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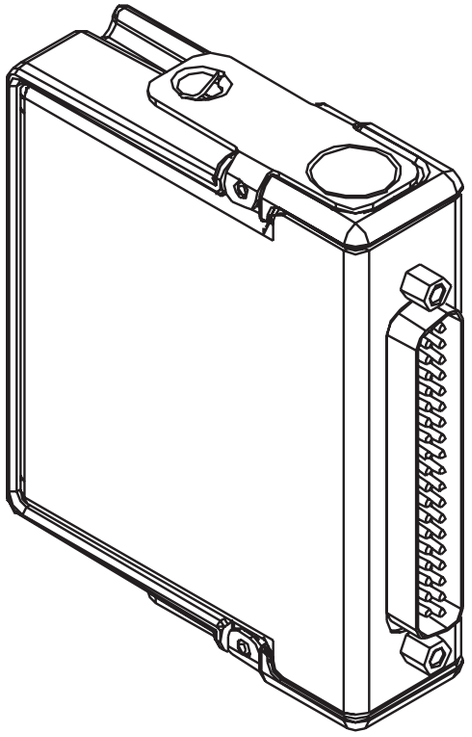
OPERATING INSTRUCTIONS AND SPECIFICATIONS

NI 9476

32-Channel, 24 V, Sourcing Digital Output Module

Français Deutsch 日本語 한국어 简体中文

ni.com/manuals



NATIONAL INSTRUMENTS™

This document describes how to use the National Instruments 9476 and includes specifications and pin assignments for the NI 9476. Visit `ni.com/info` and enter `rdsoftwareversion` to determine which software you need for the modules you are using. For information about installing, configuring, and programming the system, refer to the system documentation. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.



Note The safety guidelines and specifications in this document are specific to the NI 9476. The other components in the system might not meet the same safety ratings and specifications. Refer to the documentation for each component in the system to determine the safety ratings and specifications for the entire system. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

Safety Guidelines

Operate the NI 9476 only as described in these operating instructions.



Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.

Safety Guidelines for Hazardous Locations

The NI 9476 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nC IIC T4, and Ex nC IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9476 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.



Caution Do *not* disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.



Caution Do *not* remove modules unless power has been switched off or the area is known to be nonhazardous.

Caution Substitution of components may impair suitability for Class I, Division 2.

Caution For Zone 2 applications, install the system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.

Caution For Zone 2 applications, install a protection device between the external power supply and the V_{sup} pin. The device must prevent the V_{sup}-to-COM voltage from exceeding 50 V if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe

This equipment has been evaluated as EEx nC IIC T4 equipment under DEMKO Certificate No. 03 ATEX 0324020X. Each module is marked ⟨Ex⟩ II 3G and is suitable for use in Zone 2 hazardous locations. If you are using the NI 9476 in Gas Group IIC hazardous locations or in ambient temperatures of –40 °C ≤ Ta ≤ 70 °C, you must use the device in an NI chassis that has been evaluated as EEx nC IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.

Special Conditions for Marine Applications

Some modules are Lloyd's Register (LR) Type Approved for marine applications. To verify Lloyd's Register certification, visit `ni.com/certification` and search for the LR certificate, or look for the Lloyd's Register mark on the module.



Caution To meet radio frequency emission requirements for marine applications, use shielded cables and install the system in a metal enclosure. Suppression ferrites must be installed on power supply inputs near power entries to modules and controllers. Power supply and module cables must be separated on opposite sides of the enclosure and must enter and exit through opposing enclosure walls.

Connecting the NI 9476

The NI 9476 has a 37-pin DSUB connector that provides connections for 32 digital output channels.

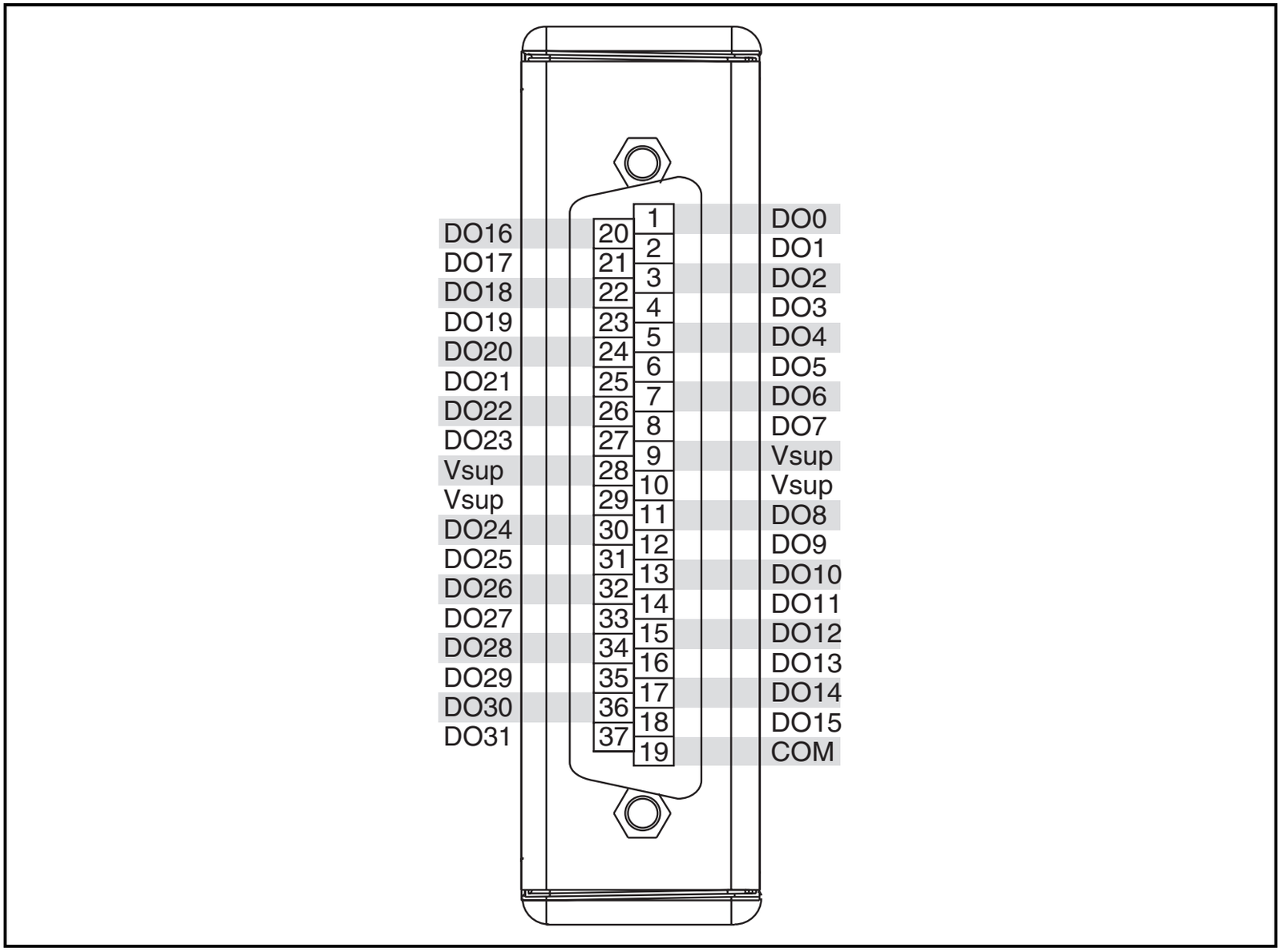


Figure 1. NI 9476 Pin Assignments

Each channel has a DO pin to which you can connect a digital input device. The 32 digital output channels are internally referenced to COM.

You must connect an external power supply to the NI 9476. The power supply provides the current for the output channels. Connect the positive lead of the power supply to the supply pin, V_{sup}, and the negative lead of the power supply to the common pin, COM. Refer to the *Specifications* section for information about the power supply voltage range.



Note The V_{sup} pins are internally connected. You can connect only one external voltage supply to the device.



Caution Do *not* remove or insert modules if the external power supply connected to the V_{sup} and COM pins is powered on.

The NI 9476 has current sourcing outputs, meaning the DO pin is driven to V_{sup} when the channel is turned on.

You can directly connect the NI 9476 to a variety of industrial devices such as solenoids, motors, actuators, relays, and lamps. Make sure the devices you connect to the NI 9476 are compatible with the output specifications of the module. Refer to the *Specifications* section for more information about the output specifications.

Connect the device to DO and COM, and connect the external power supply to V_{sup} and COM, as shown in Figure 2.

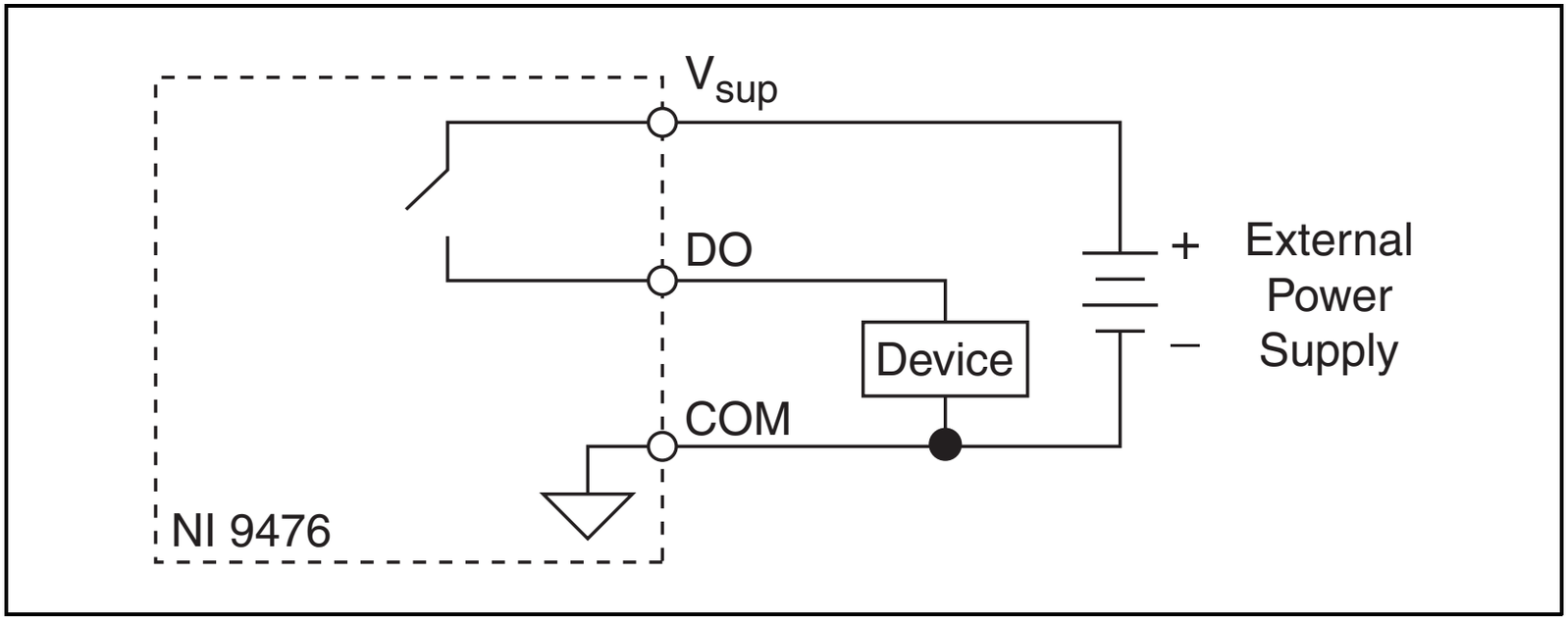


Figure 2. Connecting a Device to the NI 9476

Increasing Current Drive

Each channel has a continuous output current of 250 mA. If you want to increase the output current to a device, you can connect any number of channels together in parallel. For example, if you want to drive 1 A of current, connect DO<0..3> in parallel as shown in Figure 3. You must turn all parallel channels on and off simultaneously so that the current on any single channel cannot exceed the 250 mA rating.

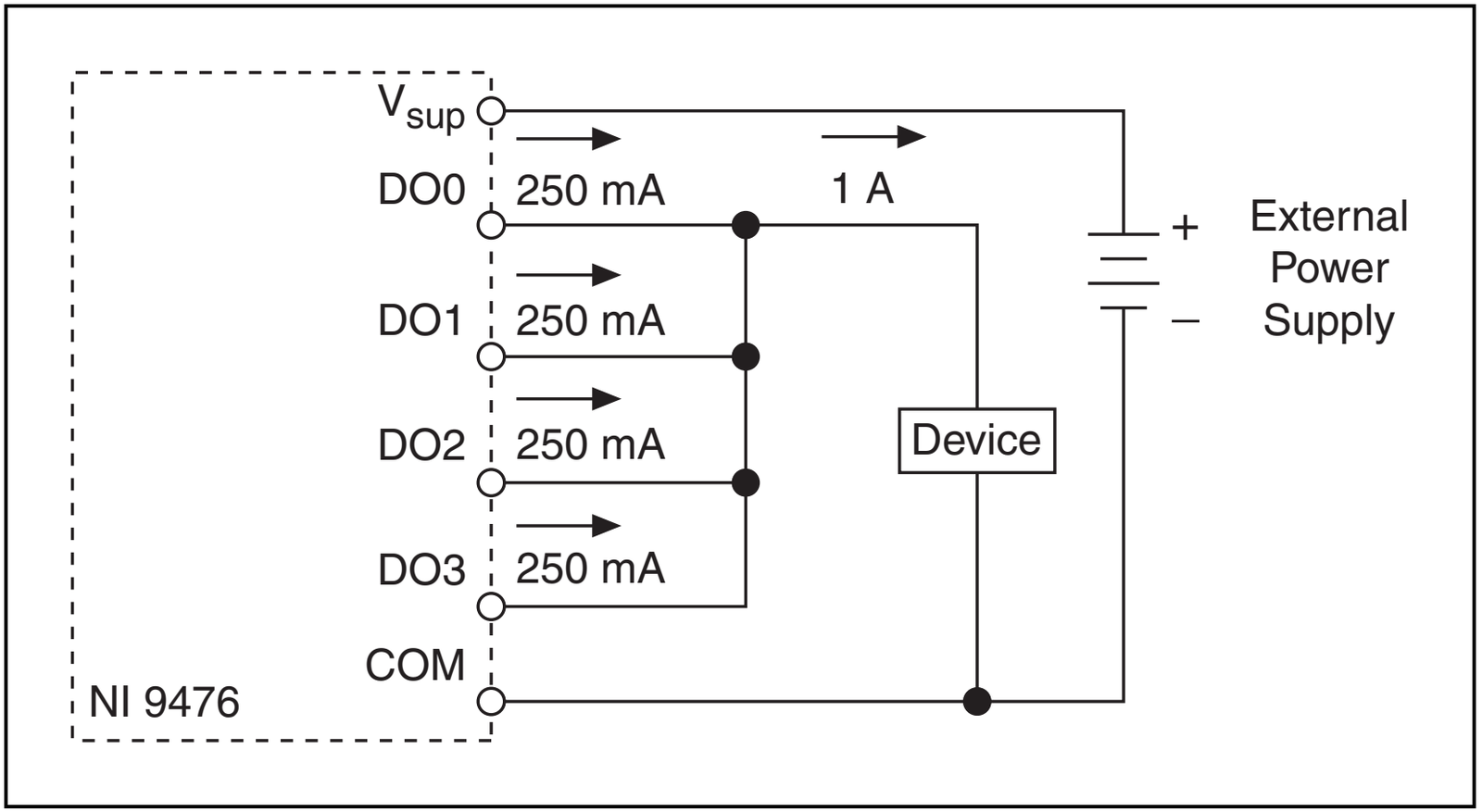


Figure 3. Increasing the Current to a Device Connected to the NI 9476

Protecting the Module from Flyback Voltages

If the module is switching an inductive or energy-storing device such as a solenoid, motor, or relay, and the device does not have flyback protection, install an external flyback diode as shown in Figure 4.

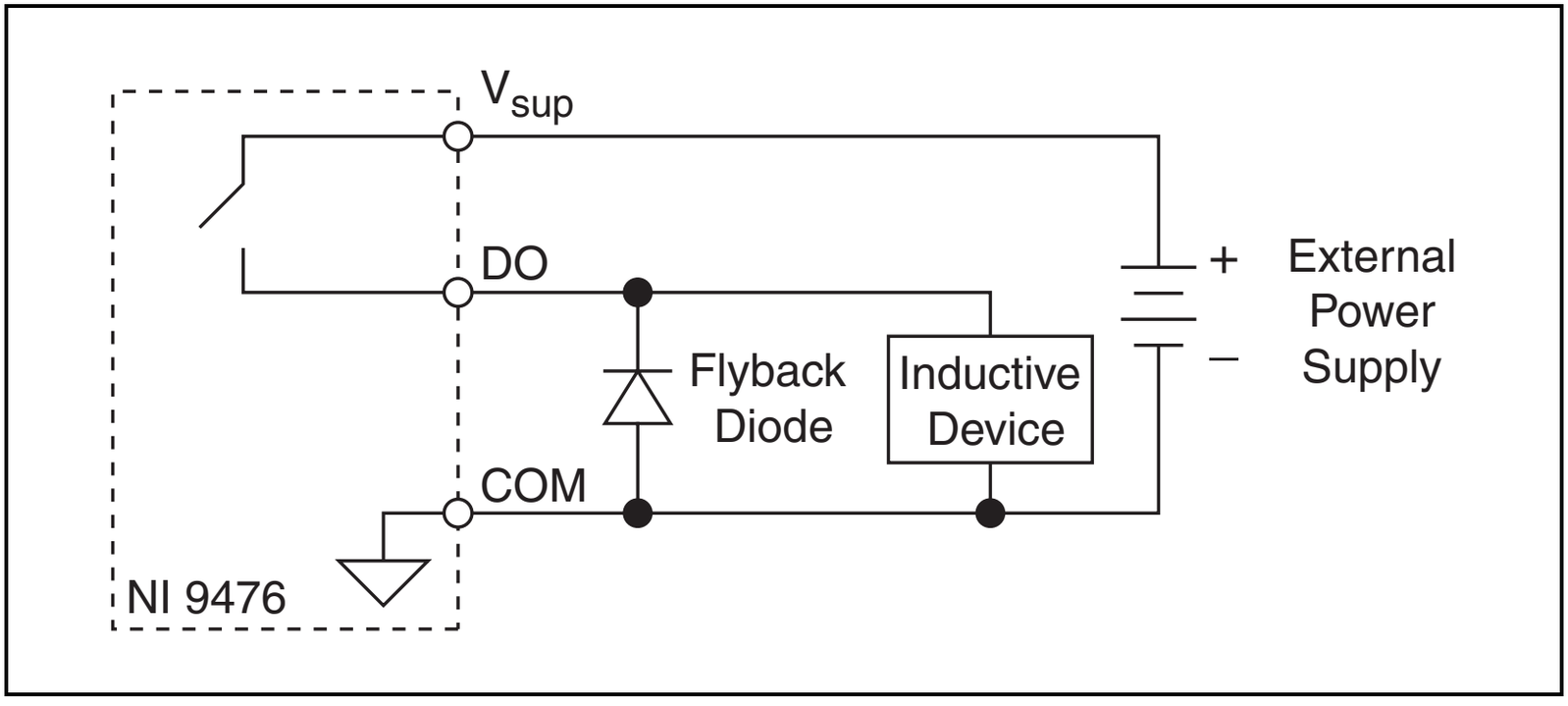


Figure 4. Connecting a Flyback Diode to the NI 9476

I/O Protection

The NI 9476 is protected against overcurrent, inrush, and short-circuit conditions in accordance with IEC 1131-2.

Understanding Protected Devices

Each channel on the NI 9476 has circuitry that protects it from voltage and current surges resulting from short circuits.



Caution The NI 9476 can be damaged under overvoltage and reverse bias voltage conditions. Check the voltage specifications for all devices that you connect to the NI 9476.

Excessive current through a DO pin causes the channel to go into an overcurrent state. In an overcurrent state, the channel cycles off and on until the short circuit is removed or the current returns to an acceptably low level. Refer the *Specifications* section for typical trip currents.

Each channel has a status line that indicates in software whether the channel is in an overcurrent state. Refer to the software help for information about reading output status.

Sleep Mode

This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis that the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Output Characteristics

Number of channels ..... 32 digital output channels

Output type ..... Sourcing

Output voltage (V_0) ..... $V_{sup} - (I_0 R_0)$

Power-on output state ..... Channels off

External power supply voltage range (V_{sup}) ..... 6–36 VDC

Continuous output current (I_0) per channel

- With 6–30 VDC supply voltage ..... 250 mA max
- With 30–36 VDC supply voltage ..... 200 mA max

Output impedance (R_0) ..... 0.3 Ω max

Continuous overvoltage protection (V_{sup}) ..... up to 40 V max

Reversed-voltage protection ..... None

Current limiting ..... None

Short-circuit protection ..... Indefinitely protected when a channel is shorted to COM or to a voltage up to V_{sup}

Trip current for one channel

- With all other channels at rated current ..... 3 A typ
- With all other channels off ..... 5 A typ

V_{sup} current consumption ..... 28 mA max

Maximum update rate ..... 40 µs max

Propagation delay ..... 500 µs max

MTBF ..... 1,091,425 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method



Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

- Active mode ..... 250 mW max
- Sleep mode ..... 25 µW max

Thermal dissipation (at 70 °C)

- Active mode ..... 1.5 W max
- Sleep mode ..... 30 mW max

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

Weight ..... 147 g (5.2 oz)

Safety

Maximum Voltage[1]

Connect only voltages that are within the following limits.

V_{sup}-to-COM..... 36 VDC,
Measurement Category 1

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as *MAINS* voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.



Caution Do *not* connect the NI 9476 to signals or use for measurements within Measurement Categories II, III, or IV.

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[1] The maximum voltage that can be applied or output between V_{sup} and COM without creating a safety hazard.

Isolation Voltages

Channel-to-channel..... No isolation between channels

Channel-to-earth ground

Continuous ..... 60 VDC, Measurement Category I

Withstand..... 1,000 V_{rms}, verified by a 5 s dielectric withstand test

Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



Note For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

U.S. (UL) ..... Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4

Canada (C-UL) ..... Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nC IIC T4

Europe (DEMKO)..... EEx nC IIC T4

Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... –40 to 70 °C

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... –40 to 85 °C

Ingress protection..... IP 40

Operating humidity
(IEC 60068-2-56)..... 10 to 90% RH, noncondensing

Storage humidity
(IEC 60068-2-56)..... 5 to 95% RH, noncondensing

Maximum altitude..... 2,000 m

Pollution Degree (IEC 60664) 2

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration

Random (IEC 60068-2-64)..... 5 g_{rms}, 10 to 500 Hz

Sinusoidal (IEC 60068-2-6) ..... 5 g, 10 to 500 Hz

Operating shock
(IEC 60068-2-27)..... 30 g, 11 ms half sine, 50 g, 3 ms half sine, 18 shocks at 6 orientations

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European directives, as amended for CE markings, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

电子信息产品污染控制管理办法 （中国 RoHS）



中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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Portugal 351 210 311 210, Russia 7 495 783 6851,
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