Encoders

magnetic Encoder, digital outputs,
3 channels, 16 - 64 lines per revolution

For combination with
DC-Micromotors
Brushless DC-Motors

Series HXM3-64

		HXM3-64	
Lines per revolution	*N*	64	
Frequency range, up to [1]	*f*	32	kHz
Signal output, square wave		2+1 Index	Channels
Supply voltage	U_{DD}	4,5 ... 5,5	V
Current consumption, typical [2]	I_{DD}	9	mA
Pulse width	*P*	180 ± 45	°e
Phase shift, channel A to B	*Φ*	90 ± 45	°e
Logic state width	*S*	90 ± 45	°e
Cycle	*C*	360 ± 30	°e
Signal rise/fall time, max. (C_{LOAD} = 50 pF)	*tr*/*tf*	60 / 60	µs
Inertia of code disc [3]	*J*	0,02	gcm²
Operating temperature range		-25 ... +85	°C

[1] Velocity (min⁻¹) = *f* (Hz) x 60/*N*
[2] U_{DD} = 5 V: with unloaded outputs
[3] No additional inertia for series 0620 ... B

For combination with Motor	
Dimensional drawing A	**<L1 [mm]**
0615 ... S - K1707	19,4
Dimensional drawing B	**<L1 [mm]**
0620 ... B - K1674	21,5

Characteristics

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

Solid state sensors and a low inertia magnetic disc provide two channels with 90° phase shift and one index channel.

The supply voltage for the encoder and the DC-Motor as well as the output signals are interfaced with a flexible printed circuit (FPC) to a 8-pin ZIF connector.

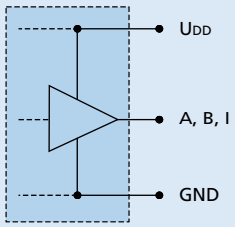
Encoder is programmable by user to 16, 32, and 64 lines per revolution by setting the CFG2 pin to high, open, or ground respectively.
The input power must be cycled off and on to change the settings.

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

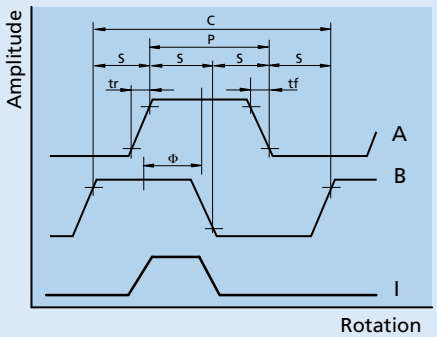
An optional interface board with suitable connector is also available on request.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



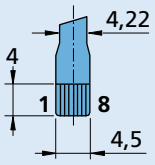
For notes on technical data and lifetime performance refer to "Technical Information".
Edition 2016

Connector information / Variants

No.	Function
1	Motor +*
2	U_{DD}
3	Channel I
4	Channel A
5	Channel B
6	Cfg2
7	GND
8	Motor –*

* **Note:** Brushless motors have separate motor leads.

Connection Encoder and Motor



Flexboard
8 circuits, 0,5 mm pitch

Recommended connector
Top contact style
8 circuits, 0,5 mm pitch, e.g.:
Molex: 52745

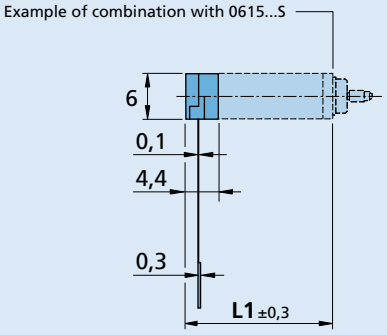
Full product description

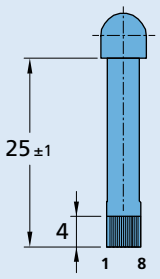
Examples:

0615N003SK1707 HXM3-64

0620K012BK1674 HXM3-64

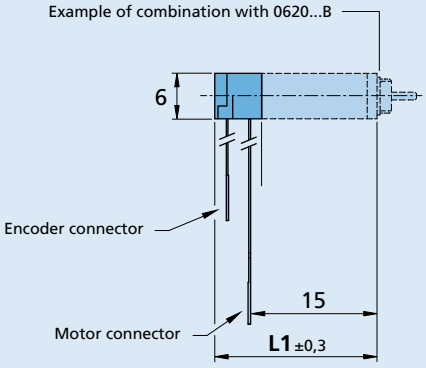
Dimensional drawing A

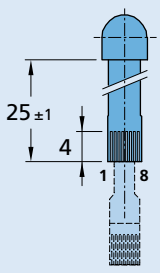




HXM3-64

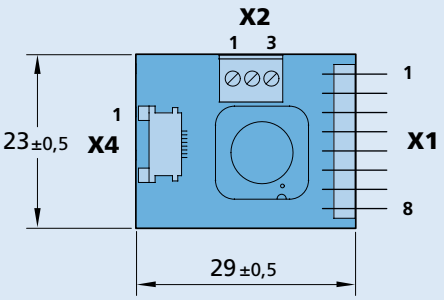
Dimensional drawing B





HXM3-64

Adapter board



Interface Board HXM3-64
for Motion Controller MCDC 3002 S
Part. No.: 6501.00145

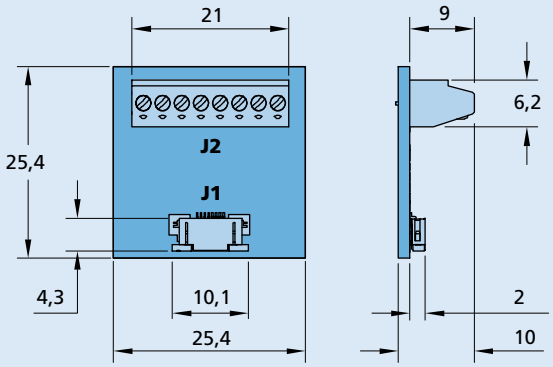
Connection

Pin	Connection X1
1	4. In
2	Channel A
3	Channel B
4	U_{DD} = 5V
5	SGND
6	Motor +
7	Motor -
8	5. In

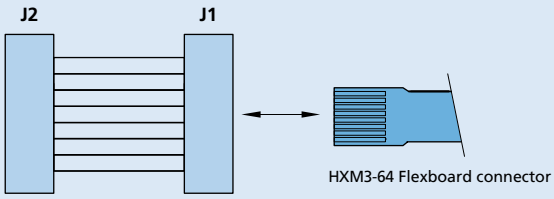
Pin	Connection X4
1	Motor +
2	U_{DD} = 5V
3	Kanal I
4	Channel A
5	Channel B
6	N.C.
7	SGND
8	Motor -

Pin	Connection X2
1	Channel I
2	5. In
3	4. In

Adapter board



Interface board HXM3-64
Part No.: D100308900



Connector
J1 - Molex 52745-0896
J2 - Phoenix 1725711

For notes on technical data and lifetime performance refer to “Technical Information”.
Edition 2016

Encoders

magnetic Encoder, digital outputs,
3 channels, 32 - 256 lines per revolution

For combination with
DC-Micromotors

Series HEM3-256 W

		HEM3-32 W	HEM3-64 W	HEM3-128 W	HEM3-256 W	
Lines per revolution	*N*	32	64	128	256	
Frequency range, up to [1]	*f*	16	32	64	128	kHz
Signal output, square wave		2+1 Index				Channels
Supply voltage [2]	U_{DD}	3 ... 3,6				V
Current consumption, typical [3]	I_{DD}	16				mA
Output current, max. [4]	I_{OUT}	2				mA
Pulse width	*P*	180 ± 45				°e
Phase shift, channel A to B	*Φ*	90 ± 45				°e
Logic state width	*S*	90 ± 45				°e
Signal rise/fall time, max. (C_{LOAD} = 50 pF)	*tr*/*tf*	0,1 / 0,1				µs
Inertia of code disc	*J*	0,02				gcm²
Operating temperature range		-30 ... +85				°C

[1] Velocity (min^{-1}) = *f* (Hz) x 60/*N*
[2] U_{DD} = 3,3 V: connect Pin 3 and 4 to 3,3 V. U_{DD} = 5 V: connect Pin 3 to 5 V, Pin 4 open
[3] U_{DD} = 3,3 or 5 V: with unloaded outputs
[4] U_{DD} = 5 V: low logic level < 0,5 V, high logic level > 4,5 V: CMOS- and TTL compatible

For combination with Motor	
Dimensional drawing A	**<L1 [mm]**
0816 ... SR - K2566	24,4
Dimensional drawing B	**<L1 [mm]**
1016 ... G - K1707	24,2
1024 ... S - K1707	32,2
Dimensional drawing C	**<L1 [mm]**
1224 ... SR - K1707	31,1

Characteristics

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

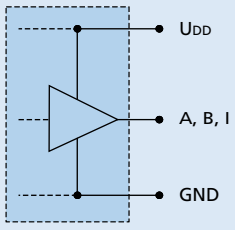
Solid state sensors and a low inertia magnetic disc provide two channels with 90° phase shift and one index channel.

The nominal supply voltage for the encoder is selectable and either 3,3 VDC or 5,0 VDC. The supply voltage for the encoder and the DC-Micromotor as well as the output signals are interfaced with discrete wires and an 8-pin Molex crimp style connector.

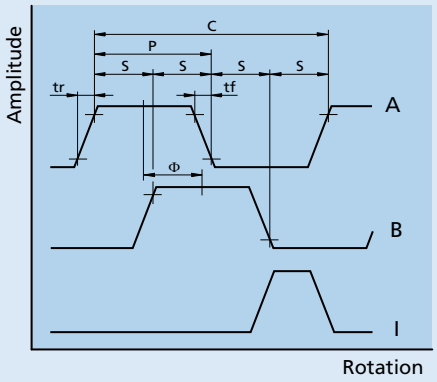
Details for the DC-Micromotors and suitable reduction gearheads are on separate catalog pages.

Circuit diagram / Output signals

Output circuit



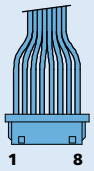
Output signals
with clockwise rotation as seen from the shaft end



Connector information / Variants

No.	Function
1	Motor –
2	GND
3	$U_{DD\ 5V}$
4	$U_{DD\ 3,3V}$
5	Channel A
6	Channel B
7	Channel I
8	Motor +

Connection Encoder and Motor



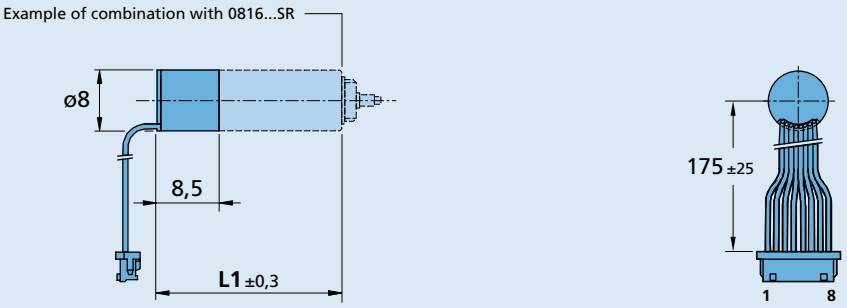
Cable
Wire: Tefzel MIL-W-22759/32, 30AWG

Recommended connector
8 circuits, 1,25 mm pitch, e.g.:
Molex: 51021-0800

Full product description

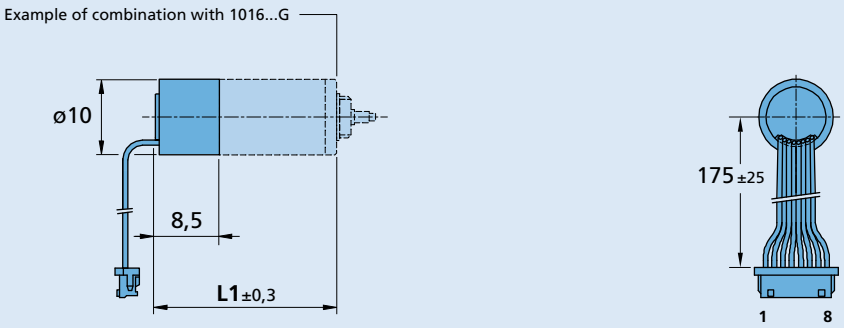
- Examples:
  1016N012G HEM3-32
  1224N012SR HEM3-256

Dimensional drawing A



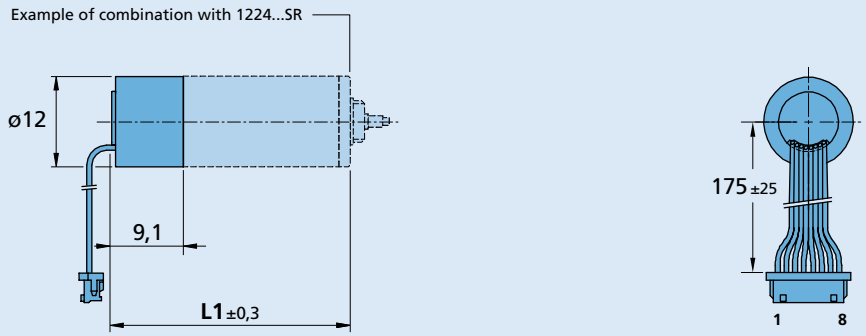
HEM3-256 W

Dimensional drawing B



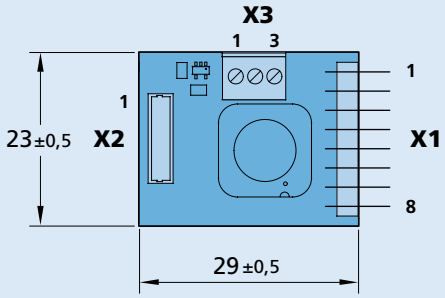
HEM3-256 W

Dimensional drawing C



HEM3-256 W

Adapter board



Interface Board HEM3-256 W
for Motion Controller MCDC 3002 S
Part. No.: 6501.00146

Connection

Pin	Connection X1
1	4. In
2	Channel A
3	Channel B
4	U_{DD} = 5V
5	SGND
6	Motor +
7	Motor -
8	5. In

Pin	Connection X2
1	Motor -
2	SGND
3	U_{DD} = 5V
4	N.C.
5	Channel A
6	Channel B
7	Channel I
8	Motor +

Pin	Connection X3
1	Channel I
2	5. In
3	4. In

Note:
U_{DD} = 3,3V available on request

Encoders

magnetic Encoder, digital outputs,
3 channels, 32 - 1024 lines per revolution

For combination with
Brushless DC-Motors

Series IEM3-1024

		IEM3-32	IEM3-64	IEM3-128	IEM3-256	IEM3-512	IEM3-1024	
Lines per revolution	*N*	32	64	128	256	512	1 024	
Frequency range, up to [1]	*f*	64	128	256	500	500	500	kHz
Signal output, square wave		2+1 Index						Channels
Supply voltage	U_{DD}	4,5 ... 5,5						V
Current consumption, typical [2]	I_{DD}	typ. 16, max. 23						mA
Output current, max. [3]	I_{OUT}	4						mA
Index Pulse width	P_0	90 ± 45			90 ± 75			°e
Phase shift, channel A to B [4]	Φ	90 ± 45			90 ± 75			°e
Signal rise/fall time, max. (C_{LOAD} = 50 pF)	*tr*/*tf*	0,1 / 0,1						µs
Inertia of code disc [5]	*J*	0,007						gcm²
Operating temperature range		-30 ... +100						°C

[1] Velocity (min^{-1}) = *f* (Hz) x 60/*N*
[2] U_{DD} = 5 V: with unloaded outputs
[3] U_{DD} = 5 V: low logic level < 0,4 V, high logic level > 4,5 V: CMOS- and TTL compatible
[4] At 5 000 min^{-1}
[5] No additional inertia for series 0824...B and 1028...B

For combination with Motor	
Dimensional drawing A	**<L1 [mm]**
0824 ... B	24,1
Dimensional drawing B	**<L1 [mm]**
1028 ... B	28,1

Characteristics

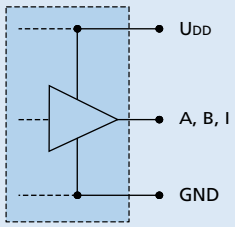
These incremental encoders in combination with the FAULHABER motors are used for the indication and control of both velocity and direction of rotation as well as for positioning.

A permanent magnet on the shaft creates a moving magnetic field which is captured using a single-chip angular sensor and further processed. At the encoder outputs, two 90° phase-shifted rectangular signals are available with up to 1024 impulses and an index impulse per motor revolution.

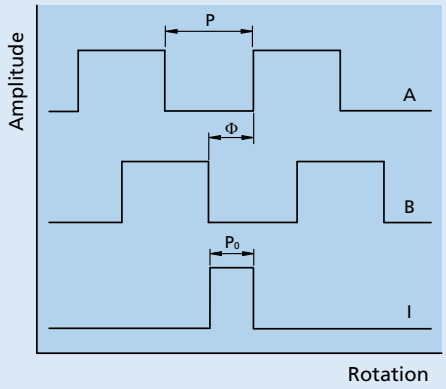
The encoder is available in a variety of different resolutions and is suitable for speed control and positioning applications.
Motor and encoder are connected via a common flexboard.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right|$$

Admissible deviation of Index pulse:

$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right|$$

For notes on technical data and lifetime performance refer to “Technical Information”.
Edition 2016

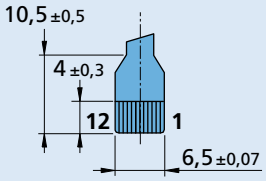
www.faulhaber.com

Connector information / Variants

No.	Function
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD}
6	Hall sensor C
7	Hall sensor B
8	Hall sensor A
9	Channel B
10	Channel A
11	Channel I
12	N.C.

Caution:
Incorrect lead connection will damage the motor electronics!

Connection Encoder and Motor



Flexboard
12 circuits, 0,5 mm pitch

Recommended connector
Top contact style
12 circuits, 0,5 mm pitch, e.g.:
Molex: 52745-1296/1297

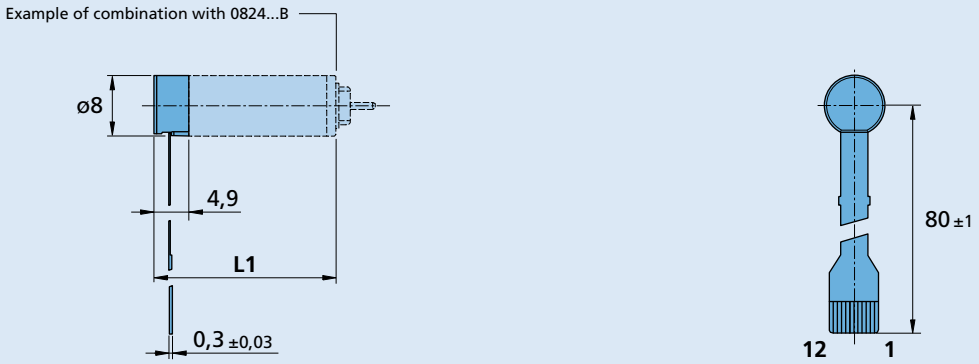
Options

- Resolutions from 1 - 127 lines per revolution are available on request.

Full product description

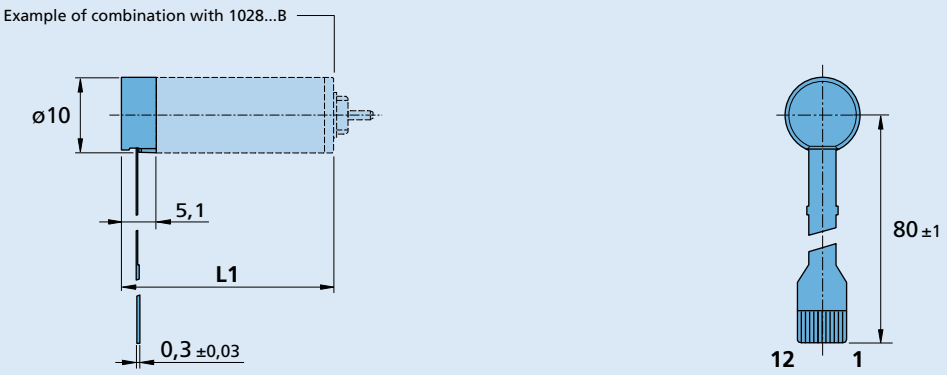
- Examples:
  0824K006B IEM3-1024
  1028S012B IEM3-1024

Dimensional drawing A



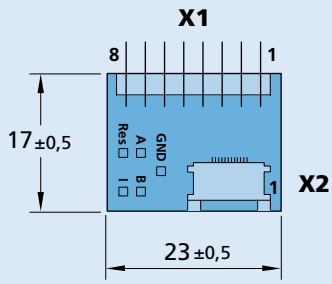
IEM3-1024

Dimensional drawing B



IEM3-1024

Adapter board



Interface Board IEM3-1024
for Speed Controller SC 1801 S
Part. No.: 6501.00163

Connection

Pin	Connection X1
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD}
6	Hall Sensor C
7	Hall Sensor B
8	Hall Sensor A

Pin	Connection X2
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD}
6	Hall Sensor C
7	Hall Sensor B
8	Hall Sensor A
9	Channel B
10	Channel A
11	Channel I
12	N.C.

For notes on technical data and lifetime performance refer to “Technical Information”.
Edition 2016

www.faulhaber.com

Encoders

magnetic Encoder, digital outputs,
3 channels, 32 - 1024 lines per revolution

For combination with
DC-Micromotors
Brushless DC-Motors

Series IE3-1024

		IE3-32	IE3-64	IE3-128	IE3-256	IE3-512	IE3-1024	
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						Channels
Supply voltage	U_{DD}	4,5 ... 5,5						V
Current consumption, typical [2]	I_{DD}	typ. 16, max. 23						mA
Output current, max. [3]	I_{OUT}	4						mA
Index Pulse width [4]	P_0	90 ± 45				90 ± 75		°e
Phase shift, channel A to B [4]	Φ	90 ± 45				90 ± 75		°e
Signal rise/fall time, max. (C_{LOAD} = 50 pF)	*tr*/*tf*	0,1 / 0,1						µs
Inertia of code disc	*J*	0,08						gcm²
Operating temperature range		-40 ... +100						°C

[1] Velocity (min⁻¹) = *f* (Hz) x 60/*N*
[2] U_{DD} = 5 V: with unloaded outputs
[3] U_{DD} = 5 V: low logic level < 0,4 V, high logic level > 4,5 V: CMOS- and TTL compatible
[4] At 5 000 min⁻¹

For combination with Motor

Dimensional drawing A	<L1 [mm]
2237 ... CXR	52,5
3274 ... BP4	90,8

Dimensional drawing B	<L1 [mm]
2342 ... CR	60,5
2642 ... CXR	60,5
2642 ... CR	60,5
2657 ... CXR	75,5
2657 ... CR	75,5
2668 ... CR	86,5
3242 ... CR	60,5
3257 ... CR	75,5
3272 ... CR	90,5

Dimensional drawing C	<L1 [mm]
2444 ... B - K1838	55,3
3056 ... B - K1838	67,3
3564 ... B - K1838	75,3
4490 ... B - K1838	100,3
4490 ... BS - K1838	100,3

Dimensional drawing D	<L1 [mm]
2232 ... BX4	50,2
2232 ... BX4 S	50,2
2250 ... BX4	68,2
2250 ... BX4 S	68,2

Dimensional drawing E	<L1 [mm]
3242 ... BX4	60,0
3268 ... BX4	86,0

Dimensional drawing F	<L1 [mm]
3863 ... CR - 2016	82,6
3890 ... CR - 2016	108,6

Characteristics

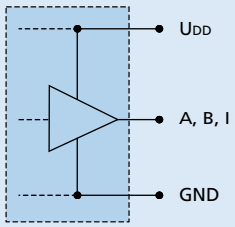
These incremental encoders have 3 output channels, in combination with the Faulhaber Motors are used for the indication and control of both shaft velocity and direction of rotation as well as for positioning.

A permanent magnet on the shaft creates a moving magnetic field which is captured using a single-chip angular sensor and further processed. At the encoder outputs, two 90° phase-shifted rectangular signals are available with up to 1024 impulses and an index impulse per motor revolution.

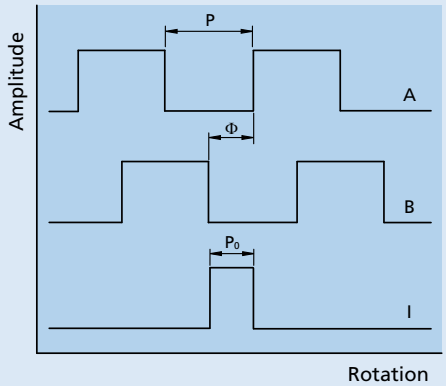
The encoder is available in a variety of different resolutions. Motor and encoder are connected via a common flexboard.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right| \leq 75°$$

Admissible deviation of Index pulse:

$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right| \leq 75°$$

Connector information / Variants

No.	Function
1	N.C.
2	Channel I
3	GND
4	U_{DD}
5	Channel B
6	Channel A

Caution:
Incorrect lead connection will damage the motor electronics!

Connection Encoder

Cable
PVC-ribbon cable
6-AWG 28, 1,27 mm

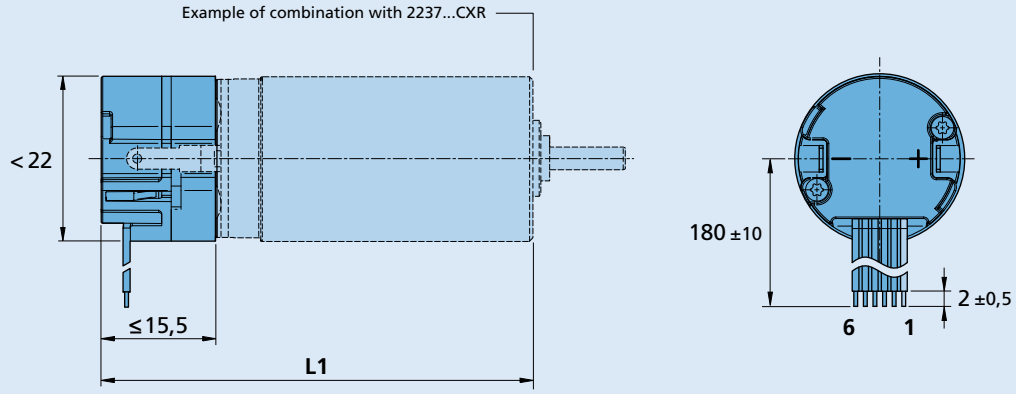
Option

- Connector variants AWG 28 / PVC ribbon cable with connector MOLEX Picoblade 51021-0600, recommended mating connector 53047-0610.
  Option no.: 3807 for combination with DC-Motors series CR, CXR and with Brushless DC-Motor series BP4.
  Option no.: 3592 for combination with Brushless DC-Motors series BX4.
  Note: inclusive motor connector 3830.
- Resolutions from 1 - 127 lines per revolution are available by request.

Full product description

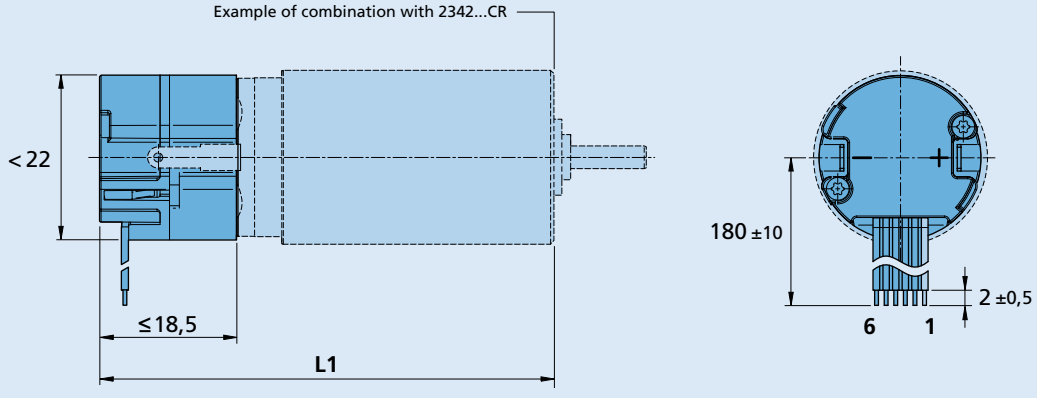
- Example:
  2444S024B K1838 IE3-1024
  2232S024BX4 IE3-256

Dimensional drawing A



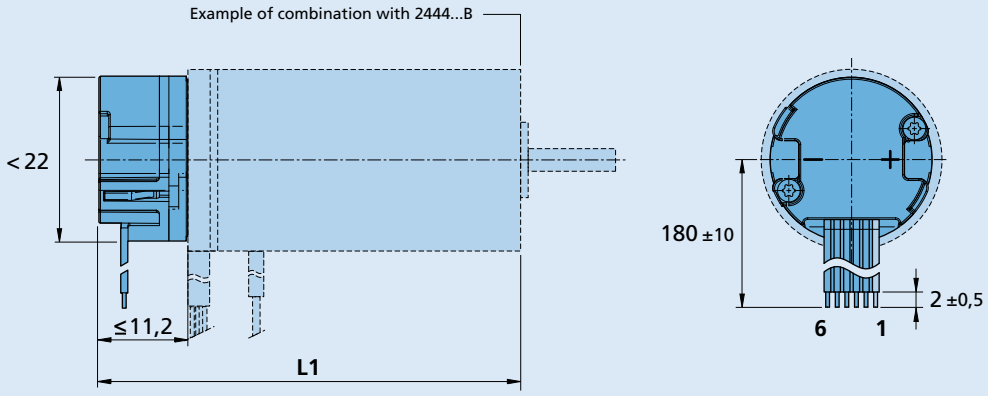
IE3-1024

Dimensional drawing B



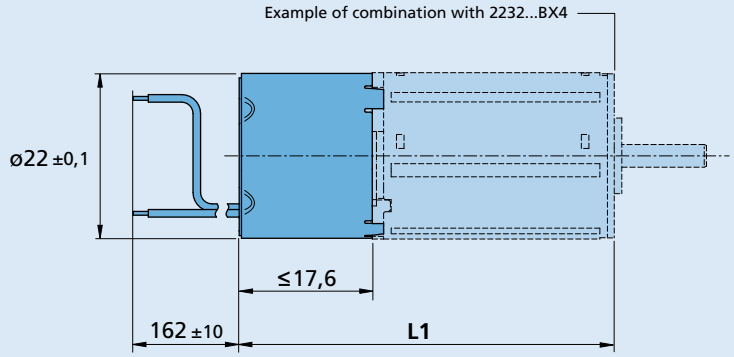
IE3-1024

Dimensional drawing C



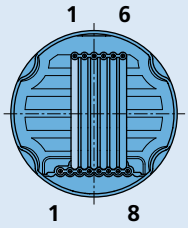
IE3-1024

Dimensional drawing D



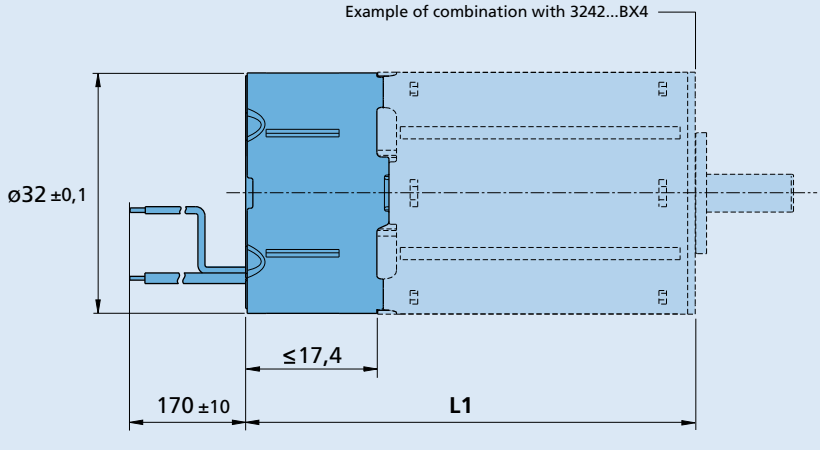
IE3-1024

Connection Encoder



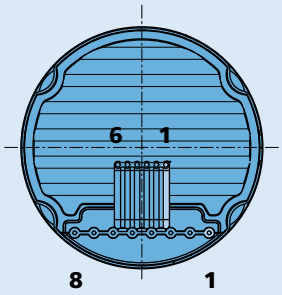
Connection Motor

Dimensional drawing E



IE3-1024

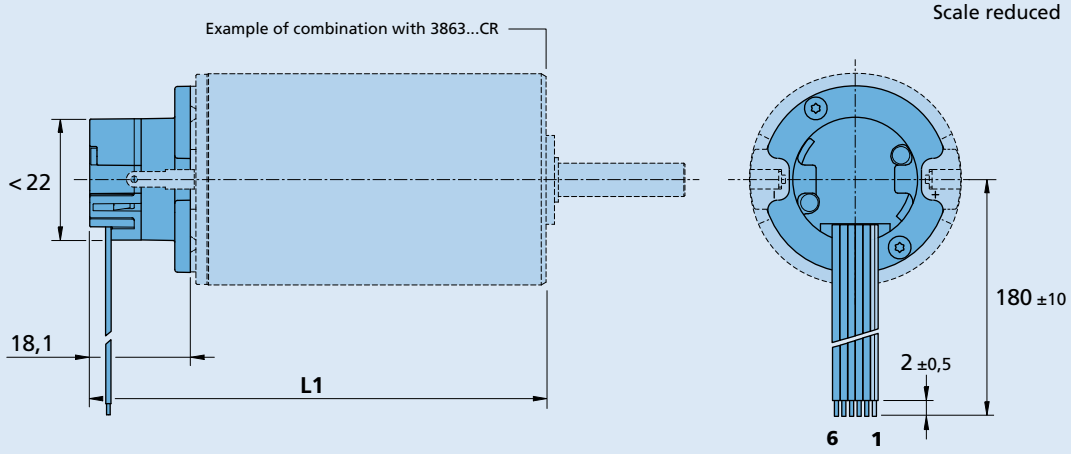
Connection Encoder



Connection Motor

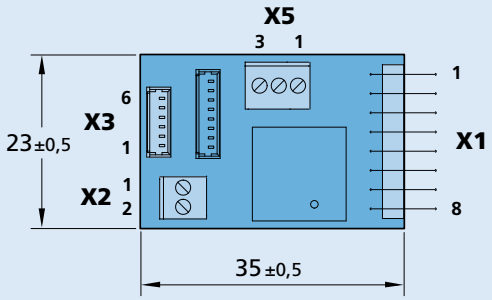
Dimensional drawing F

Scale reduced



IE3-1024

Adapter board



Interface Board IE3-1024
for Motion Controller MCDC 3002 S
Part. No.: 6501.00193

Connection

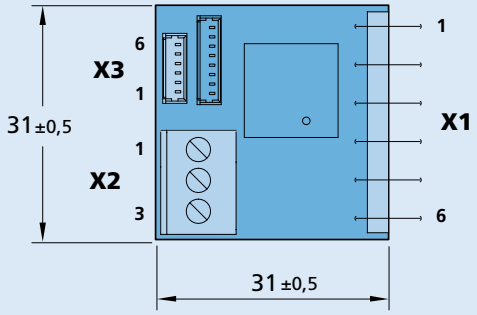
Pin	Connection X1
1	4. In
2	Channel A
3	Channel B
4	U_{DD} = 5V
5	SGND
6	Motor +
7	Motor -
8	5 .In

Pin	Connection X2
1	Motor +
2	Motor -

Pin	Connection X3
1	N.C.
2	Channel I
3	SGND
4	U_{DD} = 5V
5	Channel B
6	Channel A

Pin	Connection X5
1	4. In
2	5. In
3	Channel I

Adapter board



Interface Board IE3-1024
for Motion Controller MCDC 3006 S
Part. No.: 6501.00194

Connection

Pin	Connection X1
1	Channel A
2	Channel B
3	U_{DD} = 5V
4	SGND
5	Motor +
6	Motor -

Pin	Connection X2
1	Channel I
2	Motor +
3	Motor -

Pin	Connection X3
1	N.C.
2	Channel I
3	SGND
4	U_{DD} = 5V
5	Channel B
6	Channel A

Encoders

magnetic Encoder, digital outputs, 3 channels,
32 - 1024 lines per revolution, Line Driver

For combination with
DC-Micromotors
Brushless DC-Motors

Series 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. 17, max. 25						mA
Index Pulse width [3]	P_0	90 ± 45				90 ± 75		°e
Phase shift, channel A to B [3]	Φ	90 ± 45				90 ± 75		°e
Inertia of code disc	*J*	0,08						gcm²
Operating temperature range		-40 ... +85				-40 ... +100		°C

[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: ST26C32ABD (STM), ST26C32IP16 (EXAR), DS26C32AT (NSC).

For combination with Motor

Dimensional drawing A	**<L1 [mm]**	3257 ... CR	75,5	2232 ... BX4 S	50,2
2237 ... CXR	52,5	3272 ... CR	90,5	2250 ... BX4	68,2
3274 ... BP4	90,8			2250 ... BX4 S	68,2
		Dimensional drawing C	**<L1 [mm]**		
Dimensional drawing B	**<L1 [mm]**	2444 ... B - K1838	55,3	**Dimensional drawing E**	**<L1 [mm]**
2342 ... CR	60,5	3056 ... B - K1838	67,3	3242 ... BX4	60,0
2642 ... CXR	60,5	3564 ... B - K1838	75,3	3268 ... BX4	86,0
2642 ... CR	60,5	4490 ... B - K1838	100,3		
2657 ... CXR	75,5	4490 ... BS - K1838	100,3	**Dimensional drawing F**	**<L1 [mm]**
2657 ... CR	75,5			3863 ... CR - 2016	82,6
2668 ... CR	86,5	**Dimensional drawing D**	**<L1 [mm]**	3890 ... CR - 2016	108,6
3242 ... CR	60,5	2232 ... BX4	50,2		

Characteristics

These incremental encoders have 3 output channels, in combination with the Faulhaber DC-Micromotors 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 a single-chip angular sensor and further processed. At the encoder outputs, two 90° phase-shifted rectangular 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.

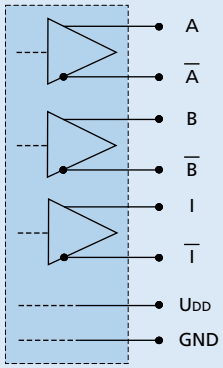
The line driver amplifies the encoder signal which means that long cables can be used without signal degradation.

Differential signal outputs must be decoded by the appropriate receiver module.

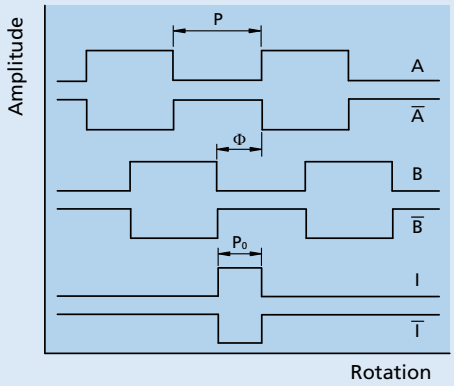
The encoder is available in a variety of different resolutions.
The motor and encoder are connected via separate ribbon cables.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen
from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right| \leq 75°$$

Admissible deviation of Index pulse:

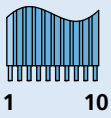
$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right| \leq 75°$$

Connector information / Variants

No.	Function
1	N.C.
2	U_{DD}
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

Caution:
Incorrect lead connection will damage the motor electronics!

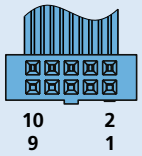
Connection Encoder



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

Option

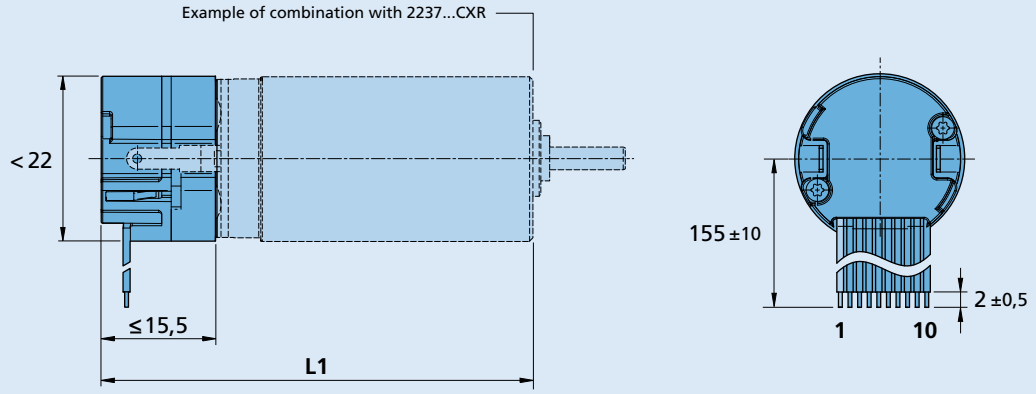
- Connector variants AWG 28 / PVC ribbon cable with connector Pancon DIN-41651, 050-010-435A, recommended mating connector Berg 71918-010.
  Option no.: 3806 for combination with DC-Motors series CR, CXR and with Brushless DC-Motor series BP4.
  Option no.: 3589 for combination with Brushless DC-Motors series BX4.
  Note: inclusive motor connector 3830.
- Resolutions from 1 - 127 lines per revolution are available by request.



Full product description

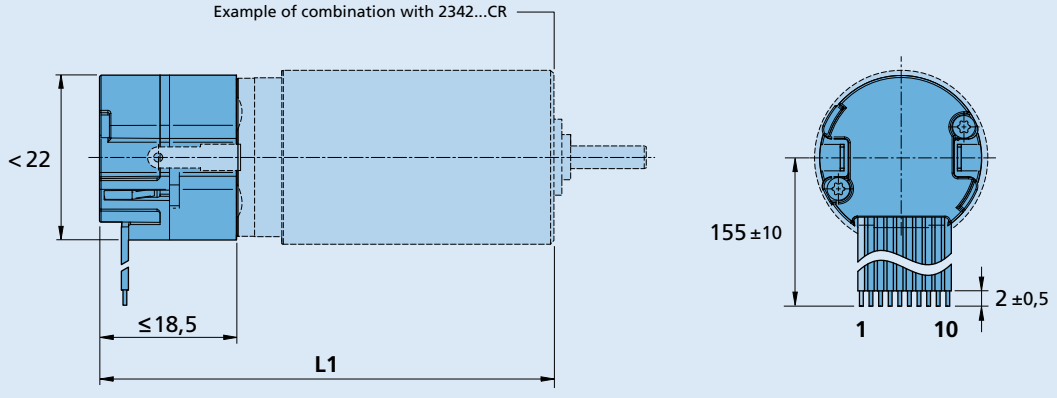
- Example:
  2444S024B K1838 IE3-1024L
  2232S024BX4 IE3-256L

Dimensional drawing A



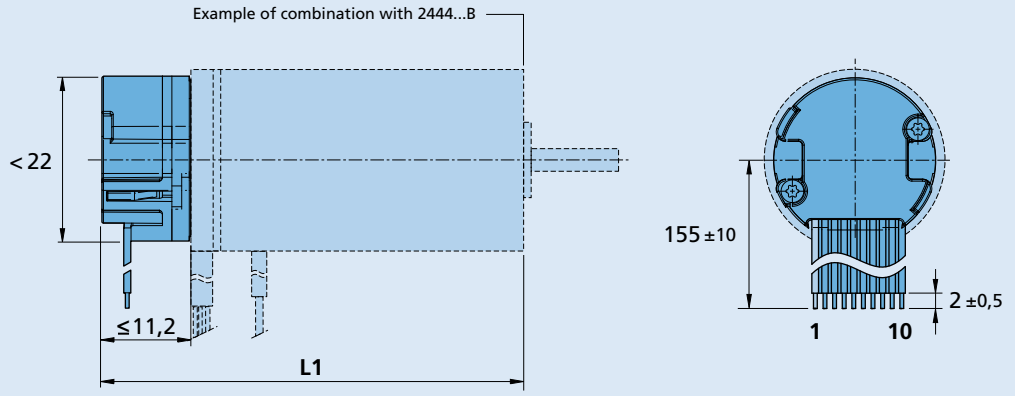
IE3-1024 L

Dimensional drawing B



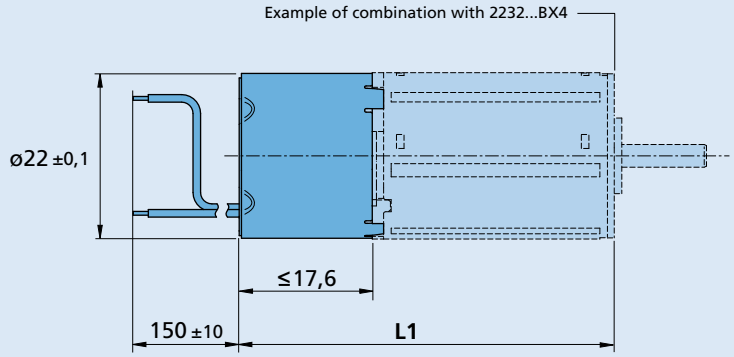
IE3-1024 L

Dimensional drawing C

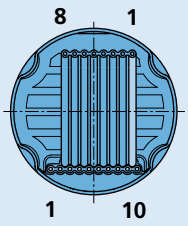


IE3-1024 L

Dimensional drawing D



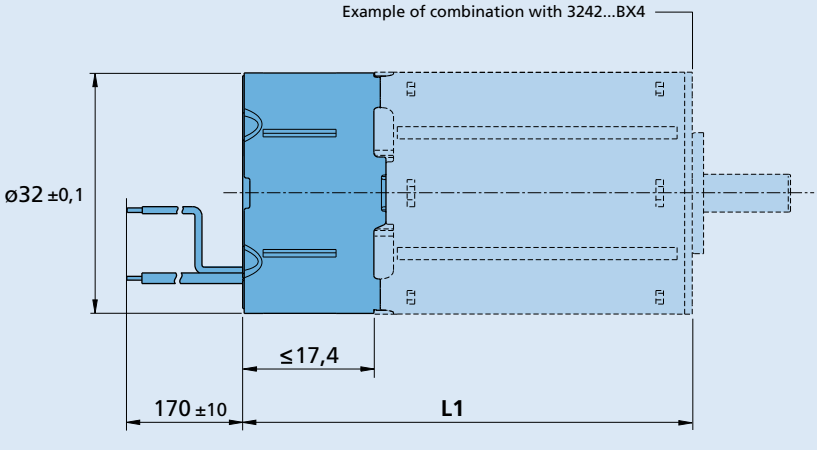
Connection Encoder



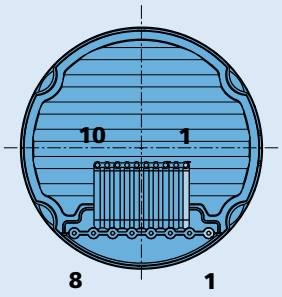
Connection Motor

IE3-1024 L

Dimensional drawing E



Connection Encoder



Connection Motor

IE3-1024 L

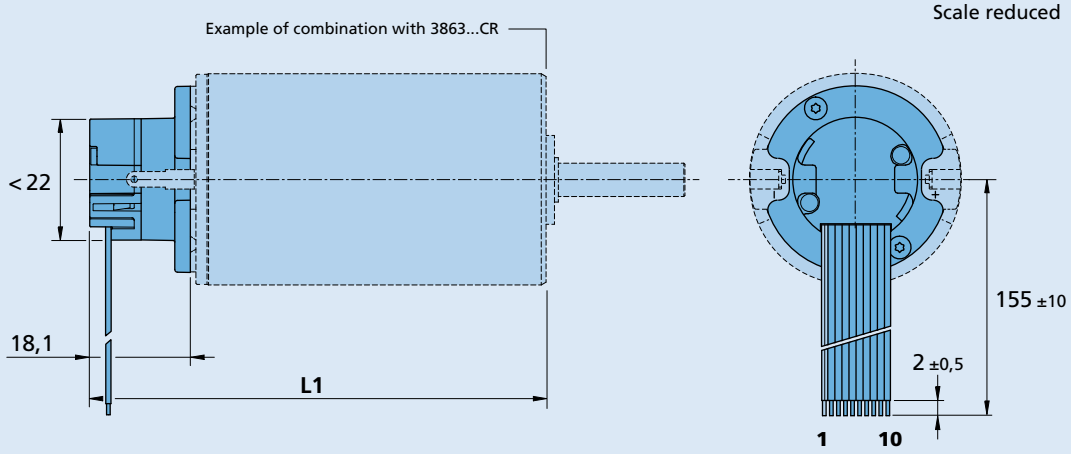
For notes on technical data and lifetime performance refer to “Technical Information”.

Edition 2016

www.faulhaber.com

Dimensional drawing F

Scale reduced



IE3-1024 L

Encoders

magnetic Encoder, digital outputs,
3 channels, 256 - 4096 lines per revolution

For combination with
DC-Micromotors

Series IEH3-4096

		IEH3-256	IEH3-512	IEH3-1024	IEH3-2048	IEH3-4096	
Lines per revolution	*N*	256	512	1 024	2 048	4 096	
Frequency range, up to [1]	*f*	80	160	320	640	875	kHz
Signal output, square wave		2+1 Index					Channels
Supply voltage	U_{DD}	4,5 ... 5,5					V
Current consumption, typical [2]	I_{DD}	typ. 25, max. 40					mA
Output current, max. [3]	I_{OUT}	2,5					mA
Index Pulse width [4]	P_0	90 ± 45		90 ± 65	90 ± 75		°e
Phase shift, channel A to B [4]	Φ	90 ± 45		90 ± 65	90 ± 75		°e
Signal rise/fall time, max. (C_{LOAD} = 50 pF)	*tr*/*tf*	0,05 / 0,05					µs
Inertia of code disc	*J*	0,11					gcm²
Operating temperature range		-40 ... +100					°C

[1] Velocity (min⁻¹) = *f* (Hz) x 60/*N*
[2] U_{DD} = 5 V: with unloaded outputs
[3] U_{DD} = 5 V: low logic level < 0,4 V, high logic level > 4,5 V: CMOS- and TTL compatible
[4] At 5 000 min⁻¹

For combination with Motor	
Dimensional drawing A	**<L1 [mm]**
1516 ... SR	18,2
1524 ... SR	26,2
1717 ... SR	19,4
1724 ... SR	26,4
2224 ... SR	26,6
2232 ... SR	34,6

Characteristics

These incremental encoders have 3 output channels, in combination with the Faulhaber DC-Micromotors 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 DC-Micromotors SR-Series and extends the overall length by only 1,4 mm.

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

The output signals of both channels consist of a square wave signal with 90° phase shift and up to 4096 impulses and an index impulse per motor revolution.

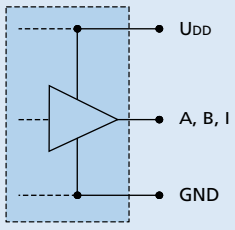
The encoder is available with different standard resolutions.

The supply voltage for the encoder and the DC-Micromotor as well as the two channel output signals are interfaced through a ribbon cable with connector.

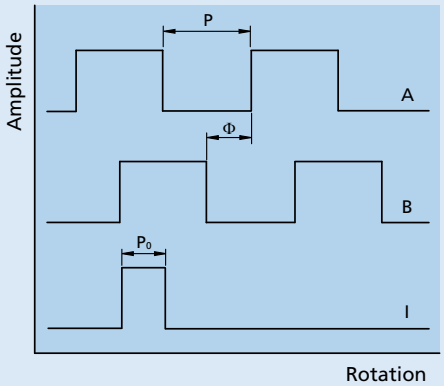
Details for the DC-Micromotors and suitable reduction gearheads are on separate catalogue pages.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right| \leq \text{see above}$$

Admissible deviation of Index pulse:

$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right| \leq \text{see above}$$

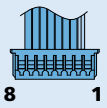
For notes on technical data and lifetime performance refer to “Technical Information”.
Edition 2016

www.faulhaber.com

Connector information / Variants

No.	Function
1	N.C.
2	Motor -
3	Motor +
4	GND
5	U_{DD}
6	Channel B
7	Channel A
8	Channel I

Connection Encoder

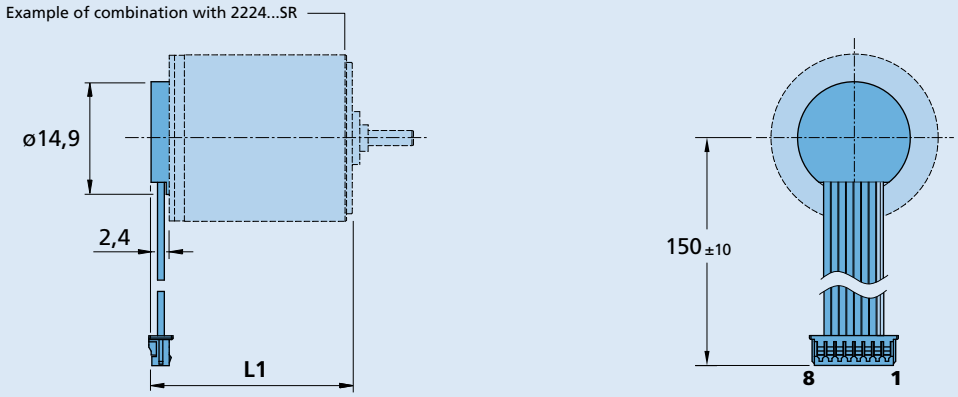


Cable
PVC-ribbon cable
8-AWG 28, 0,09 mm²

Connector
Molex PicoBlade
grid 1,25 mm

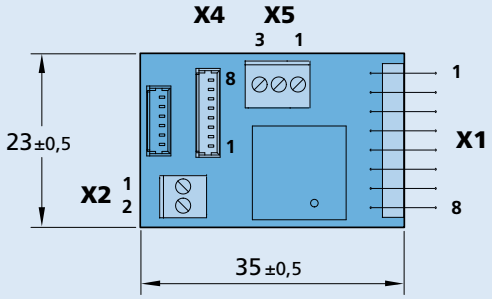
Full product description
Example:
1516T006SR IEH3-4096

Dimensional drawing A



IEH3-4096

Adapter board



Interface Board IEH3-4096
for Motion Controller MCDC 3002 S
Part. No.: 6501.00193

Connection

Pin	Connection X1
1	4. In
2	Channel A
3	Channel B
4	U_{DD} = 5V
5	SGND
6	Motor +
7	Motor -
8	5 .In

Pin	Connection X2
1	Motor +
2	Motor -

Pin	Connection X4
1	N.C.
2	Motor -
3	Motor +
4	SGND
5	U_{DD} = 5V
6	Channel B
7	Channel A
8	Channel I

Pin	Connection X5
1	4. In
2	5. In
3	Channel I

NEW

FAULHABER

Encoder

optical Encoder, digital outputs,
3 channels, 250 - 500 lines per revolution

For combination with
DC-Micromotors
Brushless DC-Motors

Series IERS3-500

		IERS3-250	IERS3-500	
Lines per revolution	*N*	250	500	
Frequency range, up to [1]	*f*	55	110	kHz
Signal output, square wave		2+1 Index		Channels
Supply voltage	U_{DD}	4,5 … 5,5		V
Current consumption [2]	I_{DD}	typ. 17, max. 25		mA
Output current, max. [3]	I_{OUT}	4		mA
Index Pulse width	P_0	90 ± 15		°e
Phase shift, channel A to B	Φ	90 ± 20		°e
Signal rise/fall time (C_{LOAD} = 25 pF)	*tr/tf*	typ. < 0,1 / typ. < 0,1		µs
Inertia of code disc	*J*	typ. 0,14		gcm^2
Operating temperature range		– 20 ... + 85		°C
Accuracy		typ. 0,3		°m
Repeatability		typ. 0,05		°m
Hysteresis		< 0,05		°m
Edge spacing, min.		600		ns
Mass		typ. 8		g

[1] Velocity (min^{-1}) = *f* (Hz) x 60/*N*
[2] U_{DD} = 5 V: with unloaded outputs
[3] U_{DD} = 5 V: low logic level < 0,4 V, high logic level > 2,4 V: TTL compatible

Product combination

Dimensional drawing A	**<L1** [mm]
2237 ... CXR	52,5
3274 ... BP4	90,5

Dimensional drawing B	**<L1** [mm]
2342 ... CR	60,5
2642 ... CXR	60,5
2642 ... CR	60,5
2657 ... CXR	75,5
2657 ... CR	75,5
2668 ... CR	86,5
3242 ... CR	60,5
3257 ... CR	75,5
3272 ... CR	90,5

Dimensional drawing C	**<L1** [mm]
3863 ... CR - 2016	82,6
3890 ... CR - 2016	108,6

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.

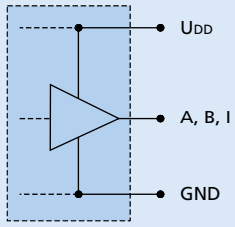
With a reflective code disc two quadature signal with 90° phase shift with up to 500 lines per revolution and one index impulse per motor revolution are generated.

The optical measurement principle allows high accuracy and repeatability for positioning applications.

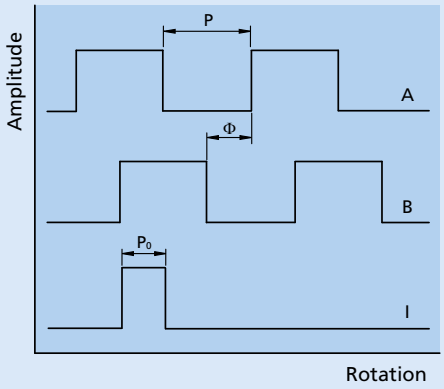
The encoder is connected via a ribbon cable. The pins are compatible to the FAULHABER Encoder IE3.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left|90° - \frac{\Phi}{P} * 180°\right| \leq 20°$$

Admissible deviation of Index pulse:

$$\Delta P_0 = \left|90° - \frac{P_0}{P} * 180°\right| \leq 15°$$

Connector information / Variants

No.	Function
1	N.C.
2	Channel I
3	GND
4	UDD
5	Channel B
6	Channel A

Connection Encoder

6 1

Cable
PVC-ribbon cable
6-AWG 28, 1,27 mm

Option

- Connector variants AWG 28 / PVC ribbon cable with connector MOLEX Picoblade 51021-0600, recommended mating connector 53047-0610.
  Option no.: 3807 for combination with DC-Micromotors series CXR, CR and for Brushless DC-Servomotors series 3274...BP4.

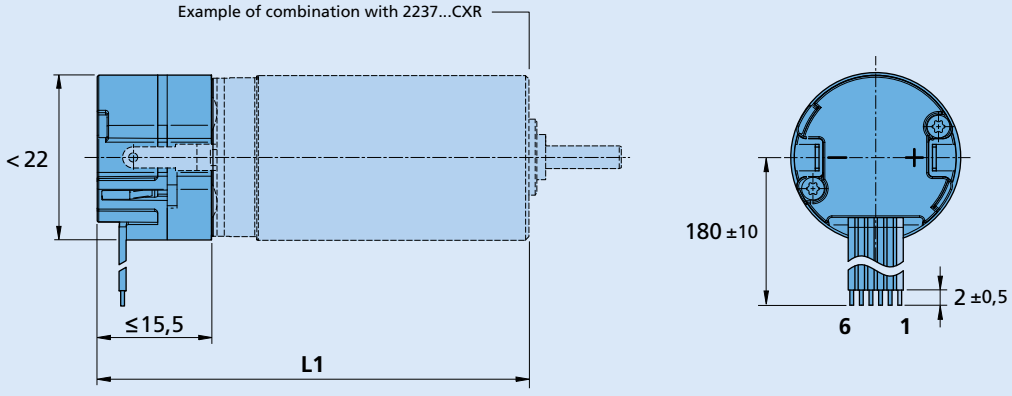
6 1

Full product description

- Example:
  2237S012CXR IERS3-500
  3863H024CR IERS3-250 3807

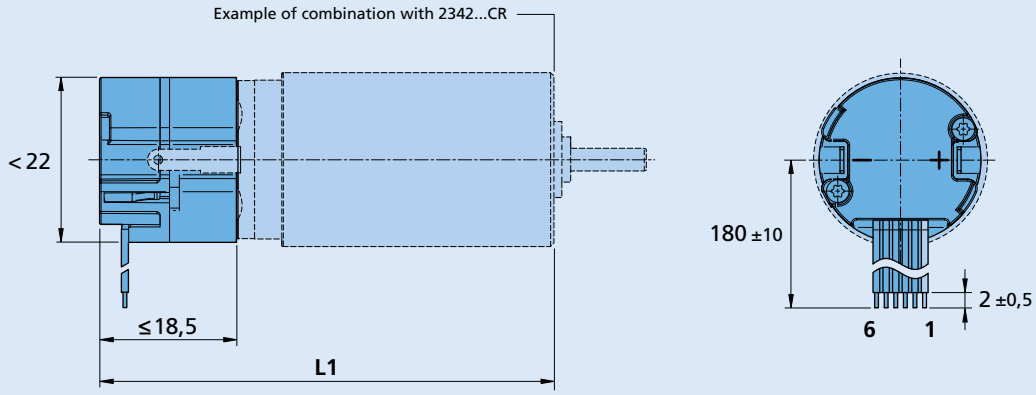
Caution:
Incorrect lead connection will damage the motor electronics!

Dimensional drawing A



IERS3-500

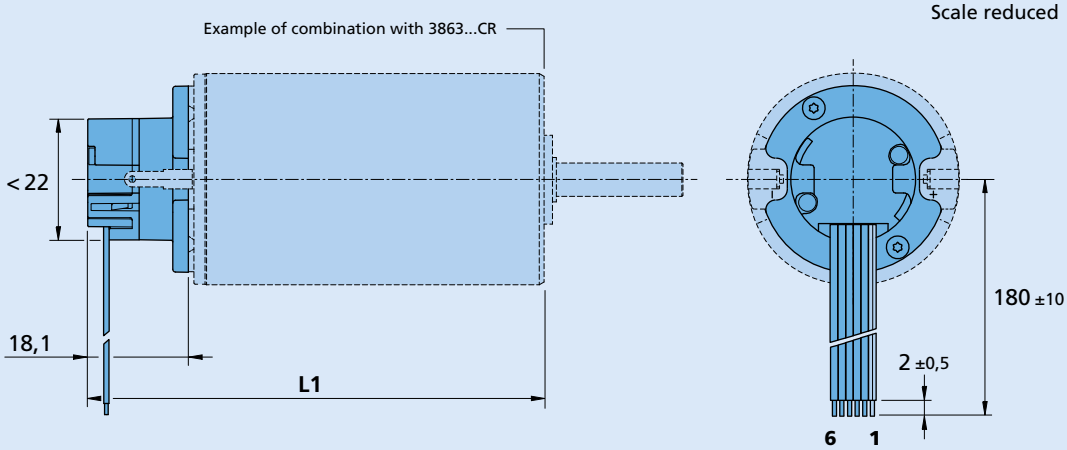
Dimensional drawing B



IERS3-500

Dimensional drawing C

Scale reduced



IERS3-500

NEW

FAULHABER

Encoder

optical Encoder, digital outputs, 3 channels,
250 - 500 lines per revolution, Line Driver

For combination with
DC-Micromotors
Brushless DC-Motors

Series IERS3-500 L

		IERS3-250 L	IERS3-500 L	
Lines per revolution	*N*	250	500	
Frequency range, up to [1]	*f*	55	110	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. 17, max. 25		mA
Index Pulse width	P_0	90 ± 15		°e
Phase shift, channel A to B	Φ	90 ± 20		°e
Inertia of code disc	*J*	typ. 0,14		gcm^2
Operating temperature range		– 20 ... + 85		°C
Accuracy		typ. 0,3		°m
Repeatability		typ. 0,05		°m
Hysteresis		< 0,05		°m
Edge spacing, min.		600		ns
Mass		typ. 8		g

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

Note: The output signals are TIA-422 compatible. Examples of Line Driver Receivers: ST26C32ABD (STM), ST26C32IP16 (EXAR), DS26C32AT (NSC).

Product combination	
Dimensional drawing A	**<L1** [mm]
2237 ... CXR	52,5
3274 ... BP4	90,5
Dimensional drawing B	**<L1** [mm]
2342 ... CR	60,5
2642 ... CXR	60,5
2642 ... CR	60,5
2657 ... CXR	75,5
2657 ... CR	75,5
2668 ... CR	86,5
3242 ... CR	60,5
3257 ... CR	75,5
3272 ... CR	90,5
Dimensional drawing C	**<L1** [mm]
3863 ... CR - 2016	82,6
3890 ... CR - 2016	108,6

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 quadature signal with 90° phase shift with up to 500 lines per revolution and one index impulse per motor revolution are generated.
The optical measurement principle allows high accuracy and repeatability for positioning applications.

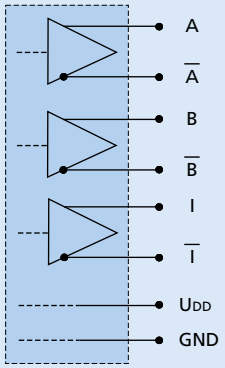
The Line Driver version has differential signal outputs (TIA-422). Differential signals reduce ambient interference and are suitable for applications with high ambient interference.

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 eventually useful.

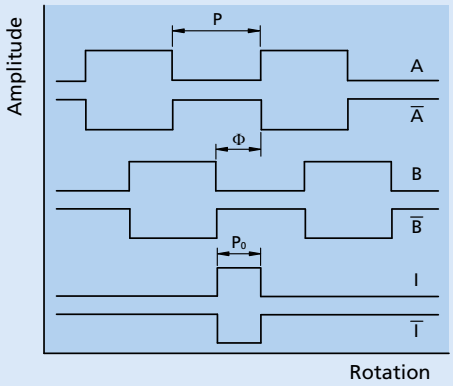
The encoder is connected via a ribbon cable. The pins are compatible to the FAULHABER Encoder IE3 L.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right| \leq 20°$$

Admissible deviation of Index pulse:

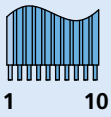
$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right| \leq 15°$$

Connector information / Variants

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

Caution:
Incorrect lead connection will damage the motor electronics!

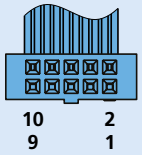
Connection Encoder



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

Option

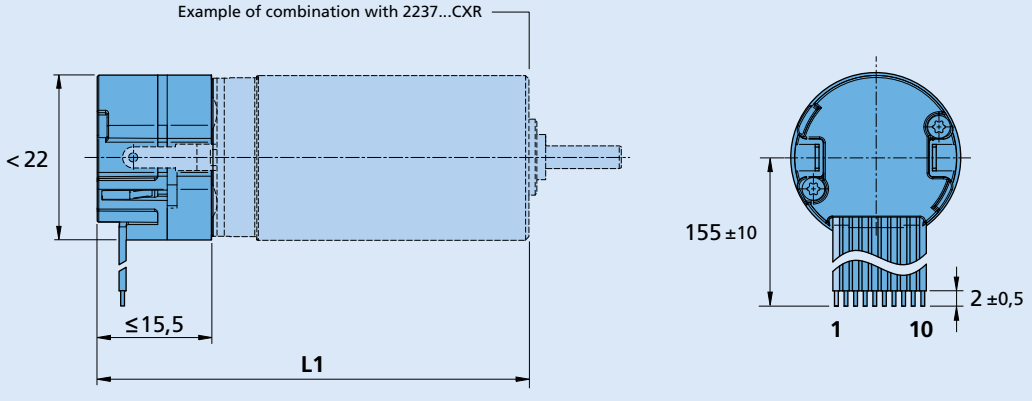
- Connector variants AWG 28 / PVC ribbon cable with connector Pancon DIN-41651, 050-010-435A, recommended mating connector Berg 71918-010.
  Option no.: 3806 for combination with DC-Motors series CR, CXR and with Brushless DC-Servomotor series 3274 BP4.



Full product description

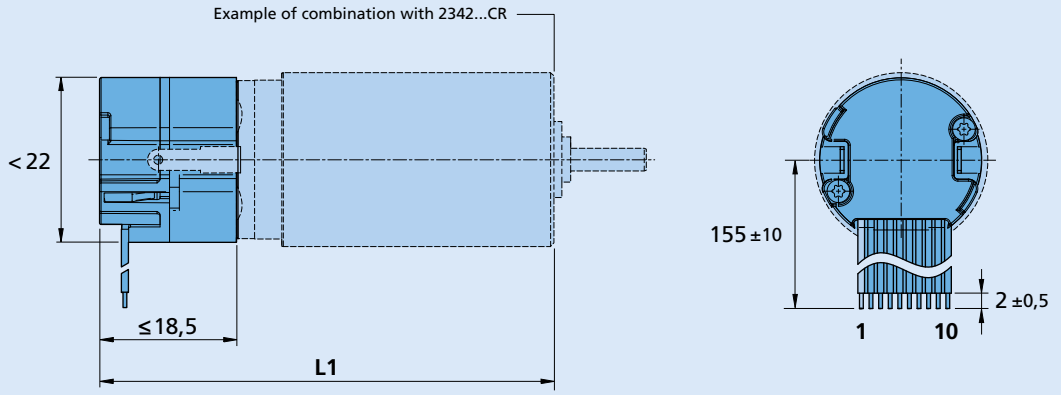
- Example:
  2237S012CXR IERS3-500L
  3863H024CR IERS3-250L 3806

Dimensional drawing A



IERS3-500 L

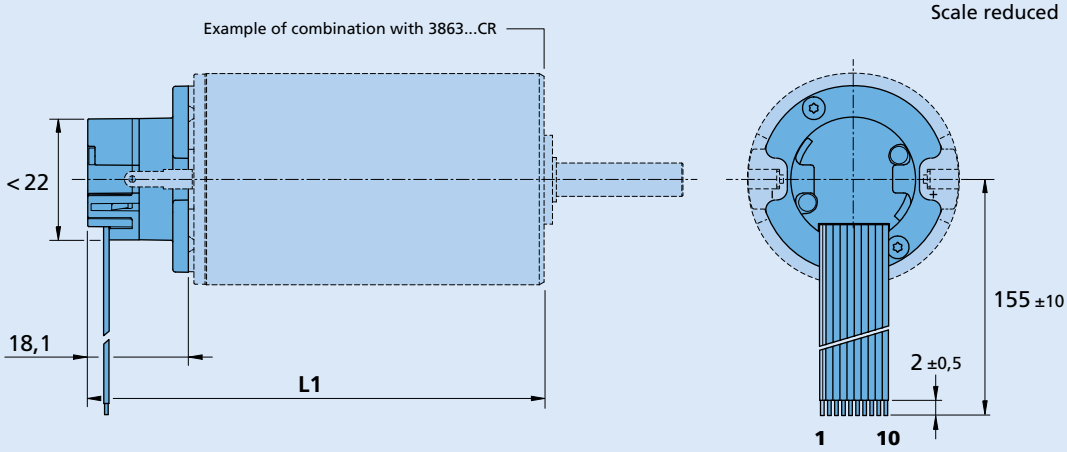
Dimensional drawing B



IERS3-500 L

Dimensional drawing C

Scale reduced



IERS3-500 L

NEW

FAULHABER

Encoders

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

For combination with
DC-Micromotors
Brushless DC-Motors

Series IER3-10000

	IER3	-1000	-2000	-4000	-1024	-2048	-4096	-1700	-3400	-6800	-2500	-5000	-10000	
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												Channels
Supply voltage	U_{DD}	4,5 … 5,5												V
Current consumption [2]	I_{DD}	typ. 27, max. 50												mA
Output current, max. [3]	I_{OUT}	4												mA
Index Pulse width	P_0	90 ± 15												°e
Phase shift, channel A to B	Φ	90 ± 20												°e
Signal rise/fall time (C_{LOAD} = 50 pF)	*tr/tf*	typ. < 0,1 / typ. < 0,1												µs
Inertia of code disc	*J*	typ. 0,14												gcm²
Operating temperature range		– 20 ... + 85												°C
Accuracy		typ. 0,3			typ. 0,3			typ. 0,2			typ. 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] U_{DD} = 5 V: low logic level < 0,4 V, high logic level > 2,4 V: TTL compatible

Product combination	IER3	-1000 -2000 -4000	-1024 -2048 -4096	-1700 -3400 -6800	-2500 -5000 -10000	
Series		**Motor, <L1** [mm]	**Motor, <L1** [mm]	**Motor, <L1** [mm]	**Motor, <L1** [mm]	**Drawing**
2237 ... CXR		52,5	52,5	–	–	A
3274 ... BP4		90,5	90,5	–	–	A
2342 ... CR		60,5	60,5	–	–	B
2642 ... CXR		60,5	60,5	–	–	B
2642 ... CR		60,5	60,5	–	–	B
2657 ... CXR		75,5	75,5	–	–	B
2657 ... CR		75,5	75,5	–	–	B
2668 ... CR		86,5	86,5	–	–	B
3242 ... CR		60,5	60,5	–	–	B
3257 ... CR		75,5	75,5	–	–	B
3272 ... CR		90,5	90,5	–	–	B
3863 ... CR - 2016		82,6	82,6	–	–	C
3890 ... CR - 2016		108,6	108,6	–	–	C
2232 ... BX4S		50,2	50,2	50,2	–	D
2232 ... BX4		50,2	50,2	50,2	–	D
2250 ... BX4S		68,2	68,2	68,2	–	D
2250 ... BX4		68,2	68,2	68,2	–	D
3242 ... BX4		60,0	60,0	60,0	60,0	E
3268 ... BX4		86,0	86,0	86,0	86,0	E

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 quadature signal with 90° phase shift and one index impulse per motor revolution are generated.

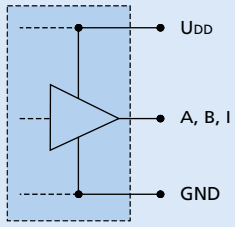
The optical measurement principle allows high accuracy and repeatability for positioning applications. The high resolution encoder provides up to 4096 lines per revolution. In combination with the brushless DC-Servomotors BX4 with diameter 22 mm up to 6800 lines per revolution are available.

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

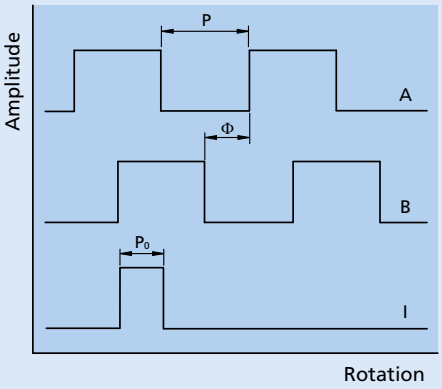
The encoder is connected via a ribbon cable. The pins are compatible to the FAULHABER Encoder IE3.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right| \leq 20°$$

Admissible deviation of Index pulse:

$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right| \leq 15°$$

Connector information / Variants

No.	Function
1	N.C.
2	Channel I
3	GND
4	UDD
5	Channel B
6	Channel A

Connection Encoder

6 1

Cable
PVC-ribbon cable
6-AWG 28, 1,27 mm

Option

- Connector variants AWG 28 / PVC ribbon cable with connector MOLEX Picoblade 51021-0600, recommended mating connector 53047-0610.
  Option no.: 3807 for combination with DC-Micromotors series CXR, CR and with brushless DC-Servomotor series 3274...BP4.
  Option no.: 3592 for combination with Brushless DC-servomotors series BX4.
  Note: inclusive motor connector 3830.

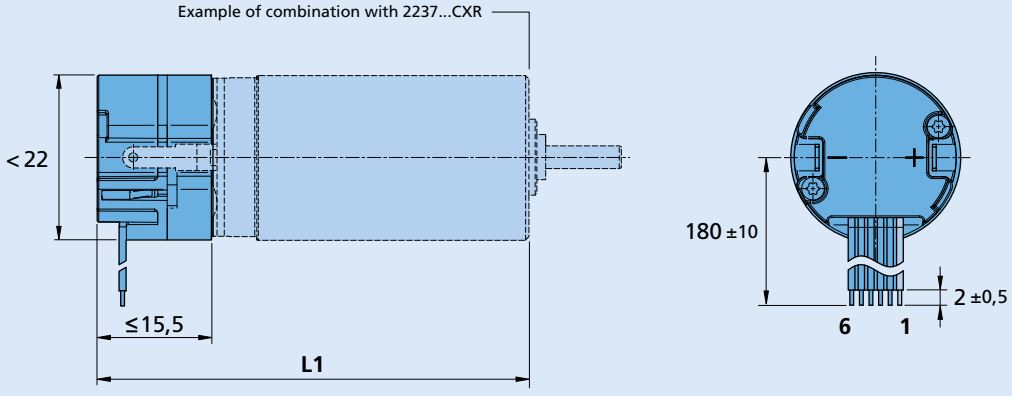
6 1

Caution:
Incorrect lead connection will damage the motor electronics!

Full product description

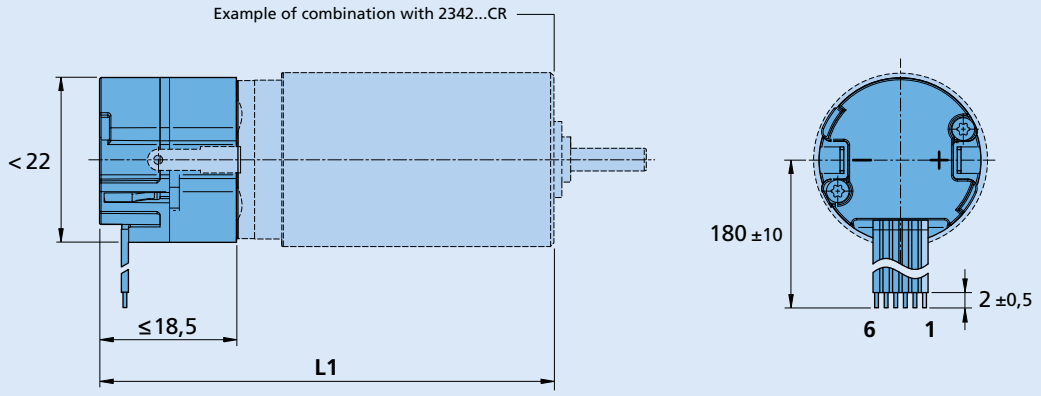
- Example:
  2237S012CXR IER3-1024
  2232S024BX4 IER3-6800 3592

Dimensional drawing A



IER3-1000...4096

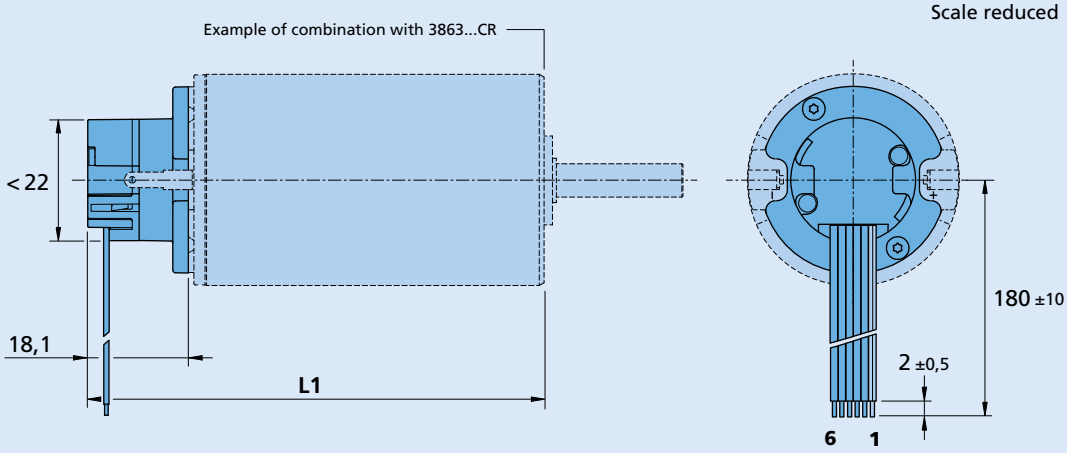
Dimensional drawing B



IER3-1000...4096

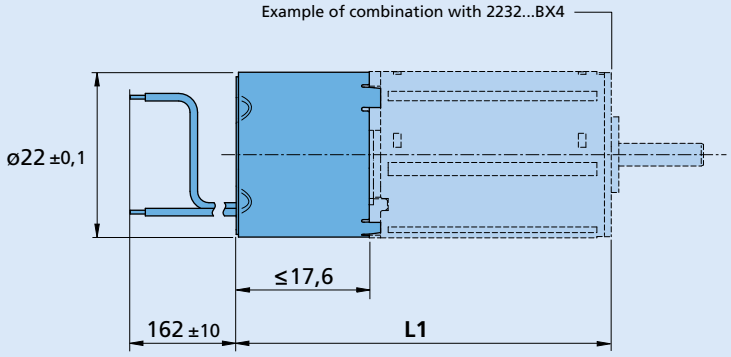
Dimensional drawing C

Scale reduced



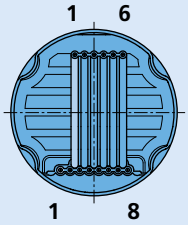
IER3-1000...4096

Dimensional drawing D



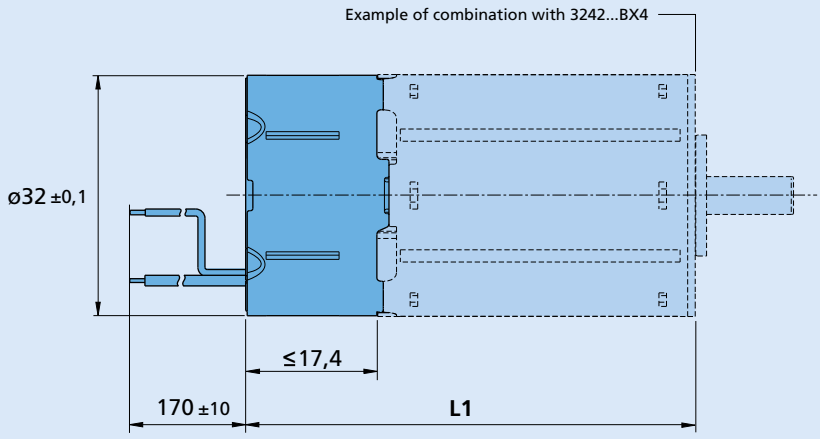
IER3-1000...6800

Connection Encoder

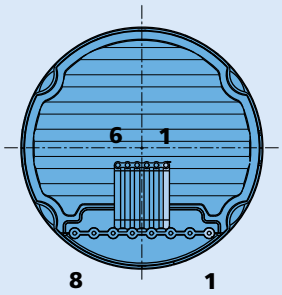


Connection Motor

Dimensional drawing E



IER3-1000...10000



NEW

FAULHABER

Encoders

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

For combination with
DC-Micromotors
Brushless DC-Motors

Series 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 [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 code disc	*J*	typ. 0,14												gcm^2
Operating temperature range		– 20 ... + 85												°C
Accuracy		typ. 0,3			typ. 0,3			typ. 0,2			typ. 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

Note: The output signals are TIA-422 compatible. Examples of Line Driver Receivers: ST26C32ABD (STM), ST26C32IP16 (EXAR), DS26C32AT (NSC).

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**
2237 ... CXR		52,5	52,5	–	–	A
3274 ... BP4		90,5	90,5	–	–	A
2342 ... CR		60,5	60,5	–	–	B
2642 ... CXR		60,5	60,5	–	–	B
2642 ... CR		60,5	60,5	–	–	B
2657 ... CXR		75,5	75,5	–	–	B
2657 ... CR		75,5	75,5	–	–	B
2668 ... CR		86,5	86,5	–	–	B
3242 ... CR		60,5	60,5	–	–	B
3257 ... CR		75,5	75,5	–	–	B
3272 ... CR		90,5	90,5	–	–	B
3863 ... CR - 2016		82,6	82,6	–	–	C
3890 ... CR - 2016		108,6	108,6	–	–	C
2232 ... BX4S		50,2	50,2	50,2	–	D
2232 ... BX4		50,2	50,2	50,2	–	D
2250 ... BX4S		68,2	68,2	68,2	–	D
2250 ... BX4		68,2	68,2	68,2	–	D
3242 ... BX4		60,0	60,0	60,0	60,0	E
3268 ... BX4		86,0	86,0	86,0	86,0	E

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 quadature signal 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.

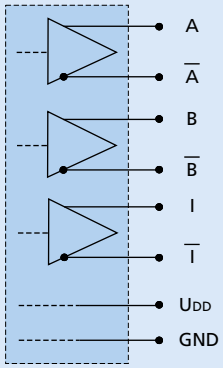
The Line Driver version has differential signal outputs (TIA-422). Differential signals reduce ambient interference and are suitable for applications with high ambient interference.

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 eventually useful.

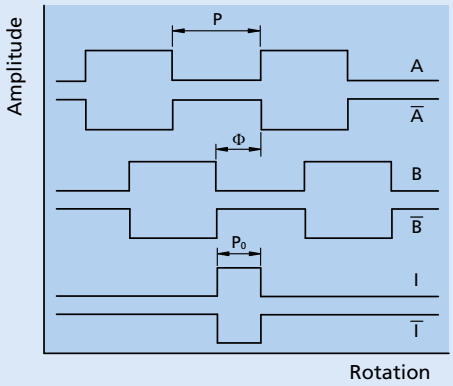
The encoder is connected via a ribbon cable. The pins are compatible to the FAULHABER Encoder IE3 L.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

$$\Delta\Phi = \left| 90° - \frac{\Phi}{P} * 180° \right| \leq 20°$$

Admissible deviation of Index pulse:

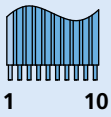
$$\Delta P_0 = \left| 90° - \frac{P_0}{P} * 180° \right| \leq 15°$$

Connector information / Variants

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

Caution:
Incorrect lead connection will damage the motor electronics!

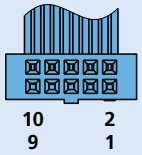
Connection Encoder



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

Option

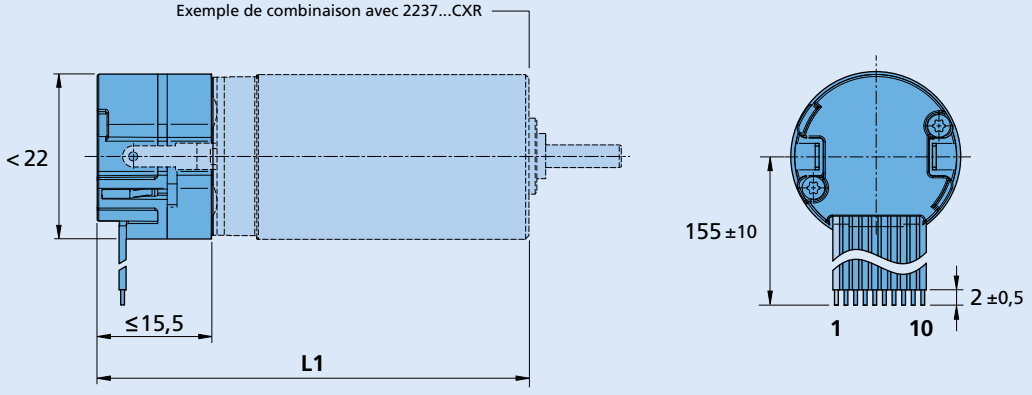
- Connector variants AWG 28 / PVC ribbon cable with connector Pancon DIN-41651, 050-010-435A, recommended mating connector Berg 71918-010.
  Option no.: 3806 for combination with DC-Motors series CR, CXR and with Brushless DC-Motor series 3274...BP4.
  Option no.: 3589 for combination with Brushless DC-Motors series BX4.
  Note: inclusive motor connector 3830.



Full product description

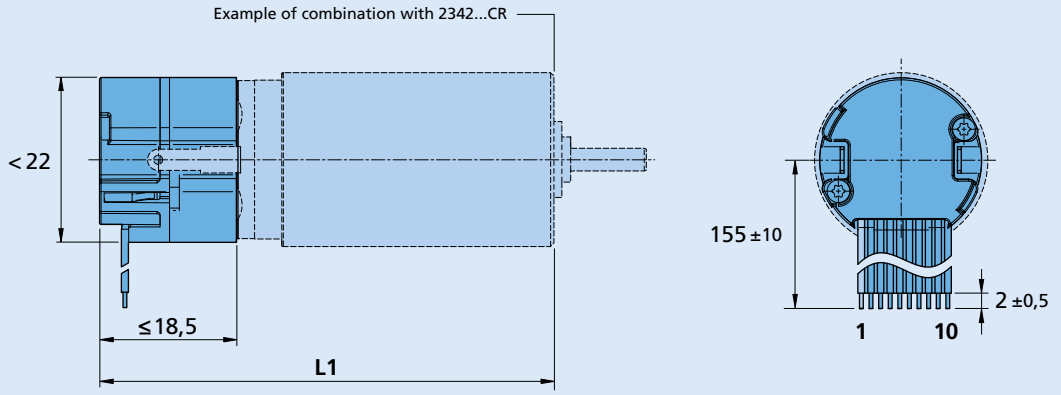
- Example:
  2237S012CXR IER3-1024L
  2232S024BX4 IER3-6800L 3589

Dimensional drawing A



IER3-1000...4096 L

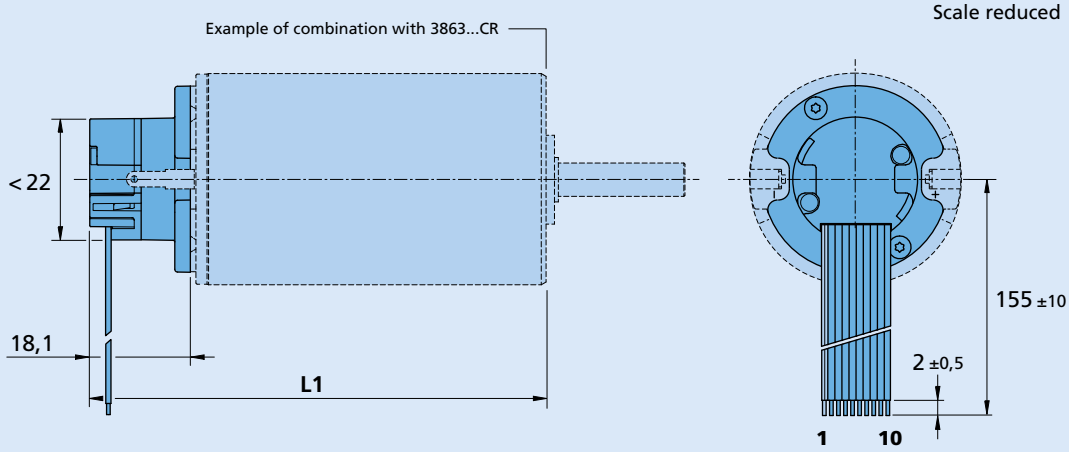
Dimensional drawing B



IER3-1000...4096 L

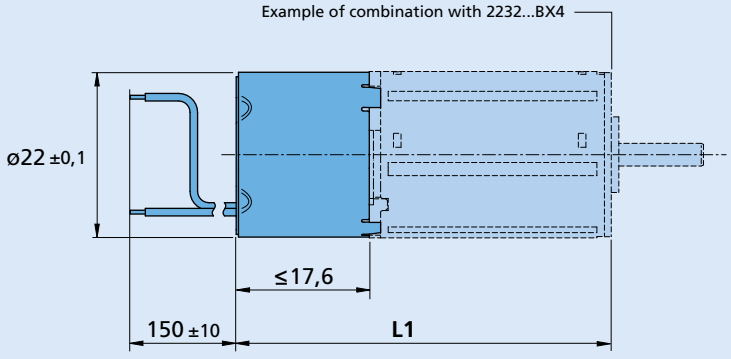
Dimensional drawing C

Scale reduced



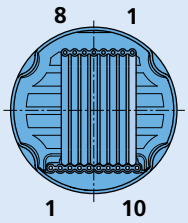
IER3-1000...4096 L

Dimensional drawing D



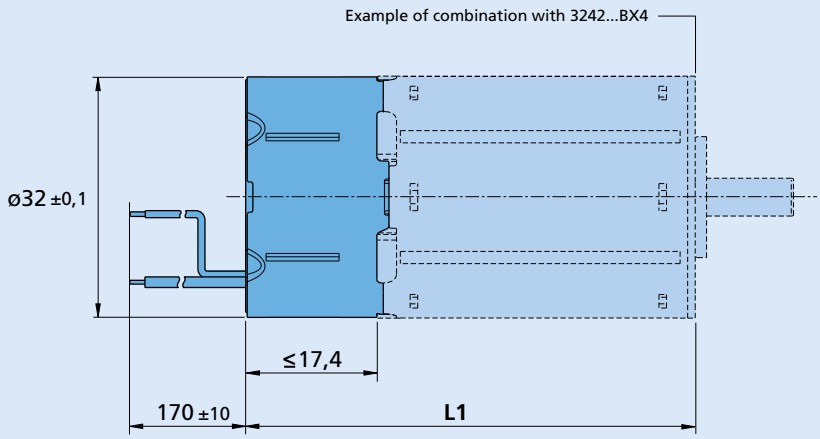
IER3-1000...6800 L

Connection Encoder

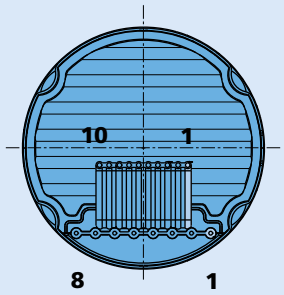


Connection Motor

Dimensional drawing E



IER3-1000...10000 L



Encoders

optical Encoder, digital outputs,
3 channels, 100 - 500 lines per revolution

For combination with
DC-Micromotors
Brushless DC-Motors

Series HEDS 5540

		HEDS 5540 C	HEDS 5540 A	
Lines per revolution	*N*	100	500	
Frequency range, up to [1)2)]	*f*	100	100	kHz
Signal output, square wave		2+1 Index		Channels
Supply voltage	U_{DD}	4,5 ... 5,5		V
Current consumption, typical [3)]	I_{DD}	57		mA
Pulse width	*P*	180 ± 35		°e
Phase shift, channel A to B	*Φ*	90 ± 15		°e
Logic state width	*S*	90 ± 35		°e
Cycle	*C*	360 ± 5,5		°e
Signal rise/fall time, max. (C_{LOAD} = pF)	*tr*/*tf*	0,25 / 0,25		µs
Inertia of code disc	*J*	0,6		gcm²
Operating temperature range		-40 ... +100		°C

[1)] Velocity (min⁻¹) = *f* (Hz) x 60/*N*
[2)] HEDS 5540 requires pull-up resistors of 2,7 kΩ between pins 2, 3, 5 and 4 (U_{DD})
[3)] U_{DD} = 5 V: with unloaded outputs

For combination with Motor

Dimensional drawing A	<L1 [mm]		
2230 ... S	52,8	3863 ... CR	86,1
2233 ... S	55,6	3890 ... CR	112,1
2342 ... CR	63,8	2036 ... B - K312	56,8
2642 ... CXR	64,8	2057 ... B - K312	75,8
2642 ... CR	64,8	2057 ... BHS - K312	75,8
2657 ... CXR	79,8	2444 ... B - K312	64,9
2657 ... CR	79,8	3056 ... B - K312	76,1
2668 ... CR	90,8	3274 ... BP4	94,0
3242 ... CR	65,3	3564 ... B - K312	84,1
3257 ... CR	80,3	4490 ... B - K312	116,3
3272 ... CR	95,3	4490 ... BS - K312	116,3

Characteristics

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

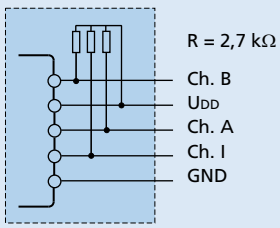
A LED source and lens system transmits collimated light through a low inertia metal disc to give two channels with 90° phase shift.
The single 5 volt supply and the two or three channel digital output signals are interfaced with a 5-pin connector.

Motors with ball bearings are recommended for continuous operation at low and high speeds and for elevated radial shaft load.

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

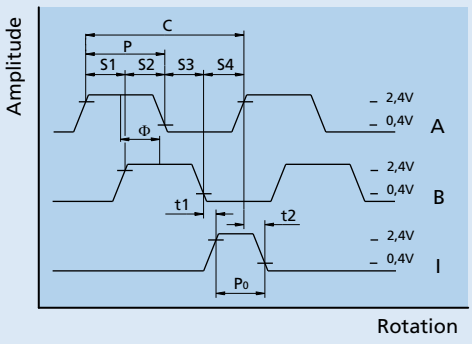
Circuit diagram / Output signals

Output circuit



Note:
HEDS 5540 requires
pull-up resistors

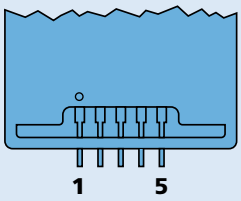
Output signals
with clockwise rotation as seen
from the shaft end



Connector information / Variants

No.	Function
1	GND
2	Channel I
3	Channel A
4	U_{DD}
5	Channel B

Connection Encoder



Recommended connector
AMP 103686-4/640442-5,
Molex 2695/2759
FCI 65039-032/4825x-000

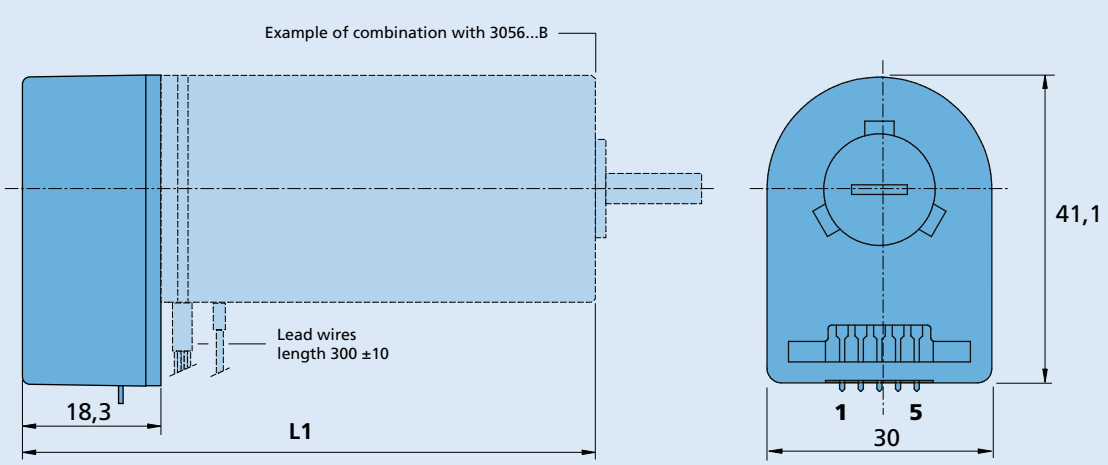
Option

- **HEDS 5540** Interlocking connector, extension cables 300 mm length (Part No.: K799)

Full product description

- Example:
  2444S024B K312 HEDS5540C
  3863H048CR HEDS5540A

Dimensional drawing A



HEDS 5540

Encoders

optical Encoder, digital outputs,
3 channels, 500 lines per revolution, Line Driver

For combination with
DC-Micromotors
Brushless DC-Motors

Series HEDL 5540

		HEDL 5540 A	
Lines per revolution	*N*	500	
Frequency range, up to [1]	*f*	100	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}	57	mA
Pulse width	*P*	180 ± 35	°e
Index Pulse width	P_0	90 ± 35	°e
Phase shift, channel A to B	*Φ*	90 ± 15	°e
Logic state width	*S*	90 ± 35	°e
Cycle	*C*	360 ± 5,5	°e
Signal rise/fall time, max. (C_{LOAD} = pF)	*tr*/*tf*	0,25 / 0,25	µs
Inertia of code disc	*J*	0,6	gcm²
Operating temperature range		-40 ... +100	°C

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

For combination with Motor

Dimensional drawing A	<L1 [mm]		
2230 ... S	52,8	3863 ... CR	86,1
2233 ... S	55,6	3890 ... CR	112,1
2342 ... CR	63,8	2036 ... B - K312	56,8
2642 ... CXR	64,8	2057 ... B - K312	75,8
2642 ... CR	64,8	2057 ... BHS - K312	75,8
2657 ... CXR	79,8	2444 ... B - K312	64,9
2657 ... CR	79,8	3056 ... B - K312	76,1
2668 ... CR	90,8	3274 ... BP4	94,0
3242 ... CR	65,3	3564 ... B - K312	84,1
3257 ... CR	80,3	4490 ... B - K312	116,3
3272 ... CR	95,3	4490 ... BS - K312	116,3

Characteristics

These incremental shaft encoders in combination with the DC-Motors are designed for the indication and control of both shaft velocity and direction of 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.

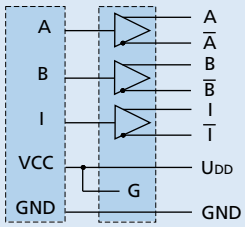
The line driver offers enhanced performance when the encoder is used in noisy environments, or when it is required to drive long distances.

Motor with ball bearings are recommended for continuous operation at low and high speeds and for elevated radial shaft load.

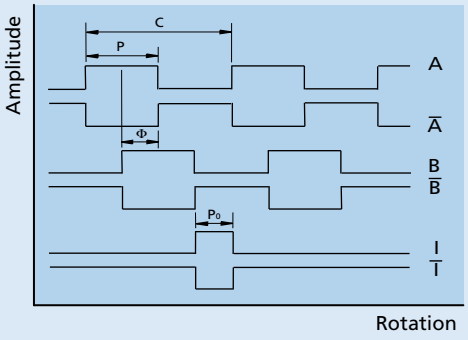
Details for the motors and suitable reduction gearheads are on separate catalogue pages.

Circuit diagram / Output signals

Output circuit



Output signals
with clockwise rotation as seen from the shaft end

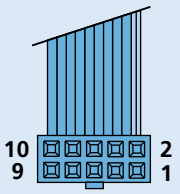


Recommendation:
Suggested Line Receivers:
AM26LS32, SN75175, MC3486

Connector information / Variants

No.	Function
1	N.C.
2	U_{DD} (+5V)
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

Connection Encoder



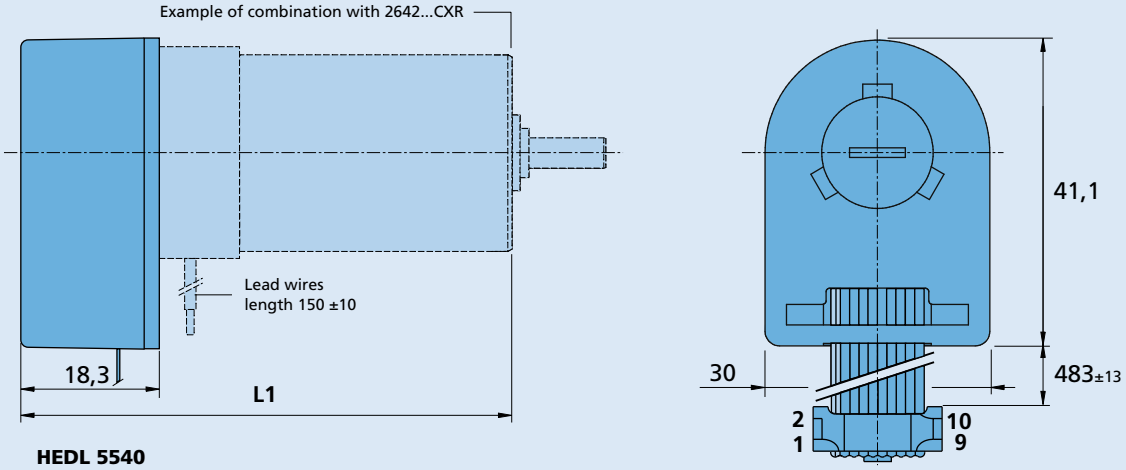
Cable
PVC-ribbon cable
10-conductors, 0,09 mm²

Connector
DIN-41651
grid 2,54 mm

Full product description

- Example:
  2444S024B K312 HEDL5540A
  3863H048CR HEDL5540A

Dimensional drawing A



HEDL 5540