

# maxon sensor

Robust encoders, DC tachometers, and resolvers with high accuracy and high signal resolution. Due to resonance, these are mainly mounted on motors with a continuous shaft. The assembly requires adjustment to the motors and may only be done in the delivery plant.

MILE Encoder	379–381
EASY Encoder	382–383
Magnetic encoders	384–393
Optical Encoder	394–406
Hall effect Encoder	408–410
DC Tacho/Resolver	411–412

# maxon Standard Specification

With our Standard Specification we offer you a means to judge maxon motors in the most important respects. To our knowledge it covers normal applications. The Standard Specification is part of our "General Conditions of Sale".

For information on standards and directives, refer to page 14 and 15.

## The Standard Specification No. 100 for maxon DC motor

### 1. Principles

The **standard specification** describes tests carried out on the **finished motor and during the production process**. In order to guarantee our high quality standard, we check materials, parts and subassemblies through the manufacturing process and the complete motor. The obtained measurements are recorded and can be made available to customers if required. Random sampling plans are according to ISO 2859, MIL STD 105E and DIN/ISO 3951 (inspection by attributes, sequential sampling, variables inspection) as well as internal manufacturing controls. This specification always applies unless a different one has been agreed between the customer and maxon.

### 2. Data

2.1 **Electrical data** apply at 22° to 25°C. Data control within one minute running time.

**Measurement voltage** +/- 0.5 % for  
voltages  $\geq 3V$  and  
 $\pm 0.015 V$  for voltages  
 $\leq 3V$

**No load speed**  $\pm 10\%$

**No load current**  $\leq$  maximum specified value

**Direction of rotation** cw = clockwise

**Motor position** horizontal

**Notes:** Measurement voltage may vary from the nominal voltage listed in the catalog. The no load current specified in the catalog is a typical value and not the maximum one. By connecting the red wires or if voltage is applied to the '+' Terminal, shaft rotation is cw (clockwise) as seen from the mounting end. For ccw running, the specified tolerance data may only be marginally exceeded.

**Terminal resistance:** Winding resistance is verified in the manufacturing process through spot checks on a representative basis. Terminal resistance is determined at product certification. It should be noted that terminal resistance depends on the rotor's rotational position. As transfer resistance depends on current density in graphite brushes, measuring resistance with an ohmmeter if the current is low does not give reasonable results. Too low a reading is produced with precious metal brush motors if the brushes bridge two commutator segments, thereby short-circuiting one coil segment.

**Inductance** is determined at product certification. Test frequency is 1 kHz. The motor's terminal inductance depends on frequency.

**Commutation:** An oscilloscope is used to check the neutral setting and test for electrical faults, such as interrupted winding or short-circuit between turns. Commutation displays for precious metal brushes and graphite brushes are not directly comparable. Precious metal brushes display a clear commutation picture which remains interference free up to the motor's recommended maximum speed, but with graphite brushes, this is only expected up to around one third of that. In addition, it should be noted that the contact resistance of graphite brushes and the torque constant may change during the run-in period due to increased brush seating. As a result, no load current and speed may drift marginally. The same effect may also be observed if motors are being operated under no load condition over a longer period.

2.2 **Mechanical data** per outline drawing:

Standard measuring instruments (for electrical length measuring DIN 32876, micrometer per DIN 863, dial indicator DIN 878, calliper per

DIN 862, bore calliper DIN 2245, thread calliper per DIN 2280 and others) are used.

2.3 **Rotor imbalance:** Rotors are balanced according to standard data or customer requirements during manufacturing.

2.4 **Noise:** Tests are carried out for anomalies within a lot, on a subjective basis. Depending on speed, the motions in the motor cause noise and vibration of varying degrees, frequency and intensity. The noise level experienced with a single sample unit should not be interpreted as indicative of the noise or vibration level to be expected of future deliveries.

2.5 **Service life:** Durability tests are carried out under uniform internal criteria as part of product certification. A motor's service life essentially depends on the operating and ambient conditions. Consequently, the many possible variations do not allow us to make a general statement on service life.

### 2.6 Environmental influences

**Protection against corrosion:** Our products are tested during product certification on the basis of DIN EN 60068-2-30.

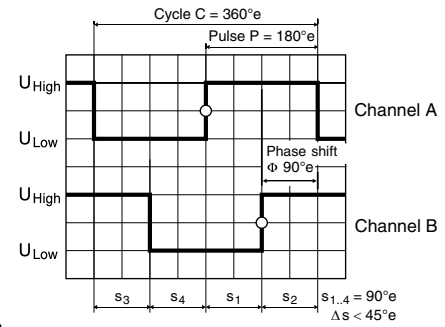
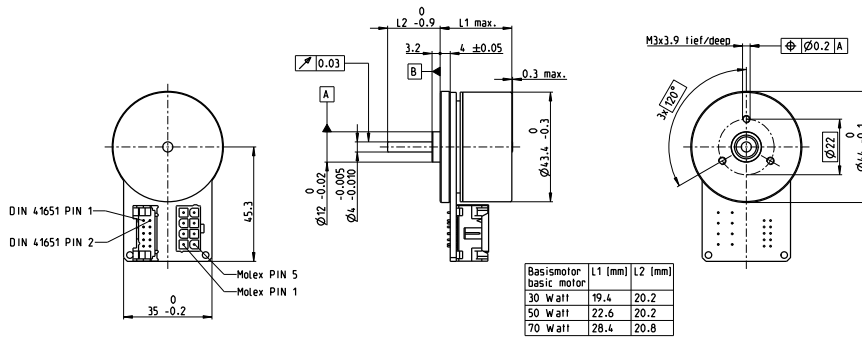
**Coating of components:** Surface treatment and coating procedures used by maxon are selected on the basis of their merits to resist corrosion. These treatments are evaluated at product certification according to their applicable standard.

3. Parameters that differ from or are additional to the data sheet can be specified and will be then a central part of our systematic testing as the customer's specification. Test/inspection certificates are issued by prior agreement.

January 2010 edition / subject to change

# Encoder MILE 256–2048 CPT, 2 Channels, with Line Driver

Integrated into motor



M 1:3

Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Article Numbers

462002	462003	462004	462005
--------	--------	--------	--------

Type	462002	462003	462004	462005
Counts per turn	256	512	1024	2048
Number of channels	2	2	2	2
Max. operating frequency (kHz)	500	500	500	500
Max. speed (rpm)	10000	10000	10000	10000



## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC 45 flat, 30 W	299					19.4 / 19.4 / 19.4 / 19.4
EC 45 flat, 30 W	299	GP 42, 3 - 15 Nm	351			● ● ● ●
EC 45 flat, 30 W	299	GS 45, 0.5 - 2.0 Nm	353			● ● ● ●
EC 45 flat, 50 W	300					22.6 / 22.6 / 22.6 / 22.6
EC 45 flat, 50 W	300	GP 42, 3 - 15 Nm	351			● ● ● ●
EC 45 flat, 50 W	300	GS 45, 0.5 - 2.0 Nm	353			● ● ● ●
EC 45 flat, 70 W	301					28.4 / 28.4 / 28.4 / 28.4
EC 45 flat, 70 W	301	GP 42, 3 - 15 Nm	351			● ● ● ●
EC 45 flat, 70 W	301	GS 45, 0.5 - 2.0 Nm	353			● ● ● ●

## Technical Data

Supply voltage $V_{CC}$	5 V ± 10%
Output signal	CMOS and TTL compatible
State length $s_n$ 90°e (1000 rpm)	45...135°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 1$ kΩ, 25°C)	100 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 1$ kΩ, 25°C)	100 ns
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 3.5 gcm <sup>2</sup>
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	10 kΩ ± 20%
Wiring diagram for Hall sensors see p. 37	

## Pin Allocation

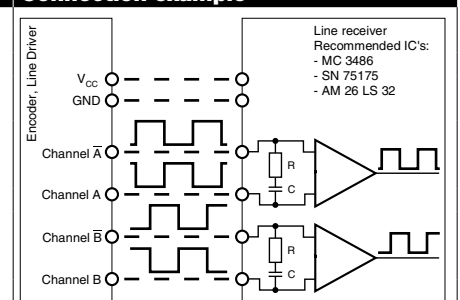
Connection motor	Connection Encoder
Pin 1 Hall sensor 1*	Pin 1 N.C.
Pin 2 Hall sensor 2*	Pin 2 $V_{CC}$
Pin 3 $V_{Hall}$ 4.5...18 VDC	Pin 3 GND
Pin 4 Motor winding 3	Pin 4 N.C.
Pin 5 Hall sensor 3*	Pin 5 Channel $\bar{A}$
Pin 6 GND	Pin 6 Channel A
Pin 7 Motor winding 1	Pin 7 Channel $\bar{B}$
Pin 8 Motor winding 2	Pin 8 Channel B
	Pin 9 Do not connect
	Pin 10 Do not connect

\*Internal pull-up (10 kΩ) on pin 3 ( $V_{Hall}$ )

**Connector:**  
39-28-1083 Molex  
DIN 41651/EN 60603-13

**Note:** Pull-down resistors < 100 kΩ on the encoder outputs are not permitted. Pull-up resistors are permitted, but not required.

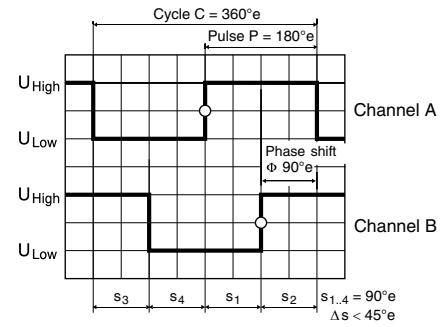
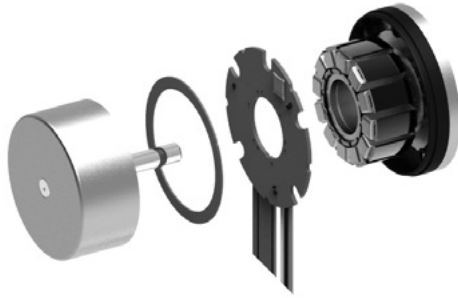
## Connection example



Opt. terminal resistance R = typical 120 Ω  
Capacitor C ≥ 0.1 nF per m line length

# Encoder MILE 512–4096 CPT, 2 Channels, with Line Driver

Integrated into motor



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

Part Numbers			
421985	421986	421987	421988

Type				
Counts per turn	512	1024	2048	4096
Number of channels	2	2	2	2
Max. operating frequency (kHz)	500	500	500	500
Max. speed (rpm)	6000	6000	6000	6000



maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC 60 flat, IP00	304					39.0
EC 60 flat, IP00	304	GP 52, 4 - 30 Nm	355			●
EC 60 flat, IP54	304					43.0
EC 60 flat, IP54	304	GP 52, 4 - 30 Nm	355			●

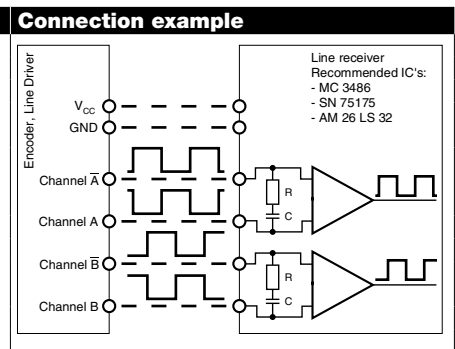
Technical Data	
Supply voltage $V_{CC}$	5 V $\pm$ 10%
Output signal	CMOS and TTL compatible
State length $s_n$ (1000 rpm)	90°e $\pm$ <45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 1$ k $\Omega$ , 25°C)	100 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 1$ k $\Omega$ , 25°C)	100 ns
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	$\leq 13$ gcm <sup>2</sup>
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	10 k $\Omega$ $\pm$ 20%
Wiring diagram for Hall sensors see p. 37	

**Pin Allocation**

- 1 N.C.
- 2  $V_{CC}$
- 3 GND
- 4 N.C.
- 5 Channel  $\bar{A}$
- 6 Channel A
- 7 Channel  $\bar{B}$
- 8 Channel B
- 9 Do not connect
- 10 Do not connect

DIN Connector 41651/EN 60603-13  
flat ribbon cable AWG 28

**Note:** Pull-down resistors < 100 k $\Omega$  on the encoder outputs are not permitted. Pull-up resistors are permitted, but not required.



Additional information can be found under 'Downloads' in the maxon online shop.

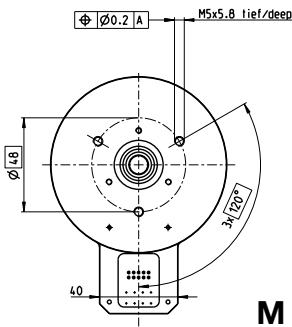
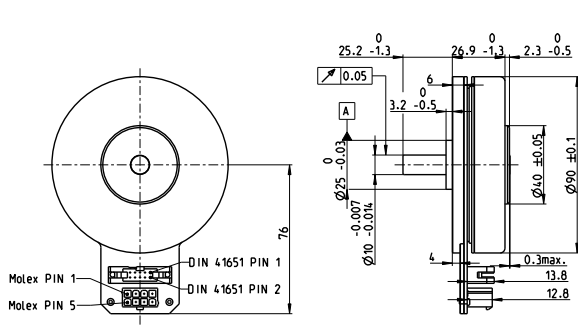
Opt. terminal resistance R = typical 120  $\Omega$   
Capacitor C  $\geq 0.1$  nF per m line length



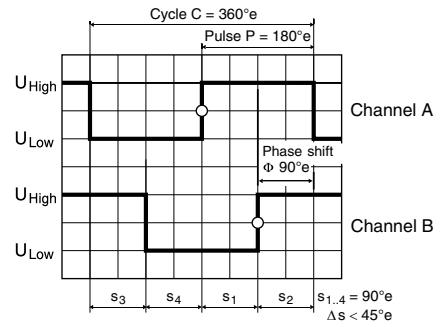
# Encoder MILE 512-6400 CPT, 2 Channels, with Line Driver RS 422

Integrated into motor

maxon sensor



M 1:3



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

453234	409996	453233	411964	453232	411965	453231	411966
--------	--------	--------	--------	--------	--------	--------	--------

Type	453234	409996	453233	411964	453232	411965	453231	411966
Counts per turn	512	800	1024	1600	2048	3200	4096	6400
Number of channels	2	2	2	2	2	2	2	2
Max. operating frequency (kHz)	500	500	500	500	500	500	500	500
Max. speed (rpm)	5000	5000	5000	5000	5000	5000	5000	4650



maxon Modular System						Overall length [mm] / ● see Gearhead					
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	29.2	29.2	29.2	29.2	29.2	29.2
EC 90 flat	305					●	●	●	●	●	●
EC 90 flat	305	GP 52, 4 - 30 Nm	355			●	●	●	●	●	●

### Technical Data

Supply voltage $V_{CC}$	5 V ± 10%
Output signal driver used:	EIA Standard RS422 AM26C31QD
State length $s_n$ (500 rpm)	90°e ± <45°e
Signal rise and fall times (typically, at $C_L = 120$ pF, $R_L = 100$ Ω)	20 ns
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 65 gcm <sup>2</sup>
Output current per channel	min. -20 mA, max. 20 mA
Wiring diagram for Hall sensors see p. 37	

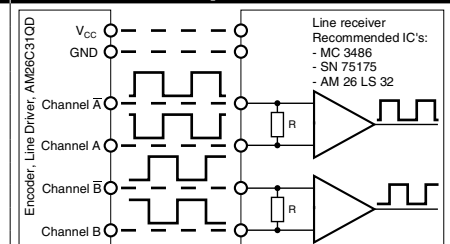
### Pin Allocation

Connection motor	Connection Encoder
Pin 1 Hall sensor 1*	Pin 1 N.C.
Pin 2 Hall sensor 2*	Pin 2 $V_{CC}$
Pin 3 $V_{Hall}$ 4.5...18 VDC	Pin 3 GND
Pin 4 Motor winding 3	Pin 4 N.C.
Pin 5 Hall sensor 3*	Pin 5 Channel $\bar{A}$
Pin 6 GND	Pin 6 Channel A
Pin 7 Motor winding 1	Pin 7 Channel $\bar{B}$
Pin 8 Motor winding 2	Pin 8 Channel B
	Pin 9 Do not connect
	Pin 10 Do not connect

\*Internal pull-up (10 kΩ) on pin 3 ( $V_{Hall}$ )

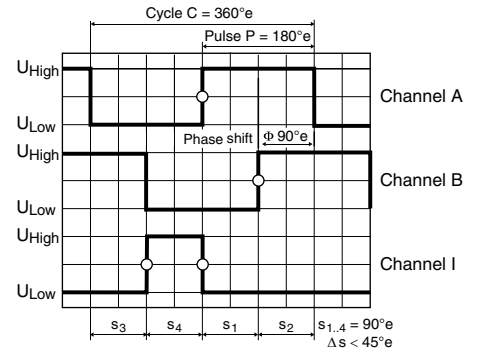
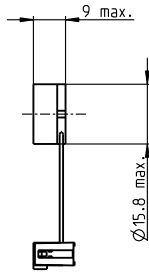
**Connector:**  
39-28-1083 Molex  
DIN 41651/EN 60603-13

### Connection example



Opt. terminal resistance R = typical 120 Ω

# Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

499356	499357	499358	499359	499360	499361
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Type (provisional)	499356	499357	499358	499359	499360	499361
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	200	400	800	800	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift $\Phi$ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead					
EC-i 40, 50 W	281/282					37.7	37.7	37.7	37.7	37.7	37.7
EC-i 40, 50 W	281	GP 32, 1 - 6 Nm	343			●	●	●	●	●	●
EC-i 40, 50 W	281	GP 32 S	370-372			●	●	●	●	●	●
EC-i 40, 50 W	281/282	GP 42, 3 - 15 Nm	350			●	●	●	●	●	●
EC-i 40, 70 W	283/284					47.7	47.7	47.7	47.7	47.7	47.7
EC-i 40, 70 W	283	GP 32, 1 - 6 Nm	343			●	●	●	●	●	●
EC-i 40, 70 W	283	GP 32 S	370-372			●	●	●	●	●	●
EC-i 40, 70 W	283/284	GP 42, 3 - 15 Nm	350			●	●	●	●	●	●
EC-i 40, 100 W	285					67.7	67.7	67.7	67.7	67.7	67.7
EC-i 40, 100 W	285	GP 42, 3 - 15 Nm	350			●	●	●	●	●	●
EC-i 52, 180 W	286					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 180 W	286	GP 52, 4 - 30 Nm	354			●	●	●	●	●	●

### Technical Data

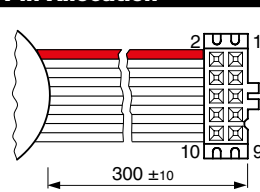
Supply voltage $V_{CC}$	5 V ± 10%
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at $C_L = 200$ pF, $R_L = 100$ Ω)	20 ns

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 34.

Additional information can be found in the maxon online shop under downloads.

The index signal I is synchronized with channel A or B.

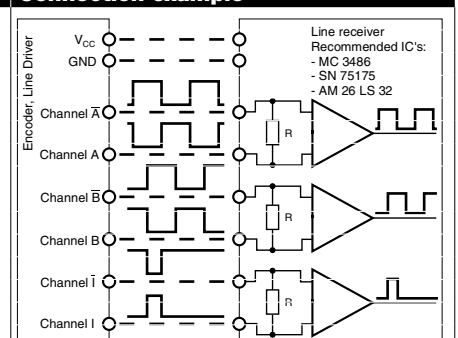
### Pin Allocation



- 1 N.C.
- 2  $V_{CC}$
- 3 GND
- 4 N.C.
- 5 Channel A
- 6 Channel A
- 7 Channel B
- 8 Channel B
- 9 Channel I (Index)
- 10 Channel I (Index)

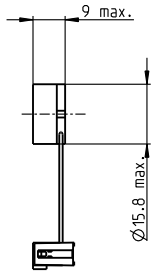
DIN Connector 41651/  
EN 60603-13  
flat band cable AWG 28

### Connection example

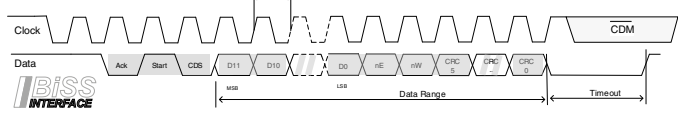


Opt. terminal resistance R = typical 120 Ω

# Encoder 16 EASY Absolute 4096 steps, Single Turn



## BiSS-C



## SSI



Angle values increase when direction of rotation is cw (definition of 'cw' on p. 150)

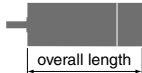
## Part numbers

488783      488782

- Stock program
- Standard program
- Special program (on request)

## Type (provisional)

Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30000	30000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.6	0.04
Max. clock frequency CLK (MHz)	10	4
Timeout (µs)	2	16



## maxon modular system

+ Motor	Page	+ Electronics	Page	+ Accessories*	Total length [mm]	
EC-i 40, 50 W	281/282				37.7	37.7
EC-i 40, 50 W	281/282	EPOS2 50/5	425	Signal Cable J5 <span style="color: red;">300586</span>	•	•
EC-i 40, 50 W	281/282	EPOS2 70/10	425	Signal Cable J5B <span style="color: red;">378173</span>	•	•
EC-i 40, 50 W	281/282	MAXPOS 50/5	435	Sensor Cable X6 <span style="color: red;">451290</span>	•	•
EC-i 40, 70 W	283/284				47.7	47.7
EC-i 40, 70 W	283/284	EPOS2 50/5	425	Signal Cable J5 <span style="color: red;">300586</span>	•	•
EC-i 40, 70 W	283/284	EPOS2 70/10	425	Signal Cable J5B <span style="color: red;">378173</span>	•	•
EC-i 40, 70 W	283/284	MAXPOS 50/5	435	Sensor Cable X6 <span style="color: red;">451290</span>	•	•
EC-i 40, 100 W	285				67.7	67.7
EC-i 40, 100 W	285	EPOS2 50/5	425	Signal Cable J5 <span style="color: red;">300586</span>	•	•
EC-i 40, 100 W	285	EPOS2 70/10	425	Signal Cable J5B <span style="color: red;">378173</span>	•	•
EC-i 40, 100 W	285	MAXPOS 50/5	435	Sensor Cable X6 <span style="color: red;">451290</span>	•	•
EC-i 52, 180 W	286				93.7	93.7
EC-i 52, 180 W	286	EPOS2 70/10	425	Signal Cable J5B <span style="color: red;">378173</span>	•	•
EC-i 52, 180 W	286	MAXPOS 50/5	435	Sensor Cable X6 <span style="color: red;">451290</span>	•	•

\* + Adapter EASY Absolute 488167 (required for all maxon controllers)

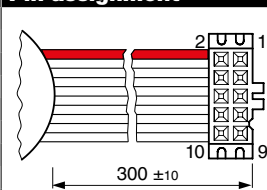
## Technical data

Supply voltage $V_{CC}$	5 V ± 10%
Output signal	CMOS compatible
Output current, data	max. 20 mA
Current draw, typ. (no load)	17 mA
Setup time after Power On	max. 4 ms
Hysteresis	0.17° mech
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Operating temperature range	-40...+100 °C

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 34.

Additional information can be found under 'Downloads' in the maxon online shop.

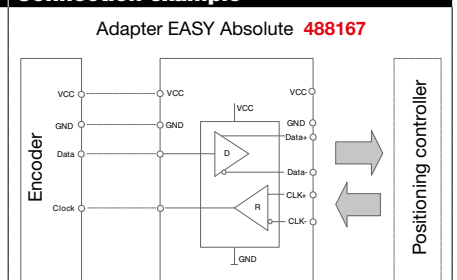
## Pin assignment



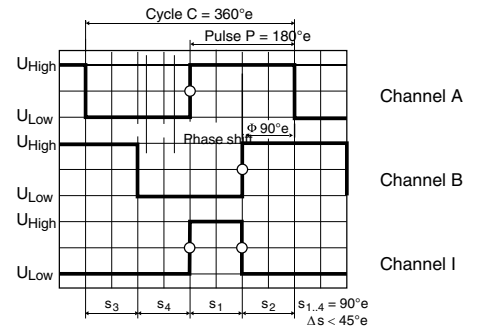
- 1 Data
- 2  $V_{CC}$
- 3 GND
- 4 CLK
- 5 Do not connect (A)
- 6 Do not connect (A)
- 7 Do not connect (B)
- 8 Do not connect (B)
- 9 Do not connect (I)
- 10 Do not connect (I)

DIN Connector 41651/  
EN 60603-13  
flat ribbon cable AWG 28

## Connection example



# Encoder 6-8 MAG 64-256 CPT, 3 Channels



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

Part Numbers			
502804	502805	502806	

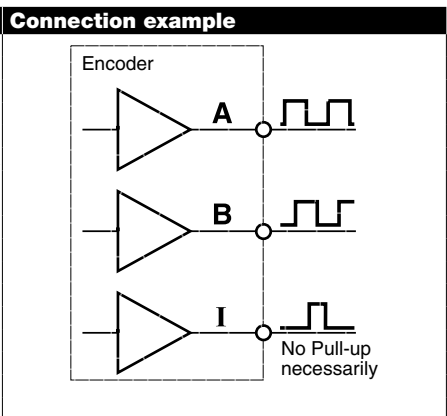
Type (provisional)			
Counts per turn	64	128	256
Number of channels	3	3	3
Max. operating frequency (kHz)	64	64	64
Max. speed (rpm)	100 000	50 000	25 000



maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC 6, 1.5 W	236					23.4    23.4    23.4
EC 6, 1.5 W	236	GP 6, 0.002 - 0.03 Nm	311			●    ●    ●
EC 6, 1.5 W	236	GP 6 S	361-362			●    ●    ●
EC 6, 2.0 W	237					23.4    23.4    23.4
EC 6, 2.0 W	237	GP 6, 0.002 - 0.03 Nm	311			●    ●    ●
EC 6, 2.0 W	237	GP 6 S	361-362			●    ●    ●

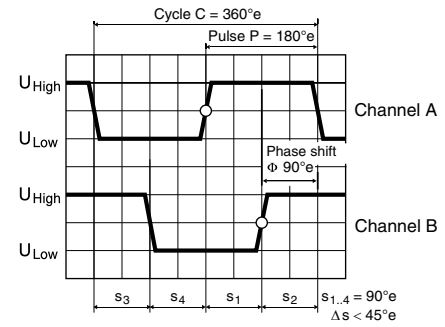
Technical Data	
Supply voltage $V_{CC}$	3 - 3.6 V
Output signal $V_{CC} = 3.3$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ e$
Index pulse width	$90^\circ \pm 45^\circ e$
Operating temperature range	$-40 \dots +125^\circ C$
Moment of inertia of code wheel	$\leq 0.001$ gcm <sup>2</sup>
Output current per channel	$\leq 4$ mA

Pin Allocation																									
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">1 Motor +</td> <td style="width: 50%;">EC W1</td> </tr> <tr> <td>2 Motor -</td> <td>W2</td> </tr> <tr> <td>3 NC</td> <td>W3</td> </tr> <tr> <td>4 GND</td> <td>GND</td> </tr> <tr> <td>5 <math>V_{CC}</math></td> <td><math>V_{CC}</math></td> </tr> <tr> <td>6 Channel A</td> <td>Channel A</td> </tr> <tr> <td>7 Channel B</td> <td>Channel B</td> </tr> <tr> <td>8 Channel I</td> <td>Channel I</td> </tr> <tr> <td>9 NC</td> <td>H1</td> </tr> <tr> <td>10 NC</td> <td>H2</td> </tr> <tr> <td>11 NC</td> <td>H3</td> </tr> <tr> <td>12 NC</td> <td>NC</td> </tr> </table>	1 Motor +	EC W1	2 Motor -	W2	3 NC	W3	4 GND	GND	5 $V_{CC}$	$V_{CC}$	6 Channel A	Channel A	7 Channel B	Channel B	8 Channel I	Channel I	9 NC	H1	10 NC	H2	11 NC	H3	12 NC	NC
1 Motor +	EC W1																								
2 Motor -	W2																								
3 NC	W3																								
4 GND	GND																								
5 $V_{CC}$	$V_{CC}$																								
6 Channel A	Channel A																								
7 Channel B	Channel B																								
8 Channel I	Channel I																								
9 NC	H1																								
10 NC	H2																								
11 NC	H3																								
12 NC	NC																								
Compatible connector: Molex 52745-0697, Tyco 1-1734839-4 Adapter: 498157																									





# Encoder MR Type S, 16 CPT, 2 Channels



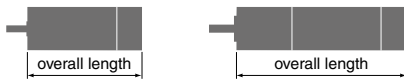
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

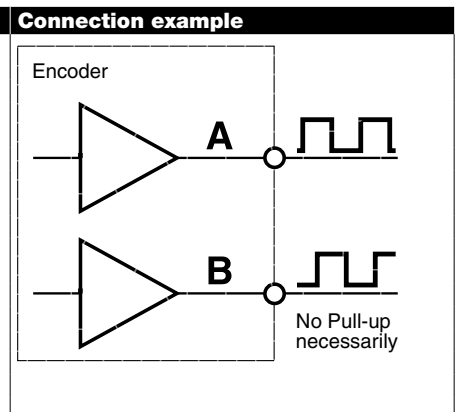
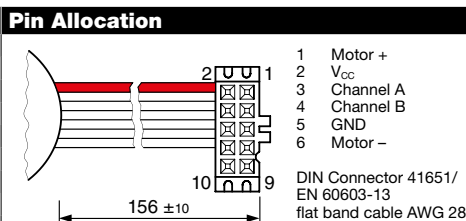
201933 224702

Type		
Counts per turn	16	16
Number of channels	2	2
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	30000	30000

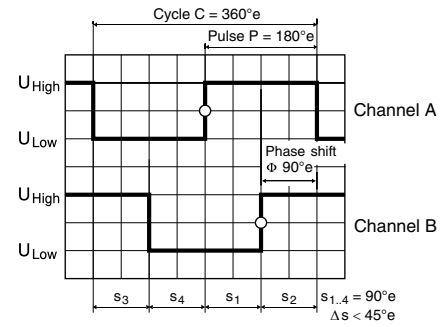


maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 10, 0.75 W	155					22.8
RE 10, 0.75 W	155	GP 10, 0.005 - 0.15 Nm	313/314			●
RE 10, 1.5 W	157					30.4
RE 10, 1.5 W	157	GP 10, 0.005 - 0.15 Nm	313/314			●
RE 13, 0.75 W	160					26.3
RE 13, 0.75 W	161					28.7
RE 13, 0.75 W	161	GP 13, 0.05 - 0.15 Nm	316			●
RE 13, 0.75 W	161	GP 13, 0.2 - 0.35 Nm	317			●
RE 13, 2 W	164					38.5
RE 13, 2 W	165					40.9
RE 13, 2 W	165	GP 13, 0.05 - 0.15 Nm	316			●
RE 13, 2 W	165	GP 13, 0.2 - 0.35 Nm	317			●
RE 13, 1.5 W	168					28.4
RE 13, 1.5 W	169					30.8
RE 13, 1.5 W	169	GP 13, 0.05 - 0.15 Nm	316			●
RE 13, 1.5 W	169	GP 13, 0.2 - 0.35 Nm	317			●
RE 13, 3 W	172					40.6
RE 13, 3 W	173					43.0
RE 13, 3 W	173	GP 13, 0.05 - 0.15 Nm	316			●
RE 13, 3 W	173	GP 13, 0.2 - 0.35 Nm	317			●
A-max 12, 0.5 W	192					25.3
A-max 12, 0.5 W	192	GP 10, 0.01 - 0.15 Nm	314			●
A-max 12, 0.5 W	192	GS 12, 0.01 - 0.03 Nm	315			●
A-max 12, 0.5 W	192	GP 13, 0.05 - 0.15 Nm	316			●
A-max 12, 0.5 W	192	GP 13, 0.2 - 0.35 Nm	317			●
RE-max 13, 0.75 W	220					25.2
RE-max 13, 0.75 W	220	GP 13, 0.05 - 0.15 Nm	316			●
RE-max 13, 0.75 W	220	GP 13, 0.2 - 0.35 Nm	317			●
RE-max 13, 2 W	222					36.2
RE-max 13, 2 W	222	GP 13, 0.05 - 0.15 Nm	316			●
RE-max 13, 2 W	222	GP 13, 0.2 - 0.35 Nm	317			●

Technical Data	
Supply voltage $V_{CC}$	2.7 - 5.5 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	$\leq 0.005$ gcm <sup>2</sup>
Output current per channel	max. 5 mA



# Encoder MR Type S, 64–256 CPT, 2 Channels, with Line Driver



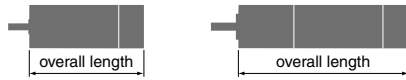
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

**323049** **323050** **334910** **323051** **323052** **323053** **323054**

Type	323049	323050	334910	323051	323052	323053	323054
Counts per turn	64	64	100	128	128	256	256
Number of channels	2	2	2	2	2	2	2
Max. operating frequency (kHz)	80	80	100	160	160	320	320
Max. speed (rpm)	75000	75000	60000	75000	75000	75000	75000



## maxon Modular System

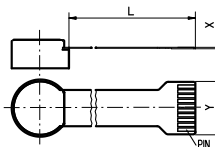
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead
RE 8, 0.5 W, A	153					22.6
RE 8, 0.5 W, A	153	GP 8, 0.01 - 0.1 Nm	312			•
RE 8, 0.5 W, A	153	GP 8 S	363–364			•
RE 10, 0.75 W	155					22.8
RE 10, 0.75 W	155	GP 10, 0.005 - 0.15 Nm	313/314			•
RE 10, 1.5 W	157					30.4
RE 10, 1.5 W	157	GP 10, 0.005 - 0.15 Nm	313/314			•
RE 13, 0.75 W	160					26.3
RE 13, 0.75 W	161					28.7
RE 13, 0.75 W	161	GP 13, 0.05 - 0.15 Nm	316			•
RE 13, 0.75 W	161	GP 13, 0.2 - 0.35 Nm	317			•
RE 13, 2 W	164					38.5
RE 13, 2 W	165					40.9
RE 13, 2 W	165	GP 13, 0.05 - 0.15 Nm	316			•
RE 13, 2 W	165	GP 13, 0.2 - 0.35 Nm	317			•
RE 13, 1.5 W	168					28.4
RE 13, 1.5 W	169					30.8
RE 13, 1.5 W	169	GP 13, 0.05 - 0.15 Nm	316			•
RE 13, 1.5 W	169	GP 13, 0.2 - 0.35 Nm	317			•
RE 13, 3 W	172					40.6
RE 13, 3 W	173					43.0
RE 13, 3 W	173	GP 13, 0.05 - 0.15 Nm	316			•
RE 13, 3 W	173	GP 13, 0.2 - 0.35 Nm	317			•
A-max 12, 0.5 W	192					25.3
A-max 12, 0.5 W	192	GP 10, 0.01 - 0.15 Nm	314			•
A-max 12, 0.5 W	192	GS 12, 0.01 - 0.03 Nm	315			•
A-max 12, 0.5 W	192	GP 13, 0.05 - 0.15 Nm	316			•
A-max 12, 0.5 W	192	GP 13, 0.2 - 0.35 Nm	317			•
RE-max 13, 0.75 W	220					25.2
RE-max 13, 0.75 W	220	GP 13, 0.05 - 0.15 Nm	316			•
RE-max 13, 0.75 W	220	GP 13, 0.2 - 0.35 Nm	317			•
RE-max 13, 2 W	222					36.2
RE-max 13, 2 W	222	GP 13, 0.05 - 0.15 Nm	316			•
RE-max 13, 2 W	222	GP 13, 0.2 - 0.35 Nm	317			•

## Technical Data

Supply voltage $V_{CC}$	5 V $\pm$ 5%
Output signal	TTL compatible
Phase shift $\Phi$	90°e $\pm$ 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	$\leq$ 0.005 gcm <sup>2</sup>
Output current per channel	max. 5 mA

## Pin Allocation

**Part Numbers 323049–323054**  
 Pin 1–10 / X = 0.3  $\pm$  0.05 / Y = 11 -0.1 / L = 80  $\pm$  3  
 Compatible connector:  
 Molex 52207-1033, Tyco 1-84953-0  
 Pitch 1.0 mm, top contact style

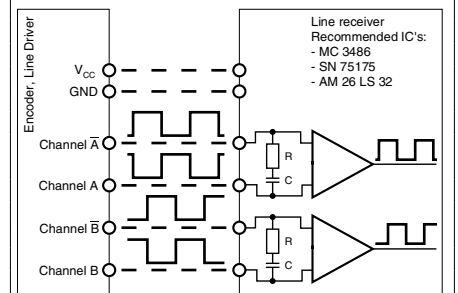


**Part Numbers 334910**  
 Pin 1–8 / X = 0.3  $\pm$  0.03 / Y = 4.5  $\pm$  0.07 / L = 84  $\pm$  3  
 Compatible connector:  
 Molex 52745-0833

- 1 Motor +
- 2  $V_{CC}$
- 3 GND
- 4 Motor -
- 5 Channel A
- 6 Channel A
- 7 Channel B
- 8 Channel B
- 9 N.C.
- 10 N.C.

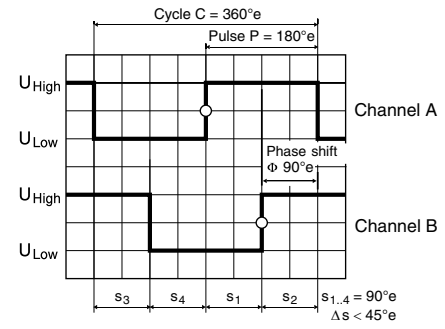
- 1 Motor +
- 2  $V_{CC}$
- 3 GND
- 4 Motor -
- 5 Channel A
- 6 Channel A
- 7 Channel B
- 8 Channel B

## Connection example



Terminal resistance R = typical 120  $\Omega$   
 Capacitor C  $\geq$  0.1 nF per m line length

# Encoder MR Type S, 64–256 CPT, 2 Channels



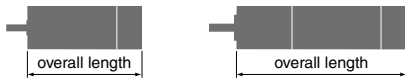
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

241057	241060	241062
--------	--------	--------

Type	241057	241060	241062
Counts per turn	64	128	256
Number of channels	2	2	2
Max. operating frequency (kHz)	80	160	320
Max. speed (rpm)	75 000	75 000	75 000



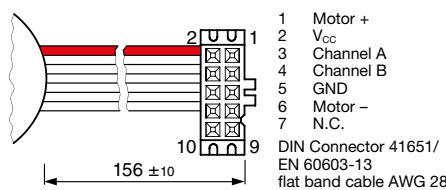
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 13, 0.75 W	160					26.3 26.3 26.3
RE 13, 0.75 W	161					28.7 28.7 28.7
RE 13, 0.75 W	161	GP 13, 0.05 - 0.15 Nm	316			● ● ●
RE 13, 0.75 W	161	GP 13, 0.2 - 0.35 Nm	317			● ● ●
RE 13, 2 W	164					38.5 38.5 38.5
RE 13, 2 W	165					40.9 40.9 40.9
RE 13, 2 W	165	GP 13, 0.05 - 0.15 Nm	316			● ● ●
RE 13, 2 W	165	GP 13, 0.2 - 0.35 Nm	317			● ● ●
RE 13, 1.5 W	168					28.4 28.4 28.4
RE 13, 1.5 W	169					30.8 30.8 30.8
RE 13, 1.5 W	169	GP 13, 0.05 - 0.15 Nm	316			● ● ●
RE 13, 1.5 W	169	GP 13, 0.2 - 0.35 Nm	317			● ● ●
RE 13, 3 W	172					40.6 40.6 40.6
RE 13, 3 W	173					43.0 43.0 43.0
RE 13, 3 W	173	GP 13, 0.05 - 0.15 Nm	316			● ● ●
RE 13, 3 W	173	GP 13, 0.2 - 0.35 Nm	317			● ● ●
RE-max 13, 0.75 W	220					25.2 25.2 25.2
RE-max 13, 0.75 W	220	GP 13, 0.05 - 0.15 Nm	316			● ● ●
RE-max 13, 0.75 W	220	GP 13, 0.2 - 0.35 Nm	317			● ● ●
RE-max 13, 2 W	222					36.2 36.2 36.2
RE-max 13, 2 W	222	GP 13, 0.05 - 0.15 Nm	316			● ● ●
RE-max 13, 2 W	222	GP 13, 0.2 - 0.35 Nm	317			● ● ●

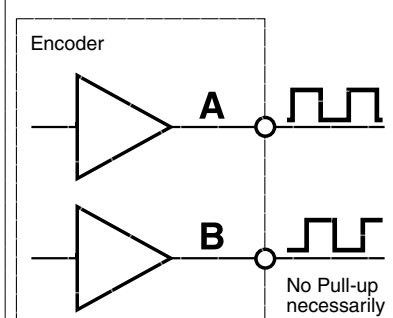
## Technical Data

Supply voltage $V_{CC}$	5 V ± 5%
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.005 gcm <sup>2</sup>
Output current per channel	max. 5 mA

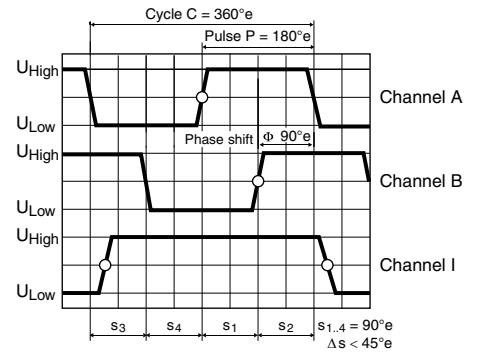
## Pin Allocation



## Connection example



# Encoder MR Type M, 32 CPT, 2/3 Channels



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

201935	201938
--------	--------

### Type

Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15 000	15 000



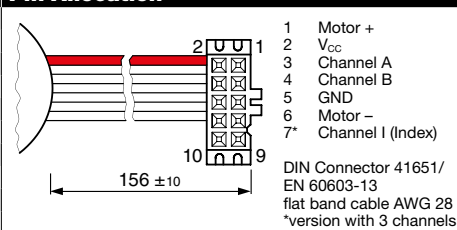
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 16, 2 W	174					28.0 / 28.0
RE 16, 2 W	174	GP 16, 0.1 - 0.6 Nm	323/324			● / ●
RE 16, 2 W	174	GP 16 S	365/366			● / ●
RE 16, 3.2 W	176					45.4 / 45.4
RE 16, 3.2 W	176	GP 16, 0.1 - 0.6 Nm	323/324			● / ●
RE 16, 3.2 W	176	GP 16 S	365/366			● / ●
RE 16, 4.5 W	178					48.4 / 48.4
RE 16, 4.5 W	178	GP 16, 0.1 - 0.6 Nm	323/324			● / ●
RE 16, 4.5 W	178	GP 16 S	365/366			● / ●
A-max 16	194/196					30.4 / 30.4
A-max 16	194/196	GS 16, 0.01 - 0.1 Nm	319-322			● / ●
A-max 16	194/196	GP 16, 0.1 - 0.3 Nm	323			● / ●
A-max 16	194/196	GP 16 S	365/366			● / ●
A-max 19, 1.5 W	198					34.0 / 34.0
A-max 19, 1.5 W	198	GP 19, 0.1 - 0.3 Nm	325			● / ●
A-max 19, 1.5 W	198	GP 22, 0.5 - 2.0 Nm	331			● / ●
A-max 19, 1.5 W	198	GS 24, 0.1 Nm	335			● / ●
A-max 19, 1.5 W	198	GP 22 S	368/369			● / ●
A-max 19, 2.5 W	200					35.8 / 35.8
A-max 19, 2.5 W	200	GP 19, 0.1 - 0.3 Nm	325			● / ●
A-max 19, 2.5 W	200	GS 20, 0.06 - 0.25 Nm	326			● / ●
A-max 19, 2.5 W	200	GP 22, 0.5 - 2.0 Nm	331			● / ●
A-max 19, 2.5 W	200	GS 24, 0.1 Nm	335			● / ●
A-max 19, 2.5 W	200	GP 22 S	368/369			● / ●
A-max 22	202/204					36.9 / 36.9
A-max 22	202/204	GP 22, 0.1 - 0.6 Nm	327/328			● / ●
A-max 22	202/204	GP 22, 0.5 - 2.0 Nm	327-331			● / ●
A-max 22	202/204	GS 24, 0.1 Nm	335			● / ●
A-max 22	202/204	GP 22 S	368/369			● / ●

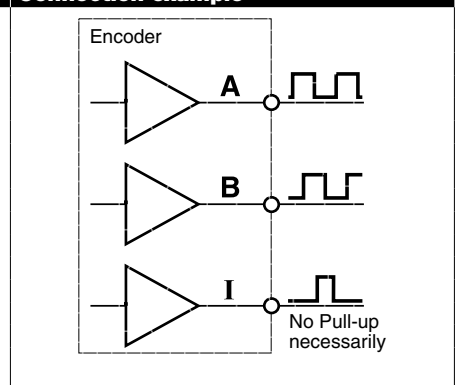
### Technical Data

Supply voltage $V_{CC}$	2.7–5.5 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	$\leq 0.09$ gcm <sup>2</sup>
Output current per channel	max. 5 mA

### Pin Allocation

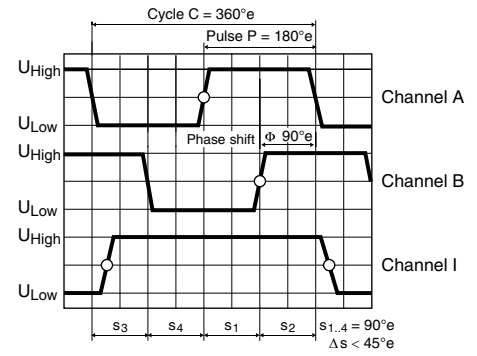


### Connection example



The index signal I is not synchronized with channel A or B. The length of the index signal can last more than one cycle.

# Encoder MR Type M, 32 CPT, 2/3 Channels



Direction of rotation cw (definition cw p. 150)

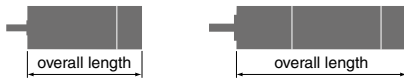
maxon sensor

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

201935	201938
--------	--------

Type	201935	201938
Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15000	15000



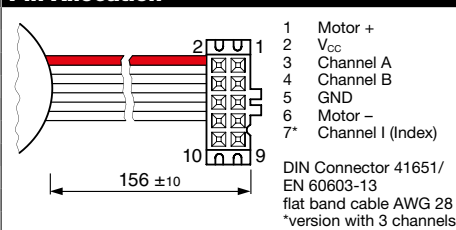
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE-max 21, 3.5 W	224					34.0    34.0
RE-max 21, 3.5 W	224	GP 22, 0.5 - 2.0 Nm	329/331			●    ●
RE-max 21, 3.5 W	224	GS 38, 0.1 - 0.6 Nm	348			●    ●
RE-max 21, 3.5 W	224	GP 22 S	368/369			●    ●
RE-max 21, 6 W	226					35.8    35.8
RE-max 21, 6 W	226	GP 22, 0.5 - 2.0 Nm	329/331			●    ●
RE-max 21, 6 W	226	GS 38, 0.1 - 0.6 Nm	348			●    ●
RE-max 21, 6 W	226	GP 22 S	368/369			●    ●

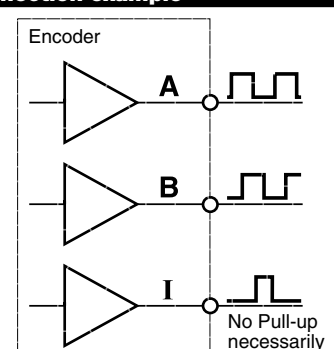
## Technical Data

Supply voltage $V_{CC}$	2.7 - 5.5 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	$\leq 0.09$ gcm <sup>2</sup>
Output current per channel	max. 5 mA

## Pin Allocation



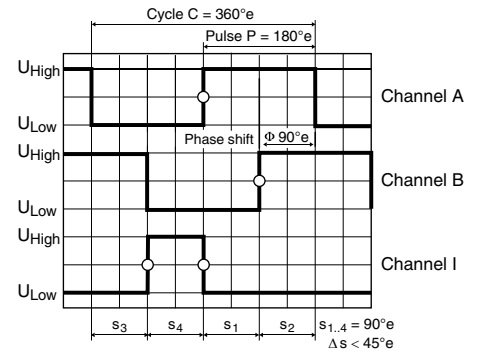
## Connection example



The index signal I is not synchronized with channel A or B. The length of the index signal can last more than one cycle.



# Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

228179	228177	228181	228182	201937	201940
--------	--------	--------	--------	--------	--------

Type	228179	228177	228181	228182	201937	201940
Counts per turn	128	128	256	256	512	512
Number of channels	2	3	2	3	2	3
Max. operating frequency (kHz)	80	80	160	160	320	320
Max. speed (rpm)	37500	37500	37500	37500	37500	37500



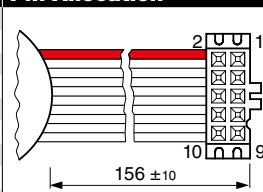
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead					
RE 16, 2 W	174					28.0	28.0	28.0	28.0	28.0	28.0
RE 16, 2 W	174	GP 16, 0.1 - 0.6 Nm	323/324			•	•	•	•	•	•
RE 16, 2 W	174	GP 16 S	365/366			•	•	•	•	•	•
RE 16, 3.2 W	176					45.4	45.4	45.4	45.4	45.4	45.4
RE 16, 3.2 W	176	GP 16, 0.1 - 0.6 Nm	323/324			•	•	•	•	•	•
RE 16, 3.2 W	176	GP 16 S	365/366			•	•	•	•	•	•
RE 16, 4.5 W	178					48.4	48.4	48.4	48.4	48.4	48.4
RE 16, 4.5 W	178	GP 16, 0.1 - 0.6 Nm	323/324			•	•	•	•	•	•
RE 16, 4.5 W	178	GP 16 S	365/366			•	•	•	•	•	•
A-max 16	194/196					30.4	30.4	30.4	30.4	30.4	30.4
A-max 16	194/196	GS 16, 0.01 - 0.1 Nm	319-322			•	•	•	•	•	•
A-max 16	194/196	GP 16, 0.1 - 0.6 Nm	323/324			•	•	•	•	•	•
A-max 16	194/196	GP 16 S	365/366			•	•	•	•	•	•
A-max 19, 1.5 W	198					34.0	34.0	34.0	34.0	34.0	34.0
A-max 19, 1.5 W	198	GP 19, 0.1 - 0.3 Nm	325			•	•	•	•	•	•
A-max 19, 1.5 W	198	GP 22, 0.5 - 2.0 Nm	329/331			•	•	•	•	•	•
A-max 19, 1.5 W	198	GS 24, 0.1 Nm	335			•	•	•	•	•	•
A-max 19, 1.5 W	198	GP 22 S	368/369			•	•	•	•	•	•
A-max 19, 2.5 W	200					35.8	35.8	35.8	35.8	35.8	35.8
A-max 19, 2.5 W	200	GP 19, 0.1 - 0.3 Nm	325			•	•	•	•	•	•
A-max 19, 2.5 W	200	GS 20 0.06 - 0.25 Nm	326			•	•	•	•	•	•
A-max 19, 2.5 W	200	GP 22, 0.5 - 2.0 Nm	329/331			•	•	•	•	•	•
A-max 19, 2.5 W	200	GS 24, 0.1 Nm	335			•	•	•	•	•	•
A-max 19, 2.5 W	200	GP 22 S	368/369			•	•	•	•	•	•
A-max 22	202/204					36.9	36.9	36.9	36.9	36.9	36.9
A-max 22	202/204	GP 22, 0.1 - 0.6 Nm	327/328			•	•	•	•	•	•
A-max 22	202/204	GP 22, 0.5 - 2.0 Nm	329/331			•	•	•	•	•	•
A-max 22	202/204	GS 24, 0.1 Nm	335			•	•	•	•	•	•
A-max 22	202/204	GP 22 S	368/369			•	•	•	•	•	•

### Technical Data

Supply voltage V <sub>CC</sub>	5 V ± 5%
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	max. 5 mA

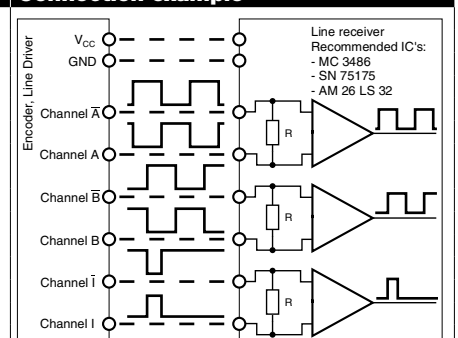
### Pin Allocation



- 1 Motor +
- 2 V<sub>CC</sub>
- 3 GND
- 4 Motor -
- 5 Channel Ā
- 6 Channel A
- 7 Channel B̄
- 8 Channel B
- 9\* Channel I (Index)
- 10\* Channel I (Index)

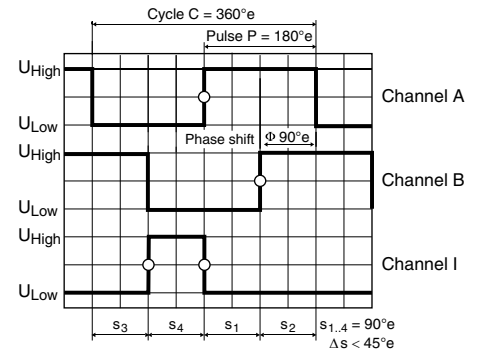
DIN Connector 41651/  
EN 60603-13  
flat band cable AWG 28  
\*version with 3 channels

### Connection example



Opt. terminal resistance R > 1 kΩ

# Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

228179	228177	228181	228182	201937	201940
--------	--------	--------	--------	--------	--------

Type	228179	228177	228181	228182	201937	201940
Counts per turn	128	128	256	256	512	512
Number of channels	2	3	2	3	2	3
Max. operating frequency (kHz)	80	80	160	160	320	320
Max. speed (rpm)	37500	37500	37500	37500	37500	37500

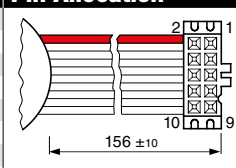
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead					
RE-max 21, 3.5 W	224					34.0	34.0	34.0	34.0	34.0	34.0
RE-max 21, 3.5 W	224	GP 22, 0.5 - 2.0 Nm	329/331			●	●	●	●	●	●
RE-max 21, 3.5 W	224	GS 38, 0.1 - 0.6 Nm	348			●	●	●	●	●	●
RE-max 21, 3.5 W	224	GP 22 S	368/369			●	●	●	●	●	●
RE-max 21, 6 W	226					35.8	35.8	35.8	35.8	35.8	35.8
RE-max 21, 6 W	226	GP 22, 0.5 - 2.0 Nm	329/331			●	●	●	●	●	●
RE-max 21, 6 W	226	GS 38, 0.1 - 0.6 Nm	348			●	●	●	●	●	●
RE-max 21, 6 W	226	GP 22 S	368/369			●	●	●	●	●	●
EC 16, 30 W	244					50.7	50.7	50.7	50.7	50.7	50.7
EC 16, 30 W	244	GP 16, 0.1 - 0.6 Nm	323/324			●	●	●	●	●	●
EC 16, 30 W	244	GP 22, 0.5 - 1.0 Nm	329			●	●	●	●	●	●
EC 16, 30 W	244	GP 16 S	365/366			●	●	●	●	●	●
EC 16, 60 W	245					66.7	66.7	66.7	66.7	66.7	66.7
EC 16, 60 W	245	GP 16, 0.2 - 0.6 Nm	324			●	●	●	●	●	●
EC 16, 60 W	245	GP 22, 0.5 - 2.0 Nm	329/332			●	●	●	●	●	●
EC 16, 60 W	245	GP 16 S/GP 22 S	365/369			●	●	●	●	●	●
EC 22, 40 W	246					50.5	50.5	50.5	50.5	50.5	50.5
EC 22, 40 W	246	GP 22, 0.5 - 3.4 Nm	332/333			●	●	●	●	●	●
EC 22, 40 W	246	GP 22 S	368/369			●	●	●	●	●	●
EC 22, 100 W	247					68.7	68.7	68.7	68.7	68.7	68.7
EC 22, 100 W	247	GP 22, 0.5 - 3.4 Nm	332/333			●	●	●	●	●	●
EC 22, 100 W	247	GP 22 S	368/369			●	●	●	●	●	●
EC-max 16, 5 W	259					31.3	31.3	31.3	31.3	31.3	31.3
EC-max 16, 5 W	259	GP 16, 0.1 - 0.6 Nm	323/324			●	●	●	●	●	●
EC-max 16, 5 W	259	GP 16 S	365/366			●	●	●	●	●	●
EC-max 16, 8 W	261					43.3	43.3	43.3	43.3	43.3	43.3
EC-max 16, 8 W	261	GP 16, 0.2 - 0.6 Nm	324			●	●	●	●	●	●
EC-max 16, 8 W	261	GP 22, 0.5 - 2.0 Nm	332			●	●	●	●	●	●
EC-max 16, 8 W	261	GP 16 S/GP 22 S	365/369			●	●	●	●	●	●
EC-max 22, 12 W	262					41.7	41.7	41.7	41.7	41.7	41.7
EC-max 22, 12 W	262	GP 22, 0.5 - 2.0 Nm	332/333			●	●	●	●	●	●
EC-max 22, 12 W	262	KD 32, 1.0 - 4.5 Nm	347			●	●	●	●	●	●
EC-max 22, 12 W	262	GP 22 S	368/369			●	●	●	●	●	●
EC-max 22, 25 W	263					58.2	58.2	58.2	58.2	58.2	58.2
EC-max 22, 25 W	263	GP 22/GP 32	333/343			●	●	●	●	●	●
EC-max 22, 25 W	263	GP 32 S	370-372			●	●	●	●	●	●

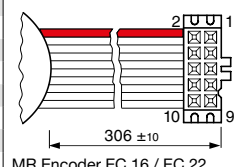
## Technical Data

Supply voltage $V_{CC}$	5 V $\pm$ 5%
Output signal	TTL compatible
Phase shift $\Phi$	90°e $\pm$ 45°e
Index pulse width	90°e $\pm$ 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	$\leq$ 0.09 gcm <sup>2</sup>
Output current per channel	max. 5 mA

## Pin Allocation



MR Encoder EC-max 16 / EC-max 22



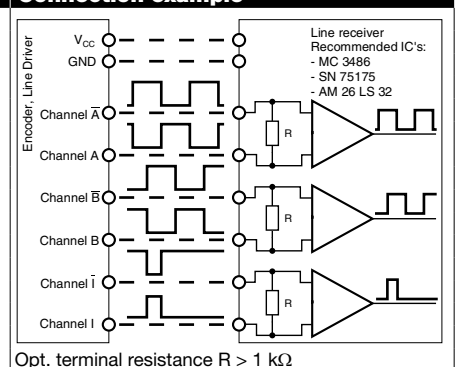
MR Encoder EC 16 / EC 22

- 1 N.C.
- 2  $V_{CC}$
- 3 GND
- 4 N.C.
- 5 Channel A
- 6 Channel A
- 7 Channel B
- 8 Channel B
- 9\* Channel I (Index)
- 10\* Channel I (Index)

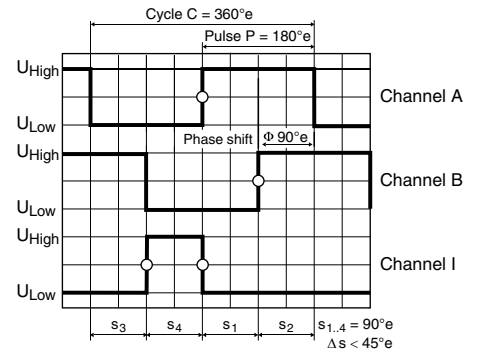
DIN Connector 41651/  
EN 60603-13  
flat band cable AWG 28  
\*version with 3 channels

Pin assignment for RE-max  
see Page 390

## Connection example



# Encoder MR Type ML, 128–1000 CPT, 3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

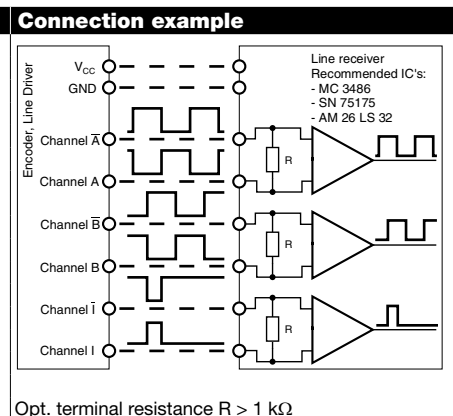
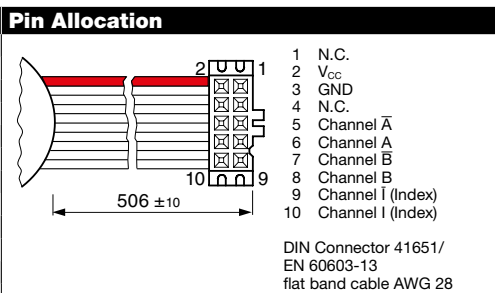
Part Numbers				
225771	225773	225778	225805	225780

Type					
Counts per turn		128	256	500	512
Number of channels		3	3	3	3
Max. operating frequency (kHz)		80	160	200	320
Max. speed (rpm)		37 500	37 500	24 000	37 500

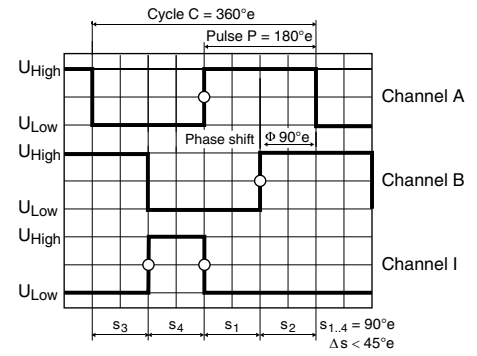
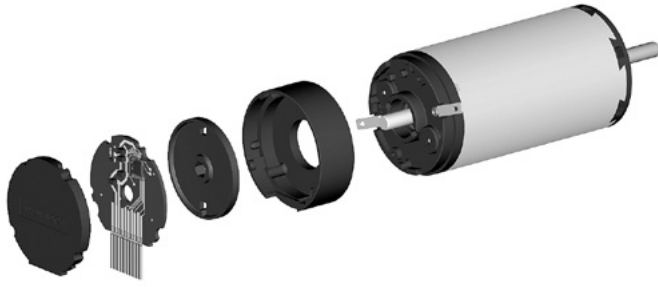


maxon Modular System						Overall length [mm] / • see Gearhead				
+ Motor	Page	+ Gearhead	Page	+ Brake	Page					
RE 25	179/181					65.5	65.5	65.5	65.5	65.5
RE 25	179/181	GP 26, 0.75 - 2.0 Nm	336			•	•	•	•	•
RE 25	179/181	GP 32, 0.75 - 6.0 Nm	338-343			•	•	•	•	•
RE 25	179/181	KD 32, 1.0 - 4.5 Nm	347			•	•	•	•	•
RE 25	179/181	GP 32 S	370-372			•	•	•	•	•
RE 25, 20 W	180					54.0	54.0	54.0	54.0	54.0
RE 25, 20 W	180	GP 22, 0.5 Nm	329			•	•	•	•	•
RE 25, 20 W	180	GP 26, 0.75 - 2.0 Nm	336			•	•	•	•	•
RE 25, 20 W	180	GP 32, 0.75 - 6.0 Nm	338-343			•	•	•	•	•
RE 25, 20 W	180	KD 32, 1.0 - 4.5 Nm	347			•	•	•	•	•
RE 25, 20 W	180	GP 32 S	370-372			•	•	•	•	•
A-max 26	206-212					53.5	53.5	53.5	53.5	53.5
A-max 26	206-212	GP 26, 0.75 - 4.5 Nm	336			•	•	•	•	•
A-max 26	206-212	GS 30, 0.07 - 0.2 Nm	337			•	•	•	•	•
A-max 26	206-212	GP 32, 0.75 - 6.0 Nm	338-343			•	•	•	•	•
A-max 26	206-212	GS 38, 0.1 - 0.6 Nm	348			•	•	•	•	•
A-max 26	206-212	GP 32 S	370-372			•	•	•	•	•
RE-max 29	227-230					53.5	53.5	53.5	53.5	53.5
RE-max 29	227-230	GP 32, 0.75 - 6.0 Nm	339-343			•	•	•	•	•
RE-max 29	227-230	GP 32 S	370-372			•	•	•	•	•
EC-max 30, 40 W	264							54.2		54.2
EC-max 30, 40 W	264	GP 32, 1 - 8.0 Nm	343/345					•		•
EC-max 30, 40 W	264	KD 32, 1.0 - 4.5 Nm	347					•		•
EC-max 30, 40 W	264	GP 32 S	370-372					•		•
EC-max 30, 60 W	265							76.2		76.2
EC-max 30, 60 W	265	GP 32, 1 - 8.0 Nm	343/345					•		•
EC-max 30, 60 W	265	KD 32, 1.0 - 4.5 Nm	347					•		•
EC-max 30, 60 W	265	GP 42, 3 - 15 Nm	350					•		•
EC-4pole 30	273							59.2		59.2
EC-4pole 30	273	GP 32, 4.0 - 8.0 Nm	345					•		•
EC-4pole 30	273	GP 42, 3 - 15 Nm	350					•		•
EC-4pole 30	275							76.2		76.2
EC-4pole 30	275	GP 32, 4.0 - 8.0 Nm	345					•		•
EC-4pole 30	275	GP 42, 3 - 15 Nm	350					•		•

Technical Data	
Supply voltage V <sub>CC</sub>	5 V ± 5%
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.7 gcm <sup>2</sup>
Output current per channel	max. 5 mA



# Encoder MR Type L, 256–1024 CPT, 3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 150)

maxon sensor

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

225783	228452	225785	228456	225787
--------	--------	--------	--------	--------

Type	225783	228452	225785	228456	225787
Counts per turn	256	500	512	1000	1024
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	80	200	160	200	320
Max. speed (rpm)	18750	24000	18750	12000	18750



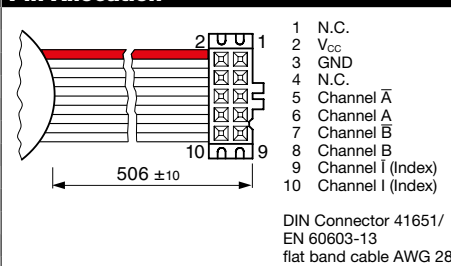
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead
RE 30, 15 W	182					79.4 79.4 79.4 79.4 79.4
RE 30, 15 W	182	GP 32, 0.75 - 4.5 Nm	340			• • • • •
RE 30, 60 W	183					79.4 79.4 79.4 79.4 79.4
RE 30, 60 W	183	GP 32, 0.75 - 4.5 Nm	338			• • • • •
RE 30, 60 W	183	GP 32, 0.75 - 6.0 Nm	340-344			• • • • •
RE 30, 60 W	183	GP 32 S	370-372			• • • • •
RE 35, 90 W	184					82.4 82.4 82.4 82.4 82.4
RE 35, 90 W	184	GP 32, 0.75 - 4.5 Nm	338			• • • • •
RE 35, 90 W	184	GP 32, 0.75 - 6.0 Nm	340-344			• • • • •
RE 35, 90 W	184	GP 32, 4.0 - 8.0 Nm	345			• • • • •
RE 35, 90 W	184	GP 42, 3 - 15 Nm	349			• • • • •
RE 35, 90 W	184	GP 32 S	370-372			• • • • •
RE 40, 25 W	185					82.4 82.4 82.4 82.4 82.4
RE 40, 150 W	186					82.4 82.4 82.4 82.4 82.4
RE 40, 150 W	186	GP 42, 3 - 15 Nm	349			• • • • •
RE 40, 150 W	186	GP 52, 4 - 30 Nm	354			• • • • •
A-max 32	214/216					72.7 72.7 72.7 72.7 72.7
A-max 32	214/216	GP 32, 0.75 - 6.0 Nm	340-343			• • • • •
A-max 32	214/216	GS 38, 0.1 - 0.6 Nm	348			• • • • •
A-max 32	214/216	GP 32 S	370-372			• • • • •
EC-max 40, 70 W	266					73.9 73.9 73.9 73.9 73.9
EC-max 40, 70 W	266	GP 42, 3 - 15 Nm	350			• • • • •
EC-max 40, 120 W	267					103.9 103.9 103.9 103.9 103.9
EC-max 40, 120 W	267	GP 52, 4 - 30 Nm	355			• • • • •

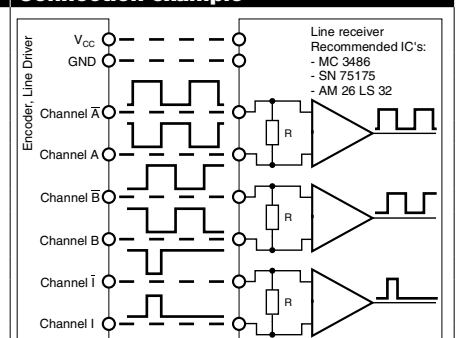
## Technical Data

Supply voltage $V_{CC}$	5 V ± 5%
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 1.7 gcm <sup>2</sup>
Output current per channel	max. 5 mA

## Pin Allocation

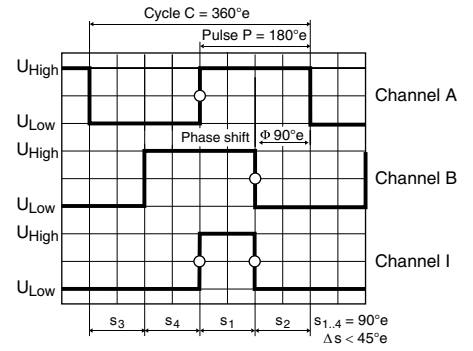


## Connection example



Opt. terminal resistance R > 1 kΩ

# Encoder 6-8 OPT 128 CPT, 3 Channels



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

502807

### Type (provisional)

Counts per turn	128
Number of channels	3
Max. operating frequency (kHz)	64
Max. speed (rpm)	60000



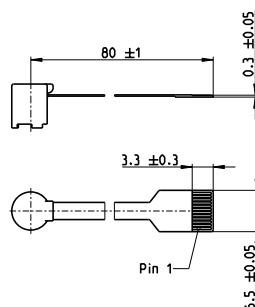
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC 6, 1.5 W	236					23.4
EC 6, 1.5 W	236	GP 6, 0.002 - 0.03 Nm	311			●
EC 6, 1.5 W	236	GP 6 S	361-362			●
EC 6, 2.0 W	237					23.4
EC 6, 2.0 W	237	GP 6, 0.002 - 0.03 Nm	311			●
EC 6, 2.0 W	237	GP 6 S	361-362			●

### Technical Data

Supply voltage $V_{CC}$	3 - 6 V
Phase shift $\Phi$	$90^\circ \pm 45^\circ e$
Index pulse width	$90^\circ \pm 45^\circ e$
Operating temperature range	-20...+85 °C
Moment of inertia of code wheel	$\leq 0.001 \text{ gcm}^2$
Output current per channel	$\leq 5 \text{ mA}$

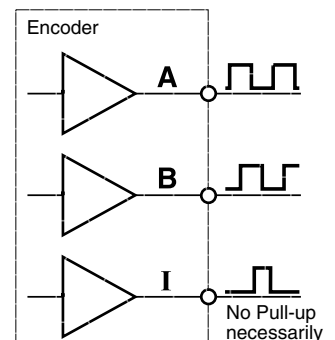
### Pin Allocation



DC	EC
1 Motor +	W1
2 Motor -	W2
3 NC	W3
4 GND	GND
5 $V_{CC}$	$V_{CC}$
6 Channel A	Channel A
7 Channel B	Channel B
8 Channel I	Channel I
9 NC	NC
10 NC	NC
11 NC	NC
12 NC	NC

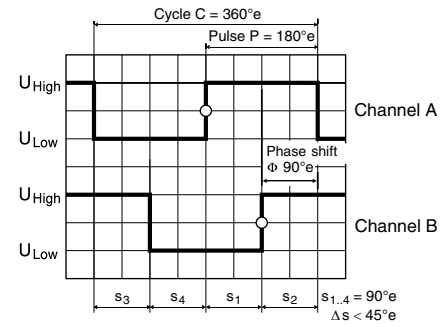
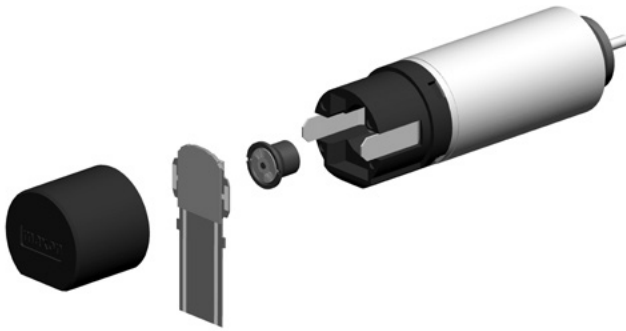
Compatible connector: Molex 52745-0697, Tyco 1-1734839-4  
Adapter: 498157

### Connection example





# Encoder 8 OPT 50 CPT, 2 Channels



Direction of rotation cw (definition cw p. 150)

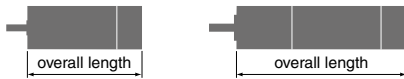
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

473594

## Type (provisional)

Counts per turn	50
Number of channels	2
Max. operating frequency (kHz)	15
Max. speed (rpm)	18000



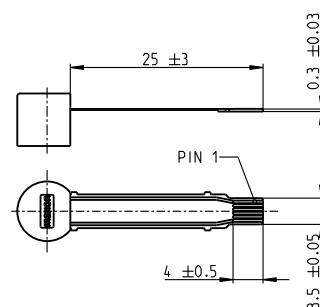
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 8, 0.5 W, A	153					24.2
RE 8, 0.5 W, A	153	GP 8, 0.01 - 0.1 Nm	312			●
RE 8, 0.5 W, A	153	GP 8 S	363-364			●

## Technical Data

Supply voltage $V_{CC}^{1)}$	$3 V \pm 10\%$
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Operating temperature range	$-20 \dots +85^\circ C$
Moment of inertia of code wheel	$\leq 0.001 \text{ gcm}^2$
Output current per channel	min. -1 mA, max. 8 mA

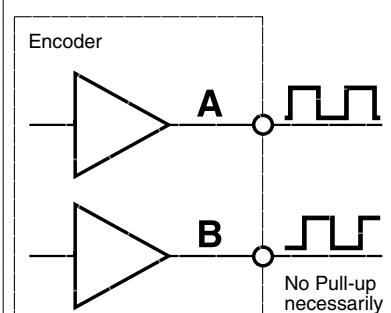
## Pin Allocation



- 1 Motor +
- 2  $V_{CC}$
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor -

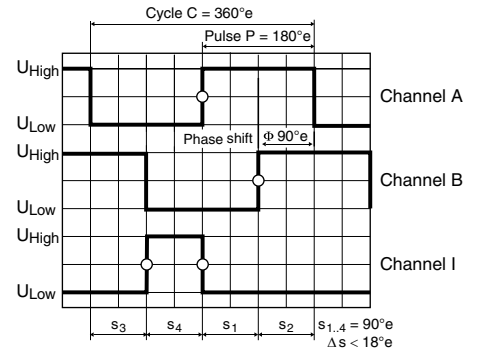
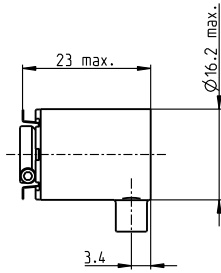
Compatible connector:  
Molex 52745-0697

## Connection example



<sup>1)</sup> Not in combination with maxon controllers.

# Encoder SCH16F 2000–3600 CPT, 3 Channels, with Line Driver RS 422

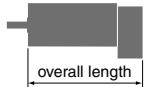


Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

Part Numbers			
461212	461211	X drives	

Type (provisional)	461212	461211	X drives
Counts per turn	2000	3600	2000–3600
Number of channels	3	3	3
Max. operating frequency (kHz)	200	200	200
Max. speed (rpm)	6000	3333	6000–3333
Shaft diameter (mm)	3	3	2

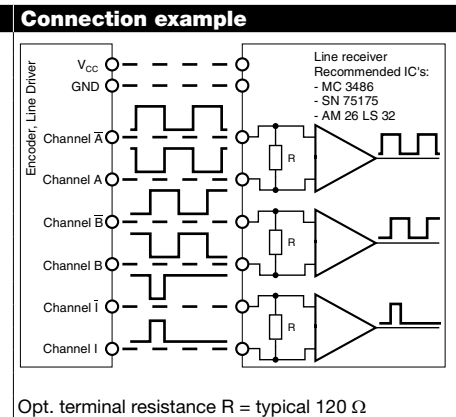
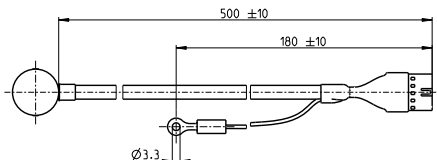


maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
DCX 22 S	76-77					online
DCX 22 L	78-79					online
EC-4pole 22, 90 W	271					76.1    76.1
EC-4pole 22, 120 W	272					93.5    93.5

Technical Data	
Supply voltage $V_{CC}$	4.5 - 30 V
Output signal	EIA Standard RS 422
Operating temperature range	-20...+70 °C
Moment of inertia of code wheel	0.25 gcm <sup>2</sup>
Output current per channel	± 20 mA
Phase shift $\Phi$	90°e ± 18°e
Index pulse width	90°e ± 18°e
Max. startup torque at 25 °C	< 5 mNm

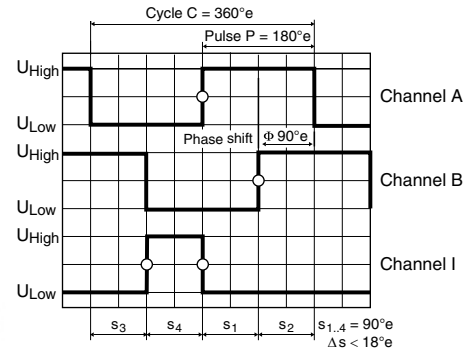
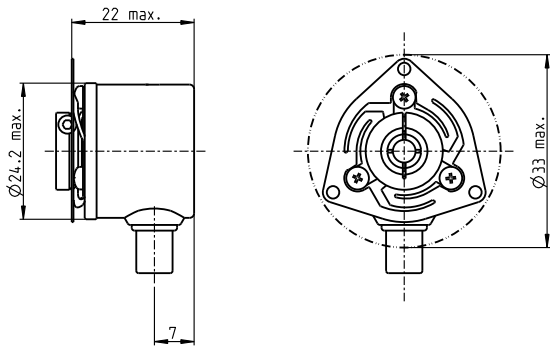
Pin Allocation	
9	10
1	2

1	N.C.	DIN Connector
2	$V_{CC}$	41651/EN 60603-13
3	GND	
4	N.C.	Ring terminal
5	Channel A	Molex 19324-0002
6	Channel A	
7	Channel B	
8	Channel B	
9	Channel I (Index)	
10	Channel I (Index)	



The index signal I is synchronized with channel A or B.

# Encoder 2RMHF 3000–5000 CPT, 3 Channels, with Line Driver RS 422

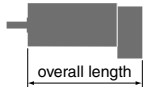


Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
461214	461216	461213	461215	X drives

Type (provisional)	461214	461216	461213	461215	X drives
Counts per turn	3000	3000	5000	5000	3000–5000
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	200	200	200	200	200
Max. speed (rpm)	4000	4000	2400	2400	4000–2400
Shaft diameter (mm)	4	6	4	6	4

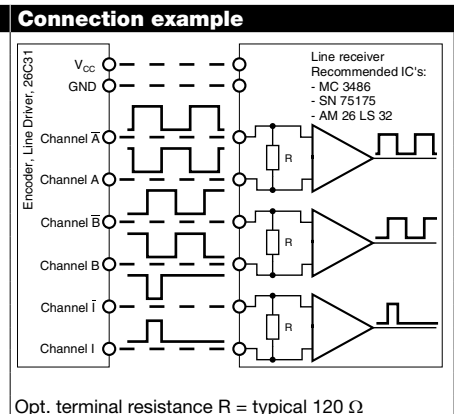
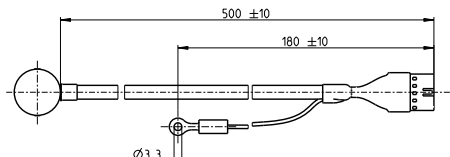


maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
DCX 32 L	82					online
DCX 35 L	83					online
EC-4pole 30, 100 W 273						75.2 / 75.2
EC-4pole 30, 200 W 275						92.2 / 92.2
EC-i 40, 50 W	281/282					56.2 / 56.2
EC-i 40, 70 W	283/284					66.2 / 66.2
EC-i 40, 100 W	285					86.2 / 86.2

Technical Data	
Supply voltage $V_{CC}$	4.5 - 30 V
Output signal driver used:	EIA Standard RS 422 26C31
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	1.0 gcm <sup>2</sup>
Output current per channel	± 30 mA
Phase shift $\phi$	90°e ± 18°e
Index pulse width	90°e ± 18°e
Max. startup torque at 25 °C	< 5 mNm

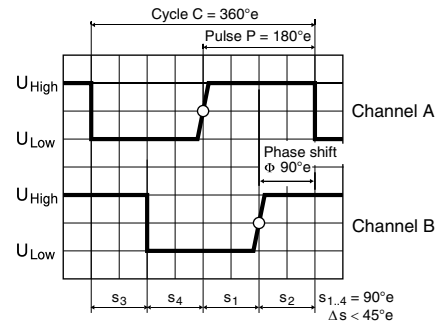
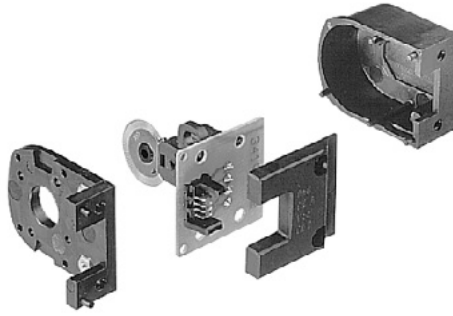
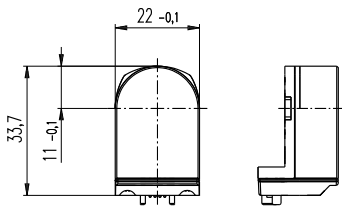
Pin Allocation	
9	10
1	2

1	N.C.	DIN Connector	41651/EN 60603-13
2	$V_{CC}$		
3	GND		
4	N.C.	Ring terminal	Molex 19324-0002
5	Channel A		
6	Channel A		
7	Channel B		
8	Channel B		
9	Channel I (Index)		
10	Channel I (Index)		



The index signal I is synchronized with channel A or B.

# Encoder Enc 22 100 CPT, 2 Channels



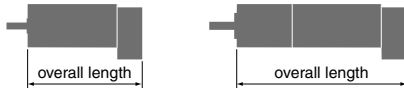
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

103935	110520	110521
--------	--------	--------

Type	103935	110520	110521
Counts per turn	100	100	100
Number of channels	2	2	2
Max. operating frequency (kHz)	20	20	20
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	2	3

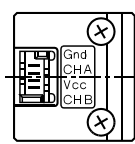


maxon Modular System				
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 25	179/181			68.6
RE 25	179/181	GP 26, 0.75 - 2.0 Nm	336	●
RE 25	179/181	GP 32, 0.75 - 4.5 Nm	338	●
RE 25	179/181	GP 32, 0.75 - 4.5 Nm	339	●
RE 25	179/181	GP 32, 1.0 - 6.0 Nm	342	●
RE 25	179/181	GP 32 S	370-372	●
A-max 19, 1.5 W	198			43.3
A-max 19, 1.5 W	198	GP 19, 0.1 - 0.3 Nm	325	●
A-max 19, 1.5 W	198	GS 20, 0.06 - 0.25 Nm	326	●
A-max 19, 1.5 W	198	GP 22, 0.1 - 2.0 Nm	329/331	●
A-max 19, 1.5 W	198	GS 24, 0.1 Nm	335	●
A-max 19, 1.5 W	198	GP 22 S	368/369	●
A-max 19, 2.5 W	200			45.9
A-max 19, 2.5 W	200	GP 19, 0.1 - 0.3 Nm	325	●
A-max 19, 2.5 W	200	GP 22, 0.1 - 2.0 Nm	329/331	●
A-max 19, 2.5 W	200	GS 24, 0.1 Nm	335	●
A-max 19, 2.5 W	200	GP 22 S	368/369	●
A-max 22	202/204			46.3
A-max 22	202/204	GP 22, 0.1 - 0.3 Nm	327	●
A-max 22	202/204	GP 22, 0.2 - 0.6 Nm	328	●
A-max 22	202/204	GP 22, 0.1 - 2.0 Nm	327-331	●
A-max 22	202/204	GS 24, 0.1 Nm	335	●
A-max 22	202/204	GP 22 S	368/369	●
A-max 26	206-212			59.1
A-max 26	206-212	GP 26, 0.75 - 4.5 Nm	336	●
A-max 26	206-212	GS 30, 0.07 - 0.2 Nm	337	●
A-max 26	206-212	GP 32, 0.75 - 4.5 Nm	338	●
A-max 26	206-212	GP 32, 0.75 - 4.5 Nm	339	●
A-max 26	206-212	GP 32, 1.0 - 6.0 Nm	343	●
A-max 26	206-212	GS 38, 0.1 - 0.6 Nm	348	●
A-max 26	206-212	GP 32 S	370-372	●

### Technical Data

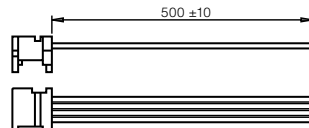
Supply voltage $V_{CC}$	$5\text{ V} \pm 10\%$
Output signal	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Signal rise time (typically, at $C_L = 25\text{ pF}$ , $R_L = 11\text{ k}\Omega$ , $25^\circ\text{C}$ )	200 ns
Signal fall time (typically, at $C_L = 25\text{ pF}$ , $R_L = 11\text{ k}\Omega$ , $25^\circ\text{C}$ )	50 ns
Operating temperature range	$-20 \dots +85^\circ\text{C}$
Moment of inertia of code wheel	$\leq 0.05\text{ gcm}^2$
Output current per channel	min. -1 mA, max. 5 mA

### Pin Allocation

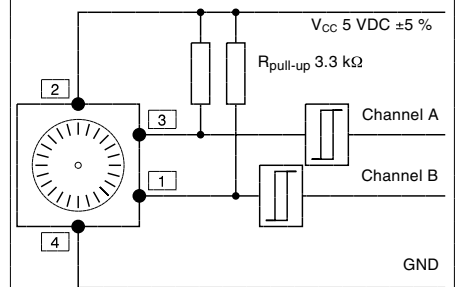


Micromodule contact strip  
Type Lumberg MICS 4  
Pin 4 GND  
Pin 3 Channel A  
Pin 2  $V_{CC}$ , Pin 1 Channel B  
recommended connectors:  
Micromodule connector  
Type Lumberg MICA 4

Order number for connector with cable: 3419.506

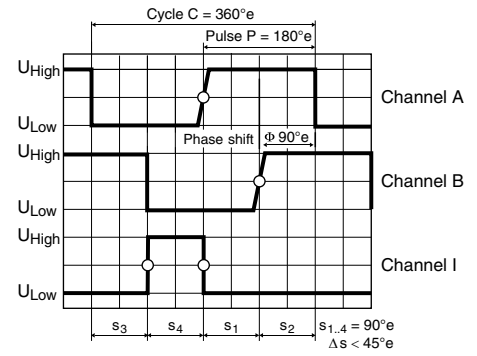
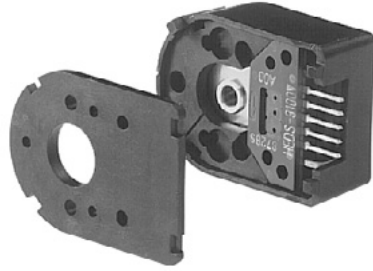
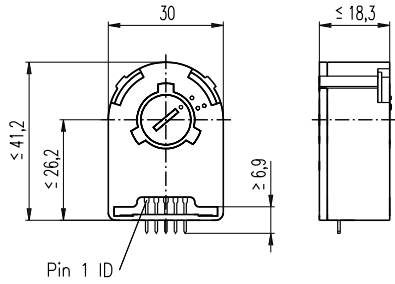


### Connection example



Ambient temperature range  $\theta_U = 22 - 25^\circ\text{C}$

# Encoder HEDS 5540 500 CPT, 3 Channels



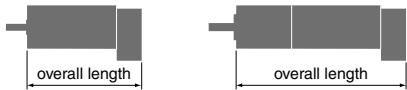
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110511	110513	110515
--------	--------	--------

Type	110511	110513	110515
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	4	6



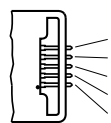
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25	179/181					75.3
RE 25	179/181	GP 26, 0.75 - 2.0 Nm	336			●
RE 25	179/181	GP 32, 0.75 - 6.0 Nm	338-342			●
RE 25	179/181	KD 32, 1.0 - 4.5 Nm	347			●
RE 25	179/181	GP 32 S	370-372			●
RE 25, 20 W	181			AB 28	446	105.8
RE 25, 20 W	181	GP 26, 0.75 - 2.0 Nm	336	AB 28	446	●
RE 25, 20 W	181	GP 32, 0.75 - 6.0 Nm	338-342	AB 28	446	●
RE 25, 20 W	181	KD 32, 1.0 - 4.5 Nm	347	AB 28	446	●
RE 25, 20 W	181	GP 32 S	370-372	AB 28	446	●
RE 30, 15 W	182					88.8
RE 30, 15 W	182	GP 32, 0.75 - 4.5 Nm	340			●
RE 30, 60 W	183					88.8
RE 30, 60 W	183	GP 32, 0.75 - 6.0 Nm	338-344			●
RE 30, 60 W	183	KD 32, 1.0 - 4.5 Nm	347			●
RE 30, 60 W	183	GP 32 S	370-372			●
RE 35, 90 W	184					91.7
RE 35, 90 W	184	GP 32, 0.75 - 8.0 Nm	338-345			●
RE 35, 90 W	184	GP 42, 3.0 - 15 Nm	349			●
RE 35, 90 W	184	GP 32 S	370-372			●
RE 35, 90 W	184			AB 28	446	124.3
RE 35, 90 W	184	GP 32, 0.75 - 8.0 Nm	338-345	AB 28	446	●
RE 35, 90 W	184	GP 42, 3.0 - 15 Nm	349	AB 28	446	●
RE 35, 90 W	184	GP 32 S	370-372	AB 28	446	●
RE 40, 25 W	185					91.7
RE 40, 150 W	186					91.7
RE 40, 150 W	186	GP 42, 3.0 - 15 Nm	349			●
RE 40, 150 W	186	GP 52, 4.0 - 30 Nm	354			●
RE 40, 150 W	186			AB 28	446	124.3
RE 40, 150 W	186	GP 42, 3.0 - 15 Nm	349	AB 28	446	●
RE 40, 150 W	186	GP 52, 4.0 - 30 Nm	354	AB 28	446	●

## Technical Data

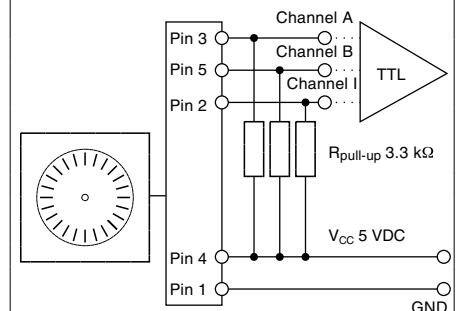
Supply voltage $V_{CC}$	$5 V \pm 10\%$
Output signal	TTL compatible
Phase shift $\phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 pF, R_L = 2.7 k\Omega, 25^\circ C$ )	180 ns
Signal fall time (typically, at $C_L = 25 pF, R_L = 2.7 k\Omega, 25^\circ C$ )	40 ns
Index pulse width (nominal)	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	$\leq 0.6 gcm^2$
Max. angular acceleration	$250000 rad s^{-2}$
Output current per channel	min. -1 mA, max. 5 mA

## Pin Allocation



Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	$V_{CC}$	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

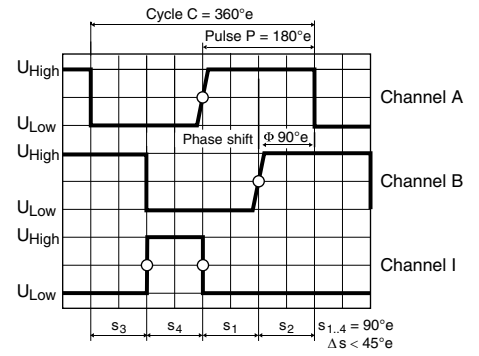
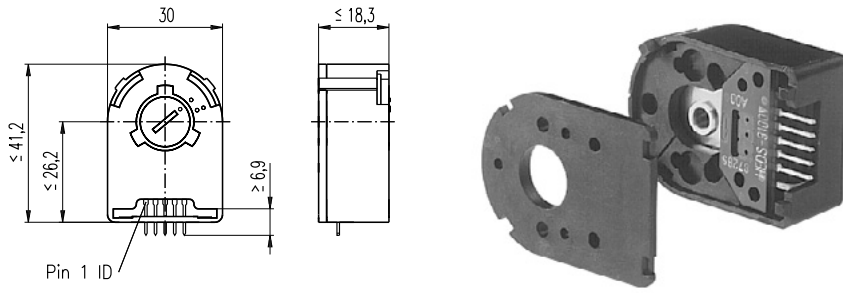
## Connection example



Ambient temperature range  $\theta_U = 25^\circ C$



# Encoder HEDS 5540 500 CPT, 3 Channels



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110511	110513	110515	110517
--------	--------	--------	--------

Type	110511	110513	110515	110517
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8

## maxon Modular System

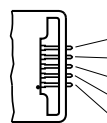
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25, 20 W	180					63.8
RE 25, 20 W	180	GP 26, 0.75 - 2.0 Nm	336			●
RE 25, 20 W	180	GP 32, 0.75 - 4.5 Nm	338			●
RE 25, 20 W	180	GP 32, 0.75 - 6.0 Nm	339/342			●
RE 25, 20 W	180	KD 32, 1.0 - 4.5 Nm	347			●
RE 25, 20 W	180	GP 32 S	370-372			●
RE 25, 20 W	180			AB 28	446	94.3
RE 25, 20 W	180	GP 22, 0.5 Nm	329			●
RE 25, 20 W	180	GP 26, 0.75 - 2.0 Nm	336	AB 28	446	●
RE 25, 20 W	180	GP 32, 0.75 - 4.5 Nm	338	AB 28	446	●
RE 25, 20 W	180	GP 32, 0.75 - 6.0 Nm	339/342	AB 28	446	●
RE 25, 20 W	180	KD 32, 1.0 - 4.5 Nm	347	AB 28	446	●
RE 25, 20 W	180	GP 32 S	370-372	AB 28	446	●
RE 50, 200 W	187					128.7
RE 50, 200 W	187	GP 52, 4 - 30 Nm	355			●
RE 50, 200 W	187	GP 62, 8 - 50 Nm	356			●
RE 65, 250 W	188					157.3
RE 65, 250 W	188	GP 81, 20 - 120 Nm	357			●
A-max 26	206-212					63.1
A-max 26	206-212	GP 26, 0.75 - 4.5 Nm	336			●
A-max 26	206-212	GS 30, 0.07 - 0.2 Nm	337			●
A-max 26	206-212	GP 32, 0.75 - 4.5 Nm	338			●
A-max 26	206-212	GP 32, 0.75 - 6.0 Nm	339/343			●
A-max 26	206-212	GS 38, 0.1 - 0.6 Nm	348			●
A-max 26	206-212	GP 32 S	370-372			●
A-max 32	214/216					82.3
A-max 32	214/216	GP 32, 0.75 - 6.0 Nm	338-343			●
A-max 32	214/216	GS 38, 0.1 - 0.6 Nm	348			●
A-max 32	214/216	GP 32 S	370-372			●
EC 32, 80 W	251					78.4
EC 32, 80 W	251	GP 32, 0.75 - 6.0 Nm	338-344			●
EC 32, 80 W	251	GP 32 S	370-372			●
EC 40, 170 W	252					103.4
EC 40, 170 W	252	GP 42, 3.0 - 15 Nm	349			●
EC 40, 170 W	252	GP 52, 4.0 - 30 Nm	354			●

## Technical Data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Output signal	TTL compatible
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 pF, R_L = 2.7 k\Omega, 25^\circ C$ )	180 ns
Signal fall time (typically, at $C_L = 25 pF, R_L = 2.7 k\Omega, 25^\circ C$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	$\leq 0.6 gcm^2$
Max. angular acceleration	$250000 rad s^{-2}$
Output current per channel	min. -1 mA, max. 5 mA

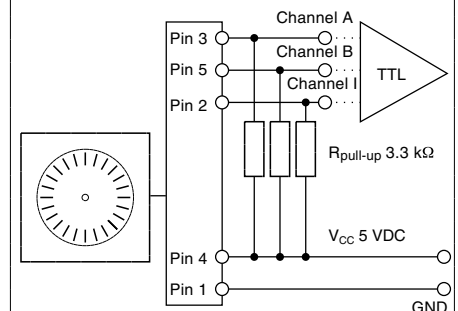
The index signal I is synchronized with channel A or B.

## Pin Allocation



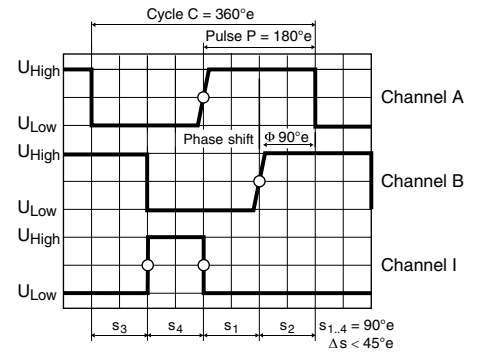
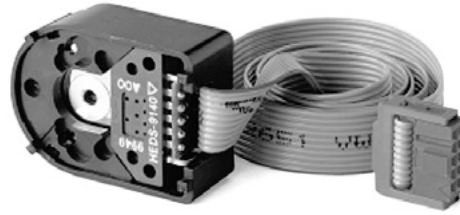
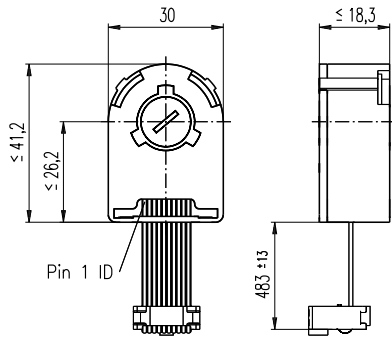
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	$V_{CC}$	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

## Connection example



Ambient temperature range  $\theta_U = 25^\circ C$

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



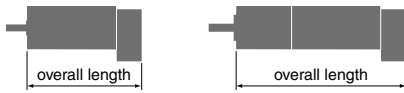
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110512	110514	110516
--------	--------	--------

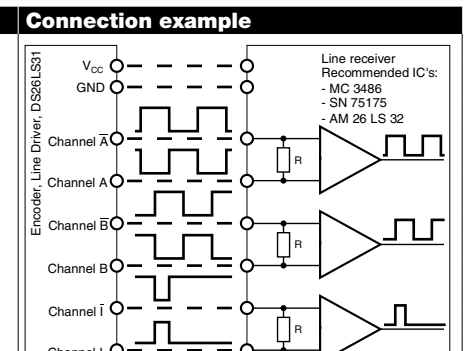
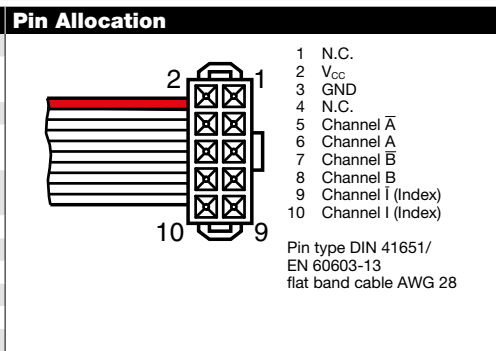
Type	110512	110514	110516
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	4	6



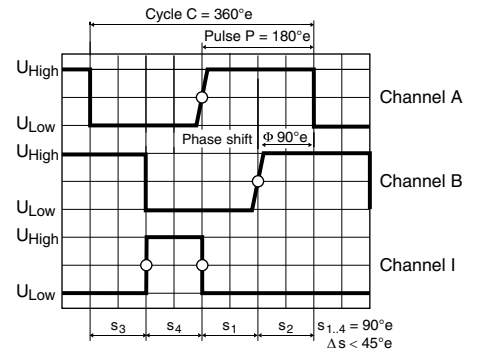
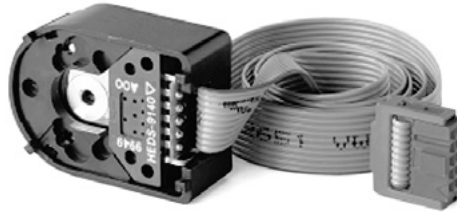
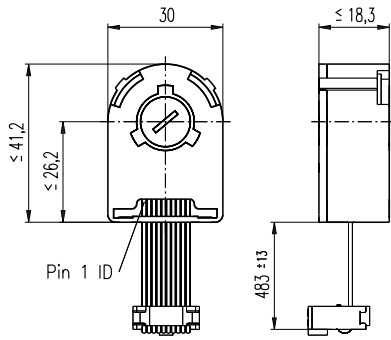
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25	179/181					75.3
RE 25	179/181	GP 26/GP 32	336/338			●
RE 25	179/181	KD 32, 1.0 - 4.5 Nm	347			●
RE 25	179/181	GP 32, 0.75 - 6.0 Nm	339/342			●
RE 25	179/181	GP 32 S	370-372			●
RE 25, 20 W	180					63.8
RE 25, 20 W	180	GP 26/GP 32	336/338			●
RE 25, 20 W	180	KD 32, 1.0 - 4.5 Nm	347			●
RE 25, 20 W	180	GP 32, 0.75 - 6.0 Nm	339/342			●
RE 25, 20 W	180	GP 32 S	370-372			●
RE 25, 20 W	180			AB 28	446	94.3
RE 25, 20 W	180	GP 26/GP 32	336/338	AB 28	446	●
RE 25, 20 W	180	KD 32, 1.0 - 4.5 Nm	347	AB 28	446	●
RE 25, 20 W	180	GP 32, 0.75 - 6.0 Nm	339/342	AB 28	446	●
RE 25, 20 W	180	GP 32 S	370-372	AB 28	446	●
RE 25, 20 W	181			AB 28	446	105.8
RE 25, 20 W	181	GP 26/GP 32	336/338	AB 28	446	●
RE 25, 20 W	181	KD 32, 1.0 - 4.5 Nm	347	AB 28	446	●
RE 25, 20 W	181	GP 32, 0.75 - 6.0 Nm	339/342	AB 28	446	●
RE 25, 20 W	181	GP 32 S	370-372	AB 28	446	●
RE 30, 15 W	182					88.8
RE 30, 15 W	182	GP 32, 0.75 - 4.5 Nm	340			●
RE 30, 60 W	183					88.8
RE 30, 60 W	183	GP 32, 0.75 - 6.0 Nm	338-344			●
RE 30, 60 W	183	KD 32, 1.0 - 4.5 Nm	347			●
RE 30, 60 W	183	GP 32 S	370-372			●
RE 35, 90 W	184					91.7
RE 35, 90 W	184	GP 32, 0.75 - 8.0 Nm	338-345			●
RE 35, 90 W	184	GP 42, 3.0 - 15 Nm	349			●
RE 35, 90 W	184	GP 32 S	370-372			●
RE 35, 90 W	184			AB 28	446	124.3
RE 35, 90 W	184	GP 32, 0.75 - 8.0 Nm	338-345	AB 28	446	●
RE 35, 90 W	184	GP 42, 3.0 - 15 Nm	349	AB 28	446	●
RE 35, 90 W	184	GP 32 S	370-372	AB 28	446	●

Technical Data	
Supply voltage $V_{CC}$	5 V $\pm$ 10%
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	90°e $\pm$ 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	$\leq 0.6$ gcm <sup>2</sup>
Max. angular acceleration	250 000 rad s <sup>-2</sup>
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels



# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 150)

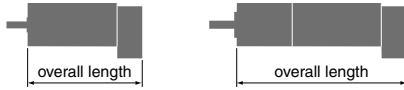
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110512	110514	110516	110518
--------	--------	--------	--------

### Type

Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8



### maxon Modular System

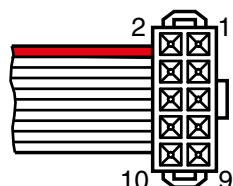
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 40, 25 W	185					91.7
RE 40, 150 W	186					91.7
RE 40, 150 W	186	GP 42, 3.0 - 15 Nm	349			●
RE 40, 150 W	186	GP 52, 4.0 - 30 Nm	354			●
RE 40, 150 W	186			AB 28	446	124.3
RE 40, 150 W	186	GP 42, 3.0 - 15 Nm	349	AB 28	446	●
RE 40, 150 W	186	GP 52, 4.0 - 30 Nm	354	AB 28	446	●
RE 50, 200 W	187					128.7
RE 50, 200 W	187	GP 52, 4 - 30 Nm	355			●
RE 50, 200 W	187	GP 62, 8 - 50 Nm	356			●
RE 65, 250 W	188					157.3
RE 65, 250 W	188	GP 81, 20 - 120 Nm	357			●
A-max 26	206-212					63.1
A-max 26	206-212	GP 26, 0.75 - 4.5 Nm	336			●
A-max 26	206-212	GS 30/GP 32	337/340			●
A-max 26	206-212	GP 32, 0.75 - 6.0 Nm	339/343			●
A-max 26	206-212	GS 38, 0.1 - 0.6 Nm	348			●
A-max 26	206-212	GP 32 S	370-372			●
A-max 32	214/216					82.3
A-max 32	214/216	GP 32, 0.75 - 6.0 Nm	338-343			●
A-max 32	214/216	GS 38, 0.1 - 0.6 Nm	348			●
A-max 32	214/216	GP 32 S	370-372			●
EC 32, 80 W	251					78.4
EC 32, 80 W	251	GP 32, 0.75 - 6.0 Nm	338-344			●
EC 32, 80 W	251	GP 32 S	370-372			●
EC 40, 170 W	252					103.4
EC 40, 170 W	252	GP 42, 3.0 - 15 Nm	349			●
EC 40, 170 W	252	GP 52, 4.0 - 30 Nm	354			●

### Technical Data

Supply voltage $V_{CC}$	5 V $\pm$ 10%
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	90°e $\pm$ 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	$\leq 0.6$ gcm <sup>2</sup>
Max. angular acceleration	250 000 rad s <sup>-2</sup>
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

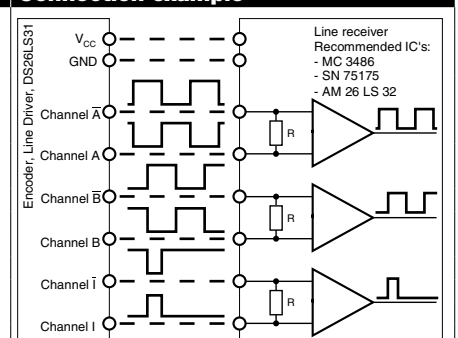
The index signal I is synchronized with channel A or B.

### Pin Allocation



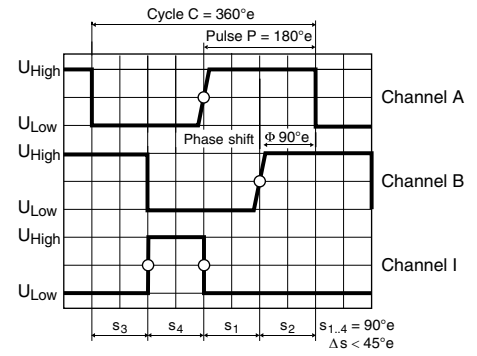
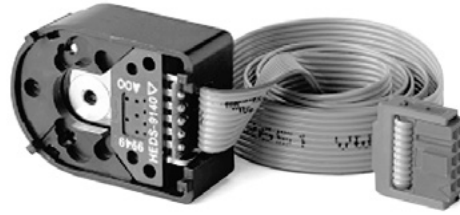
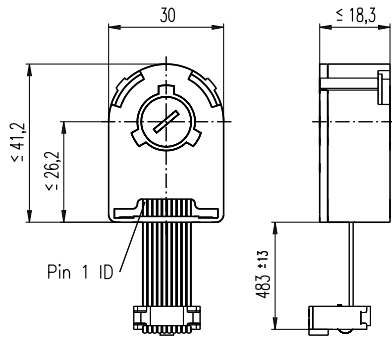
- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel  $\bar{A}$
  - 6 Channel A
  - 7 Channel B
  - 8 Channel B
  - 9 Channel I (Index)
  - 10 Channel I (Index)
- Pin type DIN 41651/  
EN 60603-13  
flat band cable AWG 28

### Connection example



Terminal resistance R = typical 120  $\Omega$

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



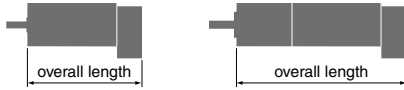
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110512	110514	110516
--------	--------	--------

Type	110512	110514	110516
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	4	6



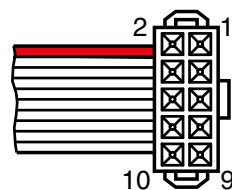
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-max 30, 40 W	264					62.6
EC-max 30, 40 W	264	GP 32, 1.0 - 8.0 Nm	343/345			●
EC-max 30, 40 W	264	KD 32, 1.0 - 4.5 Nm	347			●
EC-max 30, 40 W	264	GP 32 S	370-372			●
EC-max 30, 40 W	264			AB 20	444	98.4
EC-max 30, 40 W	264	GP 32, 1.0 - 8.0 Nm	343/345	AB 20	444	●
EC-max 30, 40 W	264	KD 32, 1.0 - 4.5 Nm	347	AB 20	444	●
EC-max 30, 40 W	264	GP 32 S	370-372	AB 20	444	●
EC-max 30, 60 W	265					84.6
EC-max 30, 60 W	265	GP 32, 1.0 - 8.0 Nm	343/345			●
EC-max 30, 60 W	265	KD 32, 1.0 - 4.5 Nm	347			●
EC-max 30, 60 W	265	GP 42, 3 - 15 Nm	350			●
EC-max 30, 60 W	265			AB 20	444	120.4
EC-max 30, 60 W	265	GP 32, 1.0 - 8.0 Nm	343/345	AB 20	444	●
EC-max 30, 60 W	265	KD 32, 1.0 - 4.5 Nm	347	AB 20	444	●
EC-max 30, 60 W	265	GP 42, 3 - 15 Nm	350	AB 20	444	●
EC-max 40, 70 W	266					81.4
EC-max 40, 70 W	266	GP 42, 3 - 15 Nm	350			●
EC-max 40, 70 W	266			AB 28	445	110.7
EC-max 40, 70 W	266	GP 42, 3 - 15 Nm	350	AB 28	445	●
EC-max 40, 120 W	267					111.4
EC-max 40, 120 W	267	GP 52, 4 - 30 Nm	355			●
EC-max 40, 120 W	267			AB 28	445	140.7
EC-max 40, 120 W	267	GP 52, 4 - 30 Nm	355	AB 28	445	●
EC-4pole 22, 90 W	271					70.1
EC-4pole 22, 90 W	271	GP 22/GP 32	333/343			●
EC-4pole 22, 90 W	271	GP 32 S	370-372			●
EC-4pole 22, 120 W	272					87.5
EC-4pole 22, 120 W	272	GP 22/GP 32	333/343			●
EC-4pole 22, 120 W	272	GP 32 S	370-372			●

### Technical Data

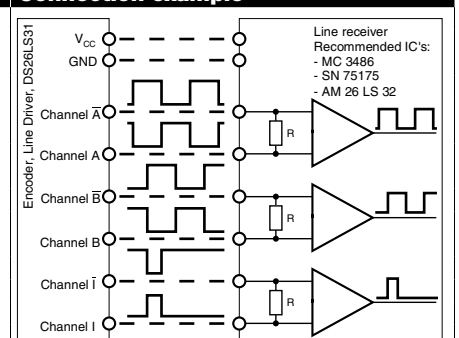
Supply voltage $V_{CC}$	$5 V \pm 10\%$
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift $\Phi$	$90^\circ \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 2.7 \text{ k}\Omega$ , $25^\circ C$ )	180 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 2.7 \text{ k}\Omega$ , $25^\circ C$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	$\leq 0.6 \text{ gcm}^2$
Max. angular acceleration	$250\,000 \text{ rad s}^{-2}$
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

### Pin Allocation



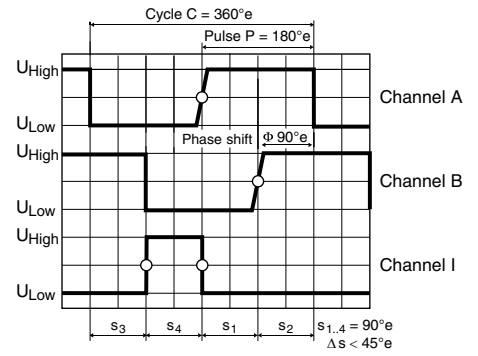
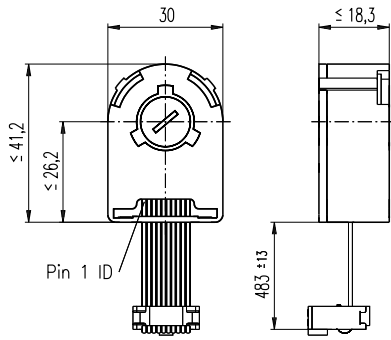
- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel  $\bar{A}$
  - 6 Channel A
  - 7 Channel B
  - 8 Channel B
  - 9 Channel I (Index)
  - 10 Channel I (Index)
- Pin type DIN 41651/  
EN 60603-13  
flat band cable AWG 28

### Connection example



Terminal resistance R = typical 120  $\Omega$

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



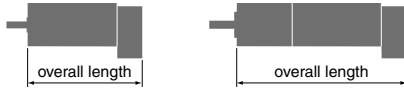
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110512	110514	110516	110518	X drives
--------	--------	--------	--------	----------

Type	110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4



### maxon Modular System

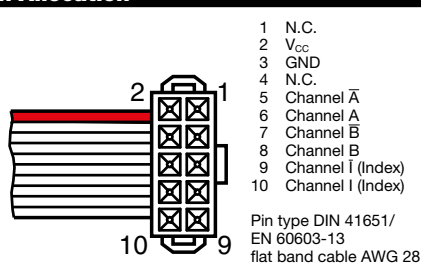
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 30, 100 W 273						67.6
EC-4pole 30, 100 W 273		GP 32, 4.0 - 8.0 Nm	345			●
EC-4pole 30, 100 W 273		GP 42, 3 - 15 Nm	350			●
EC-4pole 30, 100 W 273				AB 20	444	●
EC-4pole 30, 100 W 273		GP 32, 4.0 - 8.0 Nm	345	AB 20	444	●
EC-4pole 30, 100 W 273		GP 42, 3 - 15 Nm	350	AB 20	444	●
EC-4pole 30, 200 W 275						84.6
EC-4pole 30, 200 W 275		GP 32, 4.0 - 8.0 Nm	345			●
EC-4pole 30, 200 W 275		GP 42, 3 - 15 Nm	350			●
EC-4pole 30, 200 W 275				AB 20	444	●
EC-4pole 30, 200 W 275		GP 32, 4.0 - 8.0 Nm	345	AB 20	444	●
EC-4pole 30, 200 W 275		GP 42, 3 - 15 Nm	350	AB 20	444	●
EC-i 40, 50 W	281/282					49.0
EC-i 40, 50 W	281	GP 32, 1 - 6 Nm	343			●
EC-i 40, 50 W	281/282	GP 42, 3 - 15 Nm	350			●
EC-i 40, 50 W	281	GP 32 S	370-372			●
EC-i 40, 70 W	283/284					59.0
EC-i 40, 70 W	283	GP 32, 1 - 6 Nm	343			●
EC-i 40, 70 W	283/284	GP 42, 3 - 15 Nm	350			●
EC-i 40, 70 W	283	GP 32 S	370-372			●
EC-i 40, 100 W	285					79.0
EC-i 40, 100 W	285	GP 42, 3 - 15 Nm	350			●
EC-i 52, 180 W	286					100.7
EC-i 52, 180 W	286	GP 52, 4 - 30 Nm	354			●
DCX 22 S	76-77					online
DCX 22 L	78-79					online
DCX 26 L	80-81					online
DCX 32 L	82					online
DCX 35 L	83					online

### Technical Data

Supply voltage $V_{CC}$	5 V $\pm$ 10%
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	90°e $\pm$ 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	$\leq 0.6$ gcm <sup>2</sup>
Max. angular acceleration	250000 rad s <sup>-2</sup>
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

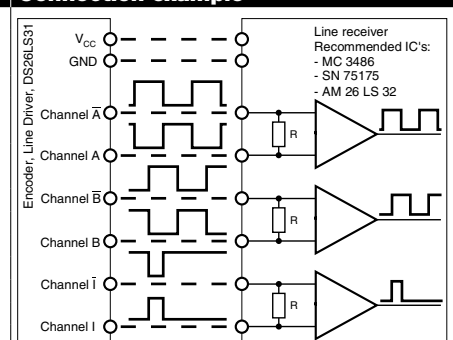
The index signal I is synchronized with channel A or B.

### Pin Allocation



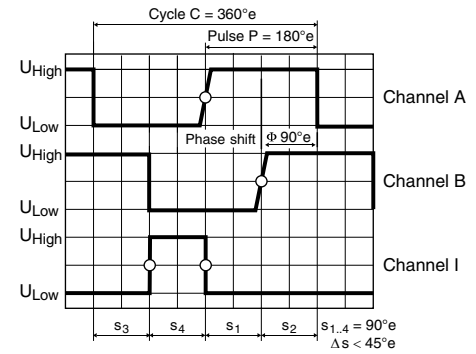
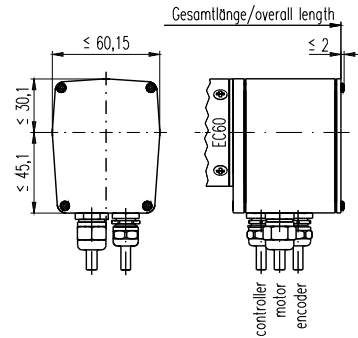
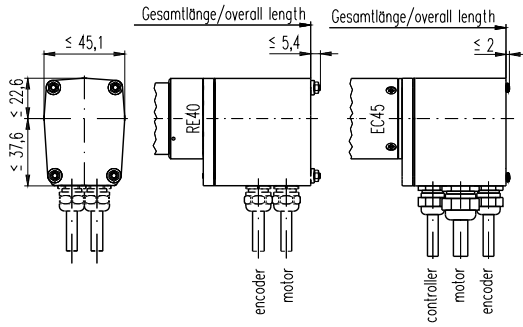
Pin type DIN 41651/ EN 60603-13 flat band cable AWG 28

### Connection example



Terminal resistance R = typical 120  $\Omega$

# Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422



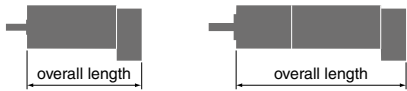
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

137959

Type	
Counts per turn	500
Number of channels	3
Max. operating frequency (kHz)	100
Max. speed (rpm)	12000



## maxon Modular System

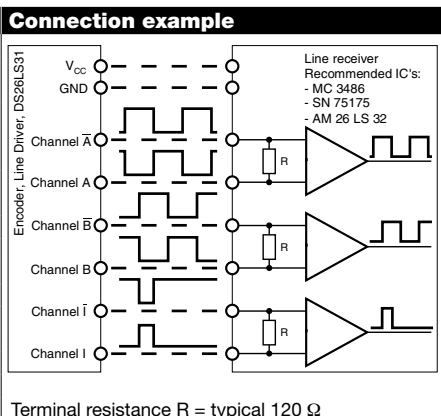
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 40, 150 W	186					125.1
RE 40, 150 W	186	GP 42, 3 - 15 Nm	349			●
RE 40, 150 W	186	GP 52, 4 - 30 Nm	354			●
RE 40, 150 W	186			AB 28	447	135.6
RE 40, 150 W	186	GP 42, 3 - 15 Nm	349	AB 28	447	●
RE 40, 150 W	186	GP 52, 4 - 30 Nm	354	AB 28	447	●
EC 45, 150 W	253					126.8
EC 45, 150 W	253	GP 42, 3 - 15 Nm	349			●
EC 45, 150 W	253	GP 52, 4 - 30 Nm	354			●
EC 45, 150 W	253			AB 28	447	135.6
EC 45, 150 W	253	GP 42, 3 - 15 Nm	349	AB 28	447	●
EC 45, 150 W	253	GP 52, 4 - 30 Nm	354	AB 28	447	●
EC 45, 250 W	254					159.6
EC 45, 250 W	254	GP 42, 3 - 15 Nm	350			●
EC 45, 250 W	254	GP 52, 4 - 30 Nm	354			●
EC 45, 250 W	254	GP 62, 8 - 50 Nm	356			●
EC 45, 250 W	254			AB 28	447	168.4
EC 45, 250 W	254	GP 42, 3 - 15 Nm	350	AB 28	447	●
EC 45, 250 W	254	GP 52, 4 - 30 Nm	354	AB 28	447	●
EC 45, 250 W	254	GP 62, 8 - 50 Nm	356	AB 28	447	●
EC 60, 400 W	255					177.3
EC 60, 400 W	255	GP 81, 20 - 120 Nm	357			●
EC 60, 400 W	255			AB 41	449	214.9
EC 60, 400 W	255	GP 81, 20 - 120 Nm	357	AB 41	449	●

Technical Data	
Supply voltage V <sub>CC</sub>	5 V ± 10%
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	90°e ± 45°e
Signal rise time (typically, at C <sub>L</sub> = 25 pF, R <sub>L</sub> = 11 k $\Omega$ , 25 °C)	180 ns
Signal fall time (typically, at C <sub>L</sub> = 25 pF, R <sub>L</sub> = 11 k $\Omega$ , 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Max. angular acceleration	250 000 rad s <sup>-2</sup>
Output current per channel	min. -20 mA, max. 20 mA

The index signal I is synchronized with channel A or B.

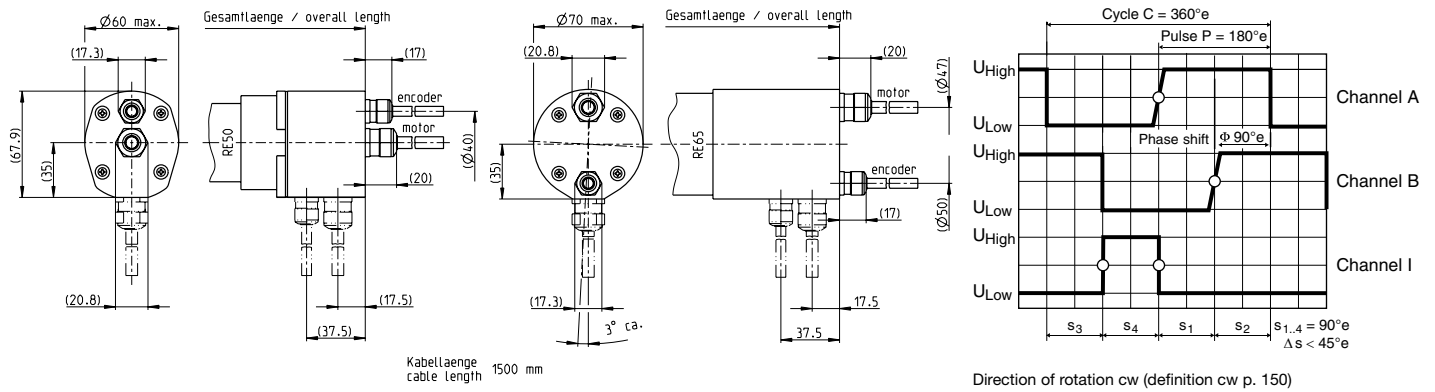
Pin Allocation	
Cable white	= 2 V <sub>CC</sub> 5 VDC
Cable brown	= 3 GND
Cable green	= 5 Channel $\bar{A}$
Cable yellow	= 6 Channel A
Cable grey	= 7 Channel $\bar{B}$
Cable pink	= 8 Channel B
Cable blue	= 9 Channel I (Index)
Cable red	= 10 Channel I (Index)

Cable size 8 × 0.25 mm<sup>2</sup>





# Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422



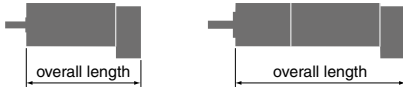
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

cable outlet axial	<b>386051</b>	<b>386001</b>
cable outlet radial	<b>386053</b>	<b>386002</b>

### Type

Counts per turn	500	500
Number of channels	3	3
Max. operating frequency (kHz)	100	100
Max. speed (rpm)	12 000	12 000



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 50, 200 W	187					170.4
RE 50, 200 W	187	GP 52, 4 - 30 Nm	355			●
RE 50, 200 W	187	GP 62, 8 - 50 Nm	356			●
RE 50, 200 W	187			AB 44	450	183.4
RE 50, 200 W	187	GP 52, 4 - 30 Nm	355	AB 44	450	●
RE 50, 200 W	187	GP 62, 8 - 50 Nm	356	AB 44	450	●
RE 65, 250 W	188					187.5
RE 65, 250 W	188	GP 81, 20 - 120 Nm	357			●
RE 65, 250 W	188			AB 44	450	205.5
RE 65, 250 W	188	GP 81, 20 - 120 Nm	357	AB 44	450	●

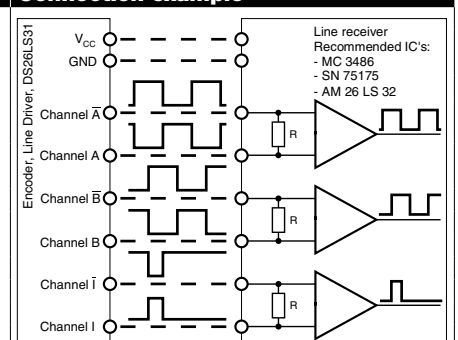
### Technical Data

Supply voltage $V_{CC}$	5 V $\pm$ 10%
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	90°e $\pm$ 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 11$ k $\Omega$ , 25 °C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 11$ k $\Omega$ , 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	$\leq 0.6$ gcm <sup>2</sup>
Max. angular acceleration	250 000 rad s <sup>-2</sup>
Output current per channel	min. -20 mA, max. 20 mA
Protection to	IP54

### Pin Allocation

Encoder		
Cable white	=	$V_{CC}$ 5 VDC
Cable brown	=	GND
Cable green	=	Channel $\bar{A}$
Cable yellow	=	Channel A
Cable grey	=	Channel B
Cable pink	=	Channel B (Index)
Cable blue	=	Channel I (Index)
Cable red	=	Channel I (Index)
Cable size	8 x 0.25 mm <sup>2</sup>	
Motor		
Cable white	=	Motor +
Cable brown	=	Motor -
Cable size	2 x 1.0 mm <sup>2</sup>	

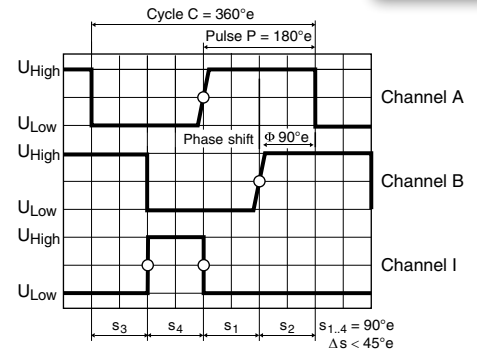
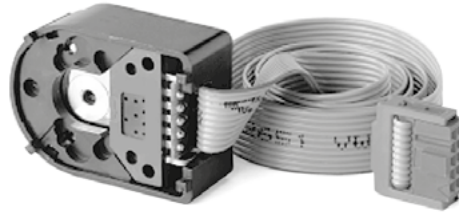
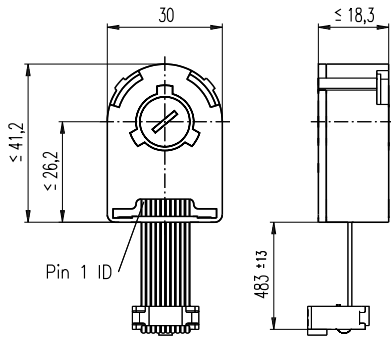
### Connection example



Terminal resistance R = typical 120  $\Omega$

# Encoder AEDL 5810 1024–5000 CPT, 3 Channels, with Line Driver RS 422

**NEW**



Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

516205	516206	516207	516208	516209	533330	X drives	X drives
--------	--------	--------	--------	--------	--------	----------	----------

Type	516205	516206	516207	516208	516209	533330	X drives	X drives
Counts per turn	1024	5000	1024	5000	5000	5000	1024	5000
Number of channels	3	3	3	3	3	3	3	3
Max. operating frequency (kHz)	250	1000	250	1000	1000	1000	250	1000
Max. speed (rpm)	14000	12000	14000	12000	12000	12000	14000	12000
Shaft diameter (mm)	3	3	4	4	6	8	2-4	2-4
Phase shift $\Phi$ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45

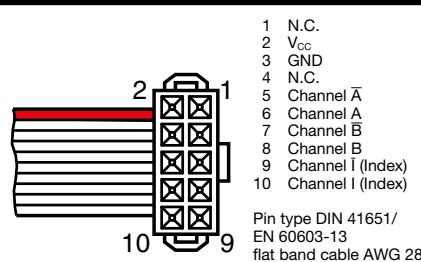
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
EC-4pole 22, 90 W	271					70.1	70.1
EC-4pole 22, 90 W	271	GP 22/GP 32	333/343			●	●
EC-4pole 22, 90 W	271	GP 32 S	370-372			●	●
EC-4pole 22, 120 W	272					87.5	87.5
EC-4pole 22, 120 W	272	GP 22/GP 32	333/343			●	●
EC-4pole 22, 120 W	272	GP 32 S	370-372			●	●
EC-4pole 30, 100 W	273					67.6	67.6
EC-4pole 30, 100 W	273	GP 32, 4.0 - 8.0 Nm	345			●	●
EC-4pole 30, 100 W	273	GP 42, 3 - 15 Nm	350			●	●
EC-4pole 30, 100 W	273			AB 20	444	104.0	104.0
EC-4pole 30, 100 W	273	GP 32, 4.0 - 8.0 Nm	345	AB 20	444	●	●
EC-4pole 30, 100 W	273	GP 42, 3 - 15 Nm	350	AB 20	444	●	●
EC-4pole 30, 200 W	275					84.6	84.6
EC-4pole 30, 200 W	275	GP 32, 4.0 - 8.0 Nm	345			●	●
EC-4pole 30, 200 W	275	GP 42, 3 - 15 Nm	350			●	●
EC-4pole 30, 200 W	275			AB 20	444	121.0	121.0
EC-4pole 30, 200 W	275	GP 32, 4.0 - 8.0 Nm	345	AB 20	444	●	●
EC-4pole 30, 200 W	275	GP 42, 3 - 15 Nm	350	AB 20	444	●	●
EC-i 40, 50 W	282						49.0
EC-i 40, 50 W	282	GP 32, 1 - 6 Nm	343				●
EC-i 40, 50 W	282	GP 42, 3 - 15 Nm	350				●
EC-i 40, 50 W	282	GP 32 S	370-372				●
EC-i 40, 70 W	283/284						59.0
EC-i 40, 70 W	283	GP 32, 1 - 6 Nm	343				●
EC-i 40, 70 W	283/284	GP 42, 3 - 15 Nm	350				●
EC-i 40, 70 W	283	GP 32 S	370-372				●
EC-i 40, 100 W	285						79.0
EC-i 40, 100 W	285	GP 42, 3 - 15 Nm	350				●
EC-i 52, 180 W	286						100.7
EC-i 52, 180 W	286	GP 52, 4 - 30 Nm	354				●
DCX 22 S	76-77						on request
DCX 22 L	78-79						on request
DCX 26 L	80-81						on request
DCX 32 L	82						on request
DCX 35 L	83						on request

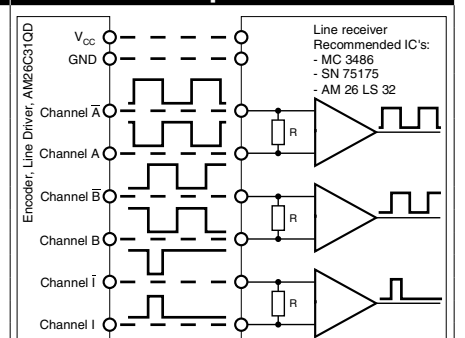
### Technical Data

Supply voltage $V_{CC}$	5 V ± 10%
Output signal driver used:	EIA Standard RS 422 AM26C31QD
Signal rise time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Signal fall time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Output current per channel	min. -20 mA, max. 20 mA

### Pin Allocation



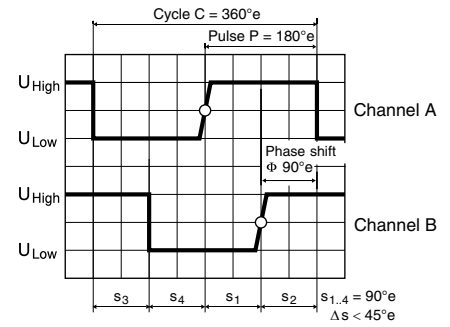
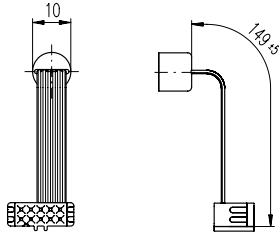
### Connection example



Terminal resistance R = typical 120 Ω

The index signal I is synchronized with channel A or B.

# Encoder MEnc 10 12 CPT, 2 Channels



Direction of rotation cw (definition cw p. 150)

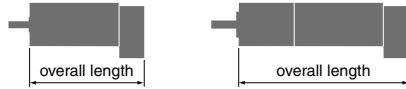
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

138061

### Type

Counts per turn <sup>1</sup>	12
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	100 000



### maxon Modular System

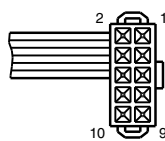
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 10, 0.75 W	155			25.1
RE 10, 0.75 W	155	GP 10, 0.005 - 0.1 Nm	313	●
RE 10, 0.75 W	155	GP 10, 0.01 - 0.15 Nm	314	●
RE 10, 1.5 W	157			32.7
RE 10, 1.5 W	157	GP 10, 0.005 - 0.1 Nm	313	●
RE 10, 1.5 W	157	GP 10, 0.01 - 0.15 Nm	314	●

### Technical Data

Supply voltage $V_{CC}$	3.8 - 24 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	$0.03 \text{ gcm}^2$
Operating temperature range	$-20 \dots +80^\circ \text{C}$
Open collector output with integrated pull-up resistance	$10 \text{ k}\Omega \pm 20\%$

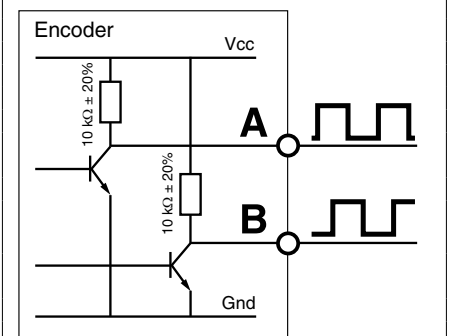
<sup>1</sup> maxon controllers require a resolution of at least 16 pulses.

### Pin Allocation

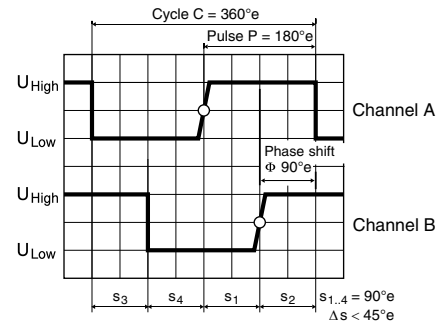
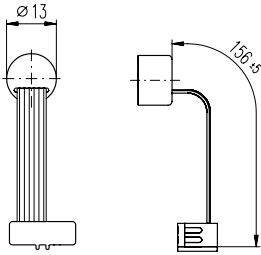


- 1 Motor +
  - 2  $V_{CC}$
  - 3 Channel A
  - 4 Channel B
  - 5 GND
  - 6 Motor -
- Pin type DIN 41651/  
EN 60603-13  
(Type 3M 89110-0101 HA)  
flat band cable AWG 28

### Connection example



# Encoder MEnc 13 16 CPT, 2 Channels



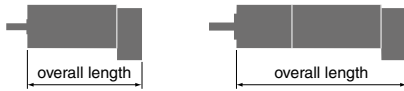
Direction of rotation cw (definition cw p. 150)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110778

Type	
Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	75 000



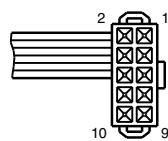
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 13, 0.75 W	160/161			27.0/29.4
RE 13, 0.75 W	161	GP 13, 0.05 - 0.15 Nm	316	●
RE 13, 0.75 W	161	GP 13, 0.2 - 0.35 Nm	317	●
RE 13, 2 W	164/165			39.2/41.6
RE 13, 2 W	165	GP 13, 0.05 - 0.15 Nm	316	●
RE 13, 2 W	165	GP 13, 0.2 - 0.35 Nm	317	●
RE 13, 1.5 W	168/169			30.3/32.7
RE 13, 1.5 W	169	GP 13, 0.05 - 0.15 Nm	316	●
RE 13, 1.5 W	169	GP 13, 0.2 - 0.35 Nm	317	●
RE 13, 3 W	172/173			42.5/44.9
RE 13, 3 W	173	GP 13, 0.05 - 0.15 Nm	316	●
RE 13, 3 W	173	GP 13, 0.2 - 0.35 Nm	317	●
RE 16, 3.2 W	176			46.5
RE 16, 3.2 W	176	GP 16, 0.1 - 0.6 Nm	323/324	●
RE 16, 3.2 W	176	GP 16 S	365/366	●
RE 16, 4.5 W	178			49.7
RE 16, 4.5 W	178	GP 16, 0.1 - 0.6 Nm	323/324	●
RE 16, 4.5 W	178	GP 16 S	365/366	●
A-max 16	194/196			33.5
A-max 16	194/196	GS 16, 0.01 - 0.03 Nm	319/320	●
A-max 16	194/196	GS 16, 0.06 - 0.1 Nm	321/322	●
A-max 16	194/196	GP 16, 0.1 - 0.3 Nm	323	●
A-max 16	194/196	GP 16 S	365/366	●
A-max 19	198/200			36.4/39.0
A-max 19	198/200	GP 19, 0.1 - 0.3 Nm	325	●
A-max 19	198/200	GP 22, 0.5 - 2.0 Nm	329/331	●
A-max 19	198/200	GS 24, 0.1 Nm	335	●
A-max 19	198/200	GP 22 S	368/369	●

## Technical Data

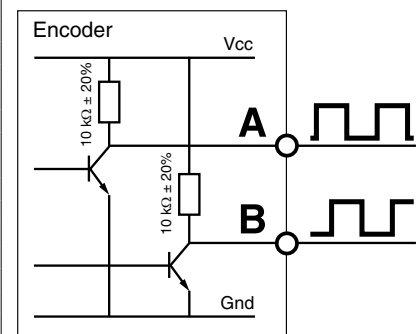
Supply voltage $V_{CC}$	3.8 - 24 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm <sup>2</sup>
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 kΩ ± 20%

## Pin Allocation

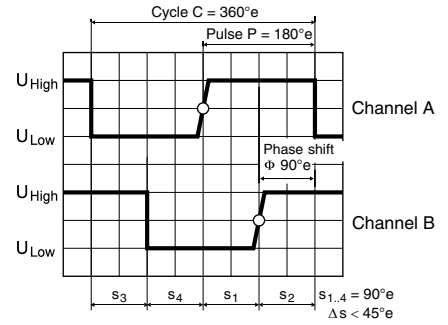
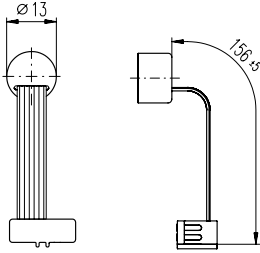


- 1 Motor +
  - 2  $V_{CC}$
  - 3 Channel A
  - 4 Channel B
  - 5 GND
  - 6 Motor -
- Pin type  
DIN 41651/EN 60603-13  
(Type 3M 89110-0101 HA)  
flat band cable AWG 28

## Connection example



# Encoder MEnc 13 16 CPT, 2 Channels



Direction of rotation cw (definition cw p. 150)

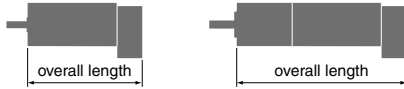
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110778

### Type

Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	75000



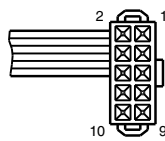
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
A-max 22	202/204			39.0
A-max 22	202/204	GP 22, 0.1 - 0.6 Nm	327/328	●
A-max 22	202/204	GP 22, 0.5 - 2.0 Nm	329/331	●
A-max 22	202/204	GS 24, 0.1 Nm	335	●
A-max 22	202/204	GP 22 S	368/369	●
A-max 26	206-212			51.8
A-max 26	206-212	GP 26, 0.75 - 4.5 Nm	336	●
A-max 26	206-212	GS 30, 0.07 - 0.2 Nm	337	●
A-max 26	206-212	GP 32, 0.75 - 4.5 Nm	338	●
A-max 26	206-212	GP 32, 0.75 - 6.0 Nm	339	●
A-max 26	206-212	GS 38, 0.1 - 0.6 Nm	348	●
A-max 26	206-212	GP 32 S	370-372	●

### Technical Data

Supply voltage $V_{CC}$	3.8 - 24 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm <sup>2</sup>
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 k $\Omega$ $\pm$ 20%

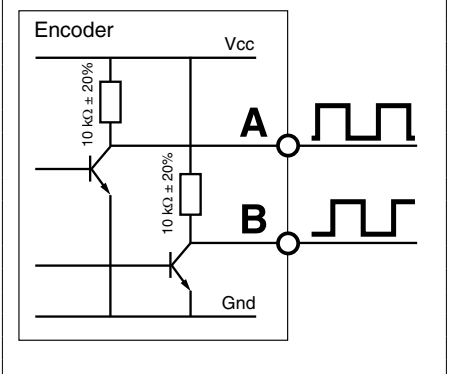
### Pin Allocation



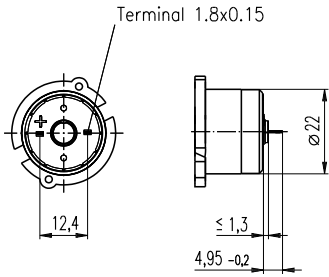
- 1 Motor +
- 2  $V_{CC}$
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor -

Pin type  
DIN 41651/EN 60603-13  
(Type 3M 89110-0101 HA)  
flat band cable AWG 28

### Connection example



# DC Tacho DCT 22 0.52 Volt



## Important Information

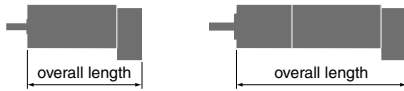
- Tacho with moving coil, maxon system.
- Tacho with precious metal commutation.
- To establish total inertia add motor and tacho inertias.
- With the output shaft turning CW as seen from the mounting surface, the tacho output voltage will be positive at the + terminal.
- A high impedance load is recommended at tacho terminals.
- The tacho current should be kept low.
- The indicated resonance frequency refers to the motor-tacho rotor system.

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118909	118910
--------	--------

Type	3	4
Shaft diameter (mm)		



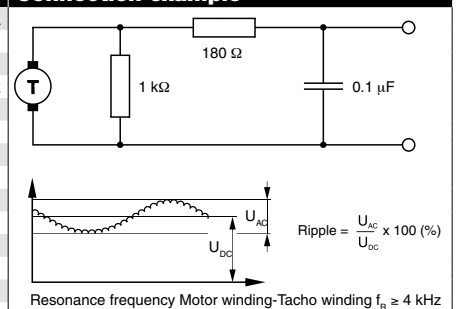
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 25	179/181			76.8
RE 25	179/181	GP 26, 0.75 - 2.0 Nm	336	●
RE 25	179/181	GP 32, 0.75 - 4.5 Nm	338/339	●
RE 25	179/181	GP 32, 0.75 - 6.0 Nm	342	●
RE 25	179/181	GP 32, 1.0 - 4.5 Nm	347	●
RE 25	179/181	GP 32 S	370-372	●
RE 25, 20 W	180			65.3
RE 25, 20 W	180	GP 22, 0.5 Nm	329	●
RE 25, 20 W	180	GP 26, 0.75 - 2.0 Nm	336	●
RE 25, 20 W	180	GP 32, 0.75 - 4.5 Nm	338/339	●
RE 25, 20 W	180	GP 32, 0.75 - 6.0 Nm	342	●
RE 25, 20 W	180	GP 32, 1.0 - 4.5 Nm	347	●
RE 25, 20 W	180	GP 32 S	370-372	●
RE 35, 90 W	184			89.1
RE 35, 90 W	184	GP 32, 0.75 - 6.0 Nm	338-344	●
RE 35, 90 W	184	GP 32, 8 Nm	345	●
RE 35, 90 W	184	GP 42, 3.0 - 15 Nm	349	●
RE 35, 90 W	184	GP 32 S	370-372	●

## Technical Data

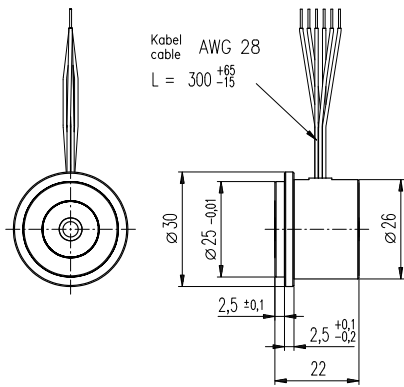
Output voltage per 1000 rpm	0.52 V	Max. current	10 mA
Terminal resistance tacho	37.7 Ω	Tolerance of the output voltage	± 15 %
Typical peak to peak ripple	≤ 6 %	Rotor inertia (tacho only)	< 3 gcm <sup>2</sup>
Ripple frequency per turn	14	Resonance frequency with motors on p. 179-181	> 2 kHz
Linear voltage tolerance, 500 to 5000 rpm	± 0.2 %	with motors on p. 184	> 4.5 kHz
Linear voltage tolerance with 10 kΩ load resistance	± 0.7 %	Temperature range	-20 ... +65 °C
Polarity error	± 0.1 %		
Temperature coefficient of EMF (magnet)	-0.02 % /°C	Option: Pigtails in place of solder terminals.	
Temperature coefficient of coil resistance	+0.4 % /°C		

## Connection example

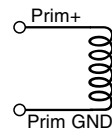




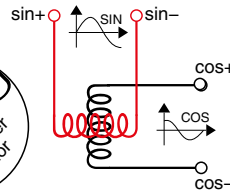
# Resolver Res 26 10 Volt



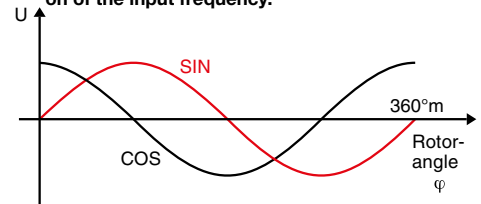
Primary



Secondary



Output voltage as a function of the rotor angle after demodulation of the input frequency.



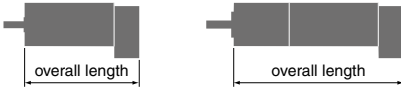
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

166488	133405	268912	199287
--------	--------	--------	--------

### Type

Shaft diameter (mm)	4	6	6	6
Max. speed (rpm)	10000	10000	10000	10000



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / • see Gearhead
EC 32, 80 W	251			80.1
EC 32, 80 W	251	GP 32, 0.75 - 6.0 Nm	338-344	•
EC 32, 80 W	251	GP 32 S	370-372	•
EC 40, 170 W	252			107.2
EC 40, 170 W	252	GP 42, 3.0 - 15 Nm	349	•
EC 40, 170 W	252	GP 52, 4.0 - 30 Nm	354	•
EC 45, 150 W	253			111.2
EC 45, 150 W	253	GP 42, 3.0 - 15 Nm	349	•
EC 45, 150 W	253	GP 52, 4.0 - 30 Nm	354	•
EC 45, 250 W	254			144.0
EC 45, 250 W	254	GP 42, 3.0 - 15 Nm	349	•
EC 45, 250 W	254	GP 52, 4.0 - 30 Nm	354	•
EC 45, 250 W	254	GP 62, 8.0 - 50 Nm	356	•
EC 60, 400 W	255			177.3
EC 60, 400 W	255	GP 81, 20 - 120 Nm	357	•

### Technical Data

Input voltage	10 V peak, 10 kHz
Transmission ratio	0.5
Electrical error	± 10 minutes
Rotor inertia	6 gcm <sup>2</sup>
Weight	40 g
Operating temperature range	-55 ... +155°C

### Pin Allocation

Prim +	EC 32/EC 40 red/white	EC 45/EC 60 white
Prim GND	yellow/white	brown
cos +	red	green
sin +	yellow	yellow
cos -	schwarz	grey
sin -	blue	pink