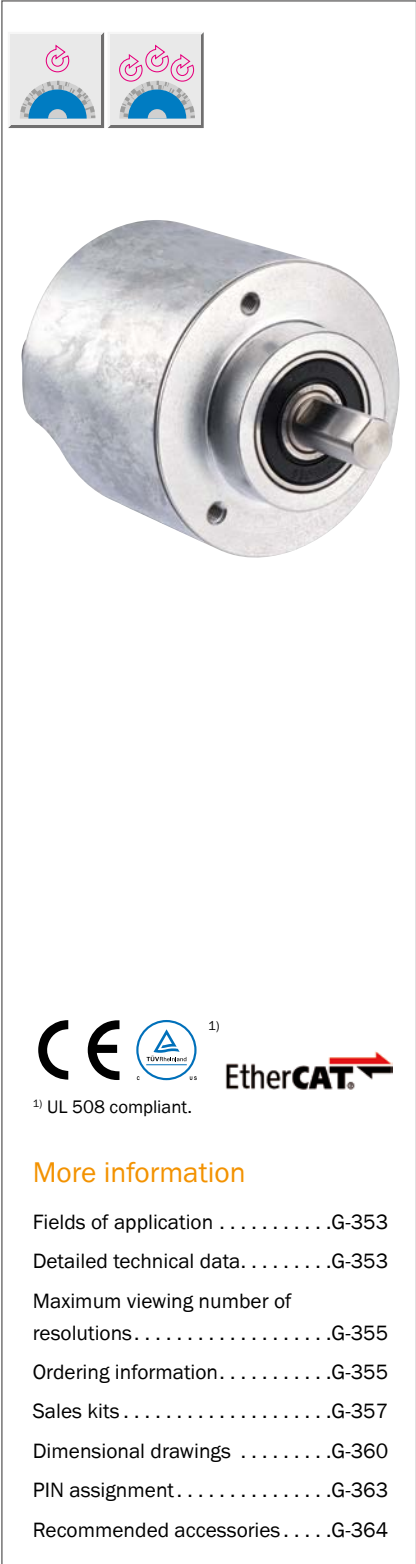


INTELLIGENT, POWERFUL, PRECISE



Product description

Intelligent diagnostic functions and rapid data transfer: High-resolution AFS/AFM60 EtherCAT® absolute encoders represent high-precision measurement of absolute position and speed in the area of industrial automation. Comprehensive functions for diagnosing parameters such as temperature or operating time and early error detection increase network reliability. Various configuration options, such as modification of resolu-

tion, rotational direction or unit of speed measurement simplify installation and enable customized adjustment to each application. Their compact design also makes AFS/AFM60 EtherCat® absolute encoders suitable for applications in confined spaces. Embedded switch technology ensures maximum system and equipment availability and thus contributes to increased productivity.

At a glance

- High-resolution 30-bit absolute encoder (18-bit singleturn and 12-bit multiturn)
- Face mount flange, servo flange and blind hollow shaft
- Connection type: 3 x M12 axial male connector
- On the fly data transmission rate in µs range
- EtherCAT® interface CoE (CiA DS-301) Device profile (CiA DS-406)
- Round axis functionality
- Alarms, warnings and diagnostics functions for speed, position, temperature, operating time, etc.
- Status display via 5 LEDs
- Up to 16 adjustable electronic cam switches

Your benefits

- Increased productivity as a result of intelligent diagnostics functions and rapid data transfer
- Increase in network reliability due to early error detection
- Simple installation with various configuration options
- Flexible, easy setup and high resolutions for various applications with binary, integer and “decimal point” values based on round axis functionality
- Maximum system availability through embedded switch technology
- Compact and cost-efficient design

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Fields of application

- Measurement of absolute position and speed in various machines and systems used in industrial automation as well as production and process technology, for example: warehouse systems, packaging machines, hydraulic presses, printing machines, robots, rotating tables

Detailed technical data

Performance

Max. number of steps per revolution, AFS60 and AFM60		262,144 (18 bit) (maximum viewing number of resolutions, page G-355)
Max. number of revolutions	AFM60	4,096 (12 bit)
	AFS60	1
Resolution	AFM60	18 x 12 bit
	AFS60	18 bit
Error limits		≤ 0.03°
Repeatability		≤ 0.002°
Measurement increment deviation		≤ 0.002°
Measuring increment (360 ° / number of steps per revolution)		0.001°
Cycle time		250 μs to 100 ms ¹⁾
Initialization time		Approx. 12 s

¹⁾ ≤ 500 μs to 250 μs in Fast Data Exchange mode.

Interfaces

Electrical interface	EtherCAT®
Bus interface	EtherCAT, CoE (CiA DS-301) ¹⁾
Encoder profile	CiA DS-406
Transfer rate	10/100 MBit/s
Transmission media	CAT 5e cable
Configuration data	Number of steps per revolution, number of revolutions, PRESET, counting direction, sampling rate for speed monitoring, unit for output of the speed value, round axis functionality (multiturn version only), electronic cams (2 channels x 8 cams), single or multi access mode, fast data exchange mode
Available diagnostic data	Current, minimum and maximum temperature, maximum speed, positioning monitoring, power-on counter, operating hours counter for power-on/motion, counter of direction changes/number of movements cw/number of movements ccw, minimum and maximum operating voltage, signal monitoring for single and multiturn

¹⁾ EtherCAT® is a registered trademark and patented technology licensed by Beckhoff Automation GmbH, Germany.

Electrical data

Operating voltage range	10 V DC ... 30 V DC
Max. power consumption without load	≤ 3 W
Reverse polarity protection	✓
MTTFd: mean time to dangerous failure	80 years (EN ISO 13849-1) ¹⁾

¹⁾ This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of devices, average ambient temperature 40 °C, frequency of use 8,760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

Mechanical data

Operating speed ¹⁾	Solid shaft	9,000 rpm (maximum viewing number of resolutions, page G-355)
	Blind hollow shaft	6,000 rpm (maximum viewing number of resolutions, page G-355)
Mass		0.2 kg
Permissible shaft load, solid shaft		80 N (radial); 40 N (axial)
Permissible shaft movement of the drive element, blind hollow shaft		± 0.3 / ± 0.05 mm (radial, static/dynamic) ± 0.5 / ± 0.1 mm (axial, static/dynamic)
Rotor moment of inertia	Solid shaft	≤ 6.2 gcm ²
	Blind hollow shaft	≤ 40 gcm ²
Bearing lifetime		3 x 10 ⁹ revolutions
Start up torque at 20 °C	Solid shaft	0.5 Ncm
	Blind hollow shaft	0.8 Ncm
Operating torque at 20 °C	Solid shaft	0.3 Ncm
	Blind hollow shaft	0.6 Ncm
Max. angular acceleration		5 x 10 ⁵ rad/s ²
Shaft diameter	Face mount flange, solid shaft	10 x 19 mm
	Servo flange, solid shaft	6 x 10 mm
	Blind hollow shaft, AFM60	8, 10, 12, 14, 15 mm, 1/4", 1/2", 3/8"
	Blind hollow shaft, AFS60	8, 10, 12, 14, 15 mm, 1/4", 1/2", 3/8", 5/8"
Shaft material		Stainless steel
Flange material	Solid shaft	Aluminum
	Blind hollow shaft, AFM60	Aluminum
	Blind hollow shaft, AFS60	Zinc die cast
Housing material		Aluminum

¹⁾ Take into account self-heating of 3.3 K per 1,000 revolutions/min when designing the operating temperature range.

Ambient data

EMC	According to EN 61000-6-2 and EN 61000-6-3 ¹⁾
Enclosure rating (as per IEC 60529)²⁾	IP 65, on the shaft side IP 67, on the housing side
Permissible relative humidity	90% (condensation of optical surfaces not permitted)
Operating temperature range	-40 °C ... +85 °C
Storage temperature range	-40 °C ... +100 °C, without packaging
Resistance to shocks (according to EN 60068-2-27)	100 g, 6 ms
Resistance to vibration (according to EN 60068-2-6)	30 g, 10 Hz ... 2,000 Hz

¹⁾ The EMC according to the standards quoted is achieved if shielded cables are used.

²⁾ When mating connector is inserted.

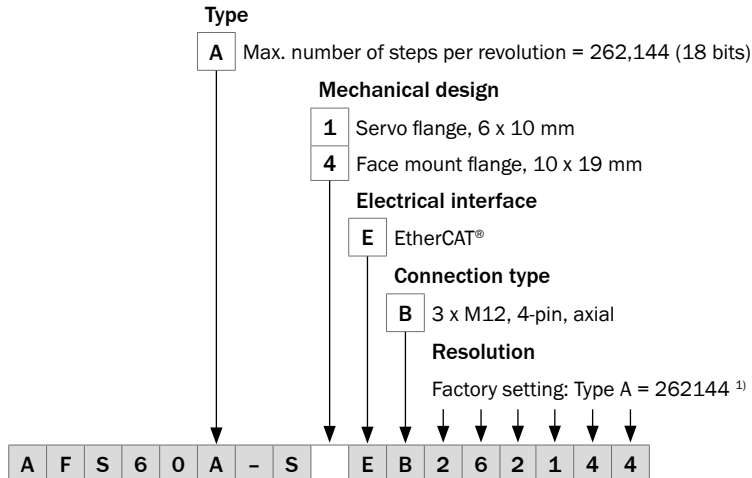


Maximum viewing number of resolutions

The maximum singleturn resolution (= 18 bit) can be operated with the maximum operating speed (blind hollow shaft 6,000 rpm and solid shaft 9,000 rpm).

Ordering information

Type code AFS absolute encoder, singleturn, solid shaft

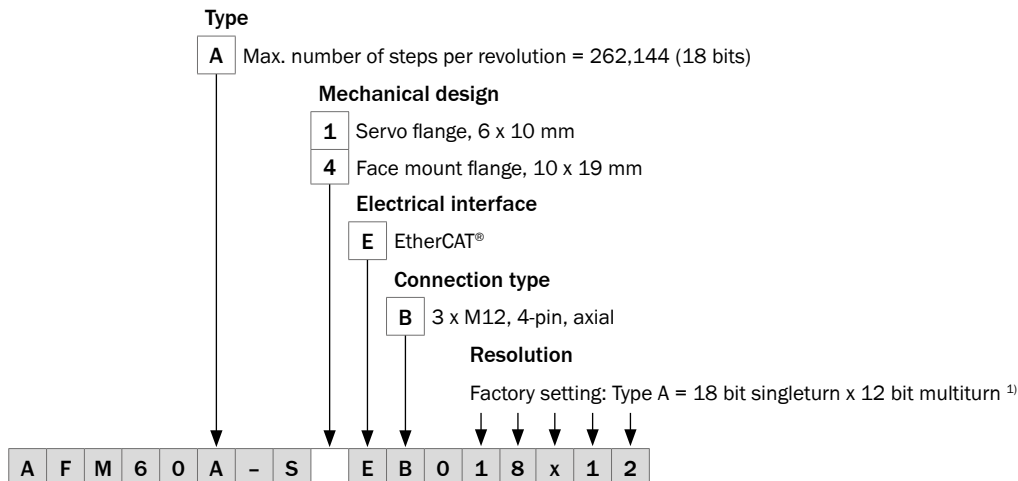


¹⁾ Number of steps programmable via control unit: Type A = 2 to 262144.

Example orders

Mechanical design	Type	Part no.
Solid shaft, servo flange, Ø 6 mm, length 10 mm	AFS60A-S1EB262144	1059072
Solid shaft, face mount flange, Ø 10 mm, length 19 mm	AFS60A-S4EB262144	1059071

Type code AFM, multiturn absolute encoder, solid shaft



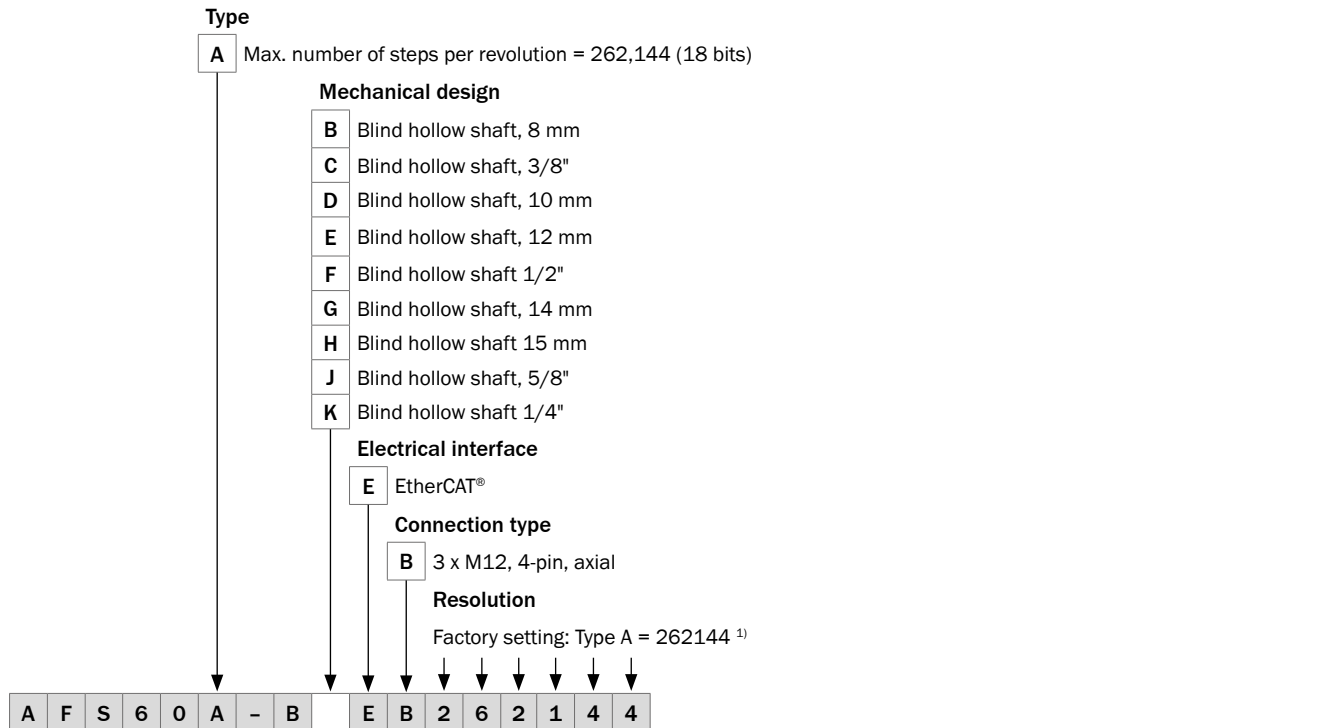
¹⁾ Programmable options for resolution via control unit.

Example orders

Mechanical design	Type	Part no.
Solid shaft, servo flange, Ø 6 mm, length 10 mm	AFM60A-S1EB018x12	1059061
Solid shaft, face mount flange, Ø 10 mm, length 19 mm	AFM60A-S4EB018x12	1059060



Type code AFS singleturn absolute encoder, solid shaft



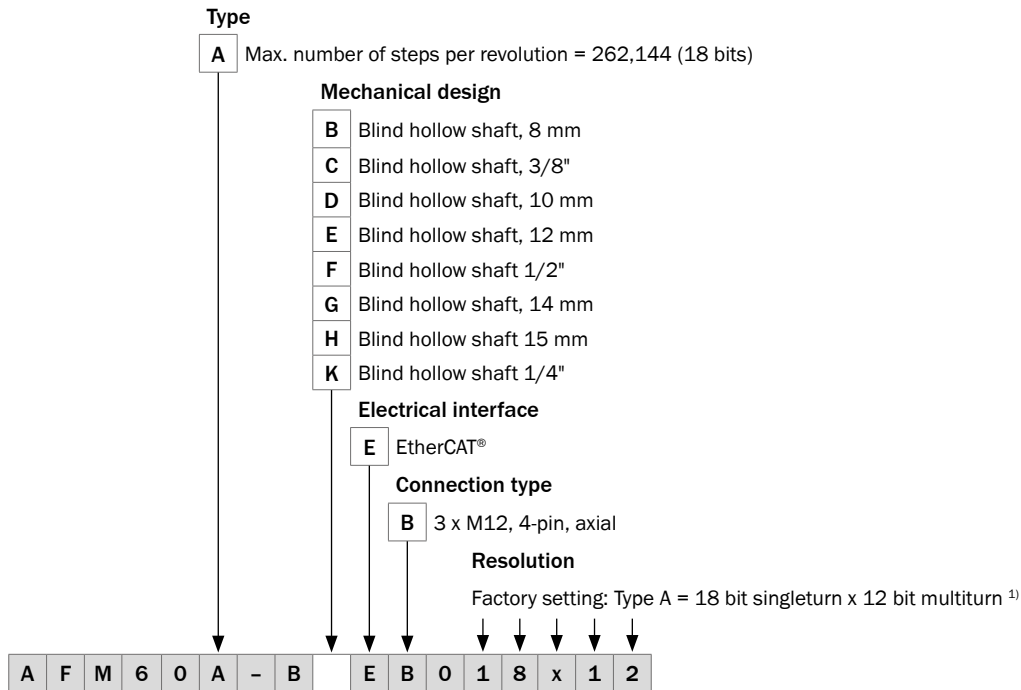
¹⁾ Number of steps programmable via control unit: Type A = 2 to 262144.

Example orders

Mechanical design	Type	Part no.
Blind hollow shaft, Ø 8 mm	AFS60A-BBEB262144	1059070
Blind hollow shaft, Ø 3/8"	AFS60A-BCEB262144	1059069
Blind hollow shaft, Ø 10 mm	AFS60A-BDEB262144	1059068
Blind hollow shaft, Ø 12 mm	AFS60A-BEEB262144	1059067
Blind hollow shaft Ø 1/2"	AFS60A-BFEB262144	1059066
Blind hollow shaft, Ø 14 mm	AFS60A-BGEB262144	1059065
Blind hollow shaft, Ø 15 mm	AFS60A-BHEB262144	1059064
Blind hollow shaft, Ø 5/8"	AFS60A-BJEB262144	1059063
Blind hollow shaft Ø 1/4"	AFS60A-BKEB262144	1059062

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Type code AFM, multiturn absolute encoder, blind hollow shaft



¹⁾ Programmable options for resolution via control unit.

Example orders

Mechanical design	Type	Part no.
Blind hollow shaft, Ø 8 mm	AFM60A-BBEB018x12	1059059
Blind hollow shaft, Ø 3/8"	AFM60A-BCEB018x12	1059058
Blind hollow shaft, Ø 10 mm	AFM60A-BDEB018x12	1059057
Blind hollow shaft, Ø 12 mm	AFM60A-BEEB018x12	1059056
Blind hollow shaft Ø 1/2"	AFM60A-BFEB018x12	1059055
Blind hollow shaft, Ø 14 mm	AFM60A-BGEB018x12	1059054
Blind hollow shaft, Ø 15 mm	AFM60A-BHEB018x12	1059053
Blind hollow shaft Ø 1/4"	AFM60A-BKEB018x12	1059052





Sales kits

Sales kit 01

EtherCAT® encoder

- + Female connector, supply voltage, angled (DOS-1204-W, part number. 6007303)
- + Male cable connector, EtherCAT® signal, angled, (STE-1204-WZ, part number 6048262)


	Encoder type (singleturn)	Description	Type	Part no.
	AFS60A-S1EB262144	Solid shaft, servo flange, 6 x 10 mm	AFS60A-S1EB sales kit 01	1060469
	AFS60A-S4EB262144	Solid shaft, face mount flange, 10 x 19 mm	AFS60A-S4EB sales kit 01	1060470
	AFS60A-BDEB262144	Blind hollow shaft, Ø 10 mm	AFS60A-BDEB sales kit 01	1060471
	AFS60A-BEEB262144	Blind hollow shaft, Ø 12 mm	AFS60A-BEEB sales kit 01	1060472
	AFS60A-BHEB262144	Blind hollow shaft, Ø 15 mm	AFS60A-BHEB sales kit 01	1060473


	Encoder type (multiturn)	Description	Type	Part no.
	AFM60A-S1EB018x12	Solid shaft, servo flange, 6 x 10 mm	AFM60A-S1EB sales kit 01	1060474
	AFM60A-S4EB018x12	Solid shaft, face mount flange, 10 x 19 mm	AFM60A-S4EB sales kit 01	1060475
	AFM60A-BDEB018x12	Blind hollow shaft, Ø 10 mm	AFM60A-BDEB sales kit 01	1060476
	AFM60A-BEEB018x12	Blind hollow shaft, Ø 12 mm	AFM60A-BEEB sales kit 01	1060477
	AFM60A-BHEB018x12	Blind hollow shaft, Ø 15 mm	AFM60A-BHEB sales kit 01	1060478

Sales kit 02

EtherCAT® encoder

- + Female cable connector, supply voltage, angled, pre-wired with 5 m cable (DOL-1204-W05MC, part number 6025904)
- + Female cable connector, EtherCAT® signal, angled, pre-wired with 5 m cable (STL-1204-W05MZ90, part number 6048257)


	Encoder type (singleturn)	Description	Type	Part no.
	AFS60A-S1EB262144	Solid shaft, servo flange, 6 x 10 mm	AFS60A-S1EB sales kit 02	1060479
	AFS60A-S4EB262144	Solid shaft, face mount flange, 10 x 19 mm	AFS60A-S4EB sales kit 02	1060480
	AFS60A-BDEB262144	Blind hollow shaft, Ø 10 mm	AFS60A-BDEB sales kit 02	1060481
	AFS60A-BEEB262144	Blind hollow shaft, Ø 12 mm	AFS60A-BEEB sales kit 02	1060482
	AFS60A-BHEB262144	Blind hollow shaft, Ø 15 mm	AFS60A-BHEB sales kit 02	1060483


	Encoder type (multiturn)	Description	Type	Part no.
	AFM60A-S1EB018x12	Solid shaft, servo flange, 6 x 10 mm	AFM60A-S1EB sales kit 02	1060484
	AFM60A-S4EB018x12	Solid shaft, face mount flange, 10 x 19 mm	AFM60A-S4EB sales kit 02	1060485
	AFM60A-BDEB018x12	Blind hollow shaft, Ø 10 mm	AFM60A-BDEB sales kit 02	1060486
	AFM60A-BEEB018x12	Blind hollow shaft, Ø 12 mm	AFM60A-BEEB sales kit 02	1060487
	AFM60A-BHEB018x12	Blind hollow shaft, Ø 15 mm	AFM60A-BHEB sales kit 02	1060488

Sales kit 03

EtherCAT® encoder

- + Female connector, supply voltage, angled (DOS-1204-W, part number. 6007303)
- + 2 male cable connectors, EtherCAT® signal, angled, (STE-1204-WZ, part number 6048262)


	Encoder type (singleturn)	Description	Type	Part no.
	AFS60A-S1EB262144	Solid shaft, servo flange, 6 x 10 mm	AFS60A-S1EB sales kit 03	1060489
	AFS60A-S4EB262144	Solid shaft, face mount flange, 10 x 19 mm	AFS60A-S4EB sales kit 03	1060490
	AFS60A-BDEB262144	Blind hollow shaft, Ø 10 mm	AFS60A-BDEB sales kit 03	1060491
	AFS60A-BEEB262144	Blind hollow shaft, Ø 12 mm	AFS60A-BEEB sales kit 03	1060492
	AFS60A-BHEB262144	Blind hollow shaft, Ø 15 mm	AFS60A-BHEB sales kit 03	1060493


	Encoder type (multiturn)	Description	Type	Part no.
	AFM60A-S1EB018x12	Solid shaft, servo flange, 6 x 10 mm	AFM60A-S1EB sales kit 03	1060495
	AFM60A-S4EB018x12	Solid shaft, face mount flange, 10 x 19 mm	AFM60A-S4EB sales kit 03	1060496
	AFM60A-BDEB018x12	Blind hollow shaft, Ø 10 mm	AFM60A-BDEB sales kit 03	1060497
	AFM60A-BEEB018x12	Blind hollow shaft, Ø 12 mm	AFM60A-BEEB sales kit 03	1060498
	AFM60A-BHEB018x12	Blind hollow shaft, Ø 15 mm	AFM60A-BHEB sales kit 03	1060499

Sales kit 04

EtherCAT® encoder

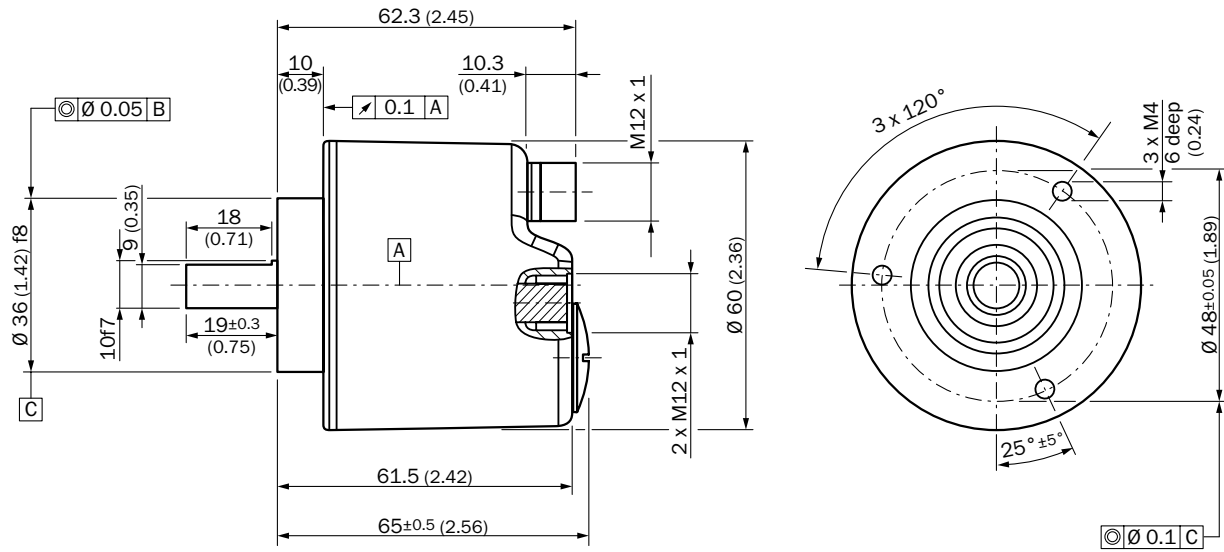
- + Female cable connector, supply voltage, angled, pre-wired with 5 m cable (DOL-1204-W05MC, part number 6025904)
- + 2 female cable connectors, EtherCAT® signal, angled, pre-wired with 5 m cable (STL-1204-W05MZ90, part number 6048257)

	Encoder type (singleturn)	Description	Type	Part no.
	AFS60A-S1EB262144	Solid shaft, servo flange, 6 x 10 mm	AFS60A-S1EB sales kit 04	1060500
	AFS60A-S4EB262144	Solid shaft, face mount flange, 10 x 19 mm	AFS60A-S4EB sales kit 04	1060501
	AFS60A-BDEB262144	Blind hollow shaft, Ø 10 mm	AFS60A-BDEB sales kit 04	1060502
	AFS60A-BEEB262144	Blind hollow shaft, Ø 12 mm	AFS60A-BEEB sales kit 04	1060503
	AFS60A-BHEB262144	Blind hollow shaft, Ø 15 mm	AFS60A-BHEB sales kit 04	1060504

	Encoder type (multiturn)	Description	Type	Part no.
	AFM60A-S1EB018x12	Solid shaft, servo flange, 6 x 10 mm	AFM60A-S1EB sales kit 04	1060505
	AFM60A-S4EB018x12	Solid shaft, face mount flange, 10 x 19 mm	AFM60A-S4EB sales kit 04	1060506
	AFM60A-BDEB018x12	Blind hollow shaft, Ø 10 mm	AFM60A-BDEB sales kit 04	1060507
	AFM60A-BEEB018x12	Blind hollow shaft, Ø 12 mm	AFM60A-BEEB sales kit 04	1060508
	AFM60A-BHEB018x12	Blind hollow shaft, Ø 15 mm	AFM60A-BHEB sales kit 04	1060509

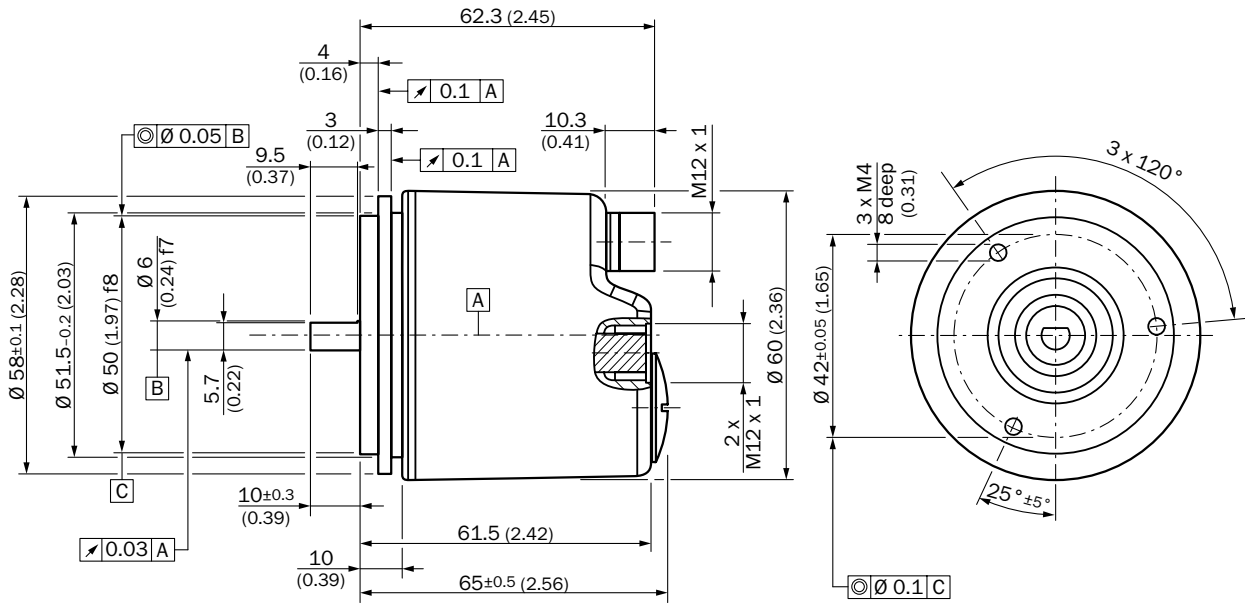
Dimensional drawings (dimensions in mm)

Face mount flange



General tolerances according to DIN ISO 2768-mk

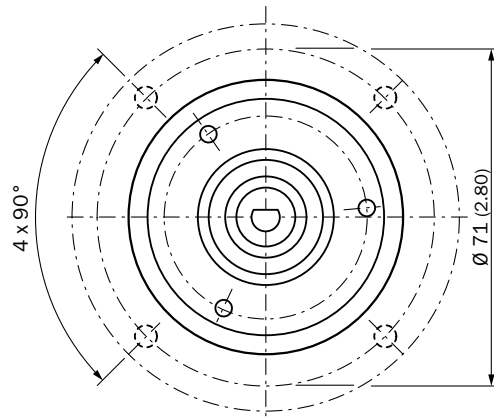
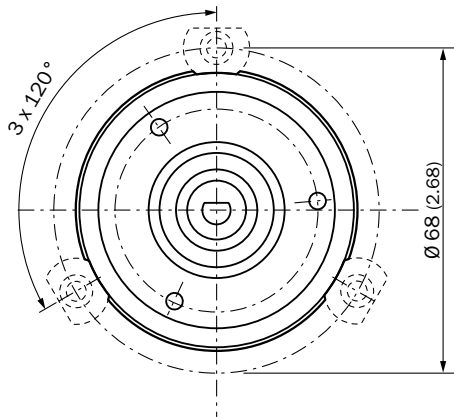
Servo flange



General tolerances according to DIN ISO 2768-mk

Mounting suggestion for small servo clamp
(part number 2029166)

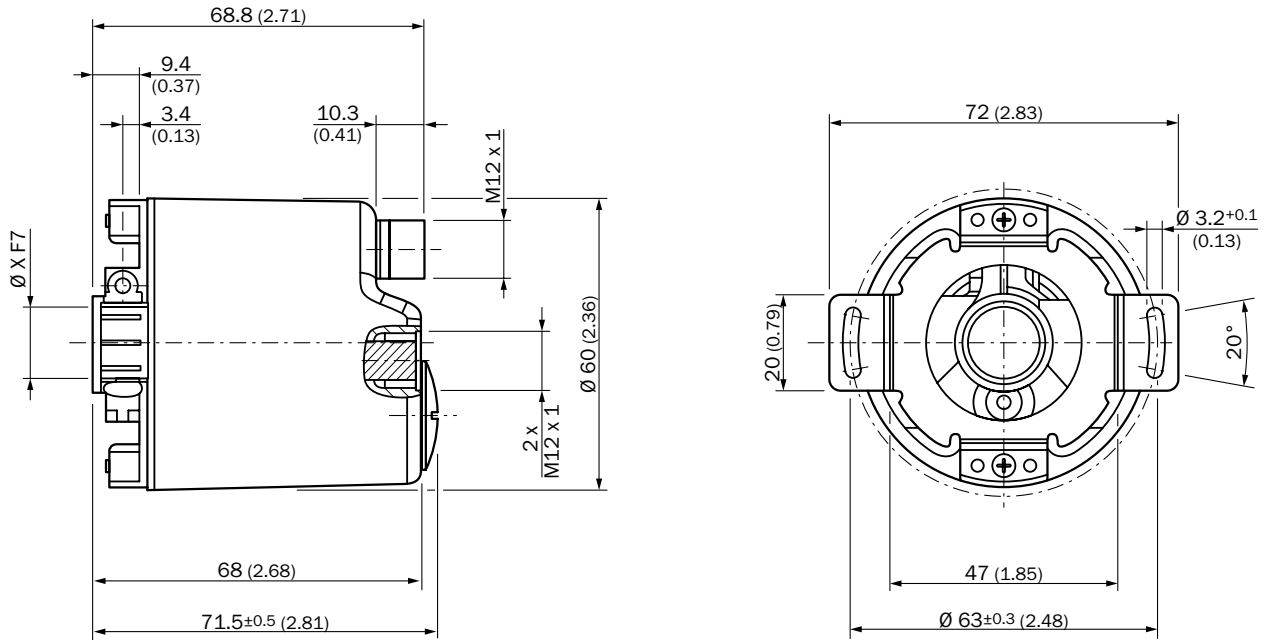
Mounting suggestion for half-shell servo clamp
(part number 2029165)



General tolerances according to DIN ISO 2768-mk

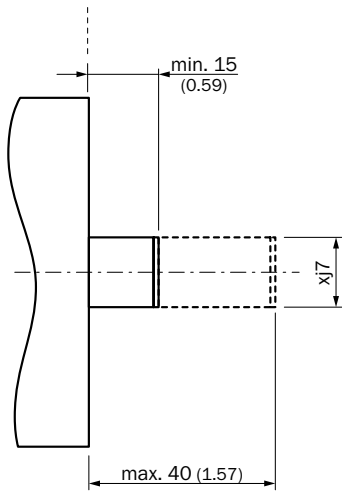


Blind hollow shaft



General tolerances according to DIN ISO 2768-mk

Mounting suggestion



General tolerances according to DIN ISO 2768-mk

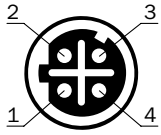
xj7 = Shaft diameter, on the customer side

Diameter X F7	
AFS60 singleturn absolute encoder	AFM60 multiturn absolute encoder
Blind hollow shaft 1/4"	Blind hollow shaft 1/4"
Blind hollow shaft, 8 mm	Blind hollow shaft, 8 mm
Blind hollow shaft, 3/8"	Blind hollow shaft, 3/8"
Blind hollow shaft, 10 mm	Blind hollow shaft, 10 mm
Blind hollow shaft, 12 mm	Blind hollow shaft, 12 mm
Blind hollow shaft 1/2"	Blind hollow shaft 1/2"
Blind hollow shaft, 14 mm	Blind hollow shaft, 14 mm
Blind hollow shaft 15 mm	Blind hollow shaft 15 mm
Blind hollow shaft, 5/8"	

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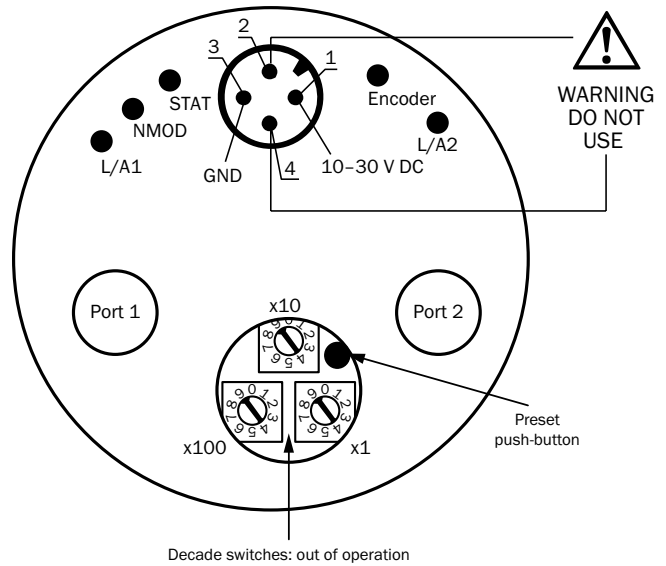
PIN assignment

M12 - 4-pin (D-coded)

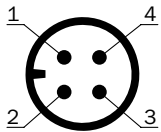


Port 1				
Signal	T x D+	R x D+	T x D-	R x D-
Pin	1	2	3	4
Wire colors	Yellow	White	Orange	Blue

Port 2				
Signal	T x D+	R x D+	T x D-	R x D-
Pin	1	2	3	4
Wire colors	Yellow	White	Orange	Blue



M12 - 4-pin (A-coded)



Supply voltage				
Signal	U _s 10 ... 30 V	Not assigned	GND	Not assigned
Pin	1	2	3	4
Wire colors	Brown	White	Blue	Black

Recommended accessories

Mounting systems

Mounting brackets and plates










Mounting bracket

Figure	Brief description	Type	Part no.
	Mounting bracket for encoder with centering hub 36 mm, including mounting kit for face mount flange	BEF-WF-36	2029164

Dimensional drawings → [page K-725](#)

Flanges

Flange plate





Figure	Brief description	Type	Part no.
	Standard stator coupling	BEF-DS00XFX	2056812
	Stator coupling, one-sided, 81 mm long with slot	BEF-DS01DFS/VFS	2047428
	Stator coupling, one-sided, 179 mm long with slot	BEF-DS02DFS/VFS	2047430
	Stator coupling, one-sided, 248 mm long with slots	BEF-DS03DFS/VFS	2047431
	Stator coupling, 16.5 mm high	BEF-DS05XFX	2057423
	Stator coupling with hole circle diameter 63 mm	BEF-DS07XFX	2059368
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 50 mm servo flange, aluminum, including 3 flat head screws M4 x 10	BEF-FA-036-050	2029160
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 60 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10	BEF-FA-036-060REC	2029162
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 58 mm square mounting plate with shock absorbers, aluminum	BEF-FA-036-060RSA	2029163
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 63 mm square mounting plate, aluminum, including 3 flat head screws M4 x 10	BEF-FA-036-063REC	2034225
	Flange adapter, adaptation of face mount flange with 36 mm centering hub to 100 mm servo flange with 60 mm centering hub, aluminum	BEF-FA-036-100	2029161

Dimensional drawings → [page K-725](#)

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Other mounting accessories

Measuring wheels and measuring wheel systems

Figure	Brief description	Type	Part no.
	Measuring wheel with smooth plastic surface (Hytrel) for 10 mm solid shaft, circumference 200 mm	BEF-MR-010020	5312988
	Measuring wheel with ridged plastic surface (Hytrel) for 10 mm solid shaft, circumference 200 mm	BEF-MR-010020G	5318678
	Measuring wheel with smooth plastic surface (Hytrel) for 10 mm solid shaft, circumference 500 mm	BEF-MR-010050	5312989
	Measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 200 mm	BEF-MR006020R	2055222
	Measuring wheel with O-ring (NBR70) for 6 mm solid shaft, circumference 300 mm	BEF-MR006030R	2055634
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm	BEF-MR010020R	2055224
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm	BEF-MR010050R	2055227
	O-ring for measuring wheels (circumference 200 mm)	BEF-OR-053-040	2064061
	O-ring for measuring wheels (circumference 300 mm)	BEF-OR-083-050	2064076


Dimensional drawings → [page K-725](#)

Modular measuring wheel system

Brief description	Type	Part no.
Measuring wheel system, desired mounting position: left, for DBS60-S4, DFS60-S4, AFS60-S4, and AFM60-S4	BEF-MRS-10-1	2071958
Measuring wheel system, desired mounting position: right, for DBS60-S4, DFS60-S4, AFS60-S4, and AFM60-S4	BEF-MRS-10-2	2071957



Dimensional drawings → [page K-725](#)

Mounting bell

Figure	Brief description	Type	Part no.
	Mounting bell for encoders with a servo flange, centering hub 50 mm, including mounting kit	BEF-MG-50	5312987




Dimensional drawings → [page K-725](#)

Servo clamps

Figure	Brief description	Type	Part no.
	Half-shell servo clamps (2 pcs.) for servo flanges with a 50 mm centering hub	BEF-WG-SF050	2029165
	Servo clamps, large, for servo flanges (clamps, eccentric fastener), 3 pcs., without mounting material	BEF-WK-SF	2029166

Dimensional drawings → [page K-725](#)

Miscellaneous

Figure	Brief description	Type	Part no.
	Mounting kit for servo flange encoder on the bearing block, 1 bar coupling SKPS 1520 06/06 1 hexagon socket wrench SW1.5 DIN 911, 3 mounting eccentric BEMN 1242 49 3 screws M4 x 10 DIN 912, 1 hexagon socket wrench SW3 DIN 911	BEF-MK-LB	5320872
	Bearing block for hollow shaft encoder, including fixing screws	BEF-FA-B12-010	2042728
	Bearing block for servo and face mount flange encoder	BEF-FA-LB1210	2044591


Dimensional drawings → [page K-725](#)

Shaft adaptation

Shaft couplings

Figure	Brief description	Type	Part no.
	Bellows coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. speed 10,000 rpm, $-30^\circ\text{C} \dots +120^\circ\text{C}$, max. torque 80 Ncm; material: stainless steel bellows, aluminum hub	KUP-0606-B	5312981
	Bellows coupling, shaft diameter 6 mm / 10 mm, maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. speed 10,000 rpm, $-30^\circ\text{C} \dots +120^\circ\text{C}$, max. torque 80 Ncm; material: stainless steel bellows, aluminum hub	KUP-0610-B	5312982
	Bellows coupling, shaft diameter 10 mm/10 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. revolutions 10,000 rpm, $-30^\circ\text{C} \dots +120^\circ\text{C}$, max. torque 80 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1010-B	5312983
	Bellows coupling, shaft diameter 10 mm/12 mm; maximum shaft offset: radial ± 0.25 mm, axial ± 0.4 mm, angular $\pm 4^\circ$; max. revolutions 10,000 rpm, $-30^\circ\text{C} \dots +120^\circ\text{C}$, max. torque 80 Ncm; material: stainless steel bellows, aluminum clamping hubs	KUP-1012-B	5312984
	Bar coupling, shaft diameter 6 mm / 6 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angle $\pm 3^\circ$; max. speed 10,000 rpm, $-10^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 80 Ncm; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0606-S	2056406
	Bar coupling, shaft diameter 6 mm / 8 mm, maximum shaft offset radial ± 0.3 mm, axial ± 0.2 mm, angle $\pm 3^\circ$; max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0608-S	5314179
	Bar coupling, shaft diameter 6 mm/10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular $\pm 3^\circ$; max. speed 10,000 rpm, $-10^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 80 Ncm; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0610-S	2056407
	Bar coupling, shaft diameter 8 mm / 10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.2 mm, angular $\pm 3^\circ$; torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-0810-S	5314178
	Bar coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset radial ± 0.3 mm, axial ± 0.2 mm, angle $\pm 3^\circ$; max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-1010-S	2056408
	Bar coupling, shaft diameter 10 mm / 12 mm, maximum shaft offset radial ± 0.3 mm, axial ± 0.2 mm, angle $\pm 3^\circ$; max. speed 10,000 rpm, torsion spring rigidity 38 Nm/wheel; material: fiber-glass reinforced polyamide, aluminum hub	KUP-1012-S	2056409
	Double-loop coupling, shaft diameter 6 mm/10 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, $-30^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-0610-D	5326697
	Double-loop coupling, shaft diameter 8 mm/10 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, $-30^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-0810-D	5326704
	Double-loop coupling, shaft diameter 10 mm/10 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, $-30^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1010-D	5326703
	Double-loop coupling, shaft diameter 10 mm/12 mm, maximum shaft offset: radial ± 2.5 mm, axial ± 3 mm, angular $\pm 10^\circ$; max. speed 3,000 rpm, $-30^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 1.5 Nm; material: polyurethane, galvanized steel flange	KUP-1012-D	5326702

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Figure	Brief description	Type	Part no.
	Spring washer coupling, shaft diameter 6 mm/10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.4 mm, angular $\pm 2.5^\circ$; max. speed 12,000 rpm, $-10^\circ\text{C} \dots +80^\circ\text{C}$, max. torque 60 Ncm; material: aluminum flange, fiber-glass reinforced polyamide membrane and tempered steel coupling pin	KUP-0610-F	5312985
	Spring washer coupling, shaft diameter 10 mm / 10 mm, maximum shaft offset: radial ± 0.3 mm, axial ± 0.4 mm, angular $\pm 2.5^\circ$; max. speed 12,000 rpm, $-10^\circ \dots +80^\circ\text{C}$, max. torque 60 Ncm; material: aluminum flange, glass fiber-reinforced polyamide membrane and hardened steel coupling pin	KUP-1010-F	5312986

Dimensional drawings → [page K-725](#)

Connectivity

Power supply

		Power supply (A-coded)
Mechanical parameters	Number of pins	4
	Cable diameter	4.7 mm
	Minimum bend radius, secured in place	47 mm
	Minimum bend radius, movable	47 mm
	Maximum length of cable between participants	100 m
Material	Outer sheath	PUR
	Conductor	Bare copper strand
	Color of outer sheath	Black RAL 9005
Cable parameters	AWG	22
	Wire cross-section	0.34 mm ²
	Wire colors	Brown, white, blue, black
	Conductor resistance	≤ 58 Ω/km
Temperature range	Fixed in place	-50 °C ... +80 °C
	Moving	-25 °C ... +80 °C
Specific features	Flame resistance	UL horizontal flame test/CSA FT2
	Halogen-free state	PUR halogen-free
	Microbe resistance	Excellent
	Hydrolysis resistance	Excellent

Plug connectors and cables

Connecting cables with female connector




Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 4-pin, straight Head B: cable Cable: for power supply, suitable for drag chain, PUR, halogen-free, unshielded, 4 x 0.34 mm ² , Ø 4.7 mm	2 m	DOL-1204-G02MC	6025900
		5 m	DOL-1204-G05MC	6025901
		10 m	DOL-1204-G10MC	6025902
		25 m	DOL-1204-G25MC	6034751
	Head A: female connector, M12, 4-pin, angled Head B: cable Cable: for power supply, suitable for drag chain, PUR, halogen-free, unshielded, 4 x 0.34 mm ² , Ø 4.7 mm	2 m	DOL-1204-W02MC	6025903
		5 m	DOL-1204-W05MC	6025904
		10 m	DOL-1204-W10MC	6025905
		25 m	DOL-1204-W25MC	6034754

Dimensional drawings → [page K-725](#)




		Data cable
Mechanical parameters		
Number of pins		4
Coding type		D-coded
Cable diameter		6.50 mm
Minimum bend radius, secured in place		19.5 mm
Minimum bend radius, movable		45.5 mm
Maximum length of cable between participants		100 m
Material		
Cable material		PVC
Conductor		Tin-plated copper strand
Cable color		Green RAL 6018
Electrical parameters		
Transmission properties (category)		CAT5 (IEC 11801:2002), CAT5e (TIA 568B:2001)
Cable parameters		
Signal type		EtherCAT®
Cable structure		1x4xAWG22/7; SF/Q
Wire colors		White, yellow, blue, orange
Wire cross-section		0.34 mm ²
Conductor resistance		≤ 120 Ω/km
Shielding		Braided tin-plated copper wires
Temperature range		
Male connector, pre-wired with cable		
Fixed in place		-25 °C ... +60 °C
Moving		-5 °C ... +50 °C
M12 connector		
Ambient temperature (operation)		-40 °C ... +85 °C
RJ45 connector		
Ambient temperature (operation)		-10 °C ... +60 °C
Specific features		
Flame resistance		According to IEC 60332-1

Connecting cables with male connector

Figure	Brief description		Type	Part no.
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: cable Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	STL-1204-G02MZ90	6048247
		5 m	STL-1204-G05MZ90	6048248
		10 m	STL-1204-G10MZ90	6048249
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: cable Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	STL-1204-W02MZ90	6048256
		5 m	STL-1204-W05MZ90	6048257
		10 m	STL-1204-W10MZ90	6048258
		25 m	STL-1204-W25MZ90	6048259

Dimensional drawings → [page K-725](#)

Female connectors (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: female connector, M12, 4-pin, straight, D-coded, shielded, for cable diameter 4 mm ... 8 mm	DOS-1204-GZ	6048263
	Head A: female connector, M12, 4-pin, angled, unshielded, for power supply, for cable diameter 3 mm ... 6.5 mm Head B: -	DOS-1204-W	6007303
	Head A: female connector, M12, 4-pin, angled, D-coded, shielded, for cable diameter 4 mm ... 8 mm	DOS-1204-WZ	6048264




Dimensional drawings → [page K-725](#)

Other plug connectors and cables

Figure	Brief description	Type	Part no.
	Head A: female connector, M12, 4-pin, D-coded Head B: female connector, RJ45, 8-pin Cable: Ethernet, EtherCAT, shielded Switch cabinet feedthrough	Feedthrough female connector Ethernet RJ45	6048180

Dimensional drawings → [page K-725](#)






Male connectors (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: male connector, RJ45, 4-pin, straight, shielded, for cable diameter 4.5 mm ... 8 mm	STE-0J04-GZ	6048260
	Head A: male connector, M12, 4-pin, straight, D-coded, shielded, for cable diameter 4 mm ... 8 mm	STE-1204-GZ	6048261
	Head A: male connector, M12, 4-pin, angled, D-coded, shielded, for cable diameter 4 mm ... 8 mm Head B: -	STE-1204-WE	6048262

Dimensional drawings → [page K-725](#)



Connection cables with male and male connector

Figure	Brief description		Type	Part no.
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: male connector, M12, 4-pin, straight Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	SSL-1204-F02MZ90	6048250
		5 m	SSL-1204-F05MZ90	6048251
		10 m	SSL-1204-F10MZ90	6048252
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, M12, 4-pin, straight Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	SSL-1204-G02MZ90	6048241
		5 m	SSL-1204-G05MZ90	6048242
		10 m	SSL-1204-G10MZ90	6048243
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: male connector, M12, 4-pin, angled, D-coded Cable: PROFINET, EtherCAT, PUR, halogen-free, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	SSL-1204-W02MZ	6050635
		5 m	SSL-1204-W05MZ	6050636
		10 m	SSL-1204-W10MZ	6050637
	Head A: male connector, RJ45, 4-pin, straight, D-coded Head B: male connector, M12, 4-pin, angled Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	SSL-2J04-F02MZ	6048253
		5 m	SSL-2J04-F05MZ	6048254
		10 m	SSL-2J04-F10MZ	6048255
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, RJ45, 4-pin, straight Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm ² , Ø 6.5 mm	2 m	SSL-2J04-G02MZ60	6048244
		5 m	SSL-2J04-G05MZ60	6048245
		10 m	SSL-2J04-G10MZ60	6048246

Dimensional drawings → [page K-725](#)→ [For additional accessories, please see page K-668 onwards](#)