



# **Control and Indicating Equipment**

## **Requirements and Test Methods**

Publisher and publishing house: VdS Schadenverhütung GmbH

Amsterdamer Str. 172-174

50735 Köln, Germany

Phone: +49 221 77 66 0; Fax: +49 221 77 66 341

Copyright by VdS Schadenverhütung GmbH. All rights reserved.

# VdS Guidelines for Fire Detection and Fire Alarm Systems

## Control and Indicating Equipment

### Requirements and Test Methods

This document is binding only if its application has been agreed on a case-by-case basis. Otherwise, any consideration of this document is non-binding. An agreement for application of this document is entirely optional. On a case-by-case basis, third parties may also accept, at their discretion, other requirements that do not comply with this document.

In order to avoid impairing the understanding of the text, VdS Schadenverhütung uses the generic masculine throughout. This expressly does not imply any preference or other evaluation of the male, female or other sex.

#### Content

<b>1</b>	<b>General</b> .....	<b>5</b>
1.1	Scope .....	5
1.2	Start of validity .....	5
<b>2</b>	<b>Definitions and abbreviations</b> .....	<b>5</b>
2.1	Definitions .....	5
2.2	Abbreviations .....	5
<b>3</b>	<b>Normative references</b> .....	<b>5</b>
<b>4</b>	<b>Classification</b> .....	<b>6</b>
<b>5</b>	<b>Requirements</b> .....	<b>6</b>
5.1	General .....	6
5.2	Requirements of EN 54-2 .....	6
5.3	Triggering of fire extinguishing systems .....	8
5.3.1	Standardised interface for extinguishing systems .....	8
5.3.2	Output for the transmission of disablements and faults.....	9
5.4	Fire brigade control panel .....	9
5.5	Fire brigade indicator panel .....	9
5.6	Fault monitoring and indication of degraded transmission paths for components type 1.....	10
5.6.1	Provision to monitor .....	10
5.6.2	Reception and processing of fault signals .....	10
5.6.3	Indication of faults .....	10
5.7	Direct triggering of valve stations (Option with requirements).....	11
5.8	Output to the switchover valve of a valve station (Option with requirements)....	11

---

<b>6</b>	<b>Tests</b> .....	<b>12</b>
6.1	General .....	12
6.2	Test methods of EN 54-2 .....	12
6.3	Triggering of fire extinguishing systems .....	12
6.3.1	Standardised interface for extinguishing systems .....	12
6.3.2	Output for the transmission of disablements and faults.....	12
6.4	Fire brigade control panel .....	12
6.5	Fire brigade indicator panel .....	12
6.6	Fault monitoring and indication of degraded transmission paths for components type 1.....	12
6.6.1	Provision to monitor .....	12
6.6.2	Reception and processing of fault signals .....	13
6.6.3	Indication of faults .....	14
6.7	Direct triggering of valve stations (Option with requirements).....	14
6.8	Output to the switchover valve of a valve station (Option with requirements)....	14
<b>Annex A</b>	<b>Comparison to the previous version</b> .....	<b>15</b>

# 1 General

## 1.1 Scope

These Guidelines specify requirements, test methods and performance characteristics for control and indicating equipment for the use in automatic fire detection and fire alarm systems installed in buildings, applicable in accordance with the relevant Guidelines for planning and installation VdS 2095.

These Guidelines are relevant in addition to European standard EN 54-2 harmonised in accordance with the Construction Products Regulation of the European Union.

## 1.2 Start of validity

These Guidelines are applicable as of 01.03.2021. They supersede Guidelines VdS 2540 : 2018-12 (03) which may be applied until 01.03.2025 on a transitional basis.

*Note: This is a translation of the German guidelines. If there are any discrepancies, the German version shall be binding.*

# 2 Definitions and abbreviations

## 2.1 Definitions

For an application of these Guidelines, the definitions used in the regulations specified in Cl. 3 shall apply.

## 2.2 Abbreviations

**CIE** Control and Indicating Equipment

# 3 Normative references

These Guidelines contain dated and undated references to other regulations (in alphabetical order). The normative references are cited in the respective clauses, the titles are listed below. For dated references, subsequent amendments to or revisions of any of these regulations apply to these Guidelines only when published by revision or amendment of these Guidelines. For undated references the latest edition of the regulation referred to applies.

*Note: Either the titles of the cited publications are translations (in italics) or the original English titles – as far as given – are cited. If there are any discrepancies, the German version shall be binding.*

**DIN 14661** Firefighting equipment – Fire brigade control panel for fire detection and fire alarm systems

**DIN 14662** Firefighting equipment – Fire brigade indicator panel for fire detection and fire alarm systems

**DIN 14675-1:2020-01** Fire detection and fire alarm systems – Configuration and operation

**EN 50130-4** Alarm systems – Part 4: Electromagnetic compatibility

**EN 54-1** Fire detection and fire alarm systems – Part 1: Introduction

**EN 54-2:1997 + A1:2006** Fire detection and fire alarm systems – Part 2: Control and indicating equipment

**EN 54-13** Fire detection and fire alarm systems – Part 13: Compatibility and connectivity assessment of system components

**EN 54-25** Fire detection and fire alarm systems – Part 25: Components using radio links

**VdS 2496** Triggering of Fire Extinguishing Systems – Planning and Installation

**VdS 2095** Fire Detection and Fire Alarm Systems – Planning and Installation

## **4 Classification**

These Guidelines do not specify any classifications of control and indicating equipment.

## **5 Requirements**

### **5.1 General**

For compliance with these Guidelines, control and indicating equipment shall fulfil the following requirements:

- the relevant requirements of product standard EN 54-2 and
- the requirements of these Guidelines

### **5.2 Requirements of EN 54-2**

On principle, the requirements of EN 54-2 apply.

Control and indicating equipment shall meet the requirements of EN 50130-4:2011 or later.

In addition, the following performance characteristics (options with requirements) of DIN EN 54-2 shall be implemented as specified below:

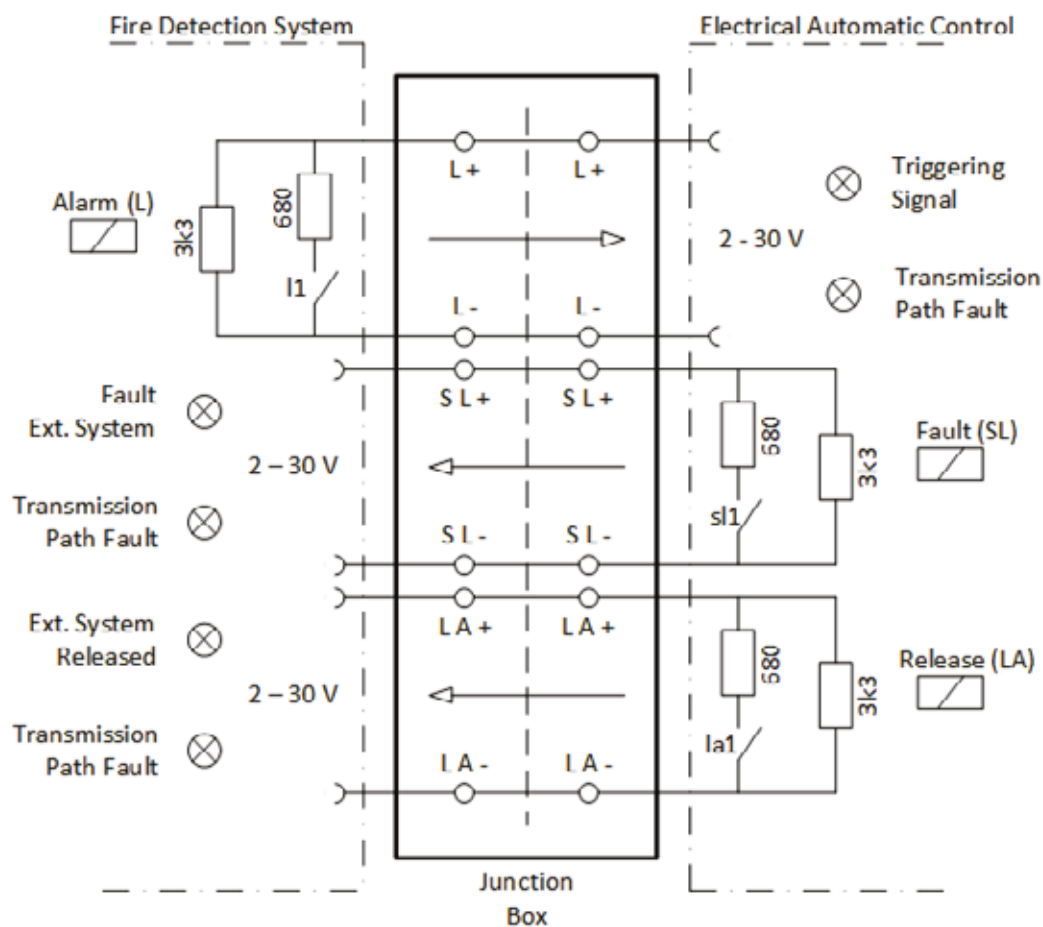
Option with requirements of EN 54-2	EN 54-2, Cl.	Option...	Note
<b>Controls:</b>			
Delays to outputs Output C	7.11.1	may be provided	2)
Delays to outputs Output E	7.11.1	may be provided	2)
Delays to outputs Output G	7.11.1	not permitted	
Provision to switch on/off delays	7.11.2	shall be provided	5)
Dependencies on more than one alarm signal Type A	7.12.1	may be provided	1)
Dependencies on more than one alarm signal Type B	7.12.2		
- Confirmation alarm signal from the same fire detector		may be provided	1), 2)
- Confirmation alarm signal from another fire detector in the same zone		shall be provided	2), 3), 6)
- Confirmation alarm signal from another fire detector in another zone		may be provided	2), 3), 6)
Dependencies on more than one alarm signal Type C	7.12.3	not permitted	
Disablement of addressable points	9.5	may be provided	
Test condition	10	shall be provided	
<b>Inputs/Outputs:</b>			
Output to fire alarm devices	7.8	shall be provided	4)
Output to fire alarm routing equipment	7.9.1	shall be provided	4)
Alarm confirmation input from fire alarm routing equipment	7.9.2	shall be provided	4)
Outputs to fire protection equipment Type A	7.10.1	may be provided	
Outputs to fire protection equipment Type B	7.10.2	may be provided	
Outputs to fire protection equipment Type C	7.10.3	shall be provided	
Fault monitoring of fire protection equipment	7.10.4	shall be provided	
Output to fault warning routing equipment	8.9	shall be provided	
Standardised input/output interface	11	may be provided	
<b>Indications:</b>			
Alarm counter	7.13	shall be provided	
Fault signals from points	8.3	may be provided	
Total loss of the power supply	8.4	may be provided	
1) Not permitted for the triggering of fire extinguishing systems in accordance with VdS 2496 2) Not permitted in combination with a manual call point 3) A confirmation alarm signal from another fire detector in another zone shall be required, if a confirmation signal from another fire detector in the same zone is technically impossible. 4) The interfaces for the triggering of fire alarm routing equipment and of control and alarm devices not incorporated in the fire detection system shall comply with DIN 14675-1:2020-01, Annex B.1, Table B.1. These requirements do not apply to interfaces for the triggering of fixed fire extinguishing systems. 5) Shall only be provided, if the option Delay to outputs acc. EN 54-2 Cl. 7.11.1 is provided. 6) Where the occurrence of an alarm has priority over the avoidance of false alarms, an alarm from the assigned detectors or detector zones and a fault, instead of two alarm signals, but no disablement, may result in fire alarm condition.			
<b>Table 5-1</b> Performance characteristics of EN 54-2			

## 5.3 Triggering of fire extinguishing systems

### 5.3.1 Standardised interface for extinguishing systems

The control and indicating equipment shall have provision for a standardised interface for extinguishing systems (SI), as shown in Figure 5-1, in accordance with VdS 2496 for the triggering of fire extinguishing systems. The function shall be tested during test and certification procedure.

*Note: The standardised interface for extinguishing systems may comprise an output in accordance with 7.10.3 and an input in accordance with 7.10.4 of EN 54-2.*



**Figure 5-1** Standardised interface for extinguishing systems (SI) in accordance with VdS 2496

#### Designation of terminals in the control and indicating equipment

The terminals of the interface for the triggering of an extinguishing system in or at the control and indicating equipment shall be marked “Extinguishing System”.

#### Indications

For each extinguishing zone, the indications for “Extinguishing System Released” and “Fault Extinguishing System” shall be by means of separate light emitting indicators and/or an alphanumeric display.



At least one common indication (general indicator) each for “Extinguishing System Released” and “Fault Extinguishing System” is required if the zonal indication for “Extinguishing System Released” and “Fault Extinguishing System” are suppressed during the fire alarm condition. The common indication shall not be suppressed during the fire alarm condition. These common indications may be the same as the separate red light emitting indicator for confirmatory signals for fire protection equipment required according to 7.10.3 of EN 54-2 or as the separate yellow light emitting indicator for fault warning signals of fire protection equipment required according to 7.10.4 of EN 54-2.

It shall be possible to interrogate suppressed indications for “Extinguishing System Released” and “Fault Extinguishing System” at access level 1.

The indications for “Transmission Path Fault” shall be by means of separate light emitting indicators and/or an alphanumeric display. These indications may be suppressed during the fire alarm condition.

The indications “Transmission Path Fault” and “Fault Extinguishing System” shall be yellow. The indication “Extinguishing System Released” shall be red.

The use of different colours is not necessary for indications on alphanumeric displays. However, if different colours are used for different indications, the colours used shall be the same as mentioned above.

### **5.3.2 Output for the transmission of disablements and faults**

The control and indicating equipment shall have provision for an output to transmit information on disablements and faults which prevent the automatic triggering of the fire extinguishing system.

## **5.4 Fire brigade control panel**

The control and indicating equipment shall have provision for an interface for the connection of a fire brigade control panel in accordance with DIN 14661. The function shall be tested during a test and certification procedure.

## **5.5 Fire brigade indicator panel**

The control and indicating equipment shall have provision for an interface for the connection of a fire brigade indicator panel in accordance with DIN 14662. The function shall be tested during a test and certification procedure.

## **5.6 Fault monitoring and indication of degraded transmission paths for components type 1**

### **5.6.1 Provision to monitor**

The CIE shall have provision to monitor one or more transmission paths for degraded performance. In this case at least the following shall apply:

- a) In the case of an optical transmission path, or a wired transmission path that is used exclusively for the transmission of information, degradation in performance shall be monitored by means specified by the manufacturer, e.g. one or more of the following:
  - 1) signal attenuation in the transmission path
  - 2) amplitude or phase distortion of the signal
  - 3) error rate for digital communications
- b) In the case of a wired transmission path that is used for the transmission of power, or of power and information, monitoring shall directly or indirectly measure:
  - 1) the series resistance in the transmission path cable cores and associated connectors from the CIE to components of the fire detection and fire alarm system (FDAS) connected to the transmission path
  - 2) the parallel resistance between all active cores of the transmission path cable
- c) In the case of a transmission path that connects the CIE to radio linked components, monitoring for degradation in performance shall comply with the requirements of EN 54-25.

### **5.6.2 Reception and processing of fault signals**

The CIE shall signal a fault at, or before a point where the transmission path cannot support its functional capability. The manufacturer shall include in the design documentation the operational range parameters for each transmission path and a description of the monitoring technologies employed and maximum or minimum values as appropriate for relevant monitored parameters, e.g. the maximum series resistance and minimum parallel resistance in the case of 5.6.1 b).

### **5.6.3 Indication of faults**

Faults shall be indicated as specified in Cl. 8.2.1 of EN 54-2. The indication as in Cl. 8.2.1 b) of EN 54-2 shall be at least common to all transmission paths and may be suppressed during the fire alarm condition.

## 5.7 Direct triggering of valve stations (Option with requirements)

The CIE may have provision for an interface for the direct triggering of valve stations in accordance with VdS 2496. The function shall be tested during a test and certification procedure.

The interface provided for transmitting the release signal to the valve station shall meet the manufacturer's specifications. The manufacturer shall specify the technical data given in Table 5-2.

CIE-Parameter		Code	Example
Z1	Nominal release voltage	$U_{ZA\text{Nenn}}$	24 V
Z2 <sup>1)</sup>	Minimum release voltage in case of mains failure, end-of-discharge voltage of battery and $I_{ZA'\text{max}}$	$U_{ZA\text{min}}$ bei $I_{ZA'\text{max}}$	20,6 V to 2 A
Z3	Maximum release voltage in operating temperature range	$U_{ZA0\text{max}}$	30 V
Z4	Maximum release current at minimum release voltage	$I_{ZA'\text{max}}$	2 A
Z5	Maximum release current	$I_{ZA\text{max}}$	2,8 A
Z6	Maximum monitoring current (shall fall below the value at which the equipment returns to the quiescent condition)	$I_{Z\ddot{U}\text{max}}$	18 mA
Z8	Minimum / maximum connection cross section	$l_{tg\text{min}} \dots A_{l_{tg}\text{max}}$	0,28 mm <sup>2</sup> ... 2,5 mm <sup>2</sup>
Z9 <sup>2)</sup>	Type of line monitoring (polarity reversal, voltage change, current change)	-	"Polarity reversal"
Z10 <sup>2)</sup>	Line terminator to be applied (EOL) with electrical specification	EOL	"EOL= 10 kΩ, ¼ W, 5%"
Z11 <sup>2)</sup>	Protection circuitry to be applied	-	"Free-wheeling diode"
Z12	maximum line resistance to ensure short circuit detection (sum of both conductors)	$R_{l_{tg}\text{max}}$	8 Ω
	Min. and max. activation time	$t_{ZAkt\text{min}}$ $t_{ZAkt\text{max}}$	10 s ∞
1) In a worst case scenario, with mains failure and a battery discharged to end-of-discharge voltage and with a corresponding maximum release current (at $I_{ZA'\text{max}}$ ), the CIE has minimum release voltage ( $U_{ZA\text{min}}$ ). 2) For functional connections, the details of the CIE manufacturer's specifications for the monitoring of the transmission path shall be considered.			
<b>Table 5-2</b> Interface specification			

## 5.8 Output to the switchover valve of a valve station (Option with requirements)

The control and indicating equipment may have provision for an output to transmit information on disablements and faults which prevent the automatic triggering of the valve station. In this case, the transmission of the information shall also be given if the CIE is de-energised. The information shall be transmitted until the fault is reset (automatically or manually) or until re-enablement.

After triggering of the valve station in case of fire (see 5.7), the information may also be transmitted. In this case, the time between triggering of the valve station and transmission of the information on disablements and faults shall be at least 15 s.

## **6 Tests**

### **6.1 General**

The general test and connection conditions of EN 54-2 apply.

### **6.2 Test methods of EN 54-2**

Testing for compliance with the requirements specified in 5.2 of EN 54-2, Cl. 4 to 14 by visual inspections and functional tests and check of the documentation. EN 54-2, Cl. 15, Test for environmental stability as specified. Exception: In the test according to EN 54-2, Cl. 15.8.1 d) "Radiated electromagnetic fields" the field strength is increased to 30 V/m in the range 890 MHz to 960 MHz at increments of 3 MHz.

The test methods of the product standard EN 54-2 and of EN 50130-4 shall be used.

Testing of inputs/outputs according to EN 54-2, Cl. 7.8, 7.9, 7.10 and testing of interfaces for compliance with the requirements of DIN 14675-1:2020-01 Annex B.1, Table B.1.

### **6.3 Triggering of fire extinguishing systems**

#### **6.3.1 Standardised interface for extinguishing systems**

Testing for compliance with the requirements of 5.3.1 with regard to connection, function and indications by functional test and visual inspection.

#### **6.3.2 Output for the transmission of disablements and faults**

Testing for compliance with the requirements of 5.3.2 with regard to connection and function by functional test and visual inspection.

### **6.4 Fire brigade control panel**

Testing of the interface for compliance with the requirements of DIN 14661 by measurement of the parameters and functional test, and testing for compliance with the required indicating and control functions specified in DIN 14661 in interaction with the control and indicating equipment by functional test and visual inspection.

### **6.5 Fire brigade indicator panel**

Testing for compliance with the indicating and control functions specified in DIN 14662 in interaction with the control and indicating equipment by functional test and visual inspection.

### **6.6 Fault monitoring and indication of degraded transmission paths for components type 1**

#### **6.6.1 Provision to monitor**

Inspect the CIE design and the manufacturer's documentation. Confirm by assessment which transmission paths are fault monitored for degraded performance, and which of 5.6.1 a), b), or c) applies for each transmission path so monitored, as follows:

- a) In the case of an optical transmission path, or a wired transmission path used exclusively for the transmission of information, introduce a disturbance (attenuation or resis-

tor) to the transmission path by a means specified or provided by the manufacturer, until a fault is indicated. The disturbance shall be recorded in the test report.

*Note: The introduction of a disturbance into the transmission path can already cause a fault of the transmission path. In this case, in an optical transmission path, the disturbance can be generated by separating the optical transmission path, and in a wired transmission path, the disturbance can be replaced by an open or short circuit. An open circuit shall be performed for each cable core and a short circuit shall be performed for all combinations of cable cores.*

- b) In the case of a wired transmission path used for the transmission of power or of power and information, inspect the CIE design and manufacturer's documentation and determine the worst case cable cores and positions where the series and parallel resistance should be introduced. Carry out the following:
- 1) With the transmission path loaded to a minimum (e.g. with one instance of each FDAS component required for the test connected with < 10 m of cable) and the maximum supply voltage, initiate a fault in the transmission path at the CIE by gradually increasing a series resistance in one cable core. Record the value of the resistance ( $S_{\min}$ ) at which the fault is indicated. Repeat this procedure for each cable core.
  - 2) With the transmission path loaded to a minimum (e.g. with one instance of each FDAS component required for the test connected with < 10 m of cable) and the maximum supply voltage, initiate a fault in the transmission path at the CIE by gradually reducing a parallel resistance across a pair of cable cores. Record the value of the resistance ( $P_{\min}$ ) at which the fault is indicated. Repeat this procedure for all combinations of cable cores.
  - 3) With the transmission path loaded to a maximum (e.g. with the maximum number of components and the maximum load connected with the maximum length of cable) and the minimum supply voltage, initiate a fault in the transmission path at the CIE by gradually increasing a series resistance in one cable core. Record the value of the resistance ( $S_{\max}$ ) at which the fault is indicated. Repeat this procedure for each cable core.
  - 4) With the transmission path loaded to a maximum (e.g. with the maximum number of components and the maximum load connected with the maximum length of cable) and the minimum supply voltage, initiate a fault in the transmission path at the CIE by gradually reducing a parallel resistance across a pair of cable cores. Record the value of the resistance ( $P_{\max}$ ) at which the fault is indicated. Repeat this procedure for all combinations of cable cores.
- Note: The steps in the level of disturbance applied to the transmission path should be the minimum practical taking into account the technology and test methods.*
- c) In the case of a transmission path that connects the CIE to radio linked components, testing shall be performed as in EN 54-25. Introduce a disturbance to the transmission path as specified in EN 54-25 until a fault is indicated.

### 6.6.2 Reception and processing of fault signals

Inspect the CIE design and the manufacturer's documentation.

- a) In the case of an optical transmission path, or a wired transmission path used exclusively for the transmission of information, carry out the following:
- 1) Remove the disturbance and reset the CIE.
  - 2) Restore the disturbance to a level at which no fault is indicated as in 6.6.1 a).
  - 3) Signal a fire alarm event and confirm that the transmission path performs the expected fire alarm functions.

- b) In the case of a wired transmission path used for the transmission of power, or of power and information, carry out the following for each introduced variable resistance of 6.6.1 b):
- 1) Remove the introduced variable resistance and reset the CIE.
  - 2) Restore the introduced variable resistance to 90 % of  $S_{\min}$  or  $S_{\max}$ , or 110 % of  $P_{\min}$  or  $P_{\max}$  and confirm that the CIE does not indicate a fault.
  - 3) Measure the operational range parameters, including at least the voltage and current at the worst case location of the transmission path, in the quiescent condition and confirm they are within the manufacturer's specification.
  - 4) Signal a fire alarm and confirm that the transmission path performs the expected fire alarm functions. Measure the operational range parameters, including at least the voltage and current at the worst case location of the transmission path, in the fire alarm condition and confirm they are within the manufacturer's specification.
  - 5) In case of transmission path with loop technology with short circuit isolator and with introduced resistances amounting to 90 % of  $S_{\max}$  or 110 % of  $P_{\max}$ , reset the CIE. Introduce an open or short circuit to the transmission path at the worst case location. After 300 s it is verified whether a fault signal is indicated at the control and indicating equipment caused by open or short circuit and whether this fault is limited to one function in not more than one zone. Signal a fire alarm and confirm that the transmission path performs the expected fire alarm functions. Measure the operational range parameters, including at least the voltage and current at the worst case location of the transmission path, in the fire alarm condition and confirm they are within the manufacturer's specification.
- c) In the case of a transmission path that connects the CIE to radio linked components, carry out the following:
- 1) Remove the disturbance and reset the CIE.
  - 2) Restore the disturbance to a level at which no fault is indicated as in 6.6.1 c).
  - 3) Signal a fire alarm event and confirm that the transmission path performs the expected fire alarm functions.

### 6.6.3 Indication of faults

During testing under 6.6.1 confirm that the fault indications specified in 5.6.3 are given.

## 6.7 Direct triggering of valve stations (Option with requirements)

Test for compliance with the requirements of 5.7 with regard to connection, function and technical data specified by the manufacturer by means of functional testing and visual inspection. In the functional tests, any data specified by the manufacturer shall be checked by measurement.

## 6.8 Output to the switchover valve of a valve station (Option with requirements)

Testing for compliance with the requirements of 5.8 with regard to connection and function by functional test and visual inspection.

## **Annex A            Comparison to the previous version**

As compared to VdS 2540:2018-12 the following changes have been made:

- a) alarm condition by alarm and fault signal for dependencies on more than one alarm signal Type B has been added;
- b) indications of “Extinguishing System Released” and “Fault Extinguishing System” have been concretised;
- c) requirements and tests for an output for transmitting the information on disablements and faults with the triggering of fire extinguishing systems has been added;
- d) requirements for an interface for connecting a fire brigade indicator panel from DIN 14675-1 has been added;
- e) fault monitoring and indication of degraded performance of transmission paths has been concretised and the test scope has been supplemented by one more test step for loop technology with short circuit isolators;
- f) CIE-Parameter „Min. and max. activation time“ in Table 5.2 has been added;
- g) requirements and tests for an output to the switchover valve of a valve station (Option with requirements) have been added.