Hellenic Gas Transmission System Operator S.A.
357-359 Messogion Av., GR 152 31 Halandri
Tel.: 213 088 4000
Fax: 210 674 9504
Email: desfa@desfa.gr

TECHNICAL SPECIFICATION

HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

FILTERS

JUNE 2021

1	Second Issue	30-06-2021	GD	KM	TPI
0	First Issue	05-04-2011	PQ DPT.		V.G.
REV	**DESCRIPTION**	**DATE**	**PRPD**	**CHKD**	**APVD**

REVISION HISTORICAL SHEET

Rev.	Date	Description
0	05/04/2011	First Issue (as Spec 134/1)
1	30/06/2021	Second Issue validated from TPI

Table of Contents

1 SCOPE

1.1 GENERAL

This Specification covers the minimum requirements for the design, fabrication and supply of Filters. Main purpose of filters installation is the removal of solid impurities from the gas stream. Filters will service sweet, natural gas with sporadic passage of water and glycol.

1.2 ADDITIONAL INFORMATION

Additional information may be given in the project's requirements, basic design documents and drawings, and should be read in conjunction with this Technical Specification.

Vendor shall be responsible to design filters and their components in accordance with requirements of applicable project's documents. In any thicknesses and other design characteristics shall not be less than those shown on the basic design documents and drawings unless specific written approval to the contrary is received from Owner.

Any conflict between requirements of this Technical Specification, basic design documents and drawings, Standards, Material Requisition and Datasheet shall be referred to Owner for clarification before proceeding with fabrication of the subject part.

2 REFERENCES

Items/equipment to be supplied under this Specification shall comply with the requirements of the latest edition of the Codes, Standards, Specifications and Practices as applicable, except if specifically, modified hereafter:

2.1 REFERENCE DOCUMENTS

- Technical Specification DSF-SPC-PIP-001 [Welding of Equipment & Piping]
- Technical Specification DSF-SPC-MEC-001 [Unfired pressure Vessels]
- Technical Specification DSF-SPC-PIP-009 [Supply of Materials]
- Technical Specification DSF-SPC-INS-001 [General Notes for Instruments]
- Technical Specification DSF-SPC-INS-002 [General instrumentation]
- Technical Specification DSF-SPC-MEC-006 [External Painting]
- Technical Specification DSF-SPC-QAC-005 [Shop Inspection of Equipment and Materials for NGT Project]
- Technical Specification DSF-SPC-QAC-006 [Inspection and Test Instructions]

2.2 REFERENCE CODES AND STANDARDS

- 2014/68/EU [Pressure Equipment Directive (PED) of the European Parliament and of the Council of 15 May 2014 on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment Text with EEA relevance]
- EN 10204 [Metallic Products – Types of Inspection Documents]
- EN 13445 series [Unfired Pressure Vessels]
- EN 1759-1 [Flanges and their joint – Circular flanges for pipes, valves, fittings and accessories, Class designated–Part 1: Steel flanges, NPS ½ to 24.]
- EN 14870-3 [Petroleum and natural gas industries –Induction bends, fittings and flanges for pipeline transportation systems – Part 3: Flanges.]
- EN 1514 series [Flanges and their joints - Dimensions of gaskets for PN – designated flanges]
- EN 1515 series [Flanges and their joints – Bolting – Part 3: Classification of bolt materials for steel flanges, class designated]
- EN 12560 series [Flanges and their joints - Gaskets for class-designated flanges]
- EN 1759-1 [Flanges and their joint – Circular flanges for pipes, valves, fittings and accessories, class designated – Part 1: Steel flanges, NPS ½ to 24"]
- EN 60947-5-6 [Low-Voltage Switchgear and Control Gear-Part 5-6. Control Circuit device and Switching Elements - DC interface for Proximity Sensors and Switching Amplifiers]
- EN ISO 15609 [Specification and qualification of welding procedures for metallic materials. Welding procedure specification.]

3 GENERAL REQUIREMENTS

3.1 DESIGN LEGISLATION AND STANDARDS

Pressure vessels shall be designed, constructed, inspected and tested in accordance with:

a. EU Directive 2014/68/EU

b. EN 13445

c. Requirements mandatory as accepted by the National or Local Authorities where the filter is to be located.

d. Insurance requirements.

3.1.1 DESIGN DATA

Refer to project's requirements, basic design documents and drawings.

3.1.2 CALCULATIONS

According to EN 13445.

Reinforcement pads, shall be calculated and provided by the Vendor for all openings and shall not be less than the required in the applicable standard.

Reinforcement shall be equal to the greater of the requirements obtained from the following:

- New vessel subject to testing conditions
- Vessel subject to design condition

3.2 UNITS

Metric.

3.3 OPERATING TEMP. RANGE

As per project's requirements, basic design documents and drawings

3.4 PRESSURE RATING

As per project's requirements, basic design documents and drawings

3.5 CONSTRUCTION

3.5.1 GENERAL

The filter shall be vertical or horizontal type.

In case of vertical type, gas inlet and outlet flanges shall be constructed on the same center line.

In case of horizontal type, construction shall include a liquid separation collection header beneath the main filter and separator sections. The main gas inlet to the filter section shall be located such that the inlet gas will not directly impinge on the filter elements.

The filter design shall secure that the separation efficiency specified in the Material Requisition and Datasheet are fulfilled.

Vessel parts shall have minimum thickness of not less than the requirements of EN 13445.

In any event, the minimum thickness shall not be less than 5 mm for Carbon and low-alloy steels filters and 3 mm for high-alloy steels.

3.5.2 HEADS AND CONICAL SECTIONS

All heads shall conform to permissible code shapes.

Elliptical heads shall have a ratio of the inside major axis to the inside minor axis of 2:1.

Appex. angle of the conical portion of toriconical heads shall not exceed 60 Deg, unless otherwise noted on filter basic design documents and drawings.

3.5.3 NUMBER OF STAGES

Filters shall be either single stage cartridge filters or two-stage units comprising a cyclone/multicyclone first stage and a cartridge second stage.

3.5.4 CLOSURE

Filters shall be equipped with a quick-opening closure mechanism (door) at the top to allow easy access for changing filter cartridges. The design of the door shall be such that it cannot be opened whilst the filter is pressurized. Suitable equipment shall be provided to lift and/or swing the door.

Hinges shall be supplied for all closures.

3.5.5 CARTRIDGES

Filters of the same type shall have identical cartridges in all filter sizes. Minimum cartridge bursting pressure as per Process Data Sheet.

3.5.6 SEPARATING PLATE

For two stage filters, the plate separating the two stages shall be designed to withstand at least the actual bursting pressure of the cartridges.

3.5.7 NOZZLE ALIGNMENT

Alignment of connection nozzles shall be within a tolerance of 1/2 degree.

3.5.8 FLANGES

Flanges shall be in accordance with EN 13445, EN 1759-1 and EN 1514 series, raised face. Flanges shall be of weld neck type unless otherwise specified in the project's requirements, basic design documents and drawings.

3.5.9 GASKETS

All gaskets and seals shall be asbestos free and be resistant to natural gas and gas condensates.

Flat ring gaskets shall be of a type having a stainless-steel lip ring on the inner edge.

Vessel external attachments and reinforcing pads: Vendor's supply shall also include the followings:

- Saddle supports (if any).

- External insulation supports if specified.

- Support legs, clips and brackets.

- Lifting lugs.

- All attachments to vessel as required for shipment and erection.

All external attachments shall be of the same material as the shell and head to which they are directly attached.

Gasket surface finished in accordance with EN 13445, EN 1759-1, EN 1514 series and EN 12560 as follows:

FLANGE FACE	GASKET TYPE	FACE FINISH
Raised & flat face	1.5 mm soft ring	"Stock"
Raised face	Spiral wound	Smooth (>3,6μm Ra)
Raised face	Metal jacketed	Very smooth (<1,6μm Ra)

3.5.10 LEVEL GAUGES

Two-stage dust/liquid filters shall be equipped with liquid level gauges on both stages.

First stage shall be equipped with a magnetic type level gauge fitted with shut-off valves and with one (or two-level alarm switch(es) mounted on the outside of the gauge, making alarm setting over the whole gauge length possible.

The level alarm switches shall be no-touch inductive proximity switches in accordance with EN 60947-5-6, having an enclosure with protection class min. IP 65 and with min. Pg 13,5 cable gland.

The Explosion protection shall be min Ex ib, for zone 1, group IIB, class T3.

Second stage shall be equipped with a reflection glass level gauge fitted with automatic shut-off safety valves, which prevents the escape of gas and liquids in case of glass rupture. Manual shut-off shall be possible.

All level gauges shall be equipped with a drain valve.

3.5.11 VALVES

Drain connections on liquid filters shall, unless otherwise stated in basic design documents, shall be equipped with a drain valve and a blind flange.

Drain valves shall be ball or plug-valves type.

Only valves manufactured in accordance with EN 13445.

3.6 MATERIALS

3.6.1 GENERAL

Materials shall fulfill the requirements of EN 13445.

Plate material according to EN 13445. For the plate material to be used for reinforcing pads applies the applicable specification for the vessel parts to which they are connected. Plate materials P295GH are not accepted. Casting shall not be used.

No other material will be used unless specifically written by Owner. Welding fittings for pressure parts shall be of seamless steel.

The individual steel items shall be marked with Vendor's mark and material grade.

Prefabricated items, as caps, reducers, flanges, etc, shall be marked according to the Standard to which they are manufactured.

Materials shall conform to EN 13445-2. Carbon content on heat analysis shall never exceed 0.22%. Carbon equivalent (CE=C+Mn/6) shall be <0.42% on heat analysis and Vanadium content <0.07%.

Impact tests: For all pressure retaining parts, V-Charpy impact test shall be performed according to EN 13445. Properties shall be determined on each heat from a set of three Charpy V-notch specimens.

The test temperature shall be -20^{o}C or lower with acceptance criteria as follows:

Impact test values from three (3) tests shall be according to material specification, but not lower than 27 joules for the average value, with the lowest single value not less than 21 joules. All test specimens shall be removed transverse to the longitudinal axis.

3.7 FABRICATION

3.7.1 GENERAL

Pressure vessels shall be manufactured in accordance with the requirements of EN 13445.

Filters shall be completely shop fabricated and no field work shall be accepted by Owner.

Tolerances on out-of-roundness of vessels shall conform to the Standard and Owner requirements.

All tolerances must be referred to the completed vessel, after heat treatment, if required.

3.7.2 HEAT TREATMENT

Cold formed dished heads shall after forming undergo appropriate heat treatment.

Hot formed dished heads shall be manufactured to ensure a heat treatment corresponding to that required for cold formed dished heads.

Any heat treatment operations performed by vessel Vendor and intended to enhance mechanical properties, shall obtain Owner approval. When normalized and tempered materials are specified, the tempering shall be performed prior to any welding unless specifically otherwise authorized in writing by Owner.

The tempering temperature shall be 10^{o}C higher than that required for PWHT, unless otherwise specified on vessel basic design documents and drawings.

Vessels which have been submitted to PWHT shall have a large warning notice

painted on shell at convenient locations stating:

STRESS RELIEVED VESSEL NO WELDING PERMITTED.

3.7.3 WELDING PROCEDURES/WELDERS QUALIFICATIONS

WPS, PQR, WQR shall be in accordance with the requirements of EN ISO 15609, EN ISO 15614-1 level 2, EN ISO 9606-1 for welder qualifications and EN ISO 14732 for welding operators.

3.7.4 WELDING

Hardness of the weld seam and the heat affected zone may nowhere exceed 300 HV10.

Repair by welding:

Only permitted in welds. Repair procedure shall be approved by Owner Representative.

3.8 NON-DESTRUCTIVE EXAMINATION

3.8.1 GENERAL

All joints on pressure retaining parts, except for nozzle weld seams with sizes below DN 100, shall be 100% radiographed and found acceptable in accordance with EN 13445.

If weld-on nozzles are used, the affected area of the shell plate shall be ultrasonically tested for laminations.

3.8.2 NOZZLES DN <100

Nozzle weld seams shall be 100% dye penetrant or magnetic particle examined in accordance with ELOT EN 13445.

3.9 TESTING

3.9.1 HYDROSTATIC TEST

Each unit shall be hydrostatic tested as per Standard.

Temperature of water shall never be less than 5oC. Filter vessel shall take all necessary precautions to avoid brittle fracture of filters during the hydrotest.

All shop fabricated vessels shall be hydrotested and certified by a Notified Body as per EU Directive 2014/68/EU and EN 13445.

Only water having less than 50 ppm chloride ion shall be used during hydrotest for all austenitic/martensitic stainless steel exposed to water-test.

In addition, the equipment shall be immediately drained after hydrotest and carefully dried by blowing with air and an absolute absence of any pocket water must be ensured.

The hydrostatic test pressure shall be measured at the top of the vessel. Vertical shop fabricated vessels shall be tested in horizontal position with test pressure increased to consider the static head present when the vessel is in vertical position.

The type of gaskets used for hydrotest must be the same selected for the operating conditions. All gaskets shall be replaced, after hydrotest.

3.9.2 TIGHTNESS TEST

Each unit shall pass a tightness test, using air or nitrogen. Test pressure, shall be 6 bar and hold time 30 minutes.

3.10 SURFACE TREATMENT

Raised faces on flanges shall neither be sandblasted nor primed, but shall be protected against corrosion with a soluble varnish or equivalent.

The vessel shall be delivered in primed conditions.

DESFA Job Spec. No. DSF-SPC-MEC-006 shall dictate surface preparation and painting required.

All parts painted with rich zinc paints or hot dip galvanized shall not be welded to the vessel.

The primer shall allow over-coating after six (6) months of stocking on site without any significant reduction in adhesion of the following coats. If necessary, this shall be achieved by the additional application of a sealer.

Machined surfaces shall not be painted welding ends shall be capped and protected against corrosion damage in transit.

3.11 MARKING

Filters shall be fitted with stainless steel identification plates, containing the item number and the information required by the Standard and EU Directive 2014/68/EU.

The text shall be in English, as per Std Drawing STD-00-11-08.

3.12 DELIVERY

All outlets shall be capped and protected against corrosion or damage in transit.

3.12.1 INSULATION

Filters shall be insulated as per relevant Specification.

4 TECHNICAL DOCUMENTATION

4.1 QUANTITY

Three (3) copies of each inclusive of original for all Documents and Certificates, except otherwise specified.

Three (3) of each inclusive of one reproducible for all drawings, except otherwise specified.

Also electronic files (word documents and/or AutoCAD documents as applicable and scanned PDF files) of all Documents and Certificates must be submitted by Vendor to the Owner.

4.2 DOCUMENT REQUIREMENTS

All drawings must be marked with Owner purchase order number and with the part number to which they apply. Design data, design and construction applied European Standards shall be noted on these drawings.

All drawings (except those with tender) shall be addressed to Owner Document Control Department.

4.3 MINIMUM DERIVERABLE REQUIREMENTS

The following documentation / drawings are the minimum requirements for the deliverables by the Vendor, at three (3) copies, unless otherwise specified:

- Technical file certified by Notified Body as per requirements of EU Directive 2014/68/EU (section 4).
- detailed construction drawings including parts list detailing material standard and grade, item description, and certification level, dimensions, location and size of nozzles, materials, overall weight, indication of accessories (type of valves, level gauges, level switches, etc.), internal design, etc.
- design calculations, including completed material requisitions and datasheets.
- heat treatment specification,
- non-destructive testing specification,
- pressure test specification,
- identification plate text,
- Comprehensive operation, maintenance and reconditioning manuals in Greek and English,
- List of recommended tools, spare parts, etc.,
- EEx-approval- and conformity certificates for level alarm switches (if any).
- As-built drawings,
- FILTER CERTIFICATION PACKAGE as listed above. Certified drawings required within two weeks after return of "For Approval" drawings.
- Electronic files (word documents and/or AutoCAD documents as applicable and scanned PDF files) of all Documents, Drawings and Certificates.

5 INSPECTION AND CERTIFICATION

Inspection will be performed by a Notified Body.

Inspection requirements are defined in the following:

a. EU Directive 2014/68/EU

b. Material requisition and Datasheet.

c. DESFA Tech. Spec. No. DSF-SPC-QAC-005 "Shop inspection of equipment and materials for NGT project",

d. Relevant project specifications.

e. Inspection clauses of EN 13445.

Inspection procedures to be followed are detailed in DESFA Tech. Spec. DSF-SPC-QAC-006 "Inspection and Test Instructions".

6 SPARE PARTS

As a minimum two (2) spare gaskets plus 10% bolts and nuts (if any) shall be supplied.

Also, Vendor shall include a start-up filtering media with a lighter filtration degree.

7 SHIPMENT

One-piece filter shall be completely equipped with all external attachments before shipment unless otherwise specified on the drawings and project's requirements.

Where necessary, filter and its components shall be supported by temporary stiffeners to avoid distortion and damage during transportation and erection.

All exposed machined surfaces shall be coated with rust preventive. All ends (flanges, welding, etc.) shall be protected with plastic covers and all threaded connections (if any) shall be plugged.

8 GUARANTEES

For guarantee requirements see the Purchase Order.