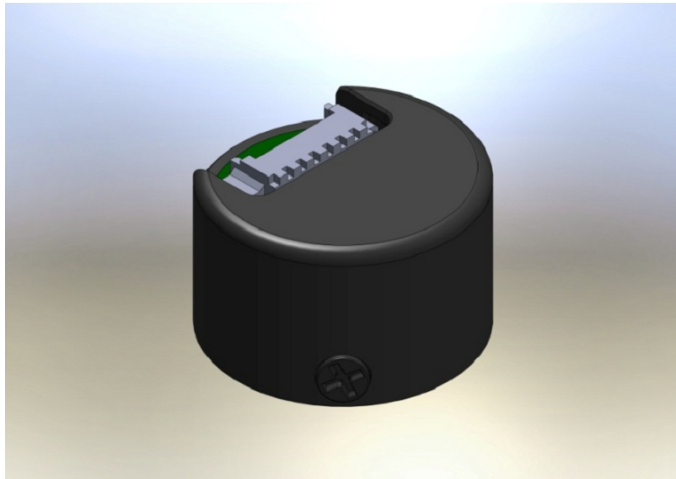


## TMCS-20 Hardware Manual

Hardware Version V1.00 | Document Revision V1.00 • 2017-Mar-01

TMCS-20 is a low-cost and small-size optical incremental encoder for use with stepper motors and 3-phase PMSM/BLDC motors. It comes with high resolution optical code wheels with a resolution of up to 8K lines.



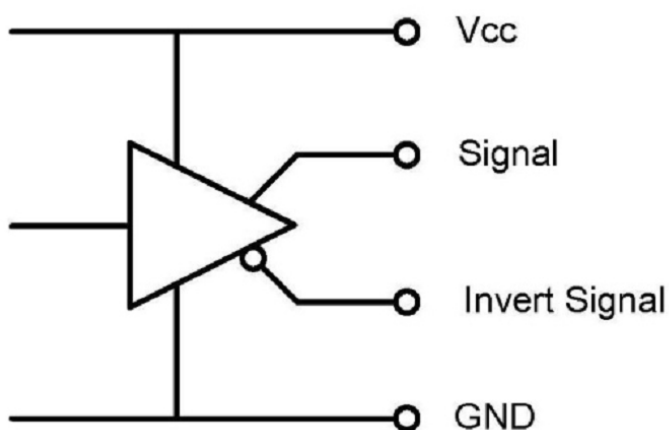
### Features

- Low Cost
- High Resolution
- Small Dimension
- Easy Mounting

### Applications

- Stepper Motor FOC
- Servo Motors
- Precision Motion Control
- Automated Equipment
- Robotics

### Simplified Block Diagram



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## 1 Order Codes

Order Code	Description	Size (LxWxH)
TMCS-20-4-8192-AT-01	Encoder Module 20mm diameter, Resolution of 8K lines (32K increments), ABN, 4mm shaft diameter, TTL	20mm x 20mm x 13mm
TMCS-20-KIT	TRINAMIC TMCS-20 encoder kit including encoder housing, all code wheel options, cable loom and assembly tools	100mm x 150mm x 30mm

*Table 1: Order codes*

Other encoder resolutions, signal output types, and shaft diameters on request.



## 2 Technical Specifications

### 2.1 Mechanical and Electrical Parameters

Parameter	Min	Typ	Max	Unit
Supply voltage	4.5	5	5.5	V
Supply current			80	mA
Rise/fall time			100	ns
Frequency			300	kHz
Output Voltage "H"	2.4			V
Input Voltage "L"			0.4	V
Max. output current			5	mA
Resolution		32.768 (32k)		increments

Table 2: Electrical Characteristics

Parameter	Min	Typ	Max	Unit
Hollow Diameter		4		mm
Starting Torque			0.8	Ncm
Shaft Loading Axial			25	N
Shaft Loading Radial			40	N
Max. RPM			6000	rpm
Net weight		30		g

Table 3: Mechanical Specifications

Parameter	Description
Operating Temperature	-20 – +85°C
Storage Temperature	-20 – +85°C
Operating Humidity	RH 85% max, non collecting
Shock	490 $m/s^2$ , 3Dx2 times
Vibration	1.2mm, 10-55kHz, 3Dx30min
Protection	IP40

Table 4: Environmental Specifications



## 2.2 Signals and Connection

Pin Number	Color	Signal Name
1	Red	VCC
2	Black	GND
3	White	A+
4	White/Black	A-
5	Green	B+
6	Green/Black	B-
7	Yellow	Z+
8	Yellow/Black	Z-
9	Blue	Shield

Table 5: Connector and cable pinning and signals

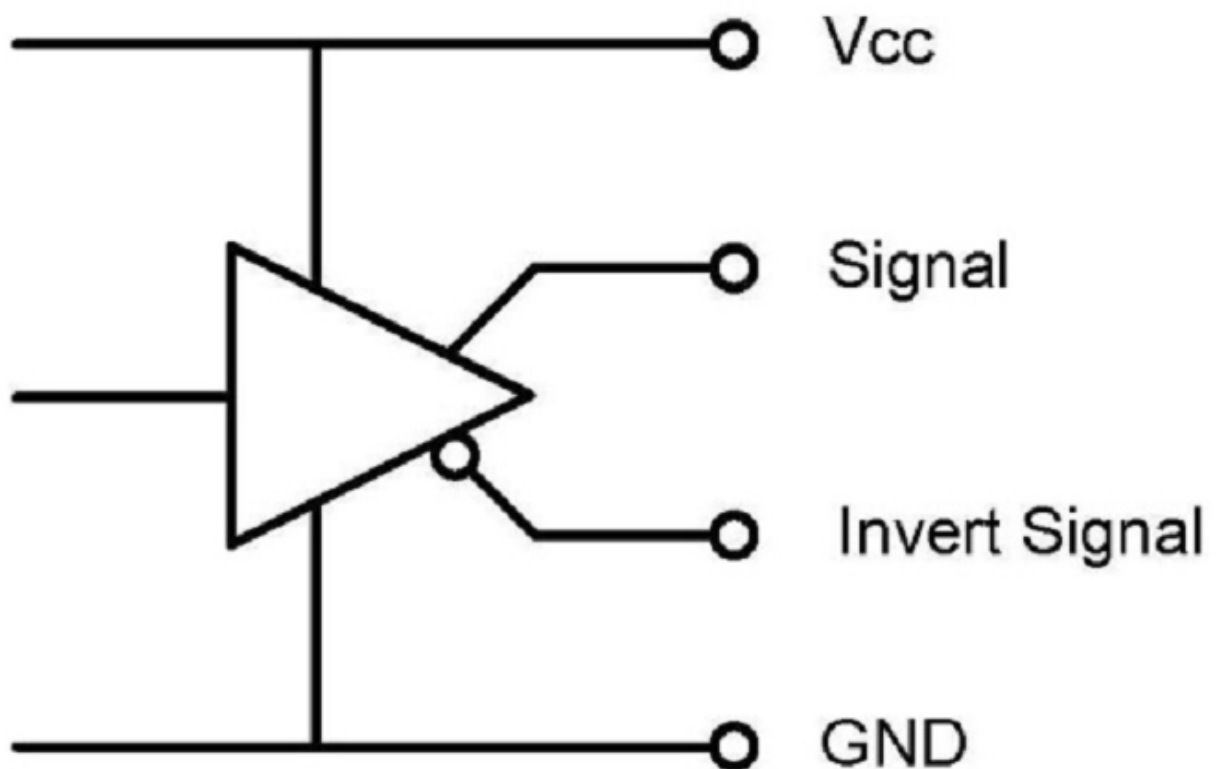


Figure 1: Connection and circuit diagram for the line driver outputs



### 2.3 Wave Form

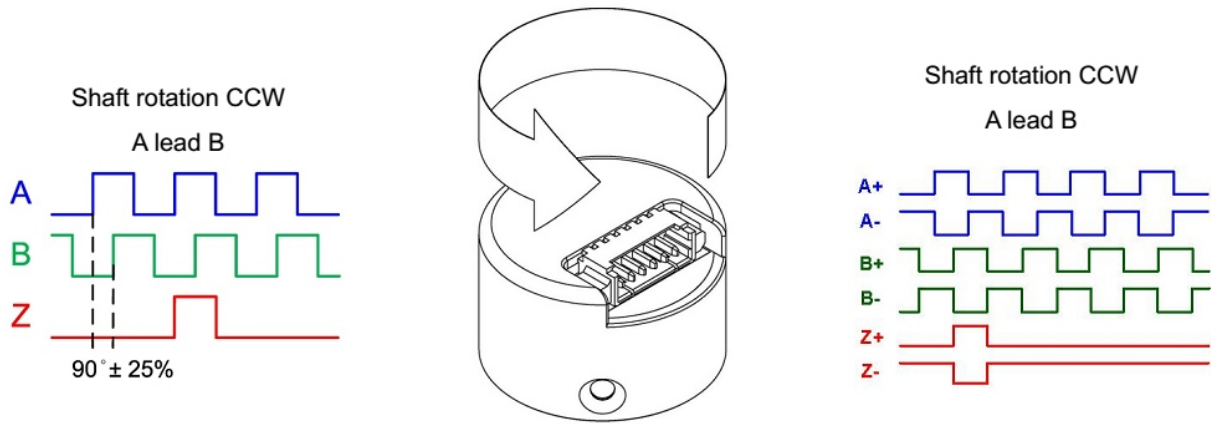


Figure 2: Wave form for CCW and CW rotation

### 2.4 Mechanical Drawings

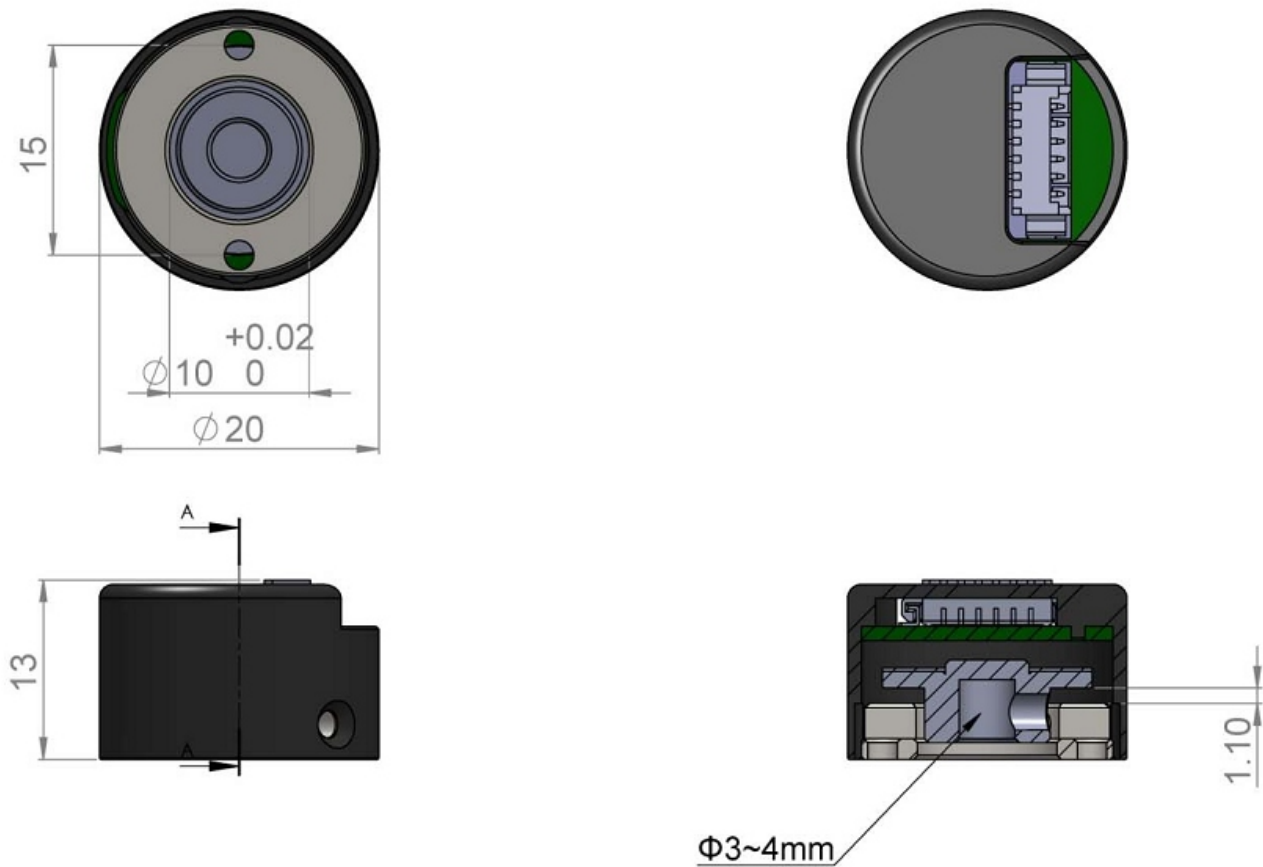


Figure 3: Bottom view, top view, side view, and cut view (units = mm)



## 2.5 Motor Assembly

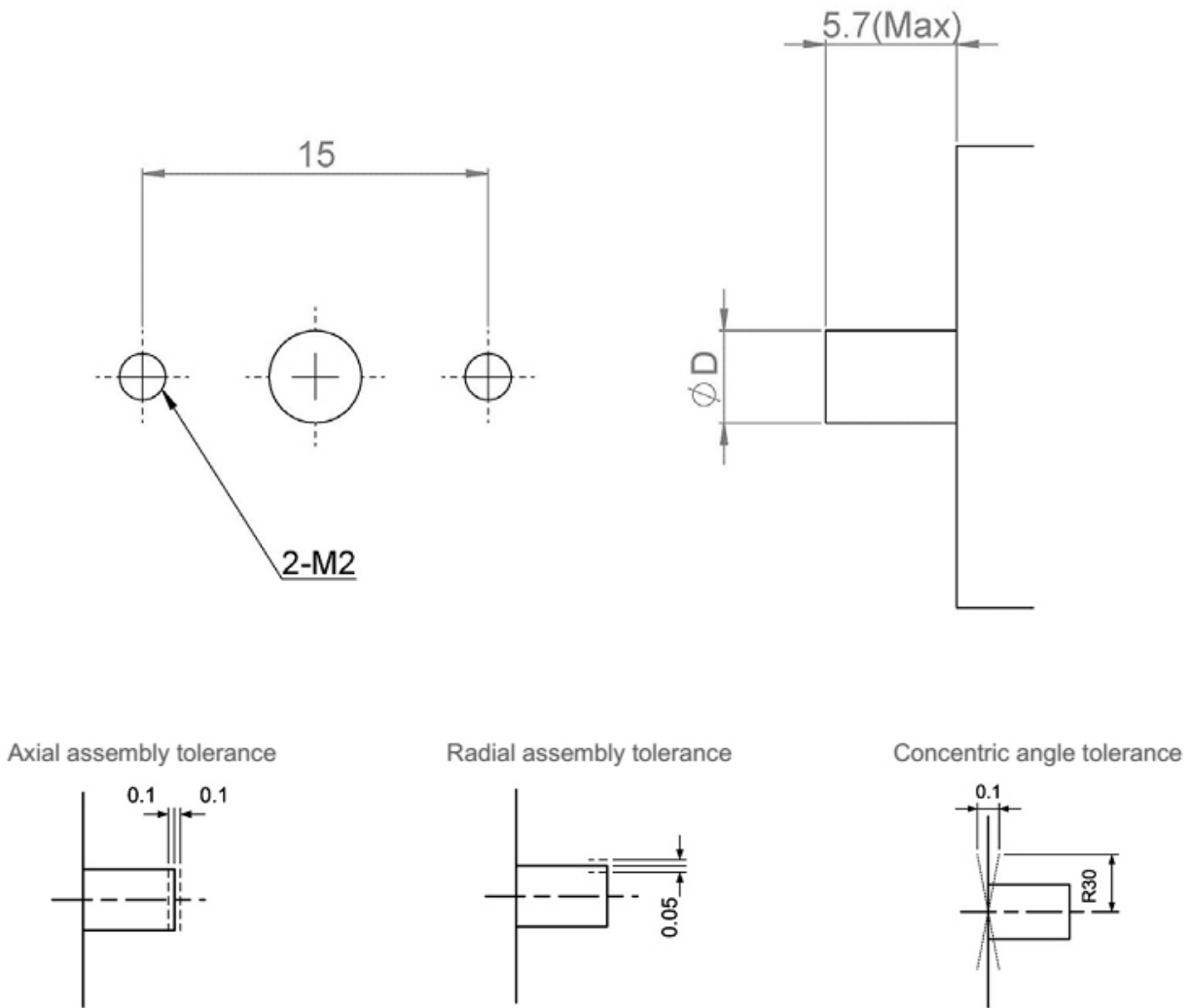


Figure 4: Required dimensions for motor assembly (units = mm)



### 3 Figures Index

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## 5 Supplemental Directives

### 5.1 Producer Information

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The documentation provided here, is for programmers and engineers only, who are equipped with the necessary skills and have been trained to work with this type of product.

The Target User knows how to responsibly make use of this product without causing harm to himself or others, and without causing damage to systems or devices, in which the user incorporates the product.

### 5.5 Disclaimer: Life Support Systems

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## 5.7 Collateral Documents & Tools

This product documentation is related and/or associated with additional tool kits, firmware and other items, as provided on the product page at: [www.trinamic.com](http://www.trinamic.com).



## 6 Revision History

### 6.1 Hardware Revision

Version	Date	Author	Description
1.00	01.03.2017	TMC	Initial release

*Table 6: Hardware Revision*

### 6.2 Document Revision

Version	Date	Author	Description
1.00	22.02.2017	SK	Initial release

*Table 7: Document Revision*

