

# Safety Standards

of the  
Nuclear Safety Standards Commission (KTA)

---

**KTA 3507 (06/02)**

**Factory Tests, Post-repair Tests and Certification of Satisfactory Performance in Service of Modules and Devices for the Instrumentation and Controls of the Safety System**

(Werksprüfungen, Prüfungen nach Instandsetzung und Nachweis der Betriebsbewährung der Baugruppen und Geräte der Leittechnik des Sicherheitssystems)

The previous version of this safety standard was issued 11/86

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

---

Editor:

KTA-Geschäftsstelle c/o Bundesamt fuer Strahlenschutz (BfS)

Willy-Brandt-Str. 5 • 38226 Salzgitter • Germany

Telephone +49-5341/885-(0) 901 • Telefax +49-5341/885-905



# KTA SAFETY STANDARD

June 2002

## **Factory Tests, Post-repair Tests and Certification of Satisfactory Performance in Service of Modules and Devices for the Instrumentation and Controls of the Safety System**

KTA 3507

Previous versions of this safety standard: 11/86 (BAnz. Nr. 44 a vom 05.03.87)

### CONTENTS

Fundamentals	1
1 Scope	1
2 Definitions	1
3 Factory Tests and Inspections	1
3.1 Quality Audit	1
3.2 Factory Tests during Fabrication	2
4 Post-Repair Testing of Modules and Devices	3
4.1 Prerequisites for Performing Repairs	3
4.2 Basic Requirements for the Post-Repair Tests	3
5 Documentation	4
5.1 Certifying Factory Tests of the Products	4
5.2 Certification of the Post-Repair Tests of Modules and Devices	4
5.3 Archiving	4
6 Certification of the Satisfactory Performance in Service of Modules and Devices	4
6.1 Basic Requirements	4
6.2 Certification of the Satisfactory Performance in Service without a Certification of a Type Test	5
6.3 Certification of the Satisfactory Performance in Service with a Supplementary Type Test for the Characteristics not Proven During Service	5
6.4 Responsibility for the Certifications	5
Appendix A: Choosing, Processing and Testing of Materials for Measuring Devices	6
Appendix B: Regulations Referred to in this Safety Standard	7

PLEASE NOTE: Only the original German version of this safety standard represents the joint resolution of the 50-member Nuclear Safety Standards Commission (Kerntechnischer Ausschuss, KTA). The German version was made public in Bundesanzeiger BAnz No. 27a of February 8, 2003. Copies may be ordered through the Carl Heymanns Verlag KG, Luxemburger Str. 449, 50939 Koeln, Germany (Telefax +49-221-94373603).

All questions regarding this English translation should please be directed to:

KTA-Geschäftsstelle c/o BfS, Willy-Brandt-Str. 5, 38226 Salzgitter, Germany

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:

<b>shall</b>	indicates a mandatory requirement,
<b>shall basically</b>	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 <b>shall normally</b> - are specified in the text of the safety standard,
<b>shall normally</b>	indicates a requirement to which exceptions are allowed. However, the exceptions used shall be substantiated during the licensing procedure,
<b>should</b>	indicates a recommendation or an example of good practice,
<b>may</b>	indicates an acceptable or permissible method within the scope of this safety standard.

## Fundamentals

(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 the hazards arising from the construction and operation of the facility (Sec. 7 para. 2 no. 3 Atomic Energy Act), in order to attain the protective goals specified in the Atomic Energy Act and the Radiological Protection Ordinance (StrlSchV) and which are further detailed in "Safety Criteria for Nuclear Power Plants" and in "Guidelines for the Assessment of the Design of Nuclear Power Plants with Pressurized Water Reactors against Incidents pursuant to Sec. 28 para. 3 of the Radiological Protection Ordinance (StrlSchV) - Incident Guidelines".

(2) In accordance with the Safety Criteria for Nuclear Power Plants No. 2.1 "Quality Assurance" and No. 2.2 "Testability" issued by the German Federal Minister of Interior, this safety standard specifies the requirements for the preparation, extent and execution of factory tests, of post-repair tests and of tests for demonstrating satisfactory performance in service for the instrumentation and control equipment of the safety system.

(3) In this safety standard it is assumed that legal requirements and technical standards (e.g., Accident Protection Requirements, DIN-Standards, VDE-Regulations) are adhered to, provided, other requirements specific to nuclear power plants are not specified.

(4) Requirements for the radiological protection equipment are specified in KTA safety standard series 1500.

(5) Requirements for the seismic instrumentation are specified in safety standard KTA 2201.5.

(6) Requirements for the reactor protection system and monitoring equipment of the safety system are specified in safety standard KTA 3501.

(7) Requirements for type testing the electrical modules of the reactor protection system are specified in safety standard KTA 3503.

(8) Requirements for type testing the measuring transmitters and transducers of the reactor protection system are specified in safety standard KTA 3505.

(9) Requirements for the tests and inspections of the instrumentation and control equipment of the safety system are specified in safety standard KTA 3506.

(10) Requirements for testing the instrumentation and control equipment of the safety system are specified in Section 7 of the RSK Guidelines for Pressurized Water Reactors.

(11) General requirements regarding quality management are specified in DIN EN ISO 9000.

(12) A model regarding quality assurance in design, development, production, assembly and servicing is specified in DIN EN ISO 9001.

(13) General requirements for quality assurance are specified in safety standard KTA 1401.

(14) Requirements for the documentation during the construction and operation of nuclear power plants are specified in safety standard KTA 1404.

## 1 Scope

(1) This safety standard applies to factory tests, post-repair tests and to the certification of satisfactory performance in service of the modules and equipment of the instrumentation and control equipment of the safety system in stationary nuclear power plants (called products in this safety standard).

(2) This safety standard specifies the requirements regarding planning, execution and documentation of factory tests, post-repair tests and tests required for certifying satisfactory performance in service.

(3) Furthermore, Appendix A specifies requirements regarding the selection, processing and testing of materials of pressurized, of medium-contacted or of structural parts.

### Note:

Pressurized parts of measuring devices are parts under internal or external overpressure. These include, e.g., pressure covers of measuring transmitters, bolted nozzle connections.

Medium-contacted parts are, e.g., parts of measuring devices that are in immediate contact with the measuring medium.

Structural parts are parts with which the measuring devices are connected to, e.g., the carrying structure.

(4) No requirements are specified in this safety standard for the tests and inspections during on-site assembly and commissioning.

## 2 Definitions

### Quality audit

The quality audit is the verification of the quality assurance system or its parts.

### Note:

In their script 11-04, the German Society for Quality Assurance (DGQ) differentiates between system audit, process audit and product audit.

## 3 Factory Tests and Inspections

### 3.1 Quality Audit

#### 3.1.1 Superordinate Requirements

(1) The manufacturer may perform the factory tests and inspections specified in this safety standard on his own responsibility, provided, he demonstrates the structural and procedural organization for carrying out the quality assurance and the product and procedure related quality assurance measures to the licensee or her contractor in quality audits and, provided, these are accepted by the licensee or her contractor.

(2) The responsible persons specified in the quality assurance system (head of quality assurance, plant expert, chief inspector) shall supervise the factory tests and inspections with respect to their proper execution in accordance with the schedules for fabrication and testing, and they shall evaluate the operational experience of the installed products. Their areas of responsibility and scope of decision and their independence from fabrication system shall be clearly documented in the quality assurance system. This shall be verified in the quality audit.

(3) Within the framework of testing the product related quality assurance measures, the documents and activities specified under para. 2 and Section 3.2 shall be checked.

(4) The quality audits shall be performed in regular intervals in accordance with a fixed schedule. The quality audits shall normally be mutually carried out by at least two inspectors. The inspectors shall have qualified product related knowledge and shall have been trained in the performance of quality audits.

(5) The quality audits shall normally be carried out in three year intervals. In case of a repeated occurrence of deficiencies in the delivered products, a quality audit shall be performed in consultation with an authorized expert (under Sec. 20 Atomic Energy Act).

(6) The focal points of the quality audit shall be specified in the form of checklists on the basis of written specifications regarding the structural and procedural organization of the quality assurance regarding the division to be inspected and the product related requirements. Random inspection of the divisions responsible for quality assurance shall be performed on the basis of checklists. These shall be used to check whether or not

- a) the described quality assurance measures are applied,
- b) the corresponding and valid regulations, standards, guide lines and instructions are available and known at the level of work performance,
- c) the instructions are sufficient and appropriate.

(7) The licensee or her contractor may accept the quality audits of other licensees or their contractors, provided, the quality audits were carried out on the basis of this safety standard.

### 3.1.2 Evaluation of the Results

The results of the quality audits shall be presented in a report. Any detected inadmissible deviations from the required quality assurance measures shall be described. On the basis of the results, an evaluation of the quality assurance system and of the product quality shall be carried out. A certificate shall be issued regarding the acceptance of the quality assurance system and of the product quality.

### 3.1.3 Corrective Measures

If the quality audit reveals inadmissible deviations, the following shall be arranged with the manufacturer:

- a) the planned measures,
- b) the schedule for their realization,
- c) the dates for their completion and
- d) the responsible divisions.

The effectiveness of these corrective measures shall be checked.

### 3.1.4 Alternative Measures

Should a manufacturer, in exceptional cases, not be able to demonstrate a quality assurance system and its application during manufacture, the licensee or her contractor, neither of whom shall not be identical with the manufacturer, shall perform tests and inspections during fabrication or on the finished product in order to assure and document the product quality.

## 3.2 Factory Tests during Fabrication

### 3.2.1 General Requirements

The factory test at the manufacturing plant shall basically be performed in accordance with the requirements for factory tests as specified under Sections 3.2.2 through 3.2.8. Exceptions are only admissible if they are approved of by the persons specifically appointed for this task in the quality assurance system and if these exceptions are recorded in non-conformance reports.

### 3.2.2 Quality Characteristics

The quality characteristics to be investigated shall be specified by the manufacturer on his own responsibility by evaluating

- a) the technical specifications,

- b) the fabrication schedules,
- c) the plant-internal tests, e.g., examinations with regard to choice of materials,
- d) the results of the type tests,
- e) the results of the certification of satisfactory performance in service,
- f) the stress calculations for pressurized parts,
- g) the plant-internal repair reports,
- h) the failure reports by the production division,
- i) the available operational experience.

The quality characteristics to be investigated shall be specified in lists.

#### Note:

Quality characteristics are, e.g., transmission behavior, electromagnetic compatibility, self-diagnosis, functionality, temperature influence, influence of the auxiliary power, high-voltage resistance, material properties, pressure resistance, gas tightness, packaging.

### 3.2.3 Testing Instructions

(1) For each specified quality characteristic the testing instructions shall contain specifications regarding

- a) test facilities,
- b) test procedure,
- c) test parameters, e.g., temperature of the testing chamber, voltage, frequency, testing pressure,
- d) extent of test and
- e) required values with admissible deviations.

(2) Regarding the tests under critical load conditions, the manufacturer shall specify in the testing instruction for the function of the product at which worst-case combination of the two testing parameters, environmental temperature and auxiliary power, the function of the product would still be assured.

### 3.2.4 Schedules for Fabrication and Testing

(1) With regard to factory testing, schedules shall be established for each product regarding

- a) receiving inspection,
- b) fabrication test and
- c) final inspection.

(2) In these schedules each fabrication and testing procedure shall be specified including the necessary fabrication and testing instructions as well as their sequence. These shall include the necessary material and fabrication tests of pressurized or medium-contacted or structural parts. These schedules shall normally assure that the quality characteristics to be demonstrated are tested at that point in time when an unrestricted testing is possible.

(3) In the case that parts with a similar [with the same] specification are installed in different products, then only one schedule is required.

### 3.2.5 Tests and Inspections of the Testing Facilities

(1) The test normals, the measuring and testing equipment shall, initially and thereafter in regular time intervals, be tested and serviced to assure that the required accuracy is achieved.

(2) In documents pertaining to the testing equipment it shall be specified when, how and by whom the necessary tests and adjustments shall be carried out, repeated and documented.

### 3.2.6 Extent of Testing Electronic Modules and Devices

#### 3.2.6.1 Extent of the Receiving Inspection

Prior to further processing, the manufacturer shall test whether or not the parts delivered by his contractor are in correspondence with the quality characteristics specified in the procurement documents. In the case that random tests are required, these shall be specified in plant-internal random-test schedules. The receiving test may be reduced to an identity check if the contractor confirms that the tests and inspections specified in the procurement documents were performed, or if it is guaranteed by other quality assurance measures that the specified quality characteristics are achieved.

#### 3.2.6.2 Extent of the Fabrication Tests and of the Final Inspections

(1) Within the scope of the final inspection an identity check shall be performed. The identity check shall verify that the device and its changed condition are in conformance with the valid manufacturing documents as specified in the document index established for the type test or for the certification of satisfactory performance in service, and that the device is in conformance with the procurement documents.

(2) The final inspection, with exception of the critical load test, shall be performed on each module or each individual device with each quality characteristic being tested according to the testing instructions as specified under Section 3.2.3. If this test is not anymore possible without restrictions then the quality characteristics shall be tested on each test object in a fabrication test.

(3) The critical load test in accordance with Section 3.2.3 para. 2 shall be performed as a random sample test on a fabrication batch. The size of the random sample shall be equal to or larger than 5 % but shall include at least three parts. If this test reveals an inadmissible deviation, each device shall be tested and a non-conformance report written up.

(4) A random sample test of the critical load condition is not required, provided, it can be demonstrated that combination of testing parameters concerned will bring no additional insight regarding the quality of the device.

### 3.2.7 Changes

If changes are carried out on a module or a device or on the manufacturing process, then the requirements affected by these changes shall be adjusted with regard to

- a) the quality characteristics as specified under Section 3.2.2,
- b) the testing instructions as specified under Section 3.2.3,
- c) the fabrication and testing schedules as specified under Section 3.2.4, and
- d) the extent of testing electronic modules and devices as specified under Section 3.2.6.

The effected changes shall be documented and shall be archived as specified under Section 5.3.3 para. 1, items a) and b).

### 3.2.8 Testing of System Components of the Instrumentation and Control Equipment of the Safety System

(1) Circuitry tests, e.g., of the circuit frames, module racks or cabinets, shall normally be performed in the manufacturing plant and need not to be repeated at the final place of installation, provided, a prior agreement was reached with the authorized expert (under Sec. 20 Atomic Energy Act) regarding the extent, execution, surveillance and documentation of these tests.

(2) Functional tests of system components shall normally be performed in the manufacturing plant if better testing prerequisites are given at this location. These tests need not to be repeated at the final place of installation, provided, the extent, execution, surveillance and documentation of these tests are in accordance with Sec. 3 KTA 3506 and a prior agreement was reached with the authorized expert (under Sec. 20 Atomic Energy Act).

## 4 Post-Repair Testing of Modules and Devices

### 4.1 Prerequisites for Performing Repairs

(1) A repair division may perform the repairs and tests on modules and devices under its own responsibility, provided, it demonstrates the structural and procedural organization for performing quality assurance and the product and procedure related quality assurance measures in quality audits to an organizationally independent and qualified authority. Experts of the manufacturing plant or authorized experts (under Sec. 20 Atomic Energy Act), e.g., may be involved as auditors.

(2) Within the framework of the quality audits it shall be demonstrated that the repair division has at its disposal proper technical equipment, qualified personnel and persons responsible for the post-repair tests. These persons responsible shall be organizationally independent of the repair division.

### 4.2 Basic Requirements for the Post-Repair Tests

#### 4.2.1 Documents

The repair division shall have at its disposal the following documents:

- a) description of the function,
- b) data sheet,
- c) operating manual,
- d) circuit diagram,
- e) parts list,
- f) position diagram of the components,
- g) assembly instructions.

#### 4.2.2 Quality Characteristics

The repair division on its own responsibility shall specify the quality characteristics to be tested by evaluating:

- a) the technical data sheets,
- b) the results of the plant-specific suitability tests and of the type tests,
- c) the existing operational experience.

### 4.2.3 Testing Instructions and Test Sequence Schedules

Testing instructions and test sequence schedules shall be available which meet the requirements as specified under Sections 3.2.3 and 3.2.4.

### 4.2.4 Execution of Post-Repair Tests

- (1) After a module or a device has been repaired, those testing steps shall be performed that are necessary to confirm that the repair was properly executed.
- (2) The surveillance of the post-repair test shall be carried out by the person responsible for the post-repair tests.
- (3) The surveillance of the test facilities shall be carried out as specified under Section 3.2.5.

## 5 Documentation

### 5.1 Certifying Factory Tests of the Products

- (1) The successful completion of the factory tests shall be certified in the form of a test certificate. This may also be certified in the form of a collective test certificate.
- (2) The test certificate shall contain at least the following information:
  - a) product identification,
  - b) revision state of the product according to the document catalog,
  - c) number and state of revision of the document catalogue,
  - d) fabrication numbers or the coding of the test mark,
  - e) test location, date,
  - f) signature of the person responsible as specified in the quality assurance system.
- (3) The successful completion of the factory test shall be certified on each product by affixing a testing mark, e.g., a test stamp or a test label, and in such a way that it cannot get lost. This testing mark shall include the certification of the quality of the materials used, of the proper materials-conforming manufacturing as specified under Appendix A, as well as of the identity check, the fabrication and final tests as specified under Section 3.2.6.2.
- (4) The fabrication number or the coding of the testing mark affixed to the product in combination with the documents archived by the manufacturer shall enable determining the fabrication and testing documents applicable to the product and the date (month and year) when the testing was performed.
- (5) In case of the tests and inspections of system parts as specified under Section 3.2.8, the documentation shall, additionally, meet the requirements in accordance with Sec. 3 KTA 3506.

### 5.2 Certification of the Post-Repair Tests of Modules and Devices

For each repaired module or each repaired device, the failures detected, the causes identified and measures taken shall be documented. After completion of the repair, the successful conclusion of the tests as specified under Section 4.2.4 shall be certified by a factory test certification (cf. Section 5.1). A fabrication or repair number shall enable correlating the repaired unit with the factory test certification including the repair report.

## 5.3 Archiving

### 5.3.1 Reports and Certifications of Quality Audits

- (1) The latest versions of the reports and certifications of quality audits shall be kept in storage for seven years by the division which performed the tests. The reports may be reviewed by the authorized expert (under Sec. 20 Atomic Energy Act). Upon his request, the authorized expert (under Sec. 20 Atomic Energy Act) receives a copy of the certifications (individual certifications or list of qualified manufacturers).
- (2) Upon his request, the authorized expert (under Sec. 20 Atomic Energy Act) receives a copy of the reports of the tests and inspections performed during fabrication and on the finished product to guarantee the product quality as specified under Section 3.1.4.

### 5.3.2 Certification of the Factory Test

The certification of the factory test and the documents specified under Section 5.2 shall be kept in storage by the licensee for the duration of the time that the product remains in operation.

### 5.3.3 Fabrication Documents, Testing Instructions and Non-conformance Reports

- (1) The following documents shall be archived together with all modified versions and shall be compiled in a revision index:
  - a) the fabrication documents listed in the document index with respect to the certification of satisfactory performance in service or to the type test,
  - b) all testing instructions for the factory test and the post-repair tests,
  - c) all non-conformance reports as specified under Section 3.2.1 written up in the course of fabrication.
- (2) The documents in accordance with para. 1 items a), b) and c) shall be archived by the manufacturer for the duration of seven years after final fabrication of the products. The documents in accordance with para. 1 item a) shall be archived by the licensee for the duration of the time that the products remain in operation.
- (3) The testing instructions and the testing schedules as specified under Section 4.2.3 shall be archived by the licensee or by the repair division for the duration of the time that the product remains in operation.

## 6 Certification of the Satisfactory Performance in Service of Modules and Devices

### 6.1 Basic Requirements

The satisfactory performance in service shall be certified by evaluating records created during the observation period of the series-produced item under consideration on the basis of the characteristics and environmental conditions specified for the item under consideration.

#### Note:

An "item under consideration" may be, e.g., a fabrication series, a device type, a functional unit, or a component type. The "observation period" of an item under consideration is deemed to be sufficient if design errors can be detected and the effect of maintenance measures can be evaluated.

## 6.2 Certification of the Satisfactory Performance in Service without a Certification of a Type Test

(1) The certification of the satisfactory performance in service without a certification of a type test shall be based on an evaluation by statistical methods of records made during the observation period of an item under consideration or of comparable items.

(2) In the case of comparable items, it shall be verified that comparable electric component types, structural elements and design principles were employed and that similar environmental and operational conditions were specified for the components.

(3) For this certification of the satisfactory performance in service the following information shall be provided spanning the duration of the observation period:

- a) annual number of units delivered over the years,
- b) total number of units delivered,
- c) estimated number and operating hours of the units in operation,
- d) annual number of repairs over the years that are evaluated in accordance with para. 4,
- e) estimated number of repairs over the years that are not evaluated in accordance with para. 4,
- f) estimated number of the items under consideration that failed per year but were not repaired.

(4) For the repairs of the items under consideration the following information shall normally be provided:

- a) type and extent of the failures,
- b) causes of the failures,
- c) evaluation of the failure cause.

(5) For each item under consideration intended for installation in the reactor protection system, each of the following

requirements shall be met for the statistical methods referred to in para. 1 to be applicable:

- a) A collective sample shall be chosen of which at least ten units have been in operation for two years.
- b) The collective sample specified under item a) shall have accumulated at least  $10^7$  operating hours. If the requirement under item a) is met without the  $10^7$  operating hours having been accumulated, then, in addition to the statistical proof, the reliability data in accordance with Sec. 4.2 KTA 3503 or Sec. 4.2.3 KTA 3505 shall be verified.
- c) For the evaluation of the failure effects, the average failure rate and the confidence interval shall be specified with a safety margin of 95 % according to the chi-square distribution.

(6) For the other items under consideration of the safety system that do not belong to the reactor protection system, the requirements shall be specified in agreement with the authorized expert (under Sec. 20 Atomic Energy Act).

## 6.3 Certification of the Satisfactory Performance in Service with a Supplementary Type Test for the Characteristics not Proven During Service

The required characteristics of an item under consideration shall normally be verified by the certification of satisfactory performance in service as specified under Section 6.2. Those characteristics not verified shall be certified by a supplementary type test.

## 6.4 Responsibility for the Certifications

The certification of satisfactory performance in service as specified under Sections 6.2 and 6.3 shall be carried out and be documented by the license applicant; the certificate shall be submitted to the authorized expert (under Sec. 20 Atomic Energy Act).

## Appendix A

### Choosing, Processing and Testing of Materials for Measuring Devices

#### A 1 Basic Requirements

The materials for the pressurized, medium-contacted or structural parts of the measuring devices shall be chosen and tested in accordance with the loading condition.

#### A 2 Choosing and Testing the Materials

(1) The materials for pressurized parts of measuring devices which cannot be isolated from the connected systems shall basically meet the requirements of the AD-Specifications (AD: German Society for Pressure Vessels) specified in **Table A-1** (exceptions are specified under para. 3).

(2) The materials for pressurized parts of measuring devices which can be isolated from the connected systems by at least two valves, e.g., primary isolation valve and device isolation valve, or the materials of medium-contacted or structural parts shall meet the requirements of the DIN-Standards specified in **Table A-1**. The type of material test certification in accordance with DIN EN 10204 shall be specified by the manufacturer of these materials.

(3) In the case of metallic materials not included in the DIN-Standards and AD-Specifications listed in **Table A-1**, the employed standards shall be specified and their requirements shall be met. In the case of materials for parts specified under para. 1, the type of material test certifications shall either be specified in accordance with AD-Specifications or, if these do not specify corresponding requirements, they shall be specified in agreement with the authorized expert (under Sec. 14 of the Equipment Safety Act (GSG)).

(4) If other materials are used, such as glass, ceramics or plastics, then, for those parts specified under para. 1, a consent is required from the authorized expert (under Sec. 14 of the Equipment Safety Act (GSG)); for those parts as specified under para. 2, a manufacturer-internal specification is required.

#### A 3 Product Fabrication and Product Testing

(1) The fabrication and testing of pressurized products in accordance with Section A 2 para. 1, e.g., welded parts, shall basically meet the requirements of AD-Specifications Series HP. Any deviations from the requirements of AD-Specifications Series HP require the consent of the authorized expert (under Sec. 14 of the Equipment Safety Act (GSG)).

(2) Parts in accordance with Section A 2 para. 2 shall be fabricated and tested in accordance with the manufacturer-internal specifications.

(3) In the case of parts-tested, type-tested or service-proved measuring devices, the requirements consented to by the authorized expert (under Sec. 14 of the Equipment Safety Act (GSG)) shall apply.

Product Form	Materials and Quality Standards	
	DIN	AD
Seamless pipes	DIN 17 175 DIN 1629 DIN 1630	W4
	DIN 17 456 <sup>1)</sup> DIN 17 458	W2
Longitudinally welded pipes	DIN 1 626 DIN 1 628 DIN 17 177	W4
	DIN 17 455 <sup>1)</sup> DIN 17 457	W2
Sheet metal and steel bands	DIN EN 10025 DIN 17 155	W1 W13
	DIN 17 440 DIN 17 441 DIN EN 10088-2 <sup>1)</sup>	W2
Cast parts	DIN EN 1563	W3/2
	DIN 17 245 DIN 17 445 DIN EN 10213-2 DIN EN 10213-4	W5
Forged parts and flanges <sup>2)</sup>	DIN 17 440	W2
	EN 10025 DIN 17 100 <sup>3)</sup> DIN 17 155 <sup>3)</sup> DIN 17 200 <sup>1)</sup> DIN EN 10083-1 DIN EN 10083-2	W13 W9
Bolts, nuts and other threaded parts	DIN 267 Part 11 DIN 17 2 440 DIN ISO 3506-1 DIN ISO 3506-2	W2
	DIN 267 Part 4 DIN 17 240 DIN-ISO 898 Parts 1 and 2 DIN EN ISO 898-1 DIN EN 20898 Part 2	W7
Rod steels	DIN EN 10277-2 <sup>1)</sup> DIN 17 100 DIN EN 10083-1 <sup>1)</sup> DIN EN 10083-2 <sup>1)</sup> DIN EN 10084 <sup>1)</sup>	W13
	DIN 17 440 DIN EN 10088-3 <sup>1)</sup>	W2

<sup>1)</sup> Not for pressurized part within the scope of AD-Specifications

<sup>2)</sup> Additionally, the rod steels C 22.8, C 22.3 and C 21 in accordance with the VdTÜV-Material Specifications 350, 364 and 399, respectively.

<sup>3)</sup> Only for flanges within the scope of AD-W9

**Table 3-1:** Materials for pressurized, medium-contacted or structural parts of measuring devices

## Appendix B

### Regulations Referred to in this Safety Standard

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

Atomic Energy Act		Act on the peaceful utilization of atomic energy and the protection against its hazards (Atomic Energy Act) of December 23, 1959 (BGBl. I, p. 814) in the version of July 15, 1985 (BGBl. I, p. 1565), most recently changed by Act of April 22, 2002 (BGBl. I, 2002, No. 26)
Equipment Safety Act (07/98)		Act on technical equipment (Equipment Safety Act – GSG) and general regulatory provisions
KTA 3503	(11/86)	Type testing of electrical modules for the reactor protection system
KTA 3505	(11/84)	Type testing of measuring transmitters and transducers of the reactor protection system
KTA 3506	(11/84)	Tests and inspections of the instrumentation and control equipment of the safety system of nuclear power plants
AD-Specifications of the Series HP (Manufacturing and Testing) and W (Materials):		
AD-HP0	(12/96)	General Principles of the design, manufacturing and associated tests and inspections
AD-HP1	(01/95)	Design and construction
AD-HP2/1	(01/00)	Procedure qualification for joining procedures; Procedure qualification for weld connections
AD-HP3	(04/96)	Weld supervision, welders
AD-HP4	(07/89)	Test supervision and testers for non-destructive testing
AD-HP5/1	(01/00)	Fabrication and testing of connections; Basic procedural requirements
AD-HP5/2	(07/89)	Fabrication and testing of connections; Production weld tests; Testing the base material after the post-welding heat treatment
AD-HP5/3	(01/00)	Fabrication and testing of connections; Non-destructive testing of weld connections
AD-HP7/1	(07/89)	Heat treatment; General principles
AD-HP7/2	(07/89)	Heat treatment; Ferritic steels
AD-HP7/3	(07/89)	Heat treatment; Austenitic Steels
AD-HP8/2	(07/89)	Testing of shell courses of steel
AD-HP30	(02/98)	Pressure tests
AD-W2	(01/00)	Austenitic steels
AD-W4	(05/92)	Pipes from unalloyed and alloyed steels
AD-W5	(02/98)	Cast steel
AD-W7	(01/00)	Bolts and nuts from ferritic steels
AD-W13	(02/00)	Castings and rolled parts from unalloyed and alloyed steels
DIN 1626	(10/84)	Welded circular unalloyed steel tubes subject to special requirements; technical delivery conditions
DIN 1628	(10/84)	High performance welded circular unalloyed steel tubes; technical delivery conditions
DIN 1629	(10/84)	Seamless circular unalloyed steel tubes subject to special requirements; technical delivery conditions
DIN 1630	(10/84)	High performance seamless circular unalloyed steel tubes; technical delivery conditions
DIN EN 10277-2	(10/99)	Bright steel products – Technical delivery conditions – Part 2: Steels for general engineering purposes; German version EN 10277-2:1999
DIN EN 1563	(08/97)	Founding – Spheroidal graphite cast irons; German version EN 1563:1997
DIN 17 100	(01/80)	Steels for general structural purposes; Quality standard

Note:

In accordance with AD-W13, this standard is still applicable to forgings.

DIN EN 10025	(03/94)	Hot rolled products of non-alloy structural steels; Technical delivery conditions (includes amendment A1:1993); German version EN 10025:1990
DIN 17 155	(10/83)	Creep resistant steel plate and strip; Technical delivery conditions
DIN 17 175	(05/79)	Seamless tubes of heat-resistant steels; Technical conditions of delivery
DIN 17 177	(05/79)	Electric pressure-welded steel tubes for elevated temperatures; Technical conditions of delivery
DIN EN 10083-1	(10/96)	Quenched and tempered steels – Part 1: Technical delivery conditions for special steels (includes Amendment A1:1996); German version EN 10083-1:1991 + A1:1996
DIN EN 10083-2	(10/96)	Quenched and tempered steels – Part 2: Technical delivery conditions for unalloyed quality steels (includes Amendment A1:1996); German version EN 10083-2:1991 + A1:1996
DIN EN 10084	(06/98)	Case hardening steels – Technical delivery conditions; German version EN 10084:1998
DIN 17 240	(07/76)	Heat resisting and highly heat resisting materials for bolts and nuts; Quality specifications
		Note: This standard is withdrawn, however, still referenced in AD-W7. The follow-up standard is DIN EN 10269.
DIN EN 10213-2	(01/96)	Technical delivery conditions for steel castings for pressure purposes – Part 2: Steel grades for use at room temperature and elevated temperatures; German version EN 10213-2:1995
DIN 17 440	(09/96)	Stainless steels – Technical delivery conditions for plates, hot rolled strip and bars for pressure purposes, drawn wire and forgings
DIN 17 441	(02/97)	Stainless steels – Technical delivery conditions for cold rolled strips and slit coils strip and sheets cut from such strips for pressure purposes
DIN EN 10213-4	(01/96)	Technical delivery conditions for steel castings for pressure purposes – Part 4: Austenitic and austenitic-ferritic steel grades; German version EN 10213-4:1995
DIN 17 455	(02/99)	Welded circular stainless steel tubes with general quality requirements – Technical delivery conditions
		Note: The follow-up standard DIN EN ISO 898-2 has not yet been issued, is, however, already referenced in AD-W7.
DIN 17 456	(02/99)	Seamless circular stainless steel tubes with general quality requirements – Technical delivery conditions
DIN 17 457	(07/85)	Welded circular austenitic stainless steel tubes subject to special requirements; technical delivery conditions
DIN 17 458	(07/85)	Seamless circular austenitic stainless steel tubes subject to special requirements; technical delivery conditions
DIN EN 10204	(08/95)	Metallic products – Types of inspection documents (includes Amendment A1:1995); German version EN 10204:1991 + A1:1995
DIN EN ISO 898-1	(11/99)	Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs (ISO 898-1:1999); German version EN ISO 898-1:1999
DIN EN 20898-2	(02/94)	Mechanical properties of fasteners; part 2: nuts with specified proof load values; coarse thread (ISO 898-2:1992); German version EN 20898-2:1993
DIN EN ISO 3506-1	(03/98)	Mechanical properties of corrosion-resistant stainless steel fasteners – Part 1: Bolts, screws and studs (ISO 3506-1:1997); German version EN ISO 3506-1:1997
DIN EN ISO 3506-2	(03/98)	Mechanical properties of corrosion-resistant stainless steel fasteners – Part 2: Nuts (ISO 3506-2:1997); German version EN ISO 3506-2:1997
DIN EN 10088-2	(08/95)	Stainless steels – Part 2: Technical delivery conditions for sheet/plate and strip for general purposes; German version EN 10088-2:1995
DIN EN 10088-3	(08/95)	Stainless steels – Part 3: Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes; German version EN 10088-3:1995