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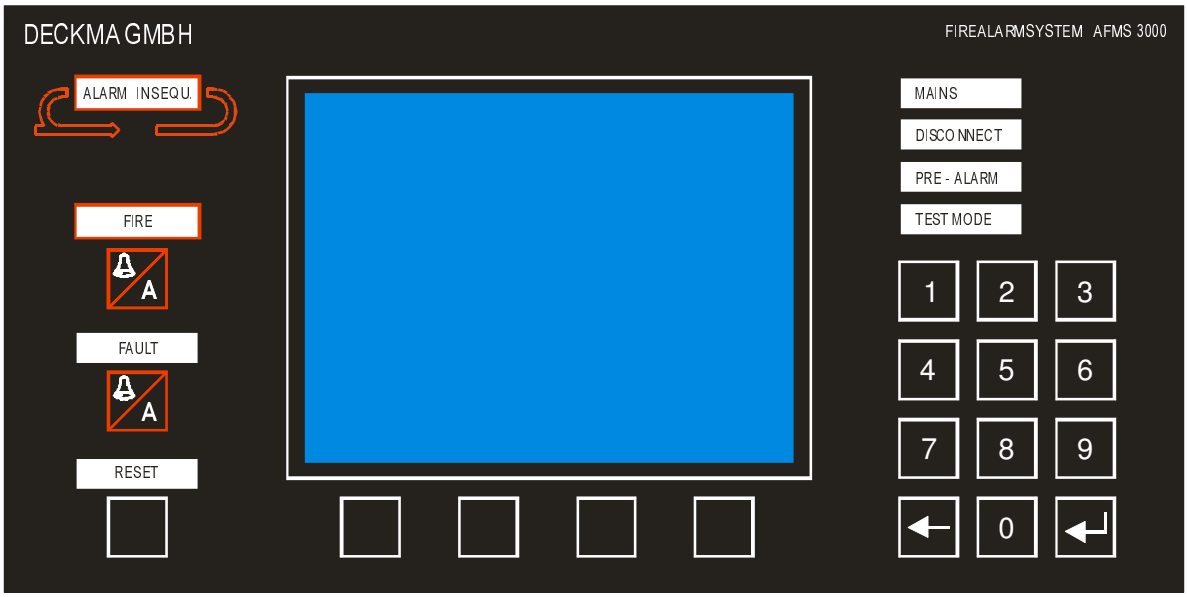
AFMS3000
Installation instructions



Version history

Version	Date	Author	Checked	Note
0.1	06/01/14	JB		Created from the old operating instructions
0.2	07/02/14	JB		Errors removed
0.3	08/02/14	TK	STO	Revised, errors removed
0.4	29.01.15	TK	STO	Added loop engineering notes
0.5	12.02.15	TK	STO	Wiring of different sensor types updated (page 6 only)

Checker	Thomas Kruse [DECKMA-GmbH] Name – Company	12.02.2015 Date
Approved	Thomas Kruse [DECKMA-GmbH] Name – Company	12.02.2015 Date

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General heading

The AFMS3000 consists of several modules in separate housings. The individual modules are connected to each other through an internal BUS (Binary Unit System) and a common supply voltage (24V DC). All modules, with the exception of the main panel, are intended for mounting on a support rail (but can also be built in) or alternatively installed together in a switchgear cabinet (e.g. from the company Rittal). All main panels are constructed as built-in devices. The AFMS3000 can be wall-mounted or installed in a console.

If a fire detector detects a fire, the fire loop module recognises the event. The BUS Master queries in a cycle the status of all modules. It thus receives the fire alarm from the fire loop module. Independent of the configuration, the main module transmits to the output module which outputs it should connect. In addition, it transmits the fire alarm to the VDR module and the printer module (in case these are both present). The VDR module and the printer module output the fire alarm through a VDR outlet or a connected printer respectively. In addition, the main panel warns the user of the event acoustically and optically.

1. Cabling requirements

For safe operation of the entire system, the following cables are recommended:

Plug	**Module / assembly**	**Cable type**	**Cable cross-section (in mm²)**
POWER Main (JN0-M)	power supply	unshielded cable	min. 3 x 1.5
POWER Emergency (JN0-E)	power supply	unshielded cable	min. 3 x 1.5
24V OUT (JN1)	power supply	unshielded cable	min. 2 x 1.5
24V IN/AKKU (JN1)	main module power supply	unshielded cable	min. 2 x 1.5 (power supply); min 2 x 1.5 (accumulator)
MONITORING (JN2)	power supply main module	unshielded cable	min. 6 x 0.75
RELAY (JP10)	main module	unshielded cable	min. 2 x 0.75
BUS (JP1-JP9)	main module fire loop module (FM) output module VDR module printer module	shielded twisted pair cable	2 x 2 x 0.75
RELAY (JAN,JAP)	fire loop module (FM und AFM)	unshielded cable	min. 2-5 x 0.75 *1 *2
LOOP (JLN, JLP)	fire loop module (FM)	unshielded cable	min. 2-8 x 0.75 *3 *4
LOOP (JLD1/2+JLR1/2)	fire loop module (AFM)	shielded cable	min. 2 x 1.0 *5
RELAY (JR1, JR2)	output module	unshielded cable	min. 2/8 x 0.75

*1 Cross-section according to the length of the cable and current
*2 Number of wires dependent on the outputs to be connected
*3 Cross-section according to the length of the loop
*4 Number of wires dependent on the outputs to be connected
***5 Cross-section according to the length and load of a loop. Please respect notes on page 4!**

24V OUT (JOC1)	output module	unshielded cable	min. 2/4 x 0.75
TST IN+24V OUT (JOC2)	output module	unshielded cable	min. 2/4 x 0.75
BUS (JR1)	main panel main module	shielded twisted pair cable	2 x 2 x 0.75 *6
VDR(RS-458) (JP2)	VDR module	shielded twisted pair cable	2 x 2 x 0.75 *7
VDR(RS-232) (JP3)	VDR module	shielded standard cable (serial)	
PRINTER (JR1)	printer module	shielded standard cable (serial)	
JM1	modbus module main panel	shielded standard cable (serial)	

The recommended cable types are FMGSGO, LMGSGO and MGSGO (marine) according to VG95218 Part 62 or equivalent cable types.

*6 The maximum cable length must not exceed 500 m.
*7 The maximum cable length must not exceed 500 m.

Calculation and design of a fire alarm loop-cable

The planning of a fire alarm loop-cable is quite complex and depends on many factors.

Decisive here are the used cable types, the load on each single loop, and thus its maximum possible length! Also the screening plays a certain roll and must be consistently.

For cable types, the conductor resistance (also the number of cores), the cable inductance and cable capacitance must be observed, because data will be transmitted with 8Vss on the power line at 1200 baud (ESP protocol). As an essential cornerstone of a good installation, 33 ohms (in special cases 40 ohms maximum) loop resistance must not be exceeded! This is essential to ensure, that the system is durable and free from unwanted errors.

Please follow the notes below, as far as they can be used somehow:

1) A fire alarm loop cable is to plan as short as possible. If necessary, additional loops can be added to meet longer cable lengths - this decreases each cable resistance per loop.
2) Do not move along fire loop cables together with “thick” and also unshielded power cables. Wherever it makes sense or it can be done, fire alarm cables should always installed with “some distance” to a main cable route. Every centimeter distance will help!
3) The possible cable length of a loop cable depends on the number of used “loop-powered”-devices or modules like CHQ-SZM, CHQ-POM, CHQ-DRC or wall- and base sounder. 5 pieces of CHQ-SZM-units can heavily decrease the cable length by 2, even it was technical possible (in theory) before!
4) CHQ-DZM-modules must be supplied with external 24V (DC). This can be done from a 24V battery or UPS power source, or can come directly from the fire alarm system. For this purpose, the fire alarm cables must have at least 4-core wires, because the spare cores will now carry the 24V - provided from the fire alarm system. This 24V power must now passed through all bases (from detector to detector) and finally will reach the CHQ-DZM-units.
5) Tests has shown, that 1mm wire cross section works quiet well for a small loop, but in case of doubt, rather thicker cable should be used.

2. Fire detectors

2.1. Sensor and base

Certain fire detectors always consist of a base and a sensor. The analog sensors ALG-E, ACB-E and ACA-E can be mounted in the mounting base (YBN-R/3), the sounder base (CHQ-BS) and the short circuit isolator (YBO-R/SCI).

Follow the given guideline for the installation and maintenance of the AFMS! (If this instruction is disregarded, proper function cannot be guaranteed)

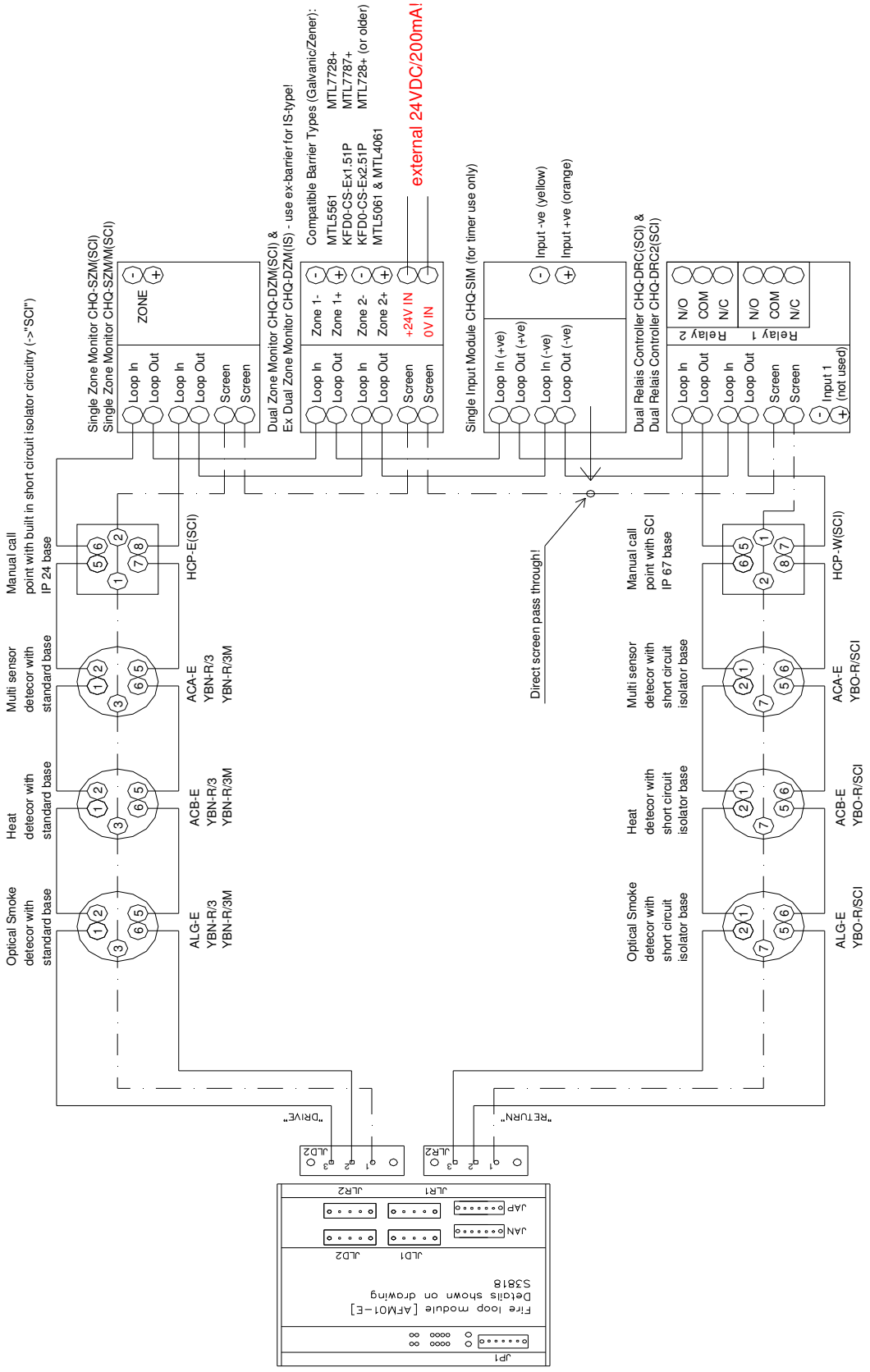
Warning:

ASX sensors cannot be used to prevent fire, but are only intended to detect certain characteristics of a fire (smoke and fumes).

Sensors of type ACB-E and ACA-E (heat detectors) are used to detect sudden temperature changes according to the Δt/Δs principle. They are not designed to detect smoke or other physical quantities. For sensor installation, it is necessary to check that the location of each individual sensor complies with the regulations and recommendations for its intended use.

2.2. Connection of different fire detector types

The following drawing shows an example of the connection of addressable fire detectors to a fire loop module (AFM).Each fire loop module (AFM) has 2 addressable loops. All terminals are to be secured against shaking loose and included in annual inspections.


external 24VDC/200mA!
Single Zone Monitor CHQ-SZM(SCI)
Single Zone Monitor CHQ-SZM/M(SCI)
ZONE
Loop In
Loop Out
Screen
Dual Zone Monitor CHQ-DZM(SCI) &
Ex Dual Zone Monitor CHQ-DZM(IS) - use ex-barrier for IS-type!
Compatible Barrier Types (Galvanic/Zener):
MTL5561
KFD0-CS-Ex1.51P
MTL5061 & MTL4061
MTL7728+
MTL7787+
MTL728+ (or older)
Zone 1-
Zone 1+
Zone 2-
Zone 2+
+24V IN
0V IN
Single Input Module CHQ-SIM (for timer use only)
Loop In (+ve)
Loop Out (+ve)
Loop In (-ve)
Loop Out (-ve)
Input -ve (yellow)
Input +ve (orange)
Dual Relais Controller CHQ-DRC(SCI) &
Dual Relais Controller CHQ-DRC2(SCI)
N/O
COM
N/C
Relay 1
Relay 2
Input 1
(not used)
Manual call
point with built in short circuit isolator circuitry (->"SCI")
IP 24 base
HCP-E(SCI)
Multi sensor
detecor with
standard base
ACA-E
YBN-R/3
YBN-R/3M
Heat
detecor with
standard base
ACB-E
YBN-R/3
YBN-R/3M
Optical Smoke
detecor with
standard base
ALG-E
YBN-R/3
YBN-R/3M
Direct screen pass through!
Manual call
point with SCI
IP 67 base
HCP-W(SCI)
Multi sensor
detecor with
short circuit
isolator base
ACA-E
YBO-R/SCI
Heat
detecor with
short circuit
isolator base
ACB-E
YBO-R/SCI
Optical Smoke
detecor with
short circuit
isolator base
ALG-E
YBO-R/SCI
"DRIVE"
"RETURN"
JLD2
JLR2
JLR1
JLD1
JAP
JAN
JP1
Fire loop module [AFM01-E]
Details shown on drawing
53818

2.3. Guideline for the installation of sensors, detectors and mounting bases

- Make sure that the detectors are installed according to the valid regulations and standards. Only use the accessories delivered with the detectors (screws!)
- Sensor and mounting base combinations should only be installed where:
  - the ambient temperature is between -10°C and +50°C
  - the condensation and dampness values are between 10% and 95% RH – not condensing (at 40°C)
- Install only in suitable environments or in protected areas.
- The following environments should be absolutely avoided:
  - Situations, in which heavy condensation can occur (e.g. showers.
  - Situations, in which aggressive gases are present (e.g. laboratories).
  - Situations, in which dust is present (e.g. loading areas).
  - Situations, in which obstructions are present, which could hinder or artificially direct the air flow to the sensors.
  - In areas at risk of explosion. In this case, special EX sensors (through EX barriers) must be used!
- Do not use any high-voltage tester on the sensor or mounting base contacts!
- Some measures can lead to permanent damage to sensors:
  - Dismantling the housing cover of a sensor.
  - Impact or long-term shock.
  - Touching the thermistor of ATG-E, ATG-E[NP] -> thermo-sensors and ACA-E multi-sensors.

2.4. Testing the fire detectors

- If a sensor or mounting base is suspected to be damaged, it is to be replaced immediately.
- After installation, all sensors in a fire alarm system are to be tested to ensure that they work correctly.
- Installation (and maintenance) should only be performed by appropriately trained or educated personnel.
- Do not test the function of sensors with a flame or open fire, since the plastic of the sensors will deform at high temperatures!
- Functional tests should be carried out with appropriately set test devices intended for tie type of sensor (testing gas does not work with temperature sensors)!
- Maintenance must be carried out after a testing interval specified by the person responsible for the fire alarm system.
- If there is no such specification, we recommend the inspection to be carried out annually. The following points are to be considered:
  - Normal function test of the sensors and smoke detectors and/or heat detectors - test devices.
  - A visual check for dirt and mechanical damage to the sensors.
  - Retighten all cable clamps (copper is "soft" and flows).
- The sensors are delivered with a dust protection cover to keep out dirt during installation. These protection covers should not be removed until commissioning, or at least immediately before. This ensures that all detectors remain in the delivered condition and are sensitive, not "damaged goods".

2.5. Setting the sensor addresses with the programming device TCH-B100

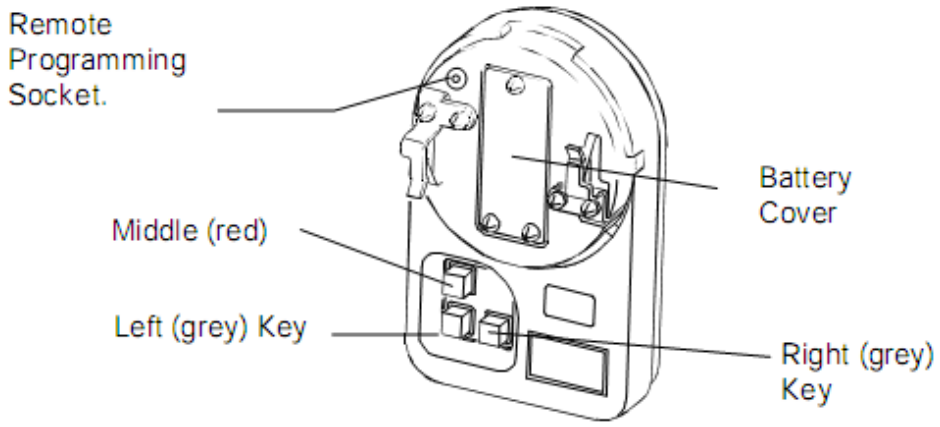


Illustration of the TCH-B100

2.5.1. General

The programming device "TCH-B100“can address the sensors listed below. The operating instructions "HOCHIKI TCH-B100 – ESP DEVICE PROGRAMMER OPERATING INSTRUCTIONS" from August 2009 also apply here:

- ALG-E/ALG-EN (analog addressable, optical smoke detector)
- ACB-E (analog addressable heat detector)
- AIE-E (analog addressable ionisation detector)
- ALK-E (analog addressable, photoelectrical sensor)
- ACA-E (analog addressable multisensor) …and similar types
- HCP-E (analog addressable hand detector IP24)
- HCP-W (analog addressable hand detector IP67) …and similar HCP types
- CHQ-POM, CHQ-ARI and many more.

2.5.2. Keys

The TCH-B has three keys, one (central) red key and two grey keys (below).

Left grey key

- Switch on device (the current address of the installed sensor is automatically shown)
- Addresses in the tens can be set here

Right grey key

- Single-figure addresses can be set here
- Switch off device – or wait 30 seconds (automatically switches off)

Middle red key

- Programme set address in the detector

– Output analog values of the sensor

2.5.3. Setting addresses (procedure)

– Turn the sensor to the appropriate marked position.
– Press the left grey key in order to switch on the programming device.
– The battery status is displayed followed by the sensor address (sensors that have not been programmed have the address 127 from the HOCHIKI works).
– Set the desired address for the sensor using the two grey keys. The display starts to blink.
– In order to save the set address in the sensor, the red key is now pressed.
– In order to be able to program the hand detectors HCP-E and HCP-W (and similar types), please use the enclosed connection cable with the 3.5 mm phone connector plug! Connect the hand detector to the TCH-B and perform the programming as described for other sensors.

2.5.4. Reading the analog values of the sensors

– Turn the sensor to the appropriate marked position.
– Press the middle red key; an "A" (for analog value) is shown, followed by the current analog value of the sensor. The display switches off after about 3 minutes or when the device is switched off with the right grey key.

2.5.5. Information messages

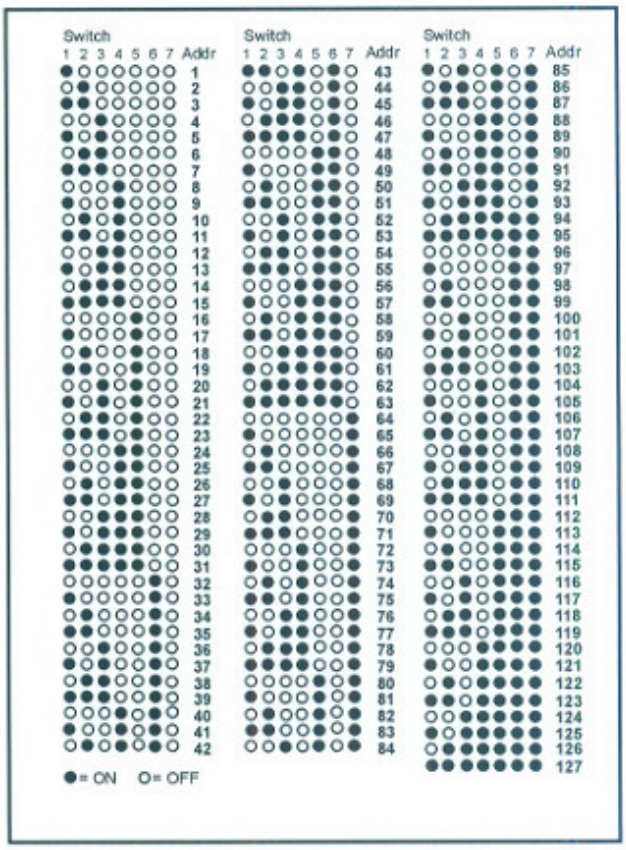
In addition to the main function, the TCH-B 100 can display the following information messages.

bAt	Battery status. About 3,000 address can be programmed after the appearance of this message .
E0	An attempt has been made to program an address higher than 127
E1	An attempt has been made to program an address without a sensor being connected
E2	No sensor was found when switched on
E3	No valid reply was received from the ASX sensor
E4	No device to program has been recognised
E5	Device read error
E6	Error reading the analog values

2.6. Setting sensor addresses using DIP switches

Some modules like e.g. CHQ-Z, CHQ-Z(IS), CHQ-S, CHQ-R, CHQ-SZM or CHQ-DZM have an 8-Bit DIP switch to set the address. Setting up is on and setting down is off, or according to the labelling, or the associated instructions for each unit.

The address is set according to the following table.



The red LED on the module blinks when the module is queried by the fire detector system and lights permanently when an input on the module is active.

With all addresses of this type, the system requires that only **EVEN-NUMBERED** addresses are set! This is connected with the possible "zones". According to the type of module, there is only "Zone 1" or "Zone 1" and "Zone 2". Zone 2 then automatically receives the next odd-numbered address.

3. Commissioning

The AFMS consists of various types of modules, which are fixed to a top-hat rail. There can be more than one of each of three modules (main panel, output module and fire loop module) in an AFMS. With these modules, the correct setting of the BUS address and their configuration in the Config-Tool are important.

3.1. General

The AFMS must be connected to the emergency power supply as a "secondary apparatus important for operation" (see GL/i/1/3 Section 3).

The AFMS must be installed on the bridge or in the main fire control station.

A main panel must be installed on the bridge in case the AFMS is not located directly on the bridge. An additional main panel (AHT or HT) is to be installed in the hold control room on ships with a hold control room (see GL/i/1/3 Section 9D)

At least one main panel must be positioned so as to be accessible for a responsible crew member at al times.

3.2. Outputs

The main module has a common status fault display (relay output "JP10"). The output is opened when there is a fault in the fire detection system. This output cannot be configured.

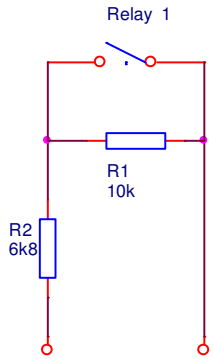
The standard configuration of the possible 8 relay outputs of an module must be:

- Machine alarm system (fire alarm, faults)
- General alarm
- VDR
- fault and common status display

The remaining outputs can be freely configured.

If the first four outputs are not so configured, then the approval becomes invalid. In addition, only approved devices may be connected to the fire detection system.

The relay outputs (output module: JR1, JR2; fire module (FM): JAN, JAP) of the output module and the fire loop module must be monitored externally for short circuit and cable breakage. For this purpose a resistance (6.8kΩ) in the cable and a resistance (10kΩ) parallel to the relay must be wired during installation. The current that flows through the circuit must be measured. If the relay is open, a small current flows through the resistances R2 and R1. If the relay is closed, a rather larger current flows only through the resistance R2. If the cable is broken, no current flows. If there is a short circuit, a maximum current flows.



Should additional resistance be desired, this can be changed by the installation company with the agreement of DECKMA without any loss of guarantee rights. In this case open circuit monitoring regulations are to be observed.

3.3. Setting the BUS address

The main module (NM01) has a rotary switch on the right side of the housing. The BUS address is set to 1 so that the module is not the BUS master in the fire detection system. The function of the BUS master is undertaken here by the main panel (AHT) in the AFMS, in contrast to the FMS3000.

The output and fire loop modules also have a rotary switch on the right side of the housing. The BUS address is to be set to 0 for the first module of a module type. The second module receives the number 1, the third the address 2 and a fourth module the address 3.

There can also be more than one main panel (HT/AHT) in the AFMS. In order to configure a BUS address, a jumper must be inserted to connect two pins in the 15-pin D-SUB connector (BUS/JR1).

Principal operation: no jumper
Parallel operation 1: jumper between pin 6 and pin 14
Parallel operation 2: jumper between pin 7 and pin 15

In addition a termination resistance (120 Ohm) must be inserted in the last main panel in the BUS directly in the D-SUB connector between pins 12 and 4. The termination resistance is to be inserted even when of only one main panel is being used!

If there is more than one identical BUS address in a BUS, this causes severe communications interruptions. It is no longer possible for the fire detection system to function without faults.

3.4. Termination resistances

No termination resistance (EOL) is necessary for the addressable loop modules since the cable from the last detector in a loop is fed back to the loop module!

All conventional (non-addressable) fire detector loops must be terminated (last detector) with a 3KΩ resistance. All "24V OUT" outputs (JOC1, JOC2 (output module)) must also be terminated with a 3KΩ resistance, since these outputs are monitored.

3.5. Use of the modules/components

Only specifically approved components may be used for the construction of a fire detector system (see standards and specifications).

Recommended are 2 similar lead-gel accumulators of type PBQ-7-12 with a capacity of 7Ah or more. All accumulators with the appropriate VDS mark are permissible. The minimum capacity is 7Ah, the maximum capacity 48Ah. If the mains supply fails, the accumulator delivers the supply voltage to the complete system for many hours (depending on the system and the outputs, currents can be up to 4A).

3.6. Organisation of the software versions

It is important that the various modules in a system all have compatible software versions (delivery state). The manufacturer should be asked for advice before using different software versions.

The history file "FMS3000_Software_ChangeLog.txt" lists the current software versions (see document: 1.4 FMS_Software_Beschreibung).

3.7. Normal procedure for installation on board

In order to make the on-board installation simpler, all fire detector loops are deactivated when delivered!

Step 1. Connect all detectors and outputs.
Step 2. Test the wiring for earth contact, short circuits, polarity and interference voltage!
Step 3. Switch on the fire detection system and check the overall condition.
Step 4. Only connect the fire detector loops one after another. Only connect a fire detector loop after the previously installed loop has tested without faults.
Step 5. Check the outputs and additional main panel or other periphery devices like printer or MODBUS module.

4. Maintenance

4.1. Checking the fire detectors

The fire detectors should be checked for correct function annually. Dirty or defective detectors are to be exchanged immediately. Dirty smoke detectors and multisensors produce a pre-alarm after some time with more than the permissible degree of dirt. Defective or missing fire detectors will produce a fault message.

4.2. Checking and changing accumulators

The average lifetime of an accumulator is about 4-5 years at an ambient temperature of 25°C. Accumulators should therefore be exchanged as a precaution every 4-5 years! The main module also monitors the condition of the accumulators. If the module recognises that a fully charged accumulator set is "too weak" (internal resistance is too high), the fire detection system displays an appropriate battery fault. In this case, the accumulators must be exchanged **in pairs**, even when younger than 4-5 years!

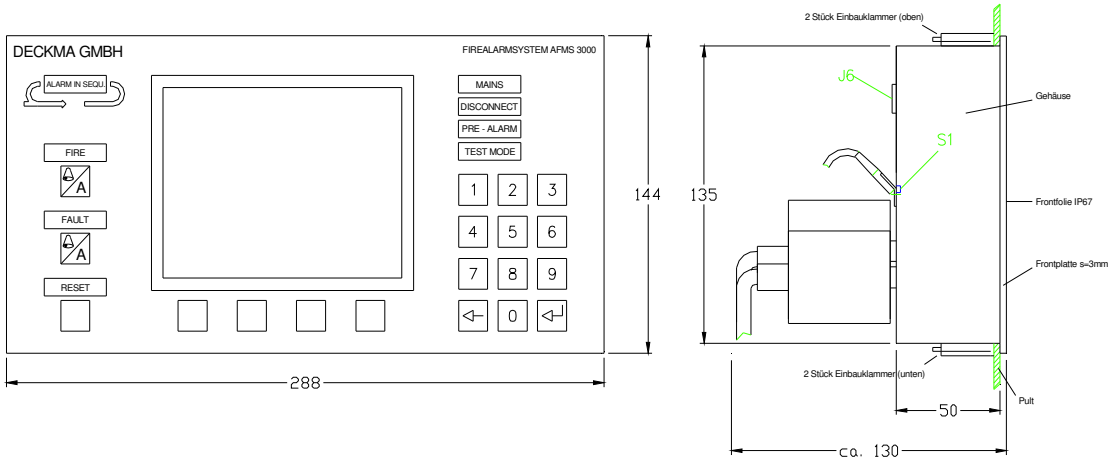
The average lifetime for the lithium battery in the real time clock (type CR2032 / 3V) is about 10 years at an ambient temperature of 25°C. After the expiry of this time, the battery is also to be changed, or when the time is no longer kept.

When changing the lithium batteries, care should be taken that the main module is switched off, since changing the battery could cause a short circuit. The data of the real time clock (date, time) must be entered again after changing the battery if the battery change lasts too long.

5. Installation

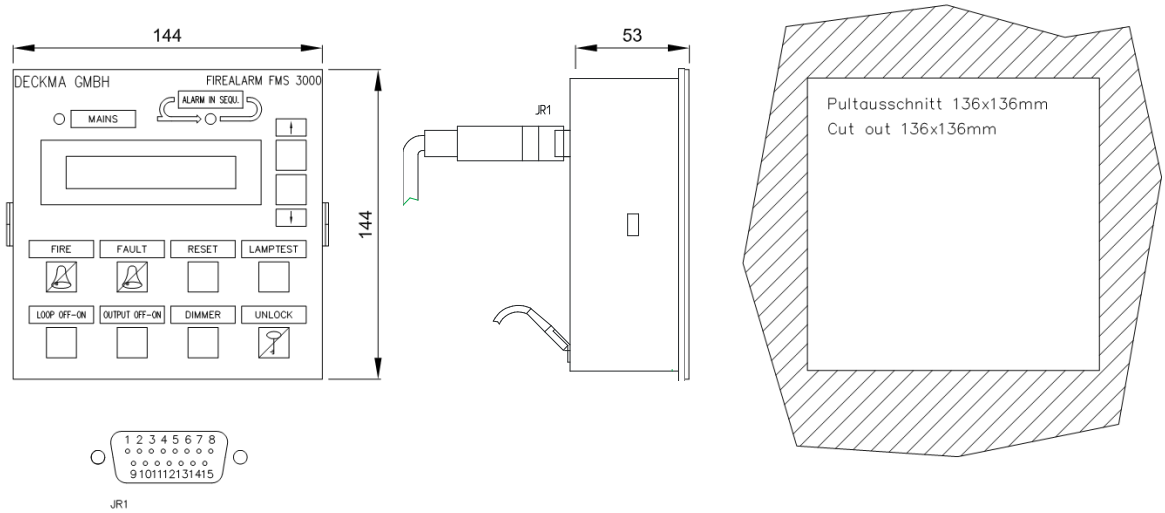
5.1. Console installation

The main panel (AHT) is installed in the safety console on the bridge and must be well visible.



External dimensions of front panel: 288 mm x 144 mm.
Installation depth about 50 mm plus the relevant D-SUB connector incl. cable bend
+ the permanently plugged data module at the back.

The main panel (HT) can also be installed on the bridge, in the hold or machine control room and must also be well visible.



External dimensions: 144 mm x 144 mm.
Installation depth about 53 mm plus the relevant D-SUB connector incl. cable bend.

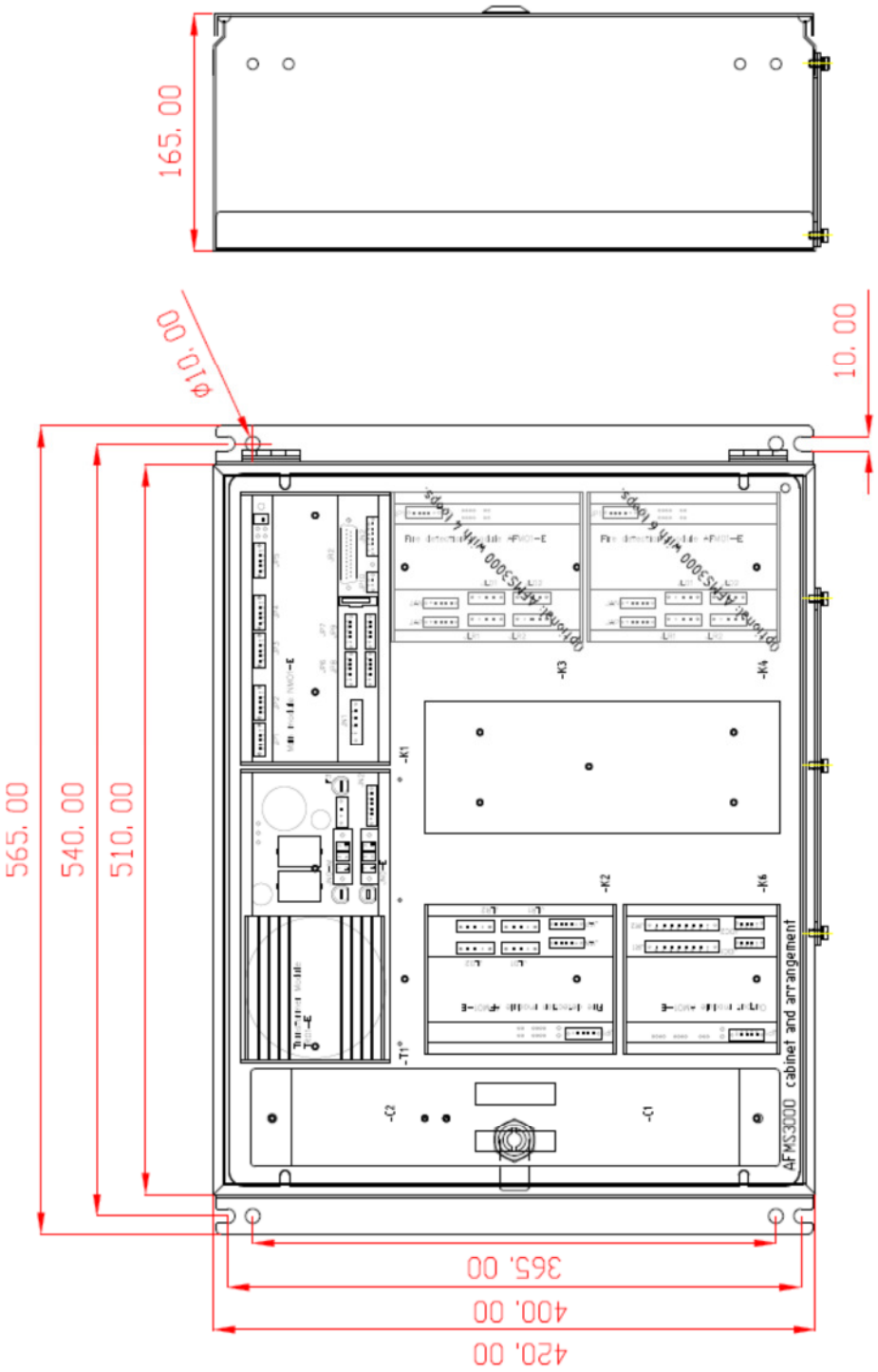
5.2. Switchgear cabinet installation

The switchgear cabinet, which contains the power supply, the main module, the printer module, the VDR module, the fire loop module (AFM), the output module and the accumulators, is normally installed on the command bridge and connected to the main panel (AHT) with a plugged cable connection up to 3 m long. Should there be no room in the switching cabinet for modules, it is important to provide an equivalent level of access.

The dimensions of the switchgear cabinet vary somewhat according to the number of modules used.

Please note here the specific dimensions of a module (see module description), since not all assemblies fit into one small housing...

Typical installation with up to 6 loops (in this case: AFMS3000 installation)



6. Configuration of the fire detection system using an excel script or the Deckma ConfigTool

Configuration data, menu texts and fire alarm and fault messages are stored on an SD card in a number of text files. The SD card is formatted with the FAT 16 filing system. The data on the SD card can be processed with normal applications (text editors). The files can be created using a pre-prepared Excel script or the DECKMA ConfigTool. These tools are used to specify detector addresses, detector locations, fire zones, relay and voltage outputs and message texts, which should be created unambiguously with clear descriptions.

The AFMS saves system files as it operates in further text files "0000.txt" to "0019.txt" on the SD card. These text files can be investigated with an application for purposes of documentation or looking for a problem. In order that the text files can be used by the fire detector system, the system must first be deleted and then restarted with the function "Reset with new init modules“(see AFMS operating instructions). This procedure can last some minutes according to the number of detectors per loop!

Since some modules have restricted EEPROM memory, configuration files for the relevant modules are saved onto the RAM of the relevant module at each start of the fire detection system.

After each successful "Reset with new init modules", all loops are switched off by default. These must then be put into operation (switched on) one after another!