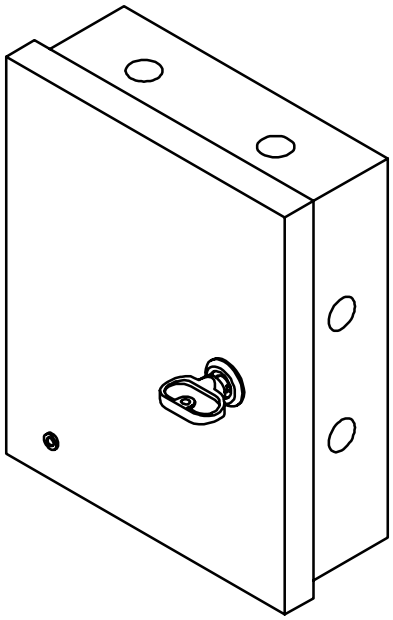
PRODUCT INFORMATION PI - 34.82a

Linear Smoke Detector FIRERAY 2000





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ST - FIR/ PRM1/ deh

Table of Contents

1. Product Description

The Fireray 2000 is a linear optical smoke detector for the detection of white and dark smoke. The detector works on the principle of light obscuration (extinction) by smoke. If smoke obscurs the beam, fewer rays reach the receiver and the infrared signal received is smaller. The attenuation is analyzed and the control unit triggers a fire alarm after a certain period.

The Fireray 2000 smoke detector consists of three components:

- Control unit,
- Infrared transmitter,
- Receiver.

2. Features

VdS Approval No: **G 297,058**

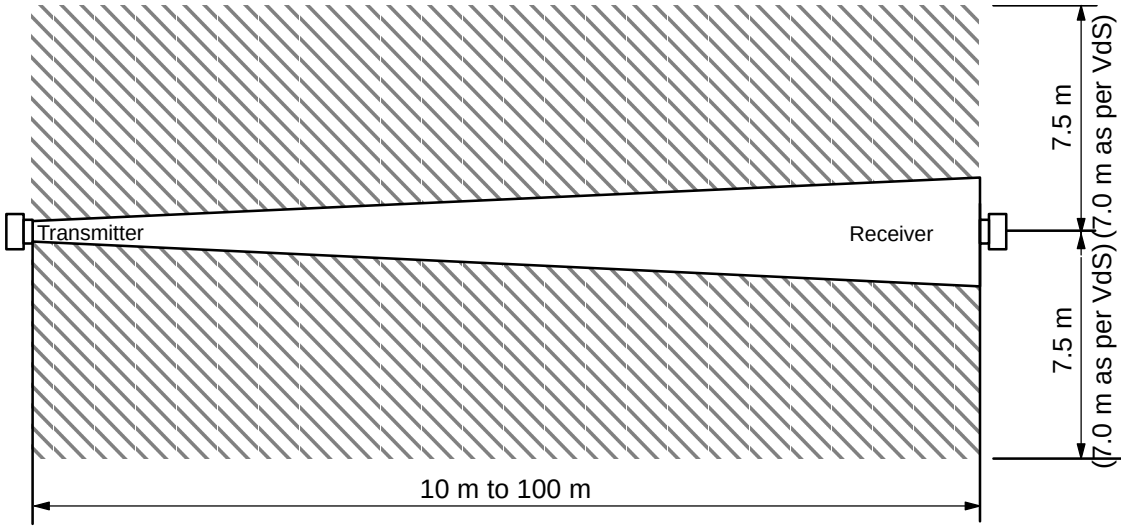
- The detector detects light and dark smoke over a distance of between 10 m and 100 m, with a side detection width of 7.5 m maximum on both sides of the beam central axis (as per VdS 7.0 m maximum on both sides of the beam axis).
- At a mounting height of 16 m, the monitored area is 22,400 m^3 (as per VdS).
- Fewer false alarms due to automatic amplification control
- Trouble display
- Alarm output in the form of a floating normally open, latching relay
- LEDs in the control unit for:
  - Trouble (interruption of beam)
  - Signal HIGH (signal too high)
  - Signal LOW (signal too low)
  - Alarm.
- Manual or automatic reset
- Adjustable thresholds
- Areas of usage:
  - Large high halls such as aircraft hangars, factory halls and similar, where the use of point detectors is not possible.
  - Applications where the IR beam is led through openings in walls. The minimum diameter of the opening must be 20 cm or an opening corresponding to the diameter of the beam.
  - Halls with long shed roofs and line of sight.
  - Non-accessible areas are monitored by the transmitter and receiver being mounted outside and looking into these areas through windows. Normal panes of glass hereby reduce the effective range of the system by about 10% per pane.

3. Planning Notes

So that the detector reacts as early as possible, careful planning and adjustment of the system is very important.

The reaction time of the system depends on the installation location, the amount of smoke produced, the roof construction and ventilation of the air.

- Addition to the guidelines for automatic fire detection systems, planning and installation VdS 2095 2001-03 (05):
  The sideways area of detection on both sides of the beam axis can be:
  - for room heights of up to 6 m: max. 6 m,
  - for room heights above 6 m to max. 12 m: max. 6.5 m,
  - for room heights above 12 m to max. 16 m: max. 7.0 m.
- As per the manufacturer's specifications, the sideways area of detection on both sides of the beam axis are:



Note: Since smoke above the source of a fire does not just rise vertically upwards, but spreads out in a mushroom-like shape (depending on air currents and any air cushions present), the width of the monitoring area is considerably greater than the diameter of the IR beam.

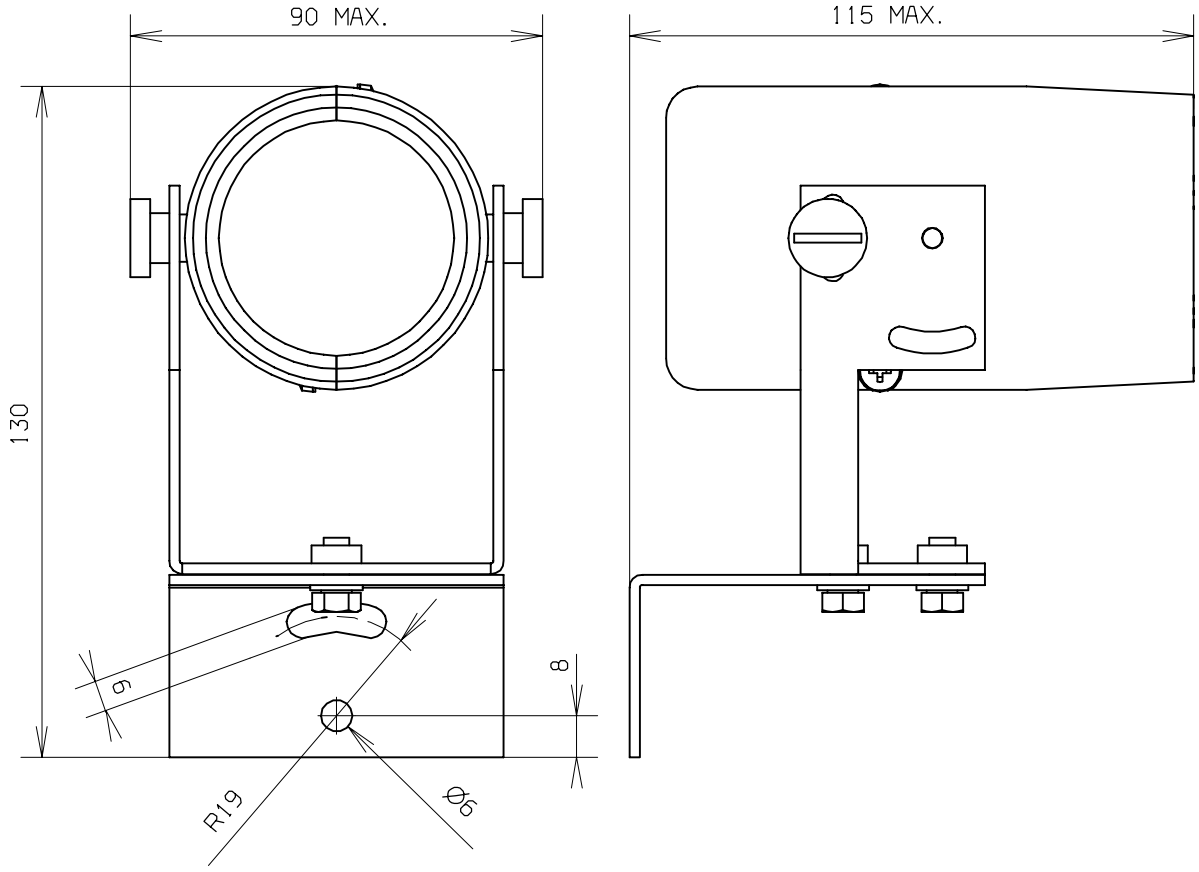
4. Order contents

Product ID	LE*	Designation
4.998.001.940	ST	Linear smoke detector Fireray 2000, consisting of: - Transmitter - Receiver - Control unit - Mounting material - Test filter
4.998.011.479	ST	Reflective prism

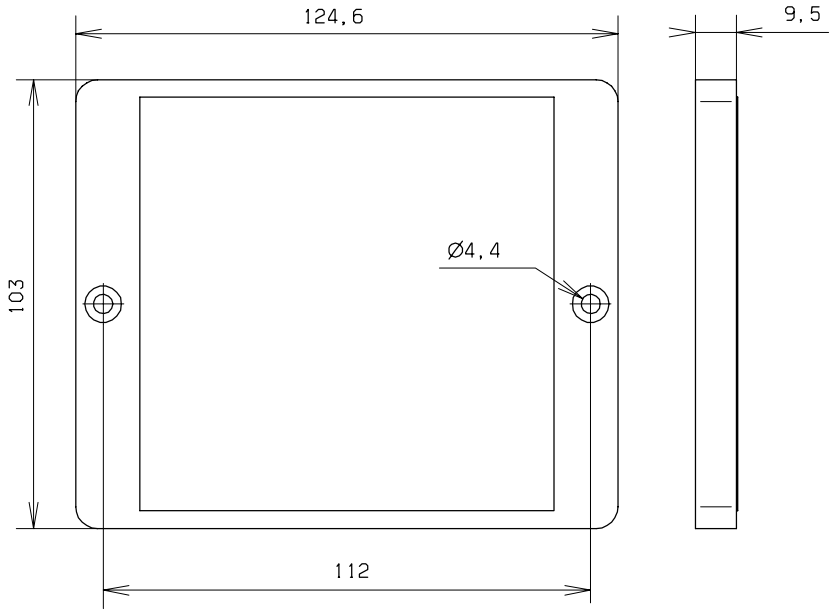
*LE = Delivery unit

5. Device structure

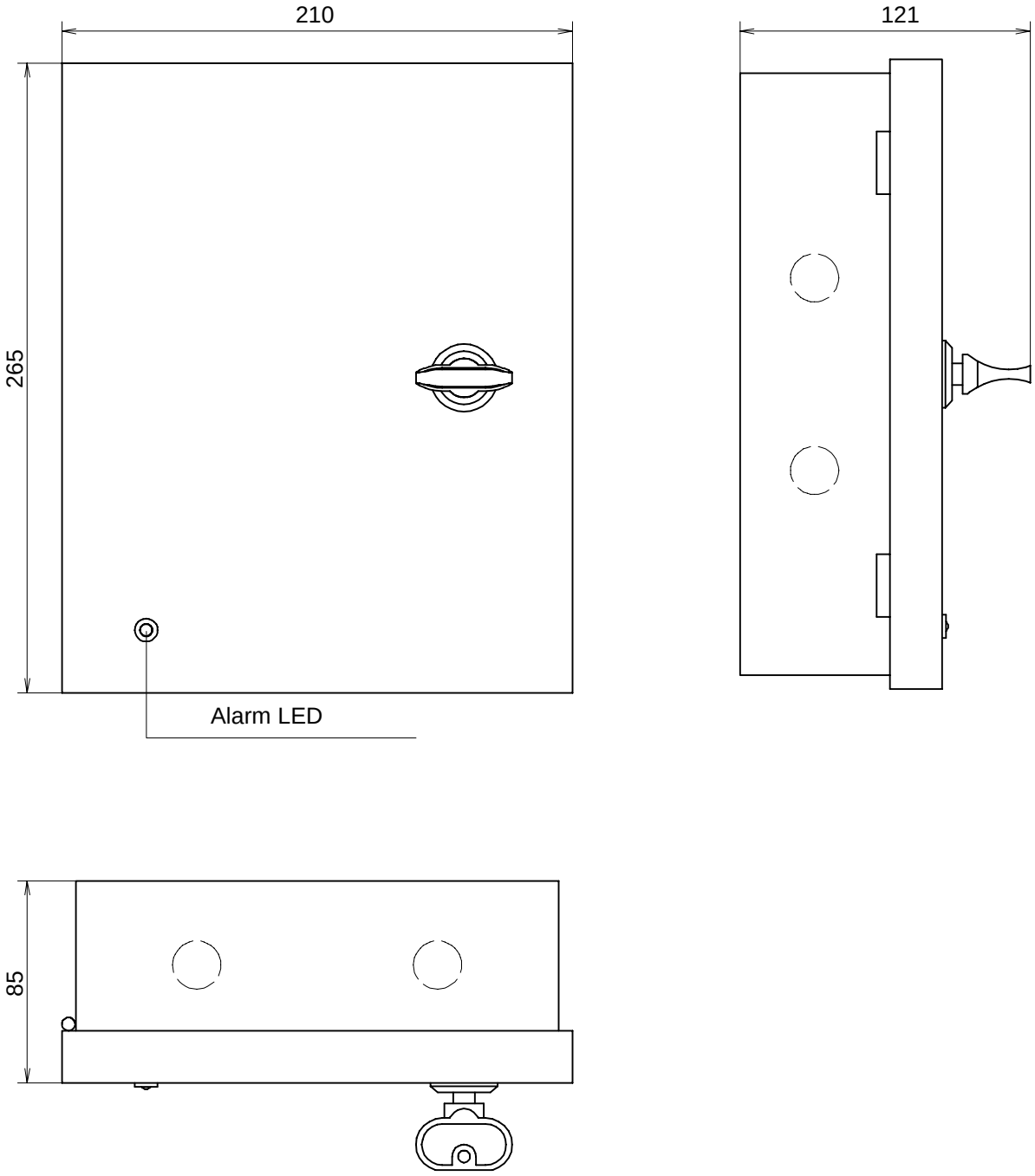
5.1. Transmitter and Receiver



5.2. Reflective prism



5.3. Control unit



6. Functional description

The transmitter sends out an infrared beam of light focused by a lens (880 nm) At a distance of 100 m, the core diameter of the IR beam is 3 m. The core diameter of the ball-shaped IR beam is that area in which trouble-free operation of the system is possible.

The threshold can be adjusted: Setting 25% to 35% for normal applications, 50% for reflected beam function.

If the IR beam received is attenuated by smoke, this signal is analyzed in the control unit. If the attenuation, depending on the threshold set, is a longer than 8 – 10 sec., the control unit triggers a fire alarm.

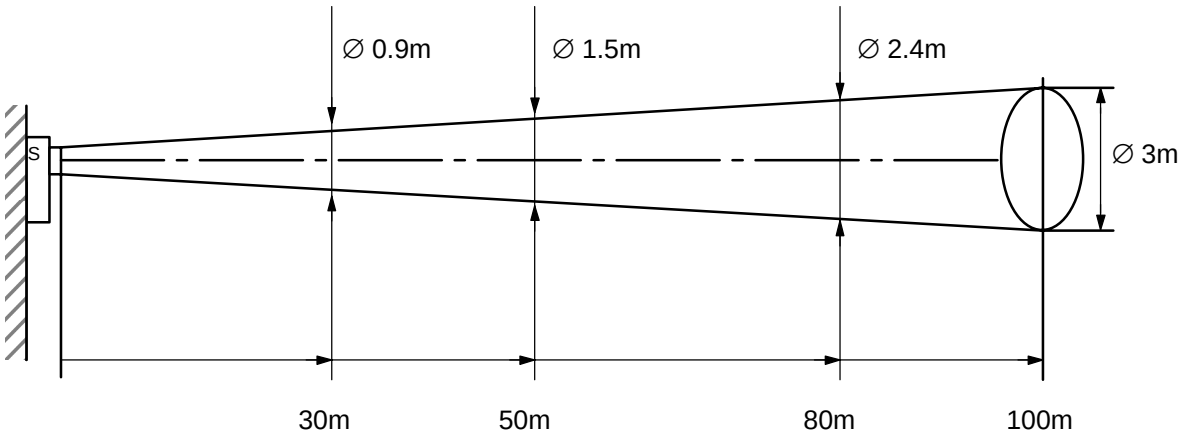
Slow changes in the operating conditions (e.g. aging of the components, contamination of the optic, etc.) do not lead to faulty triggering, but are compensated for by automatic amplification control. The current condition of the system is compared to a preset reference value and adjusted in steps for deviations of more than 7%. As standard, the adjustment takes place every 1.5 hours.

If the transmitter fails, or the IR beam is interrupted for more than 5 sec., the trouble relay is activated. The interruption threshold can be lengthened. In this condition, a fire alarm is not possible.

After remedying the trouble, the detector is automatically reset to the ready condition after 5 sec.

The detector has an alarm output in the form of a floating normally open, latching relay.

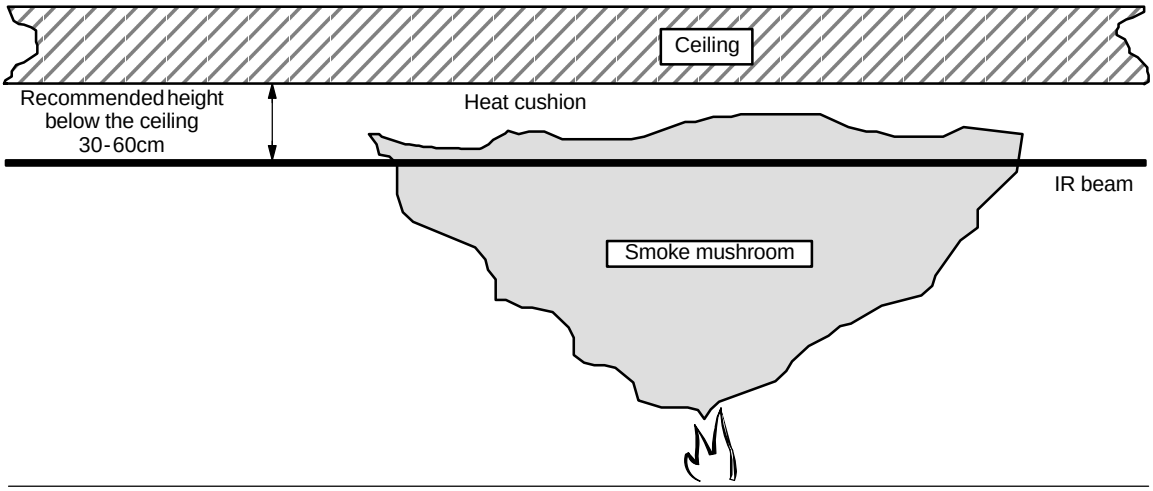
Beam divergence



7. Mounting Tips

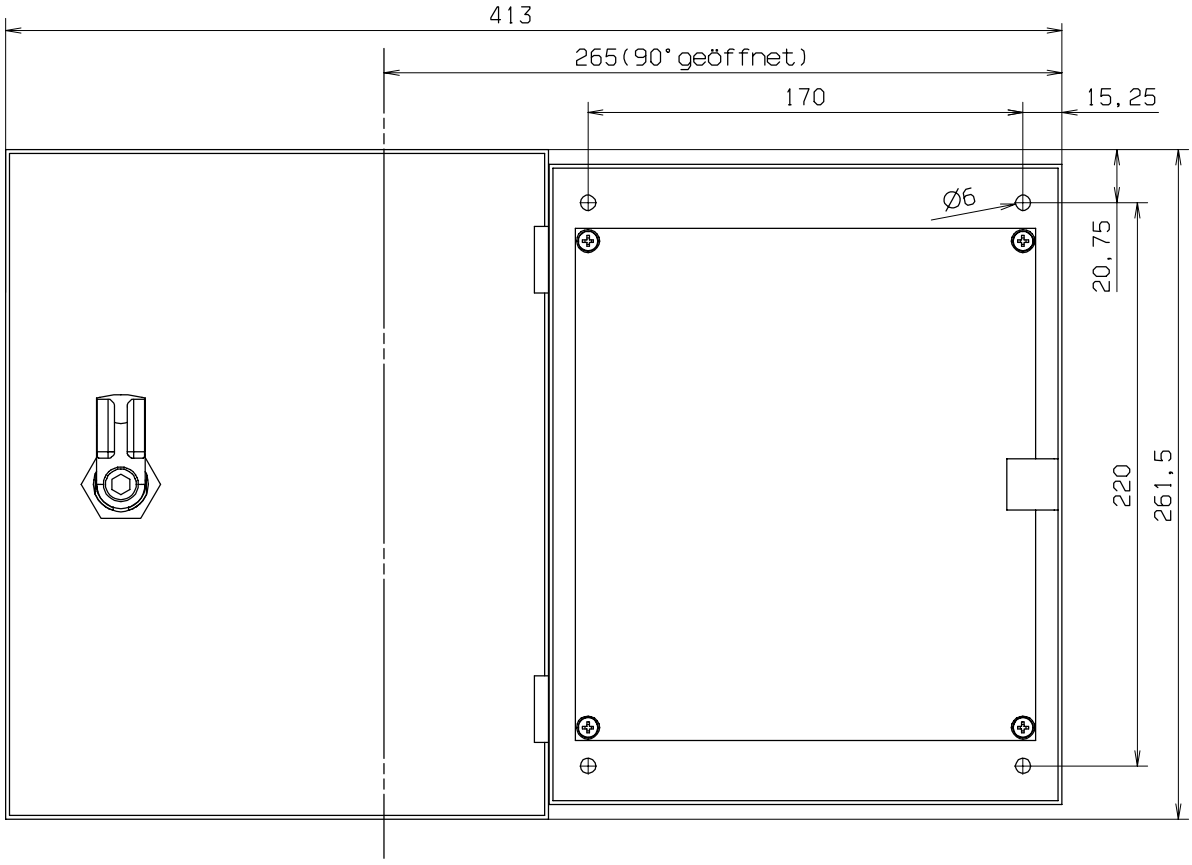
Local guidelines and regulations must be observed in the planning.

- Normally, transmitter and receiver are installed at the same height and pointed towards each other. The relatively wide angle of the IR beam makes adjustments easier and guarantees reliable long-term stability.
- Heat cushions under roof areas may prevent rising smoke from reaching the ceiling. To allow the smoke to come within the recording range of the IR beam, transmitter and receiver must be mounted below the heat cushion. Rough value: 30 to 60 cm below the ceiling!



- If uncertainty on the correct position exists, this must be determined through a smoke test.
- The mounting surfaces for the transmitter and receiver must be stable and free of vibration. Metal supports that may be affected by heat or cold are unsuitable for the installation.
- Under even ceiling surfaces, the smoke must be able to travel the distance between the point directly above the source of the fire and the detection area of the detector. The response time is determined by this distance, the height of the detector been above the source of the fire and the angle of the roof.
- The response time in buildings with saddleback roofs will be longer when the source of the fire is at the edge of the monitoring area.
- A shielded cable must be used to protect against radiated interference. Possible sources of interference are to be avoided when routing cables and the cable must be protected against mechanical damage.
- The receiver must be installed such that direct sunlight or artificial light does not enter the optics. Normal ambient light conditions have no effect on the IR beam and the control.

- The housings for both transmitter and receiver have U-shaped mounting brackets allowing swiveling of +/- 15 degrees in all directions.
- The control unit should be mounted at a high level in an easily accessible area.
- The cable lengths between the control unit and receiver may not exceed 100 m.
- Use shielded cable and avoid proximity to other electric cables.
- The control unit housing is prepared for cable entry from above, from the side or from below.
- An adjustment aid (commercially available special equipment) can be optionally connected to the control unit. Alignment, particularly over larger distances, is considerably simplified with the help of two LED displays.



Prism

The transmitter and receiver can also be mounted directly next to each other on the same side of the building (retro system). In this arrangement, special reflecting prisms are used that reflect the IR beam back through 180 ° to the receiver.

In retro operation, the range is reduced to a maximum of 45 m. The advantage of the retro system lies in its inexpensive mounting (only one installation location) and in the cabling savings, particularly when access to the opposite wall is limited or cabling is not possible.

When mounting, care must be taken that there is a direct line of sight connection between the transmitter and the receiver. Under no circumstances may reflecting objects be found in the vicinity of the beam.

In retro operation, a threshold of 50% (low sensitivity) is recommended.

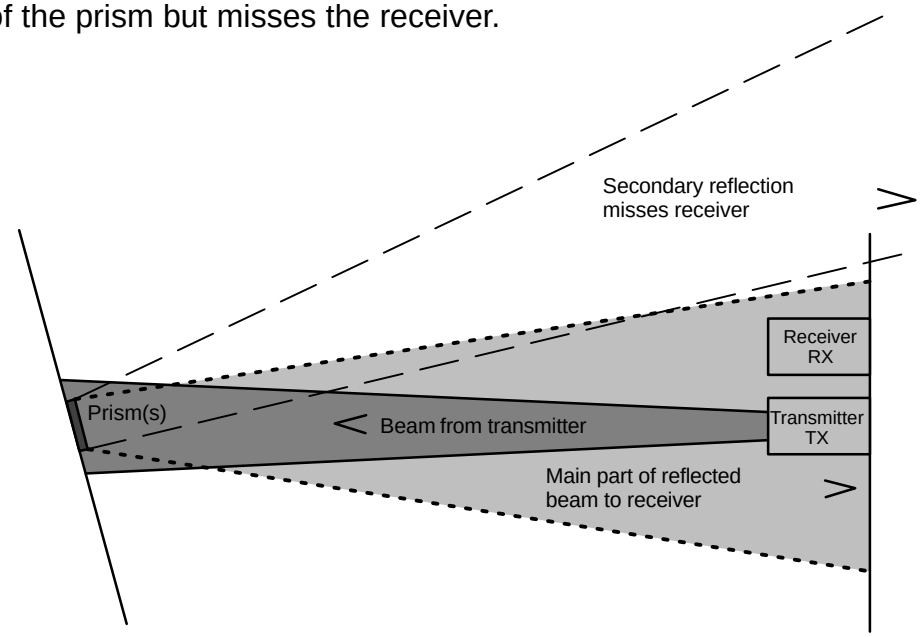
The following limiting values apply (as per VdS)

Retro operation with a range of up to 25 m. 1 prism necessary

Retro operation with a range of up to 45 m. 9 prisms necessary

When installing as a retro system, the transmitter and receiver must be placed as close together as possible. The reflectors are mounted opposite with the surfaces as near as possible at right angles to the beam axis. Deviations mean that the signal is only reflected to the receiver in a weakened form. This can make the use of further reflectors or setting of a stronger beam necessary. It should be noted that additional reflectors are of no benefit when their effective diameter is larger than that of the incoming beam.

Another reflection, known as the secondary reflection, is reflected by the polished front surface of the prism but misses the receiver.



7.1. Positioning the detector

Table 1.: Distances and monitoring areas as per VdS

Room height R_H	D_H	A	Roof angle α	
			$\alpha < 20°$	$\alpha > 20°$
			D_L	D_L
up to 6 m	6 m	1,200 m^2	0.3 m to 0.5 m	0.3 m to 0.5 m
over 6 m to 12 m	6.5 m	1,300 m^2	0.4 m to 0.7 m	0.4 m to 0.7 m
over 12 m to 16 m *)	7 m	1,400 m^2	0.6 m to 0.9 m	0.6 m to 0.9 m

D_H greatest allowable horizontal distance of any point of the ceiling to next beam

A maximum monitoring area per detector (= double the product of the greatest horizontal distance D_H and highest allowable detector/reflector distance)

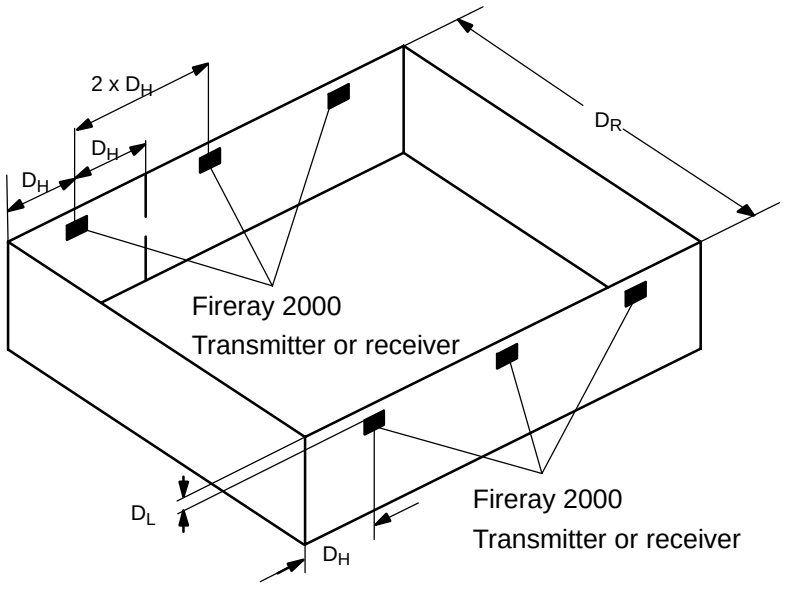
D_L Distance of detector to ceiling

α Angle that the roof/ceiling tilt forms with the horizontal; if a roof has several tilts (e.g. sheds), the smallest tilt counts

*) For a room and height above 12 m, it is recommended to provide a second monitoring level-, with the detectors shifted with regard to the first monitoring level.

Depending on use and environmental conditions (e.g. fast development of fire and smoke)

Positioning detectors on flat ceilings



D_H horizontal distance between detector and wall: 0.5 m to 7.5 m (VdS max. 7.0 m)

2 x D_H Distance between two beams running parallel, max. 15 m (VdS max. 14 m)

D_L Distance to ceiling 0.3 m to 0.9 m

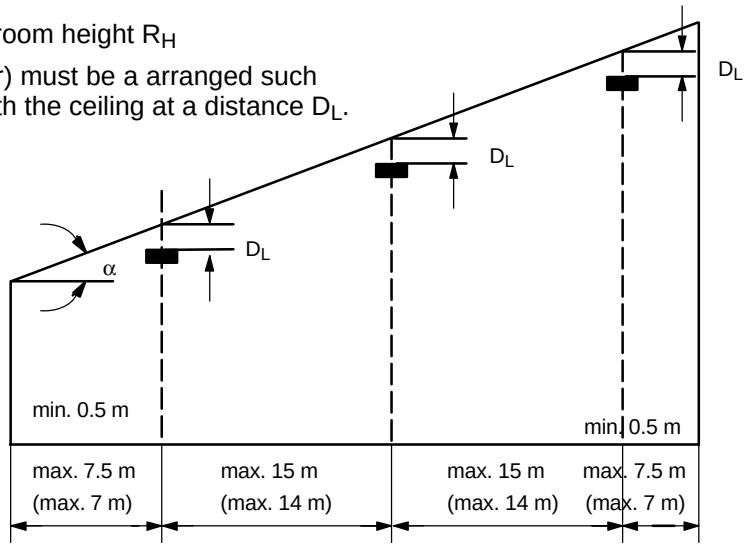
D_R Range = distance between detector and reflector: 10 m - 100 m

D_H and D_L depend on the room height R_H (see table1.).

Positioning the detectors in a tilted roof

Depends on the roof tiltα and the room height R_H

The detectors (transmitter/receiver) must be a arranged such that the light beam runs underneath the ceiling at a distance D_L.



Information in brackets as per VdS

D_H Horizontal distance between detector and wall: 0.5 m to 7.5 m (VdS max. 7.0 m)

2 x D_H Distance between two beams running parallel, max. 15 m (VdS max. 14 m)

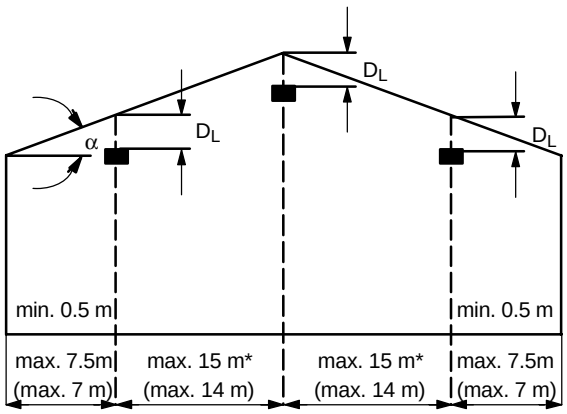
D_L Distance to ceiling 0.3 m to 0.9 m

D_R Range = distance between detector and reflector: 10 m - 100 m

D_H and D_L depend on the room height R_H and roof tilt (see table1.).

Positioning the detectors in a saddleback roof

Depends on the roof tilt α and the room height R_H Arrange receiver such that the light beam runs at distance D_L under the ceiling.



* For the detectors mounted on the ridge, the sideways Detection can be increased by 1% per degree of roof tilt, with, however, a maximum of 25 %.

D_H Horizontal distance between detector and wall: 0.5 m to 7.5 m (VdS max. 7.0 m)

2 x D_H Distance between two parallel beams maximum 15.75 m (VdS max. 14 m)

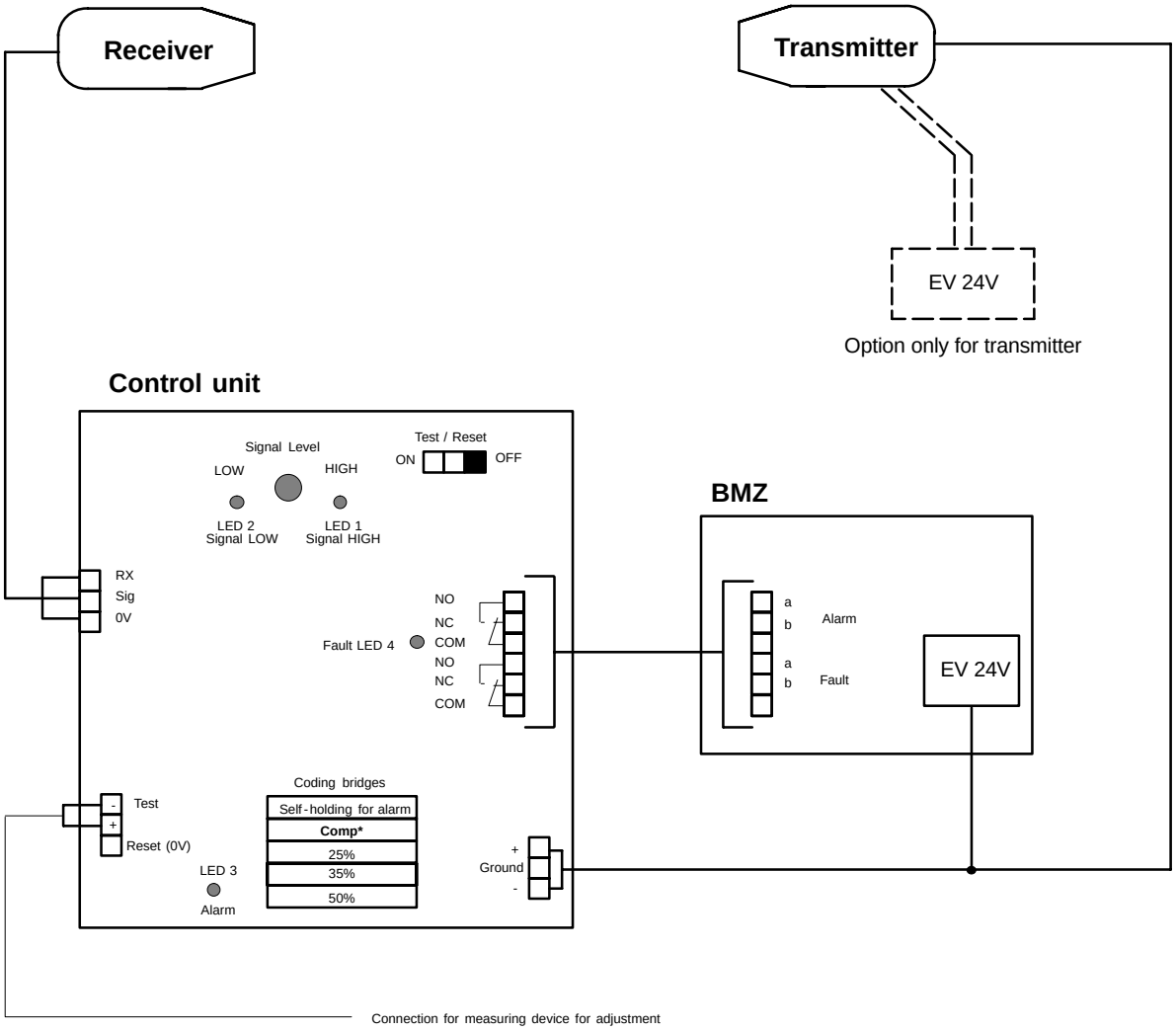
D_L Distance to ceiling 0.3 m to 0.9 m

D_R Range = distance between detector and reflector: 10 m - 100 m

D_H and D_L depend on the room height R_H and roof tilt (see table1.).

Depending on local statutes and regulations, different distances may be mandatory or permissible.

7.2. Connection



Bridge	Bridge open	Bridge closed
SW6	automatic reset	Alarm storage until reset
SW4	Comp*****	Sensitivity control as per VdS
SW3	Attenuation 25%	up to 30 m distance; transmitter⇔receiver
SW2	Attenuation 35%	30 -100 m distance; transmitter⇔receiver
SW1	Attenuation 50%	Recommended when used as a reflection smoke detection system

*** Note:** When the readjustment limit is reached, 2 operating conditions can be selected:

1: Switch open: When the last readjustment level is reached, the trouble relay triggers, if the level sinks further to under the alarm threshold, the alarm relay triggers.

2: Switch closed: When the last readjustment level is reached, the trouble relay triggers, the alarm relay is deactivated (for systems as per VdS).

7.3. Setting transmit power

The transmit power or range of the transmitter is set with a potentiometer located on the transmitter housing and covered by a white plastic plug.

For ranges greater than 30 m and also for retro operation, the potentiometer should be turned to the counter-clockwise end stop (maximum). The fully clockwise end stop corresponds to 10 m.

8. Notes on maintenance and service

For maintenance and inspection work on security systems, in Germany the regulations of DIN VDE 0833 apply, which refer to the maintenance interval as per the manufacturer's instructions.

- Bosch ST recommends a functional and visual inspection at least once a year.
- Maintenance and inspection work should be carried out regularly and by trained personnel.

8.1. Repair

In the event of a defect, the entire unit is exchanged.

8.2. Disposal

Unusable units should be disposed of in accordance with regulations.

8.3. Additional Documentation

For those with access rights, the Bosch ST ExtraNet at
www.boschsecurity.com/emea/fire
contains the most up-to-date product information and the installation manual supplied with the device can be downloaded in PDF format.

9. Technical Data

Operating voltage		11.5 V DC . . . 28 V DC
Transmitter current consumption		6 mA
Control unit current consumption (including receiver) - Standby - Alarm		 8 mA 16 mA
Optical wavelength		880 nm
Permissible operating temperature		-20 °C . . . +55 °C
Permissible distance between transmitter and receiver		min. 10 m ... max. 100 m
Permissible distance in retro system - with one prism - with 9 prisms		 min. 2 m ... max. 25 m 25 m ... max. 45 m
Adjustment range of mounting bracket		+/- 15° (vertial) +/- 90° (horizontal)
Protection class (transmitter, receiver and control unit)		IP 50
Dimensions (W x H x D)	- Transmitter/receiver - Control unit	60 mm ∅ x 102 mm 265 x 210 x 85 mm
Weight	- Transmitter/receiver - Control unit	Approx. 0.5 kg Approx. 2.1 kg
Housing material	- Transmitter/receiver - Control unit	MAZAK Alloy Aluminum Steel plate
Housing color		white, RAL 9010
VdS approval No		**G 297,058**

10. Table of Abbreviations

BMZ	=	**F**ire **detection** control unit
DIN	=	**G**erman **I**nstitute for **S**tandardization
EN	=	**E**uropean **S**tandard
ISO	=	**I**nternational **S**tandardizing **O**rganization
LED	=	**L**ight **E**mitting **D**iode
PI	=	**P**roduct**i**nformation
uP	=	**u**nter **P**utz (concealed)
VDE	=	**A**ssociation of **G**erman **E**lectrical Engineers
VdS	=	VdS Schadenverhütung GmbH

Bosch Security Systems
130 Perinton Parkway
Fairport, New York, 14450,
USA

Info-Service
Phone: +1 (585) 223 - 4060
Fax: +1 (585) 223 - 9180

www.boschsecurity.us
security.sales@us.bosch.com