Document Title	**All-metal Gate Valves DN350CF**
Description	This document stipulates all technical specifications for the procurement of all-metal gate valves with DN350CF flanges and pneumatic actuator to be used for SIS100.
Division/Organization	Vacuum Systems (VAC) – Accelerator Vacuum (ACV)
Field of Application	Project “FAIR Accelerator and Experiments”

Document History

Version	Created, date	Reason for modification
V001	I. PONGRAC, 2026-07-14	Initial version
V002	I. PONGRAC, 2026-07-14	Correction by A. FRÖHLICH/QUA
V003	I. PONGRAC, 2026-11-02	Minor revision for tendering

EDMS **3490637 v.3** status **Released** access **Restricted**
F-OS-VAC-en-VC_0001_All_metal_gate_valves_DN350CF-V003.pdf modified **2026-11-03 08:09**

Table of Contents

1. Purpose and Classification of the Document....3
2. Abbreviations, Terms and Definitions 3
3. Scope of the Technical System....4
   3.1. System Overview....4
   3.2. Scope of Delivery....4
4. System Specification 4
   4.1. Technical and Functional Requirements (Parameter List) 4
   4.3. Interfaces and System Environment....7
5. Quality Assurance, Tests and Acceptance....7
6. Documentation 8
7. Tender Response 8
8. Related Documents 9

1. Purpose and Classification of the Document

This document stipulates all technical specifications for the procurement of all-metal gate valves with DN350CF flanges and pneumatic actuator to be installed at the SIS100 heavy ion synchrotron in the scope of the FAIR accelerator complex.

FAIR GmbH and, respectively, GSI GmbH are referred to as “Company”, whereas the supplier is referred to as “Contractor”.

This document mainly covers technical specifications – commercial and organizational conditions are not considered but shall be part of the tender documentation, quotation, purchase order and order confirmation, including delivery and payment schedule.

PSP: 2.8.7.1.3.2.0 / F2.08.07.01.03.02.00 Beam line gate valves

AID: 0003655 Gate valve DN350CF all-metal

CIDs: 07-00055-131-0, 07-00055-132-7, 07-00055-133-4

2. Abbreviations, Terms and Definitions

AID	Article IDentification number
CE	Conformité Européenne (CE marking)
CF	ConFlat®; CF-F – fixed CF flange, CF-R – rotatable CF flange
CID	Component IDentification number
DN	Nominal pipe size (Diamètre Nominal); NW – Nennweite
EPDM	Ethylene Propylene Diene Monomer
FAIR	Facility for Antiproton and Ion Research in Europe GmbH
FAT	Factory Acceptance Test (milestone M9)
GSI	GSI Helmholtzzentrum für Schwerionenforschung GmbH
RoHS	Restriction of Hazardous Substances
SAT	Site Acceptance Test (milestone M10)
SIS100	Schwerionensynchrotron (heavy ion synchrotron), with maximum magnetic rigidity of 100 Tm
UHV	Ultra-High Vacuum

3. Scope of the Technical System

3.1. System Overview

In the beam injection and extraction regions of the SIS100 heavy-ion synchrotron the trajectories of the ion beams require vacuum components with an aperture of at least DN320. In order to be able to safely separate vacuum sectors from each other, primarily due to maintenance purposes, all-metal UHV gate valves with DN350CF-F flanges will be installed.

3.2. Scope of Delivery

- All-metal UHV gate valve, with DN350CF-F flanges, with pneumatic actuator
  - specifications according to chapter 4.
  - quantity: 3 pieces
- Corresponding accompanying documentation:
  - Product data sheet and manuals in English and German
  - 3d model (preferably as STEP file)
  - 2d technical drawings, including bill of materials
  - EU Declaration of Conformity (CE marking) or EU Declaration of Incorporation according to Machinery Directive 2006/42/EC or Regulation (EU) 2023/1230, as applicable
  - RoHS certification
  - FAT report for each individual valve

4. System Specification

4.1. Technical and Functional Requirements (Parameter List)

Parameter	**Specification**

Valve

Valve type		**All-metal UHV gate valve, with pneumatic actuator**
Valve installation length	Including CF flanges	≤ 170 mm
Aperture		**≥ DN320 (Ø 320 mm)**
Mounting orientation		Vertical or ideally any
Flanges	Both sides	**DN350CF-F** **ISO 3669, 90° knife-edge angle** (corresponds to 20° angle of vacuum-side flank at CF knife-edge)
	Leak check grooves	Two, opposite

Material	Valve flanges	1.4429 ESU (316LN ESR)
	Valve body	1.4404 / 1.4435 (316L) or higher
	Valve seat / valve plate	1.4404 / 1.4435 (316L) or higher
	Valve interior mechanism	1.4404 / 1.4435 (316L) or higher
	Valve interior bellows feedthrough	1.4404 / 1.4435 (316L) or higher
	Pneumatic actuator	1.4301 (304) / Al
Gasket material	Valve seat gasket	Stainless steel, silver-plated
	Valve body gasket	Stainless steel, silver-plated
	Pneumatic actuator gasket	FKM / Viton® or ideally EPDM
Weight		≤ 300 kg
Max. temperature	Valve body, bake-out (in open or closed position)	300 °C
	Pneumatic actuator	120 °C
	Limit switches	80 °C
	Solenoid valve	80 °C
	Position indicator	80 °C
Operating pressure range		10^{-12} mbar ≤ *p* ≤ 1 bar
Integral leak rate (testing time ≥ 10 min)	Valve body	**≤ $1 \cdot 10^{-10}$ mbar ℓ/s**
	Valve seat	**≤ $1 \cdot 10^{-10}$ mbar ℓ/s**
Actuation time (Ø 6 mm tubing, 5 bar)	Opening	≤ 20 s
	Closing	≤ 20 s
Pressure difference at valve seat, when valve is closed	in direction of closing	1 bar
	in direction of opening	1 bar
Pressure difference at valve seat, when valve is possible to open	in direction of closing	≤ 500 mbar
	in direction of opening	1 bar

Conductance (N_2 equivalent)		23 500 ℓ/s
Radiation resistance	Valve body	10^8 Gy (10^{10} rad)
	Actuator	10^5 Gy (10^7 rad)
	Solenoid valve	10^4 Gy (10^6 rad)
	Position indicator	10^5 Gy (10^7 rad)
Lifetime until first service		5 000 cycles

Actuator

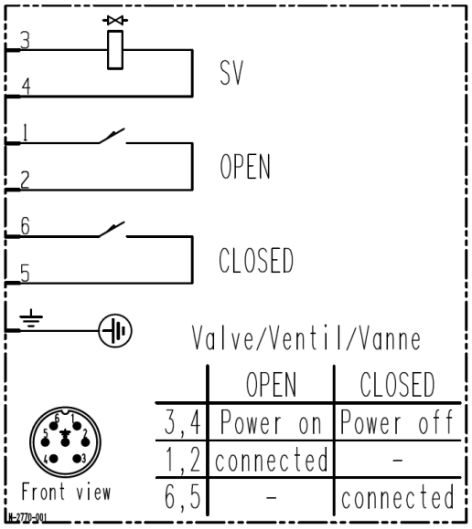
Actuator		**Extended, pneumatic, double-acting, with solenoid valve, with position indicator**
Pneumatic pressure supply		(5 … 8) bar
Pneumatic pressure connection		**G ⅛“**
Pneumatic pressure failure (pressure drop)	Valve in closed position Valve in open position During actuation	Valve remains closed, leak-tight *(to be specified in data sheet)* *(to be specified in data sheet)*
Power failure	Valve in closed position Valve in open position During actuation	Valve remains closed, leak-tight Valve closes immediately, leak-tight Valve closes immediately, leak-tight
Environmental conditions	Ambient temperature Relative humidity	(15 … 35) °C (30 … 70)%

Electrical data and connections

Connector		**Common (single) electric connector for solenoid valve and position indicator** (e.g. Binder-type connector)
Limit switches		5 A (125 – 250 VAC)
Solenoid valve (standard solenoid), wired to the 7-pin connector of the position indicator	Voltage rating Power rating	24 V DC ≤ 2.5 W
Position indicator (open and close positions)	Type / plug(s) Voltage rating Current rating	Microswitch / 1x7 poles (7-pin) ≤ 50 V AC / DC ≤ 1.2 A

4.3. Interfaces and System Environment

- In beam direction DN350CF flanges:
  - Valve: DN350CF-F, each side
  - Neighbouring components: DN350CF-R
- Compressed air:
  - Pneumatic pressure supply: (5 … 8) bar
  - Pneumatic pressure connection: G ⅛“
- Electrical connection:
  - Common (single) electric connector for solenoid valve (standard, non-impulse solenoid) and position indicator; 7-pin
  - Wiring diagram:



	OPEN	CLOSED
3,4	Power on	Power off
1,2	connected	-
6,5	-	connected

- Environmental conditions:
  - Ambient temperature: (15 … 35) °C
  - Relative humidity: (30 … 70)%

5. Quality Assurance, Tests and Acceptance

- The Contractor must be certified according to ISO 9001 or equivalent. General requirements as stipulated in [1] must be observed.
- All equipment and tools used for acceptance testing and inspection must be calibrated and certified by a valid calibration certificate.
- The FAT must be documented and must comprise at least, for each individual valve:
  - Visual checking for any damage of the valve (all surfaces, flanges, valve mechanism, actuator, connections, …)
  - Visual checking of all CF knife-edges and all sealing surfaces: no scratches, no discolourations, no stains or impurities
  - Dimensional specifications (CF flange type, threads, valve geometry)
  - Integral leak checking of the valve body and valve seat
  - Functional testing of the valve: pneumatic actuation for opening and closing; emergency actuation test of the solenoid; opening and closing times
- Failures during the FAT shall require rectification by the Contractor without any additional costs and without undue delay. The Company will not accept any valves which do not fully comply with this Order Specification.

- The FAT documentation will be checked in detail by the Company and must be complete. Only after release of the FAT documentation by the Company the shipment of the corresponding component may commence.
- The Company reserves the right to be present and to witness any tests in the scope of the FAT at the Contractor's premises.
- All tests carried out during the FAT may be repeated in the scope of the SAT by the Company. The SAT will be carried out at the Company's premises by its own personnel and testing equipment.
- Any detected failures in the scope of the SAT shall require rectification by the Contractor without any additional costs and without undue delay. The Company will not accept any valves which do not fully comply with this Order Specification.
- Only after the SAT of each valve has been carried out, approved and released, the valve will be declared as fully accepted and in compliance with this Order Specification. Subsequently, the transfer of ownership from the Contractor to the Company can take place.
- Each valve must be packaged carefully (weatherproof packaging) and protected during shipment in order to remain clean and free of damage at all times during transportation.

6. Documentation

- Complete and concise FAT documentation for each individual valve
- Product data sheet
- Operating manuals in English and German, including troubleshooting procedures, circuit diagrams, handling / lifting / installation procedures, packaging and transport regulations, storage conditions
- Risk assessment (as part of the operating manual)
- Technical drawings and 3d model (preferably as STEP file)
- EU Declaration of Conformity (CE marking) or EU Declaration of Incorporation according to Machinery Directive 2006/42/EC or Regulation (EU) 2023/1230, as applicable
- Full compliance with European Safety Regulations and Machinery Directive 2006/42/EC or Regulation (EU) 2023/1230 (valid from 2027-01-20), respectively
- RoHS certification
- All documentation accompanying each valve shall be submitted in PDF/A format.
- All documentation will become property of the Company.

7. Tender Response

The tender response must include following documentation:

- Technical specifications (product data sheet, 3d model, technical drawing) as stipulated in this Order Specification
- Verifiable track record concerning the manufacturing, supply, and maintenance of DN350CF all-metal gate valves
- Delivery schedule and payment schedule
- Warranty coverage
- Service and maintenance coverage, including a list of spare parts (if applicable)
- FAT procedures
- Delivery per DAP (Incoterms 2020)
- ISO 9001 (or equivalent) certification

8. Related Documents

General Specification for the FAIR Accelerator Facility Project:

[1] F-GS-PMO-en-General_Specification
(EDMS ID: 1365092)