START-UP PROCEDURE
for
MODEL E4-0

Your new model E4-0 has been equipped with a 1/16th DIN, digital, microprocessor based, PID controller. This instrument is accurate to within +/- .1 % of span and will provide excellent control of your heat treat or melting process.

To operate your new furnace, turn on the toggle switch located on the front control panel. When the switch is tripped, you should see the indicator light come on. This means that the unit is powered. To enter a set-point, press either the up or down arrow keys to enter the desired set point. Once the set point is entered, the furnace will begin to heat up, no further adjustments will be necessary.

The control parameters of the instrument are entered into the memory here at MIFCO and then access is locked out to prevent changes to them. Should it become necessary to make changes, please consult the factory.

An operating manual (on CD) from the instrument manufacturer is included with this operating manual. Please read it for further information on the instrument's capabilities.

FURNACE OPERATION AND START UP:

Locate the crucible block in the center of the furnace chamber. Always use the correct size base block and never place the crucible on the floor of the furnace. Doing so causes a cold spot at the bottom of the crucible and retards melting. The block locates the crucible at the proper height for the hottest reflected heat. If the crucible sticks to the base block, apply fine graphite or silica flour to the top of the block, or wet a piece of corrugated cardboard and drop on the base block just before the crucible is set. If the furnace is cold, use the cardboard dry. The paper will char and form a parting layer between the block and the crucible.

PROTECTION OF FURNACE ELEMENTS:

Proper care should be taken to insure long element life. The E4-0 heating elements are coated with a refractory coating. This coating makes the elements more abrasion resistant plus it acts as an added protection from the corrosive properties inherent in fluxes used in the melt. Avoid over fluxing of metals. Fluxes, and especially those containing acid such as boric acid used when melting gold, destroy the heating elements and the insulation that surrounds them. The elements are covered under warranty for workmanship only.

The use of flux in aluminum is almost never needed if the metal is clean to start with. After the initial charge of aluminum has melted, about 1/3 teaspoon of aluminum cover flux may be added to keep down oxidation. Aluminum scrap or ingot may be added also at this time. The melting of brass or bronze needs a cover flux, but again, it is best to add a small amount of the flux after the initial charge of metal has melted.

The following points should be kept in mind to protect the elements during operation of the furnace:

1. As a Safety Precaution, turn off the power to the elements when charging the crucible or removing the crucible at the end of the melt.

2. Avoid contact with the element walls while inserting or removing the crucible. Scraping walls repeatedly may result in loss of refractory coating and insulation which covers the actual electric element. This could then cause element breakage or electrical shock if the tongs come into contact with the bare element.

3. Periodic inspection should be made of elements to see if the refractory coating is intact. If any areas are showing excessive wear, this coating is available from MIFCO for recoating or spot coating of the element walls.

4. Do Not over fill the crucible. Over-flow of either hot metal or flux directly onto the elements or heat chamber even with the protective coating intact could cause damage.

THE USE AND CARE OF FOUNDRY CRUCIBLES

COMPOSITION - TYPES Of MATERIAL:

Crucibles are manufactured in two basic compositions; the CLAY GRAPHITE-CERAMIC BONDED, AND THE SILICON CARBIDE-CARBON BONDED TYPES. Both types utilize the refractory materials, graphite and silicon, as conductors of heat and for structural strength. Graphite is predominant in the composition of the clay graphite crucible, while silicon carbide predominates in the silicon carbide crucible. Due to its higher heat conductivity and greater strength, the silicon carbide crucible is more popular in industry. The less expensive clay graphite crucible is generally used in the School Shop. Crucible failure in School Shops is generally due to mishandling by inexperienced students, so the benefits of the more expensive silicon carbide crucible would not be realized.

Either type crucible can be used for melting aluminum, brass, or grey iron. However, different metals should not be melted in the same crucible. This practice will cause contamination of each melt and it will be very difficult to get good castings. Different crucibles should be used for each type of metal melted. If grey iron is to be melted in appreciable quantity, a special clay lined silicon carbide crucible is recommended. DO NOT USE JUST "ANY SIZE" CRUCIBLE IN YOUR FURNACE, USE THE SIZE FOR WHICH THE FURNACE WAS DESIGNED.

RECEIVING AND STORAGE:

A great deal of stress has been put on the proper care of graphite crucibles for maximum service life and safety. Several factors are important and should be carefully considered.

DO NOT STORE crucibles as received in their original container. Examine the container, UNPACK CRUCIBLES IMMEDIATELY, and inspect each crucible for cracks or damage. "SOUND" each crucible by tapping lightly with a hammer handle. If cracked, the crucible will have a dull sound. Undamaged crucibles will have a clear ring. If the shipment contains damaged pieces, have the delivering carrier acknowledge the damage on your delivery receipt, or notify the carrier of hidden damage and call for immediate inspection.

After inspecting crucibles, they should be STORED IN A WARM, DRY PLACE. If it is necessary to stock the crucibles in an exposed, unheated location, they should be moved to a warm area for two or three days prior to using. EXCESS MOISTURE SHOULD BE REMOVED PRIOR TO TEMPERING. Some shops use the top of core ovens, or build drying racks near the melting furnaces, for drying. This is an acceptable practice, provided the crucibles are not subjected to a direct furnace exhaust to force the drying. Forced drying usually results in uneven heating and sets up strains which will eventually cause cracking and premature failure.

ANNEALING NEW CRUCIBLES:

All clay graphite crucibles should be properly annealed before being put into production. Annealing relieves all strains set up in the crucible during manufacture. This also DEVELOPS A FULL ELASTIC PROPERTY TO WITHSTAND THERMAL SHOCK during service. The crucible should be dried as outlined previously, and placed in a warm furnace. Adjust the furnace burners at idle, or lowest heat input, for the first ten minutes. Increase burner setting gradually to raise furnace temperature to a red heat. Total heating cycle should cover a period of forty to forty-five minutes. After the crucible has reached a red heat, it can be removed from the furnace, charged with metal, and put into immediate service.

CHARGING THE CRUCIBLE WITH METAL:

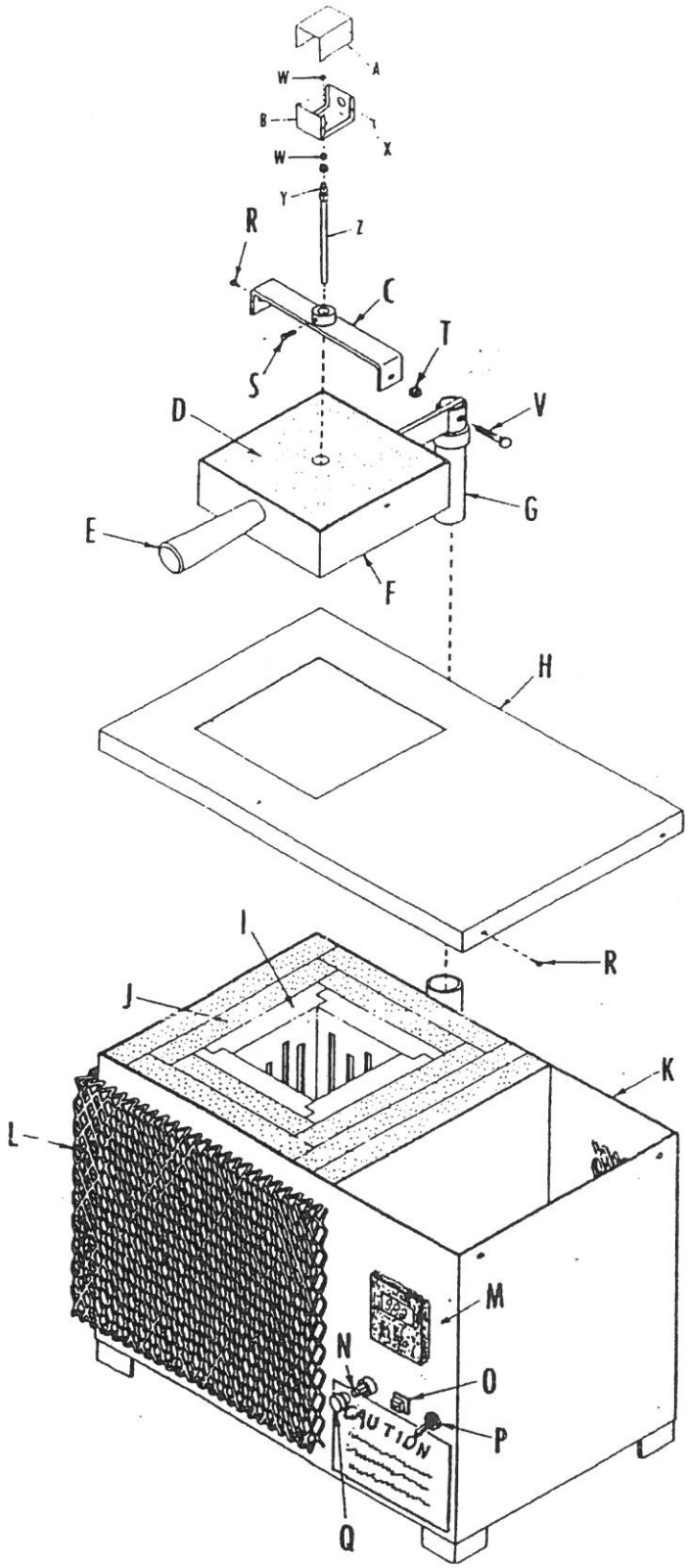
Crucibles are usually charged with metal before they are placed in the furnace chamber. The part of the charge consisting of gates and risers, or of clean scrap of equivalent size, is charged first. Ingots and bars are charged last. Turnings or very light scrap should be added into the crucible after the initial charge has become molten. Otherwise, the turnings and light sections will be attacked by the furnace atmosphere, and will be oxidized excessively before the melting temperature is reached. These oxides and impurities are carried into the casting metal, resulting in porous and unsound castings. Heat is transmitted to the light scrap more rapidly by the molten metal with a minimum of oxidation. ALWAYS BE POSITIVE THAT ANY METAL ADDED TO A MOLTEN BATH IS DRY, otherwise explosion will occur, because of steam generation in the molten bath. Ingots should be thoroughly dry, and added to the molten charge with long handled pick up tongs.

ADDING INGOT OR PIG TO THE CRUCIBLE:

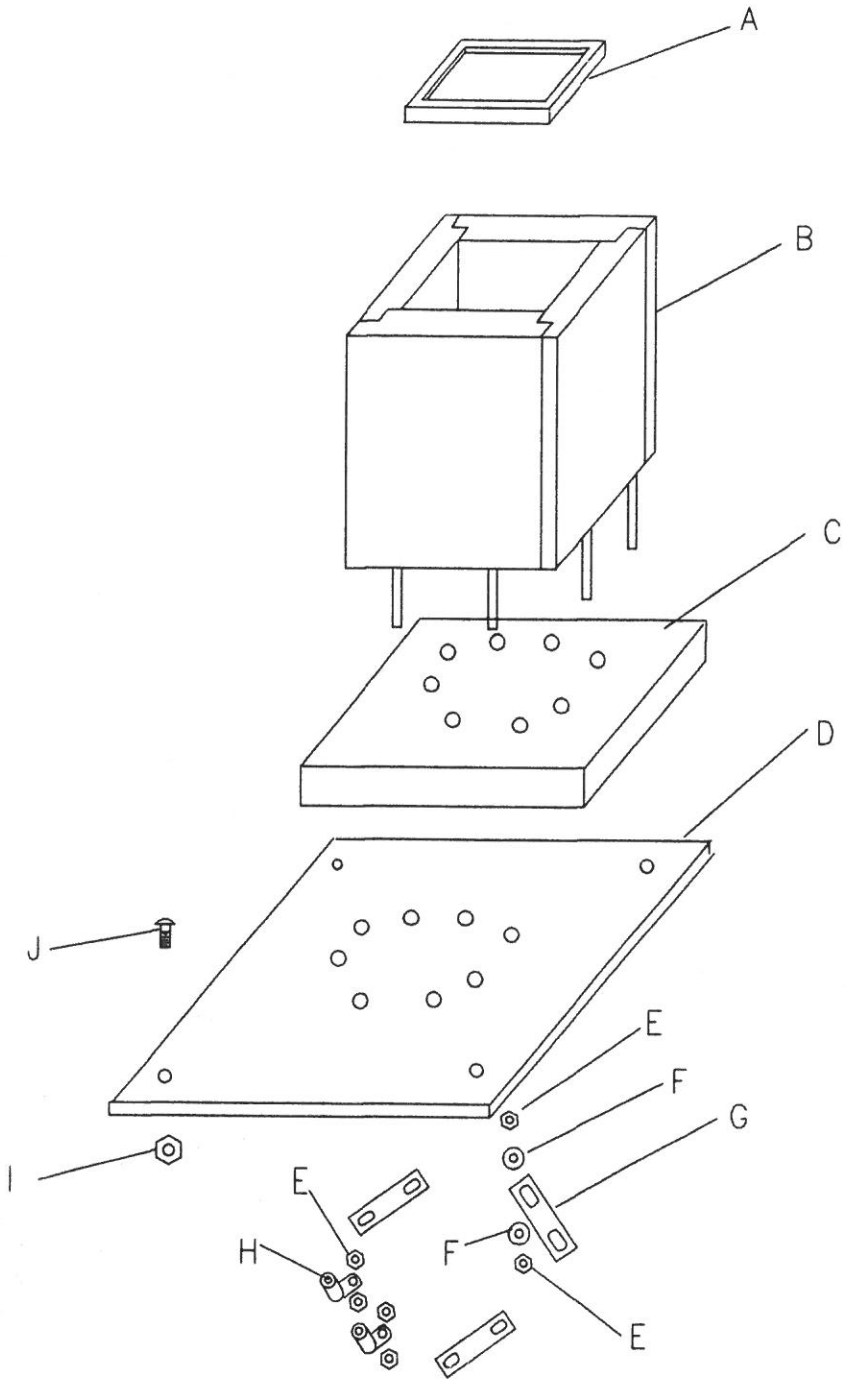
Heavy sections of the charge should not protrude above the lip of the crucible or they will be subjected to furnace atmosphere and excessive oxidation. THE INGOTS AND BARS SHOULD BE CUT TO A LENGTH SHORTER THAN THE INSIDE DIAMETER OF THE CRUCIBLE. This is particularly true when adding bars or pig to crucibles of molten metal. Long pieces, when added, will sink and come to rest in a horizontal position. They then expand before melting and press out the sides of the crucibles, causing cracks and premature failure.

PREHEATING CHARGE METAL:

It is very poor practice to preheat scrap or bars by placing them across the exhaust port in the lid of the furnace. Such practice causes excess oxidation of the metal and will result in poor castings. For the same reason, LONG BARS SHOULD NOT PROTRUDE THROUGH THE EXHAUST PORT INTO THE CRUCIBLE. In extreme cases, some of the bars will reach melting temperature, allowing the molten metal to run down inside the furnace lid and walls. This molten metal is oxidized very rapidly and attacks the refractory lining, causing premature replacement of the lid and lining. INGOT CAN BE PLACED AROUND THE LID, WELL AWAY FROM THE EXHAUST PORT.



		E-4-0 Parts List 08/2019
A		Box Cover (included in "B")
B	003859	Connecting Box
C	405049	Thermocouple Lid Strap
D	008046	Lid Brick
E	040093	Plastic Handle
F	405040	Lid Band
G	405061	Lid Swivel Pipe
H	405030	Furnace Cabinet Cover
I	405009	Heating element (4 required)
J	405050	Heating element Insulation assm (10 pcs plus 405055 bottom terminal board)
K	405010	Furnace Cabinet
L	405032	Heat Guard
M	004085	Controlling Instrument
N	003624	5 amp fuse
O	003906	"Heaters On" light
P	003666	On/Off Switch
Q	003600	Fuse Holder
R	000453	#10-16 x ¾" Self Tapping Screw-(2)
S	000820	¼ x 3/8" Sq Head Set Screw
T	002008	¼-20 Hex Lock Nut
V	000709	¼" x 1 ¼" Hex Head Bolt
W	002007	3/8" Steel Locknut
X	000105	#6 Sheet Metal Screw
Y	003408	3/8" tube x ¼" Pipe Brass Connector
Z	004041	8" Thermocouple
		Not Shown
	008400	2" x 1" Base Block
	003667	Safety Switch
	004509	SCR (optional)



Heating Chamber Components

	Part #	Item Name	No. Pcs.
A	008045	Chamber bottom brick	1
B	405009	Heating panels	4
C	004340	Chamber bottom insulation	1
D	405055	Bottom terminal board	1
E	002008	1/4"-20 terminal nuts	12
F	002111	1/4" flat washers	8
G	405046	Terminal connecting strips	3
H	003691	L70 copper lugs	2
I	002032	10-24 hex nuts	4
J	000406	10-24 x 3/4 RH screws	4

Drawn By Bill Walter

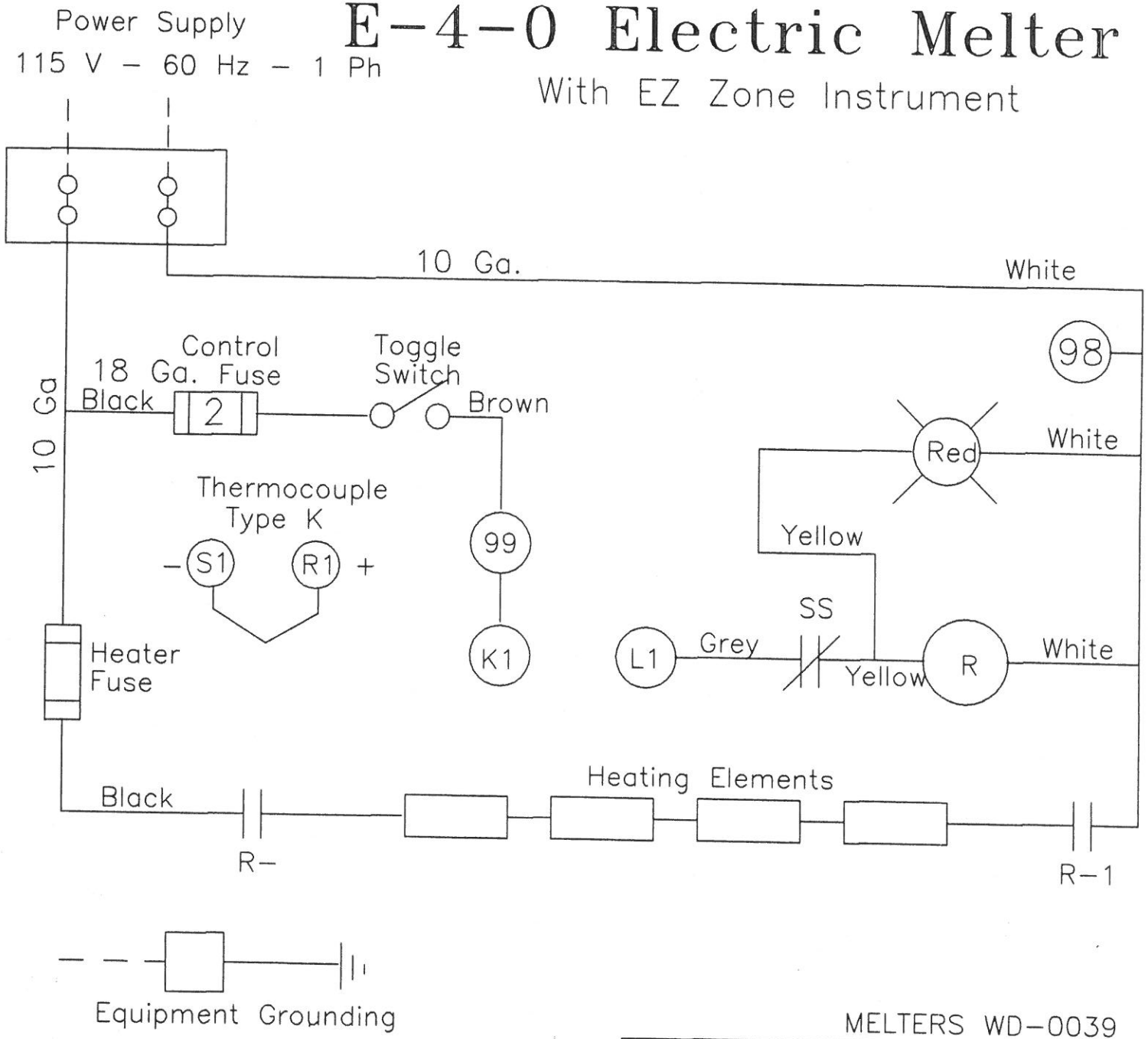
E-4-0 Heat chamber Exploded View

Mat.

MIFCO 2/12/2009

E-4-0 Electric Melter

With EZ Zone Instrument



MELTERS WD–0039

E–4–0 Melter
With Watlow EZ Zone control Inst.
M I E C O Rev. 3/5/2010