

# Micro Direct Drive Motor



## μDDMotor Miniature AC servomotor with high torque and high-resolution

### Features

- Built-in high performance encoder that enables direct fine positioning from resolutions of 1 arc-sec.
- Delivers high torque using high performance magnets and high density winding technology.
- Delivers small size with the motor and encoder designed as a single unit.
- Able to bear large loads directly through the use of a high stiffness bearing.
- Able to support hollow shaft structures.
- Customized designs are supported to suit our customer needs.

# Delivering a lineup with a wide range of application options of compact high-performance next-generation servo motors with built in encoders.

## MDS-13 series

- Body diameter:  $\phi 13$  mm  
Body length: 26/32/38 mm
- Max torque: 7/15/25 mN·m
- Max speed: 3000 rpm
- Max resolution: 500 P/R, 11 bit



## MDS/MDH-20 series

- Body diameter:  $\phi 21$  mm  
Body length: 32/38/44 mm
- Max torque: 40/90/130 mN·m
- Max speed: 3000 rpm
- Max resolution: 72,000 P/R, 18 bit
- Hollow diameter:  $\phi 2.6$  mm (MDH type)



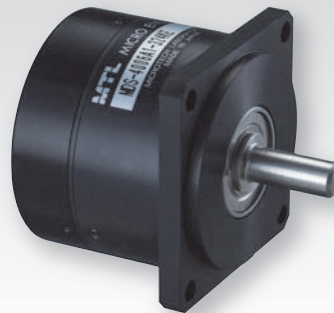
## MDS/MDH-30 series

- Body diameter:  $\phi 30$  mm  
Body length: 32/38/44 mm
- Max torque: 140/280/420 mN·m
- Max speed: 1000 rpm
- Max resolution: 108,000 P/R, 19 bit
- Hollow diameter:  $\phi 4$  mm (MDH type)



## MDS/MDH-40 series

- Body diameter:  $\phi 40$  mm  
Body length: 32/38/44 mm
- Max torque: 0.33/0.70/1.0 N·m
- Max speed: 450 rpm
- Max resolution: 324,000 P/R, 20 bit
- Hollow diameter:  $\phi 6$  mm (MDH type)



## MDH-70 series

- Body diameter:  $\phi 70$  mm  
Body length: 32/38/44 mm
- Max torque: 1.0/2.2/3.1 N·m (with DC48V drive)
- Max speed: 200 rpm
- Max resolution: 648,000 P/R, 21 bit
- Hollow diameter:  $\phi 25$  mm (MDH type)

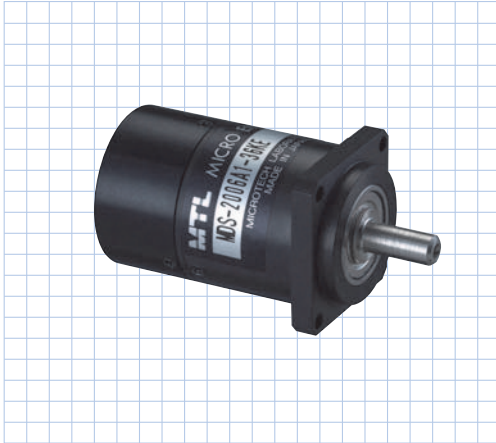


# MDS/MDH-20 series (Characteristic example)

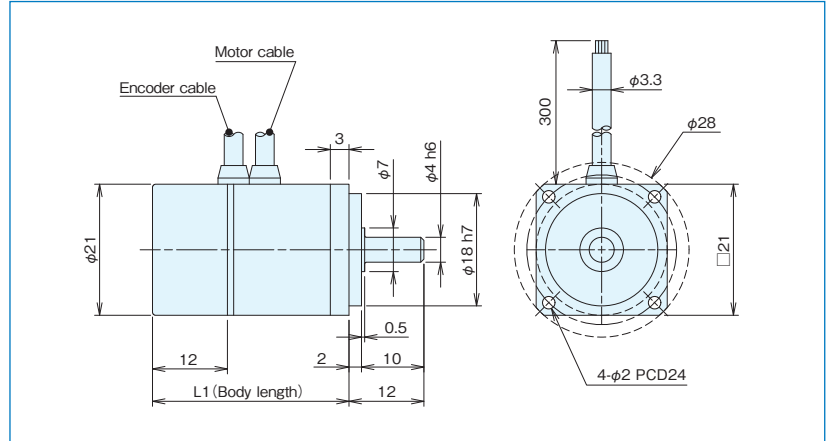


## MDS-20

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## Outer Dimensions

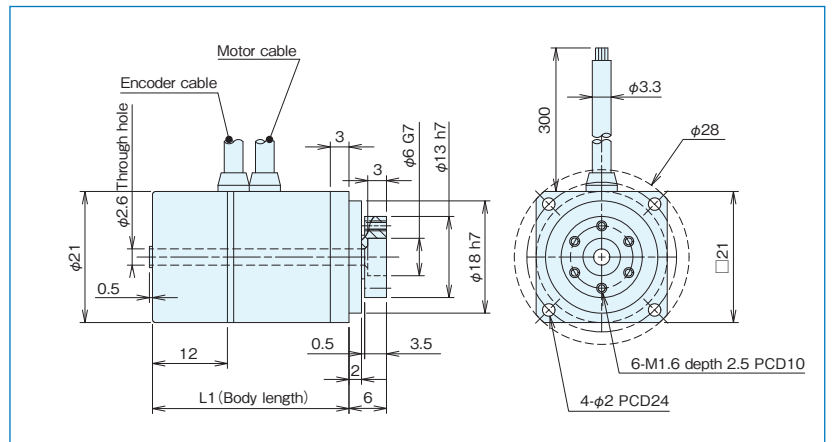


## MDH-20

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## Outer Dimensions



## Standard models

MD■-20△-36KE (Incremental)

MDS-20△-18B (Absolute)

■: Shaft shape S (solid shaft), H (Hollow shaft) △: Body length 06, 12, 18

Note: Please ask us if there is a particular resolution you prefer.

## MDS/H-20 series (Representative characteristics of standard models)

	Unit	MDS-2006	MDH-2006	MDS-2012	MDH-2012	MDS-2018	MDH-2018
Input power (Driver input)	DCV	24					
Maximum speed	rpm	3000					
Rated speed	rpm	1500					
Peak torque at stall	Nm	0.04		0.09		0.13	
Rated torque	Nm	0.017		0.030		0.040	
Continuous rated torque	Nm	0.014		0.026		0.030	
Peak power	W	5.0		10		17	
Peak power rate	kW/s	19	15	62	43	99	65
Peak armature current	Arms	2.6		4.3		5.6	
Rated armature current (*1)	Arms	1.1		1.2		1.4	
Voltage constant	V/krpm	1.6		2.5		2.4	
Torque constant (at 25°C)	Nm/Arms	0.015		0.024		0.023	
Line armature resistance (at 25°C)	Ω	3.5		2.2		1.9	
Line armature inductance	mH	1.1		0.79		0.82	
Rotor Poles	P	10					
Max encoder resolution	P/R	Incremental: 72,000 / Absolute: 262,144 (18bit)					
Moment of inertia J	g·cm <sup>2</sup>	0.78	1.5	1.2	2.0	1.7	2.4
Permissible radial load Fr	N	44					
Permissible axial load Fa	N	22					
Load reference point distance La	mm	29.8	28.5	35.7	34.5	41.7	40.4
Mass	kg	0.088		0.10		0.12	
Applicable motor driver		MC-110-2406					
Standard heat sink		100×100×5 Aluminum					

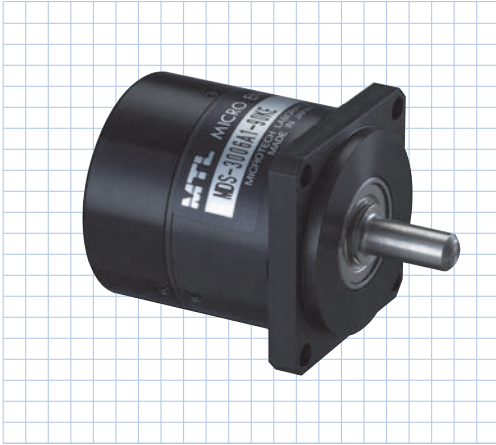
Note: (\*1) Rated armature current is the value measured with the standard heat sink attached to the motor at an ambient temperature of 40°C.

\* The absolute encoder is only available with the MDS type.

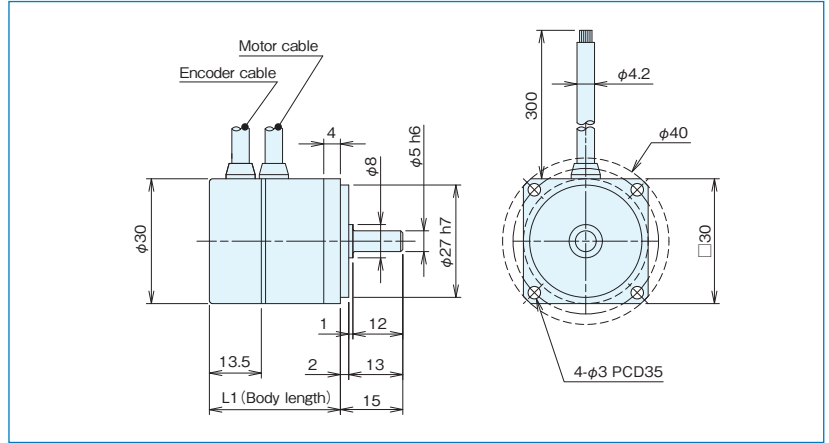
# MDS/MDH-30 series (Characteristic example)

## MDS-30

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## Outer Dimensions

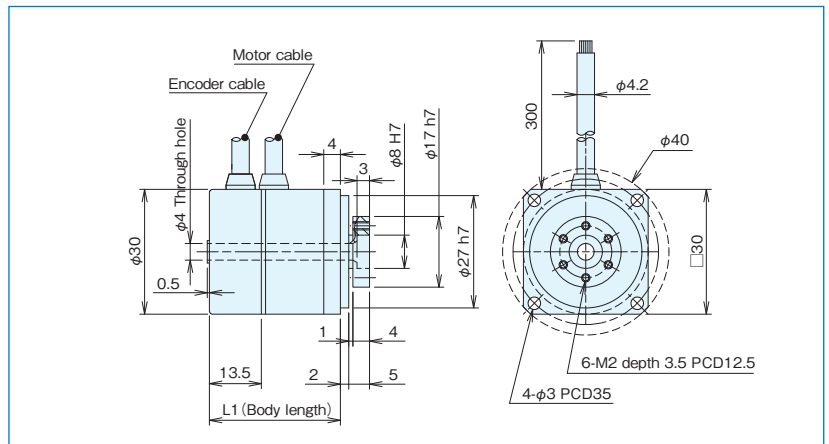


## MDH-30

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## Outer Dimensions



Model	L1 dimension
MD□-3006	31.5
MD□-3012	37.5
MD□-3018	43.5

## Standard models

MD■-30△-108KE (Incremental)

MD■-30△-19B (Absolute)

■: Shaft shape S (solid shaft), H (Hollow shaft) △: Body length 06, 12, 18

Note: Please ask us if there is a particular resolution you prefer.

## MDS/H-30 series (Representative characteristics of standard models)

	Unit	MDS-3006	MDH-3006	MDS-3012	MDH-3012	MDS-3018	MDH-3018
Input power (Driver input)	DCV	48					
Maximum speed	rpm	1000					
Rated speed	rpm	1000					
Peak torque at stall	Nm	0.14		0.28		0.42	
Rated torque	Nm	0.060		0.095		0.13	
Continuous rated torque	Nm	0.044		0.068		0.10	
Peak power	W	15		20		30	
Peak power rate	kW/s	31	23	71	60	110	98
Peak armature current	Arms	4.6		5.6		6.3	
Rated armature current (*1)	Arms	1.8		1.8		1.7	
Voltage constant	V/krpm	2.8		4.5		6.8	
Torque constant (at25°C)	Nm/Arms	0.026		0.043		0.065	
Line armature resistance (at25°C)	Ω	2.1		2.3		2.5	
Line armature impedance	mH	1		1.3		1.5	
Rotor Poles	P	16					
Max encoder resolution	P/R	Incremental:108,000/Absolute:524,288 (19bit)					
Moment of inertia J	g·cm <sup>2</sup>	6.5	8.9	11.2	13.6	15.9	18.3
Permissible radial load Fr	N	94					
Permissible axial load Fa	N	47					
Load reference point distance La	mm	32.0	30.0	38.0	36.0	43.9	41.9
Mass	kg	0.13		0.16		0.18	
Applicable motor driver		MC-110-2406/MC-110-4810					
Standard heat sink		120×120×8 Aluminum					

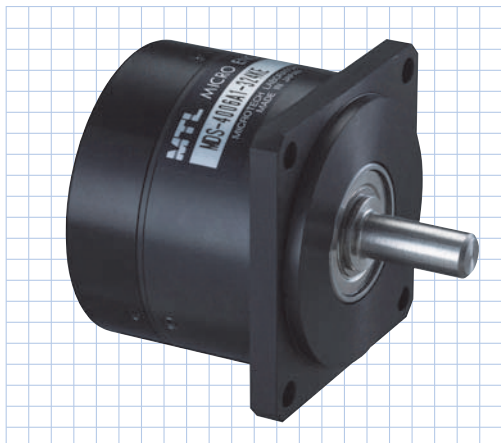
Note: (\*1) Rated armature current is the value measured with the standard heat sink attached to the motor at an ambient temperature of 40°C.

# MDS/MDH-40 series (Characteristic example)

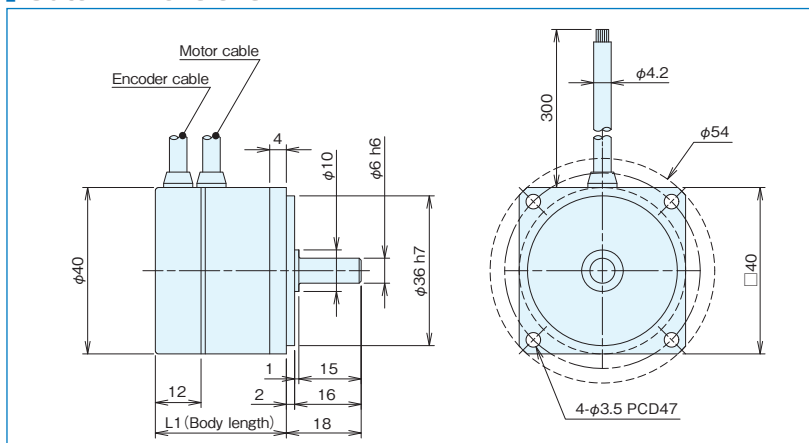


## MDS-40

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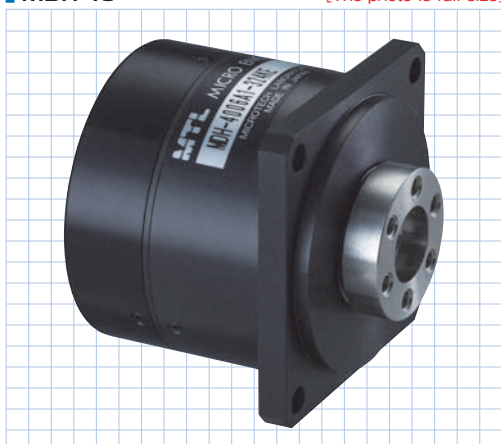


## Outer Dimensions

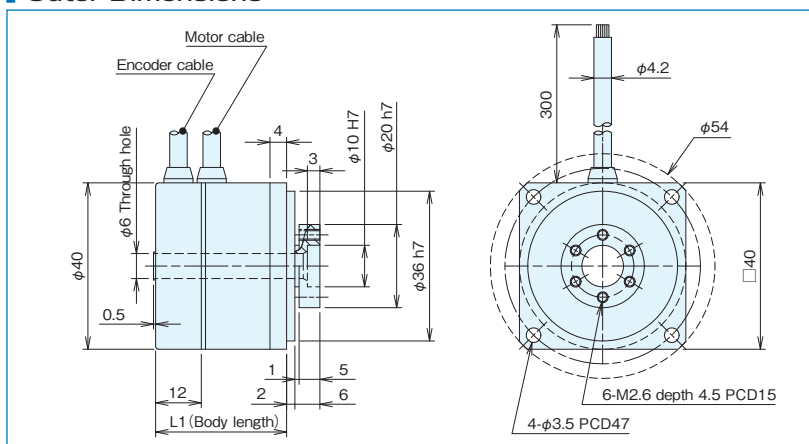


## MDH-40

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## Outer Dimensions



Model	L1 dimension
MD□-4006	31.5
MD□-4012	37.5
MD□-4018	43.5

## Standard models

MD■-40△-324KE (Incremental)

MD■-40△-20B (Absolute)

■: Shaft shape S (solid shaft), H (Hollow shaft) △: Body length 06, 12, 18

Note: Please ask us if there is a particular resolution you prefer.

## MDS/H-40 series (Representative characteristics of standard models)

	Unit	MDS-4006	MDH-4006	MDS-4012	MDH-4012	MDS-4018	MDH-4018
Input power (Driver input)	DCV	48					
Maximum speed	rpm	450					
Rated speed	rpm	450					
Peak torque at stall	Nm	0.33		0.70		1.0	
Rated torque	Nm	0.12		0.20		0.28	
Continuous rated torque	Nm	0.10		0.16		0.23	
Peak power	W	14		27		40	
Peak power rate	kW/s	50	39	140	120	180	160
Peak armature current	Arms	6.3		7.5		10	
Rated armature current (*1)	Arms	1.6		1.7		2.3	
Voltage constant	V/krpm	6.1		10		11	
Torque constant (at25°C)	Nm/Arms	0.058		0.096		0.10	
Line armature resistance (at25°C)	Ω	2.6		2.5		1.7	
Line armature inductance	mH	2.6		3.0		2.0	
Rotor Poles	P	16					
Max encoder resolution	P/R	Incremental: 324,000 / Absolute: 1,048,576 (20bit)					
Moment of inertia J	g·cm <sup>2</sup>	22.6	28.8	38.4	44.5	54.2	60.3
Permissible radial load Fr	N	140					
Permissible axial load Fa	N	70					
Load reference point distance La	mm	37.7	35.2	43.7	41.2	49.6	47.1
Mass	kg	0.21		0.26		0.30	
Applicable motor driver		MC-110-4810					
Standard heat sink		150×150×8 Aluminum					

Note: (\*1) Rated armature current is the value measured with the standard heat sink attached to the motor at an ambient temperature of 40°C.

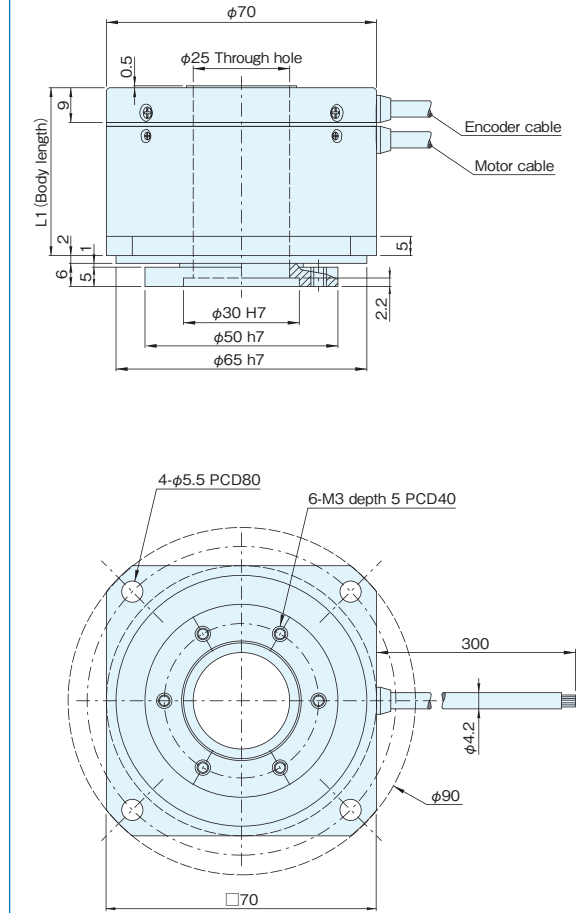
# MDH-70 series (Characteristic example)

## MDH-70

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## Outer Dimensions



## Standard models

MDH-70 $\Delta$ -648KE (Incremental)

MDH-70 $\Delta$ -21B (Absolute)

$\Delta$ : Body length 06, 12, 18

Note: Please ask us if there is a particular resolution you prefer.

Model	L1 dimension
MDH-7006	31.5
MDH-7012	37.5
MDH-7018	43.5

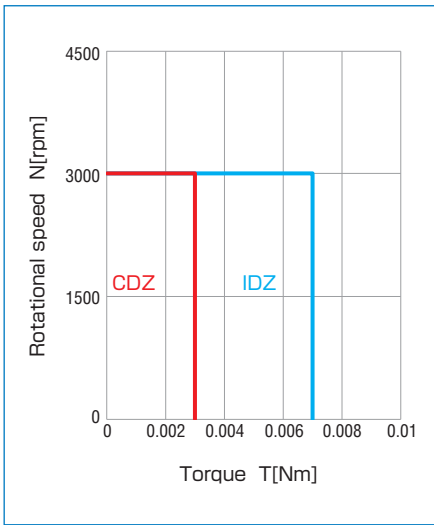
## MDH-70 series (Representative characteristics of standard models) Note: When MC-110-4810 driven at DC48V

	Unit	MDH-7006	MDH-7012	MDH-7018
Input power (Driver input)	DCV		48	
Maximum speed	rpm		200	
Rated speed	rpm		200	
Peak torque at stall	Nm	1.0	2.2	3.1
Rated torque	Nm	0.36	0.66	1.0
Continuous rated torque	Nm	0.36	0.66	1.0
Peak power	W	30	60	90
Peak power rate	kW/s	24	83	147
Peak armature current	Arms	13	16	19
Rated armature current (*1)	Arms	2.8	3.0	3.5
Voltage constant	V/krpm	0.013	0.023	0.031
Torque constant (at25°C)	Nm/Arms	0.13	0.22	0.30
Line armature resistance (at25°C)	$\Omega$	2.1	1.9	1.8
Line armature inductance	mH	2.6	3.1	3.3
Rotor Poles	P		20	
Max encoder resolution	P/R	Incremental:648,000/Absolute:2,097,152 (21bit)		
Moment of inertia J	kg·cm <sup>2</sup>	0.65	0.82	0.99
Permissible radial load Fr	N		500	
Permissible axial load Fa	N		250	
Load reference point distance La	mm	27	33	38.9
Mass	kg	0.53	0.65	0.77
Applicable motor driver		MC-110-4810, MC-200-10020 (Under development)		
Standard heat sink		225×225×10 Aluminum		

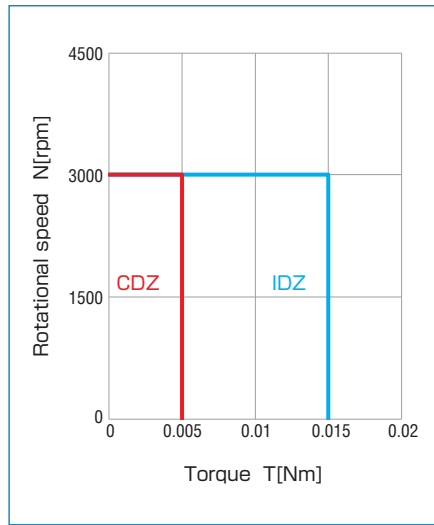
Note: (\*1) Rated armature current is the value measured with the standard heat sink attached to the motor at an ambient temperature of 40°C.

# Speed/torque characteristic examples

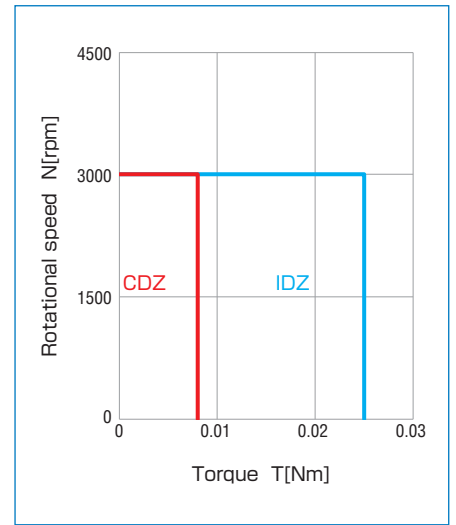
**MDS-1306**



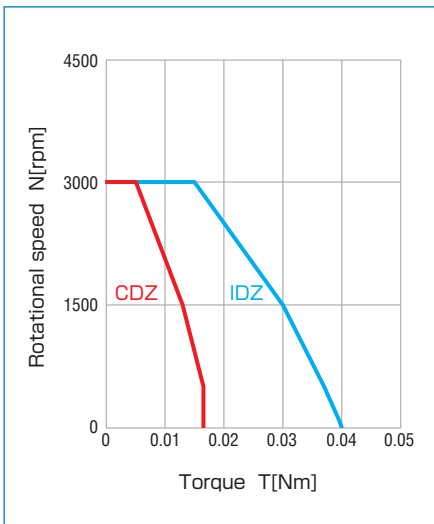
**MDS-1312**



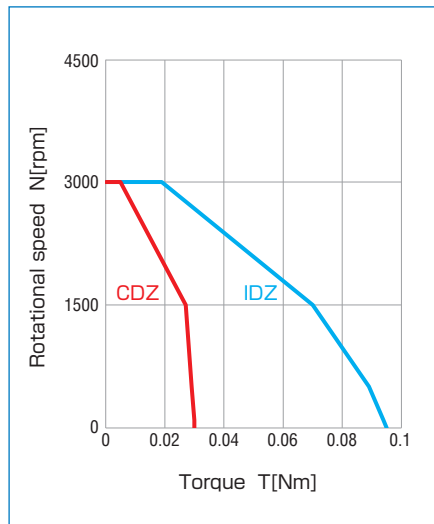
**MDS-1318**



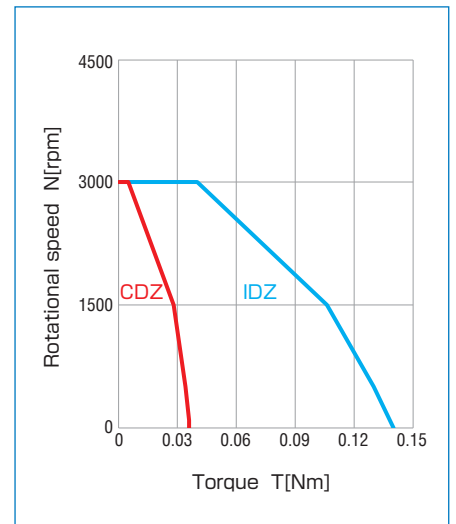
**MDS/H-2006**



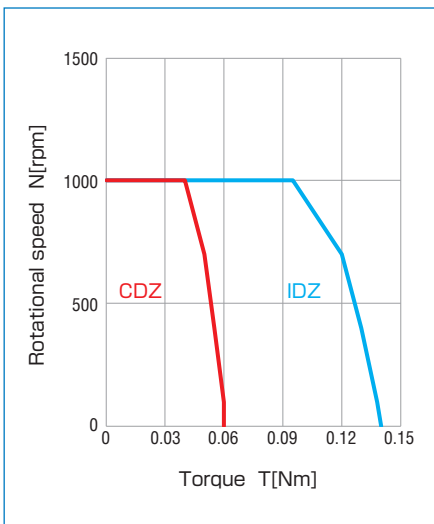
**MDS/H-2012**



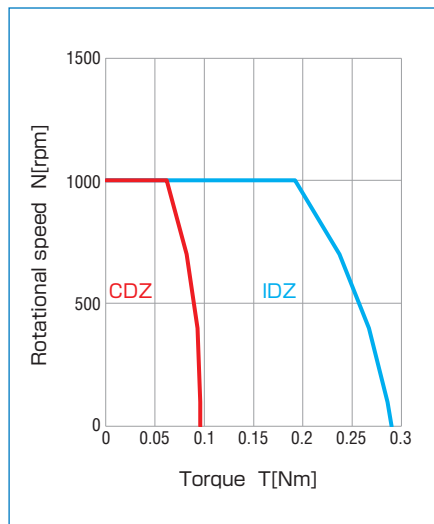
**MDS/H-2018**



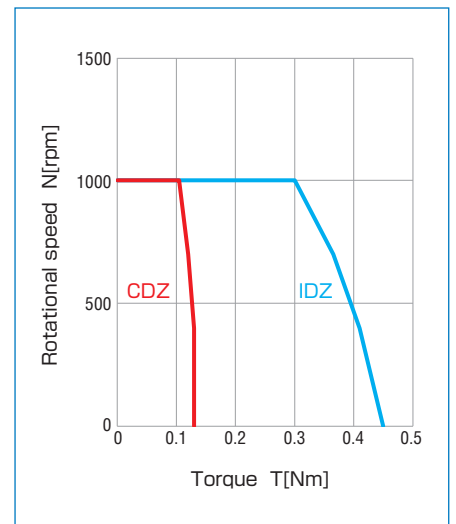
**MDS/H-3006**

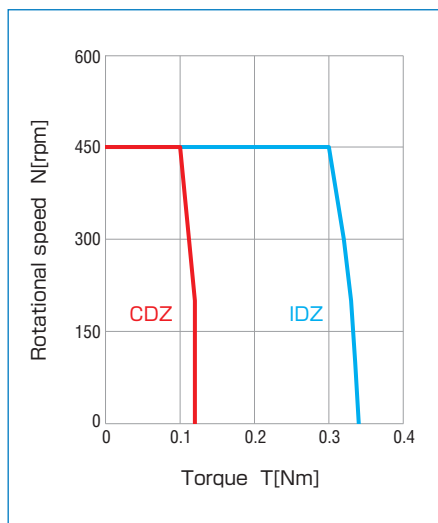
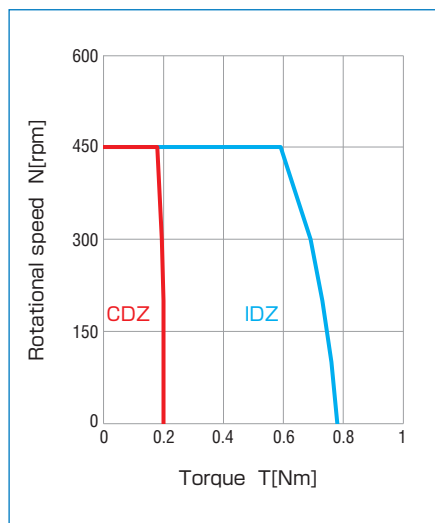
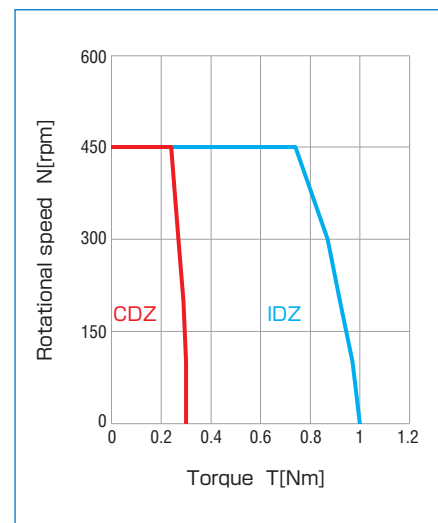
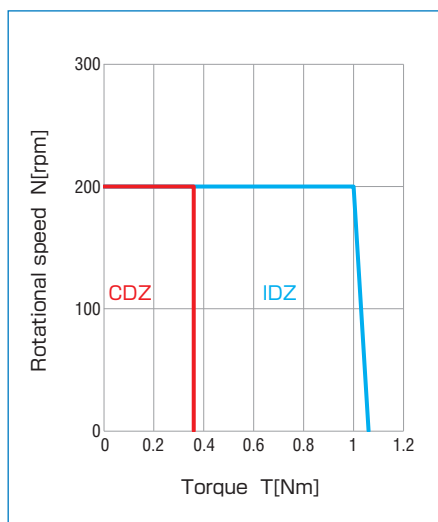
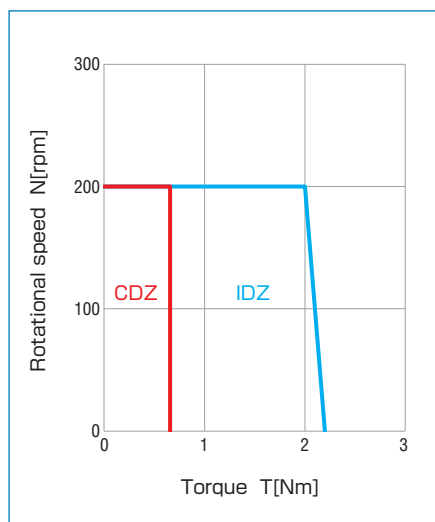
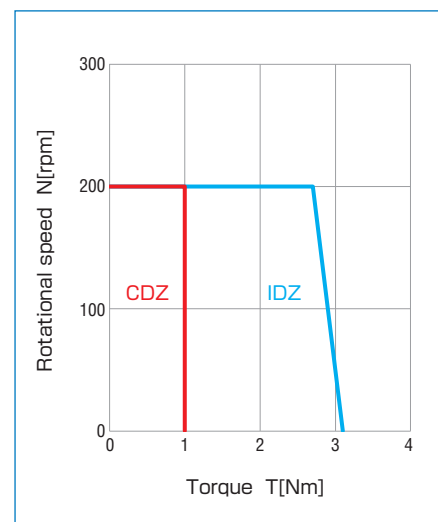


**MDS/H-3012**



**MDS/H-3018**



**MDS/H-4006**

**MDS/H-4012**

**MDS/H-4018**

**MDH-7006**

**MDH-7012**

**MDH-7018**


## Notes

### Usage regimes

#### ① Continuous usage regime (CDZ)

Indicates the range of continuously operable torques and speeds.

The continuous operation range is the value when measured with the standard heat sink at the bottom of each spec table is fitted to the motor under an ambient temperature of 40°C.

#### ② Intermittent usage regime (IDZ)

The range that can be used such as during short intermittent operation, startup, acceleration, deceleration, etc.

Refer to the overload duty characteristics in the separate document for details on the limits on torque and operation time during intermittent use. (Check the website or contact us)

### Speed

The maximum speed of an incremental encoder is limited by the response frequency.

The speed range can also be further increased by reducing the encoder resolution.