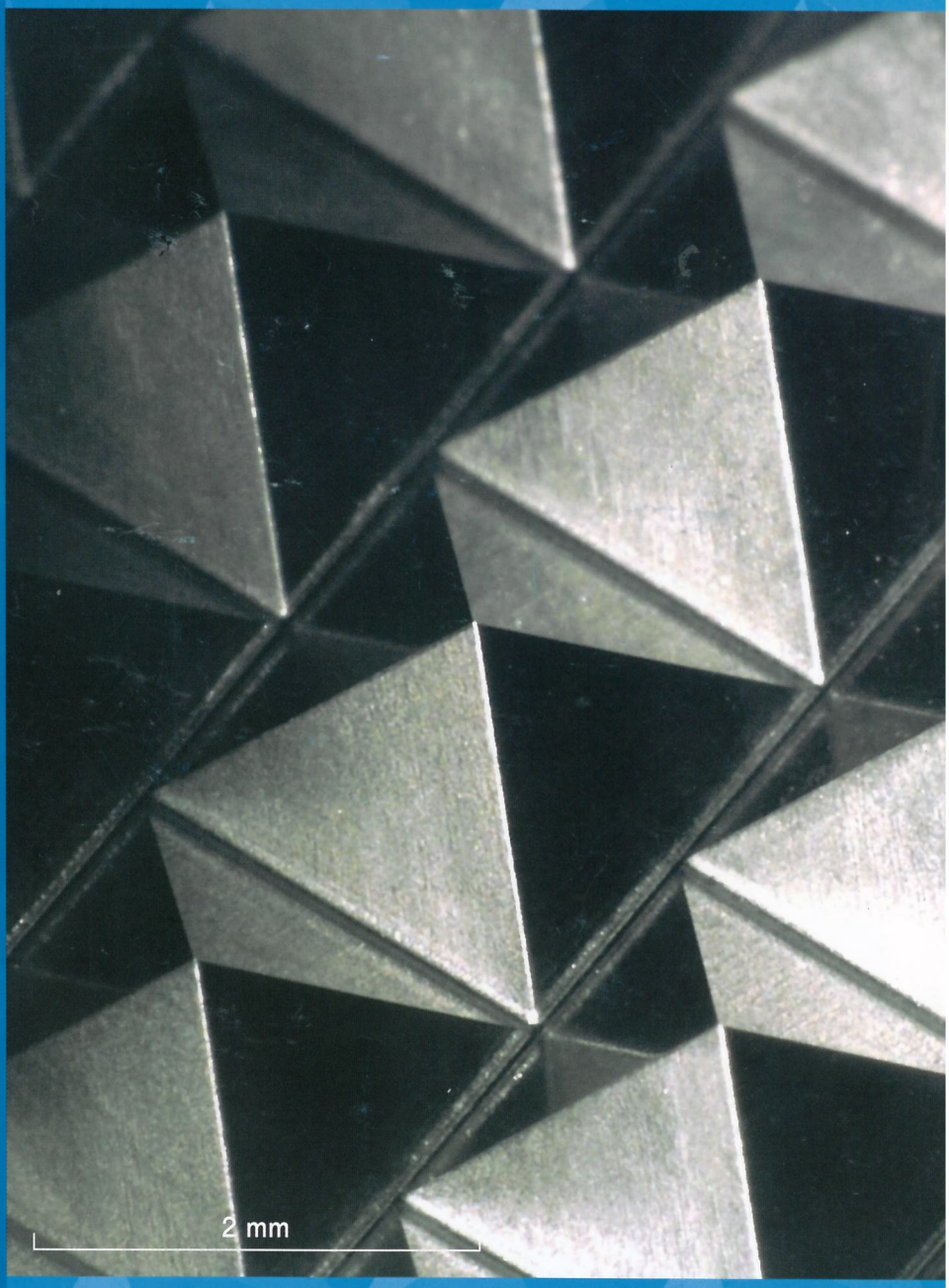
TOSHIBA MACHINE

超精密立形加工機

model UVM-450C



CatalogUVM4539-CJD-03

蓄積した超精密加工機のコアテクノロジーと超精密

超精密機械・制御 要素による夢の実現

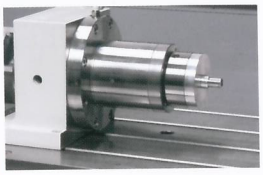
- ●磨きレス仕上げ面加工　空気軸受主軸 + リニアモータにより実現
- ●微細加工　空気軸受主軸 + 10 nm 分解能により実現
- ●超精密加工　10 nm 分解能 + 冷却システムにより実現

空気軸受主軸
+
リニアモータ
+
10 nm分解能
+
冷却システム
→ 高能率・高品位加工の実現

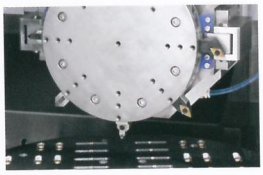
多彩なアプリケーション

●各種アタッチメントの追加により多様な加工が可能

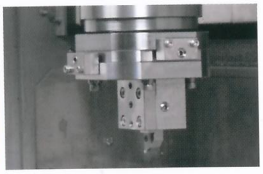
ワーク回転・割出台
(C1 軸)



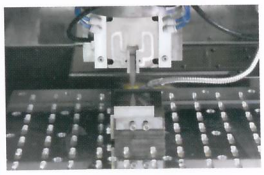
ワーク回転・割出台
(A2 軸)



バイト割出台
(A 軸)

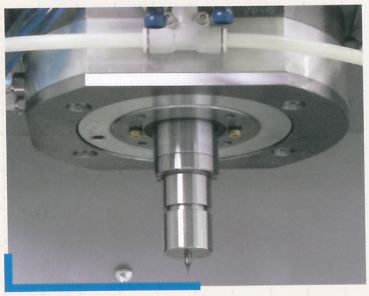


バイト旋回台
(C2 軸)



高速微細
加工システム

操作パネル



空気静圧軸受主軸部

model UVM-450C

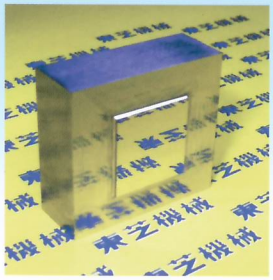
加工のノウハウが高効率・高品位加工を実現します

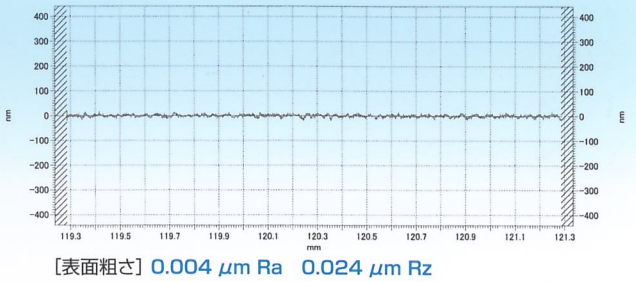
加工例

1 平面(2次元)加工

加工条件

ワーク材質: SKD61　52HRC
使用工具: φ0.5 ラジアスエンドミル(cBN)
工具回転速度: 60 000 min^{-1}



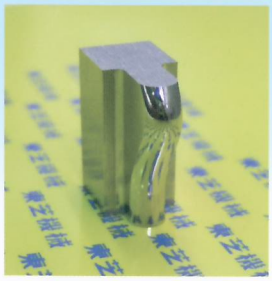


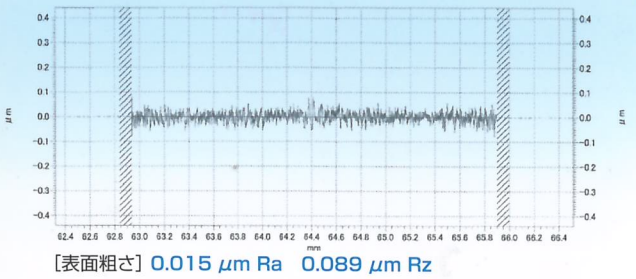
[表面粗さ] 0.004 μm Ra　0.024 μm Rz

2 自由曲面(3次元)加工

加工条件

ワーク材質: DC53　60HRC
使用工具: R0.5 ボールエンドミル(cBN)
工具回転速度:　60 000 min^{-1}





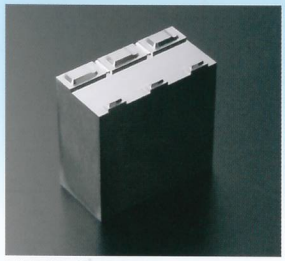
[表面粗さ] 0.015 μm Ra　0.089 μm Rz

3 LED金型加工

●パッケージリフレクタ金型

加工条件

ワーク材質: STAVAX 52HRC
使用工具: φ0.5
　　ラジアスエンドミル(cBN)
工具回転速度: 60 000 min^{-1}

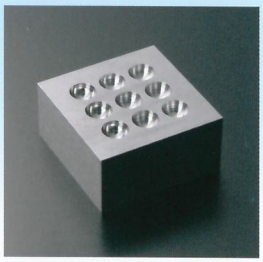


[表面粗さ] 0.022 μm Ra

●レンズアイ金型

加工条件

ワーク材質: STAVAX 52HRC
使用工具: R0.5
　　ボールエンドミル(cBN)
工具回転速度: 60 000 min^{-1}

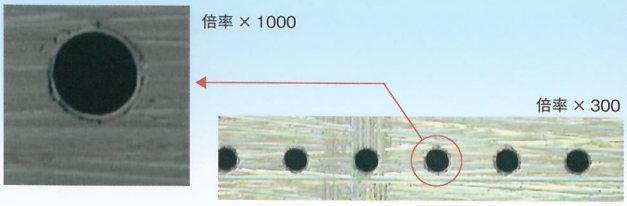


[表面粗さ] 0.030 μm Ra

4 微細穴連続加工

加工条件

ワーク材質: SUS310
加工穴: φ 0.01 mm × 0.08 mm 貫通穴
使用工具: 超硬ドリル φ 0.01 mm × 0.1 mm

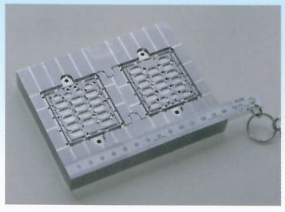


5 微細金型加工

●携帯電話キーパッド

加工条件

ワーク材質: NAK 80
　　40HRC
使用工具: R0.5, R0.2
　　ボールエンドミル(超硬)



●流体軸受金型

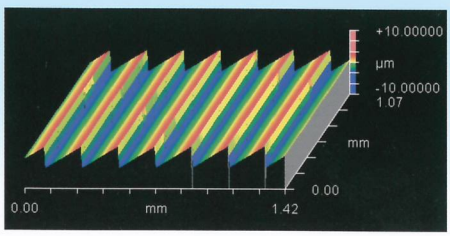
加工条件

ワーク材質: ASP23(粉末ハイス材)
　　63HRC
使用工具: φ 0.1
　　フラットエンドミル(cBN)

6 ダイヤモンドバイトによる溝加工

加工条件

ワーク材質: Ni 合金
使用工具: 単結晶ダイヤモンドバイト
送り速度: 15 m/min



鋸歯状溝加工面

溝形状: 135 °V
ピッチ: 0.2 mm
深さ: 0.007 mm

超精密加工機要素

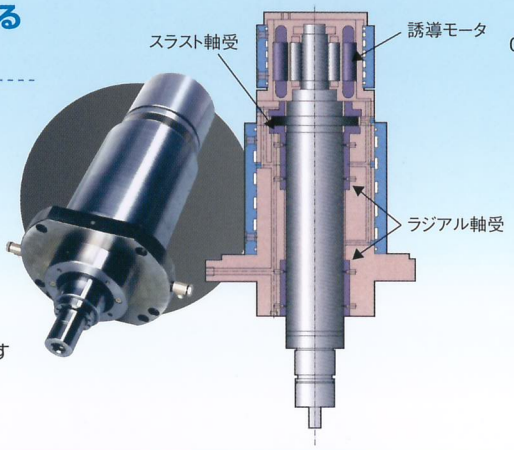
高能率・高品位加工を可能にする要素

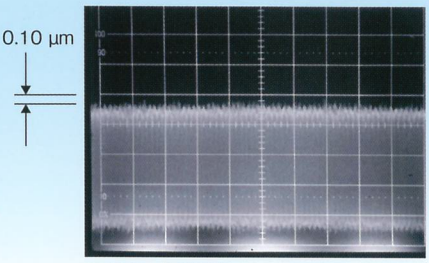
1 高速 高回転精度を実現する 空気静圧軸受主軸

[特 長]

- 東芝機械独自開発
- 高精度
- 高速回転
- 高剛性
- 長寿命
- 省エネルギー

その他超高速回転主軸も揃えてあります
(多彩なアプリケーション項参照)





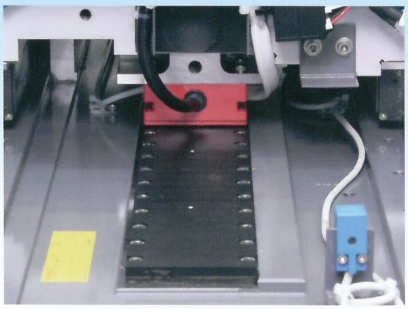
高精度な主軸回転
60 000 min^{-1}
SPAM 0.10 μm TIR 1 μm

*SPAM: Single Point Asynchronous error Motion
TIR: Total Indicator Reading

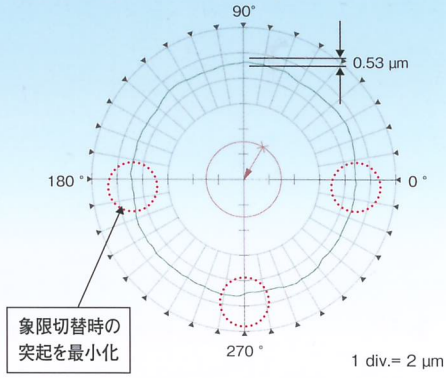
2 滑らかな軸移動とメインテナンスフリーを実現する リニアモータ駆動

[特 長]

- 東芝機械独自開発
- 高分解能スケール採用 (0.002 μm)
- コア付モータによる高ゲイン
- ボールねじレスによる 滑らかな軸移動
- 消耗品を省きメンテナンス不要

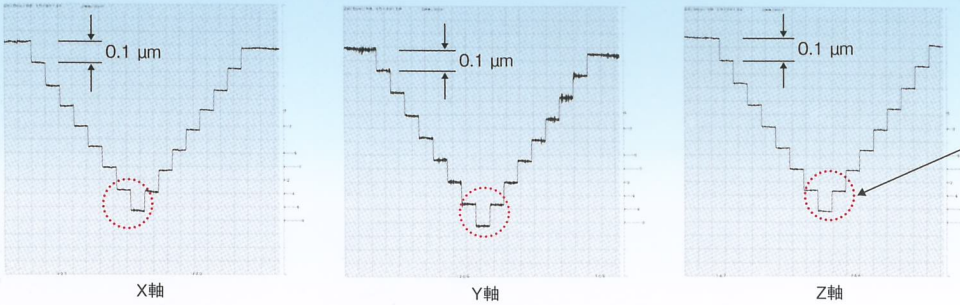


円弧補間による軸加工真円度: 0.53 μm
(切削送り速度: 1 000 mm/min)



3 高精度位置決めと滑らかな送りを実現する高分解能10 nm

[X, Y, Z軸に採用]



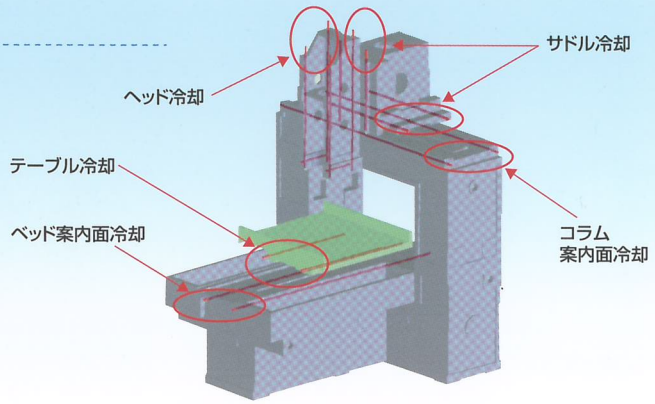
4 長時間の高精度加工を実現する冷却システム

[熱変位を最小化]

熱の発生源と対策

①リニアモータ➡冷却板
②主軸モータ➡冷却ジャケット
③案内面➡※鋳ぐるみパイプ
⇩
±0.1 ℃の冷却装置を
標準装備

※鋳造時にパイプを鋳ぐるむ
東芝機械独自の鋳造技術



自動化支援

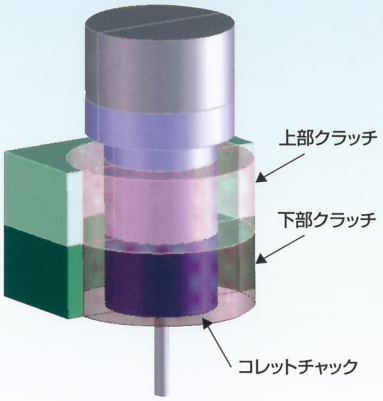
自動化・省力化のための各種オプション

1 自動工具交換装置(ATC)

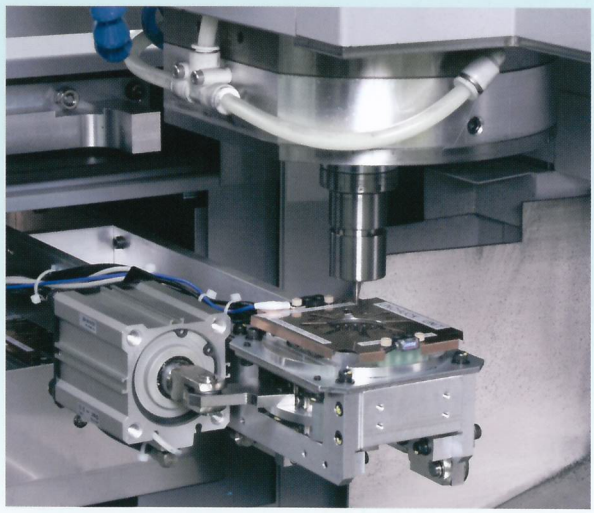
自動工具長測定装置付属

工具の長寿命を実現できる空気軸受主軸にATCを付加することにより、さらに長時間の連続高速加工が可能

工具保有数: 12本
方式: ダイレクト工具交換
対応工具径: φ4 またはφ6 mm
工具振れ再現性: 2 μm 以下



マガジン部

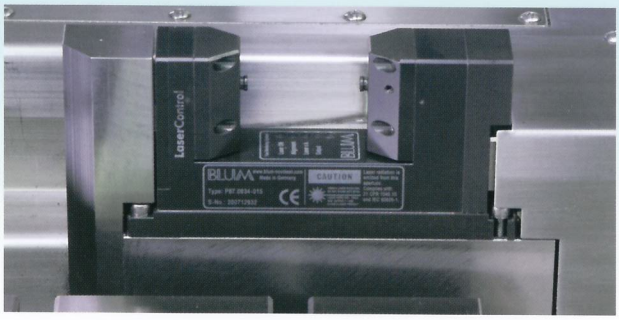


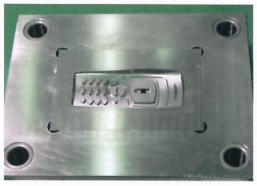
工具振れ再現性 2 μm 以下

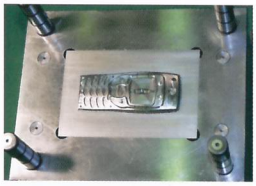
- バランスを考慮したホルダーの採用により、空気軸受主軸専用ATCを搭載
- 工具のみを交換する"ダイレクトチャッキング方式"を採用
  ワンウェイクラッチを上下に2個配置し、上部で保持、下部でナットの締め、緩めを行います

2 自動工具長測定装置

工具先端位置をレーザ光にて検出



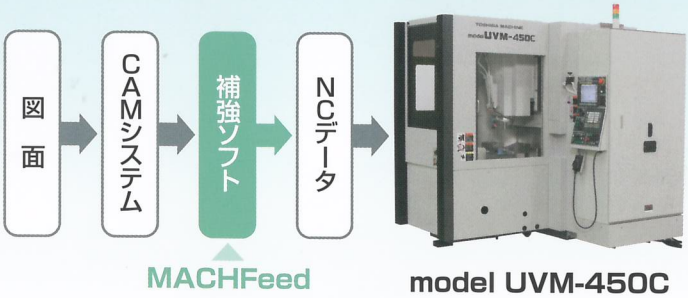


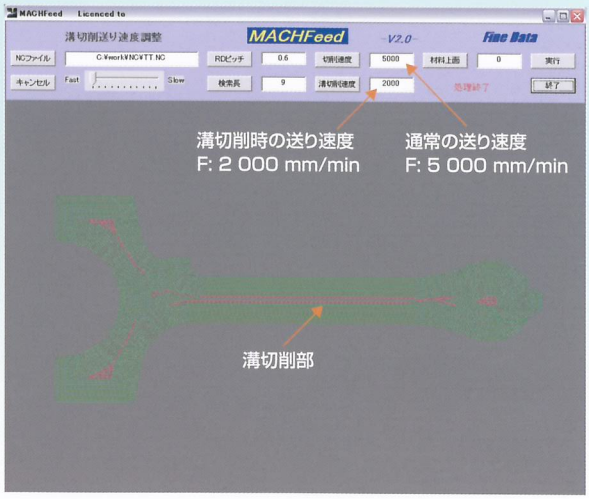


自動工具交換装置を使用した加工例(キャビティ,コアとも加工時間は6時間弱 R1, R0.5, R0.3 ボールエンドミル各1本のみ使用)

3 CAMシステム補強ソフトウェア MACHFeed

CAMシステムによりNCデータを作成後、粗加工時の溝切削における送り速度を変更することにより、工具負荷増加を緩和し、工具寿命を延長するソフトウェア





販売元: 有限会社ファインデータ

多彩なアプリケーション

1 超高速主軸

標準装備の空気静圧軸受主軸と交換することにより、さらに高速回転が得られます

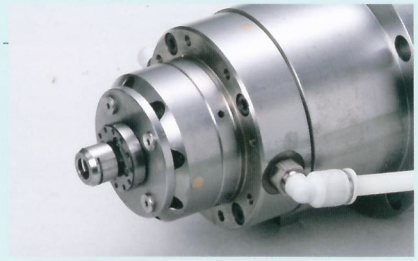
[用途]

- 小径ボールエンドミル（φ 0.5 mm以下）による微細加工

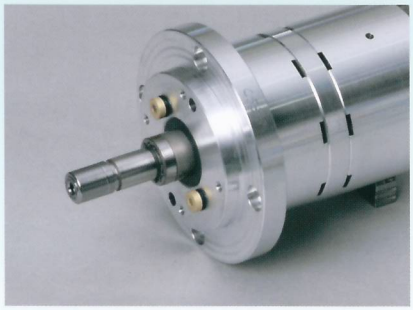
[特徴]

- 高安定回転
  ➡電動機駆動
- 高精度回転
  ➡エアタービン駆動

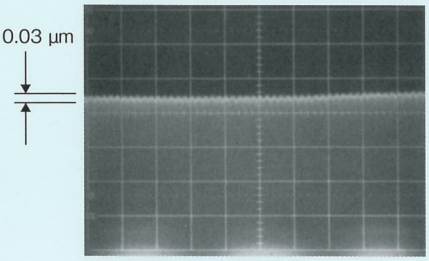
＊超高速主軸搭載時には自動工具交換装置（ATC）は使用できません



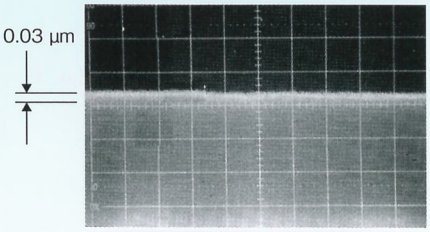
100 000 min^{-1}
（電動機駆動 ABC-20M ）



120 000 min^{-1}
（エアタービン駆動 ABC-18T ）

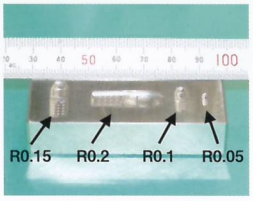


電動機駆動主軸の回転精度
100 000 min^{-1}
SPAM 0.03 μm TIR 0.2 μm

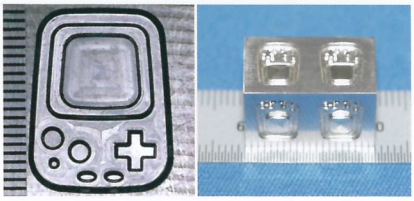


エアタービン駆動主軸の回転精度
120 000 min^{-1}
SPAM 0.03 μm TIR 0.6 μm

[加工例]



ワーク材質: NAK55



ワーク材質: DC53 59HRC

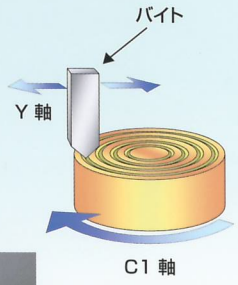
2 ワーク回転・割出台（C1 軸）

[適用例]

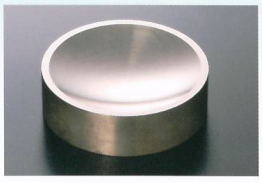
- 交差溝加工
- 旋削加工
- フレネルレンズ加工

[仕様]

- 軸受形式: 空気静圧軸受
- 付加軸: C1 軸
- 制御分解能: 0.00001 °
- 旋回角度: 無制限
- 最大回転速度: 800 min^{-1}



[加工例]



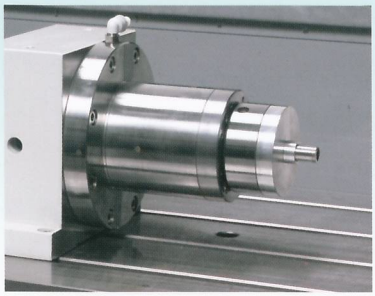
3 ワーク回転・割出台（A2 軸）

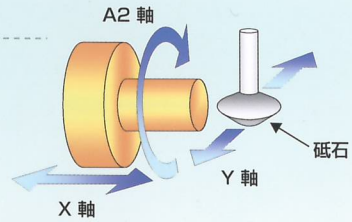
[適用例]

- レンズ金型加工
- 円筒加工

[仕様]

- 軸受形式: 空気静圧軸受
- 付加軸: A2 軸
- 制御分解能: 0.0001 °
- 旋回角度: 無制限
- 最大回転速度: 1 500 min^{-1}





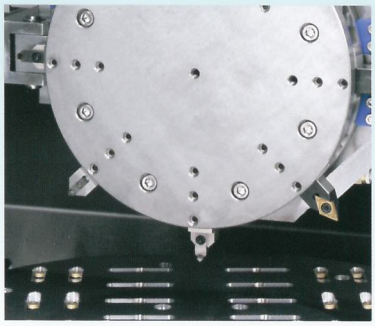
[加工例]

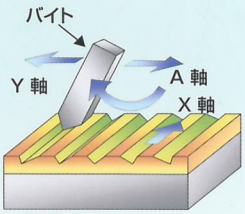
4 バイト割出台（A 軸）

[適用例]
- 溝加工
- 徐変角溝加工
- バイト交換（タレット）

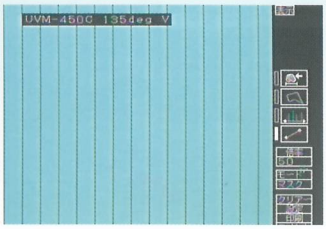
[仕様]
- 付加軸: A 軸※
- 取付け可能バイト数: 8 本
- 旋回角度: 無制限
- 旋回速度: 5 min^{-1}
- バイトシャンク: 最大 □15 mm

※標準装備の空気静圧軸受主軸を取り外した後取り付けます





[加工例]

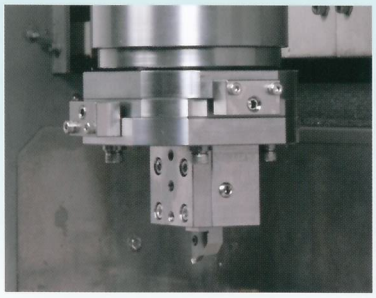


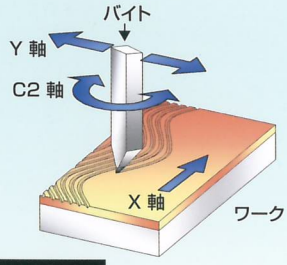
5 バイト旋回台（C2 軸）

[適用例]
- 曲線溝加工
- 微細溝加工（分析チップ等）

[仕様]
- 付加軸: C2 軸※
- 制御分解能: 0.00001 °
- 旋回角度: 無制限
- 最大旋回速度: 5 min^{-1}
- バイトシャンク: 最大 □15 mm

※標準装備の空気静圧軸受主軸を取り外した後取り付けます

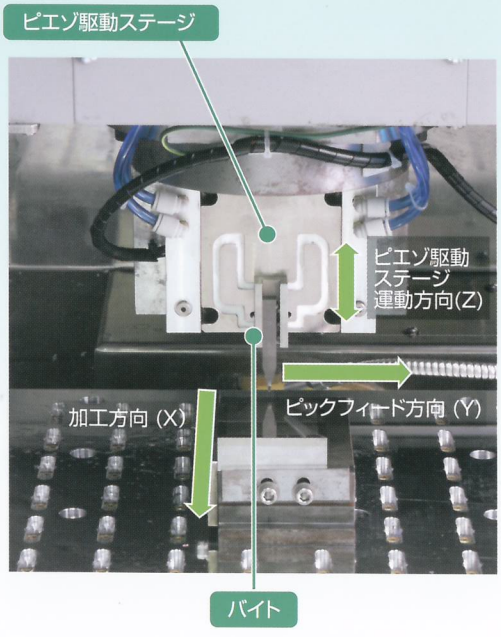




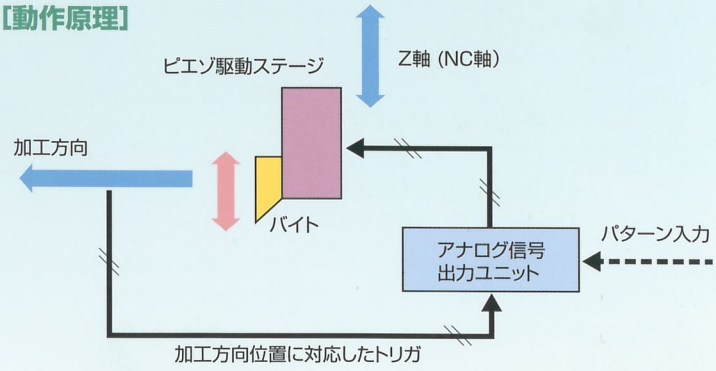
[加工例]

6 高速微細加工システム

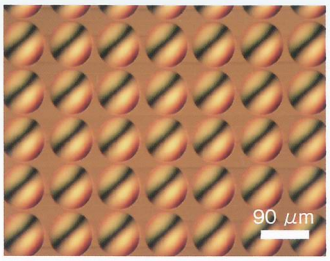
工具をピエゾ駆動ステージにより高速で微小運動させ、ディンプルアレイなど微細形状パターンを短時間に加工するシステム



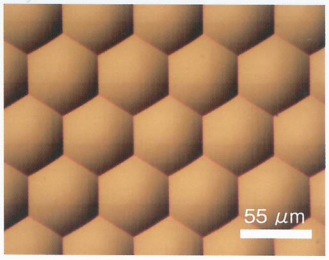
[動作原理]



[ディンプル加工事例]



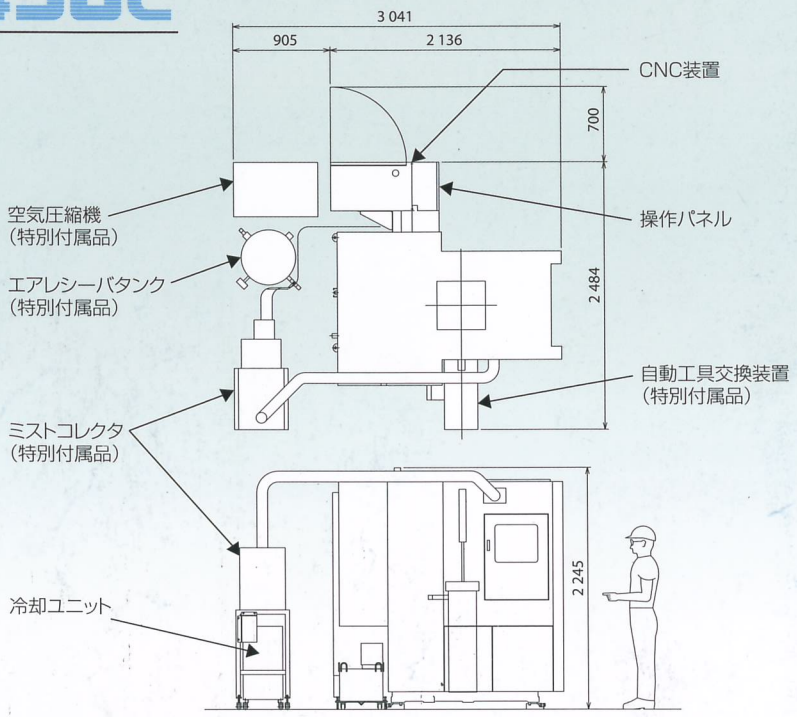
隣接ディンプル



オーバラップディンプル

model UVM-450C

機械の外形寸法



主仕様		UVM-450C
移動量	X 軸(テーブル左右)	450 mm
	Y 軸(主軸頭前後)	450 mm
	Z 軸(主軸頭上下)	200 mm
テーブル	テーブル作業面の大きさ	450 mm x 450 mm
	テーブル最大積載質量	100 kg
主軸	主軸回転速度	6 000 – 60 000 min^{-1}
	主軸電動機	1.6 kW/ 37 920 min^{-1}
最高送り速度		X, Y: 15 m/min　Z: 10 m/min
最小設定単位		X, Y, Z: 0.01 μm
自動工具交換装置 (特別付属品)	仕様 #1	シャンク径 ϕ4 mm、工具本数 12 本、工具最大長 55 mm
	仕様 #2	シャンク径 ϕ6 mm、工具本数 12 本、工具最大長 55 mm
CNC装置		FANUC Series 30i-MODEL A
電源容量(標準仕様の場合)		200/220 V 50/60 Hz 21 kVA
機械質量		5 000 kg

標準付属品

①冷却ユニット(リニアモータ、主軸冷却)　②オペレータコールランプ(3色)　③照明装置　④チップブローエア装置
⑤チップカバー　⑥手動ハンドル送り　⑦据付用部品　⑧主軸エア用フィルターユニット　⑨高速加工セット
⑩エアブロー　⑪ミストクーラント　⑫切削剤装置

特別付属品

①空気圧縮機　②エアレシーバタンク　③ミストコレクタ　④自動工具長測定装置
⑤精密制御エアドライヤ　⑥ラインフィルタセット　⑦エアタービン主軸(120 000 min^{-1})　⑧超高速主軸(100 000 min^{-1})
⑨ワーク回転/割出台(C1 軸)　⑩ワーク回転/割出台(A2 軸)　⑪バイト割出台(A 軸)　⑫バイト旋回台(C2 軸)
⑬高速微細加工システム

東芝機械株式会社　ナノ加工システム事業部

沼津本社　〒410-8510　静岡県沼津市大岡2068-3　TEL : 055-926-5080　FAX : 055-925-6592
関西支店　〒530-0001　大阪府大阪市北区梅田1-12-39(新阪急ビル)　TEL : 06-6341-6181　FAX : 06-6345-2738

URL:http://www.toshiba-machine.co.jp

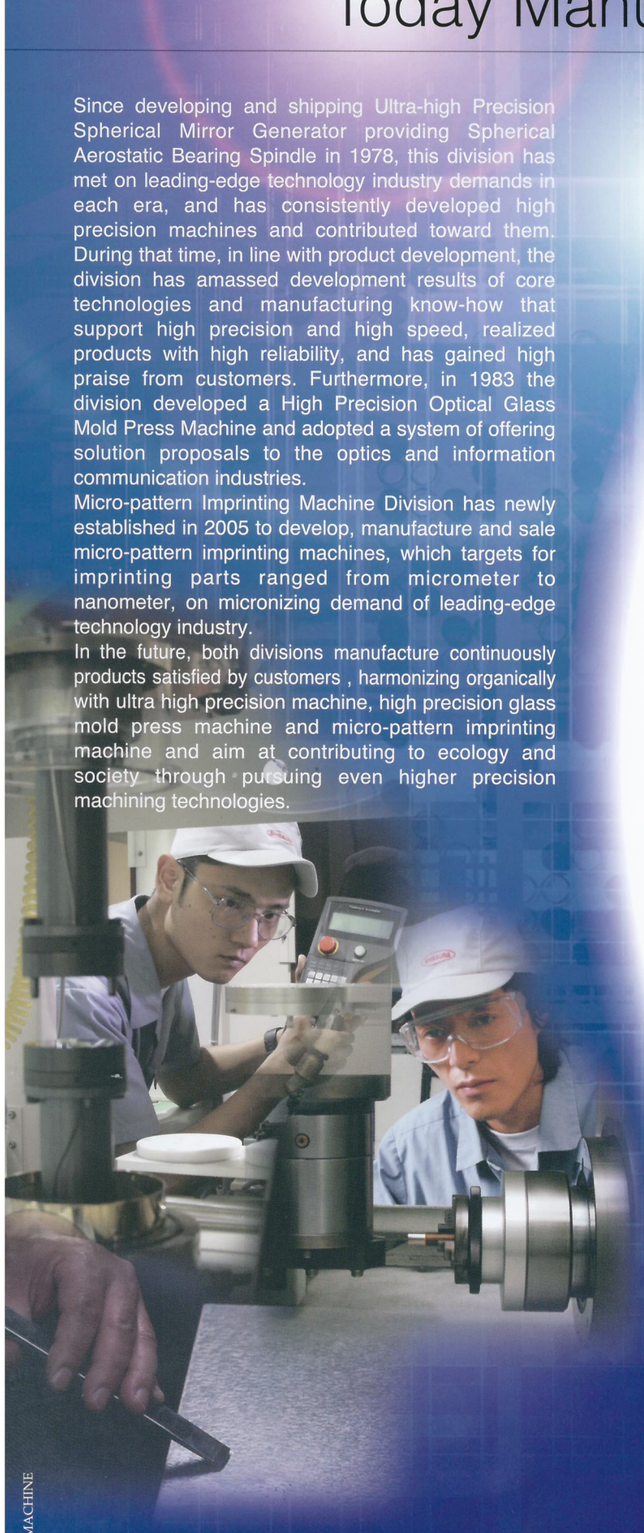
SM10049-2000-EI
Printed in japan

Challenged to Make Superfine, Today Manufacturing Superfine

Since developing and shipping Ultra-high Precision Spherical Mirror Generator providing Spherical Aerostatic Bearing Spindle in 1978, this division has met on leading-edge technology industry demands in each era, and has consistently developed high precision machines and contributed toward them. During that time, in line with product development, the division has amassed development results of core technologies and manufacturing know-how that support high precision and high speed, realized products with high reliability, and has gained high praise from customers. Furthermore, in 1983 the division developed a High Precision Optical Glass Mold Press Machine and adopted a system of offering solution proposals to the optics and information communication industries.

Micro-pattern Imprinting Machine Division has newly established in 2005 to develop, manufacture and sale micro-pattern imprinting machines, which targets for imprinting parts ranged from micrometer to nanometer, on micronizing demand of leading-edge technology industry.

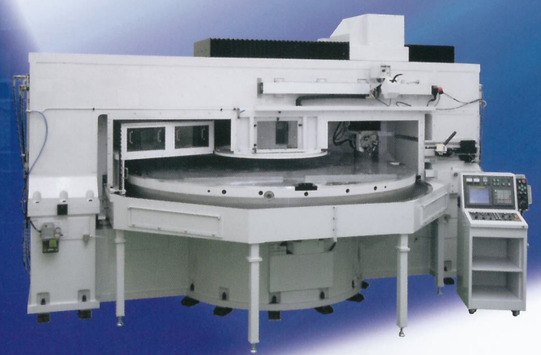
In the future, both divisions manufacture continuously products satisfied by customers , harmonizing organically with ultra high precision machine, high precision glass mold press machine and micro-pattern imprinting machine and aim at contributing to ecology and society through pursuing even higher precision machining technologies.



History

1977	Made up the 1 m square surface plate for three face fitting
1978	Completion of the spherical aerostatic bearing spindle Completion of the metal mirror generator providing spherical aerostatic bearing system
1981	Completion of the polygon mirror generator
1982	Completion of the high precision slicing machine Completion of the diamond turning machine incorporating a memory disk
1986	Completion of the high precision horizontal surface grinder
1992	Completion of the high precision aspheric surface grinder (V-V roller guide way with non-circular system provided)
1994	Completion of the high precision optical glass mold press machine Completion of the liquid crystal display (LCD) color filter painting machine
1996	Completion of the high speed milling machine Completion of the high precision vertical surface grinder Completion of the high precision double column machine (Grooving to molds for light guiding plate)
1998	Completion of the vacuum type for high precision optical glass mold press machine
2003	Completion of the linear motor drive system for the high precision aspheric surface grinder
2004	Completion of the high speed milling machine F-MACH443/643
2005	Completion of the die-molding transfer system for the high precision optical glass mold press machine Completion of the line-up for the large model of the high precision double column Machine Completion of the micro-pattern imprinting machine

Mold machining for big diameter fresnel-lenses



High Precision Turning Machine
UTD-3400B(H)

Manufacturing Small to Large Machines with based on core technologies

Dicing & grooving the sliders for the magnetic reading head and the multi-layered filters

High Precision Slicing Machine
USM-20A(F)

Asphere lens & f-θ lens machining and mold machining

High Precision Aspheric & Free-form Surface Grinder
ULG-100D(H^3)

Thermal/UV micro & nanometer imprint

Micro-pattern Imprinting Machine
ST50

Core Technologies

- Scraping & Lapping Technology
- High Precision Aerostatic Bearing Spindle
- High Precision Table Type Aerostatic Bearing Spindle
- High Precision V-V Slide Bearing Guide Way
- High Precision Aerostatic Bearing Guide Way
- High Precision Roller Bearing Rotary Table
- Linear Motor Drive Technology
- High Speed/High Precision Control Technology and Linear Motor Drive Technology
- High Precision V-V Roller Guide Way with Non-circular System
- High Precision Optical Glass Elements Heating/ Molding Technology
- High Precision Optical Glass Elements Molding Control Technology
- High Precision Optical Glass Elements Mold Manufacturing Technology

High precision mold & semi-conductor parts machining

High Precision Vertical Machine
model UVM-450C

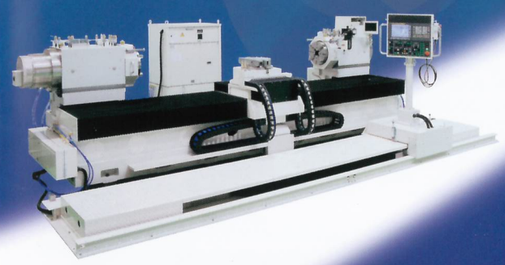
High precision molding for optical glass and fused silica

High Precision Optical Glass Mold Press Machine
GMP-311VA

Machining for the light guiding plate mold and precision grooving

High Precision Double Column Machine
UMP-6585D

Precision grooving to the roll molds for lenticular-lenses and linear fresnel-lenses



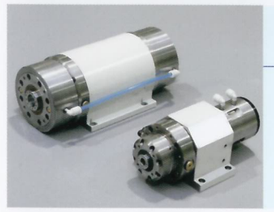
High Precision Grooving Lathe Machine
ULR-628

Core Technologies

Toshiba Machine has been grappled with ultra high precision machining since 1975. Machining accuracy required in this industrial field is rising to nanometer size from sub-micrometer. To realize nanometer accuracy in processes of machining and grinding, engineering ability, skilful technologies and know-how covering wide range for machine structure, mechanical element, control, measuring and evaluation, etc. are indispensable. This division is continuously accumulating higher technologies and know-how regarding ultra high precision machining and making an effort to answer speedily to needs from customers being in the vanguard of new era.

Scraping & Lapping Technology

Reference standard device and main parts of machines such as high precision surface plate and square gage that have undergone scraping and lapping process by a skilled heat refinement technician are vital to high precision machines.

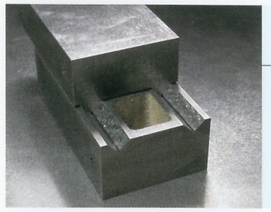


High Precision Aerostatic Bearing Spindle

With the combination of aerostatic bearing and a high performance electric motor, high precision and high speed performance are realized simultaneously with longevity. Supports high precision machining and high speed machining as an energy saving main unit. Moreover, it is also sold individually as a spindle unit.

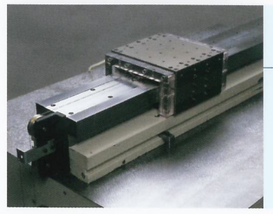
High Precision Table Type Aerostatic Bearing Spindle

A Turning and Indexing Table supported by aerostatic bearings, this is a long life spindle that can be equipped in a high precision machine with the purpose of high precision machining. Moreover, it can be used in a wide variety of operations as an attachment such as high precision parts machining and measuring.



High Precision V-V Slide Bearing Guide Way

Due to an excellent scraping technique and durable machine structure, the linear guide way with this system is the ideal guide way in terms of precision, stiffness, movement, and stability. It is an essential factor of mainstay technology as a guide way of high precision machine tools, measuring equipment, etc.

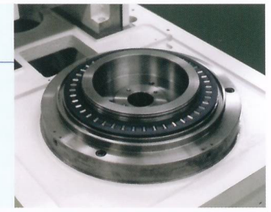


High Precision Aerostatic Bearing Guide Way

A linear guide way supported by aerostatic bearings makes the attainment of a high motion performance possible. In addition of the features of a low friction coefficient and longevity, because there are no direct contact, abrasion powder does not occur and a high environmental protection is achieved. Comparing to other bearing systems, because stiffness and load allowance are low, it is used in machines and measurement equipment of low load fluctuation, etc.

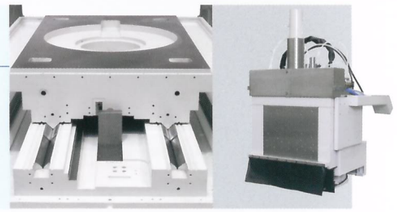
High Precision Roller Bearing Rotary Table

This rotary table is supported by a rigid, highly precise roller bearing. It deals well with unbalanced loads, and realizes a competitive high precision with an aerostatic bearing table.



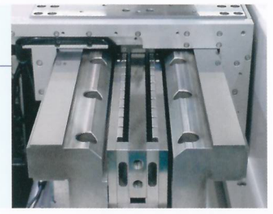
High Precision V-V Roller Guide Way with Non-Circular System

The V-V roller guide way with non-circular system configured with a strictly selected high precision needle minimizes friction, slight undulation is kept under 20 nm, and high positioning accuracy is combined with accurate motion performance. In the vertical axis, preload is given via aerostatic. This is a mainstay technology supporting the high speed, high precision and high rigidity that are demanded as a basic function of high precision machines.



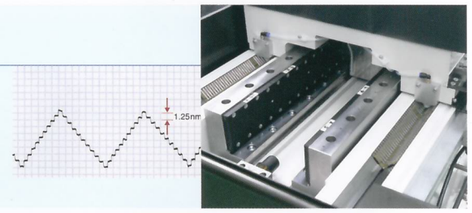
Linear Motor Drive Technology

The coreless linear motor and linear motor with cores have both been successfully completed as products. Via original technology developed by our company, the linear motor drive system with cores has especially realized a high precision and high responsiveness that is strongly stabilized against disturbance factors.



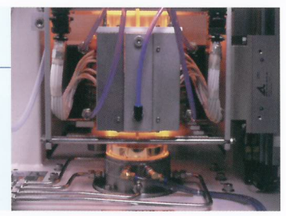
High Speed / High Precision Control Technology and Linear Motor Drive Technology

Those technologies have realized a world leading 1nm scale feedback control. Moreover, it establishes linear motor with cores high gain and high precision drive technology, and realizes stable cutting and grinding processes as well as high form accuracy and surface accuracy.



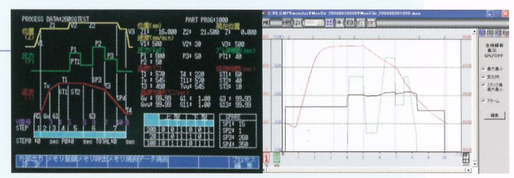
High Precision Optical Glass Elements Heating / Molding Technology

High speed-uniform heating via an infrared lamp and high positioning accuracy of a mold are realized. Combined with pressing force control, heating / cooling temperature control, and high precision mold manufacturing technology, this have realized a reduction of a post processing, etc. on the production process of high precision glass elements such as asphere glass lenses, etc.



High Precision Optical Glass Elements Molding Control Technology

Original company made CNC system is equipped, the individual process settings of heating, pressing, positioning, and cooling are easy to operate as well as monitorable, and high quality molding with a high level of reproducibility that is easy for an operator is realized.



High Precision Optical Glass Elements Mold Manufacturing Technology

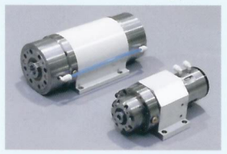
With plastic mold manufacturing technology accumulated over many years for injection molding machines as a base, the strict selection of mold materials optimal for glass molding and coating technology development has realized high quality and longevity for molds. Moreover, due to the high precision machining and related application-engineering made possible by the Aspheric & Free-form Surface Grinder ULC/ULG series, molded products with high precision and sub-micrometer scale form have been realized.

High Precision Elements & Applications

Since developing the Spherical Bearing Spindle this division has continued development and remodeling, and has produced approximately 5,000 units to the present. The high precision and reliability fostered by this long manufacturing experience know-how garners high praise from customers.
This division has supplied approximately 1,000 units as high precision/high speed cutting and grinding spindles to customers leading the leading-edge technology. In the future this division will continue to develop and improve, answer divergent customer demand.

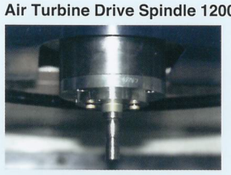
High Precision Aerostatic Bearing Spindle

- **Cutting/Grinding Spindle**
  - **Electric Motor Drive Spindle 60000min^{-1}**



  - **Spindle for Electrostatic Rotary Atomizer 90000min^{-1}**

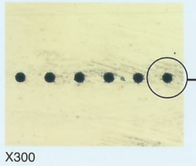
  - **Air Turbine Drive Spindle 120000min^{-1}**



* Specifications can be adjusted on customer request.

Application Examples for High Precision Aerostatic Bearing Spindle

Tiny Drilling continuously



X300

Hole diameter: Φ0.02mm through
Material: Stainless steel t 0.1mm

X2500

Spindle
Max. Speed: 60000min^{-1}

X700

Drill
Cemented carbide drill
Φ0.02mm

Machine Model
High Precision Vertical Machine
model UVM-450C

Application Examples for Ultra-high Precision Core Technology

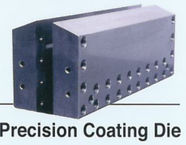
Applications of high precision core technologies, machining and engineering technologies for ultra high precision machines accumulated for a long time has realized a high precision coating machine. This machine has differential advantages to competitors for high quality, high precision and high reliability as a product from Extrusion Machine Division and has gained high praise from

Coating Roll

This unit being a monoblock for Coating Roll and a driving motor is compact and realizes a high quality and high performance.

Accuracy performance
Bearing run-out: 1μm or less
Running fluctuation: ±0.1%

High Precision Coating Machine CR-800



Ultra High Precision Coating Die

High precision lapping and measuring technologies realize the Ultra High Precision Coating Die, which has differential advantages to competitors

Accuracy performance
Straightness: .0.3μm or less
Flatness: 0.3μm or less
Deviation of Die-Lip clearance: 0.3μm or less

Coater Head Unit

Full-closed-loop control system is equipped and realizes sub-micrometer positioning accuracy.

Repeatability of positioning: ±0.043μm

Retrofitting

The High Precision Machine Division has been delivering the first product for approximately 20 years. High praise has been received from customers regarding the High Precision Slicing Machine and High Precision Surface Grinder, which were delivered in the early stages and still work an active role today. However, with the advance of technological innovation, an even deeper level high accuracy and high reliability is expected.
And the High Precision Machine Division, where responding to this demand is a necessity, is planning the fulfillment of retrofitting. In addition to products from this division, including post purchase from other suppliers, we continue to endeavor from the perspective of the customer, for whom production capacity and quality improvement is necessary.

Retrofitting Menu

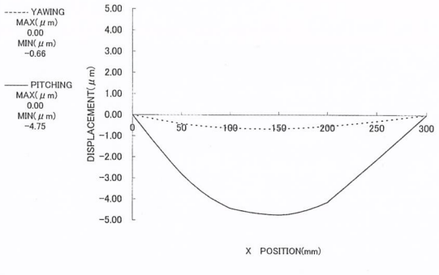
CNC System Replacement
- CNC Adaptation, CNC System Replacement
- AC Servo System Adaptation
- Spindle Driver Replacement

Overhaul
- Partial-Overhaul
- Improving of Geometric Quality
- Full-Overhaul
- Improvement of geometrical accuracy, Main parts replacement and painting, etc.

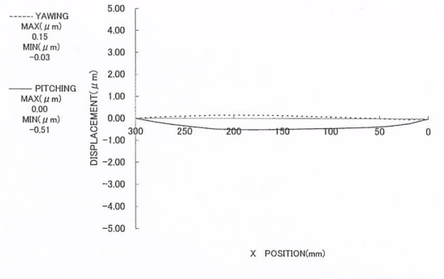
Repair / Inspection
- On-site Repair / Examination
- Periodic Inspection
- Inspection Patrol

Machine Model: High Precision Slicing Machine USM-50A (Working time: 15 years)

Before Overhaul



After Overhaul



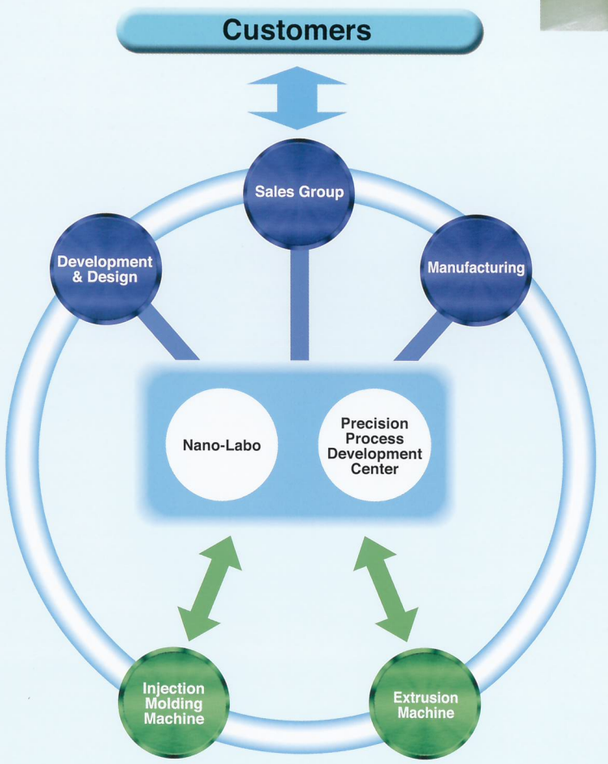
Overhaul Examples for Straightness of Table Traverse (X axis)

X axis guide way: High precision V-V slide guide way

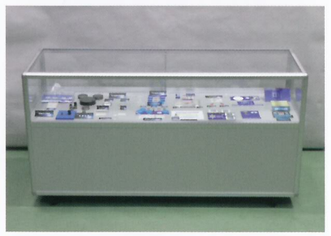
Precision Process Development Center

Our aim is to support process development and is making endeavor to propose a solution for your product through optimized process, machine tool and machining method, etc. in corporation with Injection Molding Machine Division and Extrusion Machine Division, not only High Precision Machine Division. The entire staff is looking forward to seeing you.

Precision Process Development Center



Sample Display



Ultra-high Precision Measuring Equipments installed

Following ultra-high precision measuring equipments are installed to measure and evaluate the results of machined and molded parts.

- Ultrahigh Accurate 3-D Profilometer (UA-3P/Panasonic)
- 3-D Optical Profiler New View/Zygo Co.
- GPI Interferometer/Zygo Co.
- Form Talysurf/Taylor Hobson
- High-precision Multi-surface and Centering Erro Measurement Machine: OptiCentric MOT/Trioptics Gmbh

Solution Map for Asphere Glass Lens Molding

Technical Information from Customer

1. Glass material
2. Dimension
3. Surface accuracy
4. Form accuracy

Asphere Lens Information

Discussion & Suggestions for Suitable Specifications

Solution by Toshiba Machine

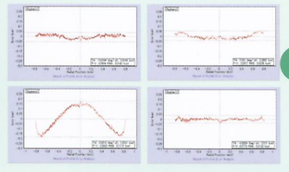
■ Mold design

1. Optimization of part's form
2. Surface accuracy
3. Form accuracy
4. Process design after molding process
5. Selection of mold material and coating specification
6. Molding temperature
7. Cost of ownership

■ Mold manufacturing

Turning, Grinding, Milling, Fly-cutting, Mold compensation

High Precision Aspheric & Free-form Surface Grinder



Mold compensation

■ Coating

Releasing, Oxidization, Adhesion, Hardness, Duration

Mold assembling

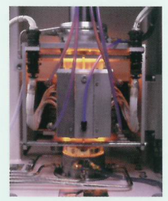
NG

GOOD!

Evaluation & Mold Compensation

■ Molding test

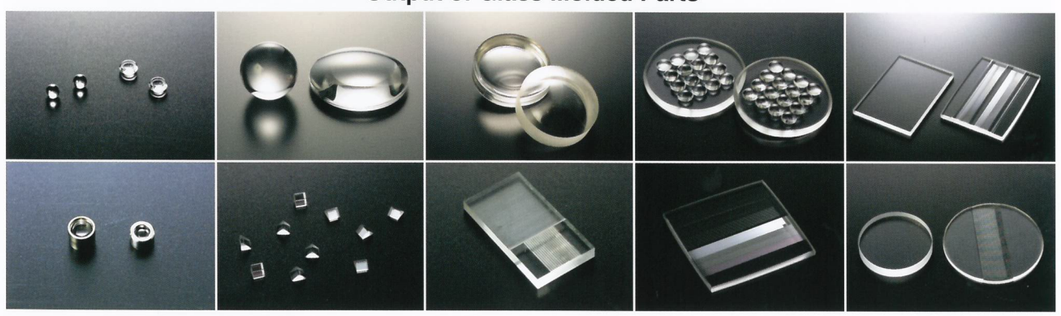
1. Molding temperature
2. Pressing force
3. heating & cooling speed
4. Soaking time



Production

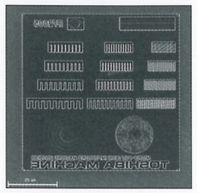
High precision Glass Mold Press Machine

Output of Glass Molded Parts



Solution Map for Micro-pattern Machining & Imprinting

Micro-pattern Imprinting Machine Division has developed the Micro-pattern Imprinting Machine ST50 micronizing accuracy of a molding progressively with nanometer-order and supply a solution to imprint nanometer sized factors to customers.



High Precision & Nanometer Structure Mold ▶▶▶ Imprinting Machine ▶▶▶ Imprinted Products

High Precision Machine — **Company Technologies**

High Precision & Nanometer Structure Mold — Micronizing

Precision Machining Technology	
UVM-450C	High Speed Milling
USM	Slicing & Dicing
UVM/UMP	Prism Machining & Grooving
UHG/UVG	Surface Grinding
UTD	Precision Turning
ULR	Grooving to Roll
UFG	Polygon Mirror Machining
ULC/ULG	Aspheric Surface Machining

Photolithography Related-Processing
Focused Ion Beam (FIB) Processing
Electron Beam (EB) Processing

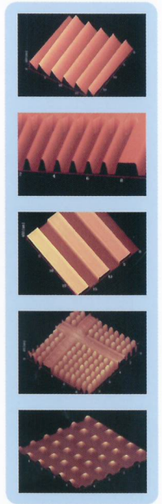
Micronizing

[Existing Technologies & Machines]
- Injection molding machine
- Glass molding machine
- Plastic Extrusion machine

[New Technologies]
Nanometer Imprinting Technology
- Thermal Imprinting Machine
- UV Imprinting Machine
- Materials & Parts Handling Equipment

Micro-pattern Imprinting Machine

Micro-Pattern Imprinting Business Area

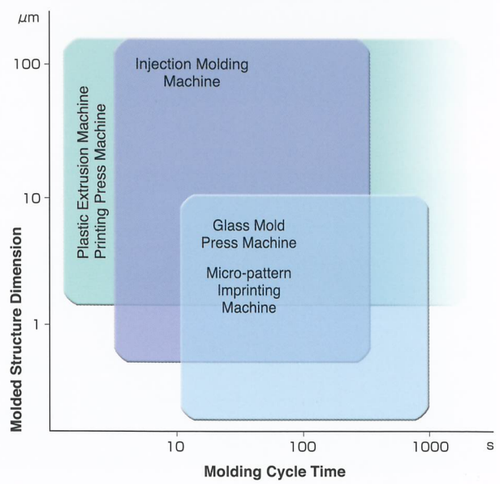


Utilizing with these new imprinting technologies and devices realizes higher capability-performance, higher cost-performance and highly integrated process.

Capability Map for Micro-pattern Imprinting Performance between Molding & Imprinting Machines

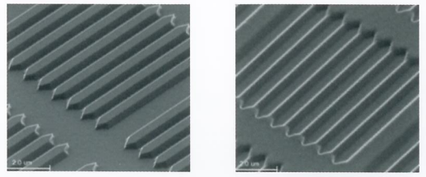
Machine Category		Key Technology	Features
1	Injection molding machine	High speed injecting	High productivity Low cost General purpose
		Compression injecting	
2	Plastic extrusion machine	Roll embossing	High productivity Wide area products applied
		Film coating	
	Printing press machines	Screen printing	
		Roll to Roll printing	
3	Glass mold press machine	Thermal imprinting	High value materials (Glass and fused silica) molding
	Micro-pattern imprinting machine		Micro-pattern imprinting 3D profile molding lithography process
		UV imprinting	

Note: Above table is simplified except other factors of Manufacturing cost, Molding area, Aspect ratio, Moldability and Robustness, etc.

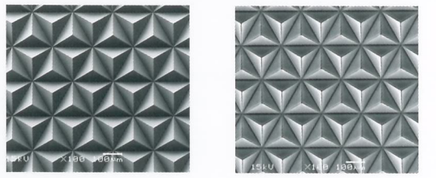


Samples for Micro-pattern Imprinting

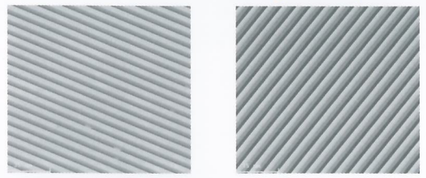
●Mold ▶ ●Imprinted product



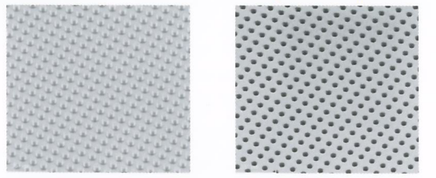
●Mold ▶ ●Imprinted product



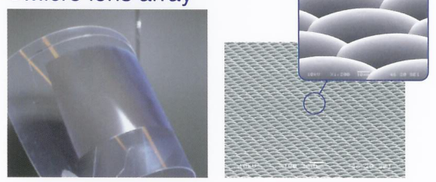
●Mold ▶ ●Imprinted product



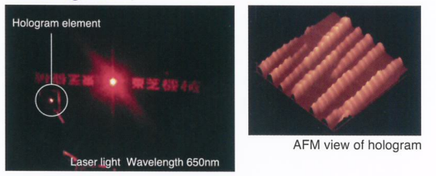
●Mold ▶ ●Imprinted product



●Micro lens array



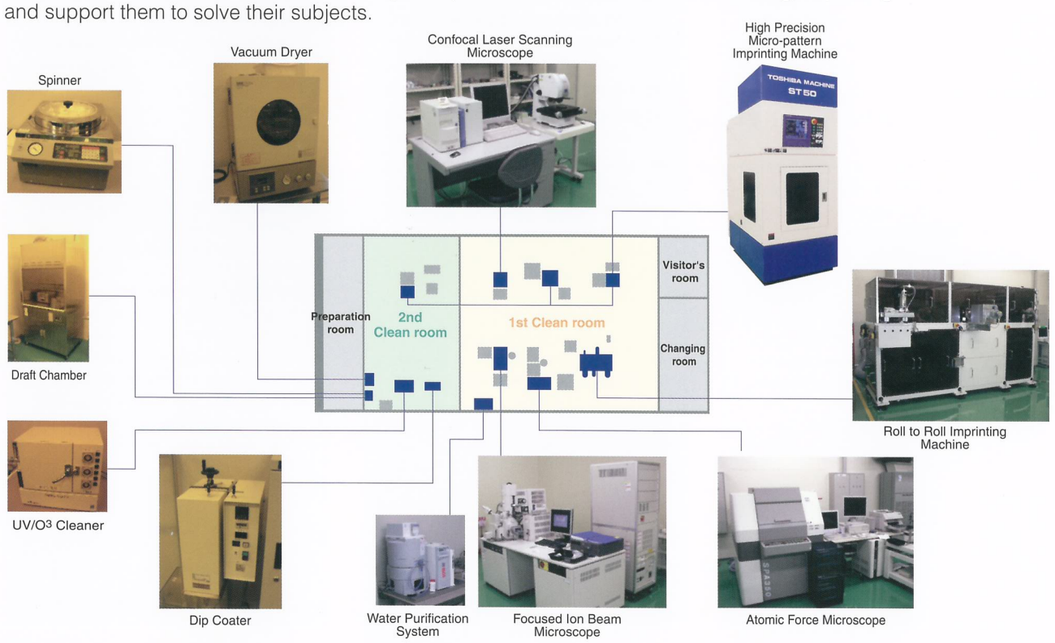
●Hologram



AFM view of hologram

Nano-Labo (Clean Room for Micro-pattern Imprinting Process)

We consistently work with customers through the processes of trial mold manufacturing, imprinting and evaluation and support them to solve their subjects.



Products Line-up

High precision machines and equipments from Toshiba Machine, which can meet requirements from customers and demands in each era.

The concentration of core technologies for high precision machining developed by Toshiba Machine has realized following machines, which are dedicated to nanometer-order machining. Each machine has been developed corresponding with customer's needs and has gained high praise from them, who are optics, semiconductor, and information communication industries. In the future, both divisions continuously develop ultra-high precision machines and equipments, pursuing higher precision and quality.

High Precision Surface Grinder

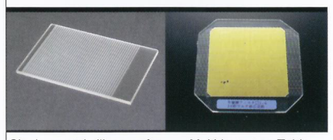
Single crystal silicon wafer　Multi-layout on Table

UVG-380B

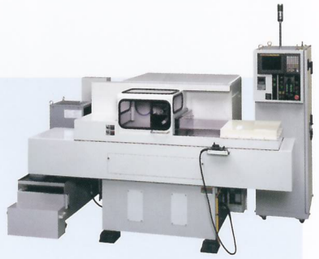
This model has a capability of machining hard and brittle materials such as glass, ceramics and ferrite precisely and efficiently with a wide range from a large diameter to multi-layout workpieces and realizes a high-cost- performance machine.

- Large diameter vacuum chuck of 380mm provided, realizing machining of a large diameter workpiece and multi-layout workpieces
- High Precision Roller Bearing provided for the Rotary Table, realizing high rigid and highly precise against unbalance loads
- High Precision Aerostatic Bearing Spindle provided for the grinding spindle, realizing highly precise machining
- Grinding Wheel Contact Detection Function provided as option

High Precision Slicing Machine



Single crystal silicon wafer　Multi-layout on Table



USM-400B

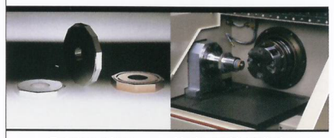
USM series

This series has a capability of high precision machining for hard and brittle materials such as glass, fine ceramics, etc. using a single or multi-diamond-blades and realizes a high quality and high cost performance machine.

- Grinding with a multi-diamond-blades under heavy load realized
- High Precision Aerostatic Bearing Spindle provided, realizing minimized thermal displacement of the spindle
- High Precision V-V Hydrodynamic Bearing Guide Way for the cutting feed traverse (X axis) provided, realizing a high motion performance and highly rigidity
- Automatic Alignment System provided as option to contribute to high productivity and stable high quality

Products Line-up

Ultra-high Precision Flat Polygon Mirror Generator



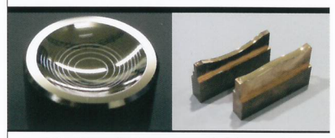
Polygon mirror　Horizontal installation of Work Indexing Head

UFG-80C(P)

High precise and high efficiency machining for soft metal materials such as aluminum alloy or cupper is possible, using a single crystal diamond tool.

- Machining of all of polygon mirrors equipped on laser printers
- Work Indexing Head installed on a horizontal axis. The diffraction ray via cutting mark takes a vertical scanning line direction, making cancellation possible.
- Uses a high rigidity and high stability facilitating specialized High Precision V-V Slide Guide Way to realize high precision and high efficiency machining
- Tail Stock provided as option to realize high efficient productivity stacking materials of 20-30 pieces

High Precision Aspheric & Free-form Surface Grinder



Diffractive optical element (DOE) mold　f-θ lens mold

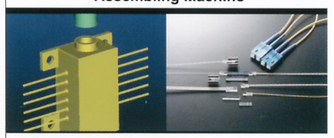
ULG-100D(H³)

ULC/ULG series

This series has a capability of turning and grinding spherical, asphere and free-form surface and is a high quality and high cost performance machine, realizing precision machining of glass lenses and effective machining of molds.

- High Precision V-V Roller Guide Way with Non-circular System provided to realize high accuracy and high rigidity
- Linear Motor Drive System and Ball Screw Drive System applied due to an application
- Application software provided to corresponding to various machining process
- High Precision Aerostatic Bearing Spindles provided for a work spindle and grinding spindle

High Precision Optical Communication Device Automated Alignment & Assembling Machine



Laser diode (LD) Photo diode (PD)　Optical fiber array Splitter

UFA-200

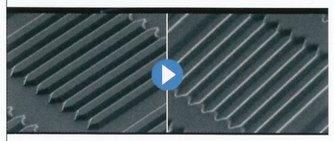
UFA series

Laser Diode (LD), Photo Diode (PD) module or Isolator and lenses, or Optical Fiber and lenses can be aligned and assembled efficiently. YAG Laser Welding or UV Adhesion System can be chosen corresponding to an application.

- After optical device manual loading, automated alignment and welding possible
- A Gimbal mechanism provided to realize surface alignment speedily and precisely
- Design and manufacture of a chuck system applied to customer's device is available. Optimization of automated assembly process

Products Line-up

Micro-pattern Imprinting Machine



Mold
Line & Space: 400nm

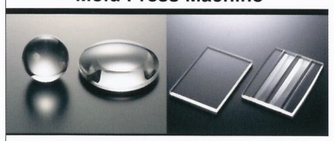
Imprinted part
Line & Space: 400nm

ST50

Micro-pattern imprinting of various micronized elements from micrometer to nanometer size is possible precisely due to the high precision pressing control of positioning and pressing force

- Both of thermal and UV imprinting possible
- High resolution X-Y Stage provided to realize Step and Repeat process
- Vacuum Chamber provided to realize Imprinting under vacuum
- The mechanism to uniform pressing force distribution in imprinted surface provided to realize high imprinting ratio
- High performance user-friendly man-machine interface provided

High Precision Optical Glass Mold Press Machine



Bi-convex asphere glass lens

V-groove substrate (Fused silica)

GMP-311VA

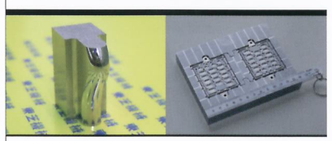
GMP-54-7S

GMP series

Molding of optical elements with high precision, high quality and high productivity due to molding with heating and pressing optical glass and fused silica, etc. is possible. Moreover, Die-molding Fix System or Die-molding Transfer System can be chosen corresponding to application or production process.

- Infrared lamps provided to realize uniform heating speedily
- AC servo system provided to realize high precision pressing process
- CNC system of company production provided to realize friendly and flexible process setting
- Automated Handling System provided as option to realize a long hour operation

High Precision Vertical Machine



Free-from surface(3D)

Fine mold

model UVM-450C

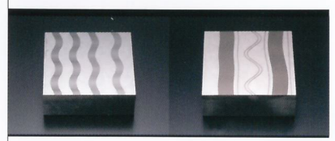
model UVM-450C

High quality and high cost-performance general purpose machine adopting the core technologies of ultra-high precision machine elements
It enables high efficient and high quality machining for small and medium size precise molds, semiconductor related precision parts, light guide molds and so on.

- Realizing high quality surface and high accuracy with linear motors and high resolution scales
- Eliminating thermal deformation factors with cooling system for main structures
- Enabling high speed, high quality machining and prolonging tool life with an aerostatic bearing spindle
- Allowing continuous high speed machining for longer hours with optional ATC which is dedicated in the aerostatic spindle
- Enabling various groove (gradually changing angle, curve) machining and dot machining with selecting optional axis attachments

Products Line-up

High Precision Double Column Machine



Curved line grooving 1

Curved line grooving 2

UMP-6585D

UMP-D series

High precision and high efficiency machining for various grooving such as straight and curved line with a single crystal diamond tool is possible. It applies with up sizing of LCD and enables high precision machining of light guiding plate molds up to maximum of 70 inches.

- High Precision V-V Roller Bearing Guide Way with Non-circular System and linear motor drive system for X and Y axes provided to realize high rigidity and high response.
- Strong and stable machine structure with a monoblock cast for Cross-rail and Column provided
- Various high precision machining with specialized accessory combination possible

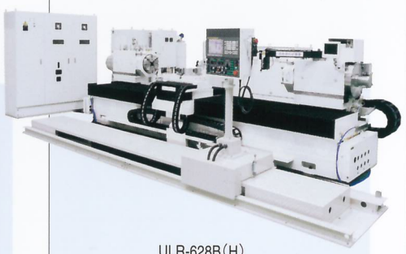
* Tool Swivel Slide (C2 axis)
* Tool Indexing Head (A axis)
* 10000min-1 spindle for fly-cutting

- Active type isolator provided to increase machining accuracy reaching the limit with the feed-forward control system

High Precision Grooving Lathe Machine

Roll mold

Tool Slide (B axis)



ULR-628B(H)

ULR series

High precision and high efficiency grooving for a prism sheet, linear fresnel lens and lenticular lens molds is possible.

- The structure mechanism with high precision and stable spindle drive system and the Carriage supported with High Precision V-V Roller Guide Way with Non-circular System provided to realize stable and high efficiency machining
- High Precision Aerostatic Bearing System for Tool Slide (B axis) provided to realize high precision machining

High Precision Turning Machine

Fresnel lens mold machining

Swivel Head (B axis)

UTD-3400B(H)

UTD series

High precision and high efficiency machining for big-diameter fresnel lens molds is possible.

- The mechanism to minimize influence of vibration and heat generation from the Table and the driving motor provided to realize high precision table run-out
- Monoblock cast for the Cross-rail and the Column provide and the High Precision V-V Roller Bearing Guide Way with Non-circular System for the Saddle provided to realize high precision and high rigidity
- Swivel Head (B axis) supported with High Precision Aerostatic Bearing and Tool Edge Adjustment Function provided to realize various and complex machining

Products

- High Precision Aspheric & Free-form Surface Grinder
- High Precision Double Column Machine
- High Precision Optical Glass Mold Press Machine
- Micro-pattern Imprinting Machine
- High Precision Grooving Lathe Machine
- High Precision Surface Grinder
- High Precision Slicing Machine
- Lapping Plate Facing Machine
- Ultra High Precision Flat polygon Mirror Generator
- High Precision Vertical Machine
- High Precision Optical Communication Device Automated Alignment & Assembling Machine
- Ultra Precision Elements & Applications
  - High Precision Aerostatic Bearing Spindle
  - Ultra Precision Measuring Device & Equipment
  - Ultra Precision Stage

Numazu Headquaters Plant (Fuji Mountain in background)

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Achievement of High Quality, High Precision, High Reliability

Guidance for High Precision Machine Division and Micro-pattern Imprinting Machine Division

A fabrication is originated in the high precision machining

High Quality

High Precision Machines

Catalog HPM0007-CED-03

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諏訪出張所：TEL:0266-57-2324 FAX:0266-58-7191
名古屋営業所：TEL:052-823-1195 FAX:052-819-1391
浜松出張所：TEL:053-436-7414 FAX:053-436-3996
豊田出張所：TEL:0565-25-0131 FAX:0565-25-0133
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富山出張所：TEL:076-422-5003 FAX:076-495-9096
広島出張所：TEL:0848-56-2375 FAX:0848-56-2377
福岡出張所：TEL:092-433-1531 FAX:092-433-1532

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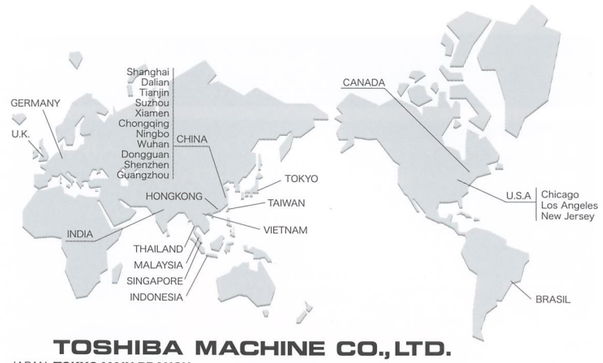
ISO9001
JQA-0848
JAB MS CM009
INJECTION MOLDING MACHINE



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TOSHIBA MACHINE

IGN
INJECTION MOLDING MACHINE GLOBAL NETWORK

EC

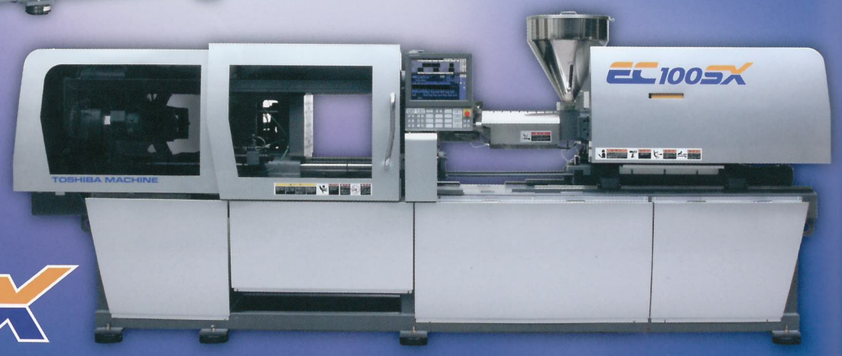
ALL-ELECTRIC INJECTION MOLDING MACHINES

CatalogEC0185-JED-01

EC-S

高生産性・安定成形を追求したグローバルスタンダード機。

TOSHIBA MACHINE'S EC-S(X) series of injection molding machines provide higher productivity stability.



EC-SX

最先端の成形制御と更なる高安定性。あらゆる成形への多様性。

Upgraded molding control and high stability. Wide flexibility for molding.

1. Solid Clamp

金型に均一な型締力を伝え、低い型締力での成形と超ハイサイクル。

Minimizing deflection on mold results uniform clamping force distribution and it enables reducing clamping force and super high cycle.

2. S-Cube

高速・高圧域での抜群の充填性能。スムーズな安定成形。

Enables powerful high speed and high pressure filling with smooth motion.

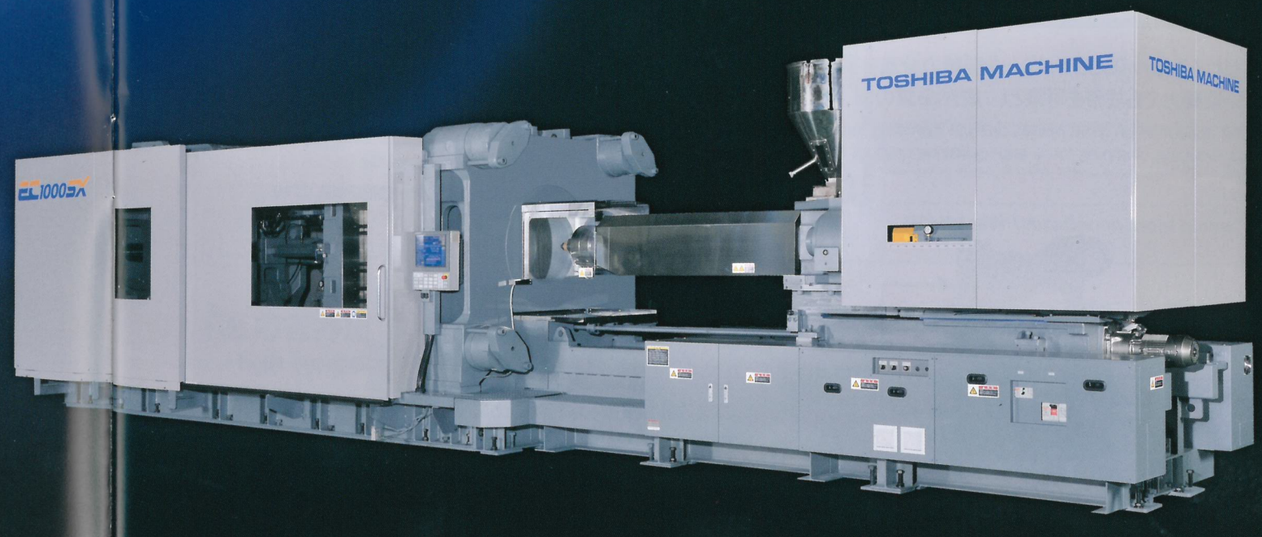
3. INJECTVISOR-S50/V50

制御周期の大幅改善により、高生産性・安定成形を実現。

Enhanced features allow increased productivity and stability in precision molding.

4. Molding Control
5. Network
6. Clean&Ecology
7. Special
8. Screw
9. Worldwide CS Network

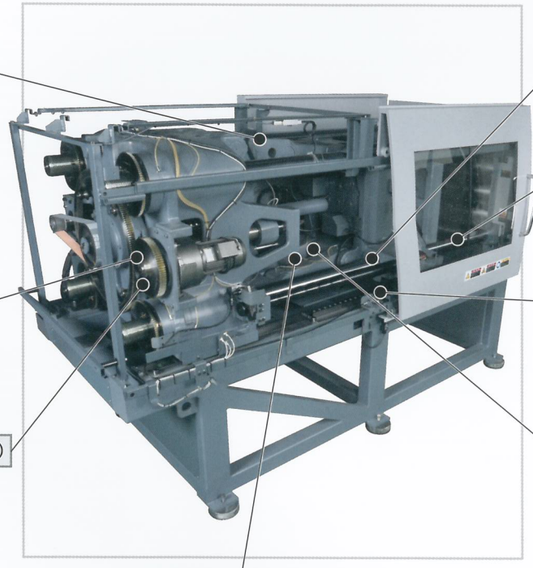
- EC50S／SX
- EC75S／SX
- EC100S／SX
- EC130S／SX
- EC180S／SX
- EC230S／SX
- EC280S／SX
- EC350S／SX
- EC450SX
- EC550SX
- EC650SX
- EC850SX
- EC1000SX
- EC1300SX
- EC1300SXW



1. 型締装置　Clamping Unit　Solid Clamp

更に低い型締力での成形とトップクラスのハイサイクルを実現した新型締装置

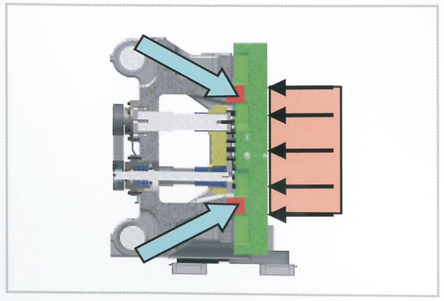
New clamping mechanism enables minimizing clamping force.
And new designed clamping unit achieves high cycle molding.



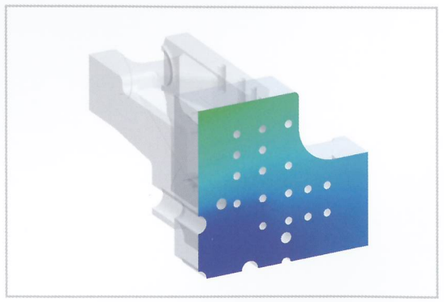
金型に優しいリンクラインドグル、ダブル剛体プレート
LINKLINE toggle mechanism and two piece platens

金型のたわみを最小限として、均一な型締力分布を実現します。
更に低い型締力でも成形を可能とし、成形品質の向上に貢献します。

Minimizing deflection on mold results uniform clamping force distribution and it enables reducing clamping force and improving product quality.



リンクラインドグル
LINKLINE toggle

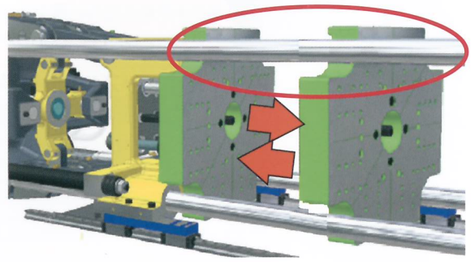


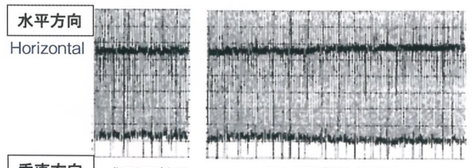
均一な型締力分布
Uniform clamping force

ハイサイクル対応リニアガイド支持機構、ダイナミック加減速、高応答押出
Linear guide structure, Dynamic acceleration and deceleration control, High response ejection for high cycle

• リニアガイド支持機構
Linear Guide Structure

- 摺動抵抗が少なく、スムーズな動作で超高速型開閉
  High Speed mold open/close smoothly with low friction.
- 無給脂リニアガイドを採用。　タイバーに油が付着無。
  Greaseless tie-bars and lubrication free linear guides.
- 移動ダイプレートの平行度維持と直進性向上
  Enhanced Parallelism and direct advance of moving platen.

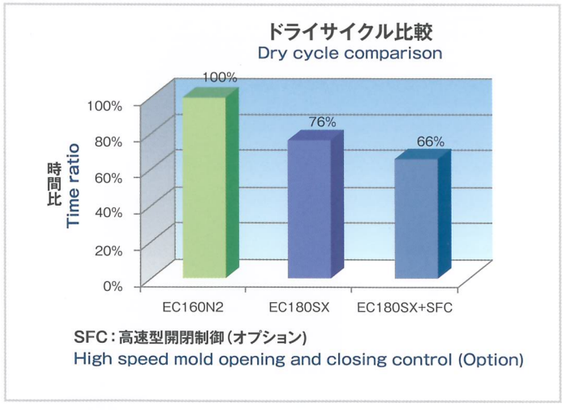




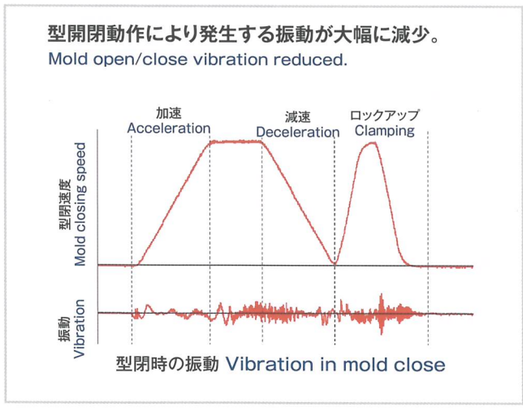
変位計による軸芯精度
Platen center alignment measurement data by displacement gauge

• ダイナミック加減速制御
Dynamic acceleration and deceleration control

ダイナミック加減速制御によりショックの無いスムーズで速い型開閉動作により、成形サイクルを短縮します。
Shock-less, smooth and quick mold open/close with dynamic acceleration and deceleration reduce cycle time.



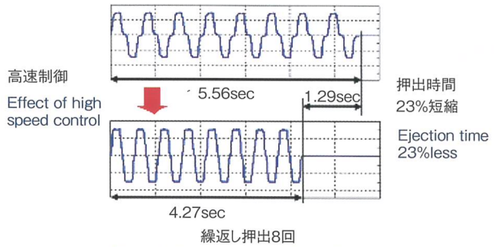
SFC：高速型開閉制御（オプション）
High speed mold opening and closing control (Option)



型閉時の振動 Vibration in mold close

• 高応答押出
High response ejection

高応答押出によりキレのある動きで押出時間を短縮します。
Reducing take out time with sharp performance by high response ejection.

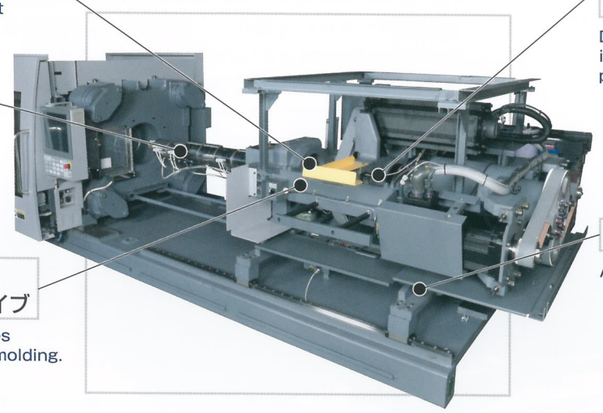


繰返し押出8回
Repeated ejector motion Up to 8 times

2. 射出装置 Injection Unit　S-Cube (Simple,Steady,Smooth)

当社の特長である高速・高圧域での力強い充填性能とずば抜けた保圧耐力を継承しつつ、スムーズな動きによる安定成形を実現する新射出装置

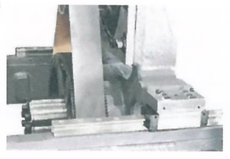
With our strong point of powerful filling performance at high-speed and high-pressure area and outstanding endurance of holding pressure, newly designed injection unit realizes stabilized production by smooth machine motion.



・フリクションフリードライブ
Friction Free Drive

摺動抵抗を極限まで抑え、射出速度の立ち上がり応答を向上し、安定した射出特性を実現します。

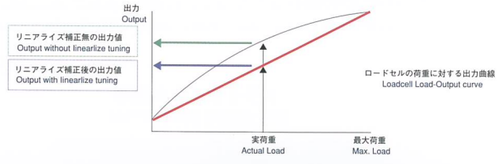
Improvement of injection acceleration response and stabilized injection motion with reducing friction resistance due to new injection structure.



・射出圧力と背圧の精度向上
Improved accuracy of injection and back pressure

圧力の検出精度の向上とリニアライズ補正により、射出圧力及び背圧の制御精度が向上し、ワンランク上の安定成形を実現します。

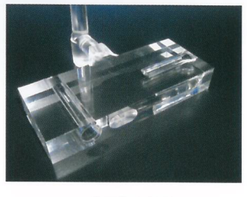
Improved pressure control and linear compensation achieve precise injection pressure and back pressure control, and that provides stabilized injection.

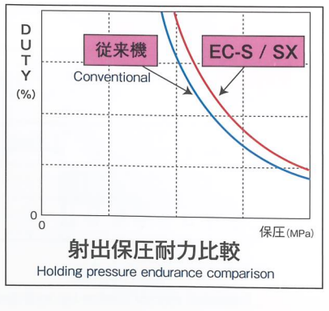


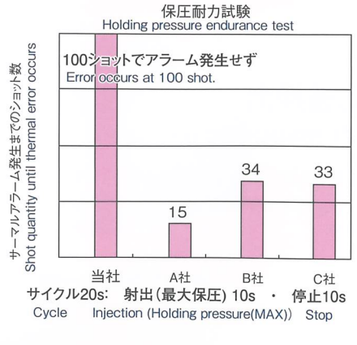
幅広い成形対応力　Wide flexibility for molding

高応答射出性能と高い保圧耐力により、薄肉精密部品から厚肉製品まで幅広い成形品に対し安定した成形を可能とします。

High response injection function and powerful holding pressure provides stabilized production from thin walled precision products to thick-wall precision products.







3. 最新制御装置　New process controller

INJECTVISOR　S50/V50

制御能力と拡張性の向上により、多様なニーズに応えます。
Improvements of control performance and functions.

・高速制御周期(40%改善)

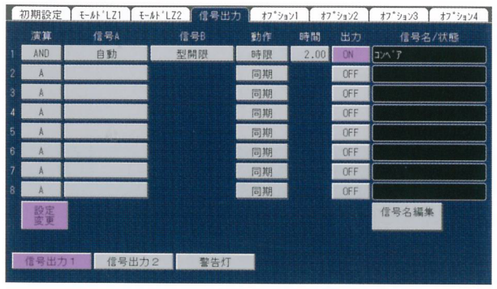
40% improvement compared with conventional controller.

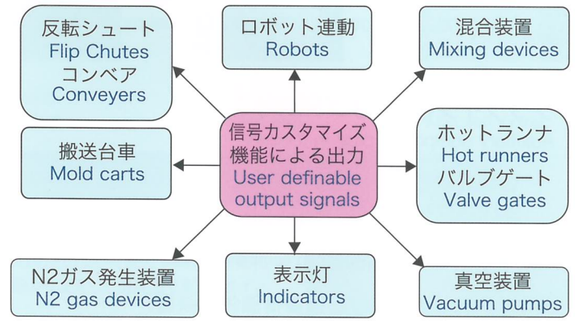
全てのモータ軸制御を高速化することにより、高速射出やハイサイクル成形において常に安定した繰返し性能を実現します。
Achieved stable repeatability at high speed injection or high cycle molding by speeding up all servo motor control frequency.

・信号カスタマイズ

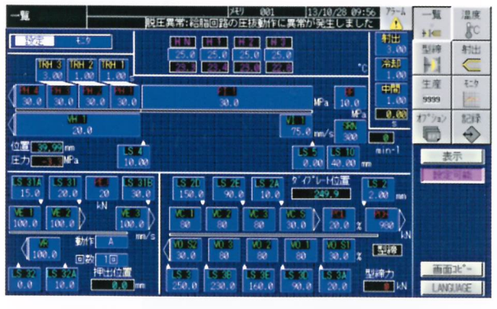
User definable output signals for auxiliary and peripheral equipments.

周辺装置への出力信号を任意に選択することが出来ます。周辺装置の構成が変わった場合に改造の手間が省けます。
Selectable output signals for auxiliary equipment. Unnecessary to modify when the configuration of auxiliary equipment is changed.

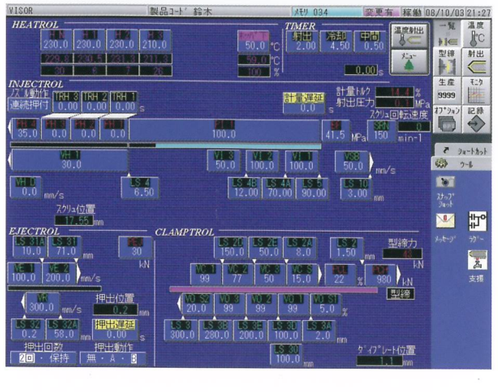




INJECTVISOR-S50　EC-S



INJECTVISOR-V50　EC-SX



10.2インチのカラー表示
・タッチパネル入力
・カラーLCD画面
・ステップスイッチによる設定
・市販のUSBメモリー対応

10.2 inch color display
・Touch Panel input
・Color LCD panel
・Selectable Step Switch setting
・Accommodate commercial USB memory

15インチ大型パネルで、さらに操作性が向上しました。
Clear and bright large 15 inch screen provides comfortable operation.

高性能HMI Human-Machine interface

一覧設定画面 Tabulated setting screen

温度、射出、型開閉、押出、タイマー条件が1画面で設定可能です。
All major condition in tabulated setting screen
・ワイドスプリットスクリーン　Wide Split-Screen
・ステップスイッチ／テンキー　Selectable Step Switch and ten key
・データ　オープン化(USBスロット)　Compatible with USB media
データ管理ソフトiPAQET LiTEによりデータの閲覧・印刷がパソコン上で行えます。
Equipped with stand-alone data management software "iPAQET LiTE"

3. 最新制御装置　New process controller

INJECTVISOR V50

・樹脂滞留防止機能
Resin degradation prevention

バレル内樹脂の熱劣化・分解防止のため、設定時間機械操作が行われない場合はバレル温度を設定温度まで自動的に下げる機能。

Prevent the resin degradation and heat decomposition in the barrel, temperature will be shifted to pre-set value if no operation time has been exceeded.

・手動背圧設定
Back pressure setting on manual mode

手動モードのみ有効となる樹脂パージ等に使用する個別背圧設定機能。
Independent BP setting valid only manual mode for material purging.

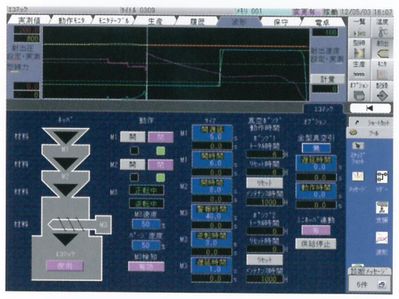
・プラグイン機能（オプション）
Auxiliary equipment plug in (Option)

合理化機器（取出機、温調機など）の操作画面を表示・操作することが出来ます。
注）対応出来ない機種があります。

The monitoring of auxiliary equipment such as take-out robot and mold temperature controller can be displayed and operated.
*Installation is restricted on some machines.

エコマック装置（減圧・適量樹脂供給装置）
ECOMAK Equipment(Decompression & Proper resin quantity supply equipment)

ECOMAK（協賛:株式会社ハルナ）
Support[HARUNA Co.,LTD]



プラグイン専用画面（成形機操作パネル内）
ECOMAK operation screen [On the operation panel]

メリット1（MERIT 1）

成形時の発生ガスを捕集し、
樹脂に含まれる有害物質や環境ホルモンを除去

ECOMAK equipment suck up the generating gas and remove the toxic substance in resin at time of molding.

メリット2（MERIT 2）

型内でのガス発生が少なく金型が汚れにくいため、
金型メンテナンス低減

Mold maintenance reduction by mold does not become dirty easily because of little generating gas in mold.

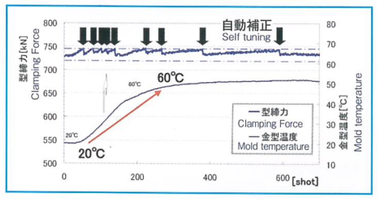
4. 高付加価値成形制御　High added value Molding Control Software

DST（Dynamic Self Tuning）　（V50 Standard）

成形の再現性と長期安定性を維持するための自動補正機能
Self-tuning control for retaining process reappearance and stabilized repeatability

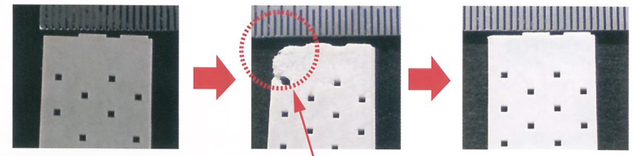
・DST-Press
（型締力補正 Clamping force self-tuning）

連続成形中の型締力変化を補正することで、常に一定の型締力を維持し、ガス逃げ状態の変化のない安定した成形が可能です。
Adjusting clamping force variation automatically in production realizes steady molding with stabilized clamping force and gas vent condition.



・DST-Fill
（成形条件補正 Injection process condition self-tuning）

樹脂のロット変化や再生材比率の変化による流動性変化に対し、成形条件を補正することで安定した品質を確保します。
Preserve product quality by compensating process parameters for transition in material flow condition caused by material lot change or mixing ratio change of regrind material.



良品成形
Good shot

ショートショット
Short shot

補正後
After self-tuning

射出圧縮「プレストロール・コアバック」
Injection compression "PRESTROL・CORE BACK" (V50 Option)

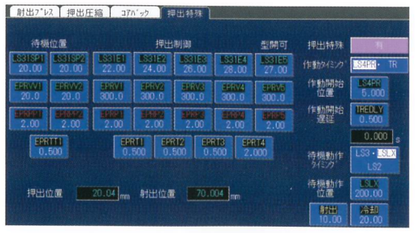
通常の型締力はもちろん、射出圧縮中の型締力もフィードバック制御し、正確な型締力で成形可能です。また、軽量化のための発泡成形を行なうコアバック制御でも型開位置補正制御により成形開始から安定した型開量を実現します。

Achieved steady molding continuously via feedback control of preset clamping force at injection compression in addition to usual clamping force. And realizing stable mold open position from production start in CORE BACK control for foam molding.

コアバック発泡成形によるドアトリム
Door trim by foam molding

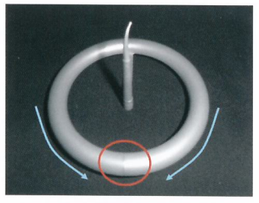
マルチEロール　Multi E-ROL (V50 Option)

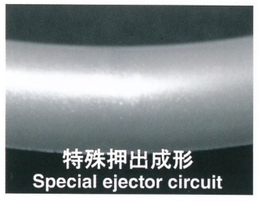
ゲートカットや部分圧縮など多様な押出アプリケーションをこなすマルチエジェクター回路
Multi ejector circuit to apply to various ejector application, e.g gate cut circuit ejector compression molding technologies.

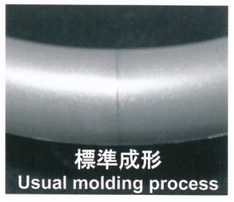


様々な動作に対応する設定項目
Effectual setting functions to apply various motion

・押出多段位置設定（最大5位置）
5-step multistage ejector position setting
・各動作任意設定（位置、速度、押出力）
Arbitrarily setting value available for each motion (Position, Velocity, Ejector force)
・押出タイミング設定
Ejector timing setting







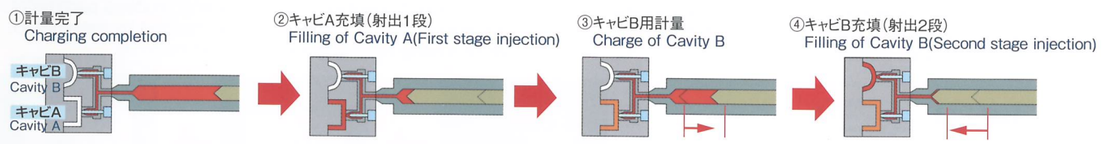
4. 高付加価値成形制御　High added value Molding Control Software

2段射出「Multi Cavity Molding」 Motion of two-stage injection "Multi Cavity Molding" (V50 Option)

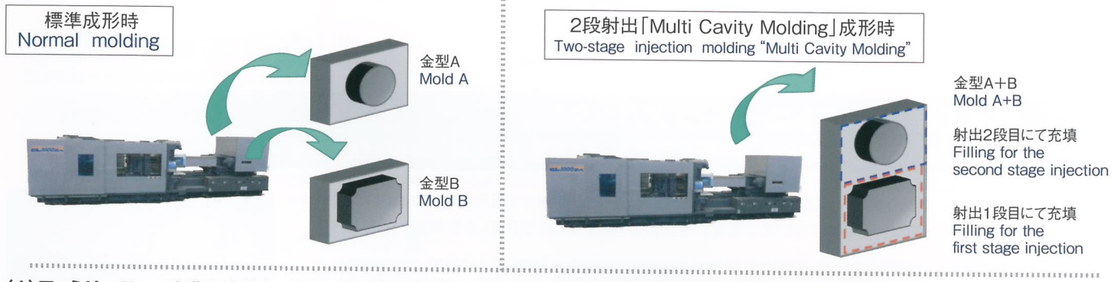
2段射出制御「Multi Cavity Molding」とは1サイクル中に2条件の射出動作を行なうことができる制御です。

"Multi Cavity Molding" is two-stage injection molding control and able to inject and switch two kind of molding process conditions in a cycle.

・動作
Motion



・効果
Advantages



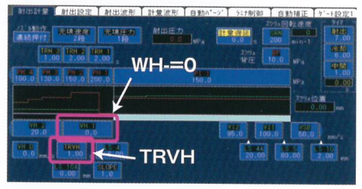
(1)ファミリーモールド化により金型製作数削減が可能!
(1)Reduction the number of molds is possible by family mold products

(2)射出装置のダウンサイジングが可能!
(2)Downsizing of the injection unit for injection molding machine

ナチュラルパック制御　Natural pack control (V50 Standard)

薄肉品など高速充填に必要な成形品の成形で、充填ピーク圧上昇によりバリ発生やソリなどの変形を生じる場合に効果のある制御です。

Thin-walled production which needs high speed injection needs this control and it prevents flash and warpage by inclining injection peak pressure.



アクティブオーバーライド制御　Active override control (S50/V50 Option)

充填工程中の設定圧力と実圧力の差および圧力勾配を検知しながら、圧力制御パラメータをリアルタイムに演算して、最適な圧力制御を行います。

Proper pressure is controlled calculating pressure control parameter in real time with detecting the difference between setting pressure during injection and real pressure, and pressure inclination.

アクティブオーバーライド制御 有 Control "ON"　アクティブオーバーライド制御 無 Control "OFF"

スクリュ高速後退制御　High speed screw retract control (V50 Option)

高速充填直後にスクリュを高速後退し、成形品のソリと板厚を調整します。

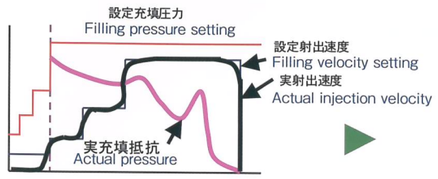
Adjusting the warpage & thickness for molding product by high speed screw retract movement after the high speed injection retract.

ラミナー制御　LAMINAR Flow Control (V50 Standard)

実充填圧力が設定圧力以上になる成形条件設定(フカシ成形)の場合、射出圧力主体に制御されるため、射出速度は外乱により変化します。ラミナー制御は、充填圧力で制御されている場合でも速度制御パターンを記憶し、速度制御として指示を与えるため安定した状態で低残留応力成形、転写性の向上、メルトフロントの層流化によるフローマークなど不良現象の低減、低圧成形(小さい型締力で大きな成形品が成形可能)などに効果を発揮します。

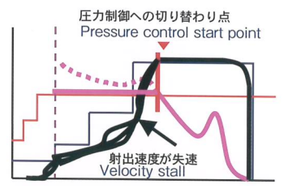
In the injection filling process when actual filling pressure reaches to the injection pressure setting, injection velocity is reduced, and the primary control parameter is shifted from velocity to pressure. Even during limited filling pressure setting, LFC converts the uncontrolled velocity stall curve to a numeric velocity setting as templated profile. This function decrease defects such as flow marks by means of generating a laminar flow at the melt front, allows low-pressure molding, reduces internal stress, and improves transferability.

■定常成形
Stabilized Molding



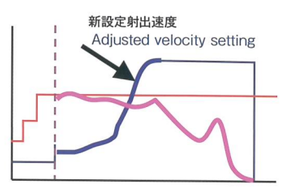
通常成形
Velocity-controlled process

■フカシ成形
Pressure Controlled Process



充填工程で圧力制御している成形
Molding using pressure control during the filling stage

■ラミナー制御
LAMINAR Flow Control



ラミナー制御による成形
Molding using Laminar Flow Control

プラストロール　PLASTROL (V50 Standard)

プラストロールは計量完了後のスクリュ動作を4つのモードで制御し、可塑化樹脂量の安定化と共にスクリュのチェックリング応答を安定させます。充填樹脂量の微小な調整や保圧切換圧力の安定化に抜群の効果を示します。

PLASTROL controls screw movement after metering by utilizing four modes and stabilize the volume of plasticized resin, as well as the screw check ring response. This control is effective for the precise adjustment of the filled resin volume and stabilization of the holding pressure switchover pressure.

VHI回路　Virtual Hydraulic Injection (VHI) Circuit (V50 Standard)

VHI回路は電動式射出成形機ECシリーズにおいて、油圧式射出成形機と同様な特性で射出動作を行う回路です。油圧式射出成形機が持つ作動油の圧縮性とポンプの吐出特性を再現することでなめらかな射出充填動作を可能とし、キャビティバランスの安定と製品品質の向上に貢献します。

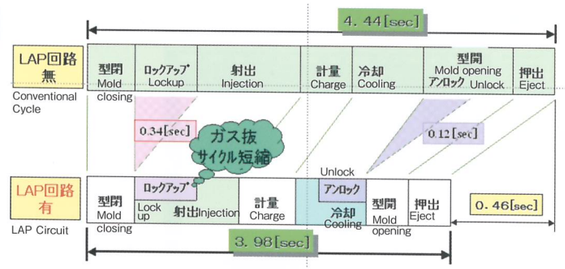
The VHI circuit enables operation of the EC Series of all-electric injection molding machines in a similar manner to operation of a hydraulic injection molding machine. Reproducing the hydraulic fluid compressability and pump discharge characteristics inherent in a hydraulic machine for a smooth injection filling phase, resulting in improved cavity balance and product quality.

FIT制御　Filling Impulse Transfer control (V50 Standard)

LAP回路　LAP Circuit (Standard)

LAP回路の使用と冷却中のアンロック動作により、ガス抜きの改善や転写性の向上及びサイクル時間の短縮が可能となります。

The use of this LAP Circuit with its overlapping feature during clamp lock up and unlocking phase, improves degassing, transferability and decrease the overall cycle times.



射出速度FF制御　Injection speed feed forward control (Standard)

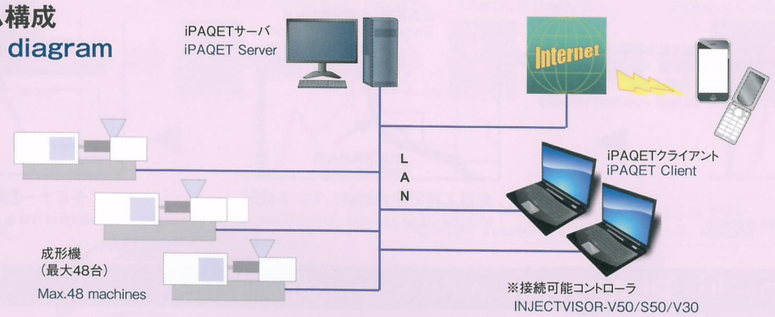
5. ネットワーク　Network

リモート監視･管理システム “iPAQET”
iPAQET Remote monitoring and management system (S50/V50 Option)

LAN回線により多数台の成形機をリアルタイムに監視･管理。生産状況の監視や品質データの蓄積･分析機能に加え、成形機の稼働状況や樹脂ロットの監視まで幅広い情報の集中管理が可能です。場所や時間にとらわれず、いつでもどこでも国境を越えて生産現場の状況が把握できるオープンな環境を提供いたします。

This system ultilizes a LAN network to monitor and manage a large number of injection molding machines in real time. In addition to production monitoring and data collection and analysis, from injection molding machine operation status to resin lot monitoring is possible. Regardless of location or time, production status can be checked at any time and from any place, even across international borders.

● システム構成 System diagram



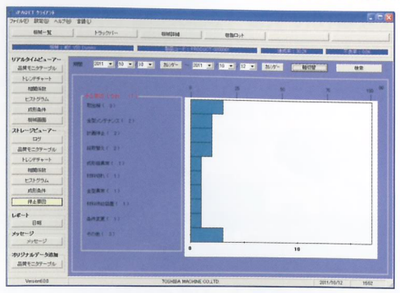
iPAQET Mobile

iPAQETクライアントのWebブラウザ化によりiPad等タブレット、フルブラウザ搭載の携帯端末にて成形機の遠隔監視が可能です。
Monitoring injection molding machines from iPad or smart phone that has full internet browser

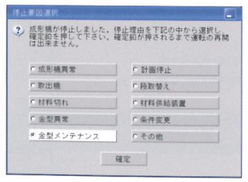
いつでもどこでも自社工場の生産状況を確認出来ます

停止要因分析機能 Stop cause analysis function

成形機停止時に選択された停止要因をiPAQETにて集計。指定日時及び製品毎の停止要因を分析可能です。
Analysis the cause of stopping that user select the reason on the machine.



iPAQET停止要因グラフ画面
Stop cause analysis graph of iPAQET

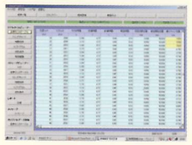


成形機側停止要因選択画面
Machine display of stop cause analysis function

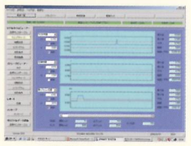
■主要画面　Major screen

稼動状態一覧
（製品名･生産進捗･サイクル時間）
Status display

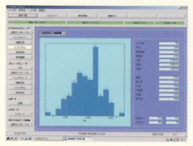
機械詳細
（生産詳細･トラックバー･樹脂ロット管理）
Machine detail



品質モニタテーブル
（品質モニタ値一覧）
Quality monitoring table



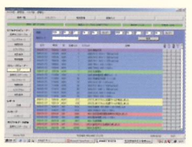
品質トレンドチャート
（トレンドグラフ･簡易統計値）
Quality trend chart



品質ヒストグラム
（ヒストグラム･詳細統計値）
Quality histogram

成形条件
（表示･保存･変更･送受信）
Molding condition

機械画面
（成形機コントローラ画面の表示/保存）
Machine display



ログ
（条件変更/アラーム/操作/稼動履歴）
Log data

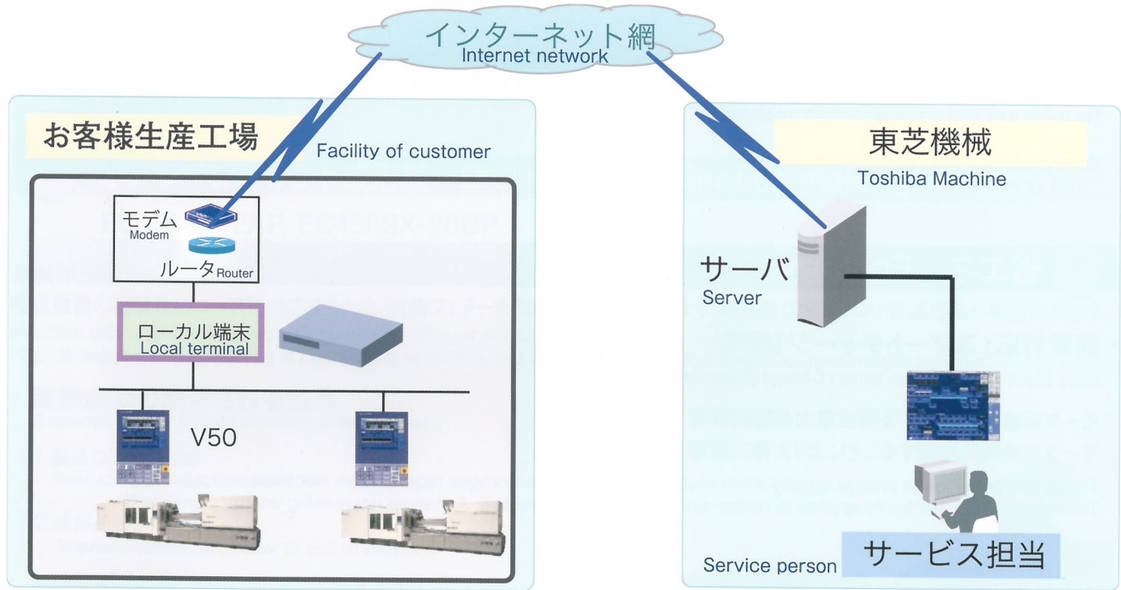
リモートメンテナンス
Remote maintenance (V50 Option)

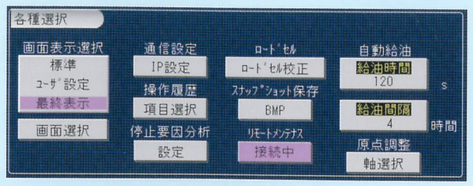
東芝機械サービス担当よりお客様の成形機画面を遠隔操作可能

Operating the screen of injection molding machine remotely by Toshiba Machine service

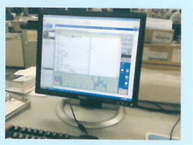
- **リモートメンテナンス導入のメリット**
  1）機械停止時間の短縮
  2）成形支援

Benefit of installation for Remote maintenance
1）Reduction down time of the machine
2）Assistance the molding





成形機画面にて接続開始釦を押していただくことで遠隔監視が可能となります。
Starting remote maintenance connection when customer press the start button.



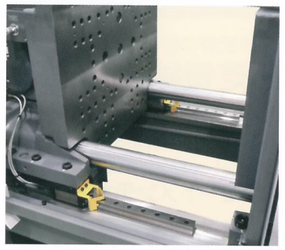
6. クリーン化・省エネ　Clean & Ecology

クリーン化　Clean

・タイバーグリースレス（標準）
Greaseless tie bars (Standard)

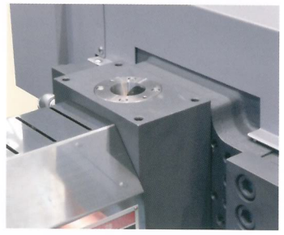
タイバーをグリースレスとし、金型・製品へのグリース付着がなくなりクリーンな環境を維持します。また、成形品の取出しや金型交換の際にグリースで汚れることがなく、作業性が向上します。

Greaseless tie bars eliminates grease sticking to mold and product allowing clean production environment. Eliminates grease problems in parts take-out and mold replacement operations and improves productivity.



・ホッパー口防錆対策（標準）
Rust-proofed hopper throat (Standard)

製品への錆び・ゴミの混入がなくなります。
No more rust and contaminants in materials.



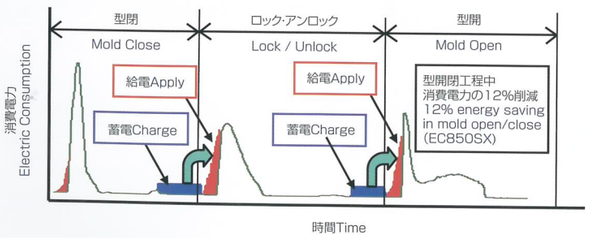
※ i61以上はオプション。
i61 or more are option.

省エネ　Ecology

・節電対応：スマートチャージ（標準）
Save Electricity solution: Smart Charge (Standard)

モータ減速時に発生する回生電力を高速蓄電
モータ加速時に給電することにより大幅に節電

The system enables to charge quickly while motor decelerate and storages regenerative electricity.
The regenerative electricity applies to motor when acceleration needs it. Achieved decreasing energy significantly.



測定条件
金型重量：2トン
型開閉ストローク：600mm
型開閉速度：全域最大速度

Measuring condition
Mold weight : 2ton
Clamp stroke : 600mm
Mold open/close speed : Maximum

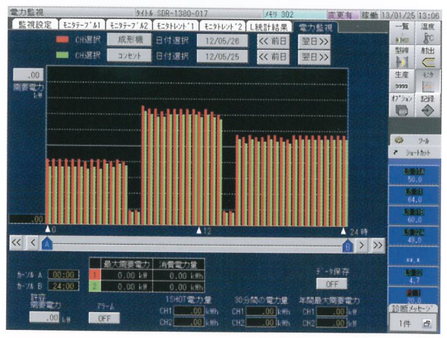
・電力消費監視システム（V50オプション）
Energy consumption monitoring system (V50 Option)

機械の消費電力をリアルタイムで監視し、省エネに寄与します。（電力の見える化）

Monitor the power consumption of machine and useful for energy saving “Visualization of the power”.

INJECTVISOR-V50のモニタ上に、1日の需要電力の分布を棒グラフで表示します。

Display bar chart of the demand power per a day on the INJECTVISOR-V50 screen.



7. 特殊機　Special machines

超高速射出成形機　Super high speed injection molding machine

EC100SX-2ZZ, EC130SX-2Z, EC180SX-3Z

電動サーボ駆動で世界最速・高応答の射出装置
超薄肉成形における高流動長・均一板厚・低残留応力成形を実現します。

The fastest and quickest response electric-servo drive injection unit in the world. Long flow lengths, uniformed thickness, and low residual stress on ultra thin-walled products.

1. Wノズルタッチモジュール
Double nozzle touch module

固定ダイプレートの倒れ防止効果で薄肉製品の均一肉厚を維持します。
（単独オプション対応も可能）
Tilt prevention of the stationary platen provides increased parallelism on the thin-walled production. (Option)

2. DDサーボモータ
DD servo motor

新開発の低イナーシャ・高応答サーボモータとダイレクトドライブの組合せにより、高トルク・低イナーシャを両立した超高応答射出を実現しました。
Newly developed low inertia, high torque and fast response direct drive servo motor provides super high speed injection.

オンラインブレンド成形機　On-line blend injection molding machine

EC100SX-2AP, EC450SX-26BP

単軸押出装置とプランジャ機構を組合せた射出装置。
輸送機器の軽量化のニーズに対応するため、直接フィラーを混練溶融することにより、高強度性能やコスト低減効果が期待出来ます。
Injection unit with single spindle Extruder and plunger structure.
High strength and cost cutting is possible by kneading and melting filler directly in order to meet weight saving of transportation.

・直接成形の期待される効果
Expecgancy of Direct molding effectiveness

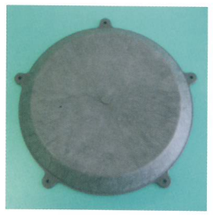
1.製造コストの削減
Reducing production cost

2.成形品物性の向上
Improve physical property out of molding

3.成形性の向上
Improvement of molding

・直接成形で出来ること
Things that Direct molding can do

1. FRTPの直接射出成形
Direct injection molding of the FRTP.
2. 無機充填プラスチックの直接射出成形
Direct injection molding of the Inorganic filling plastic.
3. ポリマーアロイの直接射出成形
Direct injection molding of the Polymer alloy.
4. 未乾燥原料の直接射出成形
Direct injection molding of the Non dried material.
5. 耐熱プラスチックや難燃プラスチックの直接射出成形
Direct injection molding of the Heat-resistant and Noncombustible plastics.
6. リサイクル材料の直接射出成形
Direct injection molding of the Recycled material.
7. プラスチック材料の開発
Development of the Plastic materials.

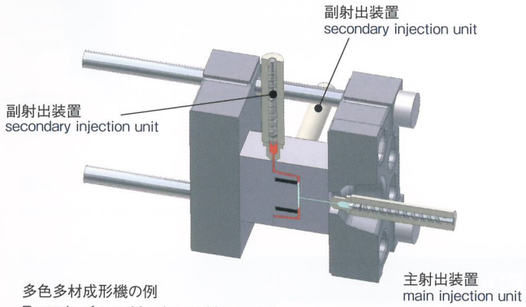


7. 特殊機　Special Machines

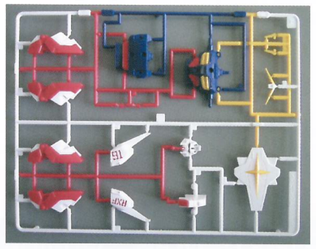
多色多材成形機　Multi-color, Multi-material injection molding machine

電動式射出成形機ECシリーズに副射出装置を組み合わせることで、カスタマイズされた電動式多色多材成形機が出来上がります。副射出方向は任意に取付可能で、射出ユニットはECシリーズの中から選択可能です。副射出装置を使用しなければ通常の金型でも成形が可能です。

Combining a secondary-injection unit with an EC Series all-electric injection molding machine, a customized all-electric multi-color/multi-material injection molding machine solution can be realized. The orientation of the secondary injection unit can be freely set, and injection units can be selected from within the EC Series. If the secondary injection unit is not to be used, standard molding is possible.



多色多材成形機の例
Example of a multi-color, multi-material injection molding machine



4色射出成形機による成形品
Product molded with a four-color injection molding machine

キャップ　樹脂:PP+TPE
cap, resin:PP+TPE

サンドイッチ射出成形機　Sandwich molding machine

再生材のコア層をバージン材のスキン層でサンドイッチする2連射出装置を備えた成形機で材料のリサイクルに有効です。保有されている油圧式成形機に電動射出装置を副射出として後付け配置させることも可能です。

This injection molding machine combines twin injection units for sandwiching a core layer of recycled material with a skin layer of virgin material. It is an effective means of material recycling. Retrofitting an existing hydraulic injection molding machine with an electric secondary injection unit is also possible.

MuCell®仕様　MuCell specification

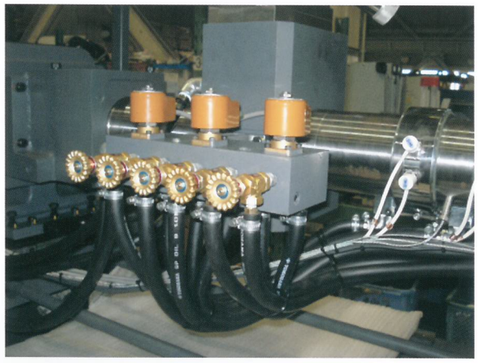
高い樹脂溶解性を持つ窒素ガスや炭酸ガスをシリンダ内の溶融樹脂に供給、微細発泡することにより型内圧の低下、溶融樹脂粘度の低下、成形収縮率の低下が得られ、ソリの解消、充填圧力低減等に効果を発揮する成形システムです。米国TREXEL社の特許技術で当社は技術使用許諾ライセンス契約を結んでいます。

In this system, nitrogen or carbon dioxide gas that exhibits high solubility in resin is supplied to the resin melt in the cylinder, and as a result of subsequent micro-foaming, a reduction in cavity pressure, a reduction in molten resin viscosity, and a reduction in mold shrinkage are obtained. These phenomena translate to the elimination of warpage and a reduction in filling pressure. U.S. firm TREXEL, INC. has patented the technology, and Toshiba Machine has concluded a licensing agreement that permits use of the technology in its machines.

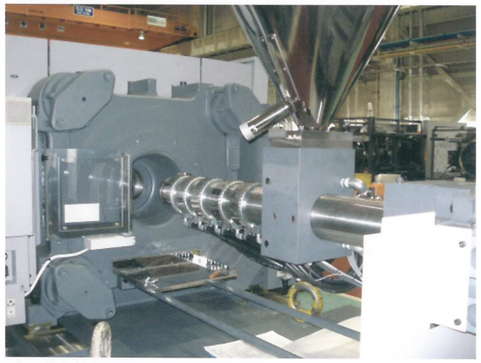
熱硬化性樹脂成形機　Thermoset resin injection molding machine

熱硬化性樹脂の成形やゴムの成形専用の電動式射出成形機です。独自の油循環式PLCコントロールによる精密な温度制御をはじめ、実績豊富な型締、射出機構などで、寸法精度の高い成形品を作ることができます。また、BMC専用成形機の対応も可能です。

This machine provides an all-electric injection molding solution for thermoset resins and rubbers. Products featuring high dimensional precision can be molded as a result of precise temperature control based on our own oil circulation-type PLC control and also through our vast experience in clamping and injection mechanisms. Furthermore, specialized BMC molding machines can be designed.



PLC温調バルブユニット(反操作側)
Proportional Liquid Cooling valve unit (Non-operation side)

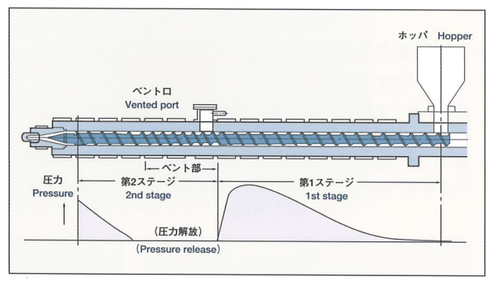


バレル温度制御部
Barrel temperature control unit

ベント式射出成形機　Vented barrel type

原料がバレル内を溶融していく過程で、水分、揮発成分、モノマーの除去を行うことができ、乾燥工程の省略による省力化、成形品物性の向上、作業環境向上、生産効率の向上等が図れる成形システムです。また、金型内に付着する汚れも低減できます。

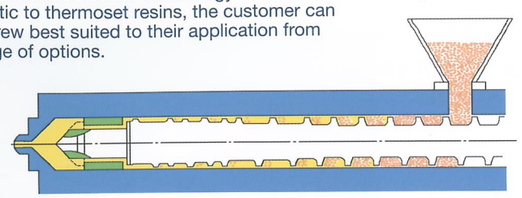
During the raw material melting process in the barrel, moisture, volatile and monomer content can be removed and energy can be conserved through elimination of pre drying the resin. The molding system allows the quality of molded products to be improved, the working environment to be enhanced, and productivity gains. In addition, mold deposits can also be reduced.



8. スクリュ　Screw

熱可塑性樹脂から熱硬化性樹脂まで様々な樹脂に対応した東芝機械のスクリュ技術により、豊富なバリエーションの中から用途に応じたスクリュを選択していただけます。スクリュにより新たな成形の可能性が広がります。

As Toshiba Machine's screw technology caters to a wide variety of resins from thermoplastic to thermoset resins, the customer can select a screw best suited to their application from a wide range of options.



標準スクリュ　Standard screw

・汎用DBGスクリュ（ショートサブフライトスクリュ）
General-Purpose DBG Screw (Short Sub-Flight screw)

対応樹脂：汎用樹脂、難燃性樹脂からエンプラまで
Resin:　From general-purpose resins, flame-retardant resins to engineering plastics.

特　長：サブフライトの効果により均一な溶融が可能で高い混練性及び材料の加熱防止効果が得られ、幅広い樹脂に対応します。
Characteristics: The Sub-Flight effect enables uniform melting and high kneading performance. The screw can be used with a wide range of resins.

樹脂別スクリュ（オプション）　Screws for specific resins (Option)

・BFスクリュ（フルフライトスクリュ）
BF Screw (Full-Flight screw)

対応樹脂：汎用樹脂、エンプラ
Resin:　General-purpose resins, engineering plastics

特　長：小径スクリュ用に開発されたスクリュで、ロングフィードにより安定した可塑化能力を発揮します。
Characteristics: This screw was developed as a small-diameter screw, and with the use of a Long Feed design, repeatable plasticization capacity is achieved.

・GN4スクリュ（フルフライトスクリュ）
GN4 Screw (Full-Flight screw)

対応樹脂：PMMA, PC
Resin:　PMMA, PC

特　長：緩圧縮、フルフライトスクリュにより安定した可塑化能力を発揮します。
Characteristics: Through the use of a Full-Flight design and a relaxation of the compression zone, repeatable plasticization capacity is achieved.

・DBCスクリュ（ショートサブフライトスクリュ）
DBC Screw (Short Sub-Flight screw)

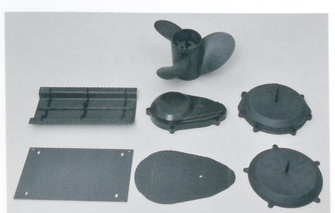
対応樹脂：硬質塩化ビニール
Resin:　Rigid polyvinyl chloride

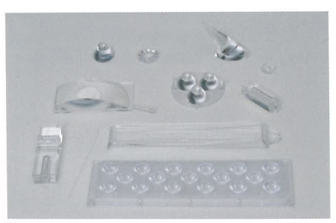
特　長：低圧縮により内部発熱を抑えることで塩ビの低温安定成形を可能にしました。
Characteristics: The low compression Sub-Flight design suppresses the amount of internal heat generation and enables stable low-temperature molding of polyvinyl chloride resin.

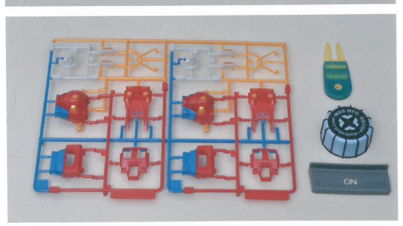
・SRBスクリュ（ロングサブフライトスクリュ）
SRB Screw (Long Sub-Flight screw)

対応樹脂：汎用樹脂、エンプラ
Resin:　General-purpose resins, engineering plastics

特　長：ロングサブフライトにより高い混練性が得られ精密・安定成形に適しています。
Characteristics: High kneading capability is achieved on account of the screw's Long Sub-Flight design. The screw is suitable for precision, reproducible molding.







9. グローバル・スクール成形技術支援　Worldwide CS Network

お客様をフルサポートする信頼のメンテナンス体制。東芝機械のワールドワイドCSネットワーク

お客様が笑顔で射出成形機をお使いいただけるように、サービスネットワークを充実。東芝機械は国内はもとより世界各国で、常にスピーディにお客様をサポートします。

A reliable and highly-responsive servicing system provides full support to all its machine users. TOSHIBA MACHINE'S worldwide CS network

TOSHIBA MACHINE'S enhanced service network has earned the approval of all its injection molding machine users.
TOSHIBA MACHINE provides quick service to its worldwide customers.

ISスクール

ISスクール（本社工場内）では、射出成形機の運転取扱い、成形技術、保守技術などの習得を目的とした講習を行っています。受講される方々の経験、レベル、目的に応じて5つのコースをご用意しております。

IS SCHOOL

The Numazu IS SCHOOL- courses are given so that the participants can acquire technology and skills. (Operation of the injection molding machine, molding technology, maintenance, etc) Depending on the participants experience level and/or purpose, five courses are available.

成形技術支援

東芝機械はお客様の品質・効率向上のために、ハード・ソフト両面からお客様をサポートいたします。
テクニカルセンター（本社工場内）では、多様な成形テストに対応するための射出成形機を数多く設置しております。成形品の品質向上やサイクルアップ、新製品のトライなど何でもご相談ください。

MOLDING SOLUTIONS

We at TOSHIBA MACHINE can offer both special hardware / software solutions so that customers can improve molding quality and efficiency.
In order to facilitate various mold tests, the Numazu Technical Center is equipped with a wide selection of injection molding machines.
Please talk to us about anything including improvement of part quality, reduction in cycle time, trial of a new part etc.