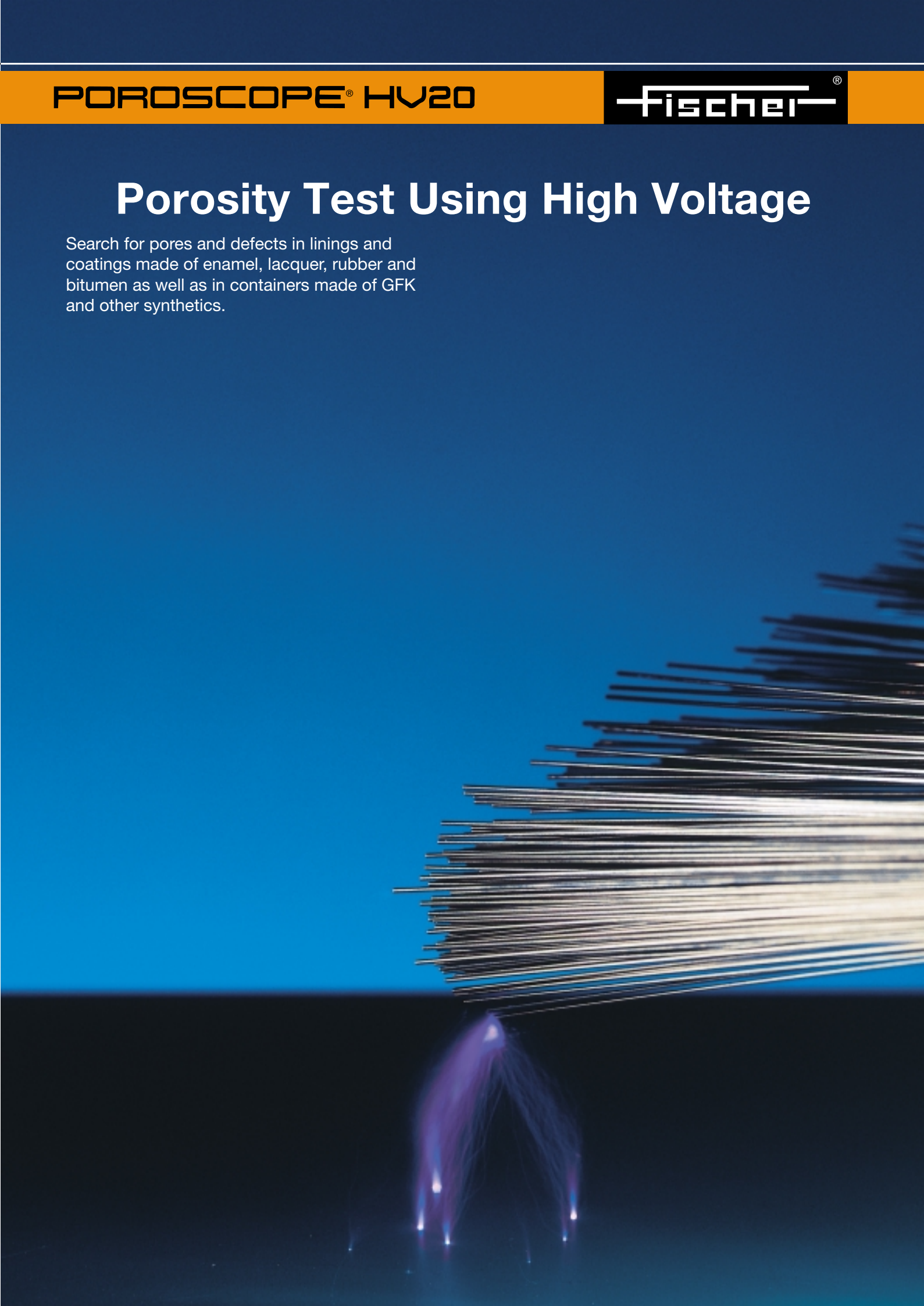
POROSCOPE® HV20

fischer®

Porosity Test Using High Voltage

Search for pores and defects in linings and coatings made of enamel, lacquer, rubber and bitumen as well as in containers made of GFK and other synthetics.



Applications, Test

Applications

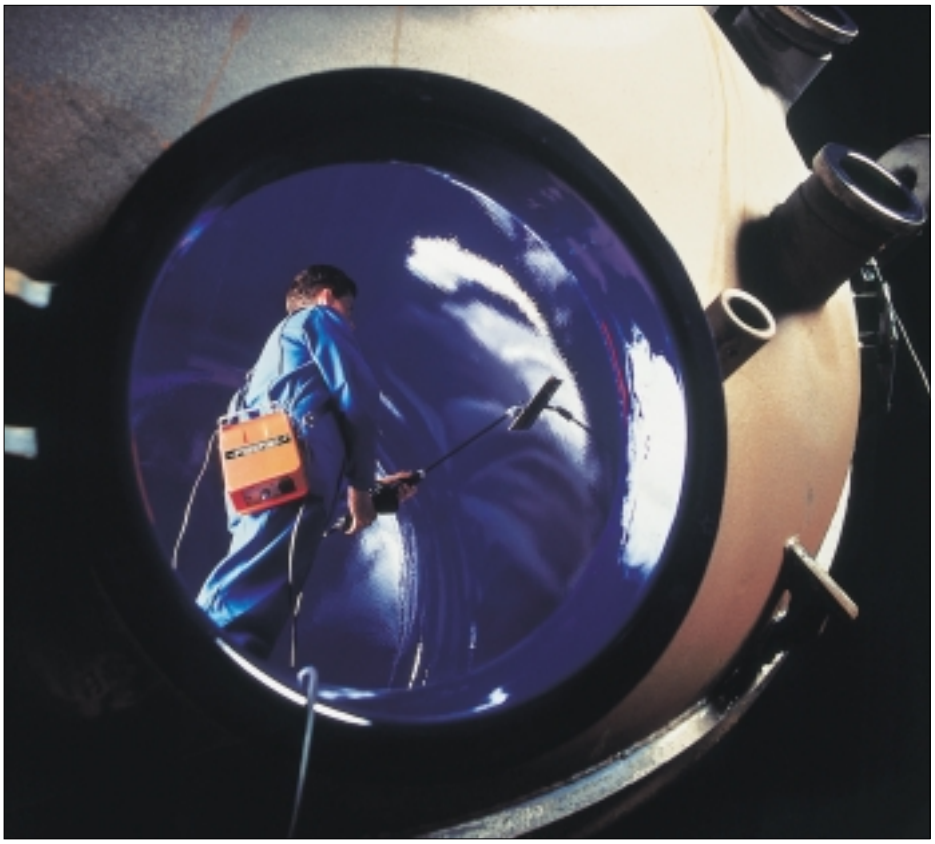
To protect objects made of steel or metal, they are coated with corrosion resistant materials such as rubber, synthetics or enamel. The protective coatings must be tight, that is, free of pores cracks or embedded foreign objects, to keep aggressive materials from the carrier material that is in danger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

With the POROSCOPE® HV20 and the POROSCOPE® HV20D, even pores and cracks not visible to the eye can be found and accounted for in electrically non-conducting protective coatings.

- 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.

This is the ideal application for the POROSCOPE® HV20.

- 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. Now, even these coatings and materials can be tested for pores with the POROSCOPE® HV20D. This instrument version will not result in erroneous functions due to electrostatic charging of the material. For example, condenser or packaging film made of synthetic materials can be tested for pores. One of the reversing rollers of the foil plant can be used as the electrically conducting base, or samples can be mounted on metal plates for the test.



Pore testing the enamel coating of a boiler using the POROSCOPE® HV20.

Test of the interior coating of a pipe with the POROSCOPE® HV20 using a rotating electrode on a rod extension system.

Five-coating stretch-foil casting plant of the SMS Company, Texas/USA.

Test

Required equipment:

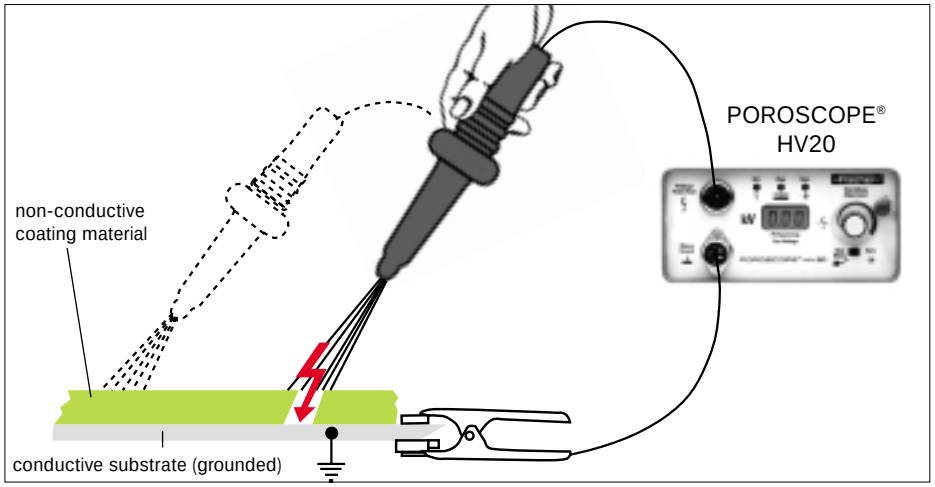
- Test instrument POROSCOPE® HV20 (or HV20D)
- Ground connection cable
- Test head with test head cable
- Electrode (screws onto test head)

The suitable test voltage is set according to the disruptive strength and thickness of the coating. 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 indicate the pore. For the test, the surface must be dry; there should be no condensation on the coated surface. A moisture film would dissipate the voltage immediately; the test voltage would not build up and the test would not be possible. Electronic test voltage monitoring provides a signal when the test voltage falls below the required minimum voltage.

Measurement Method, Features

Measurement Method

The test method is based on the fact that all electrically insulating coating materials have a much higher disruptive strength than air. Pore detection occurs at the defective spots through a spark-over (short circuit) between the test electrode and the conducting base. A defective spot may be a thin air channel (pore, crack) or a coating that is too thin over the conducting base underneath.

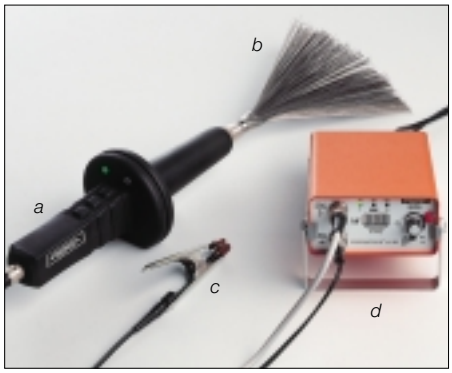


Features

- Low-energy, and therefore safe, high voltage.
- High voltage generation in the test head.
- Two test head versions with test voltage ranges: 0.3 to 3 kV and 2.5 to 25 kV can be connected.
- Extensive electrode selection
- Continuously adjustable test voltage.
- Display of the test voltage that is present directly at the electrode.
- Electronic test voltage monitoring.
- Optical indication at the test head and the test instrument when a pore is detected. Additionally, an acoustic signal will sound at the test head.
- The pore detection sensitivity is adjustable. Depending on the setting, pores are indicated at short 20 to 50% voltage drops.
- Battery or line operation (switchable).
- Connector for external 12 V voltage supply.
- Connector for external On/Off switch of test voltage and isolated relay contacts to control acoustic signals or pulse counters.

Front view of the test instrument POROSCOPE® HV20.

Rear view of the test instrument POROSCOPE® HV20.



a) Test head, b) sweeper electrode, c) grounding terminal, d) test instrument POROSCOPE® HV20.

Description HV20 and HV20D

The LCD display shows the high voltage in kV that is present directly at the electrode. Test voltage is continuously adjustable.

The high voltage is generated in the test head. The electrical energy at the test electrode is designed such that the max. short circuit current will not exceed 25 mA. The DC test voltage at the electrode can be switched on and off from the test head.

Pore indication

The pore indication occurs optically through red LEDs at the test head and the test instrument as well as through an acoustical signal at the test head. The pore detection sensitivity is selectable with both instruments. The size of the voltage drop at which pores should be detected can be set.

Test voltage monitoring

The test instruments POROSCOPE® HV20 and HV20D are equipped with electronic test voltage monitoring. A green LED on the instrument indicates that the set test voltage is present at the electrode. The green LED extinguishes when the voltage falls by more than 5% below the nominal value.

Technical Data, Content of Shipment, Order Information

Technical Data

Voltage supply/charge voltage for installed battery (12 VDC):
220 VAC / 50 ... 60 Hz

Battery operation:
about 2 h continuous operation

Battery monitoring:
green LED on the test instrument lights, when the battery voltage is no longer sufficient to maintain the set test voltage

Test voltage
(continuously adjustable range):
Test head HV3PK: 0.3 ... 3 kVDC
Test head HV20PK: 2.5 ... 25 kVDC

Dimensions [mm]
Test instruments:
14 x 70 x 220 (0.55“ x 2.8“ x 8.7“)
Test heads: length: 360 (14.2“) ;
max. ø 114 (4.5“)

Weight:
Test instruments: 2 kg
Test heads: 0.8 kg

Test voltage display:
LCD

Test voltage display error:
< 5 %

Pore indication:
acoustical: Alarm signal at test head
optical: red LED at test head and instrument

Pore detection sensitivity:
detection threshold settable between 20 and 50% voltage drop

Test voltage monitoring:
green LED; extinguishes when voltage falls by more than 5% below nominal value

Environmental conditions
during operation:
0 ... +40 ºC (32 ... +104 ºF) and
0 ... 60 % RH, no condensation
on test surface

Storage temperature:
0 ... +60 ºC (32 ... +140 ºF)

Standards:
Instrument safety: VDE 0411/1,
pasture fence ordinance
Test:
DIN 55670, DIN 28055-2, DIN 4753-3

Standard Content of Shipment

The standard shipment of the POROSCOPE® HV20 includes a protective case with sufficient room for the instrument, test cable, ground connecting cable, test head and one to two electrodes. Also included with the standard shipment is a carrying bag for mobile operation. The carrying bag is a hard shell housing made of impact-resistant synthetic material.

Ordering Information HV20 and HV20D

Test instruments

Type	Description	Order no.
POROSCOPE® HV20	Portable direct current pore test instrument with continuously adjustable test voltage.	601-933
POROSCOPE® HV20D	Portable direct current pore test instrument with continuously adjustable test voltage. Specifically designed for testing materials that are easily charged electrostatically.	602-734

Ground connection cable

with ground clip to ground the carrier material of the test specimen.

Type	Length [m]	Order no.
HV20-EK/5	5 (196“)	601-936
HV20-EK/10	10 (394“)	601-937
HV20-EK/15	15 (590“)	601-938

Test head cable

Connecting cable between test instrument and test head.

Type	Length [m]	Order no.
HV20-AK/1	1.5 (59“)	601-940
HV20-AK/5	5 (196“)	601-960
HV20-AK/10	10 (394“)	601-939

Test heads for HV20 and HV20D

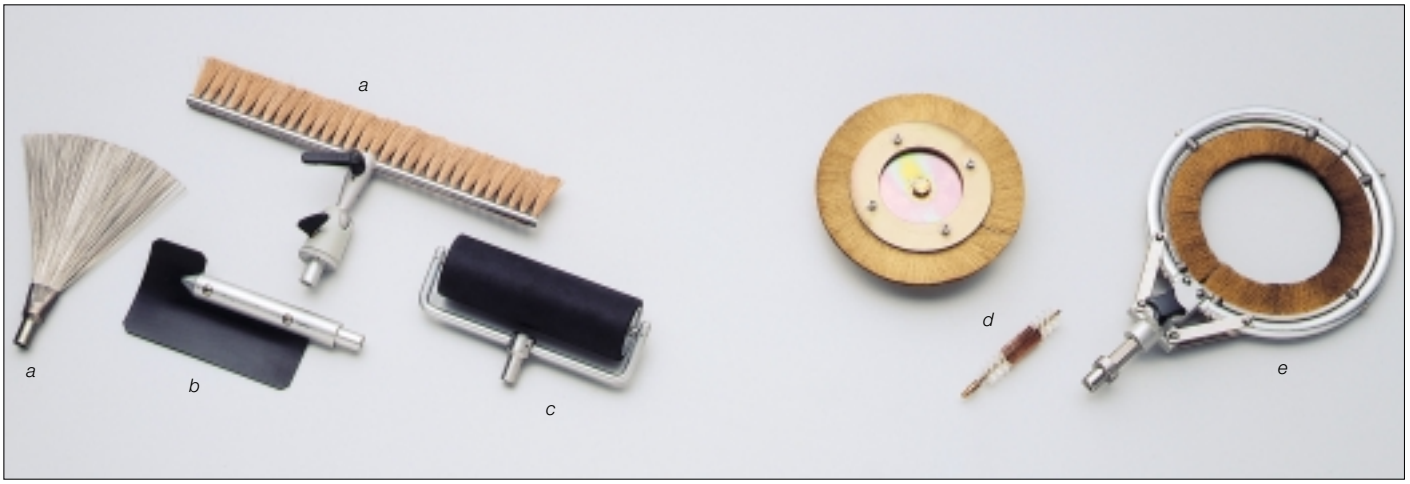
Depending on the application, the desired electrode can be screwed onto the test head.

Type	Test voltage	Order no.
Test head HV3PK	0.3 ... 3 kV	601-935
Test head HV20PK	2.5 ... 25 kV	601-934

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

Electrodes, Order Information

Electrodes for HV20 and HV20D



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

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	Order no.	Weight [g]	Dimensions [mm]	Remarks
ZH2a	600-690	≈ 180	80 x 140 (3.2 x 5.5“)	with replaceable rubber trimming
ZH2b	600-692	≈ 180	80 x 250 (3.2 x 9.8“)	with replaceable rubber trimming, can be pivoted and secured on all sides using a ball joint
Sweeper electrodes	Order no.	Weight [g]	Dimensions [mm]	Remarks
ZH6a	600-695	≈ 200	150 (5.9“)	fan-like arrangement of trimming
ZH6b	600-696	≈ 200	250 (9.8“)	fan-like arrangement of trimming
ZH6c	600-697	≈ 200	300 (11.8“)	comb-like wire trimming, can be pivoted and secured on all sides using a ball joint
Circ. ring electrodes	Order no.	Weight [g]	Pipe ID [mm]	Remarks
ZH7a	600-736	200	108 (4.3“)	
ZH7b	600-737	220	133 (5.2“)	
ZH7c	600-738	250	159 (6.3“)	
ZH7d	600-739	300	220 (8.7“)	
ZH7e	600-740	400	273 (10.7“)	
ZH7f	600-741	600	324 (12.8.)	
Roller electrode	Order no.	Weight [g]	Oper. width [mm]	Remarks
ZH10a	603-118	406.6	150 (5.9“)	

Rotating Elecrodes, Selection Table

Selection table for rotating electrodes and thread reducers

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

Selection table for rods and centering devices

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

Elastic spacer suitable for all test head types

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

Options, Order Example

Options for HV20 and HV20D

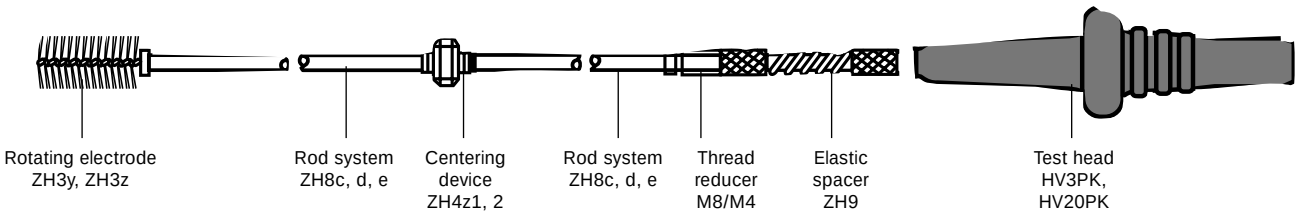
Type	Order no.	Description
Acoustical signal generator HV20	602-219	External acoustical signal generator. Can be connected to test instrument or distribution box HV20. Length of connecting cable: 5 m (196.85“).
Pulse counter HV20	602-275	6-digit pore counter. Can be connected to test instrument or distribution box HV20. Length of connecting cable: 1 m (39.37“).
External start switch HV20	602-369	External On/Off slide switch for the high voltage. Can be connected to test instrument or distribution box HV20. Length of connecting cable: 10 m (393.7“).
Distribution box HV20	602-238	For simultaneous connection of the acoustical signal generator HV20, the pulse counter HV20 and the external start switch HV20 as well as other external components for display, etc. of the pore information. Can be connected to the test instrument. Length of the connecting cable: 0.2 m (7.87“).
Additional grounding POROSCOPE® HV20	602-554	Metallic wrist band to be clipped to the test head for additional grounding. Prevents electrostatic charging of the operator, especially when working with gloves or when working on a floor that can easily become electrostatically charged.

Ordering Examples

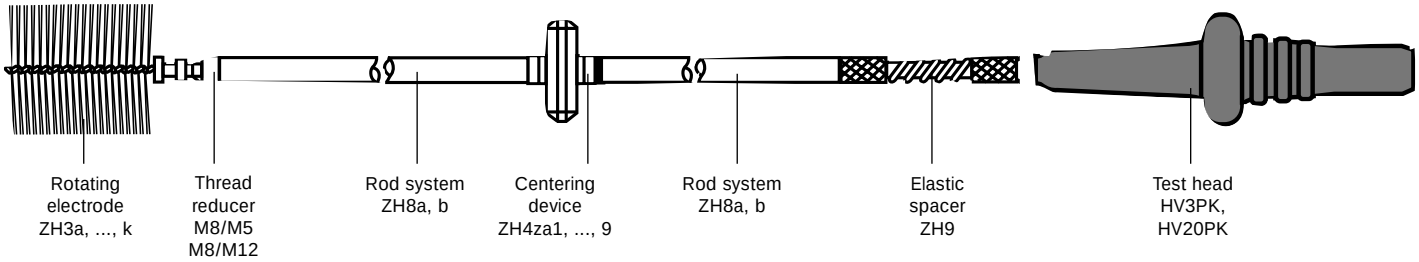
Example 1: Test system for testing enamel coatings			
	Order no.		Order no.
Test instrument POROSCOPE® HV20	601-933	Ground connection cable HV20-EK/15	601-938
Test head HV20PK	601-934	Sweeper electrode ZH6b	600-696
Test head cable HV20-AK/1	601-940	Additional grounding POROSCOPE® HV20	602-554

Example 2: Test system for testing interior pipe walls			
	Order no.		Order no.
Test instrument POROSCOPE® HV20	601-933	Ground connection cable HV20-EK/15	601-938
Test head HV20PK	601-934	Rod system ZH8b	600-760
Test head cable HV20-AK/1	601-940	Rod system ZH8b	600-760
Rotating electrode ZH3e1	600-703	Centering device ZH4e	600-731
Thread reducer M8/M12	600-722	Elastic spacer ZH9	600-720

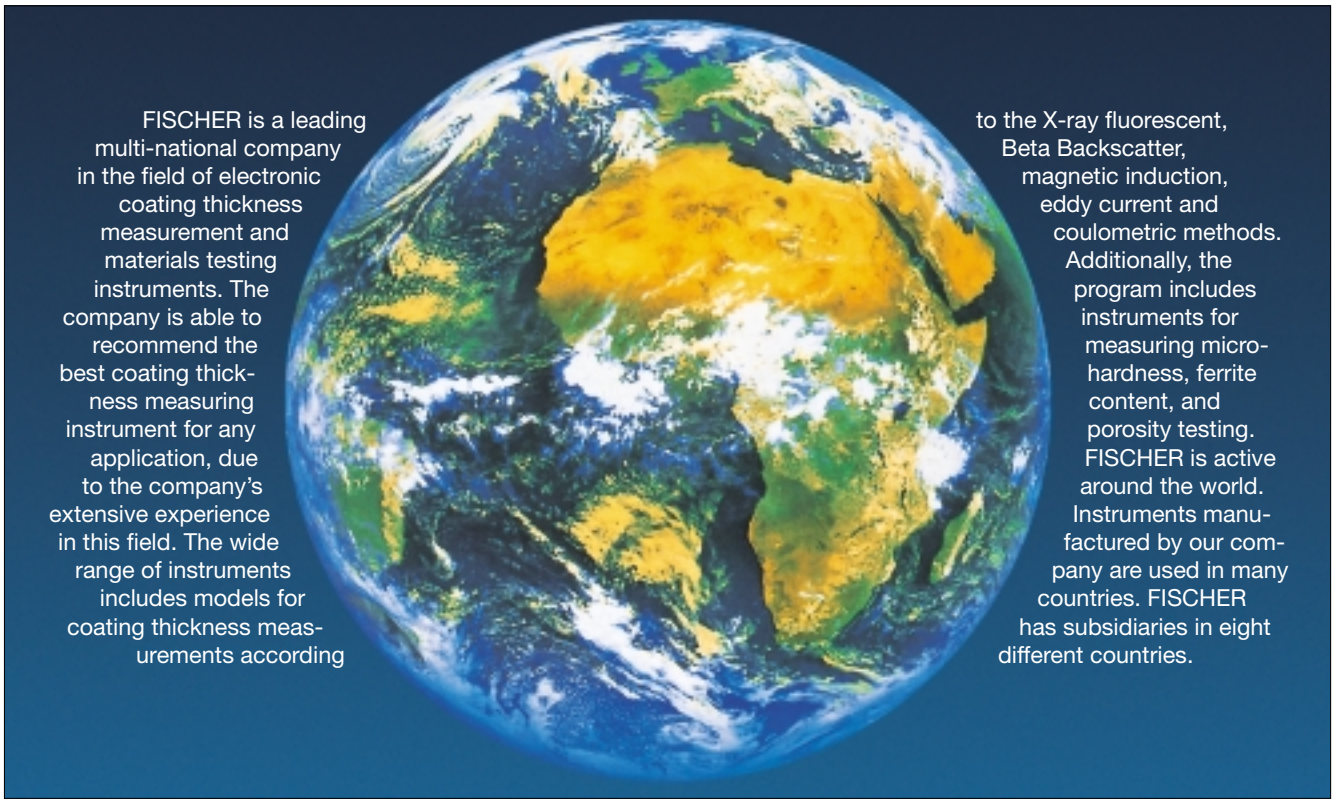
Pipe ID < 13 mm



Pipe ID 13 mm



Active Around the World



FISCHER is a leading multi-national company in the field of electronic coating thickness measurement and materials testing instruments. The company is able to recommend the best coating thickness measuring instrument for any application, due to the company's extensive experience in this field. The wide range of instruments includes models for coating thickness measurements according to the X-ray fluorescent, Beta Backscatter, magnetic induction, eddy current and coulometric methods. Additionally, the program includes instruments for measuring microhardness, ferrite content, and porosity testing. FISCHER is active around the world. Instruments manufactured by our company are used in many countries. FISCHER has subsidiaries in eight different countries.

FISCHERSCOPE® X-Ray to measure the coating thickness according to the X-ray fluorescence method.

Micro hardness measurement unit FISCHERSCOPE® H100 to determine the universal hardness HU of thin coatings and foils.

DUALSCOPE® MP40 with probe ED10 to measure coating thickness on ferromagnetic, as well as non-ferromagnetic materials with automatic recognition and selection of the measurement method.

The high quality standard of FISCHER instruments is the result of our efforts to provide the very best instrumentation to our customers.

FISCHER is a reliable and competent partner, offering expert advice, extensive service, and training seminars.

Today, FISCHER instruments are used successfully in all technological fields of industry and research.

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