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Link to Excalibur 12 video
[FICEPExcalibur12 on Vimeo](#)



File photo

Excalibur 12 CNC Single Spindle Drilling Line

MAIN TECHNICAL SPECIFICATIONS

All beams having a maximum section volume of 47" x 47"

Section length	maximum	40 ft.
Drill heads		1
Spindles per vertical drill head		1
Drilling diameter	maximum	1-9/16"
X axis positioning speed		115 FPM
Y axis positioning speed		470 IPM
Power per head (AC)		25 HP
Programmable spindle speed	maximum	3,000 RPM
Maximum beam size		47"
Drill coolant (requires shop air)		Internal/external
Positioning accuracy		± 1/64"
CNC control		PC operating under Windows
Total vise clamping pressure (2)		10 tons
Incoming voltage requirement		460 volts, 3 phase, 60 Hz

BENEFITS

- The concept of keeping the material stationary and moving the drilling spindle **reduces the required shop space to less than half** of what is required for a typical multiple spindle drilling head.
- The cost of the FICEP Excalibur 12 is about **35% of the price of a typical multiple spindle drilling line.**
- Eliminates manual layout and drilling.
- The simple CNC control **reduces the required CNC hardware to one third** of what is required on a multiple spindle drilling line.
- The **simplicity** of the Excalibur 12 makes it an ideal fit for firms that are just starting to become involved in CNC technology.
- Typical lease purchase cost is **less than the cost for a layout man with benefits.**
- You can be **running production within a week of delivery!**
- **Automatically generate layout marks** for such elements as stiffener plates.
- Ability to utilize the **secondary x axis to accomplish scribing** operations with the optional scribing capability.
- **The system is so easy to operate** that no prior computer or CNC experience is required.
- The ability to process typical structural length sections, and even short detail parts, makes the Excalibur 12 equally **suited to process beams and even plate and angle detail.**
- **Improve your bid capture ratio.**
- Be able to **respond quickly** to receiving delayed drawing releases.
- The **accuracy** of the hole locations are exactly as drawn.
- **Achieve the productivity that 6-8 men** can produce with manual methods.
- The Excalibur 12 DE takes up about the **same shop space as a normal fitting table.**

FEATURES

CONTROL

- The wireless remote feature of the Excalibur 12 eliminates the need for the operator to constantly walk back and forth from his work location to the CNC control. **This feature enhances the productivity over units with a fixed CNC control location by up to 30%!**
- If a problem were to develop with the drill bit, the operator can **easily place the unit in a feed hold mode** with his wireless remote before damaging the drill bit. If he had to walk over to the CNC control first, the tool would typically be destroyed by the time he can get to the control location.
- **The CNC control features a touch screen to simplify the operator interface with the control.** The system is also supplied with an external USB port so a keyboard and mouse can simply be plugged in if desired.
- **The control on the Excalibur 12 is furnished with the powerful FICEP proprietary Pegaso software.** Long term maintenance cost with this hardware configuration (**the hard drive is now replaced with a solid state memory device**) is almost nonexistent when compared to the field service rate for commercially available CNC controls.



SOFTWARE

- The CNC control system on the Excalibur 12 **automatically generates detailed production control data** that can be exported to your estimating program or can be viewed in text or graphical form.
- The software **automatically tracks the drill bit use** and advises the operator when it is time to change to a re-sharpened drill bit.
- The Excalibur 12 software **monitors and records those non-productive times such as tool changes, maintenance time, etc.**
- The CNC control also contains the **powerful FICEP Teleservice software**. With just an internet connection, we can log on to your system to perform the same type of analysis if our service tech was standing in front of your machine. This permits us to remotely activate elements to confirm functionality, place an oscilloscope on the servo drives to monitor performance, etc. This approach lets us resolve a problem or determine what part is required before we send a service tech to your location.
- **Direct downloading of DSTV files** from typical structural steel CAD packages such as TEKLA and SDS2.



MACHINE

- **The 1-9/16” maximum hole size** is ideal for those large hole size applications such as base plates. Larger hole sizes can be milled or can be achieved if the tool is manually inserted into the spindle or produced by milling to size
- Our proprietary material clamping system clamps the material from both the top and the bottom to **eliminate the need for any manually adjustable external table clamps.**
- **The 10 ton clamping force** eliminates the need for serrated surfaces in the table. The smooth table surface of the Excalibur 12 facilitates the ability of the operator to position sections against the datum line.
- The **vertical clamp position adjusts automatically** to the height of the section that is about to be processed. This reduces the clamping cycle to the minimum without operator involvement.
- Probing can occur from either the **left or right hand** end so either end can be the zero point.
- **The material zero point laser** is used to establish the zero reference or start position.
- **The non contact web probe system** automatically orients the flange hole pattern relative to the web centerline.
- Machine guidance system features 8” diameter rolls with **bearings that are guaranteed for life.**
- The position where the drill switches **from the rapid advance to the drilling feed cycle can be determined by using the theoretical position or the actual material surface location.** When using the actual surface location as the result of using the tool for surface sensing, **it is suggested to use HHS tools, not carbide, as this probing of the surface location with carbide tools diminishes the useful life of the tool.**



OPERATIONAL PROCESS

The FICEP Excalibur 12 CNC drilling line has been engineered to eliminate the labor intensive layout operations for the production of holes in both flanges and the web, as well as the subsequent fitting operations such as locating copes, stiffeners and even cut off locations.

In addition to the elimination of manual layout, the total drilling process is automated and performed while the operator is free to be engaged in other tasks such as material handling operations.

The Excalibur 12 is equally suited to process long structural sections and even short detail members that cannot be typically processed on a conventional drilling line because of their short length.

The versatility of the Excalibur 12 is further evidenced by the efficient manner that it addresses the following applications:

- ▶ Beams up to 46-3/8" in depth
- ▶ Angles both equal and unequal
- ▶ Channels
- ▶ T-sections
- ▶ Flat bars
- ▶ Plates up to 46-3/8" in width
- ▶ Girders
- ▶ Tapered fabrication sections
- ▶ Fabricated sections with uneven flanges
- ▶ Tubes
- ▶ Rails
- ▶ Truck frames
- ▶ Rail car frames
- ▶ Weldments

Virtually any size of shape that can be fixtured and fits within the processing window of 46-3/8" in height and 40 ft. in length can be processed.

PROCESS CYCLE

Based upon the production requirements, the operator selects the appropriate sequence of programs that are required.

After the programs are selected, the operator positions the parts to be processed against the datum line. The operator then depresses cycle start on his wireless remote control to start the CNC programs as needed.

The laser probe is used for determining the leading end location or reference point. Once the leading end of the part is located, the Excalibur 12 **proceeds to drill, layout or optionally scribe the required pattern.**

During the drilling cycle, the drill advances towards the material in a rapid mode and then proceeds drilling at the programmed rate. Once the drill finishes the hole, it **rapidly withdraws from the material just enough to clear the material** before it is commanded to drill the next programmed hole. It is not required that the spindle return back to the end of travel after each hole to keep the process time to a minimum.

The system of the Excalibur 12 has two powerful hydraulic clamps (5 tons each) that engage the material from both the top and bottom in a vise type clamping action which **eliminates distortion to the table over time.** These **two clamps** travel with the Excalibur 12 so there is no operator involvement required to secure the part during drilling.

The position of the **vertical clamp is automatically adjusted to the proper height** by means of the CNC program. The programmed height position is automatically added into the CNC program based upon what AISC or fabricated section is selected in the programming process. This keeps the process time to the minimum as the clamp does not have to return to the top of stroke and it eliminates any manual adjustment.

If there are flange holes that require drilling, the web probing system **automatically locates the web surface with a non contact probing system** and then distributes the flange hole pattern around the centerline addressing any off center web conditions that result from mill tolerance problems. A system of compressed air is incorporated into the probing process to make sure any chips that could be located on the surface of the web are removed prior to probing.

As the first part is processed, the operator is then free to position against the datum additional sections to be processed along the length of the bed. After the first section is processed, the system will automatically locate the next section and then executes the CNC program for that part, etc. This process of moving to the next section to be processed continues automatically without operator involvement.

As the Excalibur 12 proceeds to drill or layout the programmed patterns, the operator is free to perform other material handling functions such as removing a section that is finished, loading the next section to be processed on the bed or rotating a previously drilled section so another surface can be processed.

This operational sequence permits the material handling tasks that are required by the operator to be accomplished without interrupting the CNC drilling and layout operations. ***This means there is no loss of time for loading, unloading or even rotating a section if holes are required in more than one surface.***

The operator has the **wireless remote control system located on his belt** so he can not only start the programs, but he is able to stop the process to attend to a tooling problem, for example, without having to walk around to the CNC control system to stop the drilling process. This system makes it practical for the operator to truly utilize the drill cycle time to perform material handling functions. ***The wireless remote system truly enhances the productivity of this system by over 30%*** when compared to the old technology where the operator must walk each time to the CNC control.

SYSTEM ELEMENTS

IC *Material Support Table*

IC-01 **NEW** Fixed Bed (for 40 ft. Sections)

The useable area of the fixed bed is 40 ft. in length and is subdivided into a material storage area and an active processing area.



The material storage area is used to shake out material and stage sections in the order that they are to be processed. As required, the sections are then positioned to the active processing area of the table where the drilling takes place.

The fixed bed does not require any additional clamping devices since all the necessary part clamping that is required is provided with the **dual hydraulic material clamping system** that travels with the drill tower.



The fixed bed is suitable to accept additional devices such as welder's magnets that can be used to secure plates vertically for drilling (not included).

The bed is provided with machine ways complete with positive measuring through a rack and pinion system, which supports and allows for the automatic positioning of the drill head column with the drilling unit.



The piece part or section remains stationary as the drilling head travels the total length of the material bed to accommodate up to 40 ft. long sections. The traveling drilling system is cantilevered off the fixed bed so nothing is touching the floor as this facilitates chip recovery.

Based upon the desired zero point for a hole pattern, they can be referenced from the top material clamp surface, the machined surface of the fixed bed or the centerline of the web.

WU WORKING UNITS

WU-01 Mobile Column for Drilling Head Positioning

The mobile column is self contained and houses all the required hydraulics.

(The exclusive three-point guiding system uses 8" diameter rollers to guide the tower into the programmed position. FICEP Corporation offers a **lifetime guarantee on the bearings** of this movable tower assembly as we have used this design since 1978 with uncompromising results.)



WU-02 Monospindle Horizontal Drill Head



The CNC controlled drilling spindle is positioned vertically (Y Axis) on the movable tower assembly by means of a ball screw assembly that is powered by a servo drive.

Technical Specifications:

- ▶ Maximum drilling capacity in grade 50 material 1-9/16"
- ▶ Vertical (Y axis) positioning range 3/8" – 46-3/8"

The drill head described above is supplied with:

- One **AC infinitely variable drive motor** to ensure spindle rotation.
- Servo driven electric **ball screw spindle feed system**, providing a consistent feed pressure.

The spindle is provided with:

- Software to initiate the following cycles:
 - Rapid advance of the spindle to the material surface.
 - Feed of the drill bit through the material.
 - Rapid return of the drill spindle upon completion of the drilling operation.
- External spray mist coolant system is provided when solid drills are utilized in the system.

WU-03 Vertical Hydraulic Clamping System

This system consists of two separate clamping cylinders which **generate a clamping force of up to 10 tons.** This automatic clamping system is integrated into the movable tower which also contains the hydraulic power unit to effect this action.



The position of the top clamp adjusts automatically based upon the section height that is to be processed to reduce the clamp and unclamp cycle to the minimum and then to automatically set to the proper height for the next section to be processed without having to always go back to the top clamping position.



A second hydraulic clamp advances from the bottom to secure the material in a vise-type action. This proprietary design feature eliminates any clamping forces to enter into the fixed bed. The total force that is transferred from the section to the bed is never more than the weight of the section.

The hole pattern that is generated can be referenced from the table, top clamp surface or from the web centerline. The top clamp reference feature is frequently utilized when drilling web holes in a cambered beam where it is desired to have the web hole pattern follow the camber in the section.

WU-04 Device for Referencing the Zero Point Location of the Material

A laser is used to sense the leading end of the section or plate to establish the zero reference point. From this zero location, the programmed hole pattern is established.

WU-05 Through-The-Tool Coolant System

This feature provides the capability to apply an **air mist lubrication directly at the tool's cutting surface** when used in conjunction with oil hole drills. It is necessary for the user to provide shop air to the system.

HY HYDRAULIC AND PNEUMATIC SYSTEM

HY-01 Hydraulic Power Pack

The system includes:

- Hydraulic power pack is totally enclosed to generate the working pressure for the auxiliary machine functions.
- Hoses and necessary connections.
- Hydraulic system is located on the movable tower so it is **not necessary to run hydraulic lines from a fixed location to the movable tower**. The power unit is engineered to fit in the movable tower and is complete with the required solenoid valves and manifolds.

▶ Working Pressure 750 PSI



EL ELECTRIC SYSTEM

EL-01 Interconnecting Machine Wiring

EL-02 Electrical Cabinet

All the internal electrical components such as the servo drives are domestically available either from the manufacturer or from stock from FICEP Corporation.

The power supply is 460 V – 60 HZ – 3 Phases.

Note: Our equipment as quoted complies with the CE electrical code which is required for European manufactured machine tools. In the event that you require compliance with a special local electrical code, please provide the specifications so we can respond accordingly.

CN FICEP PEGASO CONTROL SYSTEM

The new generation control unit, with four controlled axes (basic version), is based on a fieldbus CAN (Computer Area Network) open technology.

The CNC is positioned in a control panel.

The CNC is equipped with:

- digital inputs (24V - optoisolated)
- digital outputs (24V – protected transistors)
- analog inputs, analog outputs, encoder interfaces (according to machine requirements)

The control system is an industrial PC that hosts the CNC, the PLC and the HMI. The power supply and the three CUPs (HMI, realtime and CANbus) are all mounted on a single board. Mass storage relies on solid state technology (flash memory) and the operating system image is write-protected against voltage dips or power losses.

Specifications:

HMI section (Human Machine Interface)

- 1.6 Ghz CPU dual core
- 2 GB DDR3 RAM with 512 kB x 2 L2 cache
- 8 GB compact flash
- 6 USB ports
- Touch screen color video LCD TFT 12"
- 10/100/1000 Mbit/s RJ45 Ethernet port
- Serial port RS232
- WINDOWS 7 embedded operative system

Realtime section

- Processor 800 Mhz ARM RISC 32 bit
- 1 MB PC dual port memory
- 128 kB CANbus dual port memory
- 128 MB RAM DDR2 memory

CANbus section

- Fujitsu processor with 3 CANbus controllers
- 1 MB flash memory

Programming

- Simplified data input (with tables and workpiece on-screen graphics)
- Base line and hole to hole dimensioning
- Diameter input
- Simplified data input for symmetrical hole patterns

Processing

- Automatic system offset
- Quantity tracking

Execution

- Automatic cycle stop for setup, modification and on-screen indication of the tools to be changed
- Possibility of the drill heads to operate in “multitasking” mode in their working areas (with automatic tool changer)
- Automatic safeguards to prevent collision of the drills
- Drilling parameters table

3D Graphics

- Display of the piece in 2D
- Display of the piece in 3D. With this modality, operations such as pan and zoom are possible.

All the indications are clearly displayed on the screen, for example:

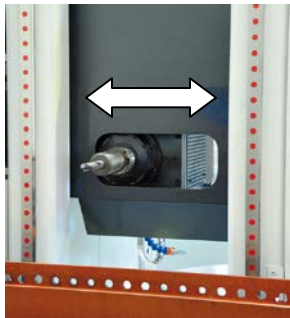
- Current program indication with a clear description of the program running at the moment
- CNC inside and outside alarms
- Registration of the date and time of the last 100 alarm messages
- Diagnostic messages to the operator

Machine Cycle

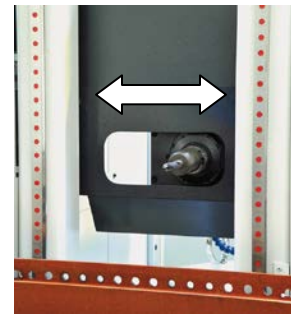
Once the work piece is loaded onto the work table and positioned against the datum line, the operator selects the program and **depresses cycle start from his wireless remote**. The process then commences as follows:



- The zero probing system **automatically locates the leading end** of the section and then references the programmed hole pattern from this zero position.
- After the zero reference is established, the **drill head moves in both the x and y axis to the programmed location**.
- Once the spindle achieves the programmed length dimension, the **vertical vise clamp is initiated to secure the part to the work table**.
- The drill automatically rapidly advances towards the material and **commences drilling at the selected feed rate**.
- As the drilling process is concluded, the **spindle rapidly returns back to the home position**.
- If the next hole pattern is within 7-3/4" **and the secondary "X" axis option is selected**, it is not necessary for the material to be unclamped and the movable tower to reposition to the subsequent "x" axis coordinates. The sub "x" axis moves just the spindle to the next programmed hole location. **It is not necessary to reposition the movable tower each and every time the "x" axis coordinate changes.**



It is not necessary to reposition the movable tower each and every time the "x" axis coordinate changes.



- The material vice unclamps slightly **only when all holes or layout marks are completed within a 7-3/4" x 47" window** before it is necessary to automatically positioning to the next programmed location in the length axis.

Since the parts can be located anywhere along the datum line, once the first part is processed, the drill will automatically move to the next part and establish the zero reference on the next part and commence drilling.

Output

The output varies as this is dependent upon the number of holes, their location and the material thickness. The typical averages in structural steel generally run between 150 and 300 holes per hour.

PA STANDARD PAINTING

The system is painted in the following standard colors:

- Light Grey RAL 7035
- Black Grey RAL 7021
- Yellow RAL 1028

TD TECHNICAL DOCUMENTATION

The system is supplied with the following technical documentation:

- Programming, maintenance, and instruction manual
- Electric schematics
- Pneumatic schematics

SP SAFETY PROTECTIONS

SP-01 Protections on the Machine (Included)

SP-02 Outside Protections

The movable tower of the Excalibur 12 DE is furnished with devices to automatically sense if the tower were to come into contact with anything in its path. If this occurs, the system will immediately stop all motion.

SUPPLIED WITH FOLLOWING OPTIONAL FEATURE

OWU- Automatic Tool Change System with Six (6) Positions

03

Incorporated in this feature is an automatic tool changer that can accommodate up to six (6) different tools – the maximum tool length is 15.5 inches.

This feature enables surfaces with different hole sizes or the requirement for different operations and corresponding tools (tapping, countersinking, scribing and milling) to be changed automatically without any operator involvement during the CNC operation of the Excalibur 12 CNC drilling line.

If the backside of a hole is more than 5” from the datum line, it is necessary to use tools that are longer than the maximum tool length of 15.5” that the automatic tool changer can accept. These tools need to be manually loaded and unloaded from the spindle.

