

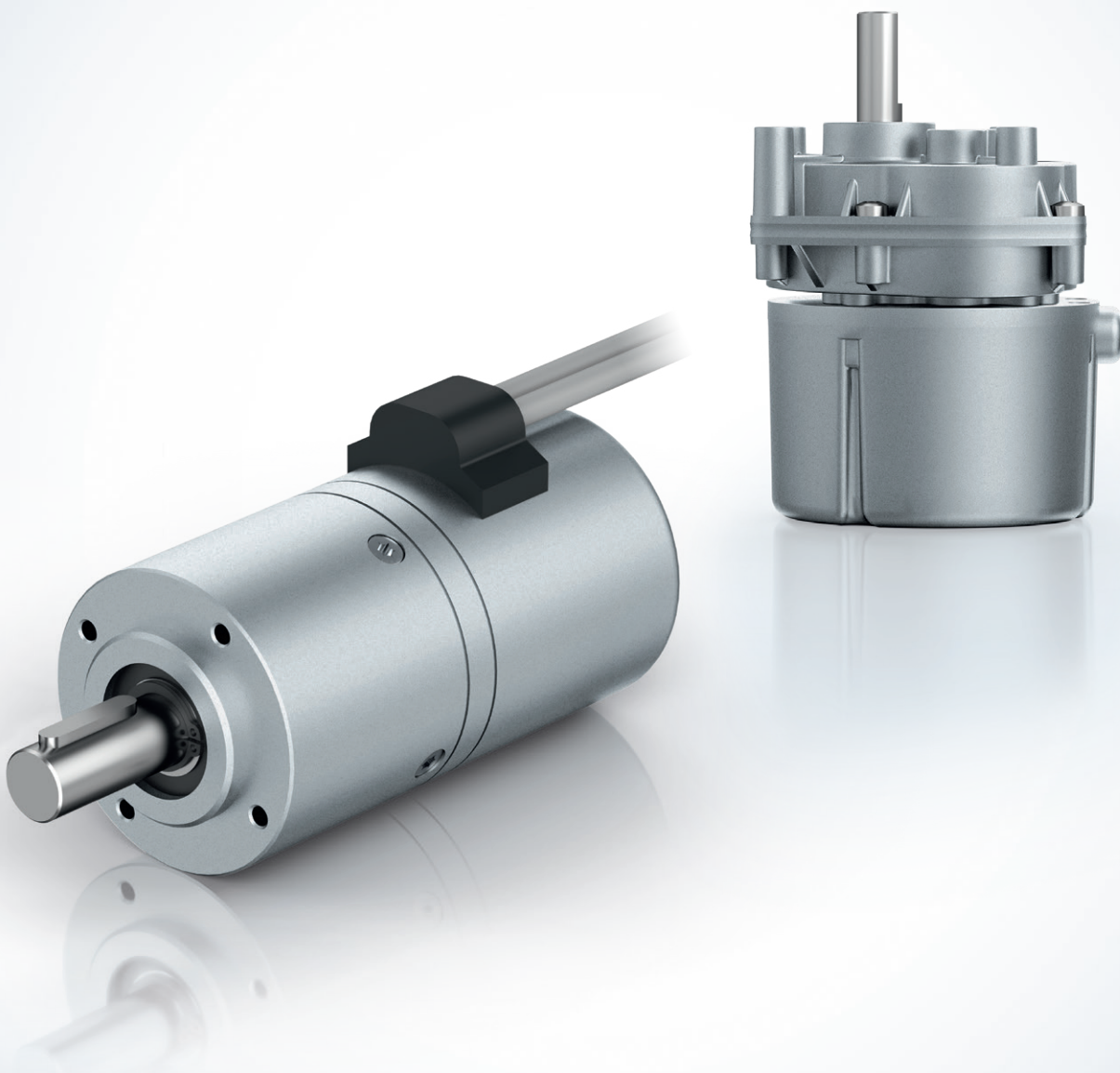
# Brushless external rotor servomotors *VD/VDC series*

Drive solutions | Industrial drive engineering

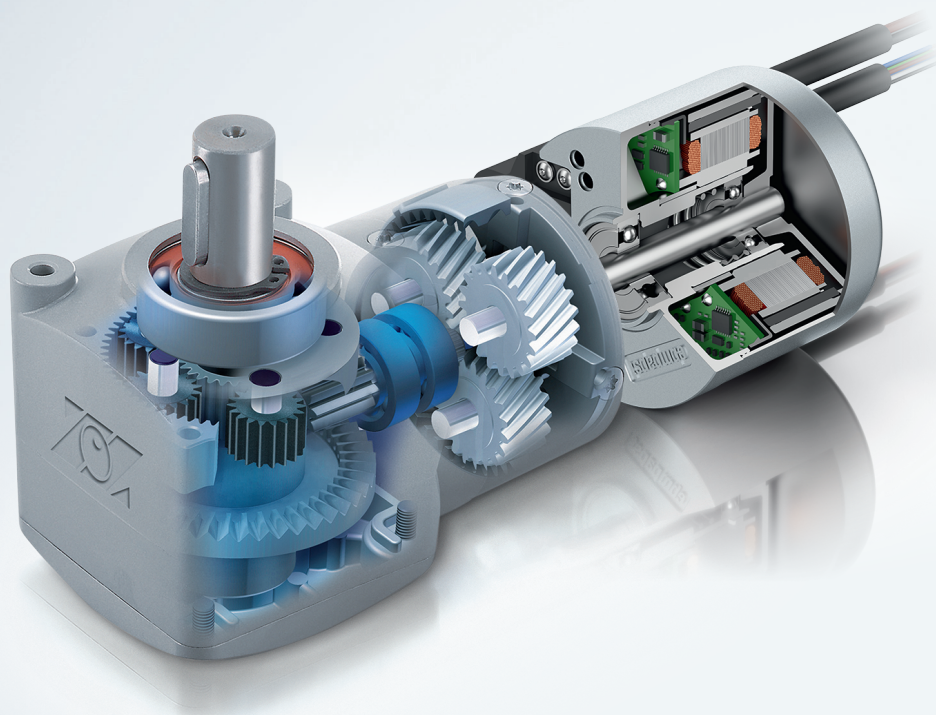
Product Catalogue 2020-10

**ebm****papst**

engineering a better life







Modular drive systems.  
Motors with integrated logic and power  
electronics – optional gearhead.



# Contents

## Brushless external rotor servomotors VD/VDC series

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Information

VD/VDC Servomotors

Control electronics

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# About ebm-papst.

ebm-papst is a leader in ventilation and drive engineering technology and a much sought-after engineering partner in many industries. With around 20,000 different products, we have the perfect solution for practically every requirement. We believe the consistent further development of our highly-efficient GreenTech EC technology provides our customers with the best opportunities for the future in industrial digitization. With GreenIntelligence, ebm-papst already offers intelligent networked complete solutions that are unique anywhere in the world today.

## Six reasons that make us the ideal partner:

**Our systems expertise:** as experts in advanced motor technology, electronics and aerodynamics, we provide system solutions from a single source.

**Our spirit of invention:** our 600 engineers and technicians will develop a solution that precisely fits your needs.

**Our lead in technology:** with our EC technology and GreenIntelligence, we combine the highest energy efficiency with the advantages of IoT and digital networking.

**Closeness to our customers:** at 49 sales offices worldwide.

**Our standard of quality:** our quality management is uncompromising, at every step in every process.

**Our sustainable approach:** we assume responsibility with our energy-saving products, environmentally-friendly processes, and social commitment.

## GreenIntelligence. *Making Engineers Happy.*



Why do our customers look so happy? Because when it comes to the Internet of Things and the digital transformation, we provide them with a clear competitive edge with GreenIntelligence for intelligent control and interconnection of fans, drives and systems to make applications more powerful, processes more efficient, businesses more successful and their customers more satisfied.

For the wide range of automation tasks needed in **industrial drive technology**, what you need most is an experienced partner who understands your needs. The drive experts at ebm-papst have detailed applications expertise and, thanks to GreenIntelligence, can offer drive solutions with intelligent networking capabilities that cater for all requirements perfectly.

### Here is how much GreenIntelligence there is in VD/VDC Servomotors:

- integrated logic & power electronics
- Speed/torque-controlled operation
- Position-controlled operation
- I/O-controlled slave in networks



Anna exploits the possibilities of the Industrial Internet of Things throughout her logistics and production processes.



# The story of our success as market and technology leader.

<b>1963</b>	Establishment of <b>Elektrobau Mulfingen GmbH &amp; Co. KG</b> by Gerhard Sturm and Heinz Ziehl.	
	Development of the first tubeaxial fan featuring <b>EC-/DC technology</b> .	<b>1965</b>
	The new <b>68 motor</b> gives momentum to the ebm-papst success story.	<b>1966</b>
	Production of the first <b>electronically commutated</b> DC external rotor motor.	<b>1972</b>
	Introduction of the first <b>gas blower with EC technology</b> .	<b>1991</b>
<b>1992</b>	Takeover of <b>PAPST Motoren GmbH</b> in St. Georgen.	
<b>1997</b>	The <b>Alcatel SEL AG motor and fan plant</b> in Landshut becomes part of the Group.	
	Development of the first fans with <b>integrated electronics</b> .	<b>1998</b>
<b>2003</b>	Re-naming of the three brands ebm, PAPST and mvl to become ebm-papst.	
	Introduction of <b>crown gear technology</b> with EtaCrown transmission.	<b>2007</b>
	Development of business into <b>system supplier</b> for gas heating and condensing technology.	<b>2008</b>
	Introduction of <b>GreenTech</b> , the symbol of energy efficiency and resource conservation.	<b>2010</b>
	Introduction of a new <b>generation of controllers (K4)</b> for BLDC motors.	<b>2012</b>
<b>2013</b>	<b>50 years of ebm-papst.</b> ebm-papst takes over the transmission specialist <b>Zeitlauf</b> .	
	Presentation of the <b>ECI-80 BLDC servomotor</b> .	<b>2014</b>
	Introduction of the overload-capable <b>Optimax 63</b> planetary gear.	<b>2015</b>
	Introduction of intelligent compact drives with <b>ECI-K5 bus interface</b> .	<b>2017</b>
<b>2018</b>	Record sales of more than <b>2.0 billion euros</b> for the global Group.	
	<b>ECI-42</b> - a modular system for individual drive solutions.	<b>2019</b>



# Overview of VD/VDC servomotors

## Key figures

- 3-phase, electronically commutated external rotor servomotor
- Output range between 5 and 125 watts
- High power density realized in a compact design
- Very quiet operation across the entire speed range
- High overload capacity
- Very high power density
- Rigid speed / torque curve
- Extremely wide speed control range
- Robust housing and bearings
- Protection class IP 54 as per EN 60 034-5: up to IP 65
- Various motor types which can be combined with planetary, crown and spur gearheads

## 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
- Additional approvals on request



## RoHS

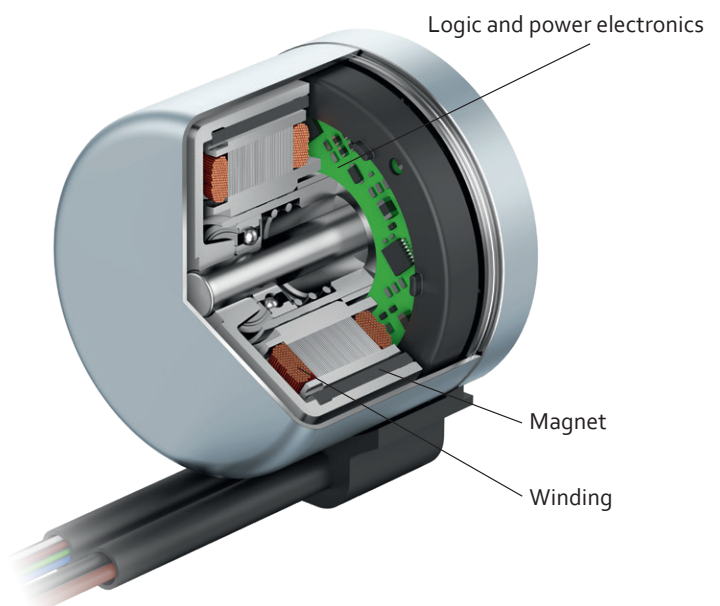
### European Directive EC No. 2011/65/EU (RoHS)

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. Thus we can confirm that basically, all of our products listed in this catalog conform to the above-mentioned directive.

## REACH Directive (EC Nr. 1907/2006)

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. Also to possible questions to these two topics, we are always at your disposal.





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 output power $P_N$ [W]

The output power which the motor can produce continuously; it is calculated from nominal torque and nominal speed. For the electro-magnetic design of the motor the determination of the nominal operating point is based on the fact that the nominal output power is close the maximum output power of the motor.

#### Nominal voltage $U_{BN}$ , $U_N$ , $U_B$ [V DC]

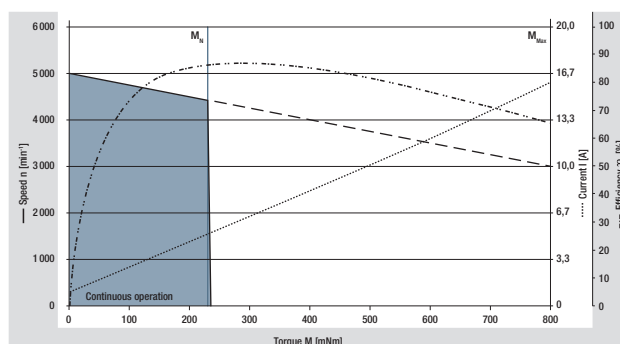
The DC voltage (i.e. DC voltage range) that is applied to the commutation electronics as a system supply voltage. All nominal values listed in the technical tables of the individual motors refer to this voltage. Motor applications are, however, not restricted to this voltage.

#### Nominal speed $n_N$ [rpm]

The speed at which the motor may be operated continuously while delivering nominal torque at an ambient temperature of 40°C and nominal output torque. It is an operating point on the max. motor curve based on an ideal electronics with negligible losses.

#### Nominal torque $M_N$ [mNm]

The torque that the motor can deliver continuously at an ambient temperature of 40°C and nominal speed.



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

#### Nominal current $I_{BN}$

The current that is drawn from the system supply when the motor delivers nominal torque at nominal speed.

#### Speed at no-load operation $n_L$ [rpm]

The speed that takes effect at the nominal voltage and with unloaded motor. The theoretical possible speed at no-load operation can, in some cases, be limited by the mechanical ceiling speed.

#### No-load current $I_{BL}$ [A]

Is established with nominal voltage and unloaded motor; is largely influenced by the bearing friction. For drive systems that have a separate supply for power and logic, the no-load current is called  $I_L$ . This no-load current is the sum of the power supply ( $I_{ZK}$ ) and the low-power logic supply ( $I_B$ ).



# Definitions for VD/VDC servomotors

## **Permanent stall torque $M_{Bn0}$ [mNm]**

Is the maximum permissible torque with which the motor may be permanently loaded when the rotor is locked.

## **Permissible eff. continuous stall current $I_{nOeff}$ [A]**

Is the maximum permissible current which at a stalled motor is allowed to flow into the motor lead as an effective value.

## **Continuous stall power $P_{Bn0}$ [W]**

Is an approximate value for the voltage-independent maximum permitted output ( $P=U \times I$ ) that can be taken from the DC voltage source in holding status.

## **Permissible peak torque short-term $M_{max}$ [mNm]**

Is the torque which the motor can usually deliver for a short time. ( $M_A$ )

## **Permissible peak current, motor lead $I_{max}$ [A]**

Is the current that must flow in to the motor lead as a peak value to achieve the short-time peak torque.

## **Induced voltage $U_{imax}$ [V/1 000 rpm]**

Maximum value of the induced voltage between two motor leads at 1 000 rpm. It is a dimension for the electromagnetic utilization of the motor.

## **Connection resistance $R_v$ [Ohm]**

The winding resistance that is measured at 20°C between any two of three winding terminations.

## **Connection inductance $L_v$ [mH]**

The average inductance that is measured at 20°C between any two of three winding terminations using a sinusoidal wave measuring frequency of 1 kHz.

## **Rotor moment of inertia $J_R$ [kgm<sup>2</sup>×10<sup>-6</sup>]**

The mass moment of inertia of the rotor and necessary dimension for the dynamic characteristics of the motor.

## **Protection class**

Information on the protection class; 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. The permissible winding temperature in the motor (115°C for insulation Class E, as per EN 60 034-1) </1125 should not be exceeded.

## **Weight $m$ [kg]**

Weight of the delivered unit without additional units or packaging.

## **Max. shaft load $F_{radial}/F_{axial}$ [N]**

The permissible forces are divided into radial and axial load values. They are based on the maximum permissible values for the motor bearing during operation at normal rating and a defined service life expectancy  $L_{10}$ .

## **Service life $L_{10}$**

The values for the  $L_{10}$  service life specified in conjunction with the permitted bearing loads have been calculated to DIN ISO 281. In addition to the specified values, this calculation is based on operation of the motor at nominal conditions (nominal torque, nominal speed) and an ambient temperature of max. 40°C. Therefore, the service life information is explicitly not a guarantee of service life, but strictly a theoretical quality figure.

## **Max. reverse voltage [V DC]**

When the braking function is activated and when the set value step change is negative, the motor operates in controlled braking mode. In this operating state, the large part of the braking energy is fed back to the intermediate circuit until the max. reverse voltage is reached and the electronics prevent a further increase beyond this value by chopped braking. This behavior should be given special consideration when selecting the system supply.



**Set value input**

Speed setting via an analogue interface for DC voltage. Depending on the drive design, the set speed can be configured in a range from 0 ...  $n_{\max f}$  where the minimum possible speed value (with limited control quality) is about 0 rpm (sine commutation) or approx. 50 to 100 rpm (block commutation). (Relevant only for drives with integrated operating electronics).

**Recommended speed range [rpm]**

Speed control range within which the speed control accuracy stipulated in the system specification is complied with.

**Starting torque [mNm]**

Is the torque that can be delivered over a short time when the motor is started based on the electromagnetic motor characteristics and the set current limitation.

**Effective torque  $M_{\text{eff}}$  [mNm]**

For cycle operation (e.g. "S5" operating mode – intermittent duty with the effect of the startup losses and the losses due to electrical braking on the heating), the effective torque corresponding to continuous operation ("S1" operating mode) is determined according to the following formula:

$$M_{\text{eff}} = \sqrt{\frac{M_A^2 \cdot t_A + M_L^2 \cdot t_B + M_{Br}^2 \cdot t_{Br}}{t_A + t_B + t_{Br} + t_{St}}}$$

$M_A$	Starting torque	$M_{Br}$	Braking
$t_A$	Acceleration time	$t_{Br}$	Braking time
$M_L$	Load torque	$t_{St}$	Standstill time
$t_B$	Load period		

At an ambient temperature of 40°C this effective torque must not be greater than the nominal torque  $M_N$  listed in the catalog for the selected motor. For intermittent operation (operating mode S3 with  $t_r$  = relative on period) the following permissible load moment applies:

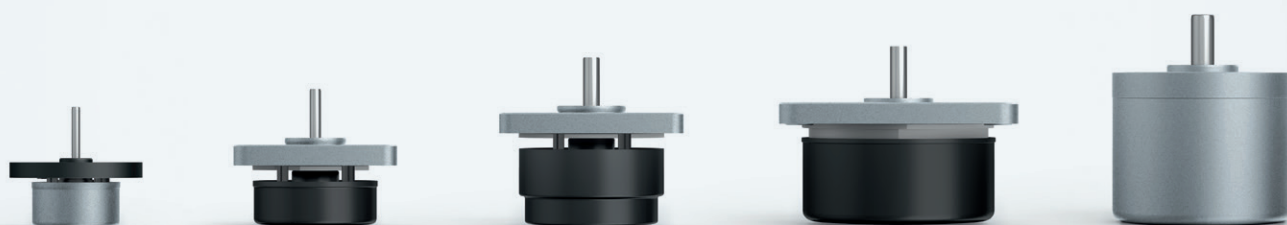
$$M_L = M_N \cdot \sqrt{\frac{100}{t_r}}$$

**System selection**

When selecting a motor and operating for a drive system, consideration should be given to the fact that the values permitted for the motor should not be exceeded by the electronics. Likewise, the relationship shown in the commutation sequences between the sequence of Hall signals and the corresponding switching times and switching states of the output stage at the phase supply lines must be observed in order to attain optimum operation of the motor.

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







# VD/VDC Servomotors

## Overview modular system

Brushless external rotor servomotors VD/VDC		VD-25.07 (p. 14)	VD-35.06 (p. 16)	VD-43.10 (p. 18)	VD-54.14 (p. 20)	VD-49.15 (p. 22)	VDC-43.10 (p. 24)	VDC-54.14 (p. 26)	VDC-49.15 (p. 28)	VDC-49.15 (p. 30)	VDC-49.15 (p. 30)
U <sub>N</sub>	VDC	24	24	24	24	24	24	24	24	24	48
M <sub>N</sub>	mNm	8	20	54	150	235	45	130	150	235	300
P	W	5	8	21	57	110	19	47,6	63	100	125
n <sub>N</sub>	rpm	6 000	3 700	3 700	3 700	4 500	4 000	3 500	4 000	4 000	4 000
l	mm	23,6	29,3	40,8	43,3	52	40	42	52	52	52
d	mm	32	44	52,8	68,4	63	52,8	68,3	63	63	63
Control electronics (integrated)											
K1 (Hall sensor system)		•	•	•	•	•					
K3 (speed)							•	•	•		
K4 (position)										○	○
Control electronics (external)											
VTD-XX.XX-K3 (speed) (p. 34)		•	•	•	•	•					
VTD-XX.XX-K4S (position) (p.36)					•	•					
VTD-60.13-K5SB (CANopen) (p. 38)				•	•	•					
Gearheads											
NoiselessPlus 63 (planetary gearhead) (p. 44)						•					
Performax® 63 (planetary gearhead) (p. 46)						•				•	•
Performax®Plus 63 (planetary gearhead) (p. 48)						•				○	○
EtaCrown® 75 (crown gearhead) (p. 50)						•				•	•
EtaCrown®Plus 63 (crown gearhead) (p. 52)						•				•	•
Compactline 90 (spur gearhead) (p. 54)					•			•			
Compactline 91 (spur gearhead) (p. 56)				•	•	•	•	•	•	•	•
Compactline 92 (spur gearhead) (p. 58)					•			•			
Flatline 85 (spur gearhead) (p. 60)					•	•		•	•	•	•
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.







# VD/VDC Servomotors

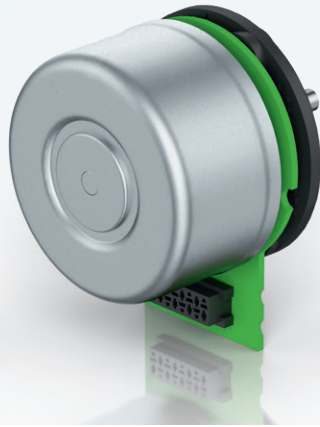
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VDC-49.15-K3	28
VDC-49.15-K4	30



# Servomotor VD-25.07-K1



## Description

- 3-phase external rotor servomotor with EC technology
- Basic motor with electronic module K1 for operation on external control electronics
- Very good synchronization characteristics
- Long lifetime by using precision ball bearings
- Insulation class E
- Electrical connection via socket directly on the circuit board
- Alternative windings / motor part sets on request

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

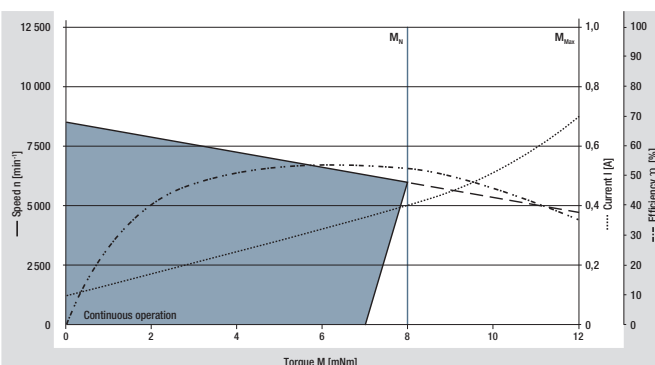
Type	VD-25.07-K1-B01	
Characteristic curve	A	
Nominal voltage ( $U_N$ )	V DC	24
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	6 000
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	8.00
Nominal current ( $I_N$ ) <sup>2)</sup>	A	0.40
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	5.00
Starting torque ( $M_A$ )	mNm	40.0
Permissible peak current ( $I_{max}$ ) <sup>3)</sup>	A	1.80
Speed at no-load operation ( $n_L$ )	rpm	8 500
No-load current ( $I_L$ )	A	0.095
Recommended speed control range	rpm	300 ... 8 500
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	4.30
Motor constant ( $K_E$ )	mVs/rad	26.6
Connection resistance ( $R_V$ )	Ω	14.8
Connection inductance ( $L_V$ )	mH	8.00
Overload protection	To be implemented via the control electronics	
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40
Weight	kg	0.055
Part number	IP 00	937 2507 000

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. – to be repeated only after complete cool down

Preferred type: ready to ship in 48 hours

Subject to alterations

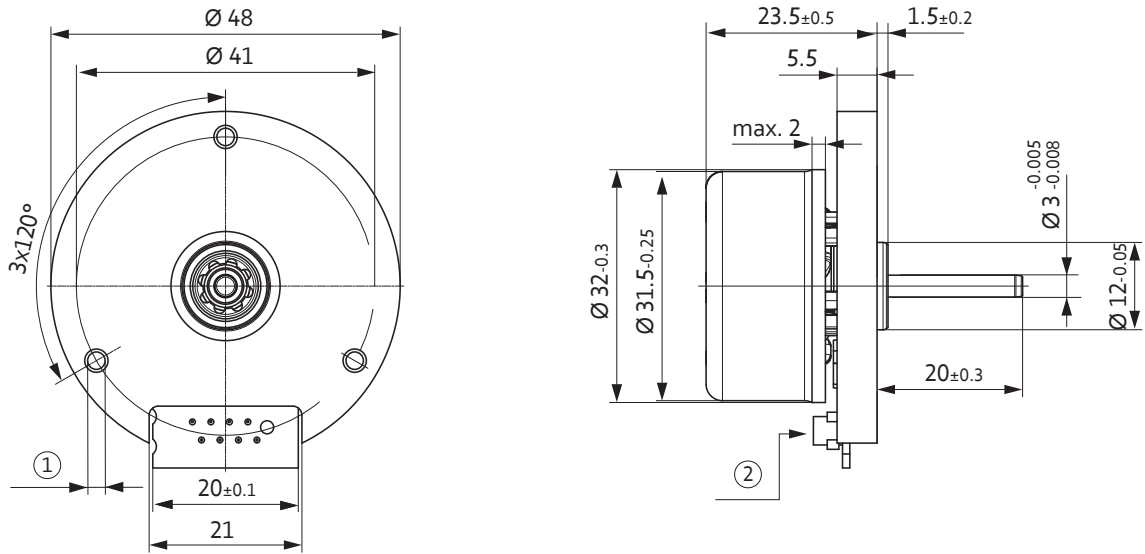
## A VD-25.07-K1-B01 (at 25 °C)



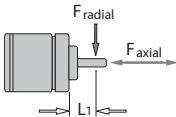


Technical drawing

All dimensions in mm



- ① 3 x for thread-rolling screws M2.5 according to DIN7500
- ② view (see electrical connection)

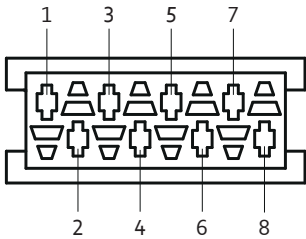


Permissible shaft load

$F_{\text{axial}}$ :	5 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. $40^\circ\text{C}$ )
$F_{\text{radial}}$ :	5 N	
$L_1$ :	10 mm	

Electrical connection

Supply wire	
No.	Function
6	Phase U
7	Phase V
8	Phase W



Signal wire	
No.	Function
1	GND
2	Hall C
3	+ $U_B$
4	Hall B
5	Hall A

Modular construction kit

Recommended external control electronics	Basic motor
VTD-XX.XX-K3	On request



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



# Servomotor VD-35.06-K1



## Description

- 3-phase external rotor servomotor with EC technology
- Basic motor with electronic module K1 for operation on external control electronics
- Very good synchronization characteristics
- Long lifetime by using precision ball bearings
- Insulation class E
- Electrical connection via the circuit board edge plug
- Alternative windings / motor part sets on request

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

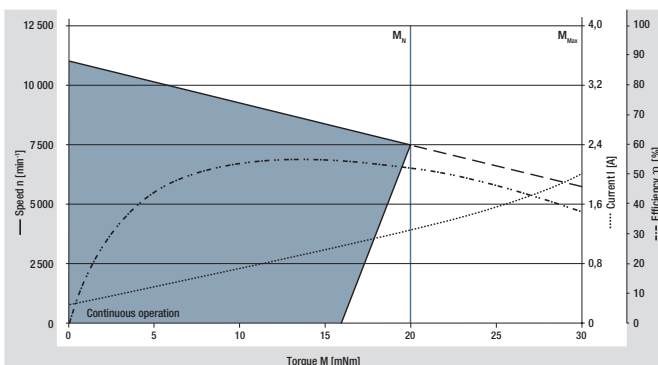
Type		VD-35.06-K1-B01	VD-35.06-K1-B00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	7 500	3 700
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	20.0	20.0
Nominal current ( $I_N$ ) <sup>2)</sup>	A	1.25	0.80
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	16.00	8.00
Starting torque ( $M_A$ )	mNm	69.0	
Permissible peak current ( $I_{max}$ ) <sup>3)</sup>	A	4.00	2.50
Speed at no-load operation ( $n_L$ )	rpm	11 000	7 100
No-load current ( $I_L$ )	A	0.25	0.16
Recommended speed control range	rpm	300 ... 11 000	300 ... 7 100
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	16.0	
Motor constant ( $K_E$ )	mVs/rad	20.9	33.6
Connection resistance ( $R_V$ )	$\Omega$	3.70	9.40
Connection inductance ( $L_V$ )	mH	2.50	6.40
Overload protection	To be implemented via the control electronics		
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.12	
Part number	IP 00	937 3506 000	937 3506 010

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. –to be repeated only after complete cool down

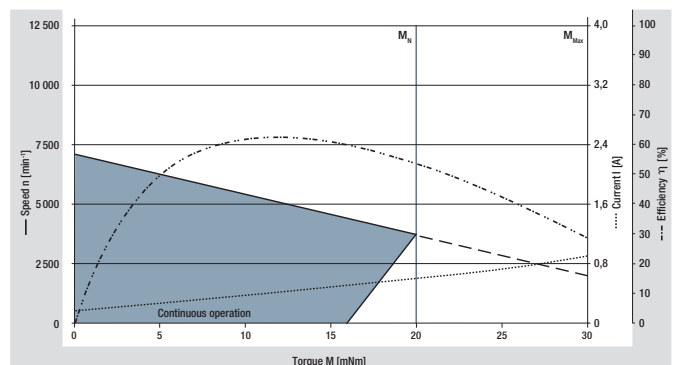
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VD-35.06-K1-B01 (at 25 °C)



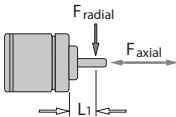
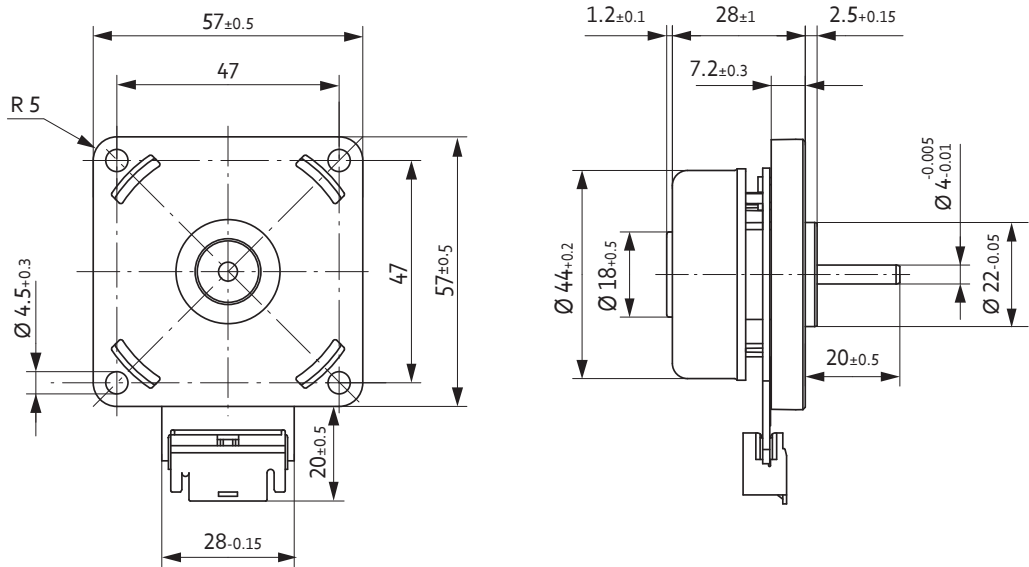
**B** VD-35.06-K1-B00 (at 25 °C)





Technical drawing

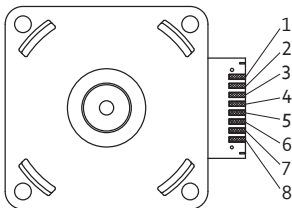
All dimensions in mm



Permissible shaft load		
$F_{\text{axial}}$ :	5 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. 40°C)
$F_{\text{radial}}$ :	20 N	
$L_1$ :	10 mm	

Electrical connection

Supply wire	
No.	Function
6	Phase W
7	Phase V
8	Phase U



Signal wire	
No.	Function
1	+ $U_B$
2	GND
3	Hall C
4	Hall B
5	Hall A

Modular construction kit

Recommended external control electronics	
VTD-XX.XX-K3	On request

Basic motor



Accessories	
Rotor protection cap	Page 66

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



# Servomotor VD-43.10-K1



## Description

- 3-phase external rotor servomotor with EC technology
- Basic motor with electronic module K1 for operation on external control electronics
- Very good synchronization characteristics
- Long lifetime by using precision ball bearings
- Insulation class E
- Electrical connection via the circuit board edge plug
- Alternative windings / motor part sets on request

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

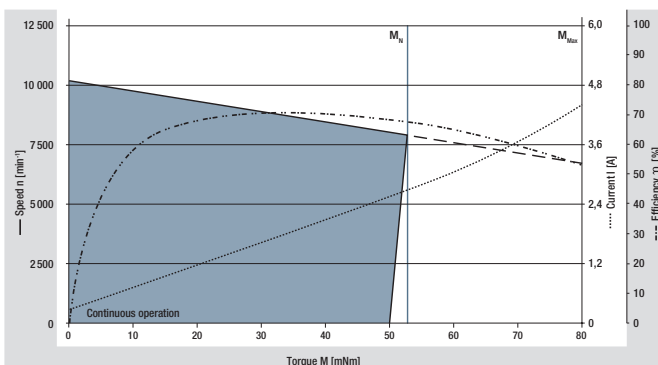
Type		VD-43.10-K1-B01	VD-43.10-K1-B00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	7 900	3 700
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	53.0	54.0
Nominal current ( $I_N$ ) <sup>2)</sup>	A	2.70	1.60
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	44.0	21.0
Starting torque ( $M_A$ )	mNm	110	
Permissible peak current ( $I_{max}$ ) <sup>3)</sup>	A	6.50	4.20
Speed at no-load operation ( $n_L$ )	rpm	10 200	8 000
No-load current ( $I_L$ )	A	0.27	0.18
Recommended speed control range	rpm	300 ... 10 200	300 ... 8 000
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	40.0	
Motor constant ( $K_E$ )	mVs/rad	19.4	29.3
Connection resistance ( $R_V$ )	$\Omega$	0.96	2.30
Connection inductance ( $L_V$ )	mH	1.55	3.50
Overload protection	To be implemented via the control electronics		
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.24	
Part number	IP 00	937 4310 029	937 4310 030

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. –to be repeated only after complete cool down

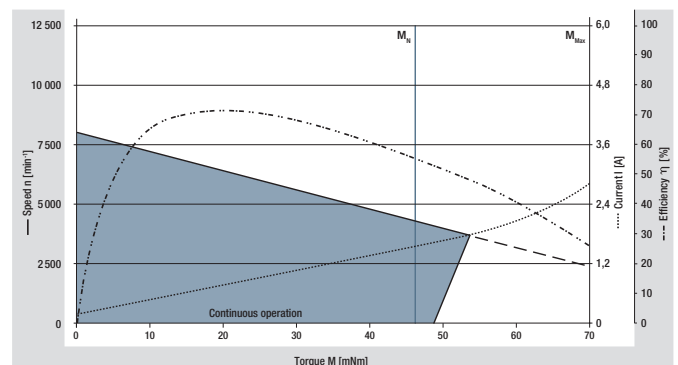
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VD-43.10-K1-B01 (at 25 °C)



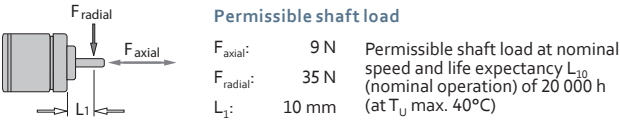
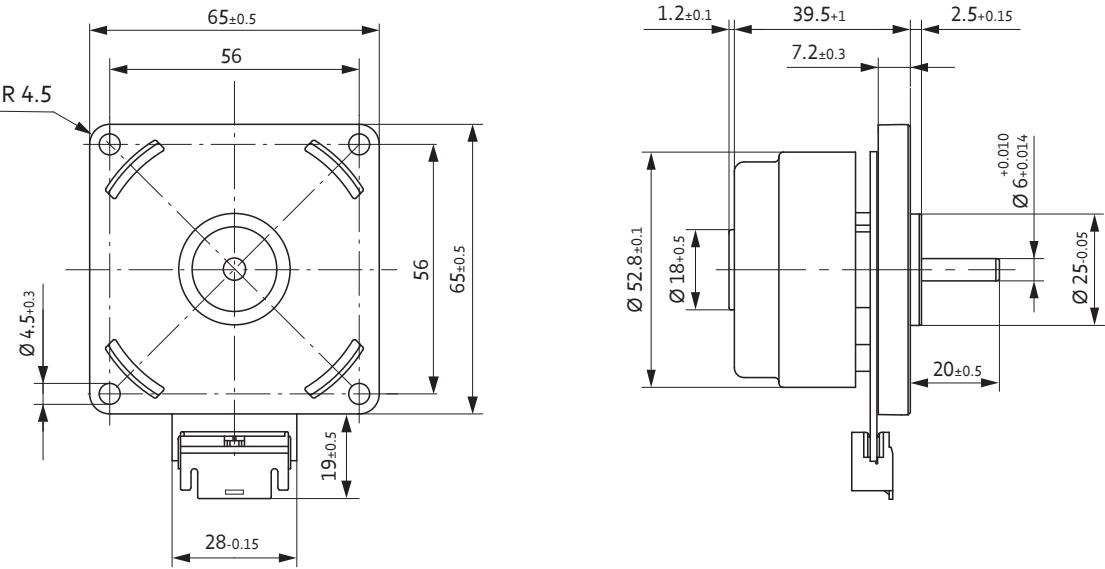
**B** VD-43.10-K1-B00 (at 25 °C)





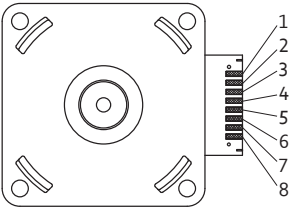
Technical drawing

All dimensions in mm



Electrical connection

Supply wire	
No.	Function
6	Phase W
7	Phase V
8	Phase U



Signal wire	
No.	Function
1	+ $U_B$
2	GND
3	Hall C
4	Hall B
5	Hall A

Modular construction kit

Recommended external control electronics	
VTD-XX.XX-K3	On request
VTD-60.13-K5SB	On request

Basic motor

Spur gearheads	
Compactline 91	Page 56



Accessories	
Rotor protection cap	Page 66
Connection cables	Page 67

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



# Servomotor VD-54.14-K1



## Description

- 3-phase external rotor servomotor with EC technology
- Basic motor with electronic module K1 for operation on external control electronics
- Very good synchronization characteristics
- Long lifetime by using precision ball bearings
- Insulation class E
- Electrical connection via the circuit board edge plug

More at [www.ebmpapst.com](http://www.ebmpapst.com)

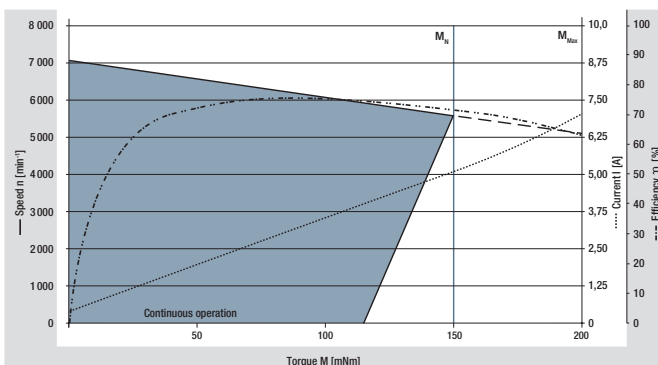
Type		VD-54.14-K1-B01	VD-54.14-K1-B00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	5 600	3 700
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	150	
Nominal current ( $I_N$ ) <sup>2)</sup>	A	5.10	3.60
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	88.0	57.0
Starting torque ( $M_A$ )	mNm	400	
Permissible peak current ( $I_{max}$ ) <sup>3)</sup>	A	15.0	10.0
Speed at no-load operation ( $n_L$ )	rpm	7 100	5 200
No-load current ( $I_L$ )	A	0.41	0.26
Recommended speed control range	rpm	300 ... 7 100	300 ... 5 200
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	145	
Motor constant ( $K_E$ )	mVs/rad	29.2	41.8
Connection resistance ( $R_V$ )	Ω	0.49	0.96
Connection inductance ( $L_V$ )	mH	1.00	2.00
Overload protection	To be implemented via the control electronics		
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.52	
Part number	IP 00	937 5414 000	937 5414 010

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. – to be repeated only after complete cool down

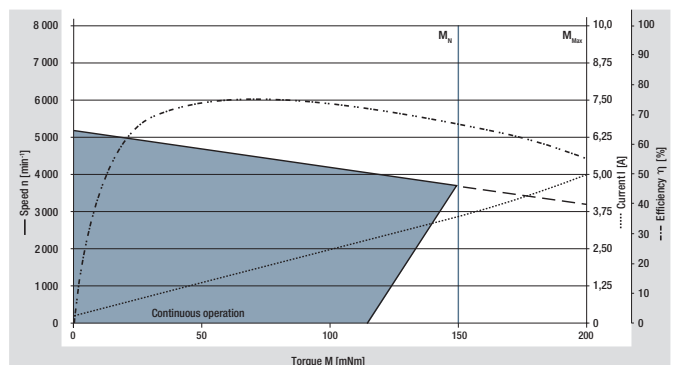
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VD-54.14-K1-B01 (at 25 °C)



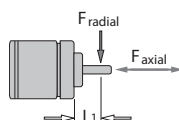
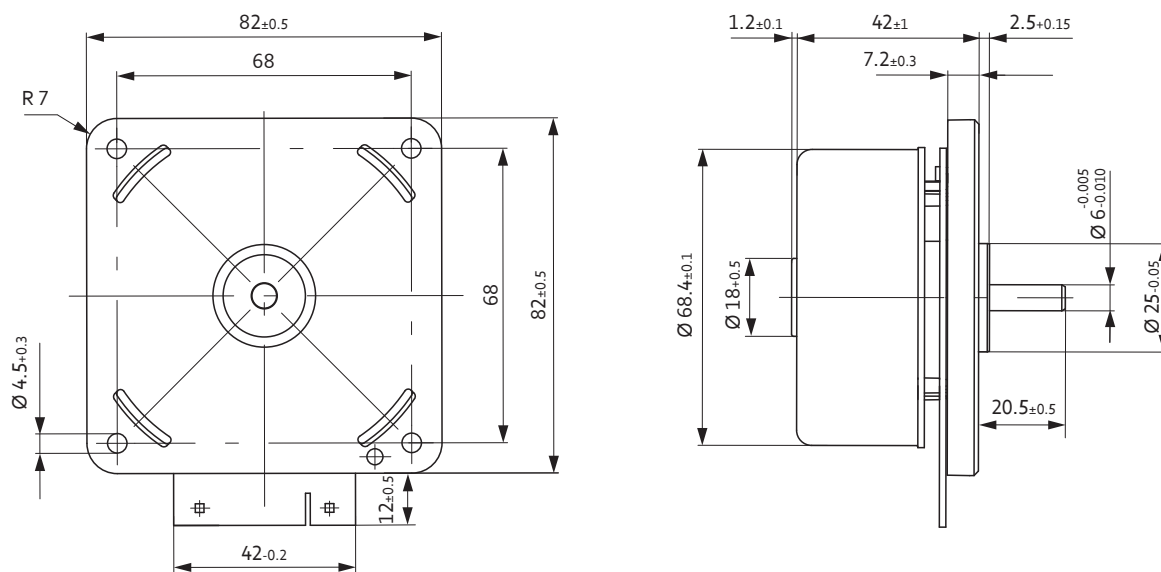
**B** VD-54.14-K1-B00 (at 25 °C)





## Technical drawing

All dimensions in mm

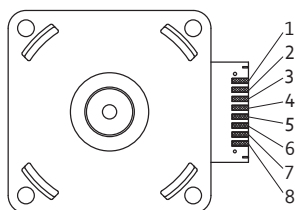


## Permissible shaft load

$F_{\text{axial}}$ :	9 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. 40°C)
$F_{\text{radial}}$ :	60 N	
$L_1$ :	10 mm	

## Electrical connection

Supply wire	
No.	Function
6	Phase W
7	Phase V
8	Phase U



Signal wire	
No.	Function
1	+ $U_B$
2	GND
3	Hall C
4	Hall B
5	Hall A

## Modular construction kit

## Recommended external control electronics

VTD-XX.XX-K3	Speed (Page 34)
VTD-XX.XX-K4S	Position (Page 36)
VTD-60.13-K5SB	Position (Page 38)

## Basic motor



## Spur gearheads

Compactline 90	Page 54
Compactline 91	Page 56
Compactline 92	Page 58

## Spur gearheads

Flatline 85	Page 60
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## Accessories

Rotor protection cap	Page 66
Connection cables	Page 67

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



# Servomotor VD-49.15-K1



## Description

- 3-phase external rotor servomotor with EC technology
- High poled motor structure for optimum power density
- Basic motor with electronic module K1 for operation on external control electronics
- Very good synchronization characteristics
- Robust mechanical design in IP 54 for industrial applications
- Long lifetime by using precision ball bearings
- Insulation class E
- Electrical connection via cable

More at [www.ebmpapst.com](http://www.ebmpapst.com)

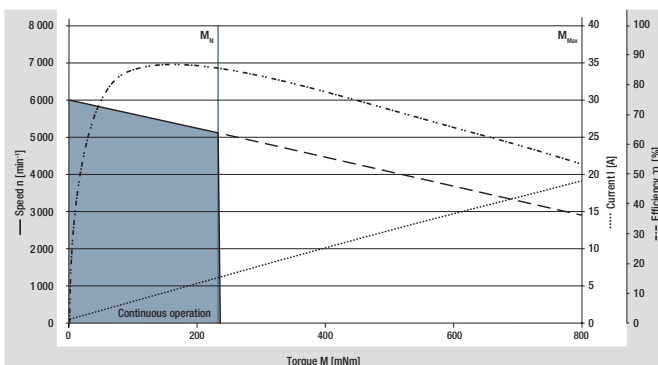
Type		VD-49.15-K1-B00	VD-49.15-K1-D00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	48
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	4 500	5 300
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	235	245
Nominal current ( $I_N$ ) <sup>2)</sup>	A	6.10	3.40
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	110	135
Starting torque ( $M_A$ )	mNm	1 150	1 300
Permissible peak current ( $I_{max}$ ) <sup>3)</sup>	A	30.0	18.5
Speed at no-load operation ( $n_L$ )	rpm	6 000	
No-load current ( $I_L$ )	A	0.47	0.36
Recommended speed control range	rpm	0 ... 6 000	
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	108	
Motor constant ( $K_E$ )	mVs/rad	41.0	80.7
Connection resistance ( $R_V$ )	Ω	0.23	0.62
Connection inductance ( $L_V$ )	mH	0.17	0.62
Overload protection	To be implemented via the control electronics		
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.59	
Part number (cable type) <sup>1)</sup>	IP 54	937 4915 000	937 4915 001

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. –to be repeated only after complete cool down

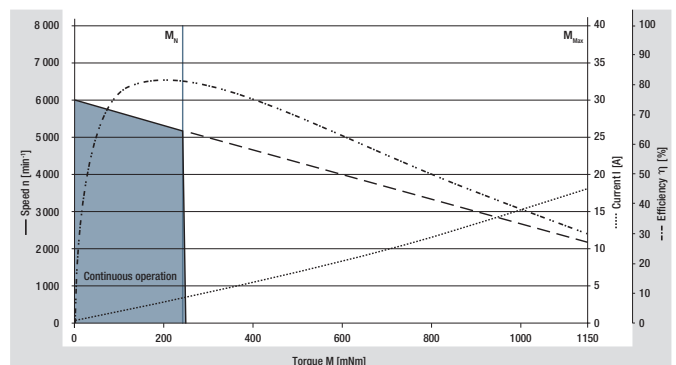
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VD-49.15-K1-B00 (at 25 °C)



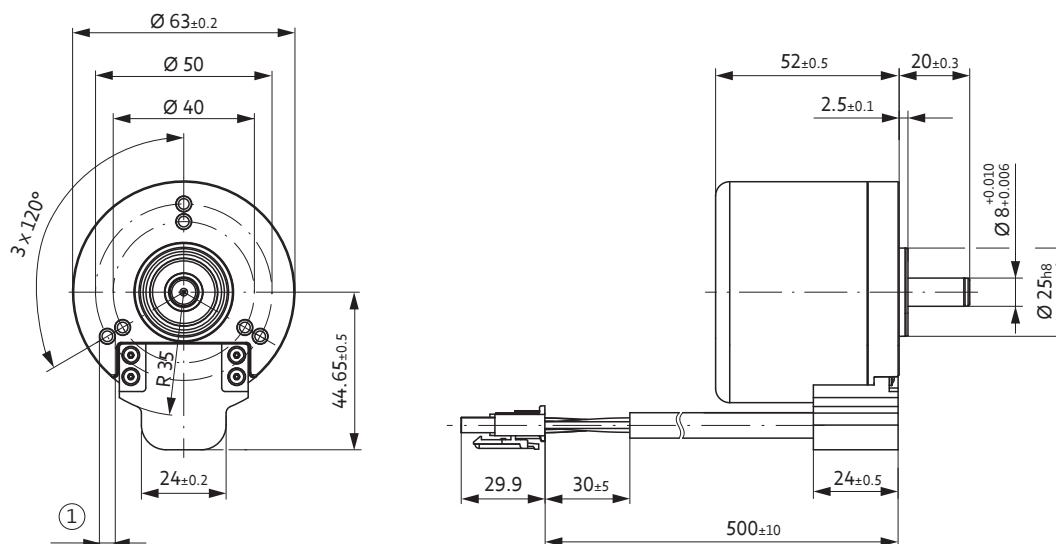
**B** VD-49.15-K1-D00 (at 25 °C)



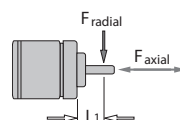


## Technical drawing

All dimensions in mm



① 6 x for thread-rolling screws M4 according to DIN 7500

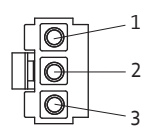


### Permissible shaft load

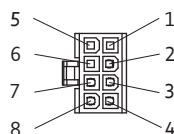
$F_{\text{axial}}$ :	20 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. $40^\circ\text{C}$ )
$F_{\text{radial}}$ :	60 N	
$L_1$ :	10 mm	

## Electrical connection

Supply wire		
No.	Color	Function
1	yellow	Phase W
2	violet	Phase V
3	brown	Phase U



Molex plug  
no. 39-03-6035



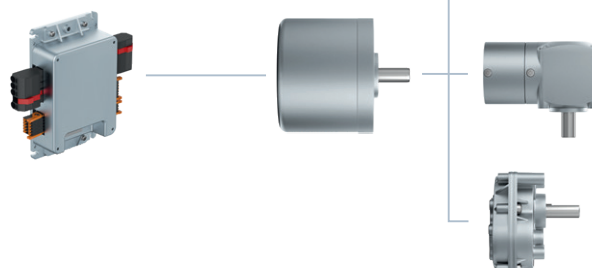
Molex plug  
no. 39-01-2085

Signal wire			No.	Color	Function
1	—	—	5	—	—
2	red	+12V	6	—	—
3	white	Hall B	7	black	GND
4	green	Hall A	8	gray	Hall C

## Modular construction kit

Recommended external control electronics		
VTD-XX.XX-K3	Speed	(Page 34)
VTD-XX.XX-K4S	Position	(Page 36)
VTD-60.13-K5SB	Position	(Page 38)

### Basic motor



### Planetary gearheads

NoiselessPlus 63	Page 44
Performax® 63	Page 46
Performax®Plus 63	Page 48

### Crown gearheads

EtaCrown® 75	Page 50
EtaCrown®Plus 63	Page 52

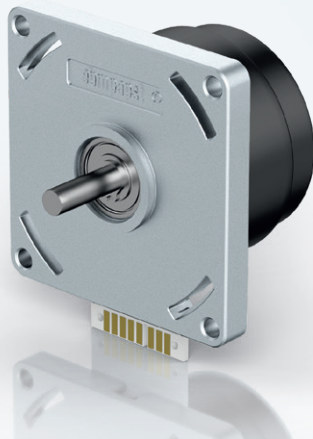
### Spur gearheads

Compactline 91	Page 56
Flatline 85	Page 60

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



# Servomotor VDC-43.10-K3



## Description

- 3-phase external rotor servomotor with EC technology
- Drive with completely integrated K3 operation and control electronics
- Integrated speed control function
- Interface with analog and digital control inputs
- Very good synchronization characteristics
- Long lifetime by using precision ball bearings
- Electrical connection via the circuit board edge plug

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

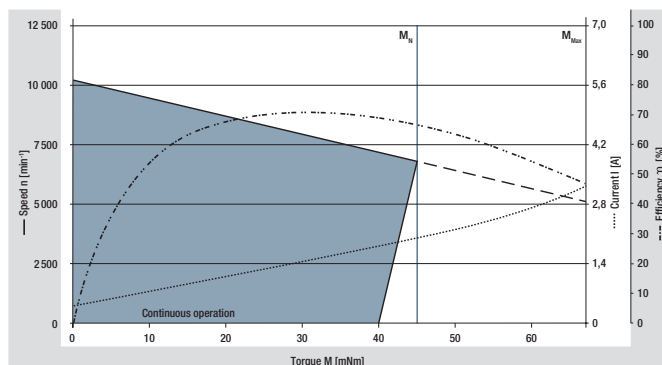
Type		VDC-43.10-K3-B01	VDC-43.10-K3-B00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	6 800	4 000
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	45	
Nominal current ( $I_N$ ) <sup>2)</sup>	A	2.00	1.25
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	32.0	18.8
Starting torque ( $M_A$ )	mNm	67	
Speed at no-load operation ( $n_L$ )	rpm	10 200	4 100
No-load current ( $I_L$ )	A	0.40	0.14
Recommended speed control range	rpm	300 ... 10 000	300 ... 4 000
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	40	
Overload protection		integrated	
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.24	
Part number	IP 00	937 4310 615	937 4310 616

<sup>2)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At TU max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. — to be repeated only after complete cool down

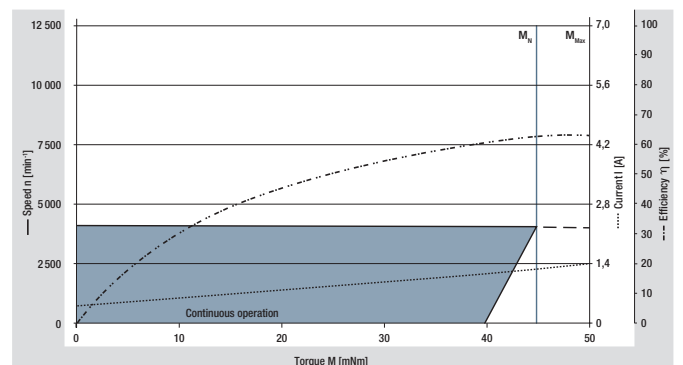
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VDC-43.10-K3-B01 (at 25 °C)



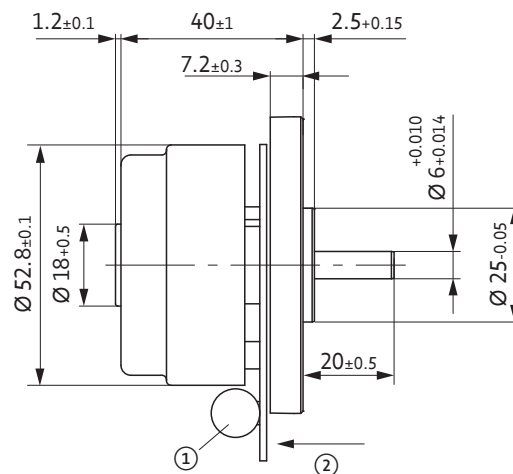
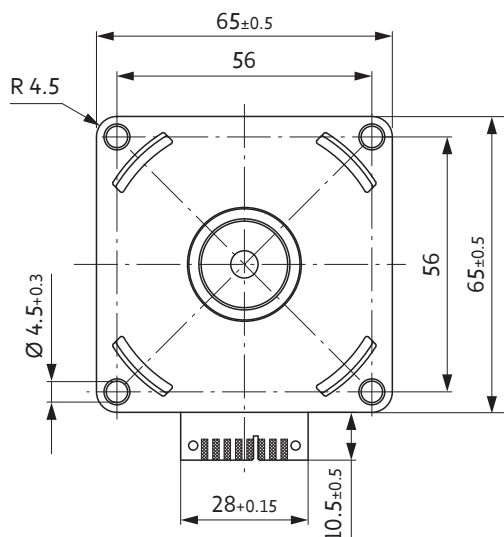
**B** VDC-43.10-K3-B00 (at 25 °C)



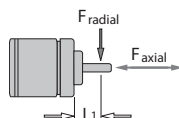


## Technical drawing

All dimensions in mm



- ① Capacitor  
② view (see electrical connection)

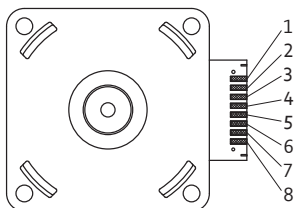


### Permissible shaft load

$F_{axial}$ :	9 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. 40°C)
$F_{radial}$ :	35 N	
$L_1$ :	10 mm	

## Electrical connection

Supply wire	
No.	Configuration
7	GND
8	$U_B$



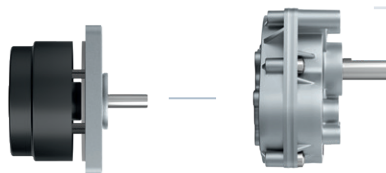
Signal wire		
No.	Configuration	Function
1	OUT	Pulse output (speed)
2	D-IN-A	Input
3	D-IN-B	Input
4	C	—
5	A-IN	0 ... 10 V (differential)
6	A-GND	GND for analog IN for differential

## Modular construction kit

### Accessories

Connection cables [Page 67](#)

### Basic motor



### Spur gearheads

Compactline 91 [Page 56](#)



# Servomotor VDC-54.14-K3



## Description

- 3-phase external rotor servomotor with EC technology
- Drive with completely integrated K3 operation and control electronics
- Integrated speed control function
- Interface with analog and digital control inputs
- Very good synchronization characteristics
- Long lifetime by using precision ball bearings
- Electrical connection via the circuit board edge plug

More at [www.ebmpapst.com](http://www.ebmpapst.com)

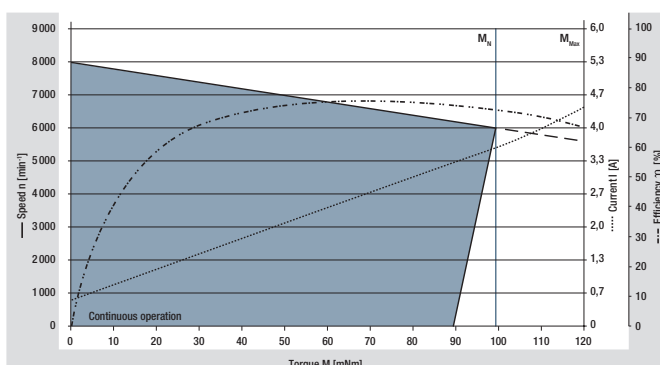
Type		VDC-54.14-K3-B01	VDC-54.14-K3-B00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	6 000	3 500
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	100	130
Nominal current ( $I_N$ ) <sup>2)</sup>	A	3.60	2.80
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	62.8	47.6
Starting torque ( $M_A$ )	mNm	120	
Speed at no-load operation ( $n_L$ )	rpm	8 000	4 000
No-load current ( $I_L$ )	A	0.51	0.21
Recommended speed control range	rpm	300 ... 8 000	300 ... 4 000
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	145	
Overload protection		integrated	
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.52	
Part number	IP 00	937 5414 622	937 5414 620

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At TU max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. — to be repeated only after complete cool down

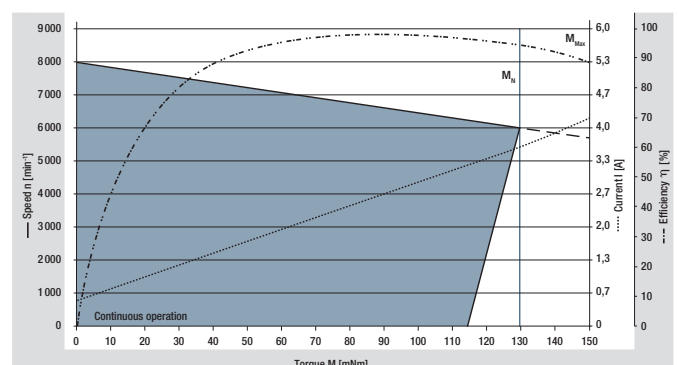
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VDC-54.14-K3-B01 (at 25 °C)



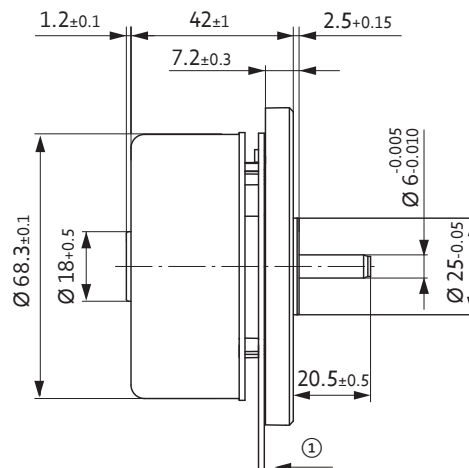
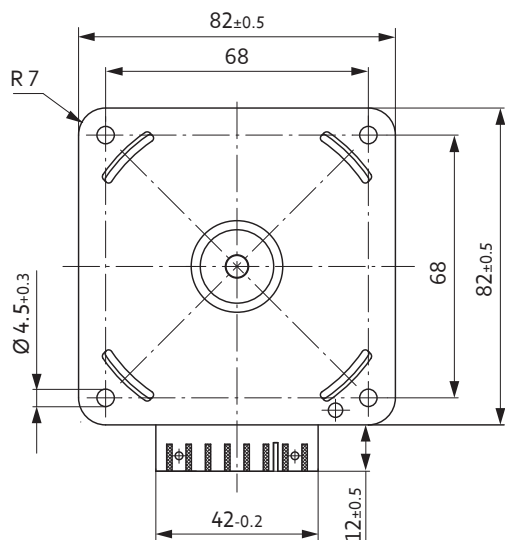
**B** VDC-54.14-K3-B00 (at 25 °C)



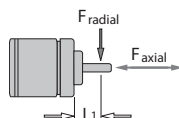


## Technical drawing

All dimensions in mm



① view (see electrical connection)

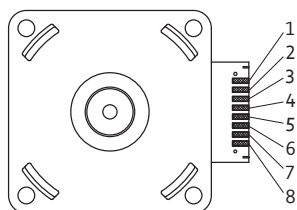


### Permissible shaft load

$F_{axial}$ :	9 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. 40°C)
$F_{radial}$ :	60 N	
$L_1$ :	10 mm	

## Electrical connection

Supply wire	
No.	Configuration
7	GND
8	$U_B$

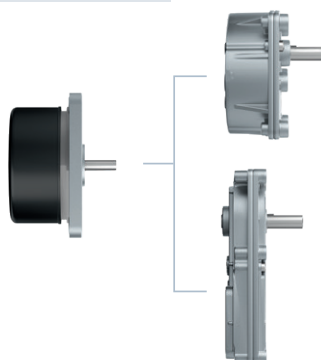


Signal wire		
No.	Configuration	Function
1	OUT	Pulse output (speed)
2	D-IN-A	Input
3	D-IN-B	Input
4	C	—
5	A-IN	0 ... 10 V (differential)
6	A-GND	GND for analog IN for differential

## Modular construction kit

Accessories	
Rotor protection cap	Page 66
Connection cables	Page 67

### Basic motor



### Spur gearheads

Compactline 90	Page 54
Compactline 91	Page 56
Compactline 92	Page 58

### Spur gearheads

Flatline 85	Page 60
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For motor-gearbox combinations, depending on the choice of the single components, the maximum allowable torque (gearbox) can be exceeded or respectively not reached.



# Servomotor VDC-49.15-K3



## Description

- 3-phase external rotor servomotor with EC technology
- High-poled motor structure for optimum power density.
- Drive with completely integrated K3 operation and control electronics
- Integrated speed control function
- Interface with analog and digital control inputs
- Very good synchronization characteristics
- Robust mechanical design in IP 54 for industrial applications
- Long lifetime by using precision ball bearings
- Electrical connection via cable with free wire ends

More at [www.ebmpapst.com](http://www.ebmpapst.com)

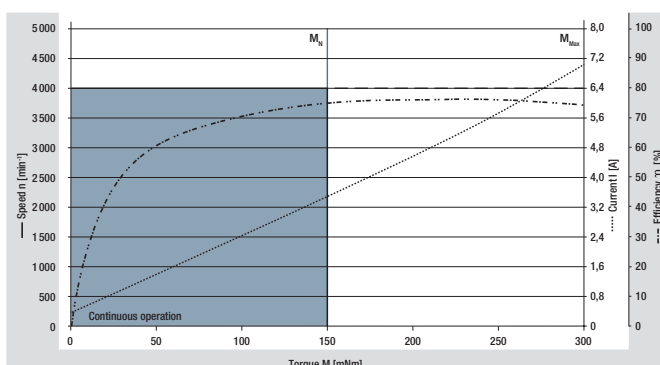
Type		VDC-49.15-K3-B00	VDC-49.15-K3-D00
Characteristic curve		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	48
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm		4 000
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	150	250
Nominal current ( $I_N$ ) <sup>2)</sup>	A	3.50	2.75
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	63.0	105
Starting torque ( $M_A$ )	mNm	300	506
Speed at no-load operation ( $n_l$ )	rpm		4 000
No-load current ( $I_l$ )	A	0.40	0.25
Recommended speed control range	rpm		0 ... 4 000
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>		108
Overload protection			integrated
Permissible ambient temperature range ( $T_U$ )	°C		0 ... +40
Weight	kg		0.59
Part number (cable type) <sup>1)</sup>	IP 54	937 4915 600	937 4915 607

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. – to be repeated only after complete cool down

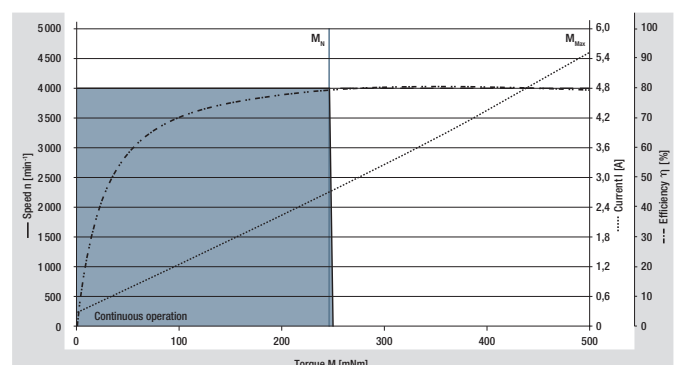
Preferred type: ready to ship in 48 hours

Subject to alterations

**A** VDC-49.15-K3-B00 (at 25 °C)



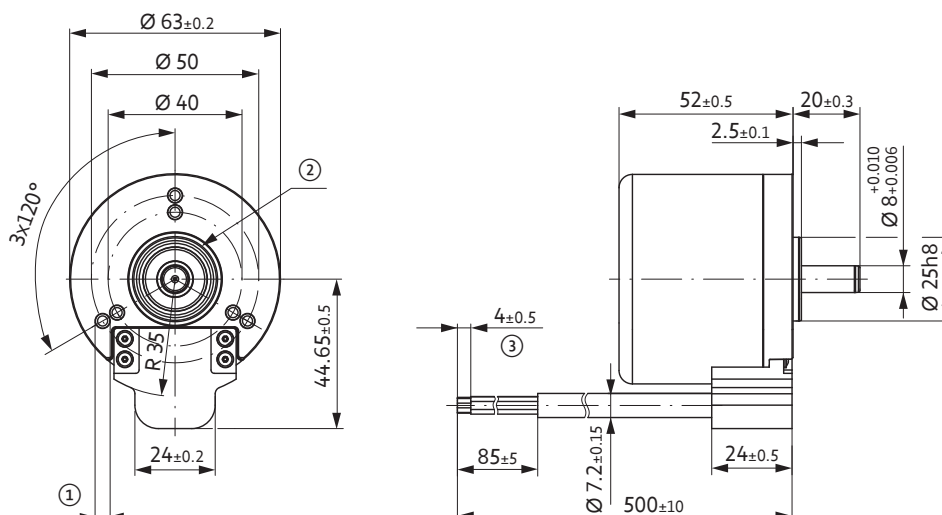
**B** VDC-49.15-K3-D00 (at 25 °C)





## Technical drawing

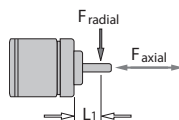
All dimensions in mm



① 6 x for thread-rolling screws M4 according to DIN7500

② grooves for O-ring

③ twisted and tin-plated



## Permissible shaft load

$F_{\text{axial}}$ :	20 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. 40°C)
$F_{\text{radial}}$ :	60 N	
$L_1$ :	10 mm	

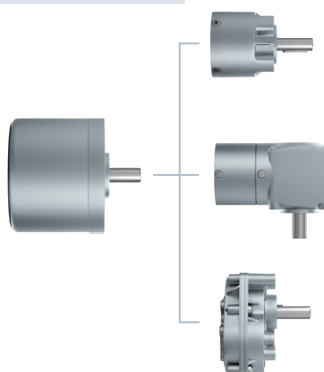
## Electrical connection / cable with open wires

	Wire color	Configuration	Function	recommended AWG
Signal	blue	GND	Logic power/signal GND	24
	pink	S1	0 ... 10 V – speed set Point	
	green	TXD	Communication / programming interface	
	white	RXD	Communication / programming interface	
	grey-pink	A	Control input A, TTL level	
	violet	B	Control input B, TTL level	
	grey	IST	Actual value 1	
	red-blue	F+	Frequency specification for speed setpoint	
	brown	S2	0 ... 5 V current limitation (torque)	
	black	C	Control input C – hardware enable	
	red	E	Actual value 2	
	yellow	D	Drive status	
Power	blue	GND	Power supply GND	16
	brown	+U <sub>b</sub>	Logic power supply	
	black	U <sub>zk</sub>	Power supply	

Subject to alterations

## Modular construction kit

## Basic motor



## Planetary gearheads

NoiselessPlus 63	Page 44
Performax® 63	Page 46
Performax®Plus 63	Page 58

## Crown gearheads

EtaCrown® 75	Page 50
EtaCrown®Plus 63	Page 52

## Spur gearheads

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Flatline 85	Page 60

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



# Servomotor VDC-49.15-K4



## Description

- 3-phase external rotor servomotor with EC technology
- High-poled motor structure for optimum power density.
- Drive with completely integrated K4 operation and control electronics
- Integrated speed, torque and position control
- Selection of operating modes and parameter setting via RS485
- Interface with analog and digital control inputs
- Integrated brake chopper
- Robust mechanical design in IP 54 for industrial applications
- Electrical connection via cable with free wire ends

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

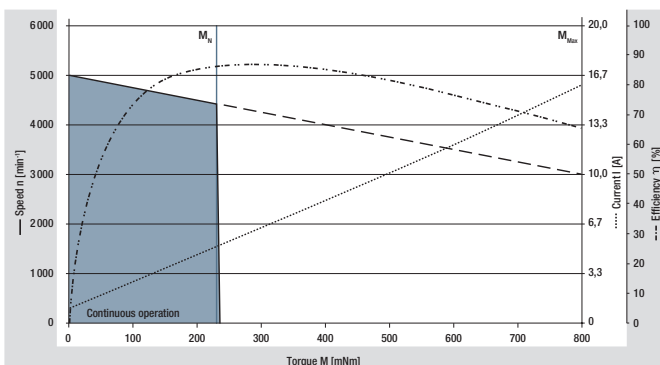
Type		VDC-49.15-K4-B00	VDC-49.15-K4-D00
<b>Characteristic curve</b>		<b>A</b>	<b>B</b>
Nominal voltage ( $U_N$ )	V DC	24	48
Nominal speed ( $n_N$ ) <sup>2)</sup>	rpm	4 000	
Nominal torque ( $M_N$ ) <sup>2)</sup>	mNm	235	300
Nominal current ( $I_N$ ) <sup>2)</sup>	A	5.20	3.20
Nominal output power ( $P_N$ ) <sup>2)</sup>	W	99	126
Starting torque ( $M_A$ )	mNm	705	900
Permissible peak current ( $I_{max}$ ) <sup>3)</sup>	A	15.6	9.60
Speed at no-load operation ( $n_L$ )	rpm	5 000	
No-load current ( $I_L$ )	A	0.40	0.25
Recommended speed control range	rpm	0 ... 4 000	
Rotor moment of inertia ( $J_R$ )	kgm <sup>2</sup> x10 <sup>-6</sup>	108	
Overload protection		integrated	
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +40	
Weight	kg	0.59	
Part number (cable type) <sup>1)</sup>	IP 54	937 4915 400	937 4915 402

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side, <sup>2)</sup> At  $T_U$  max. 40°C, <sup>3)</sup> Permissible time for peak current: max. 1 sec. – to be repeated only after complete cool down

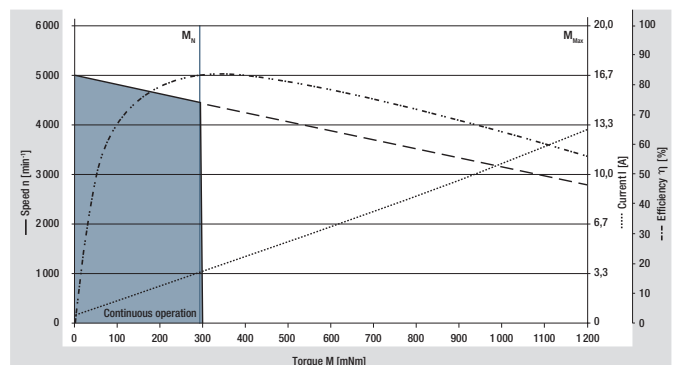
Preferred type: ready to ship in 48 hours

Subject to alterations

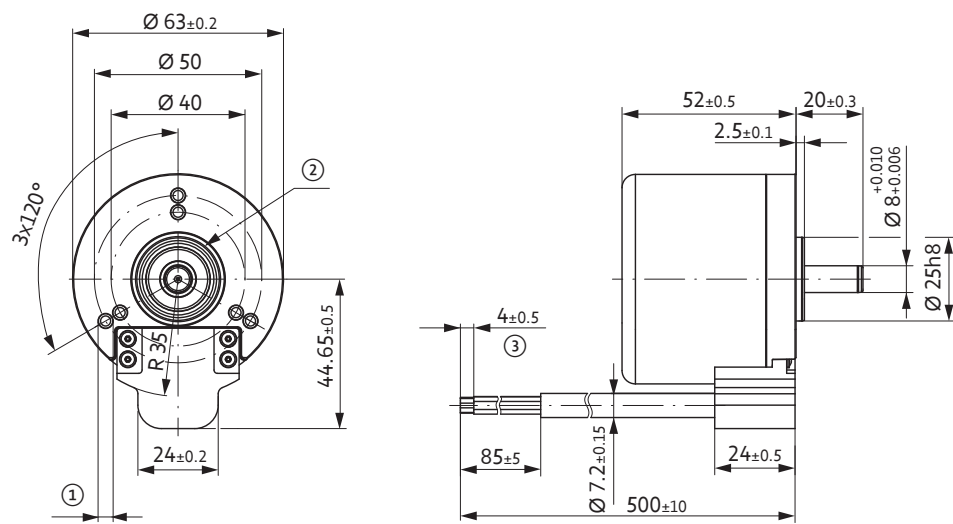
**A** VDC-49.15-K4-B00 (at 25 °C)



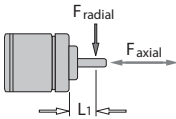
**B** VDC-49.15-K4-D00 (at 25 °C)







- ① 6 x for thread-rolling screws M4 according to DIN7500
- ② grooves for O-ring
- ③ twisted and tin-plated



Permissible shaft load		
$F_{\text{axial}}$ :	20 N	Permissible shaft load at nominal speed and life expectancy $L_{10}$ (nominal operation) of 20 000 h (at $T_u$ max. $40^\circ\text{C}$ )
$F_{\text{radial}}$ :	60 N	
$L_1$ :	10 mm	

Electrical connection / cable with open wires

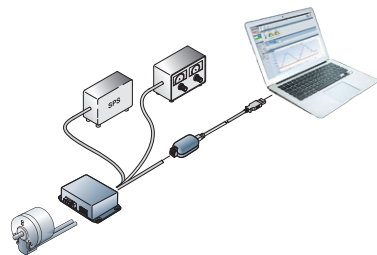
	Wire color	Configuration	Function	recommended AWG
Signal	white	D-IN-A	NPN 24 V	24
	brown	D-IN-B	NPN 24 V	
	green	D-IN-1	NPN 24 V	
	yellow	D-IN-2	NPN 24 V / analog 0 ... 10 V / brake	
	gray	D-OUT-1	PNP 24 V	
	pink	D-OUT-2	PNP 24 V	
	blue	–	Must not be used	
	red	A-IN-1	0 ... 10 V (differential)	
	black	A-GND	GND for analog IN 1 (differential)	
	violet	RS485 A (+)	Progr. bus	
Power	gray-pink	RS485 B (-)	Progr. bus	16
	red-blue	$U_{\text{Logic}}$	Logic power supply (24 V)	
	gray	Ballast	Ballast resistor	
	brown	$U_{\text{ZK}}$	Power supply	
	black	GND	Power / signal GND	

Subject to alterations

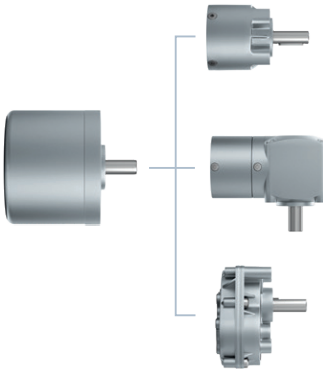
Modular construction kit

Commissioning tool
"driveSTUDIO"

Page 64



Basic motor



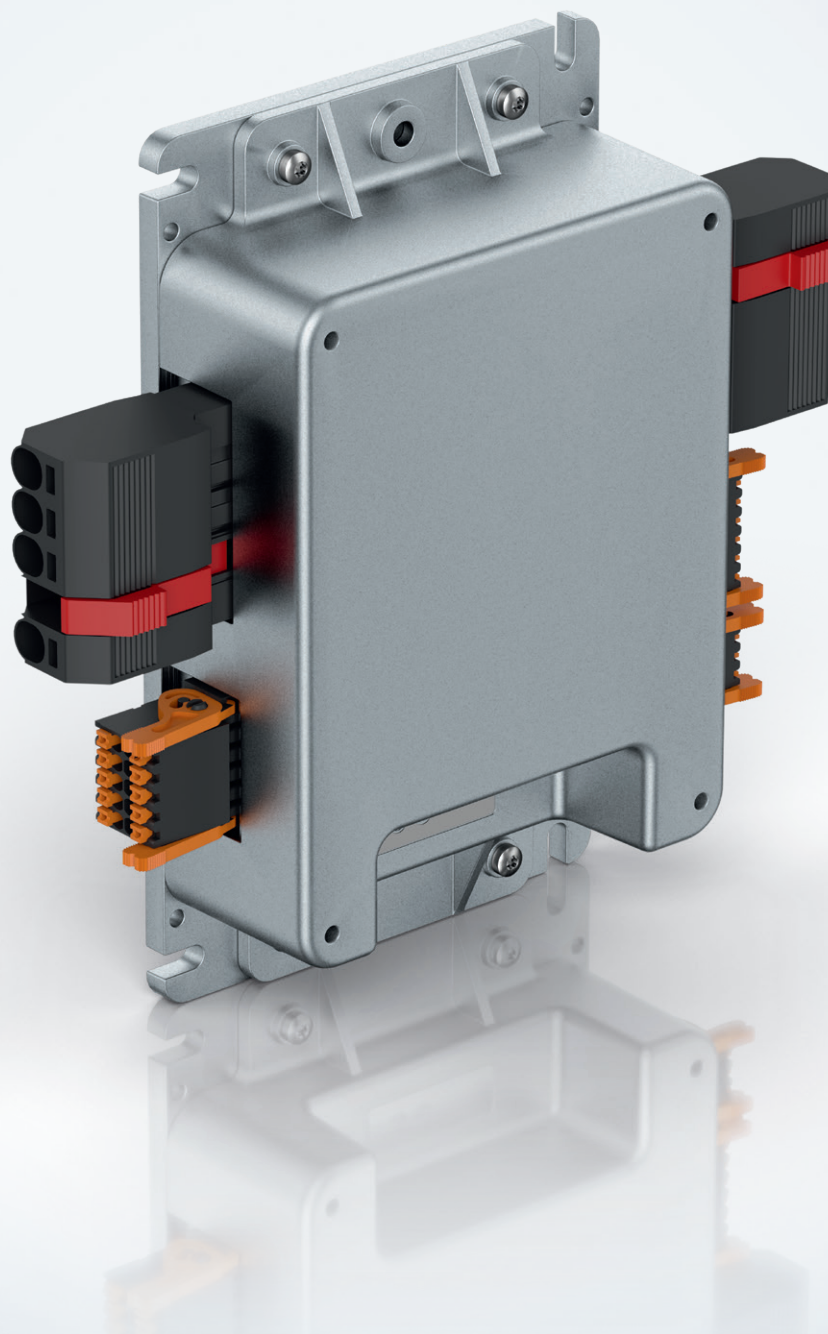
Planetary gearheads	
NoiselessPlus 63	Page 44
Performax® 63	Page 46
Performax®Plus 63	Page 48

Crown gearheads	
EtaCrown® 75	Page 50
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Spur gearheads	
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For motor-gearbox combinations, depending on the choice of the single components, the maximum allowable torque (gearbox) can be exceeded or respectively not reached.







# Control electronics

**ebmpapst**

the engineer's choice

	Page
VTD-XX.XX-K3 ((speed)	34
VTD-XX.XX-K4S (position)	36
VTD-60.13-K5SB (CANopen)	38



# Control electronics VTD-XX.XX-K3



## Description

- Motor commutation and speed control via microcontroller
- Control parameters are each specifically designed for the motor
- Four-quadrant controller
- Speed setting via analog nominal value 0 ... 10 V DC
- Speed actual value processing and output
- Setting of the operating mode via 2 control inputs
- Monitoring function for output current and voltage

More at [www.ebmpapst.com](http://www.ebmpapst.com)

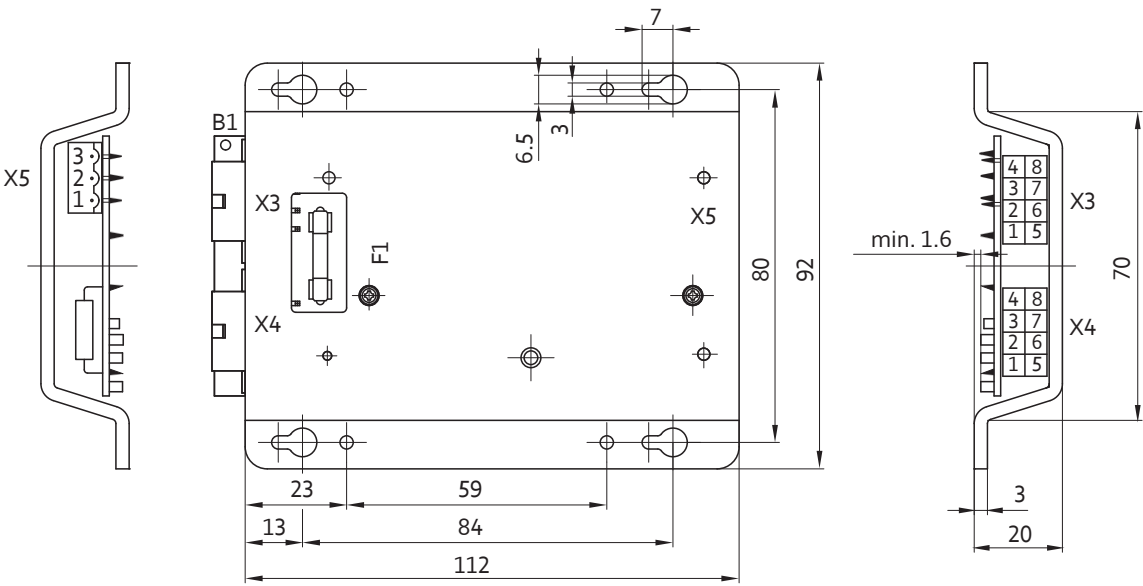
Type		VTD-24.XX-K3	VTD-48.XX-K3
Nominal voltage (power supply $U_N$ )	V DC	24	48
Permissible supply voltage range (U)	V DC	18 ... 30	30 ... 52
Permissible continuous output current <sup>1)</sup>	A	3 - 12 depending on model	3 - 6 depending on model
Maximum commutation frequency	kHz		2
Switching frequency	kHz		20
Minimum connection inductance	mH		0.10
Digital inputs	Number		2
Digital outputs	Number		1
Analog inputs	Number		1
Efficiency (in optimum working range)	%		95
Permissible ambient temperature range ( $T_U$ )	°C		0 ... +40
Permissible ambient humidity <sup>2)</sup>	%		5 ... 93
Protection class			IP 00
Weight	kg		0.20
Part number	IP 20		On request

<sup>1)</sup> Applicable at rated temperature  $T_U = 40^\circ\text{C}$

<sup>2)</sup> Condensation not permitted

Subject to alterations





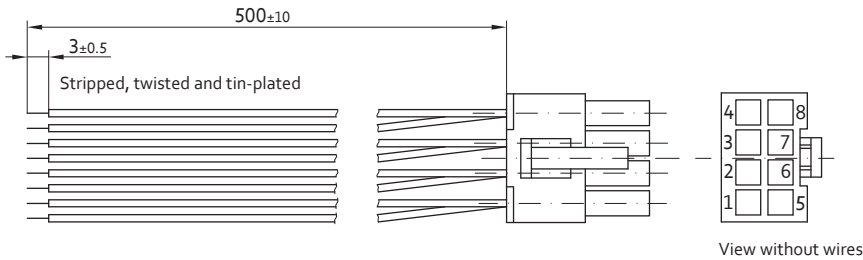
Electrical connection

Pin	Control plug X3		Motor plug X4		Capacitor plug X5	
	Configuration	Function	Configuration	Function	Configuration	Function
1	A	Operating mode	L3	Motor phase	U+	Capacitor connector
2	+U <sub>B</sub>	Operating voltage	+U-Hall	Hall sensor supply	U-	Capacitor connector
3	n.c.	Not allocated	RLG2	Hall signal 2	BR	Braking resistor
4	S+	Set value input	RLG1	Hall signal 1		
5	B	Operating mode	L2	Motor phase 2		
6	Ist	Actual speed value	L1	Motor phase 1		
7	GND	Ground	GND-Hall	Ground Hall sensor supply		
8	S-	Ground set value input	RLG3	Hall signal 3		

Subject to alterations

Accessories

Connection cables X3	
Type	Part number
X3 Control plug	194 0017 000

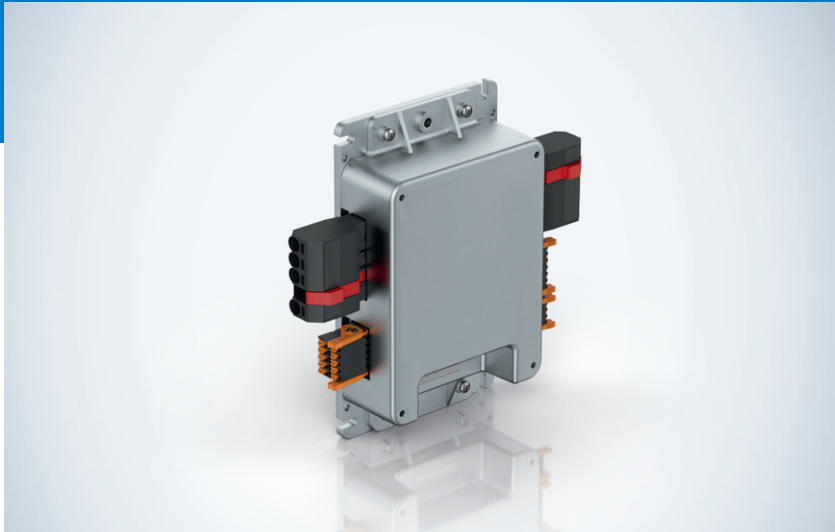


Color assignment		
No.	Color	Function
1	white (AWG 20)	A
2	red (AWG 18)	+U <sub>B</sub>
3	violet (AWG 20)	n.c.
4	green (AWG 20)	S+
5	gray (AWG 20)	B
6	yellow(AWG 20)	Actual
7	black (AWG 18)	GND
8	brown (AWG 20)	S-



# Control electronics VTD-XX.XX-K4S

With speed-, torque- and positioning



## Description

- Operating electronics for driving 3-phase BLDC motors up to 1 000 watt output power
- Four-quadrant controller
- Speed, torque and positioning mode
- Selection of operating modes and parameter setting via RS 485
- User-friendly parameter setting with "Kickstart" PC software
- Integrated brake ballast-control
- Device status notification by 2 LEDs

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

Control electronics

Type		VTD-24.40-K4S	VTD-48.20-K4S
Nominal voltage (power supply $U_N$ )	V DC	24	48
Permissible supply voltage range (U)	V DC	18 ... 30	18 ... 53
Maximum output current (max. 5 sec) <sup>1)</sup>	A		100
Permissible continuous output current <sup>1)</sup>	A	40	20
Nominal voltage (Logic supply $U_L$ )	V DC		24
Logic current draw (at 24 V DC) <sup>2)</sup>	mA		< 100
Maximum commutation frequency	kHz		2
Switching frequency	kHz		20
Minimum connection inductance	mH		0.10
Digital inputs	Number		4
Digital outputs	Number		3
Analog inputs	Number		1
Parameterization interface			RS485
Efficiency (in optimum working range)	%		> 95
Permissible ambient temperature range ( $T_U$ )	°C		-30 ... +40
Permissible ambient humidity <sup>3)</sup>	%		5 ... 85
Protection class			IP 20
Weight	kg		ca. 0.50
Part number	IP 20	994 2440 000	994 4820 000

<sup>1)</sup> Applicable at rated temperature  $T_U = 25^\circ\text{C}$ , Derating at deviating (higher) temperatures

<sup>2)</sup> Current draw without current requirement of digital outputs

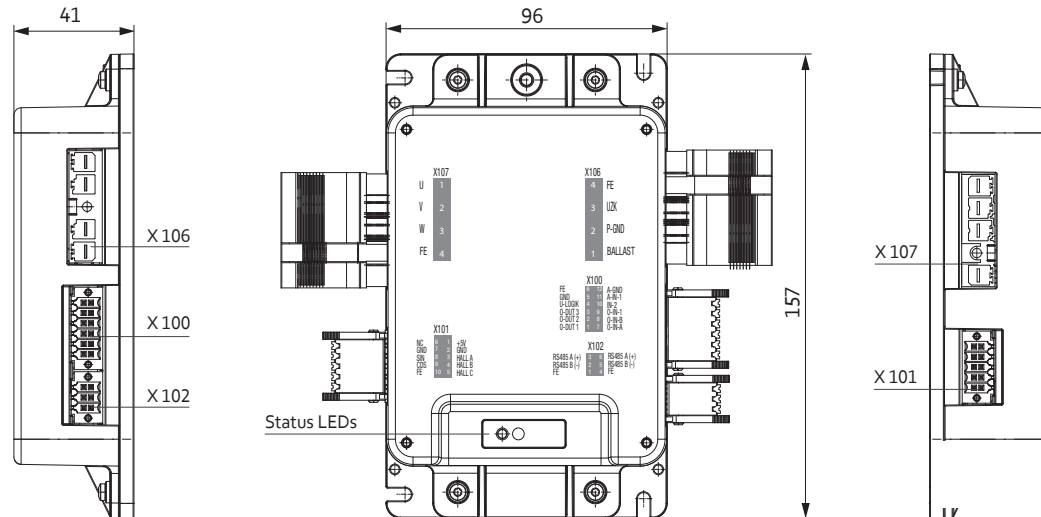
<sup>3)</sup> Condensation not permitted

Subject to alterations



## Technical drawing

All dimensions in mm



Mating connectors are included in delivery

## Electrical connection

	X100 Signals Logic supply		X101 Hall sensors		X102 Parameterization interface		X106 Power supply, controller		X107 Power supply, motor	
Pin	Configu- ration	Function	Configu- ration	Function	Configu- ration	Function	Configu- ration	Function	Configu- ration	Function
1	D-OUT-1	Digital output 1	+U Hall (5V)	Hall sensor supply	FE	Functional earth	Ballast	Ballast resistor	U	Winding connector U
2	D-OUT-2	Digital output 2	GND	Ground Hall-sensors	RS485 B (-)	Parameteriza- tion interface	P-GND	Ground Power supply	V	Winding connector V
3	D-OUT-3	Digital output 3	Hall A	Hall signal A	RS485 A (+)	Parameteriza- tion interface	U <sub>ZK</sub>	Power supply	W	Winding connector W
4	U <sub>Logik</sub>	Logic supply	Hall B	Hall signal B	FE	Functional earth	FE	Functional earth	FE	Functional earth
5	GND	Ground Logic supply	Hall C	Hall signal C	RS485 B (-)	Parameteriza- tion interface				
6	FE	Functional earth	+U <sub>sin/cos</sub> (5V)	supply voltage encoder	RS485 A (+)	Parameteriza- tion interface				
7	D-IN-A	Digital input A	GND	Ground encoder						
8	D-IN-B	Digital input B	SIN	SIN signal encoder						
9	D-IN-1	Digital input 1	COS	COS signal encoder						
10	D-IN-2	Digital input 2	FE	Functional earth						
11	A-IN-1	Analog input 1								
12	A-IN-GND	Analog input 1 Ground								
AWG	22 (0,34mm²)		22 (0,34mm²)		22 (0,34mm²)		8 (10mm² at 40A)		8 (10mm² at 40A)	

Subject to alternations

## Accessories

## Commissioning tool

„driveSTUDIO“ (Page 64)

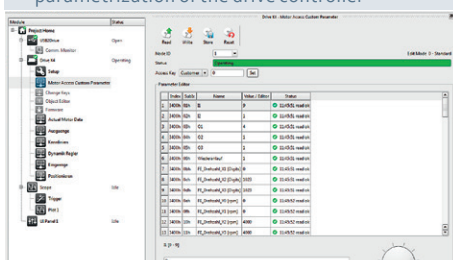
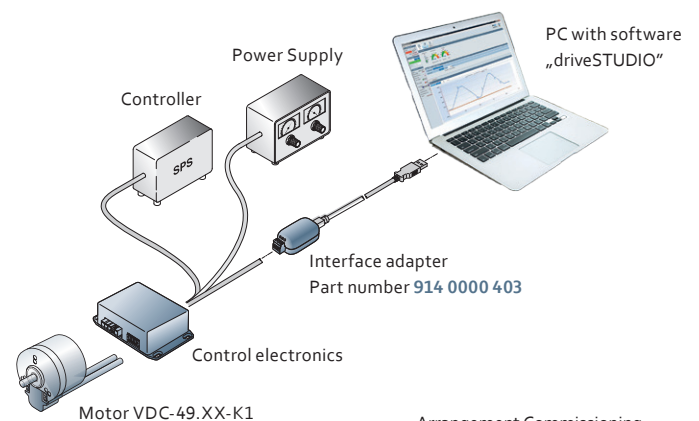
„driveSTUDIO“ PC software for commissioning/  
parametrization of the drive controller

Image of „driveSTUDIO“ PC software



Arrangement Commissioning



# Control electronics VTD-60.13-K5SB

With speed-, torque- and positioning



## Description

- Compact four-quadrant controller for BLDC motors
- Compact four-quadrant controller for BLDC motors
- Integrated digital inputs
- Integrated digital outputs
- Integrated analog inputs
- Overvoltage, undervoltage and overtemperature monitoring
- Device status notification by 3 LEDs (Power, Status, Error)
- Hex switch for setting the device node ID
- Freely programmable due to built in MPU (Motion Process Unit)

More at [www.ebmpapst.com](http://www.ebmpapst.com)

Type	VTD-60.13-K5SB		
Nominal voltage (power supply $U_N$ )	V DC	24	48
Permissible supply voltage range (U)	V DC	9 ... 60	
Maximum output current <sup>1)</sup>	A	50	
Permissible continuous output current <sup>1)</sup>	A	12.5 (at 24V)	12.5 (at 24V)
Nominal voltage (Logic supply $U_L$ )	V DC	9 ... 30	
Logic current draw (at 24 V DC) <sup>2)</sup>	mA	60	
Maximum commutation frequency	kHz	2	
Switching frequency	kHz	32	
Minimum connection inductance	mH	0.20	
Digital inputs	Number	8	
Digital outputs	Number	2	
Analog inputs	Number	2	
Parameterization interface		CANopen	
Efficiency (in optimum working range)	%	95	
Permissible ambient temperature range ( $T_U$ )	°C	0 ... +70	
Permissible ambient humidity <sup>3)</sup>	%	5 ... 85	
Protection class		IP 20	
Weight	kg	ca. 0.31	
Part number	IP 20	994 6013 000	994 6013 000

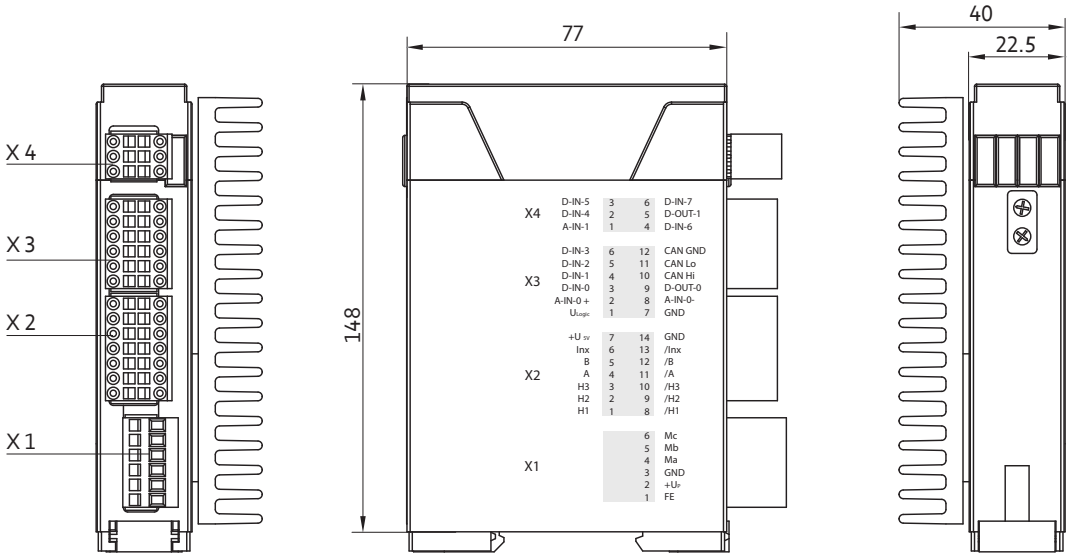
<sup>1)</sup> Applicable at rated temperature  $T_U = 25^\circ\text{C}$ , Derating at deviating (higher) temperatures

<sup>2)</sup> Current draw without current requirement of digital outputs

<sup>3)</sup> Condensation not permitted

Subject to alterations





Mating connectors are included in delivery

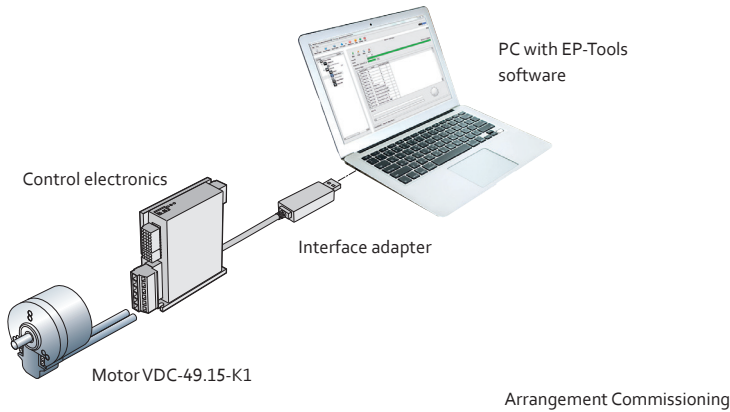
Electrical connection

Motor X1			Hall sensors and encoder X2			I/O's and CAN X3			I/O's X4		
Pin	Configu-ration	Function	Configu-ration	Function		Configu-ration	Function		Configu-ration	Function	
1	FE	Functionale earth	Hall 1	Hall sensor signal 1		U <sub>Logik</sub>	Power supply Electronics		A-IN-1	Analog input 1	
2	+Up	Power supply	Hall 2	Hall sensor signal 2		A-IN-0 +	Analog input 0, plus		D-IN-4	Analog input 4	
3	GND	Ground for power	Hall 3	Hall sensor signal 3		D-IN-0	Digital input 0		D-IN-5	Analog input 5	
4	Ma	Phase A	A	Incremental encoder- A channel		D-IN-1	Digital input 1		D-IN-6	Analog input 6	
5	Mb	Phase B	B	Incremental encoder- B channel		D-IN-2	Digital input 2		D-OUT-1	Digital output 1	
6	Mc	Phase C	Inx	Incremental encoder – index channel		D-IN-3	Digital input 3		D-IN-7	Digital output 7	
7			+U <sub>sv</sub>	5V auxiliary voltage supply (Hall and encoder)		GND	Ground for electronic supply voltage				
8			/H1	Hall sensor signal 1 inverted		A-IN-0 -	Analog input 0, minus				
9			/H2	Hall sensor signal 2 inverted		D-OUT-0	Digital output 0				
10			/H3	Hall sensor signal 3 inverted		CAN Hi	CAN bus high signal				
11			/A	Incremental encoder – A channel inverted		CAN Lo	CAN bus low signal				
12			/B	Incremental encoder – B channel inverted		CAN GND	CAN Ground				
13			/Inx	Incremental encoder – index channel inverted							
14			GND	Ground for auxiliary voltage							

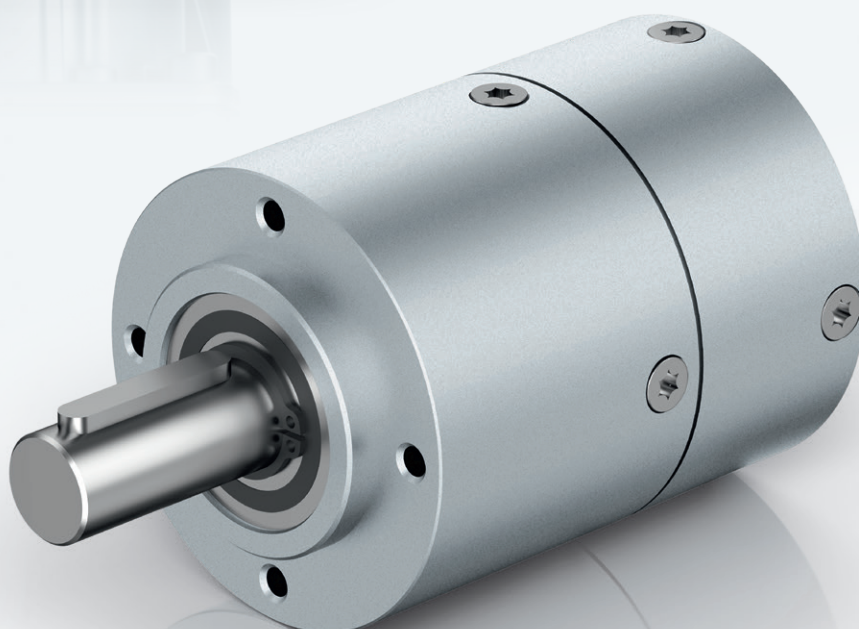
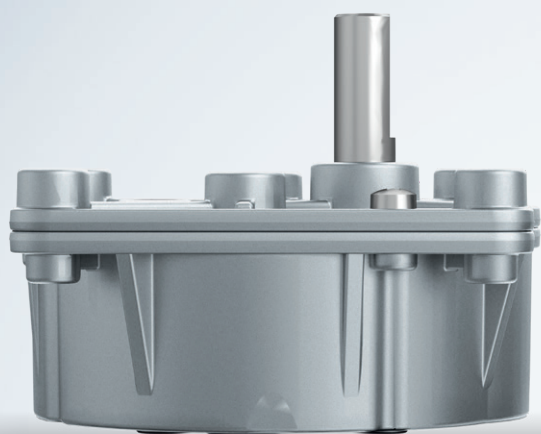
Subject to alterations

Accessories

Commissioning tool  
„epTools“ (Page 65)









# Gearheads

**ebmpapst**

the engineer's choice

	Page
NoiselessPlus 63 (planetary gearhead)	44
Performax® 63 (planetary gearhead)	46
Performax®Plus 63 (planetary gearhead)	48
EtaCrown®75 (crown gearhead)	50
EtaCrown®Plus 63 (crown gearhead)	52
Compactline 90 (spur gearhead)	54
Compactline 91 (spur gearhead)	56
Compactline 92 (spur gearhead)	58
Flatline 85 (spur gearhead)	60



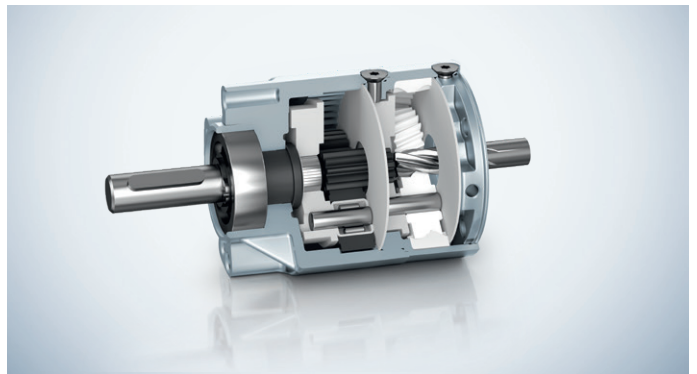
# Information for gearheads

In the gearbox product range, we offer three types of transmission technologies.

These include planetary gearing, crown gearhead units and spur gears, all individually adapted to the requirements of the customer according to the modular principle. Deciding which of these technologies will render the best results for the respective application, ultimately depends on the application itself.

## Planetary gearheads

- Higher reduction ratios within first and second stage
- Very quiet operation
- Extremely high performance
- Compact design
- No offset axle
- Comprehensive range of products with three model types
  - Noiseless Plus – unique quiet operation
  - Performax® – extreme performance



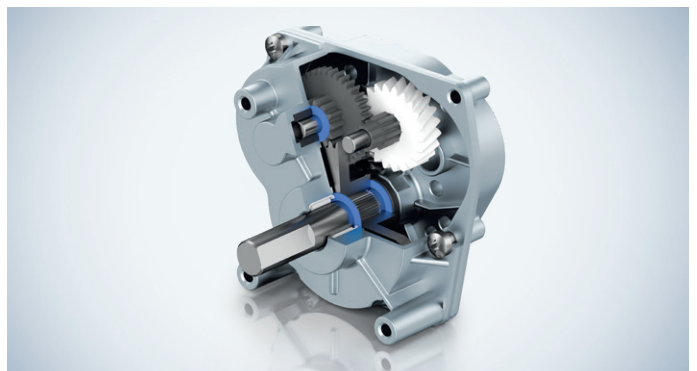
## Crown gearheads

- Outstanding efficiency
- Large reduction ratio range
- No self-locking
- Highest power density
- No offset axle
- Two different model ranges
  - EtaCrown®
  - EtaCrown® Plus



## Spur gearheads

- Highest power density
- Flat, compact design
- Large reduction ratio range
- High radial loads permitted
- Good price/performance ratio
- Two different model ranges
  - Flat-line
  - Compact-line





The comprehensive range of **planetary gearbox** products is used when high power densities are required.

When it comes to achieving high efficiency with minimal noise, the **NoiselessPlus** is the impressive, obvious choice. Its exemplary smooth operation is achieved thanks to extremely sturdy, helical planetary wheels made of high-strength plastic.

**Performax®Plus** delivers smooth operation and high performance. Helical planetary wheels made of high-strength plastic ensure excellent smooth operation in the first stage. The combination with a hardened ring gear in the output stage means that high outputs can be achieved.

ebm-papst impresses with innovative **crown gearhead** technology in its family of crown gearheads.

The **EtaCrown®** is a convincing offering with its wide reduction range and compact design. Space can always be saved during installation thanks to zero axle misalignment with a symmetrical structure. High radial loads can also be incorporated via a double ball bearing on the output shaft.

The **EtaCrown®Plus** requires minimum assembly space while achieving maximum power. Thanks to a downstream planetary stage, it can achieve significantly higher torques compared to the EtaCrown of the same size.

The range of gearboxes is rounded off by the **spur gearhead systems** of the **Flatline** and **Compactline** series.

In the first transmission stage, these have helically toothed plastic wheels, thus achieving optimum noise reduction. The following gear stages are optimally configured in terms of running noise and torque to be transferred. Ground and hardened output shafts and hardened gearwheels are standard in all Flatline series gearheads. Die-cast zinc is used as a housing material.

Gearheads of the Flatline design are particularly suitable for use in applications with limited installation lengths. In drives of the Compactline series, where the wheel widths were dimensioned in order to minimise noise particularly in the first stage, due attention was paid to having the greatest possible wheel width and therefore to a good contact ratio between the motor shaft and the combing gearwheel.

The output shafts of the ebm-papst transmission are generally made of hardened and ground case-hardened steel, meaning that they are particularly durable. Torque is transmitted via a keyway connection as standard.



# Planetary gearhead NoiselessPlus 63



Image of 1-stage gearhead

## Description

- Very quiet operation due to helical-tooth gear stages
- Toothed parts made of plastic with optimized sliding properties ensure smooth operation
- Higher reduction ratios within first and second gear stage
- High radial loads due to double ball bearing in the output shaft
- Flexible connection to customer applications (shaft variants, centering and fastening)

More at [www.ebmpapst.com](http://www.ebmpapst.com)

Type	NoiselessPlus 63.1					NoiselessPlus 63.2			
Reduction ratio	4,30	6,00	11,0	21,0	26,0	47,6	66,0	121	
No. of stages	1	1	1	1	2	2	2	2	
Efficiency	0,90	0,90	0,90	0,90	0,81	0,81	0,81	0,81	
Max. input speed ( $n_1$ )	rpm	6 000							
Rated output torque ( $M_{ab}$ )	Nm	8,99	7,13	3,98	1,32	12,6	14,7	17,5	10,6
Short-term torque ( $M_{max}$ )	Nm	22,5	17,8	9,95	3,30	31,5	36,8	43,8	26,5
Gear play	°	0,2 ... 0,5							
Permissible operating temperature	°C	-20 ... +80							
Operating mode		S1							
Protection class		IP 50							
Weight	kg	0,56	0,56	0,56	0,56	0,80	0,80	0,80	0,80
Shaft load radial / axial	N	50 / 1 000	50 / 1 000	50 / 1 000	100 / 1 000	780 / 1 000	1 000 / 1 000	1 000 / 1 000	1 550 / 1 000
Service life	h	10 000							
Lubrication		Maintenance-free grease lubrication for life							
Installation position		any							
Length	mm	59	59	59	59	91,4	91,4	91,4	91,4

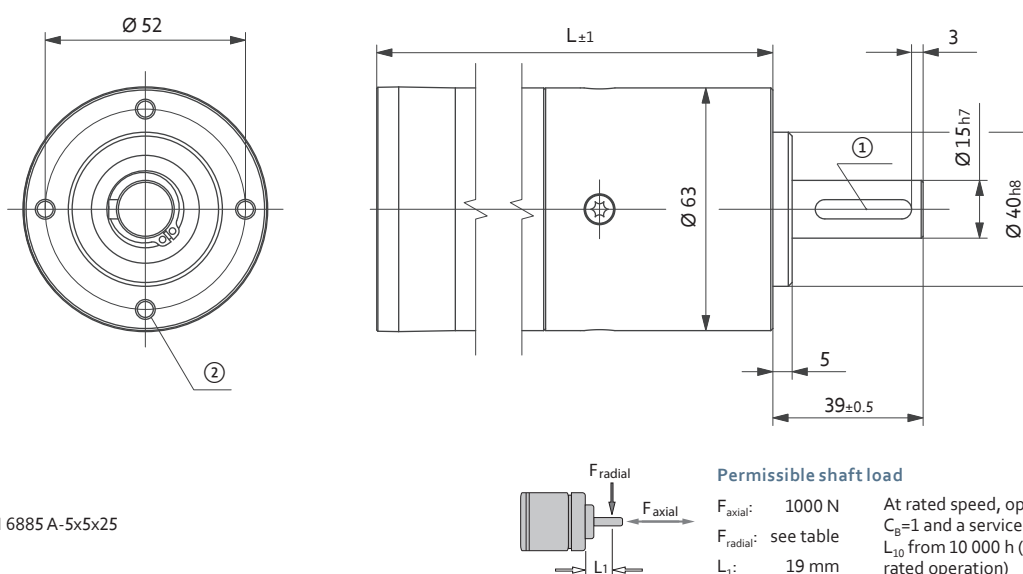
Subject to alterations



## Technical drawing

Image of 1-stage gearhead

All dimensions in mm



## Length motor / gearhead combinations

All dimensions in mm

		Length L		1-stage Reduction ratios				Length L		2-stage Reduction ratios			
		1-stage	4,30	6,00	11,0	21,0		2-stage	26,0	47,6	66,0	121	
VD-49.15-K1-NP63	24V	111	○	•	X	X	143,4	○	•	X	X	X	X
	48V		•	•	X	X				X	X	X	
VDC-49.15-K3-NP63	24V	120	•	•	X	X	152,4	•	•	X	X	X	X
	48V		•	•	X	X				X	X	X	
VDC-49.15-K4-NP63	24V	120	○	•	X	X	143,4	○	•	X	X	X	X
	48V		•	•	X	X				X	X	X	

Subject to alterations

• Standard    ○ Preferred type    X on request



# Planetary gearhead Performax® 63

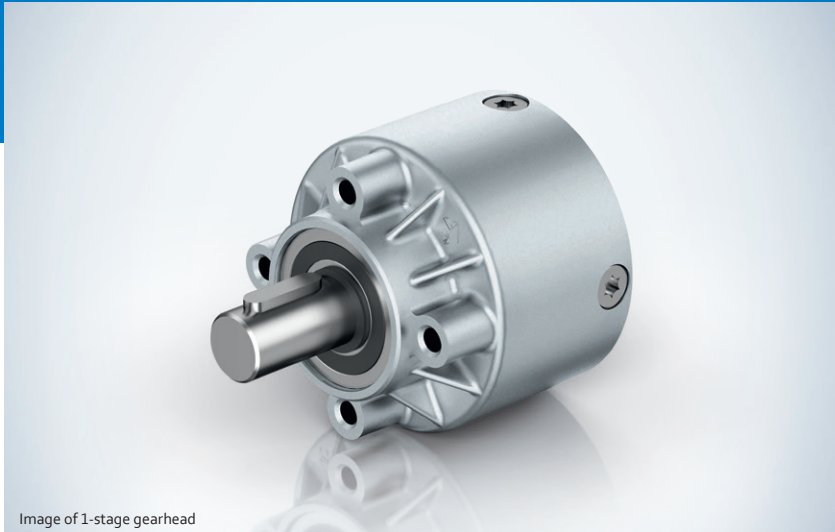


Image of 1-stage gearhead

## Description

- High power density from compact dimensions
- Very quiet operation 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

More at [www.ebmpapst.com](http://www.ebmpapst.com)

Type		Performax® 63.1					Performax® 63.2				
Reduction ratio		5,00	9,00	17,0	21,3	30,0	38,3	54,0	72,3	102	204
No. of stages		1	1	1	2	2	2	2	2	2	2
Efficiency		0,90	0,90	0,90	0,81	0,81	0,81	0,81	0,81	0,81	0,81
Max. input speed ( $n_1$ )	rpm	6 000									
Rated output torque ( $M_{ab}$ )	Nm	2,50	2,00	0,60	9,60	5,50	6,10	5,40	2,10	2,90	6,00
Short-term torque ( $M_{max}$ )	Nm	6,25	5,00	1,50	24,0	13,8	15,3	13,5	5,25	7,25	15,0
Gear play	°	0,7 ... 1,2									
Permissible operating temperature	°C	-20 ... +80									
Operating mode		S1									
Protection class		IP 50									
Weight	kg	0,40	0,40	0,40	0,60	0,60	0,60	0,60	0,60	0,60	0,60
Shaft load radial / axial	N	350 / 500									
Service life	h	5 000									
Lubrication		Maintenance-free grease lubrication for life									
Installation position		any									
Length	mm	45,7	45,7	45,7	67,1	67,1	67,1	67,1	67,1	67,1	67,1

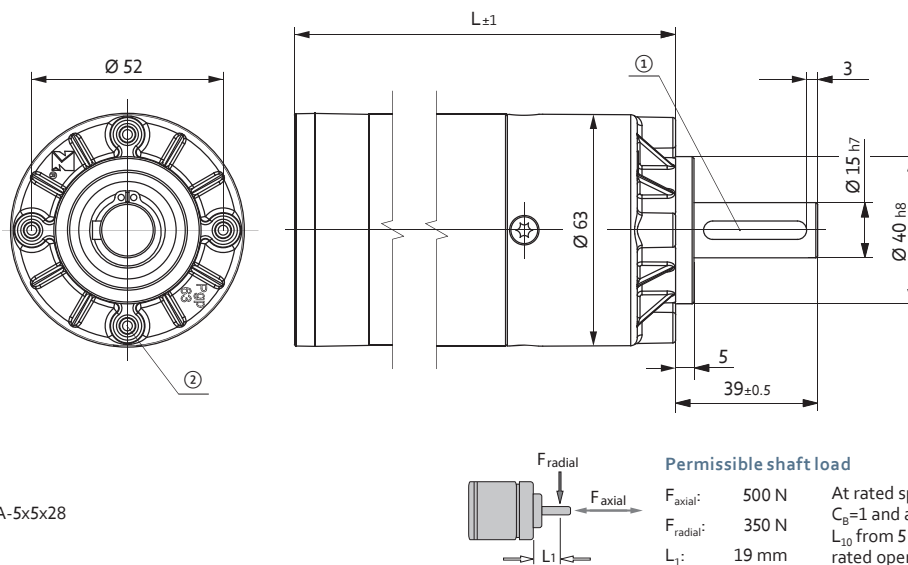
Subject to alterations



## Technical drawing

Image of 1-stage gearhead / 2-stage design completely cylindrical

All dimensions in mm



## Length motor / gearhead combinations

All dimensions in mm

		Length L			1-stage Reduction ratios			Length L			2-stage Reduction ratios		
		1-stage	5,00	9,00	17,00	2-stage	21,3	30,0	38,3	54,0	72,3	102	204
VD-49.15-K1-P63	24V	97,7	○	●	X	119,1	●	○	●	●	X	X	X
	48V		●	●	X		●	●	●	●	X	X	X
VDC-49.15-K3-P63	24V	106,7	●	●	X	128,1	●	●	●	●	X	X	X
	48V		●	●	X		●	●	●	●	X	X	X
VDC-49.15-K4-P63	24V	97,7	○	●	X	119,1	●	○	●	●	X	X	X
	48V		○	●	X		●	○	●	●	X	X	X

Subject to alterations

● Standard    ○ Preferred type    X on request



# Planetary gearhead Performax®Plus 63



Image of 2-stage gearhead

## Description

- High torques thanks to large gearing width in the first gear stage
- Good shock resistance due to housing made of case-hardened steel with linear tooth profile in the output stage
- Very quiet operation 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

More at [www.ebmpapst.com](http://www.ebmpapst.com)

Type		Performax®Plus 63.1					Performax®Plus 63.2					
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	1	1	1	2	2	2	2	2	2	2
Efficiency		0,90	0,90	0,90	0,90	0,81	0,81	0,81	0,81	0,81	0,81	0,81
Max. input speed (n <sub>1</sub> )	rpm	6 000										
Rated output torque (M <sub>ab</sub> )	Nm	6,50	11,9	7,60	4,40	45,2	64,0	28,9	41,0	16,9	23,9	27,4
Short-term torque (M <sub>max</sub> )	Nm	16,3	29,8	19,0	11,0	113	160	72,3	102,5	42,3	59,8	68,5
Gear play	°	0,7 ... 1,2										
Permissible operating temperature °C		-20 ... +80										
Operating mode		S1										
Protection class		IP 50										
Weight	kg	0,66	0,66	0,66	0,66	1,20	1,20	1,20	1,20	1,20	1,20	1,20
Shaft load radial / axial	N	350 / 500										
Service life	h	5 000										
Lubrication		Maintenance-free grease lubrication for life										
Installation position		any										
Length	mm	57,7	57,7	57,7	57,7	79,1	79,1	79,1	79,1	79,1	79,1	79,1

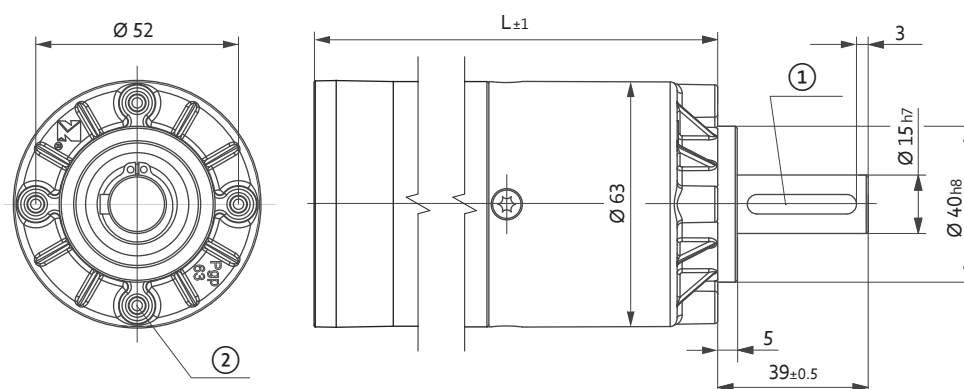
Subject to alterations



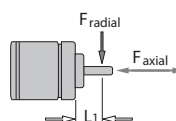
## Technical drawing

Image of 1-stage gearhead / 2-stage design completely cylindrical

All dimensions in mm



- ① Feather key DIN 6885 A-5x5x28  
 ② 4 x M5, 10 deep



## Permissible shaft load

$F_{axial}$ : 500 N At rated speed, operating factor  $C_B=1$  and a service life expectancy  $L_{10}$  from 5 000 h (at  $T_U$  max. 40°C in rated operation)  
 $F_{radial}$ : 350 N  
 $L_1$ : 19 mm

## Length motor / gearhead combinations

All dimensions in mm

		Length L				1-stage Reduction ratios				Length L				2-stage Reduction ratios			
		1-stage	3,20	5,00	9,00	17,0	2-stage	21,3	30,0	38,3	54,0	72,3	102	204			
VD-49.15-K1-PP63	24V	109,7	•	○	•	X	131,1	•	○	•	•	X	X	X			
	48V		•	•	•	X		•	•	•	•	X	X	X			
VDC-49.15-K3-PP63	24V	118,7	•	•	•	X	140,1	•	•	•	•	X	X	X			
	48V		•	•	•	X		•	•	•	•	X	X	X			
VDC-49.15-K4-PP63	24V	118,7	•	○	•	X	140,1	•	○	•	•	X	X	X			
	48V		•	•	•	X		•	•	•	•	X	X	X			

Subject to alterations

• Standard    ○ Preferred type    X on request



# Crown gearhead EtaCrown® 75



Image of 2-stage gearhead

## Description

- Maximum safety in design and operation, as well as optimal vandalism protection; no automatic lock due to high efficiency of the crown 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

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

Type		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	1	1	2	2	2	2
Efficiency		0,90	0,90	0,90	0,81	0,81	0,81	0,81
Max. input speed (n <sub>1</sub> )	rpm	6 000						
Rated output torque (M <sub>ab</sub> )	Nm	6,00	5,00	2,43	10,0	10,0	10,0	10,0
Short-term torque (M <sub>max</sub> )	Nm	15,0	12,5	6,08	25,0	25,0	25,0	25,0
Gear play	°	0,55 ... 1,10						
Permissible operating temperature	°C	-20 ... +80						
Operating mode		S1						
Protection class		IP 50						
Weight	kg	0,90	0,90	0,90	1,30	1,30	1,30	1,30
Shaft load radial / axial	N	390 / 500	380 / 500	370 / 500	450 / 500	460 / 500	580 / 500	700 / 500
Service life	h	5 000						
Lubrication		Maintenance-free grease lubrication for life						
Installation position		any						
Length	mm	91	91	91	133,3	133,3	133,3	133,3

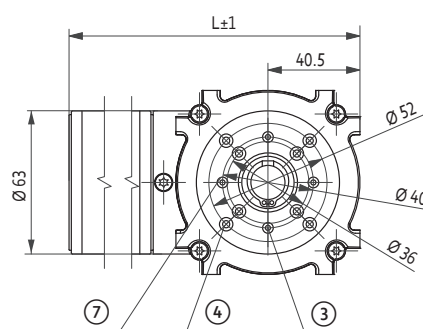
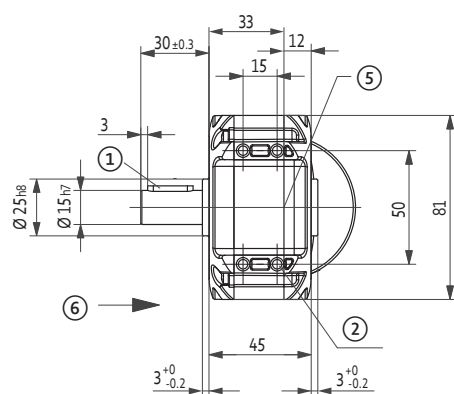
Subject to alterations



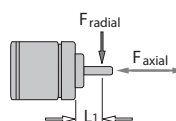
## Technical drawing

Image of 1-stage gearhead with right shaft end (W05)

All dimensions in mm



- ① Feather key DIN 6885 A-5x5x20
- ② 4 x M5, 6,5 deep (on all front faces)
- ③ 4 x M4, 6,5 deep (both sides)
- ④ 8x M5, 6,5 deep
- ⑤ Motor centre point
- ⑥ Preferred direction of load
- ⑦ Without hole at the opposite side

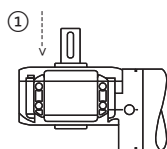


## Permissible shaft load

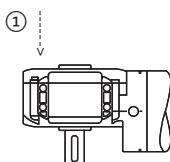
$F_{axial}$ : 500 N  
 $F_{radial}$ : see table  
 $L_1$ : 15 mm

At rated speed, operating factor  $C_B=1$  and a service life expectancy  $L_{10}$  from 5 000 h (at  $T_U$  max. 40°C in rated operation)

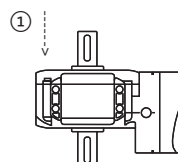
Shaft end, right (W05) (standard)



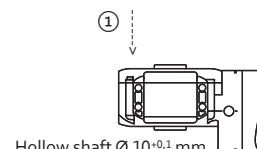
Shaft end, left (W06)



Shaft end, both sides (W07)



Hollow shaft (W08)

Hollow shaft Ø 10<sup>+0,1</sup> mm

① Preferred direction of load

## Length motor / gearhead combinations

All dimensions in mm

		Length L			1-stage Reduction ratios					Length L			2-stage Reduction ratios		
		1-stage			4,10	6,70	10,1			2-stage			20,3	33,3	60,0 113
VD-49.15-K1-EC75	24V	143	○	●			X			185,3	○	○		X	X
	48V		●	●			X				●	●		X	X
VDC-49.15-K3-EC75	24V	152	●	●			X			194,3	●	●		X	X
	48V		●	●			X				●	●		X	X
VDC-49.15-K4-EC75	24V	143	○	●			X			185,3	○	○		X	X
	48V		○	●			X				○	○		X	X

Subject to alterations



Standard



Preferred type



on request



# Crown gearhead EtaCrown®Plus 63

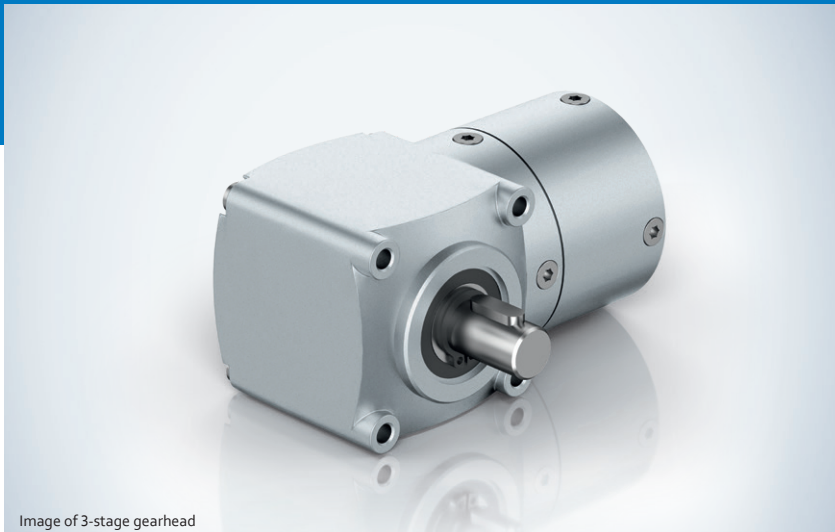


Image of 3-stage gearhead

More at [www.ebmpapst.com](http://www.ebmpapst.com)

## Description

- Compact design due to combination of the crown wheel and planetary stage in one housing
- No automatic lock due to high efficiency of the crown 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 quiet operation 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

Type		EtaCrown®Plus 63.3			
Reduction ratio		54,0	84,8	153	289
No. of stages		3			
Efficiency		0,73			
Max. input speed (n <sub>1</sub> )	rpm	6 000			
Rated output torque (M <sub>ab</sub> )	Nm	40,0	40,0	30,1	29,1
Short-term torque (M <sub>max</sub> )	Nm	100	100	75,3	72,8
Gear play	°	0,7 ... 1,2			
Permissible operating temperature	°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			
Length	mm	116,3			

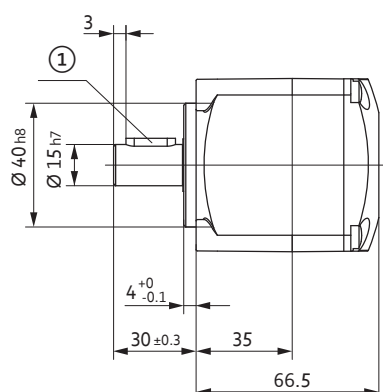
Subject to alterations



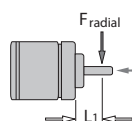
## Technical drawing

Image of 3-stage gearhead

All dimensions in mm



- ① Feather key DIN 6885 A-5x5x20  
 ② 4 x M5, 10 deep



## Permissible shaft load

$F_{\text{axial}}$ : 300 N At rated speed, operating factor  $C_B=1$  and a service life expectancy  $L_{10}$  from 5 000 h (at  $T_U$  max. 40°C in rated operation)  
 $F_{\text{radial}}$ : 600 N  
 $L_1$ : 15 mm

## Length motor / gearhead combinations

All dimensions in mm

		Length L	3-stage Reduction ratios			
		3-stage	54,0	84,8	153	289
VD-49.15-K1-EP63	24V	168,3	○	○	X	X
	48V		●	●	X	X
VDC-49.15-K3-EP63	24V	177,1	●	●	X	X
	48V		●	●	X	X
VDC-49.15-K4-EP63	24V	168,3	○	○	X	X
	48V		○	○	X	X

Subject to alterations

● Standard ○ Preferred type X on request



# Spur gearhead Compactline 90



## Description

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

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

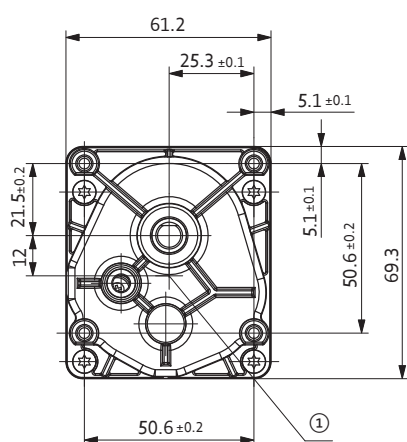
Type		Compactline 90.2			Compactline 90.3		Compactline 90.4	
Reduction ratio		16	32,0	57,8	79,1	121,6	189,3	368
No. of stages		2	2	3	3	3	4	4
Efficiency		0,81	0,81	0,73	0,73	0,73	0,66	0,66
Max. input speed (n <sub>1</sub> )	rpm	4 000						
Rated output torque (M <sub>ab</sub> )	Nm	1,90	3,80	6,20	7,00	7,00	9,00	9,00
Short-term torque (M <sub>max</sub> )	Nm	4,75	9,50	15,50	17,5	17,5	22,5	22,5
Gear play	°	0,70 ... 1,60						
Permissible operating temperature	°C	-20 ... +80						
Operating mode		S1						
Protection class <sup>1)</sup>		IP 50						
Weight	kg	0,30	0,30	0,35	0,35	0,35	0,40	0,40
Shaft load radial / axial	N	120 / 40						
Service life	h	5 000						
Lubrication				Maintenance-free grease lubrication for life				
Installation position		any						
Length	mm	40,5						

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side  
Subject to alterations

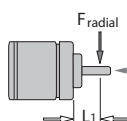
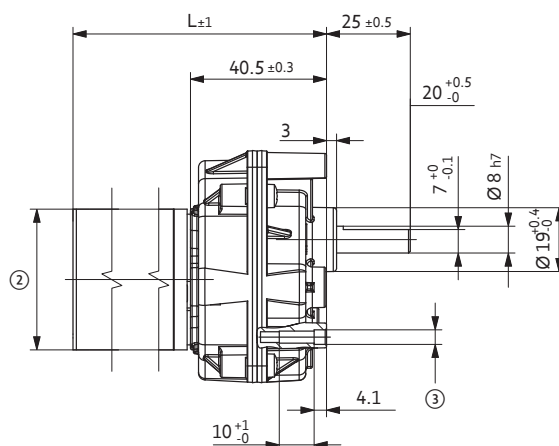


## Technical drawing

All dimensions in mm



- ① Motor centre point
- ② Motor
- ③ 4 x M4



## Permissible shaft load

At rated speed, operating factor  $C_B=1$  and a service life expectancy  $L_{10}$  from 5 000 h (at  $T_U$  max. 40°C in rated operation)

$F_{axial}$ : 40 N  
 $F_{radial}$ : 120 N  
 $L_1$ : 17 mm

## Length motor / gearhead combinations

All dimensions in mm

			Length L	2-stage Reduction ratios		3-stage Reduction ratios		4-stage Reduction ratios		
				16,0	32,0	57,8	79,1	121,6	189,3	368
VD-43.10-K1-C90	24V	81	●	●	●	●	●	X	X	X
VDC-43.10-K3-C90	24V	82	●	●	●	●	●	X	X	X
VD-54.14-K1-C90	24V	84	●	●	●	●	●	X	X	X
VDC-54.14-K3-C90	24V	84	●	●	●	●	●	X	X	X

Subject to alterations



Standard



Preferred type



on request



# Spur gearhead Compactline 91



## Description

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

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

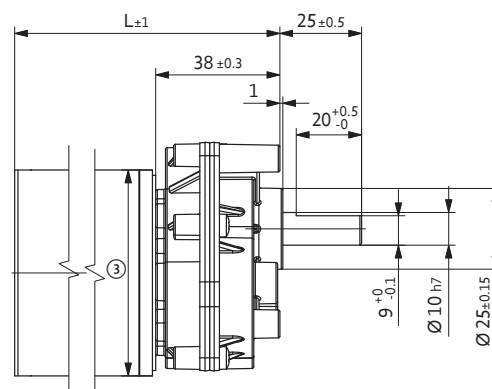
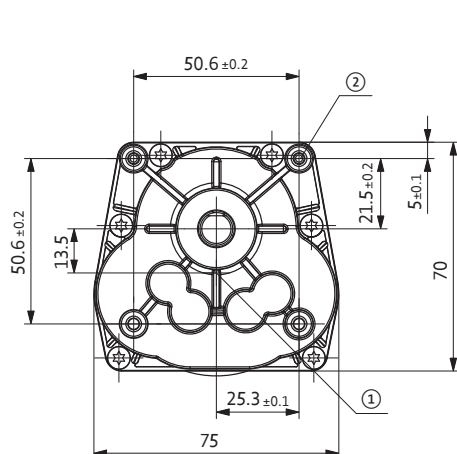
Type	Compactline 91.2					Compactline 91.3		
Reduction ratio (for motor 43.10 / 54.14)		11,3		26,4		38,6	117,1	165,8
No. of stages (for motor 49.15)	9,20		18,4		27,6			
No. of stages	2	2	2	2	2	2	3	3
Efficiency	0,81	0,81	0,81	0,81	0,81	0,81	0,73	0,73
Max. input speed (n <sub>1</sub> )	rpm	4 000						
Rated output torque (M <sub>ab</sub> )	Nm	7,00	7,00	7,00	7,00	7,00	9,00	9,00
Short-term torque (M <sub>max</sub> )	Nm	17,5	17,5	17,5	17,5	17,5	22,5	22,5
Gear play	°	0,70 ... 1,20						
Permissible operating temperature	°C	-20 ... +80						
Operating mode	S1							
Protection class <sup>1)</sup>	IP 50							
Weight	kg	0,30						
Shaft load radial / axial	N	150 / 50						
Service life	h	5 000						
Lubrication	Maintenance-free grease lubrication for life							
Installation position	any							
Length	mm	38						

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side  
Subject to alterations

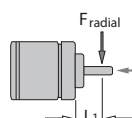


## Technical drawing

All dimensions in mm



- ① Motor centre point
- ② 4x M4, 10 deep
- ③ Motor



## Permissible shaft load

At rated speed, operating factor  $C_B=1$  and a service life expectancy  $L_{10}$  from 5 000 h (at  $T_U$  max. 40°C in rated operation)

$F_{axial}$ : 50 N  
 $F_{radial}$ : 150 N  
 $L_1$ : 17 mm

## Length motor / gearhead combinations

All dimensions in mm

Length L			2-stage Reduction ratios						3-stage Reduction ratios	
			9,20	11,3	18,4	26,4	27,6	38,6	117,1	165,8
VD-43.10-K1-C91	24V	79	—	●	—	●	—	●	X	X
VDC-43.10-K3-C91	24V	79	—	●	—	●	—	●	X	X
VD-54.14-K1-C91	24V	81	—	●	—	●	—	●	X	X
VDC-54.14-K3-C91	24V	81	—	●	—	●	—	●	X	X
VDC-49.15-K3-C91	24V	99	●	—	●	—	●	—	—	—
	48V		X	—	X	—	X	—	—	—
VDC-49.15-K4-C91	24V	99	X	—	X	—	X	—	—	—
	48V		X	—	X	—	X	—	—	—

Subject to alterations

• Standard    ○ Preferred type    X on request    — not available



# Spur gearhead Compactline 92



## Description

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

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

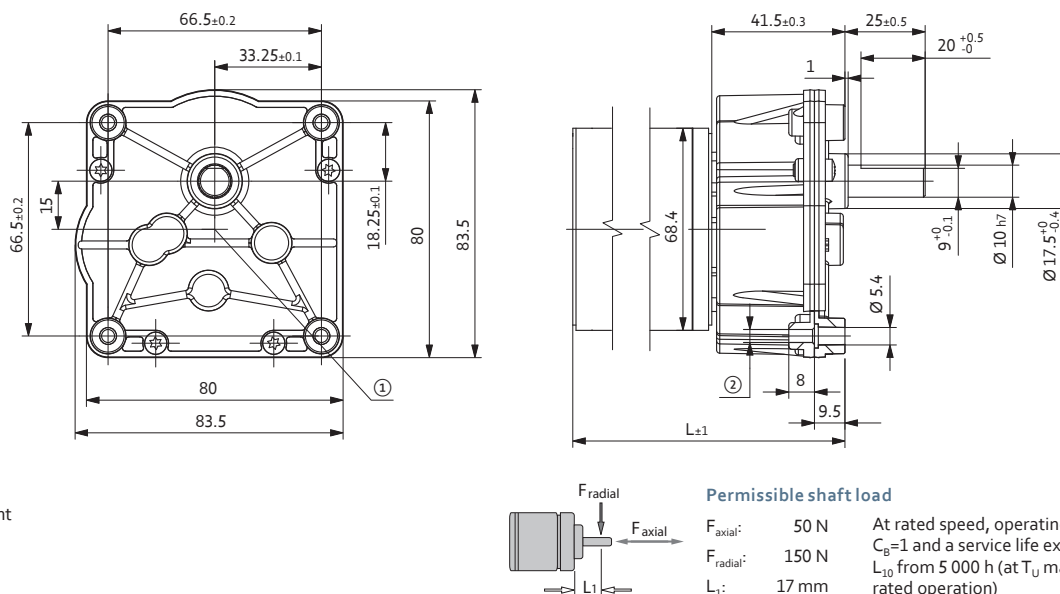
Type		Compactline 92.2			Compactline 92.3	
Reduction ratio		15,5	22,2	32,4	75,6	163
No. of stages		2	2	2	3	3
Efficiency		0,81	0,81	0,81	0,73	0,73
Max. input speed (n <sub>1</sub> )	rpm			4 000		
Rated output torque (M <sub>ab</sub> )	Nm	3,9	4,3	6,3	13,2	15,0
Short-term torque (M <sub>max</sub> )	Nm	9,75	10,8	15,8	33,0	37,5
Gear play	°			0,70 ... 1,20		
Permissible operating temperature	°C			-20 ... +80		
Operating mode				S1		
Protection class <sup>1)</sup>				IP 50		
Weight	kg	0,40	0,40	0,40	0,50	0,50
Shaft load radial / axial	N			150 / 50		
Service life	h			5 000		
Lubrication		Maintenance-free grease lubrication for life				
Installation position				any		
Length	mm			41,5		

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side  
Subject to alterations



## Technical drawing

All dimensions in mm



- ① Motor centre point  
② 4x M5

## Length motor / gearhead combinations

All dimensions in mm

Length L			2-stage Reduction ratios			3-stage Reduction ratios	
2/3-stufig			15,5	22,2	32,4	75,6	163
VD-54.14-K1-C92	24V	85	X	X	•	•	X
VDC-54.14-K3-C92	24V	85	X	X	X	X	X

Subject to alterations

•	Standard	○	Preferred type	X	on request
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# Spur gearhead Flatline 85



## Description

- 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

More at

[www.ebmpapst.com](http://www.ebmpapst.com)

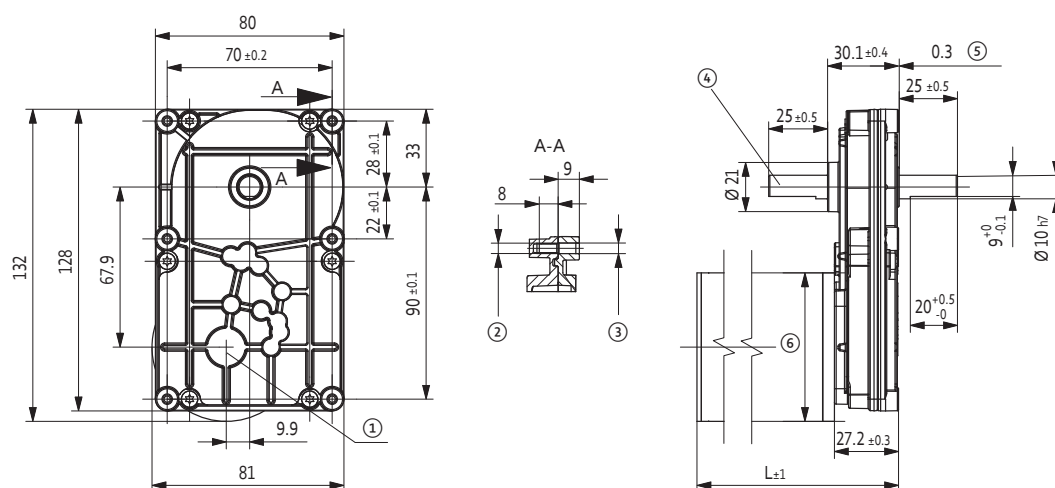
Type	Flatline 85.3								Flatline 85.4			
Reduction ratio	8,20	12,3	27,6	40,3	64,0	101,8	136,5	189	304	454	688	1 030
No. of stages	3	3	3	3	3	3	3	3	4	4	4	4
Efficiency	0,73	0,73	0,73	0,73	0,73	0,73	0,73	0,73	0,66	0,66	0,66	0,66
Max. input speed (n <sub>1</sub> )	rpm	4 000										
Rated output torque (M <sub>ab</sub> )	Nm	1,90	2,80	6,30	9,20	14,6	23,2	25,0	25,0	30,0	30,0	30,0
Short-term torque (M <sub>max</sub> )	Nm	4,80	7,00	15,8	23,0	36,0	58,0	62,0	62,0	75,0	75,0	75,0
Gear play	°	0,80 ... 1,60										
Permissible operating temperature	°C	-20 ... +80										
Operating mode	S1											
Protection class <sup>1)</sup>	IP 50											
Weight	kg	0,50										
Shaft load radial / axial	N	150 / 50										
Service life	h	5 000										
Lubrication	Maintenance-free grease lubrication for life											
Installation position	any											
Length	mm	30,1										

<sup>1)</sup> Classification of protection class refers to installed state with sealing on the flange side  
Subject to alterations

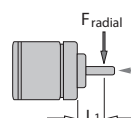


## Technical drawing

All dimensions in mm



- ① Motor centre point
- ② 6x M4
- ③ 6x Ø 4,5
- ④ Output shaft on opposite side, optional Order add-on: W03
- ⑤ projection over the fixing area
- ⑥ Motor



## Permissible shaft load

$F_{axial}$ :	50 N	At rated speed, operating factor $C_B=1$ and a service life expectancy $L_{10}$ from 5 000 h (at $T_U$ max. 40°C in rated operation)
$F_{radial}$ :	150 N	
$L_1$ :	17 mm	

## Length motor / gearhead combinations

All dimensions in mm

Length L			3-stage Reduction ratios							4-stage Reduction ratios				
			8,20	12,3	27,6	40,3	64,0	101,8	136,5	189	304	454	688	1 030
VD-54.14-K1-F85	24V	70	•	•	•	•	•	•	•	X	X	X	X	X
VDC-54.14-K3-F85	24V	70	X	X	X	X	X	X	X	X	X	X	X	X
VDC-49.15-K3-F85	24V	88	•	•	•	•	•	•	•	X	X	X	X	X
	48V		X	X	X	X	X	X	X	X	X	X	X	X
VDC-49.15-K4-F85	24V	88	X	X	X	X	X	X	X	X	X	X	X	X
	48V		X	X	X	X	X	X	X	X	X	X	X	X

Subject to alterations

•	Standard	○	Preferred type	X	on request
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## Order add-on for motor mounting position

Gearhead	VDC-49.15				VDC-54.14			
	C02 (Standard)	C02-K02	C02-K03	C02-K04	K01 (Standard)	K02	K03	K04







# Accessories

**ebmpapst**

the engineer's choice

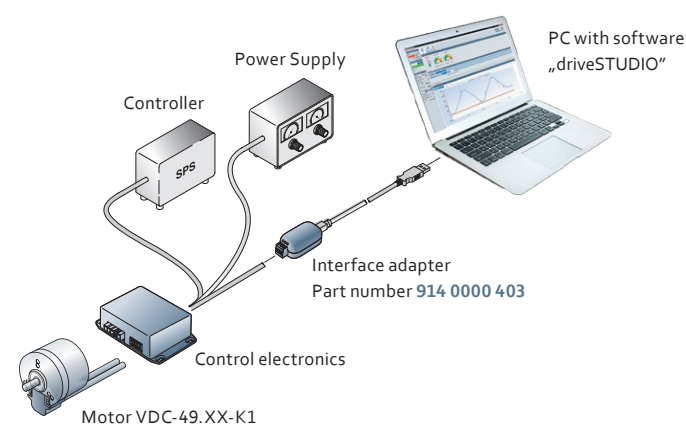
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Commissioning tools	64
Accessories	66



# Commissioning tools

## K4

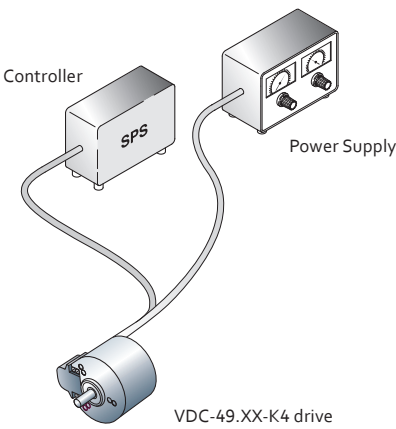
### Parameterization and commissioning



Arrangement Commissioning

### Automatic operation

Automatic operation with stored parameters and integrated control



The RS485 interface serves as an interface for parameterization and diagnosis. It can be operated using the freely available “driveSTUDIO” PC software. This requires a PC and the ebm-papst USB-RS485 adapter. Load your detailed operating manual and the PC software “driveSTUDIO” under [www.ebmpapst.com](http://www.ebmpapst.com).



Interface adapter for „driveSTUDIO“ PC software	Part number
USB-RS485-adapter	914 0000 403

Electrical connection	
PIN	Configuration
A	RS485+
B	RS485-
X	--

### Functional description of the LED displays

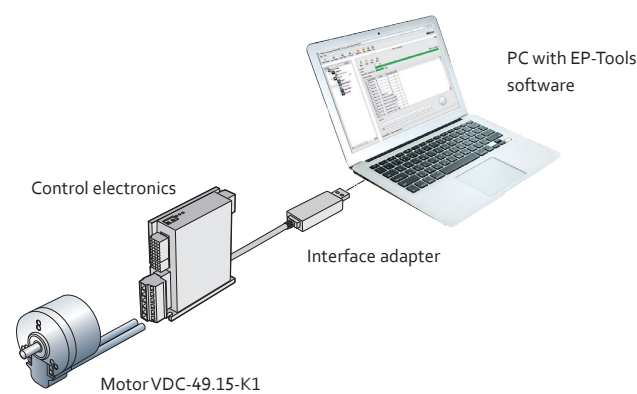
LED name	Color	Display	Function assignment
TxD	red	flashes	Flashes with outgoing message
		does not light up	No outgoing message
RxD	green	flashes	Flashes with outgoing message
		does not light up	No outgoing message
ON	orange	lights up	Normal operation



# Commissioning tools

## K5

### Parameterization and commissioning



Arrangement Commissioning

The CAN interfac serves as an interface for parameterization, process and diagnosis. This requires a PC and the ebm-papst USB CAN adapter. It can be operated using the freely available „epTools“ PC software. Load your detailed operating manual and the PC software “epTools” under [www.ebmpapst.com](http://www.ebmpapst.com).

Electrical connection	
X1	Configuration
1	reserved
2	CAN Hi
3	CAN Lo
4	reserved
5	CAN GND



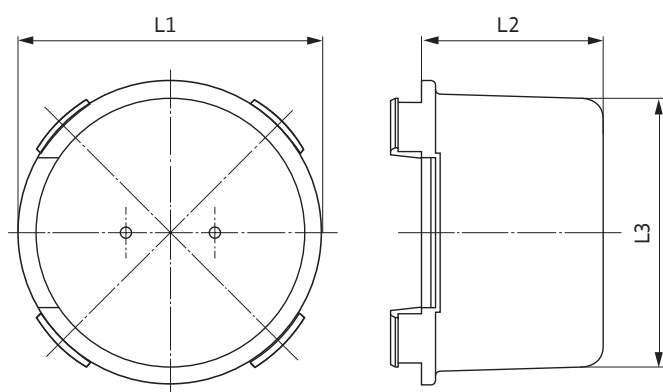
Commissioning tool for "EPTools" PC software	Part number
USB für CANStick	914 0000 401

Functional description of the LED displays			
LED name	Color	Display	Function assignment
LED0 „Power“	green	lights up	Normal operation
		does not light up	No power supply
		flashes	Bootloader mode (no firmware)
LED1 „State“	yellow	does not light up	Normal operation
		flashes	Bootloader mode (flashes with incoming message)
LED2 „Error“	red	lights up	Error
		does not light up	No error (normal operation)
LED3 „Rx“	green	flashes	Flashes with incoming message
		does not light up	No incoming message
LED4 „Tx“	yellow	flashes	Flashes with outgoing message
		does not light up	No outgoing message



## Rotor protection cap

All dimensions in mm

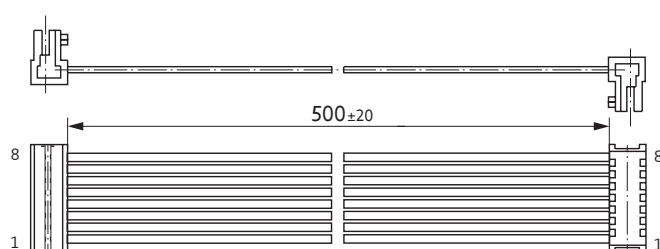


Protection cap				
For type	L1	L2	L3	Part number
VD-35.0X	57	27.4	49.5	194 3506 000
VD-43.10	65	38.8	57.4	194 4310 000
VD-54.14	82	42.0	74.4	194 5414 000



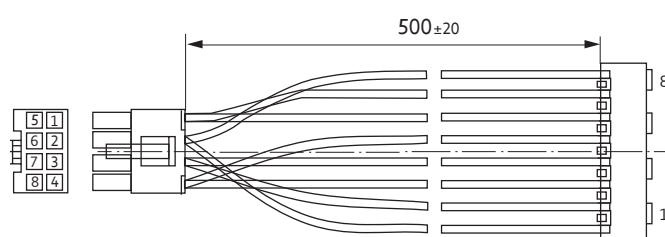
## Technical drawing connection cables K1

All dimensions in mm



8 single wires / AWG 22

Connection cables	
For type	Part number
VD-35.06-K1	194 0010 000
VD-43.10-K1	

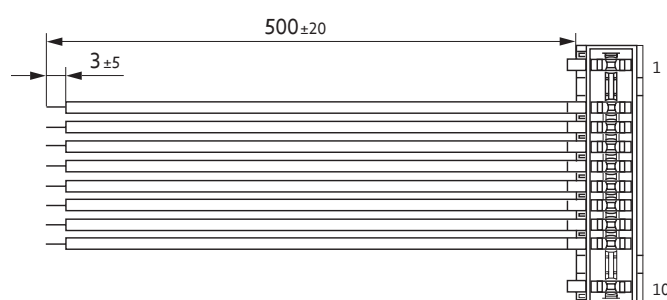


8 single wires / AWG 20

Connection cables	
For type	Part number
VD-54.14-K1	194 0012 000

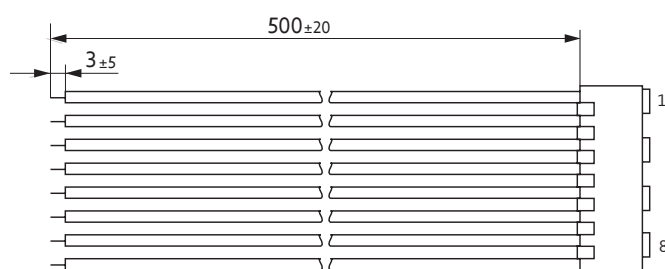
## Technical drawing connection cables K3

All dimensions in mm



8 single wires / AWG 22

Connection cables	
For type	Part number
VDC-43.10-K3	194 0009 000



8 single wires / AWG 20

Connection cables	
For type	Part number
VDC-54.14-K3	194 0014 000



# 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/days					
	even	gradual	sudden	3 h	8 h	24 h	3 h	8 h	24 h
				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 over-loading 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 $\eta$ (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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