Motor Feedback Systems Type M 15
for AC Synchronous & BLDC Motors

- Incremental + commutation
- Practically no speed limitation, since up to 12 000 RPM
- Very good dynamic behaviour through low moment of inertia of rotor and its minimal influence on the motor
- Very good drive stiffness since no coupling is used
- Compact size
- Excellent price-performance ratio
- Increased temperature range, -40 to + 120°C
- Incomparable shaft play tolerances (to 0.7 mm axial)
- Better frequency, 200 KHz
- Flexibility, since the user can integrate in all actual motor sizes
- Simple mounting and adjustment since encoders come aligned and gapped

NUMBER OF PULSES

200, 400, 500, 1000, 1024;
optional 4, 6 or 8 pole commutation signals

TECHNICAL DATA
mechanical

Weight	23 g without cover, 28 g with cover
Dimensions	
Outside diameter	39.6 mm with cover, 37.1 mm without cover
Depth	27.9 mm with cover [1] , 24.1 mm without cover
Hub shaft diameters	6 mm / 8 mm / 10 mm / 3.18 mm (1/8") / 4.76 mm (3/16") / 6.35 mm (1/4") /9.52 mm (3/8")
Hollow shaft tolerance	+0.026 mm ... -0.000 mm
Mating shaft length	min. 12 mm max. 22 mm with closed cover
Shaft misalignment	axial endplay [2] : +0.38 mm ... -0.38 mm radial runout: 0.05 mm (incl. angular misalignment)
Alignment of encoder channels to motor windings	coarse alignment: index mark on hub fine alignment: ±15° mechanical alignment range
Max. speed	12 000 min^{-1}
Moment of inertia	4.7 gcm^2
Protection class (EN 60529)	IP40 [4] (version cable) IP30 [4] (version dual row connector)
Operating temperature	-40 ... +120 °C
Storage temperature	-40 ... +85 °C
Vibration resistance (IEC 68-2-6)	25 m/s^2 (5 ... 2 000 Hz)
Shock resistance (IEC 68-2-27)	500 m/s^2 (11 ms)
Connection	shieded cable radial or dual row connector [3]
Housing	glassfibre reinforced plastic

[1] for radial cable connection
[2] + means away from mounting face
[3] 10 pins for version incremental only, 14 pins for version incremental+commutation
[4] mounted and with cover

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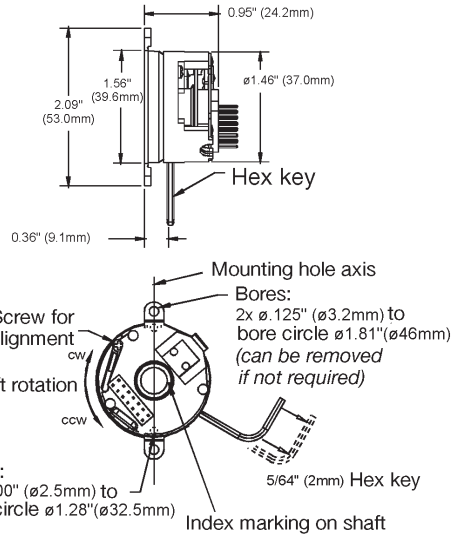
TECHNICAL DATA
electrical

General design	as per DIN EN 61010-Teil 1, protection class III, contamination level 2, over voltage class II
Supply voltage	DC 5 or 12 V ±10 % (SELV)
Max. current w/o load	Incremental: max. 100 mA Incremental + Commutation: max. 120 mA
Recommended external fuse	T 0.125 A
Output circuit	NPN-Open Collector, max. 16 mA, Pull-up 2.0 KΩ RS 422, max. 40 mA
Output signals	
Incremental	NPN-O.C: A, B, N RS 422: A, B, N, $\overline{A}$, $\overline{B}$, $\overline{N}$
Commutation (optional):	NPN-O.C: U, V, W RS 422: U, V, W, $\overline{U}$, $\overline{V}$, $\overline{W}$
Accuracy	
Incremental signals	max. ±5 arc-mins. (edge to any edge)
Commutation signals	max. ±6 arc-mins.
Phasing	
Incremental signals (A to B)	90° ±18° electrical
Commutation signals	8 pole: 30°, 6 pole: 40°, 4 pole: 60° mechanical
Index to U	±1° mech. index pulse center to U channel edge
Pulse width	
Incremental signals	180° ±18° electrical
Commutation signals	8 pole: 45°, 6 pole: 60°, 4 pole: 90° mechanical
Max. output frequency	200 kHz
Noise immunity [1]	as per EN 61000-4- 2, 3, 4, 8 EN 61000-4- 6 with 3 V/m
Noise emission [1]	as per EN 50081-2 (1993 edition)

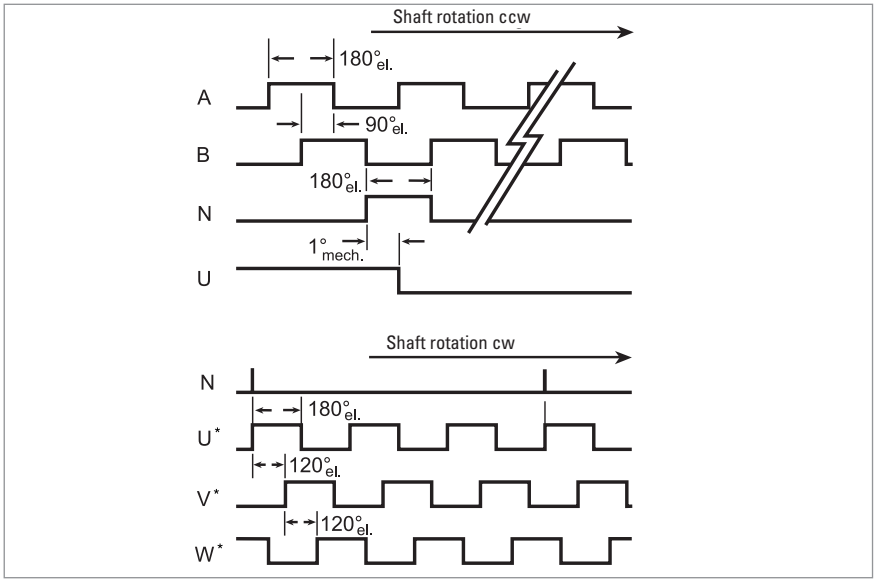
[1] EMC values are only valid for version with screened cable (connection code A ... H)

DIMENSIONAL DRAWINGS

M15



PULSE DIAGRAM



* Example with 6 pole commutation

CONNECTION DIAGRAM CABLE

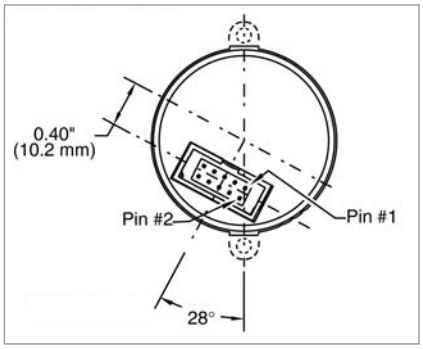
Function	Colour for version incremental only, Code Electrical = 0, 1, 3	Colour for version incremental + commutation, Code Electrical = 6, 7, 9
V_{cc}com [1]		red/white [3]
V_{cc}inc [1]	red	red
GND inc	black	black
GND com		black/white [3]
$\overline{A}$ [2]	red/black	blue/black
A	green	blue
$\overline{B}$ [2]	white/black	green/black
B	orange	green
$\overline{N}$ [2]	blue	violet/black
N	white	violet
$\overline{U}$ [2]		brown/black
U		brown
$\overline{V}$ [2]		grey/black
V		grey
$\overline{W}$ [2]		white/black
W		white

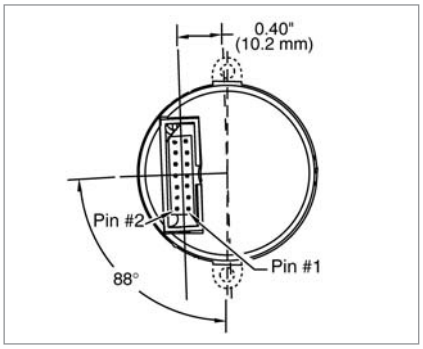
[1] V_{CC}com resp. V_{CC}inc = + DC 5 V or + DC 12 V (see ordering data electrical)
[2] only with Output $_{inc/com}$= RS 422
[3] not connected for code 6 and 9, as here $U_{inc} = U_{com}$

CONNECTION DIAGRAM DUAL ROW CONNECTOR

Pin	10 pole only incr., NPN-O.C., Code Electr.= 0, 1	10 pole only incr., RS422, Code Electr.= 3	14 pole incr.+commutation, Code Electr.= 6, 7, 9
1	A		V_{cc}
2	V_{cc}	V_{cc}	U
3	GND	GND	$\overline{U}$
4			V
5		$\overline{A}$	$\overline{V}$
6		A	W
7		$\overline{B}$	$\overline{W}$
8	B	B	$\overline{A}$
9		$\overline{N}$	A
10	N	N	B
11			$\overline{B}$
12			N
13			GND
14			$\overline{N}$

Pin Numbering:
For dual row connector with ribbon cable:
The cable side marked red designates pin 1





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ORDERING INFORMATION

Type	Pulses ppr incremental [2]	Poles commutation [2]	Housing	Electrical [1]	Hub diameter [2]	Connection
	/	-				
M15-	**0 200** **0 400** **0 500** **1 000** **1 024**	**0** without **4** 4 pole **6** 6 pole **8** 8 pole	**0** without cover **1** closed cover for blind shaft **2** cover with bore for through shaft	**incremental only without commutation** **0** U_{inc}=DC 5 V; output$_{inc}$=NPN-O.C. **1** U_{inc}=DC 12 V; output$_{inc}$=NPN-O.C. **3** U_{inc}=DC 5 V; output$_{inc}$=RS 422 **incremental plus commutation signals** **6** U_{inc}=DC 5 V; output$_{inc}$=RS 422, U_{com}=DC 5 V; output$_{com}$=NPN-O.C. **7** U_{inc}=DC 5 V; output$_{inc}$=RS 422, U_{com}=DC 12 V; output$_{com}$=NPN-O.C. **9** U_{inc}=DC 5 V; output$_{inc}$=RS 422, U_{com}=DC 5 V; output$_{com}$=RS 422	**0** 6.35 mm (1/4") **1** 9.52 mm (3/8") **4** 6 mm **5** 8 mm **6** 10 mm **8** 4.76 mm (3/16") **9** 3.18 mm (1/8")	**0** dual row connector **1...8** dual row connector with mating ribbon cable 1=30 cm, 2=60 cm, ... **A...H** screened cable radial, A=30 cm, B=60 cm, ...

[1] U_{inc}: Supply voltage incremental,
U_{com}: Supply voltage commutation (only if commutation selected)
[2] allowed combinations see available combinations (pulses/poles)

Available combinations (pulses/poles)

	Number of poles			
Pulses ppr	0	4	6	8
0200	X			
0400	X			
0500	X	X	X	X
1000	X	X	X	X
1024	X	X	X	X