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 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.

Level meters use conductivity readings 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 41*plus*)** 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 / potential savings

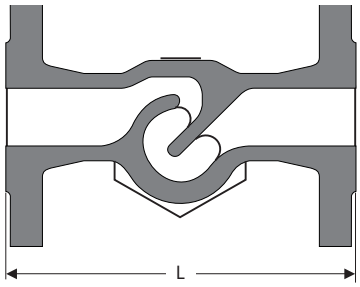
	Number of steam traps installed			
	Annual failure rate (Empirical value with first check approx. 15 – 25 %)			
A	**Number of defective steam traps**			
B	**Steam loss per steam trap (kg/h)**			
C	**Annual operating hours**			
D	**Annual steam loss (kg)**	**A x B x C**	=	
E	**Cost of steam per ton**			
F	**Annual loss in EURO**	**D / 1000 x E**	=	
G	**CO_2 saved per year (kg)**	**D x 0,16*)**	=	

*) Results may vary as a function of the fuel used for generating steam and condensate return.

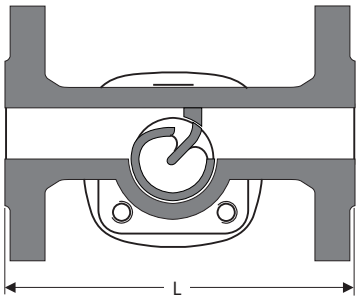
Example

A	**Number of defective steam traps**	**20**
B	**Steam loss per steam trap**	**3 kg/h**
C	**Annual operating hours**	**8000 h**
D	**Annual steam loss**	**480,000 kg**
E	**Cost of steam per ton**	**30.00 Euro/t**
F	**Annual loss**	**14,400.– Euro**
G	**CO_2 saved per year**	**76,800 kg**

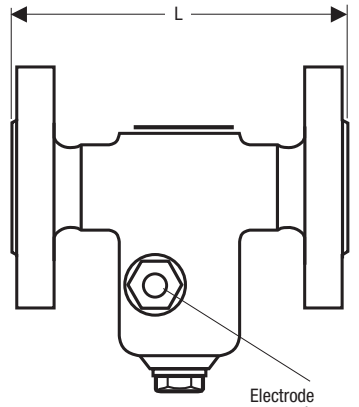
By the way:
A new steam trap costs – depending on the end connection – only approx. € 200 to € 250.



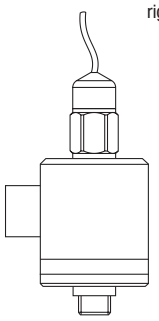
VK 14



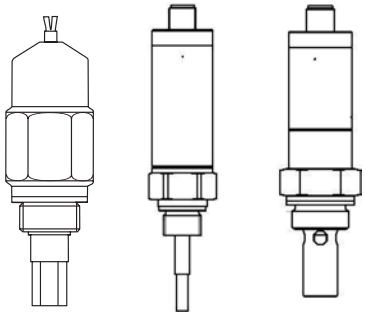
VK 16



Test chamber VKE 16-1



VKE 26 mit NRG 16-19



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

Application

Type	
Vaposcope VK 14, VK 16	**Sightglass with borosilicate glass** for checking heat exchangers and steam traps (installation upstream of traps). Visual supervision of flow conditions in condensate lines.
VKE 16-1, VKE 16A	**Test chamber** for measuring electrode for monitoring steam traps (installed upstream of the steam trap) to detect **steam loss** or **banking-up of condensate (VKE 26).** For installation in horizontal lines or mounting at steam traps **(VKE 26).**
Vapophone VKP 10	**Ultasonic detector** for detecting steam leakage in steam systems; for monitoring steam traps and stop valves.
TRAP*test* VKP 41*plus*/ VKP 41*plus* Ex	**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	**Measuring electrode** 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 or teststation NRA 1-3 CANbus). Response sensitivity 1.0 µS/cm.

Vaposcope VK

The Vaposcope can be installed in horizontal and vertical lines (without conversion). Installation in **flow direction upstream of steam trap.** The application of the VK 14 is limited to fluids with pH 9. The VK 16 is fitted with mica disks as standard for applications up to pH 10.

Test Set VKE

Consisting of: test chamber **VKE 16-1 / VKE 16A** or **VKE 26** with integrated measuring electrode NRG 16-19 or NRG 16-27 for all condensate discharge systems and types.
Test station NRA 1-3 or teststation NRA 1-3 CANbus for remote monitoring. Simultaneous and continuous monitoring of up to 16 steam traps to detect steam loss or banking-up of condensate. VKE 26: use in conjunction with float ball steam traps.

Pressure/Temperature Ratings

Type	PN / Class	Material		Pressure/Temperature[1])			
		EN	ASTM	PMA [bar]	TMA [°C]	p/T [bar/°C]	
VK 14	PN 16	5.1301	A126 Cl.B[2])	16.0	280	12.8 / 200	9.6 / 280
VK 16	PN 40	1.0460	A 105	40.0	300	30.4 / 250	27.6 / 300
VKE 16-1	PN 40	1.0619	A216 WCB	40.0	400	28.4 / 250	23.1 / 400
VKE 16A STAINLESS STEEL	PN 40	1.4571	TP 316 Ti[2])	40.0	238	40.0 / 20	32.0 / 238
VKE 26	PN 40	1.0460	A105[2])	40.0	400	28.4 / 250	23.1 / 400
NRG 16-19, NRG 16-27, NRG 16-28	PN 40	1.4571	AISI 316 Ti	40.0	238	40.0 / 20	32.0 / 238

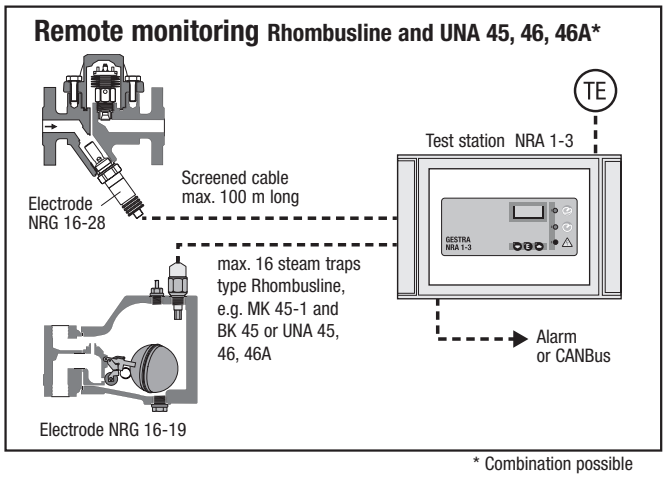
[1]) Limits for body/cover. Functional requirements may restrict the use to below the limits quoted. For full details on limiting conditions depending on end connection and type of regulator see data sheet.

[2]) ASTM nearest equivalent is stated for guidance. Physical and chemical properties comply with EN.

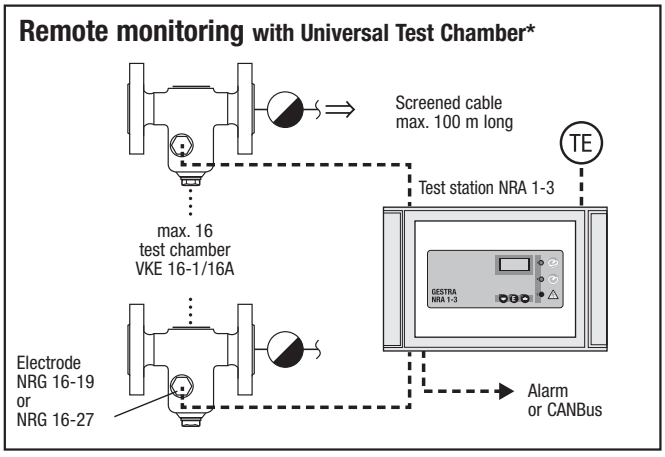
Available Connections and Overall Lengths

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	230
	Socket-weld	95	95	95	130	230
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	200	200	200	–	–
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 Rhombusline steam traps with integrated Pt 1000 thermocouple					

System VKE



* Combination possible

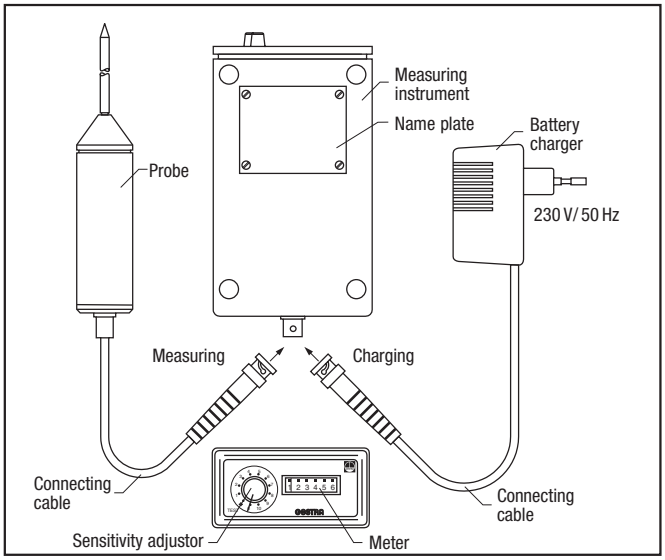


Vapophone VKP 10

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



TRAP*test* VKP 41*plus* / VKP 41*plus* Ex

Monitoring, recording and evaluation system **TRAP*test* VKP 41*plus* (VKP 41*plus* Ex** for application in potentially explosive atmospheres) for checking steam traps of all types and makes for loss of live steam and banking-up of condensate.
The equipment consists of a **data collector,** a **COM box** with **measuring probe** and a PC software program for managing steam trap data.

- For all types and makes of steam traps
- Automatic and objective evaluation of steam traps, no working knowledge of steam trap operation required
- Ultrasonic trap tester with integrated temperature sensor detects steam loss and blocked steam traps
- Graphical representation of collected data in form of curves
- Normal and quick check
- Data transfer via Bluetooth enables safe and user friendly operation
- Automatic language adaptation for over 20 languages
- Simple calculation of loss of steam in local currency
- Automatic calculation of CO_2 emissions
- Extensive data import and export functions
- Data collector: protection IP 68
- Bright, capacitance multi-touch colour display with wet finger and glove support
- Built-in camera and phone
- VKP 41plusEX for application in hazardous areas

Testing and
diagnostic system