K4 drive systems
Brilliantly versatile

Drive solutions | Industrial drive engineering 2017-11

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The engineer's choice

GREEN TECH

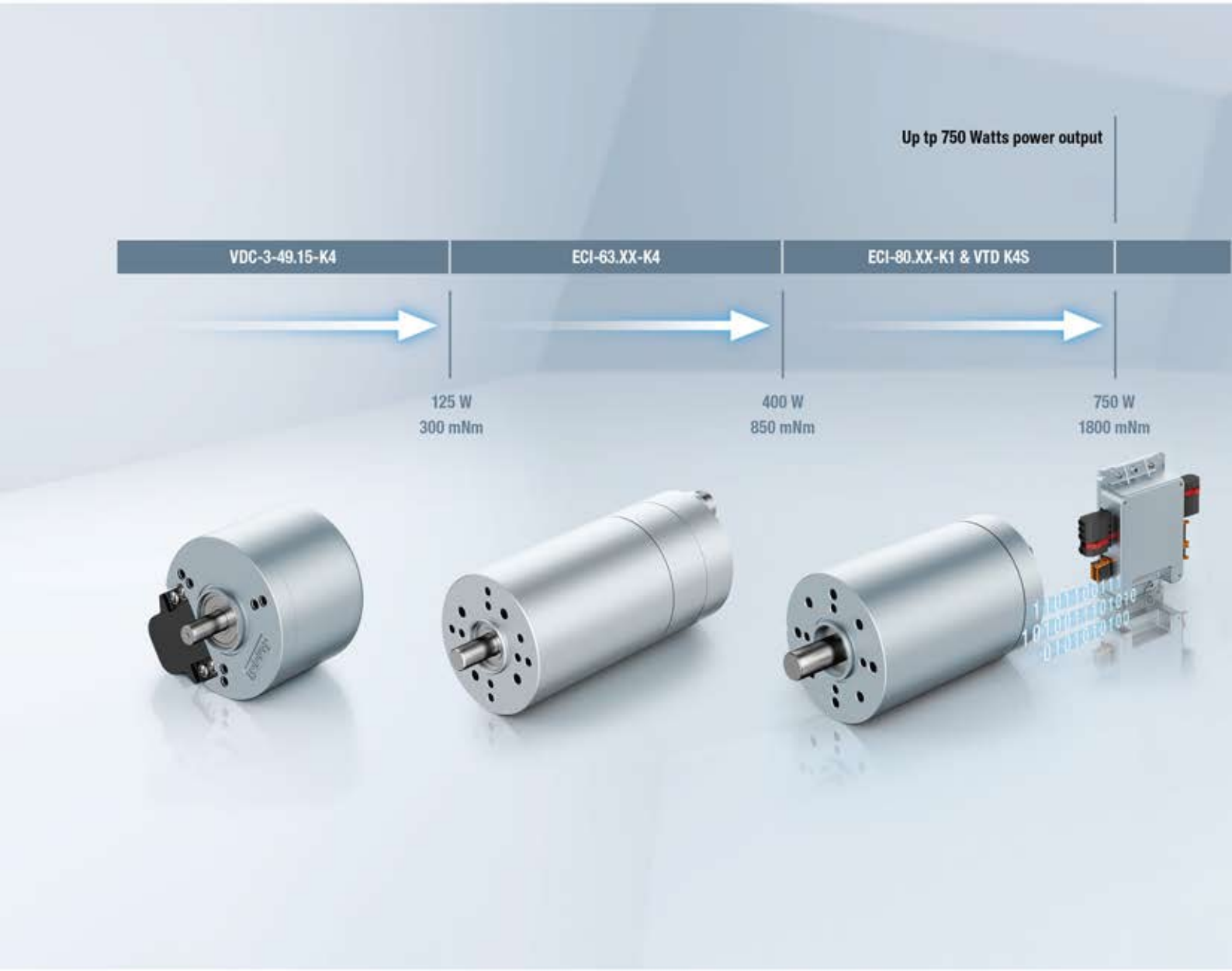
The K4 can do (almost) everything ...

Basic functions of K4 electronics

- Speed, torque and positioning control for BLDC motors

Benefits for you with K4 electronics

- Excellent control mode using field-oriented control
- Choice of operating modes and parameters using RS485
- Extensive interface with various inputs and outputs
- Activation of the power amplifier via digital input
- Integrated braking chopper function
- Set rotation speed control range from n = 0 U/min (with holding torque) up to max. speed (depending on motor)
- High efficiency and power density in compact construction



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K4 motors.

VDC-49.15-K4	8
ECI-63.XX-K4	10

VDC motor.

VDC-49.15-K4

- 3-phase external rotor motor 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

Nominal data

Type		VDC-49.15-K4-B00	VDC-49.15-K4-D00
Nominal voltage (U_N)	V DC	24	48
Nominal speed (n_N)*	rpm	4 000	
Nominal torque (M_N)*	mNm	235	300
Nominal current (I_N)*	A	5.20	3.20
Nominal output power (P_N)*	W	99	126
Starting torque (M_{max})	mNm	705	900
Permissible peak current (I_{max})**	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)	kgm² x10⁻⁶	108	
Overload protection		integrated	
Permissible ambient temperature range (T_U)	°C	0 ... +40	
Weight	kg	0.59	
Order no. (cable type)***	IP 54	937 4915 400	937 4915 402

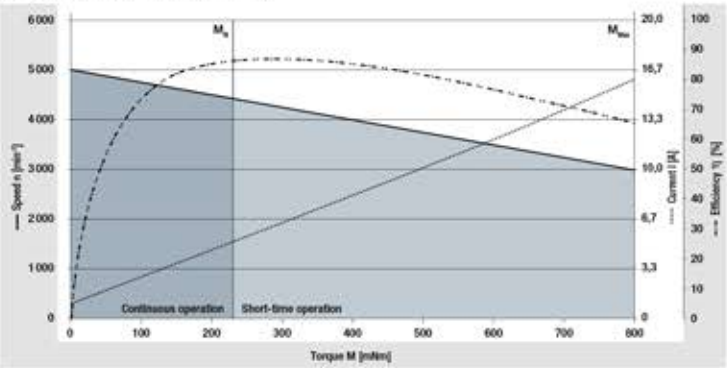
Subject to alterations

Preferred type: ready to ship in 48 hours

* At T_U max. 40°C
** Permissible time for peak current: max. 1 sec. – to be repeated only after complete cool down
*** Classification of protection class refers to installed state with sealing on the flange side

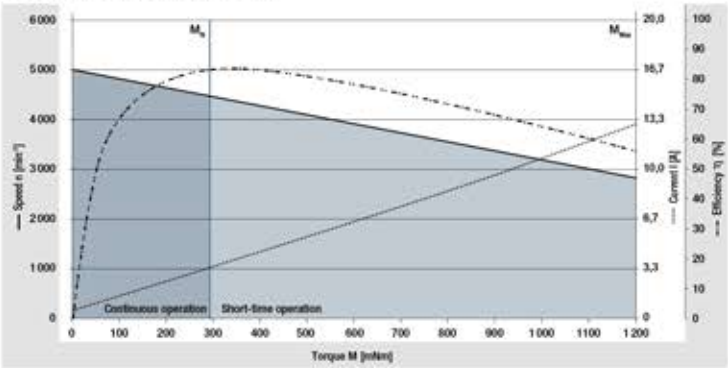
Characteristic curve

VDC-49.15-K4-B00 (at 25°C)



[1] Nominal data, see table

VDC-49.15-K4-D00 (at 25°C)



[1] Nominal data, see table

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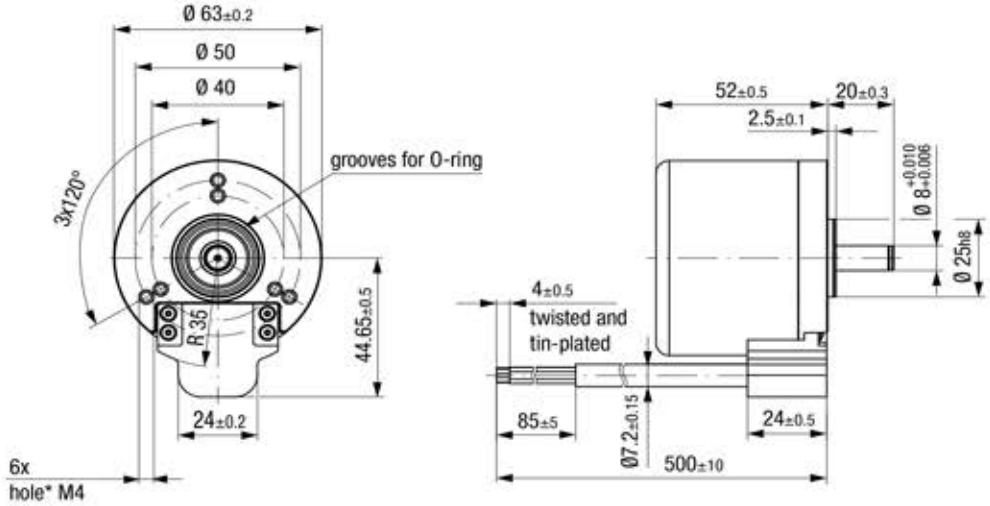
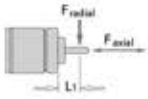
Technical drawing

All dimensions in mm





F_{axial}	20 N
F_{radial}	60 N
L1	10 mm

Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) of 20 000 h (at T_U max. 40°C)

* For thread-rolling screws according to DIN 7500

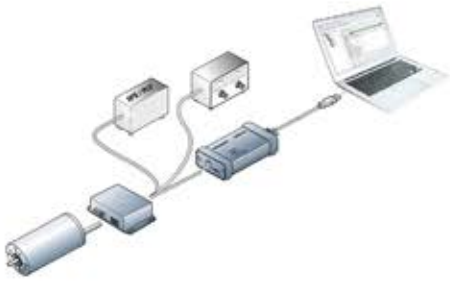
Electrical connection / cable with open wires

	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	
	gray / pink	RS485 B (–)	Progr. bus	
	red / blue	U_{Logic}	Logic power supply (24 V)	
Power	gray	Ballast	Ballast resistor	16
	brown	U_{ZK}	Power supply	
	black	GND	Power / signal GND	

Modular construction kit

Commissioning tool

"Kickstart"



Basic motor

Planetary gearheads

- NoiselessPlus 63
- Performax® 63
- Performax®Plus 63

Crown gearheads

- EtaCrown® 75
- EtaCrown®Plus 63

Spur gearheads

- Compactline 91
- Flatline 85

ECI motor.

ECI-63.XX-K4

- Drive with completely integrated 4Q operation and control electronics
- Speed, torque or position mode possible
- Selection of operating modes and parameter setting via RS485
- Extensive interface with various inputs and outputs
- Output stage enabled via digital input
- Integrated brake chopper
- Speed set values from n=0 with holding torque up to 5 000 rpm
- Excellent control behavior via field-oriented control with sine commutation
- High efficiency and high power density realized in a compact design
- User-friendly parameter setting with "Kickstart" PC software

Nominal data

Type		ECI-63.20-K4 -B00	ECI-63.20-K4 -D00	ECI-63.40-K4 -B00	ECI-63.40-K4 -D00	ECI-63.60-K4 -D00
Nominal voltage (U_N)	V DC	24	48	24	48	48
Permissible supply voltage range (U_{ZK})	V DC	18 ... 30	18 ... 53	18 ... 30	18 ... 53	18 ... 53
Max. reverse voltage	V DC	35	58	35	58	58
Nominal speed (n_N)	rpm	4 000				
Nominal torque (M_N)**	mNm	425	450	600	750	850
Nominal current (I_N)**	A	8.50	5.40	12.3	7.20	8.60
Nominal output power (P_N)**	W	178	188	251	314	356
Starting torque (M_{max})	mNm	1 480	1 890	1 500	3 000	2 550
Speed at no-load operation (n_L)	rpm	5 800	5 800	5 900	5 800	6 000
No-load current (I_L)	A	0.50	0.50	0.90	0.50	0.60
Recommended speed control range	rpm	0 ... 5 000				
Set value input		analog / PWM / frequency / digital				
Rotor moment of inertia (J_R)	$kgm^2 \times 10^{-6}$	19	19	38	38	57
Function for motor protection at stall		thermal				
Overload protection		integrated				
Permissible ambient temperature range (T_U)	°C	0 ... +40				
Weight	kg	0.85	0.85	1.15	1.15	1.50
Order no. (wire interface)*	IP 40	932 6320 403	932 6320 405	932 6340 403	932 6340 405	932 6360 405
Order no. (connector interface)*	IP 54	932 6320 400	932 6320 402	932 6340 400	932 6340 402	932 6360 402

Subject to alterations

Preferred type: ready to ship in 48 hours

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

** At T_U max. 40°C

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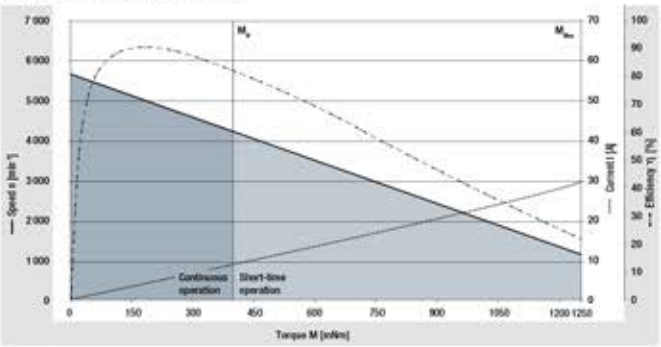
Characteristic curve

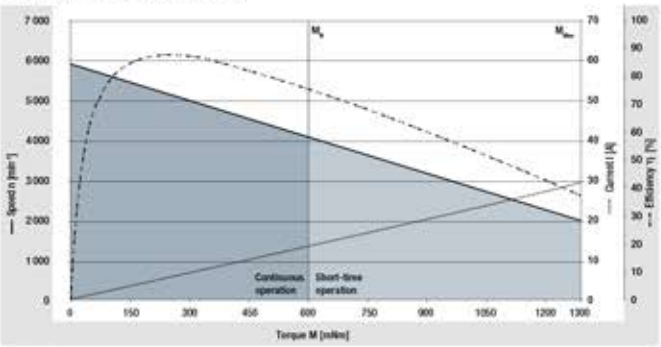
ECI-63.20-K4, 24 V (at 25°C)



[1] Nominal data, see table

Characteristic curve 48 V on request

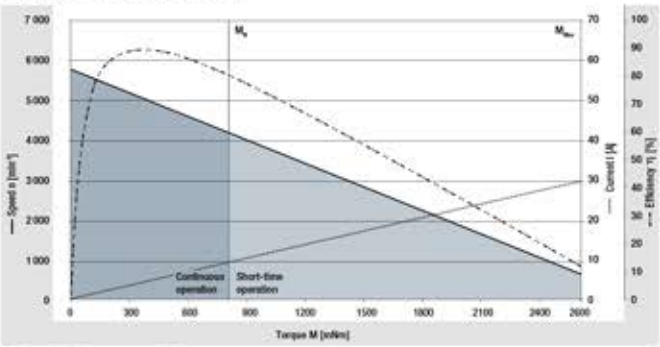
ECI-63.40-K4, 24 V (at 25°C)



[1] Nominal data, see table

Characteristic curve 48 V on request

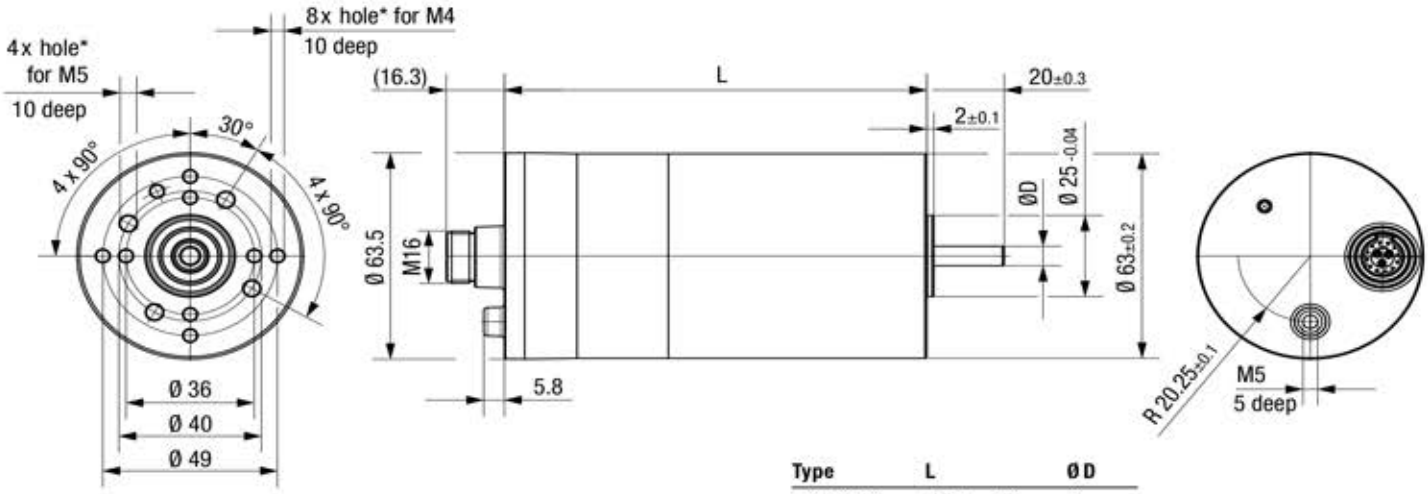
ECI-63.60-K4, 48 V (at 25°C)



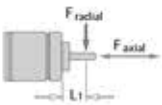
[1] Nominal data, see table

Technical drawing

All dimensions in mm



Type	L	Ø D
ECI-63.20	118.5 ± 0.3	6_{g5}
ECI-63.40	138.5 ± 0.3	6_{g5}
ECI-63.60	158.5 ± 0.3	10_{g5}

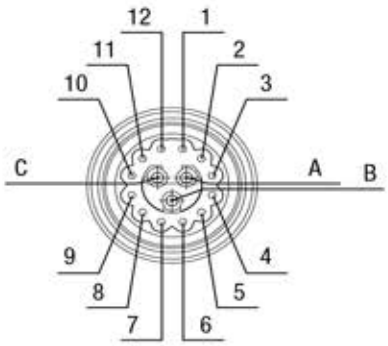


F_{axial}	150 N
F_{radial}	150 N
L1	20 mm

Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) of 20 000 h (at T_u max. 40°C)

* For thread-rolling screws according to DIN 7500

Electrical connection



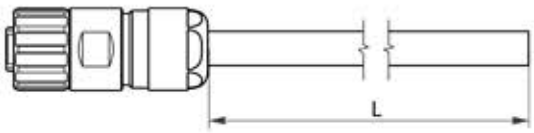
	Wire color	Pin	Configuration	Function	Recommended AWG
Signal	white	1	D-IN-A	NPN 24 V	24
	brown	2	D-IN-B	NPN 24 V	
	green	3	D-IN-1	NPN 24 V	
	yellow	4	D-IN-2	NPN 24 V / analog 0 ... 10 V / brake	
	gray	5	D-OUT-1	PNP 24 V	
	pink	6	D-OUT-2	PNP 24 V	
	blue	7	D-OUT-3*	PNP 24 V	
	red	8	A-IN-1	0 ... 10 V (differential)	
	black	9	A-IN-GND	GND for analog IN 1 (differential)	
	violet	10	RS485 A (+)	Progr. bus	
	gray / pink	11	RS485 B (–)	Progr. bus	
	red / blue	12	U_{Logic}	Logic power supply (24 V)	
Power	gray	A	Ballast	Ballast resistor	16
	brown	B	U_{ZK}	Power supply	
	black	C	GND	Power / signal GND	

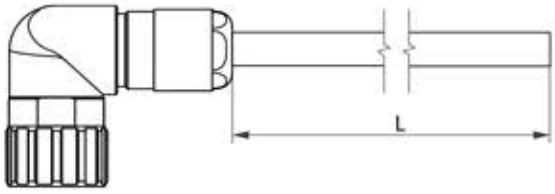
* Output (OUT 3) is only available on ECI-63.XX-K4

Cable

Type	Length L (mm)	Order no.
Cable (12+3 Pins)	1 000 ±30	992 0160 034
Cable (12+3 Pins)	3 000 ±30	992 0160 035

Type	Length L (mm)	Order no.
Cable (12+3 Pins)	1 000 ±30	992 0160 036
Cable (12+3 Pins)	3 000 ±30	992 0160 037





For self-assembly, cables can be obtained from Hummel:

Hummel cable connector M16 for cable Ø 8-11 mm, Tightening torque: 5 Nm (Order no. 7.810.500.000)

Hummel crimp insert series M16, socket 12+3 with special coding (Order no. 7K11886034)

Hummel crimp contact socket 3 x, power, crimp range 0.5 - 1.5 mm² (Order no. 7.010.981.202)

Hummel crimp contact socket 12 x, signal, crimp range 0.08 - 0.34 mm² (Order no. 7.010.980.802)

Modular construction kit

Brake system

Spring-applied brake, integrated

Brake module ECI 63-K4

Basic motor

Planetary gearheads

NoiselessPlus 63

Performax® 63

Performax®Plus 63

Optimax 63

Crown gearheads

EtaCrown® 75

EtaCrown®Plus 63

Commissioning tool

"Kickstart"

Cable

Connection cables have to be ordered separately

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

You can find an overview of our drive systems with technical data in our main catalogues ECI and VD/VDC.

K1 motor in combination with external control electronics.

ECI-80.XX-K1	16
VTD-XX.XX-K4S (position)	17

ECI motor.

ECI-80.XX-K1

- Highly dynamic 3-phase internal rotor motor with EC technology
- Low cogging torque
- Robust, noise-optimized ball bearing system for a long service life
- High efficiency and high power density realized in a compact design
- Protection class IP 40/IP 54 and connection by connector system
- Basic motor with electronic module K1 for operation with external control electronics
- Mechanical design and interfaces designed for modular flexibility

Nominal data

Type		ECI-80.20-K1 -B00	ECI-80.20-K1 -D00	ECI-80.40-K1 -B00	ECI-80.40-K1 -D00	ECI-80.60-K1 -D00
Nominal voltage (U_N)	V DC	24	48	24	48	48
Nominal speed (n_N)*	rpm			4 000		
Nominal torque (M_N)*	mNm	700	700	1 200	1 200	1 800
Nominal current (I_N)*	A	13.5	7.50	25.0	12.0	18.0
Nominal output power (P_N)*	W	293	293	503	503	754
Starting torque (M_{max})	mNm	2 400	2 500	3 900	5 000	5 600
Permissible peak current (I_{max})**	A	100	60	100	100	100
Permanent stall torque (M_{SD})	mNm	700	700	1 200	1 200	1 800
Speed at no-load operation (n_L)	rpm	1.00	0.70	1.50	0.90	1.00
No-load current (I_L)	A			0 ... 4 000		
Speed at no-load operation (n_L)	rpm	4 800	4 800	4 700	4 850	6 100
Rotor moment of inertia (J_R)	$kgm^2 \times 10^{-6}$	54	54	104	104	155
Motor constant (K_E)	mVs/rad	47.2	94.1	48.2	96.0	72.15
Connection resistance (R_V)	Ω	0.07	0.30	0.03	0.10	0.04
Connection inductance (L_V)	mH	0.30	1.30	0.20	0.60	0.20
Overload protection				integrated		
Permissible ambient temperature range (T_U)	°C			-30 ... +40		
Weight	kg	1.40	1.40	2.10	2.10	2.70
Order no. (wire interface)***	IP 40	932 8020 103	932 8020 105	932 8040 103	932 8040 105	932 8060 105
Order no. (cable routing)***	IP 54			On request		

Subject to alterations

* At T_U max. 40°C
** Permissible time for peak current: max. 5 sec. – to be repeated only after complete cool down
*** Classification of protection class refers to installed state with sealing on the flange side

Control electronics.

VTD-XX.XX-K4S

- 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

Nominal data

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)*	A	100	
Permissible continuous output current*	A	40 ± 10%	20 ± 10%
Nominal voltage (Logic supply U_L)	V DC	24	
Logic current draw** (at 24 V DC)	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		RS 485	
Efficiency (in optimum working range)	%	> 95	
Permissible ambient temperature range (T_U)	°C	-30 ... +40	
Permissible ambient humidity***	%	5 ... 85	
Protection class		IP 20	
Weight	kg	approx. 0.50	
Order number (IP 20)		994 2440 000	994 4820 000

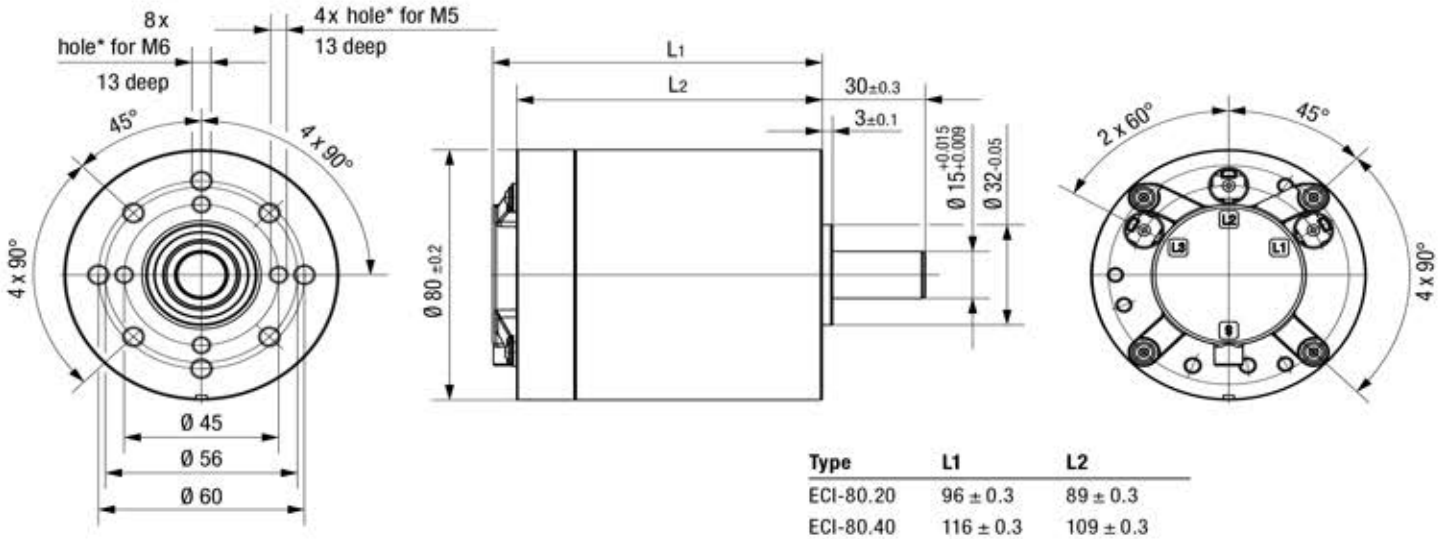
Subject to alterations

Series planned for 2nd q/2017

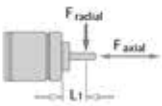
* Applicable at rated temperature T_U = 25°C, Derating at deviating (higher) temperatures
** Current draw without current requirement of digital outputs
*** Condensation not permitted

Technical drawing

All dimensions in mm



Type	L1	L2
ECI-80.20	96 ± 0.3	89 ± 0.3
ECI-80.40	116 ± 0.3	109 ± 0.3
ECI-80.60	136 ± 0.3	129 ± 0.3



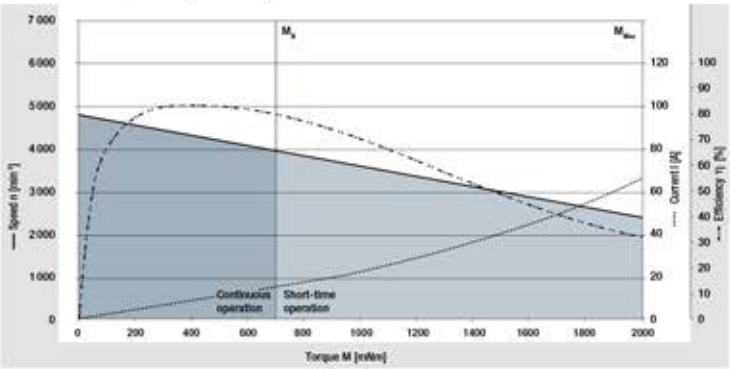
F_{axial}	70 N
F_{radial}	330 N
L1	15 mm

Permissible shaft load at nominal speed and life expectancy L_{10} (nominal operation) of 20 000 h (at T_u max. 40°C)

* For thread-rolling screws according to DIN 7500

Characteristic curve

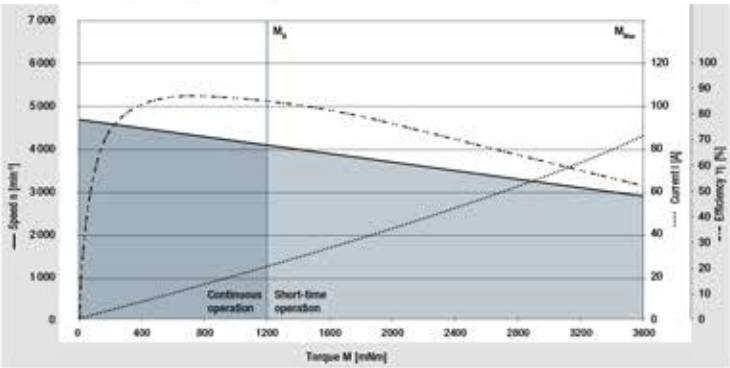
ECI-80.20-K1, 24 V (at 25°C)



[1] Nominal data, see table

Characteristic curve 48 V on request

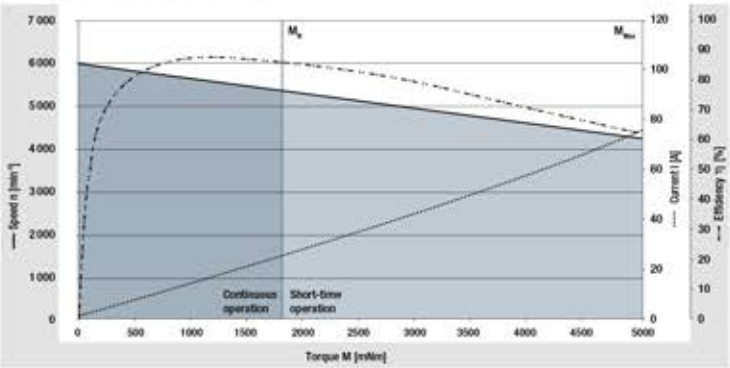
ECI-80.40-K1, 24 V (at 25°C)



[1] Nominal data, see table

Characteristic curve 48 V on request

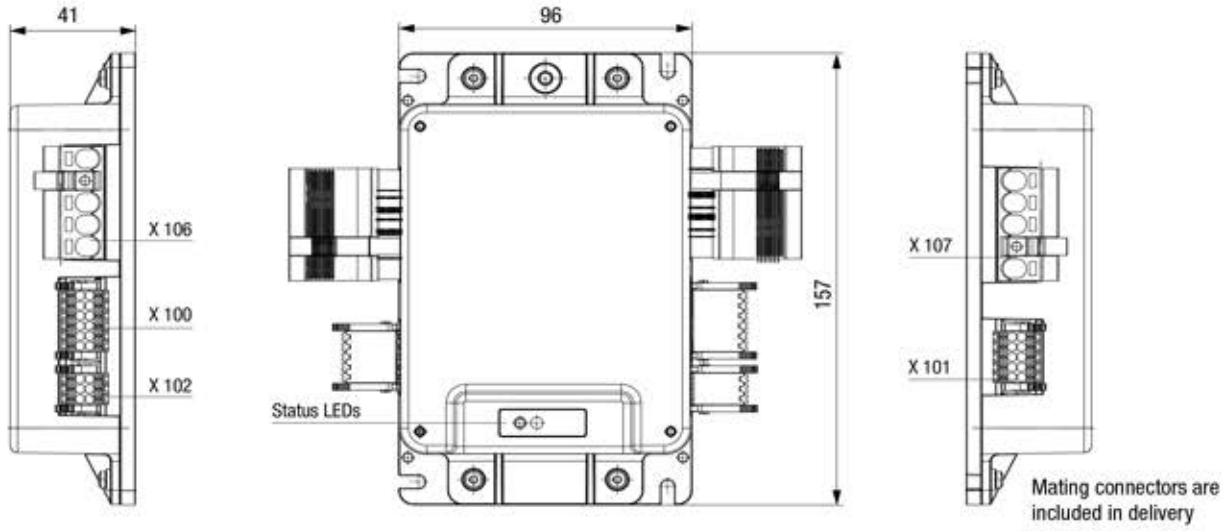
ECI-80.60-K1, 48 V (at 25°C)



[1] Nominal data, see table

Technical drawing control electronics

All dimensions in mm



Accessories setup

Commissioning tool

"Kickstart"

"Kickstart" PC software for commissioning/ parametrization of the drive controller

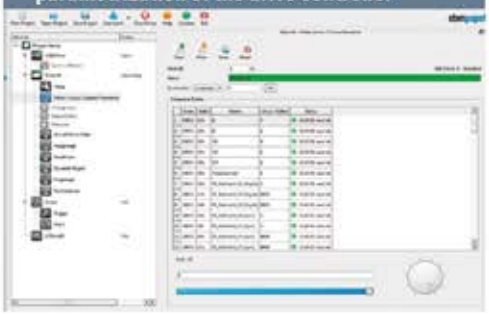
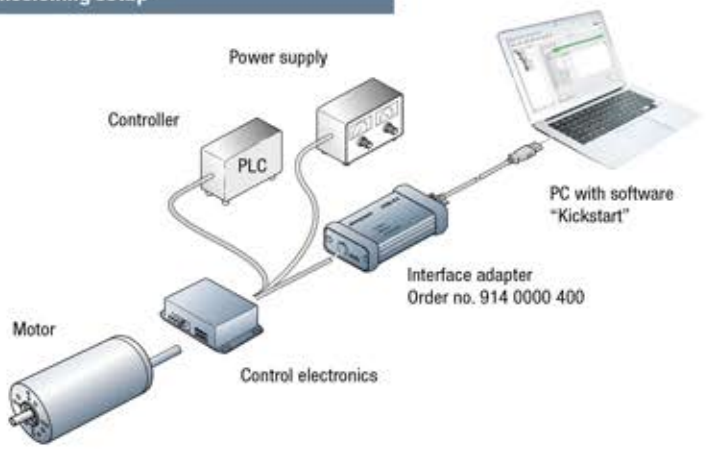


Image of "Kickstart" PC software

Commissioning setup



Modular construction kit for ECI 80 motor

Basic motor

Brake system

On request

Encoder system

On request

Planetary gearheads

Performax®Plus 63

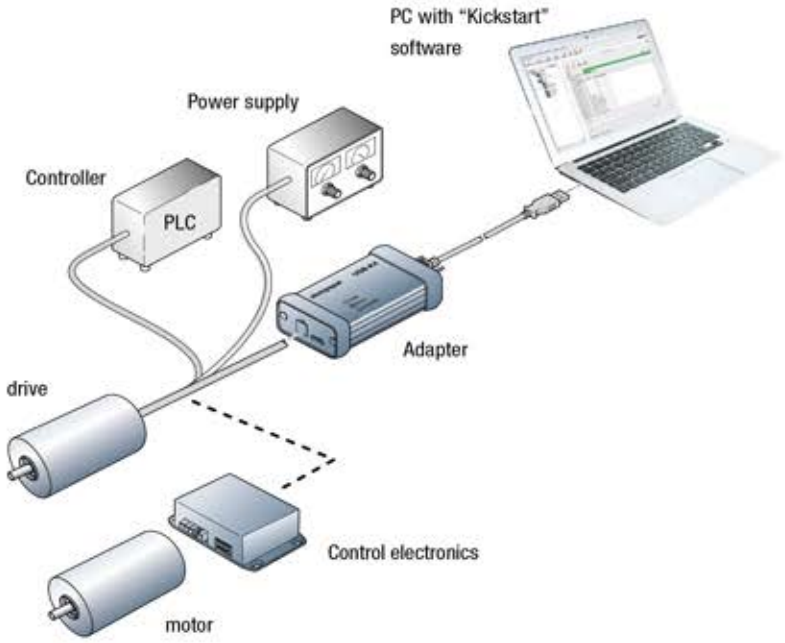
Optimax 63

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

You can find an overview of the electrical connection in our main catalogues ECI and VD/VDC.

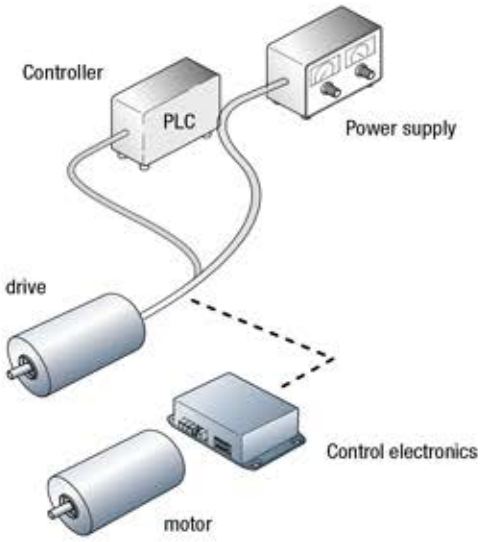
Commissioning K4 motors.

Parameterization and 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 "Kickstart" PC software. This requires a PC and the ebm-papst USB-CAN-RS485 adapter. The adapter is available as an accessory and can be ordered using the part number 914 0000 400.

Interface adapter for „Kickstart" PC software	Order No.
USB-CAN-RS485 adapter	914 0000 400

Load your detailed operating manual and the PC software "Kickstart" under www.ebmpapst.com or the adjacent QR code:

Functional description of the LED displays

LED name	Colour	Function assignment
Data	red	No assignment
	green	Active data transfer via the USB-CAN-RS485 adapter
Error	red	No response following request to K4 Receipt of a faulty data package
	green	Received data is ok
microSD	red	No assignment
	green	Access to the memory card

Easy integration into Profinet networks.

The SIEMENS ET 200SP allows easy integration of our K4 drivers in the Profitnet networks via communication module CM PtP

Advantages

- Automatic parameterization of the drive (K4 knowledge not required)
- Automatic controller setting
- Application setting in physical values
- Various statistics and diagnostic information
- Speed/position commands
- Automatic determination of the start-up time using integrated mechatronic model
- HMI control displays allow intuitive interaction

Schematic layout

- The RS485 interface available on the compact drive allows integration into Profinet networks
- Functional components allow simple control