

## Operating Procedures for 5” through 24” GripTight® Elbow Test Plug

- **Curtiss-Wright Proprietary**

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Thank you for choosing to use a GripTight® Elbow Test Plug. **Please note that the following procedures apply to testing metallic pipes or tubes. If you are testing non-metallic pipes or tubes, please contact EST Group Customer Service prior to usage. Failure to follow the correct procedures for testing non-metallic pipes or tubes may result in injury to personnel and damage to equipment.**

In order to carry out safe testing with your GripTight Elbow Test Plug, the following equipment is required:

1. A calibrated torque wrench that is capable of producing the required torque
2. A deep socket or crowfoot wrench
3. Pipe cap(s) or couplings with working pressure greater than or equal to the test pressure being used (see Tables 1, 2 & 3 for size).

All required test equipment is available through EST Group. All equipment and components required to maintain and refurbish GTLBO Test Plugs is available through EST Group. Contact EST Group Customer Service for information.

### WARNING

- ⚠ **GTLBO plugs are for use in all Carbon Steel, Stainless Steel and Alloy pipes with a hardness up to HRC 32. Contact EST Customer Service if pipes to be tested have a hardness greater than HRC 32.**
- ⚠ **Contact EST Group Customer Service if the test pressure required exceeds the maximum plug rating or is in excess of 80% of specified minimum yield stress for host pipe, tube, or equipment.**
- ⚠ **Pressure testing is inherently dangerous. Strict adherence to the operating procedures and industry standard safety practices could prevent injury to personnel and damage to equipment.**
- ⚠ **All personnel must be clear of the GripTight Elbow Test Plug during pressure testing. Never stand in the potential path of a GripTight Elbow Test Plug during testing. Always understand and observe industry standard safe practices for distance between personnel and equipment being tested.**
- ⚠ **Pressures must never exceed the maximum pressure rating of any component in a system or the maximum pressure rating of the GripTight Elbow Test Plug being used.**
- ⚠ **For safety, an incompressible liquid such as water should be used as the test medium. Residual air or gas should be displaced or vented from the pipe prior to testing.**
- ⚠ **If testing pneumatically, every attempt to limit potential damage to equipment or injury to personnel must be made. Testing procedures and protocol should adhere to the provisions for pneumatic testing set forth in the current ASME PCC-2 Repair of Pressure Equipment and Piping.**

Questions? Contact EST Group Customer Service at any of the following locations.

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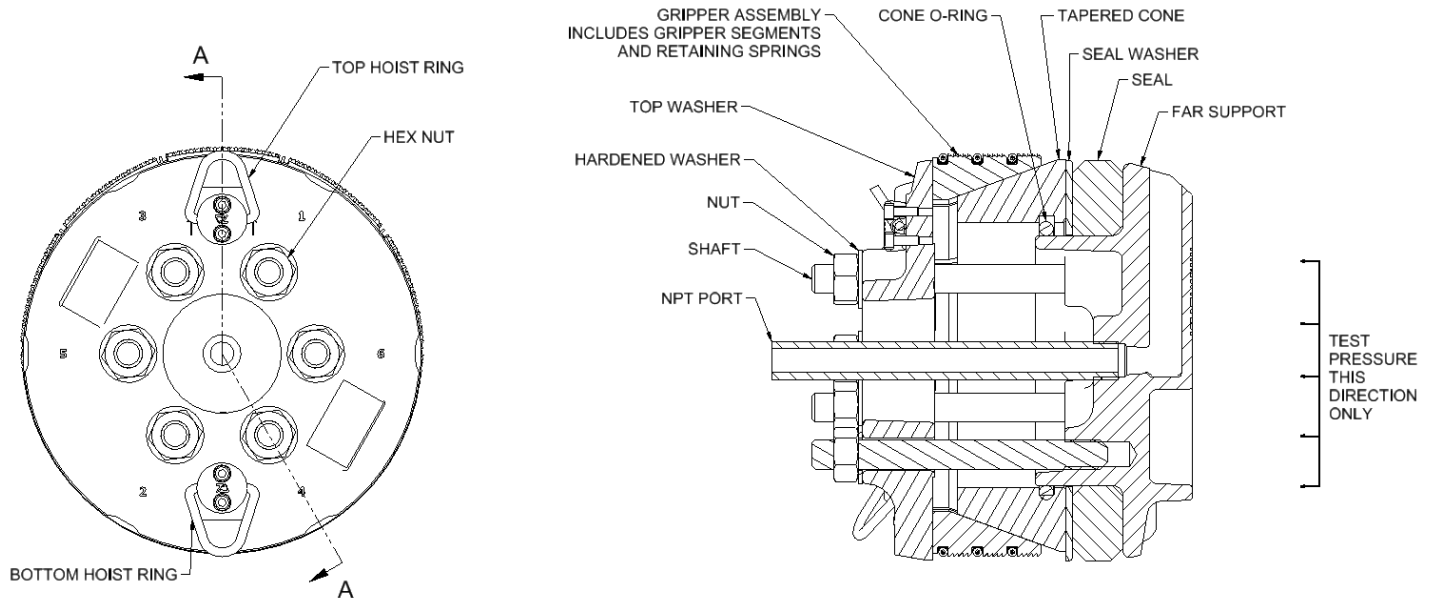
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**GripTight Elbow High Pressure Test Plug**

## 1. Test Preparation

- 1.1. Fully read and understand these operating procedures. Pressure testing is inherently dangerous and must be performed as safely as possible. If any instruction contained in this document is unclear, STOP and contact EST Group Customer Service.
- 1.2. Following these procedures and industry standard safe practices may prevent injury to personnel and damage to property.
- 1.3. Read these instructions prior to every test. Be familiar with and use applicable Human Performance Tools before, during, and after every test.
- 1.4. Hydrostatic testing is preferred over pneumatic testing due to safety concerns. Displace as much air or gas as possible prior to conducting a hydrostatic test.
- 1.5. If any instruction contained in these operating procedures contradicts a site specific guideline or procedure: STOP and contact EST Group Customer Service for guidance.

Test pressure **MUST NOT** exceed the maximum pressure rating of the lowest rated component under test.

The test pressure **MUST NOT** exceed the rated pressure of the plug.

Test pressure **MUST NOT** exceed 80% of specified minimum yield stress for host pipe, tube, or equipment.

### Examples of Human Performance Tools

- Pre-Job Briefing
- Two-Minute Drill
- Three-Way Communication
- Phonetic Alphabet
- S.T.A.R. (Stop-Think-Act-Review)
- Procedure Use and Adherence
- Place Keeping (Circle Slash)
- Flagging / Operational Barriers
- Self-Checking
- Independent Verification
- Concurrent Verification
- First Check
- STOP When Unsure
- Peer Checking
- Post-Job Review

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## 2. Equipment Inspection and Preparation

Perform the following steps prior to performing your pressure test.

Step/Action	Additional Action/Information/Result								
2.1. Visually inspect the plug for worn or damaged components. Replace as needed.	<ul style="list-style-type: none"> <li>The tapered surface between the Cone and Grippers must be free of friction producing dirt or corrosion.</li> <li>Apply a lubricant such as Molykote® DX or SAE 10W motor oil to the tapered surface of the Cone. Wipe away any excess lubricant from components making sure to leave an ample amount on tapered cone face and mating surface of gripper back. Lubricant <b>must not</b> be on seal.</li> <li>The Seal must not have excessive deformations, cuts or scores.</li> </ul>								
2.2. Lubricate surface of the Tapered Cone.									
2.3. Inspect or lubricate the underside of the positioning washer where the grippers slide.									
2.4. Liberally spread antiseize over both sides of the Hardened Washers and on the threads of the Shaft.									
2.5. Verify there is no debris in the gripper teeth; clean as needed.									
2.6. Tighten the Hex Nuts so the Grippers move freely to the end of the Tapered Cone surface.									
<p><b>CAUTION</b></p> <p>⚠ Failure to properly lubricate Shaft thread and Washer surfaces may result in unsafe operating conditions or plug leakage.</p>									
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #4F81BD; color: white;">If</th> <th style="background-color: #4F81BD; color: white;">then</th> </tr> </thead> <tbody> <tr> <td>Grippers move freely to end of the tapered Cone surfaces,</td> <td>Loosen the Hex Nuts back to its/their original position and go to the next step.</td> </tr> <tr> <td>Grippers do not fully retract,</td> <td>If required, remove any light rust, residue or corrosion on the cone face, gripper backs and tops and underside of positioning washer using a Scotch Brite Pad or pad of equivalent quality. Re-lubricate gripper backs, tops and tapered cone surface using a lubricant such as Molykote® DX or SAE 10W motor oil. Wipe away any excess lubricant from components making sure to leave an ample amount on Tapered Cone face and mating surface of gripper back. If grippers still do not fully retract and nuts cannot be easily advanced, do not use this plug for testing. Contact EST Group Customer Service for assistance.</td> </tr> <tr> <td>The Hex Nuts cannot easily be tightened to allow full gripper expansion</td> <td>Do not use this plug for testing. Contact EST Group Customer Service for assistance.</td> </tr> </tbody> </table>	If	then	Grippers move freely to end of the tapered Cone surfaces,	Loosen the Hex Nuts back to its/their original position and go to the next step.	Grippers do not fully retract,	If required, remove any light rust, residue or corrosion on the cone face, gripper backs and tops and underside of positioning washer using a Scotch Brite Pad or pad of equivalent quality. Re-lubricate gripper backs, tops and tapered cone surface using a lubricant such as Molykote® DX or SAE 10W motor oil. Wipe away any excess lubricant from components making sure to leave an ample amount on Tapered Cone face and mating surface of gripper back. If grippers still do not fully retract and nuts cannot be easily advanced, do not use this plug for testing. Contact EST Group Customer Service for assistance.	The Hex Nuts cannot easily be tightened to allow full gripper expansion	Do not use this plug for testing. Contact EST Group Customer Service for assistance.
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2.7. Clean and dry the inside of the elbow.	<ul style="list-style-type: none"> <li>All moisture, debris, and excessive scale must be removed from the elbow ID to ensure a proper seal is established during the pressure test.</li> </ul>								

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Step/Action	Additional Action/Information/Result
<p>2.8. Verify that the elbow size and schedule stamped on the GripTight Elbow Test Plug is equivalent to the size of the elbow you are testing, or that the inside diameter (ID) of the equipment being tested is within the ID operating range for the GripTight Elbow Test Plug being used.</p>	<ul style="list-style-type: none"> <li>See Tables 1 through 3 for the Functional ID Operating Range for GripTight Elbow Test Plugs.</li> </ul>
<p>2.9. Verify that the equipment to be tested is prepared before performing the test. Make sure all applicable safety procedures are observed and followed, e.g. Lock-Out Tag-Out, work permits, correct components is being tested, etc.</p>	<div style="border: 2px solid red; padding: 5px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>⚠ Special caution must be taken when applying lubricant and handling the GripTight Elbow Test Plug. The lubricant must not come in contact with the Seal, the Gripper Teeth, or the inside of the elbow.</p> </div>
<p>2.10. Insert GripTight Elbow Test Plug into the equipment to be tested.</p>	
<p>2.11. Follow remaining GripTight Elbow Test Plug installation procedure as per the steps in Section 3: Performing the Pressure Test.</p>	

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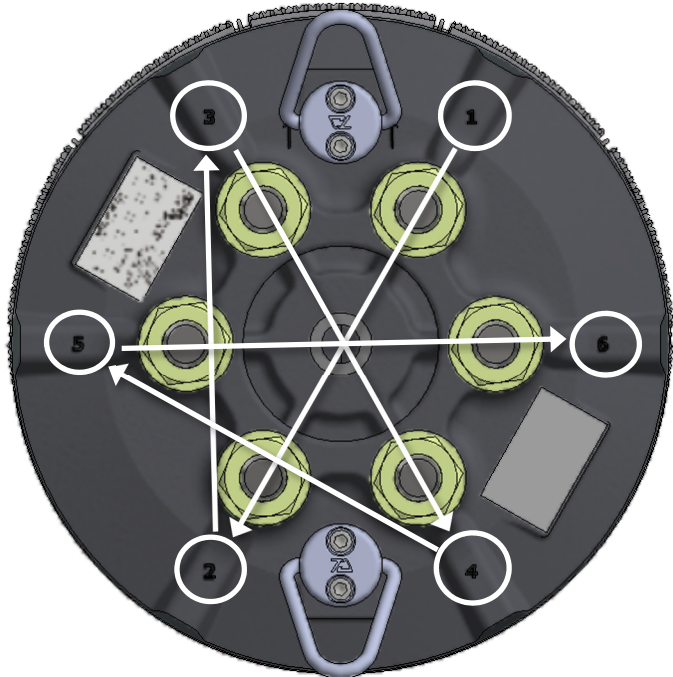
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### 3. Performing the Pressure Test

Perform the following steps to perform a pressure test with the GripTight Elbow Test Plug.

Step/Action	Additional Action/Information/Result
<p>3.1. Place the GripTight Elbow Test Plug inside the elbow. The GripTight Elbow Test Plug must be able to fit with the full length of the Grippers inside the elbow.</p> <p>3.2. Center the GripTight Elbow Test Plug within the elbow and hand tighten the Hex Nuts until the test plug has gripped the elbow ID.</p>	
<p><b>Note:</b> Slight wiggling of the plug may allow for further hand tightening of the Hex Nut(s).</p>	
<p>3.3. Use a star pattern to incrementally tighten the Hex Nuts. Numbers on the positioning washer provide a suggested tightening sequence. Repeat torque sequence until desired torque has been applied.</p>	
<p>3.4. Tighten the Hex Nut(s) with a calibrated torque wrench and an appropriately sized crowfoot wrench or deep socket. Deep Sockets are recommended for Multi-Shaft GripTight Elbow Test Plugs. See Tables for nominal and maximum installation torques.</p>	<p style="text-align: center;"><b>CAUTION</b></p> <ul style="list-style-type: none"> <li>⚠ The torque wrench being used must be calibrated to ensure that the correct amount of torque is being applied. An un-calibrated torque wrench may cause the operator to tighten the Hex Nut(s) either too much or too little. This may result in unsafe operating conditions or damage to the test plug.</li> <li>⚠ Some crowfoot wrenches may not be able to apply the required amount of torque for some GripTight Elbow Test Plugs. Before attempting to install, make sure the equipment being used is of adequate strength for the application. Using an insufficiently strong crowfoot wrench may cause injury to personnel or damage to the GripTight Elbow Test Plug.</li> <li>⚠ Failure to apply at least the nominal installation torque from Table 1-3 may result in unsafe operation of the plug.</li> <li>⚠ If a crowfoot wrench is used, ensure wrench is used at a 90° angle relative to the handle of the torque wrench. Failure to do so can result in significant and dangerous over-torque.</li> </ul>

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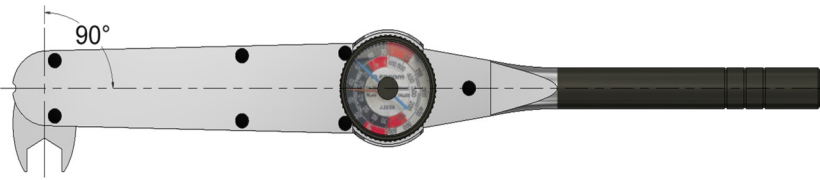
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Step/Action	Additional Action/Information/Result
3.5. If a Safety Gag is being used, slip the Link(s) over the Shaft(s) before proceeding. The Link(s) should not be placed under the Hex Nut(s) or over the center port.	
3.6. Install the pressure source leak tight. Use of a hose whip restraint is very strongly recommended. Inspect all connections to ensure they are leak tight.	<ul style="list-style-type: none"> <li>For GripTight Elbow Test Plugs not being used to pressurize or vent the system, install a pipe cap with a pressure rating that is greater than or equal to the maximum test pressure being used.</li> </ul> <div style="border: 2px solid red; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>⚠ Before proceeding, inspect the unit / component under test to ensure every component is in the correct configuration. This includes checking to make sure all GripTight Elbow Test Plugs being used have been properly installed.</p> </div>
3.7. Fill the pipe with test medium while displacing any residual air or gas.	

**WARNING**

- ⚠ **Contact EST Group Customer Service if the test pressure required exceeds the maximum plug rating or is in excess of 80% of specified minimum yield stress for host pipe, tube, or equipment.**

- |   |   |
|---|---|
| 3.8. Perform the pressure test.   | <ul style="list-style-type: none"> <li>Slowly introduce the test pressure. <b>TEST PRESSURE MUST NEVER EXCEED THE MAXIMUM PRESSURE RATING OF ANY COMPONENT IN THE SYSTEM UNDER TEST. TEST PRESSURE MUST NEVER EXCEED THE MAXIMUM PRESSURE RATING OF THE GRIPTIGHT ELBOW TEST PLUG BEING USED.</b></li> <li>Imperfections within the elbow being tested may cause small leaks.</li> <li>If leaks persist, additional tightening of the Hex Nuts may be required. <b>RELEASE ALL TEST PRESSURE</b> before making adjustments to the GT Elbow Test Plug.</li> <li>Do not exceed the maximum torque for the GripTight Elbow Test Plug. See Tables for torque values.</li> </ul> |
| 3.9. Check for leaks. A drop in pressure may not necessarily indicate a leak, as the GripTight Elbow Test Plugs require some time to “settle” while pressure is applied and the testing is being performed. |   |

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Step/Action	Additional Action/Information/Result
<p>3.10. Verify that GripTight Elbow Test Plug movement is within specified limits.</p> <div style="border: 1px solid red; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>Warning</b></p> <p>⚠ Never re-torque the hex nut(s) while the plug is pressurized. This is unsafe and can cause damage to the GripTight Elbow Test Plug.</p> <p>⚠ Release all pressure prior to adjusting GripTight Elbow Test Plug torque.</p> </div>	<ul style="list-style-type: none"> <li>• For Multi-Shaft GripTight Elbow Test Plugs, movement up to 0.50" (13 mm) is acceptable. If plug movement exceeds the acceptable amount, immediately release all pressure and remove the GripTight Elbow Test Plug.</li> <li>• Examine the GripTight Elbow Test Plug components for wear. Pay particular attention to the condition of the Grippers. Replace parts as necessary.</li> <li>• Reinstall the GripTight Elbow Test Plug, following all instructions provided. Increase the installation torque used. Do not exceed the maximum torque rating for the plug.</li> </ul>
<p>3.11. Gradually release all pressure from the system once the test is completed.</p> <div style="border: 1px solid red; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>Warning</b></p> <p>⚠ Incrementally loosen Hex Nuts on multi-shaft plugs using the same star pattern as installation. Failure to do so may over stress the shafts and nuts and cause deformation or damage.</p> </div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px;"> <p><b>Note:</b> If excessive Shaft movement persists after using the maximum GripTight Elbow installation torque, <b>stop the test, release all test pressure, and contact EST Group customer Service for technical assistance.</b></p> </div> <ul style="list-style-type: none"> <li>• If using a GripTight Elbow plugs in the Vent/Fill positions, to recover test medium, apply low pressure air to plug in Vent position.</li> <li>• Loosen the Hex Nut(s), remove the GripTight Elbow Test Plug from the pipe and then inspect the GripTight Elbow Test Plug for any deformation or damage.</li> <li>• If the plug is difficult to remove, wait for the seal to relax (up to 2-3 minutes) and a gentle wiggle of the shafts or tap on the positioning washer, will help.</li> </ul>
<p style="text-align: center;"><b>Warning</b></p> <p>⚠ Some test medium may remain inside the pipe after a hydrostatic test has been conducted. Caution must be taken when loosening Hex Nuts and removing GripTight Elbow Test Plugs to prevent unsafe conditions from occurring during removal, e.g. water spills onto a catwalk creating slippery conditions.</p>	

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## 4. Storage

- Prior to storing, clean and dry the GripTight Elbow Test Plug. Do not allow the Seal to come in contact with any cleaning chemicals or solvents. Exposure to these chemicals may damage the Seal.
- Ensure the gripper teeth are free of dirt and debris. Clean as needed.
- Re-lubricate the Shaft threads and between the Hex Nuts and mating surface as previously described in Section 2: Equipment Inspection and Preparation.
- Store the GripTight Elbow Test Plug in an area out of direct exposure to sun or ultraviolet (UV) light. Do not store in an area where it will be subjected to heat in excess of 180°F (82°C). Excessive heat or UV light exposure will damage and prematurely degrade the Seal(s).
- For additional protection, the GTLBO should be stored in a in a plastic bag or wrap.
- Store these instructions with each GripTight Elbow Test Plug.

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Table 1: GripTight Elbow Test Plug Information

Sales Number	Elbow		Plug OD		Functional I.D. Range				Maximum Test Pressure		Installation Torque				NPT Size	
	Size	Schedule			(in)		(mm)				FT-LBS		N-m			
			(in)	(mm)	Min	Max	Min	Max	(PsiG)	(BarG)	Nominal	Max	Nominal	Max		
	GTLBO-5P40	5	40	4.80	121.9	4.91	5.12	124.7	130.0	3350	231	45	55	61		75
GTLBO-5P10	10		5.10	129.5	5.21	5.33	132.3	135.4	3350	231	45	55	61	75	1/2"M	
GTLBO-5P5	5		5.16	131.1	5.27	5.44	133.9	138.2	3350	231	45	55	61	75	1/2"M	
GTLBO-6P160	6	160	4.80	121.9	4.91	5.12	124.7	130.0	3350	231	45	55	61	75	1/2"M	
GTLBO-6P120		120	5.16	131.1	5.27	5.44	133.9	138.2	3350	231	45	55	61	75	1/2"M	
GTLBO-6P80		80/XS	5.46	138.7	5.57	5.71	141.5	145.0	3350	231	45	55	61	75	1/2"M	
GTLBO-6P40	6	40	5.81	147.6	5.93	6.06	150.6	153.9	3350	231	45	55	61	75	1/2"M	
GTLBO-6P10		10	6.15	156.2	6.27	6.41	159.3	162.8	3350	231	85	100	115	136	1/2"M	
GTLBO-6P5		5	6.21	157.7	6.33	6.47	160.8	164.3	3350	231	85	100	115	136	1/2"M	
GTLBO-8P160	8	160	6.37	161.8	6.49	6.75	164.8	171.5	3350	231	85	100	115	136	3/4"M	
GTLBO-8PXXS		XXS	6.45	163.8	6.57	6.81	166.9	173.0	3350	231	85	100	115	136	3/4"M	
GTLBO-8P140		140	6.58	167.1	6.70	6.93	170.2	176.0	3350	231	85	100	115	136	3/4"M	
GTLBO-8P120		120	6.79	172.5	6.91	7.12	175.5	180.8	3350	231	85	100	115	136	3/4"M	
GTLBO-8P100		100	7.08	179.8	7.20	7.38	182.9	187.5	3350	231	85	100	115	136	3/4"M	
GTLBO-8P80		80	7.30	185.4	7.42	7.57	188.5	192.3	3350	231	85	100	115	136	3/4"M	
GTLBO-8P60		60	7.51	190.8	7.63	7.78	193.8	197.6	3350	231	85	100	115	136	3/4"M	
GTLBO-8P40		40	7.70	195.6	7.82	7.97	198.6	202.4	3350	231	85	100	115	136	3/4"M	
GTLBO-8P30		30	7.81	198.4	7.93	8.08	201.4	205.2	3350	231	85	100	115	136	3/4"M	
GTLBO-8P20		20	7.88	200.2	8.00	8.15	203.2	207.0	3350	231	85	100	115	136	3/4"M	
GTLBO-8P10		10	8.12	206.2	8.24	8.39	209.3	213.1	3350	231	85	100	115	136	3/4"M	
GTLBO-8P5		5	8.21	208.5	8.33	8.48	211.6	215.4	3350	231	85	100	115	136	3/4"M	
GTLBO-10P160		10	160	7.99	202.9	8.13	8.54	206.5	216.9	3350	231	150	250	202	340	3/4"M
GTLBO-10P140			140	8.29	210.6	8.36	8.64	212.3	219.5	3350	231	150	250	202	340	3/4"M
GTLBO-10P120			120	8.63	219.2	8.76	9.09	222.5	230.9	3350	231	150	250	202	340	3/4"M
GTLBO-10P100	100		8.88	225.6	9.03	9.34	229.4	237.2	3350	231	150	250	202	340	3/4"M	
GTLBO-10P80	80		9.17	232.9	9.32	9.59	236.7	243.6	3350	231	180	325	244	441	1"M	
GTLBO-10PXS	60/XS		9.39	238.5	9.54	9.79	242.3	248.7	3350	231	180	325	244	441	1"M	
GTLBO-10P40	40/STD		9.70	246.4	9.85	10.07	250.2	255.8	3350	231	180	325	244	441	1"M	
GTLBO-10P30	30		9.84	249.9	9.98	10.19	253.5	258.8	3350	231	180	325	244	441	1"M	
GTLBO-10P20	20		9.97	253.2	10.12	10.31	257.0	261.9	3350	231	180	325	244	441	1"M	
GTLBO-10P10	10S		10.17	258.3	10.32	10.49	262.1	266.4	3350	231	180	325	244	441	1"M	
GTLBO-10P5	5	10.25	260.4	10.39	10.55	263.9	268.0	3350	231	180	325	244	441	1"M		
GTLBO-12P160	12	160	9.60	243.8	9.74	10.05	247.4	255.3	3350	231	180	325	244	441	1"M	
GTLBO-12P140		140	9.99	253.7	10.14	10.55	257.6	268.0	3350	231	180	325	244	441	1"M	
GTLBO-12P120		120/XXS	10.26	260.6	10.41	10.78	264.4	273.8	3350	231	180	325	244	441	1"M	
GTLBO-12P100		100	10.60	269.2	10.75	11.09	273.1	281.7	3350	231	180	325	244	441	1"M	
GTLBO-12P80		80	10.95	278.1	11.10	11.40	281.9	289.6	3350	231	180	325	244	441	1"M	
GTLBO-12P60		60	11.25	285.8	11.39	11.66	289.3	296.2	3350	231	180	325	244	441	1"M	
GTLBO-12PXS		XS	11.39	289.3	11.54	11.79	293.1	299.5	3350	231	180	325	244	441	1"M	
GTLBO-12P40		40	11.67	296.4	11.76	12.04	298.7	305.8	3350	231	180	325	244	441	1"M	
GTLBO-12P30		30	11.78	299.2	11.90	12.14	302.3	308.4	3350	231	180	325	244	441	1"M	
GTLBO-12P20		20	11.97	304.0	12.12	12.31	307.8	312.7	3350	231	180	325	244	441	1"M	
GTLBO-12P10	10S/5	12.13	308.1	12.29	12.50	312.2	317.5	3350	231	180	325	244	441	1"M		

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**Table 2: GripTight Elbow Test Plug Information**

Sales Number	Elbow		Plug OD		Functional I.D. Range				Maximum Test Pressure		Installation Torque				NPT Size	
	Size	Schedule			(in)		(mm)				FT-LBS		N-m			
			(in)	(mm)	Min	Max	Min	Max	Nominal	Max	Nominal	Max				
									(PsiG)	(BarG)						
GTLBO-14P160	14	160	10.64	270.3	10.80	11.27	274.3	286.3	3350	231	180	325	244	441	1"M	
GTLBO-14P140		140	10.98	278.9	11.12	11.56	282.4	293.6	3350	231	180	325	244	441	1"M	
GTLBO-14P120		120	11.30	287.0	11.45	11.85	290.8	301.0	3350	231	180	325	244	441	1"M	
GTLBO-14P100		100	11.64	295.7	11.79	12.15	299.5	308.6	3350	231	180	325	244	441	1"M	
GTLBO-14P80		80	12.07	306.6	12.22	12.53	310.4	318.3	3350	231	180	325	244	441	1"M	
GTLBO-14P60		60	12.42	315.5	12.57	12.84	319.3	326.1	3350	231	180	325	244	441	1"M	
GTLBO-14PXS		XS	12.64	321.1	12.79	13.04	324.9	331.2	3350	231	180	325	244	441	1"M	
GTLBO-14P40		40	12.77	324.4	12.92	13.16	328.2	334.3	3350	231	180	325	244	441	1"M	
GTLBO-14PSTD		30/STD	12.93	328.4	13.08	13.30	332.2	337.8	3350	231	180	325	244	441	1"M	
GTLBO-14P20		20	13.08	332.2	13.22	13.43	335.8	341.1	3350	231	180	325	244	441	1"M	
GTLBO-14P10		10	13.21	335.5	13.32	13.56	338.3	344.4	3350	231	180	325	244	441	1"M	
GTLBO-14P10S		10S	13.36	339.3	13.47	13.69	342.1	347.7	3350	231	180	325	244	441	1"M	
GTLBO-14P5		5	13.44	341.4	13.60	13.81	345.4	350.8	3350	231	180	325	244	441	1"M	
GTLBO-16P160		16	160	12.25	311.2	12.40	12.67	315.0	321.8	3350	231	180	325	244	441	1"M
GTLBO-16P140	140		12.57	319.3	12.72	12.96	323.1	329.2	3350	231	180	325	244	441	1"M	
GTLBO-16P120	120		13.04	331.2	13.19	13.62	335.0	345.9	3350	231	180	325	244	441	1"M	
GTLBO-16P100	100		13.45	341.6	13.60	13.98	345.4	355.1	3350	231	180	325	244	441	1"M	
GTLBO-16P80	80		13.85	351.8	14.00	14.34	355.6	364.2	3350	231	180	325	244	441	1"M	
GTLBO-16P60	60		14.28	362.7	14.38	14.72	365.3	373.9	3350	231	180	325	244	441	2"M	
GTLBO-16P40	40/XS		14.64	371.9	14.74	15.03	374.4	381.8	3350	231	180	325	244	441	2"M	
GTLBO-16PSTD	30/STD		14.93	379.2	15.08	15.29	383.0	388.4	3350	231	180	325	244	441	2"M	
GTLBO-16P20	20		15.08	383.0	15.22	15.43	386.6	391.9	3350	231	180	325	244	441	2"M	
GTLBO-16P10	10		15.22	386.6	15.32	15.56	389.1	395.2	3350	231	180	325	244	441	2"M	
GTLBO-16P10S	10S/5		15.36	390.1	15.48	15.73	393.2	399.5	3350	231	180	325	244	441	2"M	
GTLBO-18P160	18		160	13.87	352.3	13.97	14.60	354.8	370.8	3350	231	180	325	244	441	1"M
GTLBO-18P140			140	14.31	363.5	14.41	14.99	366.0	380.7	3350	231	180	325	244	441	2"M
GTLBO-18P120			120	14.71	373.6	14.86	15.33	377.4	389.4	3350	231	180	325	244	441	2"M
GTLBO-18P100		100	15.18	385.6	15.33	15.74	389.4	399.8	3350	231	180	325	244	441	2"M	
GTLBO-18P80		80	15.64	397.3	15.79	16.16	401.1	410.5	3350	231	180	325	244	441	2"M	
GTLBO-18P60		60	16.07	408.2	16.22	16.53	412.0	419.9	3350	231	180	325	244	441	2"M	
GTLBO-18P40		40	16.50	419.1	16.64	16.91	422.7	429.5	3350	231	180	325	244	441	2"M	
GTLBO-18PXS		XS	16.64	422.7	16.79	17.03	426.5	432.6	3350	231	180	325	244	441	2"M	
GTLBO-18P30		30	16.77	426.0	16.92	17.16	429.8	435.9	3350	231	180	325	244	441	2"M	
GTLBO-18PSTD		STD	16.93	430.0	17.08	17.29	433.8	439.2	3350	231	180	325	244	441	2"M	
GTLBO-18P20		20	17.08	433.8	17.22	17.43	437.4	442.7	3350	231	180	325	244	441	2"M	
GTLBO-18P10		10	17.22	437.4	17.37	17.56	441.2	446.0	3350	231	180	325	244	441	2"M	
GTLBO-18P10S		10S/5	17.37	441.2	17.56	17.73	446.0	450.3	3350	231	180	325	244	441	2"M	
GTLBO-20P160		20	160	15.50	393.7	15.59	16.30	396.0	414.0	3350	231	180	325	244	441	2"M
GTLBO-20P140	140		15.94	404.9	16.04	16.68	407.4	423.7	3350	231	180	325	244	441	2"M	
GTLBO-20P120	120		16.45	417.8	16.55	17.13	420.4	435.1	3350	231	180	325	244	441	2"M	
GTLBO-20P100	100		16.91	429.5	17.06	17.53	433.3	445.3	3350	231	180	325	244	441	2"M	
GTLBO-20P80	80		17.45	443.2	17.60	18.01	447.0	457.5	3350	231	180	325	244	441	2"M	
GTLBO-20P60	60		17.93	455.4	18.07	18.43	459.0	468.1	3350	231	180	325	244	441	2"M	
GTLBO-20P40	40		18.42	467.9	18.57	18.87	471.7	479.3	3350	231	180	325	244	441	2"M	
GTLBO-20P30	30/XS		18.64	473.5	18.79	19.07	477.3	484.4	3350	231	180	325	244	441	2"M	
GTLBO-20PSTD	20/STD		18.93	480.8	19.08	19.32	484.6	490.7	3350	231	180	325	244	441	2"M	
GTLBO-20P10	10/10S/5		19.28	489.7	19.38	19.70	492.3	500.4	3350	231	180	325	244	441	2"M	

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**Table 3: GripTight Elbow Test Plug Information**

Sales Number	Elbow		Plug OD		Functional I.D. Range				Maximum Test Pressure		Installation Torque				NPT Size
	Size	Schedule			(in)		(mm)				FT-LBS		N-m		
			(in)	(mm)	Min	Max	Min	Max	(PsiG)	(BarG)	Nominal	Max	Nominal	Max	
	GTLBO-22P160	22	160	17.19	436.6	17.29	17.75	439.2	450.9	3350	231	180	325	244	
GTLBO-22P140	140		17.68	449.1	17.78	18.24	451.6	463.3	3350	231	180	325	244	441	2"M
GTLBO-22P120	120		18.20	462.3	18.30	18.90	464.8	480.1	3350	231	180	325	244	441	2"M
GTLBO-22P100	100		18.71	475.2	18.86	19.36	479.0	491.7	3350	231	180	325	244	441	2"M
GTLBO-22P80	80		19.20	487.7	19.39	19.83	492.5	503.7	3350	231	180	325	244	441	2"M
GTLBO-22P60	60		19.75	501.7	19.94	20.31	506.5	515.9	3350	231	180	325	244	441	2"M
GTLBO-22PXS	XS		20.57	522.5	20.79	21.07	528.1	535.2	3350	231	180	325	244	441	2"M
GTLBO-22PSTD	20/STD		20.86	529.8	21.08	21.33	535.4	541.8	3350	231	180	325	244	441	2"M
GTLBO-22P10	10/10S		21.16	537.5	21.38	21.60	543.1	548.6	3350	231	180	325	244	441	2"M
GTLBO-24P160	24		160	18.79	477.3	18.89	19.35	479.8	491.5	3350	231	180	325	244	441
GTLBO-24P140		140	19.29	490.0	19.39	19.85	492.5	504.2	3350	231	180	325	244	441	2"M
GTLBO-24P120		120	19.78	502.4	19.96	20.57	507.0	522.5	3350	231	180	325	244	441	2"M
GTLBO-24P100		100	20.35	516.9	20.54	21.07	521.7	535.2	3350	231	180	325	244	441	2"M
GTLBO-24P80		80	20.97	532.6	21.19	21.65	538.2	549.9	3350	231	180	325	244	441	2"M

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