

# MECHVAC

## OPTICS MANUFACTURING FACILITY



## ABOUT US

Mechvac, peeped into this world in 2001 and commenced its journey with a humble and modest beginning, The promoters visions, which were set to be matured in a long term was specifically aiming at offering exclusive, state of the art, and one of its kind solutions.

The journey commenced with setting up of a unique, one of its kind Nano machining centre and Mechvac was the only private company in India to be equipped with such cutting edge technologies. The technology which had to be established was of a very challenging nature, as the facility had to be established to produce parts with 1 micron form accuracies. Such infrastructures were not available in India and hence it was a great challenge accepted by us.

The set up to eventually establish such technologies meant that the infrastructure had to be equipped with a very Advanced, High End Ultra Precision Lathes and a well-supported Metrology system.

This facility was set up in 2004 and thereafter established in 2006, as the entire journey had lot of challenges to be dealt with the investment of time and money. Mechvac on its independent level and with a methodical planning took this journey ahead.

Mechvac takes pride in establishing these technologies in a record time. This was only possible as we are a technology driven company with a long history of revolutionary contribution. Our exceptional talent assisted us to continue to stay on the leading edge. Innovations and continued improvements in technology is all what we understand and we pride ourselves at staying ahead of the technology curve.

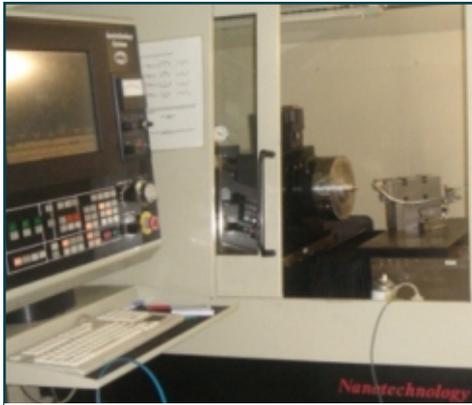
Our visions has always been to continue to utilise these technological advances to grow our product line.

## ACHIEVEMENTS

- ❖ The first private company in India to have established a unique Nano Machining facility in the year 2004.
- ❖ Established UV-VIS, IR Optics Manufacturing Processes to handle complex assignments in Ashperics, Diffractive and Off Axis Paraboloids.
- ❖ Established a unique technology, to produce large sized metal mirrors (488 mm Sq) using diamond turning, despite challenges.
- ❖ Successfully established a unique process in Diamond turning of Germanium and Silicon. The innovation covers reduced cycle time and yet achieves all challenging parameters with minimal rejections.
- ❖ Mechvac has bagged a multi million dollar export contract to supply 1000 sets of an Electro-Optic system which includes 11 Germanium Lens, 1 ZnSe Lens and 3 Aluminum Mirrors.
- ❖ We have bagged an unique developmental contract with the Tata Group to produce Germanium and Gasir Lenses.
- ❖ Mechvac embarks on an unique project to produce the IMFS system for the Government of India on a developmental contract basis.
- ❖ Offering Hyper Spectral Imaging Spectrometer – NIR as a Mechvac product.



## MACHINING – DIAMOND TURNING



NANOTECH 350



NANOFORM 700 ULTRA



NANOFORM 250

- ❖ We are the ONLY privately owned facility in India equipped with MULTIPLE diamond turning Machines.
- ❖ We have successfully machined components of Hardness 50 - 60 HRC and have achieved size accuracies of better than 1 micron and surface finish of better than 10 nm.
- ❖ We also routinely machine soft components and have achieved size tolerances of better than 1 micron and surface finish of better than 10 nm.

## MACHINING – GRINDING



SM 80 CNC



MCG 150 CNC

Make – OptoTech

Model Nos – SM 80 and MCG 150

These compact optical processing center CNC's are one of the latest processing centers made by OptoTech.

They are capable of producing aspheres, spheres, prisms or drilling holes.

Working Range Diameter -  $\varnothing$  10 - 200 mm spherical / aspherical

Working Range Radius - 5 mm -  $\infty$



## MACHINING – POLISHING



Make – OptoTech  
Model Nos – SPO 80 and ASP 200  
The OptoTech polishing machines are universal usable polishing machine for spheres, aspheres and 3D-surfaces.

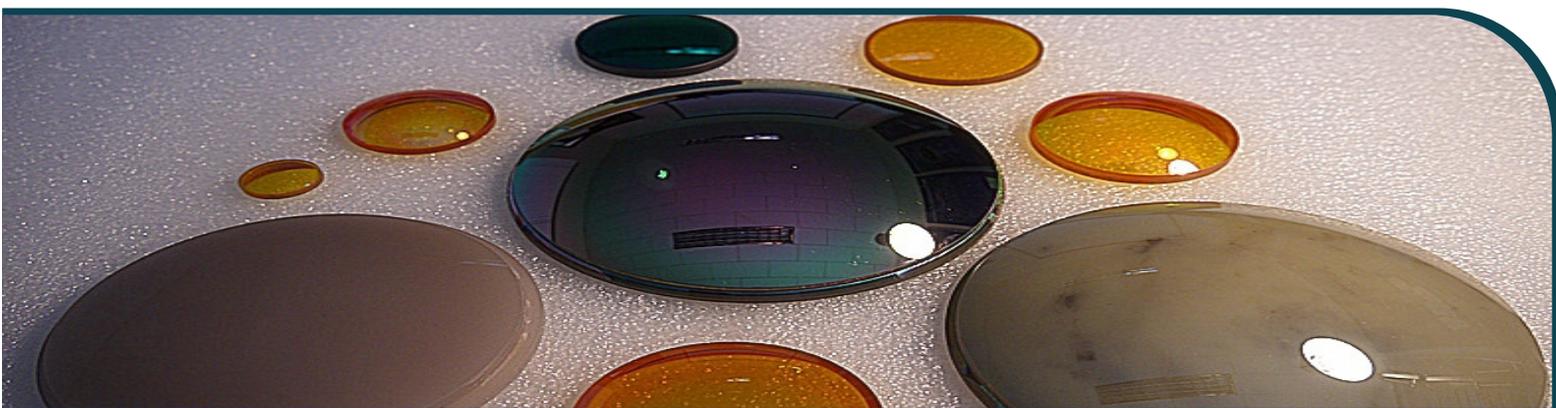
**Working Range Diameter :**  
Ø10-250 mm (Asphere Mode)  
Ø 10-120 mm (SynchroSpeed Mode)  
10 mm - ∞ (Best Fit Radius)

## MACHINING – CENTERING AND EDGING



CNC- Controlled High Precision and Flexible Centering Machine that is designed for centering operations with maximum precision and flexibility.

Working Range Ø 10 to 150 mm  
Tool Ø 120 to 180 mm  
Cutting Speed 0 to 30 m/s Variable Speed



## CONVENTIONAL MACHINES



HM 300.1 NC

Make - OptoTech  
Model - HM 300.1  
The HM 300.1 NC is a NC controlled grinding and polishing machine using conventional technology.

The machine is being installed to cater the production of IR Windows.

Working Range  $\varnothing$  up to 300 mm  
Main Spindle Drive: 0 to 120 rpm  
Stroke:  $\pm 90$  mm (Stepless)



Mechvac is also equipped with few other conventional machines, including :

- ❖ 6 Spindle Grinding & Polishing Machine
- ❖ 1 Spindle Polishing Machine
- ❖ Edging Machine
- ❖ Curve Generation Machine

## ENVIRONMENTAL TESTING



To test the effects of specified environmental conditions, we have various Environmental Test Chambers according to MIL standards.

- ❖ Salt Spray Chamber
- ❖ Rain Test Chamber
- ❖ Temperature (Hot & Cold) Chamber
- ❖ Humidity Chamber



# COATING SYSTEMS



BALZERS 1250



LEYBOLD

The machines are capable of Anti Reflective, Reflective Coatings and Protective coating including :

The Coating Chamber sizes are:

1. Balzers - 1250 mm
2. Leybold – 600 mm

- ❖ Narrowband & Broadband
- ❖ Beam Combining & Beam Splitting
- ❖ Multi-Wave Length
- ❖ Single Layer & Multi Layer

## COATING - DLC



SAMCO PD - 200 D

SAMCO's PD-200D is an automated, ion-assisted CVD (chemical vapor deposition) processing system specifically designed for the rapid deposition of DLC (diamond-like carbon) on a variety of substrate materials and shapes.

This system can also be used to anisotropically etch DLC films and silicon based films at high rates.

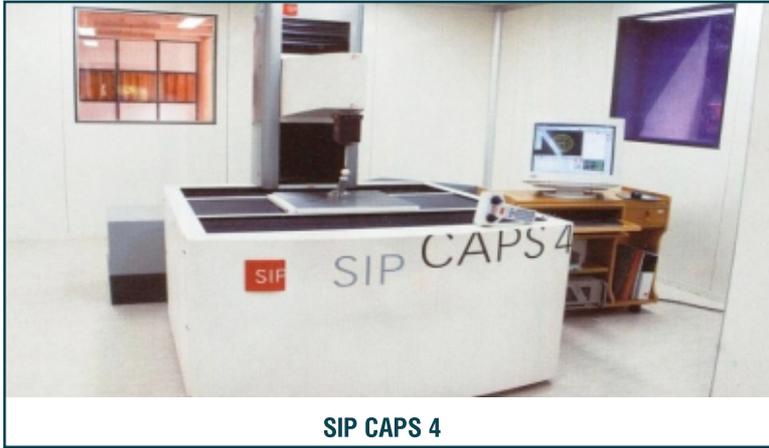
### Dimensions:

Main Unit : 1250(W) x 770(D) x 1680(H) mm

Control Unit : 570(W) x 630(D) x 1750(H) mm



## METROLOGY – CO-ORDINATE MEASUREMENT



SIP CAPS 4

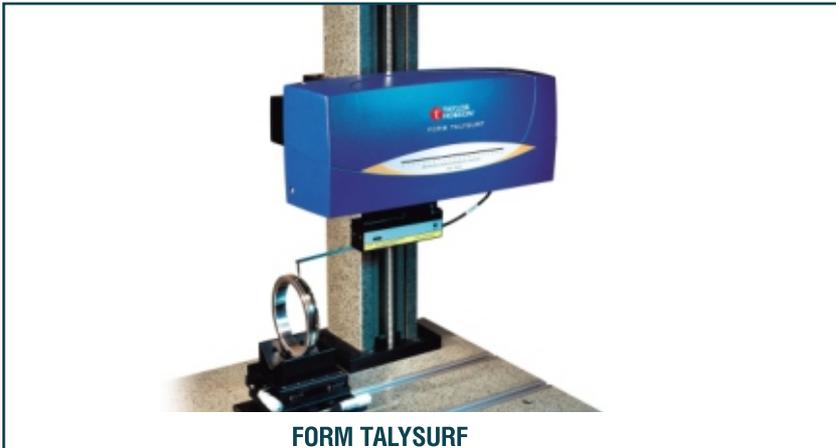


SIP 20M

These are CNC controlled co-ordinate measurement machines, which have a repeatability of 0.8 / 0.6 microns over the entire travel and a resolution of 0.1 microns.

The machines can certify parts in the sub-micron range.

## METROLOGY - PROFILE MEASUREMENT



FORM TALYSURF



ZYGO VERIFIRE

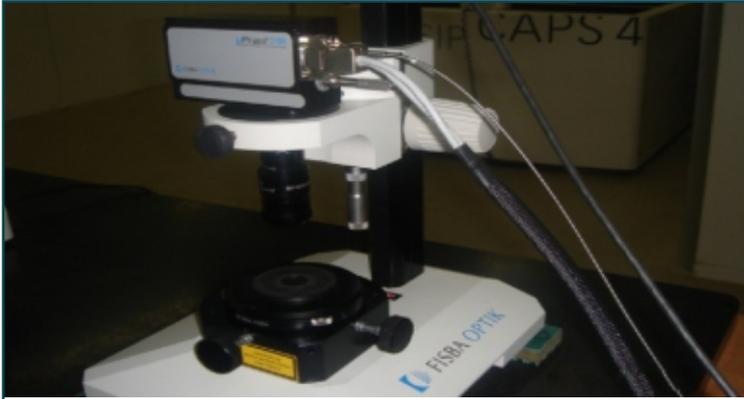
The Form Talysurf Laser from Taylor Hobson is a dedicated measurement system for the Aspheric optics. Key applications for the Form Talysurf Laser include:

- Aspheric Lenses
- Diffractive Profiles

The GPI XPS interferometer is with reference flats and transmission mounts for measurement of spherical surfaces, off axis parabolas and aspherics with CGH.



## METROLOGY – INTERFEROMETER



**FISBA OPTIK**

The Fisba interferometer is a high precision, non contact interferometer with exact evaluation of entire surface or wavefront.



**ZYGO WHITE LIGHT**

The Zygo white light interferometer is for all standard applications with facility to read surface roughness in waves, nm or fringes.

## METROLOGY – TRANSMISSION & REFLECTIVITY MEASUREMENT



**SPECTROPHOTOMETER**

UV-VIS double beam spectrophotometer is used for Transmission and reflection measurements.



**FT-IR**

Perkin Elmer FT-IR is a wavelength dispersive Spectrometer for IR measurements in the range 1 - 40 microns.



## INFRARED OPTICS

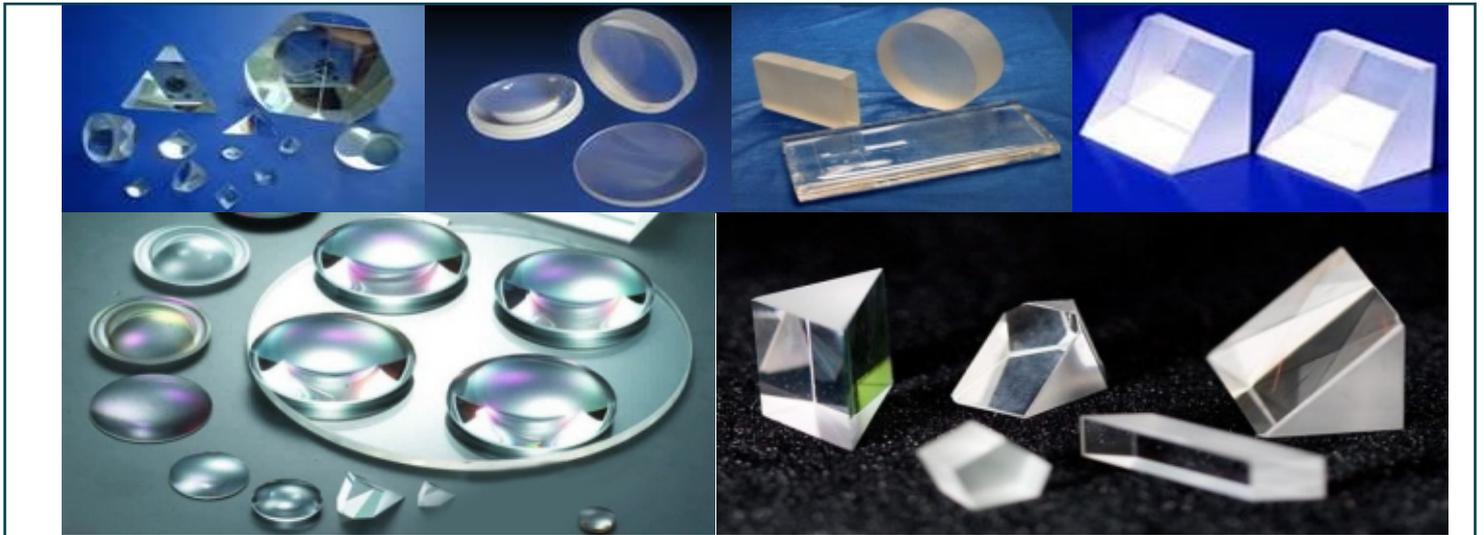


Mechvac has the complete infrastructure for production of Infrared Optics. Lenses with Aspheric, Diffractive as well as Spherical profiles can be made with utmost accuracy and precision.

Our diamond turning machines as well as grinding and polishing machines, coupled with our state-of-the-art metrology and coating facility is capable to produces optics with great ease.

Materials such as Germanium, Silicon, Calcium Fluoride, Zinc Sulfide and Zinc Selenide are produced.

## GLASS OPTICS



Mechvac is equipped with Grinding and Polishing machines that are capable for production of glass lenses and prisms.



# METAL MIRRORS



Our Diamond Turning Facility is capable of producing Mirror with utmost accuracy. These mirrors are also coated with protective enhanced coating.

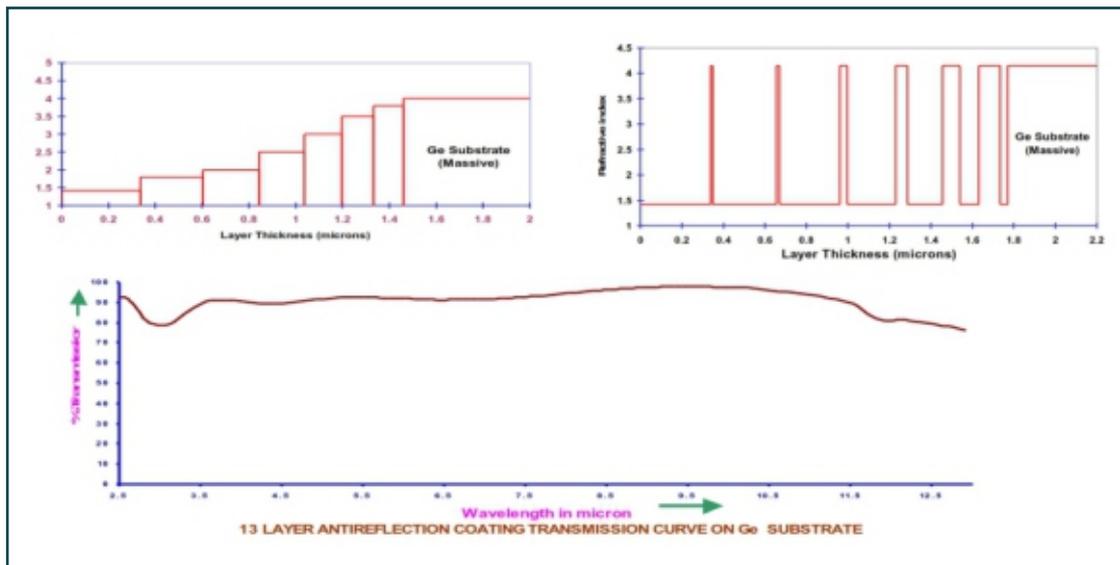
Surface Accuracy : 3 Waves @ 633 nm

Surface Roughness : < 200 Å

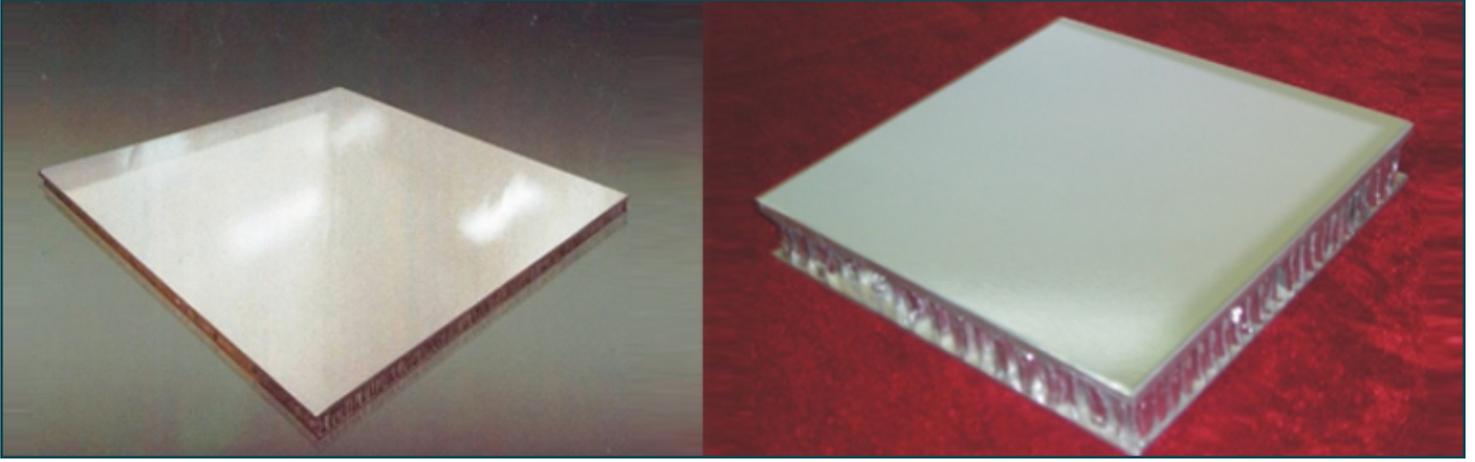
# COATING CURVES

## Antireflection Coating On Germanium:

Refractive index increases from 1.42 to 4 is approximated in seven discrete layers. In these layers except first layer other six layers are replaced by two layers equivalent of two materials germanium and IRX. Final design consists of 13 layer coating`



## ALUMINUM HONEYCOMB MIRROR



Mechvac is the first company to produce large sized mirrors on the diamond turning machine.

Mirrors of size 488x488 mm are produced with utmost accuracy.

These mirrors are of varied ROC and are installed in the MACE telescope located in Hanle, Leh.

## TITANIUM FABRICATION & MACHINING

We are one of the leading manufacturers of Titanium Structures, Equipments, Machined Parts, Sheet Metal Parts, Fasteners & Clad items, etc. We can handle a single piece Fabricated & Machined up to 10 tons. We are regularly producing very Critical Structures for the Submarines & Ships SONAR Systems. We work with Grade 1,2,3,4,5,7,9,11&18. We are also exclusive sole selling partners for the leading Titanium Raw Material producers in Middle East & Ukraine.

### Major Projects / Items Executed :-

- ❖ PSA STAVES - for Indian Navy Nuclear Submarine.
- ❖ MF Cylindrical - for Indian Navy Nuclear Submarine.
- ❖ OAS- for Indian Navy Nuclear Submarine.
- ❖ Mother Blanks - for Copper Refineries.
- ❖ Titanium Process Equipment - Gold & Silver Plant at Australia



PSA Stave



G.5 Hydrophone Holder



Ti. Fasteners



MF Cylinder



Ti. Blank with Cu clad bar

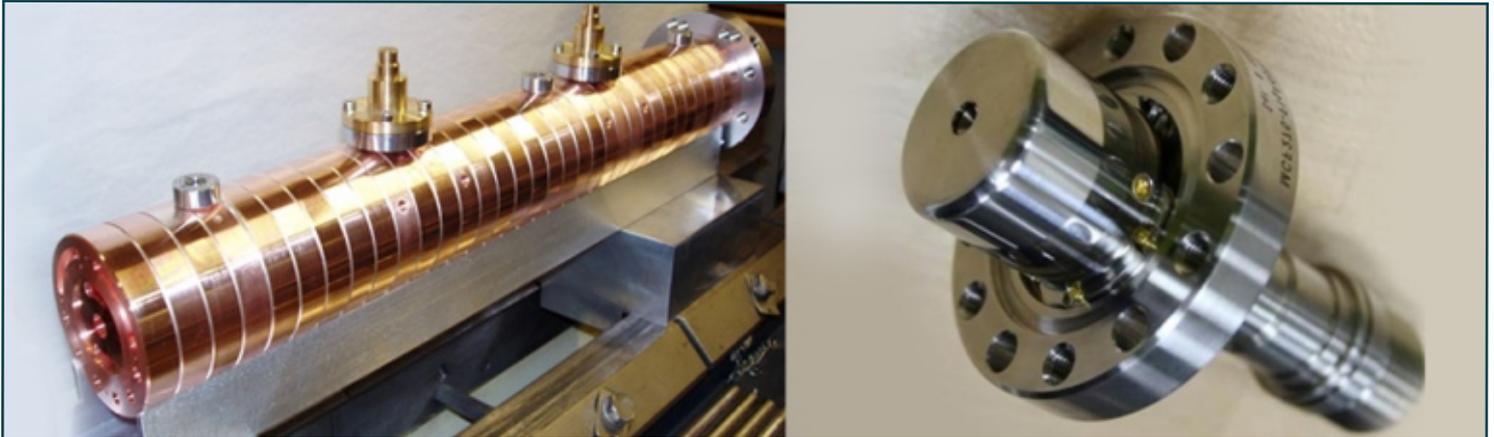


## LINAC ASSEMBLY & ELECTRON GUN

Linac Cells made of Oxygen Free Copper are machined within  $\pm 0.01$  mm concentricity,  $\pm 0.005$  mm Perpendicularity,  $\pm 0.005$  mm Parallelism and surface finish better than 50nm.

All components of the Electron Gun Assembly are also manufactured with utmost precision with materials including tantalum, rhenium, alumina, macor, stainless steel, LaB6, etc.

We have successfully supplied the Linac Assembly complete with a hydraulic system for movement and waveguide adapters.



Linac Assembly And Electron Gun

## WEAPON SIGHTS

Mechvac is gearing up to offer all weapon sights for flexible, affordable and innovative Electro-Optical solutions.

Sights including:

- ❖ Thermal Imaging Weapon Sights
- ❖ Day Sights & Night Vision Sights
- ❖ Thermal Imaging Goggles
- ❖ Night Vision Goggles



# FLOW FORMING CENTRE



3 Roller Flow Forming Machines

## FLOW FORMING CAPABILITIES

We ourselves are equipped with flow forming machines that are capable to produce flow formed parts up to:

- ❖ Forward forming: 2100 mm.
- ❖ Reverse forming: 4200 mm.
- ❖ Starting wall thickness: 12 mm.
- ❖ Minimum diameter: 25 mm.
- ❖ Maximum diameter: 560 mm.
- ❖ Radial forces 3 times 350 KN on rollers.
- ❖ Main spindle motor capacity: 132 KW

Our team embarked on this journey of specializing this process since 2002 and now with careful study, we are confident to guarantee all parameters that are critical in the flow forming process, such as:

- ❖ Tolerances
- ❖ Thickness variations
- ❖ Grain orientation
- ❖ Retaining mechanical properties viz yield strength

## ADDITIONAL CAPABILITIES



Mechvac has also been instrumental in Diamond Turning Flow Formed components.

A formed copper cone, was successfully diamond turned on our diamond turning machine and we have achieved surface accuracies of better than 20 nanometers.



## QUADRUPOLE MASS SPECTROMETERS



Mechvac has received Technology transfer from Government of India to produce quadrupole mass spectrometers (residual gas analyser). We have all the electronics, mechanical test set ups to manufacture the same.

### Analyser Unit:

The quadrupole analyser is available with a choice of ion sources, mass filters and detection systems. The standard ion source is a radially symmetrical design fitted with twin filaments and suits most applications. The standard filaments are tungsten but thoria coated iridium are available if required.

### The Electronics Unit:

This compact Residual gas Analyser contains the complete quadrupole electronics that plugs directly onto the analyser. Communication with the PC Computer is via the Rs232. The unit has a performance and features only found on more expensive Residual gas Analysers, and yet its small size and low cost is achieved by the use of the very latest electronic techniques.

### Software features:

The new 'Windows' RGA software for the Residual Gas Analyzer mass spectrometer has been designed to be 'user friendly' and very simple to learn and use.

## CAPACITANCE TYPE VACUUM GAUGE



Mechvac has the technology to manufacture Capacitance type Vacuum Gauge. It is characterized by high precision, fast response, stable and reliable, and can be used for a long time continuously, has good resistance to overload ability, test is not affected by species and composition of the measured medium, have standard electrical signal output, is advantageous for the microprocessor intelligent control, material is nickel base alloy, corrosion resistant performance is good.



## SERVICES

We can produce optical components for systems throughout the industry including thermal imaging, night vision, security and laser applications.

We can produce diamond turned components ranging between :

Minimum Diameter : 4 mm  
Maximum Diameter : 700 mm  
Surface Accuracy : 0.2  $\mu\text{m}$  - 1 $\mu\text{m}$   
Surface Roughness : 3 nm – 8 nm Ra

We can produce polished components ranging between :

Minimum Diameter : 10 mm  
Maximum Diameter : 200 mm  
Surface Roughness : Better than 1 Fringe

We produce optics of all profiles:

- Plano
- Spherical
- Fresnel
- Aspheric
- Diffractive
- Off Axis Parabolic

Materials :

- Germanium
- Copper
- Zinc sulfide
- Aluminum
- Zinc selenide
- Brass
- Silicon
- Steel
- Calcium Floride
- Gasir
- Zerodur
- Optical Glass

## VISIONS

We are working to be a Billion dollar company by 2020 and also one of the leading optics manufacturers in the world. We are also working towards offering complete Electro-Optics solutions.

We aim to offer solutions for:

- ❖ Thermal Imaging Systems
- ❖ Accelerator Systems
- ❖ Weapon Sights
- ❖ Germanium Crystal Pullers



# ESTEEMED CUSTOMERS



MINISTRY OF DEFENCE



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