Formula Hybrid Design Spec. Sheet 2017

Car No.	18
School	Rensselaer Polytechnic Institute
Team Name	Rensselaer Formula Hybrid

Dimensions	**Front**	**Rear**
Overall Length, Width, Height	126" x 59.3" x 40.1"	
Wheelbase	68.4"	
Track	44.9"	39.3"
Weight (empty)	221 lb (est)	297 lb (est)
Weight with 150lb driver	231 lb (est)	436 lb (est)

Suspension Parameters	**Front**	**Rear**
Suspension Type	Double Wishbone/Pullrod	Double Wishbone/Pullrod
Tire Size and Compound Type	20.5x7.0x13 / R25B	20x7.5-13 / R25B
Wheels	BBS E14 (Cast Magnesium/Aluminum)	BBS E14 (Cast Magnesium/Aluminum)
Design ride height (chassis to ground)	2.3"	2.3"
Center of Gravity Design Height	10.8"	
Suspension design travel	1" Jounce/Rebound	1" Jounce/Rebound
Static Toe and adjustment method	-0.5 deg / Variable Effective Rod Length	0 deg / Variable Effective Rod Length
Static camber and adjustment method	-1 deg / Upright Shims	-2 deg / Upright Shims
Front Caster and adjustment method	+5.6 deg / Non-Adjustable	
Static Akermann and adjustment method	100% / Non-Adjustable	
Anti dive / Anti Squat	N/A	N/A
Roll center position static	2.4" above ground	0" (at ground level)
Steer location, Gear ratio, Steer Arm Length	Front-Steer, 2.65"/Rev C-Factor, 2.02" Steering Arm	

Mechanical Brake System / Hub & Axle	**Front**	**Rear**
Brake Rotors	Outlaw AX36-037	Wave H022RID
Master Cylinder	Wilwood Compact : 3/4" Bore Front - 7/8" Bore Rear	
Calipers	Wilwood PS-1 - 1" Piston	Wilwood Dynapro Single - 1.75" Piston
Hub Bearings	Single-Row Tapered Roller Bearings	Single-Row Tapered Roller Bearings
Upright Assembly	Machined Aluminum / 3-Part Assembly	Machined Aluminum / 3-Part Assembly
Axle type, size, and material	Floating Axle, 1" Dia., Aluminum 6061	Rotating Axle, 0.91" Dia., Steel 4130

Regenerative Braking	**Front**	**Rear**
Type	N/A	Built-in motor controller function

Ergonomics	
Driver Size Adjustments	Adjustable pedal mounting track
Seat (materials, padding)	Welded aluminum sheet base w/ foam padding and Nomex cover
Driver Visibility (angle of side view, mirrors?)	Unobstructed side views (>180 deg)

Frame	
Frame Construction	Steel spaceframe
Material	4130 Chromoly Steel Tubes
Joining method and material	Welding / ER-70S Filler
Bare frame weight with brackets and paint	74 lbs
Crush zone material	Plascore Crushlite aluminum honeycomb
Crush zone length	8"
Crush zone energy capacity	Unknown (tested to 702.84 J for IA Data Report)

I.C. Engine	

Fuel type	Gasoline
Manufacturer / Model	Kawasaki EX250
No. of Cylinders	2
Bore	2.44"
Stroke	1.62"
Displacement	248cc
Muffler	Yoshimura TRS Race Series
Max. rated power (kW @ RPM)	26.85 kW @ 12,500 RPM
Max. rated torque (N·m @ RPM)	24.54 Nm @ 10,000 RPM

Accumulator / Batteries	
Type	Lithium Ion (Li-Co)
Manufacturer	Samsung
Model No.	INR18650-30Q
Capacity (Nameplate Rating)	3 Ah
Nominal Voltage & Operating Range	3.6 V Nominal / 2.5-4.2 V Rated Operating Range
Quantity (Number of Cells)	440
Total battery voltage	79.2 VDC (nominal)
Total capacity (*Wh*)	3.6765 kWh
Protection / Fuses	Bussman Fusetron FRN-R-200 (200A/250V rated fuse)
Protection / Relays	Kilovac EV200 (one each on +/- accumulator outputs)

Drive Motor(s)	
Manufacturer	Saietta-Agni
Type	Permanent-Magnet DC Motor
Model Number	95-R
Max. rated power (kW @ RPM)	16 kW @ 6000 RPM (continuous)
Max. rated torque (N·m @ RPM)	32 Nm @ 6000 RPM (continuous)
Maximum voltage	84V
Maximum current	220 A
Estimated efficiency range	92%

Motor Controller(s)	
Manufacturer	Sigmadrive
Model Number	PMT865L
Maximum voltage in	97.5 VDC
Maximum voltage out	80 VDC
Maximum current in	200A continuous / 450A transient
Maximum current out	200A
Estimated efficiency range	Unknown (not reported)

Drivetrain	
Type	Chain drive to rear differential
Architecture	Parallel

Instrumentation	
Driver displays	Custom-programmed Moto360 touchscreen interface / RGB LED tachometer
Telemetry	RFHB^2 - Custom telemetry system (accelerometers, wheel speed, GPS, suspension
On-board computer	Automation Direct Do-More H2 Micro Modular PLC
Fuel level/consumption/efficiency/state of charge	Electrical consumption/efficiency and charge state monitored by AMS

Aerodynamics (if applicable)	
Front Wing (lift/drag coef., material, weight)	1.69 L/D Ratio, carbon fiber w/ foam core and aluminum 6061 wing-spars
Rear Wing (lift/drag coef., material, weight)	N/A
Undertray (downforce/speed)	N/A
Wing mounting	3D-printed PLA wing adapters mounted to chassis

Additional Information	
Body Work?	Fiberglass nosecone/hood/side-panels

Special Bit A?	Active hydraulic rear suspension (independent wheel "height" control)
Special Bit B?	Team-designed custom battery management system (BMS/AMS)