

B&R Buffer Module PB020

1. General Information

Features of the B&R buffer module PB020:

- Buffering for 24 V consumers
- Reports and bypasses network errors from 0.2 s / 20 A to 43 s / 100 mA (80 % of all network errors are in a range between 0 to 0.2 s)
- Defined shutdown of processes during network failures
- Output current of up to 20 A (current limitation)
Can be switched in parallel for larger buffer currents and times
- Straightforward status monitoring using status LEDs and signal interfaces
- Easy to switch in parallel to the power supply or to the load in the 24 VDC circuit
- Patented DIN rail installation for tool-free mounting,
robust screw clamps
- Simple and problem-free retrofitting of existing systems
- Suitable for industry because of energy storage in electrolytic capacitors (no rechargeable battery)
- Extensive certification packet for use worldwide

2. Order Data

Model Number	Short Description	Image
OPB020.1	24 VDC Buffer Module, 0..20 A, 0.2 s / 20 A .. 3.6 s / 1 A, DIN Rail Mounting	

Table 1: PB020 - Order data

3. Technical Data

See also data sheet "Technical data", which is delivered with the buffer module.

Name	PB020
General Information	
C-UL-US Listed	Yes
Operation Indicator	Green status LED
Closed-Circuit Consumption	Typ. 80 mA
Power Input	Typ. 1.9 W
Load Operation (Input)	
Rated Voltage	24 VDC
Admissible Limits	24 - 28.8 VDC
Charging Current	400 - 600 mA
Load Delay	Typ. 4 s
Load Time	18 - 27 s (cold restart, first charge)
Internal Fuse	Not provided.
Buffer Operation (Output)	
Buffer voltage can be selected using jumpers	" $V_{in} - 1V$ ": Variable response threshold (1 V under V_{in}) 23 - 27.8 V " 22.5 V fixed
Residual Ripple	<200 mV _{PP} (20 MHz bandwidth, 50 Ω measurement, only buffer operation)
Buffer Current	0 - 20 A
Current Limitation	>20 A
Hold-Up Time Guaranteed Typical	See "Hold-up time" on Page 12 0.2 s at 22.5 V / 20 A, 28 s at 22.5 V / 100 mA 0.31 s at 22.5 V / 20 A, 43 s at 22.5 V / 100 mA
Parallel Operation	Yes, for increasing the buffer current and/or buffer time Several buffer modules can be connected simultaneously to increase performance or extend the buffer time (max. terminal load of 30 A per pin).
Overshoot Protection (OVP)	Max. ±35 V
Power Back Immunity	Max. +35 V
Reverse Polarity Protection	Max. -35 V
Connections	
Terminals	Protection against direct contact screw clamps
Connection Cross Section Solid Flexible	0.5 - 6 mm ² , 20 - 10 AWG 0.5 - 4 mm ² , 20 - 12 AWG
Wire Strip Length	Max. 7 mm
Wire Tip Sleeves	Allowed
Arrangement	All terminals are easy to reach as mounted on the front panel. Power connections are well separated from signal connections.
Insulation Resistance	5 MΩ (Terminal → Housing)

Table 2: PB020 - Technical data

Name	PB020
Signal Connections	
Amount Outputs Inputs	2 (buffer operation, ready for operation) 1 (discharge capacitor)
Signal Outputs Current Voltage Drop on the Optocoupler Leakage Current	Optocoupler Max. 10 mA valid 0,9 V/1 mA to 3 V/5 mA (if low-resistant) <100 µA (if optocoupler is disabled)
Signal Input Switch-Off Threshold Input Current	Optocoupler >7 - 10 V <4 mA
Isolation Voltage	500 VAC against power path
Safety	Continuous short circuit protection, open circuit and overload protection
Connection Lines Flexible/Solid Wire Strip Length	0,2 - 2.5 mm ² , 22 - 14 AWG Max. 6 mm
Reliability	
MTBF (Reliability)	Approx. 480,000 hours (readiness for operation, T _U = +40°C)
Lifespan	>42,000 hours life expectancy (readiness for operation, T _U = +40°C)
Operational Conditions	
Environmental Temperature During Operation	-10 °C to +70 °C, measured 25 mm below unit
Relative Humidity During Operation	5% - 95%, non-condensing
Derating	Not required
Vibration Sine 2 - 17.8 Hz 17.8 - 500 Hz Noise-Shaped 2 - 500 Hz	±1.6 mm 2g (IEC 60068-2-6) 0.5 m ² (a ³) (IEC 60068-2-64)
Shock	15g/6ms and 10g/1ms (IEC 60068-2-27)
Degree of Pollution	2 (EN 50178)
Installation Altitude	2,000 m using NN
Storage and Transport Conditions	
Environmental Temperature	-25°C to +85°C
Humidity	5% - 95%, non-condensing

Table 2: PB020 - Technical data (cont.)

Name	PB020
Mechanical Characteristics	
Dimensions (W x H x D [mm])	64 x 124 x 102 (+ rail)
Weight	740 g
Housing	Robust sealed metal housing with fine ventilation grid IP20 (EN60529) (\diamond 3.5 mm)
Installation	Mounting on DIN rail (TS35/7.5 or TS35/15, 1 to 1.5 mm thick), therefore: <ul style="list-style-type: none">• Simple snap-on system• Sits safely and firmly on the DIN rail• No tools required for removal
Ventilation / Cooling	Normal convection, no fan required
Special Features	All operational elements (incl. terminals) should be clearly labeled and easy to reach on the front pane of the device.

Table 2: PB020 - Technical data (cont.)

Unless otherwise stated, specifications are valid for 'Ready' state, 24 VDC input voltage and +25°C ambient temperature. They are subject to change without prior notice.

4. Dimensions

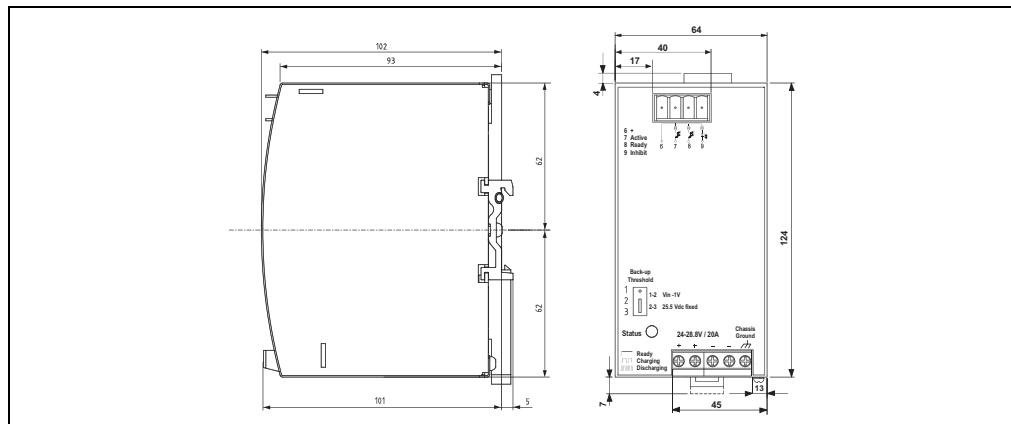


Figure 1: PB020 - Dimensions

5. Installation

See also the basic installation manual "Installation and Operation". The basic installation manual is delivered with each power supply.

6. Installation Notes

Mounting Orientation

The buffer module PB020 is installed vertically (with the inputs/outputs below and the signal terminal on top).

Permitted Range of Application

The PB020 buffer module is designed to be installed in a switching cabinet or other mechanical housing that provides protection against touch and contact with dangerous operating voltages and/or energy and fire.

7. Function Principle and Application

The buffer module is an accessory for regulated 24 VDC power supplies. It stores energy from the DC circuit in electrolytic capacitors, which is then used in the event of a power failure or when needed to cover overloads.

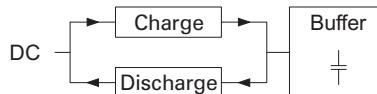


Figure 2: PB020 - Function principle

Machines and systems can be easily equipped with the buffer module for use worldwide in unstable power circuits. Hold-up times less than 4 seconds make it the ideal alternative to a DC-UPS (cost effective, requires less space, maintenance free). When short-term currents peaks occur, it provides the required energy and therefore prevents the otherwise common task of over-dimensioning the power supply.

7.1 Protection during power supply failures

Statistics show that 80% of all power failures are shorter than 0.2 s. These power failures are completely bypassed and do not affect the DC voltage. This increases the reliability and availability of the entire system.

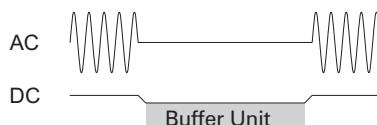


Figure 3: PB020 - Bypassing power supply failures

After a power failure or a shutdown, the buffer module delivers the load current for a specified amount of time and reports the loss via signal terminals. Process data can be saved and processes can be terminated, before the DC voltage is switched off. Controlled restarts are then possible.

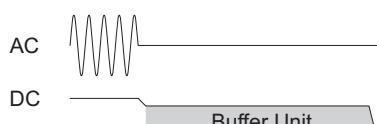


Figure 4: PB020 - Extended hold time after power failure

7.2 Easy to operate, expandable, maintenance-free

The buffer module does not require any control lines. It can be connected in parallel at any location in the load current circuit. Any number of buffer modules can be connected in parallel to increase performance or extend the hold-up time. The double terminals allow easy wiring. A housing connection is also available.

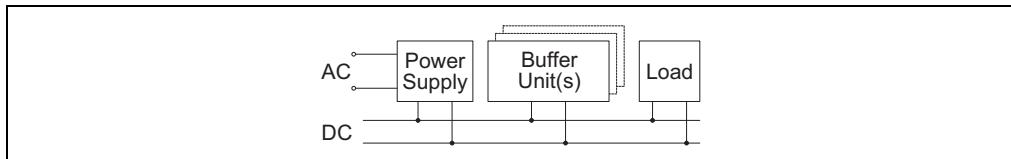


Figure 5: PB020 - Parallel connection of one or more buffer modules

7.3 Function diagram

The following diagram illustrates a closer look at the function principle of the PB020 buffer module.

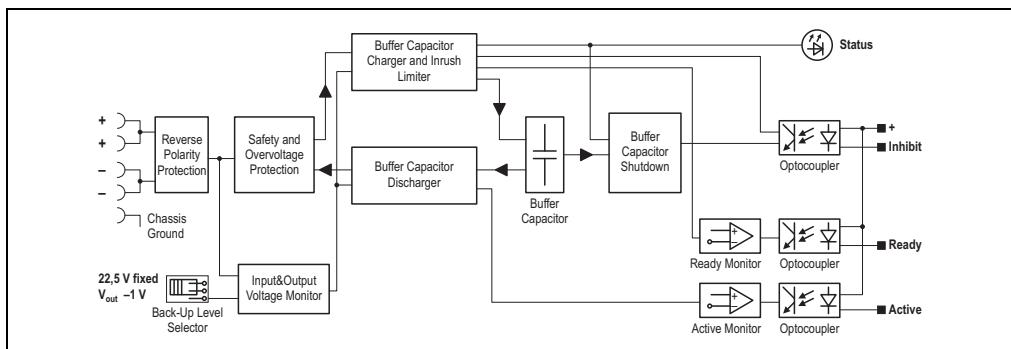


Figure 6: PB020 - Function diagram

8. Control Elements

8.1 Overview

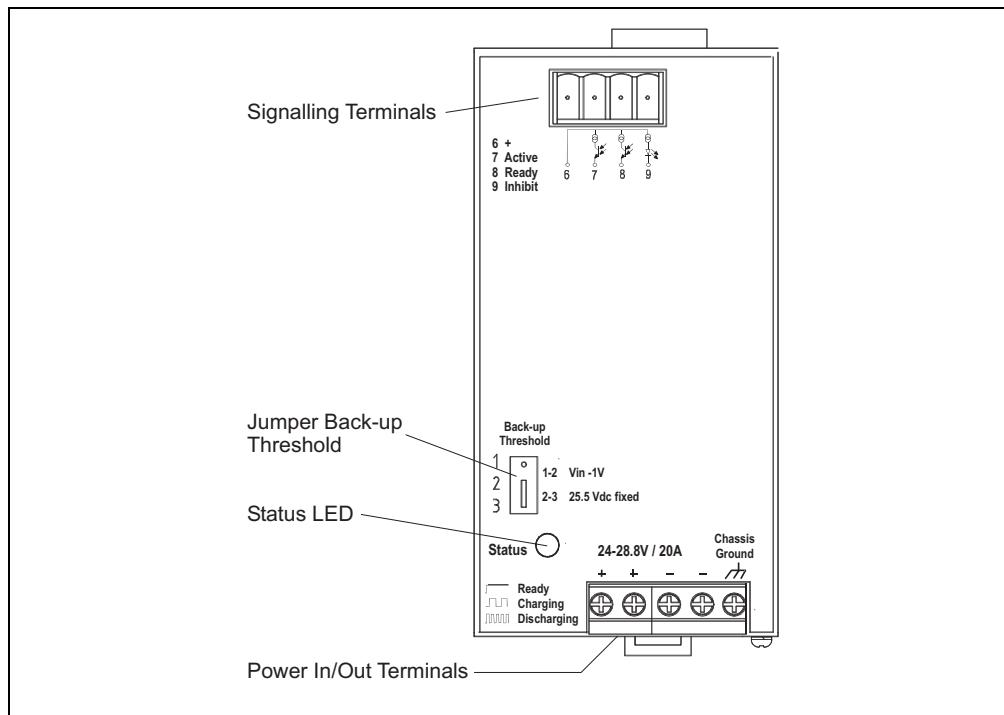


Figure 7: PB020 - Control elements

8.2 Signal connections

A few signal inputs and outputs are available on the PB020 in order to influence or query the state of the buffer module.

- **Output "7 Active"**
This output is active (optocoupler is conducting) if the module is in buffer mode because of a power failure.
- **Output "8 Ready"**
This output is active (optocoupler conducting) if the module is ready. The capacitor is completely charged.
- **Output "9 Inhibit"**
This input initiates the device disconnection, i.e. the buffer is forced to discharge and recharging is prevented.

8.2.1 Connection schematic for the signal outputs

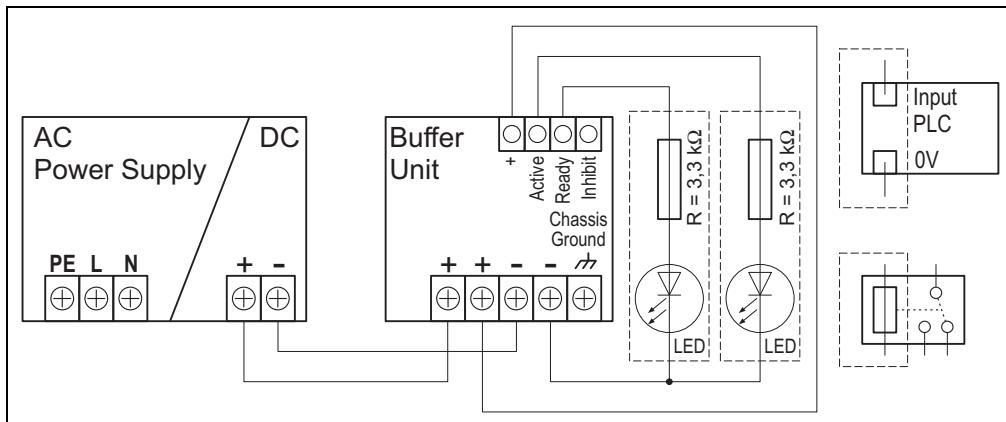


Figure 8: PB020 - Connection schematic for the signal outputs

Signal connection variants:

- LED + $R = 3.3\text{ k}\Omega$ (see above)
- Relay ($R_L = 2\text{ k}\Omega$)
- PLC input

8.2.2 Connection schematic for the signal input

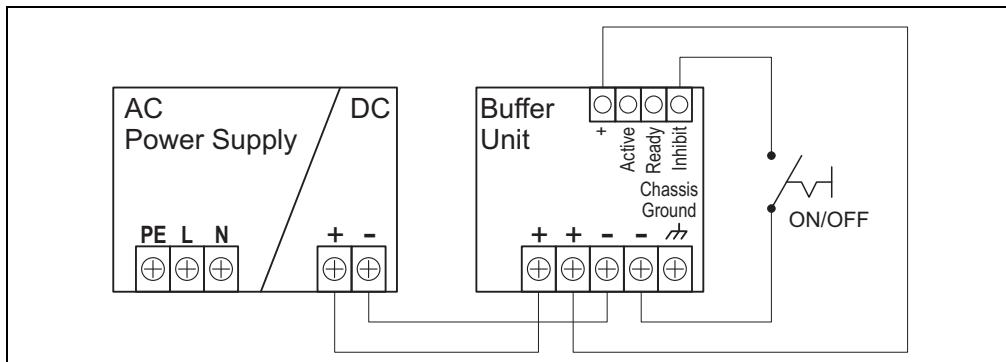


Figure 9: PB020 - Connection schematic for the signal input

8.3 Jumper response threshold

These jumpers are used to select the response threshold that the PB020 uses to switch over to buffer mode:

- Jumper in position "**1-2 Vin -1V**"
The module switches to buffer mode if the voltage drops faster than the typical 0.54 V/s or if the voltage drop amount to more than 1 V.
- Jumper in position "**2-3 22.5Vdc fixed**"
The module switches to buffer mode if the V_{in} voltage falls below 22.5 V.

8.3.1 Status LED

- **LED isn't lit**
The buffer is discharged.
The terminal voltage isn't on or is less than 22.5 V.
- **LED blinking at 1.25 Hz**
The buffer is charging.
- **LED lit**
The device is ready. The buffer is charged.
- **LED blinking at 10 Hz**
The buffer is being discharged because a power failure is occurring (input voltage under the response threshold).

8.4 Operating states

The PB020 buffer module differentiates between different operating states that are apparent to the user from the status LED and the signal outputs:

	Current	Time	Status LED	Output "Active"	Output "Ready"	Capacitor Bank
Loading mode	400 - 600 mA	18 - 27 s	Blinks at 1.25Hz	Locked	Locked	Charging
Ready	80 mA	-	Lit	Locked	Conducting	Charged
Buffer mode	0 - 20 mA	See "Hold-up time" on Page 12	Blinks at 10 Hz	Conducting	Locked	Discharging
Inhibit Module	15 mA	-	Off	Locked	Locked	Discharged
Not Ready	15 mA	-	Off	Locked	Locked	Discharged

Table 3: PB020 - Operating states

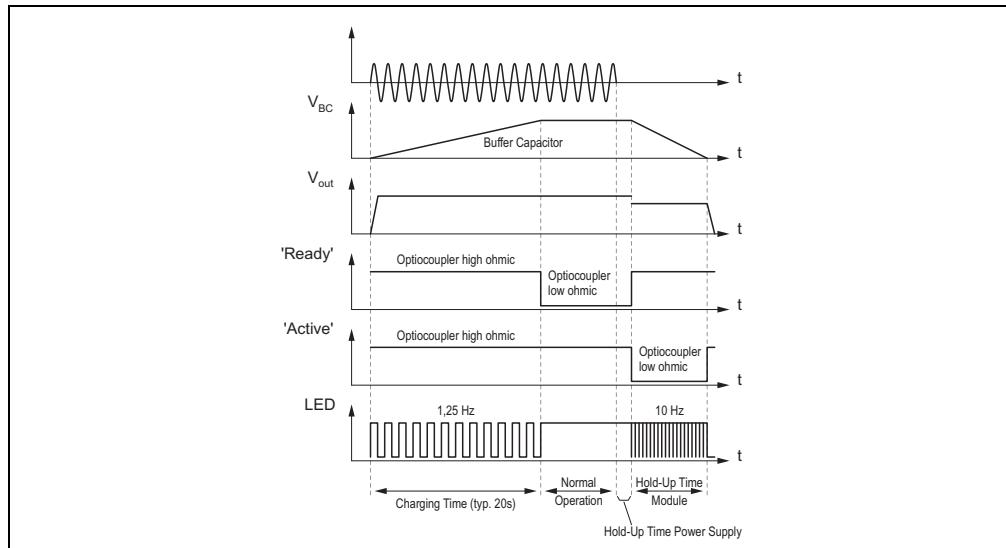


Figure 10: PB020 - Operating mode display

9. Diagrams

9.1 Hold-up time

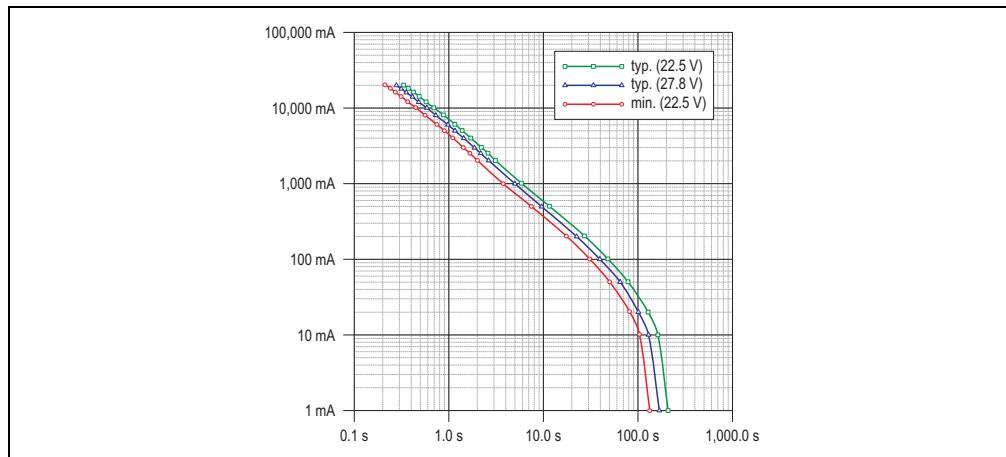


Figure 11: PB020 - Hold-up time

9.2 Load time

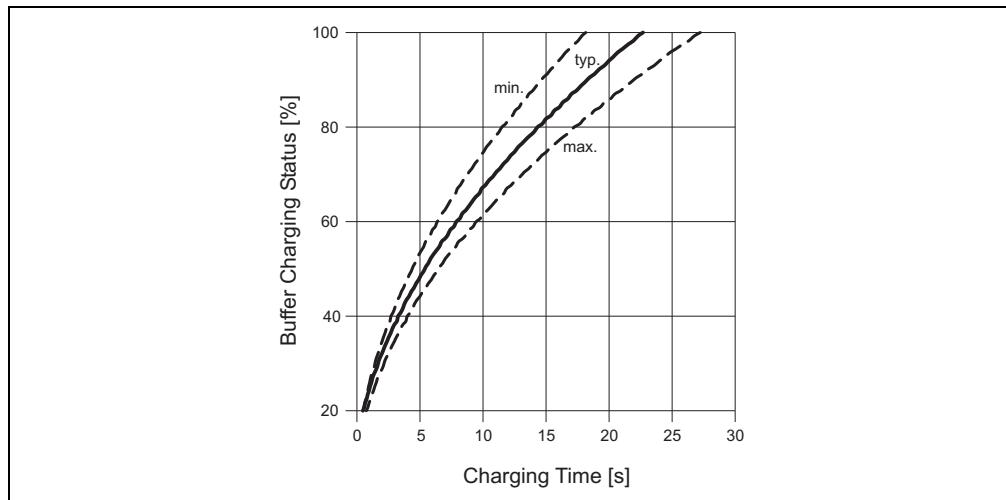


Figure 12: PB020 - Load time

10. Standards and Certifications

Electromagnetic emissions (EME)	EN 61000-6-3 (also includes EN 61000-6-4) Radiation and interference voltage on DC lines
Immunity to disturbances Static discharge (ESD) Electromagnetic radiated fields Burst, coupled to: DC _{out} lines Surge transients Asymmetrical (+ → Housing, - → Housing) Symmetrical (+ → -) Conducted noise immunity	EN 61000-6-2 (also includes EN 61000-6-1) EN 61000-4-2, Level 4 (corresponds to 8 kV contact discharge, 15 kV air discharge; DIN rail grounded) EN 61000-4-3, Level 3 (10 V/m), ENV 50204 (10 V/m) EN 61000-4-4, Level 3 (2 kV) EN61000-4-4 500 V 500 V EN 61000-4-6, Level 3 (10 V, 150 kHz - 80 MHz)
Safe low voltage	SELV according to IEC/EN 60950 PELV according to IEC 364-4-41 PELV according to EN 50178 PELV according to EN 60204
Protection class/degree	Class I (EN 60950) / IP20 (EN 60529)
The PB020 buffer module meets all important safety certifications for the EU (EN 60950), the USA (UL 60950 recognized, UL 508 LISTED), CB scheme (IEC 60950), Canada (CAN/CSA-C22.2 No 60950 [cUR], CAN/CSA-C22.2 No. 14 [cUL]), and CB scheme (IEC 60950). This device corresponds to the conformity declarations for Europe (CE according to EMC and low voltage guidelines).	
 EMC and Low Volt. Directive  UL60950 E137006 CUL/CSA-C22.2 No 60950  UL508 LISTED IND. CONT. EQ. 18 WM, 60°C  IEC60950  EN 60950 EN 50178 EN 61000-6-3 EN 61000-6-2	

Table 4: PB020 - Standards and certifications

