**Installation Instructions**

Original Instructions

Allen-Bradley
by ROCKWELL AUTOMATION

# MicroLogix 1400 Programmable Controllers

Catalog numbers 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA



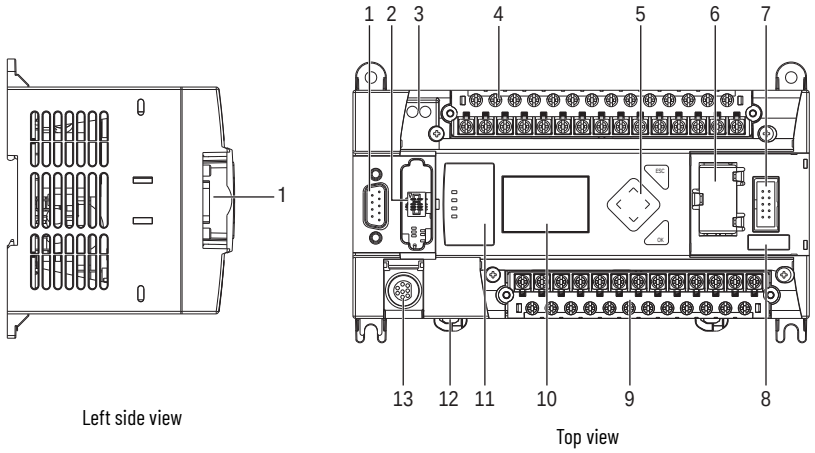
## Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

| Topic | Page |
|---|---|
| Updated template | throughout |
| Updated Environment and Enclosure | 3 |
| Added Table 1 in topic Connect 1762 I/O Expansion Modules | 9 |
| Updated Environmental Specifications | 18 |
| Updated Certifications | 19 |
| Updated Additional Resources | 19 |

Rockwell Automation

**Figure 1 - MicroLogix 1400 Controller Overview**




Left side view

Top view

## Controller Description

| | Description | | Description |
|---|---|---|---|
| 1 | Comm port 2 - 9-pin D-Shell RS-232C connector | 8 | Battery connector |
| 2 | Memory module (see MicroLogix 1400 Memory Module Installation Instructions, publication 1766-IN010 for detailed installation instructions) | 9 | Output terminal block |
| 3 | User 24V (**for 1766-L32BWA and 1766-L32BWAA only**) | 10 | LCD display |
| 4 | Input terminal block | 11 | Indicator LED panel |
| 5 | LCD display keypad (ESC, OK, Up, Down, Left, Right) | 12 | Comm port 1 - RJ45 connector |
| 6 | Battery compartment | 13 | Comm port 0 - 8-pin mini DIN RS-232C/RS-485 connector |
| 7 | 1762 expansion bus connector | | |

## Controller Input and Output Description

| Catalog Number | Description | | | | |
|---|---|---|---|---|---|
| | Input Power | User Power | Embedded Discrete I/O | Embedded Analog I/O | Comm. Ports |
| 1766-L32BWA | 100/240V AC | 24V DC | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>12 Relay Outputs | None | 1 RS-232/RS-485[1]<br>1 EtherNet/IP™<br>1 RS-232[2] |
| 1766-L32AWA | | None | 20 120V AC Inputs<br>12 Relay Outputs | | |
| 1766-L32BXB | 24V DC | | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>6 Relay Outputs<br>3 Fast DC Outputs<br>3 Normal DC Outputs | | |
| 1766-L32BWAA | 100/240V AC | 24V DC | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>12 Relay Outputs | 4 Voltage Inputs<br>2 Voltage Outputs | |
| 1766-L32AWAA | | None | 20 120V AC Inputs<br>12 Relay Outputs | | |
| 1766-L32BXBA | 24V DC | | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>6 Relay Outputs<br>3 Fast DC Outputs<br>3 Normal DC Outputs | | |

(1) Isolated RS-232/RS-485 combo port. Same as MicroLogix 1100 Comm 0.

(2) Non-isolated RS-232. Standard D-sub connector.

**ATTENTION: Unsupported Connection**

- Do not connect the Comm 0 port on the MicroLogix 1400 controller to another MicroLogix family controller such as MicroLogix 1000, MicroLogix 1200, or MicroLogix 1500 controller using a 1761-CBL-AM00 (8-pin mini-DIN to 8-pin mini-DIN) cable or equivalent.
- This type of connection will cause damage to the RS-232/RS-485 communication port (Channel 0) of the MicroLogix 1400 controller and/or the controller itself. Communication pins used for RS-485 communications are alternately used for 24V power on the other MicroLogix controllers.

| Wire Type | | Wire Size |
|---|---|---|
| Solid wire | Cu-90 °C (194 °F) | 0.25…2.5 $mm^2$ (22…14 AWG) |
| Stranded wire | Cu-90 °C (194 °F) | 0.25…1.5 $mm^2$ (22…16 AWG) |

Wiring torque = 0.791 N•m (7 lb•in) rated.

**Output Terminal Grouping**

| Controller | Output Group | Description | Outputs Voltage Terminal | Output Terminal |
|---|---|---|---|---|
| 1766-L32BWA 1766-L32BWAA | Group 0 | Isolated relay output | VAC/DC0 | OUT 0 |
| | Group 1 | Isolated relay output | VAC/DC1 | OUT 1 |
| | Group 2 | Isolated relay output | VAC/DC2 | OUT 2 |
| | Group 3 | Isolated relay output | VAC/DC3 | OUT 3 |
| | Group 4 | Isolated relay output | VAC/DC4 | OUT 4, OUT 5 |
| | Group 5 | Isolated relay output | VAC/DC5 | OUT 6, OUT 7 |
| | Group 6 | Isolated relay output | VAC/DC6 | OUT 8…11 |
| 1766-L32AWA 1766-L32AWAA | Group 0 | Isolated relay output | VAC/DC0 | OUT 0 |
| | Group 1 | Isolated relay output | VAC/DC1 | OUT 1 |
| | Group 2 | Isolated relay output | VAC/DC2 | OUT 2 |
| | Group 3 | Isolated relay output | VAC/DC3 | OUT 3 |
| | Group 4 | Isolated relay output | VAC/DC4 | OUT 4, OUT 5 |
| | Group 5 | Isolated relay output | VAC/DC5 | OUT 6, OUT 7 |
| | Group 6 | Isolated relay output | VAC/DC6 | OUT 8…11 |
| 1766-L32BXB 1766-L32BXBA | Group 0 | Isolated relay output | VAC/DC0 | OUT 0 |
| | Group 1 | Isolated relay output | VAC/DC1 | OUT 1 |
| | Group 2 | FET output | VDC2/COM 2 | OUT 2…7 |
| | Group 3 | Isolated relay output | VAC/DC3 | OUT 8 |
| | Group 4 | Isolated relay output | VAC/DC4 | OUT 9 |
| | Group 5 | Isolated relay output | VAC/DC5 | OUT 10, OUT 11 |

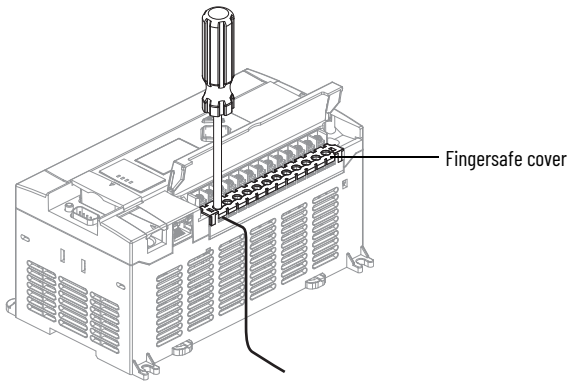
**WARNING:**
- If you connect or disconnect wiring while the field-side power is on, an electric arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding
- The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is free of ignitable concentrations of flammable gases or vapors.

## Wiring Recommendation

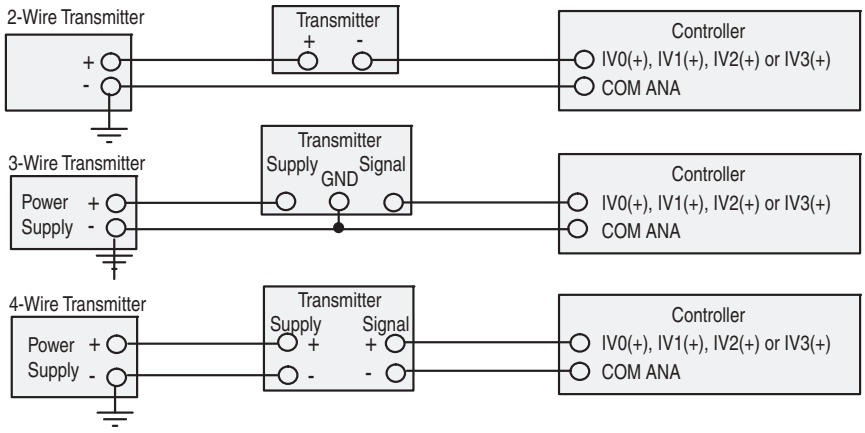
When wiring without spade lugs, keep the fingersafe covers in place.

1. Loosen the terminal screw and route the wires through the opening in the fingersafe cover.
2. Tighten the terminal screw to make sure that the pressure plate secures the wire. Recommended torque for terminal screws is 0.791 N•m (7 lb•in).

**ATTENTION:**
Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, be sure that the controller is free of all metal fragments before removing the protective debris strip. Failure to remove the strip before operating can cause overheating.



**Analog Input Transmitter Specifications**




## Minimizing Electrical Noise on Analog Channels

Inputs on analog channels employ digital high-frequency filters that significantly reduce the effects of electrical noise on input signals. However, because of the variety of applications and environments where analog controllers are installed and operated, it is impossible to make sure that input filters removes all the environmental noise.

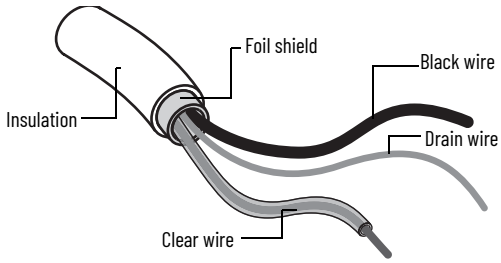
Several specific steps can be taken to help reduce the effects of environmental noise on analog signals:

- Install the MicroLogix 1400 system in a properly rated (NEMA) enclosure. Make sure that the MicroLogix 1400 system is properly grounded.
- Use Belden cable #8761 for wiring the analog channels, making sure that the drain wire and foil shield are properly earth grounded, (see Grounding Your Analog Cable topic for more information).
- Route the Belden cable separately from any AC wiring. Additional noise immunity can be obtained by routing the cables in grounded conduit.

## Grounding Your Analog Cable

Use a shielded communication cable (Belden #8761). The Belden cable has two signal wires (black and clear), one drain wire, and a foil shield. The drain wire and foil shield must be grounded at one end of the cable.

**IMPORTANT** Do not ground the drain wire and foil shield at both ends of the cable.




# Specifications

**General Specifications**

| Attribute | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA<br>1766-L32BWAA | 1766-L32BXB<br>1766-L32BXBA |
|---|---|---|---|
| Dimensions<br>H x W x D | 90 x 180 x 87 mm<br>(3.5 x 7.087 x 3.43 in.) | | |
| Shipping weight | 0.9 kg (2.0 lbs) | | |
| Number of I/O | 24 inputs (20 digital and 4 analog) and 14 outputs (12 digital and 2 analog) | | |
| Power supply voltage | 100...240V AC @ 47...63 Hz | | 24V DC Class 2 SELV |
| Heat dissipation | See MicroLogix 1400 Programmable Controllers User Manual, publication 1766-UM001 | | |
| Power supply inrush current | 120V AC: 25 A for 8 ms<br>240V AC: 40 A for 4 ms | | 24V DC:<br>15 A for 20 ms |
| Power consumption | 100 VA | 120 VA | 50 W<br>7.5 W (with no 1762 expansion I/O) |
| 24V DC sensor power | None | 24V DC @ 250 mA<br>400 µF max | None |

### General Specifications (Continued)

| Attribute | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA<br>1766-L32BWAA | 1766-L32BXB<br>1766-L32BXBA |
|---|---|---|---|
| Input circuit type | Digital: 120V AC<br>Analog: 0...10V DC | Digital: 24V DC sink/source<br>(standard and high-speed)<br>Analog: 0...10V DC | Digital: 24V DC<br>sink/source<br>(standard and high-speed)<br>Analog: 0...10V DC |
| Output circuit type | Relay | | Relay/FET |
| Relay life - Electrical | 2 x $10^5$ operations min (2.5 A, 250V AC/30V DC) | | |
| Enclosure type rating | None (open-style) | | |
| Wire size | 0.25...2.5 $mm^2$ (22...14 AWG) solid or stranded copper wire rated @ 90 °C (194 °F) or greater | | |
| Wiring category(1) | 2 - on signal ports<br>2 - on power ports<br>3 - on communications ports | | |
| Terminal screw torque | 0.79 N•m (7.0 lb•in) rated | | |
| Pilot duty rating | R300, C300 | | |
| Expansion bus | Supports up to seven 1762 modules, up to a maximum of 5V, 1500 mA (1300 mA for Series C only), and 24V, 1500 mA (1300 mA for Series C only). | | |
| North American temp code | T3C | | |

(1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

### Digital Input Specifications

| Attribute | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA | |
|---|---|---|---|
| | | Inputs 0...11<br>(12 high-speed DC inputs) | Inputs 12 and higher<br>(8 standard DC inputs) |
| On-state voltage range | 79...132V AC | 4.5...24V DC, Class 2<br>(4.5...26.4V DC @ 60 °C/140 °F)<br>(4.5...30V DC @ 30 °C/86 °F) | 10...24V DC, Class 2<br>(10...26.4V DC @ 60 °C/140 °F)<br>(10...30V DC @ 30 °C/86 °F) |
| Off-state voltage range | 0...20V AC | 0...1.5V DC | 0...5V DC |
| Operating frequency | 47...63 Hz | 0 Hz...100 kHz | 0 Hz...1 kHz<br>(scan time dependent) |
| On-state current<br>Min<br>Nom<br>Max | <br>5.0 mA @ 79V AC<br>12 mA @ 120V AC<br>16.0 mA @ 132V AC | <br>7.1 mA @ 4.5V DC<br>9.9 mA @ 24V DC<br>10.5 mA @ 30V DC | <br>3.2 mA @ 10V DC<br>5.3 mA @ 24V DC<br>5.5 mA @ 30V DC |
| Off-state leakage current, max | 2.5 mA | 0.2 mA | 1.5 mA |
| Nominal impedance | 12 kΩ @ 50 Hz<br>10 kΩ @ 60 Hz | 2.4 kΩ | 4.5 kΩ |
| Inrush current, max @ 120V AC | 250 mA | | |

### Analog Input Specifications

| Attribute | 1766-L32AWAA, 1766-L32BWAA, 1766-L32BXBA |
|---|---|
| Voltage input range | 0...10.0V DC - 1 LSB |
| Type of data | 12-bit unsigned integer |
| Input coding (0...10V DC - 1 LSB) | 0...4,095 |
| Voltage input impedance | >199 kΩ |
| Input resolution | 12 bit |
| Non-linearity | ±1.0% of full scale |
| Overall accuracy<br>-20...+60 °C (-4...+140 °F) | ±1.0% of full scale |
| Voltage input overvoltage protection | 10.5V DC |
| Field wiring to logic isolation | Non-isolated with internal logic |

### Analog Output Specifications

| Attribute | 1766-L32AWAA, 1766-L32BWAA, 1766-L32BXBA |
|---|---|
| Number of outputs | 2 single-ended |
| Voltage output range | 0...10V DC - 1 LSB |
| Type of data | 12 bit unsigned integer |
| Step response | 2.5 ms @ 95% |
| Load range<br>Voltage output | 1 KΩ |
| Output resolution | 12 bit |

### Analog Output Specifications (Continued)

| Attribute | 1766-L32AWAA, 1766-L32BWAA, 1766-L32BXBA |
|---|---|
| Analog output setting time, max | 3 ms |
| Overall Accuracy<br>-20...+60 °C (-4...+140 °F) | ±1.0% of full scale |
| Electrical isolation | Non-isolated with internal logic |
| Cable length | 30 m (98 ft) shielded cable |

### Relay and FET Outputs

| Attribute | | 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA | 1766-L32BXB, 1766-L32BXBA |
|---|---|---|---|
| Maximum controlled load | | 1440 VA | 1080 VA |
| **Maximum Continuous Current:** | | | |
| Current per channel and group common | | 2.5 A per channel<br>8 A max channel 8...11 common | 2.5 A per channel |
| Current per controller | at 150V max | 28 A or a total of per-point loads, whichever is less | |
| | at 240V max | 20 A or a total of per-point loads, whichever is less | |

### Relay Outputs

| Attribute | 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA |
|---|---|
| Turn On Time/Turn Off Time, max | 10 ms[1] |
| Load current, max | 10 mA |

(1) Scan time dependent.

| Maximum Volts | Amperes | | Amperes Continuous | Voltamperes | |
|---|---|---|---|---|---|
| | Make | Break | | Make | Break |
| 240V AC | 7.5 A | 0.75 A | 2.5 A | 1800 VA | 180 VA |
| 120V AC | 15.0 A | 1.5 A | 2.5 A | 1800 VA | 180 VA |
| 250V DC | 0.11 A | | 1.0 A | 28 VA | |
| 125V DC | 0.22 A | | 1.0 A | 28 VA | |

### 1766-L32BXB, 1766-L32BXBA FET Output

| Attribute | General Operation | High-speed Operation[1] (Output 2, 3, and 4 Only) |
|---|---|---|
| Power supply voltage | 24V DC (-15%, 10%) Class 2 | |
| On-state voltage drop:<br>At max load current<br>At max surge current | <br>1V DC<br>2.5V DC | <br>Not Applicable<br>Not Applicable |
| Current rating per point:<br>Max load<br>Min load<br>Max leakage | <br>See Figure 8 on page 17<br>1.0 mA<br>1.0 mA | <br>100 mA<br>20 mA<br>1.0 mA |
| Surge current per point:<br>Peak current<br>Max surge duration<br>Max rate of repetition @ 30 °C (86 °F)<br>Max rate of repetition @ 60 °C (140 °F) | <br>4.0 A<br>10 ms<br>Once every second<br>Once every 2 seconds | <br>Not Applicable<br>Not Applicable<br>Not Applicable<br>Not Applicable |
| Turn-On Time (maximum) | 11 µs | 28 ns (250 ns for Series C only) |
| Turn-Off Time (maximum) | 89 µs | 2.3 µs (3.5 µs for Series C only) |

(1) Output 2, 3, and 4 are designed to provide increased functionality over the other FET outputs. Output 2, 3, and 4 may be used like the other FET transistor outputs, but in addition, within a limited current range, they may be operated at a higher speed. Output 2, 3, and 4 also provide a pulse train output (PTO) or pulse-width modulation output (PWM) function.

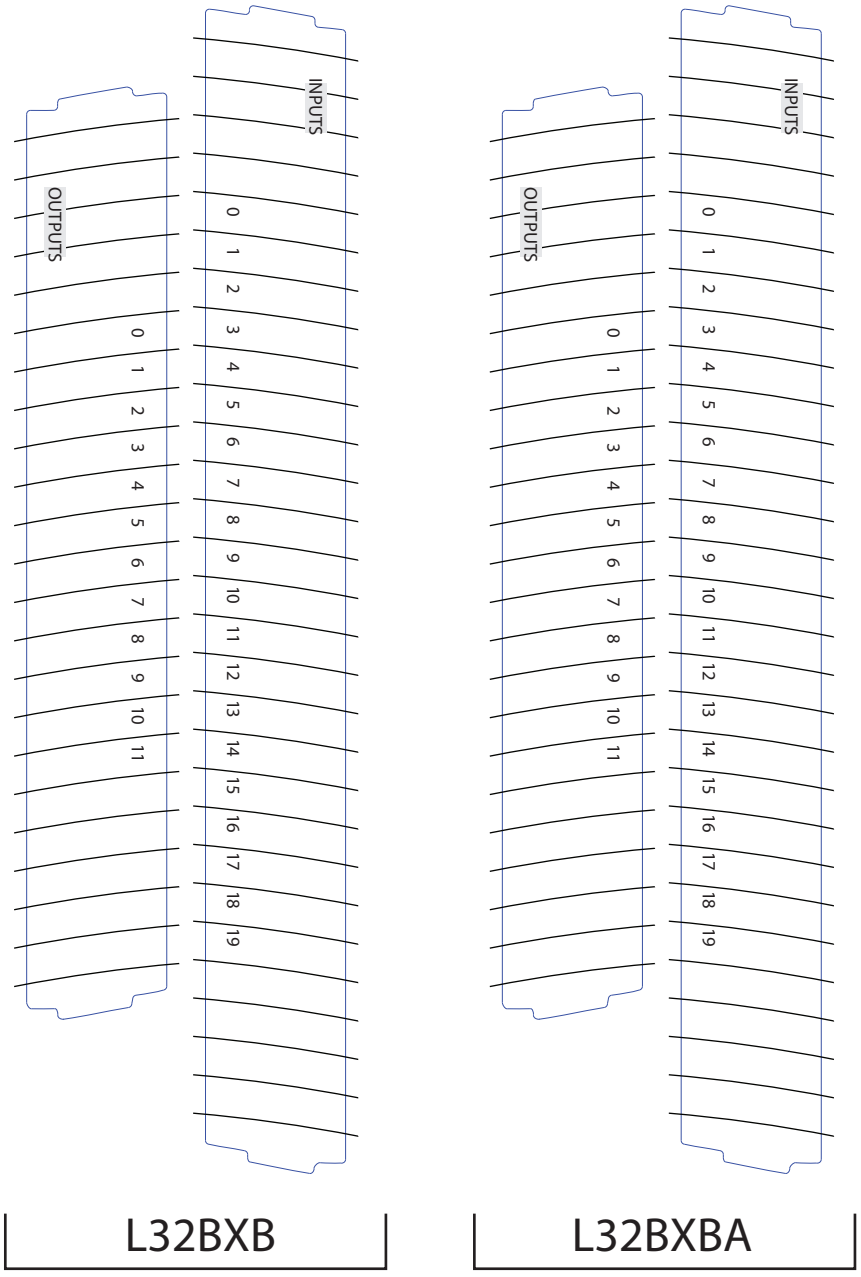
### Working Voltage for 1766-L16BXB, 1766-L16BXBA

| Attribute | Recommendation |
|---|---|
| Input group to backplane isolation and input group to input group isolation | Verified by one of the following dielectric tests:<br>• 1100V AC for 1 second<br>• 1697V DC for 1 second |
| | 75V DC Working Voltage (IEC Class 2 reinforced insulation) |
| FET output group to backplane isolation | Verified by one of the following dielectric tests:<br>• 1100V AC for 1 second<br>• 1697V DC for 1 second |
| | 75V DC Working Voltage (IEC Class 2 reinforced insulation) |
| Relay output group to backplane isolation | Verified by one of the following dielectric tests:<br>• 1836V AC for 1 second<br>• 2596V DC for 1 second |
| | 265V AC Working Voltage (IEC Class 2 reinforced insulation) |
| Relay output group to relay output group and FET output group isolation | Verified by one of the following dielectric tests:<br>• 1836V AC for 1 second<br>• 2596V DC for 1 second |
| | 265V AC Working Voltage (basic insulation), 150V Working Voltage (IEC Class 2 reinforced insulation) |

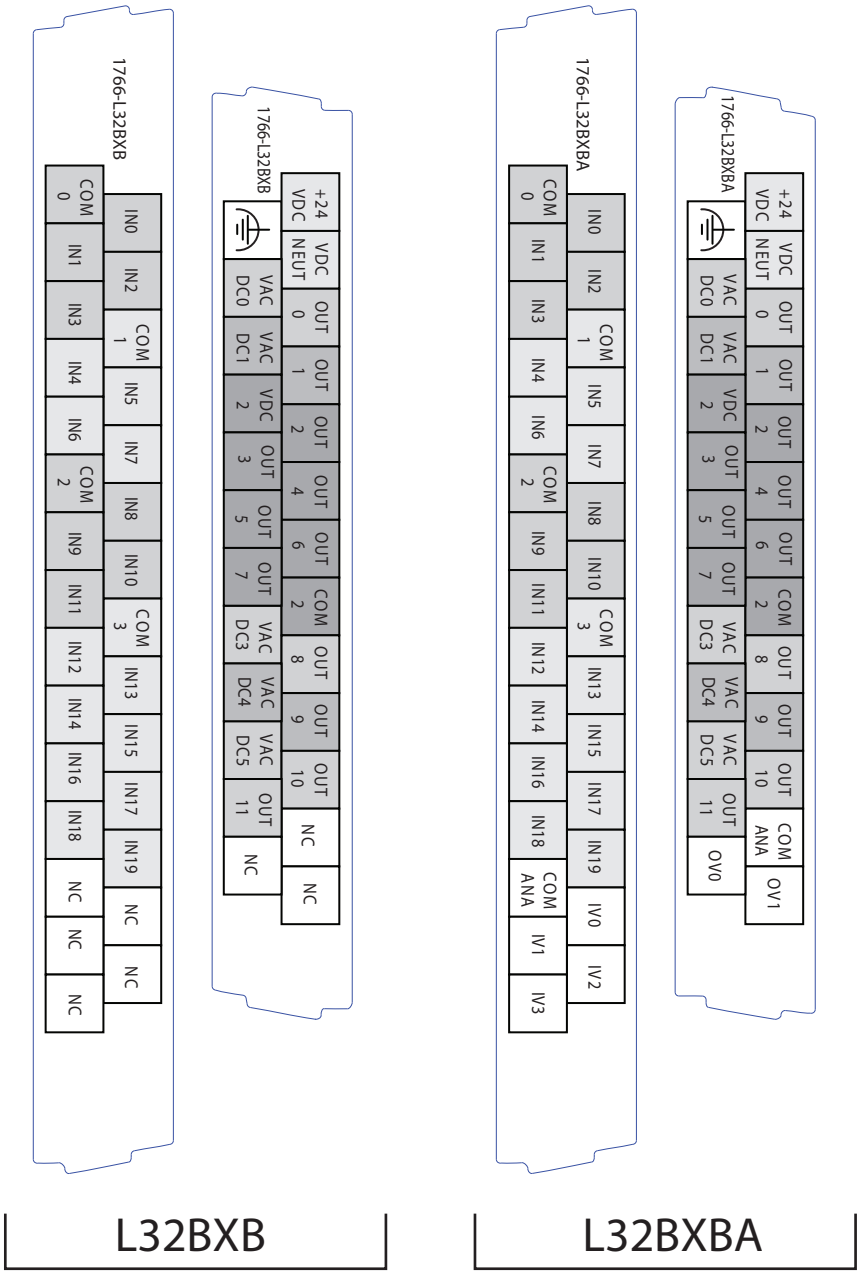
### Environmental Specifications

| Attribute | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA<br>1766-L32BWAA | 1766-L32BXB<br>1766-L32BXBA |
|---|---|---|---|
| Temperature, operating | IEC 60068-2-1 (Test Ad, Operating Cold),<br>IEC 60068-2-2 (Test Bd, Operating Dry Heat),<br>IEC 60068-2-14 (Test Nb, Operating Thermal Shock):<br>-20 °C < Ta < +65 °C (-4 °F< Ta < +149 °F) | | |
| Temperature, nonoperating | IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold),<br>IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat),<br>IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock):<br>-40...+85 °C (-40...+185 °F) | | |
| Relative humidity | IEC 60068-2-30 (Test Db, Unpackaged Damp Heat):<br>5...95% non-condensing | | |
| Vibration | IEC 60068-2-6 (Test Fc, Operating):<br>5 g @ 10...500 Hz | | |
| Shock, operating | IEC 60068-2-27 (Test Ea, Unpackaged Shock):<br>Panel mount - 30 g | | |
| Shock, nonoperating | IEC 60068-2-27 (Test Ea, Unpackaged Shock):<br>Panel mount - 30 g<br>DIN mount - 40 g | | |
| Emissions | IEC 61000-6-4 | | |
| ESD immunity | IEC 61000-4-2:<br>6 kV contact discharges<br>8 kV air discharges | | |
| Radiated RF immunity | IEC 61000-4-3:<br>10V/m with 1 kHz sine-wave 80% AM from 80...6000 MHz | | |
| EFT/B immunity | IEC 61000-4-4:<br>±2 kV @ 5 kHz on power ports<br>±2 kV @ 5 kHz on signal ports<br>±1 kV @ 5 kHz on communications ports | | |
| Surge transient immunity | IEC 61000-4-5:<br>±2 kV line-line(DM) and ±4 kV line-earth(CM) on AC power ports<br>±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports<br>±1 kV line-earth(CM) on shielded ports<br>±2 kV line-earth(CM) on communications ports | | |
| Conducted RF immunity | IEC 61000-4-6:<br>10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz | | |
| Voltage variation | IEC 61000-4-11:<br>30% dips for 1 period at 0° and 180° on AC supply ports<br>60% dips for 5 and 50 periods on AC supply ports<br>±10% fluctuations for 15 min on AC supply ports<br>>95% interruptions for 250 periods on AC supply ports<br><br>40% dip for 100 ms on DC supply ports<br>30% dip for 10 ms on DC supply ports<br>100% dip for 50 ms on DC supply ports<br>±20% fluctuations for 15 min on DC supply ports<br>5 s interruptions on DC supply ports | | |

**1766-L32BXB, 1766-L32BXBA**



**1766-L32BXB, 1766-L32BXBA**



**Mounting Template**