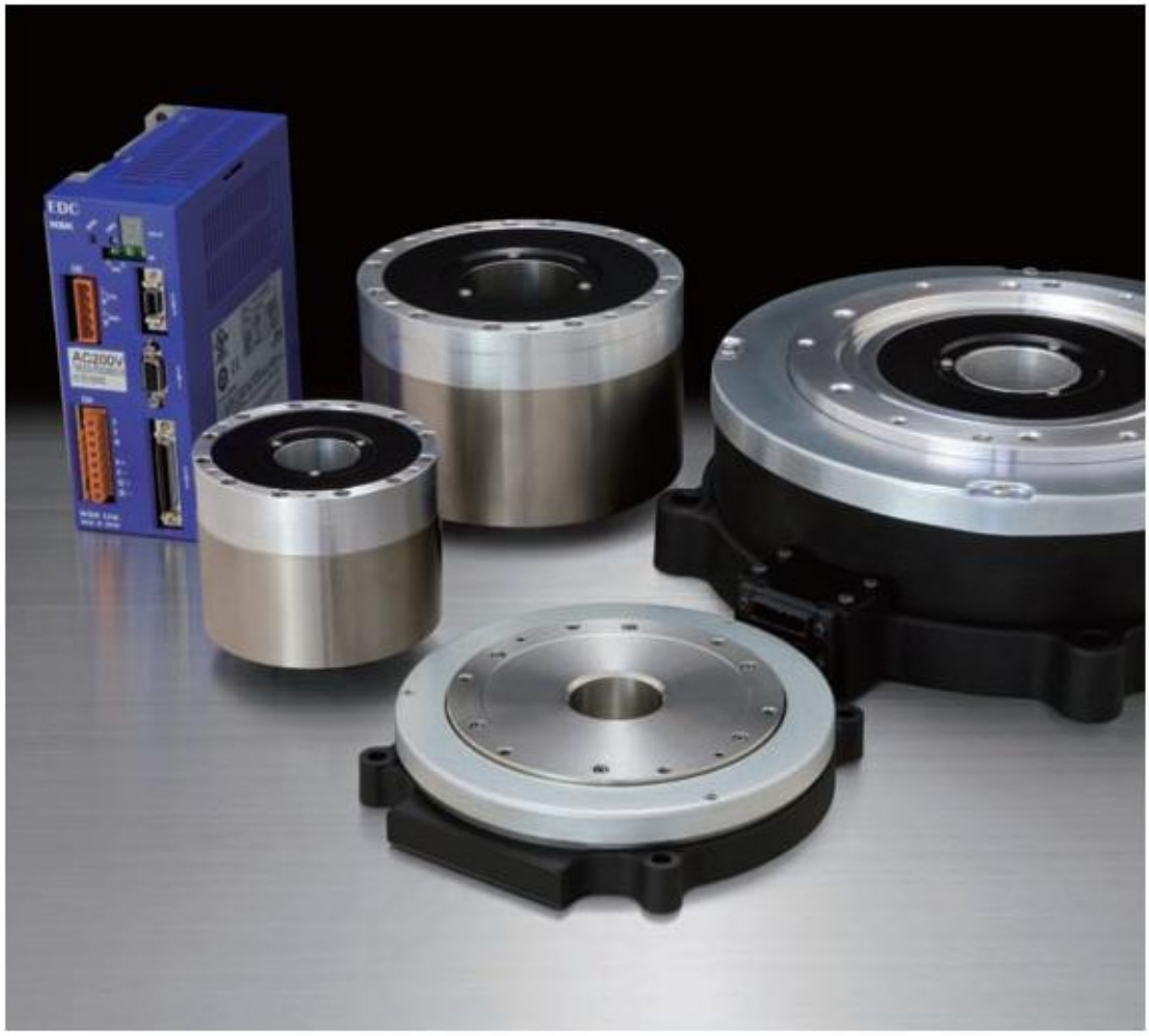
Megatorque Motor Selection Tool

Operating manual



NSK Ltd.

Document No.Z20064-01

Contents

1. Outline of Megatorque Motor Selection Tool

1.1. Features

Megatorque Motor Selection Tool has the following feature.

- A necessary Megatorque Motor can be selected easily by the wizard method.
- The moment of inertia from dimensions of the load can be calculated automatically.
- The movement pattern to accompany the request from the operating condition (index angle, load moment of inertia, etc.) can be calculated and selected automatically even if the examination of the movement pattern is not done beforehand.

1.2. Notes on use

Use the Megatorque Motor Selection Tool after perusing the following notes.

1. Copyright

Megatorque Motor Selection Tool is a copyright work of NSK Ltd. (hereafter "NSK").

2. Prohibited matter

The following restrictions apply to all users of Megatorque Motor Selection Tool.

- You are expressly forbidden to reproduce or modify any or all content of the Megatorque Motor Selection Tool in any way other than as authorized by NSK.
- Unauthorized distribution, transmission, or republication of the Megatorque Motor Online Selection Tool is strictly prohibited without prior written permission from NSK.
- Any act relating to the Megatorque Motor Online Selection Tool that is deemed inappropriate by NSK is also prohibited.

3. Change / Deletion

NSK changes or deletes Megatorque Motor Selection Tool without previous notice.

4. Immunity

No representations or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made by NSK with respect to information or the product's) to which Megatorque Motor Selection Tool refers.

Moreover, this tool is the one to support the selection of the Megatorque Motor, and is not the one to guarantee the specification of the product.

5. When you use the inquiry

Personal information filled in executes appropriate handling according to "Policy of personal information protection" of NSK.

Read through "When you use the inquiry form" about details.

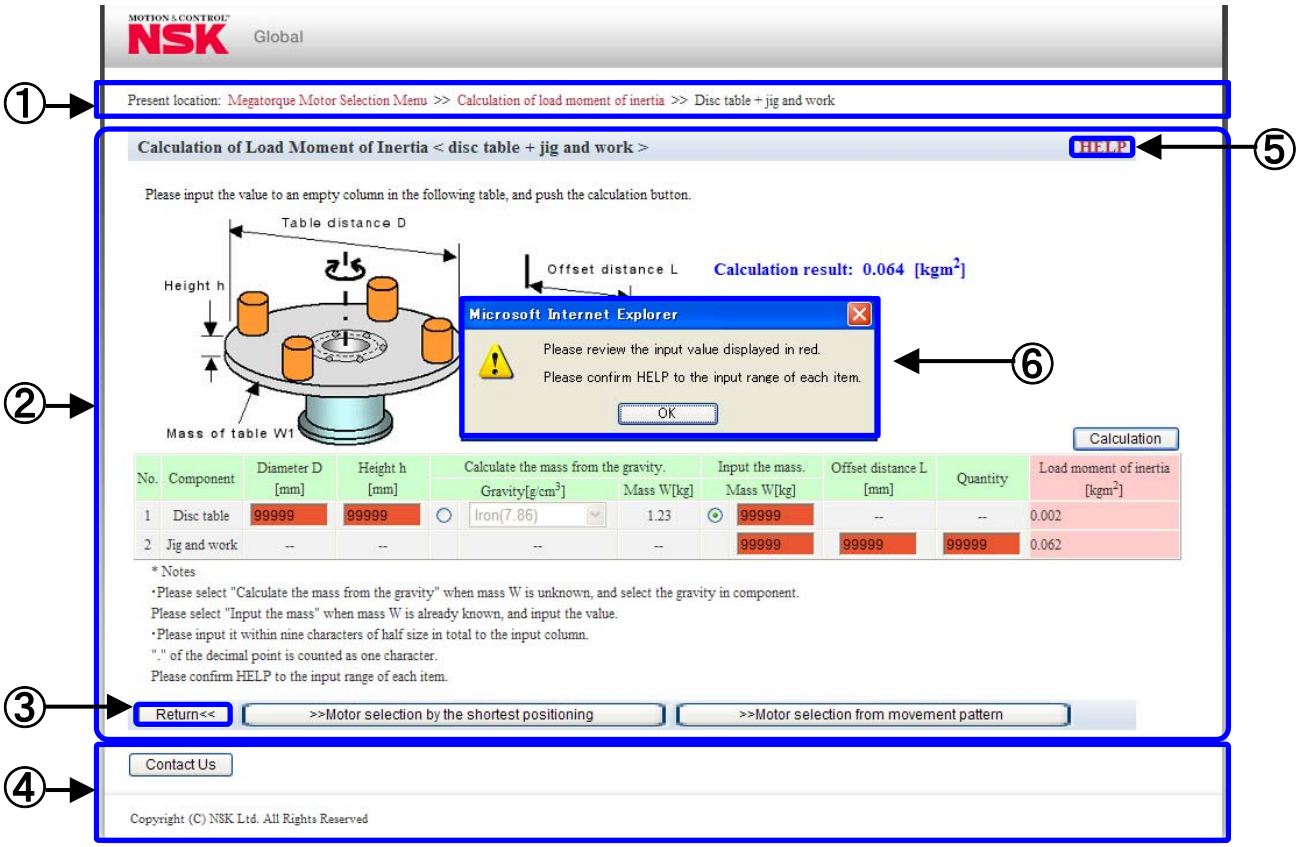
6. Notes

After reading the NSK catalog and product instruction/user manual, consider the appropriate working conditions or operating environment, overall rigidity of the system, servo tuning, etc., when making a selection based on the Megatorque Motor Selection Tool.

It uses Cookie in Megatorque Motor Selection Tool. When the use of Cookie is limited by a browser used, it cannot be used.

1.3. Basic configuration of screen

The screen of Megatorque Motor Selection Tool is shown in the figure below.



① History of selection

It returns to each screen when clicking. Note it because input data and option are reset.

② Main contents

The main contents of Megatorque Motor Selection Tool are displayed.

Input it to the input column up to 9 one-byte characters. "." of the decimal point is counted to one character. Confirm the input range of each item by "2.2 Operation explanation of each screen".

③ Return

It returns to the previous screen when clicking. Neither input data nor option is reset.

④ Footer

All screens are common.

Inquiry: It links to the inquiry of NSK Global Website when clicking.

⑤ HELP

All screens are common.

It links to the operating manual of Megatorque Motor Selection Tool when clicking.

⑥ Error message

The error message is displayed when there is incompleteness (numerical value is outside of input range, no data in the necessary item column, etc.) in the data input column. Moreover, the input column with incompleteness is displayed in red.

2. Megatorque Motor Selection Tool procedure

2.1. Outline of selection

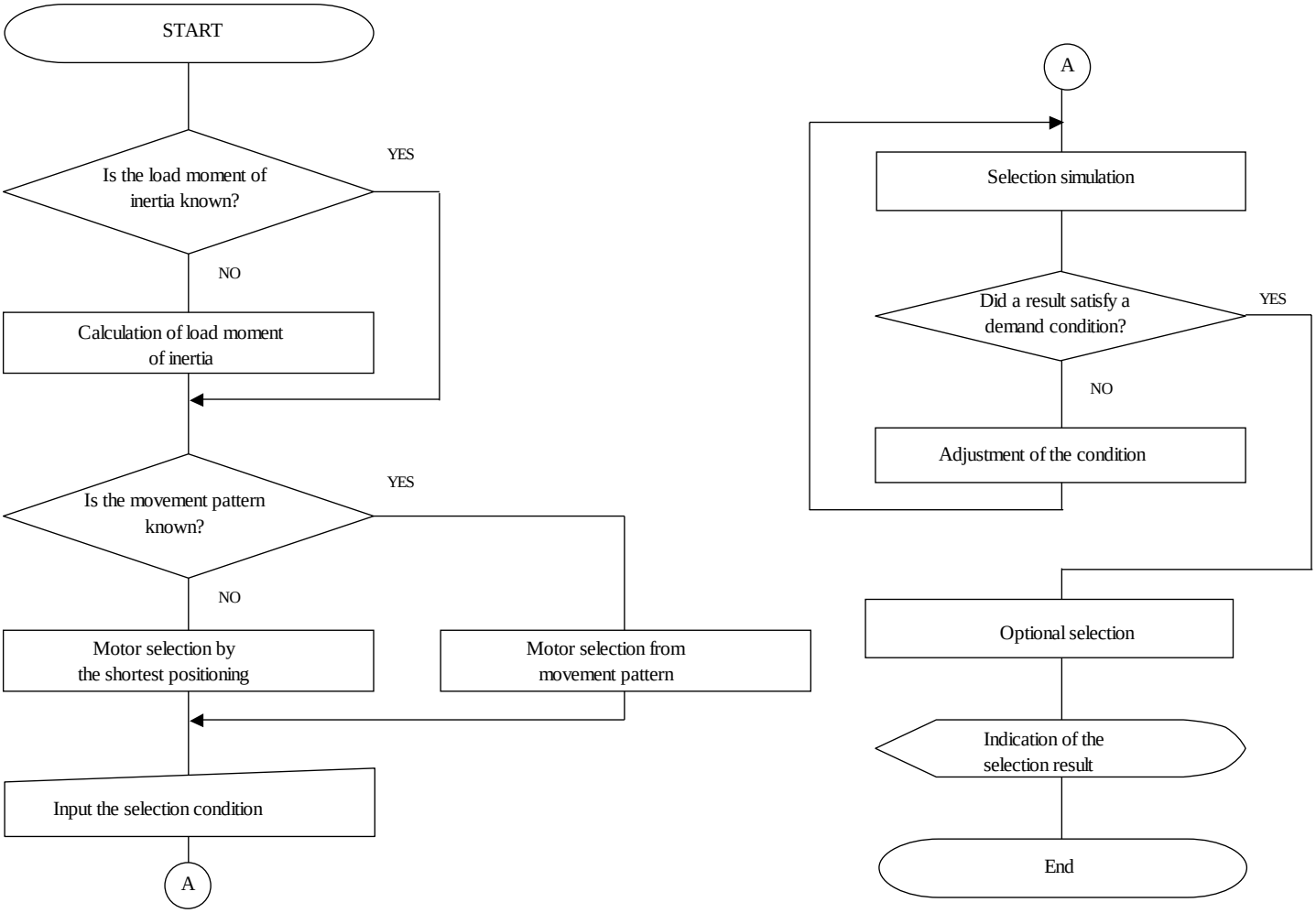
2.1.1. Preparation

Confirm the motor specification from the catalog and the manual, etc. before using Megatorque Motor Selection Tool.

- Motor dimensions
- Mass
- Allowable axial load
- Allowable radial load
- Allowable axial moment load
- Environmental condition

2.1.2. Flow of selection

The flow of Megatorque Motor selection is shown in the figure below.



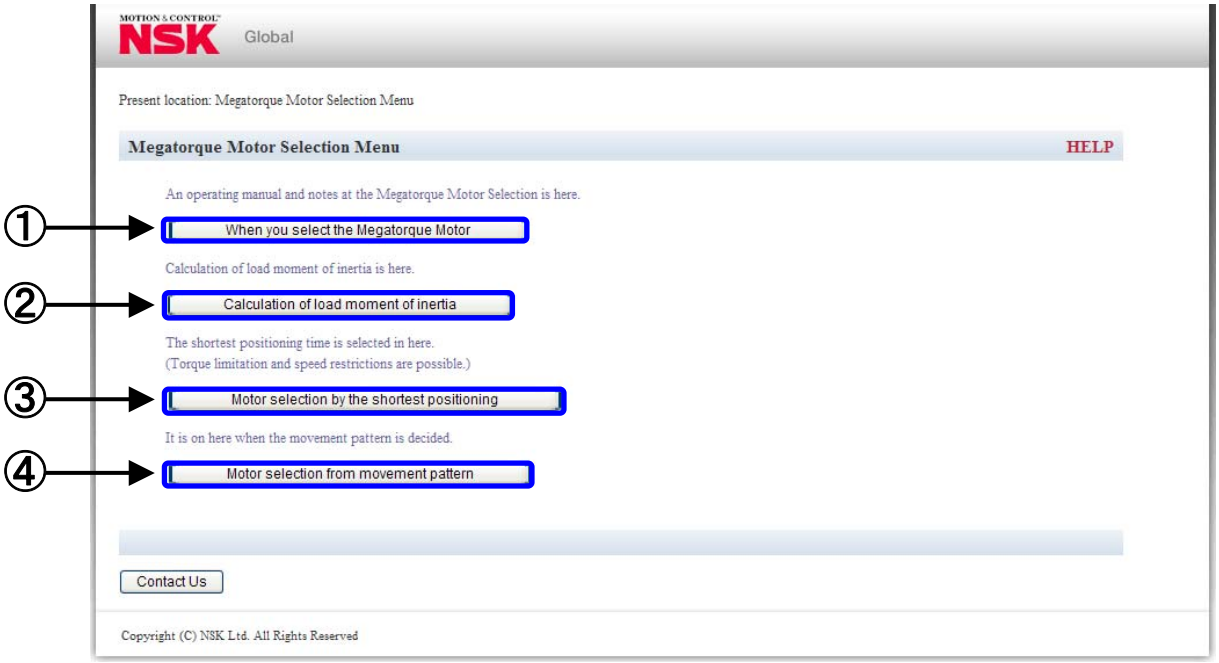
2.2. Operation explanation of each screen

2.2.1. Megatorque Motor selection menu

- Outline

  It is TOP screen of Megatorque Motor Selection Tool.

- Screen composition



- Explanation of each part

① Selection of Megatorque Motor

It links to the operating manual of Megatorque Motor Selection Tool when clicking.

② Calculation of load moment of inertia

It link s to the calculation of the load moment of inertia when clicking.

Begin the selection from here when the load moment of inertia installed in the motor is unknown.

③ Motor selection by the shortest positioning

It links to the motor selection by the shortest positioning when clicking.

Begin the selection from here when the load moment of inertia installed in the motor is already-known and the detailed movement pattern is unknown.

④ Motor selection from movement pattern

It links to the motor selection from the movement pattern when clicking.

Begin the selection from here when the load moment of inertia installed in the motor and the detailed movement pattern are already-known.

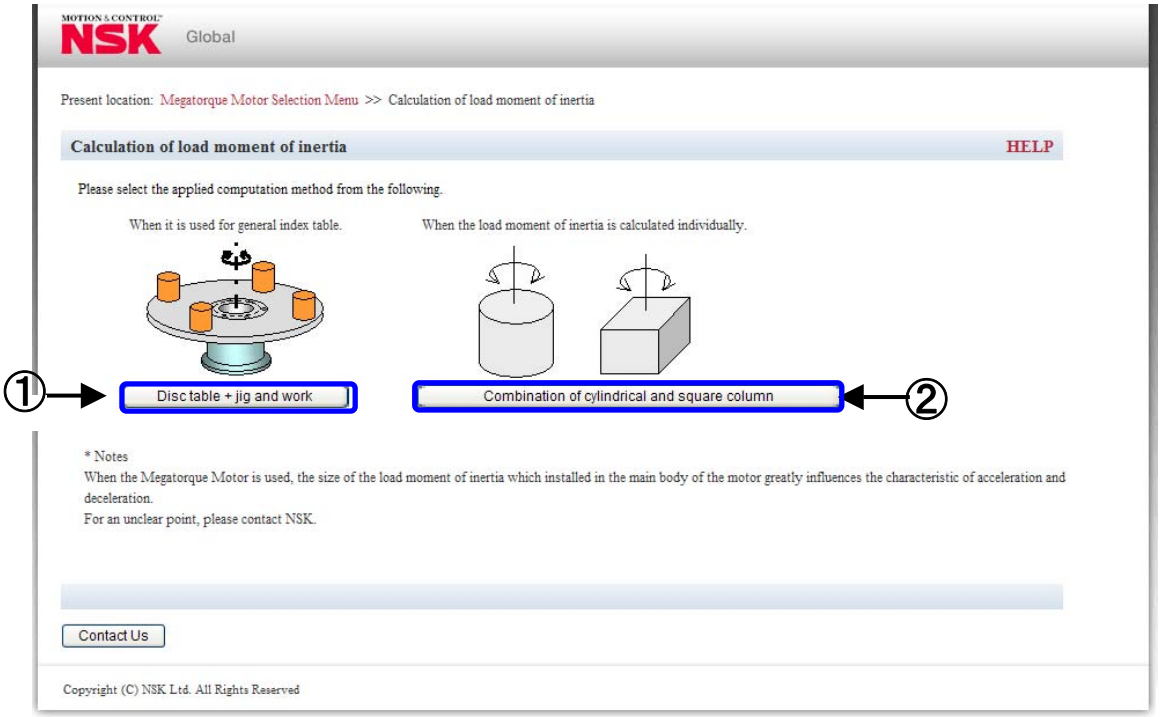
2.2.2. Calculation of load moment of inertia

- Outline

  It is a calculation method selection screen of the load moment of inertia.

  Choose to be suitable for the load installed in the motor from two calculation methods that are the calculation of general index table, and the calculation by the combination of cylindrical and square column.

- Screen composition



- Explanation of each part

① Disc table + jig and work

It links to the calculation of load moment of inertia of disc table and jig & work when clicking.

When there is the load that installed in the motor on the general index table, select here

② Combination of cylindrical and square column

It links to the calculation of load moment of inertia of combination of cylindrical and square column when clicking.

Please select here, if the load installed in the motor is not the general index table.

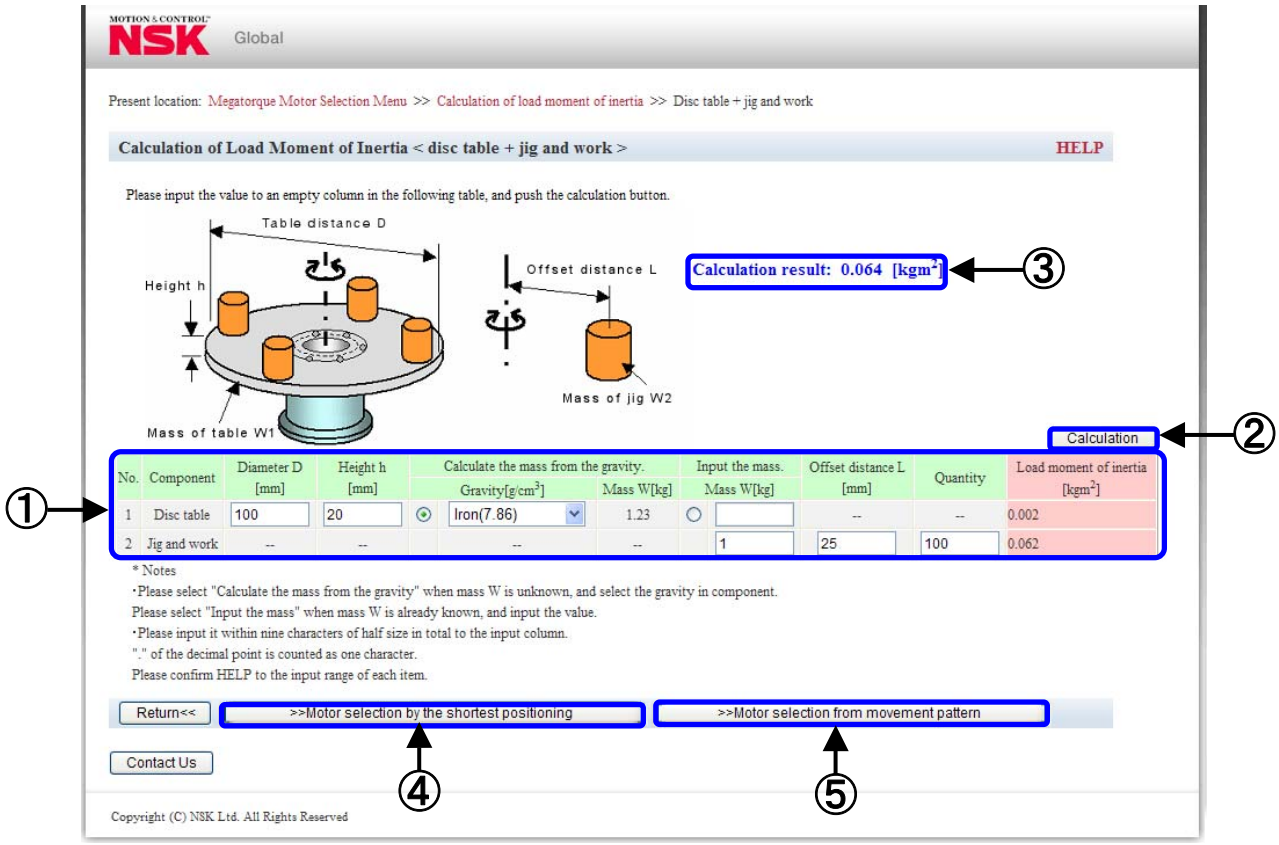
2.2.3. Disc table + jig and work

- Outline

  The load moment of inertia of disc table and jig & work is calculated.

  However, the moment of inertia of the jig & work is calculated only offset. When the motor dimensions and the mass are large and the moment of inertia of jig & work cannot be disregarded, use the combination of cylindrical and square column.

- Screen composition



- Explanation of each part

① Data column

Name	Explanation	Input range
Diameter D	The diameter of the disc table is input.	From 0 to 10^4 or less
Height h	The height of the disc table is input.	From 0 to 10^4 or less
Gravity	The gravity is selected from iron, aluminum, and copper after clicking the radio button of the gravity. When the radio button of mass W has been selected, the value of the gravity is disregarded.	-
Mass W	The mass is input after clicking the radio button of the mass. When the radio button of the gravity has been selected, the value of the mass is disregarded.	From 0 to 10^4 or less
Offset distance	The offset distance from the rotating shaft to the center of the load is input.	From 0 to D/2 or less
Quantity	Input the quantity of the jig & work.	From 0 to 10^4 or less
Load moment of inertia	The individual moment of inertia of a disc table and jig & work is output.	-

② Calculation button

The load moment of inertia is calculated when clicking after data is input.

The calculation result is not displayed when there is incompleteness (numerical value is outside of input range, no data in the necessary item column, etc.) in the data input column and the error message is displayed.

③ Result of calculation

The total value of the moment of inertia of the disc table and jig & work is displayed.

④ Go to motor selection by the shortest positioning

It links to the motor selection by the shortest positioning when clicking.

The calculated load moment of inertia is input to the load condition automatically.

⑤ Go to motor selection from movement pattern

It links to the motor selection from the movement pattern when clicking.

The calculated load moment of inertia is input to the load condition automatically.

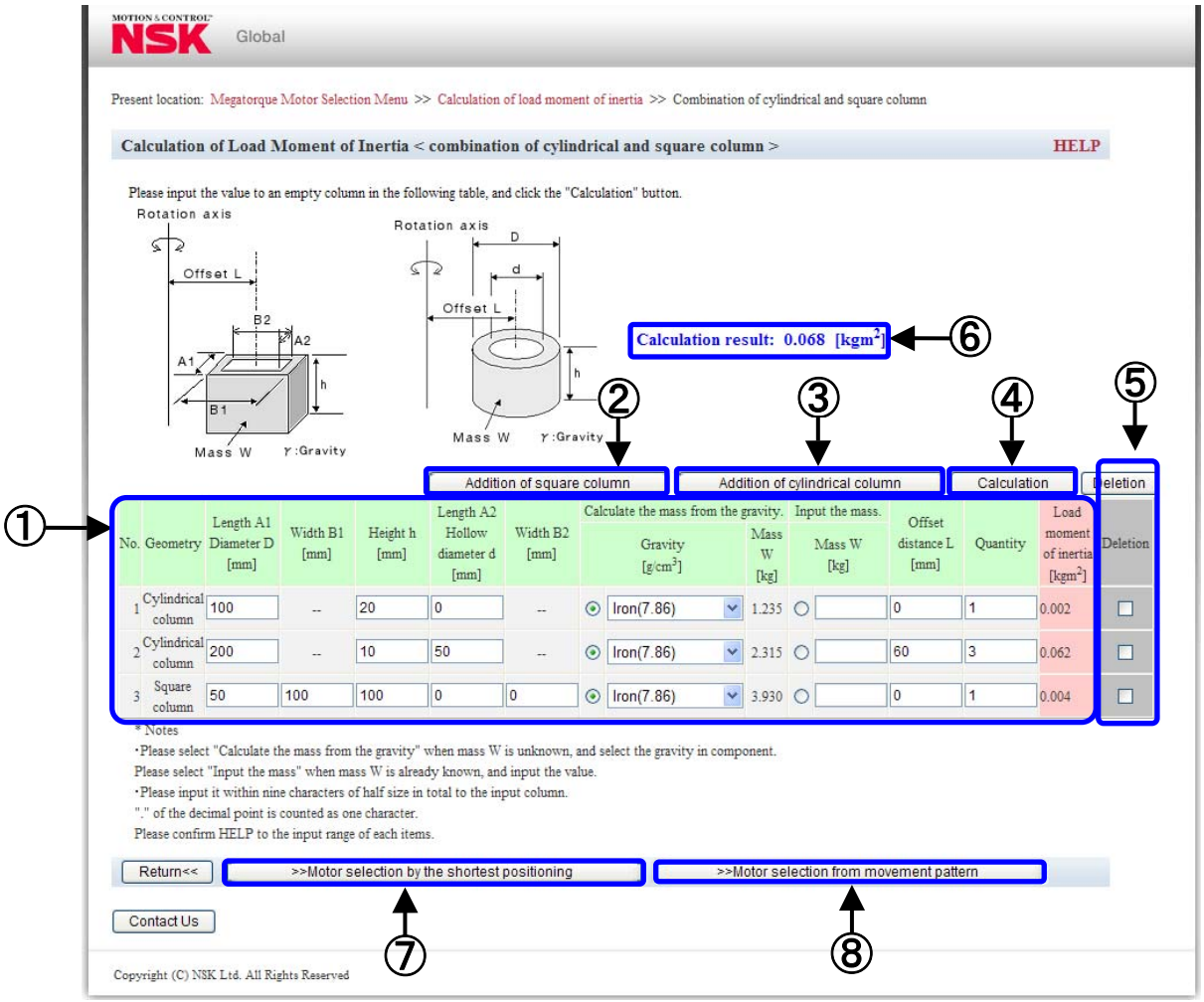
2.2.4. Combination of cylindrical and square column

- Outline

  The moment of inertia of the cylindrical and square column is calculated.

  Calculate the each parts of cylindrical and square column when the installed load is the complicated shapes.

- Screen composition



- Explanation of each part

① Data column

Name	Explanation	Input range
Length A1/diameter D	The length of the square column or the diameter of the cylindrical column is input.	From 0 to 10^4 or less
Width B1	The width of the square column is input.	From 0 to 10^4 or less
Height h	The height of the square or cylindrical column is input.	-
Length A2 / Hollow diameter d	The length of the hollow bore of the square column or the hollow diameter of the cylindrical column is input. Zero is input automatically in case of empty column.	From 0 to 10^4 or less
Width B2	The width of the hollow bore of the square column is input. Zero is input automatically in case of empty column.	From 0 to 10^4 or less
Gravity	The gravity is selected from iron, aluminum, and copper after clicking the radio button of the gravity. When the radio button of mass W has been selected, the value of the gravity is disregarded.	-
Mass W	The mass is input after clicking the radio button of the mass. When the radio button of the gravity has been selected, the value of the mass is disregarded.	From 0 to 10^4 or less
Offset distance L	The offset distance from the rotating shaft to the center of the load is input. Zero is input automatically in case of empty column.	From 0 to 10^4 or less
Quantity	The quantity of the square or cylindrical column is input..	From 0 to 10^4 or less
Load moment of inertia	The moment of inertia of the square or cylindrical column is output.	-

② Addition of square column

One line is added to the data column of the square column. Up to twenty columns can add with both the square and cylindrical column.

③ Addition of cylindrical column

One line is added to the data column of the cylindrical column. Up to twenty columns can add with both the square and cylindrical column.

④ Calculation button

The load moment of inertia is calculated when clicking after data is input.

The calculation result is not displayed when there is incompleteness (numerical value is outside of input range, no data in the necessary item column, etc.) in the data input column and the error message is displayed.

⑤ Deletion

The line to which the check mark is applied when clicking is deleted. It is also possible to delete plural lines in the batch.

⑥ Result of calculation

The total value of the moment of inertia of the cylindrical and square column is displayed.

⑦ Go to motor selection by the shortest positioning

It links to the motor selection by the shortest positioning when clicking.

The calculated load moment of inertia is input to the load condition automatically.

⑧ Go to motor selection from movement pattern

It links to the motor selection from the movement pattern when clicking.

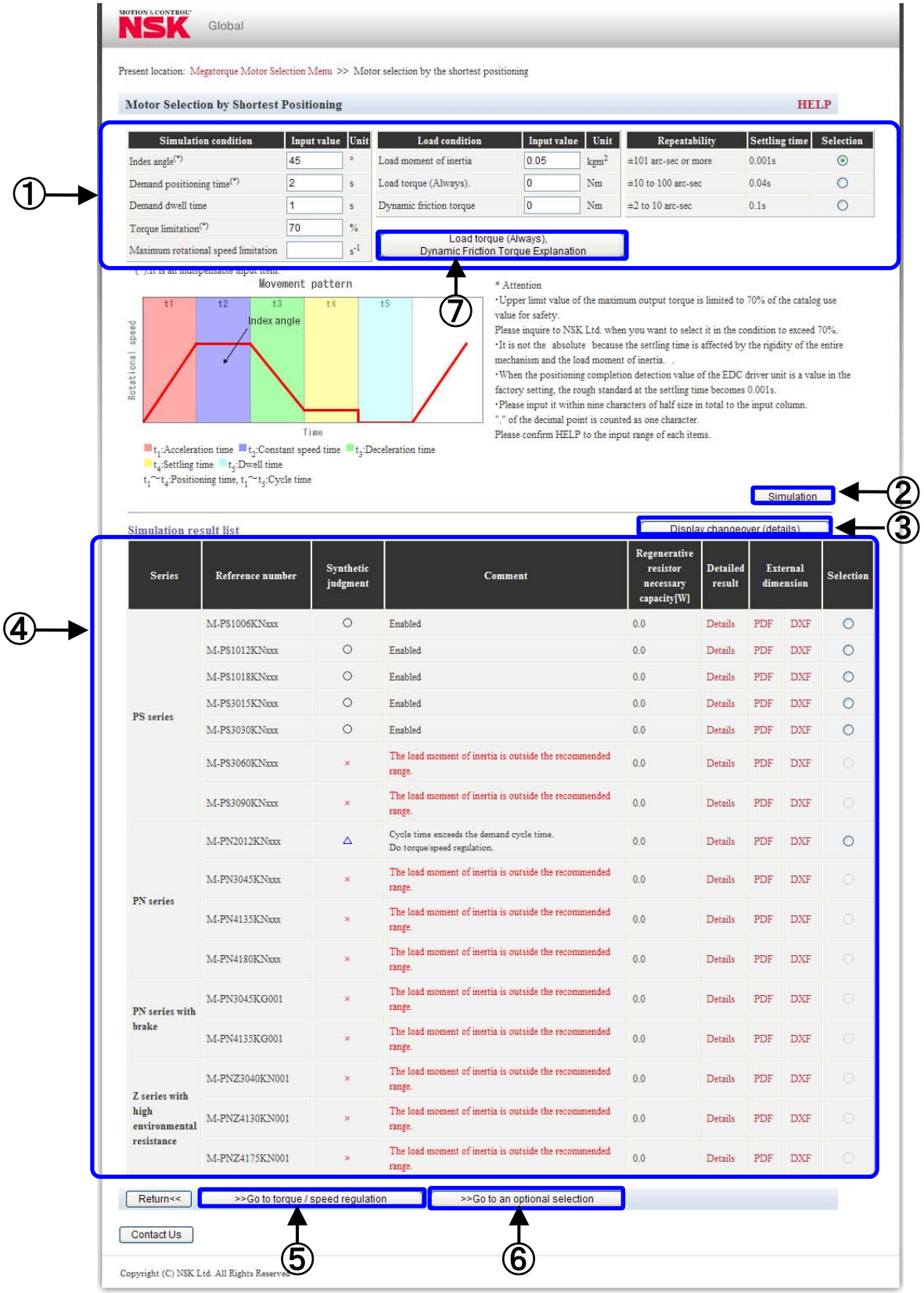
The calculated load moment of inertia is input to the load condition automatically.

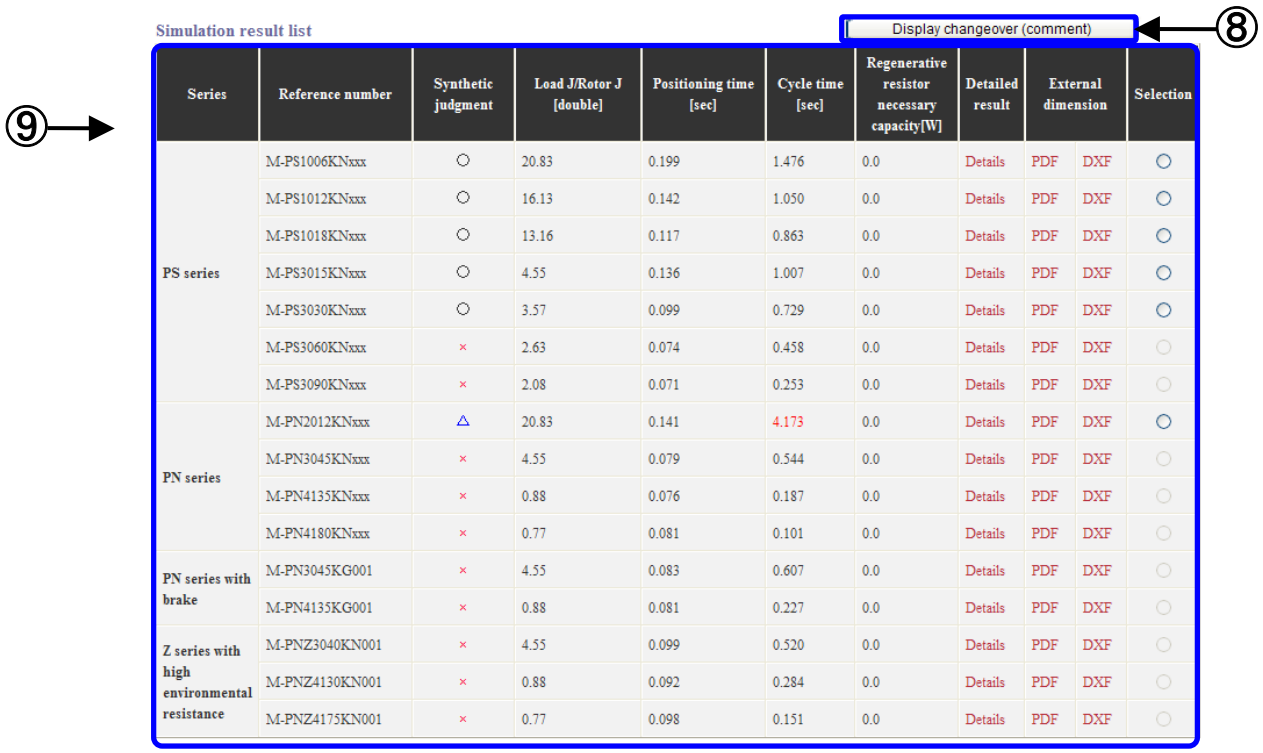
2.2.5. Motor selection by the shortest positioning

- Outline

  The movement pattern in the shortest positioning of each Megatorque Motor from the input condition is simulated.

- Screen composition





Simulation result list

Display changeover (comment)

Series	Reference number	Synthetic judgment	Load J/Rotor J [double]	Positioning time [sec]	Cycle time [sec]	Regenerative resistor necessary capacity[W]	Detailed result	External dimension		Selection
PS series	M-PS1006KNxxx	○	20.83	0.199	1.476	0.0	Details	PDF	DXF	○
	M-PS1012KNxxx	○	16.13	0.142	1.050	0.0	Details	PDF	DXF	○
	M-PS1018KNxxx	○	13.16	0.117	0.863	0.0	Details	PDF	DXF	○
	M-PS3015KNxxx	○	4.55	0.136	1.007	0.0	Details	PDF	DXF	○
	M-PS3030KNxxx	○	3.57	0.099	0.729	0.0	Details	PDF	DXF	○
	M-PS3060KNxxx	×	2.63	0.074	0.458	0.0	Details	PDF	DXF	
	M-PS3090KNxxx	×	2.08	0.071	0.253	0.0	Details	PDF	DXF	
PN series	M-PN2012KNxxx	△	20.83	0.141	4.173	0.0	Details	PDF	DXF	○
	M-PN3045KNxxx	×	4.55	0.079	0.544	0.0	Details	PDF	DXF	
	M-PN4135KNxxx	×	0.88	0.076	0.187	0.0	Details	PDF	DXF	
	M-PN4180KNxxx	×	0.77	0.081	0.101	0.0	Details	PDF	DXF	
PN series with brake	M-PN3045KG001	×	4.55	0.083	0.607	0.0	Details	PDF	DXF	
	M-PN4135KG001	×	0.88	0.081	0.227	0.0	Details	PDF	DXF	
Z series with high environmental resistance	M-PNZ3040KN001	×	4.55	0.099	0.520	0.0	Details	PDF	DXF	
	M-PNZ4130KN001	×	0.88	0.092	0.284	0.0	Details	PDF	DXF	
	M-PNZ4175KN001	×	0.77	0.098	0.151	0.0	Details	PDF	DXF	

- Explanation of each part

① Condition input column

Name	Explanation	Input range
Index angle (*)	Index angle of one cycle is input.	From 0 to 360 or less
Demand positioning time (*)	The demand positioning time is input.	From 0 to 10^4 or less
Demand dwell time	The demand dwell time is input.	From 0 to 10^4 or less
Torque limitation	The limitation to the output torque of the motor is input. For the safety, the output torque simulates 70% of the specification as an upper limit.	From 0 to 70 or less
Maximum rotational speed limitation	The limitation to the maximum rotational speed of the motor is input. It is an empty column when the maximum rotational speed is not limited.	From 0 to 10 or less
Load moment of inertia (*)	The installed load moment of inertia is input. The calculation result is input automatically when moving from the load moment of inertia	From 0 to 10^4 or less
Load torque (Always)	The load torque (Always) is input. Zero is input automatically in case of empty column.	0 or more 10^3 or less
Dynamic friction torque	The dynamic friction torque is input. Zero is input automatically in case of empty column.	0 or more 10^3 or less

Repeatability	The range of desired repeatability is selected. The settling time is changed by repeatability. When the EDC driver unit is a factory setting, the rough standard at the settling time becomes 0.001 [sec].	-

"*" mark addition is a required item. Input the value within the range of the input.

② Simulation

The selection simulation is done when clicking after the condition is input.

The simulation result is not displayed when there is incompleteness (numerical value is outside of input range, no data in the necessary item column, etc.) in the condition input column and the error message is displayed.

③ Display changeover (details)

Load J / rotor J, positioning time and cycle time are displayed instead of the comments of simulation result list after clicking.

④ Simulation result list

Name	Explanation
Series	The series name of Megatorque Motor is displayed.
Reference number	The reference number of Megatorque Motor is displayed. After the accuracy specification of motor is selected by an optional selection, a formal reference number is displayed for Megatorque Motor that the design serious number is xxx.
Synthetic judgment	Synthetic judgment of the selection result is displayed. ○: Use on the input condition is possible. △: Because cycle time exceeds the demand cycle time, it cannot be used. The demand might finish is satisfactory to adjust the torque limitation and the highest rotational speed limitation. ×: Use on the input condition is not possible.
Comment	The comment on the simulation result is displayed.
The regenerative resistor necessity capacity	The regenerative resistor necessity capacity is displayed. When the regenerative resistor necessity capacity is 0 or more, the external regenerative resistor more than the displayed capacity is necessary.
Detailed result	The details of the selection result are displayed when clicking.
Motor dimensions	I links to Megatorque Motor dimensions when clicking. The file format is selected from PDF and DXF.
Selection	One Megatorque Motor suitable for the demand is selected

⑤ Explanation of load torque (Always) and the dynamic friction torque

The explanation of load torque (Always) and the dynamic friction torque are displayed in another window when clicking.

⑥ Go to the output torque and the maximum rotational speed adjustment

When the selection column of Megatorque Motor is checked and clicked, it links to the output torque and the maximum rotational speed adjustment.

⑦ Go to an optional selection

When the selection column of Megatorque Motor is checked and clicked, it links to the optional selection. When Megatorque Motor that the synthetic judgment is △ is selected, it cannot be clicked.

⑧ Display changeover (comment)

The comment is displayed instead of the load J / rotor J, positioning time and cycle time of simulation result list after clicking.

⑨ Simulation result list

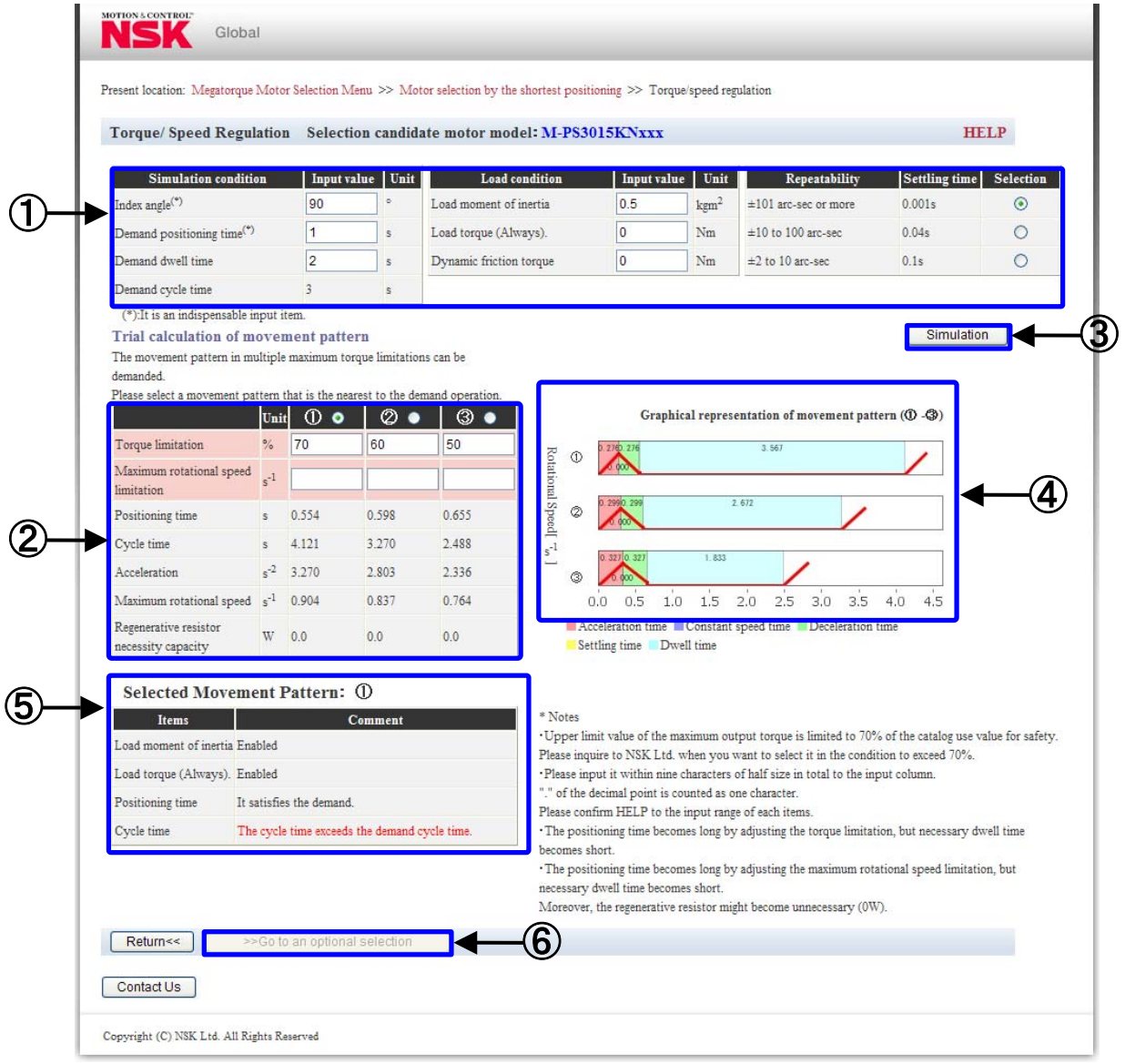
Name	Explanation
Load J / rotor J	The magnification of the rotor moment of inertia of Megatorque Motor and the load moment of inertia is displayed.
Positioning time	The shortest positioning time that Megatorque Motor can be achieved on the input condition is displayed. Megatorque Motor that the demand positioning time is longer than the positioning time becomes a selection object.
Cycle time	The cycle time at the shortest positioning time that Megatorque Motor can be achieved on the input condition is displayed. Megatorque Motor that the demand positioning time plus the demand dwell time are longer than the positioning time becomes a selection object.

2.2.6. Output torque and the maximum rotational speed adjustment

- Outline

  The torque limitation and maximum rotational speed limitation of the Megatorque Motor that has selected by motor selection on the shortest positioning are adjusted. It can approximate to the demand movement pattern by adjusting it. Moreover, the positioning time becomes long because the torque limitation or maximum rotational speed limitation is executed. But the dwell time might be shortened. The adjusted simulation results can be displayed up to three.

- Screen composition



- Explanation of each part

① Explanation of each part

Name	Explanation	Input range
Index angle (*)	Index angle of one cycle is input.	From 0 to 360 or less
Demand positioning time (*)	The demand positioning time is input.	From 0 to 10^4 or less
Demand dwell time	The demand dwell time is input.	From 0 to 10^4 or less
Demand cycle time	Demand positioning time plus demand dwell time is displayed.	-
Load moment of inertia (*)	The installed load moment of inertia is input.	From 0 to 10^4 or less
Load torque (Always)	The load torque (Always) is input. Zero is input automatically in case of empty column.	0 or more 10^3 or less
Dynamic friction torque	The dynamic friction torque is input. Zero is input automatically in case of empty column.	0 or more 10^3 or less
Repeatability	The range of desired repeatability is selected. The settling time is changed by repeatability. When the EDC driver unit is a factory setting, the rough standard at the settling time becomes 0.001s.	-

"*" mark addition is a required item. Input the value within the range of the input.

The condition that input by the motor selection in the shortest positioning is input automatically.

② Trial calculation of movement pattern

Name	Explanation	Input range
Torque limitation	The limitation to the output torque of the motor is input. 70% of the specification of the output torque is simulated as an upper limit for safety.	From 0 to 70 or less
Maximum rotational speed limitation	The limitation to the maximum rotational speed of the motor is input. It is an empty column when the maximum rotational speed is not limited.	From 0 to 10 or less
Positioning time	The trial calculated positioning time is displayed.	-
Cycle time	The trial calculated cycle time is displayed.	-
Acceleration	The trial calculated acceleration is displayed.	-
Maximum rotational speed	The trial calculated maximum rotational speed is displayed.	-
The regenerative resistor necessity capacity	The trial calculated regenerative resistor necessity capacity is displayed.	-

It can be calculated up to three conditions at the same time in the maximum.

③ Simulation

The selection simulation is done when clicking after the condition is input.

The result is not displayed when there is incompleteness (numerical value is outside of input range, no data in the necessary item column, etc.) in the condition input column and the trial column of the movement pattern, and the error message is displayed.

④ Graph of movement pattern

Graphs of the movement pattern trial calculation result are displayed up to three at the same time.

⑤ Comment on selected movement pattern

The comment on the movement pattern is displayed. If all comments are displayed that it can use or it satisfies the demand, it can use Megatorque Motor by the adjusted movement pattern.

⑥ Go to an optional selection

It links to the optional selection when clicking.

If all comments are not displayed by the selected movement pattern that it can use or it satisfies the demand, it cannot click.

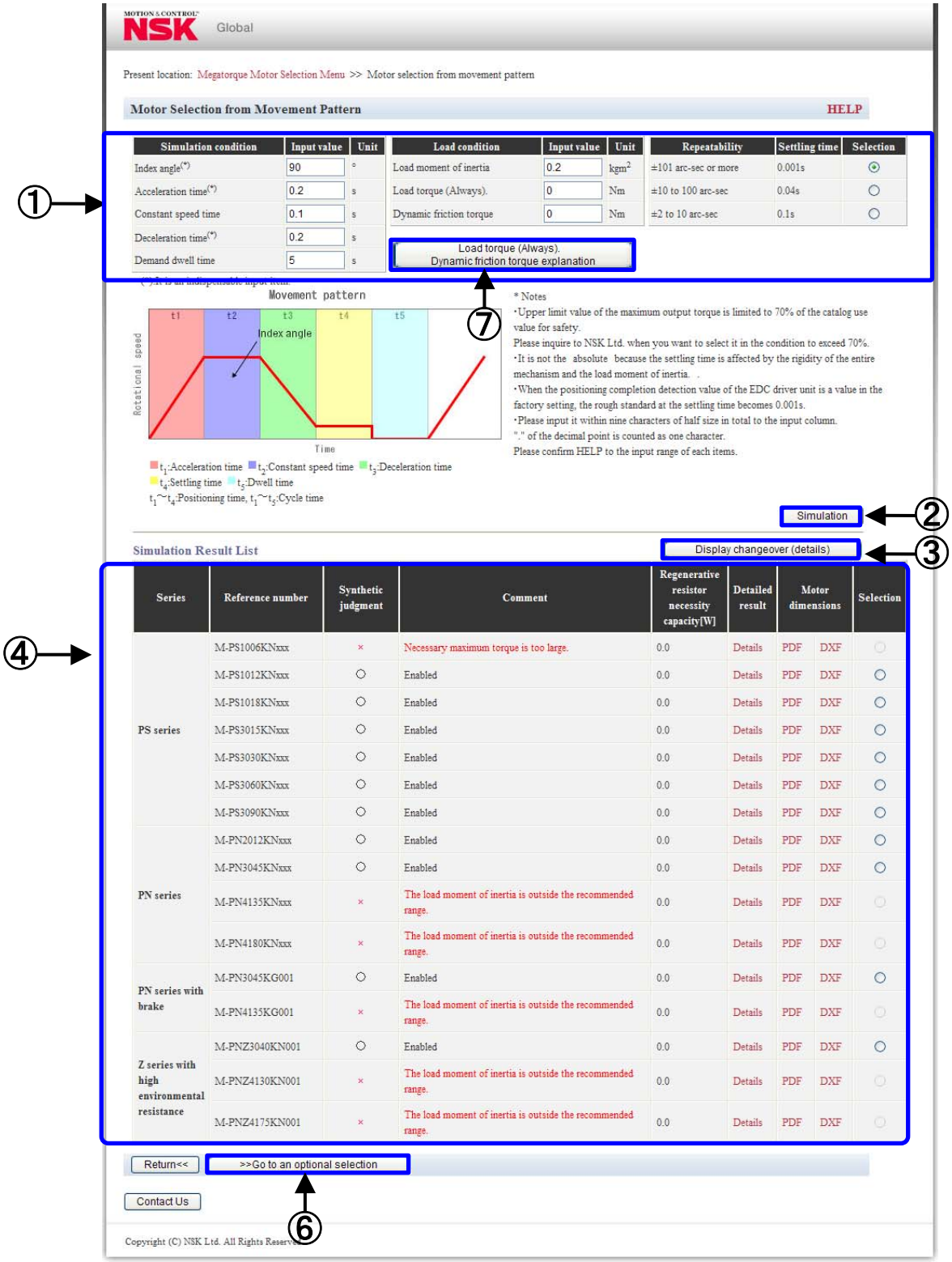
2.2.7. Motor selection from movement pattern

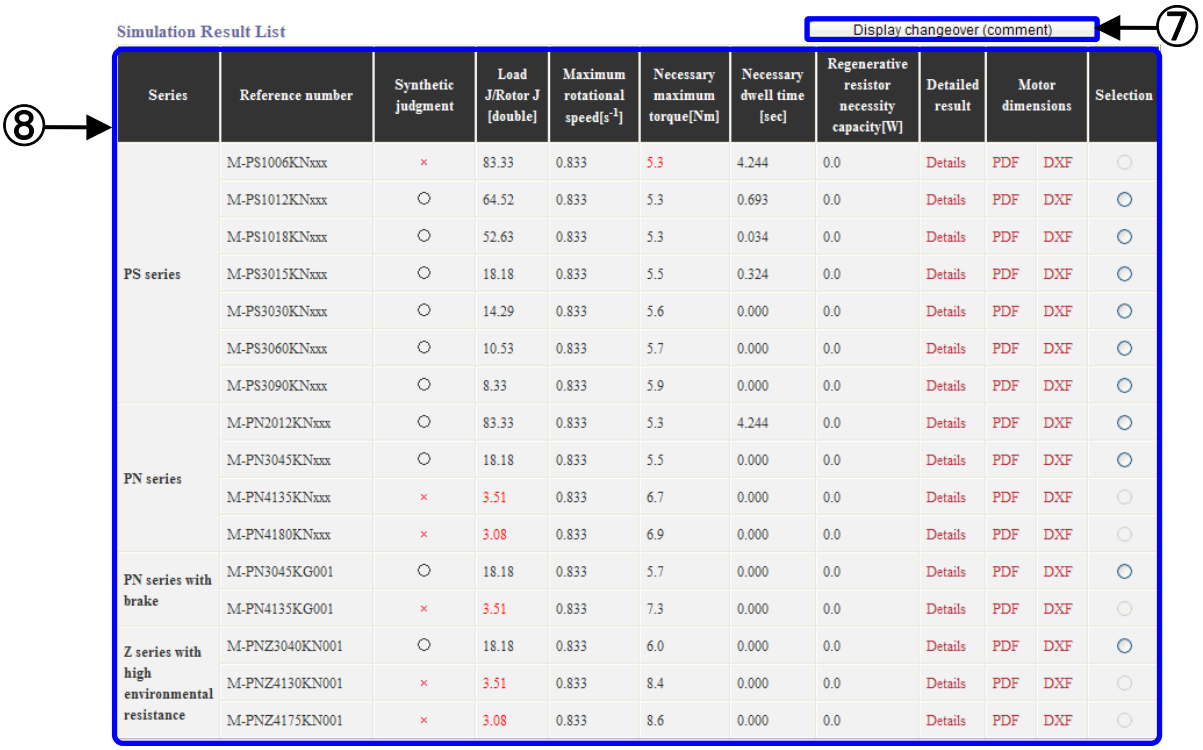
- Outline

  The motor is selected from the input movement pattern.

  Select it here when a detailed movement pattern is already-known.

- Screen composition





Series	Reference number	Synthetic judgment	Load J/Rotor J [double]	Maximum rotational speed[s^{-1}]	Necessary maximum torque[Nm]	Necessary dwell time [sec]	Regenerative resistor necessity capacity[W]	Detailed result	Motor dimensions		Selection
PS series	M-PS1006KNxxx	×	83.33	0.833	5.3	4.244	0.0	Details	PDF	DXF	
	M-PS1012KNxxx	○	64.52	0.833	5.3	0.693	0.0	Details	PDF	DXF	○
	M-PS1018KNxxx	○	52.63	0.833	5.3	0.034	0.0	Details	PDF	DXF	○
	M-PS3015KNxxx	○	18.18	0.833	5.5	0.324	0.0	Details	PDF	DXF	○
	M-PS3030KNxxx	○	14.29	0.833	5.6	0.000	0.0	Details	PDF	DXF	○
	M-PS3060KNxxx	○	10.53	0.833	5.7	0.000	0.0	Details	PDF	DXF	○
	M-PS3090KNxxx	○	8.33	0.833	5.9	0.000	0.0	Details	PDF	DXF	○
PN series	M-PN2012KNxxx	○	83.33	0.833	5.3	4.244	0.0	Details	PDF	DXF	○
	M-PN3045KNxxx	○	18.18	0.833	5.5	0.000	0.0	Details	PDF	DXF	○
	M-PN4135KNxxx	×	3.51	0.833	6.7	0.000	0.0	Details	PDF	DXF	
	M-PN4180KNxxx	×	3.08	0.833	6.9	0.000	0.0	Details	PDF	DXF	
PN series with brake	M-PN3045KG001	○	18.18	0.833	5.7	0.000	0.0	Details	PDF	DXF	○
	M-PN4135KG001	×	3.51	0.833	7.3	0.000	0.0	Details	PDF	DXF	
Z series with high environmental resistance	M-PNZ3040KN001	○	18.18	0.833	6.0	0.000	0.0	Details	PDF	DXF	○
	M-PNZ4130KN001	×	3.51	0.833	8.4	0.000	0.0	Details	PDF	DXF	
	M-PNZ4175KN001	×	3.08	0.833	8.6	0.000	0.0	Details	PDF	DXF	

- Explanation of each part

① Condition input column

Name	Explanation	Input range
Index angle(*)	Index angle of one cycle is input.	From 0 to 360 or less
Acceleration time (*)	The time to do the acceleration movement is input.	From 0 to 10^4 or less
Constant speed time (*)	The time to do the constant speed movement is input.	From 0 to 10^4 or less
Deceleration time (*)	The time to do the deceleration movement is input.	From 0 to 10^4 or less
Demand dwell time	The demand dowel time is input.	From 0 to 10^4 or less
Load moment of inertia (*)	The installed load moment of inertia is input. The calculation result is input automatically when moving from the load moment of inertia.	From 0 to 10^4 or less
Load torque (Always)	The load torque (Always) is input. Zero is input automatically in case of empty column.	0 or more 10^3 or less
Dynamic friction torque	The dynamic friction torque is input. Zero is input automatically in case of empty column.	0 or more 10^3 or less

Repeatability	The range of desired repeatability is selected. The settling time is changed by repeatability. When the EDC driver unit is a factory setting, the rough standard at the settling time becomes 0.001s.	-

"*"mark addition is a required item. Input the value within the range of the input.

② Simulation

The selection simulation is done when clicking after the condition is input.

The simulation result is not displayed when there is incompleteness (numerical value is outside of input range, no data in the necessary item column, etc.) in the condition input column and the error message is displayed.

③ Display changeover (details)

Load J / rotor J, maximum rotational speed, necessary maximum torque and necessary dowel time are displayed instead of the comments of simulation result list after clicking.

④ Simulation result list

Name	説明
Series name	The series name of Megatorque Motor is displayed.。
Reference number	The reference number of Megatorque Motor is displayed. After the accuracy specification of motor is selected by an optional selection, a formal reference number is displayed for Megatorque Motor that the design serious number is xxx.
Synthetic judgment	Synthetic judgment of the selection result is displayed.。 〇: Use on the input condition is possible. ×: Use on the input condition is not possible.
Comments	The comment on the simulation result is displayed.
The regenerative resistor necessity capacity	The regenerative resistor necessity capacity is displayed. When the regenerative resistance necessity capacity is 0 or more, the external regenerative resistance that is more than the displayed capacity is needed.
Detailed result	The details of the selection result are displayed when clicking.
Motor dimensions	It links to Megatorque Motor dimensions when clicking. The file format is selected from PDF and DXF.
Selection	Megatorque Motor suitable for the demand is selected.

⑤ Explanation of load torque (Always) and the dynamic friction torque

The explanation of load torque (Always) and the dynamic friction torque are displayed in another window when clicking

⑥ Go to an optional selection

When the selection column of Megatorque Motor suitable for demand is checked and clicked, it links to the optional selection. When Megatorque Motor that the synthetic judgment is △ has been selected, it cannot be clicked.

⑦ Display changeover (comment)

The comment is displayed instead of the load J / rotor J, maximum rotational speed, necessary maximum torque and necessary dowel time of simulation result list after clicking.

⑧ Simulation result list

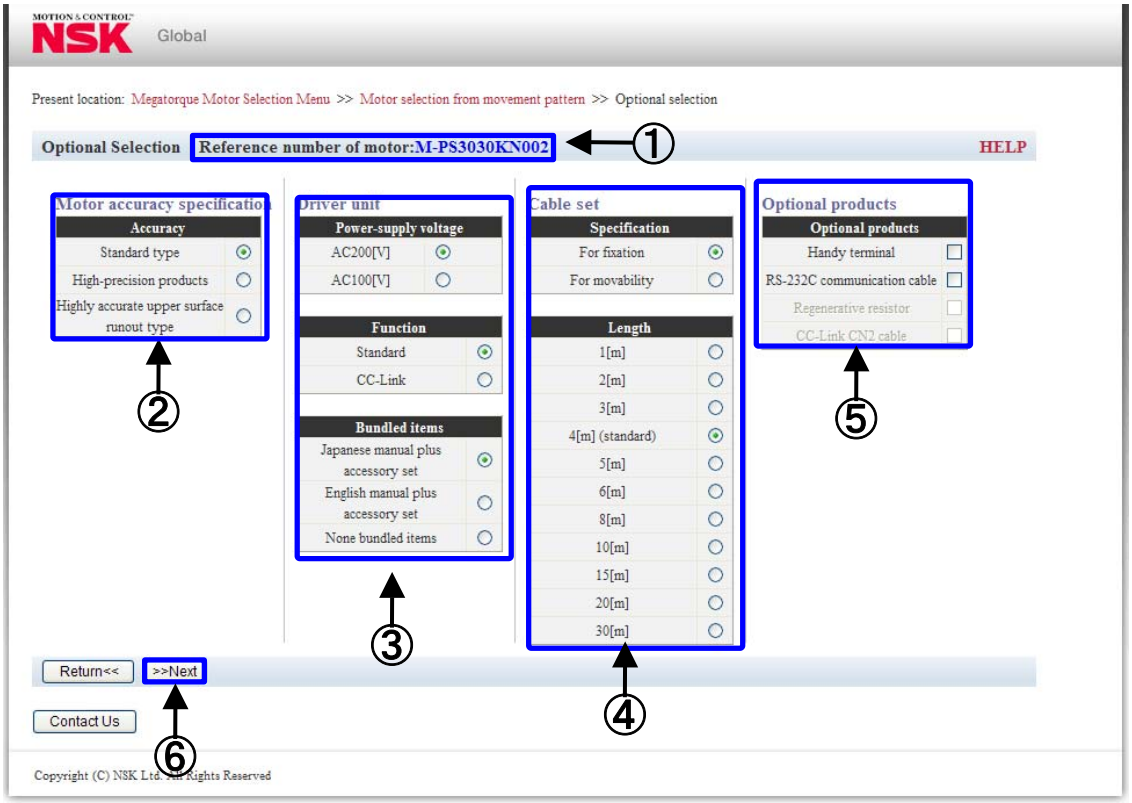
Name	Explanation
Load J / rotor J	The magnification of the rotor moment of inertia of Megatorque Motor and the load moment of inertia is displayed.
Maximum rotational speed	The maximum rotational speed of the input movement pattern is displayed. Megatorque Motor that the maximum rotational speed is lower than specification value becomes a selection object.
Necessary maximum torque	The necessary maximum torque of the input movement pattern is displayed. Megatorque Motor that the maximum rotational speed is lower than 70 % of specification value becomes a selection object. (For the safety, the output torque selects 70% of the specification as an upper limit.)
Necessary dwell time	The necessary dwell time of the input movement pattern is displayed.. Megatorque Motor that the demand dwell time is longer than the necessary dwell time becomes a selection object.

2.2.8. Optional selection

- Outline

  The option of the motor and the driver unit, the specifications of the cable set, and the necessity / unnecessity of articles not for sale are selected. The option that cannot be selected according to the specification of selected motor and driver unit is existed. Confirm details with the catalog.

- Screen composition



- Explanation of each part

① Motor reference number

The reference number of the motor selected by the motor selection on the shortest positioning or the motor selection from the movement pattern is displayed. After the accuracy specification of motor is selected, a formal reference number is displayed for Megatorque Motor that the design serious number is xxx.

② Motor accuracy specification

The accuracy of the motor is selected.

③ Driver unit

The power-supply voltage, the function, and the bundled items of the driver unit are selected.

④ Cable set

The specification and the length of the cable set are selected.

⑤ Selection of another products for sales

Necessary another products for sales are selected.

When the regenerative resistor is selected, the reference number is automatically selected from The regenerative resistor necessity capacity.

The regenerative resistor necessity capacity	Reference number of the regenerative resistor
0[W]	Unnecessary (It cannot select.).
From 0 [W] to 7 [W] or less	M-E014DCKR1-100
From 7 [W] to 120 [W] or less	M-E014DCKR1-101
Exceed 120 [W]	Please consult NSK.

⑥ Next

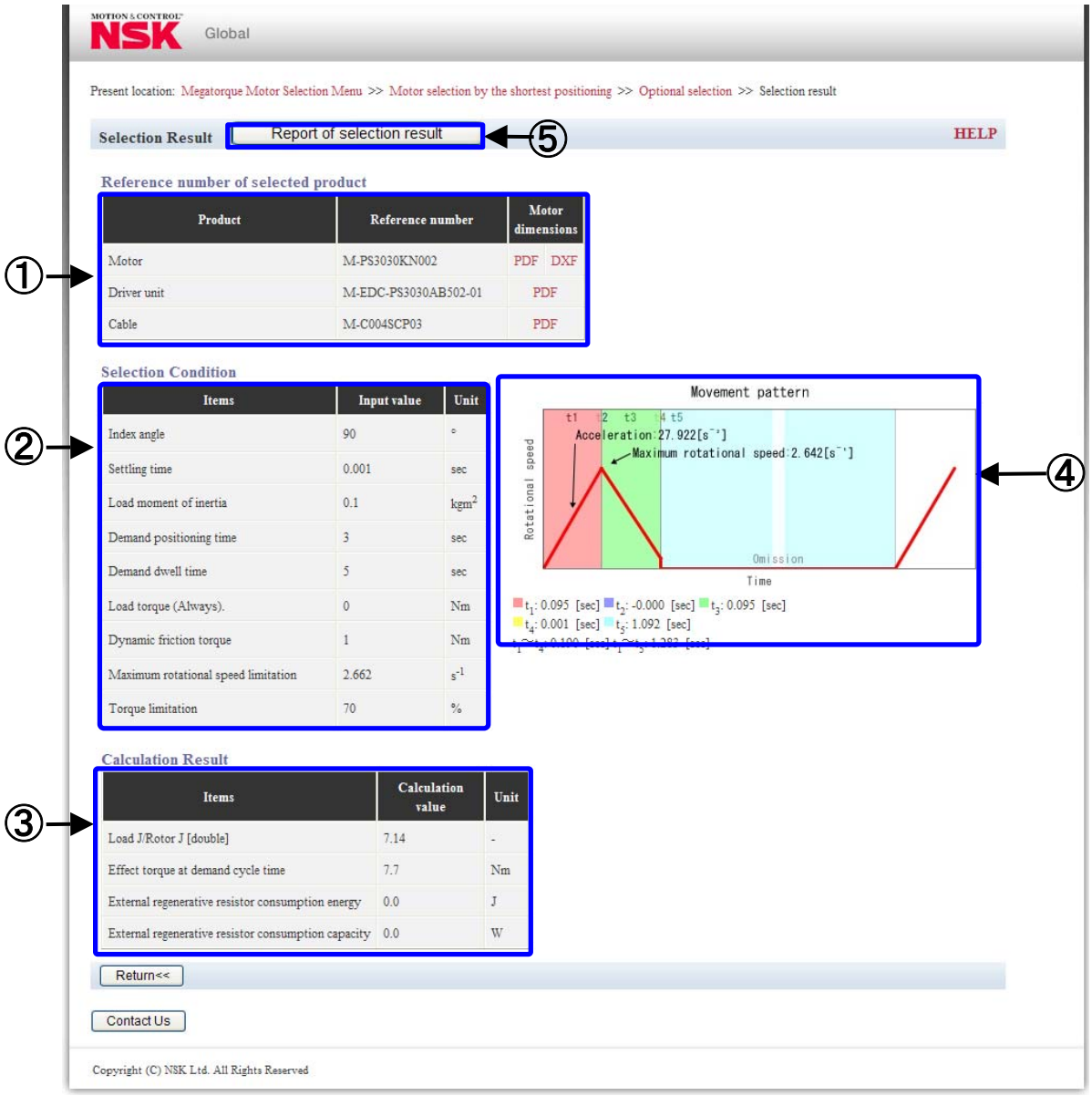
It links to the selection result when clicking.

2.2.9. Selection result

- Outline

  選択した製品の呼び番号、シミュレーション結果が表示されます。

- Screen composition



- Explanation of each part

① Reference number of selection products

The reference number of the selected products is displayed.

When dimensions are clicked, it links to the specification chart of the products.

② Selection condition

The input selection condition is displayed.

③ Result of calculation

The result calculated by the selection simulation is displayed.

④ Graph of movement pattern

The graph of the movement pattern calculated by the selection simulation is displayed.

⑤ Report of selection result

The selection result edited in the layout that has been printed easily is displayed in another window.

Print it using the print function of a browser.

3. Terms of use

Note the following point in order to demonstrate and use enough the performance of Megatorque Motor that is high performance direct drive motor.

Moreover, when you use Megatorque Motor, use it after reading NSK catalog, operating manual and the supplementation manual sufficiently (supplementation for PN series, the PN series with the brake and Z series with High Environmental Resistance) and understanding them.

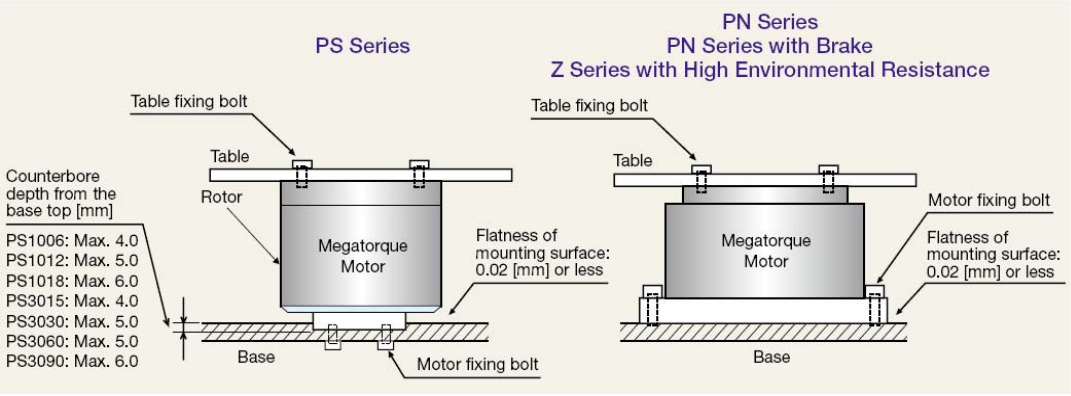
3.1. Motor

3.1.1. Installation location and environment of motor

- Use it in indoors where dust and the corrosive gas do not exist.
- Use it in the environment of 0-40[℃] in ambient temperature when the motor is used.
- PS, PN and PN series with the brake are dustproof and waterproof specifications. (IP30 equivalent)
  Uses it in the environment to which water and oil do not splash.
- The protection grade of Z series with High Environmental Resistance: IP66M is an index that shows the protective performance of the products under a constant condition. It is not the one to prove the protection of intrusion of the liquid and the solid in all the environments.

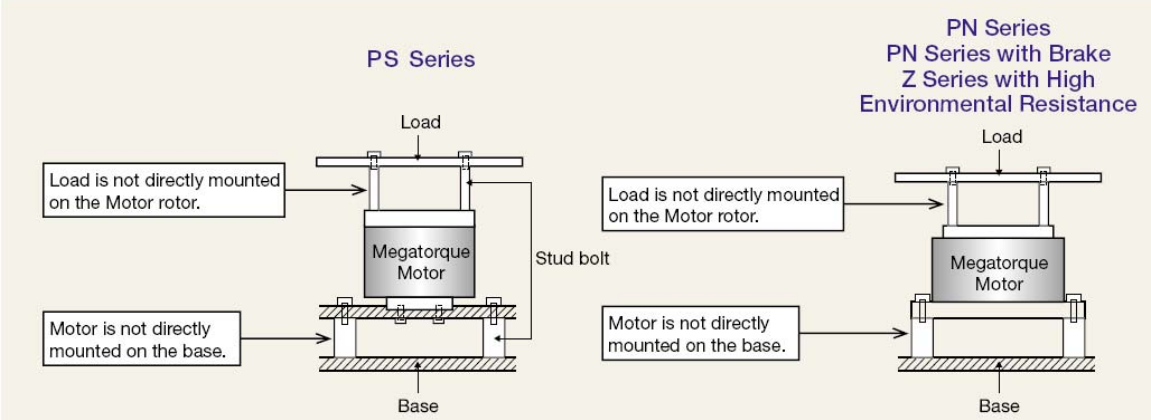
3.1.2. Installation of motor

- Be sure to mount the motor securely on a stiff mounting base, if the mounting base is not stiff enough the mechanical resonance may result in.
- Fix it using the mounting tap hole of the motor bottom.
- Surface flatness of mounting base should be 0.02mm or less.
- The motor can be mounted in horizontal or vertical direction.
  However, do not set up inverted only for Z series with High Environmental Resistance.。



Notes) In case of the example of driving mechanism shown, vibration will occur firstly because of low system rigidity, and thus you cannot increase the velocity loop proportional gain (VG) of the motor. Low gain will make the motor holding torque insufficient, which results in overshooting, and because of this, the motor does not operate smoothly. In this case, do the following measures.

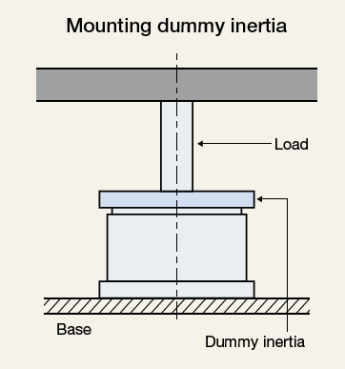
- Attach the load directly to the motor rotor.
- The motor must be mounted directly on the mounting base.



3.1.3. Dummy inertia

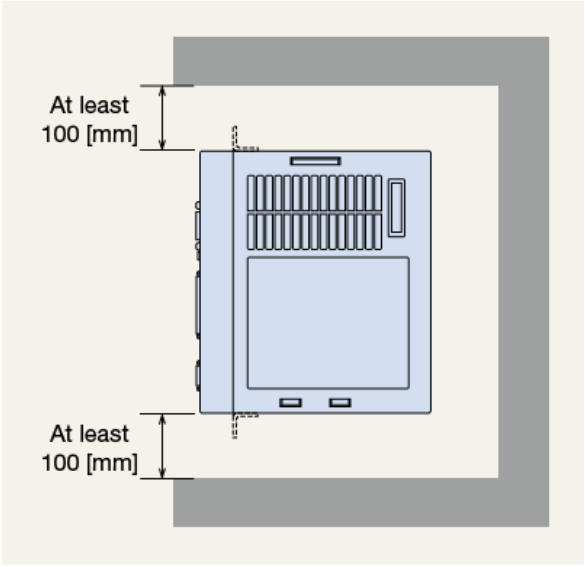
- In order to make full use of the features of direct drive mechanism, a motor should be fixed firmly on a rigid mechanism while the motor load should be higher in rigidity to increase the natural frequency of the mechanism as a whole. In case when any of the following mechanisms is to be used, it should be so designed that an additional inertia (dummy inertia) is directly coupled with the motor rotor.
  - ① A load cannot be coupled directly with the motor rotor, but be coupled by a key or other suitable means.
  - ② A load is directly coupled, but the load shaft is so thin as to cause torsional vibrations.
  - ③ Since the load is a ball screw or the like, the inertia on the whole system is very small.
  - ④ There exists play because a sprocket chain or a gear train is used.
  - ⑤ Vibration occurs because the rigidity of the structure is low, such as when the Motor is being used for driving a belt.
- The standard dummy inertia should be 20% of the load inertia. In case when a reduction gear is to be used as a load, the standard inertia should be as given below:

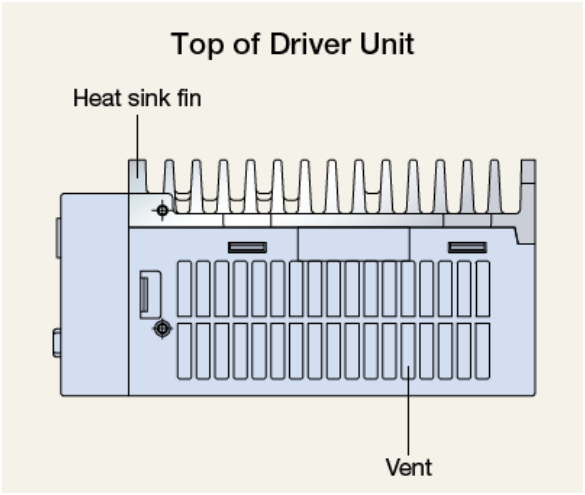
$$\frac{\text{Inertia not directly coupled}}{((\text{Reduction ratio})^2 \times \text{inertia not directly coupled})} \leq 5$$



3.2. Driver unit

- The EDC Driver Unit must be fixed so that fins are in the vertical position for natural air-cooling.
- Ambient temperatures should be in a range from 0 to 50 [°C]. The Driver Unit cannot be used in excess of 50 [°C]. A sufficient space of at least 100 [mm] should be provided both above and below the Driver Unit in a control cabinet. Operate the Driver Unit in an environment in which internally generated heat can be dissipated. If heat is trapped above the Driver Unit, open the space above it to allow for the heat to dissipate (in this case, also take steps to prevent the entry of dust) or provide a forced air-cooling system.
- Use the Driver Unit in a control cabinet with IP54 or higher. 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, which may cause circuit failure.
- When installing two or more Driver Units for multi-axis combinations, provide a 10 [mm]or more space between adjacent Driver Units.
- The temperature in the cabinet when building it into the control cabinet should be 0-50[°C]. A heat sink should be air-cooled forcibly by the fan etc. when overheating alarm is frequently generated.
- The Driver Unit can be attached to a panel using front mounting brackets (optional).
- The maximum power loss of the EDC Driver Unit is 55 W.





4. Explanation of term

The explanation of term in Megatorque Motor Selection Tool is shown in the following.

[A]

Acceleration [s^{-2}]

It is a rotation acceleration in the positioning operation. Motor selection at the shortest positioning becomes the result in which the accelerating time equals decelerating time.

Acceleration time [s]

It is time that the motor has accelerated. Motor selection at the shortest positioning becomes the result in which the accelerating time equals decelerating time.

[C]

Constant speed time [s]

It is time that the motor rotates in constant speed. When the constant speed time is 0 second, it becomes a triangular drive.

Cycle time [s]

It is time of one operation cycle. It becomes a total of the positioning time and the dwell time.

[D]

Deceleration [$s-^{2}$]

It is a rotation deceleration in the positioning operation. Motor selection at the shortest positioning becomes the result in which the accelerating time equals decelerating time.

Decelerating time [s]

It is time that the motor has decelerated. Motor selection at the shortest positioning becomes the result in which the accelerating time equals decelerating time.

Demand cycle time [s]

It is cycle time for which the customer hopes. It becomes a total of the demand positioning time and the demand dwell time.

It becomes one of the judgment standards of the motor selection.

Demand positioning time [s]

It is positioning time for which the customer hopes. It becomes one of the judgment standards of the motor selection.

Demand dwell time [s]

It is dwell time for which the customer hopes.

Dwell time [s]

It is minimum value of necessary dwell time when the motor is continuously driven under the selection condition. The motor might stop according to the alarm when the dwell time is insufficient.

Dynamic friction torque [N·m]

It is a loaded friction torque at the operation. It is assumed and calculated that it works at the direction where the output torque increases at acceleration and constant speed or decreases at deceleration.

[E]

Effective torque [N·m]

It is an average value of the torque that is generated in one motion cycle. (square mean value)
The motor might stop according to the alarm when the effective torque exceeds the rated torque.

External regenerative resistor consumption energy [J]

It is the regenerative energy that should be consumed by the external regenerative resistor. Because the energy treatable in the EDC driver unit is 28[J], the value of the rotational energy minus 28 [J] becomes external regenerative resistor consumption energy.

[L]

Load moment of inertia [kgm^2]

It is a sum total of the load moment of inertia mounted on the motor. (The amount of moment of inertia of the motor is not included.) The size of the load moment of inertia mounted on the motor greatly influences the characteristic of acceleration and deceleration. It becomes one of the judgment standards of the motor selection.

Load torque (Always) [N·m]

It is always loaded torque. It is assumed and calculated that it works at the direction where the output torque increases at acceleration time, deceleration time, constant speed time, setting time and dwell time. Unbalanced torque generated when setting the motor wall hanging calculates the maximum value as the load torque. Therefore it is selected on the worst conditions.(The cycle time, output torque and the effective torque are changed by the position of the operation start and stop, etc. when an unbalanced torque is actually generated.)

[M]

Maximum rotational speed [s^{-1}]

It is a maximum rotational speed in the positioning operation

Maximum rotational speed limitation [s^{-1}]

Maximum rotational speed is limited. The positioning time becomes long because the maximum rotational speed limitation is executed. But the dwell time might be shortened.

Moreover, the external regenerative resistor necessity capacity becomes small.

[P]

Positioning time [s]

It is time that the motor enters regularly within the range of demanded repeatability when the rotation is instructed. It is total times of an accelerating time, a constant speed time and a decelerating time.

[R]

Regenerative resistor necessity capacity

It is the external regenerative resistor necessity capacity when operating at the cycle time of the simulation result. It is requested from the following formula

External regenerative resistor necessity capacity =

external regenerative resistor consumption energy / (cycle time ×0.25)

Repeatability [arc-sec]

The positioning is repeated to arbitrary one position. The difference between the maximum value and minimum value is requested. It is a value that has added ± to the half value of above-mentioned value. (3600[arc-sec] = 1[°])

Rotational angle [°]

It is an angle that moves at one operation cycle.

[S]

Settling time [s]

It is time that the motor enters regularly within the range of demanded repeatability when the directive has finished. It is a value of below table in this selection.

However, it is not absolute because the settling time is influenced by the size of the load moment of the inertia and the overall rigidity of the system, etc.

Required repeatability[arc-sec]	Settling time [s]
±2 to ±10	0.1
±10 to ±100	0.04
±100 and above	0.001

[T]

Temperature coefficient

It is a safety coefficient to the temperature of the motor.

The motor under the ratings torque that considers the temperature coefficient as an effective torque becomes a selection candidate.

Torque limitation [%]

Output torque is limited. The positioning time becomes long because the torque limitation is executed. But the dwell time might be shortened.