

# 159AH-06030-EDE 96V Traction Set

9.8 kW drive set for traction applications

Art.-No.: 1867



## KEY FEATURES

- Interior permanent magnet synchronous machine
- 96V 3-phase motor controller
- Full torque at zero speed
- Air-cooled

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## To be noted:

The information in this technical data sheet is based on our current knowledge and experience. Due to the wide range of possible influences during application, they do not exempt the processor and user from carrying out their own tests and trials. Although the suitability for a specific application can be estimated from our information, a legally binding assurance is by no means possible. Depending on the individual case, we recommend consultation with us. Any industrial property rights and applicable laws must be observed by the recipient of our products on his own responsibility.

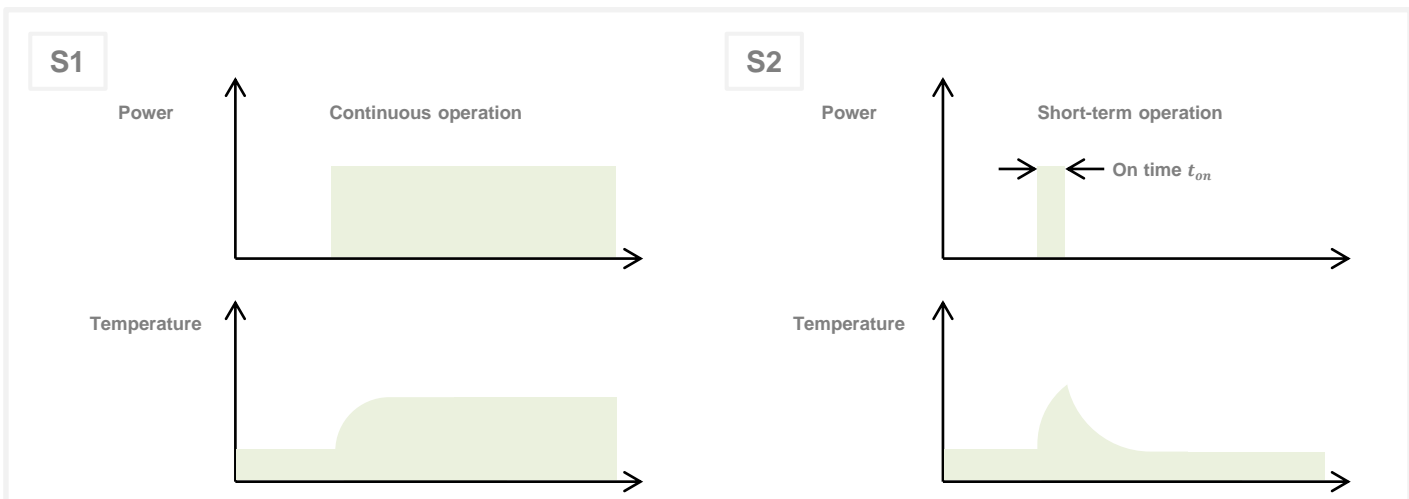
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## Characteristic Operating Points<sup>1)</sup> (cooling as specified on next page)

		S1	S2	S2	
Feasible operation time	$t_{on}$	continuous	120 sec	60 sec	
Torque	$T$	32.3	63.2	78.3	Nm
Power	$P$	9.8	16.2	18.1	kW
Recuperation power	$P_{recu}$	10.8	19.7	23.8	kW
Phase rms-current (AC)	$I_{rms}$	115 <sup>2)</sup>	236	330	A
Battery current (DC)	$I_{DC}$	113	211	264	A
Battery voltage (DC)	$U_{DC}$	96	96	96	V
Speed	$n$	2900	2450	2200	rpm
Electric frequency	$f_{el}$	242	204	183	Hz
Set Efficiency	$\eta_{tot}$	90	82	76	%

## Maximum Operating Range

		Min.	Nom.	Max.	
Torque	$T_{max}$	-	32.3 <sup>3)</sup>	78.3 <sup>3)</sup>	Nm
Power	$P_{max}$	-	9.8	18.1	kW
Recuperation power	$P_{max,Recu}$	-	10.8	23.8	kW
Phase rms-current	$I_{rms,max}$	-	115 <sup>2)</sup>	330 <sup>4)</sup>	A
Battery current (DC)	$I_{DC,max}$	-	113	264 <sup>4)</sup>	A
Battery voltage (DC)	$U_{max}$	14 <sup>5)</sup>	96	140 <sup>5)</sup>	V
Speed	$n_{max}$	-	2900	5260 <sup>6)</sup>	rpm
Electric frequency	$f_{el,max}$	-	242	438	Hz
Power density	$P_{gravimetric}$			1.16	kW/kg

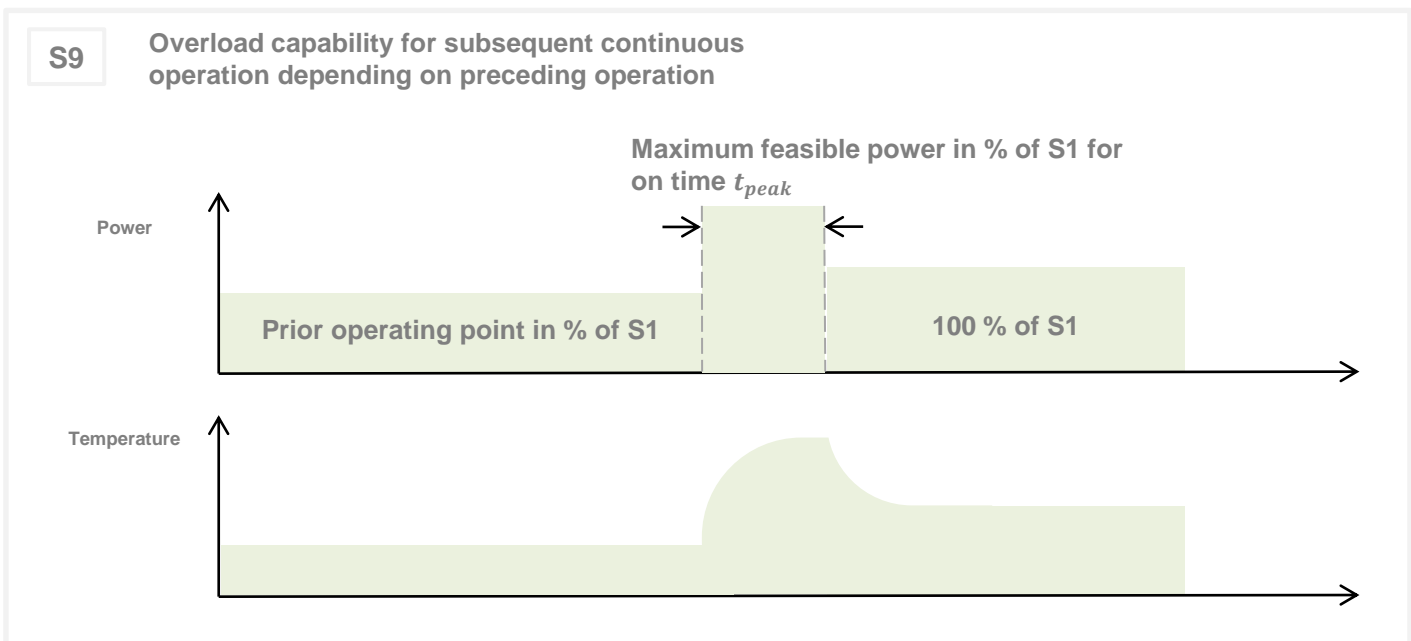


- 1) Defined Range only valid for a power factor of 1 at DC input
- 2) The cables must not exceed a temperature of 140 °C at any time. Temperature and service life depend on the installation condition.
- 3) Torque rating is dependant on rotor temperature
- 4) Peak rating for max. 60 seconds on time
- 5) Derating < 16V & Derated generating power > 130V
- 6) Higher speeds available upon request. A detailed discussion of the functional safety concept of the vehicle is required.

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## S9 Operating Points Maximum Feasible Power in % of S1

U <sub>nom</sub> = 96V		Prior operating point in % of S1				
		0 %	25 %	50 %	75 %	100 %
On time $t_{peak}$	60s	184 %	175 %	170 %	155 %	100 %
	120s	168 %	156 %	145 %	132 %	100 %
	320s	147 %	134 %	128 %	112 %	100 %

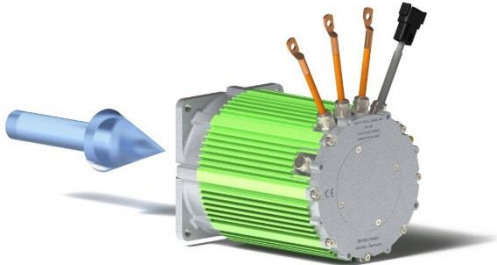


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## S1 Operating Points Based on Cooling

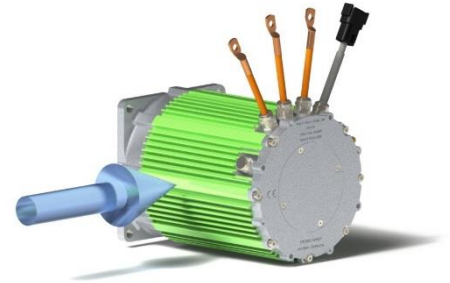
$U_{nom} = 96V$		Specified S1 point on previous page					
Cooling definition (see below)		1	1	2	1	-	
Minimal Flow Rate	$Q$	7.5	4	7.5	7.5	m/s	
Maximum Ambient Temperature	$T_{amb}$	20	20	20	60	°C	
Torque	$T$	32.4	29.0	31.1	26.2	Nm	
Speed	$n$	2900	2900	2900	2900	rpm	
Power	$P$	9.8	8.8	9.4	7.9	kW	
Phase rms-current (AC)	$I_{rms}$	115 <sup>1)</sup>	104 <sup>1)</sup>	110 <sup>1)</sup>	92 <sup>1)</sup>	A	
Battery current (DC)	$I_{DC}$	114	104	107	98	A	
Max. surface temperature	$T_{surf}$	93	103	90	100	°C	
Min. surface temperature		93	103	57	100		

### Cooling definition 1



Temperature sensors are placed on the surface of the green part of the housing.

### Cooling definition 2



Temperature sensors are placed on the surface of the green part of the housing. One sensor is directly cooled by the air flow.

1) The cables must not exceed a temperature of 140 °C at any time. Temperature and service life depend on the installation condition.

Additional Data				
		Motor	Inverter	
Weight (w/o cables)		14.9	4.1	kg
Rotor moment of inertia		0.0063	-	kg*m <sup>2</sup>
Allowed range of ambient temperature		-20...see page 4	-30 ... +40	°C
Cooling	Cooling Medium	air		
	Air Flow rate	See page 4	> 3	m/s
	Ambient temperature	See page 4	≤ 40	°C
DC link capacitance		-	2640	μF
Temperature monitoring		1 x KTY84-130	Internal	
Rotation direction		freely controllable via CAN-Bus		
Ports				
Power terminals		3 x 16-20 mm <sup>2</sup> cables with M8 cable lugs <sup>1)</sup>		
Signal connectors		AMP, 35-Pin		
Control and Communication				
Type		CAN, Hardware interface (analog/digital input)		
		Speed/Torque Control selectable via software		
CAN Bus	Symbol/Baud rate	100/125/250 kbaud/s		
	Technology	CANopen		
Torque Ramp		Safety limits can be set in inverter by ENGIRO.		
Speed Ramp		Safety limits can be set in inverter by ENGIRO.		

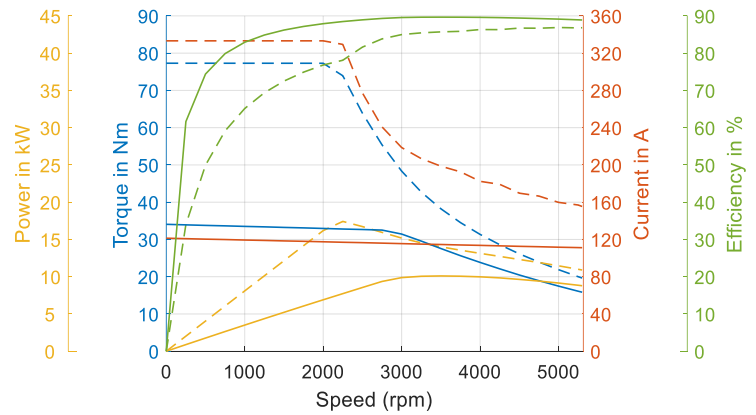
1) The cables must not exceed a temperature of 140 °C at any time. Temperature and service life depend on the installation condition.

Certifications			
	Motor	Inverter	
Type approval	CE, EN 60034	-	
Environmental	Prepared for ISO 9227	-	
Protection grade	ISO 20653 IP6K9K <sup>1)</sup>	ISO 20653 IP65	
Vibrations	Prepared for ISO 16750-3	-	
EMC	-	EN12895 (2015), EN 61000-6-3 (2007) , EN61000-6-2 (2005)	
Functional safety	-	EN1175-1 (2011), machine directive 2006/42/EC	
Customs tariff number	8501 5230	8504 4088	

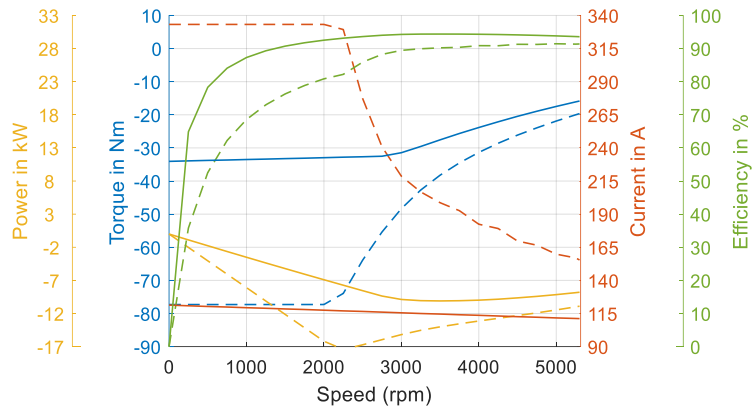
1) Only valid if the machines is installed with suitable cable glands and an appropriate shaft sealing.

## 96V

Simulated Motor Characteristics  
solid lines: continuous  
dashed lines: maximum

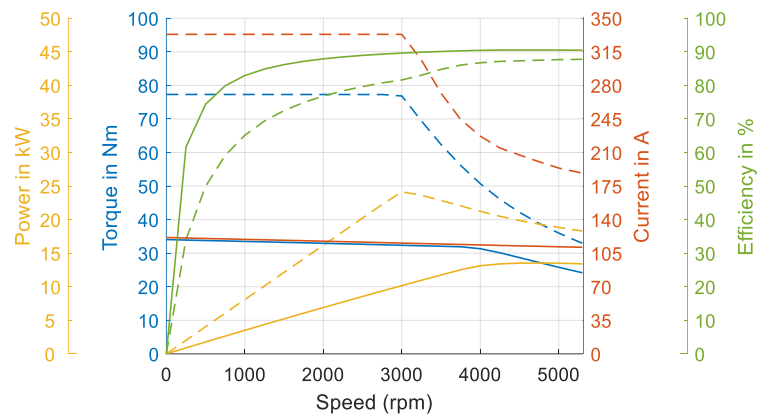


Simulated Generator Characteristics  
solid lines: continuous  
dashed lines: maximum

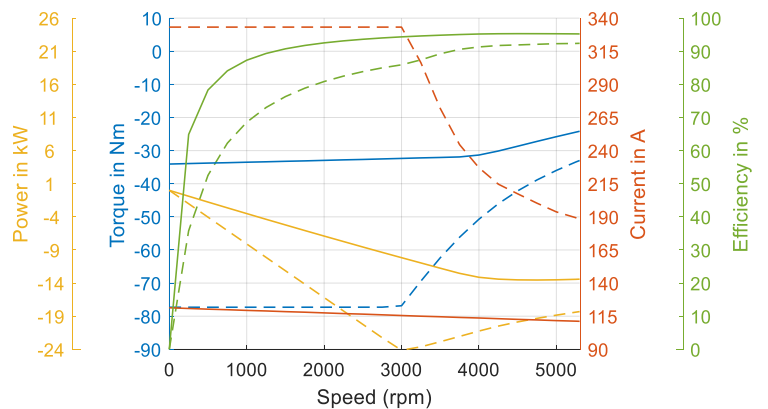


## 130V

Simulated Motor Characteristics  
solid lines: continuous  
dashed lines: maximum

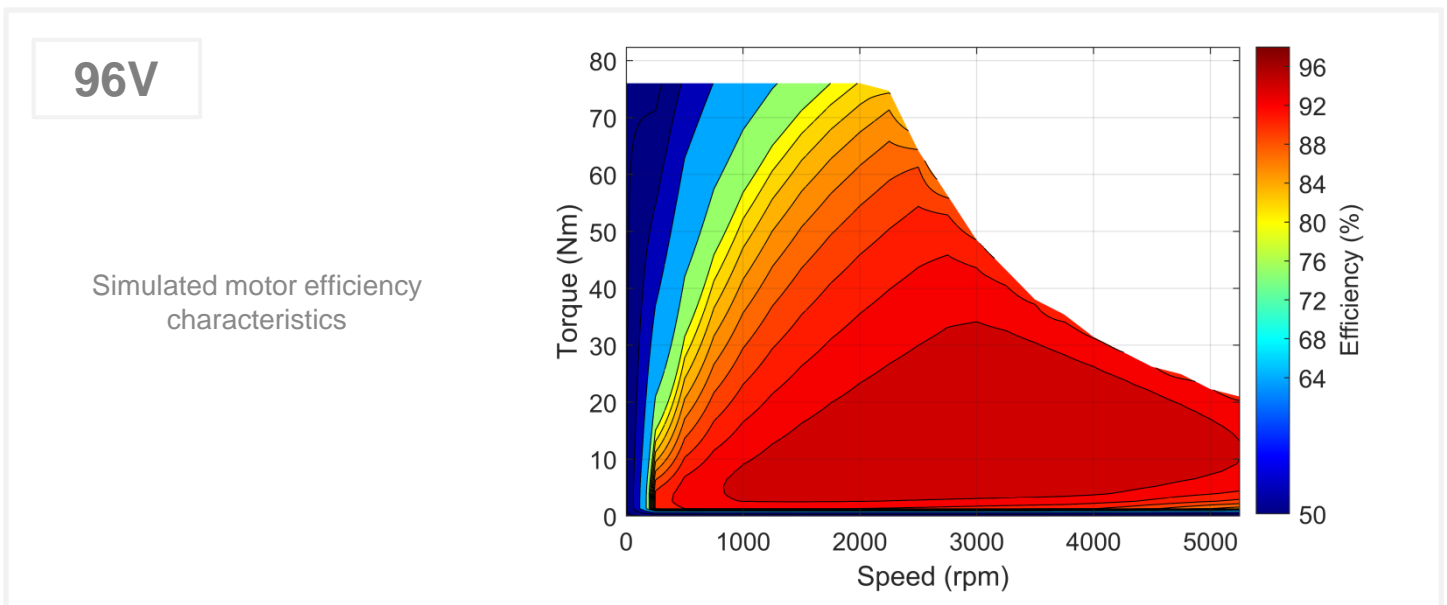
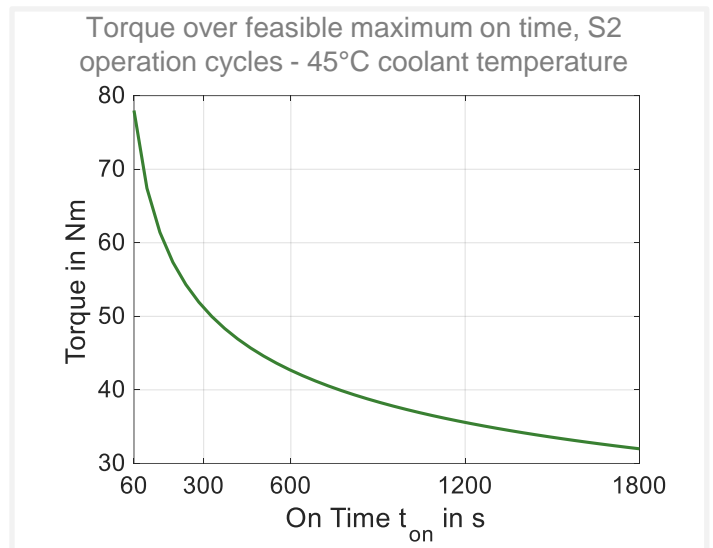
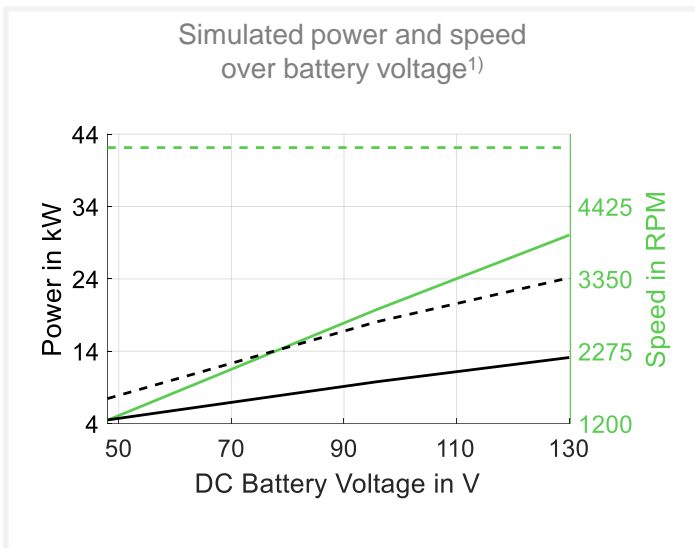
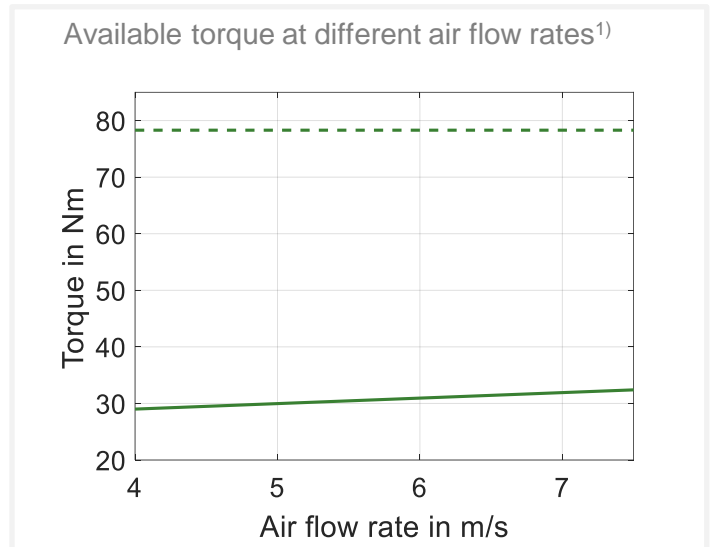
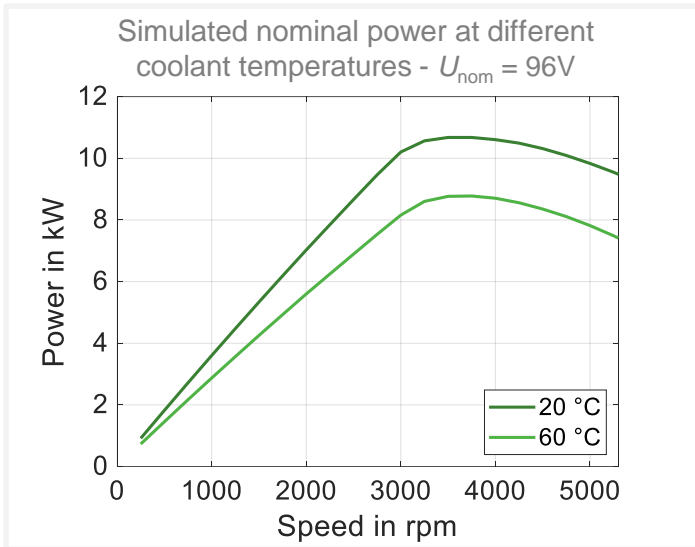


Simulated Generator Characteristics  
solid lines: continuous  
dashed lines: maximum



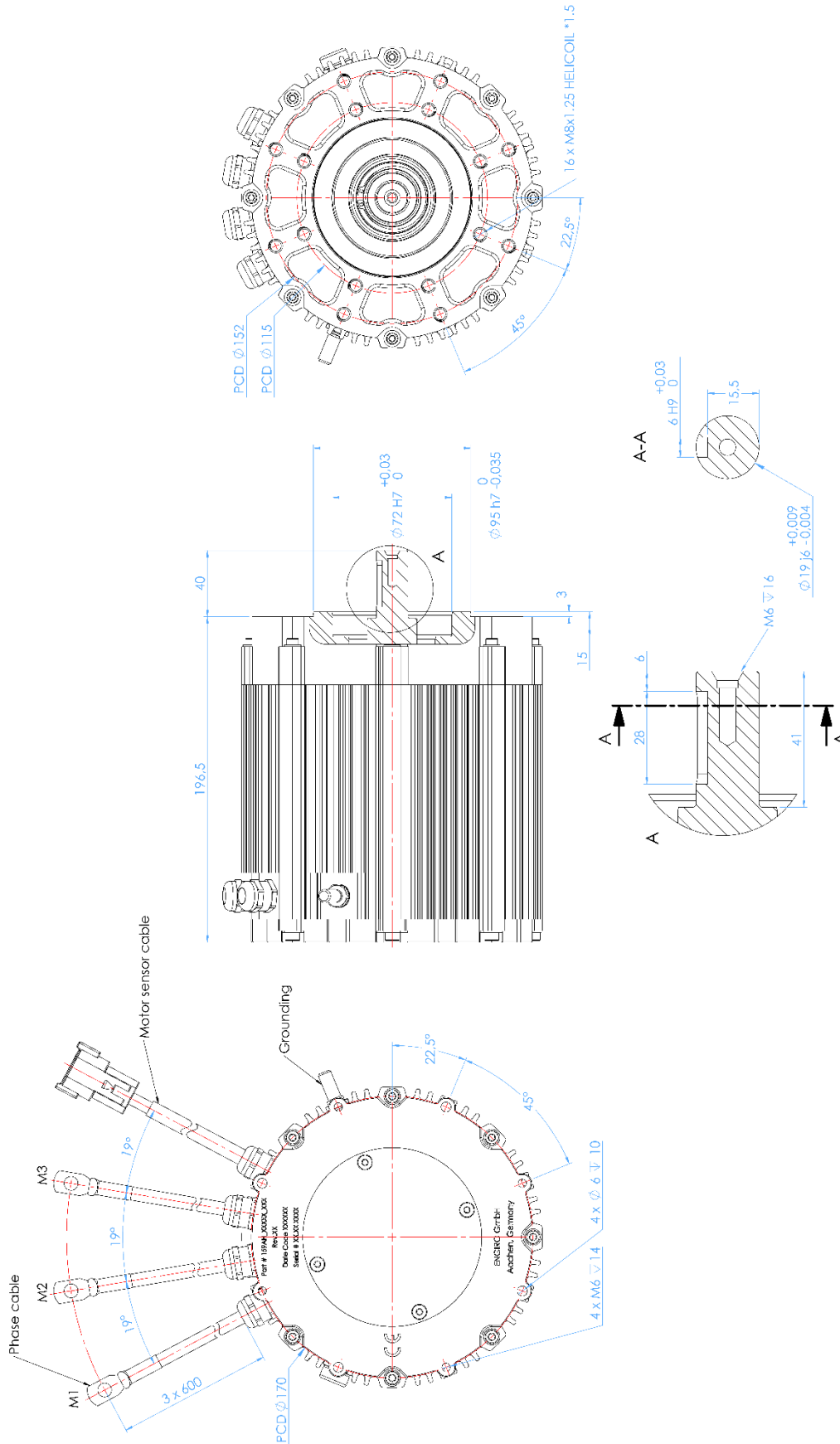
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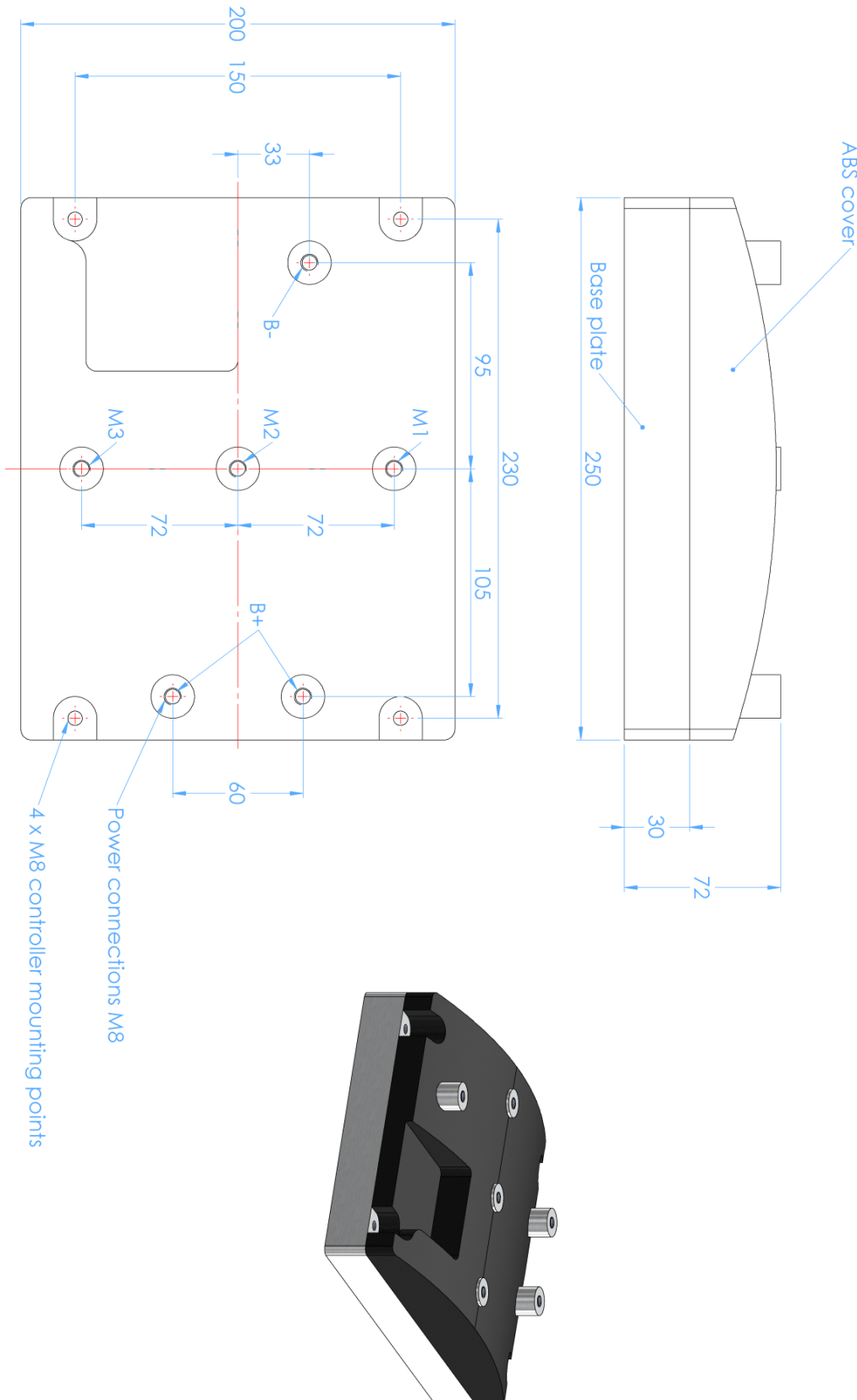


1) solid lines: continuous; dashed lines: maximum;

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Item description				Article number		
Available Motor Variants	A: flange	B: shaft	C: position sensor	Component	Set	
		E: 95 mm IEC B14 90 circular flange	D: 19 mm shaft with feather key	E: ENGIRO Sin/Cos Encoder	159AH_06030_EDE	1867
ENGIRO 230/300/450A 96V Controller				1364	1x	included in set
Encoder + Temp. data cable (0,3m length) for ENGIRO 159AH motors and ENGIRO 48-96 V controllers incl. wiring harness with CAN Bus, Digital Input, Analog Input, Key-Switch, Throttle, etc. (2m length)				1746	1x	

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