



Type	RX 70-TI / RX 71-TI (Stainless)	RI 59
Special features	■ explosion-proof according to EX II 2 G/D EEX d IIC T6/T4 ■ highest operating safety ■ applications e.g. lacquering lines, surface processing machines, filling plants, mixing machines, silo systems	■ stainless steel encoder with high degree of protection ■ high corrosion resistance ■ suitable for use in food production ■ applications e.g. packaging machinery, filling plants, washing systems, mixing machines
Number of pulses	1 ... 10 000	1 ... 10 000
Technical Data - mechanical		
Flange	K = clamping flange	Q = square flange
Shaft diameter	10 mm	9.52 mm / 10 mm
Max. shaft load	radial 100 N,axial 40 N	radial 60 N, axial 40 N
Max. speed	6 000 min^{-1} (T6), 10 000 min^{-1} (T4)	10 000 min^{-1}
Torque	≤ 0.5 Ncm	≤ 0.5 Ncm
Protection class housing/bearing	IP65/64	IP67/67
General design	as per DIN VDE 0160, protection class III	as per DIN VDE 0160, protection class III
Operating temperature	-10 ... + 40 °C	-10 ... + 70 °C
Connection	Cable axial	Cable radial
Size	Ø 70 mm	Ø 58 mm, square flange = 63.5 mm
Weight approx.	1400 g	620 g
Technical Data - electrical		
Output	RS 422 / push-pull / push-pull complementary	RS 422 / push-pull / push-pull complementary
Supply voltage (SELV)	DC 5 V / DC 10 - 30 V	DC 5 V / DC 10 - 30 V
Max. current w/o load	40 mA (DC 5 V), 30 mA (DC 24 V), 60 mA (DC 10 V)	40 mA (DC 5 V), 30 mA (DC 24 V), 60 mA (DC 10 V)
Max. pulse frequency	300 kHz (RS 422) 200 kHz (push-pull)	300 kHz (RS 422) 200 kHz (push-pull)
Output load	RS 422: ±30 mA push-pull with short circuit protection:30 mA (DC 10 - 30 V)	RS 422: ±30 mA push-pull with short circuit protection: 30 mA (DC 10 - 30 V)
Alarm output	NPN-O.C. 5 mA	NPN-O.C. 5 mA
Pulse shape	Square wave	Square wave
Pulse duty factor	1 : 1	1 : 1
Pulse width error	± max. 25° electrical	± max. 25° electrical
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Incremental Sine-Wave Enoders





Type	RIS 58-0	RIS 58-H
Special features	■ Harmonic distortion less than 1 % ■ Extended temperature range, -40° up to +100 °C ■ 500 kHz sine-wave incremental signal frequency response ■ Self-monitoring and error compensation ■ Secure against short-circuit and overload	■ Harmonic distortion less than 1 % ■ Extended temperature range, -40° up to +100 °C ■ 500 kHz sine-wave incremental signal frequency response ■ Self-monitoring and error compensation ■ Secure against short-circuit and overload
Number of pulses	1 000, 1 024, 2 048, 2 500 (other number of pulses on request)	1 000, 1 024, 2 048(other number of pulses on request)
Technical Data - mechanical		
Shaft diameter	6 mm	10 mm, 12 mm hollow shaft
Absolute max. shaft load	radial 60 N/ axial 40 N	
Balance tolerances		axial ±1.5 mm, radial ±0.2 mm
Max. speed	12 000 min $^{-1}$	12 000 min $^{-1}$
Torque	≤ 1 Ncm	≤ 1 Ncm
Protection (EN 60529)	Bearing IP64, Housing IP65	Bearing IP64, Housing IP65
General design	as per DIN EN 61010-1	as per DIN EN 61010-1
Operating temperature	-40 ... +100 °C	-40 ... +100 °C
Vibration (IEC 68-2-6)	≤ 100 m/s^2	≤ 100 m/s^2
Shock (IEC 68-2-27)	≤ 1 000 m/s^2	≤ 1 000 m/s^2
Material housing	Aluminium	Aluminium
Connection	Cable axial or radial Conin axial or radial	Cable axial or radial Conin axial or radial
Size	Ø 58 mm	Ø 58 mm
Weight approx.	265 g	270 g
Technical Data - electrical		
Supply voltage (SELV)	DC 5 V / ±10 %	DC 5 V / ±10 %
Max. current w/o load	120 mA	120 mA
Incremental signals A, B	Sine - Cosine 1 Vpp	Sine - Cosine 1 Vpp
Absolute accuracy	±35“	±35“
Repeatability	±7“	±7“
Max. frequency	500 kHz	500 kHz
Reference signal: R	> 0,4 V (1 pulse / turn)	> 0,4 V (1 pulse / turn)
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Absolute Shaft Encoders - ACURO industry

AC 36 - BiSS / SSI

Special Features

- Compact design for single or multiturn
- Interfaces: standard SSI, expanded SSI mode or BiSS
- Use of sine / cosine signals for fast control tasks possible



Type	AC36 - BiSS / SSI
Technical Data - mechanical	**(preliminary)**
Housing diameter	37.5 mm
Protection class shaft input	IP64
Protection class housing	IP64
Flange	pilot flange
Shaft diameter	6 mm
Max. speed	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}
Starting Torque	0,01 Nm
Moment of inertia	2.5 x 10^{-6} kgm^2
Spring tether (hollow shaft) Tolerance axial / radial	± 0.5 mm/ ± 0.05 mm
Shock resistance DIN EN 60068-2-27	1 000 m/s^2 (6 ms)
Vibration resistance DIN EN 60068-2-6	100 m/s^2 (10 ... 2 000 Hz)
Operating temperature	-25 … +100 °C
Storage temperature	-15 … +85 °C (because of packing)
Weight approx. ST/MT	80 g / 130 g
Technical Data - electrical	**(preliminary)**
Supply voltage	DC 5 V, -5 % / + 10 %
Max. current w/o load ST/MT	50 mA / 100 mA
Interface	BiSS or Standard SSI
Lines / Drives	Clock and Data / RS422
Output code	Gray or Binary
Resolution singleturn	13 Bit ... max. 17 Bit
Resolution multiturn	12 Bit
Incremental signals	Sine - Cosine 1 Vpp
Number of pulses	2048
3 dB limiting frequency	500 kHz
Alarm output	Alarm bit (SSI option), warning bit and alarm bit (BiSS)
Connection	Cable axial or radial
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Absolute Shaft Encoders - ACURO industry

AC 58 - BiSS / SSI, Parallel

Special Features

- Compact design for single or multiturn
- Aids for start-up and operation: diagnostic LED, preset key with optical response
- Interfaces: standard SSI, expanded SSI mode or BiSS
- Use of sine / cosine signals for fast control tasks possible





Type	AC 58 - BiSS / SSI	AC 58 - Parallel
Technical Data - mechanical		
Housing diameter	58 mm	58 mm
Protection class shaft input	IP64 or IP67	IP64 or IP67
Protection class housing	IP64 (IP67 optional)	IP64 (IP67 optional)
Flange	Synchro flange, clamping flange, hubshaft with tether, square flange	Synchro flange, clamping flange, hubshaft with tether, square flange
Shaft diameter	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm
Max. speed	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}
Shaft load	axial 40 N / radial 60 N	axial 40 N / radial 60 N
Operating temperature	-40 … 100 °C	-40 … 100 °C
Weight approx. ST/MT	260 g / 310 g	350 g / 400 g
Technical Data - electrical		
Supply voltage	DC 5 V, -5 % / + 10 % or DC 10 - 30 V	DC 10 - 30 V
Max. current w/o load ST/MT	50 mA / 100 mA	200 mA / 300 mA
Interface	BiSS or Standard SSI	Parallel
Resolution singleturn	10-17 Bit, Gray Excess: 360, 720 steps	10-14 Bit, Gray Excess: 360, 720 steps
Resolution multi turn	12 Bit	12 Bit
Optional incremental signals	Sine - Cosine 1 Vpp	
Number of pulses	2048	
Absolute accuracy	±35"	
Repeat accuracy	±7"	
Parameterization	Code type, direction of rotation, warning, alarm	
Control input	$\overline{\text{Direction}}$	ST: $\overline{\text{Latch}}$, $\overline{\text{Direction}}$, $\overline{\text{Tristate}}$ MT: Tristate
Reset key	Latch via parameterization	only with MT
Alarm output	Alarm bit (SSI option), warning bit and alarm bit (BiSS)	NPN o.c. max. 5 mA
Status LED	Green = OK.; red = alarm	Green = OK.; red = alarm
Connection	Cable axial or radial Conin axial or radial M12, 8 pole	Cable axial or radial 17 pole Conin axial or radial 37 pole Sub-D
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Absolute Shaft Encoders - ACURO industry

AC 58 with Fieldbus Interfaces

Special Features

- Overall length: 63 mm for singleturn, 73 mm for multiturn, including bus cover
- The complete bus specific electronics is integrated in the connection cover
- Option: Display "tico"
- Diagnostic LEDs in the bus cover







Type	AC 58 - Profibus	AC 58 - CANopen	AC 58 - CANLayer 2
Technical Data - mechanical			
Housing diameter	58 mm	58 mm	58 mm
Protection class shaft input	IP64 or IP67	IP64 or IP67	IP64 or IP67
Protection class housing	IP67	Bus cover: IP67 Conin, cable: IP64 (IP67 optional)	Bus cover: IP67 Conin, cable: IP64 (IP67 optional)
Flange	Synchro flange, clamping flange, hubshaft with tether, square flange	Synchro flange, clamping flange, hubshaft with tether, square flange	Synchro flange, clamping flange, hubshaft with tether, square flange
Shaft diameter	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm
Max. speed	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}
Shaft load	axial 40 N / radial 60 N	axial 40 N / radial 60 N	axial 40 N / radial 60 N
Operating temperature	-40 … 85 °C	-40 … 85 °C	-40 … 85 °C
Weight approx. ST/MT	350 g / 400 g	350 g / 400 g	350 g / 400 g
Technical Data - electrical			
Supply voltage	DC 10 - 30 V	DC 10 - 30 V	DC 10 - 30 V
Max. current w/o load ST/MT	220 mA / 250 mA	220 mA / 250 mA	220 mA / 250 mA
Interface	RS 485	CAN High-Speed according ISO/DIS 11898	CAN High-Speed according ISO/DIS 11898
Profile / Protocol	Profibus DP with encoder profile Class C2 (parameterizable)	CANopen accord. DS 301 with encoder profile DSP 406	CAN 2.0 A
Programmable	Resolution, preset, direction	Resolution, preset, direction	Direction, limit values
Output code	Binary	Binary	Binary
Transfer mode		Poll mode (only on request), Change of State (automatic if value changes), cyclical with adjustable cycle timer	Poll mode (only on request), Change of State (automatic if value changes), cyclical with adjustable cycle timer
Baud rate	is automatically set within a range of 9,6 KBaud through 12 MBaud	set via DIP switch within a range of 10 trough 1000 Kbit/s	set via DIP switch within a range of 10 trough 1000 Kbit/s
Resolution singleturn	10-14 Bit	10-14 Bit	10-14 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Integrated special functions	speed, acceleration, operating time	speed, acceleration, round axis, limit values	
Connection	Bus cover with: • 3 M12 connectors • 3 sealed cable exits • double conin 12 pole radial cw • 4 pole M12 f. “tico” display + 2 sealed cable exits	Bus cover with: • 3 sealed cable exits • double conin 9 pole radial cw Cable radial or axial Conin radial or axial, cw or ccw	Bus cover with: • 3 sealed cable exits • double conin connectors 9 pole radial cw Cable radial or axial Conin radial or axial, cw or ccw
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Absolute Shaft Encoders - ACURO industry

AC 58 with Fieldbus Interfaces

Special Features

- Overall length: 63 mm for singleturn, 73 mm for multiturn, including bus cover
- The complete bus specific electronics is integrated in the connection cover
- Option: Display "tico"
- DiagnosticLEDs in the bus cover







Type	AC 58 - DeviceNet	AC 58 - Interbus	AC 58 - SUCOnet
Technical Data - mechanical			
Housing diameter	58 mm	58 mm	58 mm
Protection class shaft input	IP64 or IP67	IP64 or IP67	IP64 or IP67
Protection class housing	IP67	Bus cover: IP67 Cable: IP64 (IP67 optional)	IP64
Flange	Synchro flange, clamping flange, hubshaft with tether, square flange	Synchro flange, clamping flange, hubshaft with tether, square flange	Synchro flange, clamping flange, hubshaft with tether, square flange
Shaft diameter	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm
Max. speed	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}
Shaft load	axial 40 N / radial 60 N	axial 40 N / radial 60 N	axial 40 N / radial 60 N
Operating temperature	-40 … 85 °C	-40 … 70 °C	-10 … 60 °C
Weight approx. ST/MT	350 g / 400 g	350 g / 400 g	260 g / 310 g
Technical Data - electrical			
Supply voltage	DC 10 - 30 V	DC 10-30 V	DC 10-30 V
Max. current w/o load ST/MT	220 mA / 250 mA	220 mA / 250 mA	220 mA
Interface	CAN High-Speed according ISO/ DIS 11898, CAN-Specification 2.0 A (11-Bit-Identifier)	Remote installation bus Interbus, ENCOM Profile K3 (parameterizable), K2	RS485
Profile / Protocol	DeviceNet nach Rev. 2.0, programmable encoder	K3 = ID-Code 37 K2 = ID-Code 36	SUCOnet-K1 or Hengstler-G1-Protocol
Programmable	Resolution, preset, direction	Direction, scaling factor, preset, offset	
Output code	Binary	32 Bit binary	Binary
Transfer mode	Poll mode (only on request), Change of State (automatic if value changes), cyclical with adjustable cycle timer		
Baud rate	set via DIP switches to 125, 250, 500 KBaud	500 KBaud according ENCOM	
Resolution singleturn	10-14 Bit	10-12 Bit	10 - 13 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Connection	Bus cover with: • 2 sealed cable exits • 4 pole M12 f. "tico" display + 2 sealed cable exits • 5 pole M12	Bus cover with: • 3 sealed cable exits • 4 pole M12 f. "tico" Display + 2 sealed cable exits • double conin 9 pole Cable 12 pole, radial and axial	Cable axial/ radial
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Absolute Shaft Encoders - ACURO industry

AC 58 - SSI programmable

Special Features

- Compact design: 59mm length for single or multiturn
- Aids for start-up and operation: diagnostic LED, preset key with optical response
- Parameterization: resolution, code type, sense of rotation, output format, warning, alarm
- Parameters can be stored in a non-volatile memory



Type	AC 58 - SSI Programmable
Technical Data - mechanical	
Housing diameter	58 mm
Protection class shaft input	IP64 or IP67
Protection class housing	IP64 (IP67 optional)
Flange	Synchro flange, clamping flange, hubshaft with tether, square flange
Shaft diameter	Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm
Max. speed	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}
Shaft load	axial 40 N / radial 60 N
Operating temperature	-40 … 70 °C
Weight approx. ST/MT	260 g / 310 g
Technical Data - electrical	
Supply voltage	DC 10 - 30 V
Max. current w/o load	max. 250 mA
Interface	SSI programmable
Resolution singleturn	10 - 17 Bit
Resolution multiturn	12 Bit
Parameterization	resolution, code type, sense of rotation, output format, warning, alarm
Control input	Direction, Preset 1, Preset 2
Alarm output	Alarm bit
Status LED	Green = ok.; red = alarm
Connection	Cable radial or axial Conin radial or axial, ccw
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Absolute Shaft Encoders - ACURO industry

AC 110 - BiSS / SSI

Special Features
- Hollow shaft up to 50 mm
- Singleturn up to bis 17 Bit



Type	AC 110 - BiSS / SSI
Technical Data - mechanical	**(preliminary)**
Housing diameter	110 mm
Shaft diameter	up to 50 mm
Protection class shaft	IP50 or IP64
Protection class housing	IP50 or IP64
Flange	Hollowshaft with tether
Max. speed	IP50: 3600 min^{-1} IP64: 1500 min^{-1}
Spring tether (hollow shaft) Tolerance axial / radial	± 0.5 mm / ± 0.05 mm
Vibration resistance (IEC 68-2-6)	100 m/ s^2 (10 - 500 Hz)
Shock resistance (IEC 68-2-27)	1000 m/ s^2 (6 ms)
Operating temperature	-20 ...+70°C
Storage temperature	-50 ...+80°C
Weight approx.	1000 g
Technical Data - electrical	**(preliminary)**
Supply voltage	DC 5 V (–5 %/ +10 %) or DC 10-30 V
Max. current w/o load ST/MT	120 mA
Lines/ Drives	Clock and Data/ RS422
Output code	Binary or Gray
Resolution singleturn	10 - 17 Bit
Incremental signals	Sine - Cosine 1 Vpp
No. of increments	4096
3 dB limiting frequency	500 kHz
Absolute accuracy	± 35“
Repeatability	± 7“
Alarm output	alarm bit (SSI), warning bit and alarm bit (BiSS)
Connection	Cable radial Cable with Conin-Coupling
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Absolute Shaft Encoders
Stainless Steel / Explosion-Proof





Type	AC 59/61	AX 70/ AX 71 (Stainless)
Special Features	■ Compact design ■ Protection class IP67 ■ High corrosion resistance ■ Robust design ■ Resolution up to 29 Bit (17 Bit ST, 12 Bit MT) ■ Connection with cable or with bus terminal box ■ Applications: - Packaging machine for food and beverage - Ship equipment (e.g. cranes, winches, cable laying ships) - Offshore - Applications	■ ATEX certification for gas and dust explosion proof ■ EX-classification: Ex II 2 G/D E Ex d II C T4/T6 ■ Same electrical performance as ACURO industry ■ Protection class up to IP67 ■ Diameter only 70 mm ■ Robust design ■ Available with stainless steel ■ Resolution up to 29 Bit (17 Bit ST, 12 Bit MT) ■ Applications: enamelling production line, petro chemistry, bottling machines, mixers, silo works, mills ■ Interfaces: SSI, SSI programmable, Profibus, CANopen
Technical Data – mechanical		
Housing diameter		70 mm
Shaft diameter	10 mm	10 mm
Flange	Square flange 63.5 x 63.5 mm	Clamping flange
Max. speed	Short term: 10 000 min^{-1} Continuous: 6 000 min^{-1}	6 000 min^{-1} (T6) 10 000 min^{-1} (T4)
Torque	< 1 Ncm	≤ 1 Ncm
Moment or inertia	approx. 20 gcm^2	approx. 20 gcm^2
Max. shaft load	axial 40 N/ radial 60 N	axial 40 N/ radial 100 N
Vibration proof (IEC 68-2-6)	100 m/ s^2 (10 - 500 Hz)	100 m/ s^2 (10 - 500 Hz)
Shock resistance (IEC 68-2-27)	1000 m/ s^2 (6 ms)	1000 m/ s^2 (6 ms)
Operating temperature	SSI, BiSS, Parallel: -40...+100°C SSI-P, Interbus: -40...+70°C Profibus, CANopen, CANlayer2, DeviceNet: -40...+ 85°C	-40 ... +60 °C (T4) -40 ... +40 °C (T6)
Storage temperature	40...+ 85°C	-25 ... +80 °C
Material Shaft/ Housing	Stainless steel	Aluminium (AX 70) Stainless steel (AX 71)
Weight approx.	AC 59 with 1.5 m cable: 700 g AC 61 with 1.5 m cable: 980 g AC 61 with bus cover (MT): 1 180 g	1 000 g (AX 70), 1 900 g (AX 71)
Technical Data – electrical		
	The electrical data depend on the type of interface. Please refer to the specific interface chapter.	The electrical data depend on the type of interface. Please refer to chapter "AX 70 / AX 71".
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Motor Feedback Systems - Kit Encoders
for Miniature DC and Stepper Motors







Type	E 9	M 9	M 14
Special features	■ ideal for position and speed sensing in small machines and actuators ■ low power standby mode is ideal for battery powered devices ■ 200 kHz operating frequency ■ resolution to 512 lines/rev	■ ideal for position and speed sensing in small machines and actuators ■ 200 kHz operating frequency ■ resolution to 512 lines/rev	■ ideal economical feedback device for servo and stepper motors ■ short axial length and compact 1.5 inch diameter ■ easy "snap-on" installation ■ high resolution to 1024 lines/rev and 200 kHz bandwidth ■ drop-in replacement for HP 5540
Number of pulses	100 ... 512	100 ... 512	200 ... 1 024
Commutation	None	None	None
Technical Data - mechanical			
Shaft diameter	Hollow shaft Ø 1.5 ... 4.0 mm	Hollow shaft Ø 1.5 ... 4.0 mm	Hollow shaft Ø 3.0 ... 8.0 mm
Max. speed	12 000 min^{-1}	12 000 min^{-1}	12 000 min^{-1}
Protection class housing/bearing	---	---	---
Operating temperature	-40 ... + 100 °C	-40 ... + 100 °C	-40 ... + 100 °C
Diameter	22.0 mm	22.0 mm	38.0 mm
Mounting depth	20.0 mm	14.8 mm	17.2 mm
Technical Data - electrical			
Output	TTL	TTL	TTL
Supply voltage (SELV)	DC 5 V ±10 %	DC 5 V ±10 %	DC 5 V ±10 %
Max. current w/o load	10 mA, typ. Standby current: max. 50 µA	10 mA, typ.	10 mA, typ.
Max. pulse frequency	200 kHz	200 kHz	200 kHz
Max. output load	3 mA (25°C), 2 mA (100°C)	3 mA (25°C), 2 mA (100°C)	6mA (25°C) 4 mA (100°C)
Pulse shape	Square wave	Square wave	Square wave
Phasing	90°±18° electrical	90°±18° electrical	90°±18° electrical
Symmetry	180°±18° electrical	180°±18° electrical	180°±18° electrical
Page	180	183	186

Motor Feedback Systems - Hollow shaft Encoders
for Asynchronous & DC Motors





Type	RI 36-H	RI 58-D	RI 58TD
Special features	■ miniature industry encoder for high numbers of pulses ■ short mounting depth ■ easy mounting procedure ■ applications, e.g. motors, machine tools, packaging machines, robots, automated SMD equipment	■ direct mounting without coupling ■ flexible hollow shaft concept up to 14 mm ■ through hollow shaft or as end shaft (blind shaft) ■ easy mounting procedure with clamping flange or fastening thread ■ short mounting depth of 33 mm ■ operating temperature up to 80 °C ■ Fixing of the flage with a stator coupling or cylindric pin ■ applications, e.g. positioning drives, motors	■ direct mounting without coupling ■ flexible hollow shaft concept up to 14 mm ■ through hollow shaft or as end shaft (blind shaft) ■ easy mounting procedure with clamping flange or fastening thread ■ short mounting depth of 33 mm ■ operating temperature up to 100 °C ■ Fixing of the flage with a stator coupling or cylindric pin ■ applications, e.g. positioning drives, motors
Number of pulses	5 ... 3 600	1 ... 5 000	4 ... 2 500
Commutation	None	None	None
Technical Data - mechanical			
Shaft diameter	Hollow shaft 4 / 6 / 8 / 10 mm	Hollow shaft 10 mm / 12 mm / 14 mm	Hollow shaft 10 mm / 12 mm / 14 mm
Max. speed	10 000 min^{-1}	6 000 min^{-1}	6 000 min^{-1}
Max. speed (continuous)			
Protection class housing/bearing	IP64/64	IP65/64	IP65/64
General design	as per DIN VDE 0160, protection class III	as per DIN VDE 0160, protection class III	as per DIN VDE 0160, protection class III
Operating temperature	-10 ... +70 °C	-10 ... +70 °C	-25 .. +100 °C
Diameter	36 mm	58 mm	58 mm
Mounting depth	39 mm	33 mm .. 50.5 mm (depends on version)	33 mm .. 50.5 mm (depends on version)
Technical Data - electrical			
Output	RS 422 / push-pull / push-pull complementary	RS 422 / push-pull / push-pull complementary	RS 422 / push-pull / push-pull complementary
Supply voltage (SELV)	DC 5 V / DC 10 - 30 V	DC 5 V / DC 10 - 30 V	DC 5 V / DC 10 - 30 V
Max. current w/o load	40 mA (DC 5 V), 30 mA (DC 24 V), 60 mA (DC 10 V)	40 mA (DC 5 V), 30 mA (DC 24 V), 60 mA (DC 10 V)	40 mA (DC 5 V), 30 mA (DC 24 V), 60 mA (DC 10 V)
Max. pulse frequency	300 kHz (RS 422) 200 kHz (push-pull)	300 kHz (RS 422) 200 kHz (push-pull)	300 kHz (RS 422) 200 kHz (push-pull)
Max. output load	RS 422: ±30 mA push-pull with short circuit protection: 30 mA (DC 10 - 30 V)	RS 422: ±30 mA push-pull with short circuit protection: 30 mA (DC 10 - 30 V)	RS 422: ±30 mA push-pull with short circuit protection: 30 mA (DC 10 - 30 V)
Pulse shape	Square wave	Square wave	Square wave
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Motor Feedback Systems - Hollow shaft Encoders
for Asynchronous & DC Motors





Type	RI 76TD	RI 80-E
Special features	■ through hollow shaft ■ shaft diameters 15 to 42 mm ■ external diameter only 76 mm ■ simple installation with clamping ring front or rear ■ operating temperature up to 100 °C ■ applications e.g. motors, printing machines, elevators	■ incremental Output ■ 30...45 mm hollow shaft ■ rugged mechanical design ■ unbreakable disc ■ integrated diagnostic system ■ wide voltage range DC 5 … 30 V
Number of pulses	1 ... 10 000	1024, 2048, 4096 other number of pulses on request
Commutation	None	None
Technical Data - mechanical		
Shaft fixation	Clamping ring front or rear	Keyway, set screw
Coupling	stator coupling (hubshaft with tether)	Spring tether (single, double)
Shaft diameter	Hollow shaft 15 ... 42 mm	Hollow shaft 30 ... 45 mm
Max. speed	6 000 min^{-1} (depends on version)	3 600 min^{-1} (IP50), 1 500 min^{-1} (IP64)
Protection class housing/bearing	IP50/40 (Option: IP65/64)	IP50, IP64
General design	as per DIN EN 61010, protection class III, Contamination level 2, over voltage class II	as per DIN EN 61010, protection class III, Contamination level 2, over voltage class II
Operating temperature	-25 ... +100 °C	-20 ... +70 °C
Connection	Cable radial	Sub-D 15p. / cable, radial
Diameter	76 mm	
Weight	320 ... 580 g (depends on version)	1 000 g
Technical Data - electrical		
Output	RS 422 / push-pull / push-pull complementary	RS 422 / push-pull / push-pull complementary
Supply voltage (SELV)	DC 5 V / DC 10 - 30 V	DC 5 V ±10% or DC 5 - 30 V
Max. current w/o load	60 mA (DC 5 V), 60 mA (DC 10 V), 35 mA (DC 24 V)	60 mA (DC 5 V), 60 mA (DC 10 V), 35 mA (DC 24 V)
Max. pulse frequency	300 kHz (RS 422) 200 kHz (push-pull)	600 kHz (RS 422) 200 kHz (push-pull)
Max. output load	RS 422: ±30 mA push-pull with short circuit protection: 30 mA (DC 10 - 30 V)	RS 422: ±30 mA push-pull with short circuit protection: 40 mA (DC 5 - 30 V)
Alarm output	NPN-O.C. 5 mA	NPN-O.C. 5 mA
Pulse shape	Square wave	Square wave
Pulse duty factor	1 : 1	1 : 1
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for Asynchronous & DC Motors



Type	RIS 58-H
Special features	■ harmonic distortion less than 1 % ■ extended temperature range, -40° up to +100 °C ■ 500 kHz sine-wave incremental signal frequency response ■ self-monitoring and error compensation ■ secure against short-circuit and overload
Number of pulses	1 000, 1 024, 2 048, 2 500, 5 000
Technical Data - mechanical	
Shaft diameter	10 mm, 12 mm hollow shaft
Balance tolerances	axial ±1.5 mm, radial ±0.2 mm
Max. speed	12 000 min $^{-1}$
Torque	≤ 1 Ncm
Protection (EN 60529)	Bearing IP64, Housing IP65
General design	as per DIN EN 61010-1
Operating temperature	-40 ... +100 °C
Vibration (IEC 68-2-6)	≤ 100 m/s^2
Shock (IEC 68-2-27)	≤ 1 000 m/s^2
Material housing	Aluminium
Connection	Cable axial or radial Conin axial or radial
Size	Ø 58 mm
Weight approx.	270 g
Technical Data - electrical	
Supply voltage (SELV)	DC 5 V / ±10 %
Max. current w/o load	120 mA
Incremental signals A, B	Sine - Cosine 1 Vpp
Absolute accuracy	±35“
Repeatability	±7“
Max. output frequency	500 kHz
Reference signal: R	> 0,4 V (1 pulse / turn)
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for Asynchronous & DC Motors





Type	AC 58 - BiSS / SSI	AC 110 - BiSS / SSI
Technical Data - mechanical		
Housing diameter	58 mm	110 mm
Shaft diameter	Hub shaft 10 mm, 12 mm	up to 50 mm
Protection class shaft input	IP64 or IP67	IP50 or IP64
Protection class housing	IP64 (IP67 optional)	IP50 or IP64
Flange	Hubshaft with tether	Hollow shaft with tether
Max. speed	Continuous: 10 000 min^{-1}, Short term: 12 000 min^{-1}	IP50: 3600 min^{-1} IP64: 1500 min^{-1}
Shaft load	axial 40 N / radial 60 N	
Spring tether (hollow shaft) Tolerance axial / radial	± 1.5 mm/ ± 0.2 mm	± 0.5 mm / ± 0.05 mm
Shock resistance (IEC 68-2-27)	1 000 m/s^2 (6 ms)	1000 m/s^2 (6 ms)
Vibration resistance (IEC 68-2-6)	100 m/s^2 (10 ... 2 000 Hz)	100 m/s^2 (10 - 500 Hz)
Operating temperature	-40 … 100 °C	-20 ...+70°C
Weight approx. ST/MT	260 g / 310 g	1000 g
Technical Data - electrical		
Supply voltage	DC 5 V, -5 % / + 10 % or DC 10 - 30 V	DC 5 V (–5 %/ +10 %) or DC 10-30 V
Max. current w/o load ST/MT	50 mA / 100 mA	120 mA
Interface	BiSS or Standard SSI	BiSS or Standard SSI
Lines/ Drives	Clock and Data/ RS422	Clock and Data/ RS422
Output code	Binary or Gray	Binary or Gray
Linearity	±1/2 LSB (± 1 LSB for resolution > 13 Bit)	
Resolution singleturn	10-17 Bit, Gray Excess: 360, 720 steps	10 - 17 Bit
Resolution multiturn	12 Bit	only singleturn
Optional incremental signals	Sine - Cosine 1 Vpp	Sine - Cosine 1 Vpp
Number of pulses	2048	4096
3 db limiting frequency	500 kHz	500 kHz
Absolute accuracy	±35“	± 35“
Repeatability	±7“	± 7“
Parameterization	Code type, sense of rotation, warning, alarm	Code type, sense of rotation, warning, alarm
Control input	$\overline{\text{Direction}}$	$\overline{\text{Direction}}$
Reset key	Disable via parameterization	
Alarm output	Alarm bit (SSI option), warning bit and alarm bit (BiSS)	Alarm bit (SSI option), warning bit and alarm bit (BiSS)
Status LED	Green = OK.; red = alarm	
Connection	Cable axial or radial Conin axial or radial M12, 8 pole	Cable radial Cable with Conin-Coupling
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Motor Feedback Systems - Comcoders
for AC Synchronous & BLDC Motors





Type	M15	M21
Special features	■ through hollow shaft, diameter 3.18 ... 10 mm ■ output signals: A, B, N as incremental signals as well as 4, 6 or 8 pole commutation signals ■ external diameter 40 mm (1.5 ") ■ mounting depth only 28 mm (1.1") ■ max. speed up to 12 000 min^{-1} ■ operating temperature up to 120°C	■ through hollow shaft, diameter 6 ... 12.7 mm ■ output signals: A, B, N as incremental signals as well as 4, 6, 8, 10, 12 or 16 pole commutation signals ■ external diameter 53 mm (2.1") ■ mounting depth only 20 mm (0.8") ■ max. speed up to 12 000 min^{-1} ■ operating temperature up to 120°C
Number of pulses	200 ... 1 024	500 ... 2 048
Commutation	4, 6 or 8 pole	4, 6, 8, 10, 12 or 16 pole
Technical Data - mechanical		
Shaft diameter	Hollow shaft 3.18 ... 10 mm	Hollow shaft 6 ... 12.7 mm
Max. speed	12 000 min^{-1}	12 000 min^{-1}
Max. speed (continuous)		
Protection class housing/bearing	IP40/40	IP40/40 (with cover)
General design		
Operating temperature	-40 ... +120 °C	-40 ... +120 °C
Diameter	39.6 mm	53 mm
Mounting depth	27.9 mm	20.3 mm
Technical Data - electrical		
Output	NPN-O.C./ RS 422	NPN-O.C. / RS 422
Supply voltage (SELV)	DC 5 V / DC 12 V ±10%	DC 5 V / DC 2 V ±10%
Max. current w/o load	Incremental: max. 100 mA Incremental + Commutation: 120 mA	Incremental: max. 100 mA Incremental + Commutation: 175 mA
Max. pulse frequency	200 kHz	200 kHz
Max. output load	NPN-O.C. 16 mA RS 422: ±40 mA	RS 422: ±40 mA NPN-O.C. 16 mA
Max. output load commutation	NPN-O.C. 16 mA RS 422: ±40 mA	NPN-O.C. 16 mA RS 422: ±40 mA
Pulse shape	Square wave	Square wave
Phasing	90°±18° electrical	90°±18° electrical
Symmetry	180°±18° electrical	180°±18° electrical
Accuracy commutation signals	±6 arc-mins. max.	±6 arc-mins. max.
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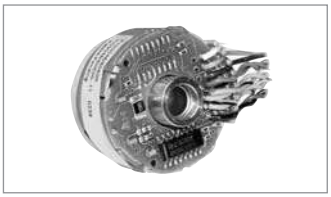
Motor Feedback Systems - Comcoders
for AC Synchronous & BLDC Motors







Type	F10	F15	F21
Special features	■ through hollow shaft, diameter 6 mm ■ output signals: A, B, N as incremental signals as well as 6 or 10 pole commutation signals ■ resolution up to 2 048 ppr ■ frequency response to 300 kHz ■ resolver compatible mounting ■ operating temperature up to 120 °C	■ through hollow shaft, diameter 9.52 mm ■ output signals: A, B, N as incremental signals as well as 6, 8 or 10 pole commutation signals ■ resolution up to 2 048 ppr ■ frequency response to 300 kHz ■ resolver compatible mounting ■ operating temperature up to 120 °C	■ through hollow shaft, diameter 12.7 mm ■ output signals: A, B, N as incremental signals as well as 6, 8,10,12 or 16 pole commutation signals ■ resolution up to 2 048 ppr ■ frequency response to 300 kHz ■ resolver compatible mounting ■ operating temperature up to 120 °C
Number of pulses	1 024, 2 048	1 024, 2 048	1 024, 2 048
Commutation	6 or 10 pole	6, 8 or 10 pole	6, 8, 10, 12 or 16 pole
Technical Data - mechanical			
Shaft diameter	Hollow shaft 6 mm	Hollow shaft 9.52 mm	Hollow shaft 12.7 mm
Max. speed	12 000 min^{-1}	12 000 min^{-1}	12 000 min^{-1}
Max. speed (continuous)	5 000 min^{-1}	5 000 min^{-1}	5 000 min^{-1}
Protection class housing/bearing	---	---	---
General design			
Operating temperature	0° ... +120 °C	0° ... +120 °C	0° ... +120 °C
Diameter	31.7mm max.	36.8 mm max.	53 mm max.
Mounting depth	22.5 mm	22.4 mm	26 mm max.
Technical Data - electrical			
Output	RS422	RS422	RS422
Supply voltage (SELV)	DC 5 V ±10 %	DC 5 V ±10 %	DC 5 V ±10 %
Max. current w/o load	100 mA max.	100 mA max.	100 mA max.
Max. pulse frequency	300 kHz	300 kHz	300 kHz
Max. output load	RS422: ±40mA,	RS422: ±40mA,	RS422: ±40mA,
Max. output load commutation	O.C.: 8mA or RS 422: ±40mA,	O.C.: 8mA or RS 422: ±40mA,	O.C.: 8mA or RS422: ±40mA,
Pulse shape	Square wave	Square wave	Square wave
Accuracy incremental signals	±2.5 arc-mins.	±2.5 arc-mins.	±2.5 arc-mins.
Accuracy commutation signals	±6 arc-mins. max.	±6 arc-mins. max.	±6 arc-mins. max.
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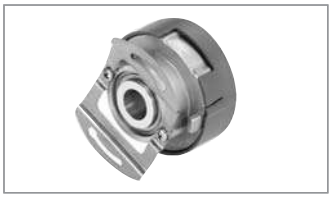
Motor Feedback Systems - Comcoders
for AC Synchronous & BLDC Motors





Type	F14	F18
Special features	■ through hollow shaft, diameter 6 ... 8mm ■ Phased Array Technology ■ resolution up to 5 000 ppr ■ with 4, 6, 8 and 10 pole commutation signals ■ frequency response to 500 kHz ■ stator coupling ■ resolver compatible mounting (optional) ■ external diameter 40 mm ■ operating temperature up to +120°C	■ through hollow shaft, diameter 6 ... 12.7 mm ■ Phased Array Technology ■ resolution up to 10 000 ppr ■ with 4, 6, 8, 10, 12 and 16 pole commutation signals ■ frequency response to 500 kHz ■ stator coupling ■ external diameter 50 mm ■ operating temperature up to +120°C
Number of pulses	200 ... 5 000	500 ... 10 000
Commutation	4, 6, 8 or 10 pole	4, 6, 8, 10, 12 or 16 pole
Technical Data - mechanical		
Shaft diameter	Hollow shaft 6 ... 8 mm	Hollow shaft 6 ... 12.7 mm
Max. speed	12 000 min^{-1}	12 000 min^{-1}
Max. speed (continuous)		
Protection class housing/bearing	IP40/40 (with cover)	IP40/40 (with cover)
General design		
Operating temperature	0° ... +120 °C	0° ... +120 °C
Diameter	39.4 mm	49.7 mm
Mounting depth	34.6 mm max.	43.4 mm max.
Technical Data - electrical		
Output	O.C. or RS 422	O.C. or RS 422
Supply voltage (SELV)	DC 5 V ±10 %	DC 5 V ±10 %
Max. current w/o load	Incremental: max. 150 mA Incremental + Commutation: 175 mA	Incremental: max. 150 mA Incremental + Commutation: 175 mA
Max. pulse frequency	500 kHz	500 kHz
Max. output load	RS 422: ±40 mA NPN-O.C. 16 mA	RS 422: ±40 mA NPN-O.C. 16 mA
Max. output load commutation	NPN-O.C. 16 mA RS 422: ±40 mA	NPN-O.C. 16 mA RS 422: ±40 mA
Pulse shape	Square wave	Square wave
Accuracy incremental signals	±2.5 arc-mins.	±2.5 arc-mins.
Accuracy commutation signals	±6 arc-mins. max.	±6 arc-mins. max.
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Motor Feedback Systems - Comcoders
for AC Synchronous & BLDC Motors



Type	RF53
Special features	■ Solid shaft motor encoder for BLDC and gearless elevator traction machines ■ Incremental & Commutation ■ up to 10 000 ppr ■ up to +120 °C operating temperature ■ IP54 ■ Housing diameter 53 mm
Number of pulses	500 ... 10 000
Commutation	4, 6, 8, 10, 12,16, 20, 24 or 32 pole
Technical Data - mechanical	**(preliminary)**
Housing diameter	53 mm
Shaft	cone solid shaft
Flange	spring tether
Protection class housing/bearing	IP54
Shaft load axial/ radial	20 / 90 N
Axial runout of mating shaft	±1.4 mm
Radial runout of mating shaft	±0.18 mm
Max. speed	12 000 U/min (short term) 5 000 U/min (continuous)
Max. operating temperature	-20°C … +120°C
Vibration resistance	1000 m/s²
Shock resistance	25 m/s²
Material shaft / housing	Stainless steel / Aluminium
Weight	200 g
Connection	Sub-D connector PCB-connector with mating connector and cable
Technical Data - electrical	**(preliminary)**
Output	O.C-NPN. or RS 422
Supply voltage	DC 5 ±10%
Max. current w/o load	100 mA
Code	Incremental with commutation option, optical
Tolerance Incremental signals	±2,5 arc-mins. max. (edge to edge)
Tolerance Commutation	±6 arc-mins. max.
Output frequency	max. 100 kHz
Output circuit	Differential line driver (ET7272), 40 mA max. Open Collector, max. 8 mA; Pull up mit 2,0 kOhm
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Motor Feedback Systems - Absolute Encoders
for AC Synchronous & BLDC Motors





Type	AD 36	AD 58	AC 110
Technical Data - mechanical			
Housing diameter	37.5mm	58 mm	110 mm
Shaft diameter	8 mm	Cone 10 mm	up to 50 mm
Protection class shaft input	IP40	IP40	IP50 or IP64
Protection class housing	IP40	IP40	IP50 or IP64
Flange	Hollow shaft with tether	Hollow shaft with tether, tapered shaft	Hollow shaft with tether
Max. speed	Continuous 10 000 min^{-1}, Short term 12 000 min^{-1}	Continuous 10 000 min^{-1}, Short term 12 000 min^{-1}	IP50: 3600 min^{-1} IP64: 1500 min^{-1}
Shaft load	0.01 Nm	0.01 Nm	
Torque	2.5 x 10^{-6} kgm^2	3.8 x 10^{-6} kgm^2	
Spring tether (hollow shaft) Tolerance axial / radial	± 0.5 mm/ ±0.05 mm	± 1.5 mm/ ±0.2 mm	± 0.5 mm / ± 0.05 mm
Shock resistance (IEC 68-2-27)	1 000 m/s^2 (6 ms)	1 000 m/s^2 (6 ms)	1000 m/ s^2 (6 ms)
Vibration resistance (IEC 68-2-6)	100 m/s^2 (10 ... 2 000 Hz)	100 m/s^2 (10 ... 2 000 Hz)	100 m/ s^2 (10 - 500 Hz)
Operating temperature	-25 … +100 °C	-15… +120 °C	-20 ...+70°C
Weight approx. ST/MT	80 g / 130 g	216 g / 310 g	1000 g
Technical Data - electrical			
Supply voltage	DC 5 V (–5 %/ +10 %) or DC 7-30 V	DC 5 V, -5 % / + 10 %	DC 5 V (–5 %/ +10 %) or DC 10-30 V
Max. current w/o load ST/MT	50 mA / 100 mA	50 mA / 100 mA	120 mA
Interface	BiSS or Standard SSI	BiSS or Standard SSI	
Lines/ Drives	Clock and Data / RS422	Clock and Data / RS422	Clock and Data/ RS422
Output code	Binary or Gray	Binary or Gray	Binary or Gray
Resolution singleturn	12 - 17 Bit (SSI), 12 - 19 Bit (BiSS)	13 Bit (SSI) ... max. 22 Bit (BiSS)	10 - 17 Bit
Resolution multiturn	12 Bit	12 Bit	only singleturn
Optional incremental signals	Sine - Cosine 1 Vpp	Sine - Cosine 1 Vpp	Sine - Cosine1 Vpp
Number of pulses	2048	2048	4096
3 db limiting frequency	500 kHz	500 kHz	500 kHz
Absolute accuracy	±35"	±35"	± 35"
Repeatability	±7"	±7"	± 7"
Alarm output	Alarm bit (SSI), warning bit and alarm bit (BiSS)	alarm bit (SSI), warning bit and alarm bit (BiSS)	alarm bit (SSI), warning bit and alarm bit (BiSS)
Connection	Cable PCB-Connector 12 pole	Cable PCB-Connector 12 pole	Cable radial Cable with Conin-Coupling
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for AC Synchronous & BLDC Motors



Type	S21
Special features	■ operating temperature range of -15 up to +120 °C ■ 500 kHz limiting frequency with excellent signal quality ■ excellent immunity to interference (EN 61000-4-4, Class 4) ■ signal control and system monitoring ■ high signal quality through control and error compensation
Technical Data - mechanical	
Shaft form	Cone 1/10
Shaft variations	Tapered solid shaft (Tapered hollow shaft on request)
Shaft diameter	10 mm
Absolute max. shaft load radial / axial	with tapered solid shaft: 90 N / 20 N
Balance tolerances	axial ± 0.5 mm, radial ± 0.1 mm
Max. speed	12.000 min $^{-1}$
Torque	≤ 1 Ncm
Protection class (EN 60529)	IP40
General design	as per DIN EN 61010-1
Operating temperature	-15 ... +120 °C
Vibration resistance (IEC 68-2-6)	≤ 100 m/s^2
Shock resistance (IEC 68-2-27)	≤ 1000 m/s^2
Material housing	Aluminium
Connection	PCB connector + cable
Size	Ø 53.5 mm
Weight approx.	170 g
Technical Data - electrical	
Supply voltage (SELV)	DC 5 V ±10 %
Max. current w/o load	max. 120 mA
Incremental signals A, B	Sine - Cosine 1 Vpp
Number of pulses	2048
Absolute accuracy	±35"
Repeatability	±7"
Max. output frequency	500 kHz
Reference signal: R	> 0.4 V (1pulse / turn)
Commutation signal: C, D	Sine - Cosine 1 Vpp (1 period / turn)
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Motor Feedback Systems - Resolver
for AC Synchronous & BLDC Motors



Type	Resolvers
Special features	■ Through hollow shaft, diameter 4 up to 92 mm ■ compact design ■ easy and quick mounting procedure (standardized resolver mounting) ■ Operating temperature up to 155 °C ■ Applications, e.g. motors, maschine tools, robots, automated SMD equipment, medical technology
Number of pulses	Drive or external electronics
Commutation	Drive or external electronics
Technical Data - mechanical	
Shaft diameter	Hollow shaft 4.0 .. 92.7 mm
Max. speed	20 000 min^{-1} (special: >30 000 min^{-1})
Max. speed (continuous)	
Protection class housing/bearing	---
General design	
Operating temperature	-25 ... +155 °C
Diameter	Ø 26.5 ... 139.7 mm
Mounting depth	16.5 ... 31.8 mm
Technical Data - electrical	
Output	depends on input signal
Supply voltage (SELV)	
Max. current w/o load	
Max. pulse frequency	
Max. output load	
Max. output load commutation	
Pulse shape	Sine
Tolerance	typical +/- 10°
Accuracy commutation signals	---
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