AMKASMART.

Decentralized drive technology.

AMK

Ideal installation options:

✔ On the motor
✔ On the machine rack
✔ On moving axes
✔ In the working area

AMK

AMKASMART iC, iX, i3X, iDT, iDP.
Decentralized drive technology.

Today's machines and plants are increasingly created based on function modules. The modular system enables reduced development costs and shorter delivery times. With its AMKASMART series, AMK extends a handshake to modular drive technology.

Realize your options without expanding the control cabinet. Locate the drive at the spot where it is needed, and minimize your wiring costs. Solve demanding tasks without adding terminals by using integrated I/Os. This saves you both time and money.

Thanks to the high degree of protection up to IP65, use in harsh production environments does not pose any problems. In terms of safety, you are also literally on the safe side. STO can be implemented with every device. Safe stopping and motion functions are available with the "Functional Safety" option.
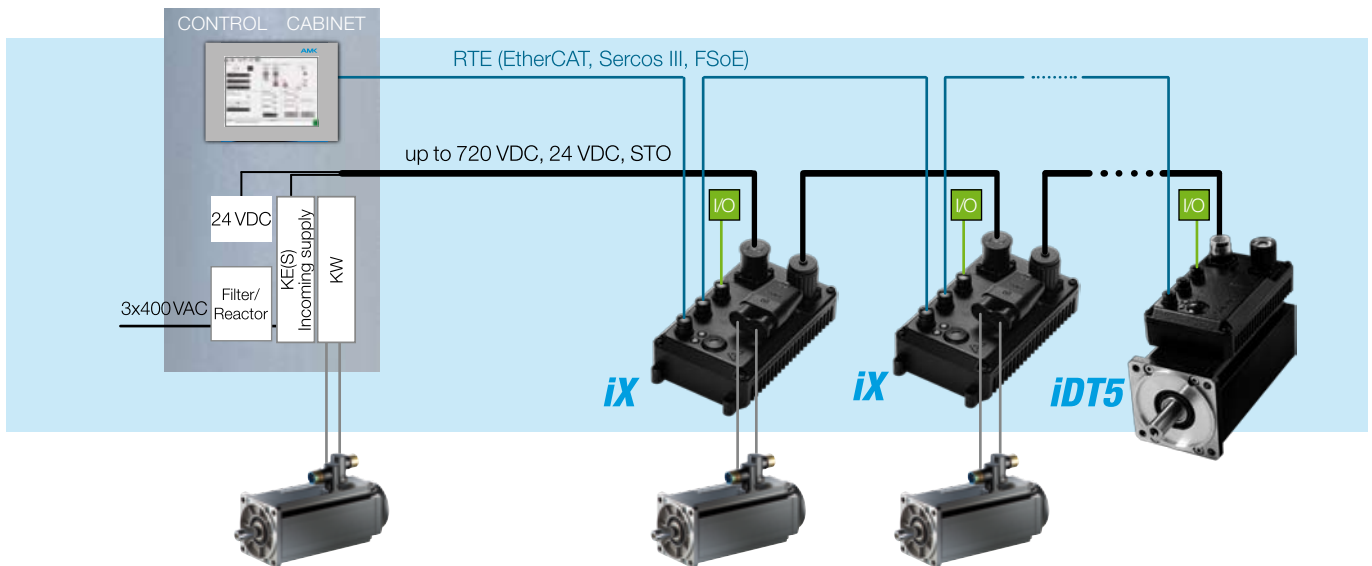
BENEFITS

- Ideal for modular machines
- Compact design
- Economical and space saving
- Reduced control cabinet costs
- Simplified wiring and installation
- High degree of protection IP 65/IP 54
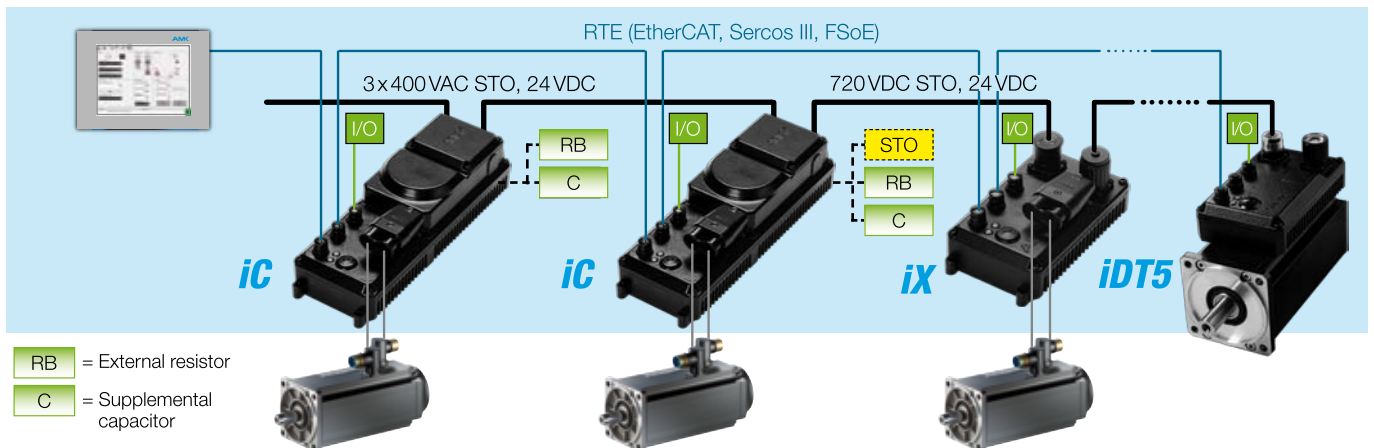- Shock- and vibration-resistant
- Multifunctional I/Os
- With safety

3

AMKASMART iC, iX, i3X, iDT, iDP.
Decentralized drive technology in the 2 kVA to 5 kVA continuous power range.

Drive structure with main module and power supply in the control cabinet

CONTROL CABINET

RTE (EtherCAT, Sercos III, FSoE)

up to 720 VDC, 24 VDC, STO

24 VDC

KE(S) Incoming supply

KW

Filter/ Reactor

3x400 VAC

I/O

I/O

I/O

iX

iX

iDT5

Drive structure with decentralized AC and DC power supply and transmission

RTE (EtherCAT, Sercos III, FSoE)

3 x 400 VAC STO, 24 VDC

720 VDC STO, 24 VDC

I/O

I/O

I/O

I/O

RB

C

STO

RB

C

iC

iC

iX

iDT5

RB = External resistor

C = Supplemental capacitor

Safety. Integrated, functional, safe.

Machines and plants may pose a risk to persons, property, and the environment in the event of dangerous failures and malfunctions. It must therefore be ensured that plants and machines can be safely operated. In its standard design, the distributed AMKASMART drive technology allows use of the STO function in PL d according to EN ISO 13849-1. Functional Safety is also available optionally.

STO (Safe Torque Off)
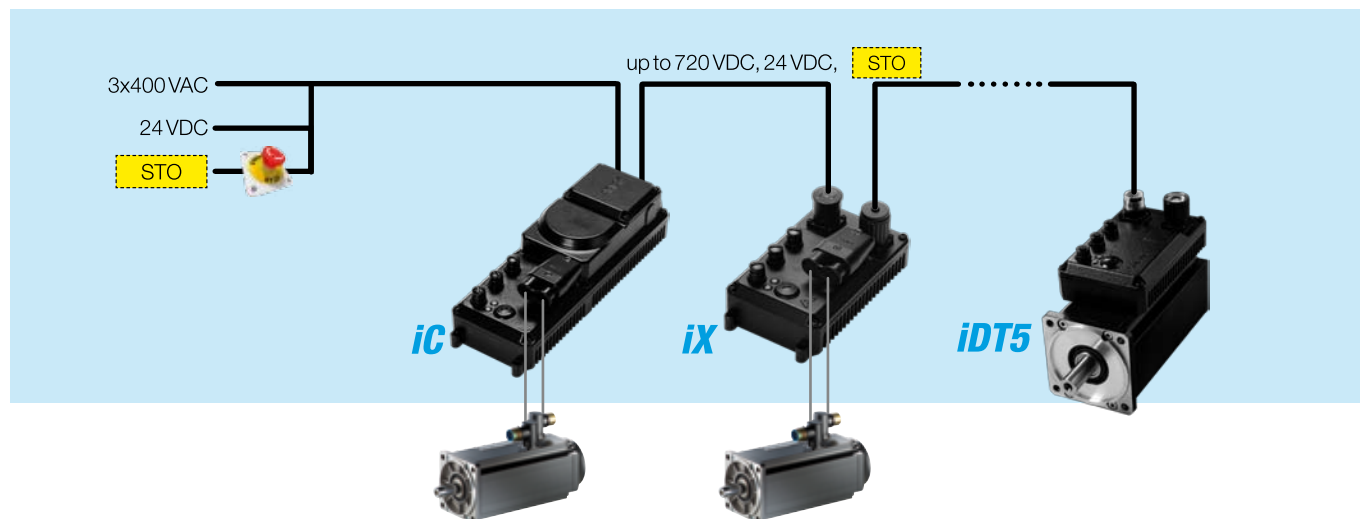
Functional Safety
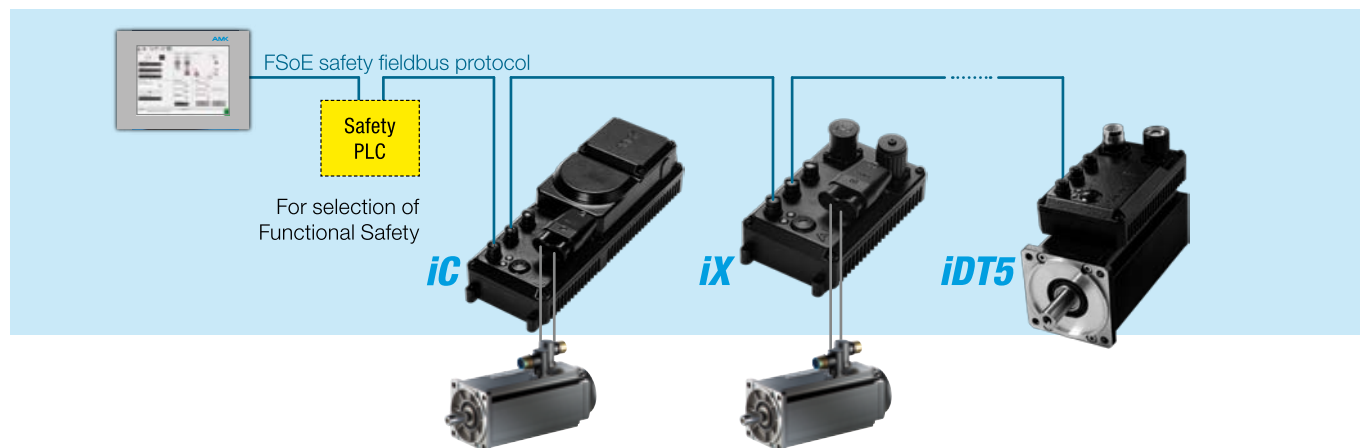
Functional Safety

- Stopping functions:
  - Safe torque off (STO)
  - Safe stop (SS1, SS2)

- Safe motion functions:
  - Safely-limited speed (SLS)
  - Safe direction (SDI)
  - Safe speed range (SSR)
  - Safe operating stop (SOS)
  - Safe maximum speed (SMS)
  - Safely-limited increment (SLI)

The safety functions are controlled using the FSoE safety fieldbus protocol.

The machine controller and the safety controller are separate in the AMK safety concept. The advantage of this approach is that when new modules are added, changes are only required in the PLC and not the safety controller. This eliminates high expenses for certification.

AMKASMART decentralized drive technology.
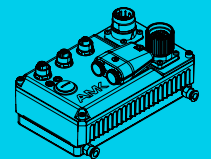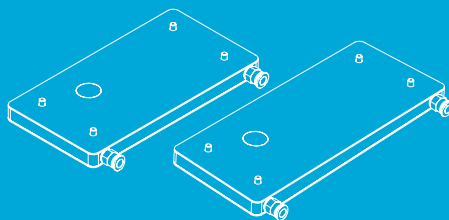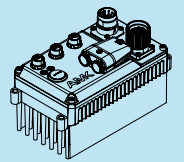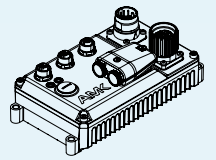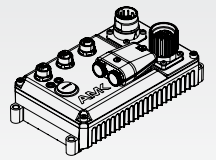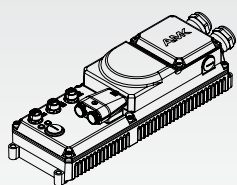## Scalable functions and cooling.

iX

Cooling type

Cold plate

Air cooling

Liquid cooling

iC

iDT

+

iDTC*

+
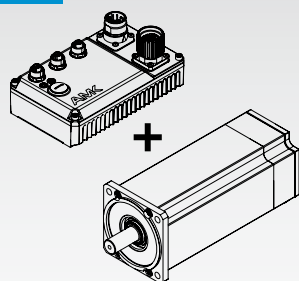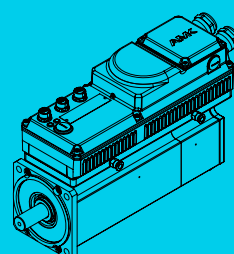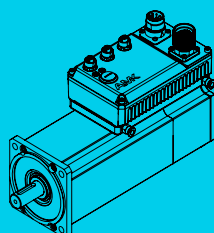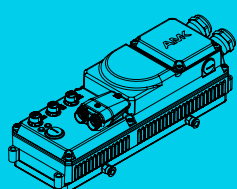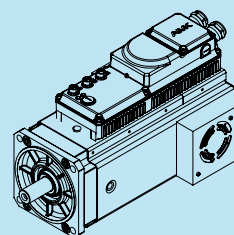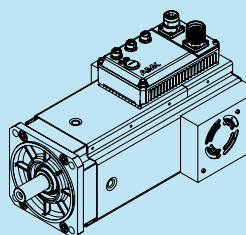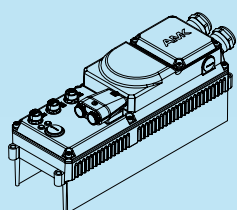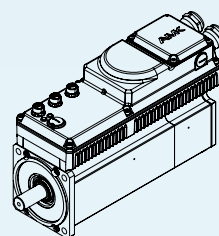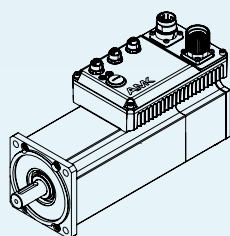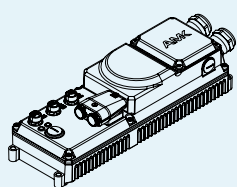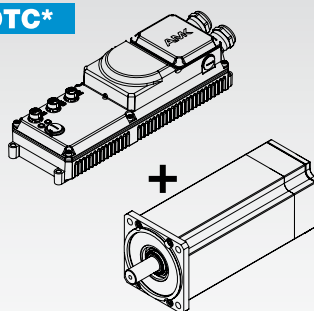
AMKASMART iC. Decentralized servo controller with power supply.

Decentralized AMKASMART iC ser-vo inverters are optimized for use in single-axis applications and modular machine structures. The integrated power supply module in the iC practically eliminates the need for a control cabinet and enables a remarkably flexible machine solution.

Additional features

- Closed-loop control of synchronous and asynchronous motors, linear and rotary
- Power supply 3 x 400 VAC
- Multifunctional encoder interface:
  - E-, F-encoder, Endat 2.1
  - P- ,Q-encoder, Endat 2.2 light
  - S-, T-encoder, Hiperface
  - Analog sin/cos 1 Vss, reference pulse
- Low-cost terminal panel for looping through
- Integrated mains filter, braking chopper, and braking resistor
- 5 multifunctional I/Os incl. 24 VDC supply voltage
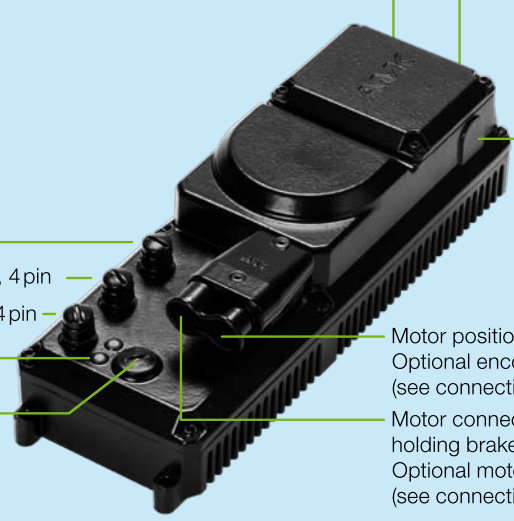
B E N E F I T S

- No control cabinet
- Simplified wiring and installation
- Low-cost terminal panel for looping through
- Installation on the machine rack
- Modular machine concepts
- Ideal for single-axis applications
- With safety
- Extremely compact

Technical data

Controller type		iC5	iC5-F
Cooling		Cold plate	Integrated air cooling
Rated output power	kVA	5	5
Rated output current	A	8.2	8.2
Maximum output current (duration <0.3 s)	A	16.5	16.5
Rated output voltage (sinusoidal)	V	3 x 350	
Output frequency	Hz	0 - 800	
Input frequency of power supply system	VAC	3 x 230…480 ± 10%, 47…63 Hz	
Voltage retransmission on DC bus	VDC	300 - 720	
DC bus shutdown threshold	VDC	850	
Rated current on DC bus	A	8	
Inverter efficiency	%	98	
Supply voltage, brake	VDC	24 V ± 15%	
Current consumption, holding brake, maximum	A	0.7	
Ambient temperature *	C	40°	
Degree of protection		IP65	IP54
Dimensions (L x W x H)	mm	293 x 100 x 75.6	293 x 100 x 121
Weight	kg	1.6	2.4

* Ratings at 40° C ambient temperature and 3 x 400 VAC/50 Hz supply system voltage

Interfaces

Power supply
Power supply 3 x 400 VAC
using terminal technology

Power transmission
3 x 400 VAC or 720 VDC
Holding brake with STO 24 VDC

Connection for options
- External braking resistor
- External supplemental capacitor

Multifunctional I/Os M 12, 8 pin

RTE out (EtherCAT, Sercos III, VARAN) M 12, 4 pin

RTE in (EtherCAT, Sercos III, VARAN) M 12, 4 pin

Status LEDs

Fieldbus address switch

Motor position encoder M12, 12 pin
Optional encoder connection as CM3
(see connections on p.19)

Motor connection,
holding brake, M 16, 8 pin
Optional motor connection as CM3
(see connections on p.19)

Dimensions

iC 5 cold plate

4xø5,5
22,5 30 30
76 28 10
282,5
273
293
100
45,6
75,6
86

iC 5-F with integrated air cooling

4xø5,5
22,5 30 30
76 28 10
282,5
273
293
100
90,6 45,6
121
86

AMKASMART iX. The decentralized servo controller solution.

Decentralized AMKASMART iX servo inverters are ideally suited for modular machine and plant construction. They are designed for rotary and linear synchronous and asynchronous motors of various kinds. The power supply and communication is looped through from module to module.

Their flexible mounting options provide a lot of freedom for machine design.

Additional features

- Closed-loop control of synchronous and asynchronous motors, linear and rotary
- Power supply up to 720 VDC, shutdown threshold 850 VDC
- Multifunctional encoder interface
  - Endat 2.1
  - Endat 2.2 light
  - Hiperface
  - Analog sin/cos 1 Vss, Reference pulse
- 5 multifunctional I/Os incl. 24 VDC supply voltage

BENEFITS

- IP 65, shock- and vibration-resistant
- Simplified wiring and installation
- Multifunctional I/Os
- Integrated safety function "STO"
- Optional Functional Safety
- Even more compact machine design
- Ideal for modular machine designs

Technical data

Controller type		iX2	iX5	iX5-F
Cooling		Cold plate	Cold plate	Integrated air cooling
Rated output power	kVA	2	5	5
Rated output current	A	3.3	8.2	8.2
Maximum output current (duration <1 s)	A	6.6	16.5	16.5
Rated output voltage (sinusoidal)	V	3 x 350		
Output frequency	Hz	0-800		
Input voltage, DC bus	VDC	1x540-720		
DC bus shutdown threshold	VDC	850		
Maximum current, DC bus plug connector	A	25		
Supply voltage, electronics	VDC	24 V ± 15%		
Power consumption, electronics (with I/O max.)	W	6 (18)		14 (26)
Efficiency, motor electronics	%	98		
Supply voltage, brake	VDC	24 V ± 15%		
Current consumption, holding brake, maximum	A	0.7		
Ambient temperature	C	40°		
Degree of protection		IP 65	IP 65	IP 54
Dimensions (L x W x H)	mm	183.5 x 100 x 68	183.5 x 100 x 68	183.5 x 100 x 114
Weight	kg	0.8	0.8	1.2

Interfaces

Power supply up to 720 VDC
Electronics voltage supply 24 VDC ⎤ M 23
Holding brake/STO 24 VDC ⎦

in   out

Multifunctional I/Os M 12, 8 pin

RTE out (EtherCAT, Sercos III, VARAN)   M 12, 4 pin

RTE in (EtherCAT, Sercos III, VARAN)   M 12, 4 pin

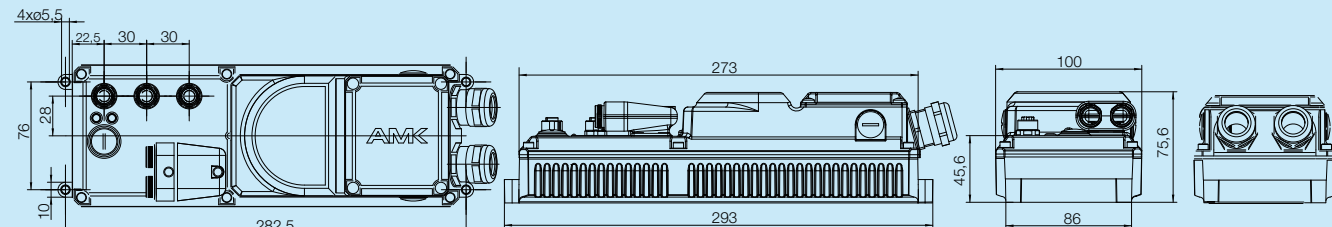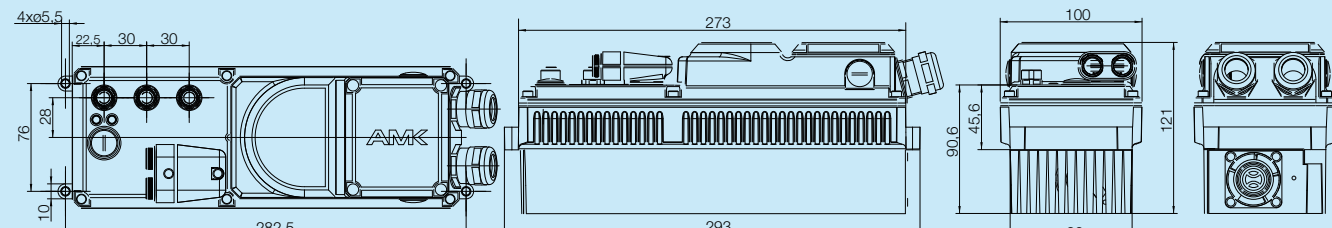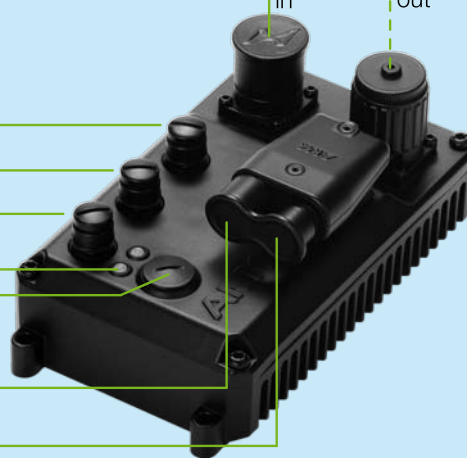Status LEDs
Fieldbus address switch

Motor connection, holding brake, M 16, 8 pin
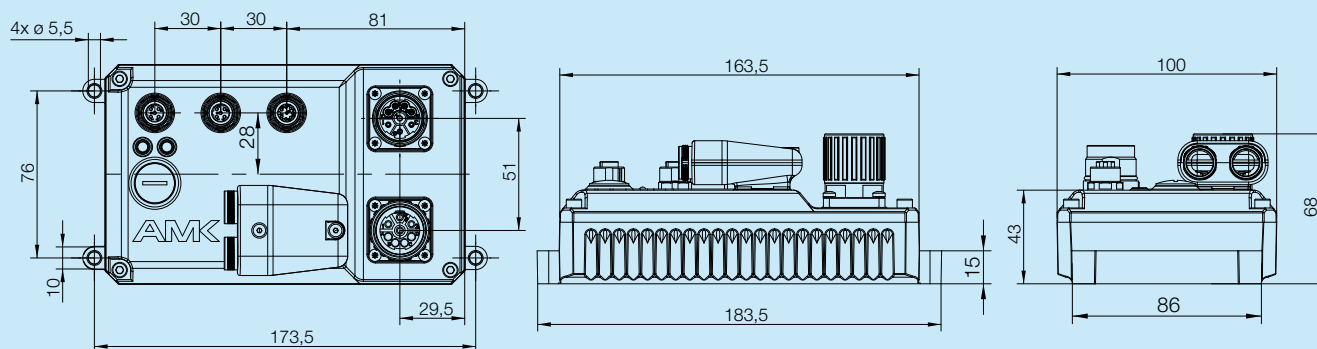optional motor connection as CM 3 (see connections on p.19)

Motor position encoder M12, 12 pin
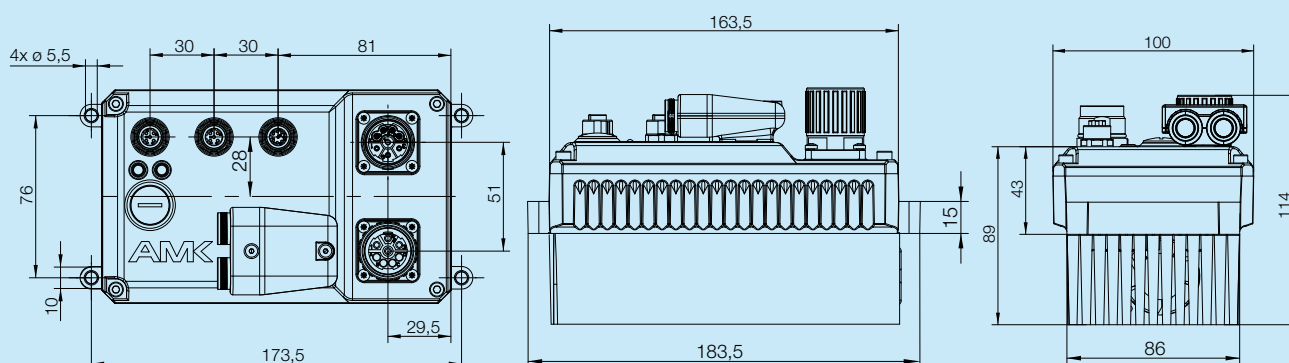Optional encoder connection as CM 3 (see connections on p.19)

Dimensions

iX2, iX5 cold plate

iX5-F with integrated air cooling

AMKASMART i3X. Three decentralized servo controllers in one housing.

Decentralized AMKASMART i3X triple servo controllers are optimal for use in three-axis machines and modular machine structures.

The i3X combines three decentralized iX servo controllers in one housing, thereby further reducing the already low cabling costs for decentralized devices.

Additional features

- Servo controller in IP 65 (with fan: IP 54) Design for decentralized installation
- Encoder interface
  - Endat 2.1
  - Endat 2.2 light
  - Hiperface
  - Analog sin/cos 1 Vss, Reference pulse
- Power supply up to 720 VDC
- Controller output power for motors up to max. 10 kVA
- 5 multifunctional I/Os incl. 24 VDC supply output
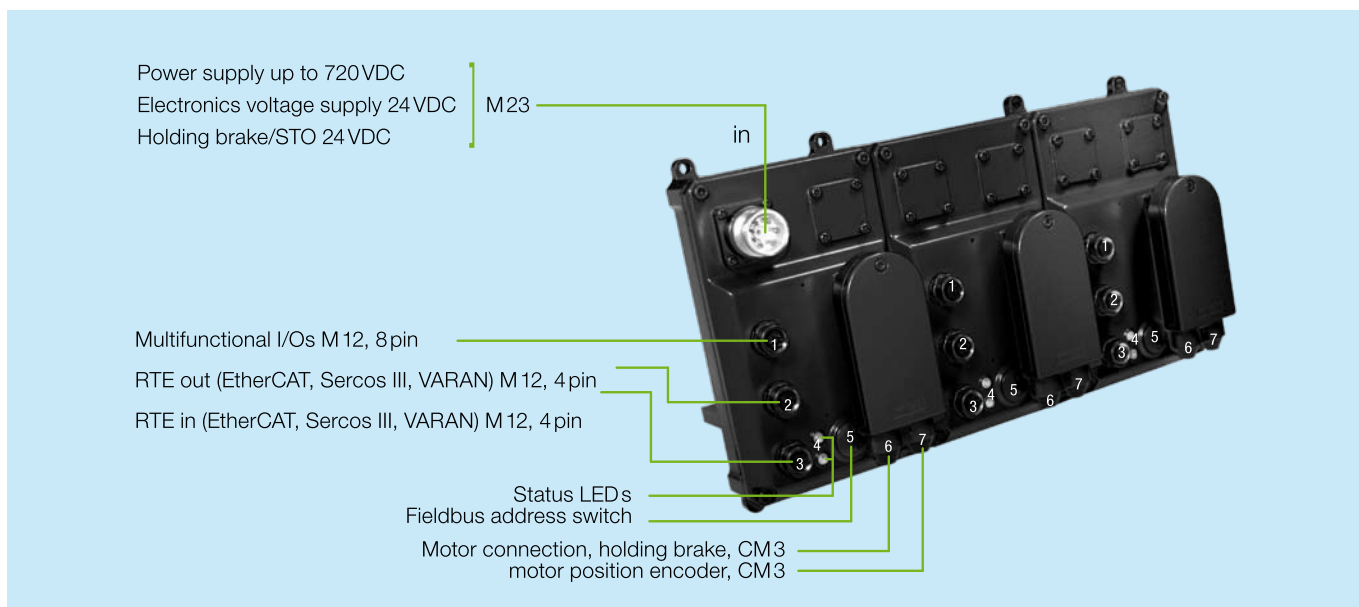- Central STO (Safe Torque Off) PL d

BENEFITS

- Three servo controllers in one housing
- IP 65, shock- and vibration-resistant
- Simplified wiring and installation
- Multifunctional I/Os
- Integrated safety function "STO"
- Optional Functional Safety
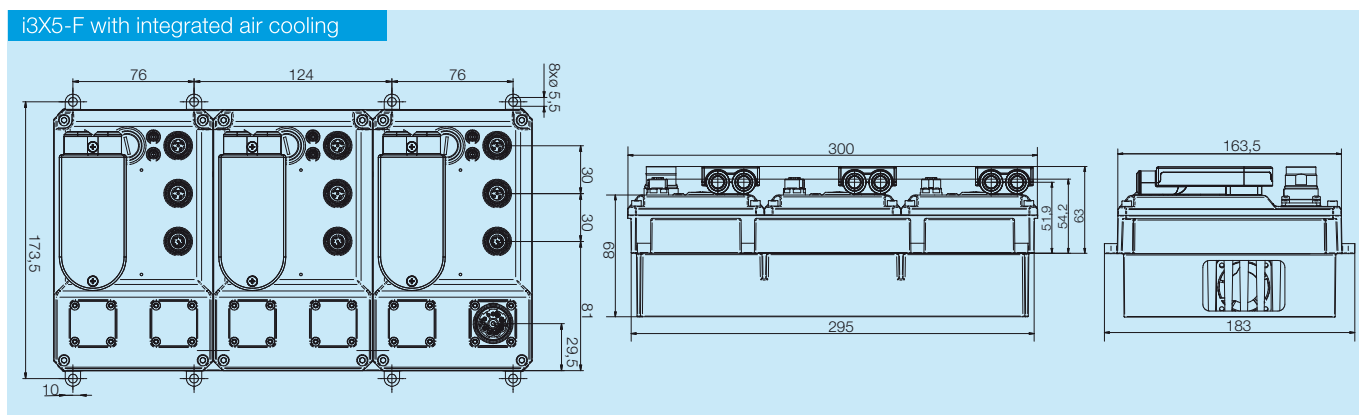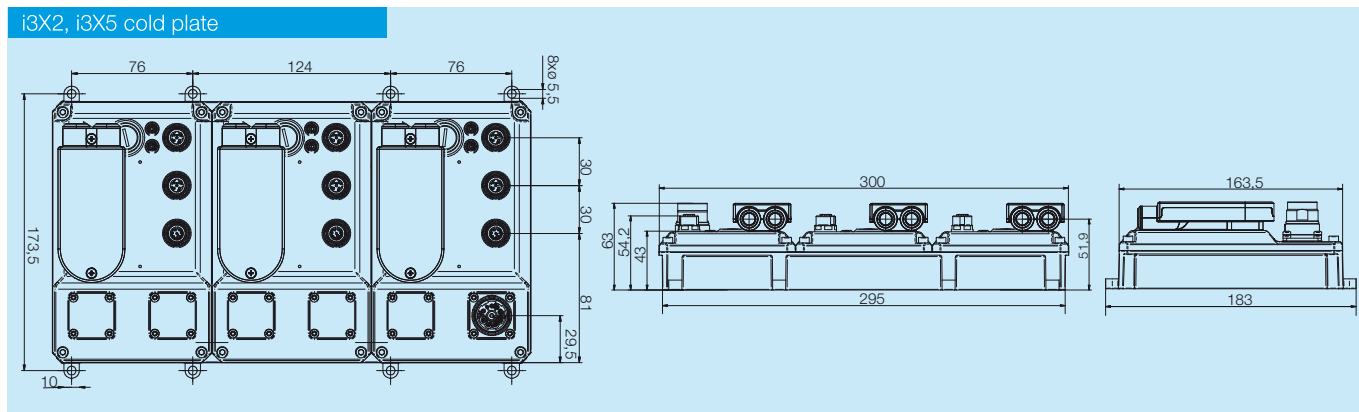- Even more compact machine design
- Ideal for modular machine designs

Technical data

Controller type		i3X2	i3X5	i3X5-F
Cooling		Cold plate	Cold plate	Integrated air cooling
Rated output power	kVA	3 x 2	3 x 5	3 x 5
Rated output current	A	3 x 3.3	3 x 8.2	3 x 8.2
Maximum output current (duration <1 s)	A	3 x 6.6	3 x 16.5	3 x 16.5
Rated output voltage (sinusoidal)	V		3 x 350	
Output frequency	Hz		0-800	
Input voltage, DC bus	VDC		1 x 540-720	
DC bus shutdown threshold	VDC		850	
Maximum current, DC bus plug connector	A		25	
Supply voltage, electronics	VDC		24 V ± 15%	
Power consumption, electronics (with I/O max.)	W		18 (54)	42 (78)
Efficiency, motor electronics	%		98	
Supply voltage, brake	VDC		24 V ± 15%	
Current consumption, holding brake, maximum	A		3 x 0.7	
Ambient temperature	C		40°	
Degree of protection		IP 65	IP 65	IP 54
Dimensions (L x W x H)	mm	300 x 173.5 x 63.5	300 x 173.5 x 63.5	300 x 173.5 x 110
Weight	kg	2.6	2.6	3.4

Interfaces

Power supply up to 720 VDC
Electronics voltage supply 24 VDC   M 23
Holding brake/STO 24 VDC

in

Multifunctional I/Os M 12, 8 pin

RTE out (EtherCAT, Sercos III, VARAN) M 12, 4 pin

RTE in (EtherCAT, Sercos III, VARAN) M 12, 4 pin

Status LEDs
Fieldbus address switch
Motor connection, holding brake, CM 3
motor position encoder, CM 3

Dimensions

i3X2, i3X5 cold plate

i3X5-F with integrated air cooling

AMKASMART iDT5. Servo motor with integrated servo inverter.

The inverter of the iDT 5 is installed directly on the servo motor. This produces a mechatronic functional unit that reduces the space requirement even further. Cabling costs are also further reduced as there is not motor cable at all.

Additional features

- DT motors with integrated servo controller
- Loopable M23 power connection
- Power supply up to 720 VDC, Shutdown threshold 850 VDC
- Optional holding brake

| Equipment	Standard	Option
Brake	–	4,5 Nm
Encoder	Single-turn: U capacitive Multi-turn: V capacitive	Single-turn: E optical, P inductive Multi-turn: F optical, Q inductive

Connection cables: Power connector M 23, Communication M 12, I/O s M 12

Technical data

Motor type	M_{max} [Nm]	I_{max} [Arms]	M_O [Nm]	I_O [Arms]	M_N [Nm]	I_N [Arms]	n_N [1/min]	P_N [W]	J [kgcm²]	L [mm]	L/L_{BR} [mm]	m [kg]
iDT5-3-10-xxO	7.7	8.5	2.2	2	1.36	1.2	4500	641	1.6	163.5	191.5	4.5
iDT5-5-10-xxO	9.6	8.5	3.8	3.3	2	1.7	3500	733	2.9	195	223	5.7
iDT5-9-10-xxO	14.1	8.5	7.1	4.6	3.3	2	3000	1037	5.5	258	286	8.3

Explanation of characteristic values: M_{max} Maximum torque · I_{max} Maximum current · M_O Continuous stall torque · I_O Continuous stall current · M_N Rated torque · I_N Rated current · n_N Rated speed P_N Rated power · J Moment of inertia · L Motor length L_{BR} Motor length with brake · m Weight
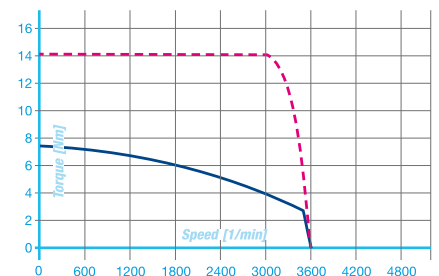
Characteristic curves
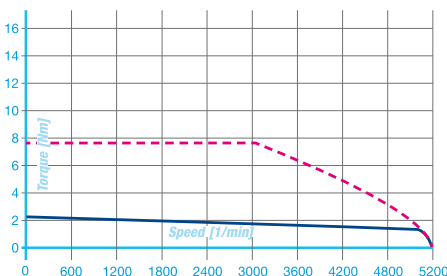
iDT 5-3
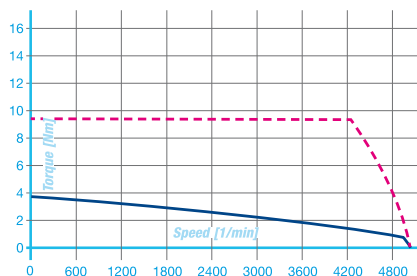
iDT 5-5

iDT 5-9

- - - Maximum torque   —— Thermal continuous torque

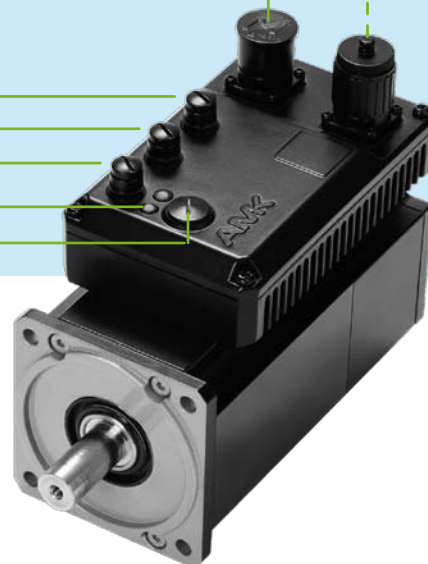## Connections

Power supply of 540-720 VDC
Electronics voltage supply 24 VDC   M23
STO/2 VDC holding brake   in   out
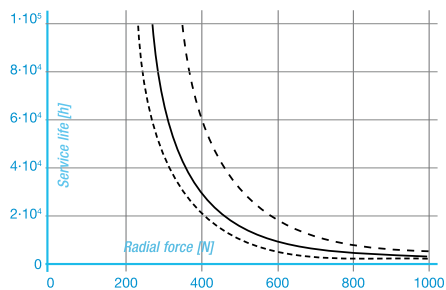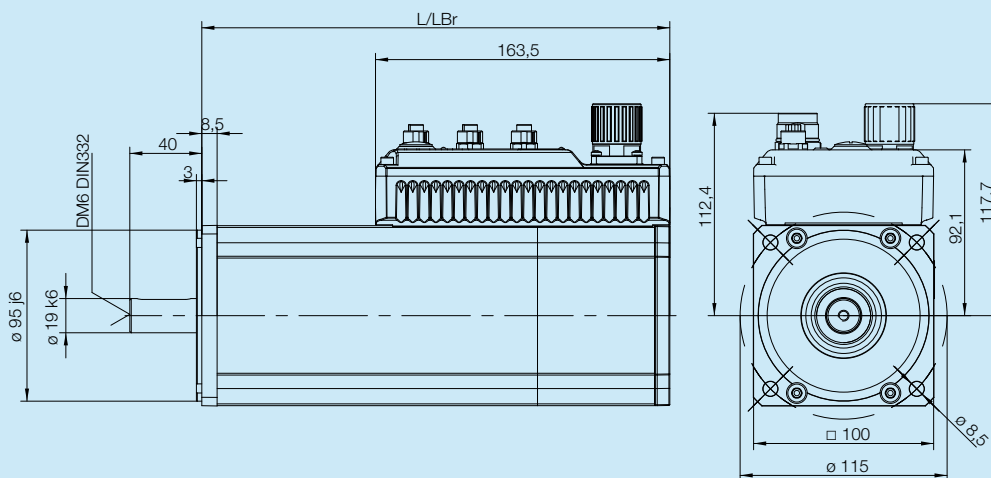
Multifunctional I/O   M12, 8 pin
RTE out (EtherCAT, Sercos III, VARAN)   M12, 4 pin
RTE in (EtherCAT, Sercos III, VARAN)   M12, 4 pin
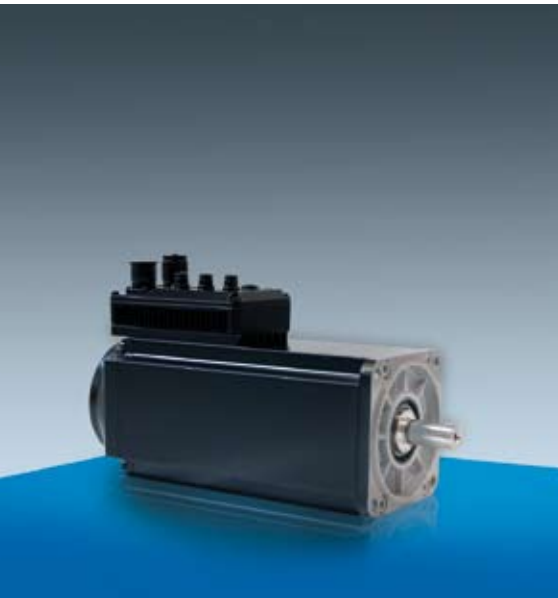
Status LEDs

Fieldbus address switch

Dimensions

L/LBr
163,5
8,5
40
3
DM6 DIN332
ø 95 j6
ø 19 k6
112,4
92,1
117,7
□ 100
ø 8,5
ø 115

Service life [h]
1·10⁵
8·10⁴
6·10⁴
4·10⁴
2·10⁴
0
Radial force [N]
0   200   400   600   800   1000

Bearing service life (L10h) characteristic curve

Bearing service life: _ _ _ _ 2 x n$_N$ _____ n$_N$ _ _ _ _ 0.5 x n$_N$

AMKASMART iDP7. Servo motor with integrated servo inverter.

The servo inverter of the iDP is installed directly on the servo motor. In addition to reducing costs by saving on control cabinet space and cabling, this design enables a very high power density.

Additional features

- DP motors with integrated servo controller
- Loopable M23 power connection
- Power supply up to 720 VDC, Shutdown threshold 850 VDC
- Optional holding brake

B E N E F I T S

- Simplification of engineering through use of function blocks
- Saves time and money when programming
- Faster development of your machine
- Proven motion control functions
- Simple maintenance of your application software
- Low training effort

Equipment	Standard	Option
Brake	–	4.5 Nm
Encoder	Single-turn: U capacitive Multi-turn: V capacitive	Single-turn: E optical, P inductive Multi-turn: F optical, Q inductive

**Connection cables:** Power connector M 23, Communication M 12

Technical data

| Motor type	M_{max} [Nm]	I_{max} [Arms]	M_O [Nm]	I_O [Arms]	M_N [Nm]	I_N [Arms]	n_N [1/min]	P_N [W]	J [kgcm^2]	m [kg]
iDP7-20-10-xxO	20	6.6	16	5.4	9.7	3.4	1500	1520	16	22
iDP7-27-10-xxF	39	16	23	8.5	20	6.3	1500	3100	16	23

Preliminary data

Explanation of characteristic values: M_{max} Maximum torque · I_{max} Maximum current · M_O Continuous stall torque · I_O Continuous stall current · M_N Continuous torque I_N Rated current · n_N Rated speed· P_N Rated power · J Inertia · m Mass
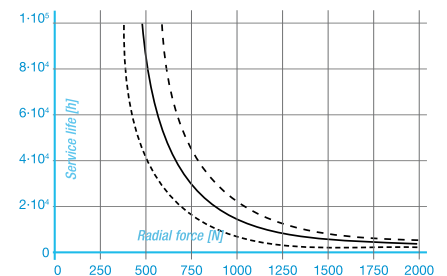
Characteristic curves
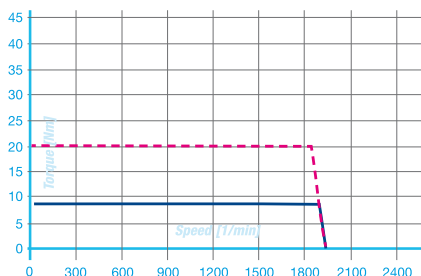
iDP 7-20
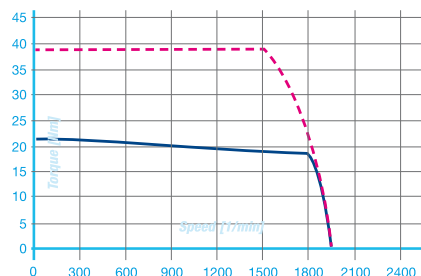
iDP 7-27

Bearing service life (L10h) characteristic curve

- - - Maximum torque ——— Thermal continuous torque

Bearing service life: - - - 2 x n_N ——— n_N - - - 0.5 x n_N

Connections

Power supply of 540-720 VDC
Electronics voltage supply 24 VDC   M 23
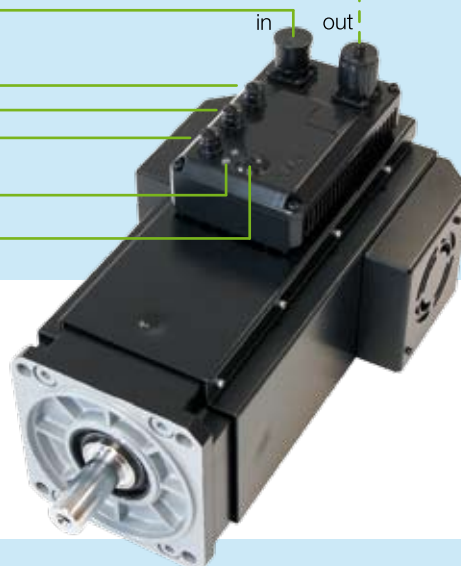STO/2 VDC holding brake

in   out

Multifunctional I/O   M 12, 8 pin
RTE out (EtherCAT, Sercos III, VARAN)   M 12, 4 pin
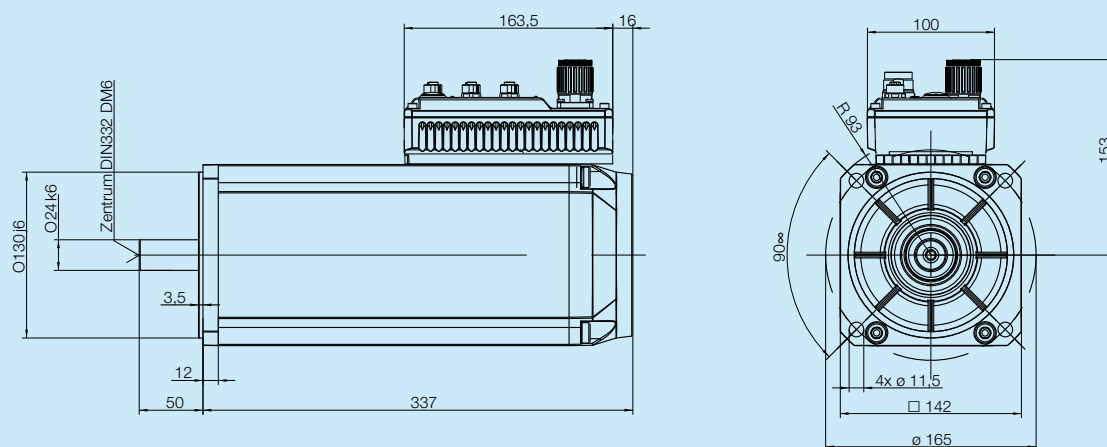RTE in (EtherCAT, Sercos III, VARAN)   M 12, 4 pin
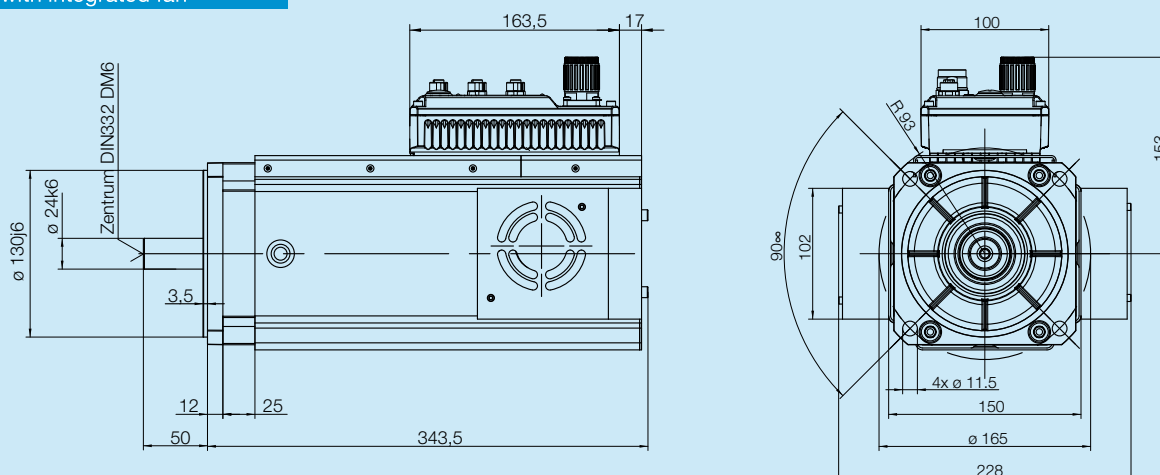
Status LEDs

Fieldbus address switch

Dimensions

iDP7-20 with convection cooling

163,5   16
Zentrum DIN332 DM6
ø 24 k6
ø 130 j6
3,5
12
50
337
100
R 93
90∞
153
4x ø 11,5
□ 142
ø 165

iDP7-27 with integrated fan

163,5   17
Zentrum DIN332 DM6
ø 24 k6
ø 130 j6
3,5
12   25
50
343,5
100
R 93
90∞
153
102
4x ø 11,5
150
ø 165
228

Interfaces and connections.

Power connector iX, iDT, iDP supply line (M23, 6-pin)

PIN	Signal	Meaning
1	UZP	Supply of DC bus +
3	UZN	Supply of DC bus -
A	24V	Supply voltage 24 VDC for electronics
B	0V	Supply voltage 0 VDC for electronics
C	24B	Supply voltage 24 VDC for STO motor holding brake
D	0B	Reference potential for 24 B
⏚	PE	Protective conductor on housing

Device-side front view, male
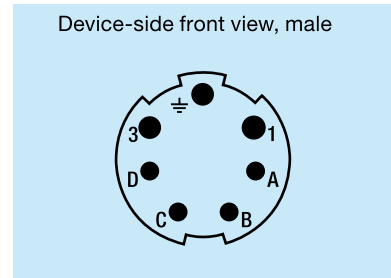
Power transmission iX, iDT, iDP (M23, 6-pin)

| PIN	Signal	Meaning
1	UZP	Supply of DC bus +
3	UZN	Supply of DC bus -
A	24V	Supply voltage 24 VDC for electronics
B	0V	Supply voltage 24 VDC for electronics
C	24B	Supply voltage 24 VDCfor STO/holding brake
D	0B	Supply voltage 0 VDCfor STO/holding brake
⏚	PE	Protective conductor on housing

Device-side front view, female
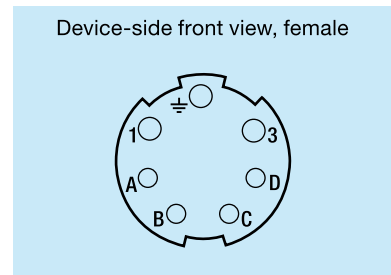
Real-time Ethernet connection iX, iC, iDT, iDP
Input and transmission (M12, 4-pin)

PIN	Signal	Meaning
1	TX+	Transmission Data +
2	RX+	Receive Data +
3	TX-	Transmission Data -
4	RX-	Receive Data -

Device-side front view, female
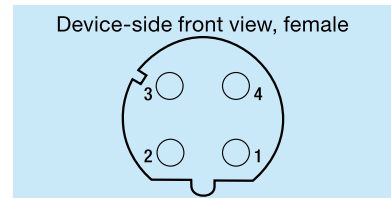
I/O pin assignment (M12, 8-pin)

PIN	Signal	Description	Level
1	GND	Reference ground	0V
2	BE1	Binary input 1	24 V/8 mA
	AE+	Analog input not inverted	±10 V/12 bit
3	BE2	Binary input 2	24 V/8 mA
	AE-	Analog input inverted	±10 V/12 bit
4	BE3	Binary input 3	24 V/8 mA
	BA1	Binary output 1	24 V/max. 100 mA
5	BE4	Binary input 4	24 V/8 mA
	BA2	Binary output 2	24 V/max. 100 mA
6	BE5	Binary input 5	24 V/8 mA
	BA3 [*]	Binary output 3	24 V/max. 250 mA
7	Data+		
8	Data-		
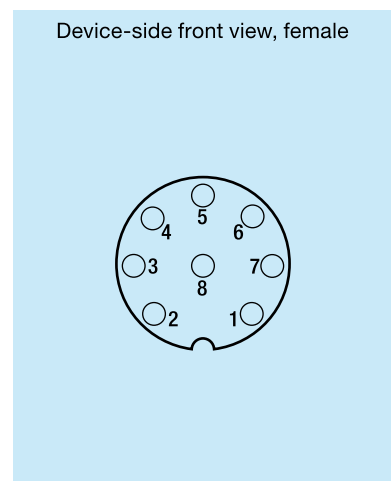
* BA3 as voltage supply, assignable

Device-side front view, female

Motor connection iC, iX (Twintus M16, 8-pin)

PIN	Signal
U	U (1)
V	V (2)
W	W (3)
PE	PE
1	KTY84+
2	KTY84-
+	Brake+
–	Brake–

Device-side front view, female
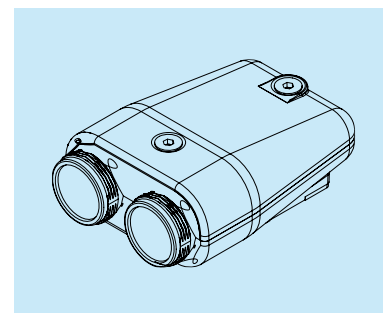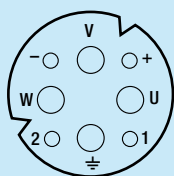
Motor connection iC, iX (CM 3)

PIN	Signal
1	KTY84-
2	KTY84+
3	Brake-
4	Brake+
1	U
2	V
3	W
4	PE

Device-side front view, female
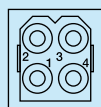
Device-side front view, male
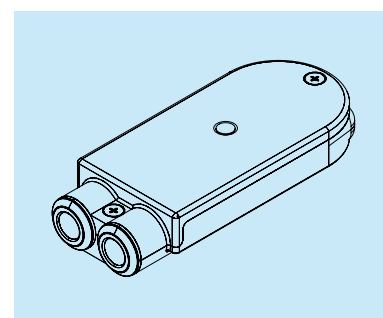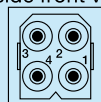
Encoder connection iC, iX (Twintus M12, 12-pin)

PIN	Signal
1	G2I(Sin-)
2	GND
3	G2N(Sin+)
4	G1N(Cos+)
5	Data-
6	G1I(Cos-)
7	GND
8	Data+
9	5V
10	8V
11	Clk+
12	Clk-

Device-side front view, male
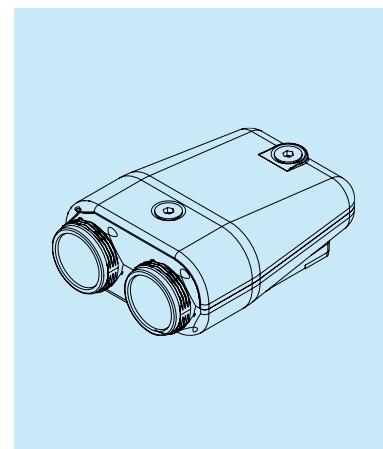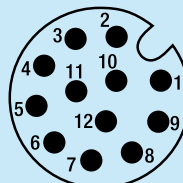
Encoder connection iC, iX (CM 3)

PIN	Signal
1	Data+
2	Data-
3	GND
4	5 VDC
5	Clk-
6	Clk+
1	GND
2	8 VDC
3	G2N (Sin+)
4	G2I (Sin-)
5	G1N (Cos-)
6	G1I (Cos+)

Device-side front view, female
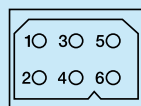
Device-side front view, female
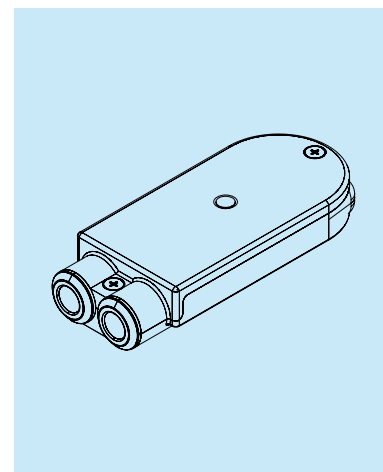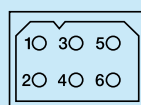
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