Linear Heat Detector

FCS-LWM-1

BOSCH

en Installation note

Table of Contents

1	**Safety Instructions**	**4**
2	**Short Information**	**4**
3	**System Overview**	**5**
4	**Installation**	**6**
4.1	Linear Installation	6
4.2	Area Installation	7
4.3	Installation in Ex-zones	10
5	**Connection**	**10**
5.1	Connecting Sensor Cables	10
5.2	Connecting the Control Unit to the Fire Panel	12
5.3	Wiring Diagram	12
6	**Configuration**	**13**
6.1	Switch Positions	14
6.2	Setting the Response Temperature (MAX ALARM)	14
6.3	Setting the Response Temperature Dependent on Time (DIFF ALARM/DIFF TIME)	16
7	**Technical Data**	**18**
7.1	Electrics	18
7.2	Mechanics	18

1 Safety Instructions

CAUTION!
Product components can become damaged by electrostatic discharge.
Wear a grounding wrist strap if you are working on the open PCB.

CAUTION!
Do not connect the grounding drain wire to grounding clips 3–4, because connection to the grounding drain wire will raise a fault message to the BZ 500 and UEZ 2000 fire panels.

NOTICE!
The FCS-LWM-1 Heat Detector is intended for use with the DIN EN 54-5:2000 response grades A1, A2, B, and C.

NOTICE!
The FCS-LWM-1 Heat Detector can be used in explosive zones 1, 2, 21, and 22. For notes on installation in ex-zones, see *Page 10*.

NOTICE!
The maximum monitoring height is 7.5 m. For rooms with higher ceilings a special VdS authorization is required.

NOTICE!
Have maintenance and installation work carried out regularly by trained, qualified personnel only. Bosch Security Systems recommends a functional and visual inspection once a year.

NOTICE!
Unusable electronic devices may not be disposed of with the household garbage, but rather in accordance with the applicable regulations and directives (e.g. WEEE).

2 Short Information

FCS-LWM-1 is a linear heat detector for detecting fire. It is suitable for use in constricted spaces and under extreme environmental conditions. The control unit reports temperature differences by monitoring the resistance in the sensor cable. If the temperature rises, the electrical resistance falls and the control unit outputs an alarm message depending on the response temperature.
The response temperature for the MAX ALARM is set using a 16-position switch. If the response temperature is exceeded, an alarm message is output. The differential alarm threshold for the DIFF ALARM is set using two 16-position switches

– DIFF TIME and
– DIFF ALARM.

Located on the control unit are four LEDs, which display the status. The green LED signals normal mode, the yellow LED a fault and the two red LEDs signal MAX ALARM and DIFF ALARM.

The control unit features three keys. The two test keys TEST FAULT and TEST ALARM can be used to test the system for fault or alarm. The RESET key restores the system to its original status.

3 System Overview

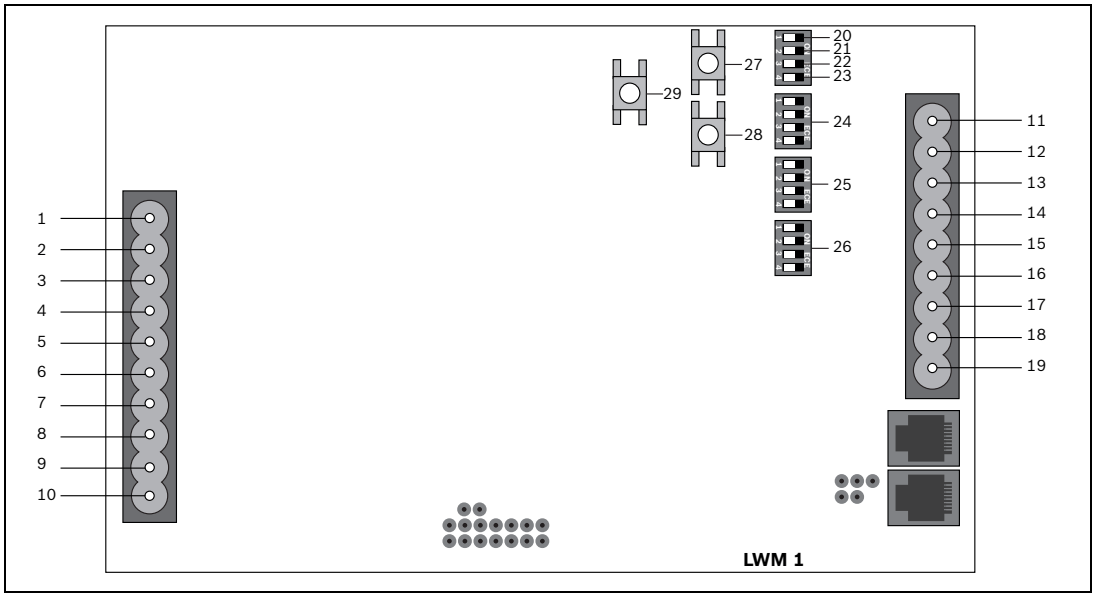


Figure 3.1

No.	Designation	Assignment
1	PWR-	Supply voltage
2	IN+	Supply voltage
3+4	⏚	Grounding clamps (not used)
5	SENSOR OR	Orange sensor cable
6	SENSOR WH	White sensor cable
7	SENSOR BL	Blue sensor cable
8	SENSOR RD	Red sensor cable
9	EXT. RESET	External reset input
10	EXT. RESET	External reset input
11	FAULT NO	Fault relay, normally open
12	FAULT CM	Fault relay, contact made
13	FAULT NC	Fault relay, normally closed
14	MAX ALARM NO	MAX ALARM relay, normally open
15	MAX ALARM CM	MAX ALARM relay, contact made
16	MAX ALARM NC	MAX ALARM, normally closed
17	DIFF ALARM NO	DIFF ALARM relay, normally open
18	DIFF ALARM CM	DIFF ALARM relay, contact made
19	DIFF ALARM NC	DIFF ALARM relay, normally closed
20+21	Unused	--
22	MAX+DIFF	MAX ALARM or DIFF ALARM actuate both relays
23	ISOLATE	Does not transmit fault or alarm messages to fire panel when "ON"
24	DIFF TIME	Calibration switch – time span of increase in temperature
25	DIFF ALARM	Calibration switch – response temperature depending on DIFF TIME

No.	Designation	Assignment
26	MAX ALARM	Calibration switch – response temperature
27	TEST FAULT	System fault test (press button for 2 seconds – triggers after around 20 seconds)
28	TEST ALARM	System test alarm
29	RESET	Restores the control unit to its original status

4 Installation

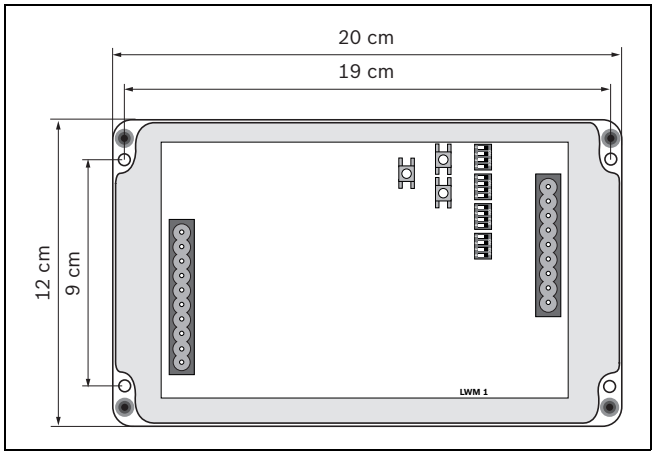


Figure 4.1 Installation

CAUTION!
Installation at temperatures below 0 °C can cause the cable jacket to break. For this reason, install the cable at temperatures above 0 °C and respect the minimum bending radius of 2.5 cm.

4.1 Linear Installation

This installation method is generally used to protect long drawn-out objects, which may take various forms:

– Installation in immediate vicinity of conveyor belts
– Installation in cable shafts

Conveyor Belts

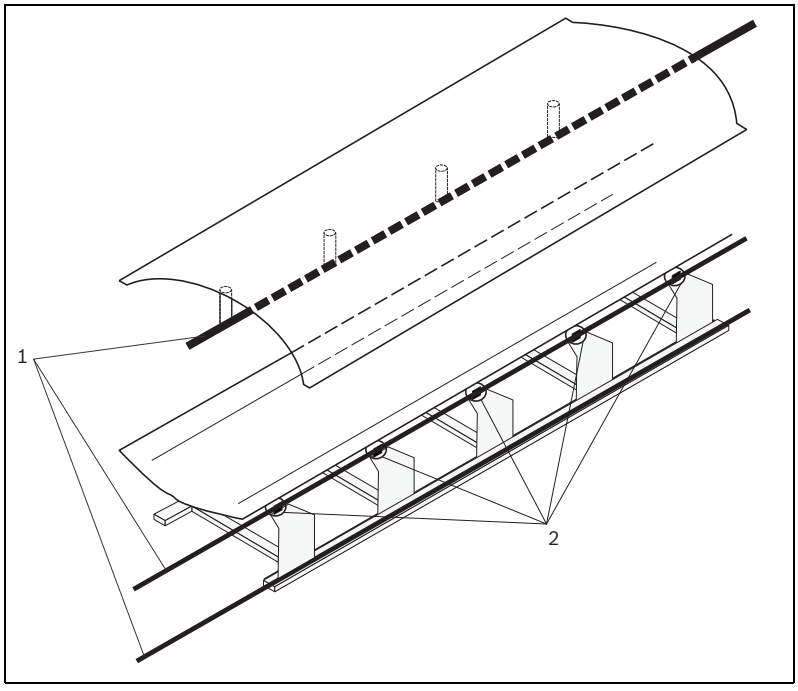


Figure 4.2 Installation in immediate vicinity of conveyor belts

1	Sensor cable
2	Fastening the sensor cable pads

In this case, a sensor cable for monitoring products in transport is installed immediately above the conveyor belt. The distance between conveyor belt and sensor cable must not exceed 2 m. Two further sensor cables are installed to the left and right of the rollers to monitor products falling from the conveyor belt.

Cable Shaft

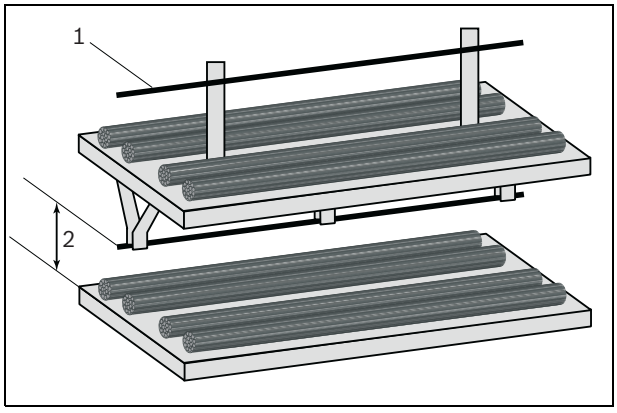


Figure 4.3 Installation in cable shaft

1	Sensor cable
2	Sensor cable distance 15–20 cm

The sensor cable is installed at a distance of approx. 15 to 20 cm above the cable platforms. This means that if the monitored cables overheat, the heat will be effectively transferred to the sensor cable.

4.2 Area Installation

Room monitoring makes use of the area installation method.

Typical applications include:

- Composting plants
- Waste deposit sites
- Special applications, e.g. underground garages (in the event that point-type detectors cannot be used due to climatic conditions)

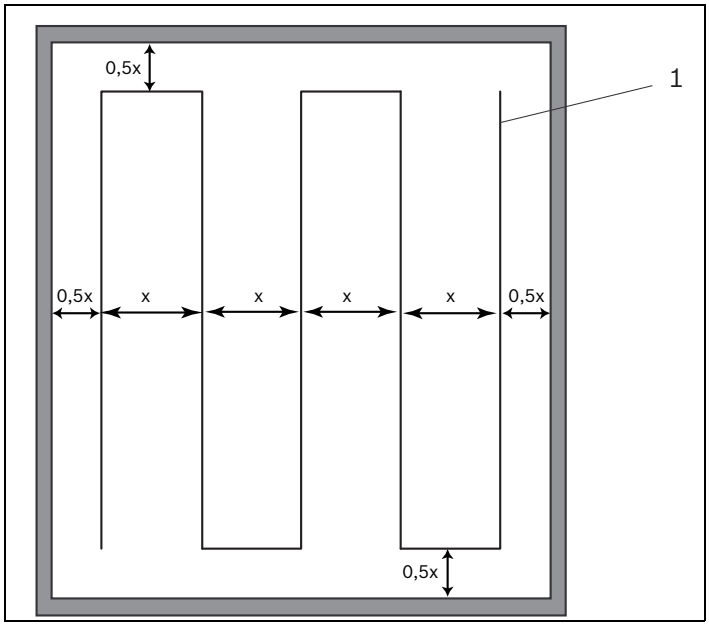


Figure 4.4 Installing cables on room ceilings

1	Sensor cable

When the sensor cable is installed on room ceilings, distance x must not exceed 6 m. If a shorter distance is selected, the distance between the sensor cable and the wall must always be between 0.5 m and 1.5 m. The sensor cable is fastened to the ceiling at 0.5 m intervals, the minimum distance to the ceiling being 1 cm. The ceiling height of the room to be protected must be no more than 7.5 m.

Installation on Ceiling Joists

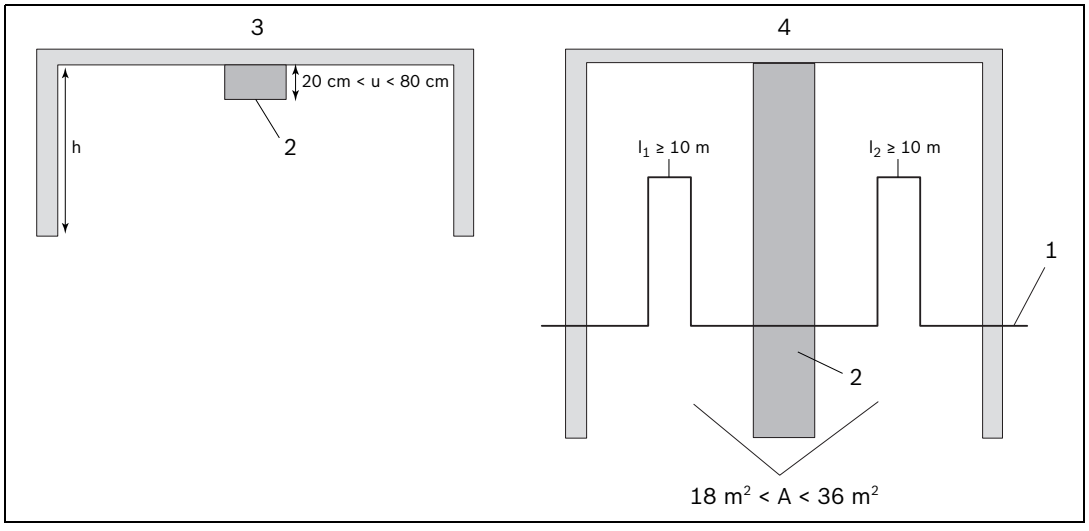


Figure 4.5 Installation on ceilings with joists

1	Sensor cable
2	Joist

3	Front view
4	Plan view

As a rule, ceiling joists with a height of ≥ 20 cm are calculated as walls, i.e. the distance from sensor cable to joist must be between 1.5 m und 3 m. With ceiling panels measuring less than 3 m in width, it may be difficult to respect these distances. In these cases, therefore, care must be taken to ensure that the sensor cable is installed in the centre of the ceiling panel.

NOTICE!
For optimal safety it is recommended in this case that a sensor cable of a length of at least 10 m is installed in both ceiling panels.

For joists with a height of between 20 cm and 80 cm and where the total ceiling area is a maximum of 18 m^2, the sensor cable must be a minimum of 10 m in length. For joists with a height of between 20 cm and 80 cm and a total area of between 18 m^2 and 36 m^2 the sensor cable is split over the two ceiling panels, so that a cable measuring at least 10 m is installed on each ceiling panel.

4.3 Installation in Ex-zones

The FCS-LWM-1 Heat Detector is designed to monitor ex-zones 1, 2, 21, and 22. With this type of installation, safety barriers must be installed between the sensor cables and the control unit (e.g. MTL 7761 AC from Neuss Measurement Technology) to ensure the safety of the system itself.
It is necessary to have two safety barriers per sensor cable. The safety barriers must be situated in a separate housing outside of the Ex-area and close to the control unit.

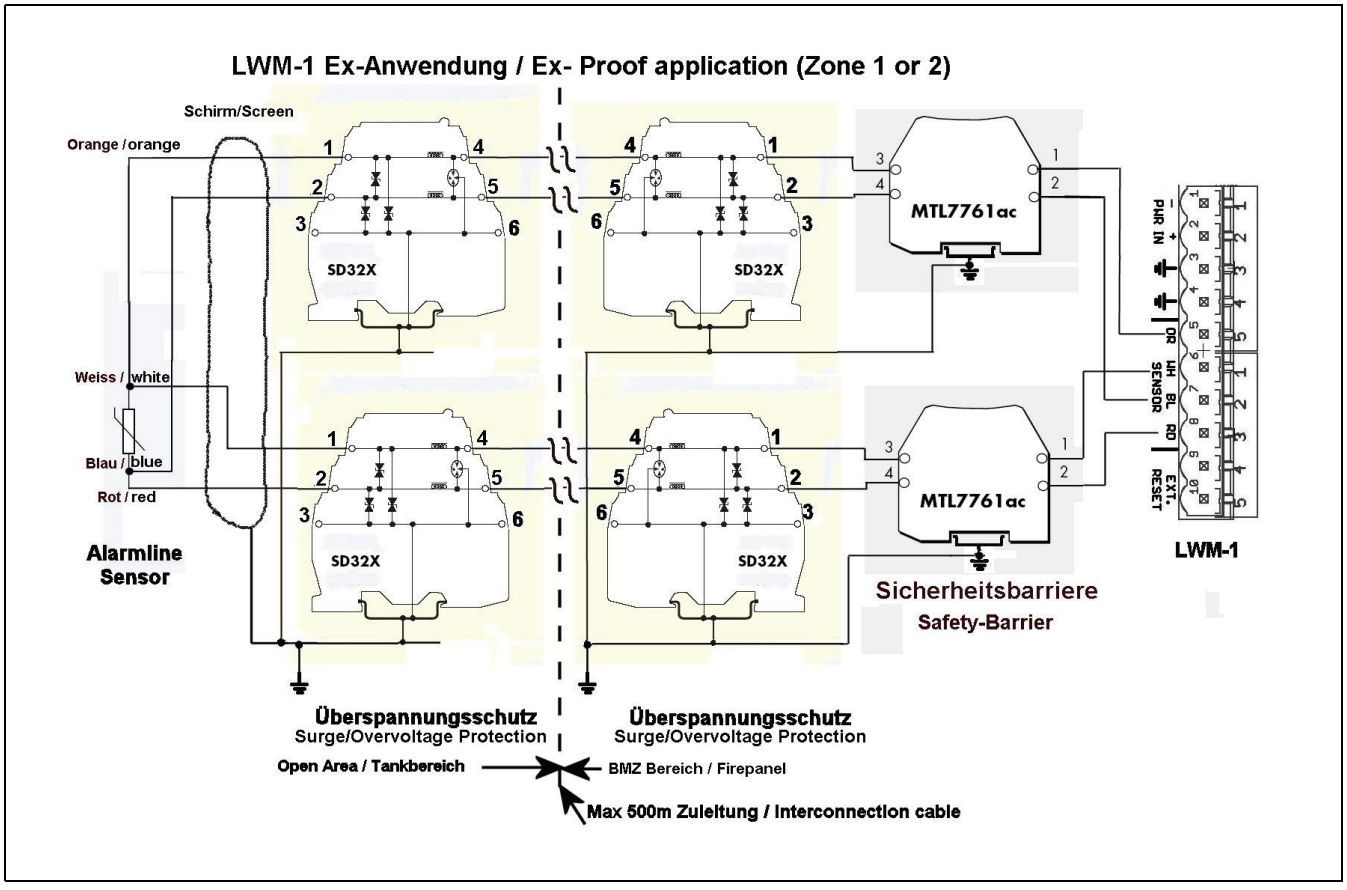


Figure 4.6

5 Connection

5.1 Connecting Sensor Cables

Cable End Connection

CAUTION!
Do not heat the sensor cable at selected points using a hot air blower. The cable has thermal conductive properties that can be lost if it is physically deformed.

NOTICE!
Intermediate connectors and end connectors are available from Bosch Security Systems.

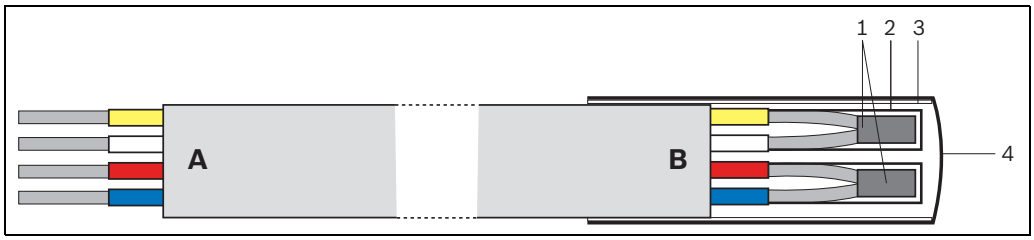


Figure 5.1 Cable end connection

1	Soldered connections
2	Small heat-shrinkable tubes
3	White heat-shrinkable tube
4	Black end cap

Sensor cable ends A and B:

1. Strip both cable ends by 15 mm.
2. Now strip the four wires by approx. 10 mm on every side. Remove the coatings from the orange and red wires.

Sensor cable end A:

3. Attach the four wires from cable end A to the control unit according to the colors of terminals 5 to 8.

Sensor cable end B:

4. Twist the white and orange wires together and solder.
5. Twist the blue and red wires together and solder.
6. Insulate the soldered connections with the small heat-shrinkable tubes and shrink on.
7. Push the white heat-shrinkable tube and then the black end cap over all four wire ends and shrink again.

Intermediate Connections

To connect and seal the ends of two sensor-cable sections, create an intermediate connection, as follows:

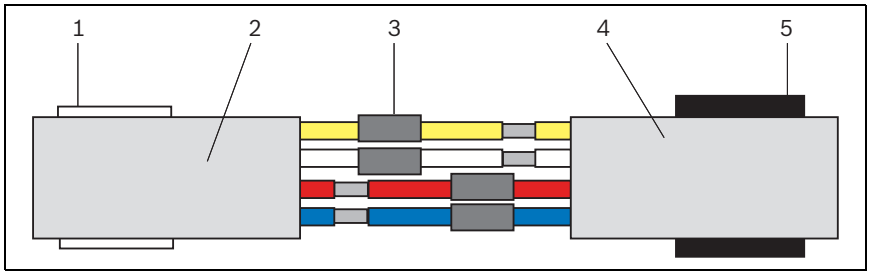


Figure 5.2

1	White heat-shrinkable tube
2	Sensor cable A
3	Small heat-shrinkable tube
4	Sensor cable B
5	Black heat-shrinkable tube

1. Strip the two sensor cable ends by approx. 50 mm. Do not damage the insulation around the four wires in the process.
2. Sensor cable end A: shorten the red and blue wires to 15 mm.
3. Sensor cable end B: shorten the orange and white wires to 15 mm.
4. Remove approx. 8 mm of insulation from all wire ends.
5. Push the white heat-shrinkable tube over sensor cable end A.
6. Push the black heat-shrinkable tube over sensor cable end B.

Sensor cable end A:

7. Push a small heat-shrinkable tube over the orange wire and one over the white.

Sensor cable end B:

8. Push a small heat-shrinkable tube over the red wire and one over the blue.
9. Twist the wire at sensor cable end A with the wire at sensor cable end B and solder. Only solder together wires of the same color.
10. Push the small heat-shrinkable tube over the soldered connection and shrink on.
11. Push the white heat-shrinkable tube over all connections and shrink on.
12. Now push the black heat-shrinkable tube over all connections and shrink again.

5.2 Connecting the Control Unit to the Fire Panel

NOTICE!
To connect the MPA parallel detector screen and to trigger an alarm to MAX ALARM as well as DIFF ALARM, turn DIP switch 22 to ON and connect the MPA to potential-free contacts 17–19.

To transfer alarm and fault messages to the fire panel, use the potential-free contacts 11–19. In normal mode, the fault relay is active and the contact between 11 and 12 is therefore closed.

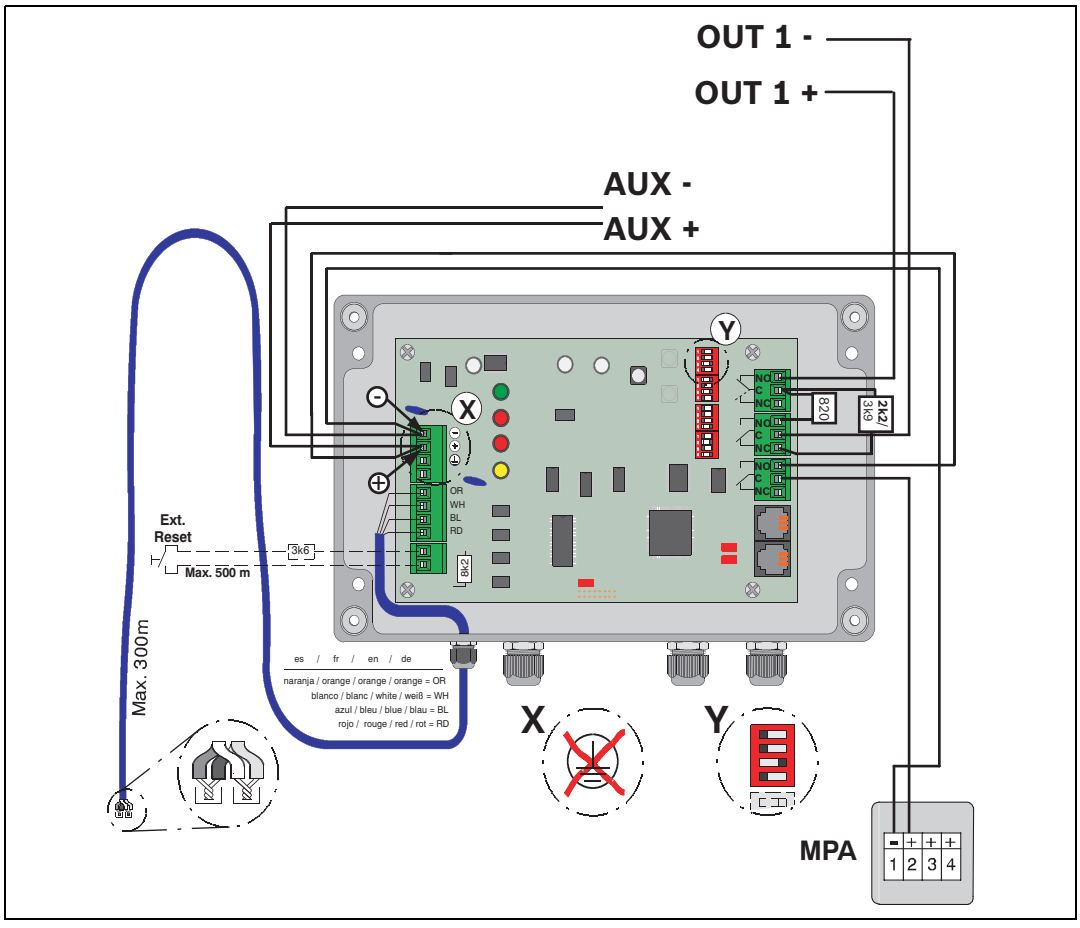
5.3 Wiring Diagram

The FCS-LWM-1 Heat Detector can be connected to a fire panel using the following modules and interfaces:

FLM-420/4-CON-D Conventional interface)

CZM 0004 A 4-Zone Module (from HW10 and SW 1.1.2 only) with the following RPS settings:

- Configurable/further settings:
  - Alarm resistance 820 Ω
  - EOL 2k2 Ω or 3k9 Ω
  - Reset By Aux Power
  - Current consumption 0 mA
  - Line resistance 0 Ω



6 Configuration

NOTICE!

On delivery, the MAX ALARM and DIFF TIME calibration switches are set to the 0 default position and the DIFF ALARM calibration switch to position 15. Switch position 0 causes a fault indication once the control unit is connected.

6.1 Switch Positions

1	2	3	4	Switch position
OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	2
ON	ON	OFF	OFF	3
OFF	OFF	ON	OFF	4
ON	OFF	ON	OFF	5
OFF	ON	ON	OFF	6
ON	ON	ON	OFF	7
OFF	OFF	OFF	ON	8
ON	OFF	OFF	ON	9
OFF	ON	OFF	ON	10
ON	ON	OFF	ON	11
OFF	OFF	ON	ON	12
ON	OFF	ON	ON	13
OFF	ON	ON	ON	14
ON	ON	ON	ON	15

Table 6.1 Calibration switch positions

6.2 Setting the Response Temperature (MAX ALARM)

The MAX ALARM calibration switch sets the response temperature at which an alarm is to be triggered.

The alarm temperature is 10 °C to 12 °C above the maximum ambient temperature.

Application	Max. ambient temperature
Underground installation (excluding road tunnels), underground garage	40 °C
Installation on concrete ceilings and thermally non-conductive materials above ground, out of direct sunlight	45 °C
Installation on insulated steel roof or metal container, out of direct sunlight	50 °C
Installation on non-insulated steel roof or in direct sunlight	60 °C
Road tunnel	50 °C

Table 6.2 Typical application-specific ambient temperatures

The table below shows the positions of the MAX ALARM calibration switch depending on ambient temperature and cable length:

Switch position	Max. ambient temperature [°C]	Length of the sensor cable in m
4	30	100
6	35	100
8	40	100
9	45	100
11	50	100
12	55	100
13	60	100
6	30	150
7	35	150
9	40	150
10	45	150
12	50	150
13	55	150
14	60	150
6	30	200
9	35	200
10	40	200
11	45	200
12	50	200
13	55	200
7	30	250
9	35	250
10	40	250
12	45	250
13	50	250
14	55	250
8	30	300
9	35	300
11	40	300
12	45	300
13	50	300
14	55	300

Table 6.3 MAX ALARM Setting Depending on Temperature

Use the following nomogram to determine settings that deviate from the standard).

Procedure:

1. Mark the cable length on scale "D".
2. Mark the maximum ambient temperature on scale "B".
3. Draw a line through the two marker points up to scale "A".
4. Read-off the switch position from scale "A" and take the detailed setting from *Table 6.1, Page 14*. Odd values are always rounded up.

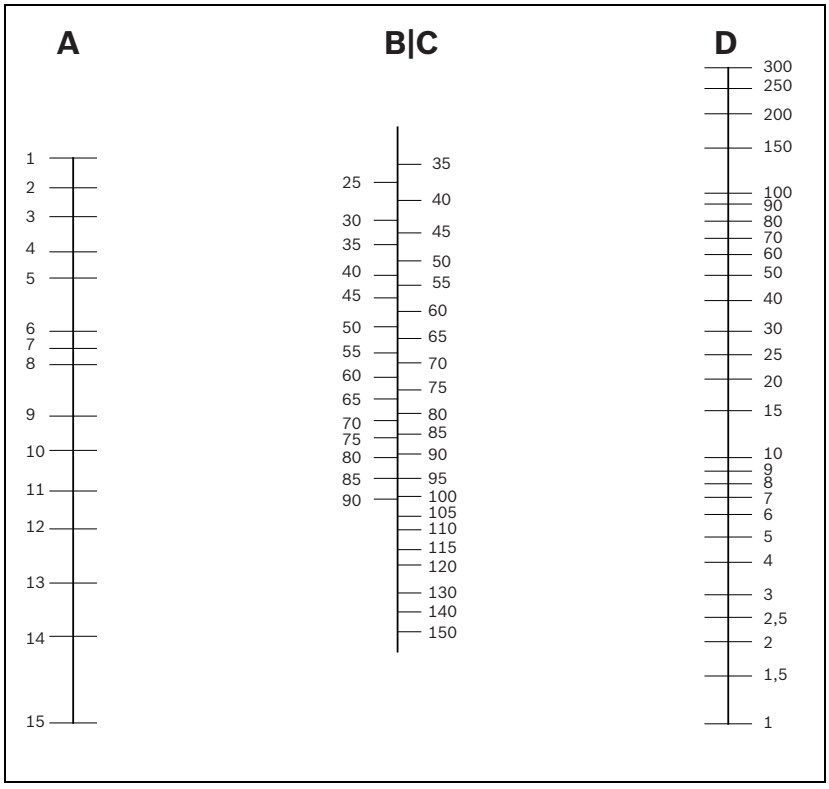


Figure 6.1 Nomogram

A	Switch position for MAX ALARM
B	Max. ambient temperature (°C)
C	Static response temperature (°C) = Equates to the temperature at which a detector will sound an alarm if it is exposed to an extremely low temperature rate-of-rise. As a general rule, a temperature rate-of-rise of approx. 0.2 K min^{-1} is calculated for measuring this temperature.
D	Sensor cable length

6.3 Setting the Response Temperature Dependent on Time (DIFF ALARM/DIFF TIME)

DIFF ALARM features two 16-position switches that can be adjusted separately:

– DIFF TIME

– DIFF ALARM

DIFF TIME sets the time span within which the ambient temperature changes. DIFF ALARM sets the temperature at which an alarm is to be triggered in dependence of DIFF TIME.

See *Table 6.1, Page 14* for DIFF ALARM and DIFF TIME calibration switch positions.

FCS-LWM-1 can be used as a grade A1, A2, B, and C heat detector. The response grades are defined according to DIN EN 54-5:2000 as follows:

Class	**Typical application temperature**	**Maximum application temperature***	**Minimal static response temperature**	**Maximum static response temperature**
A1	25 °C	50 °C	54 °C	65 °C
A2	25 °C	50 °C	54 °C	70 °C
B	40 °C	65 °C	69 °C	85 °C

Class	Typical application temperature	Maximum application temperature*	Minimal static response temperature	Maximum static response temperature
C	55 °C	80 °C	84 °C	100 °C
* The maximum application temperature according to DIN EN 54-5 differs from the maximum ambient temperature defined for the FCS-LWM-1. The maximum application temperature is a temperature that can only be applied for short periods of time and is 4 °C below the minimum static response temperature. The maximum ambient temperature for the FCS-LWM-1 is a temperature 10–12 °C below the minimum static response temperature, and can be applied for long periods of time.				

The table below shows the positions for the different DIFF TIME and DIFF ALARM calibration switch grades.

Grade A1	Grade A2	Grade B	Grade C
5/5 (blue cable)	5/8	5/9	6/13
5/4 (black cable)	-	-	-

Table 6.4 Grade settings (notation: DIFF TIME switch/DIFF ALARM switch = 5/4)

The table below contains recommendations for special applications:

Application	DIFF TIME	DIFF ALARM	response grade
Underground installation (no road tunnels), underground garage	5	5	A1 (blue cable only)
	5	4	A1 (black cable only)
	5	8	A2
	5	9	B
Installation on concrete ceilings and other thermally non-conductive material above ground, out of direct sunlight	5	5	A1 (blue cable only)
	5	4	A1 (black cable only)
	5	8	A2
	5	9	B
	6	13	C
Installation on insulated steel roof or metal container, out of direct sunlight	5	5	A1 (blue cable only)
	5	4	A1 (black cable only)
	5	8	A2
	5	9	B
	6	13	C
Installation on non-insulated steel roof or in direct sunlight	5	9	B
	6	13	C
Road tunnel	5	5	A1 (blue cable only)
	5	4	A1 (black cable only)
	5	8	A2
	5	9	B
	6	13	C

Table 6.5 Application-specific settings for the DIFF ALARM

NOTICE!

If a false alarm is triggered by the DIFF ALARM, proceed as follows:

– Shorten the sensor cable for each control unit, but do not shorten to less than the minimum length of 10 m.
– Reduce the response grade with the help of the DIFF TIME/DIFF ALARM DIP switch (e.g. from A1 to A2).

7 Technical Data

Approval

VdS approval	G 205066

7.1 Electrics

Control Unit

Voltage	10 to 30 V DC
Standby current consumption	Max. 25 mA (with 24 V)
Current consumption with DIFF ALARM or MAX ALARM	Max. 25 mA (with 24 V)
Current consumption with fault	Max. 15 mA (with 24 V)
Switch-on current	< 100 mA (with 24 V)

7.2 Mechanics

Control Unit

Housing material/color	ABS/gray, similar to RAL 7035
Overall dimensions (H x W x D)	120 x 200 x 80 mm
Weight	approx. 550 g
Display	– Green LED: power, continuously lit – Red LED: ALARM DIFF, continuously lit – Red LED: ALARM MAX, continuously lit – Yellow LED: fault, flashing light
Test keys	2 x for simulating alarm, fault and LED test
Protection category	IP 65
Temperature range	-20 °C to +50 °C

Sensor Cable

Designation	**Standard cable (blue)**	**+Nylon coating (black)**	**+ Steel netting (black)**
Order number	2.799.330.836	2.799.330.837	2.799.330.838
Exterior diameter	3.15 mm	4.8 mm	5.8 mm
Weight (200 m)	3.2 kg	4.7 kg	9.7 kg
Minimum tensile strength (N)	100	100 +	1000
Length of sensor cable	max. 300 m		
Wire diameter	0.46 mm		
Insulation thickness	0.34 mm		
Coating thickness	0.25 mm		
Wire material	– White + blue wires: copper – Orange + red wires: copper with polyester coating		
Insulation	– White + blue wires: specially doped NTC polymers – Orange + red wires: non-conductive polymers		
Wire colors	1 = orange, 2 = white, 3 = red, 4 = blue		
Resistance to temperature	All: < 100 °C — unlimited, < 150 °C — 350 h, < 175 °C — 25 h Standard blue cable (2.799.330.836) > -5 °C = unlimited Black cable with nylon or steel (2.799.330.837 or 2.799.330.838) > -60 °C = unlimited		

Bosch Sicherheitssysteme GmbH
Werner-von-Siemens-Ring 10
85630Grasbrunn
Germany
www.boschsecurity.com