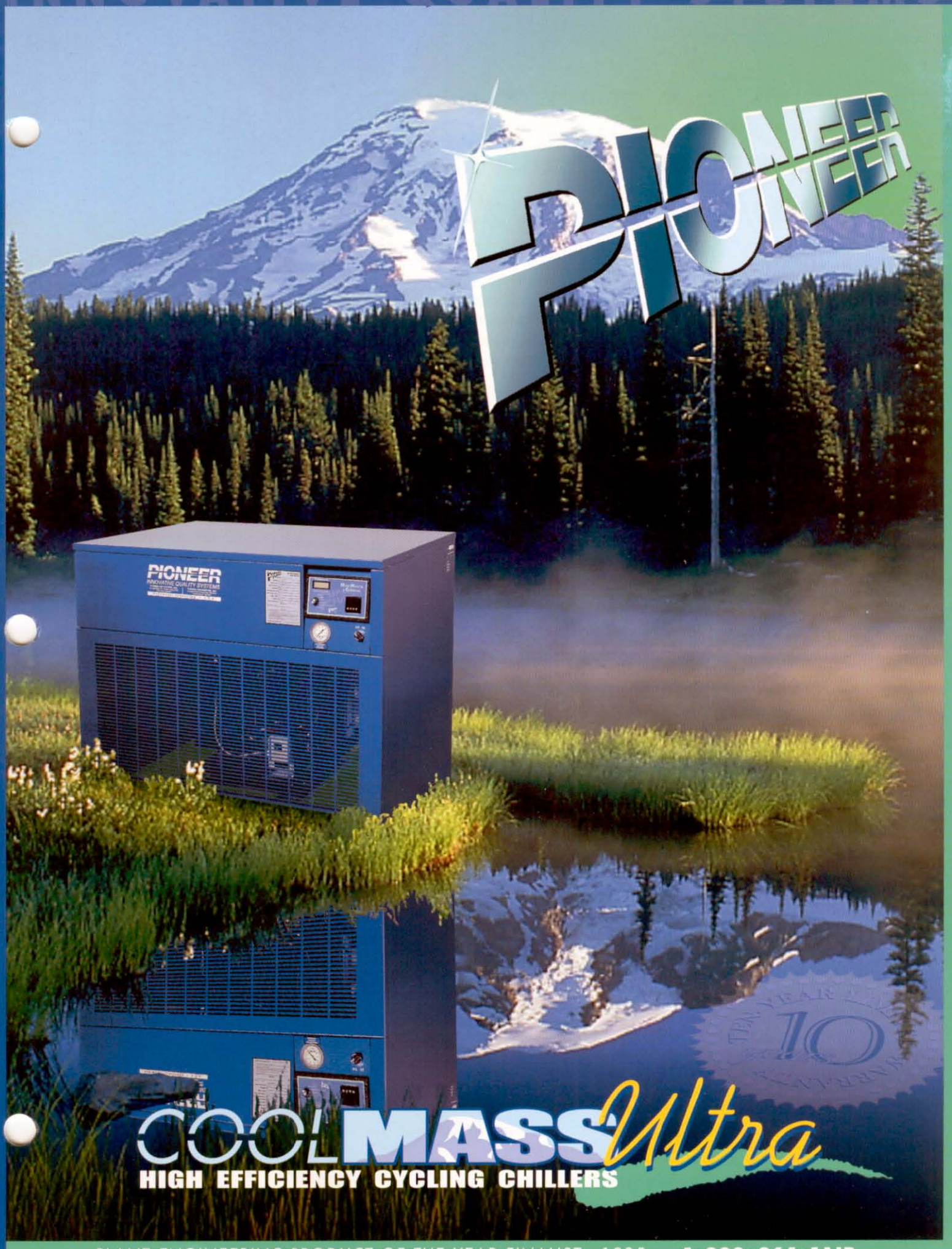
INNOVATIVE QUALITY SYSTEMS



COOLMASS Ultra

HIGH EFFICIENCY CYCLING CHILLERS

PLANT ENGINEERING PRODUCT OF THE YEAR FINALIST—1995

1•800•264•1AIR

COOLMASS
HIGH EFFICIENCY CYCLING CHILLERS

Benefits

1. Improve product quality
2. Reduce costs
3. Increase production
4. Reduce scrap
5. Increase tool life
6. Recover heat

Applications

Molding equipment
Induction heating equipment
Welding equipment
Numerically controlled machines
Oil base coolants in drilling, cutting, rolling, grinding and honing operations
Chemical operations
Food processing
Machine tools
Film processing
Bakery
Boiler feed sampling
Spray washing for poultry, produce, etc.
Cement mixing
Lasers
Computers
Plasma cutting
Packaging machinery
Process analyzers
Instruments—spectrometers, microscopes, blood cooling, scanners, etc.
Cooling jackets in mixers, ovens, candy molds, etc.
Degreasers
Electric generators
Plating tanks
Fish tanks
Quench tanks
De-ionized water or liquids (stainless steel systems without brass or copper)
Blower pressure air/gas cooling
Compressed air/gas cooling
Spot cooling (blowing air) for equipment
Spot cooling (blowing air) for people

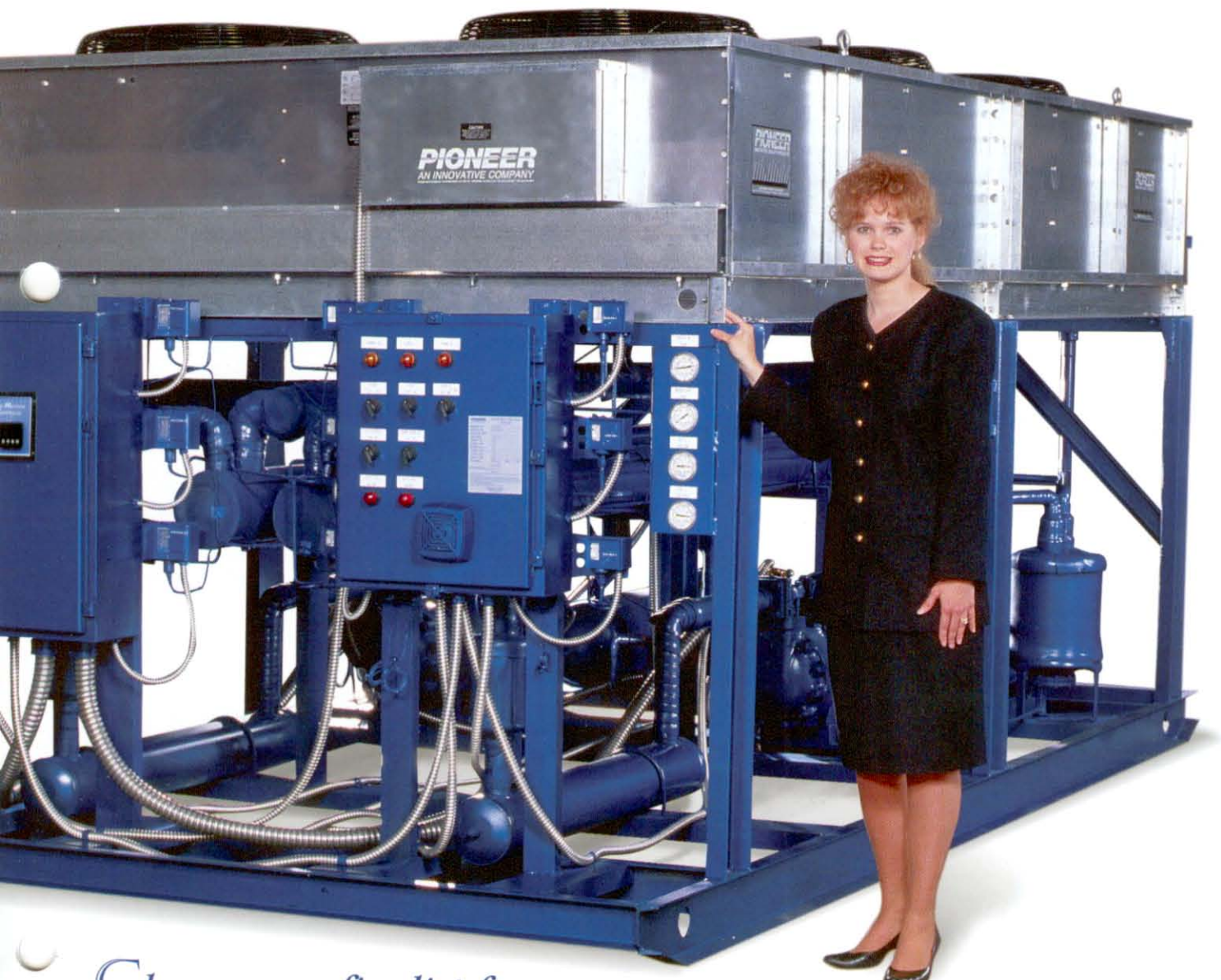
Covered by our ten-year prorated warranty, the MicroMonitor & Controller is an analog controller that allows you to set your cycle "ON" and "OFF" temperatures to achieve maximum energy cost savings, MicroMonitor & Controller provides freeze protection, and you can easily monitor temperatures at six key locations: inlet, suction, discharge, evaporator, outlet, and ambient. The LCD display monitors temperatures in either °F or °C (please specify).

PLCs and customized controls are available.

Experience Pioneer's Cool Mass advantages

1. **MicroMonitor & Controller** for precision temperature control. Standard for NEMA 1 and NEMA 4; not available for NEMA 7.
2. The **heat exchanger and tank combination** feature (patent pending) increases cooling capacity, provides more consistent temperature and minimizes loss of cooling capacity to ambient.
3. **Rust free.** The heat exchanger, tank and all cooling fluid piping are constructed of copper or brass providing rust-free service. Stainless steel construction is available.
4. **Cleaner fluid.** Rust-free, closed-loop sealed fluid flow is standard, preventing algae and atmospheric contamination problems. Kleen Water Filters are recommended to remove particles that may be picked up during use of the cooling fluid.
5. **Cycling saves.** Cool Mass chillers cycle just like your refrigerator and air conditioner. For most applications, the chillers shall be sized for the maximum heat load under the most severe ambient conditions with a 15–25% buffer for contingencies. Because the heat load and ambient conditions generally vary, the Cool Mass design uses energy in proportion to the actual heat load being placed

(continued next page)



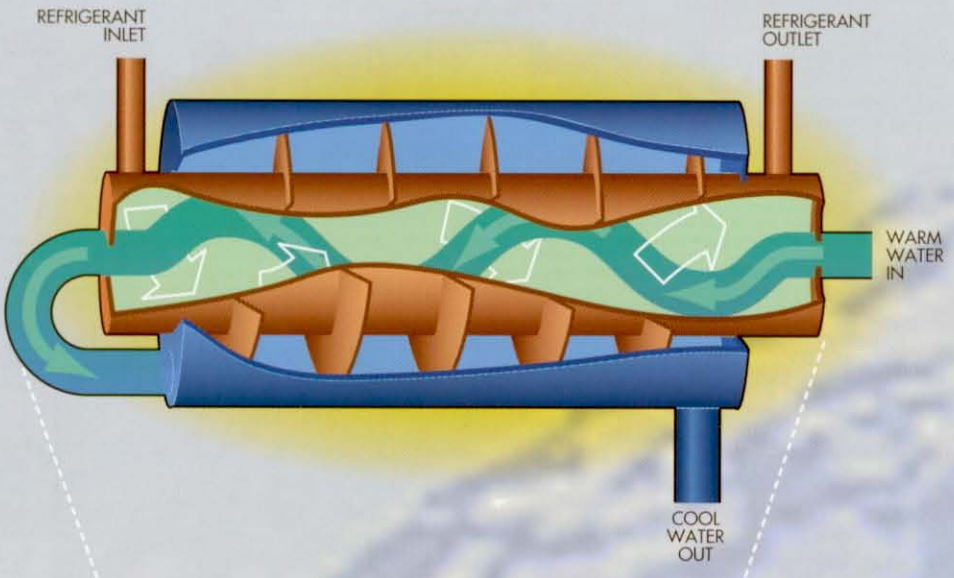
Chosen as a finalist for
Plant Engineering's *1995 Product of the Year Award*

The heat exchanger and tank combination design—exclusive to Pioneer Cool Mass cycling chillers—is a variation of the patented Triple Tube Design used very successfully in thousands of Pioneer refrigerant dryers.

on the refrigeration system, thus saving energy and decreasing wear on equipment.

The design incorporates a storage for cooling capacity (Cool Mass). This feature provides for added capacity during peak demand and turns refrigeration off during low load.

6. **Faster response.** Once cooled, the Cool Mass design reduces the time required to lower fluid temperature during startup.
7. **Cylinder unloading** (standard in C2400/CU2400 and larger) further improves the efficiency of Pioneer Cool Mass chillers by providing variable compressor capacity.
8. **Freeze protection** is standard.
9. **Automatic pump down** (standard in C2400/CU2400 and larger) saves on refrigerant loss and increases compressor life.
10. **Discus semi-hermetic compressor** (standard in C2400/CU2400 and larger) saves up to 10%...
    - Unique discus valve design increases capacities, minimizes re-expansion gas, and improves volumetric pumping efficiency.
    - Saves up to 10% in energy costs.
    - Includes service valves, deep oil sump, crankcase heater and solid state motor protection.
    - Capacity control.
    - Crankcase oil level sight glass.
    - Positive Displacement oil pump maintains required lubrication.
    - UL recognized—60 Hertz.
    - C.S.A. approved—60 Hertz.



Also available

1. **Duplex pump systems.**
2. **Dual pump and dual circuit** chiller systems for high temperature applications.
3. **Chiller/heater combination** systems.

Typical installation

COOLMASS *Ultra*
HIGH EFFICIENCY CYCLING CHILLERS

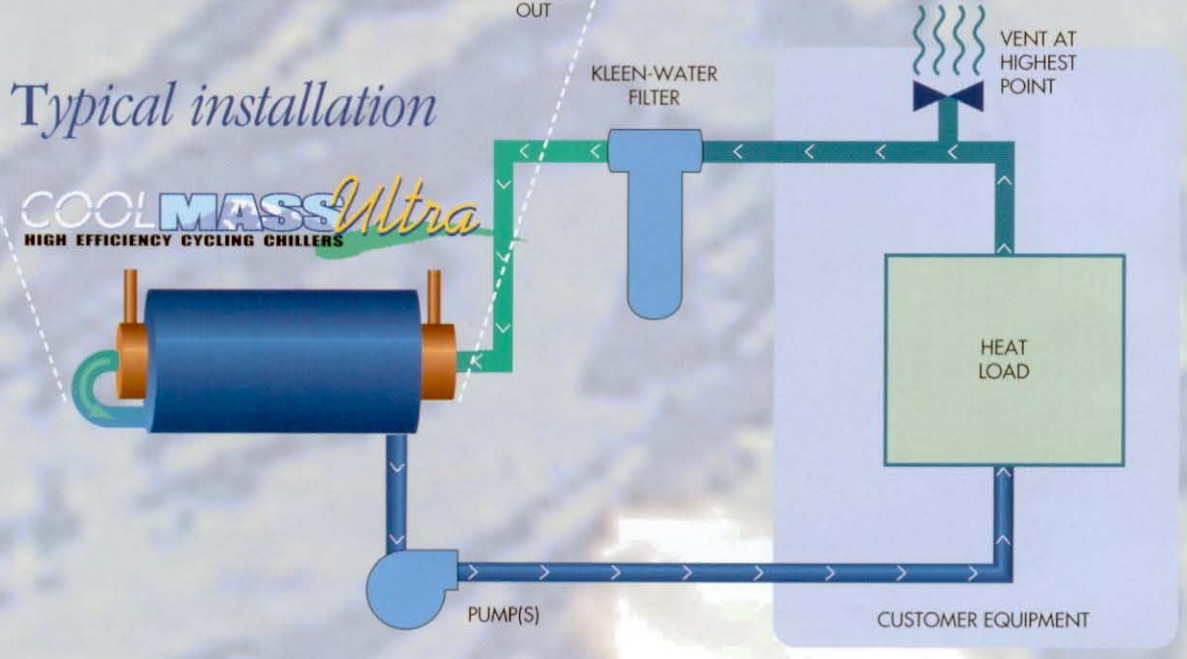


Figure 1

COOL MASS Ultra

HIGH EFFICIENCY CYCLING CHILLERS

Lower temperatures and energy savings

Pioneer's Cool Mass Ultra utilizes an evaporative condenser to yield lower temperatures while saving on energy costs.

Principle of operation

The vapor to be condensed is circulated through a condensing coil, which is continually wetted on the outside by a recirculating water system. Air is blown upward over the coil, causing a small amount of water to evaporate. This evaporation removes heat from the coil, cooling and condensing the vapor in the coil to temperatures lower than either air-cooled or water-cooled condensers.

Energy Savings

Evaporative condensers offer energy savings by requiring lower system horsepower than conventional air-cooled and water-cooled condensing systems.

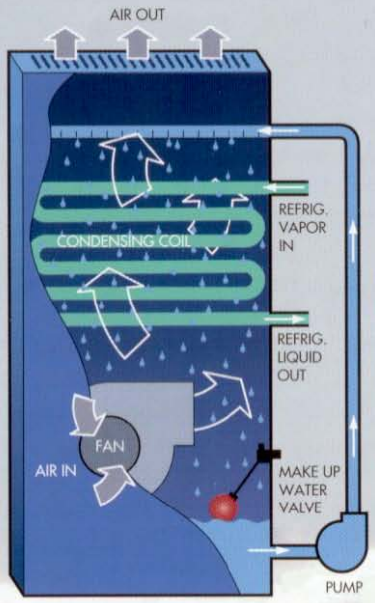


Figure 2. Cool Mass Ultra's Evaporative condenser

Saves up to 30% compared to air-cooled systems:

Evaporative condenser capacity is a function of ambient wet bulb temperature while air-cooled condenser capacity is a function of ambient dry bulb temperature.

Since design wet bulb temperatures are generally 15° to 20° F lower than design dry bulb temperatures, using evaporative condensers, the condensing temperature can be 15° to 20° F less, resulting in compressor and system horsepower savings of up to 30 percent.

Saves up to 15% compared to water-cooled systems:

The evaporative condenser rejects heat directly to the ambient air in one step of heat transfer. In the shell-and-tube condenser/cooling tower system, heat must be first transferred to the cooling water by the condenser, and then to the atmosphere by the cooling tower. The single heat transfer step in the evaporative condenser provides lower condensing temperatures and compressor horsepower savings of up to 15 %.

Kleen-Water Filters... *recommended*

For longevity and dependability, we recommend Kleen-Water Filters which are 99.0% efficient down to 1 micron. For point of installation see Figure 1.

Kleen-Water Filters data

MODEL	PORT SIZE NPT-IN	MAX. PRESS. PSIG	MAX GPM	MAX TEMP. °F	DIMENSIONS INCHES A	B	C	D	APPROX. SHIPPING WT. (LBS)	TYPE
KW25	1	300	25	225	16¼	4½	-	1⅝	15	T
KW50	1½	300	50	225	20⅜	5¾	-	1¼	20	T
KW100	2½	300	100	225	27¾	6⅛	-	1¼	35	T
KW150	2½	300	150	225	37½	6⅛	-	1¼	56	T
KW200	3	300	200	225	38⅜	7⅛	-	2⅛	58	T
KW250	3	300	250	225	44¼	7⅛	-	2⅛	70	T
KW300	4 FLG.	225	300	225	72	21¼	57	15	450	F
KW450	6 FLG.	225	450	225	85	20⅛	68	15	500	F

NOTES:
1. Filters come with initial element(s).
2. To order spare element, add 'E' before filter Model Number.
3. Larger sizes,built to specifications.

OPTIONS:
1. Flange Connections, where not standard.
2. Pressure Differential Lights/Contacts.
3. Multi-Filter Assemblies with By-Pass valving.

Table 1

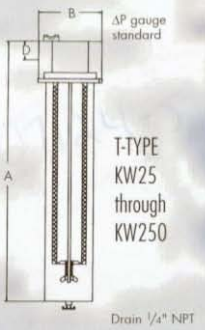


Figure 3.

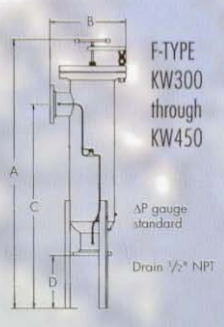


Figure 4.

COOL MASS Ultra

HIGH EFFICIENCY CYCLING CHILLERS

Model	Comp HP	Comp Type[1]	Unload Steps	Typical Pump Selection[2]	Reservoir Gallons	Air Cooled						Water Cooled			
						Refrig. cap. BTU/HR	Refrig. cap.-KW	LxWxH IN.	LxWxH MM.	App. Ship Wt. LB.	App. Ship Wt. KG.	Refrig. cap. BTU/HR	Refrig. cap.-KW	LxWxH IN.	LxWxH MM.
C60	1/2	H	1	S/D033	3	6370	1.87	32x27x22	813x584x559	200	91	7720	2.26	32x27x22	813x584x559
C90	3/4	H	1	S/D033	3	9150	2.68	32x27x22	813x584x559	250	113	10930	3.20	32x27x22	813x584x559
C120	1	H	1	S/D033	3	14200	4.16	32x27x22	813x584x559	300	136	16500	4.83	32x27x22	813x584x559
C180	1 1/2	H	1	S/D050	4	20600	6.03	45x34x37	1143x864x1016	400	181	24300	7.12	45x34x37	1143x864x1016
C240	2	H	1	S/D050	4	26100	7.64	45x34x37	1143x864x1016	550	249	30500	8.93	45x34x37	1143x864x1016
C360	3	H	1	S/D050	4	41300	12.09	45x34x37	1143x864x1016	750	340	48700	14.26	45x34x37	1143x864x1016
C480	4	H	1	S/D050	5	56000	16.40	56x34x51	1422x864x1346	1000	454	65600	19.21	56x34x51	1422x864x1346
C600	5	H	1	S/D050	5	65300	19.12	56x34x51	1422x864x1346	1250	567	75600	22.14	56x34x51	1422x864x1346
C720	6	H	1	S/D050	5	77100	22.58	56x34x51	1422x864x1346	1350	612	88300	25.86	56x34x51	1422x864x1346
C900	7 1/2	H	1	S/D075	10	94000	27.53	57x48x66	1448x1219x1676	1550	703	110600	32.39	57x48x66	1448x1219x1677
C1200	10	H	1	S/D075	10	126700	37.10	57X48X66	1448x1219x1676	1800	816	148800	43.57	57x48x66	1448x1219x1677
C1440	12	H	1	S/D100	10	170000	49.81	60x48x66	1524x1219x1676	2500	1134	198000	58.01	60x48x66	1524x1219x1677
C1800	13 1/2	H	1	S/D150	12	191000	55.96	70x48x66	1778x1219x1676	3500	1588	222000	65.05	70x48x66	1778x1219x1677
C/CU2400[3]	20	D	2	S/D150	15	258000	75.59	92x66x92	2337x1677x2337	4500	2041	296000	86.73	90x48x66	2286x1219x1677
C/CU3000	25	D	2	S/D200	18	322000	94.35	128x66x92	3251x1677x2337	5500	2495	364000	106.65	70x60x66	1778x1524x1677
C/CU3600	30	D	2	S/D200	23	375000	109.88	128x66x92	3251x1677x2337	6200	2812	426000	124.82	70x60x66	1778x1524x1677
C/CU4200	35	D	3	S/D300	30	459000	134.49	128x92x92	3251x2337x2337	8000	3629	525000	153.82	84x60x66	2134x1524x1677
C/CU4800	40	D	3	S/D300	36	551000	161.44	128x92x92	3251x2337x2337	9000	4082	626000	183.42	84x60x66	2134x1524x1677
C/CU6000	50	D	4	S/D300	46	665000	194.85	174x92x92	4420x2337x2337	10000	4536	744000	217.99	102x60x72	2591x1524x1829
C/CU7200	60	D	4	S/D500	60	764000	223.85	174x92x92	4420x2337x2337	12000	5443	866000	253.74	126x60x72	2591x1524x1829
C/CU8400	(2) 35	D	6	S/D750	60	918000	268.97	226x92x92	5740x2337x2337	16000	7258	1050000	307.65	84x72x72	2134x1829x1829
C/CU9600	(2) 40	D	6	S/D750	60	1102000	322.89	226x92x92	5740x2337x2337	18000	8165	1252000	366.84	84x72x72	2134x1829x1829
C/CU12000	(2) 50	D	8	S/D1500	92	1330000	389.69	226x92x92	5740x2337x2337	20000	9072	1488000	435.98	126x90x72	3200x2286x1829
C/CU14400	(2) 60	D	8	S/D1500	120	1528000	447.70	268x92x92	6807x2337x2337	25000	11340	1732000	507.48	126x90x72	3200x2286x1829

Notes:

1 "H" = Hermetic; "D" = Discus Accessible Hermetic

2 "S..." = Simplex pumping system; "D..." = Duplex pumping system. Model number indicates HP, eg. S/D100 is 1.0 HP

3 Model "CU..." = Cool Mass Ultra evaporative cooled system.

- Refrigeration capacities are based on: 90°F ambient temperature, 60°F discharge water for air-cooled; 80°F water, 3 GPM/HP for water-cooled; 75°F wet bulb for evaporative-cooled.
- Standard voltages: C60–C90 115-1-60V or 230-1-60V; C120 & larger 230/3/60V or 460/3/60V. 50Hz, 575-3-60V & other voltages available.
- R-22 refrigerant is standard; R-134A is available for most sizes.
- Cabinet standard C60–C360; optional in larger sizes.

Table 2

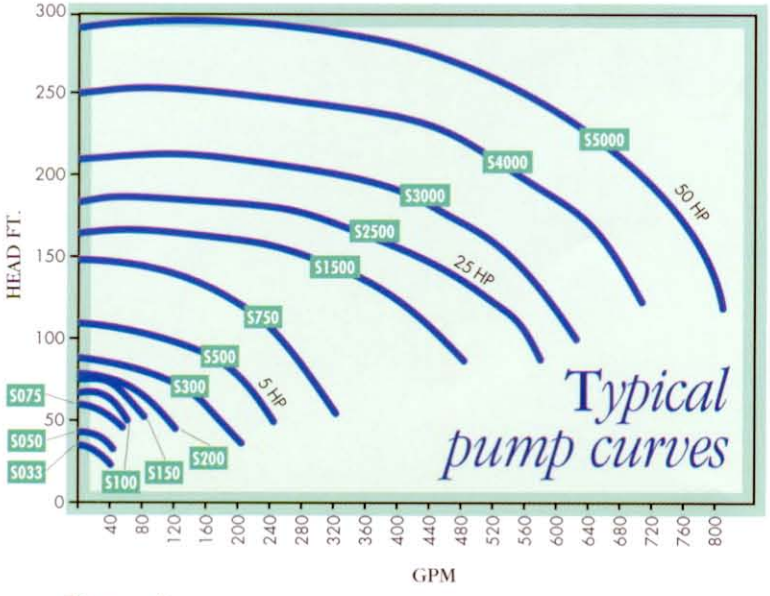


Figure 5

Pump selection

The pump shall have sufficient flow and pressure capabilities (see Figure 5). For more demanding applications, Duplex pumping system is recommended.

Simplex pumping system

Uses one pump. For example, S100 uses one 1 HP pump, prepiped and prewired.

Duplex pumping system

Uses two pumps. For example, D100 uses two 1 HP pumps, prepiped and prewired. Each pump is piped with a check valve and inlet and outlet isolation valves. One pump provides back-up while the other operates. Either of the pumps may be replaced while the other operates.

$$\text{Pump HP} = \frac{\text{GPM x pressure in PSIG}}{\text{1714 x pump efficiency x motor efficiency}}$$

Based on 20PSIG water pressure in the Example at right, minimum required pump HP is:

$$\frac{15 \times 20}{1714 \times 0.75 \times 0.9} = 0.26 \text{ HP}$$

Recommended 1/2 HP pumping system is more than sufficient. Typically, pump should be oversized by about 25% or more.

Ultra

Evaporative Cooled	
Refrig. cap. BTU/HR	Refrig. cap.-KW
314000	92.00
385000	112.81
451000	132.14
560000	164.08
662000	193.97
783000	229.42
919000	269.27
1120000	328.16
1324000	387.93
1566000	458.84
1838000	538.53

10-year prorated heat exchanger, compressor and MicroMonitor & Controller warranty is standard.

For one year from the date of purchase, Pioneer Air Systems, Inc. will replace or repair, or provide free of charge any part or parts found to be defective in material or workmanship, provided the equipment is installed and used according to Pioneer's recommendation. One year mechanical parts only warranty applies to equipment outside North America. The customer shall contact factory to obtain authorization before returning equipment or to obtain field service.

Manufacturer is not responsible for incidental, consequential, shipping and handling charges.

Selection and sizing

IMPORTANT: Calculate heat load carefully and oversize chiller by 15–25% to allow for pump heat load and losses through pipe lines and equipment.

Calculate the heat load using a formula from Table 7 and correction factors from Table 8. Determine whether your Cool Mass chiller will be air-cooled, water-cooled, or evaporative-cooled. Compare the resulting heat load in BTUH to the corresponding refrigeration capacity in Table 2. Select a model which has a higher capacity than your heat load, and remember to oversize by 15–25%.

Pipe size is governed by acceptable water velocity and pressure loss. Recommended water velocity is 3–7 feet/second and maximum recommended pressure loss is 8 ft./100 ft. of pipe length. See Table 6 for pipe selection. All cold pipes should be adequately insulated.

Example

Determine the size of an air-cooled chiller required to maintain a temperature differential of 7°F between the water in to the chiller at 60°F and the water coming out of the chiller at 53°F for the flow of 15 GPM. Maximum ambient temperature is 100°F.

Heat load = (500 x GPM x ΔT) ÷ (TC x AC)
= (500 x 15 x 7) ÷ (1.0 x 0.93)
= 56,452 BTUH

Model C600A is recommended. Based upon above stated acceptable water velocity and pressure loss, 1" pipe is adequate for up to 100 ft. equivalent (allowing for fittings) pipe distance. For greater equivalent pipe distance, 1½" is required.

Typical heat transfer coefficients (U)

TUBE SIDE FLUID	WATER	OIL	50% FREEZE PROTECTOR
Water	400	100	350
Oil	50		
50% Freeze Protector		90	300

Table 3

Typical heat rejections

TYPE OF EQUIPMENT	BTU (APPROX.)	GPM	COOLING RANGE (°F)
Plastic injection machines	125/min./oz. capacity	1.5/oz. capacity	10
Hydraulic oil cooling	2545/hr/BHP	.51/BHP	10
Welding tip cooling	84/min. (avg.)	1.0	10
Electric furnace cooling	200/hr/KW	.02/KW	20
Quench oil cooling	Heat load = specific heat x lbs. x temperature cooled		

Table 4

Proper fluid solution

% FREEZE PROTECTOR	10%	20%	30%	40%	50%
Freezing temp.	25°F/-4°C	14°F/-10°C	3°F/-16°C	-13°F/-25°C	-33°F/36°C

For temperature below 40°F/4°C, use Freeze Protector solution.

Table 5

Maximum recommended flow

PIPE SIZE	GPM @20–50 PSIG	PIPE SIZE	GPM @20–50 PSIG	PIPE SIZE	GPM @20–50 PSIG
0.5"	8	1.5"	50	4.0"	300
0.75"	14	2.0"	78	5.0"	450
1.0"	23	2.5"	120	6.0"	600
1.25"	36	3.0"	180	8.0"	1200

For 100 ft. or less equivalent pipe length (after allowing for fittings). Oversize for longer lengths.

Table 6

Calculating heat load (Q)

FLUID	FORMULA
Water	Q (BTUH) = 500 x GPM x ΔT
Oil	Q (BTUH) = 210 x GPM x ΔT
50% Freeze Protector	Q (BTUH) = 450 x GPM x ΔT

Table 7

Correction factors...

...Water out temperature (TC)

40°F	50°F	60°F	70°F
0.62	0.80	1.0	1.1

...Ambient or condenser water temperature (AC)

70°F	80°F	90°F	100°F	110°F	OVER110°F
1.12	1.06	1.0	0.93	0.87	consult factory

Table 8

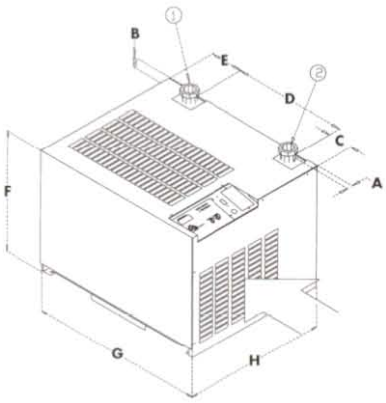


Figure 6. Models C60-C120

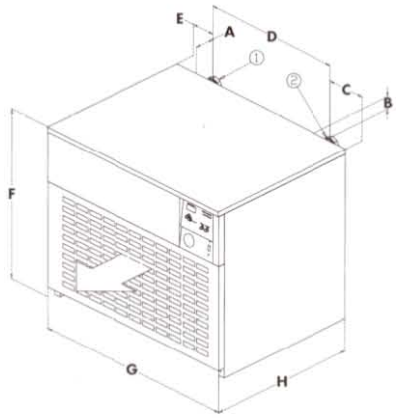


Figure 7. Models C180-360

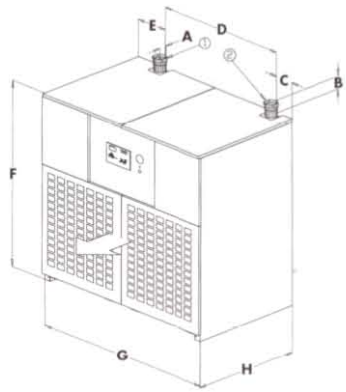


Figure 8. Models C480-C720 (cabinet optional)

Typical dimensions

MODEL	A IN.	A MM	B IN.	B MM	C IN.	C MM	D IN.	D MM	E IN.	E MM	F IN.	F MM	G IN.	G MM	H IN.	H MM	IN & OUT IN.
C60-C120	1	25.4	2	50.8	4	101.6	21	533.4	6	152.4	22	558.8	32	812.8	27	685.8	3/4
C180-C360	4	101.6	2	76.2	8	203.2	31	787.4	5	127.0	36	914.4	45	1143.0	34	863.6	1
C480-C720	2	50.8	4	101.6	6	152.4	41	1041.4	10	254.0	52	1320.8	57	1447.8	34	863.6	2

① WATER OUTLET ② WATER INLET

Table 9

Conversion data

1 GPM = 3.79 LPM
1 PSI = 2.31 ft. of water
°F = 32 + 1.8 x °C
1 HP = 746 watts = 2547 BTUH = 33,000 ft. lbs./min = 10.68 k. calories/min.
1 lb. = 0.4536 KG
1 cu. ft. = 7.48 U.S. gallons = 0.0283 cu. meter =28.32 liters=6.233 imp. gals.

COOL MASS
HIGH EFFICIENCY CYCLING CHILLERS

Specifications

The closed-loop, sealed chiller shall be capable of cooling a _____ GPM/LPM flow of process fluid from _____ °F/°C to _____ °F/°C on a continuous and automatic basis.

The chiller shall be of a cycling design and come equipped with a MicroMonitor & Controller for push-button, sequential control of the refrigerant compressor(s) and pump(s). With the turn of a knob, the MicroMonitor & Controller shall monitor the temperatures in °F (or °C) of: inlet, suction, discharge, evaporator, outlet and ambient. It shall have "on/off" controls for two pumps.

The chiller shall utilize non-rusting copper and brass on all cooling fluid surfaces, heat exchanger, tank and piping. It shall incorporate an integrated heat exchanger and tank design for consistent temperatures. It shall provide protection from process fluid freeze-up. The refrigeration system shall use R-22 refrigerant. The refrigerant condenser shall be ❑ air-cooled ❑ water-cooled ❑ evaporative-cooled.

The chiller shall incorporate more efficient Discus semi-hermetic compressor(s)*, automatic pump down* and cylinder unloading*. The solid state controls and wiring shall be NEMA 1. The chiller shall have a 10-year limited warranty (prorated).

* C2400/CU2400 and larger

The chiller shall be Pioneer Cool Mass model_____

Options:

- ❑ Kleen-Water filter
- ❑ Pumping System
- ❑ R-134A refrigerant
- ❑ Freeze Protector _____ gallons
- ❑ Stainless steel construction
- ❑ Dual compressor, dual circuit

PIONEER
INNOVATIVE QUALITY SYSTEMS

Your Representative...

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Clean Cycle refrigerant dryers
Mr. Best Aire regenerative dryers
Super Deliquescent dryers
Cooling towers
Aqua Savers
Air, Gas & Water filtration systems
Oil-Water separators
CNG purifiers *
Pionox & Piopure breathing air systems *

* Provided by Pioneer Engineering, Inc.

Pioneer Air Systems, Inc.
210 Flatfork Road, Wartburg, TN 37887-3201
(423) 346-6693 fax: (423) 346-3865

Shunfeng-Pioneer
Xiao HangZhong Hua Men Wai, Nanjing, China
8625-241-7271 fax: 8625-241-1128

***24-hour information:* http://www.pioneerair.com**

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