

Contents

1	Scope	2
2	Applicable codes and standards	2
3	Additional requirements	2
3.1	Materials.....	2
3.2	Hardness limitation.....	3
3.3	Special requirements	3
4	Marking.....	4
4.1	Additional marking.....	4
4.2	Colour marking	5
5	Inspection	5
6	Delivery notes.....	5

Remarks on the current issue:

Revision: Issue 04: Paragraph 2, 3.3.7, 4.1, 4.2.1,4.2.2; Editorial revised.

Issue 05: Sheet 2 to 5, date adapted. Table 1, footnote deleted.

Previous issues: 12.82, 07.84, 01.87, 03.93, 07.93, 03.98, 12.2004, 04.2005, 09.2009

Responsible department(s) for the technical content: TAW

Confidentiality class 1 in accordance with LS 104-03: Unrestricted publication

X	05	11.2009	TAW / Raßhofer	TKR / Dörr	TAW-N / Pertold
X	04	09.2009	TAW / Raßhofer	TKR / Dörr	TAW-N / Pertold
Status	Issue	Date	Prepared	Checked	Approved

1 Scope

This Technical Purchase Standard (TPS) shall apply to metallic and non-metallic gaskets for bolted flange connections of piping and pressure vessels according to ASME.

Statements made in the inquiry / purchase order shall have priority over the requirements of TPS.

2 Applicable codes and standards

The following codes and standards shall be applied besides those mentioned in the inquiry / purchase order. Issues valid at the time of placements of order shall govern:

ISO 1629	Rubber and latices - Nomenclature
ASME B16.20	Metallic Gaskets for Pipe Flanges - Ring Joint, Spiral-Wound, and Jacketed
ASME B16.21	Non-metallic Flat Gaskets for Pipe Flanges
ASTM F 104	Standard Classification System for Non-metallic Gasket Materials

3 Additional requirements

The below listed material designations are partly Linde specifications and will be used in the respective inquiry / purchase order. The annotations shall be considered at delivery.

Provided that no relevant standard for technical delivery conditions exists for the indicated gasket material and/or if several materials can be used, the material selected by the manufacturer shall be indicated in the confirmation of the purchase order, supported by an appropriate product datasheet.

3.1 Materials

Unless no further details are given in the purchase order or in the related dimensional standard the following terms are used:

Soft Iron	=	RJ-Gaskets: Pure iron with max. 0,15 % of other components All other gaskets: Soft iron or pure iron
SS	=	Austenitic stainless steel type 18%Cr-10%Ni stabilized or unstabilized, with or without Mo, normal or low %C
0,5Mo	=	0,5%Mo steel
CRMO	=	1%Cr-0,5%Mo-, 2,25%Cr-1%Mo- or 5%Cr-0,5Mo-steel
AL	=	ASME IIB SB-241 1060 or UNS No. A91050
CU	=	Deoxidized copper (ASME IIB SB-152 UNS No. C12200)
PTFE	=	Polytetrafluoroethylene, type of filler must be agreed upon, no reclaim
GRAPHIT	=	Graphite with ash content < 2%, density 1,0 g/cm ³ , chloride content < 50 ppm
CFO	=	Compressed fibre, asbestos-free and oil-resistant. ASTM F 104 (F712140-M6)
NBR ¹⁾	=	NBR-vulkanizate (e.g. Perbunan®, BunaN®), oil-resistant, temperature stability from - 30 °C up to + 100 °C, shore hardness (70 ± 5) °A
EPDM ¹⁾	=	EPDM-vulkanizate, oil-resistant, temperature stability from - 40 °C up to + 100 °C, Shore hardness (70 ± 5) °A
FKM (FPM ¹⁾)	=	Fluorinated rubber-vulkanizate (e.g. Viton®), oil-resistant, temperature stability from - 20 up to + 200 °C, shore hardness (75 ± 5) °A
SONDERGUMMI (CR ¹⁾)	=	Chloroprene rubber (i.e. C 160 dark SV manufacturer Menzel & Seyfried) Properties: age-, light-, ozone-, weather-, oil-, base-, acid- and seawater-resistant; burning behaviour: self-extinguishing, high fire-retardant; temperature application range - 30 °C to + 120 °C; Shore hardness approx. 60 °A

¹⁾ Abbreviations according to ISO 1629

3.2 Hardness limitation

For ring joint gaskets according to ASME B16.20 the maximum allowable hardness values according to Table 1 apply to the starting material. The hardness requirements shall also apply to metallic parts of non-metallic gaskets (centring rings and supporting excluded).

Table 1: Maximum allowable hardness for metallic gasket materials

Material	Maximum allowable hardness	
	Brinell (HBW)	Rockwell (HRB)
Soft iron	90 HBW 2,5/187,5	56
SS	160 HBW 2,5/187,5	83
All other steels	130 HBW 2,5/187,5	72
Al	20 HBW 2,5/62,5	-

3.3 Special requirements

3.3.1 Tinned copper gaskets

Tinned copper gaskets may be either hot-tinned or tin-plated with a minimum coat thickness of 12 micrometers.

3.3.2 Use of asbestos-free soft-materials

Soft- and metallic/soft-material gaskets (jacketed gaskets, spiral wound gaskets, graphite gaskets with metal reinforcement (burred or tanged plate or metallic foils), corrugated gaskets and grooved gaskets with covering layer) according to this TPS shall be asbestos-free.

3.3.3 Soft- and graphite-gaskets with metallic inner reinforcement (inner rim)

The inner rim shall be pre-pressed in such a way that during installation no additional forces shall be necessary to press the inner rim.

NOTE The appropriate pre-pressing can be checked with a ruler which is slightly pressed to the surface of the gasket. There shall be no remarkable gap between gasket surface and inner rim.

3.3.4 Centring ring and inner ring

- The centring ring shall be made of stainless or unalloyed steel. Unalloyed material shall be provided with a suitable corrosion protection.
- The inner ring shall be of a material having corrosion resistance characteristics equivalent to or better than that of the metal reinforcement, jacket metal or metal winding (preferred materials see Table 2).

3.3.5 Graphite gaskets with metal reinforcement (burred or tanged plate or metallic foils)

Graphite with impregnated surface; perforated SS plate insert thickness approx. 0,1 mm

Graphite layers of 0,5 mm thickness maximum; SS-foil insert approx. 0,025 mm thick.

- Graphite surfaces must always be impregnated;
- Burred or tanged reinforcement
The thickness of the stainless steel metal reinforcement shall be approx. 0,1 mm. The spears or tanged items shall not penetrate through the graphite layer;
- Metallic foil inserts
The thickness of the graphite-layers shall be maximum 0,5 mm, the thickness of stainless steel foils shall be approx. 0,025 mm. The number of foils is at the discretion of the manufacturer;
- Flat ring gaskets with graphite layers for pressure vessels
Flat ring gaskets with a metal reinforcement made of stainless steel (2 mm thickness) with graphite-layers on both sides (0,5 mm each) can also be used (total thickness 3 mm).

3.3.6 Metal jacketed gaskets

The non-metallic filler (core) of the gasket ring shall be in one piece. The jacket must be completely filled with the non-metallic filler. Glued overlapping sloped edges are permitted. Pass partitions for heat exchanger gaskets shall be tack welded in all corners, unless explicitly ordered otherwise. Tack welds shall not be thicker than approximately two thirds of the gasket thickness and may not exceed the gasket itself.

3.3.7 Spiral wound gasket

The filler shall have an excess of $0,3 \pm 0,1$ mm on both sides. Unless specified otherwise, spiral wound gaskets shall have an inner ring and a centring ring for all sizes and all classes.

In case of spiral wound gaskets without centring ring, the number of welds on the outer windings (i.e. on the empty wraps) shall be:

≤ NPS 11/2	min. 4
NPS 2 bis 3	min. 6
NPS 4 bis 12	min. 8
NPS 14 bis 20	min. 12
NPS 24 bis 40	min. 16

3.3.8 Grooved metal gaskets with covering layers

Grooved (i.e. covered serrated) metal gaskets shall be provided with layers of soft material on both faces (PTFE or Graphite). Centring rings shall be loosely connected.

3.3.9 Metallic gaskets

Preference shall be given to seamless gaskets. If gaskets must be welded the welding process shall be agreed upon with the purchaser. Edge misalignments, suck backs or undercuts are not permitted. Gripping surfaces (outside of sealing surface) with a width of maximum 1,5 mm on cylindrical gaskets due to manufacturing process are acceptable. Gaskets made of copper and aluminium shall be soft-annealed and smooth and flush with the abutting surface. Copper gaskets shall be pickled.

3.3.10 Corrugated gaskets

Unless otherwise specified the corrugated gaskets shall be supplied with soft material plates on both sides. The corrugated metal shall be of stainless steel.

3.3.11 Flat gaskets – special type (GARLOCK Type Gylon Standard Style 3501E®)

These gaskets are made of modified PTFE without cold flow and have a thickness of $(2 \pm 0,15)$ mm.

These gaskets are qualified for Air Separation Plants by Linde.

3.3.12 Flat gaskets made from CFO sheet material

Flat gaskets made from CFO sheet material shall be made in one piece (i.e. no bonded sections or segments).

3.3.13 Elastomer gaskets (NBR, EPDM, FKM)

Elastomer gaskets shall be delivered with a vulcanized metallic insert.

3.3.14 Bonding

For all bonding (e.g. plates on metallic gaskets or inserts in graphite gaskets) only adhesives with low grade of chloride (maximum 50 ppm) shall be used. Bonding shall be done through direct application of the bonding material. Use of tapes with adhesive on both sides is not permitted.

4 Marking

Marking shall be according to the standards mentioned in the purchase order with the following additional requirements.

4.1 Additional marking

Gaskets shall in addition be marked with tags on the coil or a label on the package with the following details:

- Manufacturer's trademark symbol or name
- ASTM F 104 Classification (if relevant)
- LINDE's purchase order No.
- LINDE's item no. (= ident No. see purchase order)

The marking shall be applied durably and well legible.

4.2 Colour marking

4.2.1 Metallic-soft-material gaskets with centring ring

Metallic-soft material gaskets with centring ring shall be provided with a colour code on the centring ring. Where the thickness of the centring ring is sufficient a continuous colour around the centring ring edge shall identify the metallic core.

Intermittent stripes on the edge of the centring ring shall identify the filler material. For gasket sizes below NPS 1 ½ there shall be a minimum of two stripes spaced approx. 180 degrees apart. For gasket sizes of NPS 1 ½ and above there shall be a minimum of four stripes spaced approx. 90 degrees apart.

The colours shall conform to those in Table 2. For materials not indicated in Table 2 the colour code shall be agreed with the purchaser.

Table 2: Colour code and abbreviations for materials

ASME-Material-Code		Colour Code
Metallic material		
CRS		silver
304		yellow
304L		No colour
309		No colour
316L		green
347		blue
321		turquoise
Soft material plates / non-metallic filler		
Graphite	F.G.	grey stripes
PTFE	PTFE	white stripes
Mica-Graphite	Manufacturer's product name	pink stripes

4.2.2 Spiral wound gasket

Spiral wound gaskets shall be colour coded according to ASME B16.20.

4.2.3 Other types of gaskets

For all other types of gaskets a colour code is necessary only if required by the related standards.

5 Inspection

Purchaser may at his discretion inspect the materials preferably at the place of manufacture.

6 Delivery notes

In addition to quantity delivered, product description, dimensions, material (specification and grade), hardness, the delivery notes shall also contain information on purchase order No., purchase order item No. and (item-) Ident. No.