



## **Safety**

Before using any cryogenic refrigerator, read the *Handle with Care* booklet provided with the unit. It details safety precautions that must be understood before using the equipment. If a replacement booklet is needed, order publication *Handle with Care* from your supplier. Following are a few of the safety precautions described in the booklet. Please be sure to read the entire booklet.

**Store and use these containers only in well ventilated areas.** In a confined area, nitrogen gas from these units may cause suffocation by displacing air needed for breathing. Install a suitable oxygen monitor.

**Do not touch liquid or cold metal surfaces with your bare skin.** The liquid nitrogen refrigerant in these containers is **extremely cold: -196°C (-320°F)**. Exposure of

skin or eyes to liquid, cold gas or frosted parts could result in a severe frostbite-like injury. Because of the extremely low temperature, a face shield and gloves must be worn when transferring liquid nitrogen and material into or out of these containers.

**Use only the necktube core supplied with this unit or a listed replacement part.** A tight fitting plug or stopper will cause a pressure increase in the container that may damage the container and/or cause personal injury.

**Dispose of liquid nitrogen only in areas specifically designed for that purpose. Disposal of liquid nitrogen should be done outdoors in a safe place. Pour the liquid slowly on gravel or bare earth where it can evaporate without causing damage.**

## **Operation**

**Filling:** Adding liquid nitrogen to a warm container may cause splashing and will generate a significant volume of nitrogen gas as cold liquid contacts warm refrigerator surfaces. Add liquid slowly to minimize these effects. Be sure there is adequate ventilation. Keep your head clear of the heavy volume of vapor that may be produced. It is extremely cold and could cause personal injury.

### **WARNING**

**DO NOT OVERFILL.** Over-filling may result in personal injury due to liquid spillage, or damage to the refrigerator.

## Determining Liquid Level

Liquid level must be checked at regular intervals – refrigeration depends on the presence of liquid nitrogen. The liquid level in the container can be determined with a dipstick. Insert the dipstick vertically into the container so that it rests on the canister indexing device on the bottom of the unit. After 5 to 10 seconds, withdraw the dipstick and wave it back and forth in the air. A frost line will form representing the depth of liquid in the container. The frost line will typically be u-shaped; read the bottom of the u-shaped line to determine liquid level.

### WARNING

Never use a hollow rod or tube as a measuring rod. When a warm tube is inserted into liquid nitrogen, liquid will exit from the top of the tube and may cause personal injury.

The liquid level chart shows volume of liquid nitrogen vs. depth for AI Shield refrigerators. These values are approximate and are based on standard conditions with no stored material in the container. With stored material, the liquid volume will be slightly less than the value of the chart.

MODEL	LITERS/INCH	LITERS/CM
AIS1.5	0.22	0.09
AIS3	0.51	0.20



## Inserting or Removing Canisters

To prevent unnecessary loss of liquid nitrogen and accumulation of ice, the necktube core (the stopper) should remain in the container when the stored material is not being accessed. When accessing stored material, the necktube core should be removed as briefly as possible. When removing material from the canister, withdraw the canister just far enough to remove contents. This process should be completed quickly.

### WARNING

Handle the canister carefully to prevent personal injury. Avoid direct canister contact with bare skin. The use of proper personal protective equipment is strongly urged – cryogenic gloves, face shield and apron – to protect against splashing.

When the room temperature product is added, slowly lower the canister into the refrigerator to reduce the boiling of refrigerant and the surge of cold nitrogen gas. When inserting the canister, tilt the bottom of the canister in the direction of the index ring notch.

## Securing Contents

The contents of all models may be secured with a seal or lock through the tabs on the edge of the lid.

## Routine Care & Maintenance

If ice accumulates inside the necktube, a general cleaning of the refrigerator should be scheduled as soon as the stored material can be conveniently transferred to another refrigerator. To clean the unit, first remove stored material, then pour out the liquid, disposing of it out-of-doors where the cold liquid will not damage driveways and other surfaces. Warm the container by purging it with air even after the container has warmed to room temperature to evaporate any collected moisture. When the container is ice-free and dry, rinse the inner vessel with household bleach. Wash the inner vessel with a 40 to 1 ratio of water to laundry detergent solution. Rinse and dry inside and out thoroughly before placing the container back into service. Do not use sharp instruments to chip ice; permanent damage to the container could result. DO NOT attempt to fasten any device to the container. Welding, brazing, or piercing of the container in any manner will cause permanent damage and void the limited warranty.

Refrigeration depends on the presence of liquid nitrogen in the refrigerator. Be sure to maintain correct liquid nitrogen levels to prevent loss of stored material. **Check liquid levels regularly.** If high evaporation rates are apparent under normal operating conditions, the refrigerator may be losing its vacuum. Sweating and the formation of frost or ice on the outer casing are indications that the vacuum integrity of the refrigerator may have been compromised.

All necessary steps should be taken to protect the refrigerator's contents.

If these conditions persist, contact your supplier or Worthington's Customer Service Department at 844-273-7517 or +1 614-438-7968 or e-mail us at [customerservice@worthingtonindustries.com](mailto:customerservice@worthingtonindustries.com) for information on how to conduct a normal evaporation rate (NER) test in the field.

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## Transportation

**Although these refrigerators are rugged, they can be damaged if mishandled. When moving or transporting the refrigerator, keep the unit upright. Take every necessary precaution to prevent sliding, tipping, bumping or dropping the unit.** Refrigerators containing liquid nitrogen must never be transported in sealed compartments. Ventilation must be assured to prevent the displacement of air and the related suffocation hazard.

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## Returns

Manufacturing defects are covered under the refrigerator's limited warranty. Evidence of mishandling, such as dents on the outer vessel or misalignment of the inner vessel, are not considered manufacturing defects. If you would like to return goods to Worthington for any reason, you must first obtain a Material Return Authorization (MRA) number for tracking purposes. Please have a description of your symptoms and the refrigerator's serial number ready. Contact your supplier or call Worthington's Customer Service Department at 844-273-7517 or +1 614-438-7968 or email us at [customerservice@worthingtonindustries.com](mailto:customerservice@worthingtonindustries.com).

## Accessories

The following accessories are available for AI Shield™ refrigerators:

LIQUID LEVEL MEASURING ROD	P/N	MODEL
Graduated in both inches and centimeters. This accessory is inserted into the cryogenic refrigerant to determine actual liquid level.	366784	All Units

REPLACEMENT PARTS		
REFRIGERATORS	AIS1.5	AIS3
Canister	370949	370948
Necktube Core	380060	380061

## Ordering Information

Order all replacement parts and accessories from your local distributor. Please include the model number of your refrigerator, part number, quantity, and description of each part requested. For more information or to find the name of your local distributor, contact Worthington at the phone number or email listed below.



**WORTHINGTON**  
INDUSTRIES

### CONTACT US

**US Toll Free:** 844-273-7517

**Global:** +43 7485 606 286 / +1 614-438-7968

**Sales Support/Order Placement:**

customerservice@worthingtonindustries.com