SECURITON

ADW 535

Line Type Heat Detector

Technical description

As of FW version 01.01.14

Imprint

Notice

This documentation, T 140 358, is valid only for the product described in Section 1.

The names and specifications of the **EN 54-22** product standard contained in this documentation relate to the draft issue **prEN 54-22**.

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This document, T 140 358, is available in the following languages:

German	T 140 358 de
English	T 140 358 en
French	T 140 358 fr
Swedish	T 140 358 sv

Current edition: Index c 15.12.2015 Po/ksa

Notice

Validity for production version and firmware version

The following documentation is applicable only to the ADW 535 line type heat detector with the following production version and firmware version:

Production version	**Firmware version**
from 151215	from 01.01.14

Imprint

Other documents

Data sheet ADW 535		T 140 359	de / en / fr / sv
Technical description ADW 535HDx (ATEX)		T 140 458	de / en / fr / sv
Operating instructions ADW 535HDx (ATEX)		T 140 459	de / en / fr / sv
Mounting and installation		T 140 360	de / en / fr
Material for sensing tube		T 140 362	multilingual (ED / FI)
Commissioning protocol		T 140 363	multilingual (EDFI)
Data sheets	XLM 35	T 140 088	de / en / fr / it / es / pt / sv
	RIM 36	T 140 364	de / en / fr / it / es / pt / sv
	SIM 35	T 140 011	de / en / fr / it / es / pt / sv
	SMM 535	T 140 010	de / en / fr / it / es / pt / sv
Installation instructions for supervising unit LSU 35		T 140 365	multilingual (EDFI)

Safety information

Provided the product is deployed by trained and qualified persons in accordance with this documentation T 140 358 and the danger, safety and general information notices in this technical description are observed, there is no danger to persons or property under normal conditions and when used properly.
National and state-specific laws, regulations and directives must be observed and adhered to in all cases.

Below are the designations, descriptions and symbols for danger, safety and general information notices as found in this document.

Danger

Danger to persons and/or property may result from the product and any system parts if danger notices are not heeded. If the product and/or its parts become damaged and cause malfunctions there is also the risk of injury to persons and damage to property.

- Description of which dangers may occur
- Measures and preventative actions
- How dangers can be averted
- Any other safety-related information

Warning

The product may be damaged if the safety information is not heeded.

- Description of which damage can occur
- Measures and preventative actions
- How dangers can be averted
- Any other safety-related information

Caution

Notice about a dangerous situation which, if not avoided, could possibly lead to minor to moderate injuries.

Notice

The product may malfunction if this notice is not observed.

- Description of the notice and which malfunctions can be expected
- Measures and preventative actions
- Any other safety-related information

Electrostatic discharge (ESD)

ESD bands for preventing electrostatic discharge are used for grounding persons and for equipotential bonding. They are always required when electronic systems and electronic components are handled or mounted. Active electronic components and integrated electrical circuits are at risk if they are improperly handled, transported or mounted or if their assemblies are touched.

Environmental protection

The products described in this technical documentation, T 140 358, comply with the relevant requirements to ensure that operation does not endanger the environment or pose a health risk to people and animals. During mounting, installation, maintenance, repair work and decommissioning of the products, there may be waste which poses a danger to persons and animals.
There is normally no danger to the environment, persons or animals if the work is performed by trained specialists and the notices in this technical documentation is observed concerning “Environmental protection / Recycling” and “Batteries” and if the products are used properly.
National and state-specific laws, regulations and directives must be observed and adhered to in all cases.

Below are the designations, content and symbols for “Environmental protection / Recycling” and “Batteries” in this document.

Environmental protection / recycling

Neither the product nor its components present a hazard to the environment provided they are handled properly.

- Description of which parts have environmental protection issues
- Description of how devices and their parts have to be disposed of in an environmentally-friendly way
- Description of the recycling possibilities

Batteries

It is not permitted to dispose of batteries in the domestic rubbish. As the end user you are legally obliged to return used batteries. Used batteries can be returned to the seller or taken to a designated recycling centre (e.g. a community collection point or dealer) at no cost. You may also send them back to the seller by post. The seller will refund the postage when you return your old batteries.

Document history

First edition Date 14.02.2014

Index „a“ Date 22.08.2014

Most important changes compared with previous issue:

Section	New (n) / changed (c) / deleted (d)		What / Reason
• Imprint	c	Notice on the prEN 54-22	Supplement
• 2.2.15 / 8.5.1	c	Text correction, flashing frequency pre-signal changed to 1 s	Correction
• 2.2.21.3	c	Text correction, button „UP changed to button „OK“	Correction
• 4.5.1	c	Notice on maximum sensor tube length according to EN 54-22 in tunnel applications	Supplement
• 7.2.1	c	Table A: Monitored area, inner diameter 4 mm only, notice on leaving the EN 54-22 Table B: Day/Night start time, resolution 1 min, notice on leaving the EN 54-22 Table C: SD memory card, interval 1 – 120 s	Correction
• 8.5.1	c	Text addition to the note: ... and test triggering ***IC1*** / ***IC2***.	Correction
• 8.5.4.2 / 10.3.1	c	Even groups ***G30*** / ***G40***: supplement „step motor“	Correction
• 8.5.6 / Fig. 37	c	Text correction THERM ➔ TERM	Correction
• 10.3.1	c	Even groups ***G50*** / ***G50***: supplement ***002*** „Length check negative“	Correction
• 13	c	Indication of the environmental group III	Supplement

Document history

Index „b“ Date 19.06.2015

Most important changes compared with previous issue:

Section	New (n) / changed (c) / deleted (d)		What / Reason
• 1.1 / 1.2 / 3.1 / 4.2 / 11.1 / 12.1	c / n	Ex applications ➔ note to T 140 458 and T 140 459	Extension
• 1.1 / 2.2.22 / 7.2 / 7.4.3 / 8.6 / 11.2	c	Text note “in preparation” removed	Extension
• 1.2 / 4.1.1	n	Response behaviour according to EN 54-22, class A1l to Bl (UL/ULC A1l to Gl)	Extension
• 1.3	n	Added abbreviations ATEX	Extension
• 1.4	c	New rating plate	Extension
• 2.2.9.1	c	Table added	Extension / correction
• 2.2.20 / 8.5.3.1	c	Number of Log-Files and Event-Files changed	Correction
• 2.2.23	n	New section, heated	Extension
• 3.4	c	Eliminating the variants HDx ➔ there are own document	Extension
• 4.4.1 / 4.4.2 / 4.6.1 / 4.6.1.1 / 4.6.1.2 / 7.3.3 / 8.3 / 13	n	Text note on the Response behaviour class-related usage = FW version ➔ deleted, note on Sec. 4.1.1	Extension
• 4.8.2 / 13	c / n	Added; heated below –20 °C	Extension
• 5.3	n	Added; protective screw-junction piece PS TU 5/4 St	Supplement
• 7.5.2	c	Correctly described, text note “in preparation” removed	Extension
• 7.6.1 / 8.3	n	Sensing tube length read out ***P*** > ***UL1*** / ***UL2***	Extension
• 8.5.3 / 12.1	c	Notice on industrial SD memory card	Correction
• 8.5.3.2	n	New status indicators „ALD“ / „ALM“	Extension
• 8.5.4.2 / 8.5.4.3	n	New event groups ***G18*** / ***G28***, test triggerings from “ADW Config”	Extension
• 8.5.4.3 / 10.3.1	n	New event code ***064*** in the ***G11*** / ***G21*** event groups, “Fault, external temperature sensor, compensation”	Extension
• 11.2 to 11.2.2	c / n	Supplemented with Ethernet networking	Extension

Index „c“ Date 15.12.2015

Most important changes compared with previous issue:

Section	New (n) / changed (c) / deleted (d)		What / Reason
• 1.1 / 12.1 / 13	c / n	Application UL/ULC for ADW 535HDx and SIM 35 / SMM 535	Extension
• 1.2 / 1.4 / 4.1.1 / 13	c / n	Response behaviour according to EN 54-22, class A1l to GI	Extension
• 8.5.4.3	c	Event codes in event group ***G06*** corrected	Correction
• Various	c	Various text corrections (SD memory card)	Correction

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1 General

1.1 Purpose

The ADW 535 is an integrated line type heat detector with a response behaviour based on heat differential and/or maximum heat. Thanks to its self-check feature and the periodic, automatic test, the ADW 535 is particularly suitable for use in applications where the legally prescribed functional and maintenance checks cannot be performed due to the given ambient conditions or only with difficulty.

The ADW 535 line type heat detector is available in four versions.

In the thermoplastic housing for normal applications:

- ADW 535-1 for one sensing tube, two relays/OCs
- ADW 535-2 for two sensing tubes, four relays/OCs

In the housing for difficult ambient conditions and Ex applications (ATEX) ➔ see **T 140 458** and **T 140 459**:

- ADW 535-1HDx for one sensing tube, two relays/OCs
- ADW 535-2HDx for two sensing tubes, four relays/OCs

The ADW 535 line type heat detector has three connections (four expansion slots) for additional modules. The following modules can be fitted:

- XLM 35 SecuriLine eXtended Line Module (**not tested to UL/ULC**)
- RIM 36 Relay Interface Module with 5 relays (2 units)
- SIM 35 Serial Interface Module
- Other

With the installation of an **XLM 35** SecuriLine eXtended line module, the ADW 535 line type heat detector can be easily connected to the SecuriFire (SecuriLine eXtended) and Integral (X-Line) fire alarm systems via the addressable loop. Control operations and changes to the ADW device configuration can be carried out directly from the FACP. For this purpose the FACP configuration software “SecuriFire Studio” and “Integral Application Center” are used to start the “ADW Config” configuration software for access to the ADWs; the configuration software is then used to make changes to the ADW 535.

A further expansion option is the **RIM 36** relay interface module. This module makes the individual alarms and the pre-signals “Diff” and “Max” available via relay contacts. The relays are also freely programmable via the “ADW Config” configuration software.

The **SIM 35** serial interface module is for networking multiple ADW 535s via RS485 bus. Using the “ADW Config” configuration software, all ADW 535 units present in the network can be configured, visualised and operated from a PC. The SMM 535 is required as the master module in the network and enables connection to a PC.

Notice

The normative alarm transmission of the ADW 535 to the superordinate centre does not take place via the ADW network. For that purpose the “Alarm” / “Fault” relays in the ADW, or the SecuriPro / SecuriFire / Integral addressable loop are to be used from the XLM 35.

The present technical description contains all information essential for trouble-free operation. For obvious reasons only those details specific to individual countries and companies or special applications can be discussed if they are of general interest.

1.2 Uses and applications

Thanks to its excellent properties under severe ambient conditions, the ADW 535 is used wherever problems are to be expected owing to latent disturbance variables during operation such that optimal protection can no longer be guaranteed with conventional point detectors. This includes:

- Road tunnels, railway tunnels and underground railway tunnels, underground mining;
- Car park halls, car decks on ships, loading platforms;
- Paint spray and paint shops (see also Sec. 4.9);
- Chemical industry, tank storage, (Ex zones see also Sec. 4.9 and 11.1 such as **T 140 458** and **T 140 459**).

The ADW 535 can also be deployed in areas where conventional point detectors are used. Local regulations and provisions must be observed from case to case.

The response behaviour of the ADW 535 is tested in compliance with (see also Sec. 4.1.1):

- **EN 54-22** = class **A1I** to **GI**;
- **UL/ULC** = according EN 54-22 class **A1I** to **GI**.

When control-unit-specific alarm transmitters, line monitoring elements etc. are used, the ADW can be connected via its potential-free change-over contacts to all common fire alarm systems virtually without restrictions.

1.3 Abbreviations, symbols and terms

The following abbreviations, symbols and terms are used in the Technical Description T 140 358. Other abbreviations can be found in Sec. 8.5.3.2 (status abbreviations on SD memory card). The abbreviations for tube material and accessories are listed in a separate document: T 140 362 (see also Sec. 5.3).

µC	=	Microcontroller / microprocessor
ABS	=	Acrylonitrile-butadiene styrene (plastic)
ADW	=	Line type heat detector
ADW Config	=	Configuration software for ADW 535
ADW HeatCalc	=	Calculation software for the sensing tube, “ADW HeatCalc”
Al	=	Alarm
ART 535	=	External reference temperature sensor (ADW reference temperature-sensor)
ATEX	=	**AT**mosphères **EX**plosibles
CE	=	Communauté Européenne (European Community)
Cu	=	Copper
Default	=	Preset values / settings
DIN	=	Deutsche Industrie Norm (German industry standard)
EasyConfig	=	Commissioning procedure without the “ADW Config” configuration software
EDP	=	Electronic data processing
EEPROM	=	Memory component for system data and ADW configuration
EMC	=	Electromagnetic compatibility
EN 54-22	=	European product standard about line type heat detectors
Ex-zone	=	Area subject to explosion hazards
FACP	=	Fire alarm control panel
FAS	=	Fire alarm system
Fault / Flt	=	Fault
Flash PROM	=	Memory component for firmware
FW	=	Firmware
GND	=	Supply ground (minus (-) pole)

➔➔

Continuation:

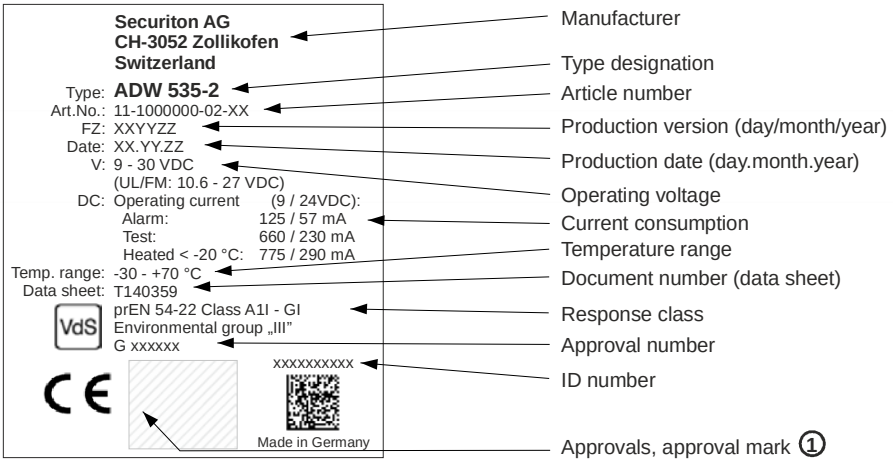
H-Al	=	Main alarm
HF	=	High frequency
HW	=	Hardware
IEC	=	International Electrotechnical Commission
Initial reset	=	Acquiring sensing tube basic data when commissioning the ADW 535
LEB 35	=	Expansion units for second sensing tube (LTHD extension board)
LED	=	Light-emitting diode (indicator)
LMB 35	=	ADW main board (LTHD main board)
LSU 35	=	Supervising unit (LTHD supervising unit)
Manufacturer	=	Securiton
mbar	=	Unit for pressure
NO / COM / NC	=	Relay contacts: NO (normally open), COM (common), NC (normally closed)
OC	=	Open collector output
OEM	=	Original Equipment Manufacturer (reseller)
PA	=	Polyamide (plastic)
PC	=	Personal computer
PC	=	Polycarbonate (plastic)
PMR 81	=	Semi-conductor relay
PSB 35	=	Pressure sensor unit in supervising unit (Pressure Sensor Board)
PTFE		Teflon (plastic)
PWR	=	Power input / power display (power)
PWR-R	=	Redundant power input
RAM	=	Memory component
ResExt	=	Reset external (state reset via input)
RIM 36	=	Relay interface module
RoHS	=	Restriction of Certain Hazardous Substances (eco-friendly manufacturing processes)
RPM 535	=	Remote pressure-sensor module RPS 535 (in preparation)
RPS 535	=	Remote pressure sensor (in preparation)
Rst	=	Hardware reset (restart)
SecuriFire	=	FAS system
SecuriLine	=	Fire detector addressable loop
SecuriPro	=	FAS system
SIM 35	=	Serial Interface Board
SMM 535	=	Serial Master Module
St	=	Stainless steel (VA)
SW	=	Software
Te.	=	Terminal
UMS 35	=	Universal Module Support
uP / aP	=	Flush mounted, surface mounted
Update / Release	=	Renewal / update of the firmware
V-Al	=	Pre-alarm
VDC	=	Direct current voltage
VdS	=	Verband der Schadenversicherer (Association of Indemnity Insurers, Germany)
VKF	=	Vereinigung Kantonaler Feuerversicherungen (Cantonal Fire Insurance Union, Switzerland)
VS	=	Pre-signal
Watchdog	=	Monitoring of the microcontroller
XLM 35	=	SecuriLine eXtended module

1.4 Product identification

For identification, the ADW 535 and its units have rating plates or identification plates.

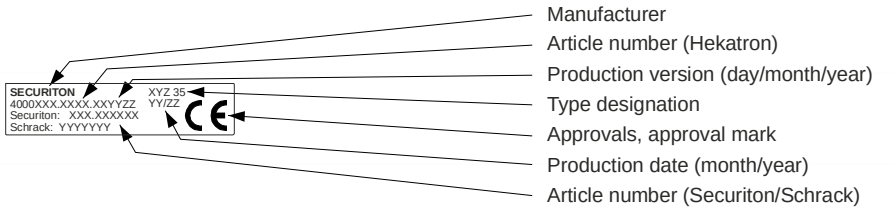
The following product identifications apply:

Rating plate on the ADW 535 and identification on the packaging



① Additional conformity marks may be affixed to a second rating plate or to an extended area of the rating plate (wider plate).

Identification on the packaging of the PCBs fitted



Notice

The rating plates, type designations and/or identifications on devices and printed circuit boards must not be removed, written over or defaced in any way.

Many products, such as accessories and mounting materials, are identified only with a sticker showing the article number. The manufacturer identifies these parts by article number.

1.5 Hardware / firmware

The hardware is considered to comprise the complete ADW 535 evaluation unit and all units belonging to the ADW 535 line type heat detector, such as sensing tube and mounting material.

The firmware is stored on the Flash-PROM in the ADW 535. An EEPROM is fitted for storing and saving system-specific parameters.

Danger

The ADW 535 is to be operated only with the appropriate original firmware from the manufacturer.
Any unauthorised intervention in the firmware or the use of non-original firmware may result in malfunction and/or in damage to the device. Furthermore, all guarantee and warranty rights with respect to the manufacturer of the ADW 535 will become null and void as a result.

Notice

A version change or extension of the ADW 535 firmware does not imply a right to an upgrade or new release for existing ADW 535 systems.

2 Function

2.1 General operating principle

The working principle of the ADW 535 is based on the volume expansion of gas due to heating in a pneumatically sealed system and the consequent pressure increase. If the pressure in the sensing tube rises to values as defined by the ADW 535 firmware (time basis, pressure threshold in mbar), the system triggers an alarm. The alarm is indicated visually on the ADW 535 and can be transmitted via a potential-free change-over contact to a superordinate fire alarm control panel.

The pneumatically sealed system is composed of the sensing tube that is locally installed in the area to be monitored and is sealed at the end with a terminal screw fitting. The sensing tube is connected to the ADW 535 evaluation unit in which the pneumatic line is wired to the **LSU 35** supervising unit. The LSU 35 consists of a fully electronic differential pressure sensor, a pressure pump and a step motor. There is regular ambient air in the entire pneumatic volume.

The ADW 535 is available as a system with one or two sensing tubes. The ADW 535 with two sensing tubes has two completely independent pneumatic circuits; thus it also has two LSU 35 supervising units. All control circuitry and measured value recordings are individually designed for each sensing tube.

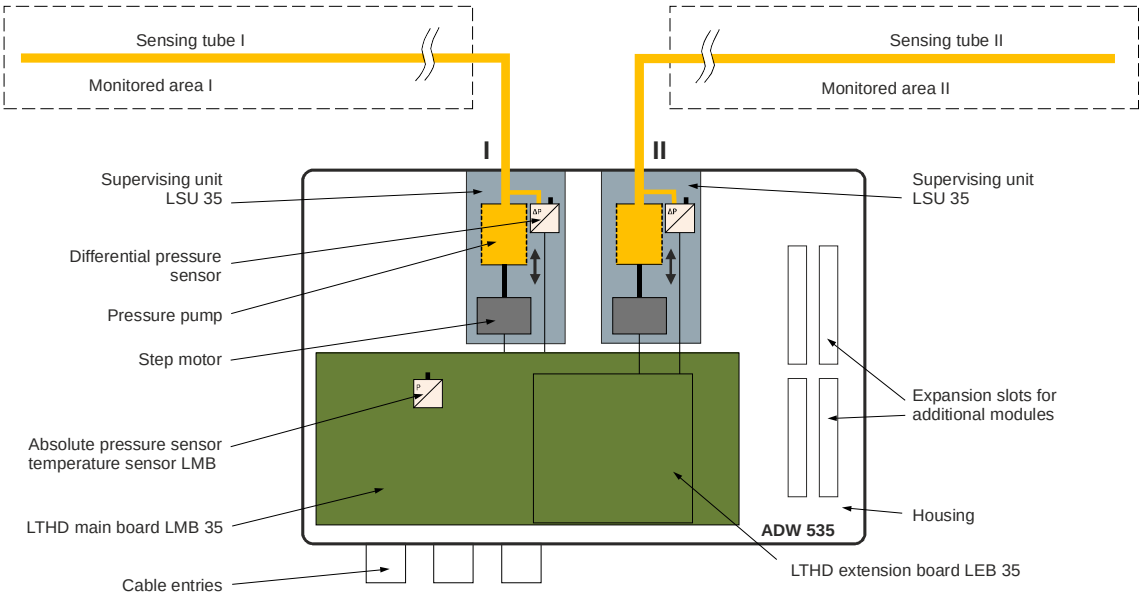
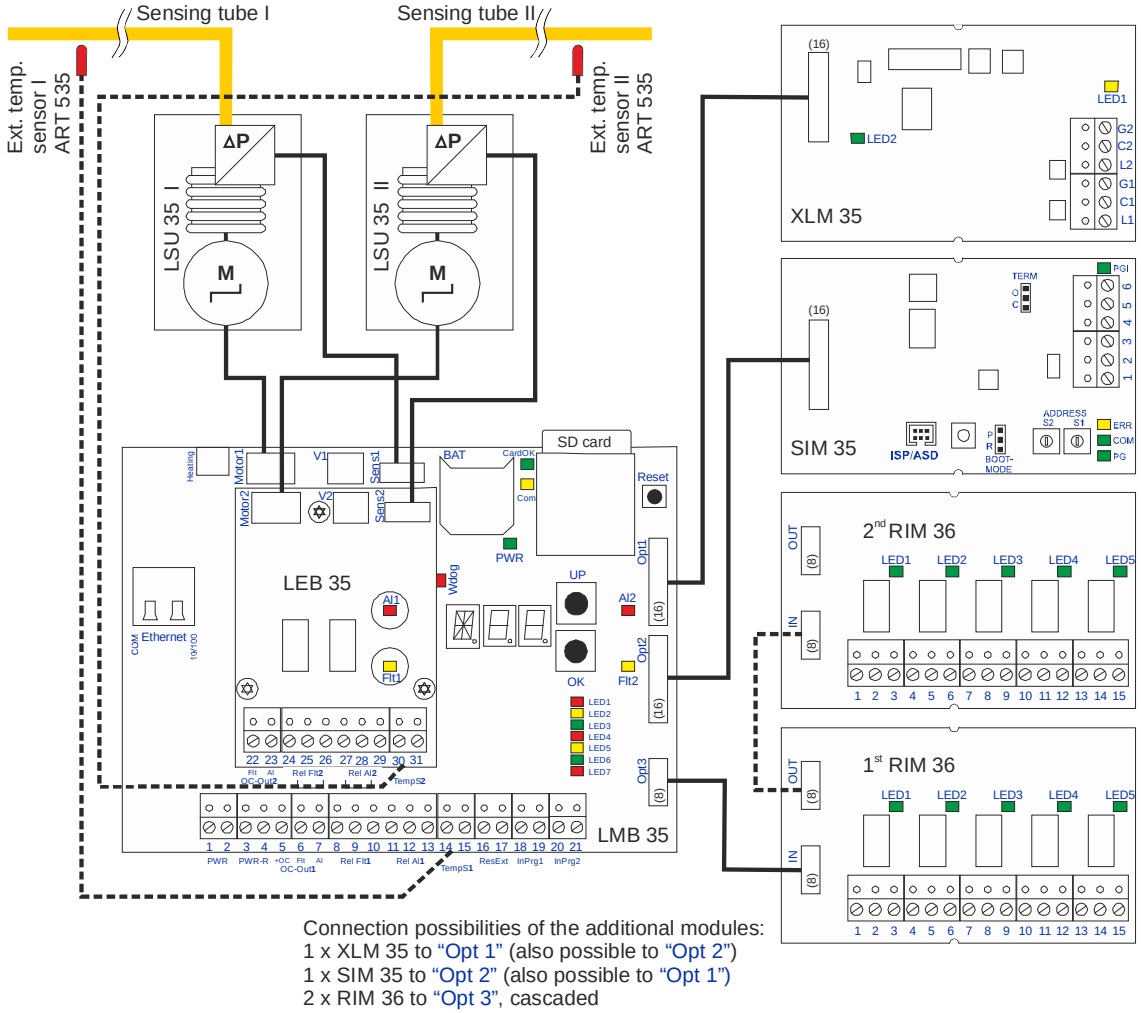


Fig. 1 General operating principle

2.2 Electrical operating principle



Connection possibilities of the additional modules:
1 x XLM 35 to “Opt 1” (also possible to “Opt 2”)
1 x SIM 35 to “Opt 2” (also possible to “Opt 1”)
2 x RIM 36 to “Opt 3”, cascaded

Fig. 2 Block diagram

2.2.1 Power supply

The operating voltage of the ADW 535 is +9 to +30 VDC (UL/FM = 10.6 to 27). On the LMB 35 main board, 3.3 and 6 VDC of the operating voltage is diverted for internal voltage use.

The operating voltage is monitored on the LMB 35 for undervoltage. If the operating voltage falls below 8.5 VDC (+0 / –0.3 VDC), the ADW 535 triggers an undervoltage fault.

2.2.2 Microcontroller

The entire program and switching sequence is controlled by a microcontroller. The firmware is stored on a Flash-PROM. System-specific configurations are stored in an EEPROM.

The program is monitored by the internal watchdog of the microcontroller. In the event of a failure of the microcontroller circuit, an emergency fault is triggered. This is indicated on the device by the "Fault" LED remaining continuously lit. The relay "Fault" (**Flt1** and **Flt2**) switches.

2.2.3 Programming / operation

The operation of the ADW 535 line type heat detector in normal operation (after commissioning) is limited to switching On/Off and resetting a triggered event (alarm, fault). Operation is generally via the FACP, with input of the "Zone(s) On/Off" and "Reset" functions.

With the ***EasyConfig*** switch position ***R*** (***R00*** = state reset) on the LMB 35 or by briefly actuating the "Reset external", the triggered events can be reset on the ADW 535 on site. The reset is possible only if the triggered event is no longer pending (e.g. pressure in the sensing tube undershoots the triggering value). The application of a continuous signal at the "Reset external" input also deactivates (switches off) the ADW 535 (see also Sec. 2.2.5 and 6.5.2).

Notice

A local reset does not reset a superordinate FACP. It may happen that the reset in the ADW 535 triggers a fault in the superordinate line of the FACP.

To aid commissioning the ADW 535, there are two 7-segment displays, an alphanumeric display, and two buttons ("UP" and "OK") inside the device on the LMB 35 main board. These elements render a kind of rotary switch function, i.e. displays and positions can appear in the range of ***A00*** to ***Z99***.

These elements are used when commissioning the ADW 535. Device settings for pre-defined system limits can also be called up (***EasyConfig***). These pre-defined positions are stored with normative values for response sensitivity and various sensing tube lengths. The ***EasyConfig*** procedure allows the device to be commissioned without the "ADW Config" software. If system-specific programming is necessary (e.g. after a calculation with "ADW HeatCalc" or when programming additional relays on the RIM 36), the "ADW Config" configuration software is to be used.

Fig. 3 shows the workflow for defining and programming project-specific device functions.

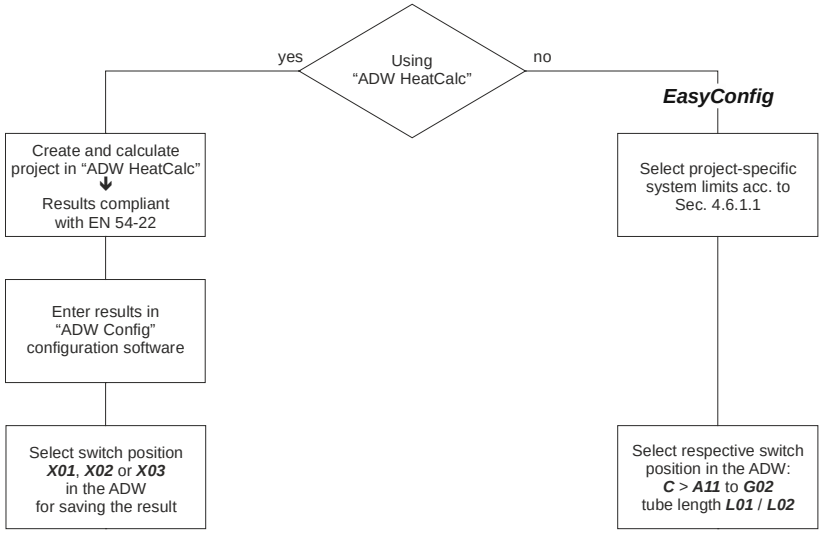


Fig. 3 Workflow for project-related programming

The definitions of the pre-defined settings and the operator structure are found in Sec. 4.6.1.1, 7.2.1 and 8.3.

2.2.4 Displays

The events are indicated with LEDs on the LTHD main board and made visible by fibre optic rods on the surface of the housing. Depending on the device version, different displays are present:

- ADW 535-1 (-1HDx ①) Operation, fault I, alarm I, pre-signal I.
- ADW 535-2 (-2HDx ①) Additionally: fault II, alarm II, pre-signal II.
  (① in preparation)

Depending on the event, the LEDs are either continuously lit or flash at different frequencies (see Sec. 8.5).

2.2.5 Relays

Depending on the device version and the additional modules installed, the ADW 535 has several relays with potential-free changeover contacts with the following assignments:

Unit	Relay designation	Version	Function, events
LMB 35	Rel. Flt1: ① Fault I	ADW 535-1	Fault; all events of sensing tube I + gen. faults ADW inactive
	Rel. Al 1: Alarm I		Sensing tube I alarm release
LEB 35	Rel. Flt2: ① Fault II	ADW 535-2	Fault; all events of sensing tube II + gen. faults ADW inactive
	Rel. Al 2: Alarm II		Sensing tube II alarm release
1st RIM 36 (from LMB 35)	Rel. 1 ②	All	Diff alarm of sensing tube I or freely programmable
	Rel. 2 ②		Max alarm of sensing tube I or freely programmable
	Rel. 3 ②		Pre-signal Diff alarm of sensing tube I or freely programmable
	Rel. 4 ②		Pre-signal Max alarm of sensing tube I or freely programmable
	Rel. 5 ②		Alarm temperature sensor LMB
2nd RIM 36 (cascaded from 1st RIM 36)	Rel. 1 ②	ADW 535-1	Freely programmable
	Rel. 2 ②		Freely programmable
	Rel. 3 ②		Freely programmable
	Rel. 4 ②		Freely programmable
	Rel. 5 ②		Freely programmable
2nd RIM 36 (cascaded from 1st RIM 36)	Rel. 1 ②	ADW 535-2	Diff alarm of sensing tube II or freely programmable
	Rel. 2 ②		Max alarm of sensing tube II or freely programmable
	Rel. 3 ②		Pre-signal Diff alarm of sensing tube II or freely programmable
	Rel. 4 ②		Pre-signal Max alarm of sensing tube II or freely programmable
	Rel. 5 ②		Freely programmable

Notice

① The "Flt1" (and "Flt2)" relays are picked up in the quiescent state ➔ Contact terminals 10/8 (24/22) closed, 10/9 (24/23) open (ADW 535 under voltage; no fault event present).

② Depending on the device version, the relays are either configured with the above named criteria or freely programmable using the "ADW Config" configuration software (see Sec. 7.2.1 and 7.2.2).

2.2.6 Outputs

OC outputs are on the ADW 535. Parallel indicators, feedback indicators or other consumers (relays) can be connected to these outputs. Depending on the device version, the outputs are configured with the following criteria (see also Sec. 6.5.5):

Unit	OC designation	Version	Function, events
LMB 35	OC-Out1; Flt	ADW 535-1	Fault; all events of sensing tube I + gen. faults ADW inactive
	OC-Out1; Al		Sensing tube I alarm release
LEB 35	OC-Out2; Flt	ADW 535-2	Fault; all events of sensing tube II + gen. faults ADW inactive
	OC-Out2; Al		Sensing tube II alarm release

2.2.7 Inputs

The ADW 535 has a "**Reset external**" ("**ResExt**") input used to reset the device to its normal state after an event. The input is potential-free (opto-isolator). It can be actuated both on the "plus" and on the "minus" side. The input operates in the 5 to 30 VDC range and has a pulse bandwidth of 0.5 to 10 s When a continuous signal is applied for longer than 20 s, the ADW 535 is deactivated (fault state) (see also Sec. 6.5.2). Switching inactive via the "Reset external" input works only if the ADW 535 is not equipped with an XLM 35.

The inputs "**InPrg1**" and "**InPrg2**" (InPrg2 = reserve, no function) are potential-free (opto-isolator) and can be actuated "plus" side or "minus" side in the range of 5 to 30 VDC. Input "**InPrg1**" is assigned the function "**day/night control from FACP**" by default.

Notice

The inputs are **not** line monitored.

2.2.8 Interfaces

Depending on the device version and installed additional modules, the ADW 535 has the following interfaces:

Unit	Designation	Version	Function, events
LMB 35	EthNet	All	Configuration with "ADW Config" Update of the firmware
XLM 35	L1 / C1 / G1 // L2 / C2 / G2	All	SecuriFire / Integral addressable loop
SIM 35	GND / D + / D –	All	RS485

2.2.9 Sensing tube monitoring

Notice

A prerequisite for the proper functioning of sensing tube monitoring is the acquisition of basic data **for every sensing tube** by means of an **initial reset** when the ADW 535 is commissioned (see also Sec. 2.2.21.3).

Prerequisite, initial reset:
The basic data acquired when an initial reset is performed is used for monitoring the sensing tube. The pressure pump is actuated with the step motor for an initial reset, whereby the pressure levels in the closed sensing tube are determined and stored as "**Initial reset pressure**" (nominal value). The pressure increase depends on the length of the connected sensing tube and comprises the reference basic data on the sensing tube.

Monitoring and interruption detection:
The differential pressure sensor on the **LSU 35** supervising unit continuously measures the present pressure in the sensing tube. The pressure in the sensing tube varies continuously due to the "normal" ambient temperature changes. If the pressure does not move out of a small pressure window over a certain period of time (nearly "zero"), the step motor starts up and pumps until the pressure in the sensing tube is again outside the pressure window (➔ pressure offset = over- or underpressure). Normally (sealed sensing tube), this mechanism causes a certain minimum over- or underpressure. If there is a leak in the sensing tube due to an interruption, the pressure in the sensing tube rapidly changes to "zero" ➔ a "Break assumption" occurs. In this state a test procedure is started (step motor and pressure pump) and the pressure sequence is measured. If the required values are not reached, a "**Sensing tube interruption fault**" is triggered.

Cyclical test procedure:
In a cyclical test procedure, after a selected **interval** the pressure pump is actuated with the step motor and the pressure sequence is measured. If the required values are not reached, the ADW 535 starts one (or more) **follow-up test procedures** after a **waiting time**. A negative result after the last follow-up test procedure (based on the points listed below) causes a "**fault**" on the ADW 535. If, however, the target values are reached after a test procedure, the ADW 535 switches to normal operation after the procedure.

Depending on the deviation from the basic data, the following may apply to the sensing tube and/or pneumatic systems:

- No pressure increase (below target value)
  - Sensing tube is open or not connected, pressure pump or step motor is defective
- Ratio of max./min. pressure increase is too small (below target value)
  - Leak in the sensing tube
  - Interruption in the sensing tube (if max./min. ratio < 1.5)
- Pressure increase too high (over target value)
  - Crushing in the sensing tube, the current sensing tube length no longer corresponds to the installed tube length.

Alternative test not EN 54-22 compliant:
According to **EN 54-22**, pipe breakage must be signalled within **300 s** as a fault. For the ADW 535 this requirement is met in ***EasyConfig*** switch positions ***C*** > ***A11*** to ***G02*** using the procedure described under "Monitoring and interruption detection".

For applications in severe environments with increased disturbance factors (**outside of EN 54-22**), in addition to ***EasyConfig*** switch positions ***C*** > ***A11*** to ***G02***, in a further step the switch positions ***W04*** to ***W09*** can be used. They use the **cyclical test procedure** with various sensitivity levels "**low**" / "**medium**" / "**high**" (see Sec. 2.2.9.1) and greater repetition factors of 2 x / 4 x (follow-up test procedure). See also Sec. 4.6.1.2.

Warning

Switch positions ***W04*** to ***W09*** may be used only after consulting with the manufacturer. The configured values they contain concerning sensing tube monitoring are **not** tested in accordance with EN.

2.2.9.1 Sensitivity of sensing tube monitoring

Depending on the selected sensitivity level "**Low**", "**Medium**" or "**High**" (can be changed with ***EasyConfig*** switch positions ***W01*** to ***W09*** or with the "ADW Config" configuration software), the following thresholds apply to the **Initial reset** and the **cyclical test procedure**.

Notice

Interruption detection compliant with EN 54-22: The sensitivity levels are not in effect for detection of the abrupt pressure drop compliant with EN 54-22.

Sensitivity:	in effect for initial reset: Leakage test ① (max. disturbance, in mbar/min)	Sealing check ② (max. pressure drop, in mbar, for 30 s) < 30 m	Sealing check ② (max. pressure drop, in mbar, for 30 s) > 30 m	Length test ③ (tolerance, in %, at least 5 m)	in effect for cyclical test: ⑥ / ⑦ Leakage test ④ (max. disturbance, in mbar/min)	Crushing test ⑤ (deviation from the initial reset value, in %)
Low	7	–0.6	–0.5	20	7	–40
Medium	3.5	–0.35	–0.25	15	3.5	–20
High	2	–0.25	–0.15	10	2	–10

Notices to the initial reset:

① **Leakage test:** During the leakage test the max/min ratio is evaluated and compared to a length-dependent limit. If the value falls below this limit the disturbance applies according to the sensitivity level shown above.
Note: At most, an existing disturbance (change in temperature in the monitored range) may falsify the result and lead to an initial reset fault (leak). Possible disturbances are: **Low** = approx. 2 °C/min / **Medium** = approx. 1 °C/min / **High** = approx. 0.6 °C/min.

② **Sealing check:** For the initial reset from "ADW Config" you can select whether the sealing check is to be performed (always performed from ***EasyConfig*** when there is an initial reset). The limit values depend on the length of the sensing tube.
Note: At most, an existing disturbance (inconstant decrease in temperature during the monitoring period) can lead to a faulty result and trigger an initial reset fault (leakage test).

③ **Length test:** For the initial reset from "ADW Config" you can select whether the length check is to be performed (always performed from ***EasyConfig*** when there is an initial reset).
A minimum tolerance threshold of 5 m applies on all sensitivity levels during the length test.
Note: At most, an existing disturbance (different temperature in the monitored range and in the range of the evaluation unit) can lead to a faulty result and trigger an initial reset fault (length test).

Notices to the cyclical test:

④ **Leakage test:** Is not evaluated if the pressure is outside the range of –10 to +10 mbar.
During the leakage test the max/min ratio is evaluated and compared to a length-dependent limit. If the value falls below this limit the disturbance applies according to the sensitivity level shown above.
Note: At most, an existing disturbance (change in temperature in the monitored range) may falsify the result and lead to an initial reset fault (leak). Possible disturbances are: **Low** = approx. 2 °C/min / **Medium** = approx. 1 °C/min / **High** = approx. 0.6 °C/min.

⑤ **Crushing test:** The deviation from the determined length of the sensing tube during an initial reset is decisive during the crushing test. If an external temperature sensor ART 535 (comparison) is used, the deviation from the preset length of the sensing tube is decisive.
Note: At most, an existing disturbance (different temperature in the monitored range and in the range of the evaluation unit) can lead to a faulty result and trigger and trigger a test fault (crushing test).

⑥ Is not performed if the pressure is outside the range of –300 to +300 mbar.

⑦ Can be configured for deactivation (with switch positions ***X*** and ***W***).

2.2.10 Differential response behaviour

The differential pressure sensor on the **LSU 35** supervising unit continually measures the pressure in the sensing tube compared to the ambient pressure. The sensor signals are mathematically evaluated by the microprocessor and can be used for computational processing and forming the differential response behaviour. If the pressure increases in the time frame defined by the software (**Diff pressure** = mbar/min.), the **alarm verification time** is started.

During the **alarm verification time**, the continued rise of the absolute pressure is monitored. If it exceeds a defined **delta pressure value** within the alarm verification time, the ADW 535 triggers a "**Diff alarm**".

The sensing tube partial length (detection length), which corresponds to the normatively defined monitored area, is decisive for the "**Diff alarm**". According to **EN 54-22** this is **10 m**. The remaining length of the sensing tube in the monitored area and the supply line determine the length-dependent size of the differential pressure value and the delta pressure value (ratio of "***detection length***" to the "***maximum length of the sensing tube***"; see also **Fig. 13**, "**D**" to "**B**").

2.2.11 Maximum response behaviour

The maximum response behaviour of the ADW 535 is designed so that a pressure value (**Max pressure** = mbar) that corresponds to a certain maximum temperature triggers an alarm. Slowly and steadily increasing pressure values over a longer period of time that are not within the detection range of the differential response behaviour (e.g. ΔT = 40°C/h; overheating of an oven) are thus evaluated as "**Max alarm**" when a certain threshold value is reached.

For the "**Max alarm**" it is assumed that heat always impinges on the entire sensing tube that is in the monitored area. The pressure value for the "**Max alarm**" is therefore only minimally dependent on the sensing tube length (only ratio of "***length in the monitored area***" to the "***length of the supply line***"; see also **Fig. 13**; "**C**" to "**A**"). There is, however, an additional dependency concerning the response-behaviour-related, typical application temperature and the decreasing factor "mbar/°C" at an increased application temperature.

2.2.12 Temperature compensation

An internal temperature sensor in the evaluation unit (on the LMB 35) or optionally in the ART 535 external temperature sensor in the area of the sensing tube (for each sensing tube) continuously measures the current ambient temperature and compensates (adjusts) the maximum response behaviour. This corrects any minimal leakage in the sensing tube. Further, the trigger thresholds function "independently" of the temperature during commissioning. Adjustment (compensation) to a prevailing temperature takes place periodically and only if the pressure and the temperature remain unchanged for a certain length of time.

If an external ART 535 temperature sensor is used on a sensing tube for the compensation, the compensation is inactive beginning at the internal temperature sensor for the concerned sensing tube.

2.2.12.1 Internal temperature sensor

The temperature sensor on the LMB 35 triggers an "**LMB temperature sensor alarm**" if the temperature exceeds 80°C. The alarms of **both sensing tubes together** are triggered (alarm I and alarm II). Also, provided the evaluation unit is located within the monitored area, the temperature sensor on the LMB 35 is used for the temperature compensation.

2.2.12.2 External temperature sensor

The ART 535 external temperature sensor is primarily for temperature compensation and is used in the following cases (see also Sec. 6.5.6):

- Applications compliant with EN 54-22, Class CI to GI
- Always (for all response grades), as soon as the application temperature in the monitored area deviates more than 20°C from the temperature of the evaluation unit.

An "**ext. alarm temperature sensor**" (per sensing tube) can be assigned to the external temperature sensor with the "ADW Config" configuration software (configurable trigger point).

2.2.13 Defining the alarm thresholds

The values required for defining the alarm threshold **according to EN 54-22** (Diff pressure, alarm verification time, delta pressure and Max pressure) are pre-specified in the ***EasyConfig*** switch positions and can be system-specifically programmed with the “ADW Config” configuration software (based on the calculation results of the “ADW HeatCalc” calculation software).

2.2.14 Alarm release

The ADW 535 triggers an “**Alarm**” (per sensing tube) when one of these events occurs: “**Diff alarm**”, “**Max alarm**” or “**Alarm temperature sensor LMB**” (or “**Alarm ext. temperature sensor**”). The **Al relay**, the **Al LED** and the **Al OC output** are actuated.

2.2.15 Pre-signal trigger

The ADW 535 has a pre-signal trigger for the **Diff alarm** and the **Max alarm** (individually). They are programmed at 70% of the concerned alarm threshold by default (without self-holding). They can be changed with the “ADW Config” configuration software in 5% increments. By default the pre-signals are programmed on two RIM relays (individually); they are indicated together via the **Al LED** (flashing, 1 s cycle).

2.2.16 Sensing tube isolation

This function is used to place the ADW 535 in an isolated state using the “ADW Config” configuration software (per sensing tube). This means that test alarms can then be triggered on the ADW 535 without activating superordinate systems (FACP) (relays, OC outputs, XLM do not trigger). When the “Isolate” function is switched on, a fault is triggered on the ADW and forwarded to the superordinate centre. The “Fault” LED is continuously lit on the ADW.

2.2.17 Day/night control & weekday control

The ADW 535 can be adapted to operational processes (e.g. in extreme environments with increased disturbance variables during working hours) using the day/night control. When the day/night control is activated along with the required weekdays, different trigger thresholds, pre-signal allocations (trigger level only, not relays) and test parameters can be assigned.

Warning

Improper parameter changes in day/night operation may result in non-compliance with the EN 54-22 norm.

Notice

- Day/night control can be used only via the “ADW Config” configuration software.
- Day/night control is effective only on the activated weekdays (“ADW Config”) and in switch positions ***X01*** – ***X03***.
- On non-activated days of the week, night mode of operation is always selected.
- In addition to the watchdog indicator (flashing point in the left segment display), the point is also continuously lit on the right segment display whenever the day/night control is active (only with selected switch positions ***X01*** – ***X03***).

2.2.18 Fault triggering

If a fault occurs on the ADW 535, the “Fault” relay is de-energised and the “Fault” display is activated. In the event of a fault, the fault profile can also be localised using the event code display on the LMB 35 (switch position ***E***) (see also Sec. 8.5.4.3 and 10.3.1). The following events trigger a fault (list is incomplete):

- Interruption, leak, crushing fault (individual)
- Pressure sensor, test fault (individual)
- External temperature sensor fault
- LMB 35 to LEB 35 communication fault
- Fault in communication LMB 35 to XLM 35 / RIM 36 / SIM 35 / SDcard (individual)
- Emergency fault (microcontroller failure)
- Clock fault
- Undervoltage fault (8.5 VDC, +0 / –0.3 V)
- Supply fault (no voltage on the ADW, without “Fault” display)
- ADW inactive via “Reset external” input.

Notice

The “Fault” relay is picked up in the quiescent state ➔ contact terminal 10/8 (24/22) closed, 10/9 (24/23) open (ADW 535 under voltage; no fault event present).

2.2.19 Event memory

The ADW 535 has an event memory capable of storing up to 1,000 events. The latest (i.e. most recent) event is always placed in the first position. If the memory exceeds 1,000 events, the oldest event is deleted. The event memory as a whole can be deleted only by the manufacturer. The event memory can be read out directly on the ADW 535 with ***EasyConfig*** (switch position ***E*** = last 99 events, see Sec. 8.5.4) or with the “ADW Config” configuration software (up to 1,000 events can be selected).

2.2.20 Data logging on the SD memory card

Measurement values: All relevant measurement values are written to the SD memory card every second (default, can be changed with ADW Config) for each sensing tube and saved in **log files** (*.xls file). After 28,800 entries (corresponding to 8 h with an SD memory card interval of 1 s) a new Log-File is automatically generated. A total of 200 Log-Files (L000.xls to L199.xls) can be generated for long-term logging. After the last Log-File the oldest one (L000.xls) is overwritten. The 200 Log-Files are sufficient to cover 66 days of data logging (with SD memory card interval of 1 s). The Log-Files can then be opened in Excel and the data can be processed with the diagram assistant to create charts.

Events: All events which occur in the ADW 535 are written to the **Event-Files** (*.lev file). After 64,000 events a new Event-File is automatically created. A total of 10 Event-Files (E000.lev to E009.lev) can be generated for long-term logging. After the last Event-File the oldest one (E000.lev) is overwritten. The 10 Event-Files can log over 640,000 events. The Event-Files can be opened with a text editor. Please refer to Sec. 8.5.4 for the interpretation of the events. There is also the possibility of importing Event-Files using the “AWD Config” configuration software and displaying them as real event text.

2.2.21 Reset types

All events triggered on the ADW 535 go into self-holding mode whenever the default configurations are used. To reset, carry out a state reset.

The following reset types are possible (see Sec. 2.2.21.1 to 2.2.21.3).

2.2.21.1 State reset

A state reset is triggered via ***EasyConfig*** switch position ***R*** (***R00***) or by actuating the “Reset external” input (see also Sec. 6.5.2). The state reset can be triggered only after an event, and only if the criterion that resulted in the event trigger is back in the normal state (e.g. Diff pressure in the smoke sensor is again below the trigger threshold or a fault event is rectified).

2.2.21.2 Hardware reset

A hardware reset is triggered if there is a brief interruption of the supply voltage or if the “Reset” button is pressed on the LMB 35 (see **Fig. 31** and **Fig. 35**). This restarts the ADW 535. The previously programmed parameters of the ADW 535 are retained (system-specific configurations).

Notice

Attention: fire incident control, remote alerting!

A hardware reset briefly triggers the fault relay (approx. 1 s). So before maintenance work is carried out on the ADW 535, it is essential to switch off the fire incident controls and remote alerting on superordinate systems (FACP).

2.2.21.3 Initial reset

An initial reset is triggered according to the information in Sec. 7.3.5.

The initial reset procedure consists of four parts:

Starting position with pressure equalisation. In the first part the step motor travels to the defined starting position and remains there (pressure pump is fully wound). In this position the sensing tube screw-junction piece for the outside pressure equalisation on the evaluation unit is to be opened for about 60 s and then firmly closed (with fork wrench). To **continue** the initial reset, press the **“OK” key** on the LMB 35. **Important:** the sensing tube must be **completely vented**. If overpressure of underpressure is still present, the initial reset cannot be continued.

Initial reset pressure. The step motor is re-started to determine the initial reset pressure. The resulting values are saved as basic data (nominal value).

Leakage analysis and **length check**. Based on the initial reset pressure and the known sensing tube length (set via ***EasyConfig*** or ADW Config), a plausibility check of the effective, connected sensing tube is performed. An initial reset fault is triggered if there is a negative length check.

Sealing check. Here, first the pressure in the sensing tube is measured (no overpressure/underpressure) over a defined time period with reference to temperature changes. Afterwards, a sealing check of the connected sensing tube is carried out by generating pressure with the LSU 35 supervising unit and then monitoring for a certain period of time. If leakage is detected, the initial reset procedure is interrupted and an initial reset fault is triggered. The leakage must then be located by means of a sealing check as described in Sec. 5.4.2.5 (mini-compressor) and rectified.

The basic data of the initial reset pressure (nominal value) remains stored until another initial reset is carried out. An initial reset does not discard the previously defined installation-specific parameters (response grade).

Danger

- When commissioning and after changes to the sensing tube (length, repairs), ***it is essential*** to carry out an initial reset. An initial reset must also be carried out after repair work on the ADW 535 (replacement of the LSU 35 supervising unit, LMB 35 main board).
- The initial reset must always be performed under the system’s “normal conditions”, i.e. if possible, under the normal operating temperature of the sensing tube (see also Sec. 4.5.3).
- After a FW upgrade, an initial reset is required only if expressly mentioned in the relevant firmware description.
- When carrying out an initial reset, make sure the sensing tube has been correctly installed (sealed connecting points, no crushings, etc.).
- On an ADW 535-2 the initial reset must be performed for both sensing tubes.

2.2.22 ADW networking

ADW networking via an RS485 interface can be realised by using the additional modules SIM 35 and SMM 535. ADW networking can also be carried out via the Ethernet interface directly from ADW 535 (LMB 35). Please refer to Sec. 11.2 for more information.

Notice

- The normative alarm transmission of the ADW 535 to the superordinate centre does not take place via the ADW network. For that purpose the “Alarm” / “Fault” relays in the ADW or the SecuriFire / Integral addressable loop are to be used from the XLM 35.
- The ADW network cannot be combined with the ASD network.

2.2.23 Heating the evaluation unit below an ambient temperature of –20 °C

If an ADW is used in the temperature range **below –20 °C** the internal heating of the evaluation unit automatically becomes effective. The heating ensures that the temperature inside the evaluation unit does not drop below the minimum permissible temperature for the individual electronic components. The heating is realised by triggering the internal coils in the step motor LSU 35 from the sensing tube I and the resulting normal development of heat. The step motor itself does not run during this process. The heating is activated below **–20 °C** and is switched off again as soon as the temperature inside the evaluation unit rises again to above **–15 °C**. If a test procedure is to be carried out during heating, this procedure takes priority, i.e. the step motor then starts to run "normally".

3 Design

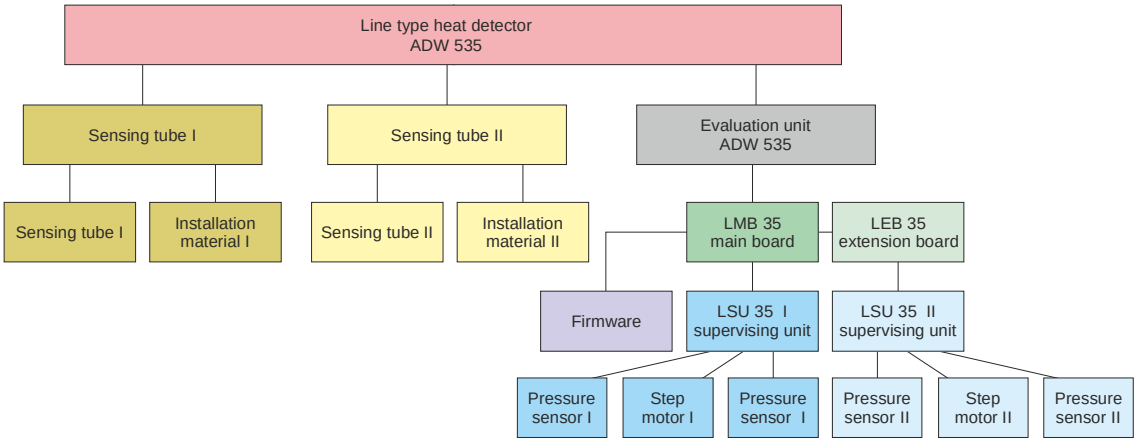


Fig. 4 ADW 535 Design

3.1 Mechanical

The AWD 535 line type heat detector consists of the evaluation unit and one or two sensing tubes.

The sensing tube includes the associated installation material, such as screw-junction pieces, pipe clamps and flexible hose. The sensing tube is connected to the evaluation unit and to screw-junction piece **I** or **II**.

The sensing tube is normally copper. The diameter dimensions are 5 mm outer, 4 mm inner. The supply line to the detection zone (ceiling, detection area) can be designed with flexible hose if necessary (see also Sec. 5.3.) In special applications (e.g. in an extremely corrosive and aggressive environment) other pipe materials may be used subject to the specifications in Sec. 5.3 (stainless steel, Teflon).

The evaluation unit consists of a housing base and housing cover. The housing cover is fitted with four captive screws. In the housing base the LSU 35 supervising unit for sensing tube **I** and **II** is fastened by means of two screws (base) and the sensing tube connection (top side wall). The LMB 35 main board is attached on five supports via the supervising units. On an ADW with two sensing tubes the required extension board is attached on the LTHD main board and electrically connected with the connection plug.

Optional additional modules (XLM 35, RIM 36, SIM 35) can be fitted in four slots in the evaluation unit.

The events are indicated with LEDs on the LTHD main board and made visible by fibre optic rods on the surface of the housing. Depending on the device version, different displays are present:

- ADW 535-1 Operation, fault I, alarm I, pre-signal I.
- ADW 535-2 Additionally: fault II, alarm II, pre-signal II.

The ADW 535 line type heat detector is available in four versions.

In the thermoplastic housing for normal applications:

- ADW 535-1 for one sensing tube, two relays/OCs
- ADW 535-2 for two sensing tubes, four relays/OCs

In the housing for difficult ambient conditions and Ex applications (ATEX) ➔ see **T 140 458** and **T 140 459**:

- ADW 535-1HDx for one sensing tube, two relays/OCs
- ADW 535-2HDx for two sensing tubes, four relays/OCs

Notice

Additional modules XLM 35, RIM 36 and SIM 35 are optionally available and are built into the ADW 535 when setting up the system. A maximum of four modules can be fitted.

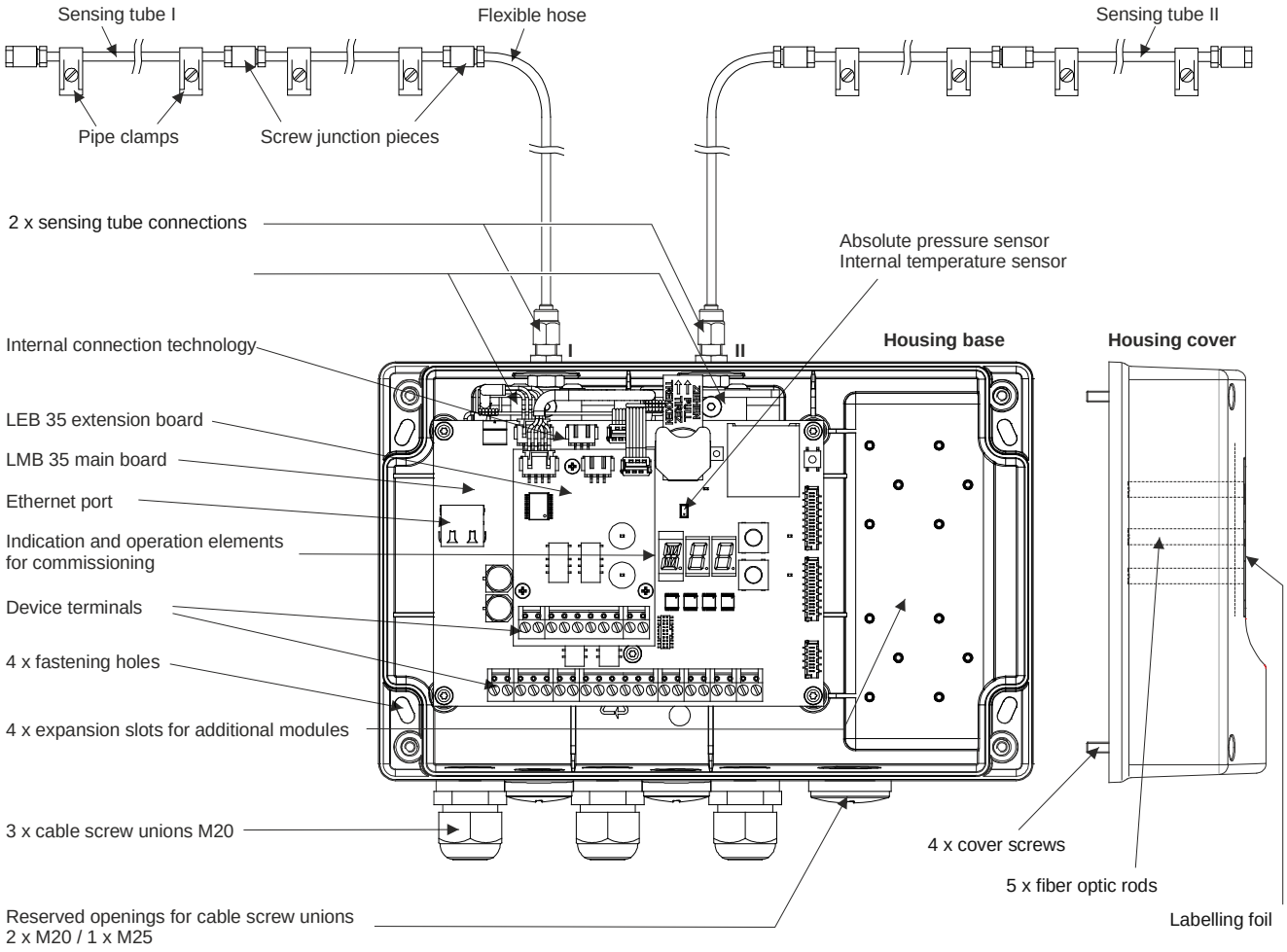


Fig. 5 Mechanical design

3.2 Electrical

The electrical design of the ADW 535 includes the following (may vary depending on the device version):

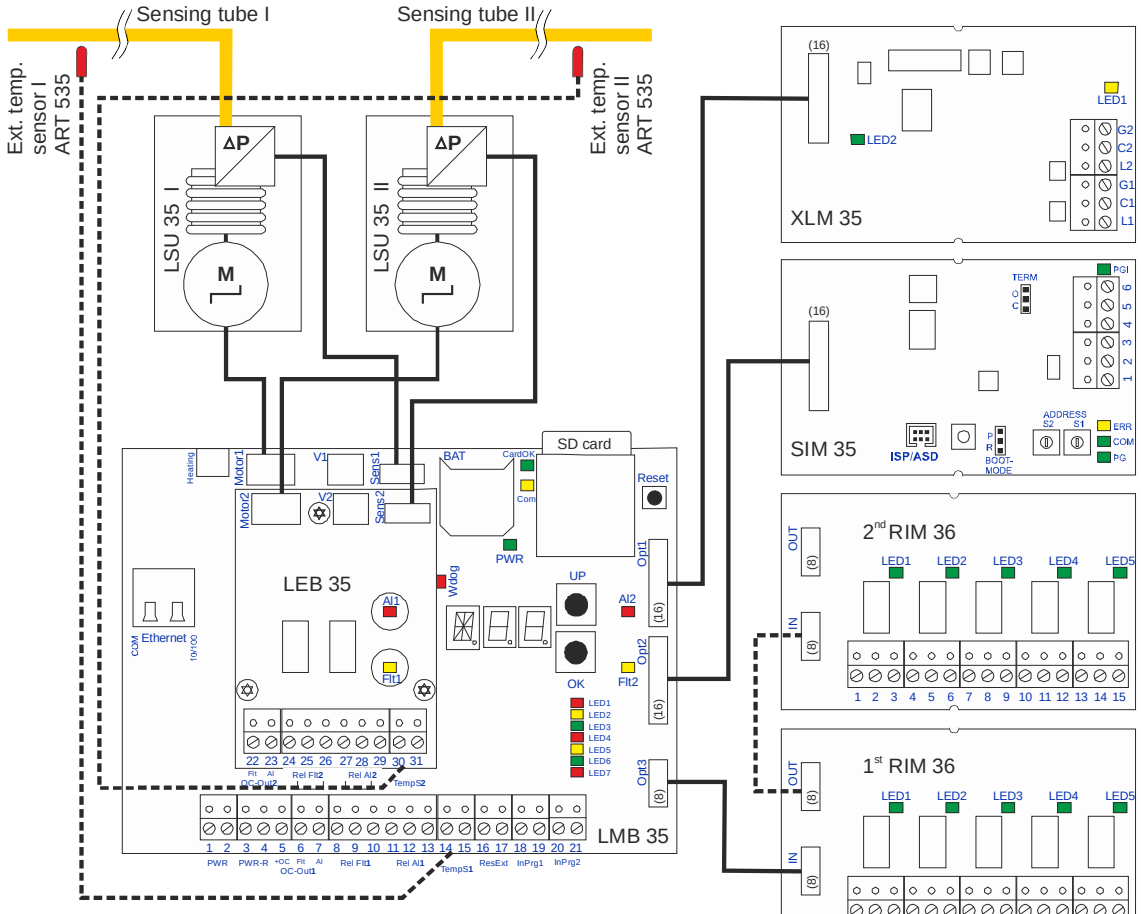
- LMB 35 main board
- LEB 35 extension board (for ADW 535-2)
- LSU 35 supervising unit (2 x for ADW 535-2)
- Additional modules XLM 35, RIM 36, SIM 35.

The following circuit parts and elements are on the **LMB 35** main board:

- Power supply unit with switching controller
- Output stage to activate step motor I
- Input & output stage of pressure sensor I
- Input stage of external temperature sensor I
- Output stage of valve I (not used)
- Evaluation of pressure sensor signals I and II
- Evaluation of external temperature sensors I and II
- 2 opto-isolator inputs (InPrg1 and InPrg2)
- Opto-isolator input for external reset
- Driver modules for actuating the relays and open collector outputs of sensing tube I
- Two relays with potential-free change-over contacts for fault I, alarm I
- Microcontroller with ports, RAM, Flash PROM, EEPROM, etc.
- Switch to write to SD memory card
- SD memory card holder
- Lithium battery
- RTC clock component
- Two buttons (UP / OK), one alphanumeric and two 7-segment displays for configuration settings
- Terminal blocks with pluggable screw terminals for the device connection
- Ethernet interface and plug
- 4 LEDs for fault I, alarm I, fault II, alarm II
- Various control LEDs
- 26-pin plug for connection to the LEB 35 extension board
- Two 16-pin ribbon cable connectors (Option1 and Option2) for connecting the XLM 35 and SIM 35
- One 8-pin ribbon cable connector (Option3) for connecting to two RIM 36 units (cascaded)
- One 4-pin ribbon cable connector for connecting to step motor I
- One 6-pin connector for connecting the pressure sensor I
- One 3-pin connector for connecting valve I (not used)
- Reset button (HW reset).

The following circuit parts and elements are on the **LEB 35** extension board:

- Output step to activate step motor II
- Input & output stage of pressure sensor II
- Input stage of external temperature sensor II
- Output stage of valve II (not used)
- Driver modules for actuating the relays and open collector outputs of sensing tube II
- Two relays with potential-free change-over contacts for fault II, alarm II
- Terminal blocks with pluggable screw terminals OC out II / relays II / ext. TempSens II
- 26-pin plug for connection to the LMB 35 main board
- One 4-pin ribbon cable connector for connection to step motor II
- One 6-pin plug for connecting the pressure sensor II
- One 3-pin plug for connecting valve II (not used)



Connection possibilities of the additional modules:
1 x XLM 35 to “Opt 1” (also possible to “Opt 2”)
1 x SIM 35 to “Opt 2” (also possible to “Opt 1”)
2 x RIM 36 to “Opt 3”, cascaded

Fig. 6 Electrical design

3.3 Hardware / firmware

The hardware is considered to comprise the complete evaluation unit and all units belonging to the ADW 535 line type heat detector, such as sensing tube and mounting material.

The firmware is stored on the Flash PROM in the ADW 535. An EEPROM is fitted for storing and saving system-specific parameters.

Danger

The ADW 535 is to be operated only with the appropriate original firmware from the manufacturer.
Any unauthorised intervention on the firmware or the use of non-original firmware may result in malfunction and/or in damage to the device. Furthermore, all guarantee and warranty rights with respect to the manufacturer of the ADW 535 will become null and void as a result.

Notice

A version change or extension of the ADW 535 firmware does not imply a right to an upgrade or new release for existing ADW 535 systems.

3.4 List of materials / components

Depending on the device version, the following materials are included with the ADW 535 on **delivery** (see also Sec. 5.1, 5.3, 9.5.1 and 12):

	LMB 35	LEB 35	LSU 35	Commissioning protocol	Ext. temp. sensor ART 535	XLM / RIM / SIM
ADW 535-1	Yes	--	1 x	Yes	-- (accessories)	-- (accessories)
ADW 535-2	Yes	Yes	2 x	Yes	-- (accessories)	-- (accessories)
The mounting set for all versions includes: 3x company signs, 1x (2x) clamping ring 5 mm, 1x (2x) 4 labels for sensing tube (specifications for ADW 535-2)						

(① in preparation)

Depending on the version of the device, the following **accessory materials** are available:

	Ext. temperature sensor, ART 535	RIM 36	XLM 35	SIM 35
ADW 535-1	1 x possible	2 x possible	1 x possible	1 x possible
ADW 535-2	2 x possible	2 x possible	1 x possible	1 x possible

(① in preparation)

The **material for the sensing tube** must be separately purchased in the required quantities from the manufacturer for the specific size and deployment of the system. This material is listed in document **T 140 362** (see also Sec. 5.3, 9.5.1 and 12).

Notice

The material for the sensing tube is a component of the VdS device approval. Only the materials listed and approved by the manufacturer may be used when setting up the system, see T 140 362. Materials from other sources may be used only if the manufacturer's written consent has been obtained.

A special **tool** is required for mounting and handling the ADW 535 (Torx screws). Please refer to the list in Sec. 5.1.

3.5 Packaging

The evaluation unit is delivered in a suitable telescopic cardboard box sealed with adhesive tape. The packaging is recyclable and can be reused.

The mounting set and installation material sundries are packed in recyclable bags. The sensing tube is supplied in sections (copper, each approx. 5.5 m; stainless steel, each approx. 6 m), depending on the quantity of wooden crates ordered for up to 500 m, 1000 m or 2000 m sensing tubes. The Teflon sensing tube is delivered in 100 m rolls. The flexible tube is also delivered in rolls of the ordered length.

The contents of the packaging is specified as described in Sec. 1.4.

Warning

- Electronic components such as printed circuit boards are supplied in antistatic protective packaging. These components should be removed from the packaging just shortly before use or mounting.
- Only devices with unbroken or unopened seals (adhesive tape seal) are considered new. Packaging should not be opened until immediately before use.
- The cardboard packaging of the evaluation unit meets the minimum requirement for packaging and can be stacked up to 10 times its weight.
- The packaging of the ADW 535 is suitable only to a limited extent for shipment by post or railway.
- For transport in or to tropical regions, marine transport etc., the appropriate measures must be taken (special packaging as provided by the shipper).

4 Planning

4.1 General aspects of planning

4.1.1 Standards, regulations, guidelines, approvals

Section 4 “Planning” provides guidelines for planning the ADW 535 line type heat detector. These guidelines address the direct application only insofar as it applies to compliance with EN 54-22 and is required to ensure technically trouble-free operation.

Notice

The use of special fire alarm systems such as the ADW 535 is subject in some cases to country-specific regulations and guidelines and must therefore be approved by the relevant technical bodies and authorities (insurance companies) prior to implementation.

For many uses that are country, facility and application specific there are planning guidelines, application examples and applicable regulations and directives. These documents can be requested from the manufacturer of the ADW 535 system or from the responsible technical bodies and authorities.

Danger

The country-specific regulations and guidelines apply as a matter of principle to the intended use, planning and application of the ADW 535 line type heat detector. In any case the country-specific specifications always take precedence over the planning specifications outlined below.

The ADW 535 line type heat detector complies with the requirements of European Product Standard **EN 54-22**.

The response behaviour of the ADW 535 is tested in compliance with:

- **EN 54-22** = class **A1I** to **GI**;
- **UL/ULC** = according EN 54-22 class **A1I** to **GI**.

4.2 Applications

Thanks to the product’s excellent properties under severe ambient conditions, the ADW 535 is used wherever problems are to be expected owing to latent disturbance variables during operation such that optimal protection can no longer be guaranteed with conventional point detectors. Thanks to its self-check feature and the periodic, automatic test, the ADW 535 is particularly suitable for use in applications where the legally prescribed functional and maintenance checks cannot be performed. Typical applications of the ADW 535 include the following:

- Road tunnels, railway tunnels and underground railway tunnels, underground mining;
- Car park halls, car decks on ships, loading platforms;
- Paint spray and paint shops (see also Sec. 4.9);
- Chemical industry, tank storage, (Ex zones see also Sec. 4.9 and 11.1 such as **T 140 458** and **T 140 459**).

The type of application determines the response grade selection according to **EN 54-22** as follows:

- Space surveillance Cl. **A1I**, **A2I** ➔ Heat impingement of **10 m**
- Equipment monitoring Cl. **BI** to **GI** ➔ Heat impingement of the **entire length** in the monitored area.

4.3 Area of application

To comply with a required system configuration, the ADW 535 can be connected via its potential-free change-over contacts or by using control-panel-specific line modules (e.g. XLM 35) to all common fire alarm systems virtually without restrictions.

4.4 Planning aids

4.4.1 Planning with “ADW HeatCalc” calculation

The “ADW HeatCalc” calculation software is used for planning the sensor tubing. It is used for designing the required pipe entities on a drawing in order to realise a system. The “ADW HeatCalc” calculation software provides a varied selection of tube materials, fittings and accessory parts (detection coil, test coil, etc.). The end result of the software calculation specifies triggering whose parameters comply with EN 54-22, Class A1l – Gl; the ADW 535 will then be programmed with these parameters. For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

Asymmetrical sensing tubes can be planned and set up using the “ADW HeatCalc” calculation software. System limits for EN 54-22 compliant triggering are defined in the calculation software.

The material stored in the “ADW HeatCalc” calculation software for the sensing tube as well as the “ADW HeatCalc” calculation software itself are components of the VdS device approval. A list of the available materials for the sensing tube is provided in a separate document (T 140 362).

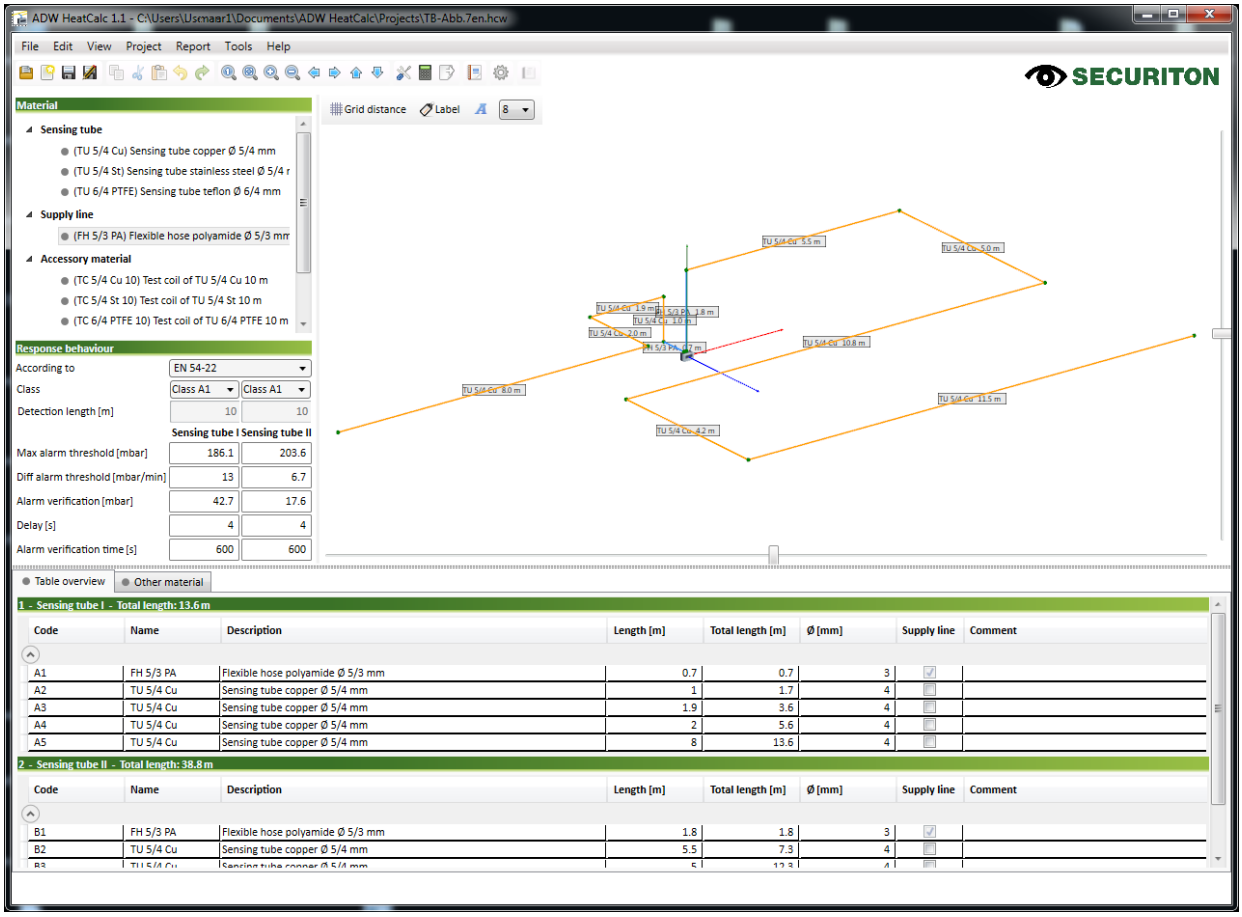


Fig. 7 “ADW HeatCalc” programming interface

Notice: Modernising existing systems with the ADW 535

When modernising existing systems, the existing sensing tubing must be re-calculated using the “ADW HeatCalc” calculation software. The existing sensing tube must be checked (inspected for damage, leakage) prior to commissioning.

4.4.2 Planning without “ADW HeatCalc” calculation

If planning work is performed **without** “ADW HeatCalc”, the ADW 535 provides a number of switch positions which have been stored with predefined values required for a trigger in accordance with EN 54-22, Class A1l–Gl (see also Sec. 4.6.1.1). For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

Notice: Planning without “ADW HeatCalc” calculation

- The maximum tube lengths specified in Sec. 4.6.1.1 may not be exceeded.
- Only **copper** and **stainless steel** tubing and their screw-junction pieces (including flexible hose for lines) may be used as listed in document T 140 362.
- **Teflon** may be used **only with “ADW HeatCalc” calculation**.
- If other tube and accessory parts are to be used (e.g. detection coils, test coils, T-pieces in the sensing tube, etc.), it is essential that you use the “ADW HeatCalc” calculation software.

4.5 Monitoring area

4.5.1 Tunnels

Notice

In the portal areas of tunnels a distance of 25 m must be maintained from the end of the sensing tube to the portal.

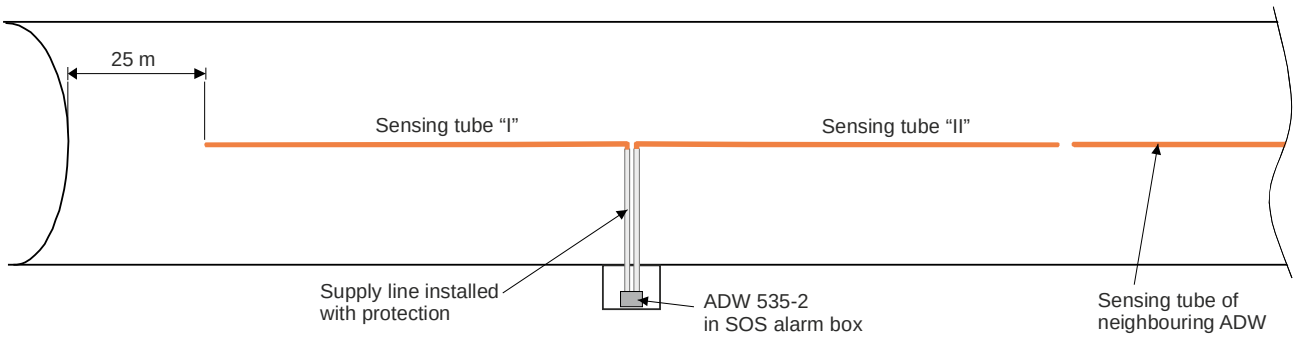


Fig. 8 ADW 535-2 arrangement in tunnels

Tunnels with arched or rounded ceilings
2 to 3 traffic lanes

- Sensing tube mounting **always** in the centre of the tunnel (lateral tolerance = 0.5 m)
- **No** sensing tube mounting permitted on the side
- Maximum length per sensing tube = 200 m ①, (if Teflon = 150 m)

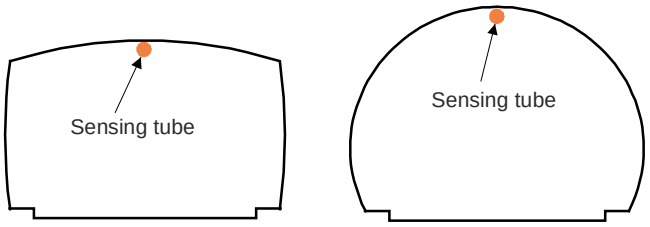


Fig. 9 Tunnel with arched, rounded ceiling

Tunnel with flat ceilings
2 to 3 traffic lanes

- Sensing tube mounting preferably in the centre of the tunnel (lateral tolerance = 0.5 m)
- Sensing tube mounting on the side possible, distance "**a**":
  - for 2 traffic lanes = min. 0.5 m
  - for 3 traffic lanes = min. 1 m
- Maximum length per sensing tube = 200 m ①, (if Teflon = 150 m)

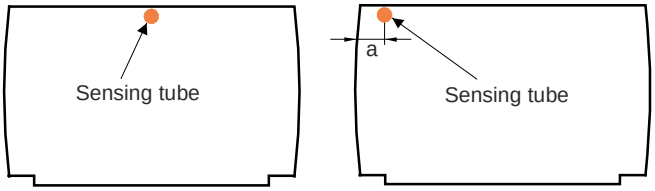


Fig. 10 Tunnel with flat ceiling

Tunnel with flat ceilings
over 3 traffic lanes

- At least 2 sensing tubes
- Sensing tube mounting distance:
  - "**a**" = max. 10 m
  - "**b**" = ½ "a"
- Maximum length per sensing tube = 200 m ①, (if Teflon = 150 m)

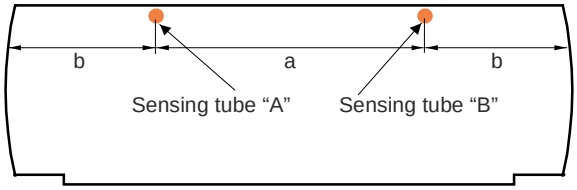


Fig. 11 Tunnels with flat ceiling, over 3 traffic lanes

Notice

① Depending on the detection properties requirements, the maximum sensing tube length can be shorter (based the manufacturer's specifications). The maximum sensing tube length of 200 m (Teflon = 150 m) specified above has not been tested according to EN 54-22. If the requirements according to EN 54-22 apply, then the system limits detailed in Sec. 4.6 must be adhered to (copper/stainless steel = 115 m / Teflon = 105 m).

4.5.2 Car park halls, car decks on ships

Notice

The following information about the monitoring area and sensing tube distances is based on country-specific directives and regulations for planning and installation of automatic fire alarm installation (e.g. VdS 2095 in Germany, VKF in Switzerland).

In vehicle storage halls and similar applications the following basic principle applies:

- Maximum sensing tube length = 115 m (per sensing tube)
- Routed in spiral shape possible
- Maximum permitted distance "**a**" of sensing tube to sensing tube = 7.0 m
- Maximum permitted distance of sensing tube to wall "**b**" = ½, "**a**" = 3.5 m
- Provision for ceiling joists acc. to country-specific directives

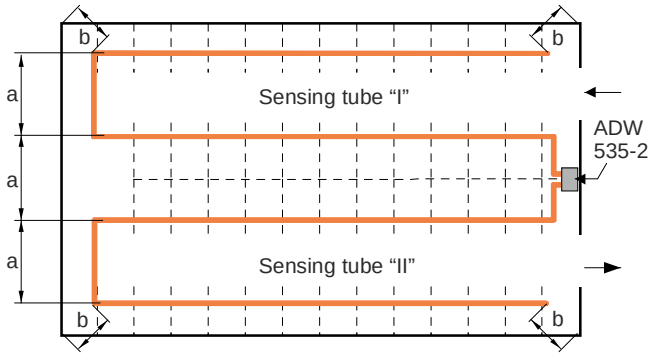


Fig. 12 Vehicle storage hall example

4.5.3 Use when ambient temperature is high

Uses of the ADW 535 in high ambient temperature areas are defined as equipment monitoring in accordance with EN 54-22. For equipment monitoring it is assumed that in the event of a fire the **entire length** of the sensing tube is impinged with heat in the monitored area. The information in the following notice must be strictly adhered to in high temperature areas.

Warning

- The **temperature specification** of the used sensing tube materials **described in Sec. 5.3** must be observed and adhered to.
- When used in an environment with high ambient temperatures, use metal pipe clamps.
- The evaluation units must be stored in an area with normal ambient temperatures.
- A supply line made of flexible tubing must be implemented between the ADW 535 and the high-temperature area (heat spreads via the tube to the evaluation unit).
- The transition from the flexible tubing to the sensing tube must be outside the high-temperature area.
- For the temperature compensation the external temperature sensor ART 535 is to be used and placed in the monitored area. For temperature ranges over 200°C a special version of the ART 535 using the manufacturer's specifications is to be used.

For use in high ambient temperatures that exceed the application temperature of the response grades compliant with EN 54-22 (greater than 140°C), the maximum alarm threshold is to be set using “ADW Config” based on the following table. Also, depending on the application temperature (or triggering temperature), the minimum temperature specified in the table for the initial reset must be observed. Finally, the maximum permitted pressure range of the pressure sensor used in the ADW must not be exceeded.

Notice

The values listed below apply to sensing tubes with a **length ratio** of **1 to 10** (“Supply line” to “Length in the monitored area”). The values for **other length ratios** are provided by the **manufacturer** upon request.

Trigger temperature ① (°C)	Max alarm threshold (mbar)	Minimum temp. for initial reset (°C)	Trigger temperature ① (°C)	Max alarm threshold (mbar)	Minimum temp. for initial reset (°C)	Trigger temperature ① (°C)	Max alarm threshold (mbar)	Minimum temp. for initial reset (°C)
160	560	11	210	735	43	260	910	76
170	595	18	220	770	50	270	945	83
180	630	24	230	805	57	280	980	89
190	665	30	240	840	63	290	1015	96
200	700	37	250	875	70	300	1050	102

① The corresponding **maximum application temperature** is in each case **30°C under** the specified trigger temperature.

Warning

- The setting of the **Diff alarm** when used in high ambient temperatures should be identical with the setting of classes **BI** to **GI** (see also Sec. 4.6.1.1).
- Because the length ratio (“Supply line length” to “Length in the monitored area”) is a key factor for the **Diff alarm**, the values of the **Diff alarm** length must always be calculated with “**ADW HeatCalc**”.

4.5.4 Other

For all other applications the monitoring area and sensing tube distances are determined in consultation with the point of delivery. The permissible sensing tube length is generally 115 m. Longer application-specific lengths have to be approved by the manufacturer. For each monitored area (for multiple areas) and in object protection, a minimum sensing tube length of 10 m must be observed (heat impingement).

4.6 System limits

When using an ADW 535 line type heat detector, the system limits below apply and ensure compliance to EN 54-22 requirements. Depending on the planning process, the system limits as set out in Sec. 4.6.1 **also** apply.

Sensing tube material	Max. total length of the sensing tube per evaluation channel							
	A1l / A2l	Bl	Cl	Dl	El	Fl	Gl	Not EN
Copper / stainless steel	115 m	115 m	115 m	115 m	115 m	115 m	115 m	200 m
Teflon	105 m	105 m	105 m	105 m	105 m	105 m	105 m	150 m

4.6.1 System limits without “ADW HeatCalc” calculation

The system limits detailed in this section apply to planning without the “ADW HeatCalc” calculation software. The system limits are switch positions (***EasyConfig***) stored with predefined values for the **alarm release** compliant with **EN 54-22**, Class A1l to Gl (switch positions ***C*** > ***A11*** to ***G02***). For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

According to **EN 54-22**, in the event of pipe breakage in the sensing tube a **fault trigger** must occur within **300 s**. This requirement is met by the ADW 535 in switch positions ***C*** > ***A11*** to ***G02***.

For applications in severe environments with **increased disturbance variables** the sensing tube monitoring can be disarmed (**outside EN 54-22**). For that purpose, in addition to switch positions ***C*** > ***A11*** to ***G02***, switch positions ***W04*** to ***W09*** are also used.

Warning

Concerning sensing tube monitoring, switch positions ***W04*** to ***W09*** react **outside** the prescribed times according to **EN 54-22** and therefore may be used only after consulting with the manufacturer.

Fig. 13 below illustrates the sensing tube design and tube length specifications. Maximum tube length is found in the table in Sec. 4.6.1.1.

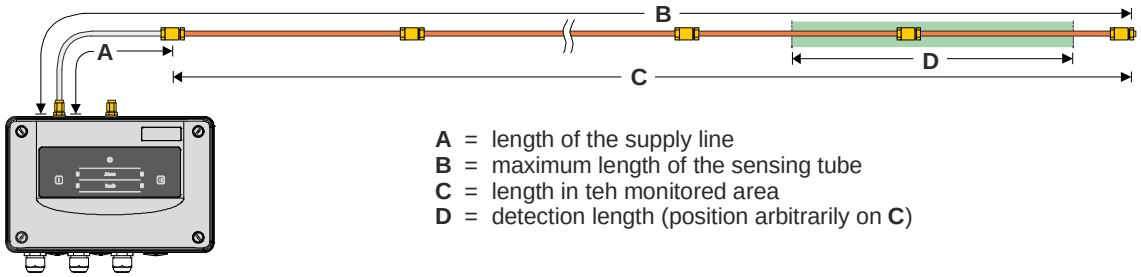


Fig. 13 Definitions of sensing tube lengths

4.6.1.1 Normative system limits without "ADW HeatCalc" calculation

Switch positions ***C*** > ***A11*** to ***G02*** have configured values necessary for alarm response sensitivity and sensing tube monitoring in compliance with EN 54-22 Class A1l to Gl. The switch position designation is deciphered as follows:

- First digit Response grade ***A***, ***b***, ***C***, etc.
- Second digit Response grade addition ***1***, ***2***, only for Class A (for Class B to G no addition = ***0***)
- Third digit Sensing tube ***1***, ***2*** (number of sensing tubes on the ADW 535).

Example: ***A22*** Response grade ***A*** / response grade addition ***2*** / ***2*** sensing tubes = Class A2 with 2 sensing tubes

Switch position compliant with EN 54-22: *C > A11 to G02* ①		Switch position (additional), not standards compliant	Application	Diff-Alarm			Max alarm	AI delay	Length of line (ADW to monit. area) ③	Max. length of sensing tube (ADW to tube end) ②
					Alarm verification					
1 tube	2 tube	1 tube / 2 tube		Diff alarm threshold ② (mbar/min)	Delta pressure ② (mbar)	Time (s)	Max alarm threshold ② (mbar)	(s)	(Fig. 13 „A“)	(Fig. 13 „B“)
A11	A12	W04 – W09	R	2.3	6.1	600	210.9	4	5 m	115 m
A21	A22	W04 – W09	R	2.3	8.2	600	220.4	4	5 m	115 m
b01	b02	W04 – W09	E	2.3	8.2	600	273.2	4	5 m	115 m
C01 ①	C02 ①	W04 – W09	E	2.3	8.2	600	326.8	4	5 m	115 m
d01 ①	d02 ①	W04 – W09	E	2.3	8.2	600	380.5	4	5 m	115 m
E01 ①	E02 ①	W04 – W09	E	2.3	8.2	600	433.2	4	5 m	115 m
F01 ①	F02 ①	W04 – W09	E	2.3	8.2	600	486.9	4	5 m	115 m
G01 ①	G02 ①	W04 – W09	E	2.3	8.2	600	540.6	4	5 m	115 m

Warning

Switch positions ***W04*** to ***W09*** may be used only after consulting with the manufacturer. The configured values they contain concerning sensing tube monitoring are **not** tested in accordance with EN (see Sec. 4.6.1.2).

Notice

① For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed. In classes **CI** to **GI** the ART 535 external temperature sensor must always be used for temperature compensation (see also Sec. 2.2.12 and 6.5.6).

② The values for **Diff alarm**, **Max alarm** and **delta pressure** specified in the table above are valid only for a version of the sensing tube that is 115 m in length (see also Sec. 2.2.10 and 2.2.11). With the programming of the project-specific length of the sensing tube in the setting procedure (***EasyConfig*** submenu ***L01*** / ***L02*** > ***015*** to ***115*** in the concerned switch position ***C***) the values are converted accordingly and configured in the ADW.

③ The length of the **line** must be observed as specified above. Deviations of ± 10% are permitted.

R / E application: The response grades according to EN 54-22 are oriented to the type of application;
R = space surveillance = **10 m** heat impingement
E = equipment monitoring = heat impingement of the **entire length** in the monitored area (crucial only for the Max alarm)

When operating the **Teflon sensing tube**, the "**ADW HeatCalc**" software must be used to determine alarm thresholds.

4.6.1.2 Non-normative system limits without "ADW HeatCalc" calculation

Switch positions ***W04*** to ***W09*** contain **non-normative system limits** concerning **sensing tube monitoring**. The alarm response sensitivity compliant with EN 54-22 Class A1l to Gl is not influenced but rather corresponds to the settings of the additionally set ***EasyConfig*** switch positions ***C*** > ***A11*** to ***G02***. For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

The following table shows the parameters of switch positions ***W04*** to ***W09*** that do not conform to EN 54-22 concerning sensing tube monitoring. The settings always apply to **both** sensing tubes.

Alarm release compliant with EN 54-22:		**Sensing tube monitoring:**							
↓	**corresponds to position**	**Remarks**	**Monitoring acc. to EN 54-22**	**Cyclical Test**	**Sensitivity ①**	**Interval**	**Repetition rate**	**Waiting time**	**Switch position**
A1l **A2l** **Bl** **Cl** **Dl** **El** **Fl** **Gl**	A11 / A12 A21 / A22 B01 / B02 C01 / C02 D01 / D02 E01 / E02 F01 / F02 G01 / G02	Normative	On	On	Medium	24 h	2 x until fault	30 min	W00 ②
		Normative	On	On	Low	24 h	4 x until fault	30 min	W01
		Normative	On	On	High	24 h	4 x until fault	30 min	W02
		Normative	On	Off	Low	---	---	---	W03
		Not normative	Off	On	Low	8 h	2 x until fault	30 min	W04
		Not normative	Off	On	Low	8 h	4 x until fault	30 min	W05
		Not normative	Off	On	Medium	8 h	2 x until fault	30 min	W06
		Not normative	Off	On	Medium	8 h	4 x until fault	30 min	W07
		Not normative	Off	On	High	8 h	2 x until fault	30 min	W08
		Not normative	Off	On	High	8 h	4 x until fault	30 min	W09

Notice

① See also Sec. 2.2.9.1 for more about the sensitivity levels "**Low**", "**Medium**" and "**High**".

Warning

- Switch positions ***W04*** to ***W09*** may be used only after consulting with the manufacturer. The configured values they contain concerning sensing tube monitoring are **not** tested in accordance with EN.

② Default setting = ***W00***. Via switch positions ***W00*** to ***W03*** the sensing tube monitoring can be subsequently switched back to **normative limits**.

4.7 Settings

Depending on the planning process – with or without the “ADW HeatCalc” calculation software – the following setting procedure is required:

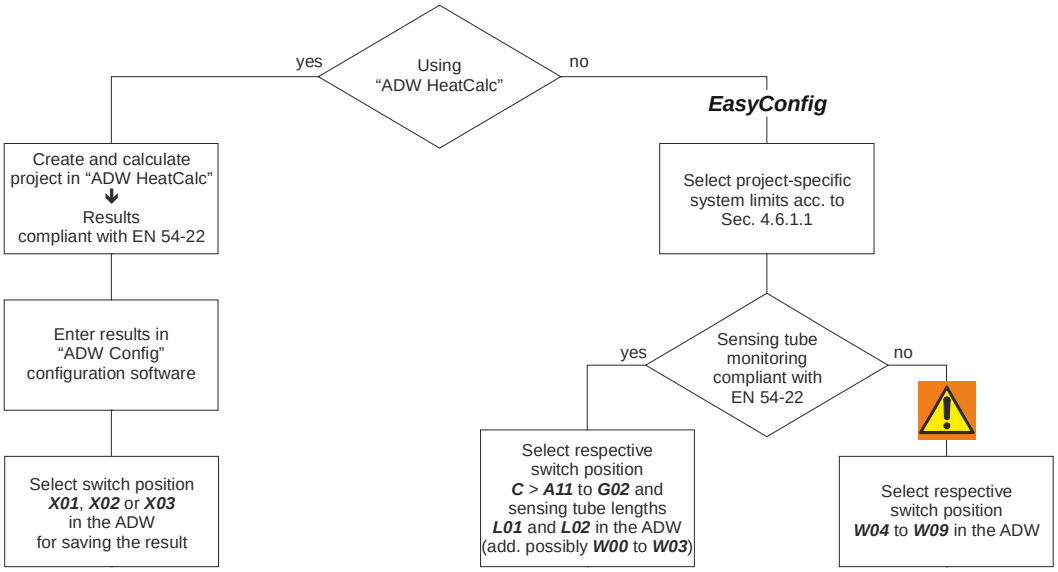


Fig. 14 Workflow for project-specific programming and adjustment

Warning

Switch positions ***W04*** to ***W10*** may be used only after consulting with the manufacturer. The configured values they contain concerning sensing tube monitoring are **not** tested in accordance with EN.

The description of the predefined positions and the operation structure is found in Sec. 4.6.1.1, 4.6.1.2, 7.2.1 and 8.3.

Depending on the use of the ADW 535, it may be necessary to make adjustments to the sensing tube monitoring using the “ADW Config” configuration software. Please note and adhere to the following information:

Warning

Starting the test procedure **only from cyclical test procedure** (not from monitoring) means non-compliance with EN 54-22 and may be performed only after consulting with the manufacturer.

Notice

- In applications in extreme environments with increased disturbance variables (e.g. tunnels) a **deviation in the sensing tube monitoring** may be necessary. **Important**: This may result in non-compliance with the EN 54-22 standard and should be used only after consultation with the manufacturer.
- Changing the configuration “**Sensing tube monitoring**” is for use under special conditions and may be implemented only after consulting with the manufacturer.

4.8 Electrical installation

4.8.1 Installation cable requirements

The supply line from the FACP to the evaluation unit is determined by the line and FACP technology in use.

Cables with twisted pairs are to be used as a matter of principle. With 4-wire and multi-wire cables, twin- or quad-twist cables are to be used.

Laying the voltage supply line and line in parallel is permitted.

A separate wire pair is to be used for the ADW 535 voltage supply.

The electrical installation is usually performed with commercially available cables. Depending on the country of use, special fire detector cable may be required by the relevant authorities. The relevant country-specific authorities should therefore be consulted concerning the required cable types.

The installation cable must have a minimum wire diameter of 0.8 mm (0.5 mm²). **Please refer to Sec. 4.8.2 for determining the exact maximum cable length and the required cable cross-section**.

Danger

For safety reasons (EN 54) individual cables must be used for the outbound and return lines for addressable loop technologies.

Further, the **FACP manufacturer's specifications** concerning maximum **line length**, **cable type**, **shielding** etc. of the addressable loop technology **must be observed**.

The order separation and installation type are also subject to country-specific guidelines and regulations.

Caution: For monitoring the automatic fire detector, **no looped lines** may be connected to terminals "**Alarm I**", "**Fault I**", "**Alarm II**" or "**Fault II**". The looped line must be interrupted to enable connection monitoring.

The electrical installation of the ADW 535 can normally be performed without screening. Screening of the installation is required wherever EMC influences are to be expected. In the following environments disturbance variables can be expected and the installation must be provided with screening accordingly:

In and around transmitter and radio facilities. Near high-voltage and low-voltage installations with high energy. In areas with EMC field intensities in excess of 10 V/m. In cable ducts and vertical shafts together with high-energy cables. In areas with high-energy devices and installations (generators, power plants, railway facilities, X-ray equipment, etc.). Outside buildings.

If screening is used, the cable screening in the ADW 535 is to be connected to an additional support terminal. The cable screening must **not** be connected to the minus or Ground terminal of the LMB 35.

4.8.2 Determining the conductor cross-section

Danger

The conductor cross-section must always be determined and logged accordingly. Insufficiently rated conductor cross-sections can result in malfunctions of the ADW 535.

Notice

When determining the required conductor cross-section, it is necessary to take into consideration not only the ADW 535 voltage consumption, but also the limit data of the line and FACP technology used.

As a rule, the conductor cross-section required for the ADW supply is also sufficient for the line. It is nevertheless advisable to calculate the minimum line cross-section with the FACP-specific limit data (power consumption/voltage drop).

The terminals of the ADW 535 are designed for maximum 2.5 mm². To continue the supply line to a neighbouring ADW it may therefore be necessary to install additional distributor or support terminals. **Important**: Use support terminals only for the power supply line.

The current consumption of consumers operated on the OC outputs must be taken into account when the current is calculated.

To ensure the ADW 535 is able to operate fault-free, the conductor cross-section must be rated so that the maximum required power consumption is available in all cases at the end of the electric installation (i.e. at the ADW 535).

When determining the conductor cross-section, the highest possible power consumption by the ADW 535 during normal operation is the decisive factor. Due to its circuitry design, the ADW 535 has the highest power consumption at the minimum supply voltage, i.e. at 9 VDC. If an ADW is used in the temperature range **below –20 °C** you should note that the maximum power consumption may be **higher** since the heating is activated automatically (see also chapter 2.2.23).

Listed below are the key conductor cross-section values for the ADW 535:

• Minimum wire diameter:		0.8 mm (0.5 mm²)
	12 VDC operation	24 VDC operation
• Maximum current consumption at:	9 VDC	18 VDC
- ADW 535-1, test running	660 mA	270 mA
- ADW 535-1, heating running (below –20 °C)	775 mA	360 mA
- ADW 535-2, test running	660 mA	290 mA
- ADW 535-2, heating running (below –20 °C)	775 mA	375 mA
- Additionally with RIM 36 (with 2 x RIM 36 = x 2)	48 mA	23 mA
- Additionally with XLM 35	20 mA	10 mA
- Additionally with SIM 35	20 mA	10 mA
• Maximum permitted voltage drop on the installation:	3 VDC	6 VDC

Calculation: $A = \frac{I \times L \times 2}{\gamma \times \Delta U}$

I = Power consumption (in A)
2 = Factor for return line
L = Single line length (in m)
γ = Cu conductivity (57)
ΔU = Voltage drop (in V)

Example 1: ADW 535-2, line length 100 m, 12 VDC operation:

Calculation: $A = \frac{0.660 \times 100 \times 2}{57 \times 3} = 0.77 \text{ mm}^2$ → **1.0 mm²**

Example 2: ADW 535-2 with XLM 35, line length 300 m, 24 VDC operation, use of the ADW down to –30 °C:

Calculation: $A = \frac{0.375 \times 300 \times 2}{57 \times 6} = 0.65 \text{ mm}^2$ → **1.0 mm²**

4.9 Restrictions

Notice

The following restrictions apply to the use and application of the ADW 535. For other solutions, please consult the manufacturer.

- Only the materials supplied by the manufacturer may be used for setting up the system. Materials from other sources may be used only if the manufacturer's written consent has been obtained.
- The sensing tube length with the sensing tube material listed in Sec. 5.3 must be within the range of 10 to 115 m (in tunnels 200 m Cu or 150 m PTFE), including ascent to the ceiling. Other tube lengths mean that special sensing tubes have to be selected (see also Sec. 5.3).
- For each monitored area (for multiple areas) and in object protection, a minimum sensing tube length of 10 m must be observed (heat impingement).
- Evaluation units and sensing tubes must not be exposed to direct sunlight.
- In applications where extreme pressure impact or extreme temperature changes due to work processes may occur, the evaluation unit must be enclosed in an additional protective box (e.g. SOS alarm boxes in road tunnels). In some cases construction measures may be necessary, e.g. shielding the sensing tube in certain areas.
- If the sensing tube is being used in extremely corrosive environments, provide for sufficiently resistant tube materials (see also Sec. 5.3).
- Monitoring paint spray and paint shops is possible with the line type heat detector ADW 535. Concerning planning and mounting the sensing tube, there are points that need to be taken into account (e.g. thermal conductivity and condensation on paint/coating due to the work process). For this reason consult with the manufacturer of the ADW 535 before implementation.

Danger

When used in **explosion hazardous areas**, it is imperative to observe and adhere to the information in **Sec. 11.1**.

4.10 Environmental influences

Danger

On the basis of the conducted tests, the ADW 535 may be used in an environment that is within the scope of the type approvals. The environmental conditions as described in Sec. 13 must also be observed. Non-observance can negatively impact proper functioning of the ADW 535.

Notice

For special applications (e.g. in arctic or tropical climates, in ship applications, high-level EMC environments, high impact etc.) please contact the manufacturer of the ADW 535 for empirical values and special application guidelines.

5 Mounting

5.1 Mounting guidelines

Notice

Material and products. When the system is set up, only the following supplied, approved and listed materials may be used:

- Evaluation unit, additional modules
- Sensing tube material and accessory materials (acc. to T 140 362).

Materials from other sources do not conform to EN 54-22 approval and may only be used if the manufacturer's written consent has been obtained.

Installation materials such as cables, intermediate distributors and fastening materials are usually supplied by the customer. Rust-proof screws are to be used for system parts (V4A).

Tools for handling the evaluation unit. The tools listed below are required for mounting and installation (sorted in the sequence in which they are used in this document):

• Opening the evaluation unit	Torx screwdriver T20
• Module holder for additional modules	Torx screwdriver T15
• Terminals	flat-blade screwdriver no. 1 (3.5 mm)
• Replacing LMB main board	Torx screwdriver T10
• Replacing LMB main board on ADW 535-2 (additional)	Fork wrench no. 5.5
• Replacing LEB extension board	Phillips-head screwdriver no. 1
• Replacing LSU supervising unit	Torx screw driver T10
• Replacing LSU supervising unit	Fork wrench no. 12
• Sensing tube connection to the evaluation unit	Fork wrench no. 10
• Sensing tube screw junction for copper and stainless steel tube	Fork wrench no. 10
• Sensing tube screw connection for Teflon tube	Fork wrench no. 10 and 12

5.2 ADW 535-2 (-1) dimensioned drawing & drilling plan for evaluation unit

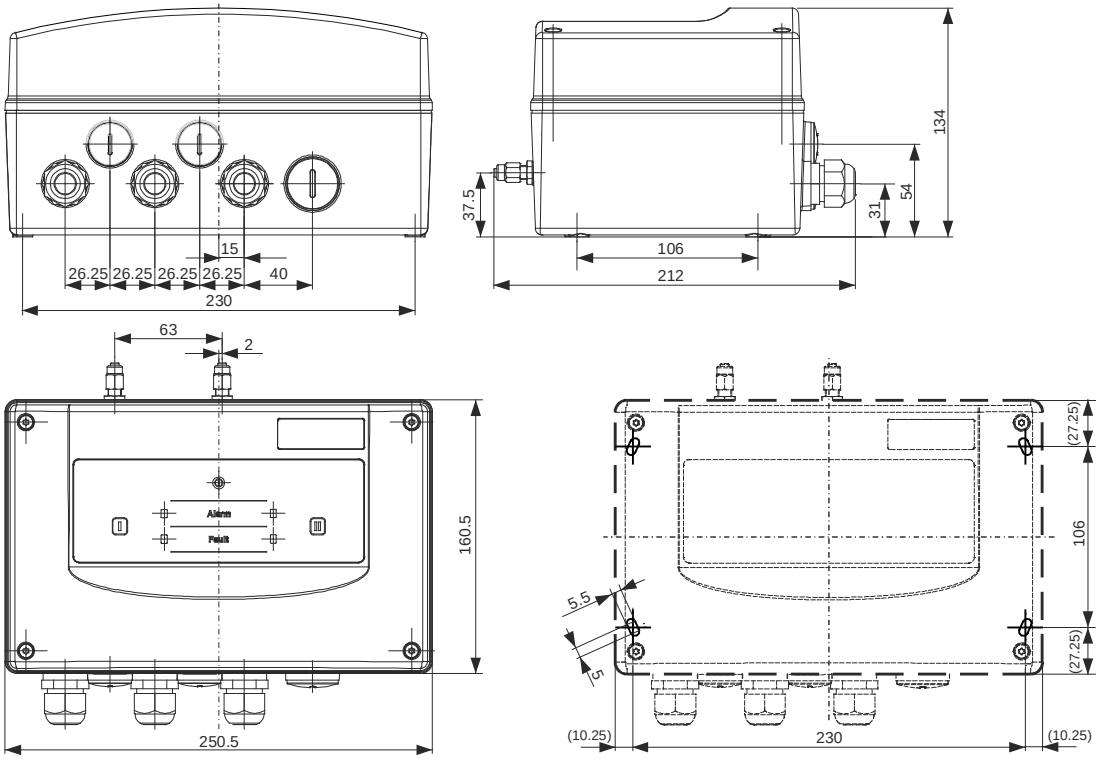


Fig. 15 Dimensioned drawing, drilling plan for evaluation unit

5.3 Material for the sensing tube

If the sensing tube is to be used in extremely corrosive environments, provide for sufficiently resistant tube materials. The available sensing tube materials and their application are listed below:

Material	Application
Copper (Cu)	Standard sensing tube for applications with normal ambient temperatures: • –40 – +180°C ➔ ① (When used at 100°C and above, use metal pipe clamps).
Stainless steel (St) ②	Sensor tube for applications in corrosive environments, especially in the food industry for hygienic reasons: • –40 – +300°C (when used at 100°C and above, use metal pipe clamps).
Teflon (PTFE)	Sensor tube for applications in very corrosive and aggressive environments: • –40 – +260°C (when used at more than 100°C, metal pipe clamps and brass screw-junction pieces must be used; if more than 180 C the screw-junction pieces must be outside of the monitored area ➔ ①).

Danger

Pipe materials other than those listed above may be used only after consulting with the manufacturer of the ADW 535 and with the manufacturer's written consent.

Use only tubing materials (material, supplier, dimensions) that have been tested and approved by the manufacturer of the ADW 535.

Notice

① Higher temperatures are possible after consulting with the manufacturer.

② When using stainless steel sensing tubes in corrosive environments, a PS TU 5/4 St protective screw-junction piece must be used in order to protect the brass sensing tube connection on the ADW map case (see T 140 362). Details for handling this protective screw-junction piece can be seen on the instruction sheet.

A list of the available **materials for the sensing tubing** (pipes, screw-junction pieces etc.) for the ADW 535 is available in a separate document (**T 140 362**).

5.4 Types of mounting

Notice

The mounting types described in the following Sec. 5.4 are decisive for the proper functioning of the ADW 535. The specifications must therefore be strictly adhered to. Deviations are permitted only with the written consent of the manufacturer.

5.4.1 Evaluation unit

The evaluation unit can be mounted in the X, Y or Z axis. An easily accessible location should be chosen so that the detector box can be worked on without aides such as ladders and scaffolding.

The evaluation unit must not be exposed to direct sunlight.

For applications such as in tunnels or when outdoor mounting is necessary, the evaluation unit must be installed in an additional protective box (e.g. SOS alarm boxes in road tunnels).

On the sensor cable entry side, a minimum distance of 10 cm to customer-side parts must be observed (protective boxes, niches etc.).

The evaluation unit is generally to be installed in an area where the relevant conditions for the evaluation unit apply as specified in Sec. 13 (also valid for use in high ambient temperature areas).

5.4.2 Sensing tube

5.4.2.1 Overview of sensing tube design

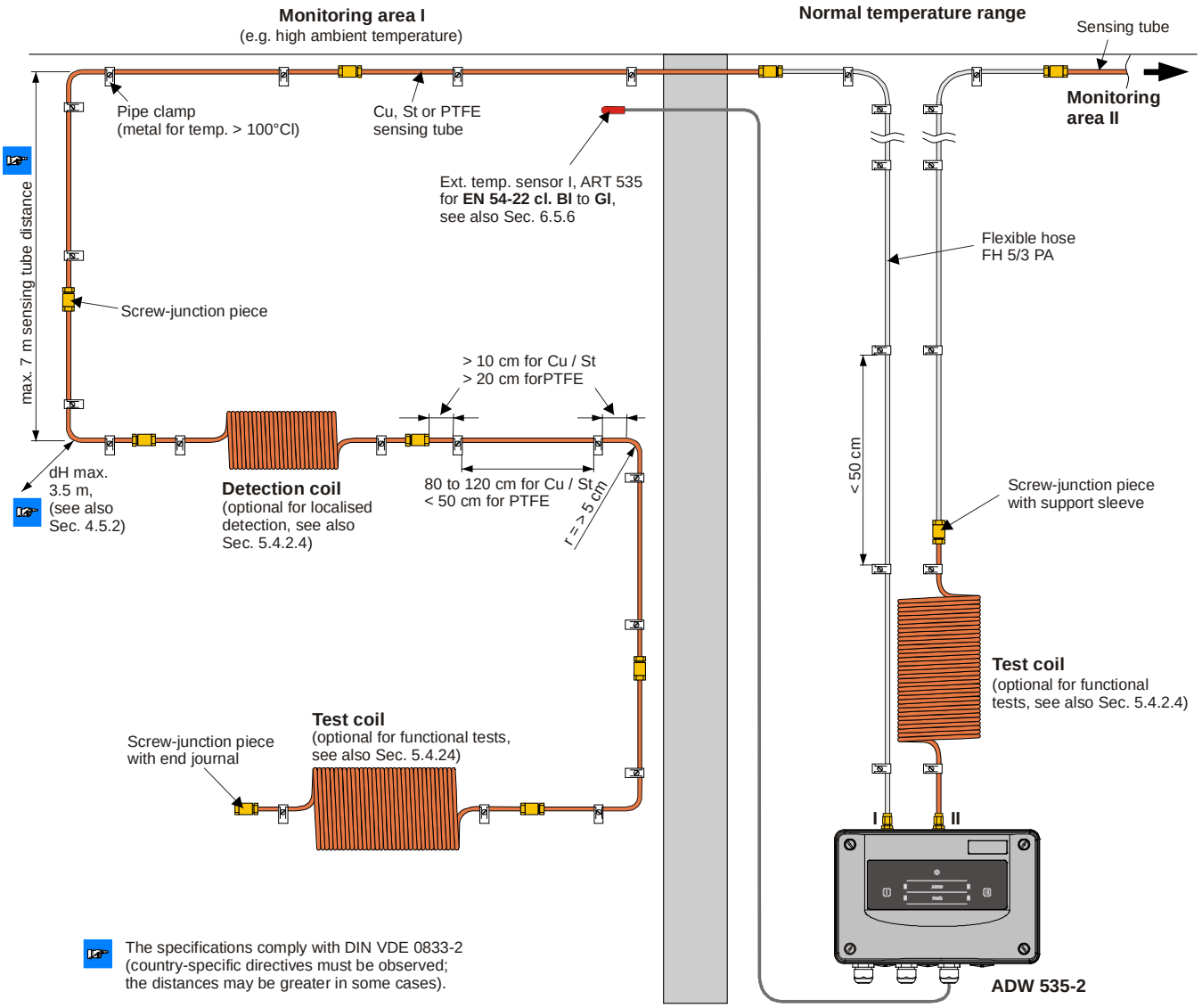


Fig. 16 Overview of sensing tube design

5.4.2.2 Sensing tube ascent and mounting

Connection of the evaluation unit to the sensing tube is usually by means of the flexible hose. The flexible hose must be mechanically protected with suitable means (protective pipe). The sensing tube can also be connected directly to the evaluation unit (e.g. for industrial applications).

The following example illustrates two options for sensing tube ascent in tunnels.

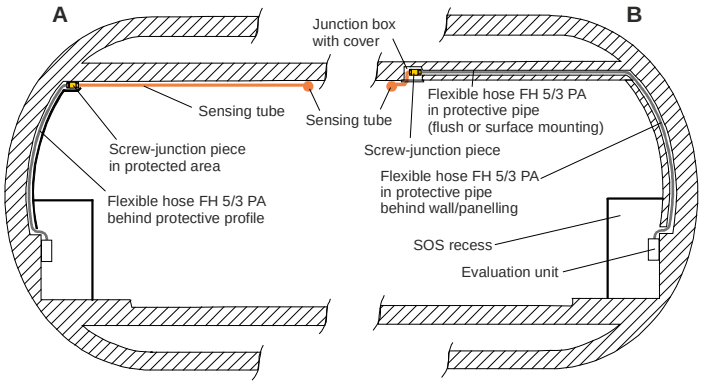


Fig. 17 Example of sensing tube ascent in tunnels

- **A**. The sensing tube (here copper) traverses from the centre of the tunnel to the side wall. There a screw-junction piece connects the sensing tube to the flexible hose. The flexible hose is conducted behind a protective profile into the SOS recess to the evaluation unit. **Important**: the transition from tunnel ceiling to the side wall and from the sensing tube to the flexible hose should be in the protected area if at all possible (covering).

or:

- **B**. Flexible hose which is drawn through a flush or surface mounted protective pipe traverses the tunnel. The flexible hose is conducted in the protective pipe behind the tunnel wall panelling into the SOS recess to the evaluation unit.

The sensing tube ascent can also be a combination of **A** and **B**.

5.4.2.3 Handling sensing cable in general

When arranging and mounting the sensing tube, the points below must be observed and adhered to:

- The sensing tube must be routed in a way that does not impact the lateral visual angle (**Fig. 18**).
- Avoid routing the sensing tube next to, beneath or above the lighting bands. A minimum distance of 0.5 m must be observed.
- For applications in tunnels, the sensing tube must generally be mounted in the centre of the tunnel, with a lateral tolerance of 0.5 m (for exceptions see Sec. 4.5.1).
- To bypass hindrances in the ceiling construction (ceiling openings, beams, etc.), you can deviate from the basic rules above. Ensure that the directional changes required to bypass hindrances in tunnels do not deviate more than 45° from the normal tube routing axis. If a change of direction or a crossing at an angle of 90° is absolutely necessary, these tube sections must be mechanically protected.
- The sensing tube is mounted directly onto the ceiling with plastic pipe clamps. In tunnels it is also possible to mount on the underside of cable ducts as long as the ducts are no farther than 0.5 m to the ceiling.
- A distance of 25 m must be maintained from the end of the sensing tube to the portal in the portal areas of tunnels.

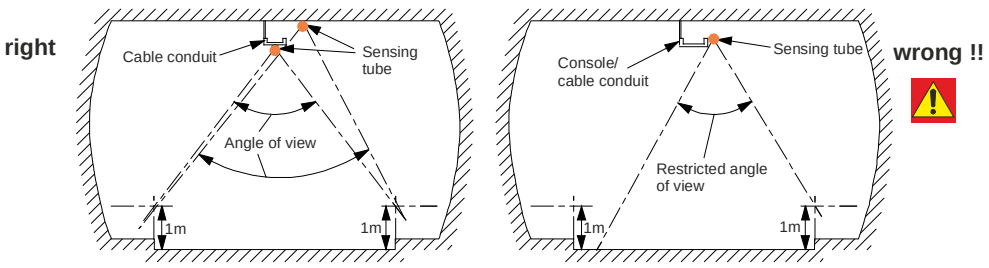


Fig. 18 Angle of view for sensing tube mounting in tunnels

- It is absolutely essential to maintain the maximum sensing tube lengths as described in Sec. 4.5.1 to 4.5.3 (incl. ascent to ceiling). Other sensing tube lengths mean that special sensing tubes have to be selected (see also Sec. 5.3).
- The sensing tube is fastened with the special plastic pipe clamps. Exception: when used in an environment with high ambient temperatures, use metal pipe clamps.
- Pipe clamp distance is 0.8 m to 1.2 m for copper and stainless steel sensing tube and 0.5 m for Teflon sensing tube.
- Only rust-free screws may be used for fastening.
- Ensure that the pipe clamps and the sensing tube are laid in a straight line (plumb line) so that the tube can slide into the pipe clamps in the case of linear expansion due to temperature fluctuations.
- The tube pieces are connected to each other with screw-junction pieces. Make sure that the tube ends are cut at a right-angle and do not have protruding metal splinters (burrs) (**Fig. 19**).
- Use a screw-junction piece with end journals at the end of the sensing tube (**Fig. 19**). Mount these only after blowing out the sensing tube.
- The distance between the end piece of one sensing tube and the end piece of the following sensing tube must not be less than 0.5 m (length expansion).
- A support sleeve must always be used for the screw-junction pieces connecting the sensing tube to the flexible hose (**Fig. 19**).
- A safety distance of min. 10 cm (copper and stainless steel sensing tube) or 20 cm (Teflon sensing tube) must be maintained between pipe clamps and screw-junction pieces & bends (due to length expansion of the sensing tube).
- The ascent to the ceiling should be realised only with a flexible hose if possible. The flexible hose must be conveyed in a protective tube for mechanical protection.
- A minimum bending radius of 5 cm of the sensing tube and flexible hose must be observed (danger of crushing). Furthermore, ensure that any existing bends in the flexible hose cannot be crushed later on (fasten before and after the bend).
- Upon completing the mounting, the entire sensing tube including ascent towards the end piece must be blown out (cleaned) with oil-free compressed air or nitrogen. The instructions for this procedure are described in Sec. 5.4.2.5.

Warning

The evaluation unit must not yet be connected at this time under any circumstances.

- If it is still not possible to connect the sensing tube to the evaluation unit after being blown out, the concerned end must be terminated using appropriate means in a way that does not allow dust or moisture to penetrate.

Notice

- A screw-junction piece can be used only once!
- The screw-junction piece must be tightened only to the point at which the thread is no longer visible.

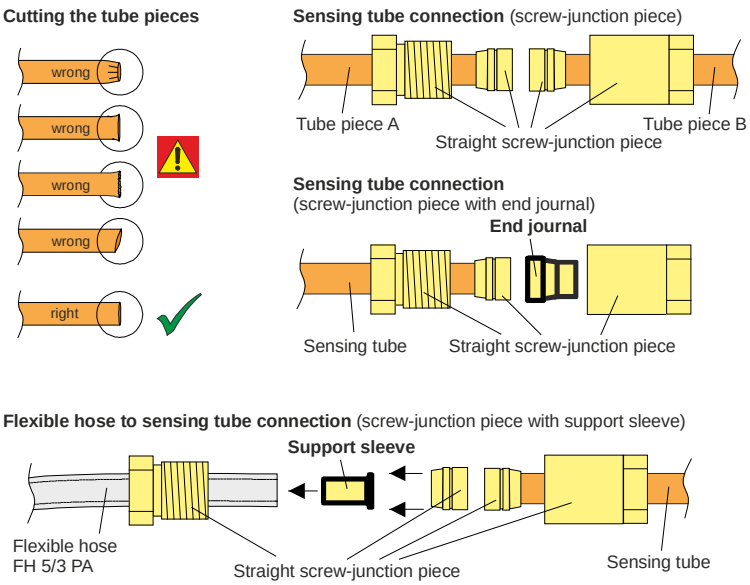


Fig. 19 Sensing tube connections

5.4.2.4 Deployment and mounting of detection coils and test coils

Detection coils can be built into the sensing tube. They provide optimal monitoring of, for example, localised danger sources (equipment and object monitoring). Detection coils correspond to a sensing tube length of 5 m.

If needed, a **test coil** can be built in when object-specific functional tests (alarm releases) are required. Test coils correspond to a sensing tube length of 10 m.

See also **Fig. 16** concerning detection and test coils. When two test coils are used directly on the evaluation unit (for ADW 535-2), they must be arranged in an offset manner to prevent both test coils from being simultaneously subjected to heat testing (hot air blower). It may be necessary to place an isolator between the test coils during testing.

Notice

The following rules must be observed when mounting detection and test coils:

- The volume of the detection and test coils corresponds to a certain sensing tube length. Thus, when calculating the overall length of the sensing tube, for each used **detection coil 5 m** of sensing tube must be taken into account and for each **test coil 10 m** of sensing tube must be taken into account. For this reason, detection coils and test coils must be taken into account during system planning in the project planning phase.
- Detection and test coils must not be exposed to direct sunlight.
- The local influence of temperature fluctuations may trigger false alarms on the detection and test coils.
- Heat impingement in the area of the detection coils may not comply with the requirements of EN 54-22 (the ADW may react more sensitively).
- Detection coils are always to be used only with equipment monitoring and object monitoring. They can be used for space surveillance if the available mounting length of the sensing tube is limited to less than 10 m.
- The test coil can be positioned at the ADW 535 evaluation unit or at the end of the sensing tube.
- The test coil should never be located in the monitored area.
- It may be necessary to install the test coil in a lockable box (protection against vandalism).

5.4.2.5 Testing the sensing tube

After the sensing tube is mounted, dust and moisture must be removed from the entire sensing tube. Also at this time a first sealing test can be performed.

Warning

Under no circumstances may the evaluation unit be connected for cleaning and sealing check work.

Moisture-free air (oil-free compressed air or nitrogen) must be used for the cleaning and sealing check. For this purpose the manufacturer of the ADW 535 can provide the **ACMS 535** "**mini-compressor**" for testing. Using a special adapter hose from the manufacturer (**AD ADW Air**), cleaning is also possible with on-site **oil-free compressed air**. A cleaning and sealing check with the "**Nitrogen set**" is of course also possible (for handling see Technical Documentation ADW 511A, T 139 420, Sec. 5.3.2.2).

Test procedure

Testing takes place at the beginning of the sensing tube where the evaluation unit is connected (**Fig. 20**).

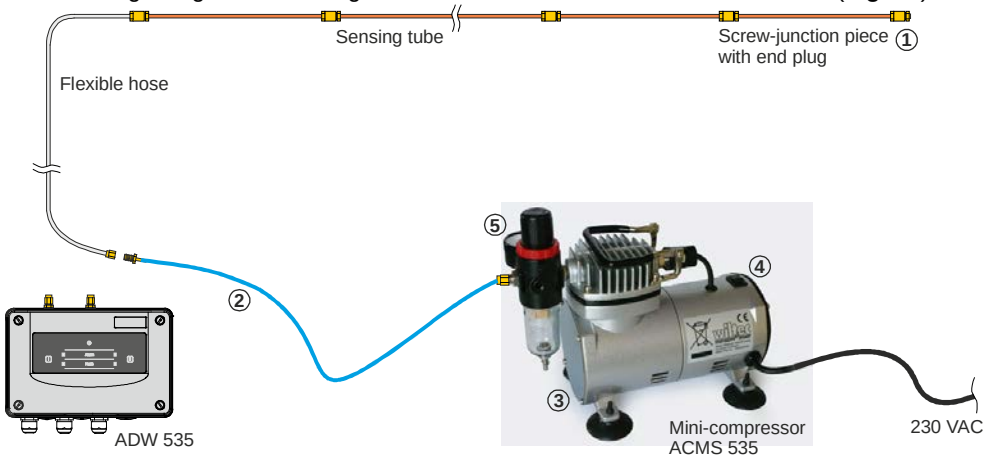


Fig. 20 Mini-compressor connection

Warning

- Before using the mini-compressor, check whether condensation is in the water filter. If this is the case, the collected water must be drained out using the drain valve. It is imperative to prevent moisture from entering the sensing tube.
- If water collects in the water filter during cleaning (point (8)), this indicates that moisture or water residues are in the sensing tube. In this case the nitrogen set must be used for cleaning the concerned sensing tube.

Sealing check	
(1)	The end journal must be used at the end of the sensing tube ① (in the sensing tube termination).
(2)	Connect the sensing tube (flexible hose) via the connection hose ② to the mini-compressor ③.
(3)	Switch on the mini-compressor at the main switch ④ and wait until a pressure of **4 bar** is generated ➔ check on the manometer ⑤. The mini-compressor switches off automatically when this pressure is reached.
(4)	The pressure on the manometer ⑤ must be observed for **3 min ➔ there must not be any recognisable drop in pressure!!** If a pressure drop occurs, use leak spray to easily find leaks (spay all connection points including termination). After a repair, repeat points **(1)** to **(4)**.
(5)	Switch off the mini-compressor on the mains switch ④.
Cleaning	
(6)	Pressure is still present in the sensing tube from the preceding sealing check.
(7)	Quickly unscrew the screw-junction piece at the end of the sensing tube ① (sensing tube termination) with a fork wrench and completely remove the outer part. **Make sure the end journal does not become lost!**
(8)	The overpressure in the sensing tube escapes quickly; any dust and remaining moisture are removed ➔ wait about **3 min** until the air has completely escaped from the sensing tube.
(9)	Completely close the sensing tube termination ① at the end of the sensing tube (mount end journal).
(10)	Log the test.

6 Installation

6.1 Regulations

Danger

The electrical installation is to be carried out in accordance with the applicable country-specific regulations, standards and guidelines. Likewise, the local provisions must also be observed.

Notice

Besides country-specific regulations and guidelines, the specifications concerning the requirements for installation cables and conductor cross-sections as described in Sec. 4.8 must be observed and implemented.

6.2 Cable entry

Danger

Make sure the power is disconnected for all connection and wiring work on the ADW 535.

There are three M20 cable screw unions in the evaluation unit for feeding in the electrical installation. If needed, an additional three cable screw unions (2 x M20, 1 x M25) can be fitted in three reserve holes (blind plugs).

The cable screw unions are suitable for cables with external diameters ranging between 5 and 12 mm (M20) or 9 and 18 mm (M25).

Notice

- The device ships with the cable screw unions sealed with a dust-protection insert; remove the inserts before feeding in the cables. The dust-protection inserts merely prevent the ingress of any dust and/or dirt during the mounting of the device and do not provide any mechanical protection. Any cable screw unions that are not in use must be replaced with blind plugs to maintain the IP65 protection class.
- **Use in compliance with UL 521**: When using the ADW 535 in compliance with UL 521, special **1/2”** and **3/4”** cable screw unions are to be used (customer-side). To be able to use them in the ADW map case, the existing M20 and M25 screw-junction pieces must be removed and replaced by 1/2” M20 adapters and 3/4” M25 adapters. The adapters are available from the manufacturer in the **AD US M-inch** range of accessories.

6.3 Installing additional modules XLM 35, RIM 36, SIM 35

There are four expansion slots for fitting the evaluation unit with optional additional modules. Given the modular assignment of ribbon cable connectors on the LMB 35 main board (see also Sec. 3.2, **Fig. 6**), it is recommended to observe the arrangement shown in **Fig. 21**.

The mounting set of each module comprises a module holder, mounting screw and the connecting cable (ribbon cable) for connecting to the LMB 35. Use a **Torx screwdriver T15** to tighten the mounting screw. The module can be removed from the module holder for mounting in the evaluation unit and for the subsequent electrical installation.

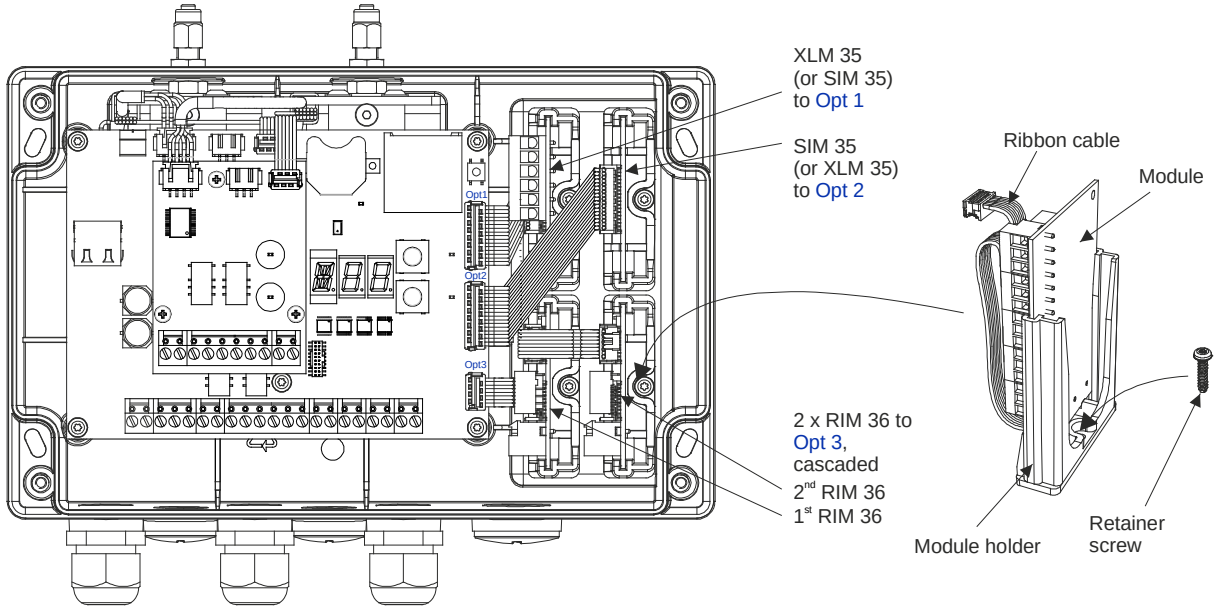


Fig. 21 Installing additional modules

Notice

The additional modules are automatically detected when the device is switched on, from which point on they are monitored and functional. When subsequently removing an additional module (e.g. because it is not being used), the additional modules must first be logged off via operation on the LMB 35 main board (***o*** switch position, see Sec. 7.3.7).

The UMS 35 universal module holder is available for installing modules other than XLM, RIM or SIM. It is fastened in the evaluation unit instead of the above described module holder and requires two expansion slots one above the other (directly next to the LMB 35). The UMS 35 consists of an angled sheet metal plate with various fastening options for additional modules.

6.4 Electrical connection

The electrical connection is implemented by means of plug-in screw terminals. Use a **flat-blade screwdriver no. 1** (3.5 mm) to tighten the screw terminals. Individual terminal blocks are fitted for the supply voltage, relay contacts, inputs, outputs, etc.

Danger

- Inside the evaluation unit the lines should be routed to the terminals using the shortest possible path. Reserve loops via the main board are to be avoided (EMC).
- **Caution**: For monitoring the automatic fire detector, **no looped lines** may be connected to terminals "**Alarm I**", "**Fault I**", "**Alarm II**" or "**Fault II**". The looped line must be interrupted to enable connection monitoring.

6.4.1 Terminal assignment for the LMB 35 main board

LMB terminal	Signal		Wiring
1	PWR +	+9 to +30 VDC ①	Main supply line from FACP or external according to **Fig. 22**
2	PWR –	0 V	
3	PWR-R +	+9 to +30 VDC ①	Redundant supply line from FACP or external according to **Fig. 22**
4	PWR-R –	0 V	
5	+OC	+ power supply	Connection of feedback loop signals according to **Fig. 29**
6	Flt OC Out1	OC output Fault I	
7	Al OC Out1	OC output Alarm I	
8	Rel Flt1 (“NO”) ②	Fault I	Connection of the line acc. to **Fig. 26** or **Fig. 27** and specifications of the used line
9	Rel Flt1 (“NO”)		
10	Rel Flt1 “COM” ②		
11	Rel Al1 “NO”	Alarm I	
12	Rel Al1 “NC”		
13	Rel Al1 “COM”		
14	TempSens1 +	External temperature sensor I	Connection according to **Fig. 30**
15	TempSens1 –		
16	ResExt +	Reset external input (opto-isolator input)	Connection according to **Fig. 23** and **Fig. 25**
17	ResExt –		
18	InPrg1 +	Day/night control from FACP (opto-isolator input)	Connection acc. to schematic **Fig. 23**
19	InPrg1 –		
20	InPrg2 +	Reserve, no function (opto-isolator input)	
21	InPrg2 –		

Notice

① UL/FM = +10.6 to +27 VDC.

② The relay “Flt1” (fault) is picked up in the quiescent state ➔ Contact terminal 10/8 closed, 10/9 open (ADW 535 under voltage; no fault event present).

6.4.2 Terminal assignment of LEB 35 extension board

LEB terminal	Signal		Wiring
22	Flt OC Out2	OC output Fault II	Connection of feedback loop signals, acc. to **Fig. 29**
23	Al OC Out2	OC output Alarm II	
24	Rel Flt2 (“NO”) ①	Fault II	Connection of the line acc. to **Fig. 26** or **Fig. 27** and specifications of the used line
25	Rel Flt2 (“NC”)		
26	Rel Flt2 “COM” ①		
27	Rel Al2 “NO”	Alarm II	
28	Rel Al2 “NC”		
29	Rel Al2 “COM”		
30	TempSens2 +	External temperature sensor II	Connection according to **Fig. 30**
31	TempSens2 –		

Notice

① The relay “Flt2” (fault) is picked up in quiescent state ➔ Contact terminal 26/24 closed, 26/25 open (ADW 535 under voltage; no fault event present).

6.4.3 Terminal assignment for SecuriLine eXtended line module XLM 35

Terminal XLM	Signal	Wiring
L1	Data A	Addressable loop acc. to **Fig. 25** or **Fig. 28** (see also Sec. 8.5.5)
C1	GND A	
G1	Screen	
L2	Data B	Addressable loop acc. to **Fig. 25** or **Fig. 28** (see also Sec. 8.5.5)
C2	GND B	
G2	Screen	

6.4.4 Terminal assignment for RIM 36 relay interface module

RIM terminal		Signal ①		Wiring
1	Rel. 1	"NO"	Diff alarm of sensing tube I (II) or freely programmable	Local info or connection to input of FACP
2		"NC"		
3		"COM"		
4	Rel. 2	"NO"	Max alarm of sensing tube I (II) or freely programmable	
5		"NC"		
6		"COM"		
7	Rel. 3	"NO"	Pre-signal Diff alarm of sensing tube I (II) or freely programmable	
8		"NC"		
9		"COM"		
10	Rel. 4	"NO"	Pre-signal Max alarm of sensing tube I (II) or freely programmable	
11		"NC"		
12		"COM"		
13	Rel. 5	"NO"	Alarm temperature sensor LMB or freely programmable	
14		"NC"		
15		"COM"		

Notice

① Depending on the device version, the assigned criteria (signals) upon product delivery apply to sensing tube I on the first RIM 36 (connected to LMB 35) and sensing tube II on the second RIM 36 (connected to the first RIM 36, cascaded). The assignment of individual or all relays can be changed with the "ADW Config" configuration software.
If two RIM 36 devices are used on the ADW 535-1, the relays of the second RIM 36 are not configured with any default criteria. The required programming must be performed with the "ADW Config" configuration software.

6.4.5 Terminal assignment of an SIM 35 serial interface module

SIM terminal	Signal	Wiring / installation (see also Sec. 8.5.6)		
1	GND	Input	1st conductor of wire pair 2	
2	D +		1st conductor of wire pair 1	twisted
3	D –		2nd conductor of wire pair 1	
4	GND	Output	1st conductor of wire pair 2	
5	D +		1st conductor of wire pair 1	twisted
6	D –		2nd conductor of wire pair 1	

6.5 Connection variants

Notice

The connection variants are determined by the possible line and FACP technologies used. For more information on connecting alarm transmitters, line monitoring elements, etc., please contact the manufacturer and/or supplier of the fire alarm system.

In all cases the ADW 535 must have an emergency power supply compliant with EN 54-4.

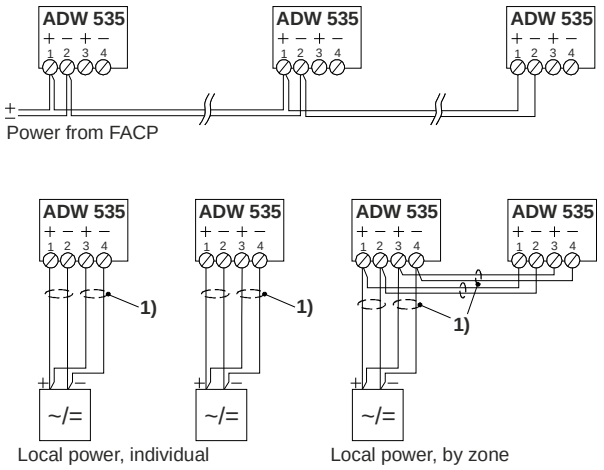
6.5.1 Power supply

The ADW 535 must always have an emergency power supply. Depending on the output current available at the fire alarm control panel (FACP) and the number of ADW 535 units to be connected, the power supply can be provided by the FACP; alternatively, an additional power supply must be provided locally.

The supply is via terminals 1 and 2. In applications which stipulate a redundant power supply line (country-specific), it is routed to terminals 3 and 4 (**Fig. 22**).

Notice

- The supply inputs are not connected internally in the ADW and therefore cannot be used for direct forwarding to neighbouring systems.
- The terminals of the ADW 535 are designed for maximum 2.5 mm². For forwarding the supply line to a neighbouring ADW it may therefore be necessary to install additional distributor or support terminals.



1) redundant power supply line (optional, country-specific)

Fig. 22 Types of power supply

Danger

To determine the required power supply and cable cross-section, the calculations set out in Sec. 4.8.2 must be carried out in all cases. For applications with redundant power supply, the calculations must be performed for both supply lines individually.

6.5.2 Reset input

The reset input is potential-free (opto-isolator) and can be actuated on both the “plus” side and the “minus” side (**Fig. 23)**. The input operates in the range of 5 to 30 VDC and in an impulse bandwidth of 0.5 to 10 s. Thanks to the continuous current consumption of approx. 3 mA across the entire operating range, actuation can be carried out directly via an OC output.

When a continuous signal is applied for longer than 20 s, the ADW 535 is switched inactive and the fault relay on the LMB 35 (on ADW 535-2 also the LEB 35) becomes active (triggers). Once the continuous signal is switched off, the ADW is re-armed. Switching inactive via the “Reset external” input works only if the ADW 535 is not equipped with an XLM 35.

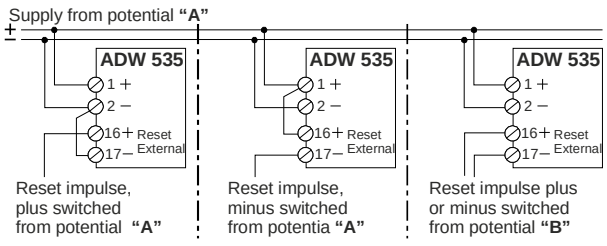


Fig. 23 Reset input

6.5.3 Control

The ADW 535 units connected to a FACP are controlled according to the detection zone mapping using the FACP states “Zone ON/OFF” and “Reset”. Two possibilities are available:

- Control via supply voltage (auxiliary relays in the ADW power supply line)
- Control via the “Reset external” input

6.5.3.1 Control via supply voltage by means of auxiliary relay

Depending on the location of the ADW supply, the auxiliary relay may be placed in the FACP or directly in the ADW 535.

The auxiliary relay can be actuated in the following ways (see **Fig. 24**):

A. line plus or minus
B. SW output of the FACP
C. SW output or function of a control module

The function types described above are determined by the FACP technology used; it is therefore essential to contact the manufacturer and/or the supplier of the FACP for details before implementing.

Danger

- The EMC protective elements at the input of the ADW electronics cause a brief current peak (5 A / 1 ms) when the supply voltage is applied. When using auxiliary relays with a maximum contact rating of 1 A, this may lead to the relay contact sticking. For this reason auxiliary relays with a contact load of over **1 A** should **always** be used, e.g. PMR 81 semiconductor relay (see **Fig. 24C**).
- The ADW supply path via the auxiliary relay contact must be short-circuit-proof or conducted through a fuse component (circuit-breaker card).

Notice

- When using a PMR 81 semi-conductor relay, it may be necessary to invert the actuation signal (PMR only has a normally open (NO) contact function).
- To guarantee comprehensive emergency running properties, the connection must in all cases be implemented in such a way that if there is an FACP computer failure the ADW will continue to function (reset input not actuated).

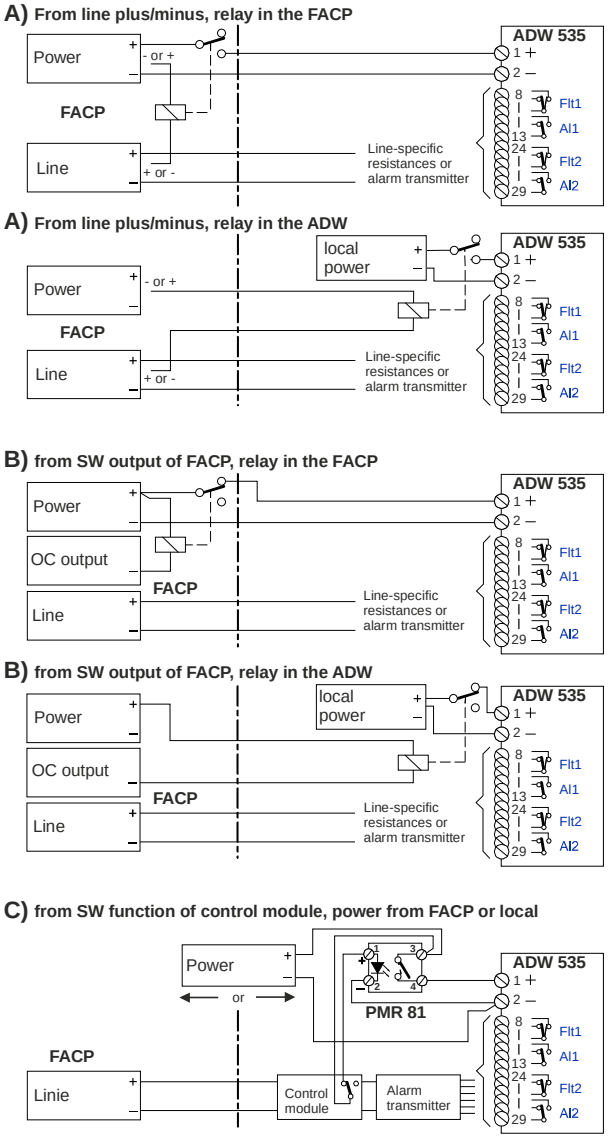


Fig. 24 Control via supply with relay

6.5.3.2 Control via input “Reset external”

The following options are available for control via the reset input (see **Fig. 25**):

A. Control via auxiliary relay from line plus

B. Control via auxiliary relay or semi-conductor relay (PMR 81) from control output (open collector)

C. Control without auxiliary relay, directly from control output (relay contact or open collector)

D. Control via addressable loop when using the XLM 35. The control is then not by means of the reset input but rather directly with the corresponding command entry via the XLM 35 on the ADW 535.

The function types described above are determined by the FACP technology used; it is therefore essential to contact the manufacturer and/or the supplier of the FACP for details before implementing.

Notice

- When using a PMR 81 semi-conductor relay, it may be necessary to invert the actuation signal (PMR only has a normally open (NO) contact function).
- To guarantee comprehensive emergency running properties, the connection must **in all cases** be implemented in such a way that if there is an FACP computer failure the ADW will continue to function (reset input not actuated).

Warning

Caution: When control is via the “Reset external” input, the ADW 535 is supplied with voltage even if the zone (FACP) is switched off.

For this reason the power supply line to the ADW must be disconnected to carry out any repair work (e.g. unplug terminals 1 and 2 on the ADW; also 3 and 4 in the case of a redundant supply).

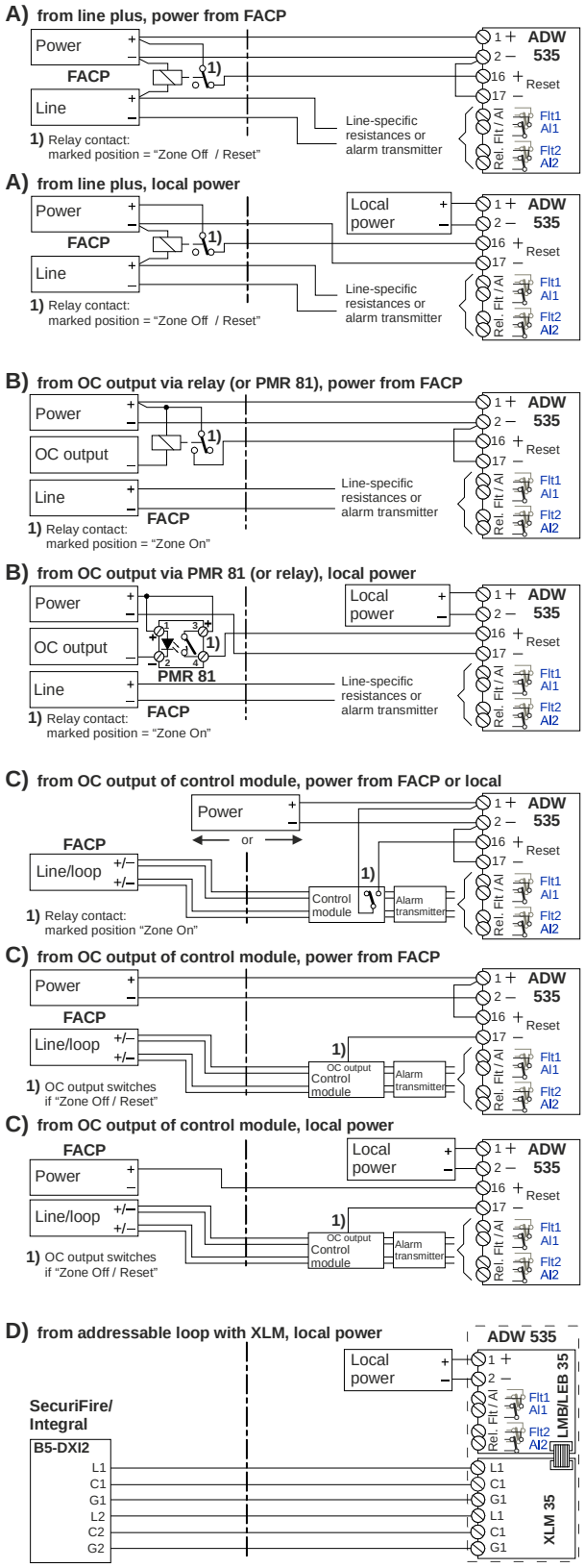


Fig. 25 Control via the “Reset external” input

6.5.4 Connection to the FACP line

Each of the following examples illustrates the control via reset input according to Sec. 6.5.3.2. If connection with the control via the voltage supply is required, the control circuit in the figures below can be implemented as described in Sec. 6.5.3.1.

6.5.4.1 Connection to zone detection via relay alarm / fault

- For connection to zone detection lines, the control relay is usually actuated from the line plus. A condition for this, however, is that the line plus also switches for “Zone ON/OFF” and “Reset” (see **Fig. 26**, **C)**, for exception).
- Connection as shown in **Fig. 26**, **B)**, is used exclusively when the FACP line is to operate with **2-detector dependency** (V-Al / H-Al) from sensing tube I and II. For that purpose the FACP line is programmed for 2-detector dependency. Both sensing tubes of the ADW then cover the **same monitored area**.
- When connecting as shown in **Fig. 26**, **C)**, Alarm I and Alarm II can be evaluated in the FACP as independent zones from two independent monitoring areas. A **2-line dependency** can also be programmed in the FACP. Then the same applies as under **B)**: both sensing tubes from a monitored area.
- If the connection as in **Fig. 26**, **C)** is used, the control signal for the reset input can no longer be picked up from the line plus; instead, a software output has to be created with the following programming:
  Output switches when:
  Line/zone A or B “Reset”
  or:
  Line/zone A and B “Off”

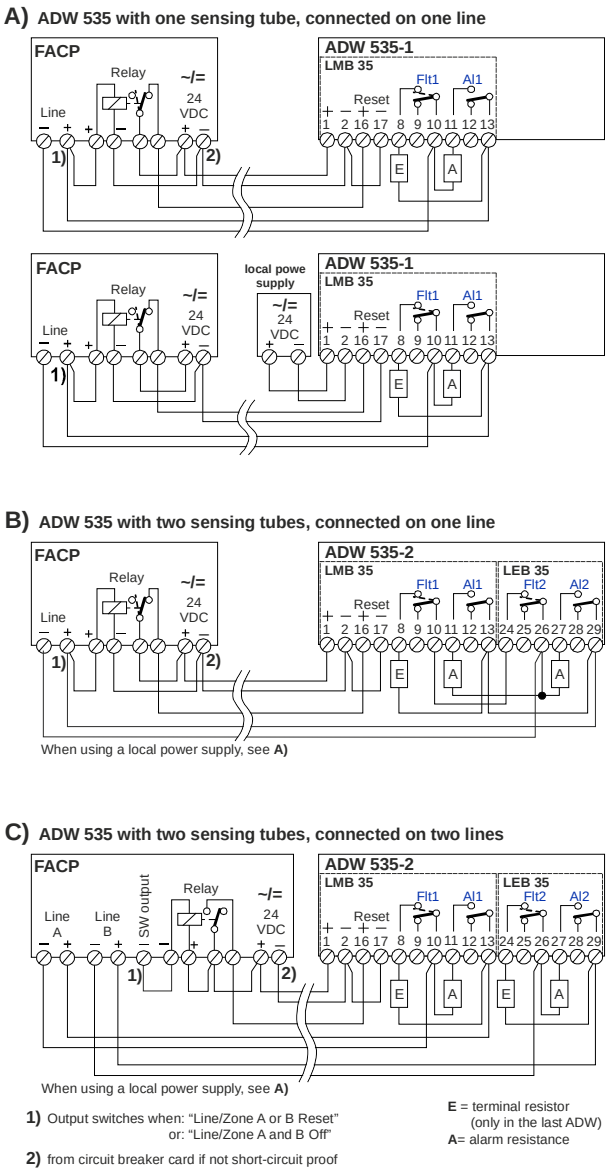


Fig. 26 Connection to zone detection

6.5.4.2 Connection to selective identification or addressable loop via relay alarm / fault

- With line technologies such as selective identification lines and addressable loops, the control relay is actuated from a software-controlled output (output card or control module). The output is programmed via the FACP software using the “Zone Off” and “Reset” functions.
- If Alarm I and Alarm II are evaluated in the FACP as individual zones (also 2-line dependency), programming of the SW output is as follows:
  Output switches when:
  Zone A or B “Reset”
  or:
  Zone A and B “Off”

A normal relay or PMR 81 semi-conductor relay can be used as the control relay.

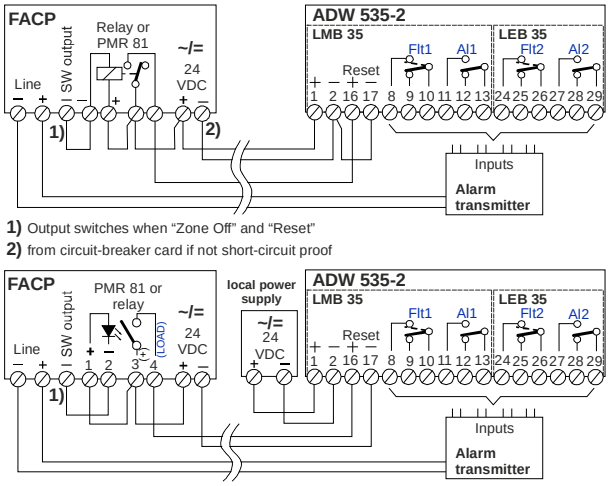


Fig. 27 Connection on selective identification or addressable loop

6.5.4.3 Connection to SecuriPro / SecuriFire / Integral addressable loop from XLM 35

- For the connection to SecuriFire / Integral addressable loop from the XLM 35 no additional control relay is needed. Likewise, the alarm and fault relays of the ADW 535 are not used. The state query and the control of the ADW 535 take place directly between the XLM 35 and the addressable loop.
- When using an ADW 535 with two sensing tubes and XLM 35 (ADW 535-2), a 2-detector dependency (V-Al / H-Al) can be programmed on the FACP. Evaluation of the individual zones (Al I and Al II) in the FACP is also possible.

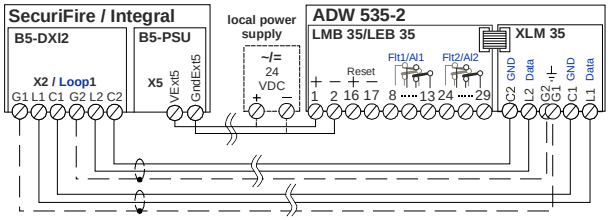


Fig. 28 Connection from XLM 35

Maximum connectible XLM 35 units**:**
(See also notice below.)
For each SecuriFire / Integral addressable loop 32 units

Notice

- The installation of the SecuriFire / Integral addressable loop must be shielded.
- The connection and line routing between **XLM 35** and the SecuriFire and Integral FACP is to be carried out in accordance with **Fig. 28** (L1 to L1, C1 to C1, etc.).

6.5.5 Open collector outputs

The ADW criteria “alarm I”, “alarm II”, “fault I” and “fault II” are available as OC outputs.

Parallel and feedback indicators or other consumers (e.g. relays) can be connected to the OC outputs.

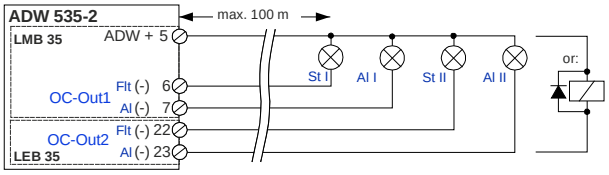


Fig. 29 Connecting the OC outputs

Danger

When connecting inductive consumers (e.g. relays), a free-wheeling diode is to be installed directly at the consumer (**Fig. 29)**.

Notice

The outputs are 0-volt switched and have a loading capacity of max. **100 mA** per output. All outputs together cannot switch more than **200 mA**. The dielectrical strength per output is 30 VDC. The outputs are not short-circuit-proof and not potential-free. Connection to the outputs affects the overall power consumption of the ADW 535.

6.5.6 External temperature sensor

The ART 535 external temperature sensor is to be used in the following cases (see also Sec. 2.2.12):

- Applications compliant with EN 54-22, Class CI to GI;
- Always (for all response grades), as soon as the application temperature in the monitored area deviates more than 20°C from the temperature of the evaluation unit.

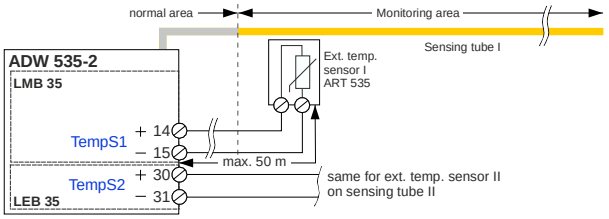


Fig. 30 Connection of external temperature sensor

The ART 535 can be remotely located a maximum of 50 m. The ART 535 has a pre-fabricated connection cable with a length of 10 m and is heat proof up to 200°C.

Warning

- The ART 535 is to be introduced to the monitored area and positioned so that it is optimally exposed to the local ambient temperatures.
- Position the ART 535 so that it is not exposed to direct sunlight.
- A special design of the ART 535 in accordance with the manufacturer's specifications has to be used for temperature ranges above 200 °C.

Notice

- The feed line to the ART 535 can be a commercially available installation cable with a cross-section of 0.5 mm^2. As soon as the feed line is routed into the increased temperature area, a heat resistant cable may have to be used, depending on the response grade.
- The polarity (+ /–) of the connection must be observed.
- If both sensing tubes are located in the same climate zone (identical application temperature in both monitored areas), **one** external temperature compensation is sufficient (can be parameterised via “ADW Config” configuration software).

7 Commissioning

7.1 General

Warning

The following points must be observed when commissioning the ADW 535:

- The ADW 535 is to be commissioned by trained and qualified personnel only.
- Prior to commissioning it must be ensured that, after mounting, the entire sensing tubing has been blown out with compressed air and/or nitrogen (see also Sec. 5.4.2.5).
- Prior to commissioning, an inspection of the mounting and installation must ensure that when the power supply is switched on there can be no damage to the ADW 535.
- Any rewiring of the device is to be carried out only once the power supply is disconnected. Exception: logging off additional modules XLM, RIM and SIM (see Sec. 7.3.7).
- Before switching on, any additional modules are to be fitted in the evaluation unit and connected to the LMB 35 main board using the supplied ribbon cable. See also Sec. 6.3.
- Before switching on the ADW power supply, ensure that all fire incident controls and remote alerting from the ADW 535 are blocked or deactivated.
- Immediately before switching on the ADW 535 for the first time, remove the isolating strip from the lithium battery (LMB 35).
- When commissioning, it is essential to perform an initial reset with integrated venting of the sensing tubing (for each sensing tube). This automatically also performs the required sealing check of the sensing tube.

7.2 Programming

The ADW 535 has several switch positions that are configured with permanently assigned parameters:

- Normative system limits according to EN 54-22, Class A1I to GI, switch positions ***C*** > ***A11*** to ***G32***;
- Non-normative system limits concerning sensing tube monitoring, switch positions ***W04*** to ***W09***;
- Configurable switch positions ***X01*** to ***X03*** for saving the settings after using “ADW HeatCalc” and/or changing the device configuration using the “ADW Config” configuration software (and SecuriFire or Integral FACP via XLM 35).

A detailed description of all switch positions is in Sec. 8.3.

If the ADW 535 is operated with ***EasyConfig***, i.e. within the present system limits according to the tables in Sec. 4.6.1.1 and 4.6.1.2, select only switch positions ***C*** > ***A11*** to ***G02*** and ***W04*** to ***W09***; it is not necessary to use the “ADW Config” configuration software to do so.

For systems where the “ADW HeatCalc” calculation software was used for planning, the results calculated by “ADW HeatCalc” are to be programmed by means of a handover file via the “ADW Config” configuration software on the ADW 535. The data is saved on the ADW 535 under one of the freely configurable switch positions ***X01*** to ***X03***. The ADW 535 is then operated on the corresponding switch positions ***X01*** to ***X03***.

The device also ships with default values already stored under switch positions ***X01*** to ***X03***. Specifically:

- position ***X01*** of position ***A11*** (for ADW 535-2 = ***A12***);
- position ***X02*** of position ***b01*** (for ADW 535-2 = ***b02***);
- position ***X03*** of position ***C01*** (for ADW 535-2 = ***C02***).

7.2.1 Configuration options

A number of parameters can be configured with the “ADW Config” configuration software:

- Diff and Max alarm response sensitivity;
- Alarm verification (delta and time);
- Trigger thresholds for pre-signals 1, 2 and 3 (individually, for each sensing tube);
- Delay times for Diff pre-signal, Max pre-signal, Diff alarm, Max alarm and fault (individually);
- Sensitivity and delay time of the sensing tube monitoring;
- Deactivate self-hold for Diff pre-signal, Max pre-signal, Diff alarm, Max alarm and fault (individually);
- Deactivate criteria (pre-signals, alarms, faults);
- Date/time;
- Day/night operation;
- Relay assignment (RIM 36);
- Other

Warning

The parameters are configured and stored ex works with default states and values to meet the triggering properties required by EN 54-22. Changing the parameters may result in non-compliance with EN 54-22. Any adjustments or modifications to the ADW 535 via “ADW Config” may be performed only by the manufacturer or by qualified personnel instructed and trained by the manufacturer.

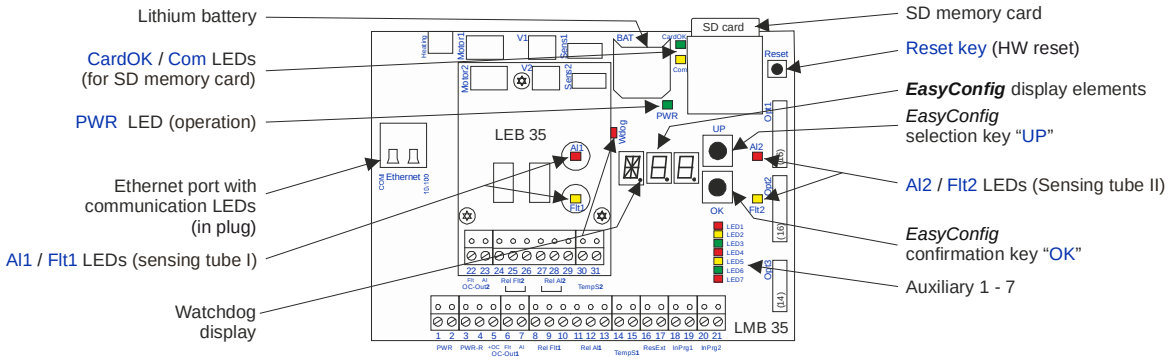


Fig. 31 Operation and display elements on the LMB 35

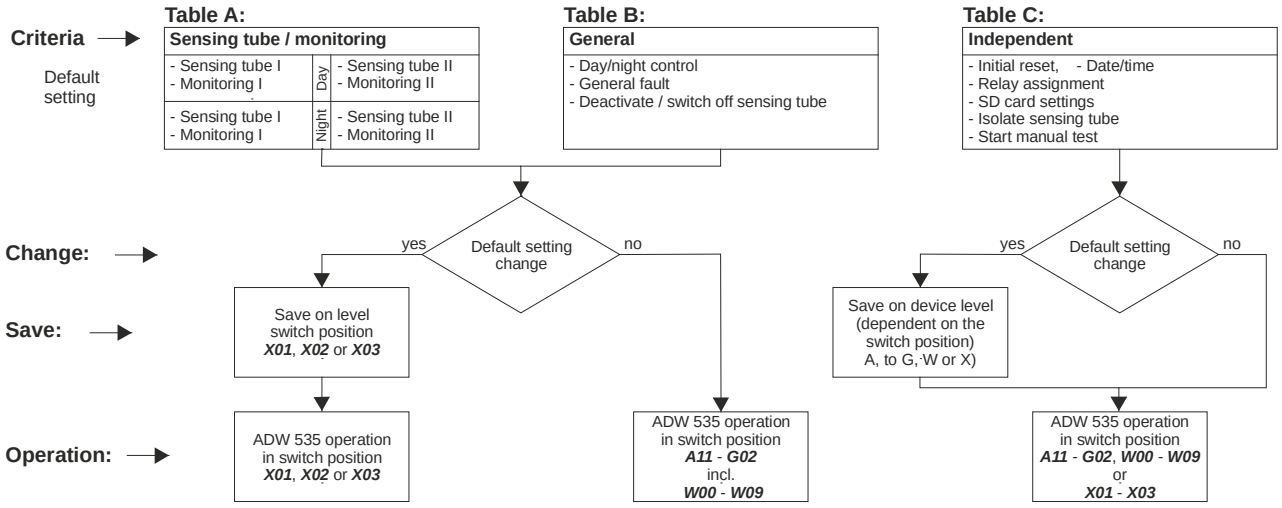


Fig. 32 Configuration overview

Table A: The following criteria can be set for each sensing tube. Also, the criteria for day/night control can be separately set. Configuration changes are saved on one of the freely programmable switch positions ***X01*** to ***X03*** using "**ADW Config**".

Sector • Parameter	**Default setting**	**Area**	**Resolution / levels**	**Saving after change**
Sensing tube parameters (length / outer diameter)				
• Feed line "**A**" (see also **Fig. 13**)	5 m	0 – 20 m	1 m	X01 – X03
• Supply line, inner diameter	3 mm	3 – 4 mm	1 mm	X01 – X03
• ① Monitored area "**C**" (see also **Fig. 13**)	10 m	10 (> "**A**") – 200 m	1 m	X01 – X03
• Monitored area, inner diameter	4 mm	---	---	X01 – X03
Alarm (EN 54-22)				
• ① Diff alarm status (On/Off)	On	On / Off ②		X01 – X03
• ① Diff alarm threshold (dependent on sensing tube length and the response grade acc. to EN 54-22)	A11 / A12	0.5 to 100 mbar/min.	0.1 mbar/min.	X01 – X03
• ① Diff alarm verification status (On/Off)	On	On / Off		X01 – X03
• ① Diff alarm verification delta pressure value	A11 / A12	1 – 100 mbar	0.1 mbar	X01 – X03
• ① Diff alarm verification time (surveillance time)	600 s	60 s – 1.200 s	1 s	X01 – X03
• ① Diff alarm delay	4 s	0 s – 30 s	1 s	X01 – X03
• Diff alarm self-holding	On	On / Off		X01 – X03
• ① Max. alarm status (On/Off)	On	On / Off ②		X01 – X03
• ① Max. alarm threshold (dependent on sensing tube length and the response grade acc. to EN 54-22)	A11 / A12	1 – 1.200 mbar	0.1 mbar	X01 – X03
• ① Max. alarm delay	4 s	0 s – 30 s	1 s	X01 – X03
• Max. alarm self-holding	On	On / Off		X01 – X03
• ① Adjustment (compensation), On/Off	On	On / Off		X01 – X03
• Adjustment (compensation), temp.sensor selection	Internal	Int. / Ext. I / Ext. II		X01 – X03
• Adjustment (compensation), interval	60 min	1 – 1.440 min	1 min	X01 – X03
• Alarm ext. temp.sensor	Off	55 – 300°C	1°C	X01 – X03
• Alarm ext. temp.sensor, delay	4 s	0 s – 30 s	1 s	X01 – X03
• Alarm ext. temp.sensor, self-holding	On	On / Off		X01 – X03
Pre-signal				
• Pre-signal Diff alarm On/Off	On	On / Off		X01 – X03
• Pre-signal Max alarm On/Off	On	On / Off		X01 – X03
• Pre-signal Diff alarm (100% = alarm threshold)	70%	5 – 95%	5%	X01 – X03
• Pre-signal Max alarm (100% = alarm threshold)	70%	5 – 95%	5%	X01 – X03
• Pre-signal delay (Diff and Max)	2 s	0 s – 30 s	1 s	X01 – X03
• Pre-signal self-holding (Diff and Max)	Off	Off / On		X01 – X03
Sensing tube monitoring / test				
• ① Sensing tube monitoring On/Off	On	On / Off		X01 – X03
• Test through monitoring (EN) / cyclic ③	Monit. + cycl.	Monit. / cycl.		X01 – X03
• Test interval	24 h	1 – 48 h	1 h	X01 – X03
• Test sensitivity	Medium	Low / Medium / High	3	X01 – X03
• Test repetition rate ③	2 ③	1 – 4	1	X01 – X03
• Test time ③	30 min ③	1 – 60 min	1 min	X01 – X03

Notice

① **Changes** to these parameters have an effect on the response characteristics of the ADW 535 and can mean that the requirements **according to EN 54-22 are no longer met**. Changes may thus be made **only after consulting with the manufacturer**.

② Diff alarm status "Off" / Max alarm status "Off"; both criteria cannot be switched off at the same time.

③ Valid for ***C*** > ***A11*** to ***G02*** and ***W00*** to ***W03***. Increased values are configured for ***W04*** to ***W09*** that are <u>not</u> tested in accordance with EN (see Sec. 4.6.1.2).

Table B: The following criteria apply to the entire ADW 535. Saving a configuration after changes is performed in conjunction with the adaptations in Table A on one of the freely programmable switch positions ***X01*** to ***X03***.

Sector • Parameter	**Default setting**	**Area**	**Resolution / levels**	**Saving after change**
Day/night control / weekday control				
• ① Day/night control On/Off	Off	Off / clock / FACP		X01 – X03
• Day start time	06:00	00:00 – 24:00	1 min	X01 – X03
• Night start time	20:00	00:00 – 24:00	1 min	X01 – X03
• Weekday control	On	Mon. to Sun.	Days	X01 – X03
General faults				
• Lithium battery / clock fault	On	On / Off		X01 – X03
Deactivate / switch off sensing tube				
• ① Sensing tube I / sensing tube II switch off (partial planning) sensing tube II only	On	On / deactivated / switched off (partial planning)		X01 – X03

① See notice to **Table A**

Table C: Independent configurations. These can be changed regardless of the switch position in the ADW 535.

Sector • Parameter	**Default adjustment**	**Selection**
Clock		
• Year, month, day, hour, minute, second	---	Seconds – year
Relay / OC output / reset key / various		
• Relay 1, 1st RIM 36	Diff alarm of sensing tube I	According to Sec. 7.2.2
• Relay 2, 1st RIM 36	Max alarm of sensing tube I	According to Sec. 7.2.2
• Relay 3, 1st RIM 36	Diff alarm pre-signal of sensing tube I	According to Sec. 7.2.2
• Relay 4, 1st RIM 36	Max alarm pre-signal of sensing tube I	According to Sec. 7.2.2
• Relay 5, 1st RIM 36	Alarm temperature sensor LMB	According to Sec. 7.2.2
• Relay 1, 2nd RIM 36	Diff alarm of sensing tube II	According to Sec. 7.2.2
• Relay 2, 2nd RIM 36	Max alarm of sensing tube II	According to Sec. 7.2.2
• Relay 3, 2nd RIM 36	Diff alarm pre-signal of sensing tube II	According to Sec. 7.2.2
• Relay 4, 2nd RIM 36	Max alarm pre-signal of sensing tube II	According to Sec. 7.2.2
• Relay 5, 2nd RIM 36	Freely programmable	According to Sec. 7.2.2
• Logging interval of SD memory card	1 s	1 – 120 s
• Perform initial reset, sensing tube I	---	On / Off
• Perform initial reset, sensing tube II	---	On / Off
• Manually initiate test, sensing tube I	---	On / Off
• Manually initiate test, sensing tube II	---	On / Off
• Isolate sensing tube (sensing tube I / II)	Normal operation	Isolate / normal operation

7.2.2 Relay allocation

The following criteria are freely programmable on max. 10 relays (5 units on 1st RIM 36, 5 units on 2nd RIM 36):

Sensing tube I	**Sensing tube II**	**General**
Diff alarm, sensing tube I	Diff alarm, sensing tube II	Alarm temperature sensor LMB
Max alarm, sensing tube I	Max alarm, sensing tube II	Undervoltage fault
Diff alarm pre-signal, sensing tube I	Diff alarm pre-signal, sensing tube II	Clock fault
Max alarm pre-signal, sensing tube I	Max alarm pre-signal, sensing tube II	
Ext. alarm temperature sensor I	Ext. alarm temperature sensor II	
Pressure sensor I fault	Pressure sensor II fault	
Test I fault	Test II fault	
Ext. fault temperature sensor I	Ext. fault temperature sensor II	
Sensing tube I interruption	Sensing tube II interruption	
Sensing tube I crushing	Sensing tube II crushing	
Sensing tube I leak	Sensing tube II leak	

The criteria can also be allocated with the “OR” function (example: sensing tube I interruption or sensing tube II interruption together on one relay).

7.3 Starting up

The information on operation and display elements necessary for startup can be found in **Fig. 31**.

Warning

Before the ADW 535 is switched on, all the precautions required for operation as described in Sec. 7.1 must be fulfilled.

7.3.1 Commissioning with EasyConfig

The workflow for commissioning with ***EasyConfig*** is shown below (planning without "ADW HeatCalc" calculation, without "ADW Config" configuration software). When RIM 36 additional modules are fitted, the RIM relays respond as indicated in Sec. 2.2.5 and Sec. 7.2.1, Table C. The default values as set out in Sec. 7.2.1 also apply to all other settings.

Commissioning workflow using *EasyConfig*

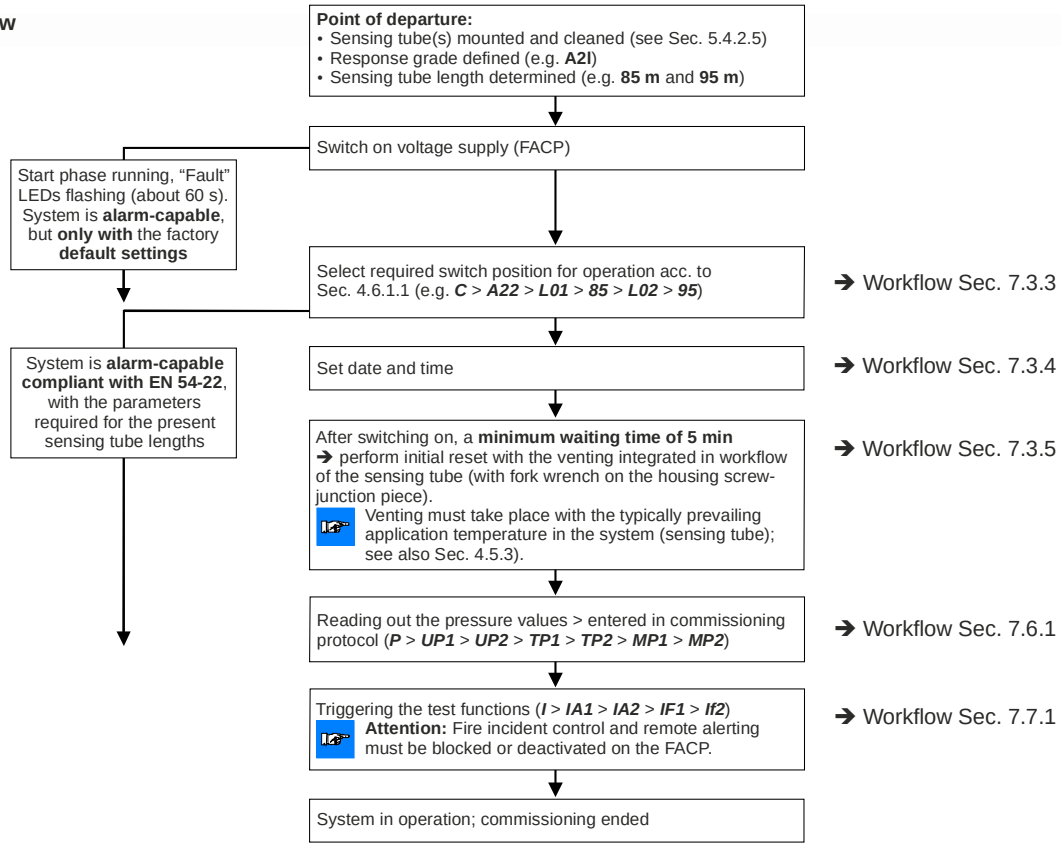


Fig. 33 Workflow for commissioning using EasyConfig

7.3.2 Commissioning with “ADW Config” configuration software

The workflow for commissioning when using the “ADW Config” configuration software is shown below. The “ADW Config” configuration software is required only if changes have to be made to the default configuration profile (Sec. 7.2.1) or if the “ADW HeatCalc” calculation software has been used.

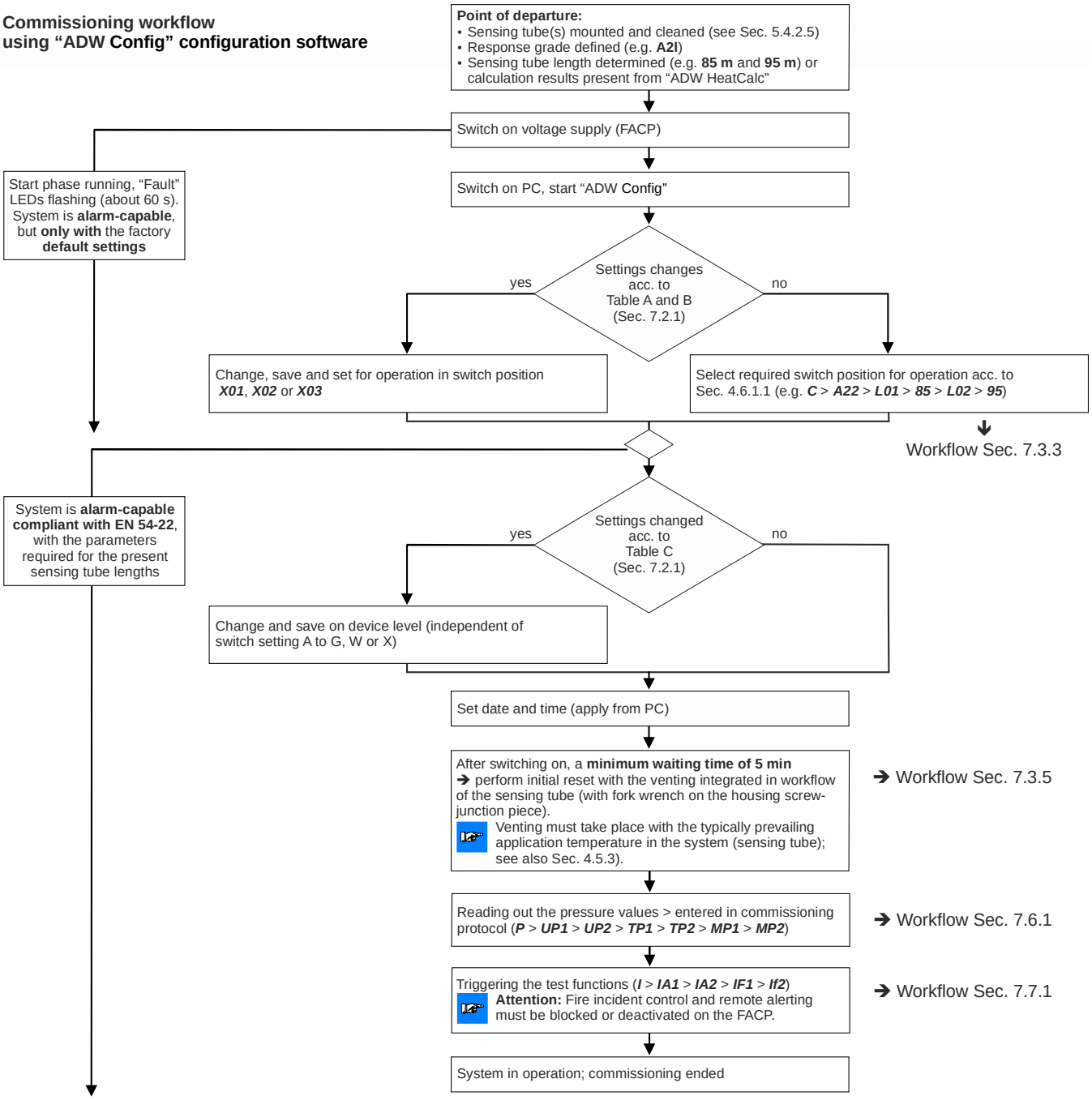


Fig. 34 Workflow for commissioning with “ADW Config” configuration software

7.3.3 Setting to pre-defined switch positions A11 to G02, W00 to W09

The following workflow describes the procedure when the ADW 535 must be set to one of the fixed configured switch positions ***C*** > ***A11*** to ***G02*** and possibly also to a modified sensing tube monitoring ***W01*** to ***W09***. It should be noted that the positions ***W04*** to ***W09*** result in a **non-normative** sensing tube monitoring.

Example: (**first part of the table**) ADW 535-2 (with 2 sensing tubes) should respond compliant with EN 54-22, Class **A2I**. The sensing tubes have different lengths: sensing tube **I = 85 m**, sensing tube **II = 95 m**. Switch position ***C*** > ***A22*** is to be selected as specified in Sec. 4.6.1.1.

The **second part of the table** shows how the sensing tube monitoring can be subsequently changed, here as an example to the **non-normative** setting ***W04***.

First part:

Measure	Display	Procedure / remarks
(1) UP Press key	Flashing ***A12*** > ***W00*** > ***L01*** > ***115*** > ***L02*** > ***115*** (in sequence)	• Displays the Default setting
(2) UP Press key again until display on ***C***	In sequence ***A12*** / ***C***	• Displays switch position group ***C***
(3) OK Press key	***A1***	• Displays class selection ***A1*** in group ***C***
(4) UP Press key until display on ***A2***	Stepwise, ***A1*** / ***A2*** to ***W*** (possible selection here: ***A1*** / ***A2*** / ***b*** / ***C*** / ***d*** / ***E*** / ***F*** / ***F*** / ***G*** / ***W*** > ①)	• Displays class selection ***A2*** in group ***C*** (①)
(5) OK Press key	***A21***	• Displays class selection ***A2*** for 1 sensing tube
(6) UP Press key until display on ***A22***	In sequence ***A21*** / ***A22***	• Displays class selection ***A2*** for 2 sensing tubes
(7) OK Press key	***L01***	• Displays entry mode for length **sensing tube I**
(8) OK Press key	***015***	• Displays the minimum sensing tube length = **15 m**
(9) UP Press the key several times until display on ***085*** (= 85 m)	Stepwise, ***015*** / ***020*** / ***025*** to ***085***	• Displays the possible sensing tube length in 5 m steps
(10) OK Press key	***L02***	• Displays entry mode for length **sensing tube II**
(11) OK Press key	***015***	• Displays the minimum sensing tube length = **15 m**
(12) UP Press the key several times until display on ***095*** (= 95 m)	Stepwise, ***015*** / ***020*** / ***025*** to ***095***	• Displays the possible sensing tube length in 5 m steps
(13) OK Press key	Flashing **- - -** (approx. 4 x)	• New setting is programmed
(14) UP Press key to check the change	Flashing ***A22*** > ***W00*** > ***L01*** > ***085*** > ***L02*** > ***095*** (in sequence)	• **Displays the new setting:** • **Normative alarm release** • **Normative sensing tube monitoring**

① For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

➔➔ (continuation)

Second part (continuation)

Warning

Switch positions ***W04*** to ***W09*** may be used only after consulting with the manufacturer. The configured values they contain concerning sensing tube monitoring are **not** tested in accordance with EN (***W00*** = default).

Measure	Display	Procedure / remarks
(15) UP Press key	Flashing ***A22*** > ***W00*** > ***L01*** > ***085*** > ***L02*** > ***095*** (in sequence)	• Display in the first part of the switch position
(16) UP Press key again until display on **C**	In sequence ***A12*** / ***C***	• Displays switch position group ***C***
(17) OK Press key	***A1***	• Displays class selection ***A1*** in group ***C***
(18) UP Press key until display on ***W***	Stepwise, ***A1*** / ***A2*** to ***W*** (possible selection here: ***A1*** / ***A2*** / ***b*** / ***C*** / ***d*** / ***E*** / ***F*** / ***F*** / ***G*** / ***W*** > ①)	• Displays submenu ***W*** in group ***C***
(19) OK Press key	***W00*** (= default)	• Selection of the switch position ***W00***
(20) UP Press key several times until display on ***W04***	Stepwise, ***W00*** / ***W01*** to ***W04***	• Selection of the switch position ***W04***
(21) OK Press key	Flashing **- - -** (approx. 4 x)	• New setting is programmed
(22) UP Press key to check the change	Flashing ***A22*** > ***W04*** > ***L01*** > ***085*** > ***L02*** > ***095*** (in sequence)	• **Displays the new setting:** • **Sensing tube monitoring not normative** • **Normative alarm release**

① For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

7.3.4 Setting and polling the date and time

The following describes the procedure for setting the date and time.

Example: Setting to 10 June 2013; 11:05:30

Measure	Display	Procedure / remarks
(1) UP Press key	Flashing ***A12*** > ***L01*** > ***115*** > ***L02*** > ***115*** (in sequence), or other	• Displays the Default setting or the installation-specific switch position
(2) UP Press key several times until display on ***T***	In sequence ***A12*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P*** / ***R*** / ***T***	• Displays switch position group ***T***
(3) OK Press key	***RE*** ①	• Date/time display, polling mode ①
(4) UP Press key until display on ***SE***	In sequence ***RE*** / ***SE***	• Date/time display, input mode
(5) OK Press key	***Y10***	• Displays the year 2010
(6) UP Press key until ***Y13***	***Y13***	• Selected year 2013
(7) OK Press key > Month	***M01***	• Displays the month of January
(8) UP Press key until ***M06***	***M06***	• Selected month June
(9) OK Press key > Day	***d01***	• Displays the first day of the month
(10) UP Press key until ***d10***	***d10***	• Selected day is 10
(11) OK Press key > Hour	***H00***	• Displays hour 00
(12) UP Press key until ***H11***	***H11***	• Selected hour is 11
(13) OK Press key > Minute	***M00***	• Displays minute 00
(14) UP Press key until ***M05***	***M05***	• Selected minute is 05
(15) OK Press key > Second	***S00***	• Displays second 00
(16) UP Press key until ***S30***	***S30***	• Selected second 30
(17) OK Press the key, date and time are programmed	Flashing ***T - -*** (approx. 4 x)	• The date is set to 10.06.2013, and the clock starts to run from the time 11:05:30

Notice

① **Poll the date and time**:
In the ***T*** > ***RE*** switch position, pressing “OK” outputs the currently set date and the current time on the ADW 535.
Example: In sequence ***Y13*** > ***M06*** > ***d10*** > ***H11*** > ***M05*** > ***S57***.

7.3.5 Initial reset

When commissioning the ADW 535, for each sensing tube an initial reset is necessary to acquire the basic data (nominal values) based on the connected sensing tube volume ➔ switch positions ***U01*** and ***U02***.

An initial reset does not discard the system-specific parameters (response grade).

Notice

- The initial reset must always be performed under the system's "normal conditions", i.e. if possible, under the normal operating temperature of the sensing tube (see also Sec. 4.5.3). When this is performed, no temperature changes occur.
- If there is an expansion, conversion, retrofitting or repair on the sensing tube, an initial reset is imperative. An initial reset must also be carried out after repair work on the ADW 535 (replacement of the LSU 35 supervising unit, LMB 35 main board).
- After a FW upgrade, an initial reset is required only if expressly mentioned in the relevant firmware description.

Measure		Display	Procedure / remarks
(1)	UP Press key	Flashing ***A12*** > ***L01*** > ***115*** > ***L02*** > ***115*** (in sequence), or other	• Displays the Default setting or the installation-specific switch position
(2)	UP Press key several times until display on ***U***	In sequence ***A12*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P*** / ***R*** / ***T*** / ***U***	• Displays the switch position group ***U***
(3)	OK Press key	***U01***	• Displays initial reset On for **sensing tube I**
(4)	UP Press key several times until display on ***U01***	In sequence, ***U01*** / ***U02***	• Selection of switch position ***U01***, initial reset On for **sensing tube I**
(5)	OK Press the key again	Static ***U***, flashing ***01***	• **Start position**; the step motor goes into start position, pressure pump is fully wound.
(6)	**Vent sensing tube** ➔ open screw-junction piece on the hose for 60 s and then **firmly close**	Static ***U***, flashing ***01***	• A pressure compensation takes place to "O" **in the sensing tube**
(7)	OK Press the key again Automatic procedure (if fault ➔ cancel)	Flashing ***U01***	• **Initial reset pressure**; the step motor starts up and generates the initial reset pressure dependent on the sensing tube length (nominal value, takes about **30 s**)
			• **Leakage analysis** and **length check**; comparison of the connected sensing tube length based on the initial reset pressure. If discrepancy ➔ initial reset fault ➔ initial reset cancelled
			• **Temp. stability**; the pressure measured in sensing tube I (no over- or underpressure) is observed for approx. **30 s** to check for temperature changes
			• **Pressure build-up**; the step motor starts and creates overpressure in sensing tube I (about 10 s)
			• **Sealing check**; the overpressure in sensing tube I is observed for about **30 s**. If pressure drop ➔ initial reset fault
		Flashing **- - -** ①	• Initial reset display ended

Notice

① The display **- - -** signals only the completed initial reset process. Depending on the result, there may be an initial reset fault.

Following the sequence above, the initial reset must be carried out separately for each individually selected sensing tube.

7.3.6 Displaying the firmware version

On the ADW 535 the switch position ***F*** can be used to display the version of the firmware currently loaded.

Measure	Display	Procedure / remarks
(1) UP Press key	Flashing ***A12*** > ***L01*** > ***115*** > ***L02*** > ***115*** (in sequence), or other	• Displays the Default setting or the installation-specific switch position
(2) UP Press key several times until display on ***F***	In sequence ***A12*** / ***C*** / ***E*** / ***F***	• Displays the switch position group ***F***
(3) OK Press key	After approx. 2 s, in sequence e.g. ***V01.*** Pause ***01.*** Pause ***14***	• Displays the firmware version, in this case V01.01.14

7.3.7 Logging off additional modules XLM 35, RIM 36, SIM 35 and the SD memory card

The additional modules (XLM 35, SIM 35, RIM 36) and the SD memory card are automatically detected when the device is switched on; from that point onwards, they are monitored and fully functional. The SD memory card begins with data logging, recognisable on the flashing "Com" LED on the LMB. To eject the SD memory card or remove a subsequently fitted additional module (e.g. because it is not being used), the additional modules and SD memory card must first be logged off via the LMB 35 main board.

Notice

A time-out (approx. 15 s) is configured for the logoff procedure. During this time the additional modules can be electrically disconnected from the LMB 35 trouble-free or the SD memory card can be removed from the holder. If no component is removed during this timeout (including removing the SD memory card), the additional modules are re-activated and data logging on the SD memory card continues.

Measure	Display	Procedure / remarks
(1) UP Press key	Flashing ***A12*** > ***L01*** > ***115*** > ***L02*** > ***115*** (in sequence), or other	• Displays the Default setting or the installation-specific switch position
(2) UP Press key several times until display on ***o***	In sequence ***A12*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o***	• Display switch position group ***o***
(3) OK Press key	***o00***	• Display log off of additional module / SD memory card
(4) OK Press the key again	Flashing ***o - -*** (timeout approx. 15 s)	• Start logoff procedure, duration approx. 15 s
(5) Electrically disconnect (ribbon cable) the relevant additional module within the logoff time (15 s) or remove the SD memory card.		• If the module is not electrically disconnected from the LMB 35 within 15 s (including removal of the SD memory card), it is re-activated and data logging on the SD memory card continues

7.4 Re-programming

Warning

The ADW parameters are configured ex works with default states and values so that the triggering properties comply with EN 54-22. Changing the parameters may result in non-compliance with EN 54-22. Any adjustments or modifications to the ADW 535 using the “ADW Config” configuration software or the user interface on the FACP may only be carried out by the manufacturer or by qualified personnel trained by the manufacturer.

7.4.1 Re-programming on the ADW 535

If a different switch position has to be selected within the present system limits (***C*** > ***A11*** to ***G02*** and ***W00*** to ***W09***), re-programming is performed as described in Sec. 7.3.3.

7.4.2 Re-programming with “ADW Config” configuration software

When changing parameters as described in Sec. 7.2.1 and 7.2.2, use the “ADW Config” configuration software.

7.4.3 Re-programming from SecuriFire / Integral with XLM 35 (in preparation)

When connecting to the SecuriFire or Integral FACP via an XLM 35, control operations and changes can be made to the ADW device configuration directly from the FACP. For this purpose the FACP user software “SecuriFire Studio” and “Integral Application Center” are used to start the “ADW Config” configuration software for access to the ADWs; the configuration software is then used to make changes to the ADW 535.

7.5 Uploading new firmware to the ADW 535

An FW upgrade can be performed in two ways:

- From SD memory card
- Via Ethernet port from the “ADW Config” configuration software.

7.5.1 FW upgrade from SD memory card

When upgrading the FW from the SD memory card, first the new FW must be saved to the SD memory card in the root directory (not in a sub-directory).

The workflow for upgrading the FW from the SD memory card is described below (see also **Fig. 35**):

Notice

- If an SD memory card is inserted on the LMB 35 for data logging, it must first be logged off using *EasyConfig* switch position ***o*** and removed as described in Sec. 7.3.7.
- The internal program “Bootloader” is used for the FW upgrade. Activation of the Bootloader causes the fault relay to trigger. When upgrading the FW on the ADW 535, it is therefore essential to switch off **fire incident controls and remote alerting** on superordinate systems (FACP) beforehand.

Measure	Display on LMB 35	Procedure / remarks
(1) If present, log off the SD memory card via switch position ***o*** and remove.		• See Sec. 7.3.7
(2) Copy the FW file to be transferred to the SD memory card and then re-insert the SD memory card in the ADW.		• On the SD memory card to the **topmost** level (no sub-directory). **Important: only one** FW file may be saved.
(3) While pressing and holding the “**OK**” key on the LMB 35, **briefly** press the “**Reset**” key. Release the “**OK**” key.	***bL -*** (displays “Bootloader”)	• Displays “Wdog” continuously lit • LED '“Al1” and “Flt1” (and “Al2” and “Flt2”) continuously lit • AWD triggers fault
(4) Transmission to the ADW 535 begins (continuous approx. 10 s)	***Sd -*** (displays “from SD memory card”)	• Transmission running
(5) Firmware upgrade is completed	Flashing **- - -** (approx. 4 x)	• Fault is reset • ADW start phase running (LED “Fault” flashes about 60 s) • ADW continues running with the previous system-specific settings • **FW upgrade is completed**

Notice

Afterwards, normal data logging begins automatically on the still inserted SD memory card. If this is not wanted, the SD memory card must be logged off and removed after the FW upgrade (via switch position ***o***).

(6) After a waiting time of at least 5 min. from point **(5)** an initial reset must be performed again. **Attention**: only necessary if expressly mentioned in the relevant firmware description.	According to Sec. 7.3.5	• Observe the firmware description for the loaded FW • According to Sec. 7.3.5

7.5.2 FW upgrade from PC via “ADW Config” configuration software

Here the FW upgrade is via the Ethernet interface of the LMB 35 using the “ADW Config” configuration software.

Notice

The FW upgrade causes the fault relay to trigger. When upgrading the FW on the ADW 535, it is therefore essential to switch off **fire incident controls and remote alerting** on superordinate systems (FACP) beforehand.

Measure		Display on LMB 35	Procedure / remarks
(1)	In „ADW Config“ via „***Extras***“ > „***Download firmware***“ select		• Window „***Download firmware***“ opens
(2)	By „***Firmware image***“ > „***Select***“, search the directory where the new FW is. Select the file to the new FW and click „***Open***“		• Selection of the new FW
(3)	Under „***Control***“ press „***Download***“ key ➔ following procedure **(4)** to **(5)** are automatic	***bL -*** (displays „Bootloader“)	• Displays “Watchdog” continuously lit • LED “Al1” and “Flt1” (and “Al2” and “Flt2”) continuously lit • AWD triggers fault
(4)	Transmission to the ADW 535 begins (continuous approx. 10 s)	***PC -*** (displays “from PC”)	• Transmission running ➔ window „***Download firmware***“ under „***Status***“ of the course of the upgrade process is indicated
(5)	Firmware upgrade is completed	Flashing **- - -** (approx. 4 x)	• Fault is reset • ADW continues running with the previous system-specific settings • **FW upgrade is completed**
(6)	After a waiting time of at least 5 min. from point **(5)** an initial reset must be performed again. **Attention**: only necessary if expressly mentioned in the relevant firmware description.	According to Sec. 7.3.5	• Observe the firmware description for the loaded FW • According to Sec. 7.3.5

7.6 Measurements

The ADW supply voltage on terminals 1 and 2 must be checked (check also terminals 3 and 4 in the case of a redundant supply). If the FACP voltage supply is correctly set (not emergency current operation), the voltage should range between 10.8 and 13.8 VDC (when operated in 12 VDC mode) or between 21.6 and 27.6 VDC (when operated in 24 VDC mode). The value depends on the line length. Once commissioning is completed, the measured voltage value is to be entered in the commissioning protocol (see Sec. 7.8).

With the conductor cross-section determined and installed as described in Sec. 4.8.2, this voltage range must always be available at the end of the electrical installation – i.e. at the ADW 535 – to ensure that the ADW 535 is able to operate fault-free (see also Sec. 4.8.2).

Notice

If the measured value is outside the specified range, the ADW 535 may malfunction or even become damaged (over 30 VDC).

Voltage values that are too low can be caused by insufficiently dimensioned conductor cross-sections or an incorrectly set FACP voltage.

7.6.1 Reading out the set configuration and pressure values

Besides the measurement of the supply voltage on the ADW 535, the set configuration (selected switch position when commissioning ***C*** > ***A11*** to ***G02*** and ***C*** > > ***W01*** to ***W09*** according to Sec. 4.6.1.1 or configured switch position ***X01*** to ***X03***) and the pressure values “Test pressure”, “Initial reset pressure” and “Absolute pressure” (***P*** > ***UP1*** to ***MP2***) must also be recorded and entered in the commissioning protocol (see also Sec. 7.8).

Measure		Display	Procedure / remarks
(1)	**Poll response grade and sensing tube lengths** UP Briefly press key	Flashing, e.g. ***A22*** > ***L01*** > ***085*** > ***L02*** > ***095*** (in sequence) or other	• Displays the commissioned switch positions ***A11*** to ***G02***, ***W01*** to ***W09***, ***X01*** to ***X03*** and sensing tube lengths (e.g. ***L01*** > ***085*** = 85 m for sensing tube I)
(2)	**Polling IP setting** UP Press key several times until display on ***N***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N***	• Displays switch position group ***N***
(3)	OK Press key	After approx. 2 s, in sequence: ***IP / 169. / 254. / 001. / 001*** ***Sub / 255. / 255. / 000. / 000*** ***GA / 169. / 254. / 000. / 254***	• Displays the IP address • Displays the IP subnet mask • Displays the default gateway
(4)	**Sensing tube I initial reset pressure** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(5)	OK Press key > ***UP1***	***UP1***	• Selection of initial reset pressure for sensing tube I
(6)	OK Press the key again	After approx. 2 s, in sequence e.g. ***+*** / ***008*** / ***.7*** / ***–*** / ***000*** / ***.2***	• Displays initial reset pressure of sensing tube I, **nominal value** • = +8.7 mbar / –0.2 mbar (Max. / Min.)
(7) ①	**Sensing tube II initial reset pressure** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(8)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(9)	UP Press key several times until display on > ***UP2***	In sequence ***UP1*** / ***UP2***	• Selection of initial reset pressure for sensing tube II
(10)	OK Press the key	After approx. 2 s, in sequence e.g. ***+*** / ***007*** / ***.4*** / ***–*** / ***000*** / ***.4***	• Displays initial reset pressure of sensing tube II, **nominal value** • = +7.4 mbar / –0.4 mbar (Max. / Min.)
(11)	**Sensing tube I initial reset lengtht** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(12)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(13)	UP Press key several times until display on > ***UL1***	In sequence ***UP1*** / ***UP2*** / ***UL1***	• Selection of initial reset length for sensing tube I
(14)	OK Press the key	After approx. 2 s e.g. ***085***	• Displays initial reset length of sensing tube I • = 85 m (calculatet from *UP1*)
(15) ①	**Sensing tube II initial reset length** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(16)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(17)	UP Press key again until display on ***UL2***	In sequence ***UP1*** / ***UP2*** / ***UL1*** / ***UL2***	• Selection of initial reset length for sensing tube II
(18)	OK Press the key	After approx. 2 s e.g. ***095***	• Displays initial reset length of sensing tube II • = 95 m (calculatet from *UP2*)

Notice

① On an ADW 535-1 the steps **(7)** to **(10)**, **(15)** to **(18)**, **(23)** to **(26)** and **(31)** to **(34)** do not appear in sequence.

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Continuation:

(19)	**Sensing tube I test pressure** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(20)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(21)	UP Press key several times until display on > ***TP1***	In sequence ***UP1*** / ***UP2*** / ***UL1*** / ***UL2*** / ***TP1***	• Selection of test pressure for sensing tube I
(22)	OK Press the key	After approx. 2 s, in sequence e.g. ***+*** / ***008*** / ***.8*** / ***–*** / ***000*** / ***.1*** > ② ③	• Displays test pressure of sensing tube I, **actual value** • = +8.8 mbar / –0.1 mbar (Max. / Min.)
(23)	① **Sensing tube II test pressure** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(24)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(25)	UP Press key again until display on ***TP2***	In sequence ***UP1*** / ***UP2*** / ***UL1*** / ***UL2*** / ***TP1*** / ***TP2***	• Selection of test pressure for sensing tube II
(26)	OK Press the key	After approx. 2 s, in sequence e.g. ***+*** / ***007*** / ***.5*** / ***–*** / ***000*** / ***.3*** > ② ③	• Displays test pressure of sensing tube II, **actual value** • = +7.5 mbar / –0.3 mbar (Max. / Min.)
(27)	**Sensing tube I absolute pressure** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(28)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(29)	UP Press key several times until display on > ***MP1***	In sequence ***UP1*** / ***UP2*** / ***UL1*** / ***UL2*** / ***TP1*** / ***TP2*** / ***MP1***	• Selection of absolute pressure measurement for sensing tube I
(30)	OK Press the key	After approx. 2 s, in sequence e.g. ***+*** / ***018*** / ***.2***	• Displays absolute pressure sensing tube I • = +18.2 mbar
(31)	① **Absolute pressure sensing tube II** UP Press key several times until display on ***P***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I*** / ***N*** / ***o*** / ***P***	• Displays the switch position group ***P***
(32)	OK Press key	***UP1***	• Selection of initial reset pressure for sensing tube I
(33)	UP Press key several times until display on > ***MP2***	In sequence ***UP1*** / ***UP2*** / ***UL1*** / ***UL2*** / ***TP1*** / ***TP2*** / ***MP2***	• Selection of absolute pressure measurement for sensing tube II
(34)	OK Press the key	After approx. 2 s, in sequence e.g. ***+*** / ***017*** / ***.8***	• Displays absolute pressure sensing tube II • = +17.8 mbar

Notice

① On an ADW 535-1 the steps **(7)** to **(10)**, **(15)** to **(18)**, **(23)** to **(26)** and **(31)** to **(34)** do not appear in the sequence.

② The display shows the result of the most recent test, called up from "**Monitoring and interruption detection**" and/or from "**Cyclical test**" (see Sec. 2.2.9) or by the manual test "**Test check sensing tube I / II**" as described in Sec. 7.7.1.

③ **Caution**: The +/– signs of the test pressure can be reversed compared to the initial reset. This depends on the initial situation of the pressure pump of the monitoring equipment prior to the test and thus whether overpressure or underpressure was generated. Important for the comparison to the initial reset pressure is the size of the value (example: initial reset pressure ➔ +**8.7** compared to the test pressure ➔ –**8.8**).

7.7 Testing and checking

In addition to the checks described in Sec. 7.1, by causing faults and alarms on the ADW 535, correct triggering on the FACP (zone and line) is to be checked. These tests are to be entered in the commissioning protocol (see also Sec. 7.8).

For every ADW 535 it is necessary to perform fine adjustments to the operating conditions. For tunnels it is therefore recommended to run the entire venting program after the first setting so that venting-related temperature fluctuations cannot lead to alarm releases.

Testing the effective “heat” characteristic is usually not necessary. If required, it is possible to generate the necessary heat (similar to an actual fire) with test devices to simulate the response of the ADW 535 (see also Sec. 5.4.2.4).

7.7.1 Test triggerings

Notice about test triggerings

Fire incident control and remote alerting must be blocked or deactivated on the superordinate FACP.

The function “test pre-signal” can also be triggered in non parameterized pre-signal (e.g. in positions ***A11*** to ***G02***)

① Between each check, reset the ADW 535 (preferably on the FACP as a reset on the ADW does not reset the FACP).

② On the ADW 535-2 the checks for both sensing tubes have to be carried out (on ADW 535-1 the steps **(5)** to **(8)**, **(13)** to **(16)**, **(21)** to **(24)** and **(29)** to **(32)** do not appear in the workflow).

Measure		Display	Procedure / remarks
(1)	UP Press key	Flashing, e.g. ***A22*** > ***L01*** > ***085*** > ***L02*** > ***095*** (in sequence) or other	• Displays the commissioned switch positions ***A11*** to ***G02***, ***W01*** to ***W09***, ***X01*** to ***X03*** and sensing tube lengths (e.g. ***L01*** > ***085*** = 85 m for sensing tube I)
(2)	**Sensing tube I test alarm** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(3)	OK Press key > ***IA1***	***IA1*** (possible selection here: ***IA1*** / ***IA2*** / ***IF1*** / ***IF2*** / ***IP1*** / ***IP2*** / ***IC1*** / ***IC2***)	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(4)	OK Press key **3 x**	Flashing ***IA1*** (until reset)	• ADW 535 triggers Alarm I ➔ via relay or XLM to FACP ➔ reset from FACP ①
(5)	② **Sensing tube II test alarm** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(6)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(7)	UP Press key until display on ***IA2***	In sequence ***IA1*** / ***IA2***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube II**
(8)	OK Press key **3 x**	Flashing ***IA2*** (until reset)	• ADW 535 triggers Alarm II ➔ via relay or XLM to FACP ➔ reset from FACP ①
(9)	**Sensing tube I test fault** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(10)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(11)	UP Press key several times until display on > ***IF1***	In sequence ***IA1*** / ***IA2*** / ***IF1***	• Displays test mode “Test fault from *EasyConfig*” for **sensing tube I**
(12)	OK Press key **3 x**	Flashing ***IF1*** (until reset)	• ADW 535 triggers Fault I ➔ via relay or XLM to FACP ➔ reset from FACP ①
(13)	② **Sensing tube II test fault** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(14)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(15)	UP Press key several times until display on ***IF2***	In sequence ***IA1*** / ***IA2*** / ***IF1*** / ***IF2***	• Displays test mode “Test fault from *EasyConfig*” for **sensing tube II**
(16)	OK Press key **3 x**	Flashing ***IF2*** (until reset)	• ADW 535 triggers Fault II ➔ via relay or XLM to FACP ➔ reset from FACP ①

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Continuation:

(17)	**Sensing tube I test pre-signal** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(18)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(19)	UP Press key several times until display on ***IP1***	In sequence ***IA1*** / ***IA2*** / ***IF1*** / ***IF2*** / ***IP1***	• Displays test mode “Test pre-signal from *EasyConfig*” for **sensing tube I**
(20)	OK Press key **3 x**	Flashing ***IP1*** (until reset)	• ADW 535 triggers Pre-signal I ➔ via relay or XLM to FACP ➔ reset from FACP ①
(21)	② **Sensing tube II test pre-signal** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(22)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(23)	UP Press key several times until display on ***IP2***	In sequence ***IA1*** / ***IA2*** / ***IF1*** / ***IF2*** / ***IP1*** / ***IP2***	• Displays test mode “Test pre-signal from *EasyConfig*” for **sensing tube II**
(24)	OK Press key **3 x**	Flashing ***IP2*** (until reset)	• ADW 535 triggers pre-signal II ➔ via relay or XLM to FACP ➔ reset from FACP ①
(25)	**Sensing tube I test check** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(26)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube I**
(27)	UP Press key several times until display on ***IC1***	In sequence ***IA1*** / ***IA2*** / ***IF1*** / ***IF2*** / ***IP1*** / ***IP2*** / ***IC1***	• Test mode indication “Test check from *EasyConfig*” for **sensing tube I**
(28)	OK Press key **3 x**	Flashing ***IC1*** (as long as step motor is running) ➔ afterwards flashing **- - -**	• ADW 535 starts test on **sensing tube I** ➔ if negative results (comparison to nominal value from initial reset) fault I is triggered ➔ reset from FACP ①
(29)	② **Sensing tube II test check** UP Press key several times until display on ***I***	In sequence ***A22*** / ***C*** / ***E*** / ***F*** / ***I***	• Displays switch position group ***I***
(30)	OK Press key	***IA1***	• Displays test mode “Test alarm from *EasyConfig*” for **sensing tube II**
(31)	UP Press key several times until display on ***IC2***	In sequence ***IA1*** / ***IA2*** / ***IF1*** / ***IF2*** / ***IP1*** / ***IP2*** / ***IC1*** / ***IC2***	• Displays test mode “Test check from *EasyConfig*” for **sensing tube II**
(32)	OK Press key **3 x**	Flashing ***IC2*** (as long as step motor is running) ➔ afterwards flashing **- - -**	• ADW 535 starts test on **sensing tube II** ➔ if negative results (comparison to nominal value from initial reset) fault II is triggered ➔ reset from FACP ①

7.7.2 Checking the alarm release

Owing to the automatic pneumatic testing of the sensing tube, a check of the effective “heat” fire characteristic is generally not necessary. If required, however, it is possible to generate the necessary heat (similar to an actual fire) with test devices to simulate the response of the ADW 535.

The alarm release by heat can be actuated via the sensing tube as follows:

- Point testing of the sensing tube. A point test of the sensing tube can be performed only via a test coil in the sensing tube (see Sec. 5.4.2.1 and 5.4.2.4). An alarm can be triggered by subjecting the test coil to a steady stream of heat from a hot air blower for about 60 s.
- Area-wide testing of the sensing tube. Area-wide testing of the sensing tube using fire tests is reasonable and practicable only following EN 54-22.

Danger

If genuine fire tests are to be carried out, the relevant local authorities (fire service) are to be consulted beforehand; the tests themselves are to be carried out by trained specialists (manufacturer) only.

7.8 Commissioning protocol

The ADW 535 ships with a commissioning protocol (fold-out) included in the scope of delivery. All of the measurements and tests carried out during commissioning and maintenance are to be entered on the protocol, which is then signed.

Notice

- When performing maintenance work or after certain other events, conclusions can be drawn concerning the commissioning state of the ADW 535 based on the commissioning protocol. The protocol also serves as a kind of life history of the ADW 535.
- The commissioning protocol is to be filled out conscientiously and fully and stored in the ADW 535. If required, a copy can be made and stored in the system dossier.

8 Operation

8.1 Operation and display elements

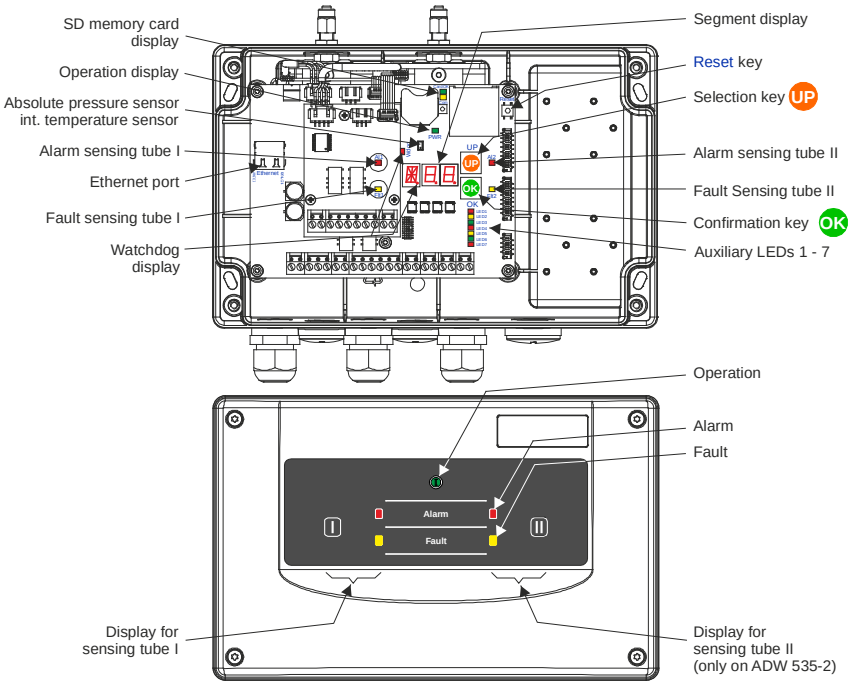

Fig. 35 View of the operation and display elements

All operation functions take place inside the device on the LMB 35 main board. It includes an alphanumeric display and two 7-segment displays as well as two buttons (“UP” / “OK”).

8.2 Functional sequence of operation

The operation of the ADW 535 line type heat detector in normal operation (after commissioning) is limited to switching On/Off and resetting a triggered event (alarm, fault). Operation is generally via the FACP, with input of the “Zone On/Off” and “Reset” functions (on “Reset external” input of the ADW 535).

With the ***EasyConfig*** switch position ***R*** (***R00*** = state reset) on the LMB 35 or by briefly actuating the “Reset external”, the triggered events can be reset on the ADW 535 on site. The reset is possible only if the triggered event is no longer pending (e.g. pressure in the sensing tube undershoots the triggering value or the fault event is rectified). The application of a continuous signal at the “Reset external” input also deactivates (switches off) the ADW 535 (see also Sec. 2.2.5 and 6.5.2).

Notice

A local reset does not reset a superordinate FACP. It may happen that the reset in the ADW 535 triggers a fault in the superordinate line of the FACP.

To aid commissioning the ADW 535, there are two 7-segment displays, an alphanumeric display, and two buttons (“UP” and “OK”) inside the device on the LMB 35 main board. These elements render a kind of rotary switch function, i.e. displays and positions can appear in the range of ***A00*** to ***Z99***.

The ADW 535 is commissioned using these elements. Device settings for pre-defined system limits can also be called up (***EasyConfig***). These pre-defined positions are stored with normative values for response sensitivity and various sensing tube lengths. The ***EasyConfig*** procedure allows the device to be commissioned without the “ADW Config” software. If system-specific programming has to be carried out (e.g. after a calculation with “ADW HeatCalc” or when programming RIM 36), the “ADW Config” configuration software must be used.

8.3 Switch positions

The switch positions which can be called up via the segment display and the “UP” / ”OK” buttons on the LMB 35 are listed below. The switch positions can be used for inputs (***C*** / ***I*** / ***T*** / ***U*** / ***W*** / ***X***) or for polling (***E*** / ***F*** / ***N*** / ***P*** / ***T***).

Stored with the rotary switch procedure is a **time-out** (approx. 5 s). If within this time period a process is not continued or completed, it is interrupted and the segment display automatically returns to the normal state (flashing point).

Pos.	*Submenu / Area / Display*	*Purpose*	*Meaning / Procedure ②*
C	***A11*** to ***G01*** ***A12*** to ***G02*** ↳ ***L01*** / ***L02*** ↳ ***015*** to ***115*** (per tube) ***W00*** to ***W09***	**Normative system limits** ① - 1 sensing tube Compliant with EN 54-22, Cl. A1l to Gl - 2 sensing tubes ↳ Sensing tube length tube I (***L01***), tube II (***L02***) ↳ Sensing tube length in m, ***015*** to ***115*** (in 5 m increments) **Sensing tube monitoring**	See Sec. 4.6.1.1, 4.6.1.2 and Sec. 7.3.3
E	***E01*** to ***E99*** ↳ ***G00*** to ***G99***	**Event memory**; 99 events (***E01*** = last event) ↳ Event group ***G00*** to ***G99***	See Sec. 8.5.4
F	***V00.*** to ***99*** (3 blocks)	Read out **firmware version**	See Sec. 7.3.6
I	***IA1*** / ***IA2*** ***IF1*** / ***IF2*** ***IP1*** / ***IP2*** ***IC1*** / ***IC2***	**Triggering** (Initiate); Test alarm (***IA.***), up to the FACP Test fault (***IF.***), up to the FACP Test presignal (***IP.***), up to the FACP Manual test check (***IC.***); Sensing tube I (***..1***), sensing tube II (***..2***)	See Sec. 7.7.1
N	***IP*** / ***Sub*** / ***GA*** ↳ ***169.*** / ***254.*** / ***001.*** / ***001*** (default)	**Polling IP setting** (Network); IP address (***IP***), Subnet (***Sub***), Gateway (***GA***)	See Sec. 7.6.1
o	***o00***	**Log off additional modules;** (optional modules, all at same time)	See Sec. 7.3.7
P	***UP1*** / ***UP2*** ***UL1*** / ***UL2*** ***TP1*** / ***TP2*** ***MP1*** / ***MP2***	**Output pressure vales** (in mBar); “Initial reset pressure” = nominal value (***UP.***) “Initial reset length sensing tube” (***UL.***), calculatet from *UP* “Test pressure” = actual value (***TP.***) “Absolute pressure” (***MP.***) Sensing tube I (***..1***), sensing tube II (***..2***)	See Sec. 7.6.1
R	R00	**Perform state reset**	
T	***Y10*** to ***Y99*** / ***M01*** to ***M12*** ***d01*** to ***d31*** / ***H00*** to ***H23*** ***M00*** to ***M59*** / ***S00*** to ***S59***	**Date and time;** Poll (Read = ***RE***), Set (Set = ***SE***)	See Sec. 7.3.4
U	***U01*** / ***U02***	Start **initial reset;** Sensing tube I (***U01***), sensing tube II (***U02***)	See Sec. 7.3.5
X	***X01*** to ***X03***	**Configurable switch positions**	See Sec. 7.2.1

Notice

① For response-class-related use of the ADW 535, the information in the chapter 4.1.1 must be observed.

② The table lists only the available switch positions. A detailed description of the operator functions (input procedure) can be found in the relevant section (“Meaning / Procedure” column).

8.4 Resetting

The ADW 535 can be reset after a triggered event in two ways:

- via ***EasyConfig*** switch positions ***R*** (***R00***) on the ADW on site
- or by briefly actuating the “Reset external” input on the ADW.

Notice

- Resetting can be triggered only after an event, but only if the criterion that resulted in the event trigger is again in its normal state (e.g. Diff pressure is again below the alarm threshold, or a fault event is rectified).
- Local resetting (“Reset” key) does not reset a superordinate FACP. It may also happen that the reset in the ADW 535 triggers a fault in the superordinate line of the FACP.

8.5 Displays

8.5.1 Displays on the housing surface

Several LEDs on the housing surface indicate the current state of the ADW 535. The table below lists the states only for the ADW 535-1 (one sensing tube). For the ADW 535-2 the indicators are doubled (**I** and **II**, see **Fig. 35**), except the operation indicator.

Display			Function / state
Operation	Alarm	Fault	
Green	Red	Yellow	
			System off (no voltage)
On		½ s T	System inactive (Reset external)
On			Quiescent state
On		1 s T	Start phase of the system (approx. 60 s)
On		1 s T	Sensing tube fault, test running ① / ②
On		On	Sensing tube fault, fault triggered
On		On	General fault triggered (internal faults)
On	1 s T		Pre-signal (Diff or Max)
On	On		Alarm (Diff or Max)

Notice

① No fault triggered (triggers only after completion of the test procedure and if negative result ➔ LED “Fault” continuously lit display).

② The “flashing” indicator does not apply to testing with the “cyclical test procedure” and test triggering ***IC1*** / ***IC2***.

T = flashing display; ½ s cycle / 1 s cycle

8.5.2 Displays on the LMB 35 main board

Besides the segment display, the LMB 35 main board has various auxiliary LEDs with the following meanings (see also **Fig. 35**):

- Flashing point on the left-hand segment display = watchdog display (processor is running)
- Left flashing point and right point continuously lit in the segment display = day/night control active (only in ***X01*** – ***X03***)
- LED **CardOk** = SD memory card inserted
- LED **Com** = communication OK / SD memory card is logging
- LED **Wdog** = watchdog display (processor not running)
- LED 1 – 7 = reserve

Other output and display possibilities on the segment display include:

- In switch position ***E*** = event memory, see Sec. 8.5.4
- In switch position ***F*** = firmware version, see Sec. 7.3.6
- In switch position ***N*** = IP address, see Sec. 7.6.1
- In switch position ***P*** = pressure values, see Sec. 7.6.1
- In switch position ***T*** > ***RE*** = date, time, see Sec. 7.3.4
- "UP" key pressed = set configuration (***A11*** to ***X03***) and sensing tube lengths, see Sec. 7.6.1
- Flashing ***000*** = Busy message, a test/adjustment is in progress or possibly falsified ➔ wait and repeat the entry.

8.5.3 SD memory card operation

The SD memory card is automatically detected when the device is switched on and when the card is inserted. From then on it is monitored. Data logging begins automatically after approx. 10 s.

Warning

- Only **industrial SD memory cards** tested and approved by the manufacturer may be used (see Sec. 12.1). The use of a Consumer SD memory card is to be avoided – this can lead to data loss or destruction of the SD memory card and faults on the ADW.
- Inserting the SD memory card: before using the SD memory card, make sure it is blank (file interpretation).
- Removing the SD memory card: to avoid data loss, the SD memory card must be logged off on the LMB 35 (EasyConfig switch position o) before removing (see Sec. 7.3.7).

The SD memory card is inserted with the contact side facing toward the LMB circuit board and pushed into the holder until it snaps into place. Pressing the SD memory card again releases the locking mechanism and the SD memory card can then be removed from the holder.

The meaning of the LEDs **CardOk** and **Com** is described Sec. 8.5.2.

8.5.3.1 Data logging on the SD memory card

Pressure and temperature values: The pressure and temperature values as well as the current status for each sensing tube are written to the SD memory card every second (default, can be changed with ADW Config) for each sensing tube and saved in **Log-Files** (*.xls file). After 28,800 entries (corresponding to 8 hours with an MCM interval of 1 s) a new Log-File is automatically generated. A total of 200 Log-Files (L000.xls to L199.xls) can be generated for long-term logging. After the last Log-File the oldest one (L000.xls) is overwritten. The 200 Log-Files are sufficient to cover 66 days of data logging (with an MCM interval of 1 s). The Log-Files can then be opened in Excel and the data represented as a diagram using the diagram assistant.

Events: All events which occur in the ADW 535 are written to the **Event-Files** (*.lev file). After 64,000 events a new Event-File is created automatically. A total of 10 Event-Files (E000.lev to E009.lev) can be generated for long-term logging. After the last Event-File the oldest one (E000.lev) is overwritten. The 10 Event-Files can log over 64,000 events. The Event-Files can be opened with a text editor. Please refer to Sec. 8.5.4 for the interpretation of the events. There is also the possibility of importing Event-Files using the "AWD Config" configuration software and displaying them as real event text.

8.5.3.2 Meaning of the status abbreviations on the SD memory card

The respective status of the ADW 535 can be viewed in the files on the SD memory card. It is shown for each sensing tube in the “Status I” and “Status II” columns with one of the following abbreviations:

- TOF Tube Off
- TNR Tube Not Ready
- ISO Sensing tube isolated
- DNR Diff Not Ready
- MNR Max Not Ready
- AVT Alarm verification time running
- ADJ Adjust, temperature compensation
- IRS Initial Reset
- TST Test
- TSD Test Delay
- BRA Break Assumption
- POR Pressure Offset Regulation
- POD Pressure Offset Delay
- POO Pressure Offset Off
- SVO Supervision Off (sensing tube supervision off)
- ALD Triggering „**Diff alarm**“
- ALM Triggering „**Max alarm**“

8.5.4 Displaying and reading out the event memory

The event memory can be called up via switch position ***E***. The last 99 events (event positions ***E01*** to ***E99***) of the overall 1,000 possible events can be accessed in it. Event position ***E01*** always contains the last (most recent) event. The event memory as a whole can be deleted only by the manufacturer.

To display the events with the 3 digits of the segment display, the events are divided into groups (***G00*** to ***G99***). For each event group, up to 8 events can be displayed as a 3-digit code. The codes are added together and displayed if there are multiple pending events per event group.

8.5.4.1 Procedure and interpretation of the event memory display

The sequence below provides an example to demonstrate how the next to last event, i.e. second youngest, is read out (***E02***). The result shows that the sensing tube I Diff alarm triggered.

Measure	Display	Procedure / remarks
(1) UP Briefly press key	Flashing, e.g. ***A22*** > ***L01*** > ***085*** > ***L02*** > ***095*** or other	• Displays the commissioned switch positions ***A11*** to ***G02***, ***W01*** to ***W09***, ***X01*** to ***X03*** and sensing tube lengths (e.g. ***L01*** > ***085*** = 85 m for sensing tube I)
(2) UP Press key again until display on ***E***	In sequence ***A12*** / ***C*** / ***E***	• Displays switch position group ***E***
(3) OK Press key	***E01***	• Select event position ***E01*** (last event)
(4) UP Press key	***E02*** ①	• Select event position ***E02*** (next to the last event)
(5) OK Press key	After about 2 s, e.g. ***G10***	• Displays the event group ***G10***, sensing tube I events
(6) Wait	After about 2 s, e.g. ***001*** ②	• Displays event code ***001***, Diff alarm sensing tube I

Notice

① Pressing the “UP” key several times accesses all 99 event positions one after the other (***E01*** to ***E99***), i.e. displays them without content. If there are **empty event positions**, event group ***G00*** and code ***000*** are then output.

② **Multiple codes**: If the pre-signal preceded the alarm release of sensing tube I, the code ***003*** is displayed as a result at point **(6)**. If is composed of (i.e. added) the individual codes ***001*** (Diff alarm) and ***002*** (pre-signal Diff alarm).

Please refer to Sec. 8.5.4.2 and 8.5.4.3 for a list of all the event groups and their events (codes).

8.5.4.2 Event groups

Event group	Purpose
G00	General events, part 1 (ADW On/Off, inactive, sensing tube On/Off from FACP)
G01	General events, part 2 (time, start initial reset, event memory clearing)
G02	General events, part 3 (sensing tube On/Off via “ADW Config”)
G03	General events, part 4 (reset events)
G04	General events, part 5 (temperature sensor LMB)
G05	General events, part 6 (temperature sensor LMB isolated)
G06	General events, part 7 (response grades configuration change)
G07	General events, part 8 (sensing tube monitoring configuration change)
G10	Sensing tube I, events (Diff alarm, Max alarm, pre-signals, alarm verification)
G11	Ext. temperature sensor I, events (alarm, fault)
G12	Sensing tube I, faults (pressure sensor events, step motor)
G13	Sensing tube I, isolated, part 1 (sensing tube isolated alarms)
G14	Sensing tube I, isolated, part 2 (isolated alarms temperature sensor)
G15	Sensing tube I, isolate, part 3 (On/Off)
G16	Sensing tube I, test triggerings from ***EasyConfig*** to FACP
G17	Sensing tube I, test events (test, adjustment, pressure offset)
G18	Sensing tube I, test triggerings from “ADW Config” to FACP
G20	Sensing tube II, events (Diff alarm, Max alarm, pre-signals, alarm verification)
G21	Ext. temperature sensor II, events (alarm, fault)
G22	Sensing tube II, faults (pressure sensor events, step motor)
G23	Sensing tube II, isolated, part 1 (sensing tube isolated alarms)
G24	Sensing tube II, isolated, part 2 (isolated alarms temperature sensor)
G25	Sensing tube II, isolate, part 3 (On/Off)
G26	Sensing tube II, test triggerings from ***EasyConfig*** to FACP
G27	Sensing tube II, test events (test, adjustment, pressure offset)
G28	Sensing tube II, test triggerings from “ADW Config” to FACP
G30	Sensing tube I, test faults (interruption, crushing, leak, step motor)
G40	Sensing tube II, test faults (interruption, crushing, leak, step motor)
G50	Initial reset faults sensing tube I (invalid parameter, Timeout, sealing check / length check negative)
G60	Initial reset faults sensing tube II (invalid parameter, Timeout, sealing check / length check negative)
G70	RIM 1, RIM 2 faults
G71	XLM faults
G72	SD memory card / SIM faults
G80	LMB faults (operating system, undervoltage, clock, day/night control, type)

8.5.4.3 Event codes within event groups

***G00*, general events, part 1**	
001	Switch on ADW (supply voltage)
002	ADW switched off (inactive, via “Reset external”)
004	ADW switched on (via “Reset external”)
008	Sensing tube I switched off from FACP (SecuriFire – Integral)
016	Sensing tube II switched off from FACP (SecuriFire – Integral)
032	Sensing tube I switched on from FACP (SecuriFire – Integral)
064	Sensing tube II switched on from FACP (SecuriFire – Integral)
***G01*, general events, part 2**	
001	Date, time set
002	Initial reset sensing tube I performed (ADW)
004	Initial reset sensing tube II performed (ADW)
008	Event memory deleted
016	Initial reset sensing tube I performed with “ADW Config”
032	Initial reset sensing tube II performed with “ADW Config”
***G02*, general events, part 3**	
001	Sensing tube I deactivated via “ADW Config”
002	Sensing tube II deactivated via “ADW Config”
004	Sensing tube I activated via “ADW Config”
008	Sensing tube II activated via “ADW Config”
016	Sensing tube II switched on (partial planning)
032	Sensing tube II switched off (partial planning)

➔➔

Continuation:

***G03*, general events, part 4, reset events**	
001	Key
002	SecuriLine
004	“ADW Config” PC program
008	External
***G04*, general events, part 5, temperature sensor LMB**	
004	Alarm temperature sensor LMB
016	Fault temperature sensor LMB
032	Parameter invalid, LMB temperature sensor
***G05*, general events, part 6, temperature sensor LMB isolated**	
004	Test alarm temperature sensor LMB

***G06*, general events, part 7, response grades configuration change**													
000	X01	***003***	A11	***006***	A22	***009***	C01	***012***	D02	***015***	F01	***018***	G02
001	X02	***004***	A12	***007***	B01	***010***	C02	***013***	E01	***016***	F02	***019***	Res.
002	X03	***005***	A21	***008***	B02	***011***	D01	***014***	E02	***017***	G01	***020***	Res.

***G07*, general events, part 8, sensing tube monitoring configuration change**													
000	W00	***004***	W04	***008***	W08	***012***	Res.	***016***	Res.	***020***	Res.	***024***	Res.
001	W01	***005***	W05	***009***	W09	***013***	Res.	***017***	Res.	***021***	Res.	***025***	Res.
002	W02	***006***	W06	***010***	Res.	***014***	Res.	***018***	Res.	***022***	Res.	***026***	Res.
003	W03	***007***	W07	***011***	Res.	***015***	Res.	***019***	Res.	***023***	Res.	***027***	Res.

***G10*, sensing tube I events**	
001	Diff alarm, sensing tube I
002	Pre-signal Diff alarm, sensing tube I
004	Max alarm, sensing tube I
008	Pre-signal Max alarm, sensing tube I
016	Alarm verification, sensing tube I
***G11*, temperature sensor I events**	
004	Alarm, external temperature sensor I
016	External temperature sensor I fault
032	Parameter invalid, external temperature sensor I
064	Fault, external temperature sensor I, compensation
***G12*, pressure sensor I faults**	
001	Pressure sensor I fault
002	Fault undervoltage step motor / LSU I
004	Parameter invalid, pressure sensor I
008	Exceedance measuring range positive, pressure sensor I
016	Exceedance measuring range negative, pressure sensor I
032	Error control step motor I
***G13*, sensing tube I, isolated, part 1, sensing tube test alarms**	
001	Isolated Diff alarm, sensing tube I
002	Isolated pre-signal Diff alarm, sensing tube I
004	Isolated Max alarm, sensing tube I
008	Isolated pre-signal Max alarm, sensing tube I
***G14*, Sensing tube I, isolated, part 2, test alarms temperature sensor**	
004	Isolated alarm, external temperature sensor I
***G15*, sensing tube I, isolated, part 3, switch On/Off**	
001	Isolate sensing tube I switched on
002	Isolate sensing tube I switched off (normal operation)
***G16*, sensing tube I, test triggerings from *EasyConfig* to FACP**	
***G18*, Sensing tube I, test triggerings from “ADW Config” to FACP**	
001	Test alarm sensing tube I
002	Test fault sensing tube I
004	Test pre-signal sensing tube I
***G17*, sensing tube I, test events**	
001	Sensing tube I test
002	Adjustment (temperature compensation) sensing tube I
004	Sensing tube I pressure offset
008	Break assumption in sensing tube I

➔➔

Continuation:

***G20*, sensing tube II events, part 1, sensing tube alarms**	
001	Diff alarm, sensing tube II
002	Pre-signal Diff alarm, sensing tube II
004	Max alarm, sensing tube II
008	Pre-signal Max alarm, sensing tube II
016	Alarm verification, sensing tube II
***G21*, sensing tube II events, part 2, temperature sensor alarms**	
004	Alarm, external temperature sensor II
016	Fault external temperature sensor II
032	Parameter invalid, external temperature sensor II
064	Fault, external temperature sensor II, compensation
***G22*, pressure sensor II faults**	
001	Pressure sensor II fault
002	Fault undervoltage step motor / LSU II
004	Parameter invalid, pressure sensor II
008	Exceedance measuring range positive, pressure sensor II
016	Exceedance measuring range negative, pressure sensor II
032	Error control step motor II
***G23*, sensing tube II, isolated, part 1 (sensing tube test alarms)**	
001	Isolated Diff alarm, sensing tube II
002	Isolated pre-signal Diff alarm, sensing tube II
004	Isolated Max alarm, sensing tube II
008	Isolated pre-signal Max alarm, sensing tube II
***G24*, sensing tube II, isolated, part 2, test alarms temperature sensor**	
004	Isolated alarm, external temperature sensor II
***G25*, sensing tube II, isolated, part 3, switch On/Off**	
001	Isolate sensing tube II switched on
002	Isolate sensing tube II switched off (normal operation)
***G26*, sensing tube II, test triggerings from *EasyConfig* up to FACP**	
***G28*, Sensing tube II, test triggerings from "ADW Config" to FACP**	
001	Test alarm sensing tube II
002	Test fault sensing tube II
004	Test pre-signal sensing tube II
***G27*, sensing tube II test events**	
001	Sensing tube II test
002	Adjustment (temperature compensation) sensing tube II
004	Sensing tube II pressure offset
008	Break assumption in sensing tube II
***G30*, test faults sensing tube I**	
001	Sensing tube interruption I
002	Sensing tube crushing I
004	Sensing tube leak I
008	Parameter invalid, sensing tube monitoring I
016	Test (check) cancelled I
***G40*, test faults sensing tube II**	
001	Sensing tube interruption II
002	Sensing tube crushing II
004	Sensing tube leak II
008	Parameter invalid, sensing tube monitoring II
016	Test (check) cancelled II
***G50*, initial reset faults sensing tube I**	
001	Sealing check I negative
002	Timeout initial reset I
004	Length check I negative
008	Parameter invalid, initial reset I
016	Interruption I
032	Ur-Reset cancelled I

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Continuation:

***G60*, initial reset faults sensing tube II**	
001	Sealing check II negative
002	Timeout initial reset II
004	Length check II negative
008	Parameter invalid, initial reset II
016	Interruption II
032	Ur-Reset cancelled II
***G70*, RIM 1, RIM 2 faults**	
001	RIM 1 fault, missing or defective
016	RIM 2 fault, missing or defective
064	Fault incompatible RIM
128	Fault, too many RIMs
***G71*, XLM faults**	
001	XLM fault, missing or defective
004	XLM fault, too many XLMs
***G72*, SD memory card / SIM faults**	
001	SD memory card fault, missing or defective
016	SIM fault, missing or defective
064	SIM fault, too many SIMs
***G80*, LMB faults**	
001	Operating system fault 1
002	Operating system fault 2
004	Undervoltage fault
008	Clock fault
016	EEPROM fault
032	Parameter invalid, day/night control
064	Fault absolute pressure sensor

8.5.5 Operation and displays on the XLM 35

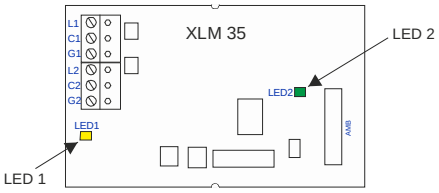

Fig. 36 XLM 35 operation and display

LED 1 (yellow)	State XLM 35 <> addressable loop (lights only if supply from LMB is OK)
Not lit	No addressable loop voltage
Continuously lit	Addressable loop voltage OK, no communication XLM <> Line
Flashes (normal operation)	Communication XLM <> Line OK
LED 2 (green)	**State ADW 535 <> XLM 35**
Not lit	No power supply from LMB 35
Flashes (normal operation)	Power supply from LMB 35 OK, communication XLM <> ADW OK

8.5.6 Operation and display on the SIM 35

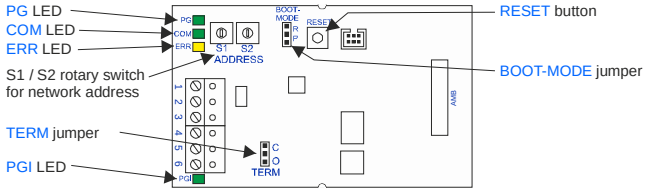

Fig. 37 SIM 35 operation and display

The functions of the rotary switches, jumpers, buttons and LEDs are shown in the following table.

The network address is set in hexadecimal code using the two rotary switches (S1 and S2). The bus termination is defined with the TERM jumper. This must be done on **both sides of the network** (beginning and end). The BOOT-MODE jumper is used only in production. The RESET button initiates a HW reset on the SIM 35. The four LEDs on the SIM 35 indicate the state of the ADW network. Please refer to Sec. 11.2 for more information about the ADW network.

Rotary switch S1 / S2	Network address

Dec	Hex S1	Hex S2	Dec	Hex S1	Hex S2	Dec	Hex S1	Hex S2	Dec	Hex S1	Hex S2	Dec	Hex S1	Hex S2	Dec	Hex S1	Hex S2
0	0	0	32	2	0	64	4	0	96	6	0	128	8	0	160	A	0	192	C	0	224	E	0
1	0	1	33	2	1	65	4	1	97	6	1	129	8	1	161	A	1	193	C	1	225	E	1
2	0	2	34	2	2	66	4	2	98	6	2	130	8	2	162	A	2	194	C	2	226	E	2
3	0	3	35	2	3	67	4	3	99	6	3	131	8	3	163	A	3	195	C	3	227	E	3
4	0	4	36	2	4	68	4	4	100	6	4	132	8	4	164	A	4	196	C	4	228	E	4
5	0	5	37	2	5	69	4	5	101	6	5	133	8	5	165	A	5	197	C	5	229	E	5
6	0	6	38	2	6	70	4	6	102	6	6	134	8	6	166	A	6	198	C	6	230	E	6
7	0	7	39	2	7	71	4	7	103	6	7	135	8	7	167	A	7	199	C	7	231	E	7
8	0	8	40	2	8	72	4	8	104	6	8	136	8	8	168	A	8	200	C	8	232	E	8
9	0	9	41	2	9	73	4	9	105	6	9	137	8	9	169	A	9	201	C	9	233	E	9
10	0	A	42	2	A	74	4	A	106	6	A	138	8	A	170	A	A	202	C	A	234	E	A
11	0	B	43	2	B	75	4	B	107	6	B	139	8	B	171	A	B	203	C	B	235	E	B
12	0	C	44	2	C	76	4	C	108	6	C	140	8	C	172	A	C	204	C	C	236	E	C
13	0	D	45	2	D	77	4	D	109	6	D	141	8	D	173	A	D	205	C	D	237	E	D
14	0	E	46	2	E	78	4	E	110	6	E	142	8	E	174	A	E	206	C	E	238	E	E
15	0	F	47	2	F	79	4	F	111	6	F	143	8	F	175	A	F	207	C	F	239	E	F
16	1	0	48	3	0	80	5	0	112	7	0	144	9	0	176	B	0	208	D	0	240	F	0
17	1	1	49	3	1	81	5	1	113	7	1	145	9	1	177	B	1	209	D	1	241	F	1
18	1	2	50	3	2	82	5	2	114	7	2	146	9	2	178	B	2	210	D	2	242	F	2
19	1	3	51	3	3	83	5	3	115	7	3	147	9	3	179	B	3	211	D	3	243	F	3
20	1	4	52	3	4	84	5	4	116	7	4	148	9	4	180	B	4	212	D	4	244	F	4
21	1	5	53	3	5	85	5	5	117	7	5	149	9	5	181	B	5	213	D	5	245	F	5
22	1	6	54	3	6	86	5	6	118	7	6	150	9	6	182	B	6	214	D	6	246	F	6
23	1	7	55	3	7	87	5	7	119	7	7	151	9	7	183	B	7	215	D	7	247	F	7
24	1	8	56	3	8	88	5	8	120	7	8	152	9	8	184	B	8	216	D	8	248	F	8
25	1	9	57	3	9	89	5	9	121	7	9	153	9	9	185	B	9	217	D	9	249	F	9
26	1	A	58	3	A	90	5	A	122	7	A	154	9	A	186	B	A	218	D	A	250	F	A
27	1	B	59	3	B	91	5	B	123	7	B	155	9	B	187	B	B	219	D	B			
28	1	C	60	3	C	92	5	C	124	7	C	156	9	C	188	B	C	220	D	C			
29	1	D	61	3	D	93	5	D	125	7	D	157	9	D	189	B	D	221	D	D			
30	1	E	62	3	E	94	5	E	126	7	E	158	9	E	190	B	E	222	D	E			
31	1	F	63	3	F	95	5	F	127	7	F	159	9	F	191	B	F	223	D	F			

Jumper TERM	Bus termination (position "C" = active)
Position **O**	SIM 35 is **not** first or last module
Position **C**	SIM 35 is **first** or **last** module
Jumper BOOT MODE	**FW upgrade (production)**
Position **R**	Normal position
Position **P**	Local FW upgrade on the SIM 35
RESET button	**SIM reset**
Press	Triggers a HW reset of the SIM 35

LED PG (green)	State of voltage supply
Continuously lit	Power supply from LMB 35 OK
LED PGI (green)	**State of internal voltage supply**
Continuously lit	Internal voltage supply OK
LED COM (green)	**State of communication**
Flashes	Communication in progress, "ADW Config" is active
LED ERR (yellow)	**State SIM / fault**
Flashes	Address is in invalid range
Continuously lit	SIM has fault

8.5.7 Operation and display on the SMM 535

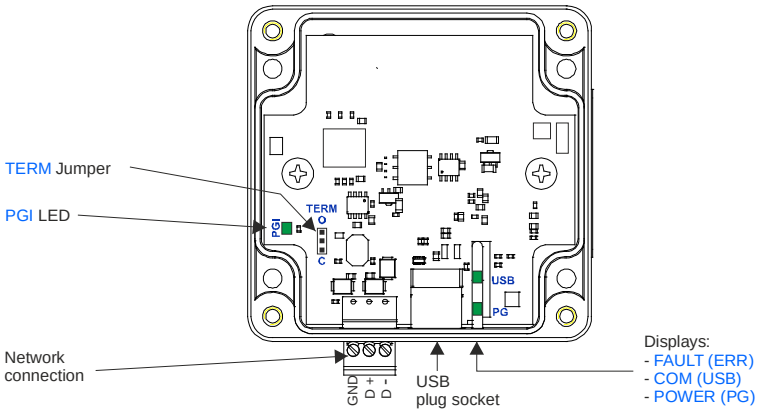

Fig. 38 SMM 535 operation and display

The functions of the jumpers and LEDs are shown in the following table.

The bus termination is defined with the TERM jumper. This must be done on **both sides of the network** (beginning and end). The three LEDs on the SMM 535 indicate the state of the ADW network. Two of these are fibre optic cables on the outside of the housing (FAULT LED is not fitted, optional).

Jumper TERM	**Bus termination (position "C" = active)**
Position **O**	SMM 535 is **not** first or last module
Position **C**	SMM 535 is **first** or **last** module

POWER (PG) (green)	**State of voltage supply**
Continuously lit	Power supply from PC (USB) OK
COM (USB) (green)	**State of communication**
Flashes	Communication in progress, "ADW Config" is active
LED PGI (green)	**State of internal voltage supply**
Continuously lit	Internal voltage supply OK

No network address has to be assigned to the SMM 535.

8.6 Operation from SecuriFire / Integral with XLM 35

When connecting to the SecuriFire or Integral FACP via an **XLM 35**, controls and changes can be made to the ADW device configuration directly from the FACP. For this purpose the FACP user software "SecuriFire Studio" and "Integral Application Center" are used to start the "ADW Config" configuration software for access to the ADWs; the configuration software is then used to operate the ADW 535.

9 Maintenance and service

9.1 General

Warning

Maintenance and service work on fire alarm systems are subject in part to country-specific laws and directives.

Maintenance and service work may be performed only by persons trained and authorised by the manufacturer of the ADW 535.

9.2 Cleaning

Clean the evaluation unit with a **non-aggressive** cleaning agent (e.g. soap suds or similar).

The sensing tube needs no cleaning to function properly.

Warning

Aggressive cleaning agents (such as solvents, pure petrol or other alcohol-based agents) must not be used for cleaning.

9.3 Maintenance checks and function checks

Notice

To avoid triggering fire incident controls, remote alerting and extinguishing areas when carrying out maintenance work, it is **essential** to block or switch off those systems beforehand.

Owing to the automatic sealing test and the self-monitoring of ADW switching, periodic function checks are unnecessary as a rule. The statutory national directives (e.g. DIN VDE 0833-1, Cantonal Fire Insurance Union) governing maintenance must be observed on the ADW 535.

Servicing, maintenance or inspection work on the ADW 535 may be necessary after an event (fire, fault).

If a evaluation unit has to be replaced due to a defect, the new ADW 535 is to undergo the same procedure as a first-time commissioning (initial reset required). When replacing an ADW 535, all customer-specific configurations have to be carried out again.

The following points have to be carried out for service checks and functional checks. All measurements and tests carried out are to be entered and signed for in the commissioning protocol. The completed commissioning protocol is to be stored with the ADW. If required, a copy can be made and stored in the system dossier.

1. Block or switch off fire incident control and remote alerting on superordinate FACPs.
2. Check that the supply voltage on the FACP is set in compliance with maintenance instructions for the control panel.
3. Open the cover of the evaluation unit. Carry out the following measurements:
   - Measure the operating voltage at terminals 1 **(+)**, 2 **(-)** ➔ target value = 10.8 to 13.8 VDC (in 12 VDC operation) and 21.6 to 27.6 VDC (in 24 VDC operation).
   - Read out the set configuration and the pressure values for each sensing tube of switch position ***V*** (see Sec. 7.6.1) and compare with the commissioning protocol.
4. Check fault triggering, alarm release and correct alarm transmission to the FACP as described in Sec. 7.7. Log the completed tests in the commissioning protocol.
5. If maintenance or repair work was carried out on the ADW 535 (including the sensing tube) as a result of a servicing check, a new initial reset may be necessary (see Sec. 7.3.5).
6. All measurements and tests carried out are to be entered and signed for in the commissioning protocol. The completed commissioning protocol is to be stored with the ADW. If required, a copy can be made and stored in the system dossier.
7. After completion of the servicing check, close the evaluation unit once again.

9.4 Replacing units

Warning

Defective units such (e.g. LMB 35, LSU 35) may be replaced only in the de-energised state (with terminal block 1/2 and possibly 3/4 unplugged from the LMB 35).

9.4.1 Replacing the LSU 35 supervising unit

To replace the LSU 35 supervising unit, the LMB 35 main board must be removed. The LEB 35 (for ADW 535-2) can remain on the LMB 35. All internal connectors to the LSU 35 (Motor / Sens) as well as any additional modules (RIM / XLM etc.) must be carefully removed beforehand. Plug-in terminals 1 to 21 (and 22 to 31 for LEB 35) do not necessarily need to be pulled out. After removing the 5 fastening screws **A** of the LMB 35 with a **Torx T10 screwdriver**, the LMB 35 can be lifted up toward the cable entries to make the fastening screws of the LSU 35 supervising unit accessible. To remove the LSU 35, first undo the sensing tube and take off the union nut **C** on the outside of the housing with a **no. 12 fork wrench**. Then remove the two screws **D** with a **Torx T10 screwdriver** (see **Fig. 39**).

Danger

All other screws on the LSU 35 must **not** be loosened.

Warning

When installing the new LSU 35, **first** ensure the correct positioning of the LSU 35 in the housing by slightly tightening the **union nut C**. Only then tighten the screws **D** as well as the union nut **C** again.

When installing the LMB 35, make sure the terminal and ribbon cable connector assignments are correct (see also **Fig. 6**).

After replacing the supervising unit, a **new initial reset** is imperative (see Sec. 7.3.5).

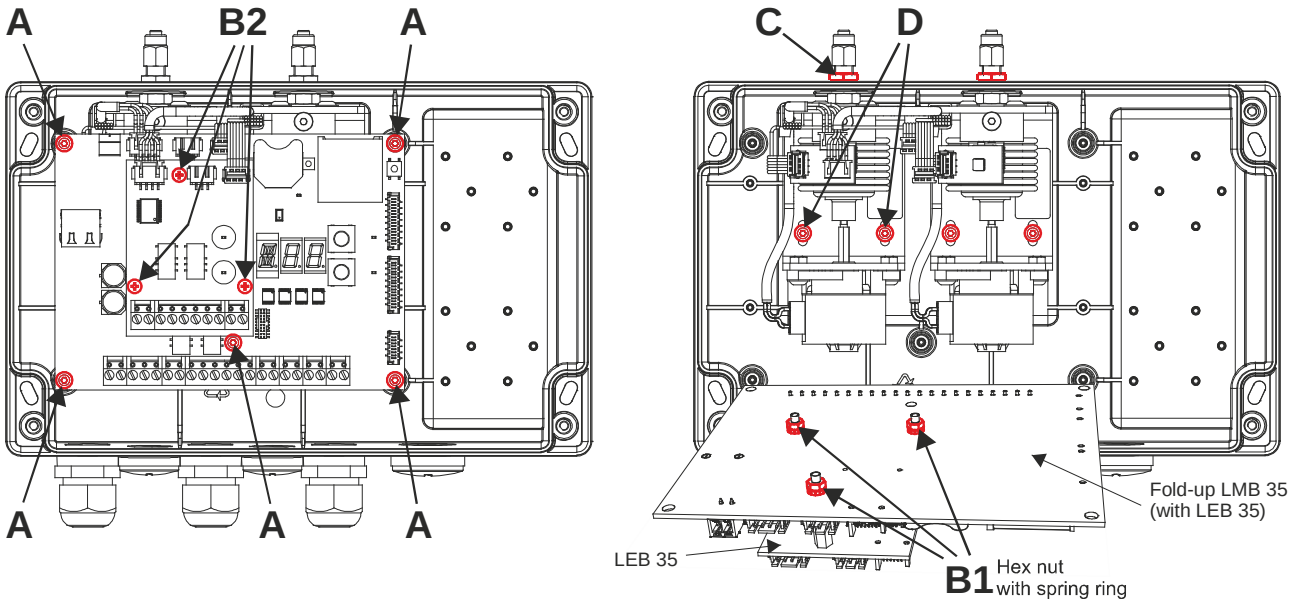

Fig. 39 Removing LSU 35, LMB 35 and LEB 35

9.4.2 Replacing the LMB 35 main board

To replace the LMB 35 main board, unplug all of the plug-in terminals (with installation wires). For the ADW 535-2 this also applies to the terminals of the LEB 35. All internal connectors to the LSU 35 (Motor / Sens – also from the LEB 35) as well as any additional modules (RIM / XLM etc.) must also be carefully removed. After removing the 5 fastening screws **A** of the LMB 35 with a **Torx T10 screwdriver**, the LMB 35 can be removed from the evaluation unit (see **Fig. 39**). If there is an LEB 35 extension board on the LMB 535, it must be removed by taking off the three hexagon nuts **B1** with a **no. 5.5 fork wrench** from the rear side of the LMB and attached to the new LMB 35 in the same way. **Important**: Use the 3 spring rings again for the new LMB. The new LMB 35 can then be mounted in the evaluation unit. All cable connections must be re-established.

Warning

- When connecting the new LMB 35, take note of the correct assignment of the terminals and ribbon cable connectors (see **Fig. 6**).
- After replacing the LMB 35, a **new initial reset** is imperative (see Sec. 7.3.5). Likewise, all customer-specific configurations and project-specific settings from the “ADW HeatCalc” configuration software must be carried out once again. To do so, proceed according to Sec. 7.3.1 and 7.3.2.
- After replacing the LMB 35, it is imperative to **check alarm transmission** as described in Sec. 7.7.1 (on ADW 535-2 for alarm 1 and alarm 2).

9.4.3 Replacing LEB 35 extension board

To replace the LEB 33 extension board, unplug the plug-in terminals 22 to 31 with installation wires. Also carefully undo the internal connections to the LSU 35 (Motor2 / Sens2). After removing the 3 fastening screws **B2** with a **no. 1 Phillips screwdriver**, the LEB 35 can be removed from the LMB 35 and replaced by the new LEB 35 (see **Fig. 39**). All cable connections must be re-established.

Warning

- When connecting the new LEB 35, take note of the correct assignment of the terminals and ribbon cable connectors (see **Fig. 6**).
- After replacing the LEB 35, it is imperative to **check alarm transmission** as described in Sec. 7.7.1 (for alarm 1 and alarm 2).

9.5 Disposal

The ADW 535 line type heat detector and its packaging consist of recyclable material that can be disposed of as described in Sec. 9.5.1.

9.5.1 Materials used

Environmental protection and recycling

All the raw materials and other materials used in the ADW 535 and all the technologies used in manufacturing are ecologically and environmentally friendly in compliance with ISO 14000.

All waste resulting from assembly (packaging and plastic parts) can be recycled and should be disposed of accordingly.

Devices, sensing tubes or parts thereof that are no longer used should be disposed of in an environmentally-friendly manner.

The manufacturer of the ADW 535 undertakes to take back any devices and sensing tubes that are defective or no longer used, for eco-friendly disposal. For this purpose the manufacturer has implemented a monitored and approved disposal system. This service is available worldwide at cost price.

Materials used in the ADW 535:

Evaluation unit	PC/ABS
LSU 35 supervising unit	St / Cu / CuZn
Circuit boards, general	Epoxy resin hard paper
Soldering process	Environmentally-friendly manufacturing compliant with RoHS
Foil on housing front	PE
Sensing tube	Cu / St / PTFE / PA
Connections	CuZn / St / PVDF
Pipe clamps	PP /St / CuZn

10 Faults

10.1 General

When troubleshooting, do not make any on-site modifications to the printed circuit boards. This applies in particular to replacing or changing soldered components. Defective printed circuit boards have to be completely replaced; they must be returned to the manufacturer for repair together with a repair note specifying the cause of the malfunction.

Warning

Printed circuit boards are to be replaced or changed only by trained and qualified personnel. Handling is permissible only when the measures for protection against electrostatic discharge are observed and heeded.

10.2 Warranty claims

Failure to observe the aforementioned rules of conduct will invalidate any warranty claims and manufacturer's liability for the ADW 535.

Danger

- Repairs to the device or parts thereof are to be carried out only by personnel trained by the manufacturer. Non-observance of this regulation results in the invalidation of warranty claims and the manufacturer’s liability concerning the ADW 535.
- All repairs and troubleshooting measures are to be documented.
- The ADW 535 must undergo a function check following a repair or troubleshooting measure.

10.3 Finding and rectifying faults

10.3.1 Fault states

With the aid of the event memory and the relevant event code display (can be called up with the segment display on the LMB 35, switch position ***E***), it is possible to localize the error in the event of a fault. The following table lists the event codes of possible fault states and how to rectify them. Because the codes are the same for sensing tubes I and II, they are listed together. For the interpretation it is therefore important to note the relevant event group (e.g. ***G10*** or ***G20***). A list of all event codes is provided in Sec. 8.5.4.3.

Notice

Multiple codes: If there are multiple events for any given event group, the display readings are added together. Example: Display ***012*** = event code ***004*** and ***008***.

G04, temperature sensor LMB faults			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
016	Fault temperature sensor LMB	LMB, temperature sensor	• LMB defective ➔ replace
032	Invalid parameter, LMB temperature sensor (production fault)	LMB, temperature sensor	• LMB defective ➔ replace
***G11* or *G21*, temperature sensor I / II faults**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
016	Fault, external temperature sensor	Connection cable, terminals LMB, LEB, temperature sensor	• Connection cable not correctly connected or defective ➔ check, replace • Temp. sensor defective ➔ replace • LMB (or LEB) defective ➔ replace
032	Parameter invalid, external temperature sensor (production fault)	Connection cable, terminals LMB, LEB, temperature sensor	• Connection cable not correctly connected or defective ➔ check, replace • Temperature sensor defective ➔ replace • LMB (or LEB) defective ➔ replace
064	Fault, external temperature sensor, compensation	Connection cable, terminals LMB, LEB, temperature sensor, configuration	• Connection cable not correctly connected or defective ➔ check, replace • Temperature sensor defective ➔ replace • LMB (or LEB) defective ➔ replace • Configuration ➔ check
***G12* or *G22*, pressure sensor I / II faults**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	Pressure sensor fault	Ribbon cable connection LMB, LEB, pressure sensor (LSU)	• Ribbon cable not correctly plugged or defective ➔ check, replace • Pressure sensor defective ➔ replace LSU • LMB (or LEB) defective ➔ replace
002	Fault undervoltage step motor / LSU	Supply voltage on the ADW, ribbon cable connection LMB, LEB, step motor (LSU)	• Conductor cross-section to the ADW insufficiently dimensioned • Ribbon cable not correctly plugged or defective ➔ check, replace • Step motor defective ➔ replace LSU • LMB (or LEB) defective ➔ replace
004	Parameter invalid, pressure sensor (production time fault)	Pressure sensor	• Replace LSU
008	Exceedance measuring range positive, pressure sensor	Use, application (high ambient temperature)	• Observance of the minimum temperature for initial reset
016	Exceedance measuring range negative, pressure sensor	Use, application (high ambient temperature)	• Observance of the minimum temperature for initial reset
032	Error control step motor	Supply voltage on the ADW	• Conductor cross-section to the ADW insufficiently dimensioned

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Continuation:

***G30* or *G40*, test faults, sensing tube I / II**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	Sensing tube interruption	Sensing tube, screw-junction pieces (also on end of sensing tube), transitions, connection on ADW, Connection to step motor on LSU	• Check sensing tube for interruption (screw-junction pieces, transitions, connection on ADW) • Sealing check if necessary, check for leak (leak detection spray) acc. to Sec. 5.4.2.5 • Defective or loose connection to step motor (LSU) • Initial reset after fault is rectified
002	Sensing tube crushing	Sensing tube, transitions from flexible hose to metal pipe (in junction boxes), radii at direction change too small	• Check sensing tube for crushing (transitions in junction boxes, radii) • Initial reset after fault is rectified
004	Sensing tube leakage	Sensing tube, screw-junction pieces (also on end of sensing tube), transitions, connection on ADW	• Check sensing tube for interruption (screw-junction pieces, transitions, connection on ADW) • Sealing check if necessary, check for leak (leak detection spray) acc. to Sec. 5.4.2.5 • Initial reset after fault is rectified
008	Parameter invalid, Sensing tube monitoring	LSU supervising unit	• Ribbon cable not correctly plugged or defective ➔ check, replace • Pressure sensor defective ➔ replace LSU • LMB (or LEB) defective ➔ replace
016	Test (check) cancelled	Supply voltage on the ADW	• Conductor cross-section to the ADW insufficiently dimensioned
***G50* or *G60*, initial reset faults sensing tube I / II**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	Sealing check negative	Sensing tube, screw-junction pieces (also on end of sensing tube), transitions, connection on ADW	• Check sensing tube for interruption (screw-junction pieces, transitions, connection on ADW) • Sealing check if necessary, check for leak (leak detection spray) acc. to Sec. 5.4.2.5 • Initial reset after fault is rectified
002	Timeout initial reset	LSU supervising unit	• Ribbon cable not correctly plugged or defective ➔ check, replace • Pressure sensor defective ➔ replace LSU • LMB (or LEB) defective ➔ replace
004	Length check negative	Sensing tube length specification incorrectly programmed (EasyConfig or ADW Config), wrong dimension of the mounted sensing tube length, possibly sensing tube I and II reversed, possible leak in the sensing tube, possible different temperature between sensing tube and ADW	• Check dimension (installed length) • Sensing tube assignment (I / II) check • Check programming (length specification) • Sealing check if necessary, check for leak (leak detection spray) acc. to Sec. 5.4.2.5 • Reduce the sensitivity of the tube monitoring • Carry out an initial reset without length test (ADW Config)

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Continuation:

008	Parameter invalid, initial reset	LSU supervising unit	• Ribbon cable not correctly plugged or defective ➔ check, replace • Pressure sensor defective ➔ replace LSU • LMB (or LEB) defective ➔ replace
016	Interruption	Sensing tube, screw-junction pieces (also on end of sensing tube), transitions, connection on ADW	• Check sensing tube for interruption • Sealing check if necessary, check for leak (leak detection spray) acc. to Sec. 5.4.2.5 • Initial reset after fault is rectified
032	Ur-Reset cancelled	Supply voltage on the ADW	• Conductor cross-section to the ADW insufficiently dimensioned
***G70*, RIM 1, RIM 2 faults**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	RIM 1 fault, missing or defective	Ribbon cable connection Module	• Ribbon cable not correctly plugged or defective ➔ check, replace • Module removed and not logged off • Module defective ➔ replace
016	RIM 2 fault, missing or defective		
064	Fault incompatible RIM	Note the production version, should be greater than 181214	• Exchange RIM
128	RIM fault, too many RIMs	Number of RIMs	• Only 2 RIM permitted!
***G71*, XLM faults**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	XLM fault, missing or defective	Ribbon cable connection Module	• Ribbon cable not correctly plugged or defective ➔ check, replace • Module removed and not logged off • Module defective ➔ replace
004	XLM fault, too many XLMs	Number of XLMs	• Only 1 XLM permitted!
***G72*, SD memory card / SIM faults**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	SD memory card fault, missing or defective	SD memory card	• SD memory card lacking or not snapped in • SD memory card was removed without logging off
016	SIM fault, missing or defective	Ribbon cable connection Module	• Ribbon cable not correctly plugged or defective ➔ check, replace • Module removed and not logged off • Module defective ➔ replace
064	SIM fault, too many SIMs	Number of SIMs	• Only 1 SIM permitted!
***G80*, LMB faults**			
Code	**Meaning**	**Check:**	**Possible causes and remedy:**
001	Operating system fault 1	LMB	• LMB defective ➔ replace
002	Operating system fault 2	LMB	• LMB defective ➔ replace
004	Undervoltage fault	Operating voltage < 8.5 VDC Conductor cross-section	• Conductor cross-section too small ➔ must be increased • Voltage of power supply not OK ➔ check and correct if needed
008	Clock fault	Lithium battery Clock setting	• Isolation strip still fitted to lithium battery ➔ remove • Clock is not set • Lithium battery defective ➔ replace
016	EEPROM fault	LMB	• Execute HW reset • LMB defective ➔ replace
032	Parameter invalid, day/night control	Day/night control configuration LMB	• Re-configure day/night control (ADW Config) • LMB defective ➔ replace

11 Options

11.1 Deployment in potentially explosive atmospheres

Danger

For deployment in potentially explosive atmospheres the following danger information must be strictly observed:

- In the **ADW 535-1** and **-2** versions, **only** the sensing tube may be implemented in the danger zone. The ADW 535 evaluation unit **must** be installed **outside of the Ex zone** in the safe area.
- If the evaluation unit must also be installed **in the danger zone**, it is **imperative** that **ADW 535-1HDx** or **ADW 535-2HDx** are deployed (see T 140 458 and T 140 459). However, they may be used **only** in **Ex zones 2** and **22**.
- The **ADW 535-1HDx** and **ADW 535-2HDx** line type heat detectors must **not** be deployed in **zones 0, 1, 20** and **21** explosion hazardous areas.
- **Exception**: After consulting with the manufacturer of the ADW 535 there is the possibility of deploying the ADW 535 in **Ex zones 1** and **21** if specially tested and approved ADW housings are used. Such areas of application and device versions may be subject to country-specific tests in some cases and therefore must be approved by the responsible authorities and licensing offices. Any consultations with the responsible country-specific approval and test offices are to be carried out by the manufacturer of the ADW 535.
- The sensing tube must **always** be connected by appropriate means to the **equipotential bonding** (earthing clamp)

11.2 ADW networking

ADW networking via an RS485 interface can be realised by using the additional modules SIM 35 and SMM 535. ADW networking can also be carried out via the Ethernet interface directly from ADW 535 (LMB 3). A combination of both principles is possible if the maximum possible number of 250 subscribers in the overall network is observed.

Notice

- The normative alarm transmission of the ADW 535 to the superordinate centre does not take place via the ADW network. For that purpose the “Alarm” / “Fault” relays in the ADW or the SecuriFire / Integral addressable loop are to be used from the XLM 35.
- The ADW network cannot be combined with the ASD network.

11.2.1 ADW networking via the RS485 interface as of SIM 35

Several ADWs can be networked with each other using the SIM 35 additional module. An ADW network can have up to 250 participants. The SMM 535 is required as the master module in the network and enables connection to a PC. Using the “ADW Config” configuration software, all ADW 535 units present in the network can be configured, visualised and operated from the PC. The SIM 35 provides galvanic separation between the RS485 interface and the LMB 35 (ADW 35).

Each SIM 35 and ADW 535 is assigned its own address. They are assigned based on the wiring topology in **ascending** order (see also **Fig. 40**).

The SIM 35 has two rotary switches (S1 and S2) for setting the network address (see Sec. 8.5.6).

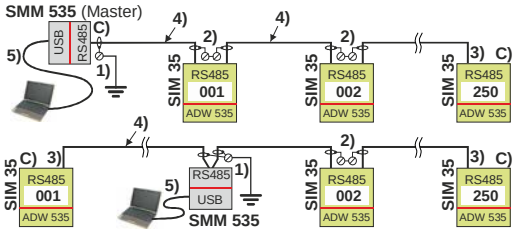

Fig. 40 Design of an RS485 ADW network

1) Screen with equipotential bonding connected, always only on the SMM 535, do not connect on the last SIM 35; **3)**.
2) Screen connected by means of a lustre terminal.
3) If SMM 535 is within the network, do not connect the screen on the first and last SIM 35 (beginning and end).
4) Network cable: 4-wire, twisted / screened (only 3 wires are used, total length max. 1,000 m).
5) USB cable, max. 3 m in length.
C) There must be bus termination on both sides of the network, beginning and end (jumper “**TERM**”, position “**C**”).

11.2.2 ADW networking via the Ethernet interface as of LMB 35

Several ADWs can be networked with one another via the Ethernet interface directly from ADW 535 (LMB 35). An ADW network can have up to 250 subscribers. This network has to be regarded as a separate network in the configuration. The ADWs cannot be integrated in an existing IT network or via the Internet (remote access). The general rules of Ethernet technology apply with respect to a possible constellation and the design. The following example shows one possible alternative for ADW networking via an Ethernet interface.

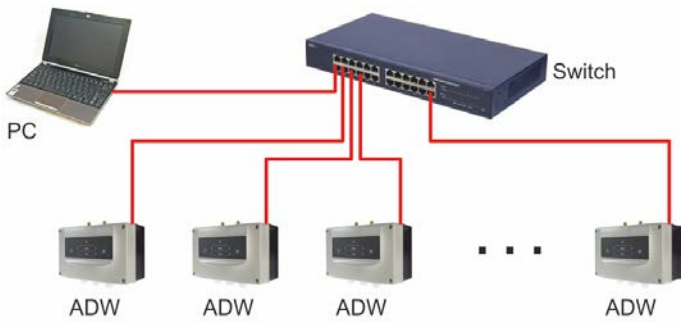

Fig. 41 Design of an Ethernet ADW network

Important notice, commissioning procedure:

- The maximum length of the lines between subscribers as shown in **Fig. 41** (Switch – ADW / Switch – PC) is 100 m.
- If longer lines are necessary they can be realised using corresponding optic fibre technology.
- Each ADW requires its own firmly programmed IP address.
- This IP address is not assigned automatically.
- Initial commissioning therefore has to be carried out directly at the device for each ADW so as to assign an IP address (by means of "ADW Config").
- You should keep within the address range 169.254.xxx.xxx during the assignment.

12 Article numbers and spare parts

12.1 Evaluation unit and accessories

Designation	Article no.
ADW 535-1 line type heat detector, for one sensing tube	11-1000000-01-XX
ADW 535-2 line type heat detector, for two sensing tubes	11-1000000-02-XX
ADW 535-1HDx line type heat detector, for one sensing tube, (ATEX, see T 140 458 and T 140 459)	11-1000001-01-XX
ADW 535-2HDx line type heat detector, for two sensing tubes, (ATEX, see T 140 458 and T 140 459)	11-1000001-02-XX
SecuriLine eXtended line module XLM 35 incl. mounting set ①	11-2200003-01-XX
RIM 36 relay interface module incl. mounting set	11-2200005-01-XX
SIM 35 serial interface board incl. mounting set	11-2200000-01-XX
SMM 535 serial master module	11-2200001-01-XX
ART 535-10 external temperature sensor	11-1000002-10-XX
Ethernet cable 3.0 m	30-6800006-02-XX
SD memory card (industrial version)	11-4000007-01-XX
Printed LMB 35 main circuit board (for ADW 535-1 / -2)	11-1200001-01-XX
Printed LEB 35 extension board (for ADW 535-2)	11-1200002-01-XX
Complete LSU 35 supervising unit	11-1200003-01-XX
Lithium battery BR 2032	11-4000008-01-XX
M20 cable screw union (set of 10)	11-4000006-01-XX
M25 cable screw union (set of 10)	11-4000005-01-XX
Adapter for US cable screw union AD US M-inch	11-2300029-01-XX
UMS 35 universal module support	4301252.0101

① not tested to UL/ULC

12.2 Sensing tube and accessories

The article numbers of all the available parts for the sensing tube (tubes, screw-junction pieces, etc.) are listed in a separate document (T 140 362).

13 Technical data

Type				ADW 535	
Voltage supply range				9 to 30 (**UL/FM = 10.6 to 27**)	VDC
Maximum power consumption,		**in 12 VDC operation**	**in 24 VDC operation**	**typical**	
measured at ➔		9 VDC ①	18 VDC ①	24 VDC	
ADW 535-1	Quiescent/fault	approx. 75	approx. 45	approx. 35	mA
	Alarm I	approx. 90	approx. 52	approx. 42	mA
	Test	approx. 660	approx. 270	approx. 210	mA
	Heated below –20 °C	approx. 775	approx. 360	approx. 275	mA
ADW 535-2	Quiescent/fault	approx. 95	approx. 53	approx. 43	mA
	Alarm I + II	approx. 125	approx. 71	approx. 57	mA
	Test	approx. 660	approx. 290	approx. 230	mA
	Heated below –20 °C	approx. 775	approx. 375	approx. 290	mA
Additionally with 1x RIM 36		approx. 48	approx. 23	approx. 15	mA
Additionally with 2x RIM 36		approx. 96	approx. 46	approx. 30	mA
Additionally with XLM 35 (not tested to UL/ULC)		approx. 20	approx. 10	approx. 5	mA
Additionally with SIM 35		approx. 20	approx. 10	approx. 5	mA
SMM 535 (not from ADW but rather from PC via USB connection)				max. 100	mA
Switch-on current peak ② (caused by EMC protection elements on the ADW supply input)				approx. 5	A
				for max. 1	ms
Sensing tube length					See Sec. 4.6
Sensing tube diameter, copper (Cu), steel (VA) (outer / inner)				Ø 5 / 4	mm
Sensing tube diameter, PTFE (outer / inner)				Ø 6 / 4	mm
Response range			EN 54-22, class A1l – Gl (**UL/ULC, according class A1l – Gl**)		
Protection type acc. to IEC 529 / EN 60529 (1991)				65	IP
Ambient conditions acc. to IEC 721-3-3 / EN 60721-3-3 (1995)				3K5 / 3Z1	Class
Environmental group acc. EN 54-22				III	Group
Extended ambient conditions:					
• Temperature range evaluation unit				–30 – +70	°C
• Sensing tube temperature range				–40 – +180 ③	°C
• Max. permissible storage temperature for evaluation unit (without condensation)				–30 – +70	°C
• Humidity ambient condition of evaluation unit (continuous, IP65)				95	% rel. humidity
• Humidity ambient condition of sensing tube (continuous)				100	% rel. humidity
Max. loading capacity, relay contact				50 (**UL max. 30**)	VDC
				1	A
				30	W
max. loading capacity per OC output (dielectrical strength 30 VDC)				100	mA
Plug-in terminals				2.5	mm²
Cable entry for cable Ø				Ø 5 – 12 (M20) / Ø 9 – 18 (M25)	mm
Housing material				ABS-Blend, UL 94-V0	
Housing colour				Grey 280 70 05 / anthracite violet 300 20 05	RAL
Approvals				EN 54-22 / (FM 3210 / UL521)	
Dimensions ADW 535-1 / -2 (W x H x D, with/without packaging)				250 x 212 x 134 / 262 x 238 x 170	mm
Weight ADW 535-1 (without/with packaging)				1,500 / 1,780	g
Weight ADW 535-2 (without/with packaging)				1,970 / 2,250	g

Notice

① Power consumption at maximum permitted voltage drop in the electrical installation (decisive value for calculating the conductor cross-section).

① May cause the protective circuit to trigger immediately in the case of power supplies with overload protective circuits (primarily in devices with no emergency power supply and output current of < 1.5 A).

③ Lower or higher temperature ranges are also possible subject to consultation with the manufacturer. When using the sensing tube at 100°C and above, use metal pipe clamps.

14 List of figures