



# ProtoJet

WaterJet Cutting Cell



## Techserv

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Waterjet cutting is one of the most versatile cutting processes around.

Well suited for high-performance cutting of metals, ceramics, plastics and most other materials.

Waterjet technology, creates a clean, burr-free cut that does not require secondary finishing and does not leave a heat-affected zone.

Techserv are a leading UK manufacturer of XY cutting machines and produce high quality waterjet, plasma and gas cutting machines with machines operating across the globe.

Profile cutting machine specialists



## The Water Jet Process

The intensifier produces the 3,800 bar ( 55,000 psi ) high pressure water required for water jet cutting. There are two main methods of producing this high pressure, either by a mechanical pump with a AC motor driving a geared arrangement of pistons or by a hydraulic pump producing 200 bar driving a 20:1 intensifier. Both systems have their merits however the long service intervals offered by hydraulic pumps offset the slight cost increase, as a result we specify a hydraulic pump supplied by Hypertherm.

### Cutting heads

The machine is specified with one cutting head and can operate as either a pure water or abrasive cutter.

### Pure water cutting

The high pressure water is constricted by an orifice ( typically 0.1mm diameter ) creating a thin beam of water traveling at very high speed and is suitable for cutting most soft materials such as foam, rubber, fibreglass, fabrics etc.

The force of the water cutting light materials may cause them to move slightly also the bubbling back of the water in the tank can cause issues so some clamping the material to the cutting bed will be necessary.

### Abrasive Cutting

The high pressure water is passed through a diamond orifice ( typically 0.18 to 0.35 mm diameter ) into a venturi chamber, the resulting high speed jet of water causes the air pressure in the chamber to be reduced, drawing metered abrasive garnet into the venturi which is then entrained in the water jet stream. This combined water and abrasive jet then passes through a hardened tube, 0.7mm diameter, to stabilise and focus the beam, creating an abrasive jet approximately 0.8mm diameter traveling at high speed (1000km/hour). This stream will cut virtually all materials upto about 100mm thick. The cutting is carried out by the abrasive wearing away the material, the water in this case is acting as a carrier for the abrasive. Materials that can be cut include, metals including aluminium, titanium, armour plating, ceramics, glass, wood, plastics, stone. etc



### Cutting Machine

Techserv manufacture a range of 2D cutting machine from our base in Mirfield, West Yorkshire with over 700 machine installations worldwide, ranging from gas cutting machines to plasma and water jet along with special purpose manufacturing and monitoring equipment. Please see overleaf for the ProtoJet machine specification.

### Running costs

Typical running costs for a waterjet cutting machine are about £ 15 per hour.

This includes the following

electricity @ 29 kW

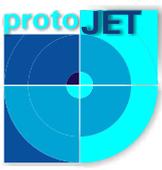
water ( about 2 litres/min )

abrasive ( approx 350 g / min, cost £ 300 tonne )

pump seals ( these last about 500 hours, £ 120 a set)

diamond orifice ( life of 1000 hours, cost about £ 1000 )

focusing nozzle ( life of 70 hours, cost £ 100 )



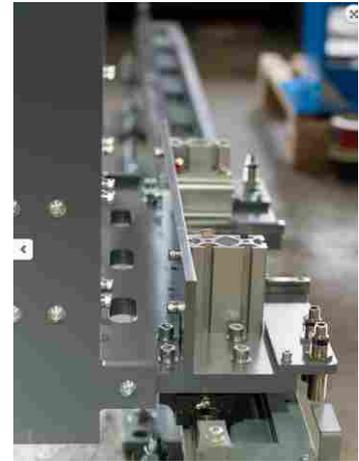
## Techserv ProtoJet machine specification

The ProtoJet machine is specifically designed to offer waterjet cutting in a compact cutting cell.

Interlocked doors protect users from the cutting jet and offer good all round viewing of the process. The cutting area of 1,000 x 1,000 mm is ideally suited to cutting small parts and where the manual handling of large sheets will be impossible.

The slides and drives of the machine are arranged above the cutting bed, improving access to the cut area for loading and observation.

The control system is specifically designed to be easy to use with minimal training required, additional copies of the control software can be utilised for machine simulations and programme testing.



### Details

Motion in all four axis, ( X, Y, YY and Z ) is produced by heavy duty digital motors coupled to ballscrew drives and linear slide sets mounted at the top of the machine, well above the cutting bed.

### Tank

The rolled steel fabricated tank catches the water and is separate to the machine outer frame. Large castors allow the bed to be uncoupled and moved away to be cleaned and emptied. A moat around the top of the cutting bed catches overspill water. The variable height drain allows the water level to be adjusted.

### Frame

The drives are mounted on a welded steel box section frame, castors allow the frame to be easily moved and can be locked into position when cutting.

### Viewing Doors

Large curved doors enclose the cutting area. The doors are interlocked to prevent machine motion and cutting when opened. The doors open wide to ease loading of heavy materials.

### Controller

The Techserv CNC is a PC based shape cutting controller, particularly suited to water jet cutting applications. The controller is based on a PC system running **Windows 10**

The software is designed to be easy to learn and use with many built in features and is operated using a 15" LCD touch screen.



### Basic Specification

Start, Stop, Go To and Reverse.

Vector moves and circular interpolation built in

Eight direction Jog.

Graphic display of nest to be cut, with zoom.

Real-time graphics. A cursor and path line change shows progress on job.

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# ProtoJet

## WaterJet Cutting Cell



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Techserv ProtoJet specification continued

Graphical 'touch screen' plate alignment.

Status displays for speed, X & Y position, program name & status and messages.

Auto or manual cutting mode.

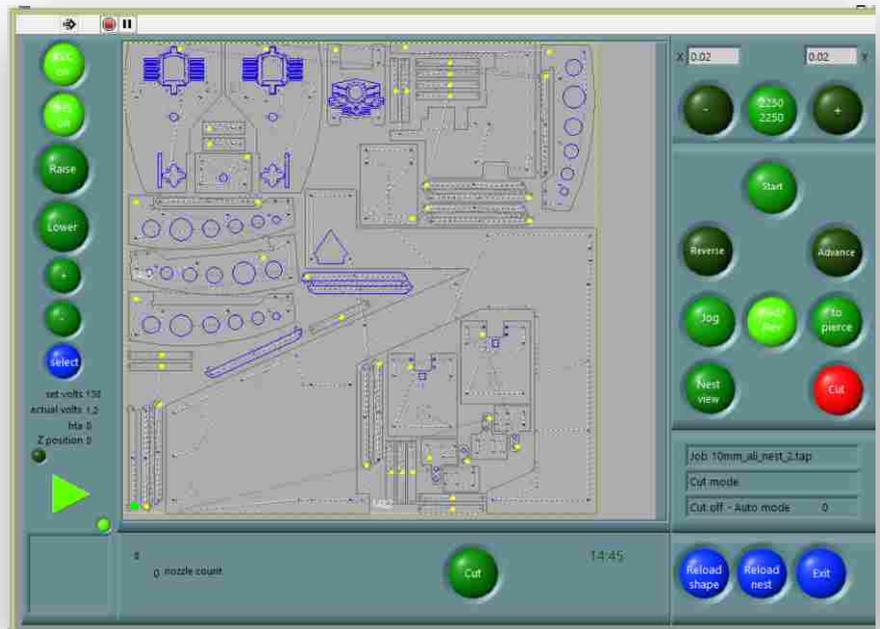
Pierce times can be taught via the screen.

Job interrupt and return, permits move off to replace consumables, with return.

Full reverse along cut.

Off path lead in allows easy restart anywhere along the program.

Test run facility with wireless joystick repositioning.



### Process data

When the operator selects the material thickness, type and desired cut quality, the controller will automatically set the cutting parameters. Additional materials can be added and edited.

### Cut quality

Five cut quality settings are available with picture icons to assist the correct selection.

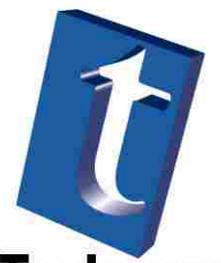
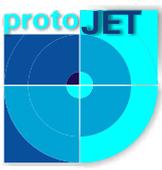
### Cutting Area

Wide opening doors and top mounted drives ease plate loading and accessibility.

Internal LED illumination gives the operator a good view of the cutting process.



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Techserv ProtoJet specification continued

### KMT Neoline intensifier

The system has a 4,000 bar 40hp (15 hp) intensifier that operates at a working pressure of 3,800 bar. This PLC controlled intensifier has a variable displacement, pressure compensated hydraulic pump.

The Neoline pump also comes with a cartridge type hydraulic seal for easier maintenance.



### Hydraulic System

A pressure compensated hydraulic radial piston pump is powered by a 30kW (11.2kW), 3 phase electrical motor.

### Accumulator

To compensate for the slight pressure drop while the system is switching, the system has an integrated accumulator with a capacity of 2 litres to reduce the pressure fluctuations of the intensifier.

### Safety Valve

A hydraulically operated safety valve is installed within the high-pressure water system This is opened to release the “high pressure” water in the event of the intensifier being switched off.

### Control cabinet

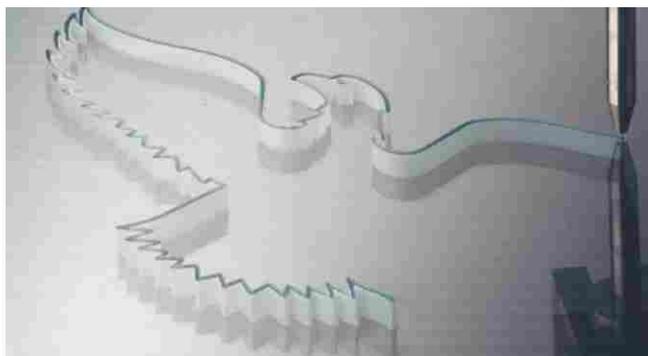
The complete intensifier is fitted to a integrated powder coated sheet metal cabinet, with separated catcher trays for the water and hydraulics. It is fitted with removable panels for easy access for maintenance.

### Specification :-

Max working pressure	4000 bar
Max continuous pressure	3800 bar
Intensifier ratio	20:1
Max oil pressure	200bar
Require inlet pressure	6-7bar

### Abrasive cutting head

Working pressure 4000 bar. The cutting head is fitted with a normally closed pneumatic control valve which controls the water flow.





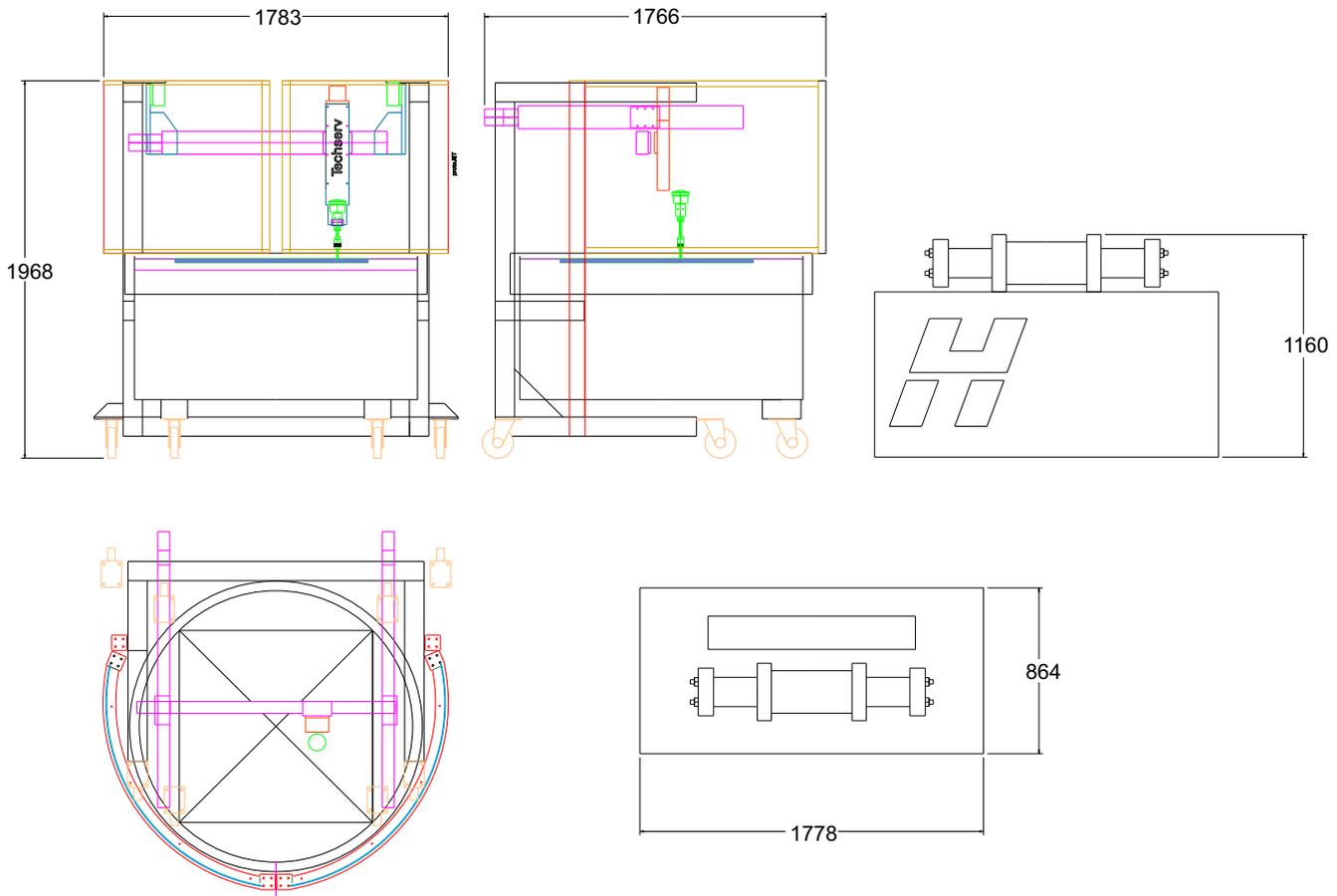
# ProtoJet

WaterJet Cutting Cell



Techserv ProtoJet specification continued

System Dimensions mm:



**Notes:**

The pump can be located upto 6 metres away from the cutting cell.  
 Additional height will be required for the high pressure feed pipe.

**Specification:**

Plate size      1,000 x 1,000 mm  
 Speed            50 to 14,000mm / min  
 Controller      Techserv PC based CNC  
 Pump            15 or 40 hp intensifier

**System requirements;**

**Power**  
 15 hp 11.2kW 3 phase at 25 amps per phase  
 40 hp 30 kW 3 phase at 65 amps per phase

**Compressed air**  
 6.5 Bar (95 psi) at 50 l/min

**Weight:**  
 Pump 1350 kg  
 Machine when full 1400 kg

**Water:**  
 15 hp 3.8 L/min at 3 Bar (40 psi)  
 30 hp 4.6 L/min at 3 Bar (40 psi)

**Orifice:**  
 15 hp maximum 0.18mm dia  
 30 hp maximum 0.28mm dia