## Important

This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

Requirements marked with ⚠ are considered as critical for exhaust emissions compliance according to the design specification in the Volvo Penta application for certification.

Failing to follow and meet these instructions and requirements when installing a certified engine in a piece of nonroad equipment for use in the United States violates U.S. federal law (40 CFR 1068.105(b)), subject to fines or other penalities as described in the Clean Air Act.

## General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel

| | | | |
|---|---|---|---|
| Number of cylinders | | | 6 |
| Displacement, total | | liters<br>$in^3$ | 7,70<br>470 |
| Firing order | | | 1-4-2-6-3-5 |
| Bore | | mm<br>in | 110<br>4,33 |
| Stroke | | mm<br>in | 135<br>5,31 |
| Compression ratio | | | 17.5:1 |
| Wet weight<br>(Not including after treatment system) | Engine only | kg<br>lb | 707<br>1559 |
| | Power pac | kg<br>lb | 817<br>1801 |

| **Performance** | | | | **rpm** | **1500** | **1800** | **2000** | **2200** |
|---|---|---|---|---|---|---|---|---|
| IFN Power | 210 kW | without fan | | kW<br>hp | 192<br>261 | 210<br>286 | 210<br>286 | 210<br>286 |
| | | with fan<br>650 mm | | kW<br>hp | 185<br>251 | 199<br>271 | 199<br>271 | 199<br>271 |
| Torque at: | | IFN Power 210 kW | | Nm<br>lbf ft | 1225<br>903 | 1115<br>822 | 1003<br>740 | 912<br>673 |
| Max torque at engine speed | IFN Power | | 1350 rpm | Nm<br>lbf ft | 1235<br>911 | | | |
| Power tolerance | | | | % | ±5 | | | |
| Mean piston speed | | | | m/s<br>ft/sec | 6,8<br>22,1 | 8,1<br>26,6 | 9,0<br>29,5 | 9,9<br>32,5 |
| Effective mean pressure at: | | IFN Power 210 kW | | MPa<br>psi | 2,00<br>289 | 1,82<br>264 | 1,64<br>237 | 1,49<br>216 |
| Max combustion pressure at: | | IFN Power 210 kW | | MPa<br>psi | 13,8<br>2001 | 14,4<br>2088 | 14,2<br>2059 | 13,4<br>1943 |
| Total mass moment of inertia, J ($mR^2$)<br>(not including flywheel) | | | | $kgm^2$<br>$lbft^2$ | 0,421<br>10,0 | | | |
| Friction Power | | | | kW<br>hp | 18<br>24 | 25<br>34 | 31<br>42 | 38<br>52 |
| **Derating see Technical Diagrams** | | | | | | | | |

| **Engine brake performance (only engines with engine brake)** | | **rpm** | **1500** | **1800** | **2200** | **2500** |
|---|---|---|---|---|---|---|
| Brake power: | without fan | kW<br>hp | 36<br>49 | 53<br>72 | 83<br>113 | 107<br>146 |
| Brake torque: | without fan | Nm<br>lbf ft | 230<br>170 | 280<br>207 | 360<br>266 | 410<br>302 |
| Engine speed range for engine brake activation: | | rpm | 900-2500 | | | |
| Min engine speed with engine brake still active: | | rpm | 750 | | | |
| Min oil temperature for engine brake activation: | | °C | N/A | | | |

**Cold start performance**

| | | | | |
|---|---|---|---|---|
| *Cold start limit temperature | without starting aid | °C<br>°F | -15<br>5 | |
| | with manifold heater 4 kW | °C<br>°F | -25<br>-13 | |
| | with manifold heater 4 kW and block heater | °C<br>°F | -35<br>-31 | |
| *Specify oil quality | Above -15°C; 15W40<br>Above -25°C; 10W30<br>Below -25°C; 5W30 | | | |
| Block heater type | Make | Power kW | Engaged hours | Cooling water temp engine block |
| | Volvo | 1,5 | | |

* See also general section in the sales guide

**Lubrication system**

| | | | | |
|---|---|---|---|---|
| Lubricating oil consumption (average) | | | Vol% | 0,05 |
| Oil system capacity including filters | | | liter<br>US gal | 27<br>7,13 |
| Oil sump capacity: | | Max | liter<br>US gal | 24<br>6,34 |
| | | Min | liter<br>US gal | 19<br>5,02 |
| Oil change intervals/specifications | VDS3, VDS4.5 | | h | 500 |
| | VDS3 with oil analysis | | h | 1000 |
| Engine angularity limits: | | front up | ° | 35 |
| | | front down | ° | 35 |
| | | side tilt | ° | 35 |
| Oil pressure at rated speed | | | kPa<br>psi | 425<br>62 |

**Lubrication system**

| | | | |
|---|---|---|---|
| Lubrication oil temperature in sump: | max | °C<br>°F | 125<br>257 |
| Oil filtration efficiency (in accordance with ISO 4548-12) | 97% | µ | 36 |
| | 50% | µ | 14 |

| **Fuel system** | | **rpm** | **1500** | **1800** | **2000** | **2200** |
|---|---|---|---|---|---|---|
| Fuel to conform to | | | EU EN590<br>US D975, 1-D and 2-D<br>(Max 3000ppm sulphur and 7% FAME)<br>For further information, see service bulletin 18-8-8 | | | |
| System supply flow at max. speed | | liter/h<br>US gal/h | 165<br>43,6 | | | |
| Fuel supply line max. restriction<br>(Measured at fuel inlet connection) | | kPa<br>psi | 10<br>1,5 | | | |
| Fuel supply line max. pressure, during engine stand still<br>(meassured at fuel inlet connection) | | kPa<br>psi | 20<br>2,9 | | | |
| System return flow at max. speed | | liter/h<br>US gal/h | 111,0<br>29,3 | | | |
| Fuel return line max. restriction<br>(Measured at fuel return connection) | | kPa<br>psi | 15<br>2,2 | | | |
| Max. allowable inlet fuel temp<br>(Measured at fuel inlet connection) | | °C<br>°F | 80<br>176 | | | |
| Prefilter / Water separator filtration efficiency | 99% | µ | 30 | | | |
| Main fuel filter filtration efficiency<br>(in accordance with ISO 19438) | 98% | µ | 5 | | | |
| | 96% | µ | 4 | | | |
| Governor type/make, standard | | Volvo / EMS 2.3 | | | | |
| Injection pump type/make | | Denso HP4 | | | | |

| **Intake and exhaust system** | | **Inlet air temp** | **rpm** | **1500** | **1800** | **2000** | **2200** |
|---|---|---|---|---|---|---|---|
| Charge air consumption at:<br>(+25°C and 100kPa) | IFN Power 210 kW | 25°C | m³/min | 13,8 | 16,6 | 18 | 19,4 |
| | | 77°F | cfm | 487 | 586 | 636 | 685 |
| ⚠<br>**See front page for important information**<br>Max allowable air intake restriction including piping | | | kPa<br>psi | 6<br>0,9 | | | |
| Heat rejection to exhaust at: | IFN Power 210 kW | | kW | 137 | 157 | 164 | 178 |
| | | | BTU/min | 7791 | 8928 | 9327 | 10123 |
| Exhaust gas temperature after turbine at: | IFN Power 210 kW | | °C | 459 | 442 | 429 | 433 |
| | | | °F | 858 | 828 | 804 | 811 |
| ⚠<br>**See front page for important information**<br>Max allowable back pressure in exhaust line (after turbine)<br>Pipe dimension Ø: 127 mm | | | kPa | 9 | 12 | 14 | 15 |
| | | | psi | 1,3 | 1,7 | 2,0 | 2,2 |
| Exhaust gas flow at:<br>(temp and pressure after turbine at the corresponding power setting) | IFN Power 210 kW | | m³/min | 34,4 | 39,0 | 40,7 | 43,9 |
| | | | cfm | 1215 | 1377 | 1437 | 1550 |

| Cooling system | | | rpm | 1500 | 1800 | 2000 | 2200 |
|---|---|---|---|---|---|---|---|
| Heat rejection radiation from engine at: | | IFN Power 210 kW | kW<br>BTU/min | 8<br>427 | 7<br>404 | 6,8<br>387 | 7,3<br>415 |
| Heat rejection to coolant at: | | IFN Power 210 kW | kW<br>BTU/min | 82<br>4663 | 94<br>5346 | 98<br>5573 | 109<br>6199 |
| Radiator cooling system type | | | | Closed circuit | | | |
| Standard radiator core area | | IFN Power 210 kW | m²<br>foot² | 0,6<br>6,46 | | | |
| Fan diameter | 650 mm | IFN Power 210 kW | mm<br>in | 650<br>25,59 | | | |
| Maximum fan power consumption | 650 mm pull | | kW<br>hp | 7,2<br>10 | 10,8<br>15 | 10,8<br>15 | 10,8<br>15 |
| Fan drive ratio | fan Ø650 | | | 1.4:1 | | | |
| Coolant capacity: | engine | | liter<br>US gal | 17<br>4,5 | | | |
| | engine + standard radiator, hoses and expansion tank | | liter<br>US gal | 51<br>13,5 | | | |
| Coolant pump | | | drive/ratio | belt/1,4:1 | | | |
| Coolant flow with standard system | | | l/s<br>US gal/s | 5,4<br>1,4 | 6,5<br>1,7 | 7,2<br>1,9 | 8<br>2,1 |
| Minimum coolant flow | | | l/s<br>US gal/s | | | | 6,0<br>1,6 |
| Maximum outer circuit restriction incl. piping | | | kPa<br>psi | 40,0<br>5,8 | | | |
| Thermostat: | | start to open | °C<br>°F | 85<br>185 | | | |
| | | fully open | °C<br>°F | 95<br>203 | | | |
| Maximum static pressure head (expansion tank height + pressure cap setting) | | | kPa<br>psi | 110<br>16,0 | | | |
| Minimum static pressure head (expansion tank height + pressure cap setting) | | | kPa<br>psi | 85<br>12,3 | | | |
| Standard pressure cap setting | | | kPa<br>psi | 100<br>14,5 | | | |
| Maximum top tank temperature | | | °C<br>°F | 107<br>225 | | | |
| Recommended Draw down capacity.<br>The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still are functioning | | | liter<br>US gal | 2<br>0,5 | | | |

| Charge air cooler system | | rpm | 1500 | 1800 | 2000 | 2200 |
|---|---|---|---|---|---|---|
| Heat rejection to charge air cooler | IFN Power 210 kW | kW | 33,9 | 40,4 | 43,3 | 49,2 |
| | | BTU/min | 1928 | 2298 | 2462 | 2798 |
| Charge air mass flow | IFN Power 210 kW | kg/s | 0,275 | 0,33 | 0,358 | 0,386 |
| Charge air inlet temp. | IFN Power 210 kW | °C | 162 | 166 | 167 | 177 |
| (Charge air temp after turbo compressor) | | °F | 324 | 331 | 333 | 351 |
| ⚠ **See front page for important information** Max allowable Charge air outlet temp. | | °C | 40 | 44 | 47 | 50 |
| (Charge air temp after charge air cooler) | | °F | 104 | 111 | 117 | 122 |
| ⚠ **See front page for important information** Maximum pressure drop over charge air cooler incl. piping | | kPa | 7 | 9 | 10 | 12 |
| | | psi | 1,0 | 1,3 | 1,5 | 1,7 |
| Charge air pressure | | kPa | 176 | 180 | 177 | 177 |
| (After charge air cooler) | | psi | 25,53 | 26,11 | 25,67 | 25,67 |
| Standard charge air cooler core area | | m² | 0,5 | | | |
| | | foot² | 5,38 | | | |

**Cooling performance: 0,6 m² radiator and 650mm fan, pull**

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

| | | | | IFN Power 210 kW | | | |
|---|---|---|---|---|---|---|---|
| Engine speed | Engine power | Air on temp | | Air flow | | External restriction | |
| rpm | kW hp | °C | °F | $m^3/s$ | $ft^3/s$ | Pa | psi |
| 2200 | 210 | 72,3 | 162 | 9,1 | 321,4 | 0 | |
| | 286 | 71,9 | 161 | 8,9 | 314,3 | 100 | 0,015 |
| | | 71,2 | 160 | 8,6 | 303,7 | 200 | 0,029 |
| | | 69,9 | 158 | 8,2 | 289,6 | 300 | 0,044 |

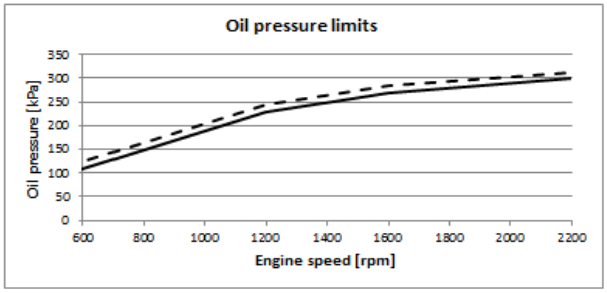
**Engine management system**

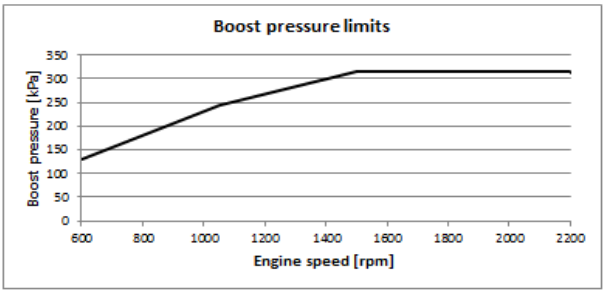
| Functionality | Alternatives | | | Default setting |
|---|---|---|---|---|
| Governor mode | Droop | Isochronous | | Isochronous |
| Governor droop | 10 | 125 | Nm/rpm | |
| Governor response | Adjustable PI constants | | | |
| Idle speed | 600 | 800 | rpm | 600 |
| Stop function | | | | Replaced by "Ignition of stop engine" |
| Preheating function | Ignition | Request | Request + temp | If preheat is available, preheat will be active at ignition on if temp low or demanded by driver. |
| Lamp test | | | | No lamp test, not used any longer |
| Ignition of stop engine | Yes | No | | No |
| | | | | |

| Engine sensors and switch settings | | | Alarm level | | Engine protection | |
|---|---|---|---|---|---|---|
| Parameter | | Unit | Setting range | Default setting | Level | Action. Default/Alternative |
| Oil temp | | °C | | 125 | 125 | Derate |
| Oil pressure | Low idle | kPa | | 100,0 | 100 | Shut down |
| | Rated speed | kPa | | 300 | 300 | Shut down |
| Coolant temp | | °C | | 107 | 107 | Derate |
| Coolant level | | | | On | Low level | Derate |
| Water in fuel | | | On if closed circuit | | | |
| Air filter pressure drop | | | | 5kPa | | |
| Altitude, above sea | | m | | | | Automatic derating, see section derating |
| Charge air temp | | °C | | 80 | 80 | Derate |
| Charge air pressure | | kPa | | See map | | Derate |
| Engine speed | | rpm | | | | Shut down. ON/OFF* |

* Off means no shut down, alarm only

| Parameter | Warning | Alarm | Derated 0% to engine protection map | Derated 100% to engine protection map | Forced idle after 0 sec | Forced shut down after 0 sec |
|---|---|---|---|---|---|---|
| Coolant temp | 103°C | 107°C | 107°C | 110°C | | |
| Oil temp | 122°C | 125°C | 125°C | 130°C | | |
| Low oil pressure | Warning map value | Alarm map value | | Alarm map value | | |
| High charge air temp | 77°C | 80°C | 80°C | 100°C | | |
| High charge air pressure | | Alarm map value | Alarm map value | | | |



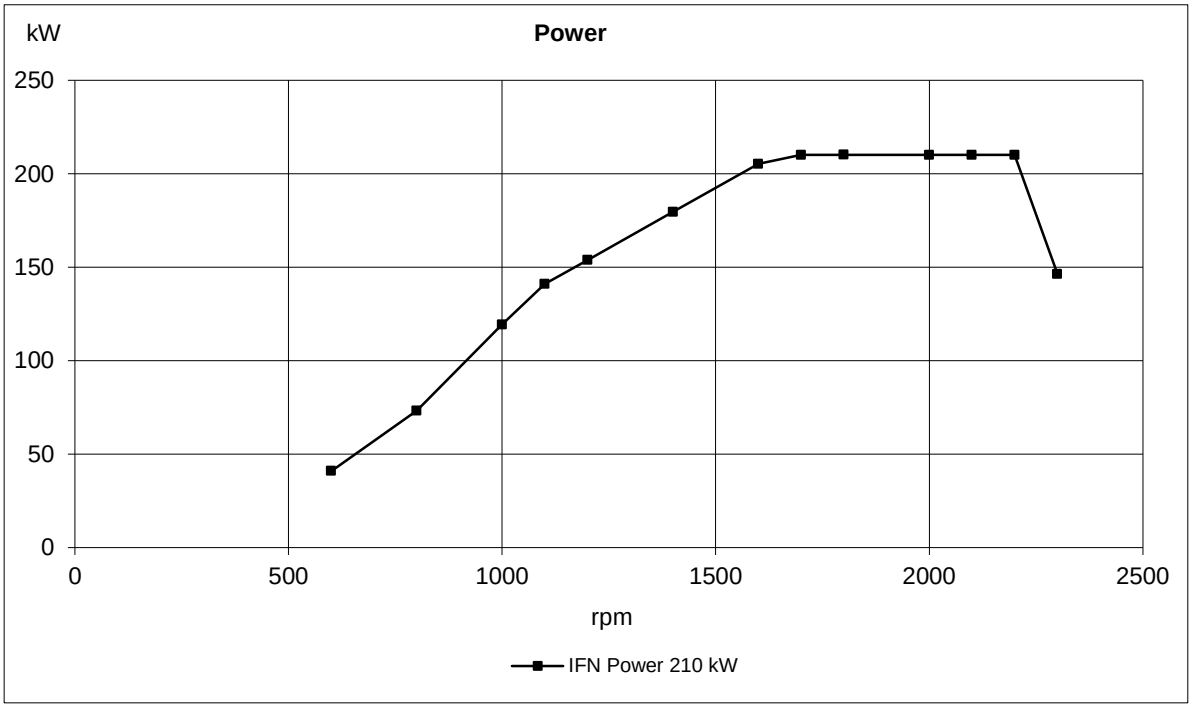
**Electrical system**

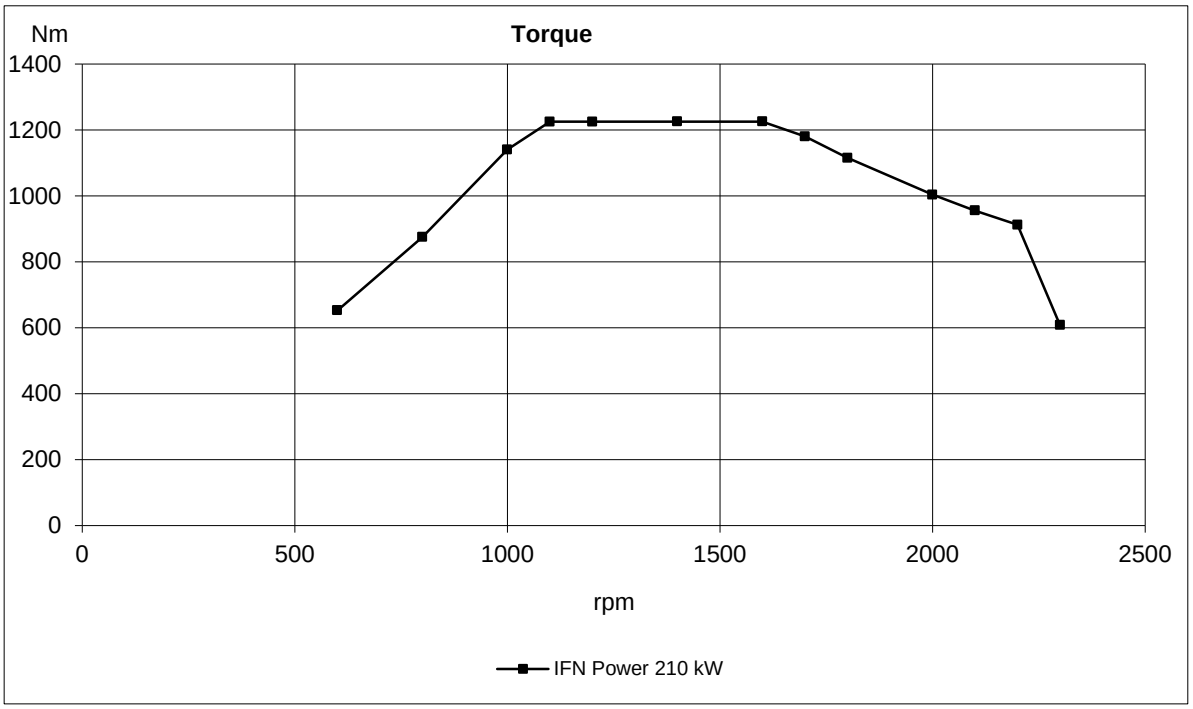
| | | | | |
|---|---|---|---|---|
| Voltage and type | | | | 24V |
| Alternator: | make | | | MELCO |
| | output | A | | 110/130 |
| | tacho output | Hz/alternator rev. | | |
| | drive ratio | | | |
| Starter motor: | make | | | MELCO |
| | type | | | 85P50 / 90P55 |
| | output | | kW | 5 / 5.5 |
| | | | hp | 6.8 / 7.5 |
| Number of teeth on: | flywheel | | | 137 |
| | starter motor | | | 10 / 12 teeth |
| Inlet manifold heater (at 20 V) | | | kW | 4 |
| Power relay for the manifold heater | | | A | 200 |

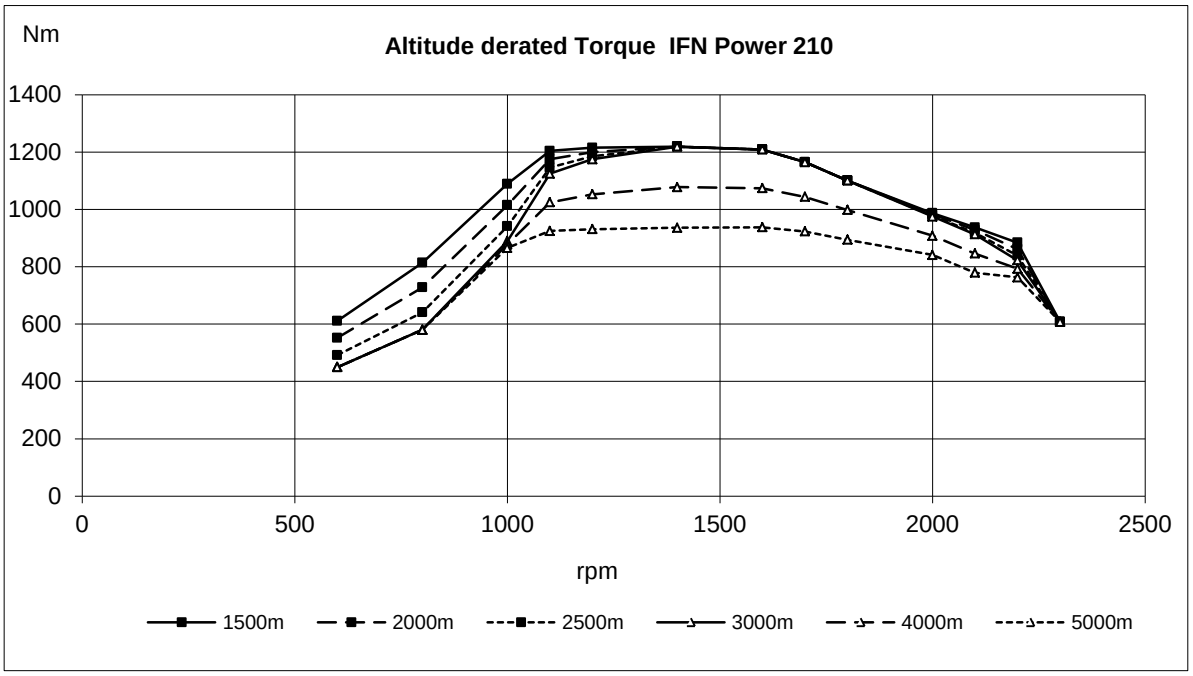
| **Conditions:** | **Temperature** | **°C** | | **25** | **0** | **-15** |
|---|---|---|---|---|---|---|
| (5 mΩ main circuit resistance@ | **Battery** | **Ah / CCA** | | **140/800** | **140/800** | **170/1000** |
| Crank speed | | rpm | | 185 | 160 | 120 |
| Crank current | | A | | 220 | 300 | 470 |
| Starter input power during crank | | kW | | 4,91 | 5,90 | 6,94 |
| Battery power during crank | | kW | | 5,15 | 6,31 | 7,50 |
| Min battery @ 0°C | | Ah / CCA | | | | |

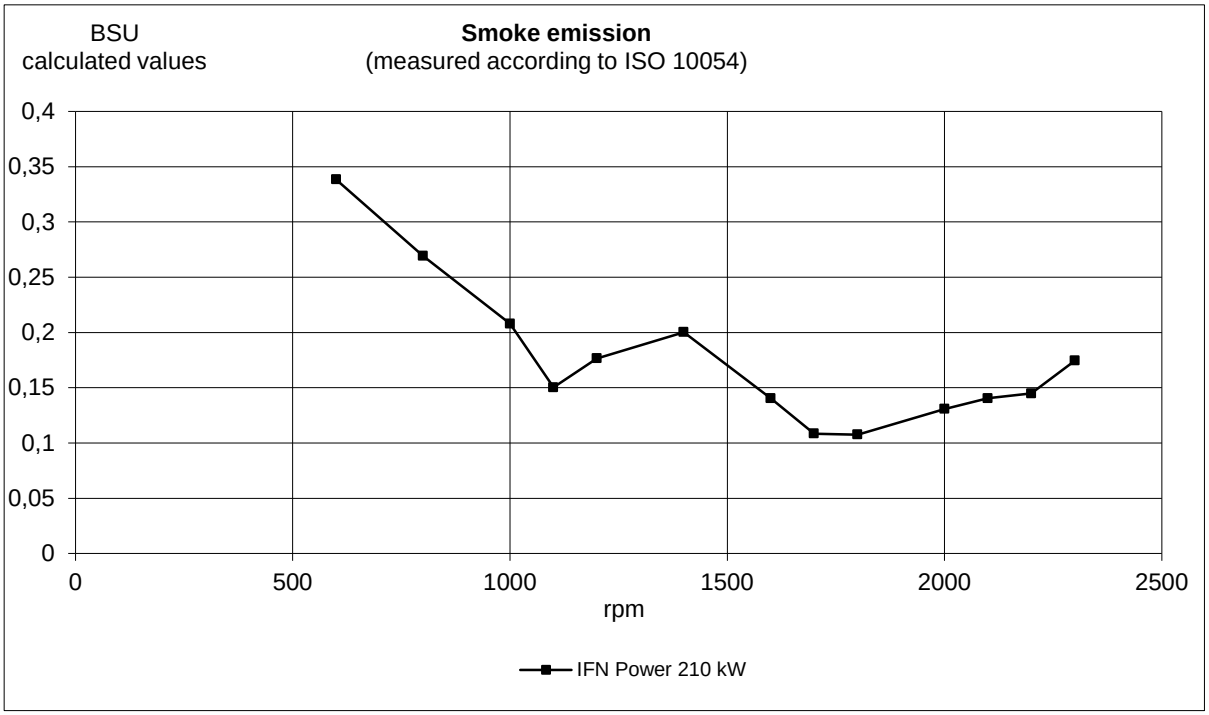
| **Power take off** | | | **rpm** | **1500** | **1800** | **2000** | **2200** |
|---|---|---|---|---|---|---|---|
| Front end in line with crank shaft max:* | | 0.02 kgm$^2$ | Nm | 1064,0 | 743,0 | 740 | 833 |
| **Flywheel** | | | lbf ft | 785 | 548 | 546 | 614 |
| SAE 2, STD 10" & 11,5 ", 1.303 kgm2 | | 0.03 kgm$^2$ | Nm | 1030,0 | 706,0 | 697 | 786 |
| SAE 3, DANA 5000, 1.336 kgm2 | | | lbf ft | 760 | 521 | 514 | 580 |
| SAE 3, ZF WG 161-211, 1.348 kgm2 | | 0.04 kgm$^2$ | Nm | 996,0 | 663,0 | 654 | 729 |
| | | | lbf ft | 735 | 489 | 482 | 538 |
| Front end belt pulley load. | Max up (above or equal to horizontal line) | | kW | 12,5 | 16 | 18,8 | 19,6 |
| | | | hp | 17,0 | 21,8 | 25,6 | 26,7 |
| | Max down (below horizontal line) | | kW | 26,6 | 34,2 | 38 | 41,8 |
| | | | hp | 36,2 | 46,5 | 51,7 | 56,8 |
| Maximum power on Rear PTO on top of flywheel housing (REPTO):* | | | kW | 75 | | | |
| | | | hp | 102 | | | |
| Speed ratio direction of rotation viewed from flywheel side | | | | 1:1 Counter clockwise | | | |
| Maximum torque on PTO at compressor position:* | | | Nm | 200 | | | |
| | | | lbf ft | 148 | | | |
| Speed ratio direction of rotation viewed from flywheel side | | | | 1.026:1 Counter clockwise | | | |
| Timing gear at hydraulic pump PTO max:* | | | Nm | 80 | | | |
| | | | lbf ft | 59 | | | |
| Speed ratio direction of rotation viewed from flywheel side | | | | 1.3:1 Clockwise | | | |
| Max allowed bending moment in flywheel housing SAE2 | | | Nm | 4600 | | | |
| | | | lbf ft | 3393 | | | |
| Max. rear main bearing load | | | N | | | | |
| | | | lbf | | | | |

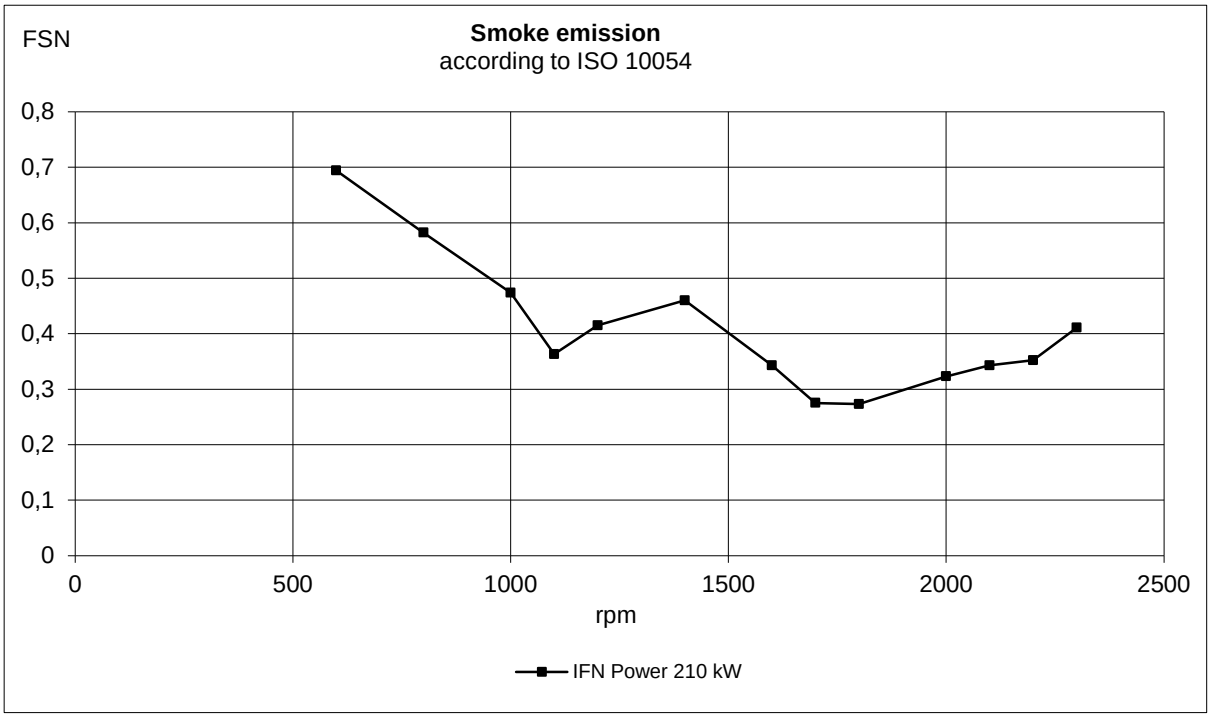
**** Maximum allowed torque at individual PTO´s.***
***If more then one PTO output is used simultaniusly, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.***

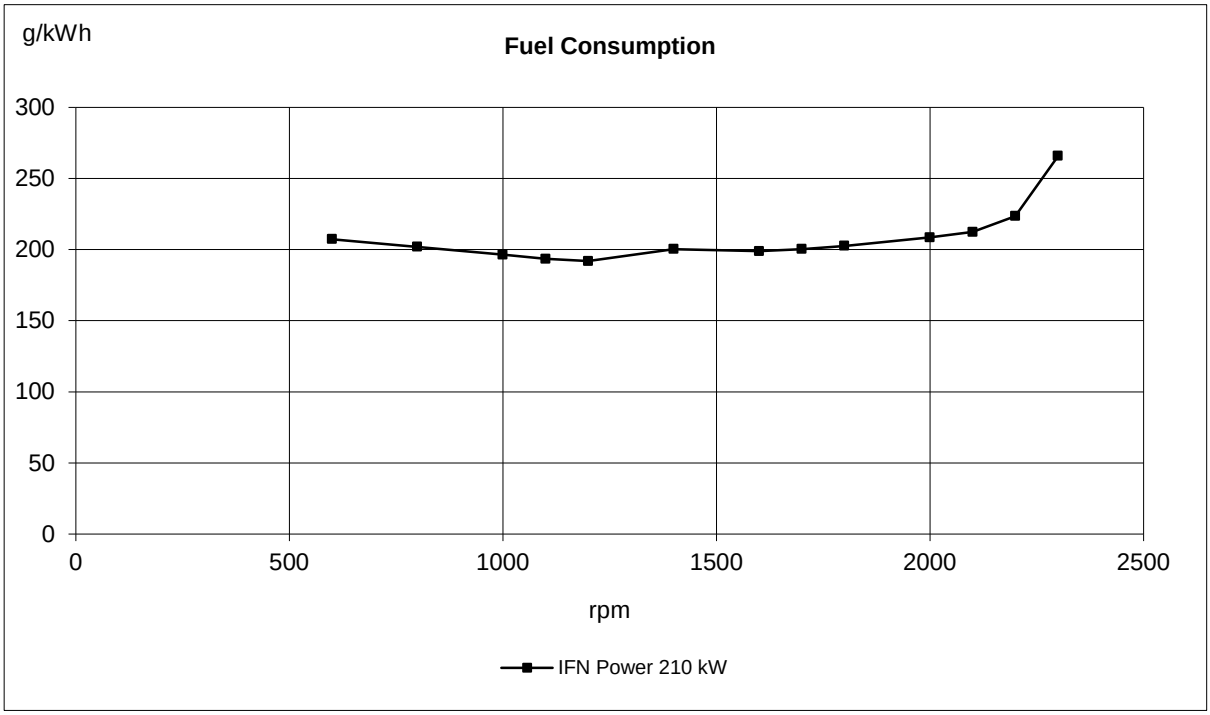

kW
Power
250
200
150
100
50
0
0
500
1000
1500
2000
2500
rpm
IFN Power 210 kW

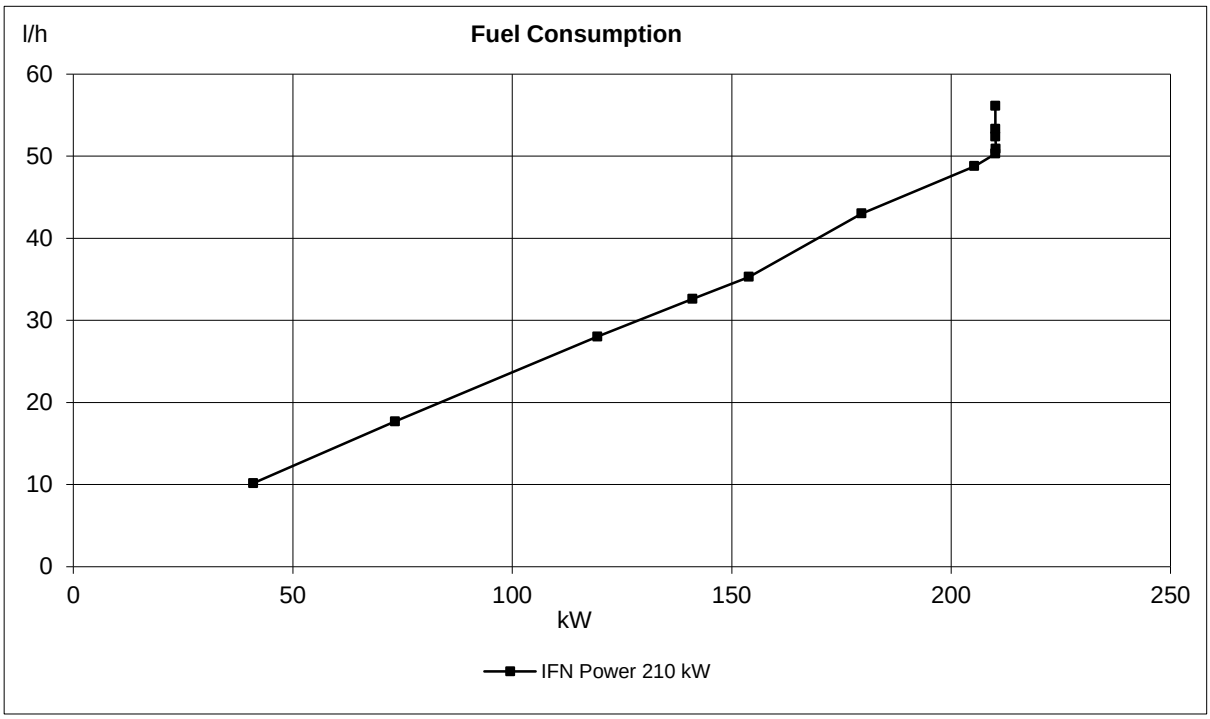

Nm
Torque
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
IFN Power 210 kW

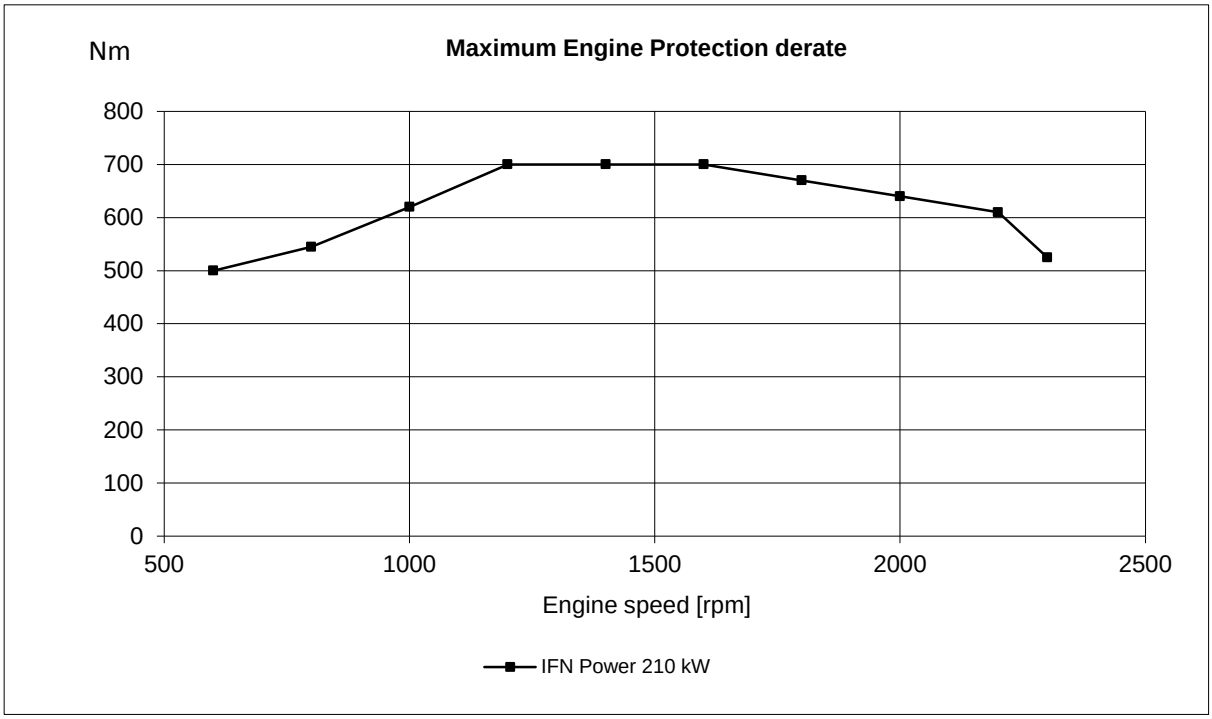

Nm
Altitude derated Torque IFN Power 210
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
1500m
2000m
2500m
3000m
4000m
5000m

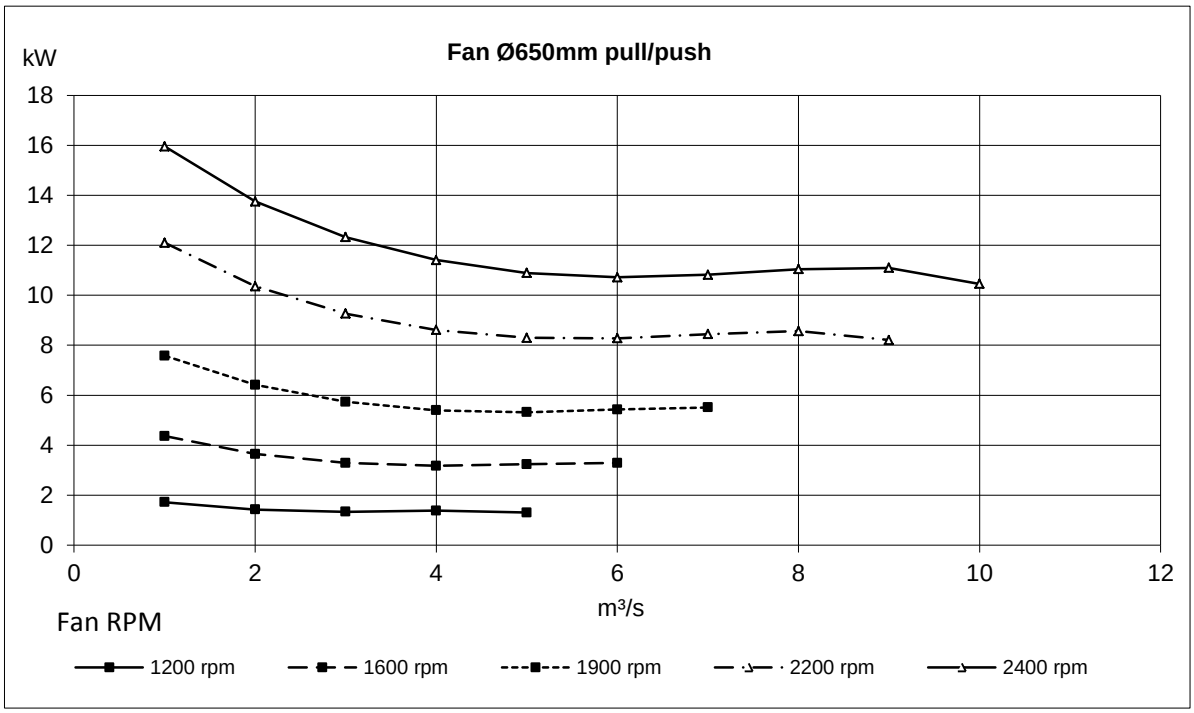

BSU
calculated values
Smoke emission
(measured according to ISO 10054)
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
0
500
1000
1500
2000
2500
rpm
IFN Power 210 kW


FSN
Smoke emission
according to ISO 10054
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
500
1000
1500
2000
2500
rpm
IFN Power 210 kW

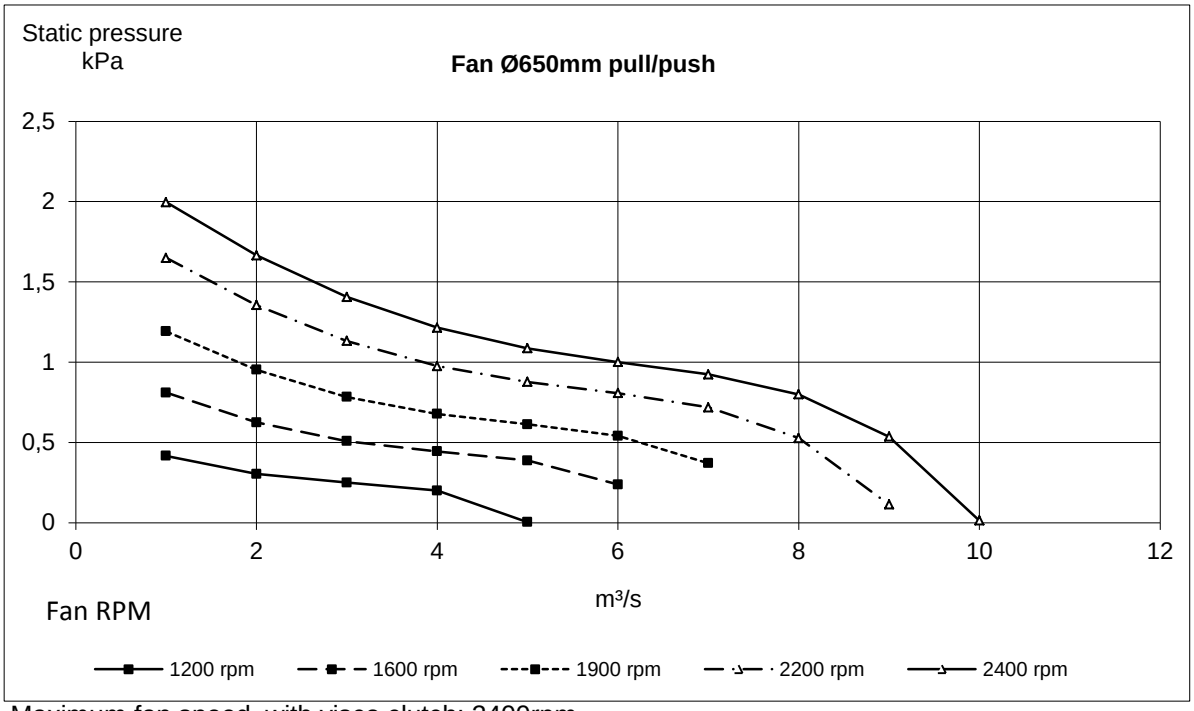

g/kWh
Fuel Consumption
300
250
200
150
100
50
0
0
500
1000
1500
2000
2500
rpm
IFN Power 210 kW


l/h
Fuel Consumption
60
50
40
30
20
10
0
0
50
100
150
200
250
kW
IFN Power 210 kW

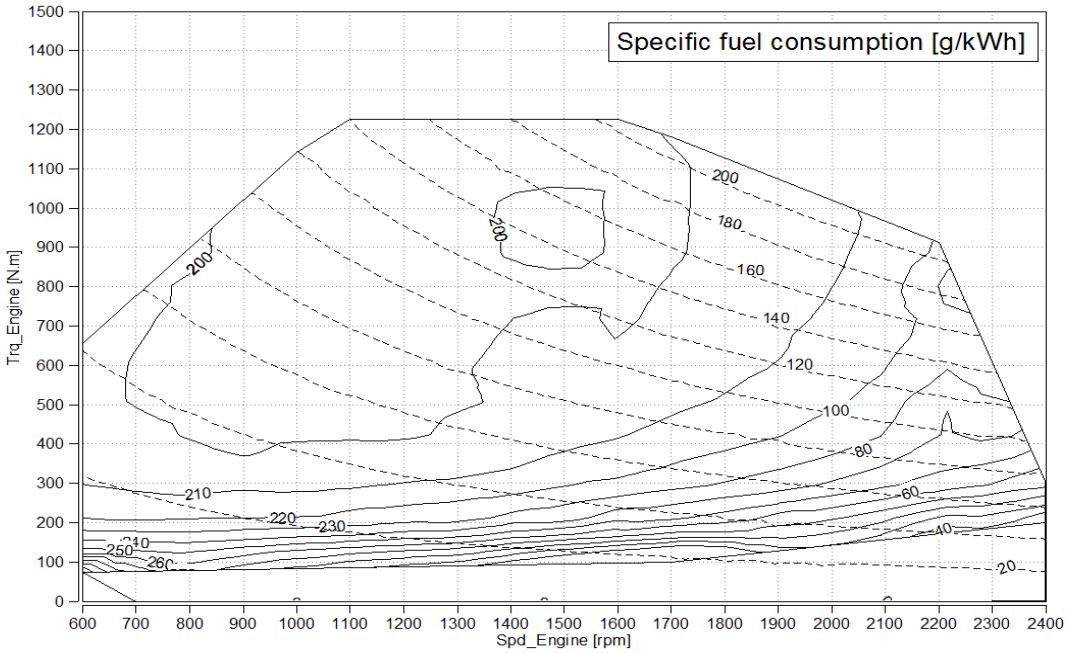

Nm
Maximum Engine Protection derate
800
700
600
500
400
300
200
100
0
500
1000
1500
2000
2500
Engine speed [rpm]
IFN Power 210 kW

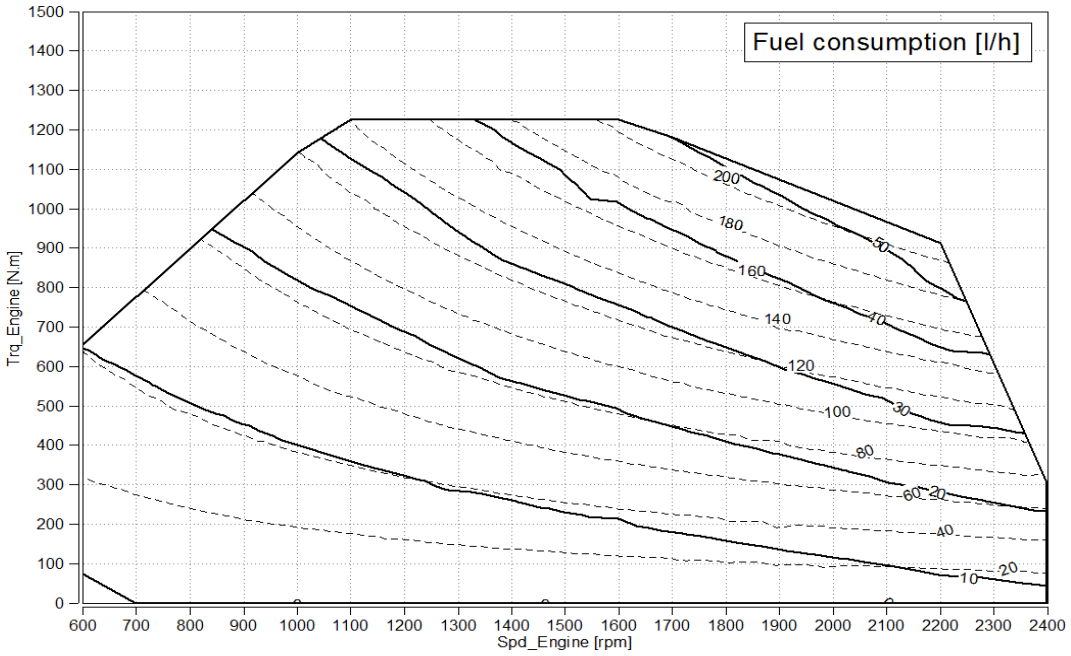



Maximum fan speed with visco clutch: 2400rpm




Maximum fan speed with visco clutch: 2400rpm


Specific fuel consumption [g/kWh]
Trq_Engine [N.m]
Spd_Engine [rpm]
200
180
160
140
120
100
80
60
40
20
210
220
230
240
250
260


Fuel consumption [l/h]
Trq_Engine [N.m]
Spd_Engine [rpm]
200
180
160
140
120
100
80
60
50
40
30
20
10