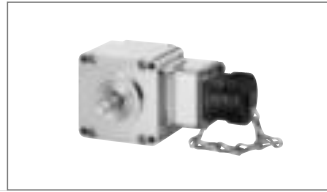


Heavy Duty Types - Incremental

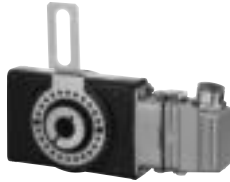
NorthStar™



Type	HD 20	HD 25	HSD 25
Special features	<ul style="list-style-type: none"> ■ Single or Dual output ■ ATEX Certification available for Intrinsically Safe application ■ High Resolution Unbreakable Disk ■ Industrial Duty Connector ■ NEMA 4X / IP67 Rated ■ Nickel or Stainless Steel Housing available 	<ul style="list-style-type: none"> ■ Single or Dual output ■ Optional high current line driver ■ ATEX Certification available for Intrinsically Safe application ■ High Resolution Unbreakable Disk ■ Industrial Duty Connector ■ NEMA 4X / IP67 Rated ■ Nickel or Stainless Steel Housing available 	<ul style="list-style-type: none"> ■ Single or Dual output ■ ATEX Certification available for Intrinsically Safe application ■ High Resolution Unbreakable Disk ■ Industrial Duty Connector ■ NEMA 4X, 6 / IP66, 67 Rated ■ Nickel or Stainless Steel Housing available
Technical Data - mechanical			
Housing diameter	52.3 mm	67.3 mm	58.93 mm
Shaft diameter	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 19.05 mm (Hubshaft)
Flange (Mounting of housing)	Square flange	Square flange	Tether
Protection class shaft input	NEMA 4X or IP67	NEMA 4X or IP67	NEMA 4X or NEMA 6 IP66 or IP67
Protection class housing	NEMA 4X or IP67	NEMA 4X or IP67	NEMA 4X or NEMA 6 IP66 or IP67
Shaft load axial / radial	max.: 440 N / 440 N	max.: 440 N / 440 N	
Max. speed	max. 6000 rpm	max. 6000 rpm	
Vibration resistance	200 m/s ² (5 ... 2000 Hz)	200 m/s ² (5 ... 2000 Hz)	200 m/s ² (5 ... 2000 Hz)
Shock resistance	500 m/s ² (11 ms)	500 m/s ² (11 msec)	500 m/s ² (11 sec)
Operating temperature	-40 °C ... +100 °C ATEX: -40 °C ... +80 °C	-40 °C ... +100 °C ATEX: -40 °C ... +80 °C	-40 °C ... +100 °C ATEX: -40 °C ... +80 °C
Connection	MS / M12	MS / M12	MS / M12
Technical Data - electrical			
Supply voltage	DC 5 - 26 V		
Max. current w/o load	max. 50 mA	max. 50 mA	max. 50 mA
Max. pulse frequency	125 kHz	125 kHz	125 kHz
Output	RS422 / Push-Pull / NPN-O.C.	RS422 / Push-Pull / NPN-O.C.	RS422 / Push-Pull / NPN-O.C.
Pulse shape	Square wave	Square wave	Square wave
Page	44	48	52

Heavy Duty Types - Incremental

NorthStar™



Products

Type	HSD 35	HSD 37	HSD 38
Special features	<ul style="list-style-type: none"> ■ Hollow Shaft design eliminates mounting bracket, flexible shaft coupling, and installation labor ■ Bore is electrically and thermally insulated ■ Single or Dual output - Optional high current line driver ■ Choice of Stamped Metal or Swivel Rod Tether ■ High Resolution Unbreakable Disk ■ Industrial Duty Latching Connector ■ NEMA 4 / IP65 Rated 	<ul style="list-style-type: none"> ■ Single or Dual Output ■ Double-Sealed Housing ■ ATEX Certification for Intrinsically Safe Applications ■ High Resolution Unbreakable Disk ■ Electrically and Thermally Isolated ■ Industrial Duty Connector ■ NEMA 4X, 6 / IP66, 67 Rated ■ Rugged Cast-Aluminum Housing ■ Stainless Steel Housing Available 	<ul style="list-style-type: none"> ■ Double-Sealed Housing ■ High Resolution Unbreakable Disk ■ Electrically and Thermally Isolated ■ Industrial Duty Connector ■ NEMA 4X, 6 / IP66 or IP67 Rated ■ Rugged Cast-Aluminum Housing
Technical Data - mechanical			
Housing diameter	90.2 mm	95.25 mm	96.52 mm
Shaft diameter	6 mm ... 31.75 mm (Through hollow shaft)	12 mm ... 22.2 mm (Through hollow shaft)	12 mm ... 22.2 mm (Hubshaft)
Flange (Mounting of housing)	Tether, Swivel rod	Tether	Tether
Protection class shaft input	IP65 or NEMA 4	NEMA 4X or NEMA 6 IP66 or IP67	NEMA 4X or NEMA 6 IP66 or IP67
Protection class housing	IP65 or NEMA 4	NEMA 4X or NEMA 6 IP66 or IP67	NEMA 4X or NEMA 6 IP66 or IP67
Max. speed	max. 3600 rpm		
Vibration resistance	200 m/s ² (5 ... 2000 Hz)	200 m/s ² (5 ... 2000 Hz)	200 m/s ² (5 ... 2000 Hz)
Shock resistance	500 m/s ² (11 ms)	500 m/s ² (11 msec)	500 m/s ² (11 msec)
Operating temperature	-40 °C ... +70 °C Option: 0 °C ... +100 °C	-40 °C ... +100 °C ATEX: -40 °C ... +80 °C	-40 °C ... +100 °C
Connection	10 pin connector	MS / M12	MS / M12
Technical Data - electrical			
Supply voltage			DC 5 - 26 V
Max. current w/o load	max. 100 mA	max. 50 mA	max. 50 mA
Max. pulse frequency	100 kHz	125 kHz	125 kHz
Output	Push-Pull / RS422 / RS422	RS422 / Push-Pull / NPN-O.C.	RS422 / Push-Pull / NPN-O.C.
Pulse shape	Square wave	Square wave	Square wave
Page	56	60	64

Heavy Duty Types - Incremental

NorthStar



Type	DWD 38
Special features	<ul style="list-style-type: none"> ■ Single or Dual output - NAMUR available ■ Well suited for DrawWorks/ oil field application ■ ATEX Certification available for Intrinsically Safe application ■ High Resolution Unbreakable Disk ■ Industrial Duty Connector ■ NEMA 4X / IP67 Rated ■ Nickel or Stainless Steel Housing available ■ Option: removable shaft with thread ■ Option: redundant output
Technical Data - mechanical	
Housing diameter	3.75"
Flange (Mounting of housing)	Synchro flange
Protection class shaft input	IP67 or NEMA 6
Protection class housing	IP67 or NEMA 6
Shaft load axial / radial	Max.: 100 N / 100 N
Vibration resistance	200 m/s ² (5 to 2000 Hz)
Shock resistance	500 m/s ² (11 msec)
Operating temperature	-40 °C ... +100 °C ATEX: -40 °C ... +80 °C
Connection	MS
Technical Data - electrical	
Supply voltage	DC 5 - 26 V
Max. current w/o load	max. 50 mA
Max. pulse frequency	125 kHz
Output	RS422 / NPN-O.C. / Push-Pull / NAMUR
Page	68

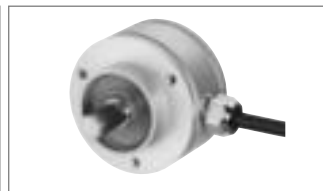
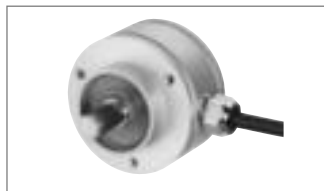
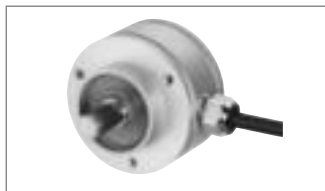
Heavy Duty Types - Absolute

ACURO®-XR HENGSTLER

SSI

SSI

CANopen



Type	AR 62/63 - BiSS/SSI	AR 62/63 - CANopen	AR 62/63 - Analogue
Special features	<ul style="list-style-type: none"> ■ Singleturn 12 Bit Resolution ■ 300 N axial and radial load ■ 200 g shock resistance ■ 20 g vibrations resistance ■ Submersible: Protection class up to IP69k ■ High temperature range: -40 ... +100°C ■ Compact design: 32 mm mounting depth ■ Option: Stainless steel housing ■ Option: Control inputs Preset and Direction 	<ul style="list-style-type: none"> ■ Singleturn 12 Bit Resolution ■ 300 N axial and radial load ■ 200 g shock resistance ■ 20 g vibration resistance ■ Submersible: Protection class up to IP69K ■ High temperature range: -40 ... +100°C ■ Compact design: 32 mm mounting depth ■ Option: Stainless steel housing 	<ul style="list-style-type: none"> ■ Singleturn 12 Bit Resolution ■ 300 N axial and radial load ■ 200 g shock resistance ■ 20 g vibration resistance ■ Submersible: Protection class up to IP69k ■ High temperature range: -40 ... +100°C ■ Compact design: 32 mm mounting depth ■ Option: Stainless steel housing ■ Option: Control inputs Preset and Direction
Technical Data - mechanical			
Housing diameter	58 mm	58 mm	58 mm
Mounting depth	32 mm	32 mm	32 mm
Shaft diameter			
Flange (Mounting of housing)	Synchro clamping flange	Synchro clamping flange	Synchro clamping flange
Protection class shaft input	IP67 or IP69k	IP67 or IP69k	IP67 or IP69k
Protection class housing	IP67 or IP69k	IP67 or IP69k	IP67 or IP69k
Shaft load axial / radial	max.: 300 N / 300 N	max.: 300 N / 300 N	max.: 300 N / 300 N
Max. speed	max. 5000 rpm	max. 5000 rpm	max. 5000 rpm
Vibration resistance	200 m/s ²	200 m/s ²	200 m/s ²
Shock resistance	2000 m/s ² (6 ms)	2000 m/s ² (6 ms)	2000 m/s ² (6 ms)
Operating temperature	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +100 °C
Connection	Cable / M12	Cable / M12	Cable / M12
Technical Data - electrical			
Supply voltage	DC 10-30 V	DC 10-30 V	DC 17 - 30 V
Max. current w/o load	max. 50 mA	max. 220 mA	max. 50 mA
EMC	EN 61326 Class A	EN 61326 Class A	EN 61326 Class A
Resolution singleturn	12 Bit	12 Bit	12 Bit
Interface			Analogue: 0 ... 10 V, Analogue: 4 ... 20 mA
Output code	Gray	Binary	
Interface		CAN High-Speed according to ISO/DIS 11898	
Profile/ protocol		CANopen according to DS 301 with profile DSP 406, programmable encoder according class C2	
Parametrization		Scaling, Preset, Offset, Direction	
Integrated special functions		Speed, Acceleration, Limit values	
Control inputs	Preset, Direction		Direction, Preset
Page	72	76	80

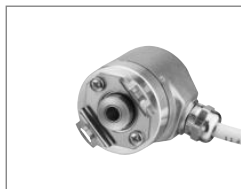
Standard Industrial Types - Incremental

Solid Shaft



Type	RI 30	RI 36-0	RI 58-0 / RI 58-T
Special features	<ul style="list-style-type: none"> ■ Miniature encoder for industrial use ■ Low current consumption ■ High noise interference immunity ■ Cable lengths of up to 100 m ■ Suitable for high pulse frequencies ■ High protection class ■ Applications: CNC machines, manipulators, motors, medical technology, textile machines 	<ul style="list-style-type: none"> ■ Miniature industry standard encoder for high numbers of pulses ■ High reliability ■ Applications: CNC axles, machine tools, robots, special purpose machines, high-speed winding machines 	<ul style="list-style-type: none"> ■ Universal industry standard encoder ■ Up to 40 000 steps with 10 000 pulses ■ High signal accuracy ■ Protection class up to IP67 ■ Flexible due to many flange and configuration variants ■ Suitable for high shock ratings ■ Applications: machine tools, CNC axles, packing machines, motors/ drives, injection moulding machines, sawing machines, textile machines ■ For EX version, see RX 70-I ■ Operating temperature up to 100 °C (RI 58-T)
Number of pulses	5 ... 1500	5 ... 3600	1 ... 10 000
Technical Data - mechanical			
Housing diameter	30 mm	36 mm	58 mm
Shaft diameter	5 mm (Solid shaft)	6 mm ... 6.35 mm (Solid shaft)	6 mm ... 12 mm (Solid shaft)
Flange (Mounting of housing)	Synchro flange, Pilot flange	Synchro flange, Pilot flange	Synchro flange, Clamping flange, Square flange, Synchro clamping flange
Protection class shaft input	IP64	IP64	IP64 or IP67
Protection class housing	IP64	IP64	IP65 or IP67
Shaft load axial / radial	5 N / 10 N	5 N / 10 N	Ø 6 mm / 6,35 mm: 20 N / 40 N Ø 7 ... 10 mm: 40 N / 60 N Ø 12 mm: 60 N / 80 N
Max. speed	max. 10 000 rpm	max. 10 000 rpm	max. 10 000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-10 °C ... +70 °C	-10 °C ... +70 °C	RI 58-0: -10 °C ... +70 °C RI 58-T: -25 °C ... +100 °C
Connection	Cable / M16	Cable / M16	cable / M23 / M16 / MS
Technical Data - electrical			
Supply voltage	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	max. 30 mA	max. 30 mA	max. 30 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz	RS422: 300 kHz Push-pull: 200 kHz	RS422: 300 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave	Square wave
Page	85	90	94

Standard Industrial Types - Incremental Hollow Shaft



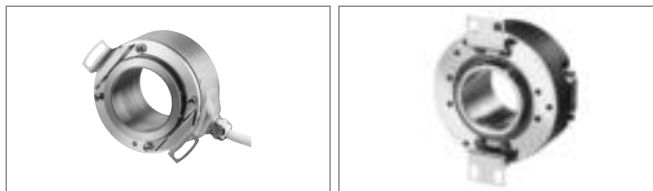
Type	RI 36-H	RI 58-H	RI 58-D / RI 58TD
Special features	<ul style="list-style-type: none"> ■ Miniature industry encoder for high number of pulses ■ Short mounting length ■ Easy mounting procedure ■ Applications: motors, machine tools, robots, automated SMD equipment 	<ul style="list-style-type: none"> ■ Through hollow shaft ■ High accuracy by means of integrated flexible coupling ■ Safe shaft mounting ■ Applications: textile machines, motors, drives, copiers 	<ul style="list-style-type: none"> ■ Direct mounting without coupling ■ Flexible hollow shaft design up to diameter 14 mm ■ Through hollow shaft or as end shaft (blind shaft) ■ Easy installation by means of clamping shaft or blind shaft ■ Short overall length of 33 mm ■ Fixing of flange by means of a stator coupling or set screw ■ Various shaft versions ■ Applications: actuators, motors ■ Operating temperature up to 100 °C (RI 58TD)
Number of pulses	5 ... 3600	1 ... 5000	1 ... 5000
Technical Data - mechanical			
Housing diameter	36 mm	58 mm	58 mm
Shaft diameter	4 mm ... 10 mm (Hubshaft)	10 mm ... 12 mm (Hubshaft)	10 mm ... 12 mm (Through hollow shaft) 10 mm ... 14 mm (Hubshaft)
Flange (Mounting of housing)	Tether	Synchro flange	Synchro flange
Protection class shaft input	IP64	IP64	IP64
Protection class housing	IP64	IP64	Through hollow shaft - D: IP64 Hubshaft - E,F: IP65
Max. speed	max. 10 000 rpm	max. 3000 rpm	max. 4000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	10 g = 100 m/s ² (10 ... 2000 Hz)	10 g = 100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)	100 g = 1000 m/s ² (6 ms)	100 g = 1000 m/s ² (6 ms)
Operating temperature	-10 °C ... +70 °C	-10 °C ... +70 °C	RI 58-D: -10 °C ... +70 °C RI 58TD: -25 °C ... +100 °C
Connection	Cable	Cable	Cable / M23
Technical Data - electrical			
Supply voltage	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	max. 30 mA	max. 30 mA	max. 30 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz	RS422: 300 kHz Push-pull: 200 kHz	RS422: 300 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA		NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave	Square wave
Page	104	109	113

Standard Industrial Types - Incremental Hollow Shaft



Type	RI 58-G / RI 58TG	RI 58-F
Special features	<ul style="list-style-type: none"> ■ Direct mounting without coupling ■ Through hollow shaft Ø 14 mm and 15 mm ■ Easy installation by means of clamping ring ■ Fixing of flange by means of a stator coupling or set screw ■ Applications: actuators, motors 	<ul style="list-style-type: none"> ■ Incremental hollow shaft encoder ■ Up to 10000 ppr ■ Through hollow shaft and hubshaft up to 12 mm (14 mm optional) ■ Optimized stator coupling ■ Applications: Feedback for asynchronous motors, industrial applications
Number of pulses	50 ... 2500	1 ... 10 000
Technical Data - mechanical		
Housing diameter	58 mm	58 mm
Shaft diameter	14 mm ... 15 mm (Through hollow shaft)	6 mm ... 12 mm (Hubshaft) 6 mm ... 12 mm (Through hollow shaft)
Flange (Mounting of housing)	Synchro flange	Tether
Protection class shaft input	IP64	IP64
Protection class housing	IP64	Through hollow shaft - D: IP64 Hubshaft - F: IP67
Max. speed	max. 4000 rpm	max. 6000 rpm
Vibration resistance	10 g = 100 m/s ² (10 ... 2000 Hz)	100 m/s ²
Shock resistance	100 g = 1000 m/s ² (6 ms)	1000 m/s ²
Operating temperature	RI 58-G: -10 °C ... +70 °C RI 58TG: -10 °C ... +100 °C	-10 °C ... +70 °C
Connection	Cable	Cable / M23
Technical Data - electrical		
Supply voltage	DC 5 V / DC 10-30 V	DC 5 V / DC 10-30 V
Max. current w/o load	max. 30 mA	max. 30 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz	
Output	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA	
Pulse shape	Square wave	
Page	122	128

Standard Industrial Types - Incremental Hollow Shaft



Type	RI 76TD	RI 80-E
Special features	<ul style="list-style-type: none"> ■ Through hollow shaft Ø 15 bis 42 mm ■ Outside diameter only 76 mm ■ Easy installation by means of clamping ring front or rear ■ Operating temperature up to 100 °C ■ Applications: motors, printing machines, lifts 	<ul style="list-style-type: none"> ■ Incremental ■ 30 - 45 mm hollow shaft ■ Rugged mechanical design ■ Unbreakable disc ■ Integrated diagnostic system ■ Wide voltage range DC 5 - 30 V ■ Isolated shaft
Number of pulses	1 ... 10 000	1024, 2048, 2500, 4096, 5000, 10 000 (other number of pulses on request)
Technical Data - mechanical		
Housing diameter	76 mm	100 mm
Shaft diameter	15 mm ... 40 mm (Hub shaft)	10 mm ... 12 mm (Through hollow shaft)
Flange (Mounting of housing)	Tether	Tether
Protection class shaft input	IP40 or IP64	IP50 or IP64
Protection class housing	IP50 (IP65 optional)	IP50 or IP64
Max. speed	max. 1800 rpm	max. 1500 rpm
Vibration resistance	10 g = 100 m/s ² (10 ... 2000 Hz)	
Shock resistance	100 g = 1000 m/s ² (6 ms)	
Operating temperature	-25 °C ... +100 °C	-25 °C ... +85 °C
Connection	Cable	Sub-D
Technical Data - electrical		
Supply voltage	DC 5 V / DC 10-30 V	DC 5 V ±10 % / DC 5-30 V
Max. current w/o load	max. 35 mA	max. 35 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz	RS422: 600 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave
Page	132	136

Standard Industrial Types - Absolute

AC 58 - BiSS / SSI, Parallel



- 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
Shaft diameter	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)
Flange (Mounting of housing)	Synchro flange, Clamping flange, Tether, Square flange	Synchro flange, Clamping flange, Tether, Square flange
Protection class shaft input	IP64 or IP67	IP64 or IP67
Protection class housing	IP64 or IP67	IP64 or IP67
Shaft load axial / radial	40 N / 60 N	40 N / 60 N
Max. speed	max. 12 000 rpm	max. 12 000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +100 °C	-40 °C ... +100 °C
Connection	Cable / M23 / M12	Cable / M23 / Sub-D
Technical Data - electrical		
Supply voltage	-5% / 10% DC 5 V / DC 10-30 V	DC 10-30 V
Max. current w/o load	max. 100 mA	max. 300 mA
Resolution singleturn	10 - 17 Bit Gray Excess: 360, 720 increments	10 - 14 Bit Gray Excess: 360, 720 increments
Resolution multiturn	12 Bit	12 Bit
Output code	Binary, Gray	Binary, Gray, Gray Excess
Parametrization	Code type, Direction, Warning, Alarm	
Output current		30 mA per Bit, short-circuit-proof
Control inputs	Direction	Latch, Direction, Tristate with ST, Tristate with MT
Reset key	Disable via parameterization	
Alarm output	Alarm bit (SSI Option), warning and alarm bit (BiSS)	NPN-O.C., max. 5 mA
Status LED	Green = ok, red = alarm	Green = ok, red = alarm
Page	147	153

Standard Industrial Types - Absolute

AC 58 with Fieldbus Interfaces



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



Type	AC 58 - Profibus	AC 58 - CANopen	AC 58 - CANlayer2
Technical Data - mechanical			
Housing diameter	58 mm	58 mm	58 mm
Shaft diameter	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)
Flange (Mounting of housing)	Synchro flange, Clamping flange, Tether, Square flange	Synchro flange, Clamping flange, Tether, Square flange	Synchro flange, Clamping flange, Tether, Square flange
Protection class shaft input	IP64 or IP67	IP64 or IP67	IP64 or IP67
Protection class housing	IP67	Connection bus cover: IP67 Connection cable or M23 (conin): IP64 (IP67 optional)	IP67 or IP64 (IP67 optional)
Shaft load axial / radial	40 N / 60 N	40 N / 60 N	40 N / 60 N
Max. speed	max. 12000 rpm	max. 12000 rpm	max. 12000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +85 °C	-40 °C ... +85 °C	-40 °C ... +85 °C
Connection	cable / Bus cover	Cable / M23 / Bus cover	Cable / M23 / Bus cover
Technical Data - electrical			
Supply voltage	DC 10-30 V	DC 10-30 V	DC 10-30 V
Max. current w/o load	max. 250 mA	max. 250 mA	max. 250 mA
EMC	EN 61326: Class A	EN 61326: Class A	EN 61326: Class A
Resolution singleturn	10 - 14 Bit	10 - 16 Bit	10 - 14 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Output code	Binary	Binary	Binary
Profile/ protocol	Profibus DP with encoder profile class C2 (parameterizable)	CANopen according to DS 301 with profile DSP 406, programmable encoder according class C2	CAN 2.0 A
Programmable	Resolution, Preset, Direction	Resolution, Preset, Offset, Direction	Direction, Limit values
Integrated special functions	Speed, Acceleration, Operating time	Speed, Acceleration, Limit values, Operating time	
Baud rate	is automatically set within a range of 9.6 Kbaud through 12 Mbaud	set via DIP switches within a range of 10 through 1000 Kbit/s	set via DIP switches within a range of 10 through 1000 Kbit/s
Device address	adjustable with DIP switches, via fieldbus (optional)		
Bus termination resistor	set via DIP switches	set via DIP switches	set via DIP switches
Basic identifier		set via DIP switches	set via DIP switches
Page	158	162	166

Standard Industrial Types - Absolute

AC 58 with Fieldbus Interfaces



- Overall length: 63 mm for singleturn, 73 mm for multiturn, including bus cover
- The complete bus specific electronics is integrated in the bus cover
- Option: Display "tico"
- Diagnostic LEDs 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
Shaft diameter	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hubshaft)
Flange (Mounting of housing)	Synchro flange, Clamping flange, Tether, Square flange	Synchro flange, Clamping flange, Tether, Square flange	Synchro flange, Clamping flange, Tether, Square flange
Protection class shaft input	IP64 or IP67	IP64 or IP67	IP64 or IP67
Protection class housing	IP67	Connection bus cover: IP67 Connection cable or M23 (conin): IP64 (IP67 optional)	IP64
Shaft load axial / radial	40 N / 60 N	40 N / 60 N	40 N / 60 N
Max. speed	max. 12 000 rpm	max. 12 000 rpm	max. 12 000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)	100 m/s ²
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ²
Operating temperature	-40 °C ... +85 °C	-40 °C ... +70 °C	-10 °C ... +60 °C
Connection	cable / Bus cover	cable / Bus cover / M23	Cable
Technical Data - electrical			
Supply voltage	DC 10-30 V	DC 10-30 V	DC 10-30 V
Max. current w/o load	max. 250 mA	max. 250 mA	max. 200 mA
EMC	Noise emission according to EN 50081-2, Immunity to inter- ference according to EN 50082-2	Noise emission according to EN 50081-2, Immunity to inter- ference according to EN 50082-2	
EMC	EN 61326: Class A		EN 61326: class A
Resolution singleturn	10 - 14 Bit	10 - 12 Bit	10 - 13 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Output code	Binary	32 Bit binary	Binary
Interface	CAN High-Speed according to ISO/DIS 11898, CAN specifi- cation 2.0 A (11-Bit-Identifier)		
Profile/ protocol	DeviceNet according to Rev. 2.0, programmable encoder	ENCOM-Profil K3 = ID-Code 37, K2 = ID-Code 36	SUCOnet-K1 or Hengstler-G1
Programmable	Resolution, Preset, Direction	Resolution, Preset, Offset, Direction	Resolution, Direction
Output current		max. 4.5 A for bus cover with 2x M23, max. 2 A for all other connections	
Baud rate	set via DIP switches to 125, 250, 500 KBaud	500 KBaud	
Address switch			set via DIP switches
Bus termination resistor	set via DIP switches		set via DIP switches
MAC-ID	set via DIP switches		
Page	170	174	178

Standard Industrial Types - Absolute

AC 58 - SSI programmable



- Compact design: 59mm length for single or multturn
- 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-P
Technical Data - mechanical	
Housing diameter	58 mm
Shaft diameter	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)
Flange (Mounting of housing)	Synchro flange, Clamping flange, Tether, Square flange
Protection class shaft input	IP64 or IP67
Protection class housing	IP64 (IP67 optional)
Shaft load axial / radial	40 N / 60 N
Max. speed	max. 12000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +100 °C
Connection	Cable / M23
Technical Data - electrical	
Supply voltage	DC 10-30 V
Max. current w/o load	max. 250 mA
Resolution singleturn	10 - 17 Bit
Resolution multturn	12 Bit
Output code	Binary, Gray
Parameterization	Resolution, Code type, Direction, Output format, Warning, Alarm
Control inputs	Direction, Preset 1, Preset 2
Alarm output	Alarm bit
Status LED	Green = ok, red = alarm
Page	180

Standard Industrial Types - Absolute

AC 110 - BiSS / SSI



- Hollow shaft up to 50 mm
- Singleturn up to 17 Bit



Type	AC 110 - BiSS / SSI
Technical Data - mechanical	
Housing diameter	110 mm
Shaft diameter	50 mm (Hub shaft)
Protection class shaft input	IP50 or IP64
Protection class housing	IP40 or IP64
Max. speed	max. 1500 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)
Operating temperature	-20 °C ... +70 °C
Connection	Cable / M23
Technical Data - electrical	
Supply voltage	-5%/ 10% DC 5 V / DC 10-30 V
Max. current w/o load	max. 120 mA
Resolution singleturn	10 - 17 Bit
Output code	Binary, Gray
Alarm output	Alarm bit (SSI Option), warning and alarm bit (BiSS)
Page	194

Stainless Industrial Types - Incremental



Type	RI 59
Special features	<ul style="list-style-type: none"> ■ Stainless steel encoder with high protection class ■ High corrosion resistance ■ Use in the area of food production ■ Applications: packing machines, bottling machines, washing plants, mixers, cranes, hoists, marine outfitters
Number of pulses	1 ... 10 000
Technical Data - mechanical	
Housing diameter	58 mm
Shaft diameter	9.52 mm ... 10 mm (Solid shaft)
Flange (Mounting of housing)	Square flange 63.5 mm
Protection class shaft input	IP67
Protection class housing	IP67
Shaft load axial / radial	40 N / 60 N
Max. speed	max. 10 000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)
Operating temperature	-10 °C ... +70 °C
Connection	Cable
Technical Data - electrical	
Supply voltage	DC 5 V / DC 10-30 V
Max. current w/o load	max. 30 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA
Pulse shape	Square wave
Page	199

Stainless Industrial Types - Absolute



- Compact and robust design, high corrosion resistance
- Protection class IP67
- Resolution up to 29 Bit (17 Bit ST, 12 Bit MT)
- Versions with cable or demontable bus cover



Type	AC 59 - BiSS/SSI	AC 59 / AC 61 - Parallel	AC 61 - Profibus
Technical Data - mechanical			
Housing diameter	58 mm	AC 59 - Parallel: 58 mm AC 61 - Parallel: 61.5 mm	61.5 mm
Shaft diameter	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 10 mm (Solid shaft)
Flange (Mounting of housing)	Square flange 63.5 mm	Square flange 63.5 mm	Square flange 63.5 mm
Protection class shaft input	IP67	IP67	IP67
Protection class housing	IP67	IP67	IP67
Shaft load axial / radial	40 N / 60 N	40 N / 60 N	40 N / 60 N
Max. speed	max. 10 000 rpm	max. 10 000 rpm	max. 10 000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +85 °C
Connection	Cable	Cable	cable
Technical Data - electrical			
Supply voltage	-5%/ 10% DC 5 V / DC 10-30 V	DC 10-30 V	DC 10-30 V
Max. current w/o load	max. 100 mA	max. 300 mA	max. 250 mA
EMC			EN 61326: Class A
Resolution singleturn	10 - 17 Bit Gray Excess: 360, 720 increments	10 - 14 Bit Gray Excess: 360, 720 increments	10 - 14 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Output code	Binary, Gray	Binary, Gray, Gray Excess	Binary
Profile/ protocol			Profibus DP with encoder profile class C2 (parameterizable)
Parametrization	Code type, Direction, Warning, Alarm		
Programmable Integrated special functions			Resolution, Preset, Direction Speed, Acceleration, Operating time
Output current		30 mA per Bit, short-circuit-proof	
Control inputs	Direction	Latch, Direction, Tristate with ST, Tristate with MT	
Reset key	Disable via parameterization		
Alarm output	Alarm bit (SSI Option), warning and alarm bit (BiSS)	NPN-O.C., max. 5 mA	
Baud rate			is automatically set within a range of 9.6 Kbaud through 12 Mbaud
Device address			adjustable with DIP switches, via fieldbus (optional)
Bus termination resistor			set via DIP switches
Status LED	Green = ok, red = alarm	Green = ok, red = alarm	
Page	202	207	212

Stainless Industrial Types - Absolute



CAN

CANopen

DeviceNet

- Compact and robust design, high corrosion resistance
- Protection class IP67
- Resolution up to 29 Bit (17 Bit ST, 12 Bit MT)
- Versions with cable or demountable bus cover



Type	AC 61 - CANopen	AC 61 - CANlayer2	AC 61 - DeviceNet
Technical Data - mechanical			
Housing diameter	61.5 mm	61.5 mm	61.5 mm
Shaft diameter	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 10 mm (Solid shaft)
Flange (Mounting of housing)	Square flange 63.5 mm	Square flange 63.5 mm	Square flange 63.5 mm
Protection class shaft input	IP67	IP67	IP67
Protection class housing	IP67	IP67	IP67
Shaft load axial / radial	40 N / 60 N	40 N / 60 N	40 N / 60 N
Max. speed	max. 10000 rpm	max. 10000 rpm	max. 10000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +85 °C	-40 °C ... +85 °C	-40 °C ... +85 °C
Connection	Cable	Cable	cable
Technical Data - electrical			
Supply voltage	DC 10-30 V	DC 10-30 V	DC 10-30 V
Max. current w/o load	max. 250 mA	max. 250 mA	max. 250 mA
EMC			Noise emission according to EN 50081-2, Immunity to interference according to EN 50082-2
EMC	EN 61326: Class A	EN 61326: Class A	EN 61326: Class A
Resolution singleturn	10 - 16 Bit	10 - 14 Bit	10 - 14 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Output code	Binary	Binary	Binary
Interface			CAN High-Speed according to ISO/DIS 11898, CAN specification 2.0 A (11-Bit-Identifier)
Profile/ protocol	CANopen according to DS 301 with profile DSP 406, programmable encoder according class C2	CAN 2.0 A	DeviceNet according to Rev. 2.0, programmable encoder
Programmable	Resolution, Preset, Offset, Direction	Direction, Limit values	Resolution, Preset, Direction
Integrated special functions	Speed, Acceleration, Limit values, Operating time		
Baud rate	set via DIP switches within a range of 10 through 1000 Kbit/s	set via DIP switches within a range of 10 through 1000 Kbit/s	set via DIP switches to 125, 250, 500 Kbaud
Bus termination resistor	set via DIP switches	set via DIP switches	set via DIP switches
Basic identifier	set via DIP switches	set via DIP switches	
MAC-ID			set via DIP switches
Page	215	218	221

Stainless Industrial Types - Absolute



- Compact and robust design, high corrosion resistance
- Protection class IP67
- Resolution up to 29 Bit (17 Bit ST, 12 Bit MT)
- Versions with cable or demontable bus cover



Type	AC 61 - Interbus	AC 61 - SSI-P
Technical Data - mechanical		
Housing diameter	61.5 mm	61.5 mm
Shaft diameter	9.52 mm ... 10 mm (Solid shaft)	9.52 mm ... 10 mm (Solid shaft)
Flange (Mounting of housing)	Square flange 63.5 mm	Square flange 63.5 mm
Protection class shaft input	IP67	IP67
Protection class housing	IP67	IP67
Shaft load axial / radial	40 N / 60 N	40 N / 60 N
Max. speed	max. 10 000 rpm	max. 10 000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +70 °C	-40 °C ... +70 °C
Connection	cable	Cable
Technical Data - electrical		
Supply voltage	DC 10-30 V	DC 10-30 V
Max. current w/o load	max. 250 mA	max. 250 mA
EMC	Noise emission according to EN 50081-2, Immunity to interference according to EN 50082-2	
Resolution singleturn	10 - 12 Bit	10 - 17 Bit
Resolution multiturn	12 Bit	12 Bit
Output code	32 Bit binary	Binary, Gray
Profile/ protocol	ENCOM-Profil K3 = ID-Code 37, K2 = ID-Code 36	
Parametrization		Resolution, Code type, Direction, Output format, Warning, Alarm
Programmable	Resolution, Preset, Offset, Direction	
Output current	max. 4.5 A for bus cover with 2x M23, max. 2 A for all other connections	
Control inputs		Direction, Preset 1, Preset 2
Alarm output		Alarm bit
Baud rate	500 KBaud	
Status LED		Green = ok, red = alarm
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EEx Industrial Types - Incremental



ATEX



Type	RX 70TI / RX 71TI
Special features	<ul style="list-style-type: none"> ■ Explosion proof class II according to EX II 2 G/D EEX d IIC T6/T4 ■ Highest working reliability ■ Resolution up to 10 000 ppr ■ Stainless steel version RX71 available ■ Applications: enamelling production line, surfacing machines, bottling machines, mixers, silo works
Number of pulses	1 ... 10 000
Technical Data - mechanical	
Housing diameter	70 mm
Shaft diameter	10 mm (Solid shaft)
Flange (Mounting of housing)	Clamping flange
Protection class shaft input	T4: IP64 or IP67 T6: IP64
Protection class housing	T4: IP65 or IP67 T6: IP65
Shaft load axial / radial	50 N / 100 N
Max. speed	max. 6000 rpm
Vibration resistance	10 g = 100 m/s ² (10 ... 2000 Hz)
Shock resistance	100 g = 1000 m/s ² (6 ms)
Ambient temperature	T4: -25 °C ... +60 °C T6: -25 °C ... +40 °C
Connection	Cable
Technical Data - electrical	
Supply voltage	DC 5 V / DC 10-30 V
Max. current w/o load	max. 30 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull / Push-pull complementary
Output current	RS 422: ±30 mA Push-pull with short-circuit protection: 30 mA (DC 10 - 30 V)
Alarm output	NPN-O.C., max. 5 mA
Pulse shape	Square wave
Page	236

EEx Industrial Types - Absolute



ATEX



CANopen

- ATEX certification for gas and dust explosion proof, protection class up to IP67
- Same electrical performance as ACURO industry
- Resolution up to 29 Bit (17 Bit ST, 12 Bit MT)
- Diameter only 70 mm, robust design, also available with stainless steel housing



Type	AX 70 / AX 71 - SSI	AX 70 / AX 71 - Profibus	AX 70 / AX 71 - CANopen
Technical Data - mechanical			
Housing diameter	70 mm	70 mm	70 mm
Shaft diameter	10 mm (Solid shaft)	10 mm (Solid shaft)	10 mm (Solid shaft)
Flange (Mounting of housing)	Clamping flange	Clamping flange	Clamping flange
Protection class shaft input	T4: IP64 or IP67 T6: IP64	T4: IP64 or IP67 T6: IP64	T4: IP64 or IP67 T6: IP64
Protection class housing	T4: IP65 or IP67 T6: IP65	T4: IP65 or IP67 T6: IP65	T4: IP65 or IP67 T6: IP65
Shaft load axial / radial	40 N / 100 N	40 N / 100 N	40 N / 100 N
Max. speed	max. 6000 rpm	max. 6000 rpm	max. 6000 rpm
Vibration resistance	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Ambient temperature	T4: -40 °C ... +60 °C T6: -40 °C ... +40 °C	T4: -40 °C ... +60 °C T6: -40 °C ... +40 °C	T4: -40 °C ... +60 °C T6: -40 °C ... +40 °C
Connection	Cable	Cable	Cable
Technical Data - electrical			
Max. current w/o load	max. 250 mA	max. 250 mA	max. 250 mA
Resolution singleturn	10 - 17 Bit	10 - 14 Bit	10 - 14 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Output code	Binary, Gray	Binary	Binary
Profile/ protocol		Profibus DP with encoder profile class C2 (parameterizable)	CANopen according to DS 301 with profile DSP 406, programmable encoder according class C2
Parametrization		Resolution, Preset, Direction	Resolution, Preset, Offset, Direction
Integrated special functions		Speed, Acceleration, Operating time	Speed, Acceleration, Rotary axis, Limit values, Operating time
Control inputs	Direction		
Alarm output	Alarm bit (SSI Option)		
Baud rate		is automatically set within a range of 9.6 Kbaud through 12 Mbaud	
Device address		set via Bus	
Bus termination resistor		external mounting	external mounting
Page	241	244	247

Light Duty Types - Incremental



Type	PC 9 / PC 9S	RI 32	RI 38
Special features	<ul style="list-style-type: none"> ■ Provides digital control inputs from operators' panel ■ Bidirectional squarewave signal outputs ■ Up to 512 increments ■ Continuous and reversible rotation ■ Non-contacting ■ Operating temperature -40 ... 100 °C 	<ul style="list-style-type: none"> ■ Replacement for type Typ RIS and RI 31 ■ The economical encoder for small appliances ■ High efficiency by means of ball bearing ■ Small torque ■ Applications: laboratory equipment, training equipment, crimping machines, tampon printing machines, miniature grinding machines 	<ul style="list-style-type: none"> ■ Replacement for type RI 39 ■ Encoder for universal installation by means of front/back panel mounting ■ High efficiency by means of ball bearing ■ Small torque ■ Applications: FHP motors, laboratory equipment, labeling machines, plotters, length measuring machines
Number of pulses	100 ... 512	5 ... 1500	5 ... 1024
Technical Data - mechanical			
Housing diameter	PC 9: 22 mm PC 9S: 22.86 mm	30 mm	39 mm
Shaft diameter	3.175 mm ... 6.35 mm	5 mm ... 6 mm (Solid shaft)	6 mm (Solid shaft)
Flange (Mounting of housing)		Pilot flange	Square flange
Protection class shaft input		IP40	IP40
Protection class housing		IP50	IP50
Shaft load axial / radial	1/8" shaft: 4 N / 27 N 1/4" shaft: 4 N / 4 N	5 N / 10 N	5 N / 10 N
Max. speed		max. 6000 rpm	max. 10 000 rpm
Vibration resistance		100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)
Shock resistance		1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +100 °C	-10 °C ... +60 °C	-10 °C ... +60 °C
Connection	PC 9: 10 pole header PC 9S: 5 pole header	Cable	Cable
Technical Data - electrical			
Supply voltage	DC 5 V ±10 %	DC 5 V / DC 10-30 V	DC 5 V / DC 10-30 V
Max. current w/o load		max. 30 mA	max. 30 mA
Max. pulse frequency	200 kHz	DC 5 V: 300 kHz DC 10 - 30 V: 200 kHz	DC 5 V: 300 kHz DC 10 - 30 V: 200 kHz
Output		Push-Pull	Push-Pull
Output signals	min. 2.5 V high (VOH), max. 0.5 V low (VOL)		
Output current	PC 9: 3 mA sink/source (25 °C), 2 mA (100 °C) PC 9S: 6 mA sink/source (25 °C), 4 mA (100 °C)		
Alarm output		NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave	Square wave
Page	256	259	262

Light Duty Types - Incremental



Type	RI 41	RI 42
Special features	<ul style="list-style-type: none"> ■ Replacement for type RIM ■ Economical miniature encoder ■ Up to 14,400 steps with 3,600 pulses ■ High mechanical efficiency ■ Applications: wood working machines, FHP motors, graphic machines, table robots 	<ul style="list-style-type: none"> ■ Economical miniature encoder ■ High protection IP65 ■ Output Push-pull or NPN-O.C. ■ High mechanical efficiency ■ Applications: textile machinery
Number of pulses	5 ... 3600	5 ... 1024
Technical Data - mechanical		
Housing diameter	40 mm	40 mm
Shaft diameter	6 mm (Solid shaft)	6 mm (Solid shaft)
Flange (Mounting of housing)	Pilot flange	Pilot flange
Protection class shaft input	IP40	IP64
Protection class housing	IP50	IP65
Shaft load axial / radial	5 N / 10 N	5 N / 10 N
Max. speed	max. 10 000 rpm	max. 10 000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-10 °C ... +70 °C	0 °C ... +60 °C
Connection	Cable	Cable
Technical Data - electrical		
Supply voltage	DC 5 V / DC 10-30 V	DC 5 V / DC 10-30 V / DC 10-24 V
Max. current w/o load	max. 30 mA	max. 40 mA
Max. pulse frequency	DC 5 V: 300 kHz DC 10 - 30 V: 200 kHz	DC 5 V: 300 kHz DC 10 - 30 V: 200 kHz DC 10 - 24 V: 50 kHz
Output	Push-Pull	Push-Pull / Push-pull complementary / NPN-O.C.
Alarm output	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave
Page	265	268

Motor Feedback - Kit Encoders

Miniature, DC & Stepper Motors



Type	E 9	M 9	M 14
Special features	<ul style="list-style-type: none"> ■ Ideal for position and speed sensing in small machines and actuators ■ Low power standby mode is ideal for battery powered devices ■ Max. output frequency: 200 kHz ■ Resolution to 512 lines/rev 	<ul style="list-style-type: none"> ■ Ideal for position and speed sensing in small machines and actuators ■ Max. output frequency: 200 kHz ■ Resolution to 512 lines/rev 	<ul style="list-style-type: none"> ■ Ideal economical feedback device for servo and step motors ■ Short axial length and compact 1.5 inch diameter ■ Easy "snap-on" installation ■ High resolution to 1024 lines/rev and 200 kHz bandwidth ■ Max. output frequency: 200 kHz ■ Replacement for HP 5540 ■ CE qualified
Number of pulses	100 ... 512	100 ... 512	200 ... 1024
Technical Data - mechanical			
Housing diameter	22 mm	22 mm	38 mm
Mounting depth	20 mm	14.8 mm	17.2 mm
Shaft diameter	1.5 mm ... 3.962 mm (Hub shaft)	1.5 mm ... 3.962 mm (Hub shaft)	3 mm ... 19.05 mm (Hub shaft)
Max. speed	max. 12 000 rpm	max. 12 000 rpm	max. 12 000 rpm
Operating temperature	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +100 °C
Connection	10 pole header	5 pole header	5 pole header
Technical Data - electrical			
Supply voltage	DC 5 V ±10 %	DC 5 V ±10 %	DC 5 V ±10 %
Max. current w/o load	max. 10 mA	max. 10 mA	max. 10 mA
Max. pulse frequency	200 kHz	200 kHz	200 kHz
Output	TTL	TTL	TTL
Output signals	min. 2.5 V high (VOH), max. 0.5 V low (VOL)	min. 2.5 V high, max. 0.5 V low	min. 2.5 V high, max. 0.5 V low
Output current	3 mA sink/source (25°C), 2 mA (100°C)	6 mA (25°C), 4 mA (100°C)	6 mA (25°C), 4 mA (100°C)
Pulse shape	Square wave		
Page	272	275	278

Motorfeedback - Incremental Types

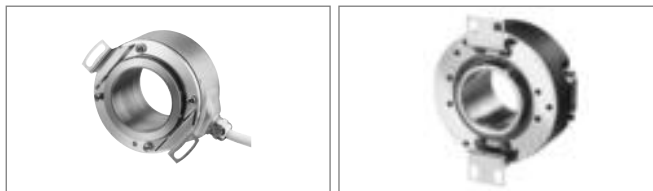
Asynchronous & DC Motors



Type	RI 36-H	RI 58-D / RI 58TD	RI 58-G / RI 58TG
Special features	<ul style="list-style-type: none"> ■ Miniature industry encoder for high number of pulses ■ Short mounting length ■ Easy mounting procedure ■ Applications: motors, machine tools, robots, automated SMD equipment 	<ul style="list-style-type: none"> ■ Direct mounting without coupling ■ Flexible hollow shaft design up to diameter 14 mm ■ Through hollow shaft or as end shaft (blind shaft) ■ Easy installation by means of clamping shaft or blind shaft ■ Short overall length of 33 mm ■ Fixing of flange by means of a stator coupling or set screw ■ Various shaft versions ■ Applications: actuators, motors ■ Operating temperature up to 100 °C (RI 58TD) 	<ul style="list-style-type: none"> ■ Direct mounting without coupling ■ Through hollow shaft Ø 14 mm and 15 mm ■ Easy installation by means of clamping ring ■ Fixing of flange by means of a stator coupling or set screw ■ Applications: actuators, motors
Number of pulses	5 ... 3600	1 ... 5000	50 ... 2500
Technical Data - mechanical			
Housing diameter	36 mm	58 mm	58 mm
Shaft diameter	4 mm ... 10 mm (Hubshaft)	10 mm ... 12 mm (Through hollow shaft) 10 mm ... 14 mm (Hubshaft)	14 mm ... 15 mm (Through hollow shaft)
Flange (Mounting of housing)	Tether	Synchro flange	Synchro flange
Protection class shaft input	IP64	IP64	IP64
Protection class housing	IP64	Through hollow shaft - D: IP64 Hubshaft - E,F: IP65	IP64
Max. speed	max. 10000 rpm	max. 4000 rpm	max. 4000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	10 g = 100 m/s ² (10 ... 2000 Hz)	10 g = 100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)	100 g = 1000 m/s ² (6 ms)	100 g = 1000 m/s ² (6 ms)
Operating temperature	-10 °C ... +70 °C	RI 58-D: -10 °C ... +70 °C RI 58TD: -25 °C ... +100 °C	RI 58-G: -10 °C ... +70 °C RI 58TG: -10 °C ... +100 °C
Connection	Cable	Cable / M23	Cable
Technical Data - electrical			
Supply voltage	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	max. 30 mA	max. 30 mA	max. 30 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz	RS422: 300 kHz Push-pull: 200 kHz	RS422: 300 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave	Square wave
Page	104	113	122

Motorfeedback - Incremental Types

Asynchronous & DC Motors



Type	RI 76TD	RI 80-E
Special features	<ul style="list-style-type: none"> ■ Through hollow shaft Ø 15 bis 42 mm ■ Outside diameter only 76 mm ■ Easy installation by means of clamping ring front or rear ■ Operating temperature up to 100 °C ■ Applications: motors, printing machines, lifts 	<ul style="list-style-type: none"> ■ Incremental ■ 30 - 45 mm hollow shaft ■ Rugged mechanical design ■ Unbreakable disc ■ Integrated diagnostic system ■ Wide voltage range DC 5 - 30 V ■ Isolated shaft
Number of pulses	1 ... 10 000	1024, 2048, 2500, 4096, 5000, 10 000 (other number of pulses on request)
Technical Data - mechanical		
Housing diameter	76 mm	100 mm
Shaft diameter	15 mm ... 40 mm (Hub shaft)	10 mm ... 12 mm (Through hollow shaft)
Flange (Mounting of housing)	Tether	Tether
Protection class shaft input	IP40 or IP64	IP50 or IP64
Protection class housing	IP50 (IP65 optional)	IP50 or IP64
Max. speed	max. 1800 rpm	max. 1500 rpm
Vibration resistance	10 g = 100 m/s ² (10 ... 2000 Hz)	
Shock resistance	100 g = 1000 m/s ² (6 ms)	
Operating temperature	-25 °C ... +100 °C	-25 °C ... +85 °C
Connection	Cable	Sub-D
Technical Data - electrical		
Supply voltage	DC 5 V / DC 10-30 V	DC 5 V ±10 % / DC 5-30 V
Max. current w/o load	max. 35 mA	max. 35 mA
Max. pulse frequency	RS422: 300 kHz Push-pull: 200 kHz	RS422: 600 kHz Push-pull: 200 kHz
Output	RS422 / Push-Pull / Push-pull complementary	RS422 / Push-Pull / Push-pull complementary
Alarm output	NPN-O.C., max. 5 mA	NPN-O.C., max. 5 mA
Pulse shape	Square wave	Square wave
Page	132	136

Motorfeedback - Absolute Types

Asynchronous & DC Motors



Type	AC 58 - BiSS / SSI	AC 110 - BiSS / SSI
Special features	<ul style="list-style-type: none"> ■ Compact design: 50 mm length for single or multiturn ■ Aids for start up and operation: diagnostic LED, preset key with optical response, status information ■ Use of sine/ cosine signals for fast control task possible ■ Control input: Direction ■ Resolution up to 29 Bit 	<ul style="list-style-type: none"> ■ Same electrical performance as ACURO industry ■ Robust bearings for long life ■ Hollow shaft up to 50 mm ■ Absolute singleturn ■ Revolution 11-17 Bit ■ BiSS or SSI interface ■ Optional: Sine-Cosine 4096 increments ■ DC 5 or 10 - 30 V ■ Integrated diagnostic system
Technical Data - mechanical		
Housing diameter	58 mm	110 mm
Shaft diameter	6 mm ... 10 mm (Solid shaft) 10 mm ... 12 mm (Hub shaft)	50 mm (Hub shaft)
Flange (Mounting of housing)	Synchro flange, Clamping flange, Tether, Square flange	
Protection class shaft input	IP64 or IP67	IP50 or IP64
Protection class housing	IP64 or IP67	IP40 or IP64
Shaft load axial / radial	40 N / 60 N	
Max. speed	max. 12000 rpm	max. 1500 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 500 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-40 °C ... +100 °C	-20 °C ... +70 °C
Connection	Cable / M23 / M12	Cable / M23
Technical Data - electrical		
Supply voltage	-5% / 10% DC 5 V / DC 10-30 V	-5% / 10% DC 5 V / DC 10-30 V
Max. current w/o load	max. 100 mA	max. 120 mA
Resolution singleturn	10 - 17 Bit Gray Excess: 360, 720 increments	10 - 17 Bit
Resolution multiturn	12 Bit	
Output code	Binary, Gray	Binary, Gray
Parametrization	Code type, Direction, Warning, Alarm	
Control inputs	Direction	
Reset key	Disable via parameterization	
Alarm output	Alarm bit (SSI Option), warning and alarm bit (BiSS)	Alarm bit (SSI Option), warning and alarm bit (BiSS)
Status LED	Green = ok, red = alarm	
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Motor Feedback - Incremental Types

AC-Synchronous & BLDC Motors



Type	M 53
Special features	<ul style="list-style-type: none"> ■ Modular hollow shaft encoder, ideal for BLDC, DC-Servo and Stepper feedback ■ Through hollow shaft Ø 6 ... 12,7 mm ■ Incremental + Commutation ■ Incremental signals A, B, N and 4, 6 or 8 pole ■ Outside diameter 53 mm ■ Mounting depth: only 23 mm ■ Maximum speed: 12 000 rpm ■ Standard Operating temperature: -40 ... +120°C ■ Easy installation and alignment
Technical Data - mechanical	
Housing diameter	53 mm
Mounting depth	22.9 mm
Shaft diameter	6 mm ... 12.7 mm (Hub shaft)
Protection class shaft input	IP50
Protection class housing	with cover: IP50
Max. speed	max. 12 000 rpm
Vibration resistance	25 m/s ² (5 ... 2000 Hz)
Shock resistance	500 m/s ² (11 msec)
Operating temperature	-40 °C ... +120 °C
Connection	Shielded cable or dual row connector
Technical Data - electrical	
Supply voltage	DC 5 V or DC 12 V ±10 %
Max. current w/o load	max. 75 mA
Max. pulse frequency	200 kHz
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Motor Feedback - Comcoders

AC-Synchronous & BLDC Motors



Type	F 10	F 15	F 21
Special features	<ul style="list-style-type: none"> ■ Compact hollowshaft motor encoder, ideal for BLDC, DC-Servo and Stepper feedback ■ Through hollow shaft Ø 6 mm ■ Incremental signals A, B, N ■ Resolution up to 2048 ppr ■ 6 or 10 pole commutation signals ■ Frequency response to 300 kHz ■ Resolver compatible mounting ■ Operating temperature up to 120 °C ■ Mounting depth: 22.4 mm 	<ul style="list-style-type: none"> ■ Compact hollowshaft motor encoder, ideal for BLDC, DC-Servo and Stepper feedback ■ Through hollow shaft Ø 9.52 mm ■ Incremental signals A, B, N ■ Resolution up to 2048 ppr ■ 6, 8 or 10 pole commutation signals ■ Frequency response to 300 kHz ■ Resolver compatible mounting ■ Operating temperature up to 120 °C ■ Mounting depth: 22.4 mm 	<ul style="list-style-type: none"> ■ Compact hollowshaft motor encoder, ideal for BLDC, DC-Servo and Stepper feedback ■ Through hollow shaft Ø 12.7 mm ■ Incremental signals A, B, N ■ Resolution up to 2048 ppr ■ 6, 8, 10, 12 or 16 pole commutation signals ■ Frequency response to 300 kHz ■ Resolver compatible mounting ■ Operating temperature up to 120 °C ■ Mounting depth max.: 26 mm
Number of pulses	1024, 2048	1024, 2048	1024, 2048
Commutation	optional additional 6 or 10 pole commutation signals	optional additional 6, 8 or 10 pole commutation signals	optional additional 6, 8, 10,12 or 16 pole commutation signals
Technical Data - mechanical			
Housing diameter	31.7 mm	36.8 mm	53 mm
Mounting depth	22.5 mm	22.1 mm	26 mm
Shaft diameter	6 mm (Hub shaft)	9.52 mm (Through hollow shaft)	12.7 mm (Hub shaft)
Flange (Mounting of housing)	Servo flange	Servo flange	Servo flange
Max. speed	max. 12 000 rpm	max. 12 000 rpm	max. 12 000 rpm
Vibration resistance	2.5 g at 5 to 2000 Hz	2.5 g at 5 to 2000 Hz	2.5 g at 5 to 2000 Hz
Shock resistance	50 g for 6 ms duration	50 g for 6 ms duration	50 g for 6 ms duration
Operating temperature	0 °C ... +120 °C	0 °C ... +120 °C	0 °C ... +120 °C
Connection	Flying leads	Flying leads	Flying leads
Technical Data - electrical			
Supply voltage	DC 5 V ±10 %	DC 5 V ±10 %	DC 5 V ±10 %
Max. current w/o load	max. 100 mA	max. 100 mA	max. 100 mA
Max. pulse frequency	300 kHz	300 kHz	300 kHz
Output current	Incremental: ±40 mA (RS422) Commutation: 8 mA (NPN-O.C) or ±40 mA (RS 422)	Incremental: max. ±40 mA (RS 422) Commutation: max. ±8 mA (NPN-O.C) or ±40 mA (RS 422)	Incremental: ±40 mA (RS 422) Commutation: 8 mA (NPN-O.C) or ±40 mA (RS 422)
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Motor Feedback - Incremental Types

AC-Synchronous & BLDC Motors



Type	HC 20	RF 53
Special features	<ul style="list-style-type: none"> ■ Compact hollowshaft motor encoder, ideal for BLDC, DC servo and Stepper feedback ■ Incremental + commutation ■ Phased Array Technology ■ Frequency response to 500 kHz ■ Operating temperature up to 120 °C ■ Outside diameter 50 mm ■ Cable plug-in radial/axial 	<ul style="list-style-type: none"> ■ Solid shaft motor encoder for BLDC and gearless elevator traction machines ■ Incremental + commutation ■ Up to 10 000 ppr ■ Operating temperature up to 120 °C ■ IP54 ■ Outside diameter 53 mm
Number of pulses		500 ... 10 000
Technical Data - mechanical		
Housing diameter	50 mm	53 mm
Mounting depth	36"	
Shaft diameter	6 mm ... 9 mm	Cone solid shaft
Flange (Mounting of housing)	Tether	Tether
Protection class shaft input	IP50	IP54
Protection class housing	IP50	IP54
Shaft load axial / radial		20 N / 90 N
Max. speed	max. 12 000 rpm	max. 5000 rpm
Vibration resistance		25 m/s ²
Shock resistance		1000 m/s ²
Operating temperature	0 °C ... +120 °C	-20 °C ... +120 °C
Connection	Cable	Cable / Sub-D / PCB
Technical Data - electrical		
Supply voltage		DC 5 V ±10 %
Max. current w/o load	max. 175 mA	max. 100 mA
Max. pulse frequency	500 kHz	100 kHz
Output		NPN-O.C. / RS422
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Motor Feedback - Absolute Types

Asynchronous & DC Motors



Type	AD 34	AD 35	AD 36
Special features	<ul style="list-style-type: none"> ■ For brushless servo motors ■ Light duty encoder ■ Notched shaft 6 mm ■ Mounting Depth: 25 mm ■ Up to 17 Bit Resolution ■ +120°C operating temperature ■ 10 000 rpm continuous operation ■ BiSS or SSI interface ■ Sinewave 1 Vpp ■ Bandwidth 500 kHz 	<ul style="list-style-type: none"> ■ Shortest absolute encoder world wide ■ Mounting depth: 23.65 mm ■ Hub shaft 8 mm ■ Resolution up to 22 Bit Singleturn ■ +120°C operating temperature ■ 10 000 rpm continuous operation ■ BiSS or SSI interface ■ Bandwidth 500kHz 	<ul style="list-style-type: none"> ■ For brushless servo motors ■ Resolver size 15 compatible ■ Through hollow shaft 8 mm ■ 19 Bit Singleturn + 12 Bit Multiturn ■ +120°C operating temperature ■ 10,000 rpm continuous operation ■ Optical encoder with a true geared multiturn ■ BiSS or SSI interface ■ Sinewave 1 Vpp ■ Bandwidth 500 kHz
Number of pulses	2048	2048	2048
Technical Data - mechanical			
Housing diameter	37.5 mm	37.5 mm	37.5 mm
Shaft diameter	6 mm (Notched Shaft)	8 mm (Hubshaft)	8 mm (Through hollow shaft) 8 mm (Hubshaft)
Flange (Mounting of housing)	Tether	Tether	Tether
Protection class shaft input	IP40	IP40	IP40
Protection class housing	IP40	IP40	IP40
Max. speed	max. 12 000 rpm	max. 12 000 rpm	max. 12 000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)	100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)	1000 m/s ² (6 ms)
Operating temperature	-15 °C ... +120 °C	-15 °C ... +120 °C	-15 °C ... +120 °C
Connection	Cable / PCB	Cable / PCB	Cable / PCB
Technical Data - electrical			
Supply voltage	DC 5 V -5 %/+10 % or DC 7 - 30 V	DC 5 V -5 %/+10 % or DC 7 - 30 V	DC 5 V -5 %/+10 % or DC 7 - 30 V
Max. current w/o load	max. 50 mA	max. 50 mA	max. 100 mA
Resolution singleturn	12 - 17 Bit	12 - 22 Bit	12 - 19 Bit (BiSS) 12 - 17 Bit (SSI)
Resolution multiturn		12 Bit	12 Bit
Output code	Gray	Gray	Gray
Alarm output	Alarm bit (SSI Option), warning bit and alarm bit (BiSS)	Alarm bit (SSI Option), warning and alarm bit (BiSS)	Alarm bit (SSI Option), warning and alarm bit (BiSS)
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Motor Feedback - Absolute Types

AC-Synchronous & BLDC Motors



Type	AD 58
Special features	<ul style="list-style-type: none"> ■ For brushless servo motors ■ All-digital and highspeed ■ +120°C operating temperature ■ 10 000 rpm continuous operation ■ Optical encoder with a true geared multiturn ■ BiSS or SSI interface ■ Option Sinewave 1 Vpp: Harmonic distortion less than 1% ■ Bandwidth 500 kHz
Number of pulses	2048
Technical Data - mechanical	
Housing diameter	58 mm
Shaft diameter	10 mm (Cone hollow shaft) 10 mm (Cone solid shaft)
Flange (Mounting of housing)	Tether
Protection class shaft input	IP40
Protection class housing	IP40
Max. speed	max. 12 000 rpm
Vibration resistance	100 m/s ² (10 ... 2000 Hz)
Shock resistance	1000 m/s ² (6 ms)
Operating temperature	-15 °C ... +120 °C
Connection	PCB
Technical Data - electrical	
Supply voltage	± 10% DC 5 V or DC 10 - 30 V
Max. current w/o load	max. 100 A
Resolution singleturn	13 Bit (SSI) max. 22 Bit (BiSS)
Resolution multiturn	12 Bit
Output code	Binary, Gray
Parametrization	Resolution, Code type, Direction, Warning, Alarm
Alarm output	Alarm bit (SSI Option), warning and alarm bit (BiSS)
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Motor Feedback - Sine-wave Types

AC-Synchronous & BLDC Motors



Type	S 21
Special features	<ul style="list-style-type: none"> ■ Wide operating temperature range of $-15\text{ }^{\circ}\text{C}$ up to $+120\text{ }^{\circ}\text{C}$, therefore optimum use of motor capacity ■ High limiting frequency with excellent signal quality, allowing highest peak speeds and reduced non-productive time wastage ■ Excellent immunity to interference (EN 61000-4-4, Class 4) ■ High functional safety due to signal control and system monitoring (under-voltage, pollution, disc damage, end of LED service life) ■ High signal quality through control and error compensation
Number of pulses	2048
Technical Data - mechanical	
Housing diameter	53 mm
Shaft diameter	Cone 1/10
Protection class shaft input	IP40
Protection class housing	IP40
Shaft load axial / radial	for tapered solid shaft: 20 N / 90 N
Max. speed	max. 15000 rpm
Vibration resistance	$\leq 100\text{ m/s}^2$ (10 ... 2,000 Hz)
Shock resistance	$\leq 1,000\text{ m/s}^2$ (6 ms)
Operating temperature	$-15\text{ }^{\circ}\text{C}$... $+120\text{ }^{\circ}\text{C}$
Connection	PCB connector and cable
Technical Data - electrical	
Supply voltage	DC 5 V $\pm 10\%$
Max. current w/o load	max. 120 mA
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Motor Feedback - Resolvers



Type	Frameless Resolvers	Housed Industry Resolvers R 25	Housed Resolvers Series R 11
Special features	<ul style="list-style-type: none"> ■ Provide accurate, absolute position feedback ■ Rugged and able to withstand high shock and vibration levels ■ Impervious to most industrial contaminant and temperature extremes ■ High temperature up to 220°C ■ Operation in non electro-conductive liquids possible ■ Maintenance-free (brushless) ■ Aging resistant (no electronic components) ■ Low-priced ■ Applications: Servo drives, medical technologie (sterilisable), robots, gearless drives, military engineering 	<ul style="list-style-type: none"> ■ Rugged housing with IP65 ■ Able to withstand high shock and vibration levels ■ Insensitive to most industrial contaminant and temperature extremes ■ High temperature up to 125°C ■ Flange- and servo-mount styles 	<ul style="list-style-type: none"> ■ Brushless construction ■ Rugged housing ■ Maintenance free ■ Able to withstand high shock and vibration levels ■ Insensitive to most industrial contaminant and temperature extremes ■ High temperature up to 115°C
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Application Examples for Encoders

Encoder Applications:

- Packaging industry
- Food industry
- Medical technology
- Elevators
- Conveyor systems
- Robotics
- Cranes
- Positioning control
- Electronics
- Baggage conveyor systems
- Metalworking
- Motors
- Servo motors
- Vector drives
- Mechanical engineering
- Turning machines
- Stamping machines
- Bending machines
- Welding systems
- Sawing machines
- etc.