Hauptmerkmale:

- Überwachung aller Arten von Ladegeräten

- Versorgungsspannung von 15V bis 135V

- Einfache und schnelle Installation (Stiftstecker)

- Verschlüsselte drahtlose Kommunikation

- Integrierte RGB-Lichtanzeige

- Schutzklasse IP67

Verwendungszweck:

- Überwachung von Batterieladegeräten für Traktionsbatterien

- Zusammenarbeit mit dem Warteschlangensystem BQS EMACH

Beschreibung: Der Controller CHG-4501 dient zur Überwachung des Betriebs von Ladegeräten für Blei-Säure-, Gel- und AGM-Batterien. Der weite Spannungsbereich der Stromversorgung von 15V bis 135V ermöglicht den Einsatz des CHG-4501 zur Überwachung von Ladegeräten von 24V bis 96V. Die drahtlose Datenübertragung eliminiert die Notwendigkeit zusätzlicher Verkabelung, was die Zuverlässigkeit der Batterieladungsüberwachung erhöht. Das miniaturisierte, dicht verschlossene Gehäuse in Verbindung mit Stiftsteckern ermöglicht eine schnelle Installation des Controllers direkt an den Drähten des Ladegeräts.

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3.   Control cabinet parameters.

3.1   Electrical parameters of the control cabinet.

Symbol	Parameter	Min.	Max.	Unit
V_sup	Supply voltage	205	265	V AC
I_sup	Power consumption	-	2	A
Range	Radio communication range between the control cabinet and the rectifier controller (built-in antenna)	30	120	m

3.2   Operating conditions.

Symbol	Parameter	Min.	Max.	Unit
T_nom	Ambient temperature	-20	45	°C

3.3   Mechanical parameters.

Dimensions of the control cabinet	300mm x 300mm x 100mm
Weight	2 kg
Material	---
Length of connection wires	5m

4.   Parameters of the CHG-4505 rectifier controller

4.1   Electrical parameters.

Symbol	Parameter	Min.	Max.	Unit
V_sup	Supply voltage	15	135	V DC
I_sup	Power consumption	-	10	mA
L_red	The intensity of the red LEDs	1500	4000	mcd
L_green	The intensity of the green LEDs	2000	4500	mcd
V_meas	Range of supply voltage measurement	0	127	V
V_acc	Accuracy of supply voltage measurement	-	0.2	V
V_res	Supply voltage measurement resolution	-	0.01	V

4.2   Mechanical parameters.

Dimensions (without connection wires)	20mm x 124mm (diameter x length)
Weight	30 g
Material	PVC
Length of connection wires	16 cm
Insulation material for connection wires	PVC
Termination of connection wires	Needle connector

4.3   Dimensions of the CHG4505 charger controller .
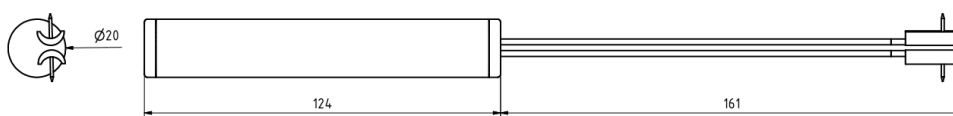
5. Description of the BQS EMACH system.

5.1 System elements.

The BQS system includes the following elements:

- CHBASE-16 control cabinet with software, MDM01 active megaphone and two integrated receiving antennas
- Up to 256 CHG4505 rectifier controllers or equivalents
- Optional additional receiving antennas
- Optional RFID card reader to control access to the charging bay
- Optional IP camera for visual recording of incorrect downloads and other events
- HDMI display (purchase and installation on the customer part)

CHG4505 rectifier controllers communicate wirelessly with the control cabinet. Thanks to this solution, the BQS system is characterized by:

- o Simple and quick installation
- o High operational reliability thanks to eliminating   connection wires
- o Galvanic isolation between all rectifiers and the control cabinet eliminating the risk of electrical damage

5.2 Operation of the battery queuing function.

The intelligent battery queuing system helps to ensure even use of fleet batteries. A very common situation is that forklift operators use rectifiers and batteries located closest to the entrance to the charging bay, which means that batteries located further away are used less frequently. On the other hand, in large warehouses where many forklift operators work, it is difficult to ensure continuous transmission of information about which batteries were connected to the rectifiers and in what order.

The BQS control panel uses rectifier controllers to collect information about the progress of the battery charging process and selects the battery in the group that has completed charging and is cooling down the longest. The ID number of the rectifier from which the battery can be collected is displayed on the HDMI screen mounted in a selected visible place in the charging bay, and additionally, the controller connected to the rectifier has a green LED on.
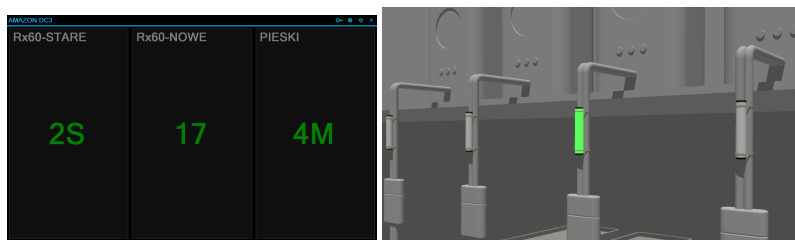
When a wrong battery is collected this fact is signaled by the control panel with a loud audible message, a visual message on the HDMI screen and a pulsating red LED of the rectifier controller from which the battery was disconnected. The operator can then reconnect the battery and collect the correct one. However, if it is not done within 10[s], such collection is treated as incorrect. The control panel records information about such an event in a log and, if it is configured to work online, it can send an e-mail notification to the indicated address.

5.3 Monitoring of anomalies in the operation of the charging bay.

The system monitors the operation of the charging bay on a continuous basis and is able to detect the following anomalies in its operation:

Incident	Description
Disconnecting of a battery that was not indicated by the system	The system ensures that the battery that cools down the longest is disconnected. Using a heated battery accelerates electrochemical reactions in its cells and shortens its life.
The battery is not connected to the rectifier in the group	In the charging bay, all rectifiers should be used to charge batteries. Otherwise, there may be a situation where there are no charged batteries in the group.
No batteries available in the group	This situation may result from very intensive use of batteries in the group or from not using all rectifiers in the group. In such a situation, the operator has two options: wait for a battery to charge or collect a random battery that is charging and proceed with working
Battery charging time too long	After 16 hours from connecting the battery, the system did not detect the completion of charging. This situation may be caused by damage to the rectifier or incorrect operation of the rectifier (charging mode for deeply discharged batteries). Exceeding the battery charging time may result in water loss, excessive hydrogen accumulation and, consequently, ignition.
No battery charging	After 5 hours after connecting the battery to the charger, the system did not detect that charging is on It may be caused by a damaged rectifier or activation of the current protection before the rectifier.

5.4 System decentralization.

The BQS system has a control cabinet that acts as a concentrator of messages from controllers, but the system as a whole is based on distributed information storage. After a main power failure, the CHG-4505 battery controllers still remember the state of the battery charging process, charging and cooling time, and which controller was selected for operation. Once the power is on, the CHBASE-16 control cabinet inquires the battery controllers about their status. Thus, the startup time from the moment of turning on the power should not be longer than 2 minutes.

5.5 Possible expansion of the system after installation.

Architecture based on wireless communication makes it possible to expand and rebuild the system at low costs. Adding additional rectifier controllers to a group comes down to:

- Physically mounting the new controller on the rectifier cable

- Logging the controller into the group in the control cabinet settings

The lack of cabling connecting rectifier controllers to the control cabinet also allows for the efficient relocation of the queuing system to a new location if necessary.

5.6 Additional software modules.

The basic version of the software can be extended with additional software modules. They increase the functionality of the battery queuing system.

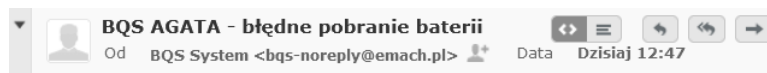| EVENT module	Sending immediate e-mails when anomalies are detected in the operation of the charging bay
EVENT-CAM module	Sending immediate e-mails when anomalies are detected in the operation of the charging bay, a photo of the charging bay is added as an attachment
REPORT module	Sending periodic summary reports on the operation of the charging bay . The reports include a list of anomalies for each group and statistical data for each group and the entire charging bay

SmartCARD module	Possibility to download the battery after positive identification of the operator using an RFID card

5.6.1 EVENT module - immediate event notification

The basic version of the BQS system can be extended by the EVENT module. In this variant, the system sends immediate email notifications after detecting any anomaly in the operation of the monitored charging bay. Messages are sent to e-mail addresses provided during system configuration.

Sample event notification emails look as follows:

The e-mail contains all the information necessary to diagnose the fault, such as:

- Date of the event

- Name of the battery room

- Battery group

- Rectifier name

- Voltage recorded when the battery was connected

- Voltage at the rectifier terminals when the event was recorded

- Charging time / time from connecting the battery to the rectifier

- Battery cooling time

- Number of the rectifier from which the battery had to be taken, if any was available, or information that there were no batteries to be taken (no charged batteries)

In the control cabinet settings, you can provide up to 5 e-mail addresses along with information on what types of events should be reported to a specific e-mail address.

5.6.2 EVENT-CAM module - notification of events with photographic documentation

The EVENT-CAM module is an alternative to the EVENT module. It allows to send immediate e-mails when any anomalies are detected. A photo of the charging bay will be added as an attachment to the email. This allows for quicker identification of the operator who incorrectly collected the battery or did not connect the discharged battery to the rectifier.
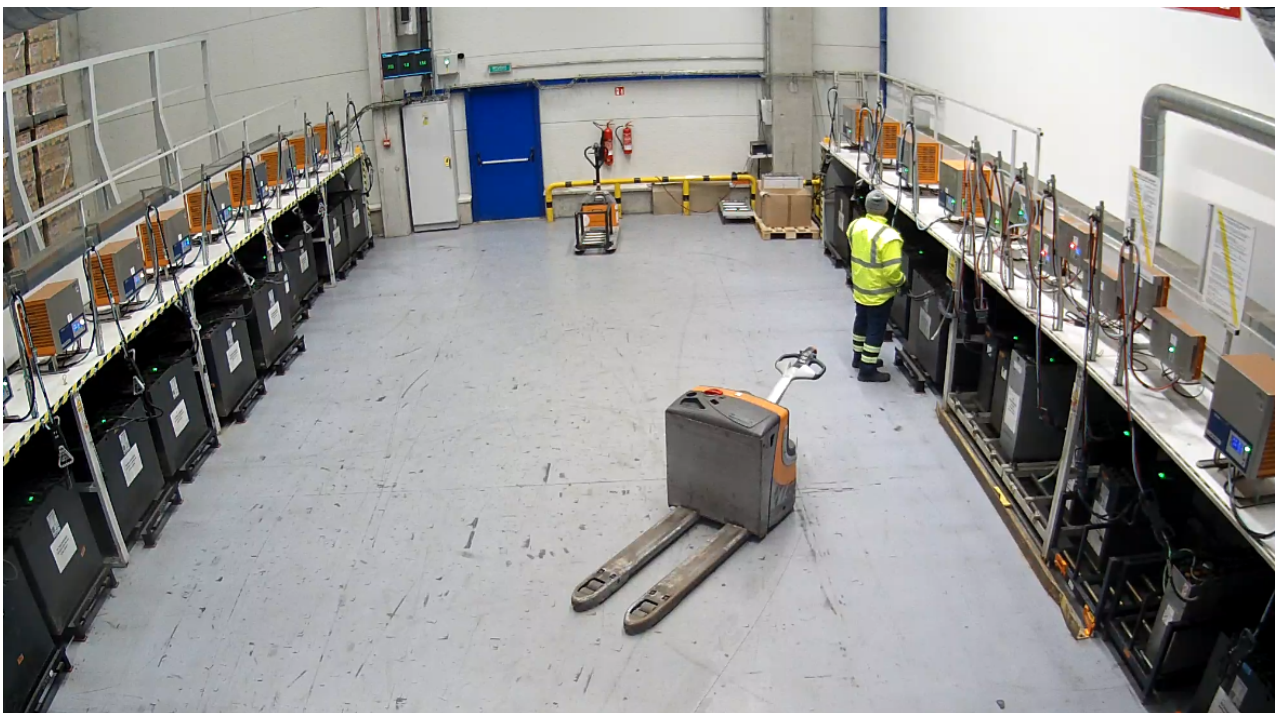
Photos are taken automatically using an IP camera connected to the control cabinet of the queuing system.

Depending on the customer's needs, one or several photos taken after disconnecting the battery at regular intervals may be added to the e-mail.

The photographic documentation is saved in the control cabinet memory for 1 month. After this period, the photos are deleted. Access to previously taken photos is possible from the e-mail box to which reports are sent.

5.6.3 REPORT module - reports on system operation.

The reporting version of the BQS system allows to generate reports on the   operation of the battery room.

Default reports are generated daily and weekly. The battery room supervisor can also manually generate a report for any period. This can be done locally or remotely. Local report generation is done as follows:

- Approach the control cabinet

- From the keyboard, select reports in the menu

- Select a date range

- Provide the e-mail address where the report will be sent to

Remote report generation is possible via the EMACH SMART BATTERY Android application.

The report contains a list of anomalies recorded in each group, including the date, time and the ID number of the rectifier from which the battery was disconnected.

By comparing weekly or monthly reports, you can determine trends in battery room operation, for example whether the number of registered rectifier failures or the number of incorrect downloads is increasing.

A sample daily report sent by e-mail looks as follows:

Reports are sent by e-mail to the addresses provided during system configuration. You can define an interval for sending reports to each e-mail address

5.6.4 SmartCard module

The SmartCard software option allows to verify the identity of operators who collect batteries or perform service activities in the battery room.

The following are used to verify operators:

- RFID or NFC card reader connected to the control cabinet
- Staff cards that operators already have

After entering the battery room, the employee cannot see on the screen which battery should be collected. To activate the BQS system, an employee must present their staff card to the reader. After reading the card, the system activates the screen and traffic lights on the rectifier controllers. Once the batteries have been downloaded, the BQS system deactivates again.

Each battery collection is recorded in the system along with the charger number, employee number, date and information whether the collection was correct or not.

Incorrect collections are reported via the EVENT or EVENT-CAM module with the staff card number attached, or in the case of battery collection without presenting the card with the appropriate information. If the operator does not place the card against the reader, the operator draws the battery completely "at random". Photos taken using an IP camera will help identify such an employee.

5.7 Mobile software for Android.

The operation of the battery queuing system can be monitored remotely using the ENACH SMART BATTERY mobile application for Android.
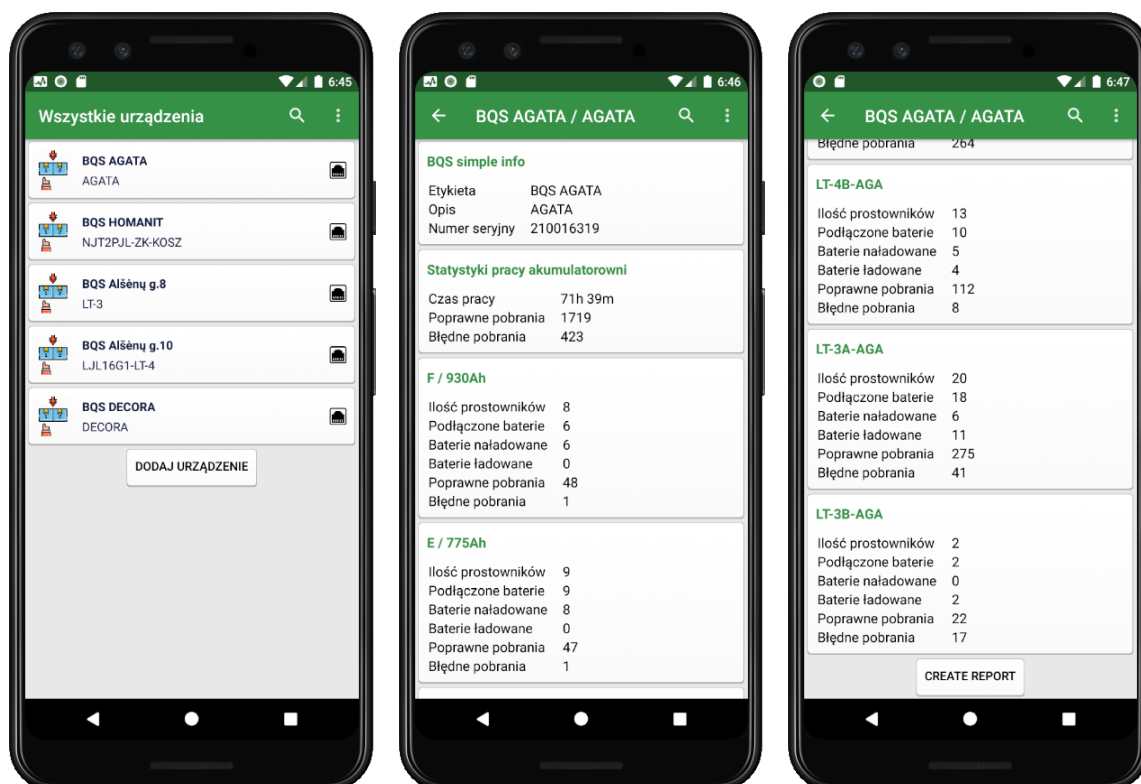
The application allows you to view and control many battery rooms at once. After clicking on the list of battery rooms, the user goes to a detailed view. You can check the total number of correct and incorrect collections in the entire battery room as well as current information about individual groups of rectifiers. It is also possible to generate a report for any period of operation of the battery room.

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