

OPERATING PROCEDURES FOR G-150A TUBE TESTING GUNS

NOTE: Numbers in parentheses refer to parts list for G-150A guns. See pages 4 through 6.

PRIOR TO TESTING:

1. The tubes to be tested should be cleaned and any loose deposits or scale should be removed. If the tubes have not been cleaned, any foreign materials present may be expelled from the tube during testing operation and may damage the test guns or injure the operators.
2. The operators should always wear safety glasses or a face shield when testing with the G-150A or any type of pressure test guns.
3. If the tubes have been chemically cleaned, please contact E.S.T. directly to determine the compatibility of the test gun seals with the cleaning agent. Alternate material seals are available.
4. Make sure the test guns have the correct size Seal and Washer Set (2) on them for the tubes being tested. Seal and washer set part number, GSA-XXXX-N, where XXXX is the number listed in the chart (see Table 1 below) for the appropriate tube OD and wall thickness (BWG). Seal and washer sets contain two seals and four washers. The seals and washers are correctly sized if the OD of the seal is 0.030" to 0.050" (0.76 to 1.27mm) smaller than the actual tube ID. Using seals that are too small may cause the following: premature seal wear, jamming of the test gun in the tube, or expulsion of the test gun from the tube end. Replacement seals for the G-150A testing guns can be manufactured for any tube ID from 1.24" to 2.53" (31.50 to 64.26mm). The procedure for replacing the seals and washer sets is outlined below.

TABLE 1 – G-150A Replacement Seal And Washer Set Sizing Chart

BWG	NOMINAL TUBE SIZE						
	1 3/8	1 1/2	1 5/8	1 3/4	2	2 1/4	2 1/2
8-9			0131	0143	0168	0193	0218
10-11		0122	0137	0150	0173	0198	0223
12-13		0128	0140	0153	0178	0203	0228
14-15	0122	0134	0147	0158	0183	0208	0232
16-17	0126	0137	0150	0162	0187	0212	0237
18-19	0128	0140	0153	0165	0190	0215	0240
20-24	0131	0143	0156	0168	0193	0218	0243

TESTING PROCEDURE: The G-150A Tube Testing Guns come as a set. This set is comprised of: an air injection gun (see page 5) and a plugging gun (see page 6). The air injection gun can be differentiated from the plugging gun because it incorporates the valve block (19) and air regulator (20).

1. Attach air supply to both guns. The G-150A test guns will be operational on plant air supplies ranging from 40 to 125 psi (2.7 to 8.6 Bar) at a minimum of 5 cfm. The maximum test pressure of the tube is dependent on the tube ID and the air supply pressure (see Table 2).
2. On the air injection gun, turn the adjusting nut on the air regulator (20) counterclockwise to set the tube testing pressure to zero.



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TABLE 2 - Maximum Tube Test Pressure Versus Air Supply Pressure And Tube ID

NOMINAL TUBE SIZE (in)	AIR SUPPLY PRESSURE -PSI				
	40	60	80	100	125
	MAXIMUM TEST PRESSURE - PSI				
1 3/8	40	60	80	100	125
1 1/2	30	40	50	60	75
1 5/8	20	30	40	50	60
1 3/4	20	30	40	50	60
2	15	20	25	30	35
2 1/4	10	15	20	25	30
2 1/2	5	10	15	20	25

3. Insert the air injection gun into one end of the tube to be tested and the plugging gun into the other end. The seal should be fully into the tube and the backup washer (3) should be against the tube end.
4. Press the "CYL" button on the valve block (19) of the air injection gun, and squeeze the handle of the air control valve (10) on the plugging gun and hold until the guns are firmly held in the tubes. Release both handle/button.
5. Press the "TUBE" button on the valve block (19) on the air injection gun and adjust the air regulator (20) clockwise until the desired tube test pressure is achieved (use Table 2 for maximum tube test pressures available).

NOTE: The air pressure regulator (20) must be readjusted if testing different size tubes or if air supply pressure changes.

6. Both injection gun and plugging gun operators should observe the pressure gage (7) on their respective guns. Any decrease in the pressure will indicate a leaking tube.
7. Press the bleed valve (12) on the injection gun between the gage (7) and the cylinder body (8) to bleed off the air pressure in the tube. After the tube test pressure has bled to zero, press the bleed valve (12) on both guns to release the pressure in the cylinder and relax the seals.
8. Remove the test guns and move on to the next tube. Mark each leaking tube encountered for repair. The total operation should be completed in 5 to 10 seconds. Your actual testing time will depend on the amount of time you choose to hold the pressure test.
9. Repeat steps 3 through 6 for each tube to be tested.

INSTALLING REPLACEMENT SEALS:

Replacement seals for the G-150A guns are always supplied with the corresponding size washers. Always replace the seals and washers on both guns at the same time.

1. Remove the locknut (1) from the end of the support tube (4) and set it aside.
2. Remove the Seal and Washer Set (2) from the support tube (4). Discard if worn. Under optimum testing conditions you should be able to test between 500 to 1000 tubes per Replacement Seal and Washer Set.



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3. If you are replacing the Seal and Washer Set with the same size set then reverse steps 1 and 2 above. If you are changing the seal and washer set to test a different size tube, please keep in mind that you may also have to change the back-up washer (3) as well. (See parts list).
4. When replacing the locknut (1) on the support tube (4) do not use a wrench, screw it on finger tight only. A small space between the locknut, seal and washer set, and back-up washers is normal. There will be enough stroke in the air cylinder to compensate for this space.

OTHER REPLACEMENTS AND REPAIRS:

Under no condition should you attempt to service the air cylinders. Any attempt will void any and all remaining warranties, implied or otherwise. Please contact EST Customer Service regarding these and other repairs and service. EST is not responsible for the misuse or misapplication of our test equipment.

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

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TABLE 3. G-150A PARTS LIST

G-150A Tube Testing Gun Set Parts List			
Item	Quantity	Description	Part Number
1	2	Lock Nut 1.24" – 2.53"	GSA-1532
2	1	Seal & Washer Set, Neoprene	*GSA-XXXX-N
3	2	Back-up Washer Set 1.24" to 1.63"	GSA-1523
		Back-up Washer Set 1.64" to 2.03"	GSA-1524
		Back-up Washer Set 2.04" to 2.53"	GSA-1525
4	2	Support Tube 1.24" to 2.53"	See Item 5
5	2	Support Tube Assembly 1.24" to 1.63" (Includes 1, 3, & 4)	GSA-1513
		Support Tube Assembly 1.64" to 2.03" (Includes 1, 3, & 4)	GSA-1514
		Support Tube Assembly 2.04" to 2.53" (Includes 1, 3, & 4)	GSA-1515
6	2	Handle	GSA-1572
7	2	Pressure Gage, 0-160psi	GSA-1540
8	2	Cylinder Body Assembly Complete (Includes Nose Cone)	GSA-1581
9	2	Short Nipple, 1/8 NPT	GSA-1552
10	1	Air Control Valve (Plugging Gun Only)	GSA-1550
11	1	Reducing Bushing, 1/4 to 1/8 NPT (Plugging Gun Only)	GSA-1551
12	3	Bleed Valve	GSA-1560
13	1	Male Swivel Elbow, 10-32 to 1/4" Tube (Injection Gun Only)	GSA-1556
14	3	Male Elbow, 1/8NPT – 1/4 Tube	GSA-6560
15	1	** Polyethylene tubing 1/4" x 6-3/8 long (Injection Gun Only)	GSA-1600
16	1	** Polyethylene tubing 1/4" x 3-5/8 long (Injection Gun Only)	
17	1	** Polyethylene tubing 1/4" x 6-1/2 long (Plugging Gun Only)	
18	1	Air Control Block (Injection Gun Only)	GSA-1554
19	1	Valve Block (Injection Gun Only)	GSA-6691
20	1	Adjustable Air Regulator (Injection Gun Only)	GSA-1555
21	2	Check Valve, 1/4NPT	GSC-6693
22	2	Three Way Control Valve	GSA-1558
23	2	Valve Actuator	GSA-1559
24	2	Male Tee, 1/8NPT	GSA-1541
25	1	Male Branch Tee, 1/8NPT to 1/4NPT (Injection Gun Only)	GSA-1543
26	1	Female Tee, 1/8NPT (Plugging Gun Only)	GSA-1542

* SEAL AND WASHER SET PART NUMBER, GSA-XXXX-N, WHERE XXXX IS THE NUMBER LISTED IN THE CHART (SEE TABLE 1 PAGE 1) FOR THE APPROPRIATE TUBE OD AND WALL THICKNESS (BWG). SEAL MATERIAL DESIGNATION: N-NEOPRENE, V-FLUOROELASTOMER (VITON OR EQUIVALENT) G-150A SEAL AND WASHER SETS CONTAIN TWO SEALS AND FOUR WASHERS.

** THE REQUIRED LENGTHS OF 1/4" POLYETHYLENE TUBING FOR BOTH THE INJECTION GUN AND THE PLUGGING GUN, (ITEMS 15 THROUGH 17) ARE INCLUDED IN GSA-1600 REPLACEMENT TUBING SET.



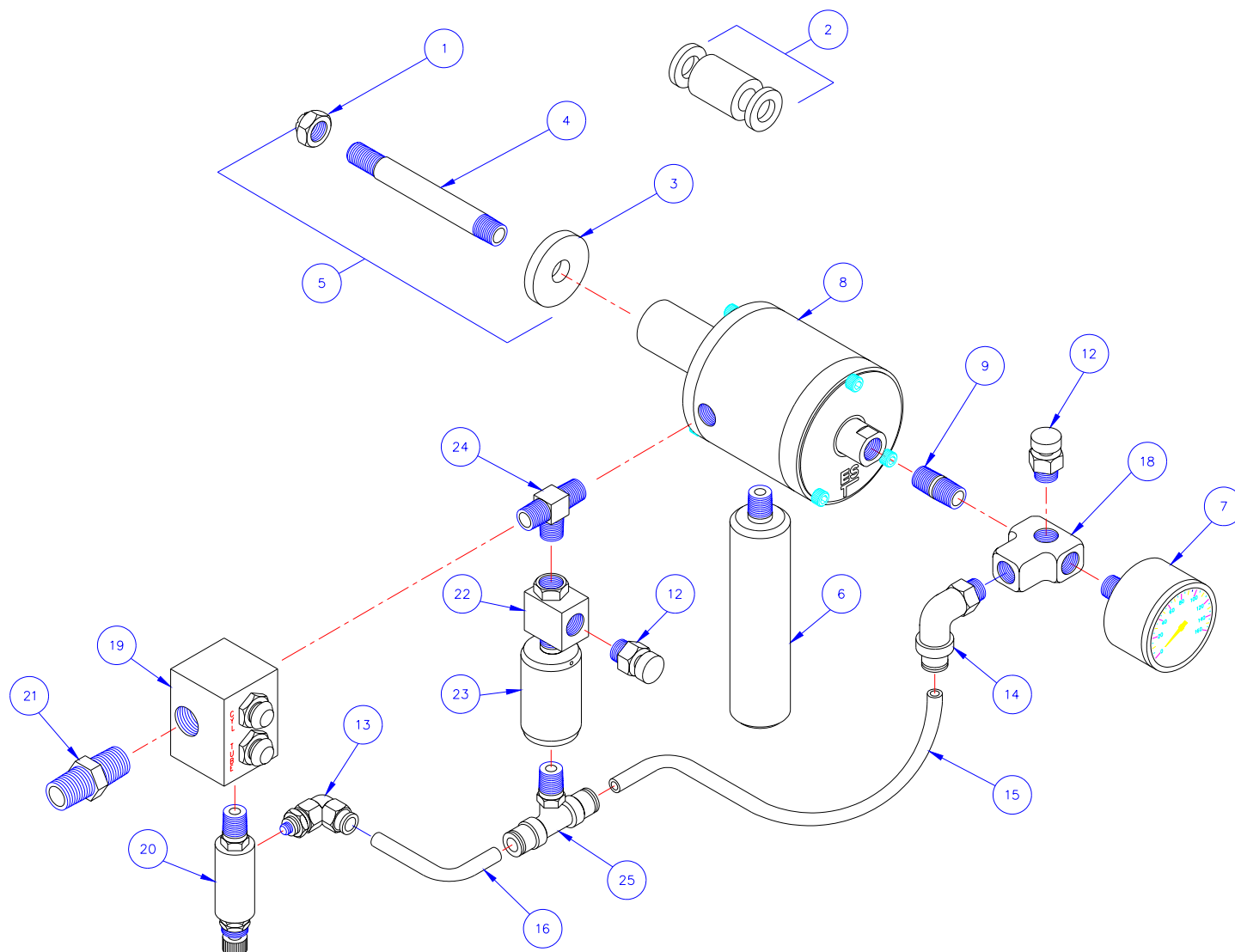
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G-150A AIR INJECTION GUN

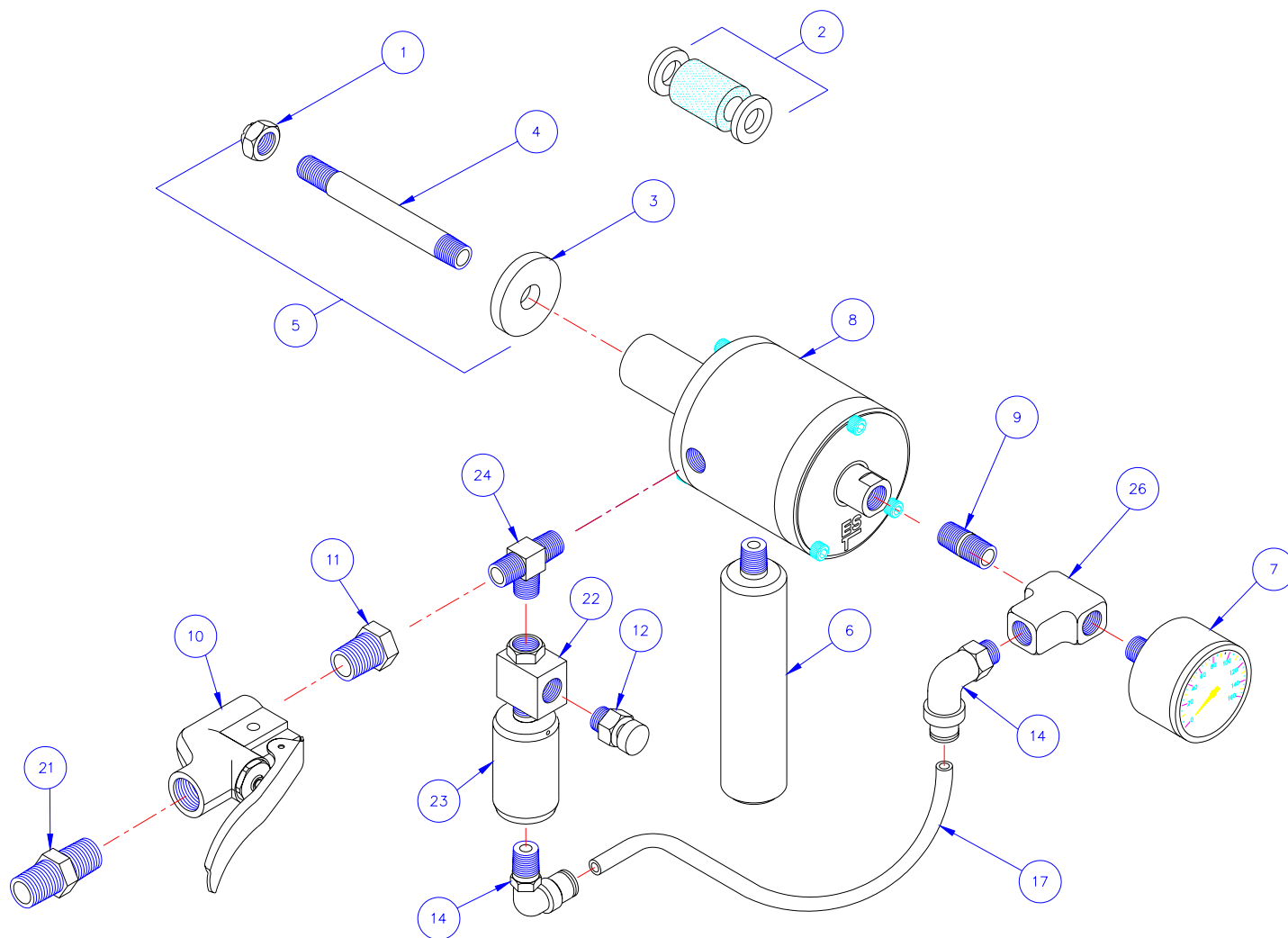
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G-150A PLUGGING GUN

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OPERATING PROCEDURES FOR G-150 TUBE TESTING GUNS

NOTE: See pages 4-6 for parts and drawings of the G-150 as indicated in instructions below.

PRIOR TO TESTING:

1. The tubes to be tested should be cleaned and any loose deposits or scale should be removed. If the tubes have not been cleaned, any foreign materials present may be ejected during the testing operation and may damage the test guns or injure the operators.
2. The operators should always wear safety glasses or a face shield when testing with the G-150 or any type of pressure test guns.
3. If the tubes have been acid cleaned please check with EST Customer Service regarding the compatibility of the test gun seals with the cleaning agent. Different types of elastomer seals are available as replacements.
4. Make sure the test guns have the correct size Replacement Seal and Washer Set (2) for the tubes being tested. The seals and washers are correctly sized if the OD of the seal is between 0.02" to 0.06" (0.5mm to 1.5mm) smaller than the actual tube ID. Using seals that are too small may cause any of the following: premature seal wear, jamming of the test gun in the tube, or expulsion of the test gun from the tube end. Replacement seals for the G-150 testing guns can be manufactured for any tube I.D. from 0.28" to 1.23" (7.1mm to 31.3mm). For tube ID's larger than 1.23", contact EST for information on the G-150A Test Gun Package. The procedure for replacing the seal and washer sets is outlined below.

TESTING PROCEDURE:

Never actuate the injection gun unless the seal assembly is installed within the proper ID tube as the washers could be forced into the seal ID.

The G-150 Tube Testing Guns come as a set. This set is comprised of: an air injection gun and a plugging gun. The air injection gun can be differentiated from the plugging gun because it incorporates the air control valve (10) and bleed valve (12). The plugging gun is a slave to the injection gun and will not operate without it.

1. Attach air supply to the air injection gun. The G-150 test guns will be operational on plant air supplies ranging from 40 to 125 psi (2.7 to 8.6 Bar) at a minimum of 5 cfm. If testing tube ID's from 0.28 to 0.48" (7.1 to 12.3 mm) the regulator assembly (part number GSA-REG) is required. Install regulator assembly (14) with arrow pointing towards gun onto nipple leak tight and attach air supply to regulator input. For tube ID's from 0.28 - 0.48" adjust regulator to 40 – 60 psi (2.7 to 4.1 Bar) by rotating adjustment knobs while viewing gage.
2. Insert the air injection gun into one end of the tube to be tested and the plugging gun into the other end. Apply enough pressure to seat the back-up washer (3) firmly against the end of the tube. Maintain this pressure throughout the test.



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3. After making sure that the plugging gun operator is ready, squeeze the handle of the air control valve (10) on the injection gun and hold until the reading on the pressure gauge (7) stabilizes.
4. Release the handle of the air control valve (10). It will automatically return to the closed position isolating the tube being tested. The Tube is now under pressure.
5. Both injection gun and plugging gun operators should observe the pressure gage (7) on their respective guns. Any decrease in the pressure indicated on the gauge (7) will indicate a leaking tube.
6. Press the bleed valve (12) on the injection gun to bleed off the air pressure in the tube and air cylinders and to relax the seals.
7. Remove the test guns and move on to the next tube. Mark each leaking tube encountered for repair. The total operation should be completed in 5 to 10 seconds. Your actual testing time will depend on the amount of time you choose to hold the test pressure.
8. Repeat steps 2 through 7.

INSTALLING REPLACEMENT SEALS:

Replacement seals for the G-150 guns are supplied with the corresponding size washers. Always replace the seals and washers on both guns at the same time.

1. Remove the locknut (1) from the end of the support tube (4) and set it aside.
2. Remove the Seal and Washer Set (2) from the support tube (4). Discard if worn. Under optimum testing conditions you should be able to test between 100 to 500 tubes per Replacement Seal and Washer Set.
3. For replacement Seal and Washer sets of the same size, install on existing support tube (4). If you are changing the Seal and Washer set to a different size, keep in mind that the support tube assembly (5) may be required to change as well. To replace the support tube assembly, refer to the procedure outlined below.
4. When replacing the locknut (1) on the support tube (4) do not use a wrench, screw it on finger tight only. A small space between the locknut, seal and washer set, and back-up washers is normal. There will be enough stroke in the air cylinder to compensate for this space.

REPLACING THE SUPPORT TUBE ASSEMBLY:

The G-150 test guns are originally shipped with three sets of support tube assemblies (5). These support tube assemblies will allow you to test tubes with ID's from 0.28" - 0.48", 0.49" to 0.83" and 0.84" to 1.23" (7.1mm to 12.3mm, 12.4mm to 21.2mm, and 21.3mm to 31.3mm respectively).

1. Remove the Seal and Washer Sets (2) as outlined above.
2. Using an open end wrench on the wrench flats provided on the piston and a pipe wrench on the support tube (4) gently unscrew the support tube from the piston.



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3. Choose the correct size support tubes for the tube ID being tested. All three sizes of support tubes will fit into the piston of the test gun. Use Never-seize or similar product to lubricate and seal the threads. Do not over tighten the support tube.
4. Repeat steps 1 thru 3 for the remaining gun.
5. If testing tube ID's from 0.28" - 0.48" (7.1mm to 12.3mm) thread the regulator assembly with arrow pointing towards gun onto nipple leak tight.
6. Prior to replacing the Seal and Washer Set (2) and the Back-up Washer Set (3) inspect the support tube for scars left from the replacement procedure. File smooth if present.

OTHER REPLACEMENTS AND REPAIRS:

Under no conditions should you attempt to service the air cylinders. Any attempt to perform service on the cylinders may void any and all remaining warranties, implied or otherwise.

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TABLE 1 Seal & Washer sets listed below are not included in the G-150 Tube Test Gun Package. Seal & Washer sets are required for all applications. See Table 3 for XXXX sizing.

Item	Quantity	Description	Part Number for Tube ID's Listed		
			0.28" - 0.48"	0.49" - 0.83"	0.84" - 1.23"
2	Minimum 1 set	Seal & Washer Set	GSA-XXXX-N (Neoprene)		

TABLE 2 Replacement Parts for G150 Tube Testing Gun Set (Injection & Plugging Gun) Part # GSA-1500

Item	Quantity	Description	Part Number for Tube ID's Listed		
			0.28" - 0.48"	0.49" - 0.83"	0.84" 1.23"
1	1 each gun	Lock Nut	GSA-1530	GSA-1531	GSA-1532
3	1 each gun	Back-up Washer Set (includes elastomer & steel washer)	GSA-1520	GSA-1521	GSA-1522
4	1 each gun	Support Tube	Supplied as part of item 5		
5	1 each gun	Support Tube Assembly (includes items 1,3 &4)	GSA-1510	GSA-1511	GSA-1512
6	1	Handle, ported w/o bleed valve (Injection Gun only)	GSA-1571		
7	1 each gun	Pressure Gauge, 0-160 psi	GSA-1540		
8	1 each gun	Cylinder Body Complete	GSA-1580		
9	1	Reducing Nipple, 1/4-1/8 NPT (Injection Gun Only)	GSA-1551		
10	1	Air Control Valve (Injection Gun Only)	GSA-1550		
11	1	2 1/2" Nipple, 1/4 NPT (Injection Gun Only)	GSA-1548		
12	1	Bleed Valve (Injection Gun Only)	GSA-1560		
13	2	Handle, w/o port (Plugging Gun Only)	GSA-1572		
14	1	Regulator Assembly	GSA-REG	Not required	
15	1 each gun (Optional)	Support rod Extension (Available in 1, 2, 3, & 4ft lengths)	GSA-1510-XX	GSA-1511-XX	GSA-1512-XX

TABLE 3 Seal & Washer Set Part Numbers, GSA-XXXX-N, where XXXX is the number listed in the chart for the appropriate tube OD and BWG. Seal and Washer Sets for the tube IDs 0.28"-0.48" contain (4) seals and (4) washers. All other Seal and Washer Sets contain (2) seals and (4) washers.

G-150 Seal & Washer Sets, Part Numbers (GSA-XXXX-N)									
BWG	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
8-9	N/A	0030	0043	0056	0068	0081	0093	0106	0118
10-11	N/A	0037	0047	0062	0072	0087	0097	0112	0122
12-13	0028	0040	0053	0065	0078	0090	0103	0115	See G-150A
14-15	0033	0047	0056	0072	0083	0097	0110	0122	
16-17	0037	0050	0062	0075	0087	0100	0112	See G-150A	
18-19	0040	0053	0065	0078	0090	0103	0115		
20-24	0043	0056	0068	0081	0093	0106	0118		



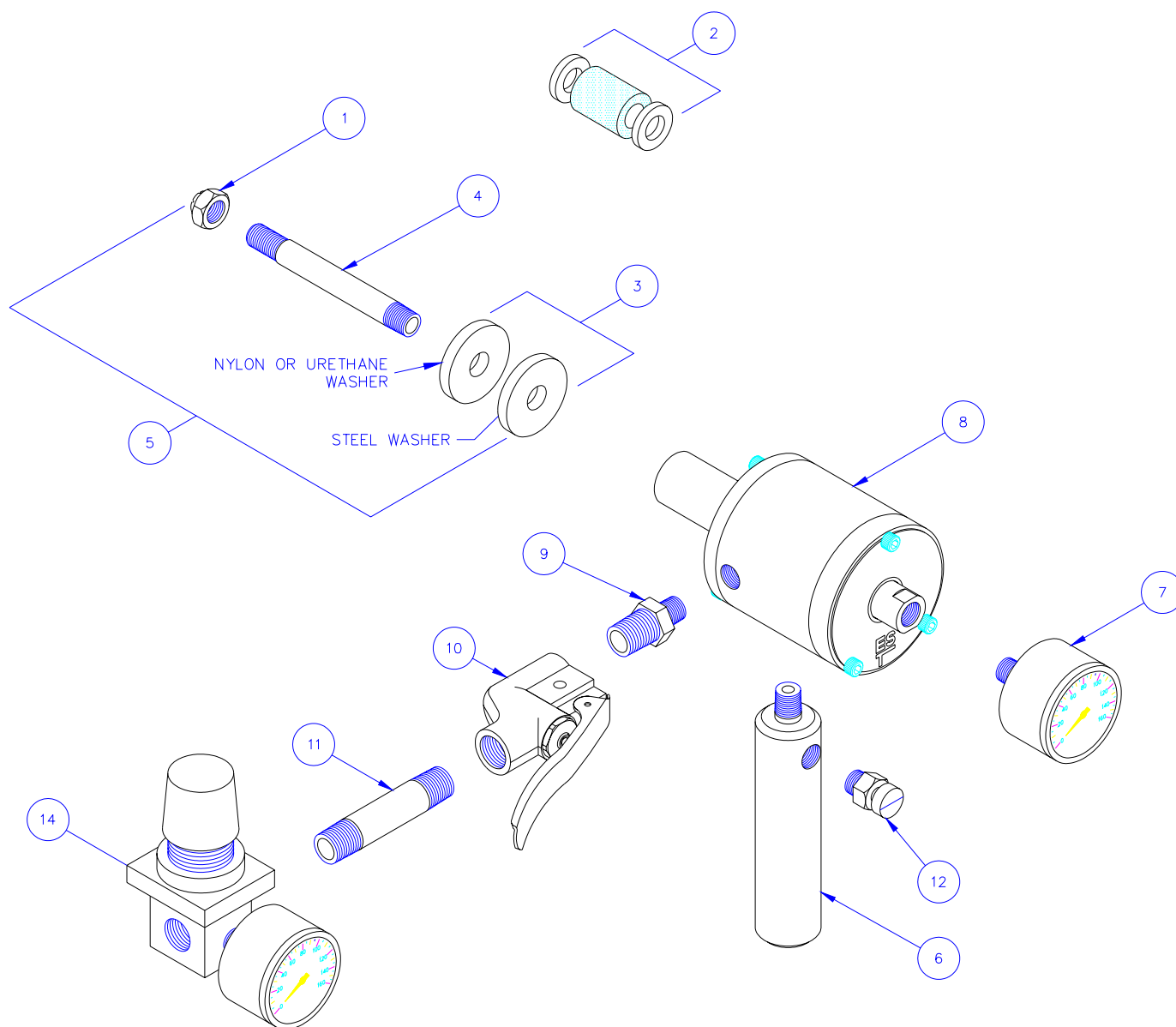
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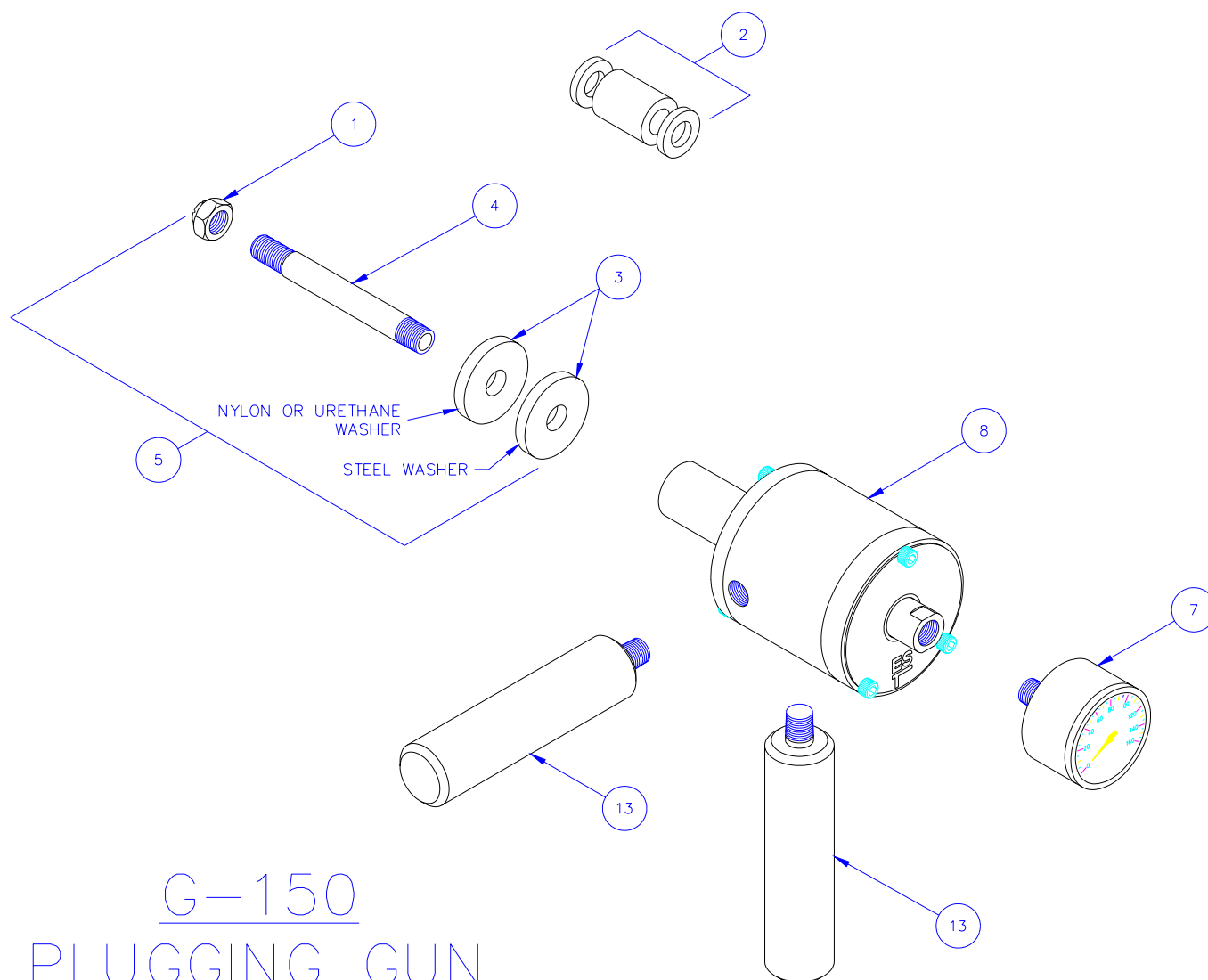
G-150 INJECTION GUN



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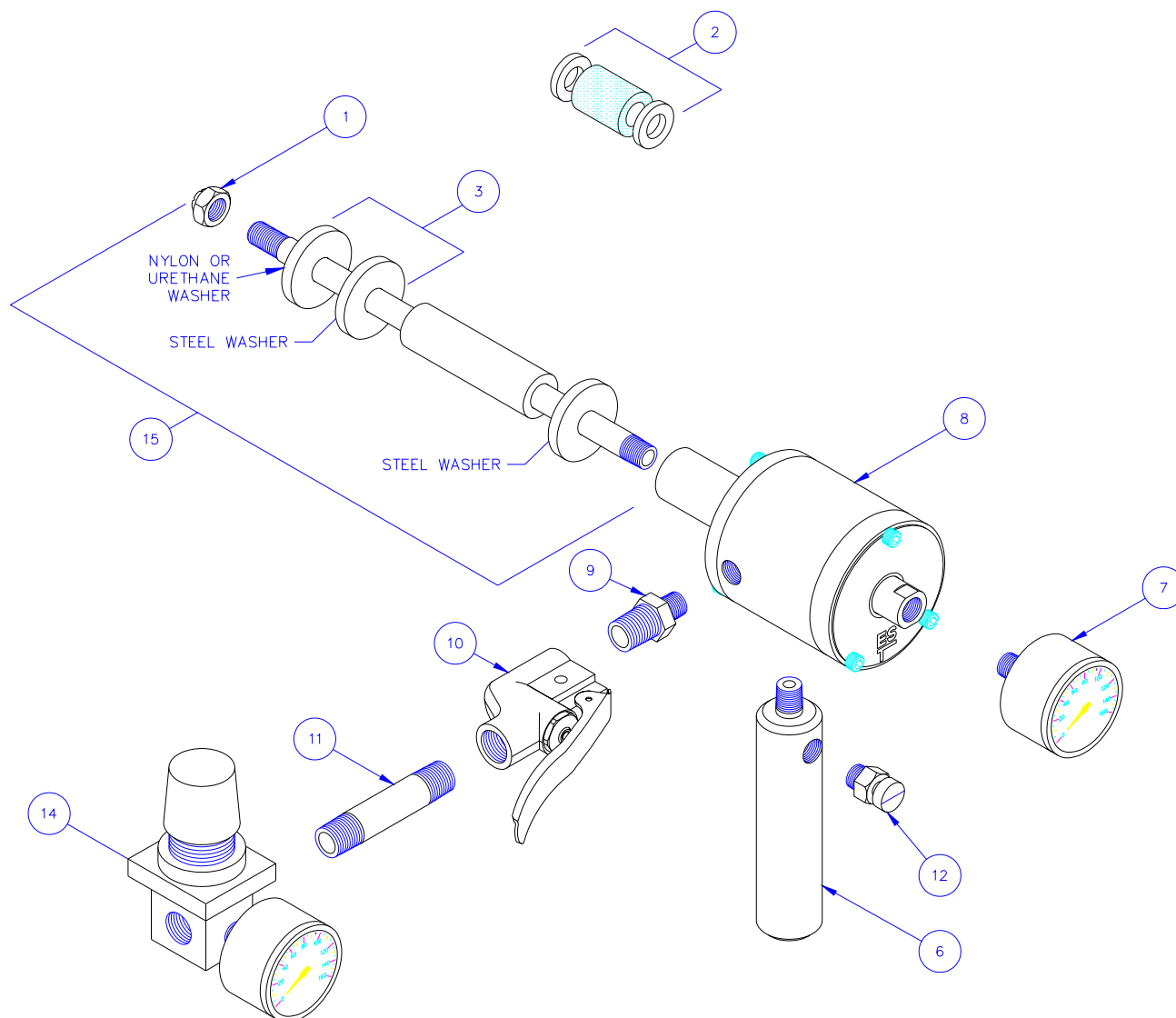
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SPECIALISTS IN TUBE TESTING, SLEEVING AND PLUGGING TECHNOLOGY

AN ISO-9001 REGISTERED COMPANY



G-150

W/ OPTIONAL SUPPORT
ROD EXTENSION



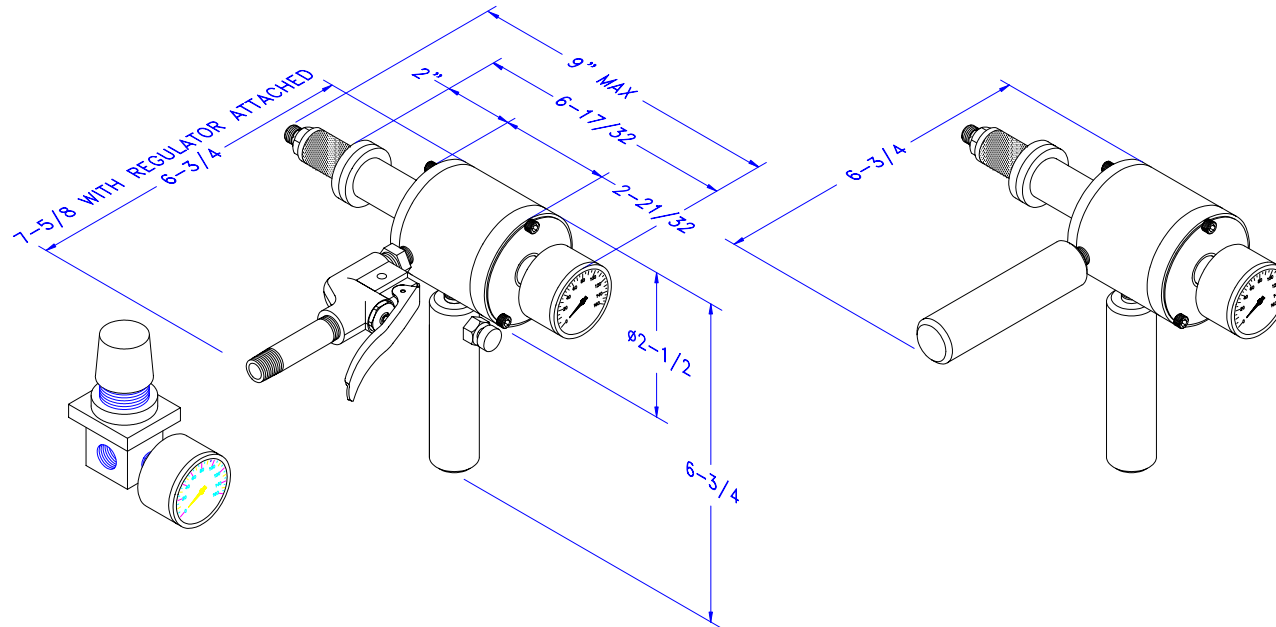
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G150 GUN SET DIMENSIONAL DRAWING**NOTES:**

1. STROKE IS 1"
2. DIMENSIONS ARE REFERENCE ONLY
3. UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE THE SAME ON BOTH GUNS

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

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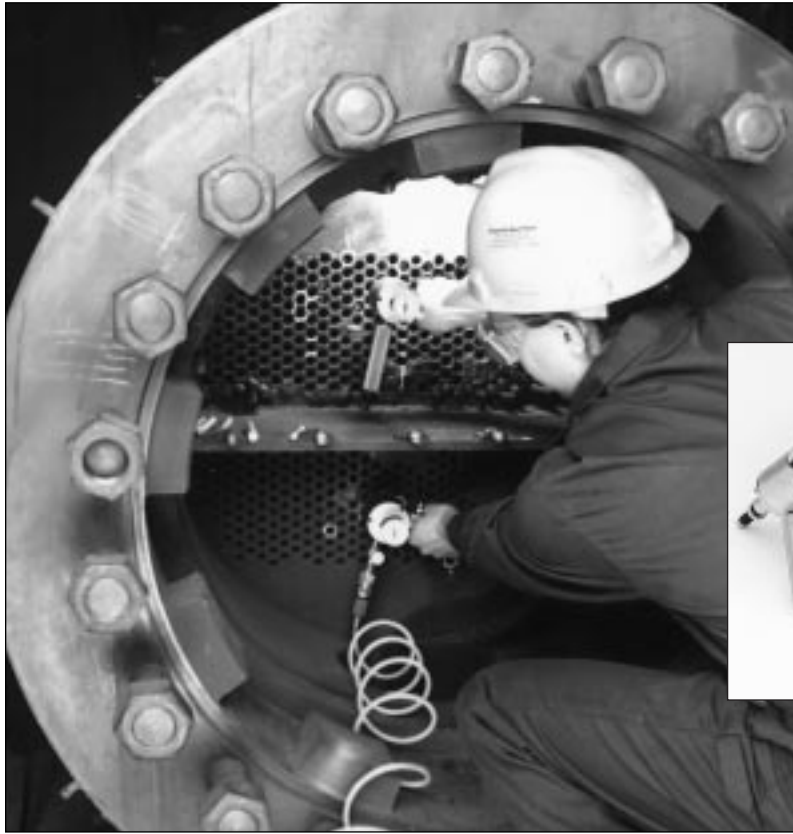
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G-150 Tube Testing Gun Set



G-150 Testing Guns

G-450 Testing Guns

G-650 Testing Guns



The Fast, Effective Way To Test For Tube Leaks



Find leaking heat exchanger tubes leaks quickly and easily, with EST's G-150 Tube Testing Gun Set. Just connect to plant air, insert the Air Injection Gun in one end of the tube, the Plugging Gun into the other, and press an air control valve. Air expands the seals on both guns and pressurizes the tube. When the pressure in the tube stabilizes, release the air control valve. Any reduction of pressure will be indicated on the integral pressure gauge to reveal even the smallest tube leak. With the G-150 Tube Testing Gun Set, you can pneumatically test from 3 to 10 tubes per minute — all with significantly less operator fatigue and greater operator safety. Comes complete with three rod and tube assemblies to test tubes from .28" to 1.23" (7.1 to 31.2 mm) ID.

Here's what the G-150 Tube Testing Gun Set has to offer:

- **Interchangeable Seal and Washer Sets:** Allows testing of tubes from .28" to 1.23" (7.1 to 31.2 mm) ID.
- **Light Weight:** Each gun weighs less than 2.1 lb (1 kg).
- **Uses standard plant air supplies from 40 to 125 psi (2.7 to 8.5 bar)¹.**
- **Standard seal material:** Neoprene, Viton® optional.
- **Quality Assurance System:** Meets requirements of ANSI N45.2, 10CFR50 Appendix B, 10CFR21, and is certified to ISO-9001.

1. Sizes .28-.48 are limited to 40-60 psi.



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G-150 Tube Testing Guns

Part No.	Description	Tube ID Range
GSA-1500	G-150 Test Gun Package (with support tubes and regulator)	.28" to 1.23" (7.1 to 31.2 mm)
GSA-1504	G-150 Air Injection Gun (with support tubes and regulator)	.28" to 1.23" (7.1 to 31.2 mm)
GSA-1506	G-150 Plugging Gun (with support tubes)	.28" to 1.23" (7.1 to 31.2 mm)

G-150 Neoprene Seal And Washer Sets

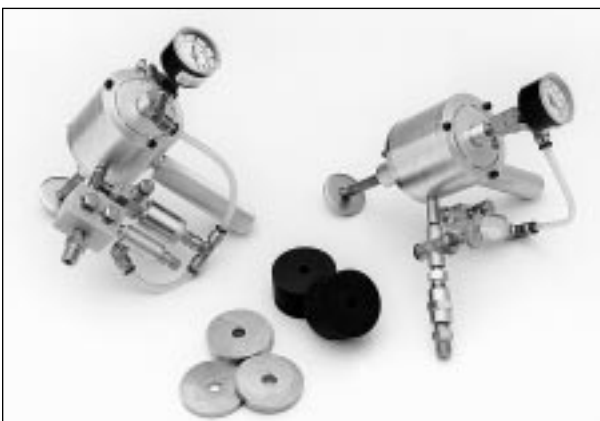
Part number, GSA-XXXX-N, where XXXX is the number listed in the chart for the appropriate tube OD and BWG

Tube OD	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/8"
BWG								
8-9	—	0030	0043	0056	0068	0081	0093	0106
10-11	—	0037	0047	0062	0072	0087	0097	0112
12-13	0028	0040	0053	0065	0078	0090	0103	0115
14-15	0033	0047	0056	0072	0083	0097	0110	0122
16-17	0037	0050	0062	0075	0087	0100	0112	—
18-19	0040	0053	0065	0078	0090	0103	0115	—
20-24	0043	0056	0068	0081	0093	0106	0118	—

Notes:

- Seal and washer sets for tube IDs .28"-.48" (7.1-31.2mm) contain (4) seals and (4) washers. All other seal and washer sets contain (2) seals and (4) washers.
- For seal sizing and part numbers for applications in SWG, metric, or other tube sizes, contact EST directly.
- Optional seal material: Viton®.

G-150A Tube Testing Gun Set



The G-150A Testing Guns operate in tube sizes up to 2.53" ID (64.3 mm), and weigh less than 2.7 lbs (1.2 kg) each.

G Series Guns now come with a durable tool box that includes a new seal size gage, as well as internal compartments for the storage of seals and rod and tube extensions.

Specifications subject to change without notice.

G-150 Support Tube Assemblies

Longer lengths (1-4 ft) can be used for easier testing when a channel head or water box is present.

Length	Tube ID Range	Part Number
Standard	.28" to .48" (7.1 to 12.3 mm)	GSA-1510
	.49" to .83" (12.4 to 21.2 mm)	GSA-1511
	.84" to 1.23" (21.3 to 31.2 mm)	GSA-1512
1 ft (304.8 mm)	.28" to .48" (7.1 to 12.3 mm)	GSA-1510-01
	.49" to .83" (12.4 to 21.2 mm)	GSA-1511-01
	.84" to 1.23" (21.3 to 31.2 mm)	GSA-1512-01
2 ft (609.6 mm)	.28" to .48" (7.1 to 12.3 mm)	GSA-1510-02
	.49" to .83" (12.4 to 21.2 mm)	GSA-1511-02
	.84" to 1.23" (21.3 to 31.2 mm)	GSA-1512-02
3 ft (914.4 mm)	.28" to .48" (7.1 to 12.3 mm)	GSA-1510-03
	.49" to .83" (12.4 to 21.2 mm)	GSA-1511-03
	.84" to 1.23" (21.3 to 31.2 mm)	GSA-1512-03
4 ft (1,219.2 mm)	.28" to .48" (7.1 to 12.3 mm)	GSA-1510-04
	.49" to .83" (12.4 to 21.2 mm)	GSA-1511-04
	.84" to 1.23" (21.3 to 31.2 mm)	GSA-1512-04

Note: The .28-.48 size support tube is limited to 60 psi max. A regulator is supplied with the set for this purpose.



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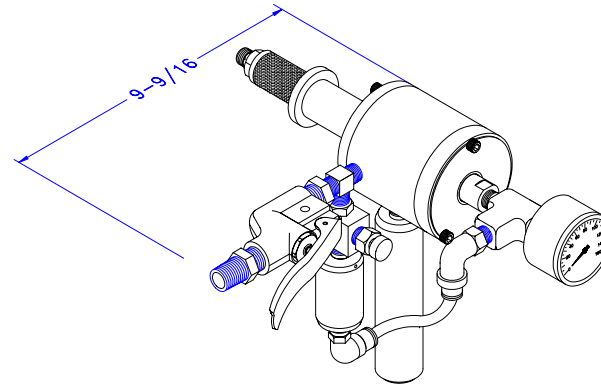
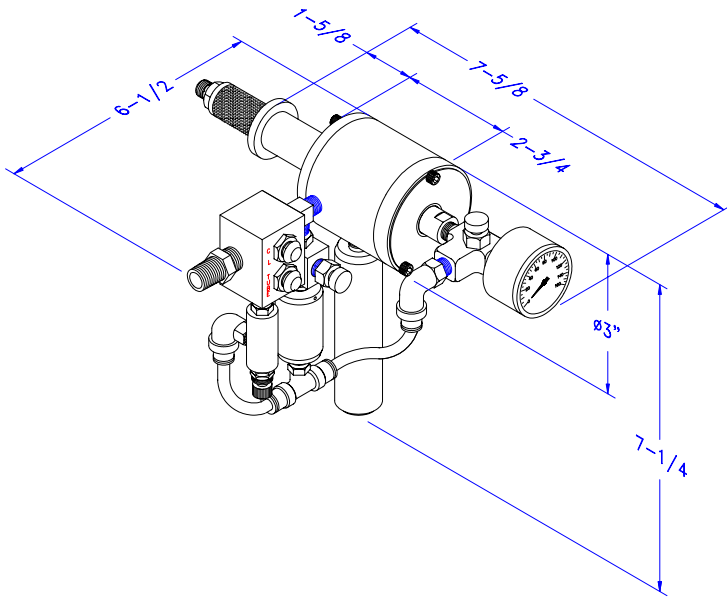
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Viton® is a registered trademark of Du Pont Dow Elastomers

G150 A TEST GUN SET DIMENSIONAL DRAWING



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