

# HarmonicDrive®

## FHA IP65 480V Rotary Actuator



Harmonic Drive® FHA series actuators are now available with IP65 rating and with an additional voltage option of 480VAC.

**New!** FHA-C Series servo actuators are now available with IP65 protection. Four sizes are available: 17, 25, 32 and 40. The IP65 rated FHA-C actuator is ideal for harsh environments. With IP65 and 480V, the FHA actuator is well suited for machine tool, packaging, and wash-down applications.

These rotary servo actuators utilize Harmonic Drive® precision gears combined with a performance matched brushless servo motor. Encoder options now include EnDat® & HIPERFACE®. The FHA has a low-profile form factor and features a hollow-output shaft. This hollow shaft feature may be used to pass cables, tubing or lasers through the axis of rotation.

The FHA series is designed to operate with a wide range of third-party servo drives including Bosch, Mitsubishi, Siemens, and Kollmorgen.

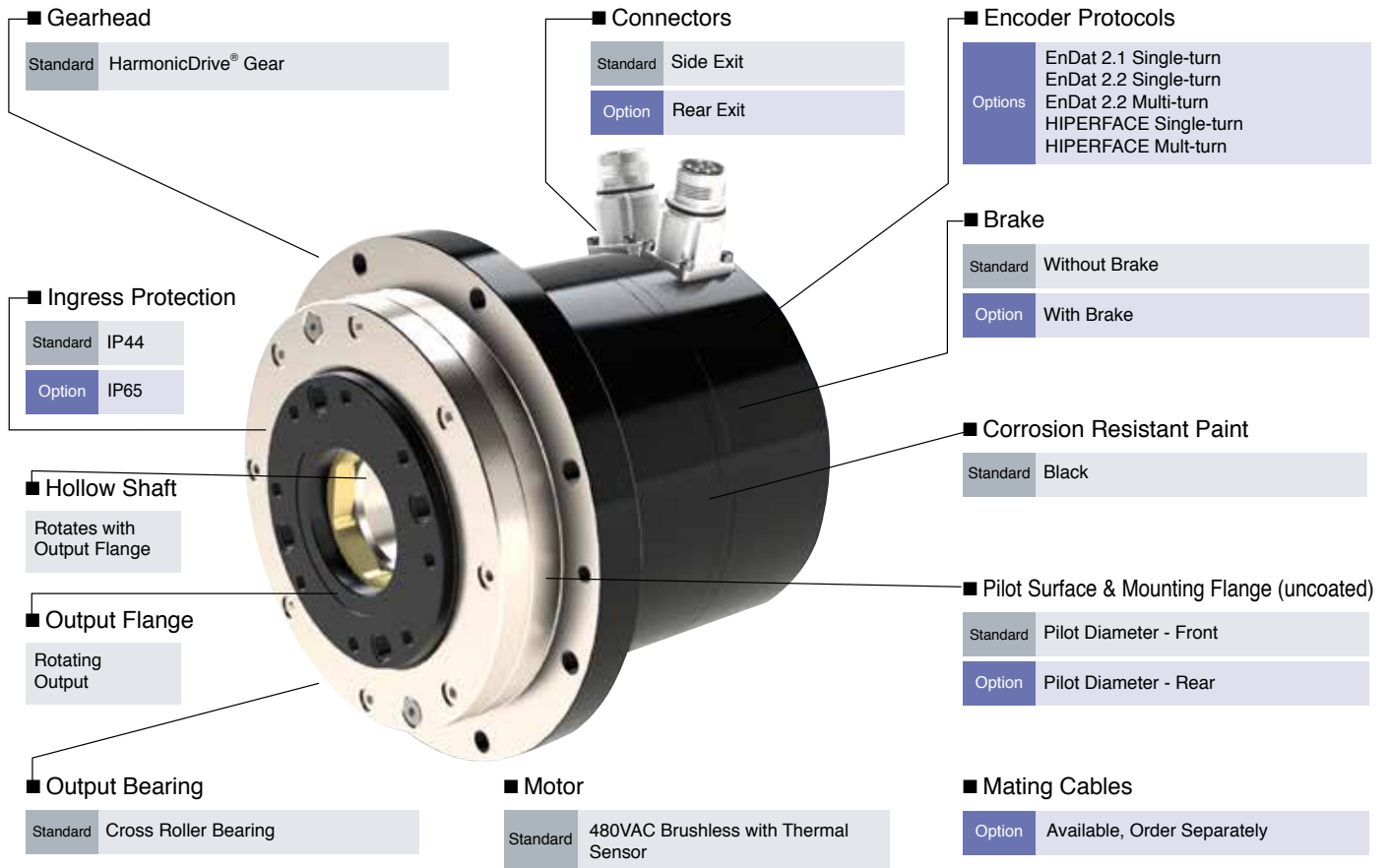


### Features

- IP65 Rating
- 480VAC\*
- EnDat® & HIPERFACE® Encoder Protocols
- DESINA style flex rated cables

\* Contact us for additional voltage options.

## Options



## Ordering Code

Series	Size	Design	Ratio	Winding Voltage	Brake	Motor Feedback	Option
FHA	17	C	50	H <sup>*1</sup>	B	SE032SC	KP
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(2) Size	(3) Design	(4) Ratio	(5) Winding Voltage
17	C	50, 100, 160	H (680VDC) <sup>*1</sup>
25			
32			
40			

(6) Brake Option	
Blank	Without Brake
B	With Brake

\*1 Contact us for voltage options.

(7) Motor Feedback	Protocol	Type
SE032SC	EnDat2.1 with Sin-Cos	Single-turn Absolute
SE19b22	EnDat2.2 (Full Digital)	Single-turn Absolute
ME19b22	EnDat2.2 (Full Digital)	Battery Buffered Multi-turn Absolute
SH064SC	HIPERFACE	Single-turn Absolute
MH064SC	HIPERFACE	Multi-turn Absolute

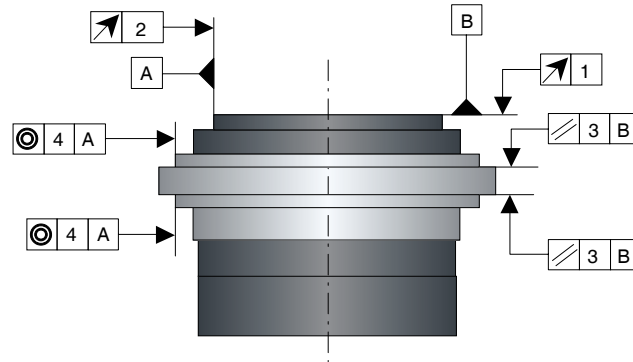
(8) Options	
K	Connector Rear Exit (Standard: Side Exit)
P	IP65 (Standard: IP44)
R	Pilot Diameter - Rear (Standard: Pilot Diameter - Front)
T	Temperature Sensing Provided within EnDat 2.2 Protocol (Standard: Separate conductors within feedback cable)

## ■ Mechanical Accuracy

Unit: mm (inch)

	FHA-17C	FHA-25C	FHA-32C	FHA-40C
1. Axial run-out of output flange	0.010 (0.00039)	0.012 (0.00047)	0.012 (0.00047)	0.014 (0.00047)
2. Radial run-out of output flange	0.010 (0.00039)	0.012 (0.00047)	0.012 (0.00047)	0.014 (0.00047)
3. Parallelism of output flange and mounting flange	0.040 (0.000157)	0.050 (0.000197)	0.050 (0.000197)	0.060 (0.000197)
4. Concentricity of output flange to mounting pilot	0.040 (0.000157)	0.050 (0.000197)	0.050 (0.000197)	0.060 (0.000197)

Note: All values are T.I.R. (Total Indicator Reading).

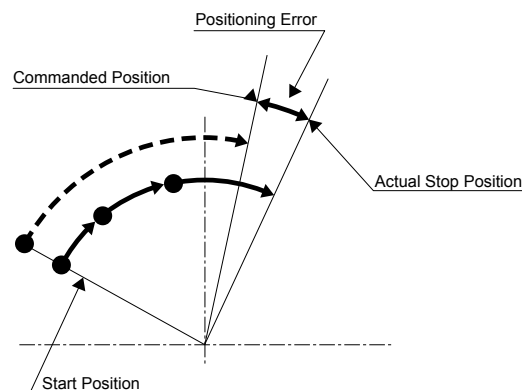


## ■ Positioning Accuracy

### One-Way Positioning Accuracy

The one-way positioning accuracy is defined as the maximum positional difference between the commanded position and the actual stop position when a series of positioning moves are performed in the same rotation direction. (Refer to JIS B-6201-1987).

The FHA-C actuator incorporates a Harmonic Drive gear which inherently has high rotational position accuracy. Because of the gearing's high ratio, any rotational error at the input (i.e. motor shaft position error or motor feedback error) is reduced by a factor of the ratio ( $1/\text{ratio}$ ) and typically becomes negligible at the output. Therefore most of the error is represented by the transmission error of the Harmonic Drive gear itself.



The one-way positioning accuracy is shown in the table below:

Unit: arc-sec

Ratio \ Model	FHA-17C	FHA-25C	FHA-32C	FHA-40C
50:1	60	40	40	40
100:1, 160:1	40	30	30	30

# Specifications

(Bus voltage 680VDC)

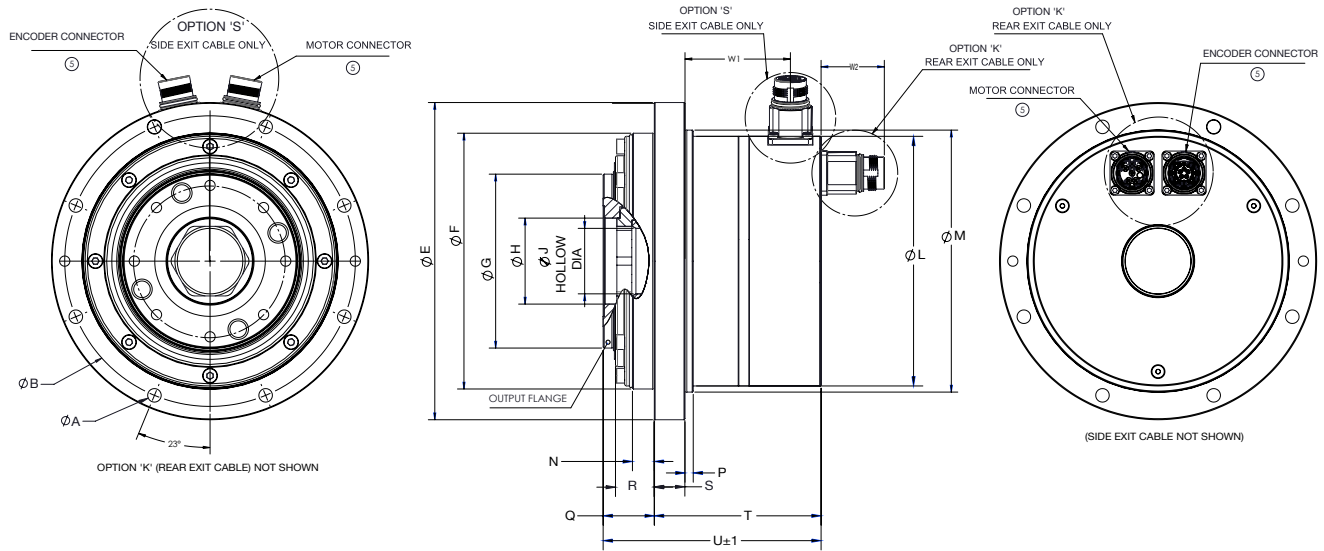
Item		Model	Symbol	FHA-17C-H			FHA-25C-H			FHA-32C-H			FHA-40C-H		
Ratio				50	100	160	50	100	160	50	100	160	50	100	160
Maximum Torque	N•m	T <sub>M</sub>		39	57	64	151	233	261	281	398	453	500	686	823
Maximum Current	A <sub>rms</sub>	I <sub>M</sub>		1.4	1.1	0.8	3.9	3	2.2	6.5	4.7	3.5	9.3	6.4	5.0
Continuous Torque	N•m	T <sub>C</sub>		15	23	23.2	40	72	90	60	153.5	240	90	234	400
Continuous Current	A <sub>rms</sub>	I <sub>C</sub>		0.65	0.55	0.45	1.3	1.3	1.25	2	2	1.9	2.4	2.4	2.4
Maximum Speed	rpm	N <sub>M</sub>		96	48	30	90	45	28.1	80	40	25	70	35	21.9
Torque Constant	N•m/A <sub>rms</sub>	K <sub>T</sub>		37	75	120	42	86	138	49	100	160	59	120	193
Motor EMF Constant (Line-Line)	V <sub>rms</sub> /(krpm)	V <sub>EMF</sub>		50			57			67			80		
	V <sub>rms</sub> /(rad/s)			0.48			0.55			0.64			0.77		
Phase Resistance (20°C, Line-Line)	Ω	R		64			22.4			7.8			5.6		
Phase Inductance (Line-Line)	mH	L		42			20			9.8			11.2		
Number of Pole Pairs	p	P		6			6			6			6		
Allowable Axial Load	kN	L <sub>A</sub>		9.8			14.7			24.5			39.2		
Allowable Radial Load	kN	L <sub>R</sub>		2.9			4.9			9.5			14.7		
Allowable Moment Load	Nm	L <sub>M</sub>		188			370			530			690		
Moment Stiffness	N•m/rad			220 x 10 <sup>3</sup>			490 x 10 <sup>3</sup>			790 x 10 <sup>3</sup>			1400 x 10 <sup>3</sup>		
One-Way Positional Accuracy	arc-sec			60	40	40	40	30	30	40	30	30	40	30	30
Feedback Type <sup>*1</sup>				Single-turn absolute (EnDat and HIPERFACE) Multi-turn absolute (EnDat)			Single-turn absolute (EnDat and HIPERFACE) Multi-turn absolute (EnDat)			Single-turn absolute (EnDat and HIPERFACE) Multi-turn absolute (EnDat)			Single-turn absolute (EnDat and HIPERFACE) Multi-turn absolute (EnDat)		
Output Shaft Resolution	SE19b22	pls/rev		26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080
	SE032SC	pls/rev		26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080
	ME19b22	pls/rev		26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080	26,214,400	52,428,800	83,886,080
	SH064SC	pls/rev		51,200	102,400	163,840	51,200	102,400	163,840	51,200	102,400	163,840	51,200	102,400	163,840
	MH064SC	pls/rev		51,200	102,400	163,840	51,200	102,400	163,840	51,200	102,400	163,840	51,200	102,400	163,840
Mass	kg	M		3.3			4.6			6.8			10.8		
Mass (with brake)				3.7			5.4			7.7			12.8		
Motor Inertia (without brake) <sup>*2</sup>	EnDat	kg•m <sup>2</sup> (x10 <sup>-4</sup> )	J <sub>A</sub>	1.37			3.95			7.63			19.3		
	HIPERFACE			1.44			3.65			7.33			19.3		
Motor Inertia (with brake) <sup>*2</sup>	EnDat			1.66			4.84			9.00			21.9		
	HIPERFACE			1.73			4.54			8.69			21.9		

The table shows typical values.

\*1 Refer to the manual for details.

\*2 Inertia shown in this table is at input side. To convert to output side, multiply the inertia by (ratio)<sup>2</sup>

## ■ Outline Dimensions



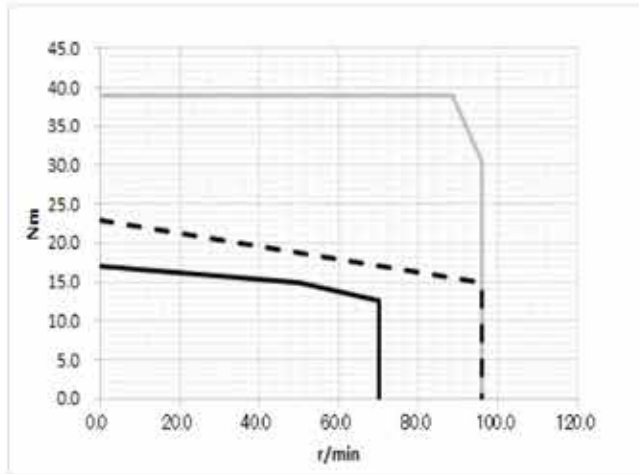
## ■ Dimensions

Model		FHA-17C-H	FHA-25C-H	FHA-32C-H	FHA-40C-H
Item	A	6- $\phi 5.5$ -5.7	8- $\phi 6.6$ -7.0	12- $\phi 6.6$ -7.0	8- $\phi 11$ -11.4
	$\phi B$	118	142	162	208
	$\phi C$	60	74	95	112
D		6-M5	8-M6	16-M6	8-M10
	Depth	8	10	12	15
	$\phi E$	128	155	175	230
Standard	$\phi F$ h7	105	125	140	185
	$\phi M+0.5/-0$	108	128	148	185
R Option	$\phi F+0.5/-0$	105	125	140	185
	$\phi M$ h7	108	128	148	185
	$\phi G$ h7	70	85	105	130
	$\phi H$ H7	25	42	60	60
	$\phi J$ +/-1	18	32	35	43
	$\phi L$	106	123	140	163
		113 <sup>*6</sup>			
	N	6.6	10.7	7.7	11.1
	P	4	4	4	8
	Q	21	25	22	30
R		15.5	20	17	23
		16.7 <sup>*1</sup>	20.5 <sup>*1</sup>	17.6 <sup>*1</sup>	21.1 <sup>*1</sup>
S		12	15	18	22
T		84.5	81.5	107	113.8
		100 <sup>*2</sup>	107.5 <sup>*2</sup>	133 <sup>*2</sup>	134.8 <sup>*2</sup>
U		105.5	106.5	129	143.8
		121 <sup>*2</sup>	132.5 <sup>*2</sup>	155 <sup>*2</sup>	165 <sup>*2</sup>
W1 <sup>*3</sup>		49	52	71	71.7
		64 <sup>*2</sup>	77 <sup>*2</sup>	97 <sup>*2</sup>	92.7 <sup>*2</sup>
W2 <sup>*2</sup>		31	31	31	31

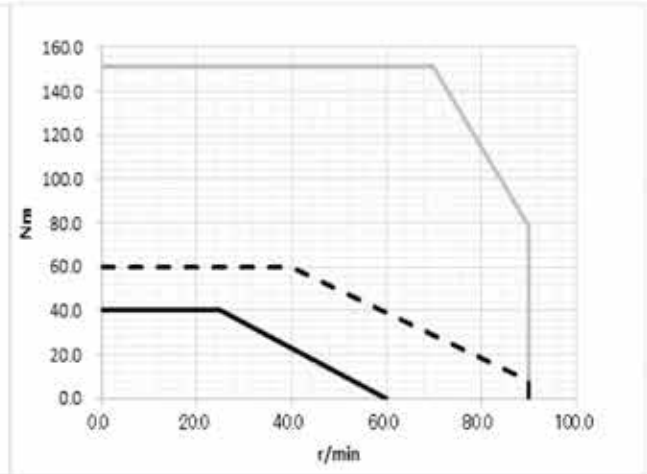
\*1) With option "P" IP65 output seal. \*2) With brake. \*3) Side connectors only. \*4) Option "K" rear connectors only. \*5) Connector positions are swapped for SH064SC encoder option. \*6) Dimension (estimated) for SH064SC option only.

■ Operating Range

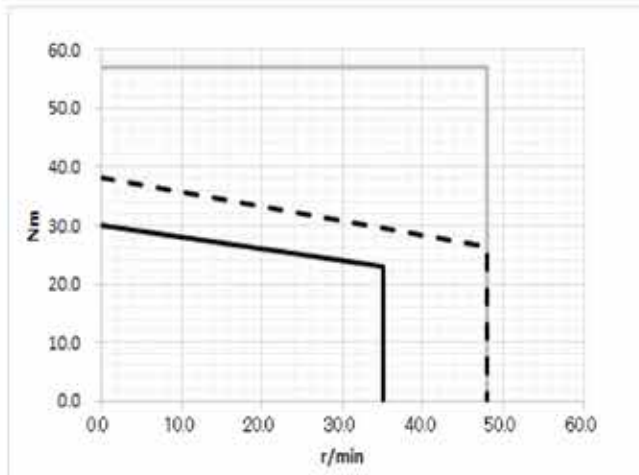
FHA-17C-50-H



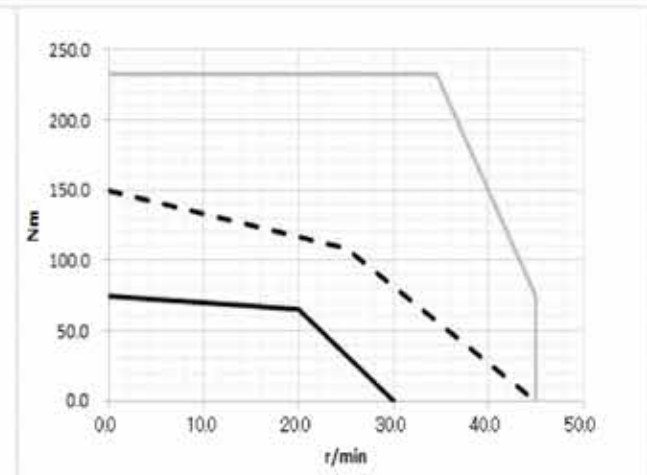
FHA-25C-50-H



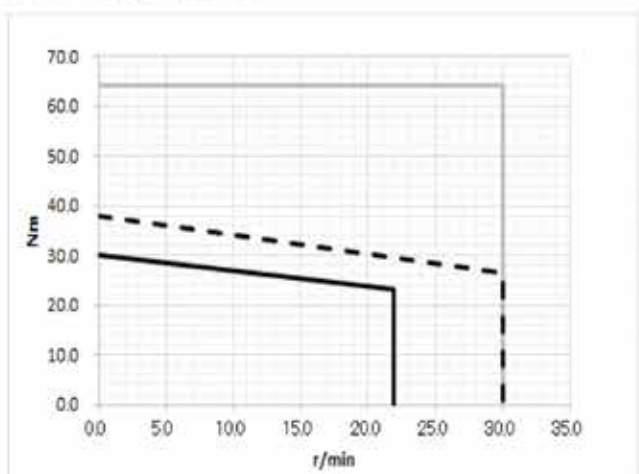
FHA-17C-100-H



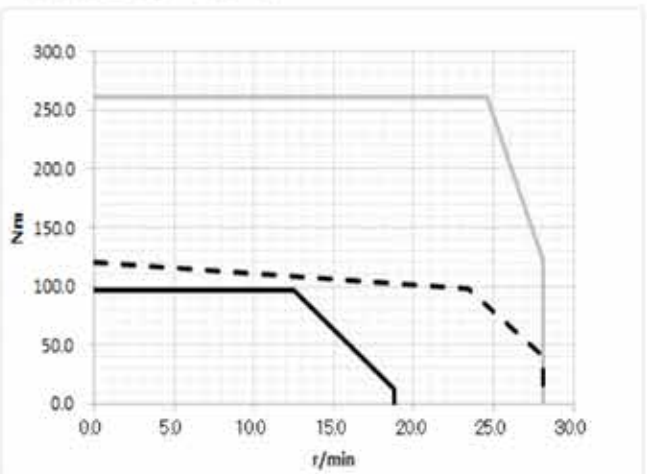
FHA-25C-100-H



FHA-17C-160-H



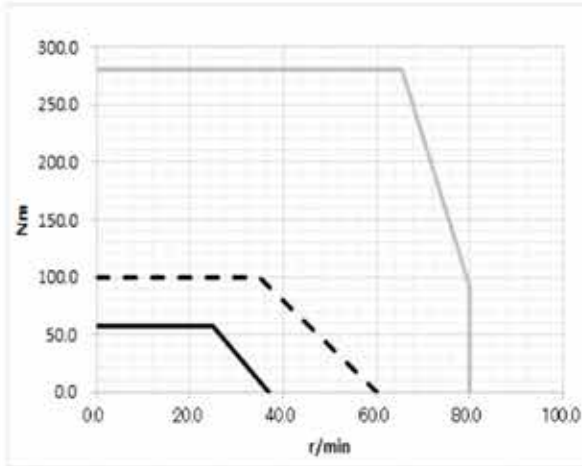
FHA-25C-160-H



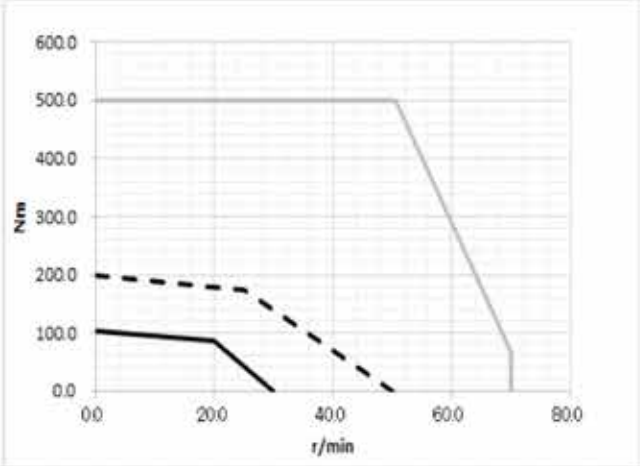
- Instantaneous maximum
- - - 50% duty
- Continuous

■ Operating Range

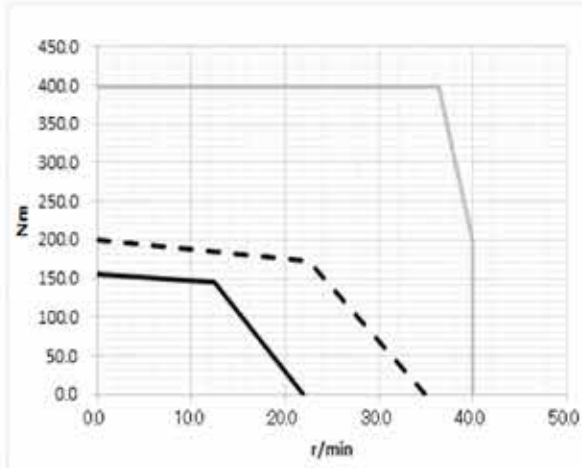
FHA-32C-50-H



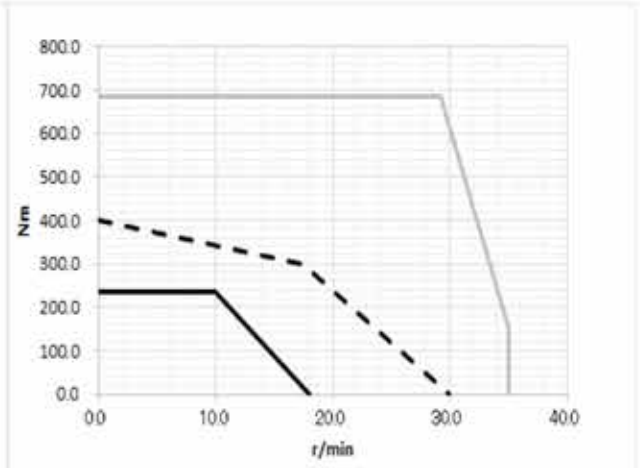
FHA-40C-50-H



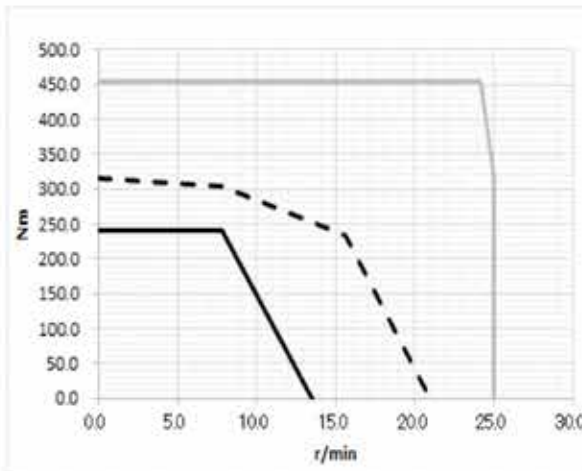
FHA-32C-100-H



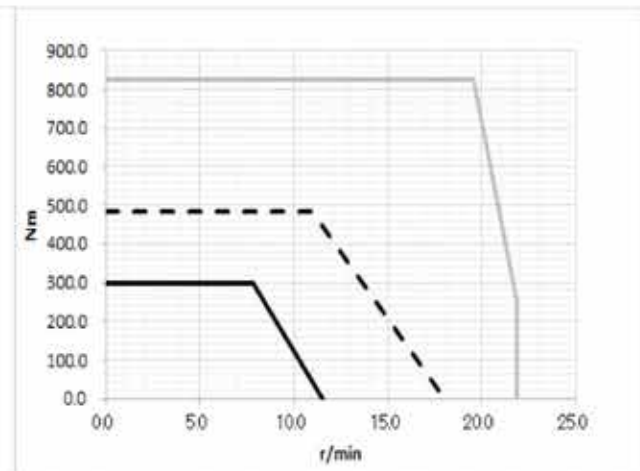
FHA-40C-100-H






FHA-32C-160-H



FHA-40C-160-H

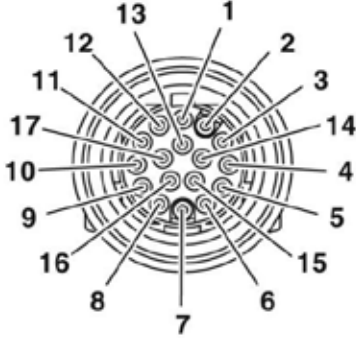


 Instantaneous maximum  
 50% duty  
 Continuous

### Motor Wiring M17 Male Connector



Pin#	Color	Signal Name
1	BLK1	Motor U
3	BLK	Brake 24VDC (No polarity)
4	WHT	Brake 24VDC (No polarity)
6	BLK2	Motor V
7	BLK3	Motor W
PE	GRN/YEL	PE



### Encoder Feedback M17 Male Connector

### Encoder Wiring

Pin#	Mating Cable	Standard Encoder Wiring				Option T Encoder Wiring	
		1590658-ZZ*	1590658-ZZ*	1590658-ZZ*	1590658-ZZ*	1590658-ZZ*	1590658-ZZ*
	Color	SE19b22	SE032SC	ME19b22	SH032SC	SE19b22	ME19b22
1	YEL	-	A+	-	+COS	-	-
2	GRN	-	A-	-	REFCOS	-	-
3	RED	DATA+	DATA+	DATA+	DATA+	DATA+	DATA+
4		-	-	-	-	-	-
5	BLU	CLOCK+	CLOCK+	CLOCK+	-	CLOCK+	CLOCK+
6		-	-	-	-	-	-
7	BRN/BLU	U <sub>p</sub> return 0V	U <sub>p</sub> return 0V	U <sub>p</sub> Return 0V	GND(0V)	U <sub>p</sub> return 0V	U <sub>p</sub> Return 0V
8	GRN/BLK	Thermal sensor+	Thermal sensor+	Thermal sensor+	Thermal sensor+	-	-
9	GRN/RED	Thermal sensor-	Thermal sensor-	Thermal sensor-	Thermal sensor-	-	-
10	BRN/RED	U <sub>p</sub> (5V)	U <sub>p</sub> (5V)	U <sub>p</sub> (5V)	U <sub>p</sub> (12V)	U <sub>p</sub> (5V)	U <sub>p</sub> (5V)
11	BLK	-	B+	-	+SIN	-	-
12	BRN	-	B-	-	REFSIN	-	-
13	ORG2	DATA-	DATA-	DATA-	DATA -	DATA-	DATA-
14	WHT/BLK	CLOCK-	CLOCK-	CLOCK-	-	CLOCK-	CLOCK-
15	BRN/GRY	Sensor 0V	Sensor 0V	Ubat Return	-	Sensor 0V	Ubat Return
16	BRN/YEL	Sensor Up	Sensor Up	Ubat	-	Sensor Up	Ubat
17	SHIELD	SHIELD	SHIELD	SHIELD	SHIELD	SHIELD	SHIELD

\*ZZ = cable length 02 = 2m, 05=5m, 10=10m. Additional lengths are available.

### Mating Cable Type: M17

Length [m]	Cable Assembly Part Number	
	Motor	Feedback
2	1590657-02	1590658-02
5	1590657-05	1590658-05
10	1590657-10	1590658-10

Please contact us for additional lengths or for a custom cable or a cable for a specific drive.



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