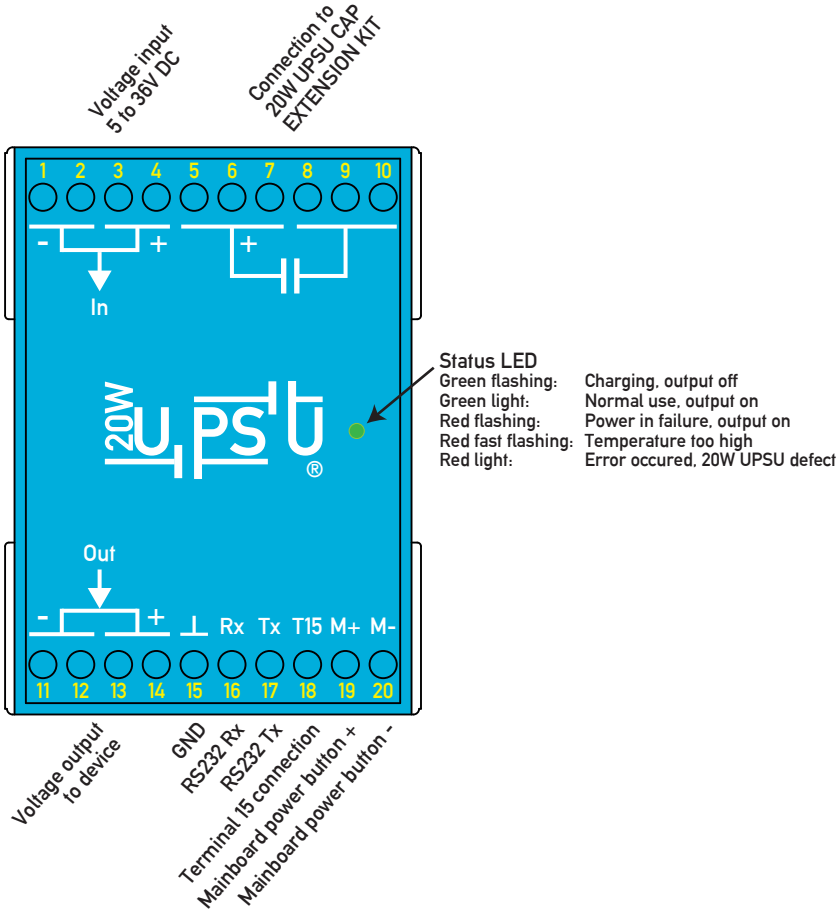
Datasheet

Observe safety instructions on page 3

Quick start guide: See page 3



20W UPSU features

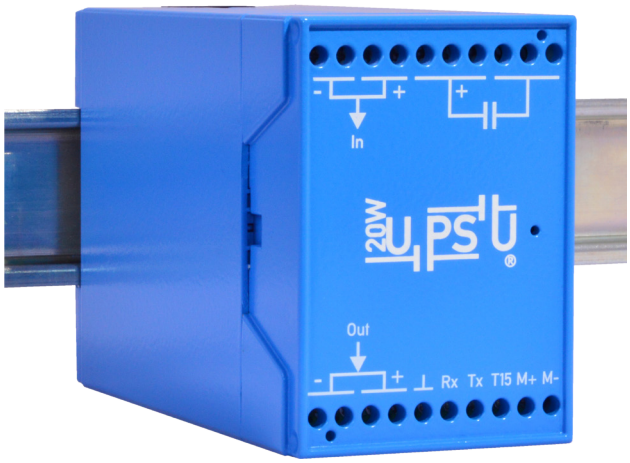
- UPS with Supercapacitors / Ultracapacitors
- Maintenance-free
- Extended operating temperature range
- Patented online UPS (VFI UPS)
- 5V to 36V DC input
- 5V to 24V DC output (configurable)
- Output voltage can be higher, equal or lower than input voltage
- DIN Case, 55 mm (width) x 75 mm x 109,5 mm
- > 25 secoonds running time with max load (20W)
- Fully charged in < 2 minutes
- Increased capacity possible with 20W UPSU CAP EXTENSION KIT
- Auto-Power-On and Auto-Shut-Down function for computers, cummunication over RS-232, terminal 15 or mainboard power button connection
- Free configuration software
- Automatic capacitor charge power regulation
- Configurable min. input voltage to Auto-Shut-Down
- Configurable waiting time to trigger shut-down in the event of power failure
- Hold-up mode for no-computer applications (like PLCs)

Applications

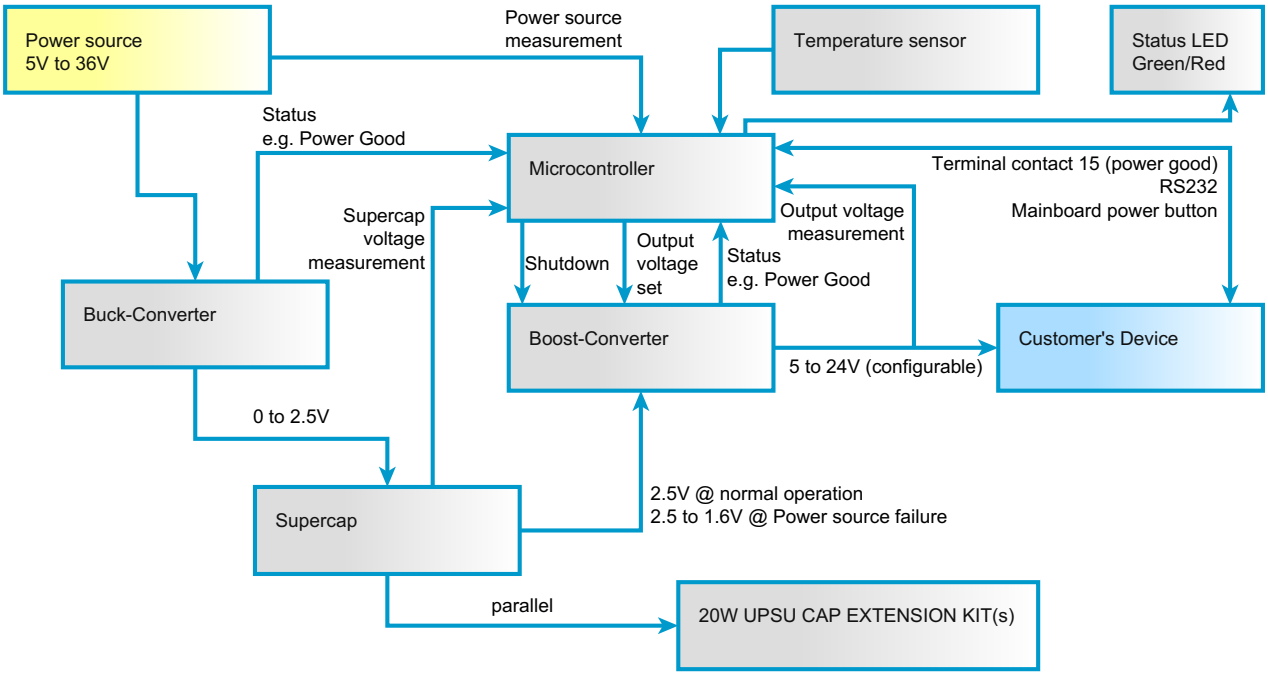
- Industrial computers (IPC)
- PLC (SPS)
- Embedded systems
- Slot machines and vending machines
- Car PCs
- Automation systems
- ...

Description

20W UPSU is a maintenance-free small UPS with 20W output for industrial, medical, vehicle and other solutions. Based on it's reduced capacity it's low cost, but can even be extended by one or more 20W UPSU CAP EXTENSION KIT. It has wide input and output voltage range, while the output voltage is configurable by a software. The device (e.g. computer) can communicate to switch on and shut down without software: Over the mainboard power button or by terminal contact 15, which many embedded computers support. Over RS-232, the device is configurable and provides status informations like voltages, power input failures startup and shut-down information.



Block diagramm



Safety instructions

The manufacturer declines any liability for damage to humans and machines. In particular, damage arising from the non-observance of the following safety regulations!
All work on the device must be carried out only by qualified and trained personnel!
Keep conductive parts away from the 20W UPSU, risk of short circuit!
If the device has visible defects or status LED lights red, disconnect the 20W UPSU and return it to manufacturer for repair.

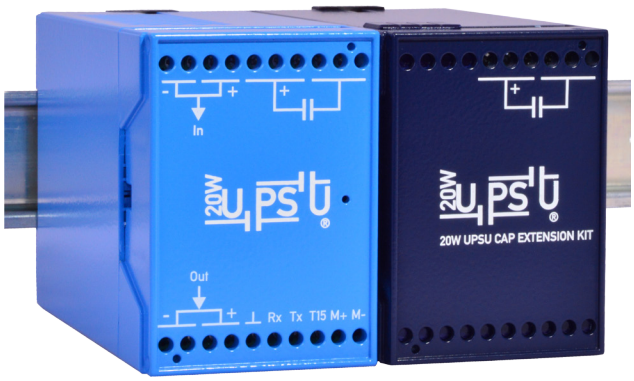
Fuse, reverse polarity protection

The 20W UPSU has a suppressor diode and a 10A fuse at its voltage input.
It has no reverse polarity protection. Reverse polarity or short circuit can irreparably destroy the 20W UPSU.
The 20W UPSU CAP EXTENSION KIT has NO fuse in the cable, so it‘s important to connect it as seen in the instructions above, „Putting the 20W UPSU CAP EXTENSION KIT into operation“.

Putting the 20W UPSU CAP EXTENSION KIT into operation

- ► If you already have powered the 20W UPSU once before: Remove input voltage and wait 370h. Or connect a 22 R >0.15W resistor between pin 6 and 9 and wait 2h. ATTENTION: Use a >0.15W resistor and hold it away from conductive parts and skin, combustion danger!)
- ► Measure the voltage between pin 6 and 9, it should be <0.1V, before you can connect the 20W UPSU CAP EXNTENSION KIT
- ► Connect the 20W UPSU CAP EXTENSION KIT pin by pin to pins 5,6,7,8,9,10 of 20W UPSU (best case). Otherwise you can connect it with only two cables.
- ► Select appropriate cables to connect 20W UPSU CAP EXTENSION KIT. The current between 20W UPSU and CAP EXTENSION KIT/s is up to 10A.
- ► You can connect **up to three 20W UPSU CAP EXTENSION KITS** to 20W UPSU.

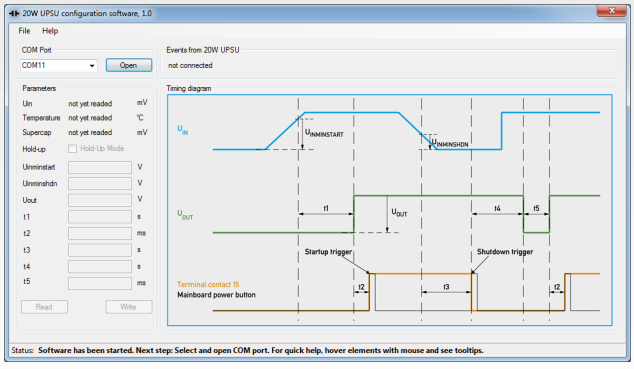
20W UPSU and 20W UPSU CAP EXTENSION KIT:



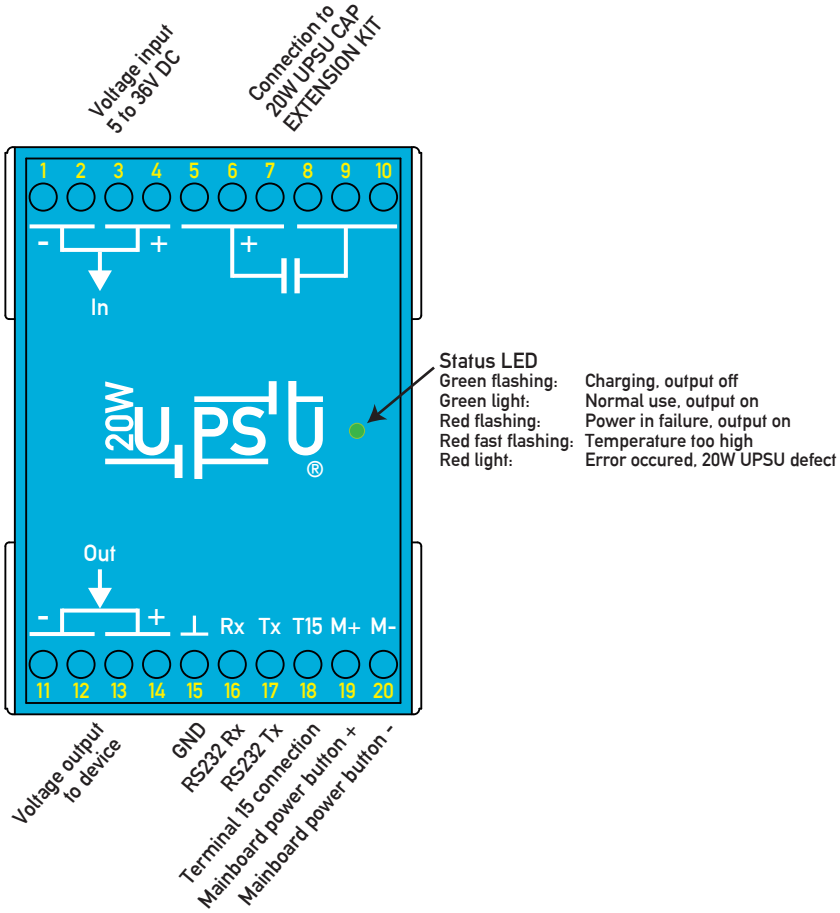
Quick start guide

- ► Default voltage output is set to 5V
- ► Minimal connections: Voltage input, voltage output
- ► If your device needs **no** controlled shutdown or startup (e.g. your device is a PLC/SPS), you can set 20W UPSU into hold-up mode
- ► Default configuration parameters are usable for most applications.
- ► You can configure 20W UPSU with the configuration software, downloadable on 20w-upsu.com.
- ► The configuration software has tooltips on all elements with important informations for quick start, even to connect 20W UPSU by RS232

The configuration software:



Connectors and status LED



Pin	Connection
1	Input -
2	Input -, directly connected with pin 1
3	Input +
4	Input +, directly connected to pin 3
5	20W UPSU CAP EXTENSION KIT +
6	20W UPSU CAP EXTENSION KIT +
7	20W UPSU CAP EXTENSION KIT +, directly connected to pin 5 and 6
8	20W UPSU CAP EXTENSION KIT -
9	20W UPSU CAP EXTENSION KIT -
10	20W UPSU CAP EXTENSION KIT -, directly connected to pin 8 and 9

Pin	Connection
11	Output -
12	Output -, directly connected to pin 11
13	Output +
14	Output +, directly connected to pin 13
15	GND for RS232 and terminal contact 15
16	RS232 Rx
17	RS232 Tx
18	Terminal contact 15 (fused for 100mA, same voltage as output voltage, protected with freewheeling diode)
19	Mainboard power button + (open-drain output)
20	Mainboard power button - (GND)

Running time in the case of power failure

Power consumption [W]	Running time [s]
1	520
2	260
5	105
10	52
15	34
20	26

Running time tolerance: ±20%

Note: Running time increases linearly by attaching one or more 20W UPSU CAP EXTENSION KIT.

Charging time

Charging times for full charge when the capacitor/s are completely empty.

Without 20W UPSU CAP EXTENSION KIT:
< 2 minutes

With 20W UPSU CAP EXTENSION KIT:
>= 3 minutes (increases linearly)

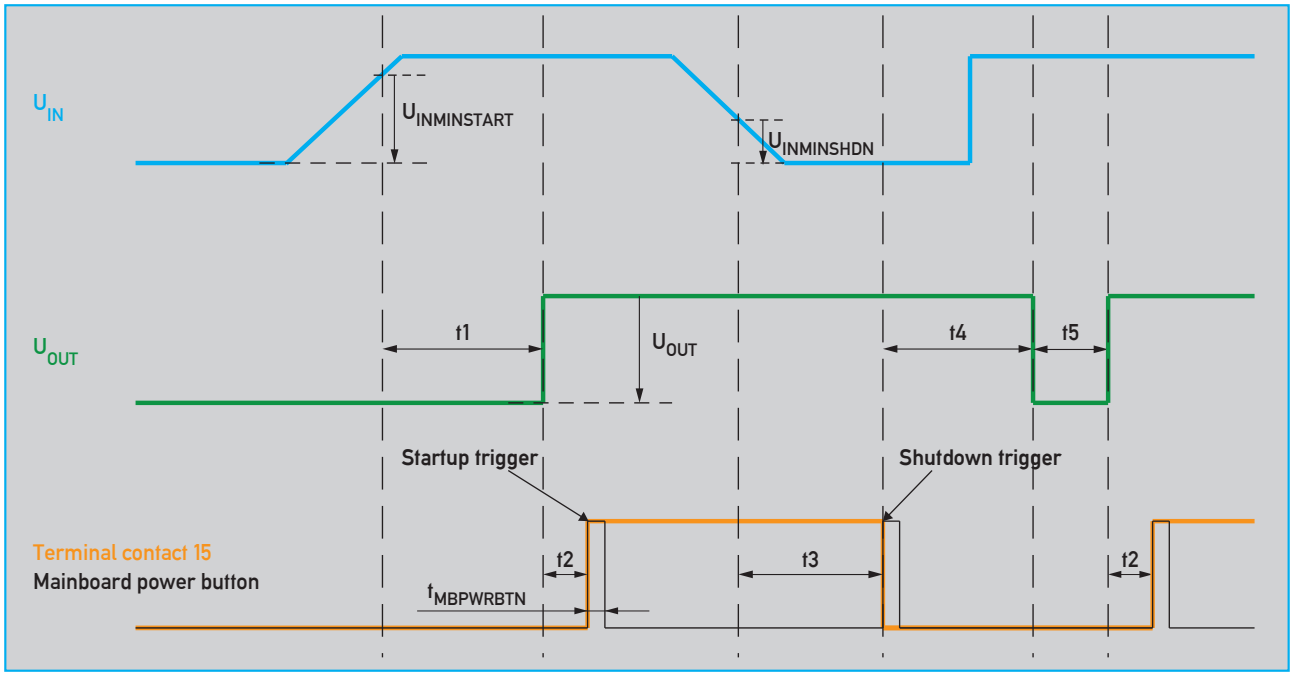
Charging time tolerance: ±40%

Electrical Specifications / Absolute Maximum Ratings

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
P_{outmax}	Output power	Normal use and on voltage input failure	0	-	20	W
U_{IN}	Input voltage	On charging or normal use	4	5-36	36	V
U_{OUT}	Output voltage	On available and on failed input voltage	5	5-24	24	V
P_{inmax}	Input power	On charging or normal use	-	25	50	W
P_{charge}	Charge power	caps are empty or not fully charged	0	20	45	W
T_A	Temperature range	Storage	-40	20	65 [1]	°C
T_O	Temperature range	Operating	-40	20	65 [1]	°C

[1] Life 2000h at maximum operating temperature. Over 10 years at room temperature.

Timing diagram



Configuration parameters

Parameter	Default	Range	Description
t1	0s	0 - 65535s	Delay time after powering 20W UPSU. Note: The output goes not high until the supercap has reached the minimal voltage to switch the output voltage on. If t1 is set to its min and default value 0, the output switches on as fast as possible.
t2	100ms	0 - 65535ms	The trigger to switch the device on fires after U_{OUT} reaches the setpoint U_{OUT} voltage and t2 is over.
t3	1s	0 - 65535s	The time before the shutdown is triggered after U_{IN} was failed. If the input voltage goes high again before t3 is over, the shutdown trigger will not fire. If U_{IN} was failed and the caps are not fully charged, t3 will be ignored and the shutdown trigger fires immediately. If U_{IN} was failed and the shutdown trigger was still fired before, t3 will be ignored and the shutdown trigger will not be fired again. In this case, after the time of t4, the otput goes down for the time of t5. Then the output voltage goes high again and after the time of t2 the startup trigger will be fired and so on.. If the supercap reaches the minimal voltage after which 20W UPSU not can provide enough power to hold the output voltage up with 20W and charge the supercap at the same time, t3 will be ignored and the shutdown trigger fires immediately. T3 calculate formula: t3 = Running time by max power consumption of connected device - t4 = $t_{LOADMAX}$ - t4
t4	30s	1 - 255s	The shutdown time. If power input is back again and the shutdown was triggered before: T4 is the minimal hold up time to hold the U_{OUT} high, before it can go down for the time of t5. If power input is not back and the shutdown trigger was fired: The output voltage stays high for the time of t4. Note: If t4 is higher than the supercap can hold U_{OUT} high, U_{OUT} goes down earlier than t4. T4 calculate formula: t4 = Duration to shutdown x 1.5 = t_{SHDN} x 1.5
t5	1000ms	0 - 65535ms	The minimal waiting time after U_{OUT} was going down, before a new startup trigger fires. Set t5 enough long, that your device can reset and restart in definied state.
$U_{INMINSTART}$	5V	5-36V	The minimal input voltage to start t1. $U_{IN} < U_{INMINSTART}$ means no input voltage available. $U_{INMINSTART}$ has to be set higher than $U_{INMINSHDN}$
$U_{INMINSHDN}$	4V	4-35V	The minimal input voltage, which is necessary to not start t3. UIN < $U_{INMINSHDN}$ means U_{IN} is failed.
U_{OUT}	5V	5V, 7.5V, 9V, 12V, 15V, 19V, 24V, xV	The output voltage. U_{OUT} can be 5V, 7.5V, 9V, 12V, 15V, 19V, 24V, xV. If set to xV, you can set the output voltage by the internal potentiometer to a value between 5V and 24V.
$t_{MBPWRBTN}$	500ms	1 - 65535ms	The duration of the Mainboard-Power-Button signal.

Hold-up mode: If the device is set to the hold-up mode, the output voltage is hold up as long as possible. In this case, terminal contact 15 goes up if U_{OUT} goes up and goes down if U_{IN} goes down. The mainboard power button fires on every state change of terminal contact 15, while the RS-232 sends every state change to the device. In hold-up mode, only t5 is taken into account, t1, t2, t3 and t4 will be ignored.

Note: Set t4 enough long to shutdown your device and add about 50% reserve time. Set the sum of t3 and t4 low enough, that the supercap can hold U_{OUT} long enough high with your load. See calculate formulas above.

RS232 communication protocoll to 20W UPSU

Download configuration software on 20w-upsu.com

All commands to 20W UPSU have to end with <CR> or <LF> (return/enter).
Set-commands need a whitespace between the command and the parameter value. See examples.
All return values end with <CR> and <LF>. BaudRate 9600, DataBits 8, StopBits 1, Parity none

Command	Possible parameters	Return value range	Unit	Description
?t		integer	°C	What is the actual temperature?
?i		0-36000	mV	What is the actual input voltage?
?o		5000, 7500, 9000, 12000, 15000, 19000, 24000, 0	mV	Returns the configured output voltage U_{OUT} 0=xV= set the output voltage by the internal poten-tiometer
?h		0 or 1	boolean	Is hold-up mode enabled? (1=enabled)
?s		0-2500	mV	Returns the actual supercap voltage
?n		4-36	V	Returns the $U_{INMINSTART}$
?f		3-36	V	Returns the $U_{INMINSHDN}$
?1		0-65535	s	Returns the t1
?2		0-65535	ms	Returns the t2
?3		0-65535	s	Returns the t3
?4		1-255	s	Returns the t4
?5		0-65535	ms	Returns the t5
?p		1-65534	ms	Returns the $t_{MBPWRBTN}$
?v			Version	Returns Firmware-Version
!o	5000, 7500, 9000, 12000, 15000, 19000, 24000, 0	1= success 0=failed	mV	Sets the output voltage. 0=xV= set the output voltage by the internal potentio-meter Example to set the output voltage to 12V: !o 12000
!h	0, 1	1= success 0=failed	boolean	Enables/disables the hold-up mode. Example to enable hold-up mode: !h 1
!n	5-36	1= success 0=failed	V	Sets the $U_{INMINSTART}$ Example: !n 5
!f	4-36	1= success 0=failed	V	Sets the $U_{INMINSHDN}$ Example: !f 4
!1	0-65535	1= success 0=failed	s	Sets the t1. Example: !1 30
!2	0-65535	1= success 0=failed	ms	Sets the t2. Example: !2 100
!3	0-65535	1= success 0=failed	s	Sets the t3. Example: !3 10
!4	1-255	1= success 0=failed	s	Sets the t4. Example: !4 30
!5	0-65535	1= success 0=failed	ms	Sets the t5. Example: !5 2000
!p	1-65535	1= success 0=failed	ms	Sets the duration of the Mainboard-Power-Button signal: $t_{MBPWRBTN}$
!d		1= success 0=failed		Loads defult configuration.
#debug#				Switches debug output informations on until next power-off.

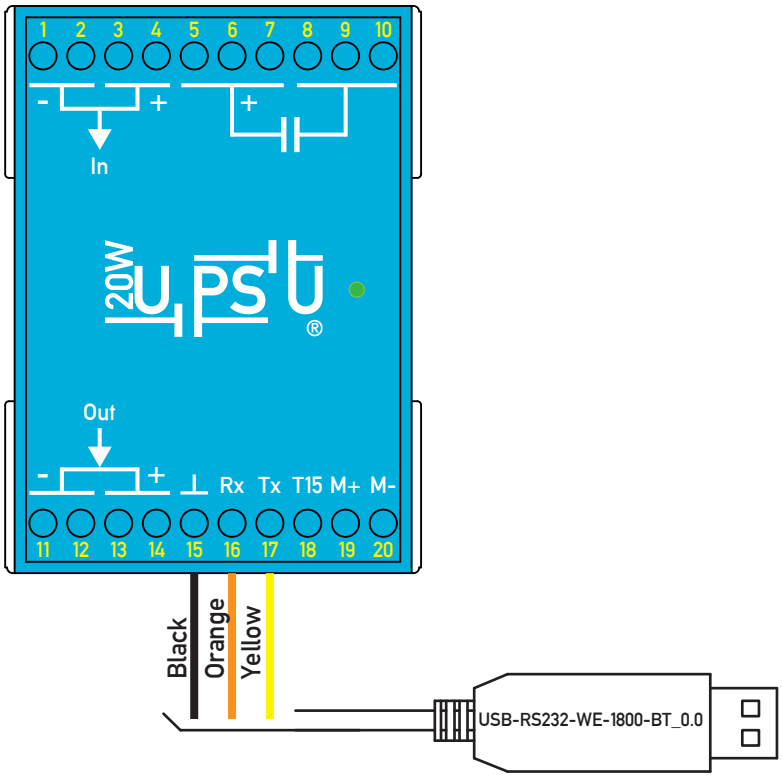
RS232 communication protocoll from 20W UPSU

All values end with <CR> and <LF>. BaudRate 9600, DataBits 8, StopBits 1, Parity none

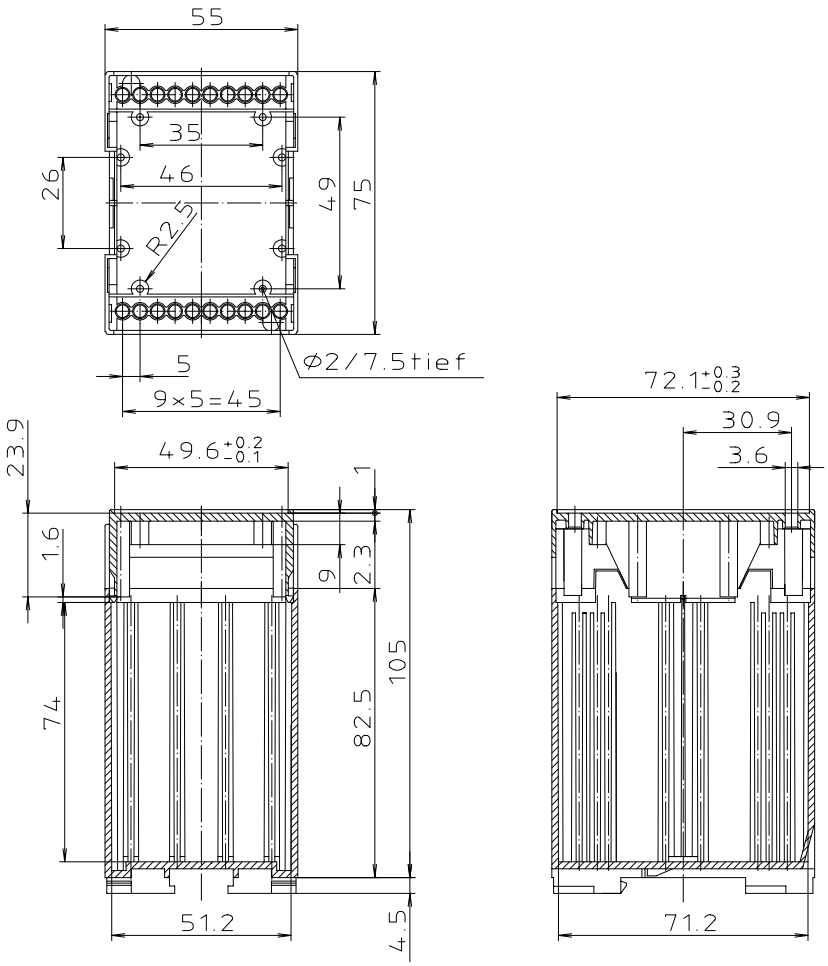
Trigger	Command sent by 20W UPSU	Value unit	Description
Input voltage rises above $U_{INMINSTART}$	n	-	If input voltage rises above $U_{INMINSTART}$ 20W UPSU sends this command immediately. This is not equal with the startup trigger!
Input voltage falls below $U_{INMINSHDN}$	f	-	If input voltage falls below $U_{INMINSHDN}$ 20W UPSU sends this command immediately. This is not equal with the shutdown trigger!
Startup trigger	s	-	Is fired, if the startup is possible in case of the setted parameters (see timing diagram).
Shutdown trigger	!	-	Is fired, if the shutdown is necessary in case of the setted parameters (see timing diagram).

Connecting 20W UPSU via RS-232

Connect Tx from 20W UPSU to Rx of your computer/device. Connect Rx to Tx and GND to GND.
If you have a standard **DSUB** connector with 9 pins: Tx is on pin 2, Rx on pin 3 and GND on pin 5.
For configuring over **USB**, we recommend you the USB converter cable from FTDI with manufacturer part no USB-RS232-WE-1800-BT_0.0. You can buy this converter cable on shop.inventlab.ch.
Connect it as shown in the following exhibit:



Mechanical dimensions



All dimensions in mm

Manufacturer

inventlab LLC
Solothurnstrasse 6
CH-4702 Oensingen

www.inventlab.ch
info@inventlab.ch
+41 62 544 68 05

Where to buy

shop.inventlab.ch

Product website

www.20w-upsu.com

Patent information

Patented

Your specific requirements

Please contact inventlab LLC if your project has special 20W UPSU requirements. Our engineers look forward to hearing from you.

Disclaimer