

ttached is a short video showing the machine. Below are the general machine specifications.

MACHINE FRAME

CONSTRUCTION: The machine base is a steel weldment, annealed and sandblasted, which has large lateral windows for easy accessibility and viewing. The rigidity and compactness of the machine reduces vibration thus increasing tool life and allowing for better workpiece surface finish and precision.

QTY. SPINDLES: The machine is equipped with 17 spindles and 1 MPM. The fixed spindles are locked into the machine frame by Buffoli patented assembly wedge system with unit support on either side of the frame (inside and outside the walls).

WORKING AREA: The inside working area of the machine is illuminated by LED lights; assembled outside the frame to allow good, diffused and homogeneous internal illumination. This system avoids any lamps burning out due to coolant contact with the lamp.

12 STATION HORIZONTAL AXIS INDEX TABLE MOD. T-H-12S-B G/B

CONSTRUCTION: The machine is equipped with a **solid block steel** indexing table. The table supporting and indexing assembly is incorporated in the frame and the table is locked directly against the machine structure for precise geometric location. This design offers constantly accurate parts.

DEVICE: The hydraulic table locking device uses a Hirth type locating device (curvic coupling). This coupling ensures high precision indexing accuracy of minimum \pm 3 arc/sec. A **pre-centering curvic coupling** is utilized to avoid premature wear on the main Hirth crown gear.

ROTATION: The turret rotation is obtained by a BUFFOLI CNC indexing system by brushless motor and high precision gearbox or by Buffoli hydraulic indexing system. Turret indexing and accelerations are CNC controlled to provide a fast, smooth and accurate indexing movement.

LUBRICATION & PRESSURIZATION: A micro-fog device for the lubrication and pressurization of turret and chucks is also utilized to prevent chips and coolant from entering the table mechanism.

Qty. 12

BUFFOLI SELF-CENTERING CHUCKS MOD. C-S20-W

CONSTRUCTION: Manufactured from casehardened steel and precision ground. **ACTUATION:** The jaw movement is by means of a lever type system of the self-centering type and are hydraulically actuated.

CLAMPING FORCE & STROKE: The theoretical maximum clamping force of approximately 6000N. Opening stroke of 20 mm (10+10).

LUBRICATION & PRESSURISATION: A micro-fog device for the lubrication and pressurization of the chucks is utilized to prevent chips and coolant from entering the chuck mechanism.

No. 12 DRILLING/BORING SPINDLE MOD. 50-130F-CV

FEED CONTROL: High precision pre-loaded ball screw driven by a brushless motor. **SPINDLE NOSE:** HSK50C or HSK50D.

ISO 40 with Buffoli hydraulic quick-change system is available as optional. **MOUNTING:** Locked onto the machine frame by Buffoli patented assembly wedge system with unit support on either side of the frame. This system allows precise alignment of the spindle to turret centerline, and may be adjusted easily if required. **FUNCTIONS & PROGRAMMING:** Designed for drilling and turning operations. Buffoli CNC programming with multi-offset tools and tabular programming for fast and userfriendly machine programming with no knowledge of CNC programming required. **Ø QUILL & STROKE:**

Maximum working stroke of 130mm.

FRONT SPINDLE BEARINGS: Pre-loaded ball bearings with internal diameter of *50 mm.* **SPINDLE MOTOR:** 4 Pole AC motor, complete with inverter to program the spindle speed. Maximum 6.000rpm with gear ratio of 1:1.

POSITION DETECTION: By means of digital encoder.

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Ø QUILL & STROKE:

Maximum working stroke of 130mm.

Quill diameter 100 mm.

QTY.3 3-Axis DRILLING/BORING UNIT MOD. 25-100F-CV

FRONT SPINDLE BEARINGS: Pre-loaded ball bearings with internal diameter of 50 *mm.* **SPINDLE MOTOR:** AC Brushless Motor, 4 poles with flux control frequency converter. Spindle speed programmable from 300rpm to 1500rpm for threading and with maximum 4.000 rpm with gear ratio of 1:1.5.

POSITION DETECTION: By means of digital encoder.

INDEXING QUILL: One spindle is equipped with an indexing quill, this allows for the indexing of the milling head for the front teeth of the shell plugs.

Qty.1 MACHINING CENTRE MULTI-PROCESS MODULE MOD. MOD.3CU

FEED CONTROL: High precision pre-loaded ball screw driven by a brushless motor. **SPINDLE NOSE:** HSK-E40 with pneumatic drawbar for tool holder release by pressing a push button.

MOUNTING: Assembled on a CNC ball screw programmable slide (2 axis; cross slide) to be moved off center ±25 mm during machine setup or working cycle. The slide is controlled by the CNC and moved by a brushless motor and a ball screw.

FUNCTIONS & PROGRAMMING: Designed for drilling operations. Buffoli CNC programming with multi-offset tools and tabular programming for fast and user-friendly machine programming with no knowledge of CNC programming required.

Ø QUILL & STROKE:

Maximum working stroke of 100 mm.

Quill diameter 75 mm.

FRONT SPINDLE BEARINGS: 4 ceramic hybrid bearings.

SPINDLE MOTOR & THRUST: AC motor, complete with inverter to program the speeds required with a speed range up to 20.000 rpm.

POSITION DETECTION: By means of digital encoder.

FEED CONTROL: High precision pre-loaded ball screw driven by a brushless motor. **SPINDLE NOSE:** ISO 40 (module is flanged on the OD of the quill for rigidity). **MOUNTING:** Locked onto the machine frame by Buffoli patented assembly wedge system with unit support on either side of the frame. This system allows precise alignment of the spindle to turret centerline, and may be adjusted easily if required. **FUNCTIONS & PROGRAMMING:** Designed for drilling and turning operations. Buffoli CNC programming with multi-offset tools and tabular programming for fast and userfriendly machine programming with no knowledge of CNC programming required.

Ø QUILL & STROKE:

Maximum working stroke of 160 mm.

Quill diameter 130 mm.

FEED CONTROL: High precision pre-loaded ball screw driven by a brushless motor. **SPINDLE NOSE:** ISO 40 (module is flanged on the OD of the quill for rigidity). **MOUNTING:** Locked onto the machine frame by Buffoli patented assembly wedge system with unit support on either side of the frame. This system allows precise alignment of the spindle to turret centerline, and may be adjusted easily if required. **FUNCTIONS & PROGRAMMING:** Designed for drilling and turning operations. Buffoli CNC programming with multi-offset tools and tabular programming for fast and userfriendly machine programming with no knowledge of CNC programming required. **Ø QUILL & STROKE:**

Maximum working stroke of 160 mm.

Quill diameter 130 mm.TOOL CHANGE: The tool change time is under 0.3-0.4 sec.POSITION DETECTION: By means of digital encoder.Qty.1

Milling Head: This includes the supply of a specially designed milling head assembled on a drillingboring unit mod. 50-130F-CV, suitable for milling operations With the rotating

quill in station 12.1 the 100° included angle teeth on the plugs, receptacles and jam nuts are made by indexing the quill. Two teeth are machined at a time with a diameter 125 mm blade.

UNLOADING DEVICE

The machine is equipped with an unloading device that unloads the finished part. The part is unloaded onto a belt and exits the guards of the machine.

N° 10 INTERNAL / EXTERNAL CNC PROFILED HEAD

This includes a CNC controlled recess head complete with control, with the following features:

Single slide with total stroke of 10mm.

Special bearing support head suitable for CNC recessing heads.

CNC recessing command with ball screw and brushless motor assembled at the rear of the unit.

This same unit is used for broaching of the parts.

Stroke adjustment carried out by means of CNC control.

Maximum rotational spindle speed of 2.500 rpm.

No. 1 COOLANT, FILTERING and CHIP CONVEYOR SYSTEM FOR EMULSION

The machine is equipped with a system suitable to evacuate, convey and filter aluminum chips.

The chip conveyor is composed of the following:

A scraping conveys the chips out of the machine.

A decanting tank collects the chips and scraping belt

The cooling plant consists of:

Internal machine washing system by means of 1.5 bar motor pump.

Tool cooling system by means of 3 bar motor pump.

High pressure pump 40 bar for through the spindle coolant on 3 stations.

A rotating *filter* ensuring a high filtering grade to cool the tools. The system is designed to work with coolant.

BUFFOLI SINGLE BUNDLE BAR LOADER - MOD. BL-SB-3

Buffoli bundle bar loader that is made up and functions as follows:

Automatically lifts, orients, and loads one bar per cycle into the machine.

A belt system lifts the bar bundle onto the roller way and a bar selection system selects an individual bar, in preparation for alignment and orientation. The bar alignment and orientation device then lines up and orients the bar head.

Storage capacity is approximately 1.500 kg.

Accepts bar of lengths up to 3 meters $\pm 150 \text{ mm} (9.8')$.

The bar must have no more than a ±0.5" maximum bend. **BUFFOLI CUT-OFF UNIT MOD. CO-S-325-CV**

DESCRIPTION: The cutting saw spindle is assembled within the machine frame on cnc ball screw slide that drives the cutting spindle with various speeds. Special taper bearings improve rigidity therefore allowing thinner saw blades to be mounted.

CONTROL: The cut-off unit is completely programmable by the computer and set-up in a user-friendlv way. this avoids any mechanical adjustment that is required for the sawing

parameters. The feed rate and stroke as well as the forward and end piece operation are all CNC programmable. Another useful feature is the tool monitoring software with graphic display.

CAPACITY:

The saw blade is carbide or HSS from 250/325 mm in diameter.

BAR FEEDER FEATURES & ADVANTAGES

RIGIDITY: Rigid bar clamping for a high speed, vibration-free cutting process. The bar feeder has a jaw that clamps the bar and feeds it into the clamping chuck on station 1. During the cutting cycle, the bar is clamped with both the chuck and the bar feeder jaw. This assures rigid bar clamping allowing the bars to be cut at high speed without noise, vibrations and also offers optimum saw blade life.

PROGRAMMABLE PART LENGTH: The bar feed stroke length is set with the machine CNC by simply entering part length. This optimizes the machine set up and facilitates fast machine set up.

AUTOMATIC BAR CHANGE: Fast, efficient, and automatic bar change system. When the end of the bar is reached, a specific cycle is performed to first discard the bar remnant and then load the new bar. This cycle is activated only when bar changes occur, and is completed quite rapidly (5-6 seconds depending on the part diameter, machine cycle, etc.). The length of the bar remnant rejected by the machine is approximately the length of one part.

MULTI-CPU CNC

The machine is provided with a Buffoli modular MULTI-CPU CNC. The benefits are: Automatic detection of machine faults.

The CNC, PLC and Master computer system run co-operative software to auto-detect machine faults with diagnostic software.

Down time history.

The machine computer writes on the disk the active machine alarm messages providing a machine down time history for future reference.

EXTERNAL SAFETY GUARDS

External safety guards with electric interlock are provided.

Safety guards are designed to allow machine accessibility for maintenance and set-up operations.

Sound proofing protection is provided on the outside guards.

GENERAL STANDARDS

The following standards features and norms are applied to the machine:

The machine is painted in two parts epoxy paint: RAL 7035 light grey with the access windows and cable raceways in RAL 5002 blue (the inside of the machine is white for better illumination). Accessories such as the chip conveyor, filtration system, and hydraulic unit are a black opaque color.

Three sets of English instruction and maintenance manuals are available.

CE marking.

ELECTRIC SPECIFICATION

The machine has one operator panel on the front and one operator panel on the rear for all main functions. A complete electrical control cabinet includes the following equipment:

Power - Siemens.

PLC - BUFFOLI.

AC Motors - Siemens.

Drives - SIEMENS.

Brushless Motors - SIEMENS.

CNC - BUFFOLI (SIEMENS or FANUC as options).

Proximity - Balluf, etc.

COMPUTER SET-UP SYSTEM

computer set-up system consists of a PC with the following features:

SVGA controller card.

17" TFT color monitor

Approx. 320Gb Hard disk USB port

Windows 7 operating system

Buffoli software allows user-friendly programming from the PC

keyboard

Open architecture menu options allow programming from the part print in common machine shop language. No knowledge of CNC programming is required. The PC program functions are:

Machine programming for each component with the input of the following data:

- Forward position;
- Back position;
- Rapid to slow travel point;
- ➤ Tool offset;

Dwell time;

- Maximum unit working time, on overtime an alarm is set on video;
- Unit job priority;
- > Pitch of the thread selection by the computer keyboard;
- Unit cycle type (drilling, recessing, etc.).

Machine part program data storage.

Machine diagnostic and machine status display.

Machine timers and counters – set up.

Inclusion and exclusion of the units.

Unit cycle-time monitoring and alarm message on overtime operation.

Alarm history and display in clear text on video.

Workpiece production notes may also be stored.

The PC program can be used on a normal office PC into the office to prepare information and programs for the machine.

HYDRAULIC EQUIPMENT

The machine is equipped with a complete hydraulic system as described below. Complete pump stations.

Directional valves.

Pressure switches.

Flow control valves.

Hydraulic Accumulators.

Hydraulic system filters.

High pressure and low pressure pumps.

PNEUMATICS

The pneumatic system is composed of the following materials:

Solenoid valve and cylinders: FESTO.

QTY.2 HYDRAULIC DRAWBAR FOR TOOL HOLDER RELASE

Six spindles are equipped with a hydraulic drawbar for tool holder release by pressing a push button on ISO40 tool holder system.

QTY.1 Coolant Refrigeration System and Heat Exchanger

For long run the machine is equipped with a refrigeration unit for conditioning hydraulic oil and coolant.

QTY.1 Fume Extractor

The machine is equipped with a fume extractor to help control the undesirable byproducts of the metal cutting process (suitable for emulsion).

A stainless steel pipe is provided to collect fume from the machine top and chips conveyor.

TOOL MONITOR SYSTEM

The machine is equipped with a Buffoli designed, tool monitoring system:

The system allows the programming of torque and thrust limits for each spindle. A real time graphical display provides valuable tool wear information.

Should an "over limit" condition occur, the spindle stops and retracts, thus avoiding catastrophic tool failure.

The operator can set special threshold curves in self-learning mode; the system automatically shows when these curves are exceeded and a proper alarm message is displayed.

Low machine loads, such as cnc profiling with the recessing head may not be able to identify chipping of an insert or small irregularities.