

# CASCADIA MOTION

## Tengam 2100A Water Pump User Manual Cascadia Motion Kit # G4-0041



# 2100A Pump User Manual (Cascadia Motion Kit# G4-0041)

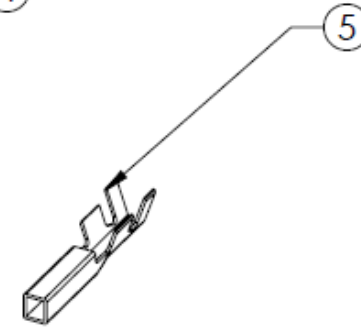
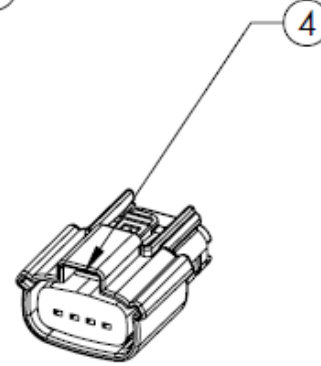
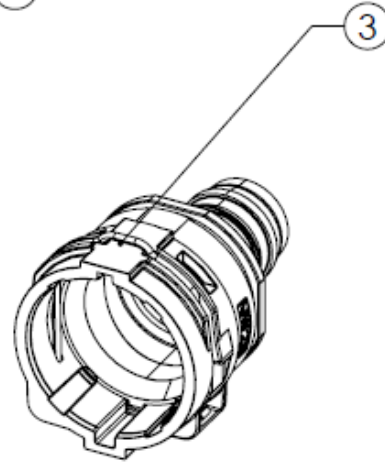
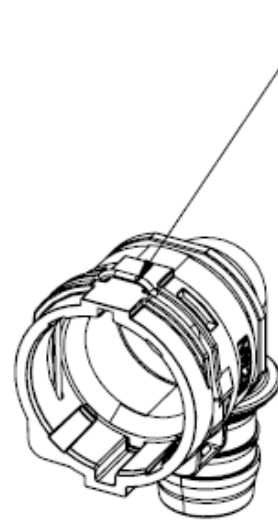
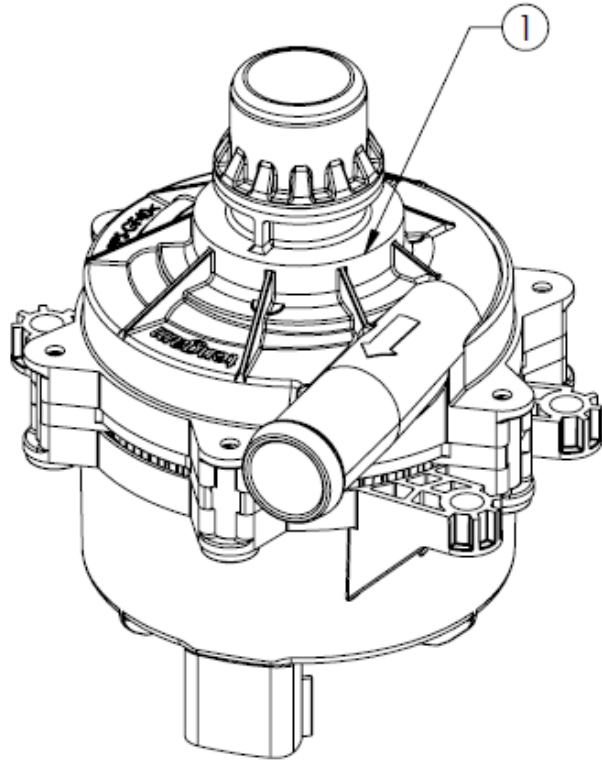


## User Manual: Overview

- Designed for use with 50% distilled water/50% automotive antifreeze at temperatures down to -33°C (-27°F). For temperatures between -33°C (-27°F) and -40°C (-40°F), 40% distilled water/60% automotive antifreeze it to be used to avoid coolant freezing.
- Operate pump only after system has been filled with fluid. Avoid pump air ingestion and cavitation.
- Ensure a mounting position that assures the pump will never be starved of fluid. Consider hills and vehicle angles. See Mounting Position and Dimensional Information pages for acceptable mounting position range and mounting points/surfaces.
- If the pump detects that it is being run dry, it will turn itself off within approximately 4-8 seconds after it first begins rotating. Next, it will stop for approximately 5 seconds, then try a second time. If after the second try, dry run is still detected, the pump will not try again until the power to the pump has been cycled (turned-off, then on).
- Maximum system pressure of 250kPa (not to be confused with pump delta-P, developed pressure)
- The mating wire harness connector and female terminals are for use with 14-16AWG wire (14AWG recommended). The connection pinouts are shown on the Pinouts page.
  - Individual wire harness components are identified in the bill of material on Kit Contents page.
- Use a stable bracket that will avoid resonant vibration.
- Pump can be run without the PWM pin (Pin #4) connected. This will operate the pump as an ON/OFF device at maximum speed.
  - Please note, there is a 2.5 second startup delay when the pump is operated without the PWM pin (Pin #4) connected.
  - See PWM and ON/OFF Operation page for a complete description of the pump speed commands.
- Do not drive the +/- terminals (Pin #1 VBAT and Pin #2 NEG) with a PWM waveform. If the PWM pin (Pin #4) is not used, the pump operates as an ON/OFF device (not dithered).
- The nominal supply (Pin #1, VBAT) operation voltage is 14.0VDC supplied to PIN#1 VBAT. The normal operational voltage range is 9.5 to 16V. Outside this range the pump is not intended to operate. Exposure to voltages greater than 24VDC may permanently damage the pump.
- At supply operation voltages below 14.0VDC (Pin #1, VBAT), the pump will operate with decreased performance.
- Operational temperature range, as measured by the internal PCB, is -25° to 135°C.
- The maximum fluid temperature is 120°C. As the fluid temperature approaches 120°C, depending on the pump load and RPM, the pump performance may be derated.
- The pump will self-protect itself against over-temperature conditions. The RPM will linearly derate from 100% of the commanded RPM all the way down to 2000RPM (pump's minimum RPM) in the following temperature range: 125°C ≤ Measured PCB Temp. < 135°C. The pump will stop if temperature reaches a critical level of >135°C. The pump will automatically restart when the measured PCB temperature drops below approximately 124°C. If the measured PCB temperature ever exceeds 145°C, the pump will fault and not automatically restart when the measured PCB temperature drops below approximately 124°C. The pump must be reset via cycling the power to the pump (turned-off, then on).



# G4-0041 Kit Contents



TERMINAL SHOWN  
AT 2:1 SCALE

ITEM	TENGAM ENGINEERING INC. PART NUMBER	DESCRIPTION	QUANTITY
1	TENGAM ENGINEERING INC P/N: 95-14124	2100A ELECTRIC WATER PUMP (PWM COMMUNICATION)	1
2	ARAYMOND PART NUMBER: 267989-0-00	16 x 18-3/4" 90° VDA NW20 QUICK CONNECTOR	1
3	ARAYMOND PART NUMBER: 265940-0-00	16 x 18-3/4" 180° VDA NW20 QUICK CONNECTOR	1
4	MOLEX PART NUMBER: 334710401	WIRE HARNESS CONNECTOR (RECEPTACLE)	1
5	MOLEX PART NUMBER: 33001-4001	FEMALE (RECEPTACLE) TERMINAL- SILVER PLATED FOR USE WITH 14-16 AWG (1.50-2.00mm <sup>2</sup> ) WIRE (14 AWG WIRE RECOMMENDED)	6 (4 NEEDED, 2 EXTRA)
6	MOLEX PART NUMBER: 638115900 OR 640160133	HAND CRIMP TOOL (FOR FEMALE TERMINAL)	NOT INCLUDED
7	MOLEX PART NUMBER: 638131500	FEMALE TERMINAL EXTRACTION TOOL	NOT INCLUDED

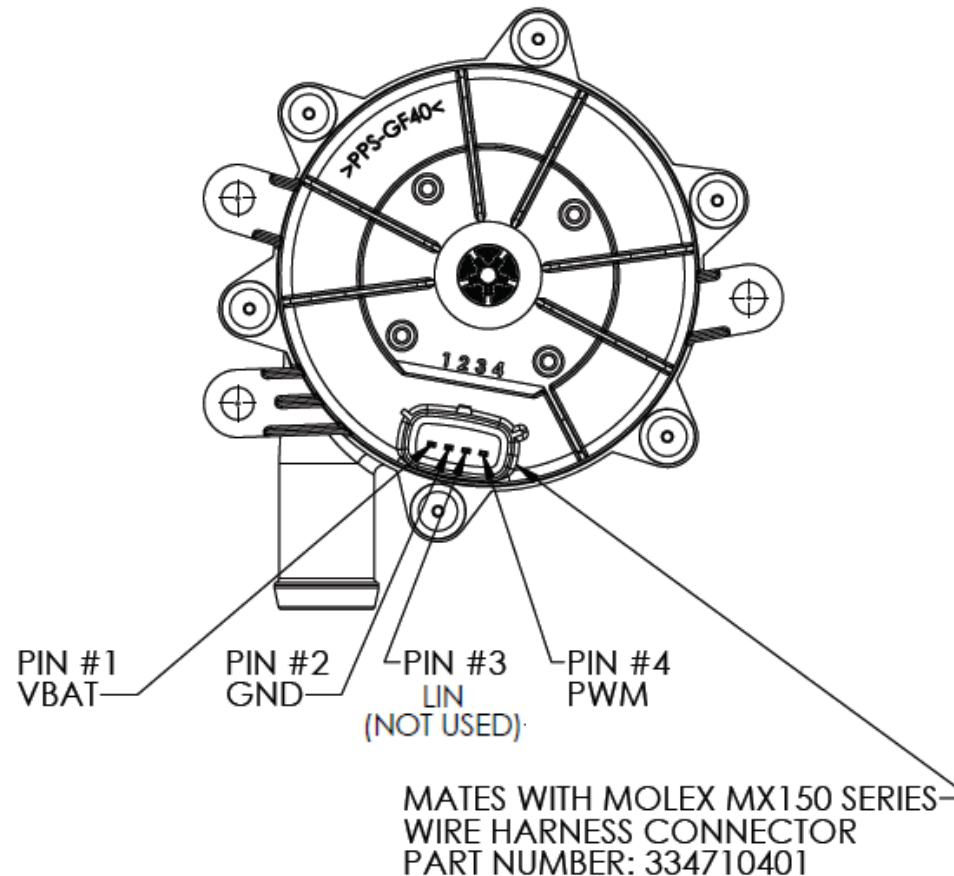
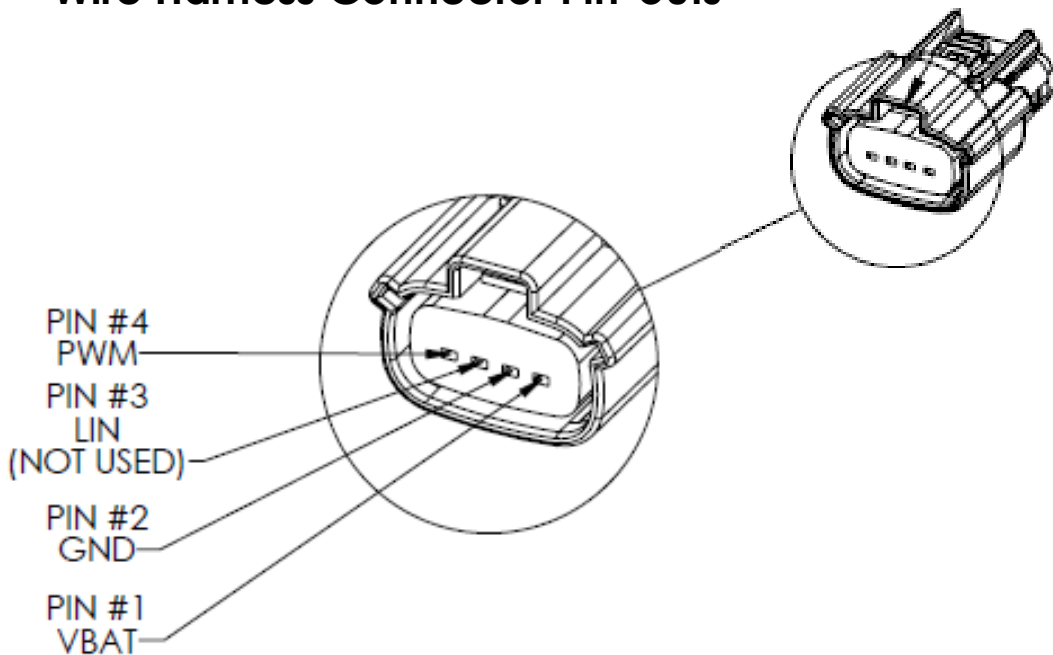
If more information is needed, Tengam tech support can be contacted via this web address:  
<https://www.Tengam.com/contact-us/>

# Pinouts



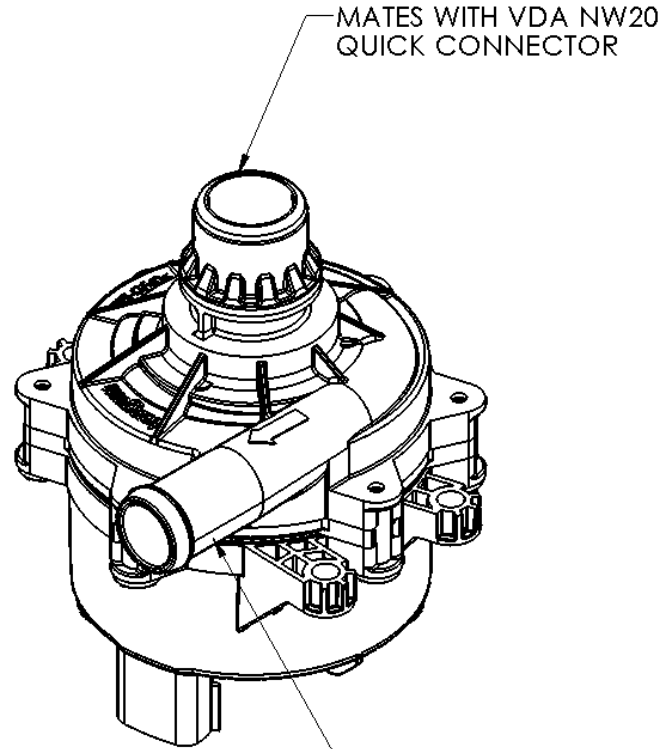
## Pump Connector Pin-outs

## Wire Harness Connector Pin-outs

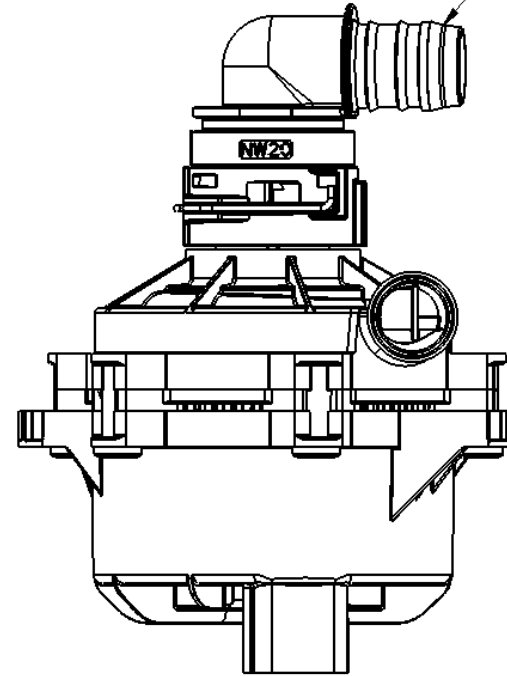


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# Hose Connections



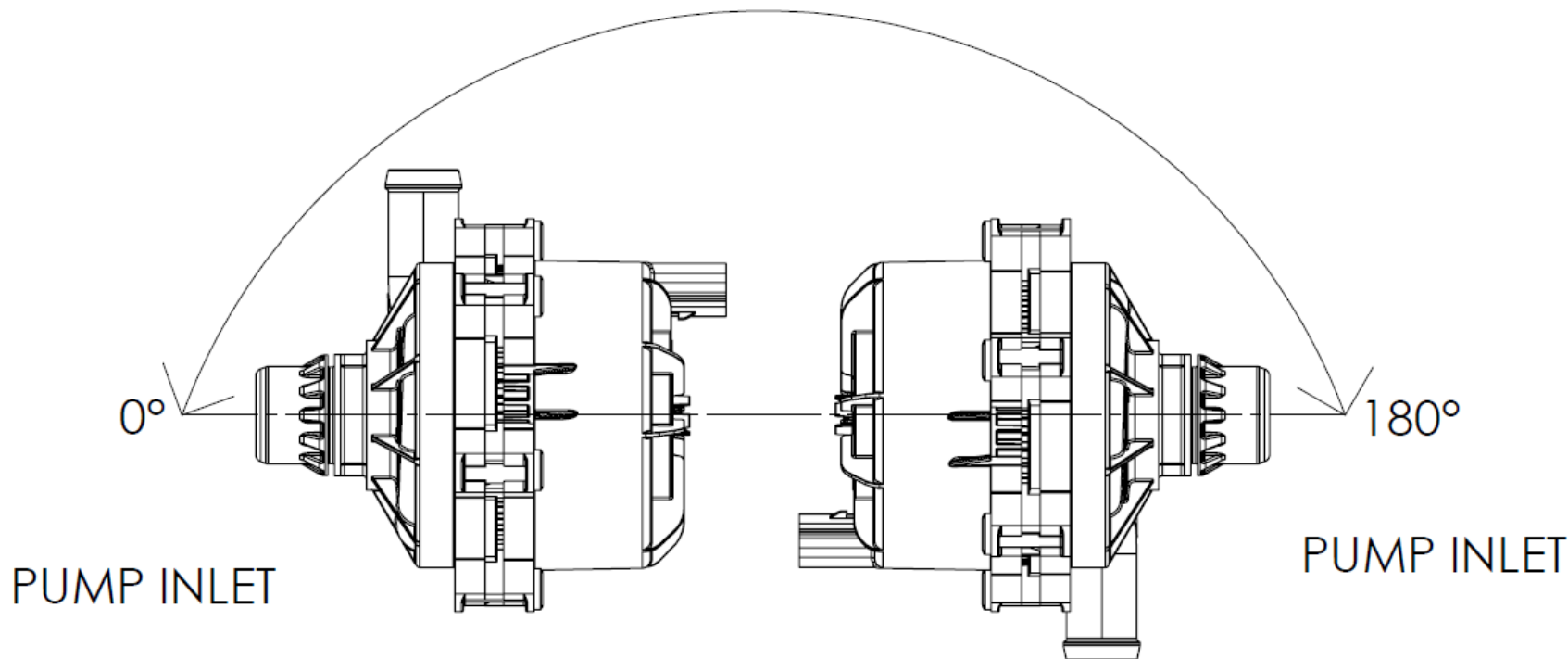
MATES WITH 3/4" (19mm) COOLANT HOSE



MATES WITH 3/4" (19mm) COOLANT HOSE

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# Mounting Position

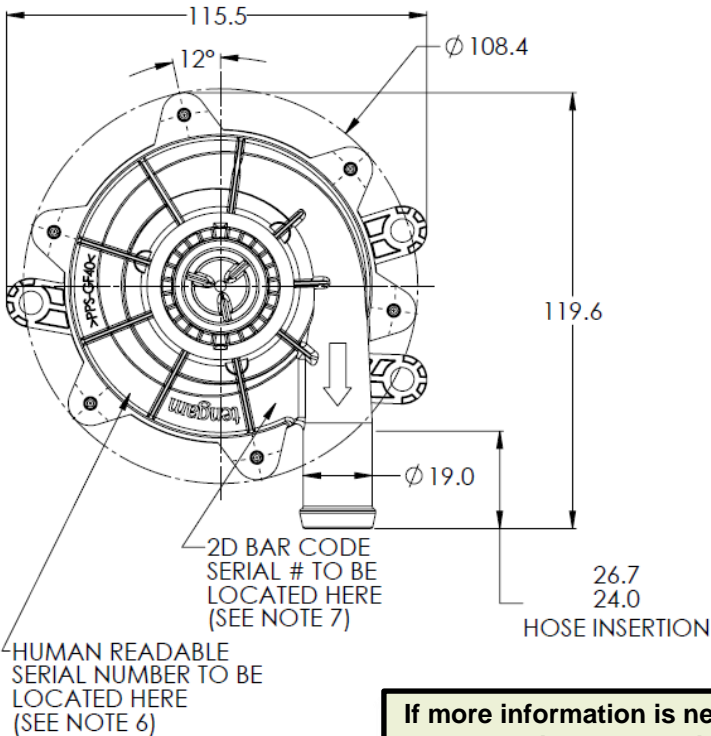


## PUMP INSTALLATION ORIENTATION

PUMP TO BE INSTALLED AND RUN WITH THE INLET PORT BETWEEN 0° TO 180° ONLY  
THE INLET PORT MAY NOT ORIENTATED LOWER THAN THE HORIZONTAL PLANE

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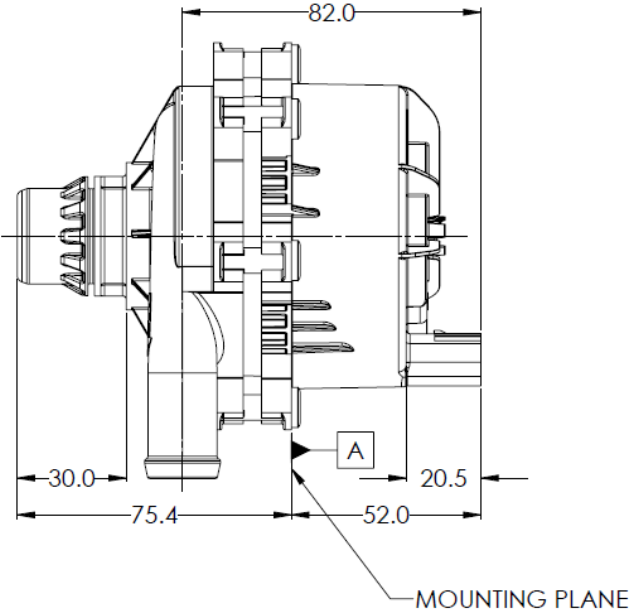
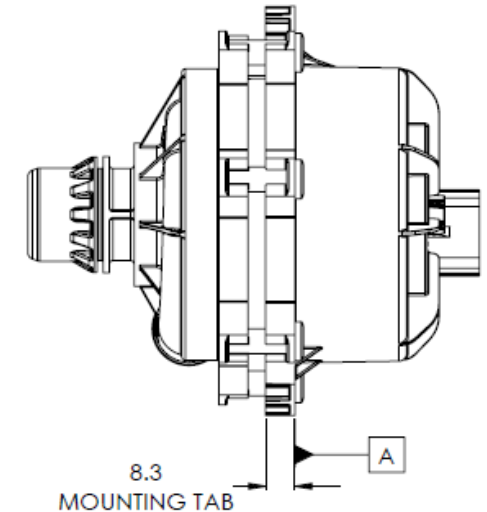
# Dimensional Information



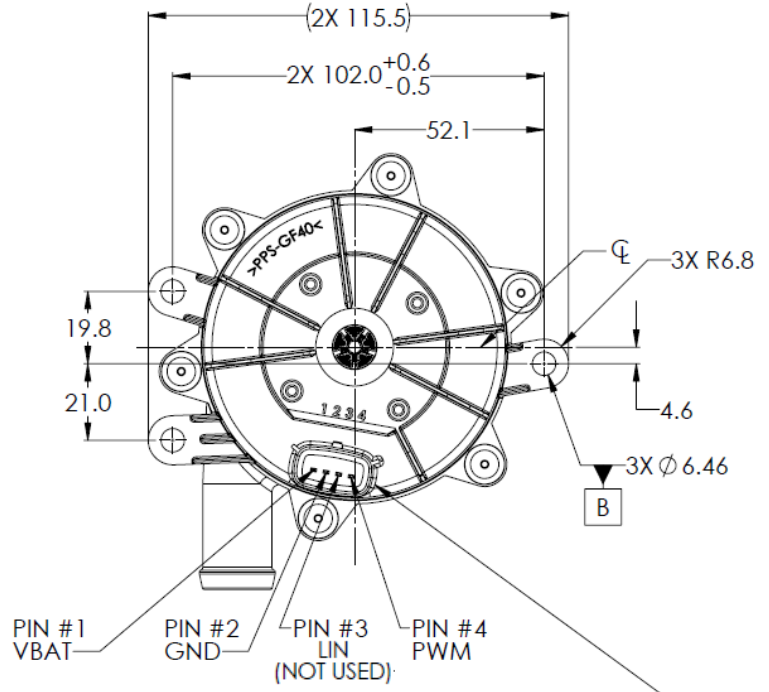
2D BAR CODE SERIAL # TO BE LOCATED HERE (SEE NOTE 7)

HUMAN READABLE SERIAL NUMBER TO BE LOCATED HERE (SEE NOTE 6)

HOSE INSERTION



MOUNTING PLANE



PIN #1 VBAT  
PIN #2 GND  
PIN #3 LIN (NOT USED)  
PIN #4 PWM

MATES WITH MOLEX MX150 SERIES WIRE HARNESS CONNECTOR PART NUMBER: 334710401

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# PWM and ON/OFF Operation

		PWM OPERATION <sup>5</sup>				ON/OFF OPERATION <sup>5</sup>		
		VALID INPUT PWM RANGE <sup>1,2</sup> Must be received on PIN#4 within 2.4 seconds of 8-16VDC being received by PIN#1VBAT.				Default Speed Control if valid PWM signal is lost during operation after having been previously established		
PWM Generator Device to Pump:	Description:	STOP	RUN Hysteresis Zone <sup>3</sup>	RUN	RUN - DEFAULT RPM <sup>4</sup> : <u>If</u> valid PWM communication has been previously established (1-80%PWM), <u>then</u> if commanded to the below PWM range, the pump will default to the RPM listed below.	Speed defaults to RPM define #3 in the event that a valid, previously established PWM signal is lost (no signal or out of range frequency). If a valid PWM signal is reestablished, PWM control will resume. Otherwise, RPM below will continue until Vbat PIN #1 power is cycled and the system is reset.	Defaults to the RPM listed below after being powered on with 8-16VDC to PIN#1 <b>and</b> PIN#4 is supplied with the below voltage.	Defaults to the RPM listed below after being powered on with 8-16VDC to PIN#1 <b>and</b> if there is no receipt of a valid PWM signal by PIN#4 within 2.4 seconds.
	Duty Cycle in PWM % (Signal % ON time) (RPM increment/% = 84):	1-19	20-23	23-80	81 - 99			
	PWM Communication Voltage (PIN#4):	High: 5.0VDC ±0.5 Low: 0.0VDC (high and low voltage sequence resembles a square wave)						
RPM:	0	2,000 - 7,050 (variable)	7,050	7,050	7,050	6,500		

<sup>1</sup>PWM Communication Frequency: 2-20Hz., (±10% at the upper and lower range), automatically recognized by the software.

<sup>2</sup>Valid PWM % Range: 1-80%

<sup>3</sup>PWM tolerance Zone for where the pump starts-up or shuts-down.

ie: the pump may start-up anywhere between 20-23% PWM and will shut down at a PWM <20.1%.

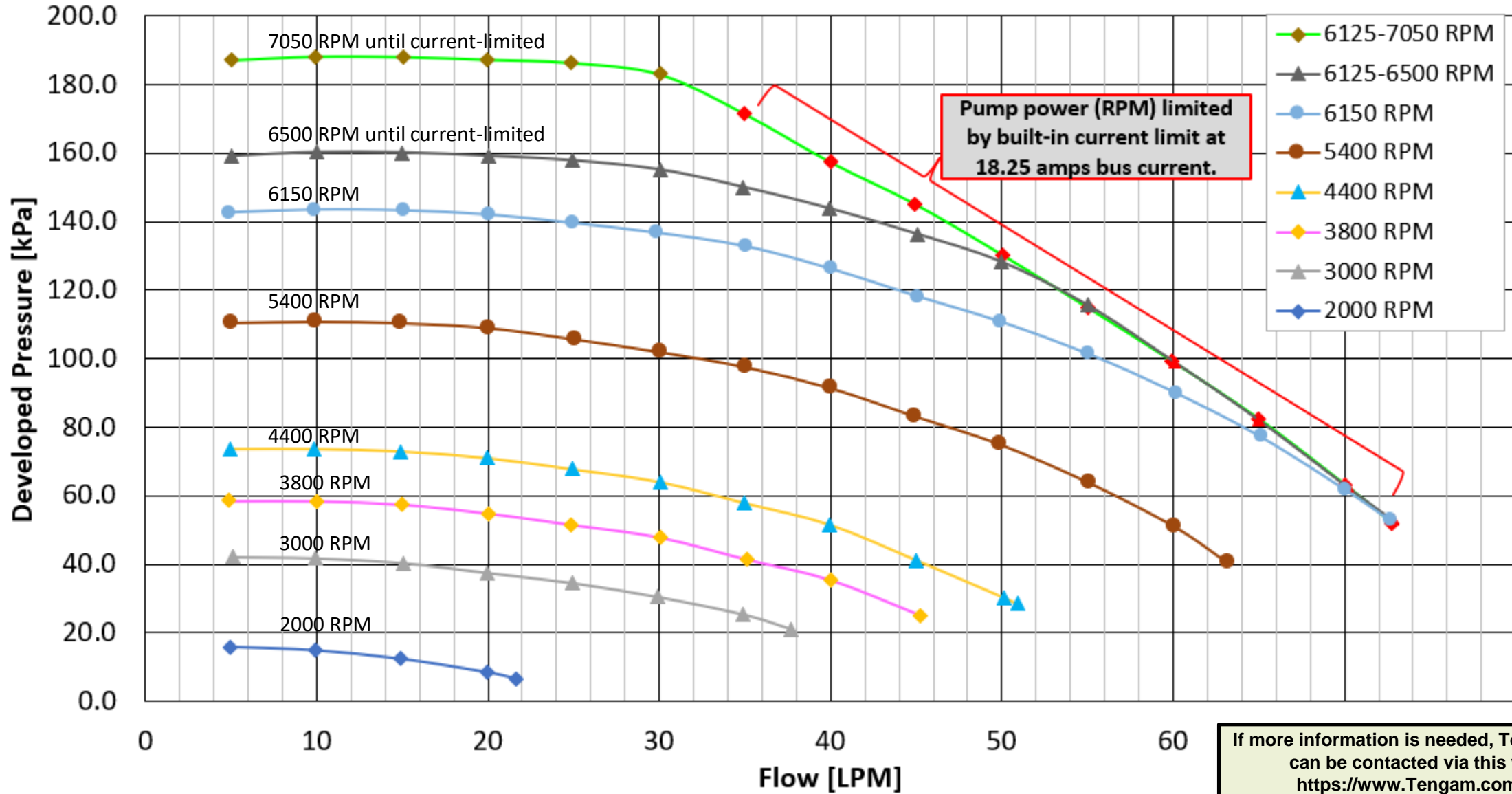
<sup>4</sup>In the case of no valid PWM communication having been previously established, see ON/OFF OPERATION.

<sup>5</sup>Upon 8-16VDC supply to VBAT (Pin#1), the firmware begins searching for a valid PWM signal. If no valid PWM signal is detected within 2.4 seconds, the pump defaults to ON/OFF OPERATION.

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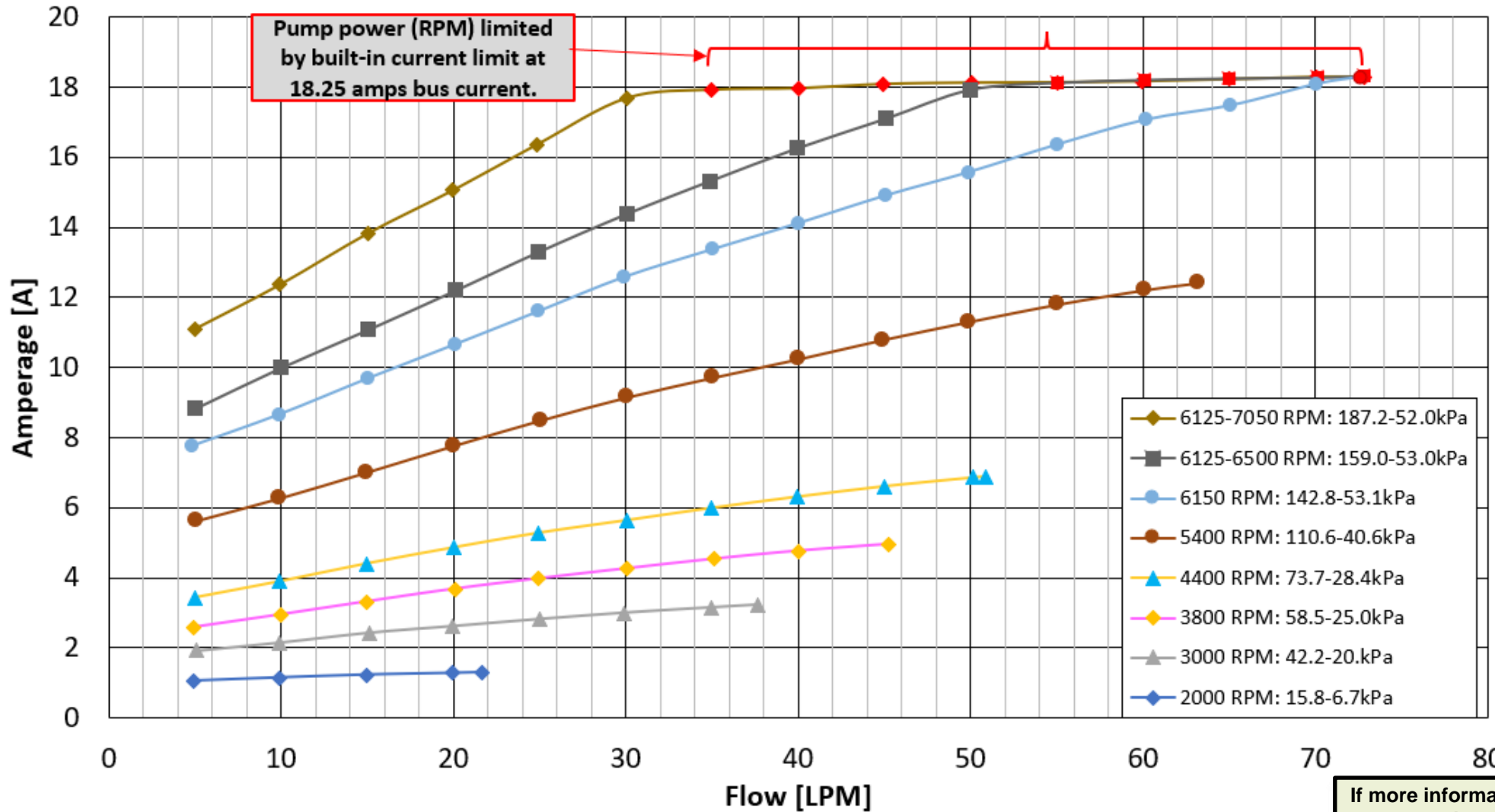


# Pump Pressure vs. Flow @ 23°C, 14.0VDC



If more information is needed, Tengam tech support can be contacted via this web address:  
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# Pump Amperage vs Flow @ 23°C, 14.0VDC



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# APPENDIX (Datasheet)





General Specifications	
Maximum System Power Consumption	255W
Nominal Operating Voltage:	14.0V
Operating Voltage Range:	9.5-16.0 Volt
Fluid - Typical Usage	50% distilled water/50% automotive antifreeze at temperatures down to -33°C (-27°F).
Fluid - Extreme Cold Temperature Usage	40% distilled water/60% automotive antifreeze at temperatures between -33°C (-27°F) and -40°C (-40°F).
Flow and Pressure Performance	See graphs
System Amperage Draw vs Flow	See graphs
Maximum Continuous Use System Pressure @ 120° C ambient and coolant temperature	250kPa @85°C coolant temperature
Storage Temperature Range (pump off)	-40° to +150°
Operational Ambient Air Temp. Range:	-25° to 135°C
Operational Coolant Temp. Range	-25° to 120°C
Vehicle mounting location capability	Engine or Chassis (inlet may not be mounted below the horizontal plane)
IPC Rating (dust and moisture)	IPC-67 or IPC-69

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Speed Control	
Speed Control	<p><b>Fixed (ON/OFF):</b> if no PWM signal - 2.4 second start delay after VBAT power applied. or invalid PWM signal.</p> <p><b>Variable:</b> via PWM</p>
Variable Speed Operation RPM Range	2,000-7,050
Default Fixed Speed if 5.0VDC $\pm$ 0.5 constant voltage on PWM Communication PIN#4.	7,050
Default Speed Control if valid PWM signal is lost during operation after having been established	7,050
Default Fixed Speed if on/off control	6,500
PWM Communication Frequency	2-20Hz., ( $\pm$ 10% at the upper and lower range) automatically recognized by the software.
PWM Communication Voltage	High: 5.0VDC $\pm$ 0.5 Low: 0.0VDC Square Wave

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Self Protection	
Full Self Protection	<p>Over/Under: voltage, amperage, temperature Sustained over power consumption.</p> <p>Other: dry run detection and shut-down, stuck/locked impeller, reverse polarity, negative voltage pulse.</p>
Over Temperature System Protection	<p>The pump will self-protect itself against over-temperature by derating the RPM.</p> <p>RPM derating temperature range: <math>125^{\circ}\text{C} \leq \text{Measured PCB Temp.} &lt; 135^{\circ}\text{C}</math>. Shut-Down Temperature: Measured PCB Temp. <math>&gt;135^{\circ}\text{C}</math> Automatic pump restart temperature in the event of a shut-down: Measured PCB Temp. <math>&lt;125^{\circ}\text{C}</math> If the measured PCB temperature ever exceeds <math>145^{\circ}\text{C}</math>, the pump will fault and not automatically restart when the measured PCB temperature drops below approximately <math>124^{\circ}\text{C}</math>. The pump must be reset via cycling the power to the pump (turned-off, then on).</p>
Automatic power consumption limiting	<p>Bus current maximum is 18.25ADC. Current is limited via RPM restriction.</p>
Over voltage protection	Up to 24 volts
Reverse Polarity Protection	Up to 30 volts

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**2100A Cascadia Datasheet**

**Wire Harness Requirements**

Electrical Connector Pin-outs	4-pins: #1 Power, #2 Ground, #3 LIN (unused), #4 PWM
Mating Wire Harness Electrical Connector	Molex MX 150
Mating Wire Harness Wire Gauge	14 AWG

**Inlet and Outlet Port Connection Requirements**

Inlet Port Connection	VDA NW20 Quick Connect
Inlet Port Quick Connect to Hose Connection	3/4" (19mm) Coolant Hose
Outlet Port Hose Connection	3/4" (19mm) Coolant Hose

**Size Envelope**

Weight (grams)	940 Max
Overall Height (inlet axis)	127mm
Overall Width (outlet axis)	119mm
Diameter Main Body	108mm

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**Thank You!**

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