

NEMA BI 50020-2024

Application Guide for Isolated Ground Wiring Devices

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Foreword

This *Application Guide for Isolated Ground Wiring Devices* was developed by the Wiring Devices Section of the National Electrical Manufacturers Association.

In the preparation of this application guide, input of users and other interested parties and organizations has been sought and evaluated. Inquiries, comments, and proposed changes are welcome and should be submitted to:

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The purpose of this application guide is to assist the user in proper installation and use of isolated ground devices. This standard was originally developed by the NEMA Wiring Devices Section and published under the NEMA WD-AG 1-2017 designation. In its current form, it was approved by the same product group under the NEMA BI 50020 designation. NEMA changed its designation policy in 2021 and subsequently changed the designation of its standards at the time of their first revision or reaffirmation after that.

Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the group was composed of the following members:

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Scope

This application guide covers wiring devices and accessories intended to help protect sensitive equipment from malfunction due to noise on the equipment grounding path. Devices include receptacles, single or duplex with straight blade or locking NEMA configurations, rated 15 A to 60 A and 125 V to 600 V. Accessories include color-coded mating plugs and wall plates to identify isolated ground receptacles.

In addition to indicating the devices and accessories available for isolated ground installations, this guide covers *National Electrical Code*[®] (NEC) requirements, applications for isolated ground circuits, and troubles shooting and maintenance of such installations.

This application guide does not consider analysis of noise currents on the grounding system of power supply circuits or their effects on sensitive electronic equipment.

Note: *National Electrical Code*[®] and NEC[®] are registered trademarks of the National Fire Protection Association.

Section 1 Application Considerations

1.1 Why?

For an isolated ground system, an additional insulated/isolated ground conductor is required. When a conventional receptacle is installed in a grounded metal box, the ground is common with the entire building grounding system, which may include the box, conduit, gas and water piping, ducting, and structural steel. It is grounded by using either a bonding jumper from the box to the green grounding terminal or the self-grounding clip on the receptacle's mounting strap. In a conventional receptacle, the grounding contacts are connected to the mounting strap and the green grounding terminal. Thus, even when a separate insulated equipment grounding wire is brought to the receptacle, it is still tied into the entire grounding system. This occurs since the device strap is grounded to the outlet box.

The building grounding system can serve as a giant antenna and conductor of electrical noise. Noise, or electromagnetic interference, is caused by numerous transient ground currents that produce random electrical signals in the grounding system.

An isolated ground conductor is connected to the building grounding system at either 1) a sub-panel or 2) the service panel or the separately derived source to keep the isolated ground receptacle relatively free of electrical noise. The isolated ground network is intended to minimize sources of noise as it is connected to the grounding system at a single point. Resonances and high impedance at noise frequencies can occur in long runs of isolated ground wiring, resulting in noise problems. Long runs can also result in an impedance problem under fault conditions. Designers and installers should give careful consideration to the point at which the isolated ground conductor is terminated to the building grounding system.

To achieve isolation of the receptacle ground from the normal grounding network, the grounding terminal and contacts are isolated from the outlet box. The green grounding terminal is connected only to the receptacle grounding contacts.

1.2 Where?

An isolated ground system is used where it is deemed necessary to minimize electrical interference on the equipment grounding conductor. Applications are for power circuits supplying sensitive electronic equipment such as point of sale terminals, accounting machines, word processors, electronic office equipment, computers, and highly sensitive medical and communications equipment.

1.3 When?

An isolated ground system should be used whenever the building grounding network is such that transient currents can produce random electrical signals (voltages) on the grounding system of sensitive electronic equipment. Such unwanted signals can be generated on the system by switching inductive loads (magnetic coils, chokes, inductors) and by motor-driven appliances and tools. Radio frequency sources can also create unwanted signals that are picked up and carried by the grounding conductor. Reduction of these signals can provide a corresponding reduction in the possibility of incorrect commands or faulty readouts from the internal operation of the equipment. This can result in the benefits of improved equipment performance, improved accuracy, and reduced downtime.

1.4 How?

Design of isolated ground branch circuits, including the number of receptacles and the size of grounding conductors, must comply with all applicable requirements of the NEC or local codes. In addition, the designer should consider recommendations of the manufacturer of the utilization equipment, wiring methods, the installation environment such as nearby or associated electrical equipment, and the lengths of conductor runs.