SITOP DC UPS uninterruptible power supplies

DC UPS with battery modules

SITOP DC UPS

Overview

By combining a DC UPS module with at least one 24 V battery module and a SITOP power supply unit, longer power failures can be bridged without any interruption. Even if a greater buffering current is required, the DC UPS with maintenance-free lead battery provides optimum safety. It spans power failures up to several hours long and delivers up to 40 A.

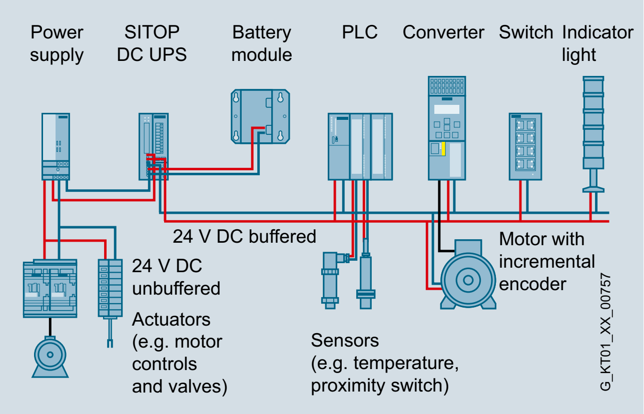
Benefits

- 24 V buffering for a few hours for the purpose of continuing processes
- Maintenance-free battery modules from 1.2 to 12 Ah
- High reliability and availability due to monitoring of the operational readiness, battery feeder, aging and charging status
- Long operating life of loads and batteries due to integrated battery management
- Settings by means of DIP switches: Battery connection threshold, end-of-charge voltage, charging current, bridging time
- SW tool, free of charge, for easy configuring and integrating in PC-based systems

Application

These battery modules that can be connected in parallel bridge power failures for a few hours. This enables processes or parts of them to be continued, measured values to be recorded without interruption and communication to be maintained. High-performance industrial PCs that have to be shut down also have somewhat higher energy demands. Especially if a large panel continues to be operated during the shutdown. The DC UPS is used, for example, in machine tool production, in the textile industry, in all types of production lines, bottling plants or also for the obstacle lights of wind power plants.

The serial or USB interface and a free software tool enable easy communication with a PC.



Configuration with SITOP DC UPS and battery module: 24 V buffering to maintain communication, signaling and sensor measured values. To relieve the load on the UPS, the actuators are supplied directly from the power supply unit.

Design

- DC UPS modules 24 V/6 A, 15 A, 40 A
- Digital inputs/outputs, optionally with serial or USB interface

- Battery modules 1.2 Ah, 3.2 Ah, 7 Ah, 12 Ah with lead rechargeable batteries of corrosion-resistant lead-calcium high-performance grid plates and glass fiber
- Battery module 2.5 Ah with "high-temperature battery" of pure lead

Function

SITOP DC UPS software tool

Via the USB interface, all relevant messages about the status of the uninterruptible DC power supply can be transmitted to a PC (e.g. SIMATIC IPC). The DC UPS can also be configured via the USB interface.

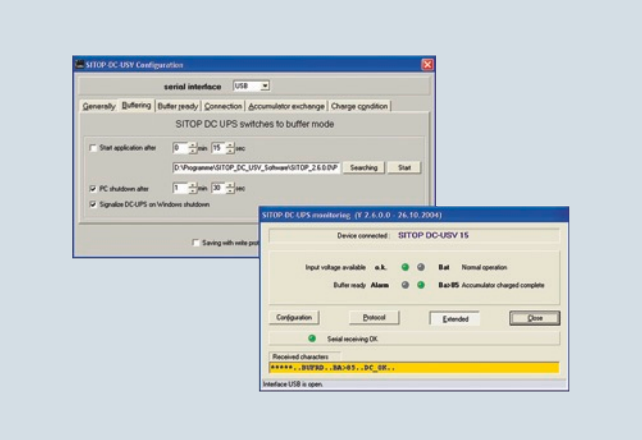
The SITOP DC UPS software provides the user with a free tool that is extremely easy to use for the purpose of monitoring and configuring the DC UPS. Signals sent from the uninterruptible DC power supply can be processed on the PC. In monitoring mode, the statuses of the uninterruptible DC power supply are visualized on the PC.

Safe shutdown in the event of a power failure and automatic PC restart are supported. It is also possible to freely define responses to the different operating states of the uninterruptible DC power supply, so that extremely flexible integration into a wide variety of applications is possible.

Overview of configuration possibilities:

- Times for shutting down the PC
- UPS switch-off
- Further processing of all signals, e.g. linking to proprietary software or WinCC flexible
- Monitoring and display of UPS operating status
- OPC server for linking signals to proprietary applications
- Automatic restarting of IPCs when power is restored during shutdown

The software runs under the operating systems Windows 2000, Windows XP, Windows Vista and Windows 7. Free download from:
http://support.automation.siemens.com/WW/view/en/48946053



serial interface: USB

SITOP DC UPS switches to buffer mode

☐ Start application after 0 min 15 sec

D:\Programme\SITOP_DC_USV_Software\SITOP_2.6.0.0\P

☑ PC shutdown after 1 min 30 sec

☑ Signalize DC-UPS on Windows shutdown

☐ Saving with write pro

Device connected: SITOP DC-USV 15

Input voltage available o.k. ● ● Bat Normal operation

Buffer ready Alarm ● ● Bat>85 Accumulator charged complete

● Serial receiving OK

Received characters

```
*****..BUFRD..BA>85..DC_OK..
```

Interface USB is open.

Monitoring and configuration window of software V3 for SITOP DC UPS

Technical specifications

The table shows the maximum buffering times for the battery modules for different load currents.

The SITOP Selection Tool offers detailed selection guidance according to criteria such as the required backup time, load current, peak current and battery connection threshold:
http://www.siemens.com/sitop-selection-tool

Load current	Battery module 1.2 Ah (6EP1935-6MC01)	Battery module 3.2 Ah (6EP1935-6MD11)	Battery module 7 Ah (6EP1935-6ME21)	Battery module 12 Ah (6EP1935-6MF01)	Battery module 2.5 Ah (6EP1935-6MD31)
1 A	34.5 min	2.6 h	5.4 h	9 h	2 h
2 A	15 min	1 h	2.6 h	4.6 h	1 h
3 A	9 min	39.3 min	1.6 h	2.9 h	37.5 min
4 A	6.5 min	27.1 min	1.2 h	2.2 h	27 min
6 A	3.5 min	17.5 min	41 min	1.2 h	17.6 min
8 A	2 min	12.1 min	28.6 min	53.3 min	12.5 min
10 A	1 min	9 min	21.8 min	43.5 min	8.8 min
12 A	-	7 min	17.3 min	33.3 min	6.8 min
14 A	-	5 min	15.1 min	27.5 min	5.1 min
16 A	-	4 min	12.5 min	23.8 min	4.3 min
20 A	-	1 min	9.1 min	20.1 min	-
25 A	-	-	-	12.6 min	-
30 A	-	-	-	9.1 min	-
35 A	-	-	-	17.1 min. (2 x 12 Ah)	-
40 A	-	-	-	13.5 min. (2 x 12 Ah)	-

Important information for selecting the battery capacity:

Determination of the mains buffering times is based on the discharge period of new or non-aged, completely charged battery modules at a battery temperature not below +25 °C to the shutdown of the DC UPS.

Battery aging reduces the still available battery capacity up until the end of the service life to typically around 50% of the original capacity value when new (1.2 Ah/3.2 Ah/7 Ah, etc.) and the internal resistance increases. When the message "Battery charge > 85%" appears, only around 50% x 85% = approx. 43% of the originally available capacity can be assumed at the end of the battery service life.

At battery temperatures below +25 °C, the available capacity drops approximately by another 30% at +5 °C battery temperature, to approximately 70% of the approximately remaining 43%. There is then only around 30% of the original capacity available.

A significantly larger battery capacity must therefore be selected when configuring the plant: A drop to approx. 50% is compensated for by selecting 1 / approx. 0.5 = approx. double the battery capacity (required as per the table for the relevant load current and the relevant buffering time). Available capacity of approx. 43% is compensated for by selecting 1 / approx. 0.43 = approx. 2.33 times the battery capacity. Available capacity of approx. 30% is compensated for by selecting 1 / approx. 0.3 = approx. 3.33 times the battery capacity.

Recommendation:

Instead of installing double the battery capacity, regular battery replacement halfway through the expected service life (reduction of capacity to approx. 50%) can be more advisable for the following reasons: Capacity does not drop below 100% until the halfway point of the expected battery life (or slightly beyond). With regular replacement after this point, only the single battery capacity (instead of double capacity) must be installed due to aging (-> neutral in price with regard to battery module costs, but only requires half the space).

Replacing the battery after half its service life dispenses above all with the large scatter range of the residual capacity at the end of the service life, which is not accurately defined by battery manufacturers (after the full time, many batteries are above, but many are also below the average 50% residual capacity, that is to say, even if double the capacity is installed, the influence of aging at the end of service life is not reliably compensated for, rather only typically) -> When replacing after half the expected service life, the configured buffering time is maintained with considerably greater reliability.

In the case of batteries stored in cool conditions (not above +25 °C) and for not longer than approximately 4 months, the following service life can be assumed, strongly dependent on battery temperature:

Battery temperature	Drop to approx. 50% of residual capacity	Recommendation: Replace (at 100% of residual capacity) all	Alternative recommendation
+20 °C	4 years	2 years	
+30 °C	2 years	1 year	
+40 °C	1 year	0.5 years	Install double capacity and replace 1 x per year

In normal cases (installation in the coolest location in the control cabinet at approx. +30 °C), the battery should be replaced with single installed battery capacity in accordance with the selection table after 1 year of operation!

- On the DC UPS module 40 A, at least 2 battery modules of 7 Ah or higher must be connected in parallel for output currents > 30 A. When connecting battery modules in parallel, you must ensure identical capacity and aging.
- After a power failure, the battery module is disconnected from the loads at the end of the selected buffering time either automatically or electronically by opening the On/Off control circuit, and as soon as the 24 V input voltage is available again, it is quickly re-charged with the charging current of the relevant DC UPS module (with I-U charge characteristic: First constant current I for fast charging, and changeover to constant voltage U to maintain the charge when the battery is almost full).

Technical specifications

Article number	**6EP1931-2DC21**[1] **6EP1931-2DC31**[1] **6EP1931-2DC42**[1]	**6EP1931-2EC21**[1] **6EP1931-2EC31**[1] **6EP1931-2EC42**[1]	**6EP1931-2FC21**[1] **6EP1931-2FC42**[1]
Product brand name	**SITOP DC UPS module**	**SITOP DC UPS module**	**SITOP DC UPS module**
Type of current supply	**DC UPS 24 V/6 A**	**DC UPS 24 V/15 A**	**DC UPS 24 V/40 A**
Input			
Supply voltage at DC Rated value	24 V	24 V	24 V
Voltage curve at input	DC	DC	DC
input voltage range	22 ... 29 V DC	22 ... 29 V DC	22 ... 29 V DC
Adjustable response value voltage for buffer connection preset	22.5 V	22.5 V	22.5 V
Adjustable response value voltage for buffer connection	22 ... 25.5 V; Adjustable in 0.5 V increments	22 ... 25.5 V; Adjustable in 0.5 V increments	22 ... 25.5 V; Adjustable in 0.5 V increments
Input current at rated input voltage 24 V Rated value	6 A; + approx. 0.6 A with empty battery	15 A; + approx. 1 A with empty battery	40 A; + approx. 2.6 A with empty battery
Mains buffering			
Type of energy storage	with batteries	with batteries	with batteries
Design of the mains power cut bridging-connection	Dependent on connected battery and load current, see selection table battery module and mains buffering times as well as the relevant important information notes!	Dependent on connected battery and load current, see selection table battery module and mains buffering times as well as the relevant important information notes!	Dependent on connected battery and load current, see selection table battery module and mains buffering times as well as the relevant important information notes!
Charging current	0.2 A - 0.4 A	0.35 A - 0.7 A	1 A - 2 A
adjustable charging current maximum Note	factory setting approx. 0.4 A	factory setting approx. 0.7 A	factory setting approx. 2 A
Output			
Output voltage			
• in normal operation at DC Rated value	24 V	24 V	24 V
• in buffering mode at DC Rated value	24 V	24 V	24 V
Formula for output voltage	V_{in} - approx. 0.5 V	V_{in} - approx. 0.5 V	V_{in} - approx. 0.5 V
ON-delay time typical	1 s	1 s	1 s
Voltage increase time of the output voltage typical	60 ms	60 ms	360 ms
Output voltage in buffering mode at DC	19 ... 28.5 V	19 ... 28.5 V	19 ... 28.5 V
Output current			
• Rated value	6 A	15 A	40 A
• in normal operation	0 ... 6 A	0 ... 15 A	0 ... 40 A
• in buffering mode	0 ... 6 A	0 ... 15 A	0 ... 40 A
Peak current	6.3 A	15.7 A	42 A
Property of the output Short-circuit proof	Yes	Yes	
Supplied active power typical	144 W	360 W	960 W
Efficiency			
Efficiency in percent			
• at rated output current for rated value of the output current typical	95 %	96.2 %	97.2 %
• in case of accumulator operation typical	94.5 %	96 %	96.9 %
Power loss [W]			
• at rated output current for rated value of the output current typical	7 W	14 W	28.6 W
• in case of accumulator operation typical	8 W	15 W	33.6 W
Protection and monitoring			
Product function			
• reverse polarity protection against energy storage unit polarity reversal	Yes	Yes	Yes
• reverse polarity protection against input voltage polarity reversal	Yes	Yes	Yes

Technical specifications (continued)

Article number	**6EP1931-2DC21 1)** **6EP1931-2DC31 1)** **6EP1931-2DC42 1)**	**6EP1931-2EC21 1)** **6EP1931-2EC31 1)** **6EP1931-2EC42 1)**	**6EP1931-2FC21 1)** **6EP1931-2FC42 1)**
Product brand name	**SITOP DC UPS module**	**SITOP DC UPS module**	**SITOP DC UPS module**
Type of current supply	**DC UPS 24 V/6 A**	**DC UPS 24 V/15 A**	**DC UPS 24 V/40 A**
Signaling			
Display version			
• for normal operation	Normal operation: LED green (OK), floating changeover contact "Bat/OK" to setting "OK" ("OK" means: Voltage of the supplying power supply unit is greater than cut-in threshold set at the DC UPS module); Lack of buffer standby: LED red (alarm), floating changeover contact "Alarm/Bat" to setting "Alarm"; Battery replacement required: LED red (alarm) flashing with approx. 0.25 Hz, floating changeover contact "Alarm/Bat" switching with approx. 0.25 Hz; Energy storage > 85%: LED green (Bat > 85%), floating NO contact "Bat > 85" closed; Permissible contact current capacity: DC 60 V/1 A or AC 30 V /1 A	Normal operation: LED green (OK), floating changeover contact "Bat/OK" to setting "OK" ("OK" means: Voltage of the supplying power supply unit is greater than cut-in threshold set at the DC UPS module); Lack of buffer standby: LED red (alarm), floating changeover contact "Alarm/Bat" to setting "Alarm"; Battery replacement required: LED red (alarm) flashing with approx. 0.25 Hz, floating changeover contact "Alarm/Bat" switching with approx. 0.25 Hz; Energy storage > 85%: LED green (Bat > 85%), floating NO contact "Bat > 85" closed; Permissible contact current capacity: DC 60 V/1 A or AC 30 V /1 A	Normal operation: LED green (OK), floating changeover contact "Bat/OK" to setting "OK" ("OK" means: Voltage of the supplying power supply unit is greater than cut-in threshold set at the DC UPS module); Lack of buffer standby: LED red (alarm), floating changeover contact "Alarm/Bat" to setting "Alarm"; Battery replacement required: LED red (alarm) flashing with approx. 0.25 Hz, floating changeover contact "Alarm/Bat" switching with approx. 0.25 Hz; Energy storage > 85%: LED green (Bat > 85%), floating NO contact "Bat > 85" closed; Permissible contact current capacity: DC 60 V/1 A or AC 30 V /1 A
• in buffering mode	Buffered mode: LED yellow (Bat), floating changeover contact "OK/Bat" to setting "Bat"; Prewarning battery voltage < 20.4 VDC: LED red (alarm), floating changeover contact "Alarm/Bat" to setting "Alarm"; Energy storage > 85%: LED green (Bat > 85%), floating NO contact "Bat > 85" closed	Buffered mode: LED yellow (Bat), floating changeover contact "OK/Bat" to setting "Bat"; Prewarning battery voltage < 20.4 VDC: LED red (alarm), floating changeover contact "Alarm/Bat" to setting "Alarm"; Energy storage > 85%: LED green (Bat > 85%), floating NO contact "Bat > 85" closed	Buffered mode: LED yellow (Bat), floating changeover contact "OK/Bat" to setting "Bat"; Prewarning battery voltage < 20.4 VDC: LED red (alarm), floating changeover contact "Alarm/Bat" to setting "Alarm"; Energy storage > 85%: LED green (Bat > 85%), floating NO contact "Bat > 85" closed
Interface			
Product component PC interface	No	No	No
Design of the interface	without	without	without
Safety			
Galvanic isolation between entrance and outlet	No	No	No
Operating resource protection class	Class III	Class III	Class III
Certificate of suitability			
• CE marking	Yes	Yes	Yes
• as approval for USA	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259
• relating to ATEX	-	-	-
• C-Tick	No	No	No
Shipbuilding approval	DNV GL, ABS	DNV GL, ABS	DNV GL, ABS
Protection class IP	IP20	IP20	IP20
EMC			
Standard			
• for emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
• for interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature			
• during operation	-25 ... +60 °C; with natural convection	-25 ... +60 °C; with natural convection	-25 ... +60 °C; with natural convection
• during transport	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
• during storage	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
Environmental category acc. to IEC 60721	Climate class 3K3, no condensation	Climate class 3K3, no condensation	Climate class 3K3, no condensation

Technical specifications (continued)

Article number	**6EP1931-2DC21**[1] **6EP1931-2DC31**[1] **6EP1931-2DC42**[1]	**6EP1931-2EC21**[1] **6EP1931-2EC31**[1] **6EP1931-2EC42**[1]	**6EP1931-2FC21**[1] **6EP1931-2FC42**[1]
Product brand name	**SITOP DC UPS module**	**SITOP DC UPS module**	**SITOP DC UPS module**
Type of current supply	**DC UPS 24 V/6 A**	**DC UPS 24 V/15 A**	**DC UPS 24 V/40 A**
Mechanics			
Type of electrical connection	screw-type terminals	screw-type terminals	screw-type terminals
• at input	24 V DC: 2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	24 V DC: 2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	24 V DC: 2 screw terminals for 0.33 ... 10 mm^2/22 ... 7 AWG
• at output	24 V DC: 4 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	24 V DC: 4 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	24 V DC: 2 screw terminals for 0.33 ... 10 mm^2/22 ... 7 AWG
• for battery module	24 V DC: 2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	24 V DC: 2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	24 V DC: 2 screw terminals for 0.33 ... 10 mm^2/22 ... 7 AWG
• for control circuit and status message	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG
Width of the enclosure	50 mm	50 mm	102 mm
Height of the enclosure	125 mm	125 mm	125 mm
Depth of the enclosure	125 mm	125 mm	125 mm
Required spacing			
• top	50 mm	50 mm	50 mm
• bottom	50 mm	50 mm	50 mm
• left	0 mm	0 mm	0 mm
• right	0 mm	0 mm	0 mm
Net weight	0.4 kg	0.4 kg	1.1 kg
Row-on-row building permitted	Yes	Yes	Yes
Mounting type	Snaps onto DIN rail EN 60715 35x7.5/15	Snaps onto DIN rail EN 60715 35x7.5/15	Snaps onto DIN rail EN 60715 35x7.5/15
Electrical accessories	Battery module	Battery module	Battery module
MTBF at 40 °C	1 085 776 h	791 139 h	522 739 h
Equipment marking acc. to DIN EN 81346-2	T	T	T

[1] Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified).

Ordering data

	Article No.
DC UPS module 6 A	**6EP1931-2DC21**
• with serial interface	**6EP1931-2DC31**
• with USB interface	**6EP1931-2DC42**
DC UPS module 15 A	**6EP1931-2EC21**
• with serial interface	**6EP1931-2EC31**
• with USB interface	**6EP1931-2EC42**
DC UPS module 40 A	**6EP1931-2FC21**
• with USB interface	**6EP1931-2FC42**