



borghi & saveri S.r.l.

Universal brake control Module (BCU Brake control Unit)





1. Description

The BCU (Brake Control Unit) is a comprehensive controller capable of controlling all types of Borghi & Saveri dynos:

- eddy current
- hydraulics
- dynamic (permanent magnet motor and asynchronous AC)
- tandem of two units

Different types of dynamometers can be managed, thanks to the capability of controlling the actuators used in the specific architecture, through parameterized control algorithms. Control parameters can be calibrated in order to meet the desired brake response.

All parameters relating to the control and safe management of the braking unit, are easily accessible (with different levels of access) via a user interface on a web browser (user interface - UI).

The BCU can be managed via the physical interface on the front panel or via an external device using analogue or several types of bus communication.

The BCU offers the possibility of acquiring up to 2 load cell sensors (both 4 and 6 wires). The signals acquisition relies on isolated integrated electronic components, to obtain excellent repeatability and immunity to disturbances. The torque signal calibration is exclusively managed via software and the user is guided through the procedure by a specific calibration tool (available on the web interface).

The BCU is set up for track laps simulation. The compatibility with the installed bench management system needs to be verified.

2. Connectivity

The BCU sends information regarding the dynamometer operating conditions through field buses commonly used in the industrial sector (CAN, RS485 serial, ethernet). Therefore, any test bench automation system can record the BCU data. Another way to record data is to store them in the BCU internal memory and periodically download the data.

The connection to the BCU can be established also using an internet browser simply by loading the HTML contents as a common web page, using wi-fi or ethernet connections. All these features make the BCU a suitable tool to be included in the company digital information management system.



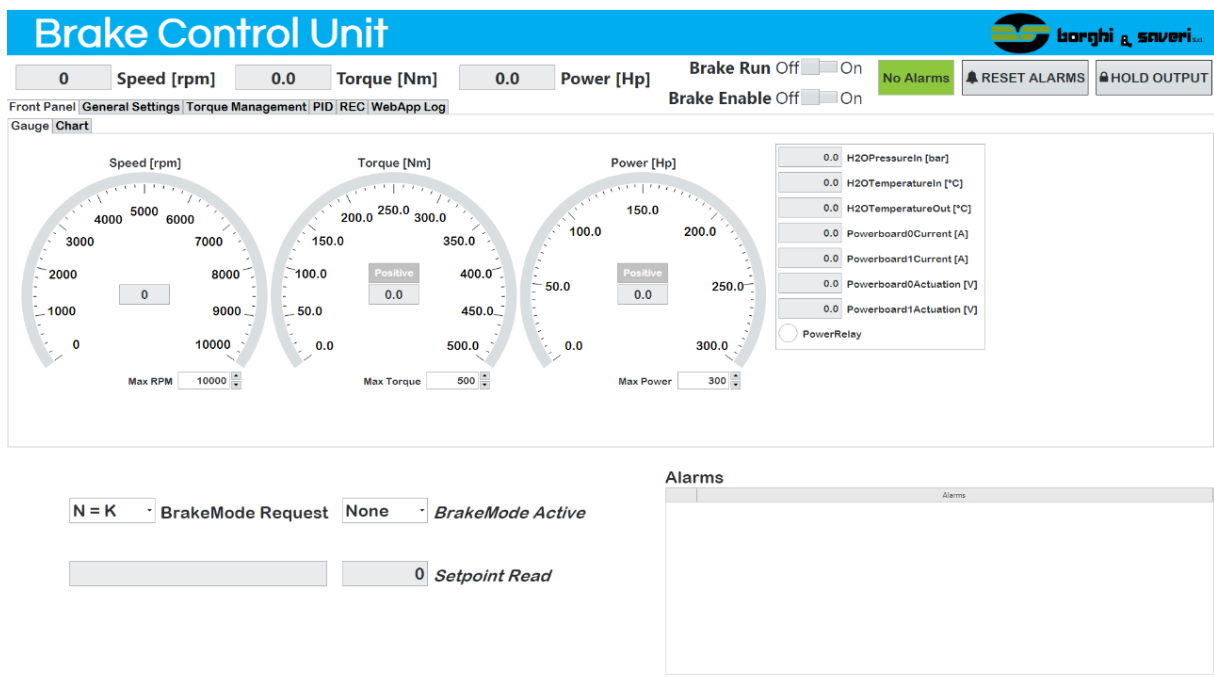
3. User interface – UI

The BCU has an advanced and user-friendly management interface designed to be used directly on the web browser. To access the UI it is necessary to connect the BCU to a PC or a mobile device (not included in the supply) via ethernet cable or wi-fi, connecting to the URL of the controller.

Through this interface it is possible to:

- monitor the main parameters, i.e., speed, torque and power
- monitor the brake conditions (temperatures, pressures, vibrations, etc.)
- define the brake operating mode
- calibrate the brake management parameters
- define the load cells calibration

The configurations can be saved into the controller's internal memory for a later recall.



4. Technical data

- Supply voltage: 230Vac +10-15%, 50/60Hz
- Maximum current absorption: 12 A
- Maximum power absorption: 2,5 KW
- Internal memory capacity: 512 MB onboard +32GB Flash



- Simultaneous acquiring of 2 cells with 4 or 6 wiring (24bit up to 24kHz)
- Supported connection and analog I/O:
 - 3 x CAN
 - 1 x RS 485
 - 12x AI (up to 400 k/S sec, range -10V +10V, simultaneous sampling)
 - 6 x Digital Output
 - 2 x Digital Input
 - 2 x Encoder
 - 2 x Buttons
 - 1 x Ethernet
 - 1 x Wi-fi
 - 1 x USB

4.1. System accuracy

- Angular speed: ± 1 rpm.
- Complete system torque indication with the entire chain of our production: $\pm 0.2\%$ of the brake torque full scale.
- Complete system regulation of the whole production chain:
 - $n = K \pm 3$ rpm across the entire range of use.
 - $M = K$ torque $\pm 0.5\%$ of the brake torque full scale.

4.2. Weight and dimensions

- Width: 483 mm (standard rack width 19")
- Height: 133 mm (3 rack units)
- Length: 490 mm (rear counterpart connectors installed included)
- Net weight: 6.5 kg

4.3. Ambient condition

- Temperature range: 0 - 40°C
- Humidity range: 90%

5. Control mode

- Constant speed control ("n = K" mode) within ± 3 rpm over the entire range of use for eddy current and dynamic dynamometers; $\pm 50-60$ rpm/min throughout the range of use for hydraulic dynamometers.
- Constant torque control ("M = K" mode) within $\pm 0.5\%$ of the full torque for eddy current and dynamic dynamometers; $\pm 1\%$ of the brake full torque for hydraulic dynamometers.



6. Alarm and protection

The BCU monitors the sensors installed on the dynamometric brake to establish its status and ensure its correct operation. In the event that an anomaly is detected, the BCU reacts interrupting the operation of the braking unit, bringing it to a safe condition. The anomaly is reported to the user both by turning on the "ALARM" LED on the BCU front panel, and on the UI interface, where the cause of the alarm is indicated.

The BCU can communicate the state of emergency to any external devices connected via bus or analogue output, so that the alarm occurring to the brake can be managed to stop the operation of the device under test. To restore the normal operation of the braking unit, once the cause of the alarm has been resolved, a reset must be sent to the BCU (via the "RESET button on the front panel" or, remotely, via web interface or bus communication/ analogue input, using the connections on the back panel).

The type of anomaly detected is communicated through the following alarms:

	Eddy current	Hydraulic brake	Dynamic brake
Insufficient brake water pressure	Alarm set by a differential pressure switch sensor	Alarm set by a differential pressure switch sensor	\
Water overtemperature	brake supply water overtemperature (sensor installed on output pipe)	brake supply water overtemperature (sensor installed on output pipe)	Electric motor overtemperature
Internal	Alarm for the following events: <ul style="list-style-type: none"> • short circuit on the brake coils • lack of power supply to the components inside the BCU • internal power chopper malfunction 	Anomaly is detected by the drives that manage the feed pump drivers or the exhaust valve drivers	Anomaly is detected by the electric machine driver
Overspeed	Alarm for the following events: <ul style="list-style-type: none"> • exceeding the maximum engine speed parameter set • interruption or disconnection of the speed sensor • simultaneous request for two different operating modes 		
Vibration	Alarm in case of the accelerometers installed on the brake detect a vibration higher than the maximum vibration parameter set via the web interface		



7. BCU rear connectors

Description	Quantity
10A coils	2
CAN lines	3
RS232	1
RS485	1
USB	3
Ethernet	1
WiFi	1
Alarm relay for protection	Overspeed Overtemperature Overpressure
VRS input	2
Accelerometer inputs	2
Torque inputs	2 non pre-amplified load cells 1 frequency 2 analog
Temperature inputs	6
Pressure inputs	6
Clean contact outputs	6





8. General safety rules

During the installation, an isolation transformer and the safety devices required by current regulations must be mounted upstream of our electronic equipment. The accident prevention regulations require, for the equipment, a connection to a ground socket. Borghi & Saveri srl declines all responsibility if these rules are not respected.

Warning: if electrical connections do not comply with the original diagrams, or the connections are modified for some reason, Borghi & Saveri S.r.l. declines all responsibility for damages and the guarantee is considered cancelled.



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