INTERNATIONAL

Designation: F2836 − 18

Standard Practice for Gasket Constants for Bolted Joint Design[1]

This standard is issued under the fixed designation F2836; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice determines room temperature gasket tightness design constants for pressurized bolted flanged connections such as those designed in accordance with the ASME Boiler and Pressure Vessel Code.

1.2 This practice applies mainly to all types of circular gasket products and facings typically used in process or power plant pressure vessels, heat exchangers, and piping including solid metal, jacketed, spiral wound, and sheet-type gaskets. As an optional extension of this practice, the maximum assembly stress for those gaskets may also be determined by this procedure.

1.3 *Units*—The values stated in SI units are to be regarded as the standard, but other units may be included.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASME Standards:*[2]

ASME B16.5 Steel Pipe Flanges and Flanged Fittings

ASME B16.20 Metallic Gaskets for Pipe Flanges—Ring-Joint, Spiral-Wound, and Jacketed

ASME B16.21 Nonmetallic Flat Gaskets for Pipe Flanges

ASME Boiler and Pressure Vessel Code Section VIII Division 1, Appendix 2

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *ASME Class 150, n*—refers to the dimensions and pressure rating of Class 150 of standard flanges in ASME Standard B16.5.

3.1.2 *flange rotation, n*—rotation of the flange face surfaces so that the gasket outside diameter (OD) is compressed more than the gasket inside diameter (ID) when the bolts are tightened to compress the gasket.

3.1.3 *gasket constants, n*—if a log-log plot of gasket stress versus tightness (*Sg-Tp* graph) is made and an analysis of the data is performed in accord with this practice, then (see Fig. 1):

(1) The value, *Gb*, is the stress intercept (at $Tp = 1$) associated with a regression of the Part A tightness data.

(2) The value, *a*, is the slope associated with the Part A data and combined values of *Gb* and *a* describe the seating or loading characteristic of a gasket and give an indication of the gasket capacity to develop tightness upon initial seating.

(3) The value, *Gs*, is the stress intercept (at $Tp = 1$) associated with Part B tightness data and values of *Gs* represent the gasket potential to maintain tightness after pressurization and during operation and indicate the gasket's sensitivity to unloading excursions or susceptibility to crushing.

(4) The combined effect of constants *Gb* and *a* is best represented by the value of $S_{Tp} = Gb \times Tp^{a}$ calculated for typical values of *Tp* such as 100, 1000, or 10 000 where S_{Tp} tells us what the minimum gasket stress shall be to maintain a specified level of minimum tightness.

(5) The value, *Gs*, is an independent constant that represents operation and it characterizes the gasket tightness sensitivity to operating bolt load reductions that occur during pressurization or gasket creep or thermal disturbances.

3.1.4 *gasket contact area, Ag, n*—initial (nominal) area of the gasket that is considered to be loaded by the flange surfaces.

3.1.5 *gasket stress, Sg, n*—gasket stress is the ratio of the applied load by the fixture over the gasket contact area, *Ag*.

3.1.6 *gasket types, n*—for this practice, it is convenient to differentiate gasket styles as:

(1) Sheet gasket materials typically from 0.5 to 5 mm thick commonly in use and in which circular gasket samples are cut,

---

[1] This practice is under the jurisdiction of ASTM Committee F03 on Gaskets and is the direct responsibility of Subcommittee F03.20 on Mechanical Test Methods.

Current edition approved Aug. 1, 2018. Published November 2018. DOI: 10.1520/F2836-18.

[2] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

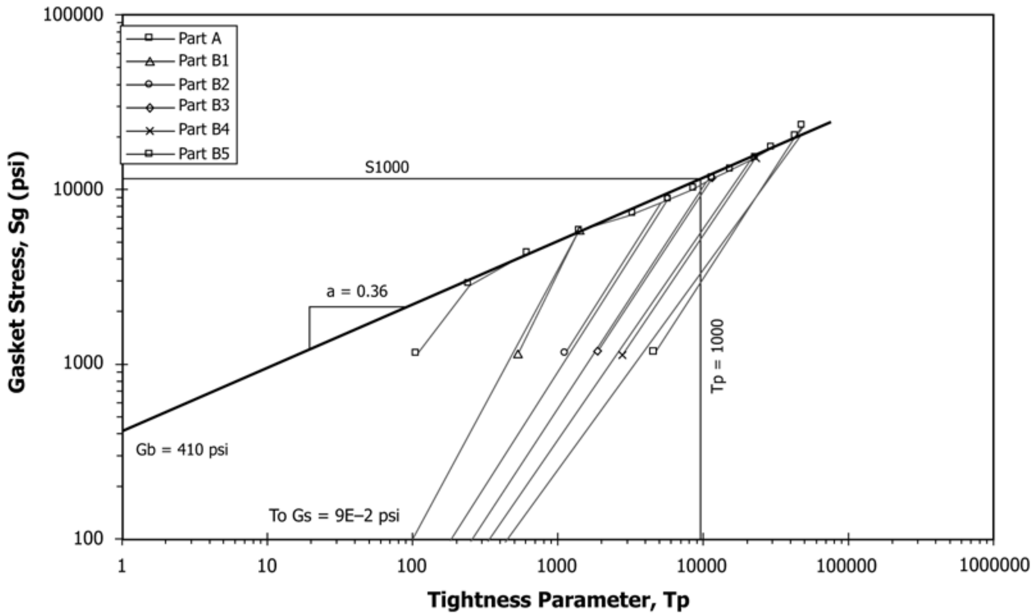

FIG. 1 Typical Representation of Gasket Constant *Gb*, *a*, and *Gs*

such as compressed or beater-added fiber-reinforced, flexible graphite and polytetrafluoroethylene (PTFE)-based sheet products;

(2) Preformed gaskets with a flat seal element that contacts the raised faced flange surfaces as intended by the manufacturer, such as solid flat metal gaskets with and without nubbin, spiral wound gaskets, flat metal jacketed with nonmetallic filler gasket, and so on;

(3) Preformed gaskets with one or several cambered seal elements in which the nominal contact area is not obvious such as solid metal oval rings, hollow metal rings, elastomer O-rings, corrugated gaskets, and so on; and

(4) Formed-in-place sealing products such as expanded PTFE rope and so on.

3.1.7 *known volumes, n*—volume of the internal high-pressure chamber or volume of the external low-pressure leak collection chamber used, respectively, in pressure decay or pressure rise methods to measure gasket specimen leaks.

3.1.8 *leakage rate, Lrm, n*—total rate of internal fluid leakage around or through the gasket expressed as milligrams per second, *Lrm*, reduced to standard conditions.

3.1.9 *maximum assembly stress, Sc, n*—maximum gasket stress found to achieve a minimum acceptable tightness when the gasket is unloaded to the minimum allowed stress level, S1, of the procedure (see Section 13).

3.1.10 *maximum and minimum tightness, Tpmax and Tpmin, n*—highest and lowest level of tightness, *Tp*, achieved, respectively, during Part A and Part B of the test procedure.

3.1.11 *nominal pipe size, NPS, "d,", n*—refers to the nominal pipe size in which "d" is the nominal size in inches, for example, NPS 12 refers to standard 305-mm pipe.

3.1.12 *pressure decay method, n*—this method measures, at regular intervals of time, the helium pressure decay of the internal high-pressure chamber of known volume upstream of the gasket.

3.1.13 *pressure rise method, n*—this method measures, at regular intervals of time, the pressure rise of an external low-pressure leak collection chamber of known volume built at the external periphery of the gasket.

3.1.14 *range of gasket behavior possibilities, n*—various gasket behaviors ranging from tightness softening to extreme tightness hardening are illustrated in Fig. 2(a-f).

3.1.15 *reference gasket diameter, n*—outside gasket diameter, 150 mm (~5.9 in.).

3.1.16 *reference mass leak, Lrm*, n*—defined as 1.0 mg/s (0.008 lbm/h) for a gasket of 150 mm outside diameter.

3.1.17 *tightness hardening, n*—refers to behavior in which large increases of gasket stress (*Sg*) cause small or no increase of tightness parameter (*Tp*).

3.1.17.1 *Discussion*—There is typically an increasing slope in log-log *Sg-Tp* plots resulting in a reverse "knee" in the Part A curve [see Fig. 2(d-e)].

3.1.18 *tightness parameter, Tp, n*—dimensionless sealability measure that is proportional to pressure and inversely proportional to the square root of leak rate.

3.1.18.1 *Discussion*—More precisely, *Tp* is the pressure relative to the atmospheric pressure required to cause a helium leak of 1 mg/s for a 150 mm OD gasket. Since this is about the same as the OD of an NPS 4 joint, the pressure to cause a leak of 1 mg/s of that joint is its tightness. (Tightness is a measure of the gasket's ability to control the leak rate of the joint for a

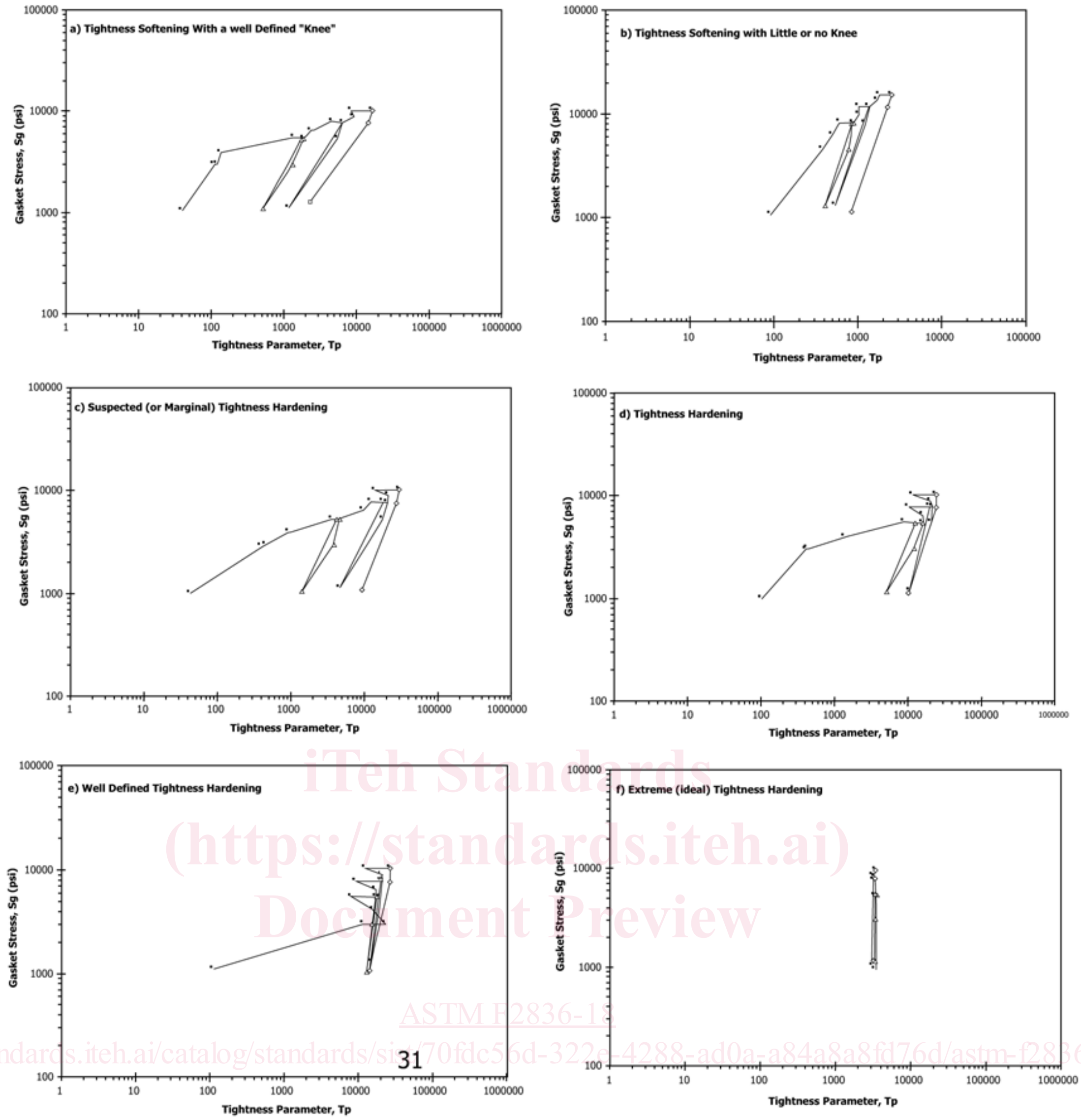

FIG. 2 Range and Definition of Typical Behaviors from Softening to Extreme Hardening

given load. With all other variables equal, a tighter gasket requires higher internal pressure to push the same rate of fluid through the joint. In other words, the tighter the seal, smaller the leak).

$$Tp = \frac{P}{P*}\left(\frac{Lrm*}{Lrm}\right)^{0.5} \quad (1)$$

where:

P	=	fluid pressure (MPa),
*P**	=	reference pressure (0.1013 MPa), (14.69 psi),
Lrm	=	mass leak rate (mg/s) of ROTT gasket specimens as defined per 8.1, and
*Lrm**	=	unit mass leak rate equal to1 mg/s for a 150 mm OD gasket in a joint.

3.1.18.2 *Discussion*—The *Tp* equation can be rewritten as follows:

$$Tp = \frac{P}{0.1013}\left(\frac{1}{Lrm}\right)^{0.5} \quad \text{(For } P \text{ in MPa)} \quad (2)$$

$$Tp = \frac{P}{14.69}\left(\frac{1}{Lrm}\right)^{0.5} \quad \text{(For } P \text{ in psi)} \quad (3)$$

3.1.19 *tightness softening, n*—refers to behavior in which small increases of gasket stress (*Sg*) cause large increases of tightness parameter (*Tp*).

3.1.19.1 *Discussion*—There is typically a decreasing slope in log-log *Sg*-*Tp* plots resulting in a "knee" in the Part A curve (see Fig. 2a).

3.2 *Acronyms:*

3.2.1 *AARH*—arithmetic average roughness height in meters (m)

3.2.2 *Ag*—nominal contact area of the gasket, mm^2

3.2.3 *Ai*—pressurized area, mm^2

3.2.4 *Dg*—gasket deflection, mm

3.2.5 *Extended LP*—extended low-pressure test sequence

3.2.6 *HP*—high-pressure test sequence. Part B of the testing sequence

3.2.7 *ID*—identification of gasket test specimen, mm

3.2.8 *LP*—low-pressure test sequence. Part A of the testing sequence

3.2.9 *Lrm*—mass leakage rate, mg/s

3.2.10 *Lr*min—minimum mass leakage rate of the system, mg/s

3.2.11 *Lrm**—unit mass leak defined as 1.0 mg/s for a 150 mm outside gasket diameter

3.2.12 *NPS*—nominal pipe size

3.2.13 *OD*—outside diameter of gasket test specimen, mm

3.2.14 *P*—internal fluid pressure, MPa

3.2.15 *P**—standard pressure, 0.1013 MPa

3.2.16 *ROTT*—room temperature tightness test procedure

3.2.17 R_{LM}—ratio of mass leak rates, *Lrm*1 and *Lrm*2, measured at the same step of the ROTT test procedure (see Tables 1 and 2) in two different ROTT tests performed on a gasket style

3.2.18 *S*—level of gasket stress defined in Table 3, MPa

3.2.19 *Sc*—the highest gasket stress of the optional extended LP tests preceding the stress level that resulted in *Tpc*, MPa

3.2.20 *Sg*—gasket stress calculated from the net applied load and the nominal area, *Ag*, MPa

3.2.21 *slpm*—standard litre per minute

3.2.22 *Ss*—gasket stress developed when contact is initiated with a compression limiting device, or stop, such as a groove containing the gasket, a gage ring, or a stress associated with a tightness limit such as *Tp*max

3.2.23 *T*—test fixture temperature in the vicinity of the tested gasket

3.2.24 *Tp*—tightness parameter (dimensionless)

TABLE 1 ROTT HP Test Sequence (with *P* = 6 MPa)

Test Step	Test Part	"S" Stress Level	Gasket Stress	Type of Measurement
			MPa	(1) Leakage (2) Mechanical
1	A	S1	8	(1+2)
2	A	S2	20	(1+2)
3	A	S3	30	(1+2)
4	A, B1	S4	40	(1+2)
5	B1	S1	8	(1+2)
6	A, B1	S5	50	(1+2)
7	A, B2	S6	60	(1+2)
8	B2	S2	20	(2)
9	B2	S1	8	(1+2)
10	A, B2	S7	70	(1+2)
11	A, B3	S8	80	(1+2)
12	B3	S3	30	(2)
13	B3	S1	8	(1+2)
14	A, B3	S9	90	(1+2)
15	A, B4	S10	105	(1+2)
16	B4	S4	40	(2)
17	B4	S1	8	(1+2)
18	A, B4	S11	120	(1+2)
19	A	S12	140	(1+2)
20	A, B5	S13	160	(1+2)
21	B5	S5	50	(2)
22	B5	S1	8	(1+2)

TABLE 2 ROTT LP and Extended LP Test Sequences (with *P* = 2 MPa)

Test Step	Test Part	"S" Stress Level	Gasket Stress	Type of Measurement
			MPa	(1) Leakage (2) Mechanical Only
LP Test Sequence				
1	A	S1	8	(1+2)
1a	A	S2	20	(1+2)
2	A	S3	30	(1+2)
3	A	S5	50	(1+2)
4	A	S7	70	(1+2)
5	A	S10	105	(1+2)
6	A	S12	140	(1+2)
Extended LP Test Sequence				
7	A	S14	170	(1+2)
8	B	S1	8	(1+2)
9	A	S15	190	(1+2)
10	B	S1	8	(1+2)
11	A	S16	210	(1+2)
12	B	S1	8	(1+2)
13	A	S17	230	(1+2)
14	B	S1	8	(1+2)
15	A	S18	250	(1+2)
16	B	S1	8	(1+2)
17	A	S19	270	(1+2)
18	B	S1	8	(1+2)

TABLE 3 Nominal Values for Gasket Stress Levels

NOTE 1—Multiply the gasket stress values by *Ag* to obtain the total load required for a particular gasket.

NOTE 2—The nominal "S" load stresses correspond to a low to high range of typical pipe fitter imposed bolting stresses. For example, S1 is typical of the low gasket stresses resulting from (69 MPa) bolt stresses on a NPS 12 ASME/ANSI cl 68 kg joint and S10 is typical of high (414 MPa) bolt stresses on a NPS 12 ASME/ANSI cl 272 kg joint.

(1) S Load Value	Gasket Stress
	MPa
S1	8
S2	20
S3	30
S4	40
S5	50
S6	60
S7	70
S8	80
S9	90
S10	105
S11	120
S12	140
S13	160

3.2.25 *Tp*max—average of highest two levels of tightness obtained from each test

3.2.26 *Tp*min—lowest tightness value achieved during Part B of all HP tests

3.2.27 *Tpc*—first tightness value of the optional extended LP tests less than *Tp*min

4. Summary of Practice

4.1 This test procedure consists of two parts (see Fig. 1):

4.1.1 *Part A*—At the fluid test pressure, obtain gasket leak rate and deflection measurements for several levels of gasket stress, each stress level being higher than any previously applied stress. Part A may be interrupted to perform Part B sequences (see 4.1.2). Part A provides information on initial loading known as gasket seating and yields the constants *Gb* and *a* (see 3.1.3).

4.1.2 *Part B*—Obtain gasket leak rate and deflection measurements under fluid pressure for five unload-reload stress cycles. Part B is performed by interrupting Part A at five specific stress levels as shown in Fig. 1. Part B provides information on the operating gasket performance including its sensitivity to load reductions after initial loading. Part B yields the constant *Gs* (see 3.1.3*(5)*).

5. Significance and Use

5.1 This practice determines the room temperature gasket constants *Gb* and *a* for initial seating and *Gs* for operating conditions as related to the tightness behavior of pressurized bolted flanged connections. These constants are used in determining the design bolt load for gasketed bolted joints.

5.2 This practice is suitable for all the types of gaskets and facings as are considered by the ASME Division 1 Code. This includes ASME B16.5 raised facings, nubbin-type facings, O-ring grooves, and a wide variety of gaskets including spiral wound, flat sheet, solid metal, jacketed, and other types of gaskets common to process and power industry pressurized equipment.

5.3 These constants are intended for direct use in determining ASME Code design calculations for bolted flanged joints. An appendix of the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 will refer to the gasket constants *Gb*, *a*, and *Gs* produced by this practice. The user and bolted joint designer are cautioned that gasket constants *Gb*, *a*, and *Gs* and any gasket design stresses calculated from these may not be conservative for design stresses below S1 or beyond S13 as indicated in Table 3.

5.4 When required, this practice evaluates both the mechanical and leakage resistance of gaskets to excessive compression to determine their maximum assembly stress, *Sc*.

5.5 This test procedure is a gasket tightness characterization test and is not considered as a gasket manufacturing quality control test.

6. Test Parameters

6.1 *Test Media*—The test media is helium of high-purity type (99.995 %).

6.2 *Test Loads*—Test loads correspond to the standard "S" gasket stress levels defined in Table 3 and shall be applied in the sequence described in Tables 1 and 2. Any deviation from the prescribed sequence is not acceptable. At each stress level, gasket stress shall be maintained as per 7.1.3.

6.3 *Test Sequences*—The determination of gasket constants *Gb*, *a*, and *Gs* and optional maximum assembly stress, *Sc*, requires the use of HP and LP test sequences.

6.3.1 *HP Test Sequence*—This sequence is a combination of Parts A and B data points (see 4.1) and is performed under a 6 MPa helium pressure. See Table 1.

6.3.2 *LP Test Sequence*—This test includes some Part A data points only (see 4.1.1) and is performed under a 2 MPa helium pressure. See Table 2.

6.3.3 *Extended LP Test Sequence*—When needed, the determination of the maximum assembly stress, *Sc*, requires an extension of stress levels of the LP test sequence of 6.3.2. See Table 2.

6.4 *Test Pressure Regulation*—The LP test pressure of 2 MPa shall be regulated to within ±20 kPa. The HP test pressure of 6 MPa shall be regulated to within ±60 kPa.

6.5 *Test Temperature*—Test temperature shall be within 18 to 30°C (64.4 to 86°F) and shall not vary more than 0.550°C/h (1°F) during a test.

7. Apparatus

7.1 *Load Fixture Requirements:*

7.1.1 *Requirements for Acceptable Fixtures:*[3]

7.1.1.1 NPS 4, ASME/ANSI Class 1500, or 900 weld neck flange pairs loaded by hydraulic bolt tensioners.

7.1.1.2 A pair of rigid platens loaded hydraulically within a larger fixture that is suitable for the hydraulic pressure or loaded externally by a servo hydraulic test machine of adequate capacity.

7.1.1.3 The minimum load capacity of the fixture shall be 1.56 MN to perform tests on any gasket defined in 8.1. A 1.8 MN fixture is necessary to perform the optional maximum assembly stress load sequence on sheet gaskets as defined in 8.1.1. A capacity of 2.6 MN is necessary to perform the optional maximum assembly stress load sequence on NPS 4 size gaskets (8.1.2).

7.1.1.4 The fixture shall be rigid enough to limit flange or platen rotation to 0.01°/100 kN. Class 900 NPS 4 flanges in accord with ASME B16.5 are considered sufficiently rigid for all types of gaskets as defined in 3.1.6.

7.1.2 *Flanges or Load Platens:*

7.1.2.1 Flanges or load platens shall be steel having an elastic modulus between 180 to 210 GPa.

7.1.2.2 Load platens shall be machined with a raised face in accord with NPS 4, ASME Class 1500, or 900 weld neck flanges. The ID of the raised face shall be that of the standard flange and its height shall be 6.3 mm (0.25 in.).

7.1.2.3 The surface finish of each flange or platen shall be machined with a phonographic-type spiral cut to result in a roughness value fixed at 6.3 ± 1.25 mm (a 1.5 mm radius tool shall be used). The roughness shall be measured along three radial lines in the gasket contact region separated by 120°. Report the average value in mm.

7.1.3 *Gasket Stress Control:*

7.1.3.1 The gasket stress shall be controlled within the highest of ±0.4 MPa or 1 % of the targeted gasket stress.

7.1.3.2 Load reaction caused by an internal pressure acting over the pressurized area (*Ai*) contained by the gasket shall be compensated by additional load so that the intended gasket stress remains constant as the internal pressure is varied.

[3] See Welding Research Council Bulletin #491 for details of fixtures that have been used previously.

Arrangements whereby this compensation is assisted by eliminating a part of the pressure reaction by substantially reducing the pressurized area (*Ai*) are acceptable.

7.1.3.3 If the fixture depends on O-rings or other seals that react to the applied load, the load reaction of the O-ring assembly shall be compensated so that the targeted gasket stress is achieved within the tolerance of 7.1.3.1.

7.2 *Instrumentation:*

7.2.1 *Pressurization System*—The pressure regulation system shall provide a minimum He flow of 6 mg/s at the target pressure.

7.2.2 *Internal Pressure Measurement Transducer*—A pressure transducer rated 0 to 6.9 MPa maximum can be used. Transducer resolution is to be 0.35 KPa with an accuracy of ±0.5 % full scale. This transducer is also used for leak measurements performed with the pressure decay method (see 7.2.3).

7.2.3 *Leakage Measurement Equipment*—Typically, for gasketing products, the leak rates varying from 10-8 to 6 mg/s may need to be measured. The leakage measurement method may vary depending on the expected leakage level to be measured for a tested gasket specimen. For this selection, the following equipment is recommended:

7.2.3.1 *Mass flowmeter*—Range 0 to 6 mg/s with a resolution of 0.01 mg/s and an accuracy of 1 % full scale.

7.2.3.2 *Pressure transducer for the pressure decay method*—Same as in 7.2.2.

7.2.3.3 *Pressure transducer for the pressure rise method*—Sealed or absolute pressure gage rated 101.4 to 140 KPa with a resolution of 0.0069 KPa and an accuracy of ±0.25 % full scale.

7.2.3.4 *Helium mass spectrometer*—Typical range from 10^{-8} to 10^{-1} mg/s of helium.

7.2.4 *Gasket Deflection Measurement*—Gasket deflection (Dg) shall be measured throughout the test at a minimum of two diametrical locations. Deflection measuring devices shall have a resolution of 0.001 mm or less with a minimum accuracy of 1 % over a minimum range of 6.35 mm.

7.2.5 *Fixture Temperature Measurement*—A temperature probe shall be located in the fixture in the vicinity of the tested gasket. The probe resolution shall be 0.01°C with an accuracy of ± 1°C, respectively.

7.2.6 *Test Parameter Control and Recording*—The following parameters are recorded or regulated or both during a test:

7.2.6.1 *Gasket compressive load (or stress)*—Recorded and regulated.

7.2.6.2 *Gasket deflection (change of thickness)*—Recorded.

7.2.6.3 *Gasket fluid pressure*—Recorded and regulated.

7.2.6.4 *Fixture temperature*—Recorded.

7.2.6.5 *Gasket leak rates or leak pressures or both to be converted into leak rates*—Recorded.

7.2.6.6 Because of the number of test parameters to be measured or controlled or both simultaneously for several hours or days, the use of a data acquisition system (DAC) controlled by a computer is highly recommended to perform the tests operations.

7.3 *Test Fixture Verification*—Test fixture shall be inspected and verified free of plumbing leaks. The inlet HP line shall be bubble free by a leak bubble test. When a mass spectrometer is used, leakage shall not exceed the equipment manufacturer's criteria for leak testing.

8. Specimens

8.1 *Test Specimen Sampling, Dimensions, and Gasket Area Definition*—It is recommended, but not required, that specimens be taken from the same batch of manufactured gaskets or cut from the same sheet as a means to ensure the greatest consistency of results. Although only four samples are needed, six samples minimum and preferably twelve shall be reserved in case repeat tests are required per Section 10. To the extent that the same batch sampling does not reflect marketplace variations, it is acceptable, if specified, to require sampling of specimens from different batches.

8.1.1 *Sheet Materials*—Gasket test specimens of sheet material shall be precut to 123.8 + 0.5 mm ID (4.87 ± 0.020 in.) and 149.2 ± 0.5 mm (5.87 ± 0.20 in.) OD. If other sizes are used, the dimensions shall be included in the report and it shall be understood that results may be different. Edges shall be clean and free of burns. These gaskets have a nominal area of $Ag = 5450\ mm^2$ (8.45 $in.^2$).

8.1.2 *Preformed Gasket with a Flat Seal Element (Such as Spiral Wound)*—Gasket specimens shall be sized NPS 4 having an OD no larger than is suitable for the fixture. The nominal contact area, *Ag*, shall be based on the initial contact area of the seal element with the flange or platen-raised faces.

8.1.3 *Preformed Gasket with One or Several Cambered Seal Elements*—(This type includes elastomeric or hollow metal ring seal elements situated in a groove or within or between metal gage rings.) Gasket specimens shall be sized NPS 4 having an OD no larger than is suitable for the fixture. The nominal contact area, *Ag*, shall be based on the average circumference of the seal elements multiplied by its initial width. The initial width is the width contacting or projected on to the flange or platen-raised face surfaces.

8.1.4 *Formed-in-Place Products (Such as PTFE Rope)*—Circular gasket specimens shall be formed in place on the flange or platen-raised face on the basis of the size of an NPS 4 preformed gasket. The nominal contact area, *Ag*, shall be based on the average circumference of the seal elements times its full projected initial width on the flange or platen-raised faces.

8.1.5 *Flat Solid Metal Gaskets and Jacketed Gaskets for Heat Exchanger Service*—Flat solid metal gaskets whether profiled or not, and whether fitted with soft envelope or not (such as Kammprofile), and metal jacketed gaskets, whether fitted with soft envelope or not, shall also have the dimensions of 8.1.1.

8.1.6 *Solid Metal Ring Gaskets (such as RTJ Oval or Hexagonal or API BX or RX)*—Gasket specimens shall be sized NPS 4 having an OD no larger than is suitable for the fixture. The nominal contact area, *Ag*, shall be based on the projected contact area of the chamfered hexagonal ring seating surface as defined in ASME B16.20 or the projected contact area of the chamfered seating surface as defined by the corresponding API standard for BX and RX.