POROSCOPE® HV5, HV20, HV40

Porosity Test Using High Voltage

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fischer®

Coating Thickness | Material Analysis | Microhardness | **Material Testing**

Applications

Applications
In order to protect objects, which are made of steel or metal, they are coated with corrosion resistant materials such as rubber, synthetics or enamel. The protective coatings must be tight, that is, free of pores, cracks or embedded foreign objects, to keep aggressive materials from the carrier material that is in danger of corrosion. Fine pores or cracks cannot be entirely avoided in any coating process.

With the POROSCOPE®, even pores and cracks, not visible to the eye, can be discovered and counted in electrically non-conducting protective coatings.

Pore testing of the enamel coating of a boiler, using the POROSCOPE®

Testing the interior coating of a pipe with the POROSCOPE®, using a rotating electrode on a rod extension system

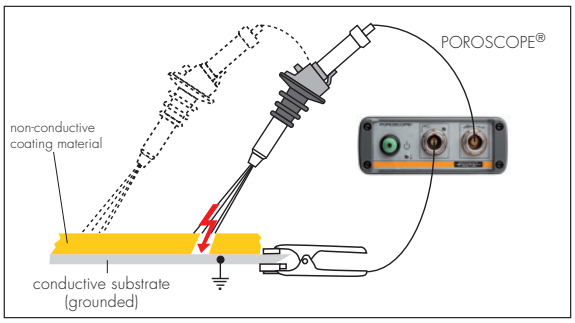
Containers lined with enamel or synthetics
A frequent application is the pore test in containers lined with enamel or synthetics, such as mineral oil tanks, agitator tanks, pipelines, boilers, heat exchangers. These are ideal applications for the POROSCOPE.

Electrostatic chargeable coatings and materials
Coatings and materials that tend to electrostatic charging are generally not suited for pore testing with high voltages, using conventional methods due to their electrostatic charging. In order to even measure these coatings and materials, the POROSCOPE is equipped with a porosity detector, which has a dynamic threshold, besides the porosity detector with a static threshold.

Testing the outer coating of a pipeline after a repair

Testing the interior coating of pipes during pipe maufacturing

Test Method



The test method is based on the fact that all electrically insulating coating materials have a much higher disruptive strength than air.

At the POROSCOPE the suitable test voltage is set according to the disruptive strength and thickness of the coating. Alternatively, a test standard can be selected and a coating thickness can be set. The POROSCOPE then adjusts the appropriate high voltage automatically. The specimen is grounded and the electrode is moved slowly across the surface to be measured. The voltage drops briefly when the electrode passes a defective spot, a sparkover as well as an optical and acoustical signal indicating the pore.

Safety

The POROSCOPE was developed with extreme care regarding safety. The safety requirements of the ISO 2746 are fulfilled in all points through the following design characteristics:

- The high voltage is directly generated in probe head. Thus, a high voltage cable is not necessary, which would store additional charge of electricity. This additional charge would lead to a higher discharge current in the case of an electrical shock.
- The high voltage is switched off automatically, if the instrument is overloaded for a longer period of time.
- The handle is isolated and covered with a metal housing, which is connected to the instrument ground. This prevents electrostatic charging of the operator.
- Firmly integrated protective resistor, which limits the current to a non-dangerous level in case of an electrical shock.
- Push button for switching on the high voltage. Only as long as the button is depressed, the high voltage is generated.

a) test head b) sweeper electrode c) grounding terminal d) supply unit

Features

- Robust instruments for harsh use on construction sites or in manufacturing
- Three instrument versions with different test voltage ranges:
  HV5: 0,8 – 5 kV
  HV20: 4 – 20 kV
  HV40: 8 – 40 kV
- Low-energy, and therefore safe, high voltage according to ISO 2746
- High voltage generation in the test head
- Intuitive operation with menu navigation, rotary push switch and OLED display
- Extensive electrode selection
- Continuously adjustable test voltage
- Electronic test voltage monitoring and display of the test voltage that is present directly at the electrode
- Optical and acoustical pore indication on the test head
- Adjustable detection sensitivity
- Also suitable for testing electrostatically chargeable materials
- Battery operation by means of a Li-ion battery with smart battery technology, a controller monitors the battery state permanently and avoids deep discharge

The following test standards are supported:
AS 3894.1, ASTM D4787, ASTM D5162, ASTM G62, EN 14430, NACE SP0188
These standards can be selected and a coating thickness can be set on the POROSCOPE. The appropriate high voltage is then adjusted automatically.

Technical Data, Standard Content of Shipment, Ordering Information

Technical Data

- Voltage supply: 100 – 240 V~
- Battery operation:
  at 40 kV: approx. 8 h continuous operation
  at 20 kV: approx. 20 h continuous operation
- Battery monitoring by means of smart battery technology
- Test voltage:
  continuously adjustable:
  HV5: 0.8 – 5 kV, in compliance with standard 1 – 5 kV
  HV20: 4 – 20 kV
  HV40: 8 – 40 kV
- Dimensions [mm]:
  Supply unit:
  approx. 200 x 125 x 50
  Test head max. Ø approx. 120
  Test head length: HV5: approx. 320
  HV20: approx. 340
  HV40: approx. 380
- Weight [kg]:
  Supply unit: 1.4
  Test head: HV5: approx. 0.9
  HV20: approx: 0.94
  HV40: approx. 1
- Test voltage display: OLED graphic display
- Test voltage display error: < 5 %
- Pore indication:
  acoustical: alarm signal at test head
  optical: red LED at test head, pore symbol with current pore counter reading on the display of the test head
- Pore detection sensitivity: detection threshold settable to a voltage drop of 10, 20, 30 or 50 %, porosity detector switchable between static and dynamic threshold
- Test voltage monitoring: green LED; turns off, if the nominal voltage decreases by more than 5 %
- Environmental conditions during operation:
  0 – 40 °C (32 –104 °F)
  0 – 60 % RH, no condensation on test surface
- Storage temperature: 0 – 60 °C (32 – 140 °F)
- Standards: Instrument safety: VDE 0411/1, pasture fence ordinance
  Test: DIN 55670, DIN 28055-2, DIN 4753-3

Standard Content of Shipment

The POROSCOPE® is delivered in a sturdy transportation case. It consists of the following components:

- Measuring head
- Supply unit with shoulder strap
- Connection cable, length approx. 1.20 – 3 m
- Ground cable, length approx. 10 m
- Power supply

Ordering Information

Type	Beschreibung	Order no.
POROSCOPE® HV5	Portable pore test instrument with continuously adjustable test voltage 0.8 – 5 kV	604-959
POROSCOPE® HV20	Portable pore test instrument with continuously adjustable test voltage 4 – 20 kV	604-958
POROSCOPE® HV40	Portable pore test instrument with continuously adjustable test voltage 8 – 40 kV	604-521

Please find the electrode selection and the respective accessories on the subsequent pages.

Overview of the various electrodes: a) Sweeper electrode b) Flat electrode c) Roller electrode d) Rotating electrodes for tests inside pipes e) Circular ring electrode for tests on the outside walls of pipes

Electrodes

Suitable electrodes are available for every application. The desired electrode is simply screwed onto the test head.

Sweeper electrodes:
Pore testing of large-area enamel, rubber and synthetic coatings.
Flat electrode with replaceable rubber tongue:
Pore testing of paint coatings.
Roller electrode:
Pore testing of foils. Circular ring electrodes: Pore testing of exterior pipe walls. The circular ring electrodes swing open for easy placement around a pipe.

Rotating electrodes:
Pore testing of interior pipe walls. Up to an inside diameter of 125, the rotating electrodes look like bottlebrushes. The brush bristles in the center are made of fine bronze spring wire; the nylon bristles in the front and back help to center the brush in the pipe.

Tests on the inside of pipes up to a length of 12 m (47") are possible using suitable rod systems. Rod pieces coated with synthetic material are combined to the desired lengths. Inserting centering devices prevents sagging of the rod. The rod system together with the inserted centering devices is also used for the voltage supply of the rotating electrode.

Selection table for flat, sweeper, circular ring and roller electrodes

Flat electrodes	Weight [g]	Dimensions [mm]	Remarks	Order no.
ZH2a	≈ 180	80x140 (3.2x5.5")	With replaceable rubber trimming	600-690
ZH2b	≈ 180	80x250 (3.2x9.8")	With replaceable rubber trimming, can be pivoted and secured on all sides using a ball joint	600-692
Sweeper electrodes	Weight [g]	Dimensions [mm]		
ZH6a	≈ 200	150	Fan-like arrangement of trimming	600-695
ZH6b	≈ 200	250	Fan-like arrangement of trimming	600-696
ZH6c	≈ 200	300	Comb-like wire trimming, can be pivoted and secured on all sides using a ball joint	600-697
Circ. ring electrodes	Weight [g]	Pipe ID [mm]		
ZH7a	200	108		600-736
ZH7b	220	133		600-737
ZH7c	250	159		600-738
ZH7d	300	220		600-739
ZH7e	400	273		600-740
ZH7f	600	324		600-741
Roller electrode	Weight [g]	Oper. width [mm]		
ZH10a	406,6	150		603-118
ZH10b	2000	400		604-089

Rotating Electrodes, Selection Table

Selection table for rotating electrodes and thread reducers

Pipe ø inside [mm]	Rotation electrodes			Thread reducer		
	Type	Weight [g]	Order no.	Type	Weight [g]	Order no.
8 (0.31“)	ZH3y	8	600-713	M8/M4	50	600-723
9 (0.35“)						
10 (0.39“)	ZH3z		600-714			
11-12 (0.43-0.47“)						
13-14 (0.51-0.55“)	ZH3a	10	600-699	M8/M5	50	600-721
15-16 (0.59-0.63“)						
18-20 (0.71-0.79“)	ZH3b	30	600-700	-	-	-
22-25 (0.87-0.98“)				-	-	-
28-30 (1.10-1.18“)	ZH3c	40	600-701	-	-	-
33-40 (1.30-1.57“)				-	-	-
50-65 (1.97-2.56“)	ZH3d	50	600-702	-	-	-
80 (3.1“)	ZH3e1	60	600-703	M8/M12	100	600-722
100 (3.94“)	ZH3e2	100	600-704			
125 (4.92“)	ZH3f1	220	600-705			
150 (5.91“)	ZH3f2	350	600-706			
200 (7.87“)	ZH3g	1300	600-707			
250 (9.84“)	ZH3h	1600	600-708			
300 (11.81“)	ZH3i	1800	600-709			
350 (13.78“)	ZH3k	2000	600-710			

Selection table for rods and centering devices

Pipe ø inside [mm]	Rod system				Centering device			
	Type	Weight [g]	Length [mm]	Order no.	Type	Weight [g]	ID [mm]	Order no.
8(0.31“)	ZH8c	30	250(9.84“)	600-717	-	-	-	-
9(0.35“)	ZH8d	60	500(19.69“)	600-718	ZH4z1	3	9-10(0.35-0.39“)	600-734
10(0.39“)	ZH8e	120	1000(39.37“)	600-719				
11-12(0.43-0.47“)					ZH4z2		11-12(0.43-0.47“)	600-735
13-14(0.51-0.55“)	ZH8a	250	500(19.69“)	600-715	ZH4a1	5	13-14(0.51-0.55“)	600-724
15-16(0.59-0.63“)					ZH4a2	6	15-16(0.59-0.63“)	600-725
18-20(0.71-0.79“)					ZH4b1	8	18-20(0.71-0.79“)	600-726
22-25(0.87-0.98“)					ZH4b2	11	22-25(0.87-0.98“)	600-727
28-30(1.10-1.18“)					ZH4c1	15	28-30(1.10-1.18“)	600-728
33-40(1.30-1.57“)					ZH4c2	20	33-40(1.30-1.57“)	600-729
50-65(1.97-2.56“)					ZH4d	30	50-65(1.97-2.56“)	600-730
80(3.1“)	ZH8b	450	1000(39.37“)	600-716	ZH4e	260	80-100(3.1-3.94“)	600-731
100(3.94“)								
125(4.92“)					ZH4f	320	125-150 (4.92-5.91“)	600-732
150(5.91“)								
200(7.87“)					ZH4g	400	200-350 (7.87-13.78“)	600-733
250(9.84“)								
300(11.81“)								
350(13.78“)								

Elastic spacer

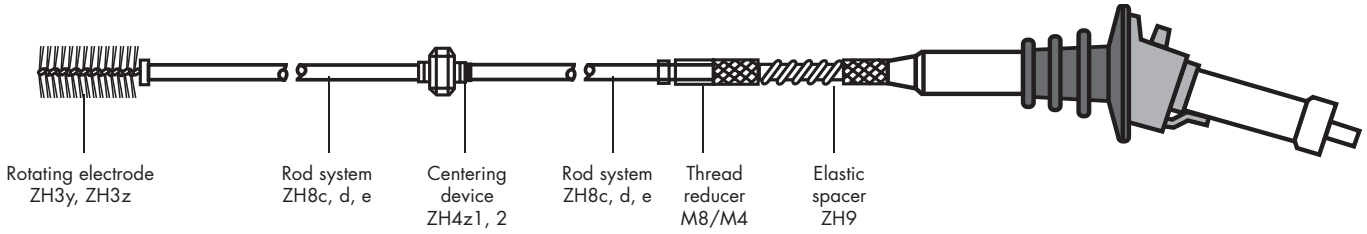
Type	Weight [g]	Length [mm]	Description	Order no.
ZH9	145	160(6.3“)	Avoids tilting when inserting into greater pipe depths	600-720

Ordering Examples

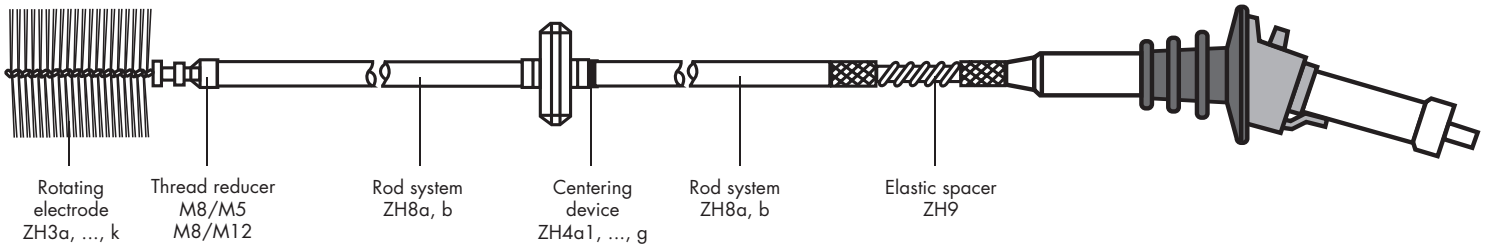
Example 1: Test system for testing enamel coatings	Order no.
Test instrument POROSCOPE® HV40	604-521
Sweeper electrode ZH6b	600-996

Example 2: Test system for testing interior pipe walls	Order no.
Test instrument POROSCOPE® HV40	604-521
Elastic spacer ZH9	600-720
2 x Rod system ZH8b	600-716
Centering device ZH4e	600-731
Thread reducer M8/M12	600-722
Rotating electrode ZH3e1	600-703

Pipe ID < 13 mm



Pipe ID ≥ 13 mm



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