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| Title: | General Specification for the FAIR Accelerator Facility Project |
| Purpose: | Common rules and definitions |
| Organizational unit: | FAIR PMO – Project Management Office |
| Valid for: | FAIR Accelerator Facility Project |

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| V1.1 | 2014-02-14 | 2014-02-27 | Listed norm-based adjustment of the cover sheet and contributors |
| V1.2 | 2014-03-13 | 2014-03-13 | Insert EDMS Id and minor corrections |
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| V003 | 2020-09-09 | See EDMS | Update according EDMS review remarks for V002<br>- Chapter 5.3.4.5 (within V002) deleted<br>- Chapter 6.1.1: Safety instructions in German language added<br>- Chapter 9.III.1.13. (within V002) deleted |

# Preface

This General Specification postulates requirements for the construction of the FAIR Accelerator Facility Project. Together with the Common Specifications (optional) and Detailed Specifications for specific trades, this is the set of specifications.

The General Specification never applies alone, but always together with at least one Detailed Specification. When creating Detailed Specifications, references should be made to the sections in the General Specification. For smaller trades, it can also make sense to transfer all relevant requirements from the General Specification into a Detailed Specification.

## Table of Contents

# 1. Introduction

FAIR, Facility for Antiproton and Ion Research, is a new multipurpose accelerator facility for the research with antiprotons and ions. The FAIR accelerator complex provides beams of antiprotons and ions with highest intensities, energies, and power in brilliant quality and for parallel operation. In consequence, FAIR will provide worldwide unique accelerator and experimental facilities allowing for a large variety of unprecedented forefront research in physics and applied science.

# 2. Definitions, Classifications and Sytematic

## 2.1 Definitions

The contracting body is either the GSI GmbH or the FAIR GmbH defined as the **“Company”**.

The **“Contractor”** is the provider in case of an in-kind contribution (IKC) or a commercial company, identified by the tendering process, hereinafter referred to as the “Contractor”.

The **“contract”** is concluded between the Company and the Contractor. In case of an in-kind contribution, the shareholder is a third contracting party.

Company indicates that in contracts and law Contractor, contract and Company may be addressed in a different way.

## 2.2 Classifications of Requirements

The requirements are divided into three categories: *Mandatory*, *Recommended* and *Permitted.*

### 2.2.1 Mandatory Requirements

**“Shall”** or **“has to”** or **“must”** or **“is required to”** are used to indicate mandatory requirements, strictly to be followed in order to conform to the standard and from which no deviation is permitted.

**“Shall not”** or **“must not”** means that the definition is an absolute prohibition of the specification.

### 2.2.2 Recommended Requirements

**“Should”** or **“is recommended”** is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not required.

**“Should not”** or **“is not recommended”** means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully assessed before implementing any behaviour described with this label.

### 2.2.3 Permitted Requirements

**“May” or “might”**, which is equivalent to **“is permitted”**, is used to indicate a course of action permissible within the limits of the standard.

2.2.4 Company indicates that in contracts and law requirements may be addressed in a different way.

## 2.3 Systematic of Specifications

A **"Detailed Specification (DS)"** specifies the purpose of the component, its detailed features, and information for its design and production.

A **"Common Specification (CS)"** is a set of definitions, prescriptions and rules valid for a technical system (e.g. the magnets, the vacuum system or the cryogenic system). It covers common technical aspects.

The **"General Specification (GS)"** is a comprehensive set of definitions, prescriptions and rules, which is valid for all accelerators and storage rings, technical systems and components of the FAIR project. It covers mainly administrative and organizational topics, e.g. general aspects of safety and quality assurance.

**Ranking of Specifications:** In case of contradictions, the requirements within the Detailed Specification replaces the requirements within the Common Specification. And the Common Specification is ranked higher than the General Specification. Further ranking of documents is specified in the contract.

**"Technical Guidelines (TG)"** are typically referenced within DS or CS. A TG describes the best-practice experience for a particular technical topic. This serves as a guideline for the implementation of technical solutions and describes solutions successfully implemented. A TG is open for technically better solutions.

# 3. Legal Requirements, Standards and Internal Safety Regulations

## 3.1 Legal Requirements

3.1.1 The company recommends that the contractor gets familiar with the applicable law and the directives in Annex I.[1]

3.1.2 The contractor bears full responsibility for a EC Declaration of Conformity according to the manufacturer role, defined in the 'Blue Guide' on the implementation of EU products rules[2], irrespective of whether said contractor is based in or outside the European Community.

## 3.2 General German Safety Regulations

Company recommends that the contractor makes himself familiar with the relevant rules to be considered are international and German standards (e.g. ISO, IEC, DIN, VDE) and the Vorschriften der Deutschen Gesetzlichen

[1] Further information is given online http://bundesrecht.juris.de
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016XC0726(02)

Unfallversicherung (DGUV) and are given in particular but not exclusively in Annex II.

## 3.3 Internal Safety Regulations

### 3.3.1 General Remarks

3.3.1.1 The Contractor shall submit in a document latest after fixing the design of components (CDR accepted, milestone S002.M6 in Table 1) all safety relevant data. The document will be checked by the Company's safety office.

3.3.1.2 Company indicates that it may be part of the risk assessment that every device has to adopt a technically safe state in case of malfunction. This comprises the contact safety as well as measures against unintended switch on via the control system. Exceptions have to be agreed upon by the Company.

3.3.1.3 Warning signs and other safety-critical notes must be in German and in English.

### 3.3.2 Remarks for Humans and Environment

3.3.2.1 Company indicates that the radiation safety for humans and the environment is subject to the German Radiation Protection Ordinance and in particular to the responsible radiation protection authority which is the Hessian Ministry of the Environment, Climate Protection, Agriculture and Consumer Protection (Hessisches Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz).

3.3.2.2 Workers carrying out work at the FAIR accelerator complex at radiation controlled areas must be educated and trained in radiation protection techniques and fulfil the given radiation protection and entrance requirements.

3.3.2.3 For workers of the Contractor or from other external companies the same rules apply as for employees of the Company. With every external company, an additional contract has to be established which settles the apportionment with the Company in terms of radiation protection, like personal dosimeter, mutual exchange of dose values, instructions and training.

# 4. General Design Aspects

## 4.1 Reliability

4.1.1 The FAIR accelerator system is planned to be operated with only a few weeks of interruptions per year. The projected lifetime of the system is about 30 years. The components placed in the accelerator tunnels will not be accessible during operation. Even during shutdown time access to components might be very limited due to remaining activation in the tunnels. Intervention time on accelerator components in service rooms will also be very limited.

4.1.2 Therefore, all components shall be rated for continuous operation (up to 6000 operating hours per year with virtually no interruption for 30 years)[3] at all power output levels, taking care of the worst case of mains and environmental conditions and with minimum of maintenance. The Contractor shall therefore

[3] In this context continuous operation is defined as continuously operating in its standard scheme, this could also be, for instance a pulsed operation scheme.

rate all components accordingly and use the most appropriate materials. If the replacement of components has to be scheduled, this must be stated.

4.1.3 All equipment shall be designed in accordance with the best existing techniques and conform to good design practices available at the time of design. In particular the worst-case design principle has to be used, that is the Contractor shall deliver the risk assessments with the components.

## 4.2 Design Principles

4.2.1 The metric system is the mandatory system to be used. Exceptions have to be agreed by the Company.

4.2.2 The Contractor ensures that the materials used and manufacturing processes are in compliance with the Detailed Specifications, the Common Specifications, the Technical Guidelines, the drawings, and the documentation at all stages of the project.

4.2.3 Provision of material certificates is not sufficient to discharge the Contractor from his responsibility that the materials used is in compliance with specifications.

4.2.4 Only certified[4] semiconductor components shall be used in the tunnel or other radiation areas.

## 4.3 Maintenance

4.3.1 FAIR is a unique accelerator facility. Scientists from all over the world will use the experimental opportunities at FAIR extensively. The operating costs of such a complex facility are significant. With respect to the international scientific community and the operating costs, unscheduled shutdown times have to be as short as possible.

A significant part of the accelerator complex will be (highly) activated. The safety of the maintenance personnel allows only short time access or remote handling in activated areas.

Thus, in general, replacement times of components shall be minimized. This must be considered in more detail during the design.

4.3.2 All components used have to be in batch production and likely to be so for at least the next five years. Commercially available components have to be used wherever possible.

Obsolete or specially selected components shall not be used.

All components and spare parts have to be available at least 10 years. The Contractor has to provide a long term strategy to ensure the availability over the required time span.

[4] According IEC (International Electrotechnical Commission) or equivalent

## 4.4 Design Report

4.4.1 All technical concepts and designs have to be given in form of a design report to the Company and must be approved by the Company. This is a Quality Gate to comply, see Chapter 5.

4.4.2 Any approval of the Company does not impact the responsibility of the Contractor to deliver the components as specified and requested.

4.4.3 The Contractor may at any time suggest modifications to the details as found in the drawings and/or specifications.

4.4.4 Any work, modification or change of documentation without approval (email or EDMS) by the Company is not permitted.

# 5. Quality Assurance

## 5.1 General Remarks

5.1.1 This chapter defines the general FAIR project quality assurance aspects and test strategy for the accelerator facility project.

5.1.2 The quality plan (Q-Plan) [Annex III.] is the basic document to achieve the necessary quality. In the contract the relevant aspects of the Q-Plan might be adjusted.

5.1.3 Further individual and specific aspects and tests are described in the relevant Detailed Specifications, Common Specifications, and Technical Guidelines.

5.1.4 General test specifications and test procedures are described in Chapter 5.3

## 5.2 Quality Gates

5.2.1 Defined by the Work Breakdown Structure, the complete accelerator complex is divided into individual accelerator systems. These are made up of various technical systems. The technical systems are built by using a set of components. Quality assurance and test strategy utilize a standard model (cf. Figure 1).

5.2.2 The next phase in the process can only be started after the acceptance of the previous quality gate[5] by the Company. Quality gates are e.g. the acceptance of the Final Design Review (S002.M7), of the pre-series (S004.M8), of the Factory Acceptance Test (S005.M9), and of the Site Acceptance Tests (S006.M10 and S007.M11). A conditional acceptance is possible.

[5] A quality gate is a special milestone in a project which focuses on the achievement of predefined quality goals. Quality gates are located before a phase that is strongly dependent on the outcome of a previous phase.

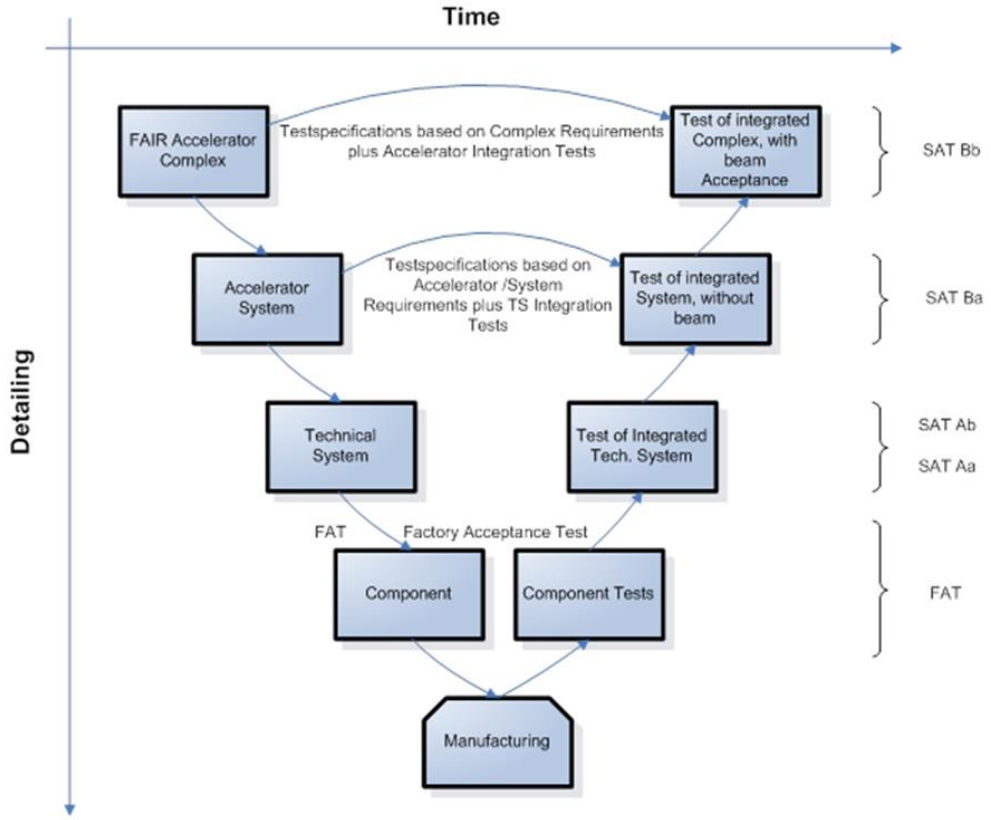


**Figure 1: V-Model for quality assurance and test strategy**

5.2.3 Tests and quality aspects are defined in the Common Specifications and in the individual Detailed Specifications.

5.2.4 **Factory Acceptance Tests (FAT)** are carried out at the Contractor's site. The FAT must take place before shipment, in order to verify the given specifications of the components.

5.2.5 **Site Acceptance Tests (SAT)** at the Company's site are divided into part A and part B.

5.2.6 **SAT Part A** includes the tests after delivery to the Company, but before the technical system is integrated in its final installation place.

- SAT Aa is the incoming goods inspection
- SAT Ab contains all other tests to be carried out to get permission for transport to the final installation place

5.2.7 **SAT Part B** comprises all tests to be performed at the final installation place.

- SAT Ba includes all tests without beam
- SAT Bb addresses all tests with beam

5.2.8 With respect to project milestones and quality gates, the following steps and phases are defined for the FAIR project. If necessary, additional steps will be added in the Detailed Specification of components.

5.2.9 For schedules the activity codes and sub codes in Table 1 shall be used for each item to be specified. The activity code divides the different tasks in 8 different groups. The sub code assigns a unique activity (A) or milestone (M) to each step.

| Project Phase | Milestone / Activity | Short description | Detailed Description |
|---|---|---|---|
| S002 | Design and planning | | |
| | A3 | Write specifications / TDR | Writing and approving specifications. |
| | **M3** | Specifications / TDR approved | Specifications / TDR are approved.<br>**Remark:** This milestone is a quality gate. |
| | A4 | Prepare contract | Preparation of contract between FAIR / GSI and partner / supplier / producer.<br>This includes contract design, consulting with legal department, negotiating with contract partners, tendering procedures according to legal requirements if necessary. |
| | **M4** | Contract is signed | Contract between FAIR / GSI and contractual partner is signed.<br>**Remark:** This milestone is a quality gate. |
| | A5 | Prepare kick-off meeting with Plan Review | Preparation of all documents for the kick-off meeting by the Contractor, in particular the quality plan and an updated schedule. |
| | **M5** | Kick-off meeting with Plan Review passed | Kick-off meeting conducted, the schedule and the quality plan prepared by the Contractor are accepted by the Company. |
| | A6 | Detailing of the manufacturing concept | The concept is concretized by the responsible specialist and supplier. |
| | **M6** | CDR (Conceptual Design Review) accepted | Conceptual Design Review (CDR) is accepted. All safety relevant data are submitted. |
| | A7 | Finalize manufacturing documentation | All documents needed for the production (drawings, concerted inspection plans, etc.) are provided by the supplier (in cooperation with the responsible specialist). |
| | **M7** | FDR (Final Design Review) accepted / planning completed | Final Design Review (FDR) is accepted and the start of the pre-series production is approved.<br>**Remark:** This milestone is a quality gate. |
| S003 | Material Procurement | | |
| | AX1 | Acquire material | Material for the in-house production (a) or materials to supply the manufacturer of the component (b) will be provided by the technical unit of GSI. |
| | MX1 | All material is acquired | Material is available at GSI (a) or at the manufacturer (b). |
| S004 | Manufacturing of pre-series / prototype | | |
| | A8 | Manufacturing of pre-series / construction of prototype | Usually it is the first component manufactured under series conditions. |
| | A89 | Testing of pre-series / prototype | Execute test of first pre-series component. |

| Project Phase | Milestone / Activity | Short description | Detailed Description |
|---|---|---|---|
| | **M8** | Pre-series accepted / Prototype tested | Pre-series component accepted. Start of series production is approved (Production Readiness).<br>**Remark:** This milestone is a quality gate. |
| **S005** | **Manufacturing of series / component** | | |
| | M81 | Series production started | Start of series production. |
| | A90 | Prepare series production | Preparation and planning of series production. |
| | A91 | Execute series production | Execution of series production. |
| | M99 | Start execution of FAT | Beginning of Factory Acceptance Test. |
| | A99 | Execute FAT | Factory Acceptance Test (FAT) will take place at the Contractor's site before shipment, to verify the given specifications of the components. |
| | **M9** | FAT accepted | Factory Acceptance Test (FAT) is accepted for all components.<br>**Remark:** This milestone is a quality gate. |
| **S006** | **Shipment, Site Acceptance Test A and pre-assembly** | | |
| | M91 | Start of Shipment | Start of shipment to GSI / FAIR. |
| | ATS | Shipment | Supplier delivers the components to the GSI or FAIR site or other agreed place. All documents to be delivered, in particular material certificates, test and measurement protocols, and all documentation related to the production and assembly process, shall be given to the Company in "as built quality". |
| | M92 | End of Shipment | End of shipment to GSI / FAIR or other agreed place. |
| | A10 | Execute SAT Aa | SAT Part A includes the tests after delivery to the Company, but before the technical system is integrated in its final installation place.<br>SAT Aa is the incoming goods inspection. |
| | A109 | Execute SAT Ab | SAT Ab contains all the other tests to be carried out to get permission for transport to the final installation place. |
| | M10-1 | 1st component ready for installation or pre-assembly | 1st component is ready for installation or pre-assembly. |
| | **M10** | SAT A accepted / approval for installation or pre-assembly | All components passed the acceptance test for installation or pre-assembly.<br>**Remark:** This milestone is a quality gate. |
| **S06P** | **Pre-assembly and testing of components / modules** | | |
| | A10-P | Pre-assembly and testing of components / modules | Pre-assembly and testing of components or modules before installation into tunnel. |

| Project Phase | Milestone / Activity | Short description | Detailed Description |
|---|---|---|---|
| | **M10-P** | Pre-assembly and testing of components / modules is finished | Pre-assembly and testing of components or modules is finished and ready for installation into tunnel |
| **S007** | **Installation in tunnel / cave** | | |
| | ABL1 | Blue lining | Measurement of the tunnel and placing blue lines on the floor |
| | MBLF1 | Blue line finished | Blue fine finished |
| | A110 | Transport into tunnel / to experimental site | Transport into tunnel or to experimental site, respectively. |
| | A112 | Assembly of components | Installation of equipment and integration into the overall system. Integration in the accelerator segment or technic room. |
| | M102-1 | 1st component is assembled | 1st component is assembled. |
| | M102 | Assembly in tunnel is finished | Assembly of all components in tunnel is finished. |
| | AAL1 | Alignment of components | Adjusting of components after the assembly |
| | MALF1 | Alignment of components is finished | Alignment of components is finished |
| | A119 | Execute SAT Ba / test without beam | Performing site acceptance tests without beam (SAT Ba) after the integration of the component in the designated position. |
| | **M11** | SAT Ba accepted / ready for beam | Component accepted without beam. **Remark:** This milestone is a quality gate. |
| **S008** | **Bringing into service / commissioning** | | |
| | A12 | Execute SAT Bb - with beam | Execute SAT Bb - with beam. |
| | **M12** | SAT Bb accepted / ready for operation | Component is ready for operation. |
| | M12-A | Stage A - Pilot Beam | |
| | M12-B | Stage B - Intensity Ramp-up and Special Systems | |
| | M12-C | Stage C - Production Operation with nominal Intensities | |

**Table 1 : Activities (A) and milestones (M) of the FAIR project**

## 5.3 Reviews, Inspections and Measurements

### 5.3.1 General Remarks

5.3.1.1 During the acceptance tests, all specified properties of the components have to be proven and demonstrated. This comprises for example the electrical, mechanical and vacuum properties of the component.

5.3.1.2 Acceptance tests are only valid if they are documented in proper form as agreed in review meetings and are accepted by the Company. All tests have to be

completed successfully according the specifications, to be accepted by the company.

5.3.1.3 The Contractor shall be responsible for providing all necessary measurement tools, equipment and devices.

5.3.1.4 Testing of prototype or first of series is defined in the Common Specifications and/or the Detailed Specifications.

5.3.1.5 Testing of serially produced components is defined in the Common Specifications and/or the Detailed Specifications.

### 5.3.2 Quality Assurance at Contractor's Site

5.3.2.1 Standards in the style of ISO 9001 have to be respected. That requires that all modules to be produced are supported by an approved and formal process designed to monitor and record each phase of the design, manufacturing and testing.

The Contractor must hand over to the Company an adequate set of process descriptions and documents which show the adherence to the ISO 9001 (or an equivalent standard).

5.3.2.2 A test plan (inspection plan) has to be established by the Contractor. Changes to the test plan (inspection plan) have to be communicated to the Company and must be agreed by the Company. The test plan (inspection plan) describes especially the required tests according to FAT.

5.3.2.3 The Contractor defines and executes individual sub-assembly inspection and test procedures at each stage. They must be designed to allow basic faults to be rapidly located, identified, and their causes eliminated by the Contractor.

5.3.2.4 The Contractor has to prepare a test protocol (test record) of each reached and executed acceptance test.

### 5.3.3 Tests and Reviews at Contractor's Site

5.3.3.1 The Contractor shall carry out all specified intermediate acceptance tests and other investigations. The Contractor shall record in protocols the results of the intermediate acceptance tests and other investigations, and shall immediately inform the Company of those.

5.3.3.2 After the completion of a component, a test of all measurable figures and their compliance with the specified tolerances shall be carried out at the Contractor's site.

5.3.3.3 After receiving notification of readiness for tests, the Company will decide on a case-by-case basis whether the test shall be carried out in the presence of representatives of the Company or whether the issuance of a test certificate is sufficient.

5.3.3.4 If the results of the test show that additional work is necessary, compliance with the specified tolerances shall be proven once again in cooperation with the Company.

5.3.3.5 Representatives of the Company have the right to attend any acceptance test at the Contractor's site (FAT).

### 5.3.4 Tests and Reviews at Company's Site

5.3.4.1 A set of tests and quality assurance activities will be executed by the Contractor on its own cost at the Company's site (SAT A).

5.3.4.2 Samples of the delivered goods will be functionally tested by using test environments of the Contractor (SAT A).

5.3.4.3 Test material and test equipment for the SAT Aa and SAT Ab tests have to be delivered by the Contractor together with the components.

5.3.4.4 A set of Site Acceptance Tests (SAT Aa) will be done after delivery to the Company to ensure the integrity of the component.

5.3.4.5 Either all tests of the FATs or a random sample of the FATs will be repeated at the Company's site. After the successful test SAT Ab the component shall be approved for installation.

5.3.4.6 Tools/ equipment and facilities for the tests shall be kept for three years after the legal acceptance of all components free of charge and such that they are protected from corrosion, theft, and distraint. Subsequently, they shall be delivered to the Company or shall continue to be stored for a fee. The Contractor shall invoice the storage expenses to the Company along with the main quotation.

5.3.4.7 The Company shall be informed about the Contractor's planned measures three months before the three-year period expires.

### 5.3.5 High Precision Geometric Measurement Services – Fiducialisation

5.3.5.1 All fiducialisation measurements will be performed at GSI.

5.3.5.2 All survey and alignment activities including fiducialisation measurements will be performed by external measurement specialists, authorized and supervised by GSI.

5.3.5.3 Information about which components have to be surveyed has to be taken from the respective Detailed Specifications.

5.3.5.4 The Contractor whose components have to be fiducialised, surveyed and aligned at their final place in the tunnel is responsible for the transport to the measuring site for fiducialisation and afterwards into the tunnel (assembly crew of Contractor).

5.3.5.5 The Contractor has to adhere to the time limits scheduled for the dedicated components.

5.3.5.6 The Contractor has to transport the component to its place of final destination and has to pre-align it roughly with respect to existing floor markings (accuracy 1-5 mm).

5.3.5.7 The Contractor agrees to support the measurement specialists in the alignment works.

### 5.3.6 Site Acceptance Tests

The site acceptance test shall be carried out after delivery to the designated location. The results of the previous tests can be taken into consideration. An acceptance protocol (test record) shall be drawn up. After the successful SAT B test the component is handed over for operation.

## 5.4 Quality Assurance Reporting

5.4.1 At the latest upon delivery, the Contractor shall provide all design documents in “as-built” quality, all material certificates, all test and measurement protocols and all documentation regarding the production/assembly process.

5.4.2 Drawings shall be submitted which document the current status of the component. At the same time, all information shall be provided which includes special procedures such as cleaning requirements, special handling requirements or assembly instructions.

5.4.3 The Contractor shall send written quality assurance reports as defined in the Q-Plan. An annex shall include all records related to tests and agreements that have taken place.

5.4.4 The Company shall be informed in writing (e-mail) in due time of any events during construction/ assembly which may cause a delay in construction/ assembly and delivery.

5.4.5 In case of quality deviations or necessary changes, a non-conformity report or an engineering change request must be initiated.

# 6. Documentation

## 6.1 Standard Language

6.1.1 The standard language of all documents is English.

Where specific rules have to be complied with regarding the use, addition or maintenance of a product in order to guarantee safety and health, German language instructions for its use shall be supplied in addition to the English manuals.

## 6.2 Template for Specifications

6.2.1 If the Contractor has to write technical specifications, the use of the specification template provided by the Company is obligatory.

## 6.3 Necessary Documents

6.3.1 During production, the Contractor shall assemble production/assembly documentation with photographs of the most important devices and processes. The Contractor shall submit comprehensive operating instructions, risk assessments and troubleshooting documentation for all components and

systems (including all documents for manufacturing, transport, operation, commissioning and decommissioning).

The following are examples of documentation:

- User manual
- Maintenance manual
- Test protocols (test records)
- Record set of the Factory Acceptance Tests (FAT)
- Record set of the Site Acceptance Tests (SAT)
- Installation plan
- Drawings, 3D models
- Proof of compliance with regulations and directives
- Material inspection certificate 3.1 according to DIN EN 10204
- Bill of materials (BOM)
- Lists of spare parts
- Electronic layouts, schematics
- Strength analysis for welded joints
- Acceptance certificate for welded products
- Acceptance certificates from governmental authorities
- TÜV expert opinions
- Handling requirements for assembly/mounting and lifting equipment

## 6.4 Usage of EDMS

6.4.1 The documentation must be submitted in electronic form via EDMS.

# 7. Shipping / Transportation

## 7.1 Responsibilities by the Contractor

7.1.1 The Contractor shall be responsible for all necessary shipping and/or transportation of

- Equipment,
- Assembly devices,
- Production or FAT/SAT required items provided by the Company and units to operate the equipment for the measuring tasks.

## 7.2 Terms of Delivery

7.2.1 The terms of delivery shall be described in the Contract. All delivery shall be regarding to INCOTERMS (latest version).

## 7.3 Responsibility for Safety and Security

7.3.1 During transport the Contractor carries the responsibility for human safety and for the safety and security of the transported goods.

## 7.4 Marking with CIDs

7.4.1 The packaging of the shipped components has to be marked on two neighbouring sides with correspondent CIDs.

# 8. Miscellaneous

## 8.1 Provisions of the Company

8.1.1 The Company will develop in due time the personal safety organization on the construction site including writing and communication of the corresponding safety instructions.

8.1.2 The Company will provide the supply of cooling water, technical gases, pressurized air, electrical power and environmental conditions (light, air, temperature) according to the requirements specified for the respective operation phase (cf. corresponding Detailed Specifications).

Any additional requirements needed by the Contractor for the assembly or construction phase are in principle not available.

The Contractor may in this case contact the Company in order to elaborate separate agreements for local support.

## 8.2 Requirements on Personnel

8.2.1 All components supplied for a system have to be manufactured by trained and qualified personnel.

8.2.2 If measurements at the Company's site have been agreed upon, qualified personnel shall be provided and shall receive instructions from the Company.

## 8.3 Labeling

8.3.1 Every FAIR component has to be labelled by the contractor with a unique number, called component ID (CID). The CID will be assigned by the Company.

8.3.2 All documentation related to a FAIR article has to be labelled with a unique number, called the article ID (AID). The AID will be assigned by the Company.

# 9. Annexes

# I. Legal Safety Regulations

Company indicates that the information guide Manufacturing and operation of equipment designed for research purposes (DGUV Information 202-002[6]) aims to provide guidance to meet the legal requirements (CE conformity and workspace safety)[7] [8].

[6] Information guide is available online: https://publikationen.dguv.de/dguv/pdf/10002/202-002eng.pdf
[7] German laws are available online: http://bundesrecht.juris.de
[8] European Directives are available online: https://eur-lex.europa.eu/homepage.html

Company recommends that the Contractor makes himself familiar with the following regulations:

- The Produktssicherheitsgesetz (ProdSG, Product Safety Law)
- The Verordnung über elektrische Betriebsmittel (1. ProdSV, Low Voltage Ordinance)
- The Verordnung über einfache Druckbehälter (6. ProdSV, Simple Pressure Vessels Ordinance)
- The Maschinenverordnung (9. ProdSV, Machinery and Amending Ordinance)
- The Explosionsschutzprodukteverordnung (11. ProdSV, Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Ordinance [ATEX])
- The Druckgeräteverordnung (14. ProdSV, Pressure Equipment Ordinance)
- The Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln (EMVG, Electromagnetic Compatibility of Equipment Law)
- The Strahlenschutzgesetz (StrlSchG, Radiation Protection Law)
- The Strahlenschutzverordnung (StrlSchV, Radiation Protection Ordinance)
- The Arbeitsschutzgesetz (ArbSchG, Safety and Health at Work Law)
- Betriebssicherheitsverordnung (BetrSichV, Industrial Safety and Health Ordinance)
- Arbeitsstättenverordnung (ArbStättV, Workplace Ordinance)

# II. Regulations of German Statutory Accident Insurance

Company indicates that in particular, but not exclusively following documents have to be considered:

- DGUV V1 Grundsätze der Prävention (Principles of Prevention)
- DGUV V3 Elektrische Anlagen und Betriebsmittel (Electrical Systems and Equipment)
- DGUV V52 Krane (Cranes)
- DGUV V54 Winden, Hub- und Zuggeräte (Jacks, Lifting and Pulling Equipment)
- DGUV Information 208-004 Gabelstapler (Forklift Trucks)

A complete set of regulations and information on safety and health of workers at work can be found at http://www.arbeitssicherheit.de/de/html/library/overview (in German)

# III. Quality Plan

**1.** The Contractor shall prepare a comprehensive Quality Plan (Q-Plan) based on ISO 10005 (a standard assigned to ISO9001) and submit it to the Company for approval. The Q-Plan shall cover the contents given hereafter as a guideline:

**1.1. General and Scope**

The Contractor should determine which elements are covered by the Q-Plan
Description of project task and reference to specification documents

**1.2. Quality objectives**

The quality plan should state the quality objectives for the specific case and how they will be achieved.

a. Quality characteristics for the specific case
b. Important issues for customer satisfaction
c. Possibilities of improvement

**1.3. Responsibilities**

The quality plan is designed to identify people who plan, implement, control and monitor the activities and resources required for the contract and monitor progress.

a. Project manager / Sub-project manager
b. Production manager
c. Scheduling
d. Purchasing
e. Quality Assurance
f. Project management structure (organization chart)

**1.4. Resource Management**

The Q-Plan should specify the type and scope of resources required to successfully fulfilment of technical and functional requirements of the contract.

a. Material, Products, Services
b. Personnel
c. Infrastructure
d. Machines and equipment

**1.5. Communication with Company**

a. Person responsible(s) for communication with the Company
b. Progress reports (monthly reports – Company will provide template to Contractor, monthly photograph to status of production)
c. Meetings and project reviews (Type, frequency, content, when ar special meetings necessary)

**1.6. Design and development**

The quality plan should reference applicable plan(s) for design and development. The quality plan should take account of applicable specifications, codes, industry standards, quality characteristics, statutory and regulatory requirements.

a. Control of design and development progress
b. Coordination with external providers
c. Coordination and approval process in coordination with the Company

**1.7. Production and Realization**

a. Purchase and procurement process
b. Control of subcontractors
c. Manufacturing process maps (representation of the project flow in the form of a process diagram for the project phases “Design (CDR, FDR)”,

"Production and Testing (inhouse production and subcontractors", "Packaging and Transport")

d. Identification and traceability (labelling of components/systems, parts, documents ac. to required CID-Number)
e. Tools, techniques, equipment and methodology (naming, description, qualification measures)
f. Manufacturing documents (e.g. production plan = sequential listing of the important production steps and all test steps, work instructions, test instructions, test record templates, FAT report template…)

**1.8. Monitoring and Measurements**

a. Inspection plan
    i. List and description of quality control steps
    ii. List of characteristics to be measured with tolerance range
b. Selection of suitable test equipment
c. Validation and verification tests
d. Control of measurement tools

**1.9. Packaging and Transport**

a. Handling and storage specifications and instructions
b. Packaging and transport specifications and instructions
c. Preservation of products (Observance of the specification documents agreed in the contract. In addition, the legal requirements regarding packaging materials and preservatives must be observed.)

**1.10. Control of Document, Data and Records**

a. List of documents and records
b. Document management process
    i. How does the process work. Designation of responsibilities
    ii. Marking and versioning of documents, data and software
    iii. Approval process for documents, data, software
    iv. filing of documents during project execution
    v. Safe-keeping of documents, data, software

**1.11. Control of Nonconformity of Products**

a. Description of nonconformity process
    i. Immediate actions on defective products or product not suitable for its final functionality
    ii. Repair actions to eliminate the cause of problem
    iii. Corrective actions (preventive measures to avoid the recurrence of the deviation in future)
b. Handling and documentation of nonconformities for each component manufactured (CID related)

**1.12. Professional Quality and Certification of Personnel**

a. Qualification and certification of the executing personnel for special processes (e.g. calculations, welding, brazing, surveying, alignment, non-destructive tests…)

**1.13. Quality Audits**

a. For internal production

b. For external production (Sub-Contractors)

**2.** The Contractor shall ensure the complete and correct execution of all measures specified in the Quality Plan.

**3.** The Contractor shall inform the Company in due time of the detection of a non-conformance by issuing a non-conformance report sent to the Technical Coordinator of the Company.

# IV. Abbreviations

| | |
|---|---|
| A | Activity |
| ArbSchG | Arbeitsschutzgesetz (Safety and Health at Work Law) |
| ArbStättV | Arbeitsstättenverordnung (Workplace Ordinance) |
| ATEX | Atmosphères Explosibles (explosive atmospheres) |
| BetrSichV | Betriebssicherheitsverordnung (Industrial Safety and Health Ordinance) |
| BOM | Bill of Materials |
| CDR | Conceptual Design Review |
| CE | Conformité Européenne (European Conformity) |
| CID | Component ID |
| CS | Common Specification |
| DGUV | Deutsche Gesetzliche Unfallversicherung (German Social Accident Insurance) |
| DIN | Deutsches Institut für Normung e.V. (German Institute for Standardization) |
| DS | Detailed Specification |
| EC | European Communities |
| EDMS | Engineering and Equipment Data Management System |
| EMVG | Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln (Electromagnetic Compatibility of Equipment Law) |
| EN | European Standard |
| EU | European Union |
| FAIR | Facility for Antiproton and Ion Research |
| FAT | Factory Acceptance Test |
| FDR | Final Design Review |
| GS | General Specification |
| GSI | GSI Helmholtzzentrum für Schwerionenforschung GmbH (GSI Helmholtz Centre for Heavy Ion Research GmbH) |
| IEC | International Electrotechnical Commission |
| IKC | In-Kind Contribution |
| INCOTERMS® | International Commercial Terms |
| ISO | International Organization for Standardization |
| M | Milestone |
| PMO | Project Management Office |
| ProdSG | Produktsicherheitsgesetz (Product Safety Law) |
| ProdSV | Produktsicherheitsverordnung (Product Safety Ordinance) |
| Q-Plan | Quality Plan |

| | |
|---|---|
| SAT | Site Acceptance Test |
| StrlSchV | Strahlenschutzverordnung (Radiation Protection Ordinance) |
| StrlSchG | Strahlenschutzgesetz (Radiation Protection Law) |
| TDR | Technical Design Report |
| TG | Technical Guideline |
| TÜV | Technischer Überwachungsverein, German Technical Inspection Association |
| VDE | Verband der Elektrotechnik, Elektronik und Informationstechnik e.V. (Association for Electrical, Electronic and Information Technologies) |