OPERATING INSTRUCTIONS

Precision Air Entrainment Meter, Type B

34-3265

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1 Introduction

1.1 Controlling entrained air in concrete is one of the biggest concerns in modern concrete manufacturing. The 34-3265 Precision Air Entrainment Meter offers the concrete engineer or technician the finest instrument available today for testing and designing concrete mixes. This superior meter can precisely determine the amount of air entrained in concrete by simplifying the application of Boyle's law. The direct reading requires no adjustment for barometric pressure changes, and one person can quickly and easily conduct the test in the field.

1.2 The 34-3265's container is rigid, with a capacity of 0.250 cubic feet (7.079 litres), providing a reliable device for precisely performing the unit weight test.

1.3 The meter's multi-range feature accurately measures entrained air to 22%. This feature, exclusive to the 34-3265, allows the user to easily and accurately measure entrained air in most types of concrete.

1.4 The instrument is constructed of the finest materials available for superior durability and effective operation. It is supplied complete with striking off bar and syringe in a rugged carrying case (7) ready for operation.

2 User Related Documentation

2.1 These operating instructions do not contain all the necessary information on the specific test procedures to measure entrained air in concrete. Please refer to BS 1881-106, EN12350-7, ASTM C-231, or AASHTO T-152 for complete information of individual standards.

3 Using the Meter (see figure 1)

3.1 Remove the lid and place the concrete to be tested in three equal layers in the material container (1). Rod each layer 25 times using a tamping rod. Remove excess concrete by sliding the striking bar in a sawing motion across the top flange until the container is full, but level.

3.2 Remove all sand and mortar from both the lid edge (2) and the rim of the container (1). Ensure that the underside of the lid is free of any material, such as sand and grit, which may damage the seal and clamps.

3.3 Open both valves (3 and 4) found on top of the lid.

3.4 Carefully position the lid (2) on the material container. Close the four toggle clamps (5), making sure the handle is flush against the side of the container.

CAUTION: Never pressurise the container until the clamps are completely closed.

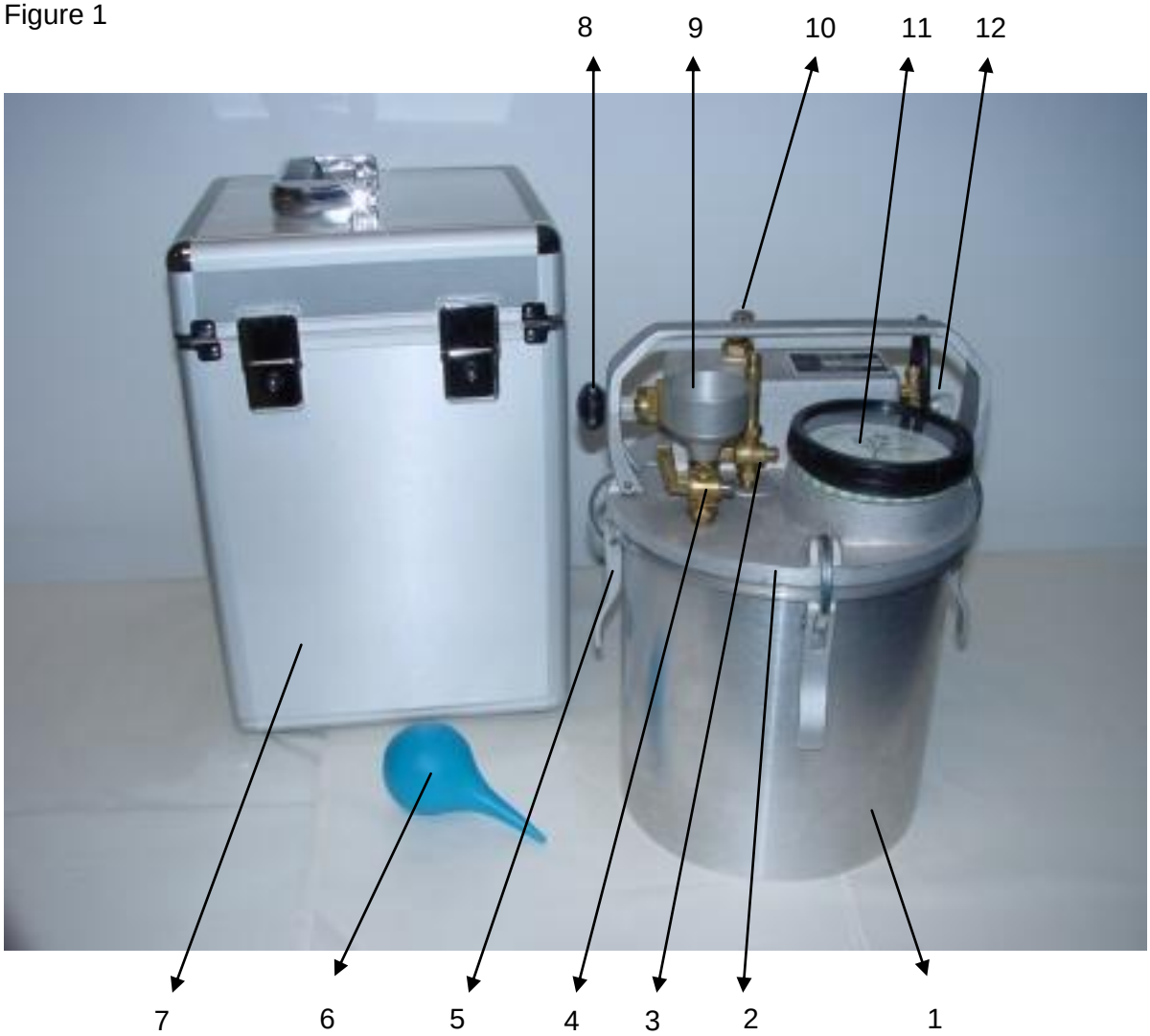
Also never undo the clamps with the unit pressurised.

3.5 Using the syringe (6), carefully pour water into the funnel (9) until it begins to come out of the centre bleed valve (3) on the lid.

Note: When using the syringe, force the water out of the syringe slowly to avoid air entry into the meter.

3.6 Gently tap the container or tap the lid until the air bubbles no longer come out of the centre valve. Add more water to be sure only water, no air, comes out. Close both valves (3 and 4).

Figure 1



1. Sample Container
2. Lid
3. Centre Bleed Valve
4. Funnel Valve
5. Toggle Clamps
6. Syringe
7. Carrying Case
8. Air Pump Handle
9. Funnel
10. Main Test Control Air Valve
11. Air Gauge
12. Air Bleed Valve
13. Striking Off Bar (not shown)
14. Tamping Rod (not shown)
15. Standpipe (not shown)

3.7 Use the air pump handle (8), located opposite the air bleed valve, to gently pump air into the receiver until the black gauge pointer is on the yellow starting line.

Note: If the black gauge pointer should go past the yellow starting line, gently tap the gauge while cracking the air bleed value (12), located at the end of the air receiver, until the gauge pointer is situated exactly on the yellow start line. Quickly close the air bleed valve. One or two goes might be required to complete this successfully.

3.8 Press open the main test control air valve (10) and hold the valve open, pressurising the sample. Tap the container slightly to allow for possible rearrangement of the particles. Gently tap the gauge until the black pointer stops moving, note the reading and release the main test control air valve (10). This reading is the air entrainment percentage.

CAUTION NOTE ! Before removing the lid, release pressure from the container by slowly opening the centre bleed valve (3). When all the pressure has been released open the funnel valve (4). Take care as some water might spurt out.

3.9 After the lid has been removed, press open the main test control air valve (10) to release air from the air receiver and to clear any concrete particles from the air entry hole on the lid.

3.10 In cases where there are large voids in the aggregate and it is necessary to deduct their volume from the measured air content, complete the following steps:

a) Place the same amount of each size aggregate used for the test in the material container.

b) Fill the container with water.

c) Complete steps 3.2 through to 3.8 as in the regular determination for air content. This reading is the aggregate correction factor.

4 Operating Instructions for Multi-range Scale (see figure 1)

For samples containing more than 10% air.

4.1 Follow Section 3 **Using the Meter,** steps 3.1 through to 3.8 in these operating instructions up to gently tapping the gauge until its pointer stops moving.

4.2 Make sure the main test control air valve (10) is closed and once again pump air into the air receiver. If the black pointer goes above the yellow starting point, again bleed excess air from the receiver through the air bleed valve (12).

4.3 Again press open the main test control air valve (10). After pressurising, again tap the container slightly to allow for possible rearrangement of the particles. Gently tap the gauge until its black pointer stops moving. Read the air percentage on the extended scale (green section of gauge face).

Note: Always make sure the main test control air valve (10) is closed before releasing pressure from either the material container centre bleed valve (3) or the air receiver. If this is not done, water can be drawn into the air receiver, adversely affecting future measurements. If water is accidentally drawn into the air receiver, open the air bleed valve (12) and tip the lid, letting the water run out of the bleeder valve. Pump the handle several times to blow out the last traces of water.

5 Calibration Check Test

5.1 Fill the material container with water. Making sure the container is level, remove the standpipe screwed into the centre bleed valve (3) and screw it tightly into the funnel valve (4) on the underside of the lid.

5.2 Wipe the lid of the container clean and dry.

5.3 Unscrew and remove the gauge window.

5.4 Make sure the main test control air valve (10) is closed. Open both the centre bleed valve (3) and funnel valve (4).

5.5 Carefully position the lid on the material container and close the four toggle clamps (5), making sure the clamp handle is flush against the container.

CAUTION: Never pressurise the container until the clamps are completely closed.

5.6 Using the syringe (6), carefully pour water into the funnel (9) until it begins to come out of the centre bleed valve (3) on the lid.

Note: When using the syringe, force the water out slowly to avoid creating air bubbles which might enter the meter.

5.7 Gently tap the container or lid until the air bubbles no longer come out of the centre valve. Add more water to be sure only water, no air, comes out. Close both valves (3 and 4).

5.8 The main test control air valve (10) should be closed. Close the air bleed valve (12) located at the end of the air receiver. Use the air pump handle (8), located opposite the air bleed valve, to gently pump air into the receiver until the black gauge pointer is on the yellow start line.

5.9 If the black gauge pointer should go past the yellow starting line, gently tap the gauge while cracking the air bleed valve (12), located at the end of the air receiver, until the black pointer is situated exactly on the yellow start line. Quickly close the air bleed valve.

5.10 Use the syringe (6) to remove all water from the funnel (9).

5.11 To allow water to enter the funnel, open the main test control air valve (10), then gently open the funnel valve (4) to control the flow of water into the funnel.

5.12 When water exactly meets the waterline inside the funnel (9), close the funnel valve (4) and the main test control air valve (10).

5.13 Tap the gauge until the pointer stops moving. The gauge pointer should stop on 1.2%. If it does not, the yellow starting point arrow should be readjusted using the following steps:

a) **If gauge reads less than 1.2%,** move the yellow starting point arrow, in a *counterclockwise* direction, the distance that is equal to the amount the gauge pointer is under 1.2%.

b) **If gauge reads more than 1.2%,** move the yellow starting point arrow, in a *clockwise* direction, the distance that is equal to the amount the gauge pointer is over 1.2%.

5.14 Always keep the main test control air valve (10) closed before releasing pressure from the container.

5.15 After the calibration check test is completed, release pressure by turning the air bleed valve (12) so that the gauge pointer will return to its initial position. Close the air bleed valve (12).

5.16 Before removing the lid, release pressure from the container by slowly opening the centre bleed valve (3) first, and when all the pressure has been released open the funnel valve (4). Some water might spurt out.

5.17 Return the standpipe to its proper location in the centre bleed valve (3).

5.18 Replace the gauge window.

6 Calibrating the Air Meter to any Reading (other than standard)

6.1 The calibration method described in this section differs from the standard 1.2% calibration; the container's centre bleed valve (3) is opened to atmosphere and then closed *before* pressure is applied through the main test control air valve (10). This brings the air over the water in the container to atmospheric pressure.

6.2 The volume of the container is ¼ cubic foot, or 432 cubic inches (approximately 7,090 litres). The meter may be calibrated by removing 4.327 cubic inches (70.9cc) of water for each percentage point of gauge reading as follows:

6.3 Fill the container with water, following steps 3.1 through to 3.5 outlined in Section 3 **Using the Meter** of the operating instructions.

6.4 Use the syringe (6) to remove water from the funnel (9).

6.5 Making sure the air bleed valve (12) is closed, pump air into the chamber until the pointer is near the yellow line.

6.6 To allow water to enter the funnel, open the main test control air valve (10), then gently open the funnel valve (4) to control the flow of water into the funnel. **Do not let the funnel overflow with water.**

6.7 Use a graduated pipette to remove specific volume of water, using the values given in ***Table 1***. If a sufficient amount of water was not removed from the funnel, steps 3.3 and 3.4 in Section 3 **Using the Meter** may be repeated.

Example: to calibrate 34-3265 for 4%, take out 283.6cc of water; to calibrate for 7%, take out 496.3cc of water.

Note: The maximum volume of water that can be taken out through the funnel in this way is limited by the length of the standpipe, which should be under water at its lower end.

Table 1

Air % Conversion Table		
Indicated % on Gauge	Volume of Water	
	Cubic Ins.	Cubic Cms.
0	0	0
1	4.32	70.79
2	8.64	141.58
3	12.96	212.37
4	17.28	283.16
5	21.60	353.96
6	25.92	424.75
7	30.24	495.54
8	34.56	566.33
9	38.88	637.13
10	43.20	707.91
11	47.52	778.71
12	51.84	849.50
13	56.16	920.29
14	60.48	991.08
15	64.80	1061.88
16	69.12	1132.67
17	73.44	1203.46
18	77.76	1274.25
19	82.08	1345.04
20	86.40	1415.84
21	90.72	1486.62
22	95.04	1557.42

6.8 Make sure the main test control air valve (10) is closed. Slowly open the container's centre bleed valve (3) to equalise the inside pressure with the atmosphere.

6.9 Open the funnel valve (4) so that both valves are now open. Excess water in the funnel will flow back into the container (1).

6.10 Close both valves (3 and 4). Pump air into the reservoir until the pointer is on the yellow line.

6.11 If required open the air bleed valve (12) while gently tapping on the air gauge (11). When the pointer is exactly on the yellow starting line, close the air bleed valve (12).

6.12 Press open the main test control air valve (10) and tap gently on the air gauge (11) until the pointer comes to a steady position. The pointer should now show the exact percentage value given in Table 1 for the specific amount of water removed.

If the pointer does not read the exact percentage, check for the presence of water in the Upper Chamber. The Upper Chamber must be dry. Drain, if necessary, by removing the air bleed valve (12).

Other situations to investigate are:

a) Was the wrong volume of water removed?

b) Is cement sticking to the inside of the container, changing its volume?

c) Are there leaks in the gaskets or fittings?

d) Is the gauge damaged and inaccurate?

e) Is the position of the yellow pointer incorrect?

6.13 If the answer to questions a) to e) is “no”, the pointer needs to be adjusted. Adjust the pointer as shown in the following examples:

a) If 283.6cc of water was removed from the 34-3265 but the reading was 4.2% instead of the expected 4%, move the yellow pointer *clockwise* through an angle equivalent to 0.2% on the scale.

b) If the same amount of water was removed, but the reading was 3.9%, move the yellow pointer *counter-clockwise* through an angle equivalent to 0.1% on the scale.

6.14 The air meter is now calibrated for an air entrainment range close to 4%.

7 Maintenance

7.1 To ensure trouble-free operation, keep the meter clean and dry between tests. Clean the meter effectively by either flushing it with a stream of pressurised water, or washing it in water using a brush. **Do not submerge the gauge in water.**

7.2 Before assembling the meter, remove any sand or grit from the underside of the material container lid and toggle clamps in order to prevent damage to the seal and clamps.

7.3 Leave both valves (3 and 4) open when the meter is not in use.

7.4 Carefully wash and clean the rubber seal after every 15-20 tests.

7.5 **NOTE !** When the meter is not in use, store it in the carrying case (7). **Do not store the meter with the lid clamped to the material container.**

7.6 Although the surface of the meter may begin to develop a dull appearance after prolonged use, this will not affect its performance. **Do not attempt to polish the meter** as this may cause damage.

7.7 The pressure gauge has an adjustable starting point. If replacement of the rubber gasket providing the seal between the lid and the material container becomes necessary, the initial yellow starting point must be set to a new, true starting point. This is required because of the variations in gasket thickness. The following procedure is recommended:

Perform Calibration Check Test, as outlined in Section 5 **Calibration Check Test.**

7.8 If the pump needs to be cleaned or inspected, use the following procedure to remove it from the air receiver:

a) Unscrew the cap nut and pull the shaft out of the pump body.

b) Use a large adjustable wrench (preferably in vertical position) to unscrew the pump body and remove it.

c) When replacing the pump into the air receiver, use a new gasket seal lubricated with a thin film of vacuum grease.

d) Using your fingers, thread the pump into the air receiver until the gasket is touching the air chamber. Tighten with a wrench until a good seal is formed. **Do not over tighten.**

e) Periodically clean the carrying case (7) and check for damage.

8 Specifications

Capacity	0.007m³ 7,090 litres approx. (¼ cu.ft.)
Readings	Up to 22% entrained air
Accuracy	± ¼% full scale (depending on accuracy of start point)
Aggregate size	50.8 mm max (2”)
Container	Four clamping handles for positive seal
Pressure Gauge	In shockproof mounting
Tamping Rod	Aluminium (where supplied)
Dimensions	248 x 337 mm (9¾” diam. x 13¼” H)
Weight Net	6.8 kg (15 lbs)