



# Grid Coupling 1020-1220 Horizontal and Vertical Cover Installation Guide

## 1.0 INTRODUCTION:

The following document is intended for the explicit use of Lovejoy customers to aid in the installation of Lovejoy power transmission products. The information may be considered privileged and should only be disseminated as an active part of conducting business with Lovejoy, Inc.

Although the coupling may have been properly specified during the design and selection process before the coupling was ordered, operational conditions could possibly have changed prior to installation. Lovejoy, Inc. provides the information and technical support necessary to ensure the appropriate coupling selection was made relative to the product specifications and limitations of Lovejoy's power transmission products. The end user is ultimately responsible for verifying the suitability of the final coupling selection based on the actual service conditions at the time the coupling is installed.

Correct installation and alignment practices will ensure longer coupling life, trouble free operation, and a safer operating environment for the coupling. Please thoroughly review all of the instructions in this document prior to installing this coupling and placing it in operation. Proper safety guidelines and practices should always be followed during every phase of the installation.

This installation document is considered part of the purchased product and should be retained for future reference.

## 2.0 SAFETY:

Accidents involving rotating equipment may result in loss of life, serious bodily harm, or property damage. The purchaser of this equipment must assure that the equipment is properly assembled, installed, safeguarded, operated, and maintained. This equipment should never be operated at, or subjected to, conditions that exceed manufacturer's specifications.

Consult all applicable Federal, State and local laws and regulations covering the safe operation and maintenance of equipment, including, without limitation, the USDOL-OSHA "Lockout / Tag-out" procedure set forth in 29 CFR 1910.147.

Because of the possible danger to persons or property from accidents which may result from the improper use or unapproved modifications of the product, this product must be installed, maintained and operated in accordance with the procedures, standards, and engineering specifications specified in the product literature. To assure safe operation, this product should be inspected in accordance with the instructions described in this document. Proper guards and any suitable safety equipment or procedures as may be necessary, or as may be specified in safety codes, should be installed by the user. Safety equipment, coupling guards, and shields are not provided by, nor are they the responsibility of Lovejoy, Inc.

Symbols and text format used in this document may contain safety information and will appear similar to the following:



**Warning!** This symbol indicates safety measures which must be observed to avoid personal injury.

**Caution!** This symbol indicates safety measures which must be observed to avoid damage to coupling.



Horizontal Split Cover

Vertical Split Cover

## 3.0 PRODUCT INSPECTION:

Prior to installation, the coupling should be examined for signs of damage that may have occurred as a result of shipping or handling. Refer to the following chart (Table-1) to ensure all the ordered parts were included with the shipment.

**Note: Standard Grid Couplings are shipped unassembled.**

**Table 1 - Components**

Size	Hubs	Grid Spring	Two Piece Split Cover	Gasket and Seal Kit <sup>1</sup>	Cover Screws & Nuts	
		Number of Segments			Horizontal	Vertical
1020	2	1	1	1	4	4
1030	2	1	1	1	4	6
1040	2	1	1	1	4	6
1050	2	1	1	1	4	6
1060	2	1	1	1	4	6
1070	2	2	1	1	4	6
1080	2	2	1	1	4	8
1090	2	2	1	1	4	8
1100	2	2	1	1	4	8
1110	2	2	1	1	4	8
1120	2	2	1	1	4	8
1130	2	2	1	1	4	8
1140	2	2	1	1	4	12
1150	2	3	1	1	6	n/a
1160	2	3	1	1	6	n/a
1170	2	4	1	1	6	n/a
1180	2	4	1	1	6	n/a
1190	2	4	1	1	6	n/a
1200	2	4	1	1	6	n/a

**Note:** 1. Gasket and seal kit consists of 2- seals and the appropriate gasket(s)  
Couplings sizes 1020 through 1090 are supplied with coupling grease.

For maximum protection, the coupling and all components should be stored in the original packaging. All parts should be measured prior to installation to ensure correctness of parts to meet the application requirements; such as the hub bore diameter, shaft diameter, shaft separation, bolt lengths, key sizes, etc.



**Warning!**

Before performing the coupling installation, make sure the machinery is made safe. Disconnect and lock out all power to the equipment. No part of the installation should be performed on moving, non secure, or unstable equipment.

**Caution!**

Lovejoy manufactured the coupling interface based on the equipment and shaft data supplied by the purchaser. Lovejoy is not responsible for inaccurate or incomplete information supplied by the purchaser.

It is the purchasers' responsibility to assure that the interface connections between the coupling and the connected equipment are capable of handling the anticipated loads.

**4.0 REQUIRED TOOLS:**

- Vernier Calipers
- Calibrated Torque Wrench
- Sockets and appropriate open end wrenches
- Allen wrenches, sockets, or other required wrenches
- Flat blade screwdriver
- Alignment Equipment
- Appropriate hoist or lifting equipment
- Rubber or soft head mallet

**5.0 COUPLING AND COMPONENT PREPARATION:**

**5.1 All exposed surfaces of the coupling and components,** including hubs, grid springs or grid spring segments, grid covers, seals, spacers, LEF kits, and any other Lovejoy supplied subassemblies should be thoroughly cleaned prior to installation to remove any protective coatings normally applied by Lovejoy at the factory. These coatings are applied as corrosion protection for the coupling surfaces during shipping. All coupling parts, equipment components, shafts, and keyways must be clean and free of any foreign materials prior to attempting assembly or installation. A clean cloth dampened with a nonflammable solvent should be sufficient for this cleaning.

**5.2 All sleeves, seals, hub bores, shafts, keys, and keyways** must be checked for raised metal, nicks, burrs, dents, gouges, etc., and should be dressed or repaired accordingly prior to installation.

**5.2.1 Prior to removing any existing coupling,** establish and record the Distance Between Shaft Ends (BSE) between the driver and driven. Compare this value with the 'G', or Gap dimension for the Lovejoy Grid Coupling in Table-4 to verify the fit of this coupling.

**5.2.2 Once all necessary measurements have been taken** and all components are confirmed to be correct, remove any existing coupling and dress the shafts of the driver and driven equipment.

**5.2.3 If the final BSE is the same as the specified Gap** for the Lovejoy Grid coupling, then the hubs can be mounted flush with the ends of the driver and driven shafts.

**5.2.4 If the final BSE is different than the specified Gap** of the Lovejoy Grid coupling, then the hubs must be mounted on the driver and driven shafts so that the distance between the hub faces match the 'G', or Gap dimension specified in Table-4.

**Note: Hubs must be mounted on the driver and driven shafts with the grid teeth (ends with serrations) facing each other.**

**5.3 Lovejoy machines bores in all Lovejoy Grid style hubs** with 'inch' dimensioned straight bores and keyways to meet the industry accepted **ANSI/AGMA 9002-B04** Standards' tolerance for clearance or interference fit bores unless otherwise specified. Tapered and spline bores may require special manufacturing and installation consideration.

**5.4 Lovejoy machines bores in all Lovejoy Grid style hubs** with 'metric' dimensioned straight bores and keyways to meet the industry accepted **ANSI/AGMA 9112-A04** Standards' tolerance for clearance or interference fit bores unless otherwise specified. Tapered and spline bores may require special manufacturing and installation consideration.

**5.5 For all Lovejoy Grid style hubs with taper bores and taper bores with keyways,** Lovejoy manufactures these hubs with bores using tolerances and specifications as supplied by the customer. Taper bores will be tested with plug gauges usually supplied by the customer or included in the cost of the coupling.

**5.6 Lovejoy grid couplings sizes 1020 through 1090 are supplied with a pre-measured amount of coupling grease** to use for the coupling installation. Customers will need to order grease for all larger couplings or subsequent maintenance and inspections when grease needs to be replaced. Lovejoy recommends the use of an approved NLGI #2 or a certain NLGI #1 rated coupling grease in all Lovejoy grid style couplings (see Table-2). Non-coupling rated grease will separate through the centrifuge process exerted when the coupling rotates. The heavier of the materials contained in the non-coupling grease will build up in the grid/groove interface and cause premature failure of the coupling hub or grid spring.

**Caution!**

Use only qualified coupling grease in Lovejoy grid couplings. General Purpose or Bearing grease should not be used. (Reference: <http://www.lovejoy-inc.com>) under the tab Resources > Installation Instructions > Technical Data > Lubrication Specifications; or refer to Table-2 below.

**Table 2 - Common Coupling Greases by Manufacturer**

Manufacturer *	Ambient Temperature Range	
	0° F to 150° F (-18° C to 66° C)	-30° F to 100° F (-34° C to 38° C)
Amoco Oil Co.	Amolith Grease #2	Amolith Grease #2
Atlantic Richfield	Litholene HEP 2	Litholene HEP 2
BP Oil Co.	Energrease LS-EP2	Energrease LS-EP2
Chevron USA Inc	Chevron Dura - Lith EP -2	Chevron Dura - Lith EP -2
Cities Service Co.	Citgo HEP -2	Citgo HEP -2
Conoco Inc	EP Conolith #2	EP Conolith #2
Exxon Co. USA	Ronex MP	Ronex MP
Gulf Oil Co.	Gulfcrown Grease #2	Gulfcrown Grease #2
E.F. Houghton&Co.	Cosmolube #2	Cosmolube #1
Mobil Oil Corp	Mobilux EP 111	Mobilux #1
Phillips Petroleum	Philube IB & RB Grease	Philube IB & RB Grease
Shell Oil Co.	Alvania Grease #2	Alvania Grease #2
Shell Oil Canada	Alvania Grease #2	Alvania Grease #2
Standard Oil Co.	Factran #2	Factran #2
Sun Oil Co.	Prestige 42	Prestige 42
Texaco	Starplex HD2	Multifak EP2
Union Oil Co. (CA)	Union Unoba #2	Union Unoba #2
Valvoline Oil Co.	Val-Lith EP #2	Val-Lith EP #2

\* Note: Check with the lubrication manufacturer for special lubricants approved for use in the food industry

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## 6.0 COUPLING INSTALLATION:



### Warning!

When installing the hub, consult with all applicable Federal, State, and local laws and regulations covering the safe operation and maintenance of equipment, including, without limitation, the USDOL-OSHA "Lockout/Tag-out" procedure set forth in 29 CFR 1910.147.

**6.1 Check the coupling** and determine if the coupling to be installed is a horizontal split cover style or a vertical split cover style (see photos in the next column). The *horizontal* or *vertical* cover style defines the cover style only and does not refer to the coupling orientation.

**6.2.1 When using a horizontal split cover style coupling**, smear a light coat of grease on the seals and place one on each shaft.

**6.2.2 When using a vertical split cover style coupling**, install a lightly greased seal in each of the cover halves. The seals have a groove in the outside edge and this groove should fit over the inside lip of the cover (see arrow in photo). Slide a cover with the seal in place onto each shaft with the flange facing towards the end of the shaft (see photos). Slide the gasket onto one of the shafts next to the cover. This must be done **prior** to installing the hubs.

**6.3 Install the key into the shaft keyway.** The key should fit snugly with no side to side movement. Consider using a small amount of sealant to prevent the grease from leaking out around the keyway.

**6.4 Lovejoy manufactures size 1020 through 1090 hubs** with a clearance, or slip fit bore and the hubs should slide onto the shaft with little or no difficulty. Make sure the end of the hub with the grid teeth is flush with the end of the shaft and the key. Tighten the two set screws in this hub until snug, but do not tighten to the specified torque at this time (see Table-3). Repeat steps 6.3 and 6.4 for the second hub. Set screws will be tightened after the hub gap is set.

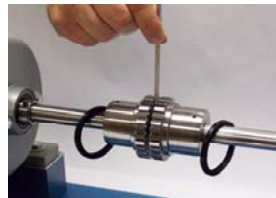
**6.5 Hub sizes 1100 and larger** are manufactured with an interference, or shrink fit bore and will need to be heated to mount on the shaft. For assistance with heating hubs, see the section **7.0 - Mounting Interference Fit Hubs**. The end of the hub with grid teeth should be flush with the end of the shaft and key. Use caution to ensure the heated hubs do not come in contact with the seals or gasket until the hubs have cooled to the ambient, or room temperature.

**6.6 Move the equipment into the operating position** ensuring the gap between the shaft ends matches the 'G', or Gap dimension in Table-4. Tighten the set screws on each hub to the torque value specified in Table-3 using a calibrated torque wrench.

**6.7 Check the angular misalignment** using vernier calipers or a spacer bar with the same thickness as the 'G', or Gap specified in Table-4. Slide the spacer bar between the two hubs an equal amount at 4 locations 90° apart (see photos). Measure the difference between the spacer bar width and the space between the hubs. Record the maximum and minimum measurements without rotating the hubs. The difference between these measurements should not exceed the Angular value listed in Table-4. The calculated angle associated with the difference in measurements should be 1/4° or less.

**6.8 Check the parallel misalignment** by placing a straight edge across the two coupling hubs and measure the offset at various positions around the periphery of the coupling without rotating either of the hubs. This can also be accomplished using a magnetic mount or shaft mount dial indicator and take measurements at different locations around the periphery by rotating the shaft with the dial indicator. If the maximum offset exceeds the allowable parallel misalignment specified in Table-4, realign the equipment and repeat steps 6.6, 6.7, and 6.8.

### Horizontal Split Cover



### Vertical Split Cover





## 6.0 COUPLING INSTALLATION (Continued):

**6.9 Secure all equipment foundation anchor bolts** to the specific manufacturers' torque recommendations.

**6.10 Prior to inserting the grid spring** or grid spring segments, thoroughly pack the grooves on each hub with a qualified coupling grease (see Table-2). If the grid springs consist of two or more segments, assemble the grid springs so that the cut ends of one segment extend in the same direction as the cut ends of the next segment. Spread the grid slightly so that the edge of the spring passes over the grid teeth in the hub. A flat blade screwdriver can be used to stretch the grid spring. Insert the blade through the grid spring and into the grid teeth groove a couple loops beyond where the grid spring is to be inserted. Tilt the screw driver to stretch the spring and the grid loops should drop into place. Towards the end you may need to switch to a soft face mallet and tap the edges of the spring into the respective grooves.

**6.11 Pack the spaces around the grid spring** with qualified grease (see Table-2) and wipe off any excess grease flush with the top of the grid spring and grid teeth on the hub.

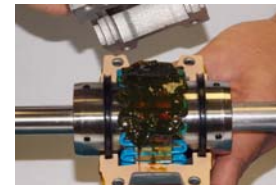
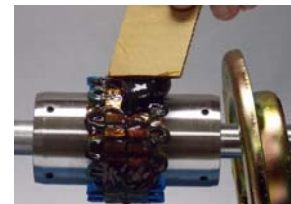
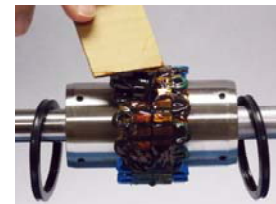
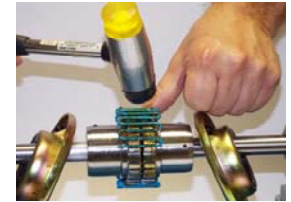
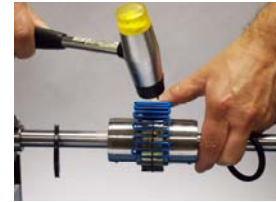
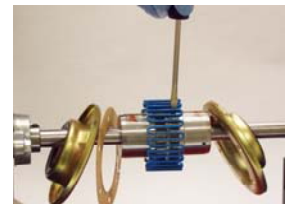
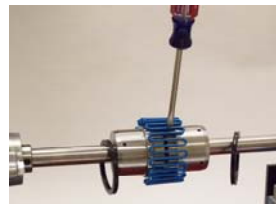
**6.12.1 When using a vertical split grid cover assembly**, slide the cover halves over the hubs lining up the bolt holes so that the grease plugs are 180° apart. Insert the fasteners through the cover holes and tighten to the torque specified in Table-5 using a calibrated torque wrench.

**6.12.2 When using a horizontal split grid cover assembly**, position the seals on the hubs so they align with the grooves in the covers. Position one cover half under the seals and place the two gaskets in position. Align the second cover half over the seals so that the match marks line up on the same end of the covers. This ensures the recesses in each of the cover halves that receive the fastener nuts are 180° apart. Insert the fasteners with the nuts fitted in the recesses provided. Tighten the fasteners to the torque specified in Table-5.

**6.13 If additional grease is required**, replace one grease plug with a grease fitting and remove the second plug. With the plugs oriented 180° apart in a horizontal position, fill until grease comes out of the second opening. Then replace the plugs.

**6.14 Make sure grease plugs are in place.** Start the equipment and operate with the coupling in place for several minutes. Stop and recheck fastener torques and inspect the coupling for any grease leaks or other abnormalities.

**6.15 Replace or install coupling guards** as required by any active government regulations and regulatory agencies.



## 7.0 MOUNTING INTERFERENCE FIT HUBS:

**CAUTION!** Shaft hubs, spacer hubs, grid springs, spacers, and cover assemblies must be supported during installation to avoid accidental damage should they slip.

**7.1 Grid 1100 series couplings and larger** are shipped with Interference Fit bores unless otherwise specified and the hubs will need to be heated prior to mounting on the shafts.

**7.2 Heat the hubs** and slide them on the shafts with grid teeth closest to the end of the shaft as seen in the photos on page 3. Make sure the hub is heated uniformly to a temperature of at least 350° F (177° C). The following steps offer suggestions to follow when heating interference fit hubs.

**7.2.1 Oil Bath Heating** is usually limited to 350° F. (177° C), or some temperature that is less than the flash point of the oil used. Special handling devices are required to support the hub in the oil bath such as tongs, threaded rods or eye-bolts placed in puller holes, etc. The hubs should not rest on the bottom of the oil bath container and must remain in place for a period of time ample to heat the hub all the way through.



**Warning!**

*If an oil bath is used, the couplings will need to be heated to approximately 350° F (177° C) or more, so the oil must have a flash point above 350° F (177° C).*

**7.2.2 Oven Heating** offers definite advantages over oil bath heating. Parts can be heated to higher temperatures, usually not to exceed 450° F (232° C). This is roughly the maximum temperature where the metal does not go through an annealing process and yet can still be handled with heat resistant gloves. When heating the hubs in an oven, place them on a rack and do not rest the hubs on the oven surface. The hubs should remain in the oven for a period of time ample to heat the hub all the way through.

**7.2.3 Induction Heating** can be used as long as the temperature rise in the hub is uniform and controlled.

**7.2.4 Open Flame Heating** is typically not recommended. If the hub is being heated with an oxyacetylene, or blow torch, use an excess acetylene mixture. Mark the hub body at the top, center, and bottom along the length of the hub with heat resistant crayons, one with a 350° F (177° C) melt temperature and another with a 450° F (232° C) melt temperature. The hub should be sitting elevated on refractory bricks oriented to allow the flame to flow through the hub. With a "Blue Flame" or "Rosebud" torch, direct the flame towards the hub bore using constant motion to avoid overheating any single area. Once the heat sensitive crayon marks melt, the hub should be ready for mounting.



**Warning!**

*Do not use an open flame in a combustible atmosphere or near combustible materials.*

**CAUTION!**

Do not "spot" heat the hub in single areas or distortion of the hub could occur.

**CAUTION!**

Do not exceed 450° F (232° C) during the heating process. Excessive heat can soften, or anneal the hub, reducing the strength of the steel thus affecting the performance characteristics of the hub.

**CAUTION!**

Use extreme care when handling heated hubs to avoid injury to personnel.

**7.3** After mounting the hub on the shaft, allow the hub to cool to an ambient, or room temperature prior to proceeding with the installation.

**8.0 GRID SPRING REMOVAL:**

**8.1 Whenever the grid spring needs to be removed** or replaced, first remove the cover. A tray and cleaning rag may be necessary to catch or wipe off excess grease.

**8.2 Use a round rod or screwdriver** that fits into the open loops at the ends of the grid spring(s). Use the grid teeth on the hubs as support and gently pry the grid spring out of the grooves radially in even, gradual stages, alternating from side to side on the grid spring.

**8.3 Return to step 6.10 to install** a replacement grid spring.

**9.0 ANNUAL MAINTENANCE:**

**9.1 Adequate lubrication is essential** to prolong coupling life and trouble free performance. It is recommended that grid style couplings be relubricated at least once annually by using a common industrial grade coupling grease. This lubrication interval should be more often when the coupling is being subjected to extreme temperatures, excessive moisture, frequent stops, starts, or reversals, or exposed to excessive vibration. Refer to step 9.3 for procedures on lubricating the coupling without disassembly.

**CAUTION!**

Coupling grease should be completely removed. The coupling, grid spring, and covers should be thoroughly cleaned, and new lubricant or grease per Table-2 replenished once every year.



**Warning!**

*Before performing coupling maintenance, make sure the machinery is made safe. Disconnect and lock out all power to the equipment. No part of the maintenance procedure should be performed on moving, non secured, or unstable equipment.*

**9.2 Prior to any maintenance activity,** disconnect and lock out all power to the equipment. Never perform maintenance on moving or non secure equipment.

**9.3 If lubrication only is required,** remove the lube plugs on both grid cover halves and install a lubrication fitting in one hole only. The holes should be 180° apart. With the lube holes approximately horizontal from each other (3:00 and 9:00 positions), fill the coupling with a recommended lubrication or coupling grease (see Table-2). Fill using the lubrication fitting until excess grease appears at the opposite lube hole. Replace both of the lubrication plugs and inspect the seals for possible leakage.

**9.4 If lubrication and inspection is required,** remove the cover assembly. A tray will be helpful to catch excess grease. Remove the grid spring or grid spring segments (see step 8.2) and thoroughly clean all coupling components. Consider replacing the grid spring and seals as part of the inspection. Note that you should be able to carefully stretch the seal over the grid teeth to remove and replace the seal.

**CAUTION!**

Ideally, grid style couplings should always be fully inspected and grease replaced on an annual basis.

**9.5 With fresh coupling grade grease** (see Table-2), pack the grid teeth in the hubs and install the grid spring or grid spring segments starting at step 6.10 proceeding through step 6.14.

**Table 3 - Set Screw - Tightening Torque**

Size	Set Screws (Inch)				Set Screws (Metric)			
	Screw Size		Tightening Torque		Screw Size		Tightening Torque	
	Size	Length	in-lbs	Nm	Size	Length	in-lbs	Nm
1020	8-32	3/16"	14	1.6	M5	5mm	24 - 26	2.9
1030	8-32	3/16"	14	1.6	M5	5mm	24 - 26	2.9
1040	10-24	1/4"	32 - 36	3.6 - 4	M6	6mm	42 - 44	4.8 - 5
1050	10-24	1/4"	32 - 36	3.6 - 4	M6	6mm	42 - 44	4.8 - 5
1060	10-24	1/4"	32 - 36	3.6 - 4	M6	6mm	42 - 44	4.8 - 5
1070	1/4-20	5/16"	78 - 87	9 - 10	M8	8mm	84 - 88	9.5 - 10
1080	1/4-20	5/16"	78 - 87	9 - 10	M8	8mm	84 - 88	9.5 - 10
1090	5/16-18	3/8"	150 - 165	17 - 18	M10	10mm	165 - 176	19 - 20

Notes: Sizes 1020 thru 1090 are bored with clearance fit with 2 set screws at 90°. Sizes 1100 thru 1200 come standard with Interference Fit. Set screws are optional.

**Table 4 - Grid Couplings - Allowable Misalignment**

Size	'G' (Gap) +/- 10%		Maximum Allowable Misalignment <sup>1</sup>					Maximum Speed (by Cover Type)		Grease Capacity (by weight)		
			Angular (1/4°)		Parallel		Axial (end float)		Horiz	Vert	oz	kg
	in	mm	in	mm	in	mm	in	mm				
1020	0.118	3.0	0.009	0.2	0.012	0.3	+ .050" / - .050"	+1.5mm / -1.5mm	4,500	6,000	1.0	0.03
1030	0.118	3.0	0.011	0.3	0.012	0.3	+ .050" / - .050"	+1.5mm / -1.5mm	4,500	6,000	1.4	0.04
1040	0.118	3.0	0.013	0.3	0.012	0.3	+ .050" / - .050"	+1.5mm / -1.5mm	4,500	6,000	1.9	0.05
1050	0.118	3.0	0.015	0.4	0.016	0.4	+ .050" / - .050"	+1.5mm / -1.5mm	4,500	6,000	2.4	0.07
1060	0.118	3.0	0.018	0.5	0.016	0.4	+ .050" / - .050"	+1.5mm / -1.5mm	4,350	6,000	3.0	0.09
1070	0.118	3.0	0.020	0.5	0.016	0.4	+ .050" / - .050"	+1.5mm / -1.5mm	4,125	5,500	4.0	0.11
1080	0.118	3.0	0.024	0.6	0.016	0.4	+ .050" / - .050"	+1.5mm / -1.5mm	3,600	4,750	6.1	0.17
1090	0.118	3.0	0.028	0.7	0.016	0.4	+ .177" / - .050"	+1.5mm / -1.5mm	3,600	4,000	9.0	0.25
1100	0.177	4.5	0.032	0.8	0.020	0.5	+ .177" / - .118"	+4.5mm / -3mm	2,400	3,250	15.0	0.43
1110	0.177	4.5	0.035	0.9	0.020	0.5	+ .177" / - .118"	+4.5mm / -3mm	2,250	3,000	17.6	0.51
1120	0.236	6.0	0.040	1.0	0.022	0.6	+ .236" / - .177"	+6mm / -4.5mm	2,025	2,700	25.6	0.74
1130	0.236	6.0	0.047	1.2	0.022	0.6	+ .236" / - .177"	+6mm / -4.5mm	1,800	2,400	30.0	0.90
1140	0.236	6.0	0.053	1.3	0.022	0.6	+ .236" / - .177"	+6mm / -4.5mm	1,650	2,200	40.0	1.14
1150	0.236	6.0	0.062	1.6	0.024	0.6	+ .236" / - .177"	+6mm / -4.5mm	1,500	n/a	69.0	1.95
1160	0.236	6.0	0.070	1.8	0.024	0.6	+ .236" / - .177"	+6mm / -4.5mm	1,350	n/a	100.0	2.81
1170	0.236	6.0	0.079	2.0	0.024	0.6	+ .236" / - .177"	+6mm / -4.5mm	1,225	n/a	123.0	3.49
1180	0.236	6.0	0.089	2.3	0.030	0.8	+ .236" / - .177"	+6mm / -4.5mm	1,100	n/a	133.0	3.76
1190	0.236	6.0	0.097	2.5	0.030	0.8	+ .236" / - .177"	+6mm / -4.5mm	1,050	n/a	155.0	4.40
1200	0.236	6.0	0.107	2.7	0.030	0.8	+ .236" / - .177"	+6mm / -4.5mm	900	n/a	198.0	5.62
1210	0.500	12.7	0.118	3.0	0.036	0.9	+ .315" / - .236"	+8mm / -6mm	820	n/a	371.0	10.50
1220	0.500	12.7	0.129	3.3	0.036	0.9	+ .315" / - .236"	+8mm / -6mm	730	n/a	566.0	16.10

Notes: 1. Misalignments listed are operational allowances. Ideally, installation should be performed at 20% of operational values.



**Table 5 - Grid Cover Bolts - Tightening Torque**

Size	Horizontal Cover Bolts				Vertical (Flanged) Cover Bolts			
	Screw Size and Tightening Torque				Screw Size		Tightening Torque	
	inch size	in-lbs	metric size	Nm	inch size	in-lbs	metric size	Nm
1020	1/4-20	100	M6	11.3	1/4-20	100	M6	11.3
1030	1/4-20	100	M6	11.3	1/4-20	100	M6	11.3
1040	1/4-20	100	M6	11.3	1/4-20	100	M6	11.3
1050	5/16-18	200	M8	22.6	5/16-18	200	M8	22.6
1060	5/16-18	200	M8	22.6	5/16-18	200	M8	22.6
1070	5/16-18	200	M8	22.6	5/16-18	200	M8	22.6
1080	5/16-18	200	M8	22.6	5/16-18	200	M8	22.6
1090	5/16-18	200	M8	22.6	5/16-18	200	M8	22.6
1100	3/8-16	340	M10	38.4	3/8-16	340	M10	38.4
1110	3/8-16	340	M10	38.4	3/8-16	340	M10	38.4
1120	1/2-13	550	M12	62	3/8-16	340	M10	38.4
1130	1/2-13	550	M12	62	1/2-13	550	M12	62
1140	1/2-13	550	M12	62	1/2-13	550	M12	62
1150 (Blue Cover)	1/2-13	648	M16	174	Vertical (Flanged) Cover and Grid assemblies are not available in sizes 1150 and larger.			
1160 (Blue Cover)	5/8-11	1300	M16	174				
1170 (Blue Cover)	5/8-11	1300	M16	174				
1150 (Silver Cover)	-	-	M12 (Hex)	72				
1160 (Silver Cover)	-	-	M12 (Hex)	72				
1170 (Silver Cover)	-	-	M14 (Hex)	72				
1180	5/8-11	1300	M16	174				
1190	3/4-10	2300	M20	340				
1200	3/4-10	2300	M20	340				
1210	3/4-10	2300	M20	340				
1220	3/4-10	2300	M20	340				

