

**Air Entrainment Meter Type B
CN030**

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User Guide
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1. Description of the meter

In order to achieve a better workability for concrete mixtures, or to increase concrete durability with regard to the effects of frost and thawing conditions, air-entraining agents are added to the concrete during its preparation. The optimum in technological improvements to be obtained for the concrete mixture is hereby achieved with approx. 3...5 % air in concrete volume.

Tests conducted in conjunction herewith are therefore of primary importance in obtaining uniformity of the proportion of air in concrete recognised as optimum in a particular case.

Air entrainment meters are employed to supervise the effects of air entraining agents in a concrete mixture. This test device operates in accordance with the principle of Boyle-Mariott's Law. In detail, the test device is designed as follows:



A pressure vessel (test pot) with contents of 8 litres is closed pressure-tight by means of a cover with four quick-operating clamps. The compressed-air chamber built in to this cover is connected together with a hand-operated air pump (red spherical button) to provide the necessary pressure, as well as with a push-button valve TEST (green cap) to function as relief valve. The air is released via a push-button valve CORRECTION (black cap). Two ball cocks screwed into the cover serve to allow refill of water and to vent the pressure vessel. The pressure chamber and the pressure vessel are connected to the manometer, which directly indicates the air entrainment in per cent by means of a special scale. The manometer, the hand-operated air pump, and the push-button valve are protected against soiling and damage by a special safety cap.

The mounting plate can be assembled and disassembled together with the built-in hand-operated air pump, the built-in push-button valve TEST, and the built-in push-button valve CORRECTION.

2. Conduct of the test

A sample of fresh concrete is placed into the pressure vessel (provided with a filling hopper) and is completely compacted there - but *not* with an internal vibrator. After compaction, the concrete must be struck off level with the top of the vessel. Determination is then made of the weight of the vessel contents. Now wipe the vessel top off clean and set the cover in place. Now clamp down the cover by fastening down the quick-operating clamps, taking two opposite at a time. In an unclamped position but with the clamp hooks already fastened to the lower part, the snaps (handles) of the clamps should form an angle of approx. 45° with the vertical wall of the pot. If the pot cannot closed air-tight, then the cover is usually not placed on straight or the sealing surface is not clean.

IMPORTANT: To avoid damage to the clamps, do *not* lift the snaps of the clamps more than approx. 45° away from the pot wall. See special sticker for illustration.

Both ball cocks on the cover must remain open here. Now fill water into the device through one of the ball cocks from a squeeze bottle until all air still contained in the vessel is evacuated through the opposite cock.

Now operate the hand pump (red spherical button) until the black manometer indicator reaches the red marker indicator (initial pressure). If the pressure slightly decreases after a few seconds, correct the manometer reading by pumping again until the black manometer indicator once again reaches the red marker.

IMPORTANT: Do never screw the red knob of the hand pump into the thread during the test. That is only to secure the pump rod from moving during the transportation of the Air entrainment meter.

If the black indicator goes past the red marker, the black manometer pointer can be corrected by carefully tapping on the CORRECTION button (black cap) until exact adjustment is made. Once both ball cocks are closed, push the TEST button (green cap) until pressure compensation is achieved. Tap lightly with a finger on the manometer until the pointer comes to rest here. The per cent of air entrainment of the concrete can then be directly read off.

IMPORTANT: After completion of the test, first slowly open both of the ball cocks, and then carefully press the TEST button until the manometer pointer has reached its initial position. If used properly, the Air entrainment meter requires no special maintenance. It is important, however, that the cover and the pressure vessel are carefully cleaned out and dried, to include the O-Ring seal, *after every test*.

3. Calibration of the meter

All new Air entrainment meters, or meters repaired by us, are always calibrated before being delivered.

From time to time, the accuracy of the meter reading must be checked.

a) *Determination of the initial/starting pressure*

The initial pressure is the pressure up to which the meter must be pumped before the entrainment can be read off. On the manometer, this pressure is marked by a red line just to the left of the zero point.

To set this red marker at the correct point, first make a preliminary (trial) setting of the red line by setting it on the second red graduation to the left of the zero point. Then carry out the following individual steps to make sure that the red marker has been set at the correct point:

- Fill the pressure vessel (test pot) with water.
- Take the cover (top part of the device) and insert the short tube (belonging to the calibration set), from the bottom, into the hole for the left ball cock.
- Place the cover onto the test pot and close it air-tight by fastening down the quick-operating clamps, taking two opposite at a time.
- Open both of the ball cocks. Tilt the meter to the side so that the cock on the right points straight up. Fill water through the left cock into the test pot by means of a squeeze bottle, until the water has forced out all the air still remaining in the vessel through the cock on the opposite side of the meter. Continue to fill until the water which flows out of the right cock contains no more air bubbles.
- Close both of the ball cocks.
- Use the hand pump to pump air into the meter until the black manometer pointer is *exactly* over the red marker. Tap lightly with a finger on the pressure gauge until the pointer comes to rest.
- Push the TEST button (green cap) to admit the air into the pressure vessel until pressure compensation is achieved. Tap lightly with a finger on the manometer until the pointer no longer moves.

Three results are now possible:

- 1) The black manometer pointer goes to zero. Then the trial position of the red marker was correct.
- 2) The black indicator goes past zero (for example, to 0.1 or 0.2%). This means that the red marker must be moved to the left by simply pushing it (after the manometer cap has been removed).
- 3) The black indicator does not reach the zero. This means that the red marker must be moved toward zero by simply pushing it (after the manometer cap has been removed).

If the manometer pointer therefore does *not* move exactly to zero, then you must shift the red marker as explained in steps 2 and 3 above. Then continue with the following steps:

- Slowly open the right ball cock to let the pressure out of the test pot.
- Use a squeeze bottle to fill water into the left ball cock again, until the water has forced out all the air still remaining in the test pot through the cock on the opposite side of the meter. When filling this water, tilt the meter to the side so that the cock on the right points straight up. Fill until the water which flows out of the right cock no longer contains air bubbles.
- Close both of the ball cocks.
- Pump up the meter until the black manometer pointer is *exactly* over the *new setting* of the red marker. Tap lightly with a finger on the pressure gauge until the pointer comes to rest.
- Push the TEST button (green cap).

If the manometer pointer does *not* move exactly to zero, then the red marker must be shifted in the direction described in steps 2 and 3 above, and the steps given must be repeated.

b) Calibration

To calibrate the meter, fill the test pot with water and remove exactly 400 cm³ of this water. This amount corresponds to 5% of the total contents of 8 liter (8000 cm³) and must therefore show up as a reading of 5% on the scale.

First make sure that the correct initial pressure has been determined through the steps given in section a), and that the black manometer pointer is exactly at zero.

Now perform the following steps:

- * Screw the long tube (belonging to the calibration set) onto the threads of the left ball cock, at whose underside the short tube protrudes into the pot.
- * Hold the long tube into a graduated laboratory measuring cylinder with a volume of at least 400 cm³.
- * Carefully open the left ball cock and allow the water to flow into the graduated cylinder.
If the water stops flowing before a full 400 cm³ has flowed out, close the cock and open the test valve by pushing the TEST button. If required, operate the hand pump once more.
- * Then open the left ball cock once more to allow water to flow into the graduated cylinder again.
- * Repeat this procedure until exactly 400 cm³ has flowed into the measuring cylinder.
- * After this amount of water has been removed, slowly open the right ball cock to release the pressure from the test pot.
- * Close both of the ball cocks.

- * Use the hand pump to pump air into the meter until the black manometer pointer is *exactly* over the red marker. Tap lightly with a finger on the pressure gauge until the pointer comes to rest.
- * Push the TEST valve to admit the air into the pressure vessel until pressure compensation is achieved. Tap lightly with a finger on the manometer until the pointer no longer moves.

→ Now, the Air entrainment meter can be checked for calibration accuracy. Since you have removed 5% of the water (400 cm³) from the test pot, the manometer reading should be exactly 5%!

→ *If the reading is not 5%, send the Air entrainment meter back to the manufacturer for checking.*

After making the reading, slowly open both ball cocks to release the pressure from the test pot.

Carefully open the test valve by pushing the TEST button. The manometer pointer will return to its starting position.

4. Cleaning the meter

The Air entrainment meter is a testing instrument and not a submarine. Please do not completely submerge the top part in water but clean it with a damp sponge. The water could penetrate the pump from the top, likewise between manometer and cap as well as between front plate and cap.

Brush oil on chamber cover and pot periodically.

5. Spare parts for CN030

- 1 ea. Manometer
- 1 ea. Hand pump, complete
- 1 ea. TEST push-button
- 1 ea. CORRECTION push-button
- 1 ea. Ball cock, right
- 1 ea. Ball cock, left
- 4 ea. Quick-operating clamps
- 1 ea. Set of O-Ring seals
- 1 ea. Calibration set

6. General remarks

- In an unclamped position but with the clamp hooks already fastened to the lower part, the handles of the clamps should form an angle of approx. 45° with the vertical wall of the pot.
- Distinguish between the following: the left- and right-hand ball cock when facing the meter. Spare parts must also be ordered as such.
- Leaks are often due to damaged hoses; so do not damage hoses.
- The parts are made of brass and the threads can strip if treated improperly. If treated well the meter needs practically no maintenance.
- Cleanliness:
Always brush oil on chamber cover and pot so that the concrete does not stick.