UFS CORPORATION
Electrocoating Equipment

UFS Corporation

Getting Started Guide

100 to 150 amp Current Sensor Modules

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www.ufsc.com

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Welcome to UFS Corporation

This manual is intended to be an overview of a typical Current Sensor Module and how it works. It is presented to the owners, system designers, installers, and members of the paint finishing department where the equipment is to be used. Also included, are pages specific to your system. It is important that you keep this documentation in an easily accessible place for future reference.

Product Support and Customer Service

You may call (219-464-2027) or fax (219-464-8646) our office during normal business hours (7:30 a.m. - 4:30 p.m., CST). Technical Service can be reached at extension 13 and Customer Service can be reached at extension 28.

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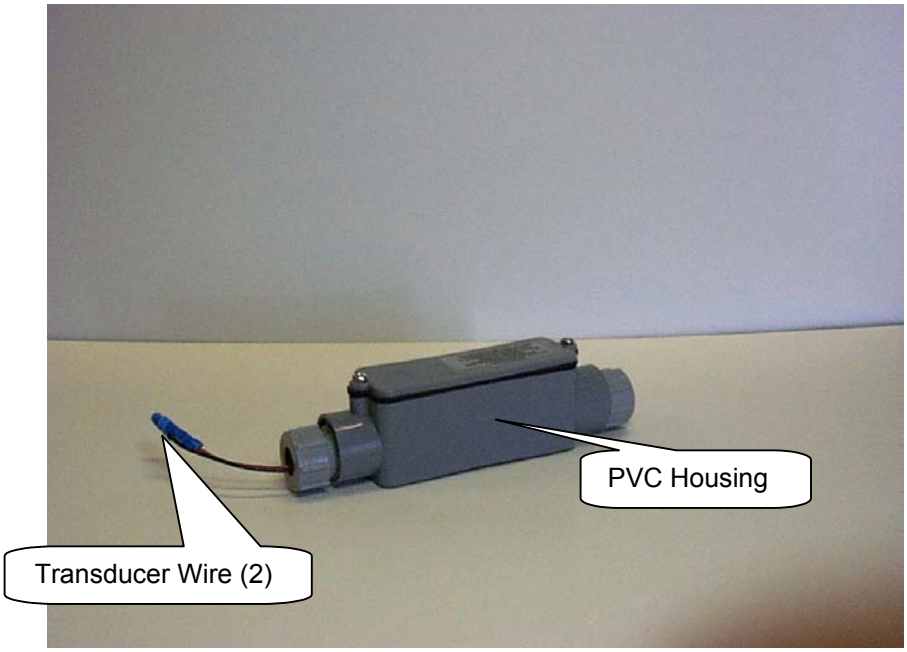
Please contact UFSc for assistance. Persons with disabilities should contact UFSc and request assistance.

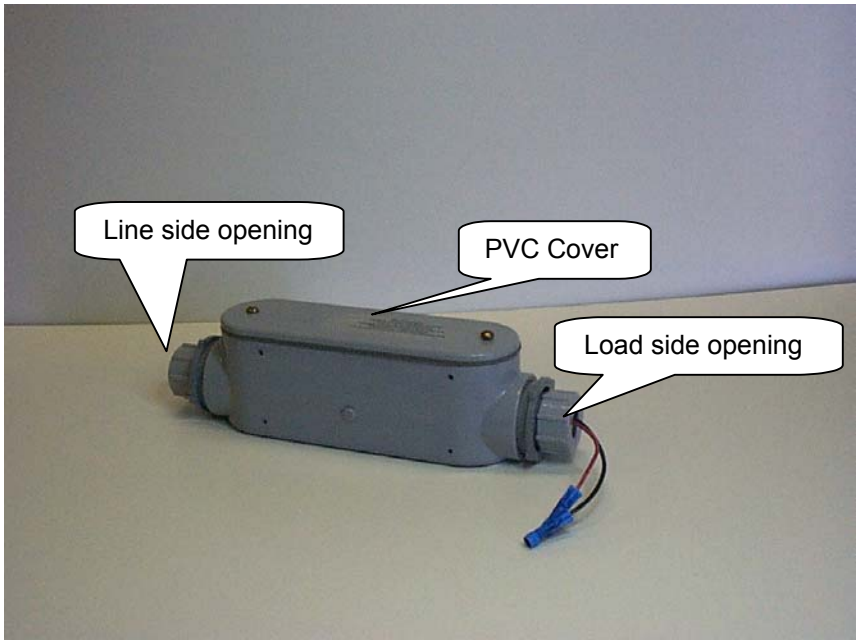
Introduction

This manual provides general instructions for: installing, operating, and maintaining a Current Sensor from UFS Corporation. This Current Sensor has the following major features (your current sensor may look different according to amperage capabilities):

100 amp Current Sensor Module (UFSc PN 295025)



150 amp Current Sensor Module (UFSc PN 295026)



At the end of this manual, you will find drawings for your Current Sensor.

Safety

A safe work environment for our customers (their employees and outside contractors) is of utmost importance to UFS Corporation. All applicable OSHA and owner's safety requirements must be followed when performing any maintenance, inspection, repair, or testing on Electrodes and/or Electrode Systems. This includes, but is not limited to, the following safety regulations: Lockout/Tagout (Energy Control); Hazard Communication; Confined Spaces; Personal Protective Equipment; Electrical Safe Work Practices; Ergonomics and Material Handling; Accident Prevention signs (Danger – Energized Equipment).

Ongoing training of employees on ED equipment and system installation, operation, and maintenance of UFSc components is strongly recommended. MSDS (Material Safety Data Sheets) available upon request.

Unpacking the Current Sensor Module

Carefully remove the packaging from around the outside of the Current Sensor Module. Make sure nothing was damaged during shipping. Please contact UFSc immediately if damage was incurred in shipping.

Description and Function

Electrodeposition (ED) coating is an electrically driven painting process. The amount of electrical current delivered over time determines how much paint film is deposited. Most electrocoating paints are limited to about 400 volts; therefore, in some cases the dwell time will have to be increased (or line speed lowered) in order to deliver the right amount of coulombs (amp • seconds).

To measure how well an ED system is working, it is helpful to take a look at the output ammeter of the DC power rectifier. If the current is low, film thickness may also be low. Since the electrocoating circuit is wired in parallel with the DC rectifier, how the individual current flows through each cell becomes more important in determining the overall performance of each cell. The total current displayed at the rectifier tells the operator that the rectifier is working, but says nothing about how that current is distributed among all the Membrane Electrode (ME) Cells and/or bare electrodes (or other completely different type of load).

The load side (of the DC shunt) is available for connecting to each individual ME Cell (i.e. load). The DC potential across the DC shunt (where 1 mV = 1 amp) is caused by the flow of current through the shunt. Fuse plugs are provided since the voltage from either DC shunt transducer wire to ground is the same as bus voltage. A **Current Monitor™** Panel can be connected downstream of the Current Sensor Modules, and individual Cell (i.e. load) currents can be seen.

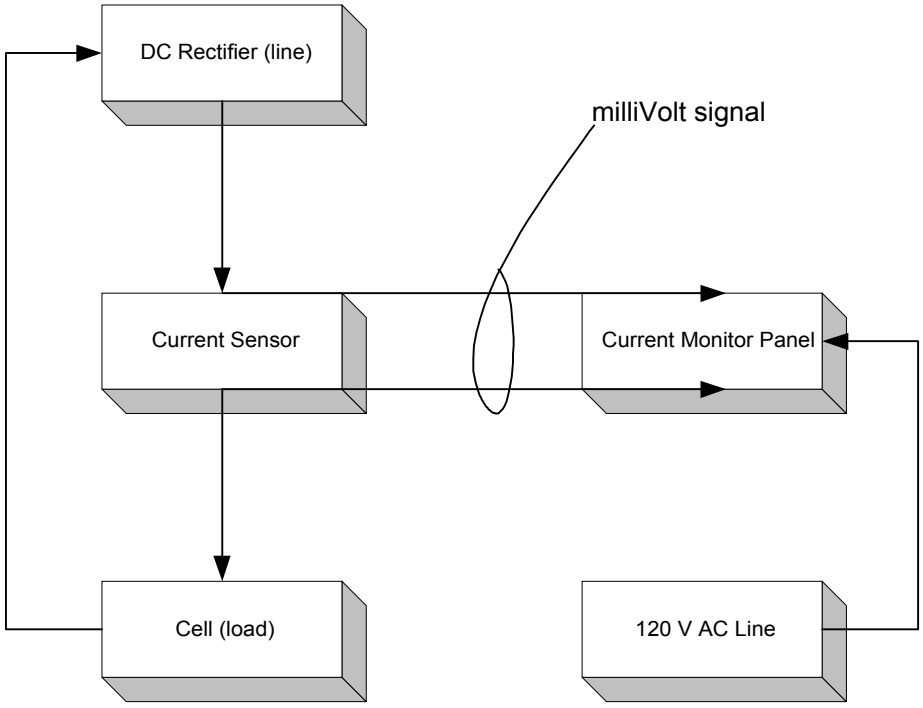
The Current Monitor Panel is well suited to quickly display current flow values for monorail type systems because there is generally a moving conveyor line and the current (for any given cell) will reach a peak as the ware crosses in front of it. On the other hand, for hoist type systems, it is generally very hard to determine the peak current value of more than one cell in each paint cycle. It will still provide current flow for each cell and serve as a spot check tool. For those who want to gather the information quicker and also want to see trend charts – consider the addition of a **Multi-function™** board that can condition the signal from the DC shunt so a PLC or factory floor PC can record the values and provide trend charts.

For more information see the FAQ section in the back of this guide.

System Requirements

The Current Sensor Module does not require a separate outside power input to operate.

Basic Schematic and Diagram



Pre-Installation Planning

Some easy planning steps will result in a better installation and more satisfying results.

A. Cell Numbering

Establish a numbering scheme for each Cell. This numbering scheme will then be used to match the Current Sensor Modules.

Monorail Systems – Begin the numbering sequence at the entrance of the ED tank. Select one of the entrance cells (either side is fine) to be #1. The opposite cell will then become #2. The second cell behind #1 will become #3. The second cell behind #2 will become #4 and so on.

Hoist Systems – Begin the numbering sequence on one end of the ED tank. Select a cell from either side to be #1. The opposite cell will then become #2. The second cell on the same side as #1 will become #3. The second cell on the same side as #2 will become #4 and so on.

Ease of Use – The purpose for the numbering scheme is to provide assistance to the person doing the observing. In either case, the number scheme will ensure the #1 cell is across the ED from the #2 Cell. Cell #3 is across the ED tank from Cell #4 and so on. When

the momentary switch is pushed up, the reading should match closely with the reading when the same switch is pushed down because of symmetry.

Create a Plan View Diagram of the Cell Locations – Create a plan view of the ED tank with the Cells shown in their approximate location. Show the direction of flow of the ware and the direction of North. Each cell should have a number next to its approximate location. This number should be the same as the number on the front of the Current Sensor. Cover this plot with a layer of clear plastic and hang near the Current Sensor.

B. Current Sensor Module Location and Transducer Wire Conduit Sizing

The milliVolt signal generated by the DC shunt is usually less than 100 milliVolts. The length of the transducer cable that carries this signal is generally limited to about 25 meters (80'). If your run is much longer, then perform a test with a long piece of cable and inject a certified milliVolt signal source (approximately 30 milliVolts) into the far end. Use an accurate voltmeter to read the signal on the other end. If the results are close, then you will probably be successful. During the test period you should cause a maximum amount of electronic interference (welding, radio traffic, motors, etc.) to be present to increase the confidence of the test result.

Refer to Drawing #997412 at the end of this guide to assist with the selection of conduit for the transducer wiring.

Monorail System – A good place to locate the Current Sensor is right beside the cell. The conduit from the other side can come under the front nose of the ED tank, which will shorten the cable run length.

Hoist System – Generally, the Current Sensor and Power Distribution panel will be needed because of room issues.

C. Power Cables and Conduit Sizing

The size of the cable to each Cell (load) needs to be determined in conjunction with the manufacturer of the Cell and the ED paint supplier. As a general rule, size the cables to carry a load equal to (based upon the effective electrode surface area)

Metric: 2 (safety factor) x Sq meters (effective electrode surface area) x 50 amps/sm

English: 2 (safety factor) x SF (effective electrode surface area of the Cell) x 10 amps/SF

If the power cables are beyond the ED tank enclosure, conduits are generally not used. If the power cables are outside of the ED tank enclosure, route them inside of appropriately sized conduits.

Installation

The Current Sensor Module is comprised of mechanical support, electrical installation, and cabling. Refer to the Current Sensor Module Drawing at the end of this manual.

A. Mechanical Support

The Current Sensor Module should be mounted above the rim of the ED tank inside of the ED tank enclosure wall. All conduits should be brought to this location and connections made into the fuse kits.

B. Electrical Installation

Size the incoming DC rectifier line cables and conduit as required. Bring the cut end of the wire into (pass through the threaded cap and the rubber seal first) the load side of the DC shunt. Strip back the insulation and attach ¼" (6.35 m) round lug for your line cable. Remove the brass nut and brass lock washer. Place the round lug over the load post of the DC shunt. Replace the brass lock washer and nut. Use only brass hardware on the posts of the DC shunts.

Size outgoing Load cables and conduit as required. Attach Load cables to the negative side of shunt (i.e., black transducer wire side) with a ¼" round lug provided in shipment. Make sure brass lock washers are used and the connection is tight.

Use a shielded 18 AWG pair, Belden number 9341 (or equal) for each DC shunt. Slide a short length of heat shrink over the positive wire and also strip back the positive wire (double the stripped end back if needed) of the Belden cable and insert it into the red (load side) butt splice. Crimp tightly and shrink the covering into its place over the butt splice. Repeat of the load side.

Checkout

Perform all checks with the DC rectifier turned off and locked out/tagged out.

A. Fuses

Confirm a fuse is in each of the fuse holders in the Current Sensor Module. Note, each module has two fuse holders. Replace any broken or damaged fuses.

B. Continuity Check

With a digital VOM meter, check the continuity from the line side of the DC Shunt to extreme far ends of both the positive and negative sides of the transducer cable runs. Repeat test for each point. Fix and/or repair continuity problems as they are found.

C. DC Shunt

Make sure all power connections (to each of the posts) to the shunt are tight. Only brass hardware is used.

D. Transducer Grounds

Are all the shields from the transducer wiring grounded at the far end (i.e. not Current Sensor Module)? Make sure only one side of the shields is grounded.

E. Identification Markings

Does each Current Sensor Module have a Cell number attached to it? Is there a Cell layout drawing with all the Identification Numbers shown on it?

Quality Assurance

In the back of this Guide you will find a copy of the Inspection and Certification report. Your product(s) were tested and certified before they left the factory, and the matters of the testing and the results are shown on the report.

Operation

NOTE: Please read all of the "Maintenance" and "Troubleshooting" sections before beginning operation. The "Troubleshooting" section explains the most common kinds of problems and what to do about them.

This panel is in operation when the ED DC rectifier system is turned on.

Maintenance

The routine maintenance required for the Current Sensor is minimal. The largest task is to make sure all the bolted electrical joints stay tight. Each electrical joint will experience great thermal stress. As current flows, the joint will warm up. When the current stops, the joint will cool off. This cycle is repeated many times each hour. Read the section on Safety before performing any work on the panel.

A. Wiring Problems

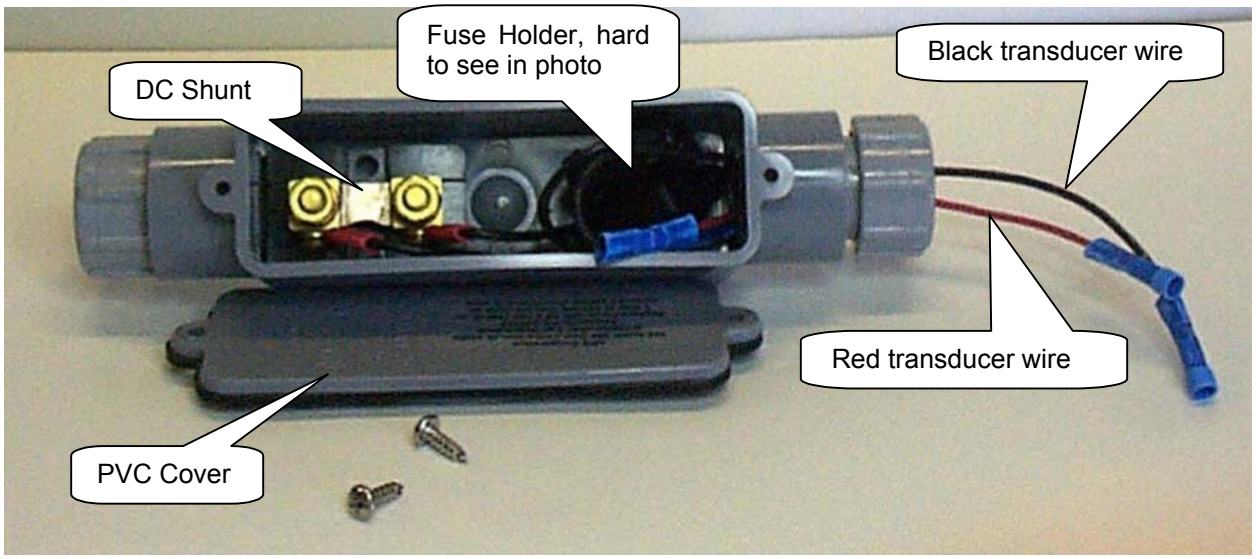
Refer to the wiring schematics at the end of this manual to correct any suspected wiring problems.

B. Fuses

Each transducer signal must be fused to protect downstream equipment from short circuit conditions. The fuses are placed in the fuse kits inside the Current Sensor. The fuse is rated at 1 amp (Ref: UFSc PN 235015).

Repair

Repair may be necessary if there has been a high temperature event, paint contamination, etc. Refer to the Spare Parts Plot at the end of this manual for complete information on end-user, serviceable parts. The spare parts plots show the exploded view. Generally, the line and load cables are pushed through the threaded end caps, the rubber seals and then into the interior of the PVC housing before the round lugs are attached.



Troubleshooting

Problem	Possible Cause	Remedies
A. Cell is showing no current flow	Fuse is blown. Loose wire(s).	Check condition of both fuses (positive and negative sides). Tighten as required.
B. Poor ED film thickness	Load (or line) cable has come loose from load (or line) side of shunt. Shunt element is blown.	Retighten as required. Replace shunt(s).
C. Hot, dark scorch marks	Electrical short conditions.	Investigate and repair.
D. Sporadic readings	No earth ground.	Insure meter panel is secured to an earth ground.

Spare Parts and Accessories

See the spare parts plot for your unit for details on end user servicable parts.

UFSc offers several add-on products to complete the instrumentation of your project. UFSc has a Current Monitor™ Panel, which is used to display current levels to each Cell. UFSc also offers signal-conditioning products (i.e. Multi Function board) so your PLC can measure and record information.

Limited Warranty and Liability

WARRANTY

We warrant all equipment manufactured by us to be free from defects in material and manufacture at the time of shipment for a period of one (1) year from the date of shipment. We will furnish without charge F.O.B. our factory, but will not install, replacements for such parts as we find to have been defective.

This warranty shall not apply to any equipment which has been subjected to misuse, neglect or accident, or has been altered or tampered with, or if corrective work has been done thereon without our specific written consent. No allowances will be made for such corrective work done without such consent. Improper maintenance, deterioration by chemical action, and wear, do not constitute defects. Equipment manufactured by others, and included in our offering, is not warranted in any way by us but carries only the manufacturer's warranty, if any. All electrodes (and or cathodes), of any material, are not warranted by us in any way since they by nature are sacrificial and will erode or corrode away with time.

All warranty claims must be submitted within ten (10) days of discovery of defects or shall be deemed waived. All parts returned for inspection must be sent prepaid. No representative of our company has any authority to waive, alter, vary or add to the terms hereof without prior approval in writing. The foregoing is in lieu of all other warranties (including that of merchantability), whether express or implied.

LIABILITY

It is expressly understood that our liability, including that for breach of Contract, negligence, strict liability in tort, or otherwise, for our products is limited to the furnishing of such

replacement parts, and that we will not be liable for any other expense, injury, loss or damage, whether direct or consequential, including but not limited to loss of profits, production, increased cost of operation, or spoilage of material, arising in connection with the sale or use of, or inability to use, our equipment or products for any purpose, except as herein provided.

Frequently Asked Questions (FAQ's)

1. **What is a Current Sensor Module?**

   A current sensor module measures the amount of electric current flowing through a conductor. The Module is comprised of a DC Shunt, two fuses, which are placed into a PVC housing.

2. **What is the maximum rating of the Current Sensor Module?**

   There are two versions available now. The smaller one is has a 100 amp rating and the larger one is good up to 150 amps

3. **How does a DC Shunt operate?**

   A DC shunt is a precision resistor. As current flows through it, a voltage drop develops. The voltage drop is proportional to the current flow (i.e., Ohm's Law). Thus, we can calculate the current if we know the resistance and the voltage drop. Generally, the resistance value is about 0.001 Ohms. You will need a high precision resistance meter to confirm the resistance value.

4. **Why does each DC Shunt have two fuses?**

   Even though the electric potential across the shunt is very low, the potential from each transducer wire to ground is the same as bus voltage.

5. **Why does the Current Sensor Module have to be installed behind the ED tank enclosure wall?**

   The Current Sensor Module does not have a lock, and it needs to be kept behind a locked door for safety reasons.

UFS Corporation is a distributor of:

- **Myron L** Conductivity Controllers
- **Synder Filtration** Ultrafilters
- **Webster** Pumps