

# Product Specification

Product Name

MDH-70◇◇-\*\*\*E

Type

MD-70 Series

Product No.

S52050, S52060, S52070

Specification No.

LAC16D05-6

Technical No.

LC-16D09

Date Of Issue

2017 / 05 / 15

Last Revision Date ( Revision No. )

2020 / 04 / 09 ( Rev. 6 )

Product Summary

- Body diameter  $\phi$  70mm
- Incremental encoder (With hall sensor (CS phase))
- Cable length 0.3m (With connector for driver (MC-110) connection)

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# 1. Specification

## 1-1. Motor Specifications (1)

Motor Model	MDH-70◇◇-***E		
	MDH-7006-***E	MDH-7012-***E	MDH-7018-***E
Motor Type	Three-phase AC servomotor, Permanent magnet		
Rotor Poles	20 P		
Input Power (Driver Input)	DC48V		
Peak Armature Current	13 Arms	16 Arms	19 Arms
Rated Armature Current (※)	2.8 Arms	3.0 Arms	3.5 Arms
Voltage Constant	13 V/(kr/min)	23 V/(kr/min)	31 V/(kr/min)
Peak Power	30 W	60 W	90 W
Peak Power Rate	24 kW/sec	83 kW/sec	147 kW/sec
Line Armature Resistance (at 25°C)	2.1 Ω	1.9 Ω	1.8 Ω
Line Amature Inductance	$2.6 \times 10^{-3}$ H	$3.1 \times 10^{-3}$ H	$3.3 \times 10^{-3}$ H
Armature Insulation Resistance	100MΩ or more ※DC500V		
Armature Insulation Withstand Voltage	AC500V 1minute		
Motor Height (◇◇)	[06] 31.5 mm	[12] 37.5 mm	[18] 43.5 mm
Moment Of Inertia ※ J=GD <sup>2</sup> /4	$6.55 \times 10^{-5}$ kg · m <sup>2</sup>	$8.24 \times 10^{-5}$ kg · m <sup>2</sup>	$9.92 \times 10^{-5}$ kg · m <sup>2</sup>
Maximum Speed	200 r/min		
Rated Speed	200 r/min		
Peak Stall Torque	1.0 N·m	2.2 N·m	3.1 N·m
Rated Stall Torque	0.36 N·m	0.66 N·m	1.0 N·m
Continuous Rated Torque	0.36 N·m	0.66 N·m	1.0 N·m
Torque Constant (at 25°C)	0.13 N·m/Arms	0.22 N·m/Arms	0.30 N·m/Arms
Maximum Shaft Loads	Radial load Fr : 500N 、 Axial load Fa : 250N		
Load Reference Point Distance La	27.0 mm	33.0 mm	38.9 mm

※ Rated armature current is the value measured with the standard heat sink attached to the motor at an ambient temperature of 40°C



# 1. Specification

## 1-1. Motor Specifications (2)

Motor Model	MDH-70◇◇-***E		
	MDH-7006-***E	MDH-7012-***E	MDH-7018-***E
Operating Environment	Temperature : 0°C~+40°C、Humidity : 10%~85%RH (However, without condensation)		
Storage Environment	Temperature : -20°C~+60°C		
Vibration Resistance	Endurance 25 m/s <sup>2</sup> (About 2.5G) 10Hz~400Hz		
Shock Resistance	Endurance 300 m/s <sup>2</sup> (About 30G) 3 times each in the XYZ direction (Except for the impact on the shaft)		
Thermal Class	B type		
Standard Heat Sink Size	225×225×10 Aluminum		
Cable	Motor Cable : Outer diameter φ 4.2(3 cores)fluorine wire, bent insulated shield cable(300mm) Encoder Cable : Outer diameter φ 4.2(14 cores)fluorine wire, bent insulated shield cable (300mm)		
Mass	530 g (Cable included)	650 g (Cable included)	770 g (Cable included)
Outline Drawing	See attachment		
Accessories	None		
Notices	None		

# 1. Specification

## 1-2. Encoder Specifications (1)

Motor Model	MDH-70◇◇-***E		
Encoder Model	ME-59-■■■■PE	ME-59-1024PST#E (Split circuit built-in specificataion)	ME-59-12960PST#E (Split circuit built-in specificataion)
Detection Type	Incremental type (With hall sensor (CS phase) )		
Phase	A、/A、 B、 /B、 Z、 /Z (Incremental phase) U、 /U、 V、 /V、 W、 /W (Hall sensor (CS phase) )		
Form	Square wave, Line driver output		
Resolution(***) = Interpolation Circuit (■■■■) Interpolated Circuit (■■■■×#)  (A, B Phase )	1024  12960 P/R	2048 = 1024 × 2 4096 = 1024 × 4 5120 = 1024 × 5 8192 = 1024 × 8 10240 = 1024 × 10 16384 = 1024 × 16 20480 = 1024 × 20 32768 = 1024 × 32 P/R	324000 = 12960 × 25 414720 = 12960 × 32 648000 = 12960 × 50 829440 = 12960 × 64 1296000 = 12960 × 100 1620000 = 12960 × 125 1658880 = 12960 × 128 2592000 = 12960 × 200 3240000 = 12960 × 250 3317760 = 12960 × 256 5184000 = 12960 × 400 6480000 = 12960 × 500 6635520 = 12960 × 512 P/R
		※When the resolution(*** )is a multiple of 1000, the resolution on the motor is expressed as 1000="K" ex) 6480000 P/R → 6480K	
Phase Difference	T/4 ± T/8		
Waveform Ratio	—	T ± 0.3T	
Z Phase	T ± T/2	1T ※Synchronize to B phase 1T	

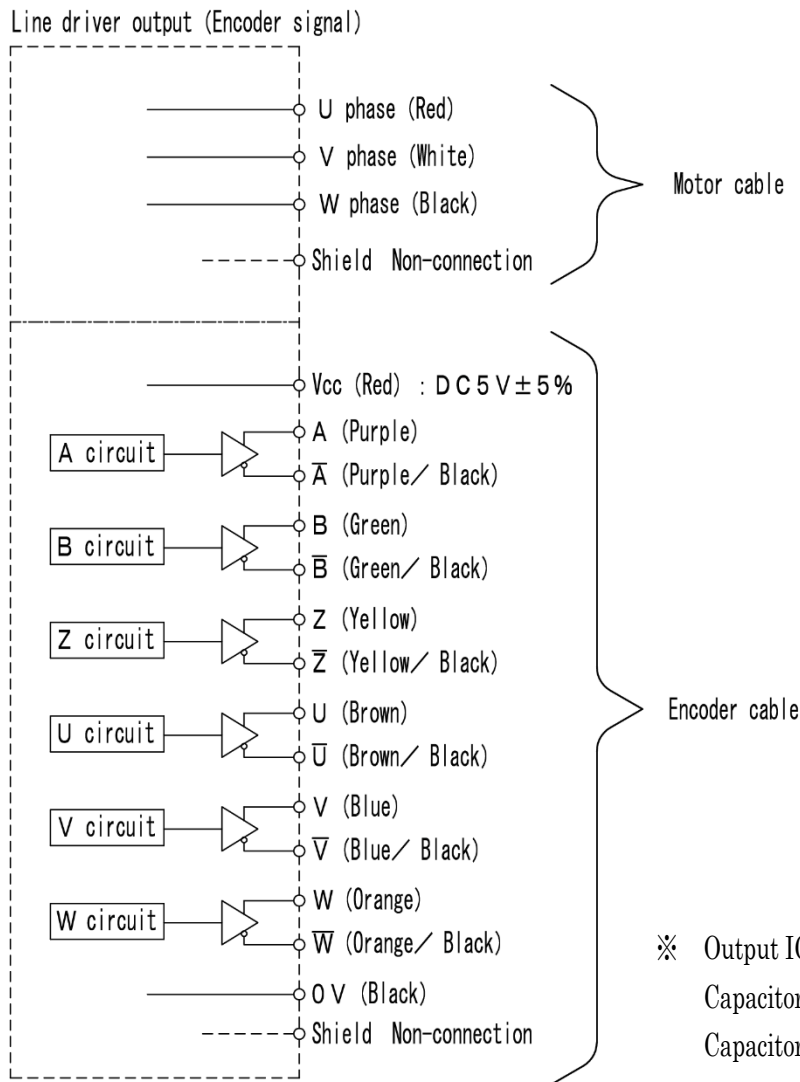


# 1. Specification

## 1-2. Encoder Specifications (2)

Motor Model	MDH-70◇◇-***E		
Encoder Model	ME-59-■■■PE	ME-59-1024PST#E (Split circuit built-in specificataion)	ME-59-12960PST#E (Split circuit built-in specificataion)
Encoder Power Supply Voltage	DC5V ± 5%		
Current Consumption	300 mA or less (at no load)		
Maximum Response Frequency	60 kHz	60 kHz × [#]Number of devision (Max 1.8MHz)	3MHz
Wave Rise Time	0.5 μs or less (Cable 1m or less)		
Capacity	$V_{OH} = 2.5V$ or more, $V_{OL} = 0.5V$ or less, $I_O = \pm 20mA$ or less		
Notices	None		

## 2. Connection Diagram



• Motor cable

Color	Red	White	Black	Shield
Signal	U phase	V phase	W phase	—

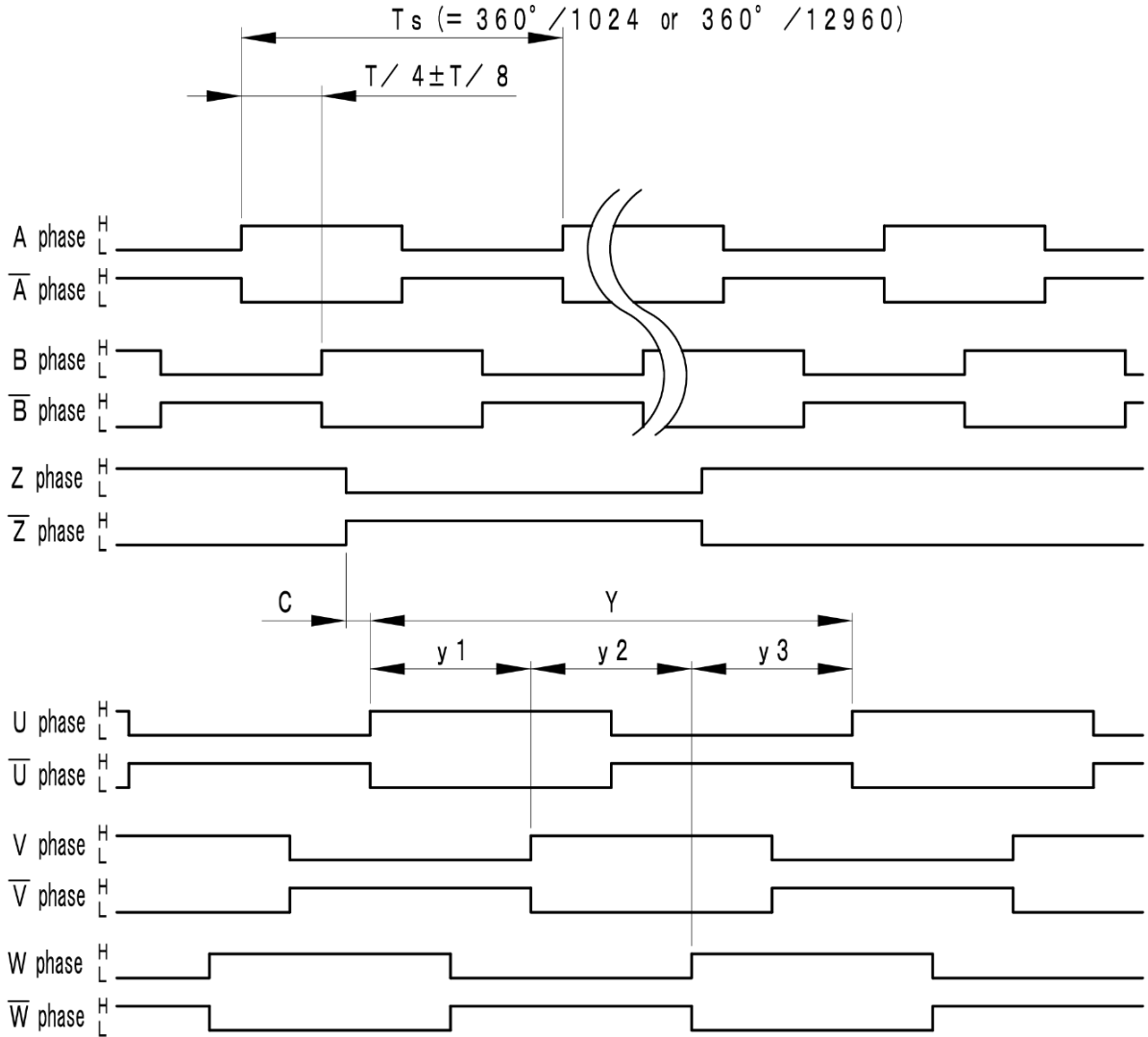
• Encoder cable (Incremental phase, Hall sensor output signal)

Color	Red	Black	Purple	Purple/Black	Green	Green/Black	Yellow	Yellow/Black
Signal	Vcc	0V	A phase	/A phase	B phase	/B phase	Z phase	/Z phase
Color	Brown	Brown/Black	Blue	Blue/Black	Orange	Orange/Black	Shield	
Signal	U phase	/U phase	V phase	/V phase	W phase	/W phase	—	

### 3. Waveform Diagram

#### 3-1. Interpolation Circuit

※ CW rotation (Clockwise from the mounting surface)



- CS phase
- Mechanical angle between Z phase and U phase :  $C = \pm 1^\circ$
  - 1Y mechanical angle :  $Y = 36^\circ \pm 1^\circ$
  - 1y (=Y/3) mechanical angle :  $y_1 \sim y_3 = 12^\circ \pm 1^\circ$

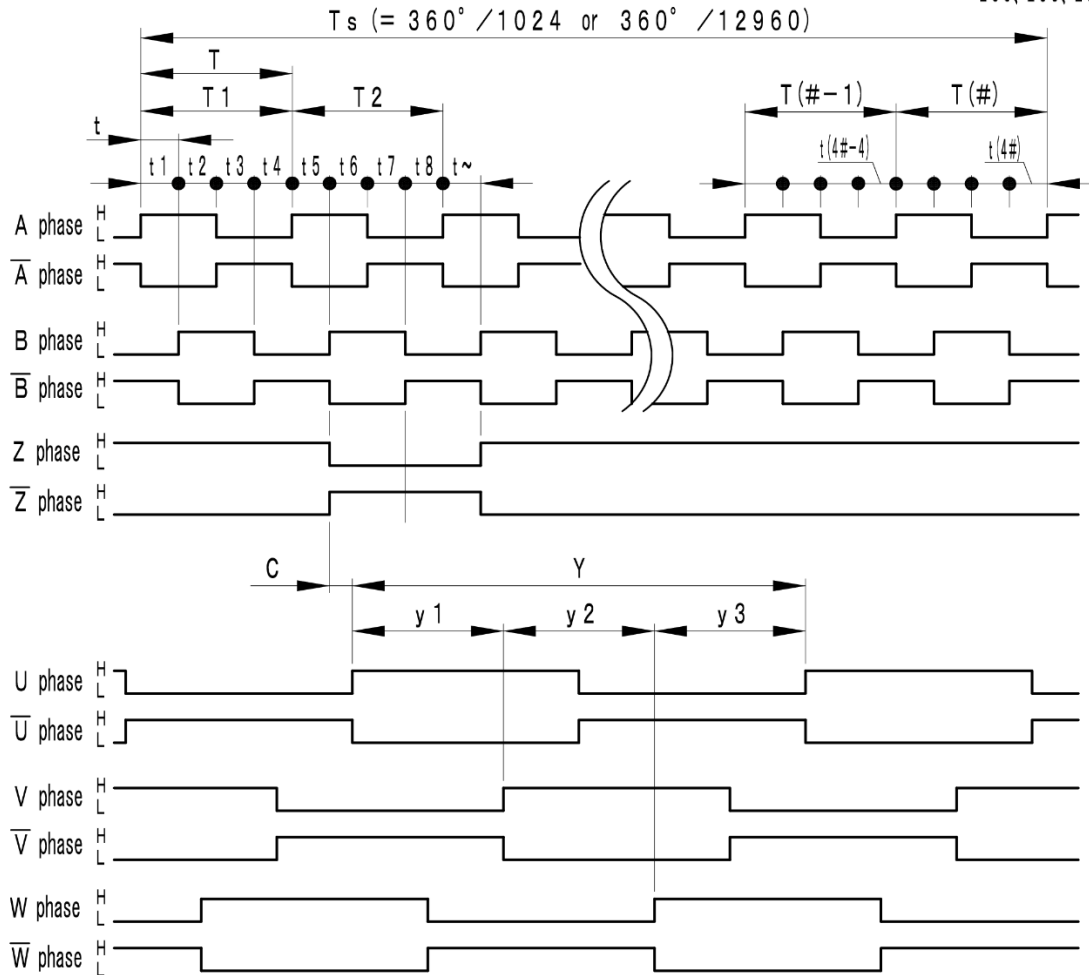


## 3. Waveform Diagram

### 3-2. Interpolated Circuit

※ #: Number of division  
 (Ts=360°/1024:  
 2, 4, 5, 8, 10, 16, 20, 32  
 Ts=360°/12960:  
 25, 32, 50, 64, 100, 125, 128,  
 200, 250, 256, 400, 500, 512)

※ CW rotation (Clockwise from the mounting surface)



- A, B phase
  - $1T (=T_s / \#)$  waveform ratio :  $T_1 \sim T(\#) = T \pm 0.3T$
  - The phase difference between adjacent A and B phases of division :  $T/4 \pm T/8$
  - $1t (=T/4)$  waveform ratio :  $t_1 \sim t(4\#) = t \pm 0.3t$
- Z phase
  - $Z = 1.0T$  (Synchronize to B phase  $1T$ )
- CS phase
  - Mechanical angle between Z phase and U phase :  $C = \pm 1^\circ$
  - $1Y$  mechanical angle :  $Y = 36^\circ \pm 1^\circ$
  - $1y (=Y/3)$  mechanical angle :  $y_1 \sim y_3 = 12^\circ \pm 1^\circ$

Waveform example (A, B phase)

