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# 1.6 Megatorque Motor YS Series

## The New YS Series

The NSK Megatorque Motors is a direct drive motor which achieves highly precise positioning with very high torque at low speed.

The New NSK Series combines the performance and reliability of the existing Megatorque Motor range with the advantages of compact size and simple design for low cost. In addition to five standard motors that cover a wide range of performance requirements while assuring low cost and short delivery times, NSK now offers special order motors featuring a low profile, locating-pin holes or a brake. Some types in the New YS Series conform to European safty requirements and bear the CE Marking. A new analog command function has been added to the dedicated ESA25 Driver Unit.

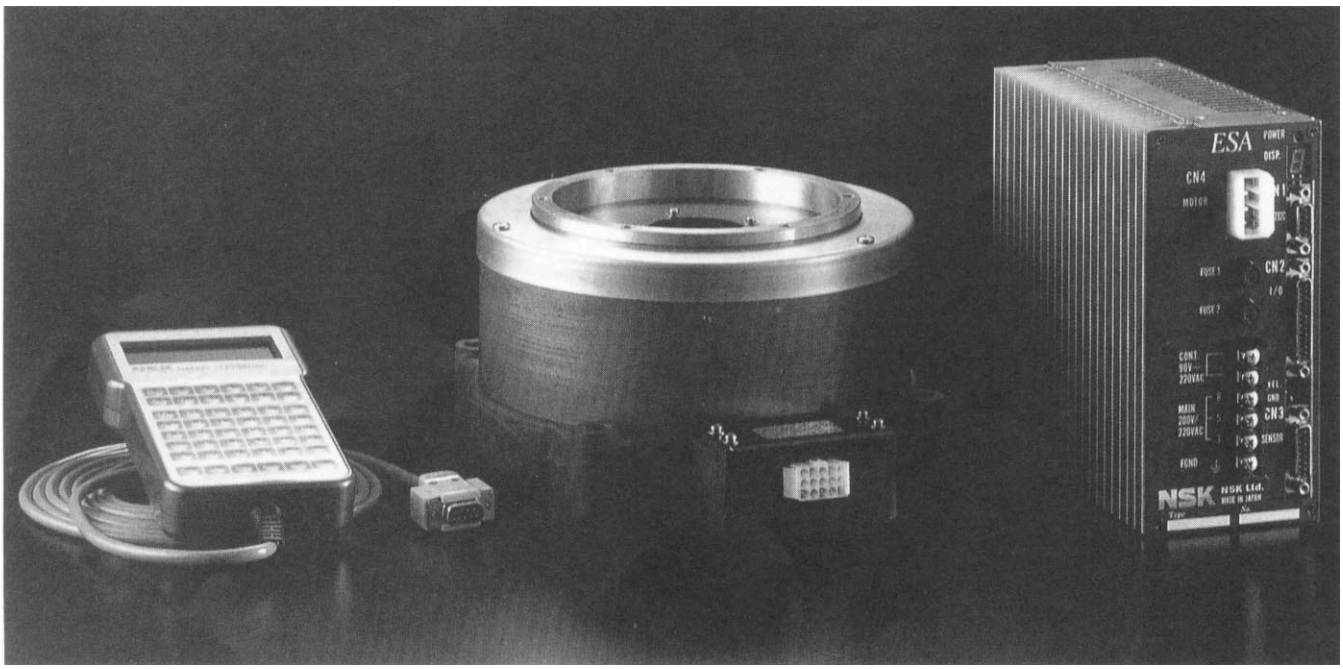
The Megatorque Motor is suitable for a wide range of industrial applications, including use as a rotary actuator for robots, transfer systems, chamfering machines and printing machines or as a rotary indexer fir assembly machines, welding systems, measuring instruments and machining centers.

The New YS Series system combines NSK's technical excellence and reliability with outstanding performance and features including

- simple motor structure and dedicated compact driver units for low cost.
- standard stock for short delivery times,
- interchangeability of motors and driver units and cable sets (lengths 2~30m),
- high resolution, full closed-loop control and zero backlash for high precision,
- high load-capacity bearings,
- max. torque 240 N・m,
- max. speed 3rps,
- repeatability of ±2.1 sec,
- hollow-core structure allowing wires and pipes to run inside the motor,
- an auto-tuning function to eliminate the time-consuming task of gain adjustment, and
- conformity with CE Marking requirements.

CE

*Conform to CE Marking*



## How to use this guide

Use this guide to select the motors, driver units and accessories you need for your application.

Pages A24~A34 describe the principal specifications and characteristics of each component in the motor system and how to choose the right components for your application.

The section “Determing your requirements” on page A44~45 lists all of the product numbers you will need to order a complete system.

If you have any uncertainties, or would like more detailed information about any aspect of the Megatorque Motor YS Series, please contact your NSK representative at one of our worldwide offices listed on the back cover.

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## Motor model number

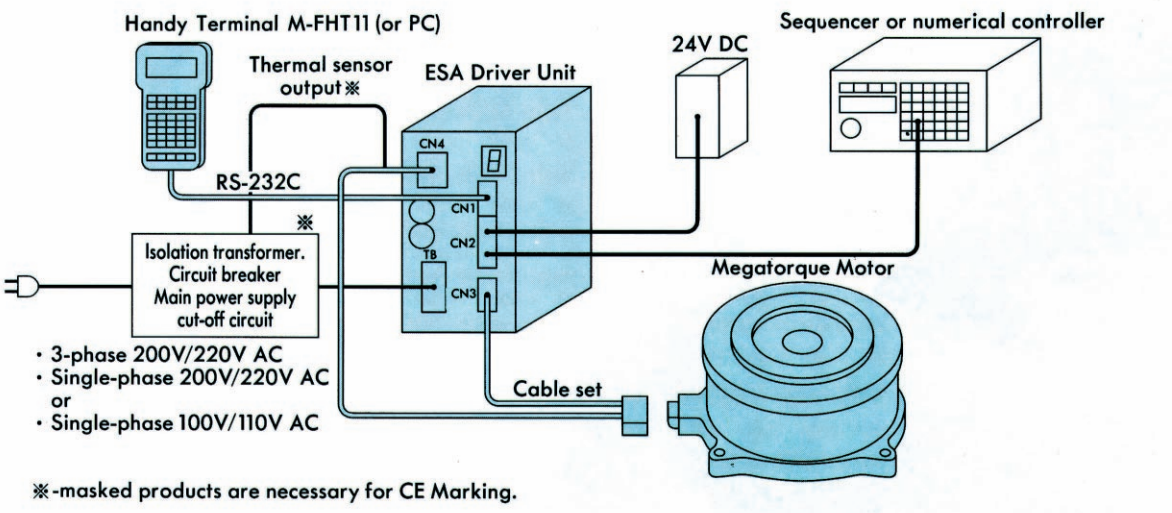
M–YS 20 20 G N 001

- M–YS: Megatorque motor YS series
- 20: Motor size number
- 20: Maxium torque(N・m)
- G: G: conformig to CE Marking; F: not conforming to CE Marking
- N: N: no brake; G: with brake
- 001: Design no. 001: no locating-pin holes; 011: with locating-pin holes

## System Components

The typical NSK Megatorque Motor system consists of a motor, a driver unit, cables and a Handy Terminal(or PC). You will also need AC and DC power supplies and a sequencer(PLC) or numerical controller.

All blue-shaded units are supplied by NSK.




**Schema of a typical Megatorque Motor system**

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## Megatorque Motors

## Standard type motors & Motors with locating-pin holes.

The NSK Megatorque Motor is a direct drive motor which eliminates all gears and other transmission mechanisms to achieve very high torque at low speeds. The New YS Series offers five standard type motors, assuring low cost and short delivery times. Motors with locating-pin holes, motors with a brake and low-profile motors are also available.

## Principal Specifications of the five standard type motors and five motors with locating-pin holes in the New YS Series

If your requirements differ from the standard specifications, please contact NSK.

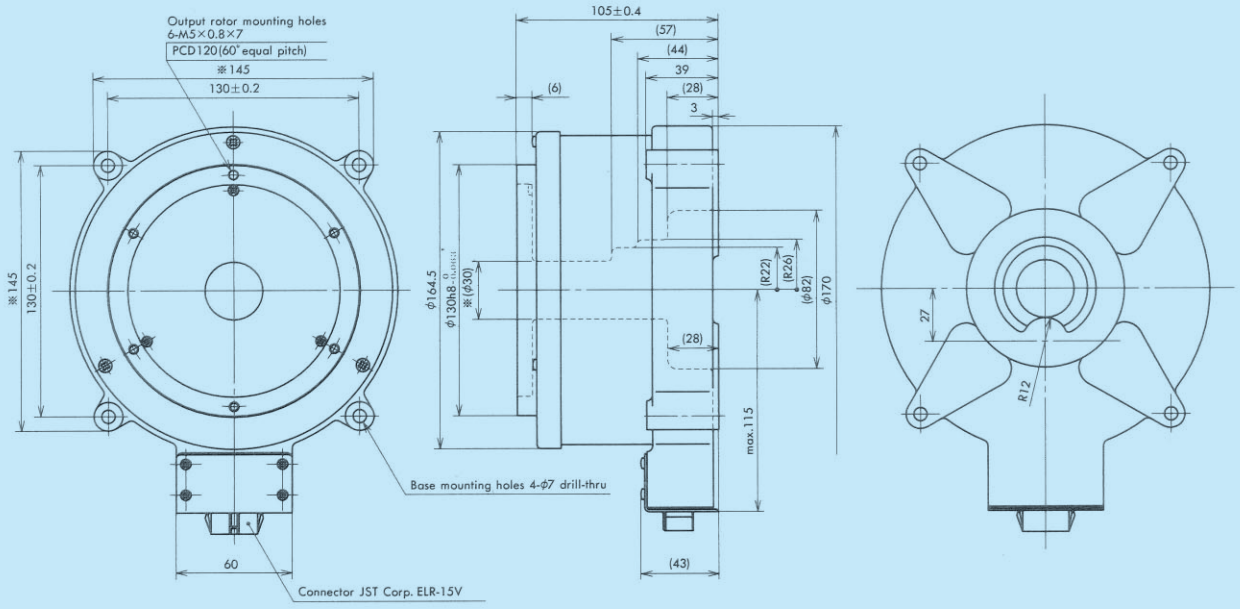
| | | | | | | |
|---|---|---|---|---|---|---|
| Comforming to CE Marking<br>Standard type motors<br>Motors with locating-pin holes | | M-YS2020GN001<br>M-YS2020GN011 | M-YS3040GN501<br>M-YS3040GN511 | M-YS4080GN001<br>M-YS4080GN011 | M-YS5120GN001<br>M-YS5120GN011 | M-YS5240GN001<br>M-YS5240GN011 |
| Not Comforming to CE Marking<br>Standard type motors<br>Motors with locating-pin holes | | M-YS2020FN001<br>M-YS2020FN011 | M-YS3040FN501<br>M-YS3040FN511 | M-YS4080FN001<br>M-YS4080FN011 | M-YS5120FN001<br>M-YS5120FN011 | M-YS5240FN001<br>M-YS5240FN011 |
| Maximum torque(2) | (N・m) | 20 | 40 | 80 | 120 | 240 |
| Maximum stall torque | (N・m) | 15 | 35 | 70 | 105 | 198 |
| Maximum current/phase | (A) | 6 | | | | |
| Allowable axial load(3) | (N) | 3700 | 4500 | 9500 | 19600 | 19600 |
| Allowable moment load(3) | (N・m) | 60 | 80 | 160 | 400 | 400 |
| Axial rigidity(1) | (mm/N) | $4.0 \times 10^{-6}$ | $3.0 \times 10^{-6}$ | $1.4 \times 10^{-6}$ | $1.0 \times 10^{-6}$ | $1.0 \times 10^{-6}$ |
| Moment rigidity(1) | (rad/N・m) | $3.5 \times 10^{-6}$ | $2.5 \times 10^{-6}$ | $1.5 \times 10^{-6}$ | $3.0 \times 10^{-7}$ | $3.0 \times 10^{-7}$ |
| Rotor moment of inertia | ($kg \cdot m^2$) | 0.007 | 0.020 | 0.065 | 0.212 | 0.255 |
| Rotor inertia GD2 | ($kgf \cdot m^2$) | 0.028 | 0.080 | 0.260 | 0.850 | 1.020 |
| Mass | (kg) | 10 | 16 | 29 | 55 | 95 |
| Operating conditions | | Temperature: 0-40°C; Humidity: 20-80% Use indoors, free from dust, condensation and corrosive gases. | | | | |
| Maximum speed | [$S^{-1}$ (rps)] | 3 | | | | |
| Resolver resolution | (p/rev) | 614400 | | | | |
| Resolver accuracy | (sec) | 150 | | | | |
| Resolver repeatability | (sec) | ±2.1 | | | | |
| Compatible driver units | | M-ESA-Y2020A23<br>M-ESA-Y2020C23<br>M-ESA-Y2020T23<br>M-ESA-Y2020V23<br>M-ESA-Y2020A25<br>M-ESA-Y2020C25<br>M-ESA-Y2020T25<br>M-ESA-Y2020V25 | M-ESA-Y3040A23<br>M-ESA-Y3040C23<br>M-ESA-Y3040T23<br>M-ESA-Y3040V23<br>M-ESA-Y3040A25<br>M-ESA-Y3040C25<br>M-ESA-Y3040T25<br>M-ESA-Y3040V25 | M-ESA-Y4080A23<br>M-ESA-Y4080C23<br>M-ESA-Y4080T23<br>M-ESA-Y4080V23<br>M-ESA-Y4080A25<br>M-ESA-Y4080C25<br>M-ESA-Y4080T25<br>M-ESA-Y4080V25 | M-ESA-Y5120A23<br>M-ESA-Y5120C23<br>M-ESA-Y5120T23<br>M-ESA-Y5120V23<br>M-ESA-Y5120A25<br>M-ESA-Y5120C25<br>M-ESA-Y5120T25<br>M-ESA-Y5120V25 | M-ESA-Y5240A23<br><br>M-ESA-Y5240T23<br><br>M-ESA-Y5240A25<br><br>M-ESA-Y5240T25<br> |

Notes:
S1 Unit system: 1N=0.225 lb; 1N・m=0.738 ft・1lb
(1) These values assume that the motor is mounted on a rigid base.
(2) For speed torque characteristics, see page A39.
(3) For details of how to calculate axial and moment load, see page A40.
∗ New YS Series Megatorque Motors can be run on either 100/110V or 200/220V AC except M-YS5240 ∗∗∗∗∗.
M-YS5240 ∗∗∗ is available only in 200/220V AC version.
∗ For order numbers of compatible Driver Units, cables and other accessories, see pages A44~A45.

## Motor dimensions

The figures on pages A26~A30 show the external dimensions of the five standard motors in the New YS Series and the five motors with locating-pin holes. Please check that the motors you plan to order will fit your workspace specifications.

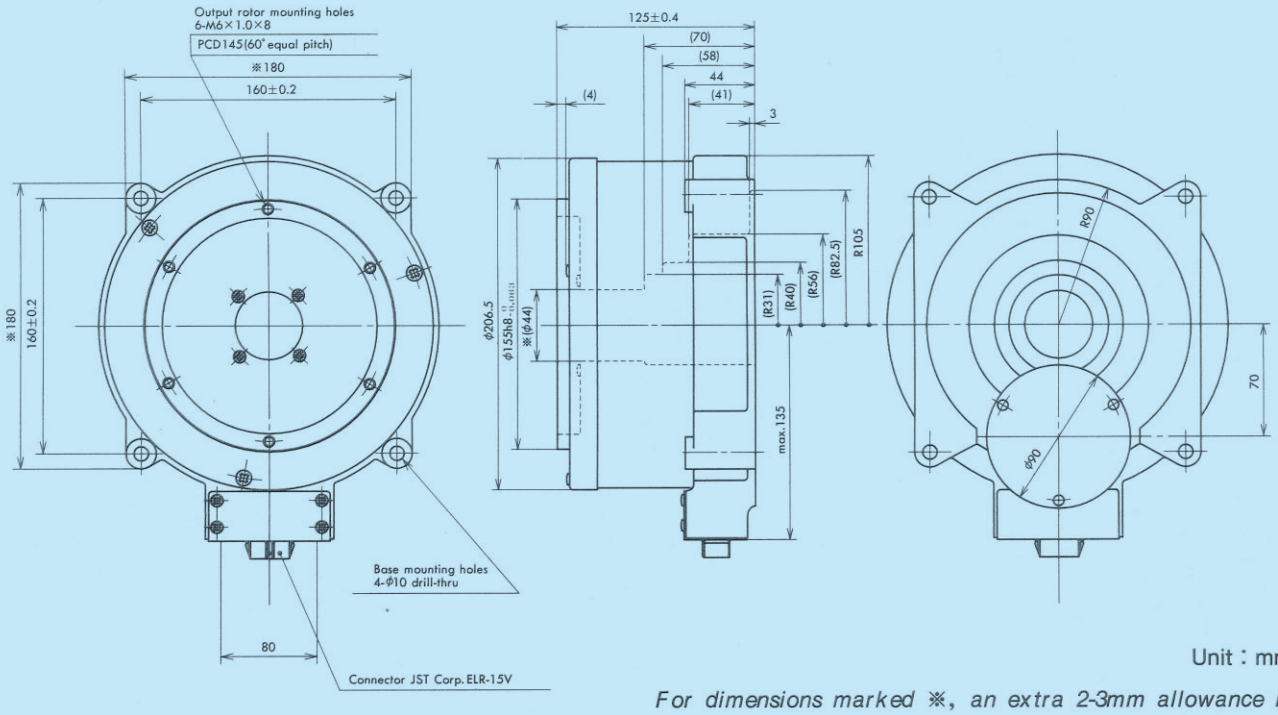
M-YS2020GN001 ／ M-YS2020FN001(standard type motor)




Unit：mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

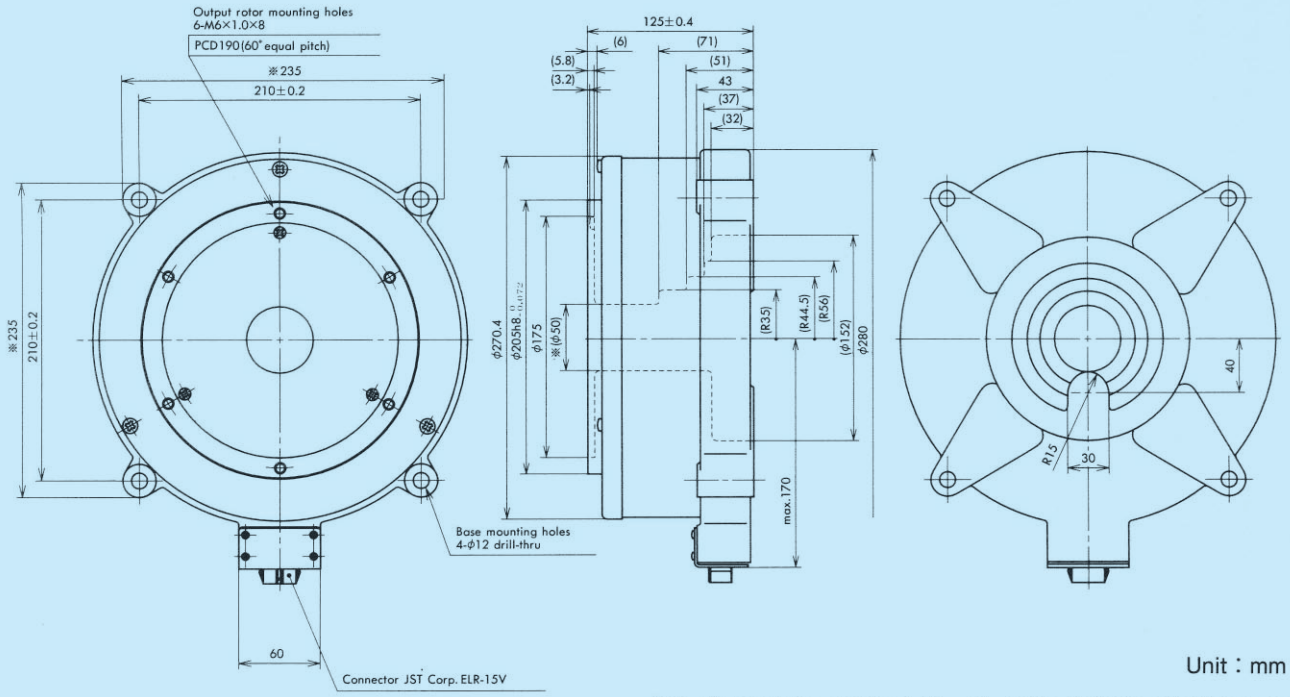
M-YS3040GN501 ／ M-YS3040FN501(standard type motor)




Unit：mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

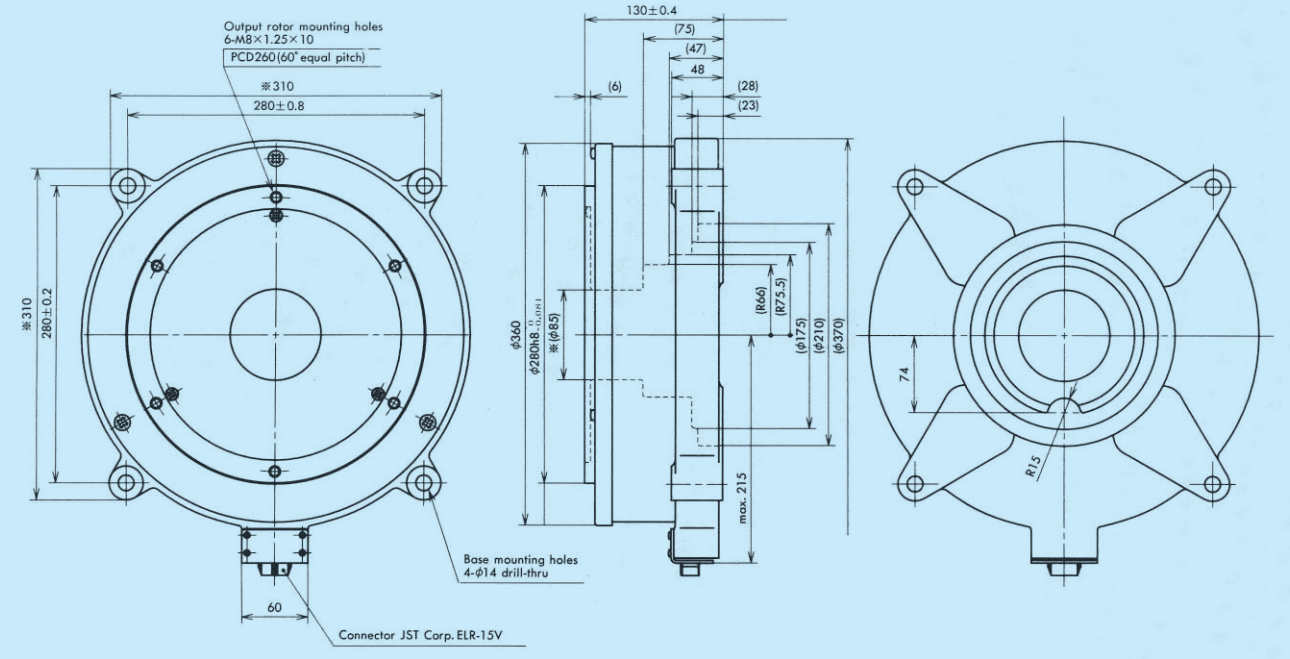
M-YS4080GN001 ／ M-YS4080FN001(standard type motor)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

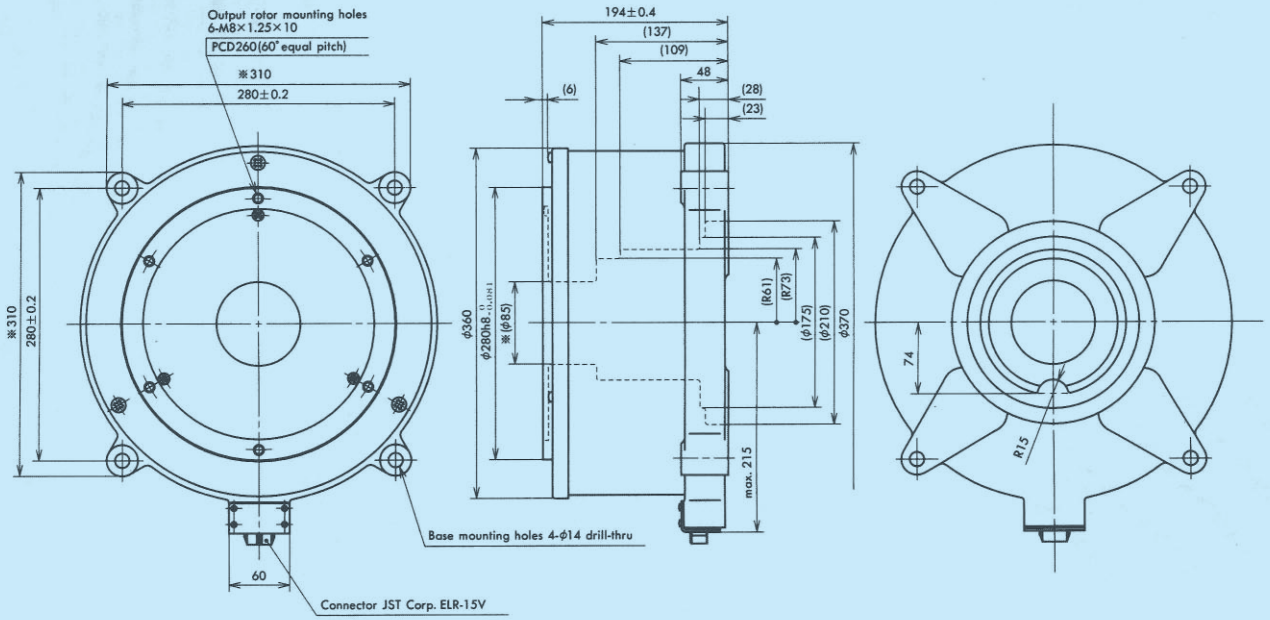
M-YS5120GN001 ／ M-YS5120FN001(standard type motor)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

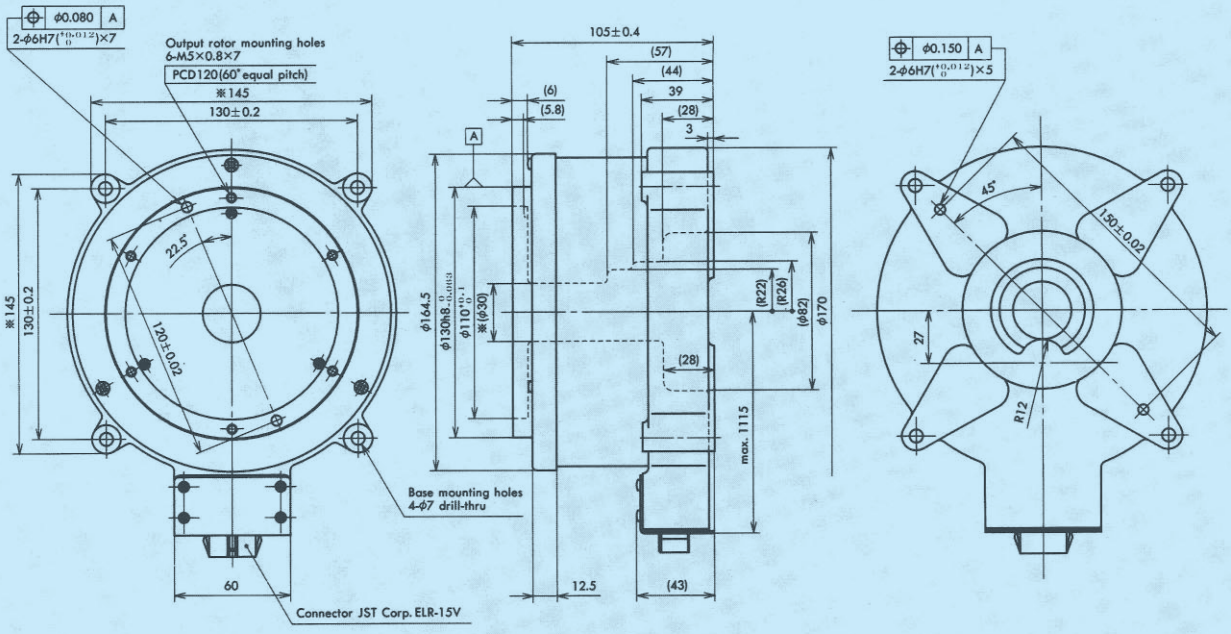
M-YS5240GN001 ／ M-YS5240FN001(standard type motor)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

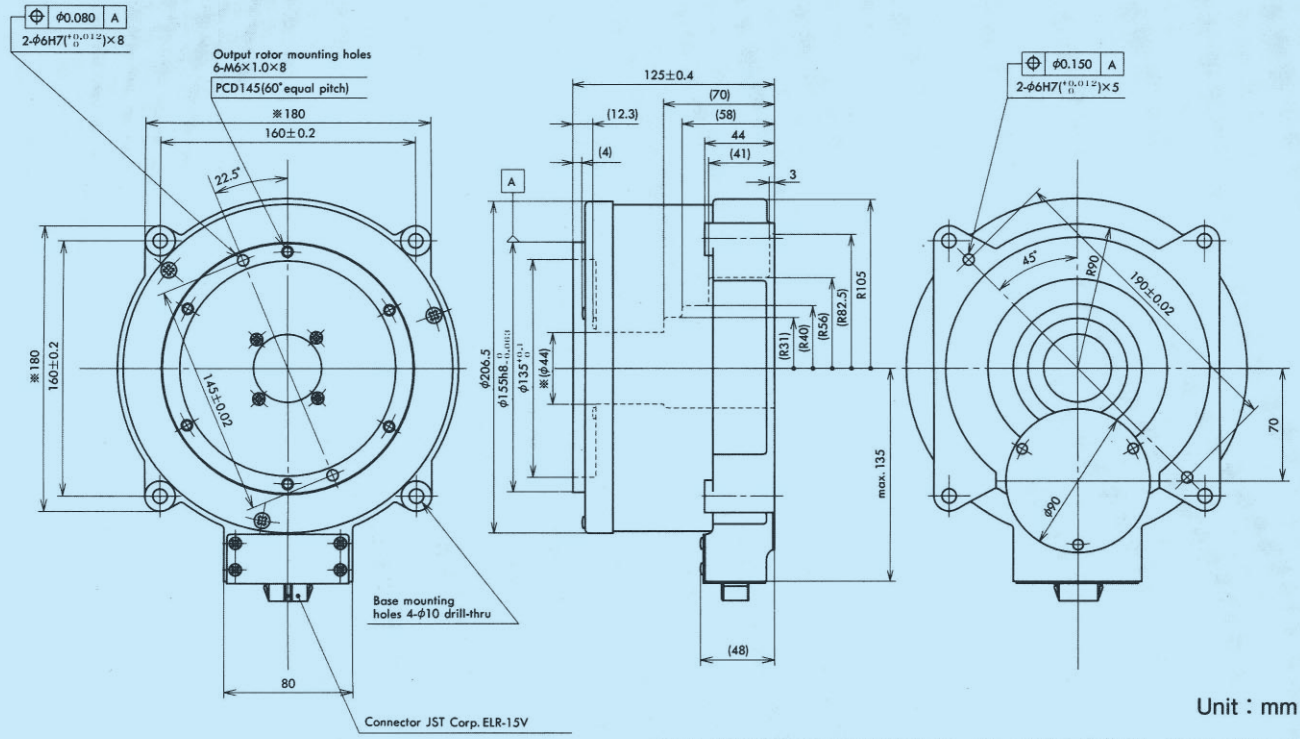
M-YS2020GN011 ／ M-YS2020FN011(with locating-pin holes)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

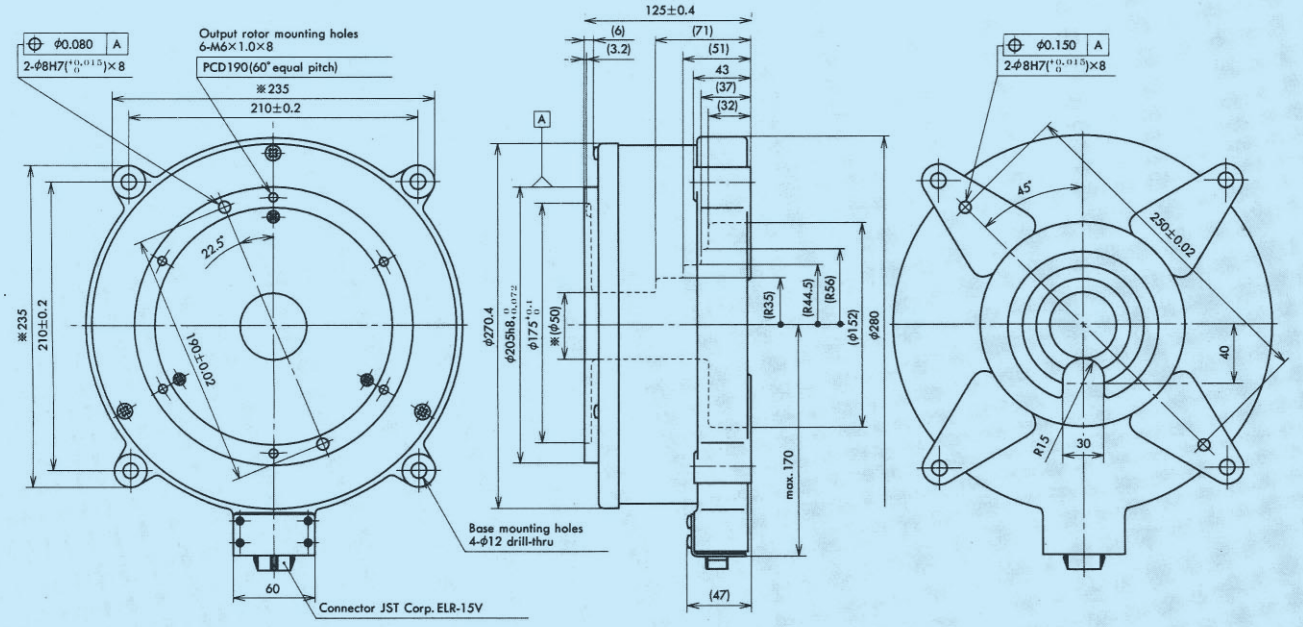
M-YS3040GN511 ／ M-YS3040FN511(with locating-pin holes)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

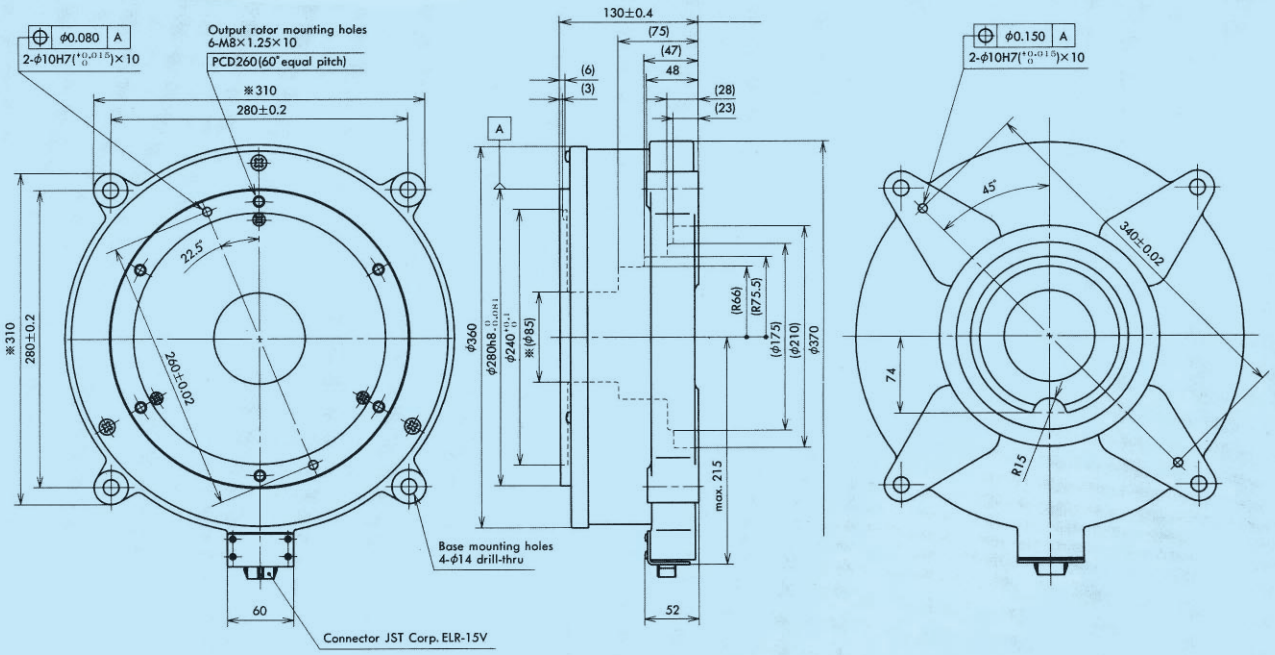
M-YS4080GN011 ／ M-YS4080FN011(with locating-pin holes)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

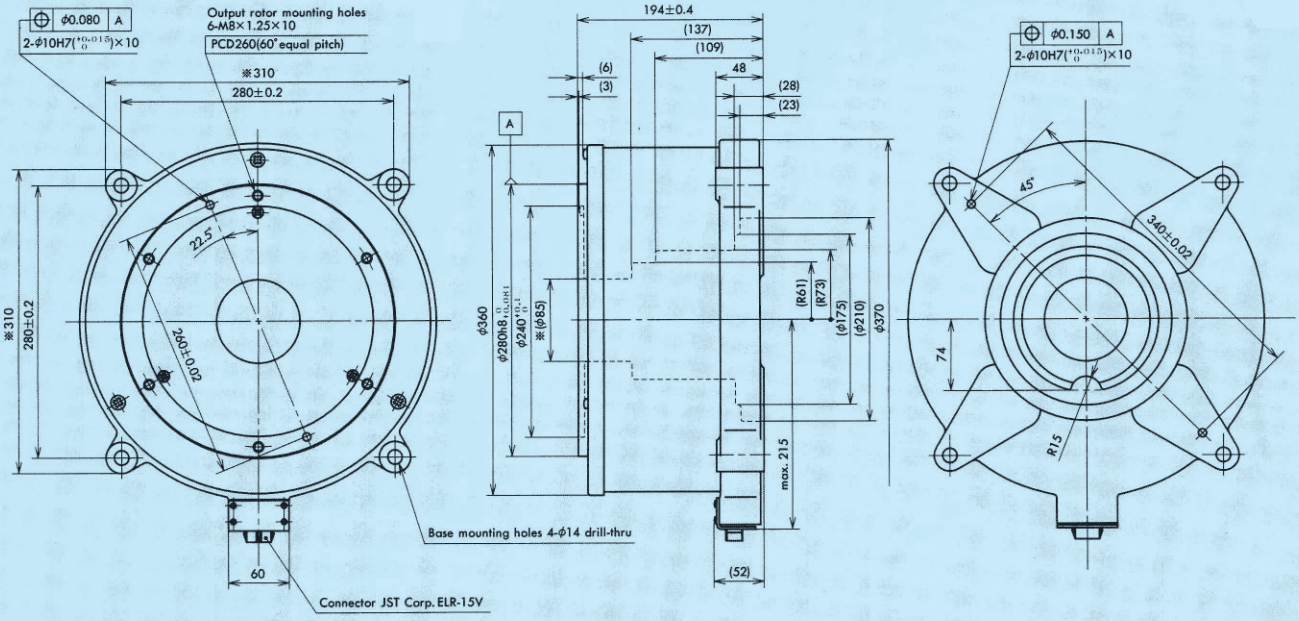
M-YS5120GN011 ／ M-YS5120FN011(with locating-pin holes)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

M-YS5240GN011 ／ M-YS5240FN011(with locating-pin holes)




Unit : mm

*For dimensions marked ※, an extra 2-3mm allowance is required for your workspace due to their variations.*

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## Motors with brake

The New YS Series of Megatorque Motors includes four motors with an integral brake that is actuated by an extemal power supply.

Fordetails of power supply, see page A38.

## Principal specifications of the four motors with brake in the New YS Series

If your requirements differ from the standard specifications, please contact NSK.

| Motors with brake<br>Comforming to CE Marking<br>Not Comforming to CE Marking | | M-YS2020GG001<br>M-YS2020FG001 | M-YS3040GG001<br>M-YS3040FG001 | M-YS4080GG001<br>M-YS4080FG001 | M-YS5120GG001<br>M-YS5120FG001 |
|---|---|---|---|---|---|
| Maximum torque(2) | (N・m) | 20 | 40 | 80 | 120 |
| Maximum stall torque | (N・m) | 15 | 35 | 70 | 105 |
| Maximum current/phase | (A) | 6 | | | |
| Allowable axial load(3) | (N) | 3700 | 4500 | 9500 | 19600 |
| Allowable moment load(3) | (N・m) | 60 | 80 | 160 | 400 |
| Axial rigidity(1) | (mm/N) | $4.0X10^{-6}$ | $3.0X10^{-6}$ | $1.4X10^{-6}$ | $1.0X10^{-6}$ |
| Moment rigidity(1) | (rad/N・m) | $3.5X10^{-6}$ | $2.5X10^{-6}$ | $1.5X10^{-6}$ | $3.0X10^{-7}$ |
| Rotor moment of inertia | ($kg・m^2$) | 0.008 | 0.023 | 0.072 | 0.240 |
| Rotor inertia $GD^2$ | ($kgf・m^2$) | 0.032 | 0.092 | 0.288 | 0.960 |
| Brake output torque | (N・m) | 20 | 40 | 80 | 120 |
| Mass | (kg) | 12 | 20 | 36 | 66 |
| Operating conditions | | Temperature: 0-40°C; Humidity: 20-80%; Use indoors, free from oil mist, dust, condensation and corrosive gases. | | | |
| Maximum speed | [$S^1$(rps)] | 3 | | | |
| Resolver resolution | (p/rev) | 614400 | | | |
| Resolver accuracy | (sec) | 150 | | | |
| Resolver repeatability | (sec) | ±2.1 | | | |
| Compatible driver units | | M-ESA-Y2020A25<br>M-ESA-Y2020C25<br>M-ESA-Y2020T25<br>M-ESA-Y2020V25 | M-ESA-Y3040A25<br>M-ESA-Y3040C25<br>M-ESA-Y3040T25<br>M-ESA-Y3040V25 | M-ESA-Y4080A25<br>M-ESA-Y4080C25<br>M-ESA-Y4080T25<br>M-ESA-Y4080V25 | M-ESA-Y5120A25<br>M-ESA-Y5120C25<br>M-ESA-Y5120T25<br>M-ESA-Y5120V25 |

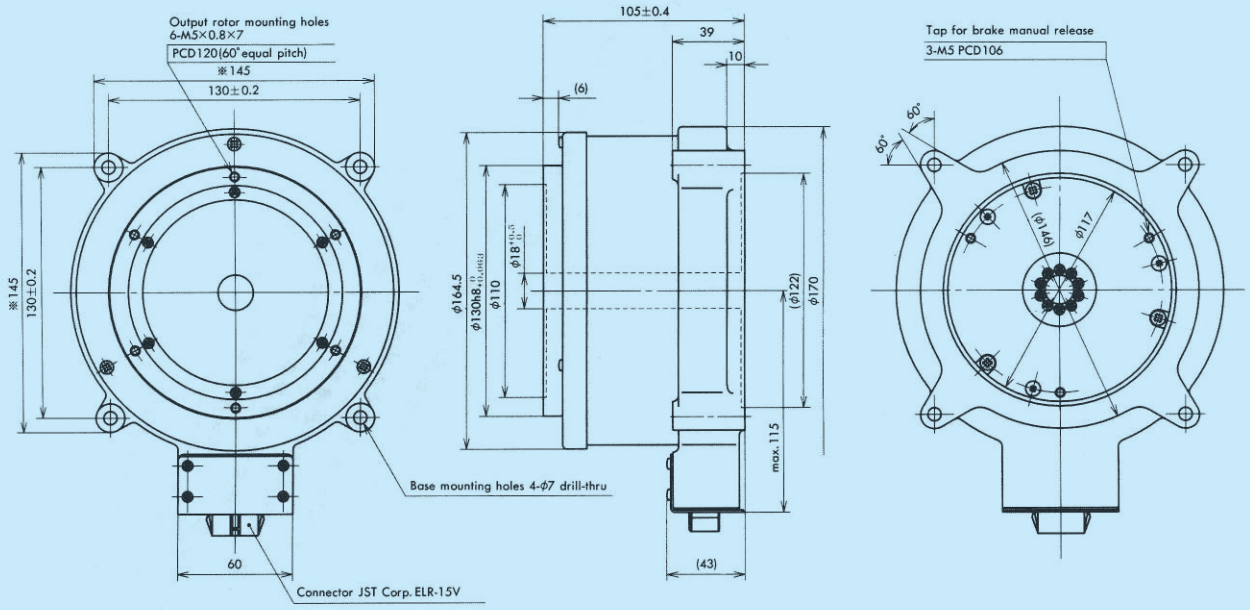
Notes:
Sl unit system: 1N=0.225lb; 1N・m=0.738ft・lb
(1) These values assume that the motor is mounted on a rigid base.
(2) For speed-torque characteristics, see page A39.
(3) For details of how to calculate axial and moment loads, see page A40.
＊ New YS Series Megatorque Motors can be run on either 100/110V or 200/220V AC.
＊ For order numbers of compatible Driver Units, cables and other accessories, see pages A44~A45

## Motor dimensions

The figures on pages A32-A33 show the external dimensions of the four motors in the New YS Series with an integral brake.

Please check that the motors you plan to order will fit your workspace specifications.

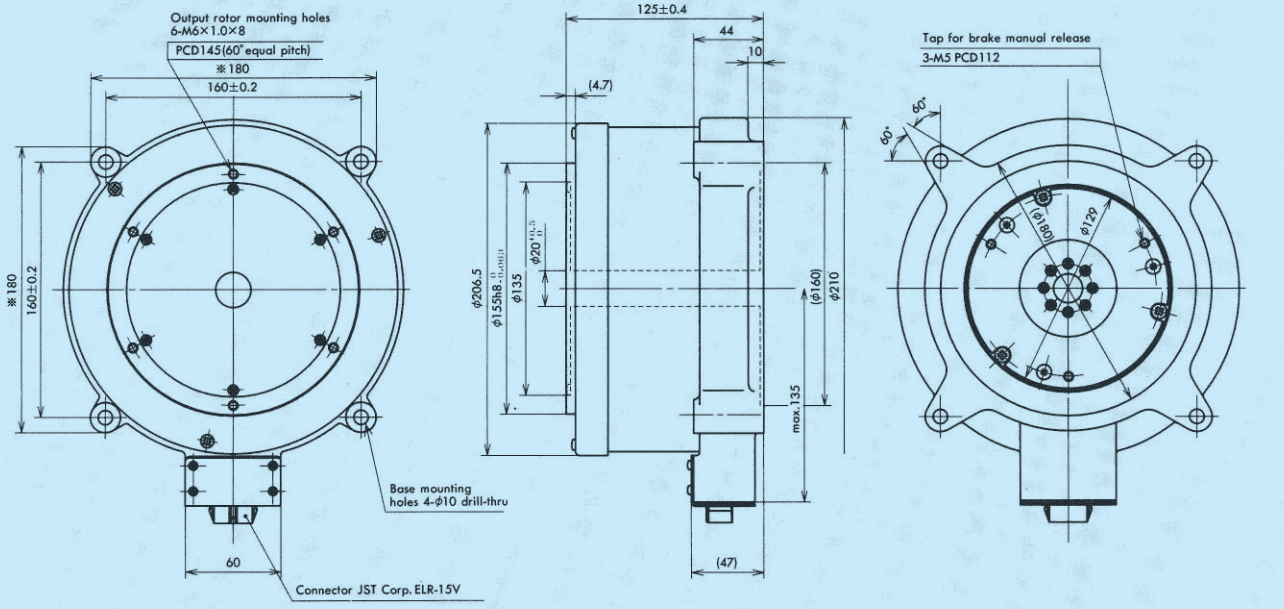
M-YS2020GG001 ／ M-YS2020FG001(with brake)




Unit : mm

*For dimensions marked ※, an extra 2-3 mm allowance is required for your workspace due to their variations.*

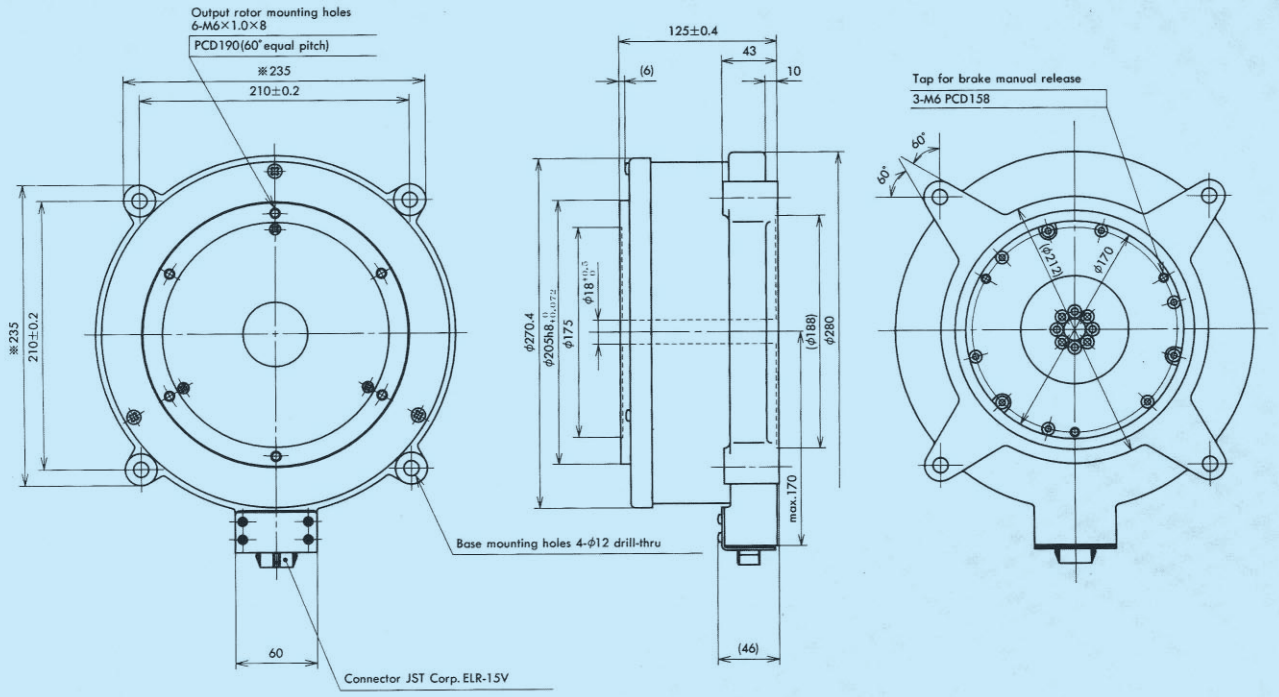
M-YS3040GG001 ／ M-YS3040FG001(with brake)




Unit : mm

*For dimensions marked ※, an extra 2-3 mm allowance is required for your workspace due to their variations.*

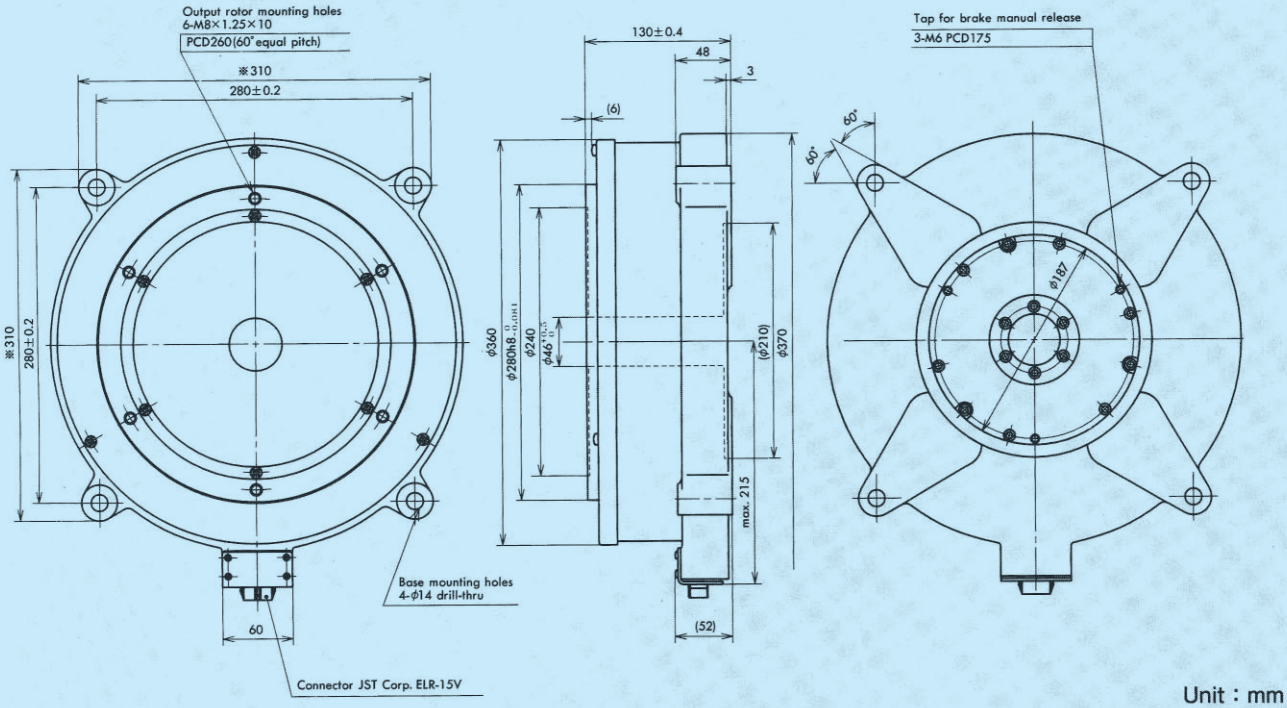
M-YS4080GG001 ／ M-YS4080FG001(with brake)




Unit : mm

*For dimensions marked ※, an extra 2-3 mm allowance is required for your workspace due to their variations.*

M-YS5120GG001 ／ M-YS5120FG001(with brake)




Unit : mm

*For dimensions marked ※, an extra 2-3 mm allowance is required for your workspace due to their variations.*

## Low-profile motors

The New YS Series of Megatorque Motors includes two motors with an extra-low profile for use in conditions where space is at a premium.

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## Principal specifications of the two low-profile motors in the New YS Series

If your requirements differ from the standard specifications, please contact NSK.

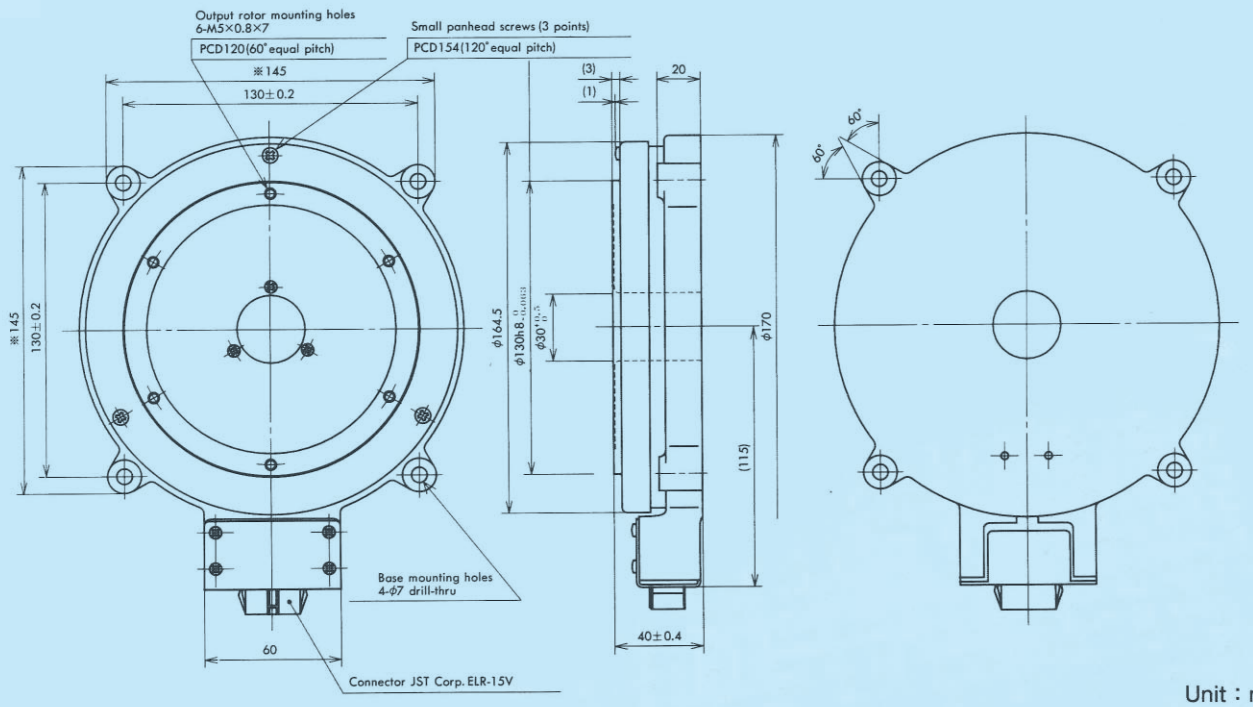
| Low-profile motors | | | |
|---|---|---|---|
| Comforming to CE Marking | | M-YS2005GN001 | M-YS3008GN001 |
| Not Comforming to CE Marking | | M-YS2005FN001 | M-YS3008FN001 |
| Maximum torque(2) | (N・m) | 5 | 8 |
| Maximum stall torque | (N・m) | 4 | 5 |
| Maximum current/phase | (A) | 1.5 | |
| Allowable axial load(3) | (N) | 3700 | 4500 |
| Allowable moment load(3) | (N・m) | 60 | 80 |
| Axial rigidity(1) | (mm/N) | $4.0X10^{-6}$ | $3.0X10^{-6}$ |
| Moment rigidity(1) | (rad/N・m) | $3.5X10^{-6}$ | $2.5X10^{-6}$ |
| Rotor moment of inertia | ($kg・m^2$) | 0.003 | 0.006 |
| Rotor inertia $GD^2$ | ($kgf・m^2$) | 0.012 | 0.024 |
| Mass | (kg) | 4 | 6 |
| Operating conditions | | Temperature: 0-40°C; Humidity: 20-80%; Use indoors, free from dust, condensation and corrosive gases. | |
| Maximum speed | [$S^{-1}$(rps)] | 3 | 2(4)/3(5) |
| Resolver resolution | (p/rev) | 614400 | |
| Resolver accuracy | (sec) | 150 | |
| Resolver repeatability | (sec) | ±2.1 | |
| Compatible driver units | | M-ESA-Y2005A23 | M-ESA-Y3008A23 |
| | | M-ESA-Y2005C23 | M-ESA-Y3008C23 |
| | | M-ESA-Y2005T23 | M-ESA-Y3008T23 |
| | | M-ESA-Y2005V23 | M-ESA-Y3008V23 |
| | | M-ESA-Y2005A25 | M-ESA-Y3008A25 |
| | | M-ESA-Y2005C25 | M-ESA-Y3008C25 |
| | | M-ESA-Y2005T25 | M-ESA-Y3008V25 |
| | | M-ESA-Y2005V25 | M-ESA-Y3008T25 |

Notes:
Sl unit system: 1N=0.225lb; 1N・m=0.738ft・lb
(1) These values assume that the motor is mounted on a rigid base.
(2) For speed-torque characteristics, see page A39.
(3) For details of how to calculate axial and moment loads, see page A40.
(4) On 100/110V AC
(5) On 200/220V AC
＊ New YS Series Megatorque Motors can be run on either 100/110V or 200/220V AC.
＊ For order numbers of compatible Driver Units, cables and other accessories, see pages A44~A45

## Motor dimensions

The figures on pages show the external dimensions of the two ow-profile motors in the New YS Series. Please check that the motors you plan to order will fit your workspace specifications.

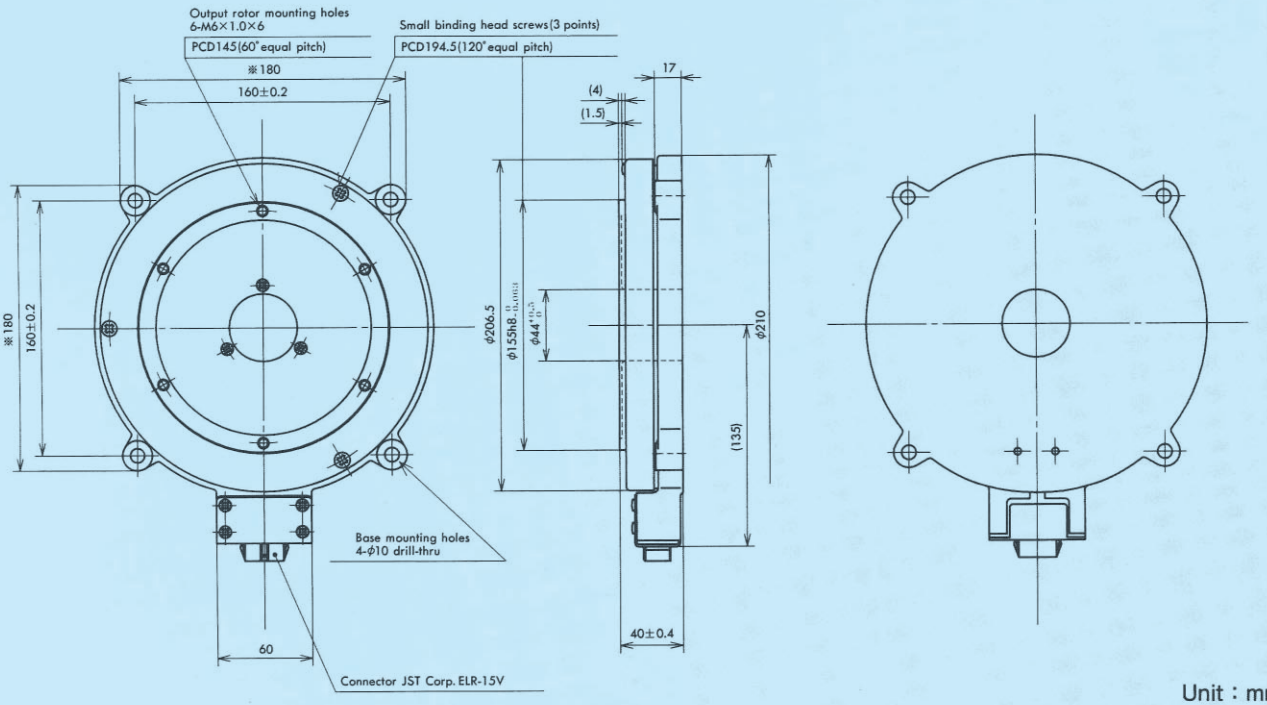
M-YS2005GN001 ／ M-YS2005FN001(low-profile)




Unit : mm

*For dimensions marked ※, an extra 2-3 mm allowance is required for your workspace due to their variations.*

M-YS3008GN001 ／ M-YS3008FN001(low-profile)




Unit : mm

*For dimensions marked ※, an extra 2-3 mm allowance is required for your workspace due to their variations.*

## ESA Driver Units

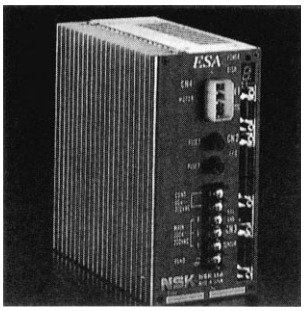
*Conform to CE Marking*

The compact low-cost ESA Driver Units are specially designed for use with YS Series Megatorque Motors. They feature a built-in auto-tuning function to eliminate the time-consuming task of gain compensation and a new analog speed or torque command function.

There are seven basic ESA Driver Units, one to suit the maximum torque of each size of Megatorque Motor.

Each is available in two versions, the ESA25 version having a wider range of functions than the ESA23 version, and available in either 100/110V or 200/220V AC types (except for the M-ESA-Y5240 models which run only on 200/220V).

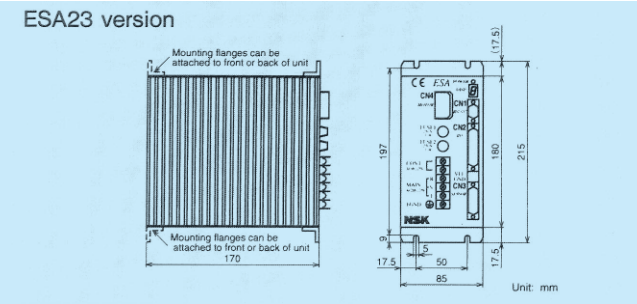
When ordering, please specify the power supply and motor model you plan to use as some diver units may be incompatible with some motors.



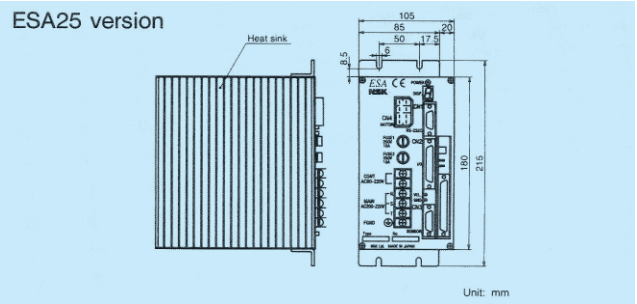
## Driver unit dimensions

These figures show the external dimensions of the ESA Driver Units.

ESA23 version




ESA25 version




## Driver Unit Model Number

M–ESA Y2020 T 23

ESA driver Unit

Motor model number
- Y2005: M-YS2005∗ ∗ ∗ ∗
- Y3008: M-YS3008∗ ∗ ∗ ∗
- Y2020: M-YS2020∗ ∗ ∗ ∗
- Y3040: M-YS3040∗ ∗ ∗ ∗
- Y4080: M-YS4080∗ ∗ ∗ ∗
- Y5120: M-YS5120∗ ∗ ∗ ∗
- Y5240: M-YS5240∗ ∗ ∗ ∗

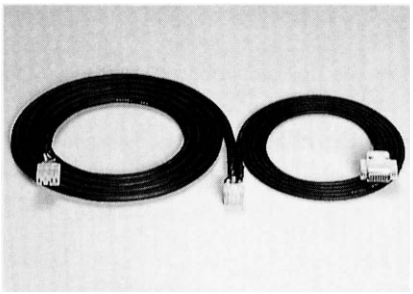
Design no. 23: ESA23 version
25: ESA25 version

Supply voltage
Not conforming to CE Macking
A: AC200/220V, C: AC100/110V
Comforming to CE Marking
T: AC200/220V, V: AC100/110V

For detaile of specifiations, see pages A92~A95.

## Accessories

The motor and driver cable set is made of NSK's special Robot Cable, which will stand up to repeated bending.
Please note that motors with a brake need a special cable (see table and diagrams below).



## Motor and driver unit cable set

Cable are available in standard lengths of 2, 4, 8, 15 and 30 meters.

## Reference number

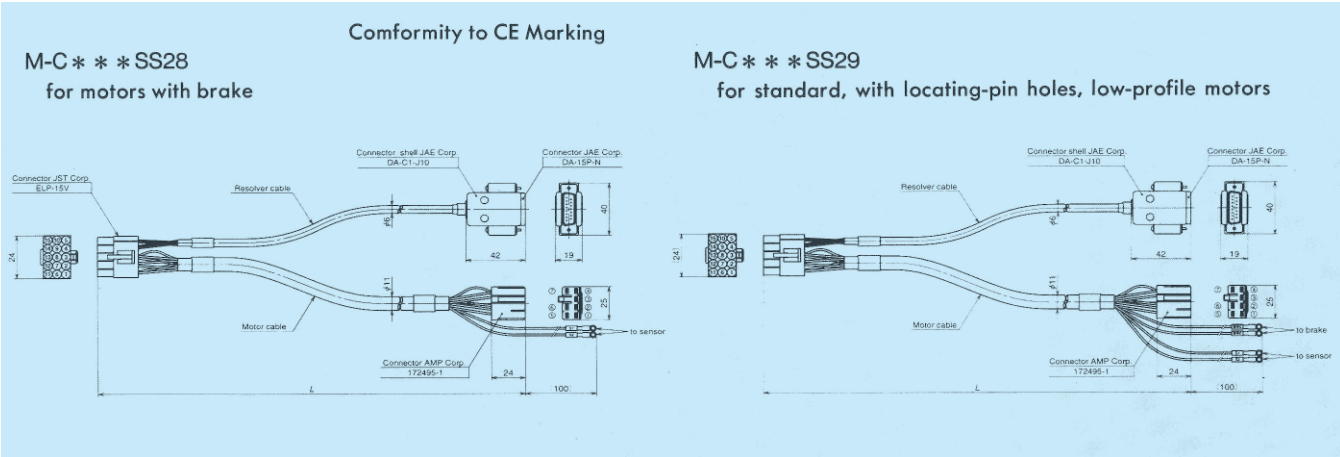
M-C 004 SS 29

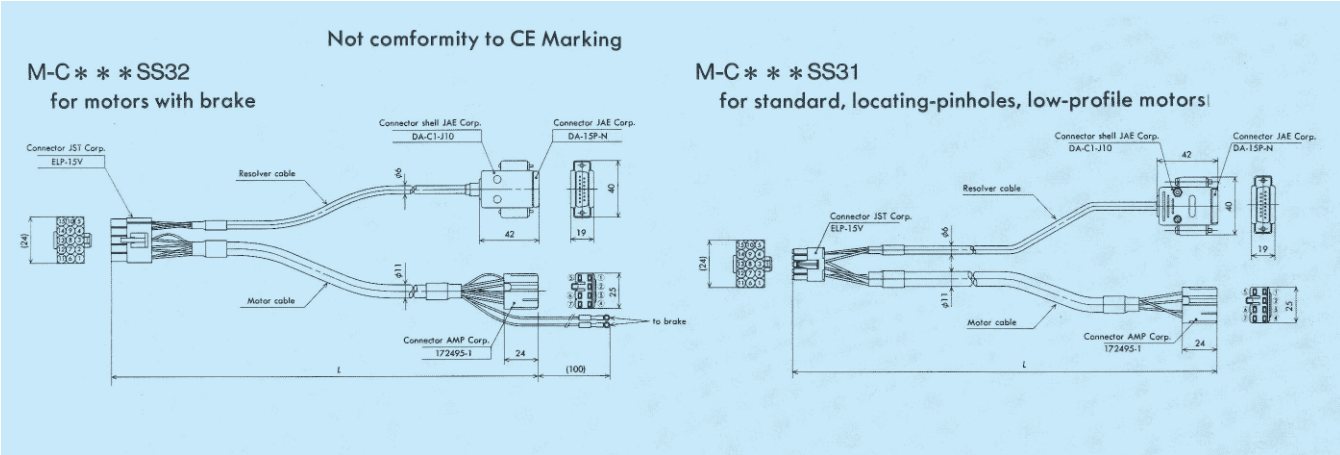
Cable set

Cable lemgth
002: 2m 015: 15m
004: 4m 030: 30m
008: 8m

foe ESA driber unit

Design no.
Comformity to CE Marking
28: motor with brake
29: except motor with brake
Not comformity to CE Marking
32: Motor with brake
31: Except motor with brake




Cable length L: 2m(M-C002SS＊＊),4m(M-C004SS＊＊),8m(M-C008SS＊＊),15m(M-C015SS＊＊),30m(M-CO30SS＊＊)

## Handy Terminal (Model number M-FHT11)

When setting up a Megatorque Motor system for the first time or if the motor is not connected to a personal computer, you will need a Handy Terminal to input parameters and programs. The Handy Terminal uses an RS-232C interface.

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