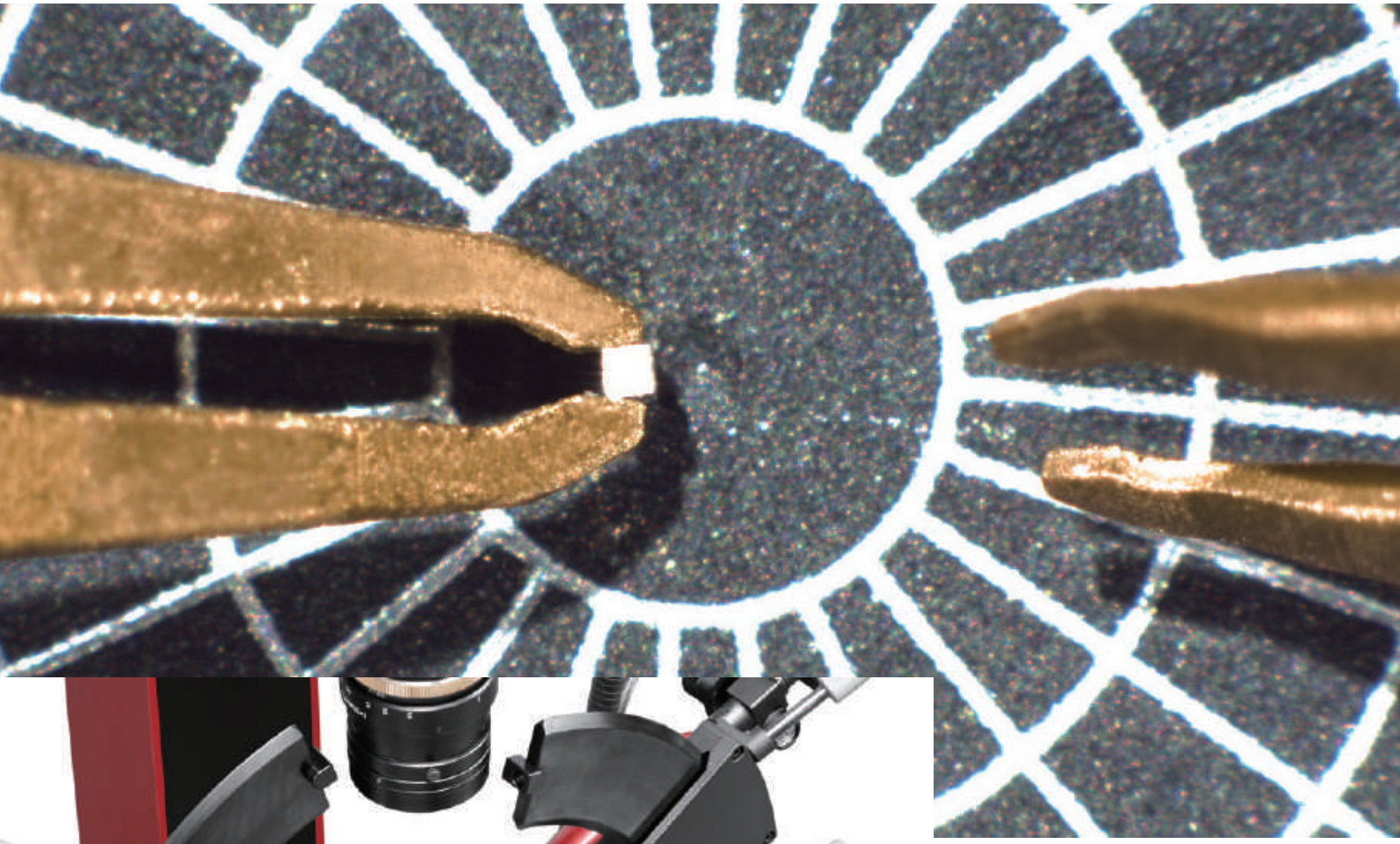
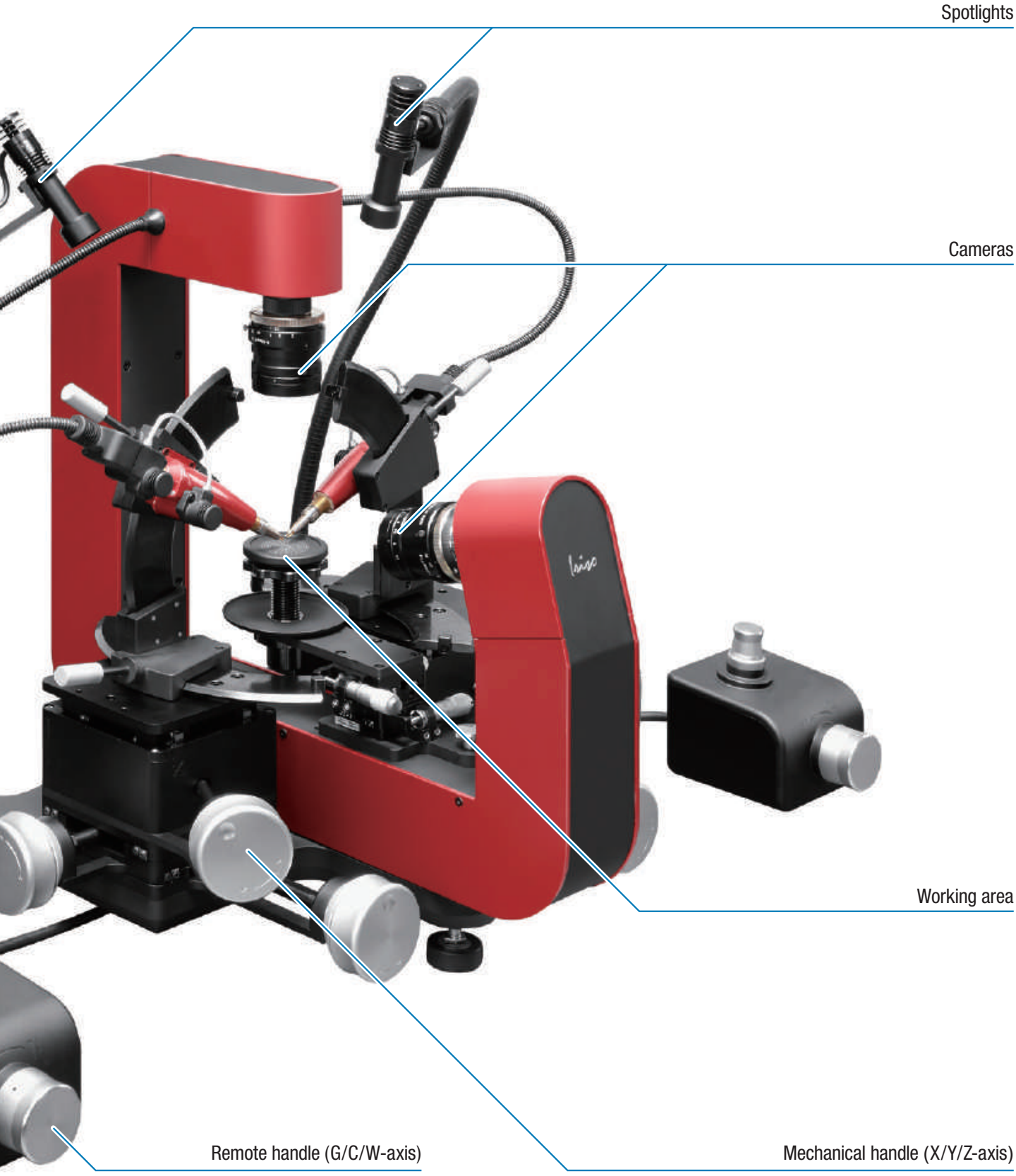
DMG MORI SEIKI



Micro Part Handling System

Ultimate Micro Handling Device for Ultrafine Workpieces

In the micro machining field it has been considered to be impossible to machine workpieces with a size of 0.02 to 1 mm (0.0008 to 0.04 in.). The Micro Part Handling System was developed to meet ever-growing "sub-millimeter" demands from the medical and other industries. This revolutionary system, which enables ultrafine parts to be carried and assembled easily, dramatically improves micro part handling that used to be performed by hand, and significantly increases mass-productivity as well as efficiency of a finishing process. Providing excellent cost performance, accurate movements and outstanding operability ensured by the use of high-precision components, the Micro Part Handling System opens up new possibilities for your production.



CONTENTS

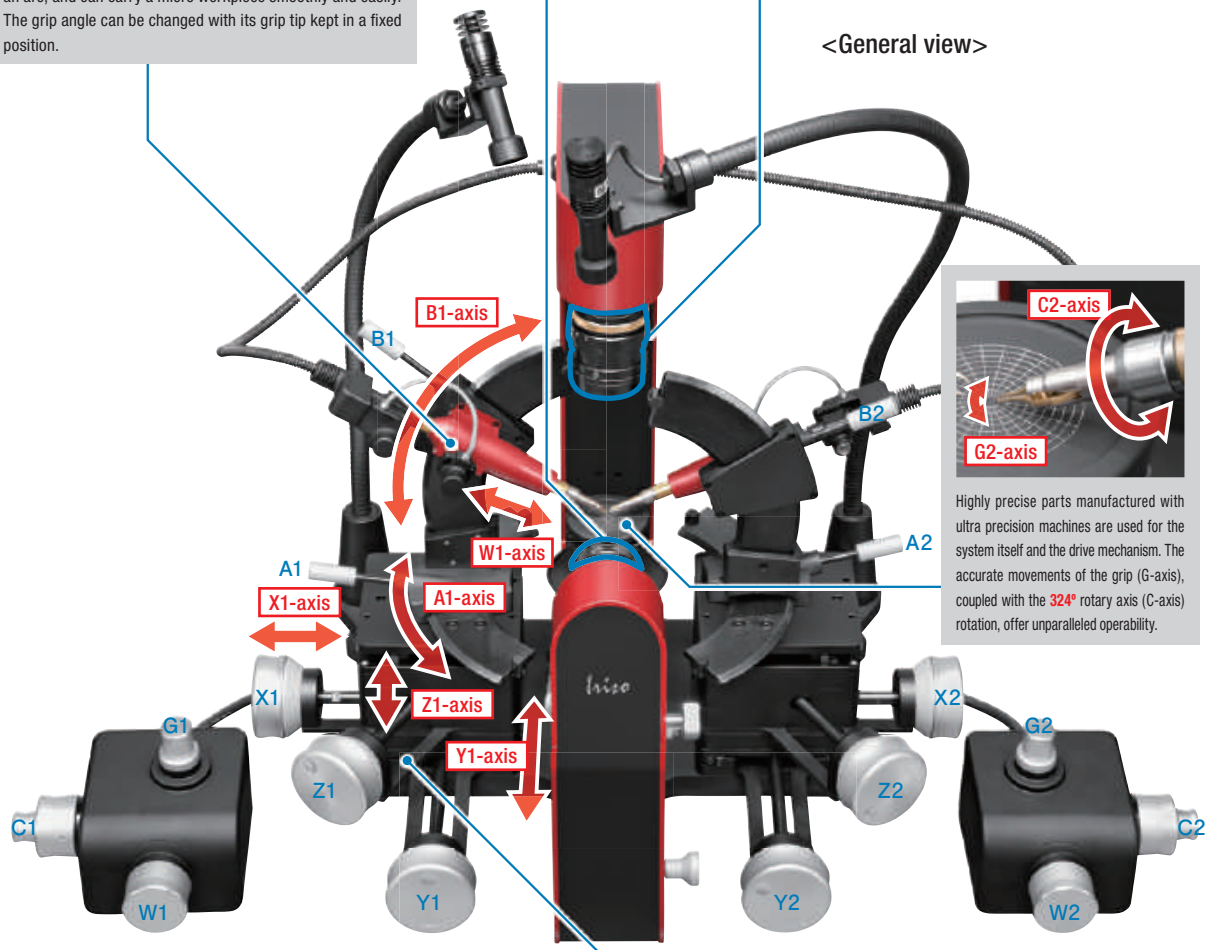
Basic structure/Operation

The grip arm (B-axis) with a large movable range moves in an arc, and can carry a micro workpiece smoothly and easily. The grip angle can be changed with its grip tip kept in a fixed position.

Camera

- 5-million-pixel CMOS color, CCTV lens
- Standard field of vision: 8.3×6.2 mm (0.33×0.24 in.)
- Enlargement/reduction ratio: Monitor magnification: 69 times (100%)
  Capture magnification: 10% — 1,600%

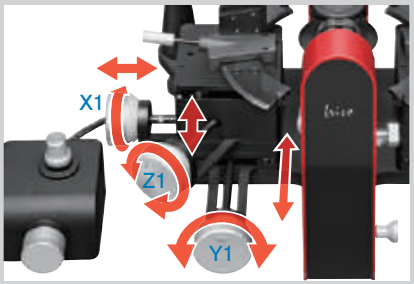
<General view>



Highly precise parts manufactured with ultra precision machines are used for the system itself and the drive mechanism. The accurate movements of the grip (G-axis), coupled with the 324° rotary axis (C-axis) rotation, offer unparalleled operability.

Grip travel per handle revolution

- Horizontal (right and left) traveling axis (X-axis) : 1.0 mm (0.04 in.)
- Back and forth traveling axis (Y-axis) : 1.0 mm (0.04 in.)
- Up and down traveling axis (Z-axis) : 0.5 mm (0.019 in.)
- Horizontal rotary axis <manual type> (A-axis)
- Vertical rotary axis <manual type> (B-axis)
- Back and forth in/out axis (W-axis) : 0.9375 mm (0.037 in.)
- Rotary axis (C-axis) : 324°



The X, Y and Z axes provided on both left and right arms enable fine positioning of the grips with the handles.

Features/Operability

Highlights

- Micro parts handling by manipulating the left and right grips with the handles
- The single grip movable in eight-axis directions allows flexible manipulation
- Images taken from the top and front of the workpiece with cameras can be simultaneously displayed on the monitor
- Clear images by flexible light adjustment
- Lightweight design for portability

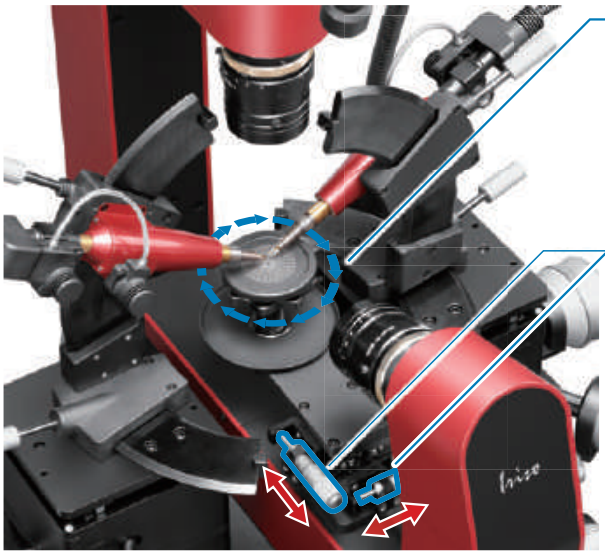


Table height adjuster

In addition to its key feature of multiple movable axes, the system has a height adjuster to adjust table heights in units of 0.1 mm (0.004 in.), offering greater ease of use.

Table position fine-adjustment dials

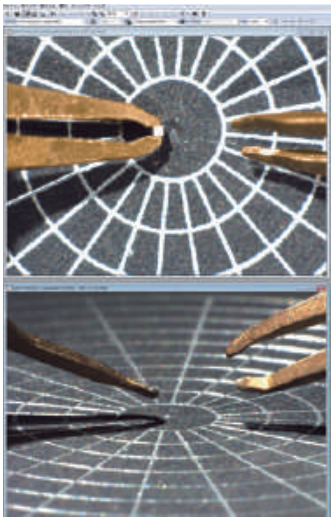
These dials are used to make fine-adjustments of table positions in the X- and Y-axis directions when setting a micro part on the table. These dials enable accurate movements of the hands.

Workpiece setting slider

Setting/removing ultrafine workpieces on/from the table, which requires extremely delicate handling, can be performed easily by sliding the table back and forth. This facilitates setup operations and significantly increases productivity.

Monitor <Cameras (for 2 directions)>

Front and top views taken with two cameras can be displayed on the 23-inch full high definition monitor, improving space recognition, visibility and operability.

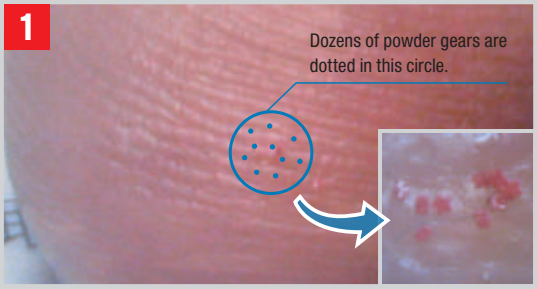


Application example

Extra machining of a micro-size, injection-molded part

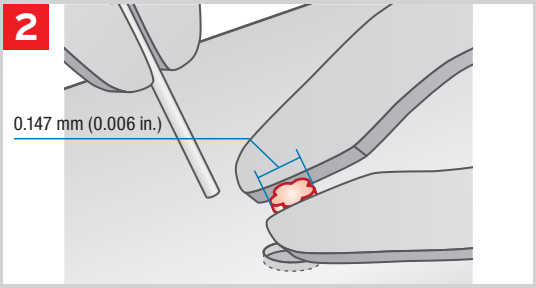
<Example: drilling of powder gears>

1



Minute, injection-molded powder gears (you can see how small they are when compared to the size of the finger prints) can be easily carried and placed with the high-precision grips.

2

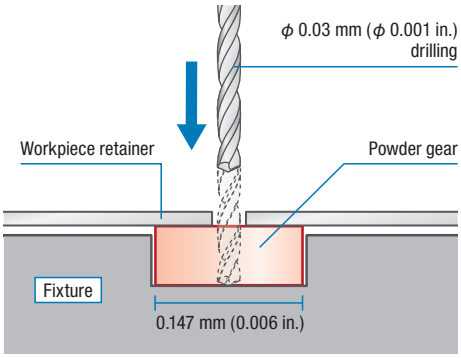


A powder gear is picked up by the right grip, and then placed into the fixture by the left grip with a fixing bar. The Micro Part Handling System allows you to move a micro part precisely, but naturally as if it were done by bare hands.

3

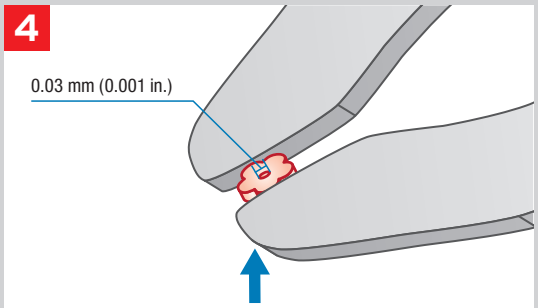
NVD1500 DCG HSC

The fixture with the workpiece placed on it is set on the NVD1500 DCG HSC, a vertical machining center suitable for micro machining, which allows less thermal displacement and is able to control by programming in units of 0.0001 mm (0.00001 in.).



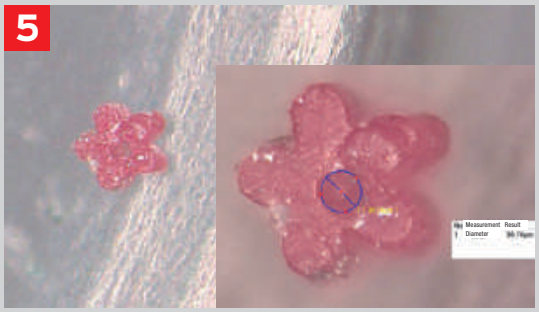
Start of hole drilling of the powder gear. The NVD1500 DCG HSC equipped with various functions and equipment for micro machining is capable of realizing ϕ 0.03 mm (ϕ 0.001 in.) superfine hole drilling of ultrafine workpieces.

4



The powder gear is removed from the fixture and carried to a designated case by the grip. Each of the eight axes able to move widely allows smooth adjustment of position changes for workpieces.

5



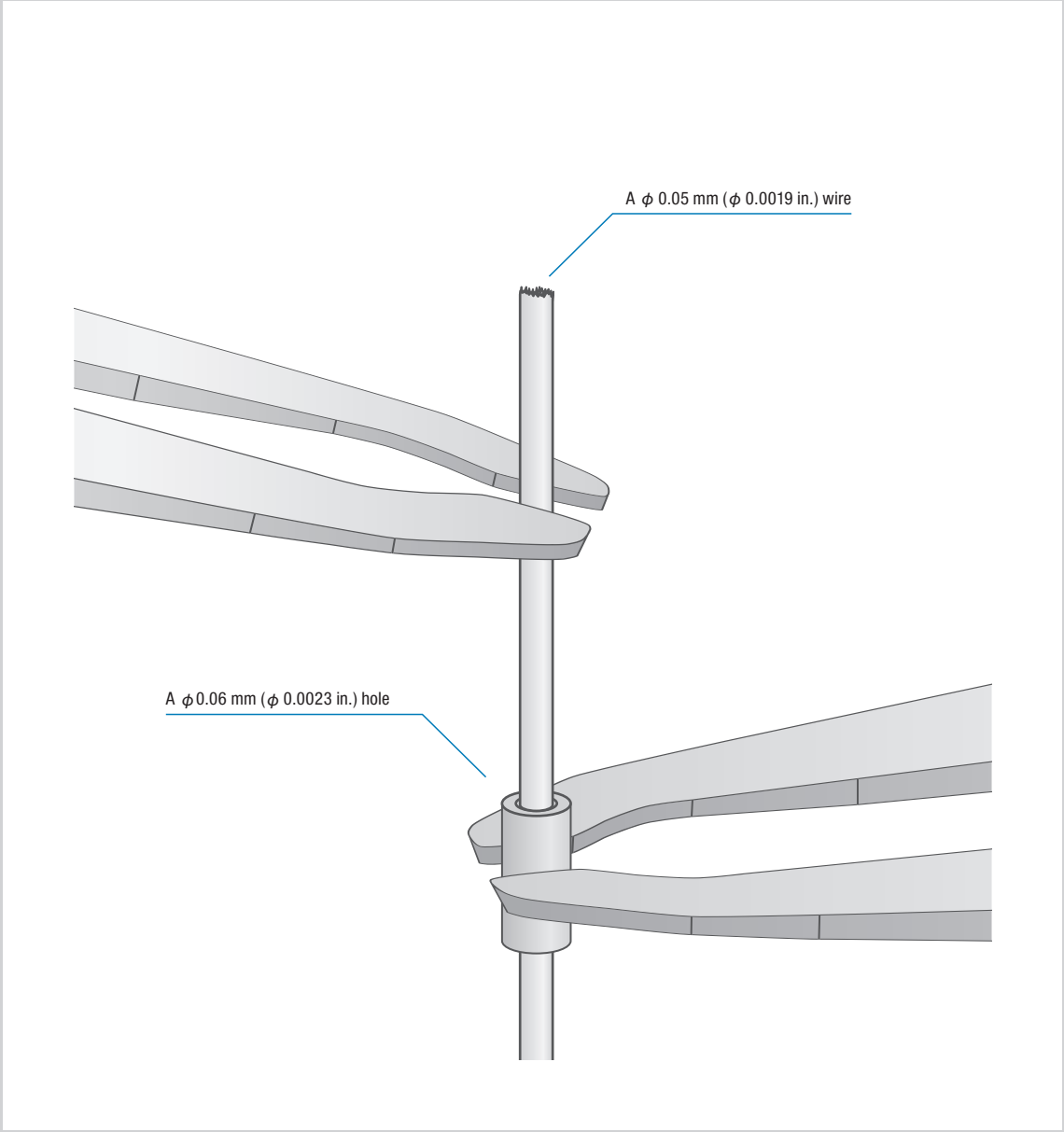
Completion of hole drilling of the powder gear with the world's smallest weight of one millionth gram. The Micro Part Handling System supports new possibilities of research and product development that need ultrafine parts.

The powder gear with five involute teeth created by injection molding <diameter: 0.147 mm (0.006 in.), thickness: 0.08 mm (0.003 in.), weight: one millionth gram> The Micro Part Handling System is capable of conducting a series of actions (hold→carry→place) easily and accurately for micro parts which are only visible with a microscope. As the system was developed aiming to allow any operators to surely handle micro parts, it enables accurate setting of workpieces within a micro area and pre-programmed additional shape machining of micro parts. The system thoroughly supports every possibility of micro cutting of parts created by injection molding and metal insert molding, which has been considered impossible by now.

Application example

Handling of superfine pin

<Example: work to pass a ϕ0.05 mm (ϕ0.0019 in.) wire through a ϕ0.06 mm (ϕ0.0023 in.) hole>



The single grip movable in eight-axis directions realizes precise positioning of workpieces when conducting painstaking work that uses superfine wires. The highly precise movement enables a ϕ 0.05 mm (ϕ 0.0019 in.) wire to pass through a ϕ 0.06 mm (ϕ 0.0023 in.) hole from directly above.

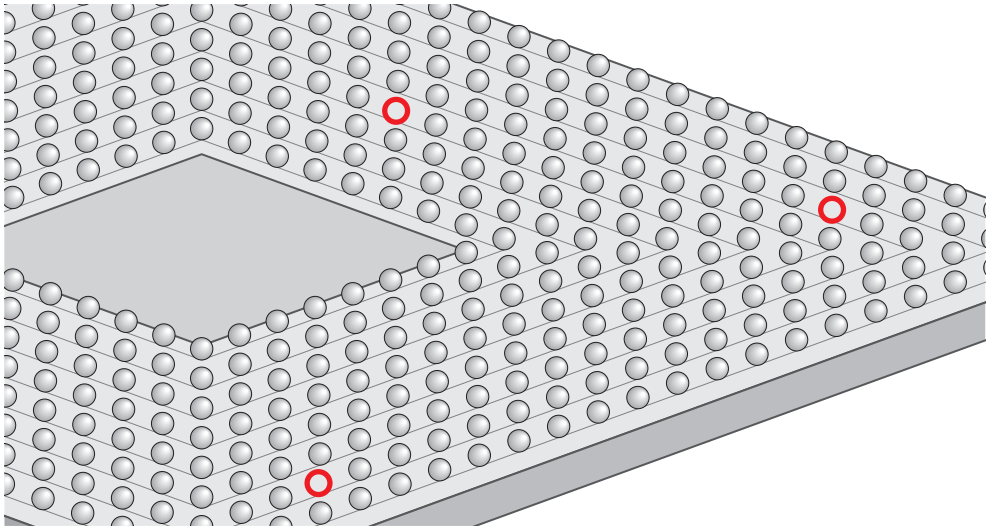
Assembly process in the development of spring contact probes for inspecting printed boards and electronic components. The Micro Part Handling System maximizes its capabilities when handling the superfine pin that requires a high level of accuracy. The cameras installed on the upper and front sides of the system allow high spatial understanding and visibility. The grip arms (the B-axes) are able to move in an arc while fixing the grip tip position, which contributes to significant improvement of operating efficiency. The Micro Part Handling System realizes the assembly of the micro spring contact probe with a size of 0.2 mm (0.008 in.) or less with its high capabilities.

Application example

Rework of micro solder ball placement

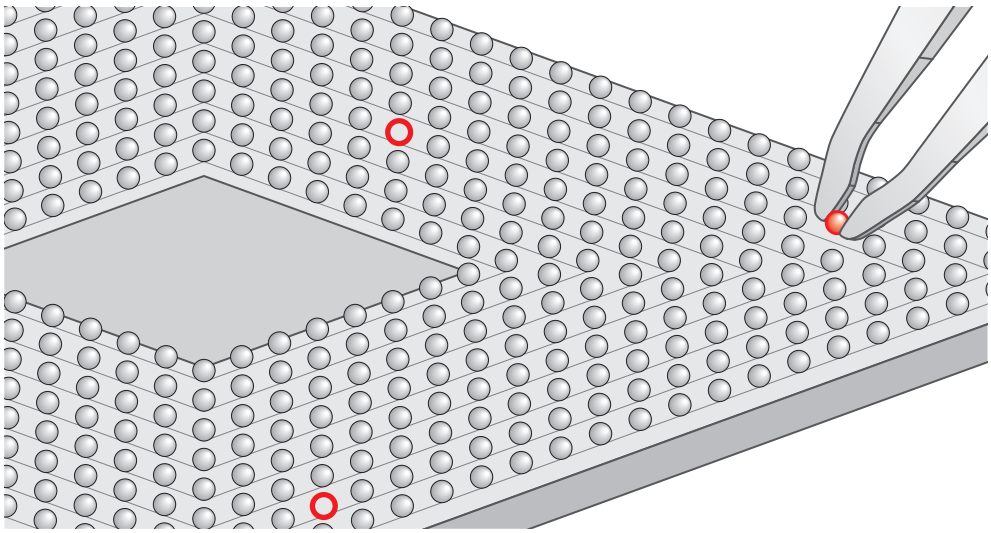
<Example: Placement of solder balls (BGA) with a ϕ 0.2 mm (ϕ 0.008 in.) or less>

1



Defects in printed boards themselves (patterns, through holes, lands) and the lack of solder balls caused by insufficient soldering are problems when solder ball placement is conducted automatically. Placement of micro-size solder balls is very difficult even when it is conducted manually by craftspeople.

2



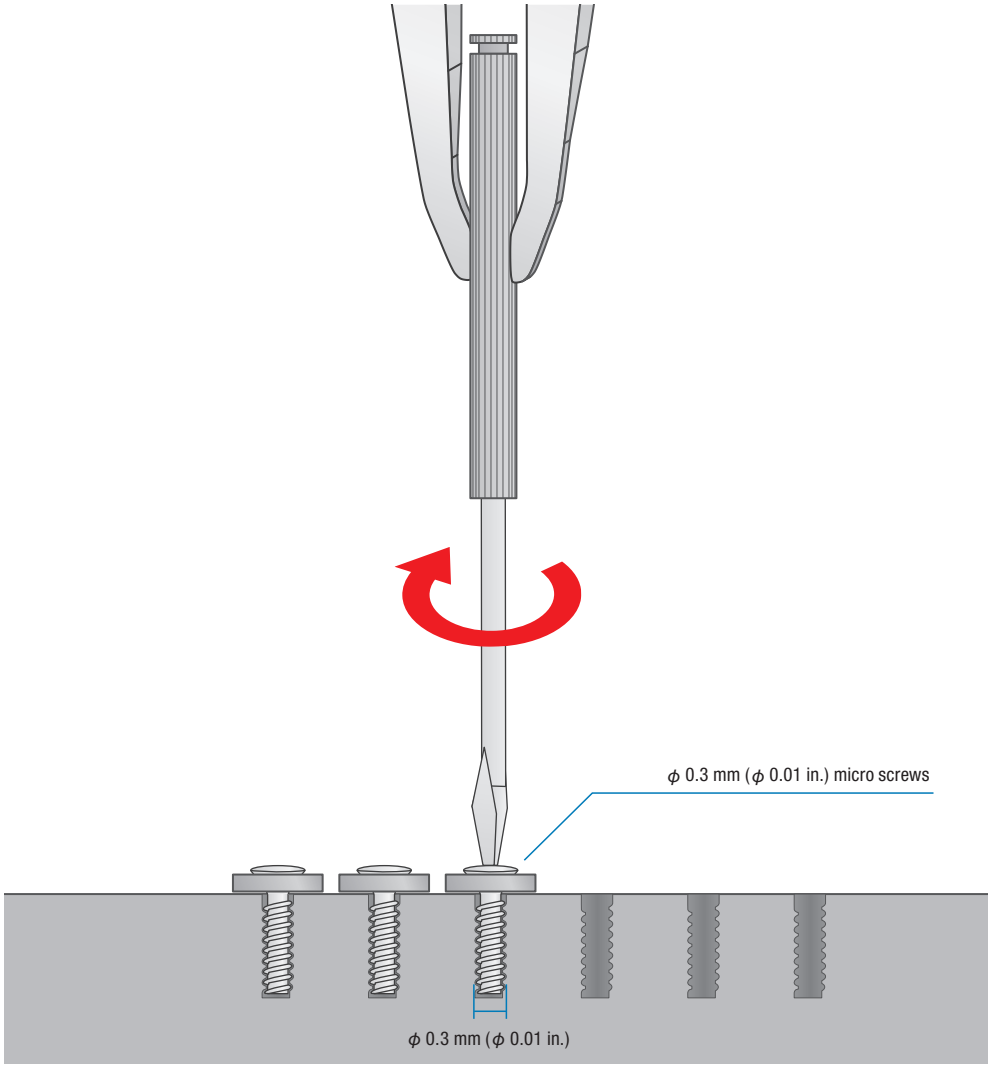
The Micro Part Handling System is capable of holding, carrying and placing ϕ 0.1 mm (ϕ 0.004 in.) ultrafine solder balls with a high level of accuracy in a short time. Improved mass productivity and increasingly efficient finishing process contribute to drastic cutdown on costs.

It has been considered to be impossible to perfectly complete solder ball placement (BGA) with the present technology when it comes to conducting the work automatically. There has been no other way than to spend a tremendous amount of time and labor on repair work that are resulted from placement defects. However, the Micro Part Handling System achieves high-density and high-accuracy placement of a ϕ 0.1 mm (ϕ 0.004 in.) solder ball in a short time. The system achieves reduction in operating time, improvement of productivity and highly-accurate work to provide customers with new possibilities.

Application example

Assembly by tightening ultrafine screws

<Example: Tightening of ϕ 0.3 mm (ϕ 0.01 in.) screws>



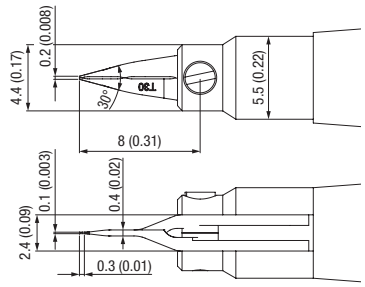
An ultrafine screw of ϕ 0.1 mm (ϕ 0.004 in.) to ϕ 0.3 mm (ϕ 0.01 in.) can be tightened naturally and efficiently as if it were tightened by hand by holding an ultra-precise driver with a grip and using the rotary axis (C-axis).

It has been considered difficult to manufacture ultrafine screws of ϕ 0.3 mm (ϕ 0.01 in.). With the Micro Part Handling System, multiple movable axes including the rotary axis (C-axis) which is necessary for tightening screws and two cameras with high visibility enable high-density part assembly by tightening screws at a minimal pitch. Ultrafine screws of ϕ 0.1 mm (ϕ 0.004 in.) also can be tightened, which overturns the concept of production because the system enables what used to be infeasible. This will contribute to future development of new machines and research and development in the various fields. This system brings customers not only improvement in operability and mass production but also unprecedented high level of added value.

Option

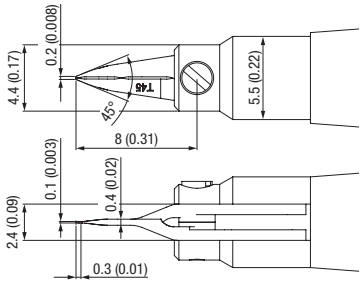
Grip

mm (in.)



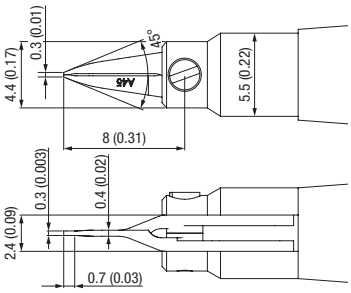
T30

For high-density, minimum space and ultrafine parts. Extremely effective when holding parts of 0.1 mm (0.004 in.) or smaller.



T45

All-purpose grip for ultrafine parts to fine wiring. It can be used for any parts because it is good for various pitches.



A45

This grip is suitable for carrying and placing parts with edges. The tips of the grip are flat and the area to capture parts is large, which enables operators to hold parts without dropping them.

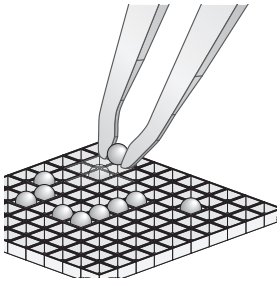
Table

Other than the standard sized table, three different sized tables are available -- small, medium, and large. These different sized tables can be used for different features or purposes of micro parts, contributing to improvement of productivity and promotion of efficiency.

Camera (Zoom Lens)

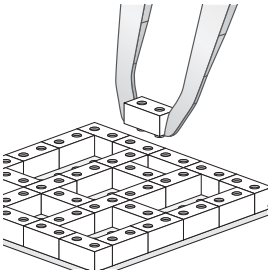
A macro zoom lens for FA with an optical magnification of 0.3 X to 1.0 X (made in Japan). The camera can be easily mounted/dismounted, demonstrating the effect when handling ultrafine parts.

Training Kit



Bonding

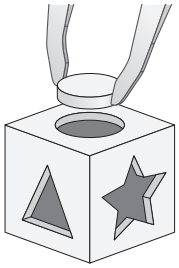
This is a repetition kit to hold, carry, and place micro solder balls by a grip. Practical skills like placement of solder balls (BGA) can be cultivated.



Micro Block

- Size of one block
  Width×Depth×Height: 1.0 × 0.5 × 0.5 mm
  (0.04 × 0.01 × 0.01 in.)

This is a basic kit to assemble blocks into various shapes with the idea of placing blocks by utilizing all the movable axes and table movements. You can enjoy practicing handling operations and acquire a skill to move each axis finely.



Assembly

This is a kit to hold and put in star-shaped or round-shaped micro parts with the idea of placing fit-in blocks. High level of assembly skills can be cultivated because minute movements that make the most of the rotary axis (C-axis) are required.

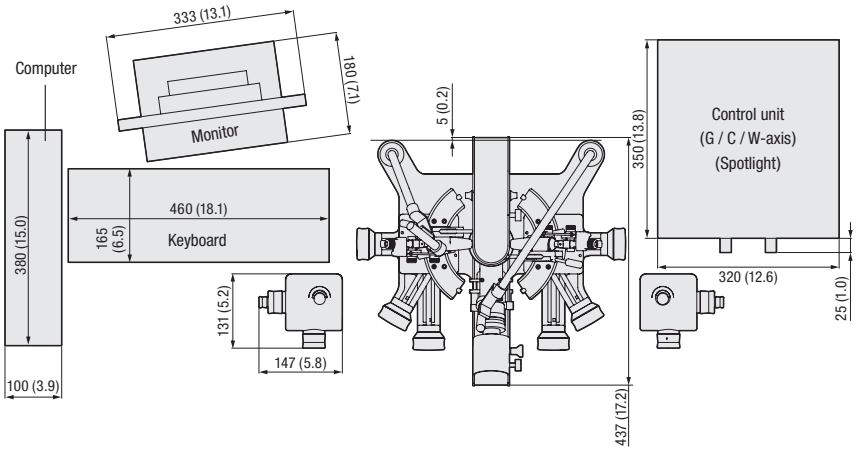
● These illustrations show images.

General view

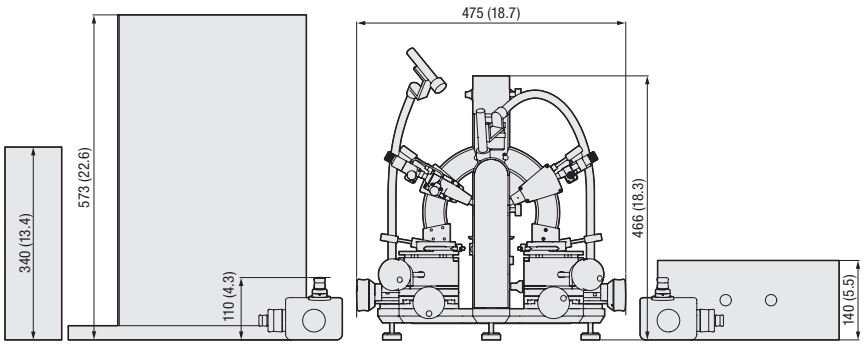
Machine

mm (in.)

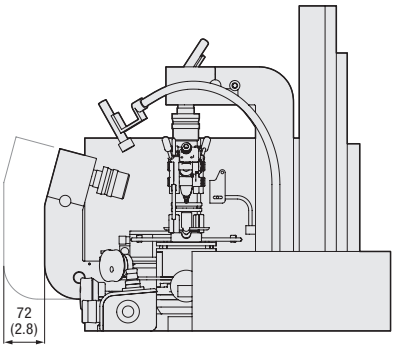
Plan view



Front view

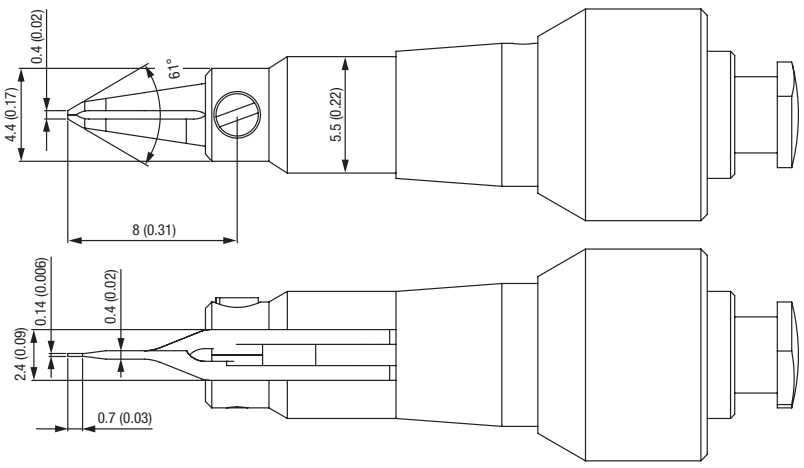


Side view



Grip

Standard



Machine specifications

Grip travel

Horizontal (right and left) traveling axis	mm (in.)	30 (1.2)
Back and forth traveling axis	mm (in.)	40 (1.6)
Up and down traveling axis	mm (in.)	14 (0.6)
Horizontal rotary axis		80°
Vertical rotary axis		55°
Back and forth in/out axis	mm (in.)	15 (0.6)
Rotary axis		360°

Grip travel per handle revolution

Horizontal (right and left) traveling axis	mm (in.)	1.0 (0.04)
Back and forth traveling axis	mm (in.)	1.0 (0.04)
Up and down traveling axis	mm (in.)	0.5 (0.02)
Horizontal rotary axis		(manual type)
Vertical rotary axis		(manual type)
Back and forth in/out axis	mm (in.)	0.9375 (0.037)
Rotary axis		324°

Table movable range

Left-right movement	mm (in.)	13 (0.5)
Back-forth movement	mm (in.)	13 (0.5)
Up-down movement	mm (in.)	28 (1.1)

Camera

Resolution / Lens		5-million-pixel CMOS color, CCTV Lens
Standard field of vision	mm (in.)	8.3×6.2 (0.3×0.2)
Enlargement/ reduction ratio	Monitor magnification	69 times (100%)
	Capture magnification	10% — 1,600%

Electrical power supply

AC100V-10A, 50-60Hz

Machine size/Max. mass

Width	mm (in.)	475 (18.7)
Depth	mm (in.)	437 (17.2)
Height	mm (in.)	466 (18.3)
Max. mass	kg (lb.)	14 (30.8)

PC

Windows7, dedicated screen capturing software, 23-inch full high definition monitor

- The information in this catalog is valid as of October 2012.

<Precautions for Machine Relocation>

EXPORTATION: All contracts are subject to export permit by the Government of Japan. Customer shall comply with the laws and regulations of the exporting country governing the exportation or re-exportation of the Equipment, including but not limited to the Export Administration Regulations. The Equipment is subject to export restrictions imposed by Japan and other exporting countries and the Customer will not export or permit the export of the Equipment anywhere outside the exporting country without proper government authorization. To prevent the illegal diversion of the Equipment to individuals or nations that threaten international security, it may include a "Relocation Machine Security Function" that automatically disables the Equipment if it is moved following installation. If the Equipment is so-disabled, it can only be re-enabled by contacting Mori Seiki or its distributor representative. Mori Seiki and its distributor representative may refuse to re-enable the Equipment if it determines that doing so would be an unauthorized export of technology or otherwise violates applicable export restrictions. Mori Seiki and its distributor representative shall have no obligation to re-enable such Equipment. Mori Seiki and its distributor representative shall have no liability (including for lost profits or business interruption or under the limited service warranty included herein) as a result of the Equipment being disabled.

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