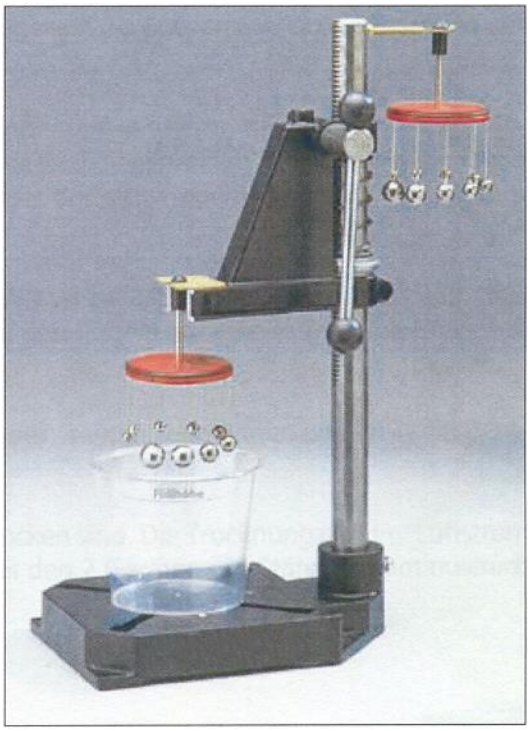
TESTING Bluhm & Feuerherdt GmbH
Manufacture and sale of equipment
for the testing of construction material

Motzener Strasse 26b
DE- 12277 Berlin, Germany
Tel. +49(0)30/710 96 450
Fax +49(0)30/710 96 45 98
www.testing.de

Operating Manual

Ball Harp
In accordance with DIN 4126



Importance of this Operating Manual:

Please read this Operating Manual entirely and become acquainted with its contents – before you place this device into operation.

Contents: **Page no.:**

1. Basic instructions 3
1.1 Purpose for which this system has been designed 3
1.2 Guarantee 3
1.3 Acceptance of the product and transport 4
1.4 Measuring principle 4
1.5 Equipment included in the delivery 5
1.6 Putting the ball harps together 5
2. Instructions for use of the ball harps 6
3. After-sales service 7
3.1 Date of issue of this Operating Manual 7
3.2 Copyright 7
3.3 Contact for help and spare parts 7

Attachments to this manual:

- Tables to determine the liquid limit. **Important**: Please note the serial numbers of these tables. Each table is valid only for the set of balls to which it belongs.

1. Basic instructions

1.1 Purpose for which this system has been designed

This Operating Manual contains the information required for operation of the products described here, for the purpose for which they have been designed. This Operating Manual is intended to be used only by technically qualified staff.

The User must by all means observe the requirements and limit values, as well as all safety instructions, given in this Operating Manual. Any use of this device not in conformity with these stipulations shall be considered to be in violation of the use for which this system was intended. If this device must be operated under special conditions, or with special modes of operation, then this shall be authorized only after consultation with the Manufacturer, and after obtaining his prior and express approval.

The operator immerses 10 glass or steel balls with various diameters simultaneously in the suspension. For any one suspension, with its own density, a different critical effective liquid limit will apply to each of these balls. For each of these limits, the respective ball will float in the liquid.

CAUTION 	The instructions given in this Operating Manual apply only for the correct application on the machine. In order to correctly conduct tests, the User and Operator must observe the specific standards that apply for the testing being conducted.

1.2 Guarantee

In all cases involving this system, the guarantee is based on our **General Terms of Sale and Delivery**.

The Manufacturer guarantees that this Operating Manual was prepared in conformity with the technical and functional parameters of the product as delivered.

The Manufacturer reserves the right to add supplementary information to this Operating Manual.

The Manufacturer grants the legally stipulated guarantee. This guarantee does not cover wear parts.

The Manufacturer guarantees trouble-free operation of this device only if the User properly follows the instructions in this Operating Manual, and only if the User employs this device in accordance with its intended use.

The Manufacturer may not be held liable for any damages that arise from employment of this device that not in accordance with its intended use, or that arise from the User's failure to follow the instructions and stipulations contained in this Operating Manual.

The User shall not be entitled to lodge guarantee claims against the manufacturer in the event that changes have been made with respect to the structural systems or to the functions of the device without the written consent of the Manufacturer.

Any violation of the stipulations contained in the above can be punished in a court of law.

1.3 Acceptance of the product and transport

When accepting delivery of the product, first inspect it for its outer, visible condition. If this inspection is satisfactory, the machine may be accepted from the forwarding agent (package service or courier, etc.).

If you have no complaint or transport damage to report, then use the bill of delivery to confirm that the delivery is full and complete.

If you assume or suspect transport damage, or if transport damage becomes apparent only after the system has been accepted, then immediately make a report of the conditions as they exist, with an exact description of the extent of the damage. Immediately send us this report by fax. You should make absolutely no modifications to the delivered system.

On the basis of this report, we will take action as follows:

- Deliver spare parts to you, or
- Send a specialized fitter/installer to your plant, or
- Ask that you return the machine to us for repair.

1.4 Measuring principle

When operating a ball harp, the user suspends ten glass or steel balls, all with different diameters, and all connected together, into the suspension being tested. For each suspension, with its own density, each of these balls will have its own critical, effective liquid limit: this is the point at which the ball will remain floating on the surface of the suspension. If the critical eff τ_F of a ball is less than the critical eff τ_F of the suspension, then the ball will float on top of the suspension. If the critical eff τ_F of a ball is greater than the critical eff τ_F of the suspension, then the ball will sink below the surface. The balls are numbered consecutively, from 1 to 10, in the order of their increasing critical effective liquid limit. The effective liquid limit of the suspension therefore lies between the critical eff τ_F of the ball with the largest number that is still floating on the suspension, and the eff τ_F of the ball with the smallest number that has sunk below the surface of the suspension. The enclosed tables for densities between τ_F = 1.02 and 1.70 g/cm^3 give the critical effective limits of all the balls.

1.5 Equipment included in the delivery

- A stand with two (2) ball harp devices
- Two (2) transparent sample containers, with content of approx. 1 litre. One of the containers is used for the suspension being tested, and the other is filled with clean water.

The user must supply the following equipment for use with the ball harp:

- A cook's whisk to stir the suspension
- A table fan.

Dimensions of the stand of the ball harp:

Length	approx. 280 mm
Width	approx. 185 mm
Height	approx. 505 mm
Weight	approx. 5.0 kg

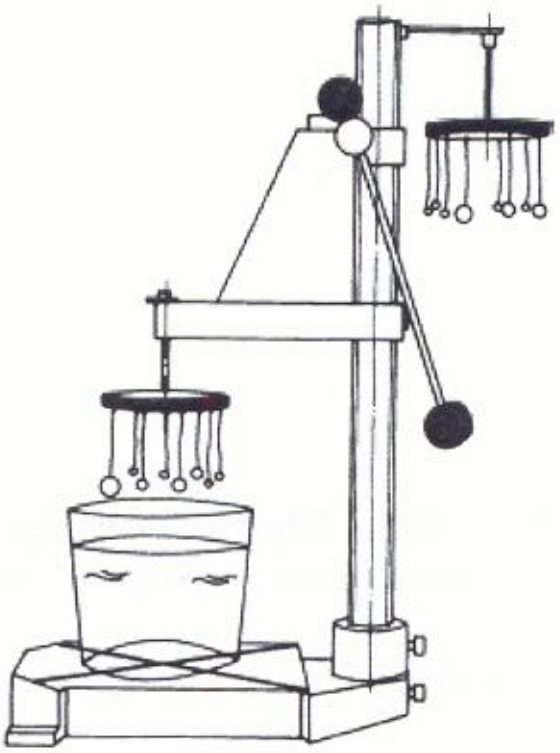
1.6 Putting the ball harps together

Installing the holding fork

- Insert the holding fork from the top down into the guide column, and screw it down there. Lock it with the nut.

Putting the ball harps together

- Remove the rubber ring for the balls from the harp unit and hang the balls no. 1 to 10 into the ring (identical to the designation on the packaging)
- Snap the rubber ring back into place in the slot.
- Hang the harps in place (see sketch).



2. Instructions for use of the ball harps

1. Fill the transparent vessel (1-litre container) up to the red mark with the suspension to be tested. Use the cook's whisk to stir the suspension for about one minute to dissolve the thixotropic solidification.
2. Place the vessel onto the base place of the stand, and press the lever slowly downward until it reaches its limit. This will lower the balls hanging on the ring into the suspension. Some balls will sink into the suspension, and some will remain floating on its surface.
3. The lines on which the balls are hanging will be straight for the balls that sink into the test suspension. The lines of the balls that float on the surface will be loose and bent. The individual balls are numbered from 1 to 10 on the ring. Note the smallest designation number of the balls that have sunk into the test suspension (their supporting lines will be straight).
4. Lift the ball harp out of the test suspension and clean the balls by immersing them into a vessel filled with clear water. Turn the harp back and forth around the axis of the harp to effectively clean the balls. Then place the unit with the balls onto a surface that can absorb the water from the balls.
5. Hang the cleaned ball harp into the fork on the rear side of the stand. Dry off the ball harp by directing a fan, with cold air, onto the balls.
6. The ball harp can be used again as soon as the balls are dry. The drying time in the air flow of the fan is about the same as the measuring time. As a result, the user can continually work with the two harps, one after the other.

Attachments to this manual:

- Tables to determine the liquid limit. **Important**: Please note the serial numbers of these tables. Each table is valid only for the set of balls to which it belongs.

3. After-sales service

A great deal of care has been taken to ensure that this Operating Manual is correct. We cannot, however, guarantee that it is without mistakes or errors, or that all information contained herein will continue to remain valid in the event of technical changes.

3.1 Date of issue of this Operating Manual

Issue no. 5
June 2007

3.2 Copyright

The copyright to this Operating Manual is held by the following company:

TESTING Bluhm & Feuerherdt GmbH

This Operating Manual is intended only for the operator, user, and his staff. The information in this Operating Manual may not be:

- Reproduced, or
- Distributed, or
- Provided to any other persons.

Any person acting in violation of the above stipulations may be prosecuted before a court of law.

3.3 Contact for help and spare parts

If you have any technical questions, or if you require spare parts, please get directly in touch with the following address:

TESTING Bluhm & Feuerherdt GmbH
Motzener Strasse 26b
DE 12277 Berlin, Germany

Tel.: 049 30 710 96 45 0
Fax: 049 30 710 96 45 98
info@testing.de
www.testing.de