

BASIC ENGINEATOR SPECIFICATIONS

AIR CLEANER – Two stage, dry panel type with rain shield and service indicator. Engine mounted.

BARRING DEVICE – Manual.

BASE – Engine, generator and radiator or heat exchanger are mounted and aligned on a welded steel, structural steel base, designed for solid mounting on an inertia block, with standard through-base holes for lifting.

BREATHER – Closed system.

CONNECTING RODS – Drop forged alloy steel, angle split, serrated joint, oil jet piston pin lubrication.

COOLING SYSTEM – Choice of mounted radiator with pusher fan, core guard and duct adaptor, heat exchanger with mounted surge tank or flanged connections for remote radiator cooling.

CRANKCASE – Alloy cast iron, fully ribbed, integral with cylinder frame.

CRANKSHAFT – Drop forged alloy steel with through hardened journals, dynamically balanced and fully counterweighted. Viscous vibration dampener.

CYLINDER HEADS – Individual, interchangeable valve-in-head type with deep section alloy casting. Two hard-faced intake and two hard-faced exhaust valves per cylinder. Replaceable intake and exhaust valve seats. Mechanical valve lifters with pivoted roller followers.

CYLINDERS – Removable wet type liners of centrifugally cast alloy iron.

ENGINE PROTECTION SHUTDOWN CONTACTS – High water temperature, low oil pressure, and overspeed.

EXHAUST – Water-cooled, cast iron exhaust manifold. Single vertical flexible stainless steel exhaust connection with ANSI 125# 8" outlet flange.

FUEL SYSTEM – Natural gas carburetor, gas pressure regulator, and 24V DC gas solenoid valve (shipped loose). Pressure required: 8" – 20" W.C.

GENERATOR – Open, drip-proof, direct connected, synchronous, fan cooled, AC revolving field type, 2/3 pitch, single bearing generator with PMG brushless exciter for 300% short circuit sustain (250% for 50 Hz) and motor starting. TIF and Deviation Factor within NEMA MG-1.32. Voltage: 480/277, 3 phase, 12 wire Wye, 60 Hz, and 400/230, 3 phase, 12 wire Wye, 50 Hz. Temperature rise within NEMA 105° C for continuous duty, within NEMA 130° C for standby duty. Voltage regulation is ± 0.5%. All generators are rated at 0.8 power factor, are mounted on the engine flywheel housing, and have multiple steel disc flexible coupling drive. All continuous power gensets have 10% overload capability.

GOVERNOR – Woodward 4024 Electrically Powered Governor (EPG) control system. Includes mounted actuator and magnetic pickup, and control box (shipped loose). 24 V DC operation.

IGNITION – Waukesha Custom Engine Control electronic ignition system with coils, cables, hall effect pickup and spark plugs. Non-shielded. 24 V DC power required.

INTERCOOLER – Air-to-water.

INSTRUMENT PANEL – Engine mounted, includes water temperature, oil pressure, intake manifold temperature and intake manifold pressure gauges, and emergency stop pushbutton.

JUNCTION BOXES – Separate AC & DC junction boxes for engine wiring and external connections.

KNOCK DETECTION MODULE (KDM) – Electronic detonation protection system. Includes engine mounted sensors, wiring and KDM. Meets CSA Class 1, Division 2, Group D hazardous location requirements.

LUBRICATION SYSTEM – Gear type pump, full flow spin-on filters and industrial type oil pan. Engine mounted plate type oil cooler.

PAINT – Oilfield orange.

PISTONS – Aluminum alloy, three ring, with combustion bowl. Oil jet cooled with full floating piston pin. 8.7:1 compression ratio.

STARTING SYSTEM – 24 V DC starting motor. Crank termination switch, (shipped loose).

TURBOCHARGER – Dry-type with wastegate.

VOLTAGE REGULATOR – Automatic type.

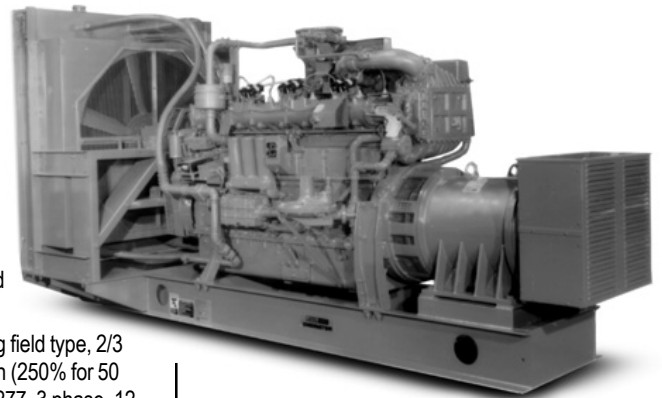
WATER CIRCULATING SYSTEM

Auxiliary Circuit – Gear driven pump for intercooler and oil cooler. Inlet temperature of 130° F (54° C) for all models.

Jacket Water Circuit – 180° – 190° F (82° – 88° C) thermostatic temperature regulation. Gear-driven pump.

VG F24GSID

VG F™ Series Gas Engineator Generating System 295 - 410 kW



Engineator shown with options.

Model VG F24GSID
 Turbocharged and Intercooled,
 Gas Fueled Engineator

SPECIFICATIONS

Waukesha Engine H24GSID	Jacket Water Capacity 20 gal. (75 L)
Cylinders Inline 8	Starting System 24V DC Electric
Piston Displacement 1462 cu. in. (24 L)	Fuel LHV 900 Btu/ft ³ (33.5 J/cm ³)
Bore & Stroke 5.98" x 6.5" (152 x 165 mm)	Lube Oil Capacity 56 gal. (212 L)
Compression Ratio 8.7:1	

PERFORMANCE DATA: VGF24GSID GAS ENGINATOR® GENERATING SYSTEM

HEAT EXCHANGER COOLING Intercooler Water: 130°F (54°C)	CONTINUOUS POWER*		STANDBY POWER	
	1800 rpm 60 Hz	1500 rpm 50 Hz	1800 rpm 60 Hz	1500 rpm 50 Hz
kW RATING	375	310	410	340
Fuel Consumption x 1000 Btu/h (kW)	3990 (1189)	3222 (944)	4279 (1254)	3484 (1021)
Jacket Water x 1000 Btu/h (kW)	1202 (352)	996 (292)	1271 (372)	1061 (311)
Intercooler x 1000 Btu/h (kW)	85 (25)	55 (16)	98 (29)	66 (19)
Lube Oil x 1000 Btu/h (kW)	221 (65)	166 (49)	227 (67)	172 (50)
Heat Radiated x 1000 Btu/h (kW)	198 (58)	171 (50)	153 (45)	156 (46)
Exhaust Heat** x 1000 Btu/h (kW)	1075 (315)	835 (245)	1157 (339)	907 (266)
Exhaust Flow lb/h (kg/h)	3445 (1563)	2783 (1263)	3694 (1676)	3008 (1365)
Exhaust Temperature °F (°C)	1114 (601)	1073 (578)	1115 (602)	1075 (579)
Induction Air Flow scfm (m³/min)	740 (21)	595 (17)	793 (22)	643 (18)

WATER CONNECTION COOLING Intercooler Water: 130°F (54°C)	CONTINUOUS POWER*		STANDBY POWER	
	1800 rpm 60 Hz	1500 rpm 50 Hz	1800 rpm 60 Hz	1500 rpm 50 Hz
kW RATING	375	310	410	340
Fuel Consumption x 1000 Btu/h (kW)	3990 (1189)	3222 (944)	4279 (1254)	3484 (1021)
Jacket Water x 1000 Btu/h (kW)	1202 (352)	996 (292)	1271 (372)	1061 (311)
Intercooler x 1000 Btu/h (kW)	85 (25)	55 (16)	98 (29)	66 (19)
Lube Oil x 1000 Btu/h (kW)	221 (65)	166 (49)	227 (67)	172 (50)
Heat Radiated x 1000 Btu/h (kW)	198 (58)	171 (50)	153 (45)	156 (46)
Exhaust Heat** x 1000 Btu/h (kW)	1075 (315)	835 (245)	1157 (339)	907 (266)
Exhaust Flow lb/h (kg/h)	3445 (1563)	2783 (1263)	3694 (1676)	3008 (1365)
Exhaust Temperature °F (°C)	1114 (601)	1073 (578)	1115 (602)	1075 (579)
Induction Air Flow scfm (m³/min)	740 (21)	595 (17)	793 (22)	643 (18)

RADIATOR COOLING - MOUNTED Intercooler Water: 130°F (54°C)	CONTINUOUS POWER*		STANDBY POWER	
	1800 rpm 60 Hz	1500 rpm 50 Hz	1800 rpm 60 Hz	1500 rpm 50 Hz
kW RATING	350	300	400	325
Fuel Consumption x 1000 Btu/h (kW)	3920 (1149)	3190 (935)	4315 (1265)	3447 (1010)
Jacket Water x 1000 Btu/h (kW)	1185 (347)	988 (290)	1280 (375)	1052 (308)
Intercooler x 1000 Btu/h (kW)	82 (24)	54 (16)	99.5 (29)	63 (18)
Lube Oil x 1000 Btu/h (kW)	220 (64)	166 (49)	228 (67)	171 (50)
Heat Radiated x 1000 Btu/h (kW)	254 (74)	206 (60)	252 (74)	217 (64)
Exhaust Heat** x 1000 Btu/h (kW)	1055 (309)	826 (242)	1167 (342)	897 (263)
Exhaust Flow lb/h (kg/h)	3419 (1551)	2756 (1250)	3725 (1690)	2977 (1351)
Exhaust Temperature °F (°C)	1113 (601)	1073 (578)	1116 (602)	1075 (579)
Induction Air Flow scfm (m³/min)	726 (21)	589 (17)	800 (23)	637 (18)
Radiator Air Flow scfm (m³/min)	48000 (1359)	40000 (1133)	48000 (1359)	40000 (1133)

Typical heat balance data is shown. Fuel consumption based on dry natural gas, 35.38 MJ/m³ [25, V (0; 101.325)] (900 BTU/scf) saturated lower heating value (SLHV), with a minimum Waukesha Knock Index™ of 91. Consult factory for guaranteed data.

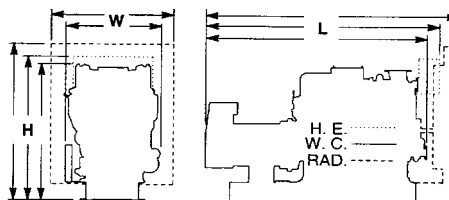
***Continuous Power Rating:** The highest electrical power output of the Enginator available for an unlimited number of hours per year, less maintenance. It is permissible to operate the Enginator with up to 10% overload for two hours in each 24 hour period.

Standby Power Rating: This rating applies to those systems used as a secondary source of electrical power. This rating is the electrical power output of the Enginator (no overload) 24 hours a day, for the duration of the primary power source outage.

Rating Standard: The Waukesha Enginator power rating descriptions are in accordance to ISO 8528, DIN6271 and BS5514. It is also valid for ISO 3046/1-1986 with an engine mechanical efficiency of 90% and auxiliary water temperature T_{cr} (clause 10.0) is limited to ± 10° F (5° C).

**Heat rejection based on cooling exhaust gas to 77° F (25° C).

Cooling Equipment	L in (mm)	W in (mm)	H in (mm)	Avg. Wt. lb (kg)
Heat Exchanger	142 (3610)	54 (1370)	79 (2000)	11100 (5030)
Water Cooler	132 (3350)	54 (1370)	79 (2000)	10600 (4810)
Radiator	176 (4470)	78 (1981)	100 (2540)	12300 (5580)



Waukesha

WAUKESHA POWER SYSTEMS
WAUKESHA ENGINE
DRESSER, INC.
 1000 West St. Paul Avenue
 Waukesha, WI 53188-4999
 Phone: (262) 547-3311 Fax: (262) 549-2795
waukeshaengine.dresser.com

WAUKESHA ENGINE
DRESSER INDUSTRIAL PRODUCTS, B.V.
 Farmsumerweg 43, Postbus 330
 9900 AH Appingedam, The Netherlands
 Phone: (31) 596-652222 Fax: (31) 596-628111

Consult your local Waukesha Distributor for system application assistance. The manufacturer reserves the right to change or modify without notice, the design or equipment specifications as herein set forth without incurring any obligation either with respect to equipment previously sold or in the process of construction except where otherwise specifically guaranteed by the manufacturer.

**Waukesha**

VGf GAS ENGINATOR®
VGf18GL/GLD/GSID – VGf24GL/GLD/GSID
BASIC ENGINATOR SPECIFICATIONS

AIR CLEANER – Two stage, dry panel type with rain shield and service indicator. Engine mounted.

BARRING DEVICE – Manual.

BASE – Engine, generator and radiator or heat exchanger are mounted and aligned on a welded structural steel base, designed for solid mounting on an inertia block, with standard through-base holes for lifting.

BREATHER – Closed system.

CONNECTING RODS – Drop forged alloy steel, angle split, serrated joint, oil jet piston pin lubrication.

COOLING SYSTEM – Choice of mounted radiator with pusher fan, core guard and duct adaptor, heat exchanger with mounted surge tank or flanged connections for remote radiator cooling.

CRANKCASE – Alloy cast iron, fully ribbed, integral with cylinder frame.

CRANKSHAFT – Drop forged alloy steel with thru hardened journals, dynamically balanced and fully counterweighted. Viscous vibration dampener.

CYLINDER HEADS – Individual, interchangeable valve-in-head type with deep section alloy casting. Two hard-faced intake and two hard-faced exhaust valves per cylinder. Replaceable intake and exhaust valve seats. Mechanical valve lifters with pivoted roller followers.

CYLINDERS – Removable wet type liners of centrifugally cast alloy iron.

ENGINE PROTECTION SHUTDOWN CONTACTS – High water temperature, low oil pressure, and overspeed.

EXHAUST – Water-cooled, cast iron exhaust manifold. Single vertical flexible stainless steel exhaust connection with ANSI 125# 8" flange.

FUEL SYSTEM (GL) – One natural gas carburetor, one Fisher Y692 gas regulator, one 2" NPT flexible connection (shipped loose) and one 2" NPT Magnatrol gas solenoid valve (shipped loose). Fuel pressure - 25 PSIG minimum and 50 PSIG maximum.

FUEL SYSTEM (GLD) – One natural gas carburetor, one Maxitrol RV91 gas regulator (shipped loose), one 2" NPT flexible connection (shipped loose), and one 3" NPT Magnatrol gas solenoid valve (shipped loose). Fuel pressure - 10" H₂O minimum and 20" H₂O maximum.

FUEL SYSTEM (GSID) – One natural gas carburetor, one Maxitrol RV91 gas regulator (shipped loose), one 2" NPT flexible connection (shipped loose), and one 3" NPT Magnatrol gas solenoid valve (shipped loose). Fuel pressure - 10" H₂O minimum and 20" H₂O maximum.

GENERATOR – Open, drip-proof, direct connected, synchronous, fan cooled, AC revolving field type, 2/3 pitch, single bearing generator with PMG brushless exciter for 300% short circuit sustain (250% for 50 Hz) and motor starting. TIF and Deviation Factor within NEMA MG-1.32. Voltage: 480/277, 3 phase, 12 wire Wye, 60 Hz, and 400/230, 3 phase, 12 wire Wye, 50 Hz. Temperature rise within NEMA 105° C for continuous duty, within NEMA 130° C for stand-by duty. Voltage regulation is ± 0.5%. All generators are rated at 0.8 power factor, are mounted on the engine flywheel housing, and have multiple steel disc flexible coupling drive.

GOVERNOR – Woodward model EG3P electric actuator (mounted) and magnetic pickup (mounted). **NOTE:** Requires separate electric governor control Woodward model 2301D or similar (not included). See Code 6020D or 6022.

IGNITION – Waukesha Custom Engine Control electronic ignition system with coils, cables, hall effect pickup and spark plugs. Non-shielded. 24 V DC power required. Includes emergency stop/service engine protection switch for local override of remote controls.

INTERCOOLER – Air-to-water.

INSTRUMENT PANEL – Engine mounted, includes water temperature, oil pressure, intake manifold temperature and intake manifold pressure gauges, and emergency stop pushbutton.

JUNCTION BOXES – Separate AC & DC junction boxes for engine wiring and external connections.

KNOCK DETECTION MODULE (KDM) – Electronic detonation protection system. Includes engine mounted sensors, wiring and KDM. Meets CSA Class I, Division 2, Group D hazardous location requirements Standard on GL and GLD engines with 11:1 compression ratio.

LUBRICATION SYSTEM – Gear type pump, full flow spin-on filters and industrial base type oil pan. Engine mounted plate type oil cooler.

PAINT – Oilfield Orange.

PISTONS – Aluminum alloy, three ring, with patented high turbulence combustion bowl. Oil jet cooled with full floating piston pin. 11:1 compression ratio. (8.6:1 on GSID).

STARTING SYSTEM – 24 V DC starting motor. Crank termination switch, (shipped loose).

TURBOCHARGER – Dry-type with wastegate.

VOLTAGE REGULATOR – Automatic type.

WATER CIRCULATING SYSTEM, AUXILIARY CIRCUIT – Gear driven pump for intercooler and oil cooler. Inlet temperature of 130° F (54° C) for all models.

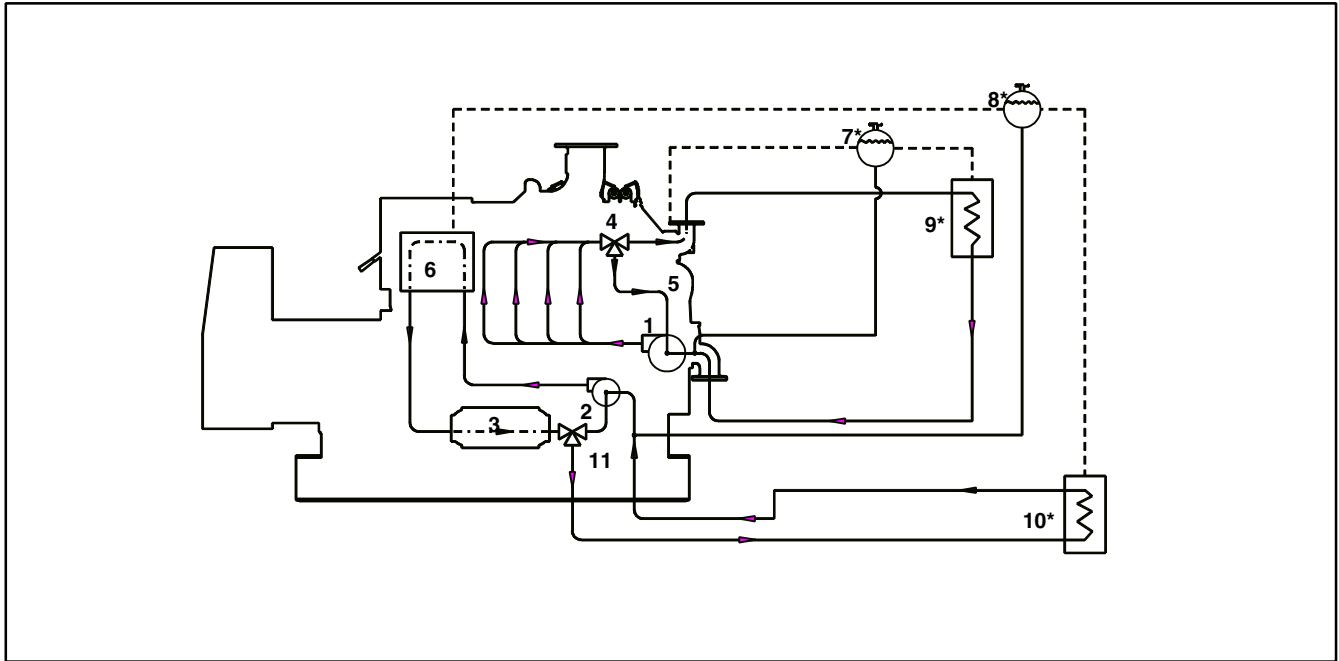
WATER CIRCULATING SYSTEM, JACKET WATER CIRCUIT – 180° – 190° F (82° – 88° C) thermostatic temperature regulation. Gear-driven pump.

DOCUMENTATION - The following items are supplied as standard with every order:

- Electronic notification and access to drawings for review and or approval.
- One Enginator® manual consisting of:
 - *Engine operation/service manual.
 - *Engine parts book.
 - *Generator/voltage regulator instructions.
 - *Instructions on major special items.

COOLING SYSTEMS 4

COOLING SYSTEM SCHEMATIC VGF F18, H24GL, GLD, GLD/2 & GSID ENGINES



LEGEND:

1. Engine Jacket Coolant Pump
2. Auxiliary Coolant Pump
3. Lube Oil Cooler
4. Engine Jacket Thermostats
5. Engine Jacket Bypass Line
6. Intercooler
7. Engine Jacket Expansion Tank
8. Auxiliary Expansion Tank
9. Engine Jacket Cooler
10. Engine Auxiliary Cooler
11. Auxiliary Circuit Thermostat

NOTES:

All Connections to unit must be flexible.

*Customer supplied component and piping.

---- Deaeration vent lines. 1/4" tubing or 1/2" tubing with 1/4" orifice at the engine.

HEAT REJECTION 3

HEAT REJECTION AND OPERATING DATA – MODEL H24GSID
8.7:1 COMPRESSION RATIO – 23° BTDC
130° F INTERCOOLER WATER TEMPERATURE – 180° F JACKET WATER TEMPERATURE

	BMEP (PSI)	ENGINE SPEED — RPM				
		1400	1500	1600	1700	1800
HORSEPOWER (BHP)	176	455	490	520	555	585
	160	415	445	475	505	530
	150	388	415	443	471	498
	125	323	346	369	392	415
	100	258	277	295	314	332
	75	194	208	222	235	249
	50	129	138	148	157	166
BRAKE SPEC FUEL CONSUMPTION (BTU/BHP-HR)	176	7173	7221	7272	7311	7380
	160	7288	7339	7392	7432	7503
	150	7372	7425	7480	7521	7593
	125	7641	7701	7762	7806	7882
	100	8046	8115	8184	8233	8316
	75	8720	8805	8888	8944	9039
	50	10067	10184	10296	10368	10484
FUEL CONSUMPTION (BTU/HR X 1000)	176	3265	3520	3780	4040	4315
	160	3015	3250	3495	3730	3990
	150	2860	3085	3315	3540	3785
	125	2470	2665	2865	3060	3275
	100	2080	2245	2415	2585	2765
	75	1690	1830	1970	2105	2255
	50	1301	1410	1520	1625	1740
HEAT TO JACKET WATER (BTU/HR X 1000)	176	994	1070	1143	1212	1280
	160	931	1003	1072	1136	1202
	150	892	961	1027	1089	1152
	125	793	856	916	971	1029
	100	695	751	804	854	906
	75	597	646	693	736	783
	50	498	541	581	618	659
HEAT TO LUBE OIL (BTU/HR X 1000)	176	156	173	192	210	228
	160	150	167	186	203	221
	150	147	164	182	199	217
	125	138	155	172	189	206
	100	129	146	163	179	195
	75	121	136	153	169	185
	50	112	127	144	158	174
HEAT TO INTERCOOLER (BTU/HR X 1000)	176	60	68	78.5	88.5	99.5
	160	49.5	56.5	66	75	85
	150	43.5	50	58.5	67	76
	125	29	34.5	41	47.5	55.5
	100	16.5	20.5	25.5	30	36
	75	5.5	8	11	13.5	18
	50	-3.5	-2.5	-2	-1.5	1.5



HEAT REJECTION AND OPERATING DATA MODEL H24GSID 130° F AUX. WATER TEMPERATURE 180° F JACKET WATER TEMPERATURE	EN: 122553 DATE: 4/04	Ref. S 7779-45
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HEAT REJECTION

**HEAT REJECTION AND OPERATING DATA – MODEL H24GSID
8.7:1 COMPRESSION RATIO – 23° BTDC
130° F INTERCOOLER WATER TEMPERATURE – 180° F JACKET WATER TEMPERATURE**

	BMEP (PSI)	ENGINE SPEED — RPM				
		1400	1500	1600	1700	1800
HEAT TO RADIATION (BTU/HR X 1000)	176	109	114	115	118	123
	160	108	113	115	118	122
	150	108	112	115	117	122
	125	106	110	113	115	119
	100	103	106	109	112	114
	75	97.5	100	103	107	108
	50	90	92.5	96	99	101
TOTAL ENERGY IN EXHAUST (BTU/HR X 1000)	176	846	917	993	1077	1167
	160	776	843	917	993	1075
	150	733	797	868	939	1016
	125	622	678	741	801	866
	100	512	559	610	660	715
	75	402	440	480	520	564
	50	295	322	353	384	417
EXHAUST TEMP AFTER TURBINE (± 50° F)	176	1063	1076	1089	1102	1116
	160	1062	1074	1088	1101	1114
	150	1059	1072	1085	1098	1112
	125	1047	1060	1073	1086	1100
	100	1025	1038	1052	1065	1078
	75	993	1007	1020	1034	1047
	50	952	965	979	992	1005
INDUCTION AIR FLOW (SCFM)	176	605	650	700	750	800
	160	560	600	650	690	740
	150	525	570	615	655	700
	125	460	495	530	570	610
	100	390	420	450	480	510
	75	315	335	365	390	420
	50	240	260	280	300	325
EXHAUST GAS FLOW (LBS/HR)	176	2815	3040	3260	3480	3725
	160	2605	2805	3015	3220	3445
	150	2470	2670	2860	3060	3270
	125	2135	2305	2480	2650	2830
	100	1795	1945	2090	2235	2390
	75	1465	1580	1705	1820	1950
	50	1130	1220	1320	1410	1510



HEAT REJECTION AND OPERATING DATA MODEL H24GSID 130° F AUX. WATER TEMPERATURE 180° F JACKET WATER TEMPERATURE	EN: 122553 DATE: 4/04	Ref. S 7779-45
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HEAT REJECTION 3

NOTES:

1. All data are based on ISO standard conditions of 29.54 inches Hg. barometric pressure, 77° F ambient and induction air temperature, 30% relative humidity (0.3 inches Hg. water vapor pressure), 180° F engine jacket water outlet temperature, and standard 23° BTDC ignition timing.
2. All data are average values at the standard conditions and will vary for individual engines and with operating and ambient conditions and with changes to ignition timing or air/fuel ratio. An adequate reserve should be used for cooling system or heat recovery calculations. See also Cooling System Guidelines, S6699-7, latest version.
3. ISO Standard (continuous) power ratings conform to ISO 3046/1, latest version, with a mechanical efficiency of 90% and auxiliary water temperature, T_{cra}, of 130° F (54° C) limited to ± 10° F (± 5.5° C).
4. Fuel standard: dry natural gas, 900 BTU/scf saturated lower heating value (SLHV), with a minimum Waukesha Knock Index of 91. Refer to S7884-7, latest version, for the full fuel specification.
5. 8.7:1 compression ratio.
6. For heat rejection changes due to engine jacket water outlet temperature higher than standard (Note 1), refer to S7613-3, latest version.
7. Total Exhaust Energy includes both recoverable and non-recoverable heat. For a procedure to calculate recoverable heat refer to S8117-2, latest version.
8. Exhaust carbon monoxide (CO) concentration set to 0.35% (with exhaust oxygen concentration of 0.18%) for stoichiometric operation at rated speed and load at standard 23° BTDC ignition timing. This CO level is measured at the port located in the exhaust manifold upstream of the turbocharger.
9. Low pressure (draw thru) fuel system on the GSID model.
10. Reference Engine Ratings and Fuel Consumption curve sheet C1132-10.
11. Exhaust flow at nominal 29.54 inches Hg. atmospheric pressure:

$$\text{Flow rate: ACFM} = \frac{(\text{Exh. Flow, lb/hr}) \times (\text{Exh. Temp. } ^\circ\text{F} + 460^\circ)}{2250}$$



HEAT REJECTION AND OPERATING DATA MODEL H24GSID 130° F AUX. WATER TEMPERATURE 180° F JACKET WATER TEMPERATURE	EN: 122553 DATE: 4/04	Ref. <u>S</u> 7779-45
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HEAT REJECTION B

— METRIC —

HEAT REJECTION AND OPERATING DATA – MODEL H24GSID

8.7:1 COMPRESSION RATIO – 23° BTDC

54° C INTERCOOLER WATER TEMPERATURE – 82° C JACKET WATER TEMPERATURE

	BMEP	ENGINE SPEED — RPM					
		1400	1500	1600	1700	1800	1400
HORSEPOWER (kW)	12.14	340	365	390	415	440	12.14
	11.03	310	330	355	375	400	11.03
	10.34	289	310	330	351	372	10.34
	8.62	241	258	275	293	310	8.62
	6.90	193	206	220	234	248	6.90
	5.17	145	155	165	176	186	5.17
	3.45	96	103	110	117	124	3.45
BRAKE SPEC FUEL CONSUMPTION (kJ/kWh)	12.14	10149	10217	10289	10343	10441	12.14
	11.03	10311	10383	10459	10515	10615	11.03
	10.34	10430	10505	10583	10641	10743	10.34
	8.62	10812	10896	10982	11044	11152	8.62
	6.90	11384	11482	11579	11648	11766	6.90
	5.17	12337	12457	12575	12655	12789	5.17
	3.45	14244	14409	14567	14669	14833	3.45
FUEL CONSUMPTION (kW)	12.14	956	1031	1108	1183	1265	12.14
	11.03	883	953	1024	1094	1169	11.03
	10.34	838	904	971	1038	1109	10.34
	8.62	723	781	840	897	959	8.62
	6.90	609	659	708	757	810	6.90
	5.17	495	536	577	617	660	5.17
	3.45	381	413	446	477	510	3.45
HEAT TO JACKET WATER (kW)	12.14	291	314	335	355	375	12.14
	11.03	273	294	314	333	352	11.03
	10.34	261	282	301	319	338	10.34
	8.62	233	251	268	285	302	8.62
	6.90	204	220	236	250	265	6.90
	5.17	175	189	203	216	229	5.17
	3.45	146	158	170	181	193	3.45
HEAT TO LUBE OIL (kW)	12.14	46	51	56	61	67	12.14
	11.03	44	49	54	60	65	11.03
	10.34	43	48	53	58	64	10.34
	8.62	40	45	51	55	60	8.62
	6.90	38	43	48	52	57	6.90
	5.17	35	40	45	49	54	5.17
	3.45	33	37	42	46	51	3.45
HEAT TO INTERCOOLER (KW)	12.14	18	20	23	26	29	12.14
	11.03	15	17	19	22	25	11.03
	10.34	13	15	17	20	22	10.34
	8.62	9	10	12	14	16	8.62
	6.90	5	6	7	9	11	6.90
	5.17	2	2	3	4	5	5.17
	3.45	-1	-1	-1	0	0	3.45



<p>— METRIC —</p> <p>HEAT REJECTION AND OPERATING DATA – MODEL H24GSID</p> <p>54° C AUX. WATER TEMPERATURE</p> <p>82° C JACKET WATER TEMPERATURE</p>	<p>EN: 122553</p> <p>DATE: 4/04</p>	<p>Ref. S</p> <hr style="width: 50%; margin: 0 auto;"/> <p>7779-45</p>
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HEAT REJECTION 3

— METRIC —

HEAT REJECTION AND OPERATING DATA – MODEL H24GSID

8.7:1 COMPRESSION RATIO – 23° BTDC

54° C INTERCOOLER WATER TEMPERATURE – 82° C JACKET WATER TEMPERATURE

	BMEP	ENGINE SPEED — RPM					
		1400	1500	1600	1700	1800	1400
HEAT TO RADIATION (KW)	12.14	32	33	34	35	36	12.14
	11.03	32	33	34	34	36	11.03
	10.34	32	33	34	34	36	10.34
	8.62	31	32	33	34	35	8.62
	6.90	30	31	32	33	34	6.90
	5.17	29	29	30	31	32	5.17
	3.45	26	27	28	29	30	3.45
TOTAL ENERGY IN EXHAUST (KW)	12.14	248	269	291	316	342	12.14
	11.03	228	247	269	291	315	11.03
	10.34	215	233	254	275	298	10.34
	8.62	182	199	217	235	254	8.62
	6.90	150	164	179	193	209	6.90
	5.17	118	129	141	152	165	5.17
	3.45	86	94	104	112	122	3.45
EXHAUST TEMP AFTER TURBINE (± 30° C)	12.14	573	580	587	594	602	12.14
	11.03	572	579	586	594	601	11.03
	10.34	571	578	585	592	600	10.34
	8.62	564	571	578	586	593	8.62
	6.90	552	559	567	574	581	6.90
	5.17	534	542	549	556	564	5.17
	3.45	511	518	526	533	541	3.45
INDUCTION AIR FLOW (NM³/H)	12.14	929	1001	1074	1148	1227	12.14
	11.03	858	926	994	1062	1135	11.03
	10.34	814	879	944	1008	1077	10.34
	8.62	703	760	817	872	932	8.62
	6.90	593	641	689	736	787	6.90
	5.17	483	522	562	600	642	5.17
	3.45	372	403	434	464	497	3.45
EXHAUST GAS FLOW (KG/H)	12.14	1279	1377	1478	1580	1689	12.14
	11.03	1181	1274	1368	1461	1562	11.03
	10.34	1120	1209	1298	1387	1482	10.34
	8.62	968	1046	1124	1200	1283	8.62
	6.90	816	882	948	1013	1083	6.90
	5.17	664	718	773	826	883	5.17
	3.45	512	555	597	639	684	3.45



<p>— METRIC —</p> <p>HEAT REJECTION AND OPERATING DATA – MODEL H24GSID</p> <p>54° C AUX. WATER TEMPERATURE</p> <p>82° C JACKET WATER TEMPERATURE</p>	<p>EN: 122553</p> <p>DATE: 4/04</p>	<p>Ref.</p> <p>S</p> <hr style="width: 50%; margin: 0 auto;"/> <p>7779-45</p>
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HEAT REJECTION **B**

NOTES:

1. All data are based on ISO standard conditions of 100 kPa barometric pressure, 25° C ambient and induction air temperature, 30% relative humidity (1 kPa water vapor pressure), 82° C engine jacket water outlet temperature, and standard 23° BTDC ignition timing.
2. All data are average values at the standard conditions and will vary for individual engines and with operating and ambient conditions and with changes to ignition timing or air/fuel ratio. An adequate reserve should be used for cooling system or heat recovery calculations. See also Cooling System Guidelines, S6699-7, latest version.
3. ISO Standard (continuous) power ratings conform to ISO 3046/1, latest version, with a mechanical efficiency of 90% and auxiliary water temperature, T_{cra}, of 54° C limited to ± 5.5° C.
4. Fuel standard: dry natural gas, 35.38 MJ/m³ [25, V (0; 101.325)] saturated lower heating value (SLHV), with a minimum Waukesha Knock Index of 91. Refer to S7884-7, latest version, for the full fuel specification.
5. 8.7:1 compression ratio.
6. For heat rejection changes due to engine jacket water outlet temperature higher than standard (Note 1), refer to S7613-3, latest version.
7. Total Exhaust Energy includes both recoverable and non-recoverable heat. For a procedure to calculate recoverable heat refer to S8117-2, latest version.
8. Exhaust carbon monoxide (CO) concentration set to 0.35% (with exhaust oxygen concentration of 0.18%) for stoichiometric operation at rated speed and load at standard 23° BTDC ignition timing. This CO level is measured at the port located in the exhaust manifold upstream of the turbocharger.
9. Low pressure (draw thru) fuel system on the GSID model.
10. Reference Engine Ratings and Fuel Consumption curve sheet C1132-10.
11. Exhaust flow at nominal 100 kPa atmospheric pressure:

$$\text{Flow rate: m}^3/\text{hr} = \frac{(\text{Exh. Flow, kg/hr}) \times (\text{Exh. Temp. } ^\circ\text{C} + 273^\circ)}{332.96}$$



<p>— METRIC — HEAT REJECTION AND OPERATING DATA – MODEL H24GSID 54° C AUX. WATER TEMPERATURE 82° C JACKET WATER TEMPERATURE</p>	<p>EN: 122553 DATE: 4/04</p>	<p>Ref. S 7779-45</p>
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SPECIFICATIONS 1

MODEL — H24GSID

BASIC MODEL SPECIFICATIONS

Type	4-cycle, overhead valve
Aspiration	Turbocharged-Intercooled
Number of cylinders.....	In-Line 8
Bore x Stroke.....	5.98 x 6.5 in. (152 x 165 mm)
Displacement.....	1462 in ³ (24.0 liters)
Compression ratio.....	8.6:1
Speed range – continuous and intermittent duty.....	1350 - 1800 rpm
Piston speed – @ 1800 rpm	1950 ft/min (9.91 m/sec)
Low idle	650 – 750 rpm
Flywheel housing	SAE No. 0 (Same as SAE No. 0 Except Metric Taps)
Firing Order	1-4-2-6-8-5-7-3

BEARINGS – MAIN

Number.....	9
Diameter x width	5.32 x 1.81 in. (135 x 46 mm)
Total main bearing projected effective area	86.7 in ² (559.1 cm ²)

BEARINGS – CRANKPIN

Diameter x width.....	4.53 x 1.81 in. (115 x 46 mm)
Total crankpin projected effective area	65.6 in ² (423.2 cm ²)

COOLING SYSTEM

Jacket capacity, engine only.....	20 gallons (75 liters)
Maximum inlet head, Jacket water pump – H ₂ O	28 ft. (8.5 m)
Normal operating temperature range with 7 psi pressure cap.....	174 – 195° F (79 – 91° C)
*Jacket water inlet, nominal pipe size flange.....	3.0 inches ANSI 125 lb. (76.2 mm)
*Jacket water outlet, nominal pipe size flange.....	3.0 inches ANSI 125 lb. (76.2 mm)
Auxiliary water capacity, engine only.....	6 gallons (23 liters)
Maximum inlet head, auxiliary water pump – H ₂ O.....	50 ft. (15.2 m)

EXHAUST SYSTEM

Maximum permissible back pressure – H ₂ O	15 in. (381 mm)
Exhaust outlet, nominal pipe size flange	8.0 inches ANSI 125 lb. (203.2 mm)

FUEL SYSTEM

**Natural gas pressure to regulator – H ₂ O min. to max:.....	8 – 10 psi (2 – 69 kPa)
Natural gas inlet pipe size.....	1.5 in. NPT (38.1 mm)

GOVERNOR

Regulation SG Governor.....	2 – 7% (Approx.)
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INDUCTION SYSTEM

Maximum permissible restriction – H ₂ O	15 in. (381 mm)
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LUBRICATION SYSTEM

Maximum permissible restriction – Lube oil sump capacity, including filter and cooler.....	28 gallons (106 liters)
***High Capacity, including filter and cooler	56 gallons (212 liters)
Normal lube oil pressure	67 – 83 psi (462 – 572 kPa)
Maximum safe tilt angle	See S-3549-J

STARTING SYSTEM

Electric Starting – DC voltage	24
Air Pressure starting - max.	150 psi (1034 kPa)
Number of teeth on ring gear	150

MISCELLANEOUS

Heaviest engine part, cylinder block assembly.....	1530 lb. (694 kg)
Heaviest engine part, top overhaul, cylinder head assembly.....	80 lb. (36 kg)
Recommended minimum spacing between engines	36 in. (914 mm)
Recommended minimum overhead clearance	6 ft. (2 m)
Weight, dry approximate – lb (kg)	7500 lb. (3400 kg)

NOTES:

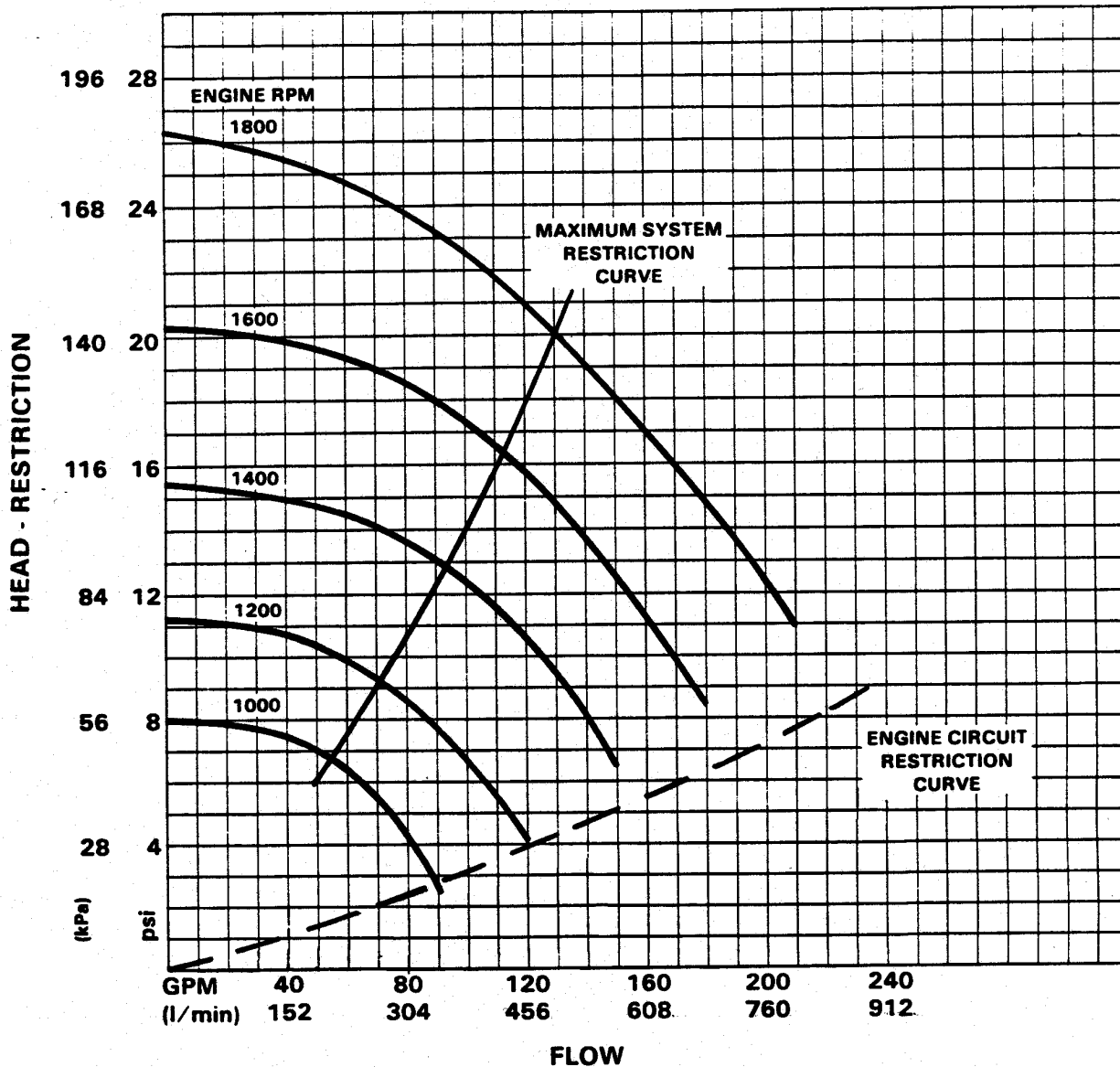
- * When no jacket water pump is provided see current Installation Drawing.
- ** Consult price book for options which affect this specification.
- *** Engines shipped after April 15, 2003 are equipped with standard high capacity oil pan.



SPECIFICATION – MODEL H24GSID	EN: 127902 DATE: 7/03	Ref. <u>S</u> 7778-3
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COOLING SYSTEMS 4

JACKET WATER PUMP PERFORMANCE MODELS F18G/GL/GLD/GSI/GSID AND H24G/GL/GLD/GSI/GSID



ENGINE RPM		1000	1200	1400	1600	1800
MIN. DESIGN FLOW	GPM	56.0	72.0	94.0	112.0	130.0
	(l/min)	(212)	(273)	(356)	(424)	(492)
MAX. EXTERNAL RESTRICTION	PSI	5.2	7.1	9.9	12.6	15.7
	(kPa)	(36)	(49)	(68)	(87)	(108)

NOTES:

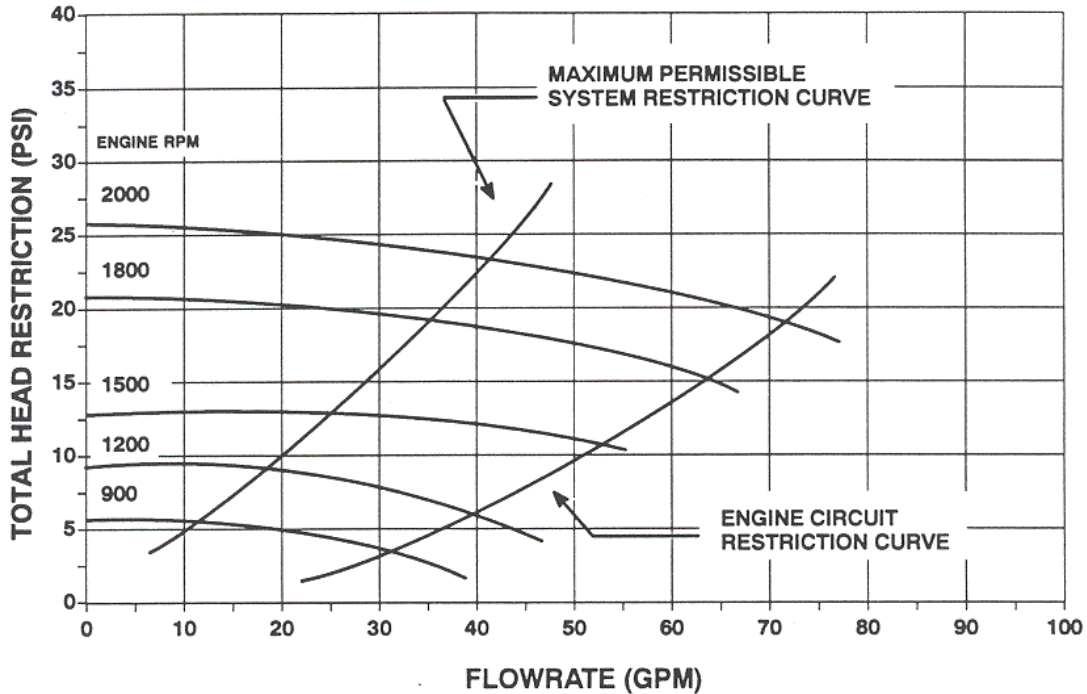
- Performance is based on 2.5 PSI min. pressure at water pump inlet with 180° F max. water inlet temperature.
- Performance information does not apply for code 4285. Jacket water pump is not supplied with the engine.



JACKET WATER PUMP PERFORMANCE MODELS F18G/GL/GLD/GSI/GSID AND H24G/GL/GLD/GSI/GSID	EN: 128574 DATE: 2/06	Ref. <u>S</u> 7797-3
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COOLING SYSTEMS 4

**AUXILIARY WATER PUMP PERFORMANCE
 MODELS F18G/GL/GLD/GSI/GSID AND
 H24G/GL/GLD/GSI/GSID
 INTERCOOLER OIL COOLER CIRCUIT
 4" CURVED IMPELLER
 WATER PUMP WED #207482W
 INTERCOOLER WED #A305464
 (THREE PASS)**



ENGINE RPM		900	1200	1500	1800	2000
MIN. DESIGN FLOW	GPM	7.5	15	25	35	40.5
	(l/min)	(28)	(57)	(95)	(133)	(153)
MAX. EXTERNAL RESTRICTION	PSI	5.2	8.5	12	14.6	16.8
	(kPa)	(36)	(58)	(82)	(100)	(115)

NOTES:

1. Pump flows are based on a positive suction pressure at pump inlet.
2. 1 PSI = 6.9 kPa
3. 1 GPM = 3.79 l/min.
4. Performance information does not apply for code 4285. Auxiliary water pump is not supplied with the engine.



AUXILIARY WATER PUMP PERFORMANCE MODELS F18G/GL/GLD/GSI/GSID AND H24G/GL/GLD/GSI/GSID	EN: 128574 DATE: 2/06	Ref. S 7797-5
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