

WÖHLER

International catalogue

2003

innovation - quality- value

Measuring instruments:

Flue gas analysis
Pressure
Temperature
Leakage

TA	164°C	TL	23.9°C
O ₂	6.3%	CO ₂	10.7%
QA	7.4%	T _g	48.8°C
Lam	1.43	Endgas	0

Visual inspections:

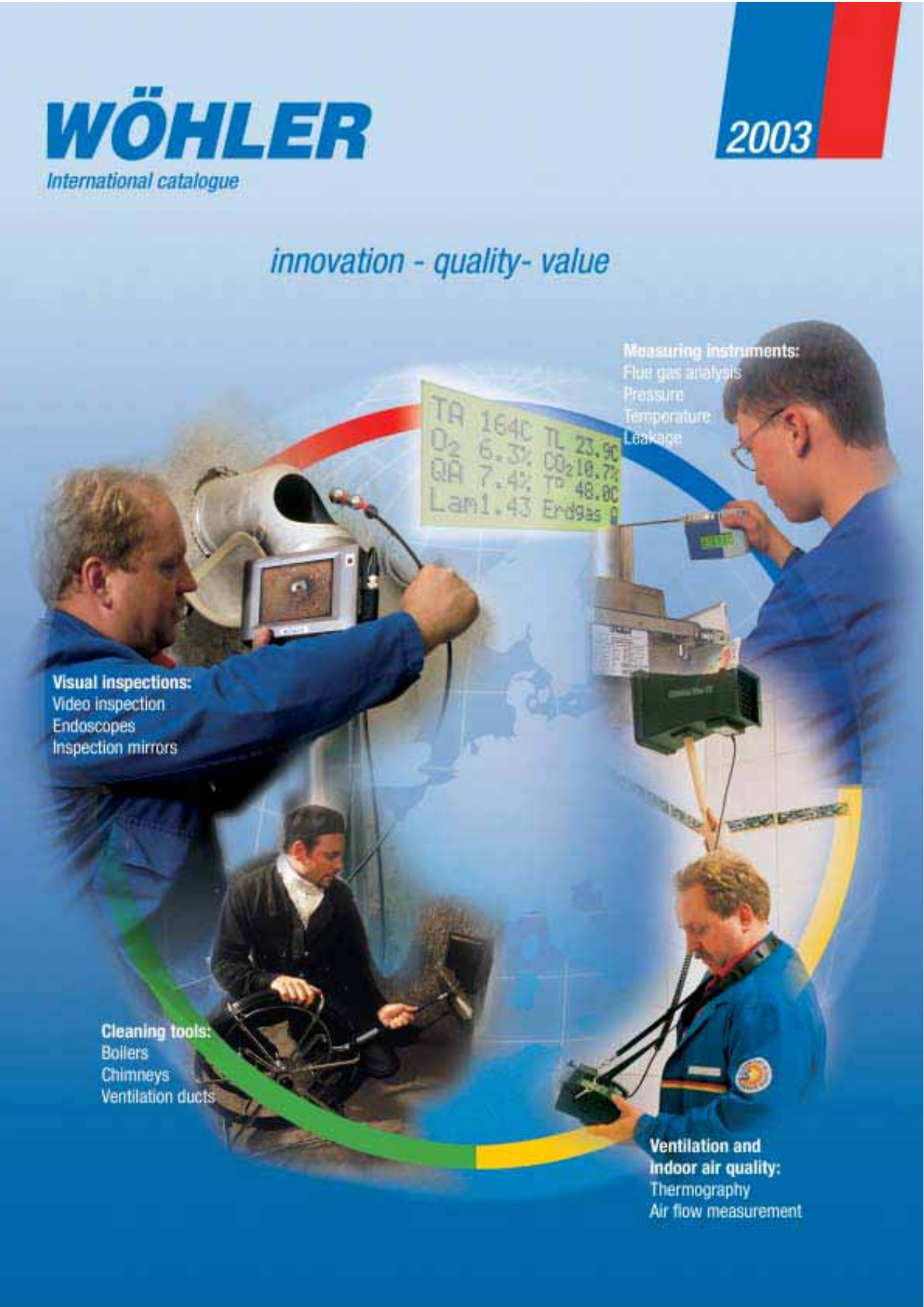
Video inspection
Endoscopes
Inspection mirrors

Cleaning tools:

Boilers
Chimneys
Ventilation ducts

**Ventilation and
indoor air quality:**

Thermography
Air flow measurement



Measurement: Heating Systems



Large display

...all data at a glance

A 97

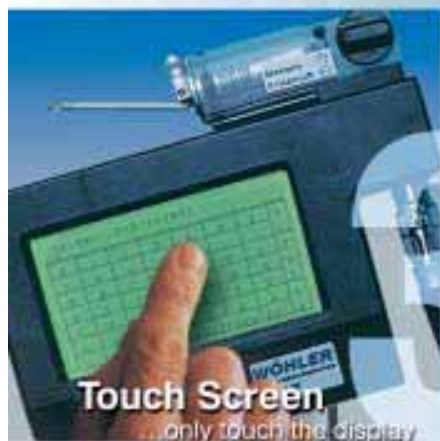
handy...



Options

...e.g. volume measuring

...universal



Touch Screen

...only touch the display

...easy memory access



one hose

...no more entanglement

...innovative technique.

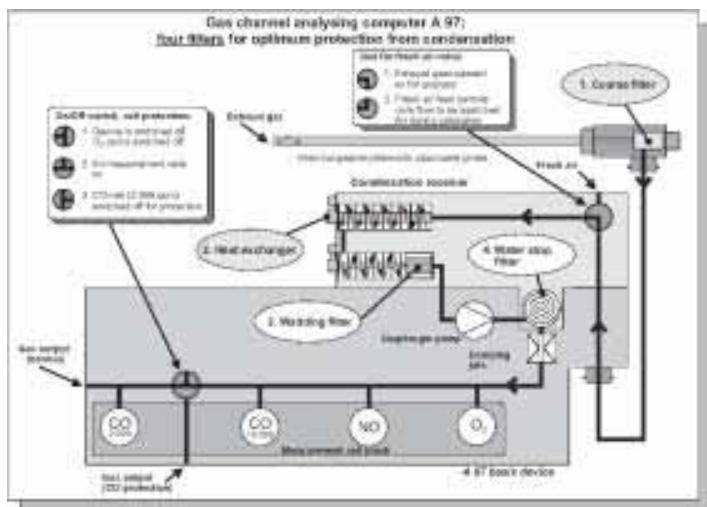
A 97 Analysis Computer



Application:

The A 97 Analysis Computer is ideally suited for :

- Measurements on oil, gas and wood furnaces
- Measurements confirming to national directives for CO measurement
- Measurements confirming to regulations for NO measurement



Advantages:

- **Responsive** - for the adjustment of multilevel burners
- **Simple operation** via touch screen
- **Excellent overview** on the large display
- **Expandable** e.g. for continuous measurements: see following pages
- **Simply entry of customer data for measurement data management** with **alphanumeric keyboard** - wireless data transmission to the printer and PC via the bi-directional IrDA interface
- **Simple to maintain** with a modular structure (see diagram above), simple cell change

TÜV By RgG 180

Measurements:

Oxygen (O ₂):	0...20.9 Vol.-%
Carbon monoxide (CO):	0...2000 ppm
Carbon monoxide (CO):	0...16000 ppm
Nitric oxide (NO):	0...2.000 ppm
Flue-gas temp. (TF):	0.0...800°C
Air temperature (TA):	-20.0...99.9°C
Chimney draught (PD):	0...+/-4000 Pa

Computed values:

Flue-gas loss (q _p)	
Efficiency (η):	from 0...120 % condensation is automatically detected
Excess Air (λ):	
Carbon dioxide content (CO ₂)	
Carbon monoxide content in undiluted flue-gas (CO _{norm}):	Reference oxygene freely adjustable (standard 0 %)
Carbon monoxide content in flue-gas solid fuel heating systems:	Reference oxygene freely adjustable (standard 13 %)
Nitric oxide in undiluted flue-gas (NO _{norm}):	Reference oxygene freely adjustable (standard 13 %)
Condensate amount in kg/m ³ or kg/l	
Flue-gas dew point	
Date / time	
Storage temperature:	-20...50 °C
Work temperature:	10...40 °C
Weight:	ca. 1600 g
Size:	190x145x50 mm

Measuring Data Management A 97



The A 97 analysis computer offers outstanding performance for administration of your measuring data by the combination of large display and touch screen. To the input of customer data a complete alphanumeric keyboard can be used, so that the character by character input, e.g. over arrow keys, is avoided. The standard memory of 100 measuring data sets can be extended to 1,000 measuring data sets.

Data exchange with PC or thermal printer HP is made by an IrDA interface. If your PC should not have an inserted infrared interface, please use the IR interface over a serial port of your PC (see accessories). For data exchange we put on our web page free of charge an appropriate PC program to your disposal. The data can be processed then problem-free with usual spread-sheet programs.

A 97 Analysis Computer - Basic equipment



A97 basic equipment with 1.7 m Hose-Cable, for:
 O_2 , CO_2 , CO , CO_{norm} , $T_{Flue-gas}$, T_{Air} , T_{Taup} , Draft, ΔP , qA , η , λ

Comes with:

A 97 Analysis Computer with IrDA-interface, Data administration up to 100 data records, 4 Mignon-rechargeable batteries (NiCd), Leather protection case, Interchangeable Probe with Plug-in Probe - 295 mm long and Cable-Hose, Combustion air temperature probe, Wadding rolls short for condensate separator, Condensate wiper, charger, 1 Coarse filter, 1 Water-Stop Filter

9600 J

A 97 basic equipment with 3 m Hose-Cable, like above

9659 J

A 97 Aluminium Equipment Case

**Advantages:**

- large space for the measuring instruments necessary with adjusting and inspection work at oil and gas firings: Analysis Computer A 97 incl. accessories, printer and soot test pump
- 2-Level-Inlet, practical for carrying of lots of useful equipment
- operation of A 97 in suit-case by special arrangement of the devices possible
- operation of A 97 and printing of measuring data can be done in the suit-case
- A 97 - Hose-Cable length 3 m

Comes with:

A 97 Analysis Computer basic equipment, but with 3 m Hose-Cable, Multi-Hole Plug-in Probe - 60/160, Combustion Air Temperature Probe with magnetic holder, Thermoprinter HP with 10 rolls of paper and batteries, RP 72 Soot test pump (set), PTFE-Cone, Swivel probe holder, Clamping cone, Coarse filter (5 pieces), Water-stop filter (3 pieces), Aluminium case

9650 J

A 97 Complete Plastic Case

**Advantages:**

- large space for A 97 - basic equipment incl. accessories and printer
- impact protection by foam material Inlet
- operation of A 97 in suit-case by special arrangement of the devices possible

Comes with:

A 97 Analysis Computer basic equipment with 3 m Hose-Cable, Combustion air temperature probe 280 mm, Thermo printer HP, Clamping cone, PTFE cone, Wadding rolls short, Plastic case

9664 I

A 97 Leather Equipment Case

**Advantages:**

- durable, upright standing Craftsman leather suit-case
- large space for the measuring instruments necessary with adjusting and inspection work at oil and gas firings: Analysis Computer A 97 incl. accessories, Printer and Soot test pump as well as additional tool
- the A 97 is placed diagonally on a metal plate - ideally for the operation of the equipment in the suit-case
- A 97 with Memory for 1,000 data records

Comes with:

A 97 Analysis Computer basic equipment, Memory for 1,000 data records, Multi-hole Plug-in probe - 60/160, Combustion air temperature probe 280 mm with magnetic holder, RP 72 Soot test pump (set), PTFE-Cone, Swivel probe holder, Clamping cone $\varnothing$ 8 mm, Fastening clips (100 pieces), 5 Coarse filters, 3 Water-stop filters, Spare parts kit A 97, Leather case

9660 J

Continuous Flue Gas Measurement - A 97

Order No.

€

A 97 Peltier-Cooler



Function:

The Peltier-Cooler A 97 is attached directly at the Interchangeable probe A 97 in place of the Coarse filter. Thus as soon as possible the condensate is extracted from the flue gas by an active cooling over a regulated, high-performance Peltier element - heated probe hoses are not necessary. In connection with the separate Condensate pump the continuous operation of the measuring instrument becomes possible with long-term measurements.

Advantages:

- direct connection of the cooling to the Interchangeable probe A 97 - heated probe hoses are not necessary
- active cooling over high-performance Peltier element - Protection of the measuring instrument from condensate

Applications:

- For adjustments at large firings
- Measurements over several hours
- Measurements with much condensate
- Measurements with high dust and soot content

Dew point depression:	15°
Work temperature:	10 ... 40 °C
Storage temperature:	0 ... 50 °C
Condenser service period:	10 h
Power supply:	7 Volt
Current consumption:	max 3 A
Weight:	240 g
Size (mm):	43 x 62 x 100

Comes with:

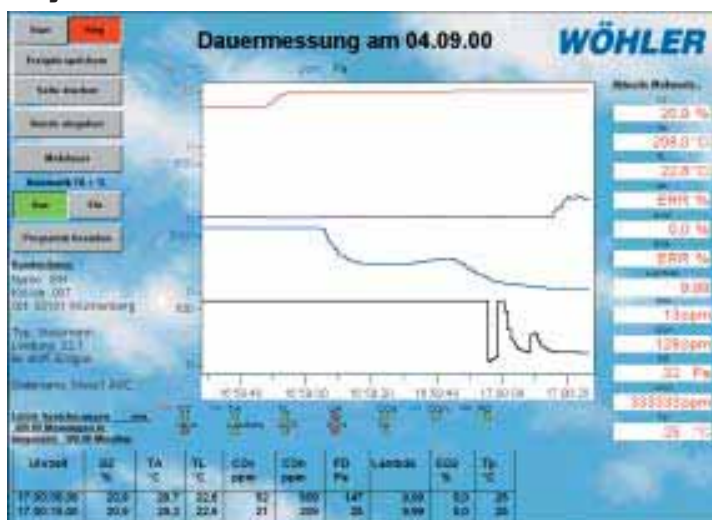
A 97 Peltier-Cooler for attaching to the Interchangeable probe A 97 incl. power pack

4635 J

A 97 Condensate pump for Peltier-Cooler, with Condensate reservoir

4636 J

DasyLab-PC-Software A 97



Applications:

- for easy measuring data collection and management with long-term measurements
- measurements in laboratories - ideally by compatibility to professional DasyLab-Software and over ASCII-tables to all other programs
- large display for training courses
- remote display for measurements on larger burner heating systems

Comes with:

DasyLab-PC-Software on CD-ROM incl. user license

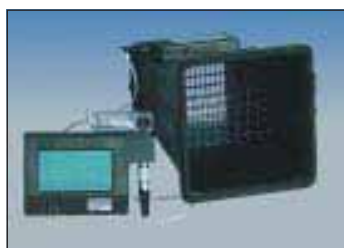
5125 L

Function:

For the continuous data communication the A 97 is connected by the IrDA-interface with the notebook/PC and the IrDA-mode at A 97 is switched on. The powerful DasyLab-PC-Software receives the data continuously transmitted from the A 97 and enables convenient evaluation and processing using tables and graphics.

Auxiliary Probes A 97

A 97 Air Flow-rate Measuring Funnel (see page 27)



A 97 Special Wall Temperature Sensor Type W (see page 31)



The auxiliary probes for the connection to the A 97 enable the measurement of important physical dimensions in related spheres of activity.

Your A 97 is a **universal measuring instrument**.

A 97 - units and accessories

A 97 Analysis Computer, Basic Equipment



A 97 Analysis Computer, Basic Equipment see page 5

A 97 Analysis Computer, Basic Equipment
+ CO: 0 - 16,000 ppm

A 97 Analysis Computer, Basic Equipment
+ Memory for 1,000 data sets

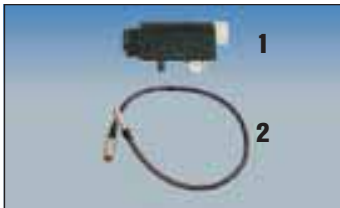
A 97 Analysis Computer, Basic Equipment
+ CO: 0 - 16,000 ppm
+ Memory for 1,000 data sets

A 97 Analysis Computer, Basic Equipment
+ NO: 0 - 2,000 ppm

A 97 Analysis Computer, Basic Equipment
+ CO: 0 - 16,000 ppm
+ NO: 0 - 2,000 ppm

A 97 Analysis Computer, Basic Equipment
+ CO: 0 - 16,000 ppm
+ NO: 0 - 2,000 ppm
+ Memory for 1,000 data sets

A 97 Interchangeable Probe A 97 Cable-Hose Fitting



1 Interchangeable probe A 97

1 Interchangeable probe A 97, in exchange

2 Cable-Hose Fitting A 97, 1.7 m

2 Cable-Hose Fitting A 97, 3.0 m

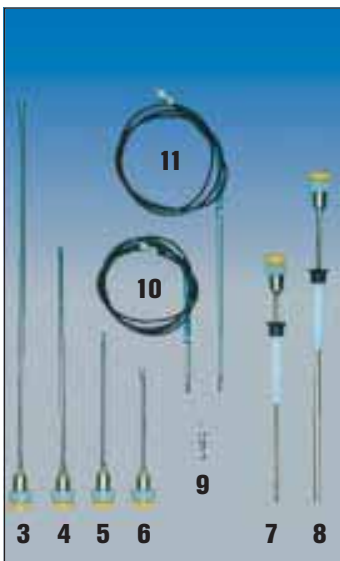
2 Cable-Hose Fitting A 97, 1.7 m, in exchange

2 Cable-Hose Fitting A 97, 3.0 m, in exchange

Connector for 2 cable-hose fittings, up to max. 9 m possible

A 97 Probes

for simultaneous gas extraction,
pressure- and temperature measuring:



3 Plug-in probe A 97 - 500 mm with protection cap

4 Plug-in probe A 97 - 295 mm with protection cap

5 Plug-in probe A 97 - 180 mm with protection cap

6 Plug-in probe A 97 - 130 mm with protection cap

7 Multi-hole Plug-in Probe A 97 - 60/160, for CO measurement, with long PTFE-Cone

8 Multi-hole Plug-in Probe A 97 - 160/260, for CO measurement, with long PTFE-Cone

9 Combustion Air Temperature Probe A 97, Plug form

10 Combustion Air Temperature Probe A 97, 100 mm with 2 m cable

11 Combustion Air Temperature Probe A 97, 280 mm, with 2 m cable

Magnetic holder to fix the Combustion Air Temperature Probes

PTFE-Cone, to fix the Combustion Air Temperature Probes

PTFE-Cone, extra long, for Multi-hole Plug-in Probe

Order No.

€

9600 J

9610 J

9649 J

9574 J

9620 J

9630 J

9570 J

9603 L

9534 Q

9604 J

9626 J

9672 0

9673 0

9446 0

9614 J

9622 J

9613 J

9652 J

9615 L

9616 L

9605 J

9651 J

9611 J

6142 J

2463 B

6170 B

Heating Systems

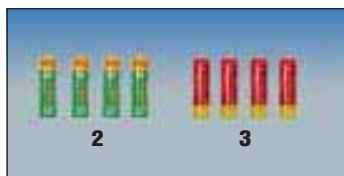
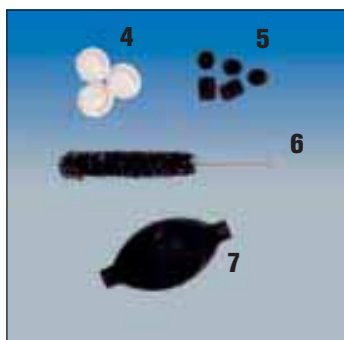
A 97 - units and accessories

Order No.

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**Protection Case A 97****9617 J****Shoulder belt for protection case A 97****9624 J****Aluminium case A 97****9618 Q****Leather case A 97****9619 L****Shoulder belt for Leather case A 97****7617 J****Plastic case A 97****50794 L****1 Rucksack** (only), made of light, stain and water resistant Cordura**5540 J****Advantages:**

- adjustable, broad-padded belts in shoulder- and hip range
- large, easily accessible side pockets
- removable plastic compartment

Batteries, Charger**2 Set of rechargeable batteries NiMH Mignon for A 97 / E 98****9407 M****3 Set of rechargeable batteries NiCd Mignon for E 98 / A 97 / A 91 / A 86****3114 J****Charger A 97**, charging period 15 hours**9633 J****Rapid charger A 97**, charging period 3 hours, prevents memory effect**9612 J****4 Water-stop filter A 97**, 3 pieces**9621 J****5 Coarse filter A 97**, 5 pieces**9632 D****6 Condensate wiper****619 D****7 Bulb pump**, for checking probe sealing**2340 L****Spare parts bag A 97****9623 J****Active carbon filter A 97**, supplementary filter for measurement of solid-fuel appliances**5876 J****Data management****HP Thermoprinter****9130 J****Memory upgrade A 97**, Data management for 1,000 measurement data records**IR-Interface for your PC**, bidirectional after IrDA-Standard**9631 L****Interface-program „MESSEN.EXE“**, on 3.5" Disk,
(free Download from our Webseite)**7504 O****Upgrade Service****Fitting A 97 with Co Measuring Cell****9609 O**

measurement range 0 up to 16,000 Vol.-ppm

Fitting A 97 with NO Measuring Cell**9608 O**

measurement range 0 up to 2,000 Vol.-ppm

Maintenance A 97

The sensors built in the analysis computers are subject to wear. The measuring instruments should be examined once annually or sooner if needed.

Analysing computer pre and final inspection, Calibration and adjustment**18 Z****O₂-Sensor A 97** with installation and pre and final inspection**9779 O****CO-Sensor A97** with installation and pre and final inspection**9780 O**

With the change of both sensors the price reduces by a pre and final inspection.

E 98 Economical flue-gas analyzer



TÜV By RgG 195

That is all that you need:

Econometer E 98



The Econometer E 98 -
high performance in a small size ...



... now also with 1.7 m
hose fitting, probe
and IR:

Econometer E 98 Maxi

Application:

- Adjustments on oil and gas-fired heating systems.
- Replaces old-fashioned analyzers and does much more.

Advantages:

- Optional data memory for ten sets of measurement data and IR interface for printing out data and permanent data transmission
- Optional 1.7 m hose (E 98 Maxi)
- Additional pressure connection for gas pressure adjustments or differential pressure measurements
- Fast response time
- Uses regular or rechargeable batteries
- Long operating period: e.g. 38 hours of operation with Mignon dry cells (2.3 Ah) or 10 hours with standard NiCd rechargeables (600 mAh)
- Gas conditions can be easily removed for cleaning
- Rugged due to well-designed gas treatment section with integral, easily replaceable water stop filter



Take **advantage** of the E 98's performance vs. costs and equip each of your technicians with an E 98 Econometer. For the heating business this new compact device for flue-gas analysis is the ideal way to save time and eliminate double work. With a press of a key the **E 98** shows you the flue-gas conditions on the large display.



You switch on:



You set the type of fuel:



You measure:



You let the unit compute:



You print the results!

O₂ measurement

Sensor: electrochemical
Range: 0...20.9 Vol.-%
Accuracy: 0.3 Vol.-% absolute

CO indicator (not H₂ compensated)

Sensor: Semiconductor
Range: 0...350 ppm
Accuracy: 50 ppm

CO sensor

Sensor: electrochemical
Range: 0...1,500 ppm
Accuracy: ± 5 % o.r.
> 5ppm

Inlet air temperature measurement - T_A

Range: 0...99.9 °C with T_F probe
Accuracy: 2 °C: 0...50 °C
opt. (for measurements accord. to pollution control regulations)
Range: -20.0...99.9 °C with T_A probe
Accuracy: 1 °C: 0...50 °C

Flue-gas temperature measurement - T_F

Range: 0...800 °C
Accuracy: 2 °C: 0...125 °C
3 °C: 125...250 °C
4 °C: 250...400 °C

Chimney draft, ΔP

Range: -100...+4,000 Pa
Accuracy: 3 Pa: -20...100 Pa
3 % FSD: -1.0...4.0 hPa

CO₂ determination

Display range: 0...CO_{2max}
Resolution: 0.1 %

Flue-gas loss determination - qA

Depending on fuel, resolution 0.1 %

Efficiency - η

Display range: 0...120.0 %
Resolution: 0.1 %

Dewpoint temperature measurement

Depending on fuel, resolution 0.1 °C

Condensate quantity

Display in kg/m (gas) or kg/l (oil)

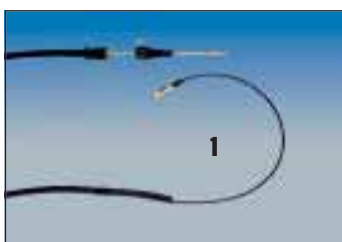
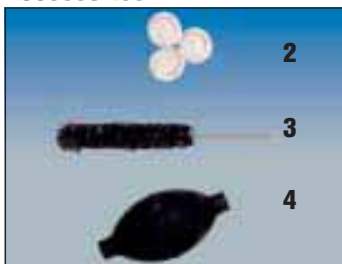
E 98 Equipment

Order No.

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E 98 Basic Equipment**E 98 Econometer with 4 regular batteries****9800 J****E 98 IR, with measurement data memory, IR interface for data printout and permanent data transmission****9830 J****E 98 Complete Case****E 98 IR Complete Plastic Case**, containing Econometer E 98 IR with measurement data memory, IR interface, protective sleeve and set of rechargeable batteries, combustion air temperature probe 280 mm, HP thermal printer, charger A 97 / E 98, plastic case, PTFE cone and spare part kit E 98**9888 J****E 98 Maxi Basic Equipment****E 98 Maxi, basic equipment,**

with measuring data memory, IR interface for data printout and realtime data transmission, 4 regular batteries, flue-gas probe 295 mm and 1.7 m hose

9920 J**E 98 Maxi Complete Case****E 98 Maxi Complete Plastic Case**, comes with Econometer E 98 IR with data memory, IR interface for data printout and realtime data transmission, magnetic holder, flue-gas probe 295 mm, 1.7 m hose, clamping cone, combustion air temperature probe A 97 / E 98, PTFE cone, charger A97 / E 98, set of rechargeable batteries, spare part kit E 98 and plastic case**9921 J****Protective Sleeve, Cases, Holder and Probes****Plastic Case E 98****9827 M****Plastic Case E 98 Maxi****9923 M****Protective Sleeve E 98****9808 J****Hand Loop with Karabiner Hook E 98****9805 J****Magnetic Holder E 98****9922 J****O₂ Probe E 98**, 200 mm probe with 1.5 m silicone hose and cone**4578 J****1 QA Probe E 98**, 155 mm probe with combustion air temperature probe and cone, 1.5 m silicone hose and connection cable**9924 J****Accessories****Regular batteries**, Mignon 1.5 V**2999 J****2 Water-stopp filter**, 3 pieces**9821 J****Wadding rolls short, large pack**, 150 pieces**620 C****3 Condensate wiper****619 D****4 Ball pump**, for sealing inspection**2340 L****Spare Part Kit E 98****9806 J**

DC 2000 Pressure Computer

Digital Manometer for all pressure measurements



Specification:

Differential pressure:

Range:	± 2 bar
Accuracy:	< 3% from measuring, in range <± 200 Pa better than ± 6 Pa
Resolution:	1 Pa in range -125 Pa up to + 125 Pa, otherwise 10 Pa

Temperature (internal NTC):

Range:	-5°C up to 55°C
Accuracy:	< ±4°C
Resolution:	1°C
Relative humidity (optional):	
Range:	0% up to 100% rH, non condensing
Accuracy:	±5% rH (0-60% rH), otherwise <10% rH
Resolution:	1%rH
Storage temp.:	-20°C up to +60°C
Work temp.:	-5°C up to +60°C
Weight:	450 g (with case)
Size:	54 x 165 x 52 mm

Applications:

- Fine tuning of burners with 1 Pa resolution
- Stress and Main test according to TRGI G 600
- Draft Measurement
- Velocity measurement with Prandtl tube (0.0 - 150.00 m/s)
- Leakage test of water pipes
- Air control: Long term recording of temperature/humidity/pressure

Advantages:

- Switchable units for temperature (°C,°F) and pressure (hPa, Pa, mmH2O, PSI, mbar)
- Quick response time
- Extra wide pressure range
- Leakage rate
- Internal temperature sensor, external probe option
- IR interface for PC and printer, personalized printout
- Humidity measurement (optional)
- Data logger (approx. 3 years)
- 2 x type AA batteries

DC 2000, basic equipment with hose 1.5 m

7200 I

DC 2000, with humidity measurement, brass connectors and hose 1.5 m

7201 I

DC 2000 protection sleeve with 2 magnets

7202 I

DC 2000 set, including order no. 7201, protection bag, 2 x hoses 1.5 m with plug in connectors and plastic carrying case MINI

7206 I

DC 2000 Prandtl-set, including order no. 7206, Prandtl tube 35 cm, temperature probe with 2 m cable, carrying case MIDI

7207 I

Complete set for pressure testing and leakage detection

Recommended Applications:

- Pressure test on gas lines according to TRGI main- and stresstest
- Locating of leaks
- Gas pressure measurement for burner adjustment
- Measurement of velocity in ductwork
- Leakage testing on water lines (TRWI)



DC 2000 Test set I, DC 2000 with humidity sensor, protection sleeve with magnets, gas detector GS 20, thermal printer, leakage spray, 2 high pressure locks, plastic carrying case MAXI and gas line sealing set consisting of: 2 adjustable cones, 1 lock, 1 gasmeter lock, 1 pump, 1 X-connector, various hoses with plug in connectors

7220 J

DC 2000 Test set II, DC 2000 with humidity sensor, protection sleeve with magnets, thermal printer, leakagespray, 2 high pressure locks, plastic carrying case MAXI and gas line sealing set consisting of: 2 adjustable cones, 1 lock, 1 gasmeter lock, 1 pump, 1 X-connector, various hoses with plug in connectors

7221 F

DC 2000 Test set MIDI, DC 2000 with humidity sensor, protection sleeve, gas line sealing set consisting of: 2 adjustable cones, 1 pump, 1 X-connector, various hoses with plug in connectors, carrying case MIDI

7277 J

HD 2000 Heating Diagnosis

Order No.

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HD 2000 Heating Diagnostic

for long-term monitoring of oil-fired heating systems

Function:

The HD 2000 heating diagnostic adapts itself in the first week after startup by a learning phase to the dynamic behavior of the exhaust gas temperature of the heating system. It determines heating cycles, which serve exclusively for the covering of the stop losses. By these consumer-independent characteristic values a change shows itself through e.g. contamination more clearly than with the usual exhaust thermometers. Request for maintenance takes place via acoustic and visual indication.

Advantage:

- Acoustic and visual service indication for clogging of oil burners
- Determination of customer-specific consumption data
- Determination of level of annual usage
- Data transfer in the IrDA mode
- Easiest mounting using magnetic holder
- Maintenance-free

Flue-gas temperature:

Range: 0...500 °C

Accuracy: ± 3 °C

Display:

Flue-gas temperature, operating and burner operating time according to VDI 3808, total hours

Data logger:

Memory for more than 3.5 years

Power supply:

2 x 1.5 V monocoils for max. 3.5 years

Comes with:

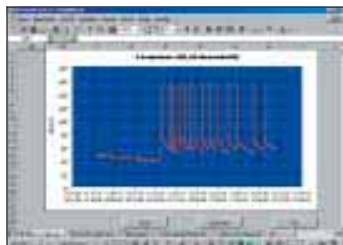
HD 2000 Heating Diagnostic
incl. probe, cone and batteries

7500 A

Regular battery, monocoil

519220

HD 2000 Software



HD 2000 Software, 3.5" disk

7503 0

Function:

The software executable under Excel picks the data out from the HD 2000 via IR interface. Pre-programmed diagrams supply the following data:

- Annual consumption index
- Burner operation period
- Firing operation period
- T continuous measurement

Special Probes for O₂ and CO measurement

O₂ measurement in annular gaps



Annular-Gap Multi-Hole Probe

suitable for all measuring instruments with probes 8 mm Ø

4505 J

Application: For checking the sealing of LAS-flue-gas pipes by measuring the O₂ content in the annular gap.

CO measurement



1 Telescopic Multi-Hole Probe, suitable for all measuring instruments with probe 8 mm Ø, extendable up to 130 cm, with telescopic handle and multi-hole probe

9639 J

2 Telescopic Multi-Hole Probe with Flex Holder extra long

suitable for all measuring instruments with probe 8 mm Ø, with telescopic handle, flex holder and multi-hole probe, extendable up to 148 cm

9694 J

Smoke Test Pump

Order No.

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RP 72 / RG 68 Soot Testing Pump



TÜV By 112 RgG 015 / 014

The well-proven soot test pump with numerous advantages:

- Long measuring hose, ideal even for inaccessible measurement openings
- Decentralised suction channel enables a number of smoke spot images on one filter paper to be obtained - ideal for comparisons
- Ryton plastic measurement head against condensation as standard
- Various probe lengths

Complete Set

RP 72 Soot Testing Pump in following set with: extraction probe 200 mm, with Ryton measuring head, smoke spot comparison scale, threaded cone, oil test bottle, servicing oil, filter papers, short wadding, long wadding, probe brush

9152 J

Individual

1 RP 72 Soot Testing Pump TÜV 112 RgG 015, with extraction probe 220 mm

2412 J

RG 68 Soot Testing Pump TÜV 112 RgG 014, Pump with stroke counter, with extracting probe 220 mm

2411 O

Ryton measuring head, with 220 mm probe and turbulence spiral

7547 L

2 Alu measuring head for temperatures over 230° C and for use with stainless steel probes of special length

2728 O

Makrolon measuring head

3879 L

3 Stainless steel probe 220 mm

2727 L

RP 72 / RG 68 Turbulence Spiral

204010

4 Smoke spot comparison scale TÜV 12 RgG 818

2416 G

5 Special servicing oil

2418 C

6 Oil test bottle, solvent Aceton for testing for oil derivatives, with dropper rod

2481 C

7 Special brush 6 mm Ø

2419 D

8 Filter paper large pack TÜV 12 RgG 001, 34 mm Ø, 1800 pieces

590 C

9 Filter paper transparent can TÜV 12 RgG 001, 34 mm Ø, 300 pieces

2414 D

Bag of Filter paper TÜV 12 RgG 001, 34 mm Ø, 300 pieces

2415 H

10 Filter paper dispenser, TÜV 12 RgG 001, with 300 pieces of filter paper

3700 G

Spare Parts Kit RP 72

1077 O

11 Spare Parts Kit RG 68

1076 L

12 Wadding rolls short, large pack, 150 pieces

620 C

Wadding rolls, 25 pieces

1006 D

13 Wadding rolls long, large pack, 150 pieces

621 C

Wadding rolls long, 50 pieces

2450 D



Ringelmann-Glass

Ringelmann-Glass



Application:

To the fast recognition of too dark smoke trails (§ 2, 1. BlmSchV) complete with leather bag, with the shading:

Grey tone 1 and Grey tone 2

1007 N

Grey tone 3 and Grey tone 4

2738 N

RZ 95 Smoke Test Computer

Order No.

€



TÜV By RgG 167

Reflectance values:

Measuring principle:	Optical Reflection measurement
Measurement range:	0.000 - 0.999 reflectance

Mass flow of flue-gases:

Measuring principle:	Hot-film anemometer
Measurement range:	0 - 5 NL/min.
Linearity error:	3 % of actual value

Computed and displayed values:

Flue-gas normalised volume:	1.63 ± 0.070 NL, Ref. values 990 hPa, 20°C
Smoke spot no:	from 0.0 to 9.9

Weight:	1,650 g with probe
---------	--------------------

Application:

The RZ 95 Smoke Test Computer is ideally suitable for precise determination of smoke spot number with a resolution of 0.1.

Advantages:

- Precise - first hand-held instrument that samples the flue-gas volume in a regulated manner and evaluates the smoke spot number with a resolution of 0.1
- Simplifies and objectivises the well-proven method of determining the smoke spot number
- With commercially available filter paper

Function:

In maximally 60 sec. (typically 40 sec..) the miniature engine pump with flow sensor draws an exhaust volume of 1.63 NL (standard litres) independently of air pressure and temperature. The caused soot mark leads to a change of the optical reflecting power on the filter paper. This is determined directly by the microprocessor in the hand-held instrument as smoke spot number with a resolution of 0.1. The equipment uses for it the commercial filter paper disks (TUEV 12 RgG 001, see page 13). By turning of the filter paper holder three individual measurings can be done with one filter paper. Apart from the single results the middle smoke test number is indicated.

Basic Equipment

RZ 95 hand-held instrument with optoelectronic measuring head, sampling probe 200 mm, threaded cone, condensate trap, charger, Leather bag with carrying strap, Test Paper, probe brush 6 mm Ø, bag of short wadding, bag of long wadding, bag of porosilicate, bag of filter papers 1,800 pieces

9200 0

Accessories

RZ 95 Test Paper

9456 G

Porosilicate, gas drying agent, 200 g

9457 D

Charger for RZ 95

51878J

Filter paper, Wadding rolls long and short, see page 13

CO Meter

CM 99 CO Meter



Application:

- Measurement of CO concentration in the ambient air
- Control of gas leakages on firings

Advantages:

- Easy operation - one button
- Flex holder (400 mm) for measurement at inaccessible points
- Precise electrochemical sensor
- Visual and acoustic indications

CO measurement

Range:	0...500 ppm
	0...1,500 ppm (briefly)
Accuracy:	±5 ppm, 0...99 ppm
	±5%, 100...499 ppm
	±10%, 500...1,500 ppm
Setting time t_{90} :	< 30 s
Display:	3 1/2 figure LCD, CO dep. puls-width modulated signal tone
Storage temp.:	-20...50 °C
Work temp.:	10...40 °C
Supply:	9 V block battery
Size:	12 x 6 x 2.5 cm
Weight:	230 g

Comes with: Instrument with flex holder, leather cover and battery

Accessories:

Protection Bag with magnetic foil

Order No.

€

7240 J

8105 F

Heating Systems

Dew-Point Indicator



1 TI 91 Dew-Point Indicator

Application:

For the inspection of burner appliances for flue-gas spillage in the scope of flue-gas path inspections.

Advantages:

- Small sensor plate for inaccessible locations
- Reliable result through 3 indicators: visual, acoustic and temperature rise

Temperature

Range:	-30...+150 °C
Resolution:	0.1 °C

Size

Housing:	12 x 6 x 2.5 cm
Flexarm:	30 cm
Sensor plate:	1 x 3 cm
Weight:	200 g
Supply:	9 V block battery

Comes with:

Instrument with 9V block battery and protection bag for sensor

Accessories:

Protection bag with magnetic foil

6818 J

8105 F

6800 J

2 R 98 Spillage Tester

Application:

Like Dew Point Indicator s.a., but only acoustic signal

Size

Housing:	5.2 x 1.8 x 2 cm
Flex holder:	30 cm
Supply:	3.6 V Lithium battery

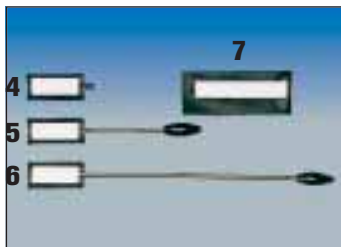
Scope of supply: Instrument with flexholder, leather bag and battery

3 Probe Mirror for reflecting segment blocks and gas nozzles of geysers.

With adjustable krypton lamp 2.5 V, ground plane mirror 20 mm Ø.

1018 L

Dew plates



All Dew Plates are supplied with leather covering.

4 Small Dew Plate 80 mm long

1115 J

5 Small Dew Plate with flex holder 15 cm

1116 J

6 Small Dew Plate with flex holder 40 cm

1017 J

7 Large Dew Plate 170 mm long

1114 F



Mirrors

for checking the flue-gas paths s. page 36

Techno Endoscopes

for checking the flue-gas paths
see page 35

DP 94-200 Leak Test Unit**For flue-gas pipes**

Order No.

€

DP 94-200 Leak Test Unit**Application:**

For the leak test of flue-gas systems with flue-gas with low temperatures.
Test pressure: 200 Pa.

Pressure

Range: 40...250 Pa
Accuracy: $\pm 5\text{ Pa}$, $\pm 5\%$

Flow rate

Range: 0.10...10.00 l/min related to 1013 hPa, 20 °C
Accuracy: $\pm 0.05\text{ l/min}$, $\pm 5\%$

Calculated values: permissible total leakage rate of up to 3 tubing sections

Supply: 230 V, 50 Hz, max. 300 W
Size: 33x32x15 cm
Weight: 7 kg

Advantages:

- menu guided measurement sequence
- menu control via back-lit LCD display
- tested by TÜV
- IR interface for data transfer to HP printer
- computation of permissible leakage rate
- integrated running-time acquisition
- expanded measurement method with possibility of finding leakage rate corresponding to operating pressure

Function:

The flue-gas pipe to be tested for leakage is enclosed in sealing bladders and expanded to a constant overpressure (200 Pa) with the Leak Test Unit DP 94. The air flow rate is needed to maintain the overpressure that is measured. This flow rate corresponds to the leakage of the flue-gas pipe. If the flue-gas pipe tested in this way is not adequately sealed, then using another procedure, the pressure to which the pipe is adequately sealed can be found. To do this the flue-gas pipe is subjected to a quantity of air corresponding to the determined permissible leakage rate and the established stationary pressure is measured. Comparison with the operating pressure of the corresponding burning appliance enables a comprehensive assessment to be made.

Complete Set

DP 94-200 Leakage Test Unit, carrying bag in Cordura, sealing bladders 50-150 mm Ø with and without double gas lead-through, HP Thermoprinter

8110 J**Accessories**

Carrying bag for DP 94 and for accessories, Material: Cordura

8106 L**1 Centering Set for Sealing Bladders****7980 O**

Flowing back of condensate from the exit gas line into the Leakage Test Unit can be avoided by the assembly of the centering set. Der PEK-star serves as spacer and lifts the double gas lead-through of the sealing bladders over the condensate possibly in the exit gas line.

DP 94-200 Leakage Test Unit pre and final inspection, Calibration and adjustment

9717 Z**Sealing Bladders**

2 Sealing bladders with double gas lead-through	50 - 150 mm	7973 Q
	150 - 350 mm	7974 Q
	350 - 600 mm	7966 Q
3 Sealing bladders without double gas lead-through	50 - 150 mm	7970 Q
	150 - 350 mm	7971 Q
	350 - 600 mm	7981 Q
Replacement sealing bladders	50 - 150 mm	8034 G
	150 - 350 mm	6217 G
	350 - 600 mm	6215 G
4 Sealing adapter, square for Isomit ASS flue-gas pipes	80 mm	8117 O
	100 mm	8118 O
	120 mm	8119 O
	140 mm	8120 O

DP 97 Leak Test Unit

**Application:**

For leakage testing of negative-pressure flue-gas systems / chimneys (see EN1443).

Pressure

Range: 0...250 Pa
Accuracy: ± 1 Pa: at 20 Pa
 ± 2 Pa: at 40 Pa
Resolution: 0.3 Pa

Flow rate

Range: 10...250 m³/h
Accuracy: ± 2.5 m³/h, ± 5 %

Computed values: permissible leakage rate according to entered tube size

Work temperatur: 10...40 °C

Storage temperatur: -20...40 °C

Supply: 230 V, 50 Hz, max. 9 A

Size: 35x40x16 cm

Weight: 9.5 kg

Advantages:

- the leakage verification on chimneys can be supported with measurements - ideal for specialist reporting activities
- automatic microprocessor controlled measurement sequence
- precise measurement
- menu-guided operation
- IR interface for data transfer to the HP Thermoprinter
- test pressure adjustable up to 200 Pa
- computation of the permissible leakage rate

Function:

The flue-gas system to be tested for leakage is sealed with sealing elements or sealing bladders (with round chimneys) and subjected to the relevant required test pressure (accord. to Chimney Class N1, N2 or continuously adjustable). The air flow rate needed to maintain this test pressure corresponds to the leakage of the flue-gas system. The user is guided through the measurement sequence via a 4-figure LCD display. Entries, e.g. the dimensions of the flue-gas system, are made using five membrane keys. From the dimensions, the DP 97 computes the permissible leakage rate. The measurement log can be printed out on the HP Thermoprinter using cordless IR interface.

Scope of supply

DP 97 Basic Equipment, Probe DP 97, pressure measuring line and air connection line **8200 J**

Accessories

DP 97 Set of Sealing Elements, 6 sealing elements with probe lead-throughs for all current chimney doors and 5 sealing elements for square chimneys from 100 x 100 mm to 380 x 380 mm. **8220 O**

Extension Tube PVC, for probe DP 97, 50 mm Ø, 500 mm long **8205 O**

Sealing elements for chimney doors and chimney openings

Sealing elements with hole 40 mm Ø, dimensions in mm

$L_{\text{above}}/L_{\text{down}} \times B_{\text{above}}/B_{\text{down}} \times T$ (150 mm)

100/200 x 150/260 **50665 O**

110/230 x 190/310 **50666 O**

220/250 x 290/310 **50667 O**

220/330 x 350/400 **50668 O**

270/410 x 340/480 **50670 O**

Sealing elements without hole, dimensions in mm

120/120 x 190/190 **50671 O**

180/180 x 250/250 **50672 O**

220/200 x 290/290 **50673 O**

330/330 x 390/390 **50675 O**

110 x 150 round **8041 K**

170 x 210 round **8042 K**

Smoke Powder, Smoke Stick

1 Smoke Powder, 1 kg, smoke colour white **1742 L**

2 Smoke Stick, pack with 10 off. **1746 L**

Leakage detection: Gas and Water

Order No.

€

GS 1 Gas Sniffer according to DVGW G 465-4 - also for leakage detection at water pipes

**Applications:**

- Leakage detection at natural gas and liquid gas systems
- Leakage detection hydrogen (H_2), e.g. at fuel cells
- Leakage detection at waterpipelines by forming gas

Advantages:

- One instrument - many applications
- Multi-use technology: natural gas (CH_4) and Propane (C_3H_8) or hydrogen (H_2),
- Kind of gas selectable over menu
- Precisely calibratable before each employment by means of test gas
- Indication of the lower explosion limit
- Indication of the gas concentration over LC display in ppm or vol.%
- Threshold values : LEDs and tone sequence
- Simple one-hand operation

Sensitivity:	1 ppm
Sensor:	Semiconductor with Ex permission
Range:	0 - 999 ppm 0.1 Vol.% to lower explosion limit, automatic change-over
Flex holder:	300 mm long
Preheating time:	approx. 40 sec.
Work temperature:	-5...40 °C
Storage temperature:	-25...40 °C
Storage and transport moisture:	20...80 % rel.
Supply:	4 Mignon rechargeables NiMH, 1.2V, 1,600 mAh
Operation time:	approx. 10 hours
Size:	190 x 40 x 28 mm
Weight:	approx. 320 g

Gas sniffer GS 1 with rechargeable batteries, charger in plastic case, for CH_4 and C_3H_8 **4361 J**

Gas sniffer GS 1 with rechargeable batteries, charger in plastic case, for H_2 selectively **4380 J**

Gas sniffer GS 1, complete set for CH_4 and C_3H_8 in metal case, additionally with test gas bottle, gas sniffer, test gas filling CH_4 , pressure control, calibration piece and hose connector **4362 J**

Gas sniffer GS 1, complete set in plastic case with Akkus, charger and flex holder, 300 mm long **4375 J**

Accessories GS 1

Protection bag for GS 1 **4374 J**

Replacement-Sensor for GS 1, standard **4363 L**

Replacement-Sensor for GS 1, hydrogen selectively **4364 L**

Flexarm for GS 1, 300 mm long **4365 J**

Spiral cable for GS 1, 300 mm to 1,000 mm long **4377 J**

Test gas 50 litres 1 % CH_4 , rest synthetic air, filling **4366 L**

Test gas 50 litres 5 % H_2 , rest nitrogen, filling **4367 L**

Deposit, for test gas can **4368 Z**

GS 20 Gas sniffer

**Applications:**

- Leakage detection at gas lines
- Examination of heating systems and exhaust ways on combustible gases

Advantages:

- Calibrated for methane and liquid gas (2 indicator scales)
- Highly sensitive and fast-response

Sensitivity:	40 ppm
Sensor:	Semiconductor
Indicators:	Indication by acoustic signal and optically by stage-LED
Flexarm:	200 mm long
Preheating time:	max. 50 sec.
Period of reply:	2 sec.
Work temperature:	-5...45 °C
Supply:	4 Mignon batteries, 1.5 V
Size:	130 x 70 x 35 mm
Weight:	300 g

GS 20 Gas sniffer, with batteries and goose neck 200 mm **6681 J**

Sensor for GS 20 **6682 O**

Technical Details

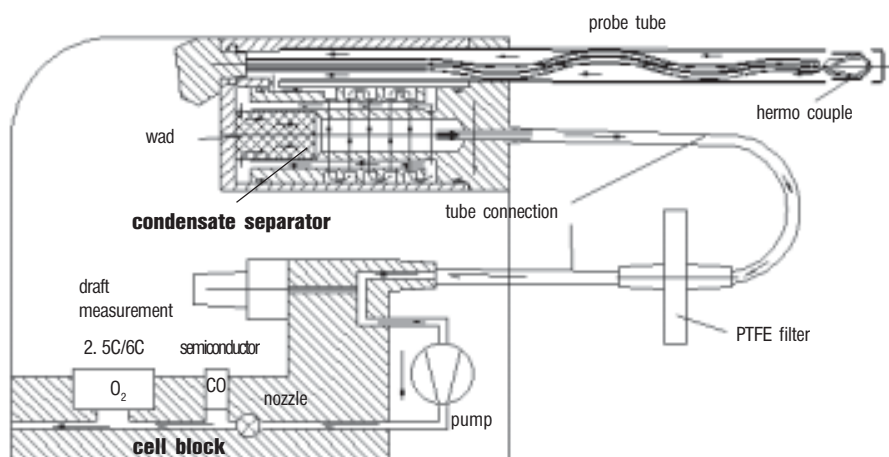
Useful information for the Specialist

Flue-gas analysis/ flue-gas leakage

Tab. 1
Pollution control
measurements

Fuel	Measurement quantity
Oil/gas	Flue-gas loss Smoke spot number (for oil) Chimney draft
Solid fuel additionally for wood	Dust measurement CO measurement

Fig. 1
Principle of a
qualification-tested
flue-gas analysis
computer.



The flue-gas loss Q_F describes the heat which is lost unused with the flue gases. It is calculated using Equ. 1 from the difference between the flue-gas temperature T_F and the combustion air temperature T_A , the measured residual oxygen content $O_{2\text{meas}}$ and the fuel-dependent constants A_2 and B :

Equ. 1
Calculation of the
flue-gas loss Q_F

$$Q_F = (T_F - T_A) \cdot \left(\frac{A_2}{21,0\% - O_{2\text{meas}}} + B \right)$$

The flue-gas loss Q_F is computed with reference to the lower calorific value of a fuel. The Analysis Computers A 86, A 91, A 97 and Econometer E 98 from Wöhler compute the flue-gas loss automatically. The instruments determine the constants A_2 and B from the selected fuel. All the fuel-specific constants used are listed in the individual operating instructions. The

Tab. 2
Limits for
flue-gas loss

Nominal heating power in KW	Day of installation or of major modifications			
	up to 31.12.82	from 1.1.83 to 30.9.88	from 1.10.88	from 1.1.98
over 4 bis 25	15	14	12	11
over 25 bis 50	14	13	11	10
over 50	13	12	10	9

adjacent table shows the currently applicable limits for the maximum permissible flue-gas loss according to [Z197]. The following tolerances are added to the limit in Table 2 in relation to the measured oxygen content $O_{2\text{meas}}$. These tolerance points take into account any measurement uncertainties in favour of the operator.

Tab. 3
Points of tolerance

Tolerance points	$O_{2\text{meas}} \leq 11\%$	$O_{2\text{meas}} > 11\%$
Burner with blower	1	1
Burner without blower	2	3

Example: The flue-gas loss Q_f on a furnace with 11 kW nominal power and blower-type burner installed on 10th December 1989 is to be checked. The oxygen content indicated by a Wöhler analysis computer is $O_{2\text{meas}} = 6.3 \text{ Vol. \%}$ and the flue-gas loss indicated is $Q_f = 7.4 \text{ \%}$.

Test:

- 1st step: „10th December 1989” and a nominal heating power of „11 kW” in Tab. 2 give a limit of 12 %.
- 2nd step: $O_{2\text{meas}} = 6.3 \text{ Vol. \%}$ with a “burner with blower” from Table 3 gives a tolerance point of 1 %.
- 3rd step: The reference value is given by $12 \% + 1 \% = 13 \%$
- 4th step: Rounding of the flue-gas loss Q_f indicated on the measurement instrument.
Decimal values up to 0.50 are rounded down, higher values rounded up.
The measured flue-gas loss $Q_f = 7.4 \%$ is rounded here to $Q_f = 7 \%$.
- 5th step: Assessment:
Actual value $7 \% < \text{reference value } 13 \% \rightarrow \text{System is OK}$

Another obligatory measurement quantity according to pollution control regulations for heating oil as in Table 1 is the smoke spot number Rz. Soot consists of almost pure carbon. The better the combustion in a furnace system, the lower the smoke spot number Rz and therefore the less darkening of a 6 mm measurement spot on the filter paper.

When measuring the smoke spot number, the probe with an inserted filter is introduced into the flue duct and 1.63 litres of flue gas are extracted in ten uniform strokes of the pump. After each suction stroke there must be a waiting period for the pressure equalisation of the filter paper to take place. The complete pump process must be finished within 60 seconds maximum. Three measurements are carried out in this way. Then a

comparison of the smoke spots is made with the ten grey grades of a smoke number comparison scale. When doing this, the smoke spot is assessed according to DIN 51 402 using the nearest integer smoke spot number on the scale. Then the rounded mean is formed and compared with the maximum permissible smoke spot number, see Tab. 4.

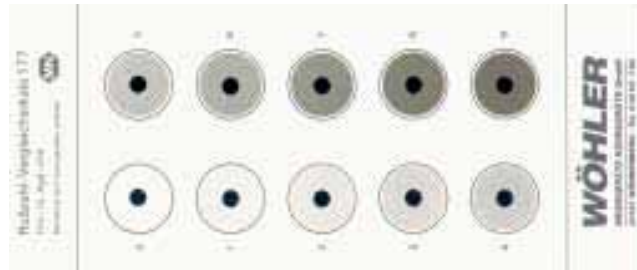


Fig. 2
Smoke spot number comparison scale.

Nominal heating power in kW	Type of burner	Smoke spot number System installed or modified		
		up to 30.9.88	from 1.10.88	from 1.1.98
4 - 11	Atomising burner	2	1	1
	Vaporising burner	3	3	3
over 11	Atomising burner	2	1	1
	Vaporising burner	2	2	2

Tab. 4
Limits for the smoke spot number according to [Z197]

With classical smoke spot measurement using the comparison scale described above, each individual measurement can only be assessed with an integer smoke spot number. Modern firings however typically have smoke spot numbers between 0 to 1 smoke spot numbers. From it the demand results to increase the resolution of the smoke spot number measurement drastically. The suitability-examined Smoke Test Computer RZ 95 outlined in Fig. 3 ensures a resolution of 0.1 smoke spot numbers. It contains apart from a Remissionsmessung with optoelectronic components directly on the filterpaper in the measuring head of the probea regulated and of the microprocessor supervised extraction procedure of 1.63 standard litres [ES95]. Both with the classical and during the automatic soot number measurement the flow material test (admission with acetone) may not prove unburned oil derivatives by yellow colouring.

Automatic smoke spot number measurement with 0.1 Rz resolution

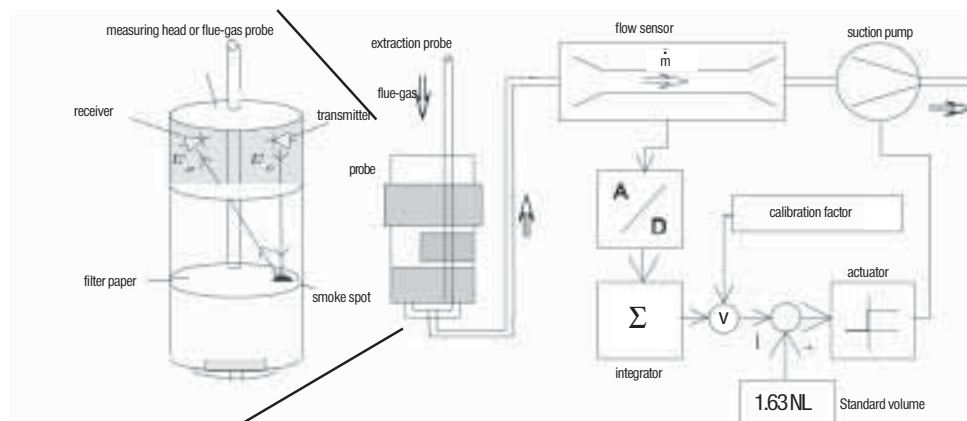


Fig. 3
Working principle of the Smoke Spot Measurement Instrument RZ 95.

Draught Measurement

The third quantity which is obligatory for pollution control according to Table 1 is the chimney draught. As with all Wöhler A 86, A 91, A 97 and E 98 Analysis Computers, the Dust Measurement Instrument SM 96-CO can also measure draught. Typical draught measurement values are below 20 Pa. Draught values that are too high impair combustion and increase the standstill losses. In this case so-called draught controllers or draught limiters can be used. Draught values that are too low or vary significantly due to the influence of the wind can be improved by Wöhler chimney cowls. When measuring draught, correct “zeroing” of the display is particularly important. To do this, the probe must be taken out of the measurement aperture.

Dust Measurement

With heating systems over 15 KW nominal heat output is fixed according to the 1.BImSchV to a maximum dust ejection fuel-independently of 0.15 g/m^3 [Z197]. The measurement of the dust content takes place gravimetrically. Therefore the Wöhler dust measurement instruments SM 96 and SM 96-CO extract 135 standard liters gas automatically regulated in a time period of 15 minutes through a heated filter. By weighing the filter out before and after such a measurement the dust loading in g/m^3 is determined from the increase of weight. With exhaust gas temperatures over 225°C appropriate flue gas condenser tubes must be switched before the filter holder.

CO Measurement Wood

With combustions of wood over 15 KW nominal heating output there must be determined the average carbon monoxid concentration during the measuring time of 15 minutes. Therefore a part of the extracted flue-gas is led into a gas collecting bag and then analysed. This has the advantage that also high however brief CO peak values can be determined correctly. In the dust measuring instrument SM 96-CO this happens automatically after each measurement. The content of an exhaust collecting bag can also be analysed with an Analysing Computer A 97 with high CO sensor (CO sensor up to 16,000 ppm).

„Ringelmann Glas“

“In continuous operation, furnace systems for solid fuels must be operated such that their flue-gas plume is lighter than the grey value 1 in the specified Ringelmann scale”, from pollution control reg. 1. BImSchV, §4 (1). The visual comparison of a flue-gas plume with the Ringelmann scale, which contains six uniformly graded grey values from 0-5, occurs at the point in the flue gas with the highest grey colouration shortly above the outlet of the chimney [Z197]. Fig. 4 shows a Wöhler Ringelmann Glass in use. It must be held with an outstretched arm such that the edge of the smoke plume is located as accurately as possible on the grey edge of the tinted glasses shortly above the chimney outlet.

Fig. 4
Assessing a flue-gas plume with a
Ringelmann scale



„Flue-gas path inspection“, „CO measurement“ on fired furnace systems

The previously described quantities are defined in the pollution control regulation, 1.BImSchV. With the exception of the “CO measurement” on wood-fired furnaces, no CO limits are defined here. These are only monitored within the scope of the safety inspection on gas-fired furnaces, the “flue-gas path inspection”, [Z190]. Here, a supplementary safety inspection is involved which is carried out as well as the flue-gas loss measurement of 1.BImSchV (Table 1) and primarily gives protection to the system users. This safety inspection is regulated in the sweeping and inspection directive of the individual federal states [Z190]. Table 5 gives the sixteen working steps in the “flue-gas path inspection” and allocates the appropriate test and cleaning equipment.

No	Working step	Test and cleaning equipment
1	Check operational readiness of the heating appliance, its condition and that of the connection piece.	Possibly gas leakage detection instrument
2	Close the windows and doors in the vicinity.	-
3	Switch off any ventilators.	-
4	Check existing air apertures for free cross-section.	Torch, mirror.
5	Inspect the flue-gas pipe for free cross-section.	Torch, endoscope, mirror, Camera VIS2000, run through with brush equipment.
6	Inspection of combustion chamber *)	Torch, endoscope.
7	Heating-gas path inspection*)	endoscope.
8	Putting into operation.	-
9	Inspection of the flue-gas flap	In addition, CO room air with e.g. CM 99.
10	Observation and assessment of the flame appearance.	-
11	Inspection of the flue-gas pipe from the burner.	Blockage Detector TI 91/R 98, dew-point plates, smoke tubes, also CO room air with CM 99.
12	Inspection of the flue-gas pipe from the flow safeguarding.	Blockage Detector TI 91/R 98, dew-point plates, smoke tubes, also CO room air with CM 99.
13	CO measurement in the flue-gas with multi-hole probe.	Analysis comp., e.g. A 97 with multi-hole probe.
14	Watch for further defects.	Torch, endoscope
15	Complete working documentation.	/
16	Complete inspection log.	/
*) not required for room heaters, but checking housing for corrosion and thermal damage.		

Tab. 5

Working steps and test equipment for the flue-gas path inspection according to [ZI 90]

In the following, Working step 13 in Table 5 is explained:

To eliminate start-up effects of the furnace system from the measurement results, the CO measurement must only start at the earliest 2 minutes after putting the system into operation and at a distance of twice the diameter of the flue-gas pipe after the flow safeguarding.

The special feature of CO measurement within the scope of a flue-gas path inspection is the application of a multi-hole probe. This probe exhibits a row of equidistant holes. Consequently, the CO concentration over the whole diameter of the flue-gas pipe is determined when extracting the sample and the influence of CO strands is eliminated. Fig. 5 shows the variation in the distribution of concentration in the flue-gas pipe in the form of lines of equal CO concentration.

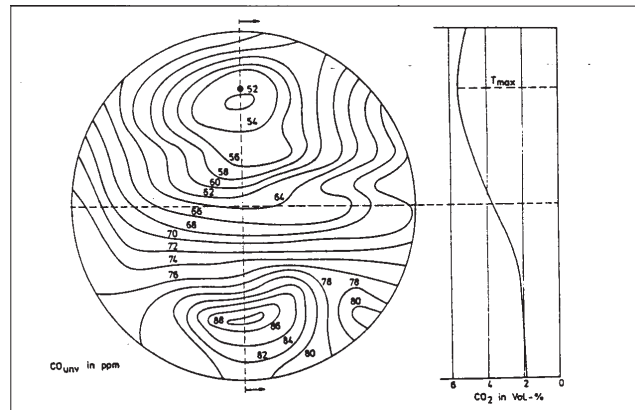


Fig. 5

Concentration distribution in the flue-gas pipe.

Since the CO concentration occurs after the flow safeguarding, the original CO concentration is already diluted by fresh air at that point. For this reason this diluted CO_{meas} measurement is converted to the undiluted CO_{norm} value with the aid of the measured oxygen concentration $O_{2,meas}$ according to Equ. 2.

$$CO_{norm} = CO_{meas} \cdot \frac{21,0\% - O_{2,ref}}{21,0\% - O_{2,meas}}$$

Equ. 2:

Determination of the normalised CO concentration

The reference oxygen $O_{2,ref}$ in Equ. 2 is equal to 0 vol. % for oil- and gas-fired heating appliances. When assessing the measurement result, only the normalised measurement CO_{norm} found from Equ. 2 should be compared with the limits in Table 6 below.

Limits	Assessment
$CO_{norm} \leq 500 \text{ ppm}$	CO measurement OK
$500 \text{ ppm} < CO_{norm} \leq 1000 \text{ ppm}$	System maintenance required
$1000 \text{ ppm} < CO_{norm}$	Rejection of system

Tab. 6:

Limits for the undiluted CO concentration CO_{norm}

Recently, CO measurements are increasingly being carried out in the room or ambient air, because backflow of the flue-gas can lead to dangerous CO poisoning. The ambient CO measurement in the room air can be carried out with our Carbon Monoxide Measurement Instrument CM 99 or also using a normal flue-gas analyser, eg. with the A 97. When using a normal flue-gas analyser, it must however be ensured that during calibration, the fresh air is absolutely free of traces of CO. For example, also after longer smoking break the breath of a smoker contains up to 10 ppm of CO. If the „zeroing“ in the

calibration phase is carried out with concentration, the analysis computer would be 10 ppm less sensitive to CO. The maximum concentration of CO at the work place (MAK value) is currently 30 ppm. In doubtful cases the analysis computer should be calibrated outside in the fresh air in an area free of traffic.

Set-up and maintenance work on furnace systems - simplified set-up rules

Previously, measurements within the framework of flue-gas analysis were carried out exclusively for pollution control and safety inspection on furnaces. In the following simplified set-up and maintenance work on burners is dealt with.

Equ. 3:

Determination of the air-fuel ratio λ

$$\lambda = 21.0\% / (21.0\% - O_{2\text{meas}})$$

One of the most important quantities when adjusting furnace systems is the residual oxygen in the flue gas $O_{2\text{meas}}$. The air-fuel ratio λ is calculated from this oxygen content according to Equ. 3.

The air-fuel ratio λ (lambda) gives the ratio of the actual existing quantity of air to the theoretically required quantity of air. During theoretical combustion all oxygen in the flue-gas is „consumed“, so that according to Equ. 3 the air-fuel ratio λ is 1. However, in practice an excess of air ($\lambda > 1$) is needed for clean, trouble-free combustion. Generally, it can be assumed that a furnace which is adjusted with an air-fuel ratio λ according to Table 7 burns cleanly.

Tab. 7:

Characteristic λ and CO₂ values of real system

Furnaces	Air-fuel ratio λ	CO ₂ Concentration / vol. %
Atmospheric gas-fired	$\lambda = 1.3..1.5$	CO ₂ = 7.9.. 9.1
Gas-blower fired	$\lambda = 1.1..1.4$	CO ₂ = 8.4..10.7
Oil-blower fired	$\lambda = 1.1..1.4$	CO ₂ = 11.0..14.0

The third column in Table 7 indicates the range of characteristic CO₂ concentrations. In modern flue-gas measurement these CO₂ figures are also automatically computed from the measured oxygen content $O_{2\text{meas}}$ and fuel-specific CO_{2max} figure according to Equ. 4 (heating oil: CO_{2max} = 15.4 %; natural gas: CO_{2max} = 11.8 %).

Equ. 4:

Determination of the CO₂ concentration.

$$CO_2 = CO_{2\text{max}} \cdot \frac{21.0\% - O_{2\text{meas}}}{21.0\%}$$

In the past this CO₂ concentration was relatively complicated and less accurately determined using the so-called „vibrating bottle“ analyser. Wöhler now offers a low-cost analysis computer, the Econometer E 98 which has been developed as a direct replacement of this type of analyser, but which offers numerous additional functions.

Heating diagnosis and automatic long-term monitoring of single-step blower firings

During the burn process unburned components, e.g. soot, can remain in the fire place. With increasing actual working time the soot deposits increase in the flue gas-lateral walls, which leads to a clear degradation of the heat transfer in the fire place. This means that with increasing contamination the efficiency of the heating sinks.

The heating diagnosis unit HD 2000 analyses independently the degree of pollution of single-step oil and gas firings and requests the operator by optical and acoustic signals in time for maintenance. Therefore modern procedures of the digital signal analysis are applied to the course of the flue-gas temperature. The equipment can later be installed to all existing single-step small firings. An intervention into existing electrical installation is not necessary as the replaceable battery guarantees a network independent operation of more than three years.

The heating diagnosis unit HD 2000 solves the following three tasks:

The first task insists in the automatic long-term monitoring of domestic oil blower firings on contamination with the purpose of punctual request for maintenance. First the equipment in a one-week learning phase adapts itself to the dynamic behavior of the exhaust gas temperature of the firing. After conclusion of the learning phase the actual monitoring takes place automatically. Only temperature gradients in heating cycles are analyzed, which serve exclusively for the covering of the stop losses and thus are consumer independent. Boiler contamination can be much more clearly recognized than this was possible with the usual exhaust thermometers. Over floating relay contacts also external signal generators can be headed for. Determination of the annual consumption index: The equipment supplies the annual ready status time apart from the actual firing operation hours and readiness hours as genuine measured variables the annual ready status time in h/a and the annual firing period of operation in h/a after VDI3808.

In addition the HD 2000 has a logging function for documentation of customized consumption data in form of 4 data memories:

Memory 1 contains the exhaust gas temperature of the last 23 h of the learning phase (1 measured value each 10 seconds).

Memory 2 contains the exhaust gas temperature of the last 23 h of the monitoring phase (1 measured value each 10 seconds).

Memory 3 contains the accumulated firing operation time in h after restart of the system (1 measured value each week over maximum 3.5 years).

Memory 4 contains service system information about learned and current characteristic values, error events etc.

All memory contents can be transferred to each PC with IrDA interface (9600 Bit/s). For the receipt of the data one uses the Excel software HD 2000 (free download from our website), which represents the data in pre-programmed diagrams.

Modern heating systems in low temperature or condensing-boiler technology produce less and less flue-gas losses. Reduction of the flue-gas temperature is coupled to the reduction in the flue-gas losses. Low flue-gas temperatures can mean however that the flue gases no longer have enough energy to escape through the chimney or flue-gas pipe to the outside air. Consequently, to ensure proper functioning of the heating system, the flue gases must be transported to the outside air with the aid of blowers or fans. This causes an overpressure within the flue-gas system. Any poorly sealed locations in the flue-gas may then lead to the emission of toxic flue gases into the room air.

In EN 1443 „Flue-gas systems – General requirements“ limits on the sealing of various types of flue-gas systems are defined. Some types of flue-gas systems are listed in Table 1 with their permissible volume leakage flows.

Type of system	Designation	Leakage rate L referred to the inside surface in l/(sec x m ²)	Overpressure between inside and outside surfaces of the system during the test in Pa	WÖHLER Instrument for taking measurements
N1	Type 1 low pressure chimneys	2.0	40	DP 97
N2	Type 2 low pressure chimneys	3.0	20	DP 97
PI	Overpressure flue-gas systems laid internally	0.006	200	DP 94-200
PE	Overpressure flue-gas systems laid externally	0.12	200	(DP 94-200)

During the measurement of the sealing of a flue-gas system, the specific test pressure for each type of system in Table 1 is automatically established. The volume air flow necessary for maintaining the test pressure is measured. The volume leakage flow is then determined by forming the mean of the volume air flow over the measurement period of about 1 minute (see also

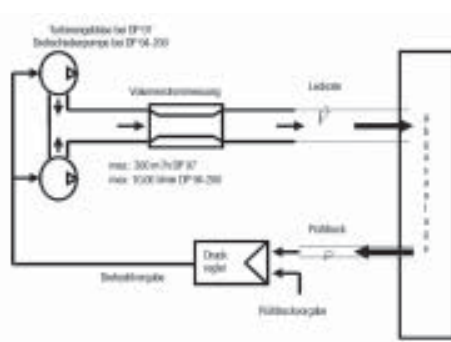


Fig. 1). After entering the system geometry (length, width, diameter or circumference), the measured volume leakage flow $\dot{V}_{\text{mess}}$ is compared with the permissible volume leakage flow $\dot{V}_{\text{perm}}$ calculated according to Table 1.

Turbinegebläse bei DP 97
Volumenstrommessung
Leckrate
Prüfdruck
Druckregler
Drehzahlvorgabe
Prüfdruckvorgabe

Tab. 1
Types of flue-gas systems
according to EN 1443, [EN1443]

Fig. 1
Measurement technique
of the DP 97/DP 94-200.

The permissible volume leakage flow is calculated according to the following equation:

$$\dot{V}_{\text{perm}} = A_i \cdot L$$

where: $\dot{V}_{\text{perm}}$ permissible leakage rate of system
 A_i inner area in m²
 L permissible leakage rate per m² (Table 1)

Equ. 1
Calculating the leakage rate.

- [EN 1443] prEN 1443: “Chimneys – General Requirements”, 1996
- [HA 94] Hausladen: **Handbuch der Schornsteintechnik**, (manual of chimney technology) 3rd edition, R. Oldenburg Verlag Munich, Vienna, 1994
- [DIN 18160] DIN 18160 part 1: “**Hauschornsteine; Anforderungen, Planung und Ausführung**” (house chimneys; requirements; planning and implementation)
- [BU 94] Buderus: **Handbuch für Heizungstechnik**, (Manual of heating engineering), 33rd edition 1994, Publ.: Buderus Heiztechnik GmbH, Beuth Verlag GmbH, Berlin, Vienna, Zurich, 1994
- [ES 95] Ester S., Lötfering J., Wöhler F.: **Meßtechnik an Kleinf Feuerungsanlagen, Spezialmeßgerät über BImSchV hinaus: Rußzahlmeßgerät**, (Measurement on small furnaces, special instrument goes beyond pollution control directive: Smoke spot measurement instrument) IKZ-Haustechnik, Issue 22, Strobel Verlag, November 1995, ISSN 0177-3054, pg.20
- [ZI 90] ZIV: **Abgaswegüberprüfung ab Brenner und Bestimmung des CO-Gehaltes im Abgas**, (Flue-gas path inspection from burner and determination of the CO content in flue gas), Worksheet No. 102, Publ.: Zentralinnungsverband des Schornsteinfegerhandwerks (Chimney sweep Association), Düsseldorf 1, 1990
- [Z 97] ZIV: **Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes**, (First directive for implementing the federal pollution control law), directive about small furnace systems, 1.BImSchV, Worksheet No. 601, Publ.: Verein zur Förderung von Maßnahmen für Feuersicherheit und Umweltschutz des Schornsteinfegerhandwerks e.V. (Chimney sweeps’ society for the promotion of measures on heating safety and environmental protection), Sankt Augustin, March 1997

Bibliography

Air Speed / Temperature

TA 22 Thermo Anemometer



Application:

- For Measurement of the air speed and temperature in the vents
- Detection of leaks in the building wall e.g. at plug sockets, windows, doors, etc
- High sensitive sensor for lower flow rates

Air Speed:

Range: 0.00...30.00 m/s
 Resolution: 0.0...3.00 m/s: 0.01 m/s
 3.1...30.0 m/s: 0.1 m/s
 Accuracy: 0.0...3.0 m/s:
 ±3 % f. m., ±0.06 m/s
 3.1...30.0 m/s:
 ±3 % f. m., ±0.2 m/s

Air Temperature:

Range: -20...80 °C
 Resolution: 0.1°C
 Accuracy: 2 % f. m., ±0.3 °C

Volume Flow:

Range: 0...2,000 m³/h
 Resolution: 1 m³/h
 Accuracy: 3 % f. m., ±1m³/h

Units:

Air Speed: m/s, fpm
 Temperature: °C, °F, K
 Volume Flow: m³/h, cfm, l/s, m³/s

Probe Ø:

8 mm

Size:

175 x 45 x 34 mm

Weight:

190 g

Supply:

9 V block battery

Advantages:

- Simultaneous reading of air speed and temperature
- Average value
- Min / Max - function
- automatic calculation of flow rates
- Hold-function
- various units available
- Probe with 1.7 m cable

Comes with:

TA 22 Thermo Anemometer with 300 mm probe, 1.7 m cable

4643 J

Accessories:

Protection Sleeve with magnetic holder and stand

53798 P

Probe extension 300 mm

53797 P

Volume Flow



Application:

- For precise adjustment and control of the flow rate at air inlets or outlets

Advantages:

- automatic flow rate reading in combination with TA 22
- various funnels in different sizes
- very light weight

Funnel K 35 with bag

size 200x200x330 mm

53794 P

Funnel K 75 with bag

size 300x300x370 mm

53793 P

Funnel K 120 with bag

size 450x450x370 mm

53789 P

Funnel K 150 with bag

size 550x100x600

53788 P

Volume Flow Measurement

LCA 6000 VA Impellar Anemometer



Advantages:

The LCA 6000 VA's wide impellar and special microprocessor technology allows averaging even with turbulences.

- direct display of the air speed in m/s
- direct display of the volume flow in m³/s
- continuously adjustable average time
- adjustable cross-section area in m²
- measurement of the volume flow with special hoods (see picture below)

Application:

- Adjustment of air openings at ventilation systems
- Examination of fans and air flows in halls and corridors

Range: 0.25...30 m/s
 0.002...2700 m³/s

Surface input: 0.008...90.00 m²

Average time: variable, min. 3 sec., max. depending on the speed, e.g.:

2 min. at 7.5 m/s

1 min. at 15 m/s

30 s at approx. 30 m/s

Accuracy: 1...12 m/s: < ± 5%

12...30 m/s: < ± 2%

Supply: 9 V battery, for approx. 50 h

Size: 110 x 40 x 265 mm

Weight: approx. 290 g

Comes with:

LCA 6000 VA Impellar Anemometer with 9V battery

4639 0

Accessories:

Carrying Bag for LCA 6000 VA

4450 0

Flow Rate Hoods Set A consisting of: 1 round hood Ø 180 mm, 1 square hood 285 x 235 mm, carrying bag, Flow Rate Curve

4451 0

Flow Rate Hoods Set B, 335 x 335 mm (opening inside), 440 x 440 mm (outer dimension) with carrying bag

4452 0



SWA 233 Flow Rate Measuring Instrument



Range:	2...65 l/s and 7...233 m³/h
Display:	digital
Resolution:	0.1
Accuracy:	< 0.5 l/s < 5% v.M.
Pressure loss:	2.5 Pa bei 100 m³/h
Supply:	NiMH-rechargeable batteries (installed)
Weight:	2.0 kg (Funnel)
Size:	190 x 190 mm (Funnel opening)
Auxiliary funnel:	340 x 340 mm (2) oder 370 x 370 mm folding (s.b.) for supply air measurements

Application:

- extremely reaction-poor examination of the exhaust air and supply air openings at ventilation systems

Function:

The funnel of the SWA 233 is covered by a thermal hot wire sensor. The measured airflow influences the sensors resistance. The current needed to stabilize the hot wire temperature is proportional to the air flow. This principle allows quick response time, precise measurement and indicates variations in the air flow. Due to the very low aerodynamic resistance of the SWA 233 (typ. 0.01" water column @ 2700 ft³/h) the airflow will not be affected by the measurement itself.

Advantages:

- very low aerodynamic resistance
- quick response time
- indication of air flow variations
- measurement of the entire flow rate profile with averaging function

1 SWA 233 Flow Rate Measuring instrument comes with funnel 190 x 190 mm, Telescope handle and rugged carrying case

9385 L

Volumetric Air Flow Funnel A 97

The SWA 233 funnel and sensor element is also available for use with A 97. This probe is connected via the standard probe connection of the A 97.



Applications:

as SWA 233 (see above)

Advantages:

as SWA 233 (see above), additionally:

- graph mode display for better representation and indication of flow rate fluctuations

Range:	1.0...65.0 l/s
Resolution:	0.1 l/s
Accuracy:	< 0.5 l/s or 5 % f.m.
Display at A 97:	value and y-t-Graphic for recognition of fluctuation

Supply, weight, auxiliary funnel see above

Comes with

Air Flow Funnel A 97, comes with connection cable and protection case

4650 L

Quick Charger A 97, necessary to recharge the batteries

9612 J

Auxiliary funnel



2 Funnel 340 x 340 mm, attachable to funnel 190x190 mm, necessary e.g. for larger inlets or outlets

9486 J

Auxiliary Funnel 370x370 mm, 280 mm high, collapsable for larger inlets or outlets

4448 L

DC 100 Pressure Computer

DC 100 Pressure Computer



Application:

The DC 100 allows measurements of extremely low differential pressure. By using capillary probes pressure differences of adjoining rooms can be measured. Air speed measurements are possible in combination with Pitot tubes. Pressure differences of less than 0.1 Pa are indicated.

Advantages:

- multi-function operation
- precise and stable measurement of lowest pressure

Pressure:

Range: ± 100 hPa
Accuracy: $< 5\%$ from measuring
Resolution: 0.1 Pa in range ± 11 hPa
 otherwise 1 Pa

Temperature (internal NTC):

Range: -5°C up to 55°C
Accuracy: $< \pm 4^{\circ}\text{C}$
Resolution: 0.1°C

Relative humidity (optional):

Range: 0% up to 100% rH, non condensing
Accuracy: $\pm 5\%$ rH (0-60% rH), otherwise $< 10\%$ rH
Resolution: 1%rH

Storage temp.: -20°C up to $+60^{\circ}\text{C}$
Work temp.: -5°C up to $+60^{\circ}\text{C}$

Weight: 450 g (with case)
Size: 54 x 165 x 52 mm

Accessories

Capillary, flexibly

4593 J

Measurement with Pitot Tubes



Application:

For measurement of the air speed with the Pressure Computer DC 100 or DC 2000.

Pitot Tube, length 35 cm, 7mm diameter

9487 M

Pitot Tube, length 50 cm, 7mm diameter

9488 M

Pitot Tube, length 100 cm, 7mm diameter

9489 M

CO₂ measurement

Telaire 7001 CO₂ Measuring instrument - Examination of the change of air rate



Application:

- Evaluation of the air quality in rooms
- Examination of the change of air rate:
Energy conservation by appropriate change of air
- Localisation of exhaust gases e.g. of fire places

Advantages:

- patented two-jet infrared sensor with high accuracy and good long-term stability
- well readable display
- analogue data output
- PC interface
- 48 hours of service life

CO₂ - measurement

Range: 0...10,000 ppm
Sensitivity: ± 1 ppm
Accuracy: ± 50 ppm or $\pm 5\%$
Temperature drift: $\pm 0.1\%$ or ± 2 ppm per $^{\circ}\text{C}$

Period of reply t_{90} : < 60 sec.

Temperature-measuring

Range: 0...50 $^{\circ}\text{C}$
Resolution: 0.1°C
Accuracy: $\pm 1^{\circ}\text{C}$

Analogue output: 0...4 V DC, / ppm,
1 mV/ppm 4.000 ppm max.

Supply: 6 V DC
Work temp.: 0...50 $^{\circ}\text{C}$
Storage temp.: -40...60 $^{\circ}\text{C}$
Size: 170 x 80 x 40 mm
Weight: 280 g

Function:

The equipment which can be served simply determines the CO₂ content by means of a patented 2-jet infrared absorption sensors in less than 30 seconds and shows it and the temperature at the same time on one large display.

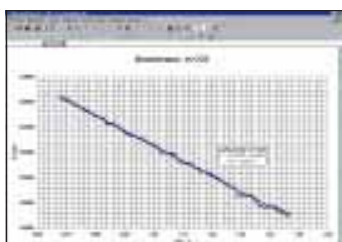
Telaire 7001 with 4 Mignon batteries

7840 L

Data communication cable, for Telaire 7001 with software (free of charge)

7841 L

Software Telaire 7001



Function:

With the data communication cable and the Excel software the data can be transmitted to Microsoft Excel and evaluated.

Advantages:

- low auxiliary costs because of Windows standard
- quick evaluation of the change of air rate
- all possibilities of the data subsequent treatment

Leica DISTO-classic Laser Distance Meter


Application:

- computation of surface and volume
- easy measuring without additional aids

Advantages:

- precise distance measurement by laser technology
- even chimney lengths measurable
- point of laser for orientation
- measured value memory

Range: min. 0.3 m.....100 m
Resolution: 0.001 m
Accuracy: ± 0.5 mm
Units: m, ft, in
Supply: 4 Micro batteries 1.5 V for light pen
Size: 172 x 67 x 40 mm
Weight: 360 g

Comes with:

Instrument with 4 Micro batteries 1.5 V and protection bag made of Cordura

8899 0

Bosch DUS 20 plus Ultrasonic Distance Meter


Application:

- fast calculation of area and volume
- trouble-free measuring without additional devices

Advantages:

- with light beam for better orientation
- storage of measured values
- display in m/cm or ft/inch

Range: min. 0.6 m, max. 20 m
Resolution: 1 cm, 1 inch
Accuracy: ± 1 %: -5...50 °C
 ± 0.5 %: 10...40 °C
Units: m, cm, ft, inch
Supply: 9 V block battery
Size: 157 x 66 x 42 mm
Weight: 200 g

Comes with:

Digital Ultrasonic Distance Meter Bosch DUS 20 plus, with 9 V battery

8888 N

LE 94 - Air Yield Measuring

LE 94 Air Yield Measuring Instrument


Application:

The LE 94 measures the availability of supply air for heat appliances.

Advantages:

- assistance for problems with the supply of combustion air - causes can be determined
- automatic measurement sequence
- menu control
- infrared interface for data output

Function:

From the measurement of the differential air pressure in the setting up area between the conditions „running“ and „switched off“ gas firings (simulation by exhaust over fan) the air productivity can be concluded. The equipment accomplishes both in the reference G 625 planned duty cycles and determines the differential pressure with a resolution of 0.1 Pa. A data output to the thermal printer HP over the inserted infrared interface is possible.

Flow rate:

Range: 10.0... 80.0 m³/h
Accuracy: ± 2 m³/h, 5 % f.m.: 10...40 m³/h
 ± 4 m³/h, 5 % f.m.: 40...80 m³/h

Pressure

Range: -100.0...100.0 Pa
Accuracy: ± 0.5 Pa, 5 % over one measuring period

Computed values accord. to TRGI G 625

Differential pressure of the last measuring interval

Average value of the computed differential pressures

Largest deviation from the average value

Storage temperature: -20...50°C

Work temperature: 10...30°C

Size: 130x250x210 mm (housing)
 $\varnothing$ 130x95 mm (blower unit)

Weight: 5.2 kg

Supply: 230 V AC

Power consumption: approx. 100 W

Comes with:

LE 94, with chimney adapters for furnace pipe connections 110, 120 and 130 mm and Cordura carrying bag.

8800 J

Sound Level Meter SP 22

Sound Level Meter SP 22



Applications:

- building services
- building physics
- heat appliances

Advantages:

- accuracy class 3 L
- different measuring range and scanning rates
- Hold function
- RS 232 interface

Range:	31.5 Hz ... 8 kHz
Accuracy:	± 1.5 dB
Measurement Level A filter:	30 dB ... 130 dB
Measurement Level C filter:	35 dB ... 130 dB
Measurement Level Range:	6 levels in 10 dB steps: 30 ... 80 dB, 40 ... 90 dB, 50 ... 100dB, 60 ... 110 dB, 70 ... 120 dB, 80 ... 130 dB
Automatic Range:	30 ... 130 dB
Display:	3 1/2 digit LCD, resolution 0.1 dB, update every 0.5 sec.
Quasi Analog Bar Indicator:	1 dB display steps, 50 dB display range, updated every 50 ms
Range:	50 dB
Time Weighting:	Fast (F): 125 ms Slow (S): 1 s
Size:	80x256x38 mm
Weight:	240g
Supply:	9 V block battery

Function:

The digital sound level meter SP 22 provides automatic or manual ranging in six measurement ranges from 30 to 130 dB. The unit meets ANSI S 1.4 and IEC 651 Type 2 standards, and features 0.1 dB resolution.

A background noise absorber permits you to measure sound levels accurately even in the presence of high background noise.

The meter allows you to select between fast and slow response times and A and C weighting. A maximum hold function is provided.

Jacks on the meter provide both AC and DC analog output, while a digital RS-232 interface allows you to use an optional cable to capture sound level data on a PC.

UL 22 Ultrasonic Leak Detector

UL 22 Ultrasonic Leak Detector



Application:

Leak detection at e.g.:

- gas lines
- water lines
- LNG-tankers
- refrigerating air conditioning installations
- pneumatic systems
- hydraulic systems
- vacuum systems
- electrical systems: switches, relays and other contacts

A leak is a not wanted flow of a substance out of a system, or in a vacuum into the system. Friction in flow generates sound, water in pipes creates sound as well as air out of a tire. The sound we can hear is less than a third of the total spectrum of frequencies generated. The sound from small leaks is mostly ultrasonic. Humans cannot hear this because it is above the human spectral range. In order for a leak to generate ultrasonic frequencies, the flow through the leak has to be turbulent. The velocity of the moving gas must be high in relation to the orifice. The UL 22 receives the ultrasonic sound that is emitted by a leak, processes it, and displays its level. As larger the leak, as higher the indication. In addition to the display, it produces an audio reproduction of the leak sound. The intensity of the audio will change proportionally to the ultrasonic sound level.

US 22 Ultrasonic Sound Generator



As the device is able to detect leaks in different types of medium (gas, liquid), there is a great number of different applications, especially in the sectors heating, air-conditioning, buildings. So the UL 22 is an effective and cost saving device that helps the craftsman and the engineer to resolve many leakage-problems.

Application:

The Ultrasonic sound generator US 22 is used to detect leaks in enclosures which are not under pressure. It is ideal for the leak detection at

- buildings: doors, windows and other leakages (support of the leak detection with the BlowerCheck BC 21)
- automobiles: panes, doors etc
- containers
- freezers

Order No.

€

6670 J

3620 J

3621 J

IK 21 Infrared Camera
5800 Z


The IK 21 infrared camera is a powerful combination of an uncooled IR detector and an easy to use photo camera. The camera is operated by a keypad and a large colour TFT display on the backside. Snapshots are initiated by a trigger on the frontside, just like a camera. The IK 21 could easily be used by hand, but for best performance a tripod is recommended.

Advantages:

- Costs: uncooled detector - lowest running costs
- Readability: integrated large colour display
- Operation: intuitively over integrated menu guidance and arrow keys - thermography at the press of a button
- Operating modes: continuous search and single-frame modes
- Display: various colour displays can be selected
- Evaluation: automatic tracing of the hottest locations, adjustable single temperatures and emission factors
- Image memory: 8 MByte memory card for 280 thermographs with all detail information
- PC evaluation: incl. extensive software for documentation and image analysis (isothermals, parameters, ...)

Application:

- Detection of cold bridges at buildings - examination of the insulation
- Identification of leakages of the building cover in connection with the blower door
- Representation of the heating distribution at heating elements
- Measurement of the radiation losses at hot water tanks, boilers/pipes
- Leakage detection at under-floor heatings and water pipes

IR spectral region: 8-12 μm
Sensor: patented, uncooled thermo-electrical IR detector

Range: -20 up to 350 $^{\circ}\text{C}$, Resolution 0.1 $^{\circ}\text{C}$
Resolution: 120 x 120, 50 μm Pixel

Accuracy: 2 $^{\circ}\text{C}$, -20 up to 0 $^{\circ}\text{C}$, 2 % f.m., 0 to 350 $^{\circ}\text{C}$
Objective: 20 mm (17.5 $^{\circ}$)

Display: high intensity 4.0" colour LCD

Ambient air temp.: 0 up to 40 $^{\circ}\text{C}$
Memory: 8.0 MByte ATA Flash card for up to 280 images

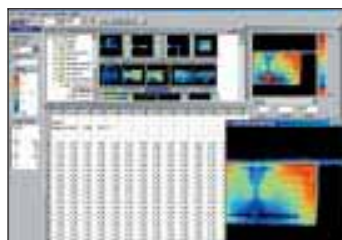
Software: Win95/NT/... software for evaluation and documentation (standard), optional RS 232-Software for external control of the IK 21

Interface: standard video output

Supply: standard 3 Ah camcorder rechargeable battery NP 98 for approx. 60 minutes operating time

Size (mm): 240 x 100 x 130

Weight: < 2 kg

Operation and PC software


- Arrow keys: for menu operation and cursor guidance during temperature analysis on the display.
- Enter key: for menu selection and entry of, for example, emission factors.
- Escape key: Changes between menu and cursor, return function.
- Power key: For switching the camera on and off
- Video socket, RS 232 socket

Comes with:

Infrared Camera IK 21 with rechargeable battery, spare battery, charger, glare protection, shoulder strap, 8 MB memory card, Win-PC software and video lead in strong carrying case.

Accessories:

Various objectives on request

Temperature measurement

IRTemp 100 L Infrared Thermometer



Application:

- Localisation of cold bridges in and around buildings
- Non-contact temperature measurement at surfaces

Advantages:

- with display of measuring point
- adjustable emissivity
- display of maximum, minimum and mean temperature values

Range:	-32...520 °C
Accuracy:	23...520 °C ± 1% f.m. -32...23 °C ± 1.5°C
Resolution:	0.1°C to 199.9 °C 1 °C from 200 °C
Ratio:	12 : 1
Reaction time:	500 ms
Display:	LCD, 3 figure
Current supply:	4 Mignon batteries 1.5 V
Size:	140 x 51 x 216 mm
Weight:	318 g

Comes with:

IRTemp 100 L with batteries

Surface Sensor IRTemp 100 L, balancing of emissivity

Protection bag IRTemp 100 L

IRTemp 10 Infrared Thermometer



Application:

- non-contact temperature measurement at surfaces

Advantages:

- for the localisation of cold bridges
- Laser Pointer
- fixed emissivity factor of 0.95

Range:	-20...420 °C ± 2% f.m.
Resolution:	1°C
Ratio:	8 : 1
Reaction time:	1 sec.
Display:	LCD, 3 figure
Supply:	9V battery
Size:	170 x 44 x 40 mm
Weight:	200 g

Comes with:

IRTemp 10 with 9V block and protection bag

DT 22 Digital Thermometer



Application:

- temperature measuring in and around building physics, house and fuel engineering

Advantages:

- connection of various NiCr-Ni-sensors possible
- 2 temperature measuring connections: difference can be announced
- hold function
- determination of the k-value with special wall temperature sensor

Range:	-50.0 °C...1,300 °C
Accuracy:	-50.0...1,000 °C: ± 0.3 % rdg + 1 °C 1,000...1,300 °C: ± 0.5 % rdg + 1 °C (at 18 to 28 °C ambient temperature)
Display:	3 1/2 figure LCD 37x42 mm
Sampling rates:	2.5 per second
Size:	181 x 71 x 30 mm
Temperature Coefficient:	0.1 times the applicable accuracy specification per °C from 0 °C to 18 °C and 28 °C to 50 °C

Comes with:

Digital Thermometer with 9V battery without temperature sensor

Special Wall Temperature Sensor Type W, for precise measurement of surface temperatures at walls (k-value s. below), ceilings, window frameworks. Also to control radiation losses at isolations.

Air Temperature Sensor Type L, for fast and exact determination of the air temperature in rooms, outside and in air ducts. Very quick reaction.

Max. measuring temperature: 150° C, with stainless steel protection tube

Flue-Gas Temperature Sensor Type TA, only 1.5 mm Ø, 250 mm probe, max. temperature up to 1,000 °C

Temperature Sensors

Wall Temperature Sensor Type W on A 97 Analysis Computer (k-value determination)



- Control of the k-values at walls
- Determination of cold bridges
- Measurement of the pre and return temperature of heating circles

Application:

The k-value of walls informs about the amount of heat, which is transported through a wall due to a temperature gradient. Over the measurement of the wall surface temperature and the knowledge of the interior and outside temperature the k-value with sufficient accuracy can be determined with the help of a table. The difficult measurement of the wall surface temperature is accomplished with the special type W in connection with the A 97 or the DMT-K7 with high accuracy.

Comes with: see above

Wall Temperature Sensor Typ W

Measuring probe length:	65 mm
Measuring head Ø:	53 mm
Max. measuring temp.:	70 °C

Order No.

€

5692 J

6694 J

6695 J

6671 J

6665 J

4651 J

5684 J

5685 J

Ventilation and Indoor Air Quality



Air flow:	more than 3,000 m³/h at a pressure difference of 50 Pa
Pressure difference:	-100...+100 Pa
Air temp.:	-20.00...50.00 °C
Accuracy:	according to EN 13829
Blower:	automatically regulated
Touch Screen:	LCD 248 x 128 pix
Supply:	230 V
Size:	
Operation unit:	130 x 240 x 280 mm
Blower:	440 x 440 x 120 mm
Installation dimensions:	
	max. 1,300 x 2,300 mm
	min. 370 x 650 mm
Weight:	22 kg in 2 cases

Modern measuring instrument - quick setup and easy operation

- automatic measuring operation according to EN 13829
- results are shown and can be printed directly
- simple installation, as measuring instrument and blower unit separately

Application:

- determination of the tightness of the building cover
- all measurements according to EN13829
- leakage detection in the building cover
- proof of the building quality

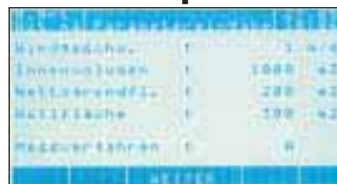
Advantages:

- integrated measurement of the interior and outside temperature
- continuous display of the flow rate in m³/h
- excellent price achievement relationship
- large diagramable LC display - all measured values on a view
- over and negative pressure measurement by key pressing
- date, time
- IrDA interface for printers and PC
- over and negative pressure measurement by key pressing
- prompting over Windows™ similar screen layout
- short setup by new clip system
- compact measuring instrument, can be transported completely in 2 suit-cases
- comfortable data input over complete alphanumeric touch screen keyboard
- integrated measuring data memory
- leakage detection with continuous measured value display

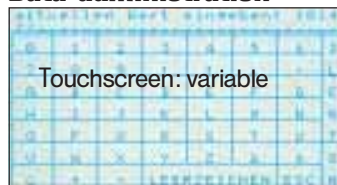
Comes with:

Blower check basic equipment, blower, hose set, thermal printer, carrying bag and aluminium suit-case

Parameter input



Data administration



Tightness measurement



Result



Pan & Tilt Video Inspection

Pan & Tilt Video Inspection System



Monitor

Size housing: 21 x 13 x 65 cm
TFT Display: 117 x 87 mm
Video Out: FBAS-Signal
Weight: 1950 g
Supply: NiMH rechargeable batteries or over rapid charger
Operation time: approx. 2 hours

Camera head colour

Type: colour camera CCD
Light sensitivity: colour: 5.0 Lux
b/w: 0.5 Lux
Objective lens: f = 2.0 mm, F = 2.0
Image angle: 98° x 75°
Rotates: 360°
Swivels: 180°
Light sources: 4 filament lamps under diffuser and 6 switchable white LEDs
Size: Ø 51 mm x 99 mm
Weight: 240 g

Application:

- inspection and documentation of damage in ventilation and exhaust systems
- menu insertion date, time, mobile cursor, and title with 10 figures
- compatible to all camera heads of the following pages

Advantages:

- splash-proof head enclosed in illuminating housing
- simple and exact inspection by the 180° tilt and 360° pan of the camera head
- high beam LEDs for extra light
- wide angle objective (f=2.0 mm) for large point of view and large depth sharpness (starting from approx. 1 cm)
- compact, light monitor in a leather bag with glare protection and carrying belt - can be carried in front of the body

Sets



1 VIS 2000 Video Inspection System, basic equipment

7800 J

with colour monitor, colour camera head, rubber collar as impact protection, 20 m of camera cable with metric marking, leather protective bag with glare protection and shoulder belt, power pack VIS 2000

2 VIS 2000 Video Inspection System, complete case

7825 J

like Order No. 7800 and additionally with cable winder and transport case

3 VIS 2000 Video inspection System with camera viper, complete case

7830 J

with colour monitor, colour camera head, camera viper, viper stand, 20 m GRP rod 7 mm Ø, leather protective bag with shoulder belt, camera roller guide with VA protective cage (see p. 36), power pack VIS 2000, centering star 20 cm Ø (see p. 34) and carrying case XXL

Individual



VIS 2000 Colour Monitor, with menu insertion

7804 J

Installation of the menu announcement, for colour monitor VIS 2000

7810 L

VIS 2000 Camera head colour

7806 J

VIS 98 Camera head b/w

7801 P

Replacement Glass Dome, for camera heads VIS 98 and VIS 2000

7802 P

VIS 2000 Power supply

51878 J

VIS 2000 Leather Protective Bag, with glare protection and shoulder belt

7815 L

VIS 2000 Transport case

7824 L

VIS 2000 Transport case XXL

8637 O

Adapter cable, 12 V for car connection

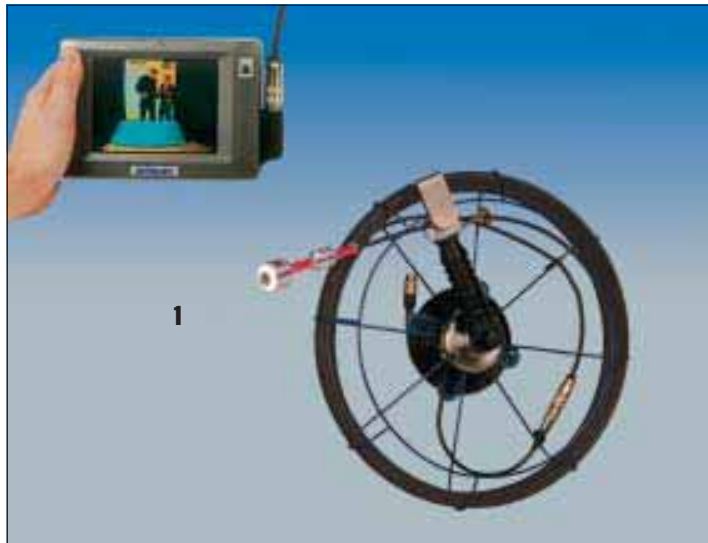
7833 J

4 Additional Glare Protection

7826 J

5 Camera roller guide with protection cage, for camera head VIS 98 and VIS 2000

VIS 2000 Mini Camera



Advantages:

- miniature camera head only 26mm Ø
- up to 3 bar water resistant
- durable stainless steel housing
- wide angle objective (f 2.5 mm) also for large pipes
- simple handling by viper, alternatively by hand, from belt or on the floor

Application:

- outstanding suitability for the optical inspection and control of
- channels
 - pipes
 - exit gas lines
 - ventilation ducts and annular gaps

The Mini Camera VIS 2000 can be pushed problem-free through pipes from a Ø of 40 mm.

Monitor see page 32, compatible with the systems

Camera head colour

Type: 1/3" COLOUR CMOS
 Light sensitivity: colour: 3.0 Lux
 b/w: 0.2 Lux
 Objective lens: f = 2.5 mm, F = 2.0
 Image angle: 120°
 Light sources: 12 white LEDs
 Size: Ø 26.5 mm x 84 mm
 Weight: 240 g

Camera Viper

Rotary transfer: up to 30 m rod length
 Weight: 2,000 g (without rod)
 Connection cable: 2.5 m long

Sets

1 VIS 2000 Mini Camera, basic equipment

7865 J

with miniature camera head, colour monitor VIS 2000, leather protection bag with glare protection and shoulder straps, power pack VIS 2000, GRP camera rod black, 20 m long, 6 mm Ø and camera viper with stand

Individual



2 Miniature camera head colour, with flexible connection for GRP camera rod

7817 J

Miniature camera head b/w, with flexible connection for GRP camera rod

7871 J

3 Protection Sleeve, for miniature camera head

7863 J

Side view mirror, for miniature camera head

7923 J

4 Camera viper, with GRP camera rod black, 20 m long, 6 mm Ø and connection cable

7308 J

Camera viper, with GRP camera rod red, 20 m long, 7 mm Ø and connection cable to monitor - particularly suitable for camera heads VIS 98 and VIS 2000

7309 J

Camera viper, for GRP camera rods up to 30 m, with 2.5 m connection cable to monitor

7822 J

5 Viper stand

7823 J

Transport case XXL, for camera viper and accessories

5824 L

Camera rod black, 6 mm Ø, 5 m long, for the inspection of pipes with the miniature camera head

7821 J

Camera rod black, 6 mm Ø, 20 m long

7818 J

Camera rod black, 6 mm Ø, 30 m long

7819 J

Camera rod red, 7 mm Ø, 5 m long for the inspection of pipes from 100 mm Ø and chimneys up to 20 x 20 cm with the camera heads VIS 2000 and VIS 98

7305 J

Camera rod red, 7 mm Ø, 20 m long

7829 J

Camera rod red, 7 mm Ø, 30 m long

7306 J

Special cable 0.8 m long, for comfortable connection of the single camera rods with the monitor

9181 L

6 Centering star, 15 cm Ø, for miniature camera head

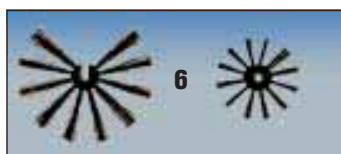
8771 H

6 Centering star, 20 cm Ø, for miniature camera head

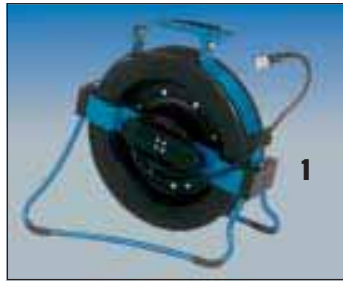
9771 H

6 Centering star, 25 cm Ø, for miniature camera head

8772 H



Video Inspection System Accessories



1 Cable reel for VIS 2000

with shoulder strap and connecting cable to monitor, without camera cable. Designed for cable lengths up to 30 m, collapsable stand legs, adjustable camera holder

30 m Camera Cable with metric marking

20 m Camera Cable with metric marking

10 m Extension cable with metric marking



2 Camera Spring Guide, for centering of the camera head in vertical vents. A stainless steel spring prevents a rotating and oscillating of the camera head. The spring is adjustable on the tubing size up to 35 cm.

3 Viper camera holder, with connection cable to camera cable and M 10 thread for attaching to rods. The camera is in a protective cage and faces down, so that incidental daylight does not cause problems. Attached to rods both, horizontal and vertical pipes can be examined.

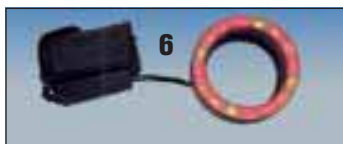


4 Stabilization sleeve with star holder, for camera head VIS 2000 and VIS 98 when used with 6 or 7 mm camera viper

- can be screwed to VIS 98 and VIS 2000 camera heads and even to the roller guide with VA protection cage (see p. 32)



5 Telescope Dolly, stainless steel, for letting down the camera head at the cable, from 22 - 40 cm extendable. Also with extended roll support the roller remains about centrally



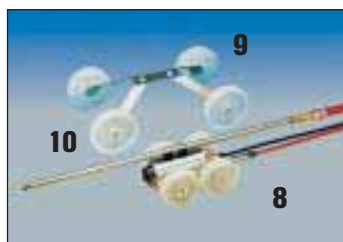
6 LED supplementary light with red-yellow LEDs, for camera head b/w, incl. battery pack with four Mignon batteries 1.5 V in Cordura bag. The supplementary light is simply pushed onto the camera.

LED supplementary light with white LEDs, for camera head colour



7 Transport Case VIS 2000 with shoulder strap

Transport Case XXL, for camera viper VIS 2000, with shoulder strap



8 Camera Trolley, ideally suitable for the inspection of horizontally running pipes from about 150 mm diameter, e.g. in ventilation ducts. The spray tube for controlled spraying out the air ducts with desinfectant can be mounted on the trolley. Adapters for the connection to the mini viper (M 5) as well as to the large viper (M 10) are included. Size: 160 x 125 x 120 mm

9 Maxi Adapter for Camera Trolley for the inspection of larger ventilation ducts (from about 300 mm), size: 350 x 175 x 125 mm

10 Spray tube with nozzle for Camera Trolley, size: 400 mm long, Ø 12 mm



11 Digital Image Converter

for the storage of images on a Notebook/PC, with USB interface, cable and software

12 USB Port Mobile Adapter, provides 2 USB ports via the PCMCIA slot.

Order No.

€

7816 J

7812 L

9172 L

8636 L

8633 J

8680 J

3590 L

5706 L

9177 P

9377 P

7824 L

5824 L

9548 F

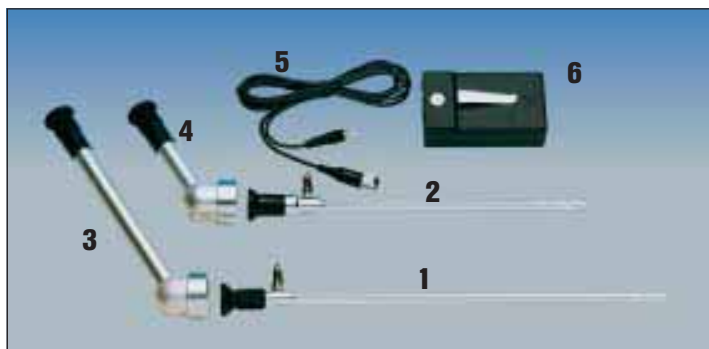
9549 F

9709 F

6233 J

6234 J

Visual Inspection

HEINE Techno Endoscope 56/420

Application:

- Inspection of air ducts and other pipes with small cross section
- Examination of isolations
- Exhaust way examination with boilers and wall devices
- Inspection of cavities

Advantages:

- view angle of 56° provides excellent picture
- super-bright halogen illumination, 12 V Heine XHL
- high-quality image transmission via achromatic lenses
- focusing eyepiece, excellent for people who wear glasses
- extra long operation period: over one hour
- ideal length 420 mm, 8 mm Ø
- short lamp forepart, only 21 mm from tip of endoscope to objective lens

Combination 5

Techno Endoscope 56/42, straight, 12 V XHL, with angular adapter 120/250 mm, connecting lead, battery box with charging transformer and endoscope leather box.

8655 Q

Combination 6

as combination 5, without endoscope leather box, with protective tube.

8653 Q

Combination 2

The well-proven and economical Techno Endoscope 35/330

Techno Endoscope 35/330, 12V, straight, angular adaptor 120/120 mm, connecting lead, battery box with charging transformer, protective tube

5118 Q

Individual

1 Techno Endoscope 56/420, straight, 12 V XHL, super-bright, probe length 420 mm, without power supply

8654 Q

2 Techno Endoscope 35/330, straight, 12 V, probe length 330 mm, without power supply

6267 Q

3 Angular Adapter 120/250, plug onto straight endoscope, good optical transition

8616 Q

4 Angular Adapter 120/120, plug onto straight endoscope, good optical transition

5265 Q

Accessories

Halogen bulb 12 V XHL Nr. 092 for Techno Endoscope 56/420 and 45/420

8618 Q

Halogen bulb 12 V Nr. 079 for Techno Endoscope 35/330, 35/485 and Angular Techno Endoscope.

6274 Q

Screw cap for Techno Endoscope 56/420

809 Q

Screw cap for Techno Endoscope 35/330

6275 Q

5 Connecting lead 12 V, 2 m long, for battery box

6272 Q

5 Connecting lead 12 V, 50 cm long, for Endoscope Camera Head

6277 Q

Protective tube for Techno Endoscope 56/420 and 45/420

6205 Q

Protective tube for Techno Endoscope 35/330

1035 Q

6 Battery box 12 V with charging transformer

8617 Q

Eyepiece Eye-Guard plugs on, rubber

6907 Q

Endoscope Leather Box and Endoscope Bag (without contents)

7 Endoscope LeatherBox

8614 L

for combinations 2, 5 and 6, 435x100x55 mm. From leather with foam material insert. Fits into the intermediate bottom of the standing leather suit-case A97 and into the aluminium suit-case A 97, as well as into the rucksack A 97.

8 Endoscope Bag from Cordura, for combinations 2, 5, 6 and the Angular Techno Endoscope

630 J

Cold-Light Endoscope 900, flexible



Application:

is suitable outstanding for optical control of smallest openings

Overall length:	1000 mm or 2000 mm
Illumination:	Halogen bulb 3.5 V approx. 20,000 Lux
Running time:	3.5 hours
Viewing direction:	0° straight on, 90° (optional)
Viewing angle:	55°
Image transfer:	Single fibre 35 µm Ø
Operating temp.:	- 20 to 60 °C
Probe + optics:	waterproof up to 1 bar
Focus:	> 10 mm
Weight:	580 g

Advantages:

- only 8 mm Ø
- very flexible
- bright illumination of 2,000 lux
- focusable eyepiece: always sharp picture, with or without glasses
- probe length 900 mm
- independent of mains

Accessories

1 Cold-Light Endoscope 900, flexible , viewing direction straighton, with 3 batteries 1.5 V and durable carrying case	4507 L
Cold-Light Endoscope 2000, flexible , viewing direction straighton, with 3 batteries 1.5 V and durable carrying case	4517 L
2 Side-View Adapter for Cold-Light Endoscope	4504 L
Protective Bag for Cold-Light Endoscope made of Codura, with shelves for side-view adapter and 3 batteries	4508 L
Halogen bulb 3.5 V 078	4509 Q
Battery 1.5 V	1029 O

Inspection with mirrors



1 Glass Mirror large , 8x15 cm with telescopic handle, 1m and artificial leather cover The large polished crystal mirror permits excellent optical control of exhaust systems. The glass mirror is provided with a metal plate for protection backside.	1107 J
2 Glass Mirror central , 5x8 cm with telescopic handle, 54 cm and artificial leather cover, with stainless steel back	8060 J
3 Glass Mirror small , 2.6x7 cm with telescopic handle, 54 cm and artificial leather cover	8670 J
4 Chimney Mirror small , 7x10 cm with telescopic handle, 54 cm and artificial leather cover. High-quality high polish-chromed metal mirror	1748 K
5 Glass Hand-Mirror , 7x10x95 mm with artificial leather cover	5064 K
6 Chimney Mirror small , 7x10 cm with artificial leather cover	1015 O

Halogen Pocket Light



7 Halogen Pocket Light , very bright illuminating, small and flat with 3 Mignon batteries a 1.5 V	400 J
8 Halogen Long Range Head Light , 350 m lightwhite Halogen light operating time with rechargeable batteries 30 minutes	6510 G

Technical Details

Useful knowledge for the specialist

In ventilation, chimneys, exit gas lines and other inaccessible areas video inspection systems are used for visual control, error tracing and documentation. For example assembly errors in chimney construction can be easily located with the help of our video systems. Figure 1 shows for this the inside of a chimney, figure 2 shows the close-up of a connecting joint of two chimney elements. Both the necessity of the cleaning and their use can be pointed out to the operator with the help of the camera system. Often the video inspection represents the most simple and manageable and most economical way to find problems, so that the camera system pays for itself after a few uses.

Videoinspedition of chimneys and flue-gas pipes



Fig. 1
View into a chimney
from above

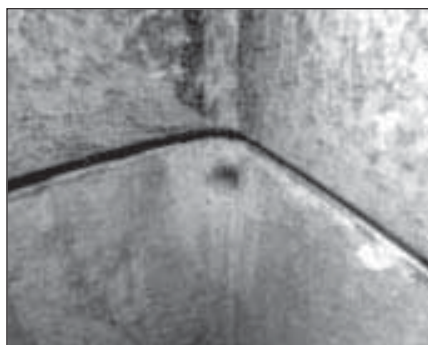


Fig. 2
Close-up of a connecting
joint of two chimney
elements

For recording and subsequent documentation of the pictures there is a video out socket provided in standard BAS and FBAS format. The video pictures can be transferred to a PC or be stored on disks with the help of a digital picture device.

For the admission of the video picture CCD modules are often used. Figure 1 shows the surface of such a module. The abbreviation CCD stands for "Charge Coupled Device". An CCD module consists of a multiplicity of photo-sensitive cells. Like a transistor a photoelectric cell steers the current permeability. The more light comes on the cell, the more electric current can flow. During the digitization a numerical value in the binary code is assigned to the height of the measured current. The more cells on the CCD module, the finer will the grid be and the sharper will the picture, built up from points, be (see figure 3).

CCD and CMOS image sensors



Fig. 3
Surface of a CCD module

In the digital photography a very high resolution of the CCD modules ensures the extreme sharp representation of the object. In the video technology exists a border, which is fixed by the number of columns and lines of the respective television transmission standard. The PAL (Phase Alternation Line) standard, which is used European-wide, shows 750 x 500 pixels. In the USA and Canada is NTSC (National Television Standards Committee). Here 768 x 576 pixels are used for the representation of the television picture. In order to correspond with both the PAL standard with 375000 pixels and the NTSC Standard with 442368 pixels, usually CCD modules are provided with 450000 up to 500000 pixels. With a 1/4" module these points are on a surface of approx. 0.4 cm². Figure 4 shows such a module inclusive electronics for control and signal processing.



Fig. 4
CCD module inclusive
elektronics for control
and signal processing

Beside CCD modules in the video inspection technology also CMOS image sensors are used. An example for this is mini camera VIS 2000. CMOS stands for "Complementary Metal Oxide Semiconductor" and designates actually only a certain manufacturing process. In principle the function mode of CCD and CMOS sensors is similar. Both types are based on the photo-voltaic reaction, which occurs, if a semiconductor material (usually silicone) is exposed to the light. CMOS image sensors have higher integration densities than CCD module. Image sensor and control electronics can be produced in a construction unit with the same manufacturing process. This leads to smaller and more efficient image sensors, which are opened thereby more and more areas of application.

Stars / Extra Large Stars / Threaded Brushes / Specialty Brushes

Spring-Steel Flat Wire

A cardboard disc indicates the wire thickness.

- 00 (1.25 x 0.25 mm), very soft, no marking, only for push-head brushes and small-hole stars
- 0 (2.00 x 0.25 mm), soft, white cardboard disc ○
- I (2 x 0.35 mm), medium hard, green cardboard disc ●
- II (2.75 x 0.35 mm), hard, red cardboard disc ●
- III (3.3 x 0.6 mm), very hard, in bright metal and galvanised version. (Heavy-duty and pumper stars), blue cardboard disc ●

Stainless-Steel Flat Wire 1.4310

Marking: A black outer cardboard disc indicates the stainless steel wire, the second cardboard disc indicates the wire thickness.

- VA 00 (1.25 x 0.25 mm), very soft, only for push-head brushes, no marking
- VA 0 (2 x 0.25 mm), soft, white cardboard disc ○
- VA I (2 x 0.35 mm), medium hard, green cardboard disc ●
- VA II (2.75 x 0.35 mm), hard, red cardboard disc ●

PEK

The high-tech fibre for light-duty sweeping, strong plastic bristles retain their shape up to about 140 °C.

Perlon

Plastic bristle for stainless steel pipes retain their shape up to about 50 °C.

Stainless Steel wire, crimped

Special manufacture:

We would be pleased to make the listed stars and push-head brushes also in other sizes and with more layers.

Please state the diameter you require and the bristle material.

	MT	PU	Ø 7 cm Order No.	Ø 10 cm Order No.	Ø 13 cm Order No.	Ø 15 cm Order No.	Ø 18 cm Order No.	Ø 20 cm Order No.
 Specialty Brushes with hole 6 mm Ø	PEK	1	8644 C	8645 C	8646 C	8647 C	-	8648 C
 Threaded Brushes with M 5 thread	PEK	1	3803 L	8076 L	7091 L	3839 L	-	7990 L
 Dome Brush with M 10 thread	Perlon	1	-	-	-	-	1466 B	-

Extra Large Stars with hole 28 mm Ø



Spring-Steel Flat Wire galvanised, very hard, 120 wire ends

- Extra Large Stars, 50 cm Ø
- Extra Large Stars, 60 cm Ø
- Extra Large Stars, 65 cm Ø
- Extra Large Stars, 70 cm Ø
- Extra Large Stars, 80 cm Ø

Order No.

- 1426 A
- 1427 A
- 1428 A
- 1429 A
- 1430 A

Heavy-Duty Stars with hole 28 mm Ø



Spring-Steel Flat Wire with bent wire ends, very hard, 80 wire ends

- Heavy-Duty Stars, 14 x 14 cm ●
- Heavy-Duty Stars, 14 x 20 cm ●
- Heavy-Duty Stars, 16 x 26 cm ●
- Heavy-Duty Stars, 20 x 20 cm ●

Order No.

- 3586 F
- 218 F
- 3198 F
- 99 F

Support Ring for Extra Large Stars

strong metal frame for insertion into the screwed joint

1432 F

Legend:

MT = Material WE = Wire Ends KN = Marking PU = Packing Unit

Stars / Threaded Brushes

	Strength	WE	KN PU	Ø 15 cm Order No.	Ø 18 cm Order No.	Ø 20 cm Order No.	Ø 25 cm Order No.	Ø 30 cm Order No.	Ø 35 cm Order No.	Ø 40 cm Order No.
Stars with hole 28 mm Ø 	Spring-Steel Flat Wire									
	soft	80	○ 1	2832 C	-	-	1266 C	1267 C	-	-
	medium hard	80	● 1	-	-	1268 C	1269 C	1270 C	1271 C	1272 C
	medium hard	80	● 5	-	-	-	5358 G	5375 G	5384 G	-
	medium hard	120	● 1	-	-	-	1290 C	1291 C	1292 C	-
	hard	80	● 1	-	-	1273 C	1274 C	1275 C	1276 C	1277 C
	hard	80	● 5	-	-	-	5358 G	5350 G	5353 G	-
	hard	120	● 1	-	-	-	1295 C	1296 C	1297 C	1298 C
	VA Flat Wire									
	soft	80	○ 1	6291 C	-	5453 C	5455 C	5454 C	-	-
	soft	80	○ 3	2851 G	-	2852 G	2853 G	2854 G	-	-
	medium hard	80	● 1	-	-	1283 C	1284 C	1285 C	742 C	761 C
	medium hard	80	● 3	-	-	-	2945 G	3008 G	3219 C	-
	hard	80	● 1	-	-	-	5362 C	5363 C	5364 C	5479 C
	hard	80	● 3	-	-	-	3638 G	4683 G	5220 G	-
	VA crimped			480 C	513 C	1315 C	1316 C	-	-	-
	PEK		1	6904 G	6903 G	6900 G	6901 G	6902 G	-	-
			2	5296 G	5299 G	5311 G	5342 G	5346 G	-	-
	Perlon		1	2743 G	-	1306 G	1307 G	1308 G	-	-
Stars with hole 16 mm Ø 	Spring-Steel Flat Wire									
	medium hard	80	● 1	-	-	1320 C	1321 C	1322 C	1323 C	-
	hard	80	● 1	-	-	-	1325 C	1326 C	1327 C	-
	VA Flat Wire									
	soft	80	○ 1	-	-	5461 C	5394 C	-	-	-
	medium hard	80	● 1	-	-	1328 C	1329 C	5397 C	-	-
	PEK		1	283 G	330 G	333 G	327 G	-	-	-
	Perlon		1	-	640 C	2211 C	1335 C	-	-	-
Small-Hole Stars with hole 10 mm Ø 	Spring-Steel Flat Wire									
	very soft	120	1	-	-	1344 G	-	-	-	-
	soft	80	1	1352 G	-	1346 G	-	-	-	-
	soft	80	3	-	-	5456 G	-	-	-	-
	soft	120	1	-	-	1347 G	-	-	-	-
	med. hard	80	1	-	-	1349 G	-	-	-	-
	med. hard	120	1	-	-	1350 G	-	-	-	-
	VA Flat Wire									
	soft, double		3	-	-	5312 G	-	-	-	-
	PEK		1	5468 G	-	885 G	-	-	-	-
Threaded Brushes  	Spring-Steel Flat Wire, with M 10 thread									
	soft, 2 layers		○ 1	1357 C	-	1365 C	1373 C	-	-	-
	med. hard, 2 layers		○ 1	1359 C	-	1367 C	1375 C	1383 C	1391 C	-
	med. hard, 3 layers		○ 1	1360 C	-	1368 C	1376 C	1384 C	1392 C	-
	hard, 2 layers		○ 1	-	-	-	1377 C	1385 C	1393 C	-
	hard, 3 layers		○ 1	-	-	-	1378 C	1386 C	1394 C	-
	VA Flat Wire									
	very soft, 2 layers		● 1	9423 C	9424 C	9425 C	-	-	-	-
	soft, 2 layers		● 1	-	-	5447 C	5448 C	4162 C	-	-
	hard		● 1	-	-	-	4676 C	5575 C	5588 C	-
	PEK		○ 1	518 K	324 K	315 K	316 K	-	-	-
	Perlon		● 1	545 C	790 C	1413 C	1415 C	531 C	-	-

Application:

The VIPER is an uniquely designed line of various sized rods for the professional to use when sweeping chimneys, ventilation systems, duct work or stoves. The VIPER rods are made of a central fiberglass core with a plastic, protective cover. The rods come in varying lengths and thicknesses as shown in the table below to provide you with the right combination of flexibility and length to suit your cleaning needs.

From our thickest 9 mm Chimney VIPER to our most flexible 4.5 mm Mini VIPER, there is a wide selection of threaded or STAR brushes that you can use to customize your cleaning action. The continuous rod design housed in either a free standing or hand held rotating rod basket provides for easy operation that saves you time, effort and money.

	Sheath	Ext.-Ø mm	Core-Ø mm	Main application
	Black	4.5	3.0	• in the Mini Viper 32 for flue-gas pipes up to 200 mm Ø and for room ventilation systems • as single rod for ventilation ducts
	Yellow	6.0	4.5	• in the Mini Viper 42 for large flue-gas pipes from 130 mm diam., small chimneys up to about 16 x 16 cm and 10 m length and ventilation ducts • as single rod for connecting pieces and ventilation ducts
	Red	7.0	4.8	• in the manual sweeping reel for small and medium chimneys up to 15 m, length also for roof-space work • as single rod for connecting pieces and chimneys
	Black	9.0	6.2	• in the sweeping rod reel for medium and large chimneys from about 14 x 14 cm. • as single rod for chimneys

Viper with GRP-Rod 9 mm Ø



Advantages:

- run-out brake
- can be secured for transport
- can be used standing upright or in lying position
- light weight
- frame can store up to 3 stars
- protective tube to prevent scraping of the GRP rod

Cage Ø:	59 cm
Maximum height:	61 cm
Weight:	4.3 - 5.3 kg
Brake:	adjustable, additional transport lock over lever

Comes with:

GRP rod with two M 10 stainless steel end-pieces for push-head brushes, GRP push-head adapter for accepting line stars, protection tube 75 cm long

Viper with GRP Rod

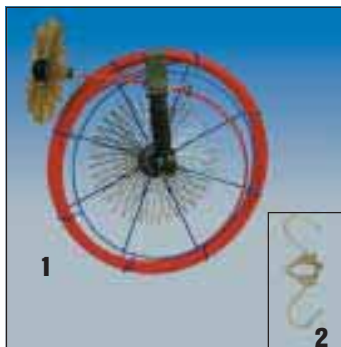
9 mm Ø, 15 m long

9412 J

9 mm Ø, 20 m long

9413 J

Handy Viper with GRP-Rod 7 mm Ø



Advantages:

- freewheel brake, precisely adjustable
- belt clip for sweeping and carrying
- transport possibility for 2 stars
- light weight
- viper stand available
- protective tube to prevent scraping of the GRP rod

Cage Ø:	42 cm
Maximum height:	42 cm
Width:	10 cm
Weight:	1,800 g
Freewheel brake:	precisely adjustable

Comes with:

GRP-rod with M10 stainless steel end-piece for push-head brushes, GRP push-head adapter for accepting stars

1 Handy viper with GRP-rod

7 mm Ø, 15 m long

7649 J

Protection tube for handy viper

7 mm Ø, 20 m long

7648 J

2 Viper stand

51984 L

7823 J

Mini Viper 42 with GRP-Rod 6 mm Ø**Advantages:**

- handy viper with precisely adjustable freewheel brake - makes running in and out of the GRP rod possible without holding the cage
- folding handle - space-saving for transport
- light weight

Cage Ø:	42 cm
Weight:	1.6 kg incl. 15 m GRP-rod
Brake:	precisely adjustable freewheel brake

Comes with:

Mini Viper 42 with GRP-rod 6 mm Ø, 15 m long, with stainless steel end-piece M10 and push-head adapter 28 mm Ø



Mini Viper 42 with folding handle

8649 J

Mini Viper 42 with belt clip

8869 J

Mini Viper 42 with folding handle and belt clip

8873 J

Mini Viper 32 with GRP-Rod 4.5 mm Ø**Advantages:**

- construction like Mini Viper 42
- well suited for tight bends
- for mini hole stars and tube brushes PEK and sponges

Cage Ø:	32 cm
Weight:	1.1 kg incl. 15 m GRP-rod
Brake:	precisely adjustable freewheel brake

Comes with:

Mini Viper 32 with GRP-rod 4.5 mm, 15 m long, stainless steel end-piece M5, deviation spiral M5 and guide ball



Mini Viper 32 with folding handle

8650 J

Mini Viper 32 with belt clip

8870 J

Mini Viper 32 with folding handle and belt clip

8872 J

Belt Clip Retrofit Kit for Mini Vipers 32 and 42, for self-assembly

8480 L

GRP-Rods, single

We supply GRP-rods also individually cut to length with end-pieces and rubber end-ball (9/11mm Ø) and/or with guide ball M5 (4.5mm Ø) and/or with stainless steel end-piece M10 (6mm Ø) for better handling. For the use of stars additionally a push-head adapter (6/9/11 mm Ø) is to be used, for the GRP-rod 4.5 mm a deviation spiral M5 is recommended.

GRP-Rod 4.5 mm Ø, 2 m long with 2 stainless steel end-pieces and guide ball M5

7415 J

GRP-Rod 6 mm Ø, 3 m long with 2 stainless steel end-pieces M10

7420 J

GRP-Rod 9 mm Ø, 5 m long with 2 end-pieces M10 and rubber end-ball

1464 J

GRP-Rod 11 mm Ø, 10 m long with 2 end-pieces M10 and rubber end-ball

102 J

GRP Push-head adapter 28 mm Ø for GRP-rods 9/11mm Ø, for line stars

7979 A

Push-head adapter 28 mm Ø for GRP-rods 6 mm Ø, for line stars / sponges

9421 G

Deviation spiral M5, stainless steel for GRP-rods 4.5 mm Ø

8639 L

GRP Push head adapter 15 mm Ø for GRP-rods 4.5 mm, for sponges

9422 G

Replacement rods

GRP-Rod 4,5 mm Ø, 15 m long with stainless steel end-piece M 5

9703 A

GRP-Rod 6 mm Ø, 15 m long with stainless steel end-piece M 10

8015 A

GRP-Rod 6 mm Ø, 20 m long with stainless steel end-piece M 10

8020 A

GRP-Rod 7 mm Ø, 15 m long with stainless steel end-piece M 10

7015 A

GRP-Rod 7 mm Ø, 20 m long with stainless steel end-piece M 10

7020 A

GRP-Rod 9 mm Ø, 15 m long with 2 stainless steel end-pieces M 10

9015 A

GRP-Rod 9 mm Ø, 20 m long with 2 stainless steel end-pieces M 10

9020 A

Sweeping Rods for Chimneys

Steel Rods

Order No.

€

GRP-Rods



with stainless steel end-piece on both sides, with internal thread M 10

GRP-rod 7 mm Ø,	3 m long	3211 J
GRP-rod 7 mm Ø,	5 m long	3210 J
GRP-rods 9 mm Ø,	3 m long	1196 J
GFK-rods 9 mm Ø,	4 m long	7363 J
GFK-rods 9 mm Ø,	5 m long	1464 J
GFK-rods 9 mm Ø,	6 m long	1124 J
GFK-rods 9 mm Ø,	8 m long	1718 J
GRP-rod 11 mm Ø,	10 m long	102 J
GRP-rod 11 mm Ø,	12 m long	103 J

Complete Rod GRP 9 mm Ø, 5 m long

with GRP push-head adapter for accepting line stars

5583 E

GRP-rods are available in all lengths. Please state which type you require and its length.

Steel Rods



with brass end-piece on both sides and internal thread M 10

B-Steel rod 3 x 3.6 mm Ø,	3 m long	2731 J
B-Steel rod 3 x 3.6 mm Ø,	5 m long	2732 J
B-Steel rod 3 x 3.6 mm Ø,	6 m long	2740 J
B-Steel rod 3 x 3.6 mm Ø,	8 m long	2741 J
C-Steel rod 2 x 4.5 mm Ø,	5 m long	2795 J
C-Steel rod 2 x 4.5 mm Ø,	6 m long	2805 J
C-Steel rod 2 x 4.5 mm Ø,	8 m long	2812 J
C-Steel rod 2 x 4.5 mm Ø,	10 m long	2847 J
D-Steel rod 3 x 4.5 mm Ø,	5 m long	2848 J
D-Steel rod 3 x 4.5 mm Ø,	6 m long	2866 J
D-Steel rod 3 x 4.5 mm Ø,	8 m long	2849 J
D-Steel rod 3 x 4.5 mm Ø,	10 m long	2850 J

Complete rod B, 5 m long, 3 x 3.6 mm Ø, twisted, brass end piece with internal thread M 10, 5582 E large stainless steel push-head for accepting stars and aluminium end-balls.

Steel rods are available in all lengths up to 12 meter. Please state which type you require and its length.

Accessories



1 GRP Push-head 28 mm for GRP-rods 9 mm Ø and steel rods for accepting line stars	7979 A
2 Large Push-head adapter, stainless steel with aluminium taper, stainless steel cap and stainless steel screw M 10 x 40 for line stars	5280 E
3 Small Push-head Adapter, for push-head stars	1440 E
4 Rubber End-Ball, M 10 thread, for GRP and steel rods, shock deadening and easy to hold	5656 E
5 End-Ball Aluminium	1448 A
6 Rod connector in stainless steel with union nut, twist lock using square pin, M 10 threaded on each end and 17 mm wrench	1409 E
7 Brass Threaded Connector	1454 A
8 Steel Chisel M 10	1457 E
9 Roller Opener, stainless steel	1455 E
10 Harpon with Barbs	1459 L

The Apparate

Order No.

€



1 The Apparate / chain, fast and simple changing of the stars,
stainless steel chain with T-fitting 50 cm long, GRP screw connection 28 mm Ø, cast iron ball

with cast iron ball 0.8 kg

5149 E

with cast iron ball 1.1 kg

5152 E

with cast iron ball 1.6 kg

5160 E

with cast iron ball 2.0 kg

3652 E

2 The Apparate / rope, especially suitable for all modern chimneys because all parts
are made of plastic, rope 50 cm long, cast iron ball, GRP screw connection 28 mm Ø

with cast iron ball 0.8 kg

5970 E

with cast iron ball 1.1 kg

5770 E

with cast iron ball 1.6 kg

5971 E



3 The Gas Apparate, with rubber ball 6 cm Ø, rope 40 cm, GRP screw connection
16 mm Ø, PEK star 20 cm Ø, M6 eyelet stainless steel

with rubber ball 590 g

5469 L

with rubber ball 430 g

5489 L

Furnace Cleaning

Stove brushes



Stove brush, with 1 m handle, horsehair-perlon mixture

80 mm Ø

1665 G

100 mm Ø

1666 G

120 mm Ø

1667 G

Stove brush, with 0.3 m handle, horsehair-perlon mixture

80 mm Ø

1669 G

100 mm Ø

1670 G

120 mm Ø

1671 G

Furnace brushes



Furnace brushes, with 2 m handle, Perlon 0.8 m

180 mm Ø

1695 G

200 mm Ø

1697 G

Rotary Viper for chimneys



Rotary Viper model PE

Lengths: 15, 23 or 33 ft
Coat: non-buckling, 20mm Ø
Threaded connection: M 10 Internal thread
Tap for drill chuck: 10 mm Ø
End piece: running in ball bearings
Core: 13 mm Ø

Application:

The Rotary Viper PE is designed to give you that extra power in your tool kit when you're fighting glazed creosote. Driven by a standard drill, the Rotary Viper PE's stainless steel chain-link teeth pack a tremendous bite.

Advantages:

- the stable Rotary Viper PE can be used without guide rod in chimneys
- clutch increases security
- comfortable and fast cleaning

Rotary Viper PE, 5 m/15 ft long, durable, with SS endpiece and SS chain 5 mm Ø,

7537 D

Rotary Viper PE, 7 m/23 ft long, durable, with SS endpiece and SS chain 5 mm Ø,

52723D

Rotary Viper PE, 10 m/33 ft long, durable, with SS endpiece and SS chain 5 mm Ø,

7538 D

Safety Clutch for Rotary Viper

7539 D

Endpiece for Chain



Endpiece for holding chains, stainless steel, for use with Rotary Viper PE, with M 12 screw and 4 screws for attachment of the chains

7540 ID

Chain SS, 5 mm Ø, 3 m long

3108 O

Rotary Viper PA, PX

Seele: 10 mm Ø
Threaded connection: M 10 internal thread
Zapfen für Bohrfutter: 10 mm Ø

Sealing Elements



Sealing elements with hole, size: conical 110/230 x 190/310 mm

50666 O

Rotary Viper for vents



Rotary Viper PX, 8 m/26 ft long, flexible, for boiler cleaning and bigger vents

4833 L

Rotary Viper PX, 10 m/33 ft long, flexible, for boiler cleaning and bigger vents

7834 L

Rotary Viper, PA, 3 m/9 ft, very flexible, for smaller vents, with short connecting piece at brush end

4831 L

Rotary Viper, PA, 5 m/15 ft, very flexible, for smaller vents, with short connecting piece at brush end

4832 L

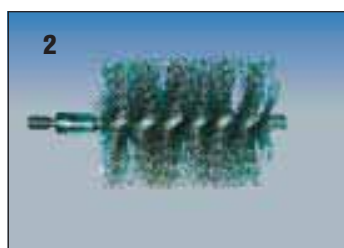
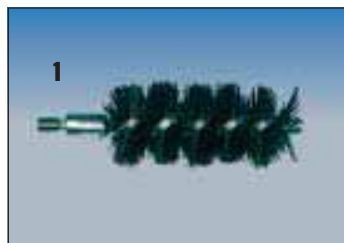
Double end M 10 screw brass, to connect 2 PA or PX rods together

1454 A

Boiler Brush with thread M 10, round and rectangular

Application:

The boiler brushes are used for manual boiler cleaning. The extra heavy duty model with a flat wire core of 3.5 x 7 mm guarantees an outstanding cleaning efficiency.



Boiler Brushes with handle 1m, round or rectangular

The handle is turned from the galvanized wire of the brush, trimming length 100 mm.



Brush Rods



Boiler Brush VA wire, crimped	20 mm Ø		1573 C
	25 mm Ø		1576 C
	30 mm Ø		1579 C
	40 mm Ø		1583 C
	50 mm Ø		1587 C
	60 mm Ø		1591 C
	80 mm Ø		1595 C
	100 mm Ø		1599 C
	120 mm Ø		1603 C
1 Boiler Brush Polyamid	20 mm Ø		1574 C
	25 mm Ø		1577 C
	30 mm Ø		1580 C
	40 mm Ø		1584 C
	50 mm Ø		1588 C
	60 mm Ø		1592 C
	80 mm Ø		1596 C
Boiler Brush Springs, 3 mm ø	40 mm Ø		1726 G
	60 mm Ø		1727 G
	80 mm Ø		2827 G
Boiler Brush flat wire, 0.28 mm ø	30 mm Ø		1578 C
	40 mm Ø		1581 C
	50 mm Ø		1585 C
	60 mm Ø		1589 C
2 Boiler Brush VA wire, crimped	25 x 50 mm		1607 C
	40 x 80 mm		1611 C
	50 x 100 mm		1615 C
	70 x 120 mm		5121 C
Boiler Brush Polyamid	25 x 50 mm		1608 C
	40 x 80 mm		1612 C
	50 x 100 mm		1616 C
	70 x 120 mm		5124 C
Boiler Brush flat wire 1.25 x 0.25 mm	40 x 80 mm		1610 C
	50 x 100 mm		1614 C
	70 x 120 mm		5148 C
Boiler Brush steel wire 0.28 mm ø	25 x 50 mm		1605 C
	40 x 80 mm		1609 C
	50 x 100 mm		1613 C
Boiler Brush SS wire, crimped	20 mm Ø	1 m handle	1637 G
	30 mm Ø	1 m handle	1638 G
	40 mm Ø	1 m handle	1639 G
	50 mm Ø	1 m handle	1640 G
	60 mm Ø	1 m handle	1641 G
	80 mm Ø	1 m handle	1642 G
Boiler Brush SS wire, crimped	10 x 25 mm	1 m handle	1653 G
	25 x 50 mm	1 m handle	1654 G
	40 x 80 mm	1 m handle	1656 G
	15 x 80 mm	1 m handle	1658 G
Boiler Brush Polyamid	20 mm Ø	1 m handle	1645 G
	30 mm Ø	1 m handle	1646 G
	40 mm Ø	1 m handle	1647 G
	50 mm Ø	1 m handle	1648 G
	60 mm Ø	1 m handle	1649 G
	80 mm Ø	1 m handle	1650 G
Boiler Brush Polyamid	10 x 25 mm	1 m handle	1659 G
	25 x 50 mm	1 m handle	1660 G
	40 x 80 mm	1 m handle	1662 G

Rod 1 m long, Aluminium pipe, 20 x 1.2 mm, with external and internal M10 thread	5433 G
Rod , spring steel, Type B (3 x 3.8 mm Ø), with internal M10 thread	
Length: 1 m	1624 G
1.2 m	1625 G

WÖHLER 's

WORLDWIDE BEST ... A 97



Measuring instruments

Flue gas analyser

- Econometer E 98
- Analysing Computer A 97
- Pressure Computer DC 2000

Accessories

- IR Receiver Interface for PC
- Data Management Software
- Active gas sampling
- Special probes
- NO, NO₂ measurement
- Thermal IR printer

Soot testing

- Soot testing pump RP 72
- Soot Count Computer RZ 95

Differential pressure

- DM 1 0 - 100 Pa
- DC 2000 ± 2 bar
- DC 100 ± 100 Pa

Temperature

- Digital thermometer
- Surface temperature probe
- Infrared thermometer/camera

Leakage

- DP 94-200
- DP 97
- Gas detection

Air flow and volume

- Thermal Anemometer
- Hydrometric vane
- Ventilation flow meter
- Air flow probe

Humidity / moisture

- Wood
- Building material

Ambient air control

- CO meter
- CO detector card
- CO₂ meter
- Spillage tester
- Dew-Point indicator
- Condensate pH meter
- Air yield meter
- Air Flow Probe

Distance meter

- Ultrasonic distance meter
- Laser distance meter

Visual inspection equipment

Video Inspection

- Visual Inspection System b/w
- Visual Inspection System colour
- Mini Spring Camera 26mm
- Mini Spring Camera colour
- Digital VCR
- Endoscope Camera Adapter

Endoscope

- Techno endoscope d. 8mm
- Flexible endoscope
- Bend fitting

Mirrors

- Glass mirror
- Metal mirror

Smoke generator

- Smoke powder
- Smoke candle
- Smoke matches

Cleaning tools

Ventilation duct and chimney cleaning

- Viper 15/20 m rod for brushes
- Mini viper 32
- Handy viper

Boiler cleaning

- Motordriven boiler brush
- Threaded brush
- Danish brush
- Buderus brush
- Viesmann brush
- Back plate brush
- Vacuum cleaner
- Boiler spray

Stars and brushes

- Push head brush
- Perlon brush head
- Hearth brushes
- Mini-Hole Star
- Star
- Sponge

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