

## Energy Environment Solutions for Sustainable Growth



# TCRS

## STEAM ENGINEERING

### Why Condensate Recovery System?

When steam is used for indirect heat transfers in heat exchangers, reactors and other indirect heating equipment, it gives off its latent (useful) heat to the process and converts itself into a liquid form known as condensate.

High pressure condensate is at almost the same pressure as steam and still contains around 15 to 20% heat of the fuel. This heat, if recovered, can reduce fuel consumption to the extent of 20%.

## What efficient condensate recovery system ensures

- High temperature feed water
- Lower blowdown losses
- Good quality boiler feed water
- Lower water treatment losses

The Thermax Condensate Recovery System (TCRS) is an integrated system comprising a flash steam generator, steam operated condensate transfer pump and deaerator unit with immersion tube.

This system efficiently recovers flash steam and hot condensate, and feeds them to the feed water tank through a well designed deaerator unit with immersion tube.

**TAFS™**



## What is TAFS?

When high pressure condensate is discharged from steam traps into low pressure condensate return lines, the excess energy is released in the form of flash steam. This flash steam can be used to heat boiler feed water or for low pressure steam applications.

## Selection Table

Condensate (Kg/hr)	Flash (kg/hr)	Model	Size (mm NB)
850	200	TAFS 150	150
2200	450	TAFS 200	200
4500	900	TAFS 300	300
7000	1150	TAFS 350	350

## Technical Specifications

### Material of Construction

Body & Nozzles      ASTM 106  
Dished Ends        IS2062 Gr.B/SA285

### Design Specifications

Design Code        ASME BPVC Sec VIII Div I  
Design Pressure    14kg/cm<sup>2</sup>(g)  
Design Temperature 200°C  
Higher design/ operating pressure available on request

## Models & Dimensions

	TAFS 150	TAFS 200	TAFS 300	TAFS 350
A	1510	1610	1660	1810
B	1250	1335	1365	1505
C	880	940	855	1075
N1	50	80	100	150
N2	65	100	150	150
N3	40	40	50	50
N4	25	25	25	25
N5	15	15	15	15
N6	25	25	40	40

### End Connections

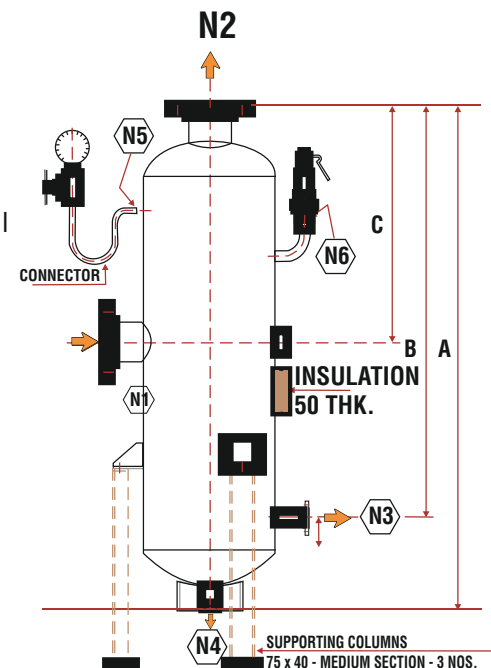
N1, N2, N3 flanged to ANSI B 16.5 Class# 150  
N4, N5, Screwed BSP

### Installation

The flash vessel should be installed in vertical position only, with flash steam outlet at the top.

## Features & Benefits

- Generates low pressure flash steam
- Not covered under IBR
- A dequately sized to minimize pressure drop
- Steam trap sized to handle condensate at low sure difference to be fitted at condensate outlet
- Designed with optimum separation velocity to get dry steam





## What is TADIT?

It is an atmospheric de-aerator head designed to remove dissolved gases and oxygen from the feed water, by properly mixing condensate, flash steam and cold make up water. Solubility of oxygen and other dissolved gases decreases with rise in temperature, and when they are released from the solution they exit through the air vent fitted on the de-aerator head.

## Selection Table

Condensate W/o flash (Steam Kg/hr)	Condensate with flash (Steam Kg/hr)	TADIT (Model)
5000		150
10000		200
20000	Refer to Thermax for details	250
30000		300

## Technical Specifications

### Material of Construction

Atmospheric De-aerator Head SS 304

Immersion Tube SS 304

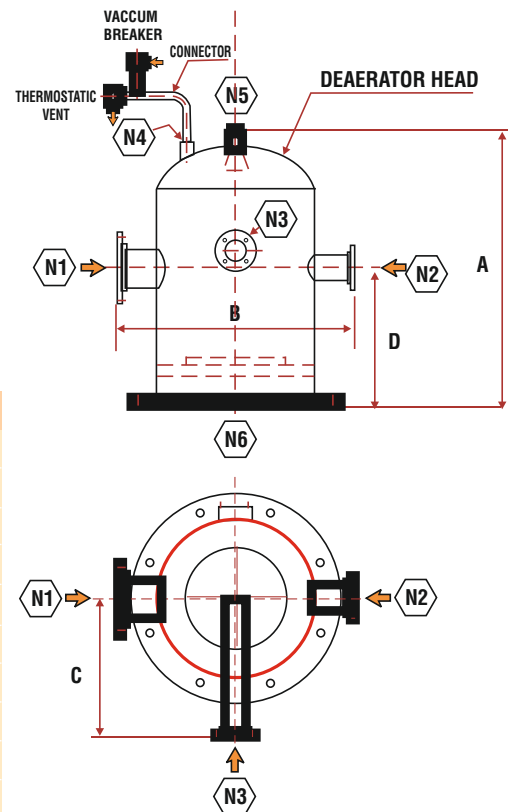
### Design Specifications

Design Pressure 5 kg/cm<sup>2</sup>(g)

Design Temperature 158OC

## Models & Dimensions

	TADIT 150	TADIT 200	TADIT 250	TADIT 300
A	440	490	500	500
B	370	420	475	525
C	185	210	235	265
D	175	200	210	225
N1	65	100	150	150
N2	50	80	80	100
N3	25	40	50	65
N4	15	15	15	15
N5	15	25	25	25
N6	150	200	250	300



### End connections

TADIT and nozzles N1, N2, N3 are provided with flanged end connection conforming to ANSI-B16.5 Class# 150, N4, N5 screwed BSP for airvent and recirculation.

### Installation

The de-aerator head is mounted on the feed water tank on a flanged nozzle. Sealing gaskets are used above and below the immersion tube flange.

Piping should preferably be of the same size as that of nozzles.

The flanged nozzle, supplied loose, is to be welded on the top of the FW Tank at a suitable location (refer GA drawing).

## Features & Benefits

- Facilitates mixing of condensate, flash steam and cold make-up water
- Liberates dissolved gases and oxygen
- SS de-aerator head with SS immersion tube

## What is TACTS?

Thermax Automatic Condensate Transfer Pump - TACTSplus and TACTSultra

This pump is capable of pumping huge quantities of condensate effectively, by utilizing motive steam and consuming approximately 3 kg per 1000 kg of condensate. The condensate is one of the purest forms of water, with conductivity of the order of 3.5 ppm of TDS (5 s/cm).

The conductivity based level controller used in TACTS and TACTS is capable of sensing very low conductivity, even up to 0.35 ppm of TDS (0.5 s/cm). This controller makes TACTSplus and TACTSultra, FIT and FORGET pumps with no moving parts - thus ensuring zero maintenance.



## Features & Benefits

- Highest reliability and availability due to zero moving parts.
- High motive inlet pressure up to 10 kg/cm<sup>2</sup> for TACTS *ultra*. No need of pressure reducing till 10 kg/cm<sup>2</sup> where low pressure steam is not available, hence saving of installation cost.
- High discharge of 50 litres per stroke - Discharges more volume/ stroke. Hence less wear and tear of parts.
- High condensate temperature return-no cavitation problem as compared to electrical pump
- Skid mounted system - Easy to install.
- CE approved level controller - a stringent quality & design process followed in European market to ensure safe operation.
- Weather proof IP 65 design - suitable for outdoor installations.
- Energy efficient pump - steam trap drain and pump vent taken back to the receiver tank to minimize vent losses and save precious fuel.

## Technical Specifications

### Material of construction

Receiver	IS-2062 GR-B/ SA 285
Pump Body	IS-2062 GR-B/ SA 285
Dished Ends	IS-2062 GR-B/ SA 285
Nozzles (seamless)	ASTM 106

### Utilities requirement

Motive Steam	TACTSplus 2-6 kg/cm <sup>2</sup> (g) TACTSultra 2-10 kg/cm <sup>2</sup> (g)
Compressed Air	4-6 kg/cm <sup>2</sup> (g)
Electricity	230 Volts +5% 1 phase, AC 50 Hz

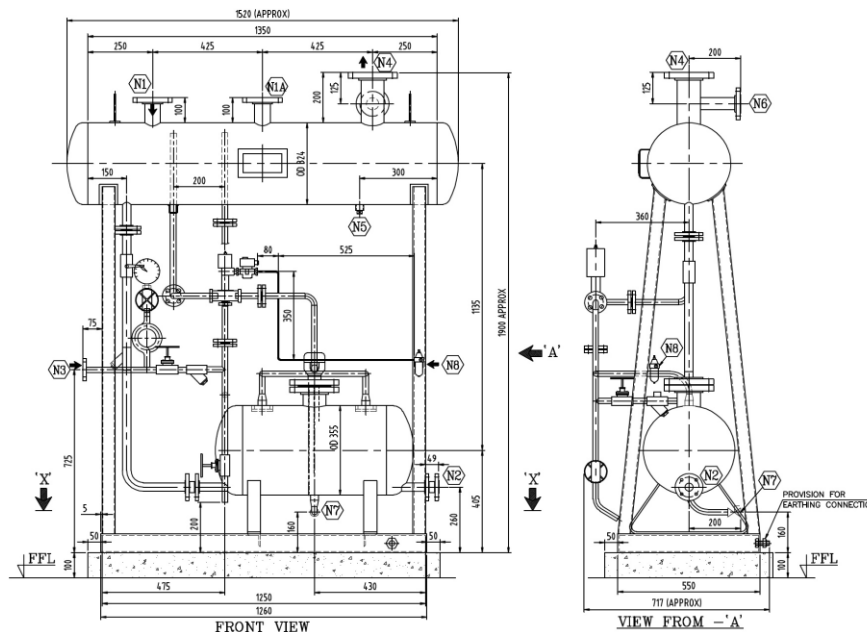
### Design specifications

Design code	ASME, BPVC Sec VIII Div 1
Design code	11 kg/cm <sup>2</sup> (g)
Design temperature	187OC
Discharge volume per stroke	25 litres
Steam consumption	3 kg/1000 kg of condensate

## Models & End Connections

Model	Condensate Inlet to receiver (N5, N6)	Condensate Outlet from pump (N3)	Motive Steam inlet (N12)	Receiver Vent (N7)	Pump Drain (N4)	Over flow (N8)	Trap line (N15)	Pump Vent (N14)
TACTS 200i	50 NB x 2	25 NB	15 NB	50 NB	25 NB. Scr BSP	40 NB	15 NB	1.5 NB
TACTS 300i	50 NB x 2	40 NB	15 NB	50 NB	25 NB. Scr BSP	40 NB	15 NB	1.5 NB
TACTS 400i	50 NB x 2	50 NB	15 NB	80 NB	25 NB. Scr BSP	40 NB	15 NB	1.5 NB
TACTS 500i	50 NB x 2	80 NB	15 NB	80 NB	25 NB. Scr BSP	40 NB	15 NB	1.5 NB

End Connections: Ranged To ANSI B 165 class # 150

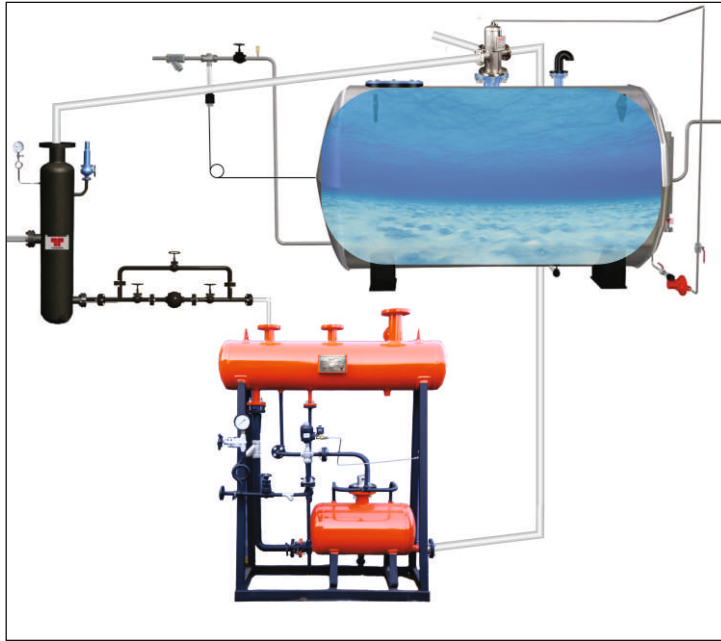


## Capacity chart for TACTS*plus* and TACTS*ultra*

		TACTS 200i		TACTS 300i		TACTS 400i		TACTS 500i		
Operating Inlet Motive Pressure	Total Lift/back pressure	<i>Plus</i>	<i>Ultra</i>	<i>Plus</i>	<i>Ultra</i>	<i>Plus</i>	<i>Ultra</i>	<i>Plus</i>	<i>Ultra</i>	
		LPH	LPH	LPH	LPH	LPH	LPH	LPH	LPH	
TACTS <i>plus</i>	2	0.5	1100	1190	2380	2860	3315	3790	5150	5400
		1.0	1035	1150	2075	2550	2910	3460	4355	4520
	3	0.5	1180	1260	2500	3000	3505	4080	5655	5980
		1.0	1140	1200	2335	2770	3335	3830	4850	5100
		1.5	1110	1170	2170	2560	3130	3600	4670	4840
	4	2.0	1030	1050	1920	2320	2905	3410	4250	4350
		0.5	1240	1300	2625	3100	3995	4290	5915	6390
		1.0	1170	1240	2480	2920	3800	4090	5275	5510
		1.5	1135	1200	2240	2670	3455	3790	4905	5200
	5	2.0	1060	1090	2040	2460	3145	3520	4160	4570
3.0		890	940	1765	2090	2670	2880	2530	2810	
1.0		1215	1270	2560	3030	4040	4290	5570	5830	
1.5		1165	1230	2285	2760	3815	3950	5190	5480	
6	2.0	1095	1130	2170	2560	3385	3600	4342	4743	
	3.0	955	980	1940	2230	2945	3040	3140	3260	
	1.0	1240	1300	2665	3130	4235	4460	5745	6090	
	1.5	1190	1250	2430	2830	3900	4070	5415	5700	
	2.0	1100	1150	2260	2650	3479	3670	4600	4880	
TACTS <i>ultra</i>	7	3.0	970	1020	1995	2340	3009	3170	3430	3620
		4.0	960	990	1710	1980	2520	2630	3300	3530
		1.0		1320		3210		4210		6310
		1.5		1270		2890		4170		5900
		2.0		1180		2720		3720		5000
	8	3.0		1050		2440		3280		3930
		4.0		1020		2030		2680		3630
		1.0		1340		3280		4320		6400
		1.5		1280		2940		4260		6070
		2.0		1200		2780		3770		5100
9	3.0		1070		2520		3380		4200	
	4.0		1040		2080		2720		3710	
	1.0		1350		3340		4420		6510	
	1.5		1290		2980		4340		6210	
	2.0		1220		2840		3820		5190	
10	3.0		1100		2600		3460		4440	
	4.0		1060		2120		2760		3780	
	1.0		1370		3400		4510		6620	
	1.5		1310		3020		4410		6340	
	2.0		1230		2890		3850		5270	
10	3.0		1120		2660		3540		4647	
	4.0		1080		2150		2800		3850	

For the pump operating without compressed air option, the condensate displacement capacity has to be verified from HO

## ■ CRS scheme



## ■ Advantages of CRS

- Pure form of condensate
- Less chemical
- Less blowdown
- Less fuel consumption

## ■ Case study

Savings Calculations		
FLASH STEAM GENERATION		
Steam generation	(kg/hr)	4000
Total condensate load	(kg/hr)	3500
Pressure of condensate	(kg/cm <sup>2</sup> )	8
Pressure of flash steam required	(kg/cm <sup>2</sup> )	1
Fuel used		FO (Liquid)
CV of fuel		9650
Flash steam generated (kg/hr)		376.22
Effective temperature of feed water		
Temperature of feed water	(Deg C)	30
Temperature of condensate	(Deg C)	90
Effective temperature of feed water	(Deg C)	83.40
ANNUAL SAVING		
Boiler efficiency	%	80.00
Saving in fuel/hr	`	27.67
Saving in fuel/ annum	`	215829.12
Rate of fuel	`	20.00
<b>Annual saving (Lac)</b>	`	<b>43.17</b>

For more information, please get in touch with your nearest Thermax representative. You can also mail us at [SteamEngineering@thermaxglobal.com](mailto:SteamEngineering@thermaxglobal.com) or visit us at : [www.thermaxglobal.com](http://www.thermaxglobal.com).

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**THERMAX**

Sustainable Solutions in  
Energy & Environment

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