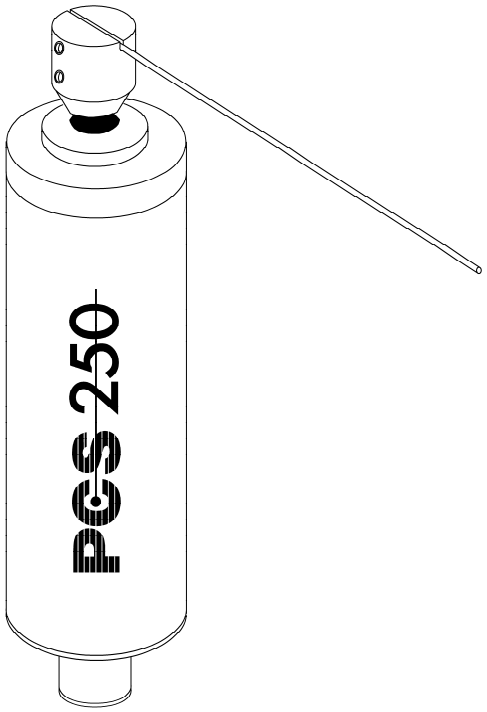
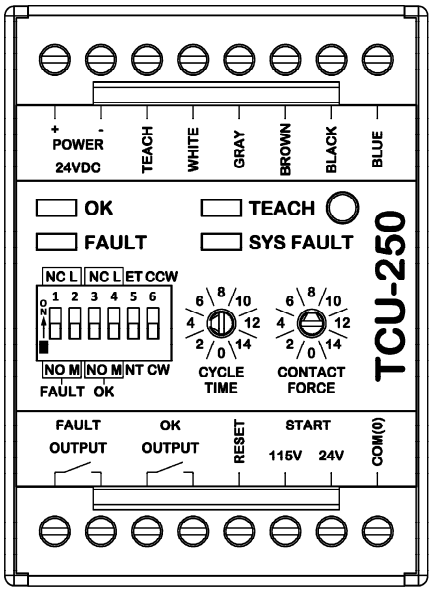
PCS-250 System

Installation Instructions





Made in the USA

PCS-250 System Specifications

TCU-250:
Control

Input: 24VDC, 250mA

Relay Outputs: 2A, 250VAC
general use

Ambient Temp: 55°C

Wiring Terminals: 18-14AWG
stranded copper wire only, 7 lb/in Torque. One wire per terminal.

Housing Material: Polycarb UL94V1
Terminal Material: Polycarb UL94V2

Mounting: 35mm DIN Rail

IND. CONT. EQ.
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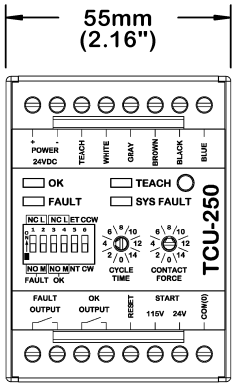
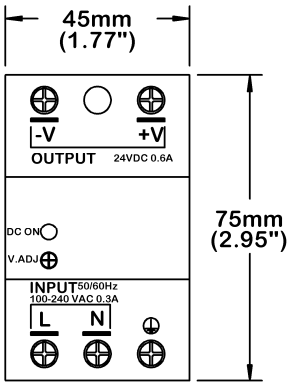
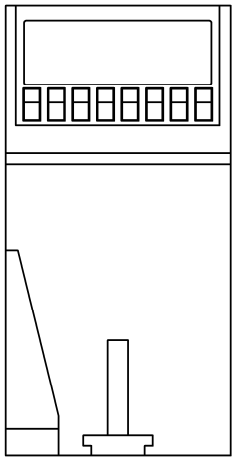
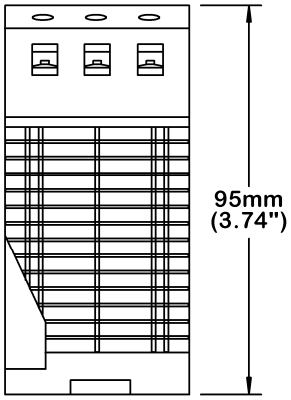








PS-1000:
Power Supply *(optional)*

Input Voltage: 110-240VAC

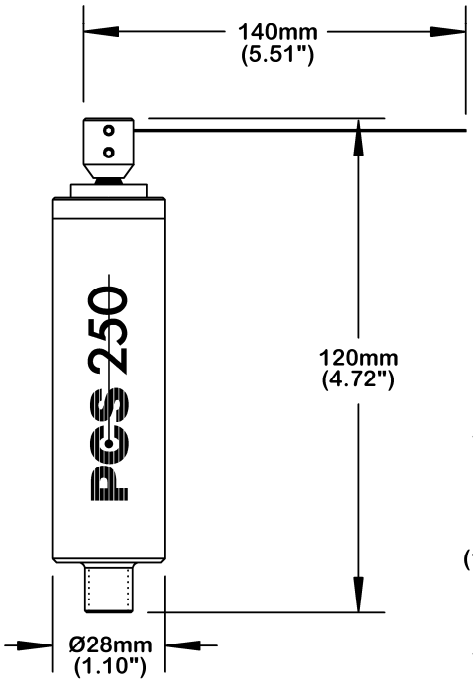
Output Voltage: 24VDC

Output Power: 15W

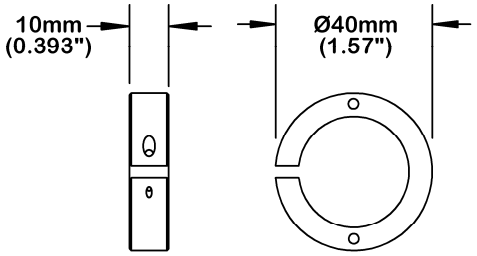
Operating Temp: 0-55°C

Mounting: 35mm DIN Rail

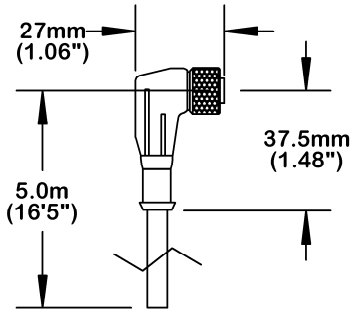
Note: The PS-1000 is available for customers with 110-240VAC applications, and it is sold separately.



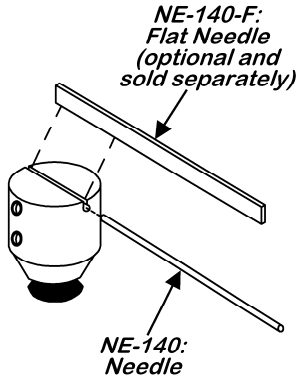
PCS-250:
Sensor



CS-6000:
Clamping Sleeve



TC-0500:
Teach Cable



SA-5000:
Swing Arm Assembly

1. General use / description

The PCS-250 System is a self teaching apparatus which consists of two main components; a PCS-250 “Sensor” (Positive Contact Sensor) and an TCU-250 “Control” (Teach Control Unit). The Sensor is mounted in close proximity to the tool which is to be monitored, while the Control is mounted in the machine electrical cabinet.

The Sensor monitors tool presence by light physical contact of the tool with the Needle in the Swing Arm Assembly. If the tool is present, the Needle will contact the tool and return to its start position. This condition will be interpreted as an Ok condition, and the machine cycle will be allowed to continue.

Conversely, if the tool is broken, the Needle will swing past the broken tool to the end of stroke. This condition will be interpreted as a Fault condition, and the Control will send the appropriate stop output to the machine.

2. Install the Swing Arm Assembly

Slide the Swing Arm Assembly onto the shaft of the Sensor. Use a 1.5mm hex key to tighten the two opposing set screws on the Swing Arm Assembly (indicated “A” in Figure 1.

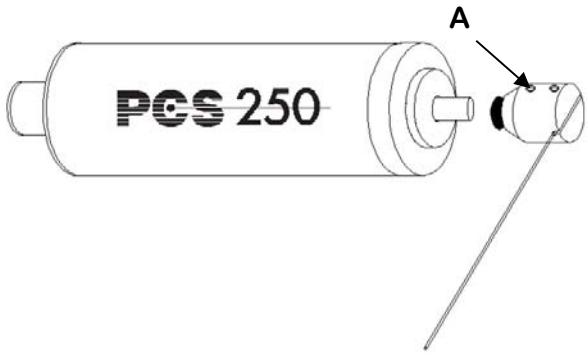


Figure 1: Swing Arm set screws

3. Determine the mounting position

Determine where you will mount the Sensor. This will depend on the space available and the tooling configuration of your machine. Some of the variables are:

a) Preference for clockwise (CW) or counter clockwise (CCW) swing direction. The Sensor is capable of swinging up to 300° CW or CCW (direction set via switch on Control). Swing direction (CW/CCW) is established by looking at the Sensor with the Swing Arm Assembly (or shaft) facing you, as shown in Figure 2.

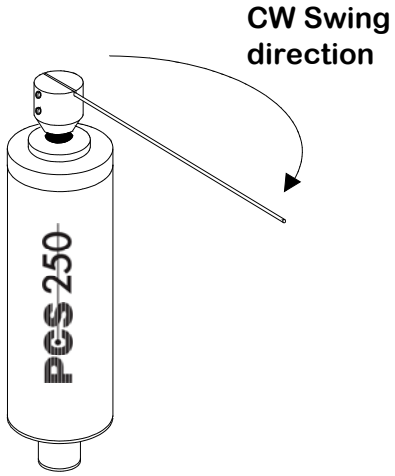


Figure 2: CW swing direction

b) You may keep the standard Needle length (as shown in Figure 3), shorten the Needle, or purchase a longer Needle (up to 8").

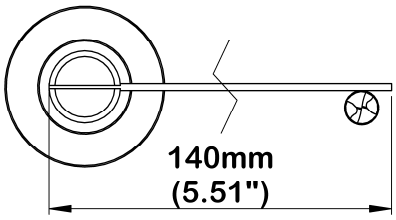


Figure 3: Needle length

c) If a straight Needle does not suit your needs, the Needle may be bent into any desired configuration (ex: to swing past an obstruction). Two examples are shown in Figure 4.

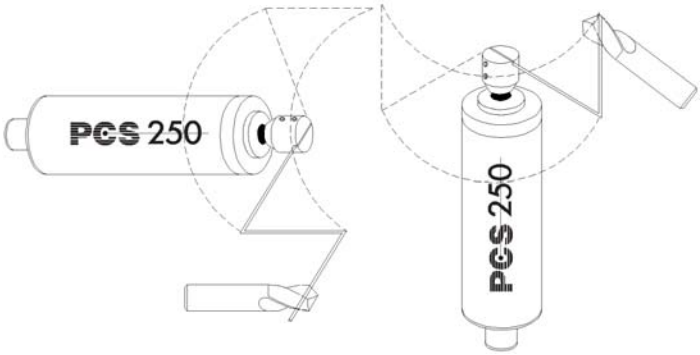


Figure 4: Bent Needle examples

d) You will need to fabricate a mounting bracket to hold the Sensor in place. Should you choose to mount the Sensor using the CS-6000 Clamping Sleeve provided with each PCS-250 System, drill holes in your bracket per Figure 5.

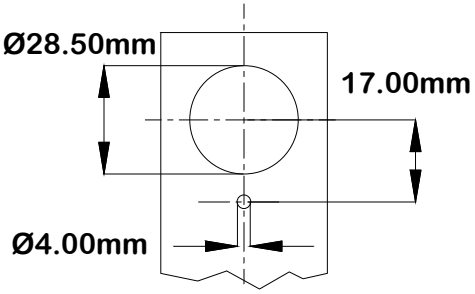


Figure 5: Hole diagram

4. Install the mounting bracket and mount the Clamping Sleeve

The Clamping Sleeve is used to hold the Sensor, and allows for attachment to the mounting bracket fabricated by the customer. Each Clamping Sleeve is packaged with a screw and nut which can be used to mount the Clamping Sleeve to the mounting bracket. Figure 6 illustrates a typical mounting example.

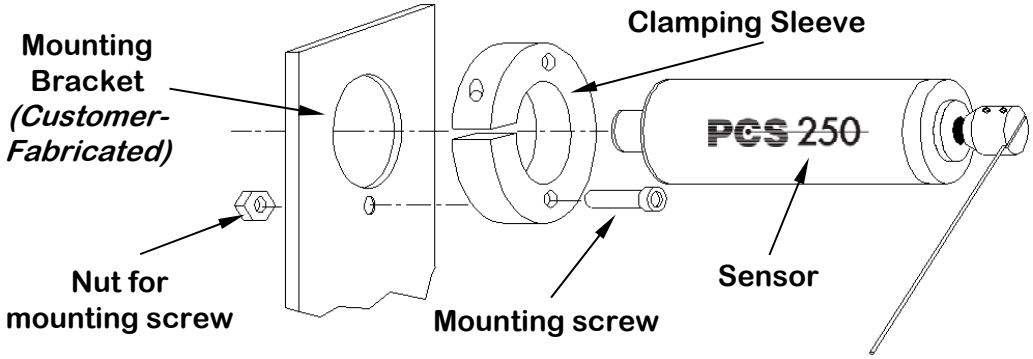


Figure 6: Typical use of Clamping Sleeve

5. Mount the Sensor in the Clamping Sleeve and connect the Teach Cable

Slip the Sensor into and through the Clamping Sleeve. Connect the Teach Cable to the Sensor and then rotate the Sensor in the Clamping Sleeve so the connector points in the desired direction. Be sure the Teach Cable is properly positioned to avoid any interference with the machine operation. Note: If the Teach Cable needs to be re-positioned while attached to the Sensor, rotate the entire Sensor to avoid damage to the connector.

Move the Sensor forward or backward to position the Needle so that it will contact the tool as shown in Figure 7. Once the Needle is properly located, tighten the Clamping Sleeve fastener to secure the Sensor to the Clamping Sleeve and mounting bracket.

Verify that Needle extends past the centerline of the tool. If this is not the case, you may need to: reposition the needle in the swing arm assembly, choose a different location for the Sensor, or purchase a longer needle.

Once the needle is in the correct location, remove the Swing Arm Assembly.

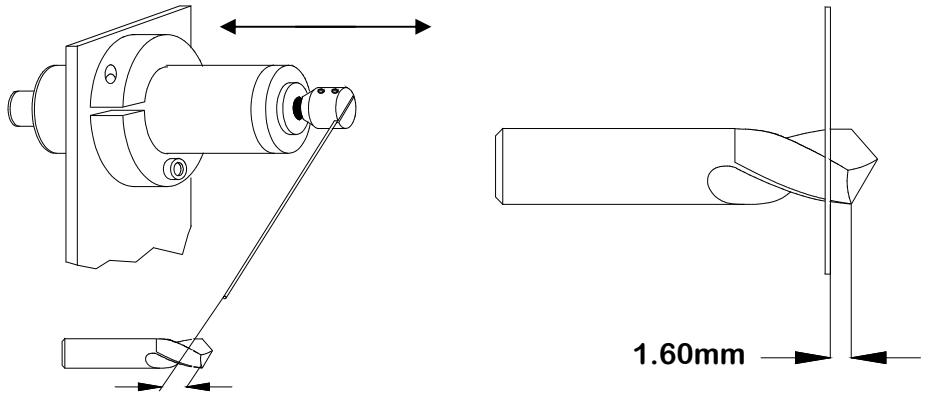


Figure 7: Needle alignment

6. Install the Control

Mount the TCU-250 Control in the electrical cabinet using either the 35mm DIN Rail mount or with two screws/bolts through the two holes on the bottom of the Control. Make the appropriate electrical connections, referencing Page 6 for Terminal Descriptions and Page 8 for Sample Wiring Diagrams. Should your installation use a supply voltage of 110-240VAC, the use of a separate power supply will be necessary. Our optional PS-1000 (sold separately) can be used to provide the required 24VDC to the Control.

7. Set CW or CCW switch on the Control

Set the CW/CCW switch on the Control to the setting that corresponds with the swing direction chosen when determining the mounting position of the Sensor.

8. Power-on the Control

Once power has been supplied to the Control, the Sensor will rotate to its start position and await a Start Input or Teach Input

9. Re-install the Swing Arm Assembly

Re-install and fasten the Swing Arm Assembly such that the Needle will contact the tool before the end of stroke as illustrated in Figure 8.

It is common for the tool to be positioned approximately 90° from the start position; however, as previously mentioned the Sensor is capable of swinging up to 300°. It is important to keep the tool at least 5° away from the end of stroke. Manually move the Needle from the start position to the tool to ensure there are no obstructions. The PCS-250 System is now ready to learn the location of the tool.

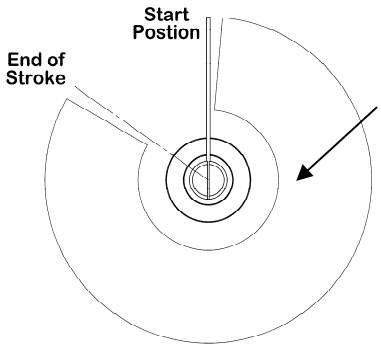


Figure 8: Monitoring zone with a CW swing

10. Explanation of teach cycle and sensing cycle

The PCS-250 System learns both the start position and the tool position by means of a teach cycle. The teach cycle must be both enabled and activated. It is enabled by either pushing the TEACH Button on the Control, or by providing a Teach Input to terminal 3 of the Control. The yellow TEACH LED on the Control will illuminate to indicate the teach cycle is enabled.

Once enabled, the teach cycle is activated by one of three methods: pushing the TEACH Button, providing a Teach Input to terminal 3, or providing a Start Input to either terminal 14 or 15 of the Control. Refer to Page 6 to review the requirements for the inputs, and Page 7 for information about the TEACH LED and Button.

During the teach cycle the needle will swing forward in the direction set on the Control (CW/CCW) and it will stop at the tool. It will then swing in the opposite direction to return to the start position. The Control stores the start positon and tool position in memory and will save them even after power is removed from the Control.

Subsequent Start Inputs will activate a sensing cycle. During a sensing cycle the needle will swing forward and after a set amount of time (see “Cycle Time Switch” on page 7) it will return to the start position. The Control seeks to verify the start position prior to the needle moving, the tool position, and the start position upon return of the needle. If any of these positions have changed relative to the positions learned in the teach cycle, the Control will indicate a fault. There is an acceptable tolerance in the measured position which accounts for minor changes in machine environment. This tolerance can be adjusted via the NT/ET Switch on the Control.

11. Teach the tool position, and check installation

Enable and activate a teach cycle. Verify that the OK LED illuminates after the teach cycle, indicating the teach cycle was successful.

Next, provide a Start Input to the Control to start a sensing cycle. The Needle will contact the tool and return to its start position (the green OK LED on the Control will illuminate). Next simulate a broken tool by removing the tool and providing another Start Input. The Needle will travel through its full swing to the end of stroke (the red FAULT LED on the Control will illuminate).

TCU-250 Terminal Descriptions

Terminals 1 & 2: 24VDC input – used to power the TCU-250 Control. Note that terminal 1 is positive (+) and terminal 2 is negative (-). A minimum supply of 250mA is required. When powering the Control with an existing 24VDC power supply, confirm that the power supply is capable of the additional output capacity required to power the Control.

Terminal 3 : Teach Input *(optional)* - used to remotely enable a teach cycle. The Teach Input can also be used to activate a teach cycle. The required input is + 24VDC (referenced to terminal 2) for a minimum of 100ms.

Terminals 4, 5, 6, 7 & 8: Teach Cable connection - colors indicated correspond to wire colors of Teach Cable. The preferred method is to connect the Teach Cable directly from the Sensor to the Control. If the Sensor and Control need to be connected via external junction box, avoid wiring near electromagnetic or high current devices.

DO NOT connect the braided shield in the supplied Teach Cable to the machine ground!

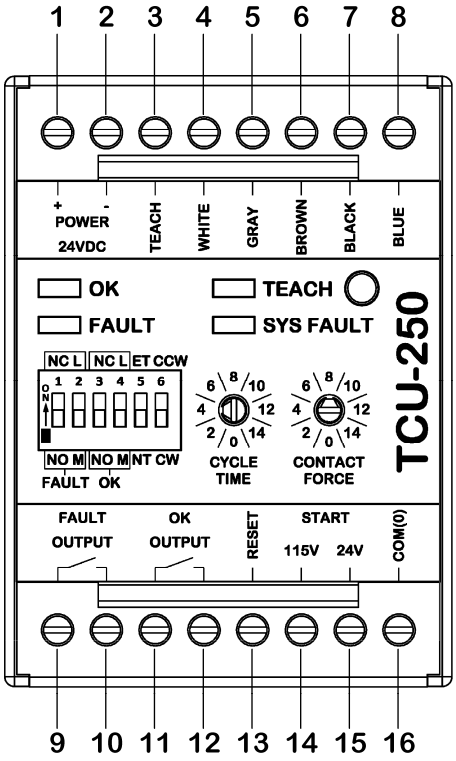


Figure 9: Terminal numbers

Terminals 9 & 10: Fault Output - dry contacts (internal relay) capable of switching up to 2A @ 250VAC. The contact operation can be configured (NO/NC and Momentary/Latch), thereby eliminating the need for peripheral devices for interfacing with the Control (see Relay Control Switches, page 7).

Terminals 11 & 12: Ok Output - dry contacts (internal relay) capable of switching up to 2A @ 250VAC. The contact operation can be configured (NO/NC and Momentary/Latch), thereby eliminating the need for peripheral devices for interfacing with the Control (see Relay Control Switches, page 7).

Terminal 13: Reset Input *(optional)* - used to reset the Control after a Fault or System Fault condition has been detected. The required input is + 24VDC (referenced to terminal 16, common) for a minimum of 100ms.

Note about Reset: The Start Input can also be used as a Reset function. After the error condition has been corrected (replace broken tool), applying a Start Input will cause the Sensor to begin the sensing cycle; touching and confirming that the tool has been replaced, thus resetting the Fault or System Fault condition.

Terminals 14, 15 & 16: Start Input - used to activate the sensing cycle. The Start Input can also be used to activate a teach cycle. Terminal 16 is the common for either a 115VAC start signal (terminal 14) or a 24VDC start signal (terminal 15). The Control recognizes a change of state in the circuit to activate the sensing cycle (or teach cycle). A minimum duration of 100ms is required regardless of the of the signal utilized: (high-low-high) or (low-high-low).

Note about Inputs: Certain solid state devices may output a small amount of current in their off (low) state. Depending on the operating characteristics of these devices, the Control may not recognize a change of state. If this condition occurs in your application you may need to incorporate an external relay to activate the Start/Reset Inputs.

TCU-250 LEDs and Switches

OK LED: Illuminates green to indicate power-on. Upon receiving a Start Input, the OK LED will momentarily turn off. At the end of the sensing cycle, the OK LED illuminates to indicate a good condition (unbroken tool) has been detected.

FAULT LED: Illuminates red to indicate a fault (or broken tool) condition has been detected.

SYS FAULT LED: Flashes red to indicate a System Fault. This is an error condition of the Control, Sensor, and/or Teach Cable which must be remedied prior to correct operation of the PCS-250 System.

TEACH LED: Illuminates yellow to indicate the teach cycle is enabled.

TEACH Button: Used to enable and/or activate a teach cycle. By pushing the TEACH button the teach cycle is enabled, and the TEACH LED illuminates. Pushing the TEACH Button a second time activates the teach cycle.

Default Settings: The default switch settings of all 6 dip-switches down/off, Cycle Time setting 4 and Contact Force setting 8 (as shown in Figure 10) are appropriate for the vast majority of installations. The following describes the function of these switches should your installation require deviation from the default settings.

Relay Control Switches: Configure the Fault Output and Ok Output (NO/NC and Momentary/Latch). Switches 1 & 2 control the Fault Output and switches 3 & 4 control the Ok Output of the Control as follows:
- NC = Normally Closed
- NO = Normally Open
- L = Latched
- M = Momentary

NT / ET Switch: Selects the acceptable deviation of the positions measured during a sensing cycle relative to the positions learned during the teach cycle:
- ET = Extended Tolerance
- NT = Normal Tolerance

CW / CCW Switch: Selects the rotation that the Sensor swings towards the tool during the sensing cycle or teach cycle.

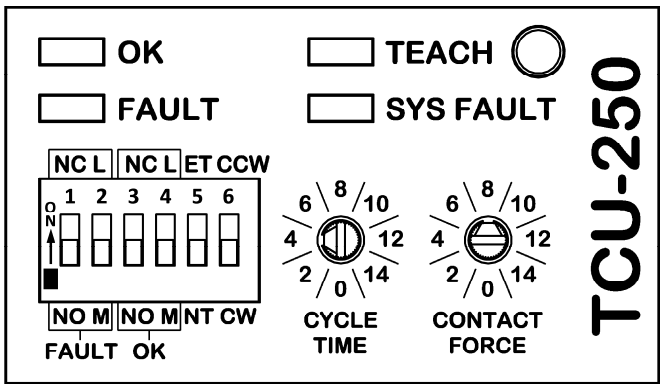


Figure 10: LEDs and switches

Cycle Time Switch (Rotary): Varies the amount of time the Needle is allowed to rotate during a sensing cycle or teach cycle. There are 15 discrete Cycle Time settings, as well as a 0 position which does not function (indicated by a System Fault). Choosing Cycle Time setting 1 enables the shortest time, and the length of time increases with each higher setting, up to the longest time enabled by choosing setting 15.

As the tool is positioned further from the start position and/or the Contact Force setting is decreased, the Needle will require more time to reach the tool. These are two situations requiring a higher Cycle Time setting.

When adjusting the Cycle Time setting, the best practice is to select at least one higher Cycle Time setting than the minimum required for the Needle to touch the tool and produce an Ok condition during the teach cycle. This provides a cushion to accommodate minor changes in machine environment.

Contact Force Switch (Rotary): Varies the amount of Contact Force the Needle has with the tool during a sensing cycle or teach cycle. There are 15 discrete Contact Force settings, as well as a 0 position which does not function (indicated by a System Fault). Choosing Contact Force setting 1 enables the lowest Contact Force, and the Contact Force increases with each higher setting, up to the highest Contact Force enabled by choosing setting 15. **NOTE**: depending on your specific set-up, the lowest Contact Force settings may not provide adequate force for the Needle to touch the tool and produce an Ok condition during a sensing cycle – it is imperative to verify this with your specific set-up at the time of installation and again during production.

The Contact Force settings have been tuned as follows:
- Settings 1-6 are specifically tuned for Micro Tools
- Setting 7 has been tuned for applications requiring less Contact Force than usual
- Setting 8 has been tuned for the typical application
- Settings 9-12 have been tuned for applications requiring more Contact Force than usual
- Settings 13-15 have been tuned for extreme situations (such as sticky coolant, extremely long needles swinging “up-hill”, etc.)

When adjusting the Contact Force setting, the best practice is to select at least one higher Contact Force setting than the minimum required for the Needle to touch the tool and produce an Ok condition during the teach cycle. This provides a cushion to accommodate minor changes in machine environment.

TCU-250 Sample Wiring Diagrams

Figures 11 and 12 illustrate basic wiring diagrams for two common machine voltages.

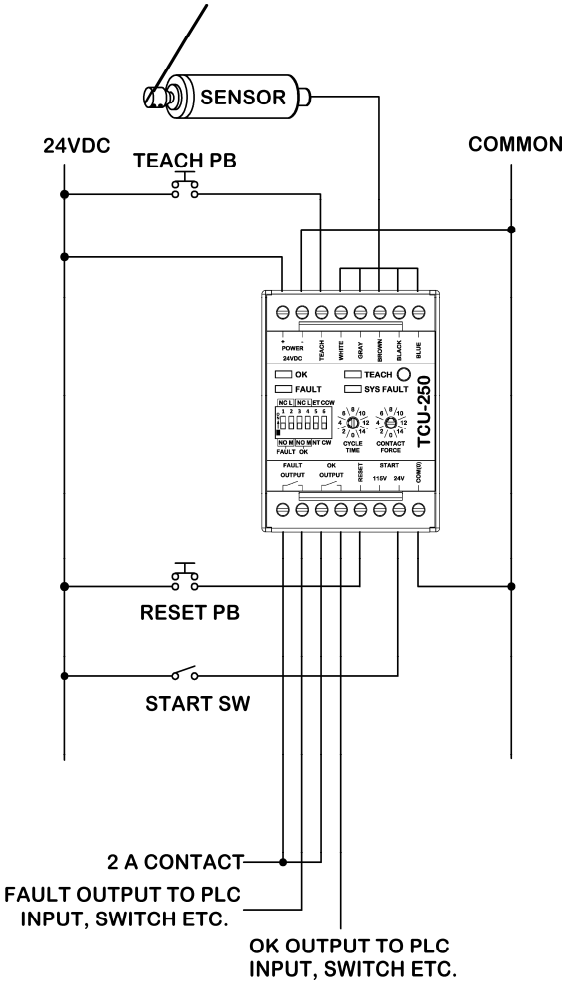


Figure 11: Wiring diagram (24VDC)

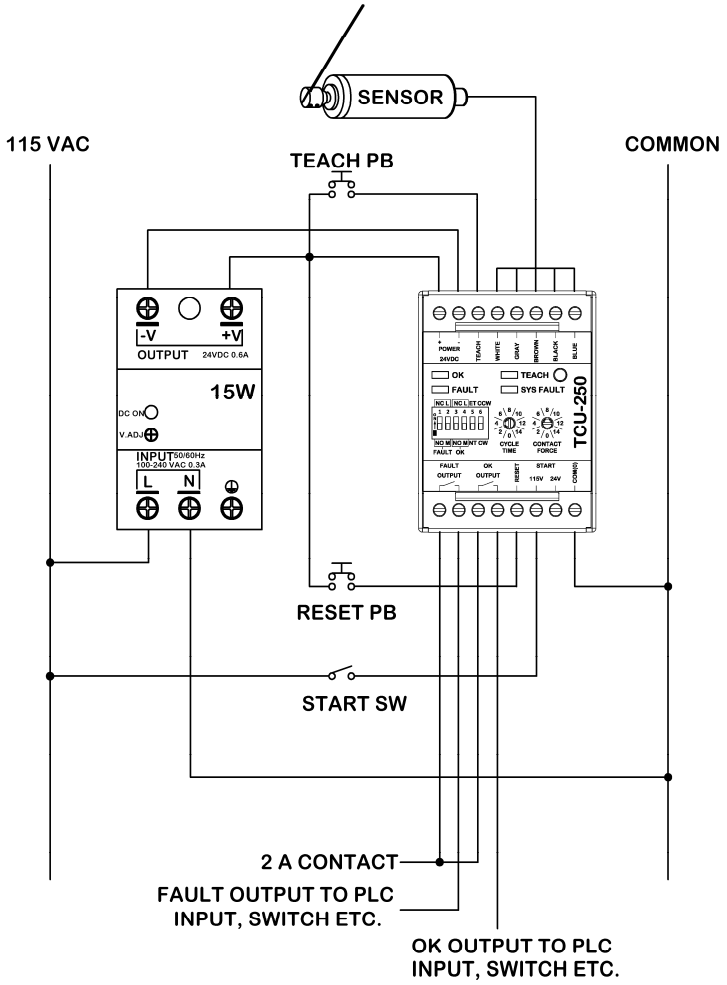


Figure 12: Wiring diagram (115VAC)

ESD/EMF PROTECTION: The TCU-250 Control is a microprocessor based unit. When mounting the Control in an electrical cabinet, avoid placing the Control near sources which might produce ESD (electro static discharge) or EMF (electro magnetic frequencies), such as large motor starters or high current devices. ESD/EMF may interfere with the proper operation of the Control.

The Teach Cable supplied with the PCS-250 System is fully shielded. The preferred installation method is to connect the wires in the Teach Cable directly to the appropriate terminals of the Control. If your installation requires connecting the Sensor to the Control via a junction box/terminal strip, avoid wiring near ESD/EMF sources.

The distance of the Sensor connection to the Control should not exceed 50m (165').

Longer, or special length shielded Teach Cables are available upon request.

Please contact Allora International (www.alloraintl.com, info@alloraintl.com, 855.866.5911) or your local distributor with any questions or for installation assistance.

PCS-250 System Troubleshooting Guide

Please refer to the section that best describes the problem you are having. Determine if you can answer YES to all of the questions. If not, attempt to correct the condition. If you have any questions, please contact our Technical Support department at 1.855.TOOL.911 (855.866.5911), or info@alloraintl.com.

System Fault: (SYS FAULT LED flashing)
- Are Cycle Time and Contact Force switches set to a setting *other than* "0" on the TCU-250?
- Is the Teach Cable properly connected to the PCS-250 and TCU-250?
  - Color coded wires of the Teach Cable should be attached to the correct terminals on the TCU-250
  - The inside of the PCS-250 connector and the Teach Cable connector should be dry
  - Teach Cable should be screwed tight to the PCS-250
- Manually move the Needle away from the start position. Does the Needle return on its own?
  - Is there approximately 3.7VDC across terminals 7 & 8 (Blue and Black) on the TCU-250? (The PCS-250 must remain connected to the TCU-250 for this measurement)
  - Is there 24VDC across terminals 1 & 2 (Power "+" & "-") on the TCU-250? Is the polarity correct?
    - If not, see **No Power to TCU-250**

TCU-250 Will Not Start: (LEDs remain steady, Needle does not swing when a Start Input is applied)
- Is the Start Input being applied to the correct terminals?
  - Terminals 15 & 16 are for a 24V Start Input
  - Terminals 14 & 16 are for a 115V Start Input
- Is the Start Input being correctly applied?
  - The input can be AC or DC voltage (polarity does not matter)
  - The TCU-250 can be started with a *low-high-low* sequence or *a high-low-high* sequence. The TCU-250 will always start on the transition from *low* to *high*
  - Is the *high* condition 24V if using terminal 15, or 115V if using terminal 14?
  - Is the *low* condition 0 V?
    - The *low* condition ***must be 0 V***. If the *low* condition is not an absolute 0 V, the TCU-250 may not recognize it
  - Is each change in condition being held for at least 100ms?
  - In an environment with a lot of electrical noise, (ie: large motors or motor starters), the *high-low-high* sequence will block any noise from accidentally starting the TCU-250
- Is the Start Input being applied ***after*** the TCU-250 has completely finished its last sensing cycle or teach cycle (as indicated by a Fault or Ok Output)?

Fault Signal When Tool is Ok: (Given an OK condition, TCU-250 gives Fault Output)
- Are Cycle Time and Contact Force switches set high enough for the Needle to reach the tool?
- Was a teach cycle performed since removing the Swing Arm Assembly, replacing the needle, moving the Sensor, changing the diameter of the tool being monitored, changing the Cycle Time and Contact Force switches, changing the NT/ET selection, or changing the CW/CCW selection?
- Are any objects obstructing the swing of the Needle between the start position and tool?
- Is the Needle returning to its start position at the end of each sensing cycle?
- Is the tool positioned within the monitoring zone, and at least 5° away from the end of stroke?
  - The Needle's tip should extend over the tool's centerline
  - The Needle should contact the tool at least 1.6mm from the tool's tip
- Is the Swing Arm Assembly tight on the PCS-250?
- Is the Clamping Sleeve tight on the PCS-250, and tight on the mounting bracket?
- Is the PCS-250 connected properly?
  - Color coded wires of the Teach Cable should be attached to the correct terminals on the TCU-250
  - The inside of the PCS-250 connector and the Teach Cable connector should be dry
  - Teach Cable should be screwed tight to the PCS-250
- With the input power removed from the TCU-250 (terminals 1 and 2), or the Teach Cable disconnected from the PCS-250, can the Swing Arm Assembly be freely rotated without any binding?
  - Look for metal chips between the Swing Arm Assembly and PCS-250.
  - Look for large chip "bird's nests" that may be obstructing the swing of the Needle.
- Is the Needle supplied by Allora being used?

PCS-250 System Troubleshooting Guide
(continued)

No Fault Signal When Tool is Broken: (Given a Fault condition, TCU-250 continues to give Ok Output)
- Are Cycle Time and Contact Force switches set high enough for the Needle to reach the end of stroke?
- Was a teach cycle inadvertently performed after the tool was broken, or removed?
- Are any objects obstructing the swing of the Needle between the start position and tool?
- Is the tool positioned within the monitoring zone, and at least 5° away from the end of stroke?
  - The Needle's tip should extend over the tool's centerline
  - The Needle should contact the tool at least 1.6mm from the tool's tip
- Is the Swing Arm Assembly tight on the PCS-250?
- Is the Clamping Sleeve tight on the PCS-250, and tight on the mounting bracket?
- With the input power removed from the TCU-250 (terminals 1 and 2), or the Teach Cable disconnected from the PCS-250, can the Swing Arm Assembly be freely rotated without any binding?
  - Look for metal chips between the Swing Arm Assembly and PCS-250.
  - Look for large chip "bird's nests" that may be obstructing the swing of the Needle.
- Is the PCS-250 connected properly?
  - Color coded wires of the Teach Cable should be attached to the correct terminals on the TCU-250
  - The inside of the PCS-250 connector and the Teach Cable connector should be dry
  - Teach Cable should be screwed tight to the PCS-250
- Is the Needle supplied by Allora being used?

No Power to TCU-250: (No LEDs illuminate on TCU-250 at power-on and no power to PCS-250)
- Is there a clean 24VDC being supplied across terminals 1 & 2 (Power "+" & "-") on the TCU-250?
  - Is the polarity correct?
- If 110-240VAC, is the PS-1000 power supply supplied by Allora being used?
  - Is there 110-240VAC being supplied to the power supply?
  - Is there no more than one TCU-250 running per PS-1000?

No Output from TCU-250: (Machine doesn't receive Ok or Fault signal after applying Start or Teach Input)
- Is the SYS FAULT LED off?
  - If not, see **System Fault**
- Does the Needle on the PCS-250 swing when the TCU-250 is given a Start or Teach Input?
  - If not, see **TCU-250 Will Not Start**
- Is the OK LED or FAULT LED illuminated and at its normal intensity?
  - If not, see **No Power to TCU-250**
- The Outputs from the TCU-250 are momentary (500ms). Is this adequate time for your application?
  - The Outputs from the TCU-250 can be set to latch (refer to Page 7)
- With tool present, give the TCU-250 a Start Input. Do terminals 11 & 12 (Ok Output) close (or open if NC switch for Ok Output is selected)?
  - This same check can be done for the Fault Output by removing the tool, or causing the needle to stop at a position other than the tool position learned during the teach cycle. Do terminals 9 & 10 (Fault Output) close (or open if NC switch for Fault Output is selected)?

No Power to PCS-250 (Sensor): (Sensor does not swing or return to the start position)
- Are one or more LEDs on the TCU-250 illuminated?
  - If not, see **No Power to TCU-250**
- Is the PCS-250 connected properly?
  - Color coded wires of the Teach Cable should be attached to the correct terminals on the TCU-250
  - The inside of the PCS-250 connector and the Teach Cable connector should be dry
  - Teach Cable should be screwed tight to the PCS-250
- Manually move the Needle away from the start position. Does the Needle return on its own?
  - Is there approximately 3.7VDC across terminals 7 & 8 (Blue and Black) on the TCU-250? (The PCS-250 must remain connected to the TCU-250 for this measurement)
  - Is there 24VDC across terminals 1 & 2 (Power "+" & "-") on the TCU-250? Is the polarity correct?
    - If not, see **No Power to TCU-250**

Positive Contact Control Units conform with the EEC directive EMC 89/336/EEC as amended by 92/31/EEC and 93/68/EEC.

In compliance with the directive, the EC Declaration of Conformity and related Technical Documentation is maintained at the following address for inspection by the appropriate officials:

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United States of America

RoHS Compliant

Positive Contact – Hazardous Materials

All **Positive Contact** products and packaging are manufactured with RoHS compliant materials. They are free of Bromide Halogens (PBB, PBDE), Mercury, Cadmium, and Chrome 6+.
All **Positive Contact** products are Lead Free.
All **Positive Contact** products comply with current EU environmental standards, including directive amendments regarding the use of perfluorooctane sulfonates, (PFOS).
All **Positive Contact** products and packaging are free of any material containing Asbestos.
All **Positive Contac**t foam packaging is free of CFC's, HCFC's or HFC's. The foam and its ash is non-toxic, landfill safe and recyclable.