WITTENSTEIN | cyber motor

Industrial small servo drive system

The second generation

connective
dynamic
compact

Catalogs, CAD files and instruction manuals can be found in our download center on

https://cyber-motor.wittenstein.de/en-en/download/

WITTENSTEIN | cyber motor

Content

GROUP

WITTENSTEIN | alpha

WITTENSTEIN alpha GmbH
Development and production of high-precision servo drives

WITTENSTEIN alpha develops and produces mechanical and mechatronic servo drive systems for sectors that require maximum precision. Our products consistently raise the bar around the world.

We have divided our product portfolio into two areas in order to meet very different requirements: in the high-end segment, we focus on technology and performance, while in the general segment, costeffective and high-demand products are the main focus.

WITTENSTEIN | galaxie

WITTENSTEIN galaxie GmbH
Superior gearboxes and drive systems

WITTENSTEIN galaxie develops and manufactures radically innovative gearboxes and drive systems based on a totally new functional design principle. With this unique expertise, we are the global leader in rotary mechatronic drive technologies.

These innovations help our customers designing machinery with vast performance parameters to secure their competitive core-advantages for the future. Our solutions enable products to be manufactured in a particularly efficient and resourceful way.

WITTENSTEIN | cyber motor

WITTENSTEIN cyber motor GmbH
Highly dynamic servo motors and drive electronics

WITTENSTEIN cyber motor develops and produces technologically advanced servo motors and demanding drive electronics as well as complete mechatronic drive systems with maximum power density. Our expertise is in specialized motors for ultra-high vacuums, high temperatures and radioactive environments.

We collaborate closely with our customers to exchange ideas, learn from each other and discover new opportunities that help our customers stand out from the competition. During the development process, we exchange information, learn from one another and think of new ideas together. The solutions we develop help differentiate our customers from their competitors.

WITTENSTEIN motion control

WITTENSTEIN
motion control GmbH
Customized linear and rotary servo systems

WITTENSTEIN motion control uses our own power electronics, software, servo motors and gear systems to develop and produce customized mechatronic systems for extreme conditions.

In the energy sector for instance, we focus on electric actuation solutions for subsea deep water oil and gas extraction. In the defense sector, we develop mechatronic drive systems for military applications. Here, integration is our guiding principle – for even better dynamics.

WITTENSTEIN aerospace & simulation

WITTENSTEIN
aerospace & simulation GmbH
Mechatronic drive systems for aerospace & simulation

WITTENSTEIN aerospace & simulation develops, integrates, produces and supplies mechatronic drive systems for aerospace and simulation applications. Our stringent and sophisticated system design processes ensure that our products meet our customers' requirements precisely.

Our innovative solutions are deployed in mission-critical, flight-critical and environment-critical systems, i.e. wherever the keys to success are performance, robustness, reliability and limitations on space and weight.

attocube pioneers of precision

attocube systems AG
Nanoprecision drive and measurement technology solutions

attocube develops and produces drive and measurement technology for highly demanding nanotech applications. Its product range includes everything from piezobased compact motors to innovative sensor solutions, which far exceed current measurement technology in their precision, speed and compactness and can also be used under extreme conditions.

baramundi

baramundi software AG
Secure management of IT infrastructure in offices and production areas

baramundi provides companies and organizations worldwide with efficient, secure and cross-platform management of networked endpoints in IT and manufacturing. The Management Suite provides our customers with integrated, future-orientated unified endpoint management.

baramundi leads the way in regard to unified endpoint management in networked production environments. We develop this solution in close cooperation with the WITTENSTEIN Digitalization Center.

WITTENSTEIN cyber motor GmbH

Comprehensive product expertise

- Rotary and linear servo motors and servo actuators
- Drive electronics
- Mechatronic drive systems

Customized solutions

- Customized solutions with maximum customer benefits
- We act holistically and are eager to explore new possibilities
- From conception and development through production and qualification to series delivery

Development and production in Germany

- Strong development team with profound competencies
- High level of vertical integration, including in-house winding room and certified test benches
- Premium quality based on innovative, controllable processes

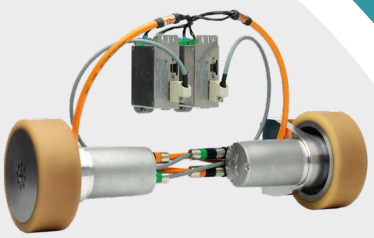
Servo motors

Drive electronics

WITTENSTEIN – Products that know no limits

Packaging	Pharmaceuticals and food	Assembly and measurement technology	Handling and robotics

Our core competencies



Mechatronic systems

Competent project management

- Preparation of feasibility studies for complex motion tasks
- Defined product development process supervised by certified project managers
- Certified according to DIN EN ISO 9001

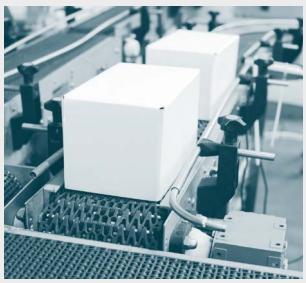
From standard industry to harsh environmental conditions

- High and low temperatures
- Radioactivity
- Vacuum
- Pressure
- Explosive atmospheres
- Clean room

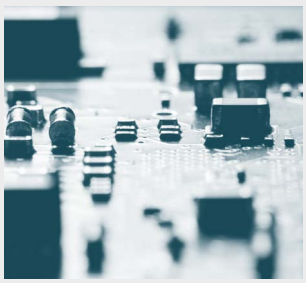
Testing, approval and certification

- CE
- UL
- IECEx (ATEX)
- EHEDG

Intralogistics



Semiconductor/
Electronics production



Electromobility

Oil and gas exploration

A plus in performance:

small servo drive system redefined.

Connectivity

Multi-Ethernet version for maximum flexibility and a variety of real-time capable fieldbus interfaces

Flexibility

Modular principle enables solutions for a wide range of applications

Compactness

Size of the second generation servo drives reduced by approx. 30 %

Precision

Outstanding high-precision control thanks to the use of absolute encoders with a resolution of 12 bits in conjunction with a high current resolution of 14 bits

Dynamics

Realization of short cycle times thanks to inertia-optimized motors, decentralized control intelligence and high overload capability

Small servo drive system
Nearly endless possibilities

The second generation of WITTENSTEIN cyber motor‘s industrial small servo drive system guarantees a plus in performance in terms of connectivity, compactness and configurability:

The system is convincing in every respect.

The cyber® simco® drive 2 servo drives are up to 30 % more compact than their predecessors and offer maximum connectivity with their Multi-Ethernet-Interface. They also feature real-time CIP Sync functionality, decentralized intelligence and a STO safety function. The new servo drives have also made it possible to realize the cyber® dynamic system. The motor-integrated design convinces through the decentralized intelligence directly on the axis and saves space in the cabinet. The servo motors of the cyber® dynamic line and the cyber® dynamic system are now optionally available with a multiturn encoder (size 32/40), holding brake (size 40), gearbox or ball screw drive.

This creates new freedom in your machine design.

connective

Flexible interfaces, intelligent software and technology functions and connection options to a wide range of control systems make the small drive system a multitalent in process design.

dynamic

Mass inertia-optimized motors, a high current resolution and coordinated control parameters permit high-precision and dynamic control of the system.

compact

Miniaturization is an integral part in the product and development strategy of WITTENSTEIN cyber motor. Servo motors with high torque density, a diameter of 17 mm and the option of decentralized use of the electronics for space savings in the switch cabinet are just a few aspects of the system.

Thanks to the numerous interfaces, the small servo drive system offers maximum flexibility for the most demanding tasks in modular machine construction.

The small servo drive system at a glance:

Servo drive - cyber® simco® drive 2

The servo drives feature a Multi-Ethernet-Interface, CIP Sync real-time functionality, decentralized intelligence and STO safety function. They are either available with protection class IP20 or IP65 in a very compact design.

Drive system - cyber® dynamic system

The motor-integrated version offers a Multi-Ethernet-Interface and convinces with decentralized intelligence directly on the axis. The system is optionally available with different encoder variants and planetary gearboxes, ball screw drive or holding brake.

Servo motors and actuators - cyber® dynamic line

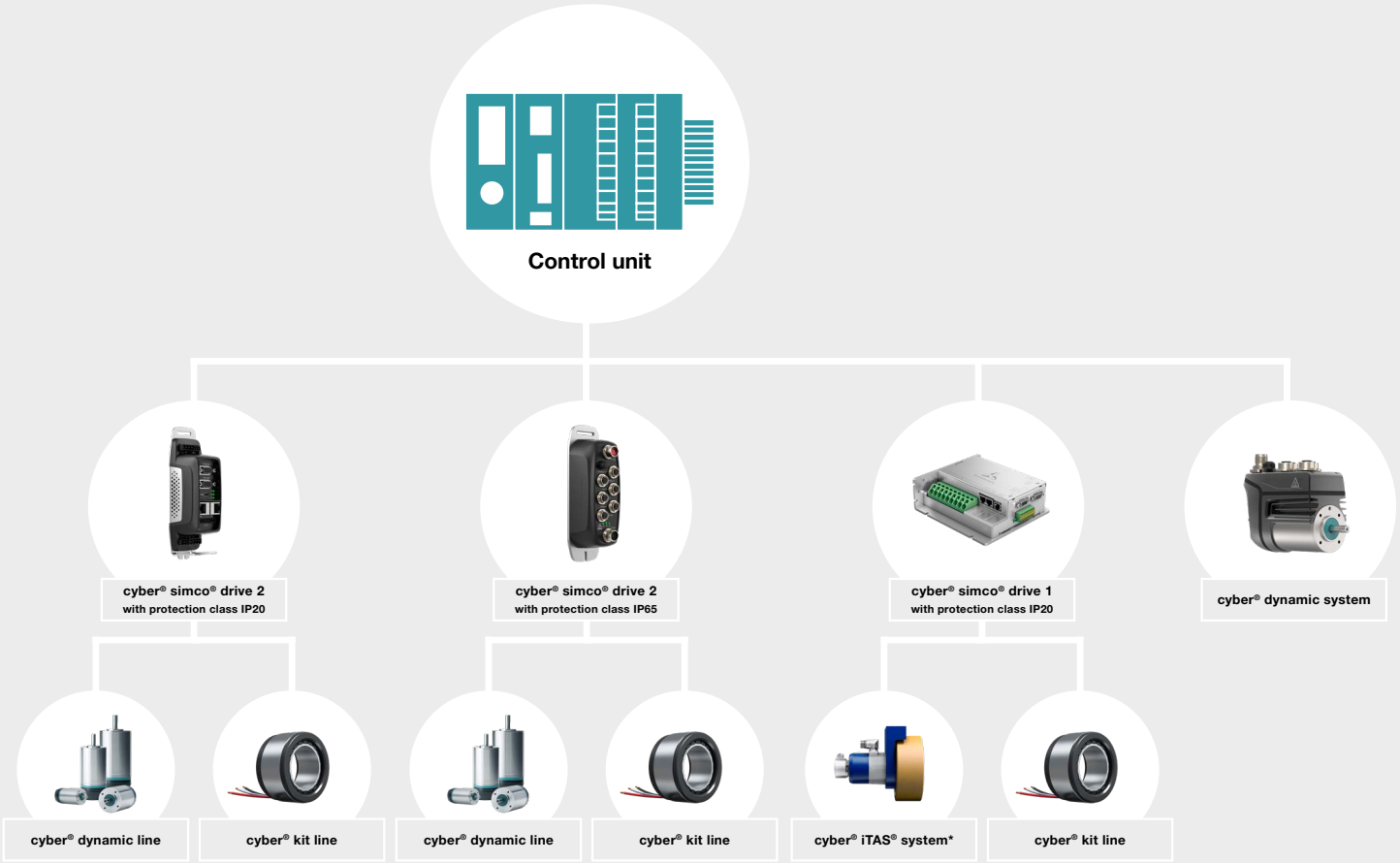
The industrial servo motors are the professional choice for dynamic applications with limited installation space. With high-quality stainless steel housing and absolute encoder (singleturn or multiturn), the motor series offers the highest reliability and precision. Optionally the servo motors can be equipped with a holding brake, planetary gearbox or ball screw drive.

Small servo drive system
Connective at all levels

The servo drives of the cyber® simco® drive 2 series and the drive system cyber® dynamic system are with the flexible fieldbus interfaces, EtherCAT, PROFINET RT / IRT, EtherNet/IP CIP Sync and TCP/IP open for the connection to very different controllers (CANopen and Sercos III on request).

The Multi-EtherNet-Interface of the cyber® simco® drive 2 servo servo drives and the compact drive system cyber® dynamic system set the new benchmark in this market segment. It enables the user to choose freely between the fieldbus variants EtherCAT, PROFINET and EtherNet/IP CIP Sync (CANopen and Sercos III on request) using one and the same hardware.This ensures proven, simple and real-time capable connectivity to a wide range of control environment.

One and the same hardware also means one and the same material number. This means that the Multi-EtherNet unique selling proposition reduces the otherwise usual number of variants. This in turn avoids costs and effort in electrical design, procurement, article administration, commissioning, service and maintenance.



*cyber® iTAS® system, please see iTAS® catalog

High transfer rates through realtime protocols measurably increase the productivity of the machine.

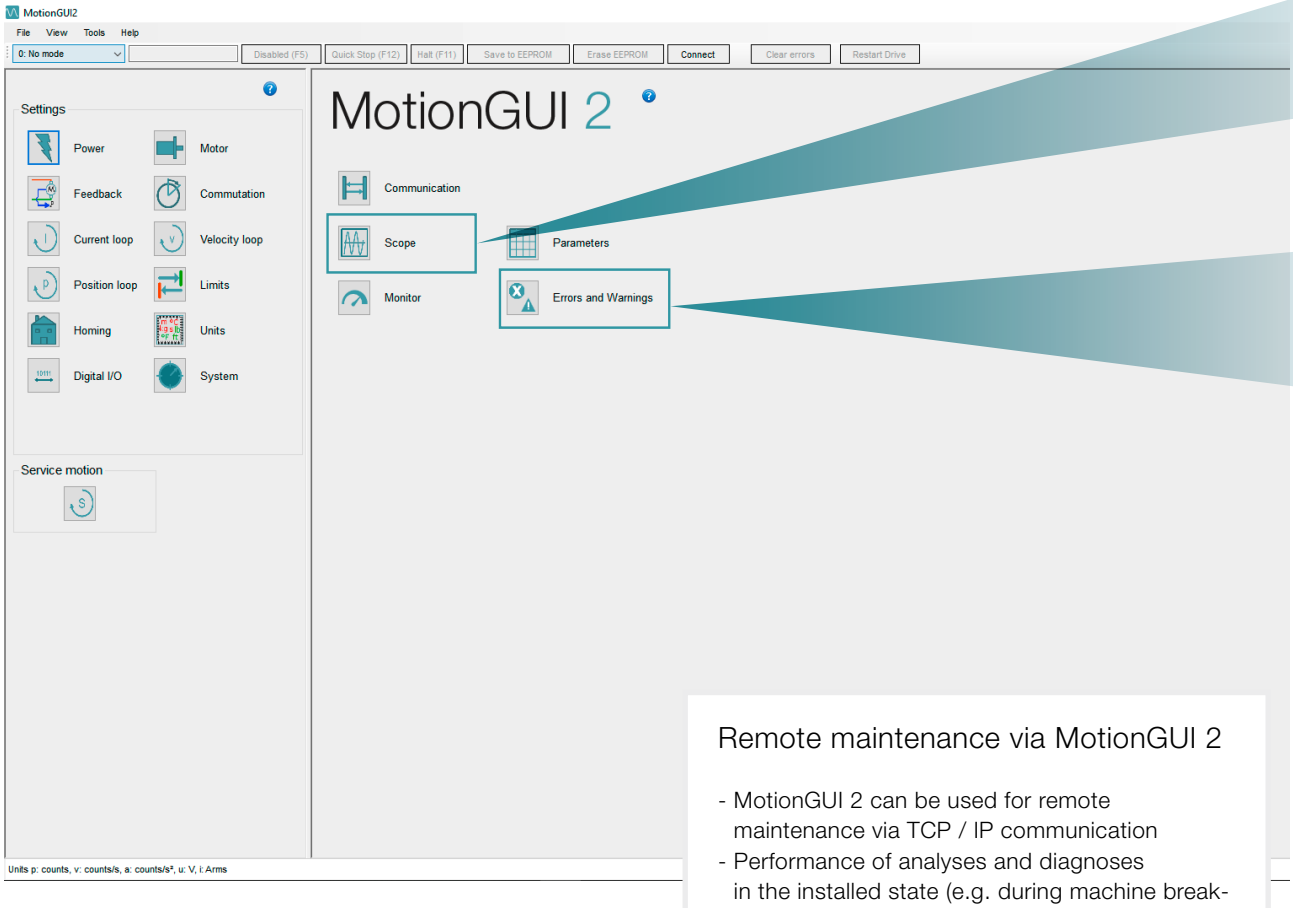
Interface performance	
PROFINET	- PROFINET RT/IRT interface supports application classes 1, 3, 4 - Simplest integration in the SIEMENS software (TIA portal/SIMOTION Scout) via the PROFIdrive drive profile - Utilization of all standard technology functions from SIEMENS - Simplest configuration through provided GSDML file – simplified axis configuration - Deviation of max. 1 µs in the bus cycle with PROFINET IRT
EtherNet/IP	- Industrial drive system for connection to the Rockwell control system - Implementation of different applications with cycle times of up to 5 ms - Simple commissioning and full utilization of the Rockwell control system save time and costs – no additional expertise required - Pre-prepared add-on instructions for implementation of different applications - Opmode selection: freely designable connection (parameters can be self-determined)
EtherCAT	- Fieldbus interface EtherCAT (CoE) for connection of the drive to a Beckhoff control system – the parameters used are thus equivalent to the CANopen standard - Time saving and easy to use thanks to File over EtherCAT: Loading of files via EtherCAT bus from the control system directly to the servo drive. Data can be simultaneously distributed to any number of drives in the network, e.g. no additional wiring during firmware updates, use of existing expertise
sercos the automation bus	- Synchronous motion profiles with a low cycle duration and jitter can be realized using the FSP Drive profile. - The standard function blocks and technology functions of individual PLCs can be used, so that it is a simple matter to connect and configure the servo drives - Products on request
CANopen	- Integration of the drive with CANopen according to protocol standar DS402 - Implementation of numerous operating modes, e.g. profile position, profile velocity, etc. - Maximum flexibility in process design through dynamic PDO mapping: Process data can be changed via dynamic PDO mapping even during operating time - Products on request
TCP/IP	- Parametrization of n-axes via the TCP/IP interface (without connecting each individual cyber® simco® line to a PC) - Elimination of wiring requirement - Implementation of web server applications

Small servo drive system
Software MotionGUI 2

Intuitive control during commissioning and operation

The MotionGUI 2 graphical user interface guides the user intuitively during commissioning and operation of the drive system.

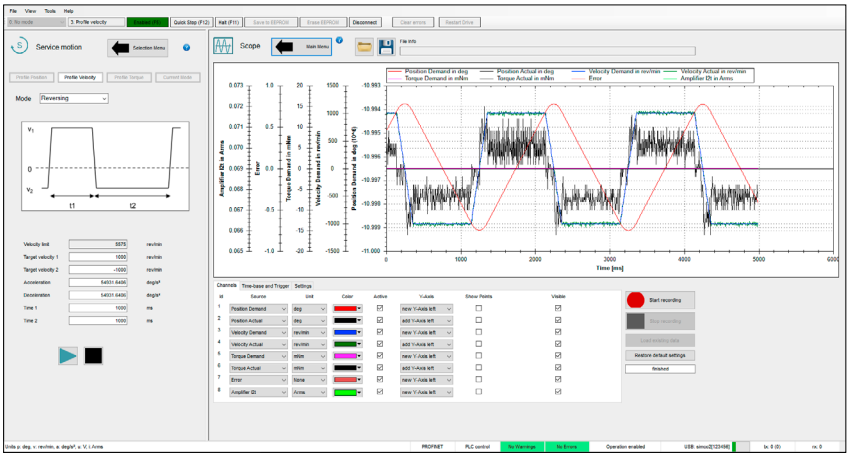
Diagnoses, optimizations and parametrization of the drive can be performed via a number of functions. Diagnostic routines and event logging are implemented by means of a time stamp. Condition monitoring as well as integration and maintenance work can be carried out in an efficient and time-saving way – visible at any time in MotionGUI 2 software.



Remote maintenance via MotionGUI 2

- MotionGUI 2 can be used for remote maintenance via TCP / IP communication
- Performance of analyses and diagnoses in the installed state (e.g. during machine break-downs)

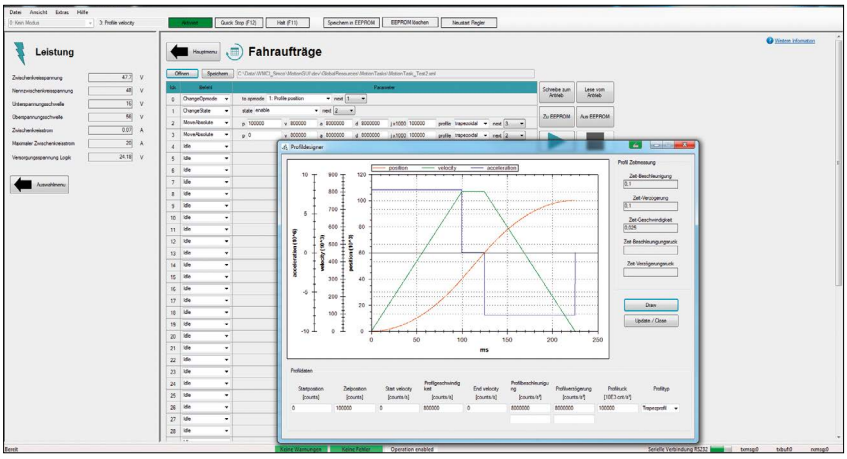
Diagnostic functions



- Oscilloscope function
  Analysis of applications and movement sequences via the oscilloscope function – also possible in offline mode

- Errors and warnings
  Logging of errors and warnings for fast troubleshooting – storage of errors in error history

Motion tasks



- Extended motion block table with „decentralized intelligence“ for individual modification and flexible programming of the application
- Simple creation of motion tasks with reduced programming effort for the machine manufacturer
- Complex single-axis movements, such as clamping processes or actuation of lifting modules can also be generated and executed decentrally
- In the case of several synchronized axes: movements can be started simultaneously via a synchronization signal from the control system
- Realization of stand-alone solutions by omitting the control system

Small servo drive system
Solutions for complex motion tasks

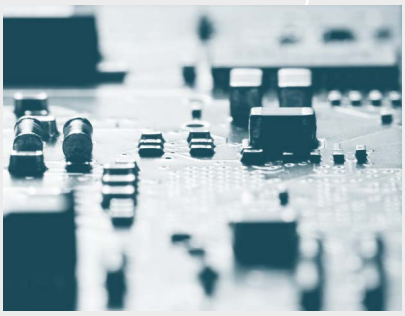
Precise.
Cost-effective.
Flexible.

Filling

Precise filling with servo motor-controlled filling valves through flexible control of the filling volume

Positioning

Highly dynamic and precise positioning of sensitive components



Adjustment

High-precision and dynamic servo motors for an automated and process monitored format or valve adjustment

Bonding and dispensing

Brushless servo motors with the highest reliability for challenging and precise bonding and dispensing systems

Gripping

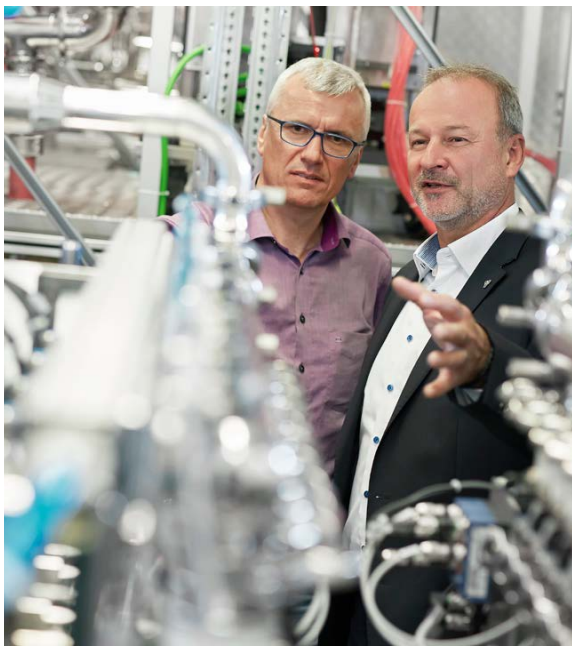
Servo electric grippers with high power density and minimal weight for sophisticated pick & place applications

Measuring and testing

Low-noise and reliable drives for innovative measurement and testing solutions to set industrial standards

Applications
in practice

Precise dosing of liquids for process reliability and product quality



„Repetable dosing precision is enormously important, both in the interests of a relaible process and to ensure uniform product quality“

Hubert Rypalla, Project Manager

Customer:
Harro Höfliger GmbH from Allmersbach/Germany

Industry:
High-tech packaging systems, process solutions and services for pharmaceutical and medical technology, chemical industry, food and consumer good

Application:
It was a complex challenge: liquids of varying viscosity needed to be dosed into pads efficiently and precisely in a dishwasher pad forming machine at Harro Höfliger GmbH – up to six million times a day.

Solution:
Harro Höfliger's developers put their trust in small servo drive systems from WITTENSTEIN cyber motor, which are made from 100 % stainless steel and hence resistant to corrosion. The compact, lightweight design likewise won the customer's enthusiasm straight away owing to significant space saving. Moreover, the web server integrated in the servo drive provides “always on” connectivity, so that the dosing stations and each individual dosing drive can be accessed at any time for optimization or servicing.

Description:
Size d40 (outer diameter in mm), stainless steel small servo motors of the cyber® dynamic line with a ratio i=30.67 are installed in two dosing stations of the product forming machine for dishwasher tabs along with SIM2010D compact servo drives of the cyber® simco® line with IP20

Dynamic and exact.
Repeatable precision.
Process reliability.

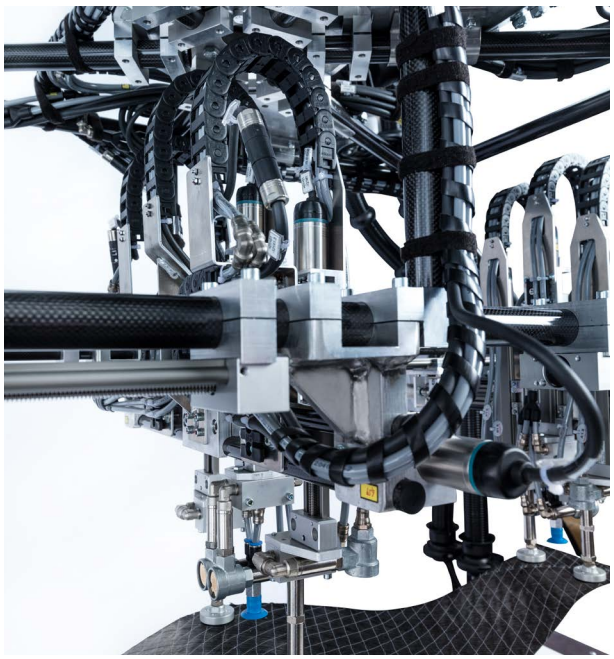
protection and a ProfiNet interface. Full stainless steel was chosen because if the product leaks, the detergent substances have a corrosive effect on surfaces and, what's more, the equipment can be cleaned externally. The motors and drives are connected using single-cable technology that is integration-friendly and compatible with drag chains.

Special feature:
The high current resolution of the servo drive enables dynamic and highly precise control of the small servo motors, which are designed with optimized mass inertia. The motors act directly on the dosing augers, which in turn ensure high, repeatable dosing precision with just a few grams of liquid per pad.

The single-source availability of the motor and the servo drive means technically optimized solutions at any time with no interface risks – also in other applications such as powder dosing or as a drive solution for screwing on caps. Regardless of where the machine is installed and what it is used for, both manufacturer and end customers can rely on worldwide support from the WITTENSTEIN service network.

Applications
in practice

Lightweight, flexible, cost-effective – latest generation gripper technology



„Differently to e.g. pneumatic systems, the servo technology enables different linear positions to be moved to in a flexible way without any mechanical conversion operations. That was decisive for the process.“

Michael Schneiderbauer, Product Development

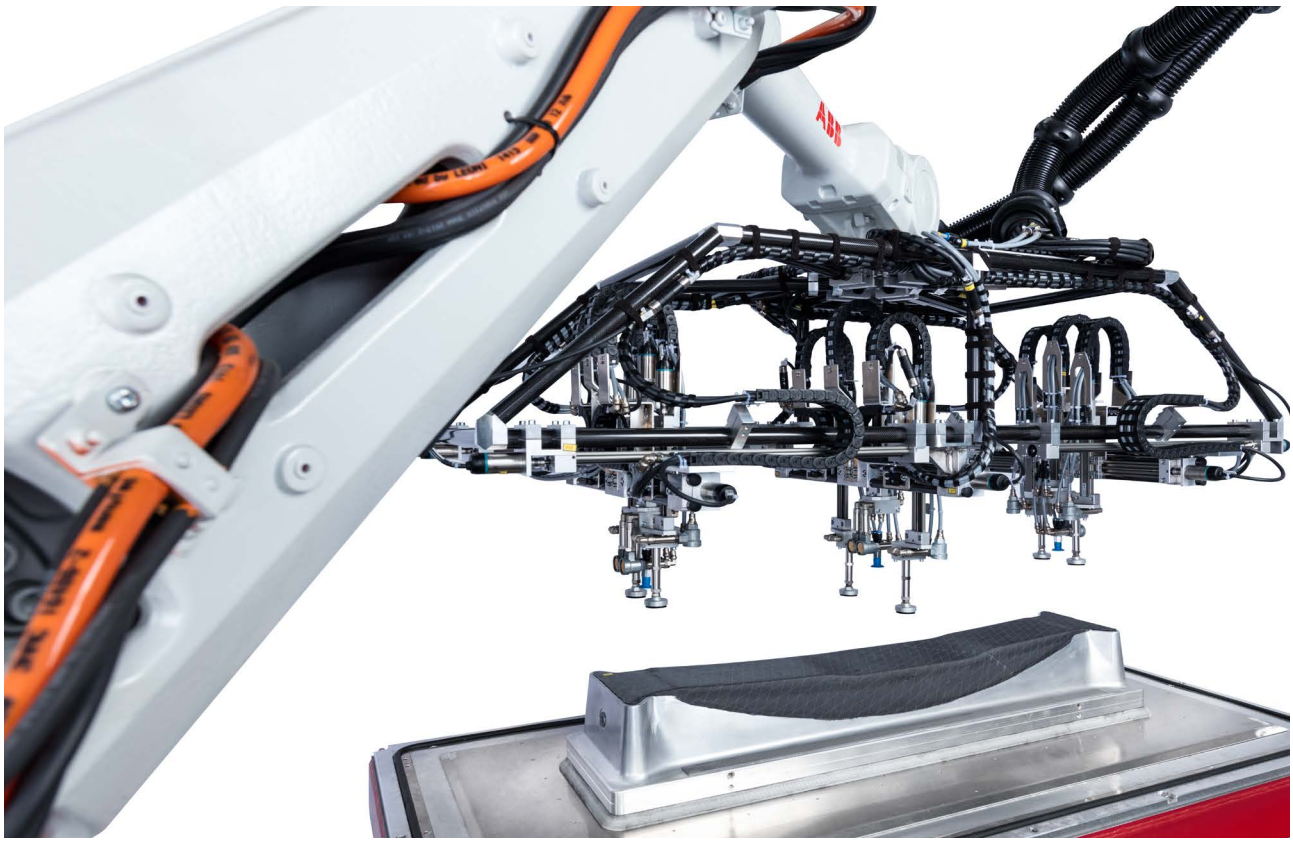
Customer:
FILL from Gurten/Austria

Industry:
Machine and plant construction

Application:
The gripper array from the Austrian machine and plant manufacturer FILL is an innovative handling system for the automated production of CFRP and GFRP parts. Three objectives had to be met in terms of production technology process innovation in any case: maximum flexibility during gripping, significant weight reductions of the end effector and cost efficiency during procurement and operation of the handling system. The layer build-up and curing of the CFRP or GFRP parts needed to be achieved on a single mould. For this purpose, the gripper system has to be able to pick up composite lengths of different sizes and PU cores, partly preform these and set them down.

Solution:
FILL implements more than a dozen industrial small, size-32 servo motors from the cyber® dynamic line, each with a cyber® simco® line servo drive in protection class IP20, in the new handling unit. Decisive for the selection of the small servo drive systems were the compact dimensions and low weight of the motors as well as the option of integrating the servo drive in the PROFINET fieldbus environment of the handling system.

Compact design.
Low weight.
Easy integration.



Description:
Through the use of carbon tubing for the supporting structure and the small servo motors from WITTENSTEIN, a weight reduction of more than 50 % and significant energy savings were achieved.

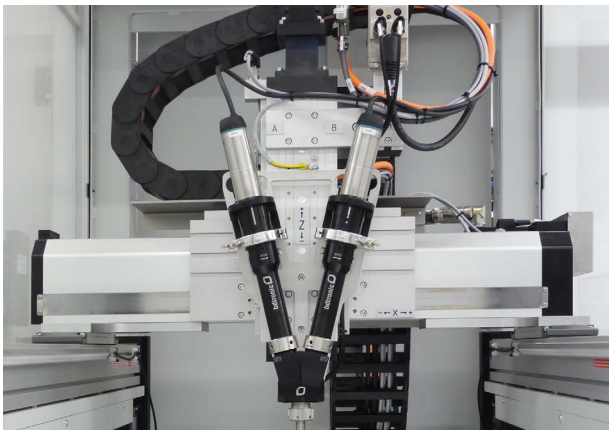
As a complete mechantronic solution, the cyber® simco® line servo drive with fieldbus integration capability and PROFINET interface was selected owing to the existing Siemens control system.

For this purpose FILL combined this with the small cyber® dynamic line series servo motor. These lightweight and compact servo motors blend in well visually and enable extremely precise movement sequences, which are determined flexibly and independently from one another and can be adapted.

Special feature:
Motor and drive from a single source – this was clearly the best technological solution for FILL because interface risks are ruled out from the outset thanks to the matched system components. For the machine manufacturer, but also for the integrators and end users, the simple connection of the existing Siemens control system with PROFINET offers numerous benefits: operation and commissioning is particularly simple and intuitive with the appropriate MotionGUI operating software. Diagnoses, optimizations and parametrization of the drive can be performed via a number of functions. Diagnostic routines and event logging are implemented by means of a real-time clock. This allows both condition monitoring and any maintenance work to be performed easily and in a time-saving manner.

Applications
in practice

Process accuracy for positioning and dosing of smallest quantities



„The market places ever higher demands on dispensing and repeat accuracy“

Markus Rieger, Sales Director Germany

Customer:
bdtronic GmbH from Weikersheim

Industry:
Plant systems and process solutions for dispensing technology and other special applications

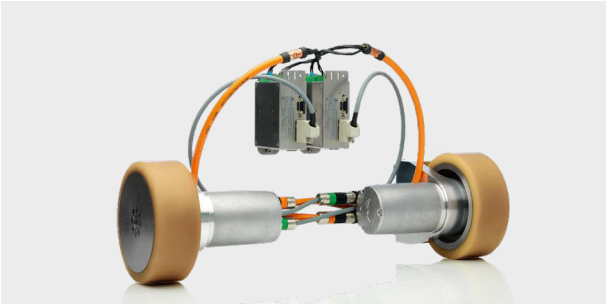
Application:
For the processing of reactive casting resins, a small servo drive system with special performance focuses was being sought: The requirement was for a complete drive solution guaranteeing the highest dispensing and repeat accuracy with completely different material properties during processing.

Solution:
The performance package consisting of cyber® simco® line drive and cyber® dynamic actuator R can reliably cope with the extremely heterogeneous influencing factors.

Description:
The complete solution from WITTENSTEIN optimally exploitsthe performance potential of the drive solution: The cyber® dynamic line size 40 servo motors work with integrated planetary gearheads and drive the eccentric screw pumps so that even the tiniest quantities in the microliter range can be dispensed with precision. Precise control via the cyber® simco® line servo drive makes it possible to individually regulate the dispensing quantities and to minimize the quantity tolerances. In this way, the dispensing results can be optimized in a reproducible manner – under full process control, at all times.

Special feature:
The cyber® simco® line servo drive is characterized by very high-resolution current regulation and fast current measurement. This enables the delivery of the tiniest quantities with great accuracy, even in the case of variable movement speeds.

Optimal system solution with decentralized control unit



„The consulting from a single source ensures reliable project planning.“

Joachim Walter, Managing Director at BeeWaTec AG

Customer:
BeeWaTec AG from Pfullingen near Reutlingen

Industry:
Mini AGV for production and warehouse logistics

Application:
The manufacturer of automated guided vehicles was looking for a tailor-made drive solution for use in a modular mini-vehicle for transporting stacked goods containers.

Solution:
iTAS® system with TAS 004 plus cyber® simco® line IP20 and, as a "perfect match", cyber® dynamic actuator R size 40 with cyber® simco® line IP20.

Description:
Through individual selection of the motor/gearhead unit in conjunction with the appropriate cyber® simco® line electronics, extremely diverse performance ranges can be covered. At BeeWaTec, the cyber® simco® line is also used as a decentralized control unit for the handling equipment on the vehicles and is adapted to the small high-torque drives of the cyber® dynamic line. Procuring both drive solutions from a single source was a decisive argument for BeeWaTec.

Special feature:
A special requirement for the BeeWaTec Mini vehicle is transporting overall weights of up to 150 kg, which not only have to be pulled, but also clamped to the vehicle. This is made possible by the innovative solution for the clamping actuator in the vehicle: the clamping is controlled decentrally via the cyber® simco® line. Digital inputs and outputs connect this to the vehicle computer; there is no need for a complicated fieldbus interface. BeeWaTec created a motion task for the clamping. This is part of the intuitive MotionGUI user interface and is stored in the cyber® simco® line. The motion task contains all the necessary parameters for the clamping in the form of a list.

cyber® simco® line
Servo drives

Saving installation space
up to 30 %

Space saving installation
Stackability and user-friendly pin assignment

Numerous fieldbus interfaces and decentral intelligence
- Multi-Ethernet version
- Real-time capable fieldbus interfaces
- Various encoder interfaces
- PLC functionality

Protection class
IP20 / IP65

Wide range input
12-60 V_{DC}

Integrated safety function
STO according to SIL3 / PL e

Torque control
High precision and dynamic

Electronic name plate
Automatic and safe parametrization of the motor

In combination with various servo motors and servo actuators, cyber® simco® drive 2 is the ideal solution for fast and precise moving and positioning tasks. With a continuous output of up to 750 W and a short-term peak output of 1.5 kW, the servo drive is suitable for high-precision applications, e.g. in the machine-tool, electronics or packaging industries – as a switch cabinet version with protection class IP20 or decentralized version with protection class IP65.

Connectivity

The cyber® simco® drive 2 servo drive is equipped with a Multi-Ethernet-Interface and allows with one and the same hardware – free selection between the Fieldbus variants EtherCat, PROFINET, EtherNet/IP CIP Sync (CANopen and Sercos III on request).This feature ensures proven, simple and real-time connectivity to a wide variety of control environments. The Multi-Ethernet version also reduces the usual number of variants and avoids high effort in the electrical construction, in procurement, article administration and commissioning, service and maintenance.

Flexibility

The Multi-Ethernet version of the simco® drive 2 series offers a wide range of flexibility in selecting the required interfaces. In addition, various performance classes are available, which can be selected precisely according to the application. The flexible programming of motion tasks and the portfolio of IP20 and IP65 variants allows enormous freedom in machine design for control cabinet or decentralized applications.

Dynamics and precision

Dynamics and precision are two further features that characterize the cyber® simco® drive servo drives. The real-time-capable and clock-synchronous Ethernet communication, the high current resolution of 14 bits and a switching frequency of 16 kHz enable highly accurate torque control in complex motion control applications.

Intelligence

cyber® simco® line "thinks" ahead and for you. Integration, commissioning, operability, expansion, configuration, communication: with cyber® simco® line, everything is designed for simplicity, intuition and efficiency. This saves time and money – and is more than clever.

Safety and robustness

Suitable for industrial use - this term can be used to describe the combination of robust design and integrated safety. With the integrated safety function STO (Safe Torque Off) all servo drive variants fulfill safety requirements according to SIL3 / PL e. In addition, the servo drives are equipped with a 12 to 60 V_{DC} wide range input, which allows compensation for any fluctuations in the voltage source.
The servo drives are also available with protection class up to IP65 and are suitable for demanding operation conditions.

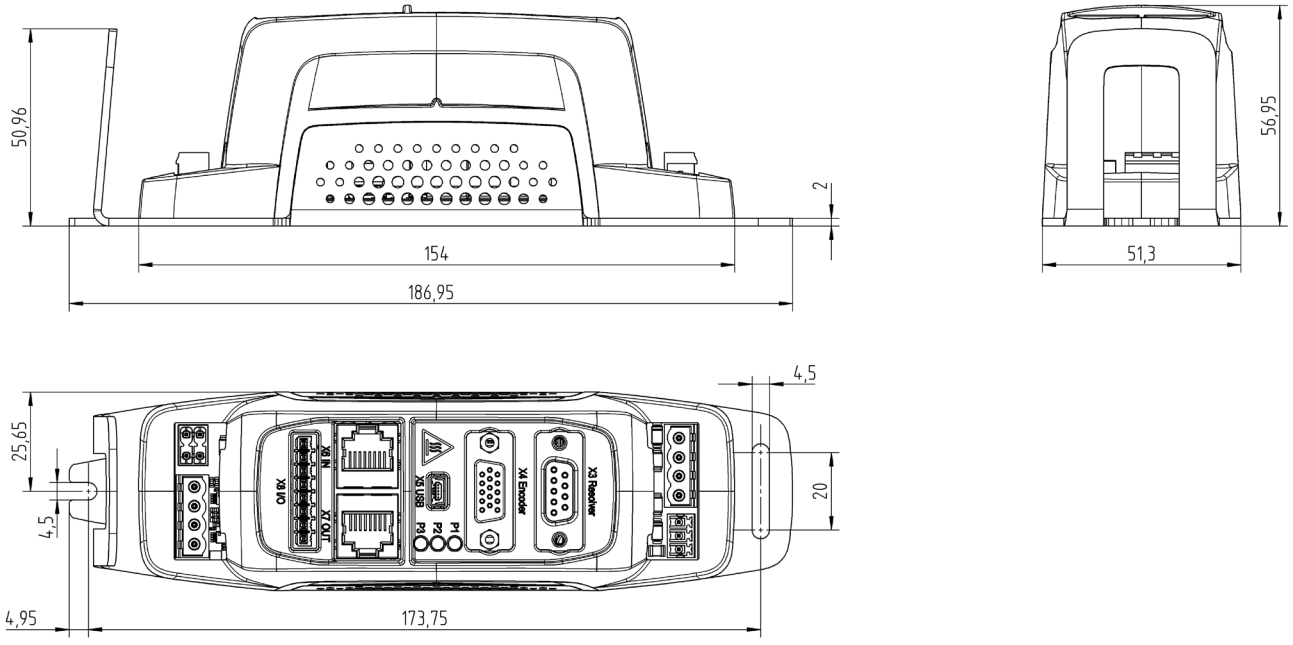
Compactness and simplicity

The cyber® simco® drive 2 servo drives convince with their compact design. This series is 30 % more compact than the previous version and allow with the forward arranged mounting brackets user friendly pin assignments. This also allows stackability of the servo drives in the switch cabinet, which saves space or offers solutions for the tightest installation conditions.

cyber® simco® drive 2
IP20

Performance version		SIM2007	SIM2015
Supply voltage (Power / Logic / STO)	V_{DC}	+ 12 ... 60	
Rated current	A_{eff}	7.5	15
Maximum current	A_{eff}	15	30
Rated power (at 48 V_{DC})	W	375	750
Maximum power (at 48 V_{DC})	W	750	1500
Communication	-	EtherCat, PROFINET RT/IRT, EtherNet/IP CIP Sync, Sercos III*, CANopen*	
Encoder interface	-	EnDat 2.2, BiSS-C, Resolver	
Commissioning	-	USB	
Digital inputs	-	4	
Digital outputs	-	2	
Safety function	-	STO according to SIL 3	
Brake control	-	yes	
Brake chopper	-	integrated, connection of a braking resistor possible	
Technology functions	-	Motion Task	
Weight	kg	0.36	
Ambient temperature	°C	0 ... 45	
Protection class	IP	20	
Approval	-	NRTL, CE, STO according to SIL3 / PL e	

* Sercos III and CANopen on request



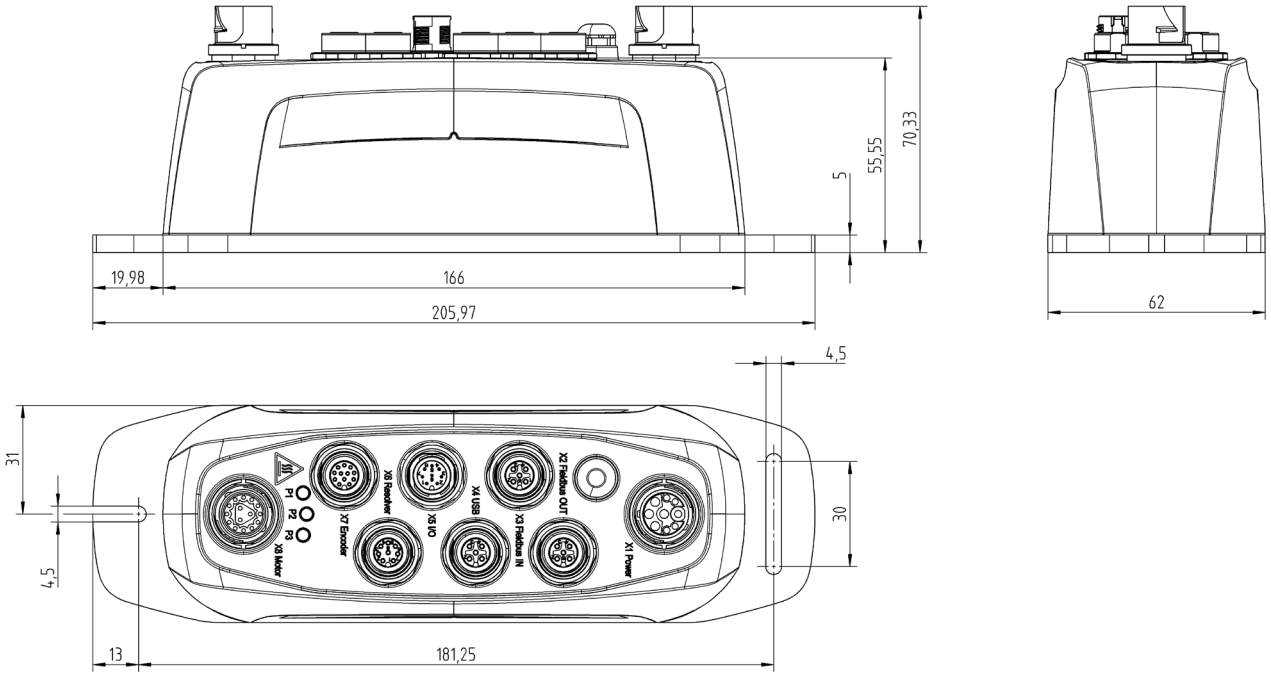
Number	Function	Connector on the device
X1	Power supply	Dinkle 5EHDVC-04PL (is supplied)
X2	Optional auxiliary voltage logic and STO	Dinkle ECH350V-03PL (is supplied)
X3	Resolver interface	SUB-D 9-pole socket
X4	Encoder interface	SUB-D 15-pole socket
X5	Diagnostic interface USB	Mini USB-B socket
X6	Fieldbus interface Input	RJ45 socket
X7	Fieldbus interface Output	RJ45 socket
X8	Digital inputs and -outputs	Dinkle 0225 (is supplied)
X9	Connection of motor temperature sensor and brake	Dinkle 0159 (is supplied)
X10	Motor (U, V, W, PE)	Dinkle 5EHDVC-04PL coded (is supplied)

Shield clamp available as accessory (see page 74)

cyber® simco® drive 2
IP65

Performance version		SIM2007	SIM2015
Supply voltage (Power / Logic / STO)	V_{DC}	+12 ... 60	
Rated current	A_{eff}	7.5	15
Maximum current	A_{eff}	15	30
Rated power (at 48 V_{DC})	W	375	750
Maximum power (at 48 V_{DC})	W	750	1500
Communication	-	EtherCat, PROFINET RT/IRT, EtherNet/IP CIP Sync, Sercos III*, CANopen*	
Encoder interface	-	EnDat 2.2, BiSS-C, Resolver	
Commissioning	-	USB	
Digital inputs	-	4	
Digital outputs	-	2	
Safety function	-	STO according to SIL 3	
Brake control	-	yes	
Brake chopper	-	integrated, connection of a braking resistor possible	
Technology functions	-	Motion Task	
Weight	kg	0.62	
Ambient temperature	°C	0 ... 55	
Protection class	IP	65	
Approval	-	NRTL, CE, STO according to SIL3 / PL e	

* Sercos III and CANopen on request

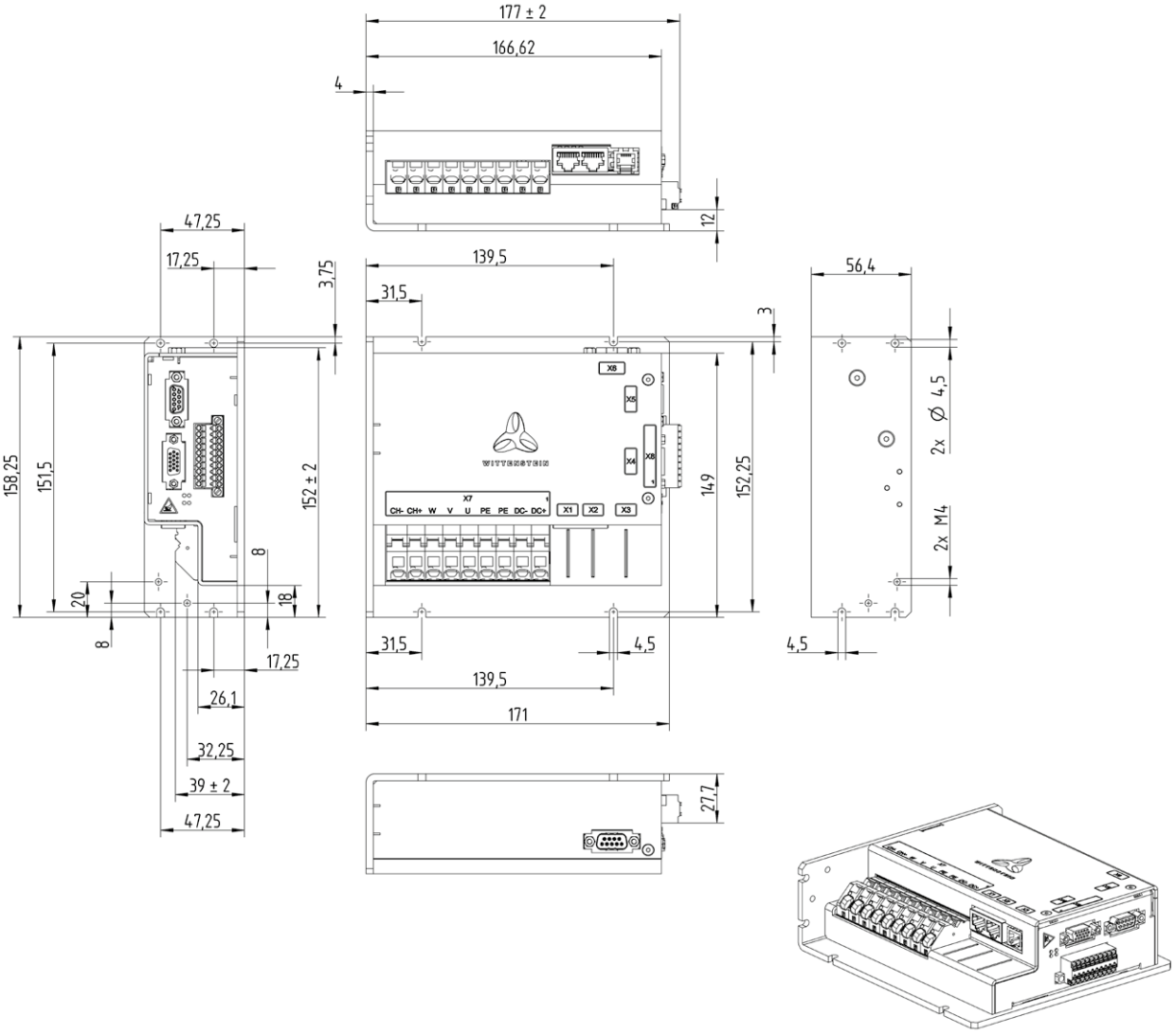


Number	Function	Connector on the device
X1	Power supply (optional auxiliary voltage logic and STO)	Intercontec, itec 915, 9-pole, connector
X2	Fieldbus interface Output	CAN: M12 5-pole socket A-coded Ethernet-based: M12 4-pole socket D-coded
X3	Fieldbus interface Input	CAN: M12 5-pole connector A-coded Ethernet-based: M12 4-pole socket D-coded
X4	Diagnostic interface USB	M12 4-pole socket A-coded
X5	Digital inputs and -outputs	M12 8-pole connector A-coded
X6	Resolver interface	M12 8-pole socket, A-coded
X7	Encoder interface	M12 12-pole socket, A-coded
X8	Motor (U, V, W, PE, connection of motor temperature sensor and brake)	Intercontec, itec 915, 15-pole, socket

cyber® simco® drive 1
IP20

Performance version			SIM2050D-C
Supply voltage (Power)	U_{DC}	V_{DC}	+12 … +60 (unregulated)
Supply voltage (Logic)	U_{log}	V_{DC}	+12 … +60 (unregulated)
Rated current	I_N	A_{eff}	50
Maximum current	I_{max}	A_{eff}	100 (for 5s)
Rated power (at 48 V_{DC})	P_N	W	2500
Maximum power (at 48 V_{DC})	P_{max}	W	5000
Switchung frequency	f_{PWM}	kHz	8 … 32
Current control resolution	-	Bit	14
Communication	-	-	CANopen, EtherCAT, PROFINET RT / IRT, EtherNet / IP, Sercos III
Encoder interface	-	-	BISS C, EnDat 2.2*, Hall sensors, Resolver
Commissioning	-	-	RS232
Digital inputs	-	-	4, opto-decoupled, freely programmable function
Digital outputs	-	-	2, opto-decoupled, freely programmable function
Safety function	-	-	STO (Safe Torque off) according to SIL3 / PL e certified
Brake control	-	-	yes
Brake chopper	-	-	Not integrated
Technology functions	-	-	Disk cam, Motion Tasks
Weight	m	kg	1.03
Event logging with real-time clock	-	-	yes
Ambient temperature	ϑ_A	°C	0 … 45
Protection class	-	IP	20
Approval	-	-	CE, STO according to SIL 3 / PL e

* not in combination with Sercos III



Number	Function	Connector on the device
X1	Fieldbus interface Input	RJ45 socket
X2	Fieldbus interface Output	RJ45 socket
X3	Diagnostic interface RS232	RJ12 socket
X4	Encoder interface	SUB-D 15-pole socket
X5	Resolver interface	SUB-D 9-pole socket
X6	Digital inputs and -outputs	SUB-D 9-pole connector
X7	Motor connection	Phoenix Contact ZFKDS 10-10.00
X8	Power supply	Phoenix Contact MC 1.5 / 10-GF-3.5

Heat sink available as accessory (see page 74)

cyber® dynamic line
Brushless servo motors

The brushless servo motors of the cyber® dynamic line are the smart choice for limited space applications. These stainless steel housed motors are equipped with absolute encoders (Singleturn and Multiturn) and deliver unparalleled performance, reliability and value from the smallest package.

The motors can be optionally extended with a holding brake in Inox- and Hygienic design, planetary gearboxes or ball screws.

Industrial grade

With a protection class up to IP69K, the cyber® dynamic line is also suitable for use under adverse conditions. The drag-chain compatible, single-cable solution facilitates integration in machines, the stainless-steel housing and the high-strength connection of the motorgearhead combination ensure a high level of reliability. An absolute encoder is also integrated as standard. Optionally, the series can be equipped with a multiturn encoder (for size 32/40) or a holding brake (for size 40).

Dynamics

The cyber® dynamic line is characterized by a high dynamic factor (maximum torque M_{max} / mass inertia J) and performs short movements with frequent speed changes in an optimal manner (e.g. pick & place). This allows higher accelerations to be achieved – together with shorter downtimes and cycle times in the machine. In addition to this productivity-increasing potential, the low inertia of the motor can effectively help save energy and enhance efficiency.

Torque density

Thanks to its high copper filling factor, the cyber® dynamic line has a comparatively high torque in a small size. This enables the direct drives to achieve a torque of up to 1 Nm. Thanks to their low weight and compact design, the motors are also particularly suitable for use in moving axes. The possibility of downsizing the entire drive train means measurable cost savings.

Simplicity

The motor parameters of the cyber® dynamic line are stored in the cyber® simco® line and automatically synchronized with the encoder circuit board by the TID. This electronic name plate makes commissioning particularly uncomplicated, fast and reliable.

cyber® dynamic motor
Servo motor

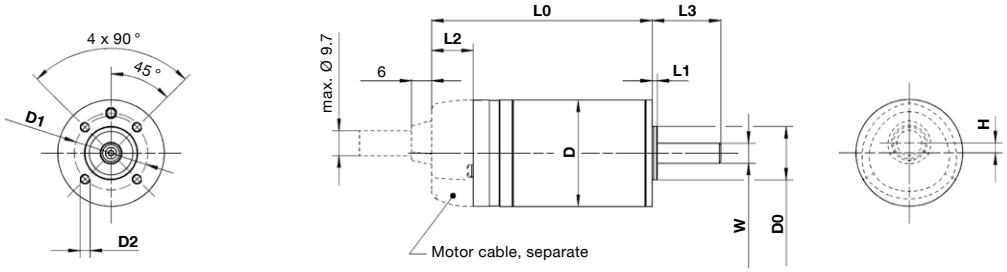
Size			17	22	32	40
DC bus voltage	U_{Dc}	V_{DC}	48	48	48	48
Maximum torque	M_{max}	Nm	0.035	0.08	0.33	1.02
Continuous stall torque	M_0	Nm	0.012	0.034	0.14	0.38
Holding torque brake (at 120°C)	M_4	Nm	-	-	-	0.36
No-load speed	n_0	min^{-1}	22.918	14.324	9.513	5.590
Continuous stall current	I_0	A_{eff}	0.52	0.96	2.6	3.9
Mass moment of inertia	J_1	kgm^2*10^{-8}	5.2	12	57	250
Weight*	m	kg	0.11	0.15	0.33	0.54
Ambient temperature	ϑ_U	°C	0 up to +40			
Protection class Shaft Cable outlet	-	IP	 20 54			
Encoder	-	-	Absolute encoder Singleturn BISS-C (HI) Absolute encoder Multiturn BISS-C (HM) for size 32/40 Incremental encoder (HF)			

* Standard version incl. 0.5 m cable and connector

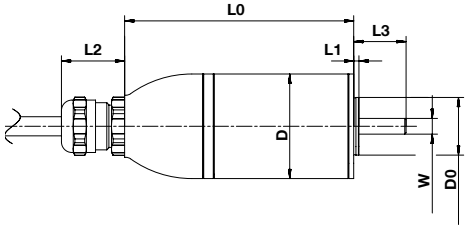
Inox / Hygienic Design

Design	Inox Design	Hygienic Design
Size (Outer diameter in mm)	17 / 22 / 32 / 40	40
Protection class Shaft Cable outlet	 IP20 IP66/67	 IP67 IP69K
Contact surfaces	Corrosion-resistant stainless steel	Corrosion-resistant stainless steel
Design	Standard	Hygienic design (according to EHEDG guidelines)
Lubrication	Food grade (NSF/H1)	Food grade (NSF/H1)
Certification	CE, UL (cRUus) for Size 32 / 40	CE
Gearbox	optional	optional
Screw drive	optional	no

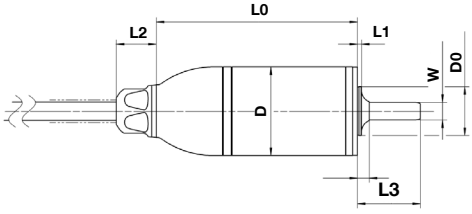
Standard:



Inox Design:



Hygienic Design:



Size	17		22		32		40		
Design	Standard	Inox	Standard	Inox	Standard	Inox	Standard	Inox	Hygienic
D	17		22		32		40		
D0	10		13		16		22		
D1	12.5		17		22		32		30
D2	M1.6x2.5		M2x3.5		M3x4.5		M3x4.5		M3x4
W	3		4		6		6		8
L0 (without brake)	47	54.4	49.1	57.9	66.1	74.6	80.3	87.4	90.4
L0 (with brake)	-	-	-	-	-	-	123.4	130.5	133.5
L1	1.2		1.5		1.5		2		
L2	13.3	20	12.4	20	12.5	22	14.5	22	18
L3	10		12		20.6		20		28.5
H	0		0		3		7.5		
Shaft type	Plain shaft								

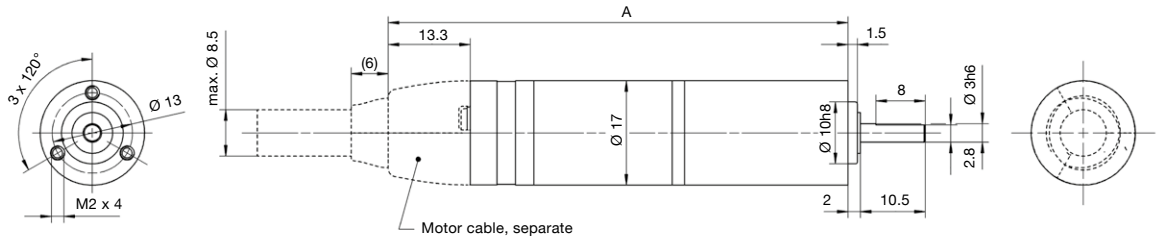
cyber® dynamic actuator R

Servo actuator - size 17

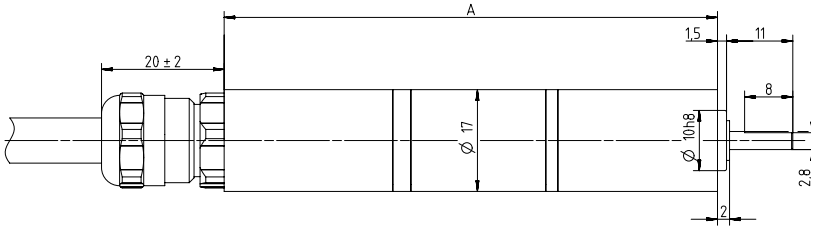
No. of stages			1	2			3		
Gear ratio	i	–	4	12	21	28	36	48	64
Maximum torque	M_{max}	Nm	0.1	0.28	0.49	0.63	0.78	1.0	1.0
Continuous stall torque	M_0	Nm	0.03	0.08	0.14	0.19	0.22	0.29	0.37
Rated torque	M_n	Nm	0.02	0.06	0.1	0.13	0.15	0.2	0.27
No-load speed	n_{max}	min^{-1}	2.500	830	475	355	275	210	150
Permanently permitted speed	$n_{max, S1}$	min^{-1}	1.500	500	285	215	165	125	90
Continuous stall current	I_0	A_{eff}	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Weight*	m	kg	0.14	0.15			0.15		
Torsional backlash	j_t	arcmin	20	35			50		
Max. axial force**	F_{AMax}	N	10						
Max. radial force**	F_{max}	N	30						
Protection class Shaft Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	20 54 66/67						
Shaft type	-	-	D-cut shaft						

* Standard version incl. 0.5 m cable and connector
** Refers to center of the output shaft

Standard:



Inox Design:

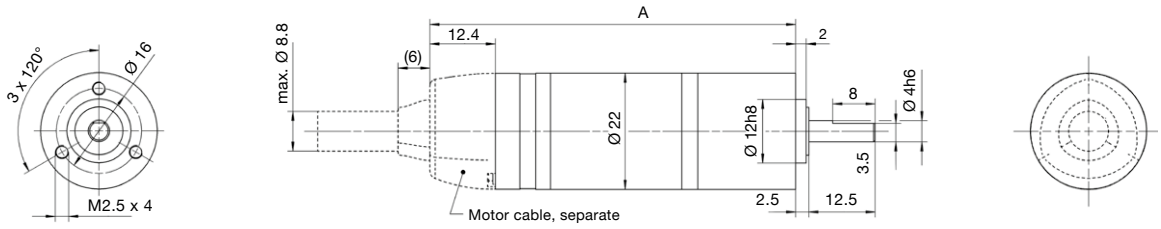


Gear ratio	Length A [mm]	Length A [mm] (Inox Design)
Single-stage, i4	64.5	71.9
Two-stage, i12/21/28	69.5	76.9
Three-stage, i36/48/64	74.5	81.9

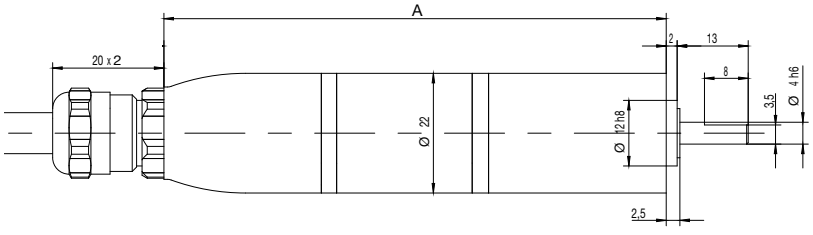
No. of stages			1	2			3
Gear ratio	i	–	4	16	20	28	64
Maximum torque	M_{max}	Nm	0.2	1.0	1.0	1.0	1.5
Continuous stall torque	M_0	Nm	0.1	0.43	0.5	0.5	1.34
Rated torque	M_n	Nm	0.1	0.39	0.48	0.5	1.2
No-load speed	n_{max}	min^{-1}	2.500	625	500	360	155
Permanently permitted speed	$n_{max, S1}$	min^{-1}	1.500	375	300	215	95
Continuous stall current	I_0	A_{eff}	0.74	0.84	0.79	0.58	0.75
Weight*	m	kg	0.20	0.21			0.22
Torsional backlash	j_t	arcmin	20	35			50
Max. axial force**	F_{AMax}	N	24				
Max. radial force**	F_{max}	N	30				
Protection class Shaft Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	20 54 66/67				
Shaft type	-	-	D-cut shaft				

* Standard version incl. 0.5 m cable and connector
** Refers to center of the output shaft

Standard:



Inox Design:



Gear ratio	Length A [mm]	Length A [mm] (Inox Design)
Single-stage, i4	69.1	77.9
Two-stage, i16/20/28	76.1	84.9
Three-stage, i64	83.1	91.9

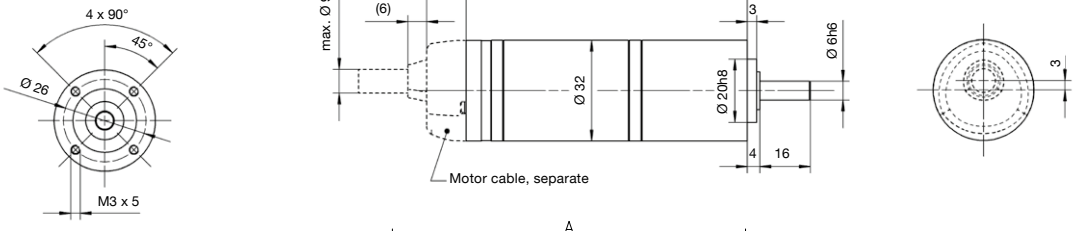
cyber® dynamic actuator R

Servo actuator - size 32

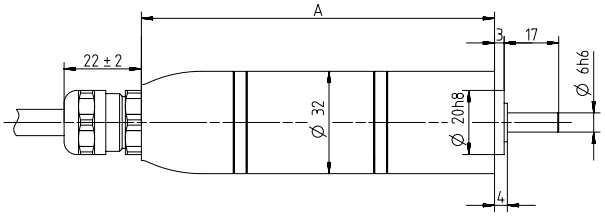
No. of stages			1	2			3		
Gear ratio	i	–	4	16	20.8	25	64	72	100
Maximum torque	M_{max}	Nm	0.8	4.0	4.0	4.0	6.0	6.0	6.0
Continuous stall torque	M_0	Nm	0.4	1.5	2.0	2.0	6.0	6.0	6.0
Rated torque	M_n	Nm	0.4	1.3	1.7	2.0	5.0	5.7	6.0
No-load speed	n_{max}	min^{-1}	2.000	500	385	320	125	111	80
Permanently permitted speed	$n_{max, S1}$	min^{-1}	1.250	313	240	200	78	69	50
Continuous stall current	I_0	A_{eff}	1.9	2.0	2.0	1.7	2.0	1.8	1.4
Weight*	m	kg	0.47	0.51			0.56		
Torsional backlash	j_t	arcmin	20	35			50		
Max. axial force**	F_{AMax}	N	65						
Max. radial force**	F_{max}	N	80						
Protection class Shaft Cable outlet (Standard Design) Cable outlet (Inbox Design)	-	IP	20 54 66/67						
Shaft type	-	-	Plain shaft						

* Standard version incl. 0.5 m cable and connector
** Refers to center of the output shaft

Standard:



Inox Design:

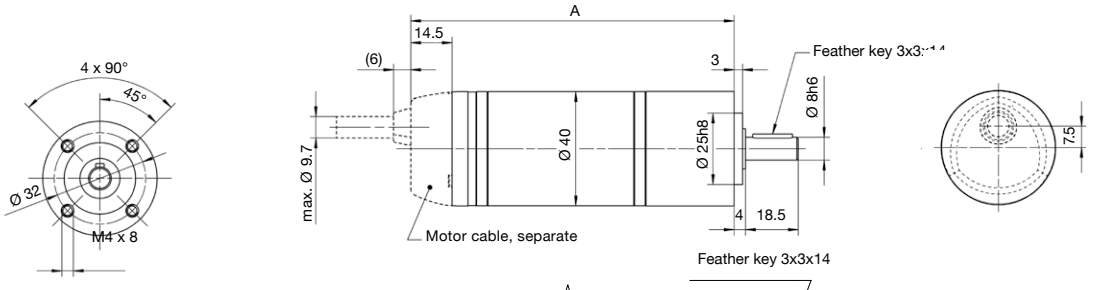


Gear ratio	Length A [mm]	Length A [mm] (Inox Design)
Single-stage, i4	92.6	101.1
Two-stage, i16/20.8/25	101.6	110.1
Three-stage, i64/72/100	110.6	119.1

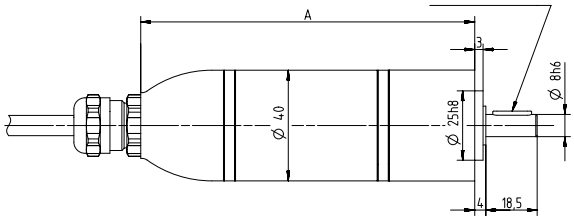
No. of stages			1	2				3		
Gear ratio	i	–	4	12.25	20	25	30.67	49	64	100
Maximum torque	M_{max}	Nm	1.4	8.0	8.0	8.0	8.0	12.0	12.0	12.0
Continuous stall torque	M_0	Nm	0.7	3.2	4.0	4.0	4.0	11.4	12.0	12.0
Holding torque brake (at 120°C)	M_4	Nm	1.6	4.8	7.8	9.8	12.0	19.2	25.1	39.2
Rated torque	M_n	Nm	0.7	2.4	4.0	4.0	4.0	7.5	9.8	12.0
No-load speed	n_{max}	min^{-1}	1.400	455	280	220	182	114	87	56
Permanently permitted speed	$n_{max, S1}$	min^{-1}	1.250	408	250	200	160	100	78	50
Continuous stall current	I_0	A_{eff}	2.0	2.9	2.3	1.9	1.6	2.9	2.5	1.8
Weight* (without brake)	m	kg	0.8	0.89				0.95		
Torsional backlash	j_t	arcmin	20	35				50		
Max. axial force**	F_{AMax}	N	120							
Max. radial force**	F_{max}	N	150							
Protection class Shaft Cable outlet (Standard Design) Cable outlet (Inbox Design)	-	IP	20 54 66/67							
Shaft type	-	-	Feather keyway							

* Standard version incl. 0.5 m cable and connector
** Refers to center of the output shaft

Standard:



Inox Design:



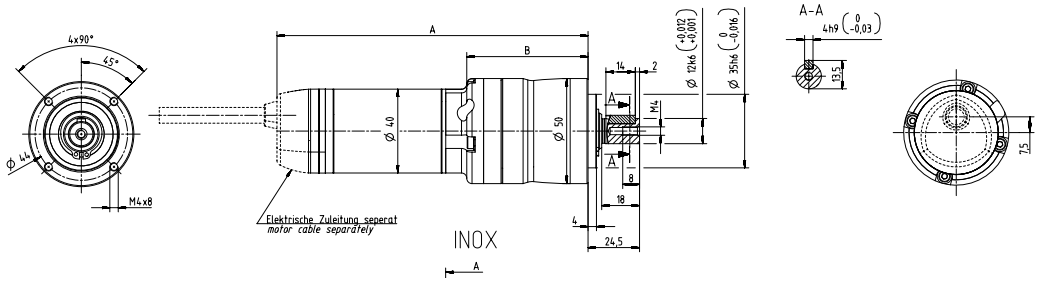
Gear ratio	Length A [mm]	Length A [mm] (Inox Design)	Additional length brake [mm]
Single-stage, i4	113.3	120.4	43.1
Two-stage, i12.25/20/25/30.67	125.8	132.9	43.1
Three-stage, i49/64/100	138.3	145.4	43.1

cyber® dynamic actuator R
Servo actuator - size 40 (NP)

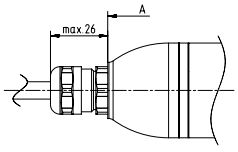
No. of stages			1		2
Gear ratio	i	–	5	10	25
Maximum torque	M_{max}	Nm	4.9	9.9	22.0
Continuous stall torque	M_0	Nm	1.6	3.4	6.5
Holding torque brake (at 120°C)	M_4	Nm	2.2	4.1	10.5
No-load speed	n_{max}	min^{-1}	1.118	559	224
Permanently permitted speed	$n_{max, S1}$	min^{-1}	800	460	160
Rated current	I_n	A_{eff}	3.7	3.7	2.9
Maximum current	I_{max}	A_{eff}	11.4	11.4	10.0
Maximum torsional backlash	j_t	arcmin	≤ 10		≤ 13
Max. axial force**	F_{AMax}	N	700		
Max. radial force**	F_{rmax}	N	800		
Weight* (without brake)	m	kg	1.1	1.1	1.3
Protection class Shaft Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	64 54 66/67		
Shaft type	-	-	Feather keyway		

* Standard version incl. 0.5 m cable and connector
** Refers to center of the output shaft

Standard:



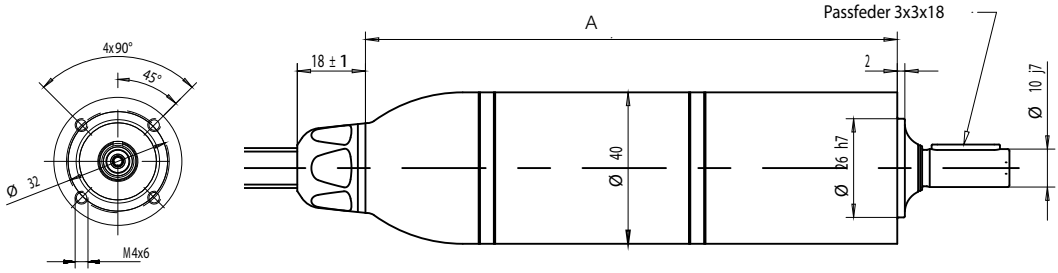
Inox Design:



Gear ratio	Length A [mm]	Length A [mm] (Inox Design)	Additional length brake [mm]
Single-stage, i5, 10	148	155.1	43.1
Two-stage, i25	163.5	170.6	43.1

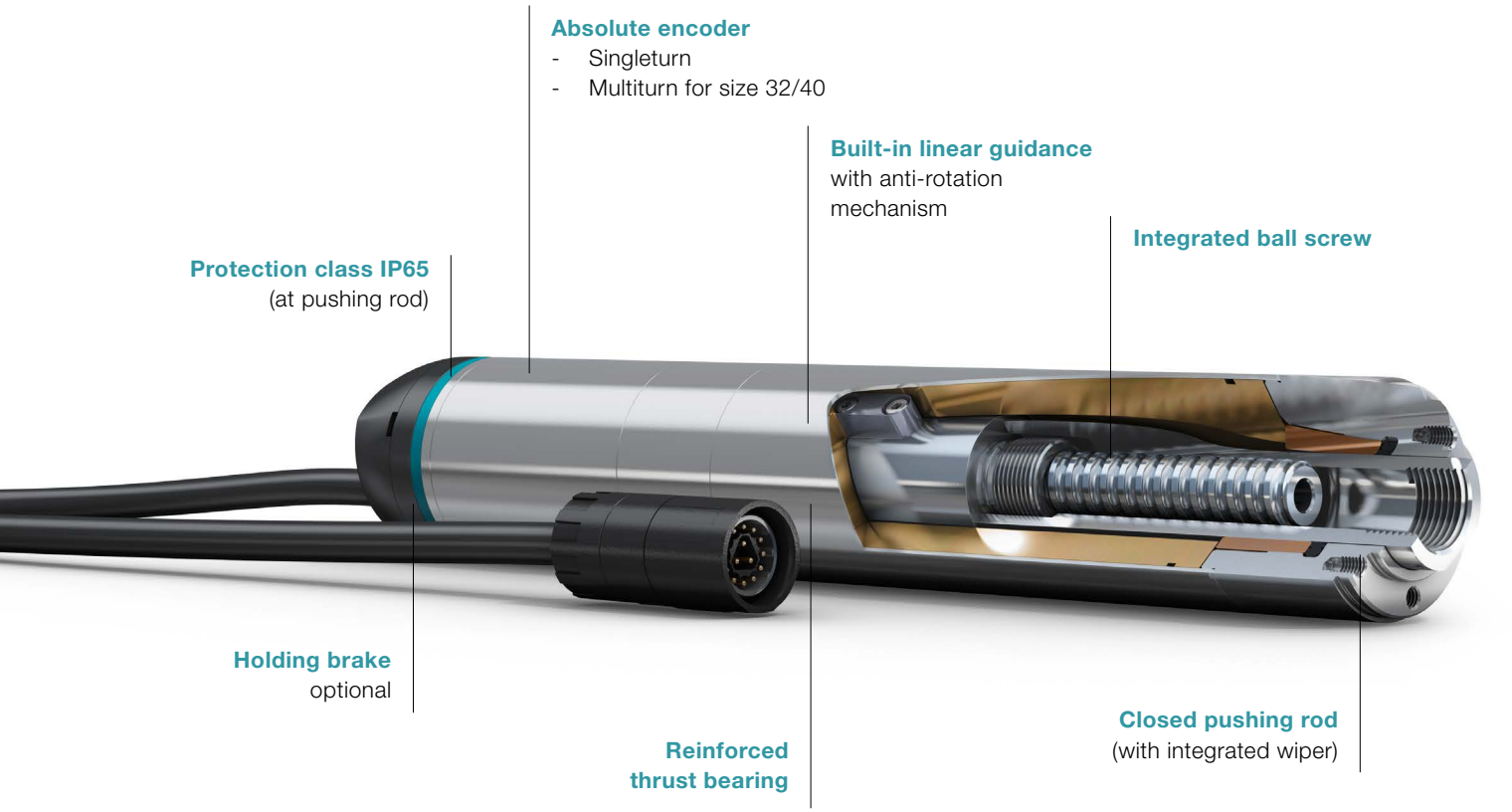
No. of stages			1		2	
Gear ratio	i	–	4	5	16	50
Maximum torque	M_{max}	Nm	3.2	4.0	8.4	8.4
Continuous stall torque	M_0	Nm	1.1	1.0	4.2	4.2
Holding torque brake (at 120°C)	M_4	Nm	1.6	2.1	6.6	20.5
Rated torque	M_n	Nm	0.91	0.76	3.65	4.2
No-load speed	n_{max}	min^{-1}	1400	1120	350	110
Permanently permitted speed	$n_{max, S1}$	min^{-1}	1000	800	250	80
Continuous stall current	I_0	A_{eff}	3.1	2.4	3.0	1.05
Weight* (without brake)	m	kg	0.92		1.13	
Torsional backlash	j_t	arcmin	20		25	
Max. axial force**	F_{AMax}	N	230			
Max. radial force**	F_{max}	N	200			
Protection class Shaft Cable outlet	-	IP	67 69K			
Shaft type	-	-	feather keyway			

* Standard version incl. 0.5 m cable and connector
** Refers to center of the output shaft



Gear ratio	Length A [mm]	Additional length brake [mm]
Single-stage, i4/5	124.6	43.1
Two-stage, i16/50	140.1	43.1

cyber® dynamic line
Linear actuators



The industrial-suited linear actuators of the cyber® dynamic line with integrated ball screw are the perfect solution for dynamic positioning operations. As servo motors with an integrated ball screw, they represent an energy efficient and maintenance free alternative to pneumatic cylinders.

The version with a closed pushing rod as well as a built-in linear guidance and anti-rotation mechanism forms a very compact unit. Optionally, the motors can be extended with a holding brake (size 40) in Inox and Hygienic design.

Industrial grade

With the linear actuators of the cyber® dynamic line, the screw is fully integrated in the actuator housing – the servo motor, ball screw, linear guide and encoder system form a closed, highly integrated and ready-to-install unit. All sizes moreover feature an absolute encoder and are designed using EMC shielded, single-cable technology that is compatible with drag chains. Thanks to these innovative features, the drives are perfect for industrial applications.

Power density & dynamics

The small servo motors with integrated screw impress with their high power density and dynamics. Each of the four sizes has two different screw pitches, making them ideal for applications, which are either force- or speed optimized. The linear actuators additionally have a compact design, which results in much lower mass inertia than feasible, for instance, if the screw is simply attached to the servo motor.

Maintenance-free system

The linear actuators are lifetime lubricated, so that no maintenance is required. The closed thrust tube has an integrated scraper to prevent dirt from getting onto the screw. Furthermore, the spindle drive with reinforced bearings allows both a tensile and a compressive force to be applied.

Process reliability

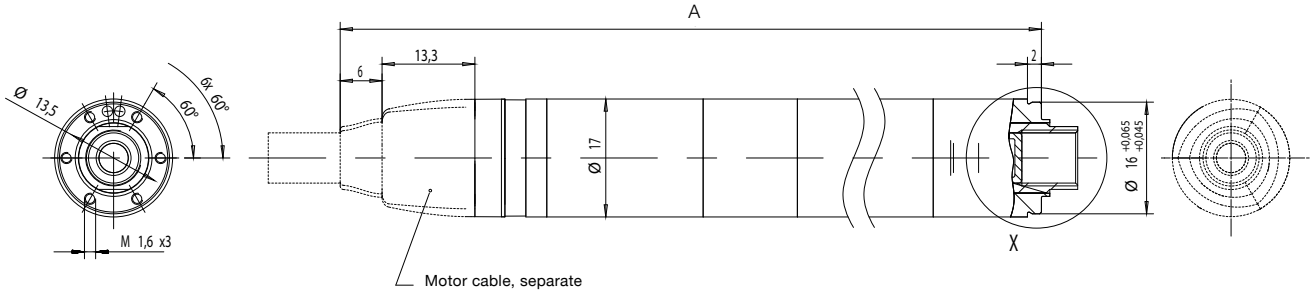
Unlike pneumatic cylinders, the linear actuators permit precise and flexible position control regardless of the application without any retooling on the machine. They are thus ideal whenever frequent format changes are likely. The servo technology offers better controllability by design; together with the easy integration into a higher-level controller, this facilitates reproducible processes that can be realized either position or force controlled.

cyber® dynamic actuator L
Linear actuator - size 17

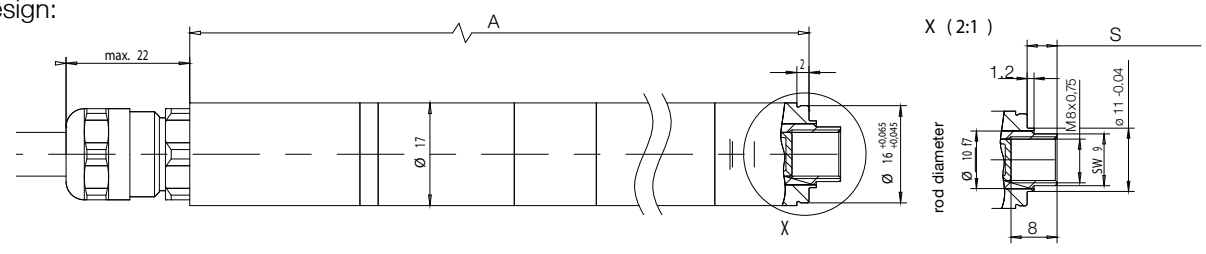
			17	
Screw pitch	p_{SP}	mm	1	3
Maximum push force	F_{AMax}	kN	0.2	0.07
Continuous stall force	F_0	kN	0.05	0.02
Max. speed (without external load)	v_0	mm/s	100	300
Positioning accuracy	-	mm	up to 0.05	
Repeatability	-	mm	0.01	
Maximum stroke	s	mm	30/120	
Weight (depending on stroke length)*	m	kg	0.23/0.33	
Protection class Pushing rod Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	 65 54 66/67	

* Standard version incl. 0.5 m cable and connector

Standard:



Inox Design:

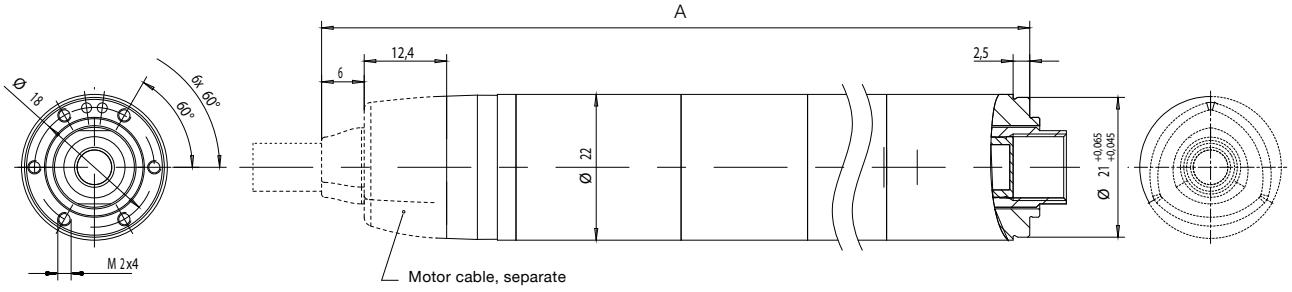


Length A [mm]	Length A [mm] (Inox Design)	Stroke S [mm]
140	147.4	5.2 - 35.2 (=30 mm)
230	237.4	5.2 - 125.2 (=120 mm)

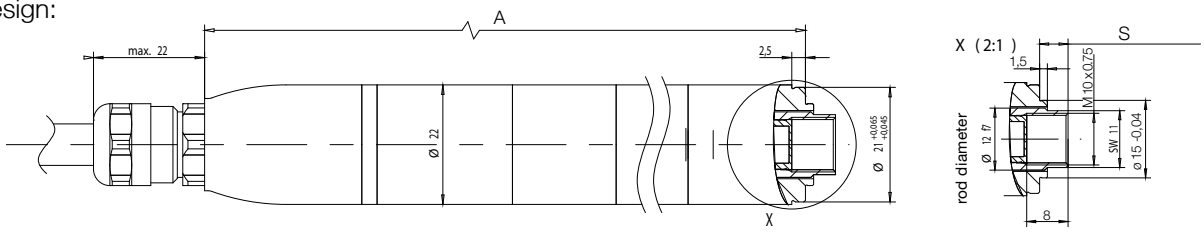
			22	
Screw pitch	p_{SP}	mm	1	6
Maximum push force	F_{AMax}	kN	0.4	0.07
Continuous stall force	F_0	kN	0.16	0.03
Max. speed (without external load)	v_0	mm/s	100	600
Positioning accuracy	-	mm	up to 0.05	
Repeatability	-	mm	0.01	
Maximum stroke	s	mm	35/140	
Weight (depending on stroke length)*	m	kg	0.39/0.62	
Protection class Pushing rod Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	 65 54 66/67	

* Standard version incl. 0.5 m cable and connector

Standard:



Inox Design:



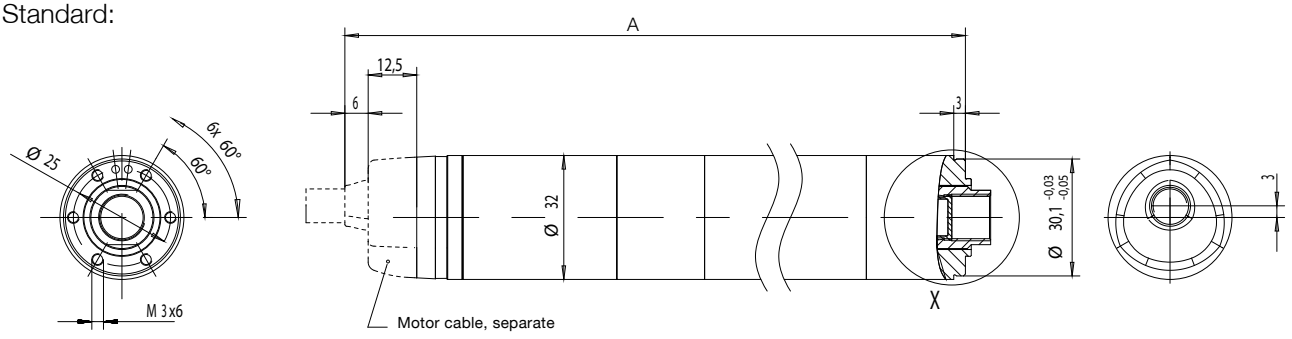
Length A [mm]	Length A [mm] (Inox Design)	Stroke S [mm]
164.5	172.9	5.5 – 40.5 (=35 mm)
269.5	277.9	5.5 – 145.5 (=140 mm)

cyber® dynamic actuator L
Linear actuator - size 32

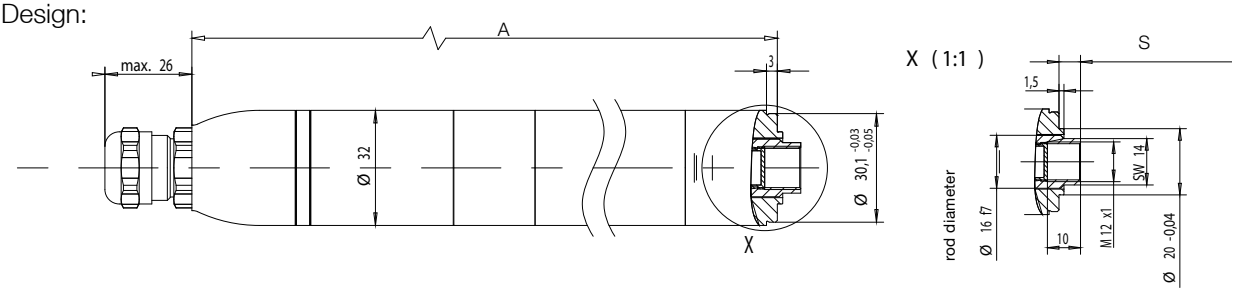
			32	
Screw pitch	p_{SP}	mm	2	8
Maximum push force	F_{AMax}	kN	0.94	0.2
Continuous stall force	F_0	kN	0.35	0.09
Max. speed (without external load)	v_0	mm/s	200	800
Positioning accuracy	-	mm	up to 0.05	
Repeatability	-	mm	0.01	
Maximum stroke	s	mm	40/160	
Weight (depending on stroke length)*	m	kg	1.0/1.6	
Protection class Pushing rod Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	 65 54 66/67	

* Standard version incl. 0.5 m cable and connector

Standard:



Inox Design:

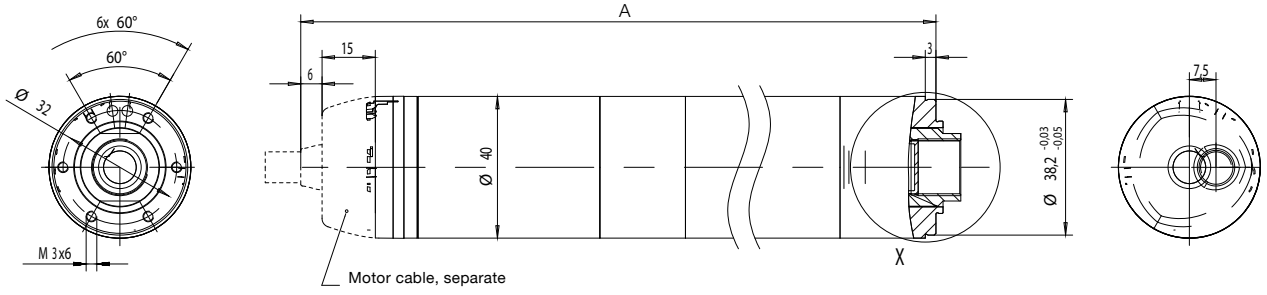


Length A [mm]	Length A [mm] (Inox Design)	Stroke S [mm]
199.1	205.6	6.5 – 46.5 (=40 mm)
319.1	325.6	6.5 – 166.5 (=160 mm)

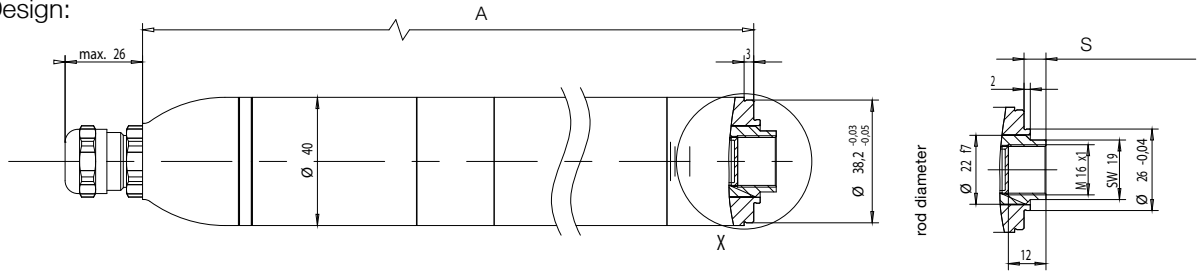
			40					
Screw pitch	p_{SP}	mm	3			10		
Maximum push force	F_{AMax}	kN	1.92	1.92	1.28	0.58	0.58	0.58
Continuous stall force	F_0	kN	0.64	0.64	0.6	0.17	0.17	0.19
Holding torque brake (at 120°C)	F_4	Nm	0.83	0.83	0.83	0.25	0.25	0.25
Max. speed (without external load)	v_0	mm/s	279	279	140	932	932	467
Positioning accuracy	-	mm	up to 0.05					
Repeatability	-	mm	0.01					
Maximum stroke	s	mm	50	200	300	50	200	300
Weight (depending on stroke length)*	m	kg	1.8	3.2	3.0	1.8	3.2	3.0
Protection class Pushing rod Cable outlet (Standard Design) Cable outlet (Inox Design)	-	IP	65 54 66/67					

* Standard version incl. 0.5 m cable and connector

Standard:



Inox Design:



Length A [mm]	Length A [mm] (Inox Design)	Stroke S [mm]	Additional length brake [mm]
239.3	246.4	7 – 57 (=50 mm)	43.1
389.3	396.4	7 – 207 (=200 mm)	43.1
489.3	496.4	7 – 307 (=300 mm)	43.1

Holding brake

A compact permanent magnet brake is fitted to secure the motor shaft when the motor or actuator is disconnected from the power. Characteristics include holding without torsional backlash, no residual torque when the brake is released and unlimited power-on time at zero speed.

Size		40
Holding torque static at 120 °C	Nm	0.36
Supply voltage	V_{DC}	24
Current at rated voltage and 20 °C	A_{DC}	0.42
Engaging time	ms	up to 0.05
Release time	ms	0.01
Weight	kg	0.18

The holding brakes used in the motors and actuators are subject to various factors, e.g. oxidation of abraded particles, flattening of friction surfaces due to frequent application of the brakes in the same position or air gap changes due to wear. This may result in a reduction of available holding torques. The specified holding torques apply under optimal conditions without detrimental influences. For critical applications we recommend dimensioning for an adequately large holding torque to take account of these factors of uncertainty.

Depending on the ratio configured for the event of an emergency stop, the brakes used in the motors and actuators can generate a dynamic braking torque at the output which exceeds the maximum permissible torque $M_{max\ act}$ of the gearbox. In this case, it must be ensured in the application that such an exceeding of the maximum torque is prevented, otherwise the gearbox may be damaged. For linear drives, the same behaviour results from external force effects.

Note: The holding brake is available for the cyber® dynamic system and for the cyber® dynamic line in size 40 in combination with an absolute encoder (HI/HM) and Inox/Hygiene Design. Variants with incremental encoder (HF) or in standard design cannot be equipped with a holding brake.

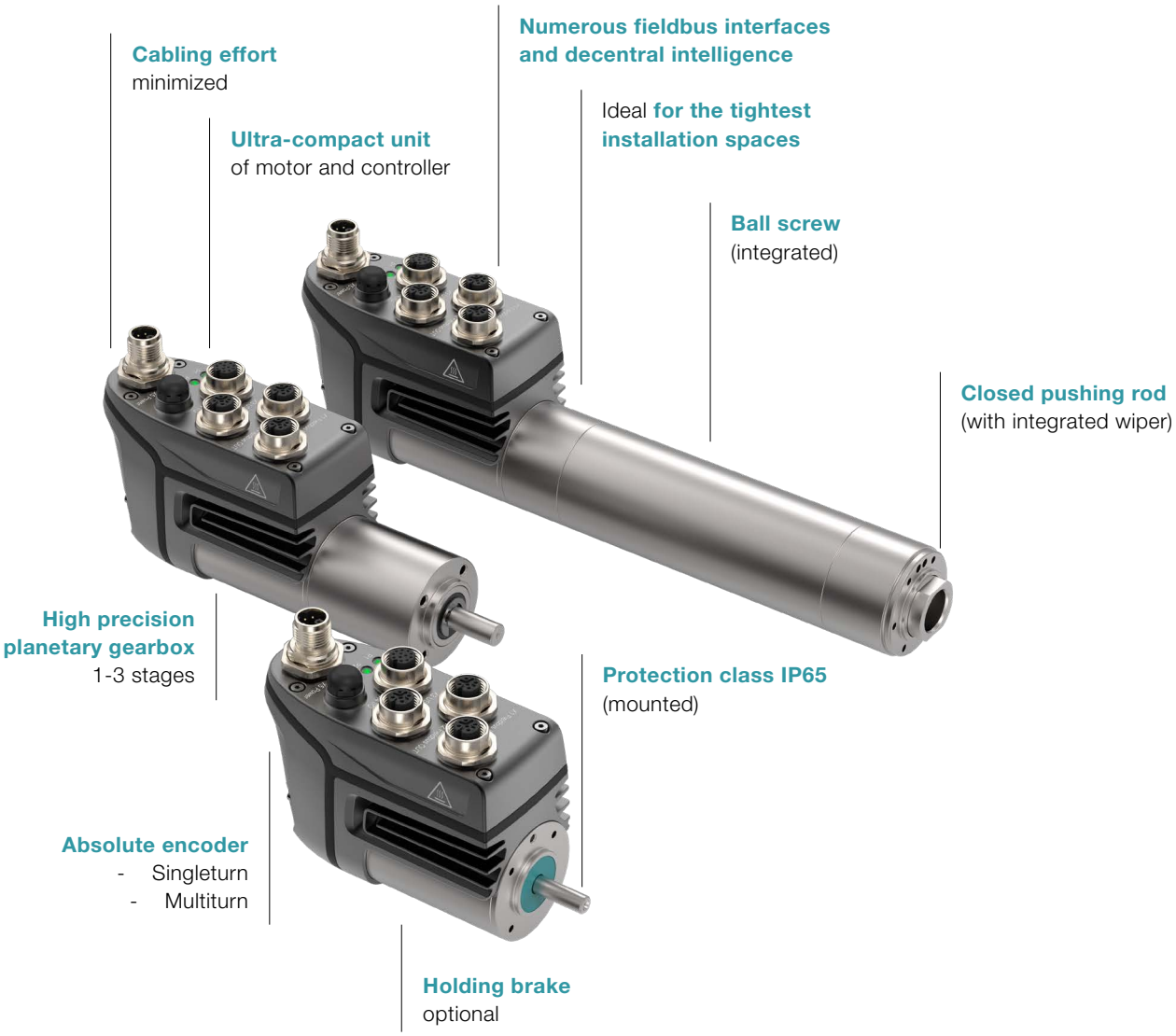
Encoder

A selection of encoder systems is available for position and speed measurement:

- BISS-C, Absolute encoder Singleturn (HI): universally usable
- BISS-C, Absolute encoder Multiturn (HM): Available for the cyber® dynamic system and the cyber® dynamic line in size 32/40 and Inox/Hygienic Design
- Incremental encoder (HF): Available for cyber® dynamic line

Encoder	HI	HM	HF
Interface	BiSS-Interface C-Mode	BiSS-Interface C-Mode	TTL
Power supply	5 V ± 10 %		
Operating power consumption (no load)	50 mA	150 mA	50 mA
Max. power consumption (no load)	275 mW	825 mW	275 mW
Resolution	4.096 positions per revolution	4.096 positions per revolution (12 Bit) / 65.536 revolutions (16 Bit)	1.024 Increments per revolution
System accuracy	± 1°		
Repeatability	± 0.2°		

cyber® dynamic system
Servo motors and actuators



The industrial drive system cyber® dynamic system offers maximum connectivity thanks to its Multi-Ethernet-Interface and scores with decentralized intelligence. The inertia-optimized motors and high current resolution also ensure highly dynamic and precise movements. The system is the professional choice for decentralized applications in demanding environmental conditions with limited installation space. In addition, the CDS is equipped with the integrated safety function STO (Safe Torque Off) and meets the safety requirements according to SIL3 / PL e.

This system is optionally available with various encoder variants as well as planetary gearboxes, ball screw and holding brake.

Connectivity

The cyber® dynamic system (CDS) is equipped with a Multi-EtherNet-Interface and allows with one and the same hardware free selection between the fieldbus variants EtherCat, PROFINET, EtherNet/IP CIP Sync (CANopen and Sercos III on request). This feature ensures proven, simple and real-time connectivity to a wide variety of control environments. The Multi-Ethernet version also reduces the usual number of variants. Thanks to an electronic name plate, automatic motor parameterization is also possible. In addition, quick commissioning and connection to the PLC is ensured.

Dynamics

The low mass inertia of the CDS motors ensures maximum acceleration and contributes to high dynamics. The real-time capable and clock-synchronous Ethernet communication supports this. The cyber® dynamic system also offers a decentralized PLC functionality for autonomous positioning operations and thus also provides for a relief of the automation system. In addition, synchronous and dynamic driving profiles can be realized with the CDS.

Flexibility

The modular principle of the small servo drive system enables optimum solutions for a wide range of applications. This also includes the optional integration of absolute encoders such as singleturn or multiturn, a holding brake as well as planetary gearboxes (GCP or NP) or a ball screw. All this creates new freedom in machine design.

Compactness

A 40 mm size motor together with a special housing design forms an ultra-compact unit that fits into the tightest of installation conditions. Furthermore, it eliminates the need for cabling except for the power supply and fieldbus communication without compromising on industrial suitability, connectivity, dynamics and precision. As a decentralized solution, the CDS therefore saves valuable space in the control cabinet.

Precision

The motor-integrated variant cyber® dynamic system is equipped with an absolute encoder with an encoder resolution of 12 bits. In addition, the high current resolution of 14 bits ensures highly accurate torque control. This enables low cycle times to be achieved for highly dynamic and precise applications.

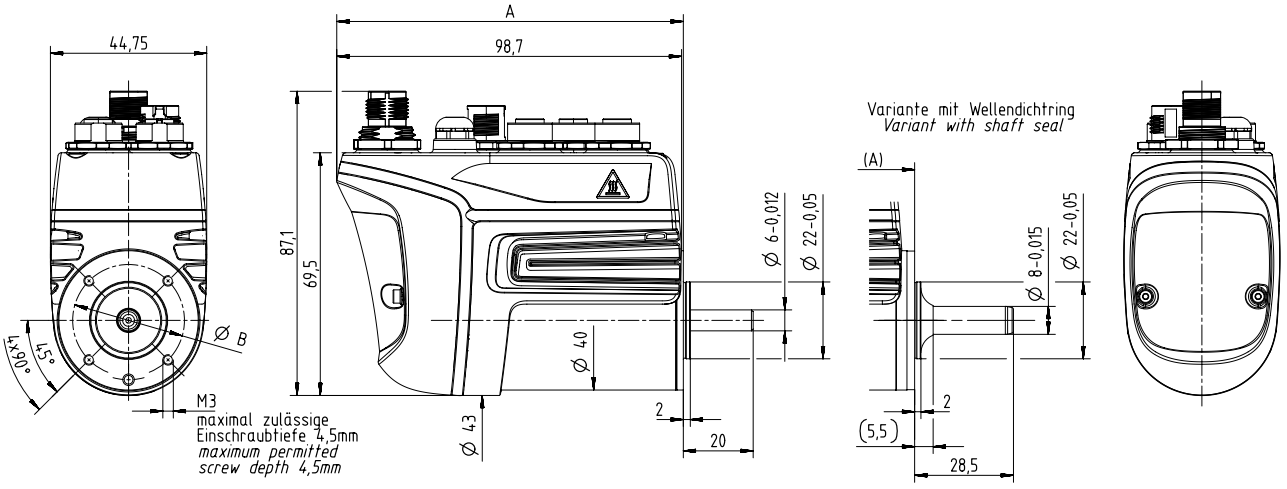
Robustness and safety

Suitable for industrial use – this term best describes the combination of robust design and integrated safety. With the integrated safety function STO (Safe Torque Off), the cyber® dynamic system meets the safety requirements according to SIL3 / PL e. In addition, the CDS has a 12 to 60 V_{DC} wide-range input on the supply side, which enables compensations for fluctuations in the voltage source. In addition, the motor-integrated version is available with IP65 protection and is therefore suitable for decentralized use in demanding environmental conditions with limited installation space.

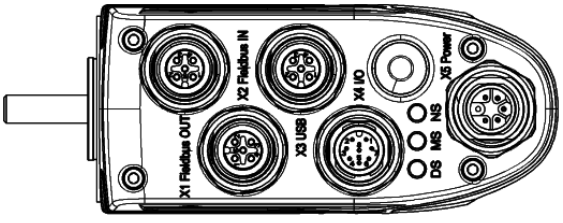
cyber® dynamic system
Servo motor

Size			40
Supply voltage (Power/Logic/STO)	U_{DC}	V_{DC}	+12…60
Maximum torque	M_{max}	Nm	1.02
Continuous stall torque	M_0	Nm	0.32
Holding torque brake (at 120°C)	M_4	Nm	0.36
No-load speed	n_0	min^{-1}	5.087
Rated current	I_n	A_{eff}	2.9
Maximum current	I_{max}	A_{eff}	11.5
Rated power	P_n	W	136
Maximum power	P_{max}	W	328
Communication	-	-	EtherCat, PROFINET RT/IRT, EtherNet/IP CIP Sync, Sercos III*, CANopen*
Commissioning	-	-	USB
Digital inputs	-	-	4
Digital outputs	-	-	2
Safety function	-	-	STO (Safe Torque Off) according to SIL 3 / PL e
Brake chopper	-	-	Not integrated
Technology functions	-	-	Motion Task
Encoder	-	-	Absolute encoder Singleturn BISS-C (HI) Absolute encoder Multiturn BISS-C (HM)
Max. axial force**	F_{AMax}	N	0
Max. radial force**	F_{rmax}	N	150
Weight (without brake)	m	kg	0.63
Ambient temperature	ϑ_U	°C	0 up to +55
Lubrication	-	-	Lubricated for life Food grade (NSF/H1)
Protection class Housing Shaft Incl. shaft sealing	-	IP	 65 20 65 (optional)
Mass moment of inertia	J_1	kgm^2	$2.5E^{-06}$
Approval	-	-	NRTL, CE, STO according to SIL3 / PL e

* Sercos III and CANopen on request
** Refers to center of the output shaft



	Length A [mm]	Diameter B [mm]	Additional length brake [mm]
CDSR	99.2	32	43.1
CDSR with shaft sealing	102.4	30	43.1



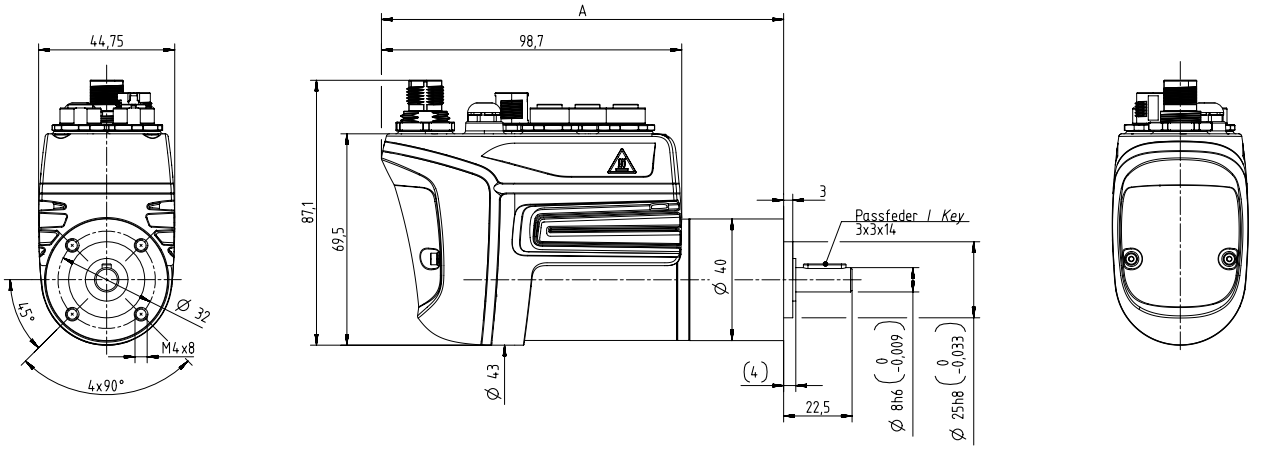
Number	Function	Connector on the device
X1	Fieldbus interface Output	CAN: M12 5-pole socket A-coded Ethernet-based: M12 4-pole socket D-coded
X2	Fieldbus interface Input	CAN: M12 5-pole connector A-coded Ethernet-based: M12 4-pole socket D-coded
X3	Diagnostic interface USB	M12 4-pole socket A-coded
X4	Digital inputs and -outputs	M12 8-pole connector A-coded
X5	Power supply	M12 6-pole connector M-Power

cyber® dynamic system
Servo actuator – GCP

No. of stages			1	2				3		
Gear ratio	i	-	4	12.25	20	25	30.67	49	64	100
Supply voltage (Power / Logic / STO)	U_{DC}	V_{DC}	+12…60							
Maximum torque	M_{max}	Nm	1.4	8.0	8.0	8.0	8.0	12.0	12.0	12.0
Continuous stall torque	M_0	Nm	0.7	2.6	4.0	4.0	4.0	9.9	12.0	12.0
Holding torque brake (at 120°C)	M_4	Nm	1.6	4.8	7.8	9.8	12.0	19.2	25.1	39.2
No-load speed	n_0	min^{-1}	1.272	415	254	203	166	104	79	51
Permanently permitted speed	$n_{max,S1}$	min^{-1}	1.250	408	250	200	163	102	78	50
Rated current	I_n	A_{eff}	2.0	2.0	2.0	2.0	1.7	1.9	1.9	1.8
Maximum current	I_{max}	A_{eff}	3.9	7.3	4.4	3.6	2.9	3.1	2.5	1.8
Rated power	P_n	W	82	82	82	81	66	59	59	51
Maximum power	P_{max}	W	164	262	183	152	126	119	93	61
Communication	-	-	EtherCat, PROFINET RT/IRT, EtherNet/IP CIP Sync, Sercos III*, CANopen*							
Commissioning	-	-	USB							
Digital inputs	-	-	4							
Digital outputs	-	-	2							
Safety function	-	-	STO according to SIL 3							
Brake chopper	-	-	Not integrated							
Technology functions	-	-	Motion Task							
Encoder	-	-	Absolute encoder Singleturn BISS-C (HI) Absolute encoder Multiturn BISS-C (HM)							
Max. torsional backlash	j_t	arcmin	≤ 20	≤ 35				≤ 50		
Max. axial force**	F_{AMax}	N	120							
Max. radial force**	F_{rmax}	N	150							
Weight (without brake)	m	kg	0.9	1.0				1.1		
Ambient temperature	ϑ_U	°C	0 up to + 55							

No. of stages			1	2				3		
Gear ratio	i	-	4	12.25	20	25	30.67	49	64	100
Lubrication	-	-	Lubricated for life							
Protection class Housing Shaft	-	IP	65 54							
Mass moment of inertia	J_1	kgm²	$4.48E^{-05}$	$4.43E^{-04}$	$1.18E^{-03}$	$1.84E^{-03}$	$2.77E^{-03}$	$7.44E^{-03}$	$1.27E^{-02}$	$3.10E^{-02}$
Approval	-	-	NRTL, CE, STO according to SIL3 / PL e							

* Sercos III and CANopen on request
** Refers to center of the output shaft



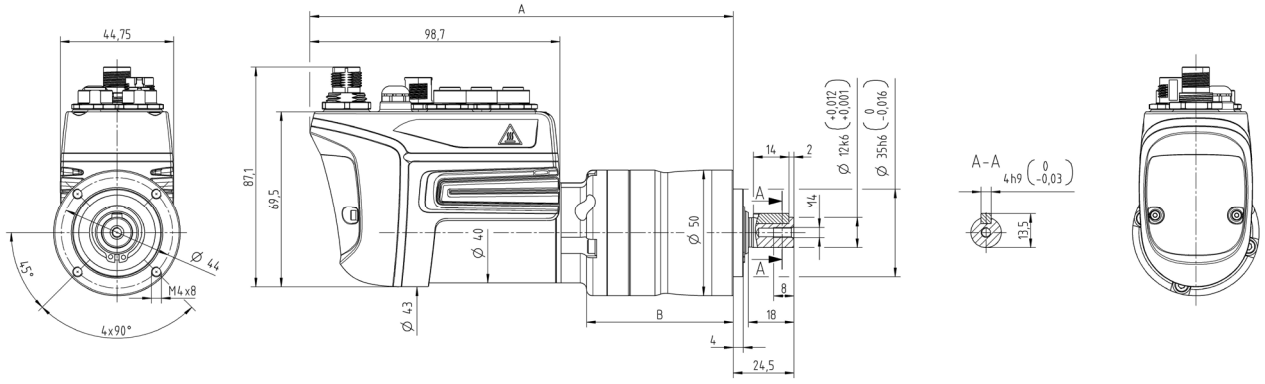
	Length A [mm]	Additional length brake [mm]
Single-stage, i4	132.2	43.1
Two-stage, i12.25/20/25/30.67	144.7	43.1
Three-stage, i49/64/100	157.2	43.1

cyber® dynamic system
Servo actuator – NP

No. of stages			1		2
Gear ratio	i	-	5	10	25
Supply voltage (Power / Logic / STO)	U_{DC}	V_{DC}	+12…60		
Maximum torque	M_{max}	Nm	4.9	9.9	22.0
Continuous stall torque	M_0	Nm	1.3	2.8	6.5
Holding torque brake (at 120°C)	M_4	Nm	2.2	4.1	10.5
No-load speed	n_0	min^{-1}	1.017	509	203
Permanently permitted speed	$n_{max,S1}$	min^{-1}	800	460	160
Rated current	I_n	A_{eff}	2.7	2.7	2.7
Maximum current	I_{max}	A_{eff}	11.4	11.4	10.0
Rated power	P_n	W	95	112	96
Maximum power	P_{max}	W	317	320	306
Communication	-	-	EtherCat, PROFINET RT/IRT, EtherNet/IP CIP Sync, Sercos III*, CANopen*		
Commissioning	-	-	USB		
Digital inputs	-	-	4		
Digital outputs	-	-	2		
Safety function	-	-	STO according to SIL 3		
Brake chopper	-	-	Not integrated		
Technology functions	-	-	Motion Task		
Encoder	-	-	Absolute encoder Singleturn BISS-C (HI) Absolute encoder Multiturn BISS-C (HM)		
Max. torsional backlash	j_t	arcmin	≤ 10		≤ 13
Torsional rigidity	C_{t21}	Nm/ arcmin	1.2	0.85	1.2
Max. axial force**	F_{AMax}	N	700		
Max. radial force**	F_{rmax}	N	800		
Max. Tilting moment	M_{Kmax}	Nm	23		
Weight (without brake)	m	kg	1.3	1.3	1.5
Ambient temperature	ϑ_U	°C	0 up to +55		

No. of stages			1		2
Lubrication	-	-	Lubricated for life Optional: Food grade (NSF/H1) – Reduction of the output torques by 20 %		
Protection class Housing Shaft	-	IP	65 64		
Mass moment of inertia	J_1	kgm²	$1.38E^{-04}$	$4.50E^{-04}$	$3.44E^{-03}$
Approval	-	-	NRTL, CE, STO according to SIL3 / PL e		

* Sercos III and CANopen on request
** Refers to center of the output shaft

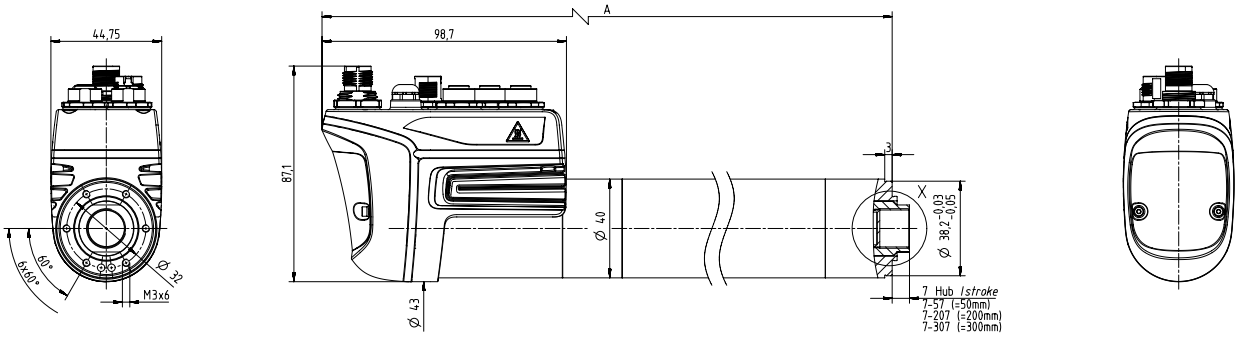


	Length A [mm]	Length B [mm]	Additional length brake [mm]
Single-stage, i5, 10	167.1	57.9	43.1
Two-stage, i25	182.6	73.4	43.1

cyber® dynamic system
Linear actuator

Size			40					
Screw pitch	p_{sp}	mm	3			10		
Maximum stroke	s	mm	50	200	300	50	200	300
Supply voltage (Power / Logic / STO)	U_{DC}	V_{DC}	+12…60					
Maximum push force	F_{AMax}	kN	1.92		1.28	0.58		0.58
Continuous stall force	F_0	kN	0.55		0.55	0.16		0.16
Holding torque brake (at 120°C)	F_4	kN	0.83			0.25		
Max. speed (without external load)	v_0	mm/s	254		139	848		464
Rated current	I_n	A_{eff}	2.4		2.7	2.4		2.7
Maximum current	I_{max}	A_{eff}	11.4		7.2	11.4		11.4
Rated power	P_n	W	106		69	106		69
Maximum power	P_{max}	W	295		178	295		266
Communication	-	-	EtherCat, PROFINET RT/IRT, EtherNet/IP CIP Sync, Sercos III*, CANopen*					
Commissioning	-	-	USB					
Digital inputs	-	-	4					
Digital outputs	-	-	2					
Safety function	-	-	STO according to SIL 3					
Brake chopper	-	-	Not integrated					
Technology functions	-	-	Motion Task					
Encoder	-	-	Absolute encoder Singleturn BISS-C (HI) Absolute encoder Multiturn BISS-C (HM)					
Positioning accuracy	-	mm	up to 0.05					
Repeatability	-	mm	0.01					
Weight (without brake)	m	kg	2.0	3.3	3.1	2.0	3.3	3.1
Ambient temperature	ϑ_U	°C	0 up to +40					
Lubrication	-	-	Lubricated for life Food grade (NSF/H1)					
Protection class Housing Pushing rod	-	IP	 65 65					
Approval	-	-	NRTL, CE, STO according to SIL3 / PL e					

* Sercos III and CANopen on request



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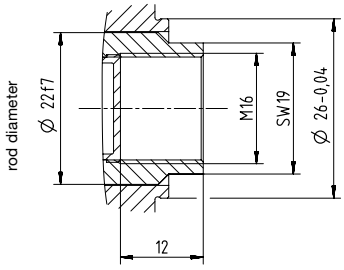


Stroke S [mm]	Length A [mm]	Additional length brake [mm]
50	258.2	43.1
200	408.2	43.1
300	508.2	43.1

Holding brake

A compact permanent magnet brake is fitted to secure the motor shaft when the motor or actuator is disconnected from the power. Characteristics include holding without torsional backlash, no residual torque when the brake is released and unlimited power-on time at zero speed.

Size		40
Holding torque static at 120 °C	Nm	0.36
Supply voltage	V_{DC}	24
Current at rated voltage and 20 °C	A_{DC}	0.42
Engaging time	ms	up to 0.05
Release time	ms	0.01
Weight	kg	0.18

The holding brakes used in the motors and actuators are subject to various factors, e.g. oxidation of abraded particles, flattening of friction surfaces due to frequent application of the brakes in the same position or air gap changes due to wear. This may result in a reduction of available holding torques. The specified holding torques apply under optimal conditions without detrimental influences. For critical applications we recommend dimensioning for an adequately large holding torque to take account of these factors of uncertainty.

Depending on the ratio configured for the event of an emergency stop, the brakes used in the motors and actuators can generate a dynamic braking torque at the output which exceeds the maximum permissible torque $M_{max\ act}$ of the gearbox. In this case, it must be ensured in the application that such an exceeding of the maximum torque is prevented, otherwise the gearbox may be damaged. For linear drives, the same behaviour results from external force effects.

Note: The holding brake is available for the cyber® dynamic system and for the cyber® dynamic line in size 40 in combination with an absolute encoder (HI/HM) and Inox/Hygiene Design. Variants with incremental encoder (HF) or in standard design cannot be equipped with a holding brake.

Encoder

A selection of encoder systems is available for position and speed measurement:

- BISS-C, Absolute encoder Singleturn (HI): universally usable
- BISS-C, Absolute encoder Multiturn (HM): Available for the cyber® dynamic system and the cyber® dynamic line in size 32/40 and Inox/Hygienic Design
- Incremental encoder (HF): Available for cyber® dynamic line

Encoder	HI	HM	HF
Interface	BiSS-Interface C-Mode	BiSS-Interface C-Mode	TTL
Power supply	5 V ± 10 %		
Operating power consumption (no load)	50 mA	150 mA	50 mA
Max. power consumption (no load)	275 mW	825 mW	275 mW
Resolution	4.096 positions per revolution	4.096 positions per revolution (12 Bit) / 65.536 revolutions (16 Bit)	1.024 Increments per revolution
System accuracy	± 1°		
Repeatability	± 0.2°		

Cables
Overview

Pre-configured lengths

The following pre-configured cables are available for fast commissioning of your drive system:

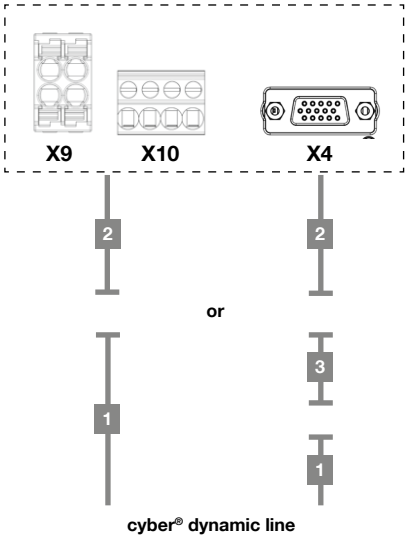
- Cable for Power supply
- Fieldbus cable for CANopen and EtherNet/IP communication
- Cable for Commissioning
- Cable for Digital in- and outputs
- Motor connection cable for the connection to the servo drive.

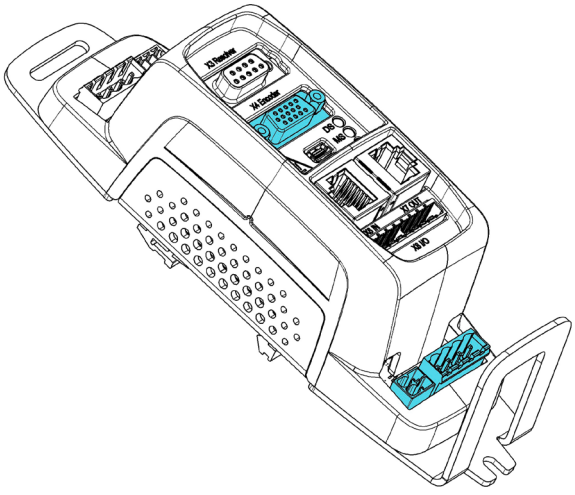
Other cable lengths can be supplied on request.

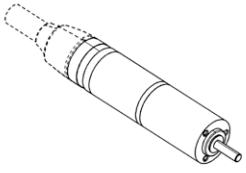
Motor connection cable

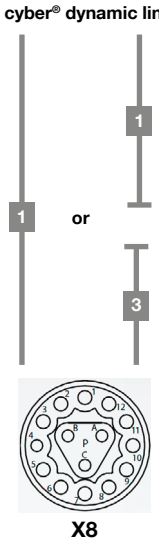
No.	Type of cable	Description	Interfaces		Standard lengths / m
			Motor	Servo drive	
cyber® dynamic line					
1	Motor connection cable	S/L-Cable XXXHx-XXXX-BMSx-x/3	Direct cable outlet	itec Serie 915	0.5; 3
2a	Adapter cable for IP20 (without brake wires)	S/L-Cable XXXHI-XXXX-BJS0-6/3	itec Serie 915	Sub-D connector 15-pole	0.5; 3; 5; 10; 15; 20
2b	Adapter cable for IP20 (with brake wires)	S/L-Cable XXXHI-XXXX-BJS1-11/3	itec Serie 925	Sub-D connector 15-pole	0.5; 3; 5; 10; 15; 20
3	Extension cable	S/L-Cable XXXHx-XXXX-BVSx-11/3	itec Serie 915	itec 915	0.5; 3; 5; 10; 15; 20

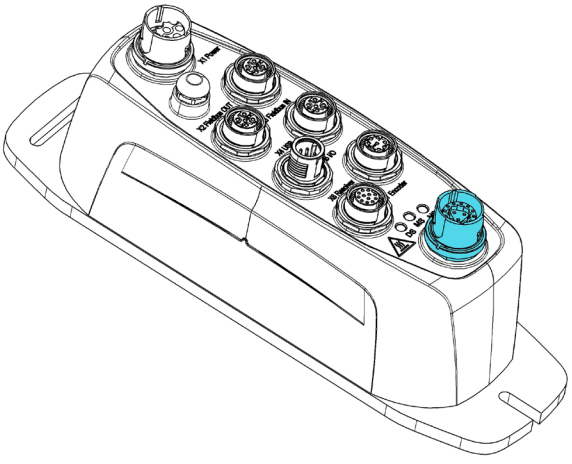
Overview motor connection options







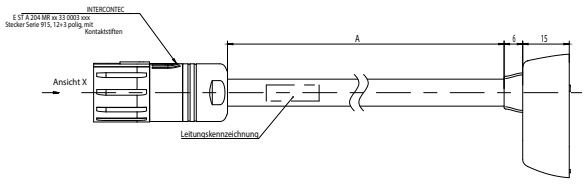




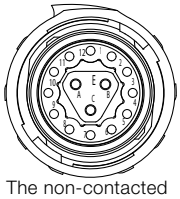
Cables
cyber® dynamic line

Technical details:
- Outer sheath material: PUR
- Min. bending radius (static): ≥ 3xD
- Min. bending radius (dynamic): ≥ 10xD
- Temperature range: -20 °C up to +80 °C
- Approval: UL AWM Style 20233, 80 °C, 300 V
- 2-fold shielded
- Suitable for drag chains (1.000.000 cycles)

Motor connection cable (No. 1)
Encoder: HI / HM



Ansicht X (3:1)

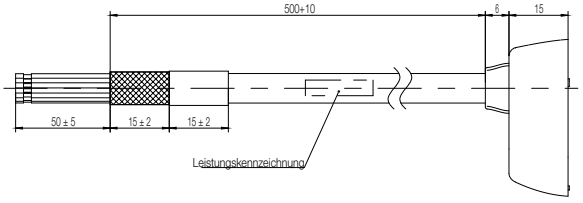


The non-contacted slots are equipped with empty pins.

	Pin assignment (without brake)	Pin assignment (with brake)
Mot.Ph. U	A	A
Mot.Ph. V	B	B
Mot.Ph. W	C	C
GND	1	1
5V	2	2
MA+ / Clock+	3	3
MA- / Clock-	4	4
SLO+ / Data+	5	5
SLO- / Data-	6	6
Brake +	-	11
Brake -	-	12

Motor size	Cable diameter in mm (without brake)	Cable diameter in mm (with brake)
17	7.2	-
22	7.6	-
32	8.7	-
40	8.7	9.7

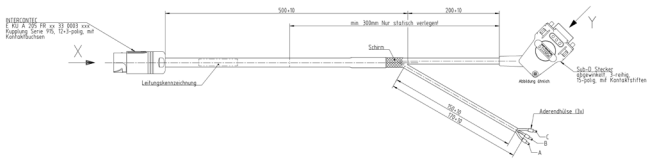
Encoder: HF



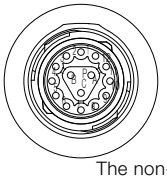
Motor size	Cabel outer diameter in mm
17	8.5
22	8.8
32	9.7
40	9.7

	Color assignment	Shield
Mot.Ph. U	Red	Outer shield
Mot.Ph. V	White	
Mot.Ph. W	Black	
Hall A	Brown	
Hall B	Orange	
Hall C	Yellow	
GND	Blue	Inner Shield
5V	Red	
A+	Pink	
A-	Green	
B+	Grey	
B-	Yellow	
Z+	White	
Z-	Brown	

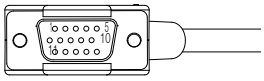
Adapter cable for simco® IP20 (No. 2)



Ansicht X (3:1)



Ansicht Y (2:1)

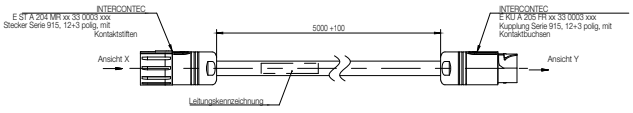


The non-contacted slots are equipped with empty pins.

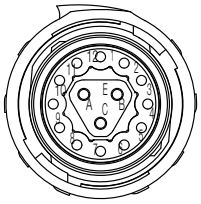
Cable diameter (without brake): 8.7mm
Cable diameter (with brake): 9.7mm

	Pin assignment (motor side)	Pin-/Color assignment (controller side)
Mot.Ph. U	A	Red
Mot.Ph. V	B	White
Mot.Ph. W	C	Black
GND	1	1
5V	2	2
MA+ / Clock+	3	3
MA- / Clock-	4	4
SLO+ / Data+	5	5
SLO- / Data-	6	6
Brake +	11	11
Brake -	12	12

Extension cable (No. 3)

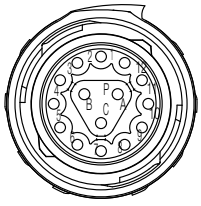


Ansicht X (3:1)



The non-contacted slots are equipped with empty pins.

Ansicht Y (3:1)

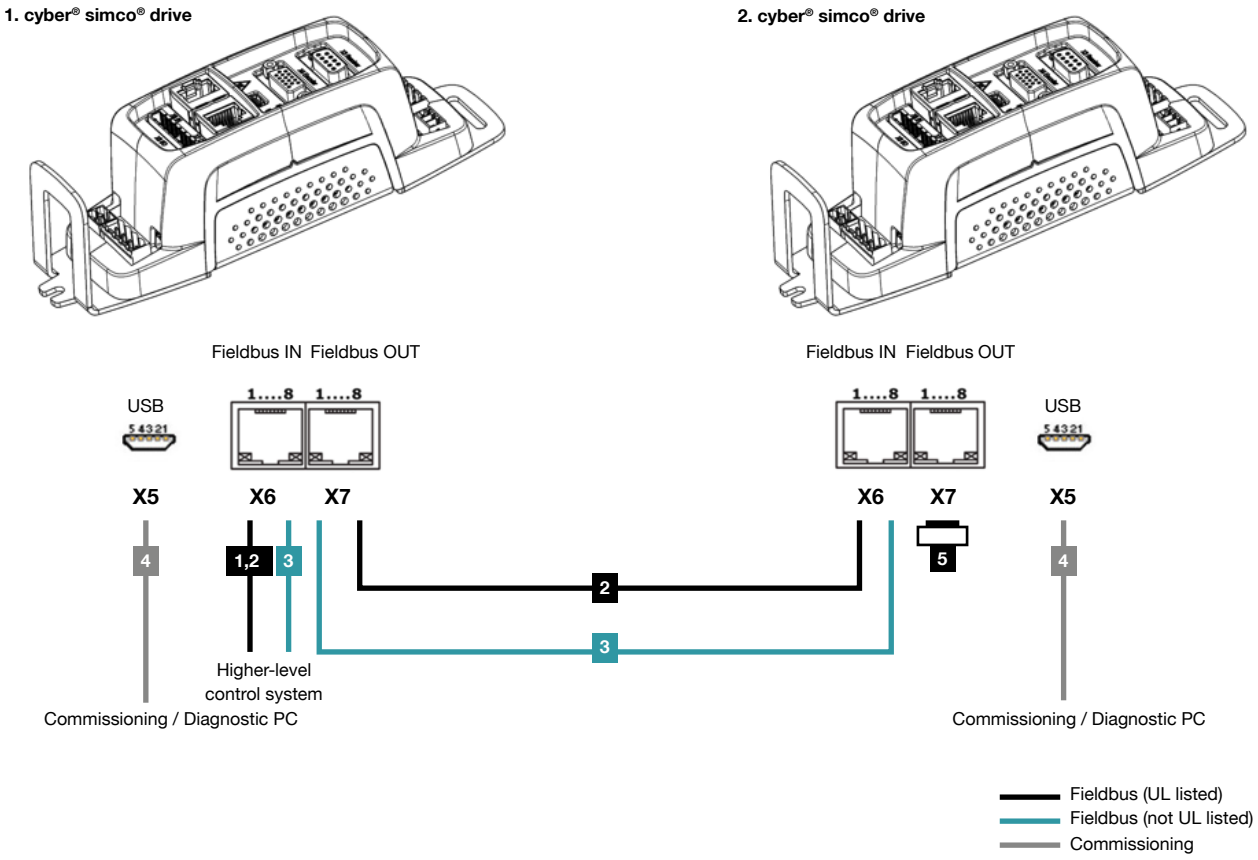


The non-contacted slots are equipped with empty pins.

Cable outer diameter: 9.7 mm

	Pin assignment (without brake)	Pin assignment (with brake)
Mot.Ph. U	A	A
Mot.Ph. V	B	B
Mot.Ph. W	C	C
Hall A	9	-
Hall B	10	-
Hall C	11	-
GND	1	1
5V	2	2
MA+ / Clock+ / A+	3	3
MA- / Clock- / A-	4	4
SLO+ / Data+ / B+	5	5
SLO- / Data- / B-	6	6
Z+	7	-
Z-	8	-
Brake +	-	11
Brake -	-	12

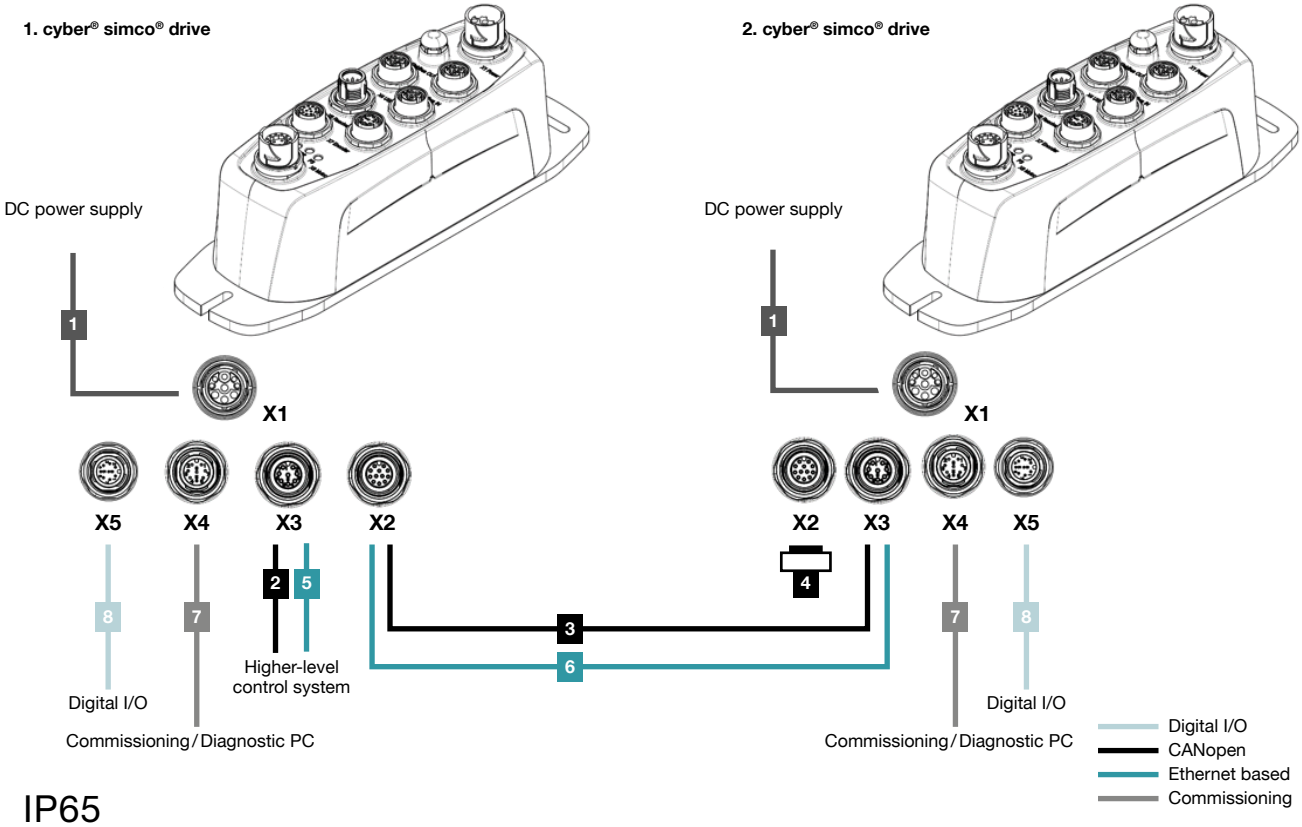
Cables
cyber® simco® line



IP20

No.	Type of accessory	Description	Interfaces		Description	Standard lengths
			1. simco® drive	PLC / PC / 2. simco® drive		
Fieldbus control cabinet / Suitable for drag chains (UL)						
1	Fieldbus cable	CAB-BUS-CAN-RJ45-FL-LXXXX	RJ45 connector	flying leads	Network connection to PLC; plug can be assembled	1.5; 5 m
2	Fieldbus cable	CAB-BUS-UN2-RJ45-RJ45-LXXXX	RJ45 connector	RJ45 connector	Network connection to PLC; second simco® drive	0.3; 1; 2; 3 m
Fieldbus control cabinet (not UL)						
3	Fieldbus cable	CAB-BUS-UN1-RJ45-RJ45-LXXXX	RJ45 connector	RJ45 connector	Network connection to PLC; second simco® drive	0.3; 1; 2; 3 m
Commissioning						
4	USB connection cable	CASIGN-USB/A-M/USB/B-L0300	Mini USB B	USB A connector	Connection cable for diagnostic purposes, commissioning with MotionGUI 2	3 m
Miscellaneous						
5	Terminating resistor CANopen	CAB-BUS-CAN-RJ45-TERMINAT	-	RJ45 connector	Only necessary for CAN communication	-

XXXX = Cable length in cm (Example: 5 m = 0500)



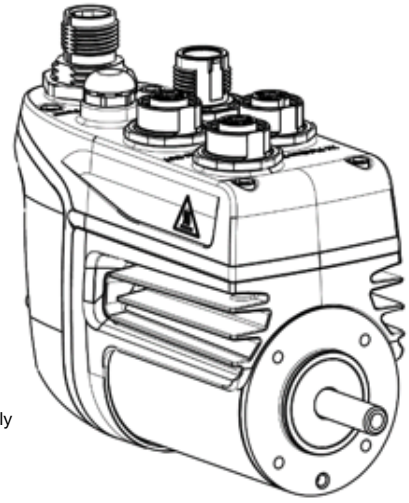
IP65

No.	Type of accessory	Description	Interfaces		Description	Standard lengths
			1. simco® drive	PLC / PC / 2. simco® drive		
Power supply						
1	Power supply cable	CAB-POW-E-S915-FL__-LXXXX	y tec 915	flying leads	DC - Power supply cable	1; 2; 5; 10; 15 m
Fieldbus CANopen						
2	Fieldbus cable PLC	CAB-BUS-CAN-M12M-FL__-LXXXX	M12 socket 5-pole A-coded	flying leads	Network connection to PLC; plug can be assembled	1; 2; 5; 10; 15 m
3	Fieldbus cable extension	CASIGN-CAN-M12F-SA-M12MSA-LXXXX	M12 connector 5-pole A-coded	M12 socket 5-pole A-coded	Network connection between simco® drives	1; 2; 5; 10; 15 m
4	Terminating resistor CANopen	CAB-BUS-CAN-M12M-TERMINAT	-	M12 connector 5-pole A-coded	Only necessary for CAN communication	-
Industrial Ethernet (EtherCAT / PROFINET / EtherNet/IP / Sercos III)						
5	Network cable PLC	TCC 002-025-XXXR-PUR	M12 connector 4-pole D-coded	RJ45 connector	Network connection to PLC	1; 2; 5; 10; 15 m
6	Network cable extension	TCC 002-026-XXXR-PUR	M12 connector 4-pole D-coded	M12 connector 4-pole D-coded	Network connection between simco® drives	1; 2; 5; 10; 15 m
Commissioning						
7	USB connection cable	CASIGN M12-4p USB-A 2.0m PVC	M12 connector 4-pole A-coded (straight)	USB A connector	Connection cable for diagnostic purposes, commissioning with MotionGUI 2	2 m
Digital in- and outputs						
8	Cable for Digital IO	CASIGN-I/O-M12FSA-M12FSA-L0500	M12 socket 8-pole A-coded (straight)	M12 socket 8-pole A-coded (straight)	Connection cable to I/O-Box	5 m

XXXX = Cable length in cm (Example: 5 m = 0500)
XXX = Cable length in dm (Example: 5 m = 050)

Cables
cyber® dynamic system

1. cyber® dynamic system

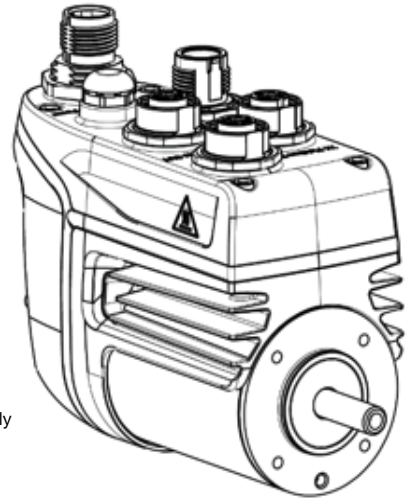


DC power supply

1

X5

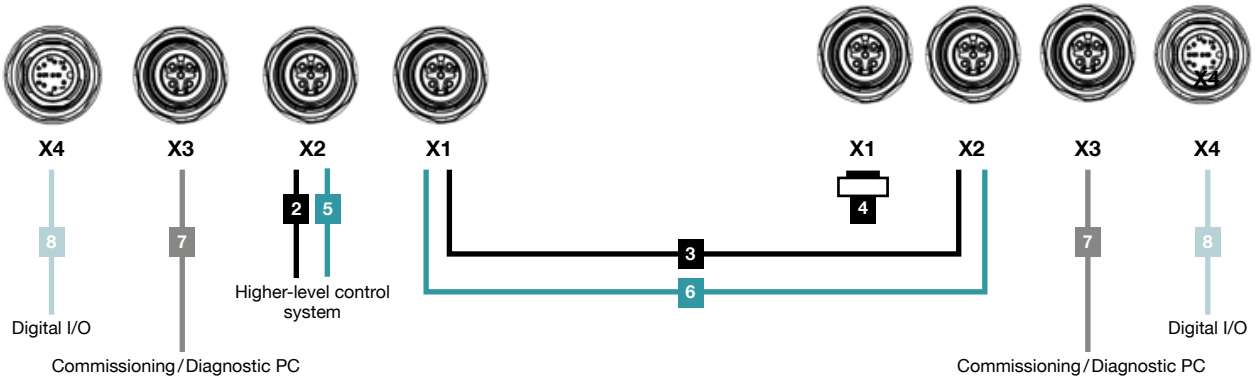
2. cyber® dynamic system



DC power supply

1

X5



Digital I/O
CANopen
Ethernet based
Commissioning

No.	Type of accessory	Description	Interfaces		Description	Standard lengths
			1. cyber® dynamic system	PLC / PC / 2. cyber® dynamic system		
Power supply						
1a	Power supply cable	CAPOWE-M12FSM-FL__-LXXXX	M12 socket 6-pole (straight)	flying leads	DC - Power supply cable	1.5; 3; 5; 10 m
1b	Power supply cable	CAPOWE-M12FRM-FL__LXXXX	M12 socket 6-pole (angled)	flying leads	DC - Power supply cable	1.5; 3; 5; 10 m
Fieldbus CANopen						
2a	Fieldbus cable PLC	CAB-BUS-CAN-M12M-FL__-LXXXX	M12 socket 5-pole A-coded (straight)	flying leads	Network connection to PLC; plug can be assembled	1; 2; 5; 10; 15 m
2b	Fieldbus cable PLC	CASIGN-CAN-M12M-RA-FL__-LXXXX	M12 socket 5-pole A-coded (angled)	flying leads	Network connection to PLC; plug can be assembled	1; 2; 5; 10; 15 m
3a	Fieldbus cable extension	CASIGN-CAN-M12F-SA-M12MSA-LXXXX	M12 connector 5-pole A-coded (straight)	M12 socket 5-pole A-coded (straight)	Network connection between simco® drives	1; 2; 5; 10; 15 m
3b	Fieldbus cable extension	CASIGN-CAN-M12FRA-M12MRA-LXXXX	M12 connector 5-pole A-coded (angled)	M12 socket 5-pole A-coded (angled)	Network connection between simco® drives	1; 2; 5; 10; 15 m
4	Terminating resistor CANopen	CAB-BUS-CAN-M12M-TERMINAT	-	M12 connector 5-pole A-coded	Only necessary for CAN communication	-
Industrial Ethernet (EtherCAT / PROFINET / EtherNet/IP / Sercos III)						
5a	Network cable PLC	TCC 002-025-XXXR-PUR	M12 connector 4-pole D-coded	RJ45 connector	Network connection to PLC	1; 2; 5; 10; 15 m
5b	Network cable PLC	CASIGN-CAT-M12M-RD-RJ45-LXXXX	M12 connector 4-pole D-coded (angled)	RJ45 connector	Network connection to PLC	1; 2; 5; 10; 15 m
6a	Network cable extension	TCC 002-026-XXXR-PUR	M12 connector 4-pole D-coded (straight)	M12 connector 4-pole D-coded (straight)	Network connection between simco® drives	1; 2; 5; 10; 15 m
6b	Network cable extension	CASIGN-CAT-M12M-RD-M12MRD-LXXXX	M12 connector 4-pole D-coded (angled)	M12 connector 4-pole D-coded (angled)	Network connection between simco® drives	1; 2; 5; 10; 15 m
Commissioning						
7a	USB connection cable	CASIGN M12-4p USB-A 2.0m PVC	M12 connector 4-pole A-coded (straight)	USB A connector	Connection cable for diagnostic purposes, commissioning with MotionGUI 2	2 m
7b	USB connection cable	CASIGN gew. M12-4p USB-A 2.0m	M12 connector 4-pole A-coded (angled)	USB A connector	Connection cable for diagnostic purposes, commissioning with MotionGUI 2	2 m
Digital in- and outputs						
8a	Cable for Digital IO	CASIGN-I/O-M12FSA-M12FSA-L0500	M12 socket 8-pole A-coded (straight)	M12 socket 8-pole A-coded (straight)	Connection cable to I/O-Box	5 m
8b	Cable for Digital IO	CASIGN-I/O-M12FSA-M12FSA-L0500	M12 socket 8-pole A-coded (angled)	M12 socket 8-pole A-coded (straight)	Connection cable to I/O-Box	5 m

XXXX = Cable length in cm (Example: 5 m = 0500)
XXX = Cable length in dm (Example: 5 m = 050)

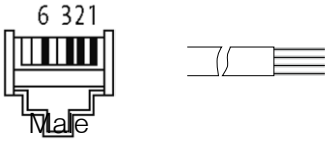
Cables
cyber® simco® line & cyber® dynamic system

IP20

Technical details:

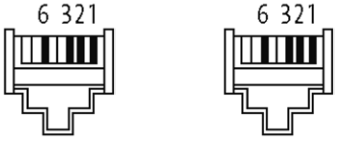
	Fieldbus cable IP20 (No. 1, 2)	Fieldbus cable IP20 (No. 3)
Suitable for drag chains	max. 3 Mio. cycles	No
Approval	UL (AWM-Style 20233/11602), CSA; CE	CE
Outer sheath material	PUR	FRNC
Shielding	Yes	Yes
Temperature range (static)	-40…+80 °C	0…+50 °C
Temperature range (dynamic)	-30…+70 °C	-20…+60 °C
Min. bending radius (static)	5 × Outer-Ø	7.5 × Outer-Ø
Min. bending radius (dynamic)	12 × Outer-Ø	10 × Outer-Ø
Outer diameter	6.7 mm ±5 %	5 mm ±5 %
Transmission parameter	CAT 5, Class D (ISO/IEC 11801:2002), (EN 50173-1)	
Transmission rate	up to 100 Mbit/s Full Duplex	

Fieldbus cable (No. 1)



	RJ45 St. straight pin assignment	Flying leads Color assignment
TD+	1	Yellow
TD-	2	Orange
RD+	3	White
RD-	6	Blue

Fieldbus cable (No. 2 and 3)



Male Male

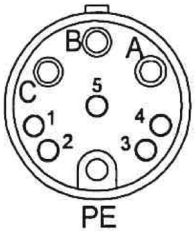
	RJ45 St. straight pin assignment	RJ45 St. straight pin assignment
TD+	1	1
TD-	2	2
RD+	3	3
RD-	6	6

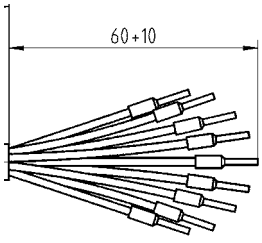
IP65

Technical details:

	Power supply cable cyber® simco® drive (No. 1)	Power supply cable cyber® dynamic system (No. 1)	Fieldbus cable IP65 (No. 2, 3)	Network cable (No. 5, 6)	Cable for Digital IO IP65 (No. 8)
Suitable for drag chains	max. 5 Mio. cycles	Max. 2 Mio. cycles	max. 5 Mio. cycles	max. 3 Mio. cycles	max. 10 Mio. cycles
Approval	CE	UL Listed (E468743)	UL (AWM-Style 20233/10578), CSA; CE	UL (AWM-Style 20233/11602), CSA; CE	CE
Outer sheath material	PUR	PUR	PUR	PUR	PUR
Shielding	Yes	Yes	Yes	Yes	No
Temperature range (static)	-40...+80 °C	-25...+80 °C	-40…+80 °C	-40…+80 °C	-25...+80 °C
Temperature range (dynamic)	-30...+80 °C	-25...+80 °C	-30…+70 °C	-30…+70 °C	-25...+80 °C
Min. bending radius (static)	4 × Outer-Ø	5 x Outer-Ø	6 × Outer-Ø	5 × Outer-Ø	5 x Outer-Ø
Min. bending radius (dynamic)	7.5 × Outer-Ø	10 x Outer-Ø	10 × Outer-Ø	12 × Outer-Ø	10 x Outer-Ø
Outer diameter	12.2 mm	10.4 mm ±0.3 mm	6.9 mm ±5 %	6.7 mm ±5 %	5.8 mm ±5 %
Transmission parameter	-	-	-	CAT 5, Class D (ISO/IEC 11801:2002), (EN 50173-1)	-
Transmission rate	-	-	-	up to 100 Mbit/s Full Duplex	-

Power supply cable cyber® simco® drive (No. 1)

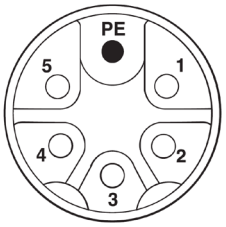




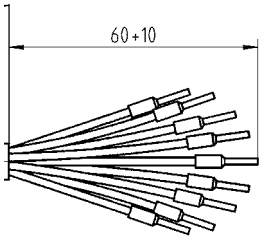
	INTERCONTEC connector, 9-pole pin assignment	Flying leads description
DCBUS +	A	A
DCBUS-	B	B
CHOPPER	C	C
PE	PE	PE
Logic +	1	1
N.C.	2	2
STO	3	3
N.C.	4	4
STO GND	5	5

Cables
cyber® simco® line & cyber® dynamic system

Power supply cable cyber® dynamic system (No. 1)

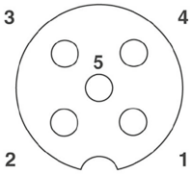


Female,
M-coded

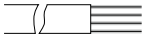


	M12 socket, straight pin assignment	Flying leads description
DCBUS+	1	BK1
DCBUS-	2	BK2
Logic+	3	BK3
STO	4	BK4
STO GND	5	BK5
FE	6	GN/YE

Fieldbus cable CANopen (No. 2)

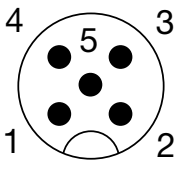


Female,
A-coded

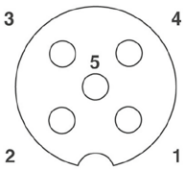


	M12 St. straight pin assignment	Flying leads color assignment
Shield	1	-
+	2	Red
-	3	Black
CAN-H	4	White
CAN-L	5	Blue

Fieldbus cable CANopen (No. 3)



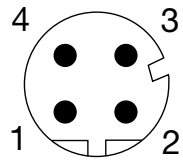
Male,
A-coded



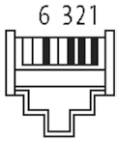
Female,
A-coded

	M12 St. straight pin assignment	M12 St. straight pin assignment
Shield	1	1
+	2	2
-	3	3
CAN-H	4	4
CAN-L	5	5

Network cable Ethernet (No. 5)



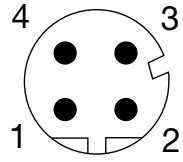
Male,
D-coded



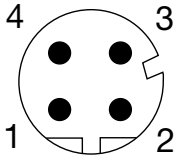
Male

	M12 St. straight pin assignment	RJ45 St. straight pin assignment
TD+	1	1
TD-	3	2
RD+	2	3
RD-	4	6

Network cable Ethernet (No. 6)



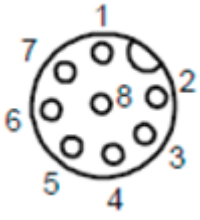
Male,
D-coded



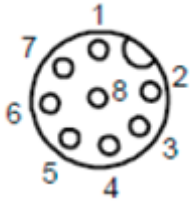
Male,
D-coded

	M12 St. straight pin assignment	M12 St. straight pin assignment
TD+	1	1
TD-	3	3
RD+	2	2
RD-	4	4

Cable for Digital IO (No. 8)



Female,
A-coded



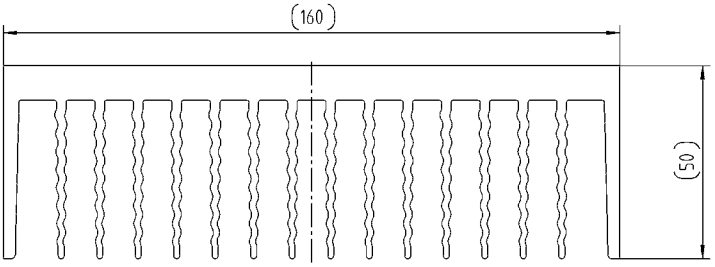
Female,
A-coded

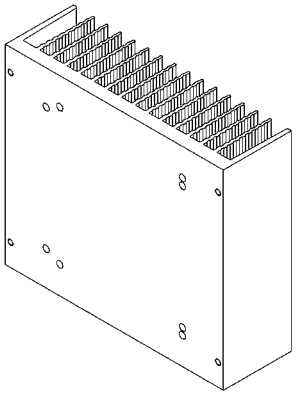
	M12 socket, straight pin assignment	M12 socket, straight pin assignment
DIN 2	1	1
DIN 4	2	2
DOUT 1	3	3
DOUT 2	4	4
VCC24	5	5
DIN 1	6	6
GND	7	7
DIN 3	8	8

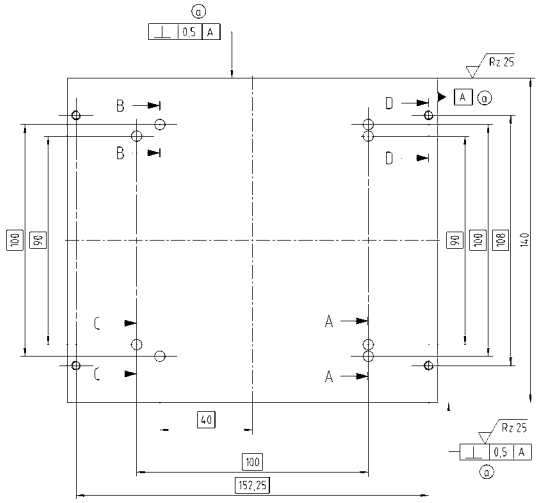
Accessories

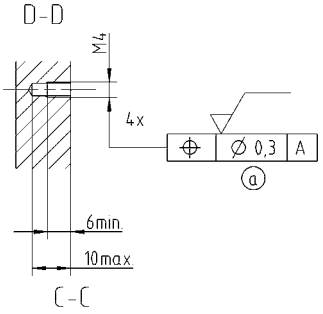
Heat sink kit SIM2050D

- Heat sink for simco® drive version SIM2050
- Delivery: Heat sink incl. M4x14 screws for fixing to the servo drive
- Different mounting holes for rotation of the heat sink
- Possibility of mounting the servo drive with heat sink via four M4 threads located on the heat sink (D-D).
- Order reference: Kuehlkoerperkit SIM2050D flex



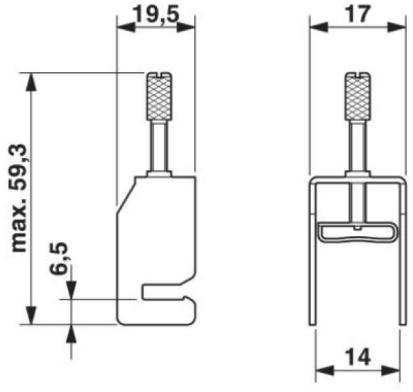






Shield clamp IP20

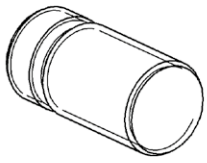
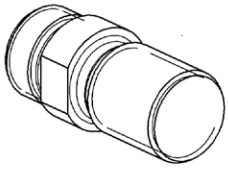
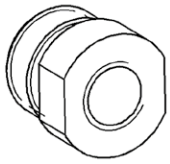
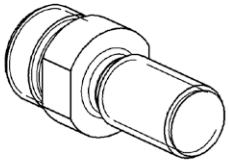
- Shield clamp for shield diameter 3-14 mm
- Connection of the outer shield of the motor cable with a screw cap
- When ordering a servo drive of the cyber® simco® line in IP20 with shield clamp, the servo drive is supplied with the shield clamp fitted
- Order reference: Schirmanschlussklemme SK 14



Attachment parts to the pushing rod

For the linear actuators of the cyber® dynamic line in size 40 as well as the cyber® dynamic system, four different attachment parts for the pushing rod are available.

Order reference: cyber® dynamic Anbauteil Tip X

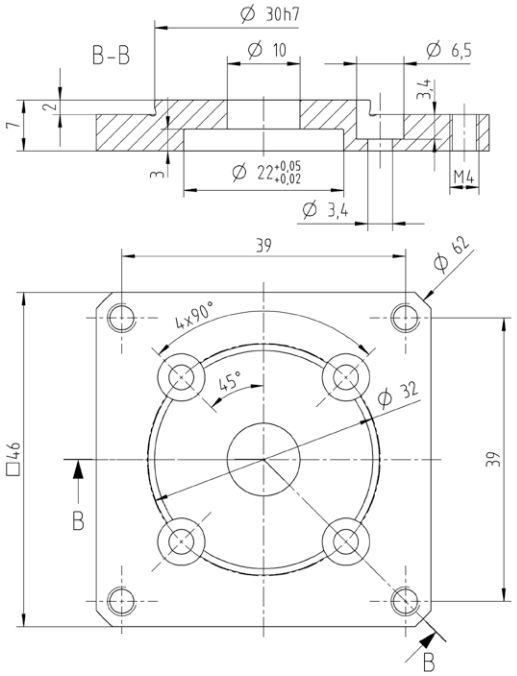
A	B	C	D
Outer thread M16 x 1.5	Outer thread M16 x 1.5 with double D-profile	Inner thread M10 x 1.25 with double D-profile	Outer thread M12 x 1.25 with double D-profile
			

Mounting adapters

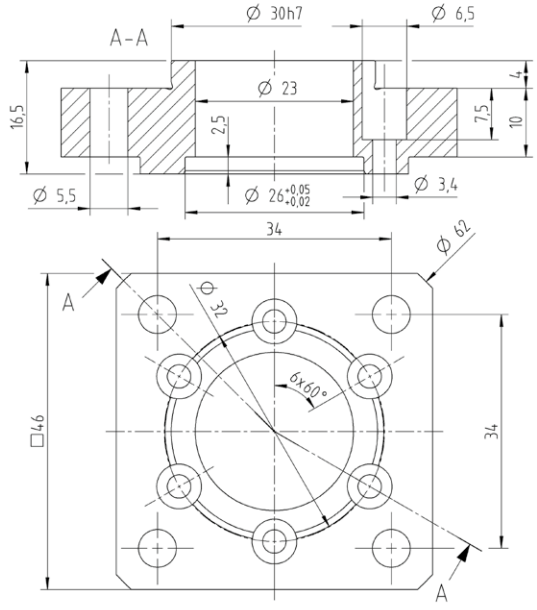
Mounting adapters are available for the cyber® dynamic system to realize an installation compatible solution to our Ternary drive system.

Order reference: Adapter CDSR or Adapter CDSL

CDSR

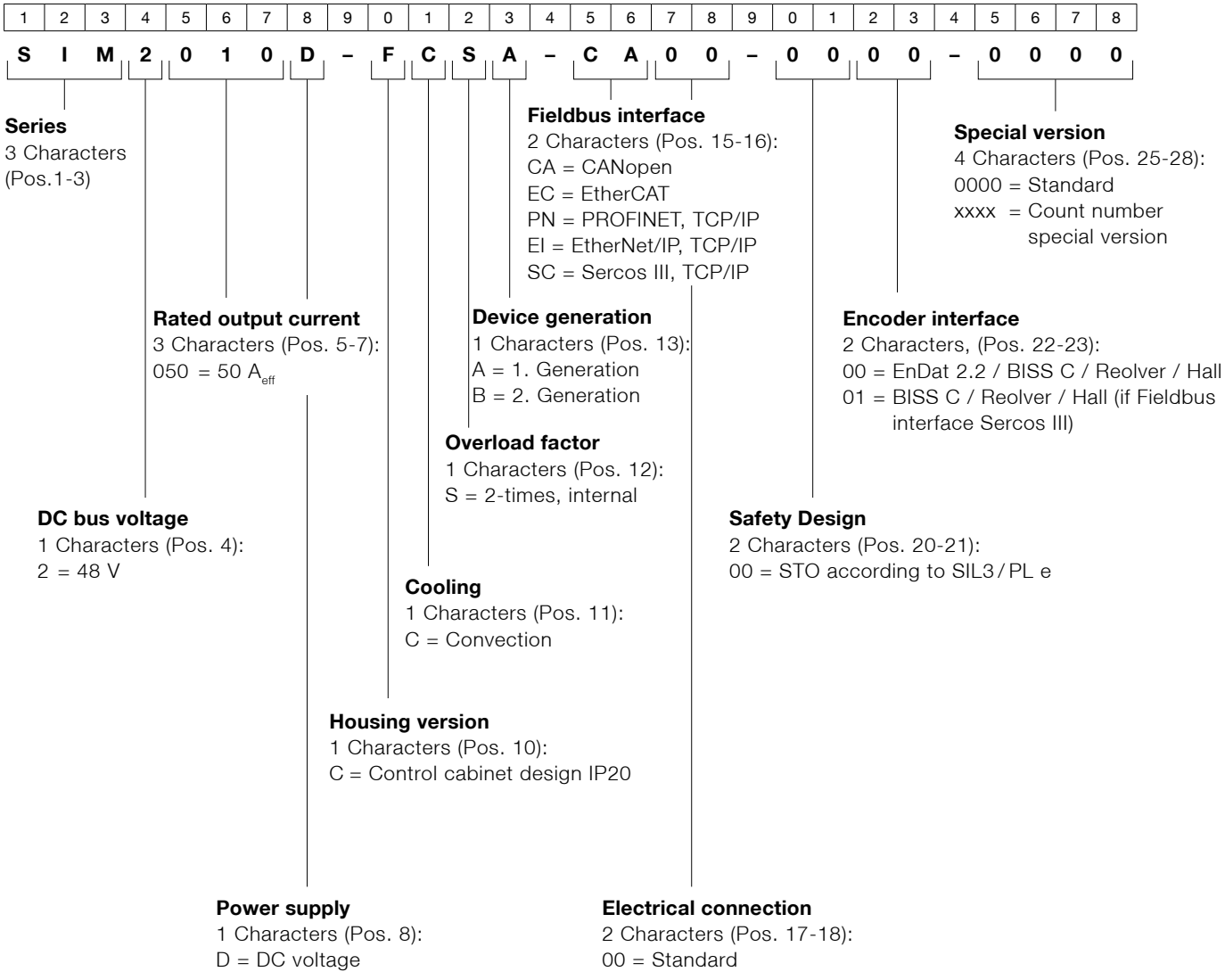


CDSL

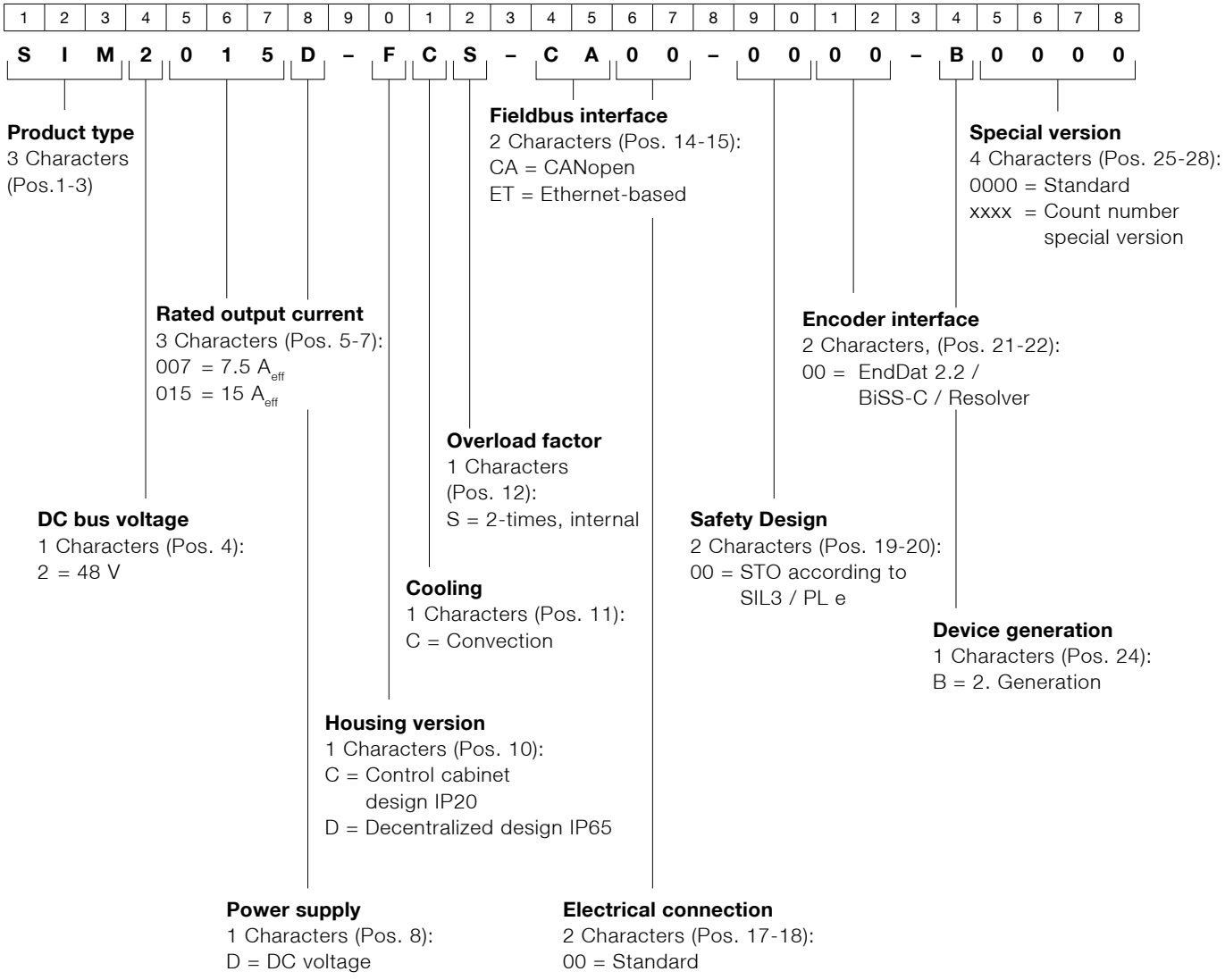


Information
Order codes

cyber® simco® line 1



cyber® simco® line 2



Information
Order codes

cyber® dynamic motor R

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
M	**R**	**S**	**R**	**0**	**1**	**6**	**B**	**-**	**0**	**1**	**0**	**C**	**-**	**2**	**C**	**0**	**B**	**S**	**-**	**H**	**I**	**0**	**G**	**S**	**N**	**-**	**N**	**N**	**N**

Series
4 Characters (Pos. 1-4)
MRSR = cyber® dynamic motor

Size
(Outer diameter of the stator in mm)
3 Characters (Pos. 5-7)
016 = Size 17
021 = Size 22
030 = Size 32
038 = Size 40

Lamination
1 Characters (Pos. 8)
B = B-lamination

Length
(Lengths of the stator)
3 Characters (Pos. 10-12)
010 = 10 mm (if size 016 or 021)
020 = 20 mm (if size 030)
030 = 30 mm (if size 038)

Cooling
1 Characters (Pos. 13)
C = Convection

Voltage constant
3 Characters (Pos. 15-17)
see specific characteristic curve

Voltage
1 Characters (Pos. 18)
B = DC bus voltage up to 60 V_{DC}

Electrical connection
1 Characters (Pos. 19)
S = Standard Design (electrical connection depending on the motor connection cable)
U = Inox / Hygienic Design with intercontec connector
F = Inox / Hygienic Design with flying leads

Encoder
2 Characters (Pos. 21-22)
HI = Singleturn, BISS C
HM = Multiturn, BISS C
HF = Incremental

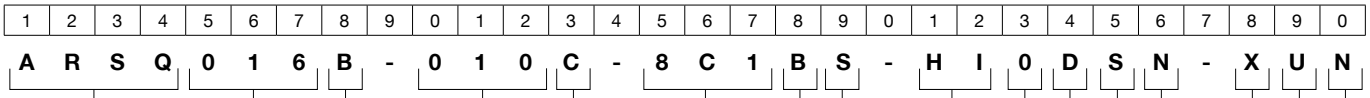
Brake
1 Characters (Pos. 23)
0 = Without
1 = With

Shaft type
1 Characters (Pos. 24)
G = Plain shaft

Temperature sensor
1 Characters (Pos. 26)
N = Without

Design
1 Characters (Pos. 25)
S = Standard (if Standard / Inox Design)
L = Food grade (if Hygienic Design)

cyber® dynamic actuator R



Series
4 Characters (Pos. 1-4)
ARSQ = cyber® dynamic actuator R

Size
(Outer diameter of the stator in mm)
3 Characters (Pos. 5-7)
016 = Size 17
021 = Size 22
030 = Size 32
038 = Size 40

Lamination
1 Characters (Pos. 8)
B = B-lamination

Length
(Lengths of the stator)
3 Characters (Pos. 10-12)
010 = 10 mm (if size 016 or 021)
020 = 20 mm (if size 030)
030 = 30 mm (if size 038)

Cooling
1 Characters (Pos. 13)
C = Convection

Voltage constant
3 Characters (Pos. 15-17)
see specific characteristic curve

Voltage
1 Characters (Pos. 18)
B = DC bus voltage up to 60 V_{DC}

Electrical connection
1 Characters (Pos. 19)
S = Standard Design (electrical connection depending on the motor connection cable)
U = Inox / Hygienic Design with intercontec connector
F = Inox / Hygienic Design with flying leads

Encoder
2 Characters (Pos. 21-22)
HI = Singleturn, BISS C
HM = Multiturn, BISS C
HF = Incremental

Brake
1 Characters (Pos. 23)
0 = Without
1 = With

Shaft type
1 Characters (Pos. 24)
G = Plain shaft (if size 030)
P = Plain shaft with feather key (if size 038)
D = D-cut shaft (if size 016 / 021)

Design
1 Characters (Pos. 25)
S = Standard (if Standard / Inox Design)
L = Food grade (if Hygienic Design)

Temperature sensor
1 Characters (Pos. 26)
N = Without

Gearbox ratio
1 Characters (Pos. 28)
X = See S. 83

Kind of gearbox and Backlash
1 Characters (Pos. 29)
U = Planetary gearbox with standard backlash

Gearbox orientation
1 Characters (Pos. 30)
N = Symmetric

Information
Order codes

cyber® dynamic actuator L

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
A	L	S	R	0	1	6	B	-	0	1	0	C	-	1	2	7	B	S	-	H	I	0	S	S	N	-	X	B	N

Series
4 Characters (Pos. 1-4)
ALSR = cyber® dynamic actuator L

Size
(Outer diameter of the stator in mm)
3 Characters (Pos. 5-7)
016 = Size 17
021 = Size 22
030 = Size 32
038 = Size 40

Lamination
1 Characters (Pos. 8)
B = B-lamination

Length
(Lengths of the stator)
3 Characters (Pos. 10-12)
010 = 10 mm (if size 016 or 021)
020 = 20 mm (if size 030)
030 = 30 mm (if size 038)

Cooling
1 Characters (Pos. 13)
C = Convection

Voltage constant
3 Characters (Pos. 15-17)
see specific characteristic curve

Voltage
1 Characters (Pos. 18)
B = DC bus voltage up to 60 V_{DC}

Electrical connection
1 Characters (Pos. 19)
S = Standard Design (electrical connection depending on the motor connection cable)
U = Inox / Hygienic Design with Intercontec connector
F = Inox / Hygienic Design with flying leads

Encoder
2 Characters (Pos. 21-22)
HI = Singleturn, BISS C
HM = Multiturn, BISS C
HF = Incremental

Brake
1 Characters (Pos. 23)
0 = Without
1 = With

Shaft type
1 Characters (Pos. 24)
S = Pushing rod

Design
1 Characters (Pos. 25)
S = Standard (if Standard / Inox Design)
L = Food grade (if Hygienic Design)

Temperature sensor
1 Characters (Pos. 26)
N = Without

Linear guidance and anti-rotation mechanism
1 Characters (Pos. 29)
B = With linear guidance and anti-rotation mechanism

Sensor
1 Characters (Pos. 30)
N = Without

Stroke length
1 Characters (Pos. 28)
X = See additional table

Stroke length

Size	17	22	32	40
C	30 mm	35 mm	40 mm	-
D	-	-	-	300 mm
E	120 mm	140 mm	160 mm	200 mm
F	-	-	-	50 mm

cyber® dynamic line cable

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
S	/	L	-	K	A	B	E	L	-	0	1	6	H	I	-	0	5	0	0	-	B	F	S	0	-	1	1	/	3

Series
9 Characters (Pos. 1-9)
S/L-KABEL = cable cyber® dynamic line

Size
3 Characters (Pos. 11-13)
016 = Size 17
(if motor connection cable for dl17)
021 = Size 22
(if motor connection cable for dl22)
030 = Size 32
(if motor connection cable for dl32)
038 = Size 40
(if motor connection cable for dl40)
XXX = Universally
(if extension or adapter cable)

Encoder
2 Characters (Pos. 14-15)
HI = HI / HM (if adapter cable cyber® simco® drive (IP20))
HF = HF
HX = Universally (if extension cable)

Cable length in mm
4 Characters (Pos. 17-20)

Voltage
1 Characters (Pos. 22)
B = DC bus voltage up to 60 V_{DC}

Electrical connection
1 Characters (Pos. 23)
J = Intercontec socket / Sub-D connector (if adapter cable cyber® simco® drive (IP20))
V = Intercontec socket / Intercontec connector (if extension cable)
F = Circuit board connector / flying leads (if motor connection cable)
M = Circuit board connector / Intercontec connector (if motor connection cable)

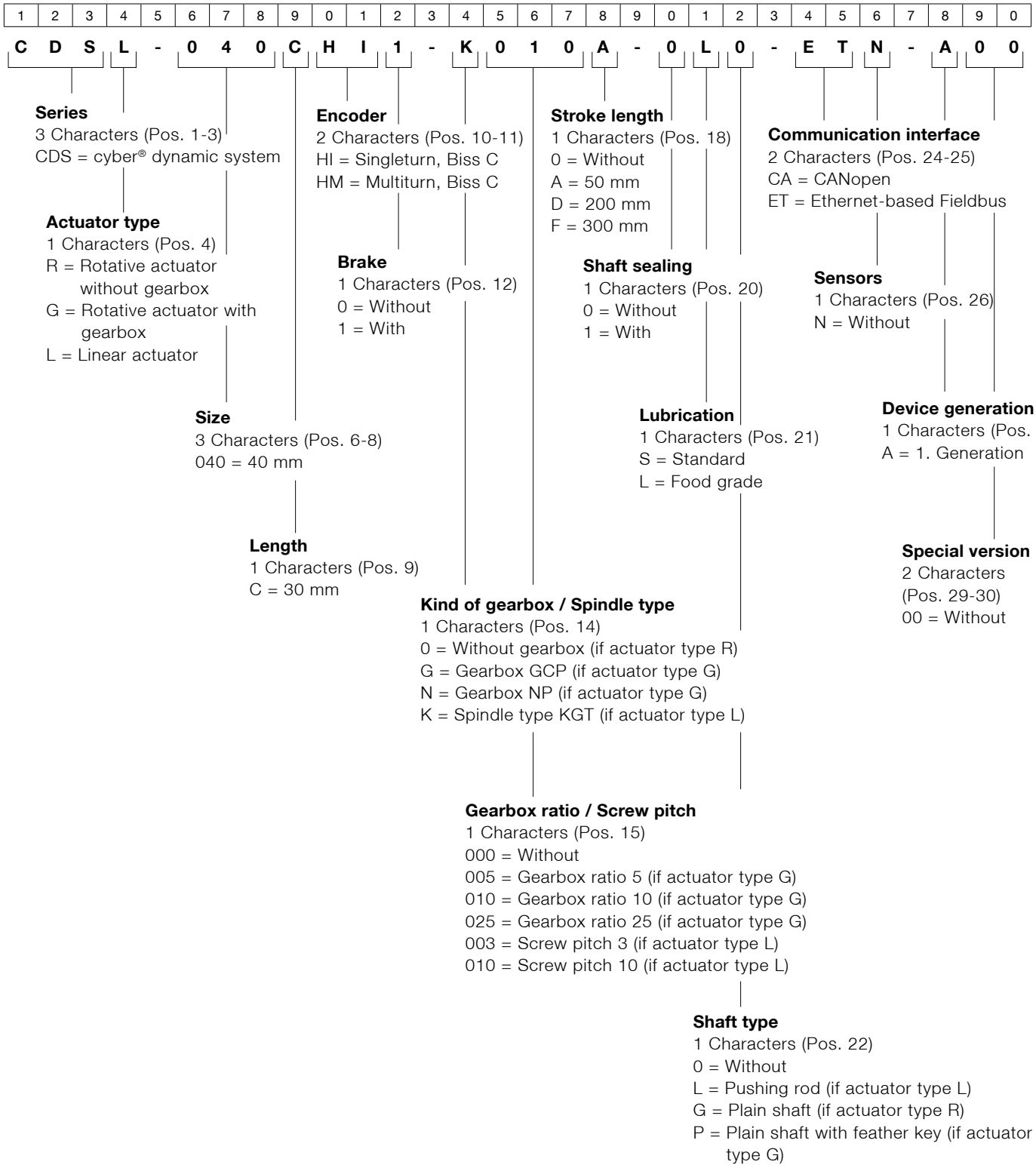
Ambient conditions
1 Characters (Pos. 24)
S = Standard (PUR)

Brake
1 Characters (Pos. 25)
0 = Without
1 = With

No. of signal wires
2 Characters (Pos. 27-28)
06 = 6 (if HI / HM)
11 = 11 (if HF / Hx)
11 = 11 (if HI / HM with brake)

No. of power wires
1 Characters (Pos. 30)
3 = 3

cyber® dynamic system



cyber® simco® line / cyber® dynamic system software

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
C	Y	D	F	W	-	C	A	-	0	2	-	0	1	-	0	1

Product type
3 Characters (Pos.1-3)
CYD = cyber® drive

Software type
2 Characters (Pos.4-5)
FW = Firmware

Fieldbus interface
2 Characters (Pos.7-8)
CA = CANopen
EC = EtherCAT
PN = Profinet
EI = EtherNet/IP
SC = SERCOS III
ME = Multi-Ethernet

Generation
2 Characters (Pos.10-11)
02 = 2. Generation

Version
2 Characters (Pos.13-14)
XX = Latest version
01 = Version 1
02 = Version 2

Subversion
2 Characters (Pos.16-17)
XX = Latest subversion
00 = Subversion 0
01 = Subversion 1

cyber® dynamic actuator R - Gearbox ratio

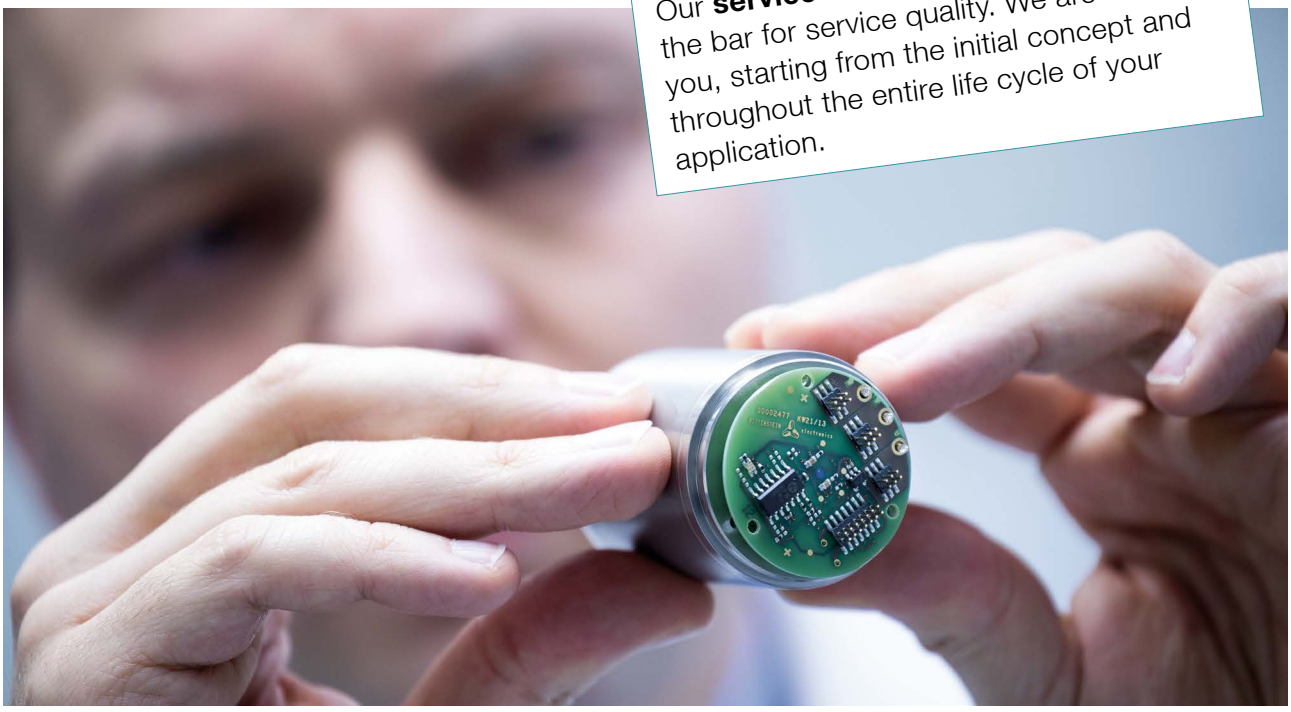
Size	17	22	32	40 (GCP)	40 (CP)	40 (NP)
A	64	4	4	4	-	-
C	12	28	-	20	-	-
D	21	64	25	25	-	-
E	28	-	-	64	-	-
F	36	-	64	-	-	-
G	48	-	-	-	-	-
H	-	20	-	-	-	-
L	-	-	16	-	-	-
M	-	-	20.8	-	-	-
P	-	-	72	30.67	-	-
R	-	-	100	-	-	-

Size	17	22	32	40 (GCP)	40 (CP)	40 (NP)
Y	-	-	-	100	-	-
Z	-	-	-	49	-	-
AQ	-	-	-	-	5	5
BQ	-	-	-	-	4	-
CQ	-	-	-	-	50	-
DQ	-	-	-	-	16	-
FQ	-	-	-	-	-	10
GQ	-	-	-	-	-	25

Our services at a glance

PRE-SALES		AFTER-SALES	
Design	Installation	Maintenance	Training
· Engineering · Consultation and trainings · Sizing software cymex® · CAD POINT	· Service Portal · Installation on-site · Operating & installation instructions · Pick-up & return service	· Service Portal · Modernization · 24 h service hotline · Maintenance and inspection · Repair · cymex® statistics	· Product training · Sizing training · Installation training · Service training

Our **service concept** continues to raise the bar for service quality. We are there for you, starting from the initial concept and throughout the entire life cycle of your application.



Contact information

PRE-SALES

Support hotline

For reliable and expert dimensioning.

Tel: +49 7931 493-15800
Fax: +49 7931 493-10905
E-Mail: info@wittenstein-cyber-motor.de

AFTER-SALES

Service hotline

For fast and unbureaucratic assistance with repairs and questions about supplied products.

Tel: +49 7931 493-15900
Fax: +49 7931 493-10903
E-Mail: service@wittenstein-cyber-motor.de

Technical Support

For any questions on installation, commissioning and optimization.

Tel: +49 7931 493-14800
E-Mail: wcm-support@wittenstein.de

For detailed information, please visit www.wittenstein-cyber-motor.de

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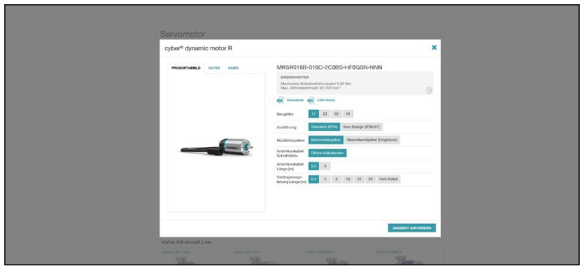

cymex®5
Calculate on the Best

- Detailed calculation of complete drive trains
- Precise simulation of motion and load variables
- Desktop software for complex designs

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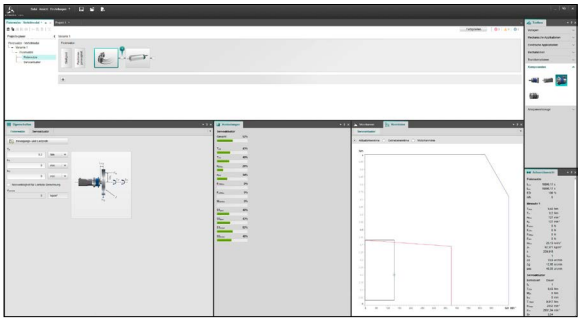
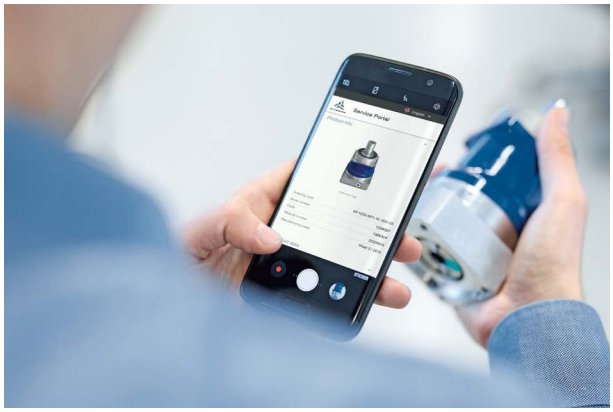


WITTENSTEIN Service Portal - One gate. All support.

The basic idea of the WITTENSTEIN Service Portal
The new web-based WITTENSTEIN Service Portal supports you throughout the entire life cycle of your WITTENSTEIN product – from installation over commissioning to service and/or drive replacement. Here you will find relevant and current information about your product, covering explanations, technical data, tutorial videos on assembly & commissioning, documentation, firmware files and the details of your contact. The WITTENSTEIN Service Portal also makes it quick and easy to request replacement products and register returns for inspection or repair.

Your advantages

- Fast:
  You will receive clear information about the present product without any time spent waiting or researching.
- Simple access:
  You can access the WITTENSTEIN Service Portal via desktop PC and mobile devices and navigate intuitively.
- Up-to-date:
  You will improve security because data, documentation and software are up to date.
- Personal:
  For further support, you can directly get in touch with the competent contact responsible.
- Understandable:
  You receive access to the version of the firmware as of delivery as well as to the latest version.
- International:
  The Service Portal is available in six languages (EN, DE, ES, IT, FR, TR).



www.wittenstein.de/service-portal-en

Discover the WITTENSTEIN Service Portal

You can access the WITTENSTEIN Service Portal both from your desktop PC by entering the serial number of your drives or, even more conveniently, via your mobile devices (tablet or smartphone) by scanning the DataMatrix code attached to the product.

Information
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Operating voltage
The motor windings are available for various operating voltages. The operating voltage (intermediate circuit voltage) corresponds to the rectified peak value of the supply voltage from the grid.

BISS C
Protocol for transmitting absolute values and parameters, developed by ICHaus. The name BISS stands for "Bi-directional/Serial/Synchronous".

cymex®
cymex® is the calculation software developed by our company for dimensioning complete drive trains. The software enables the precise simulation of motion and load variables. The software is available for download from our website (www.wittenstein-cymex.de). We can also provide training to enable you to make full use of all the possibilities provided by the software.

Encoder
The rotary encoder represents an important part of the servo system, which determines the current speed and position for control purposes. Different measuring methods are used here: Electromagnetic induction (resolver) or optical sensing of an encoder disc (absolute encoder).

Holding brake
The holding brake serves to lock an axis when stationary. In contrast to a service brake, it is not used to reduce the speed, except in emergency stop situations. The number of possible emergency stops can be calculated based on the speed and moved mass information.

Insulation class
The motor insulation class defines the maximum operating temperatures of the insulation materials used.

Tilting moment (M_{2K})
The tilting moment M_{2K} is a result of the axial and lateral forces applied and their respective points of application in relation to the inner radial bearing on the output side.

Mass moment of inertia (J)
The mass moment of inertia J [kgm²] is a measure of the effort applied by an object to maintain its momentary condition (at rest or moving).

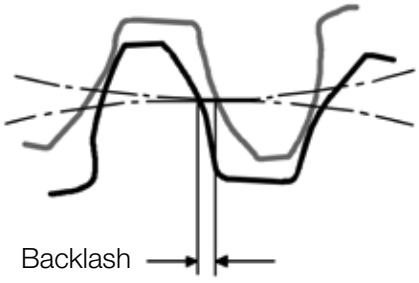
Motion Task
A motion task can be used in the servo drive in the form of an extended motion block table for individual modification and flexible programming of the application.

Pin assignment
It defines the assignment of the individual pins in the mounting socket. The supply voltage for the motor and brake, the temperature signal and the motor encoder signals are applied via these pins.

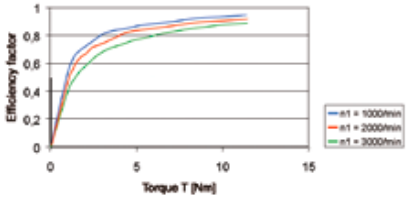
SIL
Stands for the safety integrity level from the area of functional safety and is referred to as safety level or safety integrity level in accordance with the IEC 61508 / IEC61511 standard. There are 4 levels. Up to level 2, the manufacturers can make the hazard assessments on their own authority, from level 3 upwards, this must be carried out by an independent, accredited body.

Ambient temperature
It describes the temperature of the air for the operation of servo actuators according to DIN EN 60204-1.

Torsional backlash (j_t)
Torsional backlash j_t [arcmin] is the maximum angle of torsion of the output shaft in relation to the input. Simply put, the torsional backlash represents the gap between two tooth flanks.



Efficiency (η)
Efficiency [%] η is the ratio of output power to input power. Power lost through friction reduces efficiency to less than 1 or 100 %.
$\eta = P_{off} / P_{on} = (P_{on} - P_{loss}) / P_{on}$



Example efficiency curve for a planetary gearbox as a function of torque

WITTENSTEIN always measures the efficiency of a gearbox / servo actuator during operation at full load. If the input power or torque are lower, the efficiency rating is also lower due to the constant no-load torque. Power losses do not increase as a result. A lower efficiency is also expected at high speeds.

Motor characteristic

Term	Symbol	Unit	Explanation
Continuous torque	M_{S1}	Nm	Continuous torque of the motor.
Continuous power	P_{S1}	W	Continuous power of the motor.
DC bus voltage	U_{DC}	V	Voltage at DC bus.
Torque constant	k_m	Nm/A	Torque constant calculated from torque and the RMS current. $k_m = \frac{M}{I}$
Voltage constant	k_e	Vs	Voltage constant calculated from peak value of the induced voltage between two terminals and rotation speed for the external driven motor: $k_e = \frac{\hat{U}_{tt}}{2\pi n}$
Motor constant	k_{mot}	$Nm/\sqrt{W}$	Factor of efficiency calculated form torque and power losses. $k_{mot} = \sqrt{\frac{2}{3}} \cdot \frac{k_m}{\sqrt{R_{tt}}}$
Ambient temperature	ϑ_u	°C	Maximum allowed ambient temperature (with liquid cooling maximum inlet temperature of the cooling liquid) without derating.
Maximum winding temperature	ϑ_{max}	°C	Maximum allowed winding temperature.
Thermal resistance	R_{th}	K/W	Heat transmission resistance which may not be exceeded for the dissipation of the thermal losses.
Thermal time constant	t_{th}	min	Time in which 63 % of the final value of the warming at rated loading is reached.
Thermal overload factor	k_{th}	A^2s/K	Linearized factor to determine the remaining on-time depending on the current and temperature rise.
Minimal flow rate	Q	l/min	Minimum flow rate of coolant water.
Maximum power	P_{max}	W	Maximum power in short time operation.
Maximum torque	M_{max}	Nm	Maximum torque with maximum current I_{max}.
Maximum current	I_{max}	A	Maximum current rms-value.
Continuous stall torque	M_0	Nm	Continuous torque at standstill of the motor.
Continuous stall current	I_0	A	Continuous current (rms value) which leads to the allowed heating of the winding.
No-load speed	n_0	min^{-1}	Maximum no-load speed which will be reached without field weakening at operation with U_{DC}.
Rated power	P_n	W	Continuous power at speed n_n.
Rated torque	M_n	Nm	Continuous torque at speed n_n.
Rated current	I_n	A	Continuous current (rms value) at speed n_n.
Rated speed	n_n	min^{-1}	Speed up to which M_n is produced continuously.

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Term	Symbol	Unit	Explanation
Cogging torque	M_{cog}	Nm	The cogging torque is defined as the maximum peak-to-peak value of two subsequent significant extrema of the cogging torque of one complete revolution
Motor terminal resistance	R_{tt}	Ω	Resistance between two terminals at 20°C.
Motor terminal inductance	L_{tt}	mH	Inductance between two terminals at 20°C.
Motor terminal inductance (d-axis)	L_{ttd}	mH	Direct-axis inductance between two terminals at 20°C.
Motor terminal inductance (q-axis)	L_{ttq}	mH	Quadrature-axis inductance between two terminals at 20°C.
Electrical time constant	t_e	ms	Electrical time constant, derived from: $t_e = L_{tt} / R_{tt}$
Number of pole pairs	p	-	Number of the pole pairs of the motor.
Inertia of motor	J	kgm²	Inertia of the motor without brake.
Inertia active part	J	kgm²	Inertia of the rotor.
Mass of motor	m	kg	Mass of the motor without brake.
Mass active part	m	kg	Mass of the rotor and the stator.

All specified values are liable to specific variabilities due to the tolerances of material properties and dimensions. The specified values are mean values at which a tolerance of +/-10 % of torque, current, inductance, resistance and speed is allowed. In addition the terminal inductance can alternate depending on the angle between rotor and stator.

Actuator characteristic (rotative)

Term	Symbol	Unit	Explanation
Continuous torque	M_{S1}	Nm	Continuous torque of the actuator.
Continuous power	P_{S1}	W	Continuous power of the actuator.
DC bus voltage	U_{DC}	V	Voltage at DC bus.
Torque constant	$k_{m\ act}$	Nm/A	Torque constant calculated from torque and RMS value of the current. $k_m = \frac{M}{I}$
Voltage constant	$k_{e\ act}$	Vs	Voltage constant calculated from peak value of the induced voltage between two terminals and rotation speed for the external driven actuator: $k_e = \frac{\hat{U}_{tt}}{2\pi n}$
Actuator constant	k_{act}	$Nm/\sqrt{W}$	Factor of efficiency calculated from torque and power losses. $k_{mot} = \sqrt{\frac{2}{3}} \cdot \frac{k_m}{\sqrt{R_{tt}}}$

Term	Symbol	Unit	Explanation
Ambient temperature	ϑ_u	°C	Maximum allowed ambient temperature (with liquid cooling maximum inlet temperature of the cooling liquid) without derating.
Maximum winding temperature	J_{max}	°C	Maximum allowed winding temperature.
Thermal resistance	R_{th}	K/W	Heat transmission resistance which may not be exceeded for the dissipation of the thermal losses.
Thermal time constant	T_{th}	min	Time in which 63 % of the final value of the warming at rated loading is reached.
Thermal overload factor	kth	A^2s/K	Linearized factor to determine the remaining on-time depending on the current and temperature rise.
Minimal flow rate	Q	l/min	Minimum flow rate of coolant water.
Maximum power	$P_{max\ act}$	W	Maximum power in short time operation.
Maximum torque	$M_{max\ act}$	Nm	Maximum torque with maximum current I_{max}.
Maximum current	I_{max}	A	Maximum current (rms-value).
Continuous stall torque	$M_{0\ act}$	Nm	Continuous torque at standstill of the actuator.
Continuous stall current	I_0	A	Continuous current (rms value), which leads to the allowed heating of the winding.
No-load speed	$n_{0\ act}$	min^{-1}	Maximum no-load speed which will be reached without field weakening at operation with U_{DC}.
Rated power	$P_{n\ act}$	W	Continuous power at speed $n_{n\ act}$.
Rated torque	$M_{n\ act}$	Nm	Continuous torque at speed $n_{n\ act}$.
Rated current	I_n	A	Continuous current (rms value) at speed $n_{n\ act}$.
Rated speed	nn act	min^{-1}	Speed up to which $M_{n\ act}$ is produced continuously.
Motor terminal resistance	R_{tt}	Ω	Resistance between two terminals at 20°C.
Motor terminal inductance	L_{tt}	mH	Inductance between two terminals at 20°C.
Motor terminal inductance (d-axis)	L_{tt_d}	mH	Direct-axis inductance between two terminals at 20°C.
Motor terminal inductance (q-axis)	L_{tt_q}	mH	Quadrature-axis inductance between two terminals at 20°C.
Electrical time constant	t_e	ms	Electrical time constant, derived from: $t_e = L_{tt} / R_{tt}$
Number of pole pairs	p	-	Number of the pole pairs of the motor.
Inertia of actuator	J_{act}	kgm^2	Inertia of the actuator without brake on application side.
Mass of actuator	m_{act}	kg	Mass of the actuator.
Gear ratio	iG	-	Ratio of the gear.
Gear efficiency	ηG	%	Efficiency of the gear.
Mechanical speed limit S1	$\eta_{limit,S1}$	min^{-1}	Maximum speed for continuous operation due to mechanical limits.
Mechanical speed limit Max	$\eta_{limit,Max}$	min^{-1}	Maximum speed for maximum operation due to mechanical limits.

All specified values are liable to specific variabilities due to the tolerances of material properties and dimensions. The specified values are mean values at which a tolerance of +/-10 % of torque, current and speed is allowed.

The actuator characteristic is calculated with a constant gear efficiency.
The operating range is restricted in case of mechanical load limitations. No longer admissible areas of the maximum characteristic curves defined by the electric motor are shown as dotted lines.

Actuator characteristic (linear)

Term	Symbol	Unit	Explanation
Continuous force	F_{S1}	kN	Continuous force of the actuator.
Continuous power	P_{S1}	W	Continuous power of the actuator.
DC bus voltage	U_{DC}	V	Voltage at DC bus.
Force constant	$k_{m\ act}$	kN/A	Force constant calculated from force and RMS value of the current. $k_{m\_act} = \frac{F_{act}}{I}$
Voltage constant	$k_{e\ act}$	Vs/mm	Voltage constant calculated from peak value of the induced voltage between two terminals and speed v for the external driven actuator: $k_{e\_act} = \frac{\hat{U}_{tt}}{v_{act}}$
Actuator constant	k_{act}	–	Factor of efficiency calculated from force and power losses. $k_{act} = \sqrt{\frac{2}{3}} \cdot \frac{k_{m\_act}}{\sqrt{R_{tt}}}$
Maximum power	$P_{max\ act}$	W	Maximum power in short time operation.
Maximum push force	$F_{max\ act}$	kN	Maximum push force with maximum current $I_{max\ act}$.
Maximum current	$I_{max\ act}$	A	Maximum current (rms-value), limited by mechanical load limits.
Continuous stall force	$F_{0\ act}$	kN	Continuous force at standstill of the actuator.
Continuous stall current	I_0	A	Continuous current (rms value), which leads to the allowed heating of the winding.
No-load speed	$v_{0\ act}$	mm/s	Maximum no-load speed which will be reached without field weakening at operation with U_{DC}.
Rated power	$P_{n\ act}$	W	Continuous power at speed $v_{n\ act}$.
Rated torque	$F_{n\ act}$	kN	Continuous force at speed $v_{n\ act}$.
Rated current	I_n	A	Continuous current (rms value) at speed $v_{n\ act}$.
Rated speed	$v_{n\ act}$	mm/s	Speed, up to which $F_{n\ act}$ is produced continuously.
Mass of actuator	m_{act}	kg	Mass of the actuator.
Accelerated mass	m_{act_a}	kg	Mass, which has to be accelerated in the actuator.
Spindle pitch	p_S	mm	Pitch of the spindle (distance per revolution).
Inertia actuator	J_{act}	kgm^2	Mass moment of inertia des gesamten Aktuators.

Term	Symbol	Unit	Explanation
Spindle efficiency	η_S	%	Efficiency of the spindle.
Gear efficiency	η_G	–	Efficiency of the gear.
Mechanical speed limit	v_{limit}	mm/s	Maximum speed due to mechanical limits.
Mechanical force limit	F_{limit}	kN	Maximum force due to mechanical limits.

All specified values are liable to specific variabilities due to the tolerances of material properties and dimensions. The specified values are mean values at which a tolerance of +/-10 % of torque, current and speed is allowed.

The linear actuator characteristic is calculated with a constant spindle and gear (if existing) efficiency. The characteristic gives no information which speed can be driven in reality considering the spindle hub in the application under the load and ambient conditions of the application.

The operating range is restricted in case of mechanical load limitations. No longer admissible areas of the maximum characteristic curves defined by the electric motor are shown as dotted lines.

Notes

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