



H-1060.2F
Instruction Manual
TEMPERATURE CONTROLLED
DUCTILITY TESTING MACHINE

Manufactured by:

Humboldt Mfg. Co.
7300 West Agatite Avenue
Norridge, Illinois 60706 U.S.A.

Customer Service:

Tel: 1.708.456.6300
Fax: 1.708.456.5412
Email: hmc@ehumboldt.com
USA Toll Free: 1.800.544.7220
Website: www.humboldtmfg.com

Sold and Serviced by:

Humboldt and Authorized Dealers Worldwide

Read This Instruction Manual.

Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION! All internal adjustments and maintenance must be performed by qualified service personnel.

Refer to the serial tag on the back of this manual.

The material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Humboldt Manufacturing Company makes no representations or warranties with respect to this manual. In no event shall Humboldt be held liable for any damages, direct or incidental, arising out of or related to the use of this manual.



Important operating and/or maintenance instructions. Read the accompanying text carefully.

Ce symbole attire l'attention de l'utilisateur sur des instructions importantes de fonctionnement et/ou d'entretien. Il peut être utilisé seul ou avec d'autres symboles de sécurité. Lire attentivement le texte d'accompagnement.

Wichtige Betriebs- und/oder Wartungshinweise. Lesen Sie den nachfolgenden Text sorgfältig.

Importante instrucciones de operacion y/o mantenimiento. Lea el texto acompanante cuidadosamente.



Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.

Ce symbole attire l'attention de l'utilisateur sur des risques électriques potentiels. Seules des personnes qualifiées doivent appliquer les instructions et les procédures associées à ce symbole.

Gefahr von Stromschlägen. Nur qualifizierte Personen sollten die Tätigkeiten ausführen, die mit diesem Symbol bezeichnet sind.

Potencial de riesgos electricos. Solo personas das capacitadas deben ejecutar los procedimientos asociadas con este simbolo.



Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.

Risques potentiels liés à l'énergie. L'équipement en entretien ou en maintenance doit être éteint et mis sous clé pour éviter des blessures possibles.

Geräte, an denen Wartungs- oder Servicearbeiten durchgeführt werden, müssen abgeschaltet und abgeschlossen werden, um Verletzungen zu vermeiden.

El equipo recibiendo servicio o mantenimiento debe ser apagado y asegurado para prevenir danos.

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1. Ductility Testing

1.1 General

The ductility test is a measure of the distance to which a bituminous material will elongate before breaking when two ends of a standard specimen are pulled apart at a uniform rate. The suggested method of test is covered by ASTM D113 and AASHTO T51. In the absence of any specified variations in the test method, the test procedure as outlined in these instructions maybe followed.

2. Installation

2.1 Unpacking

Carefully uncrate and remove all packing from interior, pump motor, and air passages to refrigeration unit compartment.

2.2 Location

Locate the bath on a flat level surface adjacent to the electrical power supply.

2.3 Control

The control is a Watlow 96 with dual digital display. The control panel is mounted on the front of the bath.

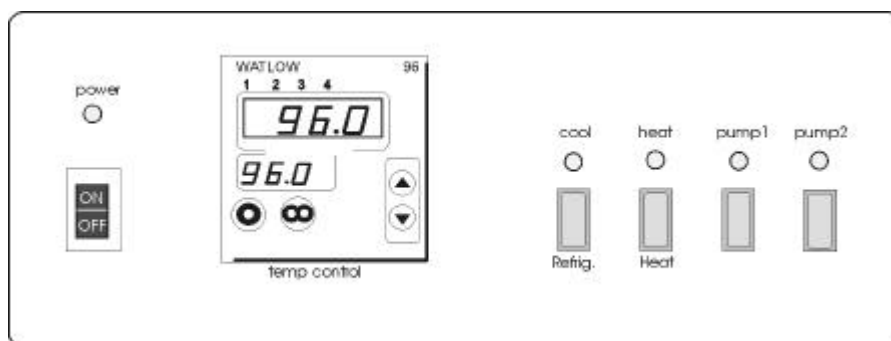


Figure 2-1

2.4 Thermometer

Carefully remove the thermometer from the shipping tube and remove the small foam rubber protector from the tip. Gently insert the tip of the thermometer into the thermometer holder (located top, right side) and slowly press it down until the glass shoulder stop rests on the insert.

2.5 Power Connection

The unit should be operated on a dedicated grounded service. Check the voltage rating on the serial tag of the unit and compare it with the outlet voltage. Then with the power switches (both bath and ductility machine) turned off, plug the line cord into the wall outlet.

Electrical Requirements: 220-230V, 1 Phase, 2 Pole, 3 Wire, 60 Hz, 12.5 FLA.

2.6 Ductility Testing Machine

The unit is shipped complete, ready for operation. The unit should be leveled and mounted on a flat surface. For best results, the unit should be mounted on four rubber pads. The ductility machine is internally wired to the bath and is energized through the power switch located on the ductility machine.

Note: It is normal for the Heat and Cool lights to "flicker" on and off frequently after the bath liquid temperature has stabilized. Because the bath liquid is constantly losing heat, the Heat and Cool lights cycle on and off frequently as the heating or cooling required to maintain the temperature set point of the bath liquid occurs.

3. Control and Indicating Devices

3.1 Power Switch and Indicator Light

The rocker On/Off switch controls the main power supply to the bath. When the switch is on, the Power indicator lights. The power switch is also a circuit breaker that protects the entire unit.

3.2 Heat Switch and Indicator Light

When the heat switch is on, power is supplied to the heater circuit. The Heat indicator lights when the heaters are activated.

3.3 Refrig Switch and Cool Indicator Light

When the Refrig switch is on, power is directed to the refrigeration solenoid valve. The Cool indicator lights when the refrigeration system is activated.



Note: It is normal for the Heat and Cool lights to "flicker" on and off frequently after the bath liquid temperature has stabilized. Because the bath liquid is constantly losing heat, the Heat and Cool lights cycle on and off frequently as the heating or cooling required to maintain the temperature set point of the bath liquid occurs.

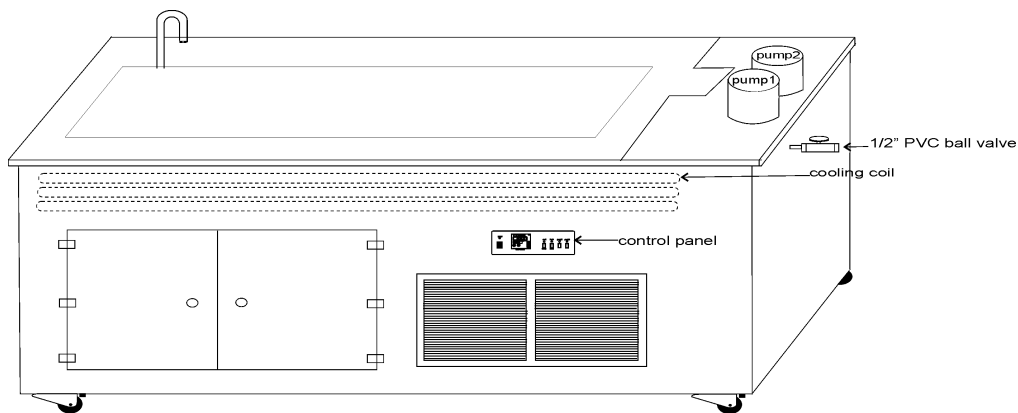


Figure 3-1

3.4 Pump1 Circulation Pump

The single stage circulation pump, located on the top right side of the bath (front pump) provides for circulation. The power switch is located on the control panel.

3.5 Pump2 Fill/Circulation Pump

The dual stage fill pump, located on the top right side of the bath (rear pump) fills the testing tank, and also provides for circulation. The power switch is located on the control panel.

3.6 Flow Control Valve

The flow control valve, located in the top right side bath, controls liquid flow through the ductility machine working area.

3.7 Main Tank Drain Valve

The drain valve, located on the right side of the bath cabinet, is used to drain the liquid from the main tank. The valve does not drain the liquid from the ductility test tank.

3.8 Testing Tank Drain

There is an overflow tube on the right side of the testing tank, underneath the motor support. The overflow tube is a friction fit in the tank fitting. Remove the overflow tube from its recess to drain the testing tank into the main tank.

4. Operation

4.1 Bath Operation



The bath heaters will be severely damaged, or destroyed if the bath is operated without the proper liquid level in the main tank.



Purity of the water used in the bath tank must be within the 50k ohm to 1 meg ohm range to protect, and prolong the life of the stainless steel testing tank. Use of water outside the specified range will decrease the operating life of the unit and may void the warranty.

1. With all switches in the "OFF" position, connect the unit to the proper power outlet.
2. Fill the main tank with liquid to a level approximately one inch below the lip of the ductility machine tank.
3. Open the flow control valve.
4. Turn the main power switch "ON", then turn pump 2 (rear pump) "ON" to fill the testing tank.
5. Allow the testing tank to fill until water runs out the over-flow pipe located under the ductility machine motor support assembly.



Note: The main tank liquid level must be below the testing tank liquid level or the testing tank will fill through the overflow pipe, until the levels in both tanks are equal.

6. Turn on the single stage circulation pump (front pump). With both pumps operational, refill the main tank to one inch below the lip of the testing tank.
7. Check to make sure that the end of the temperature sensor extends at least two (2) inches below the surface of the liquid in the main tank. The sensor sheath is located on the right side and extends into the main tank.

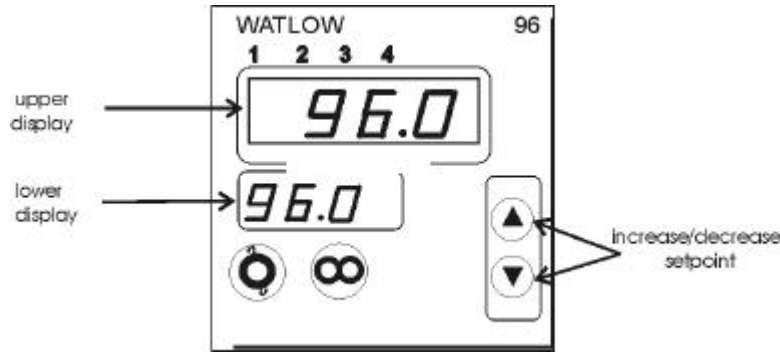


Figure 3-1

8. The Watlow temperature control's upper numerical display shows the actual temperature inside the tank. The lower display shows the temperature set point.
9. The raise or lower the set point, press the up or down arrow. Temperature is set in 1°C increments.
10. Set the Refrigeration and Heat switches to "ON". The bath will automatically achieve and hold the desired operating temperature.
11. Adjust the flow control valve, so as to provide a constant flow through the overflow tube, and back to the main tank.



If the flow is too great, the testing tank will fill and overflow. If the rate is too low, the temperature in the two tanks will not be uniform.

12. Allow the main tank and testing tank temperatures to equalize.
13. Select desired gear speed.
14. When starting the tests using the ductility machine, the water flow control valve may be closed to shut off water circulation in the testing tank and prevent water ripple in that area

4.2 Sample Preparation

- a. Unless otherwise specified the test should be conducted at a temperature of $25 \pm 0.5^{\circ}\text{C}$ ($77 \pm 0.9^{\circ}\text{F}$) and with a speed of 5 cm per minute ± 5.0 percent. When a low-temperature ductility test is desired, the test should be made at a temperature of 4°C (39.2°F) and at a rate of pull of 1 cm per minute.
- b. Assemble the mold on the brass plate. To prevent the material under test from sticking, it is suggested that the surface of the plate and interior surfaces of the sides of the mold be thoroughly amalgamated. Make sure the plate is perfectly flat and level so that bottom surface of the mold will touch it throughout.
- c. Completely melt the bituminous material to be tested until thoroughly fluid by heating it in an oil bath maintained at the minimum temperature needed to properly liquefy the sample, when paving asphalt cements are to be tested, the oil bath should be maintained at a temperature of 150 to 160°C (302 to 320°F).
- d. Strain the melted sample through a No. 50 sieve. After stirring thoroughly, pour into the mold, taking care not to disarrange the parts of the mold. Pour the material back and forth in a thin stream from end to end of the mold until the mold is more than level full.
- e. Allow the mold containing the material to cool to room temperature for a period of 30 to 40 minutes. Then place the mold in the water bath maintained at the specified temperature of test for 30 minutes. Cut off the excess bitumen with a hot straight edged knife or spatula to make the mold level full.
- f. Place the brass plate and mold, with the briquette specimen, in the water bath and keep them at the specified temperature for a period of from 85 to 95 minutes. After the elapsed period of time, remove the briquette from the plate, detach the side pieces, and immediately test the briquette.

4.3 Test Procedure

- a. Fill the trough with water until the level reaches a point where it will cover the test specimen by at least 2.5 cm both above and below.
- b. Bring the water to the desired test temperature. During the test, the water should be kept at the specified temperature within $\pm 0.5^{\circ}\text{C}$ (0.9°F).
- c. To adjust the speed of carriage move knurled knob at the end of the sliding gear all the way in for $\frac{1}{4}$ cm per minute, half way out for 1 cm per minute and all the way out for 5 cm per minute. Be sure to locate positioning lever in the proper slot-this will not only locate, but will also lock the gears in their exact alignment.

- d. Place the specimen in position by setting one end of the specimen mold onto one of the three mounting pins on the end plate. Set the other end of the mold onto the corresponding pin on the movable carriage.
- e. Move the length indicator to the zero position by loosening the adjusting screw.
- f. Measure the distance in centimeters through which the clips have been pulled to produce rupture.
- g. At the completion of the test, return the carriage to the starting position.

If the test material comes in contact with the surface of the water or the bottom of the bath, the test is not considered satisfactory. The specific gravity of the bath may be adjusted by the addition of either methyl alcohol or sodium chloride to prevent the bituminous from coming to the surface of the water or touching the bottom of the bath during the test.

4.4 Test Report

- a. The test is considered normal when the rupture occurs at the point where the thread has practically no cross-sectional area.
- b. The average of three normal tests is reported as the ductility of the sample.

5. Maintenance

5.1 Pumping System

The ductility machine and bath should periodically be flushed clean to prevent clogging of the pumping system. The pump and motor housing are conveniently located on top of the bath for ease in service.

5.2 Refrigeration System

The refrigeration system is below the tank and can be serviced from the right side of the cabinet. The refrigeration system is a sealed unit and should not be disturbed until it is certain that the problem is not in the control panel or accessories.



The refrigeration system must be serviced ONLY by trained refrigeration service personnel using the enclosed schematic diagrams.

5.3 Control Calibration

If it should become necessary to calibrate the controller, perform the following procedure. From the standard operating display (set point in bottom display, actual temperature reading in the upper display):

1. Press and hold simultaneously the infinity and the advance key for 3 - 5 seconds.
2. Press the up or down arrow keys until "LOC" is in the upper display and "Fcty" is in the lower display.
3. Press the advance key.
4. Press the advance key until "CAL" is in the lower display.
5. Press the up or down keys until "chng" is in the upper display and "CAL" is in the lower display.
6. Press the infinity key. The controller will be back to normal display.
7. Press and hold the up and down arrow keys for three seconds (until the display switches modes).
8. Press up or down keys until "USER" is in the upper display and "OPER" is in the lower display.
9. Press the advance key until "CAL1" is in the lower display.
10. Use the up and down keys to adjust offset.
11. Press the infinity key to accept the new value and return to normal display.

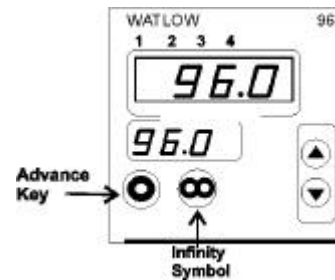


Figure 5-1

5.4 Ductility Machine Maintenance

1. All bearing surfaces should be kept clean and as dry as is practical.
2. The threaded lead screw should be kept clean and lightly greased to ensure proper carriage travel.
3. Keep oil cups on gear shafts filled with clean grease.
4. When unit is not in use, remove line cord plug from outlet to prevent accidental use, misuse, or improper operation of unit.
5. If unit is not to be used for several days, drain, flush with clean water, and wipe down tanks.

5.5 Controller Configuration

The controller has been pre-configured at the factory. Reference copies of the configuration records are included.



The controller should not be re-configured without first consulting the manufacturer.

2956/2957 WATLOW 96 CONFIGURATION RECORD

CUSTOMER: _____
JOB NUMBER: _____
UNT SERIAL NUMBER: _____
CONTROL TYPE: Temperature
PREPARED BY: GLS **DATE** 05/03/03
COMPLETED BY: _____ **DATE** _____

Program Page

See Programming Sheets if required.*

Operations Page

Mon:	Pr2**	-----	Pcnt	-----	rPsP**	-----	E St**	-----
USER:	A-M**	Auto	AtSP	90	E SP**	-----	CAL1	@
	Aut	-----	SP2**	-----	L-r**	-----		
PID1:	Pb1	1	dE1	-----	Ct1	5.0		
	It1	-----	rA1	0.10	hYS1	-----		
	rE1	0.15	brS1	NO	dB1	0		
PID2:	Pb2	1	dE2	-----	Ct2	10.0		
	It2	-----	rA2	5.00	hYS2	-----		
	rE2	0.50	brS2	NO	dB2	0		
ALM:	A2Lo	-----	A3Lo	-10.0	A4Lo	-----		
	A2hi	-----	A3hi	100	A4hi	-----		

Setup Page

InP1:	SEn1	RTD	rL1	-10	dEC1	0		
	In1	DIN	rH1	100	Ftr1	2		
InP2:	In2**	-----	rH2**	-----	E Fn	-----	AbSP*	-----
	rL2**	-----	CAL2**	-----	E cn	-----		
Out1:	Ot 1	HEAT	Prc1	-----				
Out2:	Ot 2	COOL	Ahy2	-----	Sid2	-----		
	Prc2	-----	LAt2	-----	L9c2	-----		
	Aty2	-----	SIL2	-----	Anu2	-----		
Out3:	Ot 3	AL	LAt3	no	L9c3	ALO		
	Aty3	Proc	SIL3	no	Anu3	YES		
	Ahy3	1	Sid3	both				
Out4:	Ot 4	-----	SIL4	-----	Aout	Proc	ACAL	@
	Aty4	-----	Sid4	-----	Prc4	4-20	bAUd	-----
	Ahy4	-----	L9c4	-----	A hi	100	Addr	-----
	LAt4	-----	Anu4	-----	A Lo	-10		
gLbL:	Unit	US	Man**	-----	rP**	OFF	PtyP*	-----
	C-F	C	PLSP	800.0	rP S**	-----		
	Err	nLAT	PL A	100.0	rAtE**	-----		
	FAIL**	bPLS	PL b	100.0	OPLP	OFF		

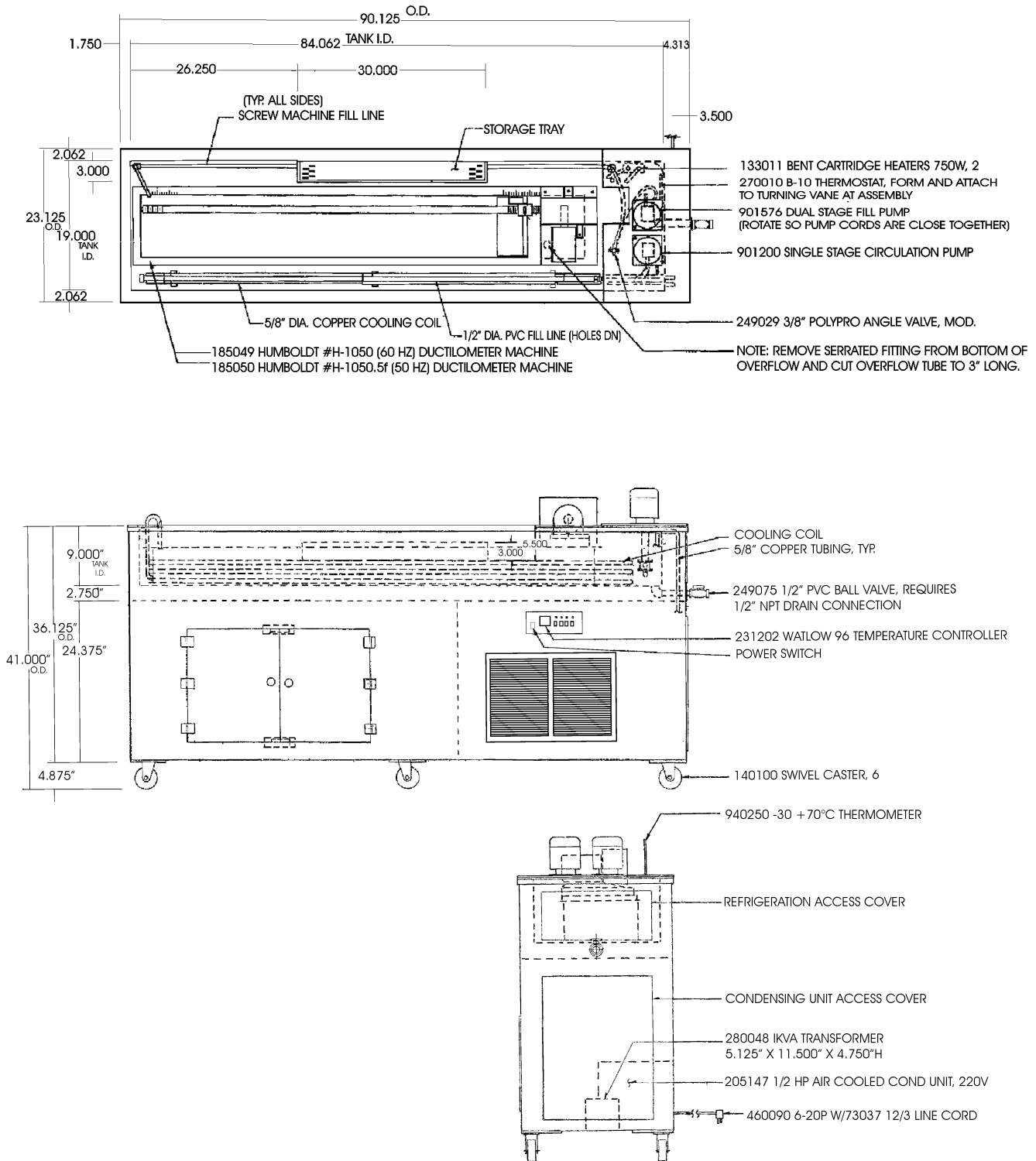
Factory Page

LOC:	SP	CHNG	CuSt**	HIDE	SET	HIDE
	Prog*	-----	OPEr	READ	CAL	READ

* Added if ramping version of controller is selected
 ** Removed if ramping version of controller is selected
 + LOC should be set at 0 until factory testing and calibration is complete.
 @ This is a calibration factor and will vary from unit to unit.

6. Specifications

Description	Ductility Bath
Operating Temperature	32°F to 120°F (0°C to +48.9°C)
Exterior Dimensions	90.1" W x 41.0" H x 23.1" F-B (228.9 cm x 104.1cm x 58.7)
Interior Dimensions	84.1" W x 22.9" H x 48.3" F-B (213.5cm x 58.2 cm x 122.7)
Controller	Watlow 96
Heat Source	Two 750W, 120V 90 deg. flange mount, Incoloy
Refrigeration	1/2 HP air cooled condensing unit, R134A
Electrical	220-230VAC, 1 PH, 2 Pole, 3 Wire, 60Hz, 12.5 FLA
Shipping Weight	700 lbs.

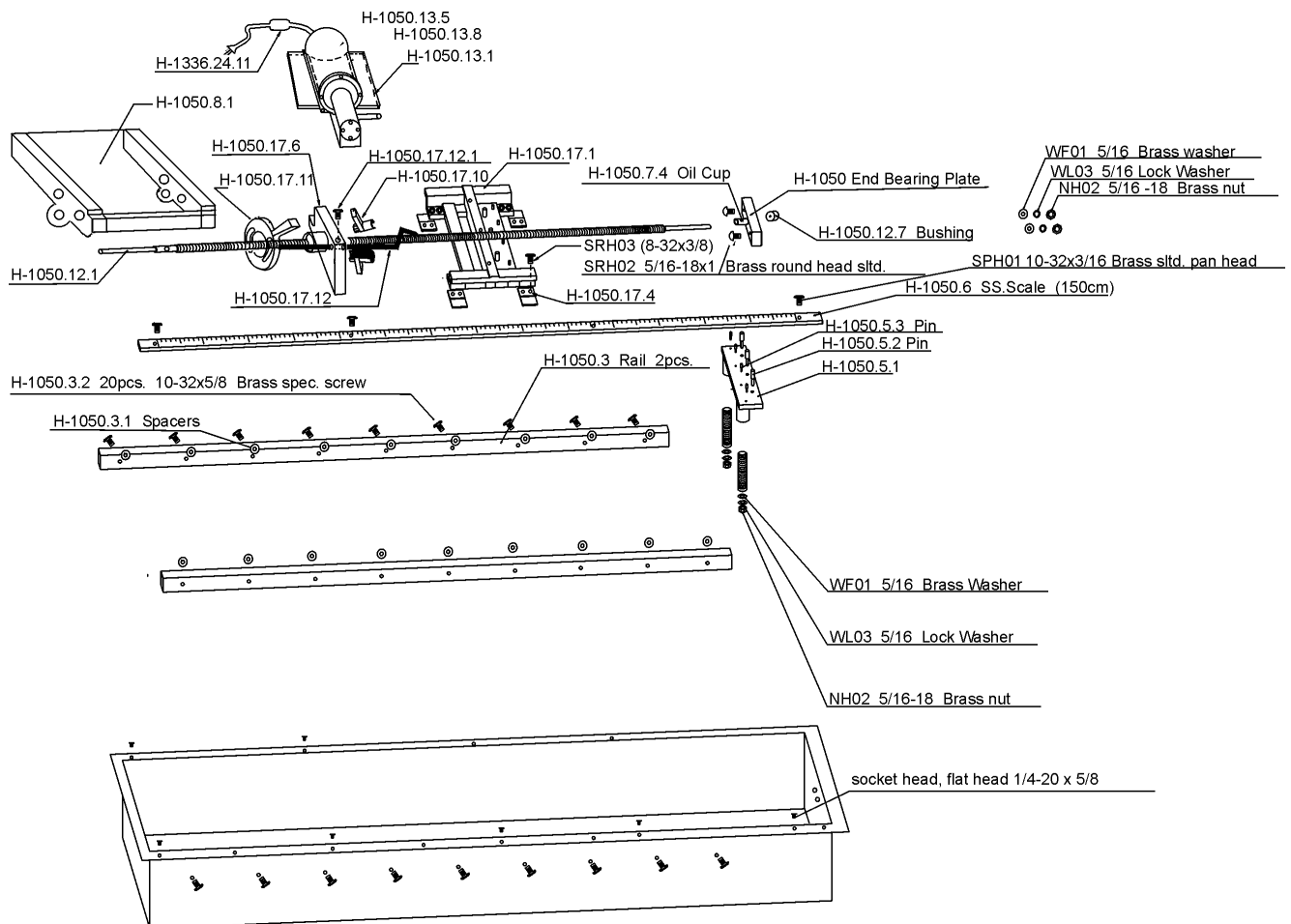


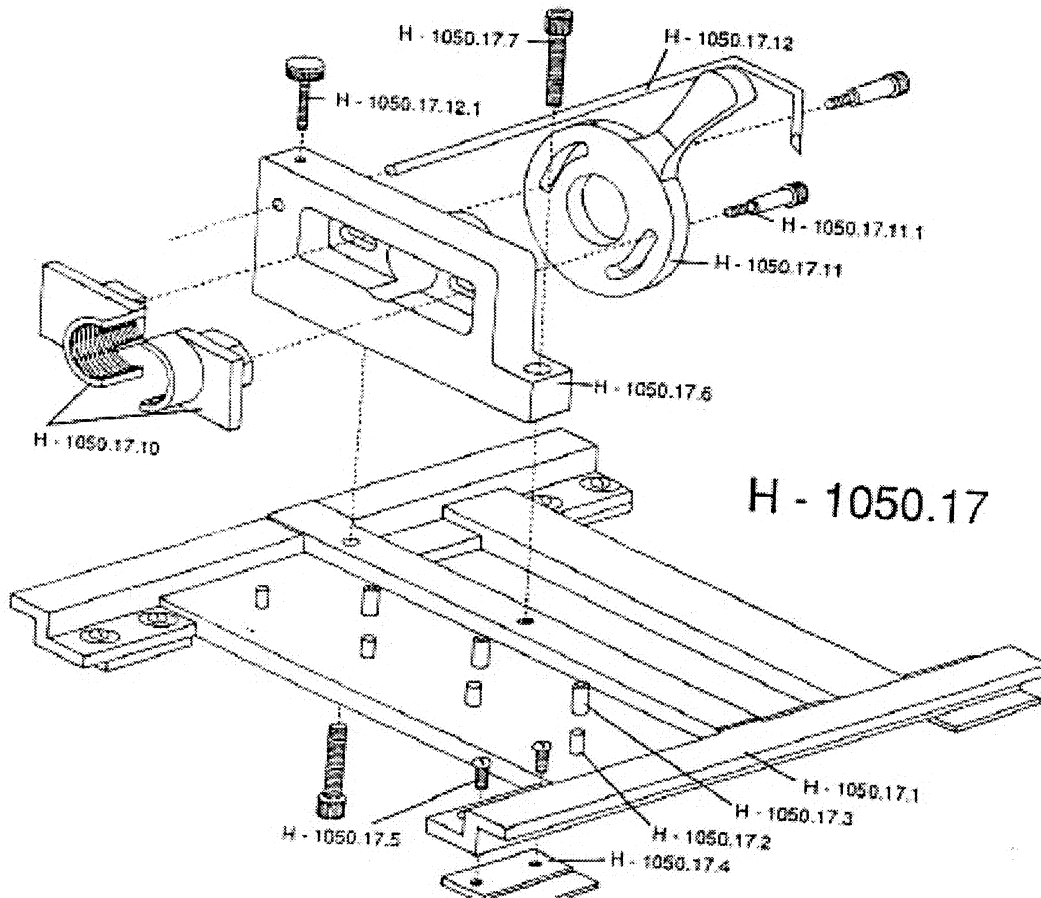
7. Parts List

Bath Parts

Description	Stock #
1/2HP Compressor, R-134A	205147
Dryer 1/4 ODF (Non-CFC)	209006
120V Solenoid Valve	991334
40A, 115V Relay	300175
Watlow 96 Control	231202
-30 TO +70 C Thermometer	940250
Bent Heater 750W	133011
Single Stage Pump	901200
Dual Stage Pump	901576
Thermostat, B-10	270010

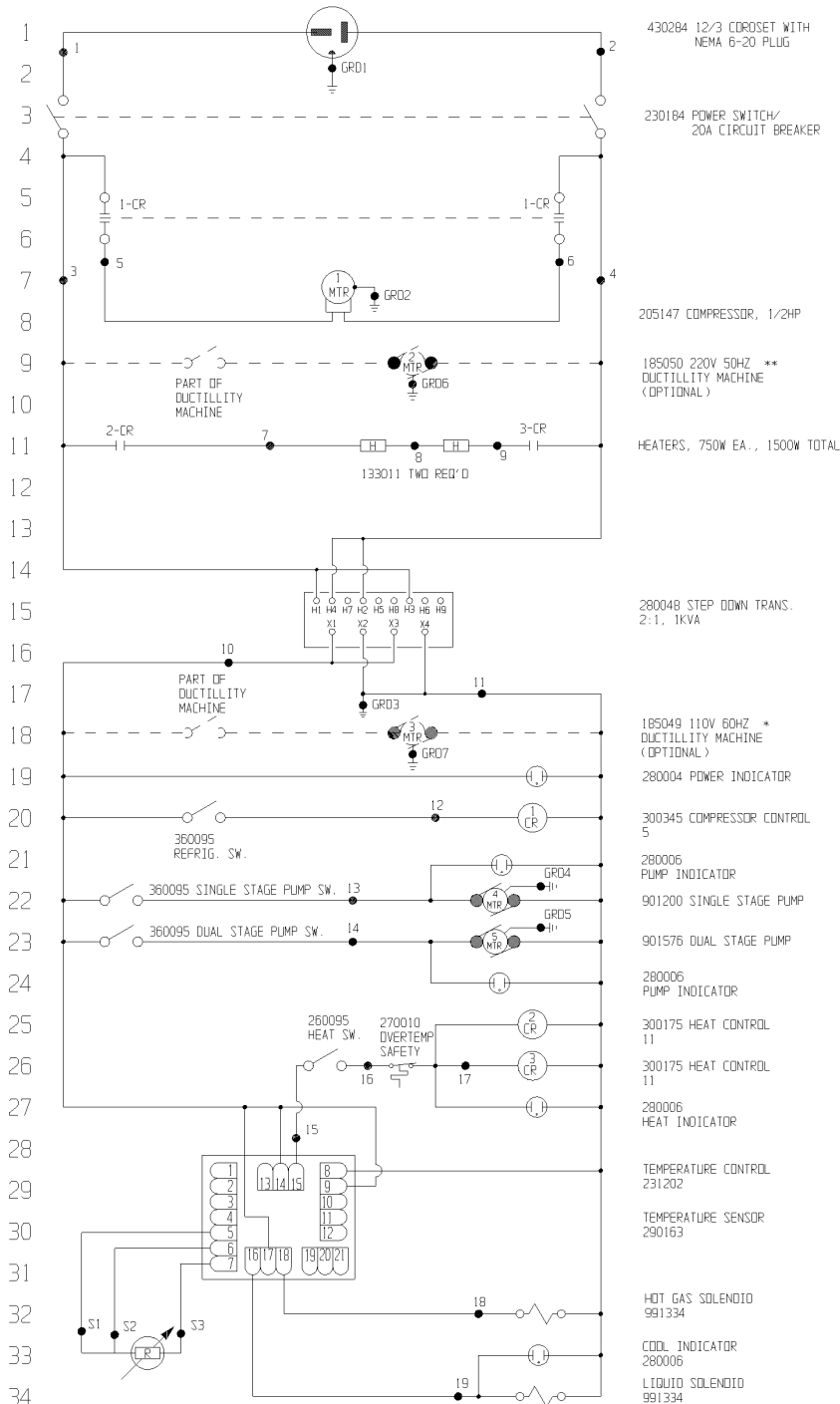
Ductility Machine Parts





H-1050

POWER REQUIREMENTS:
 220-230V, 1PH, 3W, 50/60Hz, 12.5FLA



See Notes: Page 23

See Notes: Page 23

Electrical Schematic
 Model:
 2956/2957
 Polypro Ductility Both
 with/without Machine

2956-70-0-D Rev. 14
 Page 1 of 2

WIRE REFERENCE CHART		
NUMBER	GAUGE	COLOR
1	12	BROWN
2	12	BLUE
3	12	BROWN
4	12	BLUE
5	14	BROWN
6	14	BLUE
7	16	BROWN
8		HEATER
9	16	BLUE
10	14	BLACK
11	14	WHITE
12	16	BLUE
13	16	PURPLE
14	16	ORANGE
15	16	RED
16	16	ORANGE
17	16	RED
18	16	YELLOW
19	16	BLUE
GRD1	12	GREEN
GRD2	14	GREEN
GRD3	14	GREEN
GRD4	16	GREEN
GRD5	16	GREEN
GRD6	14	GREEN
GRD7	12	GREEN
S1	SENSOR	WHITE
S2	SENSOR	RED
S3	SENSOR	BLACK

Notes:

- * 60 Hz (domestic) requires 185049 Ductility Machine = H-1050.2F
 ** 50 Hz (export) requires 185050 Ductility Machine = H-1050.5F
- Model 2957 does not have a Ductility Machine (customer installed)

NOTES:	CUSTOMER APPROVAL/REFERENCE	14	05-07-03	GLS	GLS	AKS	REV COND UNIT NO.	Electrical Schematic Model: 2956/2957 Polypro Ductility Bath with/without Machine 2956-70-0-0 Rev. 14 Page 2 of 2
⊕ Denotes Terminal Strip Connection	APPROVED BY _____	13	02/12/03	NDW	NDW	CAW	ADDED GROUND WIRING	
4-CR Last Relay Number	Ports List Reference Number	12	01/07/03	NDW	NDW	CAW	REV'D LINE CABO & OTHERS	
NA Last Terminal Number	○ Assembly	11	11/20/02	NDW	NDW	CAW	REV'D CONTROLS AND WIRING	
32 Last Wire Number	○ Panel	10	06/19/02	NDW	NDW	CAW	CHG'D COMPRESSOR STK NO.	
	○ Refrigeration	REV ECN NO. DATE BY CAD/APPO		DESCRIPTION OF REVISION		SCALE NONE		
	□ Wiring	DATE 11/26/90		OWN	CBG	CAD	APPO	
		CUSTOMER						
		JOB TITLE 2956/2957 POLYPRO DUCTILITY BATH WITH/WITHOUT MACHINE						
		DWG TITLE ELECTRICAL SCHEMATIC, 220-230V, 50/60Hz						
		LOCATION		JOB NUMBER		DRAWING NUMBER		
		BATHS01				2956-70-0-0		

PRICE REQUIREMENTS: 230-230V, 50/60Hz, 10 2514

10. Warranty

Humboldt Mfg. Co. warrants its products to be free from defects in material or workmanship. The exclusive remedy for this warranty is Humboldt Mfg. Co., factory replacement of any part or parts of such product, for the warranty of this product please refer to Humboldt Mfg. Co. catalog on Terms and Conditions of Sale. The purchaser is responsible for the transportation charges. Humboldt Mfg. Co. shall not be responsible under this warranty if the goods have been improperly maintained, installed, operated or the goods have been altered or modified so as to adversely affect the operation, use performance or durability or so as to change their intended use. The Humboldt Mfg. Co. liability under the warranty contained in this clause is limited to the repair or replacement of defective goods and making good, defective workmanship.



CAUTION: Keep hands, clothing and other objects away from moving parts when the machine is in operation.