Like any other industrial valve steam traps are subject to wear and their correct functioning can be impaired by precipitated solids and dirt deposits.

To assess the performance of a steam trap the following questions have to be answered:

- Does the steam trap work properly?
- If not, does the faulty trap cause a loss of steam (leakage) or banking-up of condensate (obstructed discharge passage)?

Faulty steam traps are a major source of waste in a steam distribution system. A trap that is blowing live steam is the worst offender, but traps that are plugged or stuck closed can also be costly.
The decreased plant efficiency due to loss of energy and additional make-up water results in lost production. Furthermore, an increase of pressure is liable to arise in condensate systems which will lead to difficulties at all locations where condensate is discharged.
The magnitude of such a steam loss depends on the cross-sectional area of the leak and, at the same time, the amount of discharged condensate. Locations where only small amounts of condensate are formed and discharged, e. g. drainage points in steam lines and tracing systems, are particularly problematical. On the other hand, locations where relatively large amounts of condensate are discharged will not give rise to considerable loss of live steam because of the presence of a large volume of liquid.

Steam traps which are **obstructed or stuck closed** do not cause loss of energy and/or water but reduce – to a greater or lesser extent – the efficiency of heat-transfer equipment and steam users. And waterhammer caused by condensate banking-up leads to considerable physical damage in steam and condensate systems.

Experience shows that installations where no regular trap testing and servicing takes place have a failure rate of defective steam traps in the order of 15 – 25 %. Regular maintenance and trap testing, which should be carried out at least once a year, can strongly reduce the failure rate to 5 %.

Test Systems

Steam traps can be tested during operation by using **sightglasses, ultrasonic listening devices** or **level meters**.

Sightglasses (Vaposcopes Type VK 14, VK 16) provide an effective means of observing the flow of liquids in pipework. They are installed upstream of the traps, and allow the assessment of the traps by making their operation visible. A satisfactory trap installation must pass all the water that flows to it without discharging live steam and must not be rendered inoperative by particles of dirt or by an accumulation of air.

Level meters use conductivity to monitor steam trap performance. A test chamber with an integral level electrode is installed upstream of the trap to detect any defective steam trap. The corresponding output signal is displayed by the **Remote Test Unit NRA 1-3x** (remote monitoring). The system **VKE** can monitor all types and makes of steam traps to detect loss of live steam. The correct operation of RHOMBUS*line* steam traps type BK 45/46, MK 45, UBK 46 can be verified by using the compact-type level probes NRG 16-19, NRG 16-27 and NRG 16-28. The test station NRA 1-3x will evalute the data coming from the system VKE.

Another way to test traps is to use an **ultrasonic listening device** which detects the sound produced by steam flowing through the traps. Depending on the test system used the sound sensed by the device is either graphically represented in the form of a curve **(VKP 40)** or indicated by the deflection on the scale of a meter **(VKP 10)**.
When using the VKP 10, the field data specialist has to assess the indicator deflection and, consequently, the operation of the steam trap. The VKP 40, however, can directly track leaks associated with faulty steam traps and provides comprehensive reporting and a complete trap survey history.

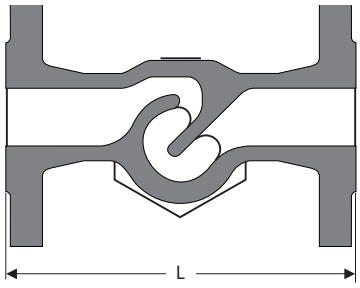
Annual costs caused by steam loss

	Number of steam traps installed		
	Annual failure rate (Empirical value with first check approx. 15 – 25 %)		
A	**Number of defective steam traps**		
B	**Steam loss per steam trap (kg/h)**		
C	**Annual operating hours**		
D	**Annual steam loss (kg)**	**A x B x C** =	
E	**Cost of steam per ton**		
F	**Annual loss in EURO**	**D / 1000 x E** =	

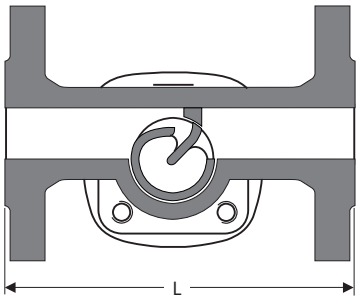
Example

A	**Number of defective steam traps**	**10**
B	**Steam loss per steam trap**	**3 kg/h**
C	**Annual operating hours**	**8000 h**
D	**Annual steam loss**	**240000 kg**
E	**Cost of steam per ton**	**30 Euro/t**
F	**Annual loss**	**7200 Euro**

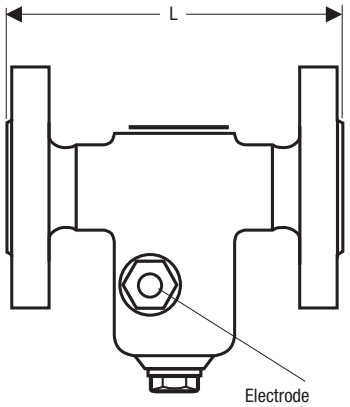
By the way:
A new steam trap costs – depending on the end connection – only approx. € 160 to € 200.



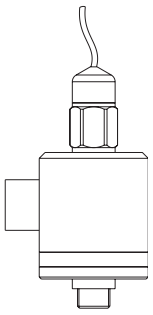
VK 14



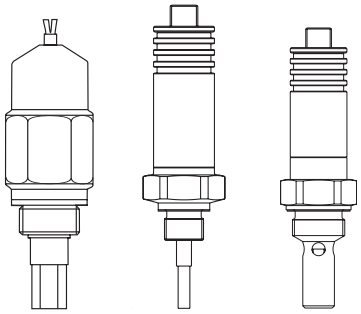
VK 16



Test chamber VKE 16-1



VKE 26 with NRG 16-19



NRG 16-19 *NRG 16-27* *NRG 16-28*

Application

Type	
Vaposcope VK 14, VK 16	**Sightglass ~~mit Borosilikatglas~~** for checking heat exchangers and steam traps (installation up-stream of the traps). Visual supervision of flow conditions in condensate lines.
VKE	**Test chamber** with level electrode for monitoring steam traps to detect loss of live steam/banking-up of condensate. Installation in horizontal lines.
Vapophone VKP 10	**Ultasonic detector** for detecting steam leakage in steam systems; for monitoring steam traps and stop valves.
TRAP*test* **VKP 40/VKP 40Ex**	**Computer-based monitoring, recording and evaluation system** for steam traps of **all** types and makes to detect loss of steam and condensate banking up.
NRG 16-19 NRG 16-27 NRG 16-28	**Level electrodes** for installation in the test chamber VKE or in the body of Rhombusline steam traps. Designed for detecting loss of live steam/banking-up of condensate (used in conjunction with test unit NRA 1.3). Response sensitivity 1.0 µS/cm.

Vaposcope VK

The Vaposcope can be used in horizontal and vertical pipework without any modifications.
Installation upsteam of the steam trap.
The application is limited to fluids with pH value 9 (VK 14) or 10 (VK 16).
VK 16 comes standard with mica disc.

Test Set VKE

Consisting of: **Test chamber with integral level electrode NRG 16-19 / NRG 16-27** for steam traps of all types and makes. And: **Test Unit** NRA 1.3 for continuous remote monitoring of up to 16 steam traps at the same time for loss of live steam or banking-up of condensate.

Pressure/Temperature Ratings *)

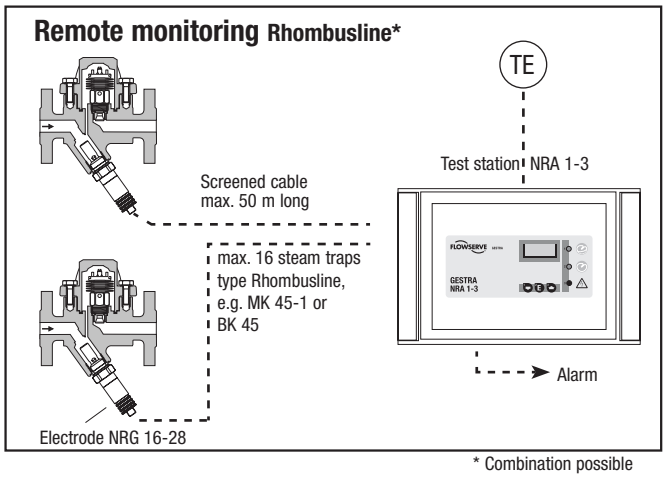
Type	PN	Material		Max. Pressure/Temperature Rating	
		EN	ASTM	PMA / TMA	PMA / TMA
VK 14	16	EN-JL 1040	A 126 B [1)]	16 bar / 120 °C	9.6 bar / 280 °C
VK 16	40	P 250 GH	A 105 [1)]	40 bar / 20 °C	25.8 bar / 300 °C
VKE 16-1	40	GP 240 GH [2)]	A 216 - WCB [1)]	28.4 bar / 250 °C [3)]	23.1 bar / 400 °C [3)]
VKE 16 A STAINLESS STEEL	40	1.4571	TP 316 Ti [1)]	38 bar / 120 °C [3)]	32.5 bar / 250 °C [3)]
VKE 26	40	P 250 GH	A 105 [1)]	40 bar / 20 °C	25.8 bar / 300 °C
NRG 16-19 NRG 16-27 NRG 16-28	40	1.4404	F 316L	40 bar / 20 °C	32 bar / 238 °C

[1)] ASTM nearest equivalent grade is stated for guidance only. Physical and chemical properties comply with EN grade.
[2)] Forged steel flange P 250 GH (1.0460).
[3)] Max. working pressure/temperature of the electrodes: 32 bar / 238 °C. Sensitivity of electrodes NRG 16-19, NRG 16-27: 1.0 µS/cm.
[*)] For more information see data sheet.

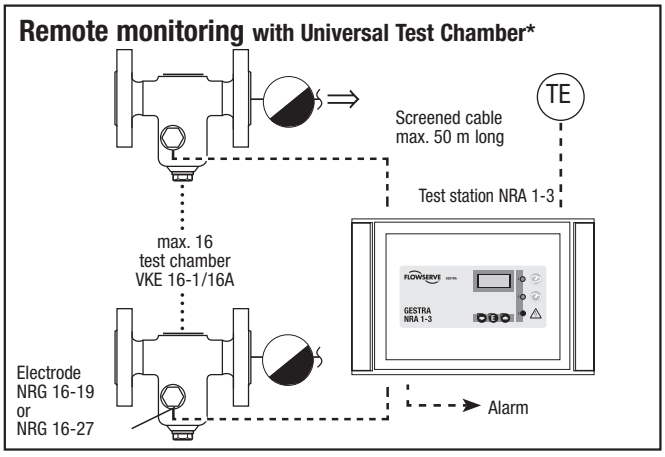
Available Connections and Overall Lengths

Type	Connection	Overall length L in mm				
		DN 15 1/2"	DN 20 3/4"	DN 25 1"	DN 40 1 1/2"	DN 50 2"
VK 14	Flanged EN PN 16	130	150	160	200	230
VK 16	Flanged EN PN 40	150	150	160	230	230
	Flanged ASME 150	150	150	160	230	230
	Flanged ASME 300	150	150	160	230	230
	Screwed sockets	95	95	95	130	210
	Socket-weld	95	95	95	130	210
VKE 16-1	Flanged EN PN 40	150	150	160	–	–
	Flanged ASME 150	150	150	160	–	–
	Flanged ASME 300	150	150	160	–	–
	Screwed sockets	95	95	95	–	–
	Socket-weld	95	95	95	–	–
VKE 16 A	Flanged EN PN 40	160	160	160	200	230
VKE 26	External/internal thread 3/8" BSP					
NRG 16-19	External thread 3/8" BSP	Nominal length = 31 mm				
NRG 16-27		with integrated Pt 1000 thermocouple				
NRG 16-28	External thread M 24 x 1.5 for installation in the bodies of the Rhombusline steam traps series with integrated Pt 1000 thermocouple					

System VKE



* Combination possible

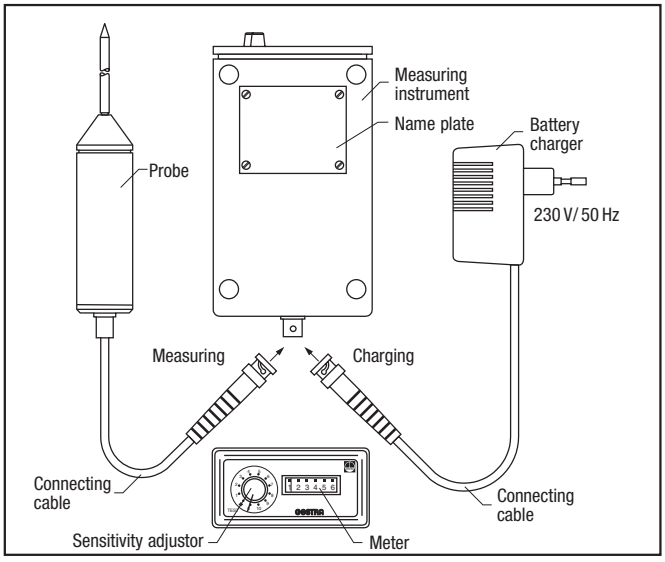


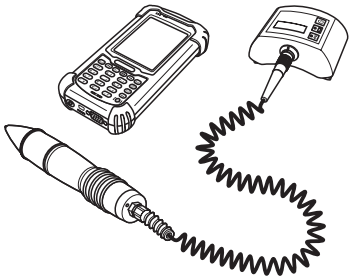
Vapophone VKP 10

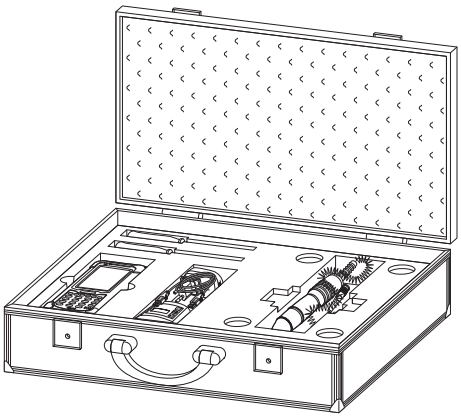
The VKP 10 is used to detect sound in the ultrasonic range as caused by flowing steam through a steam trap.

The ultrasonic vibrations are detected by a probe and converted into electric signals which are indicated on the meter of a measuring instrument.

Protection: IP 41







VKP 40plus

Test Equipment for Steam Traps
TRAP*test* VKP 40*plus*

Description

Steam trap testing, recording & evaluation system TRAP*test* VKP 40*plus* for checking steam traps of all types and makes for steam loss and banking-up of condensate.

The system TRAP*test* VKP 40*plus* comprises the following components:

Data collector VKP 40*plus*

Measuring probe VKP 40*plus*

Com Box VKP 40*plus*

In addition, the software program TRAP*test* VKP 40*plus* is part of the supply.

Function

The testing equipment detects and evaluates ultrasonic vibrations generated on the trap body surface by the media flowing through the steam trap. These ultrasonic vibrations are then picked up by the hand-held probe VKP 40plus by pressing the sensor tip onto a point on the trap body that is characteristic of the respective trap type. The ultrasonic vibrations are then converted by the measuring probe into electric pulses and – in the form of digital signals – fed via cable to the Com Box. The Com box then transfers the signals to the data collector VKP 40plus via Bluetooth.

The display of the data collector shows the signals received during the test as a standing curve. With this graphical representation one can see at once whether the tested steam trap is blowing off steam or not.

The recorded ultrasonic vibrations are analysed by the data collector and evaluated in accordance with certain empirically ascertained limit values that depend on the trap type. During the test the temperature of the steam trap is measured, too. Provided that the service pressures are specified, the system can also identify blocked (waterlogged) steam traps.

If the annual operating hours and the specific steam costs have been entered in the system, the software can calculate the financial loss caused by faulty steam traps. To quantify the steam loss caused by faulty steam traps, empirically obtained test values are used as reference.

All curves recorded for a steam trap as well as the associated numerical test results and the corresponding analysis by the system can be stored and printed out. This permits the comparison of current test results against those of former tests and also those taken from other installations. In the course of time useful information is thus obtained regarding the service life of the traps and standard maintenance intervals and it becomes easier to assess the suitability of the different trap types for the intended application.

Technical data

Power supply of the data collector

2 Lithium ion batteries (capacity 5,600 mAh)

max. operating voltage 7 V

Measuring probe

Measuring range for surface temperature: -10 °C to +350 °C

Power supplied by batteries in Com Box

Materials

Component part	**DIN / EN**
Data collector	See operating instructions for the data collector
Body of the measuring probe	3.7035
Housing of the Com box	ABS (acrylonitrile butadiene styrene)
Identification tags	1.4301
Transportation case (hard case)	Aluminium / plywood / TCN film / foamed plastic / cardboard
Carrying bag	Nylon Cordura fabric Samoa

Dimensions and weights

Components	**Dimensions (H × W × D)** [mm]	**Weight** [g]
Transportation case (hard case), without content	173 × 450 × 340	4,900
Transportation case (hard case), cpl. with content		approx. 6,800
Carrying bag, without content	310 × 260 × 8	330
Carrying bag, cpl. with content		approx. 1,600
Data collector	144 × 82 × 32	575
Com box	83.0 × 96.0 × 32.0	160
Measuring probe (diameter × length)	36 × 210	440

Scope of supply

The following items are part of the supply:

Transportation case (hard case)

Carrying bag

Strap to fix the Com box

Data collector with accessories (see operating manual for the data collector)

Four power pack adapters for different types of mains sockets

Measuring probe with connecting cable

Com box

USB network cable for Com box

Power supply plug for Com box

Four power supply plug adapters for different types of mains sockets

DVD with VKP40*plus* program software for evaluating the test results on a PC

CD ROM with software for data collector

Adjustable mirror

File

Identification tags for steam traps (optional)

Operating manual for TRAP*test* VKP 40*plus*

Test Equipment for Steam Traps

TRAP*test* VKP 40*plus*

Pressure & temperature ratings

If you want to use the TRAP*test* VKP40*plus* outside the rated pressure/temperature range please contact a FLOWSERVE Gestra representative.

Components	**Service temperature** [°C]	**Storage temperature** [°C]	**Air humidity**
Data collector	-20 to +50	–20 up to +35[1)]	0–95% (not condensing)
Com box	-10 to +50		
Measuring probe	-10 to +60		

[1)] If stored up to 24 hours: -20°C to +70 °C

TRAP*test* VKP40*plus* setting	max. condensate flowrate
Steam tracer and steam line	0...20 kg/h
Heat exchanger	> 20 kg/h

Min. upstream pressure for temperature measurement	1.1 bar
Max. differential pressure	20 bar

Bluetooth range distance	8 m
Capacity of batteries ("battery life")	Data collector: approx. 8 h / Com Box: approx. 8 h

Features of VKP 40*plus*

The system VKP 40plus offers the following benefits:

Universally applicable for all types and makes of steam traps

Automatic evaluation of the tested steam traps

User-friendly and easy-to-use PC software tool for logging and managing trap specific data

PC software is independent of country specific Windows versions

Allows for uncomplicated financial analysis (expressed in the currency of your country)

Clear and informative print-out detailing repair jobs

Export and import functions for importing databases created on other PCs or exporting databases to other PCs

Easy to migrate databases and import data from old VKP 40 versions

Additional languages can easily be added (English and German by default)

Data exchange between PC and data collector by the click of a mouse

Detailed online documentation

Country-specific settings (e. g. power supply, paper size etc.) possible

Features of the data collector

The data collector offers the following functions:

Clear graphical user interface

Easy to use touchscreen display

Data collector with PDA function

Protected against dust and splashing water acc. to IP 65

Storage capacity sufficient for 750 steam traps with 1 up to 256 test jobs

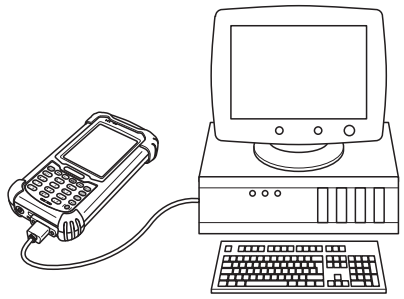
Integrated temperature measurement allows to detect waterlogged steam traps (banking-up of condensate)

Test measurement for ad hoc tests and automatic evaluation of trap performance without any previous data acquisition

During the test visual indication of steam loss caused by leaking trap

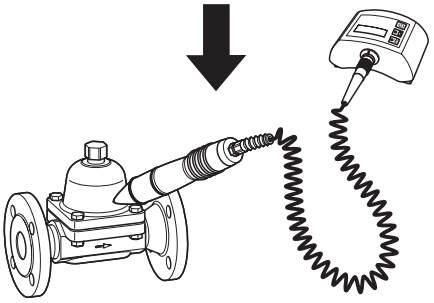
No skilled labour needed for the tests

Illuminated display shows the recorded sound in the form of a curve

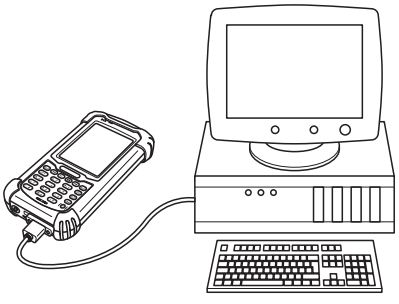


Data management via PC

Data are transferred to data collector



Steam trap is tested



Test results are transferred to the data collector

Test results are evaluated on the computer

System requirements

To create test objects and to evaluate the tests you have to install the supplied software on your computer.

To install the software on a computer the following system requirements must be met:

Operating system Microsoft Windows® 7 or Windows® Vista

SQL Server® 2008 Express

Microsoft Windows® Mobile Device Center

1 GB free hard disk memory

at least 1 GB RAM

ATEX

The VKP40plus is not approved for use in explosion-risk areas. Special equipment for use in explosion-risk areas is available on request.

Specification Text

GESTRA TRAPtest VKP 40plus

Monitoring, recording and evaluation system for steam traps of all types and makes

The system includes a palmtop computer (PDA) with stable touch screen. This PDA uses a special GESTRA software program. The Com Box and the measuring probe are Bluetooth enabled devices and allow for easy data exchange between them.

The PDA can be connected to a computer via USB port. The supplied software tool allows you to evaluate the test results directly on your PC and, among other things, to create repair jobs and view and print out financial analyses.

A constant contact pressure, which is independent of the actual pressure applied by the tester, ensures correct readings and, consequently, objective test results. A test is started by pressing the probe tip onto the trap body.

The display graphically illustrates the course of the test in form of a standing curve and also shows additional important information on the test. The large backlit colour display can be used even in poor visibility conditions.

Supply in accordance with our general terms of business.

Master Distributor

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