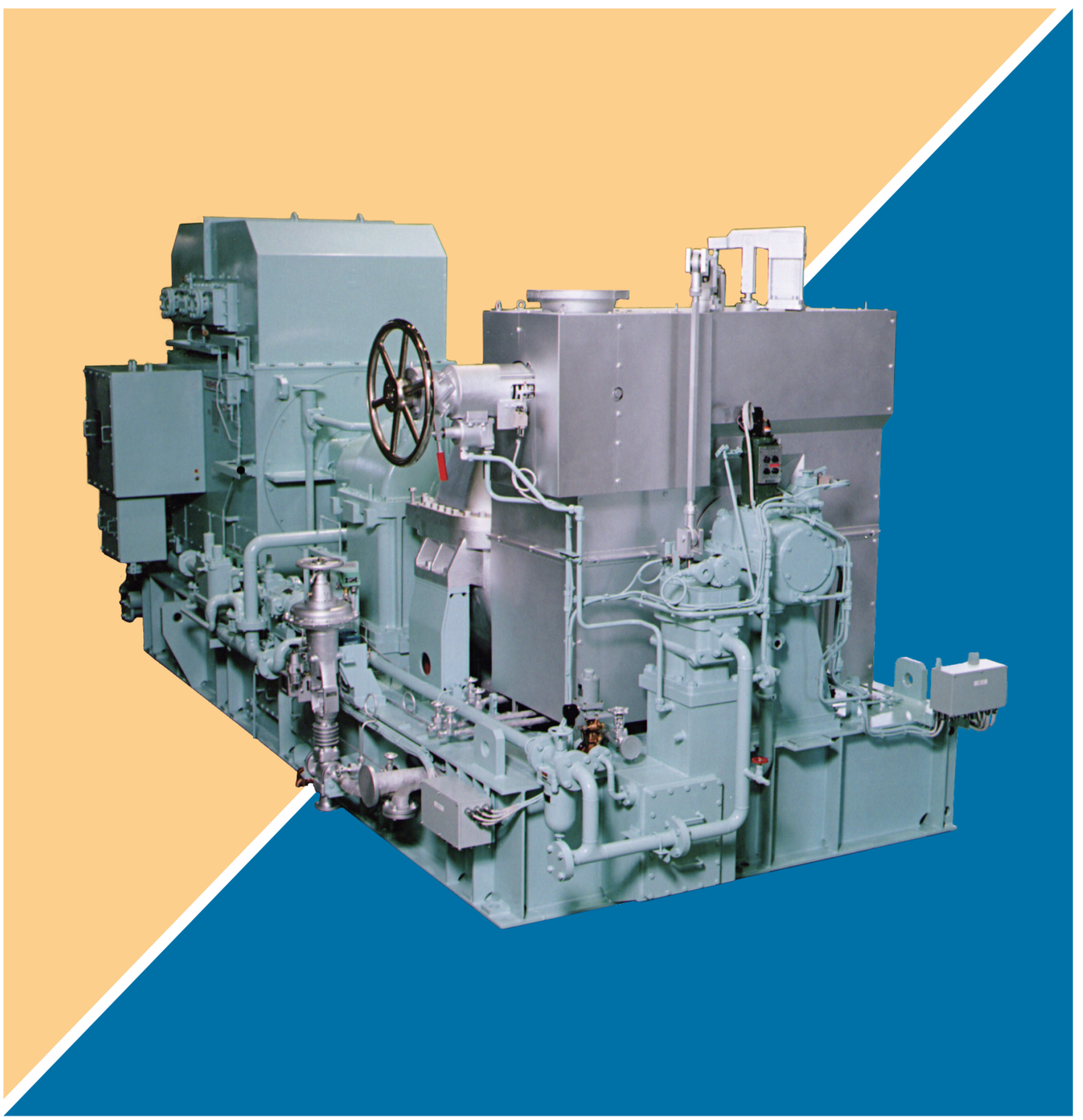
ST-115M

SHINKO

GENERATOR TURBINES FOR MOTOR SHIPS

RG60



RG60 GENERATOR TURBINES

Shinko RG60 generator steam turbines have been designed and manufactured for waste heat recovery systems to reduce vessels' diesel fuel consumption as well as the green house gas emissions.
The entire electric power demand of the vessel can be supplied by driving the steam turbine generator using recovered energy via the economizer from the main engine's high temperature exhaust gas.
We have the following 3 standard models:

- Models
  1. RG60 : Single-pressure steam turbines
  2. RG60M : Dual-pressure steam turbines
  3. RG60P : Steam turbines in combination with a power turbine

On the basis of our many years of experience on various types of steam turbines, our RG60 generator steam turbines have been developed with the following features:

- Features
  1. High thermal and mechanical efficiency
  2. Rigid construction
  3. Compact design
  4. Reduction of CO_2, NO_x, and SO_x emissions
  5. Reduction of fuel costs
  6. Lower maintenance costs

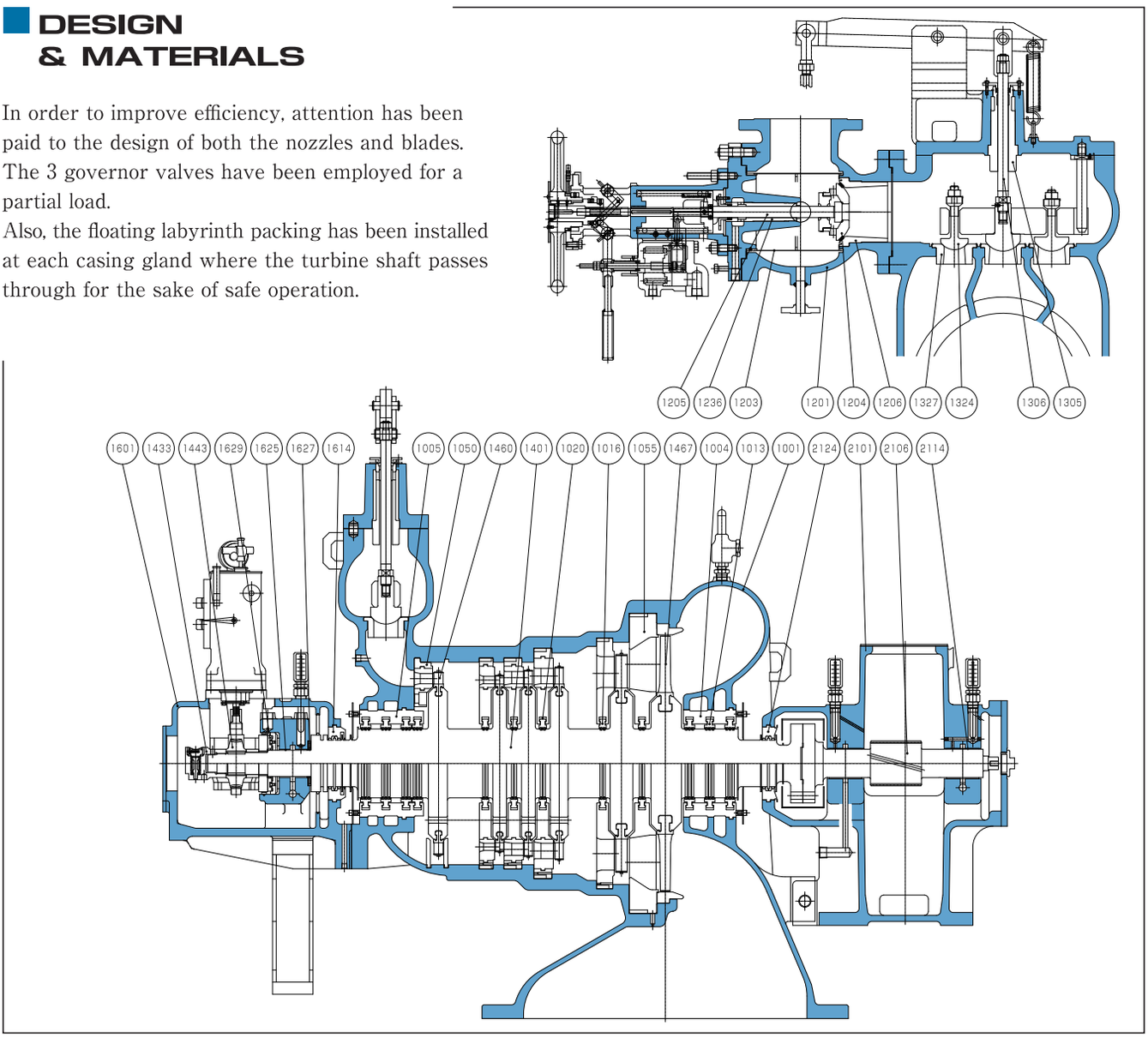
GENERAL CHARACTERISTICS

Item		Model	RG64(M)(P)	RG65(M)(P)	RG66(M)(P)
Max. generator output		(kW)	~1200	~2000	~3000
Number of stages			Rateau 6-stage		
Inlet steam pressure (HP)		(MPaG)	0.55 (max. 2.26)		
Inlet steam temperature (HP)		(℃)	240 (max. 400)		
Inlet steam pressure (LP)		(MPaG)	0.22 (max. 0.25)		
Inlet steam temperature (LP)		(℃)	Saturated		
Exhaust steam		(kPa)	-94.7		
Speed	Turbine rotor	(min^{-1})	10006	7900	5821
	Generator	(min^{-1})	1800		
Critical speed of turbine rotor		(min^{-1})	60~70% of turbine rotor speed		
Steam inlet bore (HP)		(mm)	150	200	250
Steam inlet bore (LP)		(mm)	150		
Steam exhaust bore		(mm)	700	1000	□ 1070 x 750
Lubrication System			Forced lubrication (Turbine oil ISO VG68)		
Cooling water required (S.W.)		(m^3/h)	20	25	35
Speed regulating governor			Woodward UG-10D		
Range of speed change			95~105% of rated speed		
Weight (excluding generator)		(kg)	7300	13000	20000

The 2-stage mixed turbines can be manufactured upon request.

DESIGN & MATERIALS

In order to improve efficiency, attention has been paid to the design of both the nozzles and blades. The 3 governor valves have been employed for a partial load.
Also, the floating labyrinth packing has been installed at each casing gland where the turbine shaft passes through for the sake of safe operation.

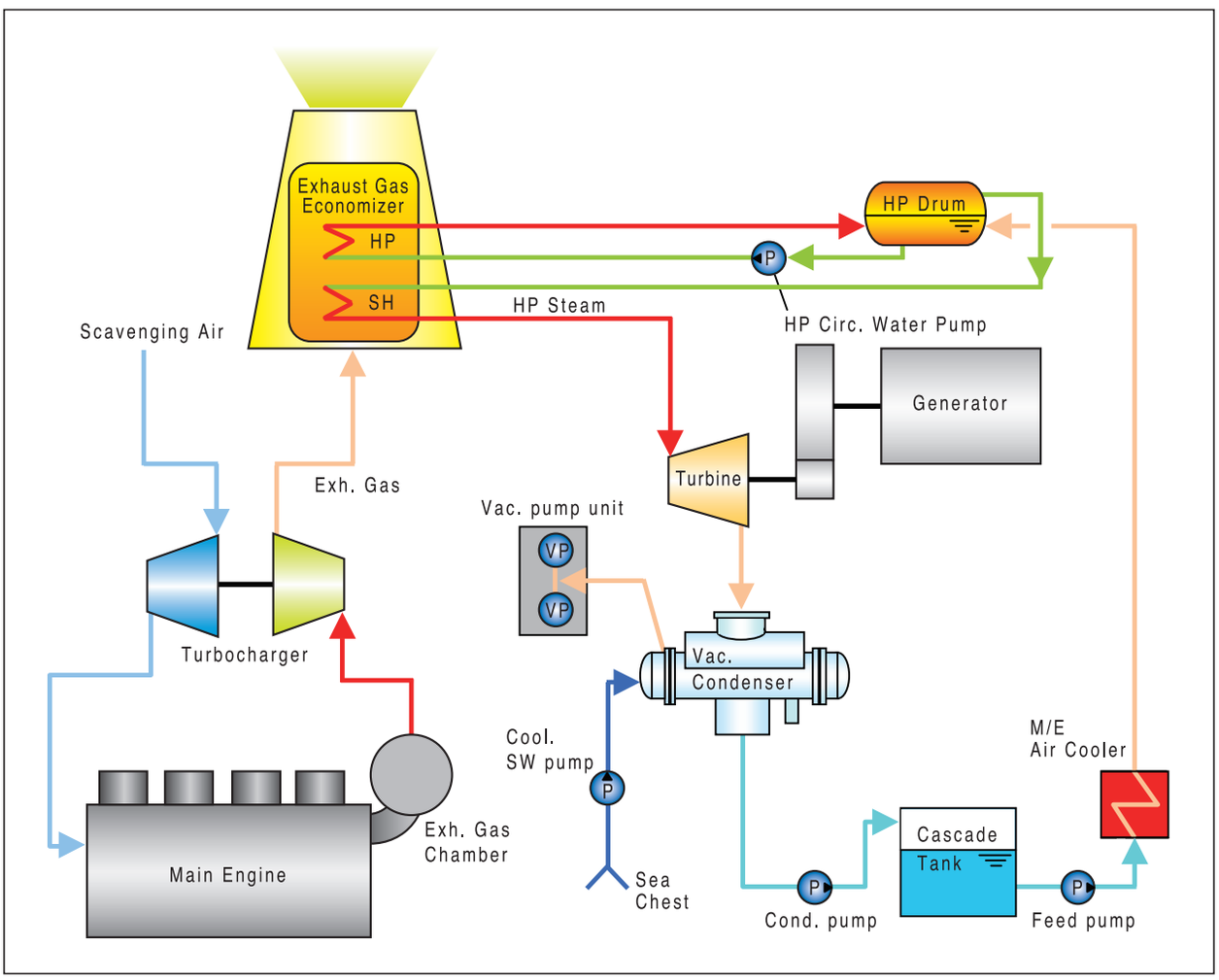


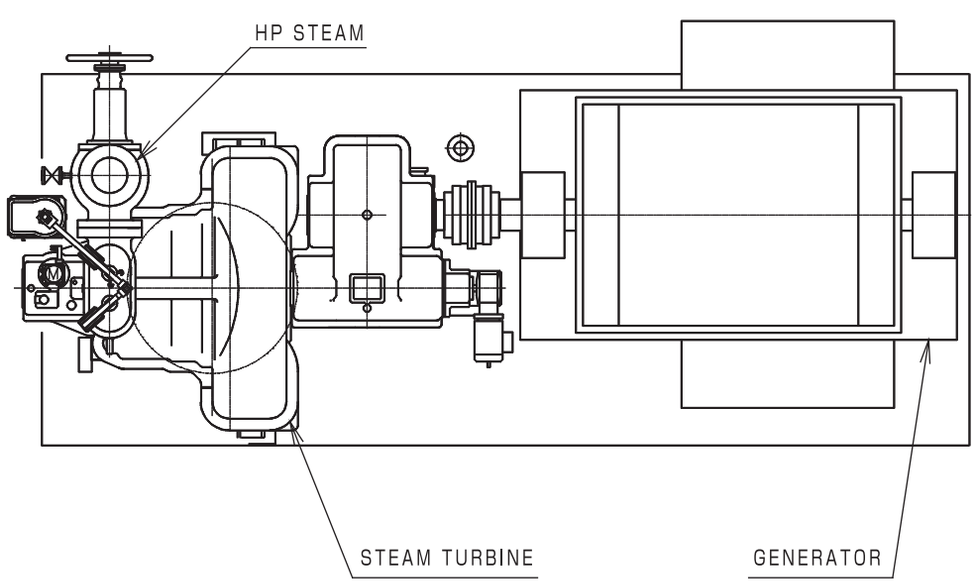
PART NO.	NAME OF PART	MATERIAL			REQ.NO. FOR 1 TURBINE	PART NO.	NAME OF PART	MATERIAL			REQ.NO. FOR 1 TURBINE
		NAME	JIS	ASTM EQUIVALENT				NAME	JIS	ASTM EQUIVALENT	
1001	TURBINE CASING	CAST STEEL	SCPH2	A216 WCB	1SET	1324	GOVERNOR VALVE	STAINLESS STEEL	SUS420J2	A276 S42000	3
1004	PACKING CASE	CARBON STEEL	S35C	A576 1035	1SET	1327	GOVERNOR VALVE SEAT	〃	〃		3
1005	PACKING CASE	〃	〃	〃	1SET	1401	TURBINE ROTOR	3%Cr-Mo STEEL			1
1013	LABYRINTH PACKING	Ni-BRASS CASTING			7SETS	1433	TRIP SHAFT	CARBON STEEL	S35C	A576 1035	1
1016	LABYRINTH PACKING	〃			5SETS	1443	WORM	Ni-Cr STEEL	SNC631		1
1020	SPRING	STAINLESS STEEL	SUS631	A564 17700	12SETS	1460	MOVING BLADE	STAINLESS STEEL	SUS410J1	A276 S41025	1SET
1050	NOZZLE	CARBON STEEL STAINLESS STEEL	S25C SUS403	1025 S40300	1SET	1467	MOVING BLADE	〃	SUH616M		1SET
1055	NOZZLE	DUCTILE C. IRON STAINLESS STEEL	FCD400 SUS430	A536 S43000	1SET	1601	BEARING HOUSING	CAST IRON	FC200	A48 35	1SET
1201	EMERG. VALVE CASING	CAST STEEL	SCPH2	A216 WCB	1	1614	OIL GUARD	BRONZE	CAC406	C83600	1SET
1203	STEAM STRAINER	STAINLESS STEEL	SUS410	A276 S41000	1	1625	BEARING METAL	WHITE METAL WITH STEEL	WJ2 S25C	B23 1025	1SET
1204	EMERGENCY VALVE	〃	SUS420J2	A276 S42000	1	1627	THRUST METAL	〃	〃	〃	1SET
1205	VALVE STEM	A ℓ -Cr-Mo STEEL	SAM645		1	1629	THRUST PAD	〃	〃	〃	1SET
1206	EMERG.VALVE SEAT	STAINLESS STEEL	SFVA F12	A276 S42000	1	2101	REDUCTION GEAR CASING	CAST IRON	FC200	A48 35	1SET
1236	BUSH	A ℓ -Cr-Mo STEEL	SACM645		1	2106	PINION	Ni-Cr STEEL	SNC815		1
1305	BUSH	〃	〃		1	2114	BEARING METAL	WHITE METAL WITH STEEL	WJ2 S25C	B23 1025	2SET
1306	VALVE STEM	〃	〃		1	2124	OIL GUARD	BRONZE	CAC406	C83600	1SET

RG60

The RG60 generator turbines are single-pressure turbine systems, and are utilized in the following situations under high steam pressure:

1. Electric power demand for an entire vessel can be provided solely by a single-pressure generator turbine.
2. Electric power demand for an entire vessel can be provided by a parallel running system using a single-pressure generator turbine along with other electricity generating devices.

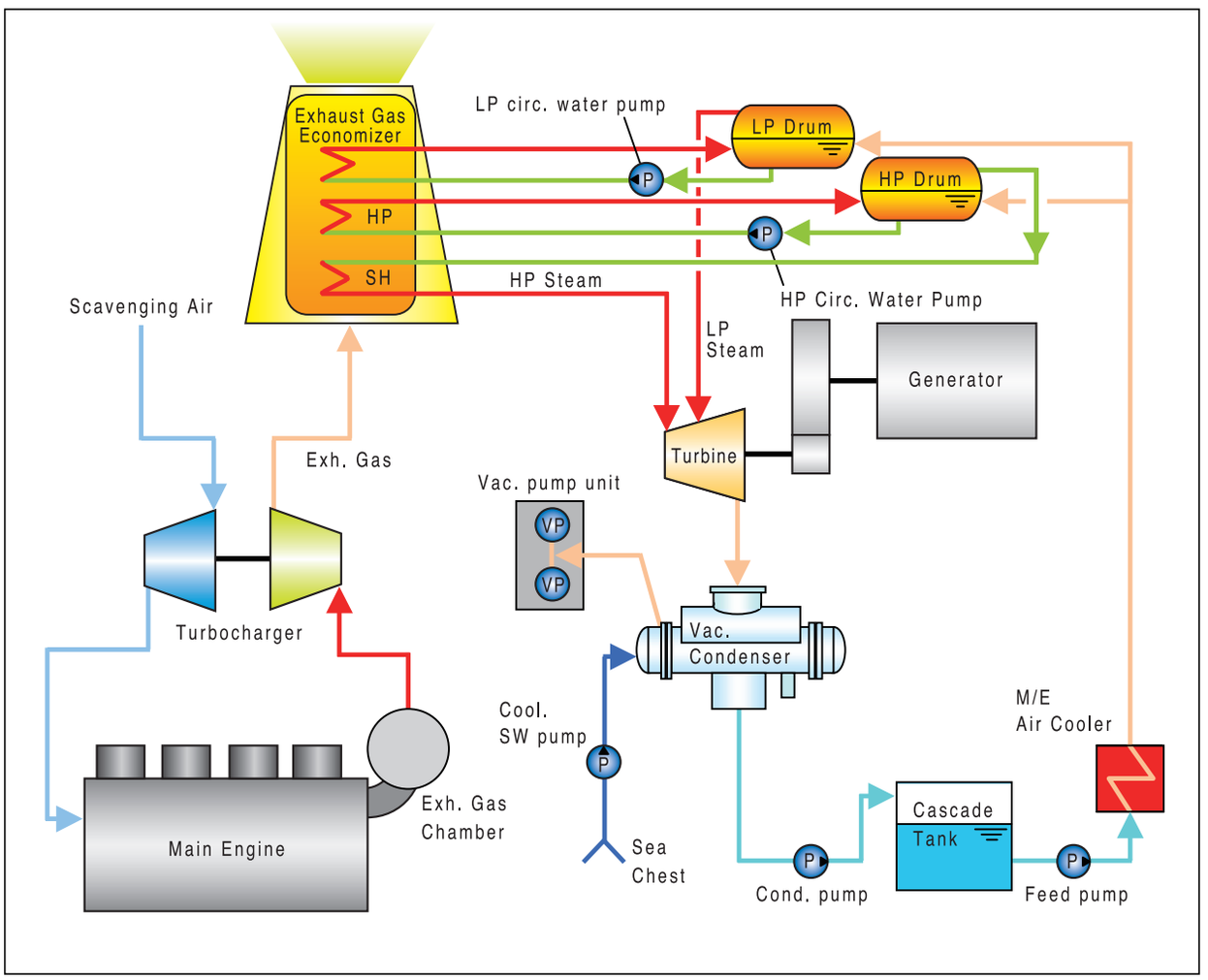


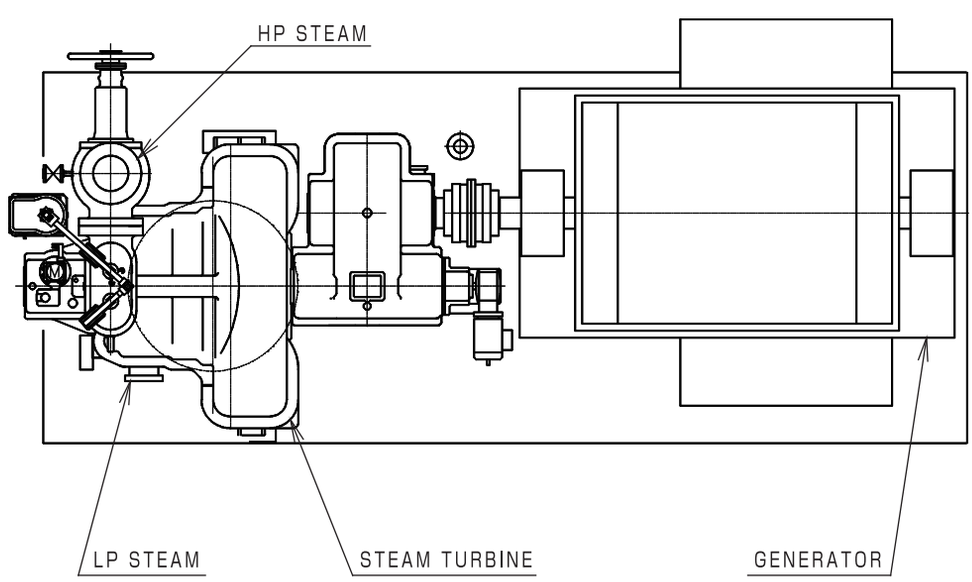


RG60M

The RG60M generator turbines are dual-pressure turbine systems in which low-pressure steam can be mixed in the back of the first stage, and are utilized in the following situation:

1. Electric power demand for an entire vessel can be provided solely by a dual-pressure generator turbine in the case that there is an insufficient capacity of high-pressure steam.

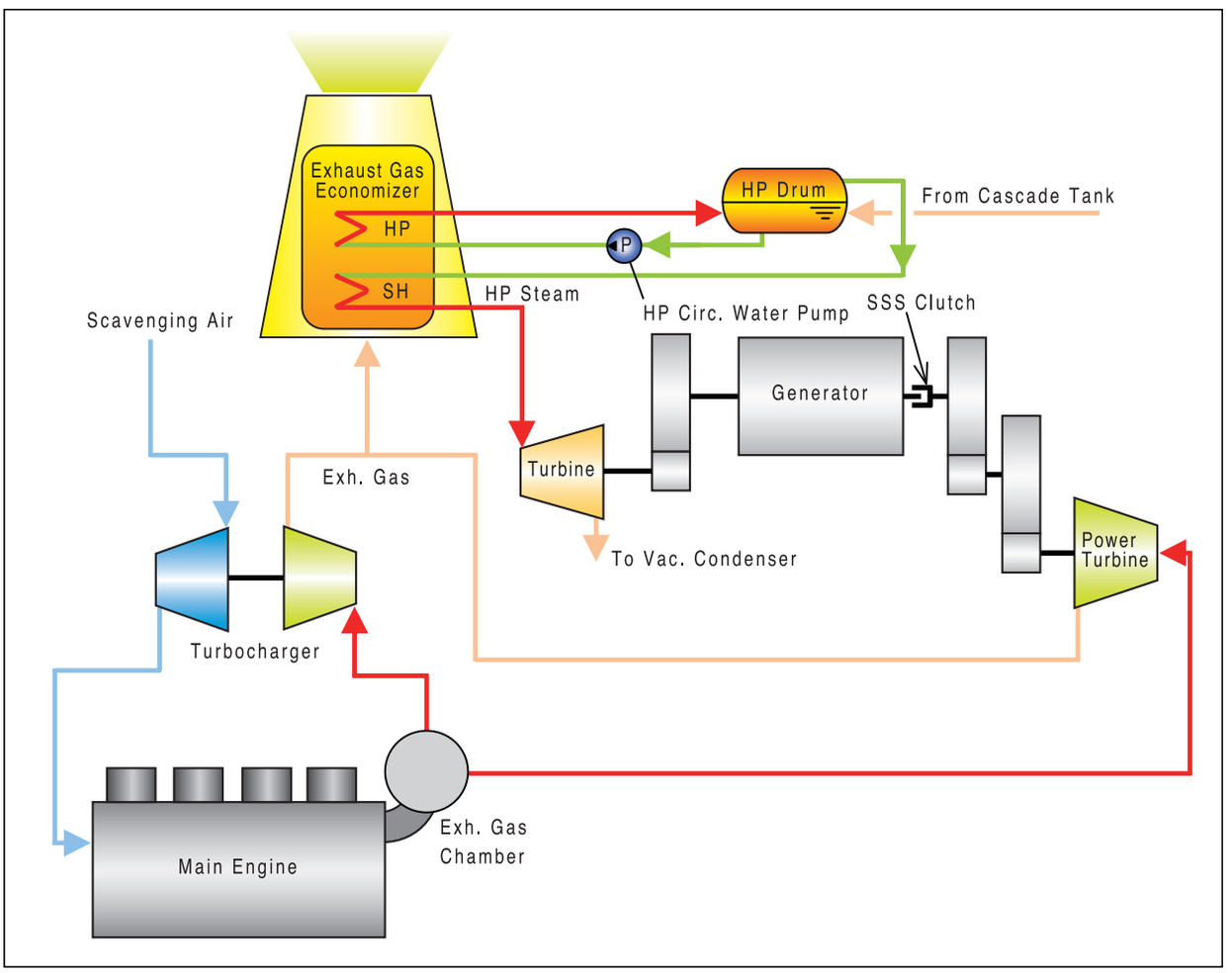


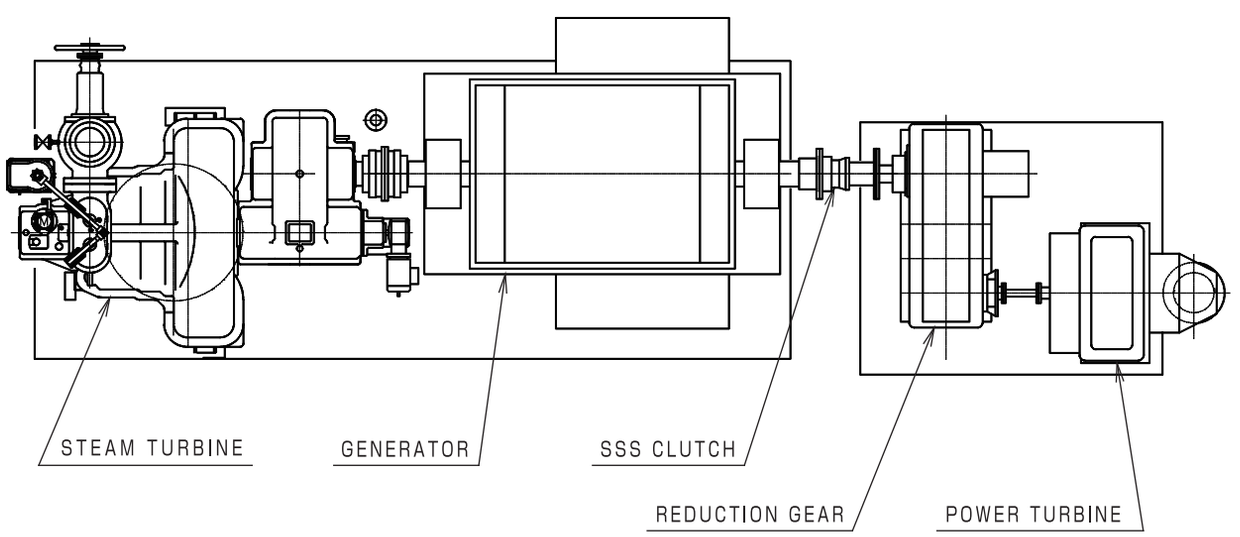


RG60P

The RG60P generator turbines are combined systems consisting of both a steam turbine and a power turbine, and are utilized in the following situations:

1. Electric power demand for an entire vessel cannot be provided by a steam turbine alone, and additional backup from a power turbine is necessary.
2. Surplus electricity, from generator systems in a vessel, is supplied to the shaft generator motor which backs up the main engine.





ACCESSORIES

	Item		Standard	Option	Notes
Safety devices	Overspeed trip	Electric	○		
		Mechanical	○		
	Low LO pressure trip		○		
	Low LO tank level alarm		○		
	Low exhaust vacuum trip		○		
	Sentinel valve		○		
	Rotor vibration monitor (alarm & trip)		○		
	Rotor axial movement monitor (alarm & trip)			○	
	Hand trip device		○		
	Remote trip at T/G local panel		○		
	E.S.V close (gen. ACB open)		○		
	Low sealing steam pressure alarm			○	
	Excess sealing steam pressure alarm			○	
	Thermo-sensor for bearings		○		Pt 100Ω
	Thermo-sensor for LO		○		Pt 100Ω
	LO temp. control valve	Wax type		○	for sea water cooling
		Air type		○	
Instruments	Pressure transmitter for inlet steam			○	
	Pressure transmitter for exhaust steam			○	
	Pressure transmitter for LO			○	
	Governor lift transmitter & indicator			○	
Others	Electric turning device		○		
	Starter for turning motor & priming LO pump			○	
	Exhaust expansion joint			○	
	Drain separator for inlet steam			○	
	Drain separator for LP steam			○	for mixed turbines
	Emergency stop valve for LP steam		○		
	Press. control valve & device for LP steam		○		
	Steam strainer for LP steam		○		

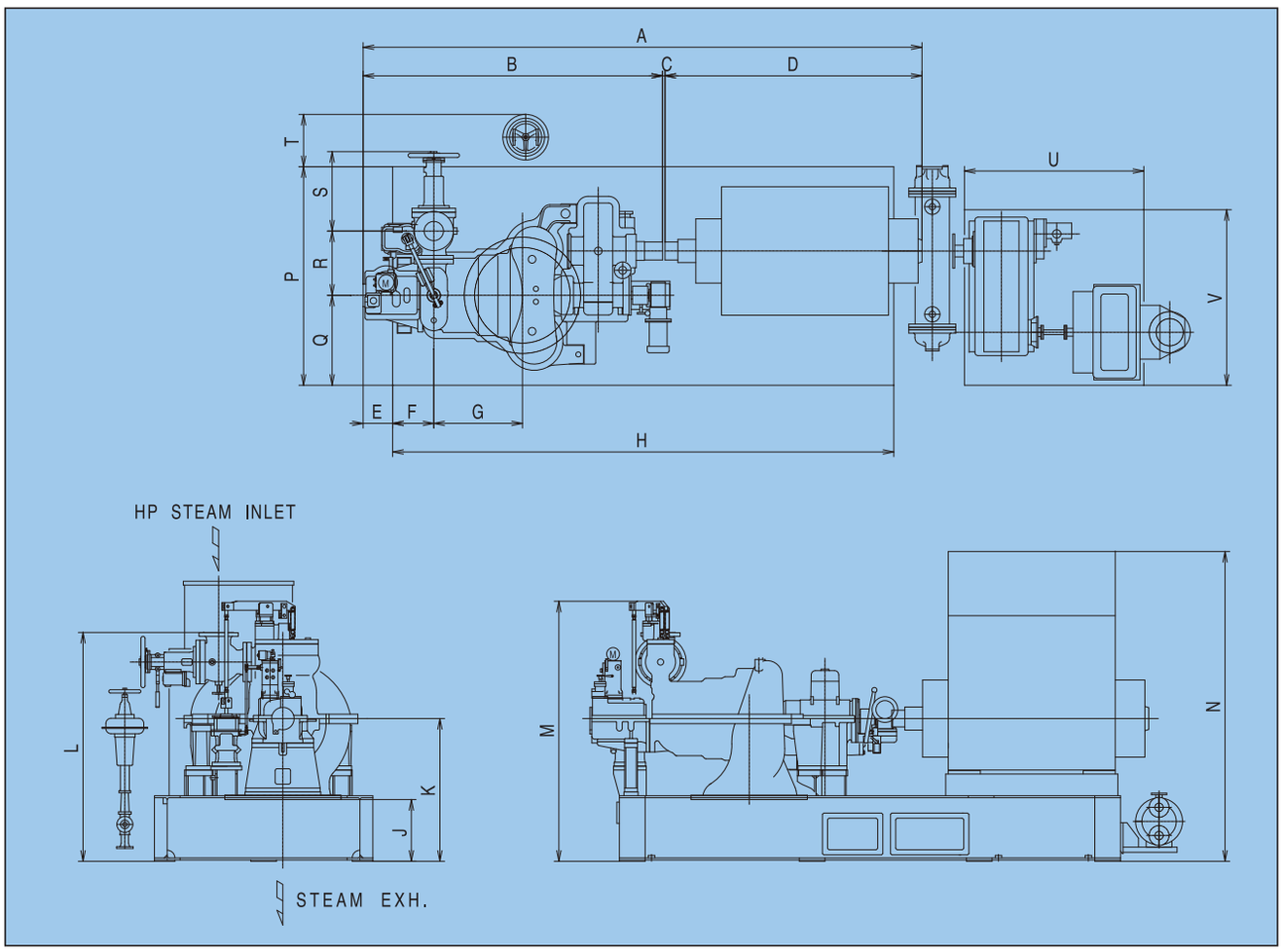
STANDARD SPARE PARTS

Journal bearing metal 1/set*
Thrust bearing metal 1/set*
Each kind of spring for main parts 1/set*
LO pump bearing metal 1/set*
Priming LO pump bearing metal 1/set*
Oil strainer net 1/set*
Each kind of ball bearing 1/set*
LO cooler cooling tube .... 2.5% of total amount/set*
Solenoid valve coil 1/set*
Special gasket 1/set*
Each kind of oil seal, O-ring, and gland packing 1/set*
Coupling bolt 1/set*
Each kind of auxiliary relay, lamp, and fuse for turbine control panel 1/set*
LO cooler protecting piece for S.W. 1/set*

STANDARD TOOLS

Turbine casing lifting guide 1kit/set*
Turbine rotor lifting guide 1kit/set*
Turbine rotor lifting tool 1kit/set*
Turning bar 1/set*
LO cooler tube expander 1kit/set*
LO cooler tube remover 1/set*
LO cooler tube cleaner 1/set*
LO cooler plug 10/set*

(set* = all units of the same model and application)



Dimensions : mm

Model		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V
RG64	(M)	4680	2330	19.5	2330	230	320	690	4000	480	1110	1780	2030	2850	1700	700	500	620	430	2300(P)	2300(P)
	(P)																				
RG65	(M)	4905	2500	19.5	2385	220	330	750	4600	480	1160	1950	2290	3035	1950	800	625	670	410	2300(P)	2300(P)
	(P)																				
RG66	(M)	6730	3150	23	3557	150	475	845	5400	515	1465	2610	2950	3030	2500	1100	790	865	500	2300(P)	2300(P)
	(P)																				

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Printed in Japan 2021-1-100Ⓣ