

Engine Group 1 General description	Engine Type W28SG	Ref. ogj, mth	Date 990324	Issue 3	Document No. 91 939 220 00E	Page 1(5)
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W28SG

Technical specification

General data

		12R28SG		16V25SG		18V28SG	
		900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Engine speed	r/min (r/s)						
Rated power p^1	kW	1093	1215	2187	2430	2916	4506
Brake mean effective pressure (BMEP) P_e	Mpa	1.65		1.65		1.65	
Bore	mm	250		250		250	
Stroke	mm	300		300		300	
Swept volume (per cylinder)	dm ³	14.7		14.7		14.7	
Mean piston speed	m/s	9.0	10.0	9.0	10.0	9.0	10.0
Compression ratio, nominal		1 : 10.5		1 : 10.5		1 : 10.5	
Firing order viewed from flywheel (clockwise)		1-4-2-6-3-5-1		1-10-4-8-2-12-6-9-3-11-5-7-1		1-13-5-11-3-10-2-16-8-12-4-14-6-15-7-9-1	
Efficiency at MCR							
mechanical	%	about 90		about 90		about 90	
brake thermal ¹	%	42.0		42.0		46.2	
Heat loss value ² at MCR							
to Exhaust	kW	292	323	550	520	1015	1530
to jacket water	kW	262	290	524	579	970	1480
to charge air cooler	kW	178	197	356	393	475	527
to lubricating oil	kW	102	113	203	225	271	301
radiation from engine	kW	53	58	105	116	140	156
charge air cooler no 1	kW	146	162	292	323	390	432
charge air cooler no 2	kW	32	35	64	70	85	94

1) Rated power and brake thermal efficiency according to ISO 3046/1 ($p_i = 100$ kPa, $T_i = 300$ K, $T_{cr} = 300$ K, $\phi = 60\%$). Methane number > 80.

2) Percentage of brake power valid for $p_e = 1.5$ MPa. For ambient (tropical) conditions at 45, 50 and 55°C, heat loss is increased by approximately

Turbocharging system

		12R28SG		16V25SG		18V28SG	
Engine speed	r/min (r/s)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Exhaust gas quantity	kg/s	1.65	1.95	3.30	3.90	6.20	6.70
Exhaust gas temperature (after compressor)	°C	410		410		410	
Total pressure drop (exhaust gas back pressure drop + inlet pressure drop)	kPa	5.0		5.0		5.0	
Charge air temperature							
normal at min/max load ³	°C	45 - 60		45 - 60		45 - 60	
max (alarm)	°C	70		70		70	
max (shutdown)	°C	75		75		75	
Exhaust gas temperature							
max after cylinders (alarm)	°C	535		535		535	
max after cylinders (shutdown)	°C	550		550		550	
after turbocharger	°C	400 - 440		400 - 440		400 - 440	

3) Inverse load dependent.

Fuel and ignition system

		6R25SG		12V25SG		18V28SG	
Engine speed	r/min (r/s)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Fuel gas pressure							
feed line	MPa _e	0.40		0.40		0.40	
pre-chamber inlet line (before engine)	MPa _e	0.05 - 0.28		0.05 - 0.28		0.05 - 0.28	
main inlet line (before engine)	MPa _e	0.05 - 0.28		0.05 - 0.28		0.05 - 0.28	
Fuel Consumption	M ³ /h	250-270		510-630		740-1180	
Fuel gas temperature	°C	0 - 40		0 - 40		0 - 40	
Fuel gas filtration (before engine)	µm	2		2		2	
Ignition timing before TDC ⁴	degrees	10 - 20		10 - 20		10 - 20	
Spark plug gap ⁵	mm	0.30 - 0.60		0.30 - 0.60		0.30 - 0.60	
Supply voltage	VDC	24		24		24	

4) Dependent on guaranteed engine performance.

5) Dependent on spark plug type.

Lubrication system		12R28SG		16V25SG		18V28SG	
		900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Engine speed	r/min (r/s)						
Oil flow through engine	dm ³ /s	7.0-8.0		11.0-12.0		14.0-15.0	
Lubrication oil pump directly driven, capacity speed	dm ³ /s r/min	7.9 3050	8.8 3390	20.0 1690	22.3 1880	20.0 1690	22.3 1880
separately driven, capacity minimum pressure	dm ³ /s MPa	8.0 0.7		13.0 0.7		16.0 0.7	
Oil temperature before engine ⁶ normal	°C	75		75		75	
alarm	°C	85		85		85	
maximum (shutdown)	°C	95		95		95	
Oil temperature in sump minimum (stand-by DG sets)	°C	40		40		40	
Oil pressure at engine normal	Mpa	0.30-0.50		0.30-0.50		0.30-0.50	
alarm ⁷	Mpa	0.10-0.25		0.10-0.25		0.10-0.25	
minimum (shutdown) ⁷	Mpa	0.08-0.20		0.08-0.20		0.08-0.20	
Electrically drive pre-lube oil pump capacity	dm ³ /s	1.7		1.7		1.7	
sequence lubrication of DG sets standing by	min/2h	2		2		2	
Oil filter fineness, nominal	µm	10-15		10-15		10-15	
difference pressure, maximum (alarm)	Mpa	0.18		0.18		0.18	
Oil volume dry sump with separate oil tank	m ³	1.5		3.0		4.0	
wet sump, min-max	m ³	0.52-0.69		0.45-0.85		0.59-1.00	
DG sets, min-max	m ³	0.69-0.92		0.91-1.87		1.17-2.40	
Oil consumption at full load ⁸	kg/h	0.7±0.2		1.5±0.2		1.9±0.2	

6) For intermittent operation or high ambient temperature conditions, a normal temperature of 73°C and a maximum temperature of 90°C is allowed.

7) Dependent on engine speed.

Cooling system

		12R28SG		16V25SG		18V28SG	
		900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Engine speed	r/min (r/s)						
Fresh-water flow through engine ⁹ (equal to pump capacity)	dm ³ /s	10.0	10.5	20.0	20.0	26.5	26.5
Fresh-water pump ¹⁰ , directly/separately driven							
pressure, normal	Mpa	0.35	0.44	0.38	0.49	0.35	0.45
pressure, minimum (alarm) ¹¹	Mpa	0.04-0.28		0.04-0.28		0.04-0.28	
pressure, minimum (shut-down) ¹¹	Mpa	0.02-0.18		0.02-0.18		0.02-0.18	
speed	r/min	2860	3180	2860	3180	2860	3180
Fresh-water temperature at engine							
inlet, normal	°C	87		87		87	
outlet, normal	°C	95		95		95	
outlet, alarm	°C	100		100		100	
outlet, maximum (shut-down)	°C	105		105		105	
Fresh-water temperature before air heat exchanger	°C	50-55		50-55		50-55	
Pre-heating of DG sets standing-by minimum	°C	40		40		40	
Fresh-water volume							
in engine ¹²	m ³	0.29		0.50		0.70	
total permitted	m ³	1.00		1.60		1.60	
Directly driven raw-water pump ¹⁰							
capacity	dm ³ /s	12.0	13.2	27.5	30.6	27.5	30.6
pressure	Mpa	0.33	0.41	0.34	0.41	0.34	0.41
speed	r/min	2860	3180	2860	3180	2860	3180

9) Approximate values when temperature rise in jacket water is adjusted to 9°C.

10) For data on directly driven pumps, see capacity curves in document no 91 930 958 00 and 91 930 964 00.

11) Dependent on engine speed.

12) Inclusive expansion tank but exclusive fresh-water cooler and pipes outside engine.

Starting system		12R28SG		16V25SG		18V28SG	
		900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Engine speed	r/min (r/s)						
Air compressor capacity ¹³							
start with disengaged engine	dm ³ /s	4.1		4.1		4.1	
start with directly coupled engine	dm ³ /s	6.1		6.1		6.1	
Air pressure, maximum	Mpa	2.9		2.9		2.9	
minimum (alarm), IR type	Mpa	1.2		1.2		1.2	
minimum (alarm), GA type	Mpa	1.6		1.7		1.8	
Air receiver ¹⁴							
start with disengaged engine	dm ³	2 x 250		2 x 250		2 x 250	
start with directly coupled engine	dm ³	2 x 375		2 x 375		2 x 375	
Air consumption per start ¹⁰							
start with disengaged engine	dm ³	1100		1200		1300	
start with directly coupled engine	dm ³	2100		2500		3000	

13) Delivered free air.

14) Air receiver volume for minimum six starts.

Engine control system		12R28SG		16V28SG		18V28SG	
		900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)	900 (15.0)	1000 (16.7)
Engine speed	r/min (r/s)						
Power supply							
voltage, nominal	VDC	24		24		24	
voltage, minimum	VDC	21.6		21.6		21.6	
voltage, maximum	VDC	28.8		28.8		28.8	
current, maximum	A	25 ¹⁵		25 ¹⁵		25 ¹⁵	

15) Or according to wiring area.