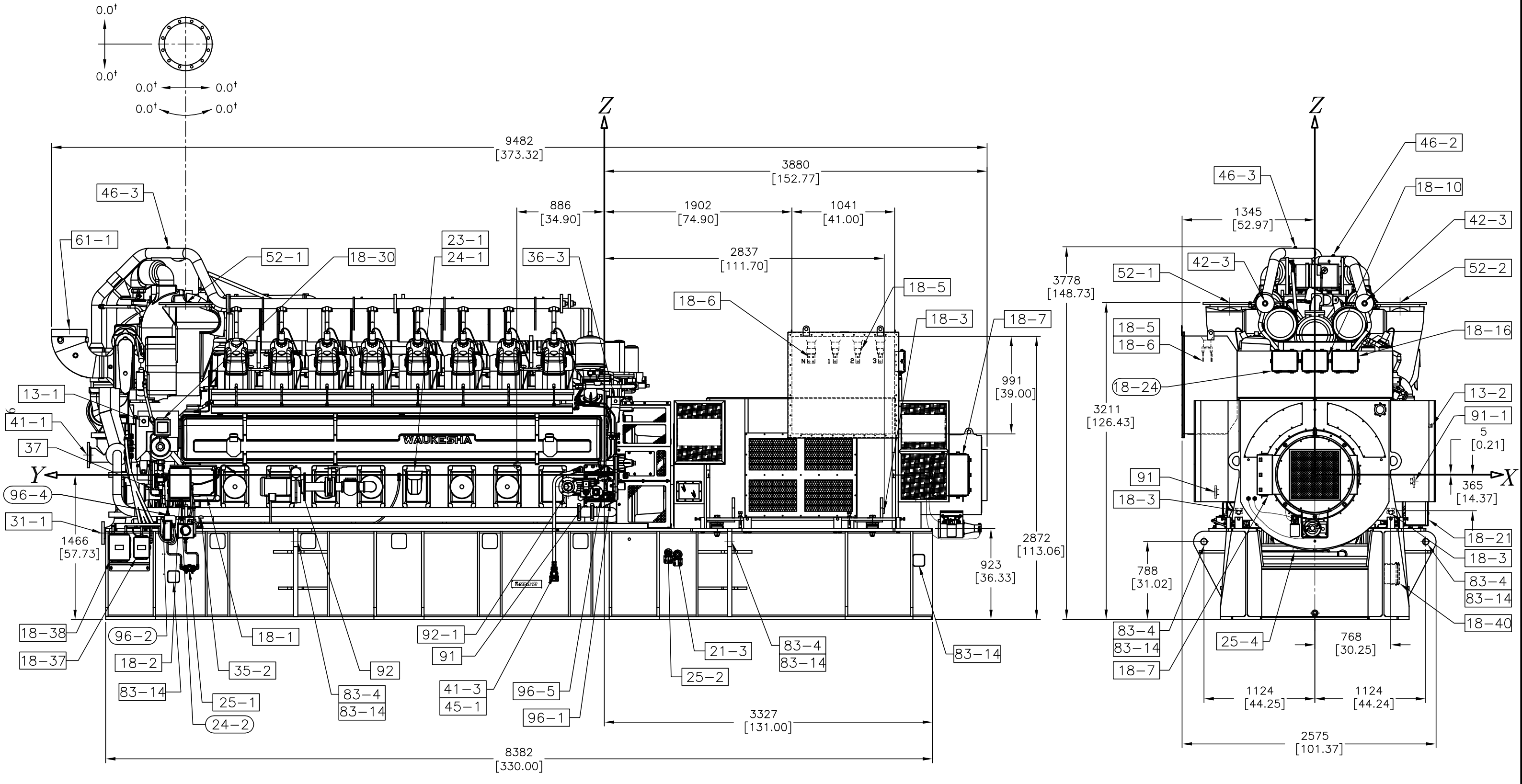


FORM PF180 (01–01–09)

DRESSER Waukesha

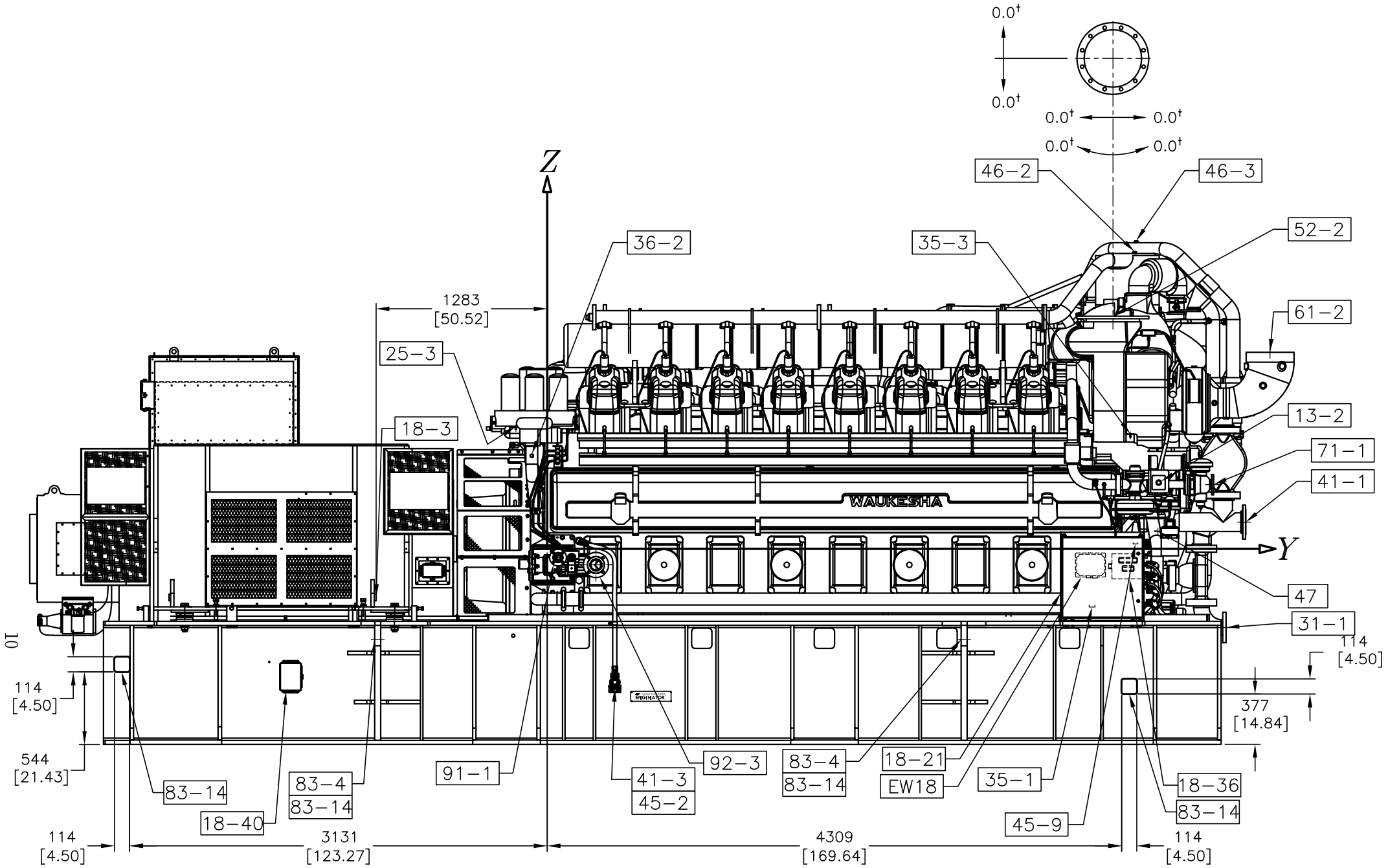
WAUKESHA POWER SYSTEMS

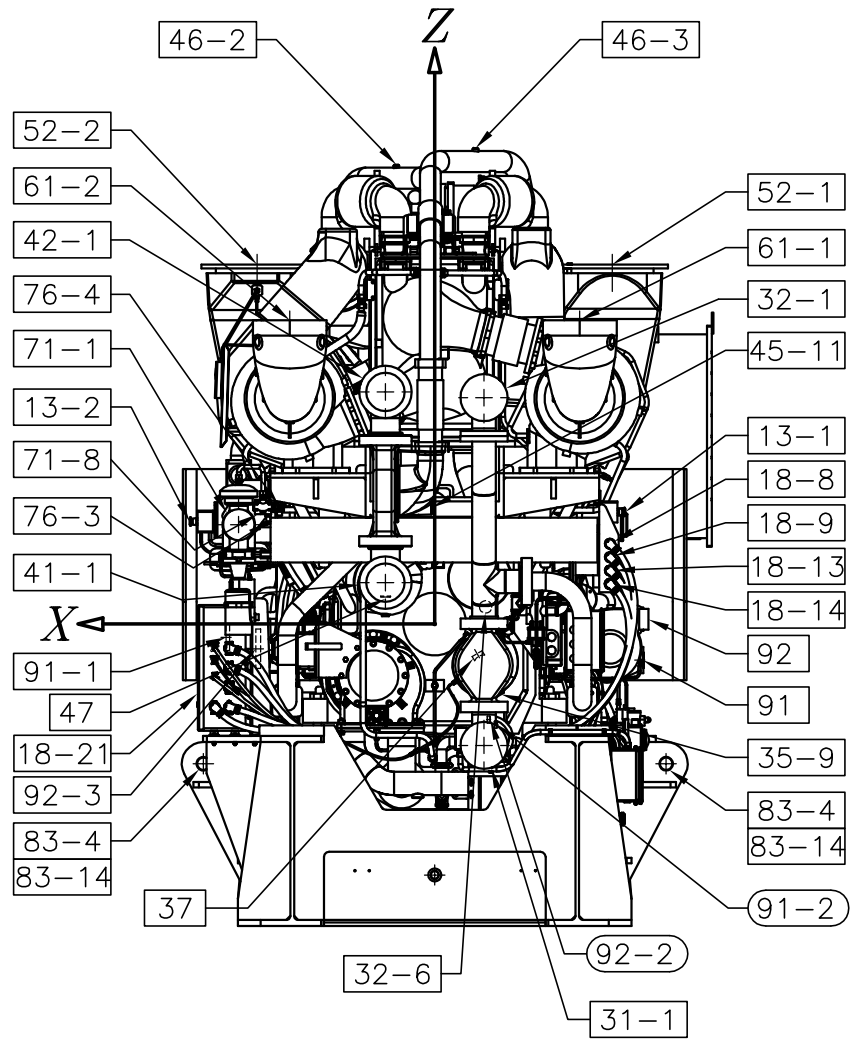
DR. AJS	12–18–13					
CH. DRO	12–19–13					
AP. BER	12–20–13	101	156000	12–13	SEE LAST SHEET	

16V275GL+
ENGINATOR® OUTLINE

B
SIZE

PC2181E
SHEET 1 OF 6





FORM PF180 (01–01–09)

DRESSER Waukesha

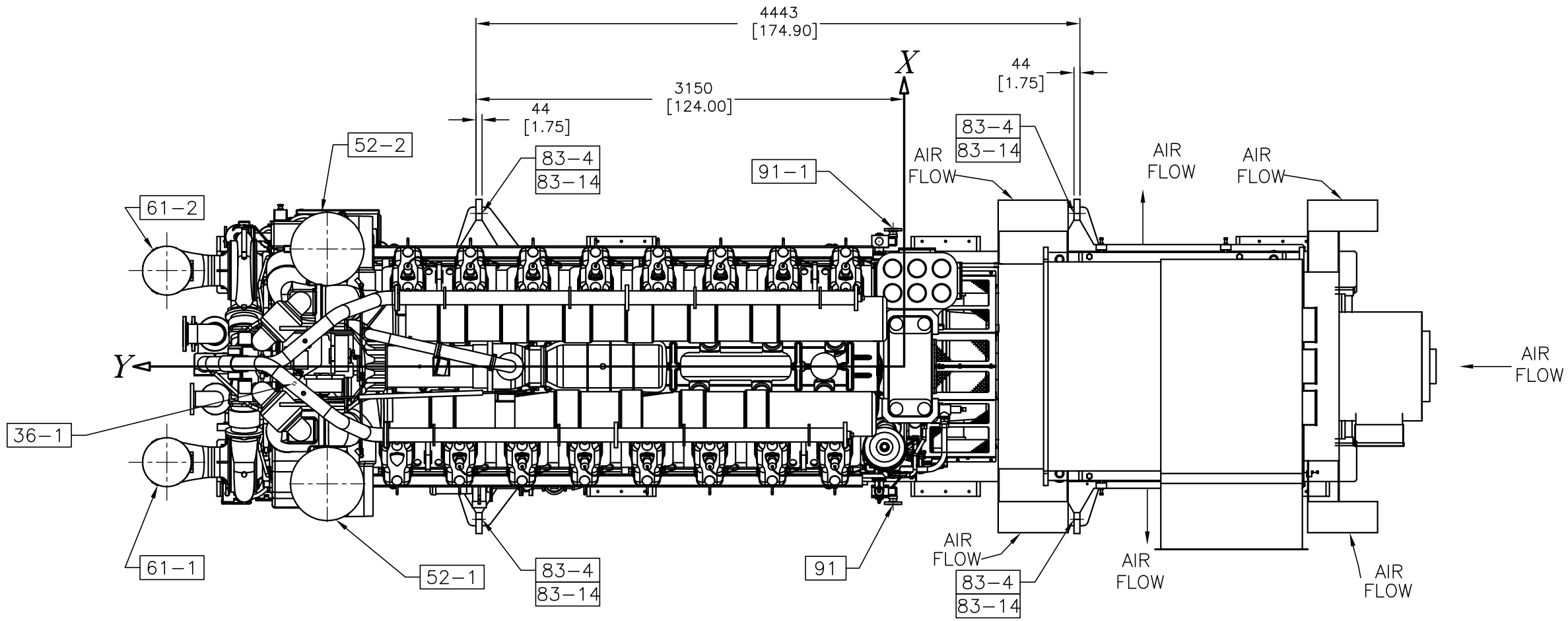
WAUKESHA POWER SYSTEMS

DR. AJS	12–18–13					
CH. DRO	12–19–13					
AP. BER	12–20–13	101	156000	12–13	SEE LAST SHEET	

16V275GL+
ENGINATOR® OUTLINE

B
SIZE

PC2181E
SHEET 2 OF 6



11

FORM PF180 (01–01–09)

DRESSER Waukesha

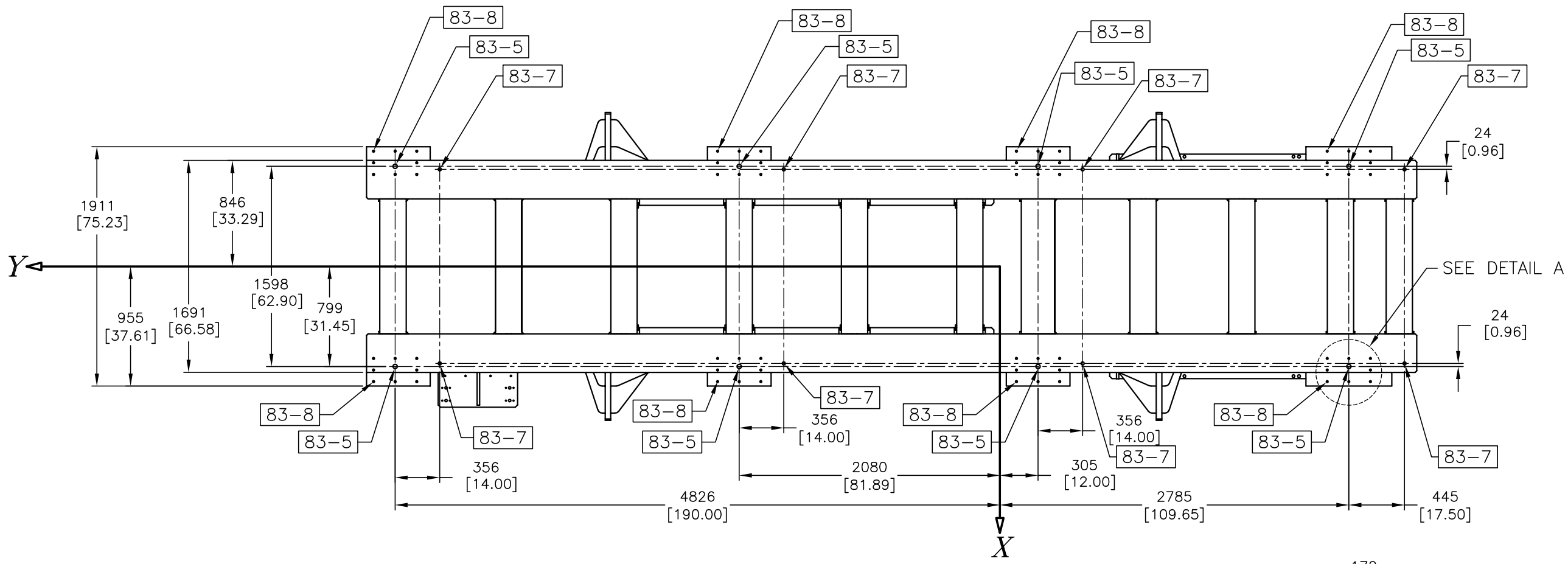
WAUKESHA POWER SYSTEMS

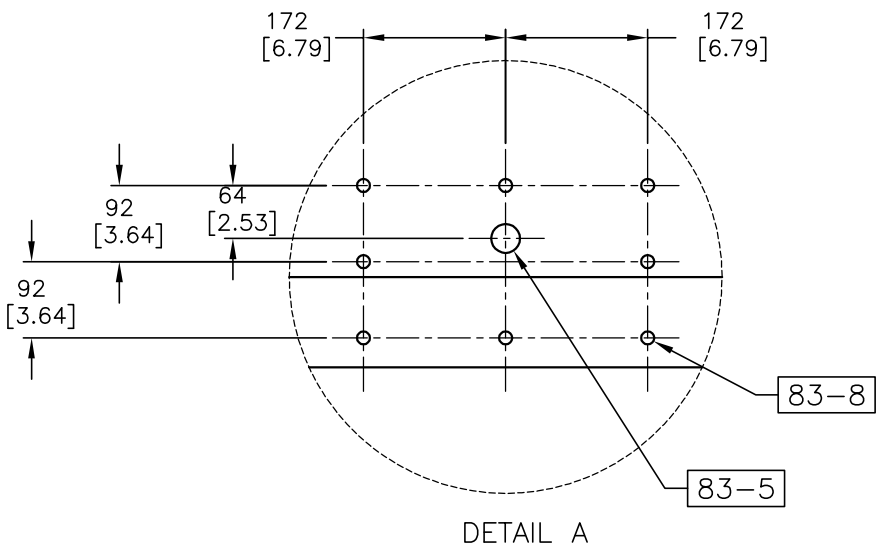
DR. AJS	12–18–13				
CH. DRO	12–19–13				
AP. BER	12–20–13	101	156000	12–13	SEE LAST SHEET

16V275GL+
ENGINATOR® OUTLINE

B
SIZE

PC2181E
SHEET 3 OF 6





DETAIL A

UNIT MOUNTING – PLAN VIEW

FORM PF180 (01–01–09)

DRESSER Waukesha WAUKESHA POWER SYSTEMS

DR. AJS	12–18–13					
CH. DRO	12–19–13					
AP. BER	12–20–13	101	156000	12–13	SEE LAST SHEET	

16V275GL+ ENGINATOR® OUTLINE

B SIZE

PC2181E SHEET 4 OF 6

CODE	CONNECTION	X	Y	Z	SIZE
13–1	E–STOP LEFT BANK	–926	4667	544	
13–2	E–STOP RIGHT BANK	1190	4587	497	
18–1	ELECTRONIC CONTROL UNIT (ECU)	–567	4168	–71	SERVICE INTERFACE CONNECTION (RS232)
18–2	POWER DISTRIBUTION JUNCTION BOX (TB7)	–730	4301	–81	
18–3	UNIT GROUNDING CONNECTION (4)	SEE SHEET 1 & 2			[.50–13 UNC–2B]
18–5	GENERATOR LEAD CONNECTION	SEE SHEET 1 & 6			2X ø14.27 [0.562] EACH
18–6	GENERATOR NEUTRAL CONNECTION	SEE SHEET 1 & 6			4X ø14.27 [0.562]
18–7	GENERATOR JUNCTION BOX (TB3P) EXCITER FIELD, PMG	SEE SHEET 1 & 2			
18–8	CUSTOMER INTERFACE HARNESS CONNECTION	–851	4751	390	
18–9	LOCAL CONTROL HARNESS CONNECTION	–851	4751	325	
18–10	GENERATOR JUNCTION BOX (TB3R) RTD's	SEE SHEET 1 & 2			
18–13	EXHAUST TEMP. DETECTOR INTERFACE HARNESS CONNECTION	–851	4751	260	
18–14	MAIN BEARING TEMP. DETECTOR INTERFACE HARNESS CONN.	–851	4751	195	
18–16	GENERATOR JUNCTION BOX (TB3S) SPACE HEATER	SEE SHEET 1 & 2			
18–21	I/O MODULE JUNCTION BOX (TB6)	1035	4166	–397	
18–30	DISPLAY, HMI (HUMAN MACHINE INTERFACE)	–860	4477	483	
18–36	NCM (NOx CONTROL MODULE)	595	4357	–131	
18–37	CRANKCASE BLOWER MOTOR JUNCTION BOX	–919	4690	–735	
18–38	PRELUBE MOTOR STARTER JUNCTION BOX	–931	4915	–735	
18–40	GEN. BEARING OIL COOLING PUMP MOTOR STARTER BOX	744	–1924	–959	
21–3	OIL HEATER CONNECTION	–801	–744	–807	[1.50"–11.5 NPT]
23–1	LUBE OIL DIPSTICK	–651	1883	–32	
24–1	LUBE OIL FILL	–642	1953	–25	[G 2.00" ISO]
25–1	LUBE OIL DRAIN (FRONT) AND OIL HEATER CONNECTION	–916	4205	–947	[1.50"–11.5 NPT]
25–2	LUBE OIL DRAIN (REAR OR LEFT SIDE)	–806	–649	–788	[1.00"–11.5 NPT]
25–3	LUBE OIL FILTER DRAIN	456	–235	910	[0.25"–18 NPT]
25–4	LUBE OIL COOLER PIPING DRAIN	–199	–145	–755	[1.00"–11.5 NPT]
31–1	AUXILIARY WATER INLET	–239	5093	–590	[4.00" ANSI 150#] FF FLANGE
32–1	AUXILIARY WATER OUTLET	–239	5249	1099	[4.00" ANSI 150#] FF FLANGE
32–6	AUXILIARY WATER OUTLET TO DRIVEN EQUIPMENT COOLERS	–247	4476	83	[2.00"–11.5 NPT]
35–1	AUXILIARY WATER COOLER DRAIN RIGHT BANK	716	4088	–437	[1.00"–11.5 NPT]
35–2	AUXILIARY WATER COOLER DRAIN LEFT BANK	–716	4088	–437	[1.00"–11.5 NPT]
35–3	AUXILIARY WATER DRAIN AFTERCOOLER	209	4374	862	[Rc 0.25" ISO] w/o VALVE
35–9	AUXILIARY WATER PUMP DRAIN	–321	4412	–342	M20 X 1.5
36–1	AUXILIARY WATER AIR VENT AFTERCOOLER	–125	4484	1831	[Rc 0.25" ISO] w/o VALVE
36–2	AUXILIARY WATER AIR VENT RIGHT BANK	769	–115	699	[0.50"–14 NPTF]
36–3	AUXILIARY WATER AIR VENT LEFT BANK	–400	–115	747	[0.50"–14 NPTF]

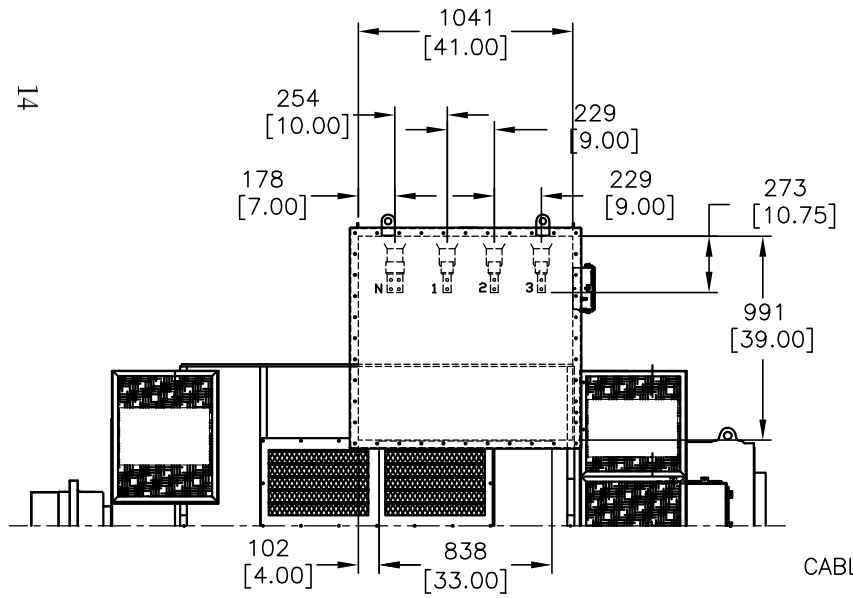
CODE	CONNECTION	X	Y	Z	SIZE
37	AUXILIARY WATER STATIC LINE CONNECTION	–206	4542	–144	[1.50"–11.5 NPT]
41–1	JACKET WATER INLET	239	5240	201	[5.00" ANSI 150#] RF FLANGE
41–3	JACKET COOLANT INLET FROM HEATER SYSTEM (TWO LOCATIONS, EITHER ON RIGHT BANK OR LEFT BANK)	874 –874	508 508	–1001 –1001	[1.50"–11.5 NPT]
42–1	JACKET WATER OUTLET	239	5305	1127	[5.00" ANSI 150#] RF FLANGE
42–3	JACKET COOLANT OUTLET TO HEATER SYSTEM LEFT BANK	–503	397	1737	[1.50"–11.5 NPT]
	JACKET COOLANT OUTLET TO HEATER SYSTEM RIGHT BANK	505	317	1737	[1.50"–11.5 NPT]
45–1	JACKET WATER CRANKCASE DRAIN LEFT BANK	–824	508	–1050	[1.50"–11.5 NPT]
45–2	JACKET WATER CRANKCASE DRAIN RIGHT BANK	824	508	–1050	[1.50"–11.5 NPT]
45–9	JACKET WATER PUMP DRAIN	239	4412	38	M20 X 1.5
45–11	JACKET WATER DRAIN AT THERMOSTAT	15	5070	565	[1.25"–11.5 NPTF]
46–2	JACKET WATER AIR VENT RIGHT BANK	188	4406	2225	[0.50"–14 NPTF]
46–3	JACKET WATER AIR VENT LEFT BANK	–197	4418	2306	[0.50"–14 NPTF]
47	JACKET WATER STATIC LINE CONNECTION	239	4581	135	[1.50"–11.5 NPT]
52–1	EXHAUST GAS OUTLET LEFT BANK	–864	4243	1745	[14" ANSI] FLAT FACE FLANGE
52–2	EXHAUST GAS OUTLET RIGHT BANK	864	4243	1745	[14" ANSI] FLAT FACE FLANGE
61–1	ENGINE AIR INLET TO TURBO LEFT BANK	–705	5423	1475	355.6 mm [14" ID]
61–2	ENGINE AIR INLET TO TURBO RIGHT BANK	705	5423	1475	355.6 mm [14" ID]
71–1	MAIN FUEL INLET	952	4999	483	[2.00" ANSI 150" FF] FLANGE
71–8	MAIN FUEL BLOCKING PILOT SOLENOID VALVE INLET	859	4807	534	[0.50"–14 NPTF]
76–3	MAIN FUEL BLOCKING PILOT SOLENOID VALVE VENT	808	4807	534	[0.50"–14 NPT] w/o MUFFLER
76–4	FUEL BLOCKING PILOT SOLENOID VALVE SOLENOID VENT	753	4934	569	[0.25"–18 NPT] w/o MUFFLER
83–4	UNIT LIFTING	SEE SHEET 1, 2 & 3			ø60 [2.38]
83–5	UNIT MOUNTING (SOLID BASE MOUNTING)	SEE SHEET 4			ø35 [ø1.38]
83–7	UNIT JACKING	SEE SHEET 4			[1.00–8 UNC]
83–8	UNIT MOUNTING HOLES (4 PLACES EACH SIDE) FOR OPTIONAL VIBRATION ISOLATOR MOUNTING	SEE SHEET 4			8X ø16 [ø0.63]
83–14	UNIT SHIPPING TIE–DOWN POINTS	SEE SHEET 1, 2 & 3			2X 127 X 127 [5.00 X 5.00] TUBE THROUGH BASE AND 4X ø60 [ø2.38]
91	STARTING AIR INLET TO STARTER LEFT BANK	–1013	82	–175	[1.50" ANSI 150#] RF FLANGE
91–1	STARTING AIR INLET TO STARTER RIGHT BANK	1013	82	–65	[1.50" ANSI 150#] RF FLANGE
92	CRANKCASE AIR VENT	–1038	3125	23	101.6 mm [4" OD]
92–1	STARTING AIR EXHAUST FROM STARTER LEFT BANK	–870	366	–120	[3.00" ANSI 150#] RF FLANGE
92–3	STARTING AIR EXHAUST FROM STARTER RIGHT BANK	870	366	–120	[3.00" ANSI 150#] RF FLANGE
96–1	STARTING AIR VENT LEFT BANK	–750	–63	–243	[0.25"–18 NPT] W/MUFFLER
96–5	STARTER SOLENOID AIR VENT LEFT BANK	–794	14	–217	[0.25"–18 NPT] W/MUFFLER
EW18	IPM–D (IGNITION POWER MODULE – DIAGNOSTIC)	623	4076	–121	

FORM PF180 (01–01–09)

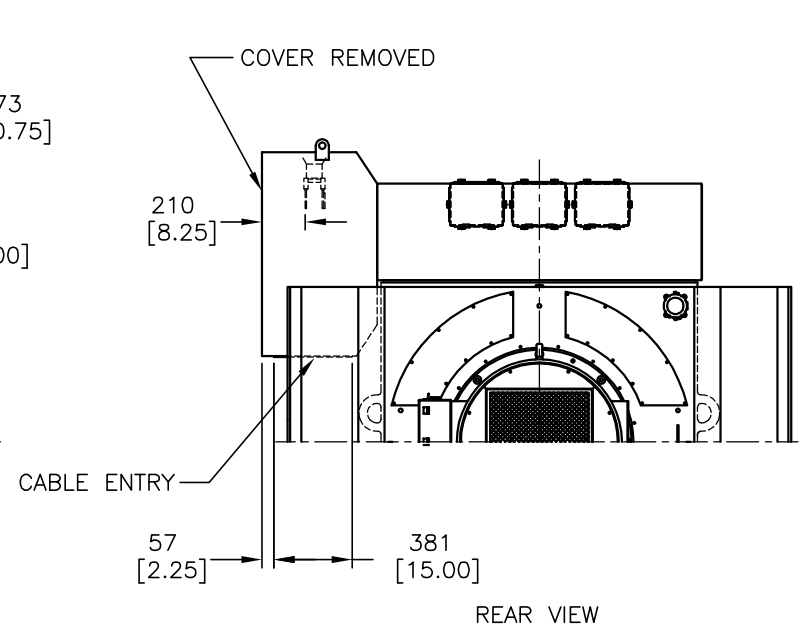
DRESSER Waukesha WAUKESHA POWER SYSTEMS

DR. AJS	12–18–13					16V275GL+ ENGINATOR® OUTLINE
CH. DRO	12–19–13					B SIZE
AP. BER	12–20–13	101	156000	12–13	SEE LAST SHEET	PC2181E SHEET 5 OF 6

OPTIONS						
CODE	CONNECTION	X	Y	Z	SIZE	OPTION CODE
18–24	GENERATOR JUNCTION BOX (TB3C) CURRENT TRANSFORMERS	–304	–3050	1154		
24–2	LUBE OIL FILL TO OIL LEVEL REGULATOR	–972	4281	–458	[0.50"–14 NPT]	CODE 5200C
91–2	PRELUBE AIR INLET	–305	4583	–489	[0.5"–14 NPT]	CODE 5040A
92–2	PRELUBE AIR EXHAUST	–270	4324	–464	[0.5"–14 NPT]	CODE 5040A
96–2	PRELUBE AIR VENT	–327	4441	–489	[0.50"–14 NPT] w/o MUFFLER	CODE 5040A
96–4	PRELUBE SOLENOID AIR VENT	–382	4412	–411	[0.25"–18 NPT] w/o MUFFLER	CODE 5040A



LEFT SIDE VIEW



REAR VIEW

TERMINAL STANDOFF

ENGINATOR® NOTES

A. REFERENCE DIMENSIONS: $X-Y$ PLANE – CENTERLINE OF CRANKSHAFT
$X-Z$ PLANE – REAR FACE OF CRANKCASE
$Y-Z$ PLANE – ENGINE CENTERLINE

B. SHIM UNDER BASE TO OBTAIN LEVEL MOUNTING (SOLID MOUNTING).
SHIM UNDER ISOLATORS TO OBTAIN LEVEL MOUNTING (ISOLATOR MOUNTING).

C. ALL CONNECTIONS TO UNIT MUST BE FLEXIBLE. SEE PC2102C FOR INSTALLATION INSTRUCTIONS.

D. GROUND UNIT. SIZE PER LOCAL ELECTRICAL CODE.

E. LUBE OIL CAPACITY – 1040 LITERS [275 GAL].

F. COOLANT CAPACITY – JACKET WATER 504 LITERS [133 GAL].
AUXILIARY WATER 152 LITERS [40 GAL].

G. EXHAUST SYSTEM BEYOND THIS POINT MUST SUPPORT ITS OWN WEIGHT AND THERMAL EXPANSION. MOUNTING ON ISOLATORS WILL REQUIRE ADDITIONAL FLEX CAPABILITIES. † MAXIMUM DISTORTION DUE TO CUSTOMERS PIPING. SEE S8242 EXHAUST SYSTEM INSTALLATION GUIDELINES.

H. DIMENSIONS ARE IN MILLIMETERS. DIMENSIONS IN [ ] ARE IN INCHES.

I. ⊕ ESTIMATED UNIT DRY CENTER OF GRAVITY

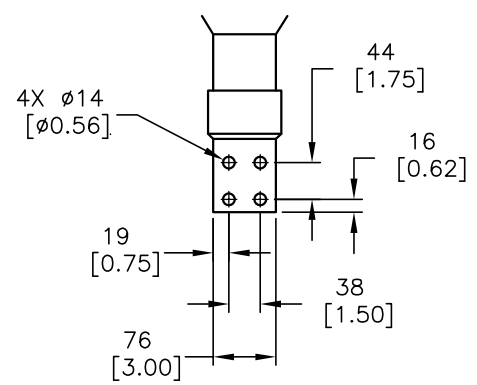
J. ESTIMATED UNIT DRY WEIGHT: 57,200 KG [126,100 LBS]

K. DUE TO CHOCK ADJUSTMENT, ALL VERTICAL DIMENSIONS CAN VARY ±6 [±.25].

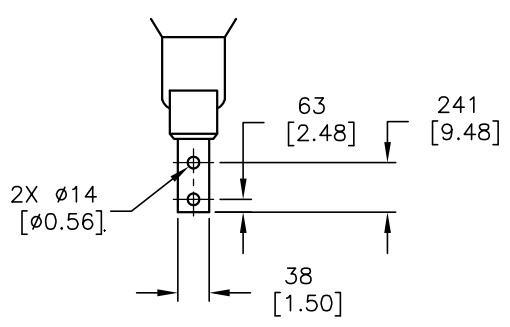
L. ALL GAS VENTED OR DISCHARGED FROM UNIT SHOULD BE PIPED TO A SAFE AREA TO MEET APPLICABLE CODES.

M. [XX–XX] INDICATES STANDARD EQUIPMENT/CONNECTION.
(XX–XX) INDICATES FACTORY OPTION EQUIPMENT/CONNECTION.

DETAIL 18-6



DETAIL 18-5



101	156000	12–13	RELEASE

FORM PF180 (01–01–09)

DRESSER Waukesha WAUKESHA POWER SYSTEMS

DR.	AJS	12–18–13
CH.	DRO	12–19–13
AP.	BER	12–20–13

16V275GL+ ENGINATOR® OUTLINE

B SIZE

PC2181E SHEET 6 OF 6

INDUSTRIAL ENGINES EQUIPPED WITH STANDARD OIL PUMP [1,2,3]

MODEL	FRONT DOWN DEGREES	REAR DOWN DEGREES	LEFT DOWN DEGREES	RIGHT DOWN DEGREES
VR155 [4]	15°	15°	15°	15°
VR155 [5]	10°	10°	15°	15°
VR220, VR330	15°	15°	15°	15°
F517	10°	12°	12°	12°
F11, F674	12°	12°	12°	12°
F817	10°	30°	30°	15°
H867	12°	12°	12°	12°
F18, H24	10°	8°	15°	15°
F18, H24 High Capacity	1°	1°	7°	7°
L36, P48,16V150LTD	7°	8°	10°	10°
L36, P48 High Capacity	1°	1°	6°	6°
16V150LTD	1°	1°	6°	6°
F1197	10°	30°	30°	25°
F1905	12°	15°	15°	15°
H2476, L3712	25°	3°	20°	5°
F2895, F2896, F3336, F3521, F3514, F3524 L5109, L5790, L5774, L5794, L5792, L6670 L7042, L7044	2°	2°	7°	7°
L5115	2°	1°	7°	7°
P8894, P9390	1°	2°	7°	7°
8LAT25/8LAT27	4°	4°	15°	15°
12V275GL/GL+	7°	7°	15°	15°
12VAT25/12VAT27 16V275GL/GL+ 16VAT27	5°	5°	15°	15°
12V220GL [6, 7]	1°	0°	0°	7°
18V220GL [6, 7]	1°	0°	0°	7°
APG2000 [7,8]	1°	0°	0°	0°
APG3000 [7,8]	1°	0°	0°	0°

NOTES:

1. Tabulated angle operation values are based on unidirectional tilt. For bidirectional tilt or allowable intermittent tilt consult Waukesha's Application Engineering Department.
2. Values apply to all model variations, i.e., G, GSI, GL, D, DS, DSI, unless otherwise noted.
3. Left and right are as viewed when facing the flywheel.
4. VR155 with D180180D oil pump and A220182E pickup tube.
5. VR155 with AH180180 oil pump and 44937 pickup float.
6. These values represent bare engine with oil leveler mounted in standard location. Contact Application Engineering for more information.

7. Per S-6977 or latest revision reference to left and right refer to A bank and B bank, respectively.
8. The ratings for the APG2000 and APG3000 Enginators are solid mounted only. For more information concerning allowable limits of equipment mounted on isolators, contact Application Engineering.

MARINE ENGINES EQUIPPED WITH MARINE OIL PAN AND OIL PUMP

MODEL	PITCH DEGREES FORE	PITCH DEGREES AFT	ATHWARTSHIPS ROLL DEGREES PERMANENT	ATHWARTSHIPS ROLL DEGREES TRANSIENT	NOTES
F674	15°	20°	12°	30°	1, 2, 3, 4
H867	25°	20°	12°	30°	1, 2, 3, 4
F2896, F3336	10°	10°	15°	45°	1, 2, 3, 5, 6
L5792, L6670	10°	10°	15°	45°	1, 2, 3, 5, 6, 7
L5794, 7044, 7042GSI S4	10°	10°	22.5°	22.5°	1, 3, 6, 7, 8
8LAT25	10°	10°	22.5°	30°	1, 3, 6
12V275GL/GL+ 12VAT25/12VAT27	10°	10°	22.5°	30°	1, 3, 6
16V275GL/GL+ 16VAT25/16VAT27	10°	10°	22.5°	30°	1, 3, 6

NOTES:
1. Tabulated angle operation values are based on unidirectional tilt.
2. Applies to all versions, i.e., DM, DSM, DSIM.
3. Pitch and roll from the vertical are listed for ship design and do not imply that the engine should be permanently installed at this angle without prior approval from WED.
4. Optional oil pans with greater pitch allowance are available.
5. 45° roll athwartships is allowed for one minute duration in five minutes. A sealed dipstick is required for 45° roll.
6. Engines have center sump oil pickup.
7. At permanent list athwartships of greater than 7° higher lube oil consumption may occur unless special provisions are made for draining the oil from the rocker arm covers.
8. Engines equipped with deep sump oil pan and DNV option code.

16V275GL/16V-AT27GL ENGINE SOUND PRESSURE LEVEL (ENGINE MIDDLE) [2, 3]											
Speed	BMEP	A-Scale dB(A)	Octave Band Frequency (Hz)								
			31.5	63	125	250	500	1000	2000	4000	8000
750	190	105.8	95	103	99	103	101	100	98	102	96
750	209	105.6	96	103	100	103	101	100	98	103	97
900	190	107.9	98	100	103	108	104	103	101	103	97
900	209	109.0	99	101	104	109	104	104	101	104	99
1000	48	101.4	87	92	93	98	97	96	94	93	91
1000	160	104.1	90	95	95	100	98	98	95	99	92
1000	220	110.5	100	104	105	109	106	106	103	105	101
ENGINE FRONT											
750	190	110.3	83	93	95	94	93	93	91	107	101
750	209	108.2	83	95	96	94	94	92	92	106	105
900	190	107.2	85	98	97	97	95	95	94	104	103
900	209	106	85	97	98	98	95	95	94	102	101
1000	48	101.7	83	91	95	98	96	97	94	94	90
1000	160	107.2	84	99	98	98	95	95	93	105	99
1000	220	108.4	86	100	101	99	97	97	94	104	102
ENGINE REAR											
750	190	102.7	84	91	94	96	95	98	95	97	89
750	209	102.6	84	92	94	96	96	98	95	96	90
900	190	103.8	80	91	99	101	97	100	96	96	90
900	209	104.1	82	93	100	101	97	100	97	96	90
1000	48	102.2	79	92	94	99	97	98	95	92	89
1000	160	104.5	86	96	98	100	98	100	97	97	90
1000	220	105.8	87	98	99	101	99	102	98	97	92

16V275GL/16V-AT27GL ENGINE SOUND PRESSURE LEVEL (OPEN EXHAUST STACK)[4]										
Speed	**BMEP**	**A-Scale dB(A)**	**Octave Band Frequency (Hz)**							
			31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
750	190	108.4	104	114	109	110	103	96	92	86	72
750	209	108.2	105	116	110	112	105	102	99	91	75
900	190	109.1	107	116	110	110	107	104	101	92	75
900	209	110.4	106	115	110	109	107	106	103	94	75
1000	48	96.6	110	111	106	99	86	86	87	79	57
1000	160	111.9	112	114	111	109	106	108	105	96	75
1000	220	115.3	110	113	111	108	108	111	110	100	80

16V275GL/16V-AT27GL ENGINE SOUND PRESSURE LEVEL (INDUCTION AIR)[1]										
Speed	**BMEP**	**A-Scale dB(A)**	**Octave Band Frequency (Hz)**							
			31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
750	190	100.6	90	93	91	81	92	94	92	97	86
750	209	101.1	91	93	92	82	92	95	92	97	87
900	190	100.9	92	91	92	83	92	94	92	97	87
900	209	101.3	94	92	93	85	92	95	92	97	89
1000	48	102.7	90	87	90	84	94	100	96	91	80
1000	160	99.8	93	91	90	82	91	93	91	96	85
1000	220	101.5	96	94	93	86	92	94	91	98	91

NOTES:

1. *Induction Air Noise was measured with Air Cleaners installed. Exhaust is piped outside of cell. Background noise is included in all measurements.*
2. *Data were taken with microphone at a location 1 meter (3.3 ft) from the side of the engine. Microphone height was at intake manifold level.*
3. *Due to variation between test cell conditions and final customer site conditions, such as room volume, wall hardness, background noise, and driven equipment, noise levels under site conditions may be different than those tabulated above.*
4. *Exhaust sound level taken at 45° (1m above and 1m to the left) to exhaust outlet, before the muffler.*
5. *Engine was operating at standard conditions when noise measurements were taken. Barometric Pressure 29.54" Hg. (100 kPa), Intake and Ambient air temperature 77°F (25°C), Ignition Timing 22° BTDC, Intercooler and Jacket coolant temperatures as per corresponding power rating(s).*
6. *For additional information, contact Waukesha's Application Engineering Department.*

ECO NO. 150339 03/09 See ECO for revision & rev history. REV. NO. 101

DRESSER Waukesha FORM M-1880 1/09	TITLE - 16V275GL/16V-AT27GL INDUCTION AIR, ENGINE AND BARE EXHAUST SOUND LEVEL DATA	DR. PAV 03-11-09 CH. GS 03-16-09 APP. RHN 03-17-09	S- 08205-6

Prelube and Postlube Requirements for Waukesha Engines

Prelubing is required on 275GL+, 16V150LTD and VHP engine models and is recommended on VGF engines. Prelube is required on VGF engines with frequent, more than twice per day, engine startups & shutdowns. Waukesha recommends several prelubing methods:

1. Prelube prior to each engine start. This works well on continuous duty applications. See table for prelube time, pressures, and flow rates.
2. Continuous prelube. VHP Series 2 engine models offer continuous prelubing as an option. This method works well on VHP Series 2 engines in standby applications where start-up is immediate. Continuous prelube is not available on VGF, VHP Series 4, and 275GL+ engines.
3. Prelube for a set time interval. This method works well for standby applications where engines must start immediately. Prelube is required on VHP engines for five minutes every hour. Prelube is recommended for standby VGF and 16V150LTD engines for 30 seconds every 30 minutes. For 275GL+ engines, prelube for 15 sec every hour.
4. Prelubing of the 220GL engines is controlled by the auxiliary system interface logic (Waukesha-supplied) prior to each start. This is a fixed time prelube sequence, with a pressure verification from the lube oil pressure sensors installed as part of ESM®. Prelube and postlube is included in standard engine configuration.

Engine Model	Prelube Time Duration	Pressure (In Header)	Flow Rate
275GL+	90 seconds before starting	25 psi[3] (172 kPa)	30 gpm[3] (113 lpm)
VHP AC Electric motor driven prelube pump 24 VDC Electric motor or Air/gas motor driven prelube pump.	Recommended: 3 minutes before starting or Required minimum: 30 seconds or until pressure is obtained	1-4.5 psi[1] (7-31 kPa)	7 gpm[1] (26 lpm)
VGF-Inline	30 seconds or until pressure is obtained	5 psi (34 kPa) maximum	1.75-3.5 gpm[2] (7-13 lpm)
VGF-Vee	30 seconds or until pressure is obtained	5 psi (34 kPa) maximum	3-6 gpm[2] (11-23 lpm)
16V150LTD	30 seconds or until pressure is obtained	25 psi (172 kPa)	1.75-3.5 gpm[2] (7-13 lpm)

[1]Based on 1200 RPM pump speed.
[2]Based on 1750 RPM pump speed.
[3]Based on 50°F oil

Note
– If an oil heater is applied, circulate oil to the sump not the header on all models except on VHP Series 2.
– When applying a prelube pump to VGF, allow approximately 7 psi loss due to pressure required to open the prelube back flow check valve and for piping losses and 2 – 3 psi on VHP for its check valve and piping losses.
– Pressures may drop in half with hot oil, flow is the determining factor.

Post Lubrication Requirements for Waukesha Engines

Waukesha recommends post lubrication for 275GL+, VGF and VHP engines, while the 16V150LTD engines require post lubrication. Post lubrication provides cooling to the turbocharger bearings and prevents carbon coking of the oil and extends turbocharger life. Post lube should be performed automatically upon main gas valve closure for five minutes after every engine shutdown. For the 275GL+ product line a post-lubrication time of 60 seconds is recommended. 220GL engines will be post-lubed by the auxiliary systems interface logic (Waukesha-supplied), in nonemergency shutdown conditions, to cool down components and protect the oil from overheating at critical locations

RECOMMENDED ALARM AND SHUTDOWN SETPOINTS

The following is a list of recommended "alarm" and "shutdown" setpoints by engine series for various engine operating parameters. These values can be used as a guide when designing protection or monitoring systems.

The **"alarm"** values shown are suggested values – they can be changed to suit a specific application or measurement device. By utilizing controls that simultaneously shut off the fuel supply and ignition system upon reaching a **"shutdown"** value, the potential for engine damage is reduced.

CAUTION: Alarm and shutdown values indicate deviation from designed operation and are not meant for continuous engine service. Engine and control systems must be designed to and operated at normal values. Disregard may result in engine damage.

Alarm and shutdown values are based on using dry natural gas of 900 BTU/cu.ft. (35.38 MJ/m^3 [25,V(0;101.325)]) Saturated Lower Heating Value (SLHV) as fuel. Refer to the *"Gaseous Fuel Specification for Waukesha Engines"* standard sheet, S-07884-7 or latest version, and the *"Lubricating Oil Recommendations for Waukesha Engines"* standard sheet, S-01015-30 or latest version, for typical changes to operating temperatures for jacket water and lube oil when running on landfill or digester gas fuels.

Refer to the most recent version of the *Gas Engine Price Book* to determine which shutdown devices are included as standard equipment with any specific engine model.

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ECO NO. 152888 08/10 SEE ECO FOR REV
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12V / 18V 220GL, APG2000/3000

JACKET WATER (HT) OUTLET TEMPERATURE:

Normal: 100° C (212° F)
Alarm: 103° C (217° F)[1]
Shutdown: 108° C (226° F)[1]

LUBE OIL HEADER TEMPERATURE:

Before January 2011	After January 2011
Normal: 63° - 75° C (145° - 167° F)	Normal: up to 80° C (176° F)
Alarm: 77° C (171° F)[1]	Alarm: 83° C (181° F)[1]
Shutdown: 80° C (176° F)[1]	Shutdown: 85° C (185° F)[1]

LUBE OIL HEADER PRESSURE:

	Idle	Rated Speed (1200 or 1500 rpm)
Normal:	4.2 bar (61 psi)	5.3 bar (77 psi)
Alarm:	2.3 bar (33 psi)[1]	4.0 bar (58 psi)[1]
Shutdown:	2.0 bar (29 psi)[1]	3.5 bar (51 psi)[1]

INTAKE MANIFOLD TEMPERATURE:

LT 45° C (113° F)
Normal: Up to 15° C (27° F) above design intercooler (LT) water inlet temperature.
Alarm: 15° C (27° F) above design intercooler (LT) water inlet temperature[1].
Shutdown: 20° C (36° F) above design intercooler (LT) water inlet temperature[1].

LT 55° C (131° F)
Normal: Up to 10° C (18° F) above design intercooler (LT) water inlet temperature.
Alarm: 10° C (18° F) above design intercooler (LT) water inlet temperature[1].
Shutdown: 15° C (27° F) above design intercooler (LT) water inlet temperature[1].

INTAKE MANIFOLD PRESSURE:

Contact Waukesha Sales Engineering.

OVERSPEED:

Shutdown: Not to exceed 7% over governed speed.[1]

FUEL PRESSURE:

Alarm: The minimum fuel pressure at the regulator (from Tech Data Book).
Shutdown: 85% of the alarm value.
Note: Required fuel pressure on the 220GL can also be affected by site derates. Contact WED application engineering for further information.

NOTES:

(1) Alarm and shutdown functionality provided by ESM.
(2) Alarm functionality provided by Auxiliary Systems Interface.

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JACKET WATER OUTLET TEMPERATURE:

Standard Cooling System:

Normal: 180 ° F (82 ° C) for continuous rating.
200 ° F (93 ° C) for intermittent rating.
Alarm: 10 ° F (5.5 ° C) above normal / design temperature.
Shutdown: 20 ° F (11 ° C) above normal / design temperature.

Elevated Temperature, Solid Water Cooling System (AT25GL/AT27GL ONLY):

Normal: 210 ° – 250 ° F (99 ° – 121 ° C) for solid water.
Alarm: 5 ° F (3 ° C) above normal / design operating temperature[1].
Shutdown: 10 ° F (5.5 ° C) above normal / design operating temperature[1].

LUBE OIL HEADER TEMPERATURE:

Normal: 172 ° F (78 ° C)
Alarm: 187 ° F (86 ° C)
Shutdown: 197 ° F (92 ° C)

LUBE OIL HEADER PRESSURE:

Normal: 60 – 65 psi (415 – 450 kPa)
Alarm: 40 psi (276 kPa)[3]
Shutdown: 35 psi (241 kPa)[3]

INTAKE MANIFOLD TEMPERATURE:

AT25GL Models

Normal: Up to 10 ° F (5.5 ° C) above design intercooler water inlet temperature.
Alarm: 20 ° F (11 ° C) above design intercooler water inlet temperature.
Shutdown: 30 ° F (17 ° C) above design intercooler water inlet temperature.

AT27GL/275GL Models

Normal: Up to 10 ° F (5.5 ° C) above design intercooler water inlet temperature.
Alarm: 15 ° F (11 ° C) above design intercooler water inlet temperature.
Shutdown: 20 ° F (17 ° C) above design intercooler water inlet temperature.

275GL+ Models

Normal: Up to 10 ° F (5.5 ° C) above design intercooler water inlet temperature.
Alarm: 160 ° F (71 ° C)
Shutdown: 165 ° F (74 ° C)

INTAKE MANIFOLD PRESSURE:

Contact Waukesha Sales Engineering.

MAIN BEARING TEMPERATURE:

Shutdown: 250 ° F (121 ° C)

OVERSPEED:

Shutdown: Not to exceed 10% over governed speed.

FUEL PRESSURE:

Alarm: The minimum fuel pressure at the regulator (from Tech Data Book).
Shutdown: 85% of the alarm value.

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