INSTRUCTIONS for UNIONMELT

SERIES VOLTAGE CONTROL

PART NO. 25V15

FOR

UWM-2

PORTABLE FLEXIBLE WELDER

1. Basic Principles

In electric arc welding, heat is generated by the flow of current through the gap between the end of the electrode and the workpiece. A voltage also exists across this gap. This voltage is proportional to the arc length (gap distance); i.e., if the arc length increases, the welding voltage will increase. Conversely, if the arc length decreases, the welding voltage will decrease.

The welding voltage is important because of its effect upon the character of the weld. To produce a uniform weld, the welding voltage must be maintained at a constant value. To accomplish this, the wire must be fed to the weld zone at exactly the same rate at which it melts.

The Series Voltage Control is used with the UWM-2 Portable Flexible Welder containing a low-voltage universal wire feed motor which operates on the voltage across the arc. If the power input to the weld zone increases momentarily, wire will melt off faster, increasing the arc length and the welding voltage. As the welding voltage increases slightly, more power is supplied to the wire feed motor thereby increasing the wire feed rate and reducing the arc length and welding voltage. When the welding voltage decreases below the selected value, power to the wire feed motor is reduced and the wire is fed more slowly to the weld zone, thereby increasing the welding voltage.

Another Customer Service From... LINDE COMPANY

Be sure this information reaches the operator. You can get extra copies through your supplier.
A. Control Power Supply

The Series Voltage Control can be used for either a.c. or d.c. welding. However, whether alternating or direct welding current is used, there must be available a 115 volt, 60 cycle alternating voltage supply. This is necessary to power the voltage control itself, and is independent from the welding supply power, which may be a.c. or d.c.

B. Wire Feed Motor

Refer to the schematic diagram (Fig. 1). This shows a simplified layout of the Voltage Control and Welder.

Notice that the welding voltage (between the electrode and the work) is supplied to the circuit of the Wire Feed Motor (WFM). There are several circuit elements in series with the WFM. The operation of these elements is described below.

Current Relay. The contacts of a Current Relay (CR) are in series with the WFM. When welding begins, current flows in the welding cable. The Relay energizes, and closes the wire feed motor circuit. Although it is not located in the Control cabinet, the Current Relay may be considered electrically as a part of the Control.

Fuse. The fuse protects the WFM against overload.

Welding Voltage Control. A Welding Voltage Control (WVC) is in series with the Wire Feed Motor. It is a rheostat. The controlling knob for WVC is located on the front of the Control cabinet. WVC controls the average speed of the WFM. For example, to obtain a welding voltage of 30 volts, the WFM may rotate at the proper speed on only a 25-volt input. Therefore, WVC serves to reduce the 30-volt welding voltage to the 25-volt value which is adequate to maintain the desired speed of the WFM. Variations in the arc voltage are immediately reflected by proportional voltage variations through the motor circuit, thus increasing or decreasing the wire speed to keep a constant welding voltage. The markings of the dial of the WVC are intended as reference points only and are not meant to indicate fixed welding voltages.

Inching Button. When no welding current flows, the contacts of the Current Relay (CR) are open. The voltage between the electrode and work is not applied to the WFM. In order that the operator may adjust the length of wire protruding from the welding nozzle, an auxiliary power supply is provided for the WFM. An Inching Button (IB) controls this power.

In one position, the contacts of the Inching Button connect the motor to the welding voltage.
circuit. In the other position (when the button is pressed) the motor is disconnected from the welding voltage circuit and is connected to the 27 volt secondary of a 115 volt transformer (ITR). With this voltage, the motor runs slowly, "inchng" the wire out of the welding nozzle.

**Feed and Retract Switch.** The field of the wire feed motor is connected in series with its armature by a reversing switch called the Feed and Retract Switch (FRS). This switch serves to reverse the direction of wire feed when desired, by reversing the direction of current through the field of the Wire Feed Motor.

**Voltmeter.** The Voltage Control includes an a.c. Voltmeter (V). This is a rectifier type meter and may be used on d.c. without damage. When Current Relay CR is closed, the Voltmeter is across the welding voltage. It gives a measure of the welding voltage during the welding operation. When CR is open, the meter is disconnected from the welding circuit.

### C. Welding Transformer Control

The Control Box is equipped with a contactor switch (CS) which gives "ON-OFF" control of the welding generator or transformer. This switch controls the current to the main contactor relay (MCR) which is not a part of the Voltage Control. MCR is a part of most welding transformers. Linde supplies a relay, Part No. 90W825, which may be used in the field of separately excited welding generators.

### III. Electrical Connections

As furnished by Linde, all internal circuit connections are already made in the UWM-2 Portable Flexible Welder. Therefore, the Voltage Control is already connected to the wire feed motor and the current relay.

Certain external connections must be made, however, between the welder and the other apparatus in the setup. One of these is between the Voltage Control and the welding transformer or generator.

This connection is made through a 4-conductor control cable. Because its required length varies with the application, the cable is not furnished with the welder. An 8-pole female contact unit, Part No. 90W45, and a plug shell, Part No. 90W39, must be attached to one end of the cable. Complete instructions on attaching the cable to the plug and to the welding transformer or generator are in the booklet, "Instructions for the Portable Flexible Welder," Form 9239.

### IV. Operating Instructions

#### A. Safety Precautions

As in all electric welding apparatus, there are certain exposed parts of UNIONMELT welding installations at the welding voltage potential. At times the even higher open circuit voltage may be present. Although this is never more than 115 volts, remember that it is the same as the ordinary house lighting voltage with which the average person avoids all contact. Under some conditions of low body resistance, as when a person is perspiring and in contact with a grounded steel plate, this voltage may force enough current through the body to be fatal. For this reason, and because of a shock, even though harmless in itself, may lead to other injuries due to the uncontrolled physical reaction, the operator should be aware of the "live" part of the machine and follow safe operating procedures.

The Portable Flexible Welder, if used properly, is a safe machine. Only one live part -- the tip of the welding wire -- is exposed during operation. The operator is in no danger of electric shock if he observes the three common-sense safety precautions.

The first precaution: Always turn the contactor switch off before removing the machine side plates. Removing the plates exposes the live parts of the machine (busbar, feed rolls, welding wire and wire reel).

The second precaution: Always turn the contactor switch off before touching the welding wire. The only live part that is always exposed is the welding wire protruding from the nozzle. Don't touch the wire while the contactor switch is on. To adjust the length of the protruding wire, always use the inching button and the feed retract switch provided for the purpose. Don't try to cut off a piece of wire unless the contactor switch is off.

The third precaution: Be sure all exposed parts are earth grounded. The welder control cables carry various voltages between the welder parts. Cable failure might transfer these voltages to the welder cabinet and dolly. Because of this, the welder cabinet and welding transformer should always be well connected to an earth ground.

#### B. Setup Check

Before starting to weld, read and follow the operating instructions in the booklet, "Instructions for the Portable Flexible Welder," Form 9239 and Form 9155 "Instructions for the Flexible Attachment."

#### C. Control of Welding Conditions

The Portable Flexible Welder may be used with a wide variety of welding generators and transformers. Therefore, no definite instructions can be given for operation with any one power source. You will find, however, that by following the general procedure given here, you can make satisfactory welds after a minimum of "test" welding.

Notice that the dial of WVC is marked off with a 0 to 100 scale. This scale is an arbitrary one; it does not indicate welding voltage. It allows you to establish reference conditions for the welds you desire to make. Typical welding conditions are shown in Form 9155, "Flexible Welding Attachment."
V. Maintenance and Trouble-Shooting

A. Purpose

The purpose of this section is to help you get the most efficient service from your UNIONMELT equipment. Your ability to detect and locate difficulties quickly and repair the equipment to full operation will minimize loss of time and money due to long shutdowns. Very often, the cost of a shutdown can be far greater than the cost of a control. It is therefore advisable to secure spare controls which can be connected in a matter of minutes.

B. Requirements

The job of trouble-shooting on the Series Voltage Control can be relatively easy if these three basic things are done:

1. Learn how the Series Control works -- the purpose of each circuit and its relationship to other circuits.

2. Have the necessary trouble-shooting equipment available. This should consist of the following:
   (a) An ohmmeter, bell or buzzer and battery, or a test light to make electrical continuity tests.
   IMPORTANT: Be sure to disconnect all power when checking for continuity or resistance.
   (b) An a.c. voltmeter with 0-10, 0-150, 0-300 scales.
   (c) A d.c. voltmeter with 0-10, 0-150, 0-300 scales.
   NOTE: Standard test meters are sold which combine all of the above functions.
   (d) Small screwdriver (6-in. blade).
   (e) Pair of long nosed pliers.
   (f) Pair of diagonal pliers.
   (g) Set of Allen wrenches.
   (h) Soldering iron.
   (i) Wiring and circuit diagrams (Form 9285).

C. Disassembly

In some cases of trouble-shooting, it may be necessary to expose the interior of the control box. If such is the case, proceed in the following manner.

1. Pull out the 8-pole and 6-pole plugs from the box.

2. Remove the four screws and nuts which secure the control box bracket to the wire reel support.

3. Remove the control box and bracket from the welder housing.

4. Remove the four screws in the corners of the control panel. Remove the single shipping screw (S-R-174, see Figure 2) on the bottom of the control case (right hand side). Remove the control panel to expose the interior.

D. Routine Maintenance

1. DRESSING RELAY CONTACTS

   After the unit has been in operation for some time, the contact surfaces of relays may become oxidized or pitted sufficiently to interfere with proper welding operation. It then becomes necessary to dress them. If they are badly oxidized or pitted, they should be replaced.

   The best method to dress contacts of relays used in UNIONMELT equipment is as follows:
   (a) Fold a small narrow strip of very fine sandpaper in half longitudinally with the grit side out.
   (b) Place the folded abrasive between the contacts to be dressed.
   (c) Close the contacts manually on the paper, exerting a gentle but firm pressure on them.
   (d) Draw the abrasive back and forth between the closed contacts until they are smooth, clean, and bright.
   (e) Be sure to remove all grit from the contacts.

2. MOTOR BRUSHES AND COMMUTATOR

   The brushes and commutator of the wire feed motor should be checked for good contact of the mating surfaces. Specific instructions for maintenance of the brushes and commutator are given in the booklet "Instructions on the Portable Flexible Welder UWM-2", Form 9239.

3. VOLTMETER

   A voltmeter, Part No. 90W21, is used in the voltage control for both a.c. and d.c. welding.

   The voltmeter indicates the voltage across the arc. During installation and at regular periods thereafter, the voltmeter should be checked against an accurate test meter which is connected directly across the voltmeter terminals. If the readings of both meters do not correspond, recalibrate the control box voltmeter or have it repaired.

   If the Feed-Reverse Switch is at neutral when a.c. open circuit voltage is across the welding zone, i.e., when the contactor switch is "on," the voltmeter will indicate open circuit voltage. This is not evidence of faulty components, circuits, or installation procedure.

E. Preliminary Visual Inspection

In many cases a close visual inspection of the wiring or equipment may reveal a broken wire or connection. Because the majority of operating difficulties are simple and can be repaired easily, a thorough preliminary inspection can often save time by eliminating the more extensive instrument checks.

In the preliminary visual inspection, look for these things:

1. Broken wires.
2. Loose or broken connections.
3. "Swinging open" connections (caused by loose or broken connections in a multi-conductor cable). This is evidenced by a closed circuit when the cable is in certain positions, and open when in other positions.
F. Preliminary Spot-Check

Listed below are a number of difficulties which occur most often. Following each difficulty are the possible causes and the points to check. Unless specified, the difficulties and their corrections apply to a.c. and d.c. welding. Where the difficulty applies to one type of welding only, it will be noted with (a.c.) or (d.c.).

1. IF THE WIRE FEED MOTOR DOES NOT OPERATE BY INCHING, CHECK THE FOLLOWING:
   (a) Be sure switch FRS is not in the neutral position.
   (b) Check the fuses.
   (c) Check the 115-volt supply to the control box.

   If the difficulty is not found after checking the above points, check the armature and field circuits of the wire feed motor according to the instructions in the booklet "Instructions on the Portable Flexible Welder UWM-2" Form 9239.

2. IF THE WIRE FEED MOTOR OPERATES BY INCHING BUT DOES NOT OPERATE FOR WELDING:
   (a) Be sure welding voltage leads (1 & 2) to plug Y are connected securely.
   (b) Check fuses.
   (c) Check setting of WVC.

3. IF A TEST METER INDICATES NO OPEN-CIRCUIT VOLTAGE WHEN CONTACTOR SWITCH CS IS TURNED ON:
   (a) Make sure that main power supply switch is on.
   (b) Check leads to welding transformer primary (a.c.), or polarity switch of generator (d.c.).
   (c) Welding ground cable not connected.

4. IF WIRE STICKS AT START-OF-WELD:
   (a) "Scratch" motion not rapid enough.
   (b) Welding voltage set too low.
   (c) Welding current too low for wire diameter.
   (d) Loose power connection.
   (e) Moved wire along seam before weld puddle formed.

5. IF WELDING VOLTAGE IS ERRATIC:
   (a) Check feed roll slippage, or for worn or damaged feed rolls.
   (b) Be sure proper welding values have been selected.
   (c) In direct current welding, check for magnetic disturbances (usually called "arc blow") which result from the welding current setting up a magnetic field. Try changing the location of the ground connection. Also try welding toward the ground connection if you have been welding away from it, or vice versa.
   (d) Be sure that welding wire is not binding in the wire reel.
   (e) Check for worn, dirty, or improperly seated tip.
   (f) Check 115-volt supply to the control box for fluctuations.
   (g) Make certain that depth of UNIONMELT composition is neither too high nor too low.
   (h) Welding wire or workpiece may be rusty or oily.

   (i) Joint design or weld backing may not be uniform.
   (j) Check welding head gears.

G. Detailed Trouble-Shooting Procedures

If a preliminary visual inspection and spot-checks do not disclose the source of trouble, a systematic instrument check must be made.

   Listed below are the common difficulties in each of the important functions of the apparatus.

WELDING POWER

1. NO VOLTAGE ACROSS THE WELDING ZONE

   The problem of "no welding power" usually concerns the plant electrician. Some obvious points to check, however, are:

   (a) Be sure that the main power line fuses are not blown, and that power is actually being supplied to the transformer or generator.
   (b) Check all welding cable connections.
   (c) Make certain that the thermal overload switch (often supplied with d.c. generators) has not been tripped.
   (d) Check to see that main contactor relay circuit has no broken or loose connections.

WIRE FEED MOTOR

If the wire feed motor does not operate properly, try to isolate the circuit which is causing the difficulty. Then look for specific difficulty within the circuit.

1. Before isolating the circuit do these things:
   (a) Be sure all plugs and receptacles are properly connected.
   (b) Turn on all main supply switches.
   (c) Check all fuses.

2. Check the inching circuit as follows:
   (a) Put switch FRS in the "Feed" position. Press the inching button.
   (b) Put the switch in the "Retract" position and press the inching button.
   (c) If the motor operates in one case and not in the other, make a continuity check of the FRS. Replace FRS if necessary.
   (d) If the motor operates in both cases, the trouble is not in the inching circuit.
   (e) If the motor does not operate in either case, make a continuity test on the inching transformer windings and the inching button.

3. If the inching circuit operates the motor properly, but the motor does not feed during welding, check the voltage supply fed to the wire feed motor circuit as follows:
   (a) Check the operation of current relay CR. All contacts should close when an arc is drawn. If necessary, dress the contacts as explained in D on Page 4.
   (b) Check fuse F3.
   (c) Make a continuity test of the voltage control WVC.
   (d) Make a continuity test of the inching button.
**How To Order Replacement Parts**

1. All replacement parts are keyed on the drawing which follows. Two types of numbers are used on this drawing:

   A. **Standard Part Numbers.** These are formed by two pairs of digits with a letter between (for example: 01N21, 18V69). Each standard part number is accompanied by a descriptive word or words.

   B. **Hardware Numbers.** These are eight digit numbers (for example: 6130-4910). Hardware numbers are usually accompanied on drawings by a one word description.

2. Order standard parts by part number and part name, as shown on drawings. DO NOT ORDER BY PART NUMBER ALONE.

3. For hardware, look up part number in hardware list below. You will find there a full description. "Hardware" items can usually be purchased locally. When ordering hardware from Linde be sure to include the complete description given in the hardware list. Do not order hardware by the number alone.

4. Many of the standard parts on the drawings, particularly electronic parts, are "vendor items." This means that they are standard commercial parts made by and purchased from other manufacturers. It will save you time and money if you buy these parts from a local electronics outlet or directly from the manufacturer. When ordering from these outside sources, use the manufacturer's part number or designation given on the "vendor items" list on Page 8. Of course, if you cannot obtain one of these items elsewhere, Linde will furnish it on order.

5. When ordering, be sure to state quantity of each part needed.

6. Always state the series or serial number of the machine on which the parts are to be used. The serial number is stamped on the unit nameplate. The "series no." is the first digit of the serial number or designation given on the "vendor items" list on Page 8. Of course, if you cannot obtain one of these items elsewhere, Linde will furnish it on order.

7. Indicate any special shipping instructions.

8. Order replacement parts from the Linde region office nearest you.

**Hardware List**

All the items which follow are standard hardware (screws, bolts, nuts, washers, pipe fittings, etc.) made by many manufacturers, which can be purchased locally by the description given. If no other source of supply is available, you may order these from us.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>6130-1705</td>
<td>No. 6-32 x 2-1/4&quot; Round-Head Steel Machine Screw (Cad. Plated)</td>
<td>6132-0811</td>
<td>No. 2 x 3/16&quot; Parker-Kalon Drive Screw (Cad. Plated)</td>
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<td>6130-1849</td>
<td>No. 6-32 x 1/4&quot; Round-Head Machine Screw</td>
<td>6132-2811</td>
<td>No. 2 x 3/16&quot; Parker-Kalon Round-Head Type &quot;Z&quot; Self Tapping Drive Screw (Cad. Plated)</td>
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<td>6130-1851</td>
<td>No. 6-32 x 3/8&quot; Round-Head Machine Screw (Cad. Plated)</td>
<td>6134-4851</td>
<td>No. 6-32 x 3/8&quot; Flat-Socket Head Cap Screw (Cad. Plated)</td>
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<tr>
<td>6130-1899</td>
<td>No. 8-32 x 3&quot; Round-Head Steel Machine Screw (Cad. Plated)</td>
<td>6320-0742</td>
<td>No. 10-24 Hex Steel Nut</td>
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<td>6130-1900</td>
<td>No. 10-24 x 3/8&quot; Round-Head Machine Screw (Cad. Plated)</td>
<td>6320-0886</td>
<td>No. 8-32 Hex Steel Nut</td>
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<td>6130-1902</td>
<td>No. 10-24 x 1/2&quot; Round-Head Steel Machine Screw (Cad. Plated)</td>
<td>6330-0862</td>
<td>No. 6-32 Hex Nut (Cad. Plated)</td>
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<td>6130-1969</td>
<td>No. 10-24 x 1/4&quot; Round-Head Steel Machine Screw (Cad. Plated)</td>
<td>6420-2748</td>
<td>No. 10 x 3/32&quot; x 3/64&quot; SAE Steel Lock Washer</td>
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<td>6130-5087</td>
<td>1/4-20 x 1/2&quot; Binding Head Steel Machine Screw (Cad. Plated)</td>
<td>6420-4918</td>
<td>No. 10 SAE 5/8 Flat Washer (Steel)</td>
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<td>6420-8859</td>
<td>No. 6 x 3/64&quot; x 1/32&quot; Steel Lock Washer</td>
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<td>6420-8888</td>
<td>No. 8 x 3/64&quot; x 3/64&quot; Steel Lock Washer</td>
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<td>6430-4110</td>
<td>5/16&quot; Plain Steel Washer (Cad. Plated)</td>
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</table>
## Vendor Items

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<tr>
<td>14W78</td>
<td>Switch (Double Pole, Double Throw Switch with Off-Position-5 Amp., 250V. - 10 Amp., 125 V. Catalog #80638 - Hart and Hegeman)</td>
<td>90W44</td>
<td>Contact (Pyle National Co., AP-810, 8-Pole Male Unit)</td>
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<td>80W09</td>
<td>Switch (Cutler-Hammer Cat. #8910 K-58 with 15/32-in. Bushing)</td>
<td>90W45</td>
<td>Contact (Pyle National Co., AP-810, 8-Pole Female Unit)</td>
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<td>82W52</td>
<td>Terminal Aircraft Marine Products, Inc. #31176 Diamond Grip Solderless Terminal</td>
<td>93W29</td>
<td>Clamp - Adel Corp. AN 742 D86 Cushion Clamp</td>
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<td>84W55</td>
<td>Switch (Momentary Contact) Square D (Heavy Duty Class 9001, Type GO-1)</td>
<td>93W32</td>
<td>Mounting Strip, Cinch-Jones Lug Type Terminal Strip Cat. #1540</td>
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<tr>
<td>89W73</td>
<td>Fuse (15 Amp) 3 AG (Glass Tube Type)</td>
<td>93W44</td>
<td>Rheostat - Hardwick - Hindle Rheostat, Type H-300-300 Watt Rating 5.0 Ohms .75 Max. Amps. (Purchase Less Knob and 1-in. Long Shaft instead of 1-13/16-in.) Voltmeter (Weston Electric Instrument Co. Model 301AC)</td>
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<td>90W10</td>
<td>Fuse Mounts (Bussman Mfg. Co., &quot;Buss&quot; H.K.P.) Fusemount</td>
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<td>Nut Timmerman Co. J-Type Speed Nut Cat. #C-1397-632-4</td>
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<td>90W34</td>
<td>Plug Shell (Pyle National Co., APD 2006)</td>
<td>97W68</td>
<td>Rheostat Knob - Ohmite Mfg. Co. W/Pointer, Cat. #5130</td>
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</tbody>
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**UNION CARBIDE**

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