



Nicolet iG50 Spectrometer

Site and Safety Guide

269-312800 Revision A June 2015

Thermo
SCIENTIFIC

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For U.S. Technical Support, please contact:

Unity Lab Services
Part of Thermo Fisher Scientific
5225 Verona Road
Madison WI 53711-4495 U.S.A.
Telephone: 1 800 532 4752
E-mail: us.techsupport.analyze@thermofisher.com

For International Support, please contact:

Thermo Fisher Scientific
Telephone: +1 608 273 5017
E-mail: support.madison@thermofisher.com

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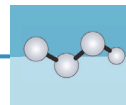
For Research Use Only. This instrument or accessory is not a medical device and is not intended to be used for the prevention, diagnosis, treatment or cure of disease.



WARNING Avoid an explosion or fire hazard. This instrument or accessory is not designed for use in an explosive atmosphere.

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Site and Safety Information

The Thermo Scientific™ Nicolet™ iG™50 spectrometer is designed to be extremely durable and reliable. It will work under adverse conditions for extended periods, however, to get repeatable, accurate results consistently, maintain a stable working environment. Before installation, please read this manual and follow its recommendations for the system.

Safety and Special Notices

In many cases, safety information is displayed on the instrument itself. The symbol indicates that there is additional safety information in the documentation and failure to heed the safety precautions could result in injury.



DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.











CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Follow instructions with this label to avoid damaging the system hardware or losing data.

Note Contains helpful supplementary information.

Tip Provides information that can make a task easier.

The following table lists some of the safety symbols and their indications that may appear in the user documentation.

Symbols	Indication
	This is a mandatory action symbol. It is used to indicate that an action shall be taken to avoid a hazard.
	This is a prohibition symbol. The graphic in this symbol is used to alert the user to actions that shall not be taken or shall be stopped.
	This is the general warning sign. Failure to heed the safety precautions could result in personal injury.
	Avoid shock hazard. If you see either of these symbols, there is a risk of electrical shock in the vicinity. Only qualified persons shall perform the related procedures.
	Avoid fire hazard. Do not test flammable or explosive samples. Read and follow the associated instructions carefully.
	Avoid toxic inhalation. Materials such as hydrochloric acid, hydrofluoric acid and phosgene are highly toxic. If you plan to regularly use solvents containing halogenated hydrocarbons, be sure your work area is properly ventilated.
	Avoid burn injury. These symbols alert you to hot surfaces. Read and follow the associated instructions carefully.
	Avoid explosion hazard. These symbols alert you to the risk of possible explosion. Never use a flammable, combustible, or toxic gas to purge this instrument. Heat from the source or from laser absorption may ignite flammable gases or reactive materials in purge gas.
	Avoid eye injury. If you see these symbols, there is a risk of exposure to laser radiation in the vicinity. Read and follow the associated instructions carefully.
	Avoid pinch hazard. If you see this symbol, there is a risk of pinch, crush or impact hazards in the vicinity.
	Avoid risk of personal injury. Use proper lifting techniques when moving the spectrometer or other system components if you see either of these symbols.












Symbols	Indication
 	<p>Avoid freeze burns. If you see any of these symbols, there is a risk of skin burns or eye damage. Protective equipment required. Follow standard laboratory safety practices.</p>
	<p>Avoid chemical burns. This symbol alerts you to possible skin irritation. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive or irritant chemicals. Use approved containers and proper procedures to dispose of waste.</p>

Table 1. Electrical Symbols

Symbol	Description
	Alternating current
	Earth terminal or ground
	Direct current
	Protective conductor terminal
	Frame or chassis terminal
	Fuse
	Power on
	Power off

When the System Arrives



WARNING Avoid personal injury. If this equipment is used in a manner not specified in the accompanying documentation, the protection provided by the equipment may be impaired.



CAUTION Avoid personal injury. Perform *only* those procedures described in the documentation. If there are other problems, contact us. Any other service must be performed by trained personnel.



CAUTION Avoid shock hazard. Be sure to unplug the system from the power source before servicing any replacement parts.

When the instrument arrives, check the exterior of the shipping box for signs of damage. If damage is apparent, contact us for instructions.

- Move the shipping box to the installation location at least 24 hours before installation.
- While moving the instrument to the installation location, keep upright.

NOTICE

- Inside the shipping box, the instrument is sealed in a plastic bag to keep the optical components dry.
- Allow 24 hours for the instrument to reach room temperature before opening the bag. If the bag is opened before the instrument reaches room temperature, moisture could condense on the optical components and cause permanent damage.

The warranty will not cover:

- Damage due to improper moving techniques.
- Damage due to removing the sealed plastic bag before the instrument has come to room temperature.

Note It is important to have all system utilities installed before the spectrometer arrives. Utility installations must comply with all local building and safety codes.

Unpacking Your System

Verify that the system has been sitting for 24 hours so that the temperature and humidity has been stabilized. While unpacking the system, check for any visible signs of damage and verify shipment is complete. If you have any issues, contact us for instructions.

Lifting or Moving the Instrument

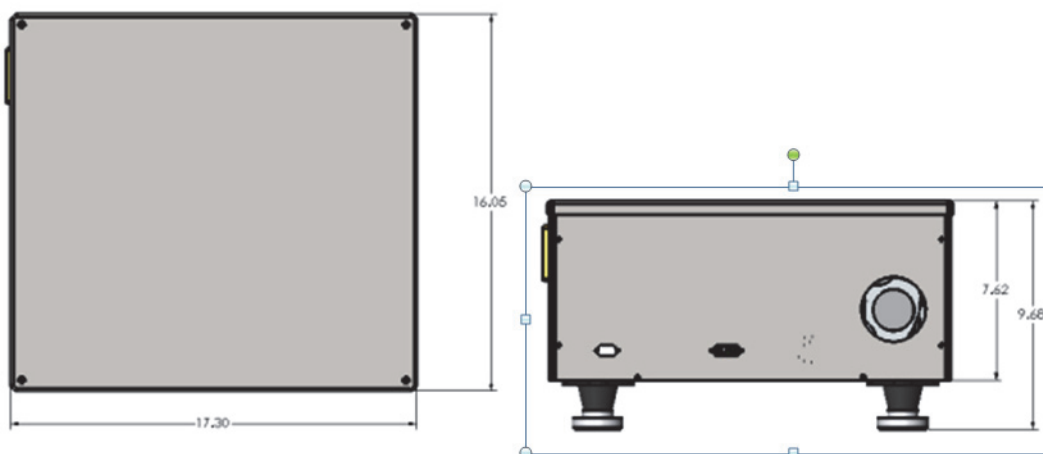


CAUTION Avoid risk of personal injury. Your instrument cannot be lifted safely by a single person. Lifting or moving the instrument requires two people. Use proper lifting techniques when lifting or moving the instrument or other system components.

Workspace Considerations

This section contains the information for use when planning the workspace for the system.

Instrument	Weight	Dimensions (W x D x H)	Clearance Needed (from tabletop)
iG™50 spectrometer	35 kg (85 lbs)	432 x 407 x 235 mm (17 x 16 x 9.25 in)	610 mm (24 in)



Environmental Factors

Consider the following environmental factors when planning your work space.

Temperature

The instrument is designed for indoor use at altitudes up to 2,000 m (6,500 ft). It operates reliably at temperatures between 16 °C and 27 °C (60 °F and 80 °F). Temperature changes may result in drift in the system response.

Once the instrument has been installed, plan to leave it turned on. The internal temperature and stability of the instrument will change significantly if it is switched on and off daily. Long-term stability improves with the length of time the instrument has been on.

Avoid placing the system near air conditioning ducts or large windows. (Even if the windows have curtains, there is still significant heat loss through the glass at night.) Also keep sources of heat, such as hot plates and heating mantles, away from the instrument. Do not place it near heating or air conditioning vents.

Vibration

The instrument will perform better in a quiet environment. All vibration that is introduced will degrade performance.

Floor vibration or acoustical noise from heavy manufacturing equipment, computer equipment, or other sources will not damage the system, but it can affect performance and spectral quality. Keep the system away from machinery that may vibrate the floor, and minimize or eliminate acoustic noise and vibration wherever possible. If vibration is a problem, consider placing the instrument on a marble-top table or counter or obtaining a vibration isolation system.

Magnetic and Electric Fields

Intense magnetic fields, such as those produced by superconducting magnets, can affect performance. The instrument should be at least 5.5 m (18 ft) away from these fields. Minimize or eliminate exposure to magnetic fields wherever possible.

Some wireless devices may also affect instrument performance. If this type of interference is suspected, move all wireless devices at least 2.0 m (6.5 ft) away from the instrument.

Humidity and Moisture

Your instrument is sealed and desiccated to help prevent damage to the optics or other internal components due to humidity. For very humid environments, we recommend the following additional measures to protect your instrument:

- Purge the system with clean, dry air or nitrogen.
- Avoid rapid changes in temperature that may cause condensation.

Ventilation

There are no special ventilation requirements for your instrument. The types of analysis you plan may require special ventilation (for example, if you will be analyzing highly toxic samples or dissolving your samples in solvents that interact with infrared sources, or sampling flammable gases). Chlorinated solvents, perfluorochlorinated solvents, and other solvents containing halogenated hydrocarbons are often used as FT-IR solvents. The pyrolysis of these solvents by an infrared source may produce hydrochloric acid (HCl), hydrofluoric acid (HF), or phosgene (COCl₂).

Hydrochloric acid and hydrofluoric acid are highly corrosive and may cause accelerated corrosion of the metallic and optical components in the instrument if seals are not properly maintained or the concentration level of corrosive gases in the air is excessively high due to improper sampling techniques.



WARNING Avoid toxic inhalation. Hydrochloric acid, hydrofluoric acid, and phosgene are highly toxic. If you plan to regularly use solvents containing halogenated hydrocarbons, be sure your work area is properly ventilated.

Be sure to provide storage space for solvents containing halogenated hydrocarbons that is away from the instrument, and do not leave these types of solvents in the sample compartment for an extended time. If measurements require the sample compartment cover to be closed, the sample compartment must be purged while the solvents are used. An optional purge kit is available from us.



DANGER Avoid fire and explosion hazard. The infrared source inside the spectrometer is an ignition source. If the use of flammable gases is intended, vent the check valves away from the spectrometer. Provide a fume hood or other active venting system that is free of spark and other ignition sources and that prevents flammable vapors from collecting in the atmosphere surrounding the instrument.

Electrical Requirements and Safety

Power supplied to the system must be from dedicated, uninterrupted sources. Power must be free of voltage dropouts, transient spikes, frequency shifts, and other line disturbances that impair reliable performance.

If you suspect power quality problems at your site, or if your system will be installed in a heavy industrial environment, we recommend a power quality audit before installation. Contact us or your local electrical authority for more information.



CAUTION Avoid shock hazard.

- Only a qualified person using the appropriate measuring device shall check the line voltage, current and frequency.
- Only our trained and certified service representatives shall attempt to service a component that carries this symbol.
- If a protective cover on a system component appears damaged, turn off the system and secure it against any unintended operation. Always examine the protective cover for transport stresses after shipping.
- Even after this instrument has been disconnected from all voltage sources, capacitors may remain charged for up to 30 seconds and can cause an electrical shock.
- Do not allow liquid to run into the power supply or the back of the instrument.
- Do not attempt to remove the cover of the power supply.

Grounding



CAUTION Avoid shock hazard. Each wall outlet used must be equipped with a ground. The ground must be a noncurrent-carrying wire connected to earth ground at the main distribution box.

Power Cords

Be sure to use an appropriate grounded power cord for your electrical service. If the power cord received is not appropriate for the electrical system in your location, or if the power cord becomes damaged, contact us.

Power Line Conditioning Accessories

Uninterruptible power supplies (UPS) are available from us. A UPS reduces the probability of a system shutdown if power is lost elsewhere in the building. Power line conditioners (which ensure that your service is free from sags, surges or other line disturbances) also are available in the U.S.A. from us for 120 volt operation. Line conditioners for 220 volt operation can be purchased locally. Contact technical support for information about power conditioners and UPS.

Electrical Service Specifications

The following table lists the specifications for electrical service. Contact our service representative in your area if you have questions about the requirements.

Requirements	Specifications
Input current	2.5 A (max.)
Input voltage	100-240 VAC
Line frequency	50-60 Hz
Line disturbances	Sags, surges or other line disturbances must not exceed 10% of input voltage (even for a half cycle).
Noise	< 2 V (common mode) < 20 V (normal mode)

Power Consumption

Generally, 50% more power should be available than the entire system (including accessories) typically uses. Maximum power consumption and heat dissipation specifications for the spectrometer and accessories are shown below. The values are approximate.

Item	Power Consumption	Max. Heat Dissipation
Spectrometer	120 W	171 Btu/hr
Standard computer and monitor*	460 W	1,570 Btu/hr
Standard printer*	200 W	683 Btu/hr

* Values shown are estimates. See the power specifications on the back panels or undersides of these units.

Purge Requirements and Safety

The instrument is sealed and desiccated; however, it does contain precise optical components that may be damaged by a moist environment. To protect those components, we strongly recommend installing a source of clean, dry air or nitrogen to purge the spectrometer. It is especially important if humidity levels are above 70% RH in the laboratory environment.

NOTICE Optical damage caused by failure to maintain the desiccants or to purge the spectrometer is not covered under your warranty.

You may also have a laboratory environment that contains solvents or other agents that can corrode spectrometer components. Purging the spectrometer will better protect the components.

NOTICE The interaction of chlorinated solvents, perfluorochlorinated solvents, or other solvents containing halogenated hydrocarbons (for example, Freon®) with an IR source can corrode spectrometer components. Do not leave these solvents exposed around the spectrometer any longer than necessary.

Purging the spectrometer can also ensure more accurate results. This is particularly true when measuring sample components that are also present in your laboratory environment.

Selecting a Purge Gas

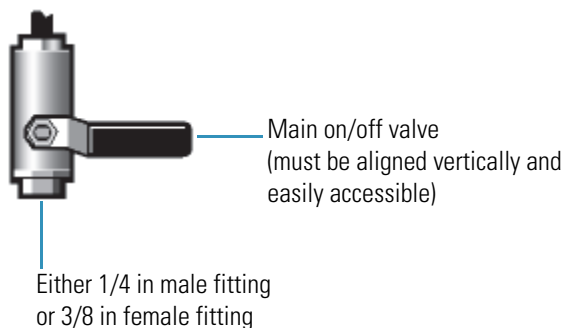


WARNING Avoid explosion hazard. Never use a flammable, combustible, or toxic gas to purge this instrument. The purge gas must be free of oil and other reactive materials. Heat from the source or from laser absorption may ignite flammable gases or reactive materials in purge gas. Use only dried air or nitrogen to purge your instrument.

NOTICE Do not use argon as a purge gas. Argon is an insulator and prevents the system from cooling properly.

Installing Purge Gas Fittings

If you plan to purge the instrument, you must install the purge line and on/off valve before the instrument arrives. The source line pressure delivered to the pressure regulator must be at least 1.4 bar (138 kPa, or 20 psig) and must not exceed 7 bar (700 kPa, or 100 psig), with a minimum flow rate of 20 SCFH.



A pressure regulator is required at 20 psig. If the purge kit was purchased with the system, our service representative will install a pressure regulator and flowmeter. This will maintain pressure and flow for optimal data collection. See the “Service” section of the user guide for more detailed information.

Note It is important to have all system utilities installed before the spectrometer arrives. Utility installations must comply with all local building and safety codes.

Purge Gas Generators

If your facility does not have a source of clean, dry compressed air or nitrogen for system purge, we recommend using a purge gas generator. It cleans and dries the air supplied by an air compressor so it can be used to purge the instrument. If your facility does not have an air compressor, a complete dry-air generating system is available. Contact our sales or service representative in your area for more information.

NOTICE If using a purge gas generator:

- Position it as far from the instrument as practical to reduce noise and vibration.
- Purge gas generators require a minimum pressure for proper operation. Failure to supply this pressure may allow moisture to enter the system, causing permanent damage.
- Read the manufacturer's instructions before installing air-drying equipment or performing any maintenance. The installation and maintenance of air-drying equipment is your responsibility. Failure to perform routine maintenance as specified by the manufacturer may void your instrument warranty.
- Before connecting a new air dryer to the instrument, it is vital to purge the dryer of water and particulates by running it for at least 12 hours at nominal air flow. Otherwise, there is risk of severe damage to the instrument when you connect the pure air dryer.

Fire Safety and Burn Hazards



CAUTION Avoid burn hazard. The source becomes extremely hot during normal spectrometer operation. Turn off the spectrometer power and wait at least 10 minutes before removing a source from the spectrometer.

NOTICE Do not position the instrument so that it is difficult to operate the power switch or access the power supply and power cord.

To avoid a burn injury and the risk of fire or explosion:

- Use caution when testing flammable or explosive samples (see the “Hazardous Materials” section in the site and safety manual)
- Use only clean, dry air or nitrogen to purge the instrument
- Turn off the instrument and wait 10 minutes before replacing components
- Never block any of the vents on the instrument or its power supply
- Only use exact replacement power supplies from us

Liquid Nitrogen

Some detectors must be cooled with liquid nitrogen before use. Follow your organization's Personal Protective Equipment (PPE) and handling guidelines when working with liquid nitrogen.



WARNING Avoid freeze burns. Liquid nitrogen is extremely cold and therefore potentially hazardous.

- Wear protective equipment and follow standard laboratory safety practices.
- To avoid hazardous contact with liquid nitrogen, make sure any dewar or container used to hold liquid nitrogen can do so safely without breaking.
- When filling the dewar, be careful not to contact the liquid nitrogen with your skin. Fill the dewar slowly. Cooling the detector too quickly may cause the dewar to rapidly boil off liquid nitrogen.

Moving Parts



CAUTION Avoid pinch hazard. To prevent personal injury, keep hands free from moving parts.

Laser and Optical Safety

This instrument is a laser product. The laser source is a helium-neon (HeNe) laser.



WARNING Avoid personal injury.

- Never stare into the laser beam or at its bright reflection. Never tamper with the laser, even if you are replacing a defective laser. Exposure to laser light or high voltage may result.
- Use of controls or adjustments or performance of procedures other than those specified in your user information may result in hazardous radiation exposure.

Laser Emissions

This instrument is classified as a Class 1 laser product (FDA-CDRH and IEC 60825-1:2007), which is inherently safe. A protective housing covers this instrument. More than 80 percent of the laser light is lost as it passes through the instrument optics. Less than 390 μW of reflective laser light is accessible during normal use and maintenance.

Emission Ports



WARNING Avoid personal injury. When working with the optional emission ports, do not use hazardous optical radiation or Class 4 lasers.

Manufacturer's Laser Information

In some jurisdictions you may be required to register this instrument; check with your organization's safety officer or your local government offices. The following is an excerpt from the laser manufacturer's manual regarding the information that might be needed for registration.

Characteristic	Specification
manufacturer	Melles Griot
type of laser	Helium-neon (HeNe)
wavelength	632.8 nm
maximum power	0.39 mW*
beam diameter	6.35 mm (1/e ²)
beam divergence	0.127 mrad
CDRH classification	Class 3A

Hazardous Materials

Many standard spectroscopy methods are based on the use of solvents. Others involve corrosive samples or pressurized samples in a gaseous state. All these sample materials can be measured using your instrument, but special precautions must be taken.

Volatile Solvents and Flammable Samples

If volatile solvents or flammable samples are used regularly, purging the instrument with clean, dry air or nitrogen is strongly recommended to create positive pressure inside the instrument.



WARNING Avoid fire and explosion hazard. The infrared source inside the instrument is an ignition source. Take these actions when working with solvents and flammable samples.

- Work with sample compartment windows installed.
- Do not leave exposed solvent or flammable sample in the sample compartment for longer than necessary.
- Work with the sample compartment cover open, or purge the sample compartment and spectrometer.
- Do not leave the solvents or flammable samples near the instrument.
- Be sure that the workspace is properly ventilated.
 - Provide an active venting system that is free of spark and other ignition sources and prevents flammable vapors from collecting in the atmosphere surrounding the instrument.

These measures will help prolong the life of the instrument and will eliminate the possibility of spectral interference caused by volatile solvent vapors.

Corrosive Solvents



WARNING Avoid toxic inhalation hazard. Materials such as hydrochloric acid, hydrofluoric acid and phosgene are highly toxic. If regular use of solvents containing halogenated hydrocarbons is desired, be sure the work area is properly ventilated.

Using solvents that may produce HCl or HF vapors in the sample compartment may severely damage the system. If using halogenated solvents, such as those listed below, purging the instrument with dry, clean air or nitrogen is strongly recommended. Equipment damage due to failure to purge is not covered under the warranty. (For questions about this, please contact us.) The following is a list of commonly used halogenated solvents:

- Freon
- Methylene chloride
- Trichloroethylene
- Chloroform
- Carbon tetrachloride

Biohazard or Radioactive Materials and Infectious Agents

Biological samples such as tissues, body fluids, infectious agents, and blood of humans and other animals have the potential to transmit infectious diseases. Wear appropriate protective equipment. Individuals should be trained according to applicable regulatory and organization requirements before working with potentially infectious materials. Follow your organization's Biosafety Program protocols for working with and/or handling potentially infectious materials.



WARNING Reduce the risk associated with potentially infectious samples:

- Do not spill samples inside the sample compartment or any of the instrument components.
- If spill occurs, disinfect the external surfaces immediately.

Instruments, accessories, components or other associated materials should not be disposed of and may not be returned to us or other accessory manufacturers if they are contaminated with biohazard or radioactive materials, infectious agents, or any other materials and/or conditions that could constitute a health or injury hazard to employees. Contact us if you have questions about decontamination requirements.

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