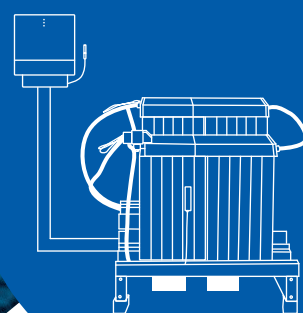


CleverWatch™

Advanced remote
monitoring solution
for Ni-Cd batteries



Reliability inside

ALCAD

CleverWatch™ main advantages

Main benefits of CleverWatch™ monitoring solution

Remote monitoring of your battery fleet



Reduce OPEX
(less site visits)

State Of Health (SOH) monitoring



Optimize CAPEX
(Replace batteries when really needed)

State Of Charge (SOC) monitoring



View battery availability

Current, Voltage, Temperature logging



Use battery history for diagnostic

Alarm notification



Peace of mind

Asset management

Intelligent maintenance

A powerful monitoring solution

- Manages unlimited number of sites and batteries
- Ideal for scattered and isolated sites
- Can be connected to batteries from 12 to 600 V

CleverWatch™ system overview

Measure
battery
data

Standard:

Voltage, current, temperature

Options:

- Individual cell voltage
- Hydrogen concentration
- Electrolyte low level

Store
&
compute
data

Data history management

Calculation of:

- State Of Charge (SOC)
- State Of Health (SOH)

Display
results

Display results on all devices

- Laptop
- Smartphone
- Tablet



→
**Data
communication**



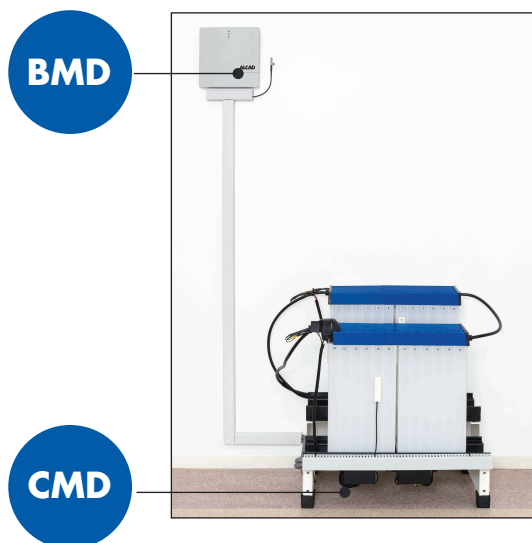
→
Visualisation



CleverWatch™ system & components

Battery Monitoring Device

Measures all the battery parameters



Current Sensor

Measures the current of the battery

Voltage sensor (battery & individual cells)

Measures the voltage of the cell and the battery

Battery Temperature Sensor

Measures the temperature of the battery

Ambient Temperature Sensor

Measures the ambient temperature in the battery room

Electrolyte low Level Sensor

Gives an alarm if the electrolyte level is too low

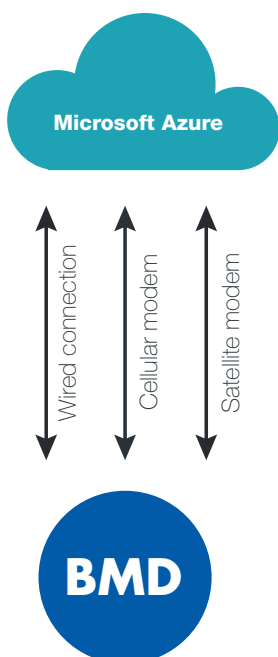
Hydrogen content sensor

Measures the hydrogen gas concentration in the battery room

Cell Monitoring Device

Measures the voltage of the individual cells

A secure Cloud Solution



Communication options:

- LAN connection (Ethernet)
- 2G/3G modem
- Satellite modem

Highest data management standards:

Security:

- Data encryption between the BMD and the Cloud (TLS protocol)
- Cyber security audit performed (ISO 27005)
- Recurring penetration tests by external testing company

Data privacy:

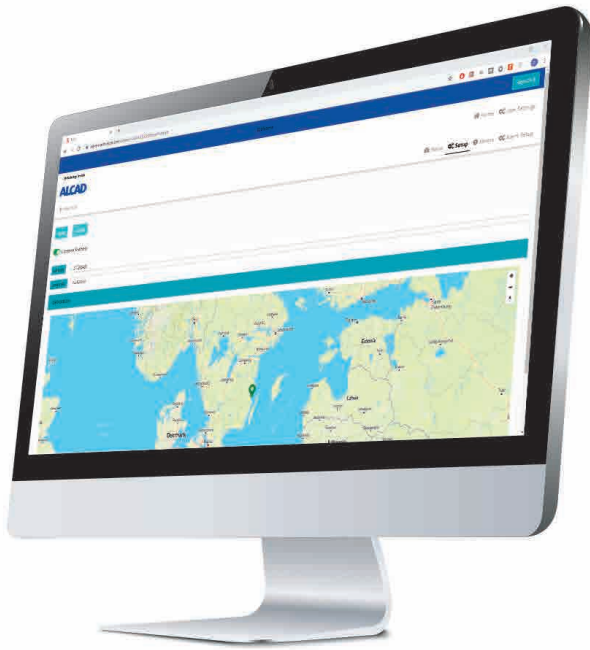
- Customer can only access their own data

Cloud solution:

- Microsoft Azure, used by major industrial high-tech companies such as Total

Nickel technology batteries are reliable by design but if remote monitoring is needed CleverWatch™ solution offers high-performance remote access to your fleet of batteries.

You can easily access to CleverWatch™ user interface from any device: your desktop, laptop, tablet or smart phone.



2 user interface options:

- **Web App**

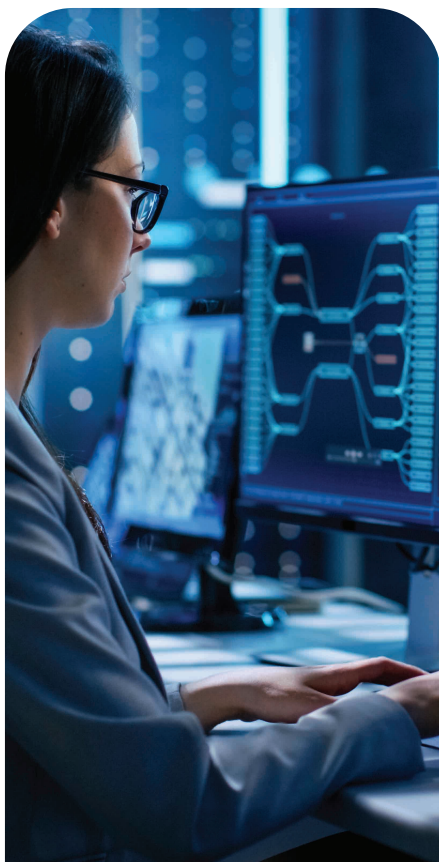
This application is used remotely from any location by customers and Alcad experts. It visualizes battery parameters trending and historical data.

- **Local App**

This App is used by on-site technicians to easy access the status of individual batteries.

CleverWatch™ key differentiators

norwatt@norwatt.es



Unique support from Alcad experts:

- Technical advice
- Application guidance
- Remote diagnosis
- Trouble shooting assistance

Real time battery data trending:

- Voltage
- Temperature
- Current

www.norwatt.es

“
A tailor-made
solution
developed by
Alcad battery
experts

”

Designed by Alcad, one of the world leading battery manufacturer with 100 years of experience in cutting-edge nickel technology.

“
A unique
battery
condition
calculation

”

Alcad's CleverWatch™ advanced State of Charge (SOC) & State of Health (SOH) proprietary algorithms have been designed by Alcad battery researchers and are the legacy from 100 years of technology experience from the field.

CleverWatch™ technical data

Battery information:

Battery voltage
Battery current
Battery temperature
Ambient temperature
State Of Charge (SOC)
State Of Health (SOH)
Electrolyte low level (option)
Individual cell voltage (option)
Hydrogen concentration (option)

Nominal battery voltage:

12 V to 600 V

Max charge/discharge current:

3000 A

Max no of temperature sensors:

25

Max no of electrolyte sensors:

24

Max no of cells per system:

500

Communication interfaces:

Ethernet port
2G/3G modem
Satellite modem (optional)

Battery Monitoring Device

Power source:

Powered by the monitored battery

3 voltage variants:

9 to 90 V (Low voltage version)
55 to 265 V (Medium voltage version)
160 to 750 V (High voltage version)

Cloud platform:

Microsoft Azure



A responsible corporate citizen

Alcad is committed to protecting and preserving the environment. We are engaged in a sustained effort to use resources responsibly and to act in a way that clearly demonstrates our great respect for the planet.

Alcad LTD has set up a network of Bring Back Points (BBPS) which receive end-of-life nickel based batteries from end users free of charge. These batteries are then shipped by these BBPs to our recycling facility in Sweden or to fully permitted recycling companies, in compliance with the laws governing trans-boundary waste shipments.

The recycling efficiency of these recyclers exceeds 75% of the nickel based battery weight (a level which exceeds the mandated recycling efficiency of 65% applicable to lead-acid batteries), and recycled materials are reused as secondary raw material for industry.

This network of Bring Back Points comprises over 30 entities, and provides services in all of our major markets in Europe, North America, Asia and Africa. The list of BBPs and their contact details are available on the Alcad website.

THE ALCAD PLANT IN OSKARSHAMN, SWEDEN HAS ITS OWN IN-HOUSE RECYCLING FACILITY

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Reliability inside

ALCAD

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