

Engine Specifications					
	Metric		Imperial		
Engine Displacement :	4.200	L	256	cu.inch	
Maximum Engine Speed :	3700	rpm			
Engine Free Airflow at Atmospheric Pressure :	0.130	m ³ /sec	274	cfm	
Peak Boost Pressure :	82.737	kPa	12	psi	
Engine Free Airflow at Peak Boost Pressure :	0.235	m ³ /sec	498	cfm	
Inlet Air Heat Load Analysis					
Intake Air Temperature @ Air Cleaner :	25.0	°C	=	298.15	°K
Intake Air Temperature @ I.C. Inlet :	140.0	°C	=	413.15	°K
Intake Air Temperature @ I.C. Outlet :	50.0	°C	=	323.15	°K
Intake Air Flowrate :	14.1	m ³ /min	=	0.23524	m ³ /sec
Atmospheric Air Pressure :	101.325	kPa	=	14.696	psi
Intake Air Density :	0.84450	m ³ /kg			
Intake Air Mass Flowrate :	0.27856	kg/sec			
Intake Air Enthalpy @ I.C. Inlet :	414.596	kJ/kg			
Intake Air Enthalpy @ I.C. Outlet :	324.281	kJ/kg			
Required Heat Transfer to I.C. Water :	25.158	kW	=	33.724	hp
			=	1432	BTU/min

Intercooler Structure Design							
Tube Data							
Tube Width (a) :	73.000	mm					
Tube Depth (b) :	8.200	mm					
Tube Cross-sectional Area :	364.3	mm ²					
Tube Surface Area per Lineal Metre :	416592.0	mm ²					
Fin Data							
Fin Thickness (c) :	0.370	mm					
Fin Spacing (d) :	12.0	fpi					
Fin Pitch (e) :	8.2	mm					
Intercooler Structure Size							
Number of Intercooler Assemblies :	1						
Inlet Tank Width (f) :	303	mm					
Inlet Tank Length (g) :	140	mm					
Intercooler Core Assembly Depth (h) :	78	mm					
Number of Tubes per Core :	18						
Number of Cores :	2						
Total Cross-sectional Area for Cooling Water Flow :	0.013115	m ²			Equivalent Diameter :	129.2	mm
Total Tube Surface Area for Cooling Water Contact :	2.099624	m ²					
Number of Fins per Length of Tube :	66.1						
Fin Length :	8.469	mm					
I.C. Core Fin Gap Cross-sectional Area :	21812.0	mm ²					
I.C. Core Airflow Cross-sectional Area :	17874.2	mm ²					

I.C. Plumbing Air Speed					
Intercooler Plumbing Pipe Diameter :	2.0	inches	50.8	mm	
Pipe Wall Thickness :	3.0	mm			
Number of Inlet Pipes :	1				
Total Pipe Cross-sectional Area :	1576.3	mm ²		0.001576	m ²
Air Temperature (Post Turbo) :	140.0	°C		413.15	°K
Air Flowrate (Post Turbo) :	0.130	m ³ /sec		129.50	L/sec
Air Velocity (Post Turbo) :	82.153	m/sec		295.75	km/hr
Reynold's Number :	118337	Turbulent			
Tube Surface Roughness, E :	0.0015	mm			
Inlet Pipe Length :	1000	mm			
Friction Factor, f :	0.017	0.017			
Head Loss :	118.150	m.N/N			
Pressure Drop :	2648.730	Pa			
Total Pressure Drop :	0.384	psi			
Inlet Pipe to I.C. Core Cross-sectional Area Ratio :	11.339				
Air Velocity Through I.C. Core :	7.245	m/sec		26.08	km/hr
Time one air molecule spends in core :	0.01932348				

Water Flow Analysis					
Rated Water Pump Flow :	64.0	L/min			
Number of Pumps :	1				
Total Flow Rate :	64.0	L/min			
Total Cross-sectional Area :	0.013115	m ²			
Average Water Velocity Through Core :	0.081	m/sec		0.29	km/hr
Heat Transfer From Air to Water Through Tubes					
Aluminium Thermal Conductivity :	215.0	W/m.K			
Average Tube Wall Thickness :	0.8	mm			
Air Side of Tube Surface Temperature :	140.0	°C	=	413.15	K
Water Side of Tube Surface Temperature :	8.0	°C	=	281.15	K
Total Tube Surface Area for Cooling Water Contact :	2.099624	m ²			
Total Heat Transfer :	74484.2	kW			
Hose Size Analysis					
Rated Water Pump Flow :	64.0	L/min			
Pipe/Hose Diameter :	1.0	inches	=	25.4	mm
Number of Pipes :	1				
Water Speed :	2.105	m/sec		7.58	km/hr
Reynold's Number :	38192.41	Turbulent			
Tube Surface Roughness, E :	0.0015	mm			
Inlet Pipe Length :	5000	mm			
Friction Factor, f :	0.022	0.023			
Head Loss :	0.991	m.N/N			
Pressure Drop :	462.585	Pa			
Total Pressure Drop :	0.067	psi			

Heat Transfer in a Rough Tube					
Tube Length :	0.140	m			
Tube Cross-sectional Area :	0.000364	m ²			
Equivalent Tube Diameter :	21.537	mm			
Fin Height :	0.3991	mm			
Relative Roughness :	0.001	mm			
Constant Tube Wall Temperature :	140	°C	=	413.15	K
Water Inlet Temperature :	34	°C	=	307.15	K
Outlet Temperature :	41.889	°C	=	315.04	K
Heat Transfer :	0.970	kW			
Core 1 Heat Transfer					
Heat Removed per Tube:	0.970	kW			
Heat Removed per Core :	17.462	kW			
Air Temperature Into Core :	140	°C	=	413.15	K
Air Temperature Out Of Core :	78.286	°C	=	351.44	K
Core 2 Heat Transfer					
Heat Removed per Tube:	0.464	kW			
Heat Removed per Core :	8.352	kW			
Air Temperature Into Core :	78	°C	=	351.44	K
Air Temperature Out Of Core :	48.575	°C	=	321.72	K

Calculated at 50°C

Percentage		Specific Heat <i>kJ/(kg.K)</i>	Heat Capacity to Water <i>(%)</i>
Water <i>(%)</i>	Ethelyne Glycol <i>(%)</i>		
100	0	4.1950	100.00
95	5	4.1090	97.95
90	10	4.0229	95.90
85	15	3.9369	93.85
80	20	3.8508	91.79
75	25	3.7648	89.74
70	30	3.6787	87.69
65	35	3.5927	85.64
60	40	3.5066	83.59
55	45	3.4206	81.54
50	50	3.3345	79.49
45	55	3.2485	77.44
40	60	3.1624	75.38
35	65	3.0764	73.33
30	70	2.9903	71.28
25	75	2.9043	69.23
20	80	2.8182	67.18
15	85	2.7322	65.13
10	90	2.6461	63.08
5	95	2.5601	61.03
0	100	2.4740	58.97