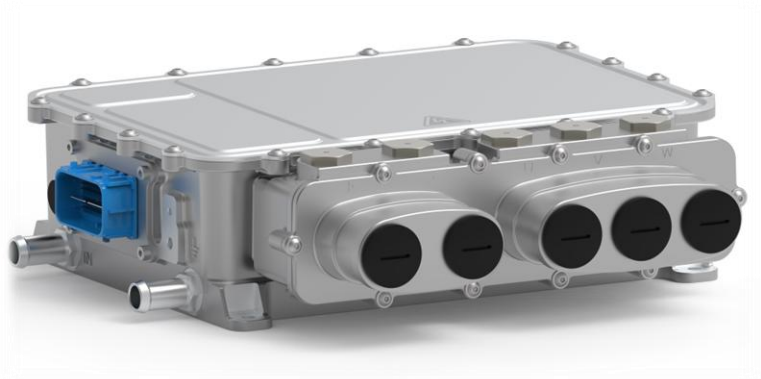


MCU-600 SiC INVERTER

KEY FEATURES

- 3 phase motor controller
- Silicon Carbide technology
- Peak power density (mass)¹ >75 kVA/kg
- Peak power density (volume)¹ >125 kVA/L
- Over 99% peak efficiency
- Dynamic switching frequency 8 - 32kHz
- Dual switching speeds
- Hybrid Pulse Width Modulation
- AUTOSAR 4.3
- ISO 26262 SEooC ASIL D



TYPICAL APPLICATIONS

- Automotive electric vehicles (BEV or HEV)
- Electrified aircraft or marine vessels (BEV or HEV)

High Voltage Inputs			
Item	Condition	Value	Units
HV DC voltage range		250 - 900	V
HV DC peak current	10 seconds duration	500	A
HV DC continuous current		340	A
DC Link Capacitance	+ / - 5%	152	uF
Y-Capacitance	One for HV+ to ground, one for HV- to ground	2 x 260	nF

Motor Output			
Item	Condition	Value	Units
Number of phases		3	-
Continuous current	70°C coolant, 10L/min flowrate, 8-26 kHz variable F _{sw} , 750V	320	Arms
Peak current	70°C coolant, 10 L/min flowrate, 8 kHz F _{sw} , 550V, 10 secs 70°C coolant, 10 L/min flowrate, 8 kHz F _{sw} , 650V, 2 secs 50°C coolant, 10 L/min flowrate, 8 kHz F _{sw} , 650V, 8 secs	545 ≥588 ² ≥588 ²	Arms
Maximum Back emf		1150	V
Peak Transient ASC current	Duration: 80ms Initial conditions - 70°C coolant heat-soaked unit	1500	Apk
Short term ASC current	Duration: 500ms Initial conditions - 70°C coolant heat-soaked unit	590	Arms
Long term ASC current	Duration: 30s Initial conditions - 70°C coolant heat-soaked unit	450	Arms

1. Peak apparent power, 750 V input, phase current 524 Arms, power factor 0.875, 10 seconds duration, 8kHz switching frequency
2. Peak current figures limited by test motor capability

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Performance			
Item	Condition	Value	Units
Motor control modes	Speed control non-standard & over XCP only	Torque and Speed	-
Efficiency		97 typical, >99 peak	%
Switching frequency	Continuously variable at rate of 1kHz	8 – 32	kHz
Demand update rate		1	mS
Response time	Receipt of command to 95% of demanded current	40	mS
Speed control accuracy	Maximum deviation from demanded	20	rpm
Output accuracy	Max power, Reg 85 test environment (non-max power points $\pm 4\%$)	± 2	%
HV DC voltage measurement accuracy	@ maximum working voltage	± 1	%
HV DC ripple voltage	Not validated below 450Vdc	≤ 16	Vpk-pk

Low Voltage Inputs			
Item	Condition	Value	Units
LV DC (KL30_1 and KL30_2)	As per requirements of ISO 16750-2 CODE B – H	8 – 32	V
CAN ports	CAN2.0b 500kbs standard, 1MBs capable FD optional – 2MBs standard, 5Mbs capable	3x CAN2.0b ISO 11898-1: 2015	-
Ethernet port	Automotive Ethernet (100Base-T1)	1 (Optional)	-
I/O	Ignition (KL15), Crash signal (KL30C)	KL 15 (on/off), KL 30C (PWM or on/off)	-
Wake up and sleep		CAN or KL15	-
Wake up response time	From off to LV On state. Operational mode: Standby	200	mS

Motor Interface			
Item	Condition	Value	Units
Position feedback	Resolver Excitation: 10kHz Frequency, 7Vrms $\pm 20\%$, 100mA	Resolver or SinCos encoder	-
Motor temperature feedback supported	Range configurable. Range for 5% accuracy: NTC10k: -19°C to 217°C NTC100k: 23°C to 217°C PT100: -50°C to 250°C PT1000: -50°C to 250°C	NTC10k NTC100k PT100 PT1000	-
Motor temperature feedback interfaces	Optimised for 2x NTC10k and 1x PT1000 as standard	3	-

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Safety and Protection			
Item	Condition	Value	Units
ISO 26262	SEooC when integrated in compliance with Safety Manual	ASIL D	-
Active discharge time	under 60V HV DC, with KL30 present	≤1	sec
Passive discharge time	under 60V HV DC	<120	sec
Active short circuit		Supported	-
Short circuit protection	Motor Terminals	Supported	-
Enclosure	Conductive material enclosure	Equipotential bonding point provided	-
Ingress protection		IP67, IP6K9K	-
Y capacitance	Max energy storage	0.2	J
Withstand Voltage	Up to 6000m altitude	≥2500	Vdc
Isolation Resistance	At 1000Vdc isolation voltage	≥5	MOhm

Mechanical			
Item	Condition	Value	Units
Dry mass	Excluding coolant	6.4	kg
Volume	Excluding connectors	4.85	L
Dimensions	Excluding connectors	262.5 x 176 x 82	mm

Environmental and Cooling			
Item	Condition	Value	Units
Coolant	Standard ratings based on 50/50 Water/glycol	Water/glycol	
Coolant inlet temperature	Full performance De-rated performance	-20 to 70 -40 to 80	°C
Min. coolant flow rate	For full performance	10	L/min
Max. coolant pressure	0°C to 105°C ambient temperature -40°C to 0°C ambient temperature	2 1.3	Barg
Inlet to output coolant pressure drop		100	mbar
Operating ambient temperature		-40 to 105	°C
Operating maximum relative humidity		95%	
Chemical agent withstand	Oils, cleaning agents	yes	
Shock	10 shocks, 6mS duration in all directions	50	g
Vibration	Power Spectral Density (5 to 2000Hz)	0.0015 to 0.2080	g ² /Hz
Storage ambient temperature		-40 to 85	°C
Altitude		6000	m

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Lifetime and Reliability			
Item	Condition	Value	Units
Lifetime	Operational and non-operational	10	years
Operating time	Usage profile: WLTC class 3b + 15% track use	2170	hours
Distance	Usage profile: WLTC class 3b + 15% track use	100,000	km

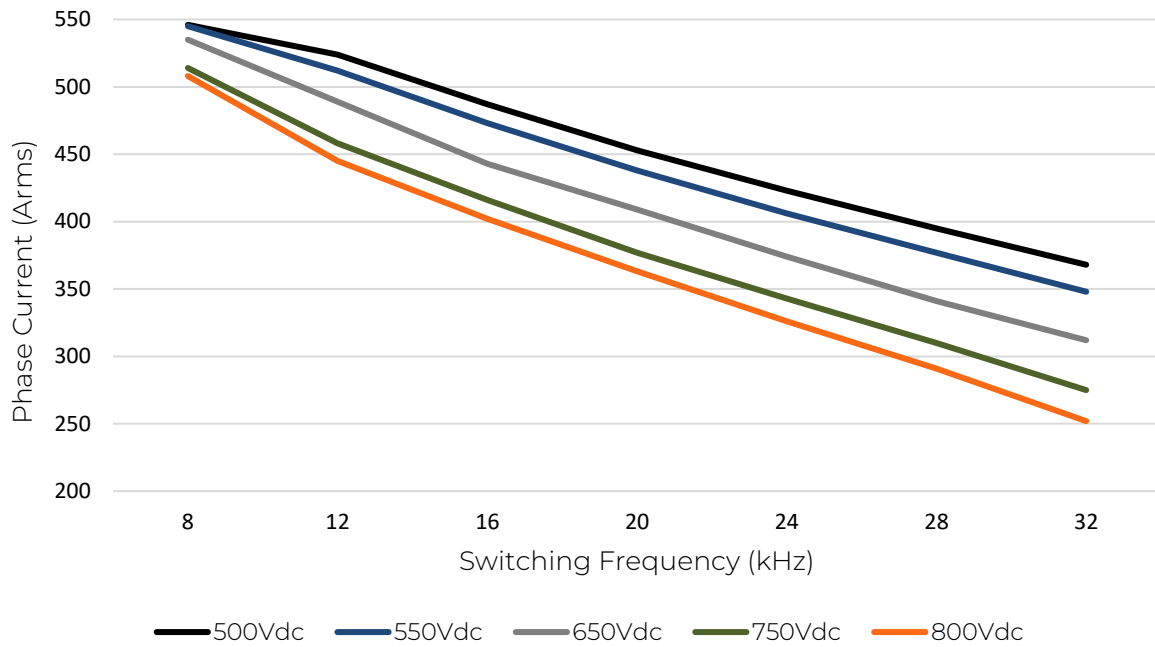
Legislation, Standards and Guidelines	
Item	Value
Regulation	Product compliance to R10, RoHS and aligned to support Vehicle Type Approval to Reg (EC) 2019/2144 (Europe) and 49CFR571 (US) with alignment to GB 18488/GB18655 (China) and R85, R100, R133, R154, R155 (worldwide) requirements
Standards	ISO 14229, ISO 16750, ISO 6469, ISO 26262, SAE-J1979 Cyber security at product level aligned to ISO 21434 processes SAE J1939 (for commercial vehicle variants, not standard product)
Environmental	Recyclable rate target >85% IMDS registered components and materials

Software and Communication			
Item	Condition	Value	Units
Operating System		AUTOSAR 4.3	
Support for customer high-level applications	Computational Resource	15	%
Diagnostics protocol	ISO 14229 SAE-J1979	UDS OBD	
Calibration protocol	Non-safety critical parameters Motor calibration (live tune supported for motorsport/development)	XCP	
Logging protocol	User selectable parameters up to 1kHz	XCP	
Security	Prevention of unauthorised control or modification	Supported	
Configurable CAN message scheme	Match customer vehicle specification	Supported	

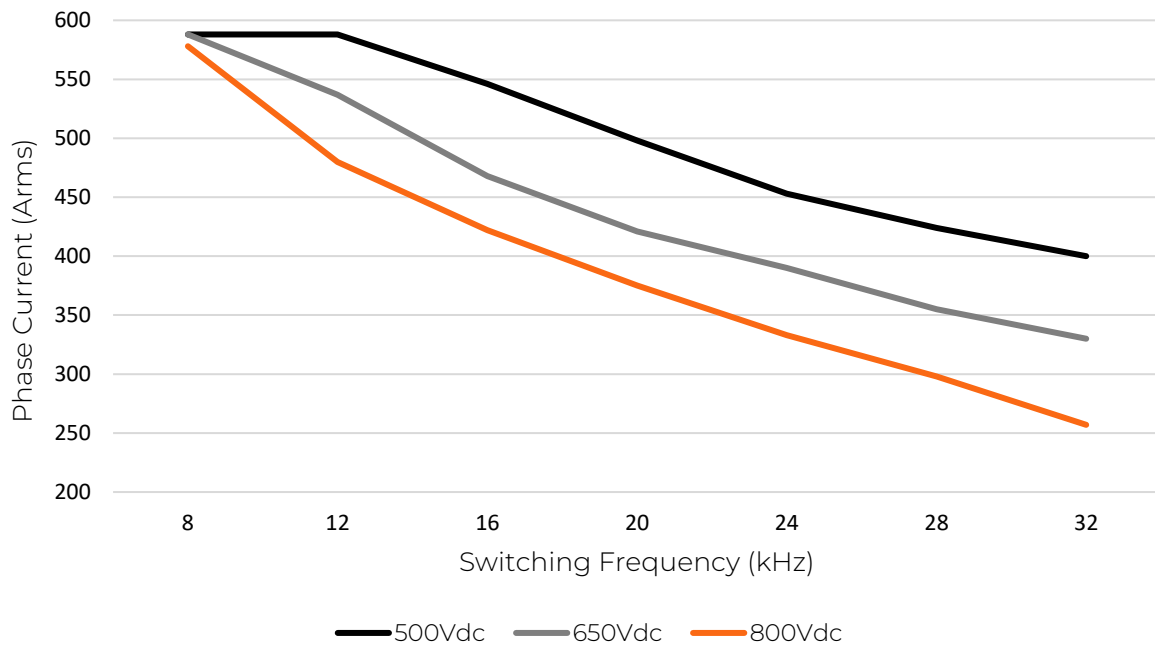
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PERFORMANCE MAPS

70°C water/glycol coolant at 10L/min. Performance limited to 588Arms by test motor.



Peak Current vs Switching Frequency Map: 10s rating, Modulation Index < 0.6, Power Factor > 0.9

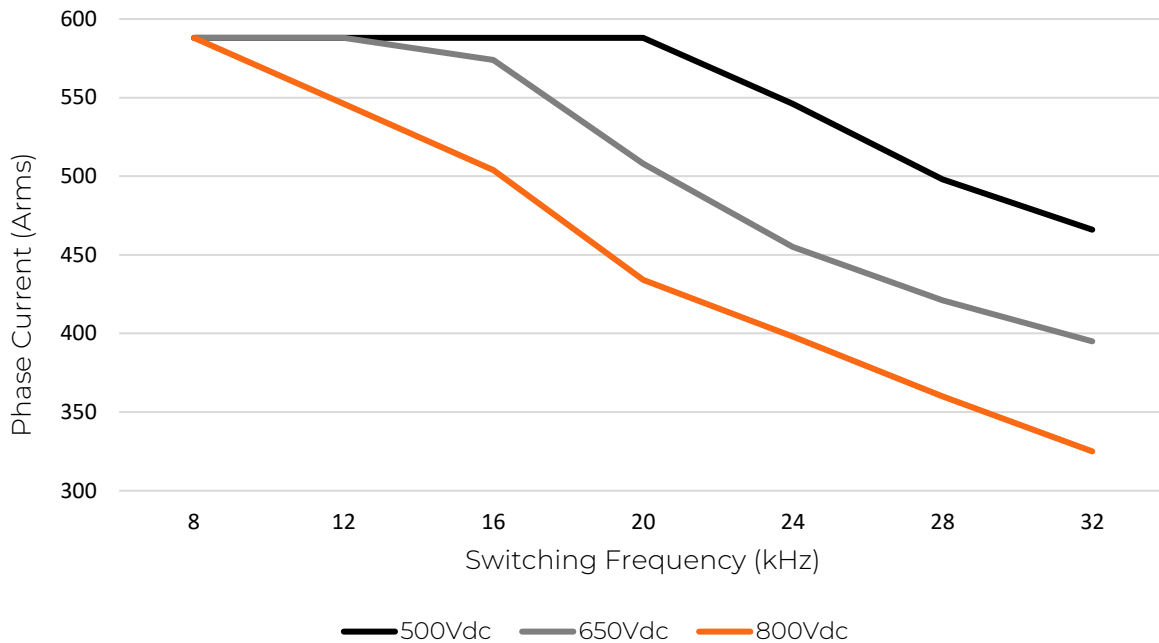


Peak Current vs Switching Frequency Map: 2s rating, Modulation Index < 0.6, Power Factor > 0.9

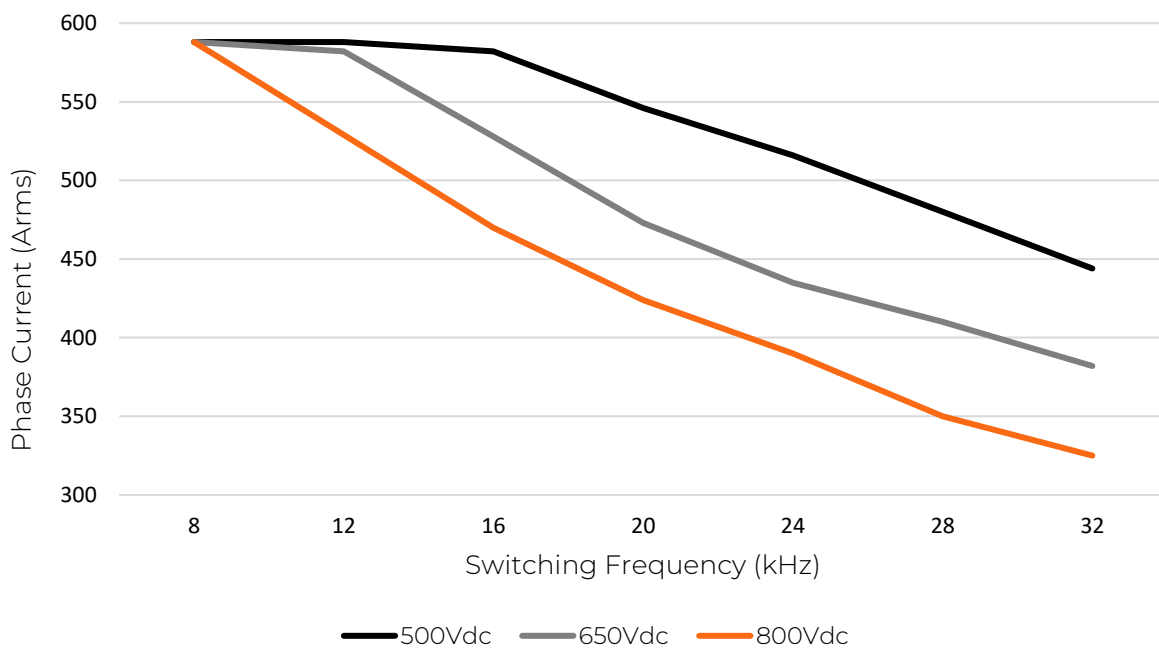
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PERFORMANCE MAPS

50°C water/glycol coolant at 10L/min. Performance limited to 588Arms by test motor.



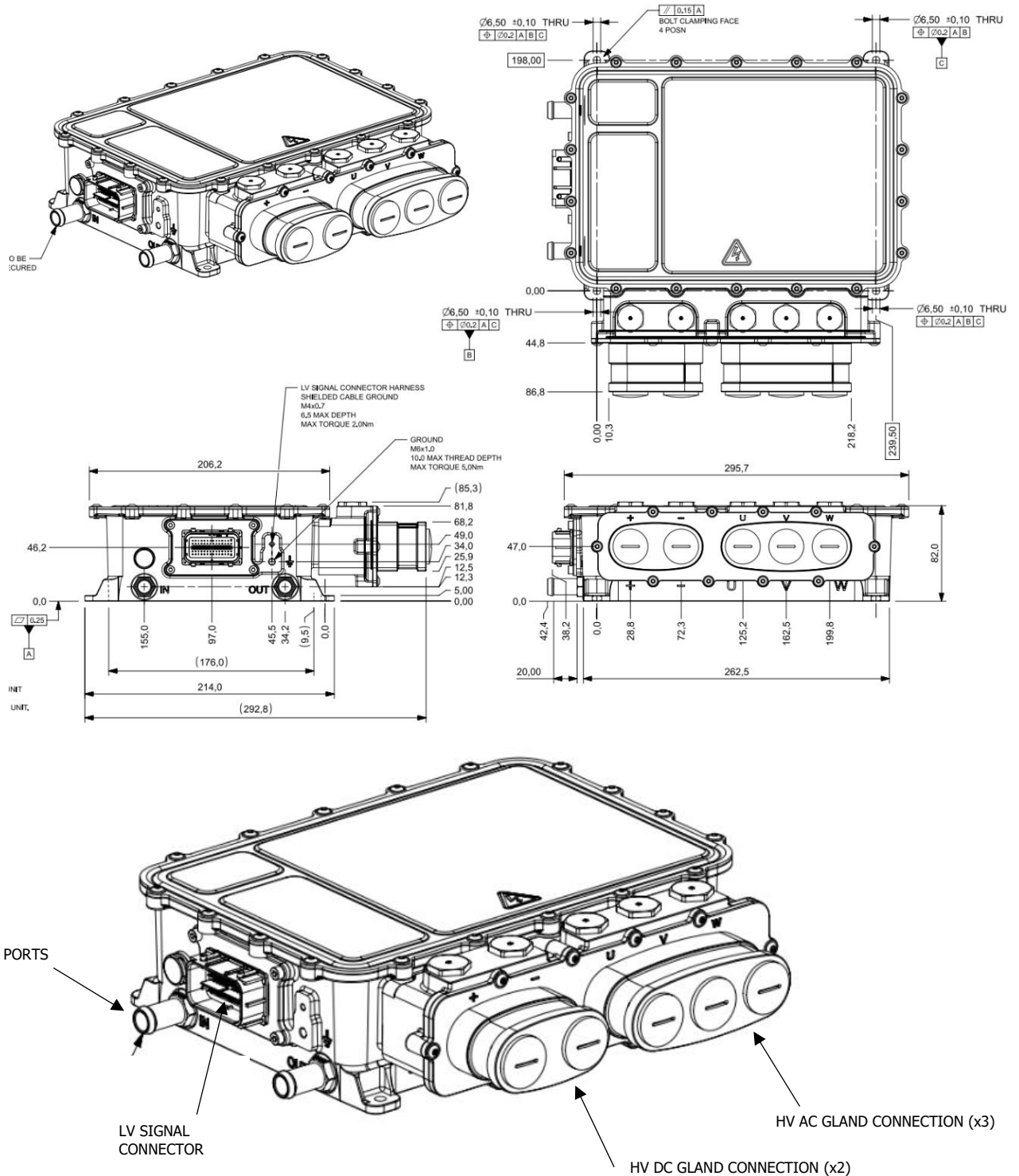
Peak Current vs Switching Frequency Map: 2s rating, Modulation Index < 0.6, Power Factor > 0.9



Peak Current vs Switching Frequency Map: 8s rating, Modulation Index < 0.6, Power Factor > 0.9

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MECHANICAL PROFILE



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