Product Catalog

MX Series Rotary Screw Chillers

Contents

Standard Features

Rotary Screw Compressor

Direct-drive rotary screw compressor technology with proven process cooling performance and reliability provides outstanding performance and low maintenance.

Stainless Steel Evaporator

High-efficiency stainless steel plates with copper brazing provide maximum performance, long life, and an enhanced level of protection from harsh process conditions.

Evaporator Inlet Strainer

The evaporator inlet strainer removes any debris present in the process fluid to prevent costly downtime and repair due to a clogged chiller evaporator.

Modular Expandable System

Our modular system design provides for system expansion to over 750 tons using up to six chillers and six refrigeration circuits.

Compressor Protection Technology

Compressor protection technology provides start-to-start anti-recycle control logic to limit compressor cycling under low-loads to extend compressor life.

Automatic Compressor Sequencing

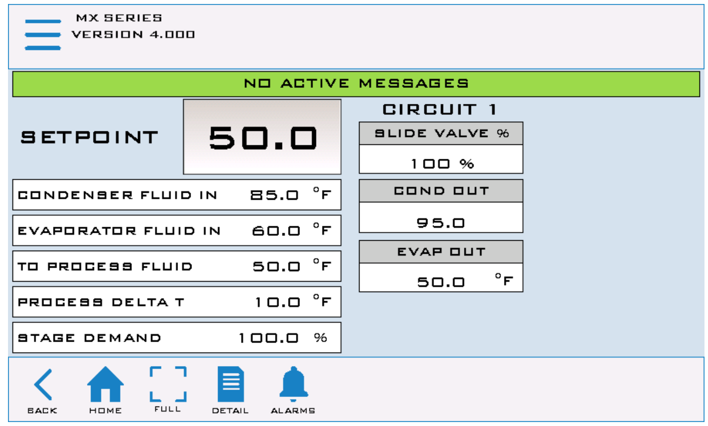
The control system records and displays individual compressor running hours and automatically distributes run time among all compressors in the system.

UL 508A Industrial Control Panel

Every chiller has a UL label certifying our panel design and components comply with UL 508A standards ensuring the panels are safe and consistent for reliable operation.

Color Touch-Screen Display

A high-resolution, high-speed, 7-inch color touch-screen with English text clearly shows chiller operation for quick and easy monitoring and control of the system.



Standard PLC Home Screen

CONNEX4.0 Ready Controls

Every chiller is equipped with an Ethernet port and is fully compatible with the CONNEX4.0 plant-wide equipment control and monitoring system.

Warranty

3 year PLC controller parts
1 year entire unit parts
12 months labor
One-day factory authorized start-up supervision

Available Options

Rotary Non-Fused Disconnect Switch

Adds a 5 kA SCCR (Short Circuit Current Rating) rotary non-fused disconnect switch to the control panel for safe lockout of main power.

10-inch HMI

Replaces the standard 7-inch screen with a 10-inch, high resolution, color screen for larger presentation of the same menus and functions as the standard screen.

12 inch HMI

Replaces the standard 7-inch screen with a 12-inch, high resolution, color screen with a built-in industrial computer to allow for remote monitoring and control using Teamviewer software installed on any remote Windows based PC or smart phone.

12-inch HMI and CONNEX4.0 Master Controller

Replaces the standard 7-inch screen with a 12-inch, high resolution, color screen with a built-in industrial computer to allow for remote monitoring and control using Teamviewer software installed on any remote Windows based PC or smart phone. This package also adds a second PLC to allow for connection of up to 15 total Thermal Care Connex4.0 ready devices for many ways to interact with the connected equipment such as smart phone/tablet control, configurable email and text alerts for alarms, warnings, event alerts, and data collection.

BACnet or Lon Works Communications Port

Adds a ModBUS to BACnet or Lon Works gateway which is wired to a RS-485 connector on the chiller control panel.

Physical Data

Water Cooled Condenser Single-Circuit Chillers

	MXW50	MXW75	MXW100	MXW125
Cooling Capacity (tons)[1]	53	69	100	122
Set Point Range (°F)	20 to 75	20 to 75	20 to 75	20 to 75
Compressor (qty)	1	1	1	1
Process Fluid In/Out (in)	3	4	4	4
Condenser Water In/Out (in)	3	4	4	4
Length (in)	140	142	147	148
Width (in)	36	36	36	36
Height (in)	81	81	81	81
Shipping Weight (lbs)	2,965	3,915	4,315	5,020
Operating Weight (lbs)	3,145	4,095	4,575	5,330
MCA @ 460/3/60 (amps)[2]	142	173	209	275
MOP @ 460/3/60 (amps)[3]	250	300	350	450

[1]Cooling capacity when cooling water with 50°F set point, 60°F return, 85°F condenser water, R-134a refrigerant.
[2]MCA is Minimum Circuit Amps under full load, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Remote Air-Cooled Condenser Single-Circuit Chillers

	MXR50	MXR75	MXR100	MXR125
Cooling Capacity (tons)[1]	49	65	93	114
Set Point Range (°F)	20 to 75	20 to 75	20 to 75	20 to 75
Compressor (qty)	1	1	1	1
Process Fluid In/Out (in)	3	4	4	4
Liquid Line Connection (in)	1 3/8	1 5/8	2 1/8	2 1/8
Discharge Line Connection (in)	2 1/8	2 5/8	2 5/8	3 1/8
Length (in)	134	137	137	137
Width (in)	36	36	36	36
Height (in)	81	81	81	81
Shipping Weight (lbs)	2,495	3,340	3,485	3,700
Operating Weight (lbs)	2,620	3,510	3,710	3,980
MCA @ 460/3/60 (amps)[2]	142	173	209	275
MOP @ 460/3/60 (amps)[3]	250	300	350	450

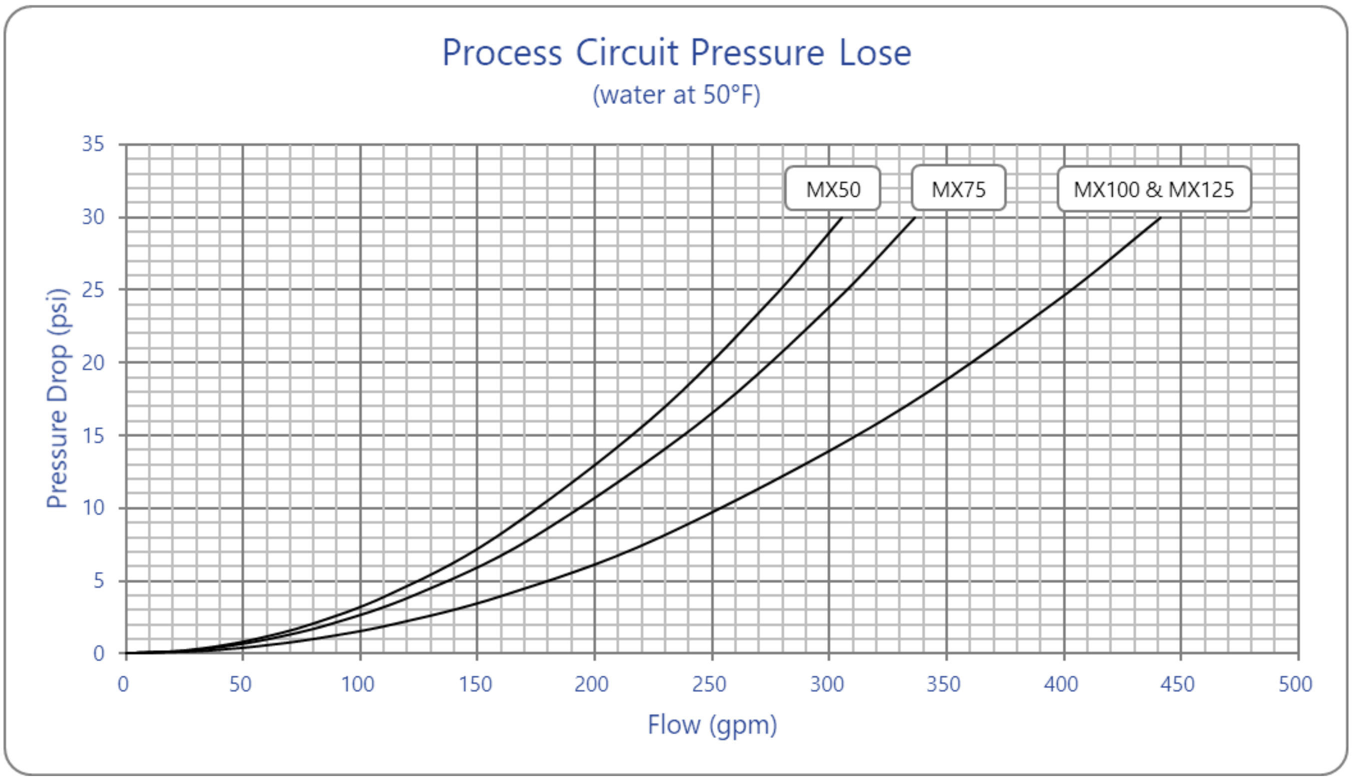
[1]Cooling capacity when cooling water with 50°F set point, 60°F return, 95°F condenser air, R-134a refrigerant.
[2]MCA is Minimum Circuit Amps under full load, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Remote Condensers

	LAVF-14412	LAVF-16410	LAVF-24410	LEVF-26410
Chiller Used With	MXR50	MXR75	MXR100	MXR125
Number of Fans	4	6	8 (2 rows of 4 fans)	12 (2 rows of 6 fans)
Refrigerant Inlet Line (in)	3⅛	3⅛	3⅛ per row of fans	3⅛ per row of fans
Refrigerant Outlet Line (in)	3⅛	3⅛	3⅛	3⅛
Length (in)	220	328	220	342
Width (in)	45	45	91	91
Height (in)	61	61	61	61
Shipping Weight (lbs)	1,600	2,810	2,851	5,218
Operating Weight (lbs)	Varies based on system refrigerant charge and operating conditions			
MCA @ 460/3/60 (amps)[1]	14	22	29	43
MOP @ 460/3/60 (amps)[2]	20	30	35	45

[1]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[2]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Process Fluid Circuit Pressure Loss



Electrical Data

Chiller Electrical Data (60 Hz)

Model	Rated Voltage	Allowable Supply		Number of Power Connections	Number of Conductors	Compressor Data		Unit Data	
		Min	Max			RLA[1]	LRA[2]	MCA[3]	MOPD[4]
MXW50	460/3/60	414	506	1	3	112	267	142	250
	575/3/60	518	632	1	3	90	212	114	200
MXW75	460/3/60	414	506	1	3	137	433	173	300
	575/3/60	518	632	1	3	109	346	138	225
MXW100	460/3/60	414	506	1	3	166	563	209	350
	575/3/60	518	632	1	3	133	449	168	300
MXW125	460/3/60	414	506	1	3	219	716	275	450
	575/3/60	518	632	1	3	175	577	220	350
MXR50	460/3/60	414	506	1	3	112	267	142	250
	575/3/60	518	632	1	3	90	212	114	200
MXR75	460/3/60	414	506	1	3	137	433	173	300
	575/3/60	518	632	1	3	109	346	138	225
MXR100	460/3/60	414	506	1	3	166	563	209	350
	575/3/60	518	632	1	3	133	449	168	300
MXR125	460/3/60	414	506	1	3	219	716	275	450
	575/3/60	518	632	1	3	175	577	220	350

[1]RLA is Rated Load Amps.
[2]LRA is Locked Rotor Amps.
[3]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[4]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Remote Air-Cooled Condenser Electrical Data (60 Hz)

Model	Rated Voltage[1]	Allowable Supply		Number of Power Connections	Number of Conductors	Fan Data		Unit Data	
		Min	Max			Qty	RLA[2] Ea	MCA[3]	MOPD[4]
LAVF-14412	460/3/60	414	506	1	3	4	3.5	15	20
LEVF-16410	460/3/60	414	506	1	3	6	3.5	22	30
LAVF-24410	460/3/60	414	506	1	3	8	3.5	29	35
LAVF-25410	460/3/60	414	506	1	3	10	3.5	36	45

[1]575/3/60 remote condensers require special selection and pricing. Consult factory for details.
[2]RLA is Rated Load Amps
[3]MCA is Minimum Circuit Amps (for wire sizing) as provided by the remote condenser manufacturer.
[4]MOCP is Maximum Over-current Protection Device as provided by the remote condenser manufacturer.

Performance Data

MXW Series Cooling Capacities (60 Hz)

Leaving Coolant Temp	Model	Entering Condenser Water Temperature											
		80°F			85°F			90°F			95°F		
		Cap[1]	Input kW[2]	Cooler Flow (gpm)	Cap[1]	Input kW[2]	Cooler Flow (gpm)	Cap[1]	Input kW[2]	Cooler Flow (gpm)	Cap[1]	Input kW[2]	Cooler Flow (gpm)
20°F	MXW50	26.0	35.2	72.6	26.0	35.2	72.6	25.9	35.4	72.3	24.9	37.6	69.4
	MXW75	35.1	50.4	98.0	35.1	50.4	98.0	34.9	50.8	97.5	33.6	52.2	93.8
	MXW100	50.7	63.6	141.5	50.7	63.6	141.5	50.4	64.3	140.6	48.5	68.2	135.3
	MXW125	62.1	81.2	173.2	62.1	83.5	173.1	61.7	84.5	172.0	59.4	87.1	165.7
25°F	MXW50	29.6	35.8	80.1	29.6	35.8	80.1	29.4	36.1	79.6	28.2	38.2	76.6
	MXW75	39.7	49.4	107.7	39.7	49.4	107.7	39.5	50.1	107.0	38.1	53.1	103.2
	MXW100	57.3	64.4	155.5	57.3	64.4	155.5	56.8	65.3	154.1	54.8	69.3	148.6
	MXW125	70.1	82.2	190.1	70.1	82.2	190.0	69.5	83.4	188.5	67.1	88.5	181.9
30°F	MXW50	33.4	36.3	88.2	33.4	36.3	88.2	33.1	36.7	87.5	31.9	39.0	84.2
	MXW75	44.7	50.0	118.1	44.7	50.0	118.1	44.4	50.9	117.1	42.9	54.0	113.2
	MXW100	64.5	65.4	170.4	64.5	65.4	170.4	63.9	66.7	168.6	61.7	70.7	162.7
	MXW125	78.8	83.4	208.1	78.8	83.4	208.1	78.0	84.9	206.0	75.4	90.0	199.0
35°F	MXW50	37.7	37.0	96.9	37.6	36.9	96.9	37.3	37.6	95.8	35.9	39.8	92.4
	MXW75	50.2	50.9	129.1	50.2	50.9	129.1	49.7	51.9	127.8	48.1	55.0	123.7
	MXW100	72.4	66.5	186.3	72.4	66.5	186.2	71.5	68.0	183.9	69.1	72.0	177.8
	MXW125	88.3	84.7	227.3	88.3	84.7	227.2	87.3	86.7	224.5	84.4	91.7	217.2
40°F	MXW50	42.3	37.7	106.1	42.3	37.7	106.1	41.7	38.4	104.7	40.3	40.7	101.1
	MXW75	56.1	51.7	140.9	56.1	51.7	140.8	55.4	52.9	139.2	53.7	56.0	134.9
	MXW100	80.9	67.7	203.2	80.9	67.7	203.2	79.7	69.5	200.2	77.2	73.6	193.7
	MXW125	98.7	86.3	247.7	98.6	86.2	247.7	97.2	88.4	244.2	94.2	93.7	236.5
45°F	MXW50	47.4	38.5	113.6	47.3	38.4	113.6	46.6	39.4	111.8	45.0	41.6	108.1
	MXW75	62.6	52.7	150.3	62.6	52.7	150.2	61.8	54.2	148.2	60.0	57.3	143.8
	MXW100	90.3	69.0	216.7	90.3	69.0	216.7	88.8	71.2	213.0	86.0	75.2	206.3
	MXW125	110.1	87.9	264.0	110.0	87.8	264.0	108.2	90.5	259.7	104.9	95.7	251.7
50°F	MXW50	52.7	39.3	126.5	52.7	39.3	126.4	51.8	40.5	124.2	50.1	42.7	120.1
	MXW75	69.4	53.7	166.6	69.4	53.7	166.6	68.3	55.4	163.9	66.4	58.5	159.3
	MXW100	100.2	70.4	240.5	100.2	70.4	240.5	98.3	72.9	235.9	95.3	76.9	228.7
	MXW125	121.9	89.6	292.6	121.9	89.6	292.6	119.7	92.7	287.2	116.1	97.9	278.6
55°F	MXW50	58.5	40.2	140.4	58.5	40.2	140.3	57.3	41.6	137.5	55.4	43.8	133.1
	MXW75	76.7	54.8	184.1	76.7	54.8	184.1	75.3	56.7	180.9	73.3	59.9	176.0
	MXW100	110.8	71.9	266.1	110.8	71.9	266.1	108.5	74.8	260.4	105.2	78.7	252.7
	MXW125	134.7	91.4	323.4	134.7	91.4	323.4	131.9	95.0	316.7	128.1	100.1	307.5
60°F	MXW50	64.7	41.2	155.3	64.7	41.2	155.3	63.2	42.8	151.8	61.2	45.0	147.1
	MXW75	84.5	55.9	203.0	84.5	55.9	203.0	82.9	58.2	199.1	80.7	61.3	193.8
	MXW100	122.3	73.5	293.8	122.3	73.5	293.8	119.4	76.7	286.8	115.9	80.7	278.4
	MXW125	148.4	93.4	356.5	148.4	93.4	356.5	145.1	97.4	348.4	140.9	102.5	338.5
65°F	MXW50	71.5	43.5	171.7	71.5	43.5	171.7	69.7	45.3	167.5	67.6	47.7	162.5
	MXW75	92.8	57.1	223.0	92.8	57.1	223.0	90.9	59.6	218.4	88.6	62.7	212.9
	MXW100	134.6	75.2	323.4	134.7	75.2	323.5	131.1	78.7	315.1	127.4	82.7	306.1
	MXW125	163.0	95.4	391.7	163.1	95.4	391.8	159.1	99.9	382.1	154.7	105.1	371.7
70°F	MXW50	72.3	42.6	173.7	72.3	42.6	173.7	70.1	44.4	168.4	67.6	46.5	162.4
	MXW75	101.7	58.4	244.4	101.7	58.4	244.5	99.3	61.0	238.6	96.9	64.1	232.8
	MXW100	147.8	77.0	355.2	147.5	77.3	354.5	143.7	80.9	345.3	139.7	84.9	335.6
	MXW125	178.9	97.7	429.8	178.6	97.9	429.2	173.8	102.4	417.5	169.1	107.5	406.4
75°F	MXW50	72.3	42.6	173.7	72.3	42.6	173.7	70.0	44.4	168.3	67.6	46.6	162.4
	MXW75	105.8	56.3	254.3	106.0	56.6	254.7	109.0	63.0	262.0	106.0	65.8	254.7
	MXW100	161.9	78.8	389.1	160.9	79.4	386.7	156.9	83.0	377.0	152.6	87.0	366.7
	MXW125	182.1	92.1	437.6	183.1	93.3	440.1	190.7	105.8	458.3	185.0	110.4	444.5

[1]Cap = Capacity in tons of refrigeration based on a coolant temperature rise of 10°F, a cooler fouling factor of 0.0001 ft^2 • hr • °F/Btu, condenser fouling factor of 0.00025 ft^2 • hr • °F/Btu, the use of an appropriate ethylene glycol solution where needed, and R134a refrigerant.
[2] kW = Total compressor input power at rated voltage.

MXR Series Cooling Capacities (60 Hz)

Leaving Coolant Temp	Model	85°F Cap[1]	85°F Input kW[2]	85°F Cooler Flow (gpm)	90°F Cap[1]	90°F Input kW[2]	90°F Cooler Flow (gpm)	95°F Cap[1]	95°F Input kW[2]	95°F Cooler Flow (gpm)	100°F Cap[1]	100°F Input kW[2]	100°F Cooler Flow (gpm)
20°F	MXR50	26.0	35.2	72.5	26.0	35.2	72.6	25.5	36.2	71.1	24.5	38.4	68.4
	MXR75	35.1	50.4	98.0	35.2	50.6	98.1	34.5	52.0	96.2	33.3	55.2	92.8
	MXR100	50.7	63.6	141.5	50.8	63.7	141.7	49.6	65.9	138.3	47.8	69.9	133.2
	MXR125	62.1	83.5	173.1	62.1	81.2	173.3	60.7	84.0	169.5	58.6	91.6	163.5
25°F	MXR50	29.5	35.7	80.1	29.6	35.8	80.3	28.7	37.2	77.9	27.6	39.4	74.9
	MXR75	39.7	49.4	107.7	39.8	49.5	107.9	38.7	51.4	105.0	37.4	54.6	101.4
	MXR100	57.3	64.4	155.5	57.4	64.5	155.8	55.6	67.6	150.9	53.6	71.6	145.5
	MXR125	70.1	82.2	190.0	70.2	82.3	190.4	68.1	86.2	184.7	65.7	91.3	178.2
30°F	MXR50	33.4	36.3	88.2	33.5	36.5	88.4	32.2	38.3	85.1	31.0	40.6	81.9
	MXR75	44.7	50.0	118.1	44.8	50.2	118.3	43.3	52.9	114.4	41.9	56.1	110.5
	MXR100	64.6	65.5	170.4	64.5	66.2	170.1	62.2	69.7	164.1	60.0	73.8	158.3
	MXR125	78.8	83.4	208.1	78.8	84.1	207.9	76.0	88.6	200.7	73.4	93.8	193.8
35°F	MXR50	37.7	37.0	96.9	37.4	37.7	96.2	36.0	39.6	92.6	34.7	41.9	89.3
	MXR75	50.2	50.9	129.2	49.9	51.7	128.4	48.3	54.5	124.2	46.7	57.7	120.2
	MXR100	72.5	66.6	186.4	71.6	68.2	184.3	69.2	71.9	178.0	66.8	76.0	171.8
	MXR125	88.4	84.8	227.4	87.5	86.7	225.0	84.6	91.4	217.6	81.8	96.8	210.3
40°F	MXR50	42.3	37.7	106.2	41.5	38.9	104.3	40.0	40.9	100.5	38.6	43.3	97.0
	MXR75	56.1	51.7	141.0	55.3	53.3	138.9	53.6	56.2	134.6	51.9	59.5	130.3
	MXR100	81.0	67.8	203.5	79.3	70.4	199.2	76.7	74.2	192.6	74.1	78.5	186.1
	MXR125	98.7	86.3	247.9	96.8	89.4	243.0	93.7	94.3	235.3	90.7	99.9	227.7
45°F	MXR50	47.5	38.5	113.8	46.1	40.4	110.5	44.4	42.4	106.6	42.9	44.9	102.9
	MXR75	62.7	52.8	150.5	61.2	55.1	146.9	59.4	58.2	142.5	57.6	61.5	138.2
	MXR100	90.5	69.5	217.0	87.7	73.0	210.3	84.9	76.9	203.6	82.0	81.1	196.8
	MXR125	110.2	88.0	264.4	106.9	92.5	256.5	103.7	97.7	248.7	100.4	103.3	240.8
50°F	MXR50	52.4	39.9	125.8	50.7	41.9	121.7	49.0	44.1	117.6	47.3	46.5	113.5
	MXR75	69.2	54.3	166.2	67.3	57.1	161.4	65.4	60.2	156.9	63.4	63.6	152.2
	MXR100	99.3	72.1	238.2	96.3	75.6	231.1	93.3	79.7	223.9	90.2	84.0	216.5
	MXR125	121.0	91.3	290.3	117.4	95.9	281.7	113.9	101.1	273.4	110.3	106.8	264.8
55°F	MXR50	57.5	41.6	137.9	55.7	43.7	133.6	53.8	45.8	129.2	52.0	48.3	124.8
	MXR75	75.8	56.3	181.9	73.7	59.1	176.9	71.7	62.4	172.2	69.6	65.8	167.2
	MXR100	108.6	74.7	260.8	105.5	78.6	253.2	102.2	82.6	245.4	98.9	87.1	237.5
	MXR125	132.2	94.6	317.5	128.4	99.3	308.4	124.8	104.9	299.6	120.9	110.6	290.3
60°F	MXR50	62.8	43.3	150.8	60.9	45.5	146.3	58.9	47.7	141.6	56.9	50.2	136.8
	MXR75	82.7	58.4	198.6	80.5	61.3	193.4	78.5	64.8	188.4	76.2	68.3	183.1
	MXR100	118.5	77.7	284.6	115.1	81.5	276.5	111.7	85.8	268.2	108.1	90.4	259.6
	MXR125	144.2	98.3	346.3	140.2	103.2	336.6	136.3	108.8	327.3	132.1	114.7	317.3
65°F	MXR50	68.7	46.7	165.0	66.6	48.9	160.0	64.2	49.9	154.2	61.7	52.3	148.3
	MXR75	89.9	60.5	216.0	87.6	63.5	210.5	85.4	67.0	205.3	83.2	70.9	199.8
	MXR100	128.9	80.8	309.8	125.4	84.9	301.2	121.7	89.3	292.3	117.8	93.9	282.9
	MXR125	156.6	102.0	376.2	152.3	107.0	365.9	148.2	112.8	356.1	144.0	119.1	345.8
70°F	MXR50	68.7	45.5	165.1	66.4	47.6	159.5	64.0	49.8	153.7	61.5	52.1	147.9
	MXR75	97.5	62.8	234.4	95.0	65.8	228.3	92.3	68.9	221.8	90.1	73.0	216.6
	MXR100	139.9	84.1	336.3	136.1	88.3	327.0	132.2	92.9	317.5	128.0	97.6	307.5
	MXR125	169.7	105.9	407.8	165.0	110.9	396.5	160.0	116.2	384.3	155.8	122.9	374.3
75°F	MXR50	68.7	45.6	165.0	66.3	47.6	159.4	63.9	49.9	153.7	61.5	52.3	147.8
	MXR75	106.8	66.5	256.5	103.4	68.8	248.4	100.3	71.8	240.9	97.5	75.5	234.3
	MXR100	151.1	87.4	363.1	146.8	91.4	352.9	142.8	96.2	343.2	138.4	101.2	332.6
	MXR125	185.3	111.9	445.2	179.3	116.1	430.8	173.5	121.0	416.9	168.3	127.1	404.4

Entering Condenser Air Temperature: 85°F, 90°F, 95°F, 100°F.

[1]Cap = Capacity in tons of refrigeration based on a coolant temperature rise of 10°F, a cooler fouling factor of 0.0001 ft^2 • hr • °F/Btu, the use of an appropriate ethylene glycol solution where needed, R134a refrigerant, and operating at sea level.

[2] kW = Total compressor input power at rated voltage.

Application Considerations

When designing a chilled water system it is important all aspects of the system are considered to ensure steps are taken to provide stable and reliable operation. The following provides some general guidelines for designing a system.

Foundation

Install the unit on a rigid, non-warping mounting pad, concrete foundation, or level floor suitable to support the full operating weight of the equipment. When installed the equipment must be level within ¼ inch over its length and width.

Chiller Unit Location

Proper ventilation is an important consideration when locating the condenser. In general, locate the unit in an area that will not rise above 110°F.

To ensure proper airflow and clearance space for proper operation and maintenance allow a minimum of 36 inches of clearance between the sides of the equipment and any walls or obstructions. Avoid locating piping or conduit over the unit to ensure easy access with an overhead crane or lift to lift out heavier components during replacement or service. In addition, ensure the condenser and evaporator refrigerant pressure relief valves can vent in accordance with all local and national codes.

Remote Air-Cooled Condenser Location

The remote air-cooled condenser is for outdoor use. Locate the remote condenser in an accessible area. The vertical air discharge must be unobstructed. Allow a minimum of 48 inches of clearance between the sides and ends of the condenser and any walls or obstructions. For installations with multiple condensers, allow a minimum of 96 inches between condensers placed side-by-side or 48 inches for condensers placed end-to-end.

When locating the condenser it is important to consider accessibility to the components to allow for proper maintenance and servicing of the unit. Avoid locating piping or conduit over the unit to ensure easy access with an overhead crane or lift to lift out heavier components during replacement or service.

Avoid areas that can create a "micro-climate" such as an alcove with east, north, and west walls that can be significantly warmer than surrounding areas. The condenser needs to have unrestricted airways so it can easily move cool air in and heated air away. Consider locating the condenser where fan noise and vibration transmission into nearby workspaces is unlikely.

Process Fluid Piping

Proper insulation of chilled process fluid piping is crucial to prevent condensation. The formation of condensation adds a substantial heat load to the chiller.

The importance of properly sized piping cannot be overemphasized. See the ASHRAE Handbook or other suitable design guide for proper pipe sizing. In general, run full size piping out to the process and reduce pipe size at connections as needed. One of the most common causes of unsatisfactory chiller performance is poor piping system design. Avoid long lengths of hoses, quick disconnect fittings, and manifolds wherever possible as they offer high resistance to water flow. When manifolds are required, install them as close to the use point as possible. Provide flow-balancing valves at each machine to assure adequate water distribution in the entire system.

Process Fluid Temperature

The chiller can operate with a variety of different supply and return temperatures. The chiller is able to start and pull down with short-term entering fluid temperatures up to 20°F warmer than the maximum set point of the chiller. This allows the chiller to pull down the temperature of a reservoir or process fluid loop on start-up. Under normal operation it is recommended that the entering water temperature not exceed 10°F warmer than the maximum set point temperature of the chiller.

Process Fluid Flow Rate

The nominal performance of the chiller is based on a temperature rise of 10°F through the process. The chiller is capable of operating with different operating temperature differentials provided certain flow limitations are not exceeded and correction to capacity, pressure drops, and other operating parameters are taken into consideration when selecting the proper unit for the application. The minimum flow rate to prevent fouling and to ensure the chiller stays within normal refrigerant operating conditions is approximately 1.2 gpm per nominal ton of cooling capacity. The fouling factor used to calculate the ratings of the vessels are 0.00010 Ft^2 • Hr • °F/Btu.

If the process flow requirement is less than 1.2 gpm per nominal ton of cooling capacity use a primary pumping loop for the lower flow at a higher temperature rise and a secondary pumping loop for a higher flow and lower temperature drop through the chiller. If a secondary pumping loop is used, the mixed temperature of coolant entering the evaporator must be a minimum of 5°F above the design set point of the chiller.

The maximum flow limitation is determined based upon a 5°F drop through the chiller at the maximum capacity of the chiller; however, the flows often times result in impractical pressure drops through the chiller and are therefore not likely for system design. If the process flow requirement is higher than the maximum flow limitation use a bypass around the chiller or a primary pumping loop designed for the high flow at a lower temperature rise and a secondary pumping loop for a lower flow and high temperature drop through the chiller. If a secondary pumping loop is used, the mixed temperature of coolant entering the chiller must be a minimum 5°F above the design set point of the chiller.

The use of varying chiller flows is sometimes necessary; however, a dedicated evaporator circulation pump provides increased system stability. If the flow through the chiller is varied, the minimum fluid loop volume must be in excess of 3 gallons of coolant per ton of cooling and the flow rate must change at a rate of no greater than 10% per minute in order to maintain an acceptable level of temperature control. If the chiller sees a net rate of change greater than 10% per minute it may result in temporary supply temperature fluctuations greater than 1°F.

Condenser Water Temperature and Flow

All water-cooled condenser chillers include a factory mounted condenser water-regulating valve to regulate the flow of condenser water to maintain the proper refrigerant pressures. The minimum flow rate is approximately 0.5 gpm per nominal cooling ton to prevent fouling and to ensure the chiller stays within normal refrigerant operating conditions. The fouling factor used to calculate the ratings of the vessels are 0.00025 Ft^2 • Hr • °F/Btu.

The chiller will start and operate with an inlet water temperature between 55°F and 95°F. The actual flow requirements will vary. Lowering the condenser water supply temperature below 85°F is an effective way to reduce the overall cooling system input power requirements.

Condenser Air Temperature

All remote air-cooled condenser chillers come with a factory selected remote air-cooled condenser to meet the needs of the chiller module to which it is connected. The chiller is designed to allow the unit to start and operate with an inlet air temperature range between -20°F and 100°F. The minimum ambient air temperature at which the chiller can be started is -20°F based on still air.

System Fluid Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a “universal solvent” because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The life giving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity.

Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved gases

Chillers at their simplest have two main heat exchangers: one that absorbs the heat from the process (evaporator) and one that removes the heat from the chiller (condenser). All our chillers use stainless steel brazed plate evaporators. Our air-cooled chillers use air to remove heat from the chiller; however, our water-cooled chillers use either a tube-in-tube or shell-in-tube condenser which has copper refrigerant tubes and a steel shell. These, as are all heat exchangers, are susceptible to fouling of heat transfer surfaces due to scale or debris. Fouling of these surfaces reduces the heat-transfer surface area while increasing the fluid velocities and pressure drop through the heat exchanger. All of these effects reduce the heat transfer and affect the efficiency of the chiller.

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved.

Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO3-)	70-300 ppm
Aluminum (Al)	Less than 0.2 ppm
Ammonium (NH3)	Less than 2 ppm
Chlorides (Cl-)	Less than 300 ppm
Electrical Conductivity	10-500µS/cm
Free (aggressive) Carbon Dioxide (CO2)†	Less than 5 ppm
Free Chlorine(Cl2)	Less than 1 PPM
HCO3-/SO42-	Greater than 1.0
Hydrogen Sulfide (H2S)	Less than 0.05 ppm
Iron (Fe)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm
Nitrate (NO3)	Less than 100 ppm
pH	7.5-9.0
Sulfate (SO42-)	Less than 70 ppm
Total Hardness (dH)k	4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x $2^{[(6.3\text{-pH})/0.3]}$ where TA = Total Alkalinity, PPM as $CaCO_3$

Recommended Glycol Solutions

Chilled Water Temperature	Percent Glycol By Volume
50°F (10°C)	Not required
45°F (7.2°C)	5 %
40°F (4.4°C)	10 %
35°F (1.7°C)	15 %
30°F (-1.1°C)	20 %
25°F (-3.9°C)	25 %
20°F (-6.7°C)	30 %

CAUTION: When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. Never use glycol designed for automotive applications. Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the chiller. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.

WARNING: Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

Over-Sizing Chillers

Over-sizing chillers is sometimes done to allow for future growth. While this practice may be necessary it is highly recommended that chillers not be oversized by more than 15% at design conditions to avoid unwanted reductions in system efficiency and excessive electrical power use and/or compressor cycling due to reduced chiller loading. If the system design requires prolonged periods of time operating at reduced loads it is recommended that two smaller chillers be considered as operating smaller chillers at higher loads is preferred to operating one larger chiller at or near its minimum load capacity.

Strainers

Each evaporator is provided with a 20 mesh inlet strainer to protect the evaporator. All water-cooled condensers should be filtered with a minimum of a 20 mesh filtering system to protect the condenser from contamination.

Remote Condenser Selection

Chillers using remote air-cooled condensers include a properly sized and selected remote condenser so there is no need for a separate remote condenser selection. For installation and line size guidelines please referrer to the Installation and Operation manual of the chiller.

Notes

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