



- Gasket Recommendation
- Design Assistance
- Failure Analysis
- Drawings
- Torque Calculations

technical@3sgaskets.com

(832) 406-7358

Technical Training

3S can provide a multitude of training to our customers. Training can be provided through PowerPoint Presentations and / or Practical Demonstrations.

Presentations can be tailored to the audience i.e. student / new engineers to detailed information for certain projects or applications. 3S has an in-depth database of field applications and in house / 3rd party gasket and bolt testing which can be shared with our customers.

Practical Demonstrations can be presented through a FADU (Flange Assembly Demonstration Unit). This is a great tool to show how correct bolt up procedures are critical to a leak free joint. It also shows the relationship between bolt load and gasket compression.

Training is mainly conducted at the customer site but can also be performed at our main manufacturing facility in Houston, this is always a good option because the trainees can then observe how different gasket types are manufactured, we always get great feedback from people who experience this.



IN HOUSE TESTING



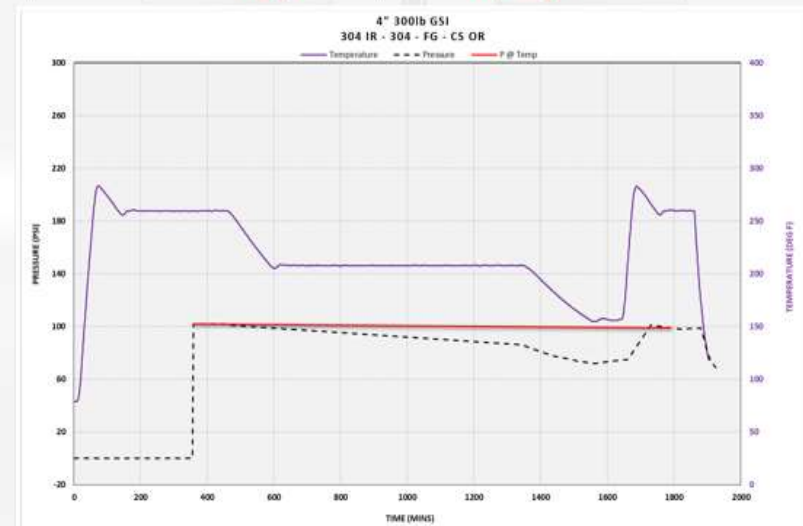
- 3S has the ability to perform in house testing.
- Leakage – ambient and temperature cycling (850 Deg F)
- Relaxation of the flanged assembly, this can be broken down in gasket and bolts relaxation at temperature.
- Gasket compression and recovery.



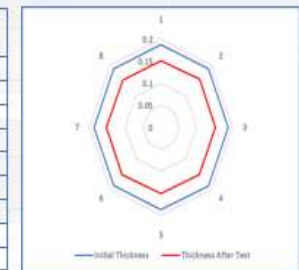
3S Test Report



Test Number = 35006-19
 Date = 05/24/19
 Gasket Type = Spiral Wound - GSI
 Gasket = 4" 300lb - GSI - 304 IR 304 WINDING - FG - CS OR
 Torque = 168 ft/lbs
 Gasket Stress = 19,836 psi
 Initial Pressure = 103 psi
 Final Pressure = 101 psi
 Pressure Drop = 2 psi
 Temperature Cycles = 3
 Temp 1 = 260 Deg F
 Temp 2 = 210 Deg F
 Temp 3 = 260 Deg F
 Temp 4 = Ambient Deg F



Bolt No	Initial Thickness (inch)	Thickness After Test (inch)
1	0.188	0.151
2	0.188	0.154
3	0.188	0.153
4	0.188	0.152
5	0.187	0.151
6	0.187	0.153
7	0.187	0.153
8	0.187	0.151



INDEPENDENT TEST OF SPIRAL WOUND GASKET



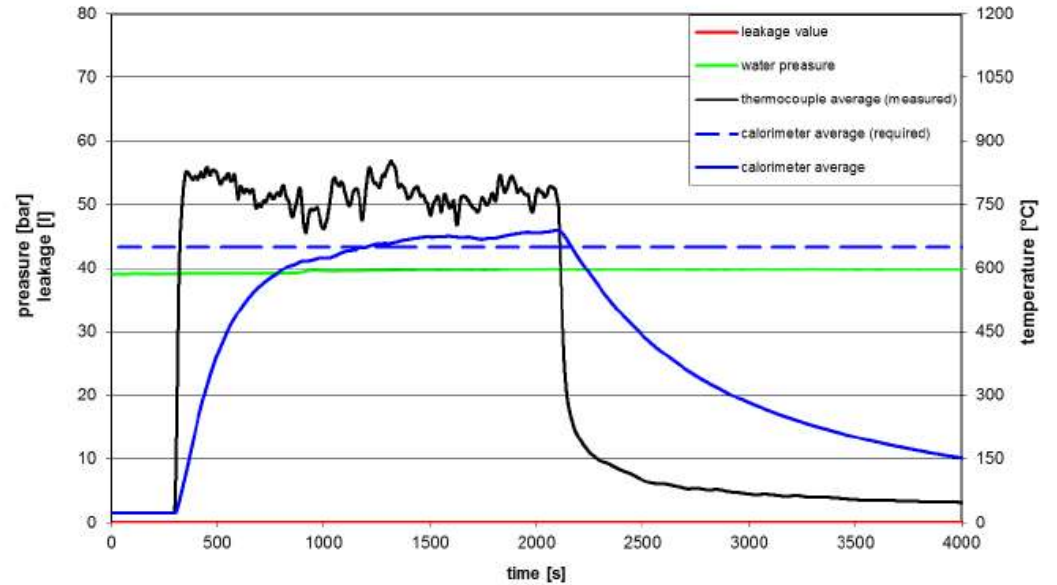
- API 6FB – API Specification for Fire Test for End Connections.

amtesc Test Report EN 13555/ROTT/API 6FB appendix 2
3S - Superior Sealing Services – 3S – Superior Sealing A300 169 1/-
Services



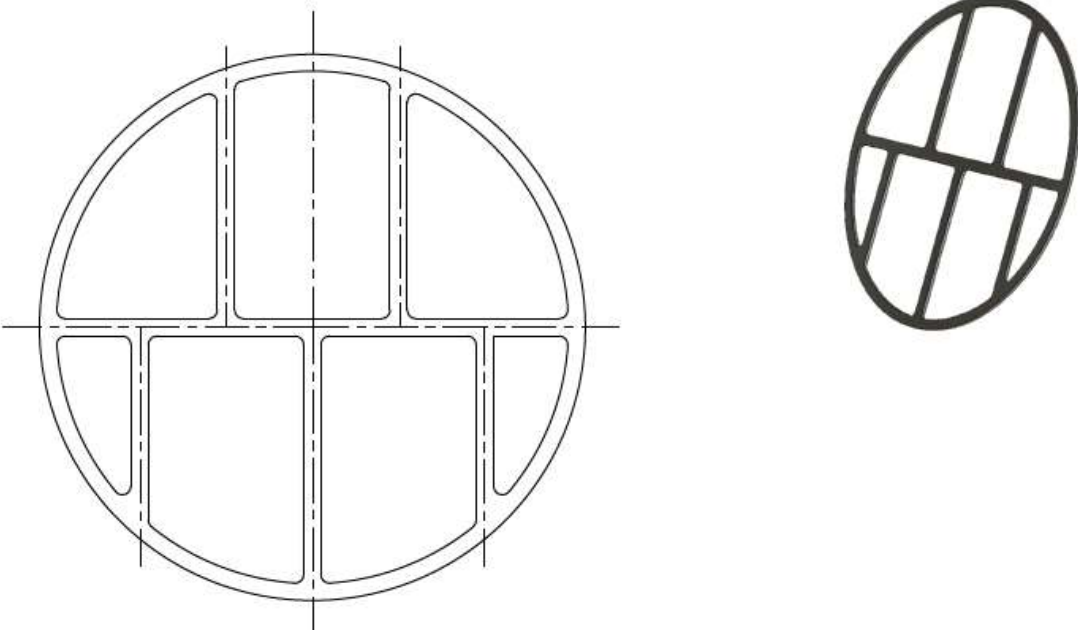

Fire Safe Testing Device

Course of Test Fire Safe Test
3S Superior Sealing Services 30.08.2017 - 137.9 MPa
17-529



Fire Safe Test 3S – Superior Sealing Services

Drawings

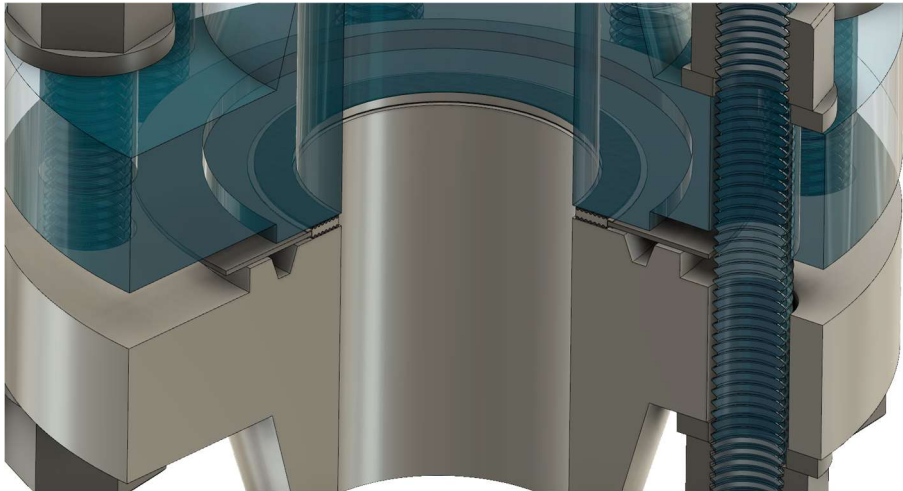
REV	DESCRIPTION	DATE	SCALE: 1 : 1		TOLERANCE TO RELEVANT GASKET STANDARD UNLESS OTHERWISE SPECIFIED	
						
CORE MATERIAL: 316L CORE THK: .125" FACING MATERIAL: APX2 FACING THK: .02"						
DATE: 10/08/18			CUSTOMER: EXAMPLE 123		GASKET TYPE: KAMMPROFILE KP-1	
SHEET: 1 of 1			EQUIPMENT: 123 EXAMPLE		DRAWN BY: RT	APPROVED BY: KA
REV 0					DRAWING NUMBER: 3SGSKRT20180910	

Drawings can be provided to our customers as above.

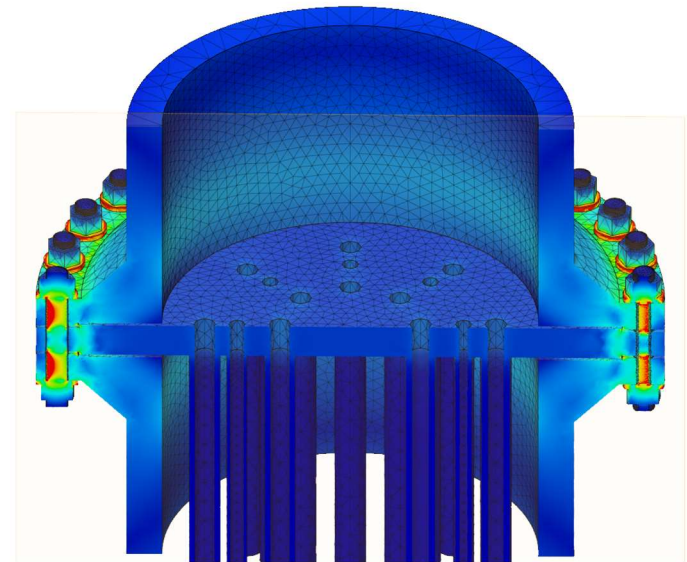
This is a good tool for both parties for record retention and speed of re-order.

A section in the title block is dedicated for "Equipment", this section is useful for our customers so they can reference a gasket to a certain piece of equipment.

Drawings / Analysis




Gasket Design For Dissimilar Flanges



Exchangers

Torque Calculations – Exchangers – Special Flanges



Torque Calculator

(ASME Section VIII - Appendix 2)

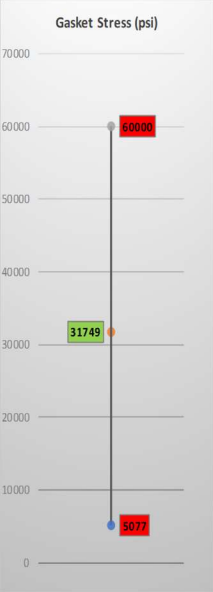
Customer Name	Exxon
Customer Contact	Cliff Hay
Equipment Reference	E-4534
Gasket Position	Shell Gasket

3S Drawing Number	3SGSKRT20181008-0
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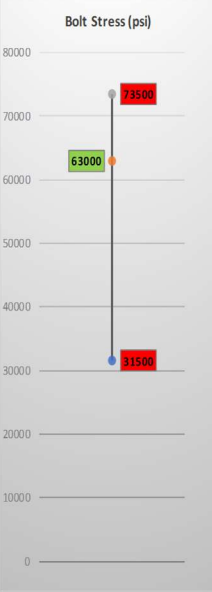
Gasket Style	Kamm KP-1, KP-2, KP-3
Gasket "m" value	2.5
Gasket "y" value	2500
Gasket ID	59.00
Gasket OD	61.00
Gasket Shape	Ring

Bolt Grade	B7 / L7
K Factor	0.17
Bolt Diameter	1 3/4 in
Number of Bolts	48
Minimum Bolt Stress	31500 psi
Selected Bolt Stress	63000 psi
Maximum Bolt Stress	73500 psi

Gasket Stress	31749	psi
Minimum Required Gasket Stress	5077	psi
Maximum Gasket Stress	60000	psi



Gasket Stress (psi)



Bolt Stress (psi)


Torque	3091	Ft-lb
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1st Pass	2nd Pass	3rd Pass	Final Pass
773	1030	1545	3091

	% Yield
Minimum Bolt Stress	30%
Maximum Bolt Stress	70%

Torque calculation sheets are available for all gasket types. We have programs for standards such as ASME Section VIII and ASME PCC-1.

As can be seen above the work sheet is very easy to read and gives a good visual aspect of the amount of gasket stress vs bolt stress.



Torque Chart - PCC-1 Appendix O Method

Customer	Another
Equipment Reference	Prepared & Made Acid Unit
Gasket Position	407 Shell
Gasket Type	Ring - KP2 (Kamm)
Gasket Shape	Ring - KP2 (Kamm)
G ID (Inches)	58.000
G OD (Inches)	57.000
Additional Gasket Area (In2)	0.00
Shell (O-1)	79,000 psi
Bolt Grade	650 A, B & C
Bolt Diameter (db)	1 1/8 in
Number of Bolts (nb)	28
K Factor	0.19
% Sbrmin	30%
% Sbrmax	97%
Sbrmax	85,000 psi
Tensile Root Area	Minor
Minor Root Area	Minor
Tightening Method	Hydraulic Tensioner
P max	200 psi
Step 6a: P max - Shell Side	200 psi
Step 6b: P max - Tube Side	200 psi
Temperature	500 °F
Rfmax	0.5 in/g
Sgmax	1.0 in/g
OK	0.68

Tb (O-2) - ft/lbs	
10% Flange Alignment	98 ft/lbs
1st Pass - ft/lbs	244 ft/lbs
2nd Pass - ft/lbs	488 ft/lbs
3rd Pass - ft/lbs	731 ft/lbs
Final Pass - ft/lbs	975 ft/lbs
Tb (O-2) - ft/lbs	1175 ft/lbs

3S DRAWING No: 3SGSKRT201903 19-00

WHEN FILLED BLACK - N/A — 1. STUD BSE NOT MANUFACTURED IN THIS GRADE. 2. BOLT NOT MANUFACTURED IN THIS SIZE. 3. OVER 200% OF BOLT YIELD

Gasket Information		
G ID	58.00 inch	ID gasket sealing element
G OD	57.00 inch	OD gasket sealing element
Ag	57.53 in2	gasket area
Sgt	26,737 psi	target assembly gasket stress
Sgmax	55,000 psi	maximum gasket seating stress
Sgmin-s	20,000 psi	minimum gasket seating stress
Sgmin-o	14,000 psi	minimum operating gasket stress

Bolt Information		
Sbrmin	25,500 psi	minimum permissible bolt stress
Sbrmax	82,450 psi	maximum permissible bolt stress
Sfmax	85,000 psi	maximum bolt stress prior to flange damage
Bolt Stress (min)	76,699 psi	selected tightening method
Bolt Stress (max)	81,370 psi	
nb	28	number of bolts
db	1 1/8 in	bolt diameter
Ab	0.693 in2	bolt root area
Bolt Yield	85,000 psi	
% Bolt Yield	93 %	
Flange Stress	93% %	selected bolt stress v Sfmax

API 660 Check - Bolt Stress is Adequate		P Max (psi)	Check Value - Bolt stress required (psi)
Step 6a: Shell Side	200	TRUE	80,833
Step 6b: Tube Side	200	TRUE	80,833
Maximum Unit Pressure	200		


Controls - Checks				
O-4	TRUE	Bolt Stress - Upper Bolt Limit Controlled		
O-5	TRUE	Bolt Stress - Lower Bolt Limit Controlled		
O-6	TRUE	Bolt Stress - Flange Limit Controlled		
O-7	TRUE	Gasket Assembly Seating Stress is Achieved	59,265	Below
O-8	TRUE	Gasket Operating Stress is Maintained	76,263	Below
O-9	TRUE	Gasket Maximum Stress is not Exceeded	101,607	Below
O-10	TRUE	Flange Rotation Limit is not Exceeded	101,607	Below



Bolt Stress (psi)



Gasket Stress (psi)



Flange Stress %

@ Sb Sel x Sbrl min @ Sgt x Sgmin-o
 x Sbrl max x Sbrl min @ Sg x Sgmax
 @ Sbrmax x Sbrmax @ Sgmin-s x Sgmin-s

Technical@Dagseal.com www.Dagseal.com sales@Dagseal.com

Torque Calculations – Standard Flanges – Soft and Semi-Metallic



Torque Chart - ASME B16.21 Gaskets - ASME B16.5 Flanges - Ring Gasket Flat Face Flange



Customer Name	AN
Customer Contact	Smith

Gasket Style	CNAF - Graphite Sheet
K Factor	0.17
Bolt Grade	B7 - B16

CLASS 150lb

	Minimum ft-lbs	Optimum ft-lbs	Maximum ft-lbs
1/2"	28	36	43
3/4"	37	47	56
1"	37	47	56
1-1/4"	37	47	56
1-1/2"	37	47	56
2"	75	94	113
2-1/2"	75	94	113
3"	110	116	128
3-1/2"	75	94	113
4"	86	107	129
5"	135	168	202
6"	154	193	231
8"	210	221	232
10"	262	327	393
12"	311	327	344
14"	393	492	590
16"	393	492	590
18"	661	696	835
20"	557	696	835
24"	794	993	1191

CLASS 300lb

	Minimum ft-lbs	Optimum ft-lbs	Maximum ft-lbs
1/2"	28	36	43
3/4"	57	72	86
1"	57	72	86
1-1/4"	57	72	86
1-1/2"	103	128	154
2"	57	72	86
2-1/2"	103	128	154
3"	103	128	154
3-1/2"	103	128	154
4"	135	168	202
5"	154	193	231
6"	154	193	231
8"	249	312	374
10"	328	410	492
12"	464	580	696
14"	464	580	696
16"	662	827	993
18"	662	827	993
20"	662	827	993
24"	1155	1444	1732

Note: 3S Superior Sealing Services LLC produces torque calculations from given information, either from relevant standards or information from our customers. 3S Superior Sealing Service LLC doesn't accept responsibility for misuse of this information.



Torque Chart - ASME B16.20 Gaskets - ASME B16.5 Flanges - Kammprofile

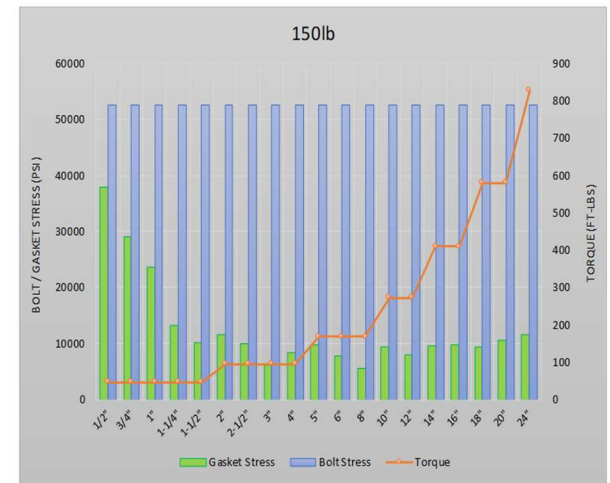


Customer Name	FSP
Customer Contact	Smith

Gasket Style	KP1 - 2 & 3
K Factor	0.17
Bolt Grade	B7 - B16

CLASS 150lb

	Bolt Stress psi	Gasket Stress psi	Torque ft-lbs
1/2"	52500	37849	47
3/4"	52500	29057	47
1"	52500	23614	47
1-1/4"	52500	13158	47
1-1/2"	52500	10094	47
2"	52500	11522	94
2-1/2"	52500	9933	94
3"	52500	6180	94
4"	52500	8305	94
5"	52500	9840	168
6"	52500	7670	168
8"	52500	5521	168
10"	52500	9430	273
12"	52500	7934	273
14"	52500	9579	410
16"	52500	9677	410
18"	52500	9325	580
20"	52500	10591	580
24"	52500	11498	827



Note: 3S Superior Sealing Services LLC produces torque calculations from given information, either from relevant standards or information from our customers. 3S Superior Sealing Service LLC doesn't accept responsibility for misuse of this information.

Please contact
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For further details