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Document Title	Order Specification – Hand-Foot-Clothing-Monitor (HFK)
Description	This document serves as an Order Specification for the HFK for BSA in FAIR
Division/Organization	SRP – GSI
Field of Application	Project “FAIR Accelerator and Experiments”

Document History

Version	Created, date	Reason for modification
V001	Dennis Gaßmann	Initial version
V002	Dennis Gaßmann	Editorial Changes

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Abstract

This order specification explains the design requirements on a system to be used for radioactive contamination measurements for persons and clothes leaving radiation protection areas defined as "Bereiche mit Strahlenschutzanforderung" (BSA) at FAIR.

The system described here will be called "Hand Fuß Kleider Monitor" (HFK).

The AID of the HFK is AID: 0003897 "SRP Hand-Foot-Clothing Monitor".

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1. Purpose and Classification of the Document

This document explains the functional and technical requirements for a HFK (AID: 0003897) to be used for radioactive contamination measurements for persons and clothes.

In this document FAIR GmbH and GSI GmbH are referred to as the “Company” and the supplier is referred to as the “Contractor”.

All commercial and organizational conditions are specified in the commercial part of the contract.

2. Abbreviations, Terms and Definitions

Table 2-1: Abbreviations and Terms

Abbreviations and Terms	Definition
GSI	Helmholtzzentrum für Schwerionenforschung GmbH
FAIR	Facility for Antiproton and Ion Research in Europe GmbH
BSA	Radiation protection zones where certain tasks are performed
HFK	Hand Fuß Kleider Monitor
AKS	Anlagen-Kennzeichnungs-System
AID	Article Identifier
CID	Component Identifier

3. Scope of the Technical System

3.1. System Overview

Currently the international accelerator facility FAIR, one of the largest research projects worldwide, is being built in Darmstadt, Germany. A drawing of the GSI/FAIR complex is presented in Figure 1.

During the operation of heavy ion particle accelerators, radioactive radiation is produced due to unavoidable particle losses. Within the FAIR complex there are different areas with controlled access due to remnant radiation or possible contamination due to handling of irradiated components.

For personnel who wants to leave these controlled areas at FAIR a system has to be provided for trained personnel to check for radioactive contamination before leaving the controlled area.

Therefore, a so-called **Hand-Fuß-Kleider Monitor**, short: **HFK** shall be provided.

The HFK has to check the hands and foots as well as the clothing.

Hands and foots have to be checked by a probe each simultaneously.

For the clothing there should be a separate probe or a removable hand probe.

Simultaneous and separate measurement of α and β -y radiation contamination must be possible.

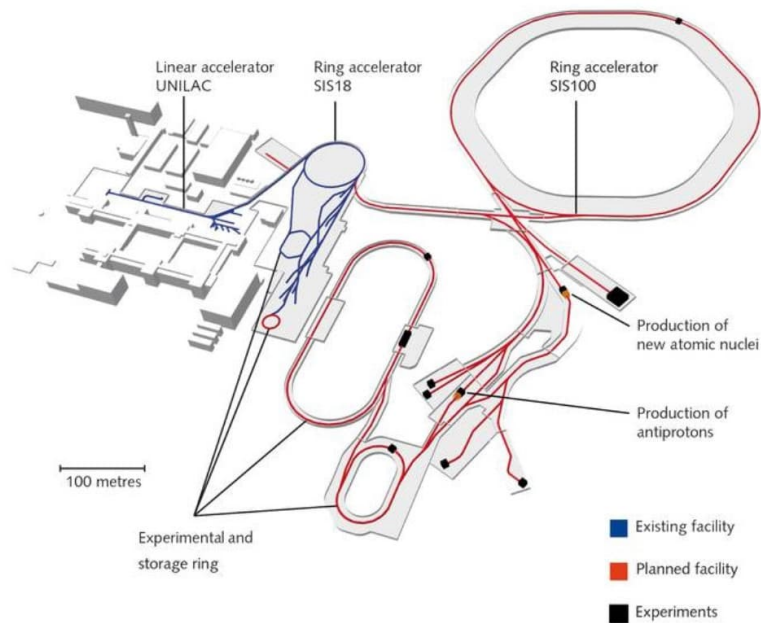


Figure 1 GSI/FAIR complex

3.2. Scope of Delivery

The scope of delivery comprises the delivery of a series of HFKs (23 pcs + 3 pcs as option), together with the necessary documentation (see chapter 6). After the tender decision a contract will be closed in order to provide the total amount of HFK systems for FAIR. The precise amount of HFK components to be delivered for FAIR and other regulations will be specified in that contract.

CE conformity has to be declared.

Availability of spare parts and a service readiness must be guaranteed through the contractor for at least 10 years.

3.3. Spare Parts

The contractor has to provide a list of reasonable spare parts inclusive prices together with his offer, if applicable.

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4. System Specification

4.1. Technical Requirements for System Components

The detectors have to be thin-layer scintillators with no counting gas required. Simultaneous and separate measurement of α and β -y radiation contamination must be possible. This means it must be possible to measure α and β -y contaminations simultaneously but the devices can also be used as pure α or pure β -y monitors.

The measurement results have to be displayed in units of Bq/cm² and/or cps in dependence of the users wish.

The background radiation must be continuously monitored for each detector and used to compensate the measurement with an average background value. Before the start of each measurement the background should be checked for fluctuations because of environmental effects of the facility.

The detection limits of the measured values have to be calculated according to DIN ISO 11929 and logged together with the measurement values.

Automatic calibration routines for each detector have to be available for periodical tests.

The user should be guided by and operate the system with a touch panel on a graphical display.

For mobility reasons the HFK must have roller or wheels or similar for easy transporting of the device within the buildings.

All HFKs are identical, therefore they have the same AID: 0003897. The AID should be mentioned on the title page of each Document from chapter 6, if possible.

Further the HFKs require a Component Identifier (CID) according to [2]. The CIDs to be used are listed in Table 4-1.

The CID and the corresponding QR-code have to be placed on a **sticker**/label which will be delivered **separately** with the HFKs but not yet placed on them. The sticker has to contain further the Type, the AID and the corresponding AKS also included into the QR-code. The information of the QR-code on the sticker/label has to be read like this, e.g.: CID:50000001132

The plain text, e.g.: CID:50000001132, has to be mentioned on the sticker as well.

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Table 4-1: List of nomenclature

AKS (Internal Number)	CID	AID
MB274.NE115.FQ002	CID:50000001132	AID:0003897
MB217.NE130.FQ001	CID:50000001149	AID:0003897
MB217.NE140.FQ001	CID:50000001156	AID:0003897
MB204.NE020.FQ001	CID:50000001163	AID:0003897
MB218.NE130.FQ001	CID:50000001187	AID:0003897
MB218.NE120.FQ001	CID:50000001194	AID:0003897
MB218.NE130.FQ002	CID:50000001200	AID:0003897
MB218.NE150.FQ002	CID:50000001217	AID:0003897
MB218.NE150.FQ001	CID:50000001224	AID:0003897
MB267.NE110.FQ002	CID:50000001248	AID:0003897
MB267.NE110.FQ001	CID:50000001255	AID:0003897
MB267.NE115.FQ002	CID:50000001262	AID:0003897
MB310.NE030.FQ004	CID:50000001279	AID:0003897
MB204.NE020.FQ002	CID:50000001286	AID:0003897
MB221.NE010.FQ002	CID:50000001293	AID:0003897
MB221.NE110.FQ001	CID:50000001309	AID:0003897
MB221.NE110.FQ002	CID:50000001316	AID:0003897
MB310.NE030.FQ005	CID:50000001323	AID:0003897
MB310.NE030.FQ006	CID:50000001330	AID:0003897
MB310.NE030.FQ007	CID:50000001347	AID:0003897
MB310.NE030.FQ008	CID:50000001354	AID:0003897
MB310.NE030.FQ009	CID:50000001361	AID:0003897
MB214.NE120.FQ001	CID:50000001378	AID:0003897
Options		
MB250.NE110.FQ002	CID:50000001385	AID:0003897
MB250.NE120.FQ001	CID:50000001392	AID:0003897
MB276.NE110.FQ003	CID:50000001408	AID:0003897

In addition, the following options would be advantageous and in case these options can be realized, they should be offered with a separate price.

Options:

- Identification of persons via authorization feature (RFID, card, etc.)
- Software for evaluation of measurement results
- Optical signal tower for device status

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4.2. Functional Requirements

The typical minimum detectable activity (MDA) for Am-241 according to ISO 11929 for a 10 s measurement has to be better than

- 0.03 Bq/cm² for hand detector
- 0.06 Bq/cm² for foot detector

The sensitive area should be at least

- 330 cm² for hand detectors
- 540 cm² for foot detectors

The supply voltage required for the HFK has to be 220-240 VAC delivered via power cable with Schuko plug by a standard Schuko socket.

The system has to contain calibration factors according to DIN ISO 7503-1.

4.3. Interfaces

The following interfaces must be provided by the system to guarantee a wired remote evaluation of the measurements

- USB
- Ethernet (TCP/IP, DHCP, NTP)

The following options for communication interface are advantageous but not mandatory.

- Encrypted communication with Client-/Server authentication
- Potential free contacts for connection to an access system
- Disclosure of the API-interface

In case these options can be realized, they should be offered with a separate price.

4.4. System Environment and Constraints

The HFKs will only be installed in the inside of buildings near the access points to controlled areas.

Therefore, the typical temperature range of -5 °C to +40 °C will not be exceeded and the relative humidity will be in a range between 0 % up to 90 % with no condensation expected due to controlled ventilation conditions.

Because of space limitations the HFK must not exceed the following dimensions.

- Length: 800 mm
- Depth: 800 mm
- Height: 1500 mm

The weight of the HFK should not exceed 40 kg.

If there is an option for improving the mobility like described in 4.1 exceeding 40 kg is acceptable to keep it movable by a single person.

If there is no such a mobility solution 40 kg is to be seen as strict limit.

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5. Quality Assurance, Tests and Acceptance

5.1 Quality Assurance System of the Contractor

The contractor has to follow the standards named in the chapters before in order to guarantee that the company is able to achieve the necessary functions. The contractor's quality assurance system shall comply with Chapter 5 "Quality Assurance" of the General Specification [1].

Therefore, as part of the evaluation process during the public tender the contractor has to explain the details of his own quality assurance system in order to document his suitability.

FAT

Each HFK has to be tested. The test results have to be documented in a quality protocol that is based on the quality plan for each individual CID and connected to the serial number of the HFK. The quality protocol has to be submitted and released by the Company. The released FAT protocol gives the Contractor the permission for shipment.

SAT Aa

After delivery to GSI a visual inspection will be done by the Company for each individual CID. The Company will provide a SAT Aa protocol to the Contractor if requested.

SAT Ab

Electrical tests and calibration will be done by the Company while installation. For each CID test and calibration results have to be documented by the Company. The Company provides a SAT Ab Protocol to the Contractor if requested.

6. Documentation

- CE declaration of conformity and CE marking
- User manual in English and German
- Mechanical and electrical datasheet
- Mechanical drawings and 3D model (.pdf und .stp)
- Assembly instruction
- Risk assessment (if possible)
- Quality/test protocol for FAT
- Quality plan (if possible)

7. Related Documents

MANDATORY:

- [1] General Specification,
F-GS-PMO-en-General_Specification,
EDMS-ID: 1365092
- [2] FAIR Technical Guideline,
F-TG-B-05e_Component-ID_Barcode_System,
EDMS-ID: 1229368