



# VI INTERNATIONAL COMPETITION 2019 - 2020

**ENGIRO**  
Advanced · Drive · Solutions

OFFICIAL MOTOR SUPPLIER

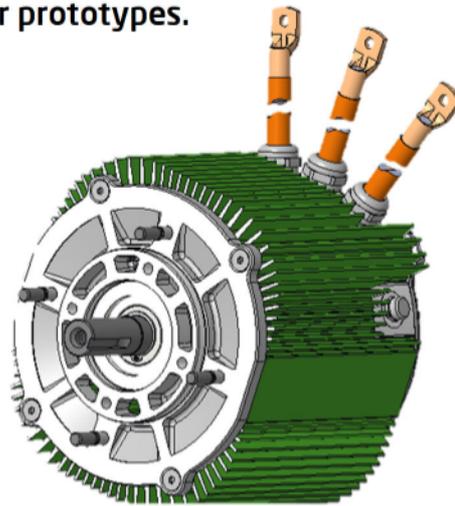
## TECHNICAL SPECS



# VI MOTOSTUDENT INTERNATIONAL COMPETITION 2019-2020

## ENGIRO-MS1920 OFFICIAL ELECTRIC MOTOR

ENGIRO has developed the ENGIRO-MS1920, the Official Electric Motor for the VI MotoStudent International Competition 2019-2020. All teams registered in the MotoStudent Electric Category will receive a unit of this motor within their MotoStudent Kit, compulsory to install in their prototypes.



### GENERAL CONSIDERATIONS

The ENGIRO-MS1920 Official Electric Motor supplied will be sealed by the MotoStudent Organization to avoid internal manipulations, as established in Art. D.2.1 of the Technical Regulations.

These seals will avoid the opening of the crankcases and covers, and must be intact at the moment of participation at the Final Event in Autumn 2020. These seals will be strictly checked at the Static Scrutineering.

#### **ANY BROKEN OR DAMAGED SEAL WILL BE REASON FOR TECHNICAL NON-CONFORMITY**

In case of breakdown or malfunction of any internal part, please contact the Organization to take the appropriate solution.

# ENGIRO-MS1920 - TECHNICAL SPECS

## TECHNICAL SPECS

Nominal Operation			
Torque	$T_{nom}$	22	Nm
Power	$P_{nom}$	13	kW
Speed	$n_{nom}$	5720	rpm
Phase rms-current	$I_{nom}$	156	A
Battery voltage (DC)	$U_{nom}$	96	V
Electric frequency	$f_{el,nom}$	381	Hz
Power factor	$\cos(\phi)$	0.75	

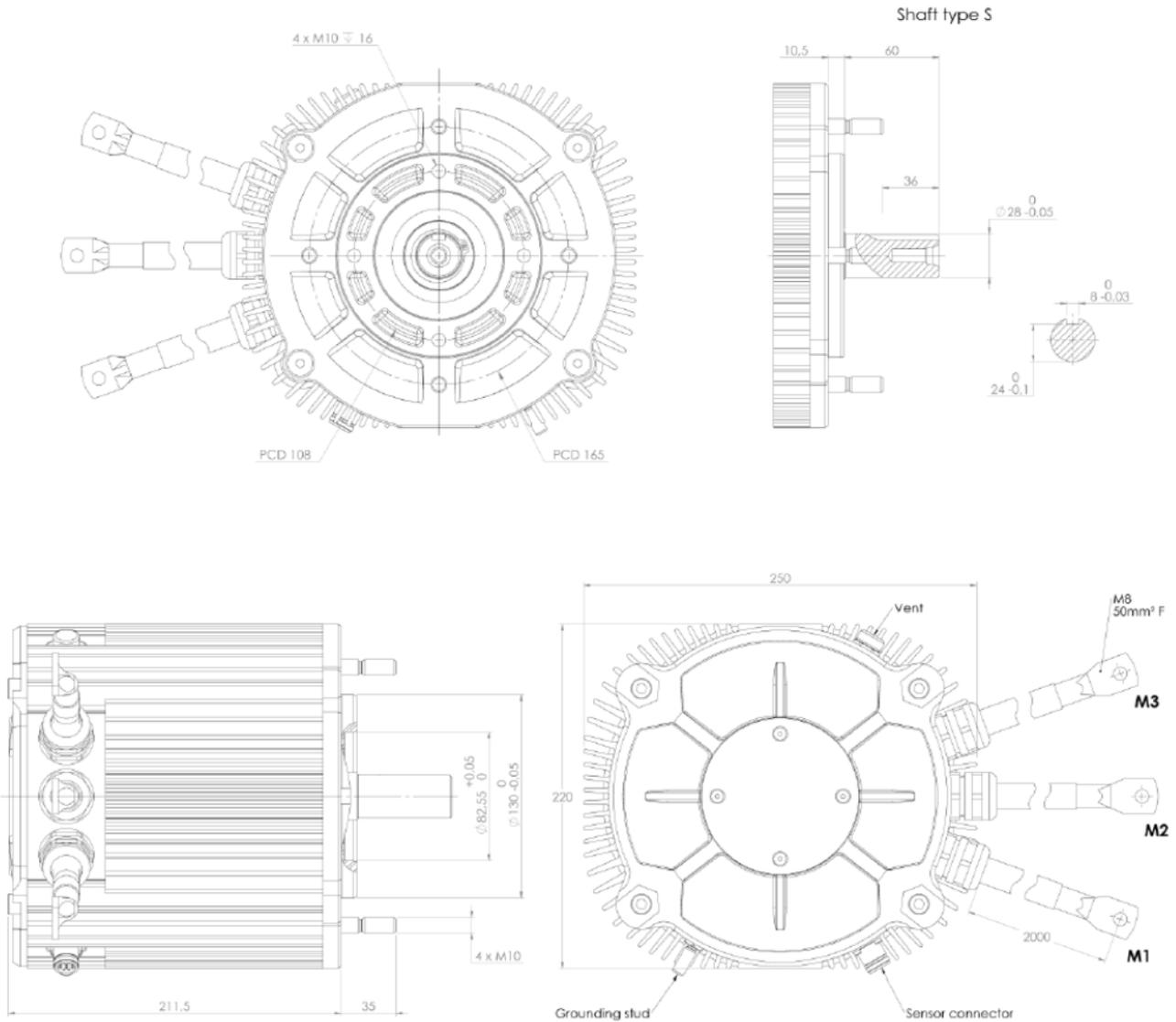
Maximal Values			
Torque	$T_{max}$	95	Nm
Power	$P_{max}$	42	kW
Speed	$n_{max}$	8000	rpm
Phase rms-current	$I_{max}$	781	A
Battery voltage (DC)	$U_{max}$	200	V
Electric frequency	$f_{el,max}$	533	Hz

Electrical Data			
Number of phases		3	
Number of poles		8	
Maximal efficiency		> 96	%
$T/I$ constant ( $I < I_{nom}$ )		0.14	Nm/A <sub>rms</sub>
$U/n$ constant (AC)	rms: 9.1	peak: 12.9	V/(1000rpm)
$K_e$ constant (AC)	rms: 0.022	peak: 0.031	V/(rad*s <sup>-1</sup> )

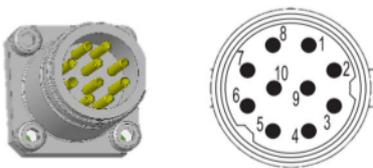
Additional Data			
Type	Permanent Magnet Synchronous Machine		
Weight (w/o cables)		20	kg
Rotor moment of inertia		0.009	kg*m <sup>2</sup>
Protection category		IP65	
Maximal motor temperature		120	°C
Allowed ambient temperature		-20 ... 45	°C
Cooling (medium, flow rate, inlet temperature, pressure)		air, 18 m/s, ≤ 45°C	
Temperature monitoring		1 x KTY84-130	

Connectors			
Power terminals	3 x 50 mm <sup>2</sup> cables with M8 cable lugs		
Power cables weight		3.3	kg
Signal connectors	M16, 10 Pin		

## TECHNICAL DRAWINGS



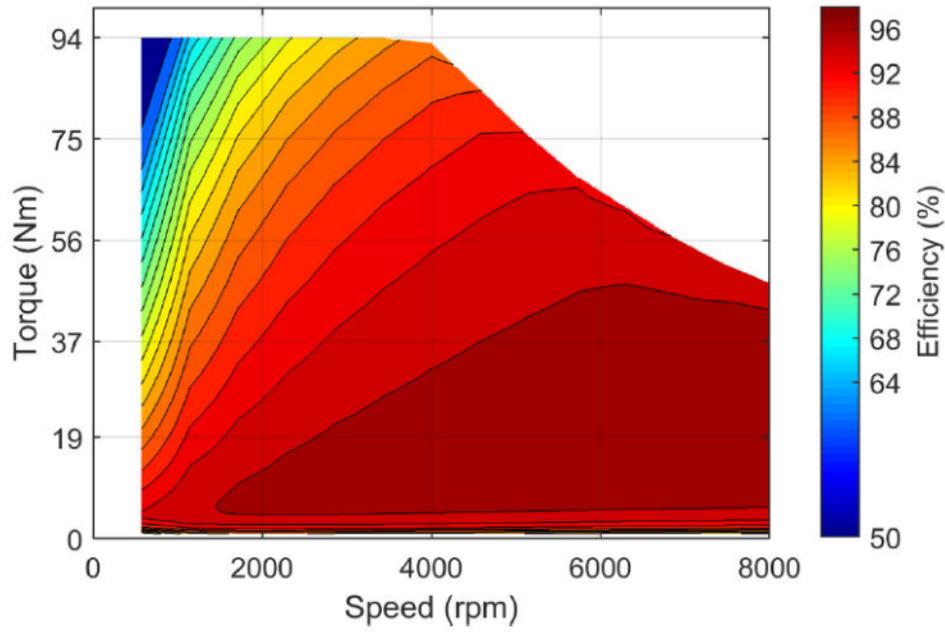
## SENSOR CONNECTOR PIN REFERENCE



	Cable	Signal	Hummel 10P Connector
Twisted Pair	Brown	KTY	1
	White	KTY	5
Twisted Pair	Blue	Sensor GND	7
	Red	+5V	8
Twisted Pair	Yellow	Sin	9
	Green	Cos	10

## SIMULATED CHARACTERISTICS GRAPHS

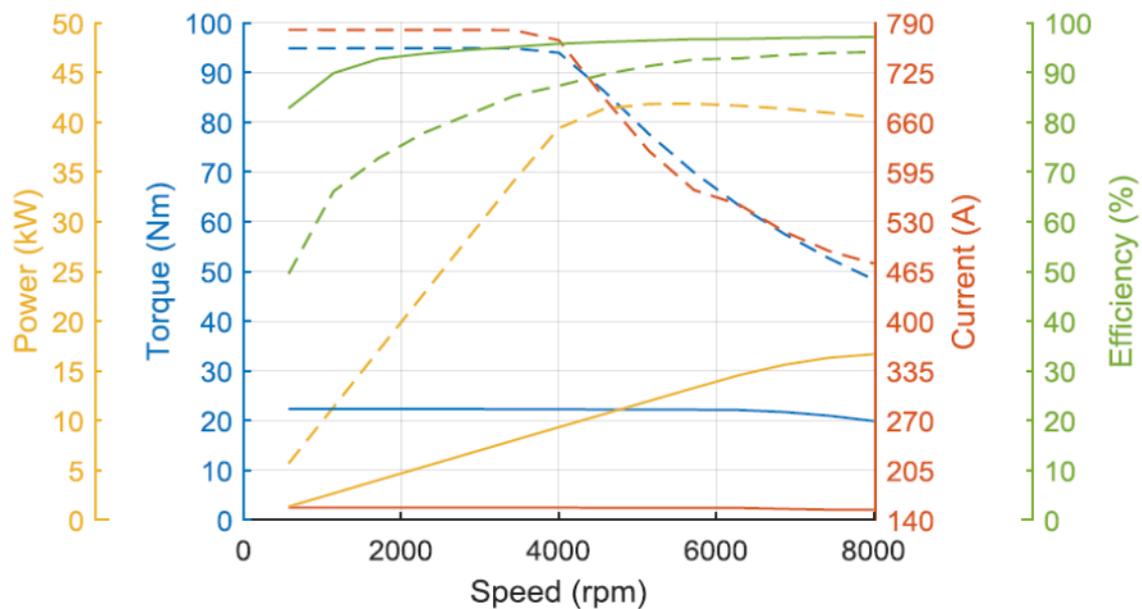
Simulated Efficiency of Motor Application  
(electric machine only;  $U_{nom} = 96\text{ V}$ ; machine at  $100\text{ }^\circ\text{C}$ ;) )



Simulated Characteristic Motor Parameters

$$U_{nom} = 96\text{ V}$$

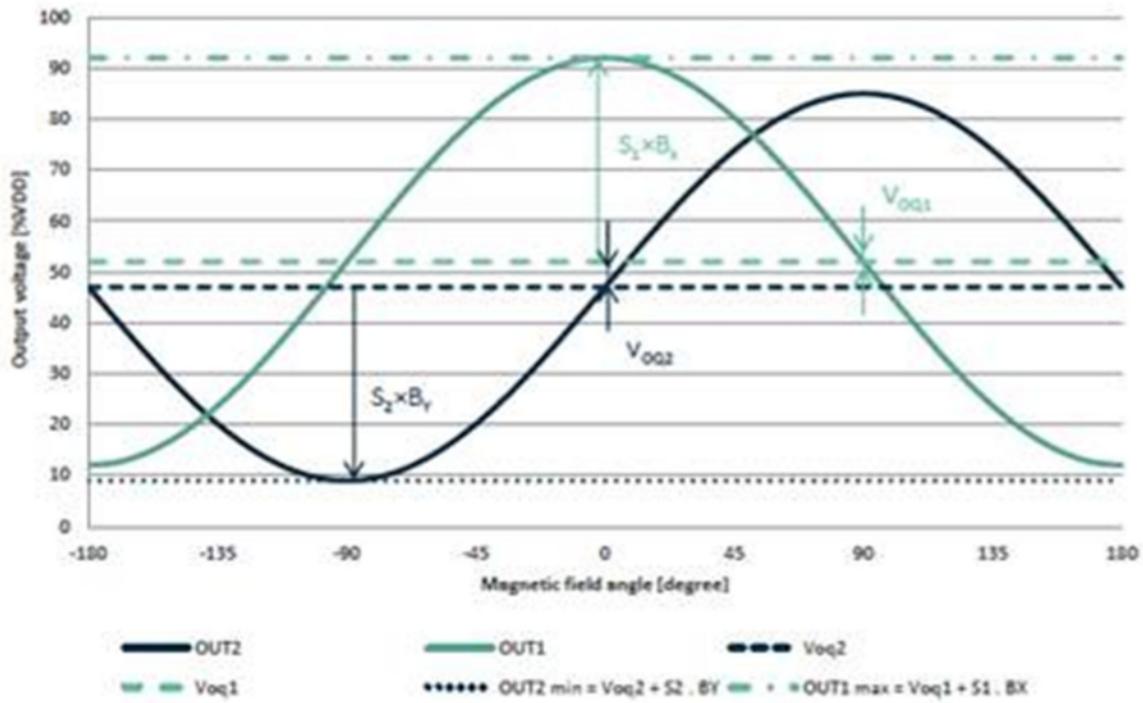
solid lines: continuous; dashed lines: maximum;  
(jitter is caused by numerical inaccuracies in the simulation software)



## ENCODER SPECS

Encoder position sensor (analogue sinusoidal)		
Power supply (VDD)	$5 \pm 10\%$	V
Power consumption	8	mA
Output signal amplitude	$1.5 \pm 0.5$	V
Resolution	1	sine/cosine wave per revolution
Accuracy	$\pm 1$	$^\circ$

## ENCODER FUNCTIONAL DESCRIPTION



All technical questions and requests about the ENGIRO-MS1920 Official Electric Motor must be directed to the MotoStudent Technical Department through MotoStudent Support Center:

MotoStudent Support Center - [support.motostudent.com](https://support.motostudent.com)

TechnoPark MotorLand 44600 - Alcañiz (Teruel) - Spain Tel. +34 978 877 935

[www.motostudent.com](https://www.motostudent.com)

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