WDI™
WISE DEVICE INC

PFA-LN Sensor Datasheet



2026

PFA-LN sensor description

The PFA-LN sensor is an automated focus tracking sensor that provides focusing servo systems with fast feedback signals to maintain accurate focus in an infinity-corrected microscope. It determines the direction and distance to best focus and sends this information to the microscope system, which adjusts the sample or objective accordingly.

The PFA-LN sensor features a flexible optical design, with select models available in both 0° (0R) and 30° configurations to support different optical setups and application requirements. The 30° configuration helps address challenges associated with rectilinear patterns without requiring external mechanical rotation. A complete list of available sensor configurations is provided in *Table 1*.

Ordering info

Table 1 PFA-LN sensor types

Type	Part Number
30° rotation variants	
Autofocus sensor (PFA-LN-450)	974180
Autofocus sensor (PFA-LN-660)	974140
Autofocus sensor (PFA-LN-785)	974160
Autofocus sensor (PFA-LN-850)	974220
0° rotation variants	
Autofocus sensor (PFA-LN0R-450)	974340
Autofocus sensor (PFA-LN0R-660)	974320
Autofocus sensor (PFA-LN0R-785)	974330
Autofocus sensor (PFA-LN0R-850)	974380

NOTE: *Cable length options of 1200 mm, 1800 mm, and 3500 mm are available for all PFA-LN sensor models.*

NOTE: *Optional filters (HIAW, HIAB, POL) and the Offset Adjuster (OA) lens are available for select models. Contact sales@wdidevice.com to discuss available configurations and imaging requirements.*

Product specifications

Table 2 PFA-LN sensor specifications

Feature	Description
Structured light pattern	Line
Laser wavelengths available	450 nm, 660 nm, 785 nm, 850 nm
Laser classification	Class 3R
Sampling rate	Up to 3 kHz (5 kHz SWIFT Mode)
Static autofocus accuracy	±0.25 objective DOF or better
Tracking autofocus accuracy	±0.33 objective DOF or better
PC communication	Gigabit Ethernet, RS485
Maximum standoff distance	300 mm
IEC certificate	61326-1, 61010-1, and 60825-1

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Table 3 PFA-LN sensor performance data for 660 nm

Objective lens[a]	Numerical aperture	DOF[b] [µm]	Linear range[c] [µm]	Capture range[d] [µm]
5X	0.14	±14	±600	More than ±4500
10X	0.28	±3.5	±170	More than ±4500
20X	0.42	±1.6	±100	±4300
50X	0.55	±0.9	±25	±1000

a. *All specifications in this table are for Mitutoyo M PLAN APO objectives.*
b. *Focus repeatability is typically 1/3 DOF or better (e.g., focus repeatability for a 20X lens is ±0.53 µm).*
c. *The linear range is the maximum distance from which both the approximate distance and direction to focus are known. The linear range is digitally limited by the sensor controller. The linear range bias setting has been found to be optimal for sensor speed and resolution. Extending the linear range reduces resolution.*
d. *The specified capture range is the maximum distance from which the direction to focus is known. It is valid only if WDI's coupling filter (or a filter with similar specifications) is used and no additional filters are placed between the sensor and the objective lens. Additional filters reduce the light transmitted and received by the sensor, adversely affecting the capture range. Capture range is affected by substrate reflectivity; the values above were obtained with glass (R~4%).*

Electrical connections

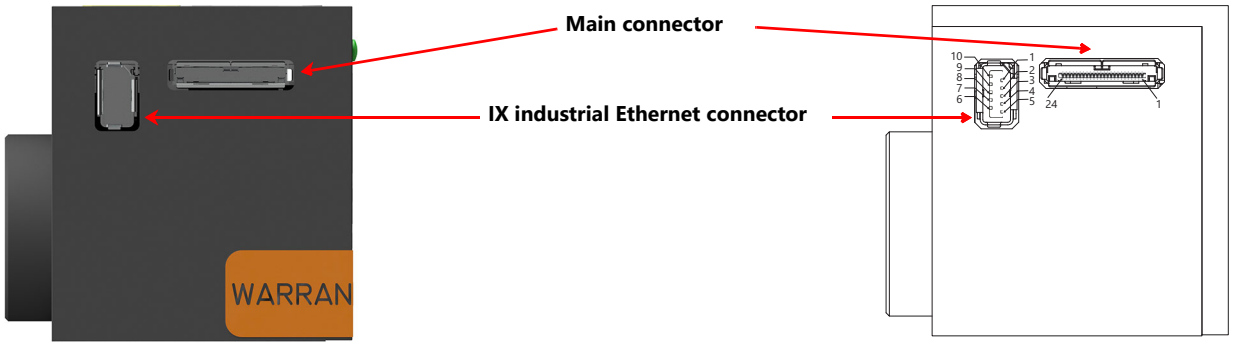


Figure 1 *PFA-LN sensor connectors*

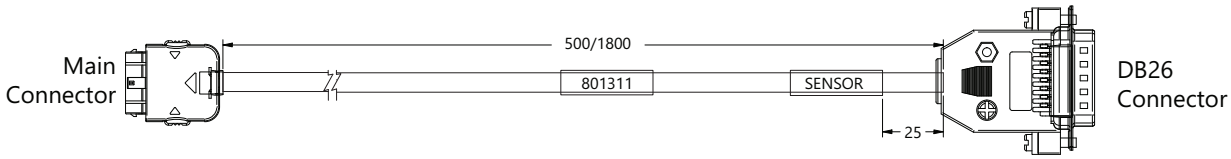


Figure 2 *PFA-LN sensor cable*

Table 4 PFA-LN sensor cable assembly pinouts

DB26 Pin #	Signal Name	Description
1	+24V	+24V power supply.
3	GND	Power supply return + CAN return.
5	CANL	CAN Low level line.
6	CANH	CAN High level line.
8	GND	Motor control return.

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Table 4 PFA-LN sensor cable assembly pinouts (continued)

DB26 Pin #	Signal Name	Description
9	AO	Analog Output.
10	PULSE	Motor Step pulse. Open-drain with internal 1kΩ pull-up to +5V.
11	DIR	Motor Direction. Open-drain with internal 1kΩ pull-up to +5V.
12	CWLIM	CW Limit Switch Input. Drive high-switch not tripped, floating or low-switch tripped.
13	CCWLIM	CCW Limit Switch Input. Drive high-switch not tripped, floating or low-switch tripped.
14	5V	5V for motor driver brick optocouplers (max 50-100mA).
16	RS485-	Inverting RS485 Receiver Input and Driver Output.
17	RS485+	Non-inverting RS485 Receiver Input and Driver Output.
18	GND	Serial Comm / IO Return.
19	INF	In Focus. Open-drain output with internal 1kΩ pull-up resistor to +5V.
20	MIV	Material In View (In Range). Open-drain output with an internal 1kΩ pull-up resistor to +5V.
22	ESTOP	Emergency Stop (Laser Enable), normally wired to supply voltage through a mushroom button. Actively drive high to enable laser diode.
23	CSYNC	Camera Sync Input, immediately disables the laser for the duration of the pulse. Active high.
Shell		The cable braided shield connects to the connector's metallic shell at both ends.

Electrical specifications

Table 5 PFA-LN sensor electrical specifications

Description	Value
Power supply voltage	10.8 VDC to 26.4 VDC
Power consumption	12 W maximum, 7 W nominal
Ethernet supported speeds	10/100/1000 Mbps

Table 6 PFA-LN sensor IO electrical specifications

Parameter	Condition	Min	Typ	Max	Units
Digital Inputs (IN1/CCWLIM, IN5/CWLIM, ESTOP, CSYNC)					
Input Voltage High (VIH)		2.8		28	V
Input Voltage Low (VIL)		-0.5		1	V
Input resistance		21.4			kΩ
Digital Outputs (DIR/INF, PULSE/MIV)					
Maximum drain current	Output active (low)			100	mA
Maximum output (pull-up) voltage	Output inactive (high)		5	5.5	V
Output Voltage Low (VOL)	Output active (low)	0	0.35	0.5	V
Internal pull-up resistor value			1		kΩ
Analog Output					
Output voltage range		-10		10	V
Maximum output current				±10	mA
Output resistance			20		Ω

Optical specifications

Table 7 Laser characteristics

	450 nm version	660 nm version	785 nm version	850 nm version
Wavelength	450 (-10/+10) nm	660 (-8/+4) nm	785 (-10/+10) nm	850 (-10/+10) nm
Typical output power[a]	1.1 mW	1.1 mW	0.9 mW	1.1 mW
Beam divergence	Collimated along the length of the sensor housing, and less than 40 mrad in the perpendicular direction[b]			
Laser pulse frequency	5 kHz max			
Duty cycle	0-100%			
Laser pulse width	0.45 µs – 20 ms			

a. Typical power values are based on an approximately 40% duty cycle.

b. For PFA-LN 785 nm OA and PFA-LN 850 nm OA sensors, adjusting the position of the OA lens, located at the output aperture, slightly changes the output beam divergence.

Laser beam shape and size

The images in this section illustrates the laser beam shape as it exits the PFA-LN sensor. The following properties can be observed:

- The laser beam has an elongated rectangle.
- The laser exits from only one half of the sensor's exit aperture.
- As the laser light travels farther from the sensor, its shape changes. The width of the line remains the same while the height of the line decreases.
- At a distance of approximately 150 mm, the beam converges into a narrow line and then starts to diverge.

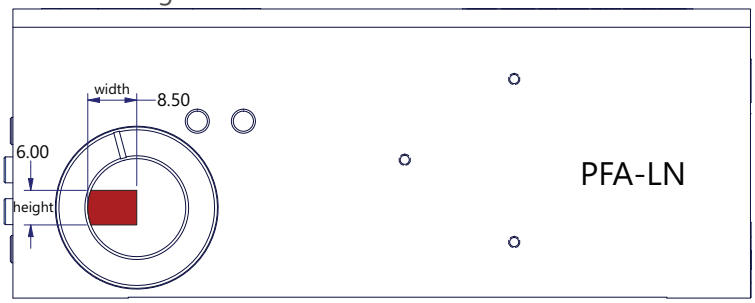


Figure 3 *PFA-LN 0R (0° rotation) sensor beam shape and size*

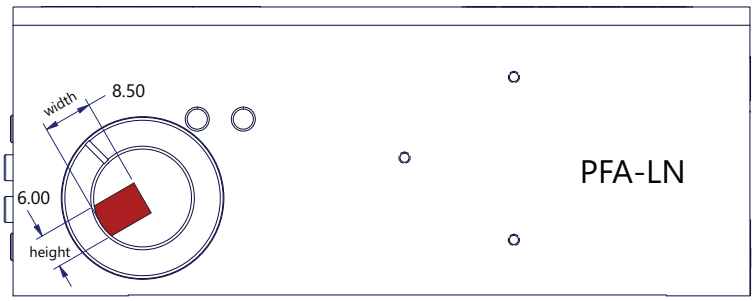
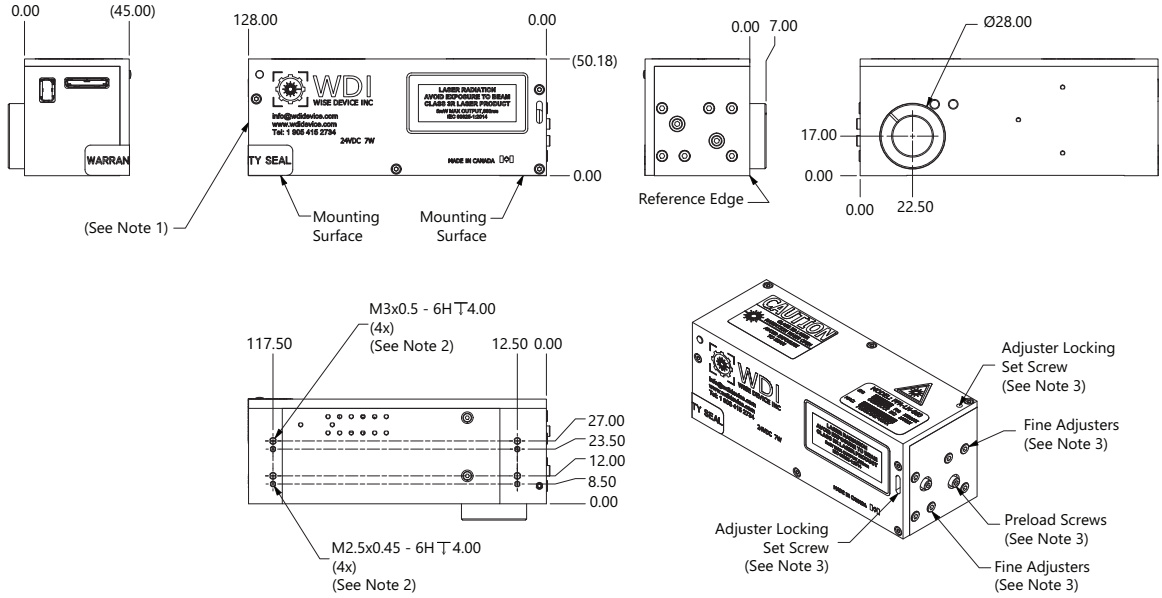


Figure 4 *PFA-LN 30° rotation sensor beam shape and size*

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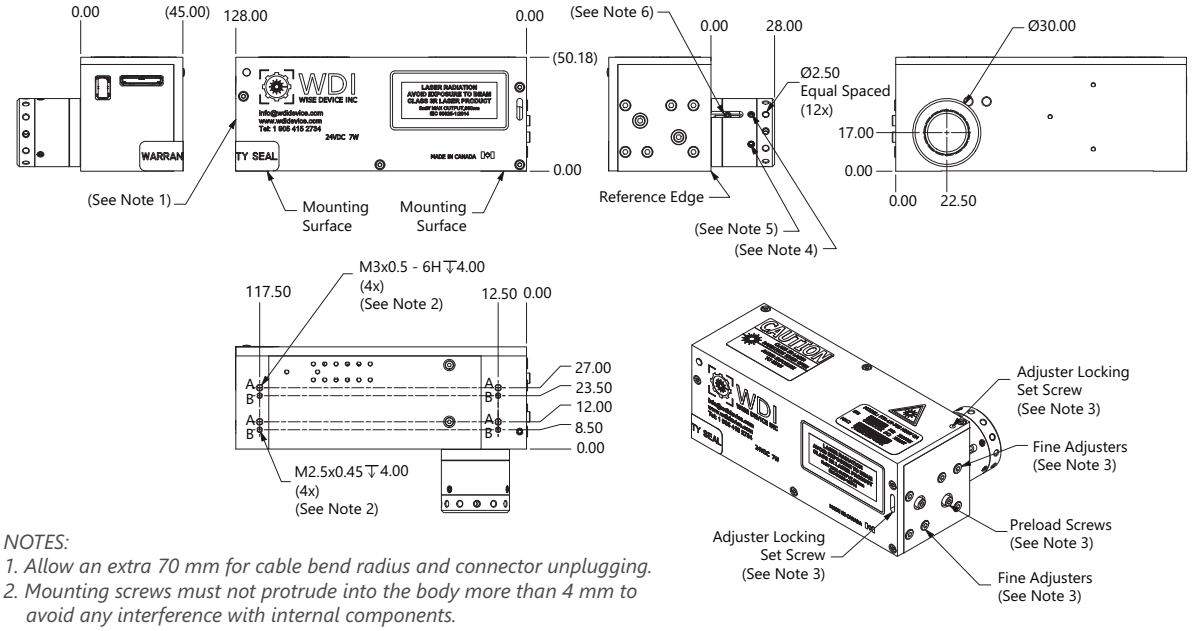
Mechanical dimensions



NOTES:

1. *Allow an extra 70 mm for cable bend radius and connector unplugging.*
2. *Mounting screws must not protrude into the body more than 4 mm to avoid any interference with internal components.*
3. *The Preload Screws, Fine Adjusters, and Adjuster Locking Set Screws must be accessible after installation for the final field calibration of the sensor.*
4. *Sensor weight: 0.44 kg.*

Figure 5 *PFA-LN sensor dimensions*



NOTES:

1. *Allow an extra 70 mm for cable bend radius and connector unplugging.*
2. *Mounting screws must not protrude into the body more than 4 mm to avoid any interference with internal components.*
3. *The Preload Screws, Fine Adjusters, and Adjuster Locking Set Screws must be accessible after installation for the final field calibration of the sensor.*
4. *This "shiny" locking set screw must be accessible after installation for the final, in field calibration of the sensor, to lock the position of the offset adjuster lens.*
5. *These three black screws **must not** be adjusted in the field. Adjusting these black set screws will compromise the performance of the offset adjuster.*
6. *This guide screw **must not** be adjusted in the field. Adjusting this screw will compromise the performance of the offset adjuster.*
7. *Sensor weight: 0.455 kg.*

Figure 6 *PFA-LN sensor dimensions – OA*

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Accessories

Table 8 PFA-LN sensor accessories

Accessory	Part Number	Remarks
PFA-DT/LN Distribution Box	970140	Includes Distribution Box and a connector kit for stand-alone configuration.
PFA-DT/LN DOF-5 Distribution Box Plus	970150	Includes Distribution Box Plus, a cable for connection to the Dover Motion DOF-5, and a connector kit.
Cable (Cat6A, IX-RJ45, 3m, Black)	301904	Ethernet cable, 3000 mm length.

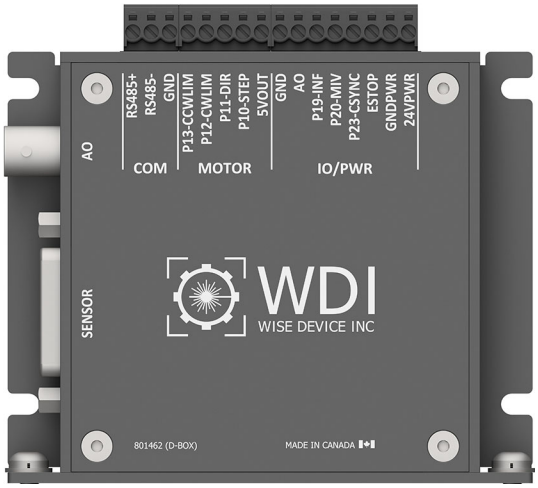
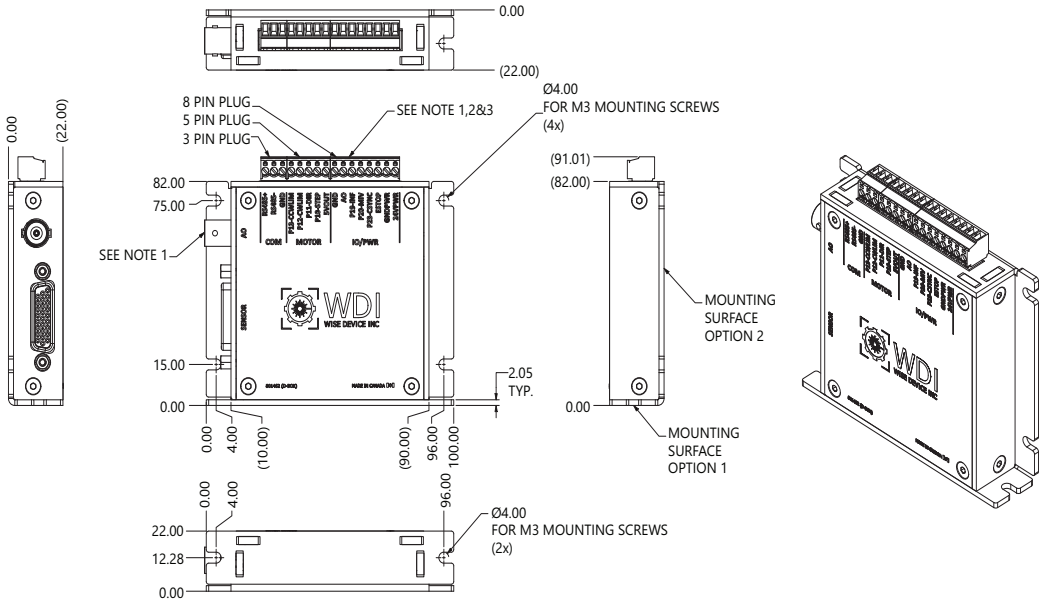


Figure 7 *PFA-DT/LN Distribution Box*

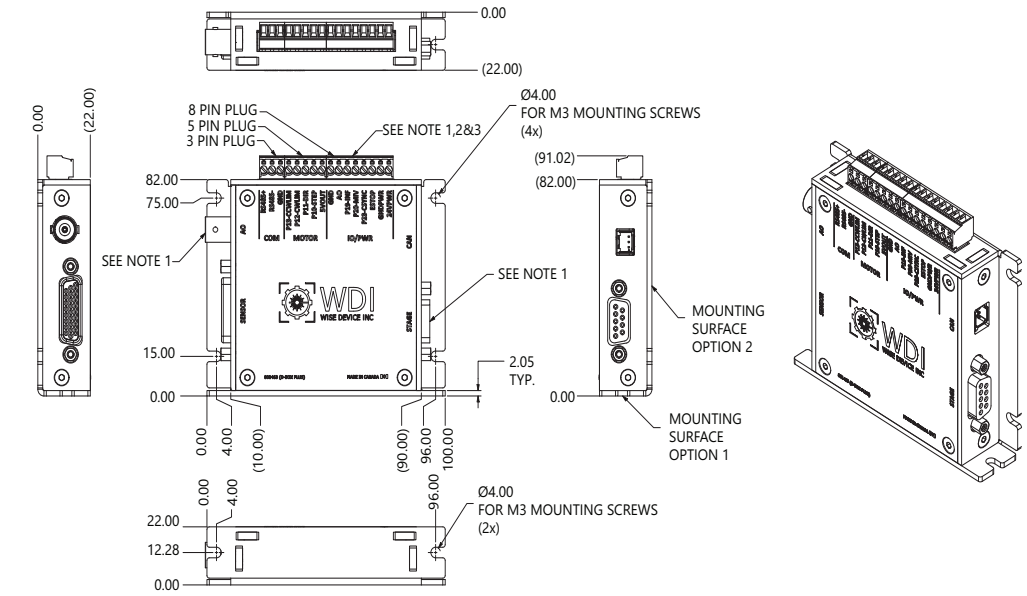
> ***NOTE:*** *This drawing shows the PFA-DT/LN Distribution Box (part number 970140). The customer connections on other versions may differ. See the PFA-DT and PFA-LN Sensor Distribution Box Datasheet for more information.*

PFA-DT/LN Distribution Box dimensions



NOTES:
1. Allow an extra 70 mm for cable bend radius and connector unplugging.
2. Connect three plugs in the correct orientation as shown below.
3. Connectors are provided in a connector kit.
4. Four sets of mounting hardware are provided with the distribution box, which can be used to mount the box in either the option 1 or option 2 mounting orientation, as shown.

Figure 8 *PFA-DT/LN Distribution Box dimensions*



NOTES:
1. Allow an extra 70 mm for cable bend radius and connector unplugging.
2. Connect three plugs in the correct orientation as shown below.
3. Connectors are provided in a connector kit.
4. Four sets of mounting hardware are provided with the distribution box, which can be used to mount the box in either the option 1 or option 2 mounting orientation, as shown.

Figure 9 *PFA-DT/LN DOF-5 Distribution Box Plus dimensions*

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Distribution box customer interface connectors keying

This information is provided for reference. WDI-provided connectors are already keyed.

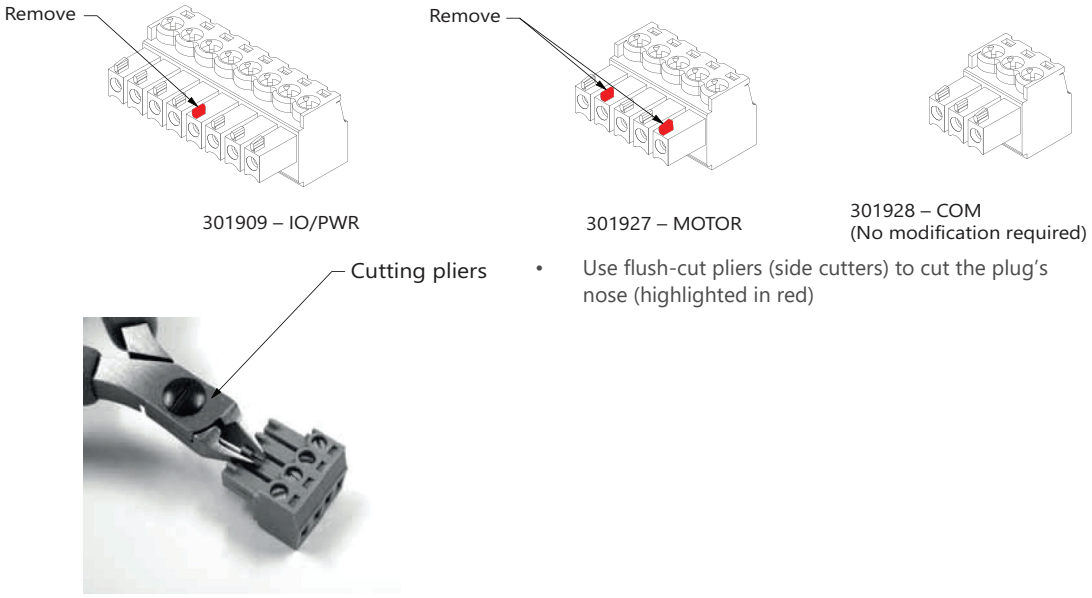


Figure 10 *Distribution box customer interface connectors keying*

Environmental specifications

Table 9 PFA-LN sensor environmental specifications

Description	Value
Transport temperature (sealed container)	-20°C to 50°C
Transport relative humidity (sealed container)	10% to 90% non-condensing
Storage temperature	0°C to 45°C
Storage relative humidity	10% to 90% non-condensing
Operating ambient temperature	20°C to 30°C
Operating ambient humidity	25% to 75% non-condensing

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