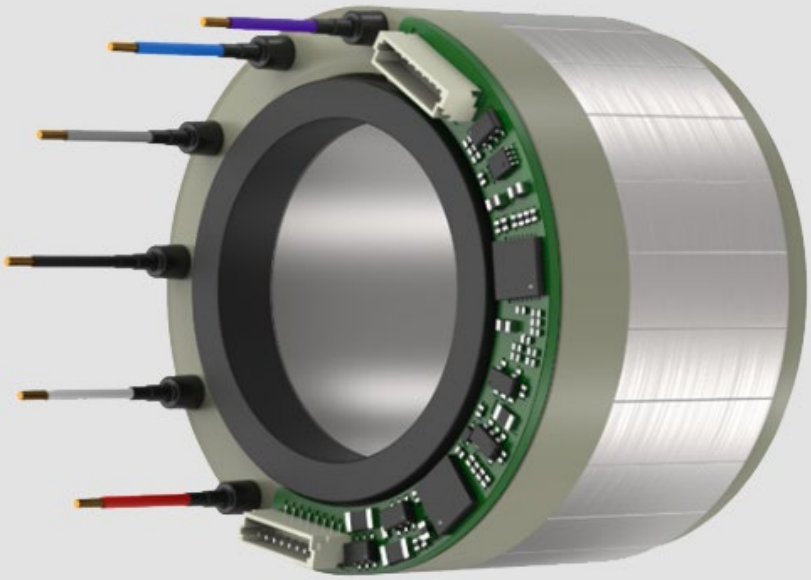
WITTENSTEIN | cyber motor

Instruction sheet

cyber® kit line with encoder board

Size 050, 085



1000174758

Revision: 01

WITTENSTEIN cyber motor GmbH
Walter-Wittenstein-Straße 1
D-97999 Igersheim
Germany

Customer Service

		✉	🕻
Germany	WITTENSTEIN cyber motor GmbH	service@wittenstein.de	+49 7931 493-15900
Benelux	WITTENSTEIN BVBA	service@wittenstein.biz	+32 9 326 73 80
Brazil	WITTENSTEIN do Brasil	vendas@wittenstein.com.br	+55 15 3411 6454
中国	威腾斯坦（杭州）实业有限公司	service@wittenstein.cn	+86 571 8869 5856
Austria	WITTENSTEIN GmbH	office@wittenstein.at	+43 2256 65632-0
Denmark	WITTENSTEIN AB	info@wittenstein.dk	+45 4027 4151
France	WITTENSTEIN sarl	info@wittenstein.fr	+33 134 17 90 95
Great Britain	WITTENSTEIN Ltd.	sales.uk@wittenstein.co.uk	+44 1782 286 427
Italy	WITTENSTEIN S.P.A	info@wittenstein.it	+39 02 241357-1
日本	ヴィッテンシュタイン株式会社	sales@wittenstein.jp	+81-3-6680-2835
North America	WITTENSTEIN Holding Corp.	technicalsupport@wittenstein-us.com	+1 630-540-5300
Spain	WITTENSTEIN S.L.U.	info@wittenstein.es	+34 93 479 1305
Sweden	WITTENSTEIN AB	info@wittenstein.se	+46 40-26 50 10
Switzerland	WITTENSTEIN AG Schweiz	sales@wittenstein.ch	+41 81 300 10 30
台湾	威騰斯坦有限公司	info@wittenstein.tw	+886 3 287 0191
Turkey	WITTENSTEIN Güç Aktarma Sistemleri Tic. Ltd. Şti.	info@wittenstein.com.tr	+90 216 709 21 23

Table of contents

1 About this manual

This manual contains the information necessary to safely use the frameless servo motor cyber® kit line with encoder board.

It is a supplement to the cyber® kit line (5022-D063737) project specifications. Contradictory specifications in this manual are therefore void.

The operator must ensure that all persons assigned to install, operate, or maintain the servo motors have read and understand these instructions in full.

Store these instructions within reach of the servo motor.

Inform colleagues who work in the area around the machine about the safety instructions and warnings so that no one sustains injuries.

The original was prepared in German, all other language versions are translations of the original instructions.

The signal words, safety symbols, and information symbols are explained in the project specifications.

2 Safety

This manual, especially the safety instructions and the rules and regulations valid for the operating site, must be observed by all persons working with the servo motor.

In addition to the safety instructions in this manual, also observe any legal and otherwise applicable environmental and accident prevention rules and regulations (e.g. personal safety equipment).

3 Description of the frameless servo motor

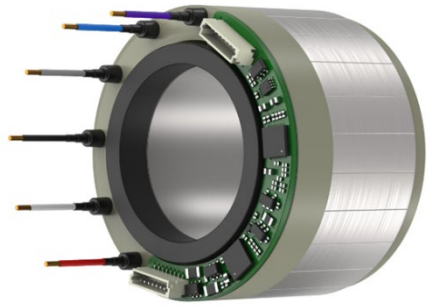


Fig. 3-1 Stator with encoder board

The stator (part of the frameless servo motor) is equipped with an encoder board, which can be used for magnetic position detection of the rotor.

ⓘ Please refer to the cyber® kit line (5022-D063737) project specifications for notes on the frameless servo motor.

3.1 Installed components

3.1.1 Encoder board

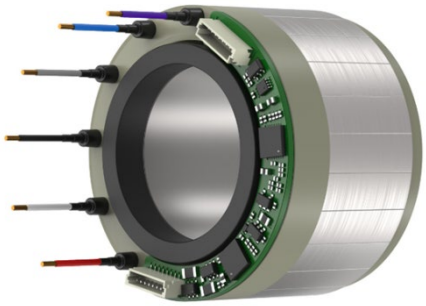


Fig. 3-2 Stator with encoder board

The position signal of the encoder board lies within a pole pair between 0° and 36° after switching on and has no absolute relation to the actual mechanical rotor position. Homing must be carried out in order to establish the absolute dimensional reference.

The signal outputs and pin assignments are described in chapter 5.1 "Plug connector on PCB". The permissible supply voltage is 5 V ±10 %.

The following can be evaluated via the encoder interface:

- BiSS C (J1)
- Hall-UVW (J2)
- ABZ (J1) + Hall-UVW (J2)

Operating modes	Technical data	
Serial BISS C	Position resolution: Positioning accuracy: Repeat accuracy:	65536 positions / motor revolution (16 bit) < ±0.5° mech. < ±0.1° mech.
Incremental ABZ	Position resolution: Positioning accuracy: Repeat accuracy:	65536 increments / motor revolution < ±0.5° mech. < ±0.1° mech.
Hall-UVW	Position resolution: Positioning accuracy:	60 switching signals / motor revolution < ±6° mech.

The positioning accuracy of the operating modes BiSS C and ABZ have the following graphically represented limits:

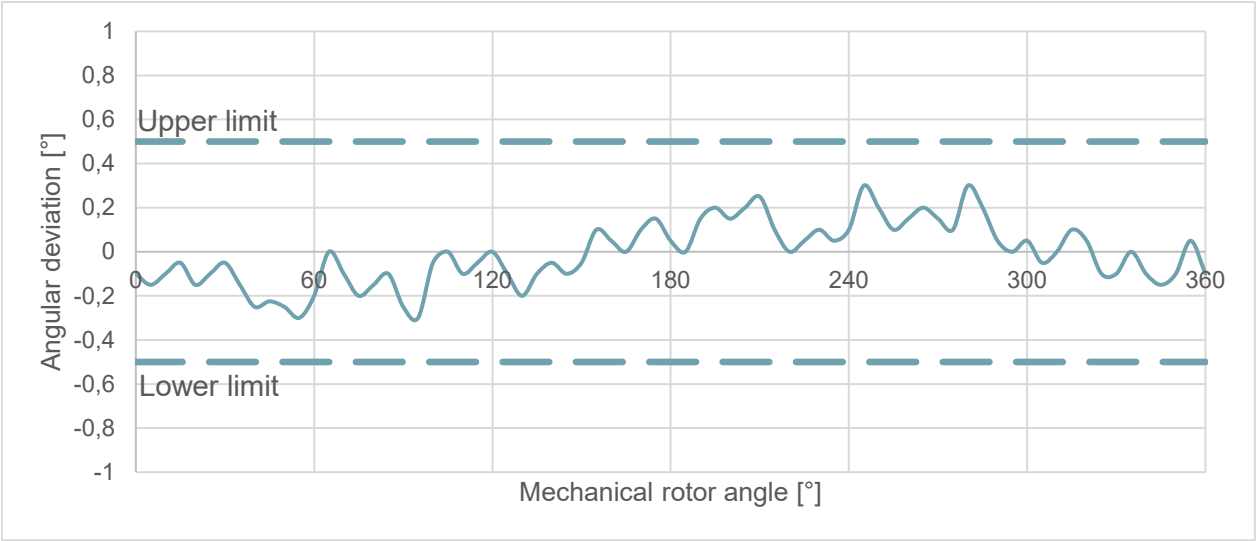
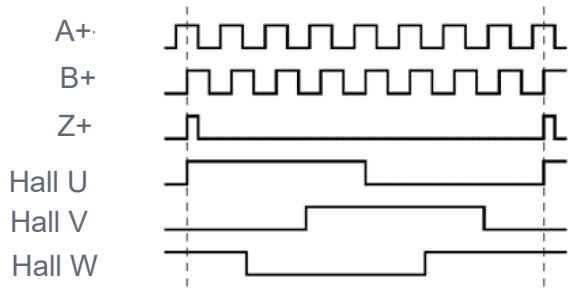


Fig. 3-3 Graphical representation of the angular deviation/positioning accuracy with an example of the trend

The change from operating mode BiSS C to operating mode ABZ takes place via the connecting of ground (GND) to pin 8 of the PCB plug connector J2. The exact allocation and description of the PCB plug connectors and pins can be found in chapter 5.1 "Plug connector on PCB".



The Z pulse of the ABZ incremental interface occurs once per revolution and has no relation to an exact position of the rotor.

ⓘ The Hall signals UVW are dependent on the number of pole pairs of the motor.

Fig. 3-4 Example trend of the ABZ and Hall signals

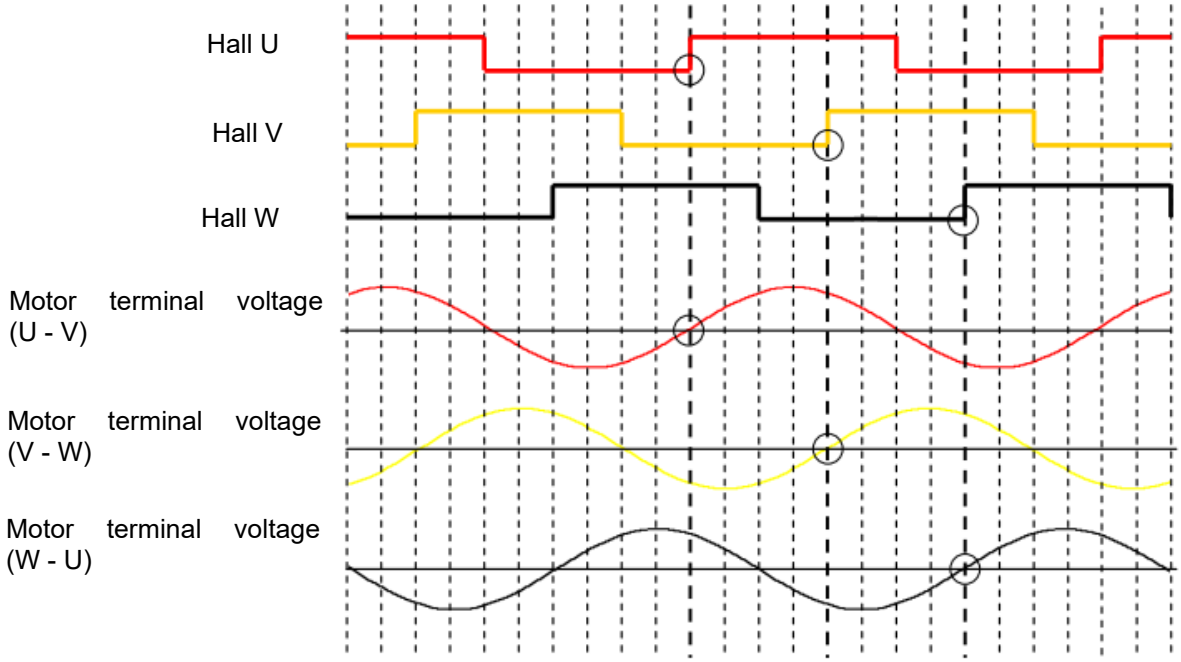


Fig. 3-5 Switching signals of the Hall sensors compared to the induced voltages (direction of rotation cw)

The LED of the encoder board indicates the status of the magnetic field for position detection for the working area:

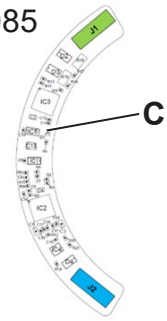
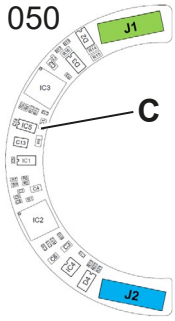
	Status LED [C]	Meaning
085  050 	Off	Magnetic field for position detection is located within the working area.
	Flashing red (flashing once, max. 1s)	The supply voltage has just been applied and the encoder board is ready for operation.
	Lights up red	System error Magnetic field for position detection outside of the working area. • Contact Customer Service.

Table 1): LED of encoder board

	Problems with connection set-up and/or quality of transmitter signals. • Check the supply voltage and communication line connection. If the malfunction persists, please contact our Customer Service department.

ⓘ You will find binding values, data and dimensions in the technical data sheets, as amended.

NOTICE

Encoder boards can be damaged due to electrostatic discharge.

- Carry out the work in an ESD-protected work environment and with suitable personal protective equipment.
- Do not remove ESD safeguards from the connections before they are established.

NOTICE

Risk of damage! Homing of the drive axes can be required after a power failure or after switching on for the first time.

- Carry out the necessary runs for referencing.
- Observe the maximum travel path of the application.

- Avoid exposure to external electromagnetic fields (EMC).
- In general, use high-quality, shielded motor and encoder cables to avoid EMC problems.

- Perform the other activities according to project specifications (5022-D063737).

4 Technical data

4.1 Definitions

The products of the cyber® kit line are documented according to the test procedure and the measuring procedure of IEC 60034-1. The specified technical data refers to the operating modes S1 (continuous operation) and S6 (periodic operation), respectively with the specified cooling type. The determined values are effective values according to IEC 60034-1 unless stated otherwise. The reference value is the intermediate circuit voltage U_{DC} specified in the product data.

Designation	Symbol	Unit	Explanation
Continuous torque	M_{S1}	Nm	Admissible continuous torque of the motor depending on the speed.
Continuous power	P_{S1}	W	Admissible continuous power of the motor depending on the speed.
DC bus voltage	U_{DC}	V	DC voltage at intermediate circuit.
Torque constant	k_m	Nm/A	Torque constant calculated from torque and effective value of the current.
Voltage constant	k_e	Vs	Voltage constant calculated from the peak value of the voltage induced between the two phases and speed n at externally driven motor.
Motor constant	k_{mot}	$\mathrm{Nm}/\sqrt{\mathrm{W}}$	Efficiency factor calculated from torque and power dissipation.
Ambient temperature	ϑ_u	°C	Maximum permissible ambient temperature without reduced performance (maximum inlet temperature of the coolant for liquid cooling).
Maximum winding temperature	ϑ_{max}	°C	Maximum admissible winding temperature.
Heat transfer resistance	R_{th}	K/W	Heat transfer resistance not to be exceeded for discharge of thermal losses.
Max. power	P_{max}	W	Maximum power for short-term operation.
Maximum torque	M_{max}	Nm	Maximum torque at maximum current I_{max}.
Maximum current	I_{max}	A	Maximum current, effective value.
Continuous stall torque	M_0	Nm	Continuously permissible torque at motor standstill.
Continuous stall current	I_0	A	Continuously permissible current (effective value) leading to the permissible heating of the winding.
No-load speed	n_0	min^{-1}	Maximum speed that is reached load-free without field-weakening when operated with U_{DC}.

Designation	Symbol	Unit	Explanation
Rated power	P_n	W	Continuously permissible power at speed n_n.
Rated torque	M_n	Nm	Continuously permissible torque at speed n_n.
Rated current	I_n	A	Continuously permissible current (effective value) at speed n_n.
Rated speed	n_n	min^{-1}	Speed up to which M_n is continuously specified.
Connection resistance	R_{tt}	Ω	Resistance between two phases at 20°C.
Connection inductance	L_{tt}	mH	Inductance between two phases at 20°C.
Electrical time constant	τ_e	ms	Electrical time constant
No. of pole pairs	p		Number of pole pairs of motor.
Mass moment of inertia	J	kgm^2	Mass moment of inertia of rotor.
Minimum flow	Q	l/min	Required minimum flow rate of water coolant medium.
Weight	m	kg	Weight of rotor and stator.
Mass moment of inertia of encoder track	J_{enc}	kgm^2	Mass moment of inertia of optional encoder track.
Encoder track weight	m_{enc}	kg	Weight of optional encoder track.
Continuous torque	M_{S1}	Nm	Admissible continuous torque of the motor depending on the speed.
Continuous power	P_{S1}	W	Admissible continuous power of the motor depending on the speed.

Tbl - 1 Explanation of electromechanical parameters

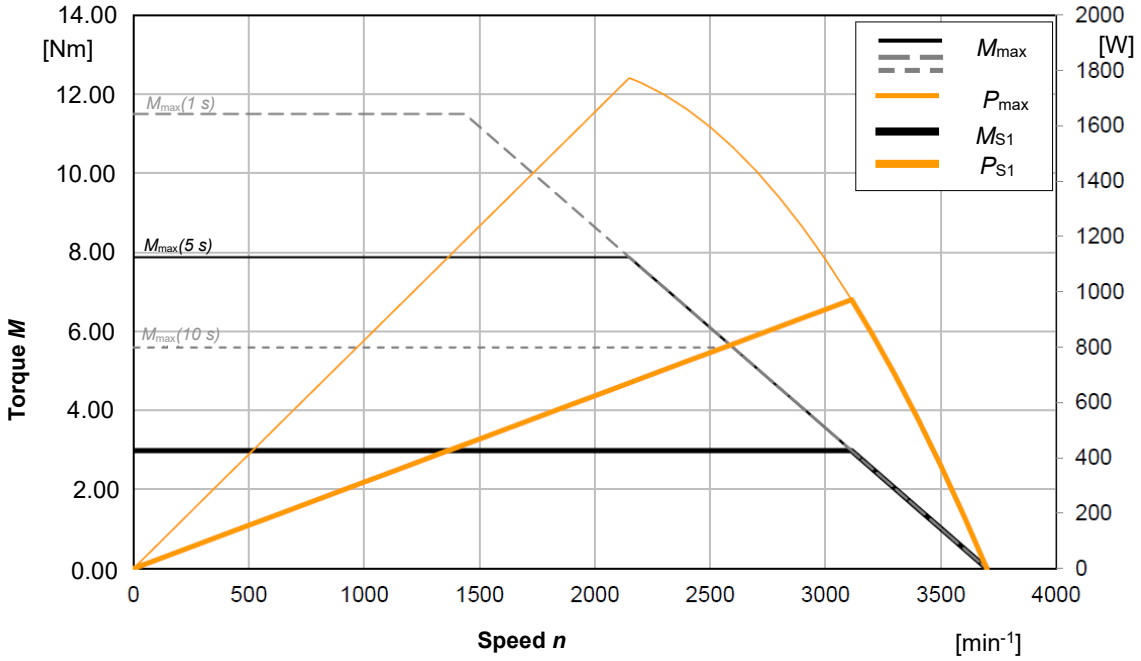
The products of the cyber® kit line primarily consist of the stator and rotor components. The technical product data apply for use of the respective rotor with the respective stator and for correct assembly of components. Stator and rotor components belonging together can be identified by the specification of the type code in version "CKLC..." (see chapter 4.4 "Type code") and the resolution of the type code in the stator and rotor components.

⚠ WARNING

Derating of the continuous current while the motor is stationary
In applications in which the motor is **permanently energized while stationary**, uneven, quicker heating of the motor occurs.

- Make sure the continuous stall current is reduced by 30% to prevent the motor from overheating.

The sample curve is an example for illustration of the operating behavior of the cyber® kit line according to technical parameters.



The maximum torque M_{max} is available up to a defined speed. With increasing speed, the maximum torque is reduced due to the speed-dependent induced voltage of the motor. This leads to a reduction in torque down to the no-load speed n_0. Up to the torque M_{S1}, the torque output is continuous at the specified cooling type. Accordingly, the maximum power P_{max} is available at the respective speed and the power is output by the motor up to the continuous power P_{S1}.

The motor curves specified in chapter 4.2 "Technical product data" apply for the use of respective combinations of stator and rotor. The maximum speed specified in the motor curve corresponds to the admissible maximum speed.

⚠ CAUTION

If the maximum speed is exceeded, flying parts can lead to injuries.

- Make sure that the maximum speed of the motor is not exceeded.
- Parameterize the admissible maximum speed of the product in your drive control unit.

The specified technical data apply according to IEC 60034-1 for installation heights of up to 1000 m above sea level. At installation heights of more than 1000 m above sea level, the performance data is reduced by 13% / 1000 m for cooling type "C" or 2.5% / 1000 m for cooling type "L". The maximum admissible installation height of motors with power connection "A" is 5000 m above sea level. For the use of connectors, sockets or terminal boxes, the installation height may be limited. Regarding the installation height and its impact, not only observe the motor but the entire drive system.

For products with cooling type "L," the minimum flow is specified for a temperature increase of 5 °C for the cooling medium water between coolant inlet and coolant outlet. If the flow is deviating, linear conversion of the temperature increase is possible.

⚠ CAUTION

An electrical breakdown due to the maximum intermediate circuit voltage U_{DC} being exceeded can lead to injuries (electric shock).

- When using the product, do not exceed the maximum intended intermediate circuit voltage.
- For 48 V versions, this is max. 72 V
- For 560 V versions, this is max. 600 V

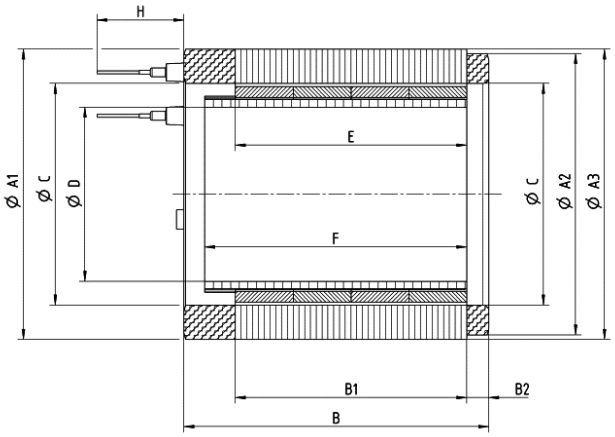
If the product is operated with a current exceeding the continuous stall current, the power dissipation in the product and the temperature are increased. Depending on the installation situation, sufficient discharge of thermal energy is not always ensured. For this reason, limit the duration for which the product is operated with a current exceeding the continuous stall current - and particularly the maximum current.

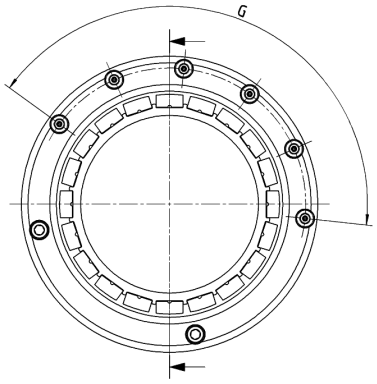
NOTICE

Extended operation with high current can lead to inadmissible heating of the product.

- Limit the duration for which the product can be operated with a current exceeding the permanently admissible current depending on the current rating, the installation situation and the thermal connection. At a maximum winding temperature of 40 °C, operation with maximum current is possible for up to 5.0 s in typical applications.
- If an exact calculation is not available, limit the duration of the maximum current to 1.0 s.

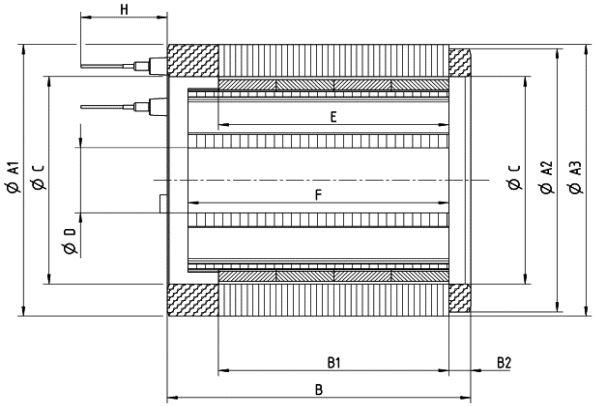
The geometrical product data in Fig. 4-1 and the additional geometrical product data for products with encoder board in Fig. 4-2 offer a quick overview of the dimensions of the products of the cyber® kit line. For exact dimensions and tolerances, please refer to the dimensional drawings in chapter 4.3 "Dimensional drawings".

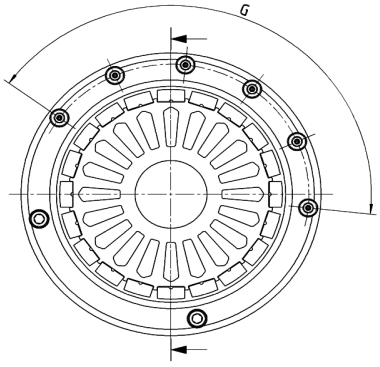




Schematic illustration. The dimensional drawing has priority and must always be observed.

Variant: Large inner diameter "E"



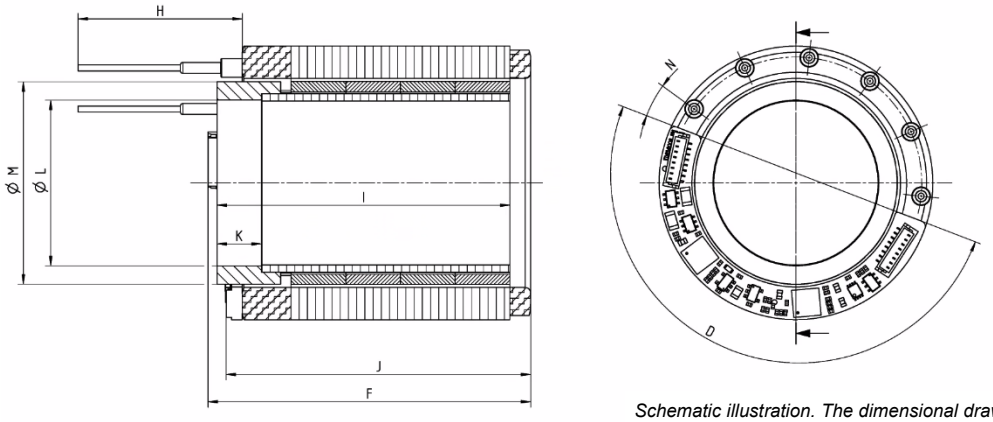


Schematic illustration. The dimensional drawing has priority and must always be observed.

Variant: Small inner diameter "A"

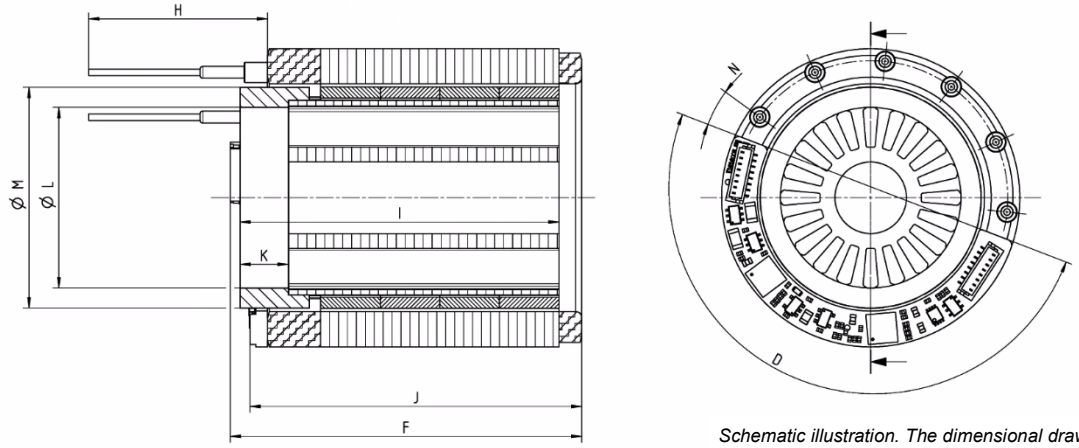
Fig. 4-1 Description of geometrical characteristics for size 050, 085

Designation	Symbol	Unit	Explanation
Potting outer diameter B	A1	mm	Outer diameter of the stator measured at the potting at cable side / B side
Potting outer diameter A	A2	mm	Outer diameter of the stator measured at the potting at counter side / A side
Stator outer diameter	A3	mm	Outer diameter of the stator measured at the laminated core
Stator length	B	mm	Length of the stator measured in axial direction without electrical connections
Length of laminated core	B1	mm	Length of the laminated core of the stator measured in axial direction
Height of winding head A-side	B2	mm	Height of winding head on A side
Stator inner diameter	C	mm	Inner diameter of stator
Rotor inner diameter	D	mm	Inner diameter of rotor
Rotor magnet length	E	mm	Length of the rotor section fitted with permanent magnets
Rotor length	F	mm	Length of the rotor
Angle	G	Degrees [°]	Angular area where the electrical connections are established
Wire length	H	mm	Length of electrical connections (wires)
Wire cross-section	-	mm²	Cross-section of electrical connections (wires), data: Power / Neutral point / PE conductor // Temperature sensor



Schematic illustration. The dimensional drawing has priority and must always be observed.

Variant: Large inner diameter "E"



Schematic illustration. The dimensional drawing has priority and must always be observed.

Variant: Small inner diameter "A"

Fig. 4-2 Description of geometrical characteristics for size 050, 085

Designation	Symbol	Unit	Explanation
Rotor length with encoder track	I	mm	Length of rotor with encoder system
Stator length with encoder board	J	mm	Length of stator with encoder system
Encoder track overall length	K	mm	Additional axial length in comparison to rotor length F (see Fig. 3-1)
Encoder track inner diameter	L	mm	Inner diameter of the rotor with encoder system measured at the encoder track
Encoder track outer diameter	M	mm	Outer diameter of the rotor with encoder system measured at the encoder track
Angular position of encoder board	N	Degrees [°]	Angle between first electrical connection and stator-side encoder board
Overlap of encoder board	O	Degrees [°]	Angle range in which the encoder board is located on the stator side

4.2 Technical product data

The values and data presented here serve the exclusive purpose of general comparison.
Neither are changes and tolerances illustrated, nor are you subject to a modification service.

ⓘ You will find binding values, data and dimensions in the dimensional sheets and characteristic curves, as amended.

4.2.1 Size 050

Version	Size – Length		050-010		050-020		050-040	
	Inner diameter		E	A	E	A	E	A
Potting outer diameter B	A1	mm	50.0					
Potting outer diameter A	A2	mm	48.5					
Outer diameter of stator	A3	mm	50.0					
Stator length	B	mm	23.2		32.9		52.7	
Length of laminated core	B1	mm	10.0		20.0		40.0	
Height of winding head on A side	B2	mm	3.8					
Inner diameter of stator	C	mm	38.2					
Rotor inner diameter	D	mm	30.0	12.0	30.0	12.0	30.0	12.0
Rotor magnet length	E	mm	≤ 10.1		≤ 20.3		≤ 40.5	
Rotor length	F	mm	15.5		25.2		45.3	
Angle	G	Degrees [°]	150.0					
Wire length	H	mm	300.0					
Power wire cross-section	-	mm²	0.22					
Power wire diameter (incl. sheath)	-	mm	1.12					
Signal wire cross-section	-	mm²	0.22					
Signal wire diameter (incl. sheath)	-	mm	1.12					
Rotor length with encoder track	I	mm	23.7		33.4		53.5	
Stator length with encoder board	J	mm	26.2		35.9		55.7	
Encoder track overall length	K	mm	8.2					
Encoder track inner diameter	L	mm	30.3					
Encoder track outer diameter	M	mm	37.1					
Angular position of encoder board	N	Degrees [°]	15					
Overlap of encoder board	O	Degrees [°]	180					

Tbl - 2 Geometrical characteristics for size 050

Version	Size – Length - Voltage class			050-010-B		050-020-B		050-040-B	
	Inner diameter			E	A	E	A	E	A
Intermediate circuit voltage		U_{DC}	V	48					
Torque constant		k_m	Nm/A	0.07		0.11		0.14	
Voltage constant		k_e	Vs	0.06		0.09		0.11	
Motor constant		k_{mot}	$\mathrm{Nm}/\sqrt{\mathrm{W}}$	0.06		0.09		0.13	
Ambient temperature		ϑ_u	°C	25					
Maximum winding temperature		ϑ_{max}	°C	140					
Heat transfer resistance		R_{th}	K/W	1.8		1.3		1.1	
Max. power		P_{max}	W	304		406		549	
Maximum torque		M_{max}	Nm	0.66		1.30		2.66	
Maximum current		I_{max}	A	10.0		13.0		20.0	
Continuous stall torque		M_0	Nm	0.35		0.73		1.09	
Continuous stall current		I_0	A	5.8		7.7		9.0	
Detent torque		M_{rast}	Nm	±2% of M_0					
No-load speed		n_0	min^{-1}	7016		5015		3801	
Rated power		P_n	W	205		295		349	
Rated torque		M_n	Nm	0.35		0.73		1.09	
Rated current		I_n	A	5.8		7.7		9.0	
Rated speed		n_n	min^{-1}	5631		3873		3051	
Connection resistance		R_{tt}	Ω	1.07		0.90		0.73	
Connection inductance		L_{tt}	mH	0.338		0.307		0.266	
Electrical time constant		τ_e	ms	3.17		2.94		2.73	
No. of pole pairs		p		10					
Mass moment of inertia		J	kgm^2	8.45×10^{-6}	1.29×10^{-5}	1.53×10^{-5}	2.25×10^{-5}	2.95×10^{-5}	4.23×10^{-5}
Weight		m	kg	0.12	0.15	0.20	0.26	0.33	0.44
Char. curve		-	-	upon request		upon request		upon request	
Mass moment of inertia of encoder track		J_{enc}	kgm^2	5.32×10^{-6}					
Encoder track weight		m_{enc}	kg	0.022					

Tbl - 3 Size 050 in voltage class B

Version	Size – Length - Voltage class			050-020-S		050-040-S	
	Inner diameter			E	A	E	A
Intermediate circuit voltage		U_{DC}	V	560			
Torque constant		k_m	Nm/A	0.61		1.03	
Voltage constant		k_e	Vs	0.50		0.84	
Motor constant		k_{mot}	$\mathrm{Nm}/\sqrt{\mathrm{W}}$	0.08		0.13	
Ambient temperature		ϑ_u	°C	25			
Maximum winding temperature		ϑ_{max}	°C	140			
Heat transfer resistance		R_{th}	K/W	1.30		1.10	
Max. power		P_{max}	W	932		1229	
Maximum torque		M_{max}	Nm	1.1		2.88	
Maximum current		I_{max}	A	3.0		3.0	
Continuous stall torque		M_0	Nm	0.63		1.01	
Continuous stall current		I_0	A	1.1		1.1	
Detent torque		M_{rast}	Nm	±2% of M_0			
No-load speed		n_0	min^{-1}	10843		7098	
Rated power		P_n	W	610		640	
Rated torque		M_n	Nm	0.63		1.01	
Rated current		I_n	A	1.1		1.1	
Rated speed		n_n	min^{-1}	9283		6036	
Connection resistance		R_{tt}	Ω	36.16		44.54	
Connection inductance		L_{tt}	mH	10.335		15.097	
Electrical time constant		τ_e	ms	3.5		2.95	
No. of pole pairs		p		10			
Mass moment of inertia		J	kgm²	1.53×10^{-5}	2.25×10^{-5}	2.95×10^{-5}	4.23×10^{-5}
Weight		m	kg	0.20	0.26	0.33	0.44
Char. curve		-	-	upon request		upon request	
Mass moment of inertia of encoder track		J_{enc}	kgm²	5.32×10^{-6}			
Encoder track weight		m_{enc}	kg	0.022			

Tbl - 4 Size 050 in voltage class S

4.2.2 Size 085

Version	Size – Length		085-020		085-040		085-080	
	Inner diameter		E	A	E	A	E	A
Potting outer diameter B	A1	mm	85.0					
Potting outer diameter A	A2	mm	82.5					
Outer diameter of stator	A3	mm	85.0					
Stator length	B	mm	36.7		57.0		96.8	
Length of laminated core	B1	mm	20.0		40.0		80.0	
Height of winding head on A side	B2	mm	5.7					
Inner diameter of stator	C	mm	63.2					
Rotor inner diameter	D	mm	50.0	15.0	50.0	15.0	50.0	15.0
Rotor magnet length	E	mm	≤ 20.3		≤ 40.5		≤ 81.0	
Rotor length	F	mm	25.7		46.0		86.0	
Angle	G	Degrees [°]	120.0					
Wire length	H	mm	300.0					
Power wire cross-section	-	mm²	1.9					
Power wire diameter (incl. sheath)	-	mm	1.12					
Signal wire cross-section	-	mm²	0.22					
Signal wire diameter (incl. sheath)	-	Mm	1.12					
Rotor length with encoder track	I	mm	35.3		55.6		95.6	
Stator length with encoder board	J	mm	39.8		60.1		99.9	
Encoder track overall length	K	mm	9.6					
Encoder track inner diameter	L	mm	50.3					
Encoder track outer diameter	M	mm	61.8					
Angular position of encoder board	N	Degrees [°]	64.5					
Overlap of encoder board	O	Degrees [°]	120					

Tbl - 5 Geometrical characteristics for size 085

Version	Size – Length - Voltage class			085-020-B		085-040-B		085-080-B	
	Inner diameter			E	A	E	A	E	A
Intermediate circuit voltage		U_{DC}	V	48					
Torque constant		k_m	Nm/A	0.14		0.18		0.24	
Voltage constant		k_e	Vs	0.11		0.15		0.19	
Motor constant		k_{mot}	$\mathrm{Nm}/\sqrt{\mathrm{W}}$	0.31		0.47		0.68	
Ambient temperature		ϑ_u	°C	25					
Maximum winding temperature		ϑ_{max}	°C	140					
Heat transfer resistance		R_{th}	K/W	0.85		0.70		0.55	
Max. power		P_{max}	W	1773		2692		3452	
Maximum torque		M_{max}	Nm	7.87		14.86		26.58	
Maximum current		I_{max}	A	61.5		89		120.0	
Continuous stall torque		M_0	Nm	2.98		5.24		7.67	
Continuous stall current		I_0	A	23.3		31.6		36.7	
Detent torque		M_{rast}	Nm	±2% of M_0		±2.5% of M_0			
No-load speed		n_0	min^{-1}	3700		2900		2290	
Rated power		P_n	W	971		1365		1595	
Rated torque		M_n	Nm	2.98		5.24		7.67	
Rated current		I_n	A	23.3		31.6		36.7	
Rated speed		n_n	min^{-1}	3114		2487		1987	
Connection resistance		R_{tt}	Ω	0.14		0.10		0.08	
Connection inductance		L_{tt}	mH	01.7		0.129		0.115	
Electrical time constant		τ_e	ms	0.81		0.74		0.70	
No. of pole pairs		p		10					
Mass moment of inertia		J	kgm^2	1.24×10^{-4}	1.83×10^{-4}	2.36×10^{-4}	3.39×10^{-4}	4.58×10^{-4}	6.50×10^{-4}
Weight		m	kg	0.61	0.80	1.05	1.39	1.90	2.52
Char. curve		-	-	upon request		upon request		upon request	
Mass moment of inertia of encoder track		J_{enc}	kgm^2	56.33×10^{-6}					
Encoder track weight		m_{enc}	kg	0.071					

Tbl - 6 Size 085 in voltage class B

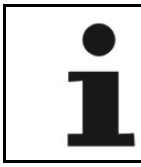
Version	Size – Length - Voltage class			085-020-S		085-040-S		085-080-S	
	Inner diameter			E	A	E	A	E	A
Intermediate circuit voltage		U_{DC}	V	560					
Torque constant		k_m	Nm/A	0.87		1.26		1.77	
Voltage constant		k_e	Vs	0.71		1.03		1.44	
Motor constant		k_{mot}	$\mathrm{Nm}/\sqrt{\mathrm{W}}$	0.34		0.49		0.70	
Ambient temperature		ϑ_u	°C	25					
Maximum winding temperature		ϑ_{max}	°C	140					
Heat transfer resistance		R_{th}	K/W	0.85		0.70		0.55	
Max. power		P_{max}	W	4656		6996		9405	
Maximum torque		M_{max}	Nm	7.41		16.09		31.46	
Maximum current		I_{max}	A	10.0		15.0		20.0	
Continuous stall torque		M_0	Nm	3.14		5.06		7.70	
Continuous stall current		I_0	A	4.1		4.6		5.3	
Detent torque		M_{rast}	Nm	±2% of M_0		±2.5% of M_0			
No-load speed		n_0	min^{-1}	8324		5890		4084	
Rated power		P_n	W	2413		2830		3051	
Rated torque		M_n	Nm	3.14		5.06		7.70	
Rated current		I_n	A	4.1		4.6		5.3	
Rated speed		n_n	min^{-1}	7339		5344		3783	
Connection resistance		R_{tt}	Ω	4.42		4.37		4.26	
Connection inductance		L_{tt}	mH	5.972		5.896		3.02	
Electrical time constant		τ_e	ms	0.74		0.74		3.02	
No. of pole pairs		p		10					
Mass moment of inertia		J	kgm^2	1.24×10^{-4}	1.83×10^{-4}	2.36×10^{-4}	3.39×10^{-4}	4.58×10^{-4}	6.50×10^{-4}
Weight		m	kg	0.61	0.80	1.05	1.39	1.90	2.52
Char. curve		-	-	upon request		upon request		upon request	
Mass moment of inertia of encoder track		J_{enc}	kgm^2	56.33×10^{-6}					
Encoder track weight		m_{enc}	kg	0.071					

Tbl - 7 Size 085 in voltage class S

4.3 Dimensional drawings

Specified dimensions and tolerances in the drawings are subject to the following standards:

- General tolerances: ISO 2768 mH
- Geometrical product specifications: ISO 14405

	• Use the corresponding internal documents (e.g. assembly instructions, circuit diagrams etc.) of your company.

ⓘ Detailed, current dimension sheets are available on request. The dimensions and tolerances listed here serve for orientation only.

4.4 Type code

The type code describes the motor variants and provides support for product selection and ordering from **WITTENSTEIN cyber motor**. The products of the cyber® kit line consist of the subassemblies "stator" and "rotor", which can be separately described as "CKLS..." (stator) and "CKLR..." (rotor) as well as in combination as "CKLC..." (stator and rotor).

Configuration	Column	Description
Product group	1-2-3	**CKL** is the designation of the product group of the cyber® kit line.
Product type	4	The product type defines the type of the product (stator, rotor, combination).
Size	5-6-7	The size is defined by the mechanical dimensions of the stator.
Length	10-11-12	The overall length is derived from the length of the active part.
Cooling type	13	"C" = natural convection "L" = liquid cooling
Voltage constant	15-16-17	The voltage constant serves to distinguish the winding variants and indicates the voltage constant in [Vs]. The following applies: *"x x x" = voltage constant for values ≥10* *"x V x" = voltage constant for values between 1.0 and 9.9* *"x K x" = voltage constant in kVs (·10^{3})* *"x D x" = voltage constant in dVs (·10^{-1})* *"x C x" = voltage constant in cVs (·10^{-2})* *"x M x" = voltage constant in mVs (·10^{-3})*
Voltage class	18	The voltage class is derived from the intermediate circuit voltage of the product.
Power connection	19	"A" = power cable with a length of approx. 300 mm "E" = power cable with a length of approx. 2000 mm
Feedback system	21-22	"HQ" = with encoder (BiSS + incremental + Hall)
Inner diameter	24	The inner diameter is defined by the mechanical dimensions of the rotor. "E" = large inner diameter "A" = small inner diameter
Temperature sensor	26	"W" = PT1000 and PTC "Z" = PT1000, PTC (triplet) and bi-metal

Tbl - 8 Description of the type code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	K	L	S	0	5	0	B	-	0	4	0	x	-	x	x	x	x	x	-	x	x	0	N	S	x	-	N	N	N

product group

CKL	= cyber kit line

product type

S	= stator
R	= rotor
C	= stator + rotor (combined)

size

050	= 050
085	= 085
100	= 100
112	= 112

sheet metal type (internal numbering)

B	= single tooth stator (050, 085) & 290, 360, 420, 530
K	= Kit Line M (100, 112)
M	= Kit Line M (130, 155)

overall length: length of the active part

050	= 10, 20, 40
085	= 20, 40, 80
100	= 30, 60, 120
112	= 30, 60, 120
130	= 30, 60, 120
155	= 45, 90, 120
290	= 50, 100, 200
360	= 50, 100, 200
420	= 70, 150
530	= 100, 200

cooling

C	= free convection
L	= water cooled

voltage constant

5C9	= CKLx050B-010C-xxxB
8C6	= CKLx050B-020C-xxxB
1D1	= CKLx050B-040C-xxxB
5D0	= CKLx050B-020C-xxxS
8D4	= CKLx050B-040C-xxxS
1D1	= CKLx085B-020C-xxxB
1D5	= CKLx085B-040C-xxxB
1D9	= CKLx085B-080C-xxxB
7D1	= CKLx085B-020C-xxxS
1V0	= CKLx085B-040C-xxxS
1V4	= CKLx085B-080C-xxxS

for different sizes, refer to the corresponding voltage constant

voltage class

B	= 60V
S	= 600V
T	= 1000V

power cable length

A	= 300 mm
E	= 2000 mm
F	= 600 mm
C	= 500 mm
D	= 800 mm

feedback system

NN	= without feedback system
HA	= with hall sensors
HQ	= with encoder (BiSS + incremental + hall)

temperature sensors

M	= PTC
W	= PT1000 and PTC
Z	= PT1000, PTC-triplet and bi-metal
Y	= PT1000
V	= PT1000 and PTC-triplet

Fig. 4-3 Type code of the stators (CKLS) of the cyber® kit line

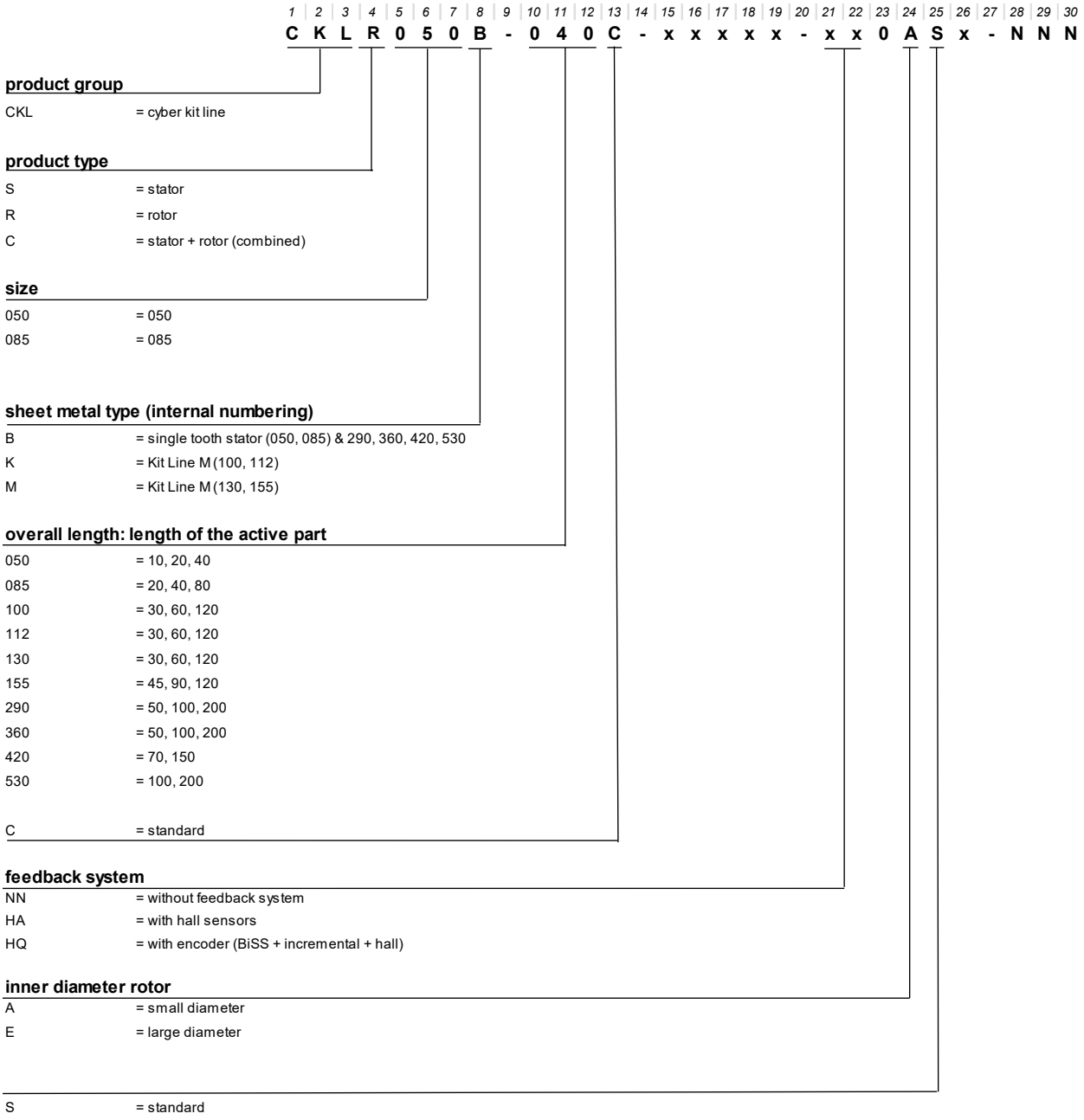


Fig. 4-4 Type code of the rotors (CKLR) of the cyber® kit line

The type code in the combined version (CKLC) consists of the type code of the stator (CKLS) and the rotor (CKLR) while the relevant digits are carried over. The necessary adjustments to the type code are highlighted in gray in the example illustrated in Fig. 4-5.

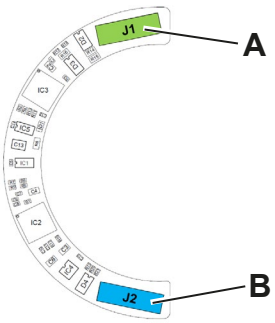
Column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Example "Combined":	C	K	L	C	0	5	0	B	-	0	4	0	C	-	1	D	1	B	A	-	H	Q	0	A	S	W	-	N	N	N		
Stator:	C	K	L	S	0	5	0	B	-	0	4	0	C	-	1	D	1	B	A	-	H	Q	0	N	S	W	-	N	N	N		
Rotor:	C	K	L	R	0	5	0	B	-	0	4	0	N	-	N	N	N	N	N	-	H	Q	0	A	S	N	-	N	N	N		

Fig. 4-5 Type code of the cyber® kit line in combined version (CKLC)

5 Appendix

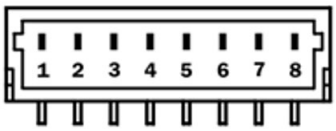
5.1 Plug connector on PCB

ⓘ The plug connector on the PCB may only be plugged in when the servo motor is in a voltage-free state.

		Designation
	**A**	PCB plug connector J1; see chapter 5.1.1 PCB plug connector J1 pin assignment
	B	PCB plug connector J2; see chapter 5.1.2 PCB plug connector J2 pin assignment

Tbl - 9 Plug connector on PCB

5.1.1 PCB plug connector J1 pin assignment

BiSS C operating mode			
	Pin	**Signal**	**Explanation**
	1	GND	Ground
	2	Vcc	Supply 5V
	3	MA+	Clock+
	4	MA-	Clock-
	5	SLO+	Data+
	6	SLO-	Data-
	7	n.c.	No connection
	8	n.c.	No connection
ABZ operating mode			
	Pin	**Signal**	**Explanation**
	1	GND	Ground
	2	Vcc	Supply 5V
	3	A+	Channel A
	4	A-	Channel A inverted
	5	B+	Channel B
	6	B-	Channel B inverted
	7	Z+	Channel Z
	8	Z-	Channel Z inverted

Tbl - 10 PCB plug connector J1: JST connector strip 8-pin

5.1.2 PCB plug connector J2 pin assignment

Hall-UVW commutation tracks operating mode			
	Pin	**Signal**	**Explanation**
	1	GND	Ground
	2	Vcc	Supply 5V
	3	Hall U	Commutation signal U
	4	Hall V	Commutation signal V
	5	Hall W	Commutation signal W
	6	n.c.	No connection
	7	n.c.	No connection
	8	BiSS_nHall	Selection of connector J1 operating mode (BiSS = not assigned; ABZ = GND)

Tbl - 11 PCB plug connector J2: JST connector strip 8-pin

6 Service & support

WITTENSTEIN cyber motor offers service and support services.

If you have technical questions, please contact the following address:

Consulting and sales	
Phone	+49 (0) 7931 493 15800
Email	info@wittenstein-cyber-motor.de
Address	**WITTENSTEIN cyber motor GmbH** Sales department Walter-Wittenstein-Straße 1 97999 Igersheim, Germany

Tbl - 12 Contact data: WITTENSTEIN cyber® motor Sales

In case of any technical malfunctions, please contact the following address:

Customer Service	
Phone	+49 (0) 7931 493 15900
Email	service@wittenstein-cyber-motor.de
Address	**WITTENSTEIN cyber motor GmbH** Customer Service Walter-Wittenstein-Straße 1 97999 Igersheim, Germany

Tbl - 13 Contact data: WITTENSTEIN cyber® motor Customer Service

If you have any questions about installation, startup or optimization, please contact our support hotline:

Support hotline	
Phone	+49 (0) 7931 493 14800
Email	wcm-support@wittenstein.de

Tbl - 30 Contact data: WITTENSTEIN cyber® motor support hotline

- Please have the following information ready:

- Detailed description of the malfunction and the circumstances
- Type code and serial number of respective products
- Phone number and Email address for contact

	• Observe the assembly instructions of your company regarding possible malfunctions and information on troubleshooting.

Revision history

Revision	Date	Comment	Chapter
01	2024-17-09	New version	All

WITTENSTEIN | cyber motor

WITTENSTEIN cyber motor GmbH · Walter-Wittenstein-Straße 1 · 97999 Igersheim · Germany
Tel. +49 7931 493-15800 · info@wittenstein-cyber-motor.de

WITTENSTEIN – one with the future
www.wittenstein-cyber-motor.de