THERMAL CARE
PiovanGroup

Product Catalog

NQ Series Portable and Remote Air-Cooled Condenser Chillers

Contents

Standard Features

Alarm Horn and/or Alarm Relay
Provides an alarm horn that sounds when a fault condition occurs as well as an alarm contact that closes whenever a fault condition occurs.

Direct Drive Scroll Compressors
Direct drive hermetically sealed scroll compressors with proven performance in industrial cooling for reliable, low maintenance, and efficient operation.

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

Stainless Steel Pump
Stainless steel pump selected for peak performance with the utmost in corrosion protection to ensure a long useful life under severe industrial conditions.

Nonferrous Reservoir and Water Lines
The insulated reservoir, fluid lines, pumps, and other components in the process fluid circuit will remain free of rust to provide maximum corrosion protection.

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.

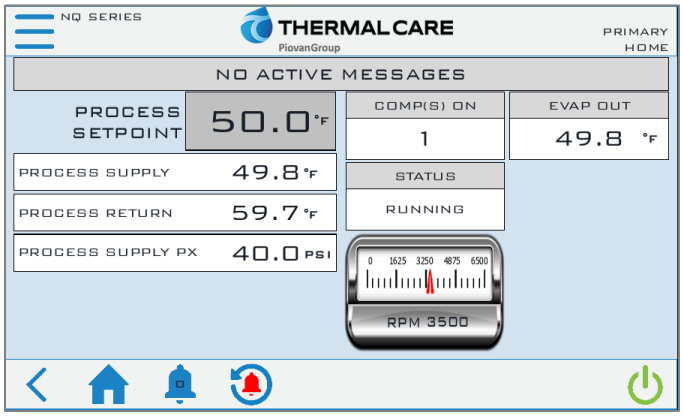
Wide Ambient Range
A wide range of indoor-duty air-cooled, water-cooled, or remote air-cooled condensers as well as outdoor air-cooled chillers fit a variety of applications.

Easy Access Cabinet
Heavy-gauge machine access doors with industrial grade tools-free latches provide quick access to all components for easy operation and maintenance.

Compressor Protection Technology
Our compressor protection technology uses start-to-start anti-recycle control logic to limit cycling under low-load operating conditions to extend compressor life.

Compressor and Pump Run Hour Displays
The ability to monitor compressor and pump running hours is useful and is an important tool to assist with scheduling maintenance.

7-Inch Color Touch Screen



Description of Functions	Standard Controls	Premium Controls
Display Parameters		
Process Fluid Supply & Return Temps	●	●
Evaporator Fluid Leaving Temperature	●	●
Process Fluid Supply Pressure	●	●
Compressor Running Hours	●	●
Pump Running Hours	●	●
Condenser Fan Running Hours	●	●
Refrigerant Suction Pressure	●	●
Refrigerant Suction Temp & Superheat	-	●
Refrigerant Liquid Temp & Subcooling	-	●
Refrigeration Discharge Pressure	-	●
Refrigerant Discharge Temperature	-	●
Alarms & Warnings	**Standard**	**Premium**
High Process Fluid Temperature	●	●
Low Process Fluid Temperature	●	●
Evaporator Fluid Freeze	●	●
Evaporator Fluid Low Flow	●	●
Refrigerant High Pressure	●	●
Refrigerant Low Pressure	●	●
Compressor Overload	●	●
Pump Overload	●	●
Condenser Fan Overload	●	●
Reservoir Low Level	●	●
Communications & Remote Interfaces	**Standard**	**Premium**
Process Fluid Supply Temp (0-10 VDC)	●	●
Remote Start/Stop	●	●
Alarm Contact	●	●
CONNEX4.0 Ready	●	●
Modbus RTU	●	●
Modbus TCP/IP	-	●
BACnet MS/TP	-	○
BACnet/IP	-	○

● = standard, ○ = optional, - = not available,

Power Monitor
The main power monitoring system protects the chiller from extensive damage to the compressor and pump due to loss of phase or phase reversal in the main supply.

Reservoir Low Level Alarm
Indicates a low process fluid condition and protects the chiller from expensive damage caused by a critically low operating level in the reservoir.

Temperature Deviation Warnings and Alarms
A warning alerts the operator of a potential problem before a fault occurs and if the condition gets worse, an alarm stops the chiller to prevent damage.

Adjustable Deviation Alarm Time Delays
Allows for programing a start-up alarm time delay to deactivate the alarms long enough for the process loop to stabilize before activating the alarms.

High-Quality 24 VDC Power Supply
Ensures dependable control circuit power and isolates the control circuit from static interference to ensure stable and precise operation.

Warranty
18 months parts on entire unit
12 months labor

Available Options

Rotary Non-Fused Disconnect Switch
Provides a rotary non-fused disconnect switch with a through the door round rotary disconnect handle.

Rotary Fused Disconnect Switch
Provides a rotary fused disconnect switch with a through the door round rotary disconnect handle.

UL508A Industrial Control Panel
Provides all needed branch circuit protection and documentation needed to meet UL508A standard and includes a UL sticker in the control panel.

Indoor-Duty, Condenser Air Range of 0° to 110°F (-18° to 43°C)
For chillers located indoors where the ambient air temperature is between 0° and 110°F (-18° and 43°C), this option adds flooded head pressure controls, liquid receiver and liquid line solenoid valve. This option is only available with R410A refrigerant. Available with or without the epoxy coated condenser coil option.

Indoor-Duty, Condenser Air Range of 60° to 122°F (16° to 122°C)
For chillers located indoors where the ambient air temperature is between 60° and 122°F (16°C and 122°C). For chillers with a remote air-cooled condenser, the remote condenser is typically oversized to account for the higher ambient air temperatures. This option is only available with R407C refrigerant. Available with or without the epoxy coated condenser coil option.

Indoor-Duty, Condenser Air Range of 60° to 120°F (16° to 49°C)
For chillers located indoors where the ambient air temperature is between 60° and 120°F (16° and 49°C). For chillers with a remote air-cooled condenser, the remote condenser is typically oversized to account for the higher ambient air temperatures. This option is only available with R454B refrigerant. Available with or without the epoxy coated condenser coil option.

Outdoor-Duty, Condenser Air Range of 0° to 110°F (-18° to 43°C)
For chillers located outdoors where the ambient air temperatures is between 0° and 110°F (-18° and 43°C), this option adds flooded head pressure controls, liquid receiver, liquid line solenoid valve, HMI window kit, upgrades the base metal of all powder coat painted cabinet components to galvanized steel, and changes zinc coated fasteners to stainless steel. This option is only available with R410A refrigerant. Available with or without the epoxy coated condenser coil option.

Outdoor-Duty, Condenser Air Range of 0° to 122°F (-18° to 50°C)
For chillers located outdoors where the ambient air temperatures is between 0° and 122°F (-18° and 50°C), chillers with a remote air-cooled condenser, the remote condenser is typically oversized to account for the higher ambient air temperatures. This option is only available with R407C refrigerant. In addition, includes flooded head pressure controls, HMI window kit, upgrades the base metal of all powder coat painted cabinet components to galvanized steel, and changes zinc coated fasteners to stainless steel. Available with or without the epoxy coated condenser coil option.

Outdoor-Duty, Condenser Air Range of -20° to 110°F (-29° to 43°C)
For chillers located outdoors where the ambient temperature is between -20° and 110°F (-29° and 43°C) , this option adds flooded head pressure controls, control panel heater, HMI window kit, upgrades the base metal of all powder coat painted cabinet components to galvanized steel, and changes zinc coated fasteners to stainless steel. This option is only available with R410A refrigerant. Available with or without the epoxy coated condenser coil option.

Outdoor-Duty, Condenser Air Range of -20° to 120°F (-29° to 49°C)

For chillers located outdoors where the ambient temperature is between -20° and 120°F (-29°and 49°C) , this option adds flooded head pressure controls, control panel heater, HMI window kit, upgrades the base metal of all powder coat painted cabinet components to galvanized steel, and changes zinc coated fasteners to stainless steel. This option is only available with R454B refrigerant. Available with or without the epoxy coated condenser coil option.

Condenser Coil Coating

For applications where a chiller with an integral air-cooled condenser or remote air-cooled condenser is in an area within 10 miles of a saltwater coast, this option adds a coating on the condenser to protect the aluminum condenser coil from possible corrosion from salt air. For chiller with integral air-cooled condenser this option also includes upgrading all galvanized internal chiller brackets to stainless steel.

Premium Control

Upgrades the PLC controller to provide additional monitoring and communications. With this option, the HMI remains the same. See the table in the Standard Features section for the additional features this controller provides.

Pump and Tank Deduct

For applications where the internal plastic tank and stainless steel pump are not required, this option removes the internal pump, reservoir and fluid level sensor, pump starter, and disables the low-level alarm and pump running hour display. The supply and return connections are located in the same locations as the standard chiller. If this option is selected the automatic water make-up option is not available.

Oversized Reservoirs

The standard size reservoirs are for nominal flows for a chiller operating with a 10°F (-12°C) temperature rise through the process. Some applications require more process fluid in the tank to act as a thermal flywheel for sudden variations in the process temperature rise. In other instances with high flows, the larger reservoir helps reduce turbulence in the reservoir. The maximum size of the reservoir is different for each size chiller and determined by the pump size and space in the chiller cabinet. Contact your local agent or one of the factory Sales Engineers for assistance in selecting and pricing this option for your application.

Automatic Water Make-up

Adds a high and mid-level sensor in the tank, a solenoid valve, and a connection on the back of the chiller for a make-up fluid source. With this option, if the fluid level in the tank drops to the mid-level sensor level, the make-up solenoid valve opens and remains open until the fluid level reaches the high-level sensor senses level or the fill timer time out. It requires the Premium Controller option.

Water Circuit Designed for De-ionized Water

Standard chillers feature a water circuit with stainless steel pump, stainless steel evaporator, a plastic tank, and all nonferrous water piping to provide protection from corrosion and ensure long useful life. In certain applications where the electrical properties of the coolant in the process equipment requires the unit to be filled with de-ionized water this option replaces any materials necessary to allow the unit to be filled with and operate with de-ionized water with conductivity down to 1 µSiemen/cm (NCCLS Type III).

Stainless Steel Cabinetry

Standard chillers are powder coat painted steel cabinets. For applications that require an enhanced appearance or durability and this option upgrades painted cabinet components to stainless steel.

High-Pressure, Variable-Speed EC Fan

Chillers with integral air-cooled condensers include fixed-speed AC fan motors designed to draw air in through the condensers and discharge the warm discharge air into an open space such as a production area. In applications where the heat given off from the chiller is unwanted, this option upgrades the fans to a high-power EC fan motor to provide additional discharge pressure for ducting the discharge air away from the chiller. In addition to providing added discharge pressure, it uses high-efficiency variable-speed EC fan motors that vary speed to maintain the refrigerant head pressure. This provides better control of the chiller operation and allows for energy savings and noise reduction when operating at a lower load and/or the condenser air temperature is cool enough to allow for a reduced airflow through the chiller.

Chiller Model	Air Flow (cfm)	Standard Fans		High Pressure Variable Speed Fans	
		Available External Static Pressure (in W.C.)	Sound Pressure @ 1 Meter (dBA)	Available External Static Pressure (in W.C.)	Sound Pressure @ 1 Meter (dBA)
NQA04	4,000	0.22	74	0.42	75
NQA05	4,000	0.22	74	0.42	75
NQA08	8,000	0.10	74	0.32	75
NQA10	8,000	0.10	74	0.32	75
NQA13	8,000	0.00	82	0.32	75
NQA15	10,450	0.00	82	0.77	82
NQA20	18,000	0.00	85	0.79	84
NQA25	20,000	0.00	85	0.75	85
NQA30	24,000	0.23	87	1.12	82

Remoted HMI

As standard, the chillers come with a control display mounted in the control panel of the chiller. In applications where the chiller is outdoors, or in an area not frequented by the operator, a remote HMI is available. This option provides a second HMI identical in function to the primary control display on the chiller as well as 50-foot wire for connection between the remote hand-held controller and the chiller.

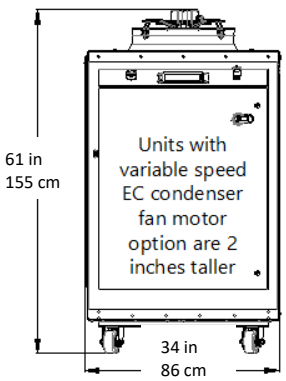
Physical Data

Air-Cooled Condenser Chillers

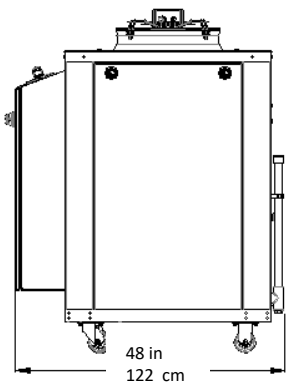
Model	NQA04	NQA05	NQA08	NQA10	NQA13	NQA15	NQA20	NQA25	NQA30
Cooling Capacity [1]	4 tons 14 kW	5 tons 18 kW	8 tons 28 kW	11 tons 39 kW	13 tons 46 kW	15 tons 53 kW	21 tons 74 kW	26 tons 91 kW	31 tons 109 kW
Set Point Range	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C
Compressor (qty)	1	1	1	1	1	1	2	2	2
Sound Pressure @ 1 meter (dBA)	74	74	76	76	76	82	84	84	86
Pump Motor Size (hp)	2	2	2	3	3	3	5	5	5
Pump Flow	10 gpm 38 lpm	12 gpm 45 lpm	19 gpm 72 lpm	27 gpm 102 lpm	30 gpm 114 lpm	36 gpm 136 lpm	48 gpm 182 lpm	60 gpm 227 lpm	72 gpm 273 lpm
Net Available Pump Pressure [2]	43 psi 3.0 bar	41 psi 2.8 bar	41 psi 2.8 bar	48 psi 3.3 bar	46 psi 3.2 bar	40 psi 2.8 bar	45 psi 3.1 bar	48 psi 3.3 bar	43 psi 3.0 bar
Reservoir Holding Capacity	14 gal 53 L	14 gal 53 L	30 gal 114 L	30 gal 114 L	30 gal 114 L	60 gal 227 L	60 gal 227 L	67 gal 254 L	67 gal 254 L
Shipping Weight	720 lbs 327 kg	720 lbs 327 kg	1,195 lbs 542 kg	1,195 lbs 542 kg	1,215 lbs 551 kg	3,200 lbs 1,452 kg	3,300 lbs 1,497 kg	3,800 lbs 1,724 kg	4,150 lbs 1,882 kg
Operating Weight	810 lbs 367 kg	810 lbs 367 kg	1,380 lbs 626 kg	1,380 lbs 626 kg	1,400 lbs 635 kg	3,535 lbs 1,603 kg	3,715 lbs 1,685 kg	4,360 lbs 1,978 kg	4,710 lbs 2,136 kg
MCA @ 460/3/60 (amps)[3]	16	19	28	36	41	46	65	74	86
MOP @ 460/3/60 (amps)[4]	25	30	45	60	70	80	90	100	125

[1]Cooling tons based on 12,000 BTU/Hr/ton with 50°F (10°C) leaving coolant and 95°F (35°C) ambient air, R410A or R454B refrigerant.
[2]Net available pressure at outlet of chiller is pump discharge pressure less the internal pressure loss through the fluid circuit.
[3]MCA is Minimum Circuit Amps with standard condenser fan(s) and pump under full load, used for minimum wire size requirement.
[4]MOP is Maximum Overcurrent Protection with standard condenser fans(s) and pump, used for sizing main power protection devices.

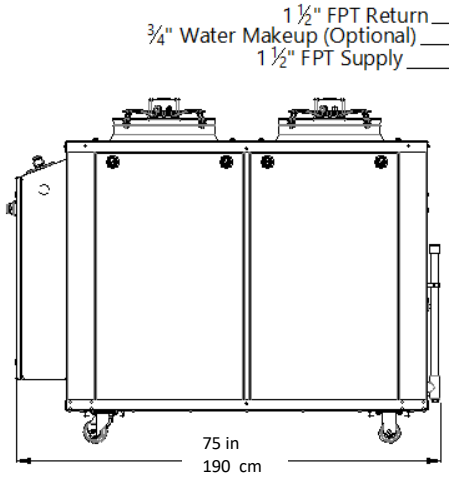
[4]MOP is Maximum Overcurrent Protection with standard condenser fans(s) and pump, used for sizing main power protection devices.



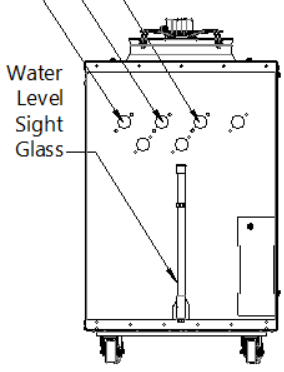
NQA04 - NQA13



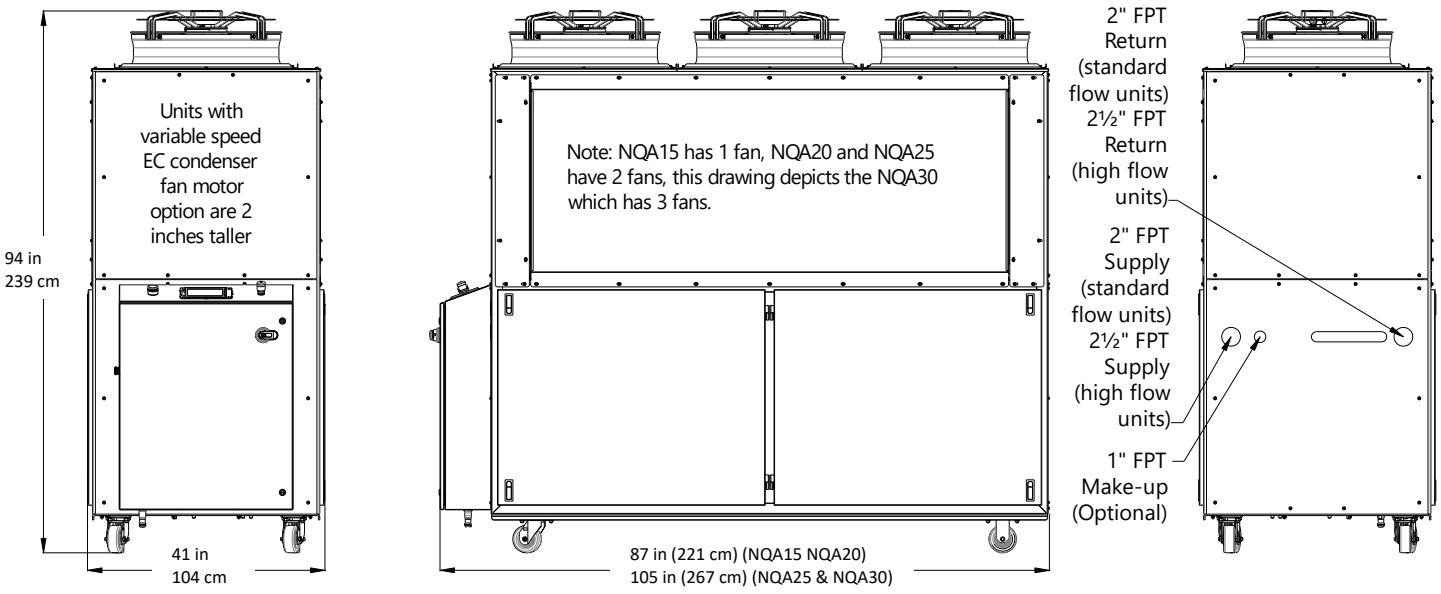
NQA04 - NQA05



NQA08 - NQA13



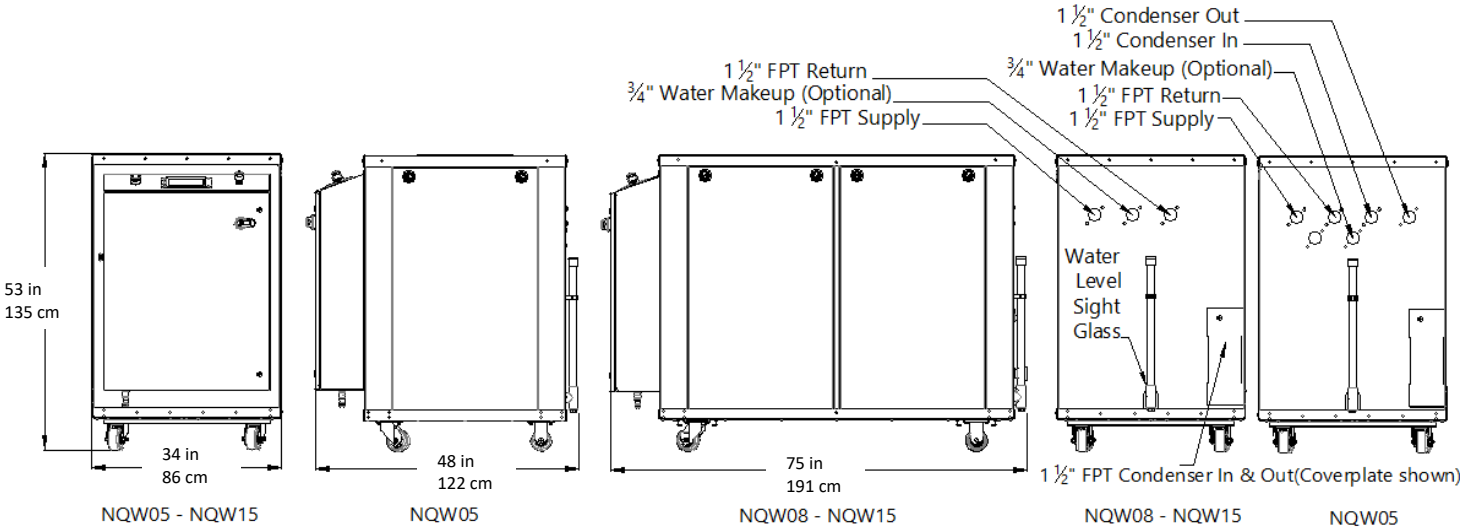
NQA04 - NQA13

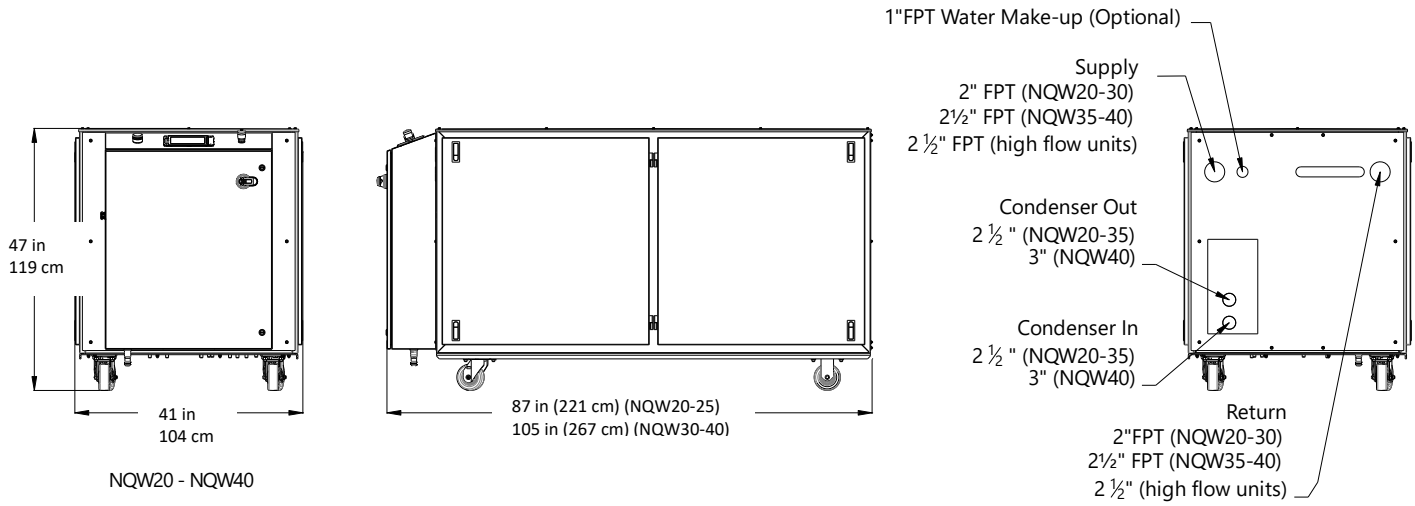


Water-Cooled Condenser Chillers

Model	NQW05	NQW08	NQW10	NQW15	NQW20	NQW25	NQW30	NQW35	NQW40
Cooling Capacity [1]	6 tons 21 kW	8 tons 28 kW	12 tons 42 kW	17 tons 60 kW	23 tons 81 kW	28 tons 98 kW	33 tons 116 kW	38 tons 134 kW	43 tons 151 kW
Set Point Range	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C
Compressor (qty)	1	1	1	1	2	2	2	2	2
Sound Pressure @ 1 meter (dBA)	70	70	71	73	74	74	75	77	78
Pump Motor Size (hp)	2	2	3	3	5	5	5	5	5
Pump Flow	13 gpm 49 lpm	20 gpm 76 lpm	29 gpm 110 lpm	39 gpm 148 lpm	54 gpm 204 lpm	67 gpm 254 lpm	79 gpm 299 lpm	92 gpm 348 lpm	102 gpm 386 lpm
Net Available Pump Pressure [2]	40 psi 2.8 bar	40 psi 2.8 bar	46 psi 3.2 bar	35 psi 2.4 bar	41 psi 2.8 bar	44 psi 3.0 bar	39 psi 2.7 bar	38 psi 2.6 bar	34 psi 2.3 bar
Reservoir Holding Capacity	14 gal 53 L	30 gal 114 L	30 gal 114 L	30 gal 114 L	60 gal 227 L	60 gal 227 L	67 gal 254 L	67 gal 254 L	67 gal 254 L
Shipping Weight	720 lbs 327 kg	1,195 lbs 542 kg	1,195 lbs 542 kg	1,315 lbs 597 kg	1,900 lbs 862 kg	2,100 lbs 953 kg	2,250 lbs 1,021 kg	3,400 lbs 1,542 kg	3,900 lbs 1,769 kg
Operating Weight	810 lbs 367 kg	1,380 lbs 626 kg	1,380 lbs 626 kg	1,500 lbs 680 kg	2,315 lbs 1,050 kg	2,515 lbs 1,141 kg	2,810 lbs 1,275 kg	3,960 lbs 1,796 kg	4,460 lbs 2,023 kg
MCA @ 460/3/60 (amps)[3]	17	25	32	41	56	65	72	74	90
MOP @ 460/3/60 (amps)[4]	30	45	60	70	80	100	100	110	150

[1]Cooling tons based on 12,000 BTU/Hr/ton with 50°F leaving coolant and 85°F condenser water, R410A or R454B refrigerant.
[2]Net available pressure at outlet of chiller is pump discharge pressure less the internal pressure loss through the fluid circuit.
[3]MCA is Minimum Circuit Amps with standard pump under full load, used for minimum wire size requirement.
[4]MOP is Maximum Overcurrent Protection with standard pump, used for sizing main power protection device.

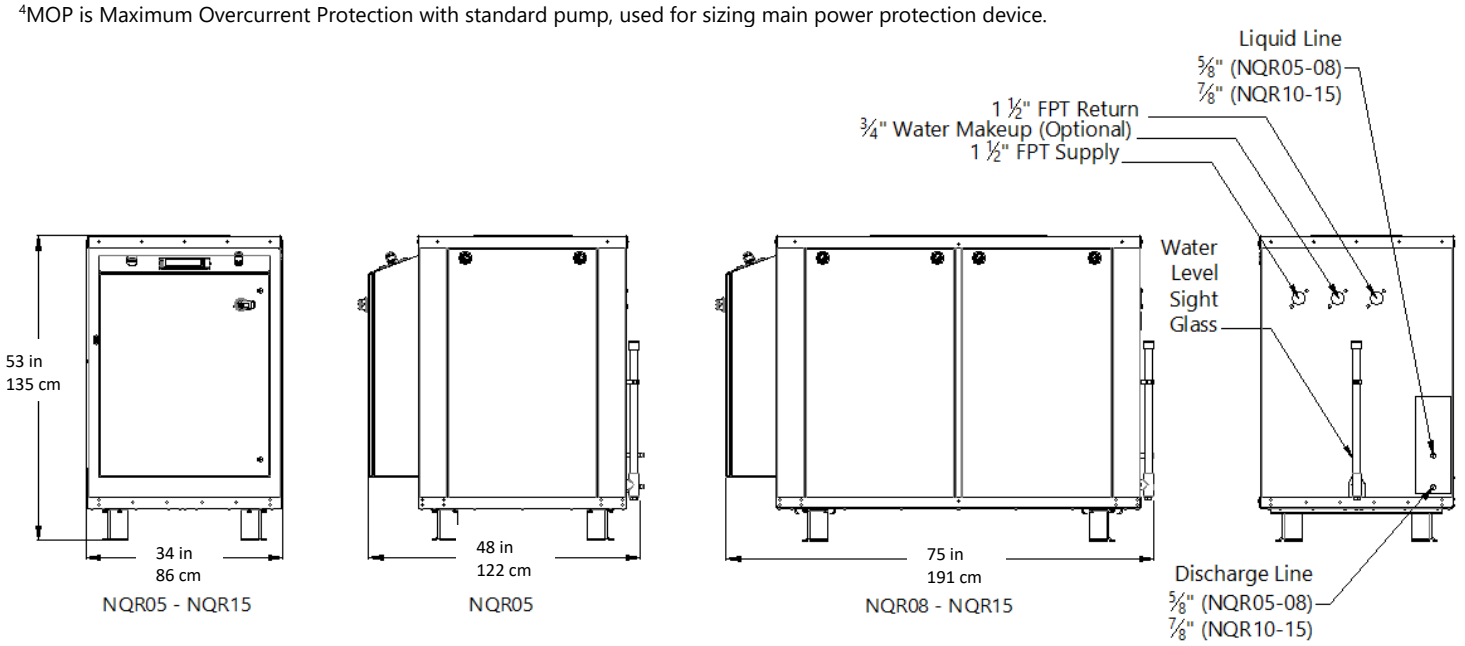

53 in
135 cm
34 in
86 cm
48 in
122 cm
75 in
191 cm
1 ½" Condenser Out
1 ½" Condenser In
¾" Water Makeup (Optional)
1 ½" FPT Return
1 ½" FPT Supply
1 ½" FPT Return
¾" Water Makeup (Optional)
1 ½" FPT Supply
Water Level Sight Glass
1 ½" FPT Condenser In & Out(Coverplate shown)
NQW05 - NQW15
NQW05
NQW08 - NQW15
NQW08 - NQW15
NQW05

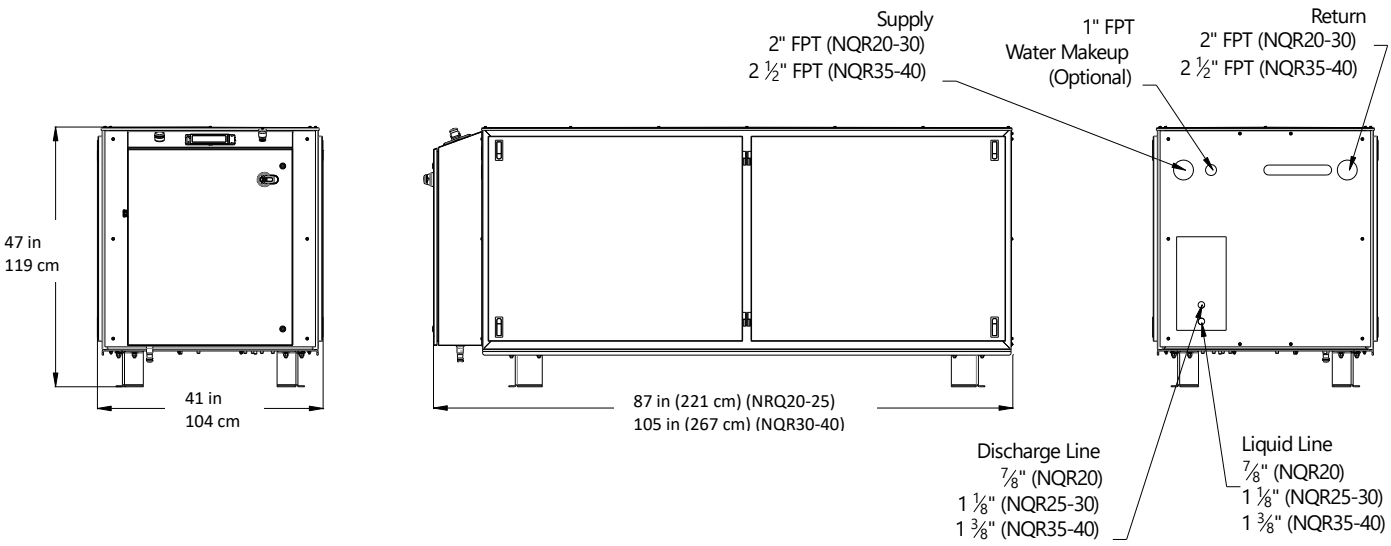

47 in
119 cm
41 in
104 cm
87 in (221 cm) (NQW20-25)
105 in (267 cm) (NQW30-40)
1"FPT Water Make-up (Optional)
Supply
2" FPT (NQW20-30)
2½" FPT (NQW35-40)
2 ½" FPT (high flow units)
Condenser Out
2 ½ " (NQW20-35)
3" (NQW40)
Condenser In
2 ½ " (NQW20-35)
3" (NQW40)
Return
2"FPT (NQW20-30)
2½" FPT (NQW35-40)
2 ½" (high flow units)
NQW20 - NQW40

Remote Air-Cooled Condenser Chillers

Model	NQR05	NQR08	NQR10	NQR15	NQR20	NQR25	NQR30	NQR35	NQR40
Cooling Capacity [1]	5 tons 18 kW	8 tons 28 kW	11 tons 39 kW	15 tons 53 kW	21 tons 74 kW	26 tons 91 kW	31 tons 109 kW	35 tons 123 kW	40 tons 141 kW
Set Point Range	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C	20 to 80°F -7 to 27°C
Compressor (qty)	1	1	1	1	2	2	2	2	2
Sound Pressure @ 1 meter (dBA)[2]	70	70	71	73	74	74	75	77	78
Pump Motor Size (hp)	2	2	3	3	5	5	5	5	5
Pump Flow	13 gpm 49 lpm	18 gpm 68 lpm	27 gpm 102 lpm	36 gpm 136 lpm	50 gpm 189 lpm	61 gpm 231 lpm	73 gpm 276 lpm	83 gpm 314 lpm	92 gpm 348 lpm
Net Available Pump Pressure [3]	40 psi 2.8 bar	41 psi 2.8 bar	48 psi 3.3 bar	40 psi 2.8 bar	44 psi 3.0 bar	47 psi 3.2 bar	43 psi 2.9 bar	42 psi 2.9 bar	40 psi 2.8 bar
Reservoir Holding Capacity	14 gal 53 L	30 gal 114 L	30 gal 114 L	30 gal 114 L	60 gal 227 L	60 gal 227 L	67 gal 254 L	67 gal 254 L	67 gal 254 L
Shipping Weight	720 lbs 327 kg	1,195 lbs 542 kg	1,195 lbs 542 kg	1,315 lbs 597 kg	1,900 lbs 862 kg	2,100 lbs 953 kg	2,250 lbs 1,021 kg	3,400 lbs 1,542 kg	3,900 lbs 1,769 kg
Operating Weight (lbs)	810 lbs 367 kg	1,380 lbs 626 kg	1,380 lbs 626 kg	1,500 lbs 680 kg	2,315 lbs 1,050 kg	2,515 lbs 1,141 kg	2,810 lbs 1,275 kg	3,960 lbs 1,796 kg	4,460 lbs 2,023 kg
MCA @ 460/3/60 (amps)[4]	17	25	32	41	56	65	72	74	90
MOP @ 460/3/60 (amps)[5]	30	45	60	70	80	100	100	110	150

[1]Cooling tons based on 12,000 BTU/Hr/ton with 50°F leaving coolant and 95°F ambient air, R410A or R454B refrigerant.
[2]Sound pressure is for the chiller unit only. See the Remote Air-Cooled Condenser table for remote condenser sound pressures.
[3]Net available pressure at outlet of chiller is pump discharge pressure less the internal pressure loss through the fluid circuit.
[3]MCA is Minimum Circuit Amps with standard pump under full load, used for minimum wire size requirement.
[4]MOP is Maximum Overcurrent Protection with standard pump, used for sizing main power protection device.

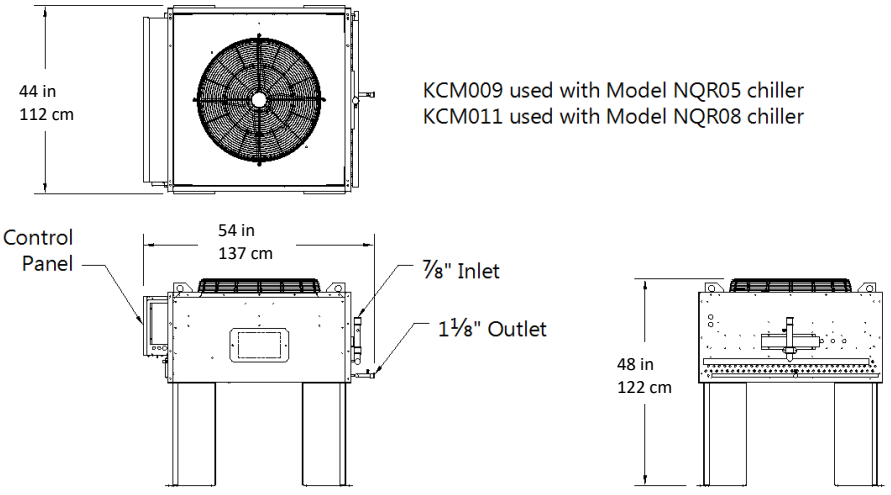


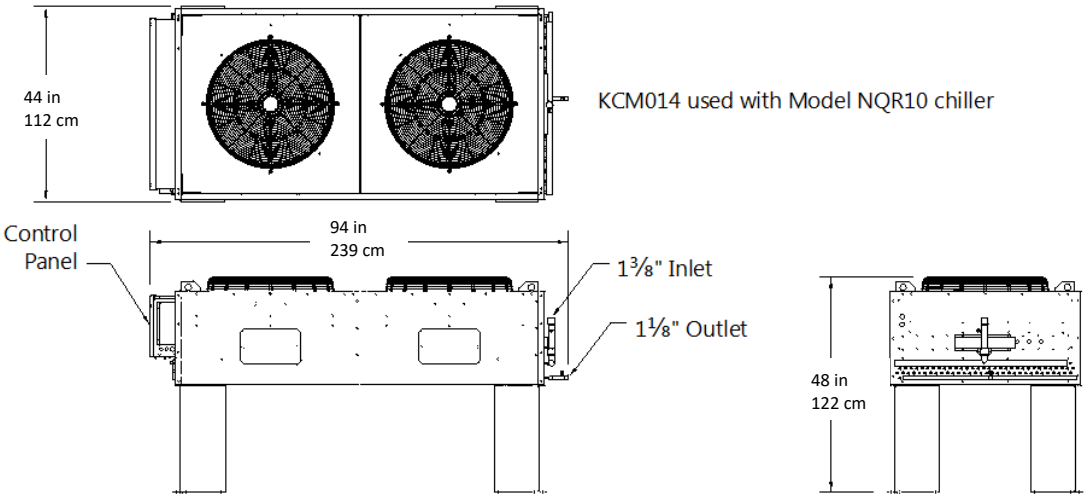


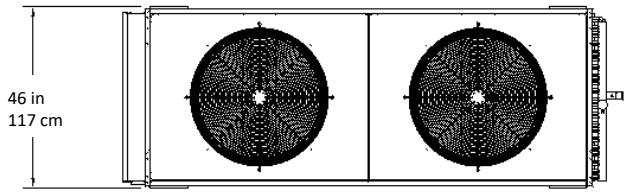
Remote Air-Cooled Condensers

Condenser Model	KCM009	KCM011	KCM014	KCL023	KCL030	KCL037	KCL045	KCL054	KCL056
Chiller Used With	NQR05	NQR08	NQR10	NQR15	NQR20	NQR25	NQR30	NQR35	NQR40
Fans (qty)	1	1	2	2	2	2	3	3	3
Shipping Weight (lbs)	245	265	415	680	720	1,050	1,075	1,175	1,450
Operating Weight (lbs)	Varies based on system charge and operating conditions								
MCA @ 460/3/60 (amps)[1]	1.4	1.4	2.6	7	7	7	10.1	10.1	10.1
MOP @ 460/3/60 (amps)[2]	15	15	15	15	15	15	15	15	15

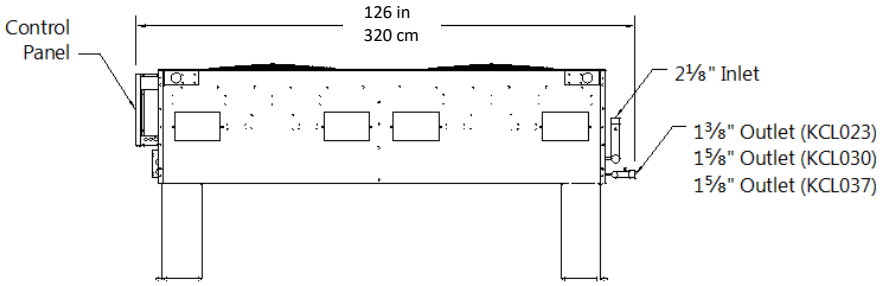
[1]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[2]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

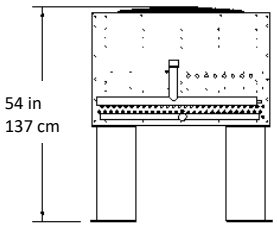


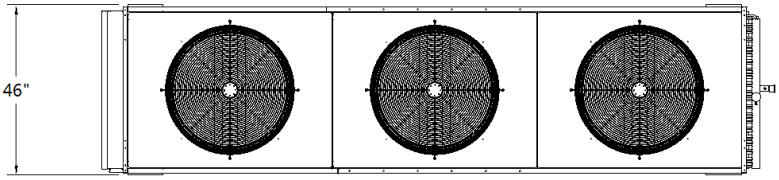

44 in
112 cm
KCM014 used with Model NQR10 chiller
Control
Panel
94 in
239 cm
1⅜" Inlet
1⅛" Outlet
48 in
122 cm



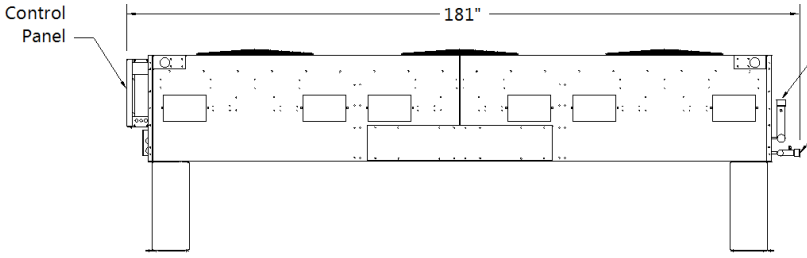
KCL023 used with Model NQR15 chiller
KCL030 used with Model NQR20 chiller
KCL037 used with Model NQR25 chiller

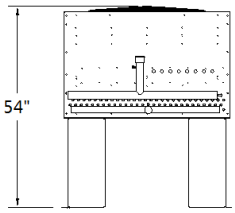




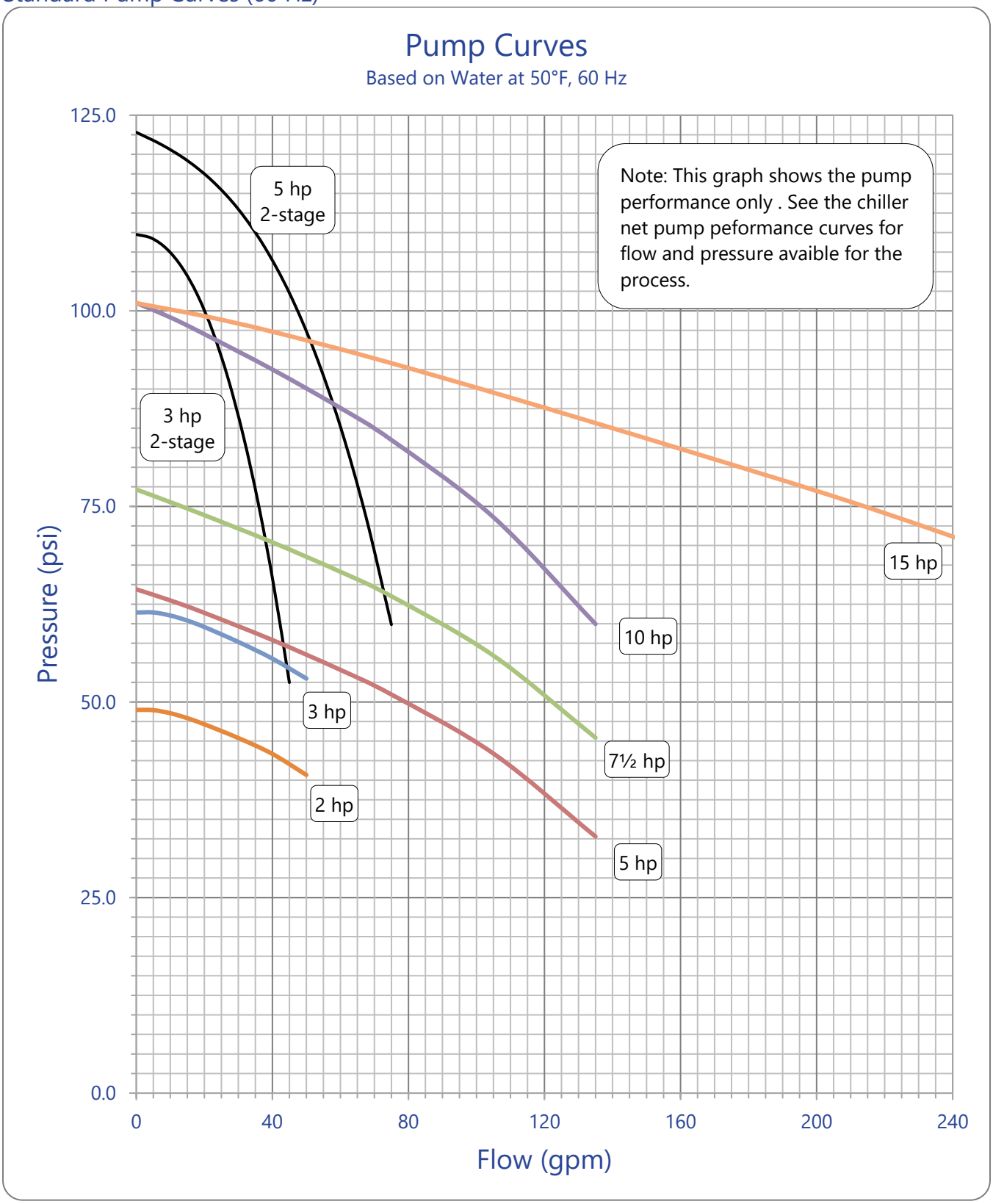


KCL045 used with Model NQR30 chiller
KCL054 used with Model NQR35 chiller
KCL056 used with Model NQR40 chiller

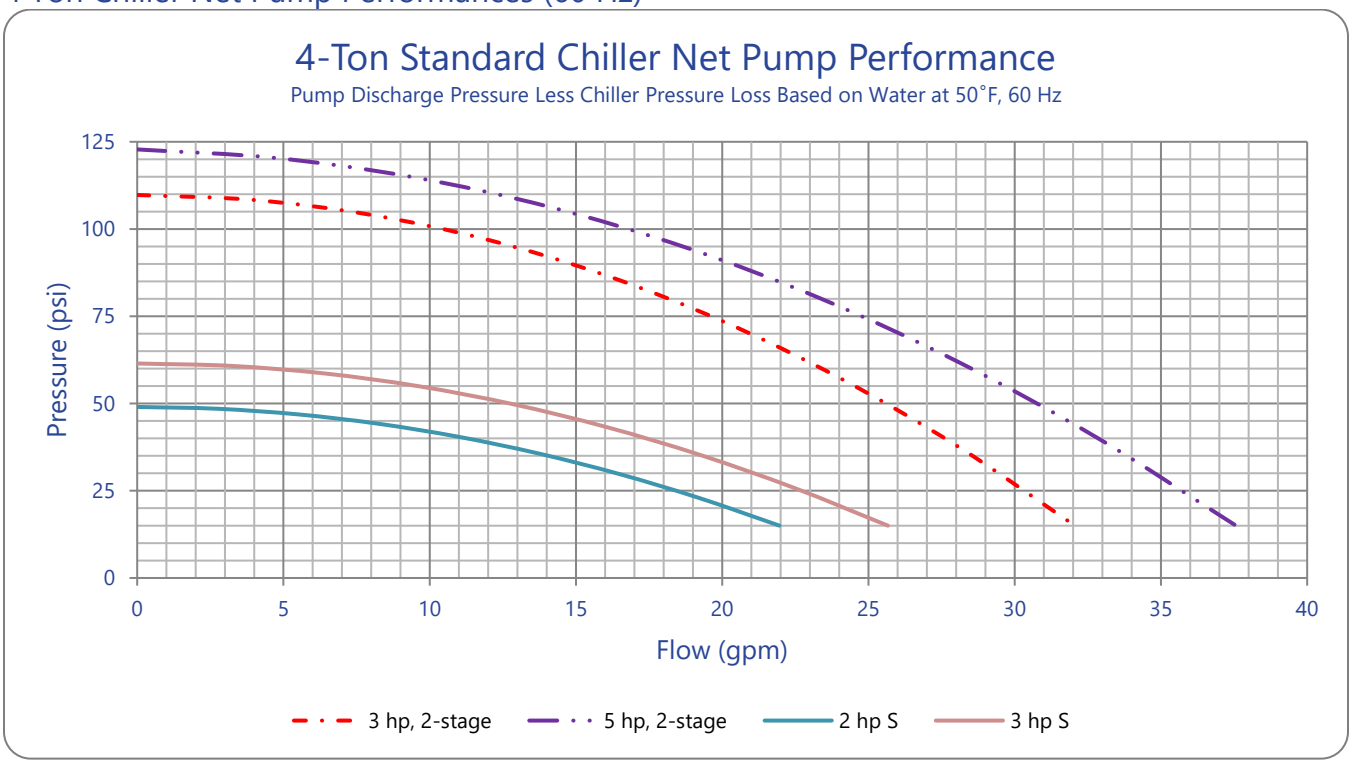




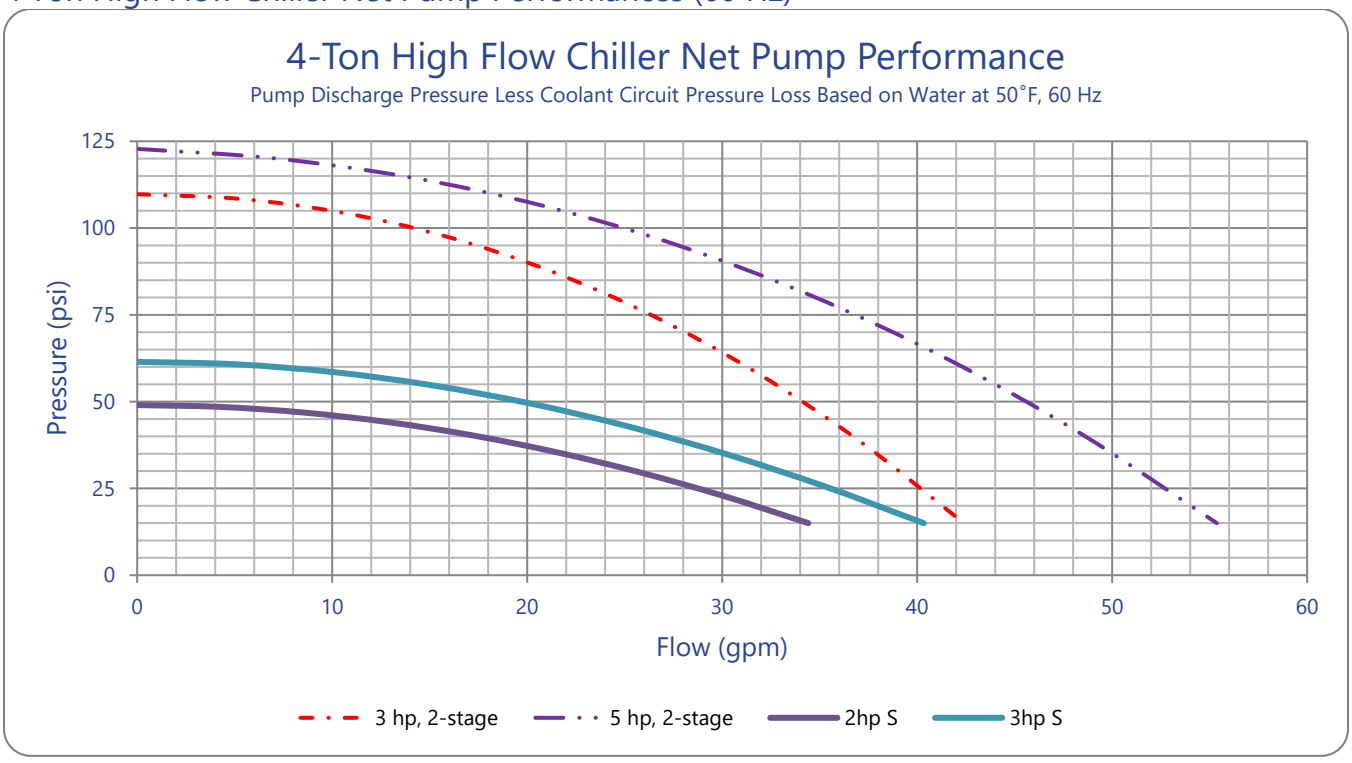
Standard Pump Curves (60 Hz)



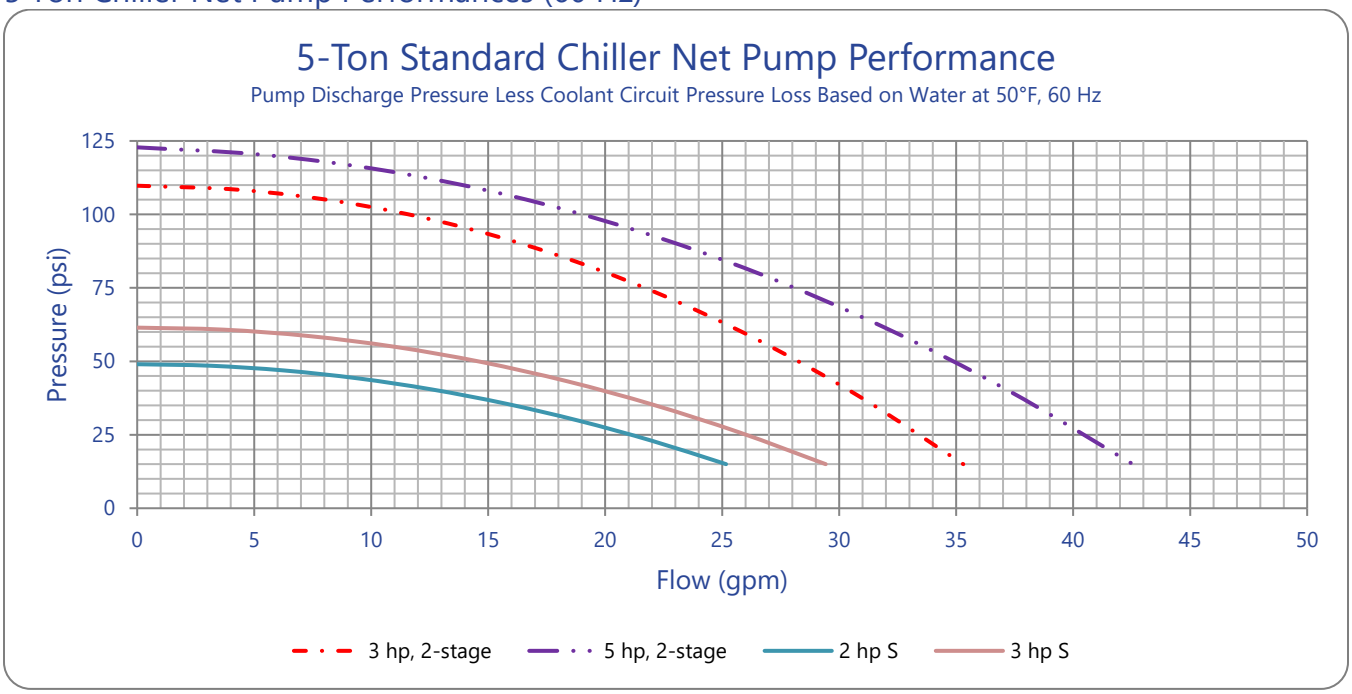
4 Ton Chiller Net Pump Performances (60 Hz)



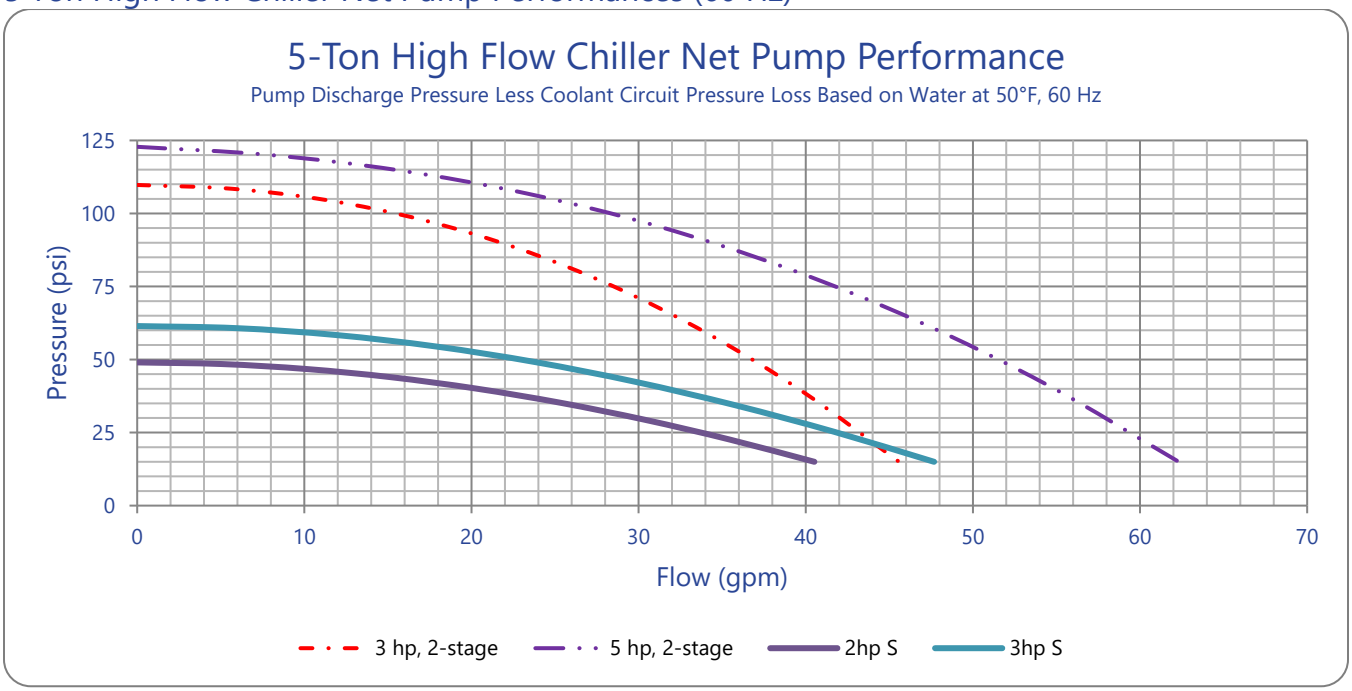
4 Ton High Flow Chiller Net Pump Performances (60 Hz)



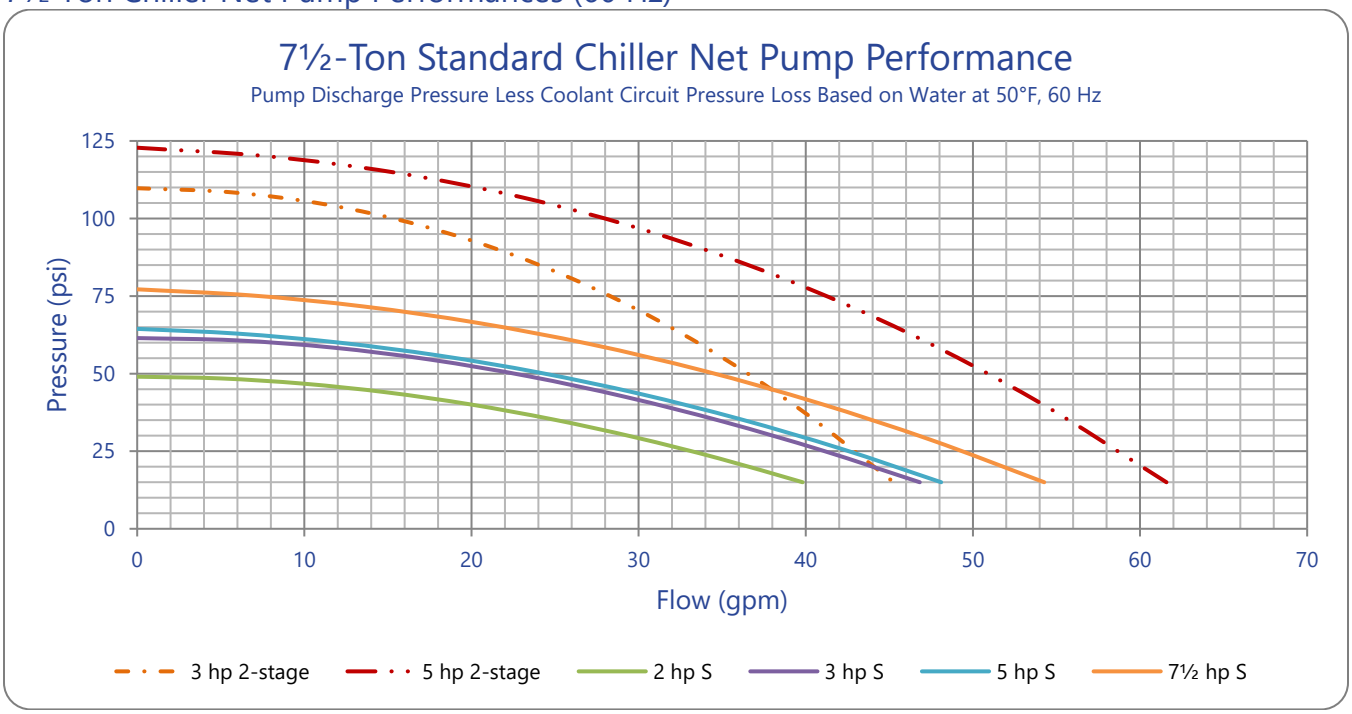
5 Ton Chiller Net Pump Performances (60 Hz)



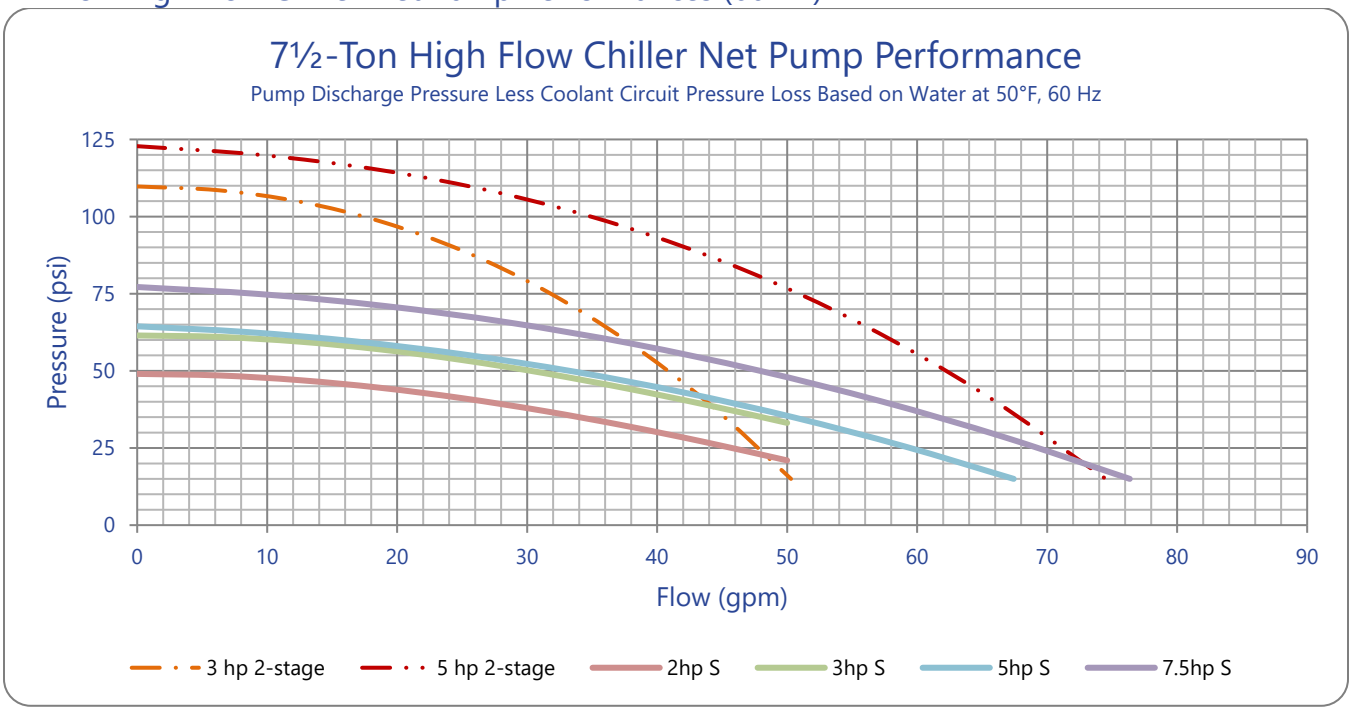
5 Ton High Flow Chiller Net Pump Performances (60 Hz)



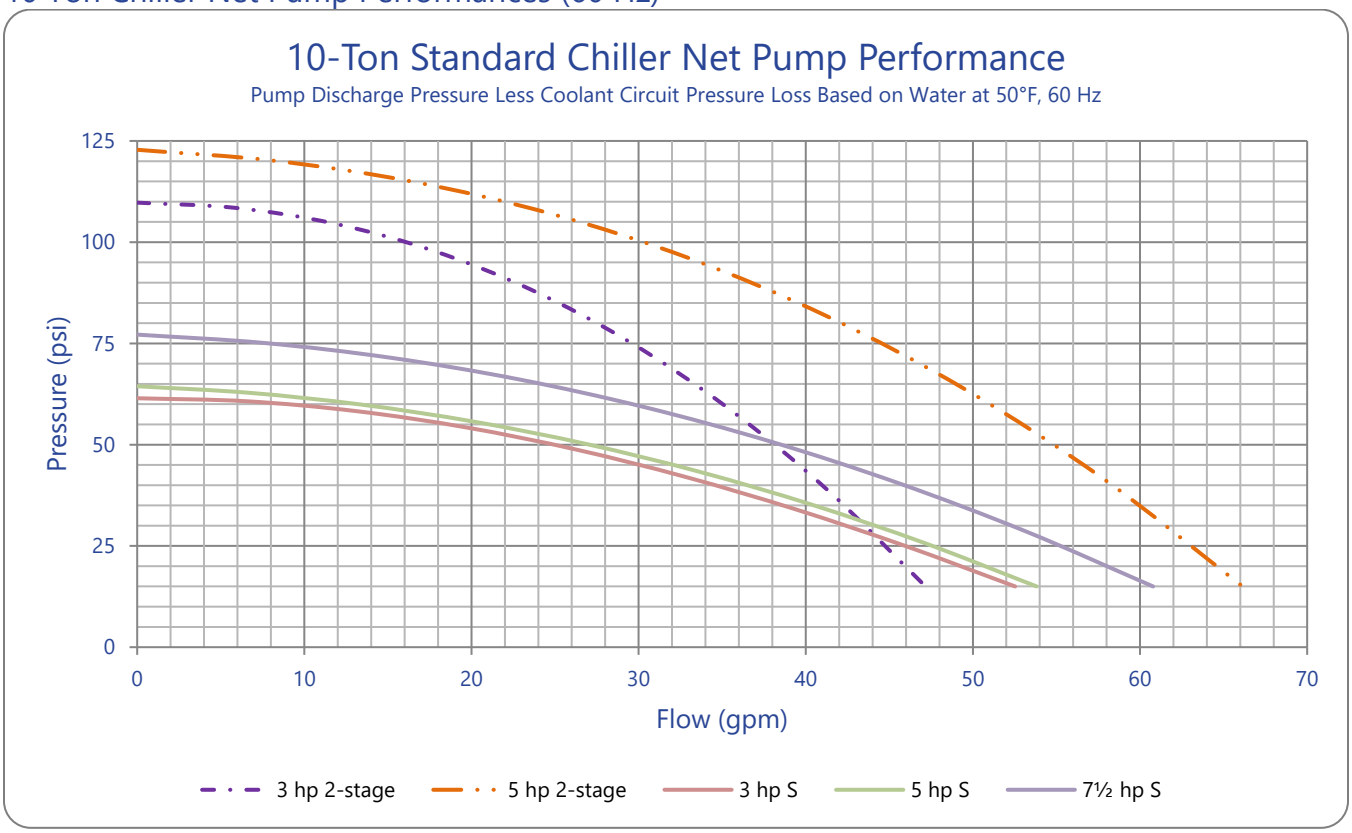
7½ Ton Chiller Net Pump Performances (60 Hz)



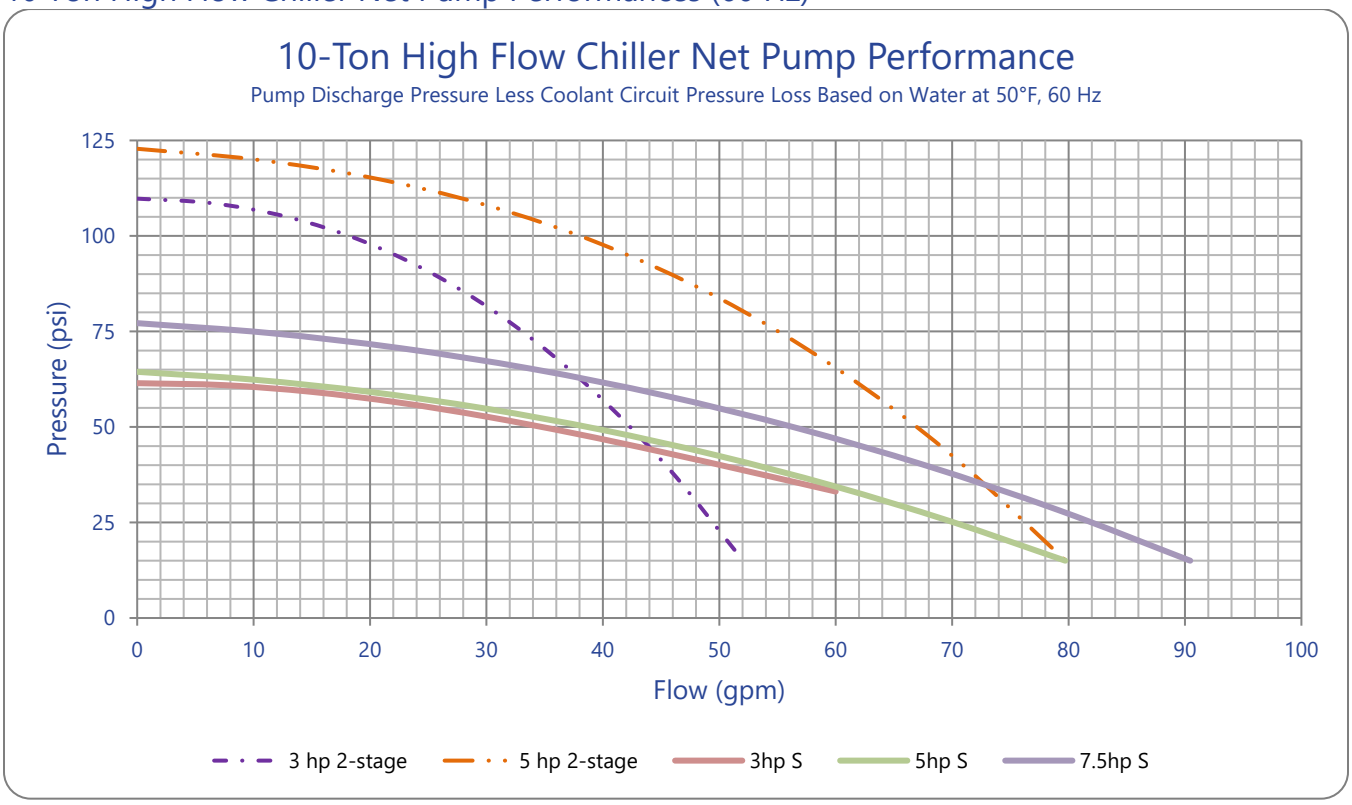
7½ Ton High Flow Chiller Net Pump Performances (60 Hz)



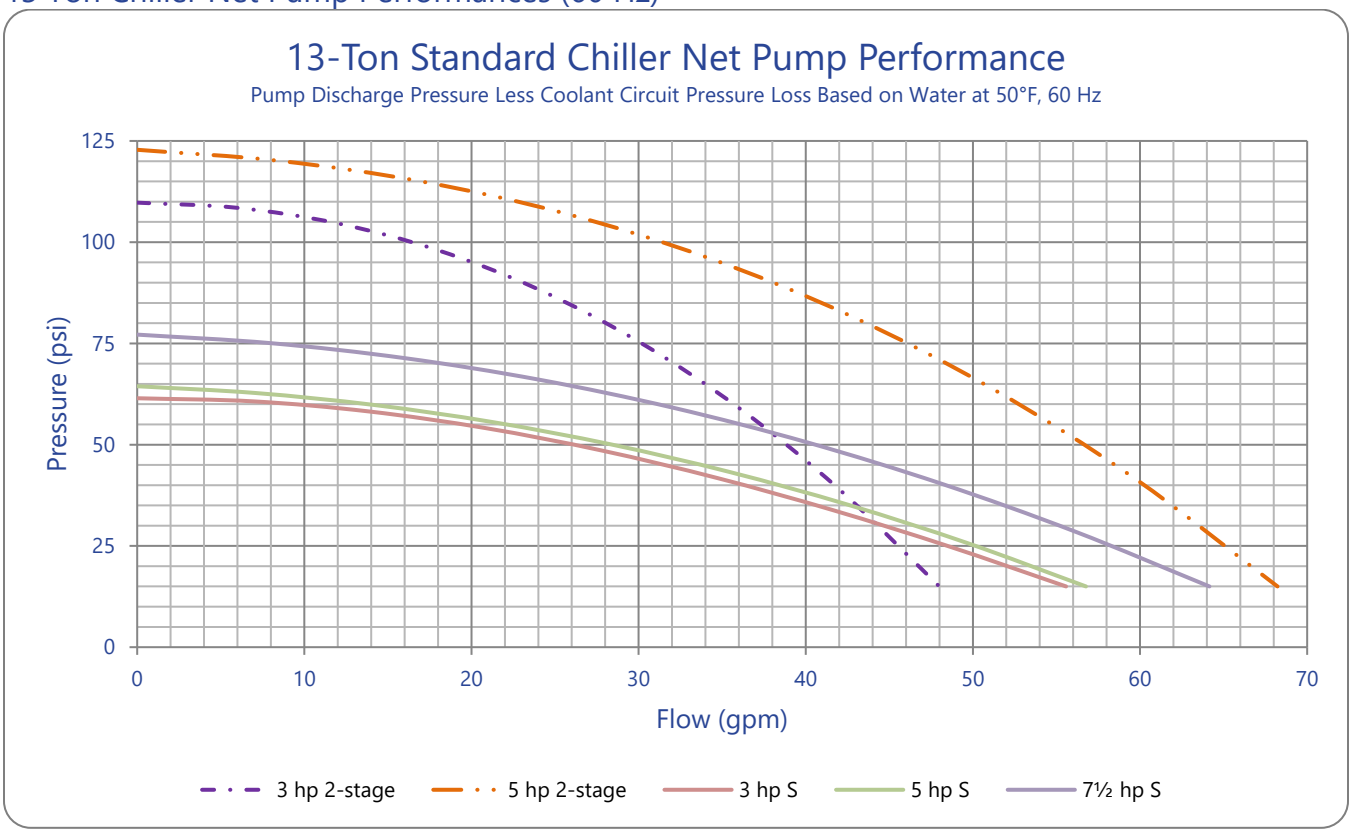
10 Ton Chiller Net Pump Performances (60 Hz)



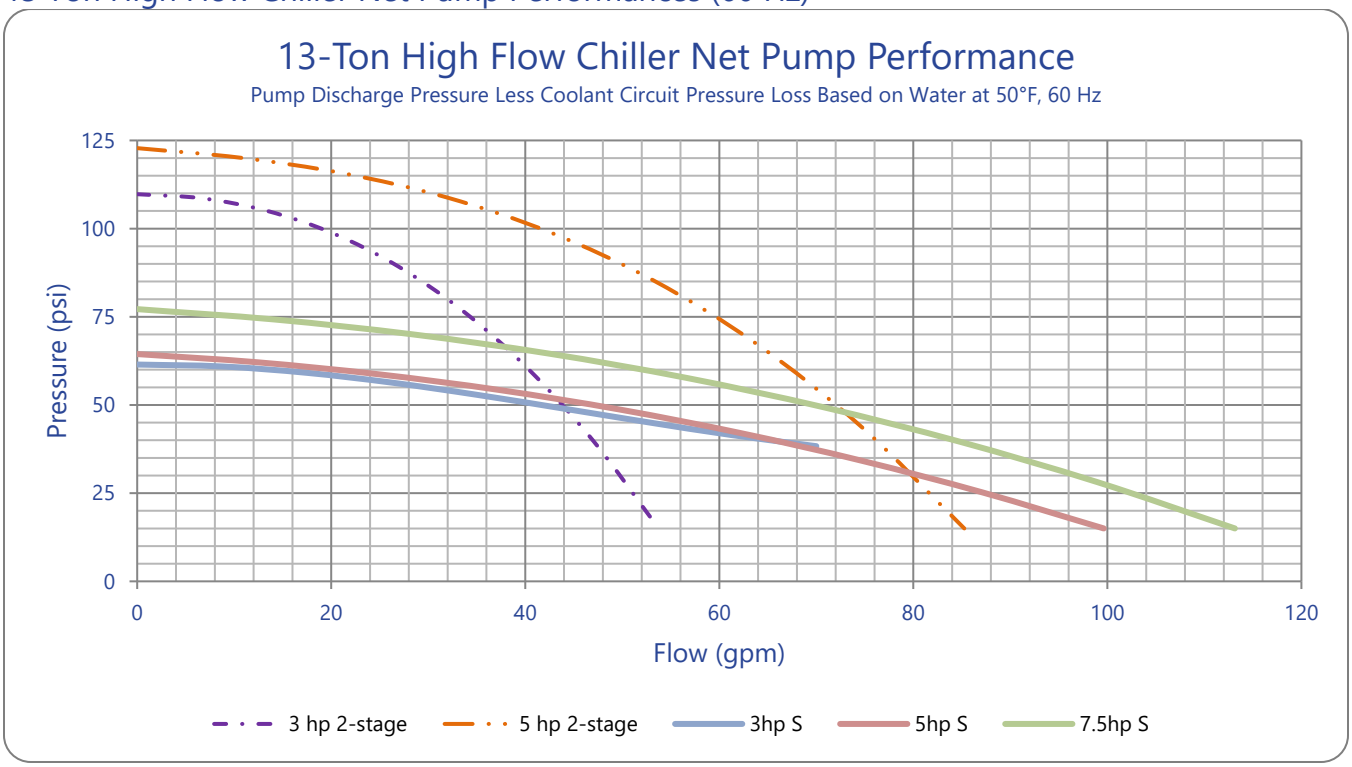
10 Ton High Flow Chiller Net Pump Performances (60 Hz)



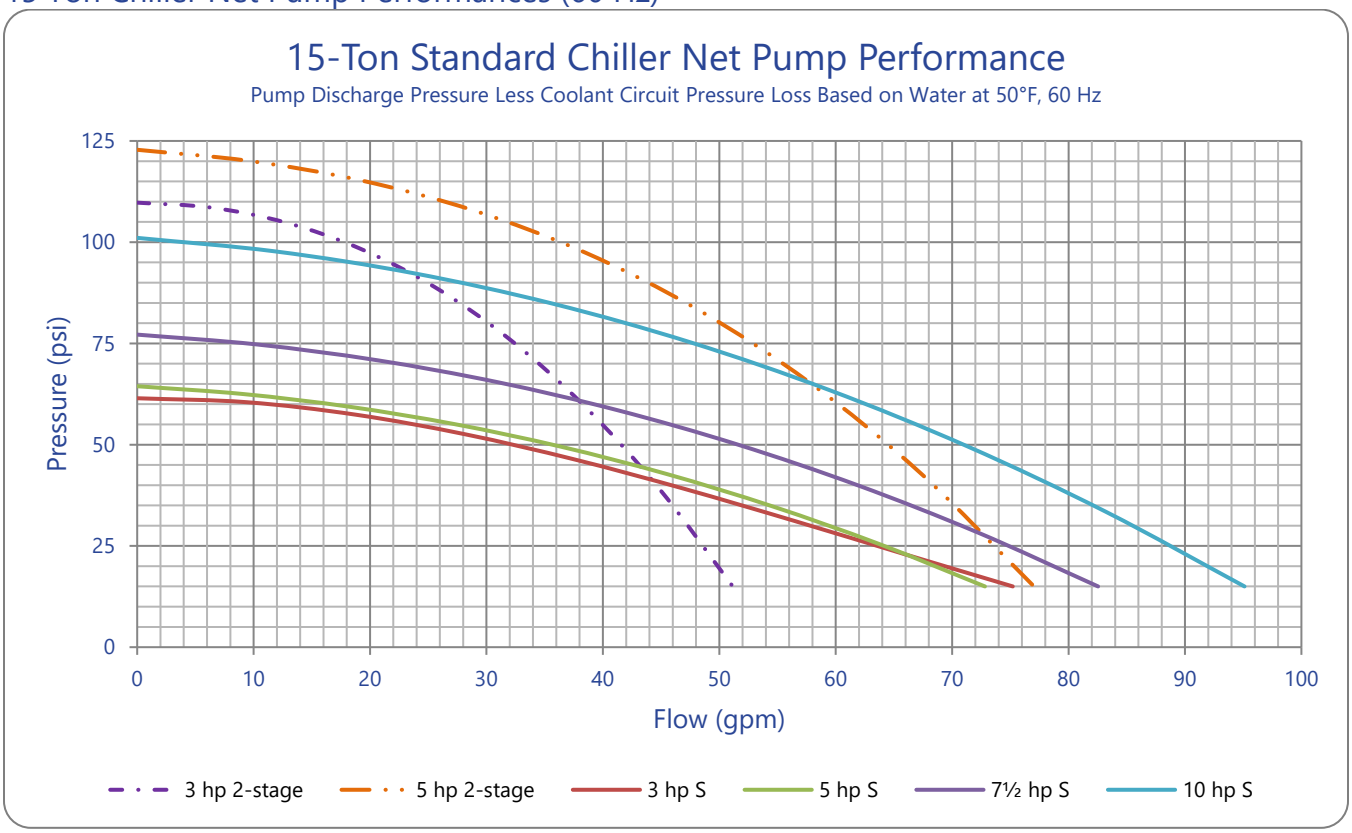
13 Ton Chiller Net Pump Performances (60 Hz)



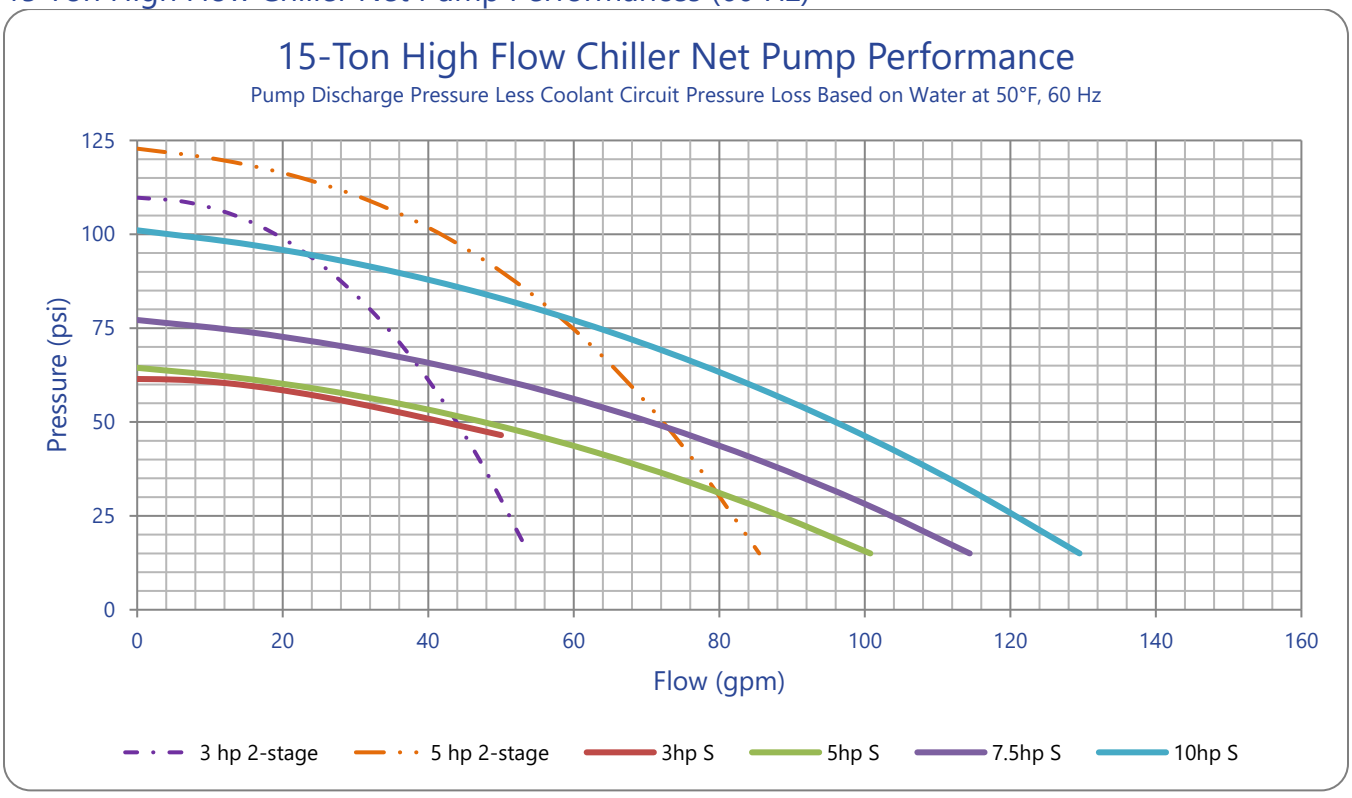
13 Ton High Flow Chiller Net Pump Performances (60 Hz)



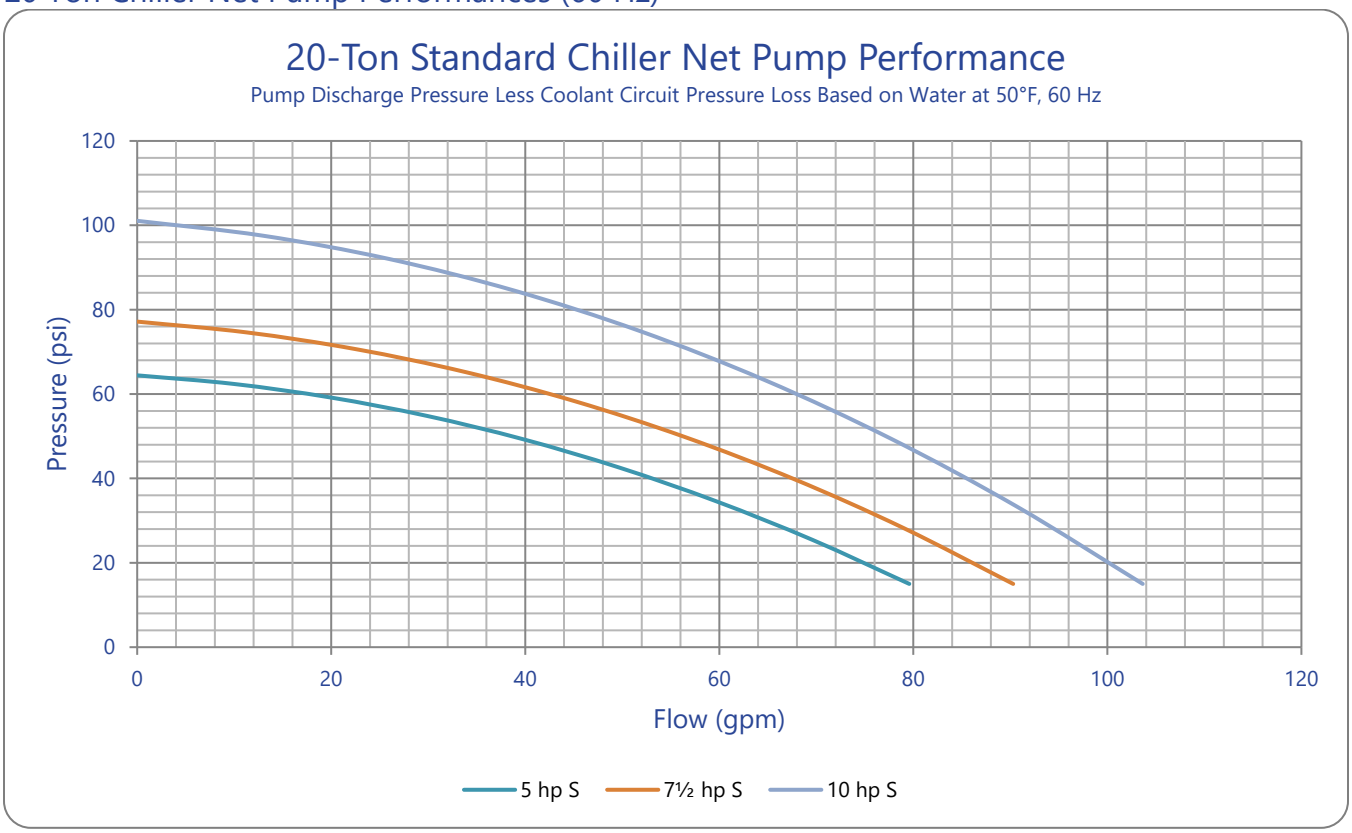
15 Ton Chiller Net Pump Performances (60 Hz)



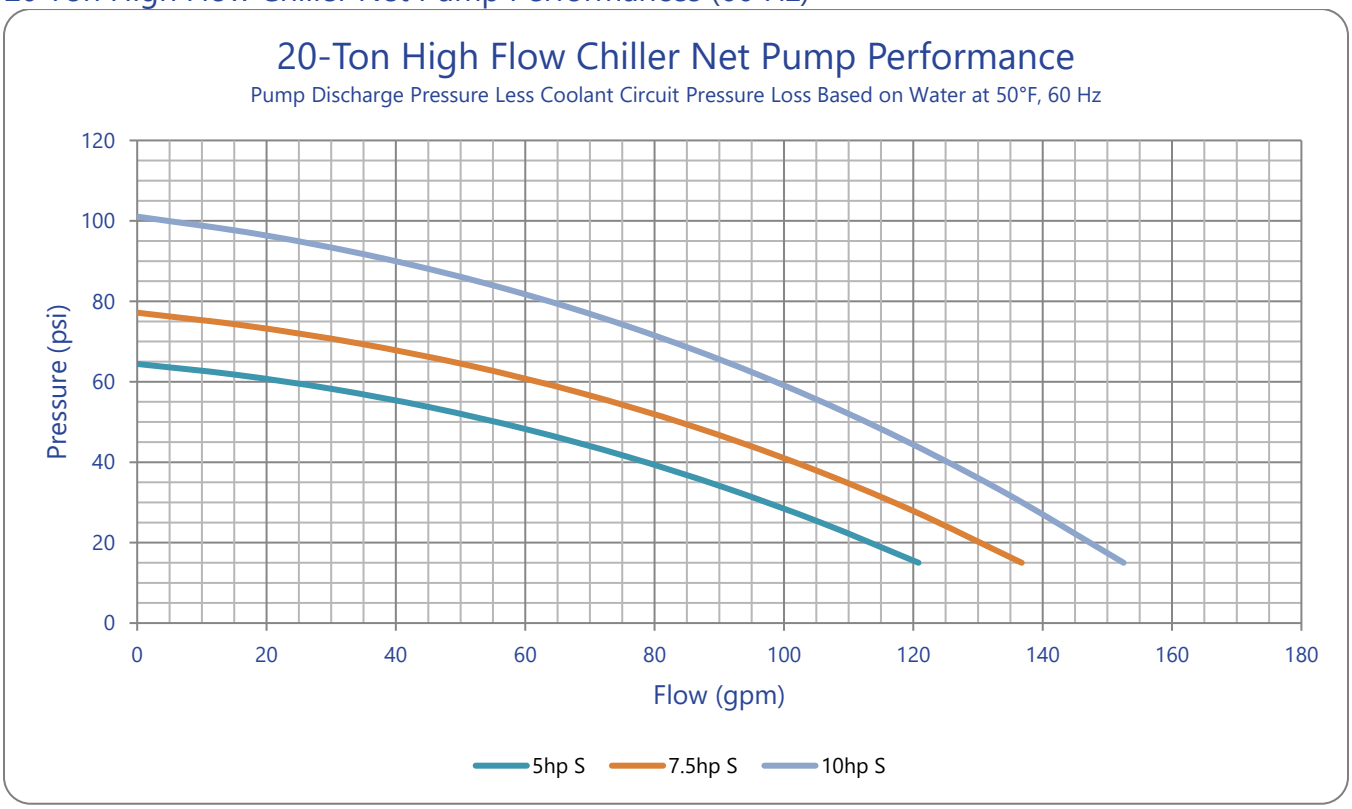
15 Ton High Flow Chiller Net Pump Performances (60 Hz)



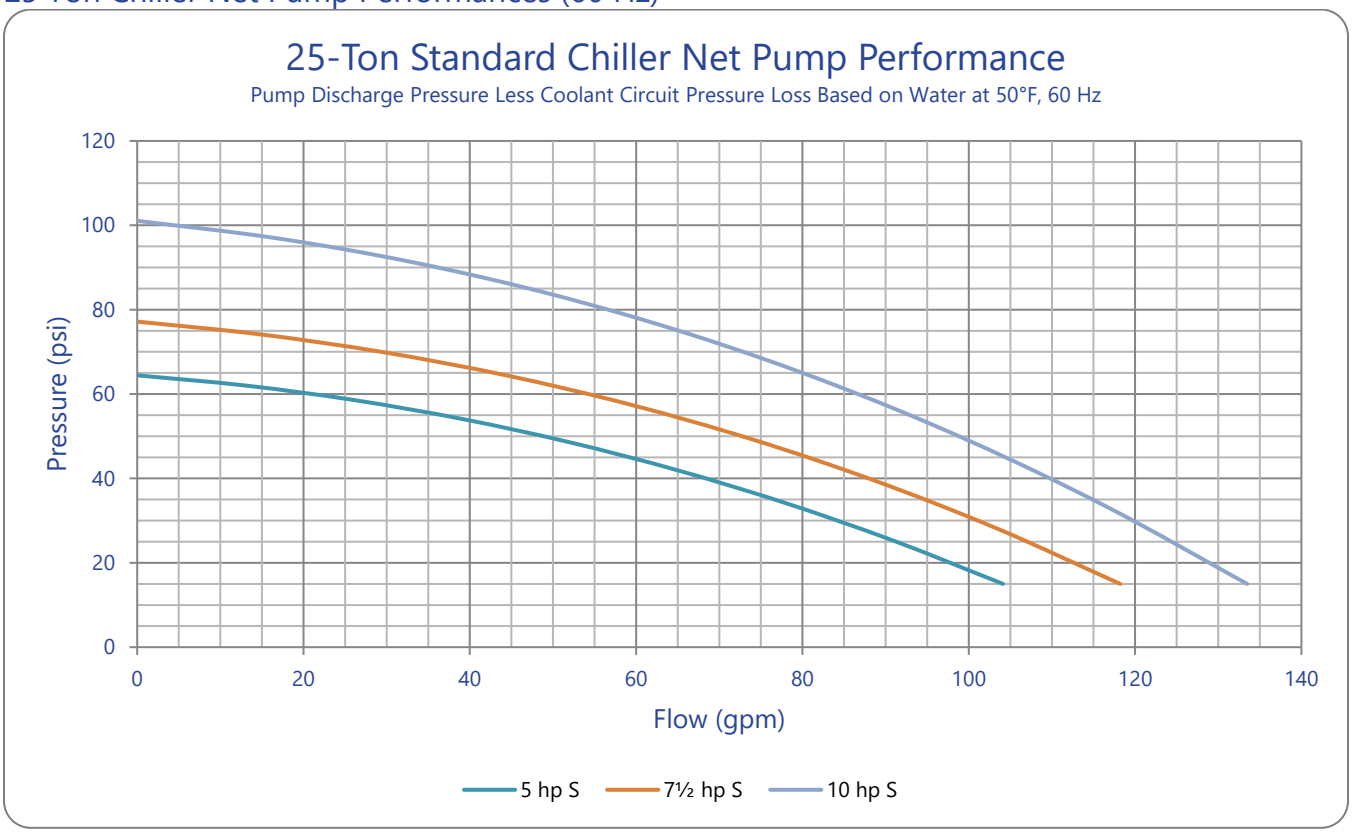
20 Ton Chiller Net Pump Performances (60 Hz)



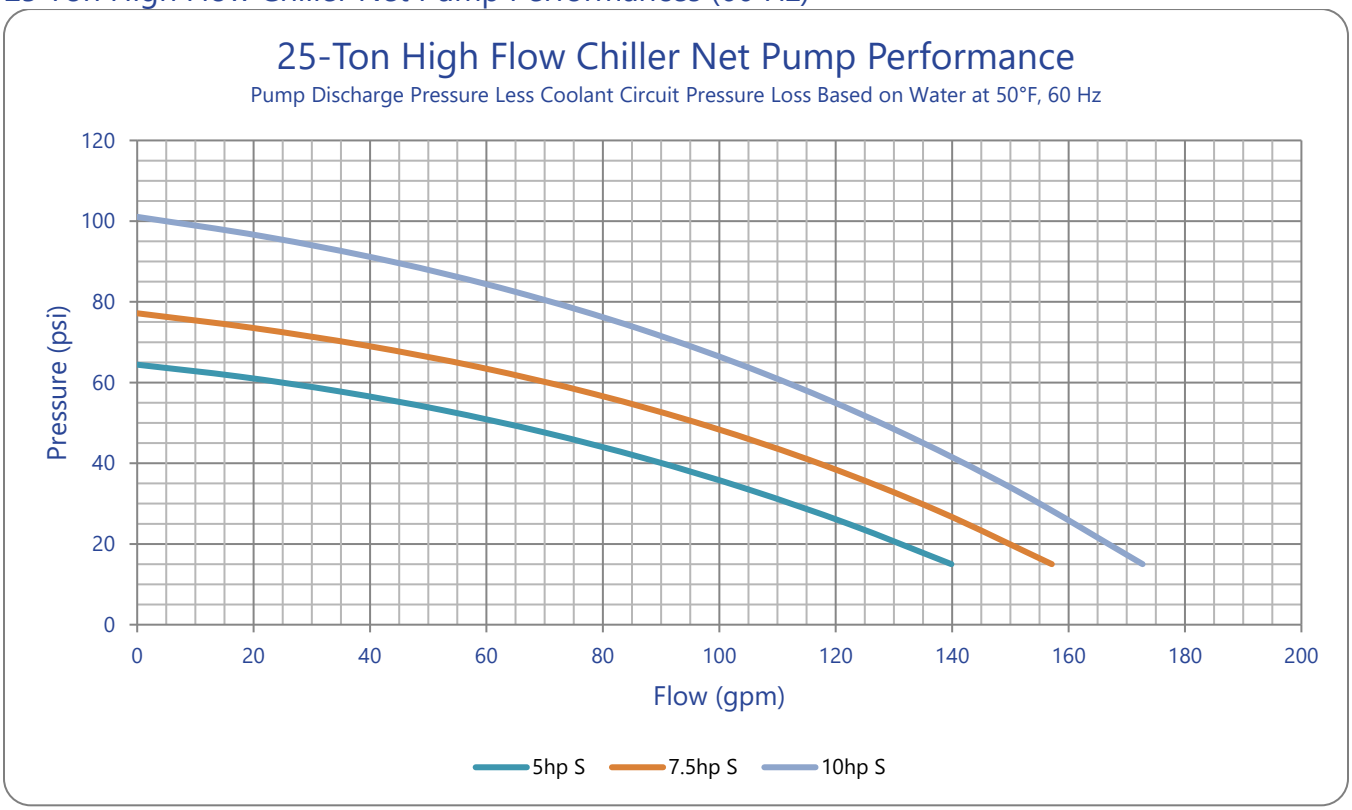
20 Ton High Flow Chiller Net Pump Performances (60 Hz)



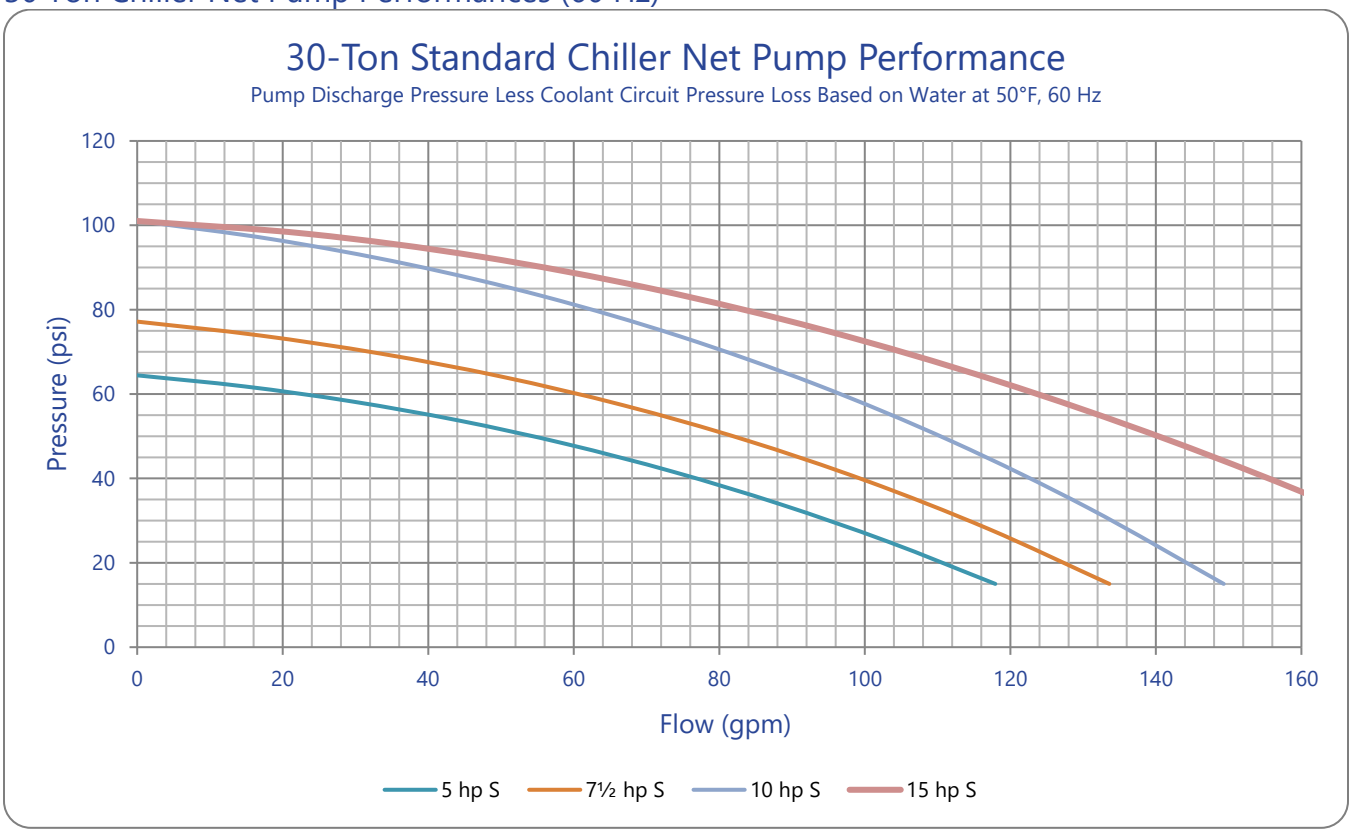
25 Ton Chiller Net Pump Performances (60 Hz)



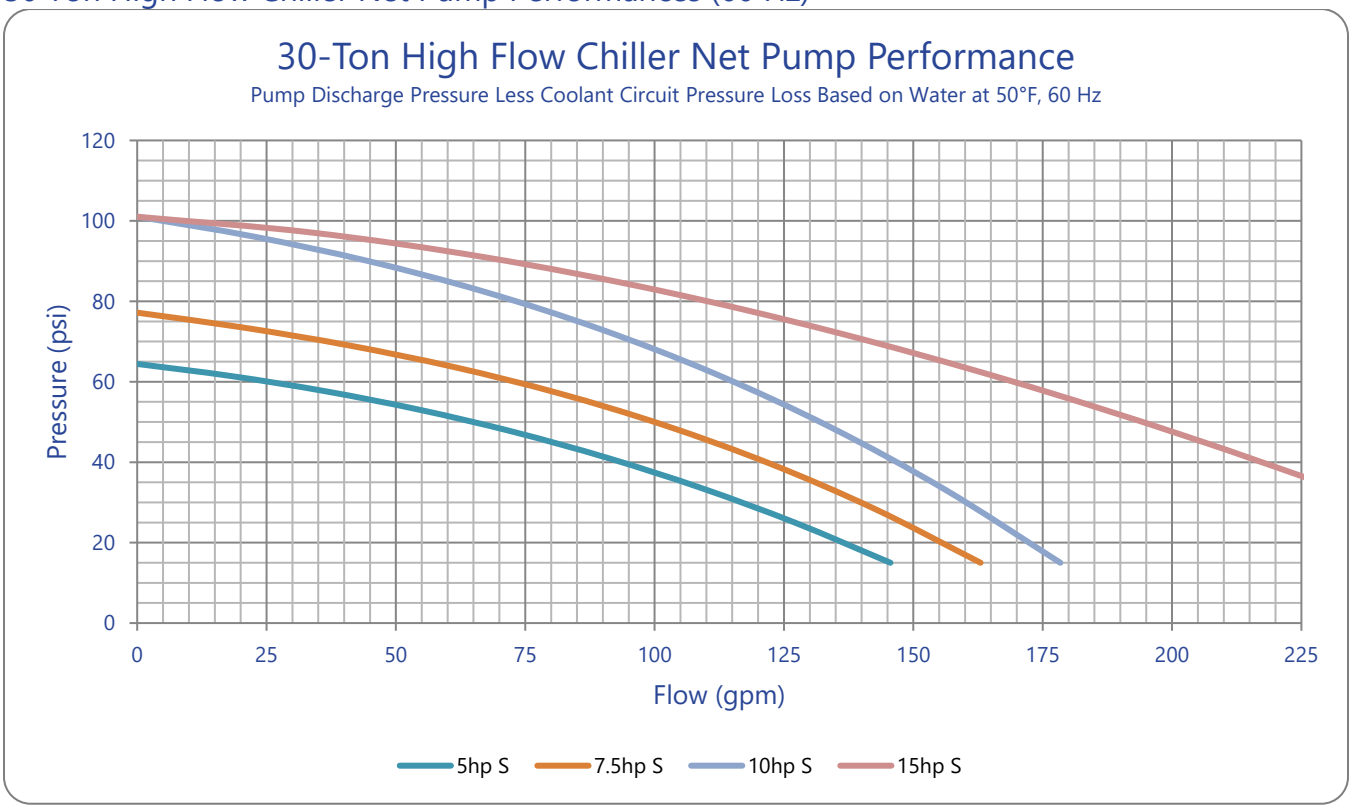
25 Ton High Flow Chiller Net Pump Performances (60 Hz)



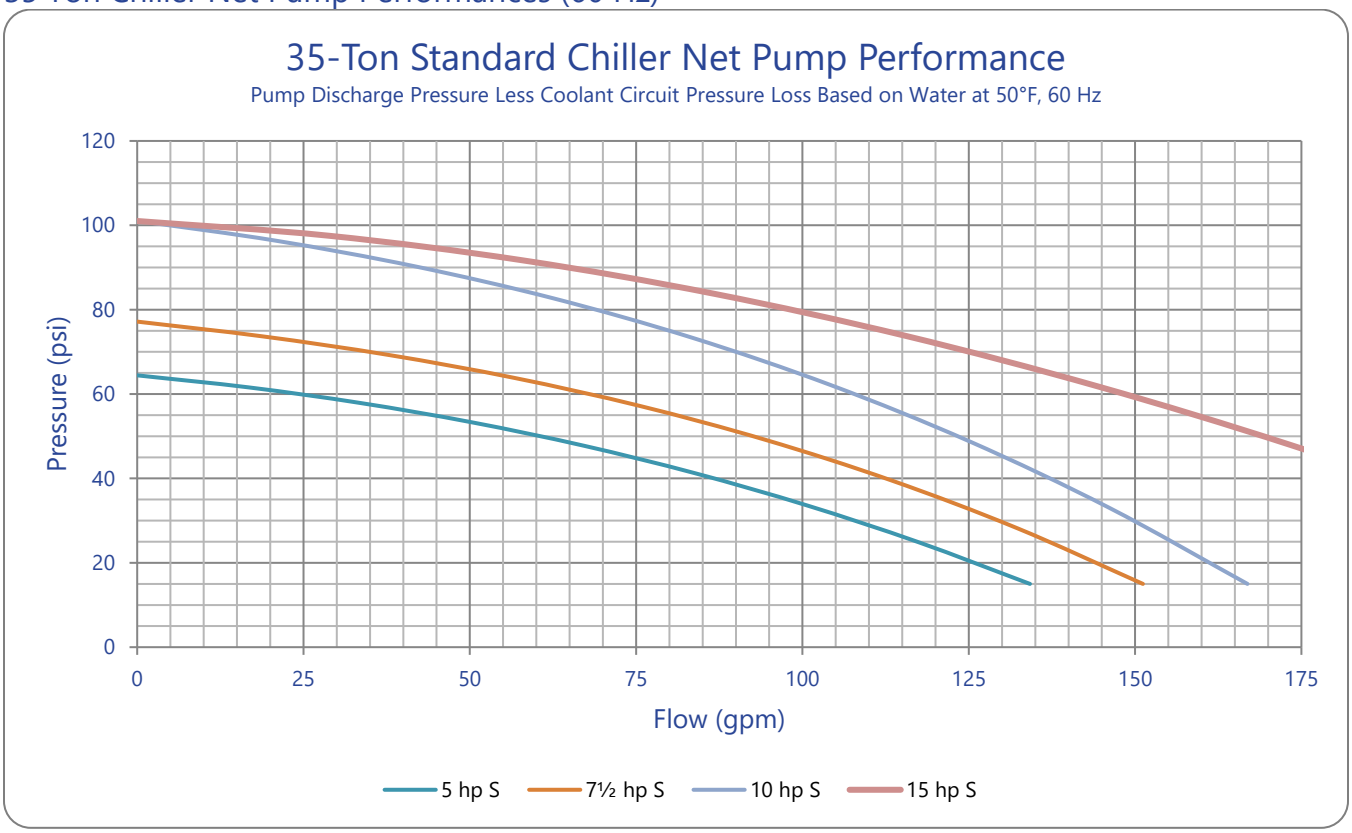
30 Ton Chiller Net Pump Performances (60 Hz)



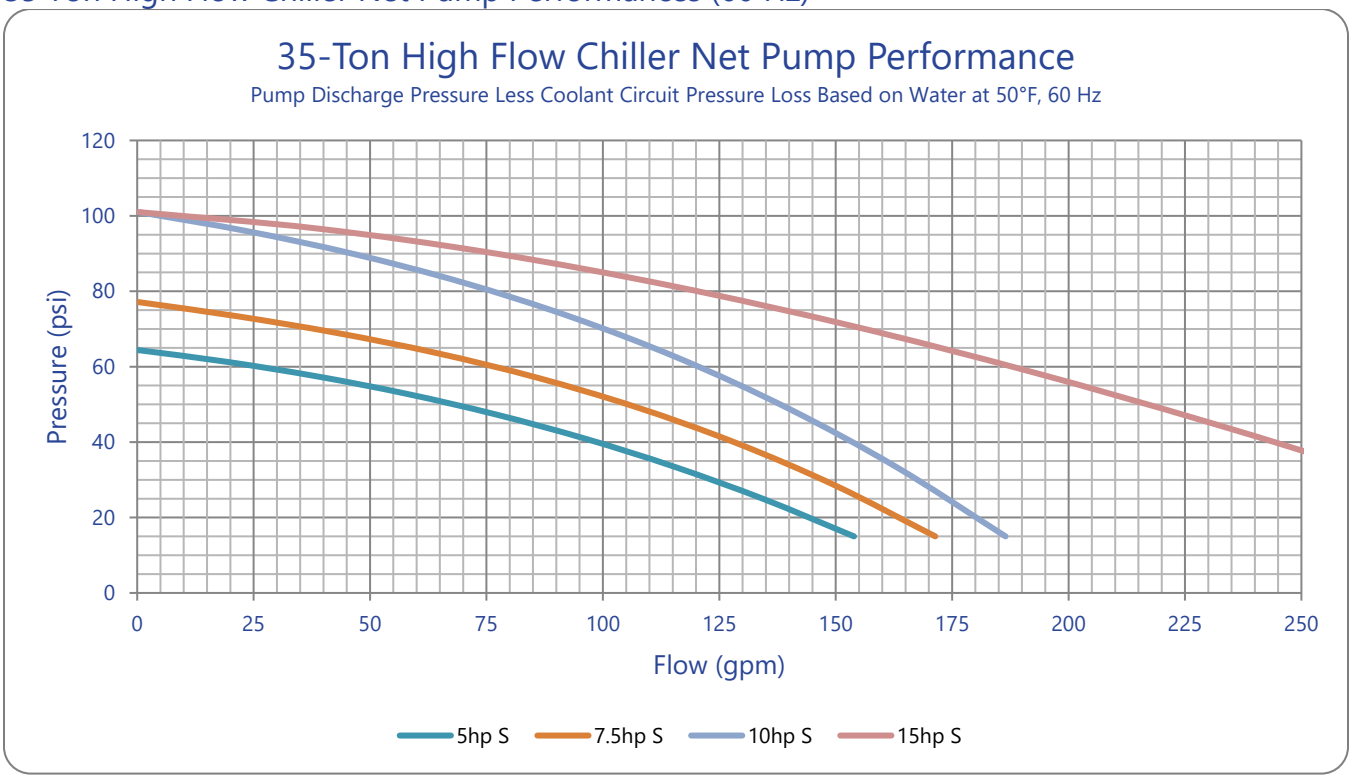
30 Ton High Flow Chiller Net Pump Performances (60 Hz)



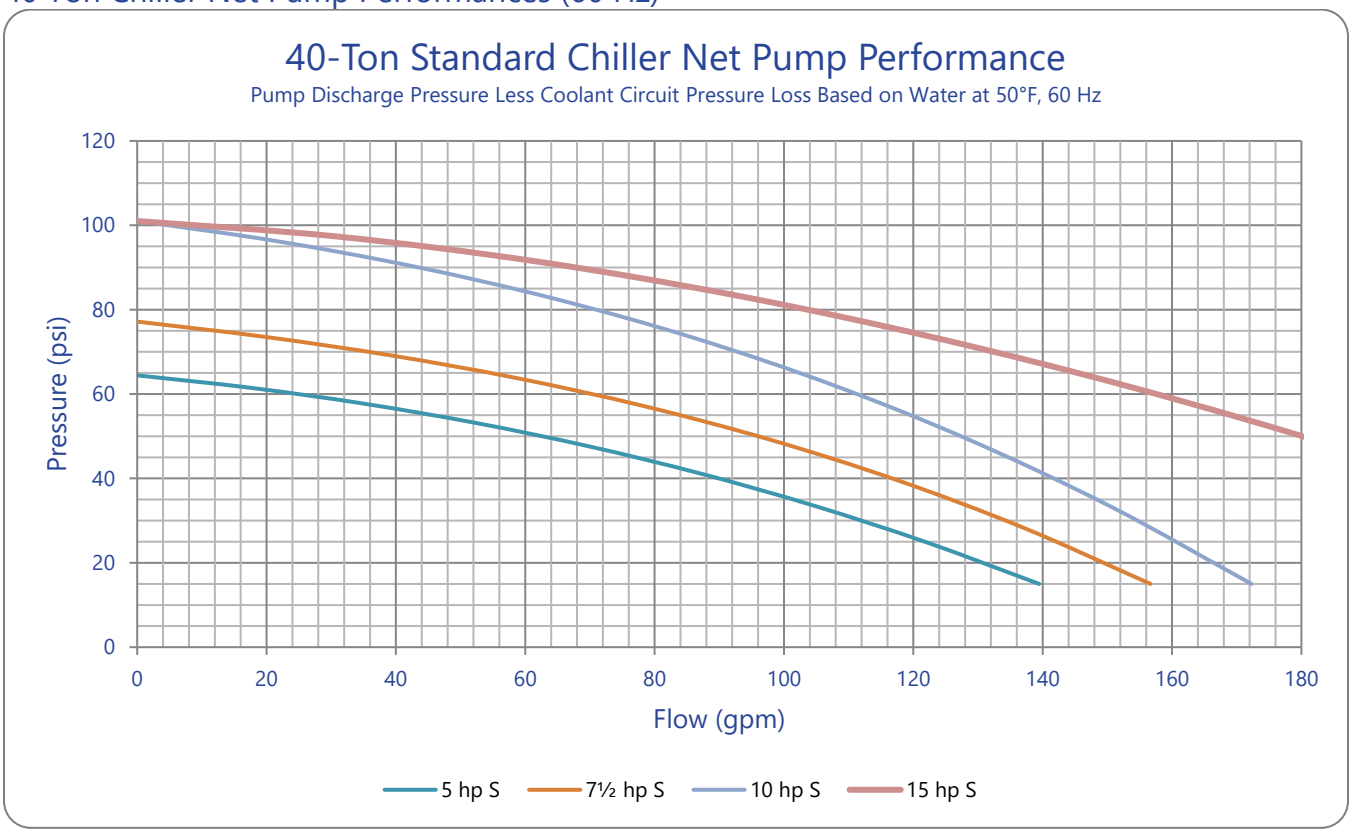
35 Ton Chiller Net Pump Performances (60 Hz)



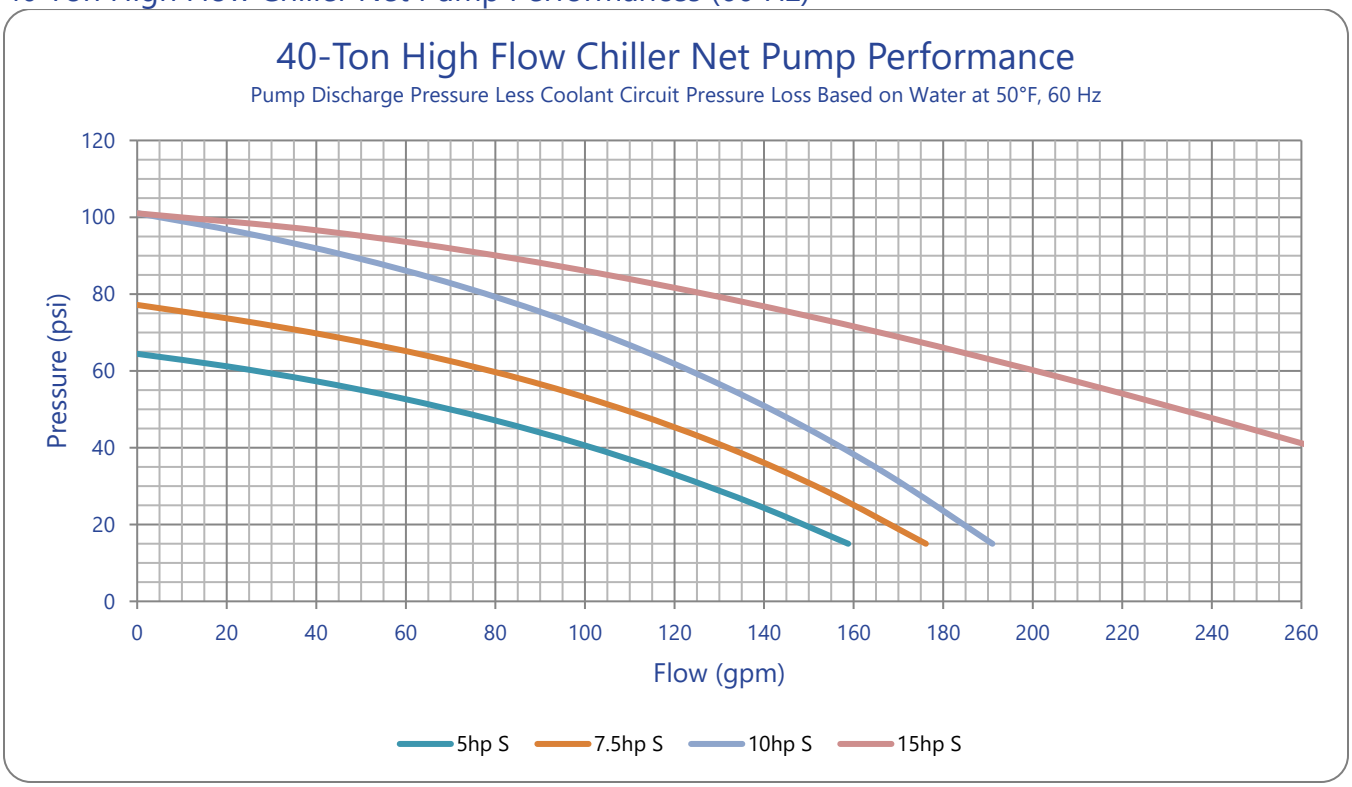
35 Ton High Flow Chiller Net Pump Performances (60 Hz)



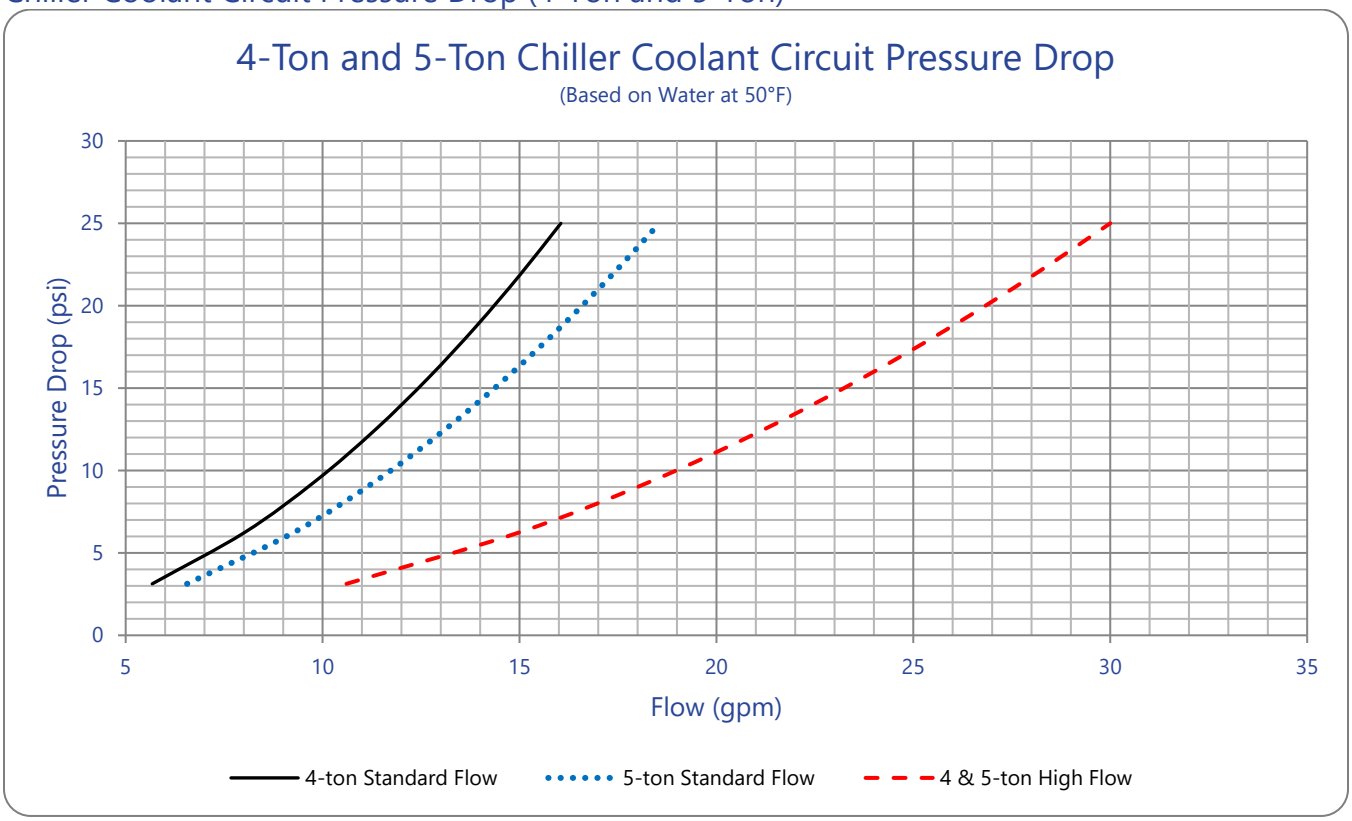
40 Ton Chiller Net Pump Performances (60 Hz)



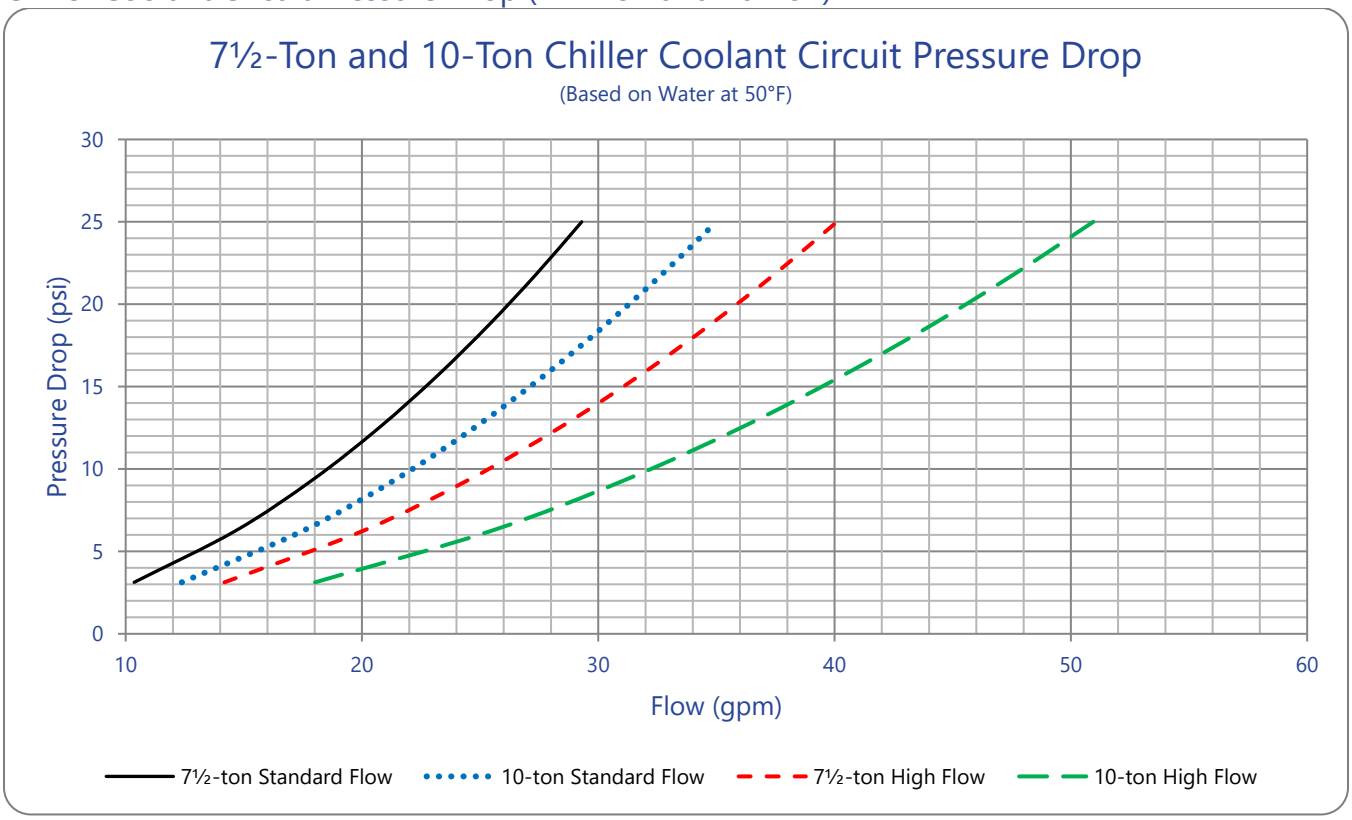
40 Ton High Flow Chiller Net Pump Performances (60 Hz)



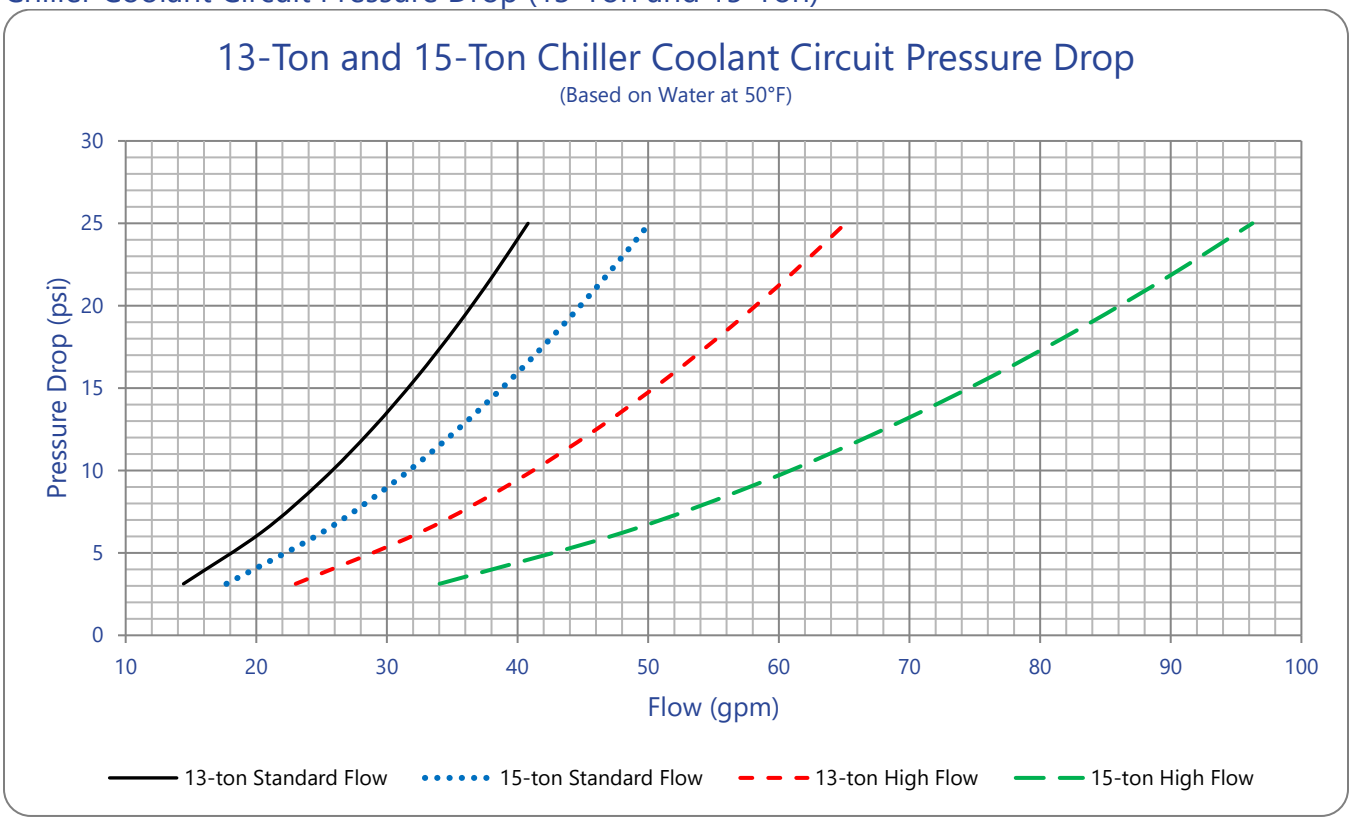
Chiller Coolant Circuit Pressure Drop (4-Ton and 5-Ton)



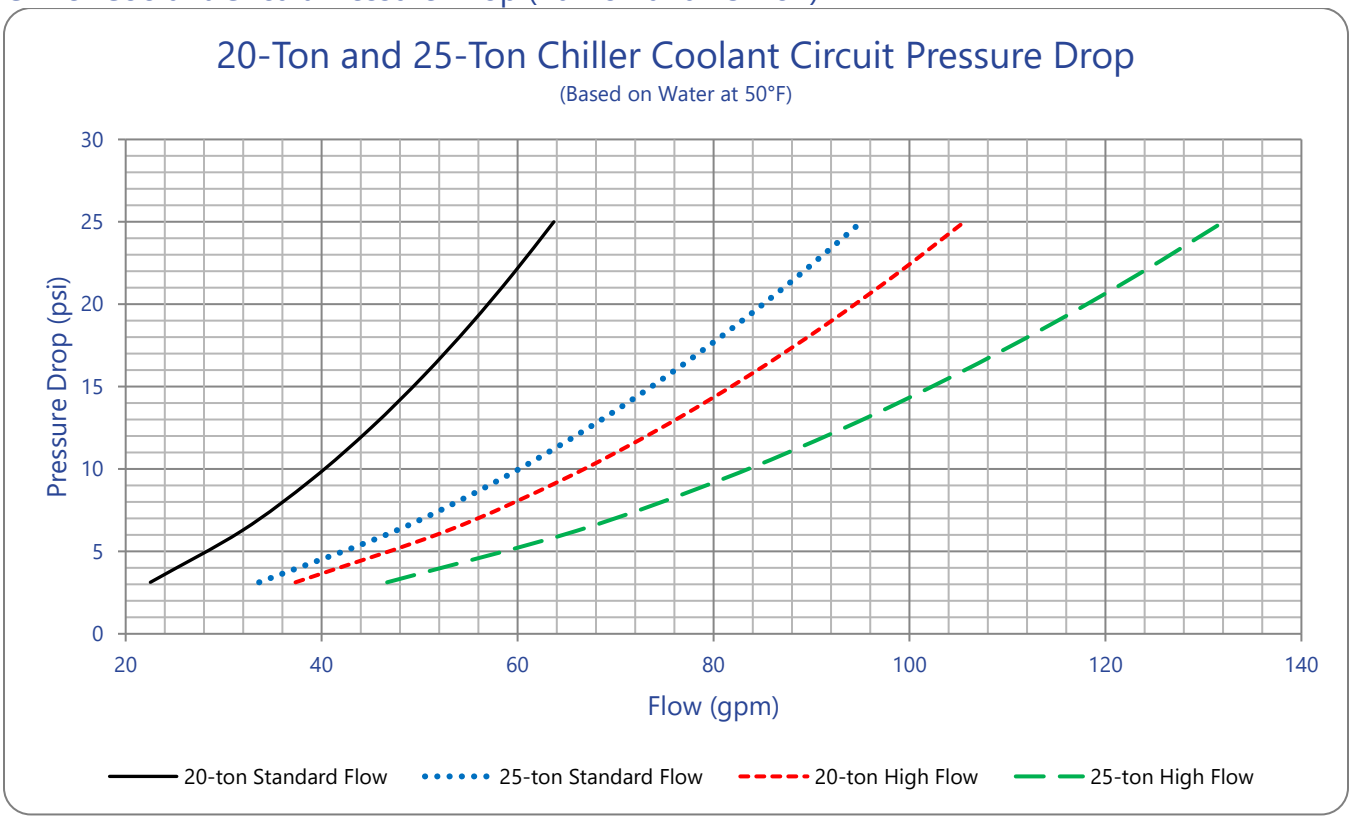
Chiller Coolant Circuit Pressure Drop (7½-Ton and 10-Ton)



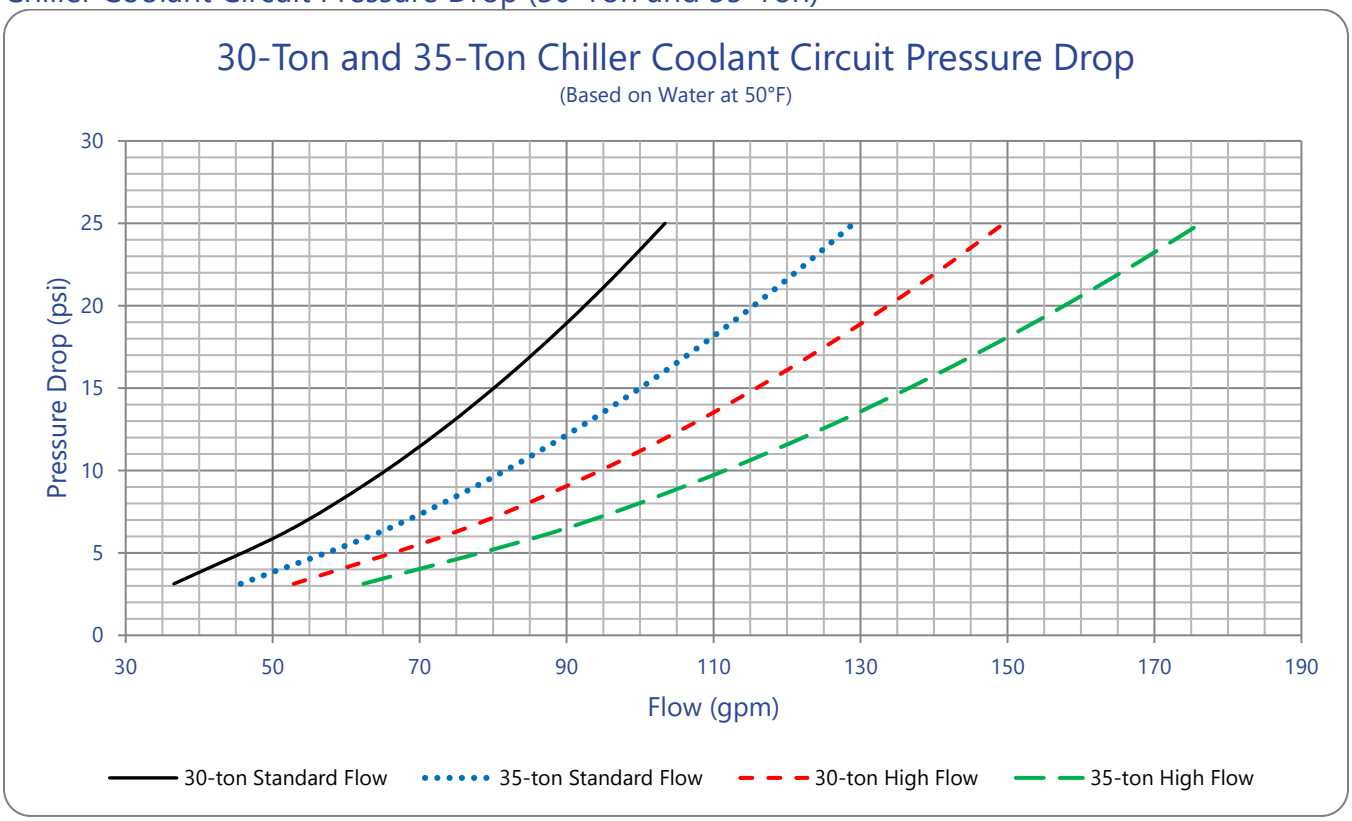
Chiller Coolant Circuit Pressure Drop (13-Ton and 15-Ton)



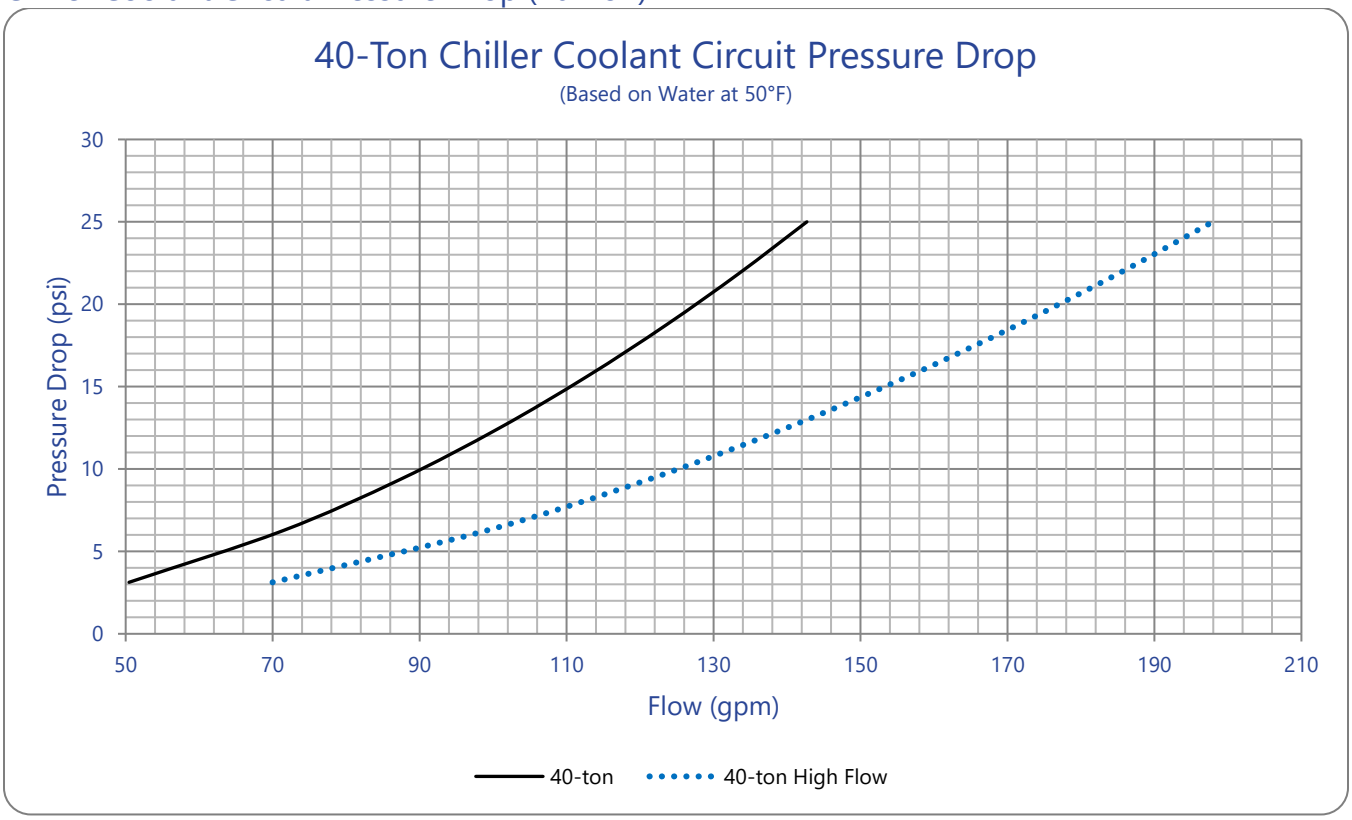
Chiller Coolant Circuit Pressure Drop (20-Ton and 25-Ton)



Chiller Coolant Circuit Pressure Drop (30-Ton and 35-Ton)



Chiller Coolant Circuit Pressure Drop (40-Ton)



Electrical Data

Air-Cooled Chiller Electrical Data

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA04 with standard condenser fan	None	208/3/60	25	45	NQA04 with high pressure variable speed EC condenser fan option	None	208/3/60	25	45
	1.5		32	50		1.5		32	50
	2		33	50		2		33	50
	3		36	60		3		36	60
	3 (2-stage)		36	60		3 (2-stage)		36	60
	5 (2-stage)		44	70		5 (2-stage)		44	70
	None	230/3/60	25	45		None	230/3/60	25	45
	1.5		31	50		1.5		31	50
	2		32	50		2		32	50
	3		35	60		3		35	60
	3 (2-stage)		35	60		3 (2-stage)		35	60
	5 (2-stage)		42	60		5 (2-stage)		42	60
	None	460/3/60	13	25		None	460/3/60	13	25
	1.5		16	25		1.5		16	25
	2		16	25		2		16	25
	3		18	30		3		17	30
	3 (2-stage)		18	30		3 (2-stage)		17	30
	5 (2-stage)		21	30		5 (2-stage)		21	30
	None	575/3/60	10	20		None	575/3/60	9	20
	1.5		12	20		1.5		12	20
	2		12	20		2		12	20
	3		13	20		3		13	20
	3 (2-stage)		13	20		3 (2-stage)		13	20
	5 (2-stage)		16	25		5 (2-stage)		16	25
	None	400/3/50	13	25		None	400/3/50	13	25
	1.5		16	25		1.5		16	25
	2		16	25		2		16	25
	3		18	30		3		17	30
	3 (2-stage)		18	30		3 (2-stage)		17	30
	5 (2-stage)		21	30		5 (2-stage)		21	30
	None	380/3/60	14	25		None	380/3/60	14	25
	1.5		17	30		1.5		17	30
	2		18	30		2		18	30
	3		20	30		3		20	30
	3 (2-stage)		20	30		3 (2-stage)		20	30
	5 (2-stage)		25	40		5 (2-stage)		25	40

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA05 with standard condenser fan	None	208/3/60	29	50	NQA05 with high pressure variable speed EC condenser fan option	None	208/3/60	29	50
	1.5		36	60		1.5		36	60
	2		37	60		2		37	60
	3		40	60		3		40	60
	3 (2-stage)		40	60		3 (2-stage)		40	60
	5 (2-stage)		47	70		5 (2-stage)		47	70
	None	230/3/60	29	50		None	230/3/60	29	50
	1.5		35	60		1.5		35	60
	2		36	60		2		36	60
	3		39	60		3		39	60
	3 (2-stage)		39	60		3 (2-stage)		39	60
	5 (2-stage)		46	70		5 (2-stage)		45	70
	None	460/3/60	15	25		None	460/3/60	15	25
	1.5		18	30		1.5		18	30
	2		19	30		2		18	30
	3		20	30		3		20	30
	3 (2-stage)		20	30		3 (2-stage)		20	30
	5 (2-stage)		23	35		5 (2-stage)		23	35
	None	575/3/60	12	20		None	575/3/60	11	20
	1.5		14	25		1.5		14	25
	2		14	25		2		14	25
	3		16	25		3		15	25
	3 (2-stage)		16	25		3 (2-stage)		15	25
	5 (2-stage)		18	30		5 (2-stage)		18	30
	None	400/3/50	15	25		None	400/3/50	15	25
	1.5		18	30		1.5		18	30
	2		19	30		2		18	30
	3		20	30		3		20	30
	3 (2-stage)		20	30		3 (2-stage)		20	30
	5 (2-stage)		23	35		5 (2-stage)		23	35
	None	380/3/60	17	30		None	380/3/60	16	30
	1.5		20	35		1.5		20	35
	2		21	35		2		21	35
	3		23	35		3		23	35
	3 (2-stage)		23	35		3 (2-stage)		23	35
	5 (2-stage)		27	40		5 (2-stage)		27	40

[1]Allowable voltage is ± 10% from rated voltage.
[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA08 with standard condenser fans	None	208/3/60	47	80	NQA08 with high pressure variable speed EC condenser fan option	None	208/3/60	47	80
	1.5		54	90		1.5		53	90
	2		55	90		2		54	90
	3		58	90		3		57	90
	3 (2-stage)		58	90		3 (2-stage)		57	90
	5		64	100		5		64	100
	5 (2-stage)		65	100		5 (2-stage)		65	100
	7.5		71	110		7.5		71	110
	None	230/3/60	47	80		None	230/3/60	47	80
	1.5		53	90		1.5		53	90
	2		54	90		2		54	90
	3		57	90		3		56	90
	3 (2-stage)		57	90		3 (2-stage)		56	90
	5		62	100		5		62	100
	5 (2-stage)		63	100		5 (2-stage)		63	100
	7.5		69	110		7.5		69	100
	None	460/3/60	25	45		None	460/3/60	24	45
	1.5		28	45		1.5		27	45
	2		28	45		2		28	45
	3		30	50		3		29	50
	3 (2-stage)		30	50		3 (2-stage)		29	50
	5		32	50		5		32	50
	5 (2-stage)		33	50		5 (2-stage)		33	50
	7.5		36	60		7.5		35	60
	None	575/3/60	20	35		None	575/3/60	20	35
	1.5		22	40		1.5		22	40
	2		23	40		2		22	40
	3		24	40		3		24	40
	3 (2-stage)		24	40		3 (2-stage)		24	40
	5		26	40		5		26	40
	5 (2-stage)		27	40		5 (2-stage)		26	40
	7.5		29	45		7.5		29	45
	None	400/3/50	25	45		None	400/3/50	24	45
	1.5		28	45		1.5		27	45
	2		28	45		2		28	45
	3		30	50		3		29	50
	3 (2-stage)		30	50		3 (2-stage)		29	50
	5		33	50		5		32	50
	5 (2-stage)		33	50		5 (2-stage)		33	50
	7.5		36	60		7.5		35	60
	None	380/3/60	29	50		None	380/3/60	29	50
	1.5		33	60		1.5		32	60
	2		34	60		2		33	60
	3		35	60		3		35	60
	3 (2-stage)		35	60		3 (2-stage)		35	60
	5		39	60		5		38	60
	5 (2-stage)		40	60		5 (2-stage)		39	60
	7.5		43	70		7.5		43	70

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA10 with standard condenser fans	None	208/3/60	63	110	NQA10 with high pressure variable speed EC condenser fan option	None	208/3/60	63	110
	2		71	125		2		71	125
	3		74	125		3		74	125
	3 (2-stage)		74	125		3 (2-stage)		74	125
	5		80	125		5		80	125
	5 (2-stage)		81	150		5 (2-stage)		81	150
	7.5		88	150		7.5		87	150
	None	230/3/60	63	110		None	230/3/60	63	110
	2		70	125		2		70	125
	3		73	125		3		73	125
	3 (2-stage)		73	125		3 (2-stage)		73	125
	5		79	125		5		78	125
	5 (2-stage)		80	125		5 (2-stage)		80	125
	7.5		85	150		7.5		85	150
	None	460/3/60	31	60		None	460/3/60	31	60
	2		34	60		2		34	60
	3		36	60		3		35	60
	3 (2-stage)		36	60		3 (2-stage)		35	60
	5		39	60		5		38	60
	5 (2-stage)		39	70		5 (2-stage)		39	60
	7.5		42	70		7.5		42	70
	None	575/3/60	25	45		None	575/3/60	25	45
	2		28	45		2		27	45
	3		29	50		3		29	50
	3 (2-stage)		29	50		3 (2-stage)		29	50
	5		31	50		5		31	50
	5 (2-stage)		32	50		5 (2-stage)		31	50
	7.5		34	60		7.5		34	60
	None	400/3/50	31	60		None	400/3/50	31	60
	2		35	60		2		34	60
	3		36	60		3		35	60
	3 (2-stage)		36	60		3 (2-stage)		35	60
	5		39	60		5		38	60
	5 (2-stage)		39	70		5 (2-stage)		39	60
	7.5		42	70		7.5		42	70
	None	380/3/60	36	70		None	380/3/60	36	70
	2		41	70		2		40	70
	3		42	70		3		42	70
	3 (2-stage)		42	70		3 (2-stage)		42	70
	5		46	80		5		45	80
	5 (2-stage)		47	80		5 (2-stage)		46	80
	7.5		50	80		7.5		50	80

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA13 with standard condenser fans	None	208/3/60	70	125	NQA13 with high pressure variable speed EC condenser fan option	None	208/3/60	69	125
	2		77	150		2		77	150
	3		80	150		3		80	150
	3 (2-stage)		80	150		3 (2-stage)		80	150
	5		86	150		5		86	150
	5 (2-stage)		88	150		5 (2-stage)		87	150
	7.5		94	150		7.5		94	150
	None	230/3/60	70	125		None	230/3/60	69	125
	2		76	150		2		76	150
	3		79	150		3		79	150
	3 (2-stage)		79	150		3 (2-stage)		79	150
	5		85	150		5		85	150
	5 (2-stage)		86	150		5 (2-stage)		86	150
	7.5		92	150		7.5		91	150
	None	460/3/60	36	70		None	460/3/60	36	70
	2		39	70		2		39	70
	3		41	70		3		40	70
	3 (2-stage)		41	70		3 (2-stage)		40	70
	5		44	70		5		43	70
	5 (2-stage)		44	70		5 (2-stage)		44	70
	7.5		47	80		7.5		47	80
	None	575/3/60	30	60		None	575/3/60	30	60
	2		33	60		2		32	60
	3		34	60		3		34	60
	3 (2-stage)		34	60		3 (2-stage)		34	60
	5		36	60		5		36	60
	5 (2-stage)		37	60		5 (2-stage)		36	60
	7.5		39	70		7.5		39	60
	None	400/3/50	36	70		None	400/3/50	36	70
	2		40	70		2		39	70
	3		41	70		3		40	70
	3 (2-stage)		41	70		3 (2-stage)		40	70
	5		44	70		5		43	70
	5 (2-stage)		44	70		5 (2-stage)		44	70
	7.5		47	80		7.5		47	80
	None	380/3/60	42	80		None	380/3/60	41	80
	2		46	80		2		46	80
	3		48	80		3		47	80
	3 (2-stage)		48	80		3 (2-stage)		47	80
	5		52	90		5		51	80
	5 (2-stage)		52	90		5 (2-stage)		52	90
	7.5		56	90		7.5		55	90

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA15 with standard condenser fan	None	208/3/60	78	150	NQA15 with high pressure variable speed EC condenser fan option	None	208/3/60	81	150
	3		89	150		3		92	150
	3 (2-stage)		89	150		3 (2-stage)		92	150
	5		95	150		5		98	175
	5 (2-stage)		96	175		5 (2-stage)		99	175
	7.5		103	175		7.5		105	175
	10		109	175		10		112	175
	None	230/3/60	78	150		None	230/3/60	81	150
	3		88	150		3		91	150
	3 (2-stage)		88	150		3 (2-stage)		91	150
	5		94	150		5		96	175
	5 (2-stage)		95	150		5 (2-stage)		97	175
	7.5		100	175		7.5		103	175
	10		106	175		10		109	175
	None	460/3/60	41	70		None	460/3/60	42	80
	3		46	80		3		47	80
	3 (2-stage)		46	80		3 (2-stage)		47	80
	5		48	80		5		50	80
	5 (2-stage)		49	80		5 (2-stage)		50	80
	7.5		52	80		7.5		53	90
	10		55	90		10		56	90
	None	575/3/60	36	70		None	575/3/60	37	70
	3		40	70		3		41	70
	3 (2-stage)		40	70		3 (2-stage)		41	70
	5		42	70		5		43	70
	5 (2-stage)		42	70		5 (2-stage)		44	70
	7.5		45	70		7.5		46	80
	10		47	80		10		48	80
	None	400/3/50	40	70		None	400/3/50	42	80
	3		45	80		3		47	80
	3 (2-stage)		45	80		3 (2-stage)		47	80
	5		47	80		5		50	80
	5 (2-stage)		48	80		5 (2-stage)		50	80
	7.5		51	80		7.5		53	90
	10		54	90		10		56	90
	None	380/3/60	52	90		None	380/3/60	54	90
	3		58	100		3		60	100
	3 (2-stage)		58	100		3 (2-stage)		60	100
	5		62	100		5		63	100
	5 (2-stage)		62	100		5 (2-stage)		64	110
	7.5		66	110		7.5		68	110
	10		70	110		10		72	110

[1]Allowable voltage is ± 10% from rated voltage.
[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA20 with standard condenser fans	None	208/3/60	118	175	NQA20 with high pressure variable speed EC condenser fan option	None	208/3/60	124	175
	5		135	200		5		140	200
	7.5		142	200		7.5		148	200
	10		149	200		10		154	200
	None	230/3/60	118	175		None	230/3/60	124	175
	5		133	200		5		139	200
	7.5		140	200		7.5		146	200
	10		146	200		10		152	200
	None	460/3/60	58	80		None	460/3/60	60	90
	5		65	90		5		68	90
	7.5		69	90		7.5		71	100
	10		72	100		10		74	100
	None	575/3/60	47	70		None	575/3/60	49	70
	5		53	70		5		55	80
	7.5		56	80		7.5		58	80
	10		58	80		10		60	80
	None	400/3/50	55	80		None	400/3/50	60	90
	5		63	90		5		68	90
	7.5		66	90		7.5		71	100
	10		69	100		10		74	100
	None	380/3/60	69	100		None	380/3/60	72	100
	5		78	110		5		82	110
	7.5		83	110		7.5		86	125
	10		87	125		10		90	125
NQA25 with standard condenser fans	None	208/3/60	129	200	NQA25 with high pressure variable speed EC condenser fan option	None	208/3/60	135	200
	5		146	200		5		151	225
	7.5		154	225		7.5		159	225
	10		160	225		10		166	225
	None	230/3/60	129	200		None	230/3/60	135	200
	5		145	200		5		150	200
	7.5		151	225		7.5		157	225
	10		157	225		10		163	225
	None	460/3/60	67	100		None	460/3/60	69	100
	5		74	100		5		77	110
	7.5		78	110		7.5		80	110
	10		81	110		10		83	110
	None	575/3/60	56	80		None	575/3/60	58	80
	5		62	90		5		64	90
	7.5		65	90		7.5		67	90
	10		67	90		10		69	90
	None	400/3/50	64	90		None	400/3/50	69	100
	5		72	100		5		77	110
	7.5		75	110		7.5		80	110
	10		78	110		10		83	110
	None	380/3/60	78	110		None	380/3/60	81	125
	5		87	125		5		91	125
	7.5		92	125		7.5		95	125
	10		96	125		10		99	150

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Air-Cooled Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQA30 with standard condenser fans	None	208/3/60	149	225	NQA30 with high pressure variable speed EC condenser fan option	None	208/3/60	157	225
	5		166	225		5		174	250
	7.5		173	250		7.5		181	250
	10		180	250		10		188	250
	None	230/3/60	149	225		None	230/3/60	157	225
	5		164	225		5		172	250
	7.5		171	225		7.5		179	250
	10		177	250		10		185	250
	None	460/3/60	78	110		None	460/3/60	82	125
	5		86	125		5		90	125
	7.5		89	125		7.5		93	125
	10		92	125		10		96	125
	None	575/3/60	68	100		None	575/3/60	72	100
	5		74	100		5		78	110
	7.5		77	110		7.5		81	110
	10		79	110		10		83	110
	None	400/3/50	75	110		None	400/3/50	82	125
	5		82	125		5		90	125
	7.5		86	125		7.5		93	125
	10		89	125		10		96	125
	None	380/3/60	99	150		None	380/3/60	104	150
	5		109	150		5		114	150
	7.5		113	150		7.5		118	175
	10		117	175		10		122	175

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Water-Cooled & Remote Air-Cooled Condenser Chiller Electrical Data

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]
NQW05 & NQR05	None	208/3/60	26	50
	1.5		33	60
	2		34	60
	3		37	60
	3 (2-stage)		37	60
	5 (2-stage)		44	70
	None	230/3/60	26	50
	1.5		32	60
	2		33	60
	3		36	60
	3 (2-stage)		36	60
	5 (2-stage)		43	70
	None	460/3/60	13	25
	1.5		16	30
	2		17	30
	3		18	30
	3 (2-stage)		18	30
	5 (2-stage)		22	35
	None	575/3/60	10	20
	1.5		13	20
	2		13	25
	3		14	25
	3 (2-stage)		14	25
	5 (2-stage)		17	25
	None	400/3/50	13	25
	1.5		16	30
	2		17	30
	3		18	30
	3 (2-stage)		18	30
	5 (2-stage)		22	35
	None	380/3/60	15	30
	1.5		18	30
	2		19	30
	3		21	35
	3 (2-stage)		21	35
	5 (2-stage)		25	40

[1]Allowable voltage is ± 10% from rated voltage.
[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]
NQW08 & NQR08	None	208/3/60	41	80
	1.5		48	80
	2		49	80
	3		52	90
	3 (2-stage)		52	90
	5		58	90
	5 (2-stage)		59	100
	7.5		65	100
	None	230/3/60	41	80
	1.5		47	80
	2		48	80
	3		51	90
	3 (2-stage)		51	90
	5		56	90
	5 (2-stage)		58	90
	7.5		63	100
	None	460/3/60	21	40
	1.5		24	45
	2		25	45
	3		26	45
	3 (2-stage)		26	45
	5		29	45
	5 (2-stage)		29	50
	7.5		32	50
	None	575/3/60	17	35
	1.5		20	35
	2		20	35
	3		21	35
	3 (2-stage)		21	35
	5		23	40
	5 (2-stage)		24	40
	7.5		26	40
	None	400/3/50	21	40
	1.5		24	45
	2		25	45
	3		26	45
	3 (2-stage)		26	45
	5		29	45
	5 (2-stage)		29	50
	7.5		32	50
	None	380/3/60	25	45
	1.5		28	50
	2		29	50
	3		31	60
	3 (2-stage)		31	60
	5		35	60
	5 (2-stage)		36	60
	7.5		39	60

Water-Cooled & Remote Air-Cooled Condenser Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]
NQW10 & NQR10	None	208/3/60	58	110
	2		65	110
	3		68	125
	3 (2-stage)		68	125
	5		74	125
	5 (2-stage)		76	125
	7.5		82	150
	None	230/3/60	58	110
	2		64	110
	3		67	125
	3 (2-stage)		67	125
	5		73	125
	5 (2-stage)		74	125
	7.5		80	125
	None	460/3/60	27	50
	2		31	60
	3		32	60
	3 (2-stage)		32	60
	5		35	60
	5 (2-stage)		36	60
	7.5		38	60
	None	575/3/60	22	40
	2		25	45
	3		26	45
	3 (2-stage)		26	45
	5		28	50
	5 (2-stage)		29	50
	7.5		31	50
	None	400/3/50	27	50
	2		31	60
	3		32	60
	3 (2-stage)		32	60
	5		35	60
	5 (2-stage)		36	60
	7.5		38	60
	None	380/3/60	32	60
	2		37	70
	3		39	70
	3 (2-stage)		39	70
	5		42	70
	5 (2-stage)		43	70
	7.5		46	80

[1]Allowable voltage is ± 10% from rated voltage.
[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]
NQW15 & NQR15	None	208/3/60	70	125
	3		81	150
	3 (2-stage)		81	150
	5		87	150
	5 (2-stage)		88	150
	7.5		94	150
	10		101	175
	15		116	175
	None	230/3/60	70	125
	3		80	150
	3 (2-stage)		80	150
	5		85	150
	5 (2-stage)		86	150
	7.5		92	150
	10		98	175
	15		112	175
	None	460/3/60	36	70
	3		41	70
	3 (2-stage)		41	70
	5		44	80
	5 (2-stage)		44	80
	7.5		47	80
	10		50	80
	15		57	90
	None	575/3/60	32	60
	3		36	70
	3 (2-stage)		36	70
	5		38	70
	5 (2-stage)		39	70
	7.5		41	70
	10		43	70
	15		49	80
	None	400/3/50	36	70
	3		41	70
	3 (2-stage)		41	70
	5		44	80
	5 (2-stage)		44	80
	7.5		47	80
	10		50	80
	15		57	90
	None	380/3/60	46	90
	3		52	90
	3 (2-stage)		52	90
	5		56	100
	5 (2-stage)		57	100
	7.5		60	100
	10		64	110
	15		73	110

Water-Cooled & Remote Air-Cooled Condenser Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQW20 & NQR20	None	208/3/60	102	150	NQW25 & NQR25	None	208/3/60	113	175
	5		118	175		5		129	200
	7.5		126	175		7.5		137	200
	10		132	200		10		144	200
	15		148	200		15		159	225
	None	230/3/60	102	150		None	230/3/60	113	175
	5		117	175		5		128	200
	7.5		124	175		7.5		135	200
	10		130	175		10		141	200
	15		144	200		15		155	225
	None	460/3/60	48	70		None	460/3/60	57	90
	5		56	80		5		65	100
	7.5		59	90		7.5		68	100
	10		62	90		10		71	100
	15		69	100		15		78	110
	None	575/3/60	39	60		None	575/3/60	48	70
	5		45	70		5		54	80
	7.5		48	70		7.5		57	80
	10		50	70		10		59	90
	15		56	80		15		65	90
	None	400/3/50	48	70		None	400/3/50	57	90
	5		56	80		5		65	100
	7.5		59	90		7.5		68	100
	10		62	90		10		71	100
	15		69	100		15		78	110
	None	380/3/60	57	90		None	380/3/60	66	100
	5		67	100		5		76	110
	7.5		71	100		7.5		80	110
	10		75	110		10		84	125
	15		85	125		15		93	125

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device

Water-Cooled & Remote Air-Cooled Condenser Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data		Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]				MCA[2]	MOP[3]
NQW30 & NQR30	None	208/3/60	124	200	NQW35 & NQR35	None	208/3/60	149	225
	5		141	200		5		166	250
	7.5		148	225		7.5		173	250
	10		155	225		10		180	300
	15		170	225		15		195	300
	None	230/3/60	124	200		None	230/3/60	149	225
	5		139	200		5		164	250
	7.5		146	200		7.5		171	250
	10		152	225		10		177	250
	15		166	225		15		191	300
	None	460/3/60	64	100		None	460/3/60	67	100
	5		72	100		5		74	110
	7.5		75	110		7.5		78	110
	10		78	110		10		81	125
	15		85	125		15		88	125
	None	575/3/60	57	90		None	575/3/60	56	90
	5		63	90		5		62	90
	7.5		66	100		7.5		65	90
	10		68	100		10		67	100
	15		74	100		15		73	100
	None	400/3/50	64	100		None	400/3/50	65	100
	5		72	100		5		72	110
	7.5		75	110		7.5		76	110
	10		78	110		10		79	110
	15		85	125		15		86	125
	None	380/3/60	82	125		None	380/3/60	79	125
	5		92	150		5		89	125
	7.5		96	150		7.5		93	150
	10		100	150		10		97	150
	15		109	150		15		106	150

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device

Water-Cooled & Remote Air-Cooled Condenser Chiller Electrical Data (continued)

Model	Process Pump (hp)[1]	Rated Voltage	Unit Data	
			MCA[2]	MOP[3]
NQW40 & NQR40	None	208/3/60	171	250
	5		188	300
	7.5		195	300
	10		202	300
	15		217	300
	None	230/3/60	171	250
	5		186	300
	7.5		193	300
	10		199	300
	15		213	300
	None	460/3/60	82	125
	5		90	150
	7.5		93	150
	10		96	150
	15		103	150
	None	575/3/60	64	100
	5		70	100
	7.5		73	110
	10		75	110
	15		81	110
	None	400/3/50	82	125
	5		90	150
	7.5		93	150
	10		96	150
	15		103	150
	None	380/3/60	93	150
	5		103	150
	7.5		107	150
	10		111	175
	15		120	175

[1]Allowable voltage is ± 10% from rated voltage.

[2]MCA is Minimum Circuit Amps, used for minimum wire size requirement.

[3]MOP is Maximum Overcurrent Protection, used for sizing main power protection device.

Remote Air-Cooled Condenser Electrical Data

Model	Chiller Used With	Rated Voltage[1]	MCA[2]	MOP[3]
KCM009	NQR05	230	2.9	15
		460	1.4	15
		575	1.1	15
KCM011	NQR08	230	2.9	15
		460	1.4	15
		575	1.1	15
KCM014	NQR10	230	5.2	15
		460	2.6	15
		575	2	15
KCL023	NQR15	230	16	20
		460	7	15
		575	5.6	15
KCL030	NQR20	230	16	20
		460	7	15
		575	5.6	15
KCL037	NQR25	230	16	20
		460	7	15
		575	5.6	15
KCL045	NQR30	230	21.5	25
		460	10.1	15
		575	8.1	15
KCL054	NQR35	230	21.5	25
		460	10.1	15
		575	8.1	15
KCL056	NQR40	230	21.5	25
		460	10.1	15
		575	8.1	15

[1]Allowable voltage is ± 10% from rated voltage.
[2]MCA is Minimum Circuit Amps as provided by the remote condenser manufacturer, used for minimum wire size requirement.
[3]MOP is Maximum Overcurrent Protection as provided by the remote condenser manufacturer, used for sizing main power protection devices.

Application Considerations

When designing a chilled water system it is important all aspects of the system are considered to ensure 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.

Air-cooled chillers use the surrounding air for cooling the condenser and require free passage of air in and out of the chiller and provision for remove of the warm air from the area.

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, the entering water temperature must not exceed 10°F warmer than the maximum set point temperature of the chiller.

Process Fluid Flow Rate

The nominal performance of the chiller assumes a temperature rise of 10°F through the process. The chiller is capable of operating with different operating temperature differentials within certain flow limitations and with correction to capacity, pressure drops, and other operating parameters 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 air-cooled condenser chillers are nominally designed to use 95°F ambient air for condenser cooling. Indoor-duty chillers have an ambient operating range of 60°F to 110°F and outdoor-duty chillers are available with either a 0°F to 110°F or -20°F to 110°F ambient range. The minimum ambient air temperature at which the chiller will start 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 to allow for future growth is sometimes necessary; however, it is highly recommended 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 operation at reduced loads, we recommended the use of two smaller chillers as operating smaller chillers at higher loads is preferred to operating one larger chiller at or near its minimum load capacity.

Strainers

Each evaporator includes a 20-mesh inlet strainer to protect the evaporator. Filter all water-cooled condensers 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 refer~~rer~~ to the Installation and Operation manual of the chiller.

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