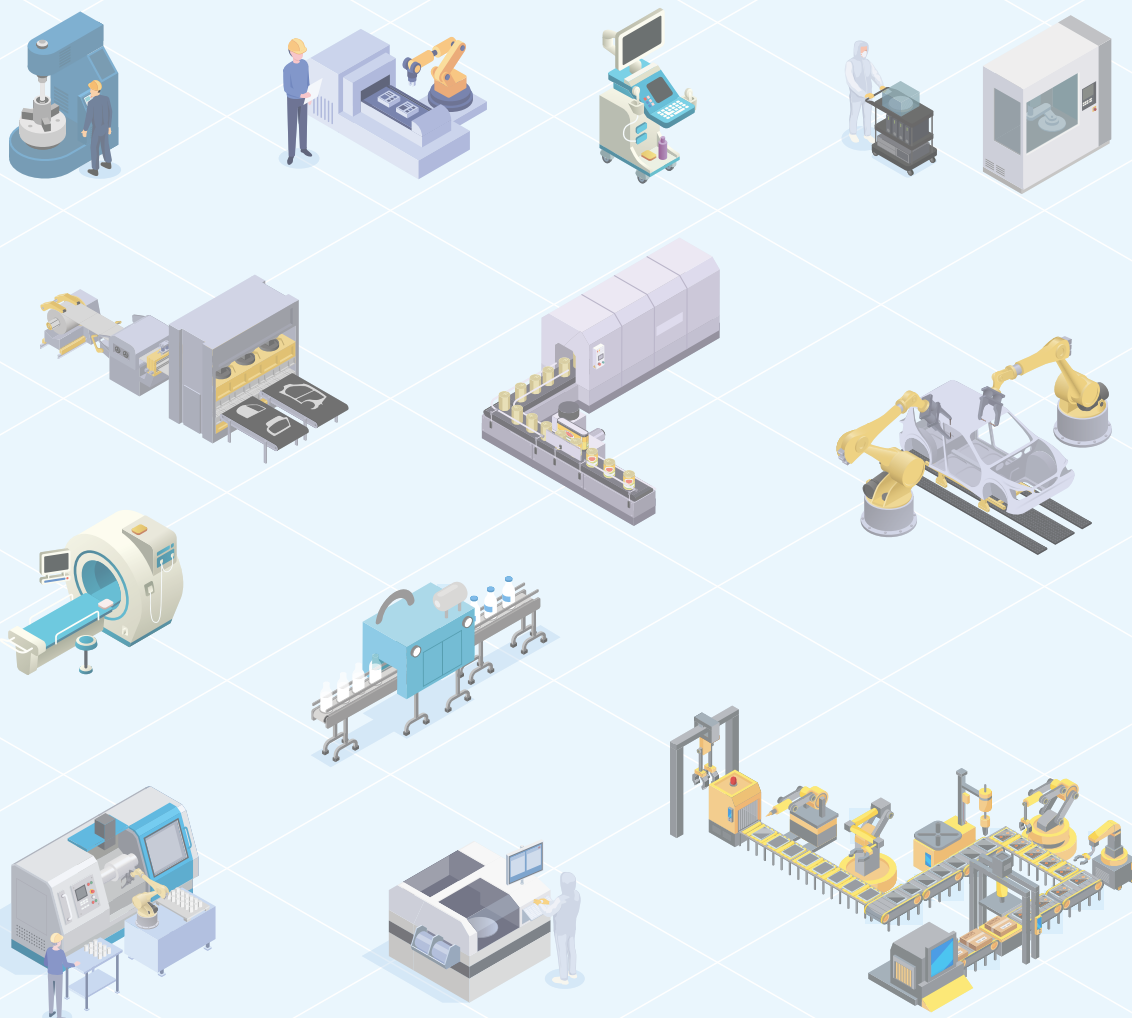


Helpful Hints for Designers

Issue Solutions

Case Studies



Are you in need of help with any of these keywords?

Semiconductor manufacturing equipment
Machine tools, food machinery, medical equipment, factory automation (FA), etc.

NBK®

Couplings, Screws, Clampers

This booklet offers plentiful case studies to help you resolve any struggles you may have. Contact us if you still require additional support. We are happy to help solve any problems.

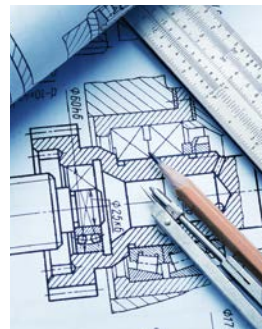
Start here if you have specific difficulties or issues!



Search Issue Solutions and Case Studies by problem

» P.2

Search based on your problem for actual issue solutions submitted by manufacturing equipment designers!



Search Issue Solutions and Case Studies by industry

» P.16

Problems and solution examples specific to each industry presented by equipment and process!

Factory automation (FA)	P.18
Machine tools	P.20
Semiconductor manufacturing equipment	P.26
Food machinery	P.38
Medical equipment	P.44



Detailed information on our products can be retrieved from the product number on the NBK website. The QR codes in each section can also be used.

Discover points of interest based on equipment and processes!



Solving manufacturing industry issues!

NBK Product Introduction

» P.48

Presenting NBK products which provide hints on design and development!





Search Issue Solutions and Case Studies by problem

Search based on your problem for actual issue solutions submitted by manufacturing equipment designers!

Increased productivity

Energy-saving/reduced work-hours

Workability/maintenance

Safety/precautionary measures

Compact/lightweight

High rigidity/high accuracy

Automation/robots/motorization

High sanitation/corrosion-resistant/clean

Safety/precautionary measures

- 01 Direct drive motor **vibration must be suppressed** P.3
- 02 Arm **vibration prevention** is required while robot is operating P.3
- 03 Long actuator **hunting** must be suppressed P.4
- 04 Latching and tightening must be done by **just turning** the knob P.4
- 05 Need to **reduce the burden** of repetitive mounting/removal work and enable secure tightening by anyone P.5
- 06 LCD monitors/tablets must be **fixed to equipment** P.5
- 07 Removing **stripped screws** P.6
- 08 Improved workability for **fixing/positioning** is required P.6
- 09 **Reinforcement** is required for places where bolts are frequently removed P.7
- 10 Levers and knobs have to be tightened **fast** with long screws P.7
- 11 Assembling work time must be shortened and **foreign matter contamination prevented** P.8
- 12 Simple **one-touch** positioning is required P.8 **NEW**
- 13 In need of simpler table height and **level adjustment/fixing** P.9 **NEW**
- 14 **Emergency stop measures** are needed for heavy parts during power cutoff P.9
- 15 **Disturbances/vibrations** must be suppressed P.10
- 16 **Theft/tampering** countermeasures are required P.10
- 17 **Countermeasures for screw loosening** are required P.11
- 18 CE-marked components which prevent **foreign matter contamination** are required P.11
- 19 Mechanism for **position retention** must be more compact P.12
- 20 Stable **speed control** of the raising/lowering shaft is required P.12
- 21 Improved reproducibility of the **main column/reference position** is required P.13
- 22 Reduction of **setup work** time on lines is required P.13
- 23 **Screw corrosion** prevention is required in environments exposed to water P.14
- 24 Plant internal **safety measures** must be reinforced P.15 **NEW**

Increased productivity

Energy-saving/reduced work-hours

Workability/maintenance

Safety/precautionary measures

Compact/lightweight

High rigidity/high accuracy

Automation/robots/motorization

High sanitation/corrosion-resistant/clean

Safety/precautionary measures

Increased productivity

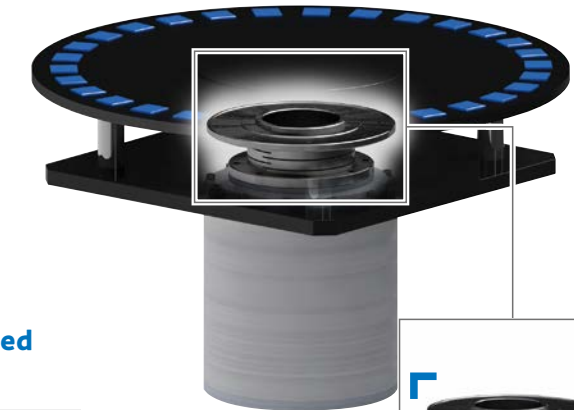
01

Increased productivity

Direct drive motor **vibration must be suppressed**

Equipment example: Index positioning equipment

Vibration may occur with high-speed index positioning using a direct drive motor. Vibration can be suppressed by the deflection of slitted parts, enabling accurate positioning to be performed at high speeds.

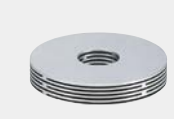


HINT

Freely designable slit-machined parts are effective

Recommended product

Multi-functional spring component "Flexus®"



02

Increased productivity

Arm **vibration prevention** is required while robot is operating

Equipment example: Mobile multi-joint robot

By mounting a clamp mechanism at the feet of the mobile multi-joint robot, the backlash when the rack & pinion mechanism stops can be suppressed. Reducing the vibration settling time improves takt time.



HINT

Suppressing backlash at stop with a clamp mechanism is effective

Recommended product

Clamp Mechanism for Linear Guide

UBPS



Increased productivity / Energy-saving/reduced work-hours

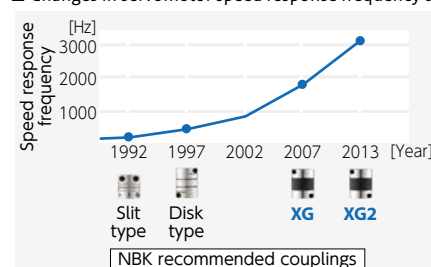
03

Increased productivity

Long actuator **hunting** must be suppressed

The speed response frequency of servomotors has evolved dramatically, while the need for long actuators has increased, making the suppression of hunting a challenge. High-gain rubber couplings can be used to suppress hunting and enable highly responsive transport.

■ Changes in servomotor speed response frequency and coupling evolution



HINT Couplings with excellent damping performance are effective

Recommended product

XGT2

High-gain Rubber Couplings



04

Energy-saving/reduced work-hours

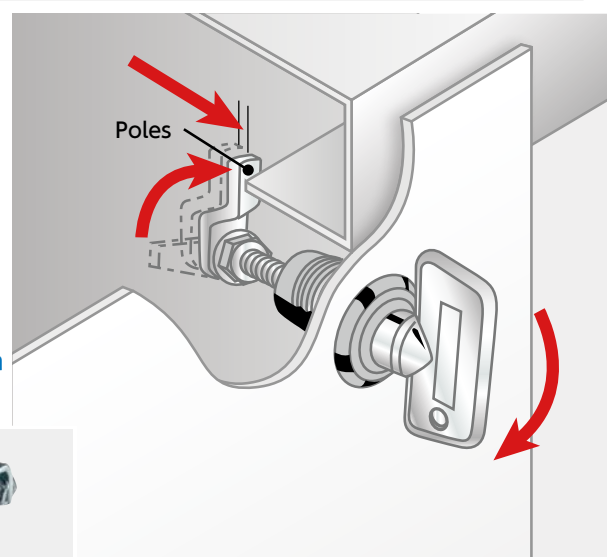
Latching and tightening must be done by **just turning** the knob

Latches enabling open/close and door inset with a single knob rotation action are available. Suitable for use in highly airtight locations or locations where play due to vibration must be prevented.

HINT Latches with full single-action operation are available

Recommended product

Vise Action Latch



Increased productivity

Energy-saving/reduced work-hours

Workability/maintenance

Safety/precautionary measures

Compact/lightweight

High rigidity/high accuracy

Automation/robots/motorization

High sanitation/corrosion-resistant/clean

Safety/precautionary measures

Workability/maintenance

05

Workability/maintenance

Need to **reduce the burden** of repetitive mounting/removal work and enable secure tightening by anyone

These clamp levers have built-in axial bearings which reduce seating surface friction, enabling the same tightening force with roughly half the normal tightening torque. Clamp lever rotating radius and knob can be made more compact. Additionally, washers with axial bearings are also available for use in combination with existing levers and knobs.

HINT Products that can be tightened with roughly half the normal force are effective

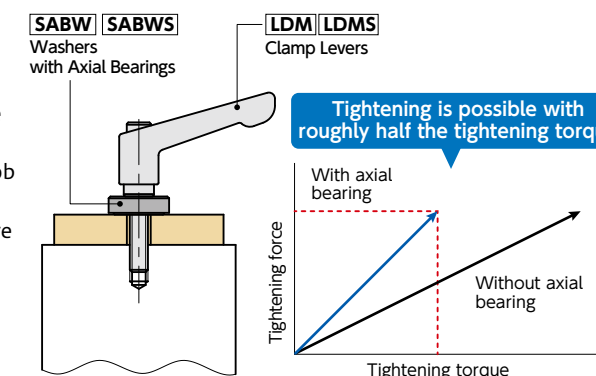
Recommended product

LDBM
LDBF

Power Clamp Levers
Power Star Knobs
Washers with Axial Bearings



KJB

SABWS
SABW

06

Workability/maintenance

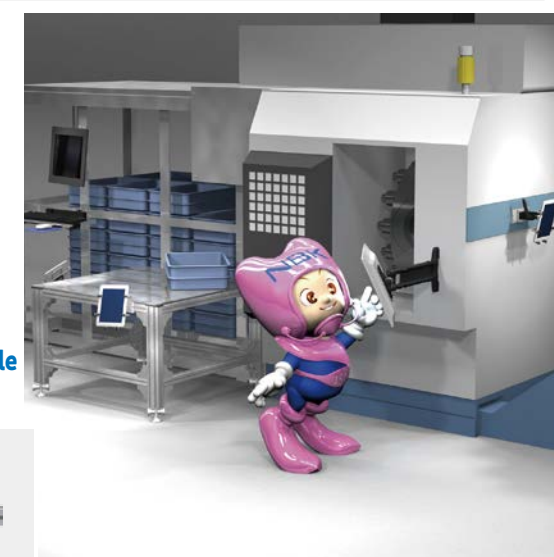
LCD monitors/tablets must be **fixed to equipment**

High-strength display mounting components, mountable to equipment panels, aluminum frames and round pipes, are available in forms specialized for production sites. The display angle can be adjusted and fixed, while the devices also contribute to paperless/IT-enhanced factory reforms.

HINT Display mounting components are available in forms specialized for production sites

Recommended product

Display Device Mounting Systems



Workability/maintenance

07

Workability/maintenance

Removing stripped screws

There are special tools for removing damaged hex head bolts and hex nuts or stripped screws that cannot be removed with ordinary tools. Screws can be easily removed with this tool even when the corners or recesses of the head have been stripped due to using a shallow tool or the wrong size tool.

● Stripped Screw Removal Bits
Creates grooves in the damaged recesses which can be used to turn and remove the screw.



● Stripped Hex Head Screw/Bolt Removal Sockets
The spiral edges inside the socket firmly bite in to enable removal.



HINT Dedicated tools for removing damaged screws are available

Recommended product

SKEID



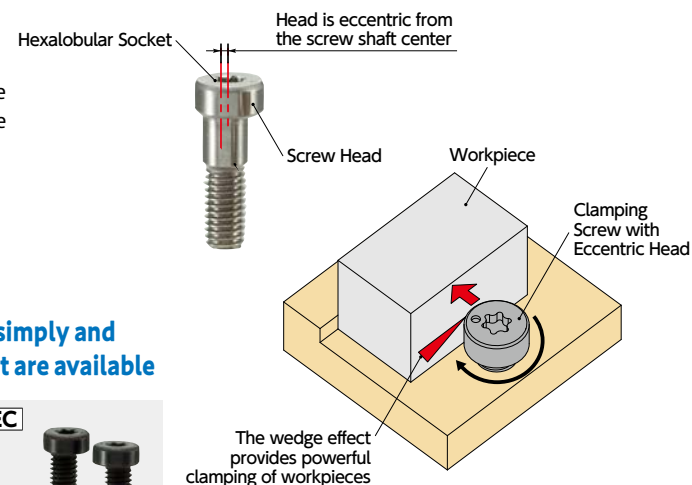
Damaged Screw Removal Tool

08

Workability/maintenance

Improved workability for fixing/positioning is required

When NBK clamping screws with eccentric head are tightened, the workpiece is strongly clamped by the head, which is set off-center from the shaft center of the screw. The wedge effect creates a large clamping force with low tightening torque. Ideal for fixing linear guideway rails or workpieces.



HINT Screws that fix workpieces simply and securely with a wedge effect are available

Recommended product

SLEC



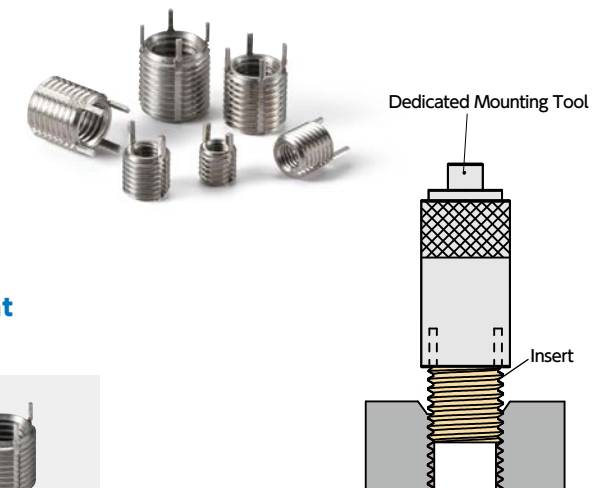
Clamping Screws with Eccentric Head

09

Workability/maintenance

Reinforcement is required for places where bolts are frequently removed

Keyed female-thread reinforcing inserts are available. The keys mechanically prevent rotation and have no risk of falling out. These high-strength stainless steel integrated types can be used for firm fastening or in areas where bolts are frequently fastened and removed. Ideal for reinforcing female threads in light metals, castings, or resin, as well as for repairing damaged female threading.



HINT Female thread reinforcement using inserts is effective

Recommended product

SHINS



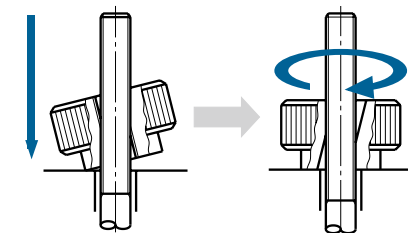
Keyed Female-Thread Reinforcing Inserts

10

Workability/maintenance

Levers and knobs have to be tightened fast with long screws

Levers and knobs enabling rapid tightening even with long screws are available. The screw is passed through the straight hole and the knob is raised perpendicular to the screw at the tightening position for tightening. Work time can be reduced in locations with frequent mounting and removal.



HINT Levers and knobs optimal for long screw tightening are available

Recommended product

LQNN



KQC



KSQ



Quick Clamp Levers/Knobs

Workability/maintenance / Safety/preventative measures

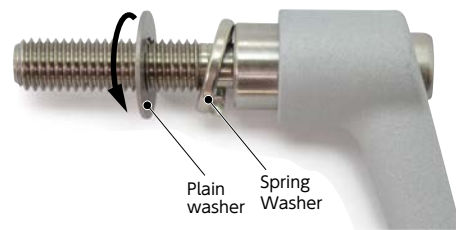
11

Workability/maintenance

Assembling work time must be shortened and foreign matter contamination prevented

The use of clamp levers with built-in washers enables reduced work time with no need to assemble washers onto screws.

Additionally, because the washers have no chance of falling out, they are also suitable as foreign matter contamination measures for assembly and mounting/removal.



Plain washer Spring Washer

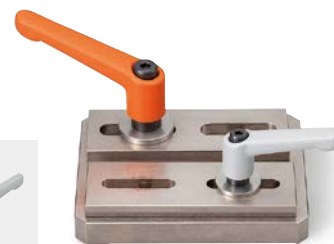
HINT Clamp levers with built-in washers are effective

Recommended product

Clamp Levers with Integrated Washer

LDM-W
LDM-LW

LDM-LWP



12

Workability/maintenance

Simple one-touch positioning is required

NEW

Brackets enabling easy positioning on round pipes (round shafts), aluminum frames, square shafts, and slotted steel are available. Simply depress the button to unlock and release to fix it in position. Also suitable for mounting limit switches, sensors, monitors, or tablets, and effective in preventing falling and misoperation.

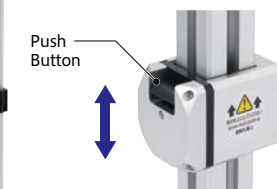
■ Usage Examples

Push Button

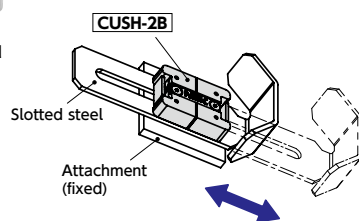
Push Button



For Round Pipe



Aluminum frame (fixed)



CUSH-2B

Slotted steel

Attachment (fixed)

HINT Brackets which can be fixed with button operation alone are available

Recommended product

Positioning Brackets

CUPB



CUSH



13

Workability/maintenance

In need of simpler table height and level adjustment/fixing

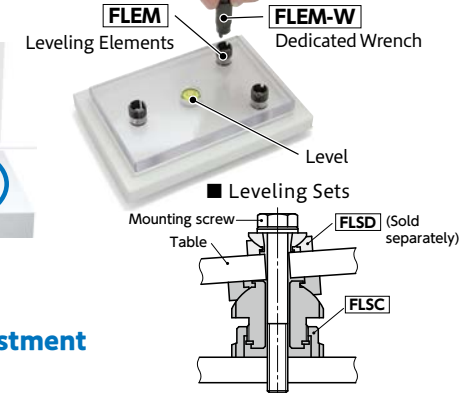
NEW

Parts for adjusting the height or horizontal level of tables in devices and equipment are available. "Leveling elements," enabling horizontal adjustment and fixing on the table using a wrench, are available along with "leveling sets," which enable height and horizontal adjustment and fixing from equipment/device sides using a hook wrench. Spirit levels are available to confirm leveling status.

■ Leveling Elements



Horizontal adjustment and fixing on tables is possible



FLEM

Leveling Elements

FLEM-W

Dedicated Wrench

Level

■ Leveling Sets

Mounting screw

Table

FLSD

(Sold separately)

FLSC

HINT Parts enabling height and horizontal adjustment with a wrench alone are available

Recommended product

Leveling Elements/Levels

FLEM



FLSC



Levels

FSLC



14

Safety/precautionary measures

Emergency stop measures are needed for heavy parts during power cutoff

Equipment example: Press machine

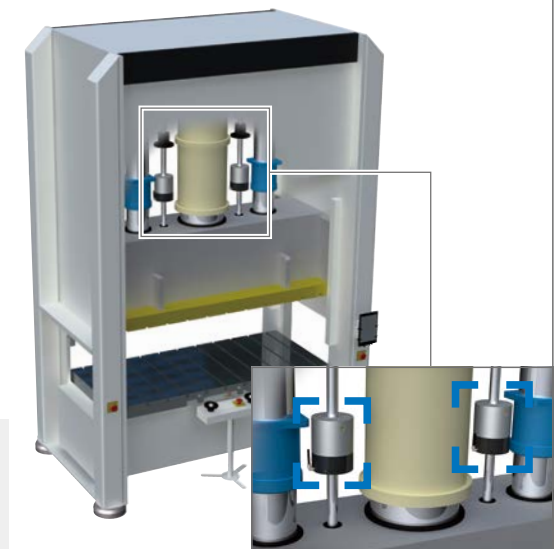
Fall prevention functions, previously requiring multiple parts, can be achieved with a single mechanism. Helps reduce design/assembly time and keep equipment compact. Since it can be mounted in the empty space immediately under the table, it can be easily incorporated into existing machines and equipment as a redundant safety measure.

HINT Safety measures simply achieved with a single mechanism

Recommended product

Clamp Mechanism for Linear Shaft

RBPS



Safety/precautionary measures

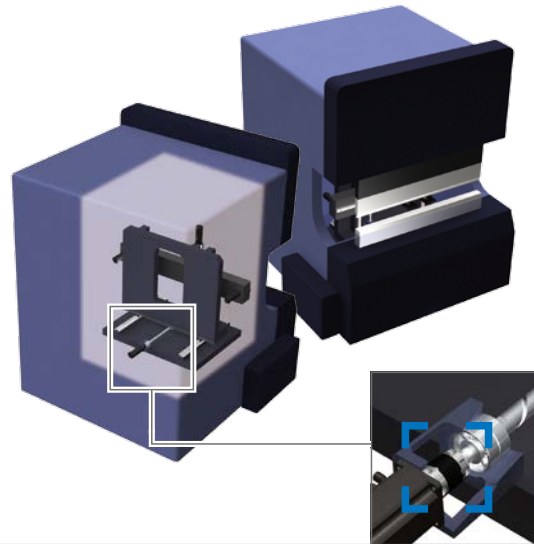
15

Safety/precautionary measures

Disturbances/vibrations must be suppressed

Equipment example: Press brake

If a heavy workpiece is pressed against the back gauge, vibration may be transmitted down to the foot area due to the external disturbance. High-gain rubber couplings can be used to reduce vibrations and suppress movement from the machine installation location.



HINT The use of couplings that suppress vibration is effective

Recommended product

XGT2

High-Gain Rubber Couplings



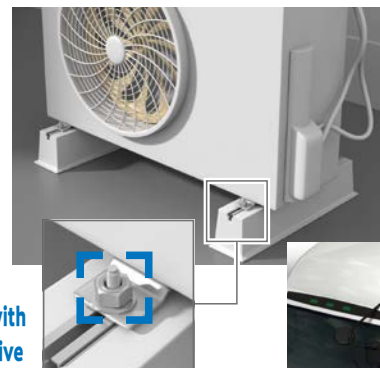
16

Safety/precautionary measures

Theft/tampering countermeasures are required

These nuts can be installed using commercially available tools but require a special tool for removal. Crime can be prevented without compromising the workability of mounting. Ideal for preventing theft of vehicles, batteries, outdoor units, bridge placards, etc. As they cannot be removed using regular commercially available tools, they also prevent tampering.

Outdoor unit



Truck battery



HINT Components that cannot be removed with commercially available tools are effective

Recommended product

SHNRS

Theft Prevention Nuts

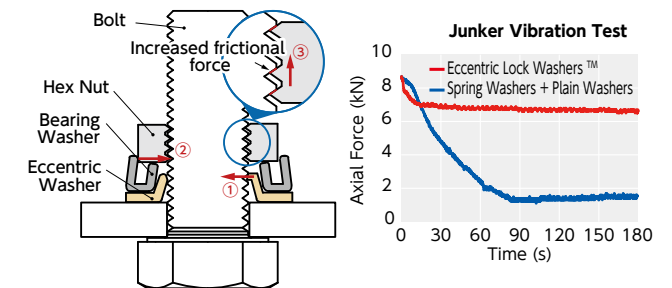


17

Safety/precautionary measures

Countermeasures for screw loosening are required

Washers that prevent screw loosening in combination with commercially available hex nuts. The hex nut can be tightened by hand until tightening force is generated, making it easier to mount. The high loosening-prevention performance has been demonstrated by Junker and NAS vibration tests.



HINT Washers that prevent screw loosening simply by combining with commercially available hex nuts

Recommended product

SWAS-EW

Eccentric Lock Washers



18

Safety/precautionary measures

CE-marked components which prevent foreign matter contamination are required

NBK has standardized products for fall prevention of parts, such as knobs, pulls and special screws. Ideal for securing protective and inspection covers that are frequently installed and removed.

- Captive Washers: Prevent screw fall-off and loss simply by assembly onto commercially available screws.
- Fall prevention machining: Machining to prevent dropping or losing screws, knobs, etc. can be performed.
- Washer integrated parts: Since a washer is incorporated into the screw part, the washer will not be lost.

HINT Components with a captive mechanism are effective

Recommended product

Captive Series

Captive Washers
SWAS-SCHex Socket Head Cap Screws
SSCCaptive Dimple Knobs
KDM-SCClamp Levers - Plain Washer Integrated Type
LDM-LW

Compact/lightweight / High rigidity/high

accuracy / Automation/robots/motorization

19

Compact/lightweight

Mechanism for position retention must be more compact

Equipment example: Aluminum sash tooling machine

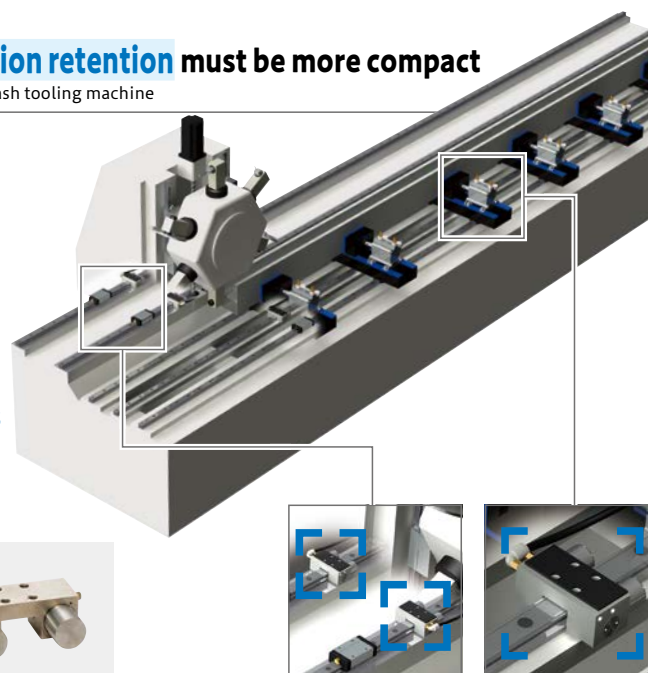
With original position retention mechanisms installed, equipment tends to become larger due to dedicated rails, etc; however, mounting a position retention mechanism in the empty space just under the table makes more compact equipment possible.

HINT Position retention mechanisms which can be installed in the empty space just under the table are available

Recommended product

MKS

Clamp Mechanism for Linear Guide



21

High rigidity/high accuracy

Improved reproducibility of the main column/reference position is required

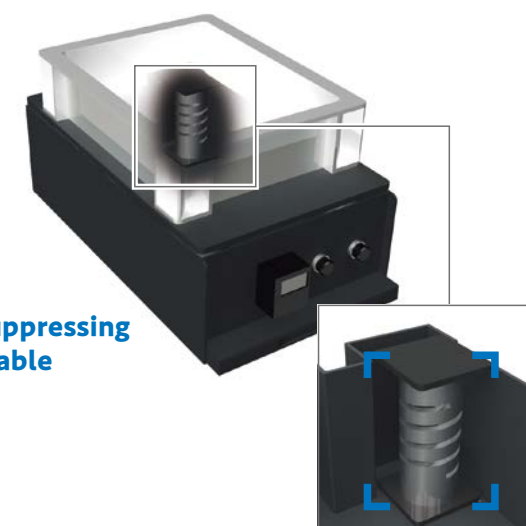
Equipment example: Parts feeder

Inconsistent positioning accuracy of the reference position may be caused by variations in the spring constant of the part. Reducing the variability of the spring constant makes it possible to improve the reproducibility of the reference position.

HINT Multi-functional components for suppressing spring constant variability are available

Recommended product

Multi-functional spring component "Flexus®"



20

High rigidity/high accuracy

Stable speed control of the raising/lowering shaft is required

Equipment example: Medical diagnostic imaging device

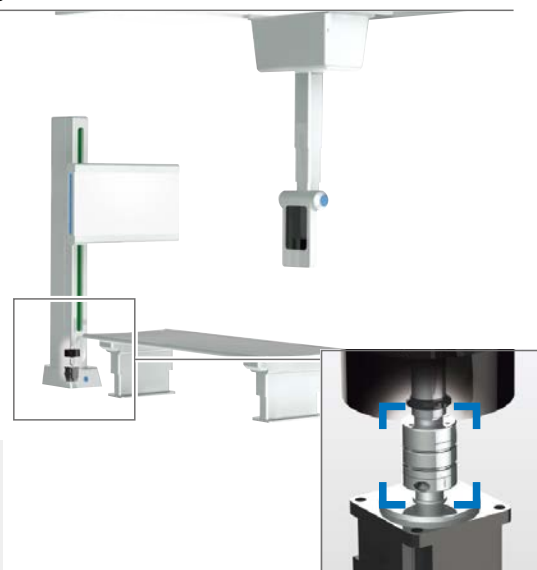
While conventional disk couplings do not have sufficient rigidity for stable raising/lowering speed, the use of high-rigidity disk couplings (XH series) with an increased number of fixing bolts enables stable speed control to be realized.

HINT High rigidity disk couplings are effective

Recommended product

XHW

Disk Coupling



22

Automation/robots/motorization

Reduction of setup work time on lines is required

Equipment example: Printer

Setup time can be reduced by changing the handle from a manual positioning type to one with automated control. Batch control of up to 32 units. Easily replaces handles. PLC compatible, dust-proof and water-proof specification.

HINT Equipment with automatic positioning capability in place of handle operation is available

Recommended product

EPU-210

Auto-Positioning Units



High sanitation/corrosion-resistant/clean

23

High sanitation/corrosion-resistant/clean

Screw corrosion prevention is required in environments exposed to water

If metals with different electric potentials come in contact with water, a battery structure is formed and electrons are exchanged between the dissimilar metals, causing corrosion of the metal with lower natural electric potential. Screws that prevent this corrosion due to differences in natural electric potential (dissimilar metal contact corrosion (galvanic corrosion)) are available.

The effective period of galvanic corrosion prevention is about 5 times longer than hot dip zinc plating, so it is suitable for fixing aluminum parts and materials that are used outdoors.

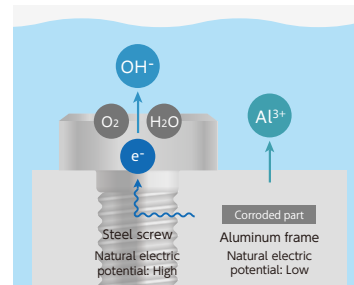
HINT

Screws that prevent galvanic corrosion are available

Recommended product

Galvanic Corrosion Prevention Treated Bolts

SNH-GJ



See here for an explanation of galvanic corrosion prevention ▼



For the bases of outdoor equipment installed outdoors

Increased productivity

Energy-saving/reduced work-hours

Workability/maintenance

Safety/precautionary measures

Compact/lightweight

High rigidity/high accuracy

Automation/robots/motorization

High sanitation/corrosion-resistant/clean

Safety/precautionary measures

Safety/precautionary measures

24

Safety/precautionary measures

Plant internal safety measures must be reinforced

NEW

Space-saving stands which can be used as partitions, screens, spatter-prevention partitions, etc. are effective. Compared to T-legged or L-legged stands, they protrude less into passages and workspaces, preventing tripping. They also contribute to the effective use of plant floor space.

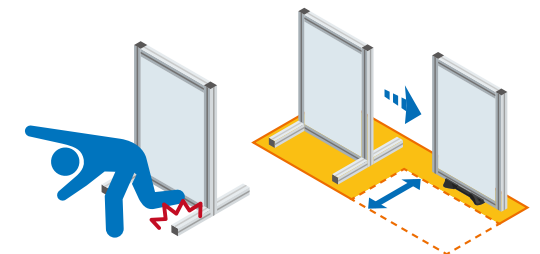
HINT

Space-saving stands which reduce protrusion into passages and workspaces are available

Recommended product

Space-saving stand

CSSP



Ensuring safety

Reduced protrusion into passages and workspaces, preventing tripping accidents.

Enlarging workspace

Workspace can be effectively used, as protrusion into passages and workspaces is reduced.

Supports aluminum frames in □30 and □40 sizes. Heavy cast iron, standing alone when assembled to a panel, without needing anchor bolts. Layout changes are also easy, with no floor fixing required.



Search by industry! Issue Solutions and Case Studies

The types of issues faced by different industries can be wide-ranging. We introduce hints that help solve examples of the various problems faced by each industry.

01



Issue Solutions and Case Studies for Factory Automation (FA)

Introducing plentiful automation examples for production lines, electrical substations, transport processes, etc.

» P.18

02

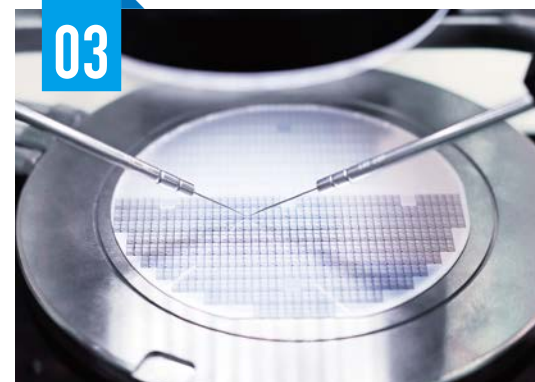


Issue Solutions and Case Studies for Machine Tools

Full of hints for improved machining accuracy and productivity in lathes, machining centers, etc.

» P.20

03



Issue Solutions and Case Studies for semiconductor manufacturing equipment

Explanations of how to handle special environments such as vacuum, high temperatures, and chemical adherence, sorted by equipment and processes

» P.26

04



Issue Solutions and Case Studies for Food Machinery

Both hygiene and workability have to be improved... From various equipment case studies to an explanation of hygienic design

» P.38

05



Issue Solutions and Case Studies for Medical Equipment

Introducing hints for ensuring cleanliness and safety in biochemical analysis equipment, MRIs, etc.

» P.44

Packed with case studies for people on the spot!

Issue Solutions and Case Studies for Factory Automation (FA)



01

Handle work needs to be done safely in locations at risk of accidents

Equipment automating handle work in spaces at risk of accidents is available (rotating manual handles in narrow gaps between machines or in high locations requiring stepladders, etc.). Replacing "manual positioning work" with "automated operation" does away with the need to enter hazardous locations during positioning, supporting safety measures.

HINT The introduction of automated equipment is effective in reducing work in hazardous locations



Recommended product

EPU-220



Auto-Positioning Units



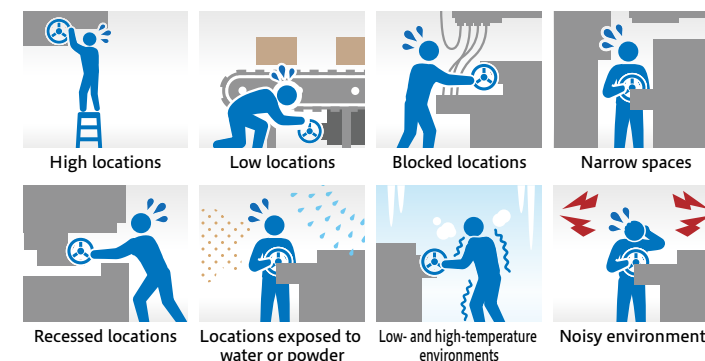
Learn More → P.58

02

Handle work in inaccessible locations needs to be automated

When using handle rotation for width adjustment on production lines, etc., machine automation is effective. Replacing positioning work at inaccessible locations on production lines (under belt conveyors, blocked by electrical wiring, etc.) with machine automation improves work efficiency and reduces physical strain.

HINT Automating manual work is effective



Recommended product

EPU-220



Auto-Positioning Units



Learn More → P.58

Issue Solutions and Case Studies for Machine Tools

Full of hints for improved machining accuracy and productivity in lathes, machining centers, etc.

1 Lathes/ Multi-tasking Machines

01

Improved machining accuracy is required

1. Mechanisms suppressing deviation and vibration due to tool rest external force are available

Prevention of deviation and vibration due to external force enables reduced dimensional error.

2. Prevention of deviation and vibration due to external force by fixing to a runout prevention device is effective

The use of a clamp mechanism is effective to prevent deviation and vibration due to external force.

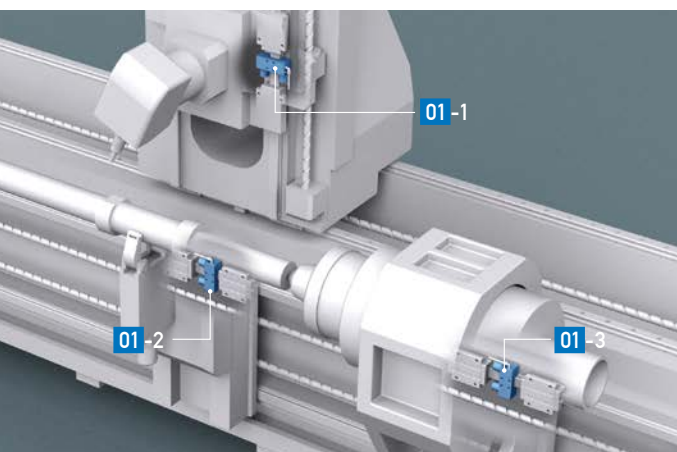
3. Prevention of tailstock shifting is effective

Rail clamp mechanisms to prevent floating and flipping are available.

HINT Clamp Mechanism for Linear Guide
Q **MKS**



Learn more about Clamp Mechanisms for Linear Guide → P.66



02

Error tolerance is required for feed shaft and ball screw shaft cores

Couplings tolerant of shaft core error (misalignment) and with high torque transmission are available.

HINT Jaw Couplings **Q** **MJC**

Learn more about couplings → P.50



05

Screws fixing protective and maintenance covers must not fall out

Screws preventing fallout when mounting/removing covers are available

Screws designed not to fall out of covers are available. Also ideal for CE marking compatibility.

HINT Captive Screws **Q** **SSC**

Learn more about Special Screws → P.54



03

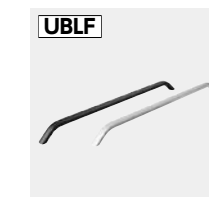
Main door and operation panel pull operability must be improved

Easily gripped, well-designed knobs are available. Customization is also available.

HINT Pulls

NEW The **MM+I** Series, with added intelligence in sensing, monitoring, switching, etc., is also available.

Learn more → P.62



04

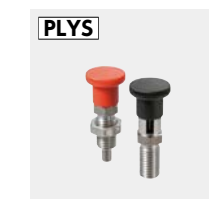
Interlock safety performance must be reinforced

Indexing Plungers which can retain the pin retracted position are effective

HINT Indexing Plungers

NEW The **MM+I** Series, with added intelligence in sensing, monitoring, switching, etc., is also available.

Learn more → P.62



2 Machining Centers

01

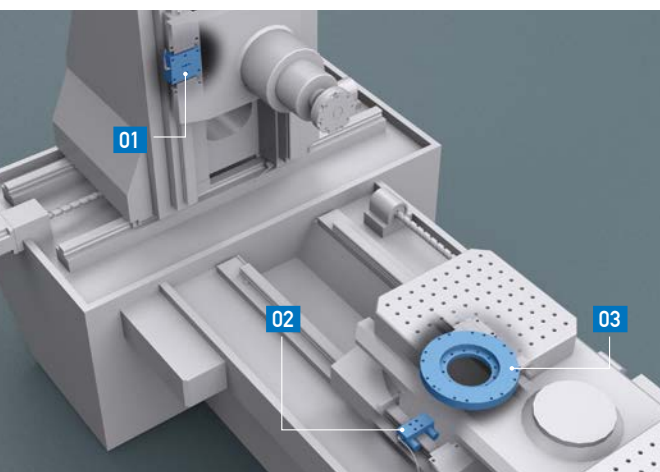
Damage prevention measures for workpieces, tools, and equipment are required

Emergency brakes for peace of mind during power cuts are available

This brake mechanism securely prevents linear motor drive shaft falls during power cuts.

HINT Brake Mechanism for Linear Guide [Q](#) **UBPS**

Learn more about Clamp Mechanisms for Linear Guide [→ P.66](#)



02

Improved machining accuracy is required

Chattering during drilling causes reduced precision

Mechanism preventing chatter with enhanced table rigidity are available.

HINT Clamp Mechanism for Linear Guide [Q](#) **MKS**



Learn more about Clamp Mechanisms for Linear Guide [→ P.66](#)

03

Improved productivity is required

Equipment suppressing turntable vibration and reducing positioning time is available

Clamp mechanisms retaining the rotation shaft are available.

HINT Rotation Shaft Retention Type Clamp Mechanism [Q](#) **TPS**



Learn more about Clamp Mechanisms for Linear Guide [→ P.66](#)

04

Linear guideways must be more easily fixed

Screws can be fixed easily and with high precision simply by tightening

The workpiece is strongly clamped by the head, which is decentered from the shaft center of the screw.

HINT Clamping Screws with Eccentric Head [Q](#) **SLEC**



Learn more about Special Screws [→ P.54](#)

07

For ATC/tool magazine revolving shaft connections

High rigidity couplings are recommended

A wide variety of rigid couplings is available. Customization is also available.

HINT Rigid Couplings [Q](#) **Rigid Type**

Learn more about couplings [→ P.50](#)



05

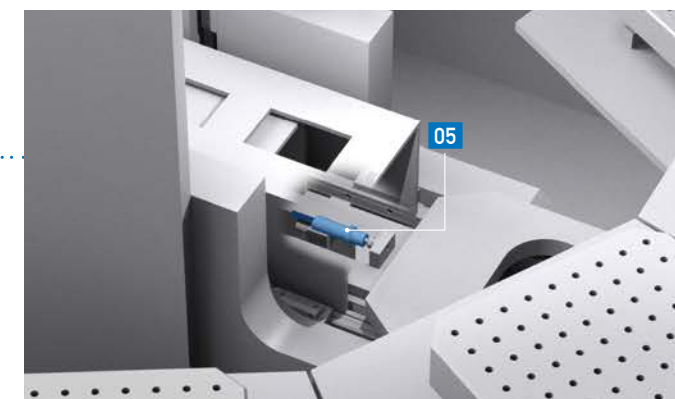
Consumable part replacement frequency is too high

Long-service-life shock absorbers for shock absorption in pallet changers

Changer receivers tend to require frequent replacement. Long-service-life shock absorbers can reduce the replacement frequency.

HINT High-performance Shock Absorbers [Q](#) **PHE**

Learn more about Shock Absorbers [→ P.70](#)



06

Inspection is a nuisance

Frequently used control panels, electrical boards, and covers can be opened/closed more easily

Latches with single-action latching and tightening are available. Suitable for equipment prone to vibration, as they can solidly grasp and fix panels.

HINT Vise Action Latches [Q](#) **E3**

Learn more about Machine Elements [→ P.62](#)



08

Heavy doors need support

High-durability hinges are effective

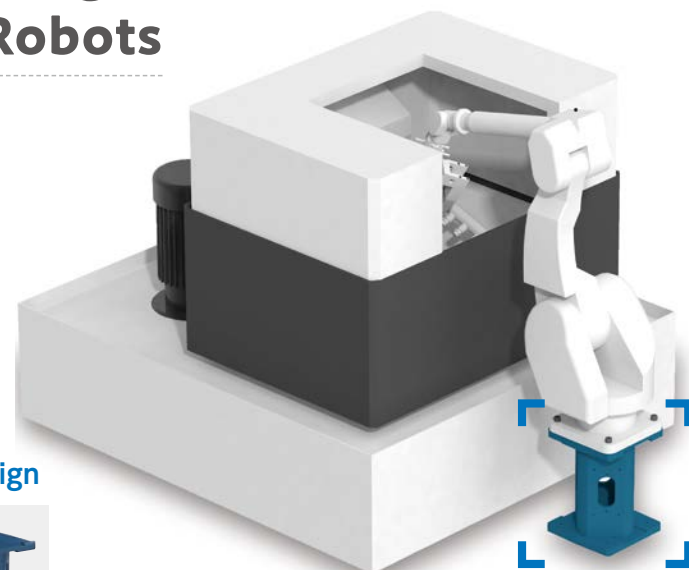
Heavy-duty metal hinges are available.

HINT Metal Hinges [Q](#) **HNGS-A-NI**

Learn more about Machine Elements [→ P.62](#)



3 Workpiece Handling by Pick & Place Robots



In need of robot stands with no design required

Robot stands supporting various robots are available

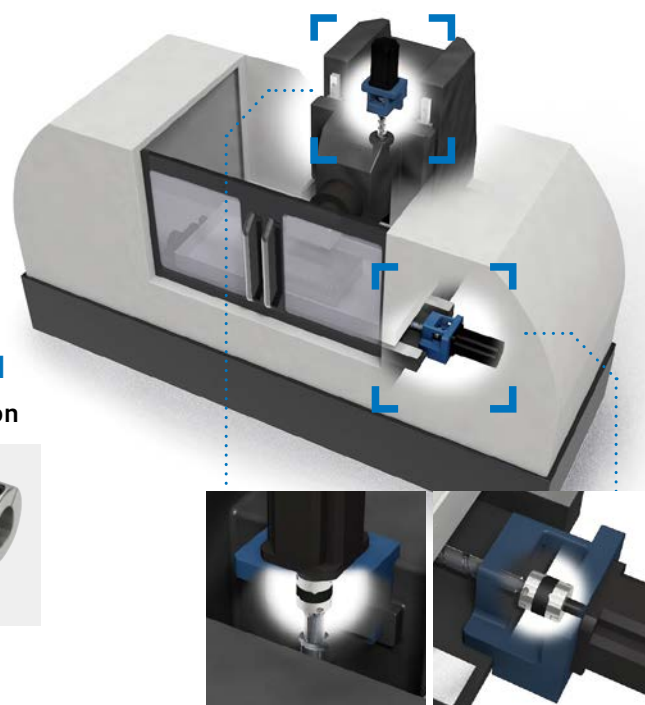
With seven sizes of heights 300 mm to 550 mm available as standard, the design and procurement of stands when introducing robots is no longer required.

HINT Robot Stands

[Learn more about Robot Stands → P.74](#)



4 Surface Grinding Machines



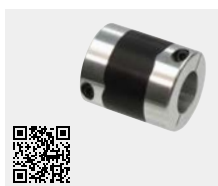
Machining marks must be prevented

The use of couplings that reduce vibration is effective

High-gain rubber couplings can be used to reduce vibrations and prevent machining marks.

HINT High-gain Rubber Couplings [Q XGT-CS](#)

[Learn More → P.50](#)



5 Large Gate Type Machines

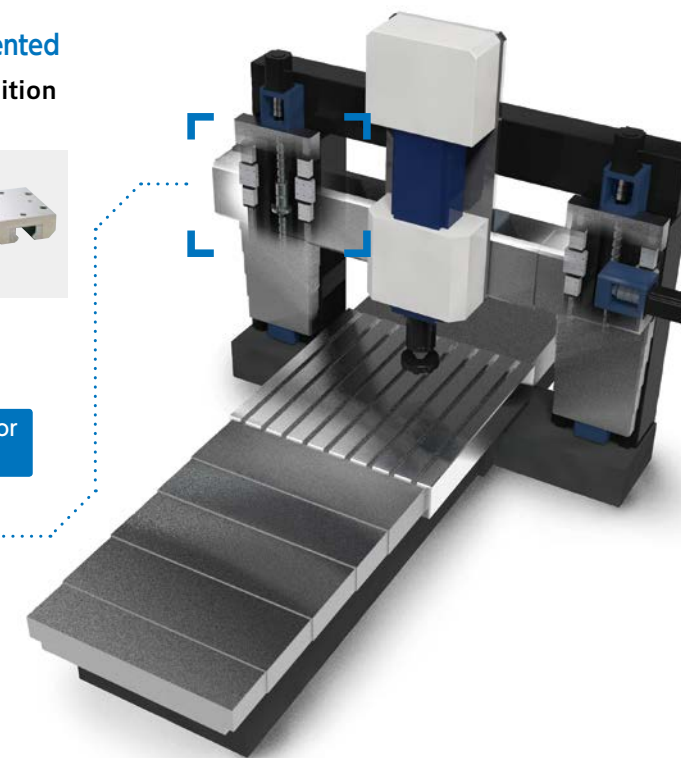
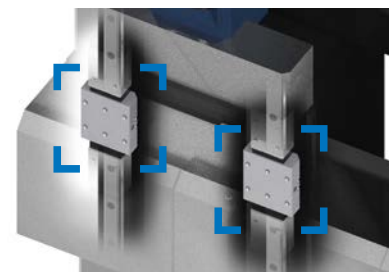
Chatter during drilling must be prevented

Mechanisms enhancing W-shaft position retention rigidity are available

By enhancing the position retention rigidity of the W-shafts (cross-rail raising/lowering shaft) on both sides of the equipment, chatter can be prevented.

HINT Clamp Mechanism for Linear Guide [Q KWH](#)

[Learn more about Clamp Mechanisms for Linear Guide → P.66](#)



Issue Solutions and Case Studies for semiconductor manufacturing equipment

Explanations of how to handle special environments such as vacuum, high temperatures, and chemical adherence, sorted by equipment and processes

1 Equipment Interior Overall

01

Tools that can be used even in narrow working spaces are required

Tools optimized for working in narrow spaces are available

Tools with reduced height dimensions are available. Required working space is decreased, so device/equipment structure can also be made more compact.

HINT Tools for Extremely Limited Access Spaces



02

NEW

Tools that can be used even in locations where magnetization must be avoided are required

Non-magnetic tools are available

Suitable for assembly and maintenance of equipment and devices in environments with strong magnetic fields. They can also be used on devices for which magnetization must be avoided.

HINT Non-magnetic Tools



03

Screws that will not affect communication are required

Solutions with plastic screws of various shapes and materials

Conventional metal screws may affect LoadPort and FOUP communication. The use of plastic screws prevents disruption of stable communications.

HINT Plastic Screws



07

Devices must be firmly connected

Washers which can correct an alignment mismatch between the bolt and seating surface, occurring frequently when connecting equipment, are available

When connecting two pieces of equipment, the use of spherical washers absorbs any bolt tilting, enabling reliable fastening.

HINT Spherical Washers

Q SQWS



04

Screws that can be used in limited spaces are required

Screws with extremely thin heads are available

Products made of highly corrosion-resistant SUS316L, pure titanium, and so on are also available.

HINT Low Profile Screws

Q SSHS SSHL SSHT



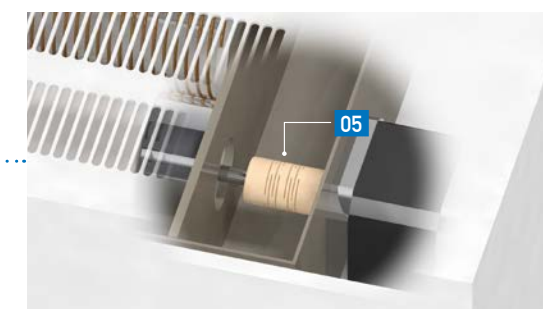
05

Improved coupling insulation properties are required

Couplings with high insulation performance are available

Oldham couplings do not have sufficient insulation, so a larger size is required. PEEK couplings can be used to improve insulation at the same size.

HINT Couplings for Vacuum Variable Capacitor **Q** MSXP-W-SP



06

High-speed control of raising/lowering shafts, suppressing hunting, is required

Couplings that suppress vibration are effective

Vibration often occurs while raising and lowering when using conventional metal couplings. High-gain rubber couplings can be used to achieve high-speed raising and lowering with excellent vibration absorption.

HINT High-Gain Rubber Couplings



2 Equipment Interior Vacuum chambers

02 NEW

Washer fallout must be prevented

The use of integrated washer type screws is recommended

Integrated washer type screws are available in order to prevent washer fall-out during equipment assembly or maintenance. Washer loss inside vacuum chambers, etc., can be prevented.

HINT Washer Integrated Hex Socket Head Cap Screws - High Strength Stainless Steel



03

Screws that can retain wafers are required

Screws with ceramic ball tips are available

Clamping screws with ceramic ball tips are available. Made of ceramic, they have excellent heat resistance.

HINT Clamping Screws
Q **SCSS-CE**



01

Screws in places unreachable by hand need to be tightened

Tools with screw holding function are available

Tools which retain hex socket head cap screws are available. Ideal for narrow spaces where screws cannot be retained by hand during assembly/maintenance of equipment, or for preventing screws from falling into devices during maintenance.

HINT Hexagon Screwdriver (with Screw Holding Function) Q **SKCD**



04

Increased degree of vacuum in equipment is required

Screws which support equipment vacuuming are available

Screws that support the evacuation of gas trapped in the bottom of screw holes or drilled holes are available.

HINT Screws for Vacuum Equipment
Q **SVSS** **SVSLG** **SVSQS**



05

Reinforcement is required for places where bolts are frequently removed

Female threads can be reinforced by using an insert

Keyed female-thread reinforcing inserts are available. These high-strength stainless steel integrated types can be used for firm fastening or in areas where bolts are frequently fastened and removed. Ideal for reinforcing female threads in resin, aluminum, or quartz, as well as for repairing damaged female threading.

HINT Keyed Female-Thread Reinforcing Inserts Q **SHINS**



06

Screws must be protected from chemicals

Screws with excellent chemical resistance and screws with head coating only are available

We offer screws made from various materials with excellent chemical resistance.

HINT Chemical Resistant Screws



08

Stainless steel screws must be prevented from galling/seizing

Screws with optimal surface treatments for each particular application are available

Special Surface Treated Screws can be used as a countermeasure against stainless steel screw galling/seizing.

HINT Special Surface Treated Screws
Q **SNSL-PN**



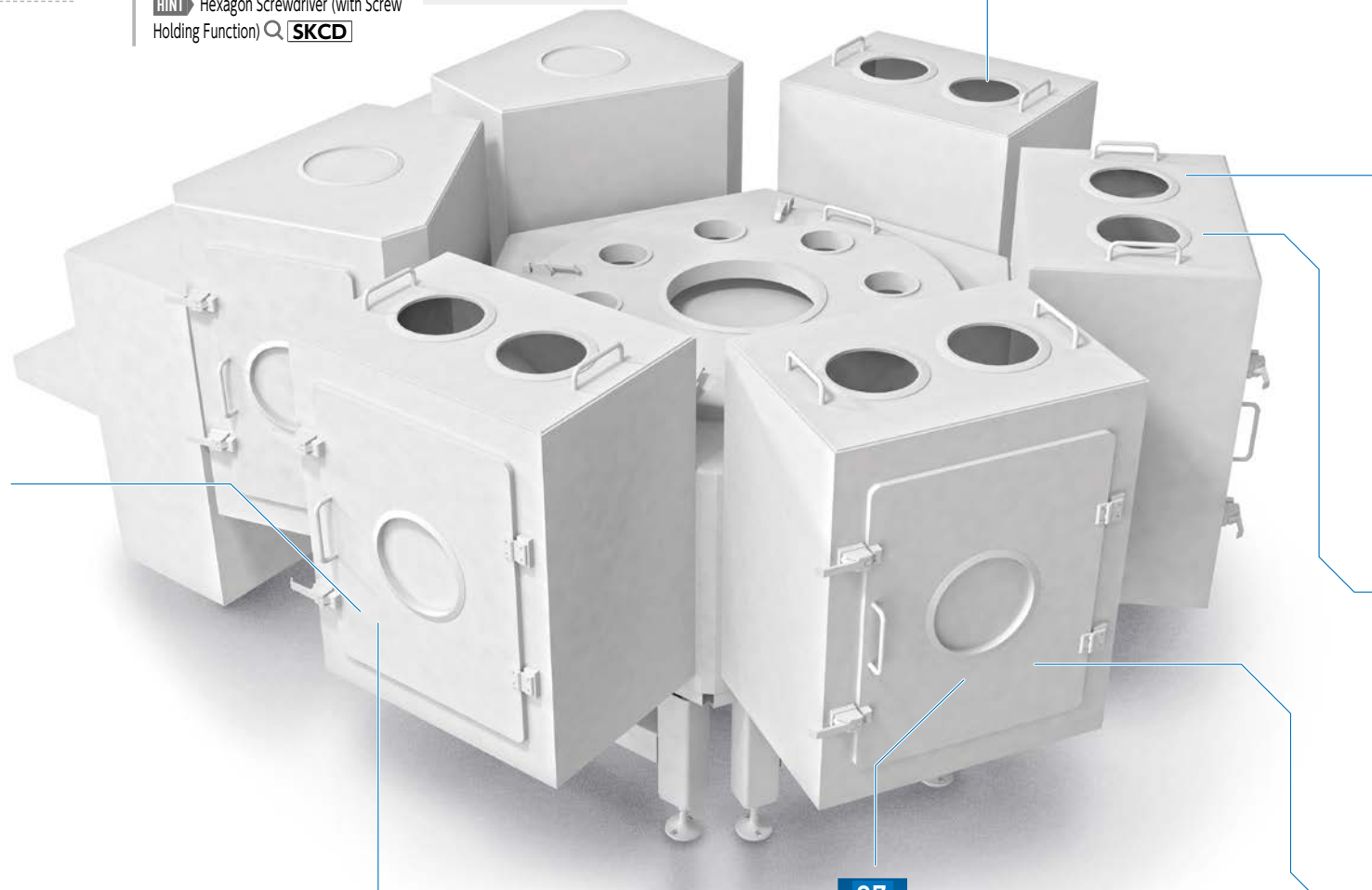
07

Screws that retain high strength even in high-temperature environments are required

We offer screws with excellent heat resistance

Screws made from various heat-resistant materials are available. Select according to the operating environment.

HINT Heat Resistant Screws



3 Equipment Exterior

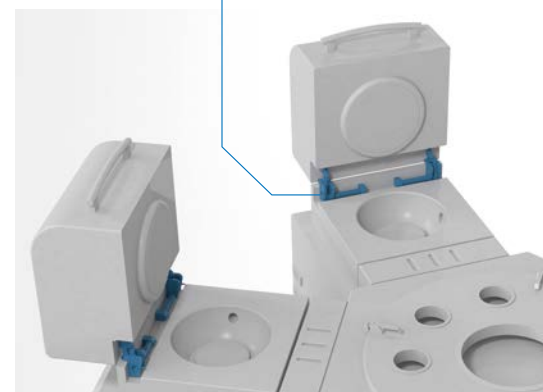
02 NEW

Heavy panels need to be lifted easily

Hinges supporting panel vertical opening/closing are available

Hinges supporting panel vertical opening/closing through torsion spring action are available. Space-saving mounting is possible in comparison to gas dampers.

HINT Counterbalance Hinges



03

Latches maintaining airtightness are needed

Robust latches are available

Using ladder action, the gasket is firmly compressed for latching. Also usable in highly airtight doors.

HINT Over-Center Draw Latches



04

CE marking compliance is required

Screws which don't fall out when the cover is removed are available

Fixed guards must be fixed by systems that can be opened or removed only with tools. The use of captive screws enables compliance with CE marking.

HINT Captive Screws **Q** SSC



01

Monitors need to be movable with one touch in accordance with the worker's height or the nature of the work

Available display mounting systems include options for various mounting locations

Adjust the monitor position freely.

HINT Display Device Mounting Systems

Q Display Mounting Systems

We offer parts which enable position changes with a single touch of a button.

HINT Positioning Brackets

Q CUAB-A



06

Touch panel operation without wobbling is required

Display arms able to withstand vibration and heavy weights are available

Displays can be retained at any angle in the vertical direction. Retention requires no screw or knob tightening and is secure even under heavy weights.

HINT Positioning Arms for Display

Q AV-D30 AV-D32



07

Only certain workers should be able to remove screws

Screws requiring dedicated tools for removal are available

Tampering can be prevented by using these screws where only certain workers should be able to remove screws.

HINT Tamper-Resistance Screws

Q SRFXS-SET



08

Doors must remain open during maintenance

Hinges retaining doors at a given angle are available

Three types (retaining angles of 80°, 115°, and 150°) are available to keep doors open at specific angles.

HINT Door Positioning Hinges **Q** C6-S



09

Products conforming to SEMI standards are required

An abundant lineup of compliant products are available for selection

The SEMI standard recommends the use of handles conforming to the Supplier Ergonomic Success Criteria (SESC) standard, in order to create a safe, comfortable, and convenient working environment.

HINT SEMI Standard Compliance



10

Doors must be easily mounted and removed

Hinges which remain mounted while doors are mounted and removed are available

Doors can be lifted up for easy removal with hinges still attached.

HINT Lift-off Hinges **Q** 96-NY



12

Doors must not be left open

Latches showing at a glance whether doors are open are available

Because the lever is pulled up when the door is open, the open/close status can be visually confirmed.

HINT Lift and Turn Compression Latches



05

Panels need to be rapidly mounted and removed

Parts enabling rapid, solid connection of panels are available

Simply rotate the stud by 1/4 turn for rapid, solid, easy connections. No loosening even when subject to violent vibration.

HINT DZUS (Quick Access Fastener)



11

Latching and tightening must be done by just turning the knob

Latches with full single-action operation are available

Latches enabling open/close and door inset with a single knob rotation action are available. Suitable for use in highly airtight locations or locations where play due to vibration must be prevented.

HINT Vise Action Latches **Q** E3-16-0



4 Various Process Issues

Pre-Process

Wafer cleaning equipment

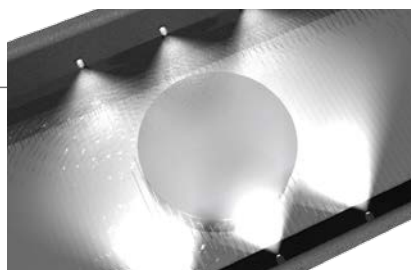
Cleaning process

► Component corrosion prevention is required

Screws with superior chemical resistance can be selected to withstand environments within equipment where chemicals are applied.

Characteristics required for special screws: **Chemical resistance**

Plastic Screws	🔥	🔍	SPEG
SUS316L Screws	🔥	🔍	SNSL
Hastelloy Equivalent Screws	🔥	🔍	SNSH
Ceramic Screws	🔥	🔍	SCX
Vespel Screws	🔥	🔍	SPD SPDC
Screws with PTFE Coated Head	🔥	🔍	SNHS-HTF
NEW Silicon Carbide Screws (SiC)	🔥	🔍	SICX
NEW Tantalum Screws	🔥	🔍	SNSTA
NEW Tungsten Screws	🔥	🔍	SNCW



Chemical Resistant Screws
Product list here ►



See here for further details
about Chemical Resistant
Screws ►



Oxidation/diffusion equipment

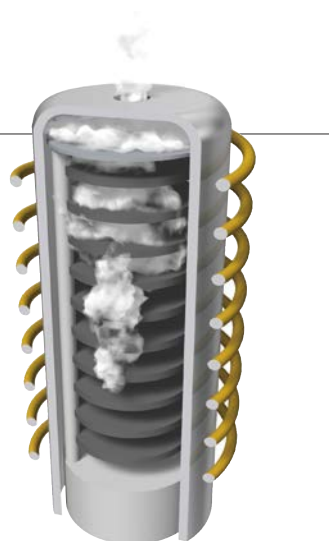
Heat treatment / oxidation/diffusion process

► Resistance to high temperatures and chemicals is required

For environments where various gases are used at high temperatures, screws with excellent heat resistance and chemical resistance are effective.

Characteristics required for special screws: **Heat resistance** **Chemical resistance**

Inconel Equivalent Screws	🔥	🔍	SNSI	
Hastelloy Equivalent Screws	🔥	🔍	SNSH	
NEW MAT21* Screws	🔥	🔍	SNSMT	



*MAT and MAT21 are registered trademarks of Hitachi Metals, Ltd.

Coater/developer

Film formation process

► Improved production capacity is required

High-rigidity couplings are effective for the high-speed rotation required for photoresist film formation on the wafer.

Characteristics required for couplings: **High rigidity**

Disk Couplings

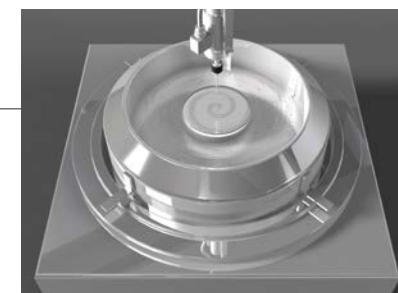
🔍 **XHW-C**



Flexible Couplings

(Vibration-Absorption Capable Disk Type)

🔍 **XGHW-C**



► Component corrosion prevention is required

Screws with superior chemical resistance can be selected to withstand environments within equipment where chemicals are applied.

Characteristics required for special screws: **Chemical resistance**

Inconel Equivalent Screws



🔍 **SNSI**



Semiconductor lithography equipment

Photolithography process

► Improved equipment accuracy is required

Even the small screws used at joints enable exposure accuracy to be improved by suppressing the influence of reflection.

Characteristics required for special screws: **Anti-reflection**

Low Temperature Black Chrome Treated Screws



🔍 **SNSS-RY**

Black Stainless Steel Screws

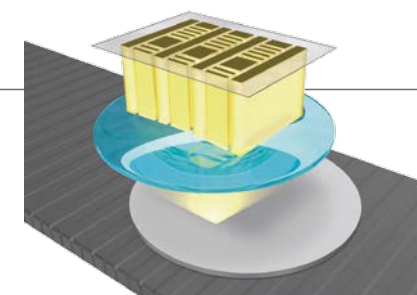


🔍 **SNSS-BK**

Anti-reflection screws



Product list here ►



Components increasing the rigidity of the equipment can be used to improve equipment responsiveness.

Properties required for drive components: **High rigidity**

Clamp Mechanism for Linear Guide

🔍 **MK**

Optimal shock absorbers for stage emergency stops are available. Using low-volatility bio-oil, they can also be used in clean environments.

High-performance Shock Absorbers

🔍 **PHE**

Etching equipment

Etching process

► Resistance to high temperatures and chemicals is required

For environments where various gases and solvents are used at high temperatures, screws with excellent heat resistance and chemical resistance are effective.

Characteristics required for special screws: **Heat resistance** **Chemical resistance**

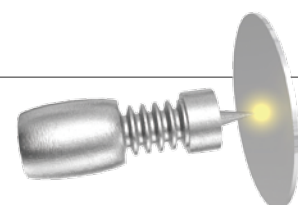
Ceramic Screws		 SCX	
Cover Cap/			
Ceramic Screws		 SCAP-CE	
NEW MAT21 Screws		 SNSMT	
Hastelloy Equivalent Screws		 SNSH	
SUS316L Screws	   	 SNSL	
Titanium Screws	    	 SNSTG	
Special Surface Hardened Screws		 SNSL-PN	
Heat-Resistant Screws		Chemical Resistant Screws	
Find product lists here ▶		Find product lists here ▶	

► Motor damage must be prevented

Components with excellent insulating properties are required as a countermeasure to prevent energization from vacuum variable capacitors.

Characteristics required for couplings: **Insulating properties**

Coupling for Vacuum Variable Capacitor
🔍 **MSXP-C-W-SP**



Ion implantation equipment

Ion implantation process

► Improved degree of vacuum is required

The degree of vacuum can be further improved by removing air trapped within the screw hole.

Characteristics required for special screws: **Vacuum**

Screws with Ventilation Hole 🔍
🔍 **Screws for Vacuum Equipment**
NEW Integrated washer types are also available
🔍 **SVSQLG**

► Screws that don't gall at high temperatures are required

We have screws that prevent galling due to heat cycling in environments of 1000°C or higher.

Characteristics required for special screws: **Heat resistance**

Special Surface Hardened Screws 🔍
🔍 **Special Surface Hardened Screws**
NEW Tantalum Screws 🔍 **SNSTA**
NEW Tungsten Screws 🔍 **SNCW**

► Improved equipment accuracy is required

Non-magnetic components are effective as fasteners to prevent ions from deflecting due to the magnetic properties of the part.

Characteristics required for special screws: **Non-magnetic**

Phosphor Bronze Screws 🔍 **SNSP**
Titanium Screws 🔍 **SNST**
NEW Tantalum Screws 🔍 **SNSTA**

Coating equipment/sputtering equipment

Film formation process

► Motor damage must be prevented

Components with excellent insulating properties are required as a countermeasure to prevent energization from vacuum variable capacitors.

Characteristics required for couplings: **Insulating properties**

Coupling for Vacuum Variable Capacitor
🔍 **MSXP-C-W-SP**

► Resistance to high temperatures and chemicals is required

For environments where various gases are used at high temperatures, screws with excellent heat resistance and chemical resistance are effective.

Characteristics required for special screws: **Heat resistance** **Chemical resistance**

Ceramic Screws 🔍 **SCX**
SUS316L Screws 🔍 **SNSL**
Molybdenum Screws 🔍 **SNSM**
Hastelloy Equivalent Screws 🔍 **SNSH**
Nickel Screws 🔍 **SNSN**
Inconel Equivalent Screws 🔍 **SNSI**
Titanium Screws 🔍 **SNST**
Heat-Resistant Screws 🔍
Find product lists here ▶
Chemical Resistant Screws 🔍
Find product lists here ▶

► Improved degree of vacuum is required

The degree of vacuum can be further improved by removing air trapped within the screw hole.

Characteristics required for special screws: **Vacuum**

Screws with Ventilation Hole 🔍
🔍 **Screws for Vacuum Equipment**

► Improved airtightness is required

To maintain the equipment interior environment, parts enhancing door and cover airtightness are recommended.

Properties required for machine elements: **High rigidity**

Draw Latches 🔍 **A7-10**
Compression Latches 🔍 **62-42**
Hinges 🔍 **96-AD**

Physical inspection equipment

Inspection/evaluation process

► Improved degree of vacuum is required

The degree of vacuum can be further improved by removing air trapped within the screw hole.

Characteristics required for special screws: **Vacuum**

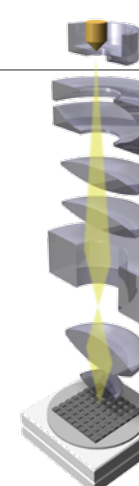
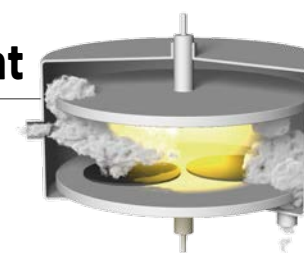
Screws with Ventilation Hole 🔍
🔍 **Screws for Vacuum Equipment**

► Increased inspection accuracy is required

Characteristics required for special screws: **Non-magnetic**

Plastic Screws: PPS 🔍 **SPS**
Titanium Screws 🔍 **SNST**
Phosphor Bronze Screws 🔍 **SNSP**

Non-magnetic screws
Product list here ▶



Electrical inspection equipment

Inspection/evaluation process

► Improved equipment accuracy is required

Realizes even greater servomotor gain, leading to reduced stabilization time.

Characteristics required for drive components: **High gain support**

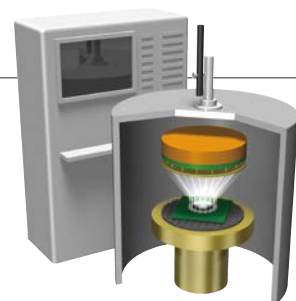
High-gain Rubber Couplings ▶ **XGT2**



Increasing the rigidity of the equipment can improve inspection speed.

Properties required for drive components: **High rigidity**

Clamp Mechanism for Linear Guide ▶ **MK**



► More compact equipment is required

We have small diameter screws of M2.6 and less, including S0.6 up and M1 up.

Characteristics required for special screws: **Space-saving**

Miniature Screws

Find product lists here ▶



Post-Process

Dicing machinery

Dicing process

► Improved productivity is required

High-strength components and components increasing the rigidity of the equipment can be used to improve equipment responsiveness.

Realizes even greater servomotor gain, leading to reduced stabilization time.

Characteristics required for couplings: **High gain support**

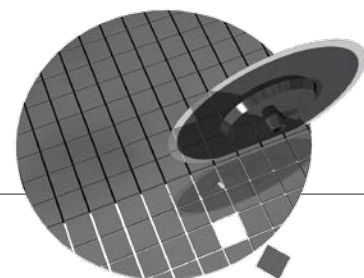
High-gain Rubber Couplings ▶ **XGT2**



Increasing the rigidity of the equipment can improve machining speed.

Properties required for drive components: **High rigidity**

Clamp Mechanism for Linear Guide ▶ **MK**



► Improved equipment accuracy is required

Screws with low thermal expansion and minimal dimension changes are effective.

Characteristics required for special screws: **Low thermal expansion**

Super Invar Screws ▶ **SNSIV**



► Components must be prevented from loosening due to vibrations

High-strength screws achieve greater fastening strength than regular screws, and consequently have loosening-preventing effects.

Characteristics required for special screws: **High strength**

High-Strength Stainless Steel Screws

▶ **SNSLG**



▶ **SNSX**



Die bonder

Mounting process

► Achieves high-speed bonding

Realizes even greater servomotor gain, leading to reduced stabilization time.

Characteristics required for couplings: **High gain support**

High-gain Rubber Couplings ▶ **XGT2**

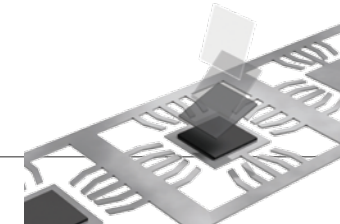


► Prevents components from loosening due to vibrations

High-strength screws achieve greater fastening strength than regular screws, and consequently have loosening-preventing effects.

Characteristics required for special screws: **High strength**

Titanium Screws ▶ **SNSTG**



Wire bonder

Bonding

► Achieves high-speed bonding

Realizes even greater servomotor gain, leading to reduced stabilization time.

Characteristics required for couplings: **High gain support**

High-gain Rubber Couplings ▶ **XGT2**



Products which reduce dynamic load by lightening equipment weight are available.

Characteristics required for special screws: **Lightweight** **space-saving**

Titanium Screws ▶ **SNSTG**



Miniature Screws

Low Profile Screws

▶ **Miniature Screw**

▶ **Low Profile Screw**

Space-saving screws

Product list here ▶



► Prevents components from loosening or falling out due to vibrations

The use of screws with a fall-out prevention mechanism (captive screws) is recommended, so that they won't fall out even if loosened by vibration.

Characteristics required for special screws: **Fall-out prevention**

Captive Screws ▶ **SSC**

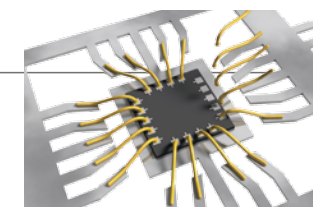


High-strength screws achieve greater fastening strength than regular screws, and consequently have loosening-preventing effects.

Characteristics required for components: **High strength**

High-Strength Stainless Steel Screws

▶ **SNSLG**



Mounting machinery

Mounting process

► Achieves high-speed bonding

Realizes even greater servomotor gain, leading to reduced stabilization time.

Characteristics required for couplings: **High gain support**

High-gain Rubber Couplings ▶ **XGT2**



Products which reduce dynamic load by lightening equipment weight are available.

Characteristics required for special screws: **Lightweight**

Titanium Screws ▶ **SNSTG**



Issue Solutions and Case Studies for Food Machinery

Both hygiene and workability have to be improved...
From various equipment case studies to an explanation of hygienic design

The "Hygienic Family" handles hygiene and cleanrooms

Toward safe and hygienic manufacturing of food products, NBK's Hygienic Family resolves issues with food machinery.

In accordance with the mounting location on the food machinery and the type of food product being manufactured, products suited to needs such as ease of cleaning, corrosion resistance, foreign matter contamination countermeasures, and so on are available.

The Hygienic Family is an overall name for the group of products for use in food machinery, including stainless steel products, those with fall prevention mechanisms, and so on as well as hygienic design products.

What is hygienic design?

Hygienic design refers to products which have been EHEDG certified or are compliant with EHEDG guidelines. Based on the criteria below, hygienic design takes into account ease of cleaning and corrosion resistance.

What is EHEDG?

European Hygienic Engineering & Design Group

EHEDG (European Hygienic Engineering and Design Group) is a consortium providing hygienic design criteria and guidelines for safe food production. They issue certificates for equipment compliant with domestic and international law and in direct contact with food products.

EHEDG design criteria

- Surface roughness less than Ra0.8
- Sealed to prevent gaps in bolt locations
- Seal part must prevent ingress of foreign matter or liquid
- Corner part R6 or more
- Made of stainless steel superior in corrosion resistance



The NBK Hygienic Family

EHEDG Certified

Hygienic Design

These products have obtained EHEDG certification. Mounting surfaces and gaps between parts, which offer easy ingress for foreign matter and liquid, are thoroughly sealed. With great ease of cleaning, they enable consistently hygienic environments and reduced cleaning costs.



EHEDG Compliant with guidelines

Hygienic Design

These products are compliant with EHEDG guidelines.



SUS316L

Made of SUS316L, with even higher corrosion and heat resistance than SUS304.



SUS304

Stainless steel with high corrosion resistance is ideal for food machinery requiring frequent cleaning. Metal contamination due to rust can also be prevented. A plentiful lineup is available.



Captive

Foreign matter contamination countermeasures are essential for food machinery. Also ideal for CE marking compatibility.



1 Food Packaging Machinery

01

Width/height adjustment changeovers must be streamlined

Automate manual operation to cut down on labor

This equipment automates handles operated one by one in multiple locations. Batch control of up to 32 units is possible.

HINT Auto-Positioning Units
Q **EPU**



Learn more about Auto-Positioning Units → P.58

02

Equipment must be kept clean

Stainless steel knobs with high corrosion resistance

SUS316L knobs, which will not rust even when frequently cleaned, are available.

HINT Stainless Steel Hand Knobs
Q **KEHS-M-A4**



Parts which help prevent the accumulation of dust and dirt

With an even surface, they are easy to clean.

HINT Stainless Steel Hand Knobs Q **KMDFS**
All-Stainless Steel Clamp Levers (Male Screws) Q **LDMS-AS**



Hygienically designed parts with EHEDG certification are available.

HINT Leveling Adjusters (Male Screws)
Hygienic Design
Q **FKAMS-W-HD**



Learn more about Machine Elements → P.62

Rust-resistant parts usable even for drive components

All-stainless steel couplings are available.

HINT Slit Couplings
SUS303: Q **MSTS**
SUS316L:
Q **XSTS-C**



Learn more about couplings → P.50

03

Touch panels and displays must be installed to move toward a paperless plant

Sturdy display mounting systems are available for onsite use

Display mounting systems with freely adjustable angles, mountable on walls, aluminum frames, or round pipes, are recommended for use.

HINT Display Mounting Components
Q **Display Mounting Systems**



04

Foreign matter contamination must be prevented

Safety comes first for food production.

These products are effective in preventing fallout or loss of parts. HACCP and CE Marking compliant products are also available.

Keep loosened nuts from falling off

With relief cutting in the handle threading, the nuts on these handles won't fall off even if they come loose.

HINT Captive Pulls Q **UNMS-SC**



Keep screws from falling into equipment or materials

Screws with structures like this will not fall out of the panel even when removed, because the relief cutting in the threads catches on the screw hole.

HINT Captive Screws Q **SSC**



Prevent part fallout when mounting/removing panels

Fixing parts are available to prevent fallout even when panels are removed. Fixed to the panels, there will be no fallout or loss. For fallout countermeasures in locations where mounting/removal is frequent.

HINT Quick Access Fasteners
Q **DZUS**



Washers prevent screw fallout

The washers can simply be assembled to commercially available screws to achieve fallout prevention countermeasures. After assembly, they will be unlikely to fall off the screws.

HINT Captive Washers Q **SWAS-SC**



Learn more about the Captive Series → P.39

05

Female thread damage when replacing cutters or squeegees must be prevented

Reinforce female threads to prevent damage

Integrated stainless steel with high strength makes them effective in areas where bolts are frequently inserted and removed.

HINT Keyed Female-Thread Reinforcing Inserts
Q **SHINS**



2 PET Bottle Molding Machinery

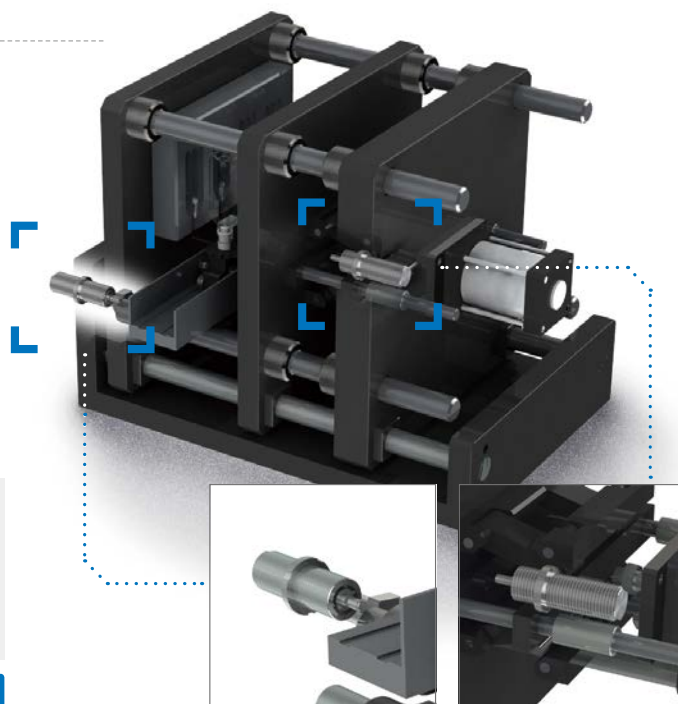
Need to absorb the shocks when molds are opened and closed

Shock absorbers with excellent shock absorption are effective

Shock absorbers with short shock absorption stroke and no need for deceleration under heavy loads are available.

HINT High-performance Shock Absorbers **PHE**

Learn more about Shock Absorbers → P.70



3 Issues and Hints on Solutions for Various Equipment and Machines

01 Screws must be protected from chemicals

We offer screws made from various materials with excellent chemical resistance.

Metal's chemical resistance

Material	Chemical Resistance
Hastelloy* ¹	High
Titanium	
Inconel* ²	
SUS316L (HiMo)	
SUS310S	

Resin's chemical resistance

Material	Chemical Resistance
PTFE (Tetrafluoroethylene)	High
PVDF	
H-PVC	
PP	
PEEK	

SCAP-PT

PTFE (tetrafluoroethylene) cover cap protects the screw head from chemicals



HINT

Screws with excellent chemical resistance and screws with head coating only are available

SNHS-HTF

The bolt head alone has PTFE coating with excellent chemical resistance



Recommended product

Chemical Resistant Screws



Learn More → P.54

Chemical resistance changes with performance conditions. Always carry out tests under the same conditions in advance.

* 1: Hastelloy is a registered trademark of Haynes International, Inc.

* 2: Inconel is a registered trademark of Special Metals Corporation.

02 Arranging for cleanroom washing and packaging is a nuisance

Products are washed and packed in cleanrooms. Ideal for use as components to be incorporated into semiconductor/FPD production equipment, food industry machines, medical equipment, etc.

■ Ultrasonic cleaning (supports rust-resistant materials such as stainless steel)



■ IPA wash (supports easily rusted materials such as iron)



HINT

Cleanroom washing/cleanroom packing delivery services are available

Recommended product

Cleanroom Wash/
Cleanroom Packing Service



Issue Solutions and Case Studies for Medical Equipment

Introducing hints for ensuring cleanliness and safety in biochemical analysis equipment, MRIs, etc.



1 Biochemical Analyzers

01

Monitors need to be movable with one touch in accordance with the worker's height or the nature of the work

Available display mounting systems include options for various mounting locations. Adjust the monitor position freely.

HINT Display Device Mounting Systems
Q **Display Mounting Systems**

We offer parts which enable position changes with a single touch of a button.

HINT Positioning Brackets
Q **CUAB-A**



02

Component corrosion prevention is required

Highly corrosion-resistant material is available, ideal for areas exposed to chemicals or frequently cleaned

We offer screws with excellent chemical resistance.

HINT Chemical Resistant Screws
Q **Chemical Resistant Screws**

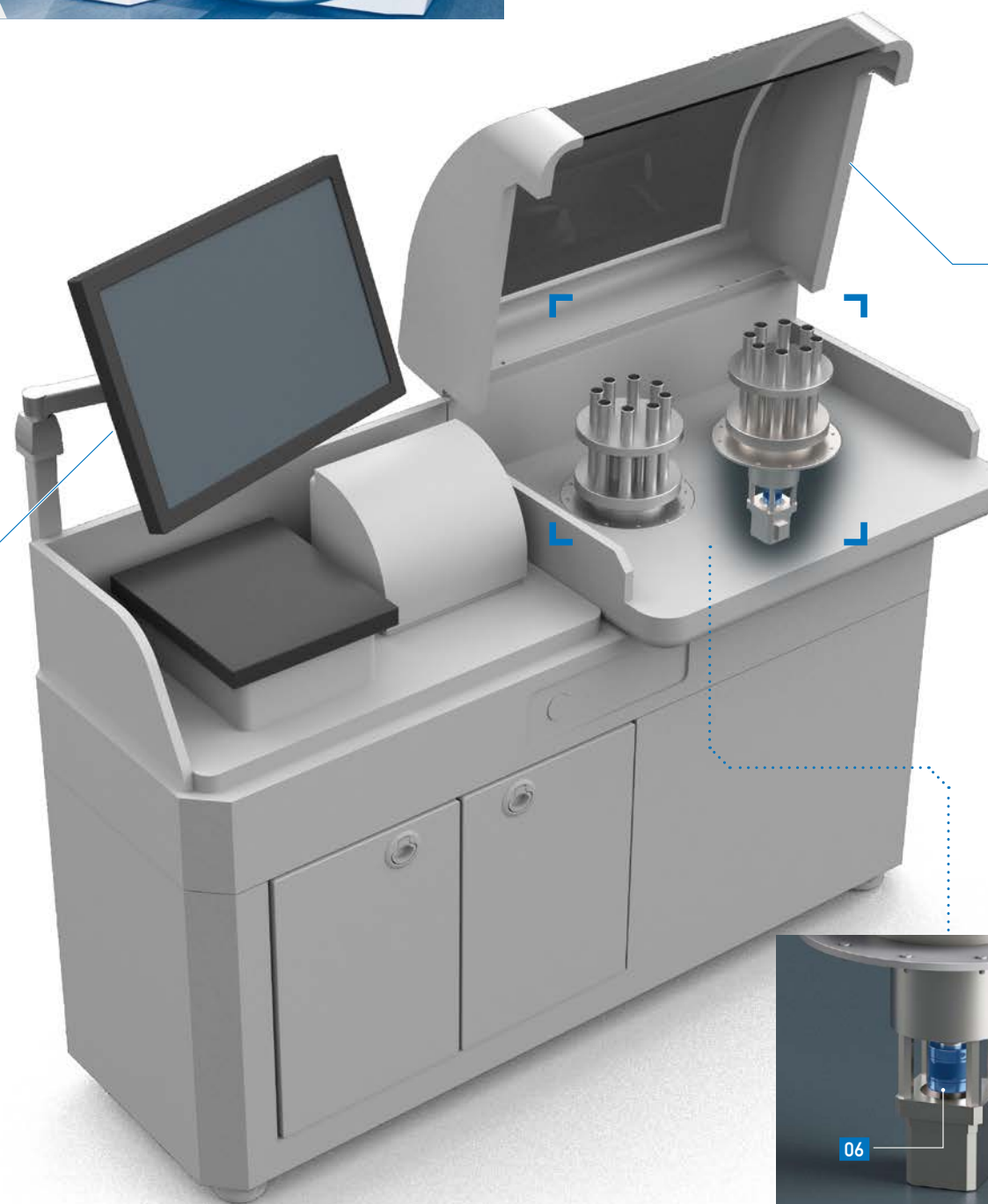
All-stainless steel parts are available. We also offer parts made of highly corrosion-resistant SUS316L and SUS304.

HINT Three-Lobe Knobs (SUS316L) Q **KTLS-M-A4**

HINT Stainless Steel Hand Knobs (SUS304) Q **KDHMS**



Learn more about Machine Elements → P.62



03

Simpler cleanroom support is required

Cleanroom washing/packing delivery services are available

Assembly to equipment is possible without separate washing.

HINT Cleanroom Washing/Cleanroom Packing Service



04

Safety measures are needed for falling covers

Hinges enabling cover angle and open/close speed adjustment are recommended

Hinges with different opening and closing torques are available.

HINT Torque Hinges Q **E6-TL**

Hinges retaining doors at a specific angle are available.

HINT Door Positioning Hinges
Q **C6**



Learn more about Machine Elements → P.62

05

NEW

Heavy doors need to be easily opened and closed

Hinges aiding door open-close torque are available

Heavy panels can be lightly operated with torsion spring action aiding panel vertical opening/closing. Suitable open-close torque for the panel size and weight can be achieved through torque adjustment screws.

HINT Counterbalance Hinges Q **CB**



Learn more about Machine Elements → P.62

06

Vibration during high-speed mixer rotation must be prevented

The use of couplings that can absorb vibration is effective

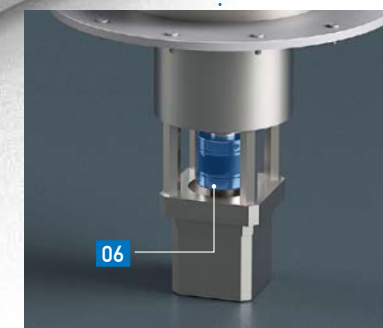
Couplings enable high-speed rotation by absorbing the vibration caused during rotation.

They also prevent equipment noise.

HINT High-gain Rubber Couplings Q **XGT2**



Learn More → P.50



2 Operating Tables

01

Everything must be kept clean

The use of parts with great ease of cleaning is recommended

Parts with minimal unevenness are available.

HINT Triangular Knobs [Q KYTS-M](#)

SUS316L parts with excellent corrosion resistance and heat resistance are available.

HINT Three-Lobe Knobs [Q KTLFS-M-A4](#)

Learn more about Machine Elements [→ P.62](#)



02

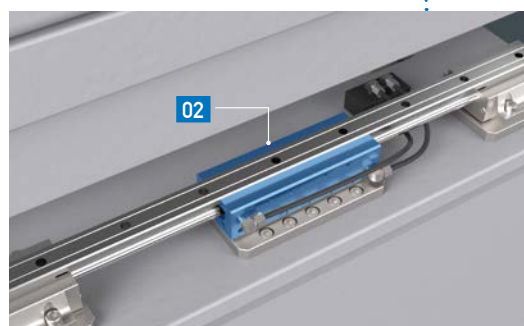
Bed rattling must be suppressed

Mechanisms which can prevent vibration are effective

Mechanisms which clamp directly onto the drive shaft to suppress vibration are available.

HINT Clamp Mechanism for Linear Guide [Q LBHS](#)

Learn more about Clamp Mechanisms for Linear Guide [→ P.66](#)



3 CT Scans/MRIs

01

CT Scan

Equipment must not be affected by microwaves

The use of plastic screws with excellent insulating properties is recommended

HINT Plastic Screws [Q SPT-H](#)



MRI

Equipment must not be affected by magnetism

Non-magnetic screws are recommended

HINT Titanium Screws [Q SNSTG](#)



Learn more about Special Screws [→ P.54](#)

02

NEW

Tools are dangerously attracted to strong magnetism

Non-magnetic tools are available

The use of non-magnetic titanium alloy hexagon keys enables assembly and maintenance of equipment and devices in environments with strong magnetic fields.

HINT Titanium Hexagon Keys [Q SKHTG](#)

Learn more about tools [→ P.54](#)



03

Bed rattling and backlash must be suppressed

Mechanisms which can prevent vibration are effective

Mechanisms which clamp directly onto the drive shaft to suppress vibration are available.

HINT Clamp Mechanism for Linear Guide [Q LBHS](#)

Learn more about Clamp Mechanisms for Linear Guide [→ P.66](#)



04

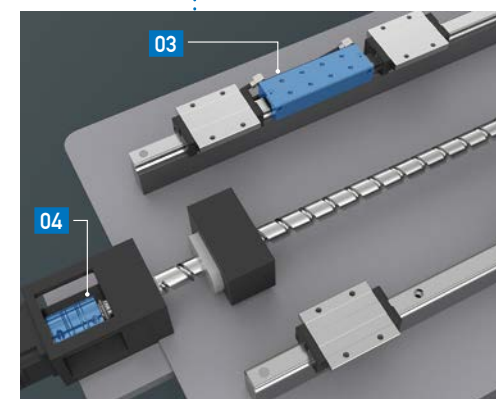
Everything must be kept clean

Highly corrosion-resistant parts are essential

All-stainless steel couplings are available.

HINT Slit Couplings [Q MSTS](#)

Learn more about couplings [→ P.50](#)





Solving manufacturing industry issues!

NBK Product Introduction

Here we present NBK products
which provide hints on design and development.

01



NBK High-performance Couplings

Enhancing servomotor performance and
realizing high-speed, high-precision positioning

» P.50

02



NBK Special Screws

Leave your toughest screw problems to us

» P.54

05



NBK Brake Clamp Mechanism for Linear Guide

“LinearClamper-Zee”

Enhancing equipment rigidity with
“stopping technology”

» P.66

06



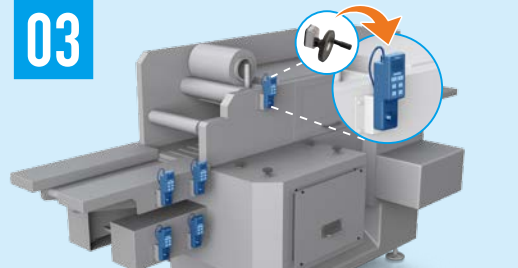
NBK High-performance Shock Absorber

“PowerStop”

Equipment performance improved with long
service life and smooth shock absorption!

» P.70

03



NBK Auto-Positioning Units

Automating the changeover process without
extra design work!

» P.58

04



NBK Machine Elements

The product lineup and engineering capacity
that only a specialist manufacturer can provide

» P.62

07



NBK Castings

NBK is a professional when it comes to
casting

» P.72

NBK High-performance Couplings

Enhancing servomotor performance and realizing high-speed, high-precision positioning



“High-gain couplings”
handling the high responsivity of the latest servomotors

XG Family

eXtraGain Family (XG Family)
With excellent “damping ability (vibration absorption/suppression)” balanced with “rigidity,” beyond the grasp of conventional couplings, these couplings realize high responsivity and high-precision positioning.

Advantages of adopting the XG Family

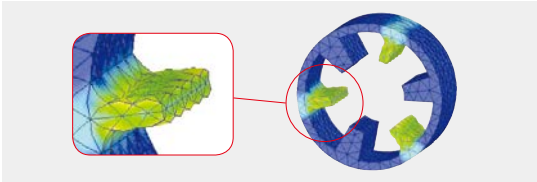
Shortens stabilization time and contributes to productivity improvement
The optimal damping and rigidity design enables realization of even higher servomotor gain, leading to reduced stabilization time and improved productivity.

● Measurement of stabilization time and overshoot
The XG Family is used to increase servomotor limit gain (the upper limit value of the gain at which servomotors can be used, with no hunting generated).

Gain*		XG Family		Disk Type
		XGT2	XGT-CS	
25	Stabilization Time (ms)	12	12	12
	Overshoot (μm)	0.4	0.9	0.6
27	Stabilization Time (ms)	8	8	Occurrence of hunting
	Overshoot (μm)	0.6	1	
32	Stabilization Time (ms)	3	Occurrence of hunting	Occurrence of hunting
	Overshoot (μm)	1.7		

*Values with all gains, such as position control gain and speed control gain, adjusted (1-32) *Values in the table vary depending on testing conditions

Long service life
This product succeeds in elongating its life by evenly dispersing the stress focused around the inner diameter of the jaw throughout the entire jaw. Properties do not change even after 10 x 8 cycles.



No adjustment required
The motor vibration frequency is automatically absorbed by the coupling itself, in the role of a mechanical notch filter requiring no adjustment.

Please visit the NBK website for more details.

Specifications of each model

XGHW High Rigidity/Vibration Absorption

A model with both high rigidity and vibration absorption.
The individual dynamic vibration absorber*1 is separate from the inertial rotor and elastic body in order to achieve vibration absorption.
*1: The mechanism for suppressing resonant vibration phenomena is achieved by connecting the dynamic vibration absorber to the auxiliary inertial rotor via the elastic body.

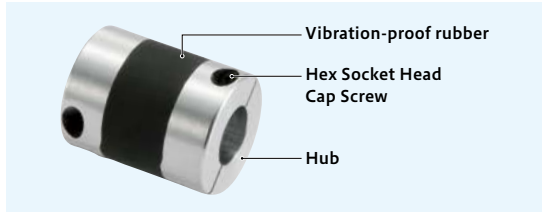


● Balance of high rigidity and vibration absorption

● Structure diagram

Please visit the NBK website for more details.

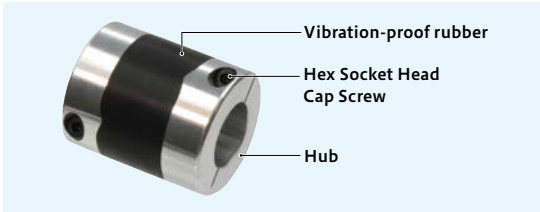
XGT2 High-gain



A model with a superb vibration absorption function (high-gain). This is a single-piece construction with the two aluminum hubs molded with high-gain rubber.

Please visit the NBK website for more details.

XGT-CS High Cost Effectiveness



A general-purpose model with well-balanced performance and price. This is a single-piece construction with the two aluminum hubs molded with high-gain rubber.

Please visit the NBK website for more details.

Comparison and selection among XG Family performance

	XGHW	XGT2	XGT-CS
Rigidity	◎	○	○
Vibration Absorption Function	○	◎	○



XGHW: for positioning in applications with vertical axes and high loads



XGT2 XGT-CS: for positioning in applications with horizontal axes and low loads

Find coupling basic information from the next page on →

Check the basics

Here we review the roles, types, and characteristics of various couplings.

What are couplings?

A coupling is a machine element that connects the drive shaft and driven shaft ball screw, etc. of a motor, etc., in order to transmit power.

Shaft couplings are available in a small type mainly for FA (factory automation) and a large casting type used for large power transmission such as in wind and hydraulic power machinery.

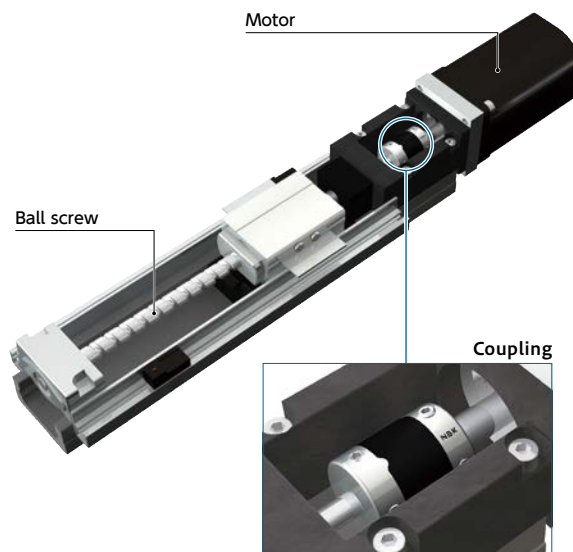
At NBK, the former is called a coupling and the latter is called a shaft coupling; here we discuss couplings.

Why do we need couplings?

1. Connecting drive shafts with driven shafts to transmit power

The most important role of a coupling is to connect the drive shaft of a motor etc. with the driven shaft of a ball screw etc. to transmit the motor power to the driven shaft, as shown in the figure below.

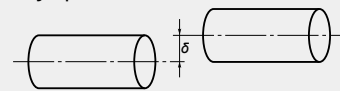
There are various types of shaft fastening, such as the “set screw type” which fastens by directly pressing screws against the shaft, the “clamping type” which fastens with frictional force, and the “bushing type” which uses the wedge effect.



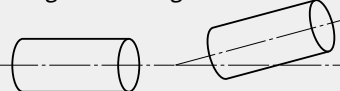
2. Providing tolerance for mounting errors (misalignment) between the drive shaft and the driven shaft

The offset between the cores of the driving shaft and the driven shaft is called misalignment. There are three different types of misalignment: eccentricity, angular alignment, and end-play (offset in axial direction). These should be minimized in order to avoid equipment issues such as vibration, noise, uneven wear on the bearing and so on.

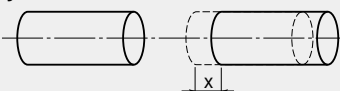
Eccentricity (parallel error)



Angular Alignment (angular error)



End-play (axial movement)



However, it is extremely difficult to completely eliminate misalignment when assembling equipment. Couplings provide tolerance for the misalignment remaining after assembly.

3. Absorbing equipment impacts and vibration

Jaw type couplings have elastic bodies such as elastomer built in as an intermediate component that functions to absorb impacts and vibration.



4. Improving equipment performance

Depending on the type of coupling, it can also work to improve equipment performance in addition to the roles described so far. As an example, high-gain rubber type couplings have integrally molded vibration-proof rubber that suppresses servomotor resonance. This improves limit gain, thus reducing stabilization time and improving productivity.



For details of High-gain Rubber Type Couplings, see the previous page

Types and features of NBK's Couplings

Various types of couplings exist, each with their own strengths and fields of application.

Select the coupling best suited for the requirements of the equipment in which it is used, based on its characteristics.

 1 High-gain Rubber type Best suited for servomotors * Details on previous page	 2 Disk type Second best for servomotors after rubber type	 3 Jaw type Best suited for power transmission applications
 4 Oldham type High allowable misalignment	 5 Slit type Classical type that can also be custom made	 6 Rigid type Highly coaxial fastening
 7 Bellows type Best suited for encoders	 8 Cross Joint type Reduces load on shaft	 9 Serration type Low cost Simple assembling

Find coupling selection methods here



NBK Special Screws

Leave your toughest screw problems to us

These screws are designed to resolve issues with special applications, such as use in vacuum, at high temperatures, or in chemical-resistant environments.



Manufacturing issues resolved by NBK screws

We resolve various client issues with “technical capacity,” “application to a wide range of fields,” and “combined technologies.”

 Vacuum	 Low Outgas	 Cleanroom Specification	 Chemical Resistance	 High Strength
 Heat Resistance	 Seizing Prevention	 Tightening Hole Damage Prevention	 Anti-reflection	 Electrical Insulation
 Non-magnetic	 Lightweight	 Space-saving	 Simple Operation	 Loss Prevention
 Anti-loosening	 Decoration	 Fixing/Positioning	 Transport	

Tools resolving screw-related struggles are also available

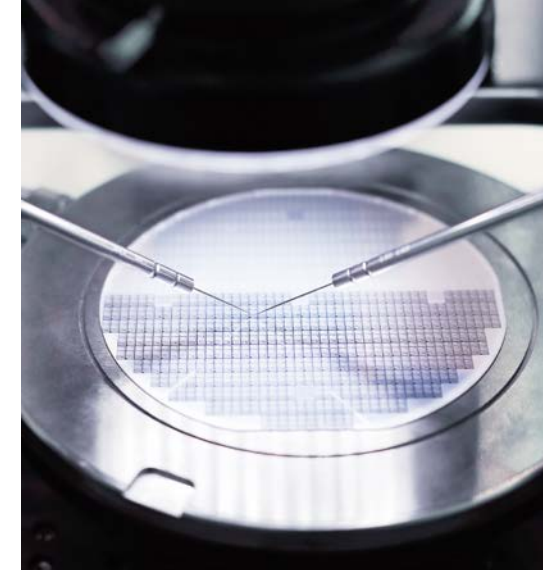
- Tools for removing screws with damaged recesses
- Tools for screw tightening work in limited access spaces
- Tools for preventing screw fallout and loss during work
- Non-magnetic tools enabling use in strong magnetic environments

Please visit the NBK website for more details.



Abundant experience of adoption for semiconductor manufacturing equipment

NBK special screws have been widely adopted for semiconductor manufacturing equipment due to their high performance in support for vacuum environments, seizing prevention, etc. Semiconductors, sometimes called the “bread of industry,” are now virtually the “bread of society,” growing ever more important. Along with the dramatic worldwide growth of semiconductors, similar development has taken place for semiconductor manufacturing equipment. NBK has worked for many years to develop special screws which resolve various issues in semiconductor manufacturing, contributing to industry development. Here are a few examples of the semiconductor manufacturing issues which have been resolved by NBK special screws.



Issues in semiconductor manufacturing resolved by NBK special screws

Issues 01 Equipment/device time to reach vacuum must be reduced and vacuum degree stabilized



▶▶▶ Screws for Vacuum Equipment do it!

Screws with ventilation holes enable venting the air pooling in screw holes, contributing to reduced time for equipment/devices to reach vacuum and vacuum degree stability.

Issues 03 Screws with higher strength than plastic, unaffected by “corrosive gases,” are required



▶▶▶ Hastelloy C-22 Equivalent Hex Socket Head Cap Screws do it!

Hastelloy C-22* is one of the few metals which can withstand wet chlorine gas, hypochlorite, and chlorine dioxide.

*Hastelloy is a registered trademark of Haynes International, Inc.

Issues 02 Screws with seizing prevention which will not contaminate a vacuum chamber are required



▶▶▶ Special Surface Hardened Screws do it!

Galling and seizing are prevented by curing the screw surface. There is nothing adhering to the surface, eliminating concerns about contamination.

▶ If you are struggling with other issues...

Various other screws are available to resolve other issues as well, including non-magnetic screws, high-strength screws, chemical resistant screws, and so on. We are also constantly developing screws using materials such as SiC and tantalum in order to respond to customer needs.

Find screws solving issues with semiconductor manufacturing equipment here



▶ As for industries other than semiconductor manufacturing...

We now offer screws to resolve a finely divided range of issues, throughout applications and industries, in addition to semiconductor manufacturing equipment.

We propose the optimal screws for the resolution of customer issues

We propose products and specifications suited to customer issues, drawing on various materials, surface treatment, machining technologies, and experience.

Material examples

High Strength		Heat Resistance		
Titanium 64 (Ti-6Al-4V)	SUS316L	Pure Molybdenum	Ceramic (Alumina 99.5%)	Plastic (VESPEL®)
				

Corrosion Resistance		
Plastic (PTFE tetrafluoroethylene)	Pure Nickel	Plastic (PEEK)
		

Other screws made from various materials are also available 

Surface Treatment Examples

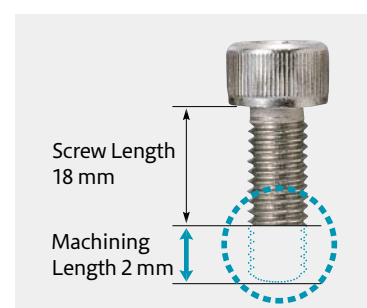
Special Surface Hardening Treatment	Gold Coating	Silver Plating	PTFE Coating	Special Chemical Polish
				
Electroless Nickel Plating	Low Temperature Black Chrome Treatment	MoS₂ Shot		
				

Other screws with various surface treatments are also available 

Examples of machining technology

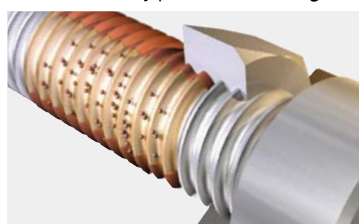
► Screw Cutting Service

The screw can be cut to your preferred length in 1 mm increments.



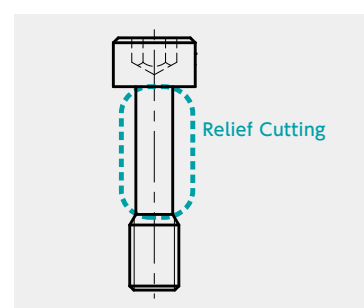
► Anti-Loosening Service

Screws are coated with sealed microcapsules containing adhesive. When the screw is tightened, the microcapsules break and release the adhesive agent, which effectively prevents loosening.



► Captive Processing Service

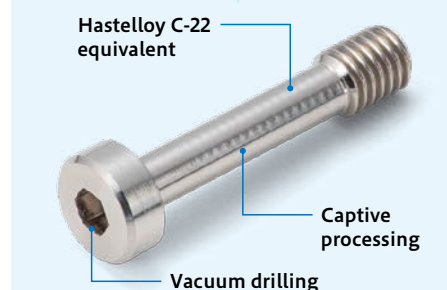
Screws are provided with relief cut and fallout prevention functions.



How about non-standard screws? Leave it to us

- Of the actual orders placed, 60% are for special screws other than standard products.
- Optimal machining methods are used to manufacture screws, such as cutting and rolling.
- Custom orders are available in small lots, from a single prototype up.

We also manufacture screws like these



Gold Coating



Magnetic Polishing



Screws made of difficult-to-machine materials

Screws made of the materials generally known as difficult to machine are also available.

► Silicon Carbide (SiC)

This material has excellent heat and chemical resistance.



Please visit the NBK website for more details.



► Tantalum

With excellent resistance to corrosion as well as strong acids like sulfuric acid and aqua regia, this material is ideal for use in environments using chemicals, inside semiconductor manufacturing equipment, or inside FPD production equipment. Cleanroom washing and packing takes place before delivery.



Please visit the NBK website for more details.



► MAT21*1

MAT21 demonstrates excellent corrosion resistance in both oxidizing and reducing environments. In a wide range of corrosive environments, this material demonstrates better corrosion resistance than Hastelloy*2 C-22 and C-276. Cleanroom washing and packing takes place before delivery.



Please visit the NBK website for more details.



► Tungsten

The characteristics of this material include a high melting point and high specific gravity. Excellent chemical resistance also includes resistance to hydrofluoric acid. Cleanroom washing and packing takes place before delivery.



Please visit the NBK website for more details.



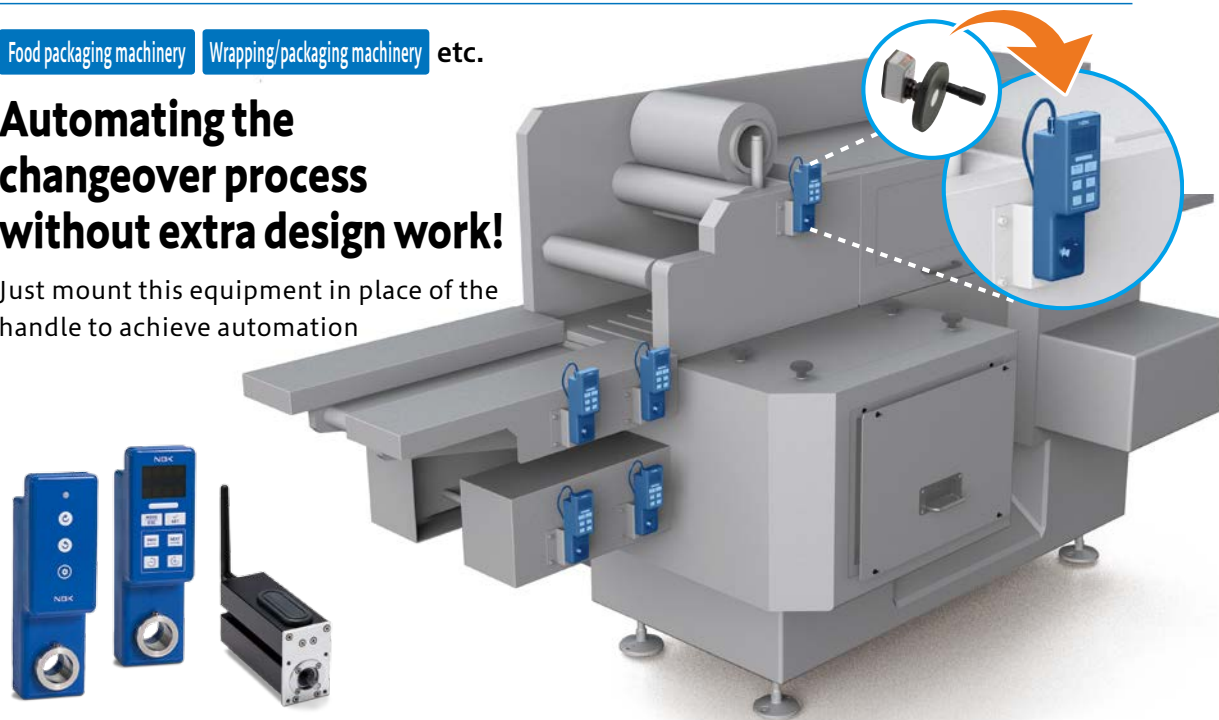
* 1: MAT and MAT21 are registered trademarks of Hitachi Metals, Ltd.
* 2: Hastelloy is a registered trademark of Haynes International, Inc.

NBK Auto-Positioning Units

Food packaging machinery Wrapping/packaging machinery etc.

Automating the changeover process without extra design work!

Just mount this equipment in place of the handle to achieve automation



Advantages for manufacturers

handling equipment design and manufacturing

Increases productivity and convenience

Difficult automation made easy!
Greater user satisfaction
when using equipment!

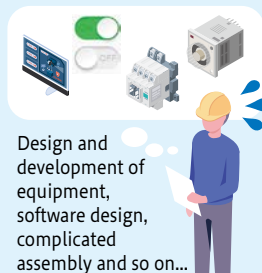
Increasing needs for automation

Given the labor shortage throughout the manufacturing industry, automation and simplification are being called for across various equipment, machinery, and onsite environments. We receive numerous consultations from designers and workers on automation and increased productivity.

How easy is the installation?
Actual mounting video available here!



Designing from square one...



Design and development of equipment, software design, complicated assembly and so on...

So much trouble!
Months of time and high costs

With Auto-Positioning Units...



Just mount in place of the handle!

Taking the struggle out of automation

Auto-Positioning Units are equipment enabling easy automation of the positioning process done with manual handles. Installation can be done just by mounting in place of manual handles, doing away with the design and development processes. This product has been adopted for various equipment and production sites.

See what users and operators like about this automation process on the righthand page!

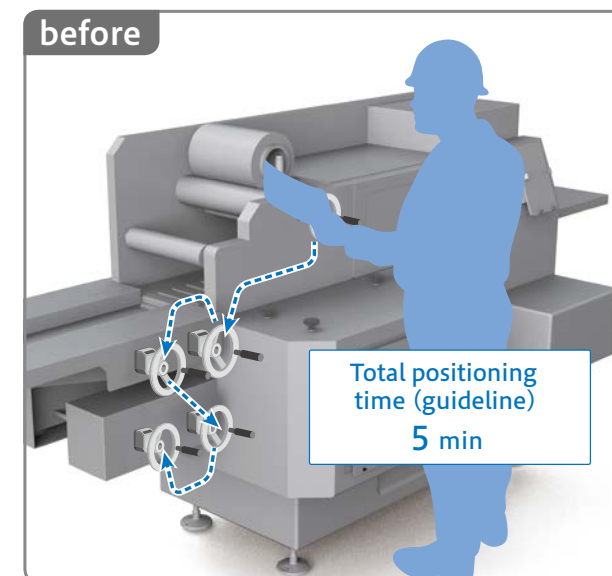
Advantages for users of equipment and facilities

Faster and with fewer errors, increasing production efficiency!

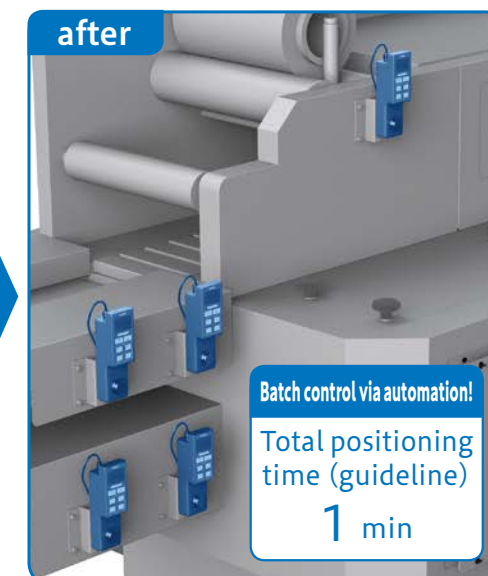
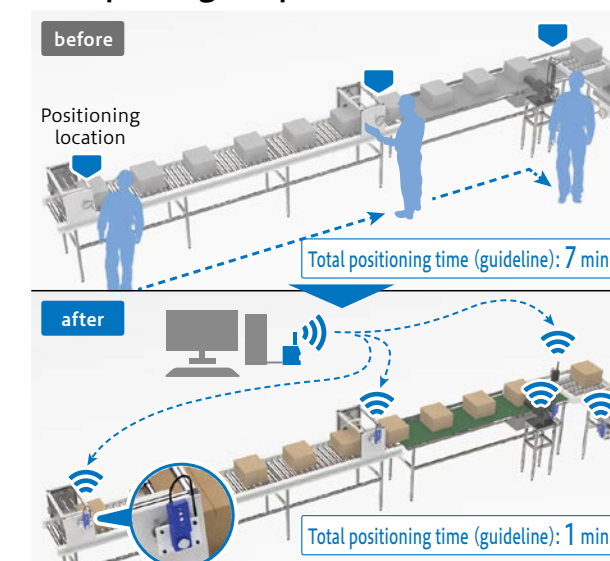
Reducing positioning work time

By replacing manual positioning work in equipment or production lines with automated control via Auto-Positioning Units, positioning in remote or multiple locations can be completed in one operation. Changeover patterns can be registered for repeated use, sharply reducing work time.

Improving production equipment!

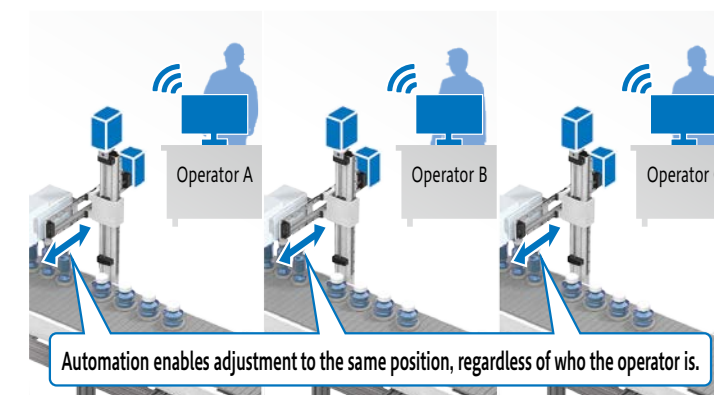


Improving the production line!



Changeover errors reduced/reliance on individual skill prevented

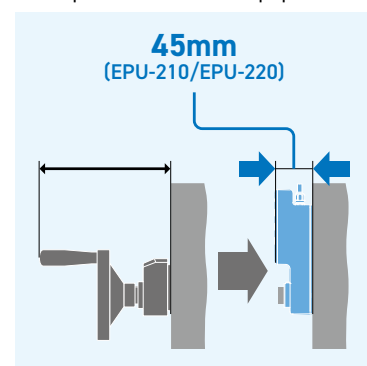
The risk of human error in positioning work in equipment or production lines is reduced, enabling accurate positioning. Additionally, positioning data can be shared more easily, as an effective measure against reliance on individual skill.



Product Characteristics

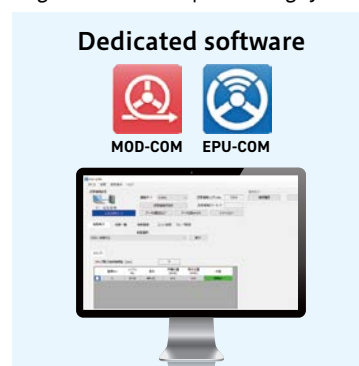
■ Thin and space-saving

Compared with the use of a combined handle and indicator, it is thinner and more compact. Contributes to space-saving without affecting the workability of the production line or equipment.



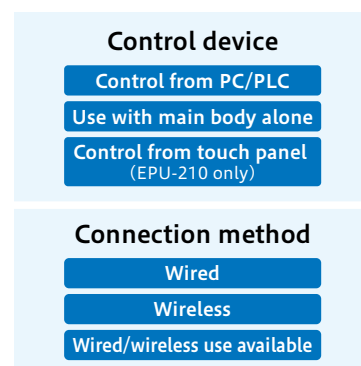
■ Dedicated software free of charge

Control software can be used free of charge. Automation is possible with minimized costs and time required compared to the construction of an original automated positioning system.



■ Various combinations enable automation

Various combinations of control devices, connection methods, etc. enable automation.



Unit Lineup

There are three unit models.
Select according to your
operating environment.



	EPU-210	EPU-220	EPU-100
Rated Torque (Standard)	0.8 N · m	0.8 N · m	0.765 N · m
Rated Torque (Using High Torque Adapter)	2.7 N · m*1 / 5.4 N · m*2	2.7 N · m*1 / 5.4 N · m*2	-
Wired Connection	○	○	○
Wireless Connection	×	○	○
Display	○	×	×
Use as a single unit	○*3	×	×
IP Protection Class	IP65	IP65	-
External Size (Power cable/excluding protrusion)	45 mm × 150 mm × 45 mm	45 mm × 150 mm × 45 mm	42 mm × 70 mm × 115 mm

*1: When used in combination with High Torque Adapter EOAT-200 - 4 *2: When used in combination with High Torque Adapter EOAT-200 - 8
*3: Usable without PC, PLC, or EPC-200-CC, EPC-210-EIP, or EPC-100 transceivers

[Usable regions]

EPU-210: Japan, US, Canada, Mexico, China, South Korea, Taiwan, Europe*1

EPU-220: Japan, US, Canada, China, South Korea, Taiwan, Europe*1

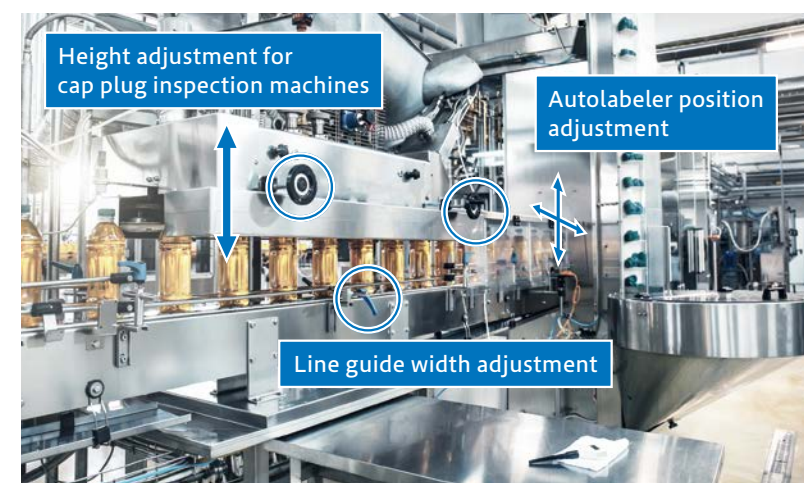
EPU-100: Japan, US, Canada, China

*1: Only the EPU-210/220 CE-compliant model units can be used in Europe.

Usage Examples

01.

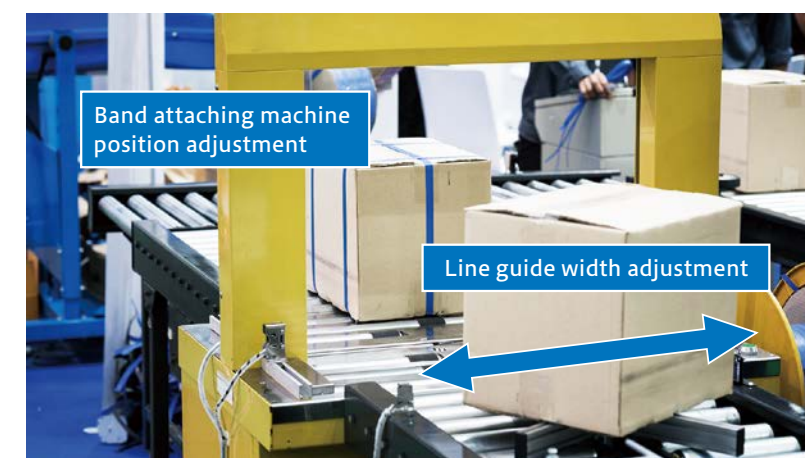
Food and beverage manufacturing industry



- Baumkuchen wrapping machine Autolabeler position adjustment
- Chopped salad packaging box Transport line guide width adjustment
- Dressing Filling line guide width adjustment
- Liquor bottle Transport line guide width adjustment
- Pastry dough Adjustment of extruded amount
- Canned coffee Pallet width adjustment in completed product transport process
- Liquid flavoring Height adjustment of X-ray inspection equipment

PET bottle

- Labeler position adjustment
- Transport line guide with adjustment
- Transport line after filling position adjustment of droplet removal equipment
- Capper line height adjustment for cap plug inspection machines
- Packaging inspection machine height adjustment



02.

Wrapping/ packaging machinery manufacturing industry

Cardboard

- Transport line guide width adjustment
- Printer head height adjustment

- Cardboard for paper packaging
Box sealer/band attaching
machine position adjustment

03.

Cosmetics manufacturing industry



- Hairstyling gel Transport line guide width adjustment
- Cosmetics Transport line guide width adjustment after filling
- Shampoo Transport line conveyor height adjustment
- Hand lotion Transport line guide width adjustment after filling

Please visit the NBK website
for more details.



NBK Machine Elements

The product lineup and engineering capacity that only a specialist manufacturer can provide

NBK's machine elements are made with painstaking attention to their comfort and beauty, as well as their functionality, operability, safety and reliability. The abundant lineup enables diversified needs to be supported. We have a range of high-performance, high-precision machine elements born from fresh ideas and accumulated technologies.

Abundant Lineup

Positioning Brackets



Levers



Knobs



Pulls



Latches/Hinges



Display Mounting Systems



Leveling Adjusters/Structural Components



Handles/Grips



Indicators/Scales/Dials



Linear Actuators



Lock Pins



Indexing Plungers



Plungers



Screws



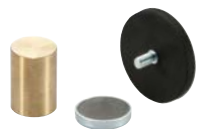
Ball Rollers



Set Collars/Cross Clampers



Magnets



Stages



Oil Level Windows



Ball Joints

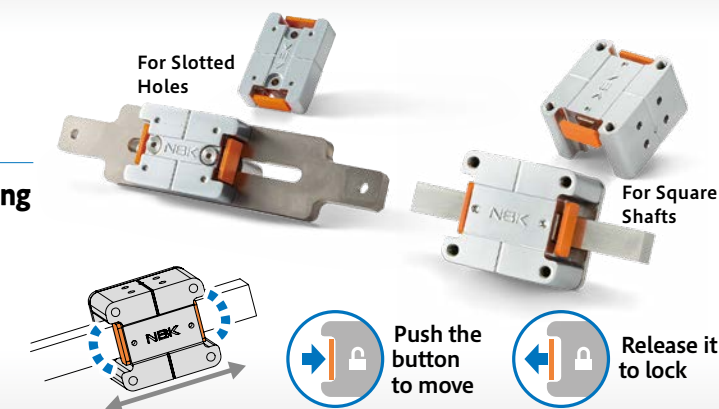


PICK UP Product

Positioning Brackets

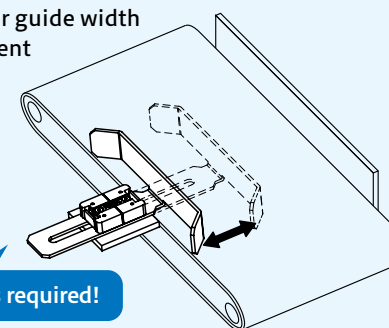
Simple one-touch positioning

These allow for positioning with one touch. Push button operation makes fixing possible with the same force regardless of the operator, with no concerns about forgotten tightening.



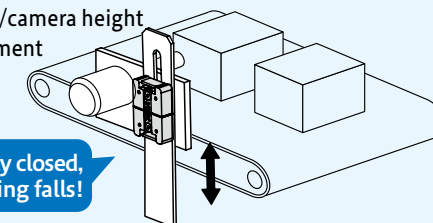
Recommended applications

Conveyor guide width adjustment



No tools required!

Sensor/camera height adjustment



Normally closed, preventing falls!

Please visit the NBK website for more details.



PICK UP Product

Display Mounting Systems

Robust mounting of displays to equipment/devices



Displays can be fixed to "display mounting components" according to the site layout, such as machine covers, walls, aluminum frames or their edges, round pipes, etc. Robust design with excellent durability

provides peace of mind even for use at plants. In addition to our diverse lineup, customization and made-to-order products are also available in accordance with customers' usage applications.

Please visit the NBK website for more details.





Mechatronics Components “MM+I”

Machine elements are integrated with sensors, switches, etc. in contribution to labor-saving and automation



Levers, pulls, handles and so on are where humans and Machines make contact, as machine elements realizing good communication (MM: Man & Machine Elements). Mechatronics components adding electrical elements (= Intelligence) such as sensing, monitoring, or switching to these

components are “MM+I (Man & Machine Elements with Intelligence).” In answer to a wider range of needs, they provide reinforced safety, reduced time spent on design and installation, standardized work, automation, prevention of human error and so on.

Pulls - With Switch

Pulls, switches, and so on are integrated to reduce time spent on design and installation

- ▶ For control of unlocking machine safety devices, etc.
- ▶ Status can be monitored during operation with LEDs (red/green).
- ▶ Switch colors can be changed with included caps (red/green/blue).

Usage Examples

Confirm interlock status visually

Push the switch on the pull mounted to the safety fence door to transmit an electrical signal, locking or releasing the interlock. LED display enables visual confirmation of locked/unlocked status. Reduces the risks of accidents due to carelessly opened doors and contributes to safety measures.



Indexing Plungers - With Sensor

Pin status is electrically monitored in contribution to reinforced safety, labor saving, and automation

Indexing Plungers with sensors enable electrical monitoring of pin status in addition to original functions. Suitable for safety reinforcement, labor saving, and automation.

- ▶ When the stroke exceeds roughly 2/3, with the pin retracted, the sensor status switches.
- ▶ Sensor status can be confirmed via LED.
- ▶ Pin is nickel plated. It has excellent wear resistance.
- ▶ PLYS-SN can be locked with the pin retracted.

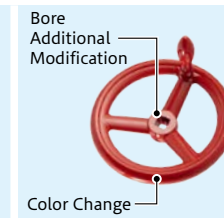
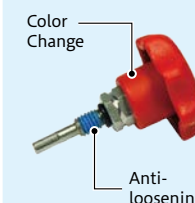
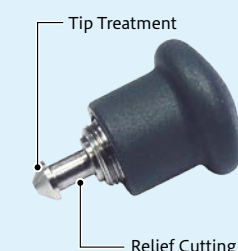
Usage Examples

Machine misoperation prevention and safety measures

Sensors and facility switches are linked to enable facility operation only when intended (at pin out/in). For example, machine misoperation after finishing machine changeover due to forgetting to return Indexing Plungers to the original position can be prevented, along with the attendant machine accidents and injuries.

Wide range of customization supported

We provide customization according to the customer's request.



Made-to-order products

Specialist engineers also design and manufacture products from scratch in accordance with customer needs, along with our standard products. We have significant experience with machine tool parts, medical equipment parts, and so on. Feel free to contact our customer service.



See here for further details...

Please visit the NBK website

Packed with basic information on machine elements and handy design know-how! Certificates for other materials, environments, etc. can also be issued.



🔍 NBK Machine Elements

<https://www.nbk1560.com/en-US/>

NBK Brake Clamp Mechanism for Linear Guide

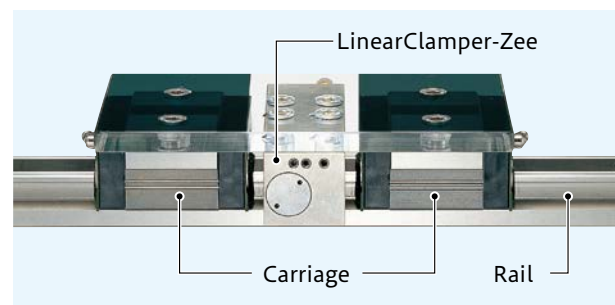
"LinearClamper-Zee"

Enhancing equipment rigidity with
"stopping technology"



What is the LinearClamper-Zee?

This product is based on a new concept, handling braking and position retention by directly clamping the linear guide rail. The original interior structure enables solid retention force even on greased guides. Equipment rigidity is therefore improved, with equipment deformation, shaking, and chatter suppressed. The compact design can normally also be mounted in the free space between two carriages.



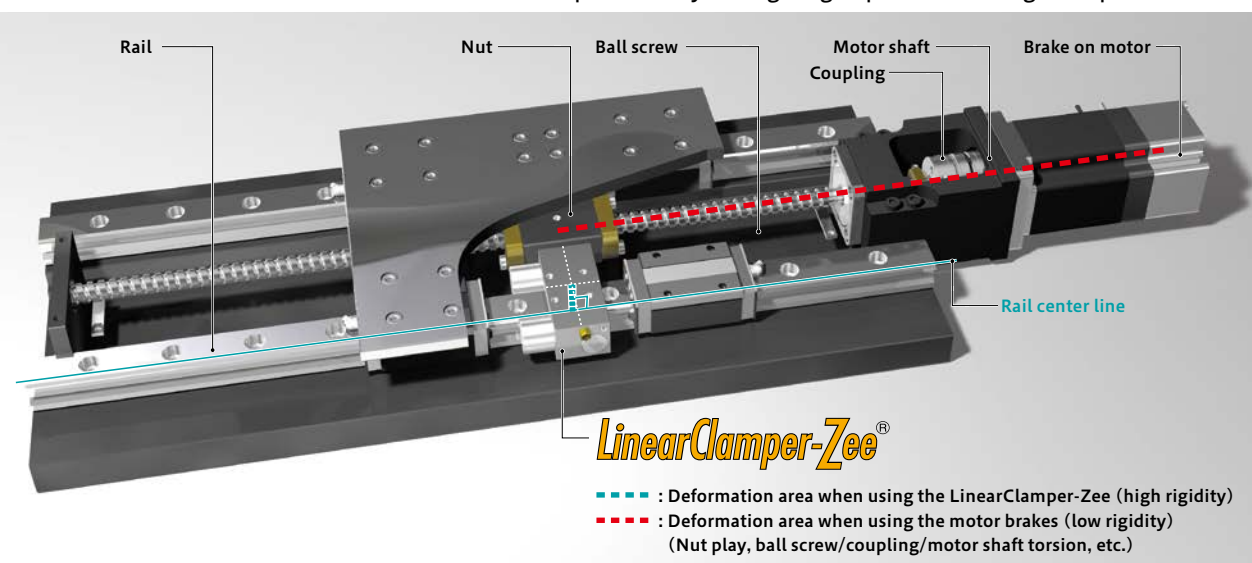
Advantages of adopting the "LinearClamper-Zee"

Effect 1

Increases productivity

Suppresses equipment deformation, shaking and chatter, and achieves high-speed operation

- ▶ By mounting the LinearClamper-Zee® directly under the table, high rigidity in position retention can be realized without influence from the ball screw or coupling rigidity.
- ▶ Suppresses equipment shaking and chatter, improving productivity through high-speed machining and operation.



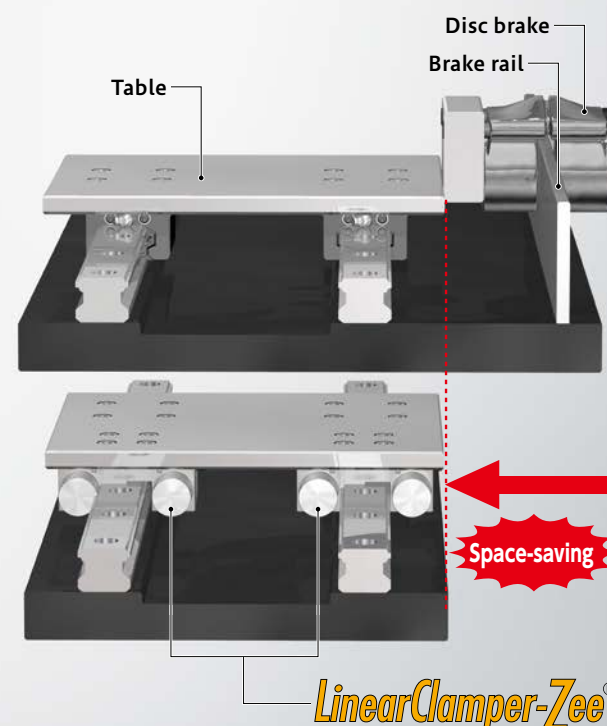
Effect 2

Miniaturization/ cost reduction of position retention mechanism

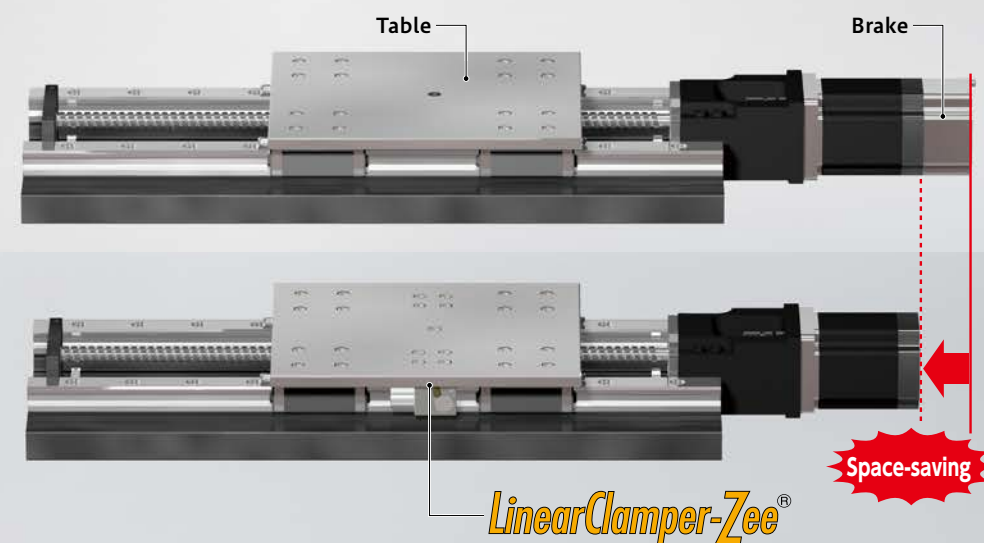
Achieves position retention function with a single part

- ▶ Since it can be mounted in the empty space under the table, it contributes to equipment miniaturization.
- ▶ Selection, design, and assembly are easy too, contributing to cost reduction.
- ▶ The brake attached to the motor or cylinder is no longer needed, reducing the space required.

<Example of replacement of the original brake mechanism>



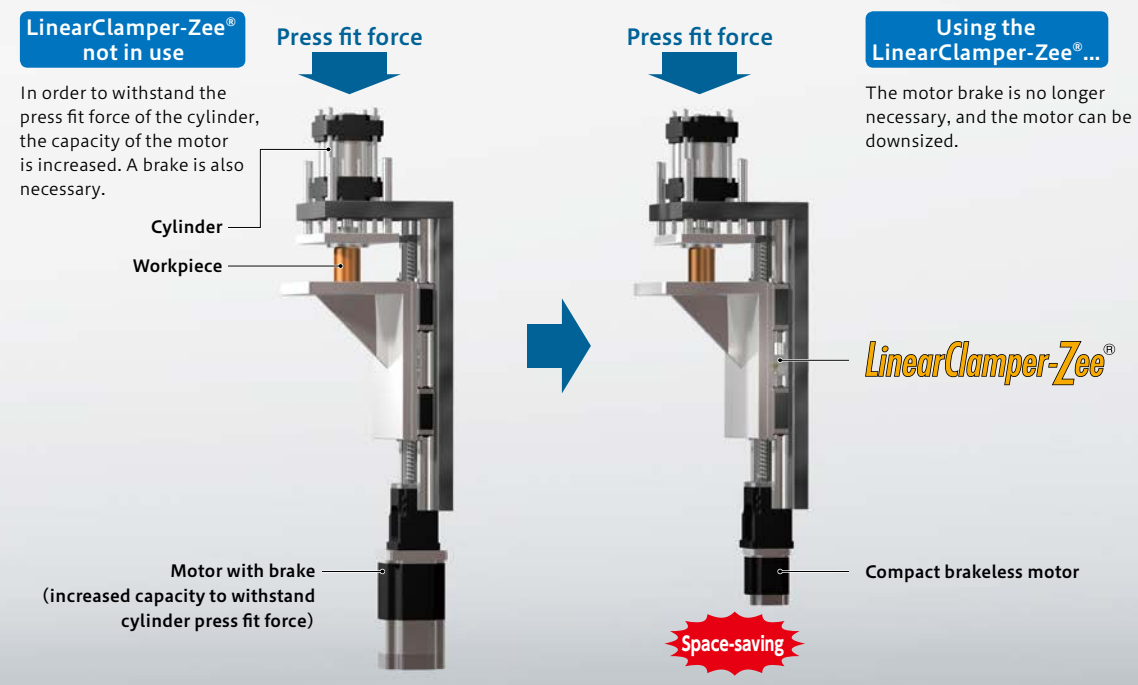
<Example of replacement of the brake on the motor>



Effect 3

Cost reduction/energy saving of drive parts

Effects of replacing the brake on the motor/cylinder



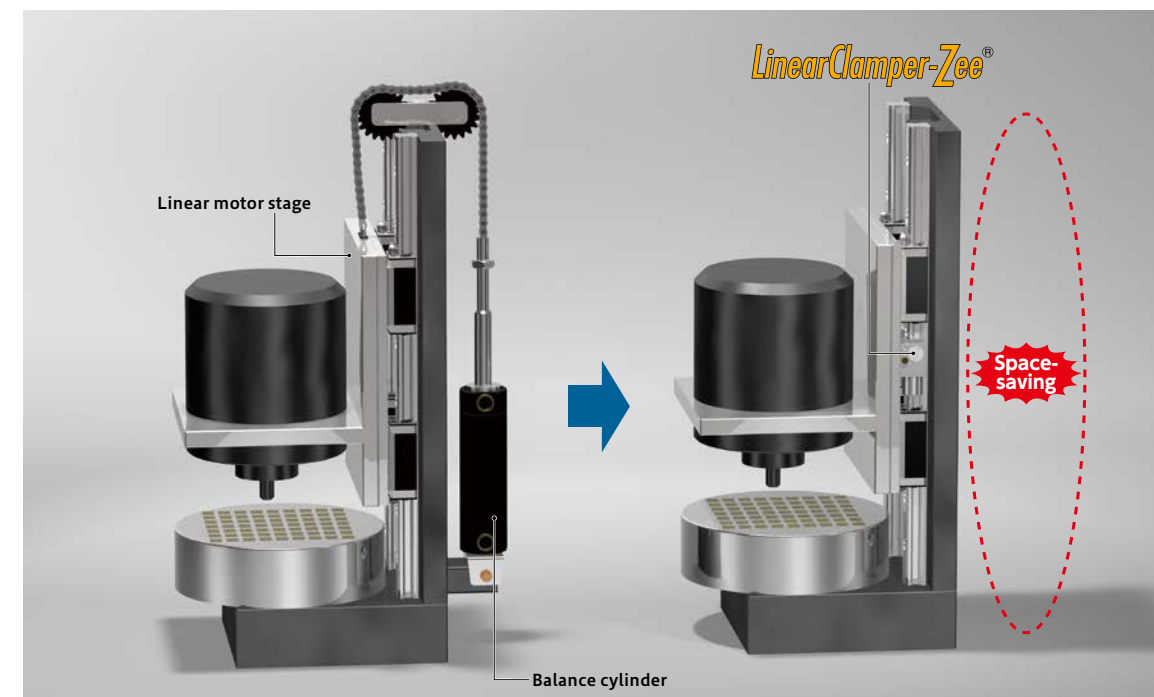
- ▶ Cost reduction is realized by reducing the capacity of the motor or cylinder, previously increased in order to generate force for position retention.
- ▶ The normally closed type renders it unnecessary to energize the motor/supply air to the cylinder to assist position retention, thus saving energy.

Effect 4

Miniaturization/improved safety of fall prevention mechanism

Achieves fall prevention/brake function with a single part

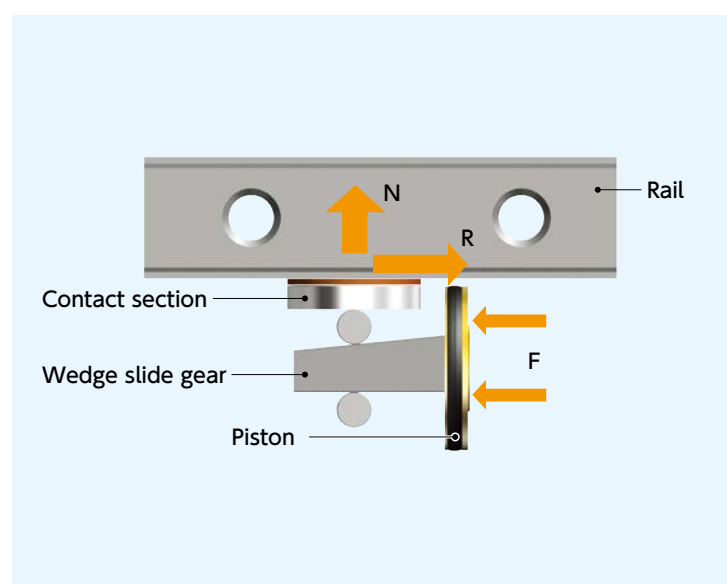
- ▶ Functions previously requiring many parts can be realized with the LinearClamper-Zee® alone, contributing to equipment miniaturization.
- ▶ Since it can be mounted in the empty space under the table, it can be easily incorporated into existing equipment as an additional safety device.



Why does pneumatic control have such high retention force?

High retention force is generated by the wedge effect of the wedge slide gear.

Pneumatic force F is converted into force N by the wedge effect of the wedge slide gear when applied to the piston. At this time, force N is $1/\tan \theta$ (θ is the wedge angle) times the size of force F . Force N creates friction force R between the linear guideway rails, leading to high retention force.



Lineup

Available for linear guideways and linear shafts.

	For linear guideway				For Linear Shaft	
	Hydraulic		Pneumatic		Manual	Manual
With/without brake mechanism	Without brake mechanism	With brake mechanism	Without brake mechanism	With brake mechanism	Without brake mechanism	With brake mechanism
Selection point	When used for applications involving stops during operation such as emergency stops, use a product with a brake mechanism					
Open/close function	Normally open	Normally open	Normally closed	Normally open	Normally closed	Normally closed
Selection point	Use a normally closed product for vertical shaft emergency stop applications, etc.					
Retention Force	1,600 to 46,000 N		80 to 7,700 N		40 to 2,000 N	180 to 52,000 N
						1,200 to 2,000 N

NBK

High-performance Shock Absorber

"PowerStop®"

Equipment performance improved with long service life and smooth shock absorption!



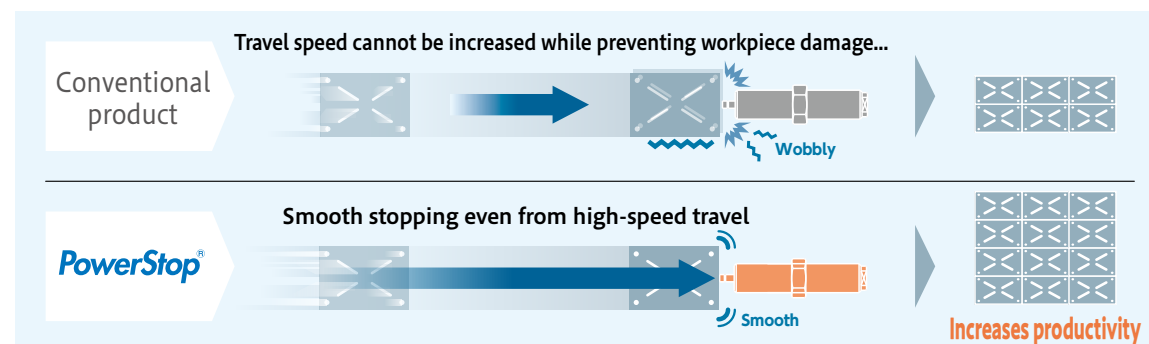
Advantages of adopting the NBK shock absorber

1 Running costs reduced by long service life

Long service life realized through unique structure and principles. Replacement and maintenance costs can be reduced. Also contributes to reduction of short stops for replacement and loss costs.

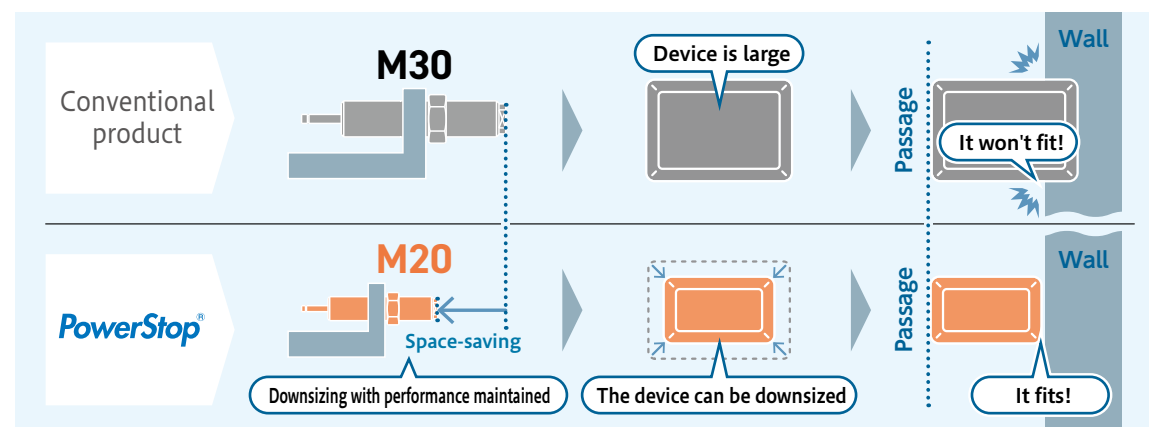
2 Productivity improved with smooth shock absorption

A gentle stop is possible even when moving the workpiece at high speed, improving productivity.



3 Equipment can be downsized with high energy absorption

By reducing the size of the absorber, the device can be downsized.



4 Usable in special environments

Low-volatility H1 grade oil/protection mechanism

Cleanroom Class 1000 Extensive support record

We have an extensive record of use in semiconductor manufacturing equipment, medical equipment, food related machinery*, etc.

Semiconductor manufacturing equipment



Medical equipment



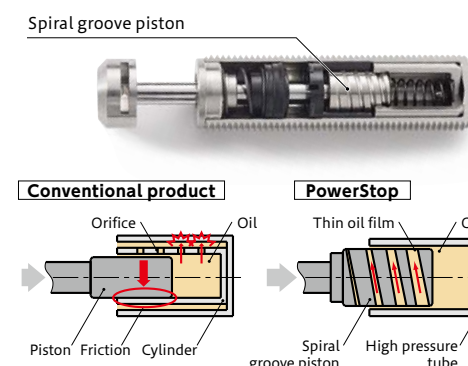
Food machinery*



*With H1 grade bio-oil used as standard, use in food machinery (PET bottles, can manufacturing, packaging, etc.) is also possible with peace of mind.

Next-level high performance ... Spiral groove piston is the key

The PowerStop has a structure in which oil passes through a special helical groove provided on the outer periphery of the spiral groove piston. Energy is absorbed by utilizing the resistance when oil passes through the helical groove. This unique structure and principle achieve long service life and smooth and high energy absorption.

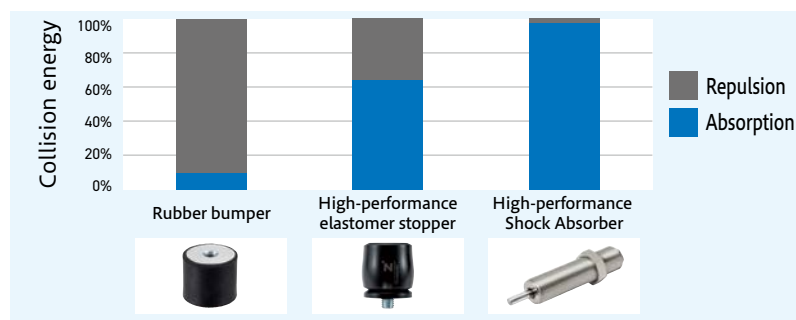


Lineup List

	PME	PHE	PSE	APS-B	PAE
Characteristics	Long service life/ high energy absorption/ small-diameter type	Long service life/ high energy absorption type	Standard Type	Long service life/ high energy absorption type with bellows cover	Adjustment type PowerStop
Max. absorbed energy (J)	0.8 - 1.8	3.5 - 400	1.5 - 185	16 - 350	4 - 400
Collision speed min. (m/s)	0.1 - 1.8	0.1 - 3	0.1 - 3	0.2 - 1.8	0.1
Collision speed max. (m/s)	1.2 - 3.5	1.2 - 5	1.2 - 5	1.2 - 3.5	5

Shock Absorber Family

NBK also offers other products with shock absorption functions. Select according to the purpose of use, rebound, degree of shock, collision speed, etc.



NBK Castings

NBK is a professional when it comes to casting

Find standard products such as the standard V-pulley, boasting the highest market share in Japan, as well as special-order cast products replacing welded assembly products and cut products with optimized design.



Standard Cast Products

1. Pulleys/Sheaves



What are pulleys?

Pulleys are the parts which transmit motor rotation to equipment. Capable of accelerating/decelerating motor rotation in fine gradations, they transmit minimal motor vibration and enable transmission without vibration or noise. With no need for lubrication and few parts, maintenance is easy.



What are rope sheaves?

These pulleys transmit motive power through ropes or guide ropes. To keep the ropes from slipping off or deforming, they adopt groove shapes matched to the rope diameter. NBK offers crane sheaves and equalizer sheaves.



Strong Points of NBK Pulleys and Sheaves

Short lead times for bore additional modification service

V-pulleys can be additionally modified with bores, keyways, set screw holes, etc. Complete products ready for immediate use will be delivered. We also offer a service modifying rope sheaves with bearing holes.



Short delivery time

Orders placed by 14:00 can be shipped in one business day.



Ready for use

Bore/keyway modification complete. Immediately mountable.



Plentiful modification types

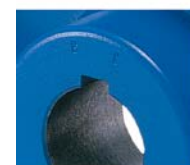
Nine modification types: bore, keyway, set screw hole, etc.

Japan favors NBK

NBK boasts the top share in Japan* for standard V-pulleys for general industrial machinery, proving their high reliability with the largest usage in the country. Various types and sizes of pulleys are available, from high-quality, high-balance accuracy complete V-pulleys to gear pulleys enabling rotation ratio adjustment to ISOMECS P pulleys requiring no bore or keyway modification.

*NBK research

Pulley additional modification examples



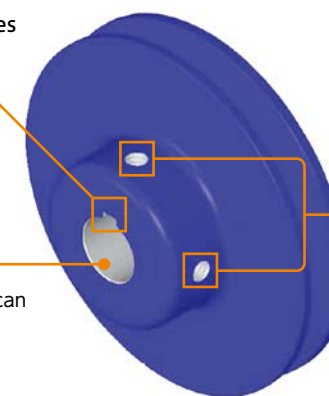
Keyway

Parallel or taper keyway can be selected. Compliance with new and old JIS standards is supported.



Bore

Dimensional allowance can be selected from HGF and tolerance class from Classes 6, 7, and 8.

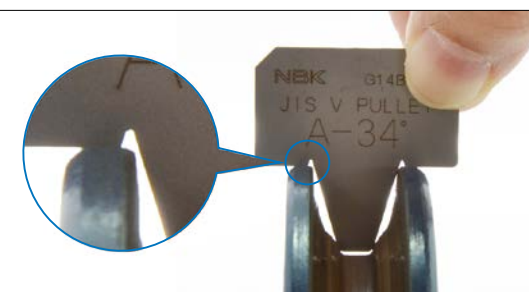


Set Screw Hole

The number of set screw holes can be selected. (0 to 2 locations) Set screw inclusion can also be designated.

V-pulley grooves wear down

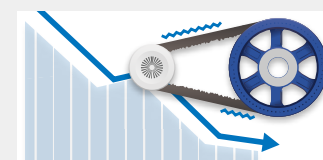
Wear amounts should be inspected roughly once a year, with replacement guidelines for V-pulleys once every five years. Use groove gauges to check the wear amount. The guideline for replacement is wear exceeding 0.8 mm. By replacing worn V-pulleys with new ones, HVAC [power consumption can be reduced](#). (proven with NBK products)



Issues due to pulley groove wear

Reduced transmission efficiency/increased power consumption

Uneven force is applied to the belt, slippage increases, and transmission efficiency decreases.



Reduced belt service life

The belt wears faster with a greater tendency to cracks and peeling, reducing the belt service life.



Noise/vibration generated

Noise due to belt slippage and vibration due to uneven belt tensile strength may be generated.



Standard Cast Products

2. Robot stands

**Stands which adjust robot height.
Saves design and procurement trouble.**

- Robot stands standardized for FANUC, Mitsubishi Electric, YASKAWA Electric

Assembly is possible immediately upon delivery.

- Supports robots from Kawasaki Heavy Industries, Fujikoshi, Yamaha, Denso Wave, Epson, etc.

The robot mounting surface is designed to match each company's robots. Provide information on the robot (manufacturer, model name) and drawings of the robot mounting surface.



Standard Cast Products

3. Space-saving stands

Supports aluminum frames in □30 and □40 sizes. Heavy cast iron, standing alone when assembled to a panel, without needing anchor bolts. Layout changes are also easy, with no floor fixing required.



- Enlarging workspace**

Compared to T-legged or L-legged stands, they protrude less into passages and workspaces, enlarging workspaces and making effective use of factory square footage.

- Ensuring safety**

Reduced protrusion into passages and workspaces, preventing tripping.



**Cast iron stand for aluminum frame panels.
Because the legs do not protrude, this product helps enlarge workspaces and prevents tripping.**

Standard Cast Products

4. Motor bases

- Reduced work time**

No work required in tight spaces on the equipment side. Work can be done through manipulation from just one side.

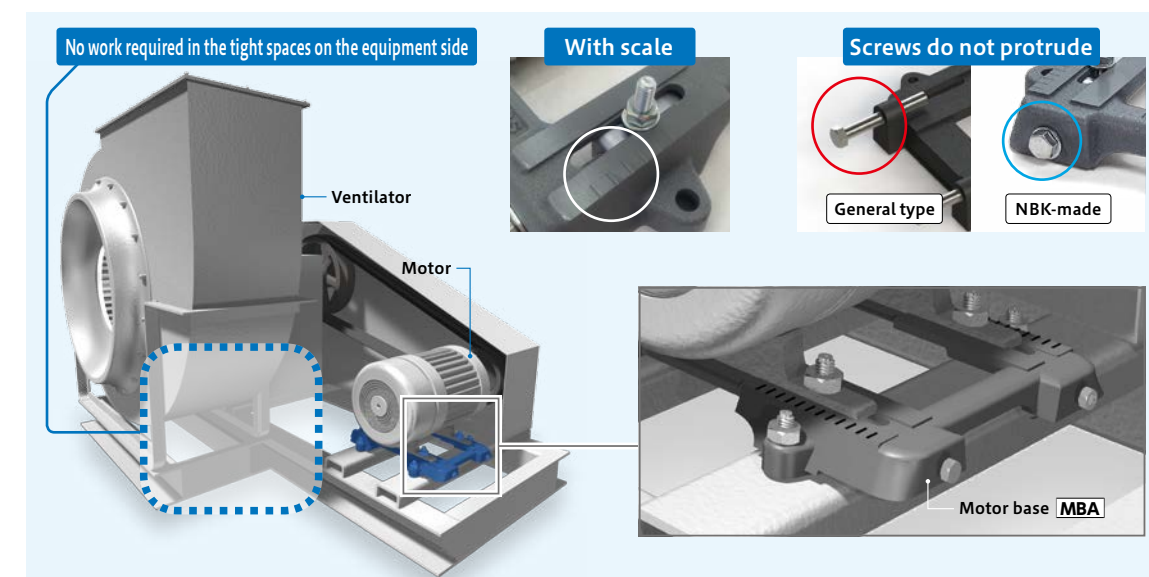
**Motor base for belt transmission.
By manipulating belts for tension and adjustment, belt tensile strength can be added.**

- With scale for easy confirmation**

Scale provided for confirmation of motor tilt and travel distance at a glance. Dependable adjustment is possible, without relying on visual estimation or instinct.

- Compact and safe**

Bolts used during adjustment fit into the main body without protruding. Compact and safe structure.



Standard Cast Products

5. Actuator brackets

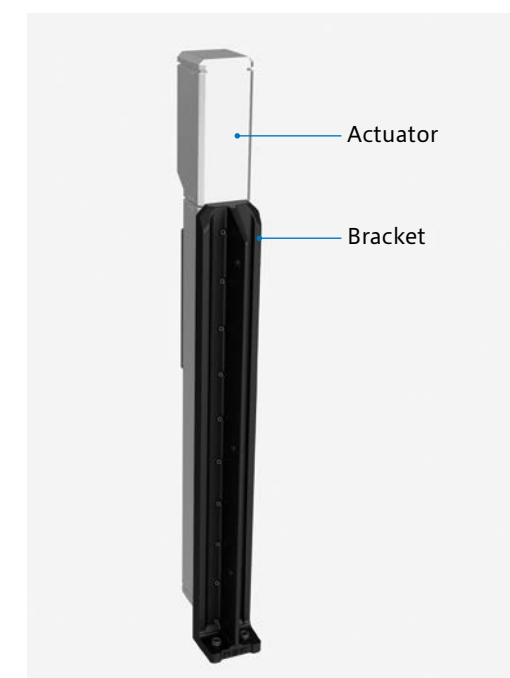
**Cast iron stands for use with IAI electric actuators in vertical orientation.
Saves design and procurement trouble.**

- Design and procurement trouble saved**

Two types (front mounting and back mounting) are available as standard.

▶ Target IAI electric actuator models

RCP6-SA4C	RCS4-SA4C
RCP6-SA6C	RCS4-SA6C
RCP6-SA7C	RCS4-SA7C



Overcome Your Challenges!



Couplings, Screws, Clampers

Since 1560

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< 8:00 to 17:00 on weekdays, Eastern Standard Time >

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