

OPERATING PROCEDURES FOR BOLT TYPE TEST PLUGS**WARNINGS!**

- ◆ **PRESSURE TESTING IS INHERENTLY DANGEROUS. STRICT ADHERENCE TO THESE OPERATION INSTRUCTIONS AND INDUSTRY SAFETY PRACTICES COULD PREVENT INJURY TO PERSONNEL**
- ◆ **ALL PERSONNEL MUST BE CLEAR OF TEST PLUG WHEN PRESSURE TESTING**
- ◆ **FOR SAFETY, AN INCOMPRESSIBLE LIQUID SUCH AS WATER SHOULD BE USED AS THE TEST MEDIUM.**
- ◆ **RESIDUAL AIR OR GAS IS TO BE EVACUATED FROM THE PIPE PRIOR TO TESTING.**

1. **The pipe to be tested must have an ID within the variance listed in Table.** Position the test plug in a clean, lubricant free pipe end so that the whole seal is within the pipe.
2. Center the plug within the pipe while hand tightening the hex nut(s). For 0.280" - 0.499" (7.11 – 12.67mm) sizes, firmly tighten the knurled nut by hand until spring washers are flat and fully deflected.

WARNING! CONTINUED TIGHTENING OF KNURLED NUT AFTER SPRING WASHERS ARE FULLY COMPRESSED MAY RESULT IN DAMAGE TO THE PLUG.

On multi-shaft plugs used horizontally, tightening the bottom hex nuts first will aid in centering the plug. The hex nuts on plugs with multiple shafts must be tightened in star pattern.

3. Tighten the hex nut(s) to the installation torque specified in Table. Use of a calibrated torque wrench is recommended.

WARNING! FAILURE TO APPLY THE INSTALLATION TORQUE SPECIFIED IN TABLE 1 COULD RESULT IN UNSAFE OPERATION OR LEAKAGE.
4. Install the pressure source or vent to the plug, leak tight. For plugs not being used to pressurize or vent the system, install a pipe cap or pipe plug, leak tight.
5. Fill the pipe with test medium while evacuating any residual air or gas. Slowly introduce the test pressure. The test pressure must never exceed the maximum test pressure listed in Table.
6. As pressure increases, movement of plug as large as 0.10" (2.5mm) may be detected. Should movement of the shaft or plug exceed .10", release **ALL** pressure immediately, remove plug, examine, reinstall and begin testing in accordance with this operating procedure. Should movement of the shaft or plug during the test still exceed 0.10" (2.5mm), contact the factory for technical assistance.
7. At the conclusion of the test, release **ALL** pressure, loosen the hex nut(s), remove and inspect plug. Any plug component that is worn or damaged must be replaced before attempting further testing. Contact factory for replacement part information.
8. Prior to storing, dry all parts of the plug and lubricate the shaft threads and hardened steel washer(s) with antiseize. Store these instructions with the plug.

PIPE OR TUBE ID RANGE		❖ INSTALLATION TORQUE		◆ MAX. TEST PRESSURE		ACCEPTABLE TUBE/PIPE ID VARIANCE FROM NOMINAL	
(in)	(mm)	(ft-lbs)	as listed	(psi)	(Bar)	under	over
0.280" - 0.499"	7.11 – 12.68	Refer to step 2		250	17	0.02" (.5mm)	0.03" (.8mm)
0.500" – 0.719"	12.69 – 18.27	3.3	4.5 N-m	250	17	0.02" (.5mm)	0.03" (.8mm)
0.720" - 0.869	18.28 – 22.08	3.3	4.5 N-m	175	12	0.02" (.5mm)	0.03" (.8mm)
0.870" – 1.429"	22.09 – 36.30	14	19.0 N-m	175	12	0.02" (.5mm)	0.03" (.8mm)
1.430" – 2.169"	36.31 – 55.10	14	19.0 N-m	75	5	0.02" (.5mm)	0.03" (.8mm)
2.17" - 3.50"	55.11 – 89.0	30	40.7 N-m	50	3.4	0.04" (1.0mm)	0.06" (1.5mm)
3.51" - 4.00"	89.1 - 101.7	45	61.0 N-m	40	2.7	0.04" (1.0mm)	0.06" (1.5mm)
4.01" - 4.50"	101.8 - 114.4	45	61.0 N-m	40	2.7	0.05" (1.3mm)	0.06" (1.5mm)
4.51" - 6.00"	114.5 - 152.5	100	135.6 N-m	25	1.7	0.05" (1.3mm)	0.06" (1.5mm)
6.01" - 6.50"	152.6 - 165.2	100	135.6 N-m	25	1.7	0.05" (1.3mm)	0.06" (1.5mm)
6.51" - 8.00"	165.3 - 203.3	100	135.6 N-m	15	1.0	0.05" (1.3mm)	0.06" (1.5mm)
8.01" - 8.50"	203.4 - 216.0	100	135.6 N-m	15	1.0	0.06" (1.5mm)	0.08" (2.0mm)
8.51" - 10.50"	216.1 - 266.8	25	33.9 N-m	10	.7	0.06" (1.5mm)	0.08" (2.0mm)

Specifications subject to change without notice.

- ❖ **INSTALLATION TORQUES ARE FOR STANDARD NEOPRENE SEALS, DO NOT EXCEED VALUES BY MORE THAN 5%**
- ◆ **MAXIMUM TEST PRESSURES HAVE BEEN DETERMINED FROM TESTS PERFORMED IN CLEAN, DRY CARBON STEEL PIPE**



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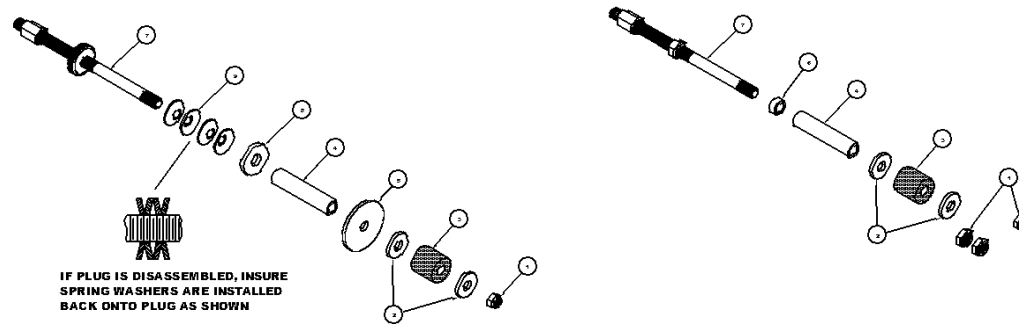
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TYPE 1 & 2

RANGE: 0.280 – 2.169

ITEM	QTY	DESCRIPTION
1	1	LOCKNUT (0.280 - 0.869)
	2	JAMNUT (0.870 - 2.169)
2	2	COMPRESSION WASHER
3	1	SEAL- STANDARD NEOPRENE BTT-XXXX-NRS
4	1	COMPRESSION TUBE
5	1	POSITIONING WASHER (0.280 - 0.499)
6	1	HARDENED WASHER (0.870 - 2.169)
7	1	SHAFT ASSEMBLY INCLUDES KNURLED NUT (0.280 - 0.869) INCLUDES HEXNUT (0.870— 2.169)
8	1	SPACER WASHER (0.280 - 0.499)
9	4	SPRING WASHER (.280 – 0.499)



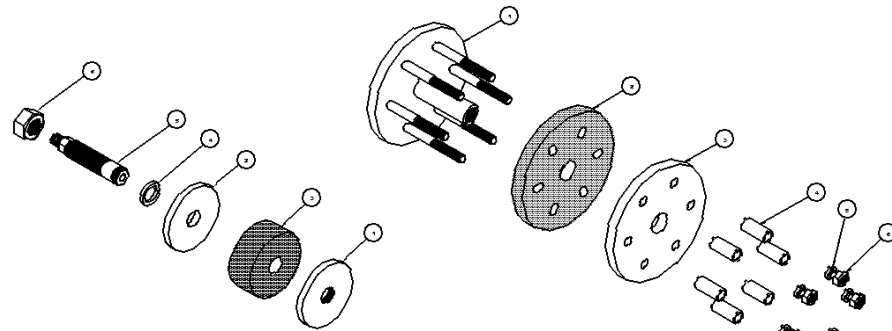
TYPE 1 (0.280 - 0.499)

TYPE 2 (0.500 - 2.169)

TYPE 3

RANGE: 2.17 – 8.50

ITEM	QTY	DESCRIPTION
1	1	BTM COMPRESSION WASHER
2	1	TOP COMPRESSION WASHER
3	1	SEAL – STANDARD NEOPRENE BTT-XXXX-NRS
4	1	HARDENED WASHER
5	1	SHAFT
6	1	HEXNUT



TYPE 3 (2.1700 - 8.50)

TYPE 4 (8.51 - 10.50)

TYPE 4

RANGE: 8.51 – 10.50

ITEM	QTY	DESCRIPTION
1	1	COMPRESSION WASHER & SHAFT ASSEMBLY
2	1	SEAL – STANDARD NEOPRENE BTT-XXXX-NRS
3	1	COMPRESSION WASHER
4	6	COMPRESSION TUBE
5	6	HARDENED WASHER
6	6	HEXNUT

QUESTIONS?

Contact EST Group Customer Service at any of the following locations with questions.

- In USA and Canada: tel: 800-355-7044, 215-721-1100; e-mail: est-info@curtisswright.com
- In Europe: tel: +31-172-418841; e-mail: est-emea@curtisswright.com
- In Asia: tel: +65-6745-8560; e-mail: est-asia@curtisswright.com
- In China: tel: +86-10-65058966; e-mail: est-china@curtisswright.cn
- On the Internet: <http://estgroup.cwfc.com>

EST Group provides a complete range of repair products, services, and replacement parts covering the life cycle of heat exchangers and condensers; additionally EST Group provides products and services to facilitate pressure testing pipe, piping systems, pressure vessels, and their components. Visit EST Group on the Internet at <http://estgroup.cwfc.com>.



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