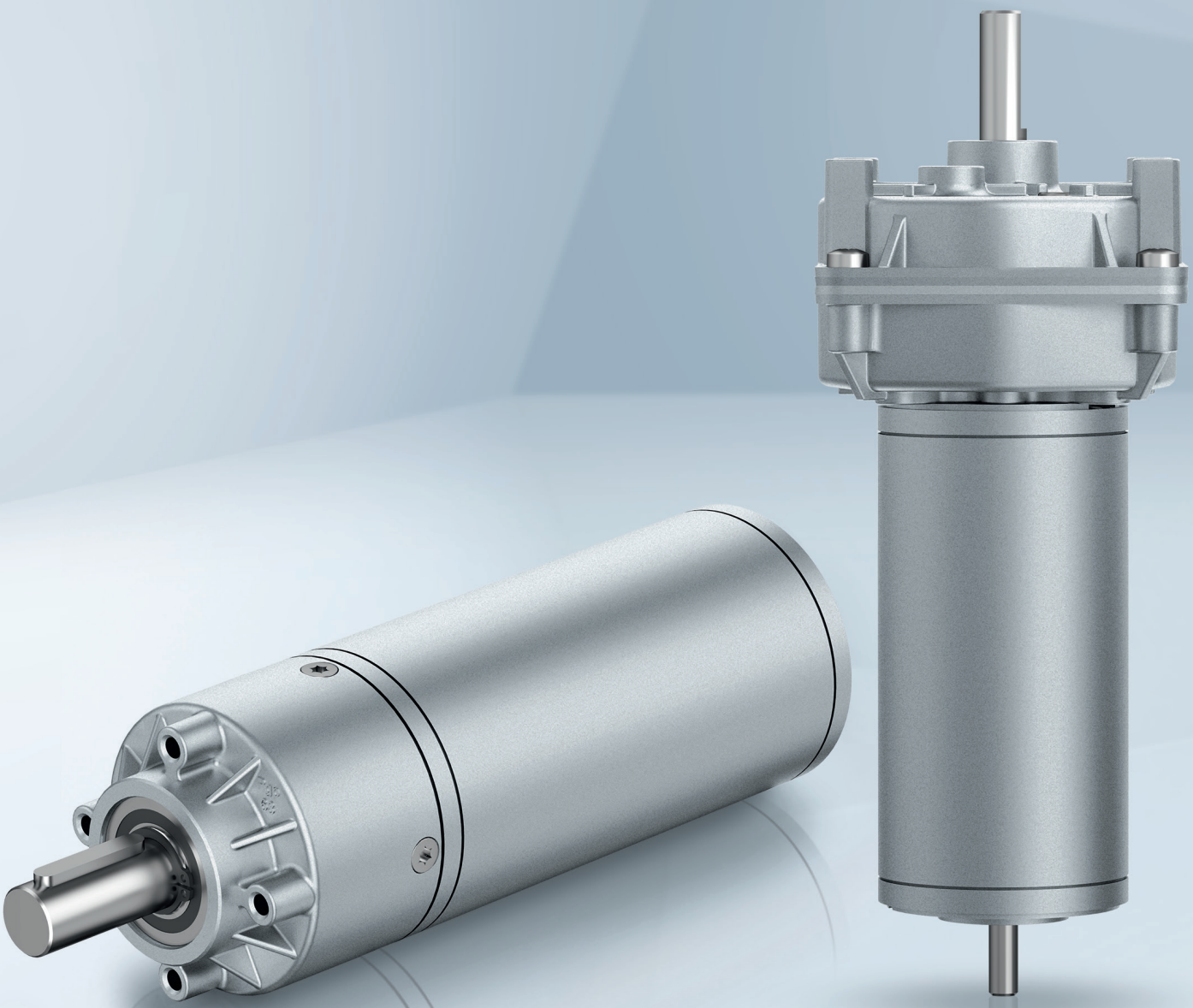
Brushed internal rotor motors
BCI series

Drive solutions | Industrial drive engineering 2018-01

ebmpapst



GREEN TECH

Contents.

About ebm-papst.

As technological leader for ventilation and drive engineering, ebm-papst is in demand as an engineering partner in many industries. With over 15,000 different products, we provide the right solution for just about any challenge. Our fans and drives are reliable, quiet and energy-efficient.

Six reasons that make us the ideal partner:

Our systems expertise.
You want the best solution for every project. The interrelationships between ventilation and drive engineering must thus be considered as a whole. And that's what we do – with **motor technology** that sets standards, sophisticated **electronics** and **aerodynamic designs** – all from a single source and perfectly matched. These system solutions release unique synergies worldwide. And in particular – they relieve you of a lot of work, so that you can concentrate on your core competency.

The ebm-papst spirit of invention.
In addition to our wide range of products, we are always able to develop customized solutions for you. A diversified team of 600 engineers and technicians works at our three locations in Germany: Mulfingen, Landshut and St. Georgen. Contact us to discuss your next project.

Our lead in technology.
As pioneer and trail-blazer for developing highly efficient EC technology, we are way ahead of other motor manufacturers. Almost all our products are also available with GreenTech EC technology. The list of benefits is long: higher efficiency, maintenance-free, longer service life, sound reduction, intelligent control characteristics and unrivalled energy efficiency with savings of up to 80 % compared to conventional AC technology. Let our technology be your competitive advantage as you lead in your industry.

Closeness to our customers.
ebm-papst has 25 production locations worldwide (including facilities in Germany, China and the USA), together with 49 sales offices, each of which has a dense network of sales representatives. You will always have a local contact, someone who speaks your language and knows your market.

Our standard of quality.
Of course you can rely on the highest standards of quality with our products. Our quality management is uncompromising, at every step in every process. This is underscored by our certification according to international standards including DIN EN ISO 9001, TS declaration of conformity and DIN EN ISO 14001.

Our sustainable approach.
Assuming responsibility for the environment, for our employees and for society is an integral part of our corporate philosophy. We develop products with an eye to maximum environmental compatibility, in particular resource-preserving production methods. We promote environmental awareness among our young staff and are actively involved in sports, culture and education. That's what makes us a leading company – and an ideal partner for you.

Our success story to becoming market leader and technological innovator.

1963 Elektrobau Mulfingen **GmbH & Co. KG founded by** Gerhard Sturm and Heinz Ziehl.

1965 Development of the first compact fan in the field of EC-/DC-technology.

1966 The ebm-papst success story started to take off with the release of the new 68 motor.

1972 The first foreign subsidiary was founded in Sweden.

1988 Gerhard Sturm receives the German Cross of Merit.

1990 The sixty millionth external rotor fan was produced.

1992 Acquisition of **PAPST Motoren GmbH** in St. Georgen.

1997 Purchase of the **Landshut** plant (mvl).

2003 Change of name to **ebm-papst**.

2007 Introduction of the gearhead **"EtaCrown®"**.

2010 **GreenTech** – our symbol for energy-efficiency and resource conservation.

2012 Introduction of a new generation of control electronics **(K4)** for BLDC motors.

2013 ebm-papst acquires the gear specialist, **Zeitlauf**, and wins the **German Sustainability Award**.

2014 Launch of the BLDC intenal rotor motor, **ECI 80**.

2015 Introduction of the overload-capable planetary gear **"Optimax 63"**.

2016 Expansion of the electronic production plant, St. Georgen Hagenmoos.

Overview of BCI motors.

Brushed internal rotor motors BCI		**BCI-42.25** (page 14)	**BCI-42.40** (page 14)	**BCI-52.30** (page 16)	**BCI-52.60** (page 16)	**BCI-63.25** (page 18)	**BCI-63.55** (page 18)
U_N	V DC	24	24	24	24	24	24
M_N	mNm	38	57	100	170	140	270
P	W	13	19	38	55	46	93
n_N	rpm	3 300	3 100	3 600	3 100	3 150	3 300
l	mm	70	85	95	125	95	125
d	mm	42	42	52	52	63	63
Gearheads (page 22)							
Performax® 42 (planetary gearhead) (page 22)		●	○				
Performax® 52 (planetary gearhead) (page 24)				●	○		
Performax® 63 (planetary gearhead) (page 26)						●	○
EtaCrown® 52 (crown gearhead) (page 28)		●	○				
EtaCrown® 75 (crown gearhead) (page 30)						●	○
EtaCrown®Plus 42 (crown gearhead) (page 32)		●	○				
EtaCrown®Plus 63 (crown gearhead) (page 34)						●	○
Compactline 90 (spur gearhead) (page 36)		●	●				
Compactline 91 (spur gearhead) (page 38)						●	●
Compactline 92 (spur gearhead) (page 40)						●	●
Flatline 78 (spur gearhead) (page 42)		●					
Flatline 85 (spur gearhead) (page 44)						●	●
Encoder systems (page 50)							
PMG 2-2/2-12 (magnetical)		●	○	●	○	●	○
HEDS 5500/512 (optical, incremental)		●	○	●	○	●	○
Brakes (page 48)							
BFK (spring-applied)		●	○	●	○	●	○

Subject to alterations

● Standard type ○ Preferred type: ready to ship in 48 hours

With our **preferred type** products, we offer a selection of motors and gear motors which are available and ready to ship within 48 hours. Preferred type products can be ordered with a maximum order quantity of 20 products per order.

With **standard type** products, we refer to a wide range of motors and gear motors which can be ordered using the stated order numbers with standard delivery times.

Further products for your project requirements are available **on request.** These products are generally available but cannot be ordered by means of an allocated material number. We reserve the right to make changes to the necessary order numbers after technical and economic evaluation of the requirement.

BCI motors.

Information about BCI motors.

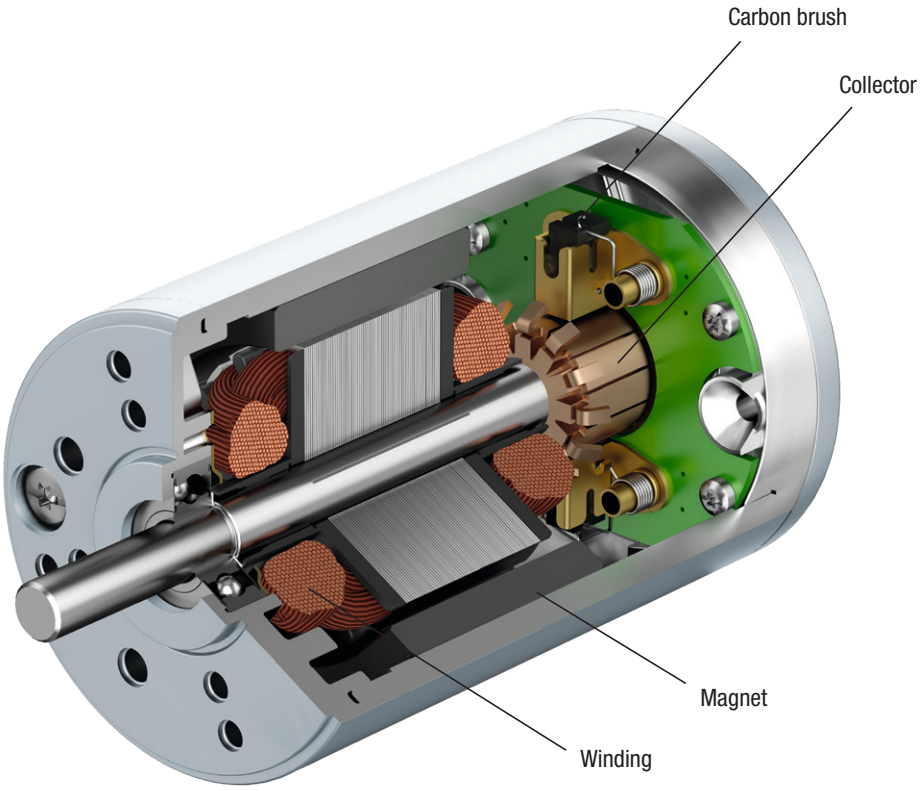
Key figures

- DC motor with permanent magnets
- Power range between 13 and 93 watts
- High power density realized in a compact design
- High overload capacity
- Highly efficient
- Mechanical commutation through a multi-piece collector
- Customer-specific winding layout
- Winding insulation as per insulation class B
- Protection class IP 40, optionally higher

- Various motor types which can be combined with planetary, crown and spur gearheads
- Optional encoder and brake modules

Approvals

- Support with the accreditation of products in different economic areas and markets
- As an experienced and competent partner we would be happy to support you
- Possible approvals include CE, CCC, UL, CSA, EAC or other certification marks.



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The data in this catalog contain product specifications, but are not a guarantee of particular properties.

All information is based on the measuring conditions mentioned below. Operation of motors using reference electronics at an ambient temperature of max. 40°C when attached (thermally conductive) to a free-standing steel plate of the following size: Steel plate 105 x 105 x 10 mm

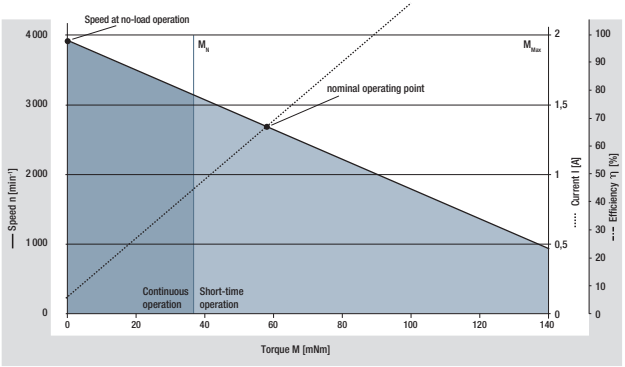
The **nominal operating point** is the basis for the electromagnetic design of the motor from the point of view of the maximum possible continuous output of the motor and is specified by the nominal values described here.

The values mentioned are typical values for the design in question and are also subject to the tolerances included in the specifications or drawings. Unless otherwise stated, the supplements and safety notes contained in the relevant operating and assembly instructions must be kept at all times. Subject to availability and technical alterations.

Nominal voltage U_{BN} [V DC]
The DC voltage that is applied to the DC motor as a supply voltage. All nominal values listed in the technical tables of the individual motors refer to this voltage. Motor applications are, however, not restricted to this voltage. Changing the voltage results in a parallel shift of the motor curve. The lower voltage limit is defined by the commutator contact resistance and the start-up behavior of the motor. The lower limit results from the mechanical ceiling speed of the motor. In every case, when selecting the voltage and defining the operating point, thermal overload of the motor in continuous operation or the selected operating cycle must be avoided. The ripple of the supply voltage should not exceed 3-5% in normal operation, as higher ripple means poorer efficiency and control quality and corresponding speed fluctuations.

Nominal speed n_N [rpm]
The speed at which the motor can be operated for long periods at an ambient temperature of 40°C and with output of the nominal torque in a thermally conductive installation. It is an operating point at the max. motor curve.

Nominal torque M_N [mNm]
The torque that the motor can output for long periods at an ambient temperature at 40°C and with output of the nominal torque in a thermally conductive installation.



The illustrated curves are idealized representations based on the figures in the tables.

Nominal current I_N [A]
The current that is drawn from the system supply when the motor delivers nominal torque at nominal speed.

$$P_N = M_N \cdot \omega_N = \frac{\pi}{30} \cdot n_N \cdot M_N = \text{ca. } 0.1 \cdot M_N \cdot n_N$$

Nominal output power P_N [W]
The product of the nominal torque and nominal angular velocity. When calculating this value, the tolerances of the individual values contained in the specification data sheets must be considered. In the electromagnetic design of the motors, the nominal operating point is defined with consideration of the fact that the nominal output corresponds approximately to the maximum permitted long-term output power of the motor.

Definitions for BCI motors.

Rated efficiency η_N [%]
Indicates the ratio in % of the mechanical output power to the absorbed electrical output relative to the nominal operating point. Typically, the nominal operating point is close to the optimum efficiency.

Speed at no-load operation n_L [rpm]
The speed that takes effect at the nominal voltage and with unloaded motor. For the DC motor, it is proportional to the applied supply voltage. The theoretical possible speed at no-load operation can, in some cases, be limited by the mechanical ceiling speed.

Start-up torque M_A [mNm]
The torque that the motor can output for short periods at speed "0" rpm and current draw in the amount of the start-up current at start-up or as holding torque.

Start-up current I_A [A]
The current drawn from the DC voltage source as the supply current if the motor outputs "0" rpm as the start-up torque. If the power supply used has a design that is too weak, it may not be possible to reach this point. In this case, the maximum possible start-up torque is limited by the power pack.

Induced current U_{imax} [V/1 000 rpm]
The value of the induced current in the motor per 1 000 rpm. It is a measure for the electromagnetic design of the motor. In no-load operation, the induced current is approximately equal to the applied supply voltage (minus the voltage loss via the ohmic resistance of the winding). Torque-forming current no longer flows; as a result, no more torque can be output to the shaft in no-load operation.
The values specified in the technical data are based on an ambient temperature of 25°C.

Connection resistance R_v [Ohm]
The resistance measure at both connection lines of the motor at 20°C. Thus it is the total resistance composed of the line resistance, brush-collector contact resistance and the actual winding resistance.

Connection inductance L_V [mH]
The average inductance measured at 20°C between the two connection lines of the motor with a sinusoidal measuring frequency of 1 kHz.

Rotor moment of inertia J_R [kgm^2x10^{-6}]
The mass moment of inertia of the wound rotor and thus a defining variable for the dynamic properties of the motor.

Thermal resistance R_{th} [K/W]
A substitutional resistance at normal rating that results from the difference between the winding temperature and the ambient temperature in relation to the overall power loss.

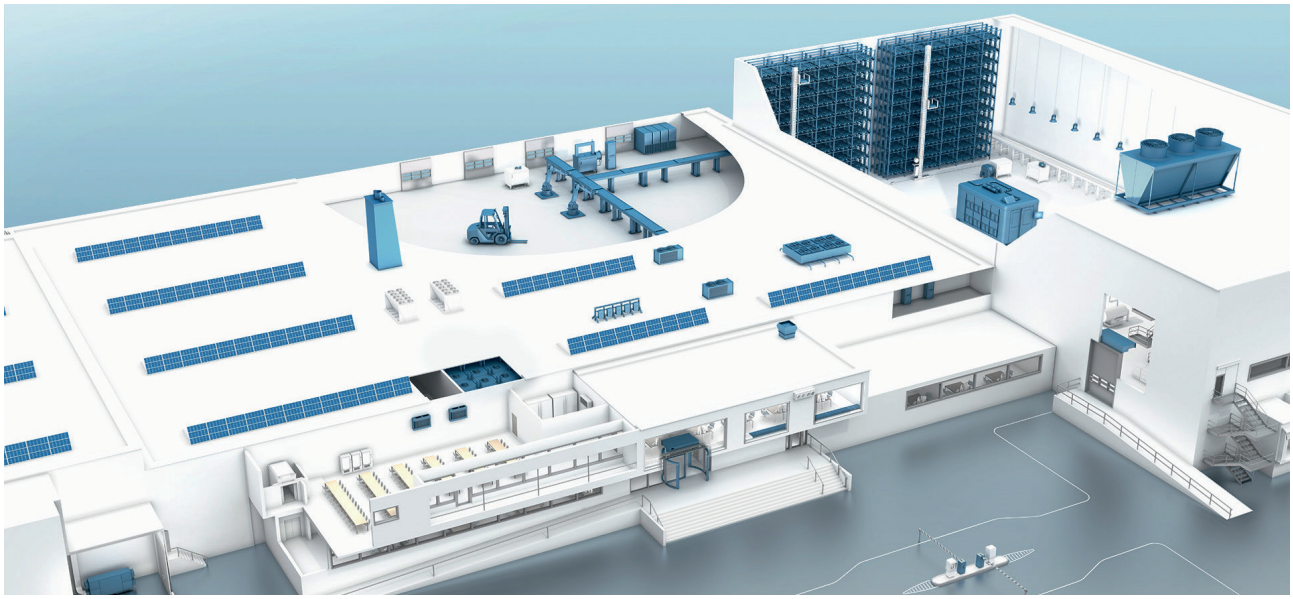
Protection class
Information on the protection class complies with the valid Standard EN 60 034-5. It describes protection against foreign particles (Point 1) and water (Point 2).

Permissible ambient temperature range T_U [°C]
Defines the minimum and maximum permissible ambient temperature to which the mentioned performance values apply when the motor is in operation. Other ambient temperatures are possible but should be given special consideration as e. g. higher ambient temperatures result in a reduction of output power.
Here, it must be ensured that the permitted winding temperature in the motor (e.g. for insulation material class B = 130°C, to EN 60 034-1) is not exceeded.
The following formula can be used to provide a rough estimate of the reduced torque permitted at a higher temperature:

$$M_{red} = M_N \cdot \sqrt{\frac{T_{winding.\ max.} - T_{amb.}}{T_{winding.\ max.} - T_N}}$$

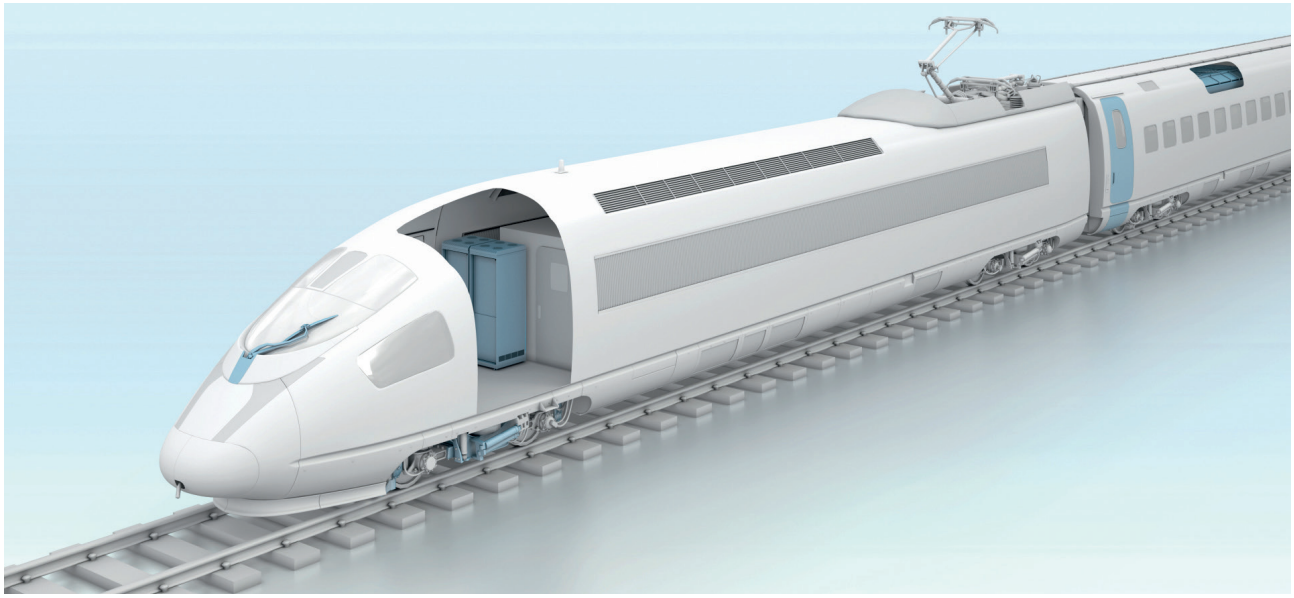
M_{red} = value for the reduced torque to be measured
$T_{winding\ max.}$ = max. permitted winding temperature defined by the ISO class
$T_{amb.}$ = value for the elevated ambient temperature
T_N = reference temperature for specifying the nominal data

Please contact the manufacturer if the drives are operated or stored under non standard environmental conditions.



Factory building

Medical technology



Railway technology

BCI motor.

BCI-42.XX

- Direct current motor with permanent magnets made of ceramic bound ferrite
- Mechanical commutation through 8-piece collector
- Closed steel motor housing with die-cast zinc bearing flanges
- Operation in both directions of rotation
- Service life 3 000 h for continuous operation (S1)
- Insulation class B
- Protection class IP 40, optionally higher

Nominal data

Type		BCI-42.25-A00	BCI-42.25-B00	BCI-42.40-A00	BCI-42.40-B00
Nominal voltage (U_{BN})	V DC	12	24	12	24
Nominal speed (n_N)*	rpm	3 300	3 300	3 100	3 100
Nominal torque (M_N)*	mNm	38	38	57	57
Nominal current (I_{BN})*	A	1.90	0.96	2.50	1.10
Nominal output power (P_N)*	W	13	13	19	19
Rated efficiency, approx. (ηN)	%	60	60	63	70
Free-running speed (n_L)	rpm	4 000	3 900	3 850	3 600
Free-running current (I_{BL})	A	0.30	0.19	0.27	0.17
Starting torque (M_A)	mNm	200	190	330	320
Starting current (I_A)	A	7.60	4.00	11.2	5.90
Induced voltage (U_{imax})	V/1 000 rpm	2.74	5.50	3.04	6.40
Connection resistance (R_V)	Ohm	1.54	6.05	1.08	4.10
Connection inductance (L_V)	mH	2.20	8.90	1.20	5.10
Rotor moment of inertia (J_R)	$kgm^2 \times 10^{-6}$	7.40	7.40	11.5	11.5
Heat resistance (R_{th})	K/W	4.80	4.80	4.75	4.75
Protection class**		IP 40			
Permissible ambient temperature range (T_U)	°C	0 ... +40			
Weight	kg	0.40	0.40	0.50	0.50
Order No.		on request	931 4225 001	on request	931 4240 062

Subject to alterations

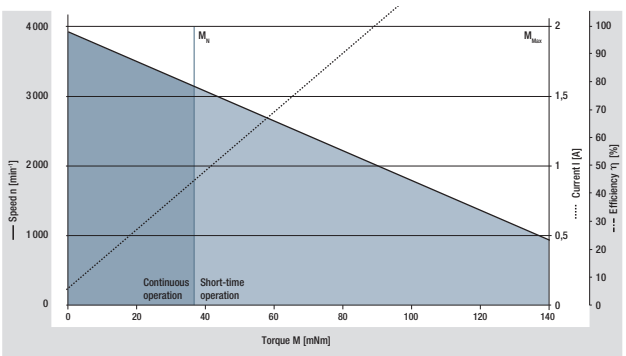
Preferred type: ready to ship in 48 hours

* at T_U max. 40°C

** Classification of protection class refers to installed state with sealing on the flange side

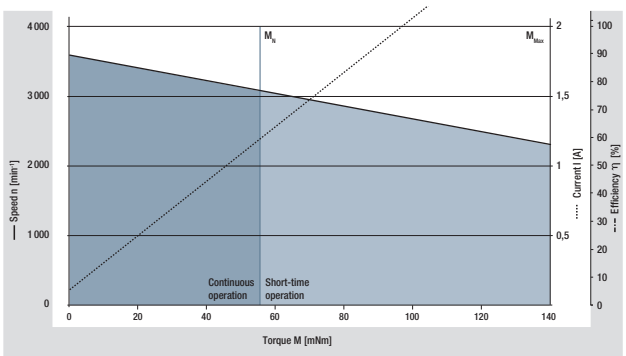
Characteristic curve

BCI-42.25, 24 V (at 25°C)



[1] Nominal data, see table

BCI-42.40, 24 V (at 25°C)



[1] Nominal data, see table

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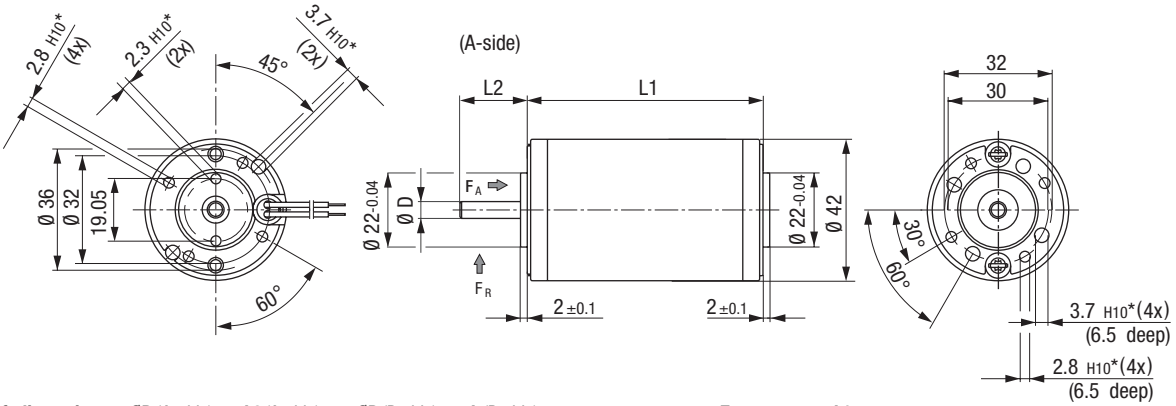
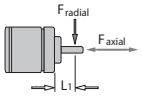
Technical drawing

Image standard type / All dimensions in mm



Shaft dimensions	ØD (A-side)	L2 (A-side)	ØD (B-side)	L (B-side)
Standard type	5_{g5}	20.0 mm	--	--
Preferred type	5_{g5}	14.5 mm	5_{g5}	15 mm

Type	L1
BCI-42.25	70 ± 0.5
BCI-42.40	85 ± 0.5



F_{axial}	30 N
F_{radial}	60 N
L1	20 mm

Permissible shaft load at nominal speed and life expectancy L_{10} of 3 000 h (at T_U 40°C).

* Blind holes for thread-forming screws according to DIN 7500

Electrical connection

Connection cable

Color	Function	
red	Power supply (+)	Cable length 300 ± 30 from motor Cable end 7 ± 2 stripped and tin-coated
black	GND (-)	

Change of the rotating direction is possible by polarity reversal of the wires

Modular construction kit

Brake system
Spring-applied braking
BFK 457-01 (page 48)

Encoder system
Magnetic encoder system
PMG 2-X (page 50)
Optical incremental encoder
HEDS 5500 / PWB AE30 (page 52)

Basic motor

Planetary gearhead
Performax® 42 (page 22)

Crown gearhead
EtaCrown® 52 (page 28)
EtaCrown®Plus 42 (page 32)

Spur gearheads
Compactline 90 (page 36)

For motor-gearbox combinations, depending on the choice of the single components, the maximum allowable torque (gearbox) can be exceeded or respectively not reached.

BCI motor.

BCI-52.XX

- Direct current motor with permanent magnets made of ceramic bound ferrite
- Mechanical commutation through 12-piece collector
- Closed steel motor housing with die-cast zinc bearing flanges
- Operation in both directions of rotation
- Service life 3 000 h for continuous operation (S1)
- Insulation class B
- Protection class IP 40, optionally higher

Nominal data

Type		BCI-52.30-A00	BCI-52.30-B00	BCI-52.60-A00	BCI-52.60-B00
Nominal voltage (U_{BN})	V DC	12	24	12	24
Nominal speed (n_N)*	rpm	3 600	3 600	3 100	3 100
Nominal torque (M_N)*	mNm	100	100	170	170
Nominal current (I_{BN})*	A	4.80	2.20	6.40	3.00
Nominal output power (P_N)*	W	38	38	55	55
Rated efficiency, approx. (ηN)	%	66	71	72	77
Free-running speed (n_L)	rpm	4 200	4 200	3 500	3 500
Free-running current (I_{BL})	A	0.48	0.30	0.60	0.40
Starting torque (M_A)	mNm	550	650	800	980
Starting current (I_A)	A	20.8	12.0	27.6	16.0
Induced voltage (U_{imax})	V/1 000 rpm	2.78	5.60	3.04	6.40
Connection resistance (R_V)	Ohm	0.58	2.00	0.44	1.50
Connection inductance (L_V)	mH	0.90	3.60	1.10	4.70
Rotor moment of inertia (J_R)	kgm^2 x 10^{-6}	23	23	46	46
Heat resistance (R_{th})	K/W	3.20	3.20	3.30	3.30
Protection class**		IP 40			
Permissible ambient temperature range (T_U)	°C	0 ... +40			
Weight	kg	0.90	0.90	1.10	1.10
Order no.		on request	931 5230 001	on request	931 6325 070

Subject to alterations

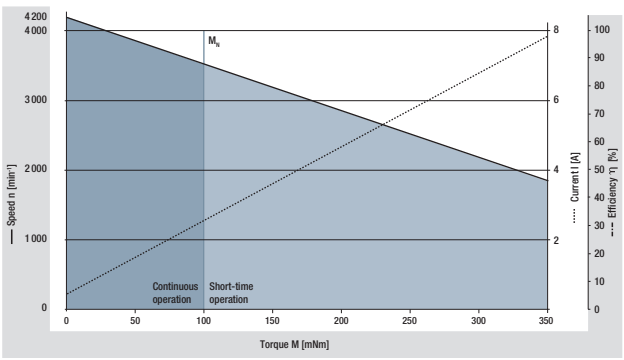
Preferred type: ready to ship in 48 hours

* at T_U max. 40°C

** Classification of protection class refers to installed state with sealing on the flange side

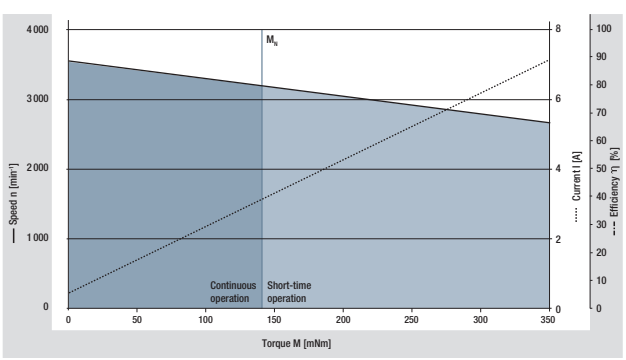
Characteristic curve

BCI-52.30, 24 V (at 25°C)



[1] Nominal data, see table

BCI-52.60, 24 V (at 25°C)



[1] Nominal data, see table

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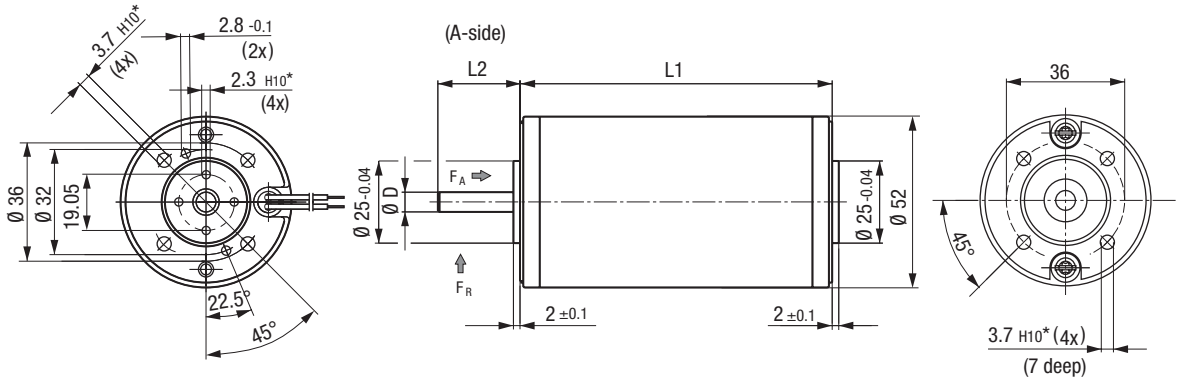
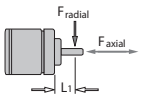
Technical drawing

Image standard type / All dimensions in mm



Shaft dimensions	ØD (A-side)	L2 (A-side)	ØD (B-side)	L (B-side)
Standard type	6_{g5}	25.0 mm	--	--
Preferred type	6_{g5}	18.2 mm	6_{g5}	15 mm

Type	L1
BCI-52.30	95 ± 0.5
BCI-52.60	125 ± 0.5



F_{axial}	90 N
F_{radial}	130 N
L1	20 mm

Permissible shaft load at nominal speed and life expectancy L_{10} of 3 000 h (at T_U 40°C).

* Blind holes for thread-forming screws according to DIN 7500

Electrical connection

Connection cable

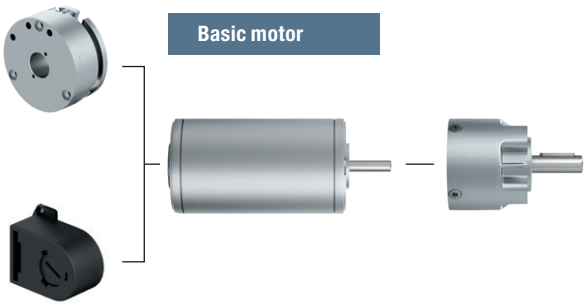
Color	Function	
red	Power supply (+)	Cable length 300 ± 30 from motor Cable end 7 ± 2 stripped and tin-coated
black	GND (-)	

Change of the rotating direction is possible by polarity reversal of the wires

Modular construction kit

Brake system
Spring-applied braking
BFK 457-02 (page 48)

Encoder system
Magnetic encoder system
PMG 2-X (page 50)
Optical incremental encoder
HEDS 5500 / PWB AE30 (page 52)



Basic motor

Planetary gearhead
Performax® 52 (page 24)

For motor-gearbox combinations, depending on the choice of the single components, the maximum allowable torque (gearbox) can be exceeded or respectively not reached.

BCI motor.

BCI-63.XX

- Direct current motor with permanent magnets made of ceramic bound ferrite
- Mechanical commutation through 12-piece collector
- Closed steel motor housing with die-cast zinc bearing flanges
- Operation in both directions of rotation
- Service life 3 000 h for continuous operation (S1)
- Insulation class B
- Protection class IP 40, optionally higher

Nominal data

Type		BCI-63.25-A00	BCI-63.25-B00	BCI-63.55-A00	BCI-63.55-B00
Nominal voltage (U_{BN})	V DC	12	24	12	24
Nominal speed (n_N)*	rpm	3 150	3 150	3 000	3 300
Nominal torque (M_N)*	mNm	140	140	270	270
Nominal current (I_{BN})*	A	5.40	2.70	8.60	4.90
Nominal output power (P_N)*	W	46	46	85	93
Rated efficiency, approx. (ηN)	%	71	71	79	79
Free-running speed (n_L)	min^{-1}	3 600			
Free-running current (I_{BL})	A	0.80	0.40	1.00	0.50
Starting torque (M_A)	mNm	840	1 100	1 900	2 550
Starting current (I_A)	A	28.0	17.5	63.0	40.0
Induced voltage (U_{imax})	V/1 000 rpm	3.20	6.60	3.30	6.70
Connection resistance (R_V)	Ohm	0.44	1.40	0.19	0.65
Connection inductance (L_V)	mH	0.70	2.90	0.40	1.50
Rotor moment of inertia (J_R)	$kgm^2 \times 10^{-6}$	40	40	75	75
Heat resistance (R_{th})	K/W	2.75	2.75	2.45	2.45
Protection class**		IP 40			
Permissible ambient temperature range (T_U)	°C	0 ... +40			
Weight	kg	1.20	1.20	1.70	1.70
Order no.		on request	931 6325 001	on request	931 6355 140

Subject to alterations

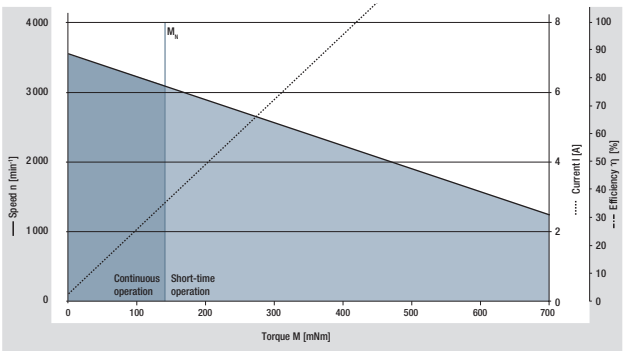
Preferred type: ready to ship in 48 hours

* at T_U max. 40°C

** Classification of protection class refers to installed state with sealing on the flange side

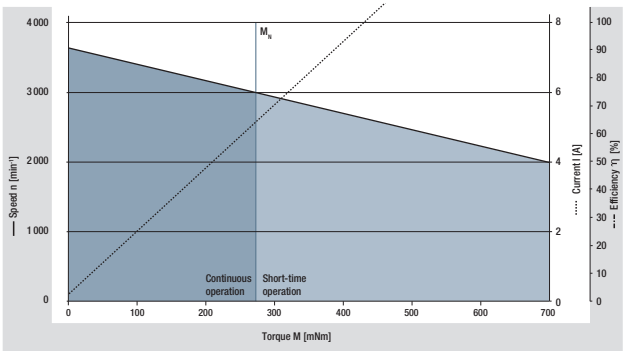
Characteristic curve

BCI-63.25, 24 V (at 25°C)



[1] Nominal data, see table

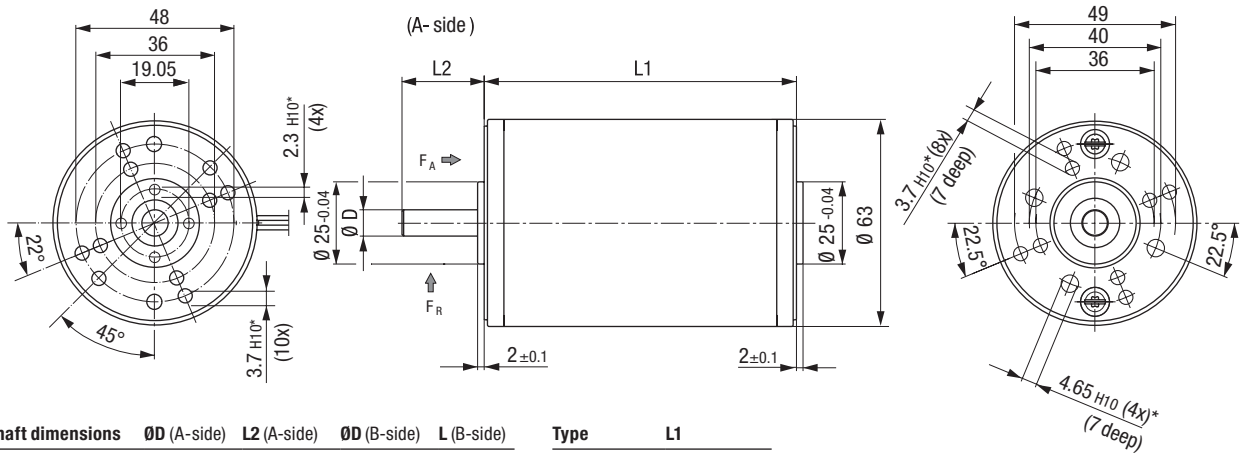
BCI-63.55, 24 V (at 25°C)



[1] Nominal data, see table

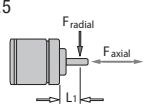
Technical drawing

Image standard type / All dimensions in mm



Shaft dimensions	ØD (A-side)	L2 (A-side)	ØD (B-side)	L (B-side)
Standard type	8_{g5}	25.0 mm	--	--
Preferred type	8_{g5}	20.2 mm	8_{g5}	15 mm

Type	L1
BCI-63.25	95 ± 0.5
BCI-63.55	125 ± 0.5



F_{axial}	150 N
F_{radial}	150 N
L1	20 mm

Permissible shaft load at nominal speed and life expectancy L_{10} of 3 000 h (at T_U 40°C).

* Blind holes for thread-forming screws according to DIN 7500

Electrical connection

Connection cable

Color	Function	
red	Power supply (+)	Cable length 300 ± 30 from motor Cable end 7 ± 2 stripped and tin-coated
black	GND (-)	

Change of the rotating direction is possible by polarity reversal of the wires

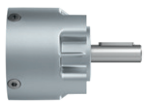
Modular construction kit

Brake system
- Spring-applied braking
- BFK 457-03 (page 48)

Encoder system
- Magnetic encoder system
- PMG 2-X (page 50)
- Optical incremental encoder
- HEDS 5500 / PWB AE30 (page 52)

Basic motor

Planetary gearhead
- Performax® 63 (page 26)



Crown gearhead
- EtaCrown® 75 (page 30)
- EtaCrown®Plus 63 (page 34)

Spur gearheads
- Compactline 90 (page 36)
- Compactline 91 (page 38)
- Flatline 85 (page 44)

For motor-gearbox combinations, depending on the choice of the single components, the maximum allowable torque (gearbox) can be exceeded or respectively not reached.

Gearheads.

Planetary gearheads.

Performax® 42

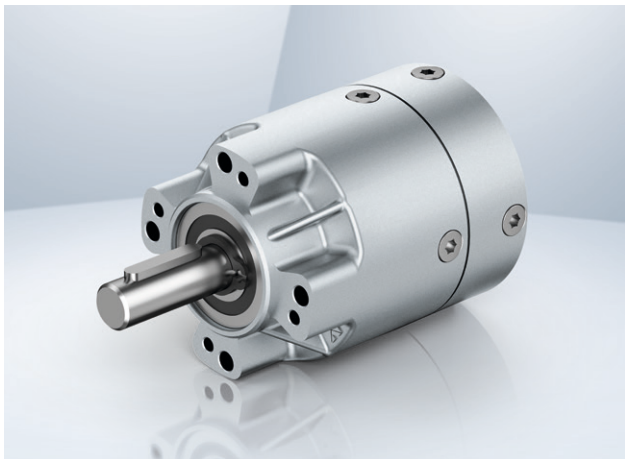


Image of 2-stage gearhead

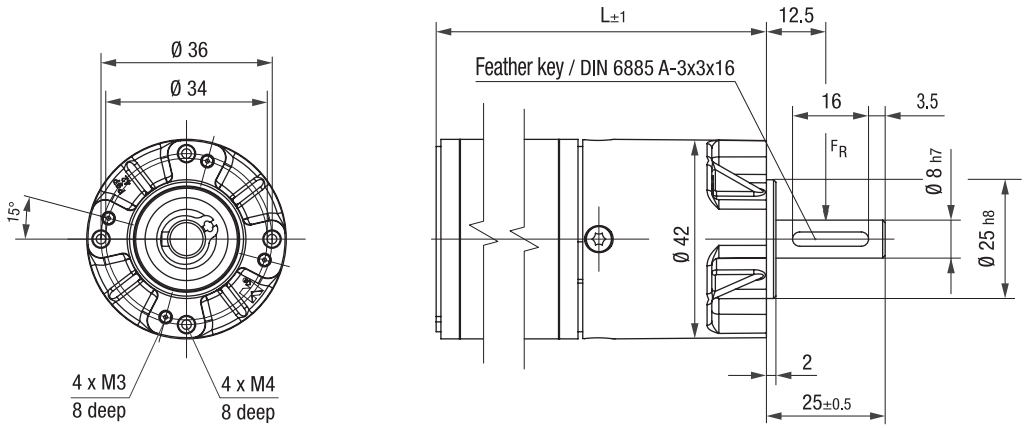
- High power density from compact dimensions
- Very quiet running due to helical teeth in the first gear stage
- Planetary wheels made of plastic with optimized sliding properties in the first stage ensure smooth operation
- Large effective diameter thanks to radial screw connection
- Economical setup due to use of many individual parts which are readily available on the market

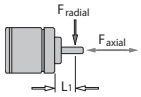
Nominal data

Gearheads		Performax® 42.1				Performax® 42.2						
Reduction ratio		3.20	5.00	9.00	17.0	21.3	30.0	38.3	54.0	72.3	102	204
No. of stages		1				2						
Efficiency		0.90				0.81						
Max. input speed (n_1)	rpm	6 000				6 000						
Rated output torque (M_{ab})	Nm	1.24	1.00	0.50	0.79	3.20	4.48	1.80	2.60	2.20	3.20	6.30
Short-term torque (M_{max})	Nm	3.10	2.50	1.25	1.98	8.00	11.2	4.50	6.50	5.50	8.00	15.8
Gear play	°	0.70 ... 1.20				0.70 ... 1.20						
Permissible operating temperature (T_U)	°C	-20 ... +80				-20 ... +80						
Operating mode		S1				S1						
Protection class		IP 50				IP 50						
Weight	kg	0.19				0.29						
Shaft load radial / axial	N	250 / 150				250 / 150						
Service life	h	5 000*				5 000*						
Lubrication		Maintenance-free grease lubrication for life										
Installation position		any										
Subject to alterations	* The service life can be reduced when combined with a motor											
Preferred type: ready to ship in 48 hours	On request											

Technical drawing

Image of 1-stage gearhead / 2-stage design completely cylindrical / All dimensions in mm





F_{axial}	150 N	Permissible shaft load at nominal speed and life
F_{radial}	250 N	expectancy L_{10} (nominal operation) and operating factor
L1	12.5 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 1-stage	L - 2-stage
BCI-42.25-P42	mm	105	121
BCI-42.40-P42	mm	120	136

Subject to alterations

Planetary gearheads.

Performax® 52

Image of 2-stage gearhead

- High power density from compact dimensions
- Very quiet running due to helical teeth in the first gear stage
- Planetary wheels made of plastic with optimized sliding properties in the first stage ensure smooth operation
- Large effective diameter thanks to radial screw connection
- Economical setup due to use of many individual parts which are readily available on the market

Nominal data

Gearheads		Performax® 52.1				Performax® 52.2						
Reduction ratio		3.2	5	9	17	21.3	30	38.3	54	72.3	102	204
No. of stages		1				2						
Efficiency		0.90				0.81						
Max. input speed (n_1)	rpm	6 000				6 000						
Rated output torque (M_{ab})	Nm	2.99	2.99	1.40	0.90	4.60	14.9	5.30	7.40	3.40	4.70	9.40
Short-term torque (M_{max})	Nm	7.48	7.48	3.50	2.25	11.5	37.3	13.3	18.5	8.50	11.8	23.5
Gear play	°	0.70 ... 1.20				0.70 ... 1.20						
Permissible operating temperature (T_U)	°C	-20 ... +80				-20 ... +80						
Operating mode		S1				S1						
Protection class		IP 50				IP 50						
Weight	kg	0.40				0.50						
Shaft load radial / axial	N	350 / 500				350 / 500						
Service life	h	5 000*				5 000*						
Lubrication		Maintenance-free grease lubrication for life										
Installation position		any										

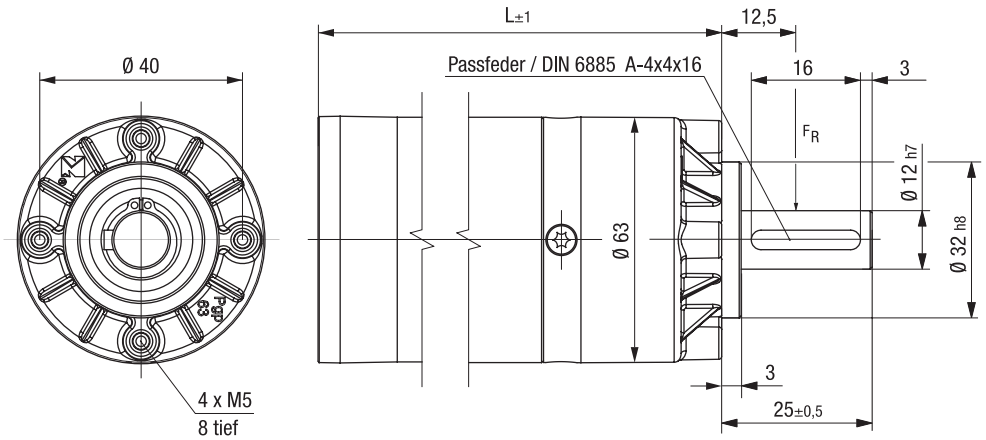
Subject to alterations

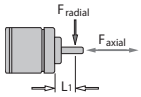
* The service life can be reduced when combined with a motor

Preferred type: ready to ship in 48 hours — On request

Technical drawing

Image of 1-stage gearhead / 2-stage design completely cylindrical / All dimensions in mm





F_{axial}	500 N
F_{radial}	350 N
L1	12.5 mm

Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) and operating factor C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 1-stage	L - 2-stage
BCI-52.30-P52	mm	137	155
BCI-52.60-P52	mm	167	185

Subject to alterations

Planetary gearheads.

Performax® 63

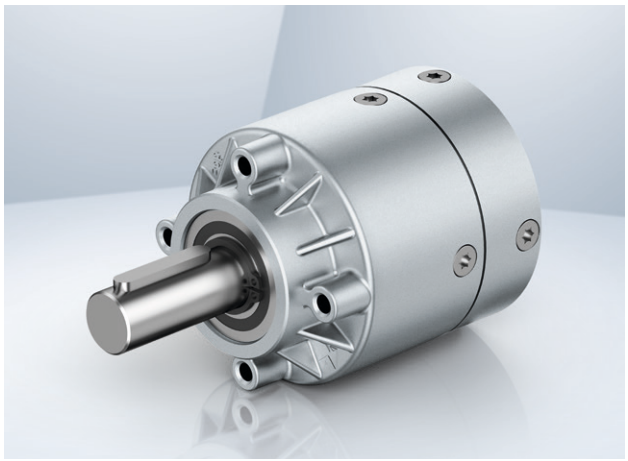


Image of 2-stage gearhead

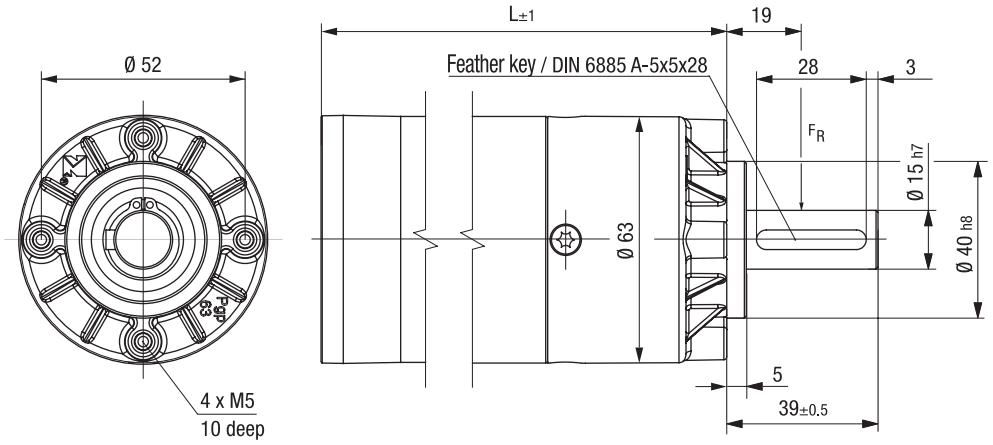
- High power density from compact dimensions
- Very quiet running due to helical teeth in the first gear stage
- Planetary wheels made of plastic with optimized sliding properties in the first stage ensure smooth operation
- Large effective diameter thanks to radial screw connection
- Economical setup due to use of many individual parts which are readily available on the market

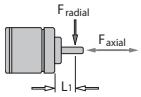
Nominal data

Gearheads		Performax® 63.1			Performax® 63.2						
Reduction ratio		5.00	9.00	17.0	21.25	30.0	38.25	54.0	72.3	102	204
No. of stages		1			2						
Efficiency		0.90			0.81						
Max. input speed (n_1)	rpm	6 000			6 000						
Rated output torque (M_{ab})	Nm	6.91	2.20	1.50	12.0	17.0	8.30	11.8	5.90	8.30	16.5
Short-term torque (M_{max})	Nm	17.3	5.50	3.75	30.0	42.5	20.8	29.5	14.8	20.8	41.3
Gear play	°	0.70 ... 1.20			0.70 ... 1.20						
Permissible operating temperature (T_U)	°C	-20 ... +80			-20 ... +80						
Operating mode		S1			S1						
Protection class		IP 50			IP 50						
Weight	kg	0.40			0.60						
Shaft load radial / axial	N	350 / 500			350 / 500						
Service life	h	5 000*			5 000*						
Lubrication		Maintenance-free grease lubrication for life									
Installation position		any									
Subject to alterations	* The service life can be reduced when combined with a motor										
Preferred type: ready to ship in 48 hours	On request										

Technical drawing

Image of 1-stage gearhead / 2-stage design completely cylindrical / All dimensions in mm





F_{axial}	500 N	Permissible shaft load at nominal speed and life
F_{radial}	350 N	expectancy L_{10} (nominal operation) and operating factor
L1	19 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 1-stage	L - 2-stage
BCI-63.25-P63	mm	141	162
BCI-63.55-P63	mm	171	192

Subject to alterations

Crown gearheads.

EtaCrown® 52

Image of 2-stage gearhead

- Maximum safety in design and operation, as well as optimal vandalism protection; no automatic lock due to high efficiency of the crow wheel technology
- Space-saving installation due to zero offset axle and symmetrical structure
- Flexible application possibilities with various optional shaft outlets and available shaft geometries
- Wide reduction range by means of upstream/downstream planetary stage
- High radial loads due to double ball bearing in the output shaft

Nominal data

Gearheads		EtaCrown® 52.1			EtaCrown® 52.2			
Reduction ratio		4.10	6.70	10.1	21.2	33.3	60.0	113
No. of stages		1			2			
Efficiency		0.90			0.81			
Max. input speed (n_1)	rpm	6 000			6 000			
Rated output torque (M_{ab})	Nm	0.21	0.34	0.52	0.98	1.54	2.77	3.48
Short-term torque (M_{max})	Nm	0.53	0.85	1.30	2.45	3.85	6.93	8.70
Gear play	°	0.55 ... 1.10			0.55 ... 1.10			
Permissible operating temperature (T_U)	°C	-20 ... +80			-20 ... +80			
Operating mode		S1			S1			
Protection class		IP 50			IP 50			
Weight	kg	0.40			0.65			
Shaft load radial / axial	N	300 / 150	350 / 150	400 / 150	500 / 150	570 / 150	720 / 150	770 / 150
Service life	h	5 000*			5 000*			
Lubrication		Maintenance-free grease lubrication for life						
Installation position		any						

Subject to alterations

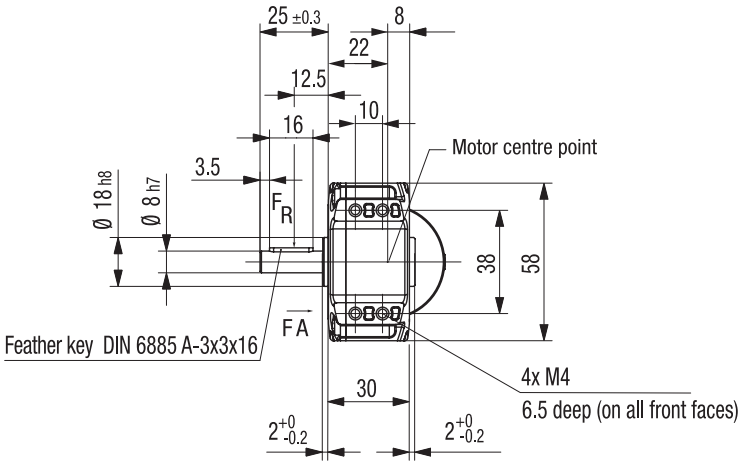
* The service life can be reduced when combined with a motor

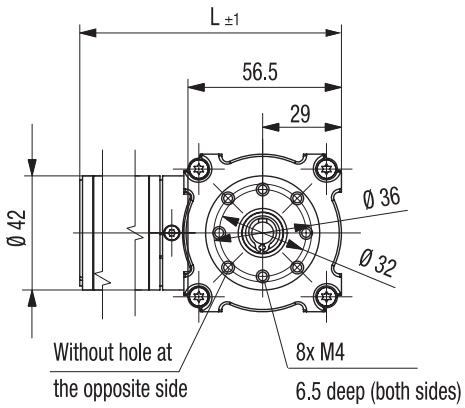
Preferred type: ready to ship in 48 hours

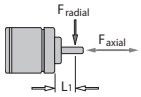
On request

Technical drawing

Image of 1-stage gearhead with left shaft end (W05) / All dimensions in mm

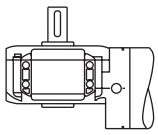
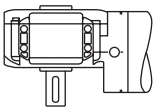
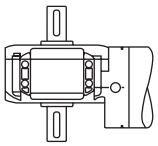






F_{axial}	150 N	
F_{radial}	see table	
L1	12.5 mm	

Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) and operating factor $C_B = 1$ (see page 56) of 5 000 h (at T_U 40°C).

Shaft end, right (W05) (standard)	Shaft end, left (W06)	Shaft end, both sides (W07)
		

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 1-stage	L - 2-stage
BCI-42.25-E52	mm	136	165
BCI-42.40-E52	mm	151	180

Subject to alterations

Crown gearheads.

EtaCrown® 75

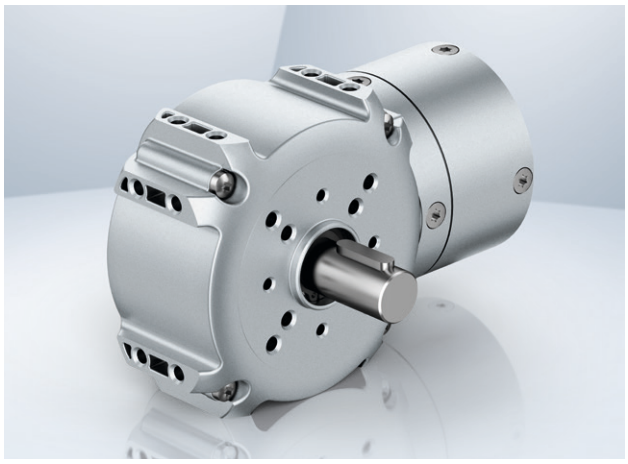


Image of 2-stage gearhead

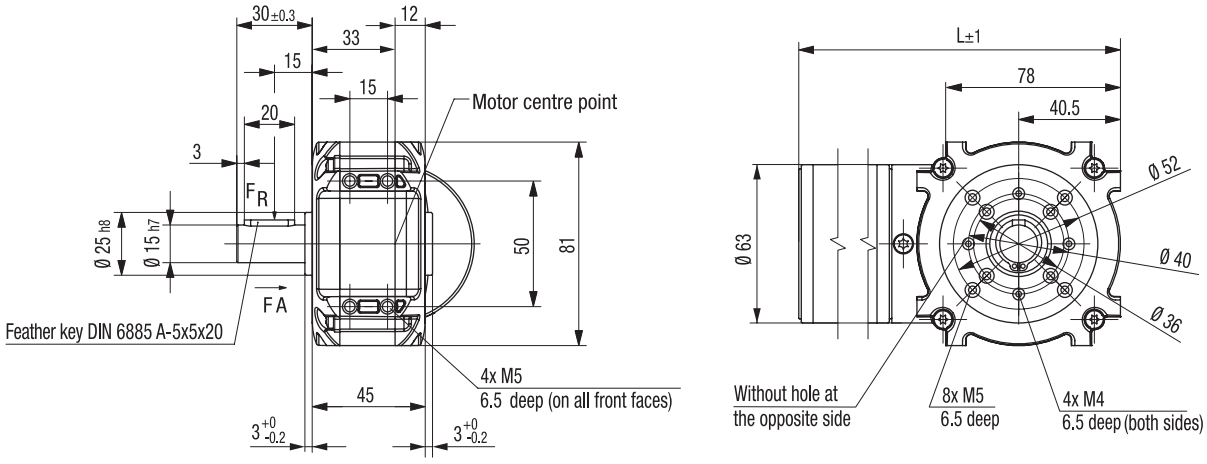
- Maximum safety in design and operation, as well as optimal vandalism protection; no automatic lock due to high efficiency of the crow wheel technology
- Space-saving installation due to zero offset axle and symmetrical structure
- Flexible application possibilities with various optional shaft outlets and available shaft geometries
- Wide reduction range by means of upstream/downstream planetary stage
- High radial loads due to double ball bearing in the output shaft

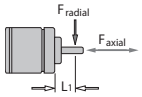
Nominal data

Gearheads		EtaCrown® 75.1			EtaCrown® 75.2			
Reduction ratio		4.10	6.70	10.1	20.3	33.3	60.0	113
No. of stages		1			2			
Efficiency		0.90			0.81			
Max. input speed (n_1)	rpm	6 000			6 000			
Rated output torque (M_{ab})	Nm	6.00	5.00	2.43	10.0	10.0	10.0	10.0
Short-term torque (M_{max})	Nm	15.0	12.5	6.08	25.0	25.0	25.0	25.0
Gear play	°	0.55 ... 1.10			0.55 ... 1.10			
Permissible operating temperature (T_U)	°C	-20 ... +80			-20 ... +80			
Operating mode		S1			S1			
Protection class		IP 50			IP 50			
Weight	kg	0.90			1.30			
Shaft load radial / axial	N	150 / 500	250 / 500	400 / 500	550 / 500	800 / 500	1100 / 500	1300 / 500
Service life	h	5 000*			5 000*			
Lubrication		Maintenance-free grease lubrication for life						
Installation position		any						
Subject to alterations	* The service life can be reduced when combined with a motor							
Preferred type: ready to ship in 48 hours	On request							

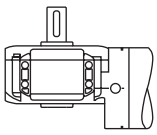
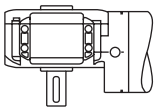
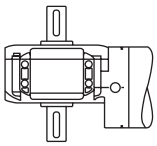
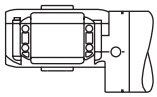
Technical drawing

Image of 1-stage gearhead with left shaft end (W05) / All dimensions in mm





F_{axial}	500 N	Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) and operating factor C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).
F_{radial}	see table	
L1	15 mm	

Shaft end, right (W05) (standard)	Shaft end, left (W06)	Shaft end, both sides (W07)	Hollow shaft (W08)
			 Hollow shaft Ø 10 mm

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 1-stage	L - 2-stage
BCI-63.25-E75	mm	186	222
BCI-63.55-E75	mm	216	252

Subject to alterations

Crown gearheads.

EtaCrown®Plus 42

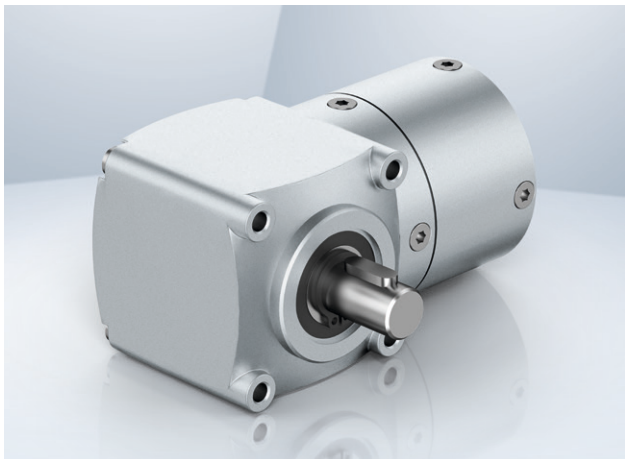


Image of 3-stage gearhead

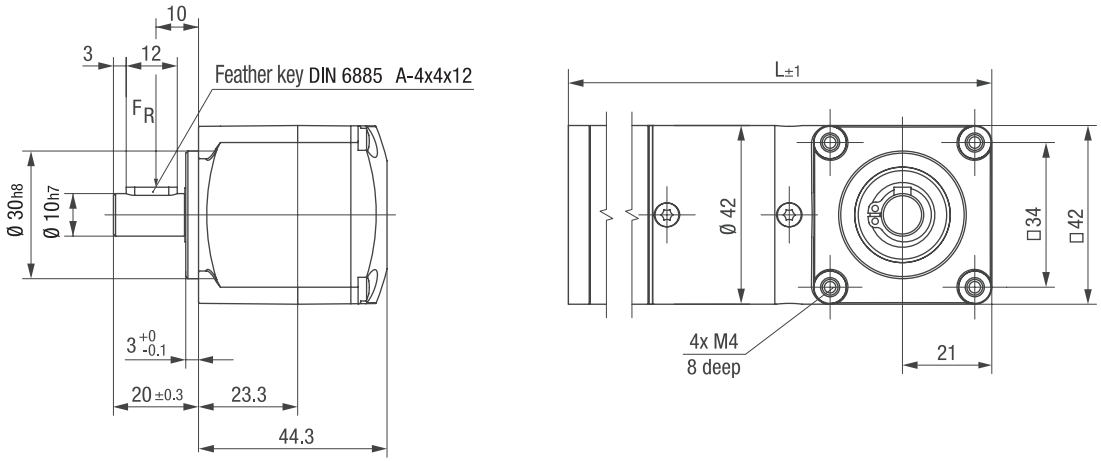
- Compact design due to combination of the crown wheel and planetary stage in one housing
- No automatic lock due to high efficiency of the crow wheel technology
- High torques by using 5 straight toothed planetary gears made of case-hardened sintered steel in the integrated planetary gear stage
- Wide reduction range thanks to possibility of an upstream planetary stage
- Improved running smoothness thanks to the optimized design of the crown wheel stage when using an upstream helical planetary gear stage made of plastic with optimized sliding properties

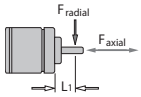
Nominal data

Gearheads		EtaCrown®Plus 42.3			
Reduction ratio		54.0	84.8	153	289
No. of stages		3			
Efficiency		0.73			
Max. input speed (n_1)	rpm	6 000			
Rated output torque (M_{ab})	Nm	10.0	10.0	6.70	8.40
Short-term torque (M_{max})	Nm	25.0	25.0	16.8	21.0
Gear play	°	0.70 ... 1.20			
Permissible operating temperature (T_U)	°C	-20 ... +80			
Operating mode		S1			
Protection class		IP 50			
Weight	kg	0.45			
Shaft load radial / axial	N	300 / 200			
Service life	h	5 000*			
Lubrication		Maintenance-free grease lubrication for life			
Installation position		any			
Subject to alterations	* The service life can be reduced when combined with a motor				
Preferred type: ready to ship in 48 hours	On request				

Technical drawing

Image of 3-stage gearhead / All dimensions in mm





F_{axial}	200 N	Permissible shaft load at nominal speed and life
F_{radial}	300 N	expectancy L_{10} (nominal operation) and operating factor
L1	10 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 3-stage
BCI-42.25-EP42	mm	150
BCI-42.40-EP42	mm	165

Subject to alterations

Crown gearheads.

EtaCrown®Plus 63

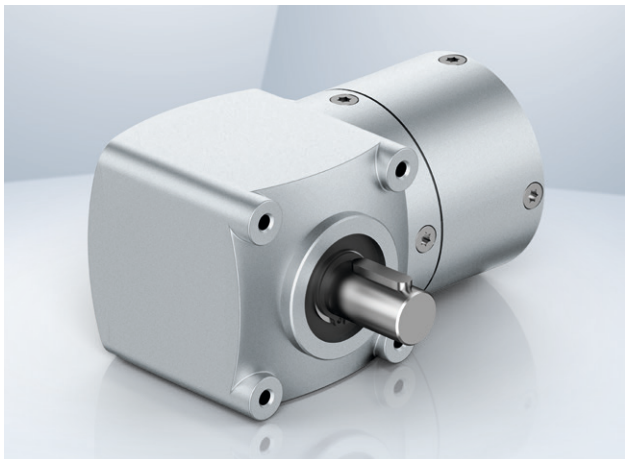


Image of 3-stage gearhead

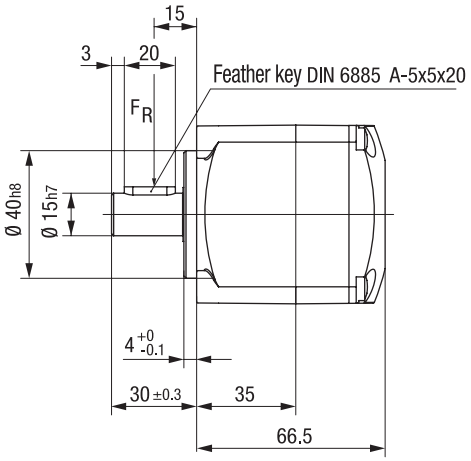
- Compact design due to combination of the crown wheel and planetary stage in one housing
- No automatic lock due to high efficiency of the crow wheel technology
- High torques by using 5 straight toothed planetary gears made of case-hardened sintered steel in the integrated planetary gear stage
- Wide reduction range thanks to possibility of an upstream planetary stage
- Improved running smoothness thanks to the optimized design of the crown wheel stage when using an upstream helical planetary gear stage made of plastic with optimized sliding properties

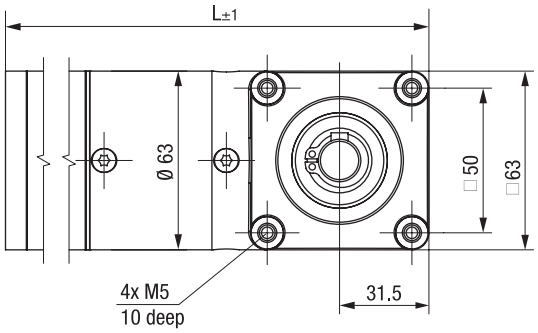
Nominal data

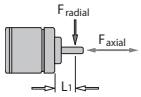
Gearheads		EtaCrown®Plus 63.3			
Reduction ratio		54.0	84.8	153	289
No. of stages		3			
Efficiency		0.73			
Max. input speed (n_1)	rpm	6 000			
Rated output torque (M_{ab})	Nm	40.0	40.0	30.1	29.1
Short-term torque (M_{max})	Nm	100	100	75.3	72.8
Gear play	°	0.70 ... 1.20			
Permissible operating temperature (T_U)	°C	-20 ... +80			
Operating mode		S1			
Protection class		IP 50			
Weight	kg	1.00			
Shaft load radial / axial	N	600 / 300			
Service life	h	5 000*			
Lubrication		Maintenance-free grease lubrication for life			
Installation position		any			
Subject to alterations	* The service life can be reduced when combined with a motor				
Preferred type: ready to ship in 48 hours	On request				

Technical drawing

Image of 3-stage gearhead / All dimensions in mm







F_{axial}	300 N
F_{radial}	600 N
L1	15 mm

Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) and operating factor C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L - 3-stage
BCI-63.25-EP63	mm	211
BCI-63.55-EP63	mm	241

Subject to alterations

Spur gearheads.

Compactline 90

- Minimum space requirement due to compact design
- High power density
- High torques from the smallest possible dimensions
- Very smooth operation thanks to optimized gear geometries and materials
- Maintenance-free over entire service life

Nominal data

Gearheads		Compactline 90.2			Compactline 90.3				Compactline 90.4		
Reduction ratio		18.8	26.8	30.6	37.5	67.8	92.7	142.5	222	296	432
No. of stages		2			3				4		
Efficiency		0.81			0.73				0.66		
Max. input speed (n_1)	rpm	4 000			4 000				4 000		
Rated output torque (M_{ab})	Nm	0.90	1.30	1.50	1.80	2.90	4.00	6.10	8.50	9.00	9.00
Short-term torque (M_{max})	Nm	2.25	3.25	3.75	4.50	7.25	10.0	15.3	21.3	22.5	22.5
Gear play	°	0.70 ... 1.60			0.70 ... 1.60				0.70 ... 1.60		
Permissible operating temperature (T_U)	°C	-20 ... +80			-20 ... +80				-20 ... +80		
Operating mode		S1			S1				S1		
Protection class**		IP 50			IP 50				IP 50		
Weight	kg	0.30			0.35				0.40		
Shaft load radial / axial	N	120 / 40			120 / 40				120 / 40		
Service life	h	5 000*			5 000*				5 000*		
Lubrication		Maintenance-free grease lubrication for life									
Installation position		any									

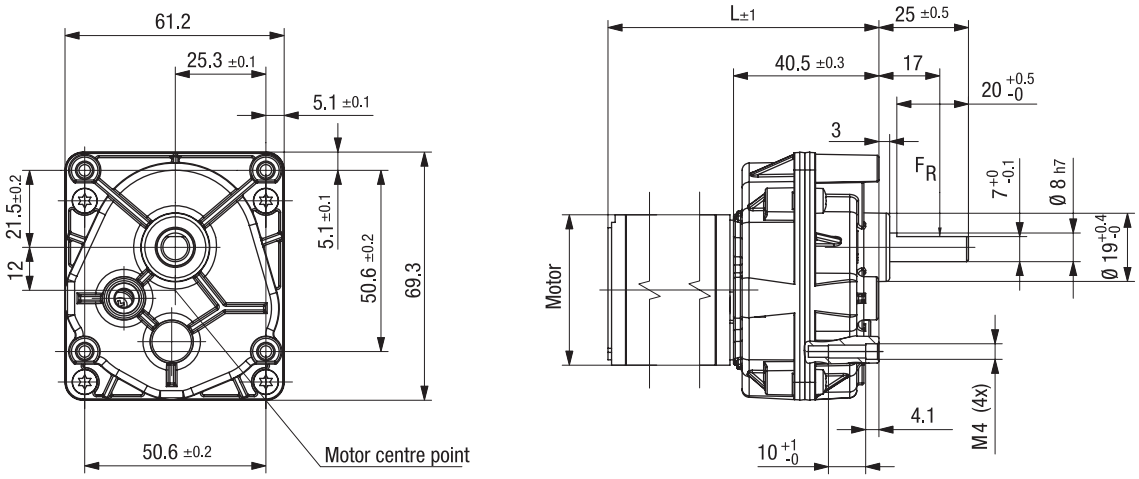
Subject to alterations

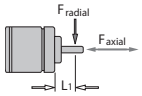
* The service life can be reduced when combined with a motor
** Classification of protection class refers to installed state with sealing on the flange side

On request

Technical drawing

All dimensions in mm





F_{axial}	40 N	Permissible shaft load at nominal speed and a
F_{radial}	120 N	life expectancy L_{10} (nominal operation) and operating factor
L1	17 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

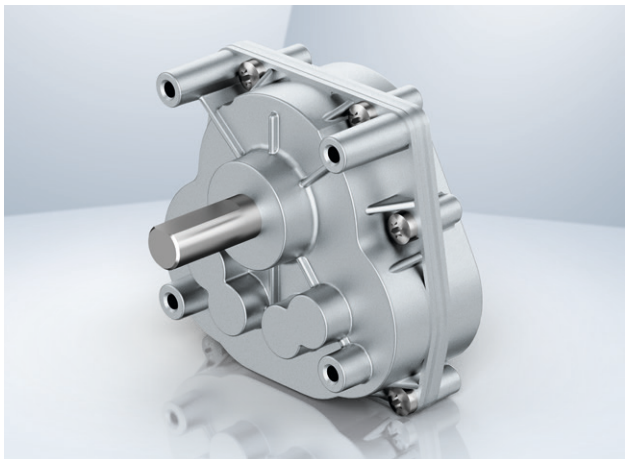
Length of the possible motor / gearhead combinations

Motor / gearhead		L
BCI-42.25-C90	mm	111
BCI-42.40-C90	mm	126

Subject to alterations

Spur gearheads.

Compactline 91



- Minimum space requirement due to compact design
- High power density
- High torques from the smallest possible dimensions
- Very smooth operation thanks to optimized gear geometries and materials
- Maintenance-free over entire service life

Nominal data

Gearheads		Compactline 91.2							Compactline 91.3			
Reduction ratio		7.8	9.2	11.1	13.8	18.4	22	27.6	41.3	67.3	117.1	165.8
No. of stages		2							3			
Efficiency		0.81							0.73			
Max. input speed (n_1)	rpm	4 000							4 000			
Rated output torque (M_{ab})	Nm	7.00	9.20	7.00	7.00	7.00	7.00	7.00	9.00	9.00	9.00	9.00
Short-term torque (M_{max})	Nm	17.5	23.0	17.5	17.5	17.5	17.5	17.5	22.5	22.5	22.5	22.5
Gear play	°	0.70 ... 1.20							0.70 ... 1.20			
Permissible operating temperature (T_U)	°C	-20 ... +80							-20 ... +80			
Operating mode		S1							S1			
Protection class**		IP 50							IP 50			
Weight	kg	0.30							0.30			
Shaft load radial / axial	N	150 / 50							150 / 50			
Service life	h	5 000*							5 000*			
Lubrication		Maintenance-free grease lubrication for life										
Installation position		any										

Subject to alterations

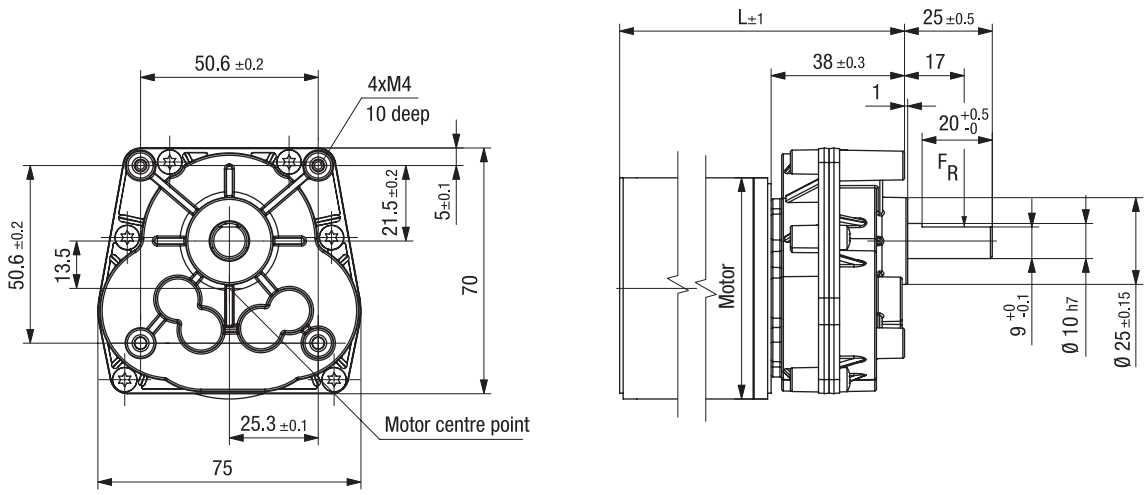
* The service life can be reduced when combined with a motor
** Classification of protection class refers to installed state with sealing on the flange side

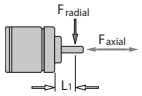
Preferred type: ready to ship in 48 hours | On request

ebmpapst

Technical drawing

All dimensions in mm





F_{axial}	50 N	Permissible shaft load at nominal speed and a
F_{radial}	150 N	life expectancy L_{10} (nominal operation) and operating factor
L1	17 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L
BCI-63.25-C91	mm	133
BCI-63.55-C91	mm	163

Subject to alterations

Spur gearheads.

Compactline 92

- Minimum space requirement due to compact design
- High power density
- High torques from the smallest possible dimensions
- Very smooth operation thanks to optimized gear geometries and materials
- Maintenance-free over entire service life

Nominal data

Gearheads		Compactline 92.2					Compactline 92.3					
Reduction ratio		15.5	18.4	23.1	31.1	40.1	55	70.4	92.3	142	184.4	274.6
No. of stages		2					3					
Efficiency		0.81					0.73					
Max. input speed (n_1)	rpm	4 000					4 000					
Rated output torque (M_{ab})	Nm	3.90	4.70	5.90	7.90	10.2	12.5	15.0	15.0	14.4	15.0	15.0
Short-term torque (M_{max})	Nm	9.75	11.8	14.8	19.8	25.5	31.3	37.5	37.5	36.0	37.5	37.5
Gear play	°	0.70 ... 1.20					0.70 ... 1.20					
Permissible operating temperature (T_U)	°C	-20 ... +80					-20 ... +80					
Operating mode		S1					S1					
Protection class**		IP 50					IP 50					
Weight	kg	0.40					0.50					
Shaft load radial / axial	N	150 / 50					150 / 50					
Service life	h	5 000*					5 000*					
Lubrication		Maintenance-free grease lubrication for life										
Installation position		any										

Subject to alterations

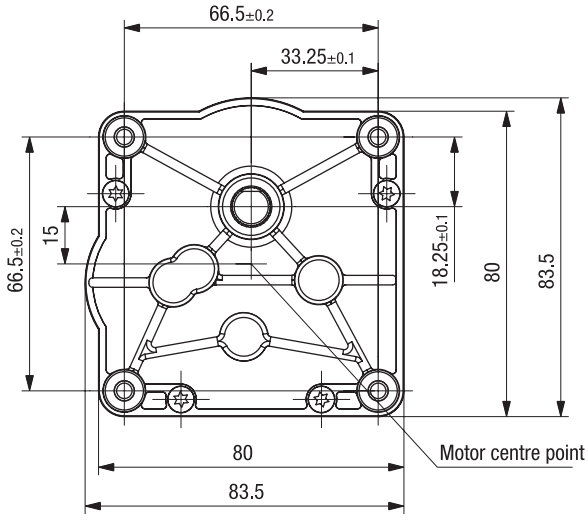
* The service life can be reduced when combined with a motor
** Classification of protection class refers to installed state with sealing on the flange side

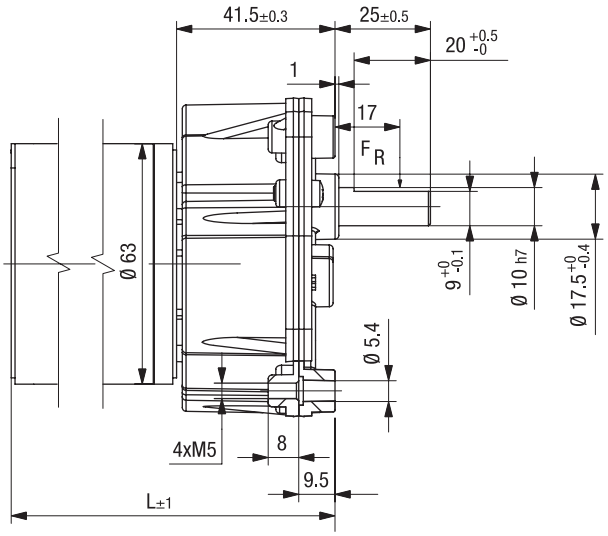
Preferred type: ready to ship in 48 hours | On request

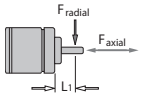
ebmpapst

Technical drawing

All dimensions in mm







F_{axial}	50 N	Permissible shaft load at nominal speed and a
F_{radial}	150 N	life expectancy L_{10} (nominal operation) and operating factor
L1	17 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L
BCI-63.25-C92	mm	137
BCI-63.55-C92	mm	167

Subject to alterations

Spur gearheads.

Flatline 78

- Optimized installation length due to flat gear design
- Large reduction range
- Flexible connection to customer applications due to different available output shafts
- Use of alternative toothing materials as standard
- Maintenance-free over entire service life

Nominal data

Gearheads		Flatline 78.3					Flatline 78. 4	
Reduction ratio		38.6	65.2	82.8	106.1	140.8	191.9	252.6
No. of stages		3					4	
Efficiency		0.73					0.66	
Max. input speed (n_1)	rpm	4 000					4 000	
Rated output torque (M_{ab})	Nm	1.10	1.50	2.30	2.60	3.20	4.70	6.10
Short-term torque (M_{max})	Nm	2.80	3.80	5.80	6.50	8.00	12.0	15.0
Gear play	°	0.8 ... 1.8					0.8 ... 1.8	
Permissible operating temperature (T_U)	°C	-20 ... +80					-20 ... +80	
Operating mode		S1					S1	
Protection class**		IP 50					IP 50	
Weight	kg	0.30					0.30	
Shaft load radial / axial	N	300 / 50					300 / 50	
Service life	h	5 000*					5 000*	
Lubrication		Maintenance-free grease lubrication for life						
Installation position		any						

Subject to alterations

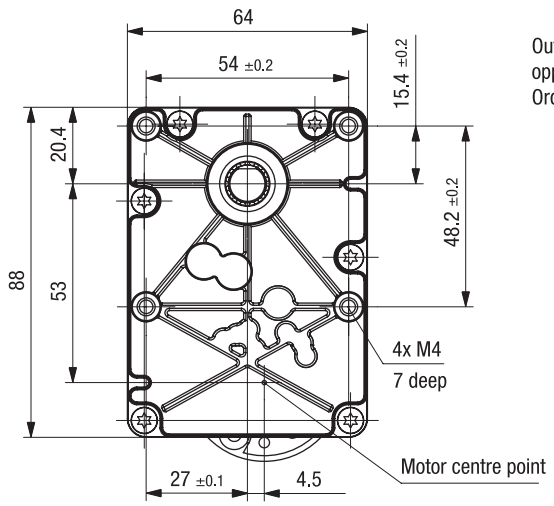
* The service life can be reduced when combined with a motor
** Classification of protection class refers to installed state with sealing on the flange side

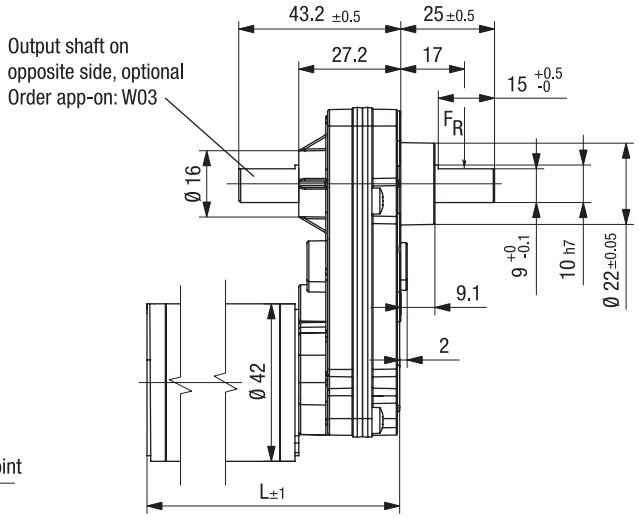
Preferred type: ready to ship in 48 hours | On request

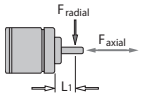
ebmpapst

Technical drawing

All dimensions in mm







F_{axial}	50 N	Permissible shaft load at nominal speed and a
F_{radial}	300 N	life expectancy L_{10} (nominal operation) and operating factor
L1	17 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

Length of the possible motor / gearhead combinations

Motor / gearhead		L
BCI-42.25-F78	mm	97

Subject to alterations

Spur gearheads.

Flatline 85

- Optimized installation length due to flat gear design
- Large reduction range
- Flexible connection to customer applications due to different available output shafts
- Use of alternative toothing materials as standard
- Maintenance-free over entire service life

Nominal data

Gearheads		Flatline 85.3									Flatline 85.4			
Reduction ratio		8.2	12.3	18	27.6	40.3	64	101.8	136.5	189	303.6	454	687	1028.7
No. of stages		3									4			
Efficiency		0.73									0.66			
Max. input speed (n_1)	rpm	4 000									4 000			
Rated output torque (M_{ab})	Nm	1.90	2.80	4.10	6.30	9.20	14.6	23.2	25.0	25.0	30.0	30.0	30.0	30.0
Short-term torque (M_{max})	Nm	4.80	7.00	10.3	15.8	23.0	37.0	58.0	63.0	63.0	75.0	75.0	75.0	75.0
Gear play	°	0.80 ... 1.60									0.80 ... 1.60			
Permissible operating temperature (T_U)	°C	-20 ... +80									-20 ... +80			
Operating mode		S1									S1			
Protection class**		IP 50									IP 50			
Weight	kg	0.50									0.50			
Shaft load radial / axial	N	150 / 50									150 / 50			
Service life	h	5 000*									5 000*			
Lubrication		Maintenance-free grease lubrication for life												
Installation position		any												

Subject to alterations

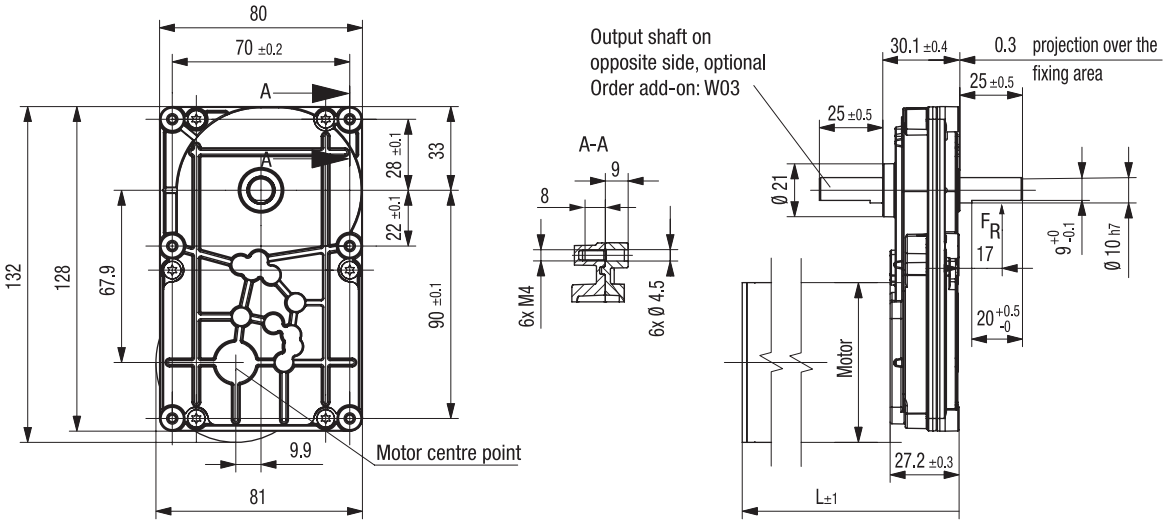
* The service life can be reduced when combined with a motor
** Classification of protection class refers to installed state with sealing on the flange side

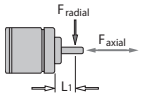
Preferred type: ready to ship in 48 hours | On request

ebmpapst

Technical drawing

All dimensions in mm





F_{axial}	50 N	Permissible shaft load at nominal speed and a
F_{radial}	150 N	life expectancy L_{10} (nominal operation) and operating factor
L1	17 mm	C_B = 1 (see page 56) of 5 000 h (at T_U 40°C).

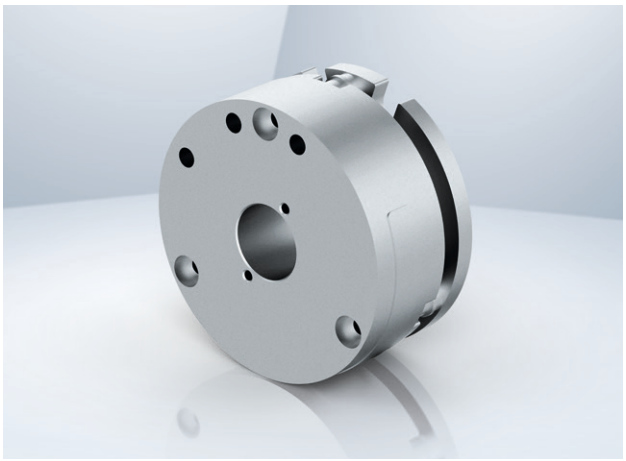
Length of the possible motor / gearhead combinations

Motor / gearhead		L
BCI-63.25-F85	mm	122
BCI-63.55-F85	mm	152

Subject to alterations

Accessories.

Brakes.



- Spring-applied braking
- Single-disk brakes with 2 friction contact surfaces
- Braking torque effective in powerless state
- Braking force is eliminated by electromagnetic force
- Holding brake with emergency stop function
- Currentless-operated brake with high power density
- Braking torque applied by spring force
- Reduced inertia for optimum dynamics

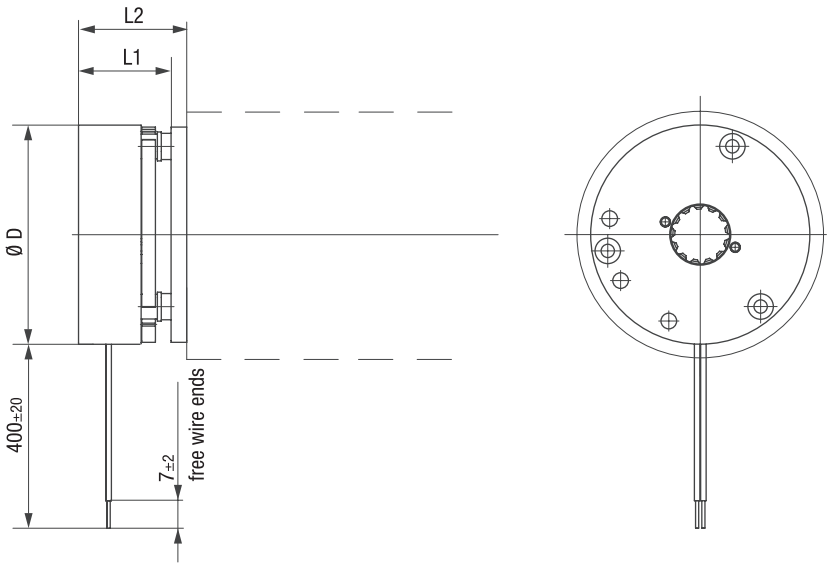
Brake system

		BFK 457-01	BFK 457-02	BFK 457-03
Nominal voltage	V DC	24	24	24
Nominal power	W	5.00	6.60	9.00
Braking torque	Nm	0.12	0.25	0.50
Engagement time	ms	11.0	8.00	12.5
Disengagement time	ms	17	17	18

Subject to alterations

Technical drawing

All dimensions in mm



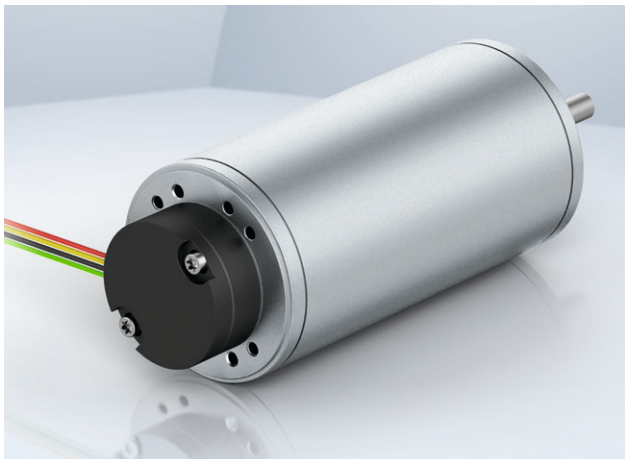
Brake type	Ø D	L1	L2
BFK 457-01 (BCI42.xx)	37	31.3	35.3
BFK 457-02 (BCI52.xx)	47	31.0	43.0
BFK 457-03 (BCI63.xx)	56	31.8	43.5

Electrical connection

Connection cable

Color	Function
red	Power supply
black	GND

Magnetic encoder system.

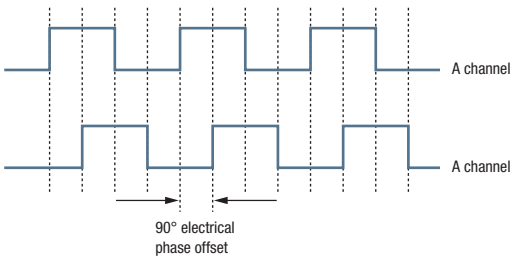


Encoder system PMG

- Magnetic pulse encoder for direct current motors
- The encoder is designed for speed recording, control and positioning in conjunction with suitable electronics
- The encoder is contactor-less and wear-free via 2 Hall sensors. The sensors are positioned around a magnet and generate two rectangular-pulse signals offset by 90°
- The encoder unit is screwed onto the motor. The electrical connection is via litz wires
- Electrical protection IP 40
- Temperature range -20°C to +80°C
- Additional resolutions and interfaces possible

Encoder systems			
		PMG 2-2	PMG 2-12
Pulses per revolution	Z	2	12
Nominal voltage	V DC	24	24
Output signal	A, B	2 rectangular pulses 90° ± 15°, when G03 ± 40° electr. phase offset	
Pulse ratio		Pulse : Pause = 180° : 180° ± 10°	
Edge steepness, rise		≤ 400 ns (U = 12 V DC, RL = 820 Ω)	
Edge steepness, fall		≤ 400 ns (U = 12 V DC, CL = 20 pF)	
Output load current	I_{load}	≤ 12 mA (U = 12 V DC)	
Electronics configuration		Open collector output stage with internal pull-up resistors Supply voltage: U_B = 4.5 to 24 V DC (protected against polarity reversal) Output amplitude: U_{low} < 0.4 V (at 12 V DC +20 mA)	
Weight	kg	0.03	
Subject to alterations			

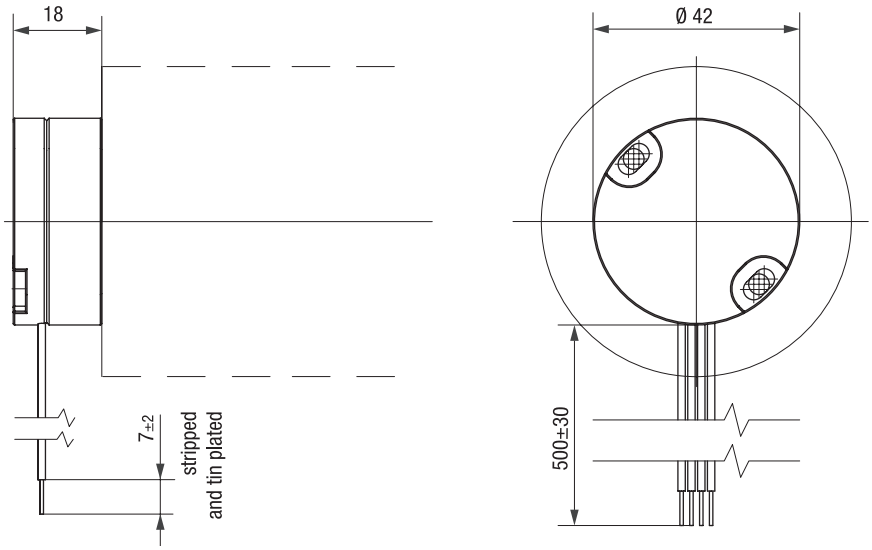
Signal path PMG



ebmpapst

Technical drawing

All dimensions in mm



Electrical connection

Connection cable AWG24

Color	Function
red	U_B 5V ... 24V
yellow	A-channel
black	GND
green	B-channel

Optical encoder system.

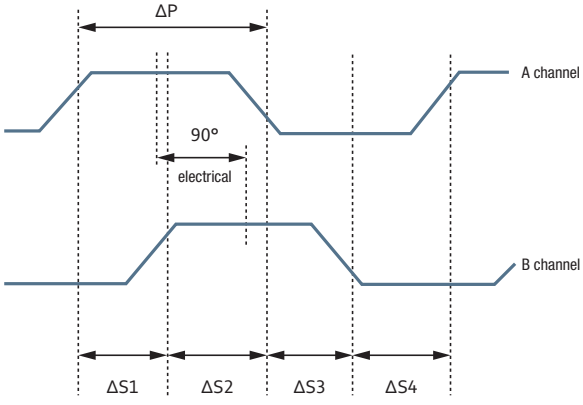
- Important! Do not use in applications in which failure of the encoder interferes with the safety relevant functions. If in doubt, consult the manufacturer
- Opto-electronic 2-channel incremental encoder. A corresponding evaluation in an external controller will achieve a resolution of max. 2048 increments per revolution
- The encoder is contactor-less and wear-free. The rotary angle resolution is achieved by means of an LED, a metallic encoder disk and a photo-diode array
- Electrical protection IP 40
- Temperature range -40°C to +100°C
- Additional resolutions and interfaces possible

Encoder systems

		HEDS 5500
No. of pulses Z		512 per revolution (channel A and B)
Output signal A, B		2 rectangular signals (90° phase offset; TTL-compatible)
Reaction frequency [f]		100 kHz
Supply voltage [U_B]	V	+ 5 ± 10%
Power consumption [I_B]	mA	type 17 max. 40
Deviation, pulse width [Δ_S]		type 5° (from electrical 90°)
Deviation, phase shift [Δ_P]		type 7° (between channel A and B from electrical 90°)
Index pulse width		–
Electrical connection		AMP: 103686-4 or 600442-5
Connector type		Berg: 65039-032 with 4825X-000 terminals or 65801-034 Molex: 2695 with 2759 terminals
Weight	kg	0.02

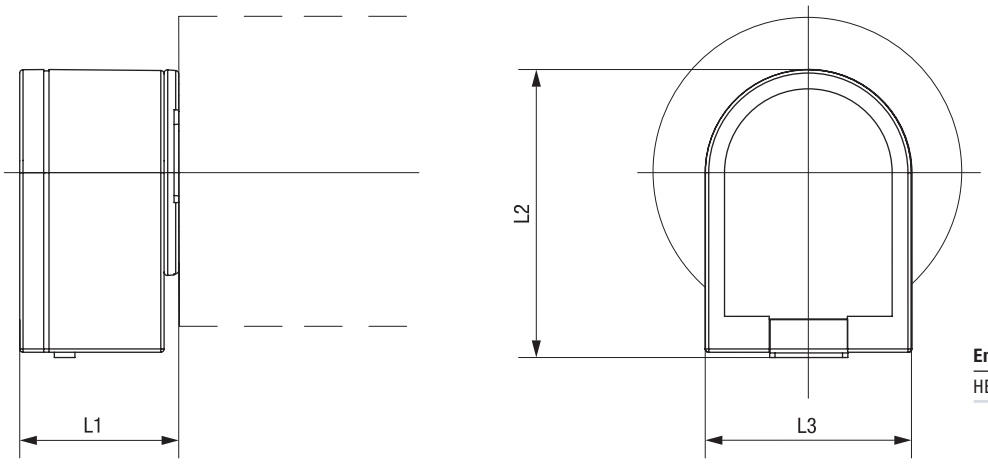
Subject to alterations

Signal processing HEDS 5500



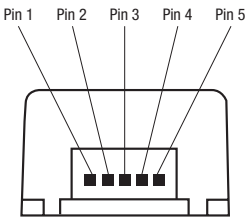
Technical drawing

All dimensions in mm



Encoder	L1	L2	L3
HEDS	18.3	41.1	30

Electrical connection



Signal wire	
Pin	**Function**
1	Ground
2	Approved
3	A
4	UB
5	B

Standards and Guidelines.

Basic information on standards and guidelines for electrical small-power motors and drive systems operated with a DC voltage of max. 75 V DC (nominal voltage):

The BCI series described in this catalog are direct current motors in a mechanically commutated design (brush-collector system), which are designed and specified for a nominal voltage of max. 75 V DC. Thus the supply voltage of these drives is within the range of safety extra-low voltage (SELV). On this basis, ebm-papst would like to provide some information intended to help you understand the classification of the motors from the relevant EC Directives and the resulting consequences.

The CE label

In order to ensure a uniform safety level in the European internal market, the European commission has implemented a new approach for technical harmonization. This has been welcomed by all relevant parties and is visible in many products as a CE label giving proof of agreement with the harmonized provisions.

CE What does CE actually mean? Why don't all products bear the CE label?

CE is the abbreviation for "Communauté Européenne". The harmonized statutory provisions are a framework directive and belong to the so-called New Approach. This framework directive defines the basic requirements, putting in circulation and operation as well as the applicable conformity assessment process. The manufacturer of a product must now decide which framework directive applies to which product. For electrical small-powered motors the following framework directive can be applied:

1) Machinery Directive 2006/42/EC
2) Low Voltage Directive 2014/35/EU
3) EMC Directive 2014/30/EU

Based on these directives, ebm-papst St. Georgen GmbH & Co. KG does not mark the electric motors and drive systems described with the "CE" mark and does not issue an EC Declaration of Conformity. The reason for this is consideration of the relevant EC Directives and the definitions of the terms used, "Electric motor" and "Drive system", by ebm-papst St. Georgen GmbH & Co. KG.

Definition of the electric motor

An electric motor is a motor without electronics or a motor with integrated electronics of low complexity, such as brush-collector systems, commutation sensors, simple commutation electronics or commutation electronics with simple speed control with a voltage range of <75 V DC (nominal voltage) for use by customers who incorporate them into end devices. According to this definition, electric motors include, for example, the BCI-XX.XX series.

Definition of drive systems

Drive systems are motors with built-in electronic control systems that have a certain degree of complexity. These include electronic control systems which, in addition to a speed control, offer other functions such as current control or position control. This also includes electronic control systems which, for example, have a CANopen interface or that can be operated via programmable sequential controls. For these drive systems, the voltage range of <75 V DC (nominal voltage) and the intended use by customers who will use the systems in end devices also apply.

Reasons according to the Machinery Directive 2006/42/EC

Electric motors are expressly exempt in Art. 1, Par. (2), lit. k) and thus are NOT given the CE mark. Installation instructions to Annex IV and a Declaration of Incorporation to Annex II, Part 1, Section B are available for each drive system. The specific technical documents to Art. 13, Par. (1), lit. a) have been created in-house and are archived for the government agencies of the individual countries. Based on this directive, the machine manufacturer is responsible for verifying and ensuring compliance with the basic requirements of the Machinery Directive.

Reasons according to the Low Voltage Directive 2014/35/EU

Due to the voltage ranges (nominal voltage), the specified electric motors and drive systems do not fall under the application area of the low voltage directive according to Art. 1.

Reasons according to the EMC Directive 2014/30/EU

Because they are sold exclusively to customers who incorporate them into end devices and not to the end user, the specified electric motors do not fall under the application area of the EMC directive according to the definition of the term in Art. 3, Par. (2), 1: As the small motors are

supplied to companies who incorporate them into end devices and not to the end user, ebm-papst has no control over further use of the pre-fabricated components in devices, machines or installations. Therefore, ebm-papst provides express notice that the system manufacturer must provide a suitable EMC circuit when selecting the power supply and must provide for EMC-compliant installation and use in the devices. For more information about EMC-compliant installation and EMC safety measures, refer to resources such as the IEC 61000-5-x series (Installation and Mitigation Guidelines).

Proper use

All motors in this catalog are determined for installation in permanently connected, stationary end devices and machines in the industrial area and must be operated on electricity only when in installed condition! Operation is prohibited until it has been ascertained that this product, along with the machine into which this product is to be installed, complies with the protective requirements of the Machinery Directive. If, when using our motors, market or application-specific product standards apply, compliance with these must be verified and ensured by the device manufacturer. This product is not intended for the end consumer.

RoHS

European Directive EC No. 2011/65/EU (RoHS)
Legally regulated substances

As an innovative company and trendsetter in the world of air technology and drive engineering, ebm-papst feels a special obligation towards the environment. Accordingly, under the GreenTech logo, we have implemented a comprehensive concept that extends from the origin to the use of our products. This includes, of course, protecting our environment and using natural resources in a way that conserves them. This applies equally to our manufacturing processes and to our products.

When developing our products, we already take into consideration any possible negative consequences they may have for the environment. Our goal is to prevent such environmental impact-even beyond the extent mandated by law-or to reduce it to a minimum, and thus to ensure sustainable development of our products. Thus we ensure that our products are free of materials and substances that are prohibited by law.

Of course, all current products have been designed for conformity with European Directive 2011/65/EU (RoHS). All older products that do not yet conform to these directives or parts thereof will be consistently redesigned. Our suppliers are required to provide us only with goods that conform to the directives. Thus we can confirm that basically, all of our products listed in this catalog conform to the above-mentioned directive. We are also available to help with any other questions you may have on both these topics.

REACH Directive (EC No. 1907/2006)

The EU legal regulation for Registration, Evaluation, Authorization and Restriction of Chemical substances (REACH) entered into force on 1 June 2007. This is a chemicals law intended to provide maximum protection to health and the environment. As defined by the REACH directive, ebm-papst is a downstream user. The units you purchase from us are products as defined by REACH and thus do not require registration. However, in our own interest and to ensure a high degree of product safety, we track the implementation of REACH and the resulting requirements as part of our duty to provide information.
To comply with the requirements of REACH, we are in contact with all suppliers from whom we obtain chemicals (substances), preparations and components that we use as part of our production process.
Within this framework, ebm-papst fulfills the obligations set forth in the REACH regulation.
If you have any other questions about the implementation of the REACH directive in our company, please do not hesitate to contact us.

Operating factor, lifetime, efficiency.

Operating factor c_B

To achieve a uniform lifetime for the gearheads and motors, the necessary torques M must be increased by the respective operating factor c_B under the various operating loads so as not to exceed the maximum permissible gearhead torque $M_{2\,max}$ (see table below).

Operating modes									
	Load			Operating period in h/day					
				3 h	8 h	24 h	3 h	8 h	24 h
	even	gradual	sudden	up to 10 switching ops./h			over 10 switching ops./h		
One rotation direction	•			1.00	1.00	1.20	1.00	1.20	1.52
Rotation direction change	•			1.00	1.30	1.59	1.20	1.59	1.92
One rotation direction		•		1.11	1.30	1.59	1.30	1.52	1.82
Rotation direction change		•		1.41	1.72	2.00	1.59	1.89	2.33
One rotation direction			•	1.20	1.52	1.82	1.52	1.82	2.22
Rotation direction change			•	1.59	2.00	2.33	2.00	2.33	2.86

Operating mode

It is necessary to define the operating mode under which a gear motor can be operated with certain nominal values in order to avoid overloading the motor and/or the gearhead. The values stated in this catalog refer to S1 operation (continuous operation). This means that the gear motor can be constantly operated with the stated values, but can also have a higher load placed on it for a short time. Please contact us if you require more information about this.

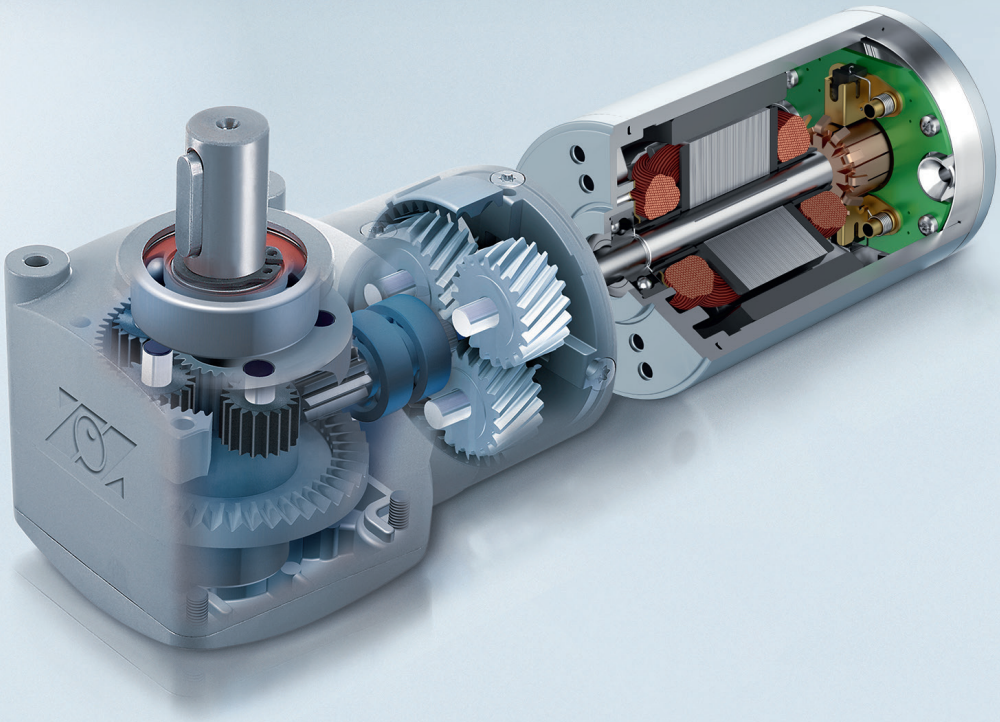
Lifetime

Lifetime is limited by the various components in the drive. If frequently overloaded, the gearhead components are subjected to more wear than under nominal load. Extreme ambient and operating conditions cause a reduction in the lifetime guaranteed for operation under operating ratio $c_B = 1$.

Efficiency η (eta)

The efficiency per gear stage is at least 90%. Depending on the tooth configuration and on the manufacturing quality, far better levels of efficiency can also be achieved. The following overall efficiencies were obtained for multi-stage gearheads:

Overall efficiency	
for 1-stage gearhead	$\eta = 0.9$
for 2-stage gearhead	$\eta = 0.9^2 = 0.81$
for 3-stage gearhead	$\eta = 0.9^3 = 0.73$
for 4-stage gearhead	$\eta = 0.9^4 = 0.66$
for 5-stage gearhead	$\eta = 0.9^5 = 0.59$



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Always find the right contact person!

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