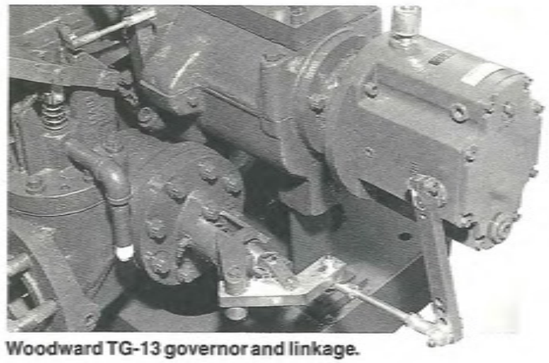
Governor Application



Woodward TG-13 governor and linkage.

Speed control governors are vital to the safe and efficient operation of steam turbines. The selection of the right governor for each application must be made with care. S range turbines are available with a selection of dependable governors, precision matched for high performance and reliability.

The standard governor is the Woodward TG-13. Optional governors are available for variable speed control, including remote control systems with air or electric signals for speed variation. All governors meet NEMA classifications.

Optional Accessories

1. SPECIAL PURPOSE GOVERNORS to maintain precise control at various speeds.
2. AUTOMATIC REMOTE START-UP AND SHUT-DOWN SYSTEMS, pneumatically or electrically actuated for remote operation.
3. FORCED FEED LUBRICATION SYSTEM, complete with oil reservoir, relief valves, heat exchangers, filter, etc.
4. SAFETY SHUT-DOWN SYSTEMS, low lubrication oil pressure, high lubrication oil temperature, high back pressure and driven equipment safety systems available. Pneumatically or electrically actuated.
5. HAND VALVES for partial load economy.
6. STEAM SEAL PIPING for condensing operation to admit sealing system supply to the glands.
7. SPECIAL SHAFT EXTENSIONS.
8. INSULATION AND JACKETING mineral insulation with sheet metal jacket.
9. BASEPLATE OR SOLEPLATE with or without drip rim.
10. SPEED REDUCING OR INCREASING GEARS where speed of driven equipment is outside the range of efficient turbine speeds.
11. STEAM GAUGES AND THERMOMETERS indicating and/or recording types.
12. TACHOMETERS, vibrating reed, electric and electronic types available. Indicating and/or recording.
13. SPECIAL MATERIALS to specification.
14. TILTING PAD (KINGSBURY TYPE) thrust bearings.

MATERIAL OF CONSTRUCTION

COMPONENT	MATERIAL
Casing	Cast steel
Steam chest	Cast steel or cast alloy steel
Sealing rings	Carbon
Sealing ring springs	Inconel
Sealing boxes	Cast iron
Bearing housings	Cast iron
Nozzles	Monel
Shaft	Alloy steel
Wheel	Alloy steel
Blades	Stainless steel
Shroud bands	Stainless steel
Governor valve	Monel
Governor valve cage	Cast steel or cast alloy steel
Trip valve	Alloy
Trip valve cage	Cast steel or cast alloy steel
Valve stems	Stainless steel
Steam strainer	Stainless steel

Quotations

When quotations are required, the following information is requested:—

1) Power required
2) Speed required
3) Steam pressure at inlet
4) Steam temperature
5) Exhaust condition
6) Any applicable specification

Computer aided selection

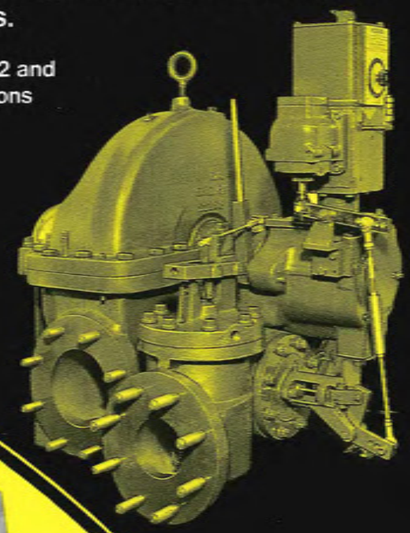
Hayward Tyler has computerised the selection of steam turbines, to ensure optimum selection in the fastest possible time.

Hayward Tyler
A Sterling Company

Hayward Tyler™ 'S' range of steam turbines

Single wheel, back pressure, general purpose steam turbines.

To API 611, API 612 and NEMA specifications



To meet the requirements of engineers' and consultants' specifications for steam turbines, Hayward Tyler S range horizontal mechanical drive turbines have the following features.

Our range of S turbines are of the single stage axial flow, re-entry type. They are of simple and rugged design, capable of being started quickly and easily when cold.

The casings are horizontally split and supported at the shaft centre-line, and there is no high pressure steam joint within the casing. A sentinel warning valve is fitted on the casing to give warning of excessive exhaust pressure.

The wheels are made of steel forgings, and blades are machined from durable rolled and drawn stainless steel and designed for easy replacement. The inner and outer ends of the blades are fitted with stainless steel shroud bands to confine the steam to the blade passage and stiffen the blades against vibration. The wheels are shrunk and keyed to the shaft, and the rotor is in dynamic balance.

The bearings are of the split type, with renewable steel backed babbitted liners, oil ring lubricated.

The nozzles are made of Monel metal and designed to efficiently direct the steam into the blades.

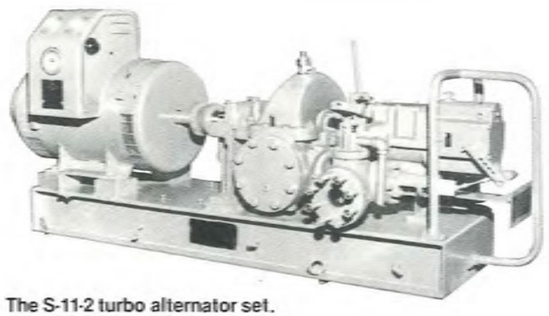
The governor valve is of Monel metal and is of the double ported, balanced, floating type with a renewable cage. The valve is in the open position when the turbine is idle.

The standard governor is to NEMA, class A rating. The governor is equipped with a manual speed changer capable of adjustment while the turbine is in operation to secure speeds from at least 10% above and 10% below the rated speed. Other governors can be fitted for different classes and ratings.

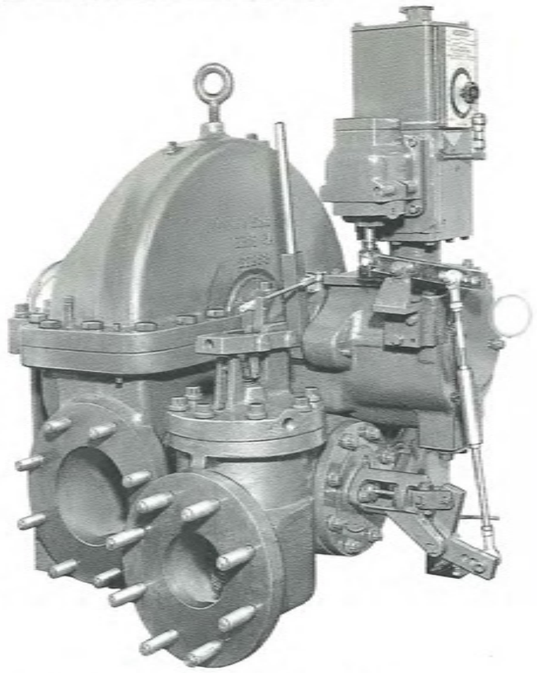
An independent emergency overspeed trip device, which is spark proof, shuts off the steam supply to the turbine when the speed exceeds the rated speed by not more than 15%. The emergency device is capable of being tripped and reset manually against full line steam pressure.

Trip valve stems are sealed with a corrosion resistant bushing. Soft packing is used to seal the governor valve stems.

The turbines are equipped with an integral corrosion resisting strainer to remove foreign matter from the steam prior to its entry into any part of the turbine control device.



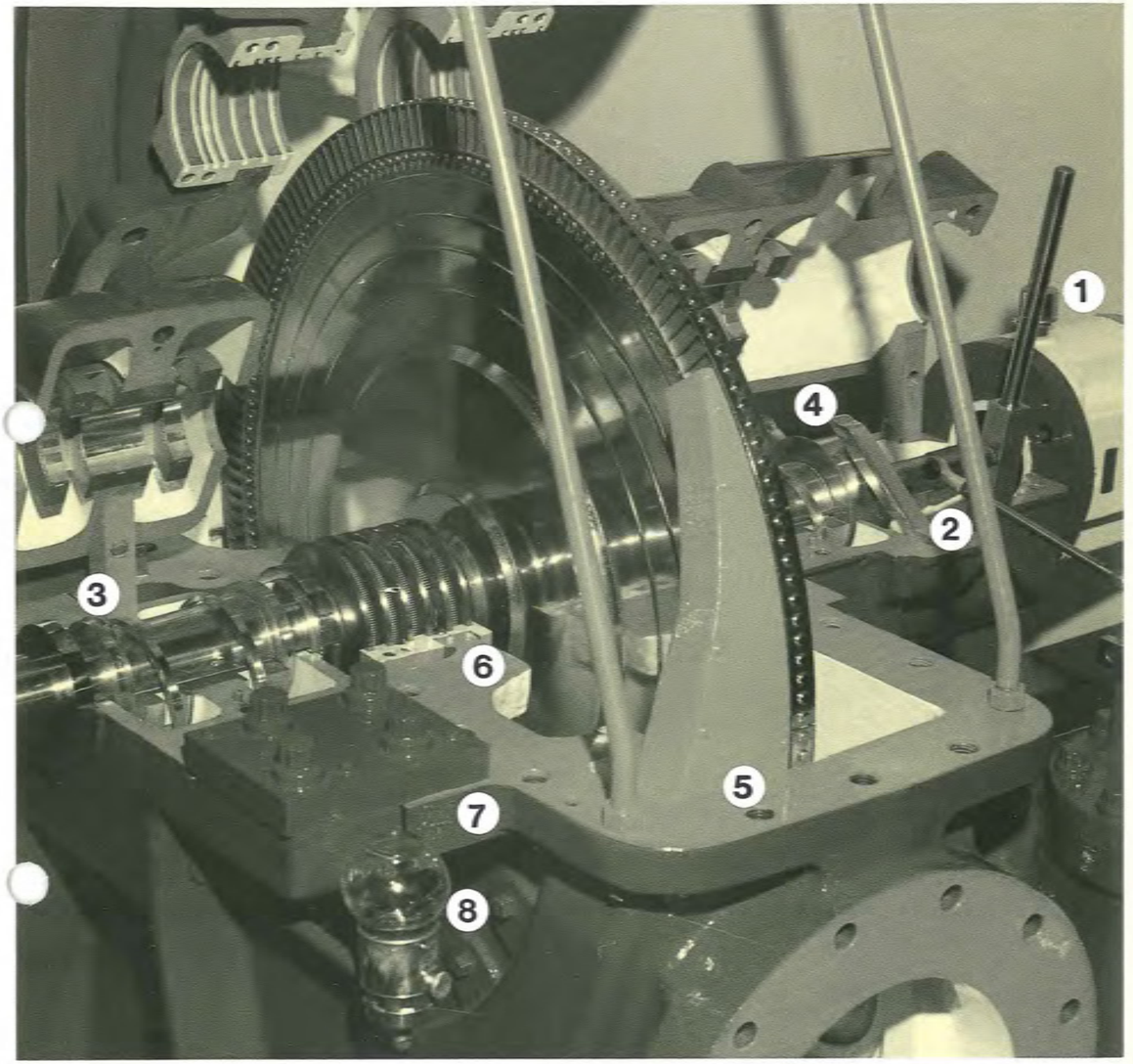
The S-11-2 turbo alternator set.



The S-23-3 horizontal turbine with Woodward vertical governor.

S range turbines meet API 611 & 612 turbine specifications, all applicable NEMA specifications,

These quality features are standard on Hayward Tyler S range turbines



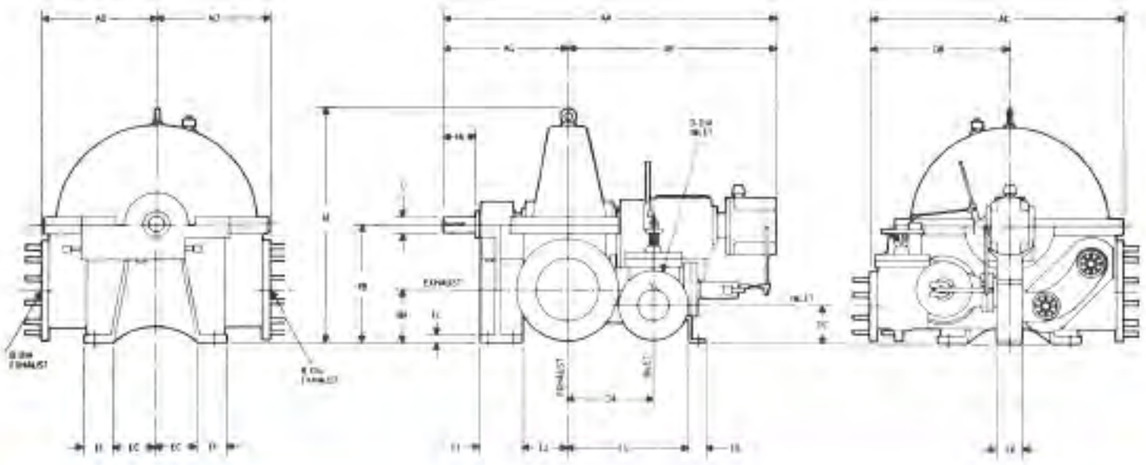
1. Woodward TG-13 governor.
2. Positive over-speed trip employing pin type construction. No set screws.
3. Ring oil lubricated babbitt insert sleeve type main bearings.
4. Heavy-duty thrust bearings for axial rotor location.
5. Horizontally split casing for easy maintenance.
6. Large packing boxes with up to 6 carbon rings per box, stainless steel separators and large two-way acting garter springs.
7. True centre line support.

Other features

No high pressure joints within the casing.
Condensing or non-condensing designs.
Optional exhaust location.
Optional rotation.
Horizontal configuration.
Water jacketed bearing housings with inter-connecting water piping.
Balanced throttle valve.
Sentinel warning valve.

Technical data

MODEL	S-11	S-18	S-23	S-28
Approx. maximum rating (hp/kW)	187/140	514/383	514/383	1500/1120
Maximum inlet gauge pressure (psi/bar)	900/62	900/62	900/62	900/62
Maximum inlet temperature (°F/°C)	900/482	900/482	900/482	900/482
Maximum exhaust gauge pressure (psi/bar)	140/9.5	140/9.5	140/9.5	140/9.5
Speed range (rpm)	1000-6000	1000-6000	1000-6000	1000-6000
Wheel pitch diameter (in/mm)	11/279	18/457	23/584	28/711
Approx. critical speed (rpm)	12,950	8,580	7,750	7,320
Inlet size (ANSI, IN)	2	3	4	4/6
Inlet location (facing governor)	Left side	Left side	Left side	Left side
Exhaust size (ANSI, IN)	4	6	6	10
Exhaust location—side	Optional	Optional	Optional	Optional
Hand valve available	1	1	2	2
Approx. shipping weight (lb/kg)	460/209	870/395	1300/590	2150/976
Direction of rotation	Optional	Optional	Optional	Optional

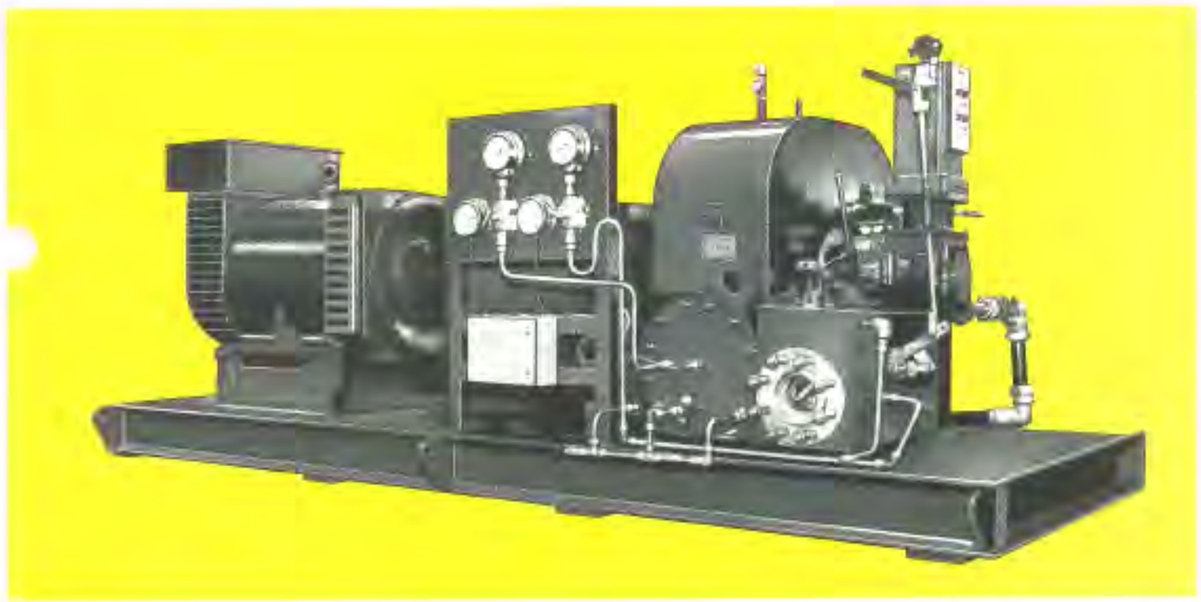


FRAME SIZE	APPROXIMATE DIMENSIONS – INCHES MILLIMETRES																				
	OVERALL											CASING								SHAFT	
	AA	AB	AC	AD	AE	AG	B DIA	BA	D DIA	DA	DB	DC	EB	EC	EE	EF	EG	EJ	EH	EL	U DIA	FA	FB
11	41.06 1042	26.37 670	18.31 465	7.81 198	15.12 480	14.68 373	4.00 102	4.75 121	2.00 51	10.25 260	10.50 267	3.25 83	1.37 35	4.00 102	3.00 76	3.00 76	15.21 387	6.10 155	2.37 60	0.75 19	1.25 31.8	3.75 95	9.25 235
18	44.87 1139	28.87 733	28.31 668	11.37 289	26.00 660	16.00 406	6.00 152	5.75 146	3.00 76	10.75 273	14.68 373	4.50 114	1.87 48	4.87 124	5.00 127	3.00 76	16.87 429	6.00 152	3.00 76	1.00 25	1.75 44.5	4.37 111	12.62 321
23	44.87 1139	28.87 733	33.88 856	13.37 340	32.25 768	16.00 406	6.00 152	5.75 146	4.00 102	12.62 321	19.56 497	4.75 121	2.25 57	6.56 167	5.00 127	2.75 70	16.62 422	6.00 152	3.00 76	1.00 25	1.75 44.5	4.63 117	14.62 371
28	51.25 1302	31.75 806	40.50 1029	18.37 467	37.06 941	19.50 495	10.00 254	8.37 213	6.00 152	13.56 344	21.76 553	5.71 145	2.62 67	6.50 165	6.62 168	4.50 114	16.93 430	7.01 178	4.00 102	1.26 32	2.50 63.5	5.06 129	18.50 470
28	51.25 1302	31.75 806	40.50 1029	18.37 467	37.06 941	19.50 495	10.00 254	8.37 213	6.00 152	14.19 360	22.65 575	6.20 157	2.62 67	6.50 165	6.62 168	4.50 114	16.93 430	7.01 178	4.00 102	1.25 32	2.50 63.5	5.06 129	18.50 470

Hayward Tyler
turbo alternator sets

From 3kW to 2.0mW

At the heart of the system – the turbine, coupled to a suitable alternator, with a complete range of optional equipment to provide anything up to a 'mini' power station.



The prime mover of the system is the steam or gas expansion driven turbine. It is a simple mechanism adaptable to all generators, etc. With practically no maintenance necessary and of great reliability, operation of the system requires no specialist knowledge. Hayward Tyler turbines are renowned for their robustness and quality.

Other equipment will be necessary to work in conjunction with the turbine in order to create the complete system. Hayward Tyler sales engineers are available to advise on your particular requirements so that the most effective system can be produced.

We have the experience
Hayward Tyler have more than 40 years experience in manufacturing turbines, and put this experience to use in the turbo alternator systems we supply to numerous industries world-wide.

Planning is important
We will study your requirements from a technical and economic angle. We will then provide you with all the elements of our proposed solution to the problem – the most economic type of installation; the most adaptable; what you must invest to put it into operation; a study of the savings you will make, and a plan of the pay-back time. We have the experience and know-how to help you save money.

After-sales service
Hayward Tyler offer a planned maintenance scheme for all systems, and along with spares and technical back-up, are in a position to solve all problems speedily.
We are always at hand to provide you with advice and information.