

# Slotless

# BLDC Motor

ECU13026

ECU13038

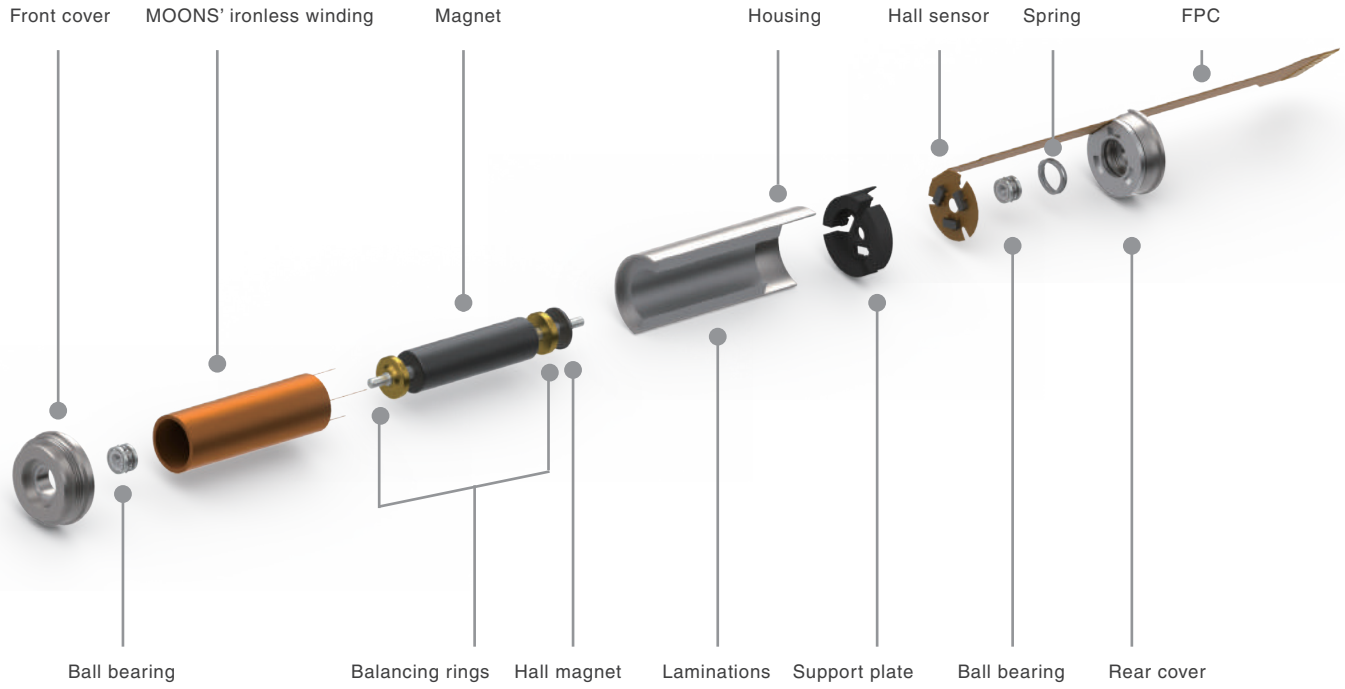
ECU16036

ECU22048

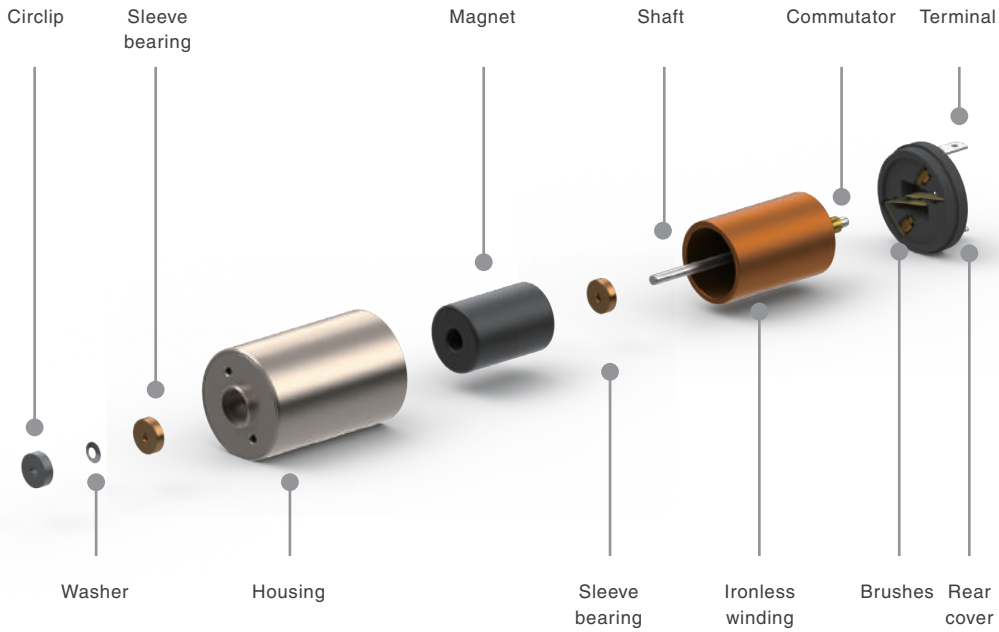


# Structure

## EC Series Motor Structure



## DC Series Motor Structure



# ECU13026

Ø13mm 4.5/9W

Motor Data		Part Numbers				
		ECU13026H06	ECU13026H09	ECU13026H12	ECU13026H18	ECU13026H24
Nominal voltage	V	6	9	12	18	24
No load speed	rpm	29200	31000	28000	28400	27600
No load current	mA	165	120	77	56	42
Rated speed	rpm	19800	21500	19300	19300	19300
Rated torque	mNm	2.33	2.45	2.31	2.41	2.33
Rated current	A	1.35	1.01	0.64	0.44	0.32
Stall torque	mNm	7.88	10.37	8.45	8.55	7.83
Stall current	A	3.97	3.60	1.96	1.40	0.96
Max efficiency	%	64	67	65	64	64
Terminal Resistance	Ohm	1.51	2.65	6.11	13.4	25.1
Terminal Inductance	mH	0.021	0.044	0.095	0.209	0.377
Torque constant	mNm / A	1.95	2.88	4.15	6.11	8.19
Speed constant	rpm / V	4867	3444	2333	1578	1150
Speed/torque gradient	rpm / mNm	3706	2990	3314	3320	3524
Mechanical time constant	ms	7.89	6.85	7.11	7.45	7.62

Specification		
Max speed	rpm	50000
Rotor inertia	gcm <sup>2</sup>	0.194
Number of pole pairs		1
Ambient temperature	° C	-40~+100
Max winding temperature	° C	155
Thermal resistance		
Housing - Ambient	° C/ W	33.5
Winding - Housing	° C/ W	2.5
Thermal time constant		
Motor	s	190
Winding	s	0.75
Max axial load	N	1
Max radial load	N	4
Weight	g	19

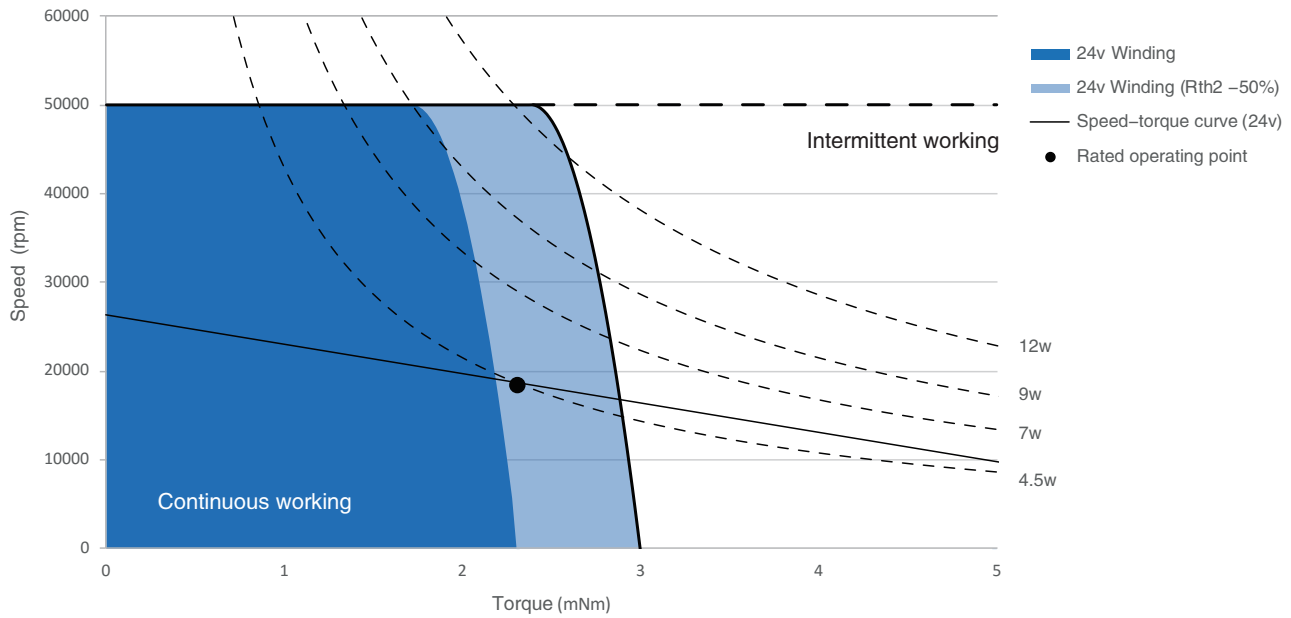
## Combination

### Gearbox

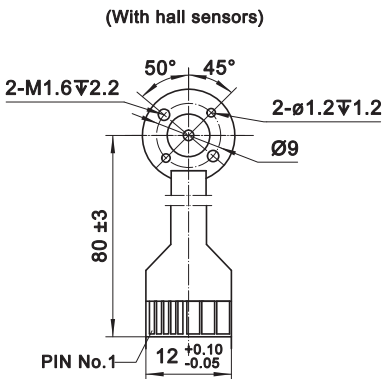
### Encoder

Please contact local sales.

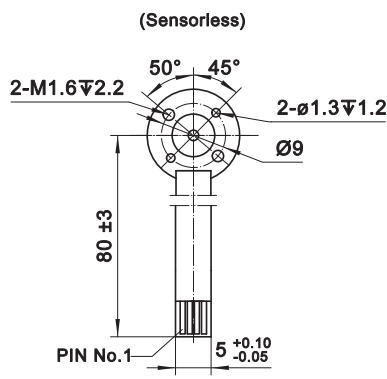
## Operating Range



## Dimension

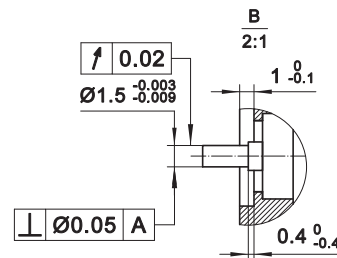
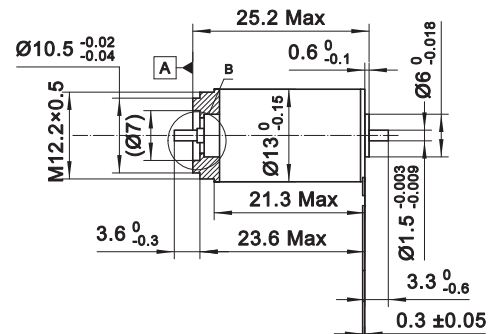


PIN No.	With hall sensors	Sensorless
1	4.5-24VDC	Winding 1
2	Hall 3	Winding 2
3	Hall 1	Winding 3
4	Hall 2	N.C.
5	GND	
6	Winding 3	
7	Winding 2	
8	Winding 1	



Connection	With hall sensors	Sensorless
	Part number	Part number
Tyco	1-84959-3	84959-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

FPC, 11-pol, Pitch 1.0mm, top contact style.



# ECU13038

Ø13mm 10/20W

Motor Data		Part Numbers					
		ECU13038H06	ECU13038H09	ECU13038H12	ECU13038H18	ECU13038H24	ECU13038H36
Nominal voltage	V	6	9	12	18	24	36
No load speed	rpm	24600	24600	24700	25400	24700	27000
No load current	mA	200	135	97	71	52	41
Rated speed	rpm	18000	19000	19000	19000	19900	22000
Rated torque	mNm	5.13	5.55	5.18	5.50	5.13	5.40
Rated current	A	2.23	1.70	1.12	0.81	0.55	0.45
Stall torque	mNm	21.23	25.87	23.71	28.70	24.63	28.57
Stall current	A	9.23	7.63	5.11	4.19	2.64	2.28
Max efficiency	%	74	76	75	76	74	77
Terminal Resistance	Ohm	0.65	1.18	2.35	4.30	9.09	15.8
Terminal Inductance	mH	0.010	0.024	0.041	0.085	0.159	0.299
Torque constant	mNm / A	2.30	3.39	4.64	6.85	9.33	12.53
Speed constant	rpm / V	4100	2733	2058	1411	1029	750
Speed/torque gradient	rpm / mNm	1159	951	1042	885	1003	945
Mechanical time constant ms		3.95	3.15	3.60	3.00	3.45	3.10

## Specification

Max speed	rpm	50000
Rotor inertia	gcm <sup>2</sup>	0.325
Number of pole pairs		1
Ambient temperature	° C	-40~+100
Max winding temperature	° C	155
Thermal resistance		
Housing - Ambient	° C/ W	25.2
Winding - Housing	° C/ W	1.27
Thermal time constant		
Motor	s	254
Winding	s	0.64
Max axial load	N	0.8
Max radial load	N	4
Weight	g	29

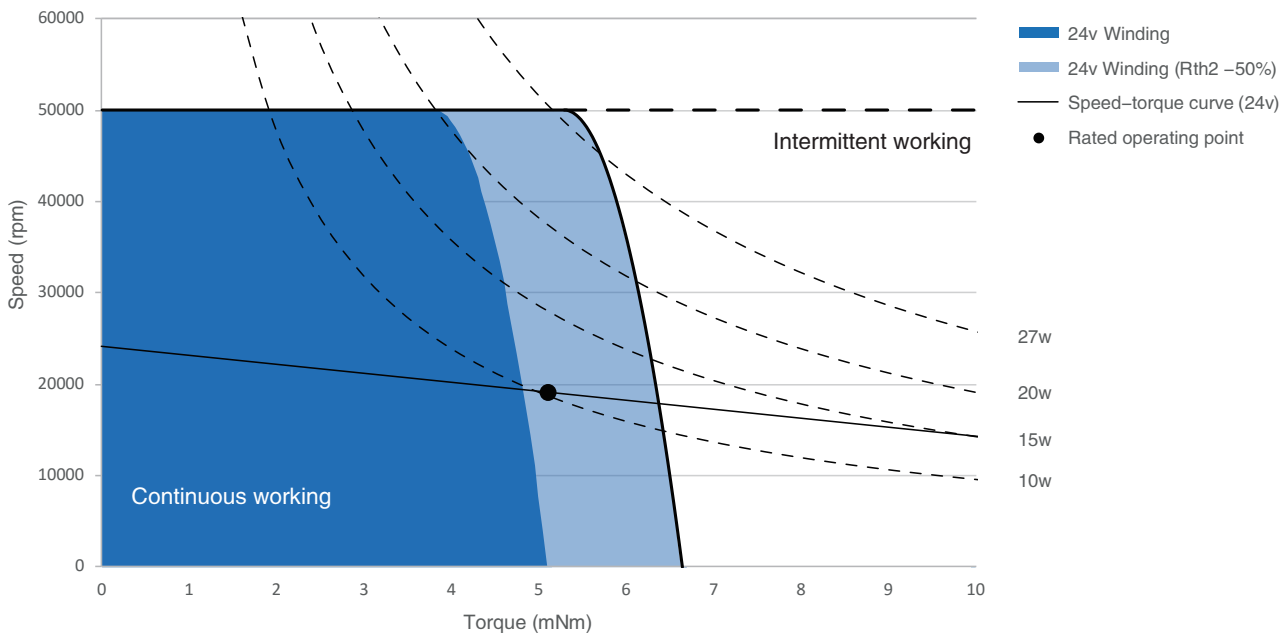
## Combination

### Gearbox

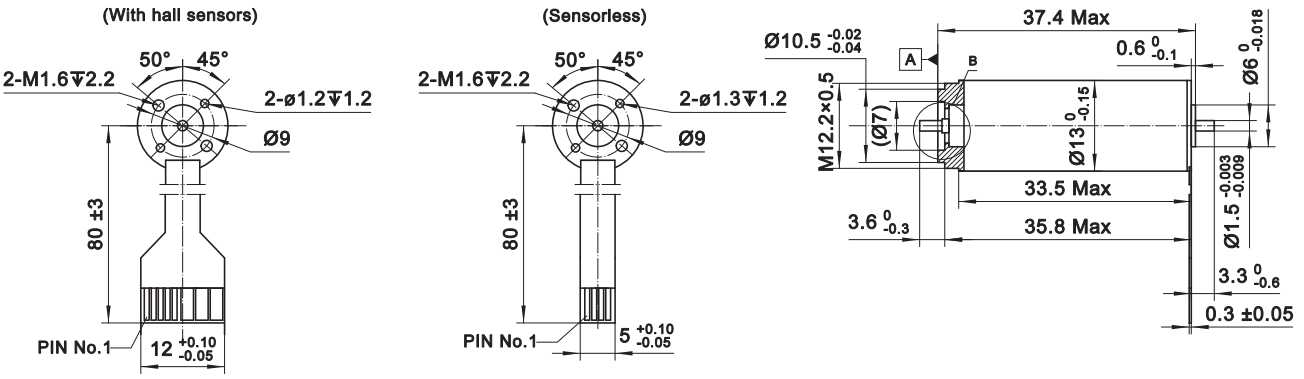
### Encoder

Please contact local sales.

**Operating Range**



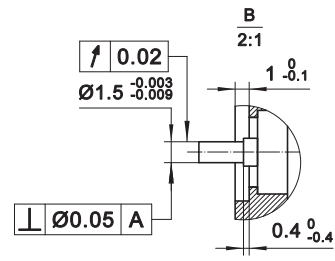
**Dimension**



	With hall sensors	Sensorless
PIN No.	Signal	Signal
1	4,5-24VDC	Winding 1
2	Hall 3	Winding 2
3	Hall 1	Winding 3
4	Hall 2	N.C.
5	GND	
6	Winding 3	
7	Winding 2	
8	Winding 1	

	With hall sensors	Sensorless
Connection	Part number	Part number
Tyco	1-84959-3	84959-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

FPC, 11-pot, Pitch 1.0mm, top contact style.



# ECU16036 Ø16mm 12/25W

Motor Data		Part Numbers				
		ECU16036H09	ECU16036H12	ECU16036H18	ECU16036H24	ECU16036H36
Nominal voltage	V	9	12	18	24	36
No load speed	rpm	17200	16000	17200	16200	17200
No load current	mA	173	113	96	64	50
Rated speed	rpm	12900	11800	13100	12000	13100
Rated torque	mNm	8.03	8.29	8.30	8.18	8.41
Rated current	A	1.88	1.28	0.97	0.62	0.49
Stall torque	mNm	29.0	27.4	31.6	26.5	29.0
Stall current	A	7.20	4.50	3.82	2.09	1.74
Max efficiency	%	79	80	80	80	80
Terminal Resistance	Ohm	1.25	2.70	4.70	11.50	18.40
Terminal Inductance	mH	0.032	0.079	0.130	0.310	0.550
Torque constant	mNm / A	4.70	7.10	9.50	14.70	19.10
Speed constant	rpm / V	2030	1340	1000	650	500
Speed/torque gradient	rpm / mNm	540	511	497	508	482
Mechanical time constant	ms	5.75	5.51	5.18	5.36	4.95

## Specification

Max speed	rpm	40000
Rotor inertia	gcm <sup>2</sup>	0.700
Number of pole pairs		1
Ambient temperature	° C	-40~+100
Max winding temperature	° C	155
Thermal resistance		
Housing - Ambient	° C/ W	18
Winding - Housing	° C/ W	1.5
Thermal time constant		
Motor	s	430
Winding	s	1
Max axial load	N	1
Max radial load	N	6
Weight	g	52

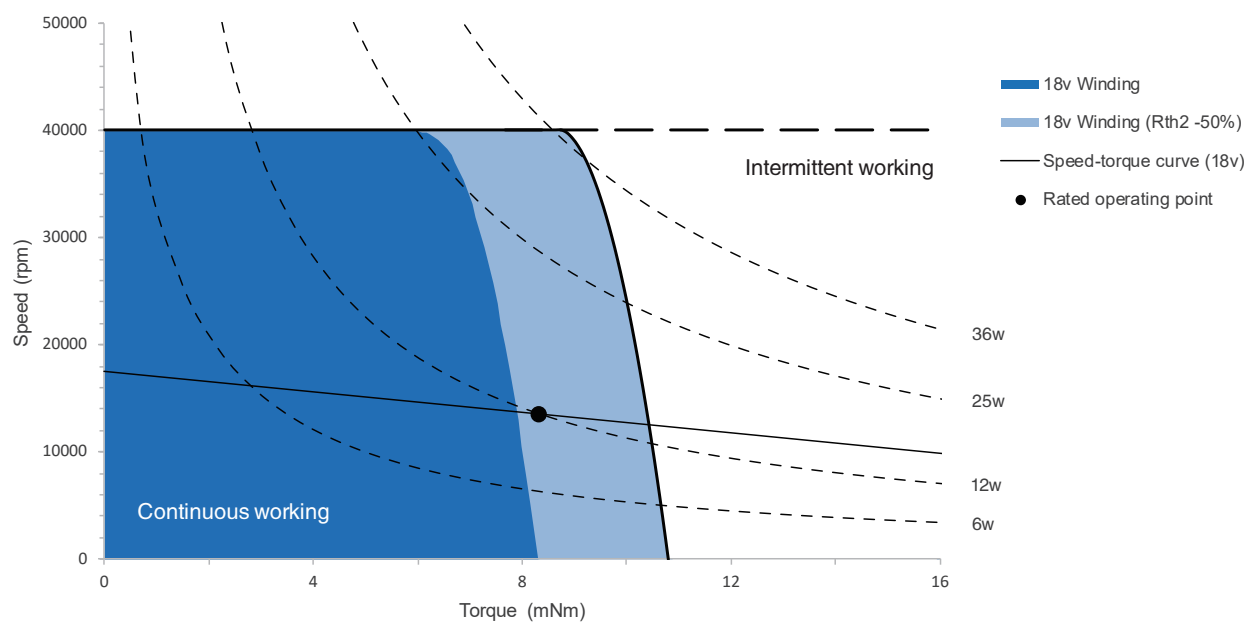
## Combination

### Gearbox

### Encoder

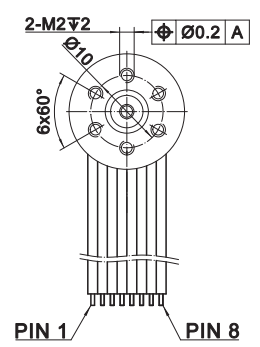
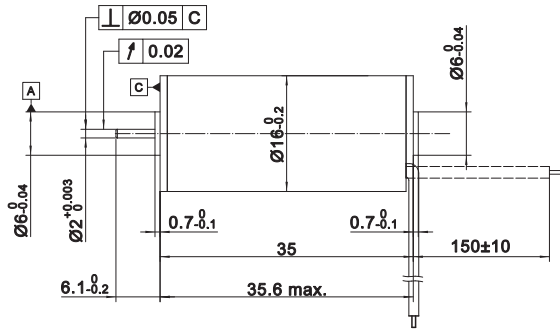
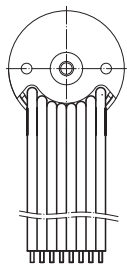
Please contact local sales.

**Operating Range**



**Dimension**

(With hall sensors)



Connection(Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V <sub>Hall</sub> 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

# ECU22048

Ø22mm 35/70W

## Motor Data

		ECU22048H18	ECU22048H24	ECU22048H36	ECU22048H48
Nominal voltage	V	18	24	36	48
No load speed	rpm	18000	18000	19500	18000
No load current	mA	290	250	230	174
Rated speed	rpm	15900	15100	15500	15600
Rated torque	mNm	21.50	23.00	23.00	23.00
Rated current	A	2.25	1.81	1.23	0.90
Stall torque	mNm	180.1	141.5	212.8	170.6
Stall current	A	18.8	11.1	11.8	6.7
Max efficiency	%	82	80	82	80
Terminal Resistance	Ohm	0.96	2.16	3.05	7.17
Terminal Inductance	mH	0.063	0.094	0.250	0.444
Torque constant	mNm / A	9.55	12.74	18.03	25.48
Speed constant	rpm / V	1000	750	530	375
Speed/torque gradient	rpm / mNm	100	127	92	106
Mechanical time constant	ms	4.04	5.14	3.62	4.26

## Specification

Max speed	rpm	40000
Rotor inertia	gcm <sup>2</sup>	3.860
Number of pole pairs		1
Ambient temperature	° C	-40~+100
Max winding temperature	° C	155
Thermal resistance		
Housing - Ambient	° C/ W	10.2
Winding - Housing	° C/ W	1
Thermal time constant		
Motor	s	600
Winding	s	2
Max axial load	N	3.5
Max radial load	N	16
Weight	g	98

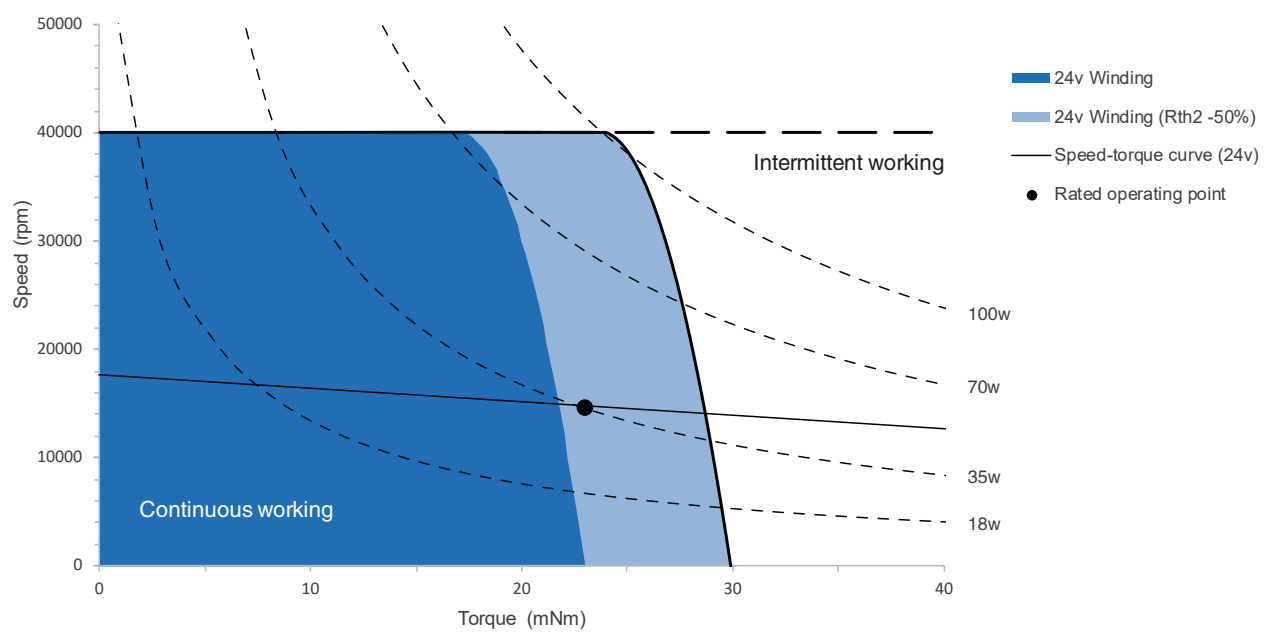
## Combination

### Gearbox

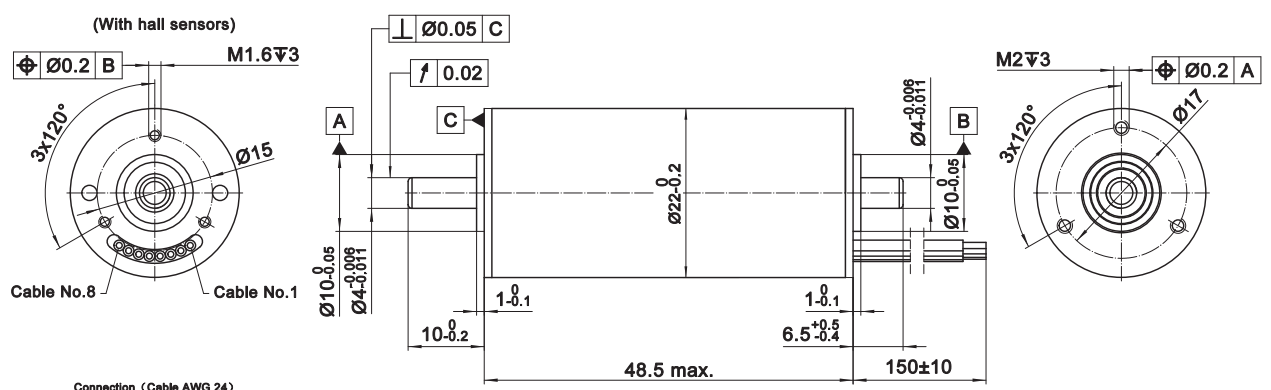
### Encoder

Please contact local sales.

**Operating Range**



**Dimension**



Connection (Cable AWG 24)

Cable No.	Signal	Color
1	Motor winding 1	brown
2	Motor winding 2	red
3	Motor winding 3	orange
4	V <sub>hall</sub> 4.5-24VDC	yellow
5	GND	green
6	Hall IC 1	blue
7	Hall IC 2	violet
8	Hall IC 3	grey



# Planetary

# Gearbox

PG08C

PG10C

PG13C

PG16C

PG22C

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# PG08C Planetary Gearhead $\varnothing 8\text{mm}$ 0.1Nm

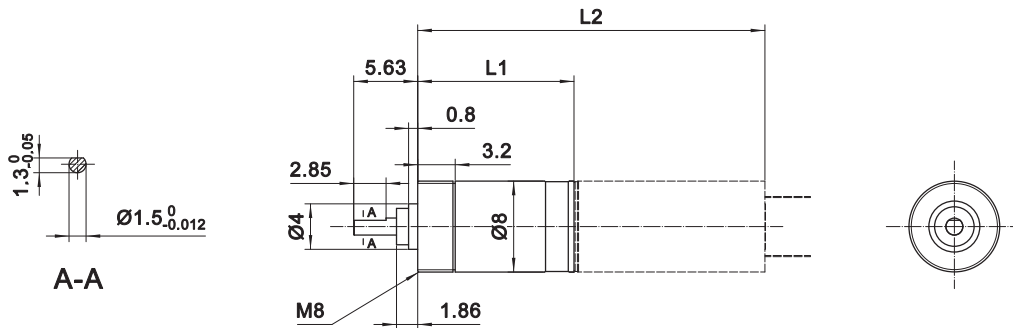
## Gearhead Data

Reduction Ratio		4:1	16:1	64:1	256:1	1024:1
Number of stages		1	2	3	4	5
Max. continuous torque	Nm	0.01	0.02	0.06	0.08	0.10
Max. intermittent torque	Nm	0.02	0.03	0.09	0.12	0.15
Weight	g	2.6	3.2	3.9	4.6	5.3
Max. efficiency	%	90	81	66	58	42
Gearhead length L	mm	8.8	11.3	13.9	16.4	19.0
Gearmotor length L2						
L-DCU08017	mm	25.6	28.1	30.7	33.2	35.8

## Specification

Planetary gearhead		straight teeth
Output shaft		stainless steel, hardened
Bearing at output		sleeve bearing
Radial play	mm	$\leq 0.07$
Axial play	mm	$\leq 0.15$
Direction of rotation (drive to output)		=
Operating temperature	$^{\circ}\text{C}$	-20~+65

## Dimension



# PG10C Planetary Gearhead Ø10mm 0.15Nm

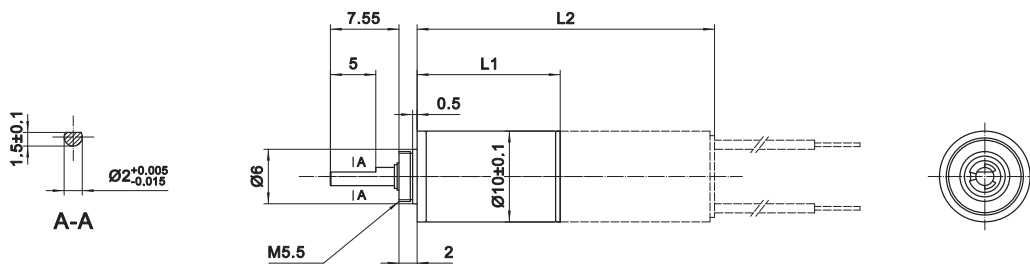
## Gearhead Data

Reduction Ratio		16:1	64:1	256:1	1024:1
Number of stages		2	3	4	5
Max. continuous torque	Nm	0.03	0.10	0.15	0.15
Max. intermittent torque	Nm	0.05	0.15	0.23	0.23
Weight	g	6.9	8.3	9.7	11.1
Max. efficiency	%	81	73	66	59
Gearhead length L	mm	12.9	15.8	18.7	21.6
Gearmotor length L2	mm				
└ DCU10017		29.9	32.8	35.7	38.6
└ DCU10025		37.5	40.4	43.3	46.2

## Specification

Planetary gearhead		straight teeth
Output shaft		stainless steel, hardened
Bearing at output		sleeve bearing
Radial play	mm	≤ 0.07
Axial play	mm	≤ 0.2
Direction of rotation (drive to output)		=
Operating temperature	°C	-20~+65

## Dimension



# PG13C Planetary Gearhead $\varnothing 13\text{mm}$ 0.3Nm

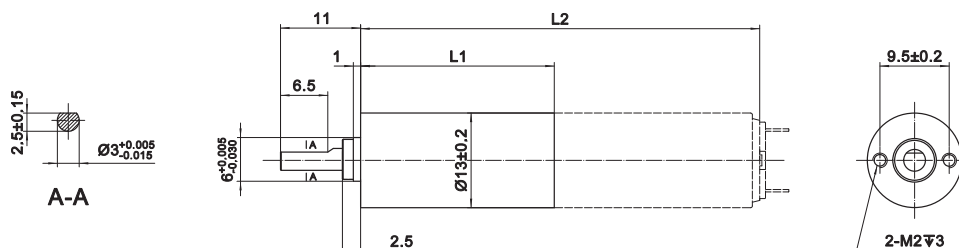
## Gearhead Data

Reduction Ratio		16:1	66:1	271:1
		19:1	77:1	315:1
			90:1	366:1
				425:1
Number of stages		2	3	4
Max. continuous torque	Nm	0.20	0.30	0.30
Max. intermittent torque	Nm	0.30	0.45	0.45
Weight	g	13.5	16.0	18.9
Max. efficiency	%	81	73	66
Gearhead length L1	mm	19.1	22.9	26.6
Gearmotor length L2				
└ DCU13020	mm	39.8	43.6	47.3
└ DCU13028	mm	48.3	52.1	55.8

## Specification

Planetary gearhead	straight teeth	
Output shaft	stainless steel, hardened	
Bearing at output	sleeve bearing	
Radial play	mm	$\leq 0.1$
Axial play	mm	$\leq 0.25$
Max. radial load	N	5
Max. axial load	N	5 (5mm from flange)
Max. force for press fits	N	15
Recommend input speed	rpm	$\leq 10000$
Direction of rotation (drive to output)	=	
Ambient temperature	$^{\circ}\text{C}$	-20~+65

## Dimension



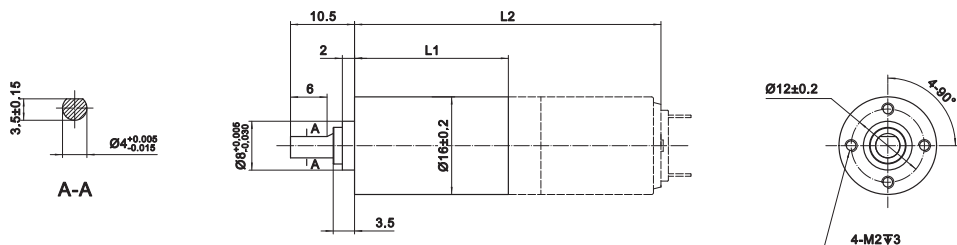
# PG16C Planetary Gearhead Ø16mm 0.5Nm

Gearhead Data				
Reduction Ratio		19:1	84:1	369:1
		23:1	103:1	455:1
		29:1	127:1	560:1
			157:1	690:1
				850:1
Number of stages		2	3	4
Max. continuous torque	Nm	0.30	0.40	0.50
Max. intermittent torque	Nm	0.45	0.60	0.75
Weight	g	19.0	22.5	26.0
Max. efficiency	%	81	73	66
Gearhead length L1	mm	18.0	21.6	25.2
Gearmotor length L2				
└DCU16025	mm	44.4	48.0	51.6
└DCU16035	mm	54.4	58.0	61.6
└DCU17025	mm	44.4	48.0	51.6
└DCU17035	mm	54.4	58.0	61.6

## Specification

Planetary gearhead	straight teeth	
Output shaft	stainless steel, hardened	
Bearing at output	sleeve bearing	
Radial play	mm	≤ 0.1
Axial play	mm	≤ 0.25
Max. radial load	N	8
Max. axial load	N	10 (5mm from flange)
Max. force for press fits	N	50
Recommend input speed	rpm	≤ 10000
Direction of rotation (drive to output)	=	
Ambient temperature	°C	-20~+65

## Dimension



# PG22C Planetary Gearhead Ø22mm 0.8Nm

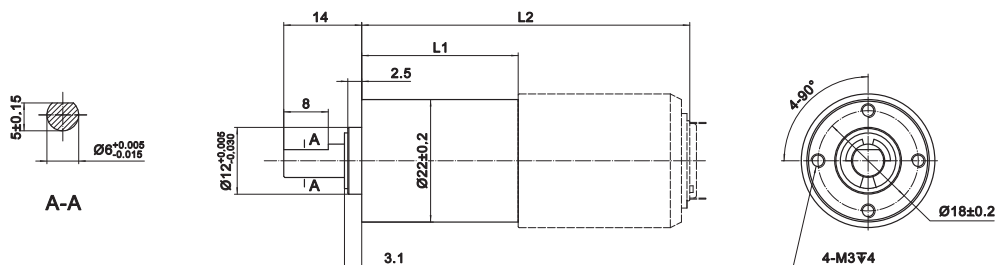
## Gearhead Data

Reduction Ratio		4:1	16:1	64:1	256:1
		5:1	19:1	76:1	304:1
			22:1	90:1	361:1
				107:1	428:1
					509:1
Number of stages		1	2	3	4
Max. continuous torque	Nm	0.20	0.40	0.60	0.80
Max. intermittent torque	Nm	0.30	0.60	0.90	1.20
Weight	g	34.3	34.6	54.4	64.0
Max. efficiency	%	84	70	59	49
Gearhead length L1	mm	17.7	22.9	28.1	33.3
Gearmotor length L2					
└DCU24032	mm	49.9	55.1	60.3	65.5

## Specification

Planetary gearhead		straight teeth
Output shaft		stainless steel, hardened
Bearing at output		sleeve bearing
Radial play	mm	≤ 0.1
Axial play	mm	≤ 0.35
Max. radial load	N	8
Max. axial load	N	15 (5mm from flange)
Max. force for press fits	N	100
Recommend input speed	rpm	≤ 10000
Direction of rotation (drive to output)		=
Ambient temperature	° C	-20~+65

## Dimension



# Encoder

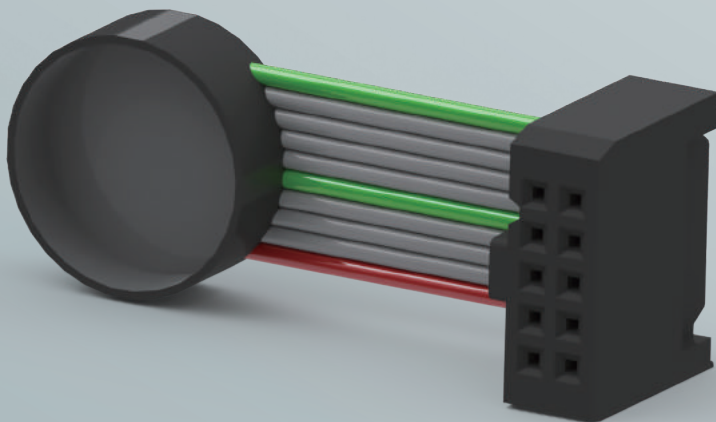
R08

R10

R13

R16

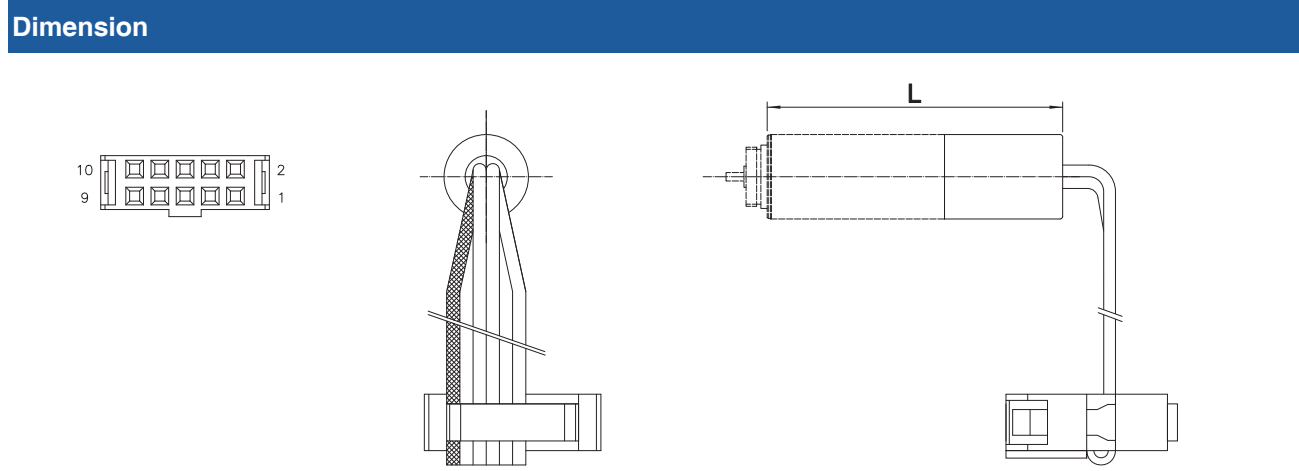
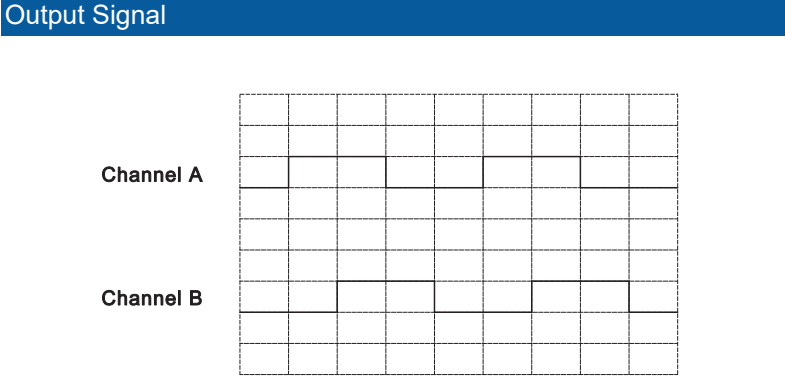
K16



# R08 Magnetic Encoder Ø8mm 2 Channels

Encoder Data		
Lines per revolution		12
Number of channels		2 (A,B)
Supply voltage	V	5
Supply current	mA	≤20
Max. output current/chanel	mA	3
Max. frequency	kHz	20
Operating temperature	°C	-20~+65
Length L		
└DCU08017	mm	28.0

Connection	
PIN No.	Function
1	Motor(+)
2	Vcc(5V)
3	Channel A
4	Channel B
5	GND
6	Motor (-)



Product Overview

Slotless Brushless DC Motor

Coreless Brushed DC Motor

Planetary Gearbox

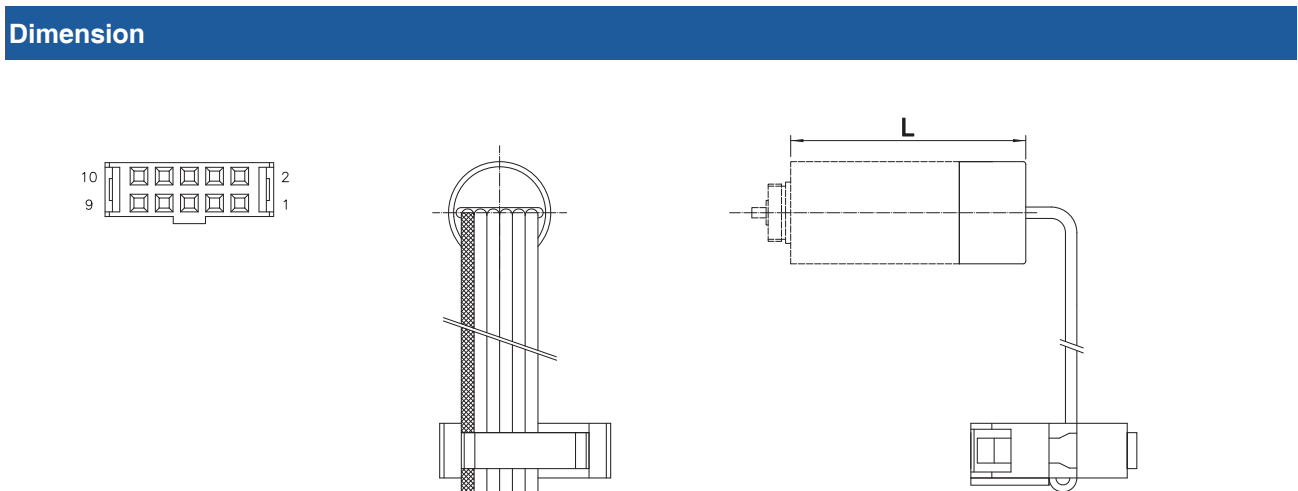
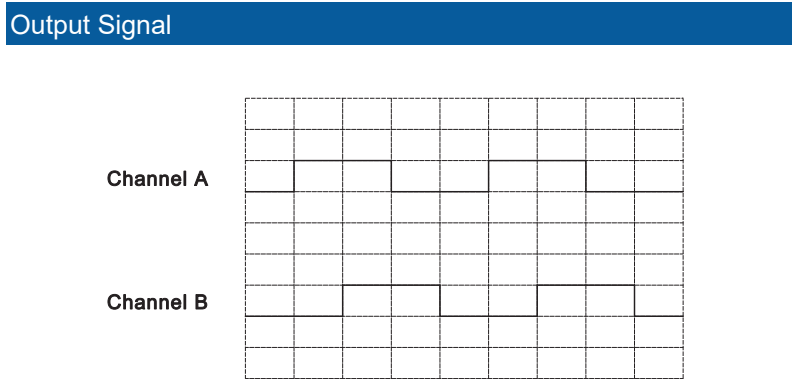
Encoder

Technical

# R10 Magnetic Encoder Ø10mm 2 Channels

Encoder Data		
Pulses per revolution		12
Number of channels		2 (A,B)
Supply voltage	V	3~24
Supply current	mA	≤10
Max. output current/chanel	mA	10
Max. frequency	kHz	20
Length L		
↳DCU10017	mm	23.5
↳DCU10025	mm	31.1

Connection	
PIN No.	Function
1	Motor(+)
2	Vcc(5V)
3	Channel A
4	Channel B
5	GND
6	Motor (-)



# R13 Magnetic Encoder Ø13mm 3 Channels

Encoder Data		
Lines per revolution		256
Number of channels		3 (A,B,Z)
Supply voltage	V	5
Supply current	mA	≤40
Max. output current/chanel	mA	5
Max. frequency	kHz	80
Length L		
└DCU13020	mm	25.4
└DCU13028	mm	33.9

Connection	
PIN No.	Function
1	Motor(+)
2	Vcc(5V)
3	GND
4	Motor(-)
5	Channel $\bar{A}$
6	Channel A
7	Channel $\bar{B}$
8	Channel B
9	Channel $\bar{Z}$
10	Channel Z

### Output Signal

Channel A

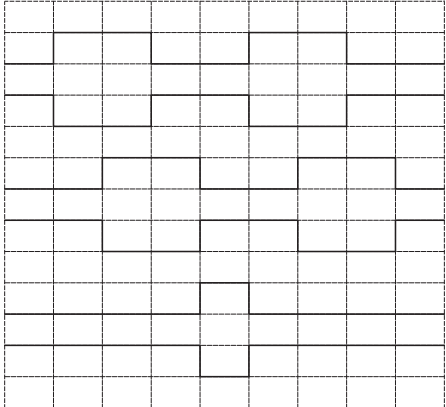
Channel  $\bar{A}$

Channel B

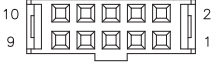
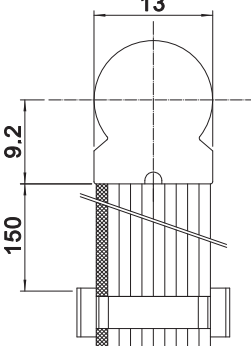
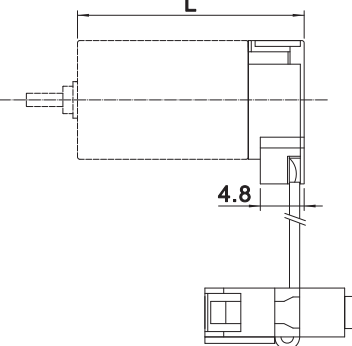
Channel  $\bar{B}$

Channel Z

Channel  $\bar{Z}$



### Dimension

# R16 Magnetic Encoder Ø16mm 3 Channels

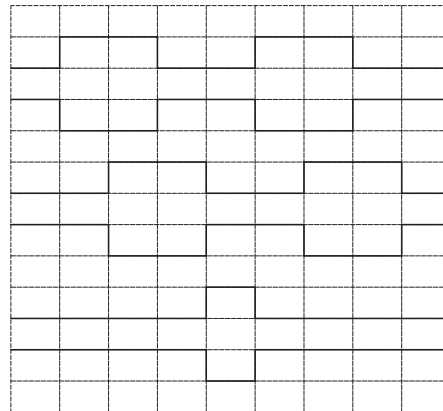
Encoder Data		
Lines per revolution		512
Number of channels		3 (A,B,Z)
Supply voltage	V	5
Supply current	mA	≤40
Max. output current/channel	mA	5
Max. frequency	kHz	160
Length L		
└DCU16025	mm	30.4
└DCU16035	mm	40.4
└DCU17025	mm	30.4
└DCU17035	mm	40.4

## Connection

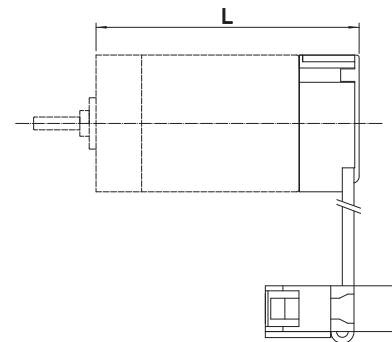
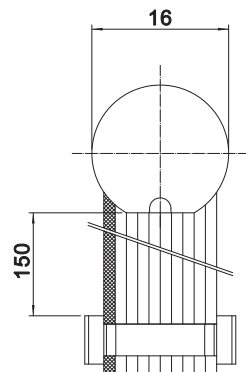
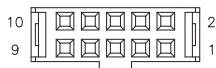
PIN No.	Function
1	Motor(+)
2	Vcc(5V)
3	GND
4	Motor(-)
5	Channel $\bar{A}$
6	Channel A
7	Channel $\bar{B}$
8	Channel B
9	Channel $\bar{Z}$
10	Channel Z

## Output Signal

- Channel A
- Channel  $\bar{A}$
- Channel B
- Channel  $\bar{B}$
- Channel Z
- Channel  $\bar{Z}$



## Dimension



# K16 Magnetic Encoder Ø8mm 2 Channels

## Encoder Data

Lines per revolution		200
Number of channels		2 (A,B)
Supply voltage	V	5
Supply current	mA	≤20
Max. output current/chanel	mA	3
Max. frequency	kHz	20
Operating temperature	°C	-20~+65

## Length L

└DCU16025	mm	37.5
└DCU16035	mm	47.5
└DCU17025	mm	37.5
└DCU17035	mm	47.5
└DCU24032	mm	43.3

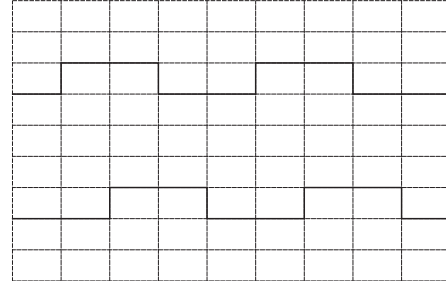
## Connection

PIN No.	Function
1	Vcc
2	Channel B
3	GND
4	Channel A

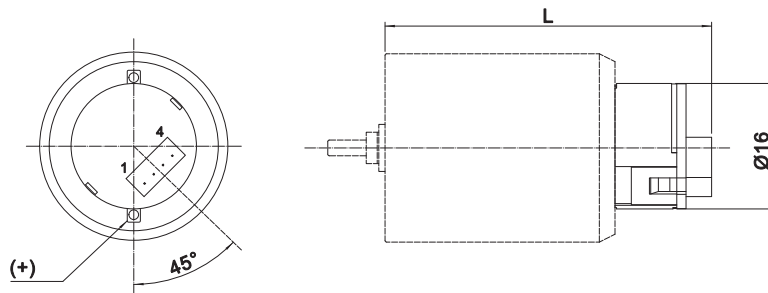
## Output Signal

Channel A

Channel B



## Dimension



# Technical

## Customized Components



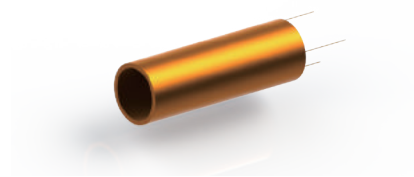
Pinion



Bearing



Flange



Winding



Shaft

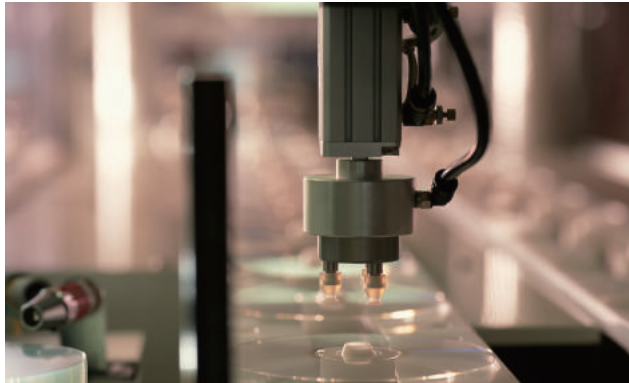


FPC & Cables

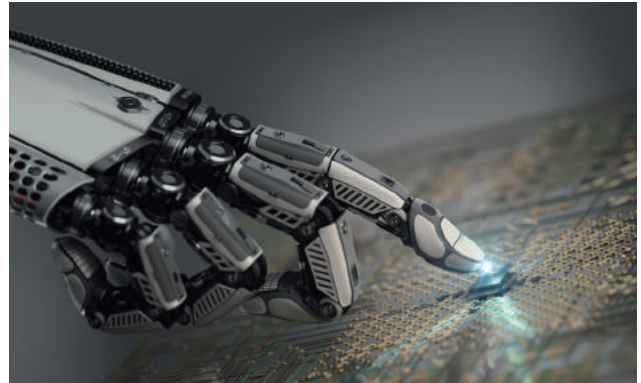
# Application

Product Overview

Slotless Brushless DC Motor



Factory Automation

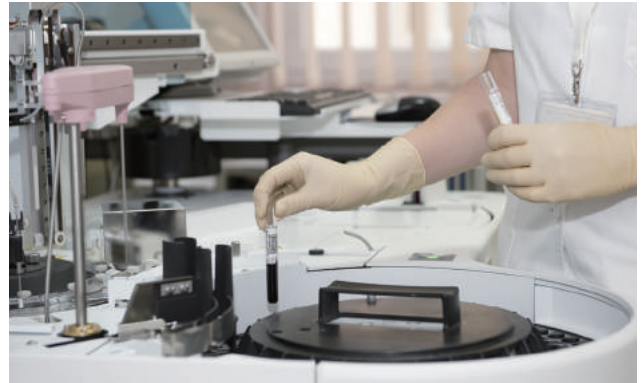


Robotics

Coreless Brushed DC Motor



Medical Technology



Laboratory Automation

Planetary Gearbox



Aerospace



Measuring Technology

Encoder

Technical

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