

# PERMEABILITY TESTER

## Fast, reliable and non-destructive measurement of the permeability of concrete structures

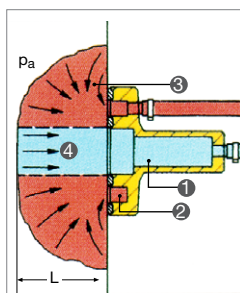
The permeability of concrete at the surface (concrete cover) has been recognized as a major factor in determining the durability of concrete structures. Many specialists emphasize the importance of this property and the possibility of measuring it reliably - not only in the laboratory but also at the building site.

### Permeability measurements

The particular features of the TORRENT method are a two-chamber vacuum cell and a pressure regulator, which ensure that an air flow at right angles to the surface is directed towards the inner chamber. This permits the calculation of the permeability coefficient  $kT$  on the basis of a simple theoretical model.

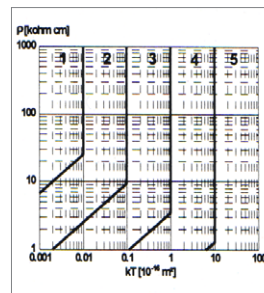
The unit has a user-friendly menu technique and measures the pressure increase as a function of time according to a specific sequence. The associated data is automatically collected by the display unit and the permeability coefficient  $kT$  and the depth of penetration  $L$  of the vacuum are calculated. The measurement takes 2-12 minutes, depending on the permeability of the concrete. In the case of dry concrete, the quality class of the concrete cover can be read from a table using the  $kT$  value. In the case of moist concrete,  $kT$  is combined with the electrical concrete resistance  $\rho$  (rho) and the quality class is determined from a nomogram.

The TORRENT permeability tester is based on investigations which were carried out by the research centre of „Holderbank Management and Consulting Ltd.“, Switzerland. The result of these measurements, which were made in the laboratory and on the building site, are in good agreement with laboratory methods, such as oxygen permeability, capillary suction, chloride penetration, etc.



- ① Inner chamber, pressure  $p_i$
- ② Outer chamber, pressure  $P_o = p_i$
- ③ Air flow to the outer chamber
- ④ Air flow to the inner chamber
- $L$  = Depth of penetration of the vacuum

Air flow to the two chambers of the vacuum cell



Nomogram for concrete quality class

In the case of moist concrete, the measured permeability is lower, i.e. the concrete quality seems to be too good. This effect can be corrected using the electrical resistance  $\rho$  of the concrete. The concrete quality class is determined from  $kT$  and  $\rho$  in a nomogram.

## Technical Information Basic Unit

### Display Unit with nonvolatile memory for 200 measured objects

**DISPLAY:** 128 x 128 graphic LCD

**INTERFACE:** RS232 or with adapter to USB

**SOFTWARE:** Integrated for printing out measured objects and transmission to PC

**BATTERIES:** 6 1.5V, LR 6 batteries for 60 hours operation

**TEMPERATURE RANGE:** -10° to +60° C

**CARRYING CASE:** 325 x 295 x 105mm, total weight 2.1kg

### Control Unit with membrane pressure regulator and pressure sensor

**VACUUM CONNECTION:** small flange 16 KF

**CARRYING CASE:** 520 x 370 x 125mm, total weight 6.3kg

The unit is operated with a commercial vacuum pump. Technical data according to DIN 28400: Suction capacity 1.5m<sup>3</sup>/h, final total pressure 10mbar, suction-side connection: small flange 10 KF/16 KF, high water vapour toleration.

## Ordering Information

### UNIT KIT

380 02 200 TORRENT Permeability Tester

Includes Display unit, printer cable, transfer cable for PC, carrying strap, operating instructions, control unit, two carrying cases

### ACCESSORIES

380 02 500 Resistance probe WENNER-PROCEQ with 8 foam pads, cable and control plate

390 00 540 Adapter RS232/USB

### REPLACEMENT PARTS

380 02 272 Carrying case to display unit

380 02 270 Carrying case to control unit

330 00 456 Transfer cable to PC

330 00 460 Printer cable serial interface

380 02 502 Resistance probe WENNER-PROCEQ without foam pads, without cable

380 02 510 Cable to resistance probe

380 02 508S Foam pad to resistance probe, 4 pieces

380 04 250 Control plate to resistance probe

380 00 079 Carrying strap to display unit

820 38 005E Operating instructions

Subject to change without notice.

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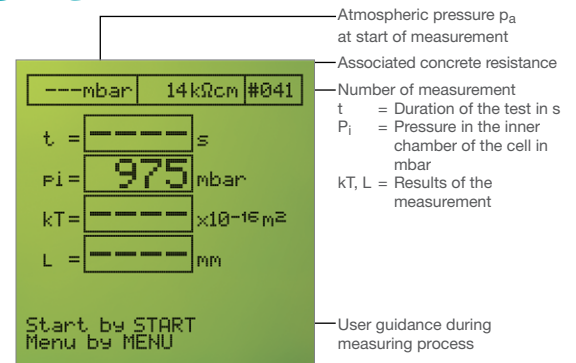
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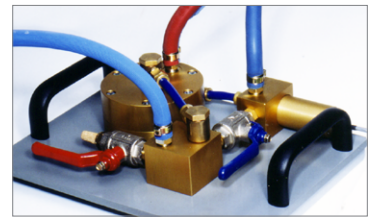
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Display before start of the measurement



Control Unit



Two-chamber vacuum cell with sealing rings

	#015	
Rho	= 39	kOhmcm
$p_a$	= 965.3	mbar
$t_{max}$	= 450	s
$dp_{max}$	= 20.4	mbar
		-16 2
$kT$	= 0.873*10	m
L	= 50.3	mm

Printout of an object



Resistance probe WENNER-PROCEQ

