

OPERATING & MAINTENANCE MANUAL

Glycol Water Vaporizer & Heater

APPLICATION TYPE: TEMA BEU

DYNAMIC & SPECIAL COMPANY

DASCO

www.dascohexas.com

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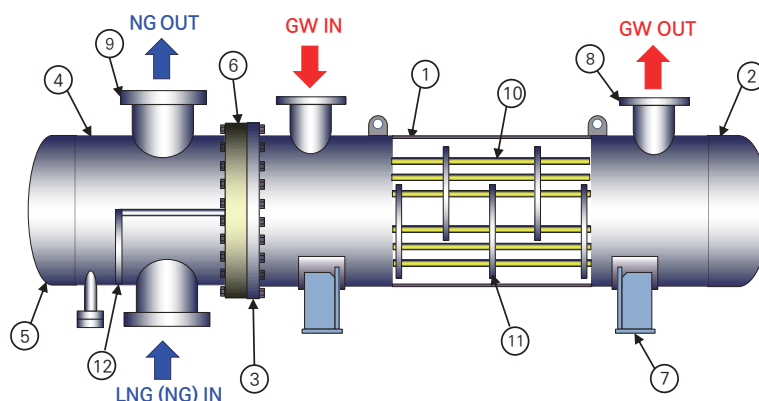
APPENDIX-1 TORQUE VALUE TABLE (DASCO'S STD)

* HOW TO CONTACT US

1. INTRODUCTION

1.1 INTRODUCTION OF H/EX.

* Flow Diagram



* Nomenclature of Heat Exchanger Components

1. Shell	4. Channel	7. Saddle	10. Tube
2. Shell - Head	5. Channel - Head	8. Shell Nozzle	11. Baffle plate
3. Shell - Flange	6. Tubesheet	9. Channel Nozzle	12. Partition plate

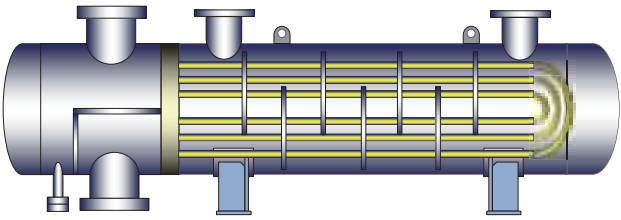
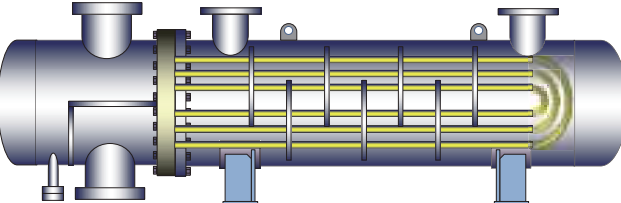
1.2 DESIGN & MANUFACTURE APPLICATION CAPACITY

1) INSIDE DIAMETERS

- SHELL FLANGE BOLTING TYPE : 250 mm ~ 600 mm - SHELL INTEGRAL WELDING TYPE : 650 mm ~ 1,200 mm

2) TUBE EFFECTIVE LENGTH : Max. 6,000mm

1.3 SHELL FLANGE & TUBE SHEET TYPE

	TYPE	FIGURE
W	SHELL INTEGRAL WITH TUBE SHEET	
B	SHELL FLANGE BOLTING WITH TUBE SHEET	

1.4 MATERIAL COMBINATIONS

1.4.1 MAIN MATERIAL

a) STAINLESS STEEL PLATE : SA240-304(L) or 316(L)

b) STAINLESS STEEL FORGING : SA182-F304(L) or F316(L)

c) STAINLESS STEEL TUBE : SA213-TP304(L) or TP316(L)

d) STAINLESS STEEL PIPE : SA312-TP304(L) or TP316(L)

* MINIMUM DESIGN TEMPERATURE : -196 °C

1.4.2 DASCO STANDARD TUBE

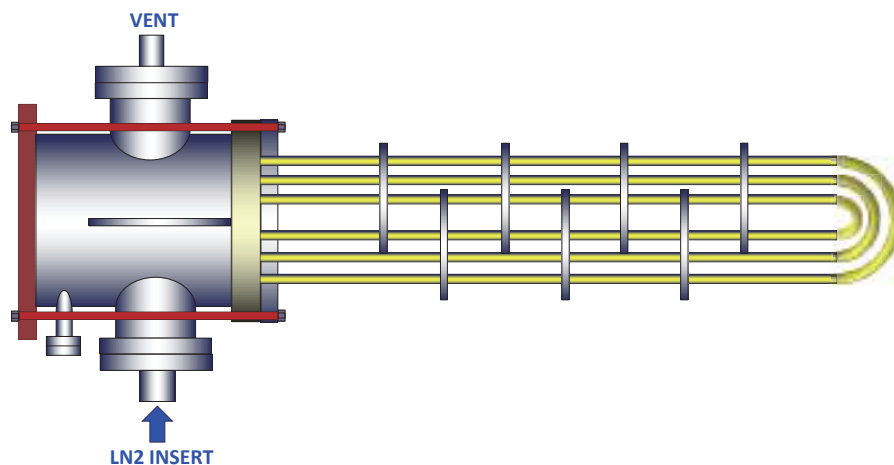


1.5 CRYOGENIC COLD TEST & HELIUM LEAK TEST

The special Test is carried out for verifying Tube to Tube Sheet Joint for Cryogenic condition.

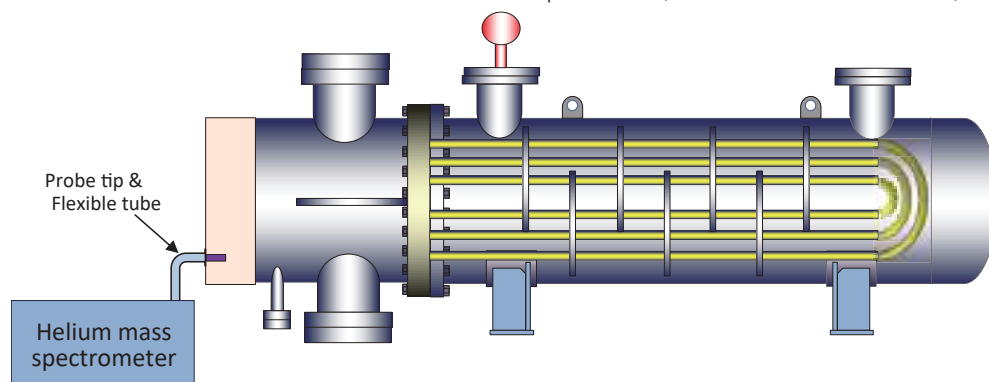
1.5.1 Cryogenic Cold Test at -196 °C by LN2 for Tube to Tube sheet joint

- Cool down slowly while checking temperature of tube sheet and tube surface.
- Through the thermocouple confirm that the temperature of the measuring part is all -196 °C.
- Open the connection and raise the temperature to ambient temperature.
- Tube to Tube sheet joint shall be NDE (P.T) Check.



1.5.2 Helium Leak Test after Cold Condition

- Inject the N2 gas and helium into shell inside as per ratio (N2 gas (or Air): He = 9 : 1) until the inside pressure is reached the test pressure. **Test Pressure = Design Pressure x 0.9
- After 30 min, insert the probe tip into the enclosure to scan the helium rate (Qt) on in the enclosure.
- Please refer to Helium Leak Test Procedure for detailed explanation. (Doc. No. : VP-STD-DSC-HL)



2. STORAGE & LIFTING

2.1 RUST PREVENTION for INTERNAL (for DRY AIR or N2 CHARGE)

- Internal : Shell & Tube side [Dry air or Nitrogen gas charge (0.3 barG ~ 0.5 barG)]
- Check the pressure gauge every 3 months during storage.
- Re-fill the Nitrogen gas if the pressure is decreased over 0.1 barg.

* Photo of
N2 Charge



* Photo of P.G
for N2 Charge



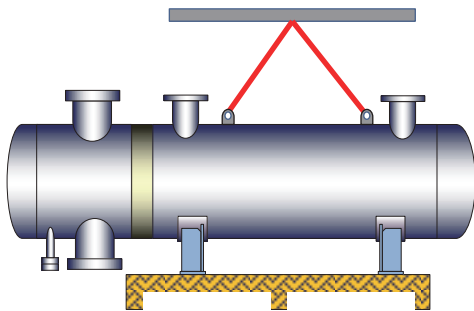
2.2 RUST PREVENTION for OUTSIDE

- Store under cover in a heated area (indoor) with dry, low humidity atmosphere.
- When storage outdoor, it's necessary to do extra packing to prevent entry of blowing dust, rain or snow, etc.

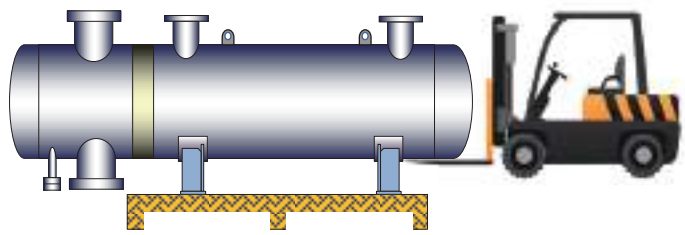
2.3 LIFTING

- Check the total weight of heat exchanger on name plate before lifting.
- Choose to lift by Crane or Fork-lift.

* Photo of Crane-lifting



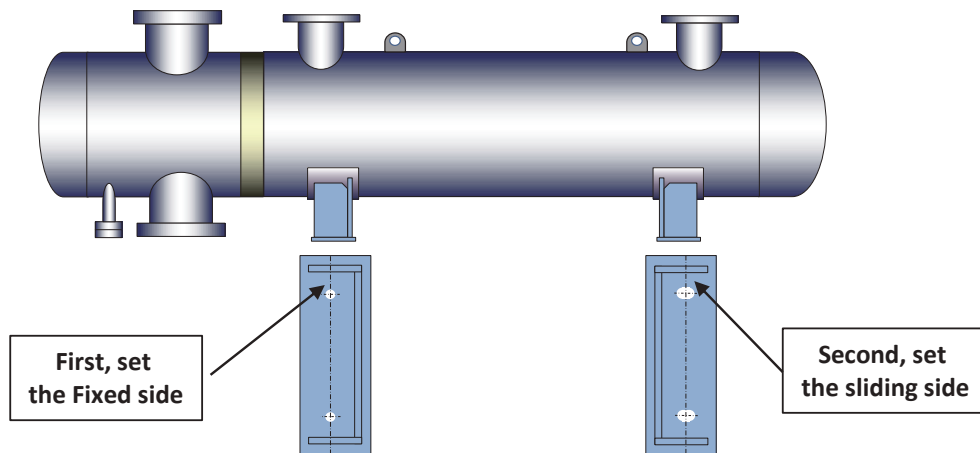
* Photo of Fork-lifting



3. SITE OR SHOP INSTALLATION

a) First, set the fixed side of saddle base plate, and set the sliding side of saddle base plate.

* Photo of saddle base plate



b) Connect LNG/NG side nozzle flange.

The flange type for LNG/NG : Welding Neck and Raised Face

* Photo of Flange Joint and Facing



Welding Neck



Raised Face

c) Connect Hot fluid side(Glycol water) nozzle flange.

4. OPERATION

4.1 START-UP OPERATION

a) **FLOW THE HOT FLUID TO SHELL SIDE BEFORE FLOW THE COLD FLUID.**

b) If any, open vent valve on hot fluid side.

c) After flowing up, close the vent valve after discharging air.

d) Increase the pressure of hot fluid slowly not over than 5barg per min.

e) After flowing up fully the hot fluid, glycol water is heated to target temperature.

f) Increase the pressure of cold fluid slowly until cool down.

Then, LNG feed is to be increased to normal feed rate.

g) Check any leak on all connections.

4.2 SHUT-DOWN OPERATION

a) **FIRST, SHUT DOWN THE COLD FLUID LINE.**

b) Hot fluid should be flowed properly during 30 minutes after shut down the cold fluid.

c) Next, shut down the hot fluid line.

5. LEAKAGE

5.1 Type characteristics

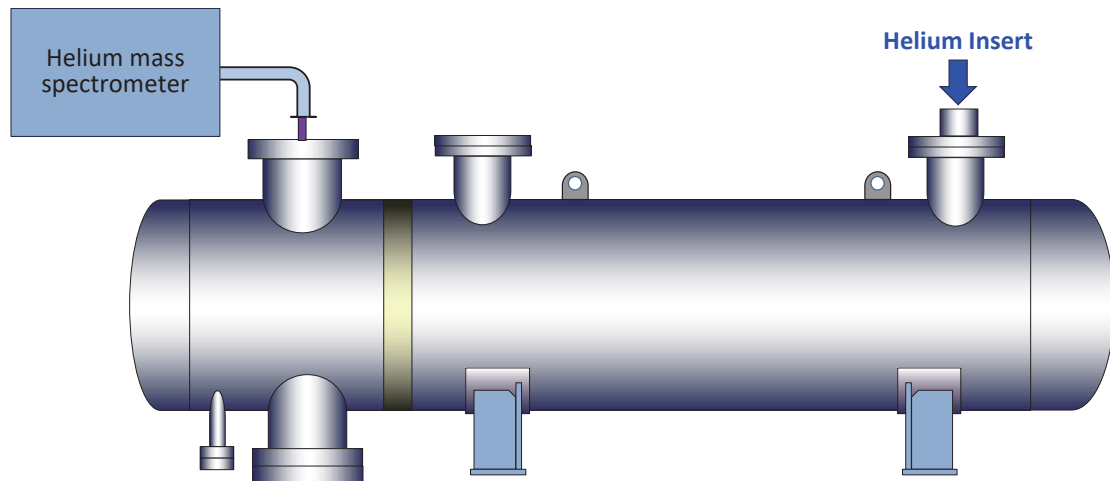
This type can not access to tube face of tube sheet due to channel integral with tubesheet.
So, when the tube is damaged, it is can not be repaired by grinding, welding and etc at site exposed to GAS.
If there is tube leakage, please contact to maker.

5.2 Repair for Tube leakage

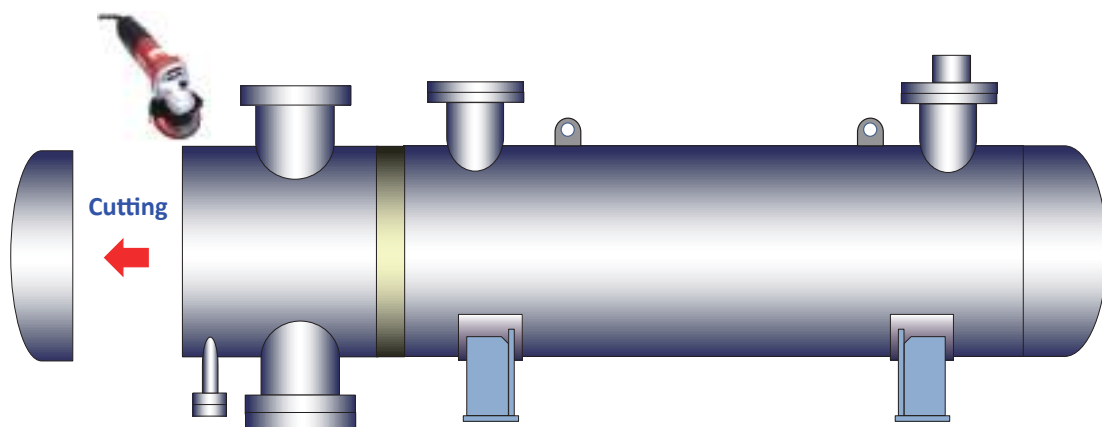
5.2.1) SHELL INTEGRAL WITH TUBE SHEET TYPE

a) Move to another place where is no exposed GAS.

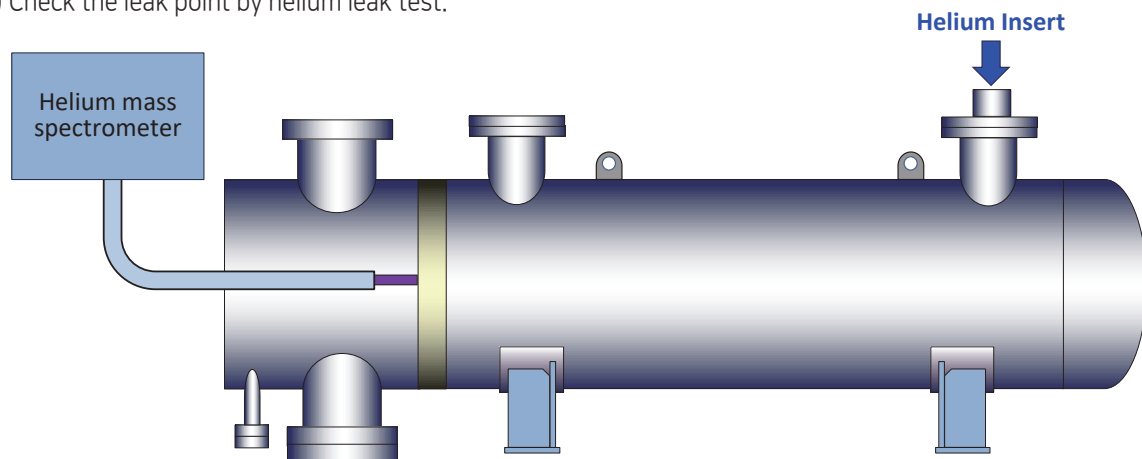
b) Check the leakage by Helium leak test.



c) If Helium detecting, Cut the welding between channel and head by grinding.

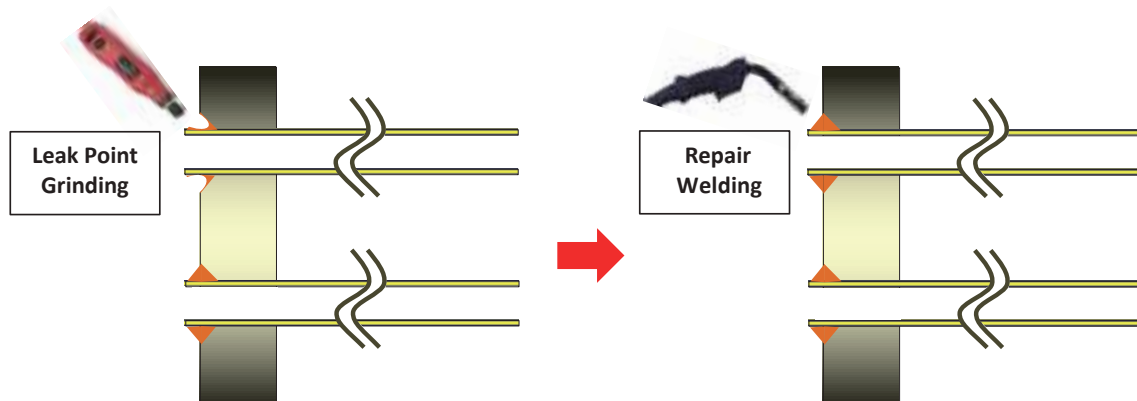


d) Check the leak point by helium leak test.



e) Leakage from Tube to Tube sheet Welding Joint

Remove the welding area of leak point by grinder and Re-welding that point.



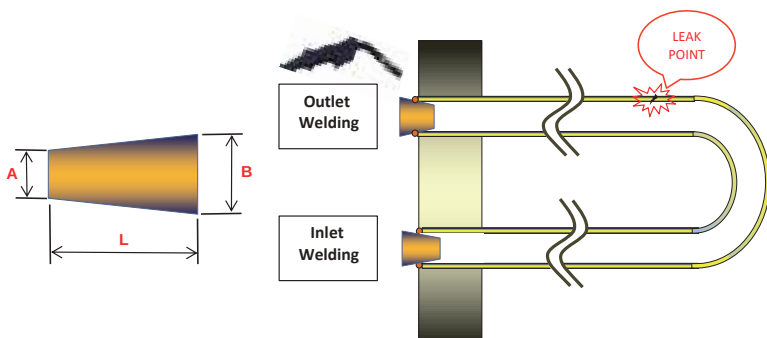
f) Leakage from Tube surface.

Plug by welding the damaged tube with special plug

Two plug should be welded at In & Out for one bended tube due to U tube.

* PLUG SPEC.

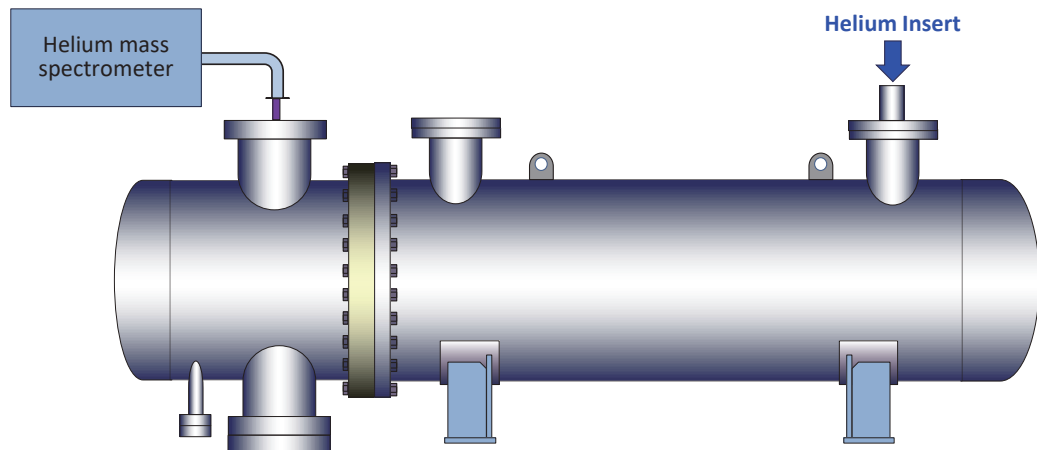
TUBE OD	A x B x L
OD 15.88	11 x 16 x 40
OD 19.05	14 x 19 x 40
OD 25.4	18 x 25 x 40



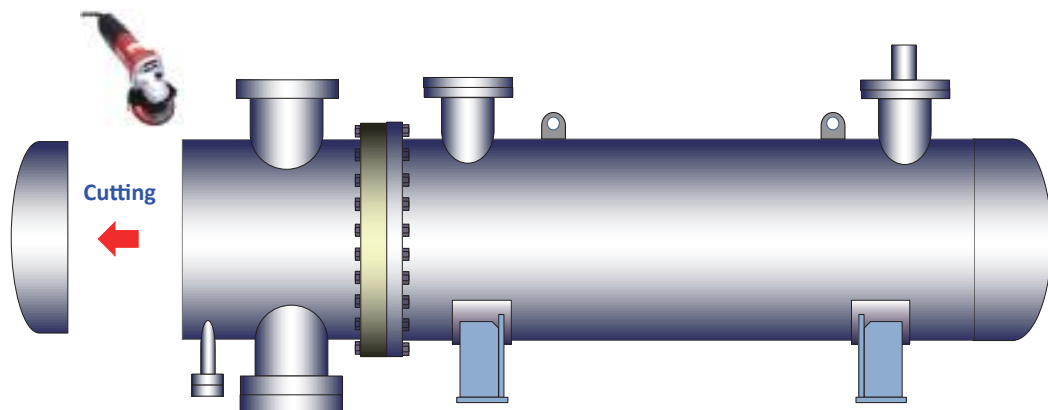
5.2.2) SHELL BOLTING WITH TUBE SHEET TYPE

a) Move to another place where is no exposed GAS.

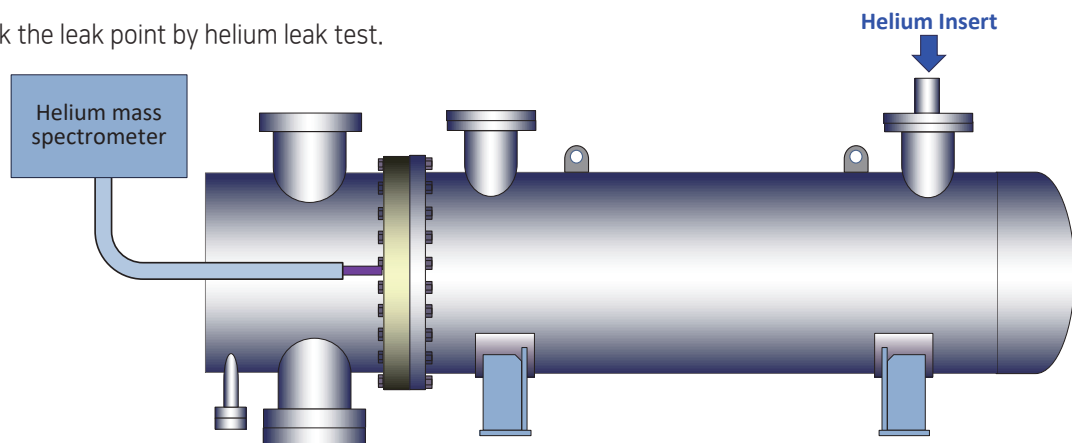
b) Check the leakage by Helium leak test.



c) If Helium detecting, Cut the welding between channel and head by grinding.



d) Check the leak point by helium leak test.



e) ~ f) Please refer to 5.2.1), e) ~ f) as same procedure.

APPENDIX-5

1. TIGHTENING TORQUE (for SA193-B7)

Nut type	Hex. Nuts (ANSI B 18.2.4.2M)				Heavy Hex. Nuts (ANSI B 18.2.4.6M)			
Thread Designation (Metric coarse)	Joints without washers		Joints without nord lock washers		Joints without washers		Joints without nord lock washers	
	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)
M8 x 1.25P	14	20	16	23	-	-	-	-
M10 x 1.50P	28	40	32	46	-	-	-	-
M12 x 1.75P	47	66	54	76	49	69	56	79
M16 x 2.00P	111	156	128	179	116	163	133	187
M20 x 2.50P	215	301	247	346	226	316	260	363
M22 x 2.50P	297	415	342	477	300	420	345	483
M24 x 3.00P	370	518	426	596	389	545	447	627
M27 x 3.00P	538	753	619	866	563	788	647	906
M30 x 3.00P	750	1049	863	1206	775	1085	891	1248
M36 x 3.00P	1317	1843	1515	2119	1364	1910	1569	2197
M42 x 3.00P	-	-	-	-	2194	3071	2523	3532
M48 x 3.00P	-	-	-	-	3304	4626	3800	5320
M56 x 3.00P	-	-	-	-	5209	7293	5990	8387
M64 x 3.00P	-	-	-	-	7729	10821	8888	12444
M72 x 3.00P	-	-	-	-	9893	13849	12593	17630

APPENDIX-5

2. TIGHTENING TORQUE (for SA193-B8-2)

Nut type	Hex. Nuts (ANSI B 18.2.4.2M)				Heavy Hex. Nuts (ANSI B 18.2.4.6M)			
Thread Designation (Metric coarse)	Joints without washers		Joints without nord lock washers		Joints without washers		Joints without nord lock washers	
	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)
M8 x 1.25P	14	19	16	22	-	-	-	-
M10 x 1.50P	27	38	31	44	-	-	-	-
M12 x 1.75P	45	63	52	72	47	65	54	75
M16 x 2.00P	106	148	122	170	111	155	128	178
M20 x 2.50P	164	229	189	263	172	240	198	276
M22 x 2.50P	225	315	259	362	228	319	262	367
M24 x 3.00P	281	393	323	452	295	413	339	475
M27 x 3.00P	334	467	384	537	350	489	403	562
M30 x 3.00P	466	652	536	750	481	674	553	775
M36 x 3.00P	627	877	721	1009	650	909	748	1045
M42 x 3.00P	-	-	-	-	-	-	-	-
M48 x 3.00P	-	-	-	-	-	-	-	-
M56 x 3.00P	-	-	-	-	-	-	-	-
M64 x 3.00P	-	-	-	-	-	-	-	-
M72 x 3.00P	-	-	-	-	-	-	-	-

APPENDIX-5

3. TIGHTENING TORQUE (for SA193-B8M-2)

Nut type	Hex. Nuts (ANSI B 18.2.4.2M)				Heavy Hex. Nuts (ANSI B 18.2.4.6M)			
Thread Designation (Metric coarse)	Joints without washers		Joints without nord lock washers		Joints without washers		Joints without nord lock washers	
	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)
M8 x 1.25P	13	18	15	18	-	-	-	-
M10 x 1.50P	26	36	30	41	-	-	-	-
M12 x 1.75P	43	60	49	69	44	62	56	79
M16 x 2.00P	101	141	116	162	105	147	133	187
M20 x 2.50P	164	229	189	263	172	240	260	363
M22 x 2.50P	225	315	259	362	228	319	345	483
M24 x 3.00P	281	393	323	452	295	413	447	627
M27 x 3.00P	334	467	384	537	350	489	647	906
M30 x 3.00P	466	652	536	750	481	674	891	1248
M36 x 3.00P	627	877	940	1316	650	909	1569	2197
M42 x 3.00P	-	-	-	-	-	-	-	-
M48 x 3.00P	-	-	-	-	-	-	-	-
M56 x 3.00P	-	-	-	-	-	-	-	-
M64 x 3.00P	-	-	-	-	-	-	-	-
M72 x 3.00P	-	-	-	-	-	-	-	-

APPENDIX-5

4.TIGHTENING TORQUE (for SA193-B7)

Nut type	Hex. Nuts (ANSI B 18.2.2.2)				Heavy Hex. Nuts (ANSI B 18.2.2.2)			
Thread Designation (Unified coarse)	Joints without washers		Joints without nord lock washers		Joints without washers		Joints without nord lock washers	
	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)
1/2 x 13UNC	54	76	62	87	57	80	66	92
5/8 x 11UNC	106	148	122	170	111	155	128	178
3/4 x 10UNC	185	259	213	298	192	269	221	309
7/8 x 9UNC	294	412	338	474	305	426	351	490
1 x 8UNC	438	613	504	705	452	632	520	727
1 1/8 x 8UNC	635	889	730	1022	653	914	751	1051
1 1/4 x 8UNC	883	1236	1015	1421	905	1267	1041	1457
1 3/8 x 8UNC	1185	1659	1363	1908	1213	1698	1395	1953
1 1/2 x 8UNC	1549	2168	1781	2493	1583	2215	1820	2547
1 5/8 x 8UNC	-	-	-	-	2024	2834	2328	3259
1 3/4 x 8UNC	-	-	-	-	2540	3556	2921	4089
1 7/8 x 8UNC	-	-	-	-	3132	4385	3602	5043
2 x 8UNC	-	-	-	-	3809	5333	4380	6133
2 1/4 x 8UNC	-	-	-	-	5456	7638	6274	8784
2 1/2 x 8UNC	-	-	-	-	7501	10501	8626	12076

APPENDIX-5

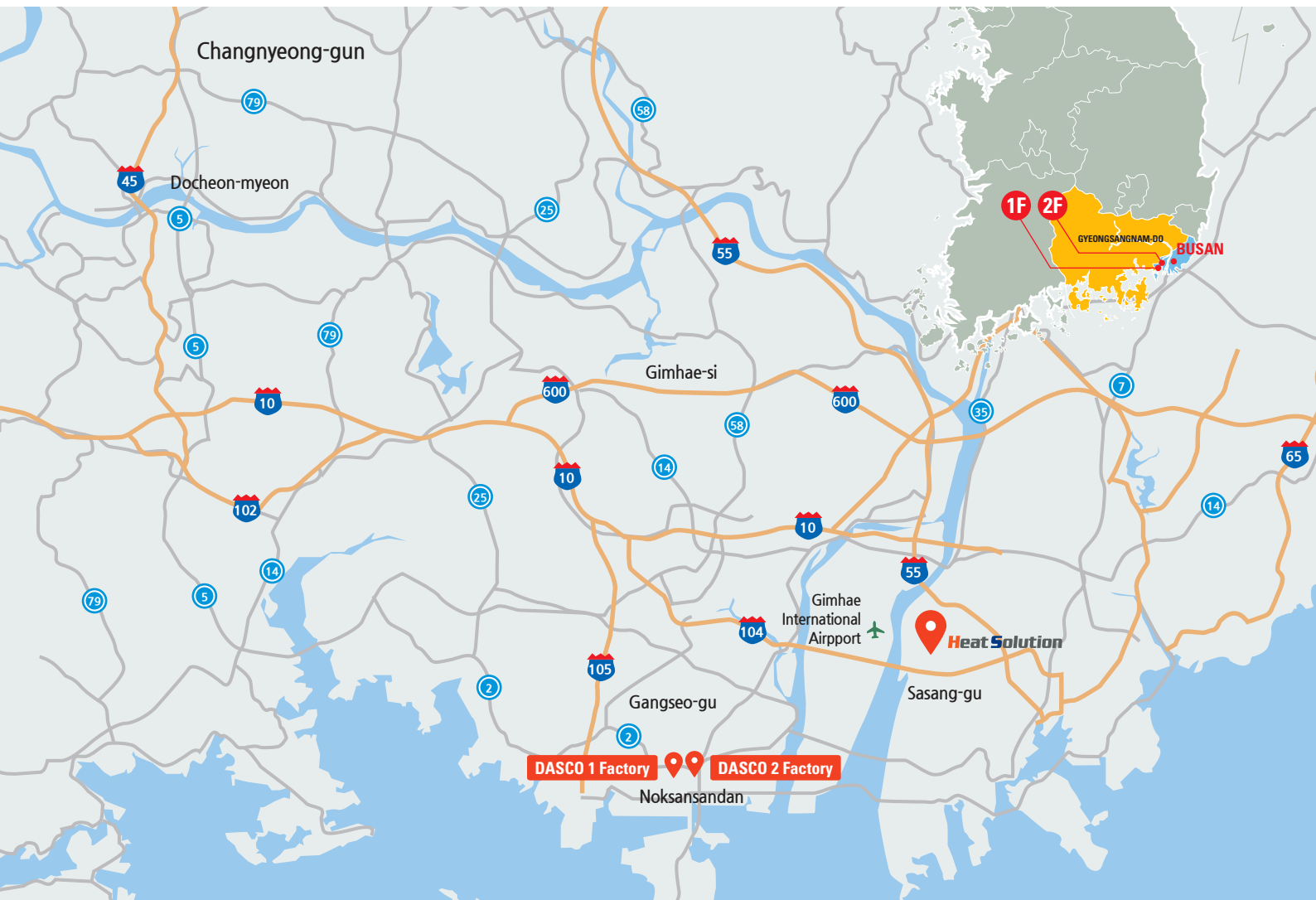
5. TIGHTENING TORQUE (for SA193-B8-2)

Nut type	Hex. Nuts (ANSI B 18.2.2.2)				Heavy Hex. Nuts (ANSI B 18.2.2.2)			
Thread Designation (Unified coarse)	Joints without washers		Joints without nord lock washers		Joints without washers		Joints without nord lock washers	
	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)
1/2 x 13UNC	52	72	60	83	55	76	63	87
5/8 x 11UNC	101	141	116	162	106	148	122	170
3/4 x 10UNC	176	247	202	284	183	256	210	294
7/8 x 9UNC	223	313	256	360	231	324	266	373
1 x 8UNC	333	465	383	535	343	480	394	552
1 1/8 x 8UNC	395	552	454	635	405	567	466	652
1 1/4 x 8UNC	548	767	630	882	562	787	646	905
1 3/8 x 8UNC	564	790	649	909	577	808	664	929
1 1/2 x 8UNC	737	1032	848	1187	753	1054	866	1212
1 5/8 x 8UNC	-	-	-	-	-	-	-	-
1 3/4 x 8UNC	-	-	-	-	-	-	-	-
1 7/8 x 8UNC	-	-	-	-	-	-	-	-
2 x 8UNC	-	-	-	-	-	-	-	-
2 1/4 x 8UNC	-	-	-	-	-	-	-	-
2 1/2 x 8UNC	-	-	-	-	-	-	-	-

APPENDIX-5

6. TIGHTENING TORQUE (for SA193-B8M-2)

Nut type	Hex. Nuts (ANSI B 18.2.2.2)				Heavy Hex. Nuts (ANSI B 18.2.2.2)			
Thread Designation (Unified coarse)	Joints without washers		Joints without nord lock washers		Joints without washers		Joints without nord lock washers	
	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)	min.(Nm)	max.(Nm)
1/2 x 13UNC	49	68	56	78	52	72	60	83
5/8 x 11UNC	96	134	110	154	100	140	115	161
3/4 x 10UNC	167	234	192	269	174	243	200	279
7/8 x 9UNC	223	313	256	360	231	324	266	373
1 x 8UNC	333	465	383	535	343	480	394	552
1 1/8 x 8UNC	395	552	454	635	405	567	466	652
1 1/4 x 8UNC	548	767	630	882	562	787	646	905
1 3/8 x 8UNC	564	790	649	909	577	808	664	929
1 1/2 x 8UNC	737	1032	917	1187	753	1054	866	1212
1 5/8 x 8UNC	-	-	-	-	-	-	-	-
1 3/4 x 8UNC	-	-	-	-	-	-	-	-
1 7/8 x 8UNC	-	-	-	-	-	-	-	-
2 x 8UNC	-	-	-	-	-	-	-	-
2 1/4 x 8UNC	-	-	-	-	-	-	-	-
2 1/2 x 8UNC	-	-	-	-	-	-	-	-



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