Application & Installation Guide

G3600 Gas Engines

LEBW5338-08

Foreword

This section of the Application and Installation Guide lists Technical Information for Cat® engines listed on the cover of this section. Additional engine systems, components and dynamics are addressed in other sections of this Application and Installation Guide.

Engine-specific information and data are available from a variety of sources. Refer to the Introduction section of this guide for additional references.

Systems and components described in this guide may not be available or applicable for every engine.

This guide provides technical data for the Cat 3600 gas engine models offered to the Oil & Gas Market. At the time of publishing, this data is correct; updates will be included periodically and this section republished. Dealers may use the Technical Marketing Information system for the most current data.

Table of Contents

1.0 General Data

System Description Metric (English)	G3606	G3608	G3612	G3616
Cylinder Bore – mm (in)	300 (11.8)	300 (11.8)	300 (11.8)	300 (11.8)
Stroke – mm (in)	300 (11.8)	300 (11.8)	300 (11.8)	300 (11.8)
Displacement/Cylinder – L (in^3)	21.2 (1294)	21.2 (1294)	21.2 (1294)	21.2 (1294)
Total Displacement – L (in^3)	127.2 (7762)	169.6 (10,350)	254.4 (15,528)	339.2 (20,704)
Rated Speed – rpm	700 to 1000	700 to 1000	700 to 1000	700 to 1000
Low Idle Speed – rpm	550	550	550	550
High Idle Speed – programmable rpm	700 to 1000	700 to 1000	700 to 1000	700 to 1000
Firing Order – CCW	1-5-3-6-2-4	1-6-2-5-8-3-7-4	1-12-9-4-5-8-11-2-3-10-7-6	1-2-5-6-3-4-9-10 -15-16-11-12-13-14-7-8
Crank Radius – mm (in)	150 (5.9)	150 (5.9)	150 (5.9)	150 (5.9)
Connecting Rod Length – mm (in)	600 (23.6)	600 (23.6)	600 (23.6)	600 (23.6)
Reciprocating Weight – N (lbs)	670.5 (150.7)	670.5 (150.7)	670.5 (150.7)	670.5 (150.7)
Dry weight – kg (lb)	15,676 (34,560)	19,000 (41,888)	25,084 (55,300)	29,892 (65,900)

Table 1.1.

2.0 Combustion Air System

System Description Metric (English)	G3606	G3608	G3612	G3616
Air Temperature @ Air Cleaner, maximum – °C (°F)	45 (113)	45 (113)	45 (113)	45 (113)
High Inlet Air Temperature (low load) 54°C SCAC, warning – °C (°F)	82 (180)	82 (180)	82 (180)	82 (180)
High Inlet Air Temperature (high load) 54°C SCAC, warning – °C (°F)	72 (162)	72 (162)	72 (162)	72 (162)
High Inlet Air Temperature (low load) 32°C SCAC, warning – °C (°F)	72 (162)	72 (162)	72 (162)	72 (162)
High Inlet Air Temperature (high load) 32°C SCAC, warning – °C (°F)	57 (135)	57 (135)	57 (135)	57 (135)
Air Inlet Restriction, new/maximum mm H_2O (in H_2O)	125/380 (5/15)	125/380 (5/15)	125/380 (5/15)	125/380 (5/15)
Aftercooler Pressure Difference @ 100% Load, clean state – kPa (psi)	3.4 (0.5)	3.4 (0.5)	3.4 (0.5)	3.4 (0.5)
Air Cleaner Style – Standard Duty without Precleaner*	1-Double Element Housing	1-Double Element Housing	1-Triple Element Housing	1-Double Element Housing
Air Cleaner Style – Heavy Duty with Precleaner*	1-Triple Element Housing	1-Triple Element Housing	1-Triple Element Housing	1-Triple Element Housing
Air Inlet Restriction, maximum limit with dirty air cleaner elements – kPa (in H_2O)	3.7 (15)	3.7 (15)	3.7 (15)	3.7 (15)
Air Inlet Restriction, design guideline for new clean system – kPa (in H_2O)	1.3 (5)	1.3 (5)	1.3 (5)	1.3 (5)
Aftercooler Pressure Difference @ 100% Load, clean state – kPa (psi)	3.4 (0.5)	3.4 (0.5)	3.4 (0.5)	3.4 (0.5)

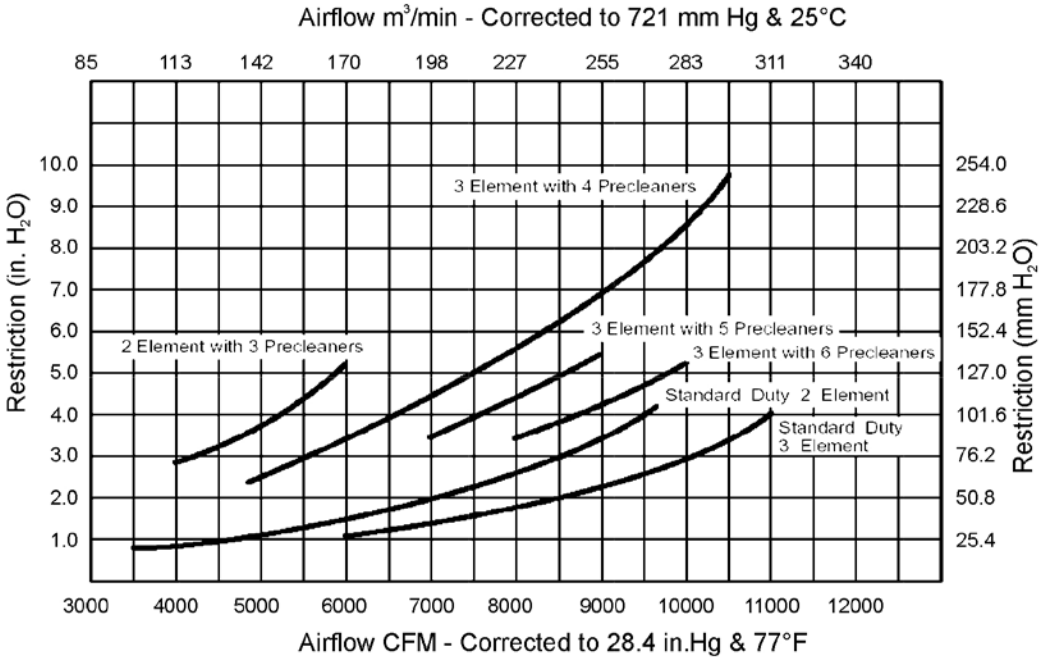
*See Price List for full descriptions of latest offerings.

Clean filters cause little air restriction. The addition of precleaners before the air cleaner extends the filter service period. A flow restriction of 0.25 to 0.75 kPa (1 to 3 in).

Air Inlet Ducting Design Guidelines:

- Keep Flow Restriction of the air ducting below 0.5 kPa (2 in H_2O)
- Ducting should have welded seam piping or seamless piping to minimize the flow restriction. PVC piping is recommended.
- Ducting must withstand a minimum vacuum of 12.5 kPa (50 in H_2O) for structural integrity.

Table 2.1.

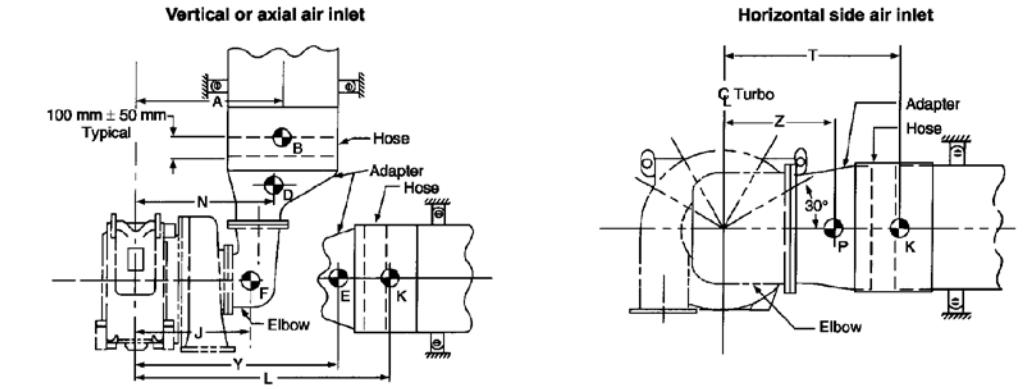


Maximum allowable total inlet restriction should not exceed 3.7 kPa (15 in. H_2O) with dirty air cleaner elements and 1.2 kPa (5 in. H_2O) with initial clean elements.

Air cleaner housings supplied by Caterpillar are provided with an indicator set for a maximum restriction of 3.7 kPa (15 in. H_2O).

Figure 2.1 – Air Cleaner Performance Curves

2.1 Loading on Turbocharger Inlet, Maximum



D, F and E = Adapter Weight
B and K = 1/2 Hose Weight
Movement (Vertical Inlet):
M_V = JF + ND + AB
Movement (Axial Inlet):
M_A = YE + LK

Allowable Maximum Moment = 294 N•m

With Caterpillar Supplied Hardware

J = 548 mm D = 13 kg
Y = 705 mm E = 14 kg
N = 625 mm F = 16 kg
L = 945 mm B = 3 kg/2
A = 700 mm K = 3 kg/2

M_V = [0.548(16) + 0.625(13) + 0.700(1.5)] X 9.6 m/s²
M_V = 176 N•m which is less than 294 N•m ∴ OK
M_A = [0.705(14) + 0.945(1.5)] X 9.8 m/s² =
111 N•m < 294 N•m ∴ OK

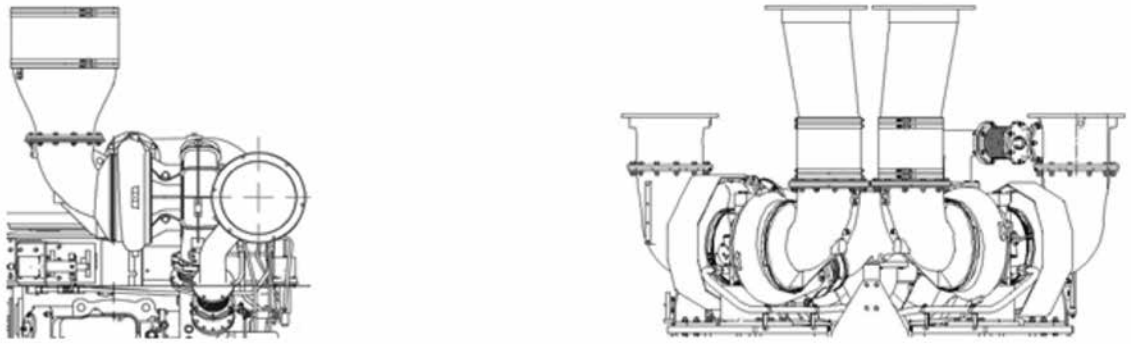
P = Adapter Weight
K = 1/2 Hose Weight
MS = ZP + TK 68 N•m

With Caterpillar Supplied Hardware

Z = 420 mm P = 13 kg
T = 500 mm K = 3 kg/2

M_S = [0.420(13) + 0.500(3/2)] X 9.8 m/s² =
61 N•m < 68 N•m ∴ OK

Figure 2.2– Maximum Loads for ABB VTC Turbocharger Intake



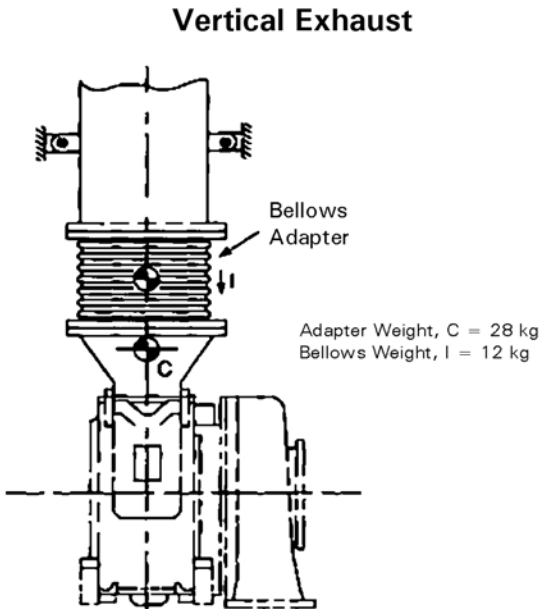
Maximum allowable weight on turbocharger inlets is price list adapters shown, up to the provided flexible connection. All pieces added beyond the flexible connection must be self-supporting.

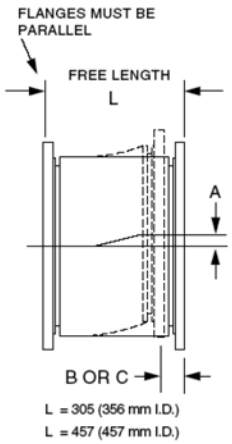
Figure 2.3 – Maximum Loads for ABB TPS Turbocharger Intake

3.0 Exhaust Gas System

System Description Metric (English)	G3606	G3608	G3612	G3616
Exhaust Outlet Connection I.D. – mm (in)	Single 350 (13.8)	Single 350 (13.8)	Dual 350 (13.8)	Dual 350 (13.8)
Exhaust System Backpressure, maximum – mm H_2O (in H_2O)	305 (12)	305 (12)	305 (12)	305 (12)
Loading on Turbocharger Outlet, maximum	The bellows and adapter supplied by Caterpillar account for the maximum allowable loading on the turbocharger. All other external piping must be self-supporting.			

Table 3.1.





Operational Limitations Of Bellows - Type Flexible Exhaust Fittings

A Max. Offset Between Flanges		B Max. Compression From Free Length		C Max. Extension From Free Length	
356 mm (14 in.) I.D.					
mm	in.	mm	in.	mm	in.
0	0	99.06	3.90	52.32	2.06
22.20	.87	0	0	0	0
Spring rate of bellows = 55.8 kN / m (318.7 lb/in.) : Axial 163.9 kN / m (936.0 lb/in.) : Lateral					
457 mm (18 in.) I.D.					
mm	in.	mm	in.	mm	in.
0	0	100.00	3.94	50.00	1.97
30.00	1.18	0	0	0	0
Spring rate of bellows = 13.37 kN / m (76.4 lb/in.) : Axial 25.7 kN / m (146.8 lb/in.) : Lateral					
Lagging or insulation must not restrain flexibility of bellows.					

Figure 3.1 – Loading on Turbocharger Outlet, Maximum.

4.0 Fuel System

System Description Metric (English)	G3606	G3608	G3612	G3616
Fuel Pressure, nominal – kPa (psi)	310 ±14 (45 ±2)	310 ±14 (45 ±2)	310 ±14 (45 ±2)	310 ±14 (45 ±2)

Table 4.1.

4.1 Gas Shutoff Valve (GSOV) Solenoid Pressure Ratings

Cat Part Number 103-0692 (Threaded Connection)	
Nominal – kPa (psi)	242 (35)
Maximum – kPa (psi)	345 (50)
Proof – kPa (psi)	690 (100)
Burst – kPa (psi)	3450 (500)
Cat Part Number 489-1434 (Flange Connection)	
Nominal – kPa (psi)	690 (100)
Maximum – kPa (psi)	690 (100)
Proof – kPa (psi)	758 (110)
Burst – kPa (psi)	3450 (500)

Table 4.2.

5.0 Lubricating Oil System

System Description Metric (English)	G3606	G3608	G3612	G3616
Engine Oil Pressure, nominal – kPa (psi)	430 (62)	430 (62)	430 (62)	430 (62)
Low Engine Oil Pressure, warning (0–600 rpm) – kPa (psi)	175 (25)	175 (25)	175 (25)	175 (25)
Low Engine Oil Pressure, warning (600–1000 rpm) – kPa (psi)	400 (58)	400 (58)	400 (58)	400 (58)
Low Engine Oil Pressure, shutdown (0–600 rpm) – kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)
Low Engine Oil Pressure, shutdown (600–1000 rpm) – kPa (psi)	350 (51)	350 (51)	350 (51)	350 (51)
Engine Oil Temperature, nominal – °C (°F)	83 (181)	83 (181)	83 (181)	83 (181)
High Engine Oil Temperature, warning – °C (°F)	88 (190)	88 (190)	88 (190)	88 (190)
High Engine Oil Temperature, shutdown – °C (°F)	90 (194)	90 (194)	90 (194)	90 (194)
Prelube Pump Capacity, intermittent (pneumatic) – Lpm (gpm)	76 (20)	76 (20)	76 (20)	76 (20)
Prelube Pump Capacity, intermittent (electric) – Lpm (gpm)	50-65 (13-17)	50-65 (13-17)	50-65 (13-17)	50-65 (13-17)
Oil Sump Capacity – L (gal)	708 (187)	912 (241)	1030 (272)	1329 (351)
BSOC @ 100% Load, typical – g/bkW-hr (lb/bhp-hr)	0.304 (0.000521)	0.304 (0.000521)	0.304 (0.000521)	0.304 (0.000521)
Oil Filter Differential Pressure, warning – kPa (psi)	100 (15)	104 (15)	104 (15)	104 (15)
Filter Differential Pressure, shutdown – kPa (psi)	300 (45)	300 (45)	300 (45)	300 (45)
Emergency Oil Pump Flow Rate – Lpm (gpm)	750 (198)	770 (203)	890 (235)	1200 (317)

Table 5.1

System Description Metric (English)	G3606	G3608	G3612	G3616
Main Oil Pump Flow Rate @ 900 rpm[1] low speed pump[2] – Lpm (gpm)	1260 (333)	1470 (388)	1630 (430)	2050 (540)
Main Oil Pump Flow Rate @ 900 rpm[1] high speed pump[3] – Lpm (gpm)	1000 (263)	1260 (333)	1470 (388)	1630 (430)
Main Oil Pump Flow Rate @ 1000 rpm[1] low speed pump[2] – Lpm (gpm)	1400 (370)	1630 (431)	1810 (477)	2280 (600)
Main Oil Pump Flow Rate @ 1000 rpm[1] high speed pump[3] – Lpm (gpm)	1100 (293)	1400 (370)	1630 (431)	1810 (477)

[1] Engine speed
[2] Low speed pumps are used for variable speed applications ranging from 800 to 1000 rpm.
[3] High speed pumps are used for constant speed applications at 900 or 1000 rpm.

Table 5.2

5.1 Prelube Solenoid Pressure Ratings

Cat Part Number 103-0692	
Nominal – kPa (psi)	242 (35)
Maximum – kPa (psi)	345 (50)
Proof – kPa (psi)	690 (100)
Burst – kPa (psi)	3450 (500)

Table 5.3

5.2 Prelube Motor Air Consumption

Cat Part Number 322-2734 TDI T303 Turbine Motor			
Methane Gas		Compressed Air	
Inlet Pressure (PSIG)	Flow (Scfm)	Inlet Pressure (PSIG)	Flow (Scfm)
150	365	150	300
120	300	120	239
90	235	90	185
60	165	60	130

Table 5.4

Continuous Tilt Angle Capability	Marine Propulsion						Marine Auxiliary
Tilt Criteria	+/- 10° Trim & +/- 22.5° List (any combination)						+/- 10° Trim & +/- 22.5° List (any combination)
	Installation Angle / Rear Down (Degrees)						Level Installation
Engine Model	0	1	2	3	4	5	
3606	X	X	X	X	X	X	X
3608	X	X	X	S	S	S	X
3612 (Standard Pan)	X	X	X	X	X	X	X
3612 (Shallow Pan)	Y	Y	Y	Y	Y	D	Y
3616	X	X	X	X	S	S	X

X = Standard Sump, capable of meeting the indicated tilt criteria.

Y = Optional Sump for 3612, capable of meeting the indicated tilt criteria.

S = Requires increased depth oil sump (special order)

D = Requires Dry Sump option to achieve the indicated tilt criteria.

Figure 5.1 – Tilt Angle Capability

Note: If the sump engine is installed at >0° tilt, it will reduce oil capacity and reduce the oil change interval. Consult Caterpillar for specific details.

6.0 Cooling Water System

6.1 Block Cooling

System Description Metric (English)	G3606	G3608	G3612	G3616
High Engine Coolant Temperature, warning (88°C Jacket Water) – °C (°F)	93 (199)	93 (199)	93 (199)	93 (199)
High Engine Coolant Temperature, shutdown (88°C Jacket Water) – °C (°F)	98 (208)	98 (208)	98 (208)	98 (208)
High Engine Coolant Temperature, warning (99°C Jacket Water) – °C (°F)	105 (221)	105 (221)	105 (221)	105 (221)
High Engine Coolant Temperature, shutdown (99°C Jacket Water) – °C (°F)	110 (230)	110 (230)	110 (230)	110 (230)
Temperature Rise, design – °C (°F)	4.5 (8)	4.5 (8)	4.5 (8)	4.5 (8)
Temperature Rise, maximum – °C (°F)	6 (11)	6 (11)	6 (11)	6 (11)
Low Engine Coolant Temperature, warning – °C (°F)	22 (77)	22 (77)	22 (77)	22 (77)
Minimum Inlet Coolant Temperature – °C (°F)	0 (32)	0 (32)	0 (32)	0 (32)
Maximum Combined Static and Dynamic Pressure Limit, engine block – kPa (psi)	461 (67)	461 (67)	461 (67)	461 (67)
Maximum Combined Static and Dynamic Pressure Limit, pump inlet – kPa (psi)	145 (21)	145 (21)	145 (21)	145 (21)
Minimum Static Pressure, pump inlet – kPa (psi)	21 (3)	21 (3)	21 (3)	21 (3)
Minimum Dynamic Pressure, pump inlet – kPa (psi)	32 (4.7)	32 (4.7)	32 (4.7)	32 (4.7)
Maximum Combined Static and Dynamic Pressure Limit, expansion tank – kPa (psi)	150 (22)	150 (22)	150 (22)	150 (22)
Maximum Combined Static and Dynamic Pressure Limit, expansion tank pressure cap – kPa (psi)	49 (7)	49 (7)	49 (7)	49 (7)
High Inlet Jacket Water Pressure, shutdown – kPa (psi)	462 (67)	462 (67)	462 (67)	462 (67)
Low Outlet Jacket Water Pressure, shutdown – kPa (psi)	138 (20)	138 (20)	138 (20)	138 (20)
Maximum Flow Limit, cylinder block – Lpm (gpm)	1600 (422)	1600 (422)	3000 (794)	3000 (794)
Jacket Water Circuit Engine Volume* – L (gal) *Does NOT include expansion tank volume.	340 (90)	470 (124)	670 (177)	900 (238)

Table 6.1

6.2 Cooling System Temperature Rise, Recommended/Maximum

System Description Metric (English)	G3606	G3608	G3612	G3616
Aftercooler – Oil Cooler, 32°C SCAC – °C (°F)	7/12 (13/22)	9/12 (16/22)	7/12 (13/22)	9/12 (16/22)
Aftercooler – Oil Cooler, 54°C SCAC – °C (°F)	6/12 (11/22)	8/12 (15/22)	6/12 (11/22)	8/12 (15/22)
Jacket Water – °C (°F)	4.5/6 (8/11)	4.5/6 (8/11)	4.5/6 (8/11)	4.5/6 (8/11)

Table 6.2

6.3 Cooling System Temperature Limits

System Description Metric (English)	G3606	G3608	G3612	G3616
Aftercooler – Single-Stage, max – °C (°F)	70 (158)	70 (158)	70 (158)	70 (158)
Aftercooler – Two-Stage, 1st stage, max – °C (°F)	95 (203)	95 (203)	95 (203)	95 (203)
Aftercooler – Two-Stage, 2nd stage, max – °C (°F)	54 (130)	54 (130)	54 (130)	54 (130)
Oil Cooler – Two Bundle, max °C (°F)	54 (130)	54 (130)	32 (90)	32 (90)
Oil Cooler – Three Bundle, max – °C (°F)	60 (140)	60 (140)	60 (140)	60 (140)
Aftercooler – Inlet, min – °C (°F)	25 (77)	25 (77)	25 (77)	25 (77)
Oil Cooler – Inlet, min – °C (°F)	0 (32)	0 (32)	0 (32)	0 (32)
Jacket Water – Inlet, min – °C (°F)	0 (32)	0 (32)	0 (32)	0 (32)
Lubricating Oil, max-to-engine – °C (°F)	85 (185)	85 (185)	85 (185)	85 (185)

Table 6.3

6.4 Cooling System Inlet Pressures

System Description Metric (English)	G3606	G3608	G3612	G3616
Aftercooler – Oil Cooler Operating	248-330	248-330	248-330	248-330
Two-Stage Aftercooler Operating Pressure, each stage – kPa (psi)	up to 1000 (145)	up to 1000 (145)	up to 1000 (145)	up to 1000 (145)
Jacket Water 88°C Operating Pressure Range – kPa (psi)	225-350 (33-51)	225-350 (33-51)	225-350 (33-51)	225-350 (33-51)
Jacket Water 110°C Operating Pressure Range – kPa (psi)	300-400 (44-58)	300-400 (44-58)	300-400 (44-58)	300-400 (44-58)
Jacket Water 127°C Operating Pressure Range – kPa (psi)	300-460 (44-67)	300-460 (44-67)	300-460 (44-67)	300-460 (44-67)
Engine Block Max Pressure – kPa (psi)	461 (67)	461 (67)	461 (67)	461 (67)
Oil Cooler Max Pressure – kPa (psi)	1000 (145)	1000 (145)	1000 (145)	1000 (145)
Expansion Tank from Factory Pressure – kPa (psi) Max	150 (22)	150 (22)	150 (22)	150 (22)

Table 6.4

6.5 Radiator Cap Pressure Settings

System Description Metric (English)	G3606	G3608	G3612	G3616
Standard Jacket Water System, 88-99°C (190-210°F) maximum cap pressure – kPa (psi)	28-48 (4-7)	28-48 (4-7)	28-48 (4-7)	28-48 (4-7)
Landfill/Corrosive JW System, 110°C (230°F) maximum cap pressure – kPa (psi)	131-151 (19-22)	131-151 (19-22)	131-151 (19-22)	131-151 (19-22)
Cogeneration JW system, 127°C (260°F) relief valve pressure – kPa (psi)	196 (28.5)	196 (28.5)	196 (28.5)	196 (28.5)

Table 6.5

Note: All pressure values shown are gauge pressure.

6.6 Cooling System Flow Limits

System Description Metric (English)	G3606	G3608	G3612	G3616
Aftercooler – Oil Cooler (Standard Config), max – Lpm (gpm)	1800 (476)	1800 (476)	2475 (655)	2475 (655)
Aftercooler – Single-Stage, max – Lpm (gpm)	800 (212)	800 (212)	1475 (390)	1475 (390)
Aftercooler – Two-Stage (Each Stage), max – Lpm (gpm)	1000 (265)	1000 (265)	1000 (265)	1000 (265)
Oil Cooler (Shell & Tube), max – °C (°F)	1000 (265)	1000 (265)	1000 (265)	1000 (265)
Jacket Water, max – Lpm (gpm)	1600 (422)	1600 (422)	3000 (794)	3000 (794)

Table 6.6

6.7 Aftercooling/Oil Cooling

System Description Metric (English)	G3606	G3608	G3612	G3616
Inlet Temperature, nominal (54°C SCAC) – °C (°F)	54 (129)	54 (129)	54 (129)	54 (129)
Inlet Temperature, nominal (32°C SCAC) – °C (°F)	32 (90)	32 (90)	32 (90)	32 (90)
Temperature Rise, design – °C (°F)	10 (18)	8 (14)	9 (16)	7 (13)
Temperature Rise, maximum – °C (°F)	12 (22)	12 (22)	12 (22)	12 (22)
Minimum Inlet Coolant Temperature – °C (°F)	25 (77)	25 (77)	25 (77)	25 (77)
Maximum Combined Static and Dynamic Pressure Limit, aftercooler – kPa (psi)	460 (67)	460 (67)	460 (67)	330 (48)
Maximum Combined Static and Dynamic Pressure Limit, oil cooler – shell and tube – kPa (psi)	1000 (145)	1000 (145)	1000 (145)	1000 (145)
Minimum Static Pressure, pump inlet – kPa (psi)	21 (3)	21 (3)	21 (3)	21 (3)
Minimum Dynamic Pressure, pump inlet – kPa (psi)	19 (2.8)	19 (2.8)	19 (2.8)	19 (2.8)
Maximum Flow Limit, aftercooler – Lpm (gpm)	1475 (390)	1475 (390)	800 (212)	800 (212)
Maximum Flow Limit, oil cooler – shell and tube – Lpm (gpm)	1000 (265)	1000 (265)	1000 (265)	1000 (265)
Aftercooler/Oil Cooler Circuit Engine Volume – L (gal)	72 (19)	64 (17)	60 (16)	60 (16)

Table 6.7

7.0 Starting Air System

System Description Metric (English)	G3606	G3608	G3612	G3616
Low Air Pressure, alarm – kPa (psi)	750 (109)	750 (109)	750 (109)	750 (109)
Breakaway Torque* – N•m (ft lb)	2700 (1990)	3400 (2510)	5000 (3690)	6000 (4430)
Cranking Torque** at 10°C (50°F) – N•m (ft lb)	2250 (1660)	3000 (2210)	4500 (3320)	5500 (4060)
Cranking Torque** at 25°C (77°F) – N•m (ft lb)	1750 (1290)	2250 (1660)	3700 (2730)	4250 (3130)
Cranking Torque** at 80°C (176°F) – N•m (ft lb)	800 (590)	1000 (740)	1800 (1330)	2250 (1660)

*Breakaway torque is independent of oil viscosity or temperature.

**Oil viscosity and temperature are significant factors in the amount of torque needed to crank the engine at a specific speed.

Values are provided with SAE 40 weight oil.

Table 7.1

7.1 Starter Solenoid Pressure Ratings

Cat Part Number 164-0717	
Nominal – kPa (psi)	1034 (150)
Maximum – kPa (psi)	1724 (250)
Proof – kPa (psi)	N/A
Burst – kPa (psi)	8618 (1250)

Table 7.2

7.2 Starter Performance Curves

I-R Starters

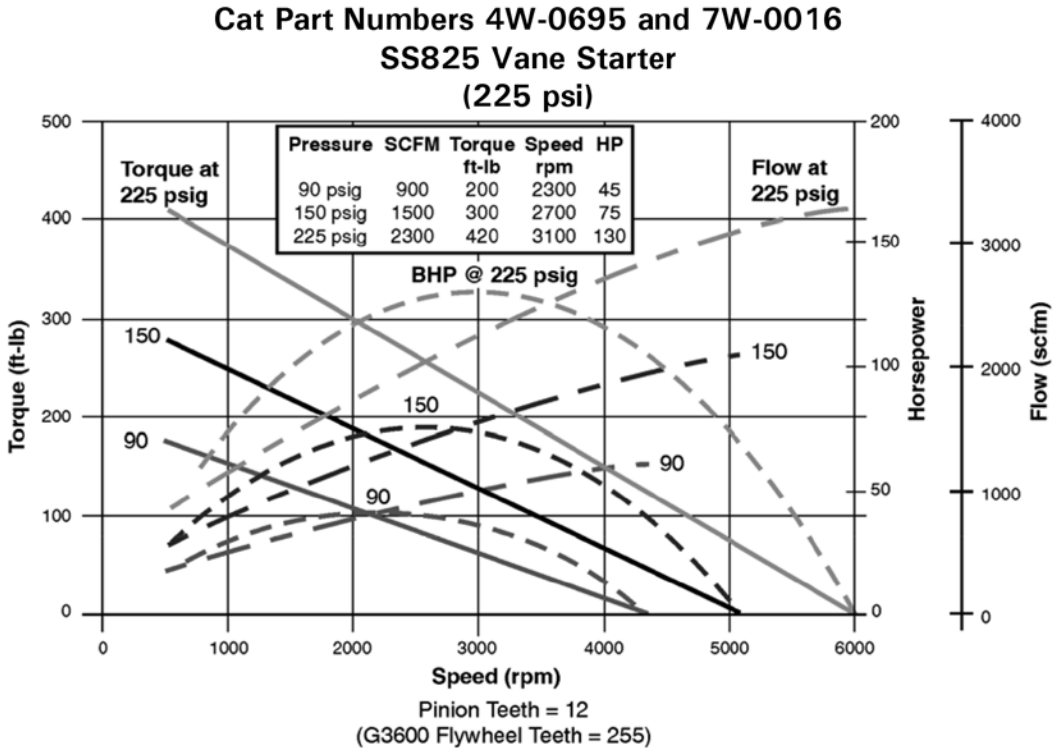


Figure 7.1

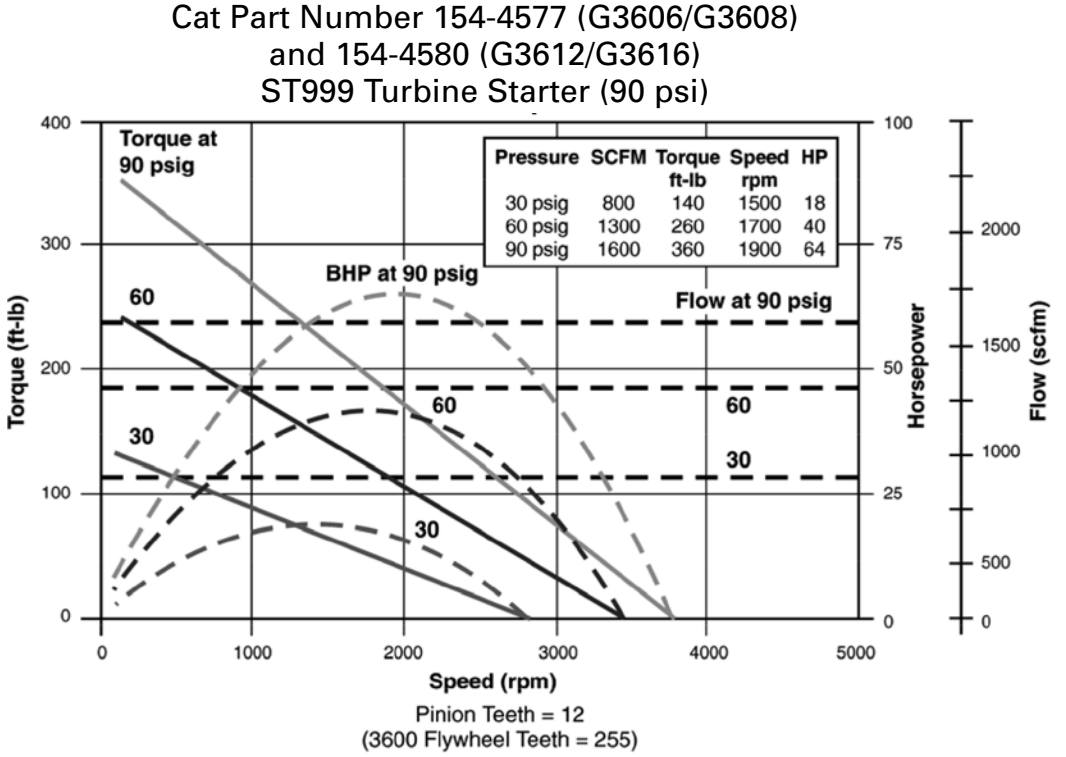


Figure 7.2

TDI Starters

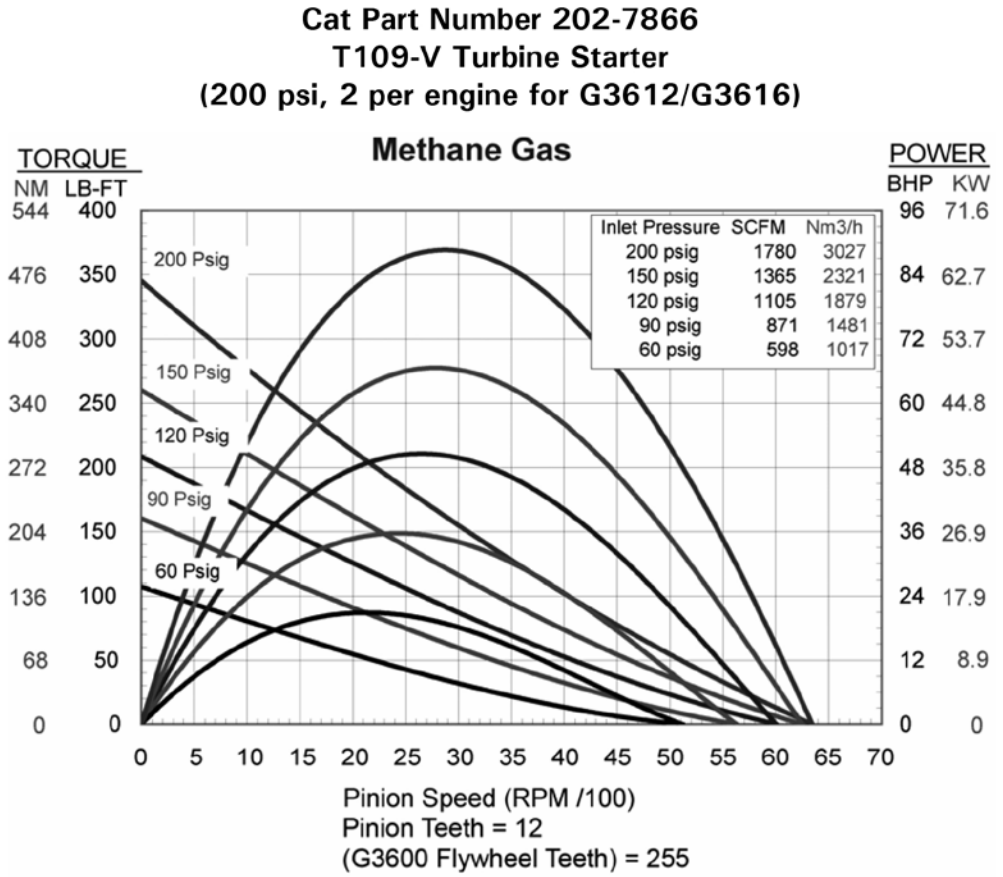


Figure 7.3

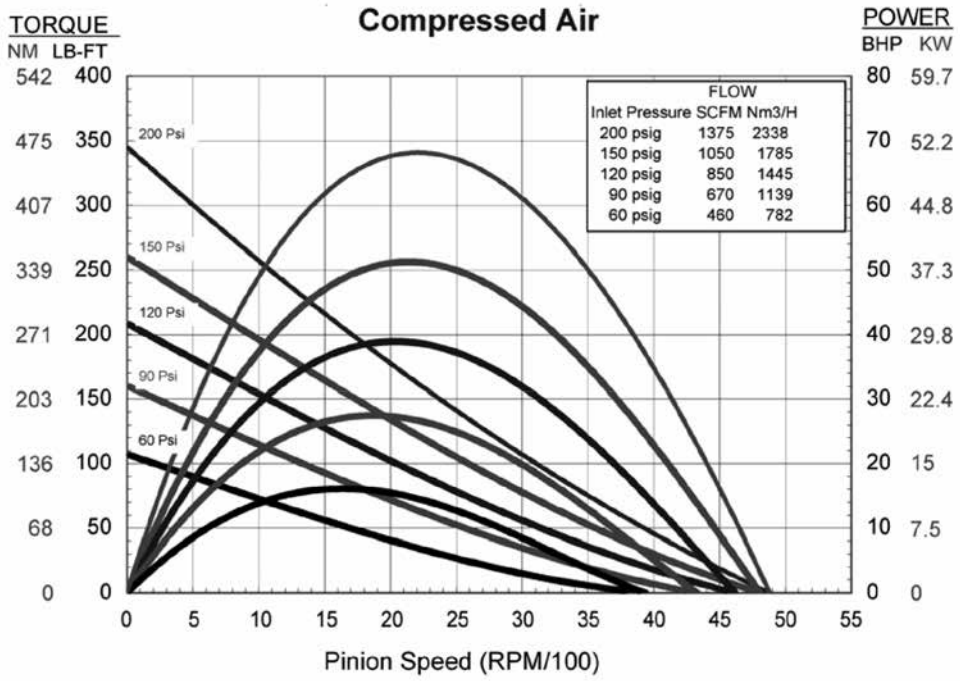


Figure 7.4

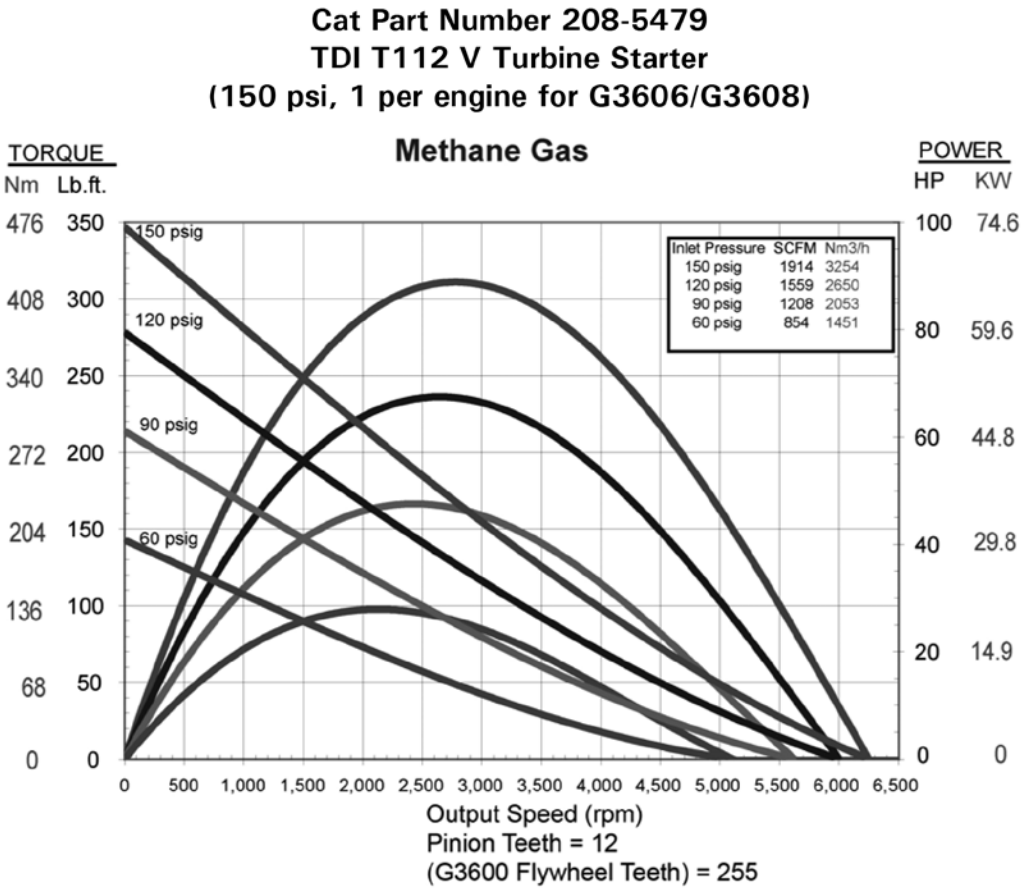


Figure 7.5

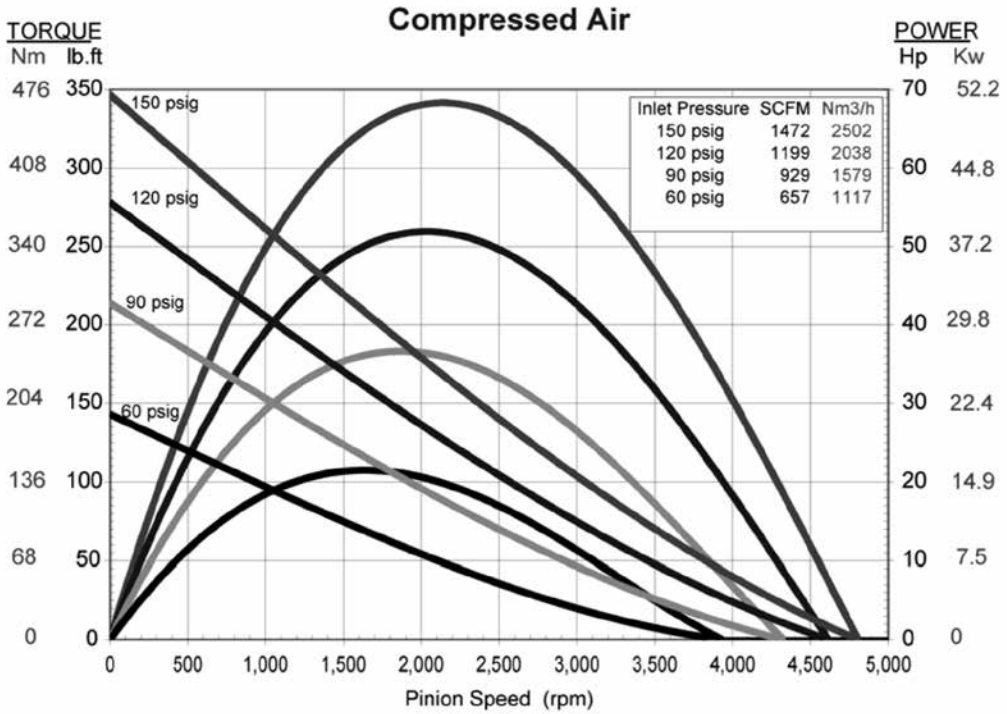


Figure 7.6

Cat Part Number 208-5423
TDI T121 V Air Starter
(90 psi, 2 per engine for G3612/G3616,
1 per engine for G3606/G3608)

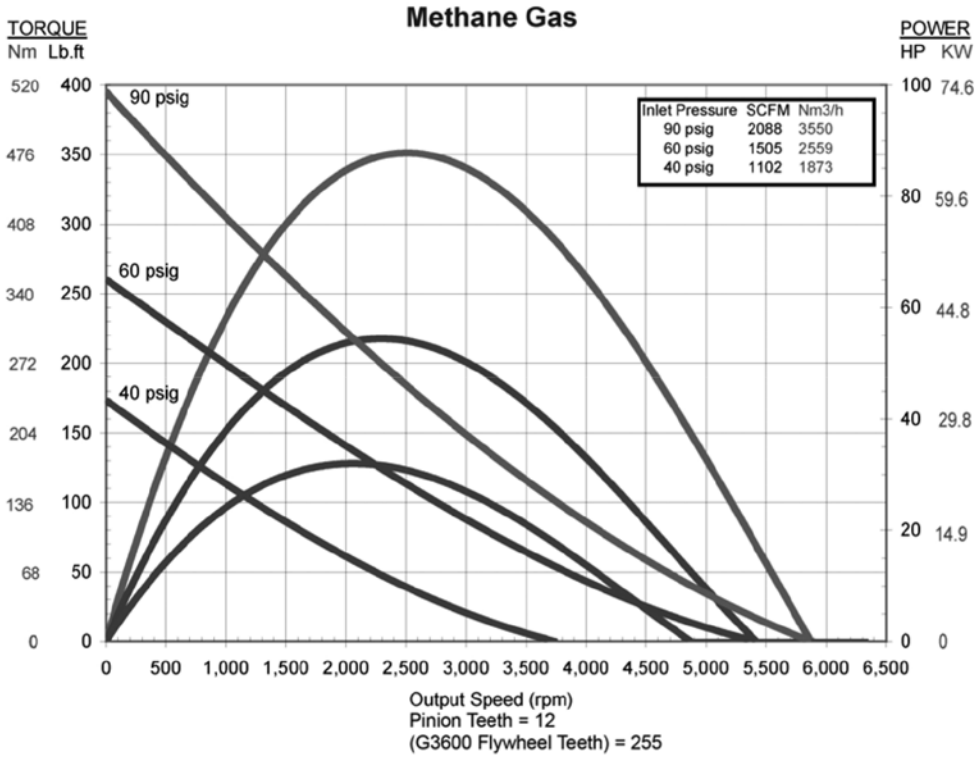


Figure 7.7

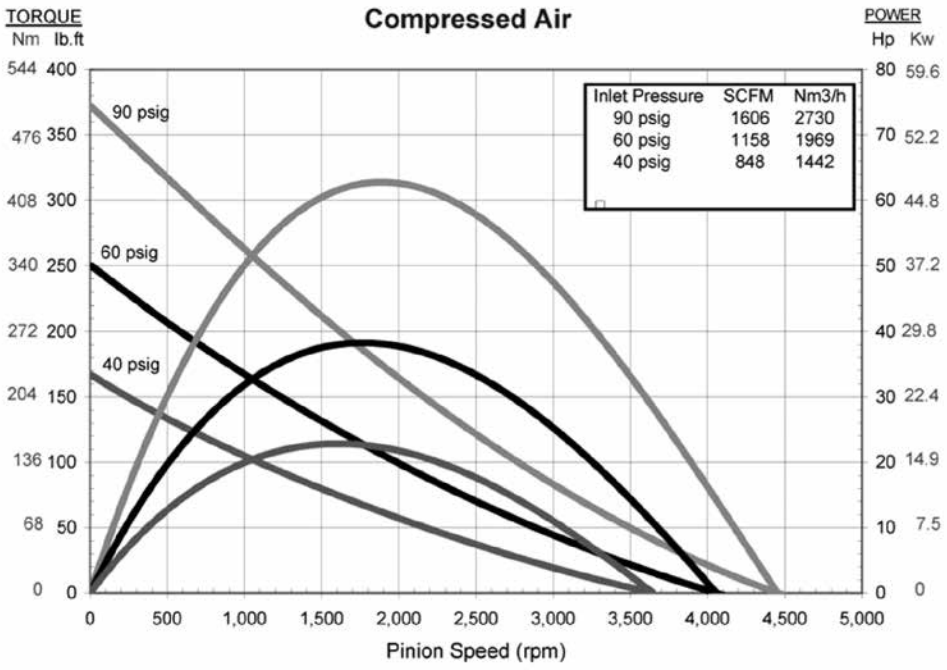


Figure 7.8

8.0 Additional Data

8.1 TVA Model Data

Please work with your Cat dealer to obtain engine-specific data needed to perform the torsional vibration analysis, either by Price List Feature Code or specific Serial Number. Cat dealers should enter a request via the Application Support Center (ASC) to obtain this information from Caterpillar.

8.2 Rolling Torque

Please work with your Cat dealer to obtain engine specific data needed for rolling torque, either by Price List Feature Code or specific Serial Number. Cat dealers should enter a request via the ASC to obtain this information from Caterpillar.

8.3 Sound Power Data (Mechanical and Exhaust)

Please refer to GERP for sound data pertaining to G3600 engines.

8.4 Unbalanced Forces and Moments

The reciprocating and rotational movement of components inside the engine creates a dynamic system. Cat gas engines are designed to be inherently balanced; that is, with all dimensions at their nominal design value, the reciprocating piston system is in balance for primary and secondary shaking forces. Due to manufacturing tolerances, the mass and/or dimensions of these internal components can vary, resulting in unbalanced forces and moments acting on the engine as a whole. The values in the tables below represent the theoretical maximum forces and moments that may result from variations in mass and/or dimension of the reciprocating system components within their manufacturing tolerance ranges. The values shown capture the “B90” value for these unbalanced forces and moments, meaning that 90% of that type of engine produced will have unbalanced forces and/or moments equal to or less than the value shown. External rotating components, such as the flywheel and damper, were not included the calculation.

The following coordinate reference plane graphic depicts the forces and moments in relation to the engine structure.

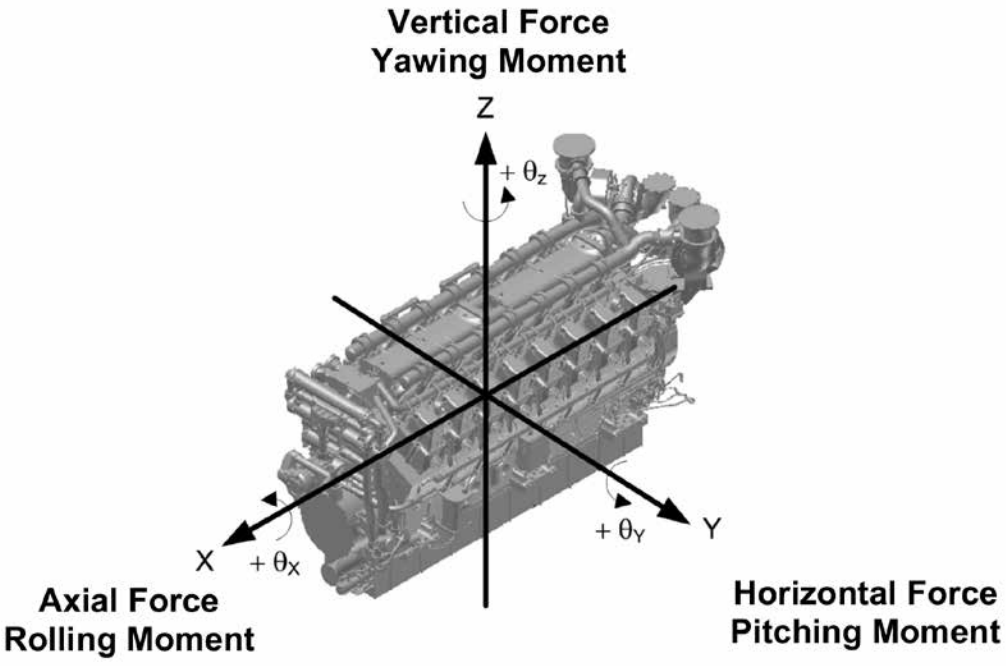


Figure 8.1 – Coordinate Reference Plane

B90 Unbalanced Forces and Moments for G3606					
First Order Force (N)		Second Order Force (N)		Third Order Force (N)	
Vertical	Horizontal)	Vertical	Horizontal)	Vertical	Horizontal)
3217.7	1235.8	958.1	223.0	25.0	3.6
First Order Moment (N-m)		Second Order Moment (N-m)		Third Order Moment (N-m)	
Yaw (Vertical)	Pitch (Horizontal)	Yaw (Vertical)	Pitch (Horizontal	Yaw (Vertical)	Pitch (Horizontal)
891.8	2221.8	161.1	647.2	2.6	16.6

Table 8.1

B90 Unbalanced Forces and Moments for G3608					
First Order Force (N)		Second Order Force (N)		Third Order Force (N)	
Vertical	Horizontal)	Vertical	Horizontal)	Vertical	Horizontal)
3753.3	1438.9	1111.3	283.0	4090.3	4.6
First Order Moment (N-m)		Second Order Moment (N-m)		Third Order Moment (N-m)	
Yaw (Vertical)	Pitch (Horizontal)	Yaw (Vertical)	Pitch (Horizontal	Yaw (Vertical)	Pitch (Horizontal)
1377.1	3488.3	266.0	1009.7	4.3	27.0

Table 8.2

B90 Unbalanced Forces and Moments for G3612					
First Order Force (N)		Second Order Force (N)		Third Order Force (N)	
Vertical	Horizontal)	Vertical	Horizontal)	Vertical	Horizontal)
4648.8	2675.2	656.8	1195.6	23.7	18.7
First Order Moment (N-m)		Second Order Moment (N-m)		Third Order Moment (N-m)	
Yaw (Vertical)	Pitch (Horizontal)	Yaw (Vertical)	Pitch (Horizontal	Yaw (Vertical)	Pitch (Horizontal)
2036.0	3499.5	498.3	914.9	13.6	18.5

Table 8.3

B90 Unbalanced Forces and Moments for G3616					
First Order Force (N)		Second Order Force (N)		Third Order Force (N)	
Vertical	Horizontal)	Vertical	Horizontal)	Vertical	Horizontal)
5421.1	3087.4	1395.9	764.2	1301.7	3403.0
First Order Moment (N-m)		Second Order Moment (N-m)		Third Order Moment (N-m)	
Yaw (Vertical)	Pitch (Horizontal)	Yaw (Vertical)	Pitch (Horizontal	Yaw (Vertical)	Pitch (Horizontal)
3201.5	5500.4	738.2	1426.2	42.5	319.9

Table 8.4

8.5 Power Supply Requirements

System Description Metric (English)	G3606	G3608	G3612	G3616
Jacket Water Heater (Optional) – kW (Btu/min)	18 (1024)	18 (1024)	30 (1706)	30 (1706)
Lube Oil Heater (Optional) – kW (Btu/min)	9 (512)	9 (512)	9 (512)	9 (512)
Combination Jacket Water/Lube Oil Heater (Optional) – kW (Btu/min)	18/9 (1024/512)	18/9 (1024/512)	18/9 (1024/512)	18/9 (1024/512)

Table 8.5

8.6 Reference Materials

The following information is provided as additional reference to subjects discussed in this guide.

RENR5908
Systems Operation, Testing and Adjusting (G3600 Engines)

SEBU7563
Operation and Maintenance Manual (G3600 Engines)

8.7 Definitions

Nominal Pressure – normal working pressure

Maximum Pressure – working pressure limit

Proof Pressure – The amount of overpressure the unit can be subjected to without damage.

Burst Pressure – The amount of overpressure at which the unit will certainly be damaged or fail.

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