FUGITIVE EMISSION TEST REPORT
OF SPIRAL WOUND GASKET (SWG)

Report No.: PITS-FET-15848-UKL-RP-01 **Report Date:** 22/01/2022

Test Dates: 16/01/2022 to 21/01/2022

Name & Address of the Gasket Manufacturer

UNI KLINGER LIMITED
GAT NO. 1240, S. NO. 140, VILLAGE VADU BUDRUK, TAL. SHIRUR, KOREGAON BHIMA, PUNE – 412 216, INDIA

Name & Address of the Testing Facility

PURVA INSPECTION & TESTING SERVICES
16, SATYAM ESTATE, STEEL TOWN, BESIDE HOF, MORAIYA, CHANGODAR, AHMEDABAD, GUJARAT,
PIN CODE: 382213, INDIA

Specification Reference:

1. BS EN ISO 15848-1: 2015 + A1: 2017
2. MESC SPE 85/300, EDITION FEBRUARY 2019, CLAUSE NO 3.3.2 FUGITIVE EMISSIONS
3. ASME BPVC SECTION V EDTION 2021 ARTICLE 10 MANDATORY APPENDIX IV

Testing Equipment Details:

Helium Mass Spectrometer Make	: LEYBOLD
Model	: PHOENIX L300i EU
Serial No	: 90001335831
Sensitivity	: Sniffer Method $1x10^{-8}$ mbar l/sec
Maximum Response Time	: < 5 sec (To reach final value)
Minimum Detection	: 5×10^{-12} mbar.l / sec
Calibration Method	: Internal (Integral) and Standard Leak (External)
Calibration Standard Leak	: 1.57×10^{-7} mbar.l / s; Serial Number: 1018
	: Make: H. Fillunger & Co. Pvt. Ltd.; Model No: HFCT1
Sniffer (Sampling) Probe Detail	: Make: LEYBOLD; Model: SL300; Serial No: 90001371479

Test Parameters:

Test Method	: Detector Probe Technique (Sniffer Method)
Test Fluid	: Helium Gas of 97% minimum purity
Test Temperature	: Ambient (Room Temperature) to 400˚C (±5% but not exceeding 15˚C)
Test pressure	: 51.1 Barg (52.11 kg/cm^{2}g) at Room Temperature (+5˚C to +40˚C)
	: 34.7 Barg (35.38 kg/cm^{2}g) at 400˚C (Elevated Temperature)
Test Results	: Test results provided only related to the Body Seal Gasket leak only, because the Test was performed only for Fugitive Emission Test of Spiral Wound Gasket (SPW) only.

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1. **Valve Details:**

Valve Type & Size	RISING STEM GATE VALVE, NPS 4 (DN 100); CLASS 300 (PN 50); BOLTED BONNET, OS & Y, RAISED FACE FLANGE END, HAND WHEEL OPERATED, API STD 600 DESIGN
Valve Manufacturer	M/S NORFLOW CONTROLS, AHMEDABAD, GUJARAT, INDIA
Material of Construction (Body, Bonnet)	ASTM A216 GR WCB
Material of Construction (Wedge)	ASTM A216 GR WCB + 13% CR. STEEL HRAD FACING
Valve Sr. No.	NC 22 A 107
Heat No.	BODY: M636; BONNET: M636; WEDGE: M636
Stem or Shaft Seal (Gland Packing)	DESCRIPTION: EXPANDED GRAPHITE FIBRE YARN BRAIDED PACKING, INCORPORATED WITH INORGANIC PASSIVE CORROSION INHIBITOR, JACKED WITH INCONEL WIRE MESH. MODEL / TYPE: JW INMARCO 100 FXI SPECIAL (100FXISPL)
Body Seal(s): Gasket (Body Bonnet)	**SPIRAL WOUND GASKET (SWG) SS316L + GRAPHITE** **DIMENSIONS: 149.4 X 127.0 X 4.5 mm** **BATCH NO: UKL/SPW/0102/22**
Body Seal(s): Gasket (END / SIDE FLANGES)	**SPIRAL WOUND GASKET (SWG) SS316L + GRAPHITE WITH INNER-OUTER RING** **DIMENSIONS: 149.4 X 127.0 X 4.5 mm** **BATCH NO: UKL/SPW/0101/22**
Stem Diameter	25.40 mm (1 inch)
Stem Material Specification	ASTM A182 GR F6A
Testing Temperature	AMBIENT (ROOM TEMPERATURE) TO 400˚C (±5% but not exceeding 15˚C)
Valve Mounting Position	STEM HORIZONTAL
Mechanical & Thermal Cycle	2500 CYCLES (FULL STROKE) WITH FOUR THERMAL CYCLES (A TOTAL OF 50 CYCLES AT RT, 50 CYCLES AT TEST TEMP, 50 CYCLES AT RT, 50 CYCLES AT TEST TEMP, 5 CYCLES AT RT, 795 CYCLES AT RT, 500 CYCLES AT TEST TEMP, 500 CYCLES AT RT AND 500 CYCLES AT TEST TEMP)
Method of Sample Selection	RANDOMLY SELECTED FROM THE PRODUCTION
Valve Mounting Instructions	STANDARD
Valve repacking before type test	NOT APPLICABLE
Insultation of Valve	NOT APPLICABLE

2. **Acceptance Criteria as per : BS EN ISO 15848-1 TABLE 2:**

Body Seals Leakage Rate	Body Seals Leakage Rate
ppmv	**mbar.l/s**
≤ 50	≤ 5.0×10^{-5}

Note:
1 ppmv = 1 x 10^{-6} mbar.l/s
1 atm.cm^3/s = 1 mbar.l/s = 1 atm.cc/s ≈ 1 std.cc/s

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3. **Acceptance Criteria as per : MESC SPE 85/300 CLAUSE NO 3.3.2 TABLE 4:**

Fugitive Emission Tightness Class	Body Seals Leakage Rate	Body Seals Leakage Rate
		GASKET OD: 149.4 mm
	$mbar \cdot l/(s \cdot mm_{dia})$	mbar.l/s
Class AH	$\leq 1.78 \times 10^{-7}$	2.66×10^{-5}
Class BH	$\leq 1.78 \times 10^{-6}$	2.66×10^{-4}

Note: mm_{dia} is per mm gasket outside (sealing) diameter

4. **Observed Values:**

Cycle No.		Pressure	Temp ˚C			Measured Leak Rate		
						Body to Bonnet Seal	End / Side Flange Seal	
		Kg/cm²g	T_1	T_2	T_3		LHS	RHS
						(mbar.l / s)		
0	RT	53	31	32	31	5.04×10^{-7}	5.73×10^{-7}	6.38×10^{-7}
50	RT	53	32	33	32	5.23×10^{-7}	6.41×10^{-7}	7.55×10^{-7}
51	ET	36	411	409	410	6.41×10^{-7}	7.22×10^{-7}	8.71×10^{-7}
100	ET	36	408	405	409	7.91×10^{-7}	8.39×10^{-7}	9.64×10^{-7}
101	RT	53	32	31	32	1.06×10^{-6}	9.53×10^{-7}	1.12×10^{-6}
150	RT	53	33	32	34	1.26×10^{-6}	9.84×10^{-7}	1.35×10^{-6}
151	ET	36	405	408	402	2.33×10^{-6}	1.72×10^{-6}	1.56×10^{-6}
200	ET	36	410	406	405	3.17×10^{-6}	2.18×10^{-6}	2.97×10^{-6}
201	RT	53	32	30	31	2.46×10^{-6}	1.23×10^{-6}	2.38×10^{-6}
205	RT	53	32	30	31	2.59×10^{-6}	1.36×10^{-6}	2.42×10^{-6}
206	RT	53	32	30	31	2.59×10^{-6}	1.37×10^{-6}	2.41×10^{-6}
1000	RT	53	34	32	33	2.83×10^{-6}	1.54×10^{-6}	2.67×10^{-6}
1001	ET	36	412	410	407	3.58×10^{-6}	2.63×10^{-6}	3.13×10^{-6}
1500	ET	36	408	409	404	5.65×10^{-6}	4.95×10^{-6}	4.62×10^{-6}
1501	RT	53	32	30	31	6.43×10^{-6}	4.66×10^{-6}	5.24×10^{-6}
2000	RT	53	33	32	32	6.86×10^{-6}	5.18×10^{-6}	5.85×10^{-6}
2001	ET	36	406	404	402	7.52×10^{-6}	5.73×10^{-6}	4.92×10^{-6}
2500	ET	36	409	407	401	8.75×10^{-6}	7.11×10^{-6}	6.48×10^{-6}
Maximum Leakage Observed						**8.75×10^{-6}**	**7.11×10^{-6}**	**6.48×10^{-6}**

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5. **Post Test Examination:**

After all the tests have been successfully completed, the test valve disassembled and all sealing components visually examined. No notable wear and no any other significant observations found.

6. **Results:**

Tested Spiral Wound Gasket values observed meet the requirement Fugitive Emission Tightness as per "BS EN ISO 15848 PART 1 TABLE 2" and Fugitive Emission Tightness Class AH as per "MESC SPE 85/300 CLAUSE NO 3.3.2 TABLE 4" hence acceptable.

Above qualification subject to:
Upon the successful completion of the test program as defined in this part of ISO 15848 and MESC SPE 85/300, this qualification can be extended to untested sizes and classes of Spiral Wound Gasket of the same type, if the following criteria are met:

a. *The Spiral Wound Gasket are of the same material, design (shape), and construction, independent of the size;*
b. *The tightness class required is equal to, or less severe than that of the qualified Spiral Wound Gasket.*

7. **Instruments:**

All Instruments used for Testing are calibrated. Calibration Certificates verified.

Sr. No.	Name of Instrument	Identification No.	Calibration Certificate No	Date of Calibration	Due Date of Calibration
1	Temperature Scanner (Digital) 4 Channel; -199˚C to 600˚C	TS-01	NCQC-E/160321/06	16/03/2021	15/03/2022
2	Thermocouple; 0˚C to 600˚C	TH-01	NCQC-T/160321/18	16/03/2021	15/03/2022
3	Thermocouple; 0˚C to 600˚C	TH-02	NCQC-T/160321/19	16/03/2021	15/03/2022
4	Thermocouple; 0˚C to 600˚C	TH-03	NCQC-T/160321/20	16/03/2021	15/03/2022
5	Thermocouple; 0˚C to 600˚C	TH-04	NCQC-T/160321/21	16/03/2021	15/03/2022
6	Pressure Gauge; 0-70 kg/cm^2	PSI/PG/05	NCQC-M/160321/05	16/03/2021	15/03/2022
7	Pressure Gauge; 0-70 kg/cm^2	PSI/PG/06	NCQC-M/160321/06	16/03/2021	15/03/2022
8	Torque Wrench (Digital)	PSI/TWQ/01	NCQC-M/160321/17	16/03/2021	15/03/2022

8. **Enclosed:**

1. Spiral Wound Gasket MTC
2. Spiral Wound Gasket Raw Material MTC

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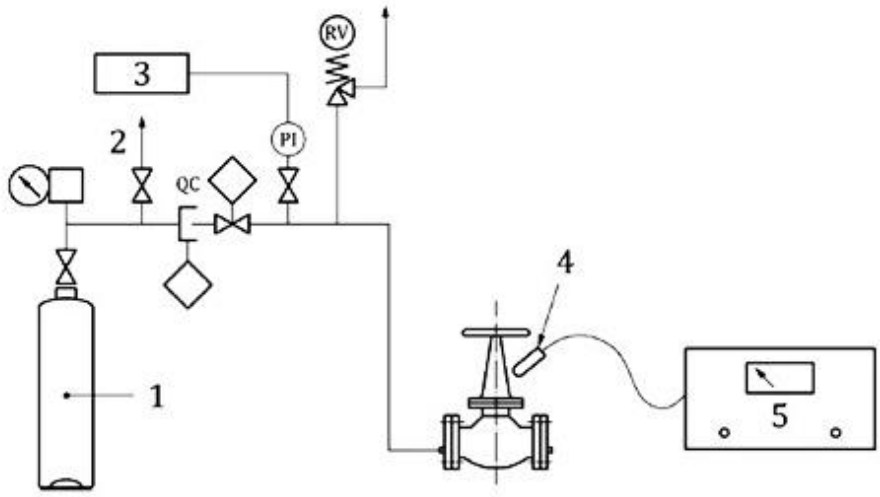
9. **Schematic Diagram:**



Key

1	gas supply	5	gas leak detector
2	vent	QC	quick coupling
3	pressure recorder	RV	relief valve
4	probe	PI	pressure sensor

Local measurement by sniffing method

TESTED BY: **FOR PURVA INSPECTION & TESTING SERVICES** **PATHIK MEHTA** **(NDT LEVEL II- LEAK TESTING)**	**WITNESSED BY:** **PINKESH PARMAR** **(M/s LLOYD'S REGISTER MARINE & INSPECTION SERVICES INDIA LLP)**

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