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# HarmonicDrive®

## Ultra-Flat Brushless DC Actuators

# FLA Series



### Ultra-Flat Actuators Integrate a High-Performance Speed Reducer and a Brushless DC Motor

The new ultra-flat, ultra-light brushless actuators combine our high-precision/high-performance reducers with a compact, high-output brushless DC motor. FLA actuators are available with our high-speed, high-efficiency Harmonic Planetary® gearhead or with our high-precision, high-torque Harmonic Drive® reducer. This new series targets a broad customer base and is ideal for a wide range of applications such as AGV wheel drives and powered exoskeletons. We offer both 24VDC and 48VDC versions to work with battery-powered applications.



## Features

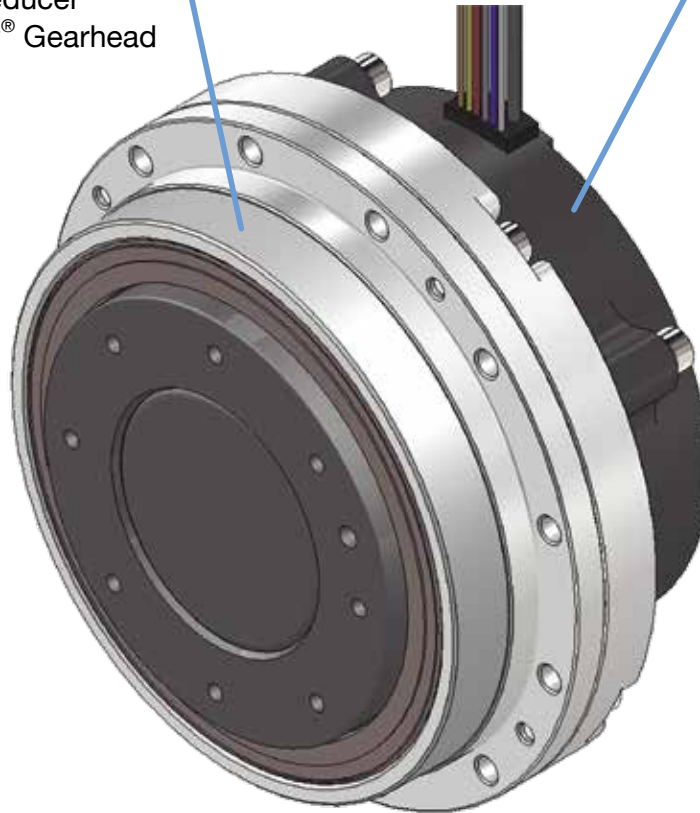
- Ultra-Flat Shape
- Multiple Options Available: Four sizes, three ratios and two voltages
- Light Weight
- Designed to operate with a wide range of third-party servo drives

### Speed Reducer

HarmonicDrive® Reducer  
HarmonicPlanetary® Gearhead

### Brushless DC Motor

Power Voltage: 24V  
48V



## Ordering Code

**FLA** - **11** **A** - **09** **HP** - **H** - **24** - **SP**

(1)            (2) (3)            (4) (5)            (6)            (7)            (8)

(1)	Series	Brushless DC Actuator FLA Series
(2)	Size	11, 14, 17, 20
(3)	Version Symbols	
(4)	Reduction Ratio	HarmonicPlanetary® Speed Reducer 08: 8:1 (Size 11 and 14 only) 09: 9:1 (Size 17 and 20 only) HarmonicDrive® Speed Reducer 50: 50:1 100: 100:1 (Size 11, 14 and 17 only)

(5)	Speed Reducer	FB: HarmonicDrive® Speed Reducer HP: HarmonicPlanetary® Speed Reducer
(6)	Sensor	H: Hall sensor
(7)	Input Power Voltage	24: 24VDC 48: 48VDC
(8)	Special Specification	No Symbol: Standard Product SP: Special Specification Code



HarmonicDrive® Speed Reducer



HarmonicPlanetary® Speed Reducer

Ultra-Flat Shape through  
Dedicated Design



## Output Shaft Resolution

Model	FLA-11A			FLA-14A			FLA-17A			FLA-20A	
Reduction Ratio	8:1	50:1	100:1	8:1	50:1	100:1	9:1	50:1	100:1	9:1	50:1
Output Shaft Resolution [P/R]	240	1,500	3,000	240	1,500	3,000	270	1,500	3,000	432	2,400
Angle Per Pulse [Degrees]	1.5	0.24	0.12	1.5	0.24	0.12	1.3	0.24	0.12	.83	0.15

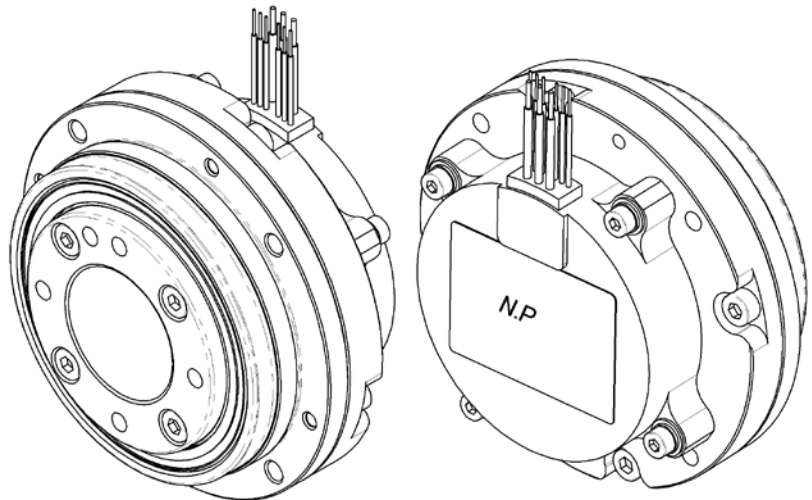
## Motor Wiring

### MAGNETIC POLE SENSOR LEAD WIRE

COLOR	SIGNAL NAME	DESCRIPTION
WHITE	HU	Hall Sensor Output (U-Phase)
GREEN	HV	Hall Sensor Output (V-Phase)
BLUE	HW	Hall Sensor Output (W-Phase)
RED	+5V	Power Input +5 V
BLACK	0V	Power Input 0 V (GND)
YELLOW	TH	Thermistor Output

### MOTOR LEAD WIRE

COLOR	SIGNAL
RED	Motor U-Phase
WHITE	Motor V-Phase
BLACK	Motor W-Phase



# Specifications

## FLA-HP - HarmonicPlanetary® Speed Reducer

### 24VDC

Item		Size	FLA-11A-08HP	FLA-14A-08HP	FLA-17A-09HP	FLA-20A-09HP
Reduction Ratio			8:1	8:1	9:1	9:1
Driver Input Power Voltage	V		24VDC			
Maximum Torque <sup>1</sup>	Nm		1.8	3.7	7.3	12.1
Allowable Continuous Torque <sup>1,2</sup>	Nm		0.6	1.2	3	4.1
Maximum Speed <sup>1</sup>	rpm		500	500	500	400
Allowable Continuous Speed <sup>1,2</sup>	rpm		100	100	100	100
Maximum Current <sup>1</sup>	Arms		8.7	18.0	26.2	31.4
Allowable Continuous Current <sup>1,2</sup>	Arms		3.0	6.0	10.4	10.7
Moment of Inertia (GD <sup>2</sup> /4)	kgm <sup>2</sup>		0.00013	0.00039	0.001	0.0026
Allowable Moment Load	Nm		1.2	1.6	2.0	2.4
Moment Stiffness	Nm/rad		2.0 x 10 <sup>3</sup>	3.3 x 10 <sup>3</sup>	4.4 x 10 <sup>3</sup>	5.1 x 10 <sup>3</sup>
Motor Position Sensor			Hall sensor			
Positioning Resolution per Motor Rotation	pls/rev		30	30	30	48
Output Shaft Resolution	pls/rev		240	240	270	432
Weight	g		390	620	870	1,060
Installation Direction			Can be installed in any direction			
Enclosure			Fully enclosed self-cooling (IP40)			

### 48VDC

Item		Size	FLA-11A-08HP	FLA-14A-08HP	FLA-17A-09HP	FLA-20A-09HP
Reduction Ratio			8:1	8:1	9:1	9:1
Driver Input Power Voltage	V		48VDC			
Maximum Torque <sup>1</sup>	Nm		1.8	3.7	7.3	12.1
Allowable Continuous Torque <sup>1,2</sup>	Nm		0.6	1.2	3	4.1
Maximum Speed <sup>1</sup>	rpm		500	500	500	400
Allowable Continuous Speed <sup>1,2</sup>	rpm		100	100	100	100
Maximum Current <sup>1</sup>	Arms		4.5	9.6	13.6	17.8
Allowable Continuous Current <sup>1,2</sup>	Arms		1.6	3.0	5.3	6.0
Moment of Inertia (GD <sup>2</sup> /4)	kgm <sup>2</sup>		0.00013	0.00039	0.001	0.0026
Allowable Moment Load	Nm		1.2	1.6	2.0	2.4
Moment Stiffness	Nm/rad		2.0 x 10 <sup>3</sup>	3.3 x 10 <sup>3</sup>	4.4 x 10 <sup>3</sup>	5.1 x 10 <sup>3</sup>
Motor Position Sensor			Hall sensor			
Positioning Resolution per Motor Rotation	pls/rev		30	30	30	48
Output Shaft Resolution	pls/rev		240	240	270	432
Weight	g		390	620	870	1,060
Installation Direction			Can be installed in any direction			
Enclosure			Fully enclosed self-cooling (IP40)			

The above values are typical values on the output shaft. Tested with Yaskawa drives.

\*1: A typical value when used with F or S drive from Yaskawa:

F Series: FLA-11A or FLA-14A

S Series: FLA-17A or FLA-20A

\*2: The value during saturation of temperature rise when mounted on an aluminum heat radiation board of a size described below.

(Heat radiation board dimensions: Size 11: 220 x 220 x 8mm, Size 14: 250 x 250 x 10mm, Size 17: 280 x 280 x 12mm, Size 20: 300 x 300 x 15mm)

# □ FLA-FB - HarmonicDrive® Speed Reducer

## 24VDC

Item		Size		FLA-11A-xxFB		FLA-14A-xxFB		FLA-17A-xxFB		FLA-20A-xxFB	
Reduction Ratio		50:1	100:1	50:1	100:1	50:1	100:1	50:1	100:1	50:1	
Driver Input Power Voltage	V	24VDC									
Maximum Torque <sup>*1</sup>	Nm	6.7	11	11.2	18.2	23	34	33			
Allowable Continuous Torque <sup>*1,2</sup>	Nm	1.7	2.4	2.6	3.8	7.9	11.4	13			
Maximum Speed <sup>*1</sup>	rpm	100	50	100	50	100	50	80			
Allowable Continuous Speed <sup>*1,2</sup>	rpm	60	30	60	30	60	30	50			
Maximum Current <sup>*1</sup>	Arms	6.0	5.0	9.7	8.7	18.4	14.3	19.2			
Allowable Continuous Current <sup>*1,2</sup>	Arms	1.9	1.7	3.0	2.5	6.8	5.3	8.7			
Moment of Inertia (GD <sup>2</sup> /4)	kgm <sup>2</sup>	0.0073	0.029	0.019	0.077	0.048	0.19	0.12			
Allowable Moment Load	Nm	1.2		1.6		2.0		2.4			
Moment Stiffness	Nm/rad	2.0 x 10 <sup>3</sup>		3.3 x 10 <sup>3</sup>		4.4 x 10 <sup>3</sup>		5.1 x 10 <sup>3</sup>			
Motor Position Sensor		Hall sensor									
Positioning Resolution per Motor Rotation	pls/rev	30		30		30		48			
Output Shaft Resolution	pls/rev	1,500	3,000	1,500	3,000	1,500	3,000	2,400			
Weight	g	420		720		940		1,170			
Installation Direction		Can be installed in any direction									
Enclosure		Fully enclosed self-cooling (IP40)									

## 48VDC

Item		Size		FLA-11A-xxFB		FLA-14A-xxFB		FLA-17A-xxFB		FLA-20A-xxFB	
Reduction Ratio		50:1	100:1	50:1	100:1	50:1	100:1	50:1	100:1	50:1	
Driver Input Power Voltage	V	48VDC									
Maximum Torque <sup>*1</sup>	Nm	6.7	11	11.2	18.2	23	34	33			
Allowable Continuous Torque <sup>*1,2</sup>	Nm	1.7	2.4	2.6	3.8	7.9	11.4	13			
Maximum Speed <sup>*1</sup>	rpm	100	50	100	50	100	50	80			
Allowable Continuous Speed <sup>*1,2</sup>	rpm	60	30	60	30	60	30	50			
Maximum Current <sup>*1</sup>	Arms	3.1	2.6	4.8	4.2	9.4	7.2	10.7			
Allowable Continuous Current <sup>*1,2</sup>	Arms	1.0	0.8	1.5	1.2	3.4	2.9	5.1			
Moment of Inertia (GD <sup>2</sup> /4)	kgm <sup>2</sup>	0.0073	0.029	0.019	0.077	0.048	0.19	0.12			
Allowable Moment Load	Nm	1.2		1.6		2.0		2.4			
Moment Stiffness	Nm/rad	2.0 x 10 <sup>3</sup>		3.3 x 10 <sup>3</sup>		4.4 x 10 <sup>3</sup>		5.1 x 10 <sup>3</sup>			
Motor Position Sensor		Hall sensor									
Positioning Resolution per Motor Rotation	pls/rev	30		30		30		48			
Output Shaft Resolution	pls/rev	1,500	3,000	1,500	3,000	1,500	3,000	2,400			
Weight	g	420		720		940		1,170			
Installation Direction		Can be installed in any direction									
Enclosure		Fully enclosed self-cooling (IP40)									

The above values are typical values on the output shaft. Tested with Yaskawa drives.

\*1: A typical value when used with F or S drive from Yaskawa:

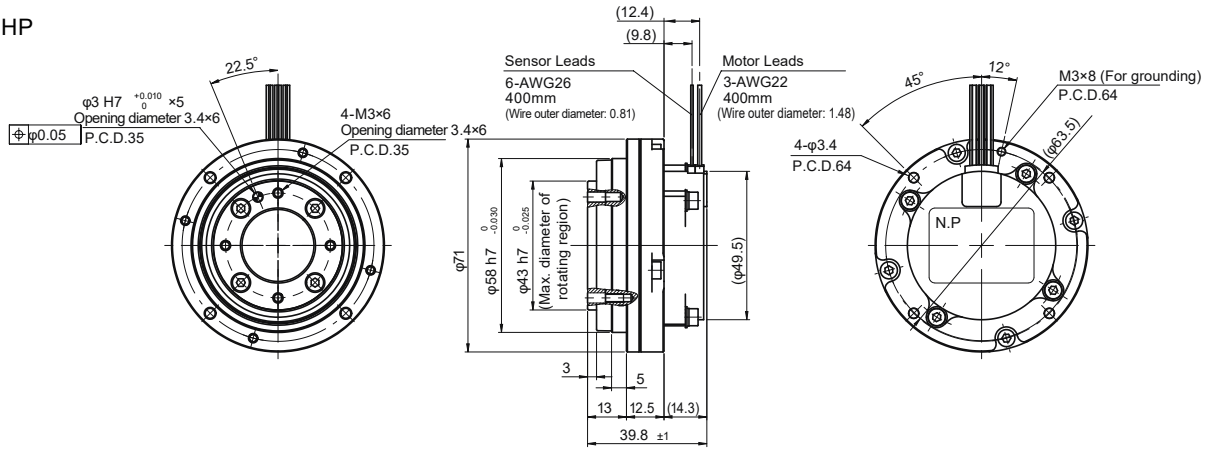
F Series: FLA-11A or FLA-14A

S Series: FLA-17A or FLA-20A

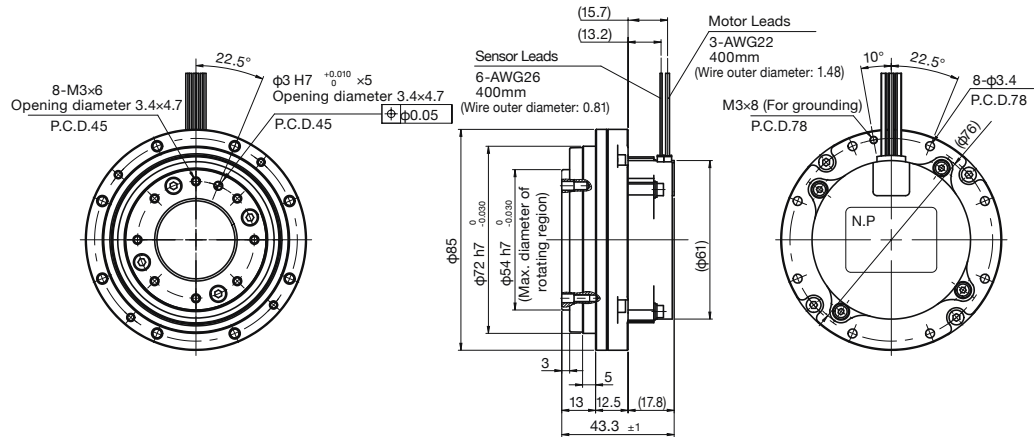
\*2: The value during saturation of temperature rise when mounted on an aluminum heat radiation board of a size described below.

(Heat radiation board dimensions: Size 11: 220 x 220 x 8mm, Size 14: 250 x 250 x 10mm, Size 17: 280 x 280 x 12mm, Size 20: 300 x 300 x 15mm)

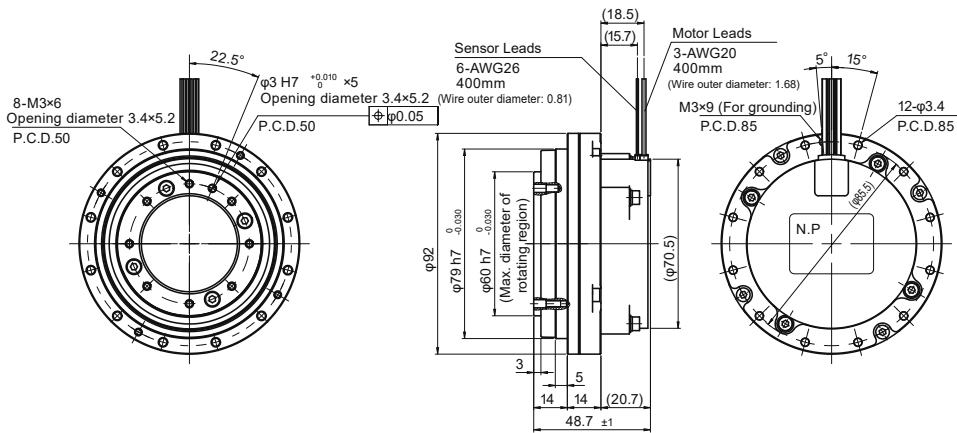
### FLA-11A-HP



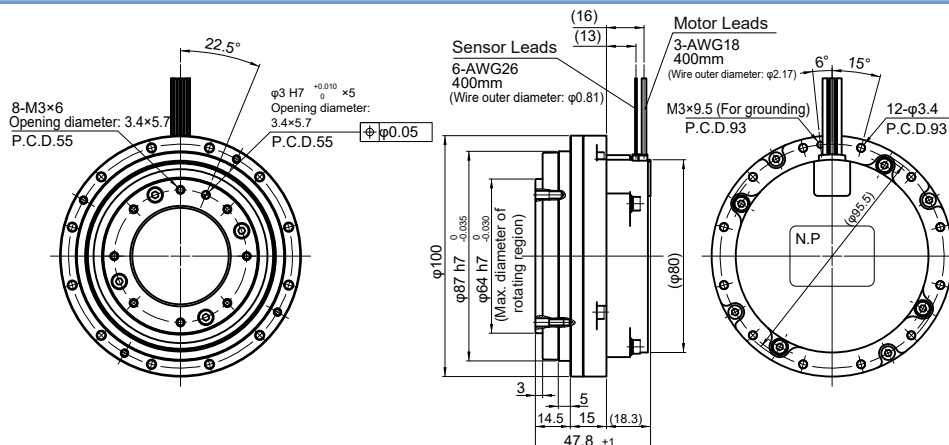
### FLA-14A-HP



### FLA-17A-HP

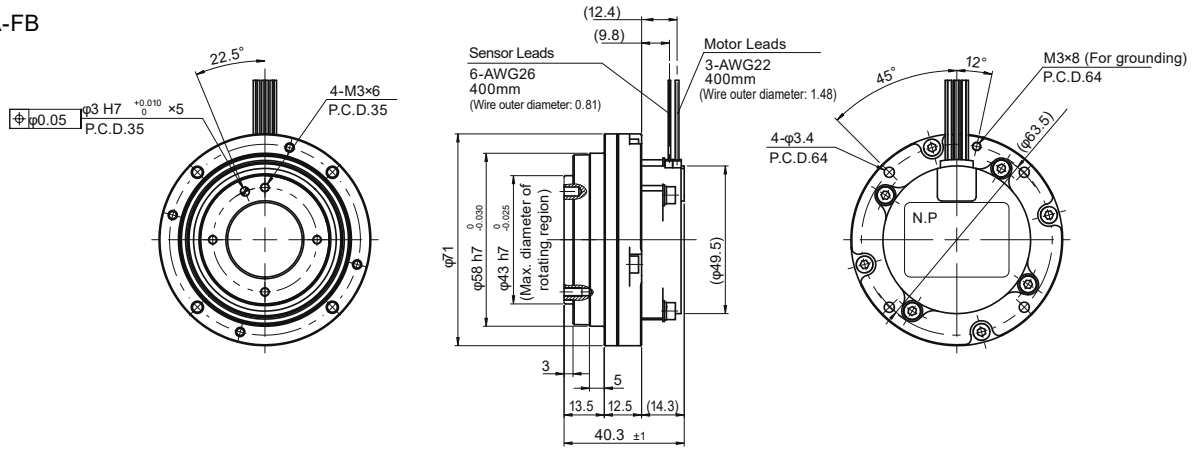


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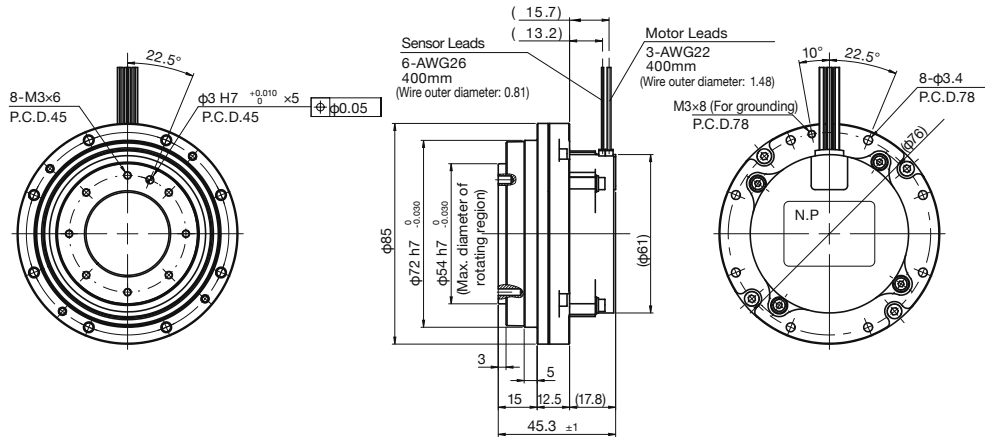




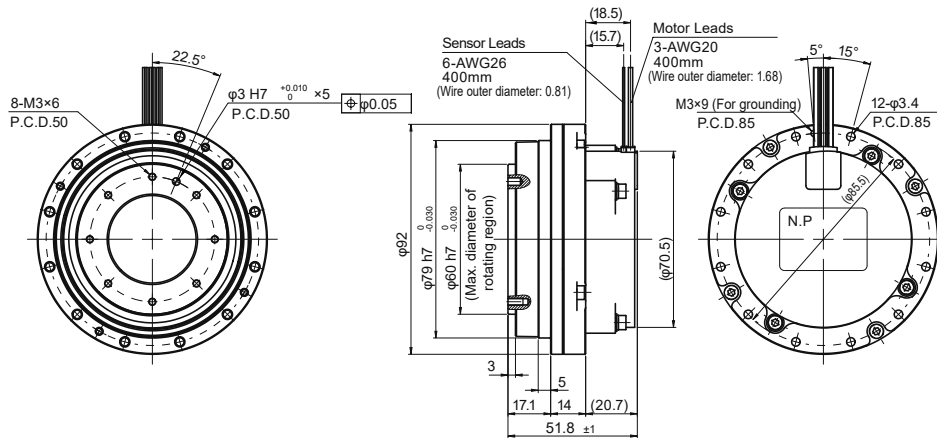
## FLA-11A-FB



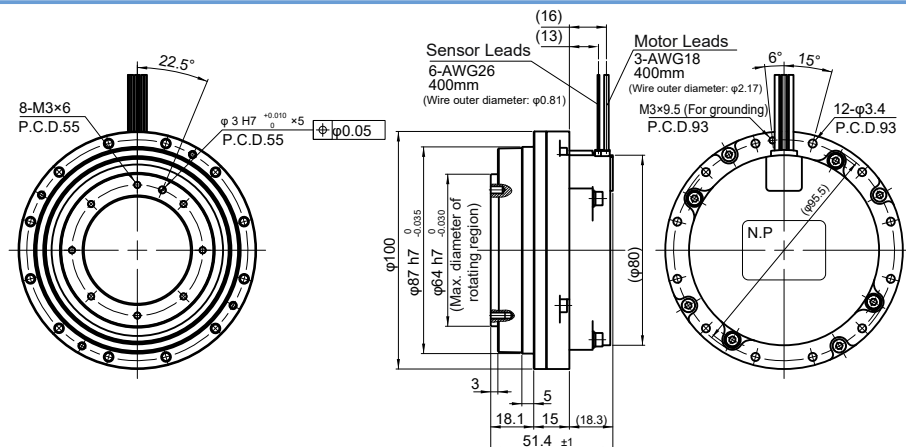
## FLA-14A-FB



## FLA-17A-FB



## FLA-20A-FB



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