

Electrical wiring diagrams

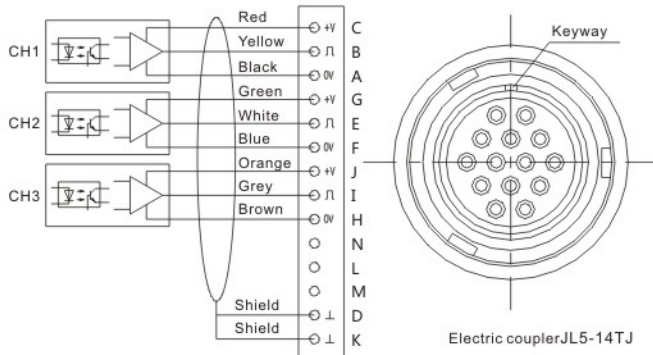


Fig.8 TQG15C Photoelectric Speed Sensor

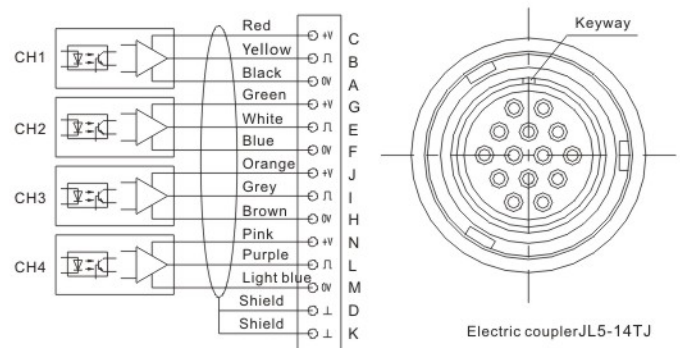


Fig.9 TQG15D Photoelectric Speed Sensor

Mounting Requirements

- * Recommended to tighten by M8 bolts;
- * Before the sensor is placed into the axle box cover, visual inspection should be carried out on the seat and enclosure of the sensor, universal coupling, cable protective sleeve and electric coupler. The seat and enclosure of the sensor, and universal coupling should have no mechanical defects affecting normal use, electric coupler should have no damages, electric coupler end sleeve does not become relaxed, the pins and bayonet position should comply with the corresponding standards, the cable protective sleeve is in good conditions and there is a good sealing between rubber hose and seat interface;
- * Before the sensor is placed into the axle box cover, rotate the output shaft manually, which should rotate steadily and smoothly without any seizing;
- * Before the sensor is placed into the axle box cover, turn on the sensor power supply, rotate the output square shaft manually, and if the output level changes, the sensor is normal;
- * In order to enable the sensor to operate reliably for a long time, please coat the walls of square hole in the sleeve with a thin layer of grease (which is the same as grease for train wheel bearings), to ensure that the four tongue plates of elastic tenon assembly slide freely in the wheel shaft end holes;
- * Wire according to the definition of the electrical interface strictly, make sure of right wiring without short circuit and break circuit;
- * Cable laying requirements: sensor conductors and subsequent connecting lines should keep away from large-scale electrical equipment and power lines, and are forbidden to be winded with power lines or transmit in the same pipeline.

Standards

- * GB/T 2423.1-2008 Environmental testing for electric and electronic products----Part 2: Testing methods Test A:Low temperature (IEC 60068-2-1 : 2007 , IDT)
- * GB/T 2423.2-2008 Environmental testing for electric and electronic products----Part 2:Testing methods Test B:High temperature (IEC 60068-2-2 : 2007 , IDT)
- * GB/T 2423.4-2008 Environmental testing for electric and electronic products----Part 2: Testing methods Test Db : Alternating temperature and humidity (IEC 60068-2-30 : 2005 , IDT)
- * GB 4208-2008 Enclosure protection class (IP code) (IEC 60529:2001 , IDT)
- * GB/T 24338.4-2009 Rail transit---electromagnetic compatibility Part 3-2: Equipment for rolling stock (IEC62236-2-30:2003,IDT)
- * GB/T 25119-2010 Rail transit--- electronic devices for rolling stock
- * TB/T 2760.2-2010 Locomotive speed sensor Part 1: photoelectric speed sensor

Main Application Fields and Achievements

Rail transit signal system (LKJ system)

Main application achievements: largely applied on railway vehicles on domestic trunk lines and branch lines

Mechanical Parameters

(2) Mounting depth dimensions

A: Dimension from sensor mounting surface to square-hole seat surface

B: Dimension from sensor mounting surface to square-hole bottom

For dimensions of two end wheels to axle box of 3-axle bogie and end wheels to axle box of 3-axle bogie:

Values of A and B: A=65 mm±5 mm B=120 mm±5 mm

For dimensions of intermediate wheel to axle box of 3-axle bogie (and long-axle sensor is needed in this case):

Values of A and B: A≥70mm B≥130mm

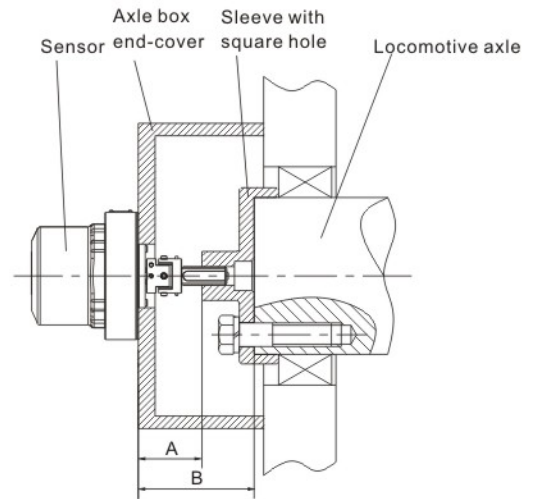


Fig.4 Mounting depth dimension

(3) Axle box end cover drilling drawing

(4) Sleeve with square hole

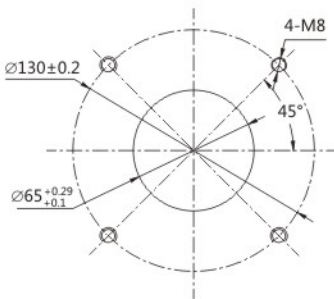


Fig.5 Axle box end cover drilling drawing

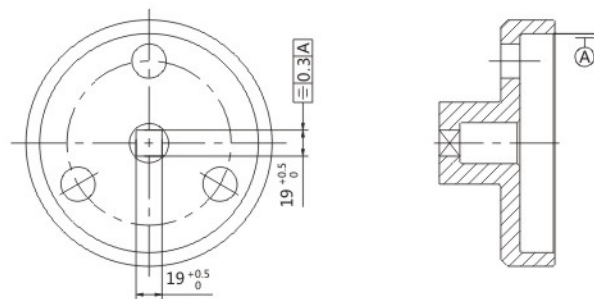


Fig.6 Sleeve with square hole

Electrical wiring diagrams

J15 Type electric coupler: JL5-14TJ

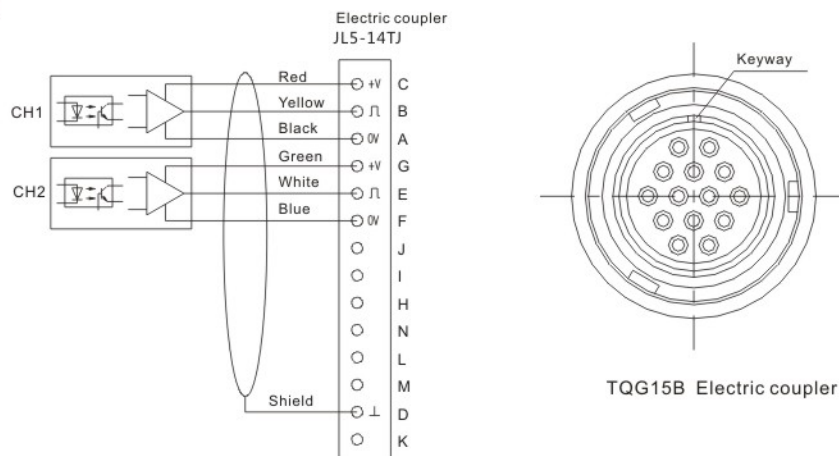


Fig.7 TQG15B Photoelectric Speed Sensor

Performance parameter

Electrical Parameters	
No-load power consumption current	≤50mA
Insulation resistance	Insulation resistance measured by 500V megger between each sensor channel and between all channels (including shielded wire) and shell should be no less than 50MΩ
Insulating strength	AC1500V/60Hz/1s
EMC	According to GB/T 24338.4-2009
Protection function	Power polarity protection and output short circuit protection
Mechanical Parameters	
Shell materials	High strength cast aluminium alloy
Shaft elongation	78mm, 95mm, 110mm and 120mm; other specifications can be customized according to user requirements
External dimension	Referring to figure 1, the standard line length is 1400mm, and can be customized according to user requirements
Connector	JL5-14TJ

Overall dimension drawing

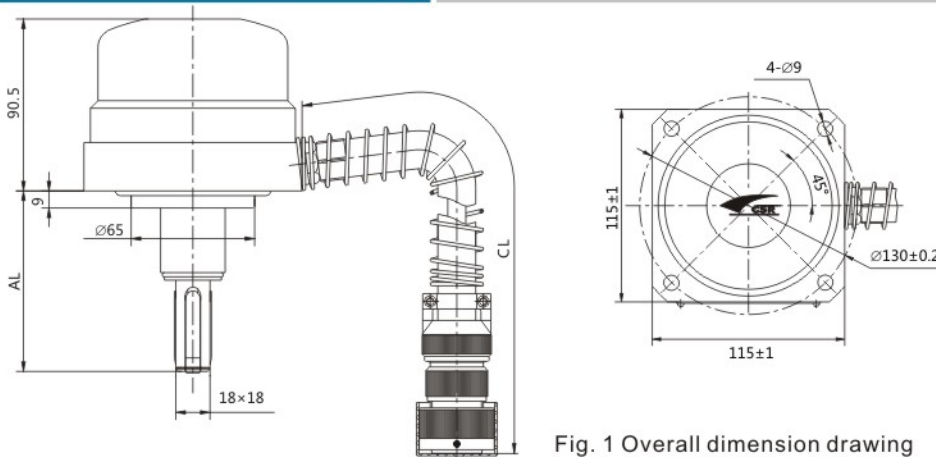


Fig. 1 Overall dimension drawing

Remarks:

1. Axle extensions AL include 78mm, 95mm, 110mm and 120mm axle extensions. Axle extensions of any other sizes can be made upon user's request
2. Length CL of lead-out cables: standard length is 1400mm. Lead-out cables of other length are available upon request

Mechanical Interfaces

The sensor is tightened by four mounting screws (M8 or appropriate specification).

(1) Mounting drawing

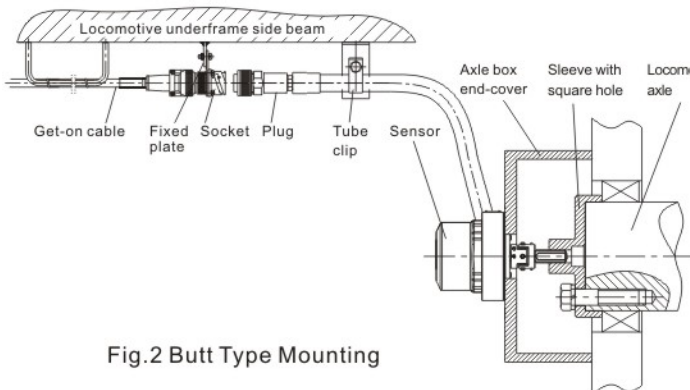


Fig.2 Butt Type Mounting

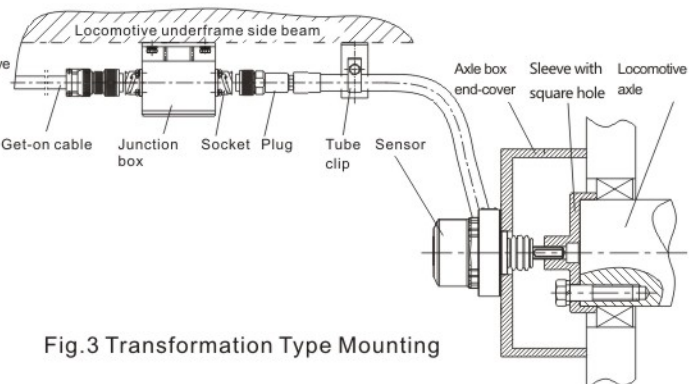


Fig.3 Transformation Type Mounting



Product Overview

- * Magnetolectric principle, passive sensor
- * Non-contact speed test, mechanical parts, no internal electronic elements, high reliability
- * Restricted by principle, inaccurate speed test under low speed

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C~+85°C
Relative humidity	0~100% (MIL-STD-202 Method 106)
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP66

Performance parameter

Electrical Parameters

Working frequency	50Hz ~3000Hz
Working air gap	0.3mm~1.5mm, standard air gap 0.9mm
Number of output channels	Single channel
Output waveform	Approximate sine wave
Direct current resistance	When the temperature is 20°C, direct current resistance is $3.2 \times (1 \pm 10\%) \text{ k}\Omega$
Load resistance	≥1kΩ
Output signal amplitude	signal voltage peak value V_{p-p} : $V_{p-p} \geq 0.1V$
Insulation resistance	A 500V megger is used for testing. Insulation resistances between all cable core and shielded wire and between all leading wire (including shielded wire) and shell should be no less than 50MΩ
Insulating strength	AC500V, 50Hz can be taken among all cable core and shielded wire, between all leading wires (including shielded wire) and shell for 60s without breakdown or flashover

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Performance parameter

Mechanical Parameters	
speed measuring gear	Modulus: 2; pressure angle: 20°; number of teeth: 68; carbon structural steel; standard involute tooth
External dimension	Referring to figure 1, line length can be customized according to customer requirements
Connector	JL5-4TJ

Outline Drawing

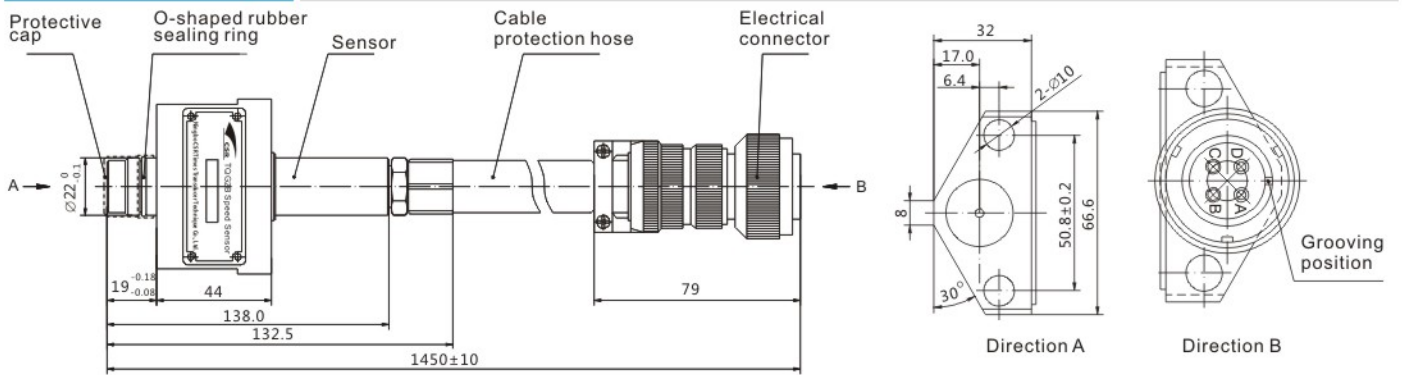


Fig.1 Outline Drawing

Mechanical Interface

The sensor is tightened through two mounting screws (M8 or appropriate specification), as shown in the figure.

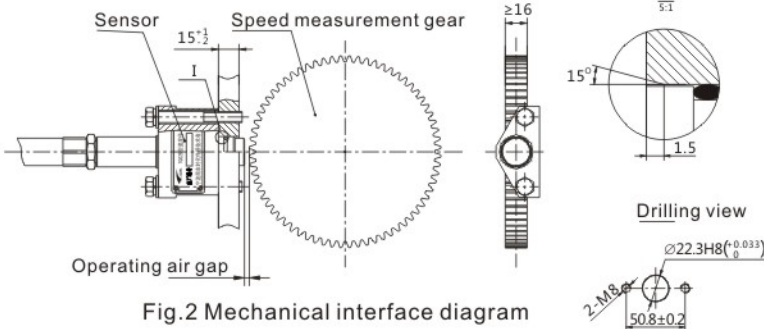


Fig.2 Mechanical interface diagram

Electrical wiring diagrams

JL5 electrical connector: JL5-4TJ

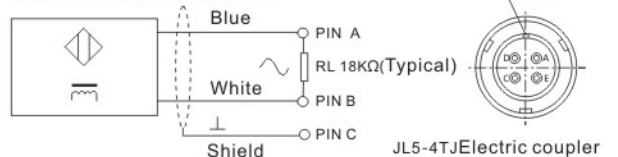


Fig.3 Electrical wiring diagram

Mounting Requirements

- * Cable laying requirements: sensor conductors and subsequent connecting lines should keep away from large-scale electrical equipment and power lines, and are forbidden to be wound with power lines or transmit in the same pipeline;
- * Wire according to the definition of the electrical interface strictly, make sure of right wiring without short circuit and break circuit;
- * Grounding way of shielded wire: recommended to be grounded on the control system through one end.

Standards

- * GB 4208-2008 Enclosure protection class (IP code)
- * TB/T 1394-93 Electronic Devices of Rolling Stock Equipment Electronic equipments used on rail vehicles
- * TB/T 1333.1-2002 Railway applications -- Electric equipment for rolling stock -- Part 1: General service conditions and general rules
- * TB/T 1333.2-2002 Railway applications -- Electric equipment for rolling stock -- Part 2: Electrotechnical components -- General rules
- * TB/T 2761-1996 Basic technical conditions for electric couplers for locomotives

Main Application Fields and Achievements

Rail transit traction system

Main application achievements: Iran STG locomotive



Product Overview

- * Magnetolectric principle, passive sensor
- * Non-contact speed test, mechanical parts, no internal electronic elements, high reliability
- * Restricted by principle, inaccurate speed test under low speed

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C~+95°C
Relative humidity	≤100%
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP68
Salt spray resistance	meet the requirements of 96h in GB/T 2423.17-2008

Performance parameter

Electrical Parameters

Working frequency	37Hz ~3109Hz
Working air gap	0.5mm~1.1mm, standard air gap 0.8mm
Number of output channels	Three channels
Output waveform	Approximate sine wave
Direct current resistance	When the temperature is 20°C, the resistance is 60× (1±10%) Ω for channel 1, 33× (1±10%) Ω for channel 2, and 27× (1±10%) Ω for channel 3
Load resistance	1kΩ
Output signal amplitude	When frequency is 37Hz, signal voltage root mean square Vr.m.s: 1.0V ≤ Vr.m.s ≤ 6.5V When frequency is 53Hz, signal voltage root mean square Vr.m.s: 1.4V ≤ Vr.m.s ≤ 9.3V When frequency is 160Hz, signal voltage root mean square Vr.m.s: 1.9V ≤ Vr.m.s ≤ 28.0V When frequency is 1000Hz, signal voltage root mean square Vr.m.s: 6.0V ≤ Vr.m.s ≤ 28.0V When frequency is 3109Hz, signal voltage root mean square Vr.m.s: 6.0V ≤ Vr.m.s ≤ 28.0V
Phase difference	90°±30°

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Product Overview

- * Magnetoelectric principle, passive sensor
- * Non-contact speed test, mechanical parts, no internal electronic elements, high reliability
- * Restricted by principle, inaccurate speed test under low speed

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C~+120°C
Relative humidity	≤100%
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP68
Salt spray resistance	meet the requirements of 96h in GB/T 2423.17-2008

Performance parameter

Electrical Parameters

Working frequency	31Hz ~2591Hz
Working air gap	0.7mm~1.3mm, standard air gap 1.0mm
Number of output channels	Single channel
Output waveform	Approximate sine wave
Direct current resistance	When the temperature is 20°C, direct current resistance is $61 \times (1 \pm 10\%) \Omega$
Load resistance	1k Ω
Output signal amplitude	When frequency is 31Hz, signal voltage root mean square Vr.m.s : $0.6V \leq Vr.m.s \leq 8.5V$; When frequency is 100Hz, signal voltage root mean square Vr.m.s : $2.06V \leq Vr.m.s \leq 12.9V$; When frequency is 290Hz, signal voltage root mean square Vr.m.s : $2.98V \leq Vr.m.s \leq 25.0V$; When frequency is 500Hz, signal voltage root mean square Vr.m.s : $4.0V \leq Vr.m.s \leq 25.0V$; When frequency is 1500Hz, signal voltage root mean square Vr.m.s : $5.0V \leq Vr.m.s \leq 25.0V$; When frequency is 2591Hz, signal voltage root mean square Vr.m.s : $5.0V \leq Vr.m.s \leq 25.0V$

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Product Overview

- * Magnetoelectric principle, passive sensor
- * Non-contact speed test, mechanical parts, no internal electronic elements, high reliability
- * Restricted by principle, inaccurate speed test under low speed
- * Threaded installation

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C ~ +125°C
Relative humidity	0 ~ 100% (MIL-STD-202 Method 106)
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP66

Performance parameter

Electrical Parameters

Working frequency	30Hz ~2000Hz
Working air gap	0.25mm~1.53mm
Number of output channels	Single channel
Output waveform	Approximate sine wave
Direct current resistance	When the temperature is 20°C, direct current resistance is 1.7× (1±10%) kΩ
Load resistance	27kΩ
Output signal amplitude	When frequency is 30Hz, signal voltage peak value $V_{p-p} : 1.3V \leq V_{p-p} \leq 3.9V$ When frequency is 52.5Hz, signal voltage peak value $V_{p-p} : 2.4V \leq V_{p-p} \leq 6.6V$ When frequency is 150Hz, signal voltage peak value $V_{p-p} : 6.5V \leq V_{p-p} \leq 17.9V$ When frequency is 750Hz, signal voltage peak value $V_{p-p} : 28.5V \leq V_{p-p} \leq 75.6V$ When frequency is 1500Hz, signal voltage peak value $V_{p-p} : 47.6V \leq V_{p-p} \leq 120V$ When frequency is 1980Hz, signal voltage peak value $V_{p-p} : 56.6V \leq V_{p-p} \leq 136V$

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Product Overview

- * Magnetolectric principle, passive sensor
- * Non-contact speed test, mechanical parts, no internal electronic elements, high reliability
- * Restricted by principle, inaccurate speed test under low speed

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C~+85°C
Relative humidity	0~100% (MIL-STD-202 Method 106)
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP66

Performance parameter

Electrical Parameters

Working frequency	18Hz ~2700Hz
Working air gap	0.3mm~1.5mm, standard air gap 0.9mm
Number of output	Single channel
Output waveform	Approximate sine wave
Direct current resistance	When the temperature is 20°C, direct current resistance is 1.5× (1±10%) kΩ
Load resistance	≥47 kΩ
Output signal amplitude	18Hz@500kΩ , 0.3V≤Vp-p≤5.3V; 30Hz@500kΩ , 0.5V≤Vp-p≤8.5V; 100Hz@166kΩ , 1.5V≤Vp-p≤23.1V; 400Hz@62kΩ , 5.1V≤Vp-p≤75V; 2000Hz@47kΩ , 19.6V≤Vp-p≤277V; 2700Hz@47kΩ , 24.8V≤Vp-p≤354V
Insulation resistance	≥500MΩ@500VDC
Insulating strength	AC1500V/60Hz/1s

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Product Overview

- * Magnetoelectric principle, passive sensor
- * Non-contact speed test, mechanical parts, no internal electronic elements, high reliability
- * Restricted by principle, inaccurate speed test under low speed

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C ~ +85°C
Relative humidity	0 ~ 100% (MIL-STD-202 Method 106)
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP66

Performance parameter

Electrical Parameters

Working frequency	18Hz ~2700Hz
Working air gap	0.3mm ~ 1.5mm, standard air gap 0.9mm
Number of output	Single channel
Output waveform	Approximate sine wave
Direct current resistance	When the temperature is 20°C, direct current resistance is 1.5× (1±10%) kΩ
Load resistance	≥47 kΩ
Output signal amplitude	18Hz@500kΩ , 0.3V≤Vp-p≤5.3V; 30Hz@500kΩ , 0.5V≤Vp-p≤8.5V; 100Hz@166kΩ , 1.5V≤Vp-p≤23.1V; 400Hz@62kΩ , 5.1V≤Vp-p≤75V; 2000Hz@47kΩ , 19.6V≤Vp-p≤277V; 2700Hz@47kΩ , 24.8V≤Vp-p≤354V
Insulation resistance	≥500MΩ@500VDC
Insulating strength	AC1500V/60Hz/1s

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Performance parameter

Mechanical Parameters	
Modulus of speed measuring gear	2.54
Number of teeth of speed measuring gear	60
Form of speed measuring gear tooth	Involute teeth (meet the requirements of GB/T 1356 or DIN 867)
Material of speed measuring gear	Low carbon magnetized steel
Material of sensor shell	Stainless steel
External dimension	Referring to figure 1, line length can be customized according to customer requirements
Connector	JL5-3TJ

Outline Drawing

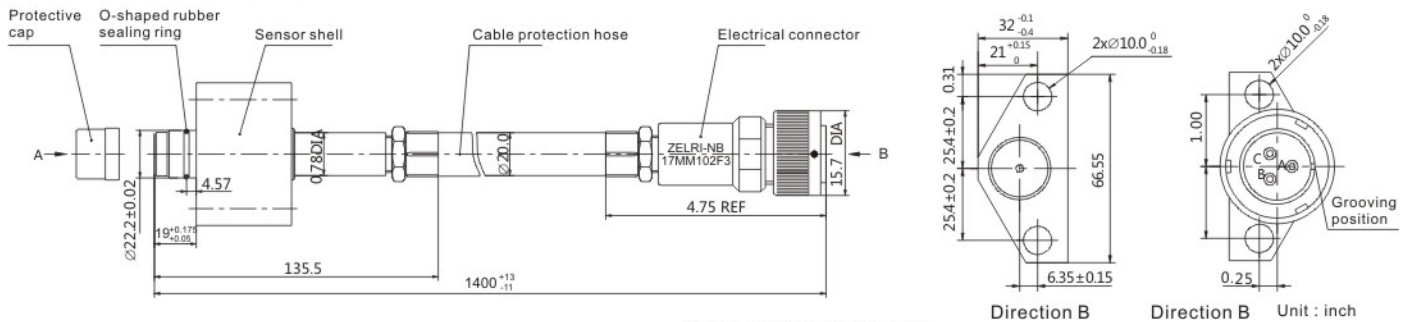


Fig. 1 Outline Drawing

Electric Wiring Diagram

JL5 electrical connector: JL5-3TJ

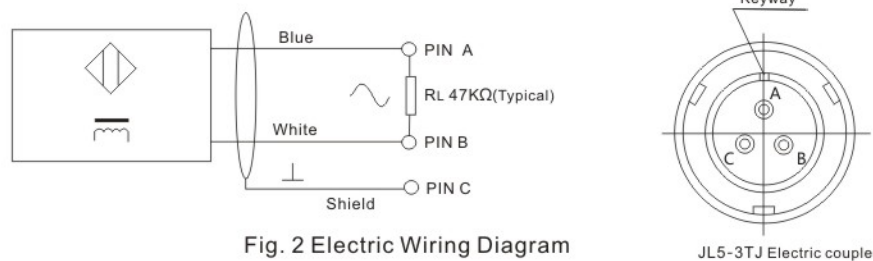


Fig. 2 Electric Wiring Diagram

JL5-3TJ Electric coupler

Mounting Requirements

- * Recommended to tighten by M8 bolts;
- * Cable laying requirements: sensor conductors and subsequent connecting lines should keep away from large-scale electrical equipment and power lines, and are forbidden to be wound with power lines or transmit in the same pipeline;
- * Wire according to the definition of the electrical interface strictly, make sure of right wiring without short circuit and break circuit;
- * Grounding way of shielded wire: recommended to be grounded on the control system through one end.

Standards

- * MIL-STD-202 DEPARTMENT OF DEFENSE TEST METHOD STANDARD ELECTRONIC AND ELECTRICAL COMPONENT PARTS
- * NEMA MATERIAL STANDARDS – DEFINITION OF FLAME RETARDANCE
- * IEC 60529:2001 DEGREES OF PROTECTION PROVIDED BY ENCLOSURE (IP CODE)

Main Application Fields

Diesel engine system of diesel locomotive

TQG15-G

Photoelectric Speed Sensor



Product Overview

- * Speed sensor based on photoelectric effect
- * Area light technology improves the capacity of resisting disturbance
- * Design of two lines of bearings improves bearing reliability
- * Multi-seal measures improve product's IP protection grade
- * Flexible selection of channels and electrical isolation of channels
- * Contact type speed measurement and a variety of connecting modes for selection
- * Low-temperature resistant rubber tube can meet the application requirements of very cold areas
- * No light gap design avoids light gap blockage
- * A variety of numbers of pulses can be selected

Environmental parameters

Service conditions

Altitude	≤2500m
Operating temperature	-40°C~+70°C
Relative humidity	≤95% (the average minimum temperature of this month is 25°C)
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP66

Performance parameter

Electrical Parameters

Power voltage	Nominal voltage value: DC15V or DC24V, capable of working under DC12V~DC30V
Speed measurement range	0rpm~3000rpm
Number of output channels	2/3/4/6
Number of pulses per revolution	200 or 96
Output waveform	Square wave, rise time and fall time are both no more than 10μs
Load resistance	≥3kΩ
High level	≥0.8 Vcc (Vcc is power voltage)
Low level	≤2V

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Performance parameter

Electrical Parameters	
Duty ratio	50%±10%
Phase difference	90°±30° (the definition of clockwise direction refers to figure 1)
No-load power consumption current	≤50mA
Insulation resistance	Insulation resistance measured by 500V megger between each sensor channel and between all channels (including shielded wire) and shell should be no less than 50MΩ
Insulating strength	50 Hz, 1500 Vr.m.s power frequency AC voltage can be taken between each sensor channel and between each channel and shell for 1min. The sensor should have no breakdown or flashover. Special series can meet the requirements of withstand voltage 50 Hz, 5000 Vr.m.s
EMC	According to GB/T 24338.4-2009
Protection function	Power polarity protection and output short circuit protection

Mechanical Parameters	
Shell materials	High strength cast aluminium alloy
Shaft elongation	78mm, 95mm, 110mm and 120mm; other specifications can be customized according to user requirements
External dimension	Referring to figure 2, the standard line length is 1400mm, and can be customized according to user requirements.
Connector	JL5-14TJ, JL5-19TK

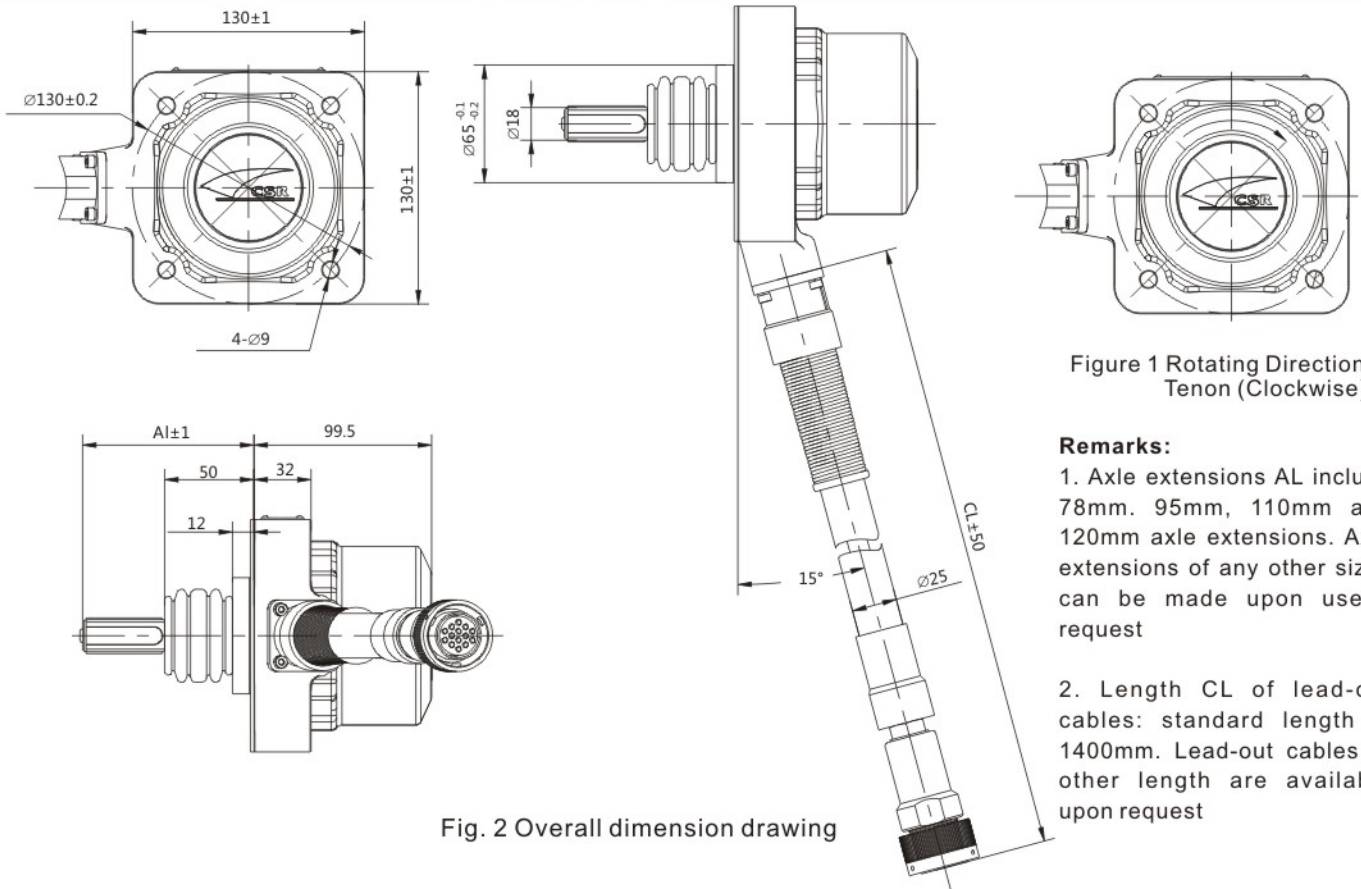


Figure 1 Rotating Direction of Tenon (Clockwise)

- Remarks:**
1. Axle extensions AL include 78mm, 95mm, 110mm and 120mm axle extensions. Axle extensions of any other sizes can be made upon user's request
 2. Length CL of lead-out cables: standard length is 1400mm. Lead-out cables of other length are available upon request

Fig. 2 Overall dimension drawing

Mechanical Interfaces

The sensor is installed and fixed using four M8 mounting screws or other screws of equivalent specifications.

(1) Mounting drawing

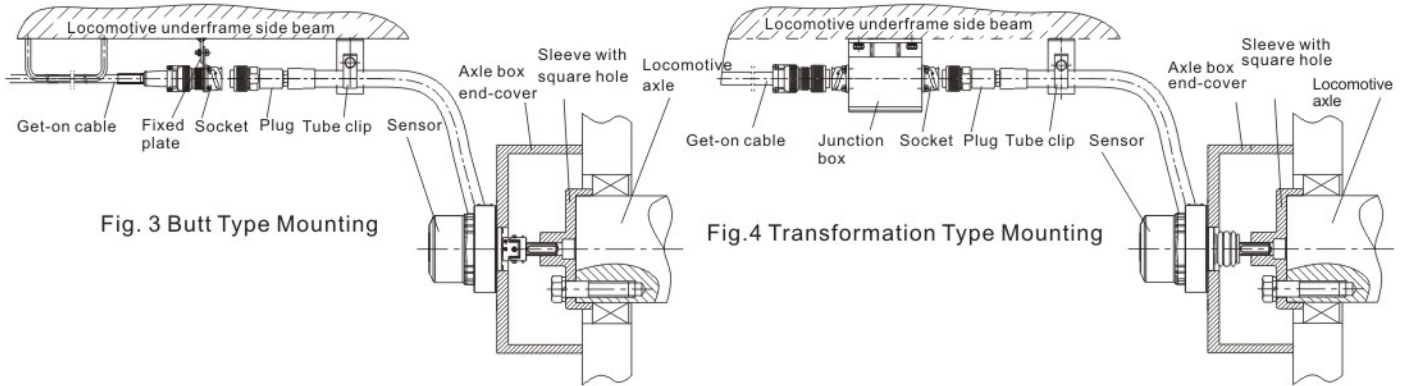


Fig. 3 Butt Type Mounting

Fig. 4 Transformation Type Mounting

(2) Mounting depth dimensions

A: Dimension from sensor mounting surface to square-hole seat surface

B: Dimension from sensor mounting surface to square-hole bottom

For dimensions of two end wheels to axle box of 3-axle bogie and end wheels to axle box of 3-axle bogie:

Values of A and B: A=65 mm±5 mm

B=120 mm±5 mm

For dimensions of intermediate wheel to axle box of 3-axle bogie (and long-axle sensor is needed in this case):

Values of A and B: A≥70mm B≥130mm

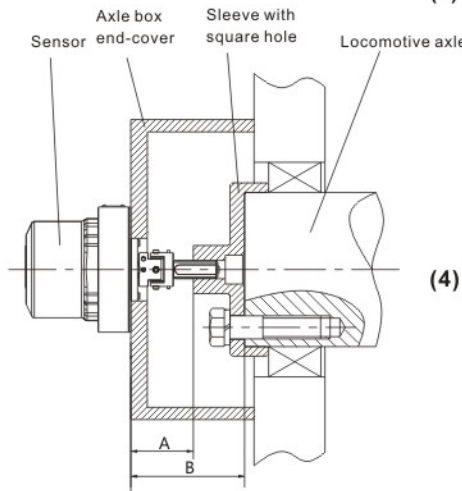


Fig. 5 Mounting depth dimension

(3) Axle box end cover drilling drawing

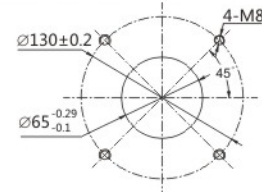


Fig. 6 Axle box end cover drilling drawing

(4) Sleeve with square hole

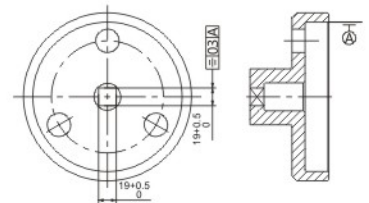


Fig. 7 Sleeve with square hole

Electrical wiring diagrams

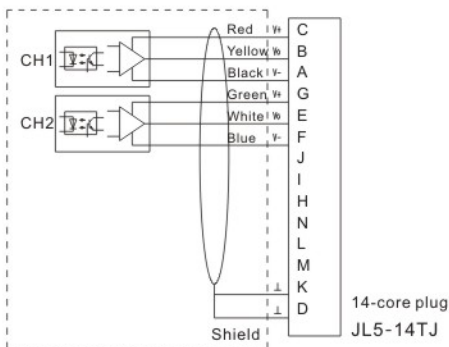


Fig. 8 TQG15B-G Photoelectric Speed Sensor of electrical interface diagram

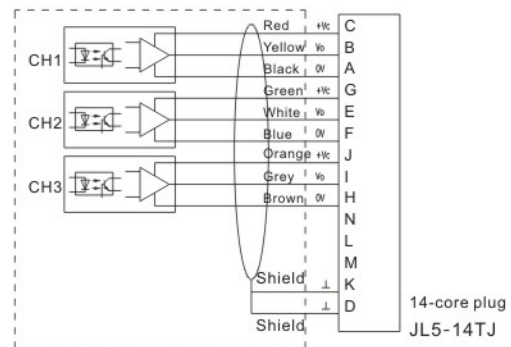


Fig. 9 TQG15C-G Photoelectric Speed Sensor of electrical interface diagram

Electrical wiring diagrams

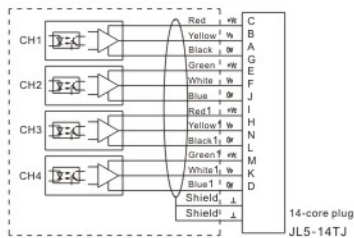


Fig.10 TQG15D-G Photoelectric Speed Sensor of electrical interface diagram

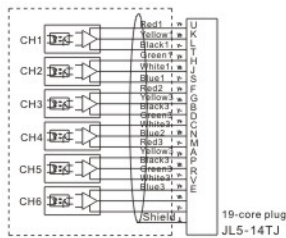


Fig.11 TQG15F-G Photoelectric Speed Sensor of electrical interface diagram

Mounting Requirements

- * Recommended to tighten by M8 bolts;
- * Before the sensor is placed into the axle box cover, visual inspection should be carried out on the seat and enclosure of the sensor, universal coupling, cable protective sleeve and electric coupler. The seat and enclosure of the sensor, and universal coupling should have no mechanical defects affecting normal use, electric coupler should have no damages, electric coupler end sleeve does not become relaxed, the pins and bayonet position should comply with the corresponding standards, the cable protective sleeve is in good conditions and there is a good sealing between rubber hose and seat interface;
- * Before the sensor is placed into the axle box cover, rotate the output shaft manually, which should rotate steadily and smoothly without any seizing;
- * Before the sensor is placed into the axle box cover, turn on the sensor power supply, rotate the output square shaft manually, and if the output level changes, the sensor is normal;
In order to enable the sensor to operate reliably for a long time, please coat the walls of square hole in the sleeve with a thin layer of grease (which is the same as grease for train wheel bearings), to ensure that the four tongue plates of elastic tenon assembly slide freely in the wheel shaft end holes;
- * Wire according to the definition of the electrical interface strictly, make sure of right wiring without short circuit and break circuit;
- * Cable laying requirements: sensor conductors and subsequent connecting lines should keep away from large-scale electrical equipment and power lines, and are forbidden to be wound with power lines or transmit in the same pipeline.

Standards

- * GB/T 2423.1-2008 Environmental testing for electric and electronic products----Part 2: Testing methods Test A: Low temperature (IEC 60068-2-1 : 2007 , IDT)
- * GB/T 2423.2-2008 Environmental testing for electric and electronic products----Part 2: Testing methods Test B:High temperature (IEC 60068-2-2 : 2007 , IDT)
- * GB/T 2423.4-2008 Environmental testing for electric and electronic products----Part 2: Testing methods Test Db: Alternating temperature and humidity (IEC 60068-2-30 : 2005 , IDT)
- * GB 4208-2008 Enclosure protection class (IP code) (IEC 60529:2001 , IDT)
- * GB/T 24338.4-2009 Rail transit---electromagnetic compatibility Part 3-2: Equipment for rolling stock (IEC 62236-3-2: 2003 , MOD)
- * GB/T 25119-2010 Rail transit--- electronic devices for rolling stock
- * TB/T 2760.2-2010 Locomotive speed sensor Part 1: photoelectric speed sensor

Main Application Fields and Achievements

Rail transit signal system (LKJ, ATP system)

Main application achievements: largely applied on railway vehicles on domestic trunk lines and branch lines



Product Overview

- * Speed sensor based on photoelectric effect
- * Flexible selection of channels and electrical isolation of channels
- * Contact type speed measurement and a variety of connecting modes for selection

Environmental parameters

Service conditions	
Altitude	≤2500m
Operating temperature	-40°C~+45°C
Relative humidity	≤95% (the average minimum temperature of this month is 25°C)
Impact and shock	meet the installation requirements of class 3 axle in GB/T 21563-2008
Protection grade	IP66

Performance parameter

Electrical Parameters	
Power voltage (Vcc)	DC15×(1±15%)V or DC24×(1±15%)V
Speed measurement range	0rpm~2500rpm
Number of output channels	2/3/4
Number of pulses per revolution	200
Output waveform	Square wave, rise time and fall time are both no more than 10μs
Load resistance	≥3kΩ
High level	≥9V
Low level	≤2V
Duty ratio	50%±20%
Phase difference	90°±45°

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