

G-650 Vacuum Joint Tester

Find Tube Joint Leaks Fast

Quickly test expanded tube-to-tubesheet joints for leakage. Ideal for heat exchanger manufacturers or companies performing retubing operations. The G-650 Vacuum Joint Tester seals the tube I.D. and the tubesheet face, then evacuates the tube end at the joint. A loss of vacuum indicates a leaky tube joint.

Interchangeable manifolds and seal & washer sets allow the G-650 Tool to test tube-to-tubesheet joints on 3/8" to 1 1/4" (9.5mm to 31.8mm) O.D. tubes.

Larger G-650A Vacuum Joint Tester will accommodate tube O.D. sizes from 1 1/2" to 2 1/2" (38.1-63.5mm). Digital Pressure Gauges are also available. Uses standard compressed air supply - 40 to 125 PsiG (2.7 to 8.5 BarG).



Interchangeable

Manifolds/Seal & Washer sets for G-650 3/8 - 1 1/4 in (9.53 - 31.75 mm)
& G-650A 1 1/2 - 2 1/2 in (38.1 - 63.5 mm)

Standard Seal Material

Neoprene, Fluoroelastomer (Viton® or equivalent) optional

Lightweight

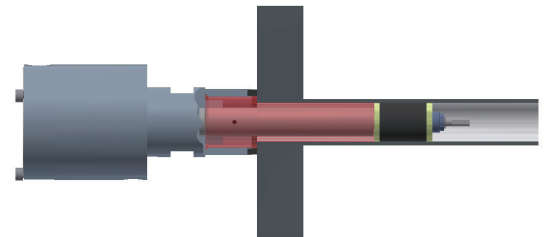
Weighs less than 2.7 lbs. (1.2 kg), when equipped with a 3/4 in manifold

Uses standard plant air supplies

40 -125 PsiG (2.8 -8.6 BarG)

Compliant with several QA Systems, including; ANSI N45.2,
10 CFR 50 App. B, and 10 CFR 21

Manufactured in an ISO 9001 registered facility



G-650

Nominal Tube Size (inches(mm))	Tube ID Size Range (inches (mm))	Gun Part Number	Manifold Part Number	Square Ring Part Number
3/8 (9.5)	0.28 - 0.34 (7.1 - 8.6)	GSC-6506	GSC-6606	GSC-6706
1/2 (12.7)	0.28 - 0.46 (7.1 - 11.7)	GSC-6508	GSC-6608	GSC-6708
5/8 (15.9)	0.29 - 0.49 (7.4 - 12.4)	GSC-6509	GSC-6609	GSC-6709
5/8 (15.9)	0.50 - 0.59 (12.7 - 15.0)	GSC-6510	GSC-6610	GSC-6710
3/4 (19.1)	0.42 - 0.47 (10.7 - 11.9)	GSC-6511	GSC-6611	GSC-6711
3/4 (19.1)	0.48 - 0.71 (12.2 - 18.0)	GSC-6512	GSC-6612	GSC-6712
7/8 (22.2)	0.55 - 0.84 (14.0 - 21.3)	GSC-6514	GSC-6614	GSC-6714
1 (25.4)	0.67 - 0.96 (17.0 - 24.4)	GSC-6516	GSC-6616	GSC-6716
1 1/8 (28.6)	0.80 - 1.09 (20.3 - 27.7)	GSC-6518	GSC-6618	GSC-6718
1 1/4 (31.8)	0.92 - 1.21 (23.4 - 30.7)	GSC-6520	GSC-6620	GSC-6720

G-650A

Nominal Tube Size (inches(mm))	Tube ID Size Range (inches(mm))	Gun Part Number	Manifold Part Number	Square Ring Part Number
1 1/2 (38.1)	1.17 - 1.46 (29.7 - 37.1)	GSC-6524	GSC-6624	GSC-6724
1 5/8 (41.2)	1.30 - 1.59 (33.0 - 40.4)	GSC-6526	GSC-6626	GSC-6726
1 3/4 (44.5)	1.42 - 1.71 (36.1 - 43.4)	GSC-6528	GSC-6628	GSC-6728
2 (50.8)	1.64 - 1.96 (41.7 - 49.8)	GSC-6532	GSC-6632	GSC-6732
2 1/4 (57.2)	1.92 - 2.21 (48.8 - 56.1)	GSC-6536	GSC-6636	GSC-6736
2 1/2 (63.5)	2.17 - 2.46 (55.1 - 62.5)	GSC-6540	GSC-6640	GSC-6740

G-650/G-650A Manifold

Extensions

For easier testing when a channel head or water box is present.

Length (feet(cm))	Part Number
1 (30.5)	GSC-6700-01
2 (61.0)	GSC-6700-02
3 (91.4)	GSC-6700-03
4 (121.9)	GSC-6700-04

G-650 / G-650A Neoprene Seal and Washer Set

BWG	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-5/8"	1-3/4"	2"	2-1/4"	2-1/2"
8-9		0030	0043	0056	0068	0081	0093	0106	0118	0131	0143	0168	0193	0218
10-11		0037	0047	0062	0072	0087	0097	0112	0122	0137	0147	0173	0198	0223
12-13	0028	0040	0053	0065	0078	0090	0103	0115	0128	0140	0153	0178	0203	0228
14-15	0033	0047	0056	0072	0083	0097	0110	0122	0134	0147	0158	0183	0208	0232
16-17	0037	0050	0062	0075	0087	0100	0112	0126	0137	0150	0162	0187	0212	0237
18-19	0040	0053	0065	0078	0090	0103	0115	0128	0140	0153	0165	0190	0215	0240
20-24	0043	0056	0068	0081	0093	0106	0118	0131	0143	0156	0168	0193	0218	0243

Notes

1. Tube ID range is for pricing of seal/washer sets only. The actual size needed for the XXXX number is listed in the BWG sizing chart below. For seal sizing and part numbers for SWG, Metric or other tubes, contact EST Group customer service.
2. Seal and Washer sets contain two seals and four washers
3. Standard seal material is (-N) Neoprene. Alternate seal material is (-V) Fluoroelastomer, Viton® or equivalent
4. Caution: G-650 tools cannot be used where the tubesheet is extremely corroded/eroded; where tube ends are flared and flares overlap; or where tube-to-tubesheet joints are welded.

Ordering Information

- Please provide tube OD
- Provide tube pitch & weld size if available

Viton® is a registered trademark of Du Pont Dow Elastomers

For more information on our full line of Tube Testing Tools, please visit www.cw-estgroup.com

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OPERATING PROCEDURES FOR G650 / G650A VACUUM JOINT TESTING GUN

PRIOR TO TESTING:

- The tube ends being tested should be cleaned and any loose deposits or scale should be removed. Any scale present in the tube end may be drawn into the testing gun and clog the internal filter washer, causing the test gun to erroneously indicate a joint leak.
- Visually inspect the tubesheet. Seriously eroded tubesheets may not be able to be tested using the G-650 since the test gun must seal on the tubesheet face. In some cases use of silicone gasket sealant on the square elastomer ring may aid in making a leak tight seal.
- Make sure the test gun has the correct size seal and manifold (2 and 6) for the tubes to be tested. G-650 / 650A Seal and Washer Sets should be sized using Table 1. The size of the manifold in inches will be stamped on the body of the manifold and should correspond with the tube OD of the tubes being tested. The correct seal size is considered to be when the seal OD is smaller than the actual tube ID by 0.02 to 0.06" (0.5mm to 1.5mm). If either the Manifold or the Seal and Washer Sets are to be changed please refer to the replacement procedure listed below.

Table 1. G-650 / G-650A Gun Seal and Washer Set Part Numbers.														
G-SERIES REPLACEMENT SEAL DASH NUMBER (XXXX)														
BWG - Birmingham Wire Gauge														
BWG	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	2	2 1/4	2 1/2
8-9		0030	0043	0056	0068	0081	0093	0106	0118	0131	0143	0168	0193	0218
10-11		0037	0047	0062	0072	0087	0097	0112	0122	0137	0147	0173	0198	0223
12-13	0028	0040	0053	0065	0078	0090	0103	0115	0128	0140	0153	0178	0203	0228
14-15	0033	0047	0056	0072	0083	0097	0110	0122	0134	0147	0158	0183	0208	0232
16-17	0037	0050	0062	0075	0087	0100	0112	0126	0137	0150	0162	0187	0212	0237
18-19	0040	0053	0065	0078	0090	0103	0115	0128	0140	0153	0165	0190	0215	0240
20-24	0043	0056	0068	0081	0093	0106	0118	0131	0143	0156	0168	0193	0218	0243

A similar table exists for SWG tubes. Contact EST Customer Service for information.

The G-650 / G-650A Part Number GSC-XXXX-M is defined as follows:

"GSC" identifies the G-650 and G-650A Gun Set.

"XXXX" is Seal Size form the Table above.

"M" is Seal Material Designation

B - Buna-N

N - Neoprene

S - Silicone

V - Fluoroelastomer (Viton® or Equivalent)

TESTING PROCEDURE:

- Attach air supply to the test gun. The G-650 will be operational on air supplies from 40 to 125 psi (3 to 8.6 Bars) at a minimum of 5 cfm (2.3 lps).
- Insert the test gun into the tube to be tested.
- Apply light pressure to seat the square ring (4) firmly against the tubesheet.
- Depress the air control button labeled "CYL" on the valve block assembly (15). Air will then fill the cylinder, expand the seal within the tube end and will draw the tubesheet seal firmly against the tubesheet. This operation should be accomplished in 1 to 2 seconds.
- Depress the air control button labeled "VAC" on the valve block assembly (15). Hold the air control valve in this position until the maximum vacuum is obtained.

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Note: The maximum vacuum obtained will vary in relation to the amount of air being supplied to the test gun.

6. At 100 psi (6.9 Bar) and 10 cfm the venturi is capable of producing a vacuum in excess of 16 in-hg vacuum in just a few seconds. Some experimentation should be performed to determine the vacuum that you will be capable of reaching. Steps 4 and 5 should take an experienced operator no more than about 5 seconds.
7. The gun operator should observe the vacuum gauge (7). A loss of vacuum will indicate a tube joint leak.

Note: Always check possible leaking tubes more than once. Variations in the tubesheet, the technique of the operator, grit lodged in the check valve or seal wear may cause erroneous joint leak indications. Proceed to step 8.

8. To release the air in the cylinder, press the bleed valve (11). Rock the test gun lightly to break the remaining vacuum. Remove the test gun from the tube and rotate the gun approximately 45 degrees. Repeat procedures 2 through 6. If the gun continues to indicate a joint leak mark the tube for repair and continue to the next tube.
9. If the test indicates the tube joint to be sound, press the bleed valve (11) to release the air in the cylinder. Rock the test gun lightly to break the remaining vacuum. Remove the test gun from the tube and continue to the next tube.

REPLACING THE SEAL AND WASHER SET:

G-650 Replacement Seal and Washer Sets should be sized using the Table 1. Replacement seals for the G-650 are supplied with corresponding washers. Always replace the seals and washers at the same time.

1. Remove the locknut (1) from the end of the support tube (3) and set aside.
2. Remove the seal and washers (2). Discard if worn. Under optimum conditions you should be able to test between 100 and 500 tubes per replacement procedure listed below.
3. If you are replacing the seal and washer set with the same size set then reverse steps 1 and 2. If you are changing the seal and washer set to test different size tubes please keep in mind that you may also have to change the support tube. To replace the support tube refer to the replacement procedure listed below.
4. When replacing the locknut (1) on the support tube (3) do not use a wrench, screw it on finger tight only. A small space between the locknut, seal and washer set, and manifold is normal.

REPLACING THE MANIFOLD:

1. Following the procedure outlined above, remove the seal and washer set.
2. Using an open end wrench on the flats provided, gently unscrew the manifold assembly (6) from the front of the air cylinder (8).
3. Prior to installing the replacement manifold (5), visually inspect the o-ring on the threaded end of the manifold and the o-ring within the manifold to make sure they are in good condition. Lubricate the o-rings, if necessary. Screw the new manifold (5) into the front of the air cylinder (8). The o-ring on the threaded end of the manifold should seat firmly against the face of the air cylinder (8) but should not bulge out. Do not over tighten when threading the manifold (5) and cylinder together (8).



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REPLACING THE SUPPORT TUBE:

1. Remove the seal set and manifold 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 (3) gently unscrew the support tube (3) from the piston.
3. Reverse steps 1 and 2 above. Do not use excessive force in tightening the support tube.
4. Prior to replacing the seal and washer set (2) inspect the support tube for scars left from the replacement procedure. File smooth if present.

OTHER REPLACEMENTS AND REPAIRS:

Under no condition should you attempt to service the air cylinder, venturi or valve block assemblies. Please contact EST Customer Service Department at any of the following locations to arrange for return and repair.

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
- 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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Table 2. G-650 / G-650A Tube Testing Gun Set Parts List

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	LOCK NUT .28 - .48 .49 - .83 .84 - 2.53	GSA-1530 GSA-1531 GSA-1532
2	2	REPLACEMENT SEAL & WASHER SET	*GSC-XXXX-M
3	1	SUPPORT ROD .28 - .48 .49 - .83 .84 - 2.53	SEE ITEM 6 SEE ITEM 6 SEE ITEM 6
4	1	SQUARE ELASTOMER RING 5/16 MANIFOLD 3/8 MANIFOLD 1/2 MANIFOLD 5/8 MANIFOLD 3/4 MANIFOLD 7/8 MANIFOLD 1" MANIFOLD 1-1/8 MANIFOLD 1-1/4 MANIFOLD 1-1/2 MANIFOLD 1-5/8 MANIFOLD 1-3/4 MANIFOLD 1-7/8 MANIFOLD 2" MANIFOLD 2-1/4 MANIFOLD 2-3/8 MANIFOLD 2-1/2 MANIFOLD 2-7/8 MANIFOLD 3" MANIFOLD	GSC-6705 GSC-6706 GSC-6708 GSC-6710 GSC-6712 GSC-6714 GSC-6716 GSC-6718 GSC-6720 GSC-6724 GSC-6726 GSC-6728 GSC-6730 GSC-6732 GSC-6736 GSC-6738 GSC-6740 GSC-6746 GSC-6748
5	1	MANIFOLD	SEE ITEM 6
6	1	MANIFOLD ASSEMBLY (INCLUDES ITEMS 1,3,4&5) 5/16 MANIFOLD 3/8 MANIFOLD 1/2 MANIFOLD 5/8 MANIFOLD 3/4 MANIFOLD 7/8 MANIFOLD 1" MANIFOLD 1-1/8 MANIFOLD 1-1/4 MANIFOLD 1-1/2 MANIFOLD 1-5/8 MANIFOLD 1-3/4 MANIFOLD 1-7/8 MANIFOLD 2" MANIFOLD 2-1/4 MANIFOLD 2-3/8 MANIFOLD 2-1/2 MANIFOLD 2-7/8 MANIFOLD 3" MANIFOLD	GSC-6605 GSC-6606 GSC-6608 GSC-6610 GSC-6612 GSC-6614 GSC-6616 GSC-6618 GSC-6620 GSC-6624 GSC-6626 GSC-6628 GSC-6630 GSC-6632 GSC-6636 GSC-6638 GSC-6640 GSC-6646 GSC-6648
8	1	CYLINDER BODY COMPLETE .28 - 1.23 1.24 - 2.53	GSC-6680 GSC-6681
9	1	HANDLE, PORTED W/O BLEED VALVE	GSC-6671
10	1	STRAIGHT TUBE FITTING	GSC-6561
11	1	BLEED VALVE	GSA-1560
12	1	CHECK VALVE	GSC-6693
13	1	VENTURI ASSEMBLY	GSC-6692
14	1	SHORT NIPPLE, 1/8 NPT	GSA-1551
15	1	VALVE BLOCK	GSC-6691
16	1	HEX NIPPLE, 1/4 NPT	GSA-1553
17	1	ELBOW TUBE FITTING	GSC-6560
18	1	TUBING, POLYETHYLENE	GSA-6662



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Figure 1. G-650 Gun Drawing

