MicNano
Micro to Nano

Option

選 配 組 合 系 列

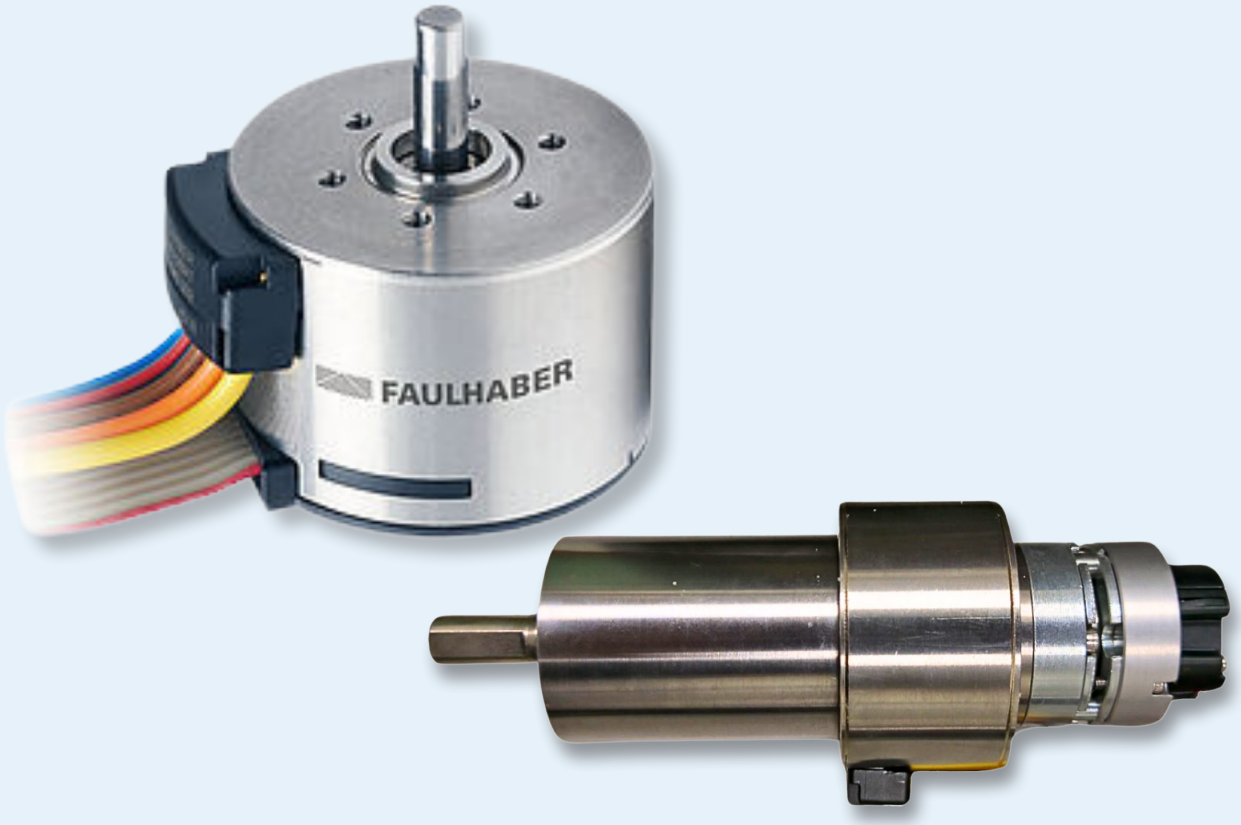
- 選配編碼器，剎車器組合
- 通電 / 斷電剎車

- 解析值：1 ~ 10 000
- 磁性式 / 光學式增量型
- 磁性式多圈絕對型
- 差動訊號 Line Driver

選配組合編碼器與剎車器系列

選配磁性式 / 光學式增量型編碼器
磁性式多圈絕對型編碼器與通電 / 斷電剎車器

歡迎諮詢服務業務進行客製化選配組合



Options

| ◎ : Encoder △ : Brake |

IE3-1024 L

magnetic Encoder, digital outputs, 3 channels,
1 - 1024 lines per revolution, Line Driver

IE3-1024 L

		IE3-32 L	IE3-64 L	IE3-128 L	IE3-256 L	IE3-512 L	IE3-1024 L	
Lines per revolution	N	32	64	128	256	512	1 024	
Frequency range, up to [1]	f	15	30	60	120	240	430	kHz
Signal output, square wave		2+1 Index and complementary outputs						Channels
Supply voltage	U_{DD}	4.5 ... 5.5						V
Current consumption, typical [2]	I_{DD}	typ. 20, max. 30						mA
Index Pulse width	P_0	90 ± 45						°e
Phase shift, channel A to B	Φ	90 ± 45						°e
Inertia of sensor magnet	J	0.08						gcm²
Operating temperature range		-40 ... +100						°C
Accuracy, typ.		0.5						°m
Repeatability, typ.		0.1						°m
Hysteresis		0.17						°m
Edge spacing, min.		421						ns
Mass, typ.		13.5						g

[1] Velocity (min^{-1}) = f(Hz) x 60/N
[2] U_{DD} = 5 V: with unloaded outputs
[3] At 5 000 min^{-1}

Note: The output signals are TIA-422 compatible.
Examples of Line Driver Receivers: ST26C32AB (STM), AM26C32 (TI).

For combination with Motor

Dimensional drawing A	<L1 [mm]
2214 ... BXT H	26.8
3216 ... BXT H	28.7
4221 ... BXT H	34

Characteristics

These incremental encoders with 3 output channels, in combination with the FAULHABER Motors, are used for the indication and control of both shaft velocity and direction of rotation as well as for positioning.

A permanent magnet on the shaft creates a moving magnetic field which is captured using an angular sensor and further processed. At the encoder outputs, two 90° phase-shifted square wave signals are available with up to 1 024 impulses and an index impulse per motor revolution.

The Line Driver version has differential signal outputs (TIA-422). Differential signals reduce ambient interference and are suitable for applications with high ambient interference.

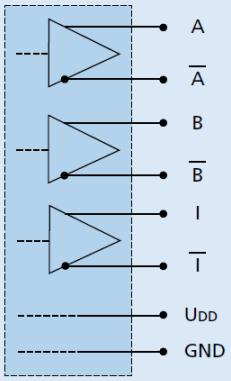
The Line Driver amplifies the encoder signal which means that long cables can be used without signal degradation.
Differential signal outputs must be decoded by the appropriate receiver module. In addition, a suitable line termination resistance (100 ohm) is possibly useful.

The encoder is available in a variety of different resolutions.
The encoder is connected with a ribbon cable.

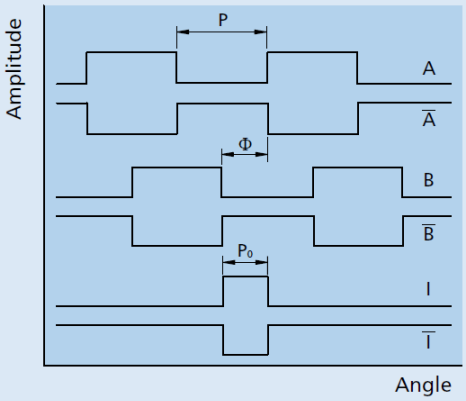
To view our large range of accessory parts, please refer to the “Accessories” chapter.

Circuit diagram / Output signals

Output circuit

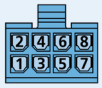


Output signals
with clockwise rotation as seen from the shaft end



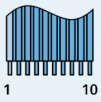
Connector information / Variants

Example product designation: **2444S024B-K1838 IE3-1024L**

Option	Type	Description
3806	Connector 	for combination with DC-Motors series CR, CXR and with Brushless DC-Motor series B(S), BP4 and BXT H. Connector variants AWG 28 / PVC ribbon cable with connector EN 60603-13 / DIN-41651.
3589	Connector 	for combination with Brushless DC-Motors series BX4. Connector variants AWG 28 / PVC ribbon cable with connector EN 60603-13 / DIN-41651.  Inclusive motor connector 3830
	Resolutions	Resolutions from 1 - 1024 lines per revolution are available by request.

Connection Encoder

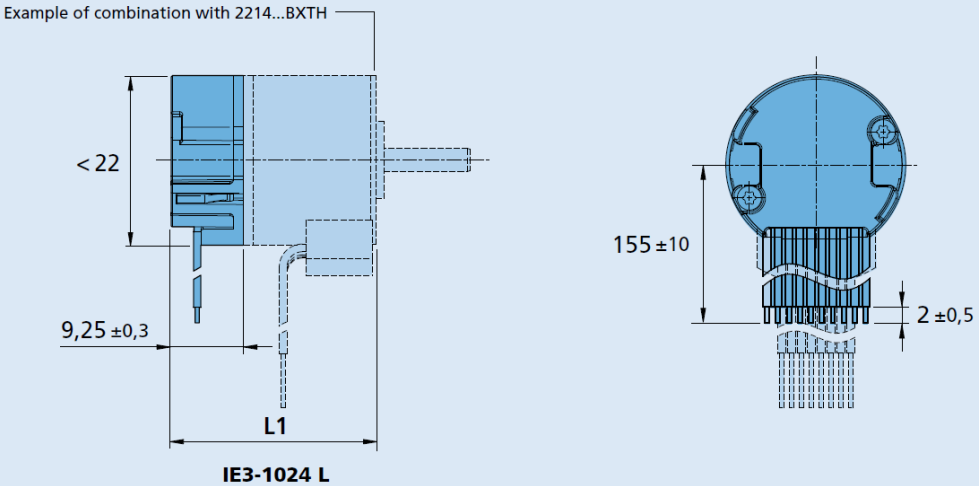
No.	Function
1	N.C.
2	UDD
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$
10	Channel I



Standard cable
PVC-ribbon cable, 10-AWG 28, 1,27 mm

Caution:
Incorrect lead connection will damage the motor electronics!
In combination with the BX4 brushless DC-servomotors with digital Hall sensors, the sensor supply connections of encoder and motor are connected to each other.

Dimensional drawing A



IE3-1024 L

IEF3-4096 L

magnetic Encoder, digital outputs, 3 channels,
16 - 4096 lines per revolution, Line Driver

IEF3-4096 L

	IEF3	-16 L	-32 L	-64 L	-128 L	-256 L	-512 L	-1024 L	-2048 L	-4096 L	
Lines per revolution	*N*	16	32	64	128	256	512	1 024	2 048	4 096	
Frequency range, up to [1]	*f*	5	10	20	40	80	160	320	640	874	kHz
Signal output, square wave		2+1 Index and complementary outputs									Channels
Supply voltage	U_{DD}	4.5 ... 5.5									V
Current consumption, typical [2]	I_{DD}	typ. 25, max. 40									mA
Index Pulse width	P_0	90 ± 45						90 ± 65	90 ± 75		°e
Phase shift, channel A to B	Φ	90 ± 45						90 ± 65	90 ± 75		°e
Inertia of sensor magnet	*J*	1.57									gcm^2
Operating temperature range		-40 ... +100									°C
Accuracy, typ.		0.5									°m
Repeatability, typ.		0.08									°m
Hysteresis		0.02									°m
Edge spacing, min.		225									ns
Mass, typ.		16.8									g

[1] Velocity (min^{-1}) = f(Hz) x 60/N
[2] U_{DD} = 5 V: with unloaded outputs
[3] At 5 000 min^{-1}

Note: The output signals are TIA-422 compatible.
Examples of Line Driver Receivers: ST26C32AB (STM), AM26C32 (TI).

For combination with Motor

Dimensional drawing A	<L1 [mm]
2214 ... BXT H	21.3
Dimensional drawing B	<L1 [mm]
3216 ... BXT H	23.3
Dimensional drawing C	<L1 [mm]
4221 ... BXT H	28.3

Characteristics

These incremental encoders with 3 output channels, in combination with the FAULHABER Brushless DC-Motors, are used for the indication and control of both shaft velocity and direction of rotation as well as for positioning.

The encoder is integrated in the Brushless DC-Motors BXT H-Series and extends the overall length by only 6,2 mm.

A segmented magnetic disc provides a magnetic field which is detected and further processed by an angle sensor.

At the encoder outputs, two 90° phase-shifted square wave signals are available with up to 4096 impulses and an index impulse per motor revolution.

The Line Driver version has differential signal outputs (TIA-422). Differential signals reduce ambient interference and are suitable for applications with high ambient interference.

The Line Driver amplifies the encoder signal which means that long cables can be used without signal degradation.
Differential signal outputs must be decoded by the appropriate receiver module. In addition, a suitable line termination resistance (100 ohm) is possibly useful.

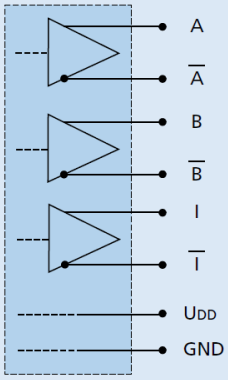
The supply voltage for the encoder and the output signals are interfaced through a ribbon cable, optional with connector.

Details for the Brushless DC-Motors and suitable reduction gearheads are on separate catalogue pages.

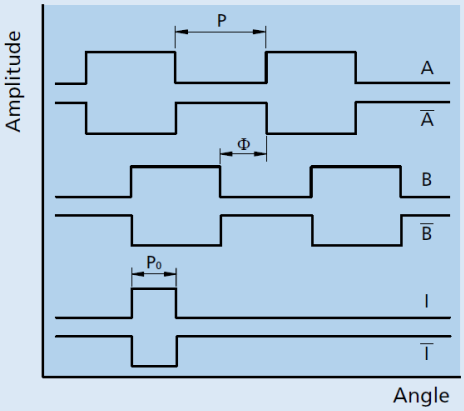
To view our large range of accessory parts, please refer to the “Accessories” chapter.

Circuit diagram / Output signals

Output circuit

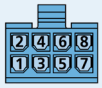


Output signals
with clockwise rotation as seen from the shaft end



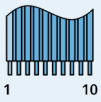
Connector information / Variants

Example product designation: **2214S012BXTH IEF3-4096L**

Option	Type	Description
3806	Connector 	for combination with DC-Motors series CR, CXR and with Brushless DC-Motor series B(S), BP4 and BXT H. Connector variants AWG 28 / PVC ribbon cable with connector EN 60603-13 / DIN-41651.
3589	Connector 	for combination with Brushless DC-Motors series BX4. Connector variants AWG 28 / PVC ribbon cable with connector EN 60603-13 / DIN-41651.  Inclusive motor connector 3830

Connection Encoder

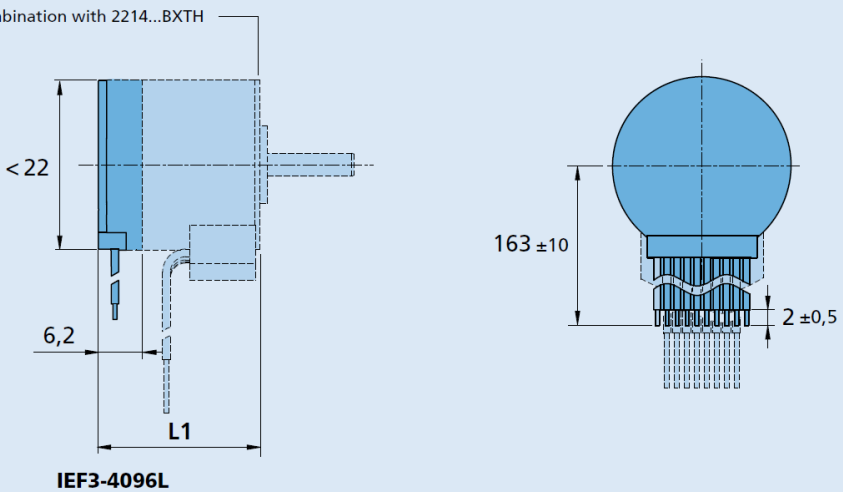
No.	Function
1	N.C.
2	UDD
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$
10	Channel I



Standard cable
PVC-ribbon cable, 10-AWG 28, 1,27 mm

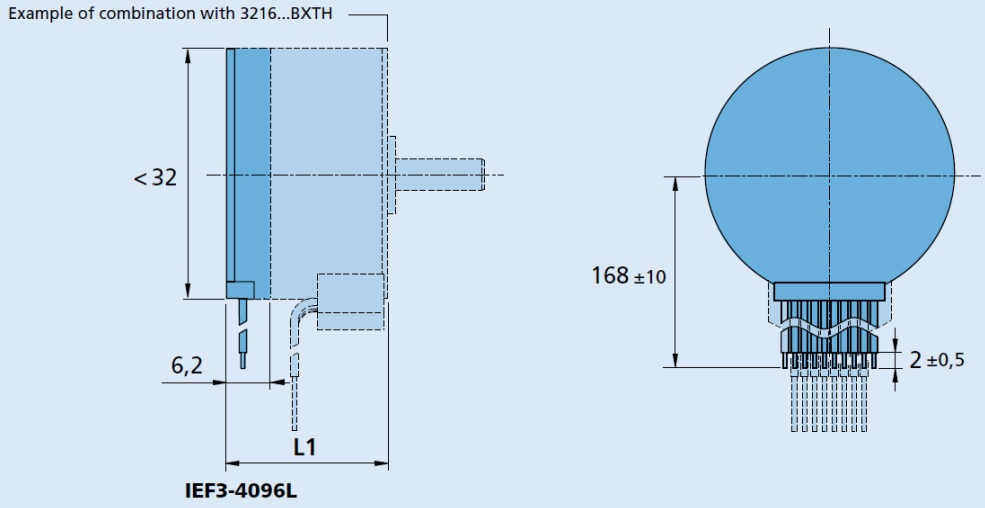
Caution:
Incorrect lead connection will damage the motor electronics!

Dimensional drawing A

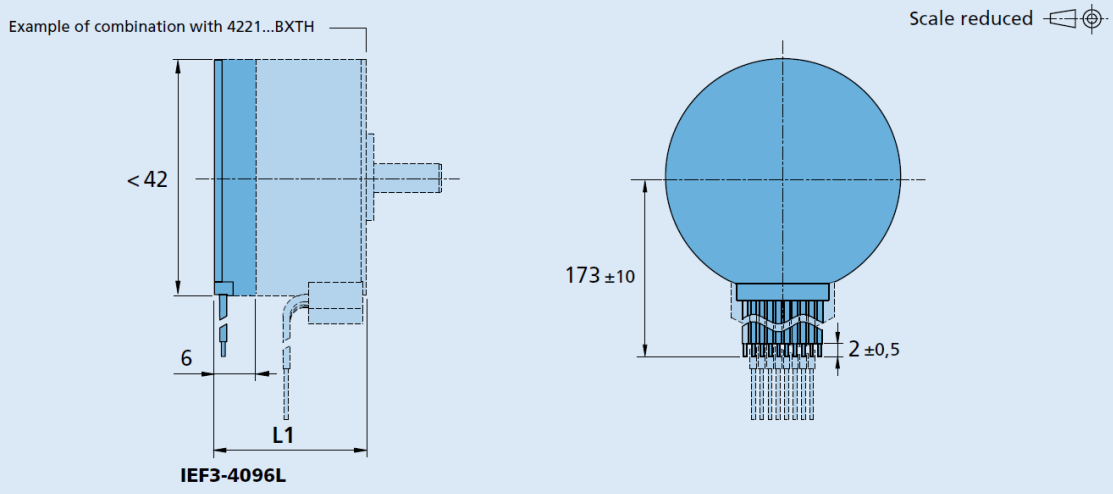


IEF3-4096L

Dimensional drawing B



Dimensional drawing C



IER3-10000 L

optical Encoder, digital outputs, 3 channels,
1000 - 10000 lines per revolution, Line Driver

IER3-10000 L

	IER3	-1000	-2000	-4000	-1024	-2048	-4096	-1700	-3400	-6800	-2500	-5000	-10000	L
Lines per revolution	N	1000	2000	4000	1024	2048	4096	1700	3400	6800	2500	5000	10000	
Frequency range, up to [1]	f	250	500	1000	250	500	1000	250	500	1000	250	500	1000	kHz
Signal output, square wave		2+1 Index and complementary outputs												Channels
Supply voltage	U_{DD}	4.5 ... 5.5												V
Current consumption, typical [2]	I_{DD}	typ. 27, max. 50												mA
Index Pulse width	P_0	90 ± 15												°e
Phase shift, channel A to B	Φ	90 ± 20												°e
Inertia of sensor magnet	J	0.14												gcm²
Operating temperature range		-20 ... +85												°C
Accuracy, typ.		0.3			0.3			0.2			0.1			°m
Repeatability, typ.		0.05												°m
Hysteresis		< 0.05												°m
Edge spacing, min.		125												ns
Mass, typ.		13.5												g

[1] Velocity (min^{-1}) = f(Hz) x 60/N
[2] U_{DD} = 5 V: with unloaded outputs
[3] Operating temperature range -40 ...+85 °C available on request

Note: The output signals are TIA-422 compatible.
Examples of Line Driver Receivers: ST26C32AB (STM), AM26C32 (TI).

Product combination	IER3	-1000 -2000 -4000	-1024 -2048 -4096	-1700 -3400 -6800	-2500 -5000 -10000	L
Series		**Motor, <L1** [mm]	**Motor, <L1** [mm]	**Motor, <L1** [mm]	**Motor, <L1** [mm]	**Drawing**
2214 ... BXT H		26.8	26.8	-	-	A
3216 ... BXT H		28.7	28.7	-	-	A
4221 ... BXT H		34	34	-	-	A

Characteristics

These incremental encoders with 3 output channels, in combination with the FAULHABER Motors, are used for the indication and control of both shaft velocity and direction of rotation as well as for positioning.

With a reflective code disc two square wave signals with 90° phase shift and one index impulse per motor revolution are generated.

The optical measurement principle allows high accuracy and repeatability for positioning applications. The high resolution encoder provides up to 4096 lines per revolution. In combination with the brushless DC-Servomotors BX4 with diameter 22 mm up to 6800 lines per revolution are available.

In combination with the brushless DC-Servomotors BX4 with diameter 32 mm up to 10000 lines per revolution are available.

The Line Driver version has differential signal outputs (TIA-422). Differential signals reduce ambient interference and are suitable for applications with high ambient interference.

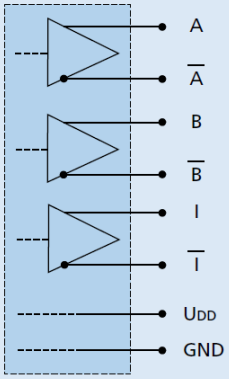
The Line Driver amplifies the encoder signal which means that long cables can be used without signal degradation.
Differential signal outputs must be decoded by the appropriate receiver module. In addition, a suitable line termination resistance (100 ohm) is possibly useful.

The encoder is connected via a ribbon cable. The pins are compatible to the FAULHABER Encoder IE3 L.

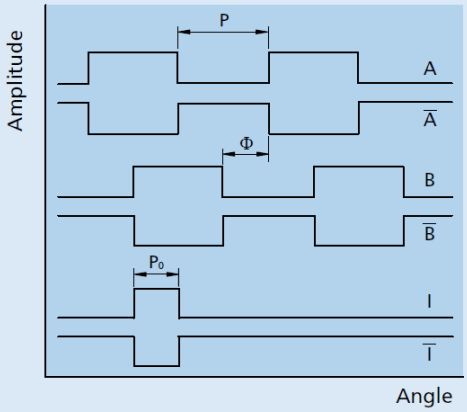
To view our large range of accessory parts, please refer to the “Accessories” chapter.

Circuit diagram / Output signals

Output circuit

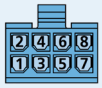


Output signals
with clockwise rotation as seen from the shaft end



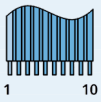
Connector information / Variants

Example product designation: **2232S024BX4 IER3-6800L 3589**

Option	Type	Description
3806	Connector 	for combination with DC-Motors series CR, CXR and with Brushless DC-Motor series B(S), BP4 and BXT H. Connector variants AWG 28 / PVC ribbon cable with connector EN 60603-13 / DIN-41651.
3589	Connector 	for combination with Brushless DC-Motors series BX4. Connector variants AWG 28 / PVC ribbon cable with connector EN 60603-13 / DIN-41651.  Inclusive motor connector 3830

Connection Encoder

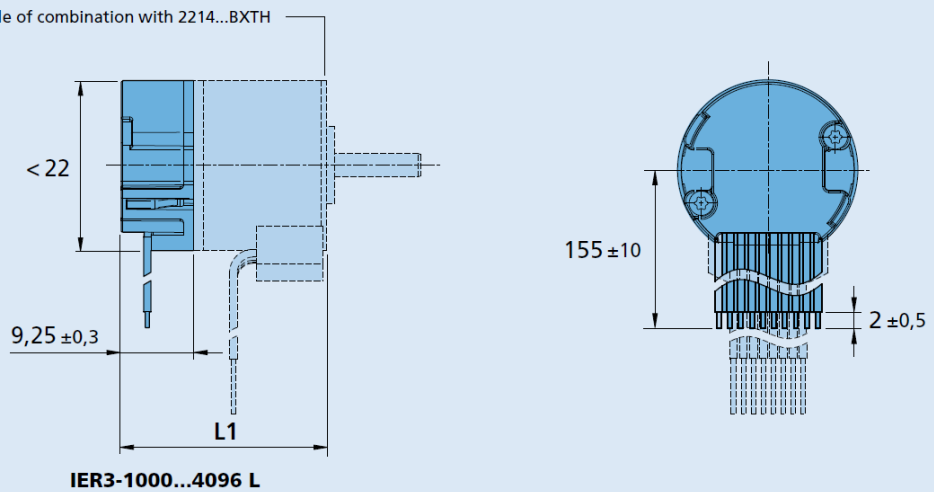
No.	Function
1	N.C.
2	UDD
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$
10	Channel I



Standard cable
PVC-ribbon cable, 10-AWG 28, 1,27 mm

Caution:
Incorrect lead connection will damage the motor electronics!

Dimensional drawing A



IER3-1000...4096 L

AEMT-12/16 L

magnetic multi-turn absolute Encoder,
SSI Interface with BISS-C Protocol,
4096 steps per revolution, Line Driver

AEMT-12/16 L

Steps per revolution		4 096	
Single-turn resolution		12 Bit	
Multi-turn resolution		16 Bit	
Signal output		SSI Interface with BISS-C Protocol	
Supply voltage	U_{DD}	4,5 ... .,5	V
Current consumption, typical[1)]	I_{DD}	typ. 25, max. 35	mA
Battery voltage[2)]		3 ... 5.5	V
Clock Frequency, max. (CLK and $\overline{CLK}$)		2	MHz
Input low level (CLK and $\overline{CLK}$)		0 ... 0.8	V
Input high level (CLK and $\overline{CLK}$)		2 ... 5	V
Setup time after power on, max.	t_{setup}	20	ms
Timeout, typ.	$t_{timeout}$	20	µs
Inertia of sensor magnet	J	0.08	gcm2
Operating temperature range		-40 ... +100	°C
Hysteresis		0.17	°m
Mass, typ.		13.5	g

[1)] U_{DD} = 5 V: with unloaded outputs
[2)] Battery adapter available as accessory (article no. 6501.00368)

Note: The output signals are TIA-422 compatible. Examples of Line Driver Receivers: iC-HF, SN65LBC179, SN75179B

For combination with Motor

Dimensional drawing A	<L1 [mm]
2214 ... BXT H	26.8
3216 ... BXT H	28.7
4221 ... BXT H	34

Characteristics

The multi-turn absolute encoder with Line Driver in combination with the FAULHABER brushless DC-Servomotors is ideal for commutation, speed and position control. It can also be used to create a sinusoidal commutation signal.

The encoder provides absolute angle information with a Single-turn resolution of 12 bits and a multi-turn resolution of 16 bits.
The position data can be communicated via an SSI interface with BiSS-C Protocol.
Besides the standard configuration as detailed here different alternative resolutions are available on request as a special programming.

Additional advantages are a higher efficiency of the motor and a reduced torque ripple.
The encoder has differential input and output signals (TIA-422).
Differential signals reduce ambient interference and are suitable for applications with high ambient interference.
The Line Driver amplifies the encoder signal which means that long cables can be used without signal degradation.

Differential signal outputs must be decoded by the appropriate receiver module. In the encoder a 120 ohm line termination resistor is integrated between the CLK and $\overline{CLK}$ inputs. A corresponding resistor is recommended for the DATA and $\overline{DATA}$ output signals on the controller. Special number 6419 is recommended for operation with FAULHABER Motion Controllers of generation V3.0. With this variant, the resistor for the DATA and $\overline{DATA}$ output signals is already integrated in the controller.

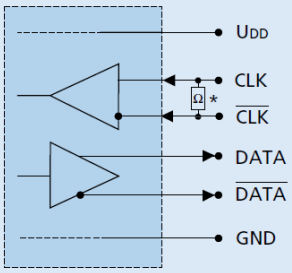
The supply voltage as well as the output signals for the encoder are interfaced through a ribbon cable, optionally with connector. Through the pin UBAT the supply with an optional backup battery is possible (Article number 6501.00368).

For the brushless DC servomotors series BX4, the motor and encoder are connected via two ribbon cables.
In the series B and BP4 the motors are connected via single wires and the encoders via ribbon cable.

To view our large range of accessory parts, please refer to the “Accessories” chapter.

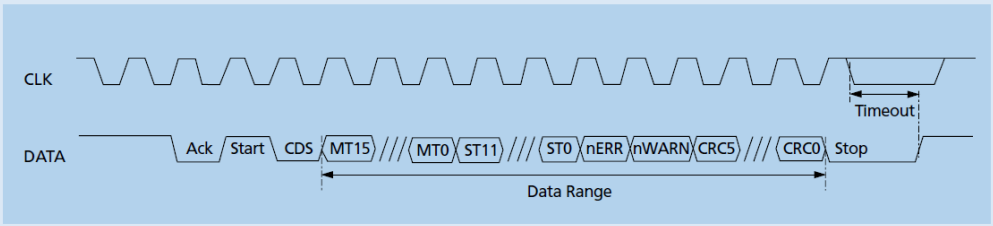
Circuit diagram / Output signals

Output circuit



Interface Protocol BISS-C

Angle position values are ascending for clockwise rotation.
Clockwise rotation as seen from the shaft end.

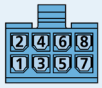


*Terminating resistor 120 Ω

Note: Data and Clock run inverted to the displayed signals Data and Clock.

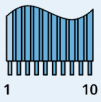
Connector information / Variants

Example product designation: **3242G024BX4 AEMT-12/16 L**

Option	Type	Description
5418	Connector 	for combination with Brushless DC-Motor series B(S) BP4, and BXT H. Connector variants AWG 28 / PVC ribbon cable with connector Molex Picoblade, 51021-1000, recommended mating connector Picoblade 53047-1010.
5419	Connector 	for combination with Brushless DC-Motors series BX4.Connector variants AWG 28 / PVC ribbon cablewith connector Molex Picoblade, 51021-1000,recommended mating connector Picoblade 53047-1010.  Inclusive motor connector 3830

Connection Encoder

No.	Function
1	Preset
2	UDD
3	GND
4	UBAT
5	Reserved
6	Reserved
7	DATA
8	DATA
9	CLK
10	CLK

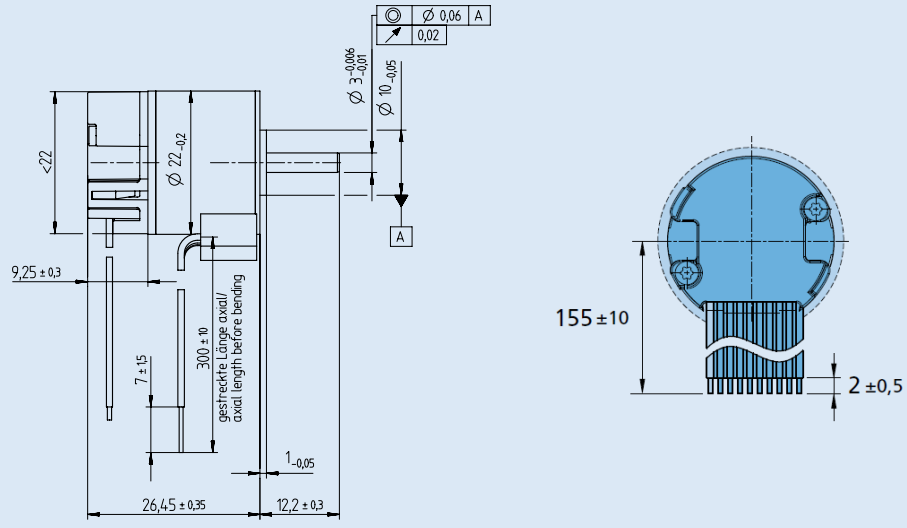


Standard cable
PVC-ribbon cable, 10-AWG 28, 1,27 mm

Note:
Motors with AEMT-12/16 L are commutated via the encoder and, by default, do not have any Hall sensors.

Caution:
incorrect lead connection will damage the motor electronics!

Dimensional drawing A



NOTE

MicNano Photronic & Mechatronic Drives Co., Ltd.
Spectifications subject to change without notice.
www.micnano.com.tw
Edition 2025

Encoder

Optical Encoder, digital outputs,
2 channel, 100 / 500 lines per revolution
3 channel, 500 / 1000 lines per revolution, Line Driver

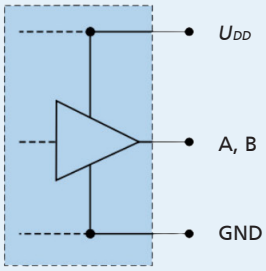
Series HE

	HE	100-2	200-2	500-2	500-3L	1000-3L	
Compatible with		HEDS 5500			HEDL 5540		
Lines per revolution	*N*	100	200	500	500	1000	
Frequency range, up to[1]	*f*	100					kHz
Signal output, square wave		2			2+1 Index and complementary outputs		Channels
Supply voltage	U_{DD}	4.5 ... 5.5					V
Current consumption, typical[2]	I_{DD}	17			57		mA
Pulse width	*P*	180 ± 45			180 ± 35		°e
Index Pulse width	P_0	-			90 ± 35		°e
Phase shift, channels A to B	*Φ*	90 ± 20			90 ± 15		°e
Logic state width	*S*	90 ± 45			90 ± 35		°e
Cycle	*C*	360 ± 5.5					°e
Signal rise/fall time, max. (C_{LOAD} = pF)	*tr/tf*	0.25 / 0.25					µs
Interia of code disc	*J*	0.6					gcm^2
Operating temperature range		-40 ... +100					°C

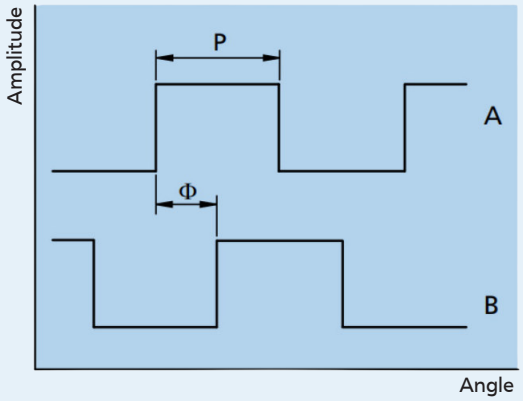
[1] Velocity (min^{-1}) = f(Hz) x 60/N
[2] U_{DD} = 5V: with unloaded outputs

HE100-2 / 200-2 / 500-2 Circuit diagram / Output signals

Output Circuit

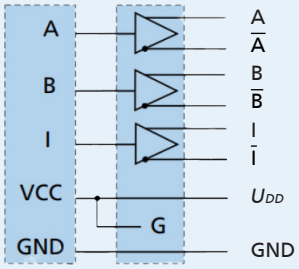


Output signals
with clockwise rotation as seen
from the shaft end



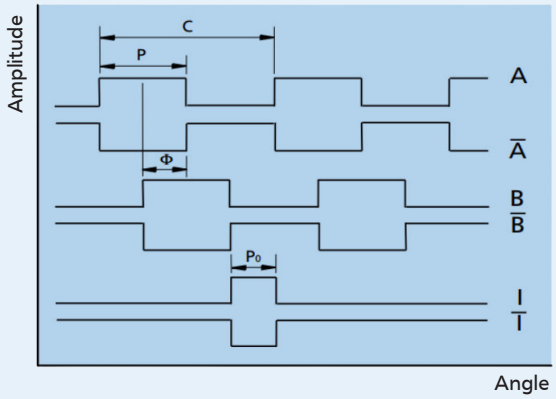
HE500-3L / 1000-3L Circuit diagram / Output signals

Output Circuit



Recommendation:
Suggested Line Receivers:
AM26LS32, SN75175, MC3486

Output signals
with clockwise rotation as seen
from the shaft end



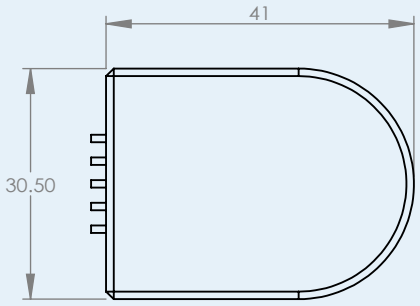
Characteristics

These incremental shaft encoders in combination with the DC-Motors are designed for the indication and control of both shaft velocity and directionof rotation as well as for positioning.

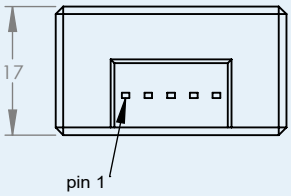
A LED source and lens system transmits collimated light through a low inertia metal disc to give two channels with 90° phase shift. The index pulse is synchronized with the channel $\overline{B}$. Each encoder channel provides complementary output signals. The single 5 volt supply and the digital output signals are interfaced with a connector.

The Line Driver offers enhanced performance when the encoder is used in noisy environments, or when it is required to drive long distances.

Dimensions / Pin-out Description - HE100-2 / 200-2 / 500-2



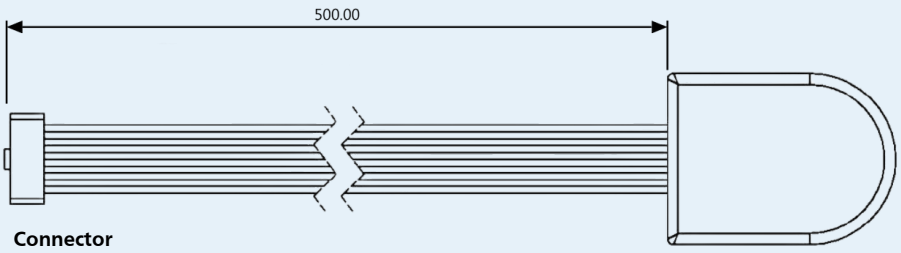
Connector
AMP 103686-4/640442-5,
Molex 2695/2759
FCI 65039-032/4825X-000



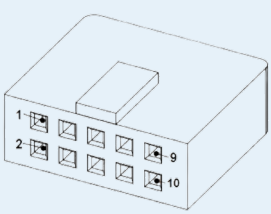
Voltage (5 pin)		
PIN	Color	Description
1	black	Ground
2	yellow	Index
3	white	Channe A
4	red	DC +5V
5	green	Channel B

Dimensions / Pin-out Description - HE500-3L / HE1000-3L Line driver

Scale reduced (mm)



Connector
EN 60603-13 / DIN-41651,
gird 2.54 mm



Line driver (10 pin)	
PIN	Description
1	N.C.
2	DC +5V
3	Ground
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Index $\overline{I}$
10	Index I

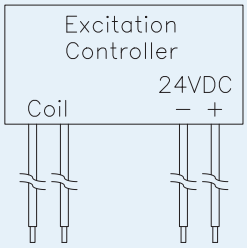
Brake + Encoders

power-off holding brake

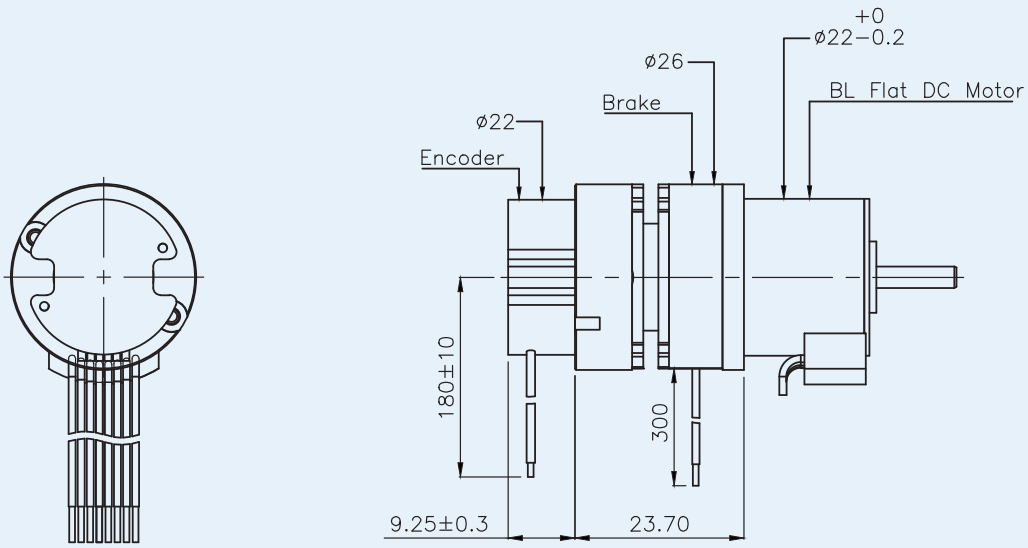
PFB26E-24V

Brake		PFB26E-24V
Function		Power-off holding brake
Rated Voltage	VDC	24
Rated Static torque	mNm	60
Rated current	A	0.6
Rated power	W	14.5
Moment of inertia	gcm^2	10
Allowable speed	rpm	5000
Weight	g	31

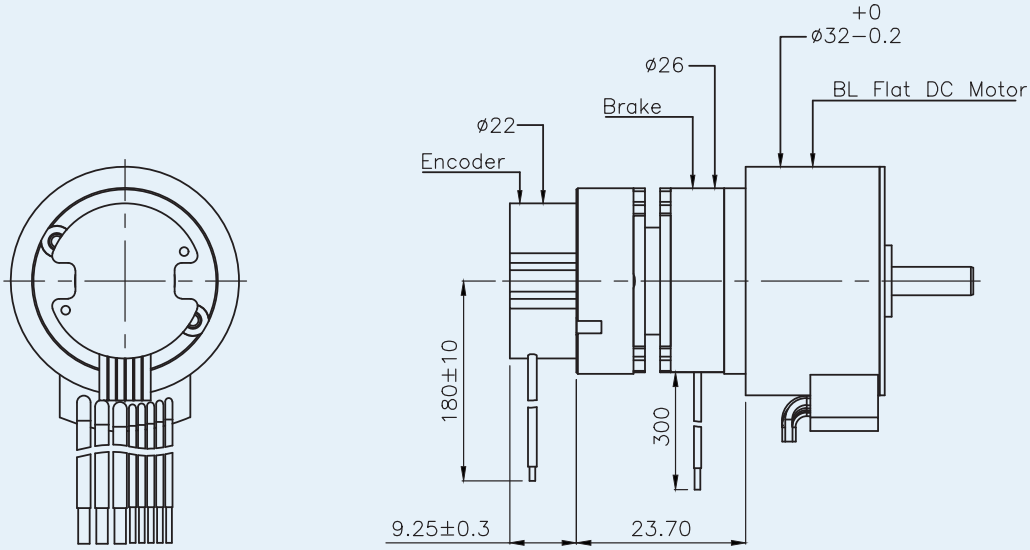
Connection



Dimensional drawing A - 2214SXXXBXTH+PFB26E-24V+IE3-1024



Dimensional drawing B - 3216WXXXBXTH+PFB26E-24V+IE3-1024



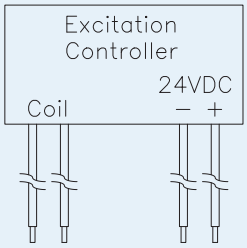
Brake + Encoders

power-off holding brake

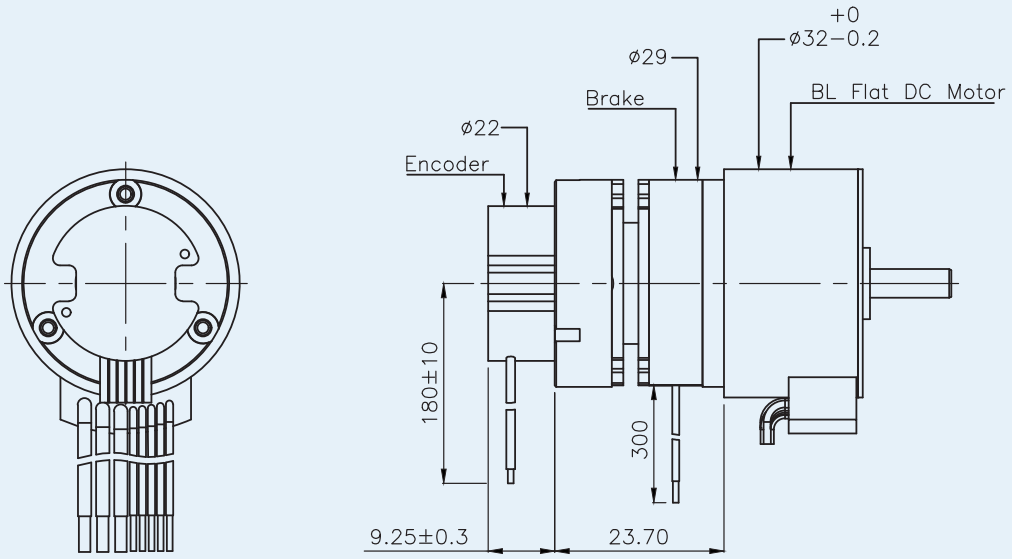
PFB29E-24V

Brake		PFB29E-24V
Function		Power-off holding brake
Rated Voltage	VDC	24
Rated Static torque	mNm	160
Rated current	A	0.42
Rated power	W	10
Moment of inertia	gcm^2	12
Allowable speed	rpm	5000
Weight	g	36

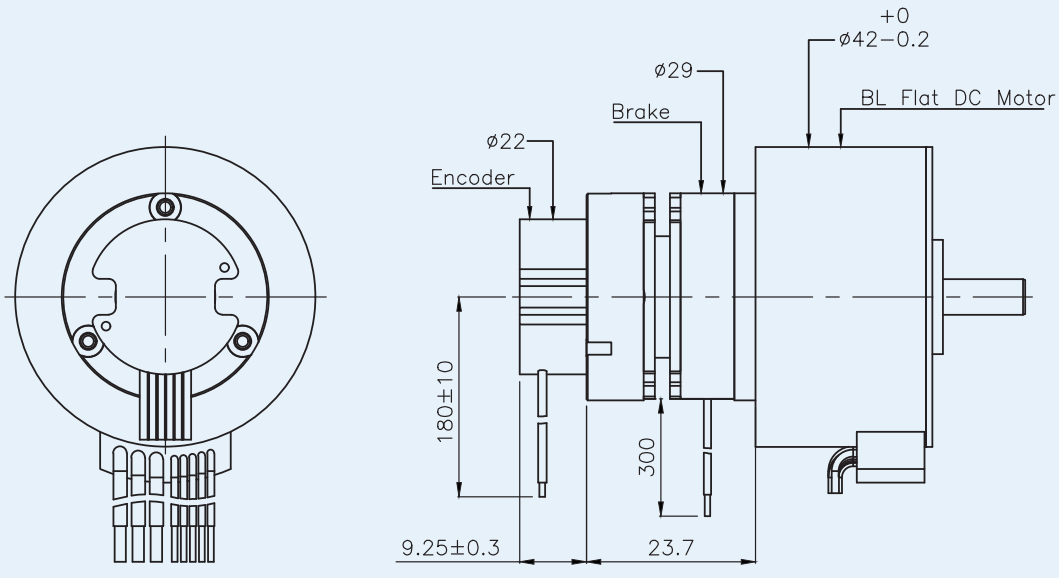
Connection



Dimensional drawing A - 3216WXXXBXTH+PFB29E-24V+IE3-1024



Dimensional drawing B - 4221GXXXBXTH+PFB29E-24V+IE3-1024



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Edition 2025

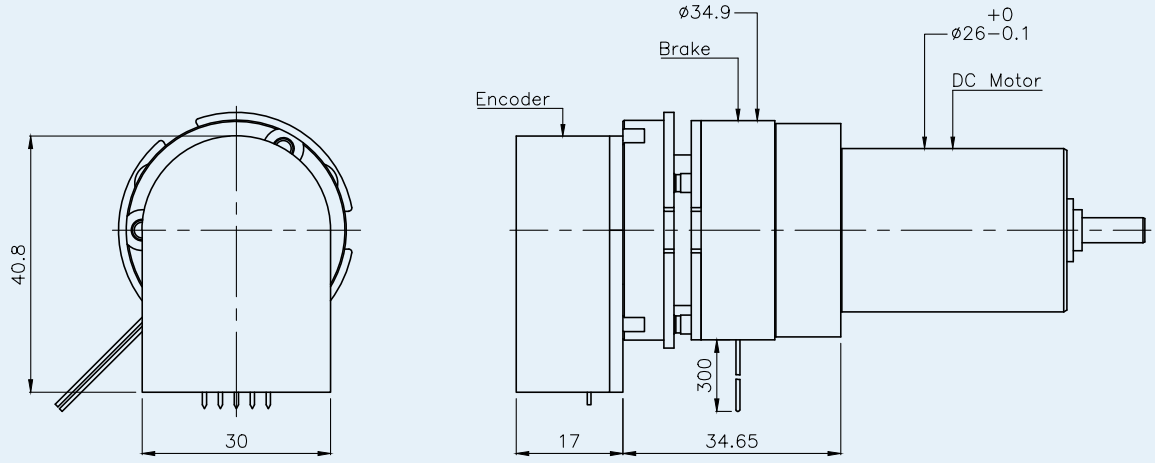
Brake + Encoders

power-off holding brake

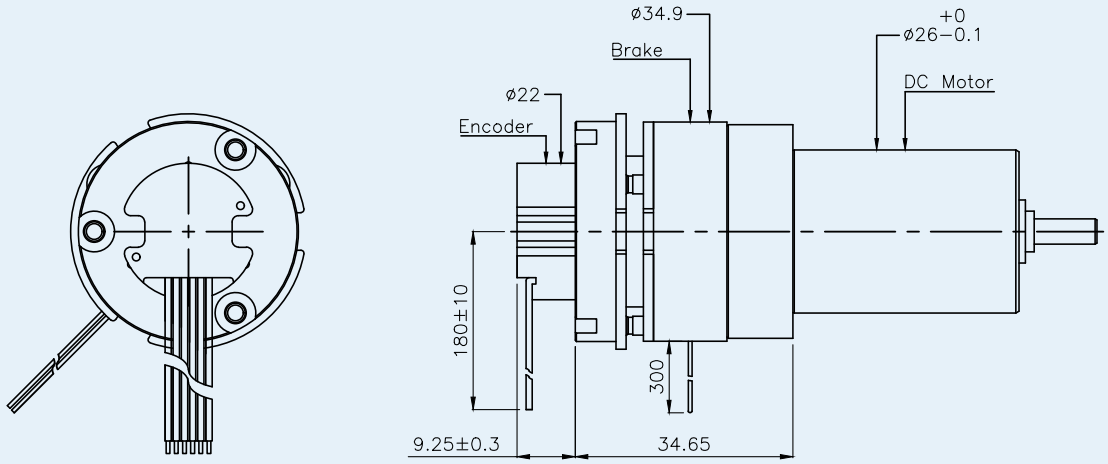
PFB35

Brake		PFB35A-24V	PFB35B-24V
Function		Power-off holding brake	
Rated Voltage	VDC	24	24
Rated Static torque	mNm	120	360
Rated current	A	0.16	0.25
Rated power	W	3.9	6
Moment of inertia	gcm^2	12	15
Allowable speed	rpm	5 000	5 000
Weight	g	75	90
Length with mounting adaptor (L)	mm	35	41

Dimensional drawing A - 2642W024CR+PFB35-24V+HE500-2 / HE1000-3L



Dimensional drawing B - 2642W024CR+PFB35-24V+IE3-1024



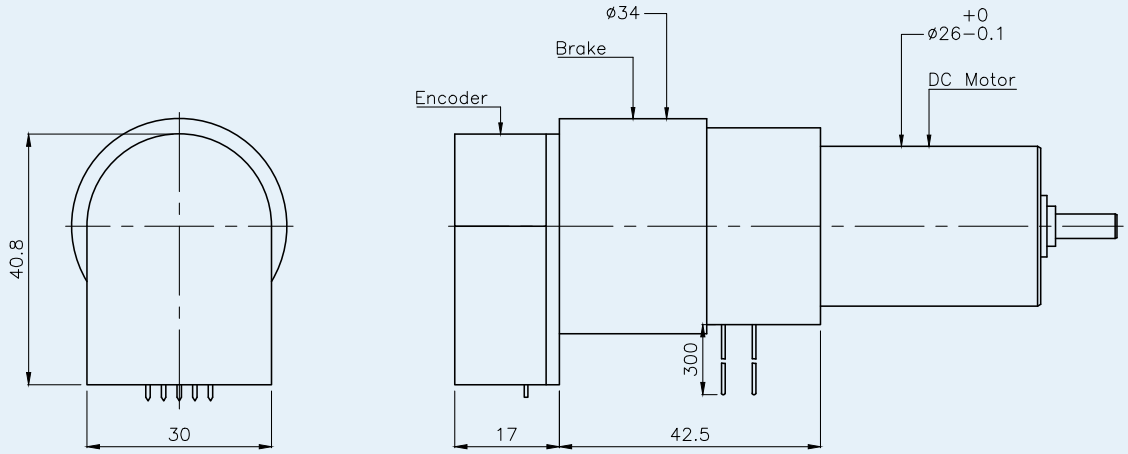
Brake + Encoders

power-on holding brake

PNB32 / 34

Brake		PNB32-24V	PNB34-12V
Function		Power-on holding brake	
Rated Voltage	VDC	24	12
Rated Static torque	mNm	600	
Rated current	A	0.26	10.55
Rated power	W	6.2	
Moment of inertia	gcm^2	12	
Allowable speed	rpm	5000	
Weight	g	80	

Dimensional drawing A - 2642W024CR+PNB32-24V+HE 500-2 / HE 1000-3L



Dimensional drawing B - 3216W024BXT H+PNB32-24V+HE 500-2 / HE 1000-3L