

STATEMENT OF TECHNICAL REQUIREMENTS FOR ASBESTOS FREE FIBRE JOINTS/SEALS.

1. **Functionality.** Cut seals made from Asbestos free fibers. for use in the fluid circuits for adaptors & plugs.

2. **Types of Seals.** Requirement exists for two types of Seals
(a) 2mm thk (b) 3mm thk

3. **Seal Material.** Asbestos free fiber

4. **Construction.** Seals are made by cutting to size the Asbestos free fiber sheets, which are made as per spec. STF 33-07-02/001E.

5. **Dimensional tolerances.** Inner diameter : 0 /+ 0.5mm
Outer diameter : 0 /- 0.5mm
Thick : 0 /+ 0.2mm

6. **Test to Guarantee the product life expectancy.** Requirements in STF 33-07-02/001E § 8 relating to sheets are applicable to cut joints i e

- Identification of the chemical composition of each component.
- Determination of their respective mass fraction.

Following these tests, comparisons shall be performed with the gasket results recorded during qualification tests.

7. **Document to be supplied during delivery.** Type 3.1 acceptance certificate as per NF EN 10204 edition 01/2005.

8. **Packing and Labeling.** Items are to be sealed inside an opaque packaging Material to protect against UV rays in flat lying condition on a rigid structure.

STATEMENT OF TECHNICAL REQUIREMENTS FOR METALLIC MRGH-TYPE JOINTS/GASKETS.

1. **Functionality.** MRGH type gasket are used in submarine exhaust system fitting on circular flanges.
2. **Types of Seals.** 3mm thk
3. **Seal Material.** Metallic ; **Metal insert** : Grade MONEL 400 (Alloy 400).
Layers : Thermally and chemically expanded vermiculite
Supranite V01.
4. **Construction.** The gasket comprises a grooved metal insert covered on each side with a layer of expanded vermiculite. The insert thickness is 2mm or 3mm (for some applications) and every layer of expanded vermiculite is 0.5mm.
5. **Dimensional tolerances.**
Inner diameter : 0 /+ 0.5mm
Outer diameter : -0.5./ 0mm
Thick : 0 /+0.2mm
6. **Test to Guarantee the product life expectancy.**
 - a) Product chemical life expectancy tests-Tests shall check the type of metal insert and the chemical type of vermiculite.
 - b) Life expectancy tests of product mechanical properties- Tests shall check the minimum constraint required to reach a given water tightness rate « Q_{min} » and the minimum constraint to maintain for a long time a given water tightness rate « Q_{Smin} ».
7. **Document to be Supplied during delivery.** Type 3.1 acceptance certificate as per NF EN 10204 edition 01/2005.
8. **Packaging and Labeling.** Items are to be sealed inside an opaque packaging material to protect against UV rays in flat lying condition on a rigid structure.

STATEMENT OF TECHNICAL REQUIREMENTS FOR ANNEALED COPPER FLAT GASKETS & COPPER GROOVED GASKETS/SEALING RINGS.

1. **Functionality.** Metallic gasket used in piping flanges

2. **Types of Gaskets.** 1. Annealed Copper flat gasket as per NF R 93-920
(a) 1mm thk (b) 1.5mm (c) 2mm thk
2. Copper grooved gasket 3mm thk

3. **Material.** Metallic ; 1. **Annealed Copper flat gasket**

Bars : Cu-DHP copper number CW024A metallurgical condition H035 annealed according to NF EN 12163 edition 06/1998.

Plates : Cu-DHP copper number CW024A metallurgical condition H040 annealed according to NF EN 1652 edition 03/1998.

Maximum hardness for both Bars & Plates 50 HB or 50 HV according to NF R 93-920 edition 12/1993.

2. **Copper grooved gasket**

Bars : Cu-DHP copper number CW024A metallurgical condition H035 according to NF EN 12163 edition 06/1998.

Plates : Cu-DHP copper number CW024A metallurgical condition H040 according to NF EN 1652 edition 03/1998.

4. **Surface condition.** **For Annealed Copper flat gasket** Ra 6,3..

5. **Dimensional tolerances.** Inner diameter : 0 / +0.5mm
Outer diameter : -0.5 / 0mm
Thick : 0 / +0.2mm

6. **Document to be Supplied upon delivery.** Conformity " typifies 2.2" according to NF EN 10204 edition 01/2005.

STATEMENT OF TECHNICAL REQUIREMENTS FOR HIGH PRECISION O-RINGS FOR RUCH SEALING.

1. **Functionality.** Rubber O-rings used in water, hydraulic fluids and hydrocarbons circuits in submarine .
2. **Types of O-rings.** O-rings ranging from ring dia 1.8-7.0mm
3. **Material.** Butadiene acrylonitrile rubbers– (NBR) according to :
 - NF L17-120 classes 20A5 - 20A6 - 20A7 - 20A8 – 20A9,
 - NF L17-121 classes 21A6 - 21A7 - 21A8 – 21A9,
 - FD L17-100 / NF L17-106 for compounds complying with the requirements in NF L17-120 and NF L17-121.
4. **Manufacturing.** Obtained by compression, transfer or injection moulding.
5. **Qualification and acceptance tests.** According to NF L17-106
6. **Inspection.** By sampling According to NF ISO 2859-1 admissible quality level NQA = 2.5. Critical defects are prohibited.
7. **Inspection Criteria.** Hardness inspection, Dimensional check, Mixes inspection, Visual inspection. Classification of the defects
8. **Shelf life.** According to NF L17-104 service life group II (NBR 20A).
Observe the curing and expiry dates of the cured products.
9. **Inspection certificate to be Supplied upon delivery.** Inspection sheet according to NF L17-106 with compound batch number for each order statement.

STATEMENT OF TECHNICAL REQUIREMENTS FOR METALIC O-RINGS FOR UNIONS.

1. **Functionality.** Metallic O-rings to be used in unions.

2. **Types of O-rings.** O-rings of ring dia 2.6mm ranging from ND6 to ND40

3. **Material. Coating :** Nickel. **Spring :** Nimonic 90.
Compression limiter: austenitic stainless steel X2 CrNiMo 17-12-2 (digital reference 1.4404) as per standard NF EN10088-3

4. **Maximum admissible pressure & temp.** 175 bar,350 °C.

5. **Qualification and acceptance tests:** a) Product chemical durability tests :
Tests are to check the nature of the materials.
b) Product mechanical durability tests :
Tests will check the Q_{min} and Q_{smin} .

6. **Document to be Supplied upon delivery.** 3.1.B type compliance certificates as per NF EN 10204.

STATEMENT OF TECHNICAL REQUIREMENTS FOR EXPANDABLE GRAPHITE SHEETS WITH S.S INSERT.

1. **Functionality.** Expandable graphite sheets with S.S insert.
2. **Types of Sheets.** 2mm thk Graphite sheets of different size.
3. **Sheet Material.** Expanded graphite sheets reinforced by a thin frame in X2CrNiMo17-12-2 stainless steel insert to standard NF EN 10088-3
4. **Dimension.** Sheet dimensions 1000x1000mm or 1000x500mm.
5. **Dimensional tolerances.** 0% à + 5% over lengths and widths
± 10% on thicknesses
6. **Physical and mechanical characteristics.**
 - (1) Density of the graphite : 1 to 1.1
 - (2) Halogen content : Chlorides ≤ 50 ppm
Fluorides ≤ 50 ppm
 - (3) Breaking strength : 2.8 daN/mm
 - (4) Compressibility : < 50 %
 - (5) Elastic recovery : < 10 %
7. **Test for durability of product.**
 - a) Tests of chemical durability of the product
 - tests to check the chemical nature of the graphite
 - the nature of the metal insert
 - b) Tests of the mechanical durability of the product
The tests will check : the Qmin and Qsmin.
8. **Document to be Supplied upon delivery.** Type 3.1B acceptance certificate as per NF EN 10204 edition 01/2005. (a) For the graphite (b) For the stainless steel strip
9. **Packing and Labeling.** Laid down flat on rigid structures into an opaque packaging that protects against UV.

STATEMENT OF TECHNICAL REQUIREMENTS FOR CUT SEALS FROM EXPANDED GRAPHITE SHEETS WITH S.S INSERT.

1. **Functionality.** Cut seals from Expandable graphite sheets with S.S inserts to be used for adaptors and plug.
2. **Types of Seals.** 3.4 mm thk & 4.9 mm thk CUT SEALS of different size.
3. **Sheet Material.** Expanded graphite sheets reinforced by a thin frame in X2CrNiMo17-12-2 stainless steel insert to standard NF EN 10088-3
4. **Construction.** Seals are made by cutting to size the Expandable graphite sheets with S.S inserts which are made as per spec. STF 33-07-02/007B
5. **Dimensional tolerances.** $\begin{matrix} +0.5 \\ 0 \end{matrix}$ over inside φ ; $\begin{matrix} -0.5 \\ 0 \end{matrix}$ over outside φ
6. **Physical and mechanical characteristics.**
 - (1) Density of the graphite : 1 to 1.1
 - (2) Halogen content : Chlorides \leq 50 ppm
Fluorides \leq 50 ppm
 - (3) Breaking strength : 2.8 daN/mm
 - (4) Compressibility : < 50 %
 - (5) Elastic recovery : < 10 %
7. **Test for durability of product.**
 - (a) Tests of chemical durability of the product
 - tests to check the chemical nature of the graphite
 - the nature of the metal insert
 - (b) Tests of the mechanical durability of the product as per NF EN 13555 version 04/2005
 - The minimum level of the surface pressure upon assembly Q_{\min} (min. stress upon assembly)
 - The minimum level of the surface pressure after loosening $Q_{S\min}$ (min. service stress).
8. **Document to be Supplied upon delivery.** Type 3.1B acceptance certificate as per NF EN 10204 edition 01/2005. (a) For the graphite (b) For the stainless steel strip
9. **Packaging and Labeling.** The seals are to be packaged individually in opaque waterproof bags.