

# **KARAJET**

Kara Sanat Tadbir Paya

# **STEAM TRAP**

## Summary

A Steam Trap is an integral part of a steam system. They are playing an important role in maintaining the productivity and efficiency of such systems. Steam trap is an automatic drain valve which distinguishes between steam and condensate. A steam trap holds back steam & discharges condensate under varying pressures or loads and should have good capacity to vent out air and other non-condensable gases quickly while holding back the live steam.

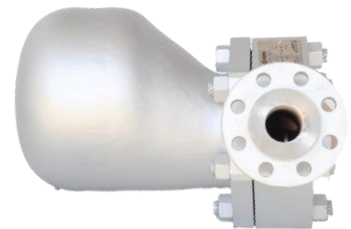
**KARAJET** is a Science-Based company with over 25 years experience in research, development and manufacturing of stationary (without rotatory parts) mechanical equipment used in several industrial applications such as power plants, petrochemical, oil refinery and ... .The company's steam trap production list includes Mechanical, Thermostatic, Thermodynamic and Venturi types for wide ranges of operating and design conditions suitable for any application. Since this is a Science-Based company other models of steam traps beside the ones included in the following lists and tables are in the company's development plan.



## Types of steam traps: Based on working principle

### *Density Operated - Ball Float / Free Float / Inverted Bucket*

The ball float type trap operates by sensing the difference in density between steam and condensate. Condensate reaching the trap will cause the ball float to rise, lifting the Valve off its seat and releasing condensate. The Valve is always flooded and neither steam nor air will pass through it, so early traps of this kind were vented using a manually operated cock at the top of the body. Modern traps use a thermostatic air vent (Float trap with thermostatic air vent). This allows the initial air to pass whilst the trap is also handling condensate.



### *Temperature Operated - Bimetal Expansion*

Thermostatic Steam Traps work on the temperature difference between steam and condensate. Condensate is at a temperature lower than the steam being used. Thermostatic type of steam trap has a port which is opened or closed based on the temperature of the inlet fluid. If the temperature is above the specified range, the port is closed. The port open when The temperature of the fluid falls down below the previously specified value. Since air and other gases have a temperature much lower than that of steam, these steam traps can also be used as air vents.



### *Kinetic Energy Operated - Thermodynamic*

Thermodynamic steam traps are operated by the principle of thermodynamics. The main principle behind the operation of thermodynamic steam traps is Bernoulli's principle. Thermodynamic Traps are the most widely used steam traps for removing condensate from main lines largely due to their small size, wide pressure range, one moving part, and resistance to water hammer and corrosion. Because operation of each model depends on the manufacturer's seat and disc design, results obtained by the user may vary widely.



### *Specific Volume Operated - Venturi*

Venturi Nozzle taking advantage of physical differences of specific volume between steam and condensate. In this type of steam trap, a venturi-shaped nozzle is installed at the outlet nozzle of the steam trap that helps steam trap to distinguish between condensate and steam. The condensate is denser and travels at a much slower speed than live steam. Because of condensate slower speed, it prevents the passage of steam from the venturi. When condensate exists from the diverging section of the venturi nozzle, some part of it starts to flashing which increases a specific volume and creating a choking effect that creates a hindrance for steam to discharge from the steam trap.



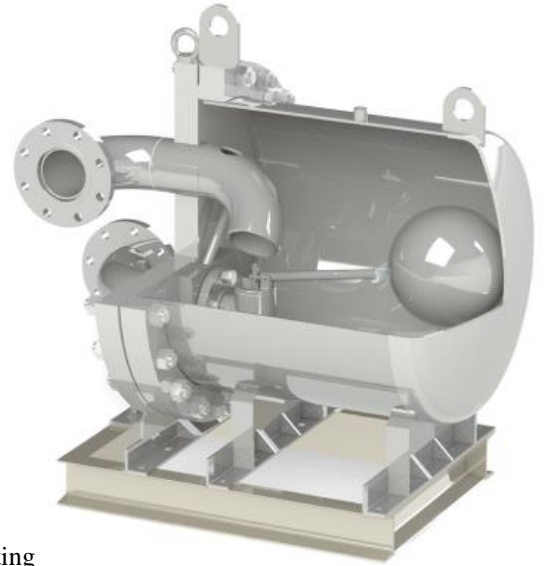
## Ball Float Steam Traps

The working principal of these types of traps is buoyancy.

Operating Pressure Range: 0.1 to 160 barg

Operating Temperature Range: 0 to 530 °C

Capacity Range: Up to 180000 kg/h



### Advantages:

- Robust, fair resistance to water hammer.
- Wide range of orifices to suit inlet pressure.
- Inline inlet and outlet facility, easy installation at low cost.
- Discharge condensate continuously as rapidly as it forms
- High air venting capacity through auxiliary bimetallic air vent, which is self-adjusting for varying steam pressures.
- High thermal efficiency at both light and heavy loads. Continuous modulating discharge does not create pressure disturbances, which may affect control in air heating coils, shell and tube exchanges, etc.

### Limitations:

- Cannot be used on high degree of superheat.
- Water hammer can damage float
- Applications subjected to freezing must be protected with insulation & SLR

### Models:

#### FT14 / FT44 / FT44-HC

Ball float steam trap with built-in strainer and bimetal type automatic air vent, for use on process equipment. Diverse body and internal material choice

#### FT44-P / UNA38 / UNA39

Ball float steam trap with bimetal type automatic air vent, for use in high pressure applications.

#### FT44-D / SW1U

Ball float steam trap with bimetal type automatic air vent, for applications with high condensate capacity.

#### UNP / FTP

Ball float steam trap with pilot operated valve for applications with high pressure and condensate capacity.

Kara Model	Body Material	Pressure Rating	Max. Capacity (kg/h) in Max. Diff. Press. (bar) depending on orifice size				TMO (°C)	PMO (barg)	TMA (°C)	PMA (barg)
			4.5	10	14					
FT14	Cast Iron	PN16	10				250	14	250	16
			1100	800	500					
FT44-HC	Carbon Steel (A216), Cast Iron	PN40	4.5	10	21	32	285	32	300	40
			2500	2000	1500	1000				
FT44	Carbon Steel (A216), Cast Iron	PN40	4.5	10	21	32	285	32	300	40
			20000	17000	11000	14000				
FT44-D	Carbon Steel (A105)	PN40	4.5	10	21	32	285	32	300	40
			40000	34000	22000	28000				
FT44-P	Carbon Steel (A105) – Stainless Steel	PN100	4.5	10	21	32	425	32	425	60
			20000	17000	11000	14000				
FTP-44	Carbon Steel (A105) – Stainless Steel	PN40	40				285	32	300	40
			46000							
FTP-46	Carbon Steel (A105) – Stainless Steel	PN63	46				425	46	425	50
			150000							
UNA38	Alloy Steel (F11 / F12)	PN100	50	64	80		525	80	525	100
			800	650	550					
UNA39	Alloy Steel (F11 / F12)	PN160	80	110	140		550	140	550	160
			500	400	300					
UNP38	Alloy Steel (F11 / F12)	PN100	80				525	80	525	100
			5000							
UNP39	Alloy Steel (F11 / F12)	PN160	140				550	140	550	160
			6000							
SW1U	Carbon Steel	PN16	4		8		300	8	300	16
			50000		180000					

Kara Model	Body Material	Flow Direction	Connection Type	Connection Size										
				1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	
FT14	Cast Iron	H	Flanged	*	*	*								
FT14	Cast Iron	H	Screwed / SW	*	*	*								
FT44-HC	Carbon Steel / Cast Iron	H	Flanged	*	*	*								
FT44-HC	Carbon Steel / Cast Iron	H	Screwed / SW	*	*	*								
FT44	Carbon Steel / Cast Iron	H	Flanged				*	*						
FT44	Carbon Steel / Cast Iron	H	Screwed / SW				*	*						
FT44-D	Carbon Steel	H	Flanged				*	*			*	*		
FT44-P	Carbon Steel / Stainless Steel	H	Flanged	*	*	*	*	*						
FT44-P	Carbon Steel / Stainless Steel	H	SW	*	*	*	*	*						
FTP-44	Carbon Steel / Stainless Steel	H	Flanged											
FTP-44	Carbon Steel / Stainless Steel	H	SW											
FTP-46	Carbon Steel / Stainless Steel	H	Flanged											
UNA38	Alloy Steel	H	Flanged	*	*	*	*	*						
UNA38	Alloy Steel	H	SW	*	*	*	*	*						
UNA39	Alloy Steel	H	Flanged	*	*	*	*	*						
UNA39	Alloy Steel	H	SW	*	*	*	*	*						
UNP38	Alloy Steel	H	Flanged											
UNP38	Alloy Steel	H	SW											
UNP39	Alloy Steel	H	Flanged											
UNP39	Alloy Steel	H	SW											
SW1U	Carbon Steel	H	Flanged								*	*	*	*

Other connection sizes and standards are available on request.

## Inverted Bucket Steam Traps

Inverted Bucket steam traps operate as a function of difference in buoyancy of steam and condensate.

Operating Pressure Range: 0.5 to 40 barg

Operating Temperature Range: 0 to 400 °C

Capacity Range: Up to 600 kg/h

### Advantages:

- Simple construction and highly durable with very less or negligible wearing.
- This type of steam trap can withstand with high pressure of the steam system.
- Can be used in superheated steam lines with NRV installed at the inlet of the trap.
- Resistance to water hammer.
- Corrosion resistance.
- Resistance against the dirt of steam because of inbuilt strainer in the bucket.

### Limitations:

- Can't sustain in low-temperature area, can freeze in a cold environment.
- Priming required before startup.
- Possibility of steam leakage with low load.
- The higher temperature of superheated steam can be a cause of losing traps water seal.



### Models:

#### SCA

The KARAJET SCA series is a low capacity maintainable carbon steel steam trap with in-line connections. They are suitable for a wide range of pressures and incorporate an integral strainer.

Kara Model	Body Material	Pressure Rating	Max. Capacity (kg/h) in Max. Diff. Press. (bar) depending on orifice size						TMO (°C)	PMO (barg)	TMA (°C)	PMA (barg)
			3	5	11	15	30	40				
SCA	Carbon Steel (A105), Cast Iron	PN50	3	5	11	15	30	40	400	40	400	51
			600	600	600	500	500	400				

Kara Model	Body Material	Flow Direction	Connection Type	Connection size					
				1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
SCA	Carbon Steel	H	Flanged	*	*	*		*	*
SCA	Carbon Steel	H	Screwed / SW	*	*	*			

Other connection sizes and standards are available on request.

## Thermodynamic Steam Traps

Thermodynamic steam traps, also called disc traps, operate as a function of velocity.

Operating Pressure Range: 0.7 to 120 barg

Operating Temperature Range: 0 to 550 °C

Capacity Range: Up to 1800 kg/h

### Advantages:

- No requirement for any adjustment of calibration.
- Compact, simple, and lightweight body design.
- Can be used for high-pressure and high-temperature steam.
- No specific installation orientation requirement.
- Highly durable and withstand with water hammering.
- Performance can be easily checked in the field.

### Limitations:

- During the start, its air handling capability is very less that can cause a stuck disc.
- Excessive back pressure in the return system can prevent the disc to close.
- High noise during condensate discharge.
- Dirt can increase the work cycle rate that increases the wear of the disc.
- Sensitive to environmental conditions. Cold weather can lead to improper working of the trap.



### Models:

#### TD42 / TD42R

Thermodynamic steam trap with built-in strainer for use in applications with up to 42 barg differential pressure. It can be manufactured with a removable seat (TD42R) for easier maintenance and can be equipped with a bimetal air ring for better air ventilation.

#### TD62

Thermodynamic steam trap with built-in strainer for use in applications with up to 62 barg differential pressure. It can be equipped with a bimetal air ring for better air ventilation

#### TD120

Thermodynamic steam trap with built-in strainer for use in applications with up to 120 barg differential pressure.

Kara Model	Body Material	Pressure Rating	Max. Diff. Press. (bar)	Capacity (kg/h) up to	TMO (°C)	PMO (barg)	TMA (°C)	PMA (barg)
TD42	Carbon Steel (A105) / Stainless Steel (A743)	PN64	42	1800	400	42	400	63
TD42R	Carbon Steel (A105) / Stainless Steel (A743)	PN100	42	1800	425	42	425	93
TD62	Stainless Steel (F11 / F12)	PN100	62	450	525	62	525	103
TD120	Stainless Steel (F11 / F12)	PN250	120	280	550	120	550	250

Kara Model	Body Material	Flow Direction	Connection Type	Connection size					
				1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
TD42	Carbon Steel / Stainless Steel	H / V	Flanged	*	*	*			
TD42	Carbon Steel / Stainless Steel	H / V	Screwed / SW	*	*	*			
TD42R	Carbon Steel / Stainless Steel	H / V	Flanged	*	*	*			
TD42R	Carbon Steel / Stainless Steel	H / V	Screwed / SW	*	*	*			
TD62	Stainless Steel	H / V	Flanged	*	*	*			
TD62	Stainless Steel	H / V	Screwed / SW	*	*	*			
TD120	Stainless Steel	H / V	Flanged	*	*	*			
TD120	Stainless Steel	H / V	Screwed / SW	*	*	*			

Other connection sizes and standards are available on request.



## Thermostatic Steam Traps

Thermostatic steam trap works on the difference in Enthalpy of Steam and Condensate.

Operating Pressure Range: 0.5 to 110 barg

Operating Temperature Range: 0 to 540 °C

Capacity Range: Up to 2500 kg/h



### Advantages:

- Steam traps can't be damaged even in a freezing environment.
- Have good air venting capabilities and complete draining of condensate.
- Compact in size but can handle a high amount of condensate from the steam system.
- Because of metallic strips, this can handle water hammering, corrosion, and high steam pressure.
- This can be installed in any orientation required.
- Can work efficiently in higher temperature and higher pressure conditions.
- Rugged, self-draining, and energy-efficient.

### Limitations:

- Discharge of condensate below steam temperature can cause waterlogging in the trap body.
- Its reaction time is not so quick which causes steam loss.
- Dirt particles can prevent the tight closing of the valve.
- Discharging against the backpressure requires cooling down condensate at 50% lower temperature.

### Models:

#### T3

Thermostatic steam trap with built-in strainer for use in applications with up to 17 barg differential pressure.

#### SM32 / SM45

Thermostatic steam trap with built-in strainer for use in applications with up to 45 barg differential pressure.

#### BK28 / BK29

Thermostatic steam trap with built-in strainer for use in applications with up to 110 barg differential pressure.

Kara Model	Body Material / Rating	Pressure Rating	Max. Diff. Press. (bar)	Capacity (kg/h) up to	TMO (°C)	PMO (barg)	TMA (°C)	PMA (barg)
T3	Carbon Steel (A105)	PN40	17	150	300	17	425	40
SM32	Carbon Steel (A105) / Stainless Steel	PN64	32	1000	400	32	400	63
SM45	Carbon Steel (A105) / Stainless Steel	PN64	45	2700	425	45	425	63
BK28	Stainless Steel (F11 / F12)	PN100	85	900	500	85	500	100
BK29	Stainless Steel (F11 / F12)	PN160	110	1000	530	110	530	160

Kara Model	Body Material	Flow Direction	Connection Type	Connection size					
				1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
T3	Carbon Steel	H / V	Flanged	*	*	*			
T3	Carbon Steel	H / V	Screwed / SW	*	*	*			
SM32	Carbon Steel / Stainless Steel	H / V	Flanged	*	*	*			
SM32	Carbon Steel / Stainless Steel	H / V	Screwed / SW	*	*	*			
SM45	Carbon Steel / Stainless Steel	H / V	Flanged	*	*	*			
SM45	Carbon Steel / Stainless Steel	H / V	Screwed / SW	*	*	*			
BK28	Stainless Steel	H / V	Flanged	*	*	*			
BK28	Stainless Steel	H / V	Screwed / SW	*	*	*			
BK29	Stainless Steel	H / V	Flanged	*	*	*			
BK29	Stainless Steel	H / V	Screwed / SW	*	*	*			

Other connection sizes and standards are available on request.

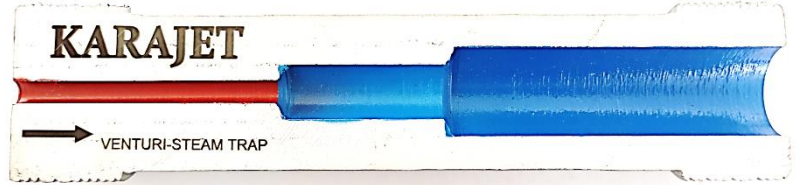
## Venturi Steam Traps

Venturi steam trap works by taking advantage of physical differences of specific volume between steam and condensate.

Operating Pressure Range: Custom Design

Operating Temperature Range: Custom design

Capacity Range: Custom Design



### Advantages:

- No moving parts in the steam trap.
- Suitable for high-pressure steam system application.
- Highly durable and can withstand water hammering.
- No damage by freezing.
- Superheated steam can also be managed well without loss of its efficiency.
- Can be installed in any position.

### Limitations:

- Venturi Size must be selected carefully, each steam trap needs special attention as per its location and size.
- They can't respond to varying condensate loads.
- Oversized venturi can make the steam trap inefficient.
- Dirt particles of steam affect its performance.
- **If no condensate is present in the trap body, this allows steam to pass from the outlet.**

### Models:

#### VT

Custom designed Venturi steam trap with built-in strainer suitable for any operating conditions i.e. capacity and pressure.

Model	Body Material	Pressure Rating	Max. Diff. Press. (bar)	Capacity (kg/h)	TMO (°C)	PMO (barg)	TMA (°C)	PMA (barg)
VT	Carbon Steel (A105) / Stainless Steel	PN63	Custom Designed	Custom Designed	Custom Designed	Custom Designed	425	63
VTP	Alloy Steel (F11/F12)	PN100	Custom Designed	Custom Designed	Custom Designed	Custom Designed	525	100

Model	Body Material	Flow Direction	Connection Type	Connection size					
				1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
VT	Carbon Steel / Stainless Steel	H / V	Flanged	*	*	*			
VT	Carbon Steel / Stainless Steel	H / V	SW/Screwed	*	*	*			
VTP	Alloy Steel	H / V	Flanged	*	*	*			
VTP	Alloy Steel	H / V	SW/Screwed	*	*	*			

Other connection sizes and standards are available on request.