PUMPS APT TO WORK WITH THE *PermeaTORR*

Assuming that you want to use the instrument immediately when it arrives, we recommend you to have available a suitable vacuum pump.

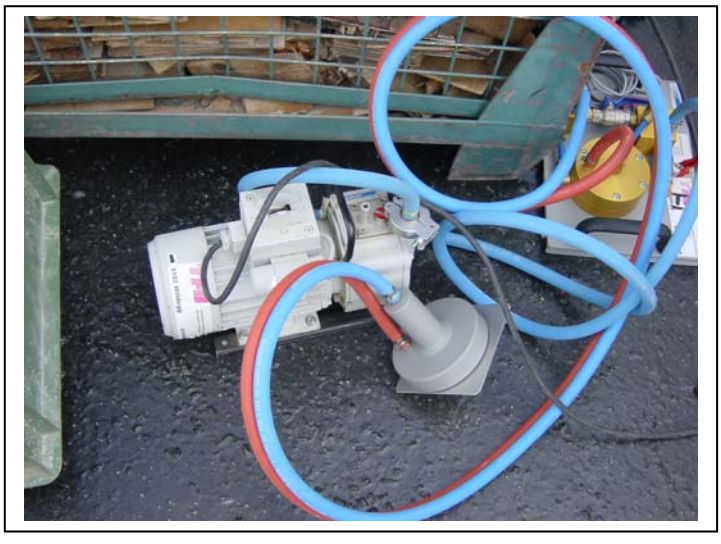
The pump should be of intermediate capacity:

- If it is too powerful, it will work, but is more expensive, heavy and difficult to handle at jobsites
- If it is not sufficiently powerful, it may not be able to extract, for concretes of high permeability, the large volume of air that enters the external chamber (guard ring) and a balance of pressure with the inner chamber would not be achieved (the *PermeaTORR* displays both pressures as a control of proper operation)

A way to check whether a pump is sufficiently powerful to successfully run an air-permeability test is to try it with the *PermeaTORR* on a highly permeable concrete (w/c>0.80, not or badly cured). If the instrument is capable of keeping the pressure of both chambers balanced (difference below 5 mbar), then it is a suitable pump.

As a guidance to find in your country the right type, pumps used successfully with Proceq'a TPT and/or the *PermeaTORR* are described below.

- TFB-Switzerland (Ref.: Frank Jacobs), used a pump Leybold S 1, 5 (Rotary Vane Pump), the characteristics of which can be found in: http://pdf.directindustry.de/pdf/leybold/c01d-trivac/13869-23637-_5.html (see picture below):

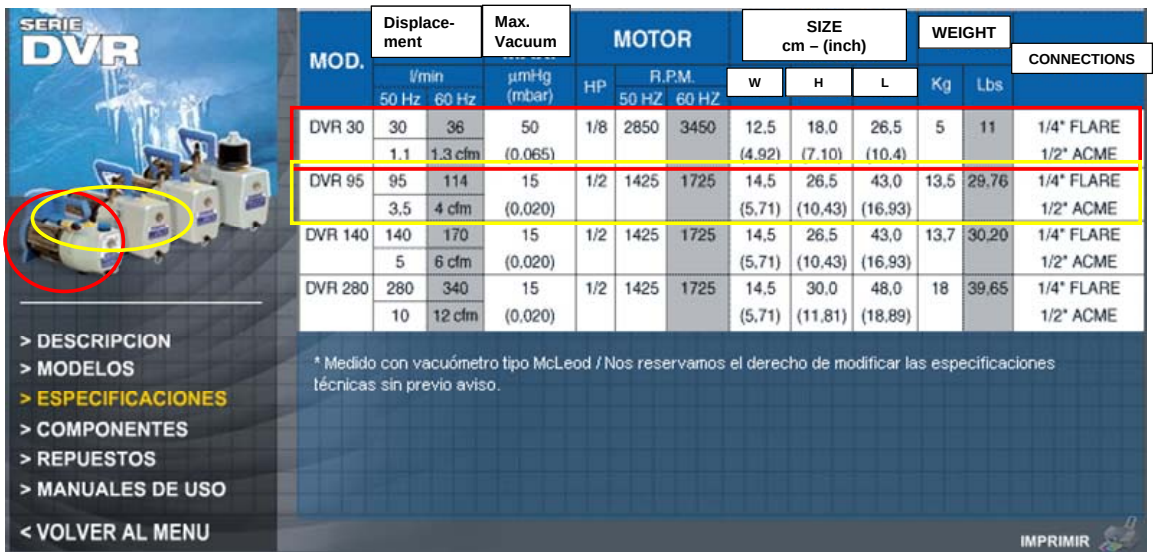


- TFB-Switzerland (Ref.: Frank Jacobs), are now using a Diaphragm Vacuum Pump KNF N 026.3 A_.18, which has the advantage of not requiring oil (which avoids emptying the pump every time there is risk of leakage during transportation: e.g. airplanes). Link: http://www.knf.ch/cms_pdf/E023_N026.1ANE_03.05.pdf
- SUPSI-Switzerland (Ref. Tiziano Teruzzi) use a pump Vacuubrand GMBH+Co Type RE 2, characteristics described in:

http://www.vacuubrand.de/data/media/_shared/downloads/D/Betriebsanleitungen/Drehschieberpumpen,%20Drehschieberpumpst%E4nde%20und%20Chemie-HYBRID-Pumpen/RZ%202.pdf?PHPSESSID=9df82189a6fa38d08fa25e2363288096
(see picture below):

- A locally made Dosivac DVR 95 pump has been used with the *Permea-TORR* (and Proceq's TPT) in Argentina, see specs in: www.dosivac.com.ar/data/PRODUCTOS/DVR_en/especificacion.htm, The pump works perfectly OK, although perhaps it is a bit too strong and heavy (see picture below).

A smaller pump, the DVR 30 has been tested, works very well and is very light (5 kg). Below the specifications of both DVR pumps and a picture of DVR30:



MOD.	Displacement l/min 50 Hz	Displacement l/min 60 Hz	Max. Vacuum µmHg (mbar)	MOTOR HP	MOTOR R.P.M. 50 HZ	MOTOR R.P.M. 60 HZ	SIZE cm – (inch) W	SIZE cm – (inch) H	SIZE cm – (inch) L	WEIGHT Kg	WEIGHT Lbs	CONNECTIONS
DVR 30	30	36	50	1/8	2850	3450	12,5	18,0	26,5	5	11	1/4" FLARE
	1,1	1,3 cfm	(0,065)				(4,92)	(7,10)	(10,4)			1/2" ACME
DVR 95	95	114	15	1/2	1425	1725	14,5	26,5	43,0	13,5	29,76	1/4" FLARE
	3,5	4 cfm	(0,020)				(5,71)	(10,43)	(16,93)			1/2" ACME
DVR 140	140	170	15	1/2	1425	1725	14,5	26,5	43,0	13,7	30,20	1/4" FLARE
	5	6 cfm	(0,020)				(5,71)	(10,43)	(16,93)			1/2" ACME
DVR 280	280	340	15	1/2	1425	1725	14,5	30,0	48,0	18	39,65	1/4" FLARE
	10	12 cfm	(0,020)				(5,71)	(11,81)	(18,89)			1/2" ACME

* Medido con vacuómetro tipo McLeod / Nos reservamos el derecho de modificar las especificaciones técnicas sin previo aviso.

IMPRIMIR

To connect any pump to the *PermeaTORR*, you need a tube that fits an air outlet of 3/8” (9 mm), that is a standard size for vacuum pipes. The plug of the pump, supplied with the *PermeaTORR*, must fit into a “Schuko” type socket as shown in the picture below.

F

("Schuko" plug)
Round pins with
side ground contacts

MOISTURE "METERS" TO BE USED IN CONJUNCTION WITH THE *PermeaTORR*

Recommendations drafted in Switzerland (see full document in our webpage):

- The determination of the air-permeability should be conducted preferably at ages between 28 and 90 days.
- The temperature of the air and of the concrete should be at least 5°C, preferably above 10°C.
- The moisture content, measured with a capacitive instrument, should be ≤ 5.5 % or, alternatively the electrical resistivity (Wenner Method) of the concrete should be ≥ 10 - 20 kΩcm (for OPC or blended cements, respectively). These conditions are usually met after at least 3 consecutive dry days (average RH ≤ 80%) following the last contact of the element with water (curing, splash or rainfall)

Therefore, in case of site testing of concretes that may not be sufficiently dry, the complementary use of a device to measure the moisture content is recommended. Non-destructive devices used in this context are contact moisture meters or the 4-point Wenner probe to measure the electrical resistivity of the cover concrete.

In Switzerland, the use of impedance contact moisture meters is becoming customary. The most popular one is the "Concrete Encounter" instrument manufactured by TRAMEX, see link and picture below: https://tramexltd.com/us/concrete.php

For Wenner probes, an instrument successfully used is the one manufactured by CNS Farnell, described in http://www.cnsfarnell.com/dynamicdata/data/docs/rm%20concrete%20resistivity%20meter.pdf.
Comments of a user: “We find the instrument quick and accurate (it has smart electronics), the sensor Ok but slightly problematic due to quick drying out of the wooden plugs, and the cabling awkward (very stiff) and failure prone (we had to replace it)”.

Users of Proceq’s “Torrent Permeability Tester” (TPT) http://www.proceq.com/en/non-destructive-test-equipment/concrete-testing/permeability-analysis.html have the chance of acquiring a Wenner probe as accessory, shown in the picture below: