Steam Traps and Monitoring Equipment

The right choice in every case

Engineering steam performance

Best equipped with GESTRA steam traps

Steam traps have to work perfectly

In industry, one of steam's most important tasks is to provide thermal energy through condensation, and to heat a variety of media in heat exchangers. During this process, the steam flows through pipes and cools down more and more en route, so that condensate forms here, too.

Condensate prevents the optimum transfer of heat, but also, in particular, leads to erosion and water hammer. To enable steam systems to work reliably and efficiently, steam traps discharge any condensate that builds up, while retaining the valuable steam to the greatest possible extent. How well steam traps perform has a considerable influence on:

- **the system's reliability**
- **availability and**
- **cost efficiency.**

To achieve the very best results here, it needs valves that satisfy all the different requirements in every respect.

Flexible for different requirements

To heat water using steam, at times large quantities of condensate must be discharged as quickly as possible, so that drainage without banking-up can be guaranteed even if load and pressure are fluctuating.

If turbines or pipes with superheated steam are drained, only low condensate flowrates occur during operation. More condensate only forms on start-up. Here, the demand is for robustness, maintenance friendliness, durability and a regulator that closes reliably even at pressures above 200 barg.

This is what sets GESTRA steam traps apart

For steam system operators, the cost of energy production is a key driver. Durable steam traps that work without loss of steam help to keep these costs as low as possible. What's more, they ensure reliable and safe operation.

For decades now, GESTRA steam traps have epitomised optimum energy efficiency and absolute reliability. They satisfy the most demanding quality requirements, and their compact and modular design makes them impressive in the field. In addition, they are very maintenance-friendly and extremely easy and convenient to use.

Best quality for every need

At GESTRA you will find an extensive selection of functional types and versions to suit every requirement. In addition, we offer systems that enable you to reliably test and monitor your steam and condensate systems.

How do I get my optimum steam trap?

We find the optimum steam trap for you, with the best efficiency. To achieve this, what matters most is keeping an eye on the decisive factors:

1. Requirements specific to your application

- Saturated steam pipe
- Superheated steam pipe
- Steam-regulated heat exchanger
- Unregulated heat exchanger or heating coil
- Steam tracing where undercooling is required
- Turbine drainage

2. System and equipment requirements

- Pressure rating
- Type of end connection, e.g. EN flange or socket weld end
- Material of construction

3. Operating parameters

- Pressure upstream from steam trap
- Temperature upstream from steam trap
- Pressure downstream from steam trap
- Condensate flowrate
- Start-up and shut-down cycles
- Load changes

4. Additional options required

- Monitoring
- Dirt strainer
- Drain valve and manual air vent
- Manual vent valve
- Bypass

Online design software

We are happy to advise you on selecting, sizing and configuring the right steam trap for you. But first you can also use our CAESar design software. This shows you the best way to your perfect steam trap.

You can find the easy-to-use CAESar steam trap selection range on our homepage, www.gestra.com, under “Service & Support”.

Integrated steam trap monitoring
VK, NRG, VKE

Visual or electronic – a reliable watchdog for every steam trap

Unwanted banking-up of condensate leads to an inadequate exchange of heat energy and the possibility of water hammer damage. A loss of steam costs energy and therefore constitutes a major financial loss. Moreover, both of these can adversely affect system safety. Therefore, monitoring steam traps for the banking-up of condensate and loss of steam always makes sense. Sightglasses – GESTRA Vaposcopes – or monitoring electrodes are a fixed part of the equipment.

VK Vaposcopes are sightglasses that allow you to see flow processes in pipes. When they are installed upstream from a steam trap, you can easily see whether the steam trap is suffering a banking-up of condensate or loss of steam.

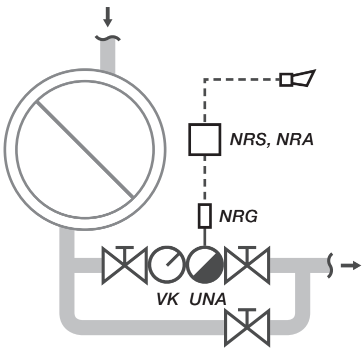
- The special design of the GESTRA Vaposcope makes any loss of steam clearly visible

NRG electrodes measure conductivity or temperature and therefore recognise, either in an upstream VKE test chamber or in the steam trap itself, the presence of an abnormal operating state. The electrode signal is processed by a single or multi-channel diagnostic tester.

- The diagnostic tester has different operating modes to ensure intelligent diagnosis
- Conductivity signal for clear, immediate detection of banked-up condensate
- Conductivity electrodes with temperature sensor for universal monitoring

Installation example

Heat exchanger



VK 14

VKE 16-1 with NRG 16-19

VK 16

NRG 16-19

NRG 16-27

NRA 1-3

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*)	=	

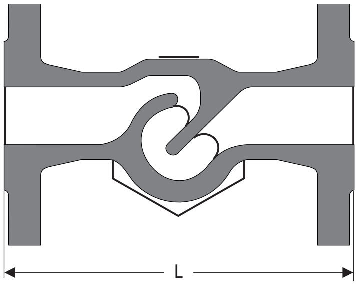
*) Results may vary as a function of the fuel used for generating steam and condensate return.

Example

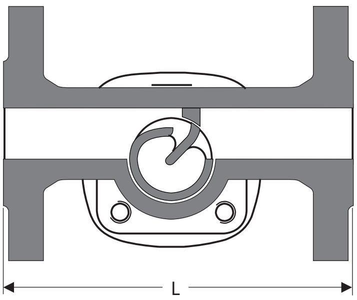
A	**Number of defective steam traps**	**20**
B	**Steam loss per steam trap**	**3 kg/h**
C	**Annual operating hours**	**8000 h**
D	**Annual steam loss**	**480,000 kg**
E	**Cost of steam per ton**	**30.00 Euro/t**
F	**Annual loss**	**14,400.– Euro**
G	**CO_2 saved per year**	**76,800 kg**

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

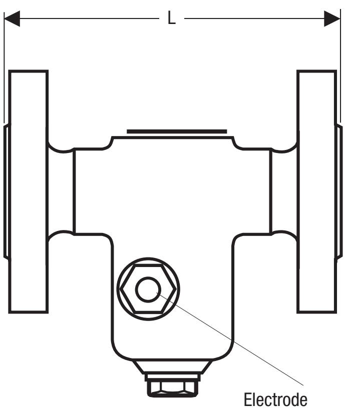
GESTRA®



VK 14

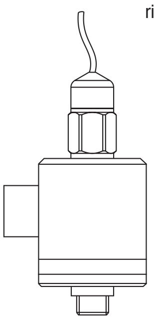


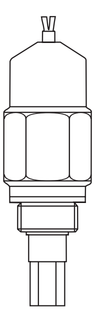
VK 16

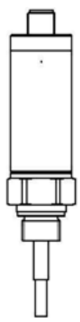


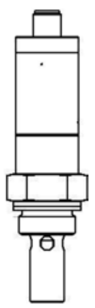
Test chamber VKE 16-1

Electrode connection either on the left or on the right side.


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.

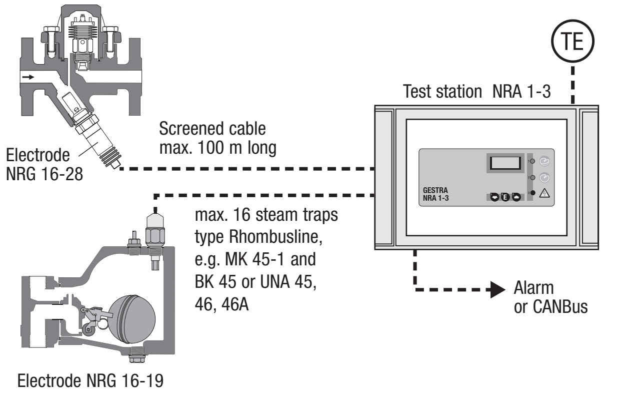
[2]) ASTM nearest equivalent is stated for guidance. Physical and chemical properties comply with EN.

Available Connections and Overall Lengths

Type	Connection	Overall length L in mm				
		DN 15 ½"	DN 20 ¾"	DN 25 1"	DN 40 1½"	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					

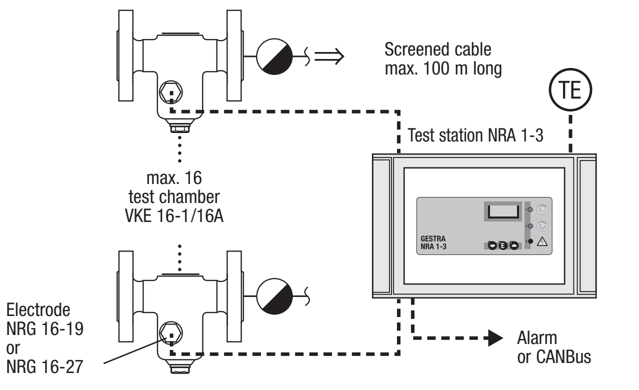
System VKE

Remote monitoring Rhombusline and UNA 45, 46, 46A*



* Combination possible

Remote monitoring with Universal Test Chamber*

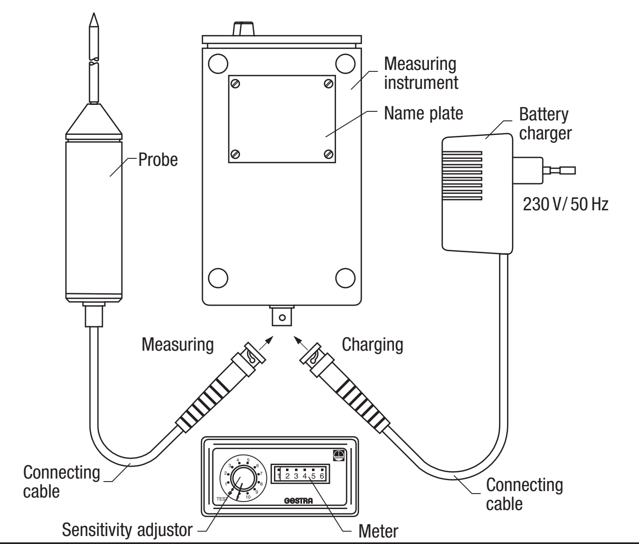


Vapophone VKP 10

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

GESTRA steam traps at a glance

Type	Materials, body, cover	Operating principle Bimetallic BK	Membrane MK	Ball float UNA	Thermodynamic DK	Inverted bucket IB
AK 45	1.0460/SA105					
BK 15	1.0460/SA105	x				
BK 27N	1.5415	x				
BK 28	1.5415	x				
BK 28-ASME	1.7335/SA182-F12-2	x				
BK 29	1.7335/SA182-F12-2	x				
BK 29-ASME	1.7335/SA182-F12-2	x				
BK 36A-7	1.4408/SA351-CF8M	x				
BK 37	1.5415	x				
BK 37-ASME	A182-F12	x				
BK 45	1.0460/SA105	x				
BK 45-LT	SA350-LF2	x				
BK 46	1.5415	x				
BK 212	1.7383/A182-F22-3	x				
BK 212-F91	1.4903/SA182-F91	x				
BK 212-1.4901	1.4901 (F92)	x				
BK 212-ASME	1.7383/A182-F22-3	x				
DK 36A-7	1.4408/SA351-CF8M				x	
DK 45	1.0460/SA105				x	
DK 47-L	A743 CA40				x	
DK 47-H	A743 CA40				x	
DK 57-L	AISI 420				x	
DK 57-H	AISI 420				x	
GK 11	5.1301					
GK 21	5.1301					
IB 16A-7	SA240-304L					x
MK 20	5.4202		x			
MK 25/2	1.0460, 1.0619/SA105, SA216-WCB		x			
MK 25/2 S	1.0460, 1.0619/SA105, SA216-WCB		x			
MK 35/31	1.0460/SA105		x			
MK 35/32	1.0460/SA105		x			
MK 35/2S	1.0460/SA105		x			
MK 35/2S3	1.0460/SA105		x			
MK 36A-71	1.4408/SA351-CF8M		x			
MK 36A-72	1.4408/SA351-CF8M		x			
MK 36/51	1.4301/SA479-F304		x			
MK 36/52	1.4301/SA479-F304		x			
MK 45-1	1.0460/SA105		x			
MK 45-2	1.0460/SA105		x			
MK 45 A-1	1.4404/A182-F316L		x			
MK 45 A-2	1.4404/A182-F316L		x			
SMK 22	1.4435		x			
SMK 22-51	1.4404		x			
SMK 22-81	1.4404		x			
SMK 22-82	1.4404		x			
TK 23	5.1301					
TK 24	1.0619/SA216-WCB					
TS 36	1.4408/SA351-CF8M					
UBK 46	1.0460/SA105	x				
UC 36, UCY 36	1.4408/SA351-CF8M					
UNA 14	5.3103			x		
UNA 14P	5.3103			x		
UNA 16	1.0460, 1.0619/SA105, SA216-WCB			x		
UNA 16A	1.4404, 1.4408/A182-316L, SA351-CF8M			x		
UNA 25-PK	5.3103			x		
UNA 25-PS	5.3103			x		
UNA 27h	1.5419			x		
UNA 43	5.1301/A126-B			x		
UNA 45	1.0460, 5.3103/SA105, (A395)			x		
UNA 45 MAX	1.0460, 5.3103/SA105, (A395)			x		
UNA 46	1.0460, 1.0619/SA105, SA216-WCB			x		
UNA 46 MAX	1.0460, 1.0619/SA105, SA216-WCB			x		
UNA 46A	1.4404, 1.4408/A182-316L, SA351-CF8M			x		
UNA 46A MAX	1.4404, 1.4408/A182-316L, SA351-CF8M			x		
UNA 38	1.5415, 1.7357			x		
UNA 39	1.7335/SA182-F12			x		
UNA-Special Typ 62-B	1.0425			x		
UNA PN 25	1.0619/SA216-WCB			x		
UNA-Special PN 63	1.5419			x		

Nominal size											Nominal pressure		Max. permitted differential pressure		Hot condensate	
8 ¼″	10 ⅜″	15 ½″	20 ¾″	25 1″	40 1½″	50 2″	65 2½″	80 3″	100 4″	150 6″	PN	Cl	∆PMX [bar]	∆PMX [psi]	[kg/h]	[lb/h]
		x	x	x							40					
					x	x					40	300	22	320	2,550	5,620
					x	x					63		45	650	1,500	3,310
		x	x	x							100		85	1,230	910	2,010
		x	x	x								600	85	1,230	910	2,010
		x	x	x							160		110	1,600	980	2,160
		x	x	x								900	110	1,600	980	2,160
												300	32	465	300	660
		x	x	x							100		45	650	570	1,260
		x	x	x								600	45	650	570	1,260
		x	x	x							40	300	22	320	510	1,120
		x	x	x							40	300	22	320	510	1,120
		x	x	x							40	300	32	465	550	1,210
		x	x	x							630		275	3,988	300	660
		x	x	x							775	2500	275	3,988	300	660
											800		275	3,988	300	660
		x	x	x								2500	275	3,988	300	660
												300	32	465	400	880
		x	x	x							40	300	32	465	510	1,120
		x	x								63	600	42	610	330	730
			x	x							63	600	42	610	2,000	4,410
		x	x								63	600	42	610	550	1,210
			x	x							63	600	42	610	2.100	4,630
							x	x	x	x	16		6	87	380,000	837,740
						x					16		6	87	18,000	39,680
												300	27.6	400	750	1,650
		x	x								6		4.5	65	1,050	2,310
					x	x					40		32	465	5,500	12,130
					x	x					40		32	465	8,200	18,080
	x	x									25		21	305	360	790
	x	x									25		21	305	790	1,740
				x							40		32	465	1,800	3,970
				x							40		32	465	3,100	6,830
												300	32	465	300	660
												300	32	465	450	990
x	x	x	x									300	32	465	500	1,100
x	x	x	x									300	32	465	830	1,830
		x	x	x							40	300	32	465	610	1,340
		x	x	x							40	300	32	465	1.100	2,430
		x	x	x							40	300	32	465	610	1,340
		x	x	x							40	300	32	465	1,100	2,430
	x	x	x	x							10		6	87	270	600
	x	x	x	x							10		6	87	270	600
	x	x	x	x							10		6	87	270	600
				x							10		6	87	400	880
						x	x	x	x		16		10	145	125,000	275,570
						x	x	x	x		25		14	203	140,000	308,640
		x	x	x								300				
		x	x	x							40	300	32	465	170	370
		x	x	x								300				
		x	x	x							25		13	188	650	1,430
		x	x	x							25		16	232	1,000	2,200
		x	x	x							40	300	22	320	650	1,430
		x	x	x							40	300	22	320	650	1,430
					x						40		13	188	3,200	7,050
					x						40		13	188	610	1,340
				x	x	x					63		45	650	4,800	10,580
								x	x	x	16	125	13	188	26,000	57,320
		x	x	x	x	x	x				40	300	32	465	6,050	13,340
					x	x	x				40	300	32	465	15,500	34,170
		x	x	x	x	x	x	x	x	x	40	300	32	465	26,000	57,320
					x	x	x				40	300	32	465	15,500	34,170
		x	x	x	x	x	x				40	300	32	465	6,050	13,340
					x	x	x				40	300	32	465	15,500	34,170
		x	x	x	x	x					100		80	1,160	5,200	11,460
		x		x		x					160	900	140	2,030	6,000	13,230
									x		16		16	232	90,000	198,410
									x		25		22	320	66,000	145,500
							x	x	x		63		45	650	32,000	70,550

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