1106D-70TA

Tier 3 112 kW @ 2200 rpm

Industrial Open Power Unit

1100 Series

Basic technical data

Number of cylinders ... 6
Cylinder arrangement ... In-line
Cycle ... 4 stroke
Induction system ... Turbo charged and air charge cooled
Combustion system ... Direct injection diesel
Compression ratio ... 18.2:1
Bore ... 105 mm
Stroke ... 135 mm
Cubic capacity ... 7.01 litres
Direction of rotation ... anticlockwise when viewed from flywheel
Firing order ... 1, 5, 3, 6, 2, 4

Estimated total weight

Dry ... 792 kg
Wet ... 822 kg

Overall dimensions

Height (above mounting feet) ... 876 mm
Length (air cleaner fitted) ... 1761 mm
Width ... 796 mm

Centre of gravity (wet)

Forward from rear of cylinder block ... 476 mm
Above crankshaft centre line ... 176 mm
Offset to RHS of crankshaft (viewed from centre line) ... 17 mm

Moments of inertia

Engine rotational components ... 0.25 kgm²
Flywheel ... 1.2 kgm²

Ratings

Speed variation at constant load ... ± 3%

Performance

Average sound pressure level for bare engine (cooling pack and air filter fitted) at one metre (preliminary data):

with puller fan @ 2000 rev/min ... TBD dB(A)
with puller fan @ 2200 rev/min ... TBD dB(A)

Test conditions

Air temperature ... 25°C
Barometric pressure ... 100 kPa
Relative humidity ... 31.5%
All ratings certified to within ... ± 3%

Emissions capability

China GB20891-2007 Stage 2. ECE R96 Stage 3. US EPA Flex (Tier III).

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T3998 112 kW @ 2200 rpm

Designation	Units	Engine speed rpm								
		800	1000	1200	1300	1400	1600	1800	2000	2200
Torque	Nm	553	669	672	666	639	608	574	532	486
Engine Power	kW	46.4	70.1	77.4	83.7	93.7	101.9	108.2	111.4	112
BMEP	kPa	991.6	1170.5	1190.6	1176.2	1130.0	1085.8	1031.8	958.1	867.0
Air temp. before charge cooler (ATAAC in temp)	°C	61.6	83.5	92.2	98.7	111.5	116.9	121.8	131.5	139.2
Charge cooler - pressure drop across	kPa	1.7	2.6	3.3	3.9	5.0	5.7	6.8	9.1	10.0
Air temp. after charge cooler (ATAAC out temp)	°C	25.5	29.7	32.0	33.9	39.3	42.7	46.1	50.6	55.0
Inlet manifold pressure	kPa	30.0	54.2	63.9	71.7	87.6	95.7	102.1	112.0	124.2
Air mass flow (wet) - (intake air flow)	kg/min	4.4	6.1	6.8	7.5	8.9	9.9	10.8	12.0	13.2
Air volume flow (wet)	m^3/min	3.8	5.3	6.0	6.6	7.8	8.7	9.6	10.7	11.9
Exhaust temp - turbo inlet (turbine inlet temp)	°C	520.0	555.0	561.0	564.0	564.0	545.0	541.0	546.0	554.0
Exhaust temp - turbo outlet (turbine outlet temp)	°C	433.7	466.2	467.6	459.3	461.0	445.8	432.7	428.7	430.7
Exhaust gas flow rate volume (wet)	m^3/min	9.2	13.0	14.5	15.6	18.2	19.6	20.7	21.8	24.0
Exhaust gas mass flow (wet)	kg/min	4.6	6.4	7.1	7.8	9.3	10.3	11.2	12.4	13.7
Performance										
BSFC - all speeds, all loads (ISO-SFC plot) (100% load)	g/ kW.hr	233.1	226.7	222.9	222.1	224.7	221.1	220.1	228.2	243.4
Fuel consumption - all speeds, all loads (ISO-SFC plot)	litres/hr	12.9	18.5	20.4	21.9	24.8	26.8	28.5	30.5	32.3
Peak cylinder pressure	bar	72.46	83.66	85.76	87.43	95.72	99.96	105.3	109.7	113.7
Smoke steady state, full load	AVL SN	4	3.13	2.42	2.28	1.74	1.56	1.35	1.5	1.95
Energy balance										
Energy in fuel	kWt	129.6	185.9	204.5	219.6	249.1	269.1	286.3	306.4	325.3
Energy to power (gross)	kWt	46.4	70.1	77.4	83.7	93.7	101.9	108.2	111.4	112.0
Energy to cooling fan and alternator (12V)	kWm									
Energy to power (nett)	kWm									
Energy to charge coolers	kWt	2.7	5.6	7.0	8.3	10.9	12.4	13.8	16.4	18.9
Energy to radiation	kWt	10.9	14.3	14.7	15.4	15.5	15.8	16.0	16.2	16.3
Heat rejection to radiator	kWt	35.7	46.4	49.0	51.7	57.1	61.0	66.8	72.8	78.8

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Cooling system

Recommended coolant: 50% anti freeze / 50% water. For complete details of recommended coolant specifications, refer to the Operation and Maintenance Manual for this engine model.

Cooling pack

Overall weight (wet). ... ... 59 kg
Overall face area . ...0.555323 m²
Width ... ...764 mm
Height .. ..1080 mm

Radiator

Radiator face area .. ..0.351840 m²
Number of rows and material . ... 4 rows, Aluminium
Matrix density and material.. ... ...10 fins/inch, Aluminium
Width of matrix .. ..440 mm
Height of matrix. ... .800 mm
Pressure cap setting (min) .. .. 110 kPa

Charge cooler

Face area ... ... .0.203483 m²
Number of rows and materials. ... ... 2 rows, Aluminium
Matrix density and material.. ... ...10 fins/inch, Aluminium
Width of matrix. ... ...258 mm
Height of matrix ... ...789 mm

Fan

Type. .. ..Puller
Diameter .. ..610 mm
Drive ratio 1:1
Number of blades 6
Blade Material.. ... ...Nylon

Coolant

Total system capacity .. .. 21 litres
Engine capacity ... ... 9.5 litres
Maximum top tank temperature . .. . 110°C
Thermostat operation range ... ... 82 - 94°C

Duct allowance with 50% Glycol

Puller fan. .. .. 53ºC @ 0 Pa / 50ºC @ 120 Pa / 46ºC @ 200 Pa

Lubrication system

Maximum total system oil capacity.. ... ... 18.0 litres
Minimum oil capacity in sump . ... 12.5 litres
Maximum oil capacity in sump ... ... 16.1 litres
Maximum engine operating angles - front up, front down, right side, left side. ... ... 25°

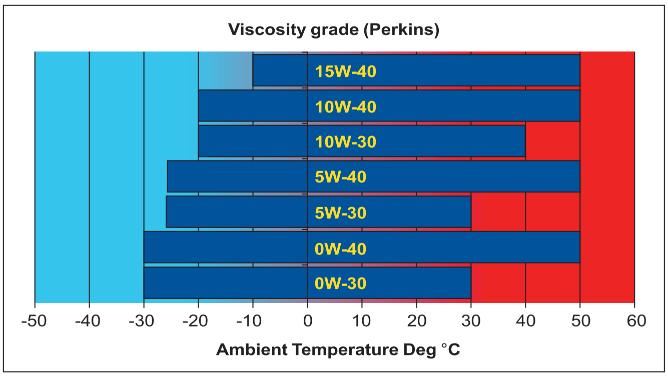
Lubricating oil pressure

Relief valve opening pressure . ...460 kPa
Pressure at maximum speed.. ... ...520 kPa
Maximum intermittent oil temperature (in rail) ... ... 135 °C
Maximum continuous oil temperature (in rail) ... ... 125 °C
Oil consumption at full load (% of fuel) ... ... < 0.1

Recommended SAE viscosity

Multigrade oil conforming to API-CH4 / CI4 must be used.

Note: Always ensure that the correct viscosity grade of lubricating oil is used for the ambient temperature range in which the engine will run as shown in the chart below.



Normal operating angles

Front and rear ... ... 25°
Side tilt .. .. 25°

Induction system

Maximum air intake restriction of engine

Clean filter ... ...5 kPa
Dirty filter . ...8 kPa
Induction indicator setting ... ...7.5 kPa
Air filter type ... .Paper element

Note: For harsh environments where the debris is greater than 20mg/m³ an air pre-cleaner to prolong the service interval of the Standard Duty filter is available in the Aftermarket, part number 226-21111

Engine mounting

Maximum static bending moment at rear face of block.. .. .. .1130 Nm

Maximum permissible overhung load on the flywheel. ... ... refer to the applications department

Maximum bending moment at rear of flywheel housing SAE 3
Vertical ... ... ± 3000 Nm

Note: Refer to “Applications and Installation Manual” for “Bending Moment approval requirements”.

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Fuel system

Injection components (common rail)

Injector ... ... Mechanical
Fuel pump DP310

Fuel priming

Priming pump type . ...Manual
Maximum priming time ... ... 90 seconds

Fuel feed

Maximum fuel flow ... ...3 litres/min
Maximum suction head at engine fuel pump inlet. ... ... 50 kPa
Maximum static pressure head... ... ... 50 kPa
Fuel temperature at engine fuel pump inlet. ... ... 85 °C
Tolerance on fuel consumption... ... ... ±5%

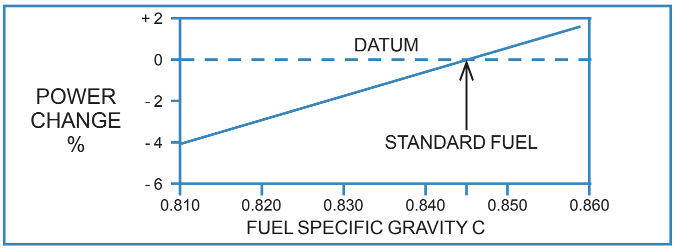
Specifications of preferred fuels

This group of fuel specifications is considered acceptable:

- DIN E 590 DERV (class A-F and 0-4)
- BS2869 Class A2 (Off highway, gas oil, red diesel)
- ASTM D975-91 Class 1-1DA and Class 2-2DA
- JIS K2204 (1997) Grades 1, 2, 3 and Special grade 3
- JP7/F63, JP8, JP5 Jet A/A1
- Diesel fuel mix with 5 volume % RME in accordance with proposal 51606
- JIS K2203
- B20 and B100 fuels which meet EN590 and DIN 51606/ASTM BS121 to warranty specification

Fuel specific gravity

Engine power is affected by changes of the specific gravity of the fuel oil. The results are shown in the graph below:



Note: It is important to maintain extreme cleanliness when working on the fuel system. Even tiny particles can cause damage to the fuel system with possible engine damage. For further information on fuel system cleanliness, please refer to the Systems Operation Testing and Adjusting manual for the engine model.

Exhaust system

Maximum back pressure ... ... 15 kPa
Exhaust outlet, internal diameter ... ... 90 mm

Electrical system

Alternator 8SI
Alternator voltage.. .. ..12 volts
Alternator output ... . 85 amps
Starter. ... . AZF
Starter motor voltage ... .12 volts
Starter motor power ... . 4.2 kW
Number of teeth on the flywheel 126
Pull-in and hold-in current of starter motor solenoid .. ..
@ 25 °C Maximum (1).. .. .. 12 volts 68 amps
Hold-in current of starter motor solenoid .. ..
@ 25 °C Maximum (1).. .. .. 12 volts 20 amps
Engine stop method . ... .Solenoid

1. All leads to rated at 10 amps minimum

Cold start recommendations

Minimum required cranking speed over TDC .. .. 60 rpm

	5 to -10 °C	-10 to -20°C	-20 to -25 °C
Oil	15W40	10W40	5W40
Start	AZF		
Battery	2X1200CCA		
Cranking current	960A		
Aids	None	Glowplugs	
Minimum mean cranking speed	130 rpm	100 rpm	100 rpm

Note: Battery capacity is defined by the 20 hour rate.

Note: If a change to a low viscosity oil is made, the cranking torque necessary at low ambient temperatures is much reduced. The starting equipment has been selected to take advantage of this. It is important to change to the appropriate multigrade oil in anticipation of operating in low ambient temperatures.

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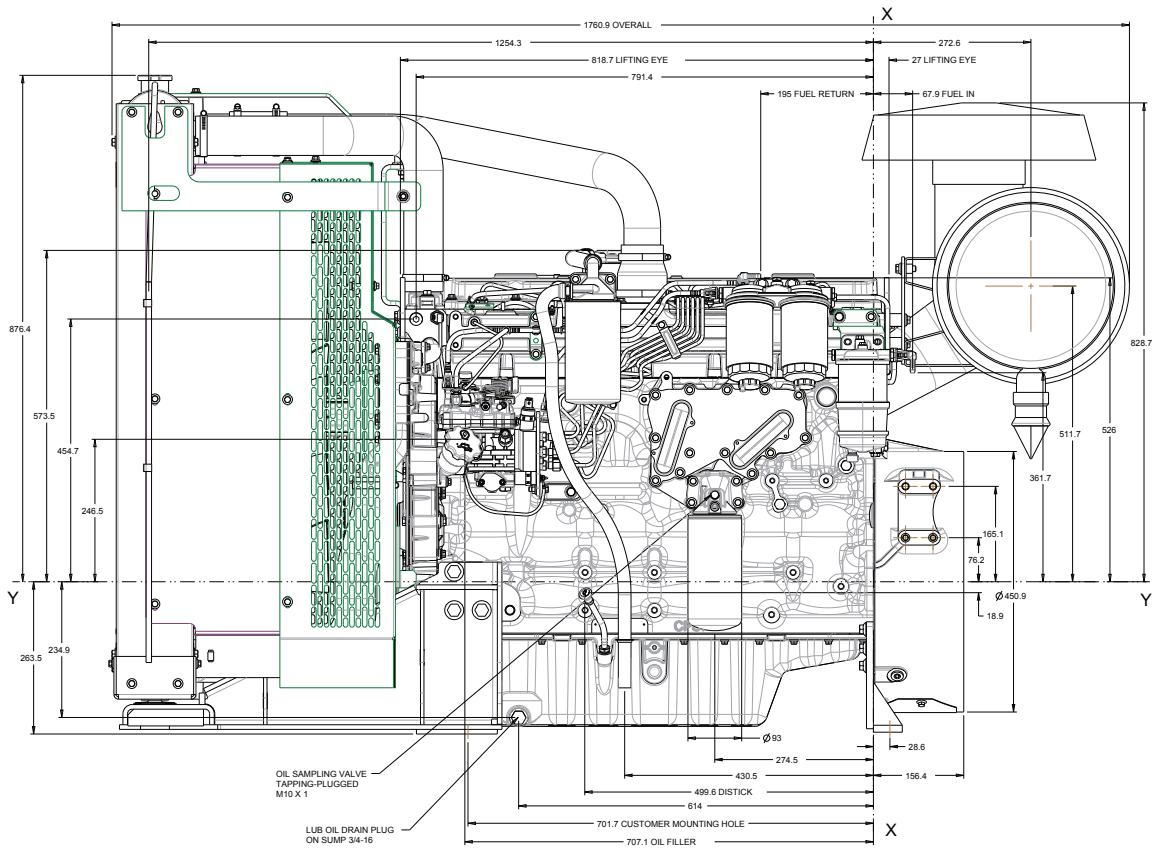
1106D-70TA - left side view



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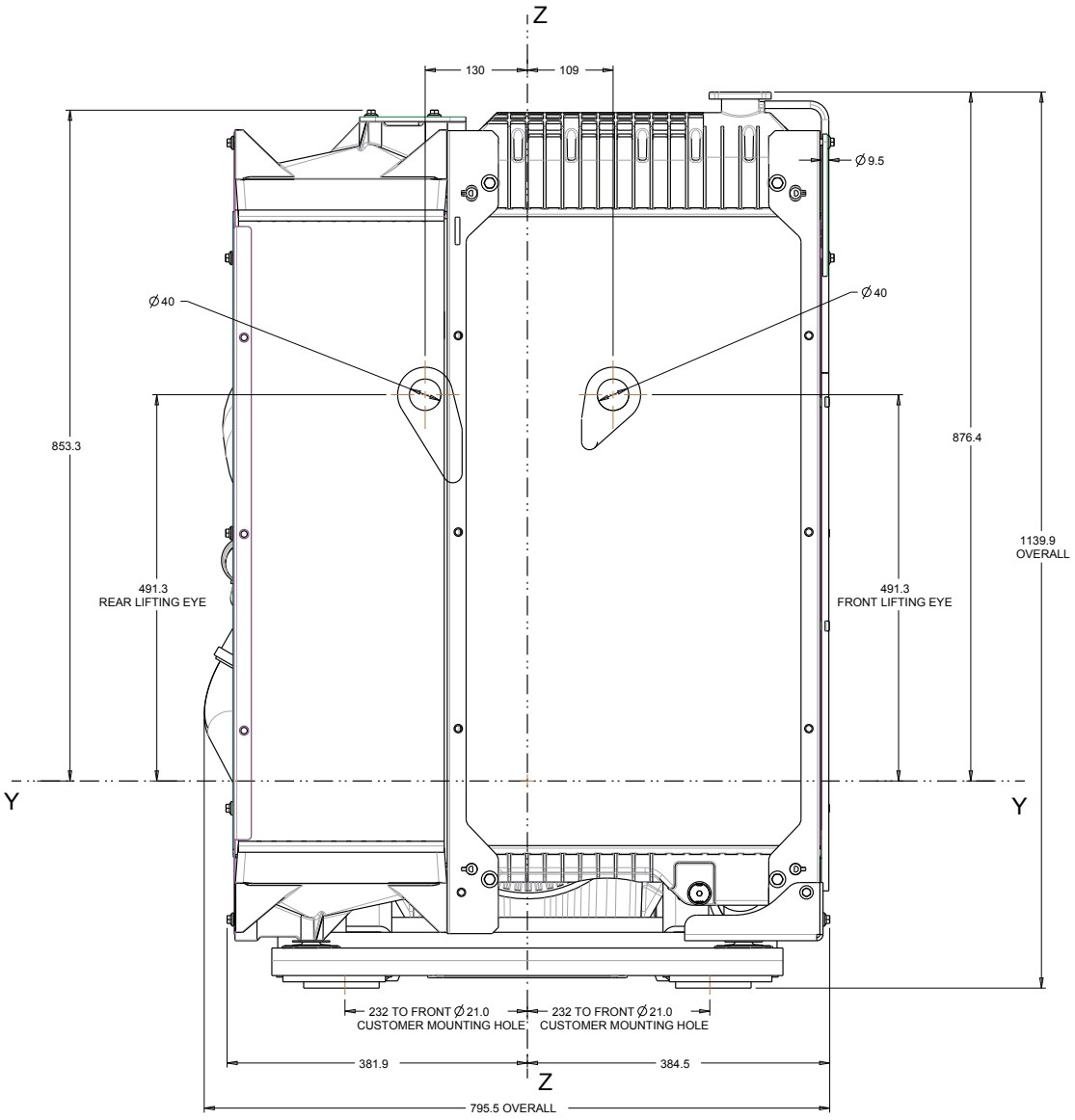
1106D-70TA - front view



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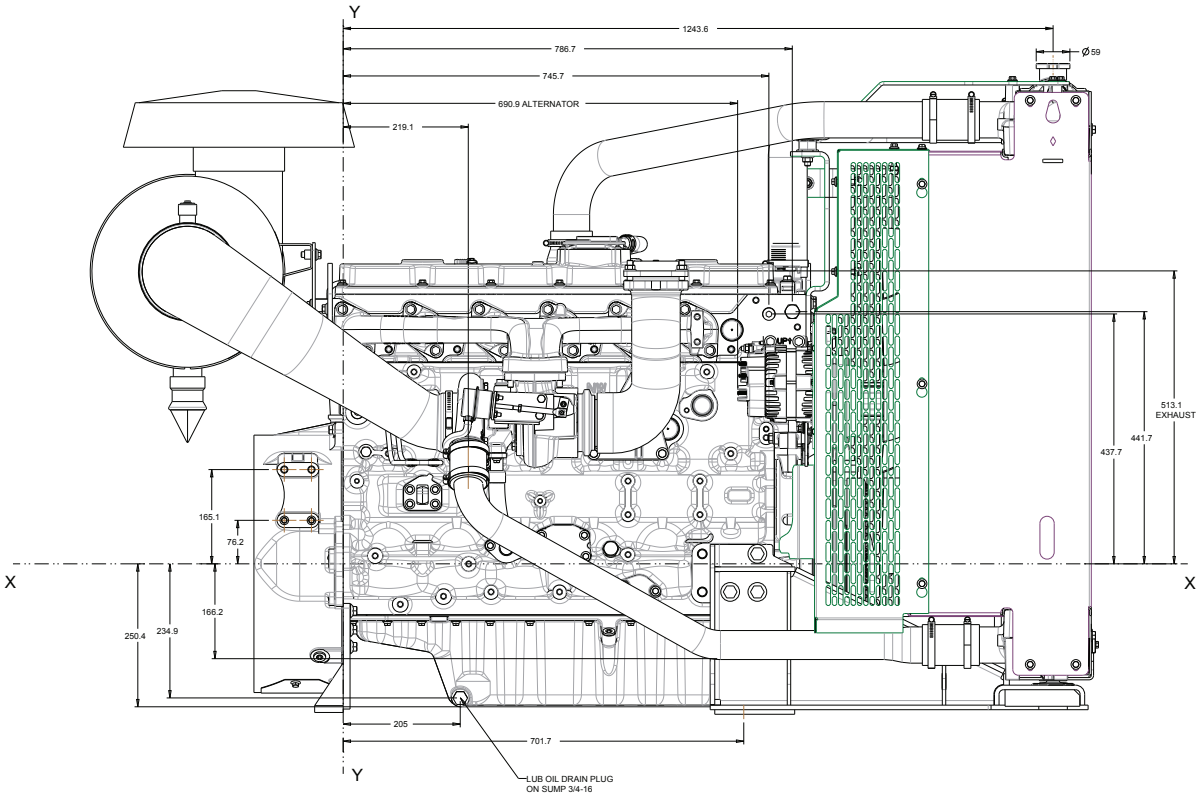
1106D-70TA - right side view



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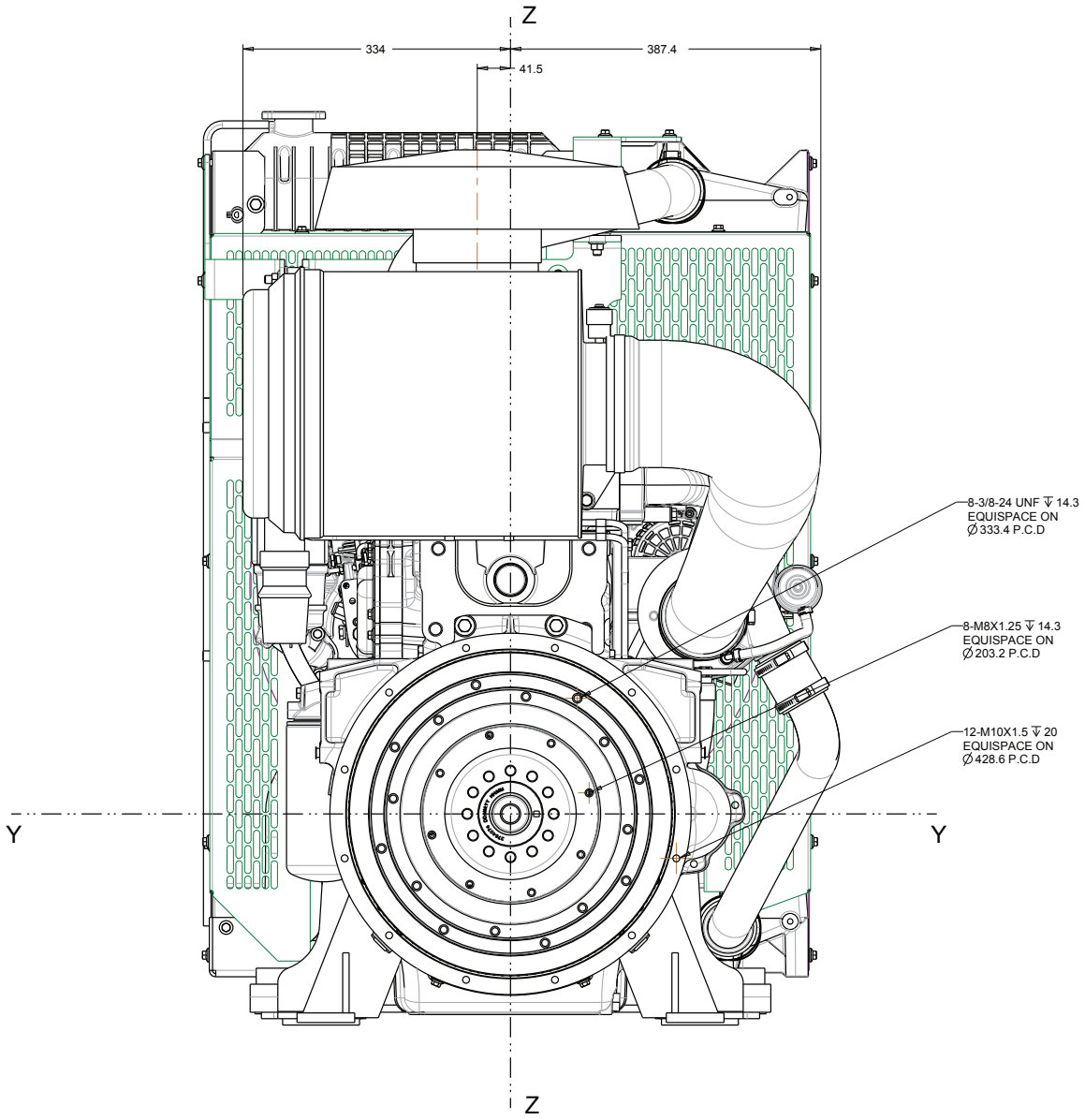
1106D-70TA - rear view



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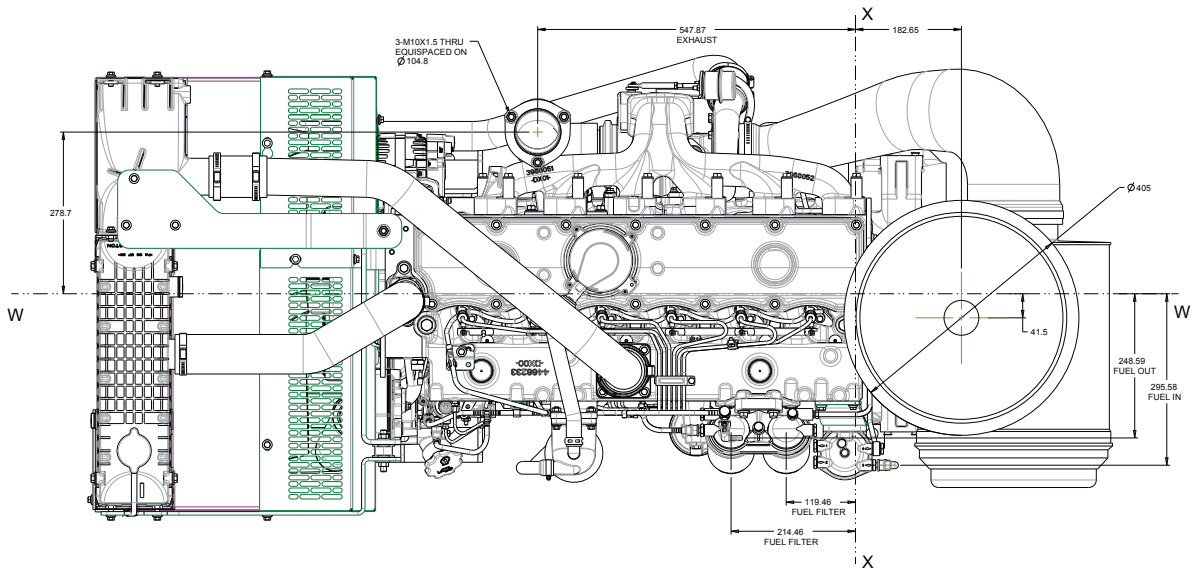
1106D-70TA - plan view



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