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Certificate No : 624202202276 **Date : February 27, 2022**

API STANDARD 624 TEST CERTIFICATE
Type Testing of Rising Stem Valves Equipped with Graphite Packing For Fugitive Emissions

This is to certify that the below mentioned valve has been inspected by Plasma & Vacuum Technologies and found to be satisfactory in accordance with the requirements of API 624, First Edition 2014.

Manufacturer:	**Fluid-O-Mech Controls Inc.**
Address:	**14/1A, Pancharatna Industrial Estate, Near Ramol Bridge, Vatva G.I.D.C, Ahmedabad – 382 445. Gujarat. India.**
Location of Test:	**Plasma & Vacuum Technologies, Plot No.17, Road 1-A, GIDC Kathwada, Ahmedabad 382430, India.**

Product :	Valve Details:	**Gate Valve, 12" 300#**
	Design Standard:	**API 600**
Packing :		**Make: New Empire Gaskets, Model: Seal-It.**
Body/Bonnet Material :		**ASTM A216 Gr. WCB**
Stem Material :		**ASTM A276 TP410**
GA Drawing No:		**FMC/300X300#/GTV/SW/00**
Test Fluid :		**Methane (>97 % Purity)**
Test Pressure :		**41.4 barG (~600 psiG)**
Test Temperature :		**At Ambient and 260°C (~ 500°F)**
Mechanical Cycle :		**310 Cycles over 3 Thermal Cycles**
Maximum Leakage :	**46.8**	**ppmv**
Average Leakage :	**25.7**	**ppmv**
Acceptance Criteria :	**< 100**	**ppmv maximum**
Test Result :	**PASS**	
Test Report No :	**PVT/SD/FET/R/202202/27**	
Test Start Date :	**February 23, 2022**	
Test End Date :	**February 25, 2022**	

Valve Qualified : All valves of the same basic design as the test valve may be deemed to have been type tested, subject to the following additional limitation. For API 600 Valves, 12" (DN 300) Class 300 test valve qualifies all valves from 8" (DN 200) through 14" (DN 350) in pressure class 150 and 300.

Test Conducted by

Venkat N. Ramani
ASNT Level III (LT) 183918
Plasma & Vacuum Technologies

ASNT NDT LEVEL III-LT 183918

Test Witnessed By

Witnessed

BUREAU VERITAS (INDIA) PRIVATE LIMITED SURVEYOR AT AHMEDABAD

27/02/2022

Shanti S.

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API STANDARD 624 FUGITIVE EMISSIONS TEST REPORT

F/CR/10.2
RevNo.00

Report No :	PVT/SD/FET/R/202202/27	Report Date :	27 February 2022
Manufacturer :	Fluid-O-Mech Controls Inc.	Valve Stem Type :	Rising Stem
Valve – Type, Size, Class :	Gate Valve, 12" 300#	API / ASME Design Standard:	API 600

Packing Description :	Number of Rings : 6 nos OD : 60.8 mm, ID : 41.5 mm Thickness : 9.5 mm Stack Height : 57 mm Stuffing box depth : 60 mm	Body / Bonnet Gasket Connection: SPW SS316 + Graphite Filler.
Make: New Empire Gaskets, Model: Seal-It.		
Packing Manufacturer :		
New Empire Gaskets	Gland Follower Exposed Length:29mm	Body-Bonnet connection : Bolted.
Gland Nut recommended torque:140Nm	Gland Follower Insertion Depth: 3mm	Body/Bonnet Nut recommended torque: 510Nm

Test Start Date :	23 February 2022	Valve Selection : by Manufacturer; Selection Date:17.02.2022	
Test Completion Date :	25 February 2022	Selected by : QA/QC Dept. Fluid-O-Mech Controls Inc. Ahmedabad.	

SUMMARY OF FUGITIVE EMISSIONS TEST DATA

Test Segment	Cycle	Methane Pressure (barG)	Temperature at Body (°C)	Temperature at Stem (°C)	Static Leak Measurement (ppmv)	Dynamic Leak Measurement (ppmv)	Remarks
Ambient Temperature T(a) = RT, P(a)=41.4 barG	0	41.4	26	26	12.6	16.7	OK
	50	41.4	27	27	13.7		
Elevated Temperature T(e) =260°C, P(e) = 41.4 barG	51	41.4	264	265	15.0	26.1	OK
	100	41.4	266	268	21.6		
Ambient Temperature T(a) = RT, P(a)=41.4 barG	101	41.4	30	31	18.3	30.9	OK
	150	41.4	33	33	24.8		
Elevated Temperature T(e) =260°C, P(e) = 41.4 barG	151	41.4	262	260	18.8	34.7	OK
	200	41.4	262	260	30.8		
Ambient Temperature T(a) = RT, P(a)=41.4 barG	201	41.4	25	25	16.8	37.0	OK
	250	41.4	27	27	29.0		
Elevated Temperature T(e) =260°C, P(e) = 41.4 barG	251	41.4	261	266	25.9	46.8	OK
	300	41.4	263	267	36.9		
Ambient Temperature T(a) = RT, P(a)=41.4 barG	301	41.4	40	40	18.0	34.4	OK
	310	41.4	40	40	31.5		

Valve Serial Number: **FMCI-118 (Heat No.: Body: G55, Bonnet: G55)**

Running Torque - First Cycle : 32 Nm, Last cycle : 28 Nm — **FINAL REMARK : Pass (√)**

Pre-test Preparations & Adjustments : 1) Gland bolting, Body/Bonnet and Valve open-close torques were verified; 2) The air in the valve cavity was evacuated and purged with Helium prior to starting the testing; 3) The stem orientation was kept vertical; 4) External valve heating was designed, with heating coils and wrapped by Alumina wool; 5) Electrical Operation using wheel was set for cycling (opening and closing) the valves.

Notes : 1) The test valve was randomly selected; 2) The test medium was methane with purity > 97%; 3) The test was conducted in a safe, well ventilated and protected environment; 4) No packing adjustment was done during test. Running torques at the start and end were measured and recorded; 5) Methane Detector (Model TVA 2020, Thermofisher) was used for ambient monitoring; 6) Methane Detector (Model TVA 2020, Thermofisher) was used for methane leakage at gland and body / bonnet joint. The Probe was calibrated prior to each measurement using an external calibration gas with known Methane concentration. T(a)= Ambient Temperature, T(e)= Elevated Temperature, P(a)= Ambient Pressure & P(e)= Elevated Pressure, RT=Room Temperature

Test Witnessed by	Test Conducted by	Test Witnessed By
	Venkat N. Ramani ASNT Level III (LT)	

ASNT NDT LEVEL III (LT)

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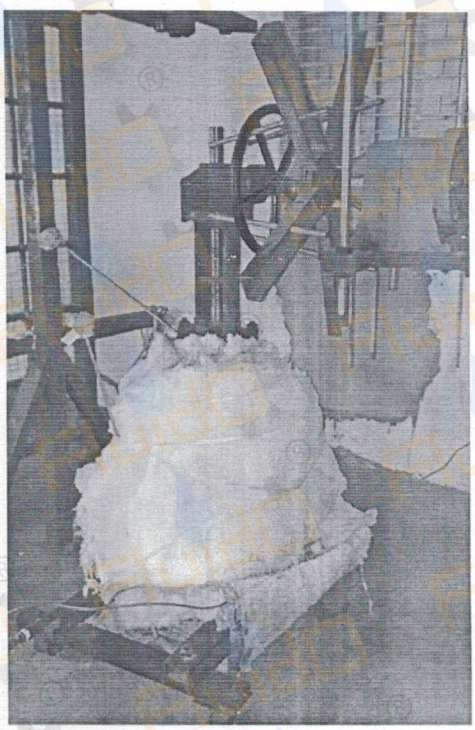
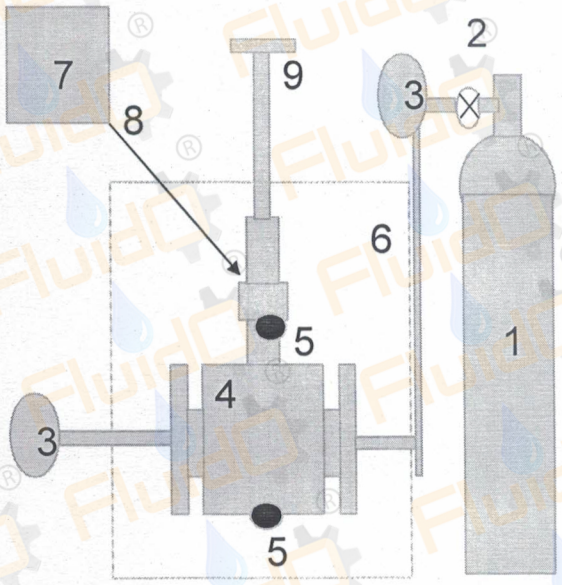
Annexure 1 : SET UP

Report No.: PVT/SD/FET/R/202202/ 27 **Report Date:** 27 February 2022





NDT LEVEL II

27/02/2022

Shaik I.S

1 : Methane Gas Cylinder; 2 : Isolation Valve; 3 : Pressure Gauge;
4 : Valve under Test; 5 : Temperature Sensor; 6 : Hot Zone;
7 : Methane Leak Detector; 8 : Sniffer Probe; 9 : Valve operation–Rising Stem.

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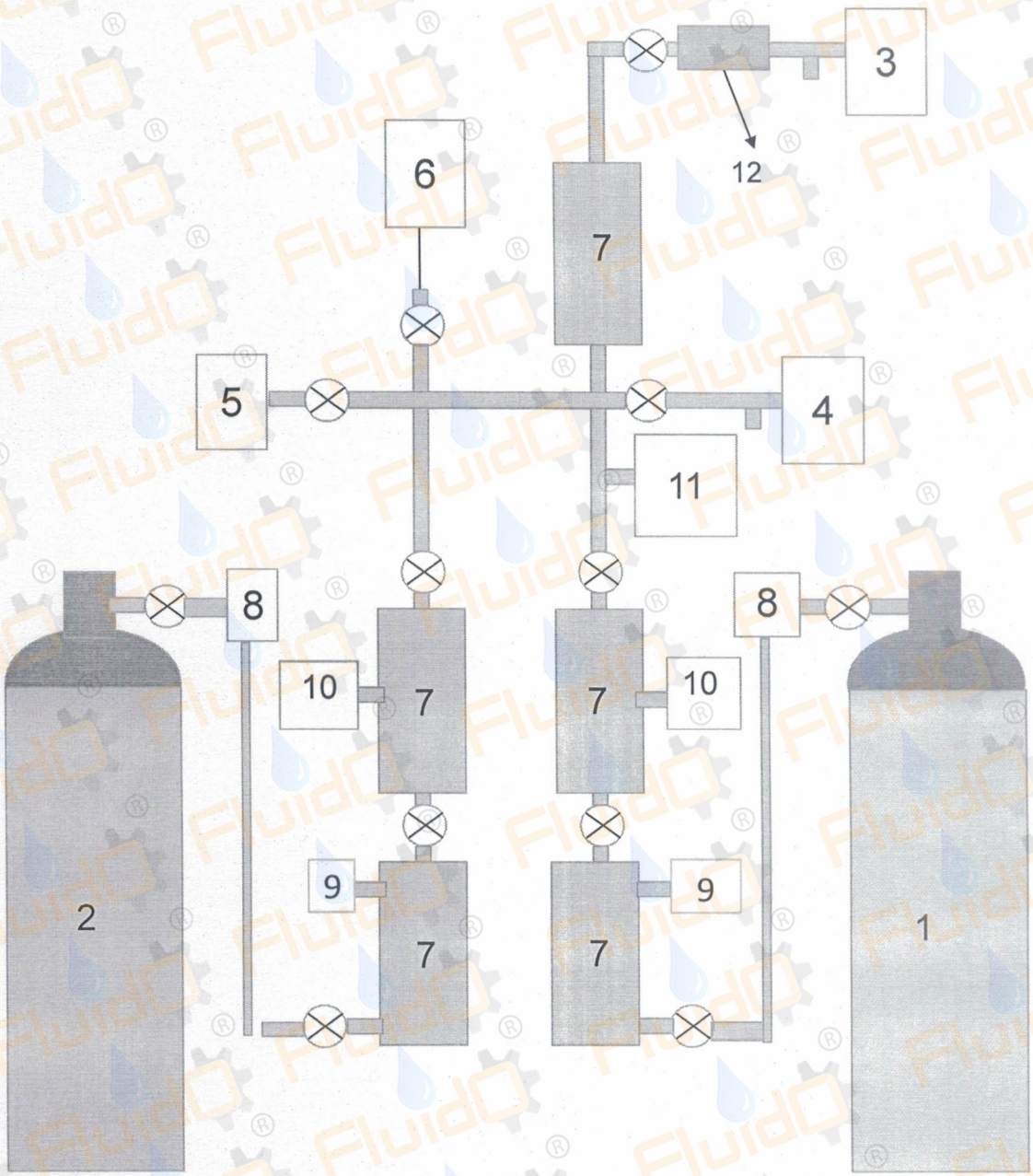
Annexure 2

Schematic of Probe Calibration Set up

Report No.: **PVT/SD/FET/R/202202/ 27** **Report Date:** **27 February 2022**



1 : Methane Gas Cylinder; 2 : Zero Gas / Helium Cylinder; 3,4,5 : Positions of Methane Leak Detector. For Calibration, EPA21 Calibration and Zeroing respectively; 6 : Vacuum Pump; 7 : Reservoir; 8, 9, 10, 11: Pressure Gauges; 12 : Methane Calibrated Leak.

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ANNEXURE 3 : TEST REPORT - HELIUM LEAK TESTING

Report No :	PVT/SD/FET- HLT/R/202202-27	Report Date :	February 23, 2022
Client :	Fluid-O-Mech Controls Inc.	Testing Equipment :	HLD ASM 310 ADIXEN
Manufacturer :	Fluid-O-Mech Controls Inc.	Calibrated Leak(s) :	PVT/CD/SL/03, PVT/CD/SL/04
Item :	Gate Valve, 12" 300#	Ref. Code(s) :	ASME Sec V, Art 10, Detector Probe Technique
Reference:	Prior to API624 Test of valve	Qualification:	Helium Leakage Rate : <1.0x10-6 mbar l/s at Body-Bonnet and Gland joints at 41.4 barG pressure (10% of Helium + 90% Nitrogen).

Leak Detector and Probe Calibration

	Standard Leak Value		Observed Leak Value		Instrument Sensitivity		
A	2.48 x 10^{-8}	mbar l/s	~ 2.5 x 10^{-8}	mbar l/s	better than	10^{-9}	std cc/s
B	1.13 x 10^{-6}	mbar l/s	~ 1.1 x 10^{-6}	mbar l/s	CF = 1.0	Response	< 5 s

	Stage	Test Date	Body Leak Rate (mbar l/s)	Gland Joint Leak Rate (mbar l/s)	Remarks
1	Prior to API624 Test	Feb 23, 2022	5.7 x 10^{-7}	7.2 x 10^{-7}	Leak Tightness is OK

Test Witnessed by	Test Conducted by	Test Witnessed By
Fluid-O-Mech Controls Inc.	Venkat N. Ramani ASNT Level III (LT) Plasma&Vacuum Technologies	23/02/2022

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Annexure 4
CALIBRATION DATA AND METHANE LEAKAGE EVALUATIONS

Report No.: **PVT/SD/FET/R/202202/ 27** **Report Date: 27 February 2022**

Test Segment	Cycle	Condition	Ambient Leak Rate Value (ppmv)	Calibration Leak Rate Value (ppmv)	Detector Sensitivity	Observed Leak Rate (ppmv)	Measured Leak Rate (ppmv)
Ambient Temperature T(a) = RT, P(a)=41.4 barG	0	Static	2.3	75.4	1.02	14.7	12.6
	50	Static	4.2		1.05	17.3	13.7
	50	Dynamic				20.2	16.7
Elevated Temperature T(e) =260°C, P(e) = 41.4barG	51	Static	5.1	75.8	1.05	19.3	15.0
	100	Static	7.6		1.09	27.4	21.6
	100	Dynamic				31.5	26.1
Ambient Temperature T(a) = RT, P(a)=41.4 barG	101	Static	2.8	76.3	1.01	20.8	18.3
	150	Static	5.2		1.05	28.9	24.8
	150	Dynamic				34.7	30.9
Elevated Temperature T(e) =260°C, P(e) = 41.4barG	151	Static	8.0	76.7	1.08	25.3	18.8
	200	Static	3.4		1.02	33.7	30.8
	200	Dynamic				37.5	34.7
Ambient Temperature T(a) = RT, P(a)=41.4 barG	201	Static	7.0	74.9	1.10	22.3	16.8
	250	Static	2.1		1.02	30.4	29.0
	250	Dynamic				38.2	37.0
Elevated Temperature T(e) =260°C, P(e) = 41.4barG	251	Static	7.7	75.4	1.10	31.2	25.9
	300	Static	5.9		1.07	40.3	36.9
	300	Dynamic				49.5	46.8
Ambient Temperature T(a) = RT, P(a)=41.4 barG	301	Static	8.4	75.9	1.10	24.7	18.0
	310	Static	2.8		1.02	33.7	31.5
	310	Dynamic				36.5	34.4
						Average Value:	**25.7**

Calibrated Leak used (ml/m) : SL	0.072
Flow Rate at Methane Leak Detector (lpm) : FR	0.966
Estimated PPM value (PPMv) = (SL/FR)x1000	74.53

Leakage at Body-Bonnet Connection

Cycle Number	Body Temperature (°C)	Pressure (barG)	Ambient Leak Rate Value (ppmv)	Calibration Leak Rate Value (ppmv)	Detector Sensitivity	Observed Leak Rate Value (ppmv)	Measured Leak Rate Value (ppmv)
0	28	41.4	2.3	75.4	1.02	12.3	10.2
310	40	41.4	2.8	75.9	1.02	24.5	22.1

Measured Leak Rate = (Observed Leak Rate – Ambient Leak Rate Value) x
[Estimated PPM value / (Calibration Leak Rate Value – Ambient Leak Rate Value)]

Test Witnessed by	Test Conducted by	Test Witnessed By
Fluid-O-Mech Controls Inc.	Venkat N. Ramani ASNT Level III (LT) Plasma&Vacuum Technologies	27/02/2022 Shakil. S

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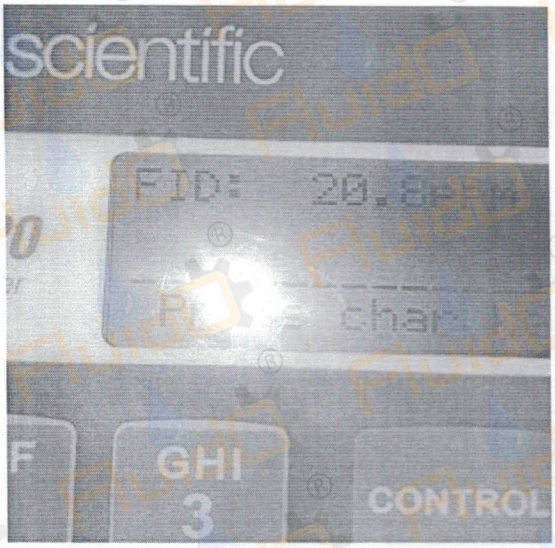
Annexure 5

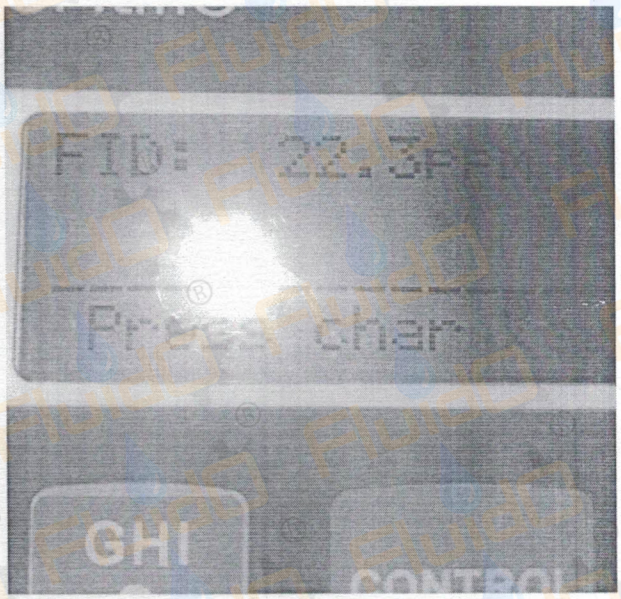
Methane Leakage Measurements

Report No. : PVT/SD/FET/R/202202/ 27 **Report Date:** 27 February 2022

(a)



(b)



(c)

(d)

Methane leakage at : a) Ambient, Static, 0 cycles; b) Ambient, Static, 101 cycles; c) Ambient, Static, 201 Cycles ; d) Elevated, Static, 300 Cycles ;

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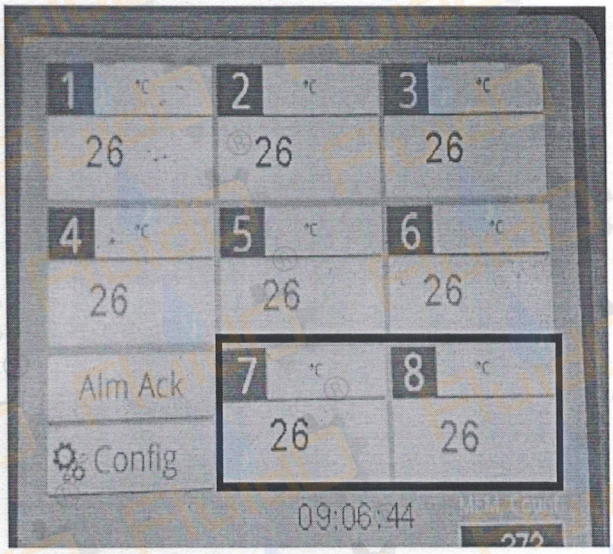
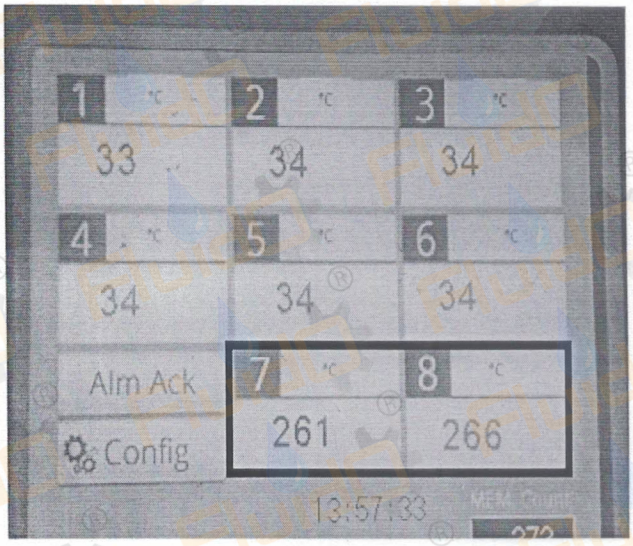
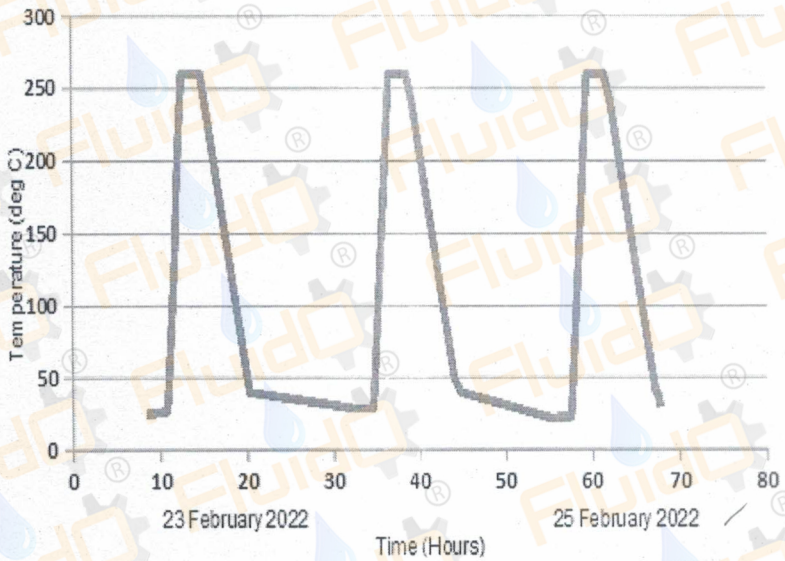
Annexure 6
Temperature Measurements

Report No. : PVT/SD/FET/R/202202/ 27 **Report Date:** 27 February 2022





12 Inch 300# Gate Valve ; Fluid-O-Mech Controls Inc.
API 624 Test : Temperature Profile



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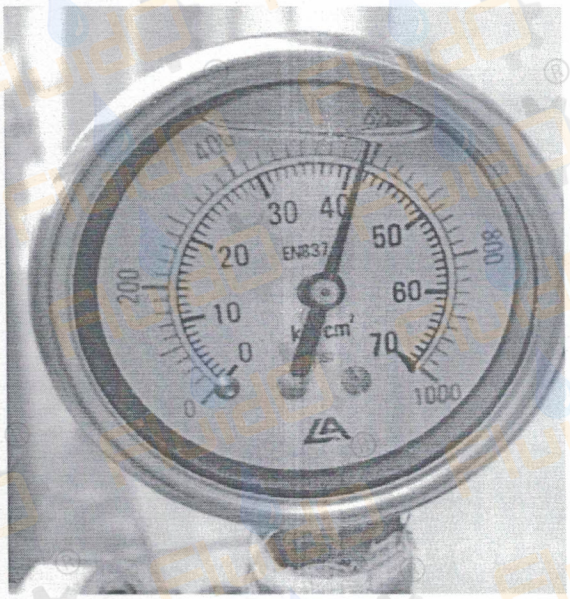
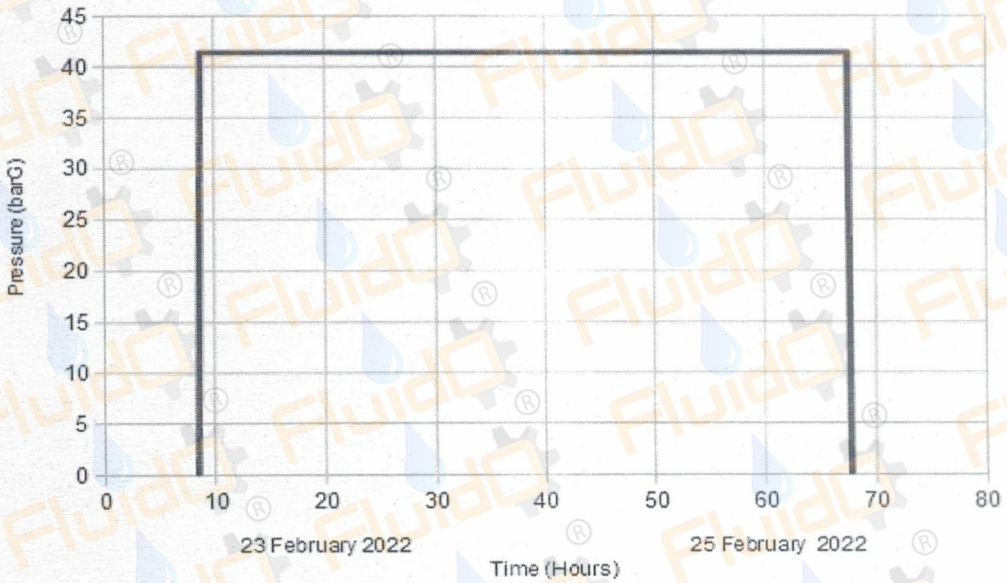
Annexure 7
Pressure Measurements

Report Date: PVT/SD/FET/R/202202/ 27 **Report Date:** 27 February 2022



12 Inch 300# Gate Valve ; Fluid-O-Mech Controls Inc.
API 624 Test : Pressure Profile



SNT NDT LEVEL III-LT

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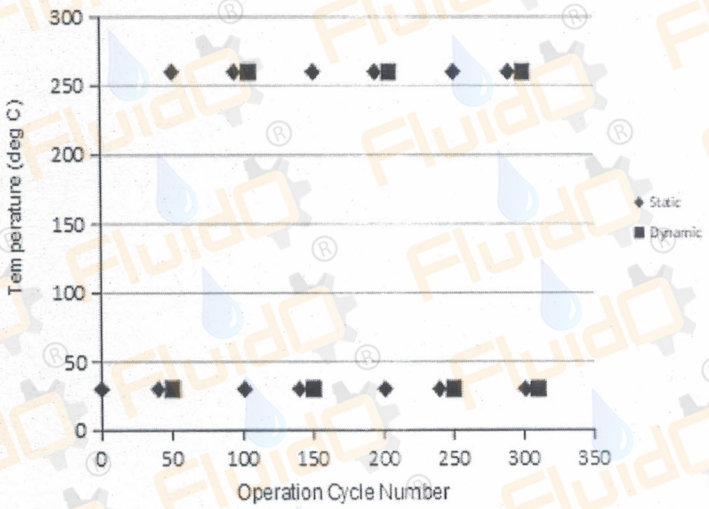
Annexure 8
Valve Operation Mechanism

Report No.: PVT/SD/FET/R/202202/ 27 **Report Date:** 27 February 2022

API 624 Test : Methane Leakage Measurement Points



ASNT NDT LEVEL III-LT 183918

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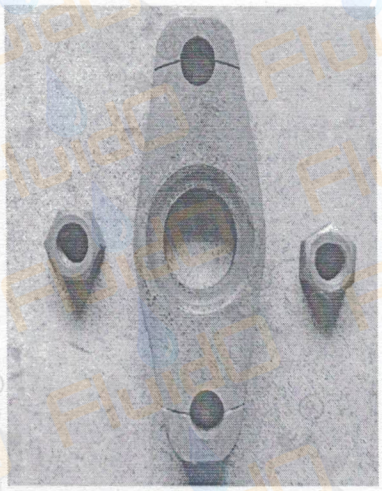
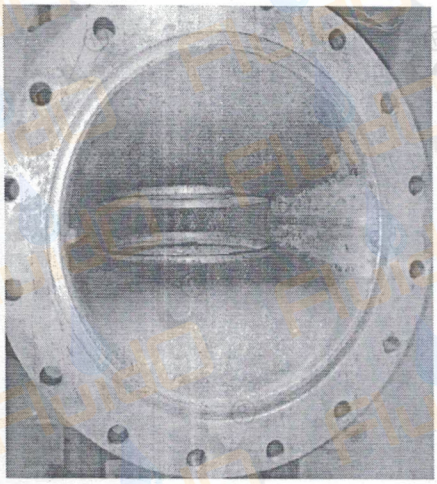
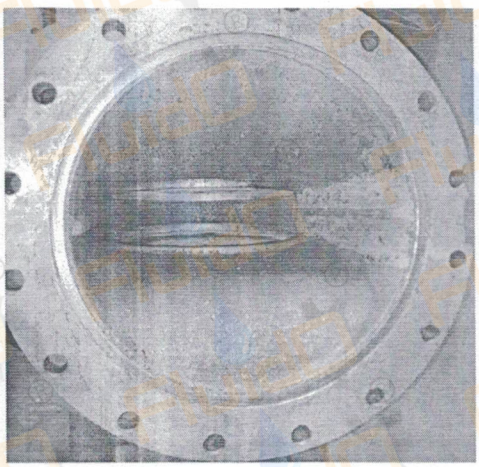
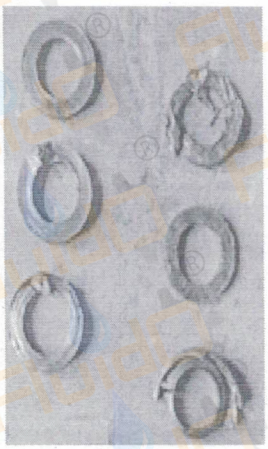
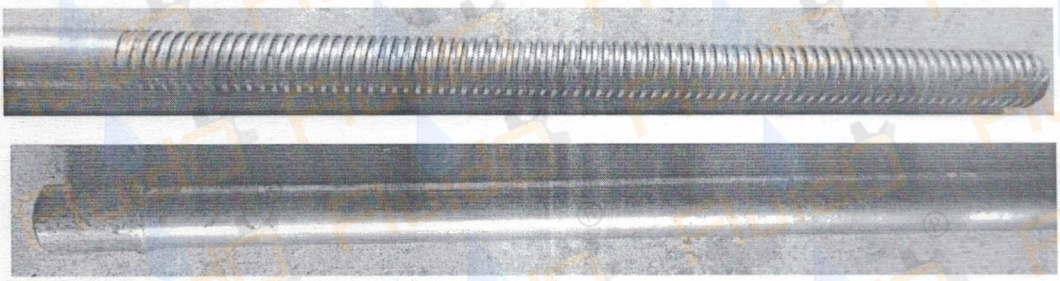
Annexure 9
Post – Test Valve Opened Up Photographs

Report No.: PVT/SD/FET/R/202202/ 27 **Report Date:** 27 February 2022

Remarks: The disassembled Valve parts were inspected and the condition was found satisfactory.

LEVEL III NDT

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PlasVac
Plot No. 17, Road 1 - A,
GIDC, Kathwada, Ahmedabad-382430.
Phone : +91 79-29705319, Fax : 079-29709216
Email : pvt@plasvac.com
Website : www.plasvac.com

List of Calibration Reports of Instruments / Documents attached

Report No.: PVT/SD/FET/R/202202/ 27 **Report Date: 27 February 2022**

1	Methane Gas Cylinder 709
2	Gas Monitor Pump (Flow Rate), Report No. PVT/SD/FRM/R/2022/01
3	Standard Leak, Sl No PVT/TD/CL/06, Report No. PVT/SD/FRM/R/2022/02
4	Helium Standard Leak, Sl No. PVT/CD/SL/03
5	Helium Standard Leak, Sl No. PVT/CD/SL/04
6	Torque Wrench, MACMASTER, PVT/SD/TW/01 & 02
7	Pressure Gauge, LA, PVT/SD/GP70D/22
8	Temperature Sensor, Thermal Sense Tech, PVT/SD/TST/31 & 32
9	ASNT NDT Level III certification of V N Ramani
10	API 622 Qualified Packing Certificate

ASNT NDT LEVEL III-LT 183918

Verified.
BUREAU VERITAS (INDIA) PRIVATE LIMITED SURVEYOR AT AHMEDABAD
27/02/2022
Shaicil.S.

NATIONAL CENTRE FOR QUALITY CALIBRATION

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E-mail : ncqc@calibrationlaboratory.in, • calibrationlab.ncqc@gmail.com
Visit our Web Site : www.calibrationlaboratory.in

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Precision Calibration with National / International Traceability for Temperature, Dimensional, Pressure, Vacuum, Time, Mass, Electrical, Noise, Airflow, Lux & all Special Purpose Instruments in all ranges.

Calibration Certificate

Name of Customer → **Plasma & Vacuum Technologies** Plot No.17, 1/A Road, GIDC Kathwada, Ahmedabad–382 430, Gujarat.		Certificate No. Date of Issue Date of Calibration Suggested Due Date	NCQC-M/161221/03 17-12-2021 16-12-2021 15-12-2022
Date Of Receipt / Ref. No.→ 16-12-2021		F/CR/M/052, Issue No.01 Page 1 of 1	
ULR – CC212821000005773F	**Discipline → Mechanical Calibration,** Force, Torque		
Details of Observation of Unit Under Calibration	Identification No. : **PVT/SD/TW/01** Serial No. : **24B – 41** Name of Instrument : **Torque Wrench**		

Range	70 – 340 Nm	Visual Inspection	OK
Least Count	10 Nm	Make	Mac Master
Type	Type II	Model	TW 250 R
Accuracy	± 4 % of rdg.	Class	A

Force Set on Torque Wrench in Nm	Reading Observed By Torque Wrench calibration system in Nm	Absolute Error In Nm	Expanded Uncertainty (±)
110	107.9	2.1	2.42 % rdg.
230	226.7	3.3	2.42 % rdg.
320	324.3	4.3	2.42 % rdg.

Remarks:

- Averages of minimum five readings are reported.
- Suggested due date is given based on customer requirements.
- Calibration points are given based on customer requirements.
- These results are obtained at the time of calibration.
- Any hand written corrections (except @ marked) or photocopies of the report invalidates this certificate.
- The uncertainties are for a confidence probability of not less than 95% with coverage factor k = 2.
- Environment condition during calibration: 23 ± 2°C, 40 to 60% Rh.
- Reference standard no.: IS/ISO 6789.
- Location of performance of calibration → At Lab.
- Condition of instrument found satisfactory during receipt.
- Reference calibration method no.: NCQC/CM/M/052.
- Our masters are directly calibrated through NABL accredited calibration laboratory having direct Traceability with national / international standard.

Details of master Instrument Used for Calibration

Nomenclature	Make / Model	Id. No. / Sr. No.	Calibration Due Date
Torque Wrench calibration system	Sushma / TS–103F & TDU–RB–103	TS13–0089,0091,0092,0093, / DU13–0032 (NCQC-M/022)	30-03-2023

NCQC System Certificate No.	Certificate no. & traceability of master with National Standards
152, 152/2, 152/3,152/4	→ Our master torque wrench calibration system is calibrated and traceable to National Standard through NABL accredited laboratory Sushma Industries calibration centre, Certificate no. SCPL/CC/2876,2877,2878,2879 /03/2020-2021, Date - 31-03-2021.

23/02/2022

Traceable To National / International Standards.

Calibrated By	Jaydeep Khatri	Reviewed & Approved By	Jigar Panchal

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NATIONAL CENTRE FOR QUALITY CALIBRATION

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Calibration Certificate

Name of Customer → **Plasma & Vacuum Technologies** Plot No.17, 1/A Road, GIDC Kathwada, Ahmedabad–382 430, Gujarat.		Certificate No. Date of Issue Date of Calibration Suggested Due Date	NCQC-M/161221/01 17-12-2021 16-12-2021 15-12-2022
Date Of Receipt / Ref. No.→ 16-12-2021		F/CR/M/052, Issue No.01 Page 1 of 1	
ULR – CC212821000005771F	**Discipline → Mechanical Calibration,** Force, Torque		
Details of Observation of Unit Under Calibration	Identification No. : **PVT/SD/TW/02** Serial No. : **24R – 12** Name of Instrument : **Torque Wrench**		

Range	10 – 68 Nm	Visual Inspection	OK
Least Count	2 Nm	Make	Mac Master
Type	Type II	Model	TW 50 R
Accuracy	± 4 % of rdg.	Class	A

Force Set on Torque Wrench in Nm	Reading Observed By Torque Wrench calibration system in Nm	Absolute Error In Nm	Expanded Uncertainty (±)
24	22.94	1.06	2.58 % rdg.
44	42.25	1.75	2.58 % rdg.
68	66.21	1.79	2.58 % rdg.

Remarks:

- Averages of minimum five readings are reported.
- Suggested due date is given based on customer requirements.
- Calibration points are given based on customer requirements.
- These results are obtained at the time of calibration.
- Any hand written corrections (except @ marked) or photocopies of the report invalidates this certificate.
- The uncertainties are for a confidence probability of not less than 95% with coverage factor k = 2.
- Environment condition during calibration: 23 ± 2°C, 40 to 60% Rh.
- Reference standard no.: IS/ISO 6789.
- Location of performance of calibration → At Lab.
- Condition of instrument found satisfactory during receipt.
- Reference calibration method no.: NCQC/CM/M/052.
- Our masters are directly calibrated through NABL accredited calibration laboratory having direct Traceability with national / international standard.

Details of master Instrument Used for Calibration

Nomenclature	Make / Model	Id. No. / Sr. No.	Calibration Due Date
Torque Wrench calibration system	Sushma / TS–103F & TDU–RB–103	TS13–0089,0091,0092,0093, / DU13–0032 (NCQC-M/022)	30-03-2023

NCQC System Certificate No.	Certificate no. & traceability of master with National Standards
152, 152/2, 152/3,152/4	↳ Our master torque wrench calibration system is calibrated and traceable to National Standard through NABL accredited laboratory Sushma Industries calibration centre, Certificate no. SCPL/CC/2876,2877, 2878, 2879 /03/2020-2021, Date - 31-03-2021.

23/02/2022

Traceable To National / International Standards.

Calibrated By	Jaydeep Khatri	Reviewed & Approved By	Utgar Panchal

NATIONAL CENTRE FOR QUALITY CALIBRATION

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Calibration Certificate

Name of Customer → **Plasma & Vacuum Technologies** Plot No.17, 1/A Road, GIDC,Kathwada, Ahmedabad–382 430, Gujarat.	Certificate No. Date of Issue Date of Calibration Suggested Due Date	NCQC-M/161221/09 17-12-2021 16-12-2021 15-12-2022
Date Of Receipt / Ref. No.→ 16-12-2021	F/CR/M/055, Issue No.01 Page 1 of 1	
ULR – CC212821000005779F	Discipline → Mechanical Calibration, Pressure and Vacuum	

Details of Observation of Unit Under Calibration	Identification No. : PVT/SD/GP70D/22 Serial No. : AQ008 Name of Instrument : Pressure Gauge				
Range	0 – 70 kg/cm²	Initial Error	Nil
Resolution	1 kg/cm²	Visual Inspection	Ok
Make / Model	LA / EN837-1	Location	====
Accuracy	====		

Set Pressure on UUC	Reading Observed Master instrument (Xi)		Absolute Error |Xi - Xt |		% Error of F.S. |Xi-Xt| / F.S. * 100		Expanded Uncertainty (±) in kg/cm²
(Xt)	Increasing Order	Decreasing Order	Increasing Order	Decreasing Order	Increasing Order	Decreasing Order	
0	0.000	0.000	0.000	0.000	0.00%	0.00%	0.292
7	7.013	7.011	0.013	0.011	0.02%	0.02%	0.292
12	12.031	12.044	0.031	0.044	0.04%	0.06%	0.293
21	21.050	21.056	0.050	0.056	0.07%	0.08%	0.292
28	28.069	28.066	0.069	0.066	0.10%	0.09%	0.292
42	42.053	42.066	0.053	0.066	0.08%	0.09%	0.293
56	56.084	56.068	0.084	0.068	0.12%	0.10%	0.294
60	60.109	60.097	0.109	0.097	0.16%	0.14%	0.293
70	70.121	70.143	0.121	0.143	0.17%	0.20%	0.296

Remarks:

- Averages of minimum three readings are reported.
- Suggested due date is given based on customer requirements.
- These results are obtained at the time of calibration.
- Pressure gauge was calibrated in Hydraulic mode.
- Condition of instrument found satisfactory during receipt.
- Any hand written corrections (except @) or photocopies of the report invalidates this certificate.
- Location of Performance of Calibration →At Lab.
- Environment condition during calibration: 23 ± 1.5°C, 40 to 60% Rh.
- The uncertainties are for a confidence probability of not less than 95% with coverage factor k = 2
- Reference Standard no. : DKD-R 6-1.
- Reference Calibration method no. : NCQC/CM/M/055.
- Our masters are directly calibrated through NABL accredited calibration laboratory having direct traceability with National / international standard.

(R)

ATLAS (INDIA) PRIVATE LIMITED SURVEYOR AT AHMEDABAD

23/12/2021

Shalat's

Details of Master Instrument Used for Calibration

Nomenclature	Make / Model	Id. No. / Sr. No.	Calibration Due Date
Digital Pressure Gauge	Vijay Enterprises/ MGA N32-2	NCQC/M-146/NVEM1806034	29-06-2022

NCQC System Certificate No.	Certificate no. & Traceability of master with National Standards
299	↳ Our master Digital Pressure gauge is calibrated and traceable to National Standard through NABL Accredited Laboratory, Vijay Instrumentation Services, Certificate No. VIS/21-22/M-517, Date -29-06-2021.

Traceable To National / International Standards.

Calibrated By Mahesh Desai

Reviewed & Approved By Jigar Panchal

NATIONAL CENTRE FOR QUALITY CALIBRATION INC.

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HI-TECH CALIBRATION

For Quality Command

Certy No. CC-2478

Head Off.: ROYAL INDUSTRIAL HUB, Gala No. 60, N.H.No. 8,
Nr. Daman Ganga River, Valvada (VAPI), Tal. Umbergaon Dist. Valsad - 396105.
Email : hitechvapi@yahoo.com / hitechvapi307@gmail.com
Web : www.hi-techcalibration.com Cell : 9426832487 / 9662980366

CALIBRATION CERTIFICATE

Service Request No. :- 2021/07/285		**Certificate No.** :- HTC/2021/07/11363	
ULR No. :- CC247821000011363F		Certificate Date of Issue :- 28-Jul-2021	
Date of Calibration 22-Jul-2021	Recom.Due Date : 21-Jul-2022	Discipline Thermal - Temperature	NABL Certificate Due on 05-Dec-2021	Page 1 of 3

1. Customer :- **Plasma & Vacuum Technologies**
Plot No 17, Road No. 1A Kathwada GIDC, Ahmedabad-382430

Received Date :- 21-07-2021 Location of Calibration :- At Lab Condition of Item :- Good	Work Instruction No.: HTC/WI/10 Reference Standard : NABL 129 & Euromat cg-8	Environment Condition Temp.°C 23.2 RH % 55.0	

2. Description of Item

Name	:- Thermocouple	Range	:- 0 to 1200 °C
ID No.	:- PVT/SD/TST/31	L.C.	:- ---
Sr. No.	:- ---	Accuracy	:- ---
Make	:- TST	Working Range	:- Full
Model / Type	:- --- / K - Type	Location	:- PVT/SD/DLD/03

3. Detail of Master equipment used for calibration

Name	Make/I.D No.	Certificate No.	Certified By	Cal. Validity
R-type Thermocouple	HTC-EQP-018	NI/2008/029/001	Nishitronic CC-2294	17-Aug-2022
Pt-100 Sensor (4-Wire)	HTC-EQP-090	HTC/2020/08/13373	HTC, & CC-2478	13-Aug-2021
Pt-100 Sensor (4-Wire)	HTC-EQP-091	NI/2008/029/002	Nishitronic CC-2294	17-Aug-2022
6 1/2 Digital Precision Multimeter	HTC-EQP-017	HTC/2021/04/6227	HTC & CC-2478	28-Apr-2022

The reported uncertainty is the expanded uncertainty in measurement obtained by multiplying the standard uncertainty by the coverage factor k=2, which corresponds to a coverage probability of approximately 95% for normal distribution.

Note :

1) UUC stands for Unit Under Calibration.
2) This certificate refers only to the particular item submitted for calibration
3) This certificate shall not be reproduced, except in full unless written permission for the publication of an approved abstract has been obtained from the Technical Manager of "Hi - Tech Calibration,Vapi".
4) The calibration results relate only to the item calibrated reported in the certificate are valid at the time of and under the stated conditions of measurement.

IRAU VERITAS (INDIA) PRIVATE LIMITED SURVEYOR AT AHMEDABAD
23/07/2021

Ankit C Patel
Calibration Engineer
Calibrated By

HI-TECH CALIBRATION * VAPI *

Dharmesh R. Purohit
Quality Manager
Authorised Signatory

HF-31/4

Name	Make/I.D No.	Certificate No.	Certified By	Page 2 of 3

All Calibration done in SI units and are traceable to National / International standards as per required ISO/IEC/17025

4. Tracibility :

1 R-Type Thermocouple Calibrate through NABL Lab Nishitronic CC-2294, Vide Certificate No.NI/2008/029/001. Calibrated on 18-Aug-2020 Traceable to National Standard.
2 Pt-100 Sensor (4-Wire) Calibrate through NABL Lab HTC & CC-2478, Vide Certificate No.: HTC/2020/08/13373.Calibrated on 14-Aug-2020 ,Traceable to National Standard.
3 Pt-100 Sensor (4-Wire) Calibrate through NABL Lab Nishitronic CC-2294, Vide Certificate No.NI/2008/029/002 Calibrated on 18-Aug-2020.Traceable to National standard.
4 6 1/2 Digital Precision Multimeter Calibrated through NABL Lab HTC & CC-2478, Vied, Certificate No. HTC/2021/04/6227. Calibrated on 28-April-2022 , Traceable to National Standard.

R

RITAS (INDIA) PRIVATE LIMITED
SURVEYOR AT
AHMEDABAD
23/04/2022
Shaikh S.

The reported uncertainty is the expanded uncertainty in measurement obtained by multiplying the standard uncertainty by the coverage factor k=2, which corresponds to a coverage probability of approximately 95% for normal distribution.

Note :

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4) The calibration results relate only to the item calibrated reported in the certificate are valid at the time of and under the stated conditions of measurement.

Ankit C Patel
Calibration Engineer
Calibrated By

HI-TECH CALIBRATION * VAPI *

Dharmesh R. Purohit
Quality Manager
Authorised Signatory

HF-31/4

HI-TECH CALIBRATION

For Quality Command

Certy No. CC-2478

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Nr. Daman Ganga River, Valvada (VAPI), Tal. Umbergaon Dist. Valsad - 396105.
Email : hitechvapi@yahoo.com / hitechvapi307@gmail.com
Web : www.hi-techcalibration.com Cell : 9426832487 / 9662980366

Certificate No. :-	HTC/2021/07/11363	Date of Calibration :-	22-Jul-2021	Page
I.D. No. :-	PVT/SD/TST/31	Recom. Due Date :-	21-Jul-2022	3 of 3
ULR No. :-	CC247821000011363F	Discipline :-	Thermal - Temperature	

5. **Calibration Method**

Actual temperature reading indicated by UUC is compared with specified stable temperature for a given temperature measured using standard – pt-100 Sensor or Thermocouple & DMM or calibrator.

6. **Calibration Results :**

A) INSTRUMENTAL ERROR FOR TEMPERATURE

Sr. No.	Cal. Point in °C	UUC Reading in °C	Standard Reading in °C	Error in °C	+/- Expanded Uncertainity in °C
1	20.0	20.0	20.075	-0.075	0.820
2	260.1	260.1	260.213	-0.113	0.650
3	750.2	750.2	750.435	-0.235	2.770
4	1000.3	1000.3	1000.588	-0.288	2.530

23/07/2022

Ankit C Patel
Calibration Engineer
Calibrated By

Kavita M. Panwala
Verification Engineer
Checked By

HI-TECH CALIBRATION VAPI

Dharmesh R. Purohit
Quality Manager
Authorised Signatory

HF-31C/00

For Quality Command

HI-TECH CALIBRATION

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Email : hitechvapi@yahoo.com / hitechvapi307@gmail.com
Web : www. hi-techcalibration.in Cell : 9426832487 / 9427634137

CALIBRATION CERTIFICATE

Service Request No. :- 2021/07/285		**Certificate No.** :- HTC/2021/07/11364	
ULR No. :- CC247821000011364F		Certificate Date of Issue :- 28-Jul-2021	
Date of Calibration 22-Jul-2021	Recom.Due Date : 21-Jul-2022	Discipline Thermal - Temperature	NABL Certificate Due on 05-Dec-2021	Page 1 of 3

1. Customer :- **Plasma & Vacuum Technologies**
Plot No. 17, Road No. 1A Kathwada GIDC, Ahmedabad-382430

Received Date :- 21-07-2021 Location of Calibration :- At Lab Condition of Item :- Good	Work Instruction No.: HTC/WI/10 Reference Standard : NABL 129 & Euromat cg-8	Environment Condition Temp.°C 24.6	 RH % 56.3

2. Description of Item

Name	:- Thermocouple	Range	:- 0 to 1200 °C
ID No.	:- PVT/SD/TST/32	L.C.	:- ---
Sr. No.	:- ---	Accuracy	:- ---
Make	:- TST	Working Range	:- Full
Model / Type	:- --- / K - Type	Location	:- PVT/SD/DLD/03

3. Detail of Master equipment used for calibration

Name	Make/I.D No.	Certificate No.	Certified By	Cal. Validity
R-type Thermocouple	HTC-EQP-018	NI/2008/029/001	Nishitronic CC-2294	17-Aug-2022
Pt-100 Sensor (4-Wire)	HTC-EQP-090	HTC/2020/08/13373	HTC, & CC-2478	13-Aug-2021
Pt-100 Sensor (4-Wire)	HTC-EQP-091	NI/2008/029/002	Nishitronic CC-2294	17-Aug-2022
6 1/2 Digital Precision Multimeter	HTC-EQP-017	HTC/2021/04/6227	HTC & CC-2478	28-Apr-2022

The reported uncertainty is the expanded uncertainty in measurement obtained by multiplying the standard uncertainty by the coverage factor k=2, which corresponds to a coverage probability of approximately 95% for normal distribution.

Note :

1) UUC stands for Unit Under Calibration.
2) This certificate refers only to the particular item submitted for calibration
3) This certificate shall not be reproduced, except in full unless written permission for the publication of an approved abstract has been obtained from the Technical Manager of "Hi - Tech Calibration,Vapi".
4) The calibration results relate only to the item calibrated reported in the certificate are valid at the time of and under the stated conditions of measurement.

BUREAU VERITAS (INDIA) PRIVATE LIMITED SURVEYOR AT AHMEDABAD

23/02/2022

Shaicil.S.

Ankit C Patel
Calibration Engineer
Calibrated By

HI-TECH CALIBRATION * VAPI *

Dhamesh R. Purohit
Quality Manager
Authorised Signatory

HF-31/4

HI-TECH CALIBRATION
For Quality Command
Head Off.: ROYAL INDUSTRIAL HUB, Gala No. 60, N.H.No. 48,
Nr. Daman Ganga River, Valvada (VAPI), Tal. Umbergaon Dist. Valsad - 396105.
Email : hitechvapi@yahoo.com / hitechvapi307@gmail.com
Web : www. hi-techcalibration.in Cell : 9426832487 / 9427634137

All Calibration done in SI units and are traceable to National / International standards as per required ISO/IEC/17025

4. Tracibility :

1 R-Type Thermocouple Calibrate through NABL Lab Nishitronic CC-2294, Vide Certificate No.NI/2008/029/001. Calibrated on 18-Aug-2020 Traceable to National Standard.
2 Pt-100 Sensor (4-Wire) Calibrate through NABL Lab HTC & CC-2478, Vide Certificate No.: HTC/2020/08/13373.Calibrated on 14-Aug-2020 ,Traceable to National Standard.
3 Pt-100 Sensor (4-Wire) Calibrate through NABL Lab Nishitronic CC-2294, Vide Certificate No.NI/2008/029/002 Calibrated on 18-Aug-2020,Traceable to National standard.
4 6 1/2 Digital Precision Multimeter Calibrated through NABL Lab HTC & CC-2478, Vied, Certificate No. HTC/2021/04/6227. Calibrated on 28-April-2022 , Traceable to National Standard.

VERITAS (INDIA) PRIVATE LIMITED SURVEYOR AT AHMEDABAD
23/10/2022
Shaicil S.

The reported uncertainty is the expanded uncertainty in measurement obtained by multiplying the standard uncertainty by the coverage factor k=2, which corresponds to a coverage probability of approximately 95% for normal distribution.

Note :

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4) The calibration results relate only to the item calibrated reported in the certificate are valid at the time of and under the stated conditions of measurement.

Ankit C Patel
Calibration Engineer
Calibrated By

HI-TECH CALIBRATION * VAPI *

Dharmesh R. Purohit
Quality Manager
Authorised Signatory

HF-31/4

For Quality Command

HI-TECH CALIBRATION

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Email : hitechvapi@yahoo.com / hitechvapi307@gmail.com
Web : www. hi-techcalibration.in Cell : 9426832487 / 9427634137

Certificate No. :-	HTC/2021/07/11364	Date of Calibration :-	22-Jul-2021	Page
I.D. No. :-	PVT/SD/TST/32	Recom. Due Date :-	21-Jul-2022	3 of 3
ULR No. :-	CC247821000011364F	Discipline :-	Thermal - Temperature	

5. **Calibration Method**

Actual temperature reading indicated by UUC is compared with specified stable temperature for a given temperature measured using standard – pt-100 Sensor or Thermocouple & DMM or calibrator.

6. **Calibration Results :**

A) INSTRUMENTAL ERROR FOR TEMPERATURE

Sr. No.	Cal. Point in °C	UUC Reading in °C	Standard Reading in °C	Error in °C	+/- Expanded Uncertainity in °C
1	20.1	20.1	20.223	-0.123	0.820
2	260.3	260.3	260.445	-0.145	0.650
3	750.4	750.4	750.673	-0.273	2.770
4	1000.5	1000.5	1000.823	-0.323	2.530

VERITAS (INDIA) SURVEYORS PRIVATE LIMITED AHMEDABAD BUREAU

23/07/2022

Ankit C Patel	Kavita M. Panwala		Dharmesh R. Purohit
Calibration Engineer	Verification Engineer	HI-TECH CALIBRATION VAPI	Quality Manager
Calibrated By	Checked By		Authorised Signatory

HF-31C/00