

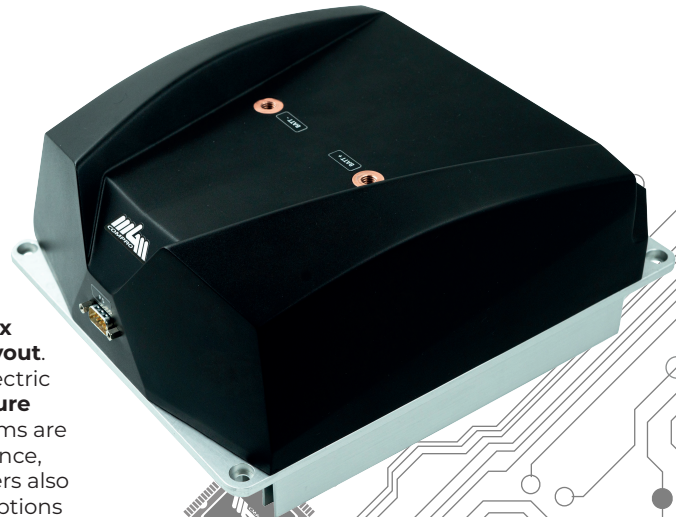
# Up to 400kW

(variants up to 400V, up to 800V)



Unrivalled performance, power density ratio, redundancy, safety and innovation throughout the features and parameters.

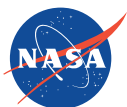
MGM COMPRO HBCi HV product line represents high performance speed controllers/inverters (ESCs) applying the most advanced IGBT and SiC modules in order to achieve maximum efficiency, small dimensions and weight, unique innovative and safety features to be compliant with most demanding requirements of aerospace application.



They are an **intelligent solution** with high-performance **32-bit ARM cortex processors** used for control, arranged in **most advanced 4 processors layout**. Specially designed to operate also with **Multi-Core** and **Multi-Winding** electric motors, i.e. **the most sophisticated and redundant/safety EPS architecture** based on using 2 or even 4 controllers/inverters (ESCs). Advanced algorithms are used to control the motor and secure safe operation. Impressive performance, small dimensions and low weight are characteristic. These speed controllers also offer a range of innovative functions, settings, control and configuration options together with **wide connectivity capabilities**. Real-time monitoring and logging of operational data are given, representing **unrivalled tools for optimizing** the propulsion setup and data evaluation. Active safety components, expanded to include the **Emergency Stop Function**, make operation even safer. This is a completely unique feature and particularly invaluable for electric vehicles (EVs), in emergency allowing traction battery (ESS) to be safely disconnected while the electric motor is running. They are produced in a number of different configurations and with various options, including air and/or fluid cooling. All types in the category feature galvanic separation. Hardware and software customization is possible based on customer specifications and requirements, which makes these controllers even more efficient for wide range of uses. Applications range from the largest **EVs** such as **eVTOLs, UAVs, electric aircraft**, military and marine vehicles, motorbikes, etc. to various other applications requiring high performance with minimal dimensions and weight along with high reliability and quality with exceptional drive unit management.

## YOUR TRUSTED PARTNER ACROSS

AEROSPACE, AUTOMOTIVE, MARINE AND MILITARY



AIRBUS

SIEMENS



HYUNDAI

Kawasaki


SUBARU

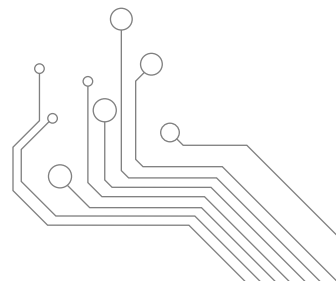
HONDA  
The Power of Dreams

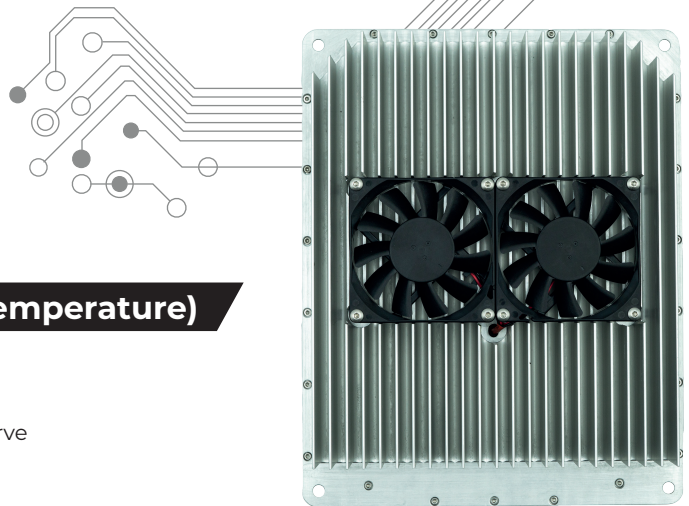




## Outstanding Technical Features:

- Working range controllers **High Voltage:** 120 ÷ 400V / 800V, up to ≈400A continuous  
Power up to **≈320 kW**  
Power up to **≈400 kW** short time
- Unique Power Density Ratio** – Weight, Size to Performance. Compact small dimensions, high power, low weight and wide range of variants
- Specially designed to operate** also with **Multi-Core** and **Multi-Winding** electric motors, i.e. the **most advanced and redundant/safety EPS architecture** based on using **2 or even 4 ESCs / Inverters**
- Controlled by powerful **32-bit processors ARM Cortex**
- Multiprocessor system, most advanced 4 processors layout**
- Connectivity** covering full specter of industrial requirements
- Very clear and easy Parameters** settings by PC with operating system Windows or/and MAC
- Firmware update via internet
- Data transfer to PC (or other equipment) and **displaying in real-time** (Monitoring mode)
- Internal Data Logging** (record of all parameters in various resolutions, i.e. voltages, RPMs, currents, temperatures, warnings, errors, etc., record length up to **12.5 hours**)
- Very **clear indication of controller** states and error codes using **5 LEDs**  and/or via all communication BUSES, display units, avionics, etc.
- Very high controller's efficiency **98 ÷ 99%**
- Motor PWM in range **8 ÷ 14 kHz, (up to 35kHz for HBCi 100400 type)**
- Suitable for **inrunner** as well as **outrunner** BLDC / PMSM motors
- Very high rpm limit **200.000 rpm** for 2 poles motor (standard version)
- Suitable for electric motors regardless number of poles
- Sensor motors as well as sensorless** motors are supported
- Automatic settings and optimization of motor sensors position
- Support of regenerative braking and battery charging under braking
- Support various working modes  
**(Direct PWM, Constant RPM, Battery discharge compensation) & mode car, boat, airplane, ...)**
- Very smooth **throttle step - 2048 values**
- Possibility to connect auxiliary outputs/inputs, various indicators, displays units, **programmable functions for I/O ports**
- Main Switch** or **START-STOP** button for activation / deactivation the controller
- Zero power consumption in sleep** (switch-off) mode
- Electronic revolution reversing
- Monitoring of all phases as well as DC bus
- Configurable current limiting
- HW support of the voltage, current, and temperature fuses
- Sophisticated and advanced protection mechanisms and procedures
- Brake configurable in main control channel or secondary (auxiliary) control channel
- Controlling by PWM, voltage, potentiometer, data (CAN, RS-485, RS-232 TTL), logic signal**
- General **communications via CAN, RS-485, RS-232 TTL**
- Support of BMS** (Battery Management System **MGM COMPRO** for Lithium batteries) connection (via the CAN bus)
- Protection and unique management of Lithium batteries** (when the BMS is not connected to the system)
- Support all battery types** (NiCd, NiMH, Al23, Lipol, Li-Ion, LiFePo4, Pb, ...) or power supply,
- Conversion (recalculation) to internal battery voltage (independence of the processes on internal resistance and currents of the battery, etc.)
- Support of **Safety Disconnection** from the traction battery during motor run (**Emergency STOP**)
- Automatic Turn-ON / Turn-OFF sequence for traction voltage connecting (controlling of antispark relay and main contactor - if this is not provided by the BMS or the master system)
- Support of external display units (display current, RPMs, voltages, temperature, energy (fuel meter), ...)
- Monitoring of controller temperature, motor temperature, ...
- Monitoring of internal voltages and temperatures
- Electronics feeding by external source 12V [11 ÷ 25V]
- Dropout of control signal protection (cut-off potentiometer, etc.)
- Compact dimensions
- Cooling variants: airflow / fans / liquid cooling
- Support of customer modification of FW and HW
- Support of customer configuration of HW





## Technical data (valid for 25°C environment temperature)

**Temperature of the environment:** -25°C to +60°C, see derating curve  
**Humidity:** 0 ÷ 90% RH, non-condensing  
**Number of regulation steps:** 2048 / full throttle range  
**Max. rpm for 2 poles motors:** 200 000 rpm  
**Motor PWM:** 8 up to 14 kHz

**Control signal:** PWM / voltages / potentiometers / logic signal / data transfer (CAN, RS485, etc.), see "HBCi Global manual" for details

**Traction Feeding:** Li-Ion, Li-Po, LiFePo4, Al23, NiMH, NiCd, acid (Pb) or any others cells, power supplies

### 400V types

### 800V types

#### HBCi-series (IGBT)

	400400	400800
Control electronics feeding (12V):	ext. 11 ÷ 25V	ext. 11 ÷ 25V
Control electronics power consumption (air/water cooling):	< 25 / 15W	< 25 / 15W
Maximal longtime power (air cooler K250 / KEA300 *):	100 / 80 kW	200 / 160 kW
Maximal longtime power (water cooling *):	160 kW	320 kW
Short time power:	200 kW	400 kW
Traction feeding voltage range:	120 ÷ 400 V	120 ÷ 800 V
No. of feeding cells Li-Ion / Li-Po:	28 ÷ 96	28 ÷ 192
Nominal Battery Current, air cooling K250 *):	250 A	250 A
Nominal Battery Current, air cooling KEA300 *):	210 A	210 A
Nominal Battery Current, fluid cooling *):	400 A	400 A
Input filtering capacitors CF:	3.9 mF	0.975 mF
Basic dimensions (on the next pages) [mm]:	see pictures bellow	see pictures bellow
Cooling plate version weight (with box) [kg] x):	4.0	4.0
Fluid cooler version weight (with box) [kg]:	4.8	4.8
Air cooler version (K250 / KEA300) weight (with box) [kg]:	5.8 / 4.6 ***)	5.8 / 4.6 ***)
Recommended power cables cross section:	(≥ 35 ÷ 70) mm <sup>2</sup> **)	(≥ 35 ÷ 70) mm <sup>2</sup> **)
Tightening torque of M8 screws (for Cu power cable lugs):	7 ÷ 8 Nm	7 ÷ 8 Nm

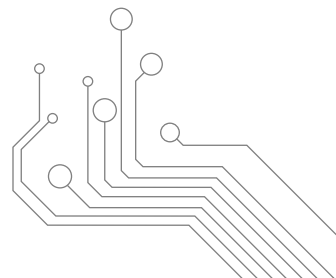
x) in this case max. power (currents, etc.) depends on customer's cooling system

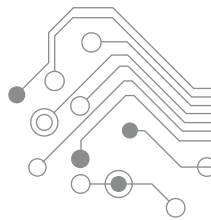
\*) for 100% motor PWM, 8 kHz motor PWM, ≤ 70.000 rpm (for 2 poles motor), 25°C environment temperature.  
Max. Phase currents ≤ Battery current × 1.3 (for higher PWM frequency see bellow „PWM frequency Derating curve“)

\*\*) or more, depend on real average or long-time currents.

For example, use 2×95mm<sup>2</sup> (battery cables), 3×70mm<sup>2</sup> (phase cables). In case 400A long time battery current, you can also use, for example, double cables: 2×70mm<sup>2</sup> for plus cable, 2×70mm<sup>2</sup> for minus cable, similarly for phases 3×(2×50mm<sup>2</sup>), etc.

\*\*\*) it is also possible to use customer's custom designed air coolers (=change in dimensions, weight and max. output power / current), see to open version on page 7 for example.





## Technical data (valid for 25°C environment temperature)

<b>Temperature of the environment:</b>	-25°C to +60°C, see derating curve
<b>Humidity:</b>	0 ÷ 90% RH, non-condensing
<b>Number of regulation steps:</b>	2048 / full throttle range
<b>Max. rpm for 2 poles motors:</b>	200 000 rpm
<b>Motor PWM:</b>	8 up to 35 kHz
<b>Control signal:</b>	PWM / voltages / potentiometers / logic signal / data transfer (CAN, RS485, etc.), see "HBCi Global manual" for details
<b>Traction Feeding:</b>	Li-Ion, Li-PoL, LiFePo4, Al23, NiMH, NiCd, acid (Pb) or any others cells, power supplies

### HBCi-series (IGBT)

**100400**

Control electronics feeding (12V):	ext. 11 ÷ 25V
Control electronics power consumption (air/water cooling):	≈ 15 / 10W
Maximal longtime power (air cooler *):	40 kW
Maximal longtime power (water cooling *):	60 kW
Short time power:	TBD kW
Traction feeding voltage range:	120 ÷ 400 V
No. of feeding cells Li-Ion / Li-Po:	28 ÷ 96
Nominal Battery Current, air cooling *):	100 A
Nominal Battery Current, fluid cooling *):	150 A
Input filtering capacitors CF:	TBD
Basic dimensions (on the next pages) [mm]:	see pictures below
Cooling plate version weight (with box) [kg] x):	TBD
Fluid cooler version weight (with box) [kg]:	TBD
Air cooler version (K250 / KEA300) weight (with box) [kg]:	TBD ***)
Recommended power cables cross section:	(≥ 35) mm <sup>2</sup> **)
Tightening torque of M8 screws (for Cu power cable lugs):	7 ÷ 8 Nm

x) in this case max. power (currents, etc.) depends on customer's cooling system

\*) for 100% motor PWM, 8 kHz motor PWM, ≤ 70.000 rpm (for 2 poles motor), 25°C environment temperature.  
Max. Phase currents ≤ Battery current × 1.3 (for higher PWM frequency see below „PWM frequency Derating curve“)

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