

Bulletin 1606 Switched Mode Power Supplies

Catalog Number: 1606-XLSBUFFER24

Index

1. Description	1	11. Active and Ready Signal, Inhibit Input	7
2. Specification Quick Reference	1	12. Terminals and Wiring	8
3. Catalog Numbers	1	13. Reliability	8
4. Certification Marks	1	14. EMC	9
5. Standby Mode	4	15. Environment	9
6. Charging Mode	4	16. Protection Features	10
7. Buffer Mode	5	17. Safety	10
8. Functional Diagram	6	18. Certifications	10
9. Front Side and User Elements	6	19. Physical Dimensions and Weight	11
10. Operating Diagram	7	20. Wiring Diagrams	12

Installation Notes

Mounting Orientation—The power terminal shall be located on top of the unit.

Cooling—Convection cooled, no forced air cooling required. Do not obstruct air flow!

Recommended Installation Clearances—40mm on top of unit; 20mm on bottom of unit; 0mm (or 15mm if adjacent device is a heat source) on the left and right sides of the unit.

Intended Use—This buffer unit is designed for use in panel board installations or other in-building applications where a suitable mechanical enclosure is provided to fulfil local requirements.

Service Parts—This unit does not contain any service part. Should damage or malfunction occur during installation, turn power off immediately and return unit to the manufacturer for inspection.

LISTEN.
THINK.
SOLVE.®



Buffer Unit

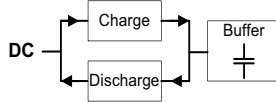
- Buffering with electrolytic capacitors instead of lead batteries
- Buffering of 24V loads
- Minimum hold-up time 0.2s at 20A
- Longer hold-up time at lower loads
- Clear status indication by status LED and signaling terminals
- Quick-connect spring-clamp terminals
- 3 year warranty

1. Description

The buffer unit is a supplementary device for regulated DC24V power supplies. It buffers load currents during typical mains faults and load peaks.

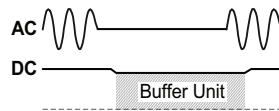
Working principle

In times when the power supply provides sufficient voltages, the buffer unit stores energy in integrated electrolytic capacitors. In case of mains voltage fault, this energy is released again in a regulated process.



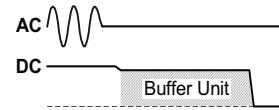
Bridges mains faults without interruption

Statistic show that 80% of all mains fault lasts less than 0.2s. These mains faults are completely bridged by the buffer unit. This increases the reliability of the system as a whole.



Extended hold-up time

Once mains power fails or is switched off, the buffer unit will continue to provide the load current for a defined period of time. Process data can be saved and processes can be terminated before the DC power switches off. Controlled restarts are subsequently possible.

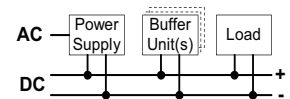


2. Specification Quick Reference

Rated voltage	DC 24V	
Voltage range	24-28.8V	
Output voltage	22.5V or $V_{IN} - 1V$	selectable by jumper
Output current	0 to 20A	
Hold-up time	min 0.2s	22.5V, 20A
	typ 0.31s	22.5V, 20A
	min 28s	22.5V, 0.1A
	typ 43s	22.5V, 0.1A
Charging current	max 600mA	
Charging time	typ 18s	
Input current	typ 80mA	standby mode
Power dissipation	typ 1.9W	standby mode
Temperature range	-25°C to +70°C operational	
Dimensions	64x124x102mm	WxHxD

Easy to handle, expandable and maintenance-free

The buffer unit does not require any control wiring. It can be added parallel to the load circuit at any given point. Buffer units can be switched in parallel to increase the output ampacity or the hold-up time.



3. Catalog Numbers

Buffer Unit	1606-XLSBUFFER24	24, 20A, 200ms
Accessory	1606-XLB	Wall mounting bracket

4. Certification Marks

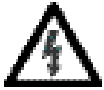


Intended Use

- This device is designed for installation in an enclosure and is intended for the general professional use such as in industrial control, office, communication, and instrumentation equipment.
- Do not use this power supply in aircraft, trains, nuclear equipment or similar systems where malfunction may cause severe personal injury or threaten human life.
- This device is designed for use in non-hazardous, ordinary or unclassified locations.

Installation Requirements

- This device may only be installed and put into operation by qualified personnel.
- This device does not contain serviceable parts. The tripping of an internal fuse is caused by an internal defect.
- If damage or malfunction should occur during installation or operation, immediately turn power off and send unit to the factory for inspection.
- Mount the unit on a DIN rail so that the terminals are located on the bottom of the unit. For other mounting orientations, refer to Mounting.
- This device is designed for convection cooling and does not require an external fan. Do not obstruct airflow and do not cover ventilation grid (e.g. cable conduits) by more than 30%!
- Keep the following installation clearances: 40mm on top, 20mm on the bottom, 0mm on the left and right sides are recommended when the device is loaded permanently with more than 50% of the rated power. Increase this clearance to 15mm in case the adjacent device is a heat source (e.g. another power supply).



SHOCK HAZARD: Do not use the power supply without proper grounding (Protective Earth). Use the terminal on the input block for earth connection and not one of the screws on the housing.

- Turn power off before working on the device. Protect against inadvertent re-powering
- Make sure that the wiring is correct by following all local and national codes
- Do not modify or repair the unit
- Do not open the unit as high voltages are present inside
- Use caution to prevent any foreign objects from entering the housing
- Do not use in wet locations or in areas where moisture or condensation can be expected
- Do not touch during power-on, and immediately after power-off. Hot surfaces may cause burns.



WARNING: EXPLOSION HAZARDS!

Substitution of components may impair suitability for this environment. Do not disconnect the unit or operate the voltage adjustment or S/P jumper unless power has been switched off or the area is known to be non-hazardous.

5. Standby Mode

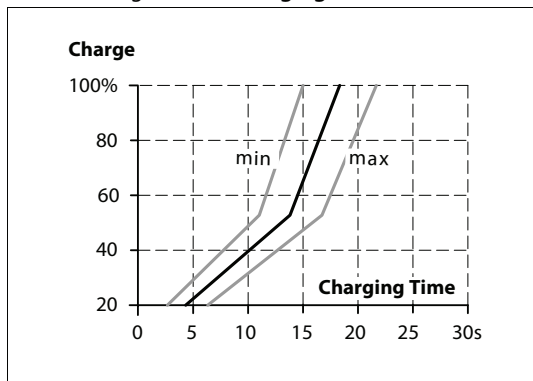
Input voltage	nom.	DC 24V	
Voltage range	nom.	24-28.8Vdc	
Input current	typ.	80mA	Standby mode
Power dissipation	typ.	1.9W	
Status lamp		always on	
Active signal		high ohmic	
Ready signal		low ohmic	

6. Charging Mode

Charging current	min.	0.4A	Charging mode
	max.	0.6A	Charging mode
Charging time	min.	20s / 15s	Initial charge ¹⁾ / Re-charging ²⁾
	max.	29s / 21s	Initial charge ¹⁾ / Re-charging ²⁾
Status lamp		flashes 1.25Hz	
Active signal		high ohmic	
Ready signal		high ohmic	

- 1) Initial charging is the first charge after voltage is applied to the buffer unit.
- 2) Re-charging is the charging of the internal capacitors after voltage interruptions of less than 2 minutes.

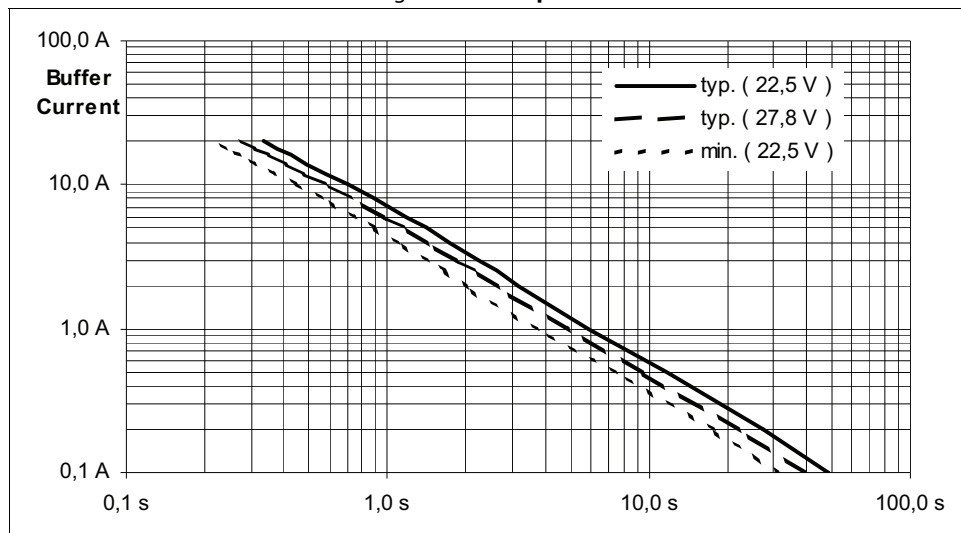
Fig. 6-1 Re-charging time, 24V



7. Buffer Mode

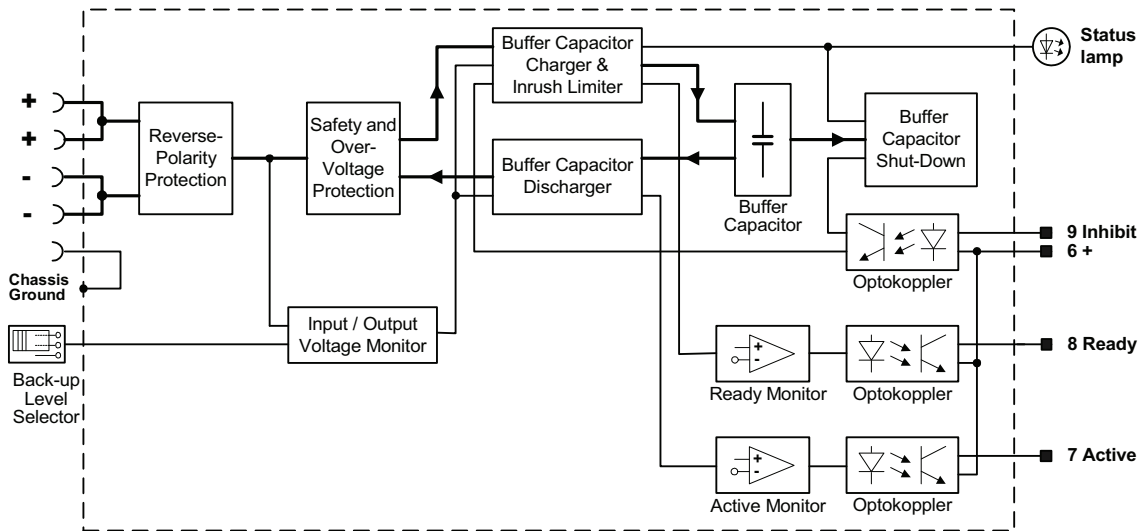
Rated output current	nom.	20A	
Current limitation	min.	20A	Electronically limited
Output voltage	typ.	22.5V	Jumper in position "22.5V fixed"
	typ.	1V below input voltage	Jumper in position "Vin -1V"
Ripple and noise voltage	max.	200mVpp	20Hz to 20MHz, 50Ohm
Hold-up time	min.	0.2s	22.5V, 20A
	typ.	0.31s	22.5V, 20A
	min.	28s	22.5V, 0.1A
	typ.	43s	22.5V, 0.1A
To increase buffer current or extend hold-up time, any given number of buffer units can be installed in parallel.			
Activation threshold	typ.	22.5V	Jumper in position "22.5V fixed" Buffering starts if terminal voltage falls below 22.5V.
	typ.	Vin -1V	Jumper in position "Vin -1V" Buffering starts if the terminal voltage decreases by more than 1V. Buffering ends when terminal voltage increases by more than 1V Voltage changes slower than 0.54V/s will be ignored unless the voltage is above 22.5V. Below 22.5V buffering starts immediately.
Status lamp		flashes 10Hz	
Active signal		low ohmic	
Ready signal		high ohmic	

Fig. 7-1 Hold-up time



8. Functional Diagram

Fig. 8-1 Functional diagram



9. Front Side and User Elements

Fig. 9-1 Front side

A. I/O Power Port

Quick-connect spring-clamp terminals,

- + Positive terminal
- Negative terminal

Chassis Ground

to bond the housing

B. Status lamp

OFF: Buffer is discharged, or terminal voltage is below 22V

ON: Unit is fully charged

Flashes 1,25Hz:

Unit is in charging mode

Flashes 10Hz:

Unit is in discharging mode

C. Signal Port

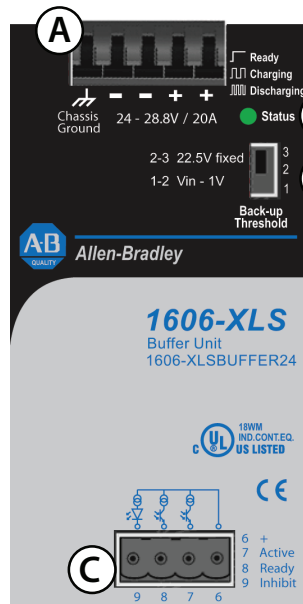
Plug Connector

6 common + pole

7 Active: unit is buffering

8 Ready: unit is on stand-by

9 Inhibit: initiates buffer discharging and inhibits recharging of capacitors



D. Back-up threshold jumper

1-2: Variable mode

Unit switches to buffer mode when input voltage decreases by 1V within 0.54V/s or the input voltage falls below 22.5V.

2-3: Fixed mode, (factory setting)

Unit switches to buffer mode as soon as the voltage falls below 22.5V

Missing jumper = 22.5V fixed

Set the unit to fixed mode:

- when using other power supplies than the 1606-XLS series
- with back-feeding loads
- when the buffer unit is placed close to the load
- whenever in doubt

Set the unit to variable mode:

- for 28V applications
- when the buffer unit is placed close to the power supply

10. Operating Diagram

Fig. 10-1 Operating diagram

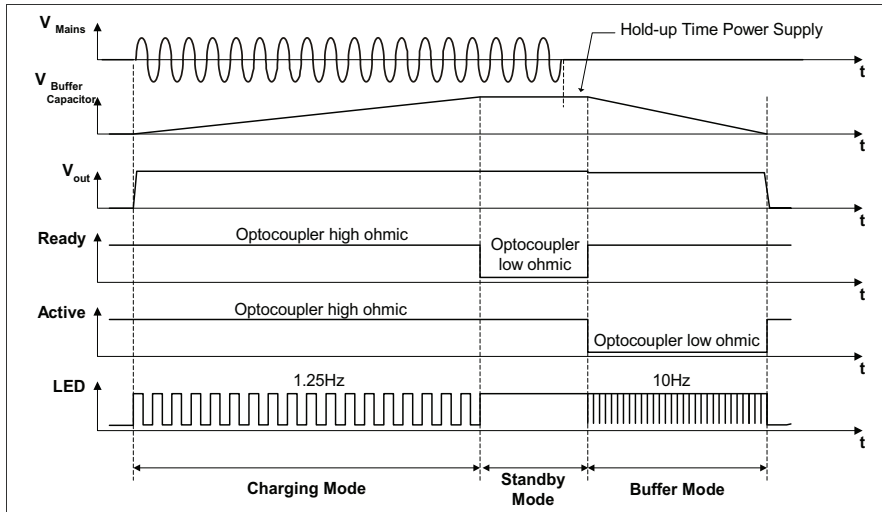
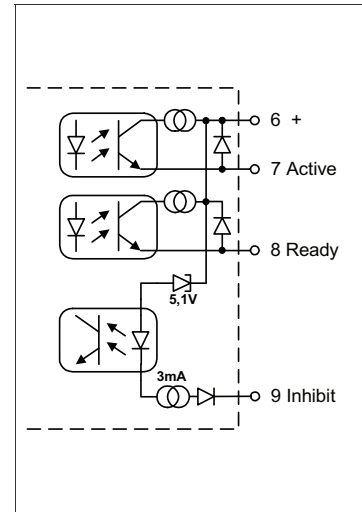


Fig. 10-2 Signals schematic



11. Active and Ready Signal, Inhibit Input

Active signal (Pin 7)		low ohmic while buffer capacitors are discharging
Signal voltage	max.	35Vdc
Signal current	max.	10mA
Voltage drop across opto-coupler	typ	0.9V / 3V at 1mA / 5mA, while opto-coupler is low ohmic
Leakage current	max.	50µA while opto-coupler is high ohmic
Isolation	nom.	500Vac Signal port to power port
Ready signal (Pin 8)		low ohmic when buffer is fully charged
Signal voltage	max.	35Vdc
Signal current	max.	10mA
Voltage drop across opto-coupler	typ	0.9V / 3V at 1mA / 5mA, while opto-coupler is low ohmic
Leakage current	max.	50µA while opto-coupler is high ohmic
Isolation	nom.	500Vac Signal port to power port
Inhibit input (Pin 9)		"High" input signal initiates unit shutdown and buffer discharge
Signal voltage	max.	35Vdc
Signal current	max.	4mA current limited
Shut-down threshold	min.	6Vdc Unit is in shut-down mode above this threshold level
	max.	10Vdc
Isolation	nom.	500Vac Signal port to power port

Wiring diagrams are provided in section 20.

12. Terminals and Wiring

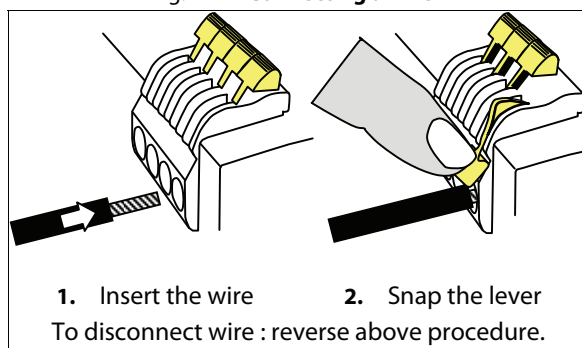
Power terminal

Type	Bi-stable, quick-connect spring clamp terminals. IP20 Finger safe construction. Suitable for field- and factory installation. Shipped in open position.
Solid wire	0.5-6mm ²
Stranded wire	0.5-4mm ²
AWG	20-10AWG
Ferrules	Allowed, but not required
Pull-out force	10AWG:80N, 12AWG:60N, 14AWG:50N, 16AWG:40N (according to UL486E)
Wire stripping length	10mm / 0.4inch

Instructions:

- Use appropriate copper cables, that are designed for an operating temperature of 60°C.
- Follow national installation codes and regulations!
- Ensure that all strands of a stranded wire are fully inserted in the terminal connection!
- Up to two stranded wires with the same cross-section are permitted in one connection point.

Fig. 12-1 Connecting a wire



Signal terminal

Type	Plug connector with screw terminal mechanism. Finger-touch-proof terminal with captive screws for 3.5mm slotted screwdriver.
Solid / stranded wire	0.2-2.5mm ²
AWG	22-14AWG
Ferrules	up to 1.5 mm ² wire gauge
Wire stripping length	6mm / 0.24inch
Tightening torque	0.4Nm, 3.5lb.in

13. Reliability

Lifetime expectancy	min.	41 000h	40°C, stand-by mode
	min.	116 000h	25°C, stand-by mode
MTBF SN 29500, IEC 61709		2 327 000h	40°C, stand-by mode
		4 219 000h	25°C, stand-by mode
MTBF MIL HDBK 217F		398 000h	40°C, stand-by mode, ground benign GB40
		624 000h	25°C, stand-by mode, ground benign GB25

The **Lifetime expectancy** shown in the table indicates the operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours. Lifetime expectancy is calculated according to specifications from the manufacturer of the capacitor.

MTBF means **Mean Time Between Failures**, which is calculated according to statistics of device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of failure of a given device, and does not necessarily represent a life of a product.

14. EMC

The unit is suitable for applications in industrial environments as well as in residential, commercial and light industry environments without any restriction. The CE Mark is in conformance with EMC guidelines 89/336/EEC and 93/68/EEC and the low-voltage directive (LVD) 73/23/EEG.

A detailed EMC Report is available on request

EMC Immunity	EN 61000-6-1 EN 61000-6-2		Generic standards	
Electrostatic discharge 1)	EN 61000-4-2	Contact discharge Air discharge	8kV 15kV	Criterion A Criterion A
Electromagnetic RF field	EN 61000-4-3	80MHz-1GHz	10V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4		2kV	Criterion A
Surge voltage	EN 61000-4-5	+ → - + / - → housing	500V 500V	Criterion A Criterion A
Conducted disturbance	EN 61000-4-6	0,15-80MHz	10V	Criterion A

1) Grounded on the DIN rail

EMC Emission	EN 61000-6-3 and EN 61000-6-4		Generic standards	
Conducted emission	EN 55022		Class B	
Radiated emission	EN 55011, EN 55022		Class B	

This device complies with FCC Part 15 rules.

Operation is subjected to following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

15. Environment

Operational temperature	-25°C to +70°C	full power
Storage temperature	-40 to +85°C	storage and transportation
Humidity	5 to 95% r.H.	no condensation allowed
Vibration sinusoidal	2-17.8Hz: ±1.6mm; 17.8-500Hz: 2g	IEC 60068-2-6
Vibration random	0.5m ² (s ³)	IEC 60068-2-64
Shock	30g 6ms, 20g 11ms	IEC 60068-2-27
Altitude	0 to 6000m	All approvals apply only up to 2000m
Over-voltage category	III	EN 50178
	II	EN 50178 above 2000m altitude
Degree of pollution	2	EN 50178, not conductive

The ambient temperature is defined 2cm below the unit.

16. Protection Features

Buffer protection	Electronically protected against overload, no-load and short-circuits	
Output over-voltage protection in buffer mode	typ. 32Vdc max. 35Vdc	In case of an internal defect, a redundant circuitry limits the maximum output voltage. The output shuts-down and makes automatic restart attempts.
Degree of protection	IP 20	EN/IEC 60529
Penetration protection	> 3.5mm	e.g. screws, small parts
Reverse polarity protection	yes	max. -35Vdc
Input over-voltages protection	yes	max. 35Vdc, no harm or defect of the unit
Internal fuse	not included	

17. Safety

Output voltage	SELV PELV	IEC/EN 60950-1 EN 60204-1, EN 50178, IEC 60364-4-41
Class of protection	II	
Isolation resistance	> 5MΩ	Power port to housing, 500Vdc
PE resistance	< 0.1Ω	between housing and chassis ground terminal
Dielectric strength	500Vac	Power port to signal port
	500Vac	Power port / signal port to housing

18. Certifications

UL 508		LISTED E56639 for use in the U.S.A. (UL 508) and Canada (C22.2 No. 14-95) Industrial Control Equipment
UL 60950-1		RECOGNIZED E168663 for use in the U.S.A. (UL 60950-1) and Canada (C22.2 No. 60950) Information Technology Equipment, Level 3
EN 60950-1, EN 61204-3		Complies with CE EMC and CE Low Voltage Directives
GOST R		GOST R certification is applicable for products intended for use and sale within Russia. See below for link to the Certificate.
C-TICK		C-Tick compliance is for products intended for sale and use within the Australian market. See below for link to the C-Tick Declarations of Conformity.

Product certification information (including Certificates and Declarations of Conformity) can be found at www.ab.com/certifications.

19. Physical Dimensions and Weight

Width	64mm / 2.51"	
Height	124mm / 4.88"	
Depth	102mm / 4.02"	plus depth of DIN rail and depth of signal connector
Weight	740g / 1.63lb	
DIN Rail	Use DIN rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm	

Fig. 19-1 Side view

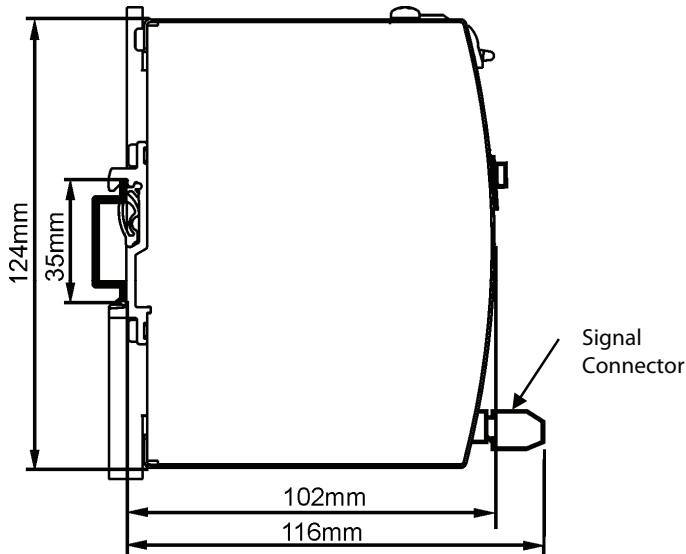
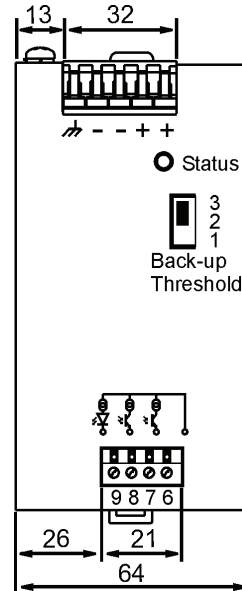


Fig. 19-2 Front view



20. Wiring Diagrams

Fig. 20-1 General wiring diagram

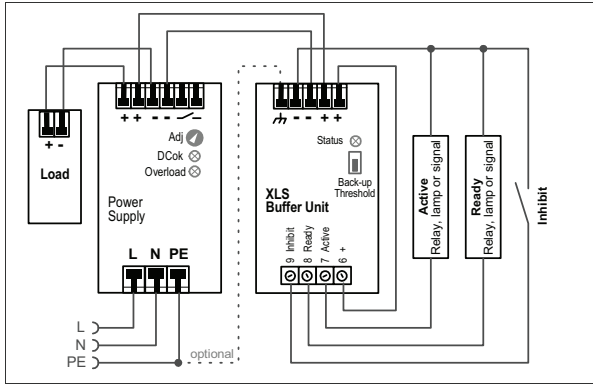


Fig. 20-2 Signals supplied from an external voltage

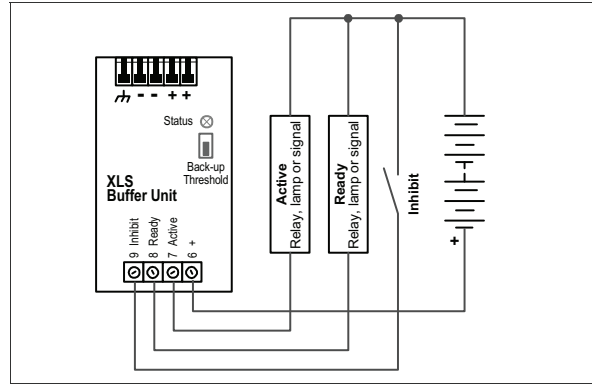


Fig. 20-3 Paralleling of buffer units

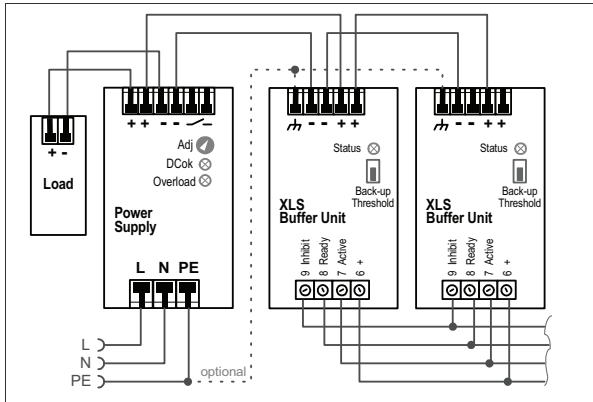
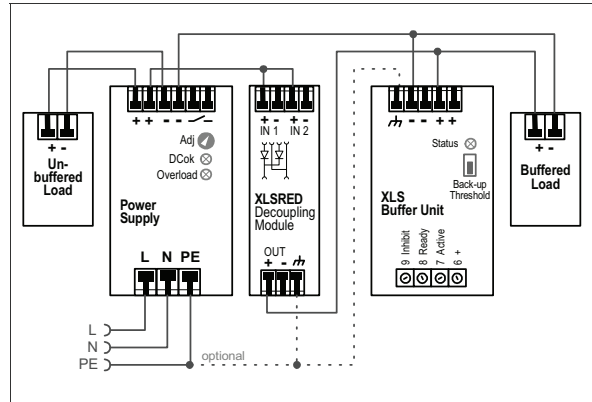


Fig. 20-4 Decoupling of buffered branches



Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://www.rockwellautomation.com/support>, you can find technical manuals, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools. You can also visit our Knowledgebase at <http://www.rockwellautomation.com/knowledgebase> for FAQs, technical information, support chat and forums, software updates, and to sign up for product notification updates.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnectSM support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page , or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846