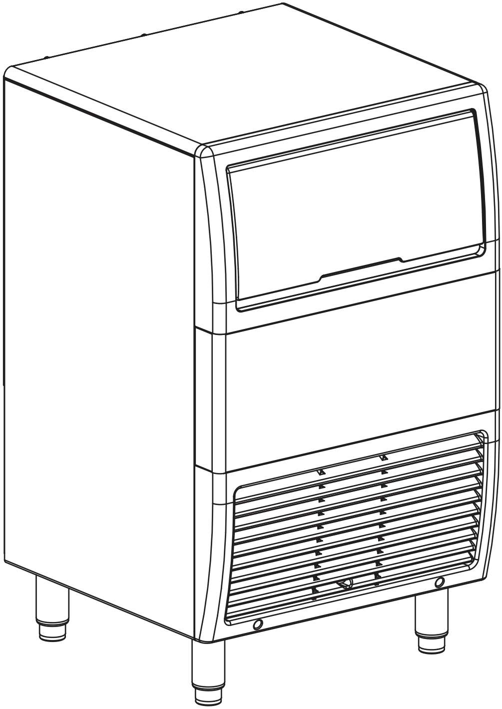


UG Models

Technician's Handbook

This manual is updated as new information and models are released. Visit our website for the latest manual.
www.manitowocice.com

America's #1 Selling Ice Machine

Manitowoc Ice P/N 040004390 7/14

Safety Notices

When using or servicing these Ice Machines, be sure to pay close attention to the safety notices in this handbook. Disregarding the notices may lead to serious injury and/or damage to the ice machine.

Throughout this handbook, you will see the following types of safety notices:

⚠ Warning
Text in a Warning box alerts you to a potential personal injury situation. Be sure to read the Warning statement before proceeding, and work carefully.

⚠ Caution
Text in a Caution box alerts you to a situation in which you could damage the ice machine. Be sure to read the Caution statement before proceeding, and work carefully.

Procedural Notices

When using or servicing these Ice Machines, be sure to read the procedural notices in this handbook. These notices supply helpful information that may assist you as you work.

Throughout this handbook, you will see the following types of procedural notices:

> **Important**
>
> Text in an Important box provides you with information that may help you perform a procedure more efficiently. Disregarding this information will not cause damage or injury, but may slow you down as you work.

NOTE: Text set off as a Note provides you with simple, but useful extra information about the procedure you are performing.

Read These Before Proceeding:

⚠ Caution

Proper installation, care and maintenance are essential for maximum ice production and trouble free operation of your Manitowoc Ice Machine. If you encounter problems not covered by this manual, do not **proceed**, contact Manitowoc Ice, Inc. We will be happy to provide assistance.

Important

Routine adjustments and maintenance procedures outlined in this manual are not covered by the warranty.

We reserve the right to make product improvements at any time. Specifications and design are subject to change without notice.

⚠ Warning

PERSONAL INJURY POTENTIAL

Do not operate equipment that has been misused, abused, neglected, damaged, or altered/modified from that of original manufactured specifications.

⚠ Warning

POTENTIAL PERSONAL INJURY SITUATION

This ice machine contains refrigerant charge. Installation and Servicing must be performed by a properly trained refrigeration technician aware of the **Dangers of dealing with refrigerant** charged equipment.

This Page Intentionally Left Blank

Table of Contents

Component Check Procedures 55

Cycle Times/24 Hour Ice Production and Refrigerant Pressure Charts 81

Diagrams 109

This Page Intentionally Left Blank

General Information

Model Numbers

This manual covers the following models:

Self-Contained Air-Cooled	Water-Cooled
UG018A	N/A
UG020A	N/A
UG030A	UG030W
UG040A	N/A
UG050A	UG050W
UG065A	N/A
UG080A	N/A

This Page Intentionally Left Blank

Installation

Location of Ice Machine

The location selected for the ice machine must meet the following criteria. If any of these criteria are not met, select another location.

- The location must be indoors.
- The location must be free of airborne and other contaminants.
- The air temperature must be at least 10ºC but must not exceed 43.4ºC.
- The location must not be near heat-generating equipment or in direct sunlight.
- The location must be capable of supporting the weight of the ice machine and a full bin of ice.
- The location must allow enough clearance for water, drain, and electrical connections in the **rear of the ice machine.**
- The location must not obstruct airflow through or around the ice machine (condenser airflow is in and out the front). Refer to the chart below f or clearance requirements.

	Self-Contained Air-Cooled	**Self-Contained Water-Cooled**
Top/Sides	203 mm (8")*	127 mm (5")*
Back	127 mm (5")*	127 mm (5")*

***NOTE:** The ice machine may be built into a cabinet.

There is no minimum clearance requirement for the top or left and right sides of the ice machine. The listed values are recommended for efficient operation and servicing only.

WATER SERVICE/DRAINS

Water Supply

Local water conditions may require treatment of the water to inhibit scale formation, filter sediment, and remove chlorine odor and taste.

Water Inlet Lines

- Do not connect the ice machine to a hot water supply. Be sure all hot water restrictors installed for other equipment are working. (Check valves on sink faucets, dishwashers, etc.)
- If water pressure exceeds the maximum recommended pressure, 5 bar (500 kPA), install a water pressure regulator.
- Install a water shut-off valve.

Drain Connections

- Drain lines must have a 2.5 cm per meter drop, and must not create traps.
- The floor drain must be large enough to accommodate drainage from all drains.

> ⚠ **Caution**
>
> The ice machine must be protected if it will be subjected to temperatures below 0°C. Failure caused by exposure to freezing temperatures is not covered by the warranty.

ELECTRICAL REQUIREMENTS

Voltage

The maximum allowable voltage variation is ±6% of the rated voltage on the ice machine model/serial number plate at start-up (when the electrical load is highest).

All ice machines are factory pre-wired with a power cord only, no plug is supplied.

Fuse/Circuit Breaker

A separate fuse/circuit breaker must be provided for each ice machine. An electrical disconnect switch must be provided if the ice machine is hard wired (wired without a plug).

Total Circuit Ampacity

The total circuit ampacity is used to help select the wire size of the electrical supply.

The wire size (or gauge) is also dependent upon location, materials used, length of run, etc., so a qualified electrician must make the determination.

ELECTRICAL SPECIFICATIONS

Ice Machine	Voltage/Phase/ Cycle	Air-Cooled		Water-Cooled	
		Maximum Fuse/ Circuit Breaker	Total Amps	Maximum Fuse/Circuit Breaker	Total Amps
UG018	230/1/50	10	2.0	N/A	N/A
UG020	230/1/50	10	2.3	N/A	N/A
	230/1/60	10	2.3	N/A	N/A
UG030	230/1/50	15	2.8	15	2.5
	230/1/60	15	2.8	N/A	N/A
	115/1/60	15	5.5	N/A	N/A
UG040	230/1/50	15	3.0	N/A	N/A
	230/1/60	15	3.0	N/A	N/A

UG050	230/1/50	15	4.0	15	2.8
	230/1/60	15	4.0	N/A	N/A
	115/1/60	15	6.8	N/A	N/A
UG065	230/1/50	15	4.5	N/A	N/A
	230/1/60	15	4.5	N/A	N/A
UG080	230/1/50	15	5.5	N/A	N/A
	230/1/60	15	5.5	N/A	N/A

POWER CONSUMPTION - KWH PER 24 HOURS

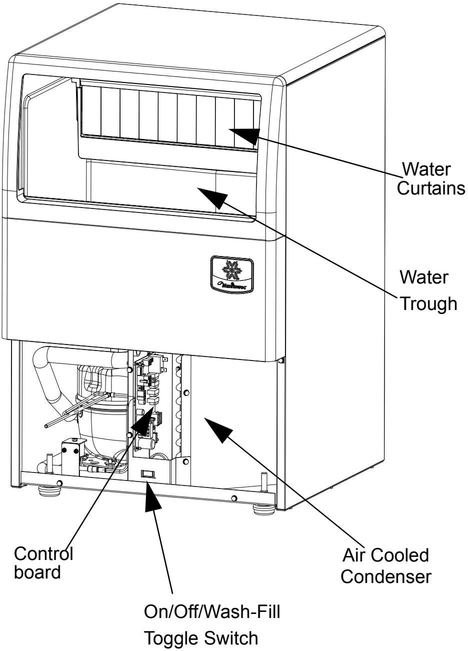
Model	Air Temp/Water Temp	
	32/21	43/32
UG018A	5.20	5.87
UG020A	6.11	6.58
UG030A	7.31	7.71
UG030W	6.38	6.44
UG040A	8.79	9.26
UG050A	10.12	10.87
UG050W	8.49	9.61
UG065A	14.33	15.78
UG080A	17.67	18.15

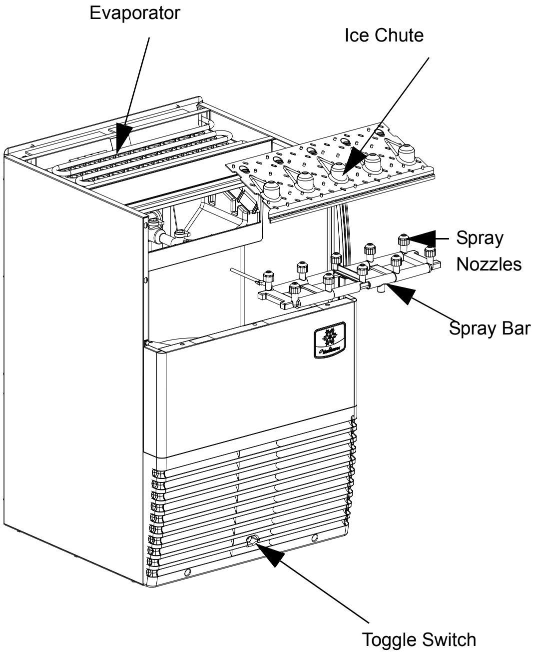
ICE MACHINE HEAT OF REJECTION

Series Ice Machine	Heat of Rejection	
	Air Conditioning	Peak
UG18	1,150	2,300
UG20	1,400	2,600
UG30	1,900	3,300
UG40	2,100	4,100
UG50	2,600	5,000
UG65	2,900	5,000
EC80	4,300	7,400

BTU/Hour
Because the heat of rejection varies during the ice making cycle, the figure shown is an average.

Component Identification



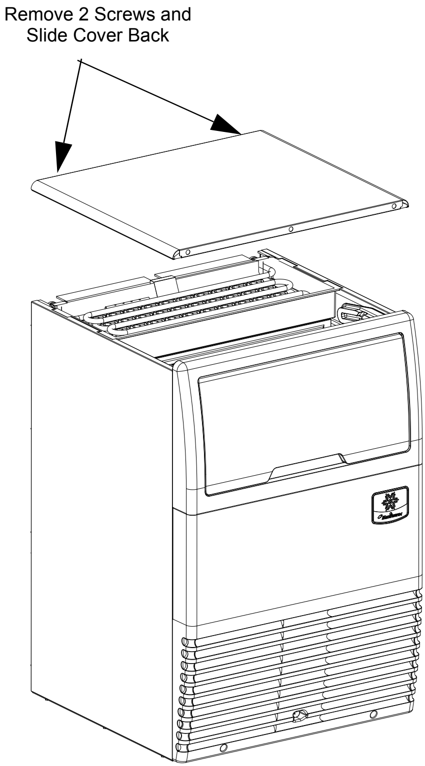

Evaporator
Ice Chute
Spray
Nozzles
Spray Bar
Toggle Switch

COMPONENT REMOVAL

Top Cover

For easiest access to the evaporator compartment, the top cover can be removed.

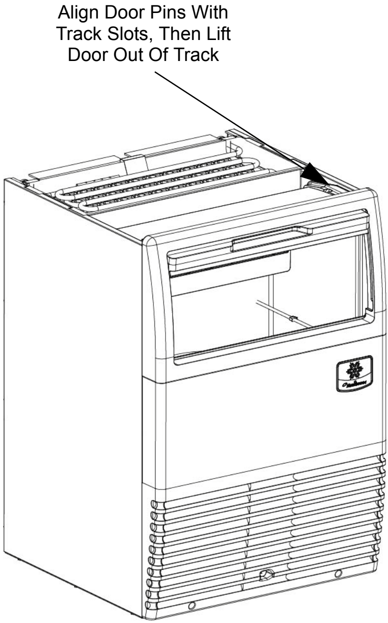
1. Remove two screws on the rear of the ice machine.
2. Slide top cover back to disengage the three pins from the front panel



Bin Door

Allows access to the storage bin.

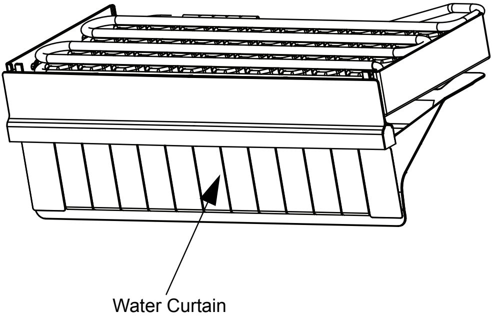
1. Remove top cover.
2. Slide door up until rear pins align with slot in door tracks.
3. Lift rear door pins out and slide door up until front door pins align with slot.
4. Lift door out of door track



Water Curtain

The water curtain is designed to keep the spraying water from escaping the evaporator compartment. Removal of the bin door is not required, but enhances access.

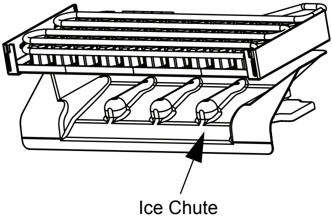
1. Grasp the ice curtain and lift up.
2. To re-install into ice machine, pivot the water curtain and pull down into position. Make sure tabs are secure in grooves.



Ice Chute

The ice chute is positioned over the spray nozzles and allows the ice to easily fall into the bin. It must be firmly positioned over the Spray Bar Assembly, with the front edge inside the water trough or the spray nozzles will not be aligned with the spray holes, and spray water will fall into bin.

1. Grab protruding spray holes on one end and lift up.
2. Pivot ice chute and remove.
3. To re-install ice chute, grasp protruding spray holes and position over Spray Bar Assembly. Make sure rear supports are over Spray Bar Assembly, and front edge is inside of water trough

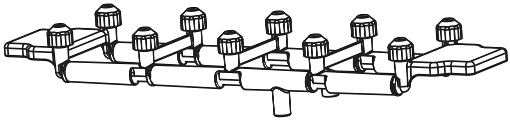


SPRAY BAR

The spray bar supplies water to the individual ice-making cups. Water from the Water Pump sprays through the nozzles, located on the upper portion of the tubes.

1. Grasp one end of the spray bar, lift up and remove from seat formed in water trough.
2. Remove both plastic clips on water inlet tubing by grasping both ears on clip and separating.
3. Apply food grade lubricate to ease re-assembly of spray bar components when necessary.
4. To re-install spray bar, position water inlet tubing on inlet ports, and squeeze clips until tight.
5. Reposition assembly on water trough seat.

NOTE: Nozzles and inserts can be removed for cleaning by unscrewing nozzles. Inserts are located inside the spray bar ports. The spray bar also disassembles for easy cleaning

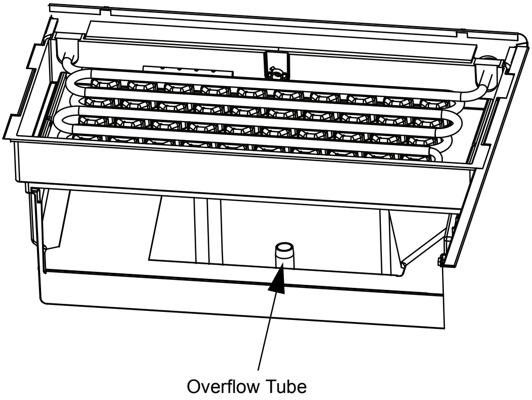


Sump Drain Overflow Tube

The sump drain overflow tube is located in the evaporator water sump.

1. Remove shutters and ice chute.
2. Lift spray bar or disconnect and remove for easiest access.
3. Pull up on over flow tube to remove.

To replace plug, insert in hole, and push with force to make a tight seal



Maintenance

INTERIOR CLEANING AND SANITIZING GENERAL

Clean and sanitize the ice machine every six months for efficient operation. If the ice machine requires more frequent cleaning and sanitizing, consult a qualified service company to test the water quality and recommend appropriate water treatment.

An extremely dirty ice machine must be taken apart for cleaning and sanitizing.

⚠ Caution

Use only approved Ice Machine Cleaner and Sanitizer. Read and understand all labels printed on bottles before use. Do not mix Ice Machine Cleaner and Sanitizer solutions together

⚠ Warning

Wear rubber gloves and safety goggles (and/or face shield) when handling Ice Machine Cleaner or Sanitizer.

CLEANING & SANITIZING PROCEDURE

Ice machine cleaner is used to remove lime scale or other mineral deposits. Sanitizer is used to remove algae or slime.

Mix 4 liters of water with 500 ml of cleaner in a plastic or stainless container.

Cleaner	Water
500 ml (16 oz)	4 l (1 gal)

Step 1 Set the toggle switch to the OFF position at the end of a Harvest Cycle, after ice releases from the evaporator. Or, set the switch to the OFF position and allow the ice to melt off the evaporator.

> ⚠ **Caution**
>
> Never use anything to force ice from the evaporator. Damage may result.

Step 2 Remove all ice from the bin.

Step 3 Remove all parts as described in Section 3, Component Identification & Removal.

Step 4 Take all components to sink and with 2 liters Cleaner/Water mixture clean all components with a soft nylon brush. Disassemble spray bar, remove nozzles and inserts and soak for 5 minutes. For heavily scaled parts, soak in solution for 15–20 minutes. Rinse all components with clean water.

Step 5 While components are soaking; use nylon brush to scrub inside of ice bin. Scrub inside of door, door track, bin, sump trough, and evaporator moldings. With clean water, rinse all of these areas thoroughly.

Step 6 Replace sump overflow tube and pour remaining 2 liters of mixture into the water sump. Replace all parts.

Step 7 To start a cleaning cycle, set the toggle switch to the WASH position.

Step 8 After 13.5 minutes, set the toggle switch to the OFF position. Remove water curtain, ice chute and over flow tube from the water sump. Allow all water to drain from the sump. Replace drain plug . Set toggle switch to WASH and circulate for 12minutes.

Step 9 Wait until the cleaning cycle(12 minutes) is complete then place the toggle switch in the OFF position.Remove water curtain, ice chute, water sump over flow tube. Drain water from sump and replace tube.

Step 10 Mix 60 ml of sanitizer with 12 l of water in a plastic or stainless steel container.

Sanitizer	Water
60 ml (2 oz)	12 l (3 gal)

Step 11 Remove Water Curtain and Ice Chute as described in Section 3, Component Identification & Removal.

Step 12 Take all components to sink and with 10 liters Sanitizer/Water mixture sanitize all components with a soft nylon brush or cloth. Do not rinse components.

Step 13 Use brush or cloth to sanitize the inside of ice bin. Scrub inside of door, door track, bin, water sump, water distribution assembly and evaporator moldings. Do not rinse.

Step 14 Replace sump drain over flow tube, and transfer remaining 2 liters of solution to the sump trough. Replace all components.

Step 15 To start a sanitizing cycle, set the toggle switch to the WASH position.

Step 16 After 13.5 minutes, set the toggle switch to the OFF position. Remove water curtain and ice chute Remove over flow tube from water sump and allow all water to drain from sump. Replace drain plug. Set toggle switch to WASH and circulate for 12 minutes.

Step 17 Wait until the cleaning cycle (12 minutes) is complete then place the toggle switch in the OFF position. Remove water curtain, ice chute, water sump over flow tube. Drain water from sump and replace tub

Step 18 Replace all parts.

Step 19 Place toggle switch to ON position,ice machine will go into ice making cycle.

EXTERIOR CLEANING

Clean the area around the ice machine as often as necessary to maintain cleanliness and efficient operation.

Sponge any dust and dirt off the outside of the ice machine with mild soap and water. Wipe dry with a clean, soft cloth.

A commercial grade stainless steel cleaner and polish may be used.

REMOVAL FROM SERVICE/WINTERIZATION GENERAL

Special precautions must be taken if the ice machine is to be removed from service for an extended period of time or exposed to ambient temperatures of 0°C (32°F) or below.

> ⚠ **Caution**
>
> If water is allowed to remain in the ice machine in freezing temperatures, severe damage to some components could result. Damage of this nature is not covered by the warranty.

Follow the applicable procedure below.

AIR-COOLED ICE MACHINES

1. Disconnect the electric power at the circuit breaker or the electric service switch.
2. Turn off the water supply.
3. Drain the water from the water sump and water pump by disconnecting the water pump tubing.
4. Disconnect and drain the incoming ice-making water line and disconnect the tubing from the water inlet valve outlet and allow water to drain.
5. Blow compressed air in the drain opening and water valve outlet hose, then reattach.
6. Make sure water is not trapped in any of the water or drain lines.

WATER-COOLED ICE MACHINES

1. Perform steps 1-6 under “Air-Cooled Ice Machines.”
2. Disconnect the incoming water and drain lines from the water-cooled condenser.
3. Insert a large screwdriver between the bottom spring coils of the water regulating valve. Pry upward to open the valve.
4. Hold the valve open and blow compressed air through the condenser until water no longer exits.

Operation

Sequence Of Operation

INITIAL START-UP

1. Water Inlet and Pressure Equalization

Turn the toggle switch to”ON” positon,the water fill valve and harvest valve are energized, 300 seconds later, the water fill valve is de-energized. 20seconds after the harvest valve solenoid is energized, the compressor is energized. 300seconds after the compressor is energized, the harvest valve solenoid is de-energized, the water pumpand the fan motor are energized,machine goes into freeze cycle.

2. Freeze Cycle

The pump sprays water into the inverted cups. The water freezes layer by layer, until an ice cube forms in each cup.

When the”water temperature”is equal to or less than 2 ? for more than 5 seconds, control will read the” liquid line temperature” and dip switch setting , get the” freeze postpone time” and “fan shut off time”.Board will shut the Fan before the end of the freeze cycle to assist harvest. When the ” freeze postpone time” has elapsed, the harvest cycle is initiated.

3. Harvest Cycle

The compressor continues to operate and the water pump is de-energized. The hot gas valve energizes, allowing hot gas to enter and warm the evaporator. The water valve is also energized, aiding with harvest, as well as filling up the sump with fresh water for a new freeze cycle.

at the point of 2 minutes to freeze end , board will read the ” liquid line temperature”again and calculate the “harvest time”

The ice falls from the cups and is directed into the bin by the ice chute. The harvest cycle continues until the harvest time has elapsed,then machine goes into a new freeze cycle

4. Automatic Shut-Off

When the storage bin is full, the ice will come in contact with the bin thermostat which is located inside the bin. The machine will stop after approximately 45seconds of continuous ice contact with the bin thermostat probe.

The ice machine remains off until a 3 minutes delay has elapsed and enough ice has been removed from the storage bin to allow the ice to fall clear of the bin thermostat probe. As the ice clears the probe, the bin thermostat warms up and the machine starts another freeze cycle.

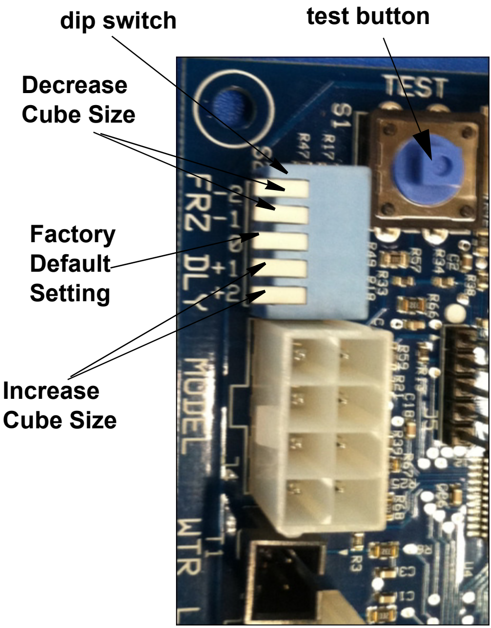
NOTE:
Be Careful not to turn the ice machine to WASH by mistake. If so then you will need to follow the WASH procedure until finished. Or, to bypass the WASH lock-in, press the Test Button (in control board) 3 times in 10 seconds and then set the toggle switch to the OFF position.

IICE CUBE THICKNESS CHECK

The ice cube thickness is factory-set to maintain the ice cube thickness at the proper size and weight.

1. Allow the ice machine to operate for three complete cycles. The cubes should have a small dimple in the center.
2. Cycle times vary, according to surrounding air and water inlet temperatures.
3. If cubes are not full (large dimple), raise the “dip switch” level to increase cube size. Allow ice machine to complete three cycles, then check cube.
4. If cubes are too full, (no dimple), lower the “dip switch” level to decrease cube size.Allow ice machine to operate three complete cycles.
5. The “dip switch” can be adjusted to five levels: -2/ -1/0/+1/+2, and ensure that only one level switch is pressed

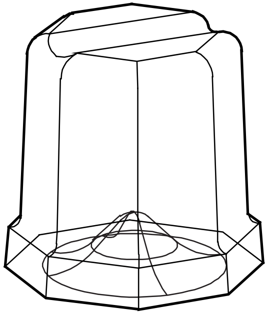
.


dip switch
test button
Decrease
Cube Size
Factory
Default
Setting
Increase
Cube Size
TEST
S1
FRZ
DLY
MODEL
WTR

CUBE SHAPE

The standard cube has an average weight of 19

Notice the normal dimple in the center of the cube.



This Page Intentionally Left Blank

Troubleshooting

All Models

ICE MACHINE WILL NOT RUN

Nothing on the ice machine will operate (compressor, water pump, condenser fan motor). If any component runs this procedure can be skipped, move on to the next diagnostics (water pump won't run, compressor won't run, etc).

1. Place the toggle switch in the clean position. If the water pump runs begin with toggle switch diagnostics. If water pump does not run place toggle switch in ice position.
2. Verify correct voltage is present and matches nameplate voltage.
3. High pressure switch must be closed on water cooled ice machines
4. Bin thermostat must be closed before any components can be energized.

COMPRESSOR WON'T RUN

If the water pump is running and the compressor is not, it may be tripping on overload or tripping the breaker/fuse. Check for grounded winding if breaker keeps tripping.

1. Compressor Relay LED lit?
2. Start capacitor and relay function?
3. Compressor windings closed?
4. Refer to compressor diagnostics.

COMPRESSOR ELECTRICAL DIAGNOSTICS

The compressor does not start or will trip repeatedly on overload.

Check Resistance (OHM) Values

NOTE: Compressor windings can have very low ohm values. Use a properly calibrated meter.

Perform the resistance test after the compressor cools. The compressor dome should be cool enough to touch (below 49°C) to assure that the overload is closed and the resistance readings will be accurate.

Single Phase Compressors

1. Disconnect power from the condensing unit and remove the wires from the compressor terminals.
2. The resistance values between C and S and between C and R, when added together should equal the resistance value between S and R.
3. If the overload is open, there will be a resistance reading between S and R, and open readings between C and S and between C and R. Allow the compressor to cool, then check the readings again.

Check Motor Windings to Ground

Check continuity between all three terminals and the compressor shell or copper refrigeration line. Scrape metal surface to get good contact. If continuity is present, the compressor windings are grounded and the compressor should be replaced.

To determine if the Compressor is seized check the amp draw while the compressor is trying to start.

Compressor Drawing High Amps

The continuous amperage draw on start-up should not be near the maximum fuse size indicated on the serial tag.

The wiring must be correctly sized to minimize voltage drop at compressor start-up. The voltage when the compressor is trying to start must be within (6% of the nameplate voltage).

Compressor Drawing Locked Rotor

The three likely causes of this are:

- Low voltage supply (check voltage while compressor is trying to start)
- Defective starting component
- Mechanically seized compressor

To determine which you have:

- Install high and low side gauges.
- Try to start the compressor.
- Watch the pressures closely.

If the pressures do not move, the compressor is seized. Replace the compressor.

If the pressures move, the compressor is turning slowly and is not seized. Check the capacitors and relay.

DIAGNOSING START COMPONENTS

If the compressor attempts to start, or hums and trips the overload protector, check the start components before replacing the compressor.

Capacitor

Visual evidence of capacitor failure can include a bulged terminal end or a ruptured membrane. Do not assume a capacitor is good if no visual evidence is present. A good test is to install a known good substitute capacitor. Use a capacitor tester when checking a suspect capacitor. Clip the bleed resistor off the capacitor terminals before testing.

Current Relay

The relay has a set of contacts that energize and de-energize the compressor start winding. The contacts on the relay are normally open (start winding de-energized). When power is applied the run winding will be at LRA. The relay coil will become an electromagnet and close the contacts (start winding energized). As the compressor motor RPM increases, the run winding current draw and relay coil magnetism decrease allowing the contacts to open. Replace a suspect relay with a known good relay, or use a momentary switch and start capacitor to mimic relay operation.

WATER PUMP WON'T RUN

1. Water pump winding closed?

- Yes-rebulid or replace water pump.
- No-Water Pump Relay LED on control board lit?

∗ Yes:repair wiring

∗ No: rebulid or replace control board

HOT GAS VALVE WON'T ENERGIZE

1. Line voltage at hot gas valve? (Wires 6& 7)

- Yes - Replace hot gas valve coil.
- No - Hot gas valve Relay LED on control board lit?

∗ Yes:repair wiring

No:rebulid or replace control board

WATER INLET VALVE WON'T ENERGIZE

1. Line voltage at water inlet valve?

- Yes - Replace water inlet valve coil.
- No - water inlet valve Relay LED on control board lit?

∗ Yes:repair wiring

No:rebulid or replace control board

ICE MACHINE PREMATURELY HARVESTS

1. Line voltage at hot gas valve?

   > No - Replace hot gas valve.

2. had set the "dip switch"?

   >Yes - Refer to"ice cube thickness check" adjusting increase cube size(increase Increased ice freeze time)

Refer to" thermistor diagnostics." test the Water Thermistor and the Liquid Line Thermistor .

CE MACHINE WILL NOT HARVEST

1. Liquid Line Thermistor temperature below setpoint?
2. Liquid Line Thermistor sensor installation correctly?
3. Refer to" thermistor diagnostics.” test the Liquid Line Thermistor.

Line voltage at hot gas valve and water inlet Solenoid?

EVAPORATOR THERMOSTAT

Function

Thermistor resistance values change with temperature.The value supplied to the control board is used to Initiates and terminates freeze cycle?harvest cycle and automatic shutdown?

Three thermistors are located on the ice machine. They are labeled T1, T2, T3?

T1- Water thermistor located at the water trough.

T2- Liquid line thermistor sensor located at outlet of the condenser.

T3-Bin full thermistor sensor located at top of

the bin.

SPECIFICATIONS

TI &T3

Temperature of Thermistor	**Resistance**	**Temperature of Thermistor**	**Resistance**
°C	**K Ohms (x 1000)**		**K Ohms (x 1000)**
-50	344.6	26	4.771
-49	320.5	27	4.567
-48	298.2	28	4.375
-47	277.6	29	4.190
-46	258.7	30	4.016
-45	241.1	31	3.849
-44	224.8	32	3.690
-43	209.8	33	3.538
-42	195.9	34	3.394
-41	183.0	35	3.256

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-40	171.0	36	3.124
-39	159.9	37	2.999
-38	149.5	38	2.879
-37	140.0	39	2.764
-36	131.1	40	2.656
-35	122.8	41	2.551
-34	115.1	42	2.452
-33	108.0	43	2.356
-32	101.2	44	2.266
-31	95.03	45	2.179
-30	89.24	46	2.095
-29	83.83	47	2.016
-28	78.79	48	1.940
-27	74.09	49	1.867
-26	69.70	50	1.797
-25	65.58	51	1.731
-24	61.75	52	1.667
-23	58.16	53	1.606
-22	54.81	54	1.547
-21	51.66	55	1.491
-20	48.72	56	1.437
-19	45.97	57	1.385
-18	43.39	58	1.336
-17	40.96	59	1.289
-16	38.69	60	1.243
-15	36.56	61	1.200
-14	34.56	62	1.158
-13	32.68	63	1.117
-12	30.92	64	1.079
-11	29.25	65	1.041
-10	27.70	66	1.006

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-9	26.24	67	0.9715
-8	24.85	68	0.9386
-7	23.55	69	0.9069
-6	22.33	70	0.8766
-5	21.18	71	0.8173
-4	20.09	72	0.8192
-3	19.07	73	0.7922
-2	18.10	74	0.7662
-1	17.19	75	0.7411
0	16.33	76	0.7170
1	15.52	77	0.6939
2	14.75	78	0.6715
3	14.02	79	0.6501
4	13.33	80	0.6293
5	12.69	81	0.6094
6	12.07	82	0.5902
7	11.49	83	0.5717
8	10.94	84	0.5538
9	10.43	85	0.5367
10	9.932	86	0.5201
11	9.466	87	0.5041
12	9.025	88	0.4887
13	8.608	89	0.4739
14	8.211	90	0.4595
15	7.836	91	0.4457
16	7.480	92	0.4323
17	7.142	93	0.4194
18	6.821	94	0.4069
19	6.516	95	0.3950
20	6.228	96	0.3833
21	5.953	97	0.3722

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
22	5.692	98	0.3613
23	5.444	99	0.3508
24	5.208	100	0.3407
25	4.984		

T2

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-40	225.1	36	6.623
-39	212.8	37	6.387
-38	200.6	38	6.162
-37	189.3	39	5.945
-36	178.7	40	5.738
-35	168.8	41	5.538
-34	159.4	42	5.347
-33	150.6	43	5.163
-32	142.4	44	4.987
-31	134.7	45	4.817
-30	127.5	46	4.655
-29	120.6	47	4.498
-28	114.2	48	4.348
-27	108.2	49	4.203
-26	102.5	50	4.064
-25	97.20	51	3.931
-24	92.17	52	3.803
-23	87.44	53	3.680

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-22	82.97	54	3.561
-21	78.77	55	3.446
-20	74.80	56	3.336
-19	71.05	57	3.230
-18	67.52	58	3.127
-17	64.19	59	3.028
-16	61.03	60	2.933
-15	58.06	61	2.841
-14	55.24	62	2.753
-13	52.58	63	2.667
-12	50.07	64	2.585
-11	47.68	65	2.505
-10	45.43	66	2.428
-9	43.30	67	2.354
-8	41.27	68	2.283
-7	39.36	69	2.214
-6	37.55	70	2.147
-5	35.83	71	2.082
-4	34.19	72	2.020
-3	32.65	73	1.960
-2	31.18	74	1.902
-1	29.78	75	1.846
0	28.49	76	1.791
1	27.20	77	1.739
2	26.01	78	1.688
3	24.88	79	1.639
4	23.80	80	1.592
5	22.78	81	1.546
6	21.81	82	1.502
7	20.88	83	1.459
8	20.00	84	1.417

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
9	19.16	85	1.377
10	18.36	86	1.338
11	17.60	87	1.300
12	16.88	88	1.264
13	16.19	89	1.229
14	15.53	90	1.195
15	14.90	91	1.162
16	14.30	92	1.129
17	13.73	93	1.098
18	13.19	94	1.068
19	12.67	95	1.039
20	12.17	96	1.011
21	11.70	97	0.9838
22	11.24	98	0.9572
23	10.81	99	0.9316
24	10.40	100	0.9066
25	10.00	101	0.8832
26	9.622	102	0.8604
27	9.260	103	0.8384
28	8.913	104	0.8170
29	8.582	105	0.7964
30	8.265	106	0.7762
31	7.961	107	0.7564
32	7.670	108	0.7374
33	7.391	109	0.7190
34	7.124	110	0.7010
35	6.868		

Check Procedure

1. Make sure the thermistor sensors installation correctly
2. Disconnect thermistor from control board and measure resistance.
3. Measure temperature at the thermistor.
4. Compare measured resistance/ temperature.Creadings to resistance/temperature relationship

- Within 10% of the published resistance value- Thermistor is good
- Not within 10% of the published resistancevalue - Thermistor is defective.

Water System Checklist

A water-related problem often causes the same symptoms as a refrigeration system component malfunction.

Water system problems must be identified and eliminated prior to replacing refrigeration components.

Water area (evaporator) is dirty

- Clean as needed

Water inlet pressure not between 1.4 and 5.5 bar

- Install a water regulator valve or increase the water pressure

Incoming water temperature is not between 1.7°C and 32.2°C

- If too hot, check the hot water line check valves in other store equipment

Water filtration is plugged (if used)

- Install a new water filter

Hoses, fittings, etc., are leaking water

- Repair/replace as needed

Water inlet valve is stuck open or closed

- Clean/replace as needed

Water is spraying out of the sump trough area

- Stop the water spray

Uneven water flow across the evaporator

- Clean the ice machine

Ice Production Check

The amount of ice a machine produces directly relates to the operating water and air temperatures. This means an ice machine with a 20°C outdoor ambient temperature and 10.0°C water produces more ice than the same model ice machine with a 32°C outdoor ambient and 21°C water.

1. Determine the ice machine operating conditions:

   Air temp entering condenser: ____°

   Air temp around ice machine: ____°

   Water temp entering sump trough: ____°

2. Refer to the appropriate 24-Hour Ice Production Chart.

3. Use the operating conditions determined in Step 1 to find published 24 hr. ice production: ____

   - Times are in minutes.
     Example: 1 min., 15 sec. converts to 1.25 min.
     (15 seconds ÷ 60 seconds = .25 minutes)

   - Weights are in grams.

4. Perform an ice production check using the formula below.

1.	________ Freeze Time	+	________ Harvest Time	=	________ Total Cycle Time
2.	1440 Minutes in 24 Hrs.		________ Total Cycle Time		________ Cycles per Day
3.	________ Weight of One Harvest	×	________ Cycles per Day	=	________ Actual 24-Hour Production

Weighing the ice is the only 100% accurate check.

Compare the results of Step 3 with Step 2. Ice production is normal when these numbers match closely. If they match closely, determine if:

- Another ice machine is required.

Relocating the existing equipment to lower the load conditions is required.

Analyzing Discharge Pressure

1. Determine the ice machine operating conditions:

   Air temp. entering condenser ______

   Air temp. around ice machine ______

   Water temp. entering sump trough ______

2. Refer to Cycle Times/24 Hour Ice Production/ Refrigeration Pressure Chart for ice machine being checked.

3. Use the operating conditions determined in Step 1 to find the published normal discharge pressures.

   Freeze Cycle ______

   Harvest Cycle ______

Perform an actual discharge pressure check.

	Freeze Cycle PSIG	**Harvest Cycle PSIG**
Beginning of Cycle	______	______
Middle of Cycle	______	______
End of Cycle	______	______

Compare the actual discharge pressure (Step 3) with the published discharge pressure (Step 2).

The discharge pressure is normal when the actual pressure falls within the published pressure range for the ice machine's operating conditions. It is normal for the discharge pressure to be higher at the beginning of the freeze cycle (when load is greatest), then drop throughout the freeze cycle.

DISCHARGE PRESSURE HIGH CHECKLIST

Improper Installation

- Refer to “Installation/Visual Inspection Checklist”

Restricted Condenser Air Flow

- High inlet air temperature
- Condenser discharge air re-circulation
- Dirty condenser fins
- Defective fan motor

Improper Refrigerant Charge

- Overcharged
- Non-condensable in system
- Wrong type of refrigerant

Other

- High side refrigerant lines/component restricted (before mid-condenser)

FREEZE CYCLE DISCHARGE PRESSURE LOW CHECKLIST

Improper Installation

- Refer to “Installation/Visual Inspection Checklist”

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- High side refrigerant lines/component restricted (before mid-condenser)

NOTE: Do not limit your diagnosis to only the items listed in the checklists.

Analyzing Suction Pressure

The suction pressure gradually drops throughout the freeze cycle. The actual suction pressure (and drop rate) changes as the air and water temperature entering the ice machine changes. These variables also determine the freeze cycle times.

To analyze and identify the proper suction pressure drop throughout the freeze cycle, compare the published suction pressure to the published freeze cycle time.

NOTE: Analyze discharge pressure before analyzing suction pressure. High or low discharge pressure may be causing high or low suction pressure.

Procedure

Step	Example Using UG040A Model Ice Machine
1. Determine the ice machine operating conditions.	Air temp. entering condenser: 32°C Water temp. entering water fill valve: 21°C
2A. Refer to "Cycle Time" and "Operating Pressure" charts for ice machine model being checked. Using operating conditions from Step 1, determine published freeze cycle time and published freeze cycle suction pressure.	39.28 minutes Published Freeze cycle time: 2.92 to2.2 bar Published Freeze cycle suction pressure:
2B. Compare the published freeze cycle time and published freeze cycle suction pressure. Develop a chart.	Published Freeze Cycle Time (minutes) 1 20 40 2.92 2.56 2.2 Published Freeze Cycle Suction Pressure (bar) In the example, the proper suction pressure should be approximately 2.92 bar at 1 minute; 2.56bar at 20 minutes; etc.
3. Perform an actual suction pressure check at the beginning, middle and end of the freeze cycle. Note the times at which the readings are taken.	Manifold gauges were connected to the example ice machine and suction pressure readings taken as follows: Beginning of Freeze cycle:5bar (at 1 min.) Middle of Freeze cycle:4 bar (at 20 min.) End of Freeze cycle:3 bar (at 40 min.)
4. Compare the actual freeze cycle suction pressure (Step 3) to the published freeze cycle time and pressure comparison (Step 2B). Determine if the suction pressure is high, low or acceptable.	In this example, the suction pressure is considered high throughout the freeze cycle. It should have been: Approximately 2.92 bar (at 1 minute) – not 5 bar Approximately 2.56 bar (at 20 minutes) – not 4 bar Approximately 2.2 bar (at 40 minutes) – not 3 bar

SUCTION PRESSURE HIGH CHECKLIST

Improper Installation

- Refer to “Installation/Visual Inspection Checklist”

Discharge Pressure

- Discharge pressure is too high, and is affecting suction pressure, refer to “Freeze Cycle Discharge Pressure High Checklist”

Improper Refrigerant Charge

- Overcharged
- Wrong type of refrigerant
- Non Condensable in system

Other

- Hot gas valve leaking
- TXV flooding (check bulb mounting)

Defective compressor

SUCTION PRESSURE LOW CHECKLIST

Improper Installation

- Refer to “Installation/Visual Inspection Checklist”

Discharge Pressure

- Discharge pressure is too low, and is affecting suction pressure, refer to “Freeze Cycle Discharge Pressure Low Checklist”

Improper Refrigerant Charge

- Undercharged
- Wrong type of refrigerant

Other

- Improper water supply over evaporator, refer to “Water System Checklist”
- Loss of heat transfer from tubing on back side of evaporator
- Restricted/plugged liquid line drier
- Restricted/plugged tubing or capillary tube in suction side of refrigeration system
- TXV starving
- Moisture in refrigeration system

NOTE: Do not limit your diagnosis to only the items listed in the checklists.

Discharge Line Temperature Analysis

General

Compressor discharge line temperature on a normally operating ice machine steadily increases throughout the freeze cycle. Comparing the temperatures over several cycles will result in a consistent maximum discharge line temperature.

Ambient air temperatures affect the maximum discharge line temperature.

Higher ambient air temperatures at the condenser = higher discharge line temperatures at the compressor.

Lower ambient air temperatures at the condenser = lower discharge line temperatures at the compressor.

Regardless of ambient temperature, the freeze cycle discharge line temperature will be higher than 71°C on a normally operating ice machine.

Procedure

Connect a temperature probe on the compressor discharge line within 6" of the compressor.

Observe the discharge line temperature for the last ten minutes of the freeze cycle and record the maximum discharge line temperature.

DISCHARGE LINE TEMPERATURE ABOVE 71°C AT END OF FREEZE CYCLE:

Ice machines that are operating normally will have consistent maximum discharge line temperatures above 71°C.

DISCHARGE LINE TEMPERATURE BELOW 71°C AT END OF FREEZE CYCLE:

Ice machines that have a flooding expansion valve will have a maximum discharge line temperature that decreases each cycle.

Verify the expansion valve sensing bulb is 100% insulated and sealed airtight. Condenser air contacting an incorrectly insulated sensing bulb will cause overfeeding of the expansion valve.

Verify the expansion valve sensing bulb is positioned and secured correctly.

Component Check Procedures

ON/OFF/WASH-FILL TOGGLE SWITCH

Function

The switch is used to place the ice machine in ON, OFF or WASH mode of operation.

Specifications

Double-pole, Double-throw switch.

Check Procedure

1. Inspect the toggle switch for correct wiring.
2. Isolate the toggle switch by disconnecting all wires from the switch.
3. Check across the toggle switch terminals using a calibrated ohmmeter. Note where the wire numbers are connected to the switch terminals, or refer to the wiring diagram to take proper readings.

Switch Setting	Terminals	Ohm Reading
ON	5-6	Open
	5-4	Closed
	2-1	Closed
	2-3	Open
WASH	5-4	Open
	5-6	Closed
	2-3	Closed
	2-1	Open
OFF	2-3	Open
	2-1	Open
	5-6	Open
	5-4	Open

Replace the toggle switch if ohm readings do not match all three-switch settings.

BIN THERMISTOR (T3)

Function

The bin thermistor stops the ice machine when the bin is full. When ice cubes contact the bin thermistor bulb holder, the bin thermistor opens and stops the ice machine. When ice cubes no longer contact the bin thermistor bulb holder, the bin thermistor closes and the ice machine starts.

The bin thermistor "temperature setting" determined by the point of T2(liquid line thermistor) of when T1 (sump water thermistor) come down 2 °C, refer to the Specifications Charts below for clearance.

Specifications

UG40/UG50/YG65

T1 (°C)	T2 (°C)	Shut down (T3)	Go back (T3)
≤2.0	T2≤28	≤1.5	≥2.0
≤2.0	28 < T2≤56	≤2.0	≥3.5
≤2.0	56 < T2	≤3.0	≥4.5

UG18/UG20/UG30

T1 (°C)	T2 (°C)	Shut down (T3)	Go back (T3)
≤2.0	T2≤32	≤1.7	≥2.2
≤2.0	32 < T2≤51	≤2.2	≥3.7
≤2.0	51 < T2	≤3.0	≥4.5

UG80

T1 (°C)	T2 (°C)	Shut down (T3)	Go back (T3)
≤2.0	T2≤37	≤1.5	≥2.0
≤2.0	37 < T2≤56	≤2.0	≥3.5
≤2.0	56 < T2	≤3.0	≥4.5

Check Procedure

> **⚠ Warning**
>
> Disconnect electrical power to the entire ice machine before proceeding.

Make sure bulb is inserted correctly 35.5 cm in the bulb well. Disconnect the wires from the bin thermostat and check the resistance across the terminals.

No Ice on Bulb	Ice on Bulb	Result
Closed (O)	Open (OL)	Thermostat good
Open (OL)	Closed (O)	Replace thermostat

NOTE: After covering/uncovering the bulb holder with ice, wait at least three minutes to allow the thermostat to react. (Open/Close)

SUMP WATER THERMISTOR (T1)& LIQUID LINE THERMISTOR(T2)

Function

The sump water thermistor sensor immersed in water to detect sump temperature.The value supplied to the control board is used to Initiates freeze cycle

The liquid line thermistor senses the refrigeration system liquid line temperature. This is used in conjunction with the control board to determine the length of the freeze and harvest cycles.

Specifications

The sump water thermostor :

R2.0°C ±0.5°C = 14.75Kohm ±1%

The liquid line thermistor:

R25°C±0.5°C = 10Kohm ±1%

Check Procedure

1. Make sure the thermistor sensors installation correctly
2. Disconnect thermistor from control board and measure resistance.
3. Measure temperature at the thermistor.
4. Compare measured resistance/ temperature.Creadings to resistance/temperature relationship

Within 10% of the published resistance value- Thermistor is good

Temperature/Resistance Chart

Important
If the ohmmeter reads "OL," check the scale setting on the meter before assuming the thermistor is bad.

TI &T3

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-50	344.6	26	4.771
-49	320.5	27	4.567
-48	298.2	28	4.375
-47	277.6	29	4.190
-46	258.7	30	4.016
-45	241.1	31	3.849
-44	224.8	32	3.690
-43	209.8	33	3.538
-42	195.9	34	3.394
-41	183.0	35	3.256
-40	171.0	36	3.124
-39	159.9	37	2.999
-38	149.5	38	2.879
-37	140.0	39	2.764
-36	131.1	40	2.656
-35	122.8	41	2.551
-34	115.1	42	2.452
-33	108.0	43	2.356
-32	101.2	44	2.266
-31	95.03	45	2.179
-30	89.24	46	2.095
-29	83.83	47	2.016
-28	78.79	48	1.940
-27	74.09	49	1.867

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-26	69.70	50	1.797
-25	65.58	51	1.731
-24	61.75	52	1.667
-23	58.16	53	1.606
-22	54.81	54	1.547
-21	51.66	55	1.491
-20	48.72	56	1.437
-19	45.97	57	1.385
-18	43.39	58	1.336
-17	40.96	59	1.289
-16	38.69	60	1.243
-15	36.56	61	1.200
-14	34.56	62	1.158
-13	32.68	63	1.117
-12	30.92	64	1.079
-11	29.25	65	1.041
-10	27.70	66	1.006
-9	26.24	67	0.9715
-8	24.85	68	0.9386
-7	23.55	69	0.9069
-6	22.33	70	0.8766
-5	21.18	71	0.8173
-4	20.09	72	0.8192
-3	19.07	73	0.7922
-2	18.10	74	0.7662
-1	17.19	75	0.7411
0	16.33	76	0.7170
1	15.52	77	0.6939
2	14.75	78	0.6715
3	14.02	79	0.6501
4	13.33	80	0.6293

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
5	12.69	81	0.6094
6	12.07	82	0.5902
7	11.49	83	0.5717
8	10.94	84	0.5538
9	10.43	85	0.5367
10	9.932	86	0.5201
11	9.466	87	0.5041
12	9.025	88	0.4887
13	8.608	89	0.4739
14	8.211	90	0.4595
15	7.836	91	0.4457
16	7.480	92	0.4323
17	7.142	93	0.4194
18	6.821	94	0.4069
19	6.516	95	0.3950
20	6.228	96	0.3833
21	5.953	97	0.3722
22	5.692	98	0.3613
23	5.444	99	0.3508
24	5.208	100	0.3407
25	4.984		

T2

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-40	225.1	36	6.623
-39	212.8	37	6.387

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-38	200.6	38	6.162
-37	189.3	39	5.945
-36	178.7	40	5.738
-35	168.8	41	5.538
-34	159.4	42	5.347
-33	150.6	43	5.163
-32	142.4	44	4.987
-31	134.7	45	4.817
-30	127.5	46	4.655
-29	120.6	47	4.498
-28	114.2	48	4.348
-27	108.2	49	4.203
-26	102.5	50	4.064
-25	97.20	51	3.931
-24	92.17	52	3.803
-23	87.44	53	3.680
-22	82.97	54	3.561
-21	78.77	55	3.446
-20	74.80	56	3.336
-19	71.05	57	3.230
-18	67.52	58	3.127
-17	64.19	59	3.028
-16	61.03	60	2.933
-15	58.06	61	2.841
-14	55.24	62	2.753
-13	52.58	63	2.667
-12	50.07	64	2.585
-11	47.68	65	2.505
-10	45.43	66	2.428
-9	43.30	67	2.354
-8	41.27	68	2.283

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
-7	39.36	69	2.214
-6	37.55	70	2.147
-5	35.83	71	2.082
-4	34.19	72	2.020
-3	32.65	73	1.960
-2	31.18	74	1.902
-1	29.78	75	1.846
0	28.49	76	1.791
1	27.20	77	1.739
2	26.01	78	1.688
3	24.88	79	1.639
4	23.80	80	1.592
5	22.78	81	1.546
6	21.81	82	1.502
7	20.88	83	1.459
8	20.00	84	1.417
9	19.16	85	1.377
10	18.36	86	1.338
11	17.60	87	1.300
12	16.88	88	1.264
13	16.19	89	1.229
14	15.53	90	1.195
15	14.90	91	1.162
16	14.30	92	1.129
17	13.73	93	1.098
18	13.19	94	1.068
19	12.67	95	1.039
20	12.17	96	1.011
21	11.70	97	0.9838
22	11.24	98	0.9572
23	10.81	99	0.9316

Temperature of Thermistor	Resistance	Temperature of Thermistor	Resistance
°C	K Ohms (x 1000)		K Ohms (x 1000)
24	10.40	100	0.9066
25	10.00	101	0.8832
26	9.622	102	0.8604
27	9.260	103	0.8384
28	8.913	104	0.8170
29	8.582	105	0.7964
30	8.265	106	0.7762
31	7.961	107	0.7564
32	7.670	108	0.7374
33	7.391	109	0.7190
34	7.124	110	0.7010
35	6.868		

HIGH PRESSURE CUTOUT (HPCO) CONTROL

Water Cooled Only

FUNCTION

Stops the ice machine if subjected to excessive high-side pressure.

The HPCO control is normally closed, and opens on a rise in discharge pressure.

SPECIFICATIONS

Model	Cut-out	Cut-in:
UG030W	300 psig ± 10	150 psig ± 10
UG050W	450 psig± 10	300 psig± 10

CHECK PROCEDURE

1. Set ON/OFF/WASH switch to OFF.
2. Connect manifold gauges.
3. Hook voltmeter in parallel across the HPCO, leaving wires attached.
4. Close the valve to the water condenser inlet.
5. Set ON/OFF/WASH switch to ON.
6. No water flowing through the condenser will cause the HPCO control to open because of excessive pressure. Watch the pressure gauge and record the cut-out pressure.

⚠ Warning

If discharge pressure exceeds 310 psig (UG030) or 460psig(UG050) and the HPCO control does not cut out, set ON/OFF/WASH switch to OFF to stop ice machine operation.

Replace the HPCO control if it:

- Will not reset (below 150 psig [UG030];below 300 psig [UG050])
- Does not open at the specified cut-out point

HOT GAS VALVE

General

The hot gas valve is an electrically operated valve that opens when energized, and closes when de-energized.

Normal Operation

The valve is de-energized (closed) during the freeze cycle and energized (open) during the harvest cycle. The valve is positioned between the compressor and the evaporator and performs two functions:

7. Prevents refrigerant from entering the evaporator during the freeze cycle.

   The hot gas valve is de-energized (closed) preventing refrigerant flow from the receiver into the evaporator.

8. Allows refrigerant vapor to enter the evaporator in the harvest cycle.

   During the harvest cycle, the hot gas valve is energized (open) allowing refrigerant gas from the discharge line of the compressor to flow into the evaporator. The heat is absorbed by the evaporator and allows release of the ice slab.

Exact pressures vary according to ambient temperature and ice machine model. Harvest pressures can be found in the “Cycle Time/24 Hour Ice Production/Refrigerant Pressure Charts in this book.

Hot Gas Valve Analysis

The valve can fail in two positions:

- Valve will not open in the harvest cycle.
- Valve remains open during the freeze cycle.

VALVE WILL NOT OPEN IN THE HARVEST CYCLE:

Although the coil is energized in the harvest cycle, the evaporator temperature/pressure remains unchanged from the freeze cycle.

VALVE REMAINS OPEN IN THE FREEZE CYCLE:

Symptoms of a hot gas valve remaining partially open during the freeze cycle can be similar to symptoms of an expansion valve, Capillary tube or compressor problem. Symptoms are dependent on the amount of leakage in the freeze cycle.

A small amount of leakage will cause increased freeze times. As the amount of leakage increases, the length of the freeze cycle increases.

Refer to the Parts Manual for proper valve application. If replacement is necessary, use only “original” Manitowoc replacement parts.

Use the following procedure and table to help determine if a hot gas valve is remaining partially open during the freeze cycle.

1. Wait five minutes into the freeze cycle.
2. Feel the inlet of the hot gas valve.

Important

Feeling the hot gas valve outlet or across the hot gas valve itself will not work for this comparison. The hot gas valve outlet is on the suction side (cool refrigerant). It may be cool enough to touch even if the valve is leaking.

3. Feel the compressor discharge line.

⚠ Warning

The inlet of the hot gas valve and the compressor discharge line could be hot enough to burn your hand. Just touch them momentarily.

4. Compare the temperature of the inlet of the hot gas valves to the temperature of the compressor discharge line.

Examples of hot gas valve inlet/compressor discharge line temperature comparison

Findings	Comments
The inlet of the hot gas valve is cool enough to touch and the compressor discharge line is hot.	This is normal as the discharge line should always be too hot to touch and the hot gas valve inlet, although too hot to touch during harvest, should be cool enough to touch after 5 minutes into the freeze cycle.
The inlet of the hot gas valve is hot and approaches the temperature of a hot compressor discharge line.	This is an indication something is wrong, as the hot gas valve inlet did not cool down during the freeze cycle. If the compressor dome is also entirely hot, the problem is not a hot gas valve leaking, but rather something causing the compressor (and the entire ice machine) to get hot.
Both the inlet of the hot gas valve and the compressor discharge line are cool enough to touch.	This is an indication something is wrong, causing the compressor discharge line to be cool to the touch. This is not caused by a hot gas valve leaking.

This Page Intentionally Left Blank

Refrigerant

RECOVER/EVACUATION/CHARGING

Normal Procedures

Do not purge refrigerant to the atmosphere. Capture refrigerant using recovery equipment. Follow the manufacturer's recommendations.

Important

Manitowoc Ice, Inc. assumes no responsibility for the use of contaminated refrigerant. Damage resulting from the use of contaminated refrigerant is the sole responsibility of the servicing company.

Important

Replace the liquid line drier before evacuating and recharging. Use only a Manitowoc (O.E.M.) liquid line filter drier to prevent voiding the warranty.

Connections

1. Suction side of the compressor through the suction service valve.
2. Discharge side of the compressor through the discharge service valve.

Self-Contained Recovery/Evacuation

Place the toggle switch in the OFF position.

Install manifold gauges (with low loss fittings), scale, and recovery unit or two-stage vacuum pump.

Open (backseat) the high and low side on manifold gauges.

Perform recovery or evacuation:

A. Recovery: Operate the recovery unit as directed by the manufacturer's instructions.

B. Evacuation prior to recharging: Pull the system down to 500 microns. Then, allow the pump to run for an additional half hour. Turn off the pump and perform a standing vacuum leak check.

NOTE: Check for leaks using a halide or electronic leak detector after charging the ice machine.

Follow the Charging Procedures on the next page.

Charging Procedures

> **Important**
>
> The charge is critical on all Manitowoc ice machines. Use a scale to ensure the proper charge is installed.

1. Be sure the toggle switch is in the OFF position.
2. Close the vacuum pump valve and the low side manifold gauge valve.
3. Open the high side manifold gauge valve.
4. Open the refrigerant cylinder and add the proper refrigerant charge (shown on nameplate) through the discharge service valve.
5. Let the system “settle” for 2 to 3 minutes.
6. Place the toggle switch in the ICE position.
7. Close the high side on the manifold gauge set. Add any remaining vapor charge through the suction service valve (if necessary).

NOTE: Manifold gauges must be removed properly to ensure that no refrigerant contamination or loss occurs.

8. Make sure all vapor in the charging hoses is drawn into the ice machine before disconnecting.
   a. Run the ice machine in freeze cycle.
   b. Disconnect the high side service valve at the ice machine.
   c. Open the high and low side valves on the manifold gauge set. Any refrigerant in the lines will be pulled into the low side of the system.
   d. Allow the pressures to equalize while the ice machine is in the freeze cycle.
   e. Disconnect the low side service valve at the ice machine.
9. Install the caps on the refrigeration access valves.

SYSTEM CONTAMINATION CLEANUP

General

This section describes the basic requirements for restoring contaminated systems to reliable service.

Important

Manitowoc Ice, Inc. assumes no responsibility for the use of contaminated refrigerant. Damage resulting from the use of contaminated refrigerant is the sole responsibility of the servicing company.

DETERMINING SEVERITY OF CONTAMINATION

System contamination is generally caused by either moisture or residue from compressor burnout entering the refrigeration system.

Inspection of the refrigerant usually provides the first indication of system contamination. Obvious moisture or an acrid odor in the refrigerant indicates contamination.

If either condition is found, or if contamination is suspected, use a Total Test Kit from Totaline or a similar diagnostic tool. These devices sample refrigerant, eliminating the need to take an oil sample. Follow the manufacturer’s directions.

If a refrigerant test kit indicates harmful levels of contamination, or if a test kit is not available, inspect the compressor oil.

1. Remove the refrigerant charge from the ice machine.
2. Remove the compressor from the system.
3. Check the odor and appearance of the oil.
4. Inspect open suction and discharge lines at the compressor for burnout deposits.
5. If no signs of contamination are present, perform an acid oil test to determine the type of cleanup required.

Contamination/Cleanup Chart

Symptoms/Findings	Required Cleanup Procedure
No symptoms or suspicion of contamination.	Normal evacuation/ recharging procedure
Moisture/Air Contamination symptoms. Refrigeration system open to atmosphere for longer than 15 minutes. Refrigeration test kit and/or acid oil test shows contamination. No burnout deposits in open compressor lines.	Mild contamination cleanup procedure
Mild Compressor Burnout symptoms. Oil appears clean but smells acrid. Refrigeration test kit or acid oil test shows harmful acid content. No burnout deposits in open compressor lines.	Mild contamination cleanup procedure
Severe Compressor Burnout symptoms. Oil is discolored, acidic, and smells acrid. Burnout deposits found in the compressor, lines, and other components.	Severe contamination cleanup procedure

MILD SYSTEM CONTAMINATION CLEANUP

Procedure

1. Replace any failed components.
2. If the compressor is good, change the oil.
3. Replace the liquid line drier.

NOTE: If the contamination is from moisture, use heat lamps during evacuation. Position them at the compressor, condenser and evaporator prior to evacuation. Do not position heat lamps too close to plastic components, or they may melt or warp.

Important

Dry nitrogen is recommended for this procedure. This will prevent CFC release.

Follow the normal evacuation procedure, except replace the evacuation step with the following:

A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of .35 bar.

B. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of .35 bar.

C. Change the vacuum pump oil.

D. Pull vacuum to 500 microns. Run the vacuum pump for 1/2 hour on self-contained models, 1 hour on remotes.

NOTE: Perform a pressure test to be sure there are no leaks.

Charge the system with the proper refrigerant to the nameplate charge.

Operate the ice machine.

SEVERE SYSTEM CONTAMINATION CLEANUP PROCEDURE

1. Remove the refrigerant charge.
2. Remove the compressor.
3. Wipe away any burnout deposits from suction and discharge lines at compressor.
4. Sweep through the open system with dry nitrogen.

Important

Refrigerant sweeps are not recommended, as they release CFC's into the atmosphere.

5. Install a new compressor and new start components.
6. Install suction line filter-drier in front of compressor.
7. Install a new liquid line drier.

Important

Dry nitrogen is recommended for this procedure. This will prevent CFC release.

A. Pull vacuum to 1000 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of .35 bar.

B. Change the vacuum pump oil.

C. Pull vacuum to 500 microns. Break the vacuum with dry nitrogen and sweep the system. Pressurize to a minimum of .35 bar.

D. Change the vacuum pump oil.

E. Pull vacuum to 500 microns. Run the vacuum pump for 1 hour additional hour.

   Charge the system with the proper refrigerant to the nameplate charge.

   Operate the ice machine for one hour. Then, check the pressure drop across the suction line filter-drier.

F. If the pressure drop is less than .14 bar, the filter-drier should be adequate for complete cleanup.

G. If the pressure drop exceeds .14 bar, change the suction line filter-drier and the liquid line drier. Repeat until the pressure drop is acceptable.

   Operate the ice machine for 48-72 hours. Replace the suction line and liquid line drier if necessary.

FILTER-DRIERS

Liquid Line Filter Drier

The filter-drier used on Manitowoc ice machines are manufactured to Manitowoc specifications.

The difference between a Manitowoc drier and an off-the-shelf drier is in filtration. A Manitowoc drier has dirt-retaining filtration, with fiberglass filters on both the inlet and outlet ends. This is very important because ice machines have a back-flushing action that takes place during every harvest cycle.

A Manitowoc filter-drier has a very high moisture removal capability and a good acid removal capacity.

Important

The liquid line drier is covered as a warranty part. The liquid line drier must be replaced any time the system is opened for repair.

TOTAL SYSTEM REFRIGERATION CHARGE

Important

This information is for reference only. Refer to the ice machine serial number tag to verify the system charge. Serial plate information overrides information listed on this page.

Model	Refrigerant Charge (grams)	Refrigerant Type
UG018AG-251G	150	R134A
UG020AG-251G	178	R134A
UG030AG-251G	230	R134A
UG040AG-251G	260	R404A
UG050AG-251G	210	R404A
UG065AG-251G	360	R404A
UG080AG-251G	290	R404A
UG020AG-261Z	178	R134A
UG030AG-261Z	178	R134A
UG040AG-261Z	280	R404A
UG050AG-261Z	184	R404A
UG065AG-261Z	360	R404A
UG080AG-261Z	290	R404A
UG030WG-251G	140	R134A
UG050WG-251G	210	R404A
UG030AG-161Z	178	R134A
UG050AG-161Z	184	R404A

Cycle Times/24 Hour Ice Production and Refrigerant Pressure Charts

These charts are used as guidelines to verify correct ice machine operation.

Accurate collection of data is essential to obtain the correct diagnosis.

- Refer to “OPERATIONAL ANALYSIS CHART” for the list of data that must be collected for refrigeration diagnostics. This list includes: before beginning service, ice production check, installation/visual inspection, water system checklist, ice formation pattern, safety limits, comparing evaporator inlet/outlet temperatures, hot gas valve analysis, discharge and suction pressure analysis.
- Ice production checks that are within 10% of the chart are considered normal. This is due to variances in water and air temperature. Actual temperatures will seldom match the chart exactly.
- Zero out manifold gauge set before obtaining pressure readings to avoid misdiagnosis.
- Discharge and suction pressure are highest at the beginning of the cycle. Suction pressure will drop throughout the cycle. Verify the pressures are within the range indicated.

UG18 SELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	**15**	**21**	**32**	
10	18.82-20.77				1.4-3.5 min.
21	19.99-24.8	20.58-25.89			
32			34.34-37.42		
38				49.68-53.50	
43				60.56-67.07	

Times in minutes.

UG18 SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	**15**	**21**	**32**
10	19.96			
21	18.06	17.93		
32			13.51	
38				9.19
43				7.10

Based on average ice weight of 0.29 - 0.32 kg per cycle. Individual cube weight 19 grams ±1.
Number of individual cubes per cycle: 16

Continued on next page …

UG18 SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	4.87-3.66	0.64-0.07	3.19-5.55	1.05-3.41
21	8.05-5.94	1.24-0.22	3.80-6.03	2.45-3.80
32	10.20-6.67	1.32-0.57	5.38-10.89	2.86-4.08
43	13.8-6.87	1.63-0.76	6.87-14.07	3.49-5.79

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG020AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	15	21	32	
10	15.37-17.95				1.4-3.5 min.
21	15.67-18.16	16.22-19.31			
32			21.73-25.54		
38				26.93-33.25	
43				33.74-38.90	

Times in minutes.

Continued on next page …

UG020AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	**15**	**21**	**32**
10	21.37			
21	21.57	21.03		
32			16.89	
38				14.06
43				11.32

Based on average ice weight of 0.43 - 0.48kg per cycle. Individual cube weight 19 grams ±1.

Number of individual cubes per cycle: 24

UG020AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	5.06-4.46	0.70-0.0.17	4.39-7.59	1.47-4.10
21	6.77-6.34	0.84-0.22	4.99-8.02	1.54-4.20
32	9.92-9.00	0.92-0.27	5.17-9.49	2.35-5.06
43	15.06-12.85	1.06-0.40	7.62-12.18	3.09-6.69

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG030AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	**15**	**21**	**32**	
10	16.41-19.84				1.4-3.5 min.
21	17.53-18.96	18.21-20.45			
32			22.38-25.01		
38				26.42-35.23	
43				37.26-41.66	

Times in minutes.

UG030AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	15	21	32
10	28.37			
21	30.96	29.81		
32			25.48	
38				20.66
43				16.11

Based on average ice weight of 0.43 - 0.48kg per cycle. Individual cube weight 19 grams ±1.

Number of individual cubes per cycle: 24

Continued on next page …

UG030AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	4.21-9.80	0.50-0	7.00-8.88	1.16-4.16
21	7.98-6.61	0.54-0	7.50-9.30	1.58-4.38
32	11.40-8.91	0.62-0.37	7.78-11.48	1.99-5.40
43	15.48-13.21	1.46-0.71	10.43-12.59	3.15-6.10

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG030WG-251G SELF-CONTAINED WATER--COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	15	21	32	
10	18.07-19.54				
21	19.67-20.92	20.82-21.77			
32			24.5-25.57		1.4-3.5 min.
38				26.39-29.02	
43				27.58-29.77	

Times in minutes.

UG030WG-251G SELF-CONTAINED WATER--COOLED — STANDARD CUBE

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	15	21	32
10	30.17			
21	29.27	28.07		
32			23.79	
38				22.34
43				21.01

Based on average ice weight of 0.43 - 0.48kg per cycle. Individual cube weight 19 grams ±1.
Number of individual cubes per cycle: 24

UG030WG-251G SELF-CONTAINED WATER--COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	7.31-9.50		3.97-6.77	2.27-4.82
21	7.46-9.60		4.10-7.04	2.46-5.04
32	8.53-9.75		4.50-8.28	2.65-3.47
43	9.85-10.80		4.95-11.34	2.58-6.05

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG040AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time Water Temperature °C				Harvest Time
	10	**15**	**21**	**32**	
10	17.5-21.73				1.4-3.5 min.
21	19.53-22.26	21.17-23.92			
32			24.36-28.92		
38				31.18-35.52	
43				36.99-44.89	

Times in minutes.

UG040AG-251GSELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	**15**	**21**	**32**
10	43.52			
21	46.5	44.39		
32			39.28	
38				31.08
43				24.90

Based on average ice weight of 0.72- 0.80kg per cycle. Individual cube weight 19 grams ±1.
Number of individual cubes per cycle: 40

Continued on next page …

UG040AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	9.24-6.98	2.15-1.20	7.35-13.63	5.38-5.88
21	14.21-8.98	2.22-1.80	7.40-13.64	5.38-5.88
32	19.13-17.53	2.92-2.20	8.34-18.36	6.33-6.57
43	25.16-22.01	3.82-2.60	8.80-23.30	6.60-7.25

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG050AG-251GSELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	**15**	**21**	**32**	
10	13.93-14.89				1.4-3.5 min.
21	17.41-18.06	18.38-19.48			
32			23.61-25.51		
38				31.51-33.34	
43				39.54-43.59	

Times in minutes.

UG050AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	**15**	**21**	**32**
10	61.94			
21	56.16	53.90		
32			43.22	
38				34.55
43				28.38

Based on average ice weight of 0.72- 0.80kg per cycle. Individual cube weight 19 grams ±1.

Number of individual cubes per cycle: 40

Continued on next page ….

UG050AG-251GSELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	12.00-10.60	3.51-1.37	7.22-8.22	4.78-6.34
21	15.62-12.69	3.90-1.42	8.64-10.16	6.32-7.93
32	20.24-18.37	4.75-1.67	11.53-12.70	7.60-10.13
43	25.50-23.00	4.84-1.65	12.25-14.20	9.00-11.56

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG050WG-251G SELF-CONTAINED WATER-COOLED

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	15	21	32	
10	16.32-18.56				1.4-3.5 min.
21	16.71-19.11	17.37-19.78			
32			20.54-21.62		
38				23.49-23.92	
43				23.05-24.58	

Times in minutes.

Continued on next page …

UG050WG-251G SELF-CONTAINED WATER-COOLED

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	15	21	32
10	52.51			
21	51.17	50.44		
32			46	
38				41.6
43				40

Based on average ice weight of 0.72- 0.80kg per cycle. Individual cube weight 19 grams ±1.

Number of individual cubes per cycle:40

UG050WG-251G SELF-CONTAINED WATER-COOLED

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	13.33-9.09	3.44-2.04	6.40-7.83	4.75-6.41
21	13.39-12.45	3.60-1.35	6.75-10.55	5.10-6.30
32	15.96-15.95	4.40-1.34	8.43-12.43	6.20-6.20
43	17.18-16.40	5.00-1.75	8.57-17.62	6.81-6.63

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

UG065AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time Water Temperature °C				Harvest Time
	10	**15**	**21**	**32**	
10	18.8-21.62				1.4-3.5 min.
21	18.44-19.86	19.89-21.6			
32			23-24.89		
38				28.52-31.89	
43				35.37-37.81	

Times in minutes.

UG065AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	**15**	**21**	**32**
10	62.13			
21	66.90	64.85		
32			59.09	
38				48.69
43				39.21

Based on average ice weight of1.01- 1.12kg per cycle. Individual cube weight 19 grams ±1.
Number of individual cubes per cycle:56

Continued on next page …

UG065AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	8.68-20.50*		11.23-14.60	6.37-8.40
21	13.50-12.66	1.88-1.40	11.25-14.65	6.40-8.51
32	19.04-17.06	2.43-1.85	11.33-16.65	6.53-10.02
43	25.01-22.24	3.15-2.65	13.34-19.87	8.02-12.20

All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

*: peak fan motor shut down.

UG080AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE

NOTE: These characteristics may vary depending on operating conditions.

Cycle Times

Freeze Time + Harvest Time = Total Cycle Time

Air Temp. Entering Condenser °C	Freeze Time				Harvest Time
	Water Temperature °C				
	10	**15**	**21**	**32**	
10	12.96-13.12				1.4-3.5 min.
21	13.84-16.38	14.58-17.02			
32			21.82-23.33		
38				25.40-28.52	
43				29.52-33.51	

Times in minutes.

UG080AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

24 Hour Ice Production

Air Temp. Entering Condenser °C	Water Temperature °C			
	10	**15**	**21**	**32**
10	88.68			
21	85.75	84.78		
32			66.76	
38				55.64
43				47.87

Based on average ice weight of1.01- 1.12kg per cycle. Individual cube weight 19 grams ±1.
Number of individual cubes per cycle:56

Continued on next page …

UG080AG-251G SELF-CONTAINED AIR-COOLED — STANDARD CUBE (Continued)

Operating Pressures—

Air Temp. Entering Condenser °C	Freeze Cycle		Harvest Cycle	
	Discharge Pressure	Suction Pressure	Discharge Pressure	Suction Pressure
10	13.42-28.07*	4.75-3.50	12.60-13.90	8.70-10.40
21	16.60-13.85	4.91-3.50	12.65-13.90	8.70-10.45
32	21.00-17.90	5.38-3.70	12.80-14.01	8.75-10.47
43	25.83-24.30	25.20-4.20	14.25-15.82	9.85-11.74

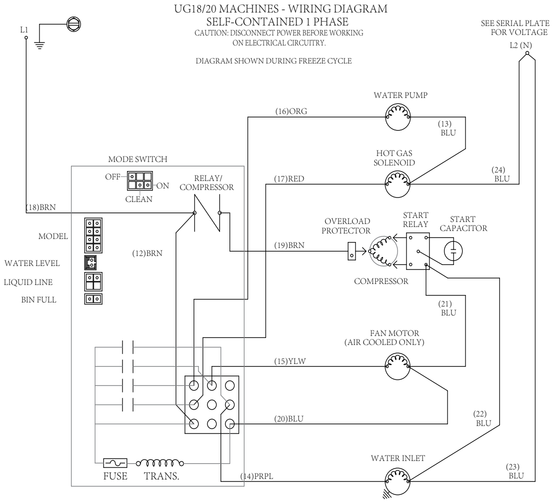
All pressures are in bar. Suction pressure drops gradually throughout the freeze cycle.

*: peak fan motor shut down.

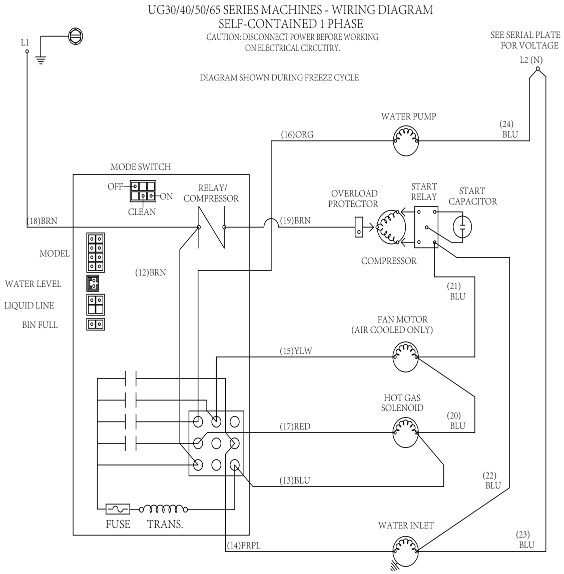
Diagrams

Wiring Diagram

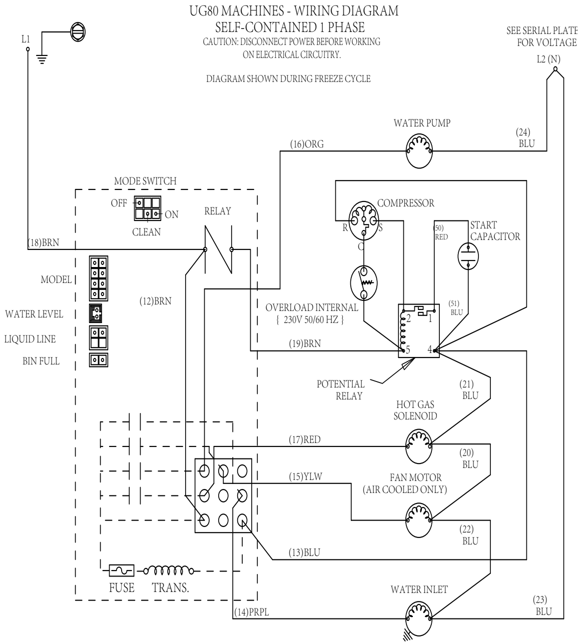
UG18/UG20 AIR-COOLED



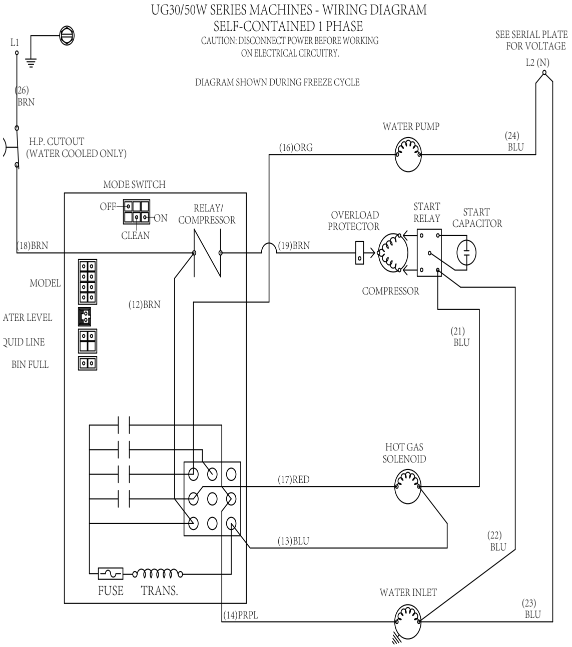
UG30/UG50/UG65 AIR-COOLED



UG80 AIR-COOLED

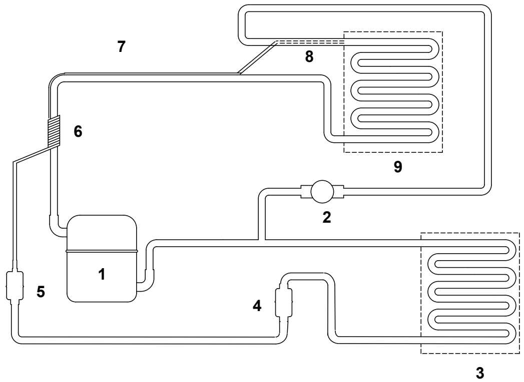


UG30/UG50 WATER-COOLED



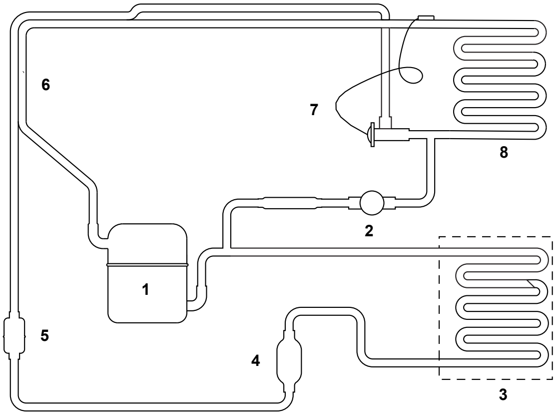
Tubing Schematics

UG18/UG20/UG30/UG40/UG65 TUBING SCHEMATIC



1. Compressor
2. Hot Gas Valve
3. Condenser (Air or Water Cooled)
4. Receiver (Water Cooled Only)
5. Liquid Line Drier
6. Suction Accumulator with Heat Exchanger
7. Heat Exchanger
8. Capillary Tube
9. Evaporator

UG50/UG80 TUBING SCHEMATIC



1. Compressor
2. Hot Gas Valve
3. Condenser (Air or Water Cooled)
4. Receiver (Water Cooled Only)
5. Liquid Line Drier
6. Heat Exchanger
7. Thermostatic Expansion Valve
8. Evaporator

Manitowoc (China) Foodservice Co., Ltd.
No.151 Jianye Road, Binjiang District,
Hangzhou, China 310011
Website – www.manitowocice.com