



Ductility Testing
Machines

Introduction

Applications

Ductility machines are used to determine the ductility of formed asphalt/cement or semi-solid bitumen by measuring the distance of elongation before reaching the breaking point of a briquet sample, which is pulled apart at a specific speed and temperature. The H-1068 Ductility machines meet ASTM D113, D6084 and AASHTO T51, T301 and T300 when H-1021 is utilized. In the absence of any specified variations in the test method, the test procedure as outlined in these instructions may be followed.

Installation

Humboldt H-1068 Ductility machines are shipped complete, ready for operation. Standard units are supplied for operation on 120V 60Hz or 220V 50Hz operation. Be sure that the power cord is plugged into a properly grounded electrical outlet. For accurate and repeatable operation, the unit should be used on a flat, level surface. For best results the unit should be mounted on four rubber pads.

Note: 220V 50Hz circulators do not ship with a plug on the power cord. If it is necessary to select different power cord, follow guidelines in the circulator user manual.

Description

The water bath trough size is 77" x 9-1/2" x 6-7/8" (L x W x D) and is constructed of polished stainless steel with over flow.

The synchronous, direct-drive motor can be set to maintain a speed of 1/4, 1 or 5 cm per minute. A single, lead screw prevents agitation of water and premature rupture of specimens, traveling pointer indicates exact position of carriage on a linear centimeter scale attached to the front edge of the trough. The trough is double-wall insulated. Gears & other parts are bronze or solid brass for lubrication and to prevent rust.

The temperature range of the circulator is -13°F to 300°F (0°C to 30°C). This permits tests to be run above or below room temperature throughout the entire testing operation. Some of the features of the circulator include solid state control; zero crossover, integrated circuitry with contact thermometer; heater wattage adjustable to 1000W; refrigeration unit is 500W; a three-wire cord is furnished with the ductility machine and constant temperature circulator. Each unit can be operated independently.

The temperature tolerance can be more easily achieved by using the cover H-1068PC, which is available as an accessory.

Standard model operates on 120V, 60Hz, .5F version operates on 220V, 50Hz A.C.

Sample Preparation

Unless otherwise specified the test should be conducted at a temperature of $77^{\circ}\text{F} \pm 0.9^{\circ}\text{F}$ ($25^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$), and a speed of 5 cm per minute \pm 5.0 percent. When a low-temperature ductility test is desired, the test should be run at a temperature of 39.2°F (4°C), and at a rate of pull of 1 cm per minute.

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 the bottom surface of the mold will touch it throughout.

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 302°F to 320°F (150°C to 160°C).

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.

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. 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.

Test Procedure

Fill the 20 gallon capacity 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.

Bring the water to the desired test temperature. During the test the water should be kept at the specified temperature within $\pm 0.9^{\circ}\text{F}$ ($\pm 0.5^{\circ}\text{C}$).

To adjust the speed of the carriage, move the knurled knob at the end of the sliding gear all the way in for 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 the positioning lever in the proper slot. This will not only locate, but will also lock the gears in their exact alignment.

Place the specimen in position by setting one end of the specimen mold into one of the three mounting pins on the end plate. Set the other end of the mold into the corresponding pin on the movable carriage.

Move the length indicator to the zero position on the scale located on the upper side of the tank by loosening the adjusting screw. The length indicator will then read the distance the specimen has been pulled apart in centimeters.

At the completion of the test return the carriage to the starting position.

Note: 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 sample from coming to the surface of the water or touching the bottom of the bath during the test.

Operating Instructions

The Temperature Controlled Ductility Machine has a separate thermostatically controlled constant temperature circulator with recommended fluids circulating through finned tubes in the trough. Recommended circulator fluids are 50/50 filtered or distilled water and glycol to maintain a constant temperature of within $\pm 0.9^{\circ}\text{F}$ (0.5°C).

Test Report

The test is considered normal when the rupture occurs at the point where the thread has practically no cross-sectional area.

The average of three normal tests is reported as the ductility of the sample.

Maintenance

All bearing surfaces should be kept clean.

Threaded lead screw should be kept clean and properly greased to insure proper carriage level travel.

When not in use, remove line cord from the outlet to prevent misuse or improper handling.

Accessories

Ductility Briquet Mold— H-1030

Mold for making test briquets for use with any ductility testing machine. H-1030 Briquet Mold has straight sides for use in forced tests. Requires H-1090 or H-1090.3 base plates. Four accurately machined interlocking brass segments are interchangeable with same parts from different molds; no parts identification marks are needed for matching. End pieces, designed to hold specimens being elongated, are provided with mounting holes. Meets ASTM D5892, D6084, AASHTO T51.

Ductility Briquet Mold— H-1032

Mold for making test briquets to meet AASHTO T301

Ductility Briquet Mold— H-1080

Same as above, but mold has angled sides for use in standard test. Meets ASTM D113

Base Plate— H-1090

Brass base plate for single mold. Flat surface provides uniform contact with bottom surfaces mold. 5-1/2" x 2" x 1/8"

Base Plate, Triple Mold— H-1090.3

Brass base plate for triple mold. Flat surface provides uniform contact with bottom surfaces mold. 5-1/2" x 8" x 1/8"



Force Determination Adapter— H-1021

Force Determination Adapter, 220V, 50/60Hz— H-1021.4F

Provides precise tensile strength measurement of any material, preparation, procedure or type of test to an accuracy of 0.01 lbs. Attaches over existing pin in ductilometer without tools or machine modification, eliminating need for dedicated equipment for standard and force ductility testing. Stainless steel unit has spring-loaded movable platform to which sample is attached and stationary L-shaped base that incorporates LVDT sensor. LVDT can accommodate two adapters simultaneously. Electric components are located out of the water bath. Digital display is calibrated in pounds. Includes power supply to serve LVDT, digital display, calibration stand to ensure consistent results, one 4-lb. and five 5-lb. slotted weights and standard 0-2 VDC analog output; 60ma DC power supply provides constant voltage excitation with adjustable voltage. Analog output provides easy interface with chart recorder, computer or other readout devices via RS232 port. H-1030 mold is recommended for use with this equipment. Adapter overall dimension: 6" x 5-3/8" x 1-3/4". Shipping wt. 20 lbs. (9kg)



H-1021

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.

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