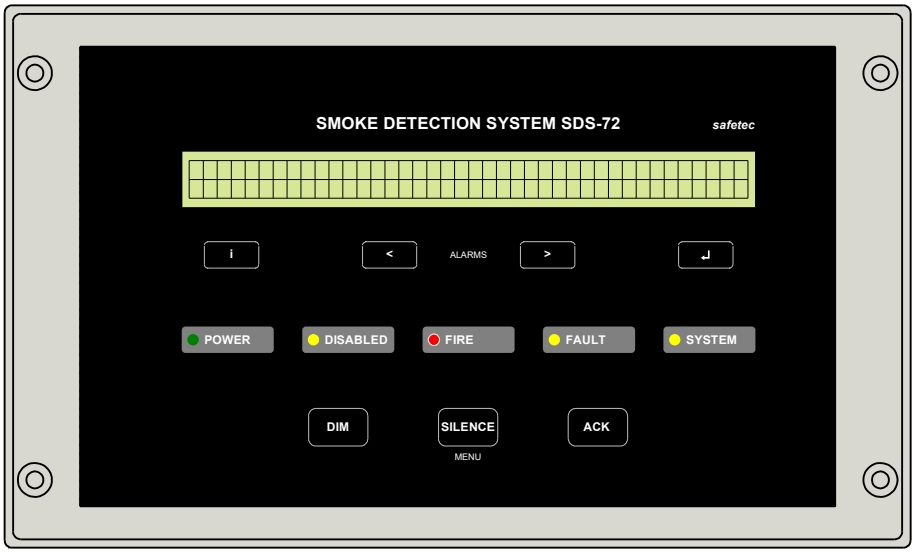
safetec

Smoke Detection System
SDS-72

according to:
FSS Code Chapter 10
EN 54-2: 1997/A1:2006
IEC 60092-504



Manual

Art. No. DOK02.140

safetec Brandes und Niehoff GmbH
Arenskule 7-9
21339 Lüneburg
Germany
Tel.: +49 4131 7670200
Fax.: +49 4131 7670201
E-Mail: mail@safetec-online.de
Internet: www.safetec-online.de

Revisions

No.	*Date*	*Author*	*Check*	*Release*	*Remark*
0	19.08.2016	dt, kb	tr, dt	kb	initial issue
1	02.09.2016	kb	Tal	kb	data sheets added, small corrections
2	06.04.2017	kb	JP	kb	better descriptions for “Terms and definitions”, fault corrections, smoke detector “Discovery” for non-ex applications added.
3	29.09.2017	kb	JP	kb	some corrections
4	18.10.2017	kb	JP	kb	drawing in “Additional smoke detector loop for exhaust ventilation ducts” now also shows detectors in non hazardous areas
5	31.10.2017	kb	JP	kb	chapter “Planning the system” completely revised, explanation for smoke detector loop to exhaust ventilation ducts improved
6	27.04.2018	kb, dt	JP	kb	revised drawings: SDS-72-3700-3300-XP95-IS, SDS-72-3700-XP95-IS, SDS-72-3700-XP95-Discovery, SDS-3700.01, SDS-M0440.01, SDS02.441.01, SDS02.441.05, SDS-M0460.03 added drawing: ADP-3500.01 chapters “Planning the systems”, “Interfaces for external system”, “Fault finding” revised display indications are corrected

Table of Content

1 Terms and definitions

The following terns and definitions are derived from the FSS-Code, chapter 10 and EN-54 as far as terms and definitions are available.

1.1 3/2-way valve

If the system is interconnected to a fixed-gas fire-extinguishing system, 3/2-way valves are used to normally align the sampling pipes to the smoke detection panel / extension panel and, if a fire is detected, the 3/2-way valves are re-aligned to connect the sampling pipes to the fire-extinguishing system discharge manifold and isolate the smoke detection panel / extension panel. For larger pipes separate interconnected CO_2-valves and smoke detection valves are used.

1.2 Airflow detector

A sensor for each sampling line giving a fault alarm if the detected airflow volume is below the required value.

1.3 Block valve

The block valve isolates a sampling pipe from the smoke detection panel resp. smoke detection unit.

1.4 CO2 section valve

The CO2 section valve connects the CO2 manifold with the sampling pipe. The CO2 section valve is combined with the smoke detection valve in such a way, that only one of both valves is open at the same time (3/2-way valve or 2 interconnected valves).

1.5 Control panel

The term “control panel” is a *function description* in the context of the FSS Code. The “control panel” function can be configured to the smoke detection panel and the remote panel.
The control panel allows acknowledging of alarms and fault messages as well as a system-wide silencing of the smoke detection panel and remote panels. Furthermore the service mode can be activated from the control panel.

1.6 Exhaust ventilation duct detector

Exhaust ventilation duct detectors are located beneath the exhaust ventilation ducts in a separate enclosure, through which a small bypass airflow from the exhaust ventilation duct is drawn. The bypass airflow is driven by the fan of the exhaust ventilation duct and and not by the fan modules resp. fan unit of the smoke detection system. It is connected to the smoke detection system by a smoke detector loop and not by a sampling pipe.

1.7 Extension panel

Extension panels have connection for sampling pipes in different numbers. They are quipped with one smoke detector and one airflow detector for each connected sampling pipe. Extension panels are supplied as an integral part of the smoke detection panel or as an external expansion of a smoke detection panel with further connections for sampling pipes.

1.8 Fan module

A fan module in the context of the SDS-72 smoke detection system is a single fan to draw air from the protected spaces to the smoke detection panel, extension panel(s) or smoke detection unit. At least two fan modules are required for one smoke detection system.

1.9 Fan unit

The fan unit in the context of the SDS-72 smoke detection system contains two smaller fan modules on a common frame.

1.10 Galvanic isolator

The galvanic isolator is a device which restricts the available electrical and thermal energy in an intrinsically safe circuit so that ignition of a hazardous (explosive) atmosphere cannot occur.

1.11 Indicating panel

The term “indicating panel” is a *function description* in the context of the FSS Code.
In contradiction to the control panel the indicating panel serves only for the indication of alarm and fault messages but does *not* allow acknowledging of alarms and fault messages as well as a system-wide silencing of smoke detection panels and remote panels. Also the service mode cannot be activated from the indicating panel. Either the smoke detection panel and/or a remote panel can be configured as indicating panel.

1.12 Loop isolator

The loop isolator is used in smoke detector ring loops to isolate the effect of a short circuit to the part of the ring loop between the next loop isolators.

1.13 Main board

The board is a connection board in the smoke detection panel, where the power supplies and the smoke detectors are connected to. It also includes connectors to a user interface and to external control systems.

1.14 Protocol translator

The protocol translator adapts the current and voltage levels of the standard “XP95” or “Discovery” smoke detector loop to the voltage level required by the intrinsically safe smoke detector “XP95 I.S”.

1.15 Remote panel

Panel for indication of smoke alarms or fault messages, normally installed on the bridge and/or in the fire control station. It can be configured as control panel or indicating panel as described in FSS-Code or EN54.

1.16 Sampling pipe

A piping network that connects the smoke accumulators to the smoke detection panel, extension panel or smoke detection unit, arranged in sections to allow the location of the fire to be readily identified.

1.17 Smoke accumulator

Air collection devices installed at the open ends of the sampling pipes in each cargo hold that perform the physical function of collecting air samples for transmission to the smoke detection panel through the sampling pipes, and may also act as discharge nozzles for the fixed-gas fire-extinguishing system, if installed. Extracted air from the protected spaces is drawn through the smoke accumulators and sampling pipes to the smoke detectors and airflow detectors in the smoke detection panel, extension panel(s) or smoke detection unit(s).

1.18 Smoke detection panel

The part of the system which provides continuous monitoring of the protected spaces for indication of smoke. The smoke detection panel is connected to extension panel(s), smoke detection unit(s) and/or exhaust ventilation duct detector(s). The smoke detection panel can be combined with an extension panel on one frame.

If smoke is sensed, the smoke detection panel and the remote panel (on the bridge or in the fire control station) automatically indicate an alarm. The crew can then determine, which cargo hold is on fire and operate the pertinent 3/2-way valve for discharge of the extinguishing agent. It can be configured as control panel or indicating panel as described in FSS-Code or EN54.

1.19 Smoke detection unit

The smoke detection unit is a sensor unit with one smoke detector and one airflow detector for monitoring the air samples of one sampling pipe. The smoke detection unit is prepared to be connected to sampling pipes with large

diameter. Furthermore the smoke detection unit can be used for monitoring exhaust ventilation ducts via the smoke detector loop.

1.20 Smoke detection valve

The smoke detection valve serves for disconnecting the sampling pipes from the smoke detection system in case of CO2 discharge on the pipe. It is coupled with the section valve so that only one valve is open at the same time.

1.21 Smoke detector loop for exhaust ventilation ducts

The smoke detector loop for exhaust ventilation ducts is an option of the smoke detection system SDS-72, which allows electrical connection of smoke detectors for monitoring of exhaust ventilation ducts as required by FSS-Code chapter 10.

2 General

2.1 Introduction

The smoke detection system SDS-72 is a sample extraction smoke detection system for up to 72 detection lines for cargo holds onboard ships. It is complying fully with all requirements of the relevant international standards and norms.

A network of pipes simultaneously draws air samples from the monitored cargo spaces, which are then fed to the smoke detection panel or smoke detection units. In most cases, the pipe net for the CO2 fire extinguishing system is used alternatively also for the smoke detection system.

The smoke detection system SDS-72 also allows monitoring of exhaust ventilation ducts either by means of additional suction pipes or by smoke detectors which are connected by a separate detector loop to the smoke detection panel.

The main features of the system are:

- simultaneously monitoring of air samples for smoke via sampling pipes and separate smoke detectors for exhaust ventilation ducts without the need of installing a separate fire alarm panel,
- using the CO2 extinguishing pipes up to DN150 for smoke sampling,
- possibility to connect the remote panel on the bridge or in the fire control station via two redundant data and power bus cables as required by EN54-2,
- connection of signals for voyage data recorder (VDR) via three-wire NMEA interface,
- flexible configuration settings, including on site configuration via configuration menu,
- handy, simple and intuitive user interface (see more in chapter “User Interface”) and
- high reliability via rich self monitoring features

2.2 Rules and regulations

The smoke detection system SDS-72 complies with following rules and regulations:

- FSS Code Chapter 10 (sample extraction smoke detection systems),
- EN 54-2, -4 and -20,
- EN 61162-1:2009 (NMEA interface)
- IEC 60092-504,
- IEC 60079 (explosion protection).

The smoke detection system SDS-72 furthermore adapts to the requirements of resolution MSC.339(91), which extends the FSS Code Chapter 5 with definitions about the maximal discharge time. These requirements lead to larger pipe diameters of the pipe net which successively requires an adequate adaption of the smoke detection system.

3 Main variants of system layout

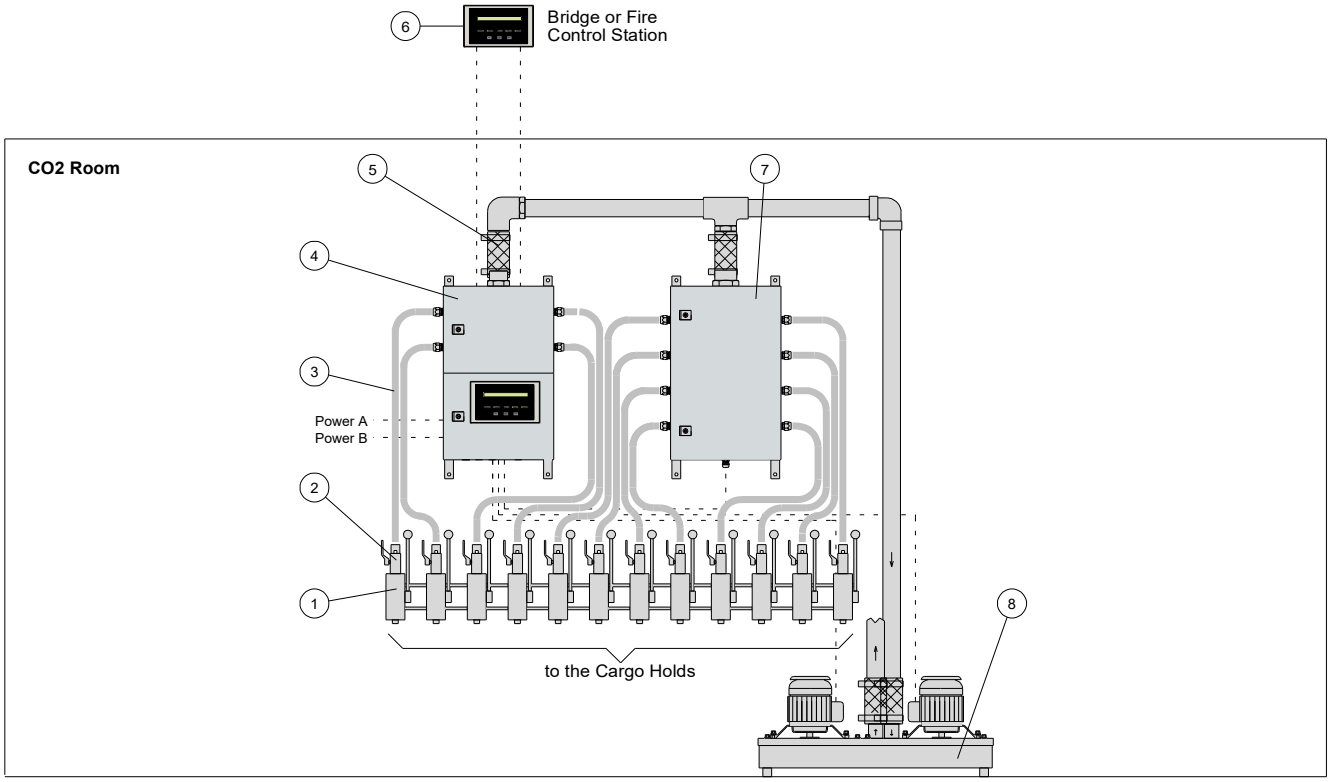
Following the development of the regulations for smoke detection systems and CO_2 extinguishing systems, the smoke detection system SDS-72 is available in three main variants:

3.1 Variant A

The system layout is similar to the well-known pipe net layout used for the SDS-48 system. It is recommended for sampling pipe diameters of max. DN20/DN25. The sampling pipes for all cargo holds run separately into the CO_2 room, where they are connected via 3-way-valves to the smoke detection system. The components of the smoke detection system in the CO_2 room comprise the smoke detection panels SDS-31xx (with integrated detection lines) and the fan unit SDS-M0440. If required, the max. possible number of sampling pipes to be connected can be increased by one or several extension panels SDS-32xx.

Certain versions of the smoke detection panel SDS-310x additionally offer a smoke detector loop for exhaust ventilation duct detectors. With this option, exhaust ventilation duct detectors can be connected electrically to the smoke alarm panel without the need of installing a separate fire alarm panel (see section 3.4).

A remote panel, which can be configured as control panel, is located on the bridge and/or in the fire control station.



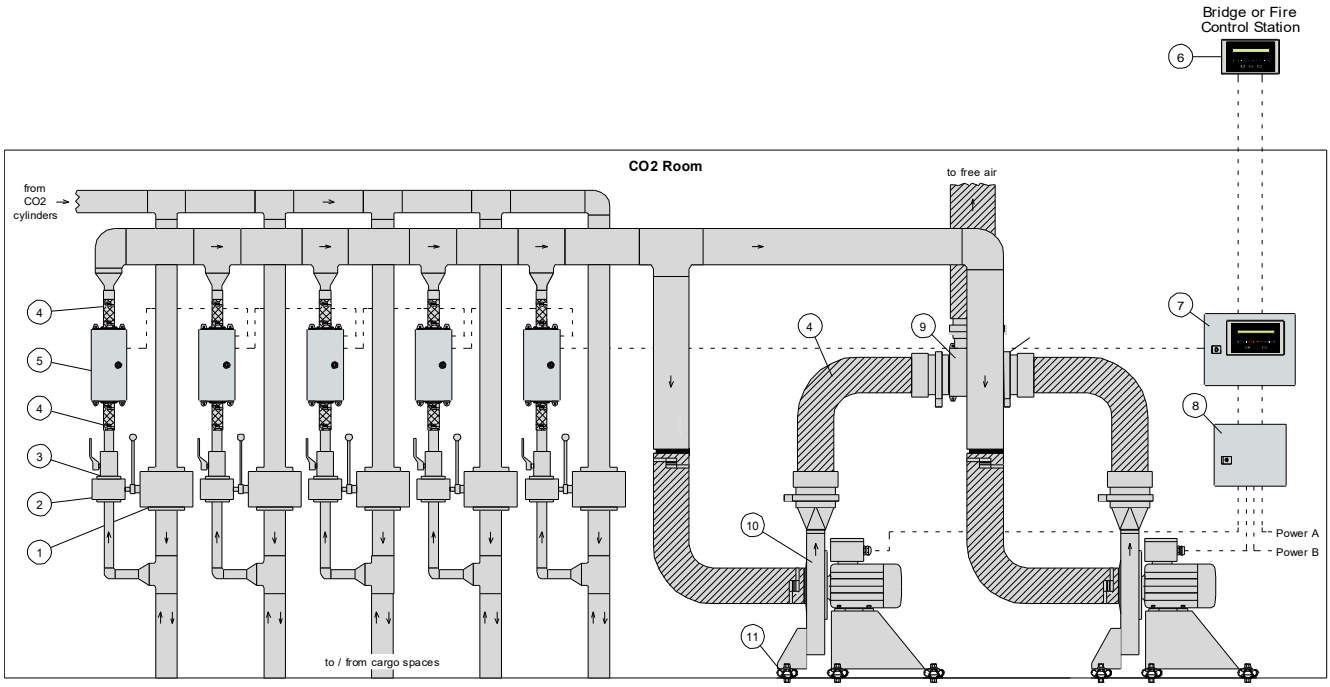
Typical Arrangement of Smoke Detection System SDS-72 in CO_2 Room, Layout Variant A

1 3/2-way-valve
2 block valve
3 flexible hose
4 smoke detection panel SDS-3104
5 flexible hose
6 remote panel SDS-3500
7 extension panel SDS-3208
8 fan unit SDS-M0440

3.2 Variant B

Variant B is similar to Variant A, in that all sampling pipes are running separately into the CO_2 room and the main components of the smoke detection system are located in the CO_2 room. However the variant B is designated for the connection of sampling pipes of up to DN150. For these larger pipes the new smoke detection unit SDU is available to allow a larger air volume to pass through. Each smoke detection unit SDU is prepared to monitor one sampling pipe. For optimal adaption to the sampling pipe arrangement in the CO_2 room, the smoke detection units SDU can be located together with the CO_2 section valves and the smoke detection valves near the entry of the sampling pipes into the CO_2 room (the smoke detection valves shall be blocked with the attributed CO_2 section valves). Integrated filter elements and the design of the smoke detection unit (patent pending) prevent excessive pollution of the internal smoke detector. Further the smoke detection panel SDS-3000 and the two fan modules SDS-M0460 are located in the CO_2 room. The fan modules convey the air samples from the outputs of the smoke detection unis to the free air. Onr or more remote panel are located on the bridge or in the fire control station.

As variant A, variant B optionally also offers the feature of connecting exhaust ventilation duct detectors directly to the smoke alarm panel without the need of installing a separate fire alarm panel (see section 3.4).



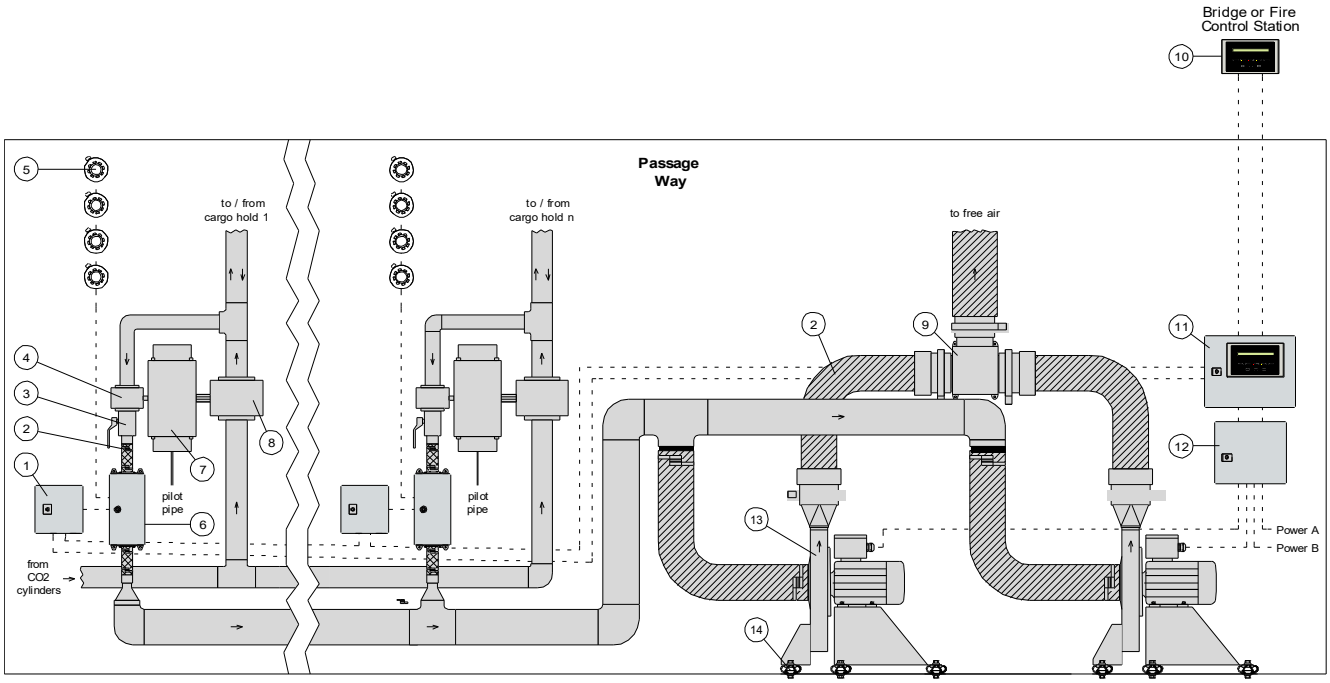
Typical Arrangement of Smoke Detection System SDS-72 in CO_2 Room, Layout Variant B

1 CO_2 section valve
2 smoke detection valve
3 block valve
4 flexible hose
5 smoke detection unit SDU
6 remote panel SDS-3500
7 smoke detection panel SDS-3000
8 junction box for fan modules SDS-3600
9 3/2-way flap SDS-3800
10 fan module SDS-M0460
11 vibration damper

3.3 Variant C

Variant C is designated for cargo vessels with a suitable passage way alongside the cargo holds. The CO_2 system uses a common CO_2 pipe routed from the CO_2 room into the passage way, from where the different cargo spaces can be flooded by separate CO_2 section valves.

The main components of the smoke detection system are located in the passage way. They comprise the smoke detection panel SDS-3000, a smoke detection unit SDU with junction box SDS-3700 for each pipe branch into the cargo holds and, depending on the size of the plant, one or two fan units SDS-M0440 or two fan modules SDS-M0460. Of course, the smoke detection panel and the fan unit or the fan modules can be installed in the CO_2 room or another suitable location outside the passage way. However all a.m. components must be installed in a safe area. The fans convey the air samples from the outputs of the smoke detection units to the free air. The smoke detection units are connected via smoke detection valves and block valves to the sampling pipes to the cargo holds (the smoke detection valves shall be blocked with the adjacent CO_2 section valves). A remote panel is located on the bridge or in the fire control station.
As variant A and B, variant C also offers the feature of connecting exhaust ventilation duct detectors directly to the smoke alarm panel without the need of installing a separate fire alarm panel.



Typical Arrangement of Smoke Detection System SDS-72 in Passage Way, Layout Variant C

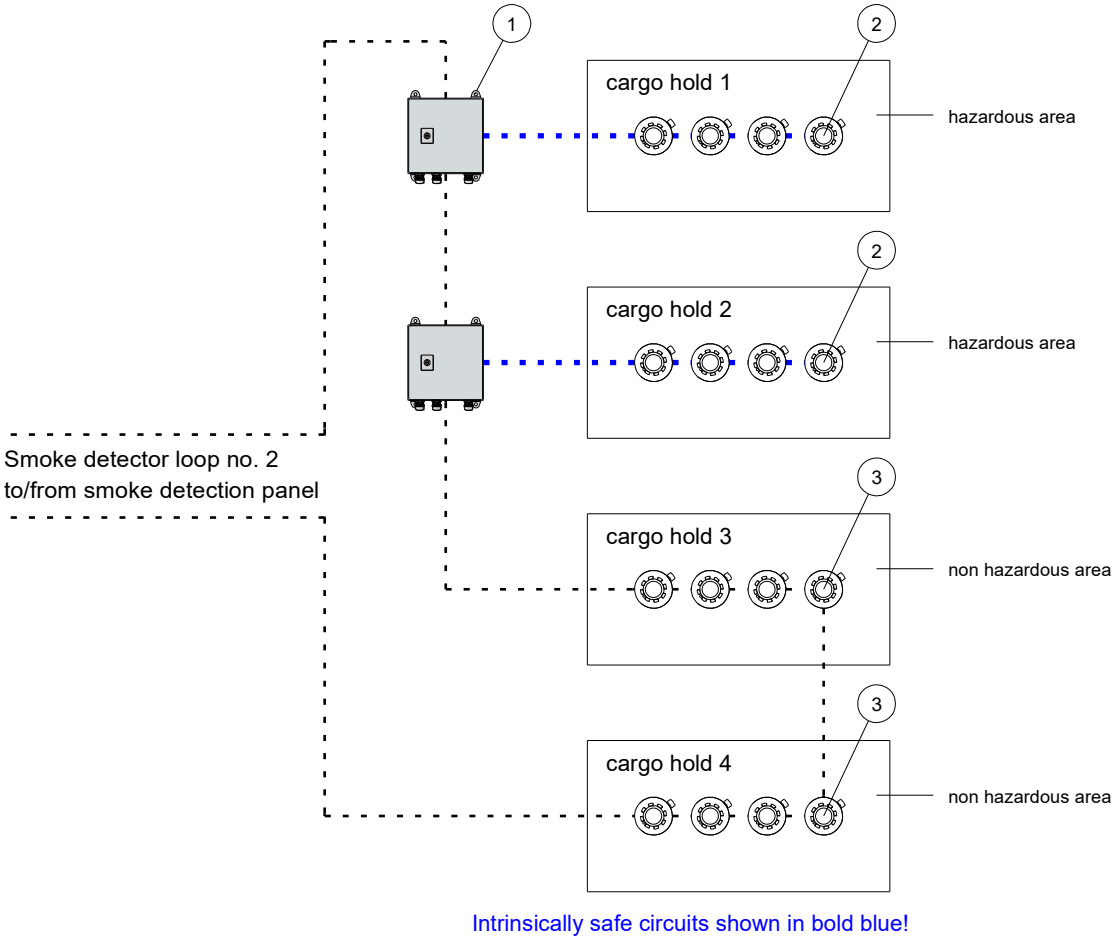
1 junction box with loop isolator and safety barrier
2 flexible hose
3 block valve
4 smoke detection valve
5 smoke detector for exhaust vent. ducts
6 smoke detection unit SDU
7 pneumatic valve actuator
8 CO_2 section valve
9 3/2-way flap SDS-3800
10 remote panel SDS-3500
11 smoke detection panel SDS-3000
12 junction box SDS-3600 for fan modules
13 fan module SDS-M0460
14 vibration damper

3.4 Additional smoke detector loop no.2 for exhaust ventilation ducts

The smoke detection panels with two smoke detector loops offer the feature of connecting exhaust ventilation duct detectors directly to the smoke detection panel without the need of installing a separate fire alarm panel. One cargo hold may contain several exhaust ventilation ducts and each exhaust ventilation duct to be monitored requires one detector. The detectors in one cargo hold must be connected in a line to the junction box for smoke detection units SDS-3700.

The junction box SDS-3700 must be mounted in a safe area (not hazardous area)!

The smoke detectors for the exhaust ventilation ducts must be connected to smoke detector loop no.2.



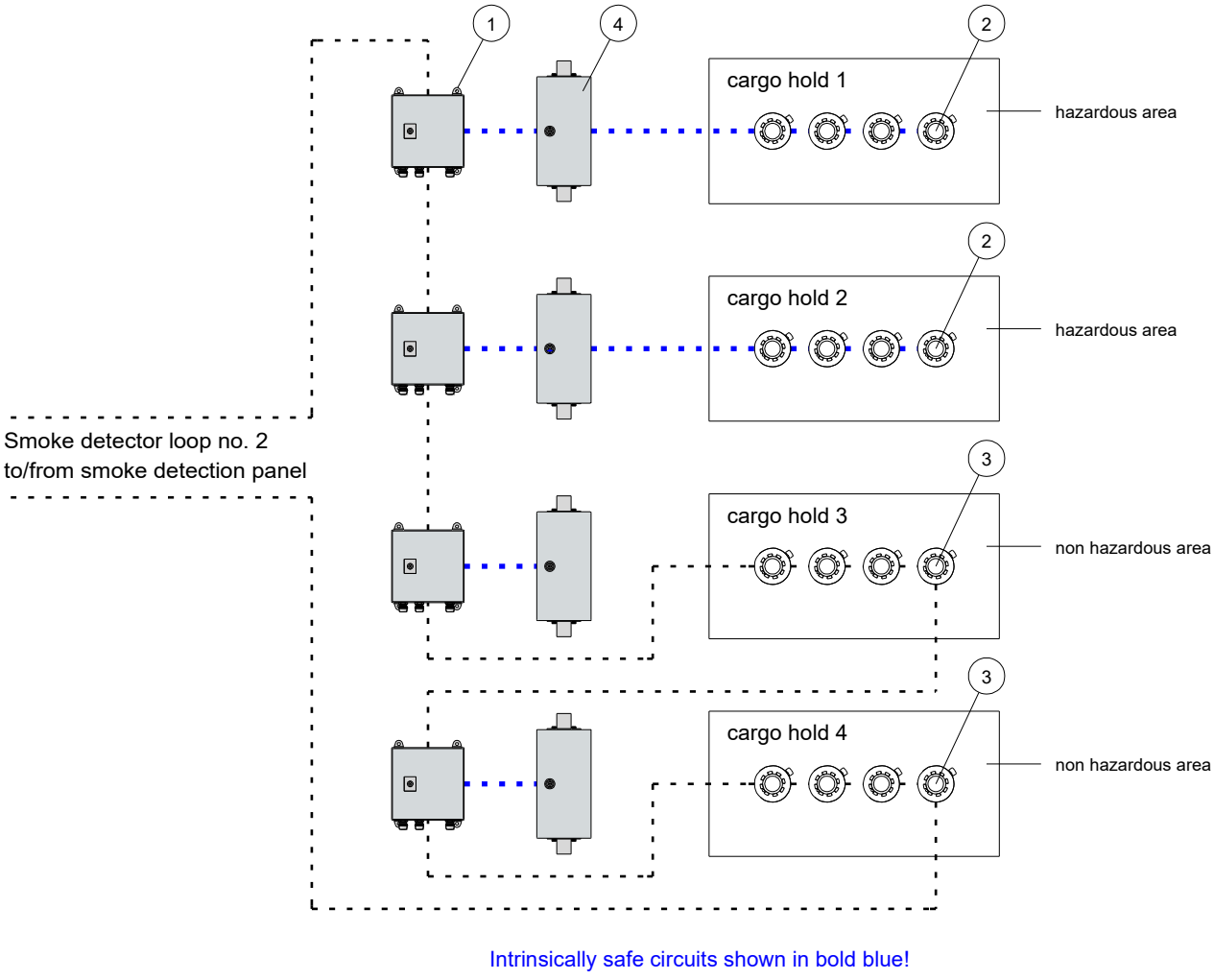
Example: Smoke detector loop only for exhaust ventilation duct detectors for hazardous and non hazardous areas in variant A and B

1 junction box SDS-3700

2 smoke detector “XP95 I.S.”

3 smoke detector “Discovery” with isolator base

In variant C the smoke detectors for the exhaust ventilation ducts can be connected to the same junction box as the smoke detection unit SDU. If you have a combination of cargo holds with hazardous area and cargo holds without hazardous area, please note, that the smoke detection units for the non hazardous areas are also operated with intrinsically safe circuits, because for these smoke detection units a contact with hazardous atmosphere cannot be excluded due to a potential feedback in the pipe net. Only the smoke detectors in the exhaust ventilation duct may be of non intrinsically safe type (see below).



Example: Smoke detector loop for exhaust ventilation duct detectors for hazardous and non hazardous areas in variant C

1 junction box SDS-3700

2 smoke detector “XP95 I.S.”

3 smoke detector “Discovery” with isolator base

4 smoke detection unit SDS-3300 (SDU)

3.5 Comparison of variants A, B and C

	variant A	*variant B*	*variant C*
smoke detection devices	smoke detection panel SDS-31xx and extension panel SDS-32xx (similar to SDS-48).	smoke detection panel SDS-3000 and smoke detection units SDU.	smoke detection panel SDS-3000 and smoke detection units SDU.
common use of pipe net for smoke detection and CO_2 discharge	yes	yes	common use only for pipe net in cargo hold
individual pipes for each cargo hold between between cargo holds and CO_2 room	yes	yes	no
additional pipe for air sampling	no	no	yes, a common air suction manifold along the passage way is required.
recommended discharge pipe diameters	DN20/DN25	DN32 ... DN150	DN32 ... DN150
Remote control for CO_2 valves required	no	no	yes
amount of air flow volume	low	high	low
smoke alarm response time	normal	normal	fast
loop for exhaust ventilation duct detectors	optional	optional	yes
suitable for ...	**... smaller vessels, where a DN20 pipe net is sufficient.**	**... mid sized vessels without a passage way, where a DN20 pipe net is <u>not</u> sufficient.**	**... larger vessels with a passage way.**

3.6 Conclusion

Variant A is a basic concept very well-known from the SDS-48 system. It offers a great advantage with its simple feature of direct connection of air exhaust duct detectors without an additional fire alarm panel.

In addition to this advantage, **variant B** allows connection of large pipes with up to DN150 to the smoke detection system and thus reduces the need of installing a bunch of DN20 pipes.

Variant C is a smart solution for larger vessels with a passage way. A common CO_2 pipe between CO_2 room and passage way reduces the amount of necessary pipe installation very much. The way for the air samples in the pipe net is short and thus allows for a fast response to the occurrence of smoke in the cargo space.

4 System components

4.1 Main components

Type	*Name*	*Typical Location*	*Remark*
ADP-3500	adapter module	near remote panel	required for remote panel
SDS-3000	smoke detection panel	CO_2 room or passage way	without integrated detection lines
SDS-3104	smoke detection panel	CO_2 room	1-4 detection lines
SDS-3108	smoke detection panel	CO_2 room	5-8 detection lines
SDS-3112	smoke detection panel	CO_2 room	9-12 detection lines
SDS-3208	extension panel	CO_2 room	5-8 detection lines
SDS-3212	extension panel	CO_2 room	9-12 detection lines
SDS-3216	extension panel	CO_2 room	13-16 detection lines
SDS-3300	smoke detection unit SDU	CO_2 room or passage way	1 detection line
SDS-3500	remote panel	bridge or fire control station	flush mount / wall mount (in enclosure)
SDS-3600	junction box	passage way	for SDS-M460
SDS-3700	junction box	safe area	for smoke detection unit SDU
SDS-3800	3/2-way flap	CO_2 room or passage way	for fan modules SDS-M0460
SDS-M440	fan unit	CO_2 room or passage way	2 fans on a frame, 230V~
SDS-M441	fan unit	CO_2 room or passage way	2 fans on a frame, 110V~
SDS-M460	fan module	CO_2 room or passage way	1 fan

4.2 Smoke detection panel SDS-3000, SDS-3104, SDS-3108 and SDS-3112

The smoke detection panels are available with one or two smoke detector loops:

4.2.1 Smoke detection panel with one smoke detection loop

The basic version of the smoke detection panels has one smoke detector loop. It is intended for the application in system layout variant A and B, if no additional loop for detectors in exhaust ventilation ducts is required. The smoke detector loop in this smoke detection panel is connected with one end only to the main board in the smoke detection panel (open loop).

4.2.2 Smoke detection panel with two smoke detection loops

This version of the smoke detection panels has two smoke detector loops. It is necessary for the system layout variant A and B, if an additional loop for detectors in exhaust ventilation ducts is required. It is also necessary for the system layout variant C. Loop no.1 is an open loop and loop no.2 is a closed loops. A closed (ring) loop must be connected with both ends to the main board.

For ordering information (article numbers) please refer to the data sheets SDS-3000.01 and SDS-3100.01 in the appendix of this manual.

4.3 Smoke detection unit SDS-3300 (SDU)

The smoke detection unit SDU allows smoke detection in conjunction with large pipe diameters of up to 150 mm diameter. To prevent smoke detector pollution ahead of time, a large dust filter for different particle sizes is integrated. The dust filter can easily be cleaned or exchanged.
The airflow passes an orifice generating a pressure drop. The pressure drop is being monitored permanently. For adaption to a large range of required airflow volumes, 2 versions with different pressure thresholds of the included pressure switch are available (see data sheet for details). Furthermore, the threshold can be adjusted to the project requirements by means of opening or closing further orifices in the smoke detection unit (max. 6 orifices). The adjustment will normally be carried out prior to delivery.

4.4 Spare parts

Type	*Name*	*Art. No.*	*Remark*
605	airflow detector	E01.003	for SDS03.340
605	airflow detector	E01.006	for SDS03.342
ADP-3500	adapter module for remote panel	BG03.590	
CM-3100	Control Module for Smoke Detection Panel	BG03.150	with 2 loop drivers
	Control Module for Smoke Detection Panel	BG03.151	with 1 loop drivers
55000-770MAR	XP95 marine dual loop isolator	E20.095	
55000-855	Protocol-Translator (single channel)	E20.091	
55000-856	Protocol Translator (dual channel)	E20.092	
KFD0-CS-Ex1.54	galvanic isolator EEx, 1 Channel	E06.101	
KFD0-CS-Ex2.54	galvanic isolator EEx, 2 Channels	E06.102	
MB-3500	main board for smoke detection panel	BG03.501	
Discovery	smoke detector	E20.302	
	Discovery marine standard base	E20.391	
	Discovery marine base with isolator	E20.392	
XP95 I.S.	smoke detector, intrinsically safe	E20.002	
	socket for smoke detector XP95 I.S.	E20.004	
	filter set for smoke detection unit SDU	BG03.900	

5 Planning the system

Before planning a smoke detection system SDS-72, the layout of the CO2 extinguishing system must be available. At least the following information is required for a correct planning:

- number of sampling pipes,
- length and diameter of each sampling pipe,
- voltage and frequency of electrical power supply.

5.1 Select a system variant

The Smoke Detection System SDS-72 can be realized in three variants, A, B and C:

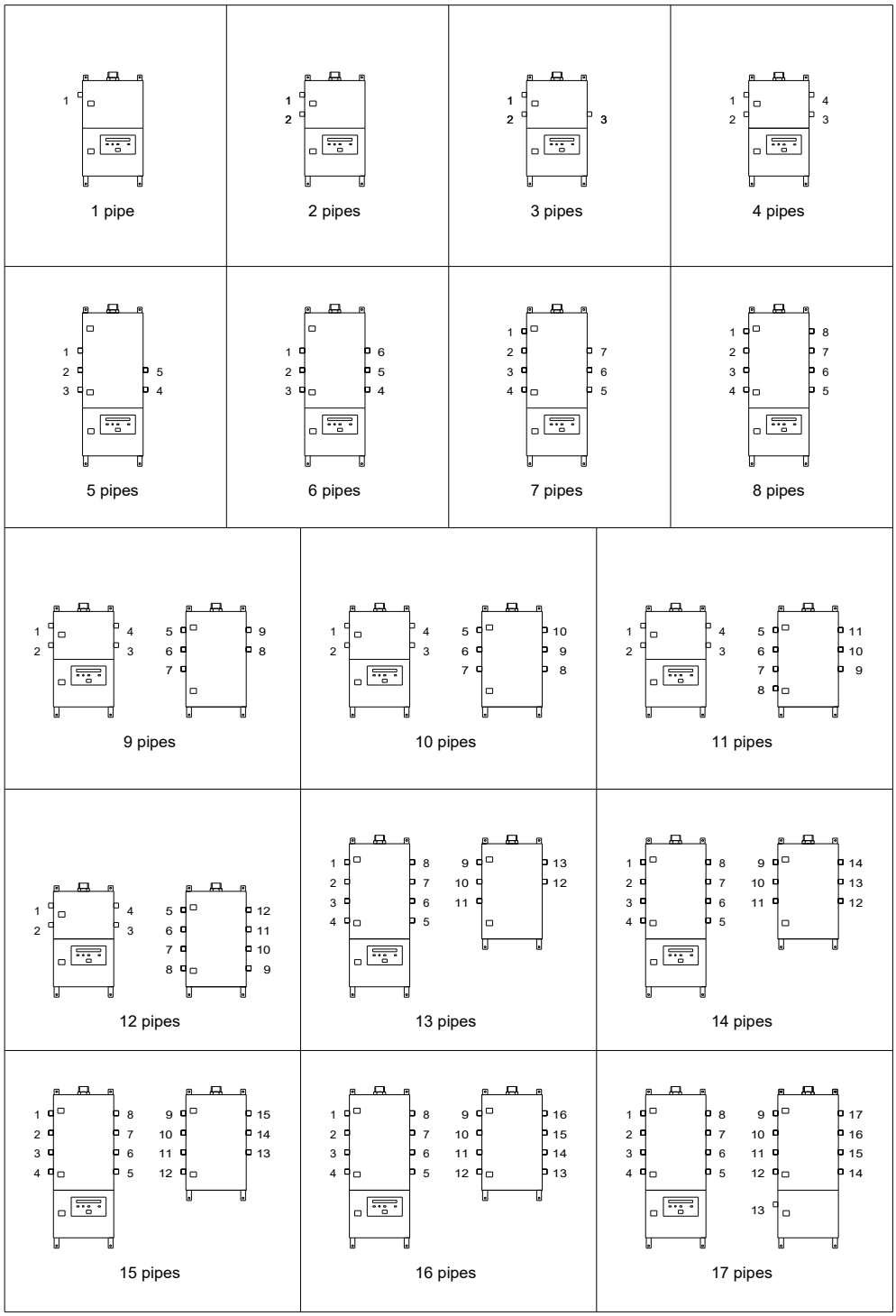
- Select Variant A, if the sampling pipes have a nominal diameter of DN20 or DN25.
- Select variant B, if the sampling pipes have a nominal diameter of DN32 or larger and the ship has no passage way beneath the cargo holds or the installation of the smoke detection system in the passage way is not appropriate.
- Select variant C, if the smoke detection system shall be installed in the passage way.

For more details please refer to chapter “Main variants of system layout”.

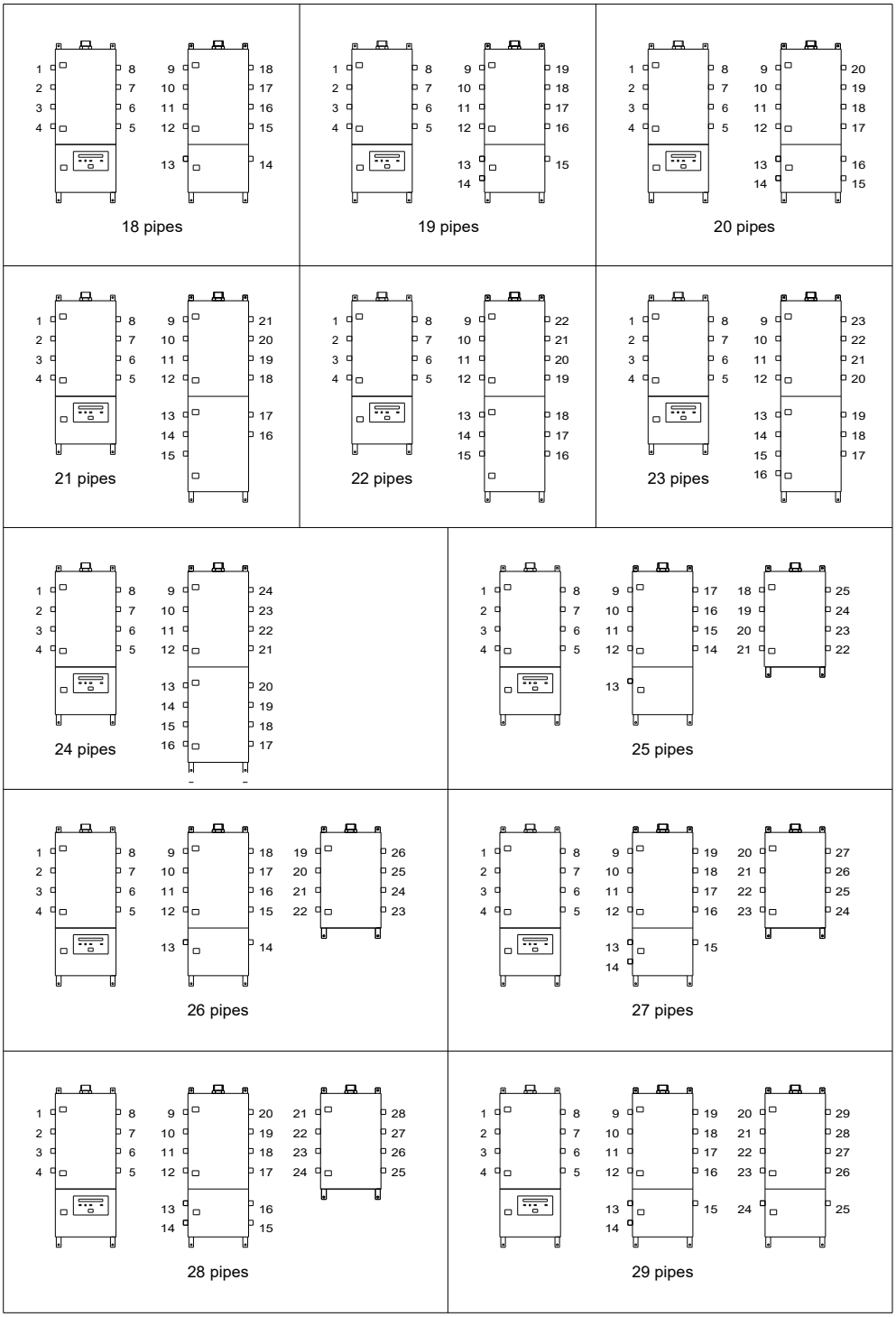
5.2 Select a smoke detection panel / extension panel

Article numbers for Smoke Detection Panels			
for System Variant	*Additional Loop no.2 for exhaust ventilation duct*		*Remark*
	no	*yes*	
A	SDS03.101 ... SDS03.112	SDS03.121 ... SDS03.132	for 1 … 12 sampling pipes, combinations with extension panels: see next page
B	SDS03.001 … SDS03.004	SDS03.011 … SDS03.014	The last digit of the article no. defines the number of included safety barrier channels for the Smoke Detection Units SDU in the CO_2 room. Max. 8 Smoke Detection Units SDU may be connected to one safety barrier channel.
C	SDS03.010		
Article numbers for Extension Panels			
A	SDS03.205 … SDS03.216		for 5 … 16 sampling pipes, for variant B and C extension panels are not required.

5.2.1 Variant A: Select a combination of smoke detection panel and extension panel(s)



Standard arrangement for system variant A with 1 – 17 sampling pipes



Standard arrangement for system variant A with 18 – 29 sampling pipes

For details to smoke detection panels and extension panels see data sheets SDS-3100.01 and SDS-3200.01 in the appendix of this manual.

5.3 Select one or more Remote Panels

Select the number of remote panels according the project requirement. Max. 3 remote panels can be connected to the system. The remote panels are available as flush mount and wall mount panels. For details to remote panels

see data sheets SDS-3500.01 in the appendix of this manual.

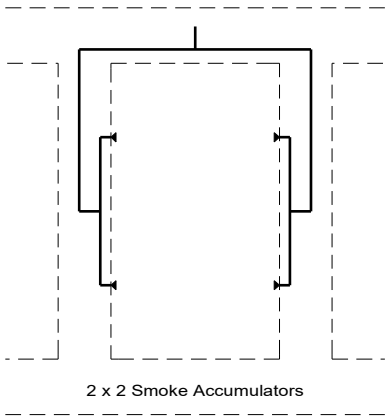
5.4 Locations of smoke accumulators

„The smoke accumulators shall be located on the overhead or as high as possible in the protected space, and shall be spaced so that no part of the overhead deck area is more than 12 m, measured horizontally, from an accumulator“ (FSS-Code chapter 10).

5.5 Layout of a sampling pipe net

To ensure an even intake of air samples at each smoke accumulator, the pipe net shall be designed with a symmetrical layout as far as possible. Depending on the size of the cargo holds, we suggest different pipe net layouts:

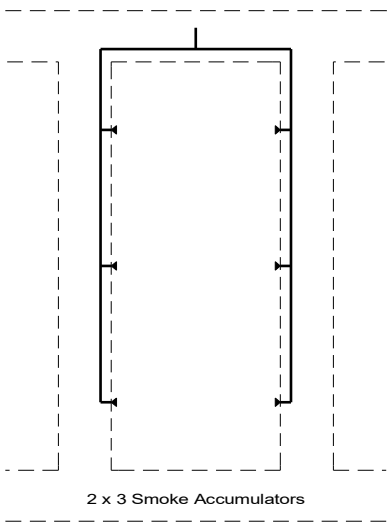
5.5.1 Example No. 1



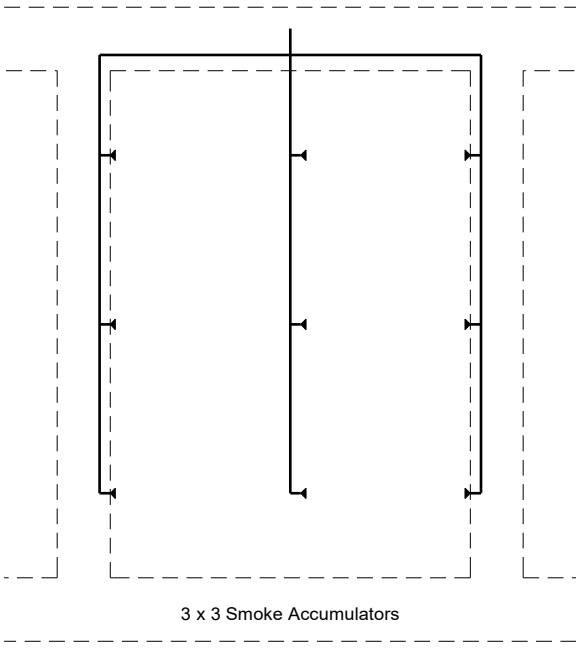
Example No.1 fits to mid sized cargo spaces and has a perfect symmetric layout.

5.5.2 Example No. 2a

The following examples can be applied for larger cargo spaces where three accumulators in one row are required to cover the width of the cargo hold. Due to the arrangement of three smoke accumulators in one row, it is necessary to mount suitable orifices in the smoke accumulators in order to ensure equal quantities of airflow extracted from the smoke accumulators.

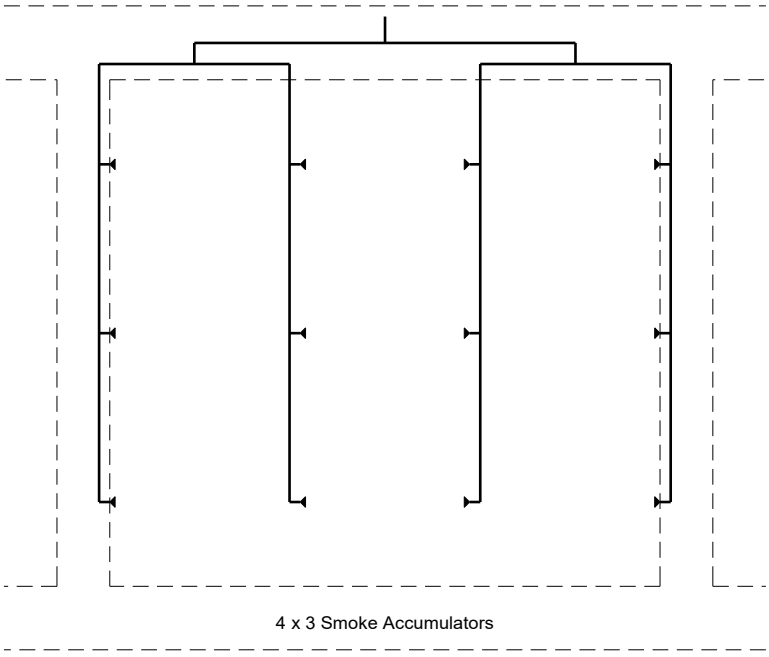


5.5.3 Example No. 2b



Example no. 2 b is similar to example No. 2 a. It fits for longer cargo spaces, where 2 rows of smoke accumulators are not sufficient. The calculation of the orifices must care for an even intake at all smoke accumulators.

5.5.4 Example No. 2c



Example No. 2 c is also similar to example No. 2 a. It fits for larger cargo spaces, where 3 rows of smoke accumulators are not sufficient. In this layout the four stubs are well balanced. At each pipe fork the pipe diameter shall be adapted to the reduced airflow volume. The smoke accumulators need orifices to balance the air intake within each stub.

5.6 Smoke detector loops

The smoke detection panel of the smoke detection system SDS-72 can be delivered with 1 or 2 electrical smoke detector loops. Smoke detector loop no. 2 is optional. It allows a very economic monitoring of the exhaust ventilation ducts because it does not need neither a separate smoke detection panel nor separate sampling pipes. Further smoke detector loop no. 2 is required for system variant C. Smoke detector loop no. 1 and loop no. 2 are slightly different in their electrical values:

5.6.1 Smoke detector loop no. 1

Smoke detector loop no. 1 has a lower voltage level and thus is optimized for direct connection of intrinsically safe smoke detectors “XP95 I.S.” without protocol translator. The galvanic isolator for the the smoke detector XP95 I.S. is mounted directly in the smoke detection panel.
Normally smoke detector loop 1 is not used as a “closed” loop but as a stub line (intrinsically safe circuits are not available as closed loop). The max. cable length of smoke detector loop no. 1 is limited to 10 m. Smoke detector loop no. 1 will be used for smoke detectors in smoke detection panels, extension panels (system variant A) and for smoke detection units SDU, which are located in the CO_2 room near the smoke detection panel (system variant B).

5.6.2 Smoke detector loop no. 2

Smoke detector loop no. 2 has a higher voltage level and thus is optimized for long cables between smoke detection panel and smoke detectors in exhaust ventilation ducts (system variants A, B or C) resp. smoke detection units SDU in the passage way (system variant C).

5.6.2.1 Hazardous Areas

For cargo holds with hazardous area the Smoke Detection Unit SDS-3300 must be applied, which includes the smoke detector XP95 I.S. For each cargo hold (fire zone) a loop isolator, a protocol translator for voltage adaption, and a galvanic isolator for the intrinsically safe circuit is required. These components are included in the junction box SDS-3700. The intrinsically safe circuit can be extended with further smoke detectors XP95 I.S. for monitoring the exhaust ventilation ducts.

5.6.2.2 Non Hazardous Areas and Mixed Cargo Holds

If exhaust ventilation ducts in non hazardous areas are to be monitored, the (not intrinsically safe) smoke detector “Discovery” can also connected directly to loop 2. The Smoke Detection Unit SDS-3300 is not available in a non intrinsically safe version, because most vessels have at least one hazardous area cargo hold. Due to the air suction pipe net all Smoke Detection Units SDS-3300 are connected to each other and therefore the must all be intrinsically safe.

5.6.3 Restrictions when planning smoke detector loops

The following restrictions must be observed:

- Maximal 8 detectors can be connected to one galvanic isolator.
- Maximal 72 detectors can be connected to the smoke detection system SDS-72.

The (not intrinsically safe) smoke detector “Discovery” can also be connected. For the smoke detector Discovery a galvanic isolator is not required.

5.7 Select a fan module / fan unit

For selection of a fan unit /fan modules it is essential to know the number of sampling pipes and the length and diameter of each sampling pipe. The length is the distance between the most remote smoke accumulator and the position of the smoke detector (in smoke detection panel, extension panel or smoke detection unit SDU). According to the FSS-Code, the air samples must be conveyed along this distance in less than 300 s for container vessels (for RoRo-vessels: 120 s).

For the further consideration we assume that

- the layout of the pipe net in the CO_2 room is *symmetric*, so that the smoke accumulators collect approx. *equal quantities* of air samples and
- the pipe diameter is reduced after a pipe fork, so that the air samples have approx. the *same speed* before and after the forks.

Following to these preconditions, we can simplify the calculation of the required airflow volume and regard the pipe net for one sampling pipe as one pipe without forks with the length from the most remote smoke accumulator to the position of the smoke detector.

Together with the pipe diameter and the transition time we can now find the corresponding airflow volume. We calculate as follows:

- To determine the minimal airflow volume per sampling pipe, we calculate with a target transition time of 300 s. This value is a measure for the airflow detector orifice, which defines the alarm threshold for the airflow detector.
- To determine the target airflow volume in the longest sampling pipe, we calculate with a target transition time of 120 s instead of 300 s (safety margin).
- For the other shorter sampling pipes, we must consider the following:
  - The target airflow volume to obtain a transition time of 120 s can be smaller, because the pipe length is shorter.
  - However the shorter sampling pipes tend to draw more airflow volume compared with the longest pipe because the flow resistance of the shorter pipe is less.
  - Therefor the shorter sampling pipes must be balanced by a flow reducer in the Smoke Detection Unit SDU.
  - The result of the balancing shall be, that the shorter pipes do not draw more airflow volume compared with the airflow volume of the longest pipe (if it has the same same diameter). As a consequence for the calculation, we calculate all sampling pipes with the length of the longest sampling pipe to get a realistic airflow volume for each sampling pipe after they have been balanced. Of course it is also possible to over-compensate the shorter pipes, so that they draw less airflow volume compared with the longest sampling pipe.
- Now we add the airflow volumes of all sampling pipes and to the sum we add a further safety margin. The result of this calculation is the required minimal fan capacity which allows to select the correct fan unit(s) / fan modules.

Select a fan unit / fan module following to the required airflow volume:

Required airflow volume	*Fan module / unit*	*Remark*
<= 40 m³/h	SDS-M0440 / SDS-M0441	50 Hz supply
<= 80 m³/h	SDS-M0440 / SDS-M0441	60 Hz supply
<= 800 m³/h	SDS-M0460	50 or 60 Hz supply

Several fan modules / units can be operated in parallel to increase the airflow volume capacity.

To ease the calculation of the required airflow volume in the sampling pipes and the required airflow volume for the fan capacity, use calculation form DOK09.001 (spreadsheet), in which you have to input only the values for the sampling pipe lengths and pipe diameters!

5.8 Smoke detection valves and flexible hoses

Flexible hoses are required as transitions from steel pipes to ...

- the smoke detection panel and possible extension units,
- the smoke detection units SDU and
- the fan unit / fan modules.

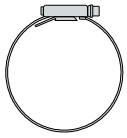
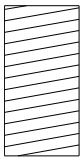
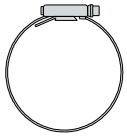
5.8.1 Flexible hoses for conveying hazardous atmosphere

The following information is derived from the German publication “Technische Regeln für Betriebssicherheit (TRBS) TRGS 727, Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen” (Technical rules for operationial safety, avoidance of ignitions due to electrostatic discharge):

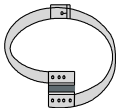
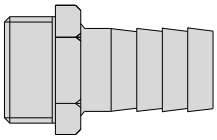
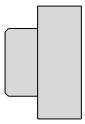
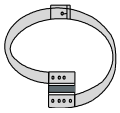
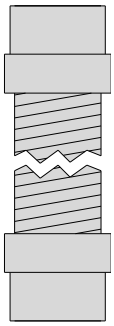
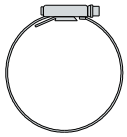
> *The flow of clean gases does not generate electrostatic electricity. However if the gas contains dust particles or water droplets, these and the adjacent system parts can be charged with electrostatic electricity.*
>
> *to be considered for air exhaust systems:*
>
> • *Air exhaust systems must be installed and operated in order to prevent dangerous electrostatic electricity.*
> • *Conductive parts (pipes, hoses, valves, flaps etc.) must be earthed.*
> • *Not conductive pipes and hoses must be installed outside the working and traffic area. They must only be cleaned with water or humid clothes, not however with compressed air or steam cleaner.*
> • *For non conductive pipes and hoses the air shall be kept free of dust particles a water droplets.*
> • *In non conductive pipes and hoses the flow velocity shall not exceed 20 m/s.*

As a consequence for applications with hazardous area in the pipe net between smoke detection valve and air out, *safetec* recommends to use mainly steel pipes. Flexible hoses shall be used as transitions from valves, smoke detection units/panels and fan modules to the steel pipes and vice versa. If dust or water droplets cannot be avoided, use conductive flexible hoses.

5.8.2 Flexible Hoses for System Variant A, non conductive

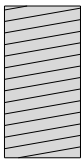
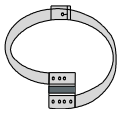
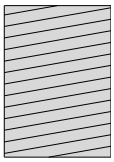
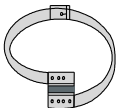
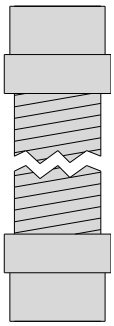
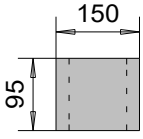
Article number	*Name*	*Diameter, inner/ outer*	*Outline*	*Remark*
Z02.002	flexible hose	12,5/17,5 mm		From 3/2-way-valve to smoke detection panel.
Z01.403	clamp			
Z02.315	flexible hose	76/85 mm		Connection of fan unit SDS-M0440 / SDS-M0441.
Z01.410	clamp			

5.8.3 Flexible Hoses for System Variant A, conductive

Article number	*Name*	*Diameter, inner/ outer*	*Outline*	*Remark*
Z02.400	flexible hose	25/32 mm		From 3/2-way-valve to smoke detection panel. For earth connection, strip off the supporting spiral at the both ends of the hose and connect to earth. Requires hose connection gland at both ends and an adapter from 3/4” to 1/2” at smoke detection panel.
Z01.603	clamp			
Z01.019	hose connection gland	3/4”		
Z01.250	adapter	3/4” / 1/2”		
Z02.405	flexible hose	76/85 mm		Flexible hose for connection of fan modules SDS-M0440 / SDS-M0441 at the suction side. For earth connection, strip off the supporting spiral at the both ends of the hose and connect to earth. The flexible hose can be connected directly to appropriate steel pipes with DIN, EN or JIS standard.
Z01.614	clamp			
Z02.455	flexible hose	75/82 mm		Flexible hose with molded soft sleeves at both ends for connection of fan modules SDS-M0440 / SDS-M0441 at the air out side (enhanced tightness for the pressure side). The soft sleeves have an outgoing wire for earth connection (not shown).
Z01.410	clamp			

Conductive hoses must be earthed at both ends when applied to transport hazardous media. The conductive hoses listed in this paragraph have an explicit qualification for application with hazardous media.

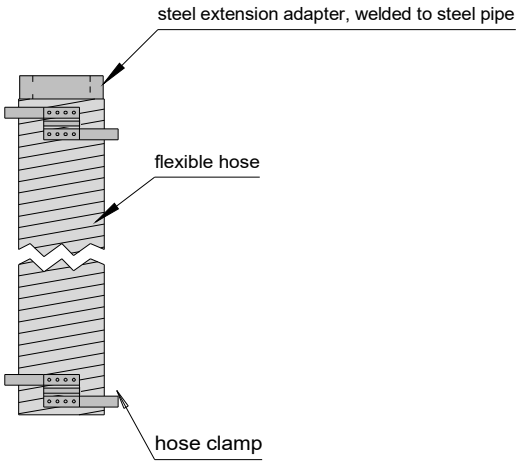
5.8.4 Flexible Hoses for System Variant B and C, conductive

Article number	*Name*	*Diameter, inner/ outer*	*Outline*	*Remark*
Z02.402	flexible hose	60/67 mm		For connection of smoke detection unit SDU. The hose can be cut for the required length. For earth connections, strip off the supporting spiral at the both ends of the hose and connect them to earth. The flexible hose can be connected directly to appropriate steel pipes with DIN, EN or JIS standard.
Z01.610	clamp			
Z02.415	flexible hose	150/157 mm		Flexible hose for connection of fan modules SDS-M0460 at the vacuum side. For earth connection, strip off the supporting spiral at the both ends of the hose and connect to earth. The flexible hose can be connected directly to appropriate steel pipes with DIN, EN or JIS standard.
Z01.622	clamp			
Z02.465	flexible hose	150/157 mm		Flexible hose with with a fixed length of 1030 mm and molded soft sleeves at both ends for connection of fan modules SDS-M0460 at the pressure side (enhanced tightness). The soft sleeves have outgoing wires for earth connections (not shown).
Z01.419	clamp			
MET04.125	steel extension adapter			steel extension adapter for flexible hose with and without soft sleeves

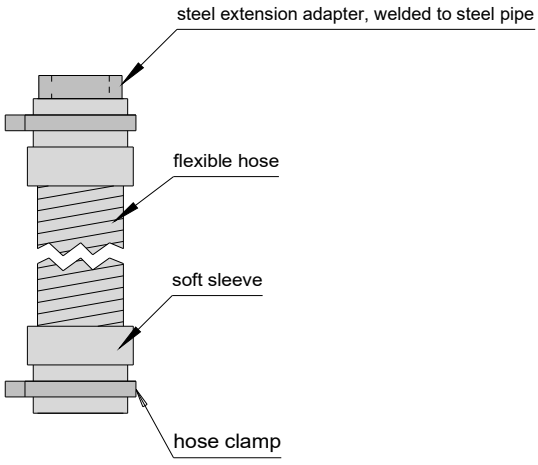
Conductive hoses must be earthed at both ends when applied to transport hazardous media. The conductive hoses listed in this paragraph have an explicit qualification for application with hazardous media.

5.8.5 Transitions from conductive flexible hose to steel pipe

For connection of flexible hose Z02.465 to 6” steel pipe, use *steel extension adapters MET04.125*. The steel extension adapter must be welded to the 6” pipe. Fix the flexible hose will be with a suitable clamp on the steel extension adapter.



for suction side of fan module



for air out side of fan module (pressure side)

5.9 Select installation locations

Device	*Location*	*Remark*
smoke detection panel	CO2 room or passage way	The smoke detection panel shall be mounted in a well accessible and visible position.
extension panel(s)	CO2 room	Applied only for variant A. Minimal horizontal spacing between panels for fastening hoses (with/without hose brackets): 40 / 25 cm.
smoke detection unit SDU	CO2 room or passage way	To be mounted together with smoke detection valve and block valve in the vicinity of the CO2 section valves.
remote panel	bridge and/or fire control station	Flush mount and wall mount version available.
fans	CO2 room or passage way	To be mounted in upright position on shock mounts. Clearing for service purposes: • SDS-M0440 / SDS-M0441: 300 mm above and 50 mm beside the fan unit. • SDS-M0460: see installation instructions. For SDS-M0440 / SDS-M0441 see additional operation manual DOK02.055.

6 Explosion protection

6.1 General

The areas in the smoke detection panel, in the extension panel(s), in the smoke detection unit and in the fan units, where air from the monitored cargo holds passes through, are designed to safeguard against explosion.
The electrical circuits of the smoke detection panel, extension panel(s) and smoke detection units where air passes through are designed “intrinsically safe” according to EN 60079 - 25. The intrinsic safety will be achieved by certified galvanic isolators mounted in a safe area in combination with certified devices and simple electrical apparatus operating in the hazardous area.
The fans are designed according EN 14986 for drawing air from hazardous area.
The relevant rules and regulations (see below) must be observed before planning and installation of a smoke detection system in a hazardous area!

6.2 Smoke detection panel and extension panel(s)

6.2.1 Smoke detection panel

The air samples with the potentially hazardous atmosphere are passing through the upper part of the enclosure. The galvanic isolators for the intrinsically safe electrical circuit(s) must be located in a safe area, and therefore they are mounted in the lower part of the enclosure (safe area).

6.2.2 Extension panel

The galvanic isolator for the extension panel is also mounted in the smoke detection panel.

6.3 Smoke detection unit

6.3.1 System variant B

The galvanic isolator for the smoke detection units (SDU) is also mounted in the smoke detection panel.

6.3.2 System variant C

While the smoke detection units in system variant C may be mounted in the passage way in the vicinity of the CO2 section valves, they must be connected to the smoke detector ring loop. Separate junction boxes SDS-3700 must be mounted near the smoke detection units in a safe area. The junction boxes include a double loop isolator and a galvanic isolator. The loop isolators split the ring loop into segments, which are isolated against short circuit and the galvanic isolator provides an intrinsically safe circuit to the adjacent smoke detection unit.
Additional smoke detectors for the exhaust ventilation ducts can also be connected to the junction box.

6.4 Smoke detectors for exhaust ventilation ducts

6.4.1 System variant A and B

A separate smoke detector ring loop must be installed. For each cargo hold with smoke detectors for exhaust ventilation ducts a junction box SDS-3700 must be mounted in a safe area.

6.4.2 System variant C

In system variant C smoke detectors for the exhaust ventilation ducts can be connected to the junction boxes SDS-3700, which also serve for the smoke detection units.

6.5 Fans

The fans are designed according EN 14986 for drawing air from hazardous areas. However they must be installed in a safe area.

6.5.1 Fan module SDS-M0440 and SDS-M0441

Information about the safeguarding against explosion of the fan units is given in the additional operation manual DOK02.055, together with useful instructions how to maintain safety.

6.5.2 Fan unit SDS-M0460

Please contact *safetec* for separate documentation.

6.6 Relevant regulations

Please observe the following rules and regulations:

- DIN EN 60079-0:2014 Explosive Atmosphere - Part 0: Equipment – General Requirements
- DIN EN 60079-11:2012 Explosive Atmosphere - Part 11: Equipment Protection by intrinsic safety "i"
- DIN EN 60079-11:2014 Explosive Atmosphere - Part 14: Electric installations, design, selection and erection"
- DIN EN 60079-17:2014 Explosive Atmosphere - Part 14: Inspection and maintenance of electrical installations in hazardous areas (other than mines)
- DIN EN 60079-25:2014 Explosive Atmosphere – Part 25: Intrinsically safe electrical systems
- DIN EN 13463-1:2009 Non-electrical equipment for use in potentially explosive atmospheres. Basic method and requirements
- DIN EN 13463-5:2003 Non-electrical equipment for use in potentially explosive atmospheres. Protection by constructional safety "c"
- DIN EN 14986:2007 Design of fans working in potentially explosive atmospheres
- TRBS 2153 Technische Regeln für Betriebssicherheit (TRBS)

7 CAN-Bus

7.1 General

The CAN bus is a serial data bus, which serves as a connection of the smoke detection panel with the remote panel(s).
The CAN bus used in the smoke detection system SDS-72 additionally includes a 24 V power supply for the connected devices.
As an essential feature the smoke detection system SDS-72 offers a *redundant* cable connections for the CAN bus to fulfill related EN54-2 requirements. This feature is required for nearly all smoke detection systems, where the indicating panel / control panel (to be located on the bridge or in the fire control station) does not include the system power supply and the smoke detectors. For practical reasons the power supply and the smoke detectors are normally included in detection panel in the CO_2 room, or the smoke detectors are connected by cables to the detection cable.

7.2 Redundant CAN bus and terminal numbers

The two redundant CAN buses used in the smoke detection system are designated „CAN Bus A“ and „CAN Bus B“. The related terminals have the same terminal numbers on all modules:

CAN Bus A:

Terminal No.	*Signal*
11	+ 24 V
21	0 V
12	CAN-H (A)
22	CAN-L (A)

CAN Bus B:

Terminal No.	*Signal*
13	+ 24 V
23	0 V
14	CAN-H (B)
24	CAN-L (B)

The smoke detection system SDS-72 remains completely ready for operation, if a fault like an open circuit or a short circuit occurs at one of the CAN buses. However a fault message will be issued.

In cases, where a second cable connection for a redundant CAN bus is not available, the system can also be operated with only one CAN bus cable. Please contact relevant authorities.

7.3 Module addresses

Each module connected to the CAN bus has its unique address for identification. The smoke detection panel has always address „1“. Further devices with CAN bus connection have subsequent address numbers. The address number of each module can be assigned in the configuration mode.

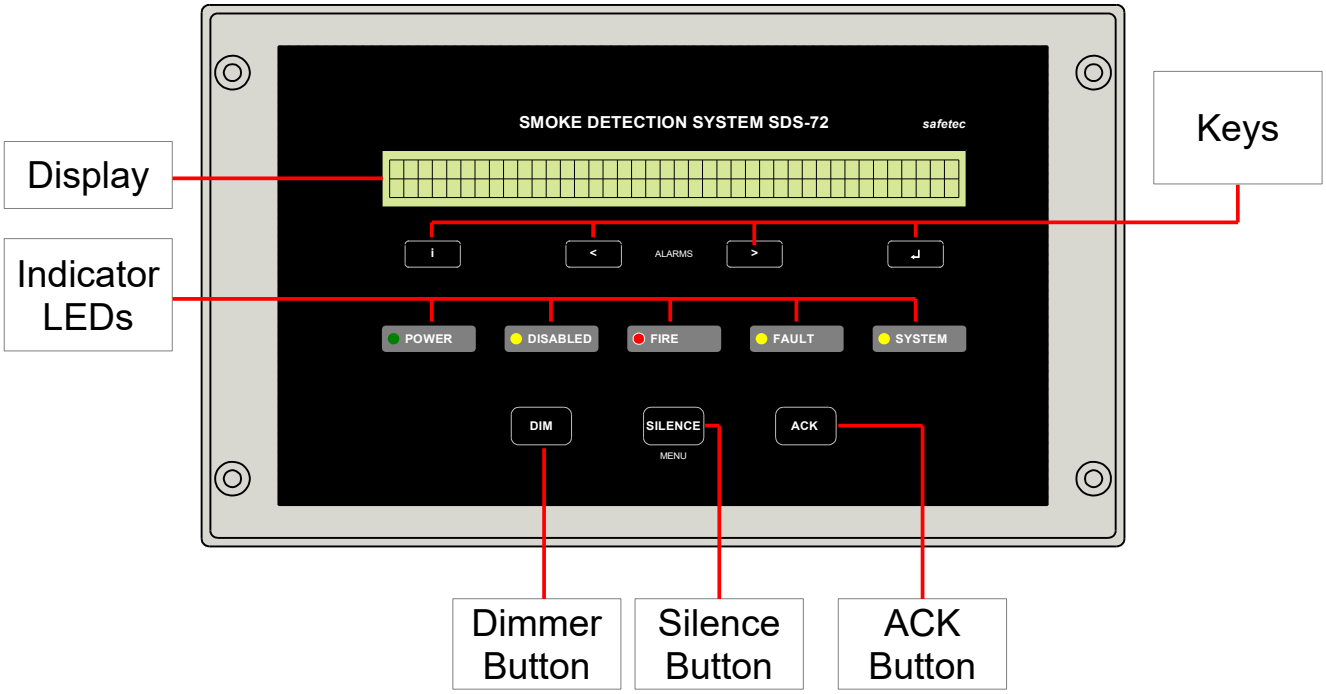
7.4 Termination resistors for the CAN buses

For a correct function, each CAN bus A and CAN bus B require termination resistors 120Ω at both ends of the bus cables. Please note, that at the smoke detection panel as one end of the CAN buses termination resistors are already integrated. At the other ends of the CAN buses, where normally a remote panels is connected, the termination resistors must be invoked by adjacent jumpers. For devices, which are located between the ends of a CAN bus, the jumpers for the termination resistors must be removed.

8 User interface

8.1 General

The user interface of the smoke detection panel and the remote panel consists of a display (LCD), 5 indicator LEDs and 7 buttons. The image below shows the surface of the user interface with all operating elements.



8.2 Display

The display shows the actual state of the system, including fault and fire alarms. It consists of two lines, 40 characters each:

```
[-------------------- Line 1 --------------------]
[-------------------- Line 2 --------------------]
```

The first line is used only to show information about the actual system status. The second line also shows information about the system status, but can additionally show soft key functions, e.g. in the test menu for relays. Soft key functions are always displayed in capital letters and are always surrounded by squared brackets:

```
TEST: Relay K1  Terminal 31/41: OFF
[CHNG]          (COMMON FIRE ALARM)
```

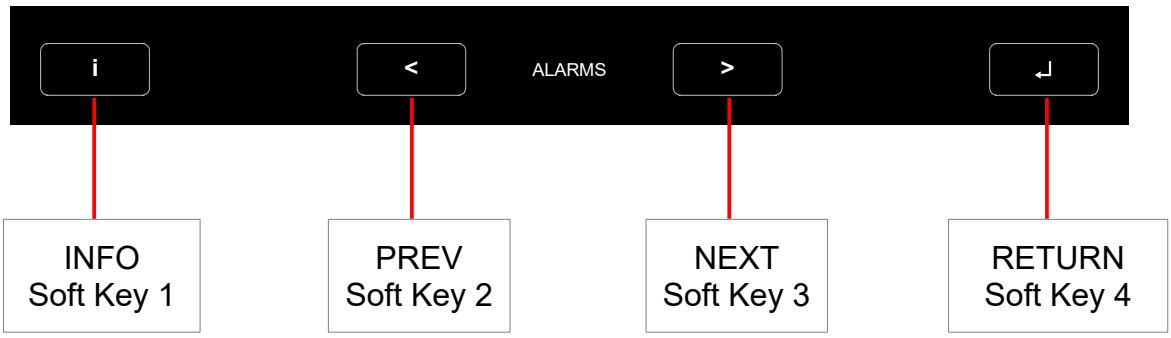
The second line is virtually divided in 4 parts to show the function labels of all 4 soft keys if required:

```
[-------------------- Line 1 --------------------]
[Label 1]     [Label 2]      [Label3]     [Label4]
```

Please refer to chapter “Operation” for different variants of messages.

8.3 Soft keys

The soft keys are located directly below the display. Each key has a default function, which is active if no other label is designated in the display.



Default function of soft keys are:

Buttons	*Symbol*	*Function*
INFO	i	Shows additional information while pressed
PREV	<	Goes to the previous message on display
NEXT	>	Goes to the next message on display
RETURN	↵	Goes one step back

The function designated by the soft key labels will always have priority over the default function.

8.4 Indicator LEDs

Description of indicator LEDs:

Indicator LEDs	*Color*	*State of Indicator LED*	*Description*
POWER	green	off	The power supply for the smoke detection panel is not available.
		on	The power supply for the smoke detection panel is available.
DISABLED	yellow	off	All system functions are enabled.
		on	One or more system functions are disabled: fans or one or more detectors
FIRE	red	off	No actual fire alarm.
		flashing	At least one not acknowledged fire alarm.
		on	All alarms are acknowledged.
FAULT	yellow	off	No faults detected.
		flashing	At least one not acknowledged fault detected .
		on	All fault messages are acknowledged.
SYSTEM	yellow	off	No internal fault in the smoke detection or remote panel(s)

Indicator LEDs	*Color*	*State of Indicator LED*	*Description*
			detected.
		flashing	At least one not acknowledged internal fault in the smoke detection or remote panel(s). *Internal faults of the smoke detection panel can be: internal memory faults (RAM,EEPROM) or an automatic software reset (watchdog).*
		on	All system fault messages are acknowledged.

8.5 Buttons

Description of buttons:

Buttons	*Description*	
Dimmer	pressed continuously	The brightness of the LEDs and the display can be dimmed between 100% and 0%.
	pressed shortly	The brightness of the LEDs and the display will return to 100%. *Note: A new alarm or fault message or pressing any other button will cause 100% brightness of the LEDs and the display.*
SILENCE	By pressing the button the internal buzzer of the smoke detection panel will be silenced. If you press the button on the control panel, the internal buzzers of all the panels in system will be silenced. *Note: If a new alarm or fault message occurs the intern buzzer will be reactivated.* If the button will be pressed longer than 6 seconds, the menu function is activated.	
ACK	Acknowledges alarm and fault messages. If the last message is acknowledged, the buzzer will also be silenced. This function is only available on the control panel(s). *Note: Only the displayed message will be acknowledged. To acknowledge further messages, go to these messages by means of „<“ and „>“ buttons.*	

9 Operation

9.1 Start-up notification

During start-up after power on or reset of the system, the display shows software name and software version of the device:

```
Software: CM3100A
Version: 01.01.000
```

After a short time the display shows the configuration (project) name:

```
<Project name max. 34 characters>
```

Next the target hardware and type of connected module will be shown on display:

```
PANEL TYPE: SMOKE DECTRCTION PANEL
CONNECTION: MAIN BOARD
```

After another short time, the panel and smoke detection system progress to normal operation.

9.2 Normal operation

Under normal operation

- the green LED (POWER) is on,
- the LCD displays “Normal operation” and
- the backlight of the display is turned off.

```
Normal operation
```

9.3 Fire alarm

If smoke is detected in the air sample of a detection line,

- the buzzer sounds in a continuous tone,
- the red LED (FIRE) flashes and
- the LCD displays the alarm message

on all panels of the system.

9.3.1 If a detector name is configured

If a detector name is configured, the display shows:

```
FIRE  <Detector Name max. 34 character>
                    1 of 1
```

where `1 of 1` is the actual serial alarm number from total number of fire alarms.

To read out the detector address, press the INFO button (i) under the display. As long as the button is pressed the following message will be shown:

```
FIRE  <Detector Name max. 34 character>
      Detector XX/Y
```

9.3.2 If a detector name is not configured

If a detector name is not configured, the display shows:

```
FIRE  Detector XX/Y
                    1 of 1
```

Here xxx is the detector address and y is the loop number.

9.3.3 More than one fire alarm

If there is more that one fire alarm at the same time, you can navigate between the alarms by means of the buttons "<" and ">".

9.3.4 Not acknowledged fire alarms

For not acknowledged fire alarms, the key word FIRE in the display and the FIRE LED will be flashing.

If a fire alarm has not been acknowledged within two minutes, the relay output "Fire, 2 min delay" of the panel will be activated. No further message will be shown on the display.

9.3.5 Fire alarms and fault messages at the same time

Fire alarms have priority over fault messages. If fire alarms are shown on the display, fault messages will be indicated by the additional soft key [FAULTS].

```
FIRE  <Detector Name max. 34 character>
                    1 of 1              [FAULTS]
```

If there is at least one not acknowledged faults, the label of the soft key FAULTS will be flashing. The display will automatically return to the fire alarm view after some seconds without button operation.

9.4 Fault messages

If the panel detects a fault,

- the buzzer sounds with an intermittent signal,
- the yellow LED (FAULT) flashes and
- the LCD shows the corresponding fault message, e.g.:

```
FAULT Missing detector XX/Y
                    1 of 1
```

1 of 1 is the actual serial fault number from total number of faults. If there are more that one fault message you can navigate between them by means of the buttons "<" and ">".

For detector faults normally only the detector number will be shown. If the detector name is configured, press the INFO button (i) under the display to read out the detector name. As long as the button is pressed the following message will be shown:

```
FAULT Missing detector XX/Y
      <Detector Name max. 34 character>
```

If fire alarms are present while a fault message is being displayed, you can change to the "fire alarm" view with the button labeled [ALARMS], or the panel changes automatically to the "fire alarm" view, if no further button has been pressed for some seconds:

```
FAULT CAN Bus A
                    1 of 1              [ALARMS]
```

If there is at least one not acknowledged fire alarm, the label of the soft key ALARMS will be flashing.

If a fault occurs, which is critical for the system function, the “SYSTEM” LED will be activated additionally to the “FAULT” LED. The following faults will generate a SYSTEM fault:

- flash memory fault
- ram memory fault
- configuration fault

9.5 Silence-button („SILENCE“)

By pressing the SILENCE button, the buzzer of this panel will be switched off. If you press the SILENCE button on the control panel, buzzers on all panels in the system will be deactivated.

9.6 Acknowledge-button („ACK“)

By pressing the ACK button the person on charge confirms that the fire alarm or fault message has been recognized. However this function is only available on the control panel. If you press the ACK button on other panels, the following message will be shown on the display:

```
Acknowledge of alarms is possible
only on control panel!
```

9.7 Disablement

The following disablement messages can be displayed in the system:

- If at least one detector is disabled:

```
Detector(s) disabled
```

- If fans are disabled:

```
Fans disabled
```

- If fans and at least one detector are disabled:

```
Fans and detector(s) disabled
```

These messages will be shown only if no fire or fault alarm is present.

9.8 System Reset

The reset function resets all fire alarms, fault warnings and the 24h-timer for the automatic fan switch over. The system starts with fan no.1.

The reset function can only be carried out from the control panel. To proceed reset, press the SILENCE button for more than 6 seconds to enter the menu. Select the [RESET] sub-menu and confirm with [YES].

10 Menu (access level 2)

10.1 General

This chapter describes the menu, which is accessible during the normal operation of the smoke detection system (access level 2). A further configuration menu with restricted access (access level 3) is available in the configuration mode (see chapter „Configuration“).

10.2 Navigation through menu

Press the SILENCE button for 6 seconds to get into the menu in access level 2. The elapse of seconds is indicated by dots in the bottom right corner of the display.

```
Normal Operation
                                          ....
```

The navigation in the menu can be done by means of soft keys, e.g.

```
Menu (Access Level 2)
[RESET]         [FANS]         [MORE]
```

The soft keys [RESET] and [FANS] open the corresponding sub-menus. Soft key [MORE] changes to the next menu page. By pressing button RETURN (default function of soft key 4) the previous menu page will be shown.

10.3 Sub-menus

10.3.1 Reset function

In this menu you can perform the system reset.

```
System reset ?
[YES]
```

Please note that this menu function has effect only on the control panel. If you press soft key [RESET] on another panel the following warning will be shown:

```
Only possible on control panel!
```

10.3.2 Fan control

This sub-menu shows the active fan. By pressing soft key [DISABLE] you can disable all fans. Soft key [SWITCH] switches the active fan off and the standby fan on, or activates the fan 1 after both fans had been disabled.

```
Active fan: 1
[DISABLE]       [SWITCH]
```

10.3.3 Disable function

In sub-menu [DISABLE] you can disable each smoke detector separately. The soft key [CHNG] toggles the actual status of the selected detector. With buttons PREV and NEXT you can navigate through all configured detectors.

```
      <Detector name max. 34 character>
[CHNG]        Detector XX/Y: enabled
```

Please note that this menu has effect only on the control panel. If you want to enter this sub-menu on other panels the following warning will be shown:

```
Only possible on control panel!
```

10.3.4 Test functions

This sub-menu gives access to the following test functions [RELAYS] and [SERVICE].

10.3.4.1 Relay test function

```
Select a test function:
[RELAYS]       [SERVICE]
```

In the sub-menu [RELAYS] you can test all relays available on the adapter module resp. main board.

```
TEST: Relay K1  Terminal 31/41: OFF
[CHNG]          (COMMON FIRE ALARM)
```

With the button PREV and NEXT you can navigate between the relays. The soft key [CHNG] will toggle the actual state of the corresponding relay.

If the relay test function will be left manually or automatically, the relays will always return to the correct system state.

10.3.4.2 Service mode

The service mode is only available on the control panel. In sub-menu [SERVICE] you can activate the service mode, which makes the smoke detection panel to an additional control panel for a time period of two hours.

```
Service Mode: OFF
[CHNG]
```

10.3.5 Diagnosis functions

The menu offers diagnosis functions for the CAN bus, the smoke detector loop and the smoke detectors:

```
Diagnosis
[CANBUS]      [LOOP]       [DEVICE]
```

10.3.5.1 CAN bus

```
Diag CANBUS A:
ShCirc: 2/TBUF: 0/RBUF: 0/DIF: 0
```

More information about possible CAN bus faults you can find in section „Fault Finding“ of this manual.

10.3.5.2 Loop

This function is working only for loop no.2 with second port (Port B). After certain circuit or wiring faults some detectors could be accessible only from one of the ports A and B. A corresponding loop fault message will be shown on the display. To localize the fault it will be necessary to know which detectors are accessible and from which port.

```
Diag Loop:
     Detector 3/2: No access from port A
```

With buttons PREV and NEXT you can navigate through compromised detectors.
More information you can find in section „Fault Finding“ of this manual.

10.3.5.3 Device

This function is only available on the smoke detection panel. For each detector the following values will be shown:

- actual analog value from last polling and
- time average analog value:

```
Diag Detector 1/1:
     Value: 25  Average: 25
```

With buttons PREV and NEXT you can navigate through all detectors.
More information about analog values and average values of the detectors you can find in section „Technical Description“ of this manual.

10.3.6 Configuration data

The configuration menu is divided into 3 sub-menus:

```
<Project name max. 34 characters>
[CANBUS]      [LOOP]       [PANEL]
```

Different configurations are referred to their project names, e.g. SMM 2016 in this case.

10.3.6.1 CAN-bus configuration

This sub-menu will provide the information about how much modules are configured in the system and if the CAN bus redundancy is activated.

```
CAN-bus     Modules on CAN-bus: 2
            Redundant: YES
```

10.3.6.2 Loop configuration

The sub-menu LOOP is also divided into 3 sub-menus:

```
Select a function:
[LOOP1]      [LOOP2]       [DEVICE]
```

`[LOOP1]` and `[LOOP2]` provide the same kind of information:

```
Loop2 devices: 2
       Port B: ON
```

Sub-menu `[DEVICE]` shows the configuration data for each detector:

```
Detector 1/1:
        Flow: YES         Fan: YES
```

`Flow` – determines whether the airflow detection for the referenced detector is activated
`Fan` – determines whether a flow fault on this detector shall be taken into account by the automatically fan switch over in case of failure of the active fan.
With buttons PREV and NEXT you can navigate through all detectors.

Please note:
The number of detectors per loop, the optional activation of port B for loop 1 and 2, the assignment of an airflow detector to an address and the assignment of an address to the fans depend on the project requirements.

10.3.6.3 Panel configuration

The sub-menu provides the following information:

- software name and version,
- whether the panel is an control panel or not (control and indication master according EN-54).

```
Module Addr.1:  SW: sw-CM3100A-01.01.000
     Control panel: YES
```

With buttons PREV and NEXT you can navigate through all modules.

10.3.7 Log function

Each CP-3100 has a log function with a capacity of approx. 1023 entries. If the log memory is full and a new message arrives, the oldest log message will be deleted before the new message will be saved.

Each entry will be shown as clear text with time stamp. The time stamp is shown as „dd.mm.yy hh:mm:ss“.

```
Log 106/106                        22.06.16 12:47:23
RESET: Detector 3/1
```

With buttons PREV and NEXT you can navigate through all entries.

10.3.8 RTC - Real Time Clock

Each panel has a real time clock (RTC), which must be adjusted independently: there is no time synchronization between panels. The time stamp provided by the RTC is used for log function. The adjusting of time can be made via the menu [RTC].

```
RTC:                  Date: 22.06.16 Time: 12:47:23
[NEXT]         [-]           [+]
```

The soft key [NEXT] moves the cursor to the next part of the time stamp. e.g. from years to hours. Soft keys [+] and [-] allow the adjustment of the values.

After pressing the button RETURN button the new date and time must be confirmed by pressing [SAVE]:

```
RTC:                  Date: 22.06.16 Time: 13:47:23
[SAVE]                                     [CANCEL]
```

10.4 Menu structure (access level 2)

Menu in access level 2 (to enter this menu, press SILENCE button for more than 6 seconds)

- [RESET] (→ reset-dialog)
- [FANS] (→ disable / switch fans)
- [MORE]

↓

- [DISABLE] (→ disable / enable detectors)
- [TEST]
  - [RELAIS] (→ toggle relays)
  - [SERVICE] (→ service mode activation / deactivation)
- [MORE]

↓

- [DIAG]
  - [CANBUS] (→ CAN-BUS A/B diagnostic)
  - [LOOP] (→ loop fault diagnostic, info button)
  - [DEVICE] (→ detector diagnostic, analogue value, smoke threshold, info button)
- [CONFIG]
  - [CANBUS] (→ number of modules, redundancy of CAN bus)
  - [LOOP] (→ loop fault diagnostic)
    - [LOOP1] (→ number of detectors, port B active)
    - [LOOP2] (→ number of detectors, port B active)
    - [DEVICE] (→ detector name, airflow detector attached, fan dependance)
  - [MODULE] (→ module address, type and software-version)
- [MORE]

↓

- [LOG] (→ log entries, info button)
- [RTC] (→ set date and time)

11 Configuration

11.1 General

The configuration of a smoke detection system can be adapted easily to different project requirements. Normally *safetec* delivers the smoke detection systems readily configured according the customer requirements. However a trained technician can modify certain configuration values after delivery, if required. Furthermore a trained technician can carry out the complete configuration.

Several methods are possible to proceed changes at the configuration. These methods are described below. The configuration process will always be proceeded at the smoke detection panel (address no.1).

11.2 Unlock configuration memory protection

The configuration memory is protected against accidental access. To unlock the memory, switch the configuration jumper on the rear side of the display panel to position “ON” (a tool is required):

- the display shows “CONFIGURATION MODE”,
- all LEDs are flashing.

After the configuration has been finished, the configuration jumper must be switched to position ”OFF”. The smoke detection system continues with normal operation.

11.3 Configuration via menu

All configuration parameters can be configured via menu. The four soft keys under the display can be used to navigate in the configuration menu and to change the parameter values. The meaning of each soft key will be shown on the display exactly above the corresponding soft key. To find the desired parameter please refer to the configuration menu structure below.

11.4 Configuration by chip exchange

The system configuration can also be modified by exchanging of the configuration memory chip. Please refer to the separate work instruction, available on demand for the replacement of the configuration chip.

11.5 Configuration by a text file via the serial interface

11.5.1 Configuration file

To configure the system via serial interface the configuration file must be created. The configuration file (typiccaly config.txt) is simple text file, which contains the whole configuration, specially prepared for transmission.
Configuration file is divided in lines, each contains a pair: a keyword and corresponding value.

11.6 Updating the configuration in remote panels

Remote panels receive their configuration data from the smoke detection panel (address no. 1). Due to the memory protection mechanism it is necessary to switch the remote panels in configuration mode before the configuration data can be transferred via the CAN-bus. While receiving the configuration data, the display on the remote panel will show the message:

- “Receive Config Data Block: XXXX”

where XXXX is consecuitive configuration data packet number.

When configuration data is transmitted successfully, the display shows:

- "CONFIGURATION MODE"

Switch the configuration jumper to position "OFF" to return to normal operation.

Important Notice:
Do not switch the panels into normal operation mode before the configuration process is completed! If you do so accidentally, re-configure the panel.

11.7 Required parameters for configuration

The following parameters are required for configuration of the Smoke Detection System SDS-72:

Menu	*Subject*	*Limitation*	*Remark*
PROJECT	Project Name	max. 34 letters	
GENERAL → Act. Device address	Current panel CAN bus address	1 – 4	Must be configured on each module.
GENERAL → CAN-BUS MODULES	Number of CAN-Bus Addresses, i.e. CP-3100 panels	1 - 4	
GENERAL → CAN-BUS REDUNDANT	Supervision of the CAN Bus redundancy.	ON/OFF	
GENERAL → LOOP 1 DEVICES	Number of addresses for loop 1	max. 72 per one loop, max 72 detectors in one system on both loops	Limitation is calculated automatically.
GENERAL → LOOP 1 PORT B	Port B activation for LOOP 1	ON/OFF	
GENERAL → LOOP 2 DEVICES	Number of addresses for loop 2	max. 72 per one loop, max 72 detectors in one system on both loops	Limitation is calculated automatically.
GENERAL → LOOP 2 PORT B	Port B activation for LOOP 1	ON/OFF	
DEVICE → DETECTOR <XX>/<Y> → NAME	Name for each address on detector loops	max. 34 letters	Optional. If no name is configured, each detector will be identified by its number and loop.
DEVICE → DETECTOR <X>/<Y> → FLOW	Airflow monitoring at detector	ON/OFF	OFF- the flow across the corresponding smoke detector will not be monitored

Menu	*Subject*	*Limitation*	*Remark*
DEVICE → DETECTOR <X>/<Y> → FAN	Fan(s) controlling by airflow detectors	ON/OFF	If all detectors with the setting configured reports the air flow fault, the fans will be switched over. The setting can be configured only if FLOW is already configured for this detector
MODULES → MODULE No.: <X> CTRL:	Control panel setting for this module	ON/OFF	ON – panel is control panel of the system

11.8 Configuration menu structure (access level 3)

Menu in access level 3 (set configuration jumper to position “ON”)

- [GENERAL]
  - [EDIT] (→ this module address)
- [MORE]
  - [EDIT] (→ CAN-Bus)
    - [MODULES] (→ number of modules on CAN-bus)
    - [REDUND] (→ redundant CAN-bus: yes/no)
- [MORE]
  - [EDIT] (→ loop 1)
    - [DEVICE] (→ number of detectors on loop 1)
    - [PORT B] (→ port B of loop 1: on/off)
- [MORE]
  - [EDIT] (→ loop 2)
    - [DEVICE] (→ number of detectors on loop 2)
    - [PORT B] (→ port B of loop 2: on/off)
- [DEVICE] (→ select detector number)
  - [EDIT] (→ this module address)
    - [NAME] (→ edit detector name to be used in the display)
    - [FLOW] (→ an airflow monitor is assigned: yes/no)
    - [FANMON] (→ airflow monitor active in fan monitor group: yes/no *))
- [PROJECT] (→ edit project name)
- [MODULES] (→ select module number)
  - [EDIT] (→ this panel is a control panel: yes/no)

*) Menu entry [FANMON] is visible only if an airflow monitor is assigned.

12 Interfaces to External Systems

12.1 Relay Contacts

The smoke detection system SDS-72 offers voltage free relay contacts for signal transmission to external alarm monitoring systems. The relay contacts are located on the main board in the smoke detection panel and on the adapter module in the remote panel. For the convenience of the installation staff the main board and the adapter module are fitted with facilities to easily connect end-of-line resistors (EoL) and alarm resistors (ALR) according the requirements of the alarm monitoring system.

The following signals are available in the smoke detection panel and in the remote panel:

Signal	*Description*	*Remark*
Fire Alarm	Active, if a fire has been detected.	*)
Fire Alarm 2 min Delay	Active, if a fire alarm has not been acknowledged from the control panel within two minutes after fire alarm has been issued.	
Fault	Active, if any fault condition has been detected.	*)
Disabled	Active, when a smoke detector or the fans are disabled.	
Max. contact load of the relays: 30 V DC / 2 A		

*) If further fire alarms or faults are detected, the corresponding relay will be reset and after 4 seconds set again.

12.2 NMEA-Interface for voyage data recorder (VDR)

12.2.1 General

For data transfer to the voyage data recorder (VDR), the NMEA-protocol via a RS-422 interface is used. The NMEA-protocol implemented in SDS-72 system corresponds to IEC 61161-1:2011.

The following messages will be sent by the NMEA protocoll:

- periodical heartbeats to indicate that the SDS-72 system is alive,
- status change of each detectors, including the information about acknowledge status,
- other fault state changes such as common system fault and power supply fault, including the information about acknowledge status,
- disablement of fans and
- system status information at regular intervals, including the detector state and the information about occurred faults.

The SDS-72 system uses “FR” in all NMEA-messages as the talker identifier for the NMEA-Protokoll.

12.2.2 Heartbeat

Heartbeat will be sent on start of the system and every further minute to provide information that the smoke detection system is alive.
A typical sequence for a heartbeat message is:

```
$FRFIR,S,163402,FS,01,,001,,,HEARTBEAT *xx
```

with

`S` – system status
`163402` – 16:34:02 panel time
`FS` – smoke type detector
`01` – address of control panel sending this message.
`001` – total number of alarm, faults and disablement

12.2.3 Detector state

A message of this type will be sent by each change of the detector state and by the system status transmission.
A typical sequence for this message is:
`$FRFIR,E,154217,FS,01,001,001,A,V,Cargo Hold 1,*xx`
with

`E` – status for corresponding detector
Another possible value can be:
`D` – for detector disablement
`154217` – 15:42:17 panel time
`FS` – smoke detector type
`01` – address of control panel sending this message
`001` – loop number
`001` – detector address
`A` – for detector activation.
Another possible value can be:
`V` – for non activated detector
`X` – for detector in fault condition
`V` – for non acknowledged state of the detector
Another possible value can be:
`A` – for acknowledged alarm or fault

12.2.4 Other faults as detector faults

The message of this type will be sent by each change of a fault state and by the system status transmission.
A typical sequence for this message is:
`$FRALA,154217,FR,SM,01,001,H,V,,*xx`
with

`154217` – 15:42:17 panel time
`FR` – fire detection system
`SM` – sub-system indicator regarding EN61162 for smoke setection
`01` – panel address
`001` – fault number according the table below
`H` – for fault activation.
Another possible value can be:
`N` – for normal state
`V` – for non ackonwledge state of the fault
Another possible value can be:
`A` – for acknowledged fault

Table: *Fault numbers for* `$FRALA`

Fault number	***Fault description***
001	Power Supply 1
002	Power Supply 2
003	Loop 1 Circuit Fault
004	Loop 2 Circuit Fault
005	Earth Connection Fault
006	Airflow Fault
007	Common CAN Bus Fault
008 - 011	Physical memory fault for each module

Fault number	*Fault description*
012 - 015	Configuration memory fault for each module
016 - 019	Watchdog Reset/System Start for each module
020 - 023	Incompatible Hardware Fault for each module
024 - 027	Module Fault
028 - 035	Fault Fan for each fan

12.2.5 Fans status and disablement

This sentence is used to transmit the disablement state of the system fans.
A typical sequence for this message is:
$ FREVE,125532,1,FANS DISABLED *hh
where

125532 – 15:42:17 panel time
1 – Tag code for fan disablement
Another possible value can be:
0 – for fans reactivation
FANS DISABLED – state description

12.2.6 Status information

Every 5 minutes SDS-72 sends the complete status information about each fault and fire alarm. The status information is preceded with this message:
`- $FRFIR,S,<time>,FS,01,,<total number of alarms>,,,STATUS TRANSMISSION BEGIN,*xx`
After that separate messages for each detector in activated or fault state and for activated faults according section „Detector state“ and „Other faults as detector faults“ of this manual are following.
The status transmission ends with the following message:
`- $FRFIR,S,<time>,FS,01,,<total number of alarms>,,,STATUS TRANSMISSION END,*xx`

Important Notice!
Please note that the individual messages during status information will be transmitted without a time stamp.

13 Fault finding

13.1 Table of faults

All possible faults of the smoke detection system SDS-72 will be indicated on the displays of all connected panels simultaneously. Please find hereafter a description of all possible fault indications.

Important Notice!
Only one fault can be shown on the display at the same time. For access to other faults please use the arrow keys "<" and ">" below the display. More information about soft keys can be found in section "**User interface**" of this manual.

The following table shows possible faults messages:

Fault Indication	*Possible Cause*	*Action*	*Possible Values*
All Valves and Fans	Either all section valves are closed or both fans are out of order. No airflow has been detected at any airflow detector *) with any fan running. *) Only airflow detectors, assigned to the fans will we be evaluated. See manual for details.	1. Check position of section valves. 2. Check function of fans.	
CAN Bus A	Fault on CAN Bus channel A	Press INFO-button to determine the location of the fault. Possible Indications: 1. This module: CAN Bus A Fault 2. This module: CAN Bus B Fault 3. This module: CAN Bus A+B Fault 4. This module: No CAN Bus Fault Read section 13.5 for a detailed fault finding description.	
CAN Bus B	Fault on CAN Bus channel B		
CAN Bus A+B	Fault on CAN Bus channel A and B		
Circuit loop <LOOP>	Short circuit between isolators or open circuit somewhere on loop <LOOP>.	1. Check the loop cable. 2. Read section 13.4 for a detailed fault finding description.	<LOOP>: 1, 2

Fault Indication	*Possible Cause*	*Action*	*Possible Values*
Config Memory Address <ADDR>	The configuration data saved in smoke detection panel are not consistent.	1. Repeat the configuration process of the smoke detection panel. 2. Replace the defective module CM-3100, if the fault occurs again.	<ADDR>: 1 - 4
Defective DETECTOR <DET>/<LOOP>	Detector is accessible, but cannot work properly due to internal faults.	Replace defective detector.	<DET>: 1 - 72 <LOOP>: 1, 2
Dirt in DETECTOR <DET>/<LOOP>	Detector <DET> on loop <LOOP> is dirty.	Clean the corresponding detector.	<DET>: 1 - 72 <LOOP>: 1, 2
Earth (-)	Earth connection to 0V.	Locate and remedy false connection.	
Earth (+)	Earth connection to +24V.	Locate and remove the corresponding earth connection.	
Fan <x>	Fan <x> seems to be defective because no airflow has been detected at any airflow detector *), while fan <x> was selected. The system has switched to the standby fan. *) Only airflow detectors assigned to the fans will be evaluated. See manual for details.	1. Check function of fan <x>. 2. Check the fuse or overload protection of this fan. 3. Refer to section 13.3 for a more detailed description.	<x>: 1, 2
Flow DETECTOR <DET>/ <LOOP>	The airflow along the corresponding detector <DET> on loop <LOOP> is too weak or is absent.	Read section 13.2 for a detailed fault finding description.	<DET>: 1 - 72 <LOOP>: 1, 2
Incompatible Hardware at Address <ADDR>	1. A Control Module for Remote Panel BG03.102 has been connected to Main Board MB-3500. 2. The module at address is neither BG03.100 nor BG03.102. 3. Main board MB-3500 or adapter ADP-3500 defective. 4. Wrong adapter.		<ADDR>: 1 - 4

Fault Indication	*Possible Cause*	*Action*	*Possible Values*
Missing DETECTOR <DET> /<LOOP>	The detector <DET> on loop <LOOP> is not accessible from both loop ports. The detector is removed or the wiring is faulty.	1. Check the loop cable (voltage at detector). 2. Replace the defective detector.	<DET>: 1 - 72 <LOOP>: 1, 2
Module <ADDR>	There is no connection between the indicated module and the panel, which shows the message, because of 1. broken cable, 2. missing module, 3. defective module	1. Check the CAN bus cable wiring and its connection to the module. 2. Check the function of the module.	<ADDR>: 1 – 4
Physical Memory Address <ADDR>	The internal memory is defective.	Replace defective module.	<ADDR>: 1 – 4
Power Supply A address <ADDR>	Faults related to the 24V-supply channel A	Press INFO-button to determine the location of the fault. Possible Indications: 1. This module: Power Supply A Fault 2. This module: Power Supply B Fault 3. This module: no Power Supply Fault Check the corresponding cable wiring.	<ADDR>: 1 – 4
Power Supply B address <ADDR>	Faults related to the 24V-supply channel B		<ADDR>: 1 – 4
Short circuit port <PORT> loop <LOOP>	Short circuit between main board terminals of port <PORT> of loop <LOOP> and the first bus isolator.	1. Check the loop cable. 2. For more Information please refer to section “Wire faults on detector loops” below.	<PORT>: A, B <LOOP>: 1, 2
Type of detector <DET> loop <LOOP>	A false detector type is installed.	Insert the correct detector type.	<DET>: 1 - 72 <LOOP>: 1, 2
Type of module <ADDR>	The type of module <ADDR> does not correspond with the configuration.	Replace with the correct module type.	<ADDR>: 1 – 4
WD reset address <ADDR>	Due to a software error or a physical harm the panel proceeded a watchdog reset.	1. Reboot the system 2. Replace the defective module, if failure occurs more than one time.	<ADDR>: 1 – 4

13.2 Fault: Flow Detector x/y

This fault can be generated for each detector separately, if the airflow along the corresponding detector is too weak, provided the flow control is configured for this detector.

Possible causes are:

- the pipe of corresponding detection line is blocked and must be cleaned, or

- the block valve, smoke detection valve or 3/2-way valve is closed, or
- the airflow detector of this sampling pipe is defective.

For fault finding please proceed as follows:

- Remove the flexible hose of the appropriate sampling pipe at the smoke detection panel resp. smoke detection unit. If the airflow fault indication for this detection line disappears now, the sampling pipe seems to be clogged and must be cleaned.
- If the fault indication is still present, proceed as follows

  Smoke detection panel / extension panel
  Open the housing in which the airflow detector is located. Disconnect the cable from the airflow detector at the sensor connection module in the middle of the housing. Short circuit the open terminals of the sensor connection module. If the airflow fault for this sampling pipe disappears now, the airflow detector must be replaced.

  Smoke detection unit SDU
  Open the smoke detection unit, disconnect the wires from the airflow detector and short circuit the disconnected wires. If the airflow fault for this sampling pipe disappears now, the airflow detector must be replaced.

13.3 Fans faults

This fault message will be generated if no airflow has been detected at any airflow detector, which has been configured for fan monitoring:

```
CHECK Fan <fan number>
                    1 of 1
```

The separate flow fault messages for each detectors will be reseted and will be not shown on display. The system will switch to the standby fan automatically. If then at least one detector resets its airflow fault, the smoke detection panel assumes that the previous fans is defective. Therefore the smoke detection panel will not switch over to the previous fan after 24 hours. Switching to the previous fan is possible only via the menu.
If however after switching to the standby fan all airflow faults remain active, the following fault message will be shown:

```
CHECK All Valves and Fans
                    3 of 3
```

In this case it is probable, that either both fans are defective or all sampling pipes are blocked by the valves.

13.4 Circuit faults in smoke detector loops

13.4.1 General description

These circuit faults are related to smoke detector ring loops with loop isolator only.

There are three possible fault causes:
- short circuit on port A,
- short circuit on port B and
- short circuit between two isolators on the loop or open circuit in the loop.

When one of these faults occurs, the system will be set into an emergency addressing mode, to ensure that all detectors are accessible at least from one port.

Every 10 minutes the system tests if the fault is still present by returning to normal addressing mode. If the fault cause is not eliminated, the system continues with the emergency addressing mode.

Important Notice!
Because of the nature of the fault the system has not full redundancy in emergency addressing mode.
The fault cause is to be located and removed as soon as possible.

13.4.2 FAULT: Short circuit on port A or B

The short circuit fault on loop port A or B will be detected if there is a short circuit directly between the port terminals of a port on the main board and the first isolator in the loop. The affected port will be switched off and the detectors will be polled from the other port. The fault cause can easily be identified by checking the cable wiring between main board terminals and the first isolator on the loop.

13.4.3 FAULT: Circuit

This circuit fault on the loop will be generated if there is an open circuit or short circuit on the loop between two isolators. This causes that the loop is not closed any longer, but all smoke detectors on this loop are accessible either from port A or from port B. Therefore the smoke detection panel will switch on both ports of this loop permanently.

In MENU → [MORE] → [MORE] → [DIAG] → [LOOP] you can see the detectors which are not accessible from port A resp. port B. This information together with the wiring diagram helps to locate the fault cause.

13.5 Fault finding in CAN-Bus A or CAN-Bus B

This type of fault can be caused by:

- Interrupted connections of CAN-H or CAN-L wiring
- short circuit between CAN-H and CAN-L wiring
- short circuit between CAN-H / CAN-L and 24V / 0V wiring
- module failure

These fault types are displayed at all connected modules. However, depending on the type of fault, the fault may be detected only by *one* or by *more* modules. So as the first step figure out, which module has detected the fault:

13.5.1 Read out fault information

13.5.1.1 Read out CAN bus fault message

Find a module, which has *detected* the CAN bus fault (it can be detected by more than one module). For this, select the CAN bus fault message and press the **i**-button. The bottom line of the display must show "This module: CAN Bus A FAULT", see example below).

Example:

```
FAULT CAN Bus A
This module:  CAN Bus A FAULT
```

There is a CAN bus A fault in the system, and (at least) this module has detected the fault.

This module will provide more information:

13.5.1.2 Read out CAN bus diagnostics

At this module, which has *detected* the fault, navigate to the CAN bus diagnostics menu:

MENU → MORE → MORE → DIAG → CANBUS.

Select with buttons < and > to the failed CAN bus channel (A or B):

```
Diag CANBUS A:
ShCirc:<S>/TBUF:<D>/RBUF:<E>/DIF:<T>
```

The bottom line of the display gives the following information:

<S> - 0: no short circuit
1: short circuit to 0V → proceed with 13.5.2
2: short circuit to 24V → proceed with 13.5.2
<T> - 0: no fault
1: data transmission problems → proceed with 13.5.3

13.5.2 Locate a short circuit (between CAN data lines and 0V or 24V)

13.5.2.1 Measure the voltage on the CAN bus

Measure the voltage between CAN-H and 0V and also between CAN-L and 0V. Any voltage between 0,7 and 5VDC is normal (no short circuit!) and a defective module must be considered. In this case, replace the module, which has detected the fault (refer to 13.5.1.1).

13.5.2.2 Check the wiring

- Check the wiring at the CAN bus terminals for any short circuit.
- If this doesn't help to locate the short circuit, and there is more than one cable segment on CAN bus A resp. B (if more than 2 addresses are in the system), identify the defective cable segment with the help of the following instruction. The instruction helps to examine the cable segments, beginning with the cable segment at the module with the next-to-last address leading to the module with the last address. Than the

instruction continues with the previous cable segment at the next lower address until the fault is located. The following instruction assumes a system with 3 addresses:

13.5.2.3 Localization procedure

Precondition is the information about ...

- the defective CAN bus channel A or B <C> (refer to 13.5.1.2) and
- the short circuit fault no. 1 or 2 <S> (refer to 13.5.1.2)

The diagnosis value <S> = 1 indicates a short circuit between CAN-H/CAN-L and 0V, and a diagnosis value <S> = 2 stands for a short circuit between CAN-H/CAN-L and 24V:

<C>	*<S>*	*what to do ...*	*result ...*
CAN bus fault A	1	Disconnect 0 V (clamp 21b) at module address 2, between module addresses 2 and 3.	**If the fault disappears at module address 2 after pressing ACK, the cable of CAN bus A between modules 2 and 3 must be defective.**
	2	Disconnect 24V (clamp 11b) at module address 2, between module addresses 2 and 3.	
CAN bus fault B	1	Disconnect 0 V (clamp 24b) at module address 2, between module addresses 2 and 3.	**If the fault disappears at module address 2 after pressing ACK, the cable of CAN bus B between modules 2 and 3 must be defective.**
	2	Disconnect 24V (clamp 14b) at module address 2, between module addresses 2 and 3.	

If the fault does not disappear at module address 2, repeat this procedure with the cable segment at the next lower addresses (subtract 1 from the above address numbers).

13.5.3 Locate a data transmission problem

Keep in mind the *original fault message,* since it will be referenced to later in the procedure!

13.5.3.1 CAN bus termination resistance

Switch off the system and check the bus termination resistance. It should be approx. 60 Ohms between CAN-H and CAN-L (2 x 120 Ohms in parallel at both ends of the bus).

CAN bus A	60 Ohm between clamps 12x and 22x at any module
CAN bus B	60 Ohm between clamps 14x and 24x at any module

13.5.3.2 Check the wiring

Check the wiring at the CAN bus terminals for any circuit interruption. If this doesn't help to locate the fault, identify the defective cable segment with the help of the following instruction. The instruction helps to examine the cable segments, beginning with the cable segment which leads from the module with the lowest address to the module with the next-lowest address, and then continues with the next cable segment at the next higher address until the fault is located:

13.5.3.3 Localization procedure for the defective segment

If the system consists of only 2 module addresses, then there is only one segment that may be defective. Skip the following procedure and continue with 13.5.3.4!

what to do ...	*result ...*
Enter the service mode (Menu → Test → Service Mode)	The service mode allows acknowledging alarms at each panel.
• Disconnect data bus A and B connection at module address 1 (clamps 12/22 and 14/24) between module addresses 1 and 2. Activate the EoL jumper (J1 and J2) on the adapter ADP-3500 of module 2. • Acknowledge all faults. • *Is the original fault* not longer reported on any module ? (ignore additional fault messages like „Missing module“)	If the original fault is not longer reported, this segment is the defective. Reconnect the data bus connection, set the jumpers to original position and proceed with 13.5.3.4.
If only one segment at the next higher address remains ...	… the remaining segment is defective. Proceed with 13.5.3.4.
Repeat the above procedure with the cable segment at the next higher addresses (add 1 to the above address numbers), until you have identified the defective segment and then proceed with 13.5.3.4.	

13.5.3.4 Fault identification procedure

Since the fault may be caused either by wiring issues but also by a defective module, the following procedure helps to isolate the component of the segment that causes the fault:

what to do ...	*result ...*
Swap data bus A /B connection at the module with the lower address of the defective segment (clamps 12 ↔ 14, 22 ↔ 24)	
Acknowledge all faults	
Check the fault report of this module (navigate to the CAN bus fault and press the **i**-button to see what fault is reported by this module).	**If the o*riginal fault* is reported (compare precisely), this module is defective and needs to be replaced.**
Re-swap data bus A /B connection at the module with the lower address of the defective segment (clamps 12 ↔ 14, 22 ↔ 24)	
Swap data Bus A /B connection at the module with the higher address of the defective segment (Clamps 12 ↔ 14, 22 ↔ 24)	
Acknowledge all faults	
Check the fault report of this module (navigate to the CAN bus fault and press the **i**-button to see what fault is reported by this module).	**If the o*riginal fault* is reported (compare precisely), this module is defective and needs to be replaced**
Re-swap data bus A /B connection at the module with the higher address of the defective segment (clamps 12 ↔ 14, 22 ↔ 24)	**CAN bus wires must be interrupted anywhere in this segment. Replace the cable.**

13.6 Contact service for additional support

If you need to contact a service station for additional support please provide the following information:

- the project reference,
- the serial number of the device(s),
- all text messages on the displays of all panels,
- the information from diagnosis menu,
- the circumstance of fault appearance.

14 Commissioning and maintenance

14.1 General

Observe MSC.1/Circ. 1318 and the rules of the responsible flag states / authorities regarding sample extraction smoke detection systems and the piping of gas extinguishing systems using CO2.

14.2 Function tests

14.2.1 Daily routine tests

Operation	Check whether the green lamp at the smoke detection panel and at the remote panel(s) is on.
Fault indications	Check the smoke detection panel or the remote panel for any fault warnings.
Lamp test	Check buzzer, lamps and display by pressing the SILENCE button at the smoke detection panel and at the remote panel(s).

14.2.2 Tests at least every 30 days

Section valves	Check whether all valves are in the correct position (MSC.1/Circ. 1318, Chapter 4.1.1).
Hoses	Check whether all flexible hoses are properly fastened and undamaged.
Pipework	Check sampling pipes (MSC.1/Circ 1318, Chapter 4.1.3).

14.2.3 Tests every 3 months

See “Commissioning and Maintenance Checklist” and “Maintenance Checklist for Fans” on the following pages. Every step / check shall be documented on the “Commissioning and Maintenance Checklist”. The filled checklist shall be filed with the documents of the accordant smoke detection system.

14.3 Commissioning and Maintenance Checklist

	Steps	*o.k.*	*not o.k.*	*n/a*
1	**Smoke accumulators** Check for location and secure mounting of the smoke collectors in the monitored areas.			
2	**Sampling pipe and hose connections** Check all pipe and hose connections for secure fastening and support. Check for mechanical damage of the piping using suitable methods.			
3	**Assignment of sampling pipe and hose connections** Check the correct assignment of sampling pipes to the smoke detection system.			
4	**Cleaning the sampling pipes** *) Clean all sampling pipes with compressed air. The sampling pipes must be free of rust, dirt and other particles. **WARNING**: Before doing this, ensure that the flexible hoses are disconnected from the smoke detection panel and extension, because otherwise the pressure switches which monitor the air flow could be damaged. 			
5	**Cable connections** Check all cable connections and cable shields for proper position and correct connection.			
6	**Earth connections** Check the earth connection.			
7	**SDS-M0460 only: check for correct configuration of motor connections** Compare with documentation for correct star or delta configuration.			
8	**Termination resistors for CAN-bus** Check correct setting of the jumper for the120 Ohm termination resistor at the last remote panel. *The smoke detection panel has firmly integrated 120 Ohm termination resistors for CAN-bus A and CAN-bus B at its end of the CAN-bus. For details please refer to "Termination resistors for the CAN-buses" in chapter "CAN-Bus".*			
9	**Valve positions** Check the correct positions of the 3/2-way valve resp. CO_2 section valve, smoke detection valve and block valve.			
10	**Switch on the smoke detection system** *Ensure that no painting or welding is going on in the monitored areas (contamination hazard for the smoke detectors).*  Turn on main and auxiliary power supplies. Acknowledge the fault warnings if any, and if necessary, remedy the reported fault(s).			
11	**SDS-M0460 only: motor current** Measure the motor current while all smoke detection valves and block valves are open. If the current exceeds the nominal current, the airflow volume in the short sampling pipes must be reduced.			
12	**Lamp test and buzzer test**			

	Steps	*o.k.*	*not o.k.*	*n/a*
	Press SILENCE button not longer than 6 seconds. All lamps, the background light for the display and the buzzer must be on while the button is pressed.			
13	**Power supply** Check function of main and emergency power monitoring. For this, switch off the main and the emergency power supply one at a time. A corresponding fault warning must appear.			
14	**Airflow monitoring** ***)** Close each block valve one at a time. After a few seconds a corresponding fault warning must appear for each sampling pipe.			
15	**Smoke test** ***)** Carry out a smoke test for each smoke accumulator. For this, bring a smoke generator in the vicinity of each smoke accumulator. A suitable smoke generator is available on request (part no. B30.001). Check the fire alarm at the smoke detection panel and at the remote panel(s). The fire alarm must be active 180 s (vehicle decks) resp. 300 s (container- and general cargo holds) after the insertion of the smoke even for the most remote smoke accumulator. *For the **3-monthly-check**, test gas can **alternatively** be blown directly into the flexible hose at the smoke detection panel or into the open smoke detection unit.* ***Important:** The test gas must be present at the smoke detector for several seconds. Close appropriate block valve to prevent quick removal of test gas during test.*			
16	Fire alarm 2 min delay Let a fire alarm go for at least 2 minutes without acknowledging it. The relays “fire alarm 2 min delay” must be active after that.			
17	Final test Reset the fire alarms and ensure that no fault warnings are indicated. When no fault and no fire alarms are shown any more, the smoke detection system is ready for operation. **WARNING**: In case of any paint or welding works in the cargo holds the smoke detection system shall be switched off to avoid soiling of optical components! 			

.....	.....	.....
Place and Date	Name	Signature

*) Test shall be repeated every 3 month!

See additional checklist for fans on the next page!

14.4 Commissioning and Maintenance Checklist for Fans

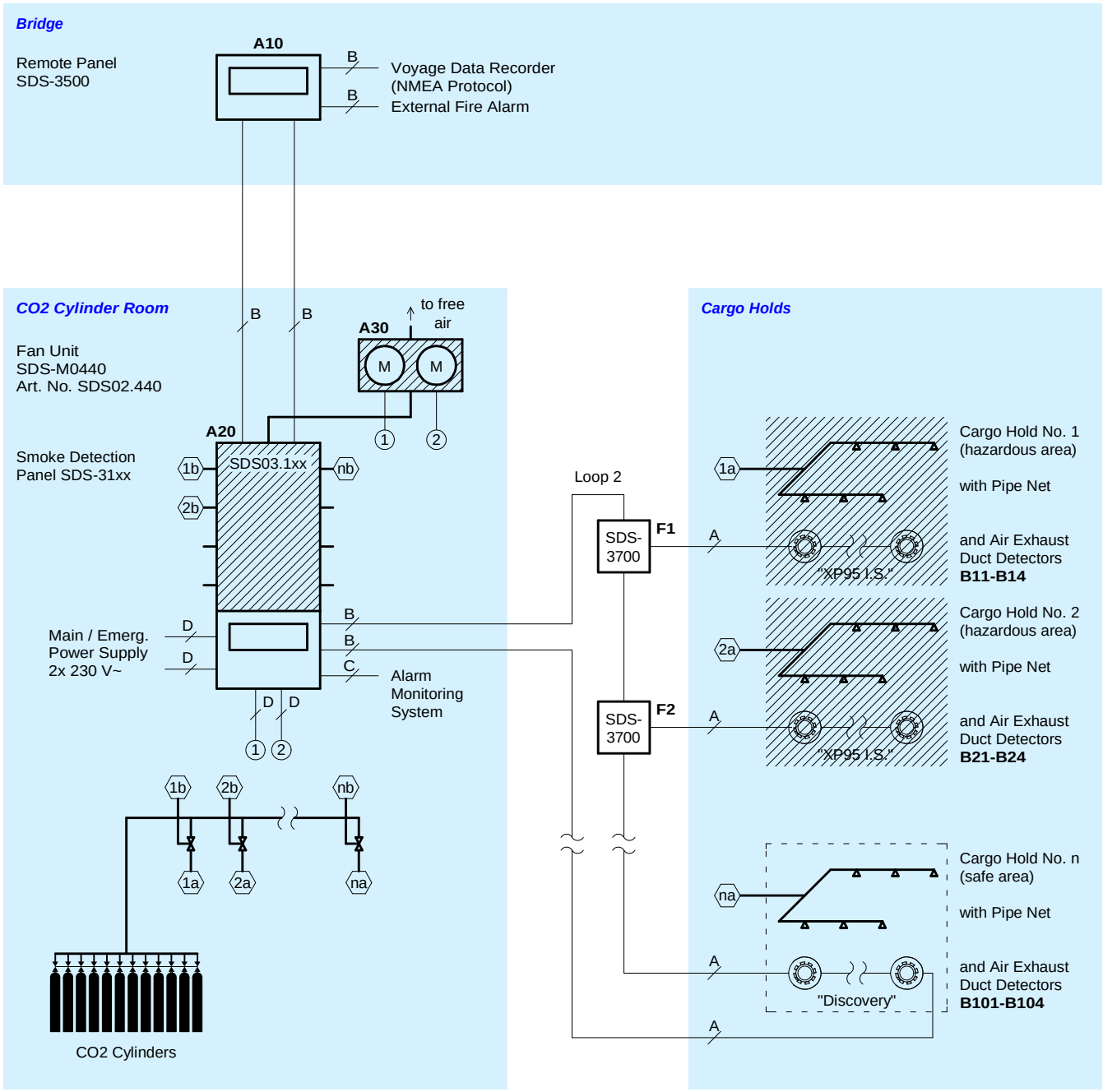
For fan units SDS-M0440 and SDS-M0441 please see separate “Installation and Operation Instructions”, part. no. DOK02.055! The following steps shall be carried out every 3 month!

	Steps	*o.k.*	*not o.k.*	*n/a*
1	**Damage and corrosion** Check fan unit for any damage or corrosion. Do not switch on a fan unit with any deformation of the enclosure and with corroded parts. 			
2	**Vibration dampers** Check, that the rubber vibration dampers are in good condition.			
3	**Dust and dirt** Clean fan unit from contamination with dust or dirt.			
4	**Pre filter** Wash pre-filter (if mounted) with warm water. Exchange pre-filter if necessary.			
5	**Sealings** Check whether sealing of the fans is not damaged or worn out.			
6	**Earth connection** Ensure, that the fan is properly connected to earth.			
7	**Screw connections** Check tightness of all screw connections.			
8	**Hose and pipe connections** Check the tightness of pipe connections between the smoke detection panel / extension panel, the fans and the outlet to free air with leakage detection spray while the fan unit is running.			
9	**Test fan no.1** Switch to fan no.1 and check whether the fan no.1 is drawing air.			
10	**Test fan no.2** Switch to fan no.2 and check whether the fan no.2 is drawing air.			
11	**Automatic fan switch over** Test the automatic switch over function by closing all block valves. As soon as all airflow detectors have detected an airflow fault, the smoke detection panel switches to the standby fan. Please note, that this function cannot be repeated until the next system reset! **Warning**: Do not remove the fuse of a running fan for test purposes! 			
12	**Vibrations** Check the motor bearings and the complete fan unit for irregular vibrations and unusual running noise. For more details please refer to ISO 14694:2003. *safetec* recommends to measure vibrations on a regular base with a vibration meter (Art. No. B06.970).			

.....	.....	.....
Place and Date	Name	Signature

Smoke Detection System SDS-72

Principal System Arrangement in CO2 Cylinder Room for Connection to Small Suction Pipes and Monitoring of Air Exhaust Ducts



—(1)	Electric Cable Electric Cable Interface		Hazardous Area
—(1)⋈	Pipe Pipe Interface Valve	SDU	Smoke Detection Unit (SDU) SDS-3300
SDS-3600	Junction Box for Power Supply and Fan Units		Smoke Detector "Discovery" resp. "XP95 I.S."
SDS-3700	Junction Box with Loop Isolator and Galvanic Isolator	M	Suction Fan SDS-M0460

No.	Cable Types	Glands
A	TCX(C)331 150/250 (300)V 1 x 2 x 0,75	MS20
B	TCX(C) 150/250 (300)V 2 x 2 x 0,75	MS20
C	TCX(C) 150/250 (300)V 4 x 2 x 0,75	MS20
D	MPRX 2 x 1,5	MS20
E	MPRX 3 x 1,5	MS20

Refer to protection notice ISO 16016.

safetec

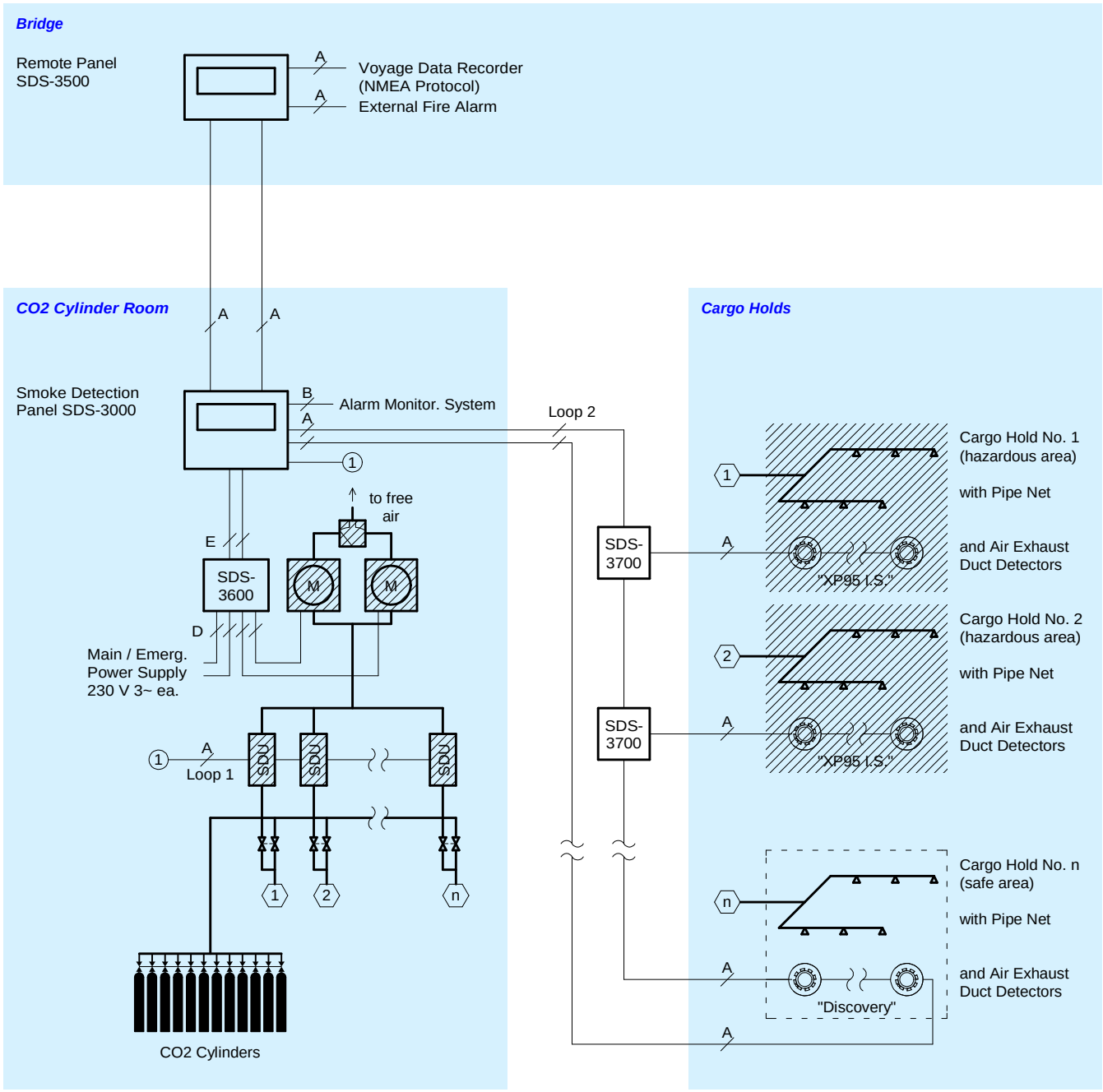
Smoke Detection System SDS-72, Variant A
Overview Plan for Electric Installation

Rev.4	04.11.2016	kb
Check	07.11.2016	AB
Approv.	09.11.2016	kb

Overview-Variant-A

Smoke Detection System SDS-72

Principal System Arrangement in CO2 Cylinder Room for Connection to Large Suction Pipes and Monitoring of Air Exhaust Ducts in Hazardous and Safe Areas



1	Electric Cable Electric Cable Interface		Hazardous Area
1	Pipe Pipe Interface Valve	SDU	Smoke Detection Unit (SDU) SDS-3300
SDS-3600	Junction Box for Power Supply and Fan Units		Smoke Detector "Discovery" resp. "XP95 I.S."
SDS-3700	Junction Box with Loop Isolator and Galvanic Isolator	M	Suction Fan SDS-M0460 — Flap SDS-3800

No.	Cable Types	Glands
A	TCX(C)331 150/250 (300)V 2 x 2 x 0,75	MS20
B	TCX(C) 150/250 (300)V 4 x 2 x 0,75	MS20
C		
D	MPRX 3 x 1,5	M20
E	MPRX 4 x 1,5	M20

Refer to protection notice ISO 16016.

safetec

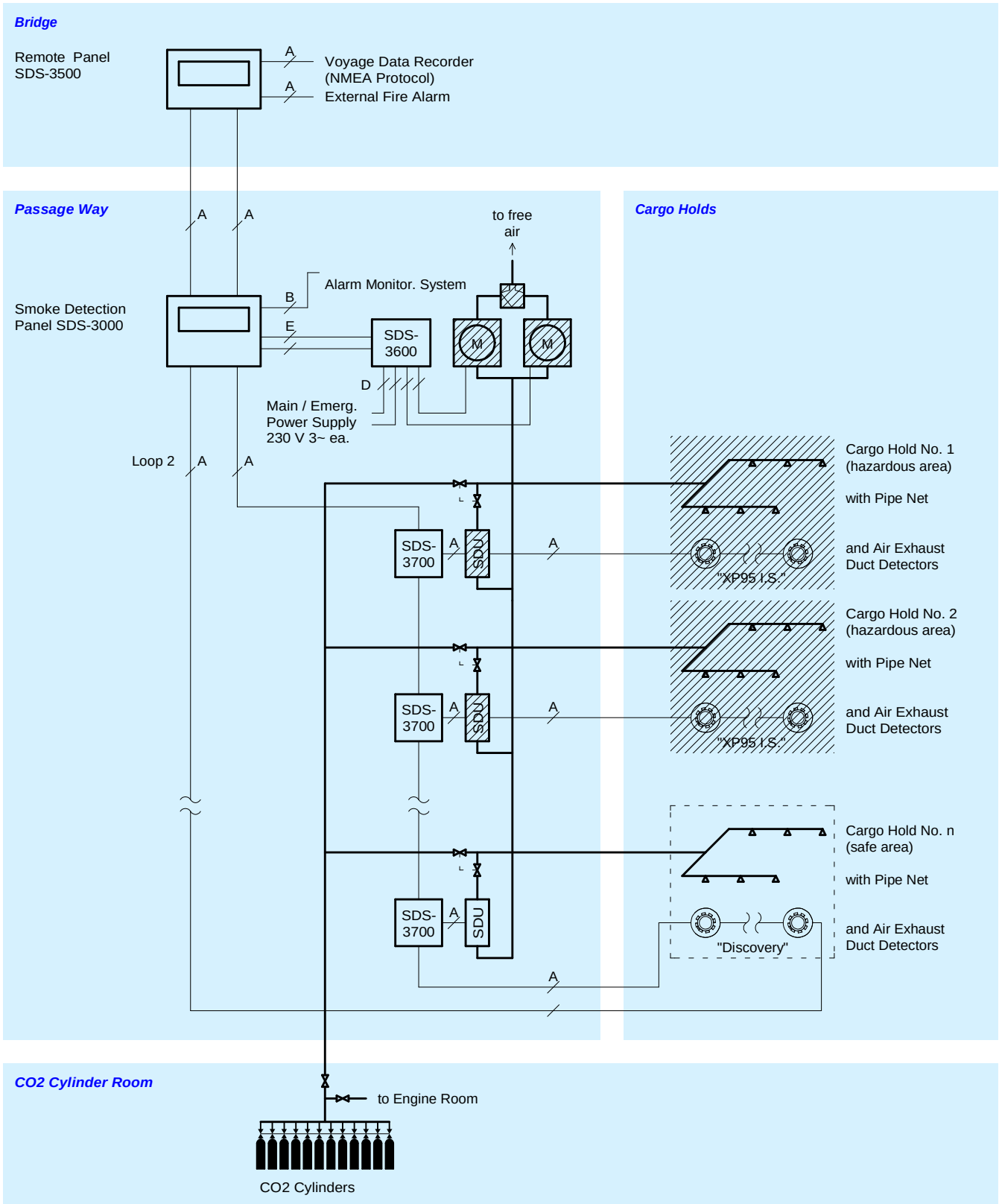
Smoke Detection System SDS-72, Variant B
Overview Plan for Electric Installation

Rev.3	09.11.2016	kb
Check	07.11.2016	AB
Approv.	03.03.2016	kb

SDS-72-B

Smoke Detection System SDS-72

Principal System Arrangement in Passage Way for Connection to Large Suction Pipes and Monitoring of Air Exhaust Ducts in Hazardous and Safe Areas



—— / —①—	Electric Cable Electric Cable Interface		Hazardous Area
—— / —①— / ⋈	Pipe Pipe Interface Valve	SDU	Smoke Detection Unit (SDU) SDS-3300
SDS-3600	Junction Box for Power Supply and Fan Units		Smoke Detector "Discovery" resp. "XP95 I.S."
SDS-3700	Junction Box with Loop Isolator and Galvanic Isolator	M	Suction Fan SDS-M0460 Flap SDS-3800

No.	Cable Types	Glands
A	TCX(C)331 150/250 (300)V 1 x 2 x 0,75	MS20
B	TCX(C) 150/250 (300)V 4 x 2 x 0,75	MS20
C		
D	MPRX 3 x 1,5	M20
E	MPRX 4 x 1,5	M20

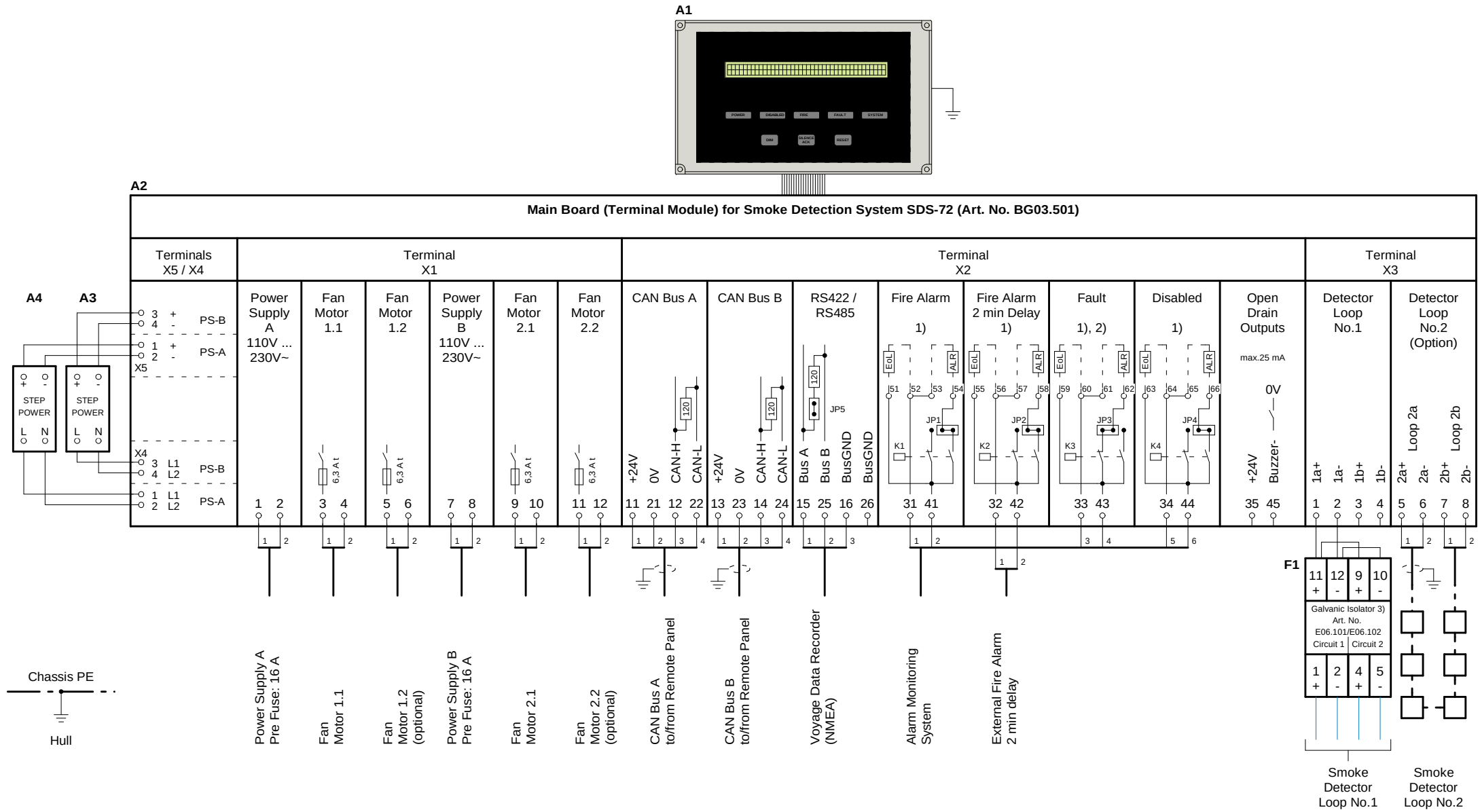
Refer to protection notice ISO 16016.

safetec

Smoke Detection System SDS-72, Variant C
Overview Plan for Electric Installation

Rev.4	09.11.2016	kb
Check	07.11.2016	AB
Approv.	03.03.2016	kb

SDS-72-C



Remarks

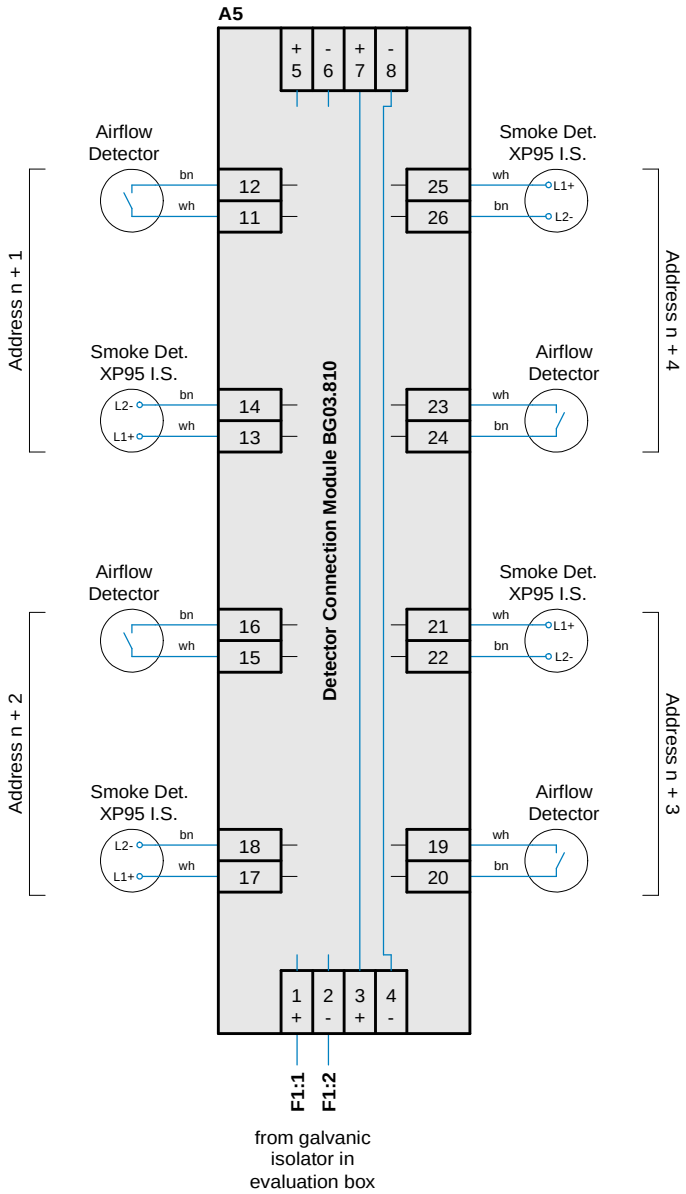
1) Max. (resisitive) contact load: 2 A at 30 V DC
2) The contacts of the fault relay are shown in fault state (relay not activated).
3) Galvanic isolator E06.101 has only one circuit. Max. 2 isolators can be integrated into the smoke detection panel.
4) Loop No.1: Intriniscally safe circuits to internal smoke detectors, to extension panels or to smoke detection units SDU.

intrinsically safe circuit (blue lines)

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Smoke Detection Panel (Part: Evaluation Box) Types: SDS-3000, SDS-3104, SDS-3108, SDS-3112	KUNDE PROJEKT AUFTRAGSNR	*Rev. 5* *Check* *Approv.*	17.04.2018 17.04.2018 17.04.2018	kb JP kb	SDS-72-3000	x



n: Adressoffset

intrinsically safe circuit (blue lines)

Terminals

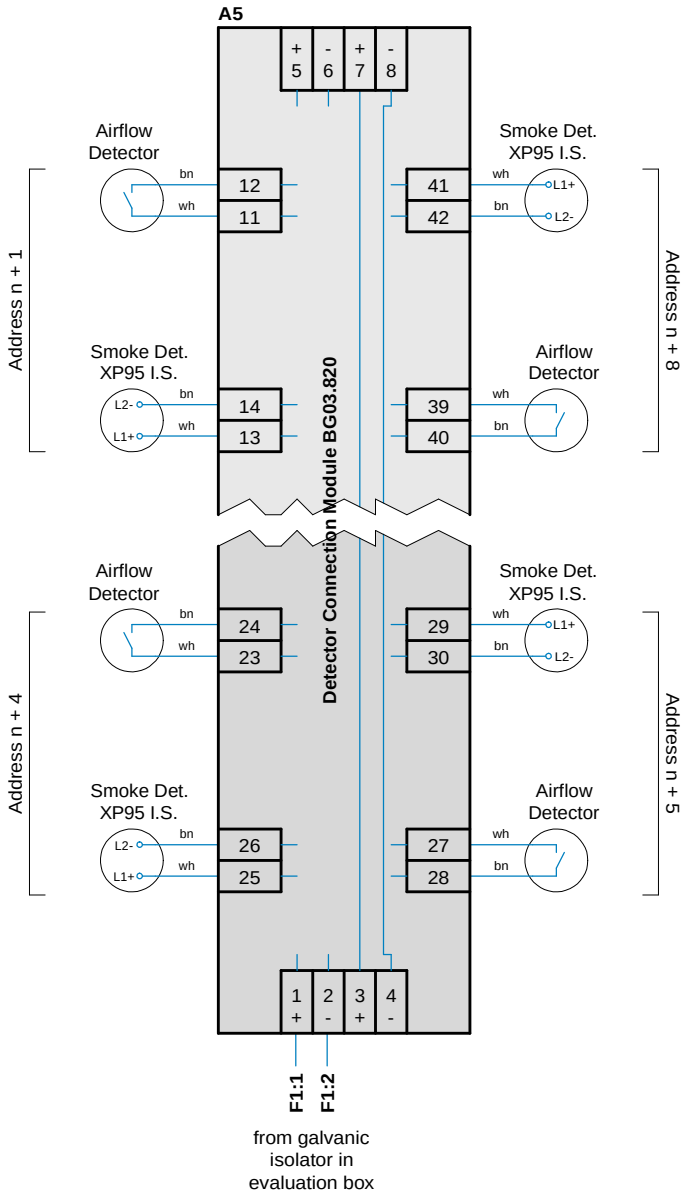
1/2: I.S. circuit No.1 from galvanic isolator in evaluation box
3/4: I.S. circuit No.2 from galvanic isolator in evaluation box (optional: use as passage to next mounted detection box)
5/6: not used
7/8: same as 3/4

Leave terminals 11 - 26 of unused addresses open.

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Smoke Detection Panel SDS-3104 (Part: Detection Box) Intrinsically Safe Circuits in Detection Box for max. 4 Sampling Pipes	KUNDE PROJEKT AUFTRAGSNR	*Rev. 0* *Check* *Approv.*	19.12.2016 23.01.2017 23.01.2017	kb AB kb	SDS-72-3104	x



n: Adressoffset

intrinsically safe circuit (blue lines)

Terminals

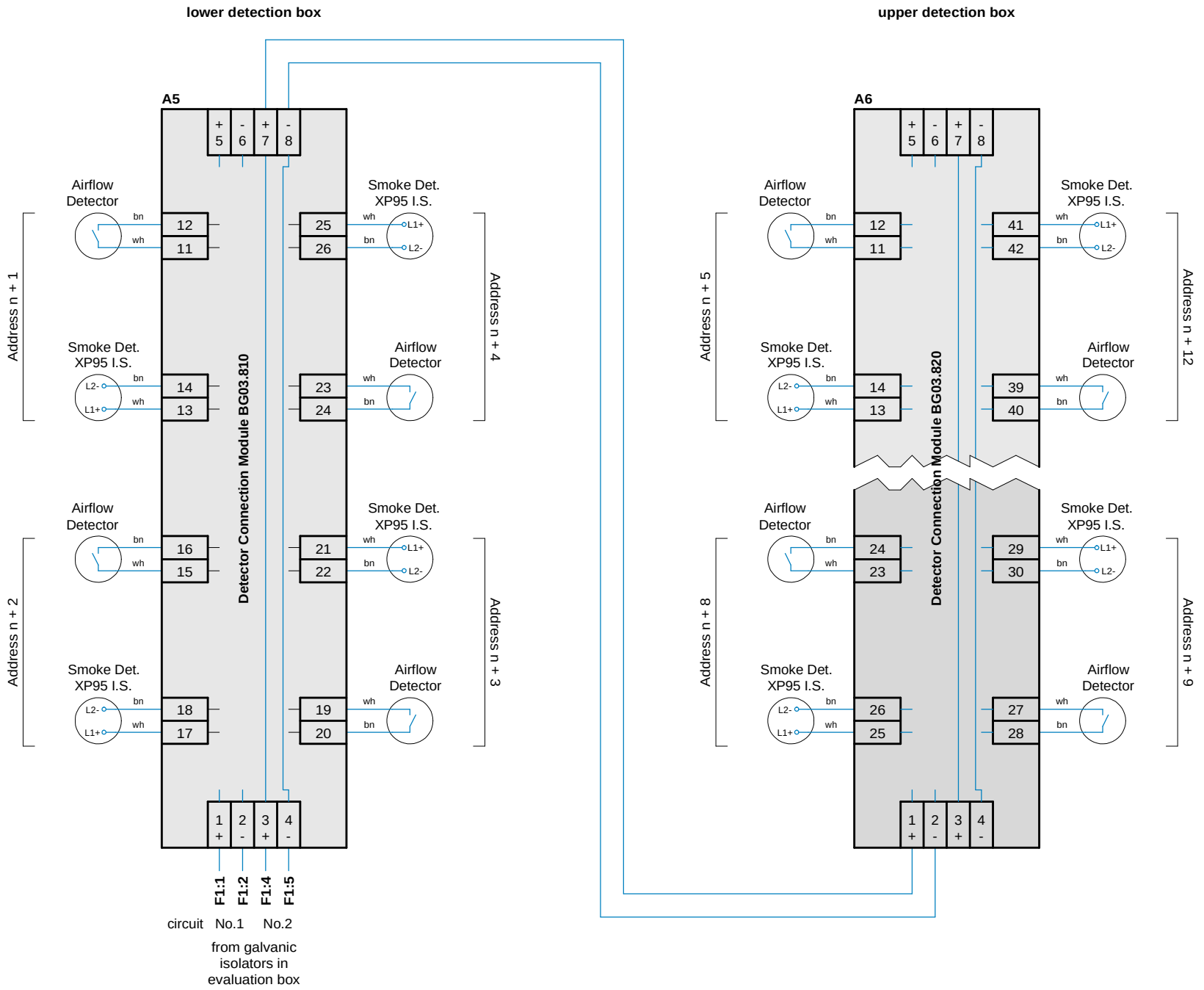
1/2: I.S. circuit No.1 from galvanic isolator in evaluation box
3/4: not used
5/6: not used
7/8: not used

Leave terminals 11-42 of unused addresses open.

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Smoke Detection Panel SDS-3108 / Extension Panel SDS-3208 Part: Detection Box with Intrinsically Safe Circuits for max. 8 Sampling Pipes	KUNDE PROJEKT AUFTRAGSNR	*Rev. 0* *Check* *Approv.*	23.01.2017 23.01.2017 23.01.2017	kb AB kb	SDS-72-3108	x



n: Adressoffset

intrinsically safe circuit (blue lines)

Terminals in upper detection box

1/2: I.S. circuit No.2 from lower detection box
3/4: not used
5/6: not used
7/8: not used

Terminals in lower detection box

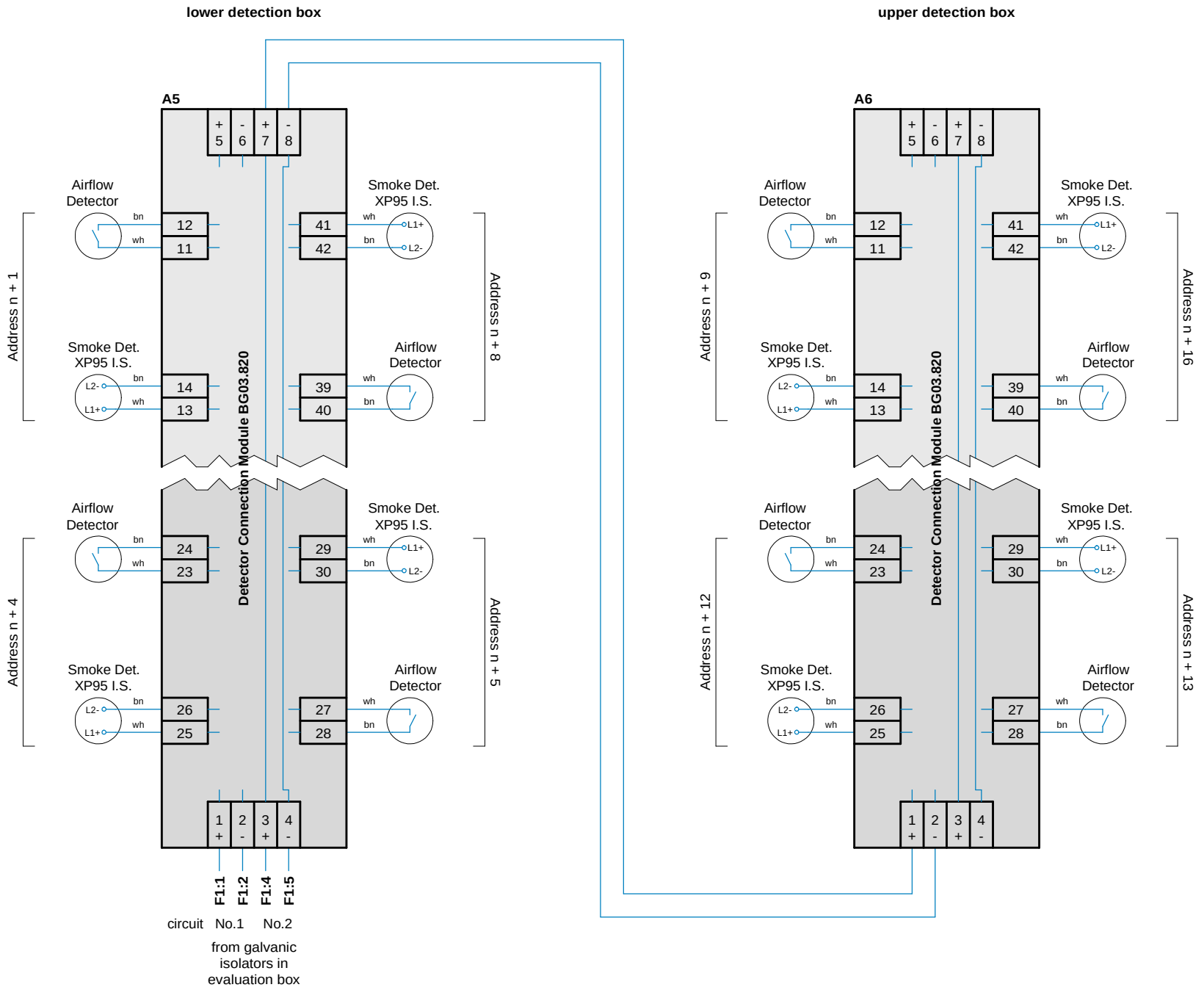
1/2: I.S. circuit No.1 from galvanic isolator in evaluation box
3/4: I.S. circuit No.2 from galvanic isolator in evaluation box
5/6: not used
7/8: connects circuit No.2 to upper detection box

Leave terminals 11 - 42 of unused addresses open.

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Smoke Detection Panel SDS-3112 / Extension Panel SDS-3212 Part: Detect. Boxes with Intrinsically Safe Circuits for max. 12 Sampling Pipes	KUNDE PROJEKT AUFTRAGSNR	*Rev. 0* *Check* *Approv.*	23.01.2017 23.01.2017 23.01.2017	kb AB kb	SDS-72-3112	x



n: Adressoffset

intrinsically safe circuit (blue lines)

Terminals in upper detection box

1/2: I.S. circuit No.2 from lower detection box
3/4: not used
5/6: not used
7/8: not used

Terminals in lower detection box

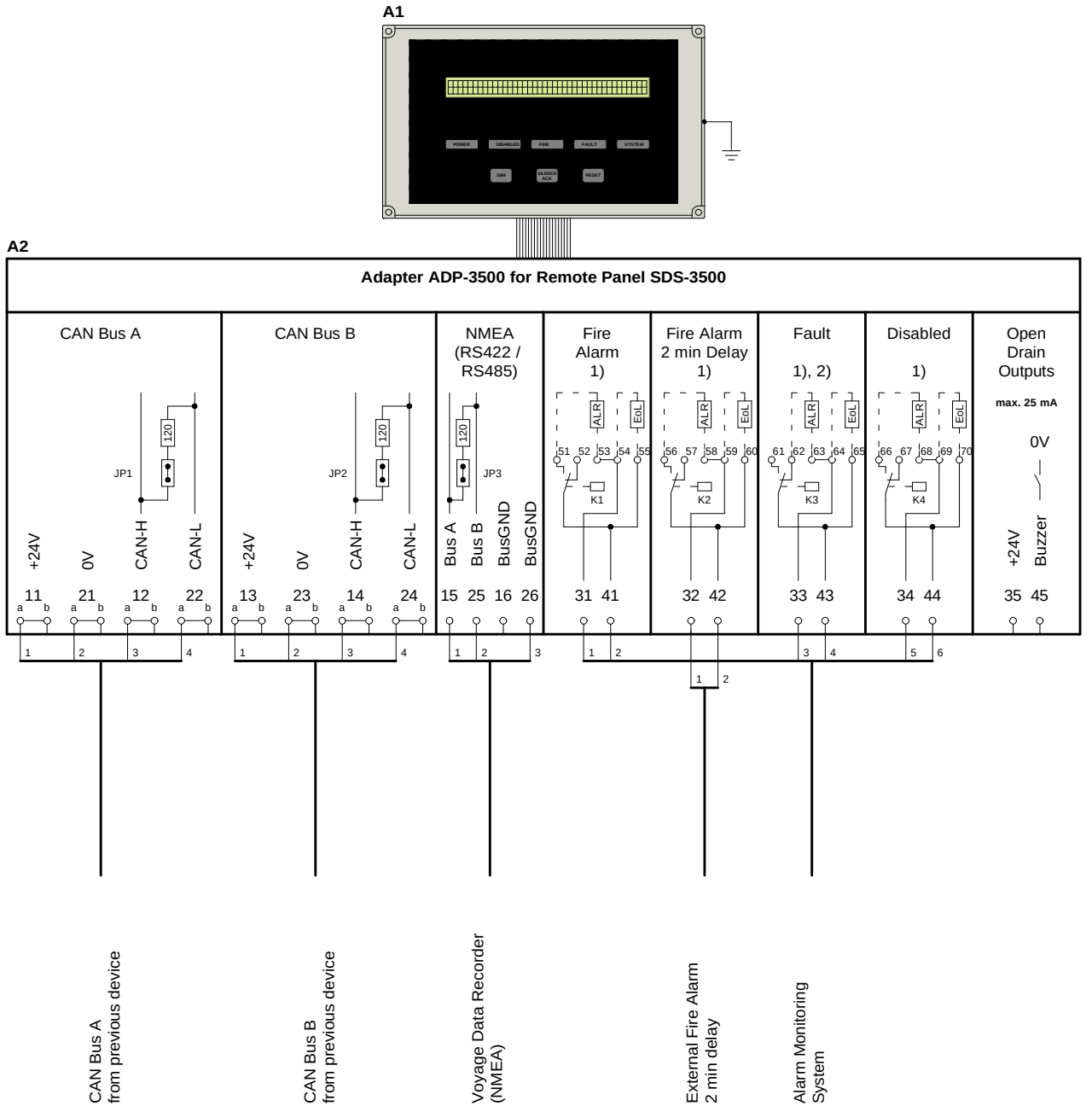
1/2: I.S. circuit No.1 from galvanic isolator in evaluation box
3/4: I.S. circuit No.2 from galvanic isolator in evaluation box
5/6: not used
7/8: connects circuit No.2 to upper detection box

Leave terminals 11 - 42 of unused addresses open.

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Extension Panel SDS-3216 Part: Detect. Boxes with Intrinsically Safe Circuits for max. 16 Sampling Pipes	KUNDE PROJEKT AUFTRAGSNR	*Rev. 0* *Check* *Approv.*	23.01.2017 23.01.2017 23.01.2017	kb AB kb	SDS-72-3216	x



Remarks

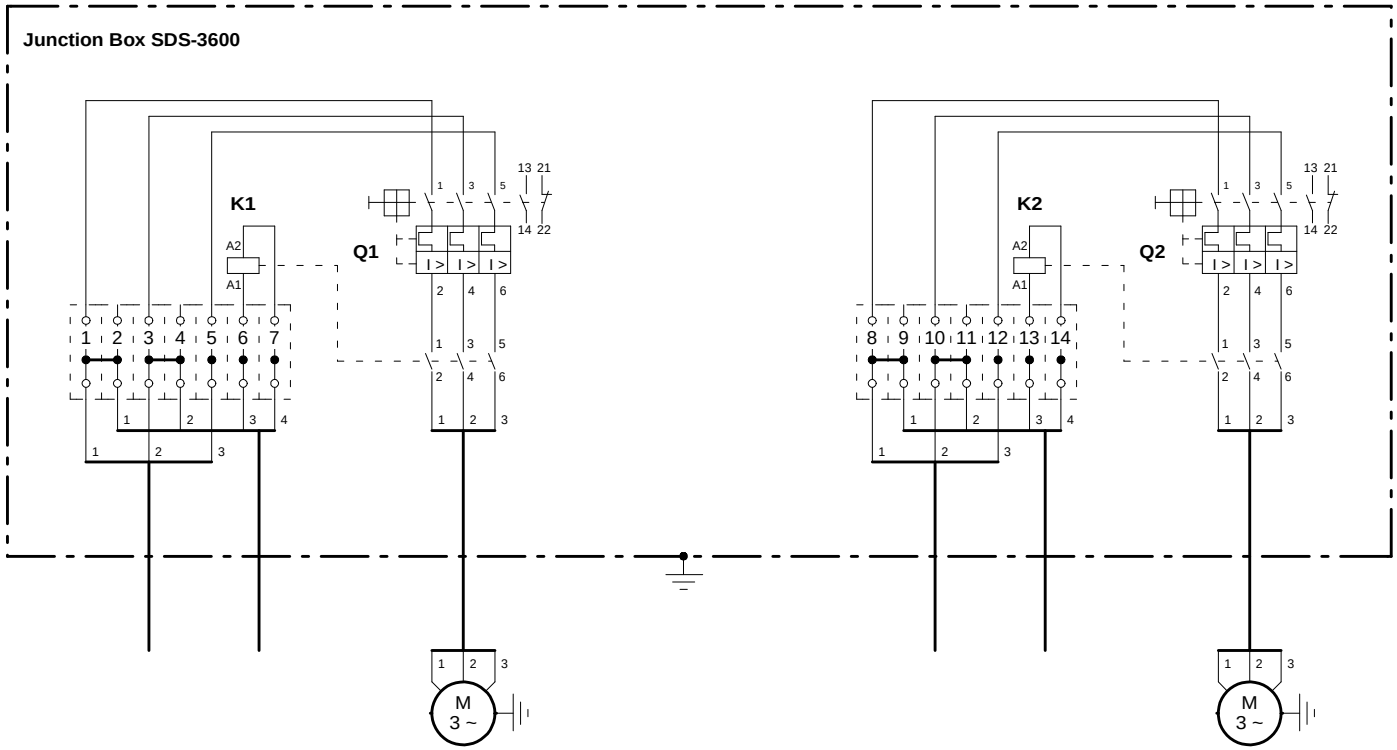
1) Max. (resisitive) contact load: 2 A at 30 V DC
2) The contacts of the fault relay are shown in fault state (relay not activated).

JP1: set/unset termination resistor for CAN bus A
JP2: set/unset termination resistor for CAN bus B
JP3: set/unset termination resistor for RS-422 / NMEA

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Remote Panel SDS-3500 with Adapter ADP-3500	KUNDE PROJEKT AUFTRAGSNR	*Rev. 4* *Check* *Approv.*	28.09.2017 29.09.2017 29.09.2017	kb JP kb	SDS-72-3500	x

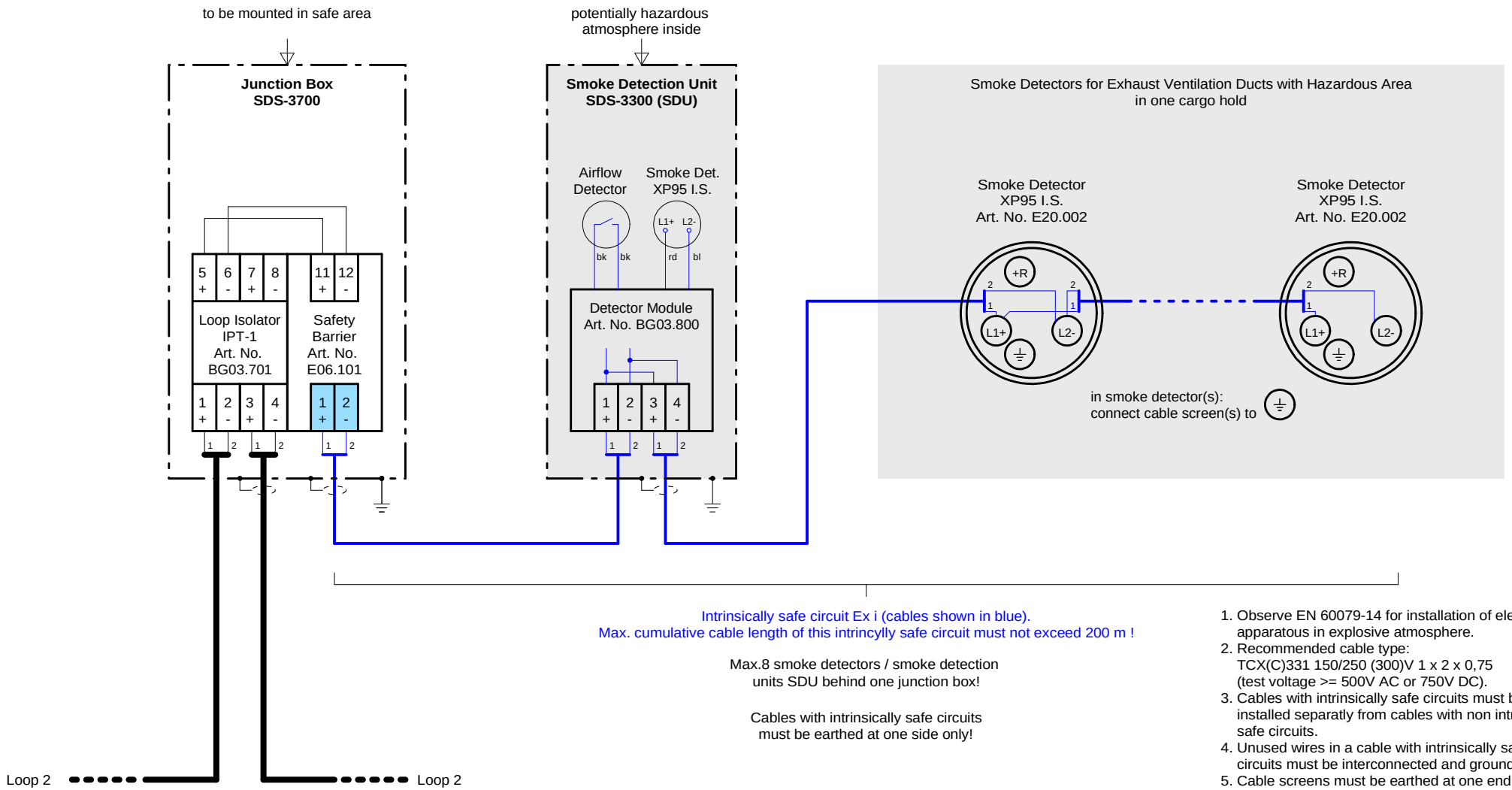


All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Junction Box SDS-3600 with Fan Motors SDS-M0460	KUNDE PROJEKT AUFTRAGSNR	*Rev. 0* *Check* *Approv.*	02.12.2015 01.09.2016 02.09.2016	kb AB kb	SDS-72-3600	X

Application: Smoke detction unit SDU for cargo hold and smoke detectors for exhaust ventilation ducts with hazardous area in system variant C



Intrinsically safe circuit Ex i (cables shown in blue).
Max. cumulative cable length of this intrincylly safe circuit must not exceed 200 m !

Max.8 smoke detectors / smoke detection units SDU behind one junction box!

Cables with intrinsically safe circuits must be earthed at one side only!

1. Observe EN 60079-14 for installation of electrical apparatous in explosive atmosphere.
2. Recommended cable type: TCX(C)331 150/250 (300)V 1 x 2 x 0,75 (test voltage >= 500V AC or 750V DC).
3. Cables with intrinsically safe circuits must be installed separatly from cables with non intrinsically safe circuits.
4. Unused wires in a cable with intrinsically safe circuits must be interconnected and grounded.
5. Cable screens must be earthed at one end only.
6. Cables with intrinsically safe circuits must be marked.
7. If the cable shall marked with colour, the colour must be light blue and in this case the colour must not be used for other purposes.
8. The intrinsical safety must be proved by calculation individually for each project.

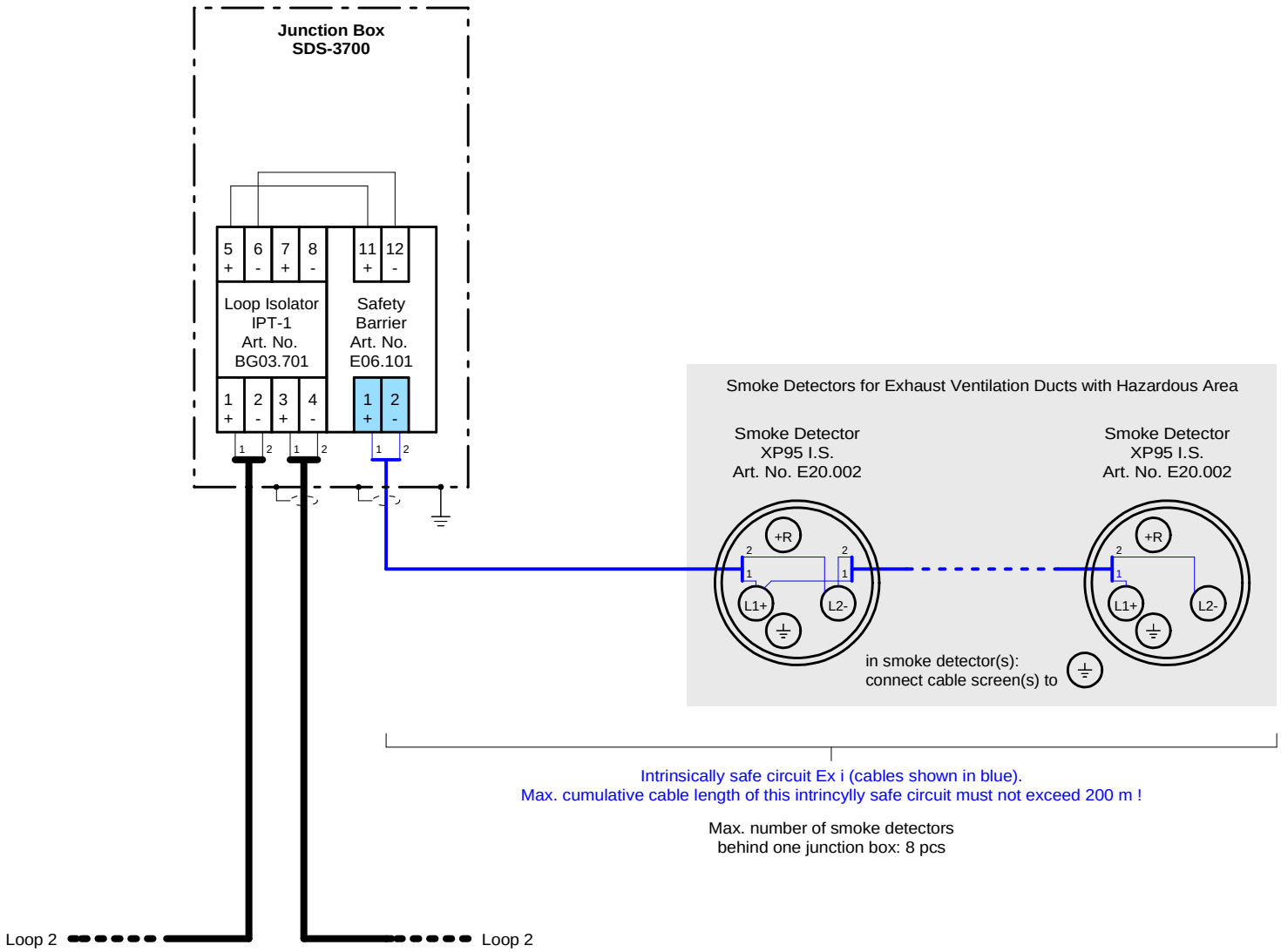
All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Detector Loop 2: Junction Box SDS-3700 with Smoke Detection Unit SDS-3300 (SDU) and Smoke Detectors XP95 I.S. for Exhaust Ventilation Ducts	customer project order no.	*Rev. 2* *Check* *Approv.*	30.01.2018 06.02.2018 06.02.2018	jp kb kb	SDS-72-3700-3300-XP95-IS	x

Application: smoke detecors for exhaust ventilation ducts with hazardous atmosphere in system variant A and B

The junction box must be mounted in a safe area!



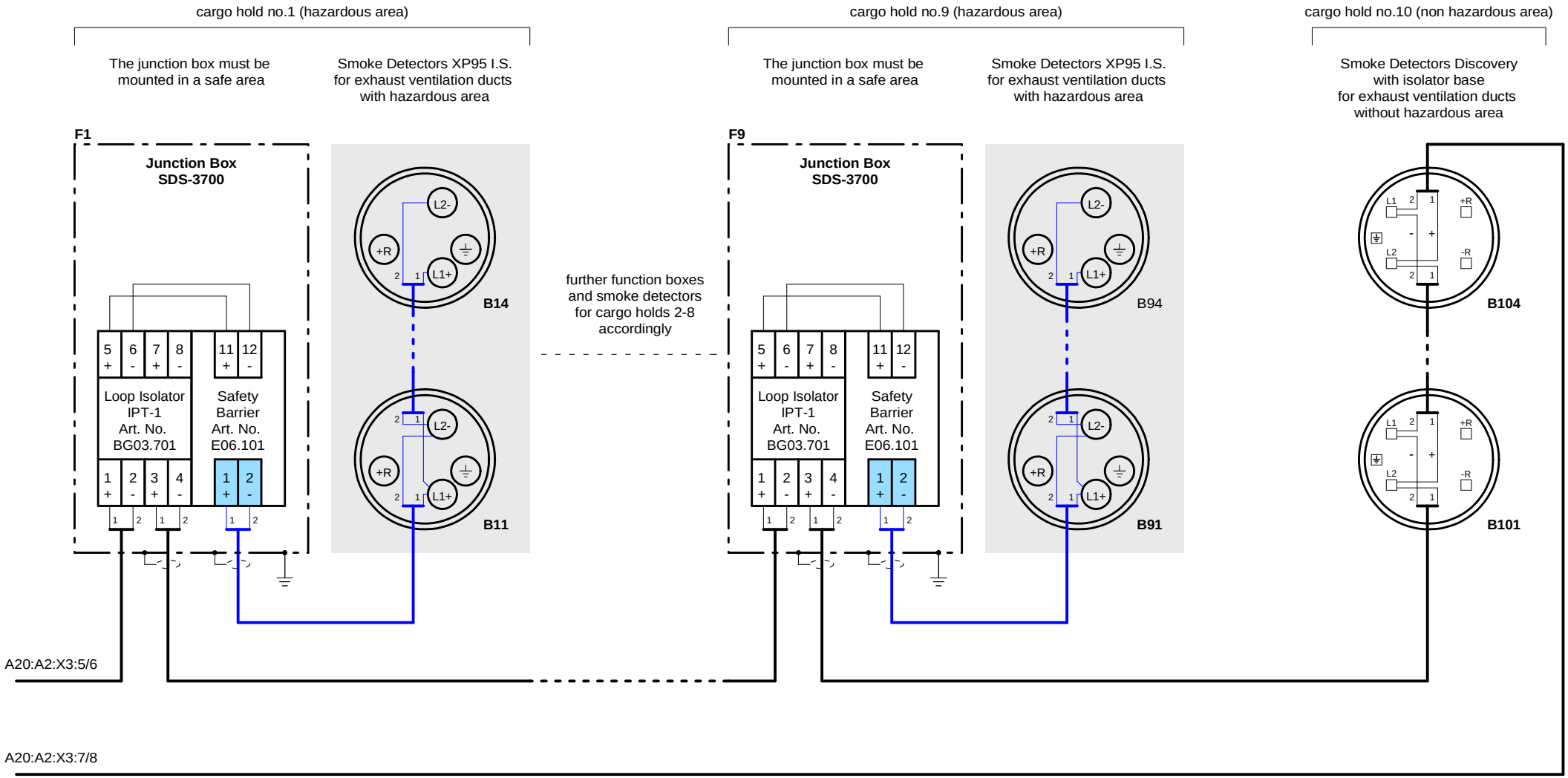
1. Observe EN 60079-14 for installation of electrical apparatous in explosive atmosphere.
2. Recommended cable type:
   TCX(C)331 150/250 (300)V 1 x 2 x 0,75
   (test voltage >= 500V AC or 750V DC).
3. Cables with intrinsically safe circuits must be installed separatly from cables with non intrinsically safe circuits.
4. Unused wires in a cable with intrinsically safe circuits must be interconnected and grounded.
5. Cable screens must be earthed at one end only.
6. Cables with intrinsically safe circuits must be marked.
7. If the cable shall marked with colour, the colour must be light blue and in this case the colour must not be used for other purposes.
8. The intrinsical safety must be proved by calculation individually for each project.

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Detector Loop 2: Junction Box SDS-3700 with Air Exhaust Duct Detectors for one Cargo Hold (hazardous atmosphere)	customer project order no.	*Rev. 3* *Check* *Approv.*	30.01.2018 06.02.2018 06.02.2018	jp kb kb	SDS-72-3700-XP95-IS	x

Application: smoke detecors for exhaust ventilation ducts with hazardous atmosphere in system variant A and B



1. Observe EN 60079-14 for installation of electrical apparatous in explosive atmosphere.
2. Recommended cable type: TCX(C)331 150/250 (300)V 1 x 2 x 0,75 (test voltage >= 500V AC or 750V DC).
3. Cables with intrinsically safe circuits must be installed separatly from cables with non intrinsically safe circuits.
4. Unused wires in a cable with intrinsically safe circuits must be interconnected and grounded.
5. Cable screens must be earthed at one end only.
6. Cables with intrinsically safe circuits must be marked.
7. If the cable shall marked with colour, the colour must be light blue and in this case the colour must not be used for other purposes.
8. The intrinsical safety must be proved by calculation individually for each project.
9. In smoke detectors XP95 I.S. connect cable screen to ⏚

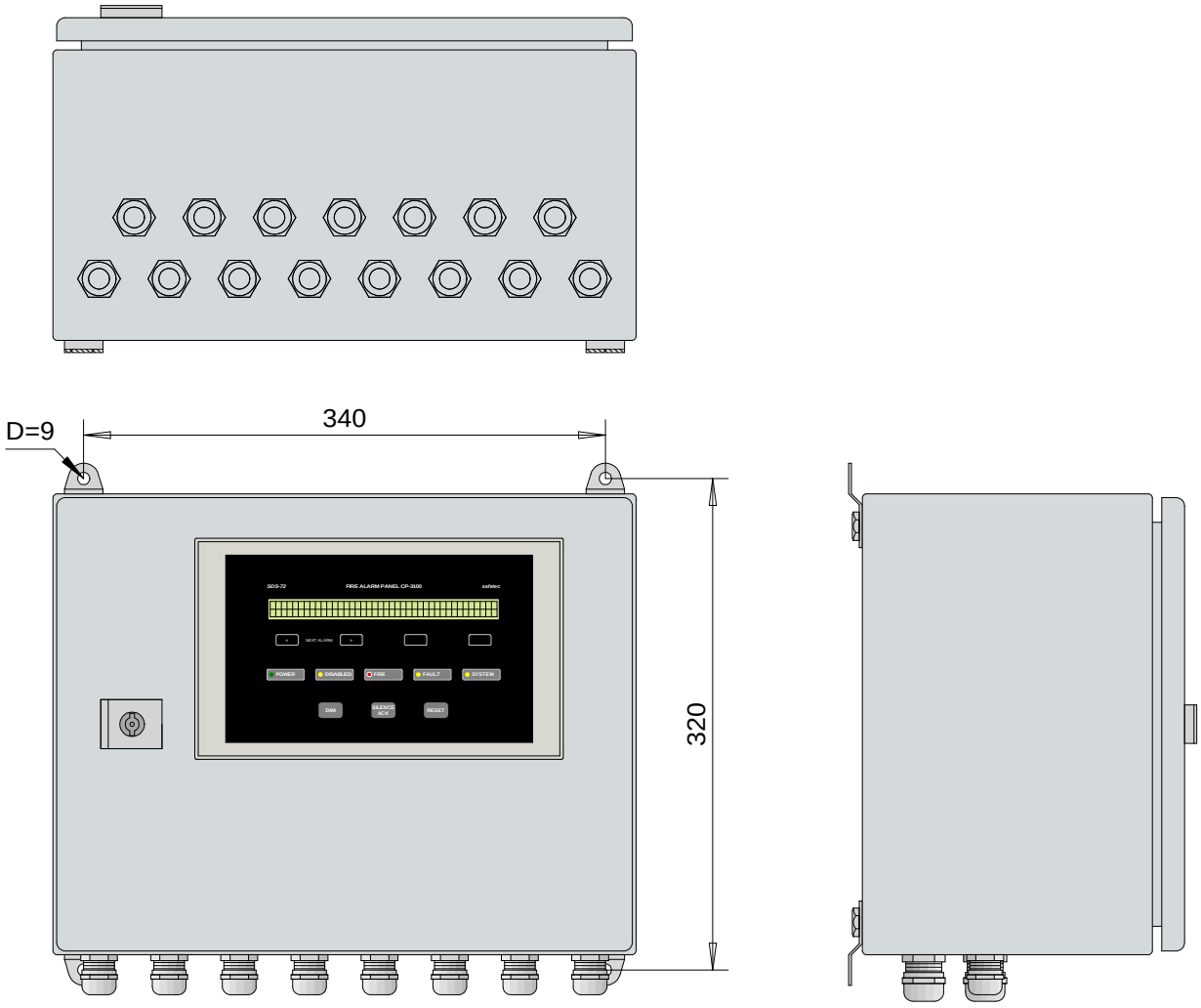
10 Max. 8 smoke detectors XP95 I.S. behind one safety barrier.

11. Max. cumulative cable length behind safety barrier: 200m.
12. Intrinsically safe circuit Ex i (cables shown in blue).

All resistors 0,6W 1% if not otherwise stated.

Refer to protection notice ISO 16016.

safetec	Detector Loop 2 for Exhaust Duct Detectors Variant A and B	customer project order no.	*Rev. 1* *Check* *Approv.*	30.01.2018 06.02.2018 06.02.2018	jp kb kb	SDS-72-3700-XP95-Discovery	x



Description

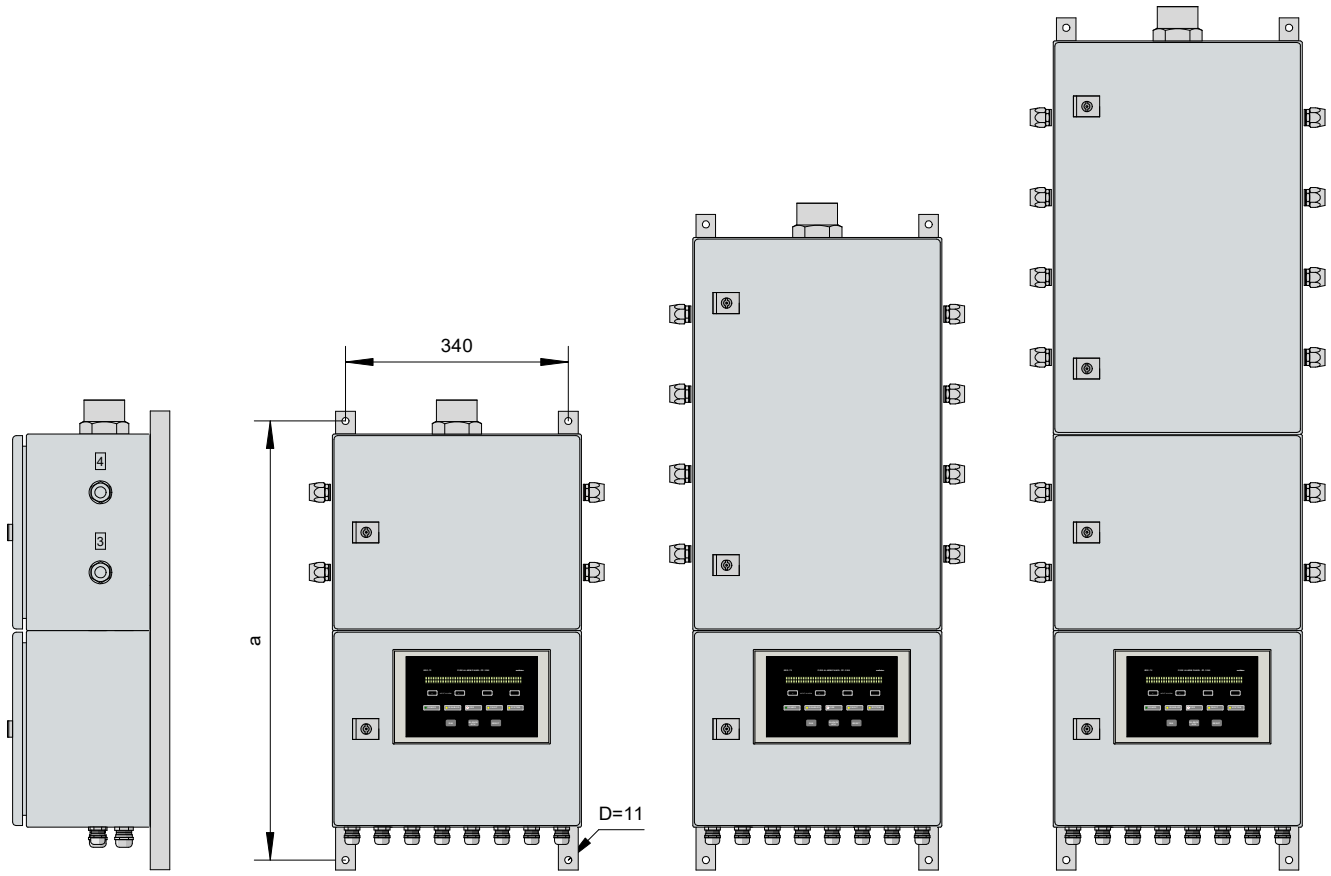
The Smoke Detection Panel SDS-3000 is normally located in the CO2 room of a vessel. The operation interface allows monitoring of the system state (alarm, fault and status messages) as well as manually switching the fans and reseting alarms. The Smoke Detection Panel includes the power converter, the terminals for the detector loops and the control / power outputs for the fan motors / fan unit. For connection of local smoke detection units or extension panels different numbers of safetey barrier channels are available.

Technical Data

Dimensions (enclosure, WxHxD):	380 x 300 x 210 mm
Weight:	10 kg
Operation temperature:	0°C ... 55°C
Degree of protection:	IP54
Surface:	dip primed, powder coated, RAL7035
Operation voltage:	2x 110 ... 230 V AC
Current consumption (without fan motors):	approx. 0,2 A (230 V AC), approx. 0,3 A (110 V AC)
Recommended backup fuses for mains protection:	16 A (characteristic B)
Cable Glands:	max. 15x M20 or M25

Article Numbers

SDS03.001	Smoke Detection Panel without external Detector Loop and with Safety Barrier (1 Channel)
SDS03.002	Smoke Detection Panel without external Detector Loop and with Safety Barrier (2 Channels)
SDS03.003	Smoke Detection Panel without external Detector Loop and with Safety Barrier (3 Channels)
SDS03.004	Smoke Detection Panel without external Detector Loop and with Safety Barrier (4 Channels)
SDS03.010	Smoke Detection Panel with external Detector Loop and without Safety Barrier
SDS03.011	Smoke Detection Panel with external Detector Loop and with Safety Barrier (1 Channel)
SDS03.012	Smoke Detection Panel with external Detector Loop and with Safety Barrier (2 Channels)
SDS03.013	Smoke Detection Panel with external Detector Loop and with Safety Barrier (3 Channels)
SDS03.014	Smoke Detection Panel with external Detector Loop and with Safety Barrier (4 Channels)



SDS-3104 SDS-3108 SDS-3112

Description

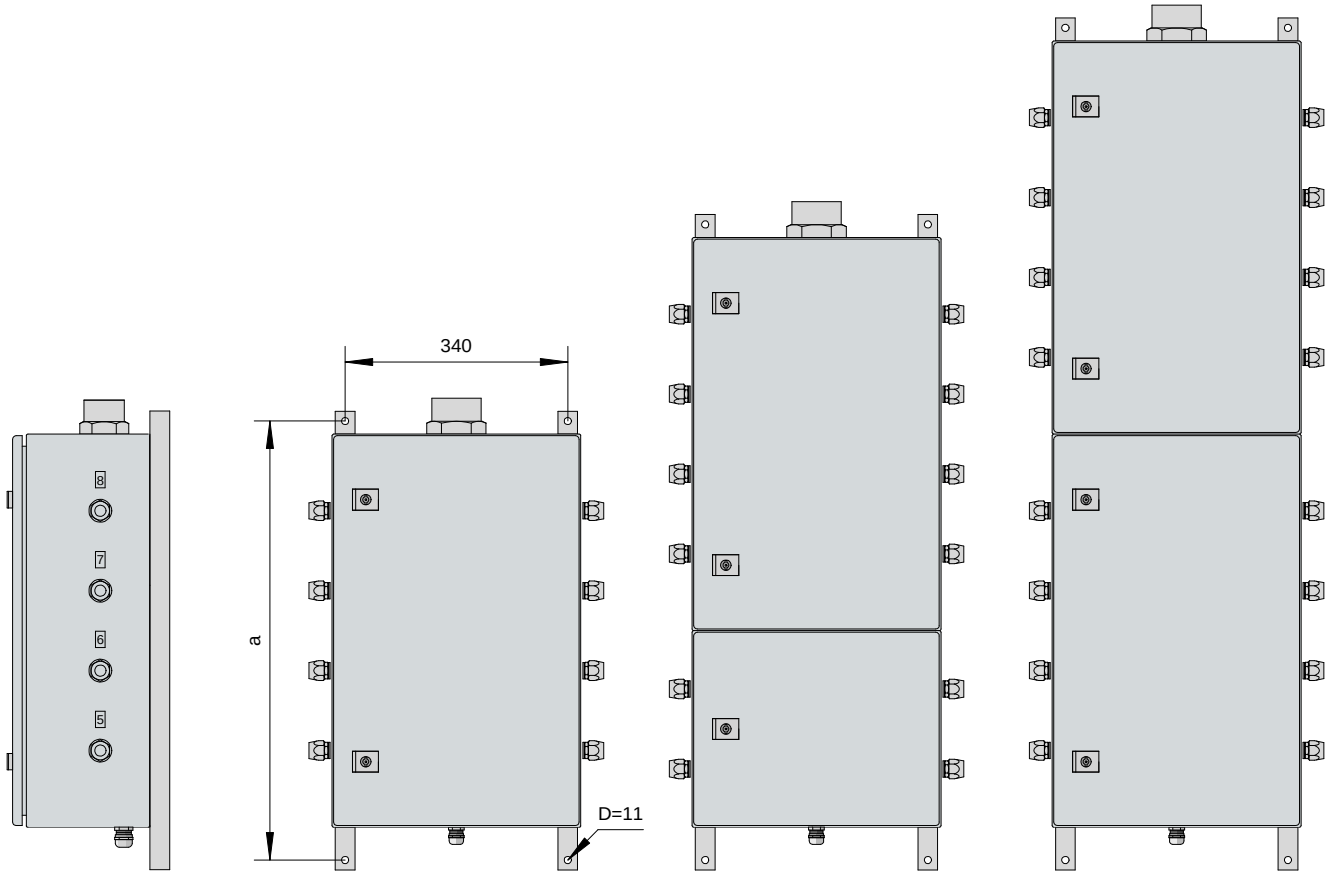
The Smoke Detection Panels SDS-3104, SDS-3108 and SDS-3112 are combinations of a Smoke Detection Panel SDS-3000 with an Extension Panel SDS-3204, SDS-3208 or SDS-3212. They are normally located in the CO2 room of a vessel. The operation interface allows monitoring of the system state (alarm, fault and status messages) as well as manually switching the fans and reseting alarms. The Smoke Detection Panels include the power converter, internal detection lines, terminals for externsion units (optional), terminals for external detector loops (optional), the control / power outputs for the fan motors / fan unit. For connection of extension panels different numbers of safetey barrier channels can be delivered.

Technical Data

Size of Flexible Hose for Air Input	12,5 x 2,5 mm
Inner / Outer Diameter Air Output Fitting	63 mm / 75 mm
Operation temperature:	0°C ... 55°C
Degree of protection:	IP54
Surface:	dip primed, powder coated, RAL7035
Operation voltage:	2x 110 ... 230 V AC
Current consumption (without fan motors):	approx. 0,2 A (230 V AC), approx. 0,3 A (110 V AC)
Recommended backup fuse for mains protection:	16 A (characteristic B)
Cable Glands:	max. 15x M20 or M25

Types	Article Numbers		Number of Detection Lines	Dimension "a"	Dimensions Enclosure	Weight	Remarks
	without external detection loop	with external detection loop			WxHxD (without fittings)		
SDS-3104	SDS03.101	SDS03.121	1	670 mm	380 x 600 x 210 mm	22 kg	
	SDS03.102	SDS03.122	2			23 kg	
	SDS03.103	SDS03.123	3			24 kg	
	SDS03.104	SDS03.124	4			25 kg	
SDS-3108	SDS03.105	SDS03.125	5	970 mm	380 x 900 x 210 mm	37 kg	
	SDS03.106	SDS03.126	6			38 kg	
	SDS03.107	SDS03.127	7			39 kg	
	SDS03.108	SDS03.128	8			40 kg	
SDS-3112	SDS03.109	SDS03.129	9	1270 mm	380 x 1200 x 210 mm	52 kg	
	SDS03.110	SDS03.130	10			53 kg	
	SDS03.111	SDS03.131	11			54 kg	
	SDS03.112	SDS03.132	12			55 kg	

Refer to protection notice ISO 16016.



SDS-3208 SDS-3212 SDS-3216

Description

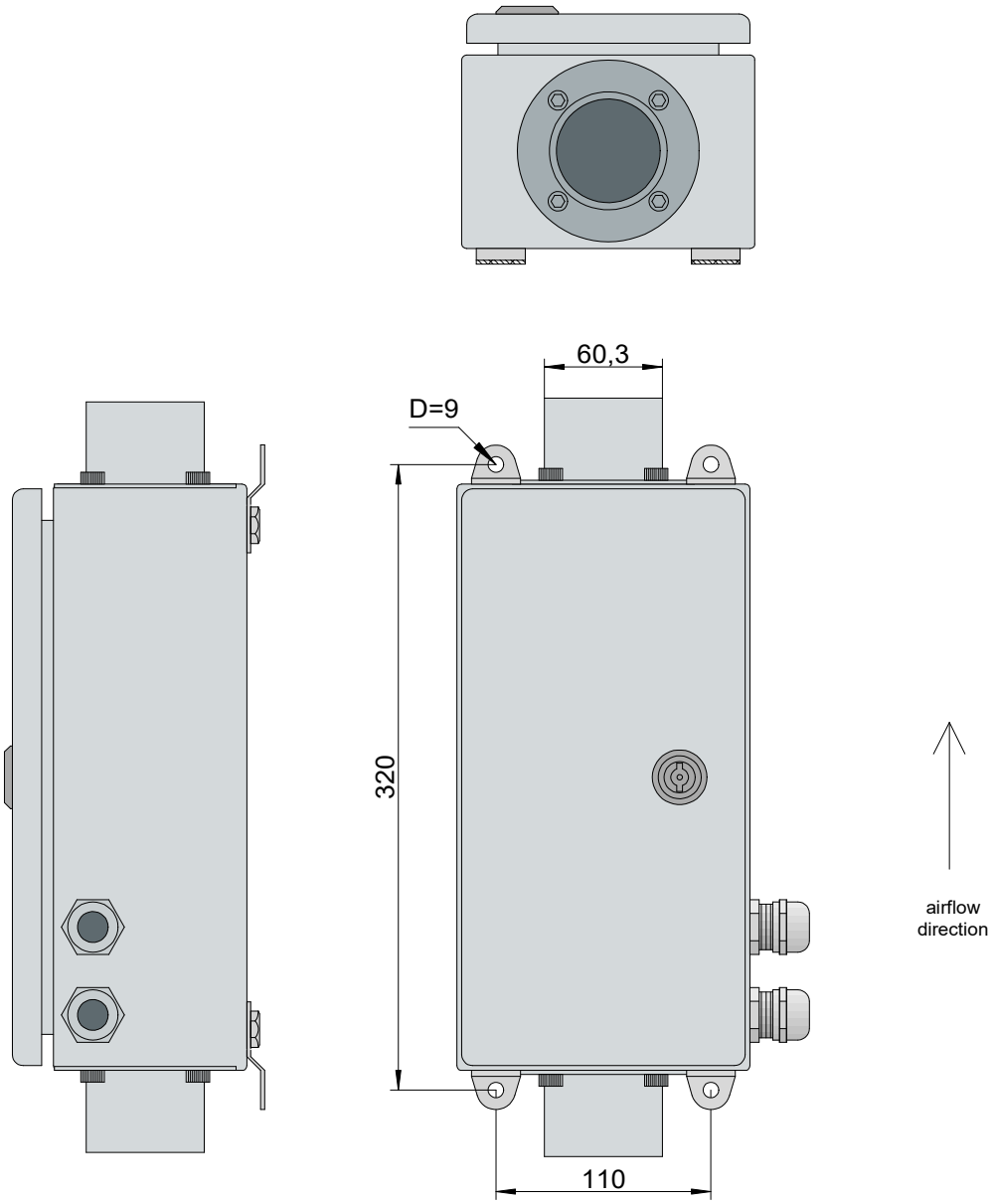
The Extension Panels SDS-3208, SDS-3212 and SDS-3216 are normally located in the CO2 room near by the Smoke Detection Panel, to which they are connected. The Extension Panels increase the number of detection lines.

Technical Data

Size of Flexible Hose for Air Input	12,5 x 2,5 mm
Inner / Outer Diameter Air Output Fitting	63 mm / 75 mm
Operation temperature:	0℃ ... 55℃
Degree of protection:	IP54
Surface:	dip primed, powder coated, RAL7035
Cable Glands:	1x M20 or M25

Types	Article Numbers	Number of Detection Lines	Dimension "a"	Dimensions Enclosure WxHxD (without fittings)	Weight	Remarks
SDS-3208	SDS03.205	5	670 mm	380 x 600 x 210 mm	27 kg	
	SDS03.206	6			28 kg	
	SDS03.207	7			29 kg	
	SDS03.208	8			30 kg	
SDS-3212	SDS03.209	9	970 mm	380 x 900 x 210 mm	42 kg	
	SDS03.210	10			43 kg	
	SDS03.211	11			44 kg	
	SDS03.212	12			45 kg	
SDS-3216	SDS03.213	13	1270 mm	380 x 1200 x 210 mm	57 kg	
	SDS03.214	14			58 kg	
	SDS03.215	15			59 kg	
	SDS03.216	16			60 kg	

Refer to protection notice ISO 16016.



Description

The Smoke Detection Unit SDU allows smoke detection in conjunction with large CO2-pipe diameters of up to 150 mm. The fittings for the hose connections at the top and at the bottom of the Smoke Detection Unit can be adapted to various hose connection sizes. To prevent smoke detector pollution ahead of time, a large dust filter for different particle sizes is integrated. The dust filter can easily be cleaned or exchanged. The airflow in the Smoke Detection Unit is being monitored permanently. The airflow detection threshold can be adjusted according the project requirements. Several Smoke Detection Units SDU are connected electrically to the Smoke Detection Panel by means of a 2-wire cable.

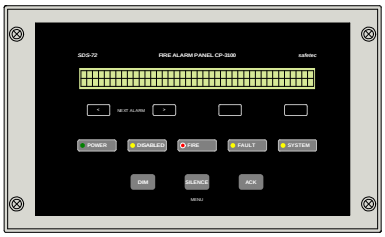
Technical Data

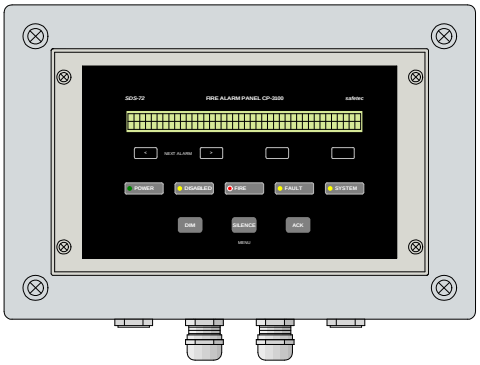
Dimensions (enclosure only, WxHxD):	150 x 300 x 120 mm
Weight:	5 kg
Operation temperature:	-20°C ... 55°C
Degree of protection:	IP54
Surface:	dip primed, powder coated, RAL7035
Cable Glands:	2x M20 or M25

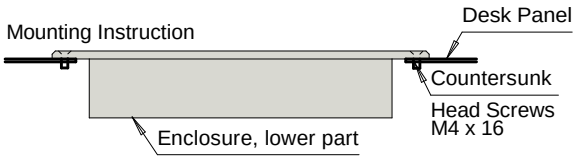
Article Number	Airflow Range	Alarm Threshold
SDS03.340	10 - 60 m³/h	4 - 24 m³/h
SDS03.342	30 - 180 m³/h	12 - 72 m³/h

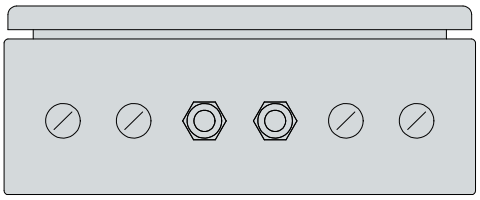
Refer to protection notice ISO 16016.

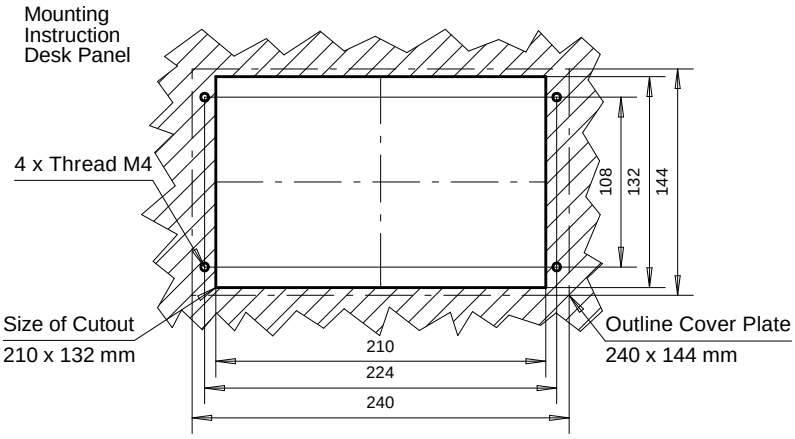
safetec	Smoke Detection Unit SDU Type: SDS-3300	*Rev.* 7	27.02.2018	HZ	SDS-3300.01
		Check	27.02.2018	kb	
		Approv.	27.02.2018	kb	









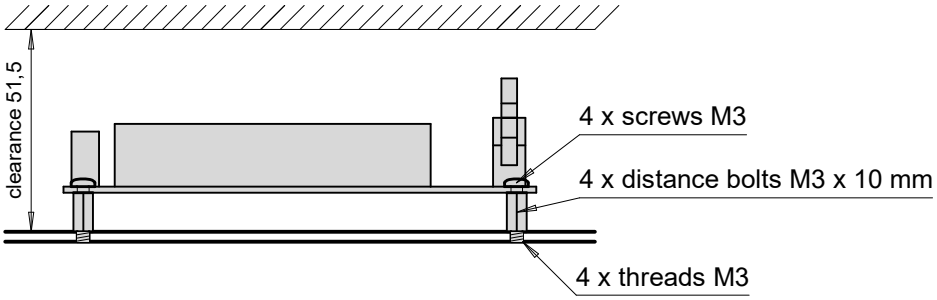


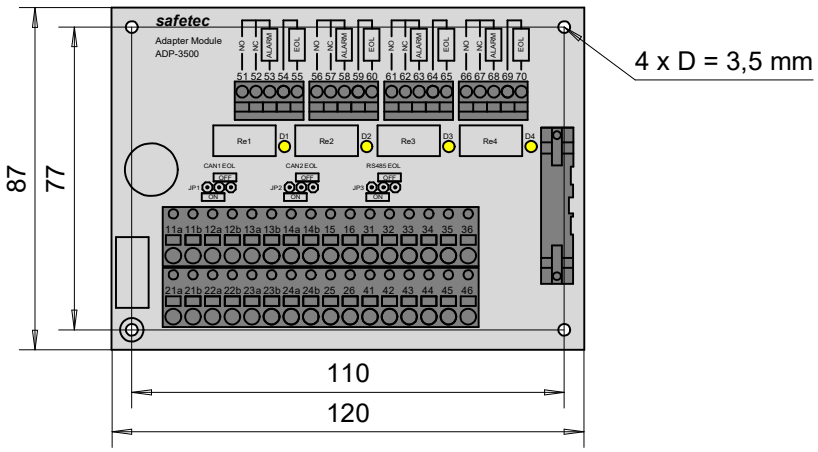
Description

The remote panel SDS-3500 is available in a flush mounting and in a wall mounting version. It is normally located on the navigation bridge or in the fire control station. The operation interface allows monitoring of the system state (alarm, fault and status messages) as well as manually switching the fans. The remote panel can be configured as inicating panel or as control panel.
The flush mount remote panel requires an external adapter ADP-3500, which must be connected by means of a flat cable. The wall mount remote panel has an integrated adapter module ADP-3500.
The adapter module includes voltage free terminals for connection of alarm and fault signals to the ship's alarm monitoring system (AMS). Further an NMEA interface (RS422) is available to connect the smoke detection system with the voyage data recorder (VDR).

Technical Data	**Flush Mounting Version**	**Wall Mounting Version**	**Description**
Dimensions (enclosure, W x H x D):	240 x 144 x 50 mm	300 x 200 x 120 mm	
Fastening Holes (W x H x D):	224 x 108 x 4,5 mm	260 x 160 x 9 mm	
Weight:	1,1 kg	4,9 kg	
Operation temperature:	0℃ ... 55℃	0℃ ... 55℃	
Degree of protection:	IP22	IP22	
Cable Glands:	-	max. 6 x M20	
Surface:	black RAL9005 (keyboard foile) on alloy plate	dip primed, powder coated, RAL7035	
Article Number:	SDS03.500 BG03.590 W04.926	SDS03.510	Remote Panel Adapter Module Flat Cable, 1 m

Mounting Instruction





Description

The adapter module ADP-3500 allows connection of the remote panel SDS-3500 by means of a 16-wire flat cable. The following terminals are available:

- CAN-Bus 1 incl. 24V power supply
- CAN-Bus 2 incl. 24V power supply
- RS485 Interface for NMEA Protocol
- Buzzer output
- 24V output
- 4 voltage free contacts

At the CAN-Bus terminals and at the RS422/RS485 output a 120 Ohm resistor can be included as End-of-Line resistor by means of jumpers.

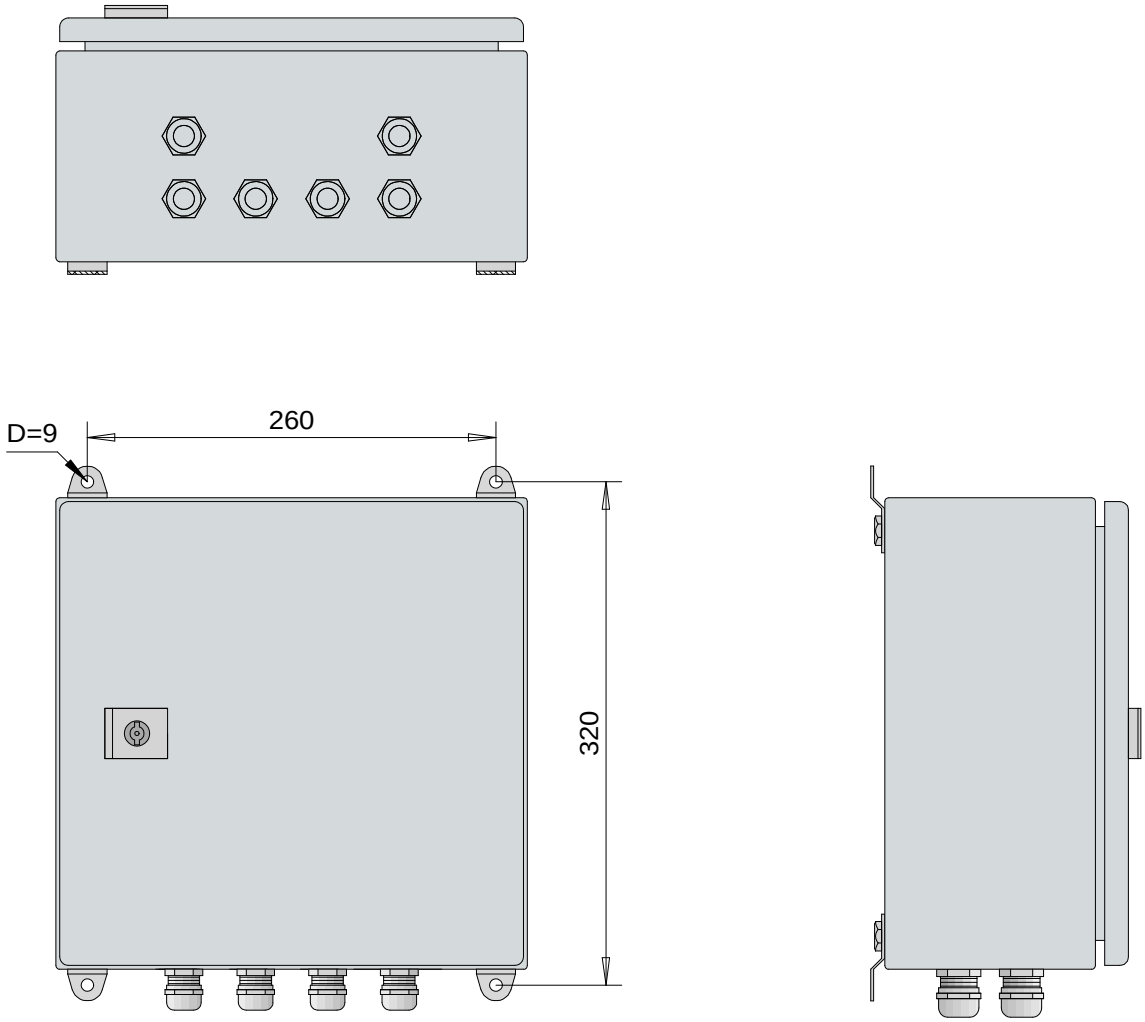
The contacts of the voltage free contacts can be configured as "Normally Open" (NO) or "Normally Closed" (NC) contacts. Additionally alarm resistors and End-of-Line resistors for these contacts can be connected to the terminals 51 - 70.

Technical Data

Dimensions (enclosure, W x H):	120 x 87 mm
Fastening holes (W x H x D):	110 x 77 x 1,5 mm
Weight:	0,155 kg
Operation temperature:	0°C ... 55°C
Current consumption:	max. 45 mA

Article Numbers

BG03.590	Adapter module for repeater panel SDS-3500
W04.926	Flatcable 1000 mm for Adapter Module ADP-3500



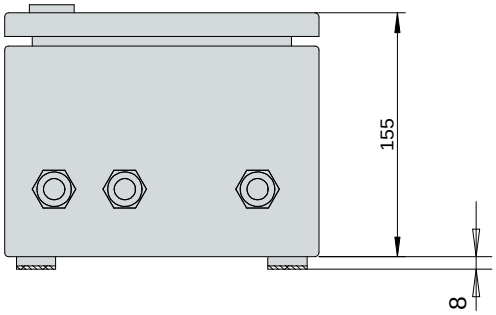
Description

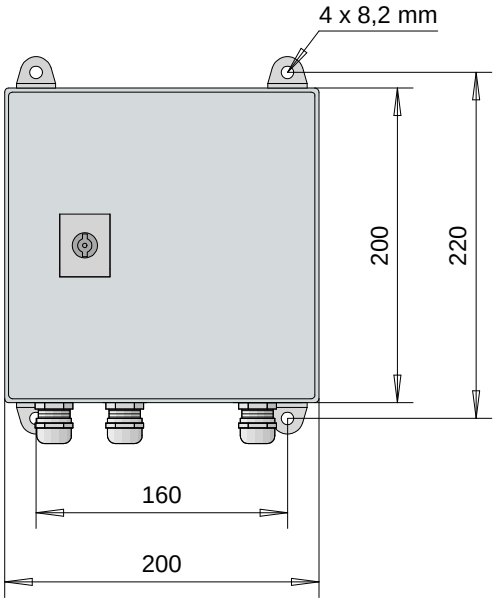
The Junction Box JB-3610 is needed for the fan unit SDS-M0460. It serves for connecting the main and emergency power supply, for connection of the fan motors and for the power supply to the smoke detection panel.

Technical Data

Dimensions (enclosure, WxHxD):	300 x 300 x 155 mm
Weight:	8,5 kg
Operation temperature:	0℃ ... 55℃
Degree of protection:	IP54
Surface:	dip primed, powder coated, RAL7035
Operation voltage:	2x 230 ... 440 V 3~ (typical: 230 V 3~)
Recommended backup fuses for mains protection:	16 A (characteristic B)
Cable Glands:	max. 6x M20 or M25

Type	Article Number	Description
SDS-3600	SDS03.611	Junction Box for 2 Suction Fans 230V 3~
	SDS03.621	Junction Box for 2 Suction Fans 110V 3~





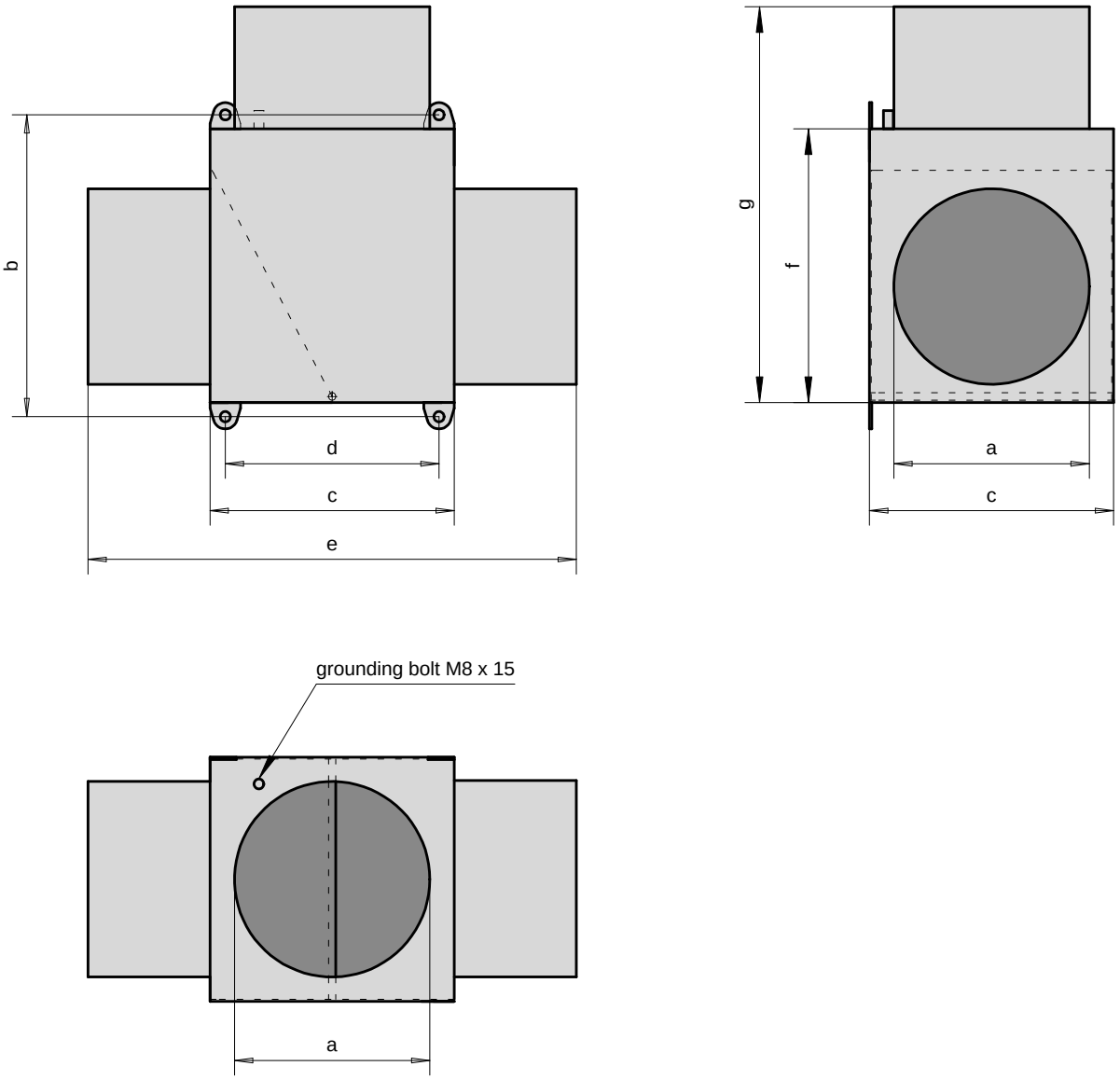
Description

The junction box comprises loop isolators and galvanic isolators for one or two intrinsically save circuits. It connects smoke detector units and air exhaust duct detectors to the smoke detector ring loop of the smoke detection panel. The junction box SDS-3700 must be mounted in a safe area.

Technical Data

Dimensions (enclosure, WxHxD):	200 x 200 x 155 mm
Weight:	3,7 kg
Operation temperature:	0℃ ... 55℃
Degree of protection:	IP66
Surface:	dip primed, powder coated, RAL7035

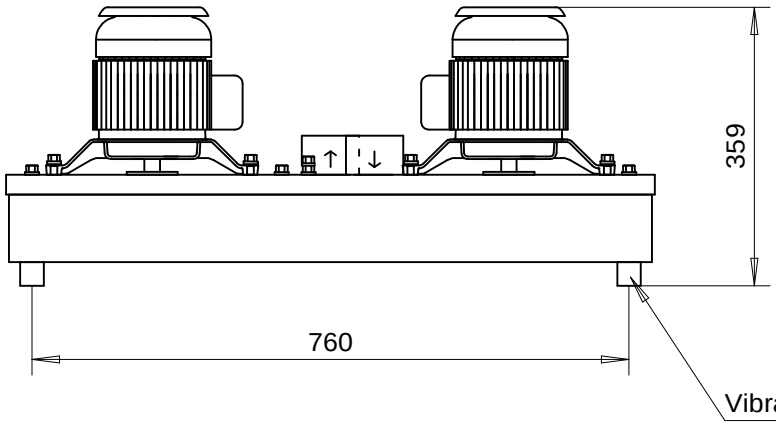
Article Numbers	Cable Glands	Remarks
SDS03.703	3x M20 or M25	1 output with loop isolator and galvanic isolator
SDS03.704	4x M20 or M25	2 outputs with loop isolator and galvanic isolators



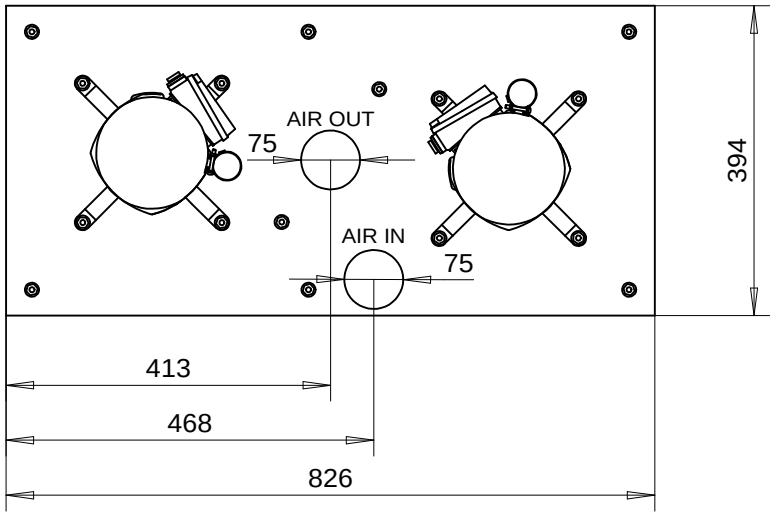
Description

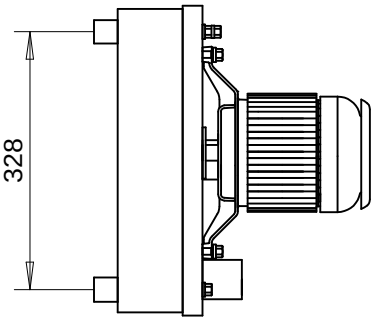
The 3/2-Way Flap connects the outputs of two fans SDS-0460 by means of flexible hoses.

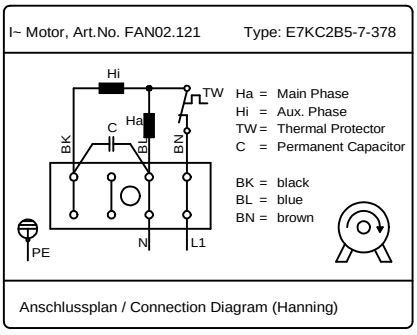
Type	Article Numbers	Dimensions							Weight	Material
		"a"	"b"	"c"	"d"	"e"	"f"	"g"		
SDS-3800	SDS03.800	160	243	200	175	420	220	330	4,3 kg	Stainless steel 1.4301
	SDS03.801	150	223	190	165	390	200	300	3,9 kg	Stainless steel 1.4301
	SDS03.805	110	174,3	137,5	112,5	337,5	151,2	251,2	2,3 kg	Stainless steel 1.4301

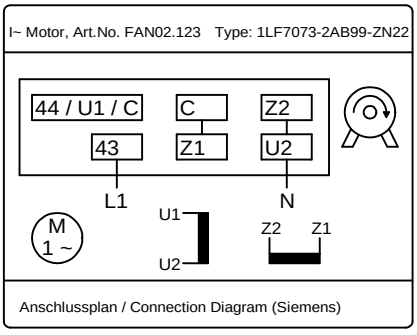


Vibration Damper, Thread M8 x 8mm







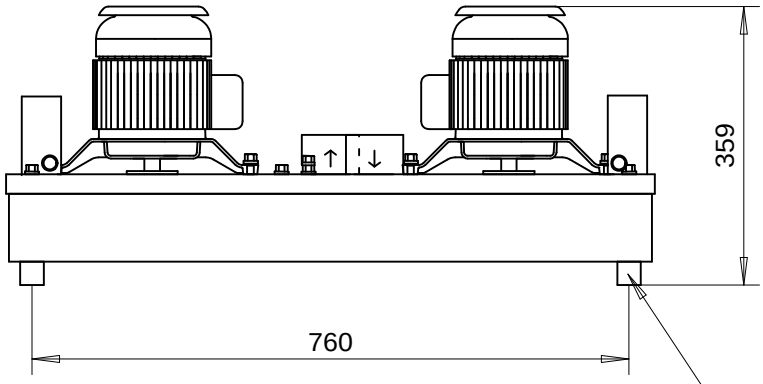


Technical Data

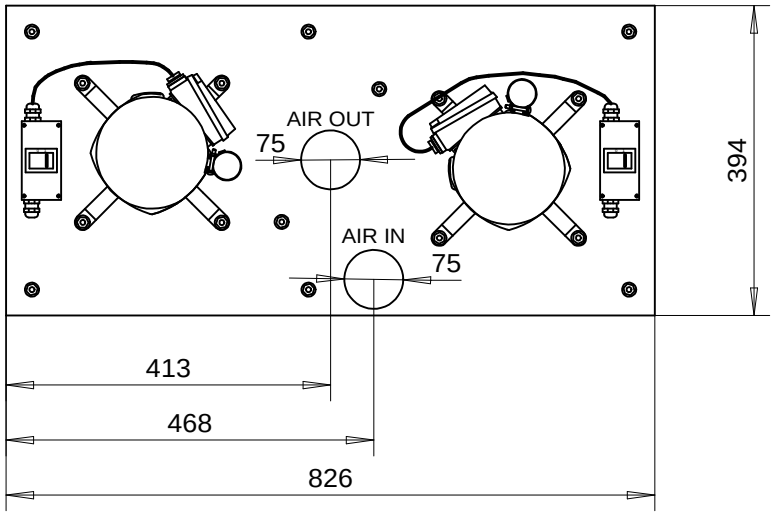
Size:	359 x 826 x 394 mm
Weight:	45 kg
Operation temperature:	-20°C - 45°C
Surface:	dip primed, powder coated, RAL7035
Power supply:	220/230 V AC 50/60 Hz
	230V: 510W@50 Hz, 630W@60Hz
Degree of protection:	IP54
Cable glands:	2 x M 20x1,5
Capacitor:	10 µ, 450 V
Rated current:	220V: 2,5A (50Hz), 3A (60Hz)
	230V: 2,3A (50Hz), 2,7A (60Hz)
Method of installation:	upright on shock mounts
	clearance: 300mm above and 50mm beside
Article number:	SDS02.440

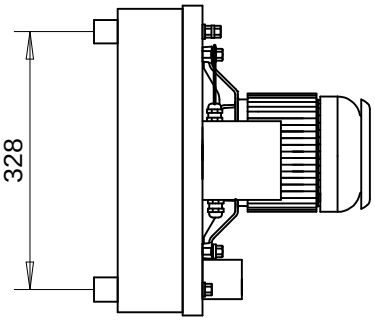
Refer to protection notice ISO 16016

safetec	Fan Unit SDS-M0440 220 V / 230 V	*Rev.12*	28.02.2018	HZ	SDS-M0440.01
		Check	28.02.2018	JP	
		Approv.	28.02.2018	kb	



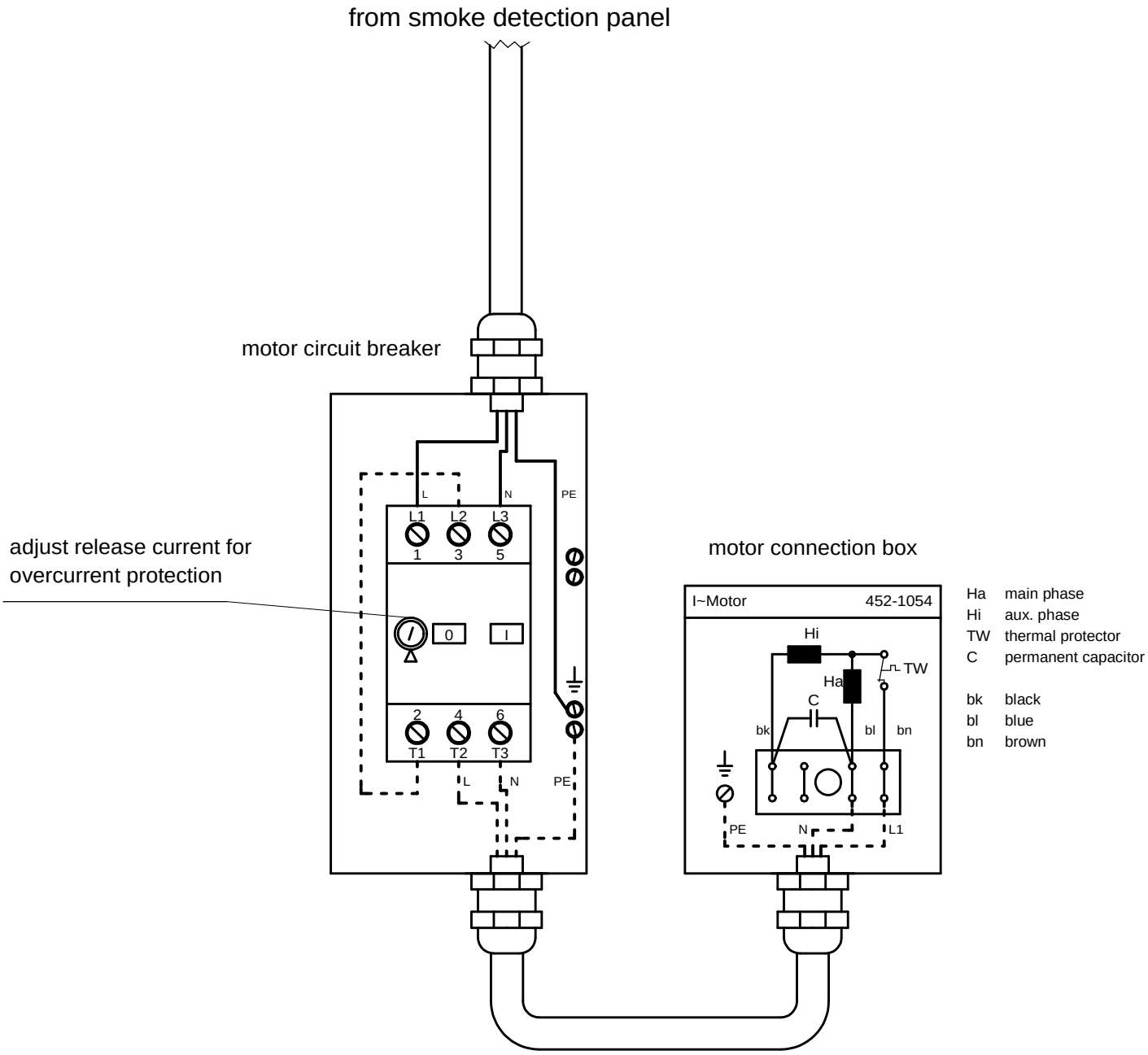
Vibration Damper, Thread M8 x 8mm





Technical Data

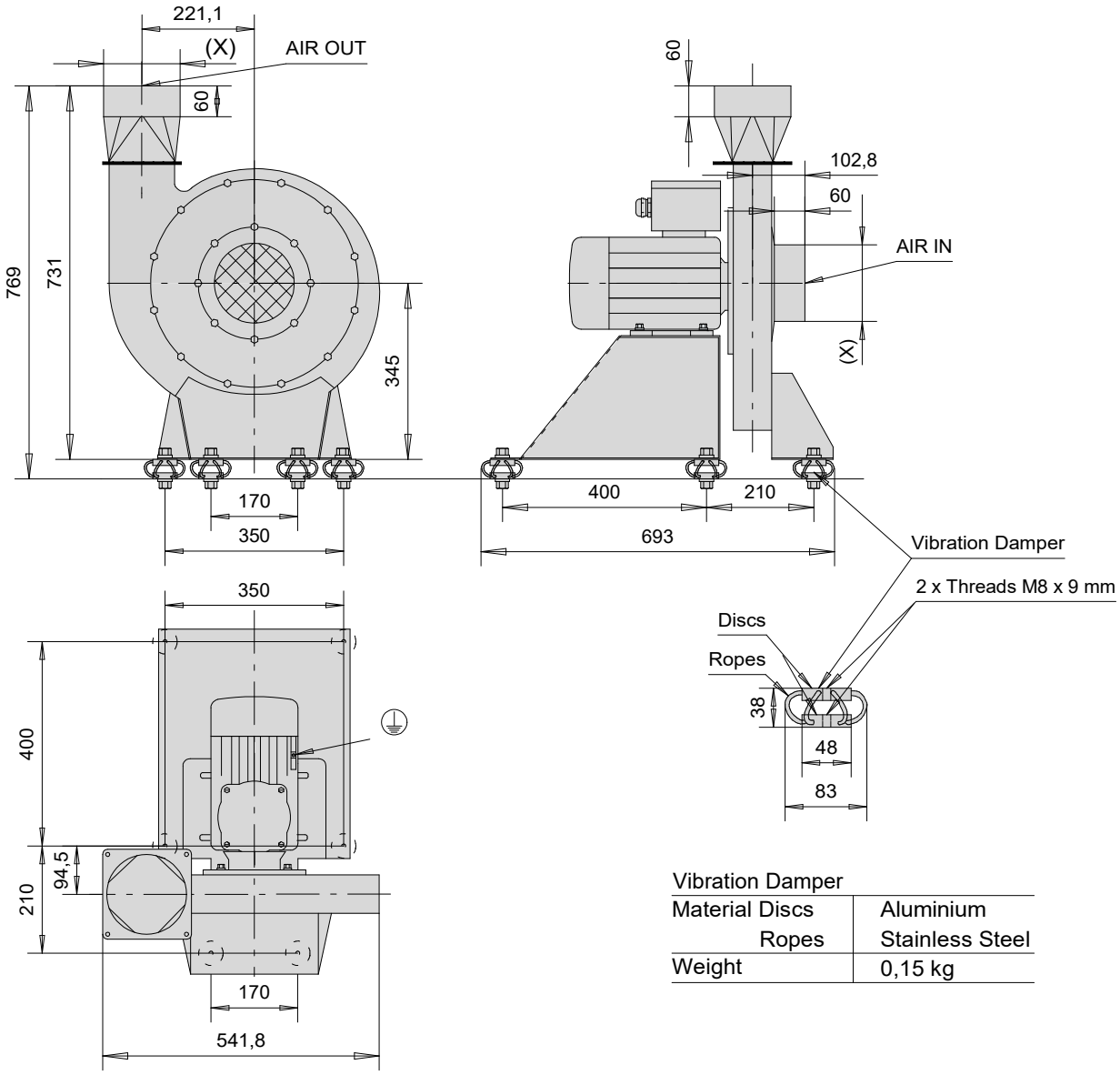
Size:	359 x 826 x 394 mm
Weight:	45 kg
Operation temperature:	-20°C - 45°C
Surface:	dip primed, powder coated, RAL7035
Power supply:	110/115 V AC, 60 Hz, 630W
Degree of protection:	IP54
Cable glands:	2 x M 25x1,5
Capacitor:	40 µ, 240 V
Rated current:	6 A
Method of installation:	upright on shock mounts clearance: 300mm above and 50mm beside
Article number:	SDS02.441



Remark:

1. The motor circuit breakers are mounted on the fan unit
2. The dotted lines are already wired by manufactorer
3. Motor is rotating clockwise
4. The wiring diagram for fan no. 2 is correspondend
5. Adjust the overcurrent protection to 6A.

safetec Art.Nos.:
Motor type Hanning 277940387: FAN02.131
Motor circuit breaker (without housing): F05.015



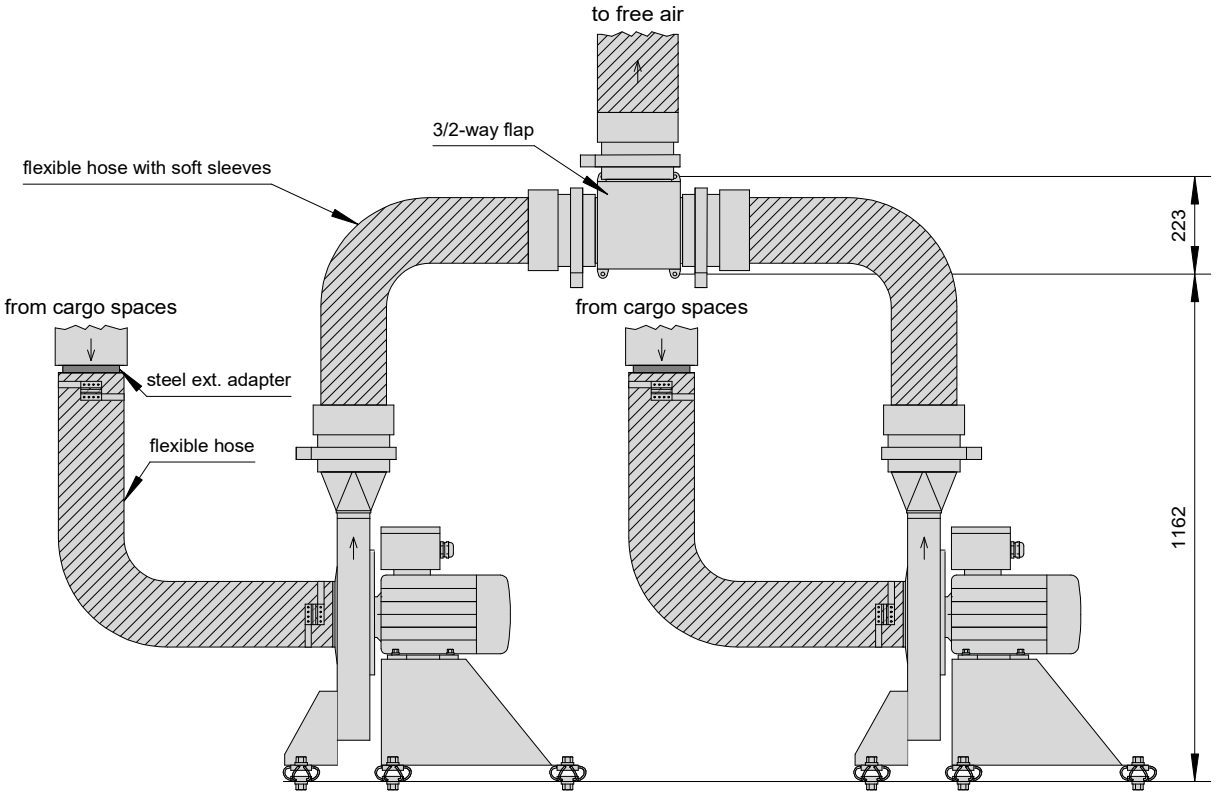
Vibration Damper	
Material Discs	Aluminium
Ropes	Stainless Steel
Weight	0,15 kg

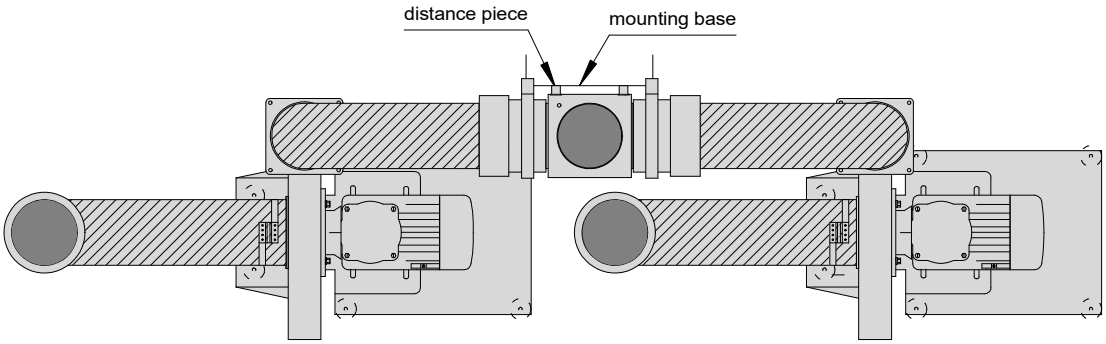
Description

The fan module SDS-M0460 is designed for application in smoke detection systems according FSS Code Chapter 10. It allows an air suction volume of 1000 m³/h and more. At least two fan modules must be installed in one system (redundancy acc. FSS Code). Both fan modules must be connected via the 3/2-Way flap SDS-3800 to the air out connection.
The fan modules together with the smoke detection panel require 2 three-phase power supplies, each 230V 3~, 16A. For 230V 3~, the fan motors must be connected in "delta" mode!

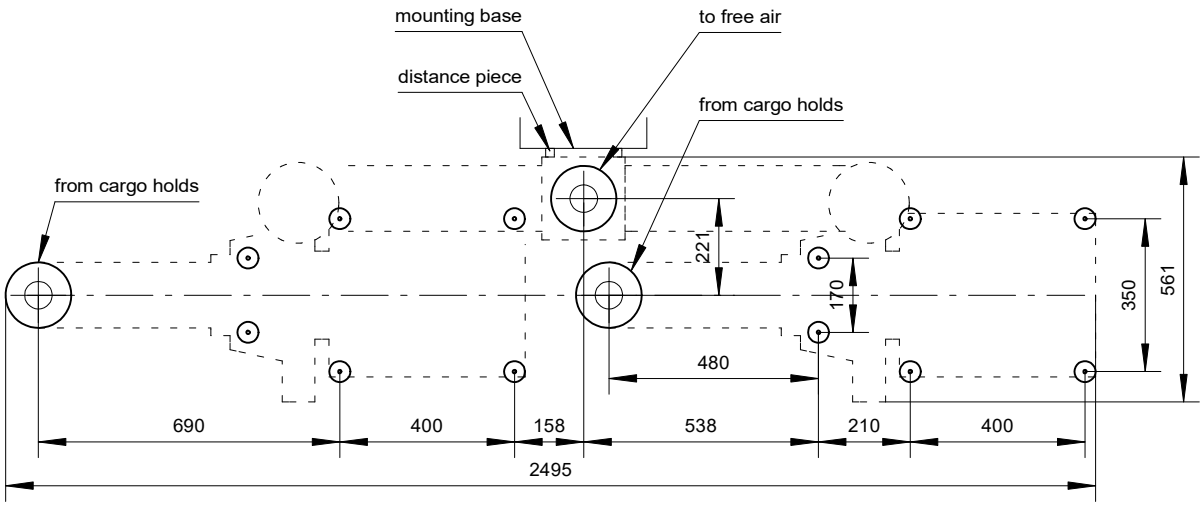
Technical Data	**50 Hz**	**60 Hz**
Size (wxhxd)	541,8 x 769 x 693 mm	541,8 x 769 x 693 mm
Weight	74 kg	74 kg
Operation Temperature	-20 °C - 45 °C	-20 °C - 45 °C
Surface Treatment and Colour for	painted in <= 80 µm RAL 9005	painted in <= 80 µm RAL 9005
Fan Module/ Motor	2K PUR acrylic resin layer paint	2K PUR acrylic resin layer paint
Power Supply	Δ 230/Y 400 V 3~ 50 Hz 5,2/2,95 A	Δ 230/Y 400 V 3~ 60 Hz 5,1/2,95 A
Motor Rated Power	1,5 kW	1,5 kW
Degree of Protection Fan Motors	IP55	IP55
Cable Glands	2 x M25 x 1,5	2 x M25 x 1,5
Rated Current	Δ 230/Y 400 V 3~ 5,2/2,95 A	Δ 230/Y 400 V 3~ 5,1/2,95 A
Method of Installation	upright on shock mounts	upright on shock mounts
Noise Level	85 db(A)	85 db(A)
Pressure Difference	approx. 1800 Pa	approx. 1800 Pa
Volume flow	approx. 1000 m³/h	approx. 1000 m³/h

Article Numbers	Description	Frequency	Size (x)	Temperature Class
SDS03.468	Fan Module	60 Hz	150 mm	T5
SDS03.469	Fan Module	50 Hz	150 mm	T5
FAN06.235	Vibration Damper; set of 6 pcs. for 1 Fan Module			





Fastening Points



					Refer to protection notice ISO 16016
safetec	Fan Modules and 3/2-Way Flap Typical Arrangement and Fastening Points	*Rev.1*	26.04.2018	kb	SDS-M0460.03
		Check	26.04.2018	HZ	
		Approv.	26.04.2018	kb	