MTL

μDD Motor

Micro Direct Drive Motor

MD series

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.

MICROTECH LABORATORY INC.

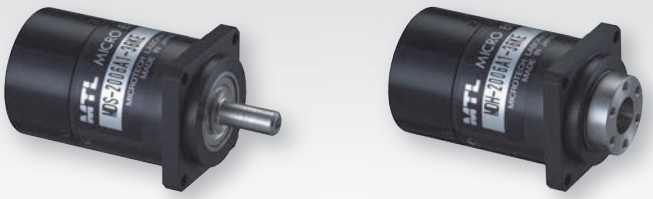
Delivering a lineup with a wide range of application options of compact high-performance next-generation servo motors with built in encoders.

MDS-13 series

- Body diameter: ϕ13 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

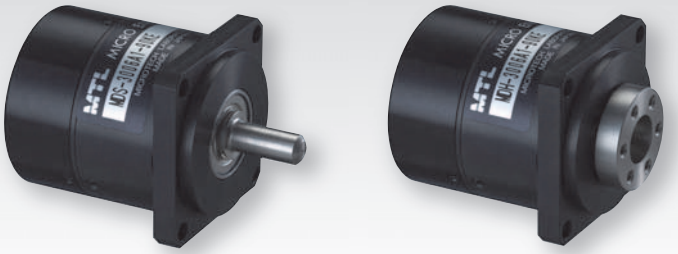
MDS/MDH-20 series

- Body diameter: ϕ21 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: ϕ2.6 mm (MDH type)



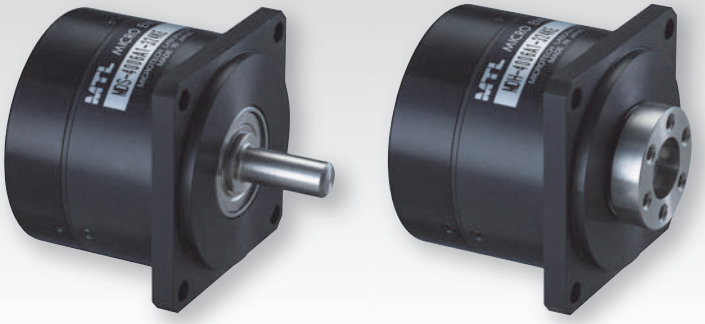
MDS/MDH-30 series

- Body diameter: ϕ30 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: ϕ4 mm (MDH type)



MDS/MDH-40 series

- Body diameter: ϕ40 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: ϕ6 mm (MDH type)



MDH-70 series

- Body diameter: ϕ70 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: ϕ25 mm (MDH type)

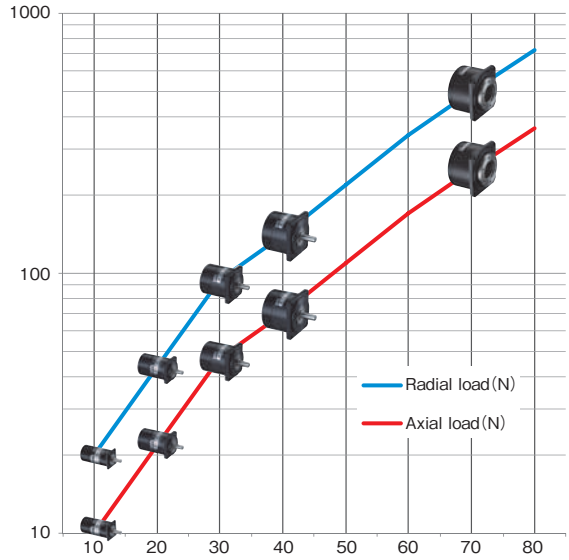
MC-110 series

MC-110-2406

MC-110-4810

Note: Download the dedicated application "MTLParam.exe" from the web.
URL:https://www.mtl.co.jp

Axle endurance load



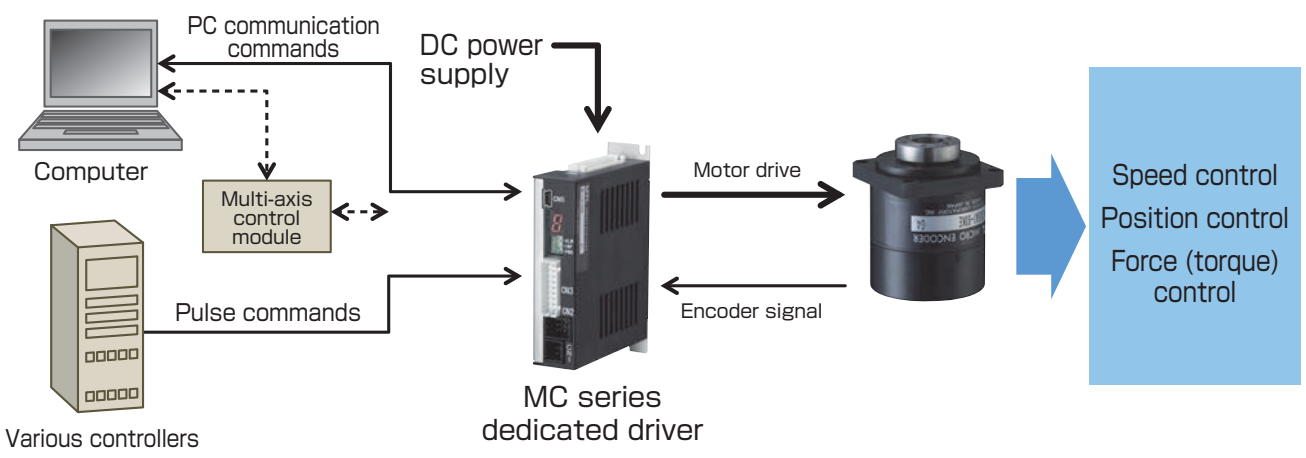
Example specifications

- Built-in absolute encoder (11 to 21 bits)
- Built-in electromagnetic encoder
- Hollow shaft structure
- Design with customized speed and torque characteristics
- Ripple reducing design (torque/speed)
- Clean room ready

Application examples

- Gearless structures
- High precision positioning applications
- Robot arms
- Small scalar robots
- Bilateral master/slave control

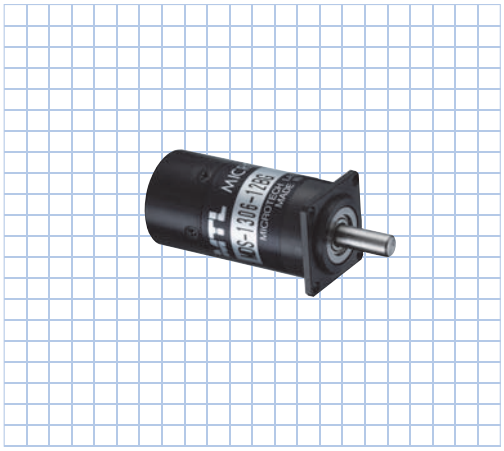
System structure



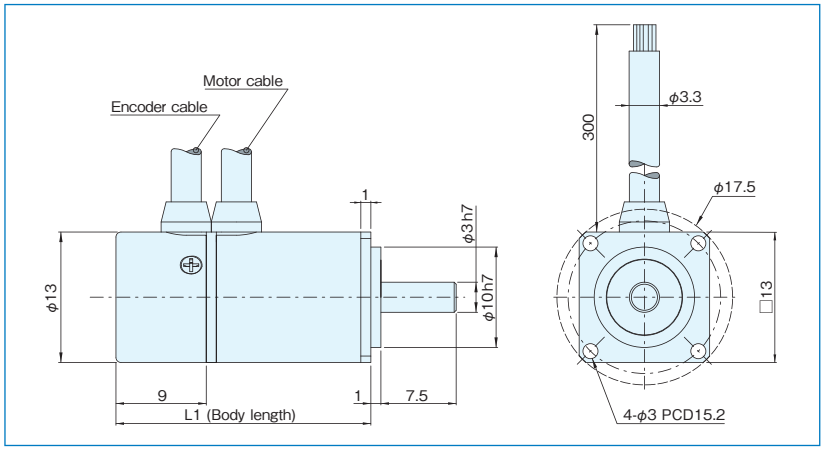
MDS-13 series (Characteristic example) Development information

MDS-13

[The photo is full size]



Outer Dimensions



Model	L1 dimension
MDS-1306	25.4
MDS-1312	31.4
MDS-1318	37.4

Standard models

MDS-13△-11B (Absolute)

△:Body length 06,12,18

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

MDS-13 series (Representative characteristics of standard models)

	Unit	MDS-1306	MDS-1312	MDS-1318
Input power (driver input)	DCV	24		
Maximum speed	rpm	3000		
Rated speed	rpm	3000		
Peak torque at stall	mNm	7.0	15	25
Rated torque	mNm	3.0	5.5	8.0
Continuous rated torque	mNm	3.0	5.0	7.5
Peak power	W	2.0	4.0	8.0
Peak power rate	kW/s	4.5	13	27
Peak armature current	Arms	2.6	2.6	2.6
Rated armature current (*1)	Arms	1.1	1.0	1.0
Voltage constant	V/krpm	0.28	0.61	1.0
Torque constant (at25℃)	Nm/Arms	2.7	5.8	9.6
Line armature resistance (at25℃)	Ω	1.1	1.8	2.5
Line armature inductance	mH	0.13	0.21	0.39
Rotor Poles	P	8		
Max encoder resolution	P/R	Incremental:500/Absolute:2,048 (11bit)		
Moment of inertia J	g·cm^2	0.11	0.17	0.23
Permissible radial load Fr	N	20		
Permissible axial load Fa	N	10		
Load reference point distance La	mm	19.7	25.7	31.7
Mass	kg	0.04	0.05	0.06
Applicable motor driver		MC-110-2406		
Standard heat sink		55×55×4 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.
* Only available with the MDS type.

Explanation of motor characteristic terminology

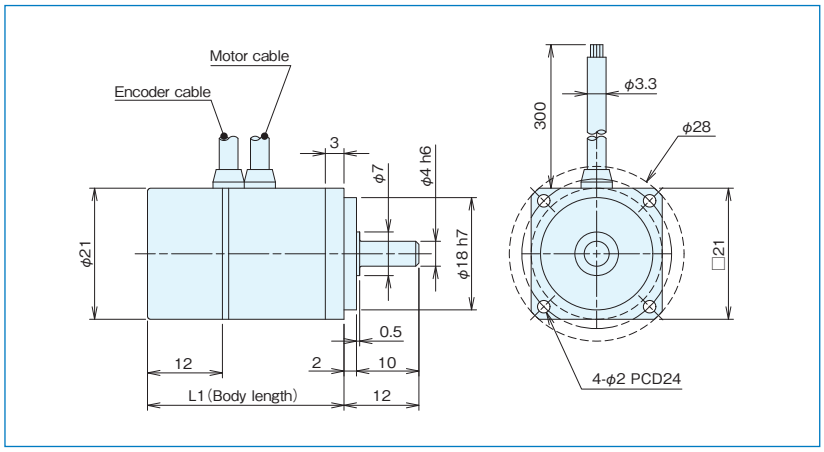
- **Peak armature current** ····· The maximum current that can flow through the motor momentarily, determined by the instantaneous heat capacity of the armature winding.
- **Rated armature current** ····· The maximum current that can flow through the motor continuously, determined from the degree of temperature increase of the motor.
- **Peak torque** ····· The maximum instantaneous torque that occurs at the peak armature current, which is the maximum torque that occurs instantaneously during acceleration and deceleration such as when starting or stopping the load.
- **Rated torque** ····· The maximum torque that occurs at the rated armature current when the motor is restrained.
- **Continuous rated torque** ····· The maximum torque that occurs at the rated armature current when the motor is at the rated speed.
- **Peak power** ····· The maximum power that can occur when driven by the designated dedicated driver.
- **Peak power rate** ····· The power increase rate when the motor alone is accelerating at the peak armature torque.
- **Moment of inertia (J)** ····· The moment of inertia is represented by J (=GD^2/4).
- **Load reference point distance L_A** ··· The distance from the bearing start point to the load reference point. (S: Total shaft length/2 H: Flange end)
- **Load point distance L_R** ····· The distance from the point of application of radial load to the load reference point.
- **Relationship between tolerated radial load and load point** ····· $F_R[N] = \frac{L_a}{L_a+L_R} \times F_r$ F_R: User load [N] F_r: Tolerated radial load [N]

MDS/MDH-20 series (Characteristic example)

MDS-20

[The photo is full size]

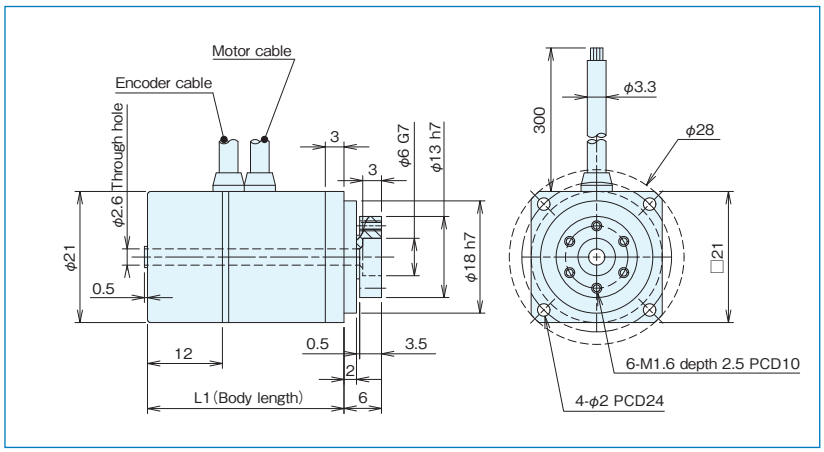
Outer Dimensions



MDH-20

[The photo is full size]

Outer Dimensions



Model	L1 dimension
MD□−2006	31.5
MD□−2012	37.5
MD□−2018	43.5

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)

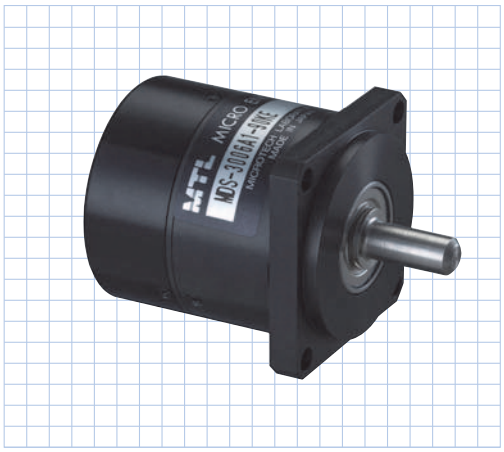
	Unit	MDS-2006	MDH-2006	MDS-2012	MDH-2012	MDS-2018	MDH-2018
Input power (Driver input)	DCV	24					
Maximum speed	rpm	3000					
Rated speed	rpm	1500					
Peak torque at stall	Nm	0.04		0.09		0.13	
Rated torque	Nm	0.017		0.030		0.040	
Continuous rated torque	Nm	0.014		0.026		0.030	
Peak power	W	5.0		10		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 (at25℃)	Nm/Arms	0.015		0.024		0.023	
Line armature resistance (at25℃)	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^2	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.

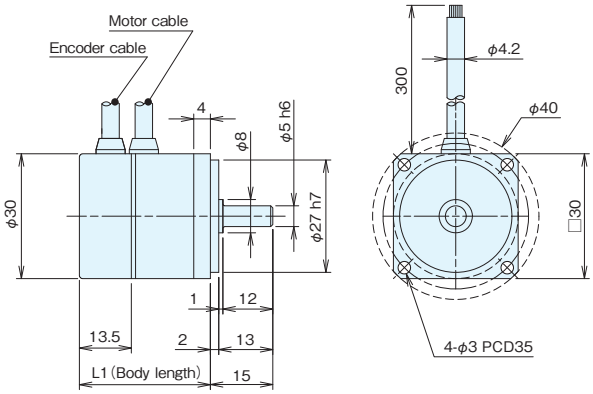
MDS/MDH-30 series (Characteristic example)

MDS-30

[The photo is full size]



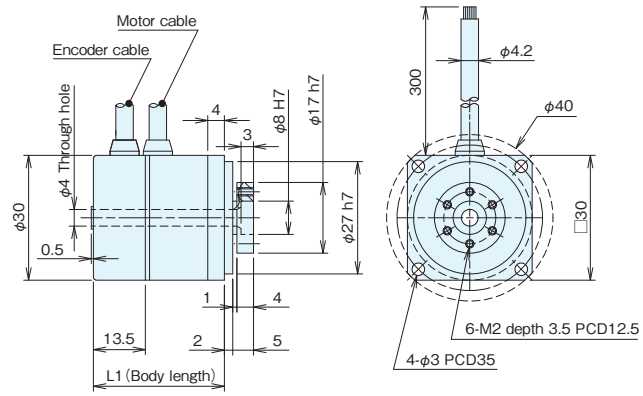
Outer Dimensions



MDH-30

[The photo is full size]

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)

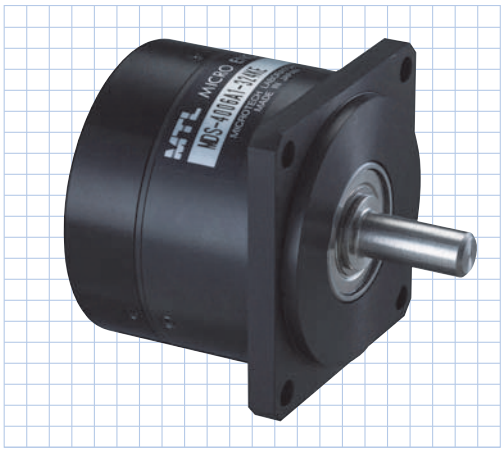
	Unit	MDS-3006	MDH-3006	MDS-3012	MDH-3012	MDS-3018	MDH-3018
Input power (Driver input)	DCV	48					
Maximum speed	rpm	1000					
Rated speed	rpm	1000					
Peak torque at stall	Nm	0.14		0.28		0.42	
Rated torque	Nm	0.060		0.095		0.13	
Continuous rated torque	Nm	0.044		0.068		0.10	
Peak power	W	15		20		30	
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℃)	Nm/Arms	0.026		0.043		0.065	
Line armature resistance (at25℃)	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^2	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.

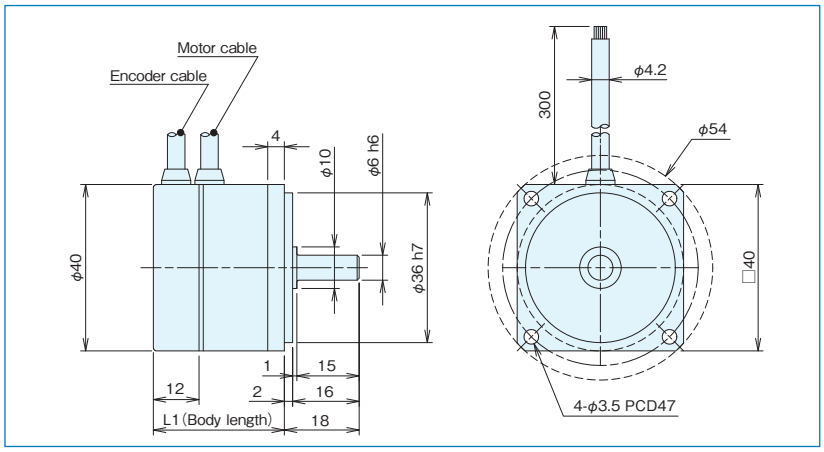
MDS/MDH-40 series (Characteristic example)

MDS-40

[The photo is full size]



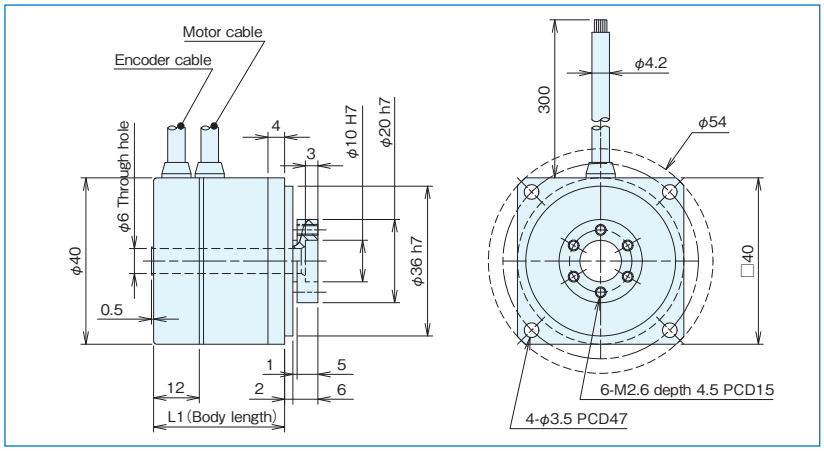
Outer Dimensions



MDH-40

[The photo is full size]

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)

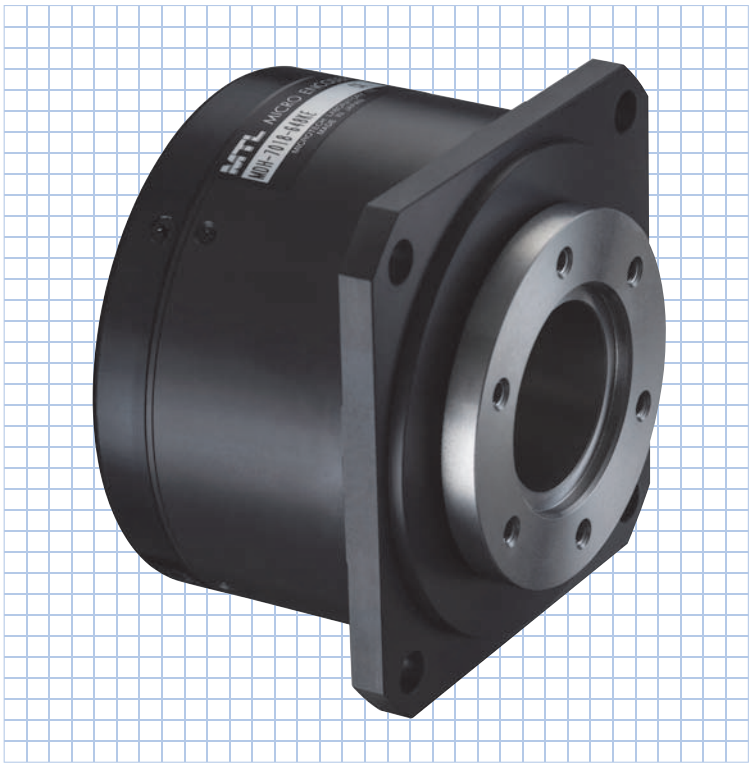
	Unit	MDS-4006	MDH-4006	MDS-4012	MDH-4012	MDS-4018	MDH-4018
Input power (Driver input)	DCV	48					
Maximum speed	rpm	450					
Rated speed	rpm	450					
Peak torque at stall	Nm	0.33		0.70		1.0	
Rated torque	Nm	0.12		0.20		0.28	
Continuous rated torque	Nm	0.10		0.16		0.23	
Peak power	W	14		27		40	
Peak power 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℃)	Nm/Arms	0.058		0.096		0.10	
Line armature resistance (at25℃)	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^2	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.

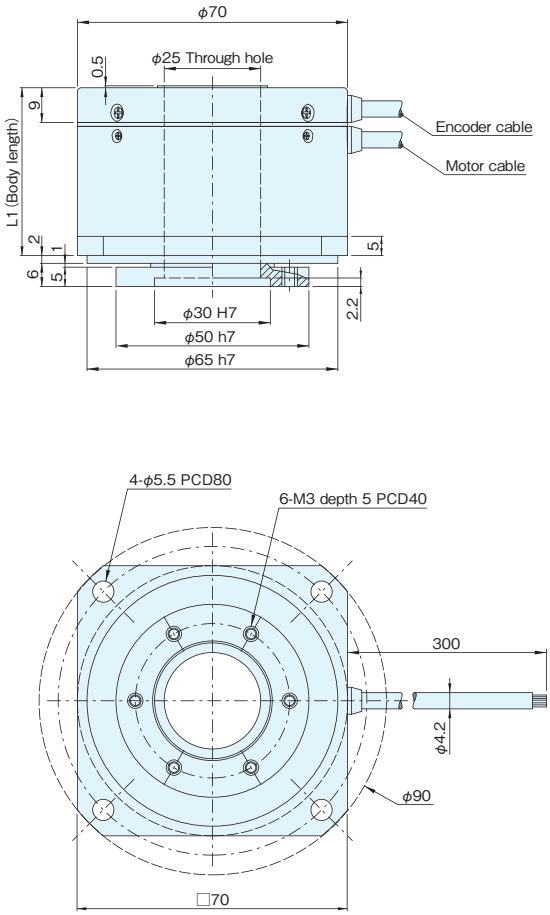
MDH-70 series (Characteristic example)

MDH-70

[The photo is full size]



Outer Dimensions



Standard models

MDH−70△−648KE (Incremental)
MDH−70△−21B (Absolute)
△: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

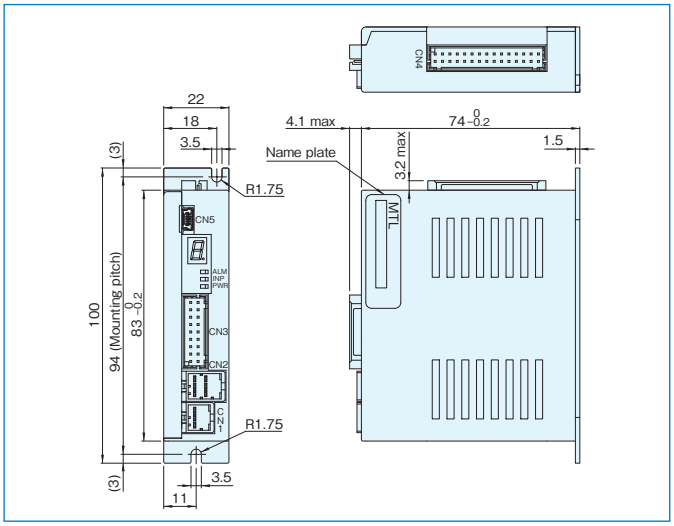
	Unit	MDH−7006	MDH−7012	MDH−7018
Input power (Driver input)	DCV	48		
Maximum speed	rpm	200		
Rated speed	rpm	200		
Peak torque at stall	Nm	1.0	2.2	3.1
Rated torque	Nm	0.36	0.66	1.0
Continuous rated torque	Nm	0.36	0.66	1.0
Peak power	W	30	60	90
Peak power rate	kW/s	24	83	147
Peak armature current	Arms	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℃)	Nm/Arms	0.13	0.22	0.30
Line armature resistance (at25℃)	Ω	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^2	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.

Dedicated driver unit MC series

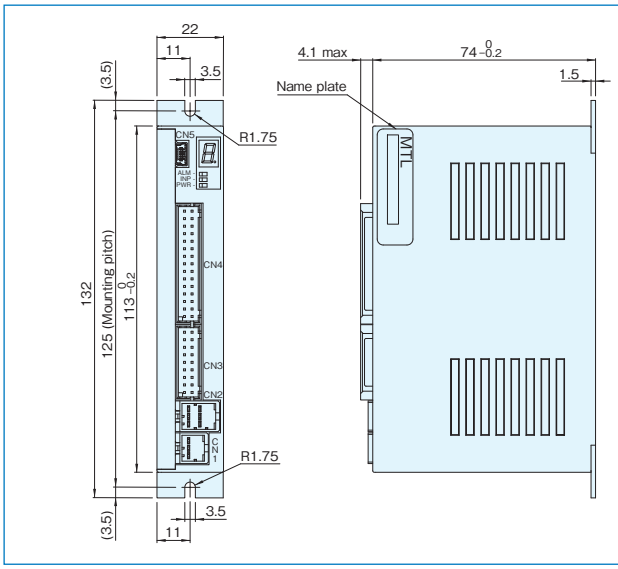
MC-110-2406

MC-110-2406 Outer Dimensions



MC-110-4810

MC-110-4810 Outer Dimensions



MC-110 series specifications

	MC-110-2406	MC-110-4810
Supply power	DC24V(20~40)	DC48V(20~60)
Continuous output current	2.0Arms	6.0Arms
Peak output current	5.6Arms	10.0Arms
Drive type	Sine wave PWM drive (20 kHz)	
Protection functions	Overcurrent, overload, overvoltage, undervoltage, heat, encoder error, damage prevention by fuse	
Communication functions	USB2.0 mini-B parameter settings, speed/position control, status monitoring	
Speed position commands	Forward/reverse pulse series method, pulse/direction method, 2-phase pulse series method	
Torque commands	Voltage command (0 to +10V) While in torque control mode	
Auxiliary signal inputs	Servo on, alarm reset, suppression mode, torque/speed control, zero point return, other general-purpose inputs	
Signal outputs	In-position, alarm, encoder A, B, Z, analog monitor output (current/speed/position difference), U, V phase output current values	
Communication specifications	9600, 19200, 38400 bps, data bits: 8, no parity, stop bits: 1, no flow control	
External dimensions	83×74×22mm	113×74×22mm
Mass	110g	140g
Dedicated application	Download the MC-110 software package from the software download page at https://www.mtl.co.jp	

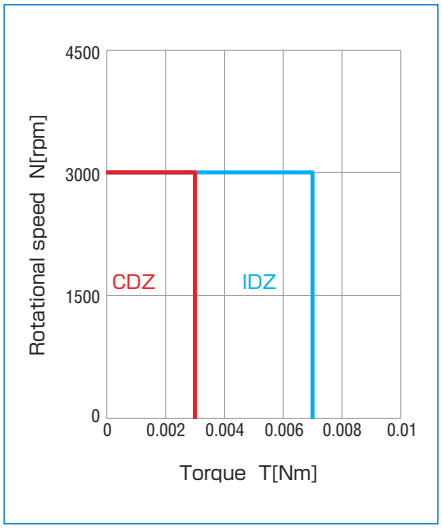
Various cables

Model	Type	No. of cores	Length
CN1 cable(4.2)1M-TE	Power cable	2	1m
CN4 cable MC-110	Flat cable for interface	30	1m
CN5 cable	USB2.0 cable	mini-B	1m

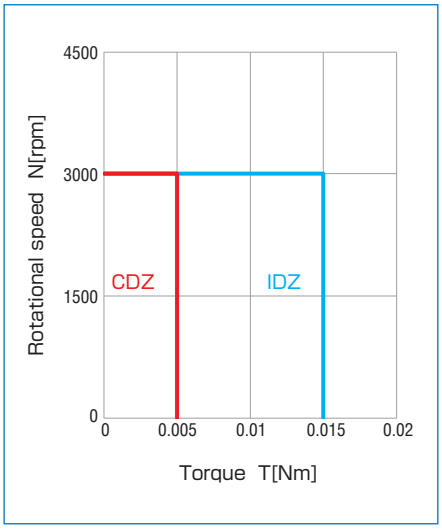
Model	Type	No. of cores	Length
CN2 bent cable(4.2)0.7M	Motor extension cable	3	0.7m
2.7M			2.7m
4.7M			4.7m
CN3 bent cable(4.2)0.7M	Encoder extension cable	14	0.7m
2.7M			2.7m
4.7M			4.7m

Speed/torque characteristic examples

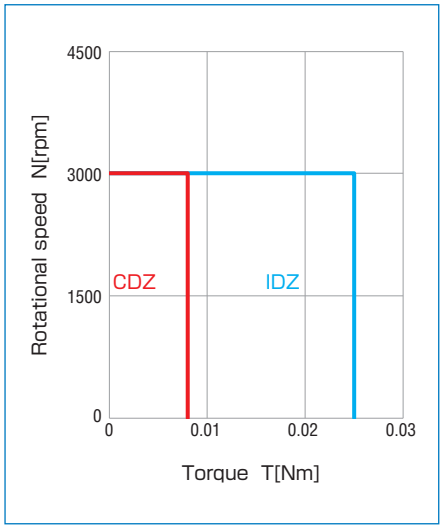
MDS-1306



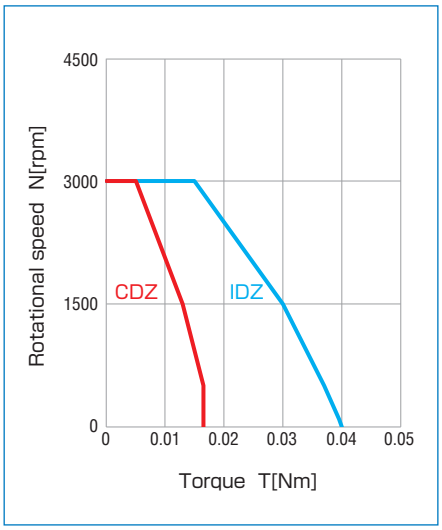
MDS-1312



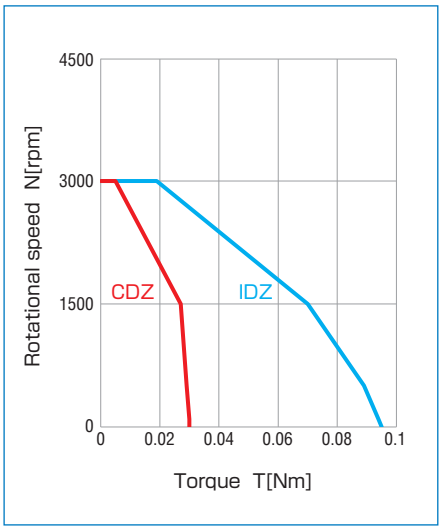
MDS-1318



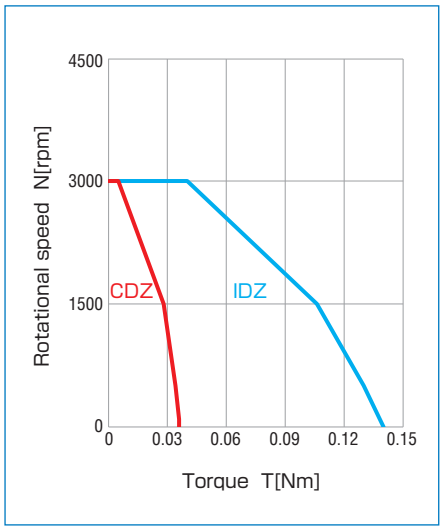
MDS/H-2006



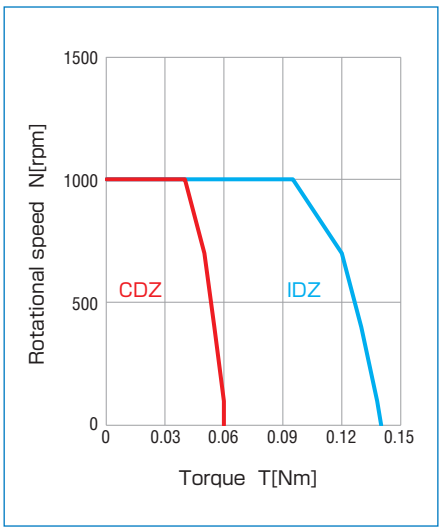
MDS/H-2012



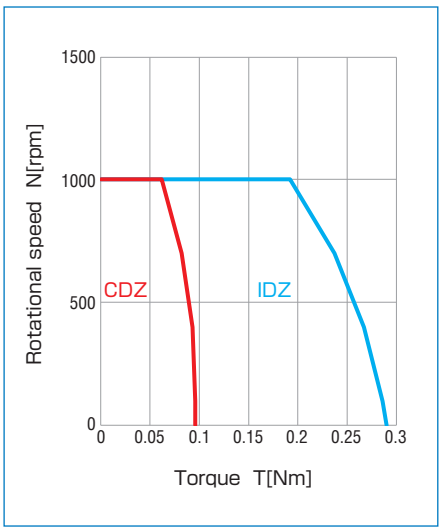
MDS/H-2018



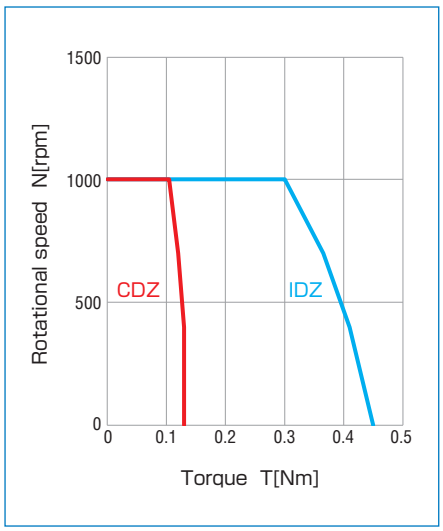
MDS/H-3006



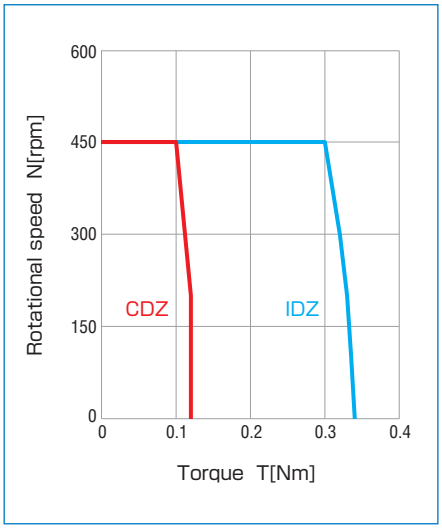
MDS/H-3012



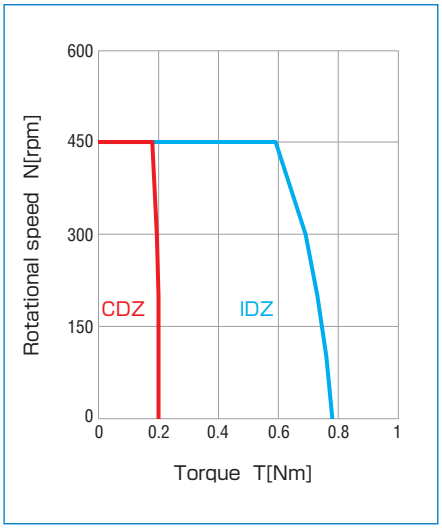
MDS/H-3018



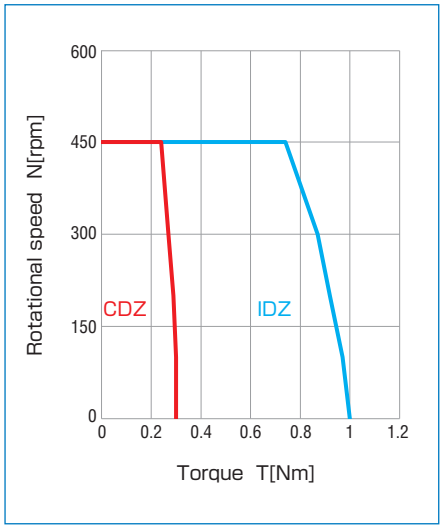
MDS/H-4006



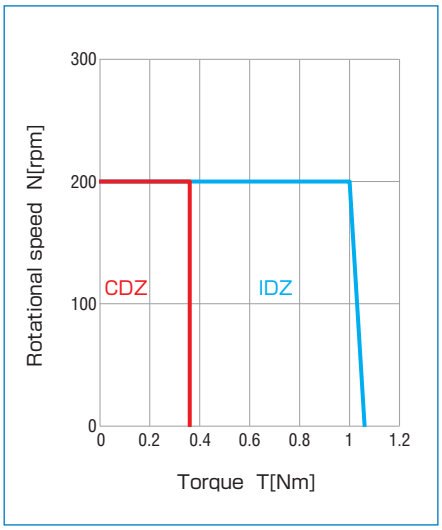
MDS/H-4012



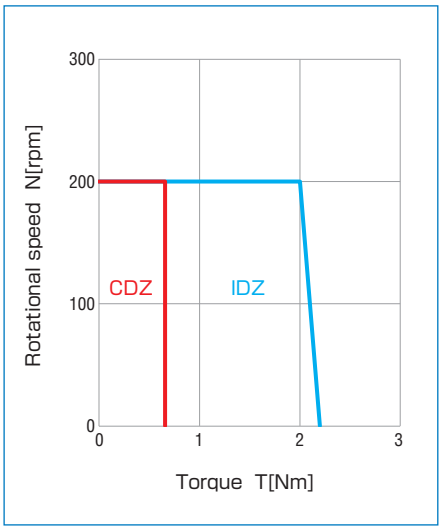
MDS/H-4018



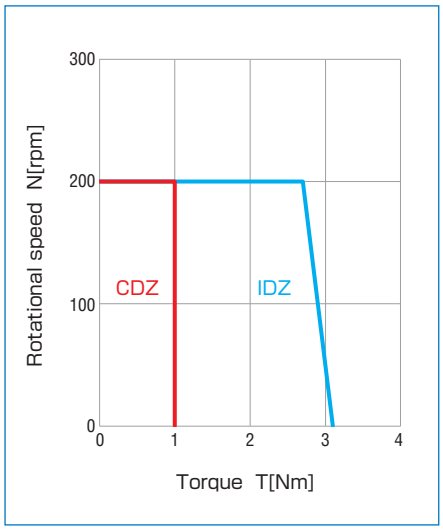
MDH-7006



MDH-7012



MDH-7018



Notes

Usage regimes

①Continuous usage regime (CDZ)

Indicates the range of continuously operable torques and speeds.
The continuous operation range is the value when measures with the standard heat sink at the bottom of each spec table is fitted to the motor under an ambient temperature of 40°C.

②Intermittent usage regime (IDZ)

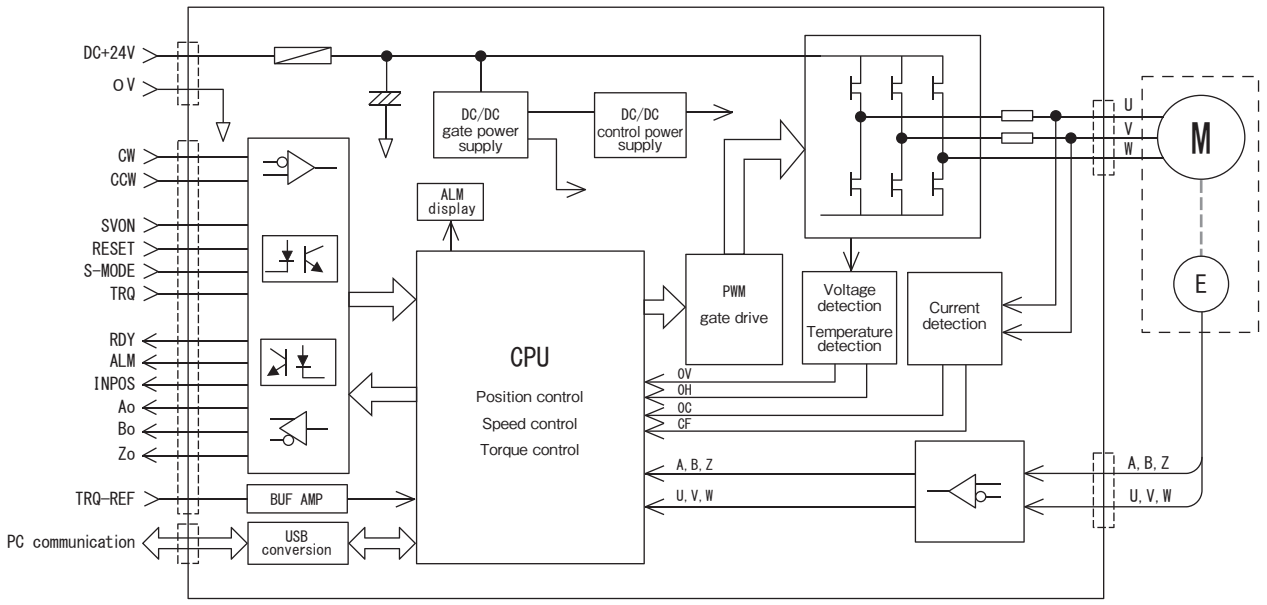
The range that can be used such as during short intermittent operation, startup, acceleration, deceleration, etc.
Refer to the overload duty characteristics in the separate document for details on the limits on torque and operation time during intermittent use. (Check the website or contact us)

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.

Dedicated driver unit MC-110 series

System block diagram



Micro Direct Drive Motor
MD series

■This product, you may want to change without notice because the development of binding products.
■For inquiries about these products, contact the following coordinator at our company.

E-mail: motor@mtl.co.jp <Coordinator: Motor unit: Nomura>

MTL MICROTECH LABORATORY INC.

■**Head office:** 8-1-46 Honcho, Kamitsuruma, minami-ku Sagamihara-shi Kanagawa 252-0318, Japan
PHONE.81-42-746-0123 FAX.81-42-746-0960

https://www.mtl.co.jp/en.html

201710MD-06E