

SECTION III

Gasket Installation

A FLEXITALLIC gasket will provide a reliable seal when properly installed in the application for which it was designed. Please remember that the performance of a bolted joint is not solely dependent on the gasket itself, but on a combination of variables, many of which are outside the control of the gasket manufacturer. Experience has shown that leakage is not necessarily a sole indication of a faulty gasket, but is more likely to be the result of improper installation, assembly or bolting practices, damaged flanges, or a combination of the myriad of variables associated in a bolted gasketed assembly. When installing the gasket the following are to be considered:

Gasket Quality

Obviously gasket quality is important. Always deal with reputable suppliers and/or manufacturers who are capable of high quality products and sound technical support.

NEVER INSTALL A PREVIOUSLY USED GASKET!

Flange Surfaces

The condition of flange surfaces, as well as the proper flange material selection play an important part in achieving a leak-free joint assembly. Assure that the following are within acceptable limits:

- Surface finish
- Flatness
- Parallelism
- Waviness
- Surface imperfections

For optimum gasket performance Flexitallic recommends that the flange surface finishes listed in the table on page 46 be used for the respective gasket selected. To assure proper and even compression of the gasket we recommend that parallelism be within 0.2 mm (0.008”), flatness and waviness are kept at better than 0.2 mm (0.008”). We suggest that the allowable imperfections do not exceed the depth of the surface finish grooves, and that any radial marks are no deeper than the depth of the flange surface finish and less than 50% in length of the overall gasket sealing surface width.

Fasteners

It is important that the proper studs/bolts and nuts are selected to assure joint integrity. Improper selection of these may compromise the entire joint assembly. The following list is to be considered when selecting fasteners:

- Type
- Grade
- Class
- Proper material
- Appropriate coating or plating
- Correct stud/bolt length

See the table on page 54 for temperature rating of stud/bolt grades.

Assembly

In an effort to achieve a high degree of success in attaining a leak-free joint several steps are required. It is imperative that a regimented bolt up procedure is applied. As a minimum the following is suggested:

- Install a new gasket on the gasket seating surface and bring the mating flange in contact with the gasket.
- Do not apply any compounds on the gasket or gasket seating surfaces.
- Install all bolts, making sure that they are free of any foreign matter, and well lubricated. Lubricate nut bearing surfaces as well. (Lubrication will not be required for PTFE coated fasteners.)
- Run-up all nuts finger tight.
- Develop the required bolt stress or torque incrementally in a minimum of four steps in a crisscross pattern. The initial pre-stress should be no more than 30% of the final required bolt stress. After following this sequence, a final tightening should be performed bolt-to-bolt to ensure that all bolts have been evenly stressed.

Note: The use of hardened washers will enhance the joint assembly by reducing the friction due to possible galling of the nut bearing surfaces.

Gasket Installation

For critical applications a more sophisticated method for bolt up may be considered such as heating rods, bolt tensioners, or ultrasonic extensometer.

Bolting Up Sequence

Stage 1 - Torque bolts up to approximately 30% of the final torque value following the diametrically opposed sequence specified on pages 47 and 48.

Stage 2 - Repeat Stage 1, increasing the torque value to approximately 60% of the final torque value.

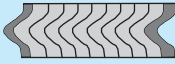
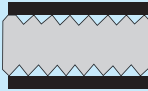
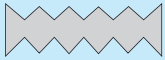

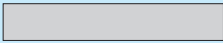
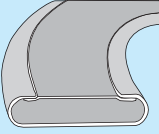

Stage 3 - Repeat Stage 2, increasing the torque value to the final required torque value.

Stage 4 - A final tightening should be performed following an adjacent bolt-to-bolt sequence to ensure that all bolts have been evenly stressed.

Note: See page 47 - 48 for bolt torque sequence.

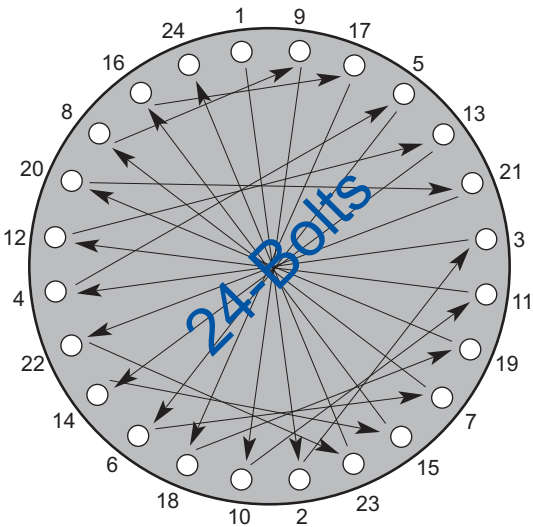
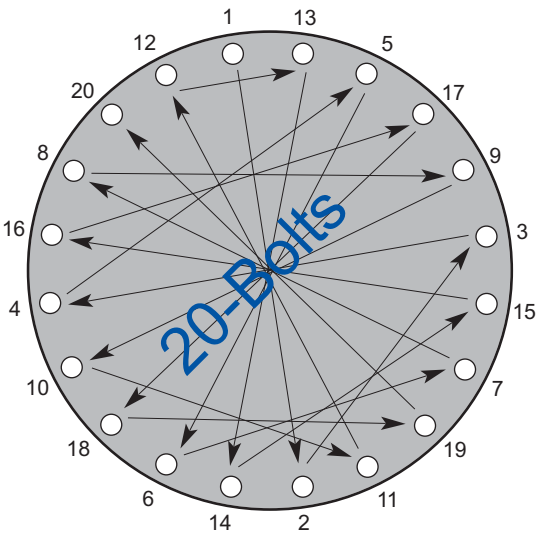
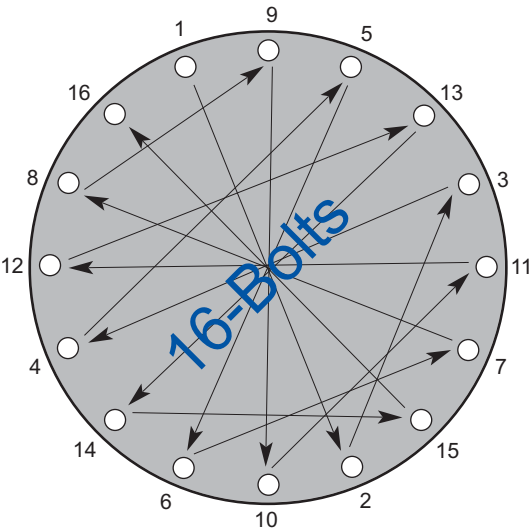
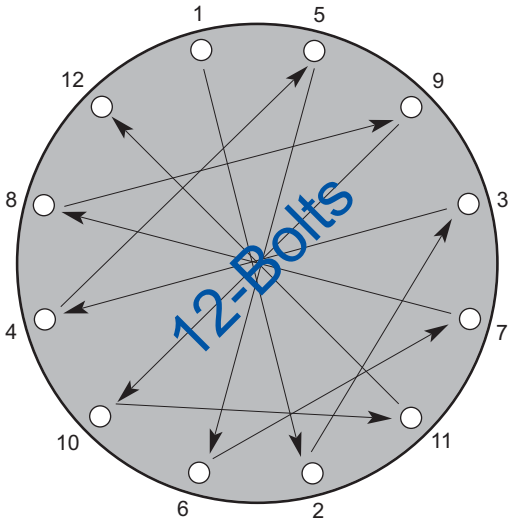
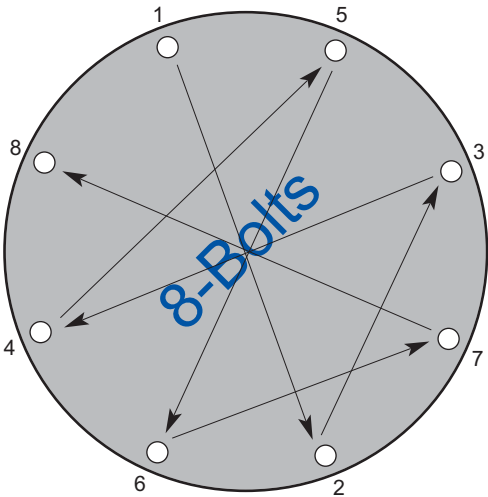
For additional information refer to ASME PCC1 2000.

Surface Finish Requirements

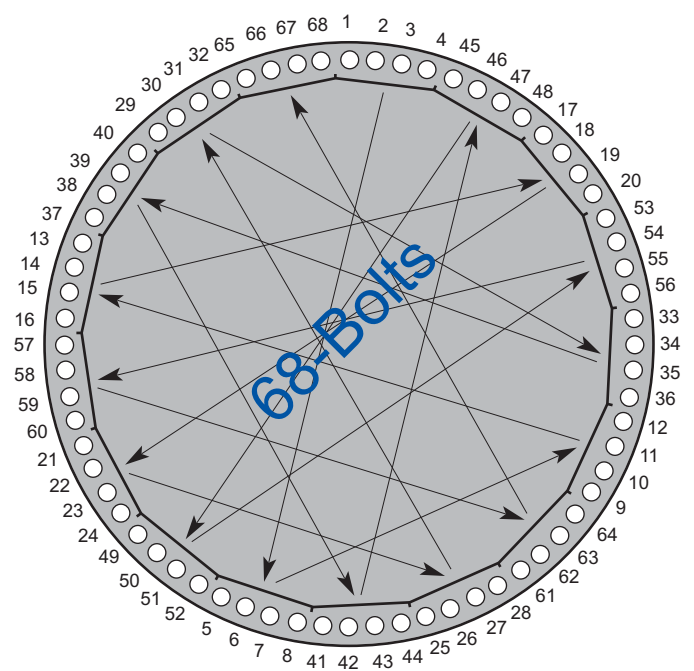
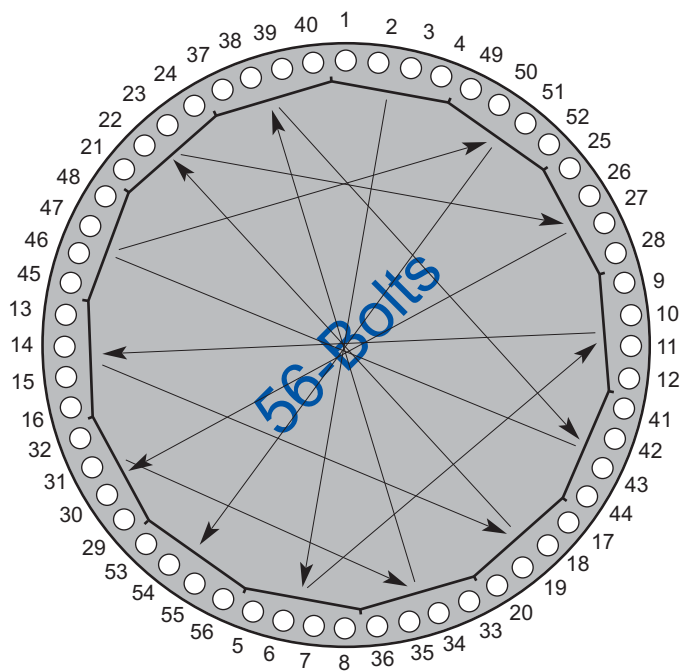
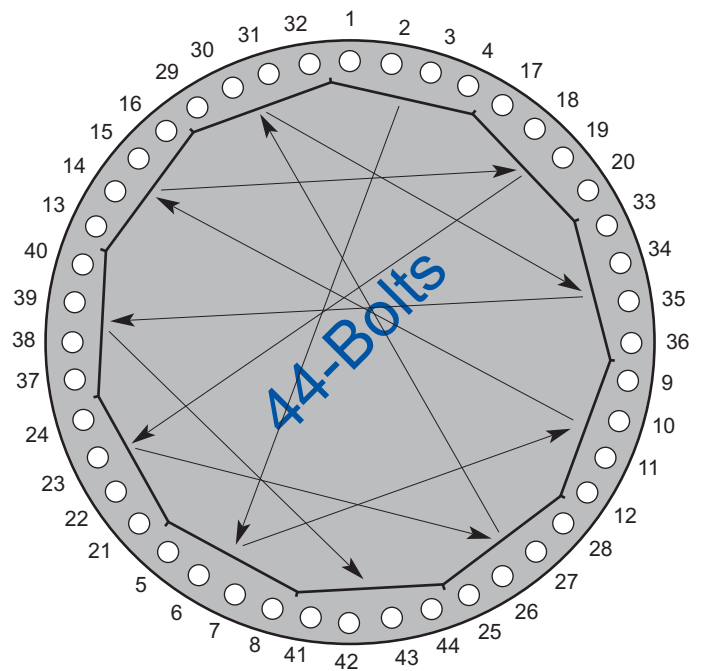
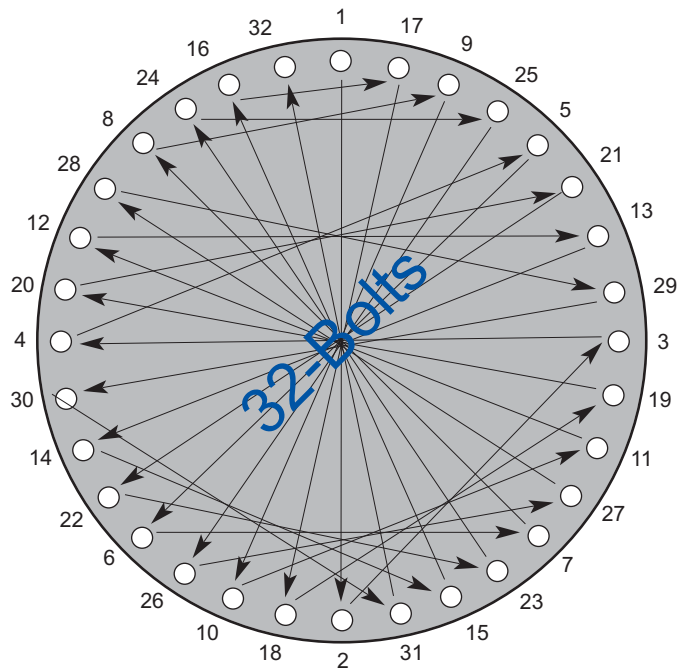
Gasket Description	Gasket Cross Section	Flange Surface Finish Microinch Ra	Flange Surface Finish Micrometer Ra
Spiral Wound Gaskets		125 - 250	3.2 - 6.3
Flexpro Gaskets		125 - 250	3.2 - 6.3
Metallic Serrated Gaskets		63 MAX	1.6 MAX
MRG		125 - 250	3.2 - 6.3
Solid Metal Gaskets		63 MAX	1.6 MAX
Metal Jacketed Gaskets		100 - 125	2.5 MAX
Soft Cut Sheet Gaskets		Mat'l < 1.5mm Thick 125 - 250	Mat'l < 1.5mm Thick 3.2 - 6.3
		Mat'l ≥ 1.5mm Thick 125 - 500	Mat'l ≥ 1.5mm Thick 3.2 - 12.5

Important - Under no circumstances should flange sealing surfaces be machined in a manner that tool marks would extend radially across the sealing surface. Such tool marks are practically impossible to seal regardless of the type of gasket used.

Bolt Torque Sequence



Bolt Torque Sequence



Troubleshooting

Good Preparation Ensures Good Performance

- Handle with care
- Keep in package
- Protect from damage and the weather
- Stack; don't hang
- Check flange surfaces for correct finish, blemishes, flatness, etc.
- Verify that proper stud material is being used
- Check condition of studs and nuts
- If washers are used they must be hardened
- Lubricate threads and bearing surface of nuts
- Don't apply any compounds or pastes on the gasket
- Use the correct, new gasket
- Don't secure the gasket to the flange with duct tape
- Use a cross bolting pattern in incremental steps; then go bolt-to-bolt
- Apply sufficient load



Troubleshooting

Joint Leakage

Often as not, when joint leakage occurs, a simple examination of the used gasket can determine the cause of failure. Firstly, always ensure that the spent gasket is correct to specification.

The Used Gasket . . . Telltale Signals of Trouble for Spiral Wound Gaskets

Gasket Features	Observation	Possible Cause	Possible Remedy
Metal Windings	Asymmetrical compression and/or flattening of the lands of the chevron	Smooth and/or Dissimilar surface finish	Apply recommended surface finish 125/250 Ra. Use inner and outer rings. Place gasket in a groove
	Corrosion	Improper metal selection	Select metal compatible for the media
	Severe discoloration, cracking	Improper metal selection Exceeding temperature limit	Select proper metal
	Impingement or mechanical damage	Gasket wrongly sized Improper installation	Redesign gasket or use alternative gasket Improve installation and/or procedure
Filler	Extreme discoloration Corrosion	Filler material incompatible with media or process	Select filler material compatible with media/ process and temperature
	Oxidation	Exceed temperature limit Incompatible with media	
Thickness	Uneven compression	Flange waviness Flange out of parallel Flange rotation Improper installation and/or procedures	Machine flanges to recommended flatness and parallelism. Reduce bolt stress and/or compensate for rotational effects. Improve installation procedures
	Over-compression	Improper gasket selection Improper joint geometry	Use inner and/or outer rings Redesign joint geometry
	Insufficient compression	Improper installation Improper gasket stiffness insufficient bolt load Improper joint geometry	Improve installation Use proper constructed gasket Improve joint geometry
Gasket face surfaces	Leak path scoring	Foreign matter	Proper clean up of flanges and/or gaskets
	Transfer or imprint of flange surface finish	Improper surface finish	Assess finish and re-machine flanges to proper finish
	Micro imperfections, dings, scratches, interrupted surfaces	Foreign matter, tool marks on flanges, hardware, i.e. set screws to other implements	Re-machine and/or repair flanges. Remove any obstruction or interrupted surfaces
	Topical residue, smearing	Use of adhesives, grease compounds or tape as a means of gasket positioning or perceived performance enhancement	<u>Do Not</u> use any compounds, paste, grease or tape or any foreign substances. Note: Use of a light spray of adhesive is permissible for holding the gasket in place if needed
Mechanical Damage	Buckling of the sealing element	Omitting the use of an inner ring. Smooth flange surface finish. Bolt up inconsistencies. Extreme temperatures. Over-compression	Use inner rings. Assess surface finish. Reduce bolt loads to acceptable stresses. Use alternative gasket, i.e. Flexpro
	Excessive dishing, cupping indentations and yielding of outer ring	Excessive bolt load. Outer guide ring engaging bolts	Reduce bolt load to acceptable stresses. Concentric gasket installation