

YIN FU Horizontal Boring & Milling Machine - YBMT-16
胤福 重型機床公司數控臥式鏜銑床 – YBMT-16



Illustration of YBMT-16

I. General Description: 綜述

The YIN FU line of horizontal boring mills brings innovation and affordability to the large machine tool market. Major design features include an optimal combination of hydrostatic and box ways, high structural rigidity, and, as a result, remarkable cutting efficiency, precision, speed, and long machine life. The linear axis drives utilize chevron belt transmissions and optimized ratios, maintaining the lowest noise and best dynamic performance available today. Our modular design offers flexibility in machine styles, configurations, and sizes; best satisfying your production needs

YIN FU 胤福重型機床公司的臥式鏜銑床系列為大型機床市場帶來了技術創新，還有買得起的高性價比。主要設計特點包括：矩形方導軌和靜壓技術的優化組合，高剛性結構，因此帶來了卓越的切削效率、高精度、高速度，以及超長的機床壽命。線性軸驅動採用人字形皮帶傳輸、最佳傳動比，既保持了低噪音，又得到了當今最佳的動態性能。我們的模塊化設計，可以靈活地提供機床類型、配置和大小，最佳滿足您的生產需要。

II. **Basic Machine Specifications:** 機床基本參數

Spindle: 主軸

- Boring spindle diameter 165mm
鏜軸直徑
- Maximum Speed 3,150 RPM
最高轉速
- Power, continuous 51 kW
功率，連續
- Torque 4,150 Nm
扭矩

Travels: 行程

- X axis 3000mm
工作臺左右移動，X 軸
- Y axis 2500mm
主軸箱上下移動，Y 軸
- Z axis 1500mm
立柱前後移動，Z 軸
- W axis 1000mm
鏜軸前後伸縮，W 軸
- Rapid rate, maximum, X, Y & Z 16,000mm/min
X/Y/Z 軸最大快移速度
- Feed rate, maximum, X, Y & Z 8,000mm/min
X/Y/Z 軸最大進給速度
- Rapid rate, maximum W 10,000mm/min
W 軸最大快移速度
- Feed rate, maximum W 5,000mm/min
W 軸最大進給速度

Table: 回轉工作臺

- Table top size 1600 x 2000mm
工作臺尺寸
- Load capacity 20,000 kg
承重能力
- Positioning and clamping at any position (accuracy – see below)
任意位置定位鎖緊

Tool Storage: 刀庫

- Pockets 40
刀位數
- Tool adaption BT 50
刀柄形式

Accuracy: 精度

- Linear axes positioning accuracy 0.010mm/1000mm
直線軸定位精度
- Linear axes repeatability 0.005mm
直線軸重複定位精度

- Rotary table positioning accuracy± 5 arc seconds
回轉工作臺定位精度
- Rotary table repeatability± 3 arc seconds
回轉工作臺重複定位精度

- Specifications are subject to change for design improvements. Please contact your distributor/our offices for detailed specifications and options to optimize a machine for your needs.
由於設計改進，參數可能會調整。請聯繫當地代理商或我們的辦事處，諮詢詳細數據和選擇項，以便最佳滿足您的需要。

III. Equipment Description 設備描述

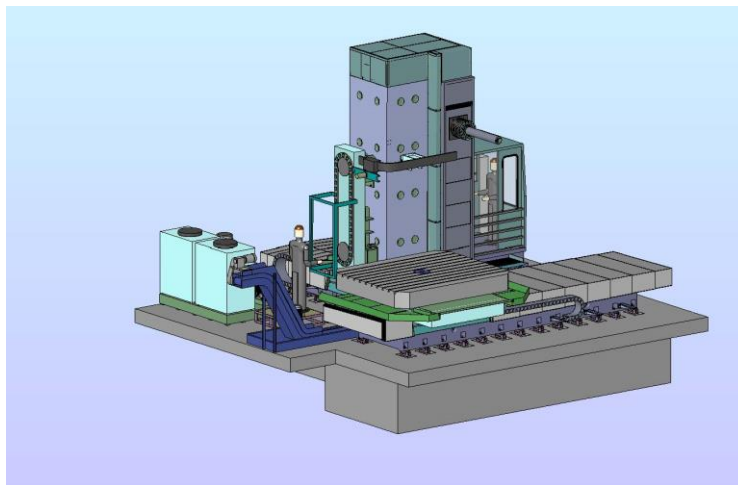
General 整體

The machine is built with generously proportioned cast iron bases and column. The machine's superior rigidity and dampening characteristics allow for heavier cutting without chatter or vibration, improving surface finish, accuracy and tool life.

機床底座立柱採用米漢納鑄鐵鑄件。機床優異的剛性和吸震特性允許更重載荷的切削而不會有震顫，提高了表面光潔度和刀具壽命。

The X and Z axis beds are positioned to form a T-type machine configuration. The rotary table travels horizontally in a direction perpendicular to the spindle centerline (X axis). The column travels horizontally in a direction parallel to the spindle centerline (Z-axis). The spindle head travels vertically (Y-axis) on the right hand side of the column. The spindle head is equipped with a hydraulic counterbalance system. All three linear axes motions are driven by pre-loaded, precision ground ballscrews, 80mm in diameter.

X 軸和 Z 軸的床座呈 T 型佈局，回轉工作臺沿著垂直於主軸軸心線的方向在水準方向左右移動（X 軸）。立柱沿著平行於主軸軸心線的方向在水準地前後移動（Z 軸）。主軸箱在立柱的右側垂直上下移動（Y 軸）。主軸箱配有液壓平衡系統。所有的三個直線軸全部由預加載荷 80mm 大直徑精密滾珠絲杠驅動。



Guideways are designed most suitable for heavy duty cutting and long term accuracy stability, the X,Z axis guideways are state of the art new generation Hydro-static guideway with flow control regulators. Y axis are combination guideway with wide box slide guideway high stiffness and rolling guideway low friction.

導軌為重型機床設計，適合重切削、有長期的精度保持性。X、Z 軸導軌為當今最先進的新一代恒流控制靜壓導軌。Y 軸為複合式導軌，既保持滑動導軌的高剛性、高抗震性，又有滾動副的低摩擦係數。

The machine includes a full contouring rotary table (B-axis). Tilting rotary table is available. Coolant drainage trays are provided on 3 sides of the table, directing the coolant and chips towards the column and into the chip conveyor. The table is machined with T-slots.

機床包括完全輪廓控制的回轉工作臺（B 軸）。還可提供傾斜工作臺。工作臺的三面都有冷卻液排水托盤，把冷卻液和鐵屑排向立柱方向，並送到排屑器上。工作臺頂面加工有 T 型槽。

The machine is equipped with a 165mm diameter boring spindle (quill type) with 1000mm of W-travel (spindle in and out) and a three speed range gearbox.

機床裝備了直徑 165 毫米的鏜軸（套筒形式），W 軸（鏜軸伸縮）行程 1000mm，3 段齒輪變速箱。

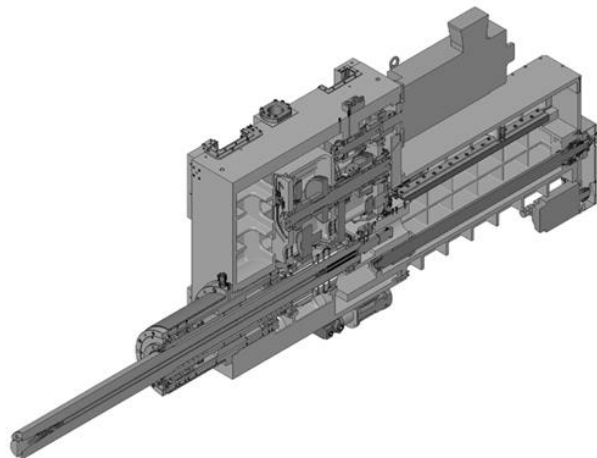
Boring Spindle Head 鏜軸主軸箱

The boring spindle headstock consists of 2 major modules built in 2 separate housings mounted inside the head main housing. These modules are the spindle cartridge and the gearbox. The boring spindle has a hard nitrided surface and travels in a tempered steel sleeve for maximum support, rigidity and long wear. The W axis motion is driven by an 80mm preloaded precision ground ballscrew. The modular design allows maintaining and replacing the units the easiest and fastest way; it also provides higher reliability as each module is tested as independently before the final assembly.

主軸箱內包括兩個主要模塊，內置在主軸箱體內兩個分開的腔內。這兩個模塊分別是主軸組件和變速箱。鏜軸表面滲氮淬硬，沿著調質鋼套滑動，支持面大、剛性好、抗磨損。W 軸運動由 80mm 大直徑精密滾珠絲杠驅動。模塊化設計，使得該單元的維護更換簡單迅速。並且在最後組裝前，每個組件都經過獨立的測試，所以可靠性更高。

The spindle is driven through a three-speed range, hydraulically shifted gearbox, by the spindle drive motor. The spindle is supported by a cylindrical roller and a set of angular contact ball bearings at the front of the headstock and a set of angular contact ball bearings at the rear. Optionally for higher speed applications the spindle is supported by TIMKEN precision tapered roller bearings at the front, and by specially designed TIMKEN Hydro Rib rear bearings with automatic hydraulic adjustment to insure optimum preload through the entire range of speeds. The spindle head is lubricated by an oil bath; the same oil is used for a cooling jacket around the spindle. An oil chiller is set up to keep oil temperature on a constant level. Tool pull studs are clamped by Belleville springs and unclamped hydraulically.

鏜軸的驅動通過三段齒輪箱變速，液壓自動換擋，由主軸伺服電機驅動。鏜軸的前端由一組圓柱滾子軸承和一組角接觸球軸承支承，後端由一組角接觸軸承支承。作為高速選項，鏜軸的前端由鐵木肯圓錐滾子軸承支承，後端支承採用專門設計的鐵木肯 Hydro Rib 後軸承，它可以自動調節壓力，以便在全部轉速範圍內確保最佳預加載荷。鏜軸頭通過油池潤滑；同是這些油還用於環繞主軸的冷卻套管。裝有油冷機以保持油溫恒定。刀具拉釘通過蝶形彈簧鎖緊通過液壓鬆開。



B Axis Rotary Table B 軸回轉工作臺

The machine will be provided with a full contouring B axis for CNC controlled positioning of the table. The B axis drive is a preloaded double pinion for elimination of backlash. This provides wear independent operations for many years. Position feedback is via a direct mount rotary encoder. The clamping system provides table clamp in any position keeping this position accurately with no deviation from reached as programmed within the table accuracy specifications.

The table top will include T-slots for the mounting of work holding components. Tilting rotary table is available for HUB machining。

機床配置全閉環數控 B 軸回轉工作臺。B 軸驅動由預加載荷雙齒輪消除間隙完成。可以保證多年不受磨損影響。位置反饋通過一個直接安裝的回轉編碼器實現。鎖緊系統可以在任意位置鎖緊工作臺，並精確保證該位置在機床定位精度完全符合編程要求。工作臺表面有 T 型槽以便安裝工件。還可提供傾斜工作臺（16 度），方便 Hub 加工。

Enclosure 防護罩

The machine includes a standard enclosure surrounding the work area. The guards will be built to a height sufficient for protecting the operators from moving elements and pinch points of the machine.

本機床包括環繞工作區域的標準防護罩。護板高度足以保護操作者不受運動部件以及加工用出物的傷害。

Automatic Tool Changer 自動換刀裝置

The machine is equipped with a 40 position chain style, automatic tool changer. The ATC is attached to the left side of the column by a steel bracket. A double motion arm exchanges tools between the storage unit and boring spindle. The arm moves on its rail between the storage chain and spindle exchange positions. The arm rotates 180 degrees during tool exchange. The arm is equipped with two grippers, one at each end, which locate and grip the tools holders during the exchange.

機床配置 40 把刀鏈式自動刀庫。自動換刀庫 ATC 通過鋼板支架安裝在立柱的左側。雙轉向換刀機械手在刀庫和鏜軸之間更換刀具。換刀機械手沿著他自己的軌道在刀庫和換刀點之間移動。換刀臂在換刀時有 180 度的轉動。換刀臂有兩個卡鉗，每端一組，換刀時，可以定位和抓緊刀柄。

The tools are protected from chips and coolant while in the carousel by steel covers and a retractable door. A powerful air blast is provided while in the tool change cycle for further protection from chip intrusion.

刀庫有防護鋼板和可粉筆和打開的門，防止冷卻液、鐵屑和灰塵的進入。換刀時有強力吹風，以防止鐵屑進入。

Chip Conveyor 自動排屑裝置

The machine is equipped with a chip conveyor positioned between the X and Z axis beds. Chips will be conveyed to the left side of the machine, where they will be deposited in a bin supplied by the customer.

自動排屑裝置安裝在機床 X 和 Z 軸床身之間。鐵屑向機床左側排放，排出到用戶自製的鐵屑箱中。

Linear Glass Scales 線性光柵尺

The machine will be equipped with Heidenhain linear glass scales on the linear axes for improved positioning, repeatability and thermal compensation.

機床所有的線性軸都裝有海德漢線性光柵尺，很好地提高了定位精度、重複定位精度和熱補償。

Hydraulic System 液壓系統

The hydraulic system powers all hydraulic valves, tool and table clamps, the hydraulic counterbalance, gear selection, provides recirculating lubrication to the spindle headstock and operates the toolchanger. A variable displacement pump is used to provide efficient operation.

所有的液壓閥、刀具和工作臺的鎖緊鬆開、液壓配重平衡、齒輪變換檔位、以及主軸箱的循環潤滑，換刀機構動作均由液壓系統提供動力。使用變量活塞泵以保證有效操作。

An automatic metered type lubrication system provides ample lubrication to all necessary points. The system is alarm protected for blockages.

全自動潤滑系統可以為所有需要潤滑部位供油。一旦有堵塞，立刻會報警提示。

Machine Control 控制系統

The machine is supplied with a Siemens 840D CNC control. The Siemens 840D is an ultra-compact CNC based on state-of-the-art integration technologies to provide the highest levels of reliability and ease of use.

機床配置西門子 840D 數控系統。西門子 840D 是基於當代最新的綜合技術而高度集成的數控系統，可行最高，易於使用。

The following FANUC options are included as standard with the machine:

以下 FANUC 系統的選擇項，在此都作為標準功能包括在此台機床中：

- 320 meters part program storage
320 米工件程式存儲容量
- Manual pulse generator (MPG) remote mount
手搖脈衝發生器可遠端手持操作
- 64 tool offset pairs
64 組刀具偏置值
- Workpiece coordinate system (G54 –G59)
工件座標系統 (G54-G59)
- Rigid tapping
剛性攻絲

IV. Service and Support Package: 服務支持包

Installation: 安裝

Technicians from YIN FU will assemble, level, and perform start-up of the machine on Customer's shop floor, once the machine is in position.

一旦機床在安裝位置就位，YIN FU 技術人員將在用戶車間負責機床組裝、調水準、和機床的試車。

Training: 培訓

YIN FU engineers will provide training for machine operators, programmers, and maintenance personnel during the installation of the machine. The goal of the training is to prepare Customer personnel for the independent operation of the machine and to perform basic maintenance and troubleshooting. The training is based on the assumption that Customer personnel will be experienced in the operation of CNC machines. The training will take place over a period of Five (5) working days, each of eight (8) hours.

YIN FU 工程師在機床安裝過程中將為用戶培訓機床操作人員、編程人員、和維護人員。培訓的目的是為客戶準備人員以獨立操作機床、並且可以進行基本的維護和故障診斷。培訓基於客戶人員有數控機床操作經驗。通常培訓時間為 5 個工作日，每日 8 小時。

Additional training courses can be quoted upon request.

如有需要，我們可以根據您的要求提供附加的培訓課程

Machine acceptance at Customer's plant: 在用戶工廠的機床驗收

After completion of installation and commissioning, final acceptance procedures will take place at Customer's facility, with the following procedures:

安裝和調試全部完成後，在用戶工廠將進行最終驗收，步驟如下：

- Geometric checks for complete alignment, according to YIN FU acceptance/alignment specifications.
根據 YIN FU 驗收/調整參數要求，進行幾何精度檢測，已完成精度調整。
- Functional checks with CNC-control (dry run using test program).
CNC 控制系統的功能檢測（用檢測程式進行控運行）

For the measurement of the accuracies, the following pre-conditions are necessary:

測量精度時，按照國際標準，需要具備以下前提條件：

- Machine on adequate foundation built according to YIN FU recommendation drawing.
機床需安裝在地基基礎上，地基基礎應符合 YIN FU 推薦的圖紙要求。
- Ambient temperature around the machine to be within $20^{\circ}\pm 1^{\circ}\text{C}$ during 12 hours before and during the tests, and the rate of change of the environmental air shall not exceed 1°C per hour during the test period
在開始檢測 12 小時以及檢測過程中，機床周圍的環境溫度應該在 $20^{\circ}\pm 1^{\circ}\text{C}$ ，在檢測過程中，環境溫度的變化每小時不要超過 1°C 。
- No direct exposure to sun, heaters, or strong air currents
不能直接暴露在日光下，不能對著加熱器，不能有很強的氣流。

- The exclusion of external shocks and vibrations
要隔離外界衝擊和振動
- Machine warm-up operation shall be performed according to YIN FU procedure included in alignment specifications
機床的熱機操作要根據 YIN FU 機床調整說明書的要求進行
- **Basic Machine Features:** 機床基本配置
 - Siemens 840D control and digital drives
西門子 840D 控制系統，數字驅動
 - Heavy-duty cast iron construction
重型鑄件結構
 - Combination hydrostatic/box ways
矩形/靜壓導軌組合
 - Combination steel/bellows waycovers
鋼板和伸縮風箱式導軌護罩組合
 - 165mm boring spindle
165mm 鏜軸
 - Coolant through the spindle
主軸內冷
 - Hydraulic boring head counterbalance
主軸箱重量液壓平衡
 - 1600x2000mm contouring rotary table with 20 T load capacity and T-slots on the top plate
1600x2000 全閉環輪廓控制工作臺，承重 20 噸，頂面 T 型槽
 - Linear scales
光柵尺
 - (40) position automatic tool changer
40 工位自動刀庫
 - One chip conveyor
排屑器
 - Splash guard around the table
工作臺四周防濺護罩
 - Work light and a signal light tower
工作燈和報警信號燈塔

Completion of Work 交貨週期

The machine is available for shipment approximately (7) seven-months after receipt of Purchase Order.
合同簽訂後約 7 個月機床可以發運