ENGINE DATASHEET

TEKSAN

400 Series 404D-22TAG ElectropaK

32.4 kWm net prime @ 1800 rpm
35.7 kWm net standby @ 1800 rpm

The Perkins® 400 Series engine family continues to set new standards in the compact engine market. Developed alongside customers to fulfill their needs in the generator set, compressor, agricultural and general industrial markets.

These new ElectropaKs provide compact power, from a robust family of 3 and 4 cylinder diesel engines designed to provide economic and durable operation at prime and standby duties, hitting the key power nodes required by the power generation industry.

Emissions statement

Constant Speed Engines for use in Industrial, IOPU and ElectropaK applications: Certified against the requirements of EU Stage IIIA (Directives 97/68/EC, as last amended, for mobile applications).

Specification		
Number of cylinders	4 vertical in-line	
Bore and stroke	84 x 100 mm	3.3 x 3.9 in
Displacement	2.216 litres	135.2 in^3
Aspiration	Turbocharged aftercooled	
Cycle	4 stroke	
Combustion system	Indirect injection	
Compression ratio	23.3:1	
Rotation	Anti-clockwise, viewed on flywheel	
Total lubricating capacity	10.6 litres	2.8 US gal
Cooling system	Water cooled	
Total coolant capacity	9.3 litres	2.4 US gal

Publication No. PN1914/12/14 Produced in England ©2014 Perkins Engines Company Limited

Perkins®
THE HEART OF EVERY GREAT MACHINE

400 Series 404D-22TAG ElectropaK

32.4 kWm net prime @ 1800 rpm
35.7 kWm net standby @ 1800 rpm

Features and benefits

Powered by your needs

- The 404D-22TAG ElectropaK is a powerful but quiet 2.2 litre turbocharged aftercooled 4-cylinder compact package

Compact, clean, efficient power

- Design features on the 400D range of ElectropaKs ensures clean rapid starting in all conditions whilst delivering impressive performance with low operating costs in a small, efficient package size

Lower operating costs

- Approved for operation on biodiesel* concentrations of up to 20%
- Oil and filter changes are 500 hours, dependent on load factor
- Engine durability and reliability, the warranty offering and ease of installation combine to drive down the cost of ownership
- Warranties and Service Contracts

  We provide one-year warranties for constant speed engines and two-year warranties for variable speed models, as standard. These are supported by multilevel Extended Service Contracts that can be bought additionally.
  Discover more: **www.perkins.esc**

Long-term power solution

- The 400D range of ElectropaKs has been designed to fully comply with stringent EU emissions regulations, providing an emissions compliant power solution for the future

Product support

- With highly trained Perkins distributors in thousands of communities in over 180 countries, you are never far away from expert product knowledge, genuine parts and a range of advanced diagnostic technology for keeping your engine in peak condition
- To find your local distributor: **www.perkins.com/distributor**

*Subject to conformance with ASTM D6751 and EN14214

Publication No. PN1914/12/14 Produced in England ©2014 Perkins Engines Company Limited

Perkins®

THE HEART OF EVERY GREAT MACHINE

400 Series 404D-22TAG ElectropaK

32.4 kWm net prime @ 1800 rpm
35.7 kWm net standby @ 1800 rpm

Technical information

Air inlet

- Mounted air filter

Fuel system

- Electronically governed cassette type fuel injection pump
- Split element fuel filter

Lubrication system

- Wet steel sump with filler and dipstick
- Spin-on full-flow lub oil filter

Cooling system

- Thermostatically-controlled system with belt driven coolant pump and pusher fan
- Mounted radiator, piping and guards

Electrical equipment

- 12 volt starter motor and 12 volt 65 amp alternator with DC output
- Oil pressure and coolant temperature switches
- 12 volt shut-off solenoid energised to run
- Glow plug cold start aid and heater/starter switch

Flywheel and housing

- High inertia flywheel to SAE J620 Size 7½ Heavy
- Flywheel housing SAE 4 Long

Mountings

- Front and rear engine mounting bracket

Optional equipment

- Parts book

Option groups

A selection of optional items is available to enable you to prepare a specification precisely matched to your needs.

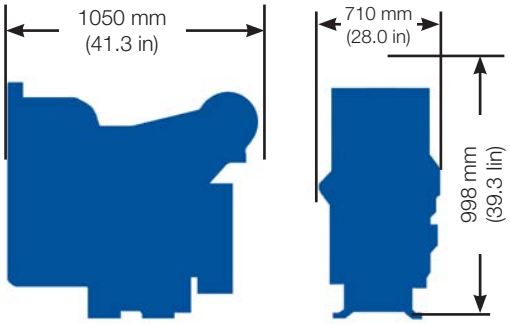
Publication No. PN1914/12/14 Produced in England

Perkins®

THE HEART OF EVERY GREAT MACHINE

400 Series 404D-22TAG ElectropaK

32.4 kWm net prime @ 1800 rpm
35.7 kWm net standby @ 1800 rpm



Engine package weights and dimensions		
Length	1050 mm	41.3 in
Width	710 mm	28.0 in
Height	998 mm	39.3 in
Weight (dry)	306 kg	675 lb

Publication No. PN1914/12/14 Produced in England ©2014 Perkins Engines Company Limited

Perkins®
THE HEART OF EVERY GREAT MACHINE

400 Series 404D-22TAG ElectropaK

32.4 kWm net prime @ 1800 rpm
35.7 kWm net standby @ 1800 rpm

Speed rpm	Type of operation	Typical generator output (Net)		Engine power			
				Gross		Net	
		kVA	kWe	kWm	hp	kWm	hp
1800	Prime power	36.5	29.2	33.1	44.4	32.4	43.4
	Standby power	40.2	32.1	36.4	48.8	35.7	47.8

The above ratings represent the engine performance capabilities to conditions specified in ISO 8528/1, ISO 3046/1:1986, BS 5514/1. **Derating may be required for conditions outside these; consult Perkins Engines Company Limited.**

Generator powers are typical and are based on typical alternator efficiencies and a power factor (cos θ) of 0.8. **Fuel specification:** BS 2869: Part 2 1998 Class A2 or ASTM D975 D2.

Rating definitions:
Prime power: Power available at variable load in lieu of a main power network. Overload of 10% is permitted for 1 hour in every 12 hours operation.
Standby (maximum): Power available at variable load in the event of a main power network failure. No overload is permitted.

Percent of prime power	Fuel consumption at 1800 rpm g/kWh	Fuel consumption at 1800 rpm l/hr
Standby power	247	10.2
Prime power	238	8.9
75%	231	6.5
50%	244	4.6

www.perkins.com

Photographs are for illustrative purposes only and may not reflect final specification.
All information in this document is substantially correct at time of printing and may be altered subsequently.
Final weight and dimensions will depend on completed specification.

Publication No. PN1914/12/14 Produced in England

Perkins®
THE HEART OF EVERY GREAT MACHINE

404D-22TAG

36.4 kWm (gross) @ 1800 rpm

Electropak

400 Series

Basic technical data

Number of cylinders 4
Cylinder arrangement . . . . . Vertical in-line
Cycle . . . . . Four stroke
Induction system . . . Turbo charged, with air to air charge cooling
Compression ratio 23.3:1
Bore . . . . . 84 mm
Stroke . . . . . 100 mm
Cubic capacity . . . . . 2·216 litres
Direction of rotation . . . Anti-clockwise when viewed from flywheel
Firing order 1, 3, 4, 2
Estimated total weight (dry) . . . . . 306 kg

Overall dimensions

-height . . . . . 997.5 mm
-length . . . . . 1050.0 mm
-width . . . . . 709.8 mm

Moments of inertia (mk²)

-engine rotational components . . . . . 0.44 kg m²
-flywheel . . . . . 2.55 kg m²

Centre of gravity

-forward from rear of block . . . . . 280 mm
-above centre line of block . . . . . 105 mm
-offset to RHS of centre line . . . . . mm

Performance

Note: All data based on operation to ISO 3046-1:2002 standard reference conditions

Steady state speed stability at constant load
G3 . . . . . ± 0.5%
Cyclic irregularity
-at 110% stand-by power . . . . .

Test conditions

-air temperature . . . . . 25 °C
-barometric pressure . . . . . 100 kPa
-relative humidity 31.5%
-air inlet restriction at maximum power (nominal) . . . . . 5 kPa
-exhaust back pressure at maximum power (nominal) . . . 10.2 kPa
-fuel temperature (inlet pump) . . . . . 40 °C

Sound level

Average sound pressure level for bare engine (without inlet and exhaust) at 1 metre . . . . . 78 dB(A)
-all ratings certified to within . . . . . ± 5%
If the engine is to operate in ambient conditions other than those of the test conditions, suitable adjustments must be made for these changes. For full details, contact Perkins Technical Service Department.

Emissions capability: Certified against the requirements of EU2007 (EU97/68/EC Stage IIIA) and EPA Interim Tier 4 (EPA 40 CFR Part 1039 Interim Tier 4) legislation for non-road mobile machinery, powered by constant speed engines.

Perkins Engines Company Limited
Peterborough PE1 5FQ United Kingdom
Tel: +44 (0)1733 583000
Fax: +44 (0)1733 582240
www.perkins.com

General installation

Designation	Units	Type of operation and application	
		Prime	Stand-by
		60Hz	60Hz
Gross engine power	kWb	33.1	36.4
Brake mean effective pressure	kPa	996.1	1095.4
Mean piston speed	m/s	6	
Engine coolant flow (coolant pump ratio 1·1:1)	l/min	56.2	
Combustion air flow	m³/min	2.49	
Exhaust gas flow (max)	m³/min	8.4	
Exhaust gas temperature (max)	°C	478	
Overall thermal efficiency (nett)	%	33.1	
Typical genset electrical output (0.8 pf 25°C)	kWe	29.2	32.1
	kVA	36.5	40.2
Assumed alternator efficiency	%	90	
Energy balance			
Energy in fuel (heat of combustion)	kWt	97.9	107.7
Energy in power output (gross)	kWb	33.1	36.4
Energy to cooling fan	kWt	0.7	
Energy in power output (nett)	kWm	32.4	35.7
Energy to coolant and lubricating oil	kWt	34.3	37.7
Energy to exhaust	kWt	26.3	29.0
Energy to radiation	kWt	4.2	4.6

Cooling system

Radiator

-face area ... ... .0.245 m²
-rows and materials . ... 5 rows, Aluminium
-matrix density and material ... ... 38 tubes row, Aluminium
-width of matrix ... ...430 mm
-height of matrix... ... ...570 mm
-pressure cap setting... ... ...110 kPa
Estimated cooling air flow reserve... ... ... .kPa

Fan

-diameter . ...457.2 mm
-drive ratio ... ...1.1 :1
-number of blades 7
-material... ... ... plastic
-type. ... ... pusher

Coolant

Total system capacity
-with radiator ... ... litres
-without radiator... ... ... 3.6 litres
Maximum top tank temperature... ... ... 112 °C
Temperature rise across engine.. ... ... .7.5 °C
Max permissible external system resistance... ... ... .kPa
Thermostat operation range ... ... 82 - 95 °C
Maximum static pressure head on pump. ... ... .30.4 kPa
Recommended coolant:
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.

Duct allowance

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance 50% Glycol	Duct allowance Pa	m³/sec
73°C	0	2.0
66°C	125	1.2

Charge cooler
-face area . .. .0.1. m²
-rows and materials . ... 2.rows, Aluminium
-matrix density and material ... ... 9 tubes per row Aluminium
-width of matrix ... ... .180. mm
-height of matrix... ... ...550 mm

Electrical system

-type.. ... ... 12V negative grounding
-alternator.. ... ... 65 amps, 12 V
-starter motor Delco Remy, 12 V
-starter solenoid pull-in current . ... TBA
-starter solenoid hold-in current ... ... TBA
Number of teeth on starter pinion 9
Number of teeth on flywheel 126

Cold start recommendations

Minimum engine cranking speed over TDC.. ... ...150 rev/min

Minimum starting temperature	Grade of engine lubricating oil	Battery specifications			
°C		BS3911 Cold start amps	SAEJ537 Cold cranking amps	Number of batteries needed	Commercial ref number
0	20W	540	740	1	647
-15	10W	540	740	1	647
-20	5W	600	780	1	655

Note: Additional information for battery and cable limits can be found in the installation manual.

Exhaust system

Maximum back pressure . ... .10.2 kPa
Exhaust outlet size .. .. 42 mm

Fuel system

Type of injection .. .. .Indirect injection
Fuel injection pump . ... .Cassette type
Fuel injector . ... Pintle nozzle
Nozzle opening pressure . ... 14.7 MPa
Max. particle size . ... 25 microns

Fuel lift pump

-type . ... mechanical (camshaft driven)
-flow/hour . ...63 litres/hr
-pressure . ... 10 kPa
Maximum suction head ... ...0.8 m
Maximum static pressure head ... ...3.0 m
Governor type .. .. Electronic/Mechanical

Fuel specification

USA Fed Off Highway - EPA2D 89.330-96
Europe Off Highway - CEC RF-06-99
For further information on fuel specifications and restrictions, refer to the OMM Fuels section for this engine model.

Fuel consumption - 1800 rev/min

Power rating %			
110	100	75	50
g/kWh (litres/hr)			
247 (10.2)	238 (8.9)	231 (6.5)	244 (4.6)

Note: All fuel consumption figures are based on Nett engine power

Induction system

Maximum air intake restriction

-clean filter ... ... 3.0 kPa
-dirty filter .. .. 6.4 kPa
-air filter type . ... Dry element type

Lubrication system

Lubricating oil capacity

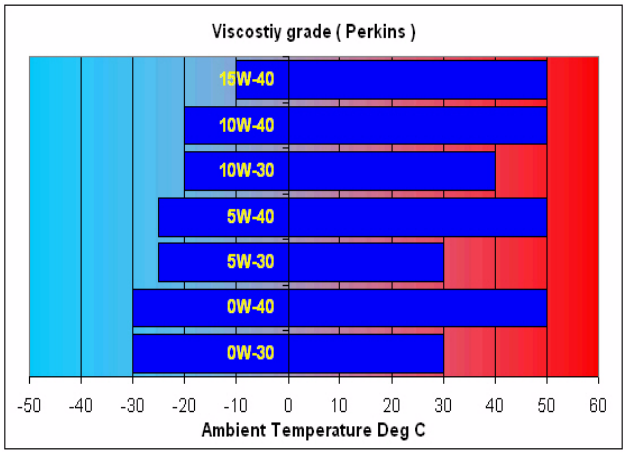
Max. sump capacity .. ..10.6 litres
Min. sump capacity ... ... 8.9 litres
Maximum engine operating angles
-front up, front down, right side or left side ... ...35° continuous

Lubricating oil pressure

-relief valve opens . ... 352 - 448kPa
Min oil pressure . ... 120 kPa
-at maximum no-load speed . ... 147 kPa
Oil flow at rated speed .. ..15.2 litres/min
Normal oil temperature . ... 125 °C

Recommended SAE viscosity

A single or multigrade oil must be used which conforms API-CH-4 or ACEA E5.



Maximum static bending moment

at rear face of block . ...1400 Nm

Load acceptance

The below complies with the requirements of classification 3 and 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5

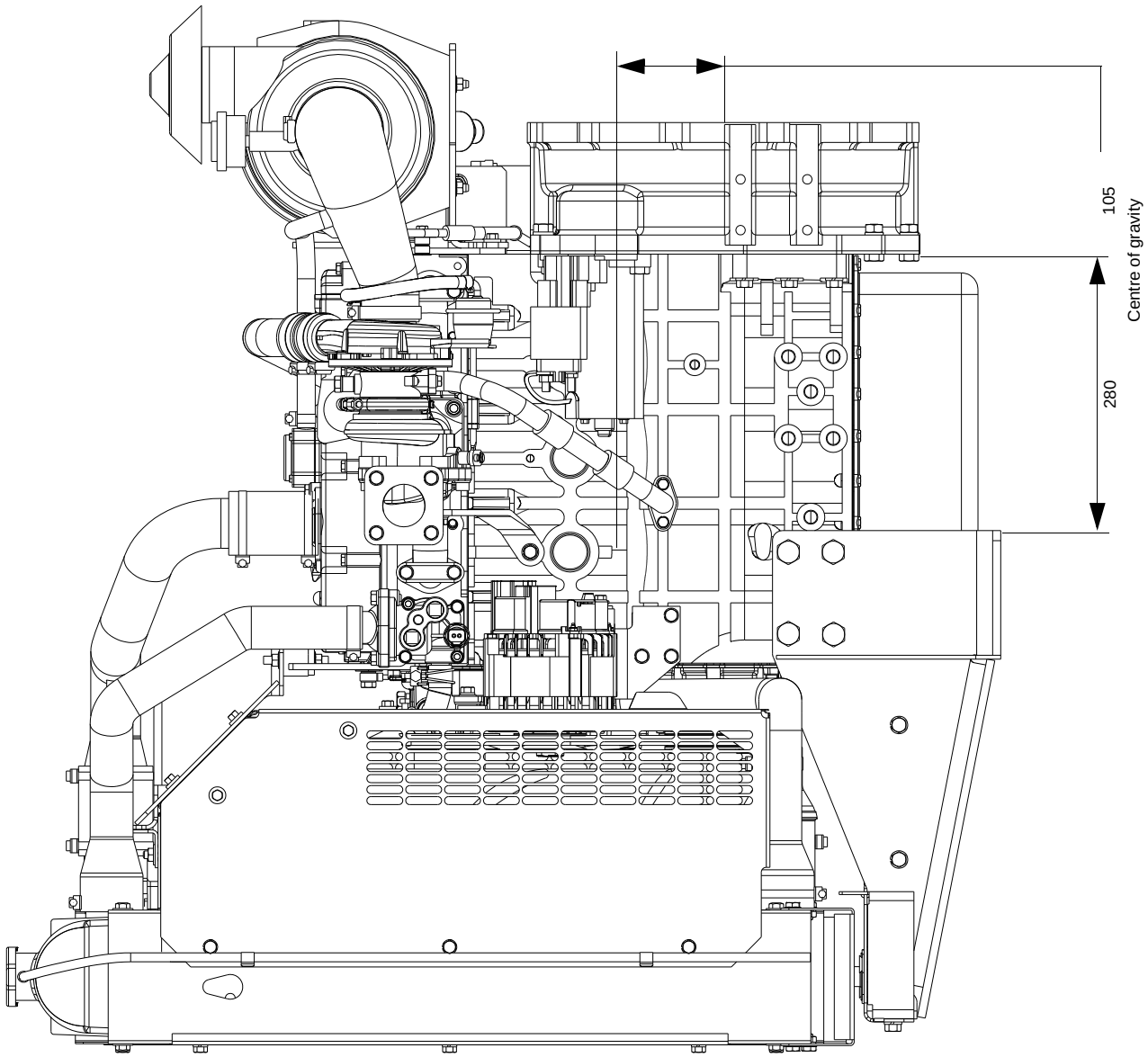
Initial load application: When engine reaches rated speed (15 seconds maximum after engine starts to crank)		
Descriptor	Units	60 Hz
% of prime power	%	92
Transient frequency deviation	%	9.4
Frequency recovery	Seconds	1.9

The above figures were obtained under the following test conditions:
-minimum engine block temperature ... ... 65 °C
-ambient temperature ... ... 11.5 °C
-governing mode ... ... 5 %
-alternator inertia ... ... 0.1611 kgm²
-under frequency roll off (UFRO) point set to2% Volt / 1% frequency
-UFRO rate set to ... ... 1 Hz below rated speed
LAM on/off ... ... off
All tests were conducted using an engine which was installed and serviced to Perkins Engines Company Limited recommendations.

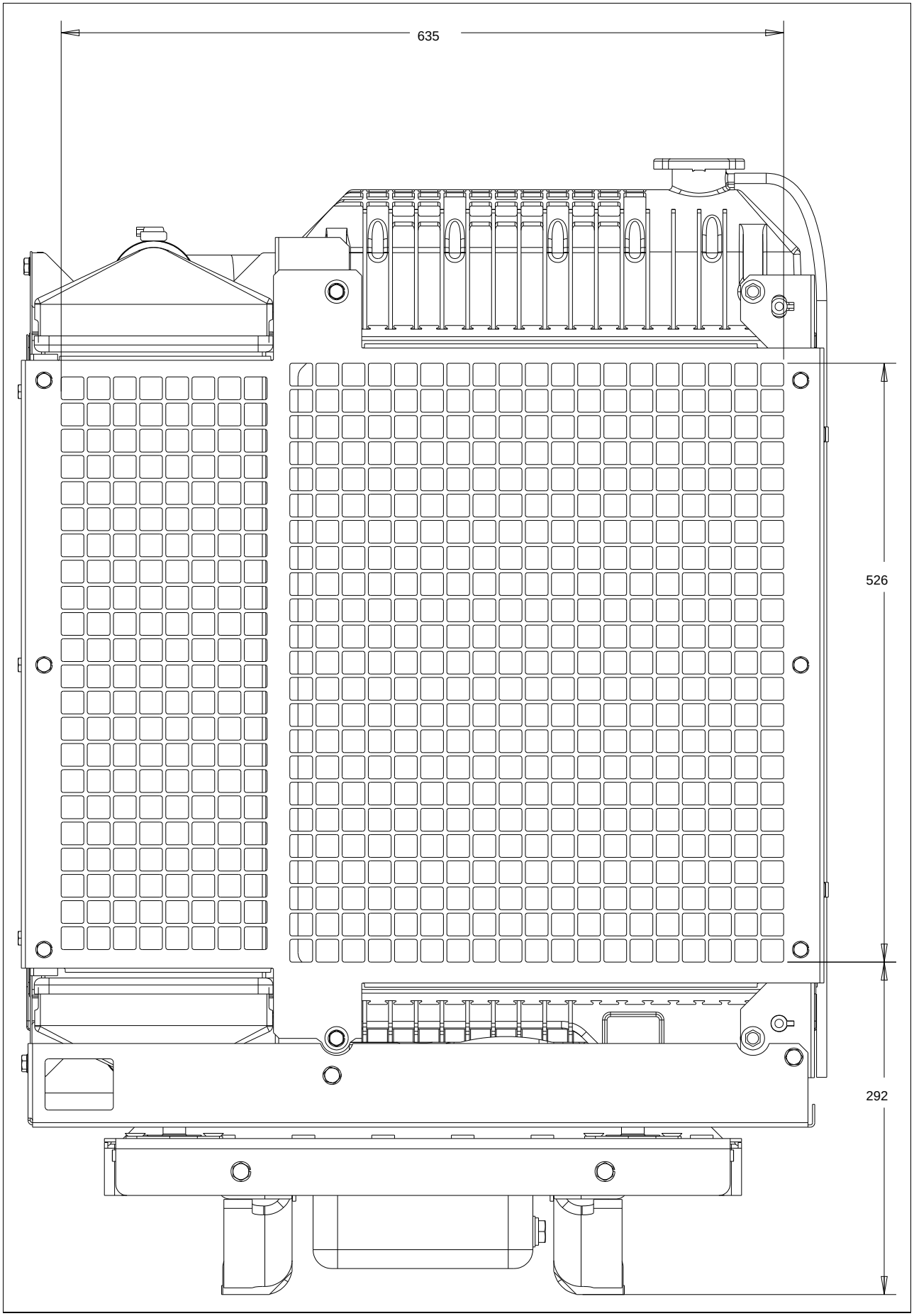
Derate Curves

Derate curves for altitude and humidity can be found in Chapter 6, of the 400D Engine Sales Manual.
The general arrangement drawings shown in this data sheet are for guidance only. For installation purposes, latest versions should be requested from the Applications Department, Perkins Engines Stafford, ST16 3UB United Kingdom.

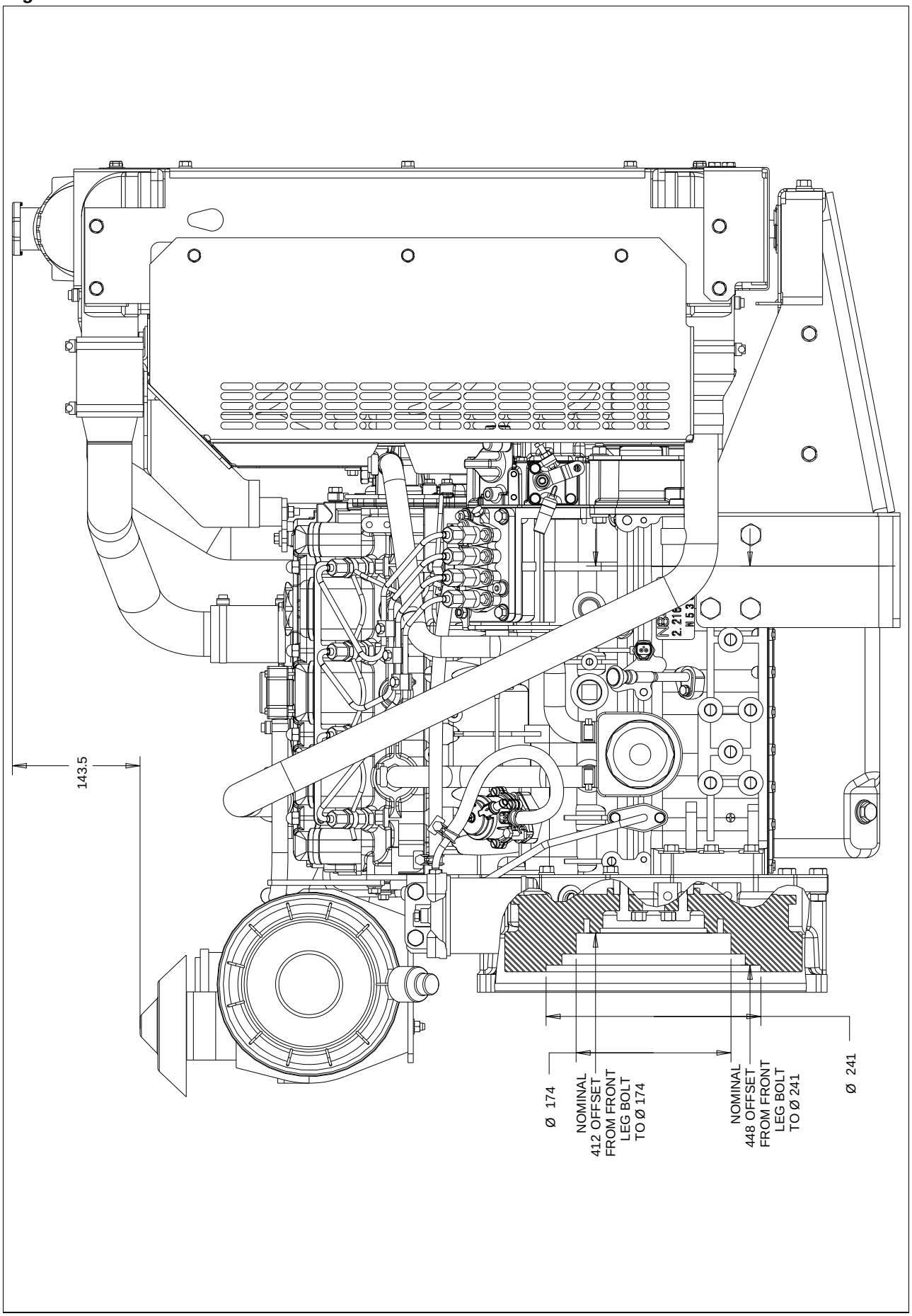
Left side view



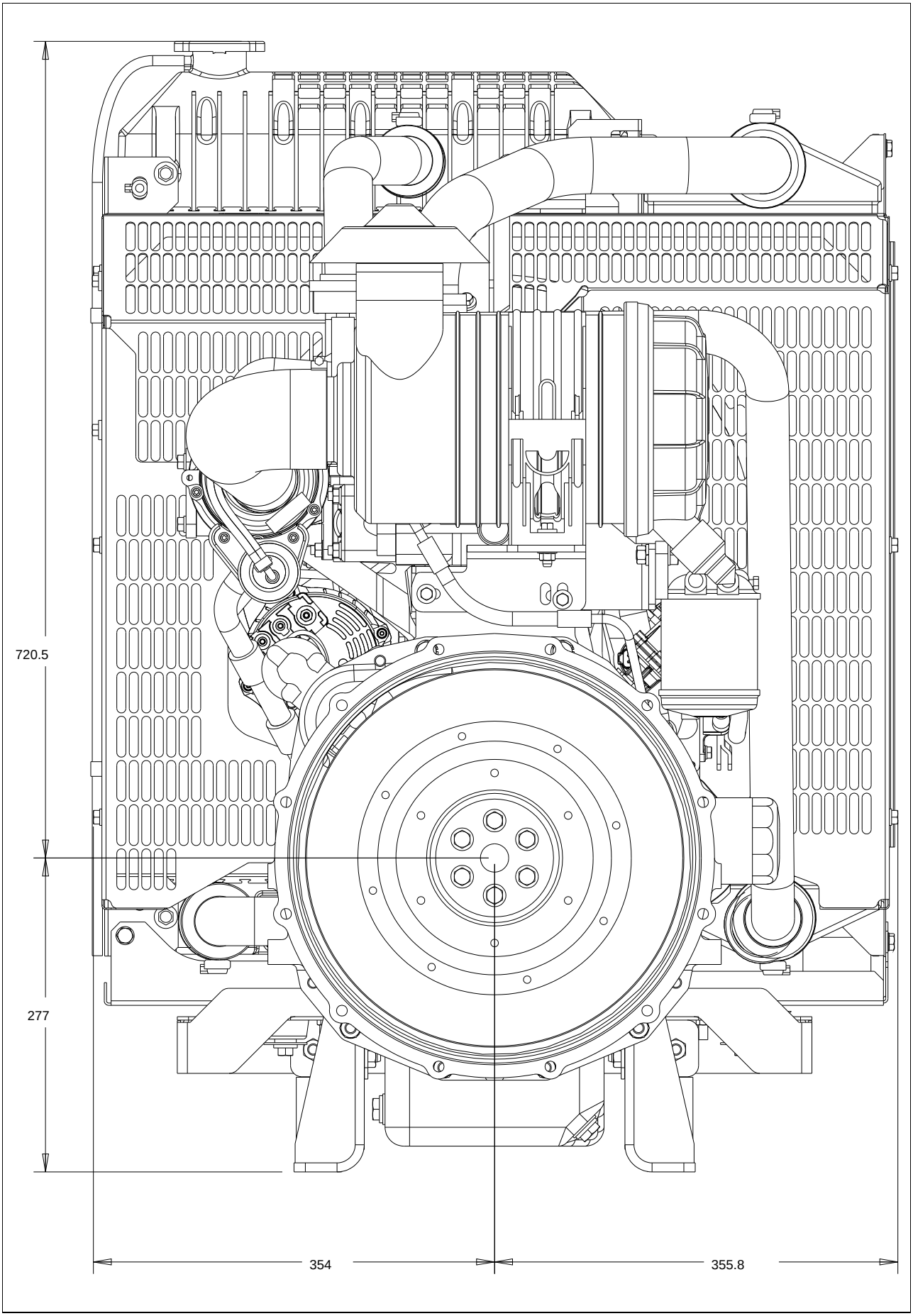
Front view



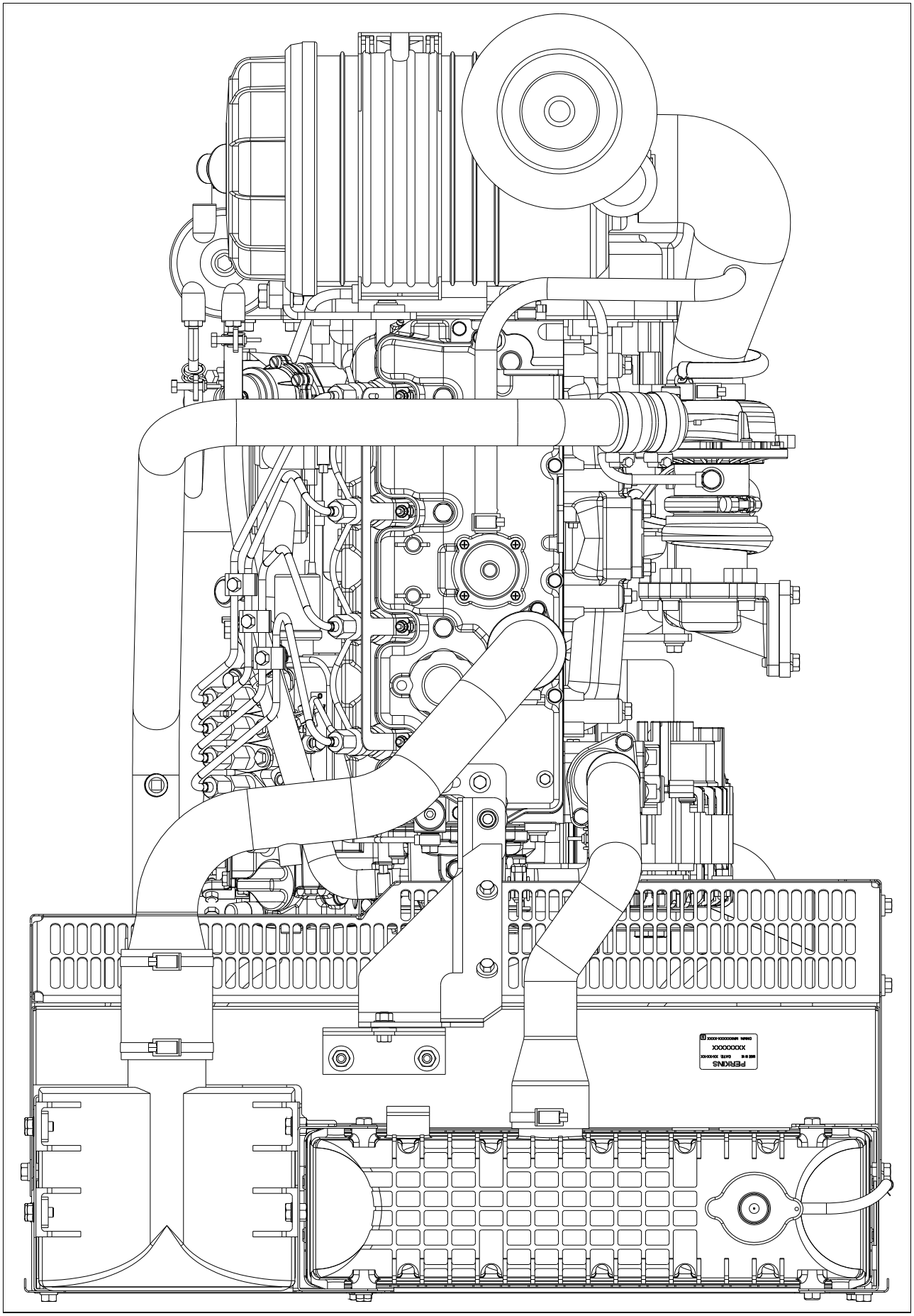
Right side view



Rear view



Plan view



View from below