

USER MANUAL

Vanadium redox flow battery

CELLCUBE®

FB 10-40/70/100/130 FB 20-40/70/100/130 FB 30-40/70/100/130



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1. General information

1.1. Scope of validity

This operating manual is intended for owners/users of the CELLCUBE® FB 10/20/30. It explains the primary functions and the correct use of the system in daily operation.

Please note that installation, commission, maintenance, and repairs of the CELLCUBE® are to be carried out by GILDEMEISTER energy storage GmbH or its authorized partners. Instructions for installation and service are not included in this operating manual.

1.2. Area of application

The CELLCUBE® FB 10/20/30 system is exclusively intended for storing electrical energy. Other uses which are not intended by the manufacturer are not permitted. Only operate this product within the specified limits. The FB 10/20/30 energy storage system complies with the requirements of the EU guidelines. Its conformity is confirmed by the CE mark.

The FB 10/20/30 is an energy storage system for stationary applications. The proper commissioning can be carried out only by GILDEMEISTER energy storage GmbH or qualified partner companies.

Please use only products which are approved by GILDEMEISTER energy storage GmbH.

1.3. References

This operating manual references other chapters of the operating manual in several places. The operating manual forms part of the documentation provided together with the battery.

The following expressions are used for this:

See chapter x (referring to chapter x of the operating manual)

The system documentation is provided in the external switch cabinet.

1.4. Symbols

Important information in this operating manual is specifically emphasized using the following symbols:



Important warning note: Non-compliance can lead to injuries, risk of death, and damage to the system.



This symbol marks a note. Non-compliance might make using the system more difficult or affect the proper use of the system.

1.5. Terms

Several technical terms and abbreviations are used in this operating manual. Refer to the following table for an explanation:

Technical term / abbreviation	Explanation
Electrolyte	A liquid containing ions for the purpose of energy storage
ENS	Device for monitoring the electrical grid with assigned switching devices
Flow Battery Controller (FBC)	Control unit of the battery
IBC	Intermediate Bulk Container (IBC), used for the transport of the electrolyte
Service flap	Flap on the side of the housing
GESt	GILDEMEISTER energy storage GmbH

2. Description of the vanadium redox flow battery

2.1. View



Figure 1: View of the FB 10/20/30

- 1 Weather-proof insulating housing
- 2 External switch cabinet
- 3 Ventilation openings

2.2. Characteristics



Figure 2: Structure and function of the vanadium redox flow battery

The Vanadium Redox Flow Battery is an electrochemical storage device which utilizes liquids (called electrolyte) for storing energy. It consists of a number of electrochemical cells, which are connected in series to form a stack. This is typically done to build a practical working voltage for the battery and its associated power electronics.

Energy is stored via a reversible chemical reaction in the electrochemical cells. During charging these reactions change the ionic state of electrolyte, leaving a portion of the electrolyte more positively charged relative to the other. The two resulting electrolyte solutions are referred to as positive and negative electrolyte respectively and are stored in two separate tanks. During discharging, these reactions are reversed and electrical energy can be supplied to the end user. The electrolyte solutions are continuously pumped through the stacks during operation.

The electrochemical reactions in the stack result in a DC current. The FB10/20/30 is equipped with bidirectional inverters to allow charging and discharging with AC power.

The FB 10/20/30 is equipped with SMA Sunny Island 6.0H or 8.0H. The regulations determined by the manufacturer SMA are valid for using this inverter. Please refer to the original documentation issued by the manufacturer (www.sma.de).

2.3. Intended use

The FB 10/20/30 is a rechargeable battery designed for frequent charging and discharging cycles. As for all electrochemical batteries, output power (kW) and capacity (kWh) may be affected by temperature and other operating conditions. Operation outside of normal operating conditions may temporarily affect the available power and capacity.

2.3.1. Deep discharge

The FB10/20/30 can be regularly deep discharged (0% charge level) without damaging itself. If kept at 0% charge level for extended periods of time (6-12 hrs), the FB10/20/30 will enter a standby charging mode in which it periodically draws standby power from an external source (main grid, PV, etc...). If no external power source is available, having already entered the standby charging mode, the FB10/20/30 will send a warning to the GESt service center and begin a controlled shutdown.

2.3.2. Use as a stand-alone system (island grid, off-grid)

The FB 10/20/30 can be configured by the manufacturer as a stand-alone system (island grid), which forms an independent power grid. A TN-S grounding configuration is recommended (*see chapter 5*). For TT systems, please contact your local sales partner.

Integrating diesel generators in the stand-alone grid may require additional setup and equipment. Further information can be found at the inverter manufacturer's website (www.sma.de), as well as by your local sales partner.

2.3.3. Grid connected operation



Grid connected systems (gird parallel, on-grid) operating on the public grid are subject to local regulations. Additional setup and equipment may be necessary. For this reason, always obtain the required permits and clarify technical requirements with the responsible authorities and / or the local grid operators (see chapter 5).

Additional information can be found at the inverter manufacturer's website (www.sma.de). The FB10/20/30 uses SMA Sunny Island inverters which operate in accordance with the requirements of:

VDE-AR-N 4105

For further information please see the declaration of conformity of SMA (http://files.sma.de/dl/1368/SI60H-80H-ZE-G2-Erzeugungseinheit-VDE-de-12.pdf).

3. Safety instructions

3.1. Symbols on the device

The following warning signs (or valid equivalents in the country of installation) are attached to the FB 10/20/30 in a clearly visible position:

Symbol	Placement	Meaning
	Both sides - interior	Hazardous to health, toxic (T) – refers to the charged electrolyte, specifically to the V (V) component
EX	Fluid side - interior	Danger of explosive atmosphere - refers to an explosive hydrogenous gas atmosphere in the tank compartment and the degasification line
	Both sides - interior	Corrosive (C) - refers to the electrolyte, specifically to the component sulphuric acid
	Both sides - exterior	Danger caused by batteries
	Both sides - interior and exterior switch cabinet	Dangerous voltage - refers mainly to 230 V AC on the electrical side, but also to the DC battery voltage (dangerously high discharging currents)
und la	Fluid side - interior	Wear protective gloves, refers to the electrolyte
i	Both sides - interior	Read the operating manual, refers to all service and maintenance work



Ensure that the warning symbols are clean, legible and complete. If they are damaged or illegible, inform customer service.

3.2. Safety instructions and potential dangers

3.2.1. Safety instructions for electrolyte and leakages

The electrolyte is a solution of vanadium salts in sulphuric acid. The electrolyte is corrosive and toxic in all of its ionic states. For this reason, avoid touching the electrolyte!

The energy storage system is equipped with a double-walled tank preventing a contamination outside of the system. In case of a leak, sensors detect emerging electrolyte and the service center is alarmed.



If electrolyte manages to escape the FB10/20/30's external housing, please contact the appropriate authorities as well as GILDEMEISTER energy storage GmbH immediately. In the meantime, keep a safe distance from the electrolyte.

Do not try to collect or wipe off the electrolyte. This will be done by the emergency service / service personnel. The electrolyte is most dangerous when it is inhaled or ingested as dry powder. To avoid spreading powdered electrolyte, do NOT scrape off dry deposits! Should electrolyte come in contact with your eyes or skin, immediately rinse the exposed areas repeatedly. Eye washing bottles are the easiest method of flushing out eyes. Seek medical attention after contact with electrolyte.

For the corresponding safety measures for the electrolyte, refer to the material safety data sheet (MSDS) in the system documentation.

3.2.2. Safety instructions for fire

All electrical components are fused separately. Additionally, a smoke detector monitors any smoke development within the CELLCUBE® and switches the battery into "emergency mode" if triggered. This mode creates an alarm message to the service center and switches off all pumps and sensors. The inverters are switched into "stand-by mode".



If fire or smoke is detected, immediately contact the appropriate authorities, the fire brigade and GILDEMEISTER energy storage GmbH. Never try to put out the fire by yourself. Keep a safe distance.

3.2.3. Safety instructions for hydrogen formation

As is the case for any other battery with water-based electrolyte, the vanadium redox flow battery can produce hydrogen. Compared to other battery types (e.g. lead-acid batteries) the amount is very small. The gas is discharged from the tanks to the outside through a gas line. The tank compartment is separated from the ambient air by means of a gas barrier. As a consequence, the gas atmosphere in the tank room will only pass through the gas barrier as of a certain excess pressure. This causes a higher concentration of hydrogen in the tank compartment.



A flame arrester is located at the end of the degasification line to prevent accidental or deliberate ignition of the gas.

An integrated hydrogen gas sensor triggers a warning signal if gas accumulates in the interior of the system. If the first warning level has been reached (far below the dangerous explosion limit), the ventilators are automatically started to convey the gas from the container. However, if the gas concentration keeps rising, a second warning level is reached. The respective alarm messages are automatically transmitted to the service center. The battery is automatically switched off when the second warning level is reached.

A regular maintenance and examination of the hydrogen sensor is necessary. Qualified service personnel will carry out this work within the scope of the regular maintenance.

3.2.4. Safety information for electronic components

The inverter provides current on household level (typically 230VAC, 50Hz or 400VAC, 50Hz three-phase current for Europe). Voltages and currents dangerous to life occur within the system as well as in the external switch cabinet.



The connection terminals for the electrical energy sources, consumers and earthing are located in the external switch cabinet. There is danger of electric shock when servicing the connection terminals!

For safety reasons, only qualified electricians and/or personnel trained in electrical engineering are permitted to access the switch cabinet.

Ensure that the connection work is carried out by an authorized electrical company, see *chapter 5*.

The connection sockets for data communication are also located in the external switch cabinet.



The description of the terminal markings and a block wiring diagram can be found in chapter 5.

Adhere to all locally valid standards and directives.

3.2.5. Safety instructions for mechanic components

The FB 10/20/30 is installed in a weather-proof housing and separated from the environment by means of insulation panels. The access paths to the ventilators are located on the face side behind the cover plates. Do not block or cover them. There are no automatically moving parts posing a safety risk.



Opening the service panels can be dangerous and is only permitted by trained service personnel that are familiar with the required protective clothing (protective suits, protective goggles, gloves, shoes) and service procedures.

Key locks in the service flaps protect the CELLCUBE® against unauthorized access. Switch contacts are used to determine if the service panels are open or closed. Unauthorized opening of the service panels triggers an alarm message to the GESt service center and stops the battery.

3.2.6. Additional notes

For repairs and service work, always use replacement parts and auxiliary means approved by GILDEMEISTER energy storage GmbH!



Using unsuitable replacement parts or incorrect service materials (oils, greases, lubricants, cleaning agents, etc.) is dangerous and can lead to damage of the system. The use of a high-pressure cleaners is not allowed. Qualified service personnel are trained for the correct servicing of the FB10/20/30.

4. Assembly

The installation, assembly and commissioning is exclusively carried out by qualified personnel of GILDEMEISTER energy storage GmbH or trained partner companies. However, for a successful installation the following should be considered:

4.1. Requirements for the installation site

The constant ambient operation temperature of the CELLCUBE® FB 10/20/30 is -20 °C to +45 °C. If you plan to use the CELLCUBE® permanently outside of this temperature range please contact GILDEMEISTER energy storage GmbH.

The FB 10/20/30, in accordance with the requirements of protection rating IP 54, is suitable for outdoor installations.

It is designed for installation in altitudes up to 3000 m above sea level. For use in higher altitudes please contact GILDEMEISTER energy storage GmbH.

4.1.1. Outdoor installation

The base area of the battery is: $4.79 \times 2.20 \text{ m}^2$. However, ensure that the foundation also provides enough space for maintenance work around the battery. A surrounding free space of 1.3 m is required. Ensure that the foundation is as level as possible, can support a total weight of up to 15 000 kg and that it does not sink.



Ensure that the installation site is not located in areas at risk of earthquakes or floods. Also ensure that it is in a safe distance from driveways and roads. If there is a risk of collision with a vehicle, ensure adequate collision protection by means of construction measures according to the valid local legal regulations.

A concrete foundation is recommended for the foundation.

Ensure that there are access roads and loading areas for trucks (trailer trucks).

The unloading is carried out by means of a crane designed for a load of at least 5000 kg over the lifting distance to be covered. Ensure that a crane of at least 25 tons is available for this task.

For detailed information please see the document "Site Preparation Guide FB 10/20/30".



Figure 3: Schematic depiction of the installation site

4.1.2. Indoor installation

The FB 10/20/30 is constructed for outdoor installation. If the system is installed in a building, the basic thermal conditions (ventilation, air conditioning, hydrogen draining, etc.) have to be clarified in detail. GILDEMEISTER energy storage GmbH will offer respective advice. The required installation area and the maintenance space are the same as for the outdoor installation.



Additional requirement: Piping for the exhaust air must be provided by the customer in order to conduct the warm air to the external environment (normally outdoors). If further ventilators are installed in the exhaust air system, ensure that they are installed and activated in parallel. The exhaust system must be checked once a year as part of the yearly maintenance plan.

5. Electrical connection

All electrical interfaces are located in the external switch cabinet (*see Figure 4*). Ensure that a standardized connection is made and the electro-technical approval is carried out by an authorized electrical installation company.

According to the regulations determined by the inverter manufacturer SMA the inverter can be connected to TN grids as well as TT grids. Refer to the technical description of the inverter SMA Sunny Island 6.0-H/8.0-H; (www.sma.de).

The safety elements are located in the external switch cabinet. For safety reasons, access to the switch cabinet is only permitted for electricians or persons trained in electrical engineering.

The protective earthing is installed as a bridge between N and PE in the external switch cabinet.

Sunny Island 6.0-H/8.0-H:

The bridge is installed (standard) when the system is delivered. Depending on the grid type the bridge might has to be removed:

- grid parallel with TN-S grid \rightarrow remove bridge
- grid parallel with TN-C grid \rightarrow bridge remains
- grid parallel with TT grid \rightarrow remove bridge
- stand-alone with TN-S grid \rightarrow bridge remains
- stand-alone with TN-S grid and MultiCluster-Box
 - → Remove bridge in external switch cabinet, establish bridge on generator side or load side, not in MultiCluster-Box

(see: www.sma.de)



Figure 4: External switch cabinet, interior view

- 1 Automatic fuse for AC1-connection (stand-alone grid) of DC-Bus A
- 2 Automatic fuse for AC2-connection (public grid, generator) von DC-Bus A
- 3 Automatic fuse for AC1-connection (stand-alone grid) of DC-Bus B
- 4 Automatic fuse for AC1-connection (island grid) of DC-Bus B (only FB 20/30)
- 5 Main terminal XAC30 (20 and 30 kW; public grid)
- 6 Potential equalizing bar
- 7 Communication interfaces
 - XCOM9ModBus–Interface (e.g. for external control system)XCOM10Ethernet-Interface (e.g. LAN, switch)
- 8 Automatic fuse for ventilation fluid department
- 9 Switch relays for ventilation fluid department
- 10 Automatic fuse for electric department
- 11 Switch relays for electric department



5.1. Interfaces

5.1.1. Communication interfaces



Figure 5: CAT5-RJ45 sockets

XCOM9	ModBus–Interface (e.g. for customized control)
XCOM10	Ethernet-Interface (e.g. LAN, switch)

5.1.2. Connection to stand-alone grid



Figure 6: Terminals AC1_A and AC1_B

Automatic circuit breaker FAC1_A (C32A):

- 1 Phase L1
- 2 Phase L2
- 3 Phase L3

Terminal XFAC1_A:

- 4 Neutral conductor
- 5 Protective conductor

Automatic circuit breaker FAC1_B (C32A, only FB 20/30):

- 7 Phase L2
- 8 Phase L3

Terminal XFAC1_B:

- 9 Neutral conductor
- 10 Protective conductor

Via the automatic circuit breakers FAC1_A und FAC1_B the energy storage system can be separated from the island grid.

5.1.3. Connection to public grid / generator



Figure 7: Terminals AC2_A and AC2_B

Automatic circuit breaker FAC2_A (C32A):

- 1 Phase L1
- 2 Phase L2
- 3 Phase L3

Terminal XFAC1_A:

- 4 Neutral conductor or PEN
- 5 Protective conductor

Automatic circuit breaker FAC2_B (C32A, only FB 20/30):

- 6 Phase L1
- 7 Phase L2
- 8 Phase L3

Terminal XFAC1_B:

- 9 Neutral conductor or PEN
- 10 Protective conductor

Via the automatic circuit breakers FAC2_A and FAC2_B the energy storage system can be separated from the public grid / generator.

5.1.4. Connection to public grid / generator via terminal XAC30



Figure 8: Terminal XAC30

Terminal XAC30:

- 1 Phase L1
- 2 Phase L2
- 3 Phase L3
- 4 Neutral conductor or PEN
- 5 Protective conductor

Terminal XAC30 is the main battery terminal for CELLCUBE® FB 20/30. It is suitable for cables with diameter from 10 to 35 mm^2 .

5.1.5. Automatic circuit breakers F50 and F51



Figure 9: Automatic circuit breakers F50 and F51

The automatic circuit breakers F50 and F51 are connected to the AC1-terminal of masterinverter A and serve for protection for the AC-fans and the service socket inside of the CELLCUBE®. Both circuit breakers have to be switched on during operation of the CELLCUBE®.

5.2. Earthing



The customer must provide a standardized earthing connection (foundation earth electrode) close to the system. The earthing must be connected according to all local safety regulations. Earthing points on the system are located on the two diagonally opposite pedestals (see *chapter 4.1.1.*) and on the main earthing terminal in the external switch cabinet. Ensure that the electrical grounding electrode, the main earthing terminal and the two housing earthing points are connected with one earthing line (\geq 16 mm²).



Figure 10: Equipotential bonding terminal



Figure 11: Connection point for electrical grounding electrode

5.3. Lightning protection



Ensure that the lightning protection complies with all locally valid regulations. The lightning protection is the responsibility of the owner. Local electric companies will provide information about local conditions and regulations. Connect the steel construction of the battery to the electrical grounding electrode by means of the two housing earthing points via an earthing line ($\geq 16 \text{ mm}^2$) (see chapter 5.2).

5.4. Line protection

The energy storage system is connected to the customer's mains by the connection terminal in the external switch cabinet of the CELLCUBE®. SMA recommends the use of an separate residual-current-operated protective device (RCD) if connected to the grid. The customer must design the line protection of the customer mains according to the inverter manufacturer's regulations (*see: www.sma.de*).

5.5. Grid and plant protection according to VDE AR-N 4105

The grid and plant protection is implemented as an integrated grid and plant protection in the SMA Sunny Island 6.0-H/8.0-H inverters. *(see: www.sma.de)*.



Ensure that prior to the installation of the system the basic conditions for grid parallel operation are clarified in each country and that the required safety devices are available.

(see: www.sma.de)

6. Operation

After commissioning by qualified personnel of GILDEMEISTER energy storage GmbH or a qualified service partner, the system continues to run independently. No interaction by the user is necessary. No operation or display elements are required for normal operation.

If a circuit breaker was triggered, the cause must first be identified and rectified. Often the cause is an overload, short-circuit, or malfunction of a device outside of the CELLCUBE®. After rectifying the cause of the malfunction, the circuit breaker can be reactivated.

6.1. Commissioning of the CELLCUBE®

For commissioning of the CELLCUBE®, the service flap on the electric department (near external switch cabinet) must be opened. The operator push-buttons are located on the electronic sideboard. The following information is valid for FBC software version **V3.05.06**.



Figure 12 and 13: Electronic sideboard and start button S1

The start-button (S1) and T1 must be pushed simultaneously for 3 sec to start the system. During start up the auxiliary systems are initially fed by a small designated back-up battery. The internal controller (FBC) starts and there is an audible switching sound of the FBC relay.



Figure 14: Push-buttons T1 and T2 on FBC

The pumps are switched on for app. 5 minutes to supply the stacks with charged electrolyte (this procedure is carried out with every start of the software). After start-up, the auxiliary systems are supplied from the CELLCUBE® itself.

6.2. Menu navigation

By simultaneously pressing buttons T1 and T2 (see figure 14) for 3 sec, the CELLCUBE® displays its possible operating modes in the FBC menu (see figure 15).



Figure 15: FBC menu

T1 enables the navigation through the menu. A selected mode has to be confirmed by pressing and holding T2 for 3 sec.

- *Running mode* represents the normal operation of the energy storage system.
- During *standby mode* the pumps are switched off and the inverters switch into standby mode. Communication with the GESt service center is still available.
- During *flushing mode* the stacks are flushed with charged electrolyte (typically executed after leaving the battery in standby for extended periods of time). To preemptively exit the flushing mode before it ends automatically, T1 and T2 have to be pressed simultaneously for 3 sec. This leads to a restart of the energy storage system.
- During *shutdown mode* the inverters, pumps, fans, sensors and the FBC are switched off. Communication with GESt service center stops. The FBC briefly displays the message "System was switched off" before shutting down. A restart must be carried out manually by the GESt service (or specially trained users) directly at the CELLCUBE®.
- The *emergency mode* is entered by pressing the emergency stop button. Doing so turns off all pumps, fans, sensors, and places the inverters in standby. The FBC remains active long enough to initiate the shutdown mode, if necessary.

When transitioning from running mode to either flushing or shutdown, the CELLCUBE® will briefly switch to standby.

The following table shows the states of the software and the functions of the push buttons T1 and T2: $% \left(T^{2}\right) =0$

Action	Reaction
Button T1 & T2 pressed for 3 sec.	Menu appears
Press button T1	Navigation through menu (Menu items: Running, Standby, Flushing und Shutdown)
Press button T2 for 3 sec	Confirmation of the chosen menu item
Flushing mode and buttons T1 & T2 pressed for 3 sec	Quitting of flushing mode, restart of system and switching into running mode
EMERGENCY STOP switch pressed	Emergency mode is activated

Figure 16: Table of states

6.3. EMERGENCY STOP button

This button is intended for switching off the energy storage system in an emergency situation (leakage, fire, etc.). If this button is pressed, the software of the FBC goes into emergency mode. The pumps stop, the inverters switch to standby mode and the sensors are switched off. In this state, the CELLCUBE® is no longer operational, i.e. does not charge or discharge. For monitoring purpose the communication system remains active.



In both the emergency and shutdown modes there are life-threatening voltages at the grid connection points, the inverters, and the stacks. Danger of lethal electric shock!

Once the dangerous situation has been corrected, the EMERGENCY STOP button can be reset.

To reactivate the battery, press the start-button T1 and T2 simultaneously for 3 sec. The main menu will appear and the desired operating mode must be selected (e.g. running).



Figure 17: EMERGENCY STOP button

6.4. Ethernet interface

The FB 10/20/30 is connected to the GESt service center via an internet connection. The system communicates with the service center by means of the interface XCOM10 and sends status data and alarm messages if necessary.

For the correct function of this interface it is mandatory that there is an unrestricted access to the internet. The system is connected with the internet either by UMTS- modem with SIM card or connection to an existing LAN of the customer.

The following requirements are valid if the LAN-connection is used:

To connect the CELLCUBE® to the network (LAN) an Ethernet cable Cat. 5 or higher shall be used. The maximum cable length is 100 m.

Following ports have to be enabled:

HTTP 80,81; HTTPS 443 outgoing SSH 22 OVPN 1194 (UDP) outgoing NTP-timeserver 123 (outgoing) SMTP 25 and 587 ComPort redirect (RS232 to TCP) 5678 Modbus TCP/IP 502

For communication via ethernet interface the use of static IP-addresses is necessary. The use of dynamic IP-addresses (DHCP) is possible on request.

7. Control of the CELLCUBE®

The user has different possibilities to control the energy storage system CELLCUBE® (charge / discharge / stand-by).

7.1. External Control

The energy storage system CELLCUBE® includes a ModBus-RTU interface to enable the connection to an external control system. For more information please see the document "ModBus Interface Specification".

Upon request, control via ModBus-TCP can be made available.

7.2. Increased self-consumption

The increased self-consumption option automatically controls your CELLCUBE® to store and later utilize excess power from your renewable energy sources. This option includes:

- Energy management software
- Smart meters for the energy management software

This option increases your independence from the public electricity grid and increases the amount of renewable energy used at your site.

8. CELLCUBE® customer portal

The CELLCUBE® customer portal is a web based system which can be used with all standard browsers and offers the customer information about the most important operating parameters of the CELLCUBE®.

To ensure security, the HTTPS-protocol is used. Live data as well as historical data is displayed. Continuous data storage of the CELLCUBE® in the Gildemeister cloud enables the graphical display of instantaneous values and historical values.

The portal offers access to an optional energy flow visualization.

8.1. Standard user

Each CELLCUBE® comes with a standard user account, which enables the customer to monitor the energy storage systems 24/7. The CELLCUBE® customer portal presents the key parameters such as charge level, charge and discharge power, energy, temperatures and hours of operation.

The CELLCUBE® customer portal can be reached under following address:

http://cellcube.gildemeister.com

OUDENEISTED	-	-	
energy efficiency	Nutzername	Passwort	Anmelden



Figure 18: CELLCUBE® customer portal

The customer receives a user name and password during commissioning from the GESt service.

On the monitoring page (see figure 19) live data of selected CELLCUBE®s are presented. The data are updated every 3 sec.

Clicking on one of the key parameters (e.g. charge level) will display the last 7 days of data for that parameter.



Figure 19: CELLCUBE® Monitoring

The measurement data can be downloaded as a csv-file for Excel. The time period may be specified by the user.



Figure 20: CSV export of data

8.2. Premium user

The premium user account includes additional functions such as a visualization of power flow as well as the presentation of generated and consumed energy.

The power flow visualization shows the magnitude and direction of power flowing between renewable sources, the public grid and loads.



Figure 21: Energy flow visualization

In the tab "Generation and consumption" the generated and consumed energy gets displayed in a bar chart. Years, months or days can be chosen as a period.



Figure 22: Presentation generation and consumption

9. Maintenance

To ensure a long operating life, we strongly recommend to carry out a yearly maintenance. Apart from that, it is of course possible to cover repairs and maintenance work through a maintenance contract. For details, please contact GILDEMEISTER energy storage GmbH.

Apart from removing external fouling and dirt, maintenance work is to be carried out by GILDEMEISTER energy storage GmbH or its certified service members.

The following work is carried out during the annual maintenance by GILDEMEISTER energy storage GmbH or a qualified partner company:

External:

Cleaning the ventilation openings and replacing the filters Inspecting the flame arrester Inspecting the container for corrosion Inspecting the state of the radio antenna (if installed)

Inspecting the state of the external switch cabinet and external wiring (closing,

tightness, dirt, insulation, corrosion)

Removing fouling

Internal:

Inspecting the housing seal

Removing dirt (the surface of the tank shall be cleaned only with a wet cloth!)

Inspecting the fluid system for leaks (optically and with a hydrogen-sniffer)

Inspecting the pumps (leaks, running noises, pressure), pipes and hoses (optically and with a hydrogen-sniffer)

Inspecting the gas barrier (leaks, oil containers; optically and with a hydrogensniffer)

Inspecting the ventilators and sealing flaps

Inspecting the control of the external ventilation system (if installed)

Inspecting the function of the EMERGENCY STOP button

Inspecting the sensors

Inspecting the DC contact rail, high voltage contacts

Inspecting the power unit

The use of a high-pressure cleaner is not allowed. The surface of the tank shall be cleaned only with a wet cloth to avoid electrostatic charge!

10. Malfunctions

The energy storage system monitors itself and triggers alarm messages in case of any warnings or malfunction. These messages are sent to a pre-defined recipients by e-mail. Malfunctions can only be rectified by trained personnel.

In case of emergency (fire, emerging electrolyte, etc.) adhere to the emergency plan in the documentation folder.

In the scope of a maintenance contract these malfunction messages are analyzed by the GESt service center or the responsible service partner and appropriate correction measures are taken.

11. Disassembly & Disposal

Ensure that disassembly and disposal are carried out by qualified personnel. Before beginning, the CELLCUBE® must be completely electrically discharged. The discharged electrolyte is then pumped into IBC containers and can then be recycled.

The tanks and the fluid system still contain electrolyte residues after being drained. For this reason they must be properly disposed of according to nationally valid regulations. The material safety data sheets for the chemicals can be found in the customer documentation.



The electrical and electronic components are regarded as waste electronic equipment. Dispose them according to the nationally valid regulations. Likewise two small lead-acid batteries are located in the electronics components. Dispose these batteries separately as spent batteries.

The steel frame can be recycled as scrap metal.

For detailed disassembly instructions for the system contact GILDEMEISTER energy storage GmbH.

If an already installed CELLCUBE® shall be put up at a new installation site, the discharged electrolyte has to be pumped into IBC. Any movement of a CELLCUBE® is only allowed with empty tanks and mechanically secured stacks.

Please contact GILDEMEISTER energy storage GmbH if you plan to move your energy storage system to another installation site.



Any CELLCUBE® which tanks are filled with electrolyte must not be moved, lifted, or tilted!

12. Exclusion of liability

The adherence to all conditions listed in this operating manual cannot be monitored by the manufacturer. For this reason the manufacturer accepts no liability or responsibility for damage and losses resulting from improper operation of the system.

Likewise, the manufacturer accepts no liability for violations of the patent law or other violations of the rights of third persons resulting from the use of this device.

It is the sole responsibility of the owner to protect the system against access by third persons and/or - depending on the installation location - take additional measures.

The manufacturer reserves the right to change the technical data of the energy storage system or this operating manual without prior notice or announcement, as long as the changes are not relevant for the safety regulations or the CE conformity.

13. Warranty

For the warranty provisions please refer to the contractual agreements.

14. Contact

GILDEMEISTER energy storage GmbH

IZ NÖ-Süd, Straße 3, Objekt M36 2355 Wiener Neudorf, Austria

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15. Technical Data

	FB 10-40	FB 20-40	FB 30-40
Power and energy			
Rated charge/discharge power* AC	10 / 10 kW	20 / 20 kW	30 / 30 kW
Energy capacity	40 kWh	40 kWh	40 kWh
Expandable up to	70 / 100 / 130 kWh	70 / 100 / 130 kWh	70 / 100 / 130 kWh
Discharge energy AC		·	
FB xx-40		32 kWh	
FB xx-70		56 kWh	
FB xx-100		80 kWh	
FB xx-130		104 kWh	
Energy efficiency storage system (AC)		up to 70%	
Energy efficiency on cell level (DC)		up to 85%	
Charge level		0 100%	
Typ. number of cycles		> 20,000	
AC connections			
Nominal AC voltage**		400 VAC 3 phase	
Nominal frequency (adjustable)		50 Hz (45 Hz 65 Hz)	
Nom AC current per phase (230 V)	14 5 A	29 A	43 5 A
Power factor (cos (0)		-1 +1	
Beaction time (grid parallel mode)	-1 T1 < 2 c		
Reaction time (stand-alone mode)	< 20 ms		
Discharge time at constant power			
Discharge time (autonomy)	4 hrs @ 8 kW	2 hrs @ 16 kW	1.3 hrs @ 24 kW
	const.	const.	const.
Solf discharge			
Self-discharge (shut down mode***)		< 1% ner vear	
Self-discharge (bot stand-by****)	0.13 kW	0.27 kW	0.37 kW
		0,27 KW	0,07
Noise emission			
Sound level (distance 3 m)	Typically: < 50 dB(A);	during high charge/di	scharge power and
	high ambient temper	ature it can rise up to	66 dB(A)
Mechanical data			
Footprint L x W x H	4,	79 m x 2,20 m x 2,42	m
	(1	15.7 ft x 7.2 ft x 7.9 f	t)
Weight empty	4250 kg	4700 kg	5000 kg
	(9370 lbs)	(10 360 lbs)	(11 030 lbs)
Weight filled with electrolyte			
40 kWh	6950 kg	7400 kg	7700 kg
	(15 330 lbs)	(16 310 lbs)	(16 980 lbs)
70 kWh	8975 kg	9425 kg	9725 kg
	(19 790 lbs)	(20 780 lbs)	(21 440 lbs)
100 kWh	11 000 kg	11 450 kg	11 750 kg
	(24 250 lbs)	(25 250 lbs)	(25 910 lbs)
130 kWh	13 025 kg	13 475 kg	13 /75 kg
Directorian rating	(28 / 20 IDS)		(30 370 105)
Protection rating	·	IP 54	

energy solutions

Climatic operating conditions

Ambient temperature	constant ambient temperature from -20 °C to + 45 °C (-4 °F to
	+113 °F); optional air conditioner and insulation enables usage
	in every climatic surrounding
Altitude	Up to 3000 m (9800 ft) above sea level (at a height of 2000 m
	(6560 ft) and more, power derating can be assumed)

* all data measured at an electrolyte temperature of 30 °C (86 °F)
** allowed grid for SI 6.0/8.0-H: TN and TT grid
** other voltage ranges available upon request

*** shut down mode: CELLCUBE® is switched off

**** hot stand-by: state in which electrolytes are circulating