UFS CORPORATION
Electrocoating Equipment

UFS Corporation

Getting Started

Membrane Electrode Cell
Current Sensor and Power Distribution Panel

23 December 2000 Note

This manual was written for a 40 point version. 48 point version has only one bus bar, which is wider (6" w) and longer (36" l). Maximum current rating for the copper bus bar is 2,250 amps. The maximum current ratring for any single point is 100 amps.

Ph: 219-464-2027 Fax: 219-464-8646

www.ufsc.com

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Welcome to UFS Corporation

This manual is intended to be an overview of a typical Membrane Electrode Cell Current Sensor and Power Distribution Panel 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

For customers in the **United States** and **Canada**:

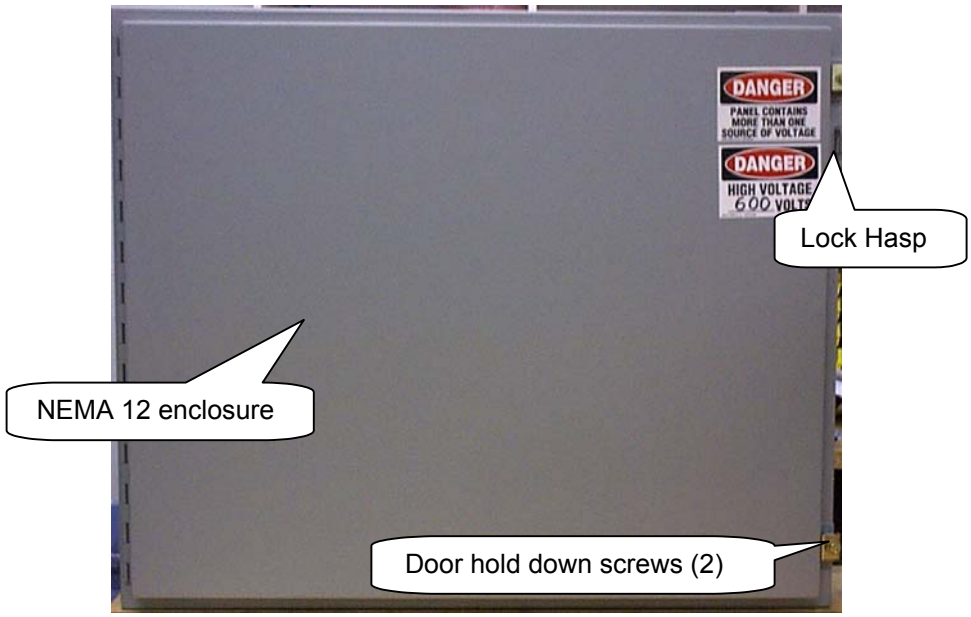
You may call (219-464-2027) or fax (219-464-8646) our office during normal business hours (7:30 a.m. - 4:30 p.m., CST). Technical Service can be reached at extension 13 and Customer Service can be reached at extension 16 or 28.

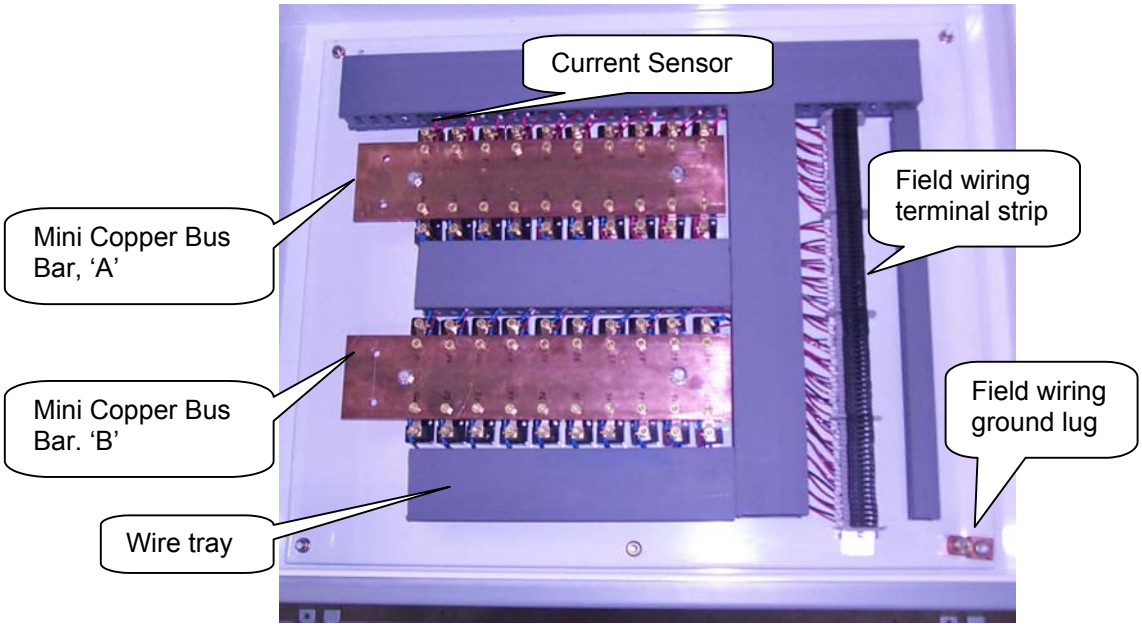
UFS Corporation
330 North 400 East
Valparaiso, IN 46383 USA
PH: 219-464-2027
Fax: 219-464-8646
http://www.ufsc.com
email: service@ufsc.com

Many of the Getting Started manuals are available in German and Spanish. 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 Membrane Electrode Cell Current Sensor and Power Distribution Panel. This panel has the following major features (your panel may look different or have fewer number of components):





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

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).

On going training of employees on ED equipment and system installation, operation, and maintenance of UFSc components is strongly recommended. MSDS (Material Safety Data Sheets) are provided for UFSc materials. Replacement or missing copies are available upon request from the UFSc Safety Coordinator.

Unpacking the Current Sensor and Power Distribution Panel

Carefully remove the packing from around the outside of the panel. Loosen the two front door hold down screws and remove the compressible material separating the door from the back of the panel.

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, 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 or bare electrodes.

The Current Sensor and Power Distribution Panel is designed for ED Systems where space is at a premium and it makes sense to place all the current sensors in a centralized place. The Current Sensor and Power Distribution Panel has one or more mini copper bus bars. The line power from the DC rectifier is connected to these mini bus bars. The line side of the DC shunt is already connected to the mini copper bus bar. The load side is available for connecting to each individual ME Cell. The DC potential across the DC shunt (where 1 mV = 1 amp) is connected to a terminal strip. A fuse plug is built into the terminal strip since the voltage from either DC shunt wire to ground is the same as bus voltage. A **Current Monitor™** Panel can be connected to the terminal strip and individual Cell 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

Pre-Installation Planning

Some easy planing 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 location of cells with the numbers shown on the Current Sensor and Power Distribution panel.

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 (either side is fine) 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 and Power Distribution panel. Cover this plot with a layer of clear plastic and hang near the Current Sensor and Power Distribution panel.

B. Panel Location and 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 selction of conduit for the transducer cables.

Monorail System – A good place to locate the Current Sensor and Power Distribution panel is on the front end of either side of the ED tank enclosure wall. 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 placed on one of the short ends of the ED tank. The cable run lengths are then usually very short.

Installation

The Membrane Electrode Cell Current Sensor and Power Distribution Panel installation is comprised of mechanical support, electrical installation, and cabling. Refer to the Membrane Electrode Cell Current Sensor and Power Distribution Panel Drawing at the end of this manual.

A. Mechanical Support

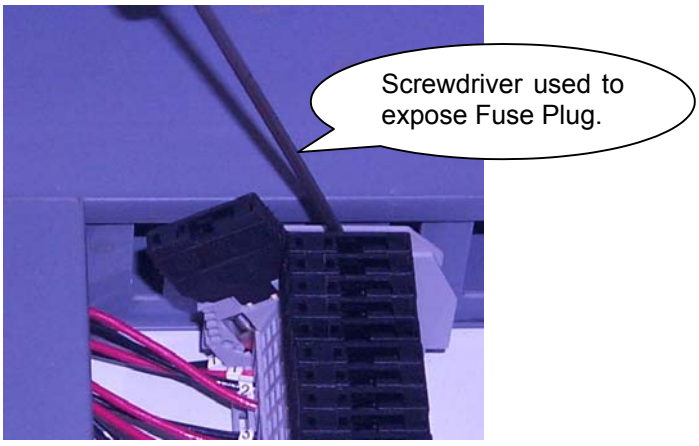
The Panel should be mounted below the rim of the ED tank. All conduits should be brought to this location and connections made into the panel. Make sure that the panel door can open up to perform any work that may need to be done on the inside of the enclosure.

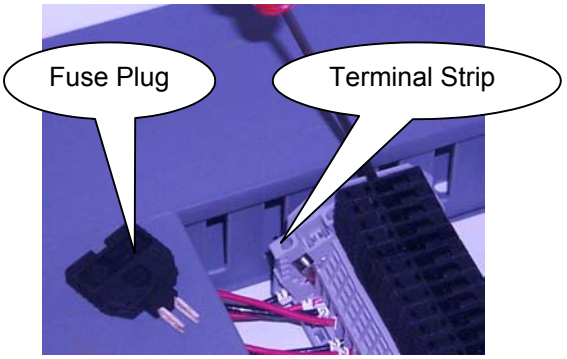
B. Electrical Installation

Size the incoming DC rectifier line cables and conduit as required. The suggested entry is on the left middle side of the panel. Attach the Line cables power to the mini bus bar(s) with an appropriate lug. To make sure the connections remain tight, use compression washers.

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

Size the transducer cable conduit for the proper number of Belden Cables (i.e., #9341 or equal). The suggested entries are the middle of the right hand side. The Fuse Plugs have been removed from their terminal strip to speed up the installation of the transducer cabling. Once the red and black wires of the transducer cable have been attached for each point, place one of the black colored Fuse Plugs (make sure there is a glass fuse inside) into the top of each terminal strip. If it will be necessary to remove the Fuse Plug from the top of the terminal strip, use a screwdriver to expose the Fuse Plug. Make sure to ground the transducer cable shield only on one 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 Plugs atop the terminal strip. Confirm that a black Fuse Plug is placed into the top of each terminal strip. Replace any broken 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

Confirm each shunt is tightly connected to the mini copper bus bar. Some of the bolted connections may of come loose during shipping. Make sure there is a 3/8" gap on each of the long sides of the DC Shunt. Adjust as needed.

D. Transducer Grounds

Are all the shields from the transducer wiring grounded to the lug? Make sure only one side of the shields is grounded. Is the metal enclosure itself attached to a ground?

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 Panel 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 and 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. Open Panel Door

To open the front of the Meter Panel, first make sure the DC rectifier to the e-coat system is turned off and locked out with your own key. Open the door slowly and make sure it will stay where you leave it.

B. Wiring Problems

Refer to the wiring schematics (997409 and wiring schematic plot of 221025) at the end of this manual to correct any suspected wiring problems.

C. Fuses

Each transducer signal must be fused to protect downstream equipment from short circuit conditions. The fuses are placed in the fuse plug atop the terminal strip. The fuse is rated at 1/3 amps, UFSc PN 235005.

D. Spare Parts

Refer to the Spare Parts Plot at the end of this manual for complete information on end-user, serviceable parts.

Current Sensor and Power Distribution Panel 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 cable has come loose from load side of shunt. Shunt element is blown.	Retighten as required. Replace shunt(s) (UFSc PN 295003).
C. Hot, dark scorch marks	Electrical short conditions.	Investigate and repair.
D. Panel dropped	Loose bolts holding panel.	Repair and tighten as required.
E. Erratic readings	No earth ground.	Insure panel is secured to an earth ground.
F. No warning labels	Warning labels were removed.	Order UFSc PN Z150012 and Z150013.
G. No lock on panel	Lock not replaced after maintenance.	Replace with suitable lock.

Spare Parts and Accessories

See the spare parts plot for PN 221025 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?**

   A current sensor measures the amount of electric current flowing through a conductor.

2. **What is the maximum rating of the Current Sensor and Power Distribution Panel?**

   Each of the mini copper bus bars is limited to 1500 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.

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

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

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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.

The maximum rating for each DC shunt may not be useable since the total current to each mini copper bus bar is about 1500 amps.

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

System Requirements

The Membrane Electrode Cell Current Sensor and Power Distribution Panel does not require a separate outside power input to operate. However, the panel does need to be mounted to a suitable ground.

Basic Schematic and Diagram