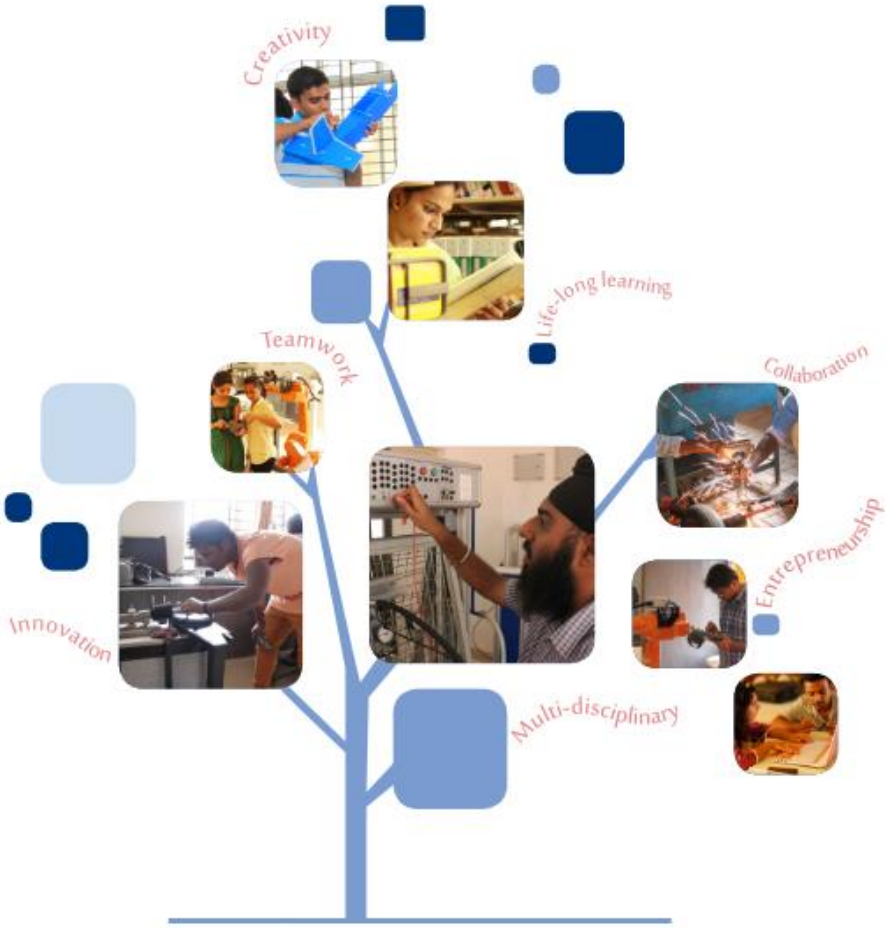
KLE Technological University, Hubballi



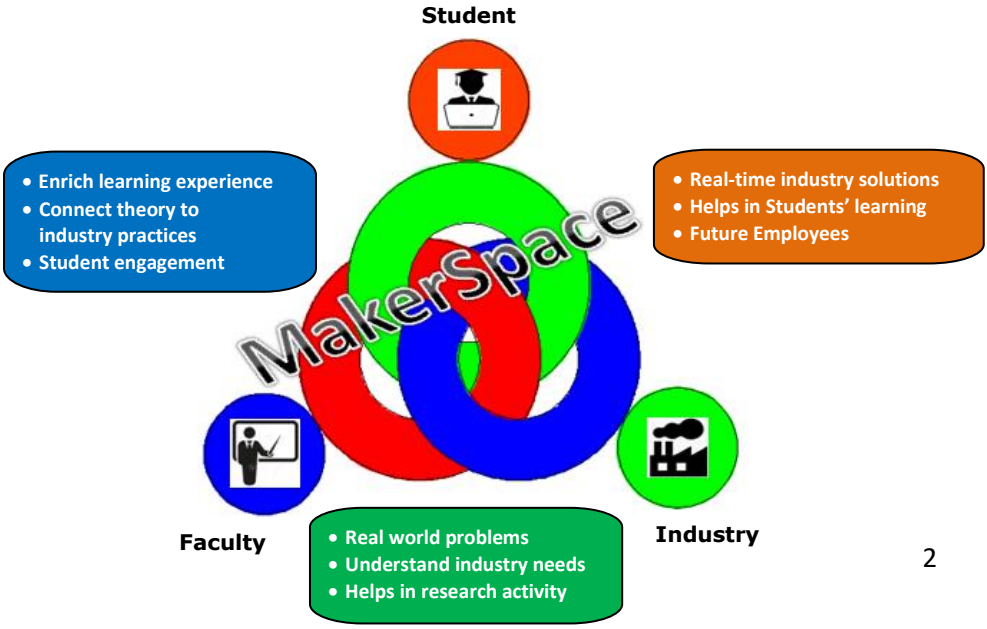
MakerSpace

Dream it.., Make it…

MakerSpace

The 'MakerSpace' is a central facility created to promote product development and realization eco-system on the campus. It intends to provide students with unique learning experiences on real industry problems and products in a work-emulating environment. It helps them understand industry needs, professional requirements and the product realization process. The MakerSpace provides modern design, prototyping, and manufacturing facilities required for realization of any electro-mechanical product. It also provides expert supervision and training to use the facilities.

The MakerSpace is administered by the College as a resource for all engineering departments. Facilities, with an investment of about 3.0 crores of rupees, occupying 10,000 square feet, include a machine shop (4000sq.ft), model shop (2000sq.ft) and project work area (4000sq.ft). Engineering student can use the MakerSpace for concept design & realization, course-related activity and/or competition projects such as SAE Formula, SAE- BAJA SAE- ecokart, SAE-Efficycle, ROBOCON, etc. The shop is open 8 am-8 pm weekdays and on weekends as needed.



Supervision is provided and advice is offered to get them started, but students build their own dreams, make their own mistakes, and learn from them. Facilities include state of the art machine tools and support systems that compliment the prototyping process.

The ultimate goal of the MakerSpace is to support the students and entrepreneurs to convert their product ideas into a reality. The facilities are open to student teams, faculty members and entrepreneurs working towards creating products to realize our national dream 'Make in India'.

To avail the MakerSpace facility engineering student/ student teams irrespective of any discipline should undergo a safety training workshop which would be conducted on every Saturday from 10am to 12noon. The workshop emphasis is on the personal safety in the workshop, safe handling of the equipment/ the artifacts made and the environment. Thereafter students will be issued with a MakerSpace identity card and would be the gate pass. It has a full- time staff members, headed by a facilities coordinator.

Facilities in Nutshell

SNo.	Facility	Capability
1.	CNC Turning Centre	Precision Cylindrical parts High-speed Machining Versatile
2.	CNC Vertical Machining Centre	Parts of dies and molds High-precision parts Prismatic part machining
3.	CNC Wire EDM Machine	Electric Discharge Machining Machining difficult to machine materials Delicate parts
4.	CNC Router	Machining various materials Complex contours Easy to operate
5.	CNC Laser Cutting Machine	Cutting materials such as acrylic, Double colored board, leather, fabric, paper, wooden packaging box, bamboo craft, leather shell, ivory and so on. Architectural model, aviation and navigation model
6.	CNC Plasma Cutting Machine	Any thickness from 0.3mm through to 25mm can be cut. Virtually any metal can be plasma cut including: steel, stainless steel, aluminum, copper, galvanized sheet Cut precise and intricate flat shapes.
7.	3D Desktop Milling Machine	PCB making Non-proprietary materials – acrylic, wax, . . . Creating prototypes
8.	3D Printing Machine	High-end prototyping Powered by Poly-jet technology ABS as printing material.

9.	3D Imager	Fast and consistent measurements for dimensional inspection and reverse engineering applications. On parts, assemblies, and tools. Reverse engineering applications
10.	Portable Co-ordinate Measuring Machine	Verification of product quality by performing 3D inspections, tool certifications, CAD comparison, dimensional analysis, reverse engineering Measurements with regard to GD&T
11.	Plastic Injection Molding Machine	The plastic injection molding machines along with the customized mold are used to produce vast quantities of identical plastic items ranging from disposable consumer goods to high precision engineering components Mass Production
12.	Universal Cylindrical Grinding Machine	Grind the external and internal surfaces of a cylindrical work-piece to a very close tolerance up to 0.003mm with high quality surface finish (up to N4).
13.	Universal Tool & Cutter Grinding Machine	Sharpening and reconditioning wide range of high speed and carbide tipped tools
14.	PCB Machining	PCB Prototyping systems enable easy and high precision board making • Ideal for in-house prototyping • Time saving of product development • Produces boards with the precision expected in a laboratory • Processing without chemicals

CNC Turning Centre (02Nos.)

CNC turning center meets the needs of modern machine shops, now and long into the future. High-speed precision CNC turning center offers maximum versatility and productivity.

Specifications

Swing over Bed/ cover	400mm
Swing over carriage	250mm
Distance Between Centers	380mm
Max. Turning Diameter	225mm
Max. Turning length between chuck & center	300mm
Motor Power	5.5/7.5 k W
Spindle Bore Diameter	40mm
Bar Capacity	25mm
Max. Speed	4000RPM
No. of Stations on Turret	08 No.
Positional Accuracy X axis	+/- 0.005mm
Positional Accuracy Z axis	+/- 0.0075mm
Repeatability X axis	+/- 0.002mm
Repeatability X axis	+/- 0.003mm
Control System	FANUC Oi Mate TD
Power Supply	3HP

CNC Vertical Machining Centre (02Nos.)

A vertical machining center (VMC) is a machining center with its spindle in a vertical orientation. VMCs are high-precision machines often used for tight-tolerance milling, such as fine die and mold work. Vertical machining centers are creating the parts and die/ molds that matter with precision, accuracy, repeatability and surface finishes that virtually eliminate bench work. They can rough and finish hardened steel cavities/cores far more efficiently than general-purpose machines. High-speed spindles employ high-feed-rates at shallow depths of cut to achieve high- efficiency milling.

Specifications

X axis travel (Longitudinal)	480mm
Y axis travel (Transverse)	360mm
Z axis travel (Vertical)	500mm
Repeatability	+/-0.005mm
Positional Accuracy	0.010mm
Stalling Torque	6Nm
Control System	FANUC OI Mate MD
Max. Spindle Speed	9000RPM

CNC Vertical Machining Centre (DMG MORI)

Aircraft parts are more difficult to machine than general parts. The reasons include the work-pieces being with complex curved surfaces, as well as being susceptible to deformation because of thin walls; also the issue of high-performance aircraft materials such as titanium, stainless, exotic alloy. The Machine is intended for this purpose with capabilities for machining high speed-high precision parts for aerospace application. An optimized machine structure also increases stability during machining, and a high degree of manufacturing flexibility is provided in the standard version by having 30 tool pockets in the tool magazine.

Specifications

X axis travel (Longitudinal)	600mm
Y axis travel (Transverse)	560mm
Z axis travel (Vertical)	510mm
Repeatability	+/-0.005mm
Positional Accuracy	0.005mm
Stalling Torque	6Nm
Control System	HEIDENHAIN
Max. Spindle Speed	12,000RPM

CNC Wire EDM

Wire EDM is a method to cut conductive materials with a thin electrode that follows a programmed path. The electrode is a thin wire. Typical diameters range from 0.10mm - 0.30mm although smaller and larger diameters are available. The hardness of the work piece material has no detrimental effect on the cutting speed. There is no physical contact between the wire and the part being machined. Rather, the wire is charged to a voltage very rapidly. This wire is surrounded by de-ionized water. When the voltage reaches the correct level, a spark jumps the gap and melts a small portion of the work piece. The de-ionized water cools and flushes away the small particles from the gap. The CNC machine can independently move four machines axes to generate taper cuts. A stamping die can be machined with 1/4 degree taper or a mold with one degree taper in some areas and two degrees in another with precision. Extrusion dies can be cut with the taper constantly changing. Wire EDM can be accurate to +/-0.003mm. Virtually no burrs are generated. Since no cutting forces are present, wire EDM is ideal for delicate parts. No tooling is required so delivery times are short. Pieces up to 200mm thick can be machined.

Specifications

Max. Table Size	370 x 670 mm
Max. Work-piece height	200 mm
Max. Taper Angle	+/- 5 degrees/100mm
Dry run Speed	80 mm/min
Wire Diameter	0.25mm
Min. Input Command	0.001mm
Min. Resolution	0.001mm
Data Input/ Output	USB 2.0, Keyboard & RS232C
Power Supply	3Ph 415V

CNC Router

A CNC router is a computer-controlled machine for cutting various hard materials, such as wood, composites, aluminum, steel, plastics, and foams. It is one of many kinds of tools that have CNC variants. A CNC router is very similar in concept to a CNC milling machine.

A CNC router can be used in the production of many different items, such as door carvings, interior and exterior decorations, wood panels, sign boards, wooden frames, moldings, musical instruments, furniture, and so on. In addition, the CNC router helps in the thermoforming of plastics by automating the trimming process. CNC routers can help ensure part repeatability and sufficient factory output.

Specifications

Bed type	Regular PCB Drilling Type
Max. Working Area	1200 x 600 x 120mm
Spindle	2.2KW, Water Cooled, 24000RPM
Collet Type	ER16
Control Language	Exlon Drill File, Standard NC
Addressable Resolution	0.05 mm
Power Supply	AC 1Ph-240V

3D Desktop Milling Machine

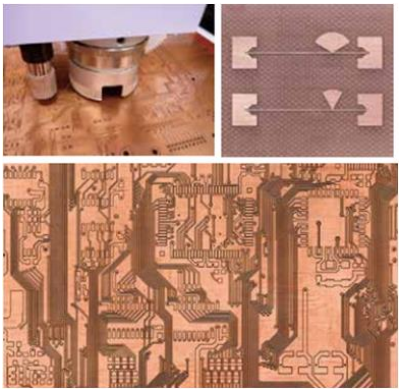
The 3D desktop milling machine incorporating innovative subtractive rapid prototyping (SRP) features to deliver accuracy, smooth finishes and efficiency in a compact format. With its new-design milling spindle, collet, circuit boards and control software, the machine produces beautiful finishes, including smooth curved surfaces and intricate details. Precision milling makes it ideally suited for creating prototypes which require mechanical checks and confirmation of fit. The machine can mill a variety of non-proprietary materials including modeling board, acrylic and wax. The results look and feel closer to the final production runs and are ready for final validation.

Specifications

Max. Working Area	203 x 152 x 60mm
Table Size	232 x 156 mm
Max. Weight On Table	2 Kg
Tool Shaft Diameter	STD Collet 6mm
Max. Feed Rate	30mm/sec
Mechanical Resolution	0.001mm
Spindle Motor	30W, DC motor
Cutter Rotation Speed	3000- 7000 RPM
Type of axis motors	Stepper
Interface with Computer	USB 2.0
Control Software	Modela Player 4
Power Consumption	55W

PCB Prototyping Machine

MITS PCB prototyping machine can mill various types of the boards from normal circuit boards to extremely thin circuit boards. Besides PCBs, MITS PCB prototyping machine achieve the fine processing on the surface of other materials such as aluminum or acrylic. Printed circuit boards can be machined by importing your CAD data (Gerber or DXF output format) to MITS software enabling smooth process from CAD designing to board making.



Specifications

Working area	229x300x45*6 mm
Table size	296x370 mm
Minimum width line & space	0.1mm
Resolution	0.156 μm
Maximum travel speed	55 mm/sec
Spindle speed	5,000 -62,000 RPM
Power consumption	200 VA
Features	Auto tool change
Machine weight	Approx. 0.34 kg

CNC Laser Cutting Machine

Over the past decade, laser cutting has developed into state-of-the-art technology. It is estimated that more than 40,000 cutting systems are used for the high-power cutting of metals and non-metals world-wide. When including low-power applications, such as plastics cutting and paper cutting, the numbers are even higher.

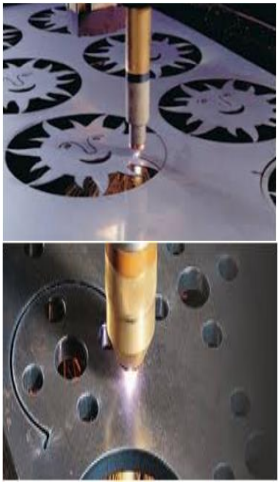
This CNC Laser cutting machine has laser power of 180watt CO2, sealed Laser tube of wave length 10.6um; able to cut up to 30mm acrylic, up to 8mm MDF, up to 0.8mm stainless steel, fabric, paper and paper board. The power working is 1220 x 2440 mm and the positional accuracy is about 10 microns.

Specifications

Laser Tube	180W
Working Area	1220 x 2440mm
Laser Type	CO_2, Sealed Laser Tube, Wave Length 10.6um
Cooling System	Water Cooling
Power Adjustment	0-100% Step-less control 0-100% Adjustable in software
Engraving Speed	0-70000mm/min
Cutting Speed	0-18000mm/min
Positional Accuracy	<0.01mm
Consuming Power	<2000W
Support Format	PLT, DST, DXF, BMP, AI, Support Auto CAD, Corel Draw Output
Power Supply	AC 220V/110V+10% 50Hz/ 60Hz Peak current 10KVA

CNC Plasma Cutting Machine

The plasma cutting systems are powerful and accurate machines which run off a personal computer. These machines are remarkably versatile and easy to use; cut precise and intricate flat shapes. Any thickness from 0.3mm through to 25mm can be cut, depending on plasma cutter selection. Virtually any metal can be plasma cut including: steel, stainless steel, aluminum, copper, galvanized sheet and more.



Specifications

Machine Type	Cantilever
Effective Cutting Width	1500mm
Effective Cutting Length	3000mm
Positioning Speed	6m/min
Air Plasma Source (Torch)	Power Source to Cut Pierce Capacity 10mm
Auto Lifter, Anti-collision Device	Enabled
Oxy-Fuel Torch (Acetylene/ LPG)	Cutting Range 6mm-50mm (MS) Hole Piercing 6mm-40mm(MS)
Power Supply	3Ph, 415V, 20HP at Peak Load

3D Printer

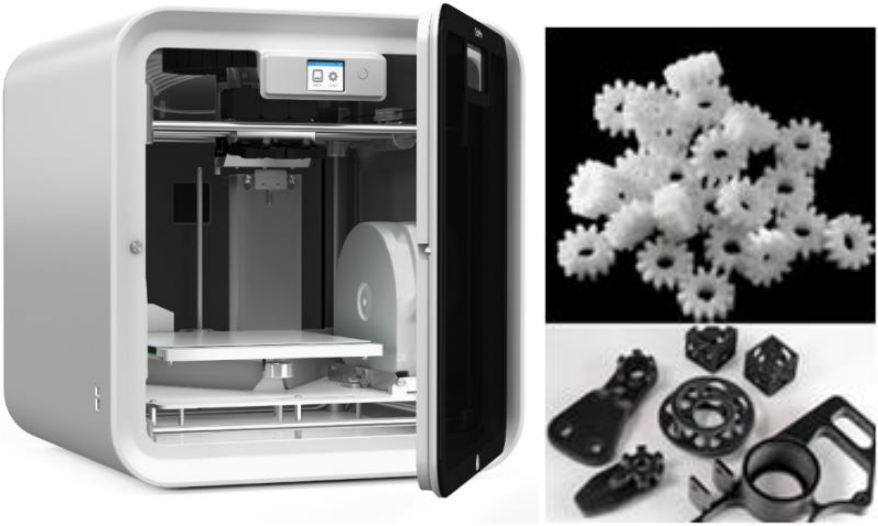
The Objet30 Pro combines the accuracy and versatility of a high-end rapid prototyping machine with the small footprint of a desktop 3D printer. Powered by Poly-Jet technology, it offers eight different 3D printing materials, among them clear, high-temperature and simulated polypropylene, and features the industry's best print resolution so you get smooth surfaces, small moving parts and thin walls. With a roomy tray size of 300 × 200 × 150 mm. Objet30 Pro is ideal for prototyping consumer goods, consumer electronics, medical devices and more. The Objet30 Pro gives the power to create realistic models with specialized properties quickly and easily in-house.

Specifications

Model Material	Rigid opaque, Vero White Plus, Vero Gray, Vero Blue, Vero Black, Simulated Polypropylene: Durus
Support Material SUP705 gel-like photopolymer support	SUP 705 (Water jet removable) SUP706 (Soluble)
Max. Bed Size	294 x 192 x 148.6mm
System Size & Weight	82.6 x 60 x 62 cm; 106kg
Resolution	X-Y axis 600 dpi, Z-axis 900 dpi
Accuracy	0.1mm varies depending on part geometry , size orientation, material and post processing method
Min. Layer Thickness	28 microns
Build model	High Speed 30 microns resolution
Software	Objet Studio
Operating Conditions	Temperature 18-25ºC Relative Humidity 30-70%
Power Requirements	1Ph, 100-200V, 50-60Hz, 7A or 200-240V; 50-60Hz, 3.5A

3D Printers (Cubepro 2 Nos.)

The **Cubepro** 3D printers (Duo & Trio) are efficient, strong, fast, fully automated low cost printers, multi-colored, easy feed cartridges gives the flexibility in printing accurate components out of ABS, PLA and wood filaments.



Specifications

Max. Build Size (Duo-Double Head)	242.9(W) x 230(H) x 270.4(B)mm
Max. Build Size (Trio-Triple Head)	200.4(W) x 230(H) x 270.4(B)mm
Z axis Resolution	0.100mm
Layer Thickness	70microns, 200microns and 300microns for fast mode
Print Tolerance	X & Y axis_ +1% of Dimension or +0.2mm Z axis_ half the processed Z resolution
Print Speed Extruded Volume	Max. 15mm/sec and polymer dependent
Weight	4.5 kg
Power Requirement	100-240V AC
Max. Operating Temperature at Extruder Tip	536ºF / 280ºC
Support Material	PLA/ABS/ Dissolvable natural PLA
Support Removal	Dissolvable in sodium hydroxide solution used with heated ultrasonic cleaner

3D Printer -AION 500

AION 500 is a fully enclosed industrial grade 3D printer and high print quality and repeatability. The machine is easy to use for prototyping to low-volume manufacturing with impeccable accuracy. The AION 500 is a high performance 3D printer that offers a professional-level build size of 500 x 500 x 500 mm volume. With multiple connectivity options and sensors, it is one of the most advanced 3D printers available.

Specifications

Physical Dimensions(DWH)	955mm x 1040mm x 925mm (37.6in x 40.99in x 36.41in)
Maximum Printable Area(Dual Extruder)	500mm x 500mm x 500mm
Recommended Materials	ABS, PLA, HIPS, PETG, Carbon fiber, AFPM Special Material, & AFPM Carbon fiber
Material Support	Non hygroscopic HIPS
Maximum Print Speed	200mm/s
Build Rate(Material Deposition Rate)	15-30 cm^3/hour
Layer Precision	Layer thickness range:range1:0.1-0.15,range2:0.15-0.25,range3:0.25-0.3
XY Precision	Positional accuracy 16 micron
Z Precision	Patented precision Z axis mechanism with electromechanically synchronized four ball screws and moving XY gantry

3D Imager

The FARO Cobalt Array Imager is a metrology-grade, non-contact scanner which utilizes blue light technology and on-board processing to capture millions of high resolution 3D coordinate measurements in seconds. It delivers fast and consistent measurements for dimensional inspection and reverse engineering applications.

Compact and lightweight, the Cobalt Array Imager is easy to use across multiple applications. The combination of flexibility, portability, speed and accuracy makes Cobalt Array Imager an ideal solution for demanding metrology needs

Benefits: Increases the effective field of view which, in turn, reduces inspection time and increases productivity. A multiple imager array of Cobalt sensors is more flexible and affordable than purchasing a larger field of view system.

Portable Coordinate Measuring Machine

The Faro Arm is a portable coordinate measuring machine (CMM) that allows manufacturers easy verification of product quality by performing 3D inspections, tool certifications, CAD comparison, dimensional analysis, reverse engineering, and more. Using a point or ball probe on an articulating arm allows the user to collect individual 3D data points of an object in space.

This method of data collection is the most accurate way to define the form of an object that is typically more geometric than organic.

It is especially useful for reverse engineering applications when precision is the most important factor.

Specifications	
Working volume	1200mm spherical
Accuracy	0.018mm
Most Common Applications	
Metal Fabrication	Dimensional Analysis, Part Inspection, On-Machine Inspection
Aerospace	First article Inspection, Alignment, Dimensional Analysis
Tool & Die	Dimensional Analysis, Tool Set-up, On-Machine Inspection
Automotive	Part Inspection, Alignment, Dimensional Analysis
Features	Portable and easier-to-use than a fixed CMM Mount and measure parts in process Generate GD&T & SPC reports

Vertical Plastic Injection Molding Machine

Injection molding is often ranked as the one of the commonly used processes in the production of plastic items. The plastic injection molding machines along with the customized mold are used to produce vast quantities of identical plastic items ranging from disposable consumer goods to high precision engineering components.

Specifications

Max. Injection Shot	60gm
Injection Unit Screw Diameter	25-30mm
L/D ratio	20
Screw Speed	0-180RPM
Injection Stroke	125mm(Min.)
Max. Mould Clamping	30T
Mould Opening Stroke	300mm
Min. Mould Thickness	75mm
Max. Mould Thickness	175mm
Size of the Mould Plate Distance Between Tie-Bar	300 x 180mm

Power Tools

These robust tools offer personnel in the metalworking trades fast work progress, even in tough applications. The special advantages include an extremely robust lever and spring construction and a powerful 2000-watt motor with starting current limitation. They work quickly and reliably when cutting metal profiles like rectangular or steel pipes. At the heart of this tool is the tried-and-tested Bosch angle grinder motor, so these always deliver and achieve a superior lifetime.

Pedestal Grinder

Hand Drilling Machine

Angle Grinding Machine

Abrasive cut-off machine

Mitre saw

Jig Saw Machine

Other Machine Tools

Centre Lathe

Drilling Machine

Surface Grinder

Universal Tool & Cutter Grinding Machine

Universal Cylindrical Grinding Machine

Contact Details

The students, faculty members and the entrepreneurs who are in alignment with the objectives and wish to avail the support of the MakerSpace may note the contact details as follows.

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