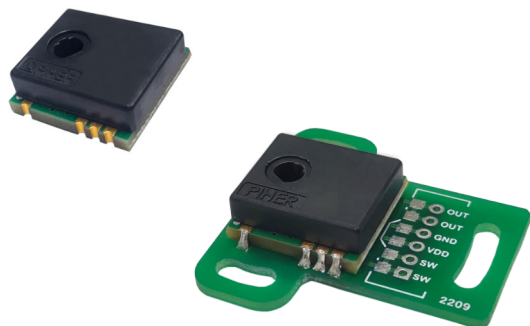


# MTS-360

## Miniature Hall-Effect Through-Shaft Rotary Position Sensor



### KEY FEATURES



#### True, contactless operation

Without any gears or mechanical interfaces the sensor is easily assembled and calibrated and subject to limited wear and tear over lifetime.



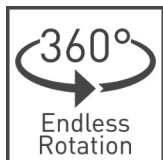
#### Fits in the smallest of spaces

With a footprint of less than 18 x 18mm, height of 5.9mm and less than 3g this rotary sensor can be used in even the most space-constraint application.



#### Through-hole design

Allows shaft insertion from top or bottom, simple assembly and makes it even more suitable in applications where space is limited.



#### 360 degree absolute position feedback

Endless mechanical rotational angle without dead band, keeps the position on power loss with programmable electrical angles from 15 to 360 degrees.



#### Durable and robust design

The non-contacting design allows for an extra-long product lifetime of up to 50 million cycles.



#### Adaptable to your requirements

Programmable transfer function and switch outputs as well as different output protocols and redundancy levels available.

### DESCRIPTION

The MTS-360 provides a true breakthrough in contactless sensor technology by combining a through-shaft design with 360° absolute position feedback in an ultra miniature size. The result is the smallest fully featured rotary sensor on the market with reliability up to 50 million cycles.

With its tiny size, engineers can now integrate a fully featured rotary sensor directly on their PCB without the packaging issues that typically accompany encoders or other absolute position devices. The exceptionally low profile fits easily in places that were previously too small for pre-packaged rotary sensors.

The MTS-360 PCB package enables time and cost-savings by easily mounting a fully featured rotary sensor including connector without the need to design a printed circuit board for the sensor.

### APPLICATIONS

#### Industrial

- ▶Optical image stabilization
- ▶Precision biomedical devices
- ▶Instrumentation
- ▶Autonomous warehouse robotics
- ▶Robotics and automation feedback

#### Home and Building Automation

- ▶HVAC systems

#### Transportation

- ▶Valve monitoring
- ▶Conveyor operation

#### HVOR

- ▶Autonomous steering
- ▶Joystick controls
- ▶Hand throttle position

# MTS-360

## Miniature Hall-Effect Through-Shaft Rotary Position Sensor

### MECHANICAL SPECIFICATIONS

Rotational life	Up to 50.000.000 cycles
Mechanical range	360° (endless rotation)

### ELECTRICAL SPECIFICATIONS

Linearity <sup>1,2</sup>	±1% absolute (±0.5% upon request)
Electrical angular range <sup>1</sup>	Programmable from 15° to 360°
Output protocols	Analog (Ratiometric), PWM Serial Protocol (SPI)
Output	Simple Redundant Full-redundant (on request)
Switch output	Yes, programmable
Switch accuracy <sup>1</sup>	±3°
Resolution	Analog, PWM SPI
	Up to 12 bit Up to 14 bit
Supply voltage <sup>1</sup>	5V ±10%
Supply current	Single version Redundant version
	Typ 8.5 mA Typ 17 mA
Voltage protection	+20V / -10V
Self-diagnostic features	yes

<sup>1</sup> Other specifications available

<sup>2</sup> Ferromagnetic materials close to the sensor (i.e. mounting surface) may affect the sensor's linearity.

### ENVIRONMENTAL SPECIFICATIONS

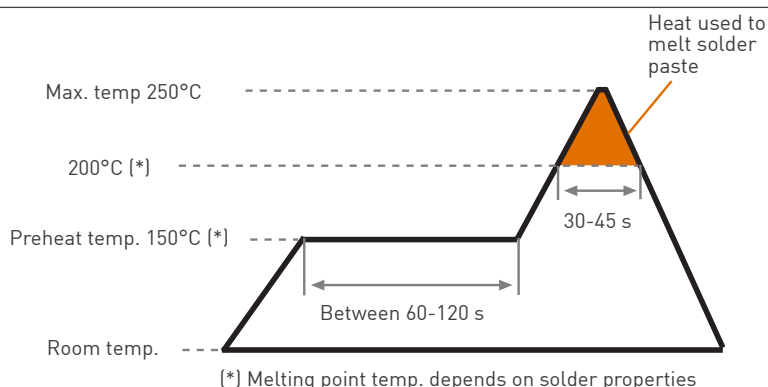
Model	MTS-360	MTS-360PCB
Operating and storage temperature <sup>1</sup>	-40° to +125°C	with connector: -40° to +105°C without connector: -40° to +125°C
Shock	50g	
Vibration	5-2000 Hz; 20g; Amax 0,75 mm	
Sealing <sup>1</sup>	IP50	

<sup>1</sup> Other specifications available



Sensitive to Electro Static Discharge (ESD).  
Observe control procedures whenever  
handling semiconductor products.

### RECOMMENDED REFLOW PROFILE

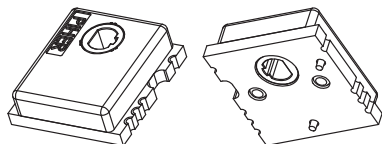


The recommended reflow profile is provided as a guideline. Optimal profile may differ due to oven type, assembly layout or other design or process variables. Customers should verify actual device performance in their specific application and reflow process. Please contact Piher if you require additional support.

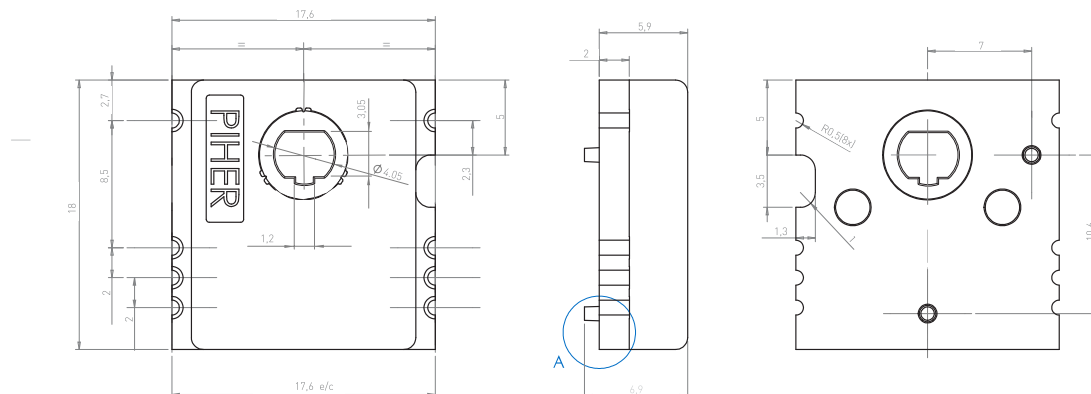
## Miniature Hall-Effect Through-Shaft Rotary Position Sensor

## DIMENSIONS MTS-360

## Outer Dimensions

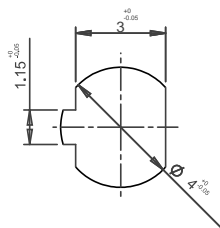


Download the STEP file here:  
[www.piher.net](http://www.piher.net)



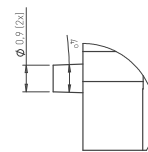
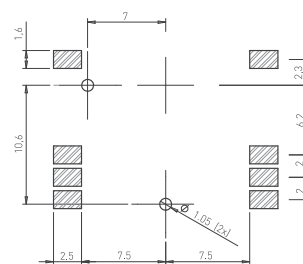
Rotor is shown at zero position. Sensor is delivered at random position

### Recommended shaft dimensions



Shaft should be ferromagnetic material. If you want to use a non-ferromagnetic shaft please contact Piher.


## Recommended footprint



Detail A  
Scale 8:1

## CONNECTION SCHEME

PIN	Simple Output	Redundant Output	SPI Output
1	Supply voltage	Switch output 2*	Power Supply
2		Signal output 2**	Power Supply
3	Switch output*	Ground	//SS
4		Ground	SCLK
5	Signal output**	Power supply	MOSI
6		Power supply	MOSI
7	Ground	Signal output 1**	Ground
8		Switch output 1*	Ground



\* If the feature is not used in the application, please connect to ground.

\*\* Piher can supply the recommended wiring diagram.

More instructions of use on [www.piher.net](http://www.piher.net)

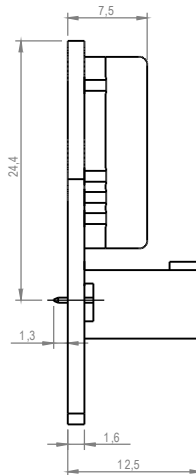
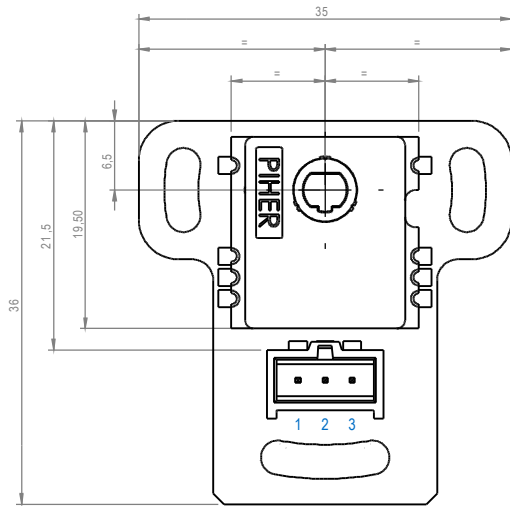
# MTS-360PCB

## Miniature Hall-Effect Through-Shaft Rotary Position Sensor

### DIMENSIONS MTS-360PCB

#### 3-pin version

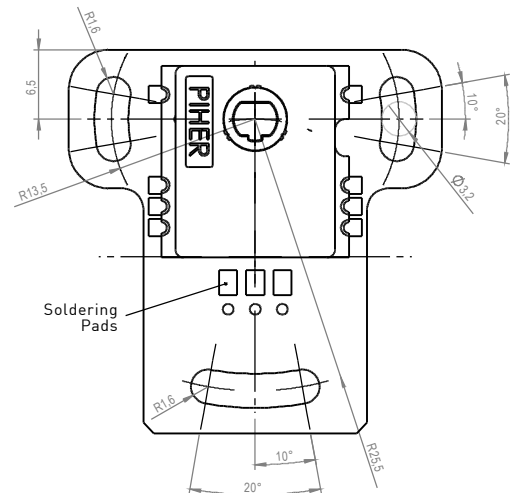
With connector



Without connector

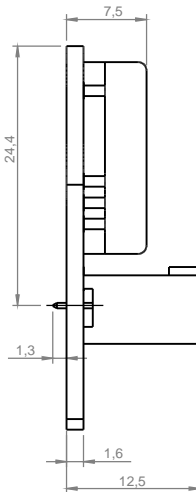
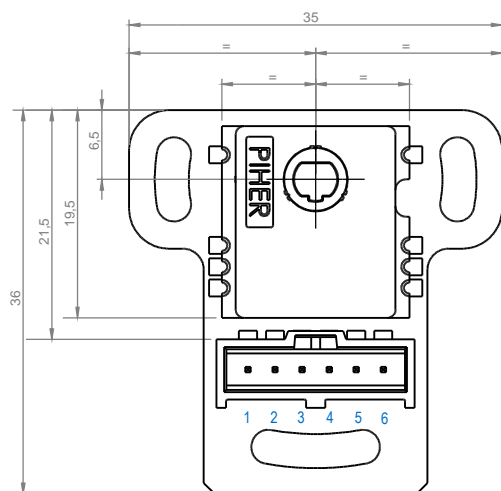


Download the STEP file here:  
[www.piher.net](http://www.piher.net)

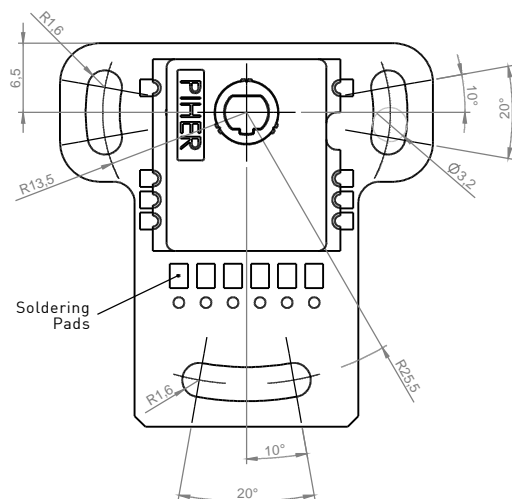


#### 6-pin version

With connector



Without connector



### CONNECTIONS

PIN	3-pin	6-pin (simple)	6-pin (redundant)	6-pin (SPI)	Connectors	Terminals
1	Supply voltage	Switch	Ground	SCLK	Header connector: 3-pin: Molex 90136-1203 6-pin: Molex 90136-1206	Recommended crimp terminals: Molex 90119-2120 Molex 90119-2121 Molex 90119-2122
2	Signal output	Switch	Signal output 2	//SS		
3	Ground	Supply voltage	Switch 2	Supply voltage		
4	n/a	Ground	Switch 1	Ground	Recommended mate connector: 3-pin: Molex 90156-0143 6-pin: Molex 90156-0146	
5	n/a	Signal Output	Signal output 1	MOSI		
6	n/a	Signal Output	Supply voltage	MOSI		

# MTS-360

## Miniature Hall-Effect Through-Shaft Rotary Position Sensor

### HOW TO ORDER (Example: MTS360G2-1A-C0000-ERA360-05K)

#### Simple Output - Analog and PWM

MTS360G2 - 1 - - - - C - ERA - 05 K - - - - -

Series	Type	Output <sup>1</sup>	Switch <sup>2</sup>	Switch position <sup>2</sup>	Output function <sup>3</sup>	Electric rotational angle <sup>4</sup>	Voltage supply	Temperature range	PWM Frequency Hz <sup>5</sup>	Packaging
	1 = simple	A = analogic P = PWM	[empty] = none W = switch	[empty] 000 016 ... 360	C0000 C0001	ERA040 ERA041 ... ERA360	05 = 5V ±10%	K = -40°C to +125°C	[empty] = 200Hz F100 = 100Hz F101 = 101Hz ... F999 = 999Hz	[empty] = bulk R = reel

#### Redundant Output - Analog and PWM

MTS360G2 - 2 - - - - C - ERA - 05 K - - - - -

Series	Type	Switch1 <sup>2</sup>	Switch2 <sup>2</sup>	Output function <sup>3</sup>	Electric rotational angle <sup>4</sup>	Voltage supply	PWM Frequency Hz. (1) <sup>5</sup>	PWM Frequency Hz. (2) <sup>5</sup>	Packaging
	2 = redundant	[empty] = none W = switch	[empty] = none W = switch	C0002 C0003	ERA040 ERA041 ... ERA360	05 = 5V ±10%	[empty] F100 F101 ... F999	[empty] F100 F101 ... F999	[empty] = bulk R = reel

Output<sup>1</sup>

AA = analogic  
PP = PWM

Switch1 position<sup>2</sup>

[empty]  
000  
016  
...  
360

Switch2 position<sup>2</sup>

[empty]  
000  
016  
...  
360

Temperature range

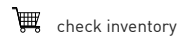
K = -40°C to +125°C

#### Simple Output - SPI

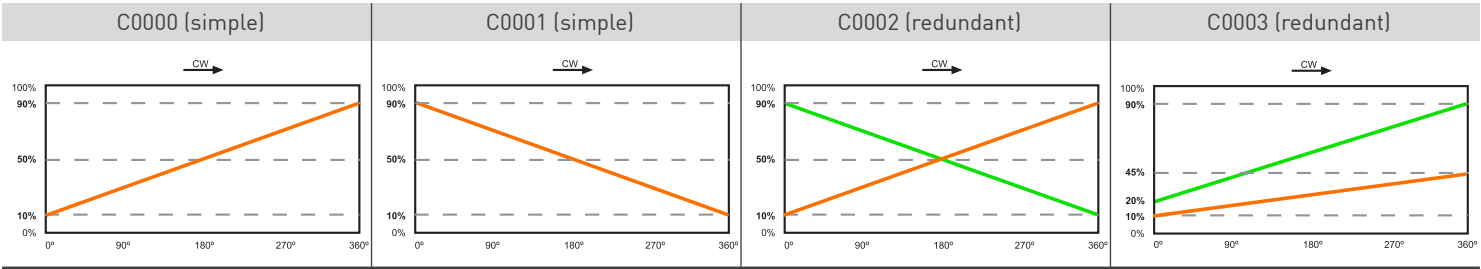
MTS360G2 - 1 S - C - ERA - 05 K - - - - -

Series	Type	Output	Output function <sup>3</sup>	Electric rotational angle <sup>4</sup>	Voltage supply	Temperature range	Packaging
	1 = simple	S = SPI	C0000 C0001	ERA040 ERA041 ... ERA360	05 = 5V ±10%	K = -40°C to +125°C	[empty] = bulk R = reel

1 The analog output is ratiometric, proportional to input supply voltage.  
2 Leave empty if not applicable. Switch function diagram: see next page.  
3 Other output functions available, please check availability. Enter CXXXX as long as the new output function is not defined.  
4 Models with ERA < 40° available on request  
5 Leave empty if not applicable. Default frequency is 200 Hz



### EXAMPLE OUTPUT FUNCTIONS



# MTS-360PCB

## Miniature Hall-Effect Through-Shaft Rotary Position Sensor

HOW TO ORDER (Example: MTS360G2PCB3-1A-C0000-ERA360-05K- - - - -)

### Simple Output - Analogic and PWM - 3 pin version

MTS360G2PCB3		-	1	-	-	-	C _ _ _ _	-	ERA _ _ _	-	05	-	K	-	- _ _ _	-	-
Series	Type	Output <sup>1</sup>	Output function <sup>3</sup>	Electric rotational angle <sup>4</sup>	Voltage supply	Temperature range <sup>5</sup>	PWM Frequency Hz <sup>6</sup>	Connector									
	1 = simple	A = analogic P = PWM	C0000 C0001	ERA040 ERA041 ... ERA360	05 = 5V ±10%	K = -40°C to +125°C	[empty] = 200Hz F100 = 100Hz F101 = 101Hz ... F999 = 999Hz	C = with N = without									

### Simple Output with Switch - Analogic and PWM - 6 pin version

MTS360G2PCB6																			-	1	-	_	-	_	-	---	-	C	----	-	ERA	----	-	05	-	K	-	----	-	_																																																																																																																																																																								
Series																			Type																			Output <sup>1</sup>																			Switch <sup>2</sup>																			Switch position <sup>2</sup>																			Output function <sup>3</sup>																			Electric rotational angle <sup>4</sup>																			Voltage supply																			Temperature range <sup>5</sup>																			PWM Frequency Hz <sup>6</sup>																			Connector																		
																			1 = simple																			A = analogic P = PWM																			[empty] = none W = switch																			[empty] 000 016 ... 359																			C0000 C0001																			ERA040 ERA041 ... ERA360																			05 = 5V ±10%																			K = -40°C to +125°C																			[empty] = 200Hz F100 = 100Hz F101 = 101Hz ... F999 = 999Hz																			C = with N = without																		

### Simple Output - SPI - 6 pin version

MTS360G2PCB6		-	1	S	-	C _ _ _ _	-	ERA _ _ _	-	05	K	-	_
Series	Type	Output	Output function <sup>3</sup>	Electric rotational angle <sup>4</sup>	Voltage supply	Temperature range <sup>5</sup>	Connector						
	1 = simple	S = SPI	C0000 C0001	ERA040 ERA041 ... ERA360	05 = 5V ±10%	K = -40°C to +125°C	C = with N = without						

### Redundant Output - 6 pin version

MTS360G2PCB6											-	2	-	--	-	---	-	---	-	C	---	-	ERA	---	-	05	-	K	-	---	-	---	-	-
Series	Type	Switch1 <sup>2</sup>		Switch2 <sup>2</sup>		Output function <sup>3</sup>		Electric rotational angle <sup>4</sup>		Voltage supply		PWM Frequency Hz. (1) <sup>6</sup>		PWM Frequency Hz. (2) <sup>6</sup>		Connector																		
	2 = redundant	[empty] = none W = switch		[empty] = none W = switch		C0002 C0003		ERA040 ERA041 ... ERA360		05 = 5V ±10%		[empty] F100 F101 ... F999		[empty] F100 F101 ... F999		C = with N = without																		
	Output <sup>1</sup>	Switch1 position <sup>2</sup>		Switch2 position <sup>2</sup>						Temperature range <sup>5</sup>																								
	AA = analogic PP = PWM	[empty] 000 016 ... 359		[empty] 000 016 ... 359						K = -40°C to +125°C																								

1 The analog output is ratiometric, proportional to input supply voltage.

2 Leave empty if not applicable. Switch function diagram: see next page.

3 Other output functions available, please check availability. Enter CXXXX as long as the new output function is not defined.

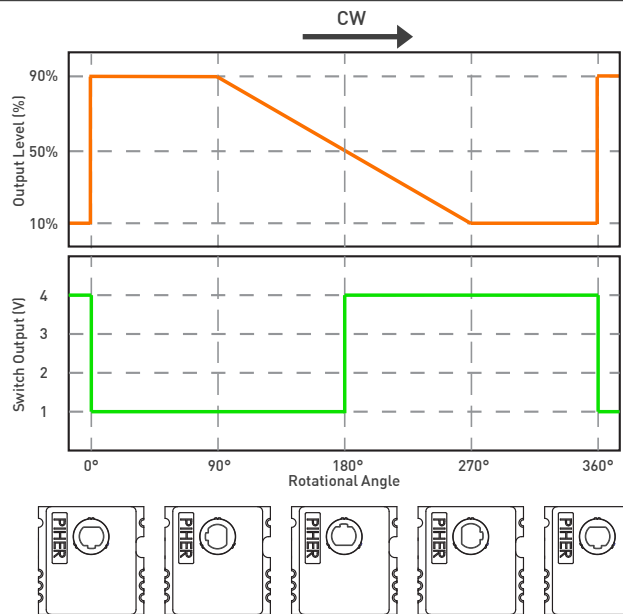
4 Models with ERA < 40° available on request

5 Temperature range is limited to +105°C for connector versions.

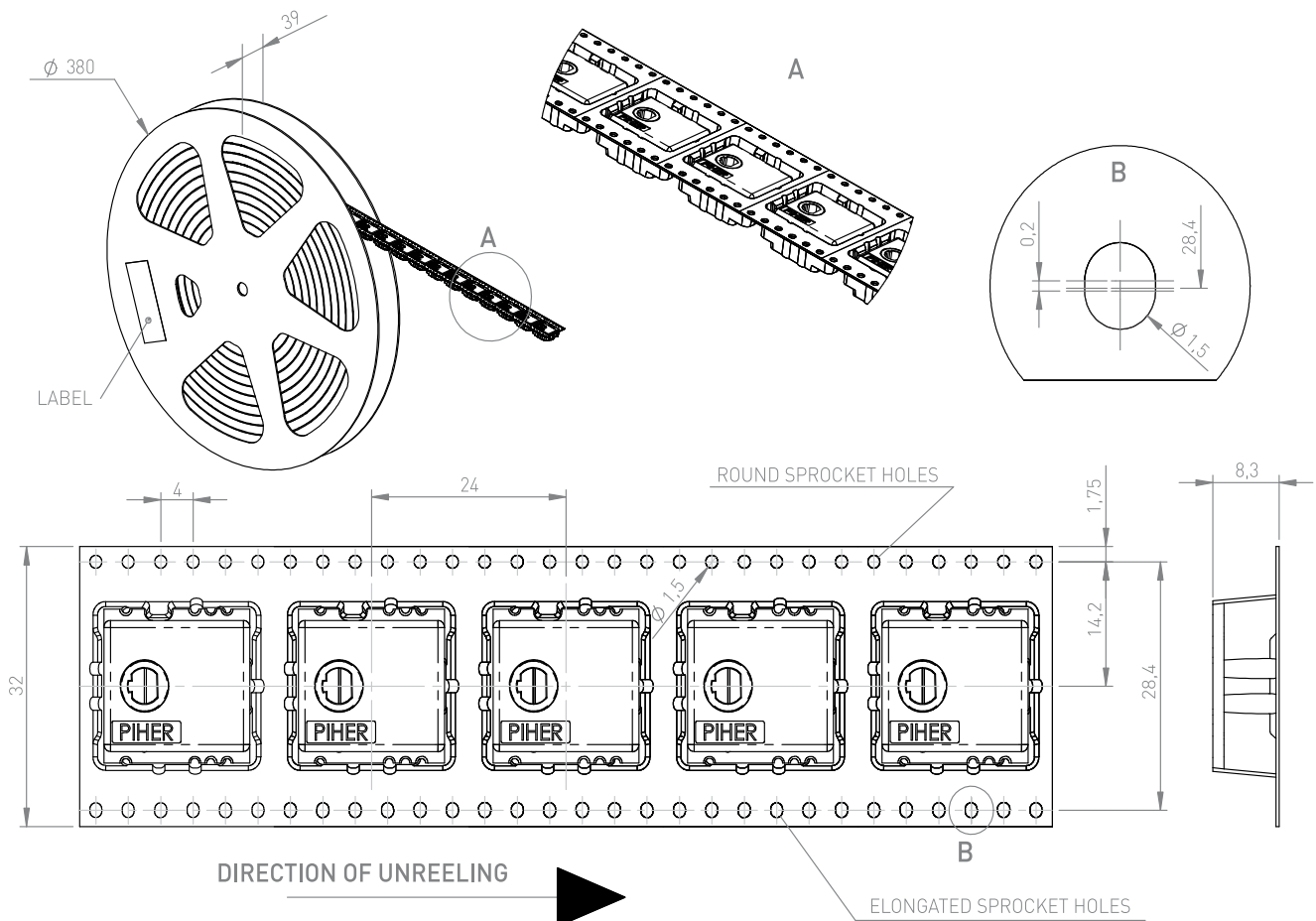
6 Leave empty if not applicable. Default frequency is 200 Hz

## Miniature Hall-Effect Through-Shaft Rotary Position Sensor

**MTS360G2-1A-W180-C0072-ERA180-05K**



Reel - Embossed Tape (max. 400 pcs / reel)



Page 7 of 8

# MTS-360

## Miniature Hall-Effect Through-Shaft Position Sensor

### PACKAGING

Bulk



Box dimensions (mm): 250x160x95

### OPTIONAL FEATURES AVAILABLE ON REQUEST

- ▶Special output slopes and protocols
- ▶Full redundant version with switches
- ▶Fast versions
- ▶Energy harvesting versions
- ▶IP sealing
- ▶Connectors
- ▶Shaft interfaces

### OUR ADVANTAGE

- ▶Leading-edge innovative position sensing solutions
  - ▷Contactless (Hall-effect and Inductive Technology)
  - ▷Contacting (Potentiometers, Printed Electronics)
- ▶Engineering design-in support
- ▶All our products can be customized to fit target application and customer requirement
- ▶Capability to move seamlessly from development to true high-volume production
- ▶A global footprint with global engineering and commercial support
- ▶One-stop shop not limited to position sensors (temperature, pressure, gas,...) through group collaboration
- ▶Flexibility and entrepreneurship of a medium-sized company with the backing of Amphenol Corporation



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