28.01.2021

EU-/FDA-Konformitätserklärung
„Lebensmittel- und Pharma-Unbedenklichkeit“

Das Dichtungsmaterial **TEADIT TF 1580** eignet sich hervorragend für den direkten Kontakt mit Lebensmitteln und pharmazeutischen Wirkstoffen, und damit zur Anwendung in der pharmazeutischen Industrie.

Das Produkt wird in Übereinstimmung mit der Verordnung (EG) Nr. 2023/2006, über gute Herstellpraxis für Materialien und Gegenstände, die dazu bestimmt sind mit Lebensmittel in Berührung zu kommen, gefertigt und erfüllt zudem die Anforderungen folgender Richtlinien:

a) EU – Richtlinie

- EG Rahmen-Richtlinie 1935/2004
- EU Richtlinie Nr. 10/2011

b) US – Richtlinie

- U.S. regulations 21 CFR 177.1550

TEADIT verwendet in der Fertigung keine Stoffe tierischen Ursprungs (ADI). Das Produkt ist, nach derzeitigem Kenntnisstand, frei von BSE (Bovine Spongiform Encephalopathy) und TSE (Transmissible Spongiform Encephalopathy).

Diese Konformitätserklärung gilt für das von uns gelieferte Produkt und wie oben angegeben. Die in diesem Dokument enthaltenen Informationen gelten für die angegebenen Revisionsversionen und -daten und / oder bis dieses Dokument ersetzt wird.

Aufgrund möglicher Änderungen der zugrunde liegenden Gesetze und Vorschriften sowie möglicher Änderungen unserer Produkte können wir nicht garantieren, dass der Status dieses Dokuments unverändert bleibt. Wir empfehlen unseren Kunden daher, den regulatorischen Status regelmäßig zu überprüfen. Es wird erneuert, wenn die vorherige Konformität nicht mehr gewährleistet ist. Es liegt in der Verantwortung des Benutzers, die Eignung des Materials für eine bestimmte Anwendung zu bewerten und zu bestimmen. Teadit übernimmt keine Haftung, welcher Art auch immer.

TEADIT International Produktions GmbH
Europastrasse 12, 6322 Kirchbichl, Austria
Tel. +43 5372 64020-0
Fax +43 5372 64020-20
e-Mail: austria@teadit.eu
www.teadit.eu

UniCredit Bank Austria in Woergl, Austria
IBAN: AT34 1100 0048 9323 6200 (EURO Konto/Account)
IBAN: AT04 1200 0048 9323 6202 (USD Konto/Account)
BIC/Swift-Address BKAUATWW

ARA-Lizenz-Nr.: 4223 - UID-Nr. ATU31891209 - Rechtsform: GmbH - Sitz: 6322 Kirchbichl, FN 52702d, Handelsgericht Innsbruck
Es gelten unsere allgemeinen Geschäftsbedingungen / Our Genereal Terms of Business apply

BAM
Bundesanstalt für Materialforschung und -prüfung
12200 Berlin
Telefon: 030 8104-0
Telefax: 030 8112029

Bericht

über die Prüfung eines nichtmetallischen Materials auf Reaktionsfähigkeit mit gasförmigem Sauerstoff

Aktenzeichen	2-1073/2014 I
Ausfertigung	1. Ausfertigung von 2 Ausfertigungen
Auftraggeber	TEADIT Deutschland GmbH Schanzenstraße 35 51063 Köln
Auftrag vom	29. April 2014
Eingegangen am	30. April 2014
Prüf-/ Versuchsmaterial	TEADIT TF 1580 (Chargenbezeichnung unbekannt) für den Einsatz als Flachdichtung in Flanschverbindungen an/in Sauerstoffleitungen/-anlagenteilen und –armaturen für gasförmigen Sauerstoff bei Temperaturen bis 250 °C. BAM-Auftrags-Nr.: 2.1/52 084
Eingegangen am	6. Mai 2014
Prüfdatum	26. Mai bis 10. Juni 2014
Prüfort	BAM - Arbeitsgebiet „Sicherer Umgang mit Sauerstoff“, Haus 41, Raum 073
Prüfung bzw. Erfordernis gemäß	DIN EN 1797: 2002-02 „Kryo-Behälter - Verträglichkeit von Gas/Werkstoffen“ ISO 21010: 2004-07 „Cryogenic Vessels - Gas/Material Compatibility“ Anhang vom Merkblatt M034-1 (BGI 617-1) "Liste der nichtmetallischen Materialien, die von der Bundesanstalt für Materialforschung und -prüfung (BAM) zum Einsatz in Anlageteilen für Sauerstoff als geeignet befunden worden sind.", Berufsgenossenschaft Rohstoffe und chemische Industrie, Stand: März 2014; TRGS 407 Technische Regeln für Gefahrstoffe „Tätigkeiten mit Gasen - Gefährdungsbeurteilung“ Kapitel 3 „Informationsermittlung und Gefährdungsbeurteilung“ und Kapitel 4 „Schutzmaßnahmen bei Tätigkeiten mit Gasen“, Stand: Juni 2013

Alle im Bericht angegebenen Drücke sind Überdrücke.
Dieser Prüfbericht besteht aus Blatt 1 bis 5 und den Anhängen 1 bis 3.

Prüfberichte dürfen nur in vollem Wortlaut und ohne Zusätze veröffentlicht werden. Für veränderte Wiedergabe und Auszüge ist vorher die widerrufliche schriftliche Einwilligung der BAM einzuholen. Der Inhalt des Prüfberichtes bezieht sich ausschließlich auf die untersuchten Gegenstände.

PRÜFBERICHT

DIN-DVGW-Baumusterprüfzertifikat

DIN-DVGW type examination certificate

NG-5125BM0465
Registriernummer
registration number

Anwendungsbereich ***field of application***	Produkte der Gasversorgung *products of gas supply*
Zertifikatinhaber ***owner of certificate***	TEADIT® International Prod. GmbH Europastraße 12, A-6322 Kirchbichl
Vertreiber ***distributor***	TEADIT® International Prod. GmbH Europastraße 12, A-6322 Kirchbichl
Produktart ***product category***	Schmier-/Dicht-/Betriebsmittel: Flachdichtungswerkstoff auf Basis PTFE (5125)
Produktbezeichnung ***product description***	Flachdichtungswerkstoff auf Basis PTFE
Modell ***model***	TEADIT® TF 1580
Prüfberichte ***test reports***	Baumusterprüfung: 16/124/5125/1 vom 11.07.2016 (EBI)
Prüfgrundlagen ***test basis***	DIN 3535-6 (01.04.2019)
Ablaufdatum / AZ ***date of expiry / file no.***	05.10.2021 / 21-0121-GNU

70028-04-A-DE

16.03.2021 Rie A-1/2
Datum, Bearbeiter, Blatt, Leiter der Zertifizierungsstelle
date, issued by, sheet, head of certification body

DAkkS
Deutsche
Akkreditierungsstelle
D-ZE-16028-01-05

DVGW CERT GmbH
Zertifizierungsstelle
Josef-Wirmer-Str. 1-3
53123 Bonn
Tel. +49 228 91 88 - 888
Fax +49 228 91 88 - 993
www.dvgw-cert.com
info@dvgw-cert.com

Typ *type*	Technische Daten *technical data*	Bemerkungen *remarks*
TEADIT® TF 1580	Normbezeichnung: DIN 3535-TF	

Staatliche Materialprüfungsanstalt

Universität Stuttgart

MPA STUTTGART

Zertifikat

Die **PTFE-Flachdichtung** vom Typ **Tealon TF1580**

der **Teadit International Produktions GmbH**
Rosenheimer Str. 10
A-6330 Kufstein/Austria

wurde von uns nach den Vorgaben der VDI-Richtlinie 2440 (Ausgabe November 2000) geprüft. Nach 48-stündiger Auslagerung bei 150°C an Luft und anschließender Leckagemessung bei Raumtemperatur und 1 bar Druckdifferenz mittels Helium-Massenspektrometrie erfüllt sie mit

$5.9 \cdot 10^{-7}$ mbar l / (s·m)

das Leckageratenkriterium

10^{-4} mbar l / (s·m)

und gilt damit hinsichtlich des oben genannten Leckagekriteriums als

hochwertig im Sinne der TA Luft.

Dieses Zertifikat gilt nur in Verbindung mit unserem
Prüfungsbericht 950 822 002 Dr.Koc/Hh/Gd vom 17. April 2003
und den dort niedergelegten Prüf- und Randbedingungen.

UNIVERSITÄT STUTTGART * STAATL. MATERIALPRÜFUNGSANSTALT (10) *

Stuttgart, den 17.04.2003

Dipl.-Ing. R. Hahn
Fachgruppenleiter Dichtungstechnik

Nach DIN EN ISO/IEC 17025 durch die DAP Deutsches Akkreditierungssystem Prüfwesen GmbH akkreditiertes Prüflaboratorium
Die Akkreditierung gilt für die in den Urkunden aufgeführten Prüfverfahren (DAP-Reg.-Nr.: DAP-PL-2907.99)
Zusätzliche Akkreditierungen und Zertifizierungen nach DIN EN ISO 9001 durch DKD/PTB, KBA und TÜV

FH Münster
Forschungsbereich Dichtungstechnik
Bürgerkamp 3
48565 Steinfurt

Fachhochschule Münster University of Applied Sciences

Zertifikat

Die Flachdichtung vom Typ **TF 1580** der Firma

TEADIT International
Rosenheimer Str.10
A-6330 Kufstein

wurde vom Forschungsbereich Dichtungstechnik der FH Münster nach den Vorgaben der VDI- Richtlinien 2200 (Ausgabe Juni 2005) hinsichtlich Ausblassicherheit geprüft. Die Untersuchung fand unter folgenden Randbedingungen statt:

Dichtungshöhe:	3 mm
Prüfflansch:	DN40/PN40
Ausgangsflächenpressung:	30,0 MPa
Auslagerung:	200 °C / 48h
Testbedingungen:	Umgebungstemperatur

Die Restflächenpressung betrug 3,7 MPa ($< Q_{Smin}$).

Die Überprüfung der Ausblassicherheit ergab: Klasse A: 60 bar

Dieses Zertifikat ist nur in Verbindung mit dem Prüfbericht 06050201 vom 26.Juni 2006 gültig.

Steinfurt, den 26.06.2006 Prof. Dr. A. Riedl

Akkreditiert im Rahmen der DAP Akkreditierung durch den TÜV SÜD.

Electronically published by ABS Hamburg.
Reference T2063743, dated 06-JAN-2021.

CERTIFICATE NUMBER	21-2063743-PDA
EFFECTIVE DATE	06-Jan-2021
EXPIRY DATE	05-Jan-2026
ABS TECHNICAL OFFICE	Hamburg Engineering Department

CERTIFICATE OF

Product Design Assessment

This is to certify that a representative of this Bureau did, at the request of

TEADIT INTERNATIONAL PROD. GMBH

located at

EUROPASTRASSE 12, A-6322 KIRCHBICHL, Austria

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product:	**Gasket**
Model:	**24SH, 30SH, TF1570, TF1574, TF1580, TF1590, NA1002, NA1005, NA1006, NA1100, NA1122, SWG 913/913M**
Endorsements:	
Tier:	**3 - Type Approved, unit certification not required**

This Product Design Assessment (PDA) Certificate remains valid until 05/Jan/2026 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

American Bureau Of Shipping

Dimitrios Nikolakis,Engineer/Consultant

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS or a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without approval from ABS will result in this certificate becoming null and void. This certificate is governed by ABS Rules 1-1-A3/5.9 Terms and Conditions of the Request for Product Type Approval and Agreement (2010)

Sensitivity: Internal & Restricted

Electronically published by ABS Hamburg.
Reference T2063743, dated 06-JAN-2021.

TEADIT INTERNATIONAL PROD. GMBH
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A-6322 KIRCHBICHL
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Fax: +43 537 264020 20
Email: austria@teadit.eu
Web: www.teadit.eu

Tier: 3 - Type Approved, unit certification not required

Product: **Gasket**
Model: **24SH, 30SH, TF1570, TF1574, TF1580, TF1590, NA1002, NA1005, NA1006, NA1100, NA1122, SWG 913/913M**
Endorsements:

Intended Service:
Marine & Offshore Application.

Description:
24SH is a large gasket sheet produced from 100% pure, multi-directionally expanded PTFE.
30SH is a large gasket sheet produced from 100% pure, multi-directionally expanded PTFE.
TF1570 and TF1574 are structured PTFE - Gasket - Sheet produced from virgin PTFE resin filled with hollow glass micro spheres.
TF1580 is a structured PTFE - Gasket - Sheet and produced from virgin PTFE resin filled with Barium Sulfate.
TF1590 is a structured PTFE - Gasket - Sheet and produced from virgin PTFE resin filled with Silica.
NA1002 is a compressed non-asbestos jointingsheet material produced from Aramid fibres, bonded with Nitrile rubber (NBR). It is being manufactured by means of a hot calender process under quality control standards which are registered under ISO 9001 certification.
NA1005 is a compressed non-asbestos jointingsheet material produced from Aramid fibres, bonded with Nitrile Rubber (NBR). It is being manufactured by means of a hot calender process under quality control standards which are registered under ISO 9001 certification.
NA1006 is a non-asbestos jointing-sheet material produced from cellulose fibres, bonded with Nitrile rubber (NBR). It is being manufactured by means of a hot calender process under quality control standards, registered and certified under ISO 9001.
NA1100 is a universal jointing sheet with high temperature and pressure resistance, manufactured from graphite and carbon fibre, bonded with Nitrile rubber (NBR). It is manufactured by means of a hot calender process under quality control standards which are registered and certified under ISO 9001.
NA1122 is a compressed non-asbestos sheet gasket material produced from a combination of inorganic fibers, bonded with nitrile rubber (NBR). It is being manufactured by means of a hot calender process under quality control standards which are registered under ISO 9001 certification.
Spiral-Wound Gaskets (SWG) 913/913M are made of a preformed metallic strip and a soft filler material (PTFE or graphite), wound together under pressure, and optionally with an inner and/or outer guide ring. The metal strip holds the filler.

Rating:
24SH
Temperature Min./continuous Max.: -240°C/270°C
Pressure: Max. 200 bar
Color: white
30SH
Temperature Min./continuous Max.: -268°C/260°C
Pressure: Max. 200 bar
Color: white
TF1570, T1574
Temperature Min./Max.: -210°C/260°C
Pressure: Max. 55 bar
Color: blue
TF1580:
Temperature Min./Max: -210°C/260°C
Pressure Max.: 83 bar
Color: Off-White
TF1590:

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Reference T2063743, dated 06-JAN-2021.

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Web: www.teadit.eu

Tier: 3 - Type Approved, unit certification not required

Temperature Min./Max: -210°/260°C
Pressure Max.: 83 bar
Color: Fawn
NA1002
Temperature Max./Continuous Max. 400°C / 260°C
Pressure Max./ Continuous Max: 110 bar / 80 bar
Color: Green
NA1005
Temperature Max./Continuous Max. 400°C / 240°C
Pressure Max./ Continuous Max: 110 bar / 50 bar
Color: Blue
NA1006
Temperature Max./Continuous Max. 450°C / 270°C
Pressure Max./ Continuous Max: 130 bar / 70 bar
Color: Black
NA1100
Temperature Max./Continuous Max. 450°C / 270°C
Pressure Max./ Continuous Max: 130 bar / 70 bar
Color: Black
NA1122
Temperature Max./Continuous Max. 550°C / 430°C
Pressure Max./ Continuous Max: 150 bar / 102 bar
Color: Black
Spiral-wound Gaskets (SWG) 913/913M
Max Temperature for PTFE filler material: 260°C
Max Temperature for Grafite filler material: 450°C
Max Temperature with steam and under inert conditions: 650°C

Service Restriction:
1) Unit Certification is not required for this product.
2) If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.
3) No to be used in the following systems:
a. for fire mains and hydrants unless adequately protected as per 4-7-3/1.11.1 of Marine Vessels Rules 2021.
b. for connection to the shell where the failure of the material in the vent of a fire would give rise to a danger of flooding as per 4-6-2/9.13.1 of Marine Vessels Rules 2021.
c. for remote closure of valves on fuel oil tanks unless protected adequately to ensure effective closure facility in the vent of fire as per 4-6-4/13.5.3 of Marine Vessels Rules 2021.

Comments:
1) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
2) Physical properties and manufacturer´s acceptance criteria are to meet the design/application requirements.
3) Chemical compatibility as per manufacturer´s recommendation.

Notes/Drawing/Documentation:
Drawing No. Declaration of conformity_signed, DoC, Revision: -, Pages: -
Drawing No. Spiral seals 913 M acc. ASME B 16, Standard Dimensions ASME B16.20, Revision: -, Pages: -
Drawing No. Spiral seals 913M acc. EN 1514-2 2005_DE, Standard Dimensions EN1514, Revision: -, Pages: -
Drawing No. Standards_Dimensions_V1-2019-293-293, Standard Dimensions, Revision: -, Pages: -
Drawing No. TA_ISO 14001_E, certificate, Revision: -, Pages: -
Drawing No. TA_ISO 9001_E, certificate, Revision: -, Pages: -
Drawing No. act on form alert, request, Revision: -, Pages: -

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Tier: 3 - Type Approved, unit certification not required

Terms of Validity:
This Product Design Assessment (PDA) Certificate remains valid until 05/Jan/2026 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

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STANDARDS

ABS Rules:
- 2021 Rules for Building and Classing Marine Vessels: 1-1-4/7.7, 1-1-A3, 1-1-A4, 4-6-1/3.5, 4-6-1/7.5.2, 4-6-2/5.15, 4-6-2/9.5, 4-6-2/9.13.1, 4-6-2/9.15, 4-6-4/13.5.3, 4-6-4/15.3.2, 4-7-3/1.11.1
- 2021 Rules for Building and Classing Mobile Offshore Units:1-1-A2, 1-1-A3, 1-1-4/9.7.

National:
ASTM F36 (Edition 2015), F37 (Edition 2019), F38 (Edition 2018), F104 (Edition 2020), F152 (Edition 2017), F146 (Edition 2019), F1315 (Edition 2017), F495 (Edition 2019), D792 (Edition 2013).
DIN 28090-2 (Edition 2014), DIN 52913 (Edition 2002), DIN 3535 (Edition 2019).
EN 13555 (Edition 2014).

International:
NA

Government:
NA

EUMED:
NA

OTHERS:
NA

Electronically published by ABS Hamburg.
Reference T2063743, dated 06-JAN-2021.

21-2063743-PDA

Attachment to 21-2063743-PDA covering
TEADIT Deutschland GmbH, Gaskets

Models:
24SH, 30SH, TF1570, TF1574, TF1580, TF1590, NA1002, NA1005, NA1006, NA1100, NA1122, SWG 913/913M

Issuance Date: 6-January-2021
Expiry Date: 5-January-2026

Intended Service:
Marine & Offshore Applications

Drawing List

Engineering Office:	Hamburg Engineering Department	
Submitter:	TEADIT INTERNATIONAL PROD. GMBH (444760)	
Drawing No	**Revision No**	**Drawing Title**
act on form alert	-	request
TA_ISO 14001_E	-	certificate
TA_ISO 9001_E	-	certificate
Declaration of conformity_signed	-	DoC
Standards_Dimensions_V1-2019-293-293	-	Standard Dimensions
Spiral seals 913 M acc. ASME B 16	-	Standard Dimensions ASME B16.20
Spiral seals 913M acc. EN 1514-2 2005_DE	-	Standard Dimensions EN1514

Electronically published by ABS Hamburg.
Reference T2063743, dated 06-JAN-2021.

21-2063743-PDA

Drawing List as per 16-1549485-1PDA of October 2019:

Engineering Office:	Hamburg Engineering Department	
Submitter:	TEADIT DEUTSCHLAND GMBH (444760)	
Drawing No	**Revision No**	**Drawing Title**
PDA Request DOC200819-20082019092208	-	PDA Request DOC200819-20082019092208
Correspondence	-	Fee Confirmation

Drawing List as per 16-1549485-PDA of August 2016

Engineering Office:	Hamburg Engineering Department	
Submitter:	TEADIT DEUTSCHLAND GMBH (444760)	
Drawing No	**Revision No**	**Drawing Title**
Product information TEADIT NA 1122	-	Product information TEADIT NA 1122
Product Information TEADIT 30SH	-	Product Information TEADIT 30SH
Correspondence	-	Type approval request form

Electronically published by ABS Hamburg.
Reference T2063743, dated 06-JAN-2021.

21-2063743-PDA

Drawing List as per 15-1455552-1-PDA of January 2016:

Engineering Office:	Hamburg Engineering Department	
Submitter:	TEADIT DEUTSCHLAND GMBH (444760)	
Drawing No	**Revision No**	**Drawing Title**
2015-11-23 Application Form	-	Application Form
2015-11-23 Declaration of Conformity	-	Declaration of Conformity
Correspondence	-	CorrespondenceNamenaenderung

Drawing List as per 15-1296050-PDA of January 2015:

Engineering Office:	Hamburg Engineering Department	
Submitter:	TEADIT DEUTSCHLAND GMBH (444760)	
Drawing No	**Revision No**	**Drawing Title**
1570_BAM_D_31	-	1570_BAM_D_31
1580_BAM_D_26	-	1580_BAM_D_26
Correspondence	-	2013-06-04 GL NA1002, Na1005, NA1100
2013-09-16 BAM TF1590	-	2013-09-16 BAM TF1590
24SH_BAM_D_31	-	24SH_BAM_D_31
Correspondence	-	ABSapplicationInclAsbFreeDecl
Correspondence	-	certificate_Teadit_24SH_TF1570_TF1580_TF1590_TF1510
Correspondence	-	CorrespondenceConfirmation
Correspondence	-	GL 5476708
Correspondence	-	GL 5476808
TEADIT_24SH_DE	-	TEADIT_24SH_DE
TEADIT_24SH_EN	-	TEADIT_24SH_EN
TEADIT_NA-1002_DE	-	TEADIT_NA-1002_DE
TEADIT_NA-1002_EN	-	TEADIT_NA-1002_EN
TEADIT_NA-1005_DE	-	TEADIT_NA-1005_DE
TEADIT_NA-1005_EN	-	TEADIT_NA-1005_EN
TEADIT_NA-1040_EN	-	TEADIT_NA-1040_EN
TEADIT_NA-1100_DE	-	TEADIT_NA-1100_DE
TEADIT_NA-1100_EN	-	TEADIT_NA-1100_EN
TEADIT_SWG_DE_2013345	-	TEADIT_spiral_wound_gaskets_DE_2013345
TEADIT_SWG_EN_2013345	-	TEADIT_spiral_wound_gaskets_EN_2013345
TEADIT_TF_1570_DE	-	TEADIT_TF_1570_DE
TEADIT_TF_1570_EN	-	TEADIT_TF_1570_EN
TEADIT_TF_1580_DE	-	TEADIT_TF_1580_DE
TEADIT_TF_1580_EN	-	TEADIT_TF_1580_EN
TEADIT_TF_1590_DE	-	TEADIT_TF_1590_DE
TEADIT_TF_1590_EN	-	TEADIT_TF_1590_EN

THE CHLORINE INSTITUTE

Pamphlet 95

Gaskets for Chlorine Service

Edition 5, Revision 1

A LEGACY OF 1924 since SAFETY STEWARDSHIP

May 2016

Table of Contents

1. INTRODUCTION

1.1 SCOPE

This pamphlet is intended to provide manufacturers, packagers, and consumers of chlorine with practical information that can be used to improve safety and environmental performance by helping to prevent failures and minimize fugitive emissions from gasketed connections in dry and wet chlorine service. The pamphlet provides guidance for gasket material selection and gasket installation.

This pamphlet lists gaskets that have found user acceptance in chlorine service. Gaskets are added to the pamphlet only during routine pamphlet revisions. The Task Group charged with reviewing the pamphlet will decide whether to include additional gaskets based on experience and recommendations from member companies. Member companies utilizing new gaskets and sharing results will enable other members to become aware of gaskets that may provide improved service and reliability. This is consistent with the Institute's goal of continuous improvement.

The Chlorine Institute **does not** approve, rate, certify or endorse any gasket. The information on gaskets and gasket materials contained in this pamphlet reflects information obtained from member companies in their use and/or evaluation of the gasket or gasket material.

1.2 CHLORINE INSTITUTE STEWARDSHIP PROGRAM

The Chlorine Institute (CI) exists to support the chlor-alkali industry and serve the public by fostering continuous improvements to safety and the protection of human health and the environment connected with the production, distribution and use of chlorine, sodium and potassium hydroxides, and sodium hypochlorite; and the distribution and use of hydrogen chloride. This support extends to giving continued attention to the security of chlorine handling operations.

Chlorine Institute members are committed to adopting CI safety and stewardship initiatives, including pamphlets, checklists, and incident sharing, that will assist members in achieving measurable improvement. For more information on the Institute's stewardship program, visit the CI website at www.chlorineinstitute.org.

1.3 DEFINITIONS AND ACRONYMS

Unless otherwise stated, the following meanings apply:

chemical lead	lead with 2% to 4% antimony
dry chlorine	chlorine is considered dry if it meets the criteria established in Chlorine Institute Pamphlet 100 (*4.1*)
Institute	The Chlorine Institute
lead	lead (not alloyed)

packaging plant	a chemical plant that repackages chlorine
producing plant	a chemical plant that manufactures chlorine
PTFE	polytetrafluoroethylene
psig	pounds per square inch gauge
SBR	styrene-butadiene rubber
EPDM	Ethylene propylene diene monomer
wet chlorine	Chlorine that does not meet the definition of 'dry' will be considered 'wet'. See CI Pamphlet 100 (*4.1*) for complete definition and technical summary of 'dry' chlorine.

1.4 DISCLAIMER

The information in this pamphlet is drawn from sources believed to be reliable. The Institute and its members, jointly and severally, make no guarantee and assume no liability in connection with any of this information. Moreover, it should not be assumed that every acceptable procedure is included or that special circumstances may not warrant modified or additional procedure. The user should be aware that changing technology or regulations may require a change in the recommendations herein. Appropriate steps should be taken to insure that the information is current when used. These suggestions should not be confused with federal, state, provincial, municipal, or insurance requirements, or with national safety codes.

1.5 APPROVAL

The Institute's Health, Environment, Safety and Security Issue Team approved Edition 5, Revision 1 of this pamphlet on May 24, 2016.

1.6 REVISIONS

Suggestions for revisions should be directed to the Secretary of the Institute.

1.6.1 Significant Revisions in Current Edition

This pamphlet was revised to update the gasket tables, provide an expanded Definitions and Acronyms section, clarify certain guidance including adherence to manufacturers' recommendations and the use of auxiliary materials such as lubricants or anti-seize compounds, and update the references section. The lists of gaskets that have been used successfully at member companies are still included in the pamphlet. Revision 1 of this edition added Table 3.5, Gasket Materials That Have Found User Acceptance with Chlorine Tank Cars.

1.7 REPRODUCTION

The contents for this pamphlet are not to be copied for publication, in whole or in part, without prior Institute permission.

2. GASKET SELECTION, INSTALLATION AND PERSONNEL TRAINING

2.1 CHEMICAL RESISTANCE

Chlorine is a highly aggressive oxidizer that reacts with many metals and organic compounds. Chemical compatibility and resistance to chlorine are key criteria in the selection of a chlorine gasket material. Service conditions, including contact with dry or wet chlorine, must be taken into account when assessing chemical resistance. For thermal considerations please see Table 3.1.

2.2 PHYSICAL PROPERTIES

Because all gasket materials are porous, a compressive load sufficient to reduce this porosity must be applied. If the initial load is insufficient or if there is a loss of gasket compression, porosity allows the system pressure to push the contained fluid into or around the gasket, leading to gasket degradation, leakage, or blow-out. Material factors such as gasket creep and bolt relaxation, and most importantly, installation practices or flange make-up can affect gasket compression. When choosing a gasket material, compressibility, recovery, creep relaxation, sealability, tensile strength, and stress required to seal should be considered.

2.3 INSTALLATION AND MAINTENANCE

Proper gasket installation and maintenance is a critical component of a leak-free chlorine system. The installation must create the proper compressive force to provide sufficient friction between the gasket and the flange, and provide sufficient compression to reduce the gasket material porosity to provide the proper seal. It is imperative that personnel be trained to install gaskets correctly.

When installing a gasket, the recommended procedures of the manufacturer, equipment supplier, and/or end-user should be followed. These procedures typically include the following:

- Inspect the gasket to verify that it is the correct size, material, and type for the intended service, and that it is clean and undamaged.
- Inspect the flanges to verify that they are properly aligned, clean, and undamaged.
- Examine bolts or studs, nuts, and washers for defects such as burrs or cracks, and rust. Clean and /or replace as needed.
- Avoid applying release agents such as anti-seize products, pipe dope, lubricants or grease to the gasket or flange faces. These release agents can attack some gaskets and can contribute to gasket blowout by filling the grooves on the face of the flanges and lowering the coefficient of friction

between the gasket and the flange faces. Also, the oils and greases in some of these products may react violently with chlorine.

- If using lubricants and/or coatings on nut threads and facings, and bolts to reduce friction between the flange fasteners and to create a consistent and correct bolt load ensure that the lubricants and/or coatings are chlorine compatible

- Tighten the bolts to the gasket and/or flange manufacturer's specifications. Most manufacturers recommend a cross bolt pattern in multiple steps of increasing torque, until the final torque requirements are achieved, followed by a final circular pass. To prevent damage it is important not to overtorque. This is particularly important in wet chlorine service when non-metallic piping is used.

- External factors including vibration, temperature cycling and pressure spikes can cause the loss of compressive load. If recommended by the gasket manufacturer, retorque the bolts per proper procedure after letting the gasket set and after the gasket has been in service for a short period of time.

2.4 TRAINING

Training of the personnel who install gaskets is a critical component of a leak-free chlorine system operation. Good procedures and a well-trained crew will enhance the integrity of the chlorine piping system.

3. CHLORINE GASKET SELECTION

3.1 DRY CHLORINE SERVICE

The gaskets listed in Table 3.2 and Table 3.3 have found user acceptance in dry chlorine service for the service class indicated (where applicable).

The use of gaskets on packaging equipment (i.e. outlet cap and yoke adapter) is considered a unique application by the packaging industry. These gaskets are typically in service for a much shorter time and at less severe temperatures and pressure conditions than gaskets used elsewhere in the chlorine industry. Table 3.3 contains information regarding packaging gaskets.

Contact gasket manufacturers for more detailed information including composition, testing, and service category details.

Gaskets used in fixed chlorine piping systems for a more severe service should be considered as acceptable for a less severe service, using the following criteria:

- Class II gaskets will be suitable for Class I service

- Class III gaskets will be suitable for Class I and Class II service

- Class IV service will be suitable for Class I service

- Class V service will be suitable for Class I, Class II and Class IV service

- Class VI service will be suitable for Class I, Class II, Class III, Class IV and Class V service

Table 3.1 Service Classes

I	Gas only vacuum to 150 psig (1034 kPa) and -20°F to 300°F (-29°C to 149°C)
II	Gas only vacuum to 150 psig (1034 kPa) and -50°F to 300°F (-46°C to 149°C)
III	Gas only vacuum to 150 psig (1034 kPa) and -150°F to 300°F (-101°C to 149°C)
IV	Gas or liquid vacuum to 300 psig (2068 kPa) and -20°F to 300°F (-29°C to 149°C)
V	Gas or liquid vacuum to 300 psig (2068 kPa) and -50°F to 300°F (-46°C to 149°C)
VI	Gas or liquid vacuum to 300 psig (2068 kPa) and -150°F to 300°F (-101°C to 149°C)

3.2 WET CHLORINE SERVICE

Table 3.4 is a listing of gasket materials that have found user acceptance in wet chlorine service. Specific gasket descriptions are given in lieu of manufacturers' brand names.

3.3 METHOD FOR THE INCLUSION OF CHLORINE GASKETS IN THIS PAMPHLET

Gaskets will be added to the tables during routine pamphlet revisions; currently a five year cycle. The Task Group that reviews the pamphlet will verify that new gaskets added to the tables were used and found acceptable by a member company.

To have a gasket added to the table, submit a notice to the Secretary of the Institute. The notice should include contact information from the gasket manufacturer and the member company that used the gasket.

The following information will typically be requested from the gasket manufacturer and/or member company for verification that the gasket was used successfully by the member company (see Appendix A for a suggested format):

- Name of member company where gasket was in service
- Gasket manufacturer and style/model number for dry service. For wet service a specific gasket description should be included
- Service conditions (temperature and pressure ranges, etc.) and Class if applicable
- Statement about gasket performance in the above service
- Quantity and duration of gaskets in service

3.4 USE OF GASKETS NOT INCLUDED IN TABLES

When considering the use of a gasket for chlorine service that is not included in the tables of this pamphlet the gasket should be thoroughly evaluated for compatibility with chlorine. Installing a gasket that is not compatible with chlorine could lead to a serious incident. Gaskets are typically added to this pamphlet only during the routine revision cycle (currently five years). Gaskets which have found user acceptance since the previous revision will not appear in the current edition. Contact the gasket manufacturer for detailed information.

Table 3.2 Gasket Materials That Have Found User Acceptance in Dry Chlorine Service

		Service Class						Comments
		I	II	III	IV	V	VI	Field test results can be obtained from the gasket manufacturer.
1	Asbestos, compressed (Fed. Spec. HH-P 46E)	A	A	A*	A	A	A*	May be restricted in some jurisdictions. Used successfully for service conditions down to -100°F (-73°C)
2	Chemical lead (2-4% antimony)	A	A	NI	A	A	X	Tongue & Groove Joints (confined on all four sides)
3	Spiral wound Monel/PTFE	A	NI	NI	A	NI	NI	
4	Virgin PTFE (unfilled & unexpanded)	A	A	NI	A	A	NI	Tongue & Groove Joints (confined on all four sides)
5	Lead	A	NI	NI	A	NI	X	Tongue & Groove Joints (confined on all four sides)
6	Garlock Gylon® 3510	A	A	A*	A	A	A*	Barium sulfate filled PTFE; “Off-White Color” *Tested for service conditions between 100°F (38°C) and -90°F (-68°C). Gasket Mfr.: Garlock Sealing Technologies, Inc.
7	Durlon® 9000	A	A*	NI	A	A*	NI	Silicate Filled PTFE; “Blue Color” Tested for service conditions between 250°F (121°C) and -40°F (-40°C). Gasket Mfr.: GRI/Triangle Fluid Controls Ltd

Table 3.2 Gasket Materials That Have Found User Acceptance in Dry Chlorine Service

		Service Class						Comments
		I	II	III	IV	V	VI	Field test results can be obtained from the gasket manufacturer.
8	Gore GR® Sheet Gasketing	A	NI	NI	A	NI	NI	Expanded PTFE tested for service conditions between 100°F (38°C) and 0°F (-18°C). Gasket Mfr.: W.L. Gore and Associates, Inc.
9	Inertex® SQ-S	A	A	NI	A	A	NI	Expanded PTFE. Tested for service conditions between 60°F (16°C) and -50°F (-46°C). Gasket Mfr.: Inertech, Inc./YMT.
10	Garlock Graphonic®	A	NI	NI	A	NI	NI	Graphite with Hastelloy C276 insert. Tested for service conditions between 300°F (149°C) and 0°F (-18°C). Gasket Mfr.: Garlock Sealing Technologies, Inc.
11	TEXOLON®	A	NI	NI	A	NI	NI	PTFE with 304 stainless steel insert. Tested for service conditions between 270°F (132°C) and 20°F (-7°C). Gasket Mfr.: Plastomer Products, Inc.
12	Flexitallic Sigma® 500	A	NI	NI	A	NI	NI	Glass-Filled PTFE; “Blue color”. Tested for service conditions between 45°F (7°C) and 20°F (-7°C). Gasket Mfr.: Flexitallic L.P.
13	Gore-Tex® TriGuard™	A	A*	NI	A	A*	NI	Expanded PTFE. Tested for service conditions between 40°F (4°C) and -45°F (-43°C). Gasket Mfr.: W.L. Gore and Associates, Inc. Gasket has been replaced by Gore Universal Pipe Gasket (Style 800).
14	Task-Line®	A	NI	NI	A	NI	NI	PTFE with 304 stainless steel insert. Tested for service conditions between 222°F (106°C) and 0°F (-18°C). Gasket Mfr.: PureFlex.

Table 3.2 Gasket Materials That Have Found User Acceptance in Dry Chlorine Service

		Service Class						Comments
		I	II	III	IV	V	VI	Field test results can be obtained from the gasket manufacturer.
15	Flexitallic Sigma 533	A	A	NI	A	A	NI	Barium sulfate filled PTFE; "Off-White color". Tested for service conditions between 20°F (-7°C) and 72°F (22°C). Gasket Mfr.: Flexitallic L.P.
16	Gore Universal Pipe Gasket (Style 800)	A	A	A*	A	A	A*	Tested for service conditions between -90°F (-68°C) and 284°F (140°C). Gasket Mfr.: W.L. Gore and Associates, Inc.
17	Teadit Tealon TF1590	A	A	NI	A	A	NI	Tested for service conditions between -50°F (-46°C) and 131°F (55°C). Gasket Mfr.: Teadit.
18	Teadit Tealon TF1580	A	A	A	A	A	A	Tested for service conditions between -99°F (-73°C) and 255°F (124°C). Gasket Mfr.: Teadit.
19	Garlock® Gylon® 3591	A	NI	NI	A	NI	NI	Barium sulfate/Glass sphere filled PTFE. Tested for service conditions between 30°F (-1°C) and 70°F (21°C)
20	Teadit TF 1510	A	NI	NI	A	NI	NI	Glass microsphere filled PTFE. Tested for service conditions between 15°F (-9°C) and 45°F (7°C) in liquid and 50°F (10°C) to ambient in dry gas.

A = Gaskets used or tested successfully within this service class
A* = See comments for additional restrictions or information
NI = No information exists for the use of the gasket in this service
X = Gasket not recommended in this service class

Table 3.3 Chlorine Cylinder and Ton Container Valve Connection Gaskets That Have Found User Acceptance in Chlorine Service

1	Asbestos, compressed, (Fed. Spec. HH-P 46E)	May be restricted in some jurisdictions
2	Lead with 0 - 4% antimony	
3	GORE-TEX® TriGuard™	Expanded PTFE. Gasket has been replaced by Gore Universal Pipe Gasket (Style 800)
4	Gore Universal Pipe Gasket (Style 800)	Expanded PTFE

Table 3.4 Gasket Materials That Have Found User Acceptance in Wet Chlorine Service (1)

1 **Expanded PTFE gasket** sheet made from 100% Virgin PTFE without fillers and without pigmentation. A lowered density product less than 1.2 s.g. than skived or filled PTFE sheet, has a multi-directional fibrillated structure that resists cold-flow and creep relaxation.

2 **Microcellular PTFE gasket** sheet made from 100% Virgin PTFE without fillers and without pigmentation. A lower density product than skived or filled PTFE Sheet made with a manufacturing process that creates resistance to cold-flow and creep relaxation.

3 **Filled PTFE gasket** sheet, reinforced with glass beads or barium sulfate fillers to reduce creep and cold-flow characteristics.

4 **Ethylene Propylene Diene Monomer (EPDM) high polymer content** (elastomer), peroxide cured, soft (approx. 62 Durometer) for use at lower pressured applications. (Generally used in wet chlorine service on thermoplastic or fiberglass reinforced plastic flanges as well as on flat faced metal flanges).

5 **Ethylene Propylene Diene Monomer (EPDM) gasket fully or partially encapsulated with PTFE for added chemical resistance**. Generally used in wet chlorine service on thermoplastic or fiberglass reinforced plastic flanges as well as on flat faced metal flanges.

6 **Fluoroelastomer**, soft (approximately 60 Durometer Suggest 60 - 75) gasket sheet for use at lower pressure applications (up to approximately 100 psig for $^1/_{16}$ inch and 75 psig for $^1/_8$ inch thick gaskets). Generally used in wet chlorine service on thermoplastic or fiberglass reinforced plastic flanges as well as on flat faced metal flanges.

7 **SBR (Styrene-butadiene rubber)** has seen reduced use over the years as due to improvements in other gasket elastomeric materials.

8 **Virgin PTFE**, (unfilled and unexpanded), a high resistance to wet and dry chlorine but is susceptible to cold flow and creep. Chlorine permeability through the gasket is relatively high. Filled, microcellular or expanded PTFE is generally a better gasket material choice.

(1) Grade 2 titanium can be attacked at stagnant flow areas around gaskets, especially at low pH conditions (<2.5). Porous materials, such as virgin PTFE can also cause titanium flange failures.

Table 3.5 Gasket Materials That Have Found User Acceptance With Chlorine Tank Cars

Gasket Manufacturer	Garlock	Gasket Resources Inc./Triangle Fluid Controls
Gasket Model Number	Garlock 3510	Durlon® 9000
Gasket Material	PTFE w/ barium sulfate filler	silicate glass filled w/ PTFE
Typical Operating Temperature Range	-40°F to 200°F	-40°F to 200°F
Maximum Recommended Temperature Range	-450°F to 500°F	-350°F to 520°F

4. REFERENCES

4.1 CHLORINE INSTITUTE PUBLICATIONS

The following publications are specifically referenced in CI Pamphlet 95. The latest editions of CI publications may be obtained at http://www.chlorineinstitute.org.

Pamphlet #	Title
6	*Piping Systems for Dry Chlorine*, ed. 16; Pamphlet 6; The Chlorine Institute: Arlington, VA, **2013**.
100	*Dry Chlorine: Behaviors of Moisture in Chlorine and Analytical Issues,* ed. 4, Pamphlet 100, The Chlorine Institute: Arlington, VA, **2011**.

4.2 MISCELLANEOUS

Gasket Installation Procedures, Booklet by the Fluid Sealing Association and the European Sealing Association: Wayne, PA, **2001**.

APPENDIX A – GASKET INCLUSION REQUEST FORM

Typical information to be submitted to the Secretary of the Institute for inclusion in Chlorine Institute Pamphlet 95:

- Member Company: _____
- Member Company Contact: _____
- Submittal Date: _____

Gasket

- Gasket Manufacturer: _____
- Gasket Manufacturer Contact: _____
- Gasket Model Number: _____
- Gasket Material (as descriptive as possible): _____
- Number of Gaskets Installed: _____
- Duration of Service (provide dates – minimum of 6 months): _____

Service Conditions (check one service only:)

____ Chlorine Cylinder
____ Ton Container
____ Wet chlorine gas
____ Chlorine Tank Car
____ Chlorine Cargo Tank
____ Dry chlorine (check one of following service classes only):
__ Gas above -20°F (CI Pamphlet 6, Class I)
__ Gas above -50°F (CI Pamphlet 6, Class I or II)
__ Gas above - 150°F (CI Pamphlet 6, Class I, II or III)
__ Gas or liquid above -20°F (CI Pamphlet 6, Class I or IV)
__ Gas or liquid above -50°F (CI Pamphlet 6, Class I, II, IV or V)
__ Gas or liquid above -150°F (CI Pamphlet 6, Class I, II, III, IV, V or VI)

Operating Conditions

Temperature Range*: Min _____ Max _____

Pressure Range*: Min _____ Max _____

*Only complete if Wet or Dry Chlorine Service

Describe the performance of the gasket (leaks, need to retorque, ease of installation, ease of removal, etc.)

APPENDIX B – PAMPHLET 95 CHECKLIST

This checklist is designed to emphasize major topics for someone who has already read and understood the pamphlet. Taking recommendations from this list without understanding related topics can lead to inappropriate conclusions.

Place a check mark (✓) in the appropriate box below:

Yes	No	N/A		
❒	❒	❒	1. Were the gasket manufacturer's recommended procedures followed when the gasket was installed?	{2}
❒	❒	❒	2. Are the personnel responsible for installing the gasket properly trained?	{2}
❒	❒	❒	3. Are the gaskets used in chlorine service listed in the gasket tables?	{3}
❒	❒	❒	4. For gaskets used in dry chlorine service, is information from the manufacturer and Table 3.1 being considered?	{3}
❒	❒	❒	5. Do gaskets being used in wet chlorine service meet the criteria found in Table 3.4?	{3}
❒	❒	❒	6. If you are using a gasket in commercial service and would like to add it to Table 3.1, have you submitted a notice to CI?	{3}

REMINDER:

Users of this checklist should document exceptions to the recommendations contained in this pamphlet.

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