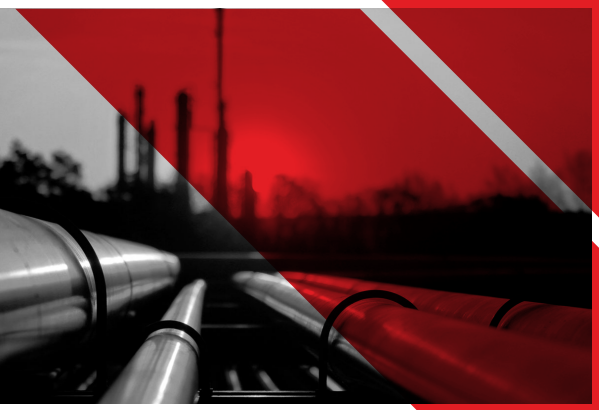
GHATGE PATIL INDUSTRIES LTD.
Imagination Solidified

Since - 1961

Oil & Gas Division

www.gpi.co.in

Company Profile



One-Stop Solution

Ghatge Patil Industries (GPI) is a leading solution provider to Oil & Gas Industry for exploration, production and distribution of crude oil, natural gas & other petroleum products/hydrocarbons. GPI offers a full range of valve sizes and configurations within each of its core product line. Customer base includes leading Oil & Gas companies, manufactures of wellhead equipment, pipeline companies & distributers in energy industry the world over.

GPI has more than 25 years of experience in manufacturing of valves for Oil & Gas industry & is accredited by American Petroleum Institute to use API 6A and 6D monograms. GPI has two manufacturing locations, one in INDIA & other in the USA to meet short- and long-term needs of customers. Both facilities maintain highest quality standards in line with changing customer needs.

GPI is committed to delivering valve solutions that meet or exceed region specific, customer specific and even project specific requirements. GPI works closely with customers to understand their unique requirements and develop long-term strategic relationships. This often involves customizing and designing special manufacturing programs for valves.

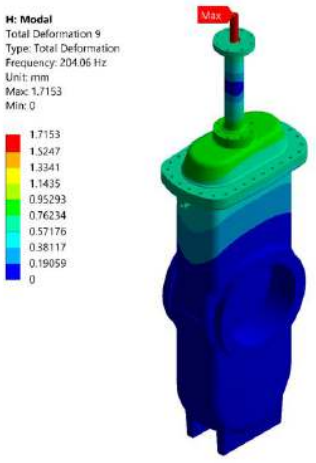
Special valve solutions provided by GPI meet with stringent environment protection requirements. Both the facilities are certified for ISO and adhere to stringent HSE standards in all segments of business.

Our Facilities

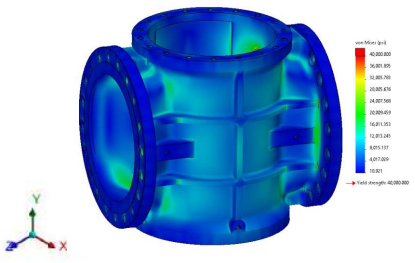
Design Facilities

- Finite Element Analysis
- Flow Simulation (CFD)
- Seismic Analysis
- Experimental Stress Analysis
- Solid Works
- CAM Works Simulation
- Seismic Analysis
- AutoCAD
- Math CAD
- BricsCAD V13
- UG Nx 10
- CAM Works
- Hyper-Mesh
- Ansys
- Fluent

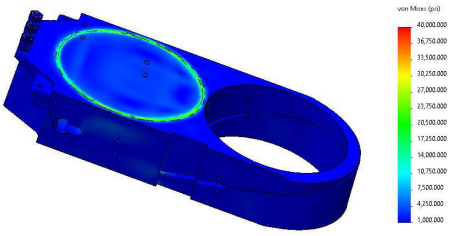
CAM Works Simulation



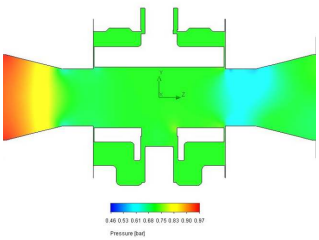
Seismic Analysis



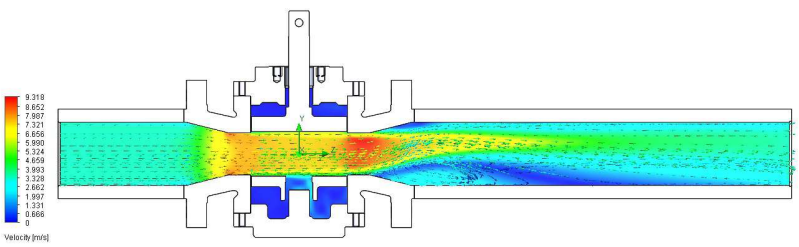
FEA Stress Plot



FEA Stress Plot



CFD Pressure Plot



CFD Analysis of Flow through Valve

Quality Assurance Facilities

- In-house Calibration Lab (Dimension, Pressure & Torque Metrology) accredited as per ISO 17025
- In-house Metallurgical Testing Lab (Chemical, Mechanical & Metallography) accredited as per ISO 17025
- 3D Co-Ordinate Measuring Machine (CMM)
- Portable Co-Ordinate Measuring Machine (Romer Arm)
- MAAG SP60 Gear Profile & Lead Measuring Machine
- 3D Scanner
- Charpy V Notch Impact Testing verified by 'NIST' at temperatures up to -73°C
- Hardness Testing (Brinell Hardness Testing, Rockwell Hardness Tester, Vicker's Hardness Tester, Micro Vicker's Hardness Tester)
- Universal Testing Machine
- Metallurgical Microscope Leica make is used for the analysis of Graphite Morphology, Phase Analysis, Inclusion Rating and Grain Size Measurement
- Thermo-Fisher ARL Spectrometer & Belec (Germany) make Spectrometer for Chemical Analysis
- Non-Destructive Examination (Magnetic Particle Examination, Liquid Penetrant Examination, Ultrasonic Testing, Visual Examination (Video Borescope))

Machining Facilities

GPIL has in-house machining facility to supply fully finished machined components to various customers using our following range of Machines.

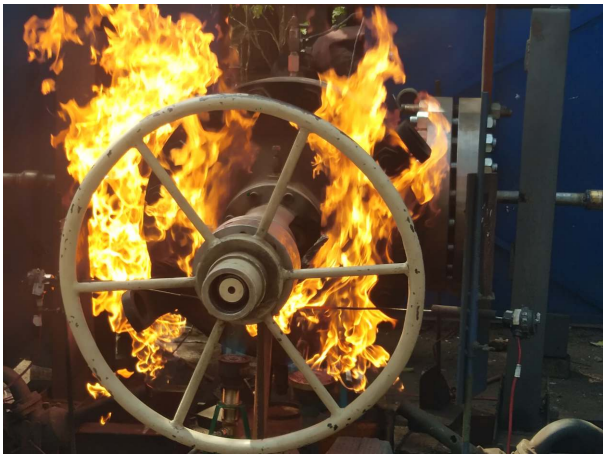
- Horizontal Machining Centers
- CNC Turning Centers
- Vertical Machining Centers
- CNC Vertical Turret Lathes
- Five Axis Machine
- Gear & Surface Grinding

Assembly & Testing Facilities

- In-house testing equipment for valves and transmissions
- High pressure testing beds in accordance with API 6A with optical monitoring system
- Hydrostatic pressure testing beds in accordance with API 6D with optical monitoring system
- Fire testing facility as per API 6FA, API 607 and ISO 10497
- Type test facility as per API 6A-Annex-F PR2
- Fugitive Emission testing facility as per ISO 15848-Part 1-2015

High Pressure Testing Bed

API 6D Hydraulic Test Bed



Fire Test

Surface Preparation & Coating Facilities

- Shot, Sand & Grit Blasting
- Manganese & Zinc Phosphating
- Nitriding
- Xylan Coating
- Everslik Coating
- Molykote Coating
- Electroless Nickel Plating
- Hard Chrome Plating
- Copper Plating
- Primer & Top Coat Painting

Surface Pre-treatment

Manganese & Zinc Phosphating

Nitriding

Surface Coating

Certificates

Product Certificates:

1. API 6A
2. API 6D
3. API 609

ISO Certificates:

1. ISO 9001:2015
2. ISO 14001:2015
3. ISO 45001:2018

CE Certificate:

European Directive 2014/68/EU (Module H)

Laboratory Certificates:

1. Calibration Lab ISO/IEC 17025:2017
2. Metallurgical Testing Lab ISO/IEC 17025:2017
3. Testing Lab – Mechanical Rubber and Rubber products as per ISO/IEC 17025:2017

Fire Test Certificate:

Third Party Witness by TUV NORD as per API 6FA, API 607 and ISO 10497 standard

SIL-3 Certificates:

For Plug Valve, Gate Valves & Triple offset Butterfly valve

Fugitive Emission Certificate:

For Plug Valves as per ISO 15848-Part 1-2015

EIL Certificate:

Valid certificate for Plug Valve

GreenCo Certificate:

Green Initiative

Green Co Certificates

API 6A High Temperature Expanding Gate Valve (Cast/Forged Body)

Size	2-1/16" to 7-1/16"
Pressure Rating	2000, 3000 & 5000 PSI
Product Specification Level	PSL1 & PSL2
Performance Requirement	PR1, PR2, PR2F
Design Standard	API 6A
Material Trim	DD, EE0.5, EE1.5
Temperature Class	L to Y (-46°C to 345°C [-50°F to 650 °F])
Certification	CE/PED

API 6A Expanding Gate Valve (Cast/Forged Body)

Size	2-1/16" to 7-1/16"
Pressure Rating	2000, 3000 & 5000 PSI
Product Specification Level	PSL1, PSL2 & PSL3
Performance Requirement	PR1, PR2, PR2F
Design Standard	API 6A
Material Trim	AA, BB, CC, DD, EE, FF, EE0.5, EE1.5, FF0.5, FF1.5
Temperature Class	L to U (-46°C to 121°C [-50°F to 250 °F])
Certification	CE/PED

API 6A Slab Gate Valve (Cast/Forged Body)

Size	1-13/16" to 7-1/16"
Pressure Rating	2000 through 15000 PSI
Product Specification Level	PSL1, PSL2 & PSL3
Performance Requirement	PR1, PR2, PR2F
Design Standard	API 6A
Material Trim	AA, BB, CC, DD, EE, FF, EE0.5, EE1.5, FF0.5, FF1.5
Temperature Class	L to U (-46°C to 121°C [-50°F to 250 °F])
Certification	CE/PED

API 6A Swing Check Valve

Size	2-1/16" to 4-1/16"
Pressure Rating	2000, 3000 & 5000 PSI
Product Specification Level	PSL1 & PSL2
Performance Requirement	PR1, PR2,
Design Standard	API 6A
Material Trim	AA, BB, CC, DD, EE0.5, EE, FF0.5, FF
Temperature Class	L to U (-46°C to 121°C [-50°F to 250 °F])
Certification	CE/PED

API 6D Through Conduit Expanding Gate Valve

Size	2" to 36" - Expanding/ Slab gate, Full bore (Piggable)
Pressure Rating	ASME Class 150 through 1500, Bi-directional, Soft seated, DBB & DIB-1
Product Specification Level	API 6D, ASME B16.34, ASME B16.5, ASME B16.47, ASME B16.10
Performance Requirement	API 6D, API 598
Design Standard	API 607, API 6FA, ISO 10497
Material Trim	ISO 15848
Temperature Class	-46°C to 150°C (-50°F to 300°F)
Operation	Handwheel/ Gear Operated, Electric Actuated
Certification	CE/PED, SIL 3

API 6D Through Conduit Slab Gate Valve

Size	2" to 36" - Expanding/ Slab gate, Full bore (Piggable)
Pressure Rating	ASME Class 150 through 1500, Bi-directional, Soft seated, DBB & DIB-1
Product Specification Level	API 6D, ASME B16.34, ASME B16.5, ASME B16.47, ASME B16.10
Performance Requirement	API 6D, API 598
Design Standard	API 607, API 6FA, ISO 10497
Material Trim	ISO 15848
Temperature Class	-46°C to 150°C (-50°F to 300°F)
Operation	Handwheel/ Gear Operated, Electric Actuated
Certification	CE/PED, SIL 3

API 6D Through Conduit Spring Loaded Slab Gate Valve

Size	2" to 30" - Spring Loaded Slab gate, Full Bore (Piggable)
Pressure Rating	ASME Class 150 through 900, Bi-directional, Soft seated, DBB
Product Specification Level	API 6D, ASME B16.34, ASME B16.5, ASME B16.47, ASME B16.10
Performance Requirement	API 6D, API 598
Design Standard	API 607, API 6FA, ISO 10497
Material Trim	ISO 15848
Temperature Class	-46°C to 150°C (-50°F to 300°F)
Operation	Handwheel/ Gear Operated, Electric Actuated
Certification	CE/PED, SIL 3

API 6D Expanding Plug Valve

Size	2" to 42" - Expanding Plug, Reduced or Full (Full is Piggable)
Pressure Rating	ASME Class 150 through 900, Bi-directional, Non-lubricated, Resilient seal, DBB & DIB-1
Product Specification Level	API 6D, ASME B16.34, ASME B16.5, ASME B16.47, ASME B16.10
Performance Requirement	API 6D, API 598
Design Standard	API 607, API 6FA, ISO 10497
Material Trim	ISO 15848
Temperature Class	-46°C to 200°C (-50°F to 400°F)
Operation	Handwheel/ Gear Operated, Electric Actuated
Certification	CE/PED, CRN, ATEX, SIL 3

API 6D Swing Check Valve

Size	2" to 36" - Cast Body, Soft Seated
Pressure Rating	ASME Class 150 through 1500, Unidirectional, Piggable
Product Specification Level	API 6D, ASME B16.34, ASME B16.5, ASME B16.47, ASME B16.10
Performance Requirement	API 6D
Design Standard	API 6FA
Temperature Class	-46°C to 200°C (-50°F to 400°F)
Operation	Automatic, Lever Operated
Certification	CE/PED

API 6D Rising Stem Ball Valve (Tilt & Turn)

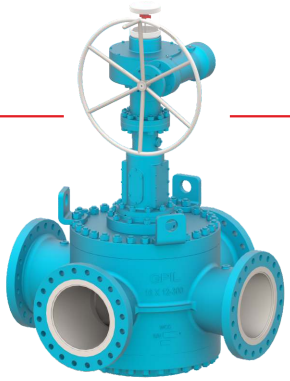
Size	1" to 20" - Cast Body, Soft Seated
Pressure Class	150# through 600#, Unidirectional
Design Standard	API 6D, ASME B16.34, ASME B16.5, ASME B16.47, ASME B16.10
Testing Standard	API 6D
Fire Safe Design	API 607, API 6FA, ISO 10497
Fugitive Emission Design	ISO 15848
Temperature Range	-46°C to 427°C (-50°F to 800°F)
Operation	Handwheel or Gear Operated
Certification	CE/PED, SIL 3

API 609 Triple Offset Butterfly Valve

Size	3" to 48"
Pressure Rating	Class 150, 300, 600
Design Standard	API 609, ASME B16.34, ASME B16.47, ASME B16.10
Testing Standard	API 598
Fire Safe Design	API 607
Fugitive Emission Design	ISO 15848
Temperature Class	-46°C to 400°C (-50°F to 800°F)
Operation	Manual, Electric Actuated, Pneumatic
Certification	CE/PED, SIL 3

Four Way Diverter Plug Valve

Size	2" to 16" - Expanding Plug, Reduced or Full (Full is Piggable)
Pressure Class	ASME Class 150 through 900, Bi-directional, Non-lubricated, Resilient seal
Design Standard	ASME B16.34, ASME B16.5, ASME B16.10
Testing Standard	API 6D, API 598
Temperature Range	-46°C to 200°C (-50°F to 400°F)
Operation	Handwheel/ Gear Operated, Electric Actuated
Certification	CE/PED, CRN



Oil and Gas Product Application

1. API 6A High Temperature Expanding Gate Valve (Cast/Forged Body)
Oil and Natural Gas wellhead, Christmas tree, Steam Service, Manifold, fracture, safety shutdown & other critical service applications.

2. API 6A Expanding Gate Valve (Cast/Forged Body)
GPIL Valves are used in major applications for Upstream, Downstream and transportation Segments of the Oil & Gas Industry, Petrochemical, Chemical, and Industrial markets.

3. API 6A Slab Gate Valve (Cast/Forged Body)
GPIL Valves are used in major applications for Upstream, Downstream and transportation Segments of the Oil & Gas Industry, Petrochemical, Chemical, and Industrial markets.

4. API 6A Swing Check Valve
- Prevent backflow in pipelines
- Prevent leakage to the environment in the event of a pipeline rupture
- Protect the integrity of upstream equipment

5. API 6D through Conduit Expanding Gate Valve
- Liquid Pipelines
- Liquid Storage
- Tank and Station Valves
- Meter Bypass Valves
- Emergency Shutdown
- Mainline Isolations (Full Bore Design)
- Double Block and Bleed applications

6. API 6D through Conduit Slab Gate Valve
- Pipelines
- Power Plants
- Emergency Shutdown
- Liquids Storage

7. API 6D through Conduit Spring Loaded Slab Gate Valve
- Pipelines
- Power Plants
- Emergency Shutdown
- Liquid Storage
- Filtration Storage
- Double Block and Bleed Applications

8. API 6D Expanding Plug Valve
- Blending Units
- Offshore Platforms
- Product Isolation
- Terminals
- Multi-Product Manifolds
- Tank Farms (Oil Depots)
- Prover Loops
- Aviation Fueling Systems
- Custody Transfer Units

Oil and Gas Product Application

9. API 6D Swing Check Valve
- Prevent backflow in pipelines
- Prevent leakage to the environment in the event of a pipeline rupture
- Protect the integrity of upstream equipment

10. API 6D Rising Stem Ball Valve (Tilt & Turn)
- Meter Isolation
- Molecular Sieve Dehydration
- Hydrogen Services
- Product Pipe Lines
- Gas Transmission
- Natural Gas Storage
- Dryer Services
- High Temperature Services
- Gas Separation Systems
- Block and Bypass
- Isolation for Metering
- Emergency Shutdown

11. API 609 Triple Offset Butterfly Valve
- Petrochemicals
- Refining
- Pulp & Paper
- Power Plants

12. Four-Way Diverter Plug Valve
- Metering System
- Product Pipe Lines
- Multi Product Manifolds
- Custody Transfer Units
- Terminals
- Tank Farms (Oil Depots)
- Aviation Fueling Systems
- Fuel Loading Systems

Plant Facilities & Capabilities

Research & Development Centre

GPIL's R&D Centre is engaged in design and development of new products and working towards enhancing existing products or processes through innovation.

Activities like design optimization of existing products using value engineering, patent applications, control of standards and specific certification requirements are also being carried out by the R&D Centre

Activities carried out at R&D Centre -

- Finite Element Analysis (FEA)
- Flow Simulation
- Experimental Stress Analysis
- Fire Safe Testing
- Life Cycle Testing
- Functional Acceptance Testing
- Prototype Development
- Tool Design
- Computer Aided Engineering (CAE) Static Stress Analysis
- Flow Simulation for Valves gear analysis
- Propeller Optimization for fishing vessels
- Experimental Stress Analysis (ESA) by fixing strain gauges

Tool Room & Pattern Shop

- In-house capability of designing and manufacturing complete tooling solution VMC machines (Max 2400 x 800 mm)
- SIP jig boring (2500 x 1000 mm) Plano milling machine
- Design software UG NX 10, CAM Works, Solid Works
- Casting Simulation software facility (Auto CAST) support of 'Magma' simulation software
- Centralized design & manufacturing of jig fixture & Machine tool
- Preventive and predictive tool maintenance section

Elastomer Product Manufacturing

We are the leading manufacturer of a wide and increasing range of elastomeric seals and various rubber products having requisite capacity to cater to the requirements of a vast clientele in Marine, Earth moving, Oil & Gas sector.

Elastomer Products

Rubber Bonded Metal Seal

'O' Ring

Diaphragm Cut Section

Diaphragm

Elastomer Compatibility Chart

ELASTOMER TYPE	NR	EPDM	NBR	HNBR	Aflas	Viton A	Viton GLT	Viton B	Viton GFLT	Viton GF	Viton Xtreme ETP	Kalrez 4079
CONTINUOUS DUTY TEMP °F	-76~250	-65~300	25~250	-75~250	-65~400	-20~400	-31~400	-4~400	-31~400	-5~400	-4~400	-36~550
Acetaldehyde	N	?	N	N	?	N	N	N	N	?	Y	Y
Acetate Solvents	N	?	N	N	?	N	N	N	N	N	?	Y
Acetic Acid (30%)	?	Y	?	?	?	?	?	Y	Y	Y	Y	Y
Acetone	N	Y	N	N	N	N	N	N	N	N	Y	Y
Acrylonitrile (monomer of NBR)	N	N	N	N	?	N	N	N	N	N	?	Y
Amines	N	?	N	N	Y	N	N	N	N	N	Y	Y
Ammonia (anhydrous, liqified hot, cold)	N	Y	?	?	?	N	N	N	N	N	Y	Y
Amyl Acetate	N	Y	N	N	N	N	N	N	N	N	Y	Y
Aromatic Fuels	N	N	?	?	?	Y	Y	Y	Y	Y	Y	Y
Asphalt	N	N	?	?	?	Y	Y	Y	Y	Y	Y	Y
Benzene	N	N	N	N	N	?	?	Y	Y	Y	Y	Y
Biodiesel (wet)	N	N	Y	Y	?	N	N	Y	Y	Y	Y	Y
Butadiene (monomer of NBR)	N	N	N	N	?	N	N	Y	Y	Y	Y	Y
Butane (liquifies @ 180 psi)	N	N	Y	Y	?	Y	Y	Y	Y	Y	Y	Y
(n-)Butyl Acetate	N	N	N	N	N	N	N	N	N	N	?	Y
Condensate	N	N	?	?	Y	?	Y	Y	Y	Y	Y	y
Cetane (Hexadecane)	N	N	Y	Y	?	Y	Y	Y	Y	Y	Y	Y
Creosote Oil (Coal Tar)	N	N	?	Y	?	Y	Y	Y	Y	Y	Y	Y
Crude Oil (sweet, asphalt base)	N	N	?	?	?	Y	Y	Y	Y	Y	Y	Y
Crude Oil (sour, not asphalt base)	N	N	?	?	?	Y	Y	Y	Y	Y	Y	Y
Cumene	N	N	N	N	?	Y	Y	Y	Y	Y	Y	Y
Denatured Alcohol	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Diesel Fuel	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Diesel Oil	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Diethyl Benzene	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y
Ethane	N	N	Y	Y	Y	?	Y	Y	Y	Y	Y	Y
Ethanol (Ethyl Alcohol)	?	Y	?	?	Y	Y	Y	Y	Y	Y	Y	Y
Ethers	N	N	N	N	N	N	N	N	N	N	?	Y
Ethyl Acetate	N	?	N	N	N	N	N	N	N	N	Y	Y
Ethylene	N	?	?	?	N	?	Y	Y	Y	Y	Y	Y
Ethylene Diamine	?	Y	?	?	Y	N	N	N	N	N	Y	Y
Ethylene Glycol	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Explosive Decompression	?	?	?	?	?	?	?	?	Y	Y	Y	Y
Freon 11,12,13	N	N	N	N	N	?	?	?	?	Y	Y	Y
Fuel Oil	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Furfural (Furfuraldehyde)	N	?	N	N	?	N	N	N	N	N	?	Y
Gasoil	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Gasoline (auto, leaded & unleaded)	N	N	Y	Y	?	Y	Y	Y	Y	Y	Y	Y
Gasoline (aviation)	N	N	Y		?	Y	Y	Y	Y	Y	Y	Y
Glycols	N	Y	Y	?	Y	Y		Y	Y	Y	Y	Y
(n-) Hexane	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Hydrogen Gas	?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hydrogen Sulfide (H2s dry)	?	?	?	N	Y	N	N	N	?	?	Y	Y
Hydrogen Sulfide (H2s wet)	N	?	N	N	Y	N	N	N	?	?	Y	Y
Iso Butane	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y

ELASTOMER TYPE	NR	EPDM	NBR	HNBR	Aflas	Viton A	Viton GLT	Viton B	Viton GFLT	Viton GF	Viton Xtreme ETP	Kalrez 4079
CONTINUOUS DUTY TEMP °F	-76~250	-65~300	-25~250	-75~250	-65~400	-20~400	-31~400	-4~400	-31~400	-5~400	-4~400	-36~550
Iso Pentane	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Isopropyl Acetate	N	?	N	N	N	N	N	N	N	N	Y	Y
Isopropyl Alcohol	Y	Y	?	?	Y	Y	Y	Y	Y	Y	Y	Y
Impermiability	?	?	?	?	?	?	?	?	Y	Y	Y	Y
Jet fuel (JP-8, JP-2 & A)	N	N	?	?	Y	Y	Y	Y	Y	Y	Y	Y
Kerosene (fuel, solvent)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ketones	N	Y	Y	Y	N	N	N	N	N	?	Y	Y
LPG (liquified petroleum gas)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lunricating Oil (petroleum base)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mercaptans	N	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y
Methane (natural gas)	?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Methanol (Methyl Alcohol)	?	Y	?	?	Y	N	N	?	Y	Y	Y	Y
MEK (Methyl Ethyl Ketone)	N	Y	N	N	N	N	N	N	N	N	Y	Y
MIBK (Methyl Iso Butyl Ketone)	N	Y	N	N	N	N	N	N	N	N	Y	Y
MMT (Methylcyclopentadienyl Manganese Tricarbonyl)	N	N	?	?	?	?	Y	?	Y	Y	Y	Y
MTBE (Methyl Tertiary ButilEther)	N	?	?	?	Y	N	N	N	N	N	Y	Y
MTBE (< 25% blend w/ fuel)	N	N	?	?	Y	N	?	?	Y	Y	Y	Y
Mineral Spirits	N	N	?	?	Y	Y	Y	Y	Y	Y	Y	Y
Naphtha	N	N	?	?	Y	Y	Y	Y	Y	Y	Y	Y
Natural Gas	?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nitric Acid (concentrated)	N	N	N	N	?	N	?	?	?	Y	Y	?
Nonenes	N	N	Y	Y	?	Y	Y	Y	Y	Y	Y	Y
Octane (N-Octane)	N	N	?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Oil SAE (petroleum base)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Olefins	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pentane	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Phenol	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Propane (fuel)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Propylene	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Raffinate	N	N	?	?	N	Y	Y	Y	Y	Y	Y	Y
Sodium Hydroxide (50%)	?	Y	?	?	Y	N	N	N	N	N	Y	Y
Sour Crude Oil	N	N	N	N	Y	N	N	?	?	?	Y	Y
Sour Natural Gas	N	N	N	N	Y	N	N	?	?	?	Y	Y
Steam (<400°F)	N	N	N	N	Y	N	N	?	Y	Y	Y	Y
Sulfuric Acid (concentrated)	N	N	N	N	Y	?	Y	Y	Y	Y	Y	Y
Tertiary Amyl Methyl Ether (TAME)	N	N	N	N	?	N	N	N	Y	Y	Y	Y
Toluene	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y
Toluene (< 50% blend w/ fuel)	N	N	Y	Y	?	Y	Y	Y	Y	Y	Y	Y
Urea (Uric acid)	N	Y	N	N	?	N	?	Y	Y	Y	Y	Y
Undenatured Ethanol	?	Y	?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vinyl Acetate	N	?	?	?	N	N	N	N	N	N	?	Y
Water (Fresh)	?	Y	?	?	Y	?	Y	Y	Y	Y	Y	Y
Water Sea	N	y	?	?	Y	?	Y	Y	Y	Y	Y	Y
Xylene (Xylol)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y

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Elastomer Compatibility Chart

SEAT ELASTOMER DATA						
DURO A	MAX P	MIN MOD	ANSI CLS	VITON GFLT-S	VITON GF-S	VITON XTREME ETP-S
75	285	428	150#	L	F	X
80	740	1110	300#	RL	RF	RX
85	1440	2160	600#	DRL	DRF	DRX
90	2160	3240	900#	TDRL	TDRF	TDRX

CONTINUOUS DUTY TEMPERATURE°F	-50~400	-21~400	-29~400
Acetaldehyde	N	?	Y
Acetate Solvents	N	N	?
Acetic Acid (30%)	Y	Y	Y
Acetone	N	N	Y
Acrylonitrile (monomer of NBR)	N	N	?
Amines	N	N	Y
Ammonia (anhydrous, liqified hot, cold)	N	N	Y
Amyl Acetate	N	N	Y
Aromatic Fuels	Y	Y	Y
Asphalt	Y	Y	Y
Benzene	Y	Y	Y
Biodiesel (wet)	Y	Y	Y
Butadiene (monomer of NBR)	Y	Y	Y
Butane (liquifies @ 180 psi)	Y	Y	Y
(n-)Butyl Acetate	N	N	?
Cetane (Hexadecane)	Y	Y	Y
Condensate	Y	Y	Y
Creosote Oil (Coal Tar)	Y	Y	Y
(Sweet Oil asphalt base)	Y	Y	Y
(Sour Oil asphalt base)	Y	Y	Y
Cumene	Y	Y	Y
Denatured Alcohol	Y	Y	Y
Diesel Fuel	Y	Y	Y
Diesel Oil	Y	Y	Y
Diethyl Benzene	Y	Y	Y
Ethane	Y	Y	Y
Ethanol (Ethyl Alcohol)	Y	Y	Y
Ethers	N	N	?
Ethyl Acetate	N	N	Y
Ethylene	Y	Y	Y
Ethylene Diamine	N	N	Y
Ethylene Glycol	Y	Y	Y
Explosive Decompression	Y	Y	Y
Freon 11,12,13	?	Y	Y
Fuel Oil	Y	Y	Y
Furfural (Furfuraldehyde)	N	N	?
Gasoil	Y	Y	Y
Gasoline (auto, leaded & unleaded)	Y	Y	Y
Gasoline (aviation)	Y	Y	Y
Glycols	Y	Y	Y
(n-) Hexane	Y	Y	Y
Hydrogen Gas	Y	Y	Y
Hydrogen Sulfide (H2s dry)	?	?	Y
Hydrogen Sulfide (H2s wet)	?	?	Y
Iso Butane	Y	Y	Y

SEAT ELASTOMER DATA						
DURO A	MAX ΔP	MIN MOD	ANSI CLS	VITON GFLT-S	VITON GF-S	VITON XTREME ETP-S
75	285	428	150#	L	F	X
80	740	1110	300#	RL	RF	RX
85	1440	2160	600#	DRL	DRF	DRX
90	2160	3240	900#	TDRL	TDRF	TDRX

SEAT CONTINUOUS DUTY TEMPERATURE F	-50~400	-21~400	-29~400
Iso Pentane	Y	Y	Y
Isopropyl Acetate	N	N	Y
Isopropyl Alcohol	Y	Y	Y
Impermiability	Y	Y	Y
Jet fuel (JP-8, JP-2 & A)	Y	Y	Y
Kerosene (fuel, solvent)	Y	Y	Y
Ketones	N	?	Y
LPG (liquified petroleum gas)	Y	Y	Y
Lubricating Oil (petroleum base)	Y	Y	Y
Mercaptans	Y	Y	Y
Methane (natural gas)	Y	Y	Y
Methanol (Methyl Alcohol)	Y	Y	Y
MEK (Methyl Ethyl Ketone)	N	N	Y
MIBK (Methyl Iso Butyl Ketone)	N	N	Y
MMT Methylcyclopentadienyl Manganese Tricarbonyl	Y	Y	Y
MTBE (Methyl Tertiary Butl Ether)	N	N	Y
MTBE (< 25% blend w/ fuel)	Y	Y	Y
Mineral Spirits	Y	Y	Y
Naphtha	Y	Y	Y
Natural Gas	Y	Y	Y
Nitric Acid (concentrated)	?	Y	Y
Nonenes	Y	Y	Y
Octane (N-Octane)	Y	Y	Y
Oil SAE (petroleum base)	Y	Y	Y
Olefins	Y	Y	Y
Pentane	Y	Y	Y
Phenol	Y	Y	Y
Propane (fuel)	Y	Y	Y
Propylene	Y	Y	Y
Raffinate	Y	Y	Y
Sodium Hydroxide (50%)	N	N	Y
Sour Crude Oil	?	?	Y
Sour Natural Gas	?	?	Y
Steam (<400°F)	Y	Y	Y
Sulfuric Acid (concentrated)	Y	Y	Y
Tertiary Amyl Methyl Ether (TAME)	Y	Y	Y
Toluene	Y	Y	Y
Toluene (< 50% blend w/ fuel)	Y	Y	Y
Urea (Uric acid)	Y	Y	Y
Undenatured Ethanol	Y	Y	Y
Vinyl Acetate	N	N	?
Water (Fresh)	Y	Y	Y
Water Sea	Y	Y	Y
Xylene (Xylol)	Y	Y	Y

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Elastomer Compatibility Chart

Elastomeric Material Properties

		Specialty Elastomers					FluoroElastomers								PerFluoroElastomer
		Polyisoprene (Natural Rubber) NR	Ethylene Propylene EP, EPDM	Buna-n, Nitrile NBR	Hydrogenated Nitrile HNBR	Aflas	Viton A	Viton GLT	Viton GFLT	Viton B	Viton F	Viton GF	Viton GF-S	Viton Extreme ETP	Viton Xtreme ETP-S	Kalrez 4079
Monomer Family Straight Chain [Bulky Chain]		Polyisoprene	Ethylene [Propylene/diene]	Butadiene [Acrylonitrile]	Hydrogenated Butadiene [Acrylonitrile]	Tetra Fluoro Ethylene [Propylene] TFE [P]	FKM Type 1 Vinyl, Dene Fluoride, [HexaFluoro Propylene] VDF [HFP]	FKM Type 2 Vinyl Dene Fluoride [Perfluoro Methyl Vinyl Ether] Tetra Fluoro Ethylene VDF [PMVE] TFE	FKM Type 3	Vinyl Dene Fluoride [Hexa Fluoro Propylene] Tetra Fluoro Ethylene VDF [HFP] TFE				FKM Type 5 Ethylene [Perfluoro Methyl Vinyl Ether] Tetra Fluoro Ethylene E [PMVE] TFE		FFKM Tetra Fluoro Ethylene [Perfluoro Methyl Vinyl Ether] TFE [PMVE]
Began Circa		1843	Late 1950's	1909	1970's	Mid 1980's	1957 / 1970	1976	1985	2002	1959 / 1976	1980	2002	1985	2002	Mid4079
Curative		Sulfur	Sulfur / Peroxide	Sulfur / Peroxide	Sulfur / Peroxide	Peroxide	Diamine / Bisphenol AF	Peroxide	Peroxide	APA Peroxide	Bisphenol / Peroxide	Bisphenol / Peroxide	APA Peroxide	Peroxide	APA Peroxide	Proprietary
Coagent		None	None	None	None	None	None	TMAIC	TMAIC	TAIC	None	None	TAIC	TMAIC	TAIC	Proprietary
Cure Site Monomer		None	None	None	None	None	None	None	None	Proprietary	None	None	Proprietary	None	Proprietary	Proprietary
Dissociation Energy (KJ/mole)			415	310			490									
Specific Gravity/Densityg/cm3		0.93	0.86	0.98-1.00	1.10-1.30	1.55-1.86	1.87-1.91	1.87-1.91	1.87-1.91	1.87-1.91	1.87-1.91	1.87-1.91	1.87-1.91	1.87-1.91	1.87-1.91	2.01-2.02
Flourine Content		0%	0%	0%	0%	55% - 60%	66%	64%	67%	68%	67% - 68%	69%	70%	67%	73%	74%
Chemical Compatibility		82%N	61%N	35%N	33%N	25%N	35%N	33%N	24%N	21%N	22%N	21%N	19%N	3%N	0%N	0%N
		7%?	15%?	24%?	24%?	23%?	7%?	8%?	14%?	7%?	12%?	11%?	7%?	12%?	7%?	1%?
		11%Y	24%Y	41%Y	43%Y	52%Y	58%Y	59%Y	62%Y	72%Y	66%Y	68%Y	74%Y	85%Y	93%Y	99%Y
Max Continuos Temp Tmax (F)		250	300	250	350	400	450 / 400	400	400	400	400	400	400	400	400	600
Minimum Sealability Temp (F)		-20	-65	-75	-40	-40	-32	-65	-31	-51	-26	-25	-21	-24	-29	+5
Glass Transistion Temp (F)		-20 ~ -70	-70	-40 ~ -60	-40	+25	-20	-31	-21	-31	-5	+5	+5	-20	-20	+19
150# / 285 mwp ~75 duro min rqd strngth 428 psi	Tensile	500	500	200	1500	2000	900	1300	1800	2500	1400	1600	2500	1800	2500	1400
	Modulus	100	500	500	1100	600	500	600	700	800	600	700	800	700	900	500
300# / 740 mwp ~80 duro min rqd strngth 1110 psi	Tensile	1500	1200	1100	3000	2300	1600	1900	2300	2800	2000	2200	2900	2300	2800	1800
	Modulus	200	1300	600	1700	1200	1000	1200	1300	1600	1200	1300	1800	1400	1700	900
600# / 1440 mwp ~85 duro min rqd strngth 2160 psi	Tensile	2500	1800	2100	4500	2700	2300	2500	2700	300	2600	2700	3300	2700	3100	2200
	Modulus	300	2200	700	2300	1900	1500	1700	1700	2500	1800	2000	2700	2100	2500	1300
900# / 2160 mwp ~90 duro min rqd strngth 3240 psi	Tensile	3500	2500	3000	6000	3000	3000	3100	3200	3400	3200	3300	3700	3200	3400	2600
	Modulus	400	3000	800	2900	2500	2000	2300	2800	3300	2400	2600	3700	2800	3300	1700
Shelf Life (Years)		2	5	2	5	20	5	10	10	15	5	5	15	15	20	20
Expolsion Proof Resistance		Fair-Good	Good	Fair-Good	Good	Good	Good-Excellent	Good-Excellent	Good-Excellent	Excellent	Good-Excellent	Good-Excellent	Excellent	Good-Excellent	Excellent	Excellent
Steam Resistance		Fair-Good	Excellent	Fair-Good	Excellent	Fair-Good	Poor-Good	Poor-Good	Poor-Good	Excellent	Poor-Good	Poor-Good	Excellent	Poor-Good	Excellent	Excellent
Compression Set (%)		10	40	13	10	33	13	10	28	13	28	37	28	34	24	30

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NABL Accredited

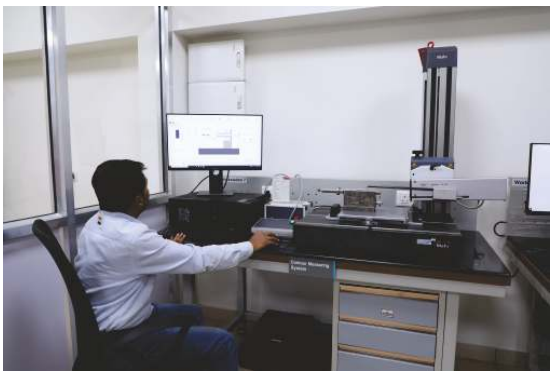
Our **Metrology Testing Lab**, and **Elastomer Testing** facilities are **NABL** (National Accreditation Board for Testing and Calibration Laboratories) and **ilac - MRA** certified.
Material testing laboratory is accredited as per ISO/IEC 17025: 2017 by NABL.
Mechanical, metallurgical, and chemical testing - all under one roof to better serve customer needs.
A sound-proof laboratory, where environmental conditions are maintained as per NABL guidelines.

CC-3234

In-House Metrology Lab Facility

Well-equipped NABL calibration lab for in-house testing and calibration of measuring equipment.
All equipment is of Japanese make & German make.

- Universal Length Measuring Machine
- Form Measuring Station
- Surface Roughness Machine
- 2D Height Gauge Machine
- Surface Measuring Instrument
- Counter Measuring System
- I-CHECKER
- Profile projector



Counter Measuring System

NABL Accredited Calibration Lab

Universal Length Measuring Machine

I-CHECKER

In-House Material Testing Facility

Well- equipped NABL material testing laboratory for inhouse mechanical, metallurgical and chemical testing under one roof to serve customer needs. World class equipment is used for testing like Leica (Germany), Thermo-fisher ARL (USA), UTM Blue Star (Germany), Belec (Germany), Neophot (Germany)

CC-3234

Lab Testing Services :

- Tensile testing (ferrous material alloys and product)
- Metallography testing (ferrous material alloys and product, stainless steel, and steel)
- Hardness testing by Brinell, Vickers & Rockwell
- Impact testing
- Chemical analysis by spectrometer (cast iron, low alloy steel, high alloy steel)

Metallurgical Microscope

Spectrometer

Universal Testing Machine

Charpy Impact Testing Machine

Brinell Hardness Tester

Vicker's Hardness Tester

In-House Elastomer Testing Facility

Our Rubber testing laboratory has been designed & constructed to meet the requirements of ISO/IEC 17025:2017 & relevant NABL guidelines. The laboratory is furnished with robust Structure and environmental conditions are maintained as per the requirement of activity being performed

Tensile Testing

Hardness Testing

Compression Set Test Apparatus

Oscillating Disc Rheometer

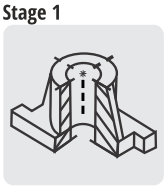
Sand 3D Printing for Castings

India's Largest Sand 3D Printer Print space LxWxH 4000 x 2000 x 1000 mm

Benefits of 3D Printing Process vis-à-vis Conventional Process

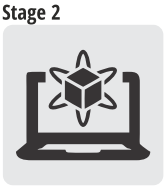
- Reduction in lead time: 2 - 3 weeks for casting development
- Improved quality casting:
  1. Casting weight reduction
  2. Improved casting surface finish
  3. Dimensional accuracy
- Low volume production
- Prototype development

Stage 1



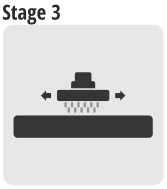
Casting Design

Stage 2



Casting Simulation

Stage 3

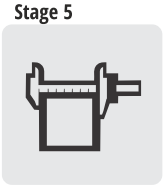


3D sand mold & core printing

Stage 4

Cast Metal Pouring

Stage 5



Casting Inspection

Stage 6

Prototype Packing

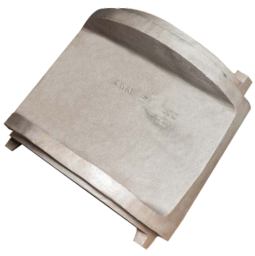
12"-150# 4 Way Diverter Plug Valve Parts Casting developed by using Sand 3D Print

CAP UPPER
Weight – 388 Kg

CAP LOWER
Weight - 427 Kg

PLUG
Weight - 353 Kg

BODY
Weight -734 Kg



CORE
Weight – 275 Kg

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GHATGE PATIL
INDUSTRIES LTD.

Address: GHATGE PATIL INDUSTRIES LTD. UCHAGAON, KOLHAPUR - 416005.

Tel : +91(231) 260 8000 / +91(231) 260 8176 / +91(231) 260 8184

Fax : +91(231) 260 8080

E-Mail : marketing@gpi.co.in / sales2@gpi.co.in / sales3@gpi.co.in

Web : www.gpi.co.in