Safety Standards

of the
Nuclear Safety Standards Commission (KTA)

KTA 1501 (2022-11)

Stationary System for Monitoring the Local Dose Rate within Nuclear Power Plants

(Ortsfestes System zur Überwachung von Ortsdosisleistungen innerhalb von Kernkraftwerken)

The Previous versions of this Safety Standard were issued in 2004-11, 2010-11 and 2017-11

If there is any doubt regarding the information contained in this translation, the German wording shall apply.

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KTA SAFETY STANDARD

November 2022	Stationary System for Monitoring the Local Dose Rate within Nuclear Power Plants	KTA 1501

Previous versions of this safety standard:
1977-10 (BAnz-No. 234 of December 15, 1977)
1991-06 (BAnz-No. 7a of January 11, 1992)
2004-11 (BAnz-No. 35a of February 19, 2005)
2010-11 (BAnz-No. 199a of November 30, 2010)
2017-11 (BAnz AT of February 5, 2018 B3)

Contents

Comments by the Editor:

Taking into account the meaning and usage of auxiliary verbs in the German language, in this translation the following agreements are effective:

shall	indicates a mandatory requirement,
shall basically	is used in the case of mandatory requirements to which specific exceptions (and only those!) are permitted. It is a requirement of the KTA that these exceptions - other than those in the case of **shall normally** - are specified in the text of the safety standard,
shall normally	indicates a requirement to which exceptions are allowed. However, exceptions used shall be substantiated during the licensing procedure,
should	indicates a recommendation or an example of good practice,
may	indicates an acceptable or permissible method within the scope of this safety standard.

Basic Principles

(1) The safety standards of the Nuclear Safety Standards Commission (KTA) have the task of specifying those safety-related requirements which shall be met with regard to precautions to be taken in accordance with the state of science and technology against damage arising from the construction and operation of the plant (Sec. 7, para. (2), subpara. (3) Atomic Energy Act - AtG) in order to attain the protective goals specified in the AtG, the Radiation Protection Act (StrlSchG) and the Radiation Protection Ordinance (StrlSchV) as well as further detailed in the Safety Requirements for Nuclear Power Plants (SiAnf) and the Interpretations of the SiAnf.

(2) The objective of monitoring the radiation and radioactivity is, among others, to protect the persons inside and outside of the plant against ionizing radiation, to monitor the specified normal guided flow of solid, liquid and gaseous radioactive substances inside of the plant as well as to monitor the discharge of radioactive substances.

(3) The stationary system for monitoring local dose rates (in short: LDR-System) serves to monitor the local dose rates within the controlled access areas of nuclear power plants during specified normal operation, and to actuate alarms whenever alarm thresholds are exceeded.

(4) The LDR-System shall normally present information during and after design basis accidents regarding the accessibility of the monitored areas.

(5) Monitoring by the LDR-System contributes towards fulfilling the requirements of Secs. 56, para.3 and 90 StrlSchV.

(6) The measuring equipment specified in safety standard KTA 3502 for measuring the local dose rates to evaluate the plant condition during and after design basis accidents are not dealt with in the present safety standard. However, it may be useful to design particular measuring equipment in such a way that it meets the requirements of the present safety standard and of safety standard KTA 3502 and therefore can be employed to fulfill tasks according to both safety standards.

(7) The LDR-System does not serve to fulfill the tasks specified in Sec. 2 para. 1 Calibration Ordinance.

1 Scope

This safety standard applies to the stationary measurement equipment for monitoring the local dose rate due to gamma radiation and emitted neutrons in the controlled access areas of nuclear power plants with light-water reactors during specified normal operation and in the case of design basis accidents.

2 Definitions

(1) Measurement equipment

The term measurement equipment comprises the entirety of all measuring devices and auxiliary devices required for registering a measurand, for transferring and adapting the measurand and for displaying a measured value as image of the measurand.

(2) Measurement location

The measurement location is that location for which the local dose rate shall normally be determined.

(3) Local dose

The local dose is the dose equivalent measured at a specific location and in the measurands as specified in Appendix 18 Part A StrlSchV.

(4) Local dose rate

The local dose rate is equal to the local dose generated in a specific time interval, divided by the length of this time interval.

3 Measurand

The measurand addressed in this safety standard is the local dose rate of gamma radiation and, if applicable, the local dose rate of emitted neutrons.

4 Measurement Locations

(1) Measurement locations for the LDR-System are:

a) Locations where, in the course of specified normal operation, changes of the local dose rate are expected and persons would then have to be warned.

b) Locations where a determination of the local dose rate is required in the case of events which are not included in specified normal operation.

c) Exclusion areas, provided, the determination of the local dose rate in these areas requires stationary measuring equipment.

(2) Typical measurement locations for pressurized water reactors and boiling water reactors are specified in **Table 4-1**.

Note:

The measurement of the local dose rate of neutron emission is limited to specific cases, e.g., measurements in close vicinity of the reactor pressure vessel and when handling neutron sources. A monitoring with stationary measuring devices is, generally, not required.

(3) The local dose rate inside the containment vessel of a nuclear power plant shall under all circumstances be monitored at the entrances (personnel lock and equipment lock) with the LDR-System.

Reactor Type	***Measurement Location***	***Design Requirements*** [2]
PWR	In front of the storage location for radioactive wastes	I
	Material lock (inside the containment vessel) [1]	I, II
	Personnel lock (inside the containment vessel) [1]	I, II
	Refueling platform (refueling machine)	I
	Aeroball measurement room	I, III
BWR	In front of storage location for radioactive wastes	I
	Material lock (inside the containment vessel) [1]	I, II
	Personnel lock (inside the containment vessel) [1]	I, II
	Refueling platform (refueling machine)	I
	Floor level of turbine building	I, II
	Compartment of control rod drive mechanisms	I, II
	Compartment of traversing in-core probe system	I, III

[1] Measurement display outside the containment vessel at entrance to lock

[2] I: To be designed for specified normal operation (Section 5.2)
II: To be designed for design basis accidents (Section 5.3)
III: Temporary exclusion area

Table 4-1: Typical measurement locations

5 Requirements for the Measuring Equipment and their Components

5.1 General Requirements

(1) The measuring equipment specified in this safety standard shall be calibrated prior to commissioning and shall, thereafter, be subjected to inservice inspections as specified in **Table 8-1**.

(2) The measuring equipment shall be connected to the emergency power system. When the line voltage has been restored after power interruptions, the functional capability of the measuring equipment shall not have been impaired.

(3) The measurement values shall be recorded with recording devices.

(4) Where measuring equipment is provided with warning alarm thresholds for the actuation of warning alarms, these alarm thresholds shall be adjustable.

(5) In the case of measuring equipment with several linear display ranges, the successive measurement ranges shall, at least, directly adjoin each other. The scale end value of an individual measurement range shall not be larger than ten times the scale end value of the next more sensitive measurement range.

(6) In the case of measuring equipment with several logarithmic display ranges, the successive measurement ranges shall overlap each other by at least one decade (i.e., by one power of magnitude).

(7) If the local dose rate exceeds the upper measurement range limit by up to fifty times the end value, however, no more than up to a local dose rate of 250 Gy/h, this out-of-range range condition shall be clearly displayed for the duration of at least five minutes.

(8) After no more than ten minutes from the time the local dose rate has exceeded the end value of the measurement range as described in para. 7, the measurement equipment involved shall again meet the requirements specified in **Tables 5-1** through **5-3**.

(9) In case of a variation of one influence parameter (including a variation of the local dose rate itself) within the respective nominal operating range as specified in **Tables 5-1** or **5-3** while the other influence parameters (with the exception of pressure) are left constant near the individual reference values, the resulting measurement value shall basically not deviate from the true value by more than the maximum permissible relative deviation f_{max} as specified for this influence parameter in the above mentioned tables. In the case of the influence parameters “operating voltage”, “ambient temperature”, “pressure of the inner atmosphere” and “relative humidity”, the specified maximum permissible relative deviation f_{max} of the measurement display may be considered as being an orientational value.

(10) In the case of digital display devices, means shall normally be provided for checking the functional capability of all display segments.

(11) The measuring equipment shall be secured against any unauthorized changes of the alarm thresholds.

(12) It is recommended that no measuring equipment are used that have any adjustment elements for setting the zero point or the discrimination. However, in the case of measuring equipment that require re-adjustments during operation, adjustment elements shall be provided that are integrated into the equipment.

(13) If programmed electronic elements are contained in the signal path between the detector and the display unit, a test program for an internal functional check shall be installed.

(14) Above a local dose rate of 1/50 of the upper measurement range limit, the measuring equipment shall, within 10 seconds, display 95 % of a sudden increase of the local dose rate if this increase amounts to 80 % of the end value of the individual display range.

(15) The measuring equipment shall be designed and constructed to meet the requirements of Protection Degree IP 54 in accordance with DIN EN 60529 (protection against foreign particles and water).

(16) The measuring equipment shall meet the specifications of DIN EN 62598.

(17) With regard to the disturbance resistance of the measuring equipment against electromagnetic disturbance signals (e.g., electrostatic discharges, electromagnetic fields, interference voltages), the Act on the electromagnetic compatibility of components (EMVG) shall be observed.

(18) Local dose rates above $3 \cdot 10^{-3}$ Sv/h shall be displayed within a response time of no more than 5 seconds.

(19) In the case of local dose rate measuring equipment intended for use in areas of mixed radiation fields (e.g., neutron emissions and gamma radiation), the manufacturer shall specify how this equipment will react to the different types of radiation.

5.2 Additional Requirements Concerning Measuring Equipment for Specified Normal Operation

(1) The measuring equipment shall meet the requirements specified in **Table 5-1**.

(2) If more than 20 % of the local dose rate could be caused by gamma radiation above 1.3 MeV, then the nominal operating range shall cover 100 keV to 3 MeV. If, in addition, more than 20 % of the local dose rate could be caused by gamma rays in an energy range above 3 MeV, then the effect on the discrimination of gamma rays between 3 MeV and the highest occurring gamma ray energy shall, additionally, be known. The discrimination in the energy range from 80 keV to 100 keV shall be known.

(3) The measuring equipment for determining the local dose rate of gamma radiation outside of exclusion areas shall have a nominal operating range covering at least 10^{-6} Sv/h to 10^{-2} Sv/h, and inside of exclusion areas a nominal operating range covering at least 10^{-4} Sv/h to 1 Sv/h.

(4) In case of a variation of the local dose rate within the nominal operation range, the displayed value of an analog display of more than four decades may not deviate from the true value by more than ± 30 %, in all other cases by not more than 20 %. The manufacturer shall specify the reference value of the local dose rate that must be adjusted in case of a change of one of the other influence parameters as specified under Section 5.1 para. 9.

(5) The measurement value display of the measuring equipment in an exclusion area shall be readable outside of the exclusion area in an accessible area.

(6) In the case of measuring equipment for neutron emission, the nominal operating ranges and reference values specified in **Table 5-1** – with the exception of the values specified for gamma radiation – shall be applied. The nominal operating range for the neutron energy shall extend from 0.025 eV to 10 MeV. The factor f_{max} to be observed in the case of a variation of the neutron energy shall be in the range from +400 % to -75 %. The other reference values (local dose rate and neutron energy) shall be specified by the manufacturer. The manufacturer shall, likewise, specify the maximum permissible error of the local dose rate (deviation from the true value) within the nominal operating range as well as the changes of measurement values caused by a maximum variation, f_{max}, of the other

influence parameters. In this respect, the requirements specified under Section 5.1 para. 9 shall be applied.

(7) Local dose rate measuring equipment for neutron emissions shall normally have a measurement range covering at least 10^{-6} Sv/h to 10^{-1} Sv/h.

5.3 Additional Requirements Concerning Measuring Equipment for Measurements during and Directly after Design Basis Accidents

(1) The measuring equipment for determining the local dose rate of gamma radiation inside the containment vessel during and directly after design basis accidents shall have a nominal operating range covering at least 10^{-6} Sv/h to 10^{2} Sv/h. This requirement may be fulfilled by providing two measuring devices with each individually covering a segment of the entire measurement range. Generally, the requirements specified in **Table 5-2** shall be applied.

(2) The measuring equipment for determining the local dose rate of gamma radiation inside the turbine building of a plant with a boiling water reactor during and directly after design basis accidents shall have a nominal operating range covering at least 10^{-6} Sv/h to 1 Sv/h. Generally, the requirements specified in **Table 5-3** shall be applied.

(3) The reference value for the local dose rate of the equipment under paras 1 and 2 shall be specified by the manufacturer for any variation of the other influence parameters specified under Section 5.1 para. 9. The displayed measurement value for a variation of the local dose rate within the measurement range may not deviate from the true value by more than 40 %.

(4) The design of the components of the measuring equipment shall take those ambient conditions into account which these components could be subjected to during and directly after design basis accidents. This applies, in particular, to the radiation resistance of the electronic components.

(5) For the protection against effects from design basis accidents, the detector may also be installed away from the measurement location, provided, the ratio between local dose rate at the installation location and local dose rate at the measurement location is known and is considered in the calibration. This provisional condition shall be proven under consideration of possible changes of the nuclide spectrum. In this case, the requirements regarding the measuring device shall be adjusted accordingly.

(6) The measuring equipment shall be designed for all design basis accidents where the equipment shall normally be functional as well as for the sequential effects of these design basis accidents such as debris, pipe whips, jet impingement forces and coolant blowdown. If these design requirements cannot be achieved with an individual measuring equipment, spatially separated redundant measuring equipment shall be provided.

(7) Measuring equipment installed inside the containment vessel shall meet the requirements specified in **Table 5-2**. **Table 5-3** applies to the measuring equipment installed in the turbine building of boiling water reactors. The nominal operating ranges specified in **Table 5-2** or **Table 5-3** for ambient temperature, pressure and relative humidity of the inner atmosphere need to be applied only to those parts of the measuring equipment which could be subjected to the design basis accident conditions and which are required to remain functional during the design basis accident. Section 5.1 para. 9 also applies in this case.

(8) Instead of the proof that the specified maximum permissible relative deviations, f_{max}, of the measurement value display for the influence parameters “ambient temperature”, “pressure of the inner atmosphere” and “relative humidity” are as specified in **Tables 5-2** and **5-3**, a test in accordance with Sec. 5.11.3 of safety standard KTA 3505 (test curve for the course of the design basis accidents) may be performed.

(9) The measuring equipment for monitoring the local dose rate at or near the personnel lock inside the containment vessel shall be designed as being redundant equipment. The detectors shall be installed spatially separated from each other.

Influence Parameter	*Nominal Range of Operation*	*Reference Value of Influence Parameter*	f_{max} [1]
Gamma ray energy			
Measuring equipment for gamma radiation with a maximum energy of up to 1.3 MeV	100 keV to 1.3 MeV	662 keV	± 40 %
Measuring equipment for gamma radiation with a maximum energy of up to 3 MeV	100 keV to 3 MeV	662 keV	± 40 %
Measuring equipment for gamma radiation with a maximum energy of over 3 MeV	100 keV to 3 MeV	662 keV	± 40 % within the range of 100 keV to 3 MeV; additionally, the function of discrimination with changing energy must be known
Incidence angle of radiation	preferred direction ± 45°	preferred direction	± 30 % [2]
Operating voltage			
DC voltage supply	18 V to 30 V	24 V	± 5 % [2]
AC voltage supply	187 V to 253 V	230 V	± 5 % [2]
Ambient temperature	10 °C to 50 °C	20 °C	± 20 % [2] [3]
Pressure of inner atmosphere	900 hPa to 1300 hPa	1013 hPa	± 5 % [2] [3]
Relative humidity	30 % to 95 %	60 %	± 20 % [2]

[1] Maximum permissible variation of the displayed measurement value with the respective influence parameter being varied within its nominal operating range relative to the measurement value at the reference value of the influence parameter.

[2] Orientational value

[3] The air density correction may be taken into account in order to meet the requirements in case the detectors are not leak tight.

Table 5-1: Requirements for local dose rate measuring equipment during specified normal operation

Influence Parameter	*Nominal Range of Operation*	*Reference Value of Influence Parameter*	f_{max} [1]
Gamma ray energy	100 keV to 3 MeV	662 keV	± 40 %
Incidence angle of radiation	preferred direction ± 45°	preferred direction	± 30 %
Operating voltage			
DC voltage supply	18 V to 30 V	24 V	± 5 % [2]
AC voltage supply	187 V to 253 V	230 V	± 5 % [2]
Ambient temperature	10 °C to 165 °C	20 °C	± 20 % [2] [3]
Pressure of inner atmosphere	900 hPa to 6300 hPa	1013 hPa	± 5 % [2] [3]
Relative humidity	30 % to 100 %, condensing steam	60 %	± 20 % [2]

[1] Maximum permissible variation of the displayed measurement value with the respective influence parameter being varied within its nominal operating range relative to the measurement value at the reference value of the influence parameter.

[2] Orientational value

[3] The air density correction may be taken into account in order to meet the requirements in case the detectors are not leak tight.

Table 5-2: Requirements for local dose rate measuring equipment inside the containment vessel during and after design basis accidents

Influence Parameter	*Nominal Range of Use*	*Reference Value of Influence Parameter*	f_{max} [1]
Gamma ray energy	100 keV to 3 MeV	662 keV	± 40 %
Incidence angle of radiation	preferred direction ± 45°	preferred direction	± 30 %
Operating voltage			
DC voltage supply	18 V to 30 V	24 V	± 5 % [2]
AC voltage supply	187 V to 253 V	230 V	± 5 % [2]
Ambient temperature	10 °C to 80 °C	20 °C	± 20 % [2] [3]
Pressure of inner atmosphere	900 hPa to 1300 hPa	1013 hPa	± 5 % [2]
Relative humidity	30 % to 100 %, condensing steam	60 %	± 20 % [2]

[1] Maximum permissible variation of the displayed measurement value with the respective influence parameter being varied within its nominal operating range relative to the measurement value at the reference value of the influence parameter.

[2] Orientational value

[3] The air density correction may be taken into account in order to meet the requirements in case the detectors are not leak tight.

Table 5-3: Requirements for local dose rate measuring equipment inside the turbine building of boiling water reactors during and after design basis accidents

6 Measurement Value Display, Recording and Documentation

(1) The measurement value shall be displayed on-location and shall be displayed and recorded in the control room. The on-location display unit may be installed spatially separated from the detector (cf. Section 5.2 para. 5). The display and recording shall represent units of Sv/h, mSv/h or µSv/h.

(2) The recording devices for the measurement values shall be located in the control room or in an annex to the control room. Multi-track plotters or printers may be used, however, with no more than six tracks each. The recordings on the recording strips shall be clearly visible and well legible for a period of at least three hours.

(3) The display and recording of the measurement values on CRT monitors is permissible, provided, one, that a monitor is available primarily for displaying these values, two, that a hard-copy of the display can be obtained at any time and, three, that the measurement values are stored. A second monitor shall be available for the purpose of redundancy.

(4) These recordings shall be regularly evaluated and shall be safely stored in accordance with the legal regulations or the provisional conditions.

(5) Equipment failure alarms and warning alarms shall be displayed optically and acoustically in the control room.

(6) Group alarms may be used in the control room, provided, a display in or near the control room shows from which measurement equipment the individual alarm signal originates.

(7) The individual optical signal of the equipment failure alarms and of the warning alarms in the control room shall be such that the state of the alarms can be identified (e.g., recently queued, acknowledged).

(8) It shall be possible to reset the acoustic alarms in the control room. A renewed transition of the upper or lower limit values shall cause a renewed issue of the acoustic alarms.

(9) It is permissible to individually or collectively annul the acoustic signals prior to the removal of their causes.

(10) An equipment failure shall also be optically displayed on-location. A transition of the alarm threshold shall be optically and acoustically displayed on-location. It is permissible to dispense with an on-location acoustic failure alarm, provided, the hazard region is secured by a sufficient number of blinking or flashing lights. The cause leading to the transition of the alarm threshold shall be recorded.

(11) The alarm displays on-location shall be designed and constructed (with respect to, e.g., brightness, loudness) such that the signals can be reliably perceived under all expected ambient conditions. It shall normally be possible to distinguish between the equipment failure alarms and the warning alarms.

(12) Equipment failure alarms and warning alarms shall not be able to cancel themselves automatically while the transition situation of an upper or of a lower limit value persists. It shall be possible to cancel the acoustic warning alarms at all times, whereas the optical warning alarms may only be cancelled when the alarm condition has ended.

(13) The threshold values for the warning alarms may be altered only with approval of the radiological protection officer; the alteration shall be documented.

7 Servicing and Repair

(1) Regular servicing and the repairs of measuring equipment shall be carried out by competent personnel and in accordance with servicing schedules and repair instructions.

(2) The servicing and repair tasks shall be recorded in device-specific documents. These documents shall be put into safe storage and shall be presented during the inservice inspections to the experts authorized by the proper authority.

(3) When measuring equipment fails then, until their repair, the individual measurement tasks shall be carried out using suitable alternative measures. The required repair shall be carried out without delay. Corresponding requirements shall be specified in the operating manual.

Note:

In the case of measuring equipment inside an exclusion area, a "repair without delay" is understood as being carried out during the next plant shut-down or during the next major inspection (refueling).

8 Tests and Examinations

8.1 Test and Examination Documents

Test instructions shall be written down for all tests and examinations specified in Sections 8.3 to 8.6. In the case of inservice inspections, the test intervals, the responsibilities for tests and examinations and the applicable test instructions shall be listed in the testing schedule in accordance with Sec. 3.3 of safety standard KTA 1202.

8.2 Demonstration of Suitability

It shall be demonstrated that the measuring equipment specified in this safety standard meet the requirements of the measurement objective.

Note:

Requirements for the demonstration of suitability of radiation measurement equipment are specified in safety standard KTA 1505 "Verification of Suitability of Radiation Measuring Equipment".

8.3 Factory Test and Inspection

(1) A factory test and inspection shall be performed to demonstrate proper manufacture and fault free functioning of the measuring equipment.

(2) The factory test and inspection shall be carried out as a production test and shall comprise, at least:

a) Visual inspection,
b) Test of the change of display upon variation of the operating voltage within its nominal operating range,
c) Calibration with radioactive test sources for at least two measurement points which shall be apart from each other by no less than one decade (one order of magnitude),
d) Test of the measurement characteristic using, alternatively, radioactive test sources or an impulse or current generator with at least one test value per decade of the measurement range.

(3) The factory test and inspection shall be carried out by plant experts and, in substantiated cases, in the presence of the proper authority or an authorized expert appointed by the proper authority.

8.4 Commissioning Test

The post installation commissioning test shall be carried out by the licensee and, in substantiated cases, in the presence of the proper authority or an authorized expert appointed by the proper authority. This test shall comprise, at least:

a) Inspection of the installation,
b) Test with an impulse or current generator with at least one test value per decade of the measurement range (display on-location and in the control room; recording),
c) Specification of recalibration values using radioactive test sources in a defined geometry for the verification of the calibration within the framework of inservice inspections (cf. Section 8.5 para. 2),
d) Tests of the alarms regarding equipment failure,
e) Tests of the alarms regarding transition of limit values,
f) Test of the limit value generators,
g) Test of the connection to the power supply, and
h) Function of the alarm devices, if applicable.

8.5 Inservice Inspections

(1) The measuring equipment shall be subjected to the inservice inspections as specified in **Table 8-1**. The inspection intervals, also specified in **Table 8-1**, shall be considered as orientational values that may be varied with the objective of achieving a dose reduction (cf. Sec. 8 para. 2 StrlSchG).

Note:

The exposure caused by certain tests and inspections can be reduced if these tests and inspections are performed during the major inspection (refueling).

(2) The calibration test with the identical geometry and similar radioactive test sources (taking radioactive decay into account) may deviate from the recalibration values specified in Section 8.4 item c) by no more than ± 30 % of these recalibration values.

(3) When Geiger counters are used as detectors, the functional capability and the residual life shall be verified by checking the plateau gradients at the individual operating voltages. The radiation source used in this test shall be chosen such that, at the detector operating voltage and at a level of 100 V below and above this operating voltage, the measurement values will lie approximately in the central decade of the nominal operating range. From these measurement values the plateau gradients shall be determined relative to the measurement value at the operating voltage, and these gradients shall, then, be compared with the specifications of the manufacturer. The detector shall be replaced at the latest when the plateau gradient has reached a value of twice that specified by the manufacturer.

8.6 Tests and Inspections after Repairs

After completion of a repair task, the proper functioning shall be demonstrated by performing a commissioning test as specified in Section 8.4 and to an extent corresponding to the extent of the repair task.

8.7 Test Certifications

The results of the tests and inspections specified in Section 8 of this safety standard shall be documented in test certifications. The test certifications shall be put into safe storage. The test certifications shall contain, at least, the following information:

a) Test object,
b) Type of test,
c) Test documents,
d) Test results,
e) In case of defects: time limits specified for eliminating the defects or for replacing the test object,
e) Date of testing,
f) Name and signature of tester.

9 Documentation

(1) For every device the documents specified under Section 7 para. 2, Sections 8.1 and 8.7 shall be put into safe storage and shall be available at all times.

Note:

Additional requirements regarding documentation are specified in safety standard KTA 1505 "Verification of Suitability of Radiation Measuring Equipment".

(2) Data sheets shall be available for all measuring equipment and shall contain at least the following data:

a) Description of the measuring equipment,
b) Technical documents regarding installation and set-up,
c) Operating instruction,
d) Calibration instruction,
e) Calibration means and arrangement,
f) Servicing and test instructions.

Note:

The certifications underlying documents under items d), e) and f) are, generally, kept by the manufacturer of the measuring equipment.

Item No.	*Test or Examination*	*Method of Testing*	*Testing Interval*	
			Licensee	Proper authority or an authorized expert appointed by the proper authority
1	Electronic tests	Input of standard signals into the transmitter [1] (at least one value per decade of the measurement range). Comparison of all displays and recorded data	yearly	yearly
2	Testing of the detectors	As specified in Section 8.5 para. 3 – (only if Geiger counters are used)	half-yearly	yearly
3	Testing of the calibration	Comparison of the specified and actual values using radiation sources with at least two measurement values that are apart by at least one decades	a) half-yearly (in the case of Geiger counters) b) yearly (other measuring equipment)	yearly
4	Testing the signals (signaling)	Failure alarm: e.g., by interrupting the voltage supply or by breaking the signal connection between transducer and detector	half-yearly	yearly
		Hazard alarm: with radiation source or electrically	half-yearly	yearly
5	Visual inspection of the equipment outside of exclusion areas	–	half-yearly	yearly
6	Inspection of the recordings	–	–	yearly

[1] The testing method of inputting standard signals into the transmitter with at least one value per decade of the measurement range is not required for digital equipment, provided, the software program is tested and controls itself (self-surveillance). In this case, inputting a signal into the uppermost decade of the measurement range is sufficient, provided, no switchovers are carried out by the signal conditioning logic in the entire measurement range. This may, also, be dispensed with, if, during the calibration test, one measurement value lies in the uppermost decade.

Table 8-1: Inservice inspections

Appendix A

Regulations Referred to in this Safety Standard

Regulations referred to in this safety standard are valid only in the versions cited below. Regulations which are referred to within these regulations are valid only in the version that was valid when the latter regulations were established or issued.

AtG		Act on the Peaceful Utilization of Atomic Energy and the Protection against its Hazards (Atomic Energy Act) Atomic Energy Act in the version promulgated on July 15, 1985 (BGBl. I, p. 1565), most recently changed by article 1 of the act dated December 4, 2022 (BGBl. I, p. 2153)
StrlSchG		Act on the Protection against the Harmful Effect of Ionising Radiation (Radiation Protection Act - StrlSchG) Radiation Protection Act of June 27, 2017 (BGBl. I, p. 1966), most recently changed by the promulgation of January 3, 2022 (BGBl. I, p. 15)
EMVG		Act on the electromagnetic compatibility of operating components (EMVG) of September 26, 1998 (BGBl. I, No. 64, p. 2882), most recently changed by Article 51 of the act of June 23, 2021 (BGBl. I p. 1858)
StrlSchV		Ordinance on the Protection against the Harmful Effects of Ionising Radiation (Radiation Protection Ordinance - StrlSchV) Radiation Protection Ordinance of November 29, 2018 (BGBl. I, p. 2034, 2036), most recently changed by article 1 of the ordinance dated October, 2021 (BGBl. I p. 4645)
SiAnf	(2015-03)	Safety Requirements for Nuclear Power Plants (SiAnf) of November 22, 2012, amended version of March 3, 2015 (BAnz AT 30.03.2015 B2), most recently changed as promulgated by BMUV on February 25, 2022 (BAnz AT 15.03.2022 B3)
Interpret of SiAnf	(2015-03)	Interpretations of the safety requirements for nuclear power plants of November 22, 2012, of November 29, 2013 (BAnz AT 10.12.2013 B4), changed on March 3, 2015 (Banz AT of March 30, 2015 B3)
KTA 1202	(2017-11)	Requirements for the testing manual
KTA 1505	(2022-11)	Certification of suitability of radiation measuring equipment
KTA 3502	(2022-11)	Accident measuring systems
KTA 3505	(2022-11)	Type testing of measuring sensors and transducers of the safety-related instrumentation and control system
DIN 6818-1	(2004-08)	Radiation protection dosimeters – Part 1: General
DIN EN 62598	(2014-03)	Nuclear instrumentation - Constructional requirements and classification of radiometric gauges (IEC 62598:2011); German version EN 62598:2013
DIN EN 60529	(2014-09)	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999 + A2:2013); German version EN 60529:1991 + A1:2000 + A2:2013
DIN EN 60529 Corrigendum 1; VDE 0470-1 Corrigendum 1:2017-02		Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999 + A2:2013); German version EN 60529:1991 + A1:2000 + A2:2013, Corrigendum to DIN EN 60529 (VDE 0470-1):2014-09, (IEC 60529 Edition 2.2 Corrigendum 2:2015); German version EN 60529:1991/AC:2016-12
DIN EN 60529 Corrigendum 2; VDE 0470-1 Corrigendum 2:2019-06		Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989/A2:2013/COR1:2019); German version EN 60529:1991/A2:2013/AC:2019-02