Product overview

HighLine

Measuring lengths up to 60 m – heavy-duty wire draw encoder for indoor and outdoor use

SICK
Sensor Intelligence.

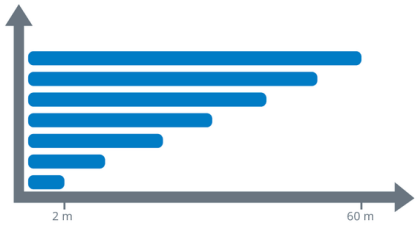
Advantages

HighLine – wire draw encoders for harsh environments

Dust or rain, heat or cold: The HighLine wire draw encoder is a very good solution for positioning tasks in harsh environments or for very long measuring ranges. With measuring lengths of 2 m to 60 m, its range of applications is almost limitless. The rugged IP64 industrial housing with two chambers – measuring chamber and spring chamber – and integrated dirt scraper protects the encoder and mechanics. Neither contamination nor normal mechanical influences affect the measurement accuracy. With extensible accessories and device adaptations, the HighLine can also be adapted to difficult ambient conditions.

Deflection rollers provide flexibility when extending the draw wire and allow the wire draw encoder to be integrated intelligently.

When winding and unwinding, the wire forms not several, but only one row on the measurement drum. This ensures a high measurement accuracy.



Measuring lengths of 2 m to 60 m are available, depending on the variant.

Rugged and compact: The HighLine is a good choice – it proves to be an especially resilient solution for measuring in harsh ambient conditions.

Can be adapted to different interface environments

Thanks to their modular concept, wire draw encoders are available with many different communication interfaces: IO-Link, CANopen, PROFINET, SSI, analog communication interfaces etc. This allows the HighLine to be very easily integrated into any control environment. It also makes it possible to utilize the individual encoder functions. For example, the diagnostic functions, parameterization via SOPAS, or using Smart Tasks to directly transmit speeds or the measuring distance covered.

The HighLine delivers continuous diagnostic data. This provides the foundation for safe process monitoring and increases the plant availability. Any developing faults can be detected early.

Ensuring future security: Thanks to the decentralized intelligence of IO-Link, diagnostic data can be saved, Smart Tasks such as length measurements can be executed and production processes with Industry 4.0 concepts can be designed with high efficiency.

PROFINET

Detecting faults early on: Extensive diagnostic functions are available with the PROFINET standard which improve the reliability of the measurement process and therefore increase machine availability and productivity.

Thanks to its modular design and intelligent functions, the HighLine can be precisely adapted to any system environment.

Technical data overview

Measuring range	0 m ... 60 m (depends on variant)
Resolution	0.0008 mm ... 0.2 mm (depends on variant)
Communication interface	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud) CANopen SSI SAE J1939 PROFINET EtherCAT® EtherNet/IP™ PROFIBUS DP DeviceNet™ Analog / Current / 4...20 mA Analog / Voltage / 0...10 V Incremental / TTL / RS-422 Incremental / HTL / Push pull Incremental / TTL / HTL

Product description

With wire draw lengths from 2 to 60 m, the HighLine series of wire draw encoders have enormous range. Thanks to guide rollers, the HighLine series enables flexible measurement paths - even around obstacles. Their rugged housing and dirt-resistant brush assemblies allow the encoder to be used in the toughest of environments, including dust, shock and vibration, which ensure a long service lifetime.

At a glance

- Measuring lengths: 2 m ... 60 m
- Modular measuring system with a wide selection of interfaces/measuring lengths
- Very rugged system (dirt scraper, integrated brushes)
- High-quality winding mechanism and wire input
- High enclosure rating
- High shock and vibration resistance
- Extremely high resolution possible
- Expandable using external accessories

Your benefits

- Reliable solution for use in harsh ambient conditions
- Long service life due to rugged industrial housing
- Quick and easy installation without the need for precise linear guidance
- Low integration and maintenance costs
- Customization option reduces storage costs
- Analog interface speeds up commissioning and cost-effective interface card can be used

Fields of application

- Positioning of rack operation equipment
- Positioning grippers and trolleys with cranes
- Automated guided systems
- Elevators
- Lifting platforms
- Presses

Type code

Other models and accessories ➜ www.sick.com/HighLine

Absolute

Construction size

0	8	80 mm [1)]
1	3	130 mm [2)]
1	9	190 mm [3)]

Communication interface

A	SSI
C	CANopen [4)]
D	DeviceNet [4)]
E	EtherCAT®
H	HIPERFACE® (on request)
I	EtherNet/IP
K	SSI + SinCos (on request)
L	SSI + Incremental HTL (on request)
N	PROFINET
P	PROFIBUS
Q	IO-Link
R	SSI + Incremental programmable (on request)
S	SSI + SinCos programmable (on request)
T	SSI + Incremental TTL (on request)

Connection type

A	Male connector, M23, 12-pin, radial [5)]
B	Male connector, 3 x M12, axial [6)]
C	Male connector, M12, 8-polig, radial [5)]
H	Male connector for field bus adapter [4) 7)]
K	Cable, 8-wire, universal, 1.5 m (on request)
L	Cable, 8-wire, universal, 3.0 m (on request)
M	Cable, 8-wire, universal, 5.0 m (on request)
N	Male connector, M12, 8-pin, universal [5)]
Q	Male connector, M12, 5-pin, universal [8)]
R	Male connector, M12, 4-pin, universal [9)]

Measuring length

0	2	2 meters
0	3	3 meters
0	5	5 meters
1	0	10 meters
1	5	15 meters
2	0	20 meters
2	5	25 meters
3	0	30 meters
5	0	50 meters
6	0	60 meters

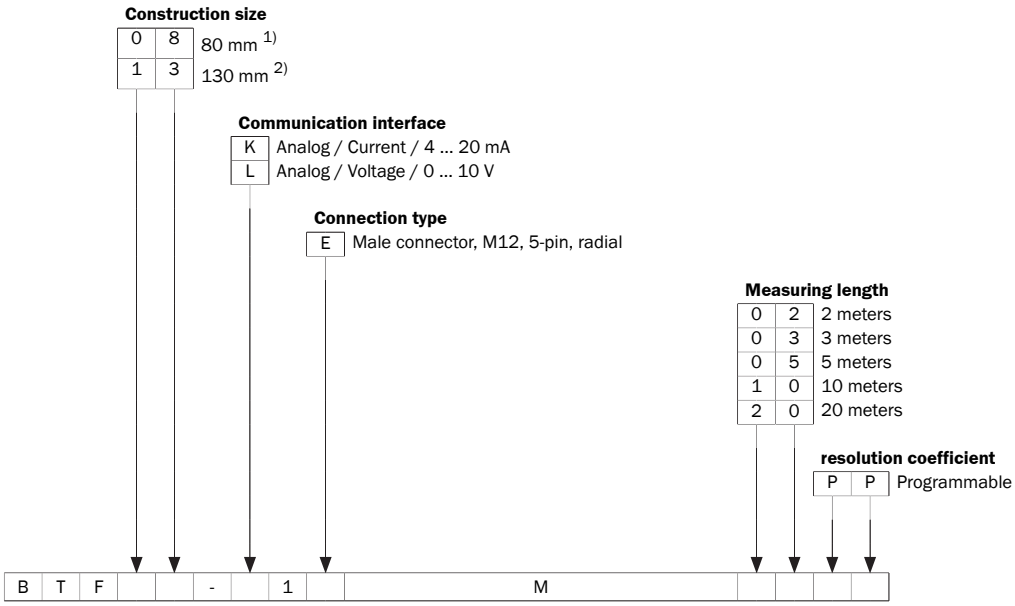
resolution coefficient

4	0	A = SSI with connection type A / measuring 2 m, 3 m
2	0	A = SSI with connection type A / measuring length 5 m, 10 m, 20 m, 30 m
1	0	A = SSI with connection type A / measuring length 50 m
4	1	A = SSI with connection type N / measuring length 2 m, 3 m
2	4	A = SSI with connection type N / measuring length 5 m, 10 m
2	5	A = SSI with connection type N / measuring length 20 m, 30 m
1	7	A = SSI with connection type N / measuring length 50 m
4	1	C = CANopen with connection type H ; D = DeviceNet; P = PROFIBUS / measuring length 2 m, 3 m
2	5	C = CANopen with connection type H; D = DeviceNet; P = PROFIBUS / measuring length 5 m, 10 m, 20 m, 30 m
1	7	C = CANopen with connection type H; D = DeviceNet; P = PROFIBUS / measuring length 50 m
8	2	C = CANopen with connection type Q; D = DeviceNet; P = PROFIBUS / measuring length 2 m, 3 m
4	9	C = CANopen with connection type Q; D = DeviceNet; P = PROFIBUS / measuring length 5 m, 10 m, 20 m, 30 m
3	3	C = CANopen with connection type Q; D = DeviceNet; P = PROFIBUS / measuring length 50 m
9	9	I = EtherNet/IP; E = EtherCAT®; N = PROFINET / measuring length 2 m, 3 m
9	9	I = EtherNet/IP; E = EtherCAT®; N = PROFINET / measuring length 5 m, 10 m, 20 m, 30 m
9	9	I = EtherNet/IP; E = EtherCAT®; N = PROFINET / measuring length 50 m
6	1	Q = IO-Link / Basic
6	2	Q = IO-Link / Advanced

B	T	F			-		1		M				

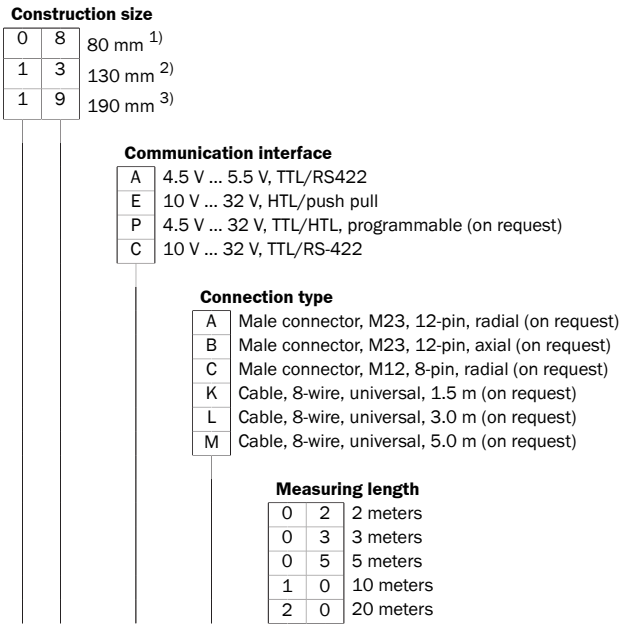
[1] Only in combination with measuring length 02 and 03.
[2] Only in combination with measuring length 05, 10, 15, 20, 25, 30.
[3] Only in combination with measuring length 50, 60.
[4] Field bus adapter for CANopen, DeviceNet, and PROFIBUS please order separatly.
[5] Only in combination with communication interface A.
[6] Only in combination with communication interfaces E, I, N and P.
[7] In combination with communication interfaces C, D and P).
[8] Only in combination with communication interface C.
[9] Only in combination with communication interface Q.

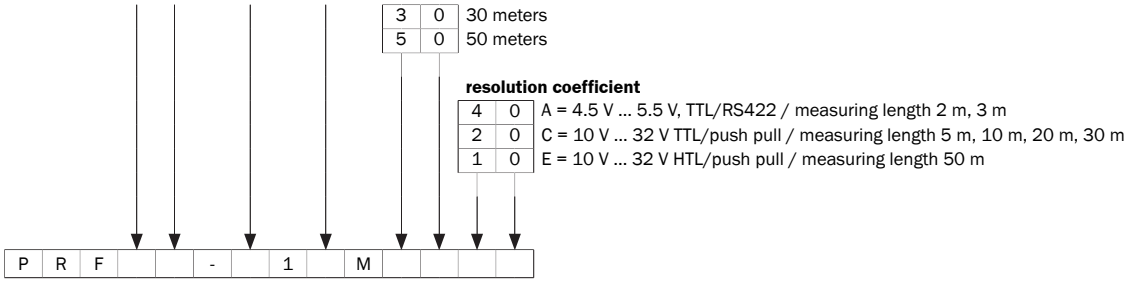
Analog



[1] Only in combination with measuring length 02 and 03.
[2] Only in combination with measuring length 05, 10, 20.

Incremental





[1] Only in combination with measuring length 02 and 03.

[2] Only in combination with measuring length 05, 10, 20, 30.

[3] Only in combination with measuring length 50.

Ordering information

Other models and accessories ➜ www.sick.com/HighLine

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 10 m	Analog / Current / 4...20 mA	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1KE13X06, 6045312	MRA-F130-110D2, 6028627	BTF13-K1EM10PP	1060989

[1] The values shown have been rounded.

[2] Example calculation based on the BTF08 with PROFINET: 200 mm (wire draw length per revolution - see Mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of wire draw + encoder combination).

[3] Order bus adapter separately.

[4] Example calculation based on the PRF08 with HTL Push Pull: 200 mm (wire draw length per revolution - see Mechanical data): 2,000 (pulses per revolution) = 0.1 mm (resolution of wire draw + encoder combination).

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
	Analog / Voltage / 0...10 V	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1LE13X06, 6045313	MRA-F130-110D2, 6028627	BTF13-L1EM10PP	1060990
	CANopen	Bus adapter for CANopen [3)]	0.04 mm [1) 2)]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F130-110D2, 6028627	BTF13-C1HM1025	1034319
		Male connector, M12, 5-pin, universal	0.02 mm [1) 2)]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F130-110D2, 6028627	BTF13-C1QM1049	1068891
			0.04 mm [1) 2)]	AHM36 CANopen, AHM36A-S3C-C000S10, 1134073	MRA-F130-110D2, 6028627	BTF13-C1QM10S01	1134278
	DeviceNet™	Bus adapter for DeviceNet [3)]	0.04 mm [1) 2)]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F130-110D2, 6028627	BTF13-D1HM1025	1034313
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.001 mm [1) 2)]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F130-110D2, 6028627	BTF13-E1BM1099	1060994
	EtherNet/IP™		0.001 mm [1) 2)]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F130-110D2, 6028627	BTF13-I1BM1099	1060993
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.02 mm [1) 2)]	AHM36 IO-Link Advanced, AHM36A-S3QC014X1[illegible] 1101532	MRA-F130-110D2, 6028627	BTF13-Q1RM1062	1110596
			0.08 mm [1) 2)]	AHM36 IO-Link Basic, AHM36B-S3QC012X1[illegible] 1092014	MRA-F130-110D2, 6028627	BTF13-Q1RM1061	1097318
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.03 mm [1) 4)]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-110D2, 6028627	PRF13-E1AM1020	1034337
	Incremental / TTL / RS-422	Male connector, M23, 12-pin, radial	0.03 mm [1) 4)]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-110D2, 6028627	PRF13-A1AM1020	1034325
						PRF13-C1AM1020	1034331
	PROFIBUS DP	Bus adapter for PROFIBUS [3)]	0.04 mm [1) 2)]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F130-110D2, 6028627	BTF13-P1HM1025	1034307
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.04 mm [1) 2)]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F130-110D2, 6028627	BTF13-P1BM1025	1060991
	PROFINET	Male connector, 1x, M12, 4-pin, axial	0.0013 mm [1) 2)]	ANM58 PROFINET, ANM58PANNR0000101000	MRA-F130-110D2, 6028627	BTF13-N1BM1077	1150703

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 15 m	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.001 mm [1) 2)]	AFM60 EtherCAT®, AFM60A-S1E-B018X12, 1059061	MRA-F130-115D2, 6072738	BTF13-E1BM1599	1112107
	EtherNet/IP™		0.001 mm [1) 2)]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F130-115D2, 6072738	BTF13-I1BM1599	1105976
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.02 mm [1) 2)]	AHM36 IO-Link Advanced, AH-M36A-S3QC014X1: 1101532	MRA-F130-115D2, 6072738	BTF13-Q1RM1562	1110597
	SAE J1939	Male connector, M12, 5-pin, universal	0.02 mm [1) 2)]	AHM36 SAE J1939, AH-M36A-S3JC014x12 1120251	MRA-F130-115D2, 6072738	BTF13-J1QM1564	1127313
0 m ... 20 m	Analog / Current / 4...20 mA	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1KE13X06, 6045312	MRA-F130-120D1, 6028628	BTF13-K1EM20PP	1060995
	Analog / Voltage / 0...10 V	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1LE13X06, 6045313	MRA-F130-120D1, 6028628	BTF13-L1EM20PP	1060996

[1)] The values shown have been rounded.

[2)] Example calculation based on the BTF08 with PROFINET: 200 mm (wire draw length per revolution - see Mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of wire draw + encoder combination).

[3)] Order bus adapter separately.

[4)] Example calculation based on the PRF08 with HTL Push Pull: 200 mm (wire draw length per revolution - see Mechanical data): 2,000 (pulses per revolution) = 0.1 mm (resolution of wire draw + encoder combination).

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
	CANopen	Bus adapter for CANopen [3]	0.04 mm [1] [2]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F130-120D1, 6028628	BTF13-C1HM2025	1034320
		Male connector, M12, 5-pin, universal	0.02 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F130-120D1, 6028628	BTF13-C1QM2049	1068893
			0.04 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C000S10, 1134073	MRA-F130-120D1, 6028628	BTF13-C1QM20S01	1134272
	DeviceNet™	Bus adapter for DeviceNet [3]	0.04 mm [1] [2]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F130-120D1, 6028628	BTF13-D1HM2025	1034314
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.001 mm [1] [2]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F130-120D1, 6028628	BTF13-E1BM2099	1061000
	EtherNet/IP™		0.001 mm [1] [2]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F130-120D1, 6028628	BTF13-I1BM2099	1060999
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.02 mm [1] [2]	AHM36 IO-Link Advanced, AHM36A-S3QC014X1 1101532	MRA-F130-120D1, 6028628	BTF13-Q1RM2062	1110599
			0.08 mm [1] [2]	AHM36 IO-Link Basic, AHM36B-S3QC012X1 1092014	MRA-F130-120D1, 6028628	BTF13-Q1RM2061	1097319
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-120D1, 6028628	PRF13-E1AM2020	1034338
	Incremental / TTL / RS-422	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-120D1, 6028628	PRF13-A1AM2020	1034326
						PRF13-C1AM2020	1034332
	PROFIBUS DP	Bus adapter for PROFIBUS [3]	0.04 mm [1] [2]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F130-120D1, 6028628	BTF13-P1HM2025	1034308
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.04 mm [1] [2]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F130-120D1, 6028628	BTF13-P1BM2025	1060997
	PROFINET	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.0013 mm [1] [2]	ANM58 PROFINET, ANM58B-SANNB0000101000X 1145910	MRA-F130-120D1, 6028628	BTF13-N1BM2077	1150704
			0.001 mm [1] [2]	AFM60 PROFINET, AFM60A-S1N	MRA-F130-120D1, 6028628	BTF13-N1BM2099	1060998

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 2 m	Analog / Current / 4...20 mA	Male connector, M12, 5-pin, radial	0.02 mm [1) 2)]	ACM60, ACM60B-S1KE13X06, 6045312	MRA-F080-102D2, 6028625	BTF08-K1EM02PP	1060964

[1)] The values shown have been rounded.

[2)] Example calculation based on the BTF08 with PROFINET: 200 mm (wire draw length per revolution - see Mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of wire draw + encoder combination).

[3)] Order bus adapter separately.

[4)] Example calculation based on the PRF08 with HTL Push Pull: 200 mm (wire draw length per revolution - see Mechanical data): 2,000 (pulses per revolution) = 0.1 mm (resolution of wire draw + encoder combination).

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
	Analog / Voltage / 0...10 V	Male connector, M12, 5-pin, radial	0.02 mm [1) 2)]	ACM60, ACM60B-S1LE13X06, 6045313	MRA-F080-102D2, 6028625	BTF08-L1EM02PP	1060965
	CANopen	Bus adapter for CANopen [3)]	0.02 mm [1) 2)]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F080-102D2, 6028625	BTF08-C1HM0241	1034317
		Male connector, M12, 5-pin, universal	0.01 mm [1) 2)]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F080-102D2, 6028625	BTF08-C1QM0282	1068885
	DeviceNet™	Bus adapter for DeviceNet [3)]	0.02 mm [1) 2)]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F080-102D2, 6028625	BTF08-D1HM0241	1034311
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.0008 mm [1) 2)]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F080-102D2, 6028625	BTF08-E1BM0299	1060969
	EtherNet/IP™		0.0008 mm [1) 2)]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F080-102D2, 6028625	BTF08-I1BM0299	1060968
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.01 mm [1) 2)]	AHM36 IO-Link Advanced, AHM36A-S3QC014X1[illegible] 1101532	MRA-F080-102D2, 6028625	BTF08-Q1RM0262	1110592
			0.05 mm [1) 2)]	AHM36 IO-Link Basic, AHM36B-S3QC012X1[illegible] 1092014	MRA-F080-102D2, 6028625	BTF08-Q1RM0261	1097307
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.02 mm [1) 4)]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F080-102D2, 6028625	PRF08-E1AM0240	1034335
	Incremental / TTL / RS-422	Cable, 8-wire, universal, 5 m	0.1 mm [1) 4)]	DFS60, DFS60E-S1CK02000, 1084353	MRA-F080-102D2, 6028625	PRF08-C1KM0240	1084449
		Male connector, M23, 12-pin, radial	0.02 mm [1) 4)]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F080-102D2, 6028625	PRF08-A1AM0240	1034323
						PRF08-C1AM0240	1034329
	PROFIBUS DP	Bus adapter for PROFIBUS [3)]	0.02 mm [1) 2)]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F080-102D2, 6028625	BTF08-P1HM0241	1034305
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.02 mm [1) 2)]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F080-102D2, 6028625	BTF08-P1BM0241	1060966
	PROFINET	Male connector, 1x, M12, 4-pin, axial Female connector	0.0008 mm [1) 2)]	AFM60 PROFINET, AFM60A-S1N-B018X12	MRA-F080-102D2, 6028625	BTF08-N1BM0299	1060967

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 30 m	CANopen	Bus adapter for CANopen [3]	0.04 mm [1] [2]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F130-130D1, 6028629	BTF13-C1HM3025	1034321
		Male connector, M12, 5-pin, universal	0.02 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F130-130D1, 6028629	BTF13-C1QM3049	1068896
			0.04 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C000S10, 1134073	MRA-F130-130D1, 6028629	BTF13-C1QM30S01	1134273
	DeviceNet™	Bus adapter for DeviceNet [3]	0.04 mm [1] [2]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F130-130D1, 6028629	BTF13-D1HM3025	1034315
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.001 mm [1] [2]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F130-130D1, 6028629	BTF13-E1BM3099	1061006
	EtherNet/IP™		0.001 mm [1] [2]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F130-130D1, 6028629	BTF13-I1BM3099	1061005
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.02 mm [1] [2]	AHM36 IO-Link Advanced, AHM36A-S3QC014X1: 1101532	MRA-F130-130D1, 6028629	BTF13-Q1RM3062	1110601
			0.08 mm [1] [2]	AHM36 IO-Link Basic, AHM36B-S3QC012X1: 1092014	MRA-F130-130D1, 6028629	BTF13-Q1RM3061	1097320
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-130D1, 6028629	PRF13-E1AM3020	1034339
	Incremental / TTL / RS-422	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-130D1, 6028629	PRF13-A1AM3020	1034327
						PRF13-C1AM3020	1034333
	PROFIBUS DP	Bus adapter for PROFIBUS [3]	0.04 mm [1] [2]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F130-130D1, 6028629	BTF13-P1HM3025	1034309
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.04 mm [1] [2]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F130-130D1, 6028629	BTF13-P1BM3025	1061003
	PROFINET	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.0013 mm [1] [2]	ANM58 PROFINET, ANM58B-SANNB0000101000) 1145910	MRA-F130-130D1, 6028629	BTF13-N1BM3077	1150705
			0.001 mm [1] [2]	AFM60 PROFINET, AFM60A-S1N	MRA-F130-130D1, 6028629	BTF13-N1BM3099	1061004

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 3 m	Analog / Current / 4...20 mA	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1KE13X06, 6045312	MRA-F080-103D2, 6030125	BTF08-K1EM03PP	1060970
	Analog / Voltage / 0...10 V	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1LE13X06, 6045313	MRA-F080-103D2, 6030125	BTF08-L1EM03PP	1060973

[1)] The values shown have been rounded.

[2)] Example calculation based on the BTF08 with PROFINET: 200 mm (wire draw length per revolution - see Mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of wire draw + encoder combination).

[3)] Order bus adapter separately.

[4)] Example calculation based on the PRF08 with HTL Push Pull: 200 mm (wire draw length per revolution - see Mechanical data): 2,000 (pulses per revolution) = 0.1 mm (resolution of wire draw + encoder combination).

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
	CANopen	Bus adapter for CANopen [3]	0.04 mm [1] [2]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F080-103D2, 6030125	BTF08-C1HM0341	1034895
		Male connector, M12, 5-pin, universal	0.02 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F080-103D2, 6030125	BTF08-C1QM0382	1068887
	DeviceNet™	Bus adapter for DeviceNet [3]	0.04 mm [1] [2]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F080-103D2, 6030125	BTF08-D1HM0341	1034894
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.001 mm [1] [2]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F080-103D2, 6030125	BTF08-E1BM0399	1060980
	EtherNet/IP™		0.001 mm [1] [2]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F080-103D2, 6030125	BTF08-I1BM0399	1060978
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.01 mm [1] [2]	AHM36 IO-Link Advanced, AHM36A-S3QC014X12 1101532	MRA-F080-103D2, 6030125	BTF08-Q1RM0362	1110594
			0.05 mm [1] [2]	AHM36 IO-Link Basic, AHM36B-S3QC012X12 1092014	MRA-F080-103D2, 6030125	BTF08-Q1RM0361	1097316
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F080-103D2, 6030125	PRF08-E1AM0340	1034898
	Incremental / TTL / HTL	Male connector, M12, 8-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1PC10000, 1036756	MRA-F080-103D2, 6030125	PRF08-P1CM0340	1100153
	Incremental / TTL / RS-422	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F080-103D2, 6030125	PRF08-A1AM0340	1034896
						PRF08-C1AM0340	1034897
	PROFIBUS DP	Bus adapter for PROFIBUS [3]	0.02 mm [1] [2]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F080-103D2, 6030125	BTF08-P1HM0341	1034893
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.02 mm [1] [2]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F080-103D2, 6030125	BTF08-P1BM0341	1060975
	PROFINET	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.0011 mm [1] [2]	ANM58 PROFINET, ANM58B-SANNB0000101000X 1145910	MRA-F080-103D2, 6030125	BTF08-N1BM0377	1150701
			0.001 mm [1] [2]	AFM60 PROFINET, AFM60A-S1NB018X12	MRA-F080-103D2, 6030125	BTF08-N1BM0399	1060976

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 50 m	CANopen	Bus adapter for CANopen [3]	0.06 mm [1] [2]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F190-150D2, 6028630	BTF19-C1HM5017	1034322
		Male connector, M12, 5-pin, universal	0.03 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F190-150D2, 6028630	BTF19-C1QM5033	1068898
			0.06 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C000S10, 1134073	MRA-F190-150D2, 6028630	BTF19-C1QM50S01	1134274
	DeviceNet™	Bus adapter for DeviceNet [3]	0.06 mm [1] [2]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F190-150D2, 6028630	BTF19-D1HM5017	1034316
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.002 mm [1] [2]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F190-150D2, 6028630	BTF19-E1BM5099	1061012
	EtherNet/IP™		0.002 mm [1] [2]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F190-150D2, 6028630	BTF19-I1BM5099	1061011
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.03 mm [1] [2]	AHM36 IO-Link Advanced, AHM36A-S3QC014X1 1101532	MRA-F190-150D2, 6028630	BTF19-Q1RM5062	1110602
			0.12 mm [1] [2]	AHM36 IO-Link Basic, AHM36B-S3QC012X1 1092014	MRA-F190-150D2, 6028630	BTF19-Q1RM5061	1097321
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.05 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F190-150D2, 6028630	PRF19-E1AM5010	1034340
	Incremental / TTL / RS-422	Male connector, M23, 12-pin, radial	0.05 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F190-150D2, 6028630	PRF19-A1AM5010	1034328
						PRF19-C1AM5010	1034334
	PROFIBUS DP	Bus adapter for PROFIBUS [3]	0.06 mm [1] [2]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F190-150D2, 6028630	BTF19-P1HM5017	1034310
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.06 mm [1] [2]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F190-150D2, 6028630	BTF19-P1BM5017	1061009
	PROFINET	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.0019 mm [1] [2]	ANM58 PROFINET, ANM58B-SANNB0000101000X 1145910	MRA-F190-150D2, 6028630	BTF19-N1BM5077	1150706
			0.002 mm [1] [2]	AFM60 PROFINET, AFM60A-S1N	MRA-F190-150D2, 6028630	BTF19-N1BM5099	1061010

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 5 m	Analog / Current / 4...20 mA	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1KE13X06, 6045312	MRA-F130-105D2, 6028626	BTF13-K1EM05PP	1060982
	Analog / Voltage / 0...10 V	Male connector, M12, 5-pin, radial	0.04 mm [1) 2)]	ACM60, ACM60B-S1LE13X06, 6045313	MRA-F130-105D2, 6028626	BTF13-L1EM05PP	1060983

[1)] The values shown have been rounded.

[2)] Example calculation based on the BTF08 with PROFINET: 200 mm (wire draw length per revolution - see Mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of wire draw + encoder combination).

[3)] Order bus adapter separately.

[4)] Example calculation based on the PRF08 with HTL Push Pull: 200 mm (wire draw length per revolution - see Mechanical data): 2,000 (pulses per revolution) = 0.1 mm (resolution of wire draw + encoder combination).

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
	CANopen	Bus adapter for CANopen [3]	0.04 mm [1] [2]	ATM60 CANopen, ATM60-C1H13X13, 1030025	MRA-F130-105D2, 6028626	BTF13-C1HM0525	1034318
		Male connector, M12, 5-pin, universal	0.02 mm [1] [2]	AHM36 CANopen, AHM36A-S3C-C014X12, 1065999	MRA-F130-105D2, 6028626	BTF13-C1QM0549	1068889
	DeviceNet™	Bus adapter for DeviceNet [3]	0.04 mm [1] [2]	ATM60 DeviceNet, ATM60-D1H13X13, 1030018	MRA-F130-105D2, 6028626	BTF13-D1HM0525	1034312
	EtherCAT®	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.001 mm [1] [2]	AFM60 EtherCAT®, AFM60A-S1EB018X12, 1059061	MRA-F130-105D2, 6028626	BTF13-E1BM0599	1060988
	EtherNet/IP™		0.001 mm [1] [2]	AFM60 EtherNet/IP, AFM60A-S1IB018X12, 1055331	MRA-F130-105D2, 6028626	BTF13-I1BM0599	1060987
	IO-Link / IO-Link V1.1 / COM3 (230,4 kBaud)	Male connector, M12, 4-pin, universal	0.02 mm [1] [2]	AHM36 IO-Link Advanced, AHM36A-S3QC014X11 1101532	MRA-F130-105D2, 6028626	BTF13-Q1RM0562	1110595
			0.08 mm [1] [2]	AHM36 IO-Link Basic, AHM36B-S3QC012X11 1092014	MRA-F130-105D2, 6028626	BTF13-Q1RM0561	1097317
	Incremental / HTL / Push pull	Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-105D2, 6028626	PRF13-E1AM0520	1034336
	Incremental / TTL / RS-422	Cable, 8-wire, universal, 1.5 m	0.2 mm [1] [4]	DFS60, DFS60B-S1CK01670, 1084354	MRA-F130-105D2, 6028626	PRF13-C1KM0520	1084425
		Male connector, M23, 12-pin, radial	0.03 mm [1] [4]	DFS60, DFS60B-S1MA10000, 1056866	MRA-F130-105D2, 6028626	PRF13-A1AM0520	1034324
						PRF13-C1AM0520	1034330
	PROFIBUS DP	Bus adapter for PROFIBUS [3]	0.04 mm [1] [2]	ATM60 PROFIBUS, ATM60-P1H13X13, 1030014	MRA-F130-105D2, 6028626	BTF13-P1HM0525	1034306
		Male connector, 2x, M12, 5-pin, axial Female connector, 1x, M12, 5-pin, axial	0.04 mm [1] [2]	A3M60, A3M60B-S1PB013X13, 1051018	MRA-F130-105D2, 6028626	BTF13-P1BM0525	1060985
	PROFINET	Male connector, 1x, M12, 4-pin, axial Female connector, 2x, M12, 4-pin, axial	0.0013 mm [1] [2]	ANM58 PROFINET, ANM58B-SANNB0000101000X 1145910	MRA-F130-105D2, 6028626	BTF13-N1BM0577	1150702
			0.001 mm [1] [2]	AFM60 PROFINET, AFM60A-S1NB018X12	MRA-F130-105D2, 6028626	BTF13-N1BM0599	1060986

Measuring range	Communication interface	Connection type	Resolution (wire draw + encoder)	Mounted encoder	Mounted mechanic	Type	Part no.
0 m ... 60 m	SAE J1939	Male connector, M12, 5-pin, universal	0.03 mm [1) 2)]	AHM36 SAE J1939, AH-M36A-S3JC014x12 1120251	MRA-F190-160D2, 6073783	BTF19-J1QM6064	1127318

[1)] The values shown have been rounded.

[2)] Example calculation based on the BTF08 with PROFINET: 200 mm (wire draw length per revolution - see Mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of wire draw + encoder combination).

[3)] Order bus adapter separately.

[4)] Example calculation based on the PRF08 with HTL Push Pull: 200 mm (wire draw length per revolution - see Mechanical data): 2,000 (pulses per revolution) = 0.1 mm (resolution of wire draw + encoder combination).

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