



Cummins Inc.

Base Engine Data Sheet

Industrial Market

**QSK60
D593001CX03**

Number Cylinders:	16	Bore:	6.26 in (159 mm)
Displacement:	3,674 in3 (60.2 L)	Stroke:	7.48 in (190 mm)
Aspiration:	Turbocharged and Aftercooled		

Revision:
23-Jan-2018

General Engine Data

Approximate engine weight (wet) *	18,203 lbm	8,257 kg
<small>* Specification dependent. Not to be used for contractual agreements. Note: See change log</small>		
Maximum overspeed capability		
Mass moment of inertia of rotating components (excluding flywheel)	102.97 in-lbf-sec**2	11.63 kg-m**2
Maximum allowable installed engine power angle	6 deg	
Maximum allowable installed engine tilt angle	6 deg	

Engine Mounting System

Moment of inertia of complete engine:		
X moment of inertia (Roll)	8,606 in-lbf-sec**2	972 kg-m**2
Y moment of inertia (Pitch)	36,990 in-lbf-sec**2	4,178 kg-m**2
Z moment of inertia (Yaw)	36,007 in-lbf-sec**2	4,067 kg-m**2
Maximum crankshaft thrust bearing load limit		
Intermittent load	2,001 lbf	8,900 N
Continuous load	1,000 lbf	4,450 N
Maximum bending moment available from front of the crankshaft:		
0 degrees	3,840 lb-ft	5,206 N-m
90 degrees	6,691 lb-ft	9,072 N-m
180 degrees	6,973 lb-ft	9,454 N-m
270 degrees	4,807 lb-ft	6,518 N-m
Maximum torque available from front of crankshaft: (without side load)		
Maximum static mounting surface bending moment:		
Front side pad		
Front face of block		
Rear face of block	7,634 lb-ft	10,350 N-m
Flywheel housing side mounting pads		
Center of Gravity		
from rear face of block	41.33 in	1,050 mm
from engine centerline to left side of engine (as viewed from rear of engine)	-0.01 in	0 mm
above crankshaft centerline	8.62 in	219 mm
Engine block side mounting pad width from engine centerline		

Intake Air System

Maximum intake air restriction (heavy duty air cleaner)		
Dirty Filter	25 in H2O	6.2 kPa
Clean Filter	15 in H2O	3.7 kPa
Minimum dirt holding capacity with heavy duty air cleaner	25 g/cfm	
Maximum allowable intake air bleed for accessories (not including air compressor)	0 ft3/min	0 L/s
Recommended intake piping size (inner diameter)	5.83 in	148 mm

Exhaust System

Maximum allowable static bending moment @ exhaust outlet flange	20 lb-ft	27 N-m
Exhaust manifold/turbocharger blanketing acceptable	No	

Status for curves and data: Final-(Measured data)
Tolerance: Within +/- 5 %

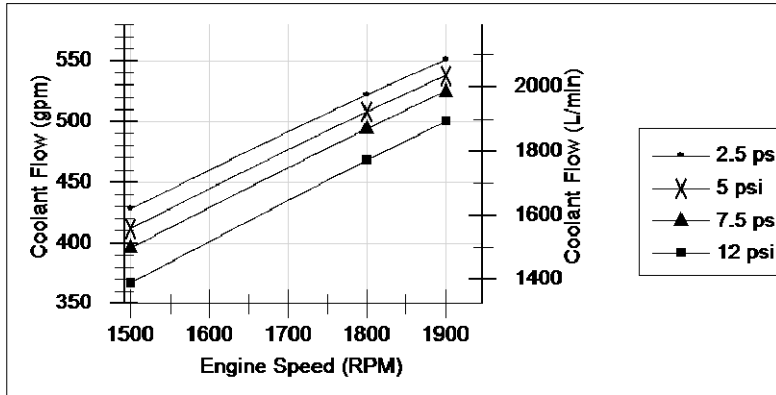
Chief Engineer:
Trevor Coy

Cooling System

Engine cooling circuit

Coolant system type	2 Pump-2 Loop	
Minimum operating block coolant temperature	160 deg F	71 deg C
Minimum fill rate	5 gpm	19 L/min
Maximum initial fill time	40 min	
Minimum water pump inlet pressure with non-deaerating or partially deaerating cooling system	N/A in-Hg	N/A kPa
Minimum water pump inlet pressure with fully deaerating cooling system	0 in-Hg	0 kPa
Maximum static head of coolant above crankshaft centerline	60 ft	18.3 m
Minimum pressure cap rating at sea level	11 psi	76 kPa
Maximum pressure cap rating at sea level	15 psi	103 kPa
Minimum coolant expansion space (% of system capacity)	6 %	
Maximum deaeration time	25 min	
Acceptable types of deaeration systems	Positive	
Minimum drawdown (% total cooling system capacity)	11 %	
Full ON Fan engine coolant outlet temperature	185 deg F	85 deg C
Maximum allowable accessory coolant flow	0 gpm	0 L/min
Coolant capacity - engine only	147.9 quarts	140 L
Coolant capacity - low temperature aftercooler	35.9 quarts	34 L
Maximum recommended external coolant flow restriction in engine circuit:	12 psi	82.7 kPa
Engine coolant circuit thermostat opening temperature:	180 deg F	82 deg C
Engine coolant circuit thermostat fully open temperature	202 deg F	94 deg C

Thermostat out coolant flow vs. external restriction for engine system (with open thermostat)



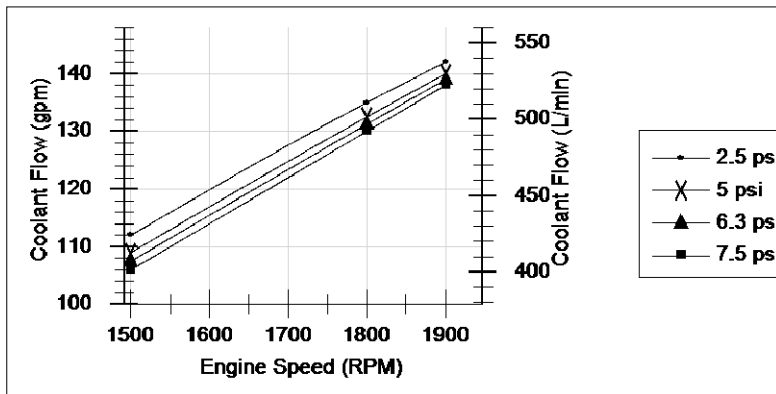
System Restriction

Engine Speed RPM	2.5 psi (17.2 kPa)		5 psi (34.5 kPa)		7.5 psi (51.7 kPa)		12 psi (82.7 kPa)	
	gpm	L/min	gpm	L/min	gpm	L/min	gpm	L/min
1,500	428	1,620.2	412	1,559.6	396	1,499	367	1,389.2
1,800	522	1,976	508	1,923	494	1,870	468	1,771.6
1,900	551	2,085.8	538	2,036.6	525	1,987.3	500	1,892.7

Low Temperature Aftercooler (LTA) circuit

LTA Aftercooler circuit thermostat opening temperature	115 deg F	46 deg C
LTA Aftercooler circuit thermostat fully open temperature	135 deg F	57 deg C
Maximum recommended external coolant restriction in LTA aftercooler circuit (1P-2L or 2P-2L)	11.99 psi	82.7 kPa
LTA radiator coolant flow with 5 psi external restriction at 25C (77F) ambient and rated speed	140 gpm	530 L/min

Thermostat out coolant flow vs. external restriction for aftercooler system (with open thermostat)



System Restriction

Engine Speed RPM	2.5 psi (17.2 kPa)		5 psi (34.5 kPa)		6.3 psi (43.1 kPa)		7.5 psi (51.7 kPa)	
	gpm	L/min	gpm	L/min	gpm	L/min	gpm	L/min
1,500	112	424	109	412.6	108	406.9	106	401.3
1,800	135	511	133	501.6	131	496.8	130	492.1
1,900	142	537.5	140	530	139	526.2	138	522.4

Lubrication System

Maximum lube oil flow to all accessories	15 gpm	56.78 L/min
Maximum oil pressure spike on cold engine	250 psi	1,724 kPa

Electrical System

System voltage:	<u>24 V</u>	
Minimum battery capacity-cold soak at -18 deg C (0 deg F) or above		
Engine only-cold cranking amperes: (CCA)	1,800 CCA	
Engine only-reserve capacity: (RC)	640 min	
Maximum starting circuit resistance	0.002 Ohm	

Fuel System

Typical clean fuel filter restriction	1 in-Hg	3 kPa
Maximum fuel supply restriction at fuel pump inlet		
with clean fuel filter element(s) at maximum fuel flow	5 in-Hg	16.9 kPa
with dirty fuel filter element(s) at maximum fuel flow	9 in-Hg	30 kPa
Maximum fuel drain restriction (total head)		
after (or with) check valve	10 in-Hg	34 kPa
before (or without) check valve	N/A in-Hg	N/A kPa
Maximum fuel inlet temperature	160 deg F	71 deg C
Minimum fuel tank venting rate	127.1 ft ³ /hr	1 L/s

RATING GUIDELINES**1. LOAD RATINGS**

- 1.1 *Maximum Rating may be used for intermittent load applications (full throttle operation is cyclically interrupted) where the average load factor does not exceed the continuous rating, and where full throttle operation does not exceed 60 minutes without interruption.
- 1.2 *Continuous rating may be used for constant load applications requiring uninterrupted service at full throttle for extended periods of time and for Water Management applications.

2. SPEED RATINGS

- 2.1 If the application qualifies for the continuous load rating the governor cut-in point shall be set within the limits of the solid line portion of the continuous curve.
- 2.2 If the application qualifies for the maximum load rating the governor cut-in point shall be set within the limits of the solid line portion of the maximum curve.

3. DEFINITIONS

- 3.1 Load (Speed) factor is defined as the arithmetic mean of the Load (Speed) profile of the normal duty cycle, not including prolonged periods of idle operation.

4. INTERNATIONAL RATING GUIDELINES

*These ratings represent gross engine performance capabilities obtained and corrected in accordance with SAE J1995 and the conditions as stated on the front of the curve. The ratings are in conformance with the requirements specified in ISO 3046, BS 5514 and DIN 6271. Although these specific standards have a note excluding road construction, earth moving equipment, agricultural tractors and industrial trucks as applications not covered by the standard, these are included as acceptable applications of these ratings.

The Maximum Rating conforms to ISO 3046 overload power and fuel stop power. The Continuous Rating may be used for continuous service in commercial applications and it conforms to ISO 3046 continuous power.

Reference standards: BS 5514 and DIN 6271 standards are based on ISO 3046.

Change Log

Date	Author	Change Description
7/27/2012	Kelle Ravn	Corrected wet engine weight from 18,893lbs to 17,424 lbs.
1/23/2018	Trenton Miller	Corrected wet engine weight from 17,424 lbs to 18,204 lbs, based on average engine weights from plant

End of Report



Engine Performance Data

Cummins Inc

Columbus, Indiana 47202-3005
<http://www.cummins.com>

Industrial
QSK60
FR60045

2,237 BHP (1,668 kW) @ 1800 RPM
6,677 lb-ft (9,053 N-m) @ 1500 RPM

Configuration
D593001CX03

CPL Code
2821

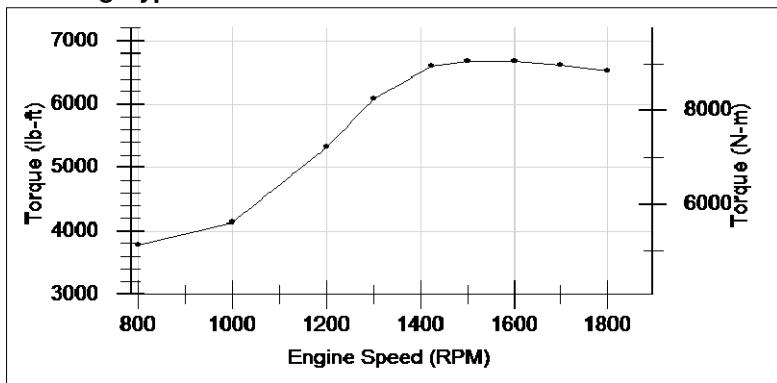
Revision
15-Jan-2015

Compression Ratio: **14.5:1**
 Fuel System: **Celect Electronic**
 Emission Certification: **Non-certified**

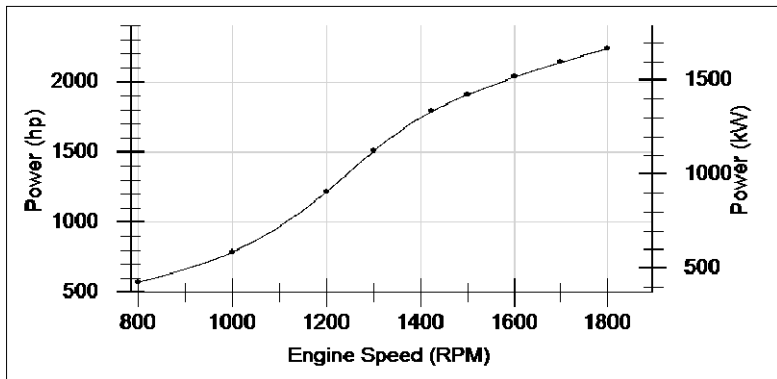
Displacement: **3,674 in3 (60.2 L)**
 Aspiration: **Turbocharged and Aftercooled**

All data is based on the engine operating with fuel system, water pump, and 15 in H₂O (3.73 kPa) inlet air restriction with 5.83 in (148 mm) inner diameter, and with 1.5 in Hg (5 kPa) exhaust restriction with 9.74 in (247 mm) inner diameter; not included are alternator, fan, optional equipment and driven components. Coolant flows and heat rejection data based on coolants as 50% ethylene glycol/50% water. All data is subject to change without notice.

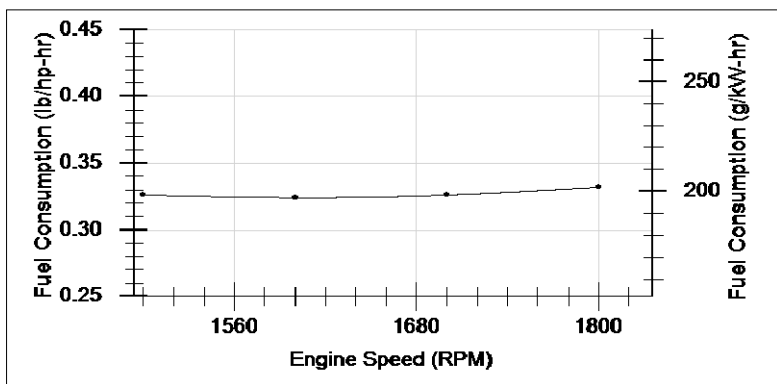
Rating Type: Intermittent



Torque Output		
RPM	lb-ft	N-m
800	3,771	5,113
1,000	4,141	5,614
1,200	5,321	7,214
1,300	6,082	8,246
1,425	6,600	8,948
1,500	6,677	9,053
1,600	6,671	9,045
1,700	6,614	8,967
1,800	6,527	8,849



Power Output		
RPM	hp	kW
800	574	428
1,000	788	588
1,200	1,216	907
1,300	1,505	1,122
1,425	1,791	1,336
1,500	1,907	1,422
1,600	2,032	1,515
1,700	2,141	1,597
1,800	2,237	1,668



Fuel Consumption		
RPM	lb/hp-hr	g/kW-hr
1,500	0.326	198
1,600	0.324	197
1,700	0.326	198
1,800	0.332	202

Curves shown above represent gross engine performance capabilities obtained and corrected in accordance with SAE J1995 conditions of 29.61 in Hg (100 kPa) barometric pressure [300ft (91m) altitude] 77 deg F (25 deg C) inlet air temperature, and 0.30 in Hg (1kPa) water vapor pressure with No. 2 diesel fuel. The engine may be operated up to 8,000 ft (2,438 m) altitude before electronic derate is applied.

STATUS FOR CURVES AND DATA: Final

CHIEF ENGINEER:
 Trevor Coy

TOLERANCE: Within +/- 5 %

Intake Air System

Maximum allowable air temperature rise over ambient at Intake Manifold (Naturally Aspirated Engines) or Turbo Compressor inlet (Turbo-charged Engines): (This parameter impacts emissions, LAT and/or altitude capability)	20 delta deg F	11.1 delta deg C
Maximum intake air restriction (only for High Horsepower Engines)		
Clean Filter		
Dirty Filter		
Maximum intake manifold temperature at 25 deg C (77 F) ambient	150 deg F	66 deg C
Maximum allowable pressure drop across charge air cooler and OEM CAC piping (IMPD):		

Low Temperature Aftercooling System

Coolant temperature from the Aftercooler outlet @ Maximum engine coolant out temperature at Limiting Ambient Temperature (1P-2L)		
Coolant temperature from the Aftercooler outlet @ 25C (77F) ambient	148 deg F	64 deg C
Maximum coolant temperature into the Aftercooler @ 25C (77F) ambient	128 deg F	53 deg C
Maximum coolant temperature into Aftercooler @ Limiting Ambient conditions	161 deg F	71 deg C
Maximum coolant temperature for engine protection controls	216 deg F	102 deg C
Maximum coolant operating temperature at engine outlet (max. top tank temp):	212 deg F	100 deg C

Exhaust System

Maximum exhaust back pressure:	2 in-Hg	7 kPa
Recommended exhaust piping size (inner diameter):	9.74 in	247 mm

Lubrication System

Nominal operating oil pressure		
@ minimum low idle	25 psi	172 kPa
@ maximum rated speed	65 psi	448 kPa
Minimum engine oil pressure for engine protection devices		
@ minimum low idle	20 psi	138 kPa

Fuel System

Fuel cooling requirements (with diesel fuel)		
Maximum heat rejection to return fuel at max. coolant and inlet fuel temperature:	1,746 BTU/min	31 kW
@ fuel return flow rate of:	3,049 lb/hr	1,383 kg/hr
@ fuel return temperature prior to cooler:	225 deg F	107 deg C
Maximum supply fuel flow:	3,420 lb/hr	1,551 kg/hr
Maximum return fuel flow:	3,049 lb/hr	1,383 kg/hr
Engine fuel compatibility (consult Service Bulletin #3379001 for appropriate use of other fuels)	DF1, DF2	
Maximum fuel inlet pressure:	3 psi	21 kPa

Performance Data

Maximum low idle speed:	1,400 RPM
Minimum low idle speed:	600 RPM
Minimum engine speed for full load sustained operation:	

	Rated Power		Maximum Power		Torque Peak	
Engine Speed	1,800 RPM				1,500 RPM	
Output Power	2,237 hp	1,668 kW			1,907 hp	1,422 kW
Torque	6,527 lb-ft	8,849 N-m			6,677 lb-ft	9,053 N-m
Friction Horsepower	309 hp	230 kW			196 hp	146 kW
Intake Manifold Pressure	63 in-Hg	211 kPa			46 in-Hg	154 kPa
Turbo Comp. Outlet Pressure	64 in-Hg	215 kPa			47 in-Hg	158 kPa
Turbo Comp. Outlet Temperature	356 deg F	180 deg C			299 deg F	148 deg C
Inlet Air Flow	4,774 ft ³ /min	2,253 L/s			3,346 ft ³ /min	1,579 L/s
Charge Air Flow	348 lb/min	157.9 kg/min				
Exhaust Gas Flow	11,268 ft ³ /min	5,318 L/s			9,106 ft ³ /min	4,298 L/s
Exhaust Gas Temperature	850 deg F	454 deg C			980 deg F	527 deg C
Maximum Fuel Flow to Pump	2,529 lb/hr	1,147 kg/hr			2,445 lb/hr	1,109 kg/hr
Heat Rejection to Coolant	35,359 BTU/min	622 kW			32,600 BTU/min	573 kW
Aftercooler Coolant Heat Rejection	17,872 BTU/min	314 kW			10,115 BTU/min	178 kW
Heat Rejection to Fuel						
Heat Rejection to Ambient	7,928 BTU/min	139 kW			6,645 BTU/min	117 kW
Heat Rejection to Exhaust	70,510 BTU/min	1,240 kW			59,629 BTU/min	1,049 kW

**When operating Naturally Aspirated engines above SAE J1995 conditions, it should be noted that smoke levels will increase due to combustion inefficiencies associated with a reduction in the air to fuel mixture.

Cranking System (Cold Starting Capability)

Unaided Cold Start:

Minimum cranking speed	140 RPM	
Minimum ambient temperature for unaided cold start	10 deg F	-12.2 deg C
Breakaway torque at minimum unaided cold start temperature:	675 lb-ft	915 N-m

Aided Cold Start:

Minimum ambient temperature with Ether only	-25 deg F	-32 deg C
Minimum ambient temperature with coolant and lube heater only	-25 deg F	-32 deg C

Cold starting aids available

Ether, Block Heater

Maximum parasitic load at 10 deg F @

Noise Emissions

Top	106 dBa
Right Side	106 dBa
Left Side	105.8 dBa
Front	107.5 dBa
Exhaust noise emissions	120 dBa

Estimated Free Field Sound Pressure Level at 3.28ft (1m) and Full-Load Governed Speed
(Excludes Noise from Intake, Exhaust, Cooling System and Driven Components)

End of Report