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TES Issue 2

CSM-K
High Capacity Clean Steam Generator

The typical package shown below is for illustration purposes only

Description

The CSM-K range of high capacity clean steam generators has been designed to provide sterilizer grade clean steam from suitably treated feedwater using plant steam as the heating medium. Units using other fluids on the heating media can be provided to special order.

The range covers outputs up to 3 800 kg/h.

The pressure vessel is manufactured in accordance with the Pressure Equipment Directive (PED) and is supplied with a standard package of documentation. The primary medium passes through a tube bundle which can be extracted for cleaning and maintenance. All secondary wetted parts are manufactured from 316 stainless steel.

Applications

Suitable for process applications, laundries, food and beverage applications, hospital sterilizers, laboratories and humidification. The CSM-K can also be used in a number of electronic production processes, pharmaceutical and general biotechnological applications. Please refer to our general sales brochure on clean steam for information on other products that can be used in association with the clean steam generator.

Principle features:

- Produces clean steam for sterilization, humidification, and culinary or clean processes, from standard plant steam.
- Fully assembled skid-mounted with all essential safety systems.
- PLC for accurate steam and feedwater pressure control.
- All clean steam wetted parts in 316 stainless steel to avoid contamination.
- Produces steam to HTM 2031 standards.
- Automatic blowdown controls - TDS and bottom blowdown.

Materials

Primary steam header	Carbon steel
Primary side pipework and fittings	SG iron and carbon steel
Tube sheet	Stainless steel AISI 316L
Gaskets	Reinforced graphite
Tube bundle	Stainless steel AISI 316L
Shell	Stainless steel AISI 316L
Shell side flanges	Stainless steel AISI 316L
Support frame	Carbon steel
Insulation (optional extra)	Rock wool + Cover in Aluminium (standard) or stainless steel 304

Maximum steam pressures

Maximum primary steam pressure	12 bar g
Maximum clean steam pressure	7 bar g

Technical data

Pneumatics

Compressed air: A 6 bar g compressed air supply is required; where this is unavailable an optional compressor can be supplied with the unit (at extra cost).

Electrical

Electrical requirements: 400 V 3-phase 50 Hz. A fused isolator of the correct rating must be incorporated in the supply line as near as possible to the unit. Information on the installed load for each individual unit will be supplied by Spirax Sarco.

Feedwater quality

To meet the requirements of HTM 2031 we would recommend the use of de-mineralised or reverse osmosis feedwater.
It is advised that analysis of the feedwater is undertaken prior to installation and commissioning. Whilst not mandatory the table opposite gives a guide to recommended typical values.

Property	Maximum value
Ammonium	0.2 mg/l
Heavy metals substitute	0.1 mg/l
Chloride	0.5 mg/l
Nitrate	0.2 mg/l
Residue on evaporation	30.0 mg/l
Phosphate	0.1 mg/l
Silicate	0.1 mg/l
Electrical conducivity at 25 °C	35.0 µS/cm

Control

The unit is PLC controlled with the generator having pressure and level control.

Dimensions (approximate in mm) and standard output production (approximate in kg/h)

Standard output production is based on the following conditions:

- Primary steam pressure 10 bar g;
- Clean steam pressure 3.5 bar g;
- Feedwater inlet temperature 20 °C

Engineering drawings, including holding down details, will be provided after ordering 'for approval' and as 'final certified' (as built).

Model CSM-K		401	402	403
Maximum dimensions (guidance) in mm	Length **L**	2900	3400	3700
	Width **W**	1400	1400	1400
	Height **H**	1600	1600	1600
Clean steam output (kg/h)		260	320	370

Model CSM-K		702	703	704
Maximum dimensions (guidance) in mm	Length **L**	3900	4150	4900
	Width **W**	1800	1800	1800
	Height **H**	2050	2050	2050
Clean steam output (kg/h)		1730	2000	2630

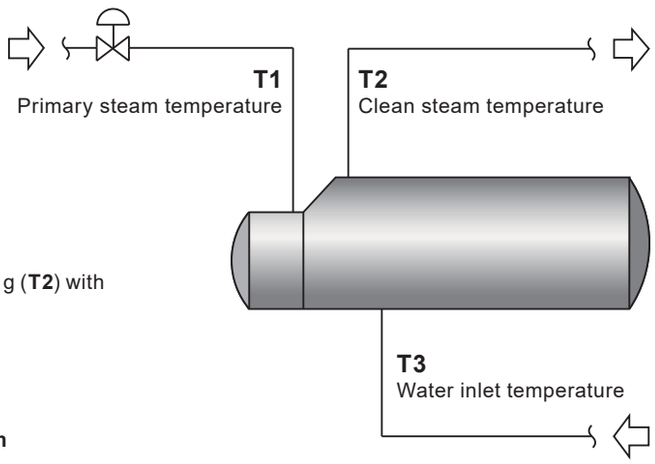
Model CSM-K		501	502	503
Maximum dimensions (guidance) in mm	Length **L**	3000	3500	3800
	Width **W**	1500	1500	1500
	Height **H**	1700	1700	1700
Clean steam output (kg/h)		500	620	700

Model CSM-K		802	803	804
Maximum dimensions (guidance) in mm	Length **L**	4000	4000	5000
	Width **W**	1900	1900	1900
	Height **H**	2250	2250	2250
Clean steam output (kg/h)		2600	2900	3800

Model CSM-K		601	602	603	604
Maximum dimensions (guidance) in mm	Length **L**	3300	3800	4000	4750
	Width **W**	1700	1700	1700	1700
	Height **H**	1900	1900	1900	1900
Clean steam output (kg/h)		930	1150	1300	1700

Sizing and selection

Note: To meet the requirements of HTM 2010 and HTM 2031 it is recommended that the feedwater entering the generator is a minimum of 85 °C. We would recommend the use of the CSM-PD preheat and degasser system.



Sizing and selection example

A CSM-K is required to generate 1000 kg/h clean steam @ 4.5 bar g (**T2**) with steam @ 9 bar g after the control valve (**T1**).
The water inlet temperature (**T3**) is 30 °C

From Table 1:

The **water corrective factor** @ 30 °C = 1.1
Consequently, the **steam load** = 1000 kg/h (T2) x 1.1 = **1100 kg/h**

Table 1 Corrective factor for water inlet temperatures

10 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C	80 °C	90 °C	100 °C	110 °C	120 °C
1.12	1.11	1.10	1.08	1.065	1.05	1.035	1.02	1.00	0.96	0.94	0.93

From steam tables:
T1 (primary steam pressure) at 9 bar g **= 180 °C**
T2 (clean steam pressure) at 4.5 bar g **= 156 °C**
T1 - T2 = 24 °C

From Table 2 select the unit:

- Follow the **T1** - **T2** heading to 24 °C
- Follow the column downwards from 24 °C until you reach a figure either the same as the required steam load or larger. For this example it is 1198 kg/h.
- Follow the line to the left hand side of the Table to select the correct unit for your application.
- Model selected **= CSM-K604**

Table 2
CSM-K sizing and selection in kg/h @ 20 °C water inlet temperature and 10 bar g primary steam pressure

T1-T2	52 °C	37 °C	28 °C	26 °C	24 °C	20 °C	16 °C	12 °C	11 °C
CSM-K401	403	278	219	202	184	149	110	75	63
CSM-K402	500	350	273	250	230	185	137	93	78
CSM-K403	571	397	308	285	262	211	156	105	88
CSM-K501	752	522	409	377	346	279	207	140	118
CSM-K502	936	652	509	469	431	347	256	173	146
CSM-K503	1 058	738	573	530	487	393	291	196	165
CSM-K601	1 400	974	760	701	645	519	385	259	219
CSM-K602	1 737	1 210	945	871	803	645	479	322	271
CSM-K603	1 976	1 372	1 069	985	907	730	540	364	307
CSM-K604		1 810	1 413	1 300	1 198	962	720	476	404
CSM-K702	2 512	1 887	1 470	1 355	1 246	1 003	743	501	422
CSM-K703		2 120	1 651	1 531	1 408	1 129	840	564	476
CSM-K704		2 700	2 178	2 017	1 844	1 489	1 109	743	625
CSM-K802	3 354	2 727							
CSM-K803		3 063	2 390	2 206	2 030	1628	1 212	813	687
CSM-K804		3 604	3 145	2 885	2 632	2 139	1 592	1 062	901

Typical specification

The clean steam provider shall be a Spirax Sarco clean steam generator CSM-K704 designed and built to produce steam to the HTM 2031 standard, dependant upon feedwater.
To raise 2000 kg/h of clean steam at 3 bar g when supplied with plant steam at 8 bar g.
All items are to be pre-assembled and mounted on to a compact frame.

How to order

Example: 1 off Spirax Sarco CSM-K704 clean steam generator.
Please provide details of primary steam pressure, clean steam pressure, clean steam flowrate and feedwater system.

Ancillary items to be used depending on installation:

- Blowdown vessel and system.
- Clean steam check valves.
- Clean steam isolation valves.
- Primary steam isolation valves.
- Clean steam and primary steam trapsets.
- CSM-PD preheater and degasser unit.

Other items may be required, please contact Spirax Sarco to discuss the full installation.

6 Heat transfer solutions
Clean steam generators