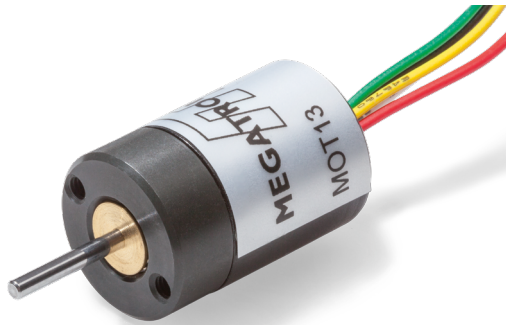


# Data Sheet for Angle Sensors

## Optical Encoders

## Series MOT13



Also available as hollow shaft variant

- Ultra precise miniature high-end rotary encoder in top quality
- Available as solid shaft or hollow shaft variant
- Housing diameter only 13 mm
- Until 16000 pulses per revolution thanks to an integrated multiplier
- 2 channels + Index
- Ball bearing
- 5V supply voltage
- TTL, Open Collector or Linedriver electronics

MOT13 is the high-end encoder which offers at very compact housing dimensions, by means of a multiplier, resolutions until 16000 pulses per revolution. This high-quality encoder for special applications is preferable found in precision machines, devices for semiconductor manufacturing and in robotics.

### Electrical Data

Output Signal	A, B, Z (Index)		
Number of pulses	Resolution (pulses per rev.) without multiplier:	Resolution (pulses per rev.) with multiplier:	
	32, 100, 200, 256, 300, 360, 500, 1024	900, 1000, 2000, 4000, 8000, 16000	
Limit Frequency	100 kHz (50 kHz in combination with Linedriver and multiplier)		
Supply voltage	Resolution 32...1024 pulses per rev. 5 VDC ±10 %	Resolution 2000...16000 Imp./U 5 VDC ±5 %	
Power consumption (no load)	≤ 40 mA @32..1024 pulses per rev. ≤ 50 mA @2000..16000 pulses per rev.		
Output capacity	Sink current: max. 20mA Residual voltage: 0.5V or less @10mA Open Collector output: load voltage DC max. 13.2V		
Output electronics	Voltage output (TTL) resolution 32, 100, 200, 256, 300, 360, 500, 1024 pulses per rev.	Open Collector (all resolutions)	Line Driver (all resolutions)
Switch-on delay	max. 2 µs @32..1024 pulses per rev. max. 1 µs @2000..16000 pulses per rev.		

### Mechanical and Environmental Data, Miscellaneous

Mechanical angle of rotation /stroke 1.)	360° without stop
Bearing	Ball bearing
Max. operational speed	6000 rpm.
Operational torque @ ambient temperature1.) 2.)	≤ 0.1 Ncm
Operating temperature range	0..+60 °C
Storage temperature range	-20..+80 °C
Protection grade (IEC 60529)	IP40
Vibration (IEC 68-2-6, Test Fc)	55 Hz; 1.5 mm; each 2 h in X, Y, Z
Shock (IEC 68-2-27, Test Ea)	(50 G) 500 m/s <sup>2</sup> , each 3 times in X, Y, Z

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Optical Encoders

Series MOT13

## Mechanical and Environmental Data, Miscellaneous

Housing diameter / length	Without multiplier: 13 mm	With multiplier: 13.5 mm
Housing depth	Without multiplier: 20 mm	With multiplier: 22 mm
Shaft diameter	1.5 mm	
Shaft type	Solid shaft / hollow shaft	
Max. radial load	$\leq 1.9 \text{ N @}100..500 \text{ pulses per rev.}$ $\leq 0.98 \text{ N @}900..16000 \text{ pulses per rev.}$	
Max. axial load	$\leq 1.9 \text{ N @}100..500 \text{ pulses per rev.}$ $\leq 0.98 \text{ N @}900..16000 \text{ pulses per rev.}$	
Connection type	TTL, Open Collector, Linedriver with resolutions 32...1024 ppr.: Single strands AWG30, 140 mm length	Open Collector, Linedriver with resolutions 2000...16000 ppr.: Single strands AWG32, 330 mm length
Connection position	Axial	
Sensor mounting	Solid shaft variant: 2 x M2 thread screw, depth 2	Hollow shaft variant: spring flange
Mass	Without multiplier: 10g	With multiplier: 20g
Fastening parts included in delivery	Version with solid shaft: no mounting parts included	Version with hollow shaft: incl. spring flange
Material shaft	Stainless steel	
Material housing	Aluminium	
Material disc	Glass	

1.) According IEC 60393

2.) Determined by climatic conditions according to IEC 68-1, para. 5.3.1 without load collectives

# Data Sheet for Angle Sensors

Optical Encoders

Series MOT13

## Order Code

Description	Selection: standard=black/bold, possible options=grey/cursive						
<b>Series</b>	<b>MOT13</b>						
<b>Shaft:</b> Standard: Solid shaft: Ø1.5 x 10 mm Option hollow shaft Ø1.5 mm Option solid shaft length in mm		- H Ax,xx					
<b>Resolution in pulses per revolution:</b> Option 100 ppr. Option 200 ppr. Option 256 ppr. Option 300 ppr. Standard: <b>360 ppr.</b> Option 500 ppr. Option 900 ppr. (*) Option 1000 ppr. (*) Option 1024 ppr. Option 2000 ppr. (*) Standard: <b>4000 ppr. (*)</b> Option 8000 ppr. (*) Option 16000 ppr. (*)			100 200 256 300 <b>360</b> 500 900 1000 1024 2000 <b>4000</b> 8000 16000				
<b>Supply voltage:</b> Standard: <b>5 V</b>				<b>5</b>			
<b>Output signal:</b> Standard: <b>A+B+Z (index)</b>					<b>BZ</b>		
<b>Output electronics:</b> Standard: <b>TTL</b> (TTL exclusively for 32, 100, 200, 256, 300, 360, 500, 1024 ppr.) Standard: <b>Open Collector</b> (all resolutions) Option <i>Line Driver</i> (all resolutions)						<b>TTL</b> <b>K</b> <b>N</b>	
<b>Electrical connection:</b>  Standard: For TTL, Open Collector and Linedriver electronics and resolutions 32...1024 ppr.: Single strands AWG30, 140 mm length  Standard: For Open Collector and Linedriver electronics and resolutions 2000...16000 ppr.: Single strands AWG32, 330 mm length  Option: Custom defined cable length in meter							-  -  X,XX

\*) With integrated multiplier circuit

## Order example MOT13

### Requirement:

360 pulses per revolution, supply voltage 5 V, 2 channels with index, TTL output electronics, electrical connection: single strands AWG30 with 140 mm length

**Example for order coder:** MOT13 360 5 BZ TTL

# Data Sheet for Angle Sensors

Optical Encoders

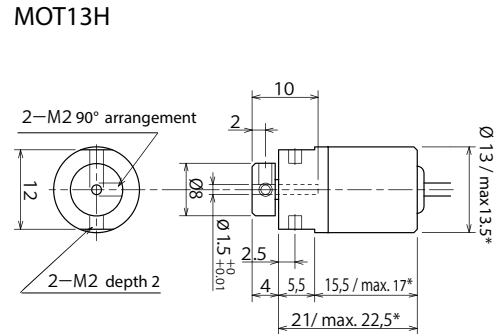
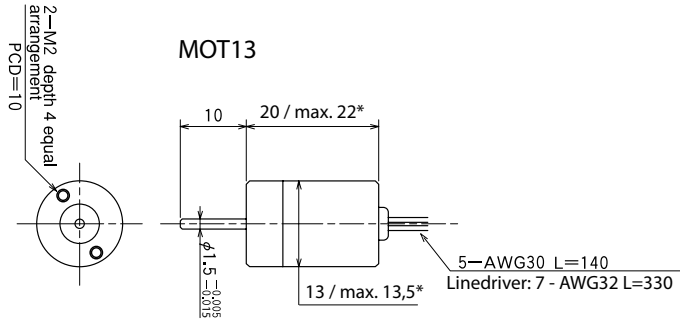
Series MOT13

**For higher quantities or on-going demand, additional options are available as described below**

For example:

- Other resolutions
- Specials shaft design
- Special connector and cable design
- Other operational torque

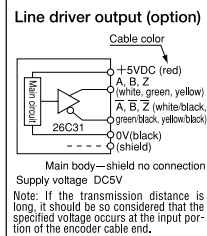
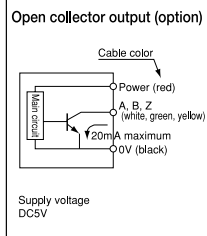
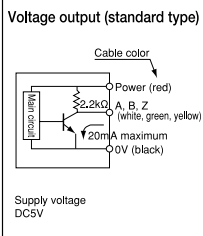
### Technical Drawing



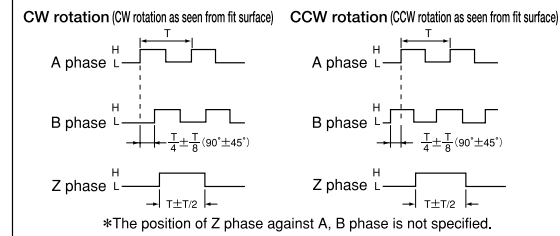
Dimensions in mm

\*Multiplier Versions

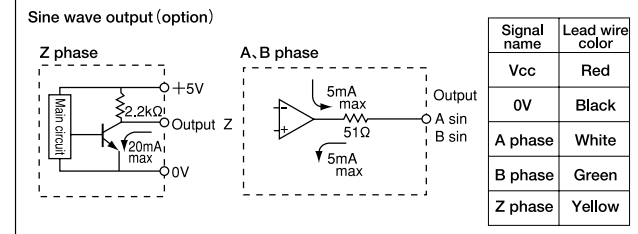
#### Output circuit diagram



#### Output waveform

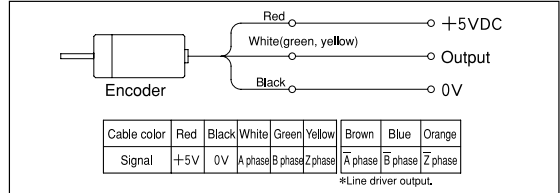


#### Output circuit diagram

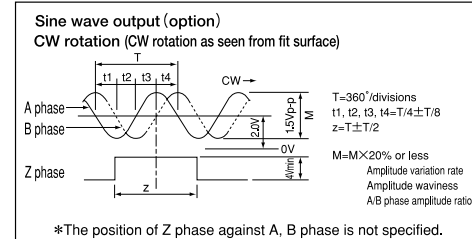


A capacitor (0.1 μF) is connected between 0V and FG (frame ground).

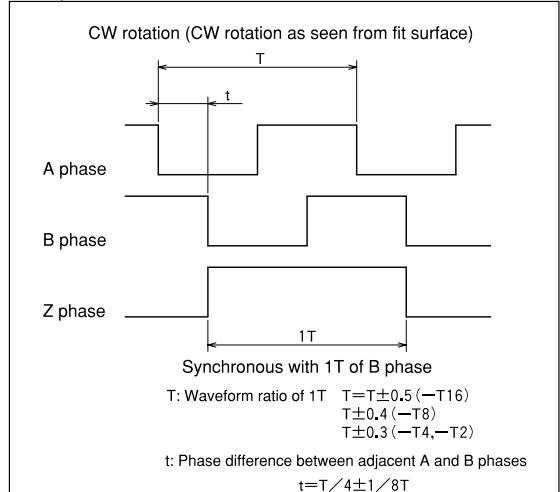
#### Output connection diagram



#### Output waveform



#### Output waveform



#### Spring flange MOT13H (Included)

