

PRODUCT SPECIFICATION

TITLE

DATE

REV

Product Requirements

24 May 2018

0

# Project Supercharger Product Requirements



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Product Requirements	24 May 2018	0

### Document History

Rev Number	Date	Modified By	Reason
0	18June2019	A.Hoang	Initial Release
0	18June2019	N.Miller	Initial Release
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TITLE	DATE	REV
Product Requirements	24 May 2018	0

## Table of Contents

<b>1 OBJECTIVE</b>	<b>5</b>
<b>2 SCOPE</b>	<b>5</b>
<b>3 REFERENCES</b>	<b>5</b>
3.1 CITED DOCUMENTS	5
3.2 ACRONYMS	5
<b>4 FUNCTIONAL REQUIREMENTS</b>	<b>6</b>
4.1 USER INTERFACE REQUIREMENTS	6
4.2 WHAT IT SHOULD DO	6
<b>5 MECHANICAL REQUIREMENTS</b>	<b>6</b>
5.1 STRENGTH REQUIREMENTS	6
5.2 SPATIAL REQUIREMENTS	6
5.3 WEIGHT/MASS REQUIREMENTS	7
5.4 MOUNTING / INTERFACE REQUIREMENTS	7
5.5 APPEARANCE REQUIREMENTS	7
5.6 DURABILITY REQUIREMENTS	7
5.7 RELIABILITY REQUIREMENTS	7
<b>6 ELECTRICAL REQUIREMENTS</b>	<b>7</b>
6.1 OPERATIONAL VOLTAGE	7
6.2 OPERATIONAL POWER CAPABILITY	7
6.3 ENERGY STORAGE CAPACITY	7
<b>7 SOFTWARE REQUIREMENTS</b>	<b>8</b>
7.1 FUNCTIONALITY	8
7.2 USER INTERFACE	8
<b>8 ENVIRONMENTAL REQUIREMENTS</b>	<b>8</b>
8.1 TEMPERATURE	8
8.2 ENVIRONMENTAL SEALING	8
<b>9 REGULATORY REQUIREMENTS</b>	<b>8</b>
9.1 UL REQUIREMENTS	8
9.2 SHIPPING REQUIREMENTS	8
<b>10 COST REQUIREMENTS</b>	<b>8</b>

## PRODUCT SPECIFICATION

TITLE	DATE	REV
Product Requirements	24 May 2018	0

10.1 PROTOTYPE COST	8
10.2 PRODUCTION REQUIREMENTS	9
<b>11 SCHEDULE REQUIREMENTS</b>	<b>9</b>

## PRODUCT SPECIFICATION

TITLE	DATE	REV
Product Requirements	24 May 2018	0

# 1 Objective

The objective of this document is to document the requirements needed to design and manufacture a supercharged single-cylinder four-stroke engine that would fit in a snowmobile chassis.

# 2 Scope

The scope of this document is to define the requirements that is needed to fit the supercharged KTM engine in the snowmobile chassis. In order to get the supercharged engine to fit in the chassis, there would be a lot of designing and manufacturing for the plenum, mounts, crankcase, intercooler, and assembly to run the engine.

# 3 References

## 3.1 Cited Documents

“1248 Standard for Engine-Generator Assemblies for Use in Recreational Vehicles | Standards Catalog.” UL, UL LLC, 2019, [standardscatalog.ul.com/standards/en/standard\\_1248\\_3](https://standardscatalog.ul.com/standards/en/standard_1248_3).

## 3.2 Acronyms

V Voltage  
A Ampere  
HP Horse Power

# PRODUCT SPECIFICATION

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## 4 Functional Requirements

### 4.1 User Interface Requirements

The operator shall be able to start the engine with an electric starter.

### 4.2 What it should do

Once the complete engine assembly is finished and the supercharger is added, it should be able to fit within the snowmobile chassis and be ready for testing/calibration.

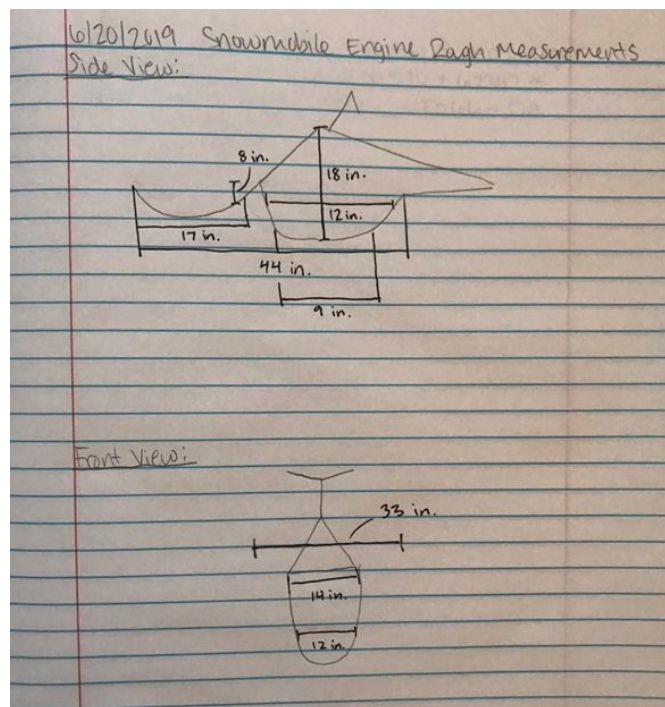
## 5 Mechanical Requirements

### 5.1 Strength Requirements

The design shall be able to produce no more than 85 HP with the functioning supercharger and intercooler setup.

### 5.2 Spatial Requirements

The KTM engine and supercharger must fit within the snowmobile chassis. The dimensions of the snowmobile is below.



## PRODUCT SPECIFICATION

TITLE	DATE	REV
Product Requirements	24 May 2018	0

### **5.3 Weight/Mass Requirements**

The total weight of the supercharged KTM engine shall not exceed 60 lbs.

### **5.4 Mounting / Interface Requirements**

The mounting/interface requirements will become known once the original snowmobile engine can be removed and the KTM engine can be placed inside the chassis.

### **5.5 Appearance Requirements**

There are currently no major appearance requirements.

### **5.6 Durability Requirements**

The system won't be designed for long term use, but instead a proof of concept that we can get the KTM engine and supercharger installed inside the snowmobile and ideally become temporarily operational.

### **5.7 Reliability Requirements**

All components (bearings) shall have a 90% reliability

## **6 Electrical Requirements**

### **6.1 Operational Voltage**

During operation the bus voltage shall remain above 12 V.

### **6.2 Operational Power Capability**

During operation, the battery pack shall be capable of delivering or absorbing power per 14.0 – 15.0 V when fully charged.

### **6.3 Energy Storage Capacity**

The battery shall target a maximum period of 10 hours at 0.5 A and a maximum of 14.4 V for recharge.

## PRODUCT SPECIFICATION

TITLE	DATE	REV
Product Requirements	24 May 2018	0

## 7 Software Requirements

### 7.1 *Functionality*

The software allows users to design the layout of the chassis, crankcase, and parts needed to get the engine to run and fit in the chassis.

### 7.2 *User Interface*

SOLIDWORKS will be used throughout this project to design the KTM engine, Eaton supercharger, and other components to fit into a snowmobile.

## 8 Environmental Requirements

### 8.1 *Temperature*

The Product is expected to have full operational capabilities in environments with ambient temperatures of -40°F to 158°F.

### 8.2 *Environmental Sealing*

In accordance with the international quality management ISO 9001 standard, KTM uses quality assurance processes that lead to the highest possible product quality.

## 9 Regulatory Requirements

### 9.1 *UL Requirements*

The components shall comply with the UL 1248 Standard.

### 9.2 *Shipping Requirements*

The KTM engine and Eaton supercharger should be bubble-wrapped and packaged in a cardboard box during shipment.

## 10 Cost Requirements

### 10.1 *Prototype Cost*

The total budget for this project will be around \$500. However, this does not include the stock KTM engine and the Eaton supercharger because we are already in possession of these parts. The remaining new and unexpected parts will be covered by our \$500 budget.

The expected parts will vary but might include some of the following: crankcase, chain drives, gaskets, piping, lubricants, fuel, coolant, spark plug, and raw materials.



## PRODUCT SPECIFICATION

TITLE	DATE	REV
Product Requirements	24 May 2018	0

Machining and shop labor will be completed for free by the group members. The tools, machines, and location will be provided for free from the University of Idaho Machine Shop and Gauss Johnson senior design suite.

### 10.2 *Production Requirements*

The team will be designing all the components that are needed to run and fit the engine in the snowmobile chassis and produce a bill of materials to build this set up for any snowmobile chassis. Also, there will be a math model to predict the engine performance with the supercharger and intercooler.

## 11 Schedule Requirements

The following are the major Project Milestones:

### Summer 2019

- Client Visits June. 18, 2019
- Product Requirements Doc. Due June 24, 2019
- 2nd Client/Instructor Meeting June 25, 2019
- Design Validation and Concept Review July 1, 2019
- Project Schedule Due July 1, 2019
- 3rd Client/Instructor Meeting July 2, 2019
- Portfolio, Wiki page, Logbook Due July 5, 2019
- Snapshot Day 1 (Wiki page) July 8, 2019
- 4th Client/Instructor Meeting July 9, 2019
- Design Validation Plan Due July 15, 2019
- 5th Client/Instructor Meeting July 16, 2019
- Project Value Proposition Due July 22, 2019
- 6th Client/Instructor Meeting July 23, 2019
- Snapshot Day 2 (Expectations) July 29, 2019
- Snapshot day 2 (GJ Design Suite) Aug. 1, 2019
- Portfolio Due Aug. 2, 2019

### Fall 2019

- Semester Schedule and Re-group Aug. 27, 2019
- Engineering Release Review Sept. 27, 2019
- Industry Panel Oct. 1, 2019
- Logbook Due Oct. 10, 2019
- Snapshot Day 3 Oct. 15, 2019

## PRODUCT SPECIFICATION

TITLE	DATE	REV
Product Requirements	24 May 2018	0
- Wiki page Review Session	Nov. 12, 2019	
- Team Member Citizenship Assessment	Nov. 22, 2019	
- Snapshot Prep	Dec. 3, 2019	
- Snapshot Day 4	Dec. 6, 2019	
- Wiki page Review Session	Dec 10, 2019	
- Course Deliverables Due	Dec. 13, 2019	