



Ultrasonic sensor
MUD Series

User's manual

Thank you for choosing AkuSense products. Please read the instructions carefully before using the products. For your convenience, please keep this instruction carefully so that you can check it at any time.

SYMBOL

The following symbols are important information in this manual, please be sure to observe the following.

	There is the risk of causing malfunction or fire, please do not exceed the rated voltage when using.
	There is a risk of rupture, do not use AC power.
	Danger of burns at high temperatures. .

SAFETY PRECAUTIONS

To ensure your safety, be sure to observe the following.

- Do not use in flammable, explosive gas environment.
- Do not use in water, oil, chemical droplets environment, and exposure to steam environment. Please do not disassemble, repair, rebuild this product.
- Do not use beyond the rated voltage and current range. Do not use beyond the rated environment.
- Please pay attention to the polarity of the working power, do not take the wrong line. Please connect the load correctly.
- Do not short-circuit the load.
- Please do not use the case damaged. When discarded, dispose of as industrial waste. Do not use in direct sunlight.
- Depending on the operating conditions (ambient temperature, supply voltage, others), the temperature of the sensor surface may increase. In operation and cleaning, please note that there is a danger of burns.

NOTICE FOR USE

- Do not use in the following places :
Daylight direct place
High humidity, easy to open places
Place containing corrosive gases
Vibration, shock directly to the product body of the place
- This product wire and power lines used in the same piping, will be disturbed, malfunction or even destroyed.
- The extension wire must use a wire with a cross-sectional area of 0.3 mm² or more and a length of 100 m or less. When the Korean S-mark certification model is used as a certification product, please set it below 10m.
- For the force applied to the wire, please refer to: below 40N, 0.1N.m torque less, 20N or less, and 3Kg below the bending.
- When the power is turned on, the product can be detected within 200ms. So if the load and product connected to a different power supply, you must first turn on the product power.
- When the power is turned off, the output pulse may be generated, so please cut off the power supply of the load or load line.
- Please do not use thinner, gasoline, acetone, kerosene and other solvents to clean up.

Packaging

Sensor 1 Set
User's manual 1 piece

Main Feature

Main Feature

- 3 control inputs: external sensitivity selection and self-learning based on the material being tested.
- Optional self-learning: for example, testing of solar wafers with water overlay
- M18 Receiver, M18 Transmitter

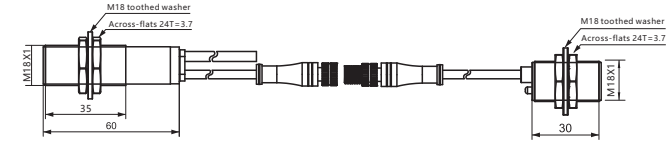
Basic Features

- Reliable detection of single and double sheets of material
- No self-learning (use it after installation)
- Single, double/multiple and paperless detection
- The detection distance can be selected from 20mm to 60mm

Specifications

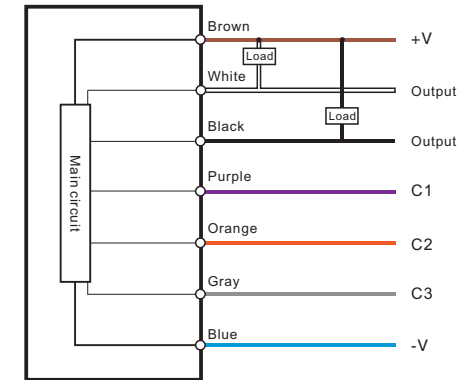
Model No.	NPN	MUD-60N-400	MUD-60N-200
	PNP	MUD-60P-400	MUD-60P-200
Sensing distance	20~40mm	20mm±2mm(Optimum)	20~60mm 40mm±5mm(Optimum)
Blind area	In front of the transmitter and receiver 5mm		
Angle deviation	± 45° with vertical planes		
Transducer frequency	400kHz		200kHz
Operating voltage	20~30V DC, Reverse polarity protection		
Response time	The automatic operation mode is 2.5ms		The automatic operation mode is 6.5ms
Power-on delay	< 750ms		< 1.9s
Voltage pulsation	±10%		
No-load current	≤50mA		
Probe material	Polyurethane foam, glass filled epoxy resin		
Housing material	Copper nickel plating		
Tightening torque	15Nm		
Protection degree	IP65		
Operating temperature	+5°C~+60°C		
Storage temperature	+40°C~+85°C		
Control device	Control input: C1 to C3		
Control description	<-V+6V: Logic 1 (control input terminal -V or floating); >-V+10V: Logic 0 (control input terminal +V)		
Indicator	Green light: single sheet Green light flashing: teaching Red light: double/multiple sheet Red light flashing: no paper		
Output	NPN/PNP Output, Lmax=200mA(-V+2V), Short circuit protection		
Output logic	No paper status: White line OFF, Black line OFF Single sheet status: white line ON, black line OFF Dual/multiple sheet status: white line OFF, black line ON		
Scope of application	Paper and paper of 20-1200g/m ² in unit area, alloy laminates and film thickness up to 0.4mm, self-adhesive film		Paper and paper of 50-1200g/m ² in unit area, alloy laminate, self-adhesive film

Dimensions(Unit:mm)

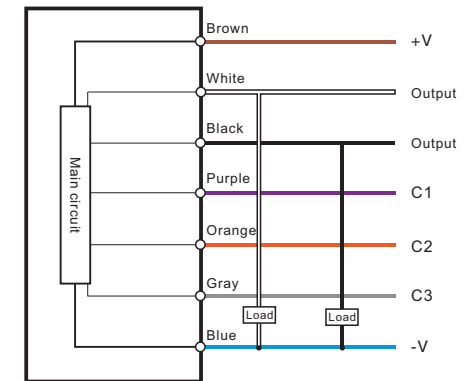


Circuit Diagram

NPN



PNP



Operating Principle

An ultra-high frequency ultrasonic transmitter emits an ultrasonic beam from beneath the sheet. The sound waves vibrate the sheet, and this also emits a very small sound wave on the other side of the sheet, which is received by the ultrasonic receiver. When the signal passes through the two sheets (double sheets), it weakens and cannot reach the receiver. The MUD-60 can detect missing sheets, single sheets and double sheets.

Operating Range

The MUD-60 can preset three detection ranges with three control inputs. The standard test range includes sheet material weight per unit area, MUD-60□-400 from 20g/m² to 1200g/m², and regular printing paper with a basis weight of less than 20g/m². The MUD-60□-200 is from 50g/m² to 1200g/m², and the regular printing paper with a unit area of less than 50g/m² is reset. Scanning can be done by setting to "thin" or by setting "thick" to scan cardboard and corrugated cardboard, which can change the sensor's detection range while work is in progress without self-learning settings for the material being tested. If the three control inputs are not connected, the MUD60 operates in a standard work unit, even though it can detect a wide range of materials.

Self-learning

Additional self-learning functions will be enabled when the material cannot be scanned by any of the three detection ranges. Self-learning of materials can be accomplished by placing a single sheet of material into a two-sheet controller. First, MUD-60□-400 connects C1 and C2 to the brown line, then sets the control input C3 on the brown line for about three seconds. During the self-learning process, the uneven component of the material must be moved to enable detection. MUD-60□-200 connects C1 and C2 to the blue line first, then sets the control input C3 to the blue line for about 6 seconds. During the self-learning process, the uneven component of the material must be moved to enable detection. When the green light is on, it indicates that the self-learning operation is done, and the material can be scanned. Self-learning ensures that the wafer from the paper to the water film can be scanned.

Automatic mode

The MUD-60 works as a standard in automatic operation mode, which means that the MUD-60 is cycled at a high measurement rate. Under uninterrupted work, the working range can be changed and self-learning through the C1-C3 control inputs. (Note: "0" is brown line, "1" is suspended or connected to the blue line.)

MUD-60- 400

Control input	C1 (Purple)	C2 (Orange)	C3 (Gray)
Standard mode	1	1	1
Thick mode	1	0	1
Thin mode	0	1	1
Teach-in mode	0	0	1
Teach-in	0	0	0

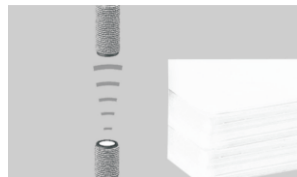
MUD-60- 200

Control input	C1 (Purple)	C2 (Orange)	C3 (Gray)
Standard mode	0	0	0
Thick mode	0	1	0
Thin mode	1	0	0
Teach-in mode	1	1	0
Teach-in	1	1	1

Installation

The recommended mounting distance between the transmitter and receiver is -400:20mm, -200:40mm.

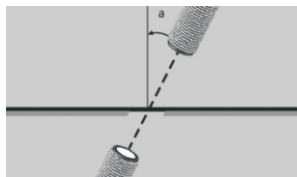
The mounting pitch can be selected from -400:20mm to 40mm and -200:20mm to 60mm as required. During the test run, you can complete the installation and debugging through a single self-learning.



Installation angle

For paper and film, the double sheet controller is mounted perpendicular to the material. For example, thin corrugated cardboard, thin metal sheets, crystals and thick plastic films (such as credit cards), the MUD-60 is mounted with a special tilt angle "a" from the vertical.

- Corrugated cardboard, optimal installation angle $\alpha \geq 35^\circ$
- Thin metal sheet or thick plastic film is 27°
- Wafer mounting angle is 11°



Regular Maintenance Check

During the use of regular inspection, maintenance is necessary, to ensure the normal operation of the machine. Periodically check items as follows:

- When the object is detected, whether the switch is in the distance, whether there is a loose phenomenon, whether there is a tilt correction, whether the inspection has changed.
- Wiring or other connection lines, whether the contact is normal, or no break.
- Does the sensor face dust?
- Check operating temperature, and the surrounding environment is suitable.
- Installation space, whether there has difference, such as vibration, electrical leakage

When the power is applied, the sensor needs 100ms lead time, in order to achieve stable output of the sensor, so during this time, do not operate the sensor. Avoid being applied to the outside (except for shelter).

- Avoid direct contact with organic solvents.
- To prevent the detection surface by the impact of objects, because the sensing surface is very fragile.
- When the device or motion switching power supply can not be too pull, move.

Precautions

- Make sure that the power is turned off when connection.
- Make sure that the supply voltage changes within the rated range.
- If the power supply is supplied by a commercial switch regulator, make sure that the power supply ground terminal (F.G) is grounded.
- Be sure to ground the device ground terminal (F.G).
- Do not use when power on within 0.5s.
- Do not run the line with a high voltage line or a power cord or in a wire tube, which may cause malfunction due to induction.
- Avoid dust and water vapor.
- Do not expose the sensor to direct contact with water, oil, grease or organic solvents, such as thinner.

WARRANTY

Warranty period

- The product warranty period is one year, from the date of delivery of the product to the date of purchase.

Warranty range

- (1). AkuSense will repair the product free of charge if there is a malfunction caused by AkuSense Company in the above warranty period. But the following is not covered by the warranty.
 - Not in accordance with the operating instructions, the user manual or the purchaser and the AkuSense company specifically reached the technical requirements of the conditions specified in the environment under the incorrect operation, or improper use of appropriate failure.
 - Failure is not due to product defects, but the purchaser equipment or the purchaser software design caused.
 - Malfunctions caused by modifications or repairs by non-AkuSense company personnel.
 - In accordance with the operating instructions or user manual correct repair or replacement of wearing parts and other provisions can be completely avoided failure.
 - In the product from the AkuSense company after delivery, due to unpredictable changes in science and technology and other factors caused by the failure.
 - Due to fire, earthquake and floods and other natural disasters, or abnormal voltage and other external factors caused by the fault AkuSense company is not responsible for the warranty.
- (2). The warranty is limited to the conditions specified in Article (1), and Meiji Company shall not be liable for any indirect loss (damage to equipment, loss of opportunity, loss of profits, etc.) or other loss caused by its equipment.