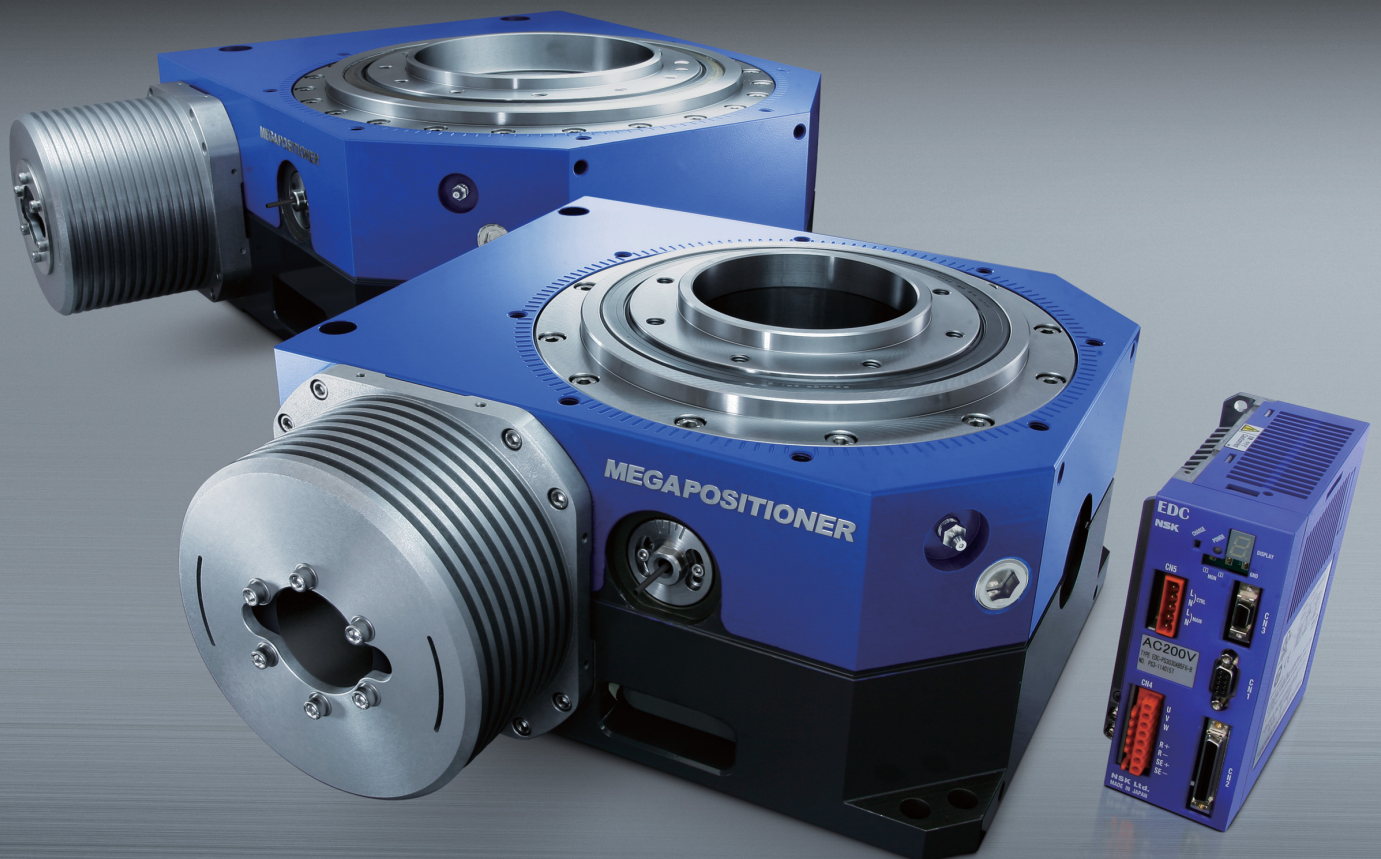


MEGAPOSITIONER™

Rotary Actuator with High Rigidity and Ultra-large Torque Output

Combination of Megatorque Motor and zero-backlash speed reducer for a compact and powerful precision rotary positioning unit.



MEGAPOSITIONER™

High-rigidity and large-output-torque precision rotary positioning unit using speed reducer and Megatorque Motor™

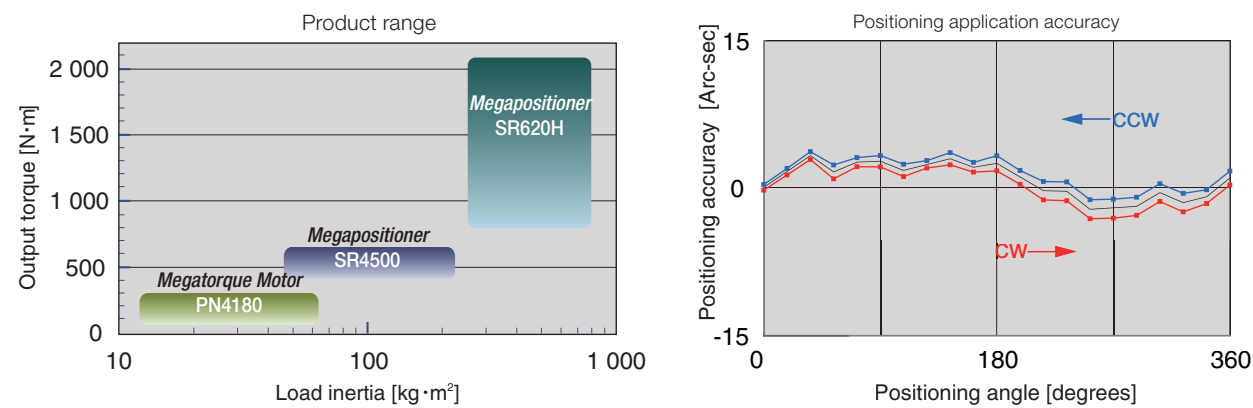
◆ Features

1 High-speed positioning of large-inertia loads

Precision speed reducer combined with Megatorque Motor effectively attenuates reflected load fluctuation and disturbance for high speed positioning.
Max. output torque of 1,960 N·m and applicable inertia up to 700 kg·m². (Model SR6)

2 High-accuracy positioning performance

Provides +/- 5 arc-sec repeatability (precision type) using rigid-shaft design zero-backlash speed reducer driven by high positioning accuracy Megatorque Motor.



3 Low profile, compact footprint and large through holes

Minimized footprint includes motor with 222 mm low-profile height (Model SR6).
Output axis has 145 mm large through holes (Model SR6).

4 Max. 10 μm rotor run-out with high rigidity

High moment rigidity in low profile design achieved with custom bearings.
Moment load: Max. 9000 N·m, Rotor run-out: Max. 10 μm (Model SR6)

5 Custom Driver Unit with positioning controller function

Positioning operation can be controlled without complicated communications or additional controller.
Home position sensor incorporated so Megapositioner can be connected directly to Driver Unit.



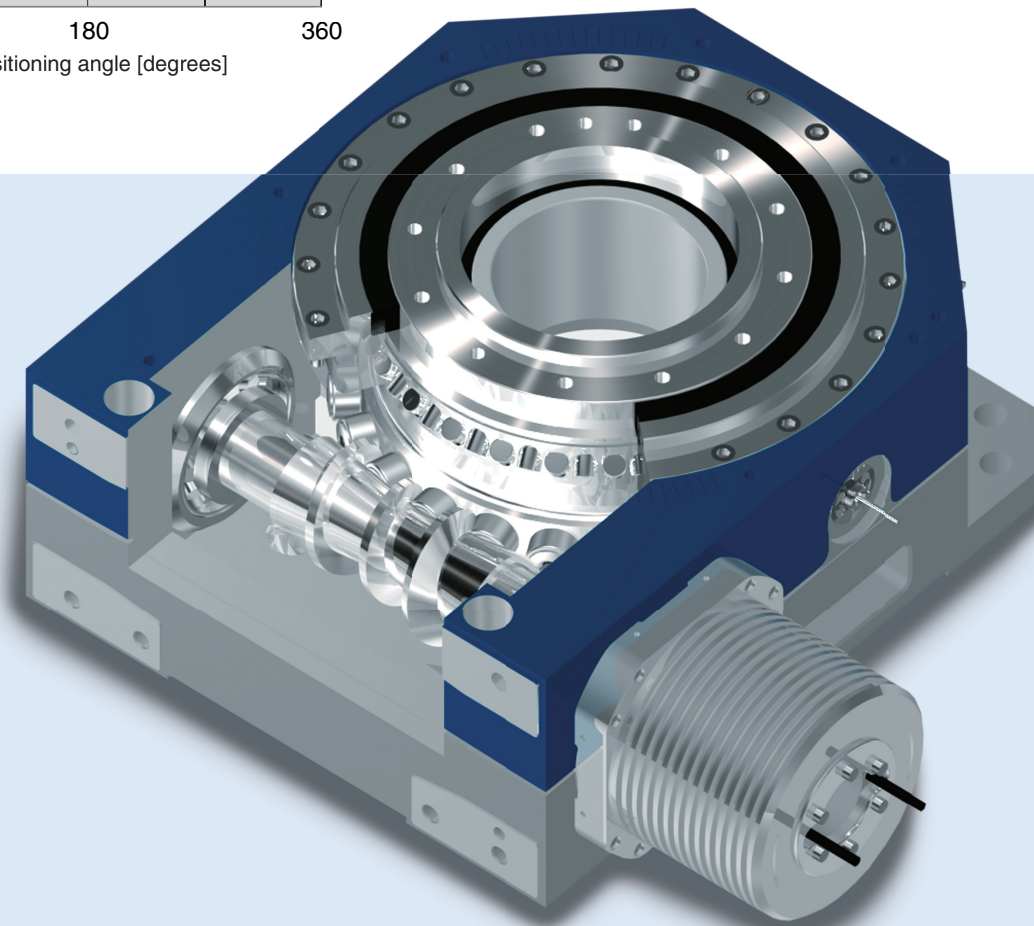
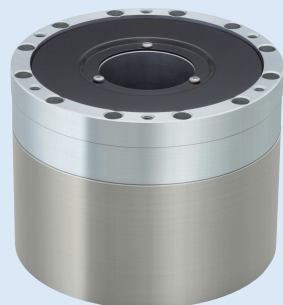
◆ Product Configuration

Megatorque Motor™

(PS series: High-speed outer rotor type)

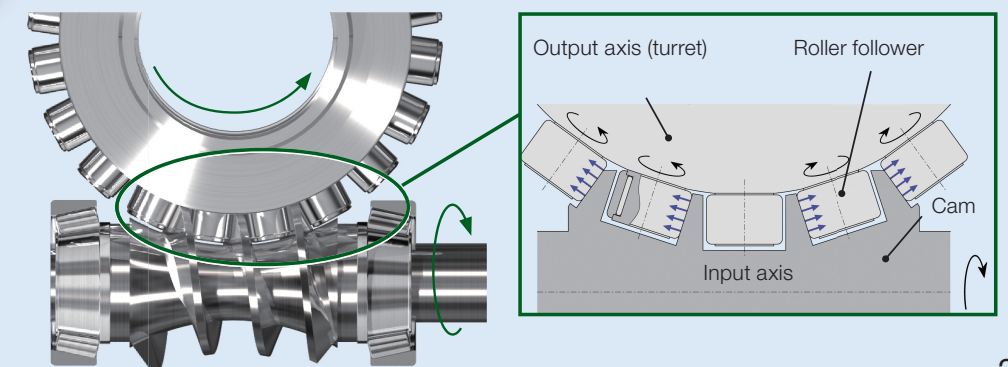
This direct drive motor features high torque, high speed and compact size.

It is capable of handling load inertia up to 100 times the rotor inertia. The combination of proprietary disturbance observer and preview-based feed-forward control configuration enables very-high-speed positioning.



Zero-backlash precision speed reducer

Zero-backlash design is achieved by an input screw shape in which output roller followers contact the output contact screw at consistent preload. This design enables precise positioning in any rotating direction and maintains accuracy without developing any wear.

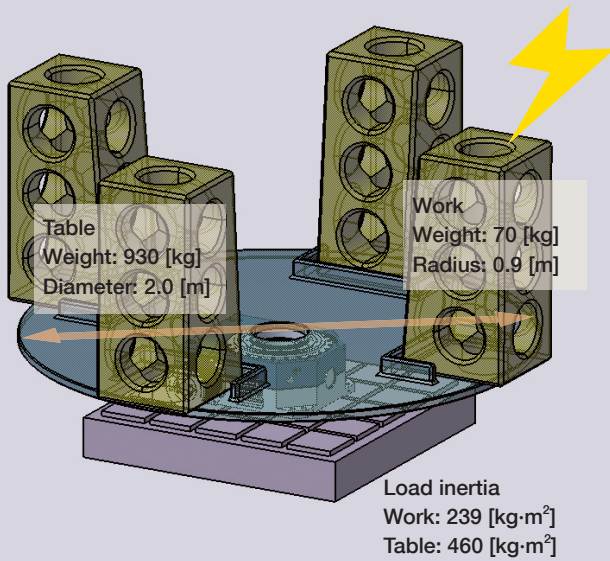


Automotive Industry

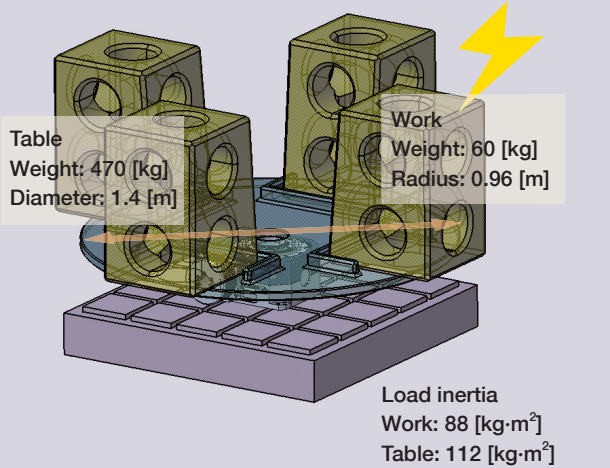
Packaging Transfer System

Index table for large loads

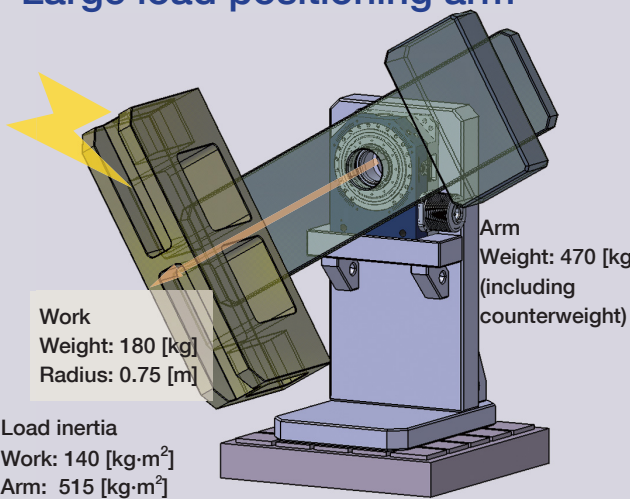
Model: SR6



Model: SR4

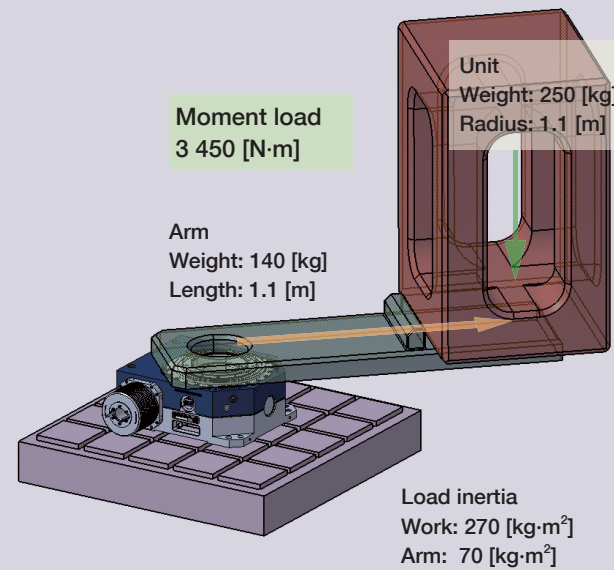


Large load positioning arm

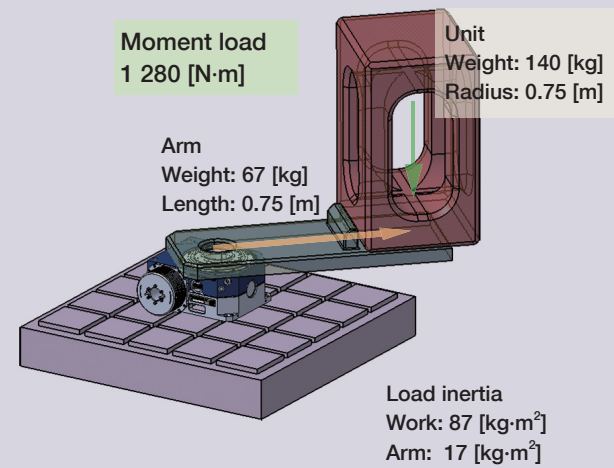


Cantilever index arm

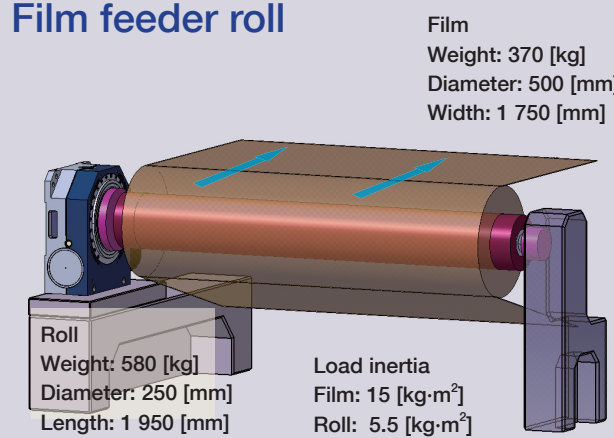
Model: SR6



Model: SR4



Film feeder roll



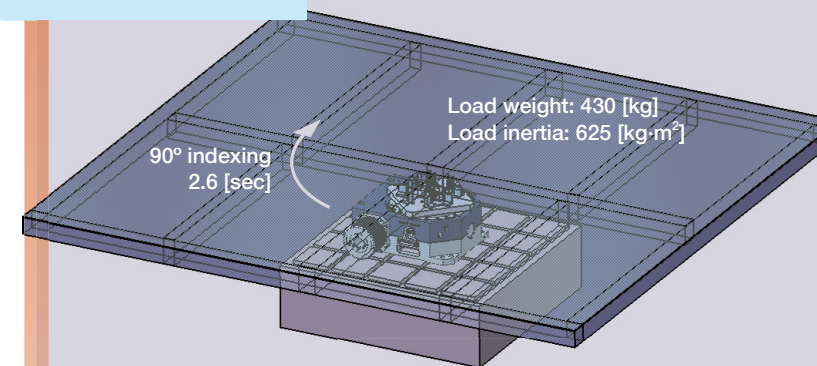
*These application examples are for reference purposes only. Please consult NSK for actual applications.

Index table for large-size glass substrates.

Liquid Crystal Displays

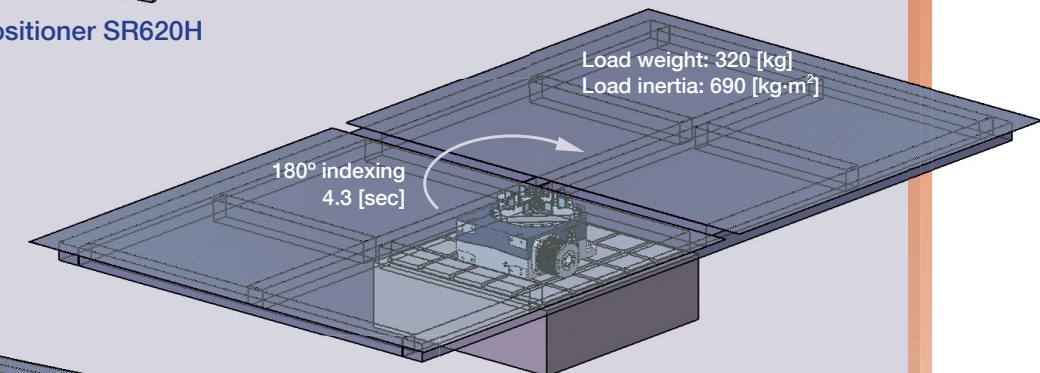
Solar Panels

10th gen. glass substrate
(2 850×3 050mm)



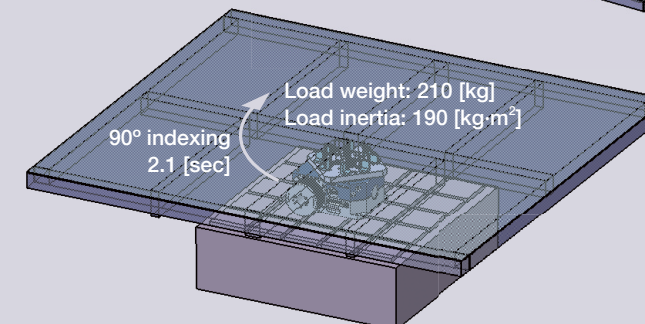
Megapositioner SR620H

8th gen. glass substrate × 2
(2 250×2 500mm)



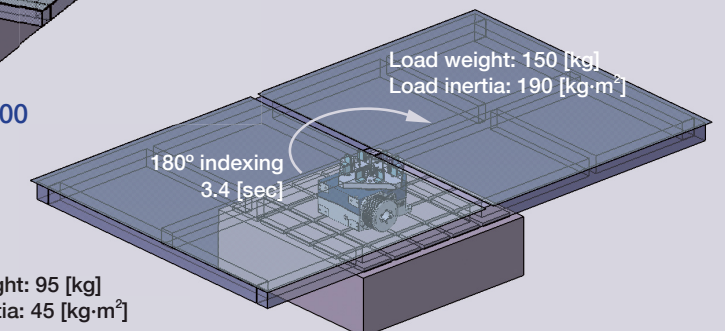
Megapositioner SR620H

8th gen. glass substrate
(2 250×2 500mm)



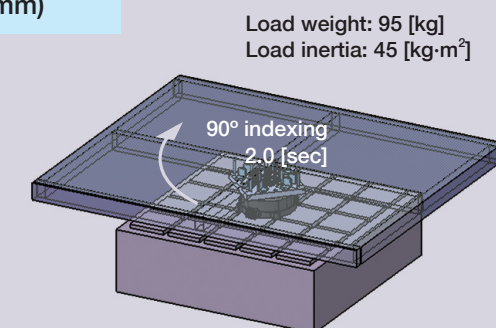
Megapositioner SR4500

6th gen. glass substrate × 2
(1 500×1 850mm)



Megapositioner SR4500

6th gen. glass substrate
(1 500×1 850mm)



Megatorque Motor PN4180

Megapositioner

Megapositioner reference number

Example of reference number: **XY – SR 6 20H FN001 E01**

Megapositioner

Size

Max. output torque [N·m]
H indicates hecto (10²) units

Driver Unit No.
E01: Standard
C01: CC-Link



Design no.
FN001: Standard, FN002: High-precision

Megapositioner specifications

| Item | Model | XY-SR4500FN001 | XY-SR4500FN002 | XY-SR620HFN001 | XY-SR620HFN002 |
|--|-------|---|----------------|----------------|----------------|
| Max. torque [N·m] | | 500 | | 1 960 | |
| Rated torque [N·m] | | 80 | | 520 | |
| Max. speed [S ⁻¹] | | 0.42 | | 0.21 | |
| Rated speed [S ⁻¹] | | 0.25 | | 0.04 | |
| Speed reduction ratio | | 20 | | 24 | |
| Sensor resolution [counts/rev] | | 52 428 800 | | 62 914 560 | |
| Accuracy [arc-rec] | | 60 | 40 | 60 | 40 |
| Repeatability [arc-rec] | | ±15 | ±5 | ±15 | ±5 |
| Rotor run out [μm] | | 10 | | | |
| Max. axial load [N] | | 11 600* | | 32 700* | |
| Max. radial load [N] | | 10 200* | | 28 900* | |
| Max. moment load [N·m] | | 820* | | 2 770* | |
| Max. load inertia [kg·m ²] | | 200 | | 700 | |
| Through hole diameter [mm] | | 115 | | 145 | |
| Weight [kg] | | 100 | | 240 | |
| Environmental conditions | | 5 to 40 °C, 20 to 80% humidity. In indoor use, free from dust, condensation and corrosive gas. | | | |

* Load rating is with all max loads applied. Load ratings vary due to combination of applied loads. Refer to allowable load chart for details. Load condition, load inertia, rigidity and resonance frequency must be considered for proper positioning. Please consult with NSK for details.



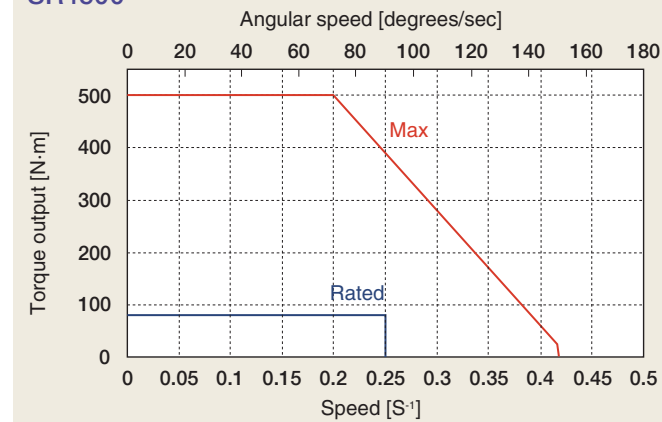
SR620H

SR4500

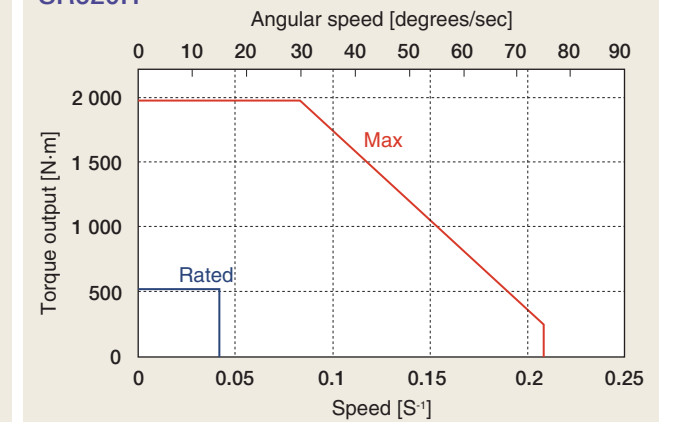
Rotational speed and output torque characteristics

Torque-speed curve

SR4500



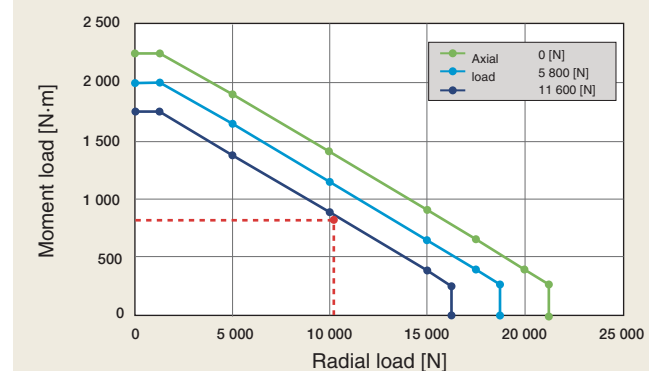
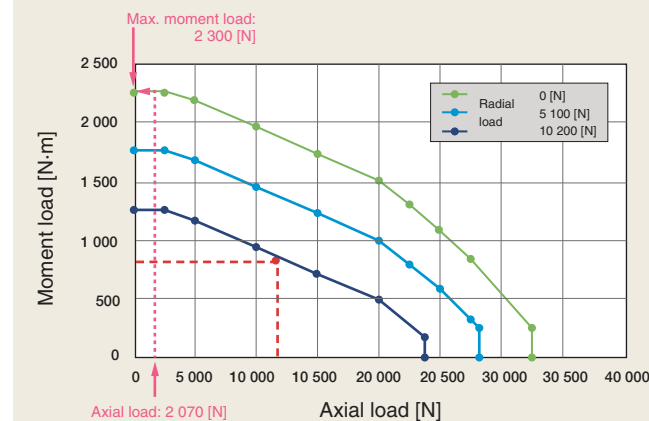
SR620H



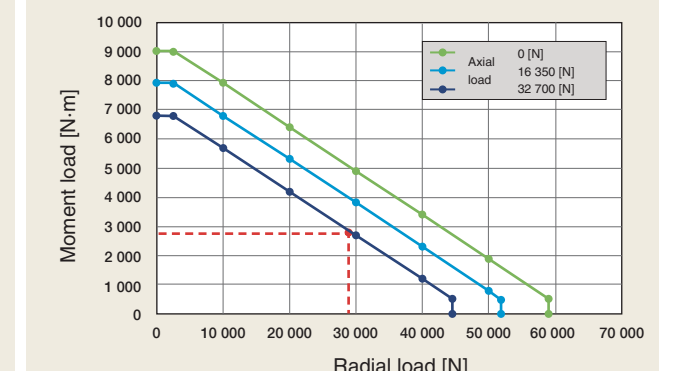
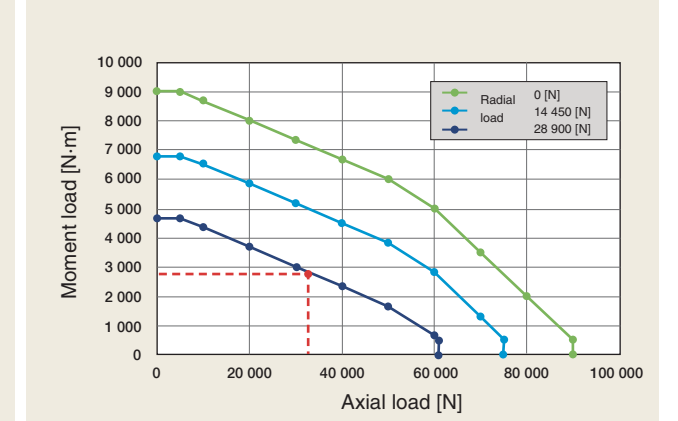
- Please refer to the selection guide.
- Please consult NSK in if positioning exceeds 360° or for continuous rotation.

Allowable load chart

SR4500



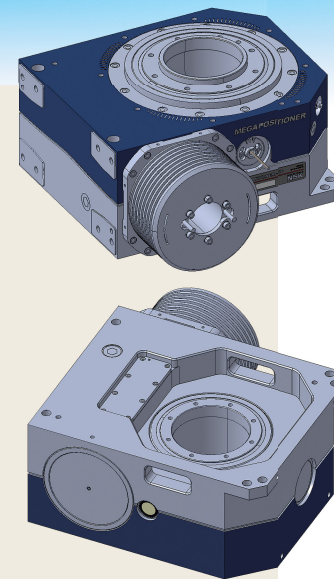
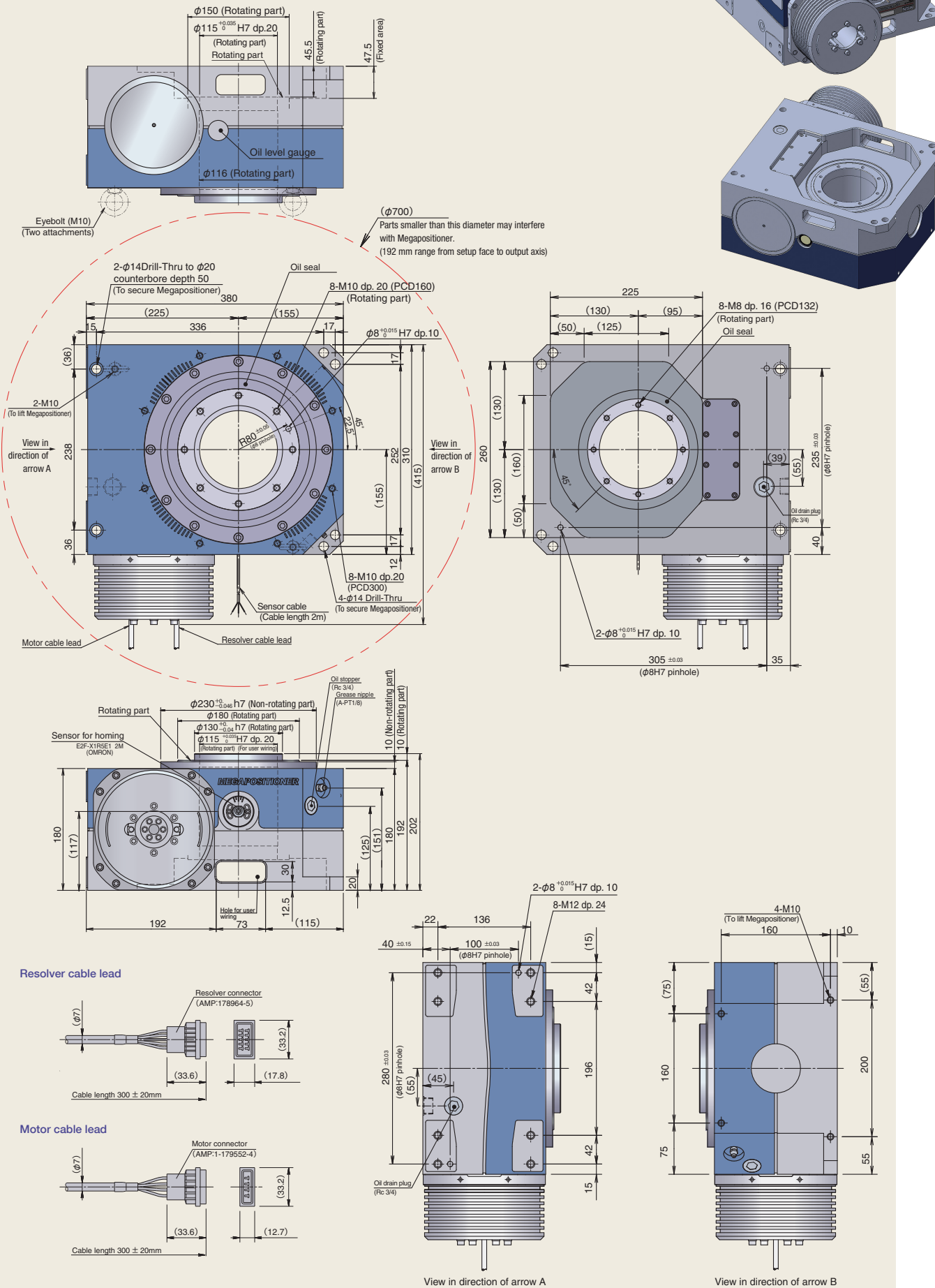
SR620H



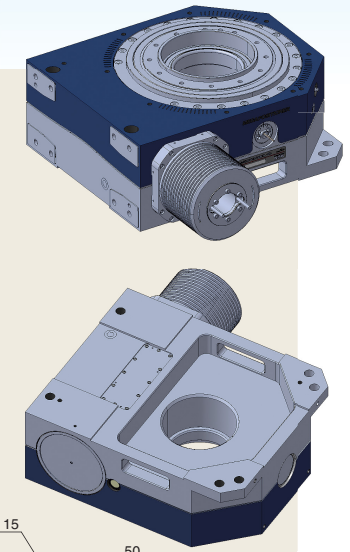
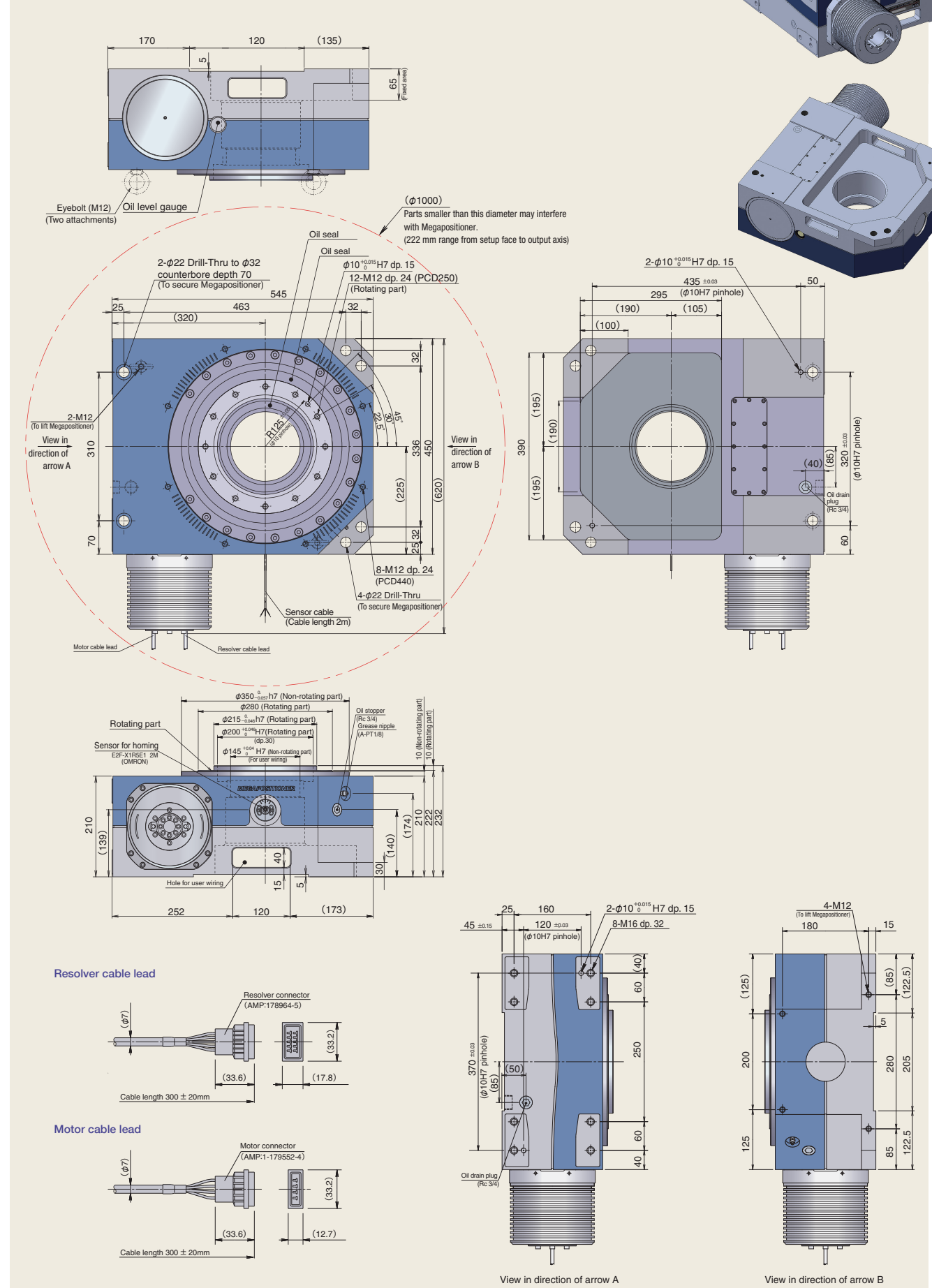
The load chart above shows static allowable load on the output axis. Please consult with NSK for dynamic or impact loads.

Dimensions

XY-SR4500 FN001*** (XY-SR4500 FN002***)



XY-SR620H FN001*** (XY-SR620H FN002***)



EDC Driver Unit

Features of EDC Driver Unit

→ Adopts new servo algorithm (achieves settling time of 1 [ms])

The EDC Driver Unit adopts an original disturbance observer and preview-based feed-forward control, which significantly reduce positioning time.

→ Positioning controller function

Positioning operation can be controlled without complicated communications or upper controller.

→ Compact Driver Unit

Combined with special electric components and advanced integration technology, the Driver Unit body is 65% smaller than conventional NSK units.

→ Variety of control I/Os

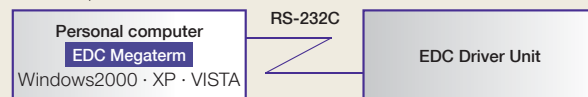
Control inputs/outputs required for positioning are available, including encoder output, servo control and program control. No additional sensor is required to monitor the status.

Components and functions of EDC Driver Unit

- Rear mounting hole**
Optional mounting bracket available for front mounting.
- Independent inputs for main power and control power**
Separate power lines assure system safety.
- Motor cable connector**
Clamping type connector shortens work time and prevents miswiring.
- Seven-segment LED indicator**
Driver Unit status can be identified at a glance.
- Analog monitor output terminal**
Speed, positioning error, torque, motor current, etc. can be monitored by analog voltage. Useful for set-up tuning or for monitoring operating status.
- RD-232C communication connector**
Connect a portable terminal to set parameters. Use the EDC Megaterm software to communicate with a PC.
- Control I/O connector**
A variety of signals are available, including servo on, in-position, emergency stop, area signal, override, various alarm outputs, and $\phi A/\phi B/\phi Z$.

EDC Megaterm Application Software

Once installed on your computer, this software enables editing, preparation and control of EDC Driver Unit programs and parameters. It also facilitates allocation and monitoring of control input/output. And its oscilloscope function allows for easy confirmation of Motor operation. EDC Megaterm can be downloaded for free from the NSK Web site (<http://www.nsk.com/>).

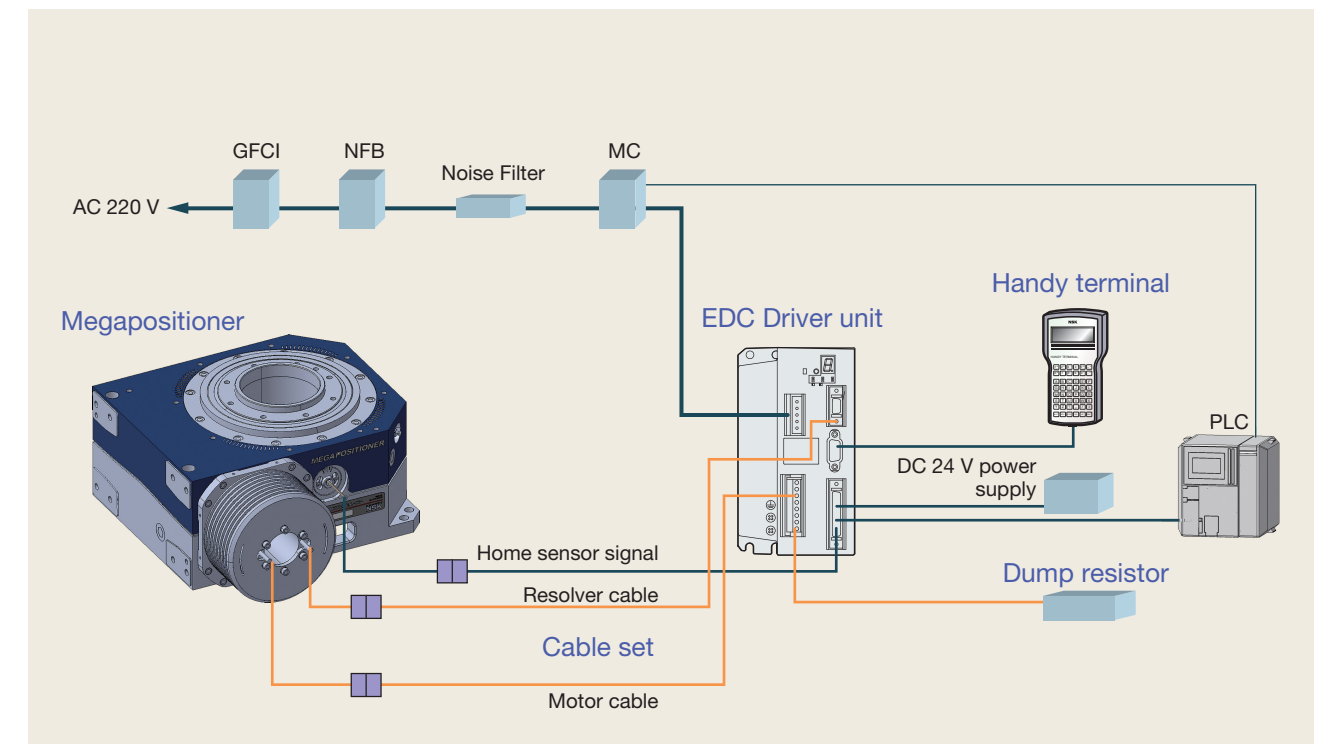


Functions

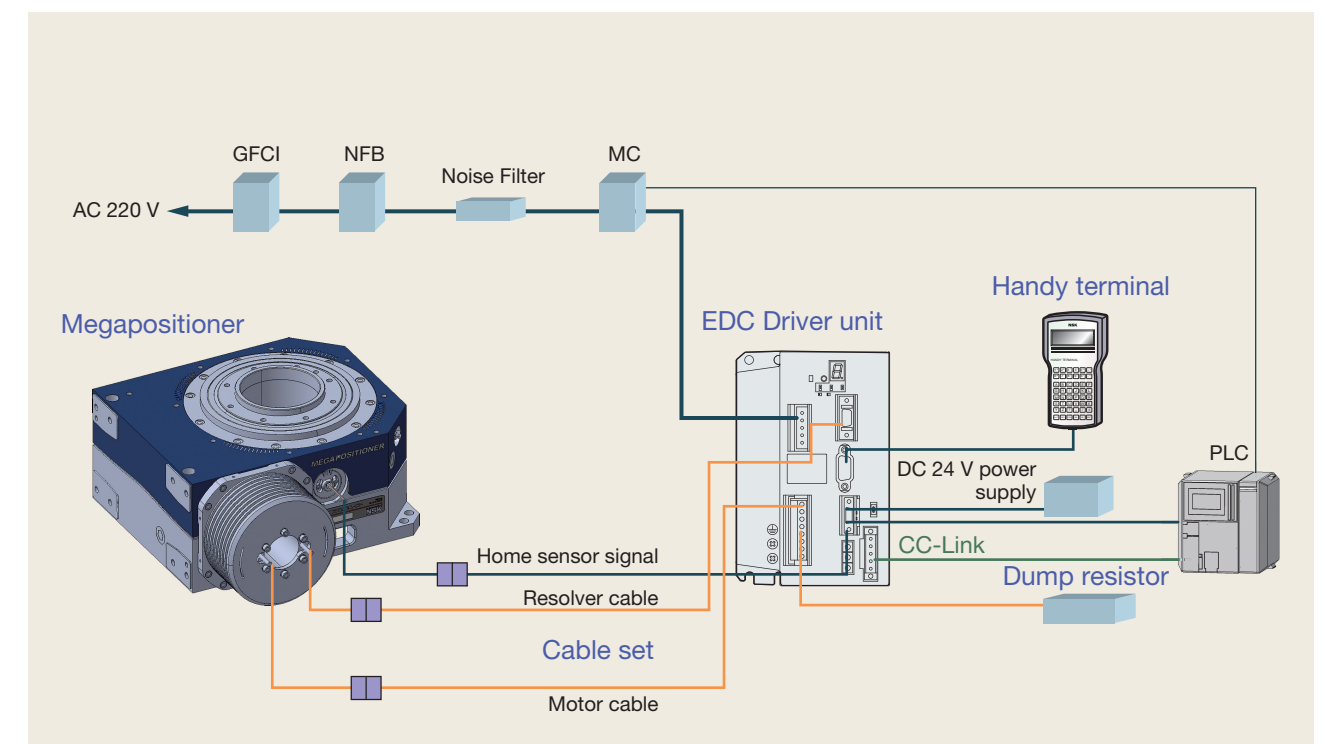
- Oscilloscope function
- Allocation and monitoring of control input/output
- Parameter editing
- Channel editing
- Others:
 - Upload/download of parameter and channel data
 - Terminal



System configuration



CC-Link



The system configuration described above is just one example. Please refer to the manual to safely design systems on under at own responsibility.

Driver Unit specifications

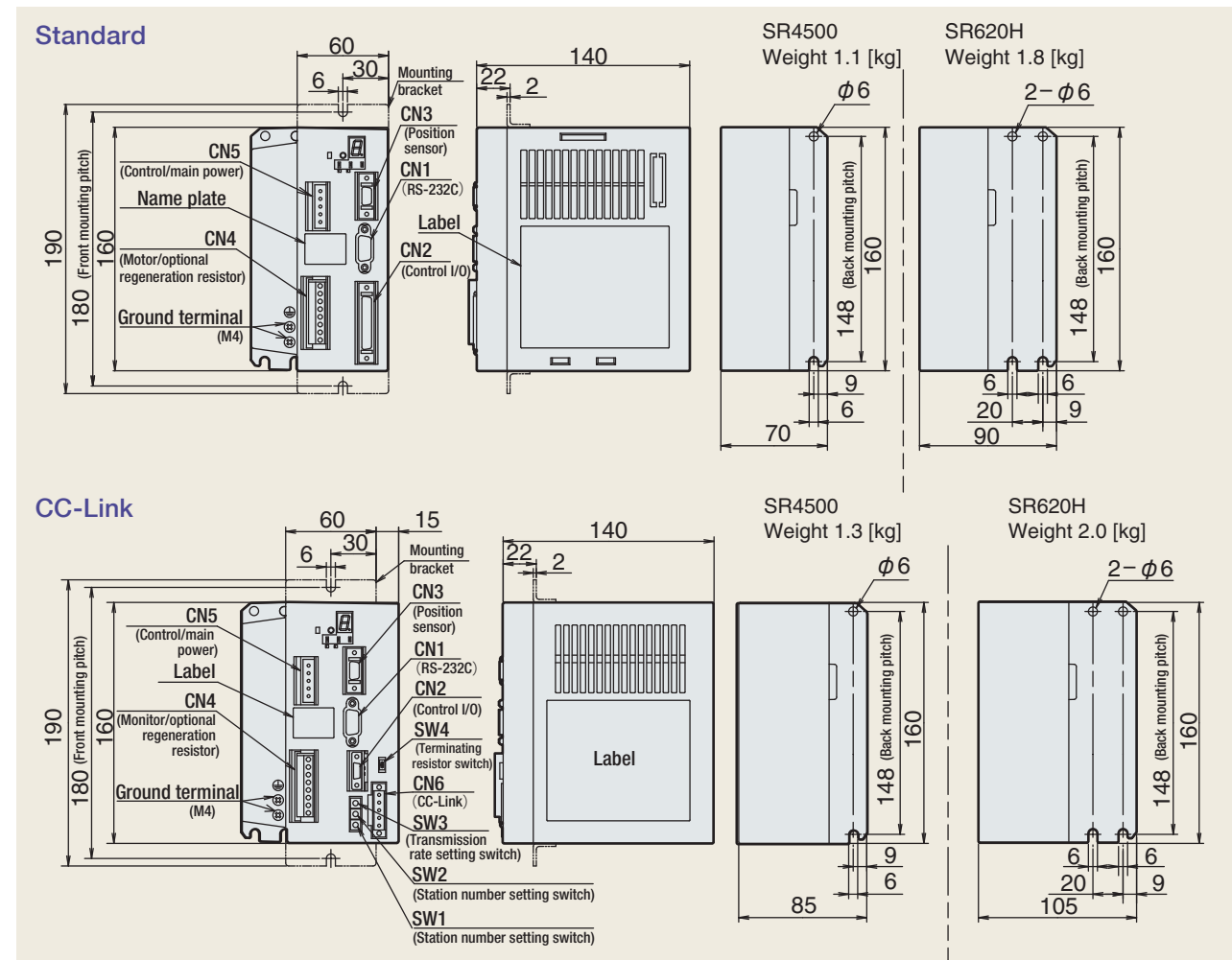
| Item | Model | XY-SR4500FN***E01 | XY-SR4500FN***C01 | XY-SR620HFN***E01 | XY-SR620HFN***C01 |
|--------------------------|----------------------|--|----------------------|----------------------|----------------------|
| Driver Unit part No. | | M-EDC-PS3030AB5F6-01 | M-EDC-PS3030ABC6F-01 | M-EDC-PS3090AB5F5-01 | M-EDC-PS3090ABC5F-01 |
| AC power | Rated power [VA] | 800 | | 600 | |
| | Max. power [VA] | 2 900 | | 5 500 | |
| | Voltage [V] | AC 200 [V] – 230 [V] single phase, ±10% | | | |
| Positioning mode | | Programmable channels (Max. 256 channels) | | | |
| Input | | 17 input signals, DC 24 [V]: Emergency stop, Servo On, Homing, Execute program, Jog, etc. | | | |
| Output | | 8 output signals, DC 24 [V]: Servo state, Warning, In-position, etc. | | | |
| Protection | | Emergency stop, Sensor error, Motor cable error, Over speed, Excess position error, Software thermal error, Over heat, Over voltage, Excess current, etc. | | | |
| Monitor | | <ul style="list-style-type: none"> Dual Analog monitor (Velocity, Position error, Torque command, etc.) Monitor through RS232C | | | |
| Communication | | RS232C (9600 [bps]) | | | |
| Other functions | | Dynamic brake built in / Optional external re-generation resistor / Allocatable input and output / Individual acceleration and deceleration / Cam motion profile / Alarm history | | | |
| Field Bus option | | CC-Link Ver. 1.10 | | | |
| Environmental conditions | Temperature | Operation at 0 to 50 [°C] / Storage at -20 to 70 [°C] | | | |
| | Humidity / Vibration | Max. 90 [%], No condensation / Max. 4.9 [m/s ²] | | | |

Items included in the shipping box.

<Standard> CN2 connector, CN5 connector, Driver Unit mounting bracket, manual

<CC-Link> CN2 connector, CN5 connector, CN6 connector, Driver Unit mounting bracket, manual

Driver Unit dimensions



Signal Specifications of CN2 (Control I/O)

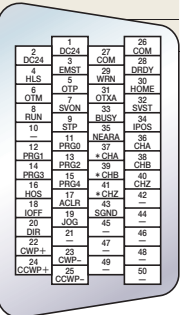
Standard EDC Driver Unit

Input signals

| Signal name | Pin. No | Function |
|---------------|----------|--|
| DC24 | 1, 2 | DC 24 V external power supply |
| EMST | 3 | Emergency stop |
| HLS | 4 | Home position limit |
| OTP / OTM | 5 / 6 | Over travel limit (+/- direction) |
| SVON | 7 | Servo on |
| RUN | 8 | Start program |
| STP | 9 | Stop |
| PRG0 to PRG4 | 11 to 15 | Internal program channel selection (Total 31 channels) |
| HOS | 16 | Home return start |
| ACLR | 17 | Clears warning |
| IOFF | 18 | Integration OFF |
| JOG | 19 | Jogging |
| DIR | 20 | Jogging direction |
| CWP+ / CWP- | 22 / 23 | CW Pulse train input |
| CCWP+ / CCWP- | 24 / 25 | CCW Pulse train input |

Output signals

| Signal name | Pin. No | Function |
|---------------------------------|----------|---------------------------------------|
| COM | 26, 27 | Output signal common |
| DRDY | 28 | Driver Unit ready |
| WRN | 29 | Warning |
| HOME | 30 | Home position |
| OXTA | 31 | Travel limit detection, +/- direction |
| SVST | 32 | Servo state |
| BUSY | 33 | In-operation |
| IPOS | 34 | In-position |
| NEARA | 35 | Target proximity A |
| CHA, *CHA, CHB, *CHB, CHZ, *CHZ | 36 to 41 | Positioning feedback signal |
| SGND | 43 | Signal ground |



Carefully follow these instructions for wiring to CN2.

• When wiring to CN2, use shielded wires and a twisted pair for pulse train input and position feedback output.

These wires should be as short as possible (up to 2 m).

• Control input/output signals can be assigned to different functions by parameter. (Input signals: Pin. 4-9, 11-20 Output signals: Pin. 29-35)

Please refer to the manual for details.

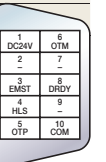
EDC Driver Unit with CC-Link Function

Input signals

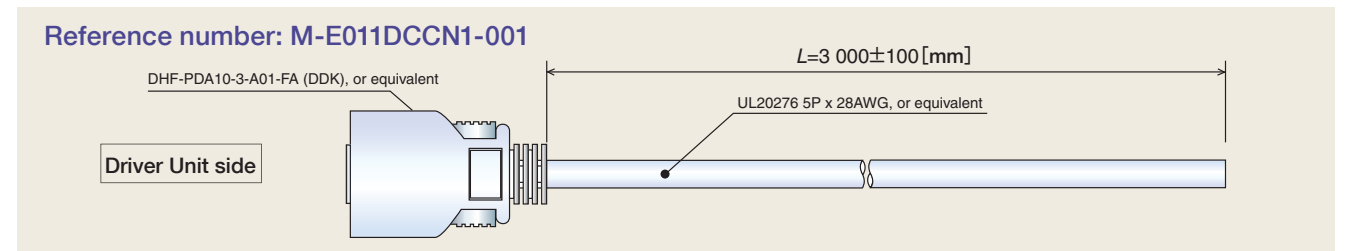
| Signal name | Pin. No | Function |
|-------------|---------|---------------------------------|
| DC24 | 1 | DC 24 V external power supply |
| EMST | 3 | Emergency stop |
| HLS | 4 | Home position limit |
| OTP | 5 | Over travel limit (+ direction) |
| OTM | 6 | Over travel limit (- direction) |

Output signals

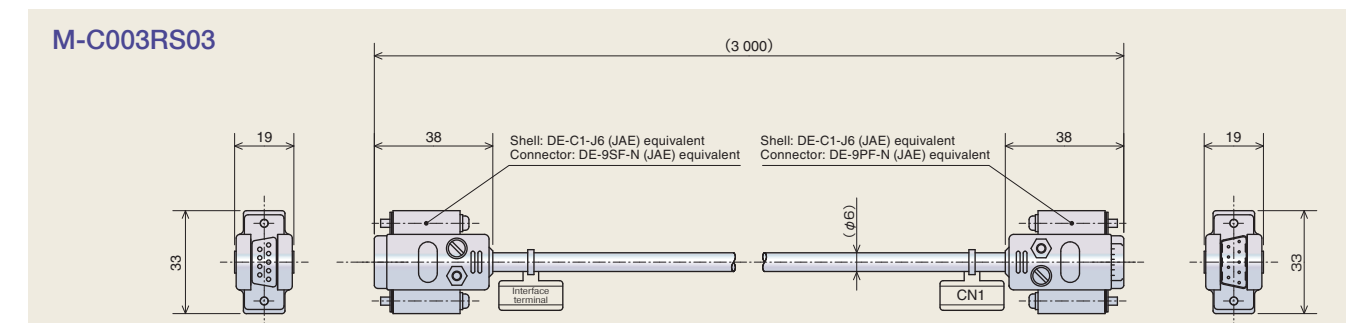
| Signal name | Pin. No | Function |
|-------------|---------|-------------------|
| DRDY | 8 | Driver Unit ready |
| COM | 10 | Output common |



Cable with CN2 connector (optional)



RS-232C Communication Cable (Communication cable between EDC Driver Unit and PC)



Accessories

Cable Set Reference Number

Example of Reference Number: **M-C** **004** **SCP** **13**

Cable set: M-C
 Cable length: 004 (Example: 004 = 4 [m])
 SCP: EDC Driver Unit
 03: Stationary cable 13: Flexible cable

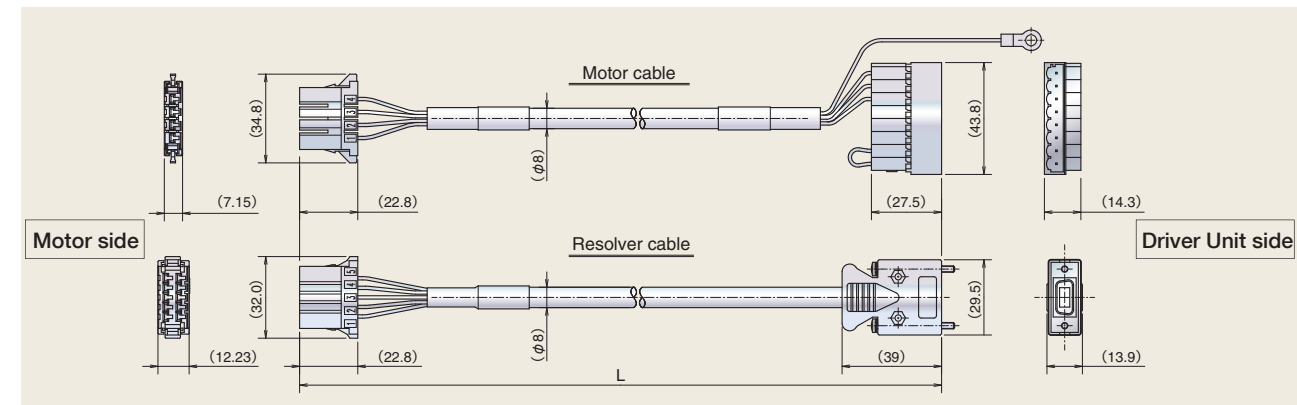
*Cable length
 1 [m], 2 [m], 3 [m], 4 [m], 5 [m], 6 [m], 8 [m], 10 [m], 15 [m], 20 [m], 30 [m]

Cable bending radius (Motor cable, Resolver cable)

| | Bending radius for fixed part | Bending radius for flexible part |
|------------------|-------------------------------|----------------------------------|
| Stationary cable | R43 or more | - |
| Flexible cable | R40 or more | R80 or more |

*Cable must be installed without bending stress around cable connector part.

Dimension of Cable Set



Handy Terminal

Reference number: M-FTH21

Handy Terminal FHT21 is an easy-to-handle RS-232C communication terminal for inputting parameters and programs to the EDC Driver Unit. The device can also read and save (upload) driver unit parameters and channel programs and transmit (download) them to other driver units.

- LCD screen: 20 characters x 4 lines, no external power source required, cable length: 3 m

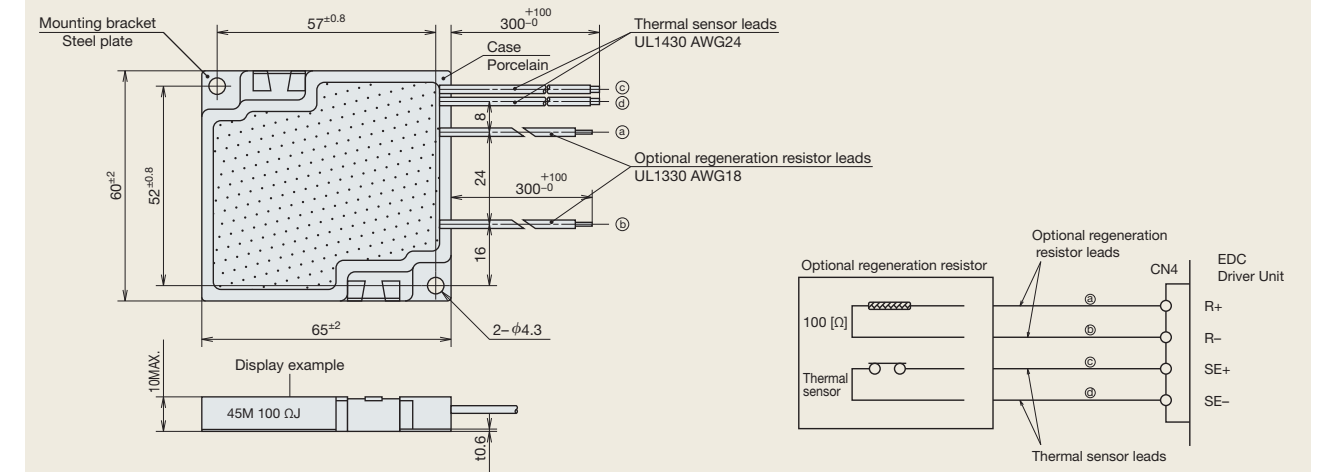
Conventional model M-FTH11 is also supported by the EDC Driver Unit.



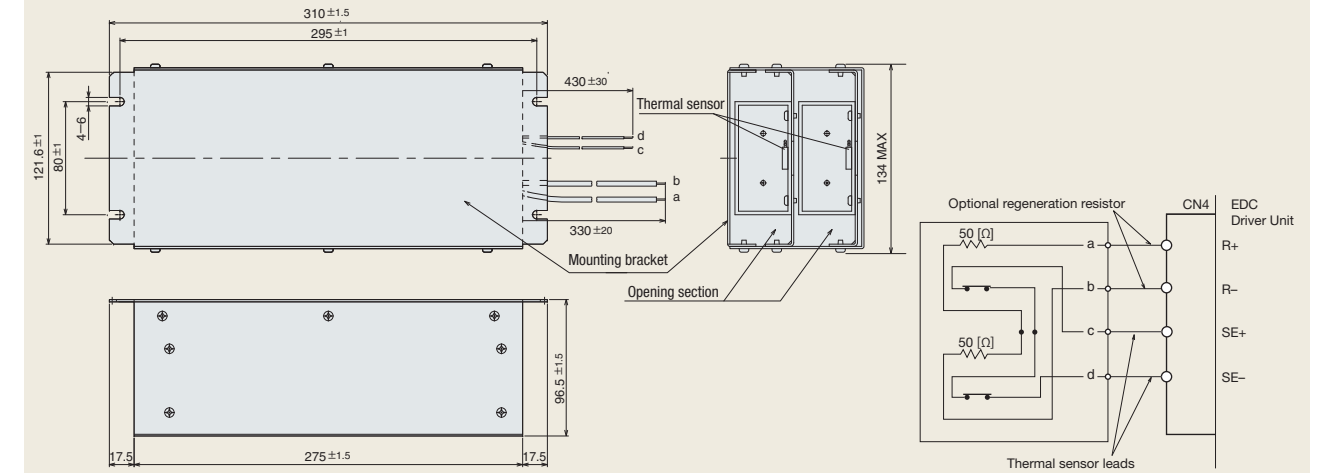
Optional Regeneration Resistor (M-E014DCKR-100/101)

| Reference Number | M-E014DCKR1-100 | M-E014DCKR1-102 | M-E014DCKR1-101 |
|--|-----------------|-----------------|-----------------|
| Rated wattage [W] | 7 | 70 | 120 |
| Resistance [Ω] | 100 | 100 | 100 |
| Thermal sensor temperature [$^{\circ}$ C] | 100 | 100 | 100 |
| Ambient temperature [$^{\circ}$ C] | 0 to 40 | | |

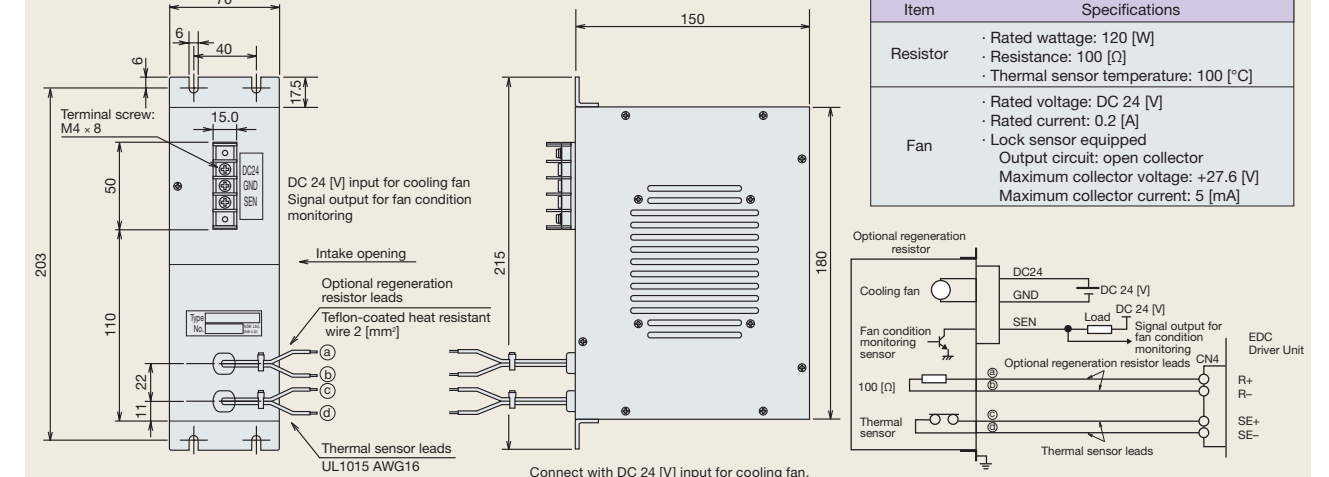
M-E014DCKR1-100



M-E014DCKR1-102



M-E014DCKR1-101





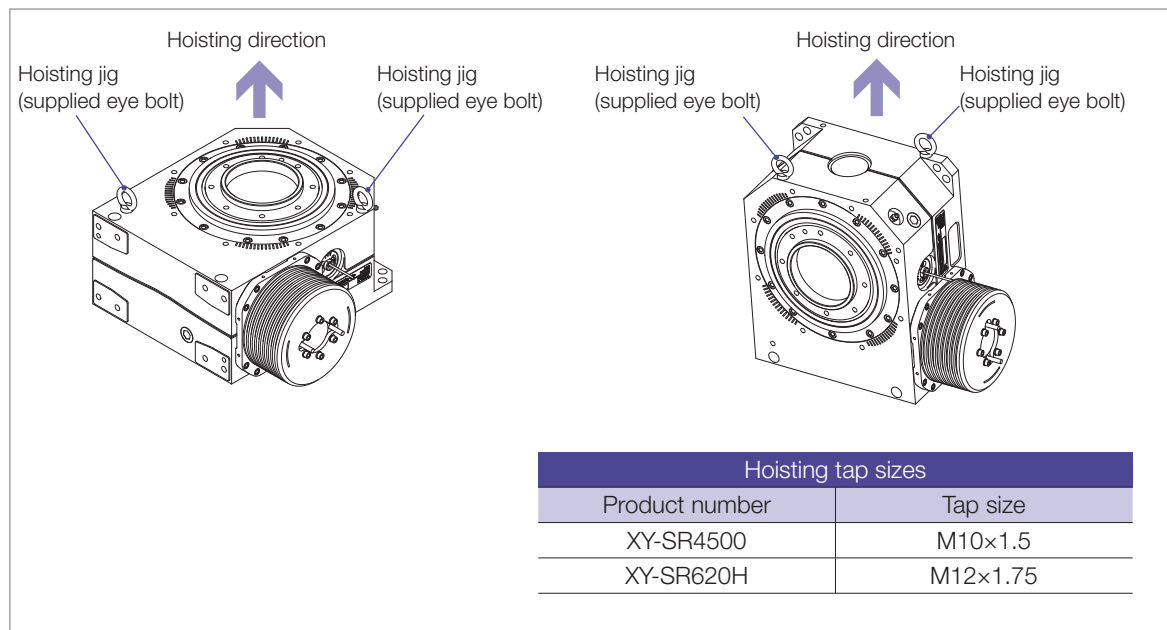
Safety Warnings and Cautions

1. Device selection

- This product is intended for general industrial use. It was not designed or manufactured for uses that may affect human life. Please use only in the following types of environments or locations.
 - (1) Places that are not in a vacuum or high pressure, places out of direct sunlight, and environments without condensation
 - (2) Places without excessive electromagnetic noise and that are insulated from electrical current (Sufficient measures need to be taken especially near welding machines.)
 - (3) Places with no radioactive materials or strong electromagnetic fields
 - (4) Places where there are no combustible/flammable materials in the surrounding area.
 - (5) Strong, flat, and smooth surfaces that can withstand the weight of the product and loads (rigid surfaces where resonant vibration due to vibration when running will not occur)
- This product has lubricant in it. Lubricant may leak from oil seals when in use. Take protective measures such as setting up an oil pan to avoid accidents including operators slipping and falling and malfunctioning of equipment.
- Use within the scope of specifications noted in the specifications table.
- To prevent loads (work, etc.) from vibrating when running, consider rigidity and securely hold or fix the load.
- This product has very high delivery efficiency and part does not have self-locking ability. It cannot maintain the stop position when motor force is released with large torque applied to the output shaft when used with unbalanced loads such as those placed vertically. If the stop position must be maintained, use clamps and the like.
- Maintain space to prevent impact with surrounding equipment and place safety stoppers and safety sensors to stop the product safely even if the load moves in an unexpected manner.

2. Transport

- Prevent impact when transporting by taking care not to bump into objects or drop the product.
- Work must be done by an operator qualified for crane operation and slinging. Improper work may lead to the product dropping or falling over, injuries, equipment damage, etc.
- Before hoisting, check the product's weight by catalogs, diagrams, and the like, and use proper hoisting gear.
- When hoisting, screw the supplied eye bolts in at the specified tap hold positions and lift with equal force on the two locations. Stay away from the product while it is being hoisted. Failure to do so may lead to dropping or swinging.
- Do not place loads (work, etc.) on the product until it is set up.
- Avoid lifting machinery, etc. with the product attached to it.



3. Installation/assembly

- Installation must be done by someone with a basic knowledge of machinery assembly.
- Personnel involved in the work must maintain safety and undergo hygiene/safety training before starting work.
- Electrical wiring must be done by someone with basic knowledge in that field upon reading and understanding the operating manual for this product and the Driver Unit.
- Apply thread-locking adhesive to the tightening bold of the output shaft, and tighten to the specified torque with a torque wrench. (See the product's operating manual for specified torque.)
- Before using, conduct risk assessment and take countermeasures based on analyzed and assessed risks.
- Secure an appropriate safety zone and take protective measures through a safety protection system.
- When using an external regeneration resistor, be sure to set up protective covers and guards at the resistor to protect against burns.

4. Startup adjustment (instruction)

- Conduct startup adjustment outside the safety fence in a safe location outside the range of movement of the load.
- Set up a safety system whereby the power is disconnected in irregular situations.
- Conduct work by personnel with knowledge in machinery assembly, electrical wiring, this product, and the Driver Unit.
- When conducting work, confirm work instructions, use of protective gear, and securing of the main unit and load.
- Make sure fingers and tools are not inserted into openings on the main unit and load.
- When using with unbalanced loads such as those placed vertically, take safety measures so there is no danger or movement even in cases such as reverse operation.

5. Operation (use)

- Set up safety fences and the like, and make sure nobody except the person directly involved in work enters the movement range.
- Train personnel instructing and controlling operation start on work regulations regarding safety.
- Give instructions to notify that the device is operating.
- Set up mechanisms by which operation is immediately stopped in irregular situations, such as by pressing the emergency stop button.
- The emergency stop function (CN2) of the Driver Unit does not satisfy requirements in IEC 60204-1 (JIS B9960-1) for disconnecting device power. Therefore, set up a safety system that can safely stop the device (disconnect power) at input of emergency stop signal.
- Take safety measures by a safety system that can immediately stop the device (disconnect power) at alarms from the product or by signals of safety sensors installed.
- Confirm safety when starting operation. Also prepare work regulations that stipulate safety confirmation procedures and items.
- Stop operation immediately in abnormalities with the product (irregular noise, irregular smell, vibration, etc.)
- If the product is stopped (power disconnected) by the safety system, investigate the reason for stopping and only restart operation when the irregularity is eliminated. Prepare work regulations that stipulate investigation procedures and methods in such situations.

6. Maintenance/inspections

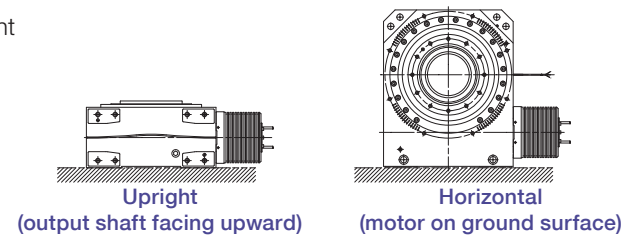
- Personnel involved in the work must maintain safety and undergo hygiene/safety training before starting work.
- Give instructions when conducting maintenance inspection work.
- When using with unbalanced loads such as those placed vertically, take safety measures so there is no danger in load movement even in cases such as reverse operation.
- Do not conduct maintenance/inspection work with the power live.
- Conduct periodic inspections/maintenance. (See the operating instructions of this product for inspection/maintenance items.)

7. Disposal

- Dispose this product appropriately as industrial waste.

Megapositioner setup/maintenance

- The Megapositioner can be set up in two directions: upright and horizontal.

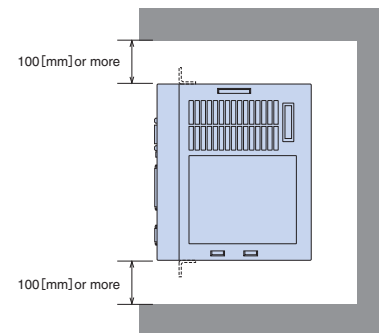


- Do not use a motor lead lines or resolver lead lines for moving parts. Also, lead line curve radius must be R30 mm or greater.
- For maintenance inspections, space should be secured around motor attachment, homing sensor attachment, oil plug, drain, and grease nipple.
- Set up on a flat and smooth surface.
- Apply Locktite 242 or equivalent thread-locking adhesive to loads bolts for securing load, and tighten to the specified torque with a torque wrench.
- Use the following types of oil as lubricant. Periodically replace lubricant to maintain safety and quality. See the instructions included with the lubricant for replacement timing.

| | Brands | Manufacturer |
|--------|---------------------|--------------|
| Oil | Mobil SHC 629 | Exxon Mobil |
| Grease | Pyronoc Universal 2 | Nippon Oil |

Driver Unit Setup

- Be sure to set up the EDC Driver Unit in a vertical position so the heat sink fins for air-cooling are at the top and bottom.
- Keep the ambient temperature between 0 and 50 °C. The Driver Unit cannot be used in high temperatures greater than 50 °C. Keep space of 100 mm or more above and below the Driver Unit in the control cabinet. If heat is trapped above the Driver Unit, open the space above it to allow the heat to dissipate (dust prevention measures required) or provide a forced air cooling system to provide an environment where heat can escape.
- Use the Driver Unit in a control cabinet with IP54 or higher protection from dust and water. Protect the Driver Unit from exposure to oil mist, cutting water, cutting dust, coating gas, etc. to prevent their entry into the Driver Unit through ventilation openings. Failing to do so may lead to failure.
- When installing two or more Driver Units for multi-axis combinations and the like, provide 10 mm or more space between adjacent Driver Units so they are not too close to each other.
- The EDC Driver Unit can be attached to a panel using the supplied mounting brackets.
- The maximum power loss of the EDC Driver Unit is 55 W.



<Using RS-232C Cables>

- These cables are dedicated cables for use with the EDC Driver Unit. The pin arrangement is different than that of RS-232C connectors for PCs.
- Do not plug in or unplug when the EDC power is on. Doing so may damage the Driver Unit.

Cable setup

- Do not cut the cable set to extend, shorten, disconnect, etc.
- Do not place the power lines (AC main power and motor cable) and the signal lines in close proximity. Do not tie wrap them or to put them in the same duct.

Regeneration resistor setup

- Do not use in environments such as underwater or with high temperature and humidity, condensation, corrosive gas, etc.
- The surface will become hot, so measures to protect from burning are necessary. Be sure to set up protective covers to prevent people from easily gaining access. Protective covers must be secured or other measures taken to prevent accidental contact. Also avoid setting up in closed spaces.

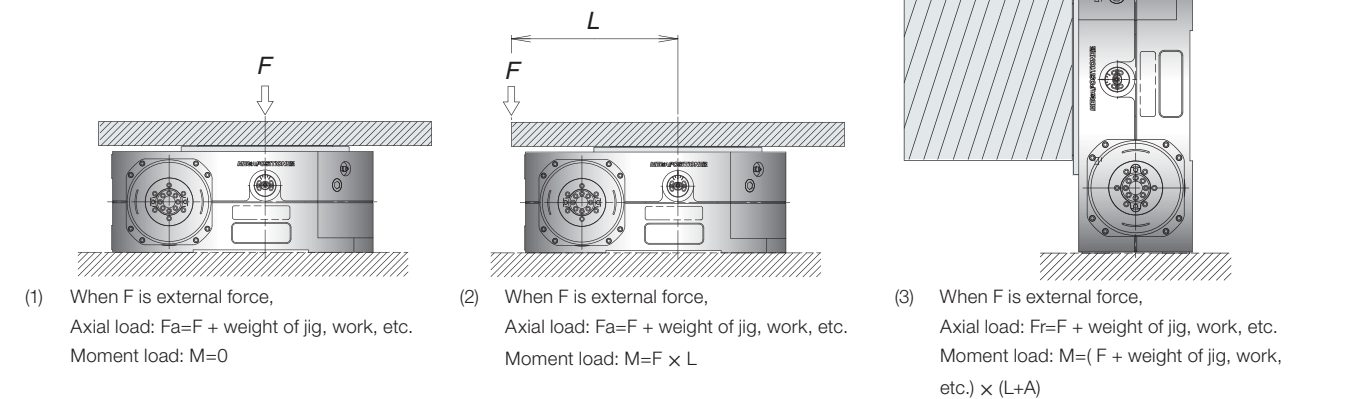
Selecting a Megapositioner

Consider the following when selecting a Megapositioner.

- Load on output shaft**
(External moment load inertia, axial/radial/moment load, holding torque when static)
- Positioning accuracy**
- Calculation of positioning time**
- Calculation of effective torque/ave. rotational speed**
- Selection of regeneration resistor**

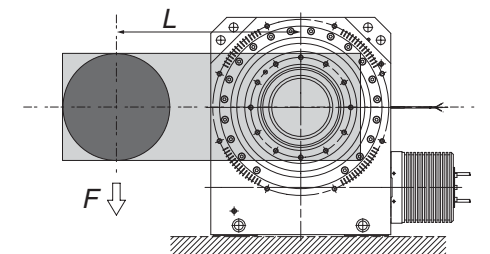
1. Load on output shaft

- A. External load inertia
Load inertia placed on the Megapositioner output shaft greatly affects acceleration and deceleration performance. Calculate the load inertia placed on the output shaft.
- B. Axial/radial/moment load
Calculate the load placed on the Megapositioner output shaft. Typical patterns of the relation between external force and load are shown below. Make sure the individual loads are less than the allowable values.



| Product name | XY-SR4500FN*** | XY-SR620HFN*** |
|-------------------|----------------|----------------|
| A dimensions [mm] | 40.5 | 48.0 |

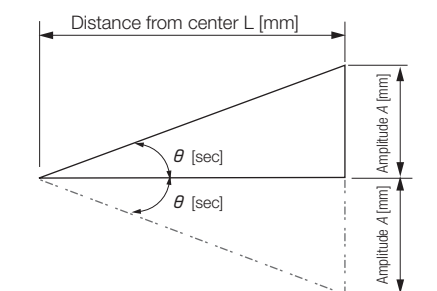
- C. Required holding torque when static
 $F \times L$ torque acts as load torque when the arm is stopped at the position shown on the right, so holding torque equivalent to that load torque is required. Therefore, set the holding torque to less than the rated torque. If holding torque exceeds the rated torque, take measures such as setting counterbalance to make holding torque less than the rated torque. When placing such an unbalanced load, take safety measures so there is no danger even if the load moves due to factors such as reverse operation.



2 Positioning accuracy

Repeated positioning accuracy can be found by the formula below from amplitude A [mm] and distance L from center [mm].

$$\theta = 3600 \times \tan^{-1}(A:L) \text{ [sec.]}$$



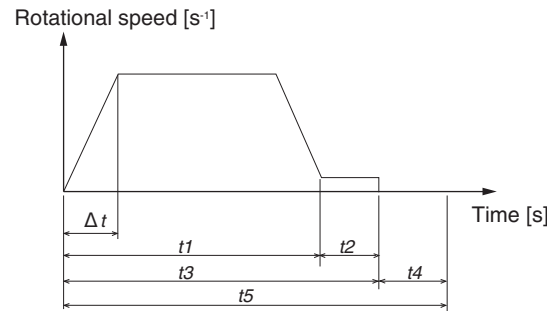
3. How to calculate positioning time

Estimated positioning time within 360° can be calculated by the formula described below.

Note) Please consult NSK for positioning greater than 360° and for continuous rotation.

- J_m : External load inertia [kg·m²]
- J_i : Internal inertia [kg·m²]
- i : Speed reduction ratio
- N : Speed [s⁻¹]
- N_{mean} : Average speed [s⁻¹]
- T_N : Torque at rotational speed N [N·m]
- T_W : Load torque [N·m]
- T_{rms} : Effective torque [N·m]
- θ : Rotational angle [°]
- t_1 : Travel time [s]
- t_2 : Settling time [s]
- t_3 : Positioning time [s]

- t_4 : Dwell time [s]
- t_5 : Cycle time [s]
- Δt : Accelerating time [s]
- η : Safety factor (1.4 – 2.0)



(1) Load inertia J

(1) Load inertia J

Calculate total load inertia J [kg·m²]:

$$J = J_m + J_i \times i^2$$

J_m : Load inertia

J_i : Internal inertia (Refer to table at right)

| Model | Internal Inertia J_i [kg·m ²] | Speed reduction ratio i |
|--------|---|---------------------------|
| SR4500 | 0.0185 | 20 |
| SR620H | 0.0341 | 24 |

(2) Acceleration time Δt .

Acceleration time Δt is calculated by the formula below:

$$\Delta t = \frac{J \times 2\pi \times N}{T_N - T_W} \times \eta \text{ [s]}$$

T_N : Refer speed-torque chart.

(3) Positioning time.

Positioning time t_1 is calculated by the formula below:

$$t_1 = \frac{\theta}{360 \times N} + \Delta t \text{ [s]}$$

Settling time t_2 varies due to required positioning accuracy and load.

Please consult NSK for estimated value.

Total positioning time t_3 is:

$$t_3 = t_1 + t_2 \text{ [s]}$$

Where $\{ T_N - T_W > 0 \}$

$$2 \times \Delta t \leq t_1$$

4. Effective torque and average rotational speed

When selecting Megapositioner, it is necessary to consider the maximum required torque. Also, allowable effective torque must be less than rated torque, and average rotational speed must be less than rated rotational speed.

(1) Required torque.

Required torque can be calculated by the formula below:

$$T_1 = J \times \frac{2\pi \times N}{\Delta t} \times \eta + T_W \quad T_1: \text{Torque at accelerating [N·m]}$$

Torque at constant speed

$$T_2 = T_W \quad T_2: \text{Torque at constant speed [N·m]}$$

Torque at deceleration

$$T_3 = J \times \frac{2\pi \times N}{\Delta t} \times \eta + T_W \quad T_3: \text{Torque at deceleration [N·m]}$$

(2) Effective torque

T_{rms} must be less than rated torque.

$$T_{rms} = \sqrt{\frac{T_1^2 \times \Delta t + T_2^2 \times (t_1 - 2 \times \Delta t) + T_3^2 \times \Delta t}{t_5}}$$

(3) Average rotational speed

N_{mean} must be lower than rated rotational speed.

$$N_{mean} = \frac{\theta}{360 \times t_5} \text{ [s}^{-1}\text{]}$$

5. Selection of Optional Regeneration Resistor

(1) Obtain rotational energy of Megapositioner during deceleration.

$$E_1 = \frac{1}{2} \times \frac{J}{i^2} \times (2\pi \times N \times i)^2 \quad E_1: \text{Rotational energy at deceleration [J]}$$

(2) Obtain rotational energy of load torque during deceleration.

$$E_2 = \frac{1}{2} \times 2\pi \times N \times i \times \Delta t \times \frac{T_W}{i} \quad E_2: \text{Rotational energy by load torque at deceleration [J]}$$

(3) Regenerative energy capacity by internal capacitors

$$E_3 = 28 \text{ [J]}$$

(4) Confirm necessity of optional regeneration resistor.

Calculate energy capacity E consumed by optional regeneration resistor.

$$E = E_1 - (E_2 + E_3) \text{ [J]}$$

$E \leq 0$...Optional regeneration resistor is NOT required.

$E > 0$...Optional regeneration resistor is required.

(5) Required capacity R_u for regeneration resistor.

$$R_u = \frac{E}{0.25 \times t_5} \text{ [W]} \quad R_u: \text{Required capacity of regeneration resistor [W]}$$

0.25: Load factor of regeneration resistor.

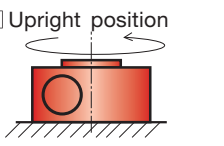
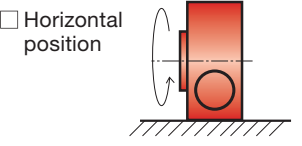
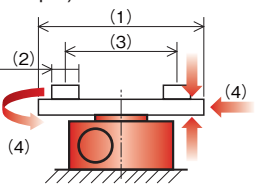
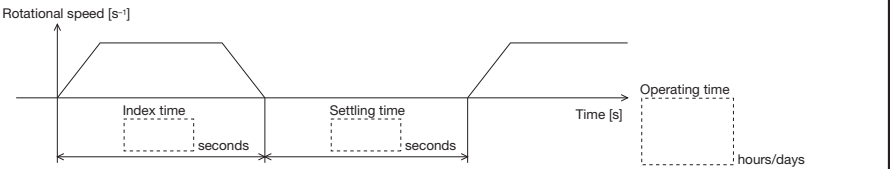
| R_u [W] | Applicable regeneration resistor |
|---------------------|----------------------------------|
| $R_u \leq 7$ | M-E014DCKR1-100 |
| $7 < R_u \leq 70$ | M-E014DCKR1-102 |
| $70 < R_u \leq 120$ | M-E014DCKR1-101 |

Please consult NSK if R_u calculation value results are 120 W or greater.

Reconsidering conditions for 3. Positioning time and 4. Effective torque / Average rotational speed may allow conditions for regeneration resistor to be met.

Form for Requesting Selection

NSK will assist in selecting the optimal Megapositioner.
 Please fill in the necessary items in the below form and send it by fax to your local NSK office.
 Items marked with **Ⓞ** represent important information required for selection. Please provide as much detail as possible.

| | |
|---|--|
| To _____ | Date (DD/MM/YYYY): / / _____ |
| Ⓞ Company Name: _____ | Ⓞ Section: _____ |
| Ⓞ Name: _____ | Ⓞ Contact TEL. _____ FAX. _____ |
| Ⓞ Application and equipment used (specify with as much detail as possible) | |
| Ⓞ Motor installation position (check in <input type="checkbox"/>) | <input type="checkbox"/> Upright position  Output shaft in a vertical direction |
| | <input type="checkbox"/> Horizontal position  Output shaft in a horizontal direction |
| Ⓞ Load conditions (1) Geometry, dimensions, thickness, material (or mass) of table (2) Dimensions, mass, quantity of loads/jigs (3) PCD (distance between the jigs/loads) (example of description) (Example)  | Schematic drawing (an attached illustration showing outside dimensions is acceptable) • Please provide information on outside dimensions, dimensions from the center, material, etc. Attachment: <input type="checkbox"/> Yes <input type="checkbox"/> No |
| (4) External force (pressure/ impact loads, sliding, friction, etc.) | Timing of external force : <input type="checkbox"/> At stationary <input type="checkbox"/> When rotating Impact / Friction : <input type="checkbox"/> Impact <input type="checkbox"/> Friction Direction of external force : Radial _____[N] Axial _____[N] Moment _____[N.m] Special conditions : _____ |
| Motor size requested | |
| Positioning command system | <input type="checkbox"/> Internal program system <input type="checkbox"/> CC-Link |
| Ⓞ Index angle / Number of points | Settle at _____°, Number of points: _____ |
| Ⓞ Repeatability (±) | ± _____ seconds (± _____ mm at _____ mm from the motor center) |
| Ⓞ Cycle pattern (desired positioning time) *Specify settling time. |  |
| Desired model | <input type="checkbox"/> XY-SR4 <input type="checkbox"/> XY-SR6 <input type="checkbox"/> Unknown |
| Environmental conditions | Operating environment <input type="checkbox"/> General environment (equivalent to IP30) <input type="checkbox"/> Oil, water and chemical <input type="checkbox"/> Chips and dust <input type="checkbox"/> Clean Operating temperature <input type="checkbox"/> 0°C to 40°C <input type="checkbox"/> Below 0°C <input type="checkbox"/> Above 40°C <input type="checkbox"/> Other (_____ °C) Contact NSK for details. |
| Ⓞ Cable specification and length | <input type="checkbox"/> Stationary cable <input type="checkbox"/> Flexible cable Length: _____ m Select "Movable" when cable is repeatedly bent anywhere along the wiring route. |
| Other request items | |

Warranty Term and Scope

1. Content and term of warranty

NSK Ltd. will repair for the purchaser of this product (hereinafter, the "user") without charge (hereinafter, "warranty") failures that occur within one year of the product delivery (hereinafter, the "warranty term") due to fault of NSK. Actions taken for failures that occur after the warranty term has expired will be charged by NSK Ltd.

2. Immunities

The warranty does not cover failures that occur for the following reasons.

- (1) Relocation, transport, storage, setup, operation, or use in a manner contrary to items displayed on or with the product, items noted in instructions and other manuals, catalogs and the like, and items instructed or notified to the user at delivery or before failure; as well as confirmed use in environments or maintenance contrary to as noted in the above places
- (2) Repairs or modifications conducted by parties other than NSK Ltd. without the approval of NSK Ltd.
- (3) Combination with products other than those for this product (including software)
- (4) Consumption of consumables
- (5) Replacement of parts for this product by the user other than lubricant, grease, and homing sensor
- (6) Reasons not foreseeable by scientific or technical standards at the time of product delivery by NSK Ltd.
- (7) Natural disasters, accidents, conflicts, and other force majeure and external factors not attributable to the product including fire, application of irregular voltage/signals
- (8) Other reasons not attributable to fault by NSK

3. Limit of responsibility

Items noted herein are the entirety of responsibility by NSK in terms of product warranty. NSK bears no responsibility whatsoever for secondary or incidental damages, loss of opportunity, etc. caused by failure of this product.

4. Service fees, etc.

Fees for dispatch of NSK Ltd. personnel and for the following services conducted based on request by the user shall be paid by the user. Such fees shall be calculated according to NSK Ltd. regulations.

- (1) Re-application, repair, or replacement of consumables such as lubricant, grease, or sealed components such as oil seals (NSK will not notify of need for replacement of consumables.)
- (2) Items other than repair of failures (unpacking, setup/adjustment/maintenance, operation instruction, diagnosis of failure, removal, transport for return, relocation/re-setup, etc.)

■ Product discontinuation and maintenance term

NSK Ltd. will notify of discontinuation of the product and its repair parts at least one year in advance. The maintenance term after such discontinuation (including term in which repair parts are supplied) shall be five years.

■ Confirmation of applicability to use

1. This product is intended for general industrial use. It was not designed or manufactured for uses that may pose serious risk to people's lives or property. It cannot be adapted for special uses such as nuclear control, aeronautical devices, transport devices, medical devices, explosive/corrosive/poisonous material handling devices, safety devices, and their systems. Please contact NSK Ltd. in advance before using this product for such uses. We will study compatibly upon setting separate special use conditions and quality assurance conditions.
2. Users are required to as a condition for using this product to have the failsafe function for failure, malfunction, or other problems with this product be appropriately applied to external mechanisms of this product.
3. The user is requested to confirm standards that must be conformed to and laws and regulations that must be adhered to in the location of delivery for devices and systems this product is used in. Also, restrictions of the Foreign Exchange and Foreign Trade Act may apply if this product may be used in or for the production of weapons in the final location of delivery or use. The user should take note of the location where the product will be used and take the appropriate applications and procedures as needed.

■ Cautions regarding maintenance and repairs

1. Replacement, maintenance, or repair of items other than the following shall be done by NSK Ltd. at the user's expense by returning them to NSK Ltd.
 - (1) Lubricant/grease
 - (2) Homing sensor
2. When returning for maintenance, etc., return this product only. Also, use packaging and method of transportation equivalent to that used at delivery. NSK Ltd. bears no responsibility for damage, loss, etc. to items other than the returned product.

Worldwide Sales Offices

P: Phone ☆: Head Office

NSK LTD. HEADQUARTERS, TOKYO JAPAN

INDUSTRIAL MACHINERY BUSINESS DIVISION-HEADQUARTERS P: +81-3-3779-7227
 AUTOMOTIVE BUSINESS DIVISION-HEADQUARTERS P: +81-3-3779-7189

Africa

South Africa:

NSK SOUTH AFRICA (PTY) LTD.
 JOHANNESBURG P: +27-11-458-3600

Aisia and Oceania

Australia:

NSK AUSTRALIA PTY. LTD.
 MELBOURNE ☆ P: +61-3-9765-4400
 SYDNEY P: +61-2-8843-8100
 BRISBANE P: +61-7-3347-2600
 PERTH P: +61-8-9256-5000

New Zealand:

NSK NEW ZEALAND LTD.
 AUCKLAND P: +64-9-276-4992

China:

NSK HONG KONG LTD.
 HONG KONG ☆ P: +852-2739-9933
 SHENZHEN P: +86-755-25904886

NSK (SHANGHAI) TRADING CO., LTD.

JIANGSU P: +86-512-5796-3000

NSK (CHINA) INVESTMENT CO., LTD.

JIANGSU ☆ P: +86-512-5796-3000
 BEIJING P: +86-10-6590-8161
 TIAN JIN P: +86-22-8319-5030
 CHANGCHUN P: +86-431-8898-8682
 SHENYANG P: +86-24-2334-2868
 DALIAN P: +86-411-8800-8168
 NANJING P: +86-25-8472-6671
 FUZHOU P: +86-591-8380-1030
 WUHAN P: +86-27-8556-9630
 QINGDAO P: +86-532-5568-3877
 GUANGZHOU P: +86-20-3817-7800
 CHANGSHA P: +86-731-8571-3100
 LUOYANG P: +86-379-6069-6188
 XI'AN P: +86-29-8765-1896
 CHONGQING P: +86-23-6806-5310
 CHENGDU P: +86-28-8528-3680

NSK CHINA SALES CO., LTD.

JIANGSU P: +86-512-5796-3000

India:

NSK INDIA SALES CO.PVT.LTD.

CHENNAI ☆ P: +91-44-2847-9600
 GURGAON P: +91-124-4104-530
 MUMBAI P: +91-22-2838-7787

Indonesia:

PT. NSK INDONESIA

JAKARTA P: +62-21-252-3458

Korea:

NSK KOREA CO., LTD.

SEOUL P: +82-2-3287-0300

Malaysia:

NSK BEARINGS (MALAYSIA) SDN.BHD.

SHAH ALAM ☆ P: +60-3-7803-8859
 PRAI P: +60-4-3902275
 JOHOR BAHRU P: +60-7-3546290
 IPOH P: +60-5-2555000

Philippines:

NSK REPRESENTATIVE OFFICE

MANILA P: +63-2-893-9543

Singapore:

NSK INTERNATIONAL (SINGAPORE) PTE LTD.

SINGAPORE P: +65-6496-8000

NSK SINGAPORE (PRIVATE) LTD.

SINGAPORE P: +65-6496-8000

Taiwan:

TAIWAN NSK PRECISION CO., LTD.

TAIPEI ☆ P: +886-2-2509-3305
 TAICHUNG P: +886-4-2708-3393
 TAINAN P: +886-6-505-5861

TAIWAN NSK TECHNOLOGY CO., LTD.

TAIPEI ☆ P: +886-2-2509-3305
 TAICHUNG P: +886-4-2358-2945
 TAINAN P: +886-6-505-5861

Thailand:

NSK BEARINGS (THAILAND) CO., LTD.

BANGKOK P: +66-2320-2555

Vietnam:

NSK VIETNAM CO., LTD.

HANOI P: +84-4-3955-0159

NSK REPRESENTATIVE OFFICE

HO CHI MINH CITY P: +84-8-3822-7907

Europe

United Kingdom:

NSK EUROPE LTD. (EUROPEAN HEADQUARTERS)

MAIDENHEAD P: +44-1628-509-800

NSK UK LTD.

NEWARK P: +44-1636-605-123

France:

NSK FRANCE S.A.S.

PARIS P: +33-1-30-57-39-39

Germany:

NSK DEUTSCHLAND GMBH

DUSSELDORF ☆ P: +49-2102-4810
 STUTTGART P: +49-711-79082-0
 WOLFSBURG P: +49-5361-27647-10

Italy:

NSK ITALIA S.P.A.

MILANO P: +39-299-5191

Netherlands:

NSK EUROPEAN DISTRIBUTION CENTRE B.V.

TILBURG P: +31-13-4647647

Poland:

NSK REPRESENTATIVE OFFICE

WARSAW P: +48-22-645-1525

Russia:

NSK POLSKA SP. Z O.O.

SAINT-PETERSBURG P: +7-812-332-5071

Spain:

NSK SPAIN S.A.

BARCELONA P: +34-93-433-5775

Turkey:

NSK RULMANLARI ORTA DOGU TIC. LTD. STI.

ISTANBUL P: +90-216-477-7111

UAE:

NSK BEARINGS GULF TRADING CO.

DUBAI P: +971-4-804-8200

North and South America

United States of America:

NSK AMERICAS, INC. (AMERICAN HEADQUARTERS)

ANN ARBOR P: +1-734-913-7500

NSK CORPORATION

ANN ARBOR P: +1-734-913-7500

NSK PRECISION AMERICA, INC.

FRANKLIN ☆ P: +1-317-738-5000

SAN JOSE

P: +1-408-944-9400

NSK LATIN AMERICA, INC.

MIAMI P: +1-305-477-0605

Canada:

NSK CANADA INC.

TORONTO ☆ P: +1-905-890-0740

MONTREAL

P: +1-514-633-1220

VANCOUVER

P: +1-877-994-6675

Argentina:

NSK ARGENTINA SRL

BUENOS AIRES P: +54-11-4704-5100

Brazil:

NSK BRASIL LTDA.

SAO PAULO ☆ P: +55-11-3269-4786

BELO HORIZONTE

P: +55-31-3274-2591

JOINVILLE

P: +55-47-3422-5445

PORTO ALEGRE

P: +55-51-3222-1324

RECIFE

P: +55-81-3326-3781

Peru:

NSK PERU S.A.C.

LIMA P: +51-1-652-3372

Mexico:

NSK RODAMIENTOS MEXICANA, S.A. DE C.V.

MEXICO CITY ☆ P: +52-55-3682-2900

MONTERREY

P: +52-81-8000-7300

<As of March 2014>

For the latest information, please refer to the NSK website.

www.nsk.com

NSK Ltd. has a basic policy not to export any products or technology designated as controlled items by export-related laws. When exporting the products in this brochure, the laws of the exporting country must be observed. Specifications are subject to change without notice and without any obligation on the part of the manufacturer. Every care has been taken to ensure the accuracy of the data contained in this brochure, but no liability can be accepted for any loss or damage suffered through errors or omissions. We will gratefully acknowledge any additions or corrections.

For more information about NSK products, please contact: _____

