

## Operating Procedures for 26” through 48” GripTight MAX® High Pressure Test Plug

Thank you for choosing to use a GripTight MAX (GTMAX®) 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 MAX 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 (2 inch for all plugs).
3. Pipe cap(s) or couplings with working pressure greater than or equal to the test pressure being used (see Table 1 for size).

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

### WARNING

- ⚠ **GT MAX 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 MAX Test Plug during pressure testing. Never stand in the potential path of a GripTight MAX 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 MAX 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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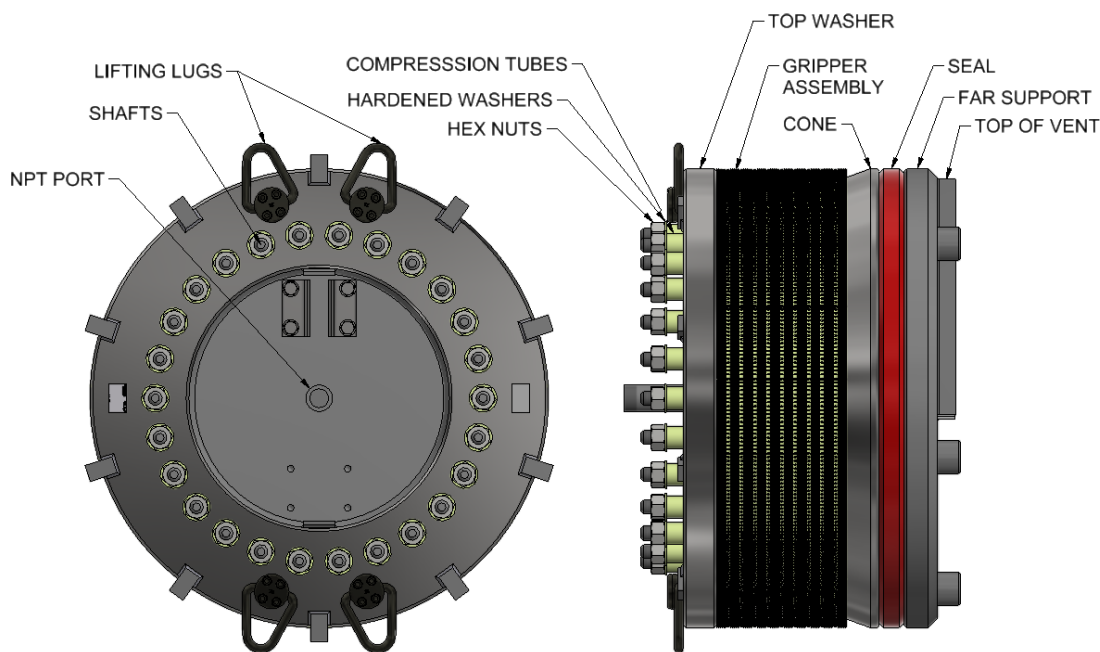


Figure 1 42" GripTight MAX High Pressure Test Plug

## 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 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 <u>must not</u> 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.									
<div style="border: 2px solid red; padding: 5px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>⚠ Failure to properly lubricate Shaft thread and Washer surfaces may result in unsafe operating conditions or plug leakage.</p> </div>									
<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. 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. 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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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.								
2.7. Clean and dry the inside of the pipe.	<ul style="list-style-type: none"> <li>All moisture, debris, and excessive scale must be removed from the pipe ID to ensure a proper seal is established during the pressure test.</li> </ul>								

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**Step/Action****Additional Action/Information/Result**

- 2.8. Verify that the pipe size and schedule stamped on the GripTight MAX Test Plug is equivalent to the size of the pipe you are testing, or that the inside diameter (ID) of the equipment being tested is within the ID operating range for the GripTight MAX Test Plug being used.
- 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.

**NOTE:**

Schedule 5 wall thickness pipe, or tubes with a wall thickness less than equivalent Schedule 10/10S pipe, must have an OD restraint. Contact EST Customer Service for information.

- See Table 1 and Table 2 for the Functional ID Operating Range for GripTight MAX Test Plugs.

**CAUTION**

- ⚠ Special caution must be taken when applying lubricant and handling the GripTight MAX Test Plug. The lubricant must not come in contact with the Seal, the Gripper Teeth, or the inside of the pipe or tube.

### 3. Installing and Using the Lifting Fixture

- 3.1. EST Group Lifting Fixtures are strongly recommended for every application as they enhance the safety of the installation of the High Pressure GTMAX Plug. See DC2595 for Operating Procedures for Test Plug Lifting Fixture.
- 3.2. Contact EST Group for additional information for Lifting Fixtures.

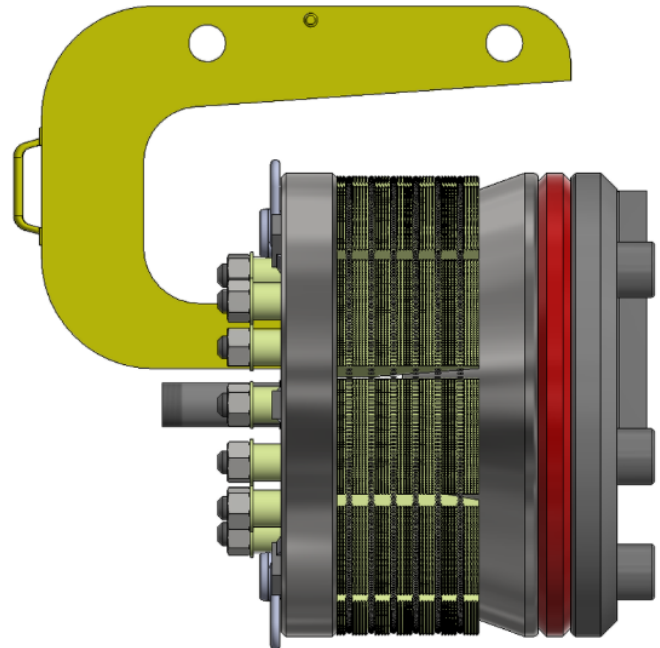


Figure 2 GTMAX Plug with Lifting Fixture

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## 4. Performing the Pressure Test

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

Step/Action	Additional Action/Information/Result
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- 4.1. Place the GripTight MAX Test Plug inside the pipe. The GripTight MAX Test Plug must be able to fit with the full length of the Grippers inside the pipe. Ideally, the plug should be inserted until the positioning washer contacts the face of the equipment being tested.

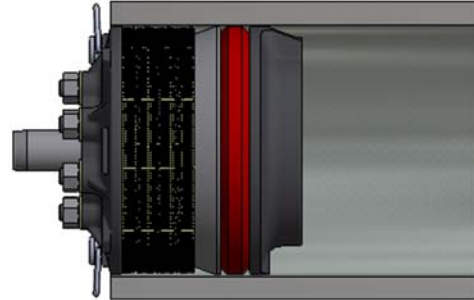


Figure 3 GTMAX Plug Fully Inserted in Host Pipe

- 4.2. If testing in seam-welded pipe, position the Grippers so that the weld seam is between two Gripper segments.
- 4.3. Center the GripTight MAX Test Plug within the pipe and hand tighten the Hex Nuts until the test plug has gripped the pipe ID.

**Note:** Slight wiggling of the plug may allow for further hand tightening of the Hex Nut(s).

- 4.4. 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.

If	Then
Using GripTight MAX Test Plugs horizontally,	Tighten the bottom Hex Nuts first to help center the GripTight MAX Test Plug within the pipe.

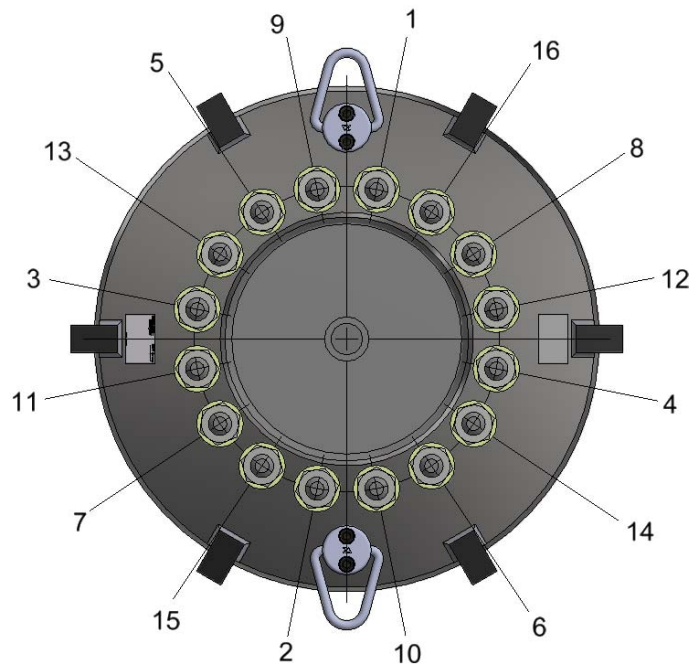


Figure 4 STAR Pattern for 16 Bolts

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Step/Action	Additional Action/Information/Result
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4.5. 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 MAX Test Plugs. See Table 1 for nominal and maximum installation torques.

**CAUTION**

- ⚠ 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.
- ⚠ Some crowfoot wrenches may not be able to apply the required amount of torque for some GripTight MAX 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 MAX Test Plug.
- ⚠ Failure to apply at least the nominal installation torque from Table 1 may result in unsafe operation of the plug.
- ⚠ 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.

4.6. If a Safety Gag or Pipe Restraint 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.



**Figure 5 Manual Torque Wrench**

4.7. 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.

- For GripTight MAX 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.

**CAUTION**

- ⚠ 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 MAX Test Plugs being used have been properly installed.

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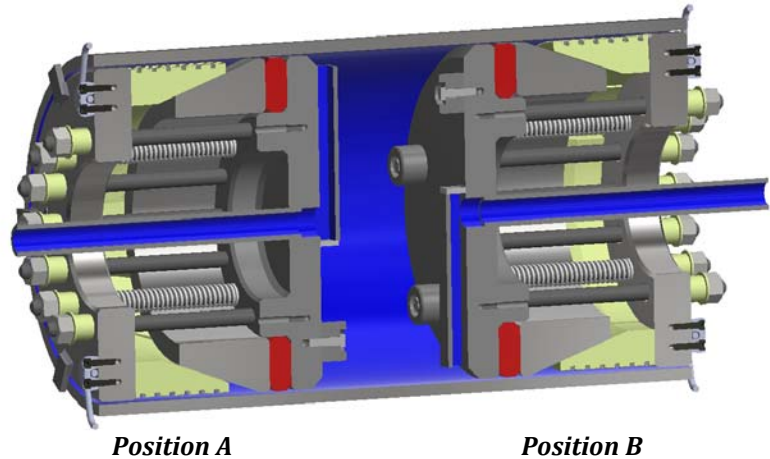
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**Step/Action****Additional Action/Information/Result**

4.8. Fill the pipe with test medium.



- Check for any leaks while filling.
- If using multiple GTMAX test plugs, fill the pipe or tube being tested through GTMAX Test Plug in position B (the Fill position) until test medium flows steadily out of GTMAX Test Plug in position A (the Vent position).
- If not using fill and vent plugs, displace residual gases from the test system by opening the system at its highest point.

**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.**

4.9. Perform the pressure test.

4.10. Check for leaks. A drop in pressure may not necessarily indicate a leak, as the GripTight MAX Test Plugs require some time to “settle” while pressure is applied and the testing is being performed.

- Slowly introduce the test pressure. 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 MAX TEST PLUG BEING USED.
- Imperfections within the pipe being tested may cause small leaks.
- Seam welded pipes occasionally require some weld bead to be removed. If the pipe is seam-welded and leaking persists after additional tightening, remove the weld bead in the area where the GripTight MAX Test Plug seal is installed.
- If leaks persist, additional tightening of the Hex Nuts may be required. RELEASE ALL TEST PRESSURE before making adjustments to the GTMAX Test Plug.
- Do not exceed the maximum torque for the GripTight MAX Test Plug. See Table 1 for torque values.

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Step/Action	Additional Action/Information/Result
<p>4.11. Verify that GripTight MAX 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 MAX Test Plug.</p> <p>⚠ Release all pressure prior to adjusting GripTight MAX Test Plug torque.</p> </div>	<ul style="list-style-type: none"> <li>• For Multi-Shaft GripTight MAX 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 MAX Test Plug.</li> <li>• Examine the GripTight MAX Test Plug components for wear. Pay particular attention to the condition of the Grippers. Replace parts as necessary.</li> <li>• Reinstall the GripTight MAX Test Plug, following all instructions provided. Increase the installation torque used. Do not exceed the maximum torque rating for the plug.</li> </ul>
<p>4.12. 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 MAX 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 MAX plugs in the Vent/Fill positions, to recover test medium, apply low pressure air to plug in Position A (see Section 4.8 reference).</li> <li>• Loosen the Hex Nut(s), remove the GripTight MAX Test Plug from the pipe and then inspect the GripTight MAX Test Plug for any deformation or damage.</li> <li>• If the plug is difficult to remove, wait for the seal to relax (up to 10 minutes) and a gentle wiggle of the shafts or tap on the positioning washer, will help.</li> </ul>
<div style="border: 1px solid red; padding: 10px;"> <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 MAX Test Plugs to prevent unsafe conditions from occurring during removal, e.g. water spills onto a catwalk creating slippery conditions.</p> </div>	

## 5. Storage

- Prior to storing, clean and dry the GripTight MAX 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.
- Ensure the hex nuts are backed off so the seal can fully relax.
- 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 MAX 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 GTMAX should be stored in a in a plastic bag or wrap.
- Store these instructions with each GripTight MAX Test Plug.

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**Table 1: GripTight MAX Test Plug Information**

Part Number	Pipe Size	Pipe Schedule	Plug OD		Functional I.D. Range				Maximum Test Pressure		Installation Torque				NPT Size
					(in)		(mm)				FT-LBS		N-m		
			(in)	(mm)	Min	Max	Min	Max	(PsiG)	(BarG)	Nominal	Max	Nominal	Max	
GTMAX-26PXS	26	XS	24.42	620.3	24.72	25.32	627.9	643.1	1200	83	250	450	339	610	2"M
GTMAX-26PSTD	26	STD	24.92	633.0	25.22	25.82	640.6	655.8	1200	83	250	450	339	610	2"M
GTMAX-28PXS	28	XS	26.42	671.1	26.72	27.32	678.7	693.9	1200	83	250	450	339	610	2"M
GTMAX-28PSTD	28	STD	26.92	683.8	27.22	27.82	691.4	706.6	1200	83	250	450	339	610	2"M
GTMAX-30PXS	30	XS	28.42	721.9	28.72	29.32	729.5	744.7	1000	69	250	450	339	610	2"M
GTMAX-30PSTD	30	STD	28.92	734.6	29.22	29.82	742.2	757.4	1000	69	250	450	339	610	2"M
GTMAX-32PXS	32	XS	30.42	772.7	30.72	31.32	780.3	795.5	900	62	250	450	339	610	2"M
GTMAX-32PSTD	32	STD	30.92	785.4	31.22	31.82	793.0	808.2	900	62	250	450	339	610	2"M
GTMAX-34PXS	34	XS/ STD	32.67	829.8	32.97	33.57	837.4	852.7	900	62	250	450	339	610	2"M
GTMAX-34P10	34	10	32.98	837.7	33.28	33.88	845.3	860.6	900	62	250	450	339	610	2"M
GTMAX-36PXS	36	XS	34.42	874.3	34.72	35.32	881.9	897.1	800	55	250	450	339	610	2"M
GTMAX-36PSTD	36	STD	34.92	887.0	35.22	35.82	894.6	909.8	800	55	250	450	339	610	2"M
GTMAX-38PXS	38	XS	36.42	925.1	36.72	37.32	932.7	947.9	750	52	250	450	339	610	2"M
GTMAX-38PSTD	38	STD	36.92	937.8	37.22	37.82	960.6	960.6	750	52	250	450	339	610	2"M
GTMAX-40PXS	40	XS	38.42	975.9	38.72	39.32	983.5	998.7	750	52	250	450	339	610	2"M
GTMAX-40PSTD	40	STD	38.92	988.6	39.22	39.82	996.2	1011.4	750	52	250	450	339	610	2"M
GTMAX-42PXS	42	XS	40.42	1026.7	40.72	41.32	1034.3	1049.5	700	48	250	450	339	610	2"M
GTMAX-42PSTD	42	STD	40.92	1039.4	41.22	41.82	1047.0	1062.2	700	48	250	450	339	610	2"M
GTMAX-44PXS	44	XS	42.42	1077.5	42.72	43.32	1085.1	1100.3	650	45	250	450	339	610	2"M
GTMAX-44PSTD	44	STD	42.92	1090.2	43.22	43.82	1097.8	1113.0	650	45	250	450	339	610	2"M
GTMAX-46PXS	46	XS	44.42	1128.3	44.72	45.32	1135.9	1151.1	650	45	250	450	339	610	2"M
GTMAX-46PSTD	46	STD	44.92	1141.0	45.22	45.82	1148.6	1163.8	650	45	250	450	339	610	2"M
GTMAX-48PXS	48	XS	46.42	1179.1	46.72	47.32	1186.7	1201.9	600	41	250	450	339	610	2"M
GTMAX-48PSTD	48	STD	46.92	1191.8	47.22	47.82	1199.4	1214.6	600	41	250	450	339	610	2"M

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

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