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BULLETIN 132
Revised 12/2022

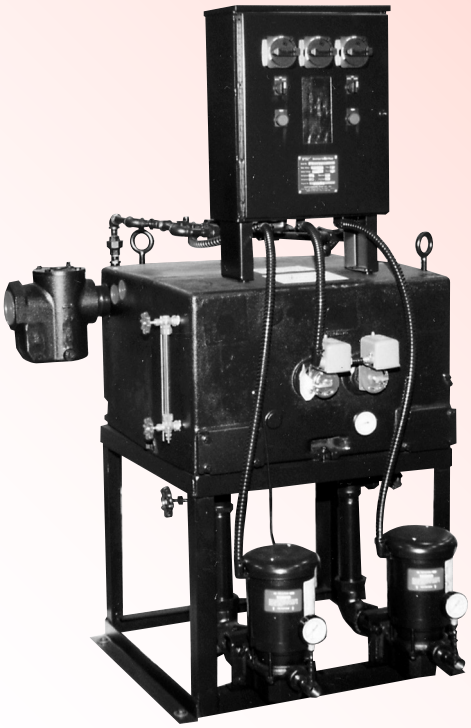
TYPE DMC

Durable Make-up Cast Iron Receiver Boiler Feed Units

Condensate Temperature of unit is generally around 200°F.

Temperature is a function of pump NPSH and elevation above sea level.

Certain pumping points have NPSH requirements of 2 feet and therefore can handle 210°F.



TYPE DMEC

Durable Make-up Elevated Cast Iron Receiver Boiler Feed Units

Condensate Temperature of unit is generally around 210°F.

Temperature is a function of pump NPSH and elevation above sea level.

Certain pumping points have NPSH requirements of 2 feet and therefore can handle 212°F.

20 Year Warranty Against Corrosion Failure on Receiver

NOTE: If unit used as a surge tank, pumps should run continously.

SHIPCO® PUMPS Single Stage Units are equipped with Mechanical Seals rated for temperatures up to 250°F as standard.

SHIPCO® PUMPS Multi Stage Units are equipped with Mechanical Seals rated for temperatures up to 300°F as standard.

Higher temperature seals and special faces available upon request.

TYPE DMC BOILER FEED UNITS

BOILER CAP. BHP	PUMP CAP. GPM	DISCH. PRESS. PSIG	MOTOR 3500 RPM HP	MOTOR 3500 RPM PHASE	MOTOR 1750 RPM HP	MOTOR 1750 RPM PHASE	DISCH. SIZE INCHES	CATALOG NO.	REC. CAP. GALS.	INLET SIZE INCHES
		20	1/3	1 or 3	1/2	1 or 3		3 DMC-20		
		25	1/2	1 or 3	1/2	1 or 3		3 DMC-25		
		30	3/4	1 or 3	1-1/2	3		3 DMC-30		
		40	1	1 or 3	3	3	3/4"	3 DMC-40		
20	3	50	1-1/2	1 or 3				3 DMC-50	25	2"
		60	2	1 or 3				3 DMC-60		
		70	3	1 or 3				3 DMC-70		
		75	3	3				3 DMC-75		
		80	3	3			1-1/2"	3 DMC-80		
		90	5	3				3 DMC-90		
		100	5	3				3 DMC-100		
		20	1/3	1 or 3	1/2	1 or 3		6 DMC-20		
		25	1/2	1 or 3	1/2	1 or 3		6 DMC-25		
		30	3/4	1 or 3	1-1/2	3		6 DMC-30		
		40	1	1 or 3	3	3	3/4"	6 DMC-40		
40	6	50	1-1/2	1 or 3				6 DMC-50	25	2"
		60	2	1 or 3				6 DMC-60		
		70	3	3				6 DMC-70		
		75	3	3				6 DMC-75		
		80	3	3			1-1/2"	6 DMC-80		
		90	5	3				6 DMC-90		
		100	5	3				6 DMC-100		
		20	1/3	1 or 3	1/2	1 or 3		9 DMC-20		
		25	1/2	1 or 3	1/2	1 or 3		9 DMC-25		
		30	3/4	1 or 3	1-1/2	3		9 DMC-30		
		40	1	1 or 3	3	3	3/4"	9 DMC-40		
55	9	50	1-1/2	1 or 3				9 DMC-50	37	3"
		60	2	1 or 3				9 DMC-60		
		70	3	3				9 DMC-70		
		75	3	3				9 DMC-75		
		80	3	3			1-1/2"	9 DMC-80		
		90	5	3				9 DMC-90		
		100	5	3				9 DMC-100		
		20	1/3	1 or 3	1/2	1 or 3		12 DMC-20		
		25	1/2	1 or 3	3/4	1 or 3		12 DMC-25		
		30	3/4	1 or 3	1-1/2	3		12 DMC-30		
		40	1	1 or 3	3	3	3/4"	12 DMC-40		
80	12	50	1-1/2	1 or 3				12 DMC-50	57	3"
		60	2	1 or 3				12 DMC-60		
		70	3	3				12 DMC-70		
		75	3	3				12 DMC-75		
		80	3	3				12 DMC-80		
		90	5	3				12 DMC-90		
		100	5	3				12 DMC-100		
		20	1/3	1 or 3	1/2	1 or 3		15 DMC-20		
		25	1/2	1 or 3	3/4	1 or 3		15 DMC-25		
		30	3/4	1 or 3	1-1/2	3		15 DMC-30		
		40	1	1 or 3	3	3	3/4"	15 DMC-40		
100	15	50	1-1/2	1 or 3				15 DMC-50	80	4"
		60	2	1 or 3				15 DMC-60		
		70	3	3				15 DMC-70		
		75	3	3				15 DMC-75		
		80	3	3			1-1/2"	15 DMC-80		
		90	5	3				15 DMC-90		
		100	5	3				15 DMC-100		

TYPE DMC BOILER FEED UNITS

BOILER CAP. BHP	PUMP CAP. GPM	DISCH. PRESS. PSIG	MOTOR 3500 RPM HP	MOTOR 3500 RPM PHASE	MOTOR 1750 RPM HP	MOTOR 1750 RPM PHASE	DISCH. SIZE INCHES	CATALOG NO.	REC. CAP. GALS.	INLET SIZE INCHES
125	18	20	1/3	1 or 3	1/2	1 or 3		18 DMC-20	80	4"
		25	1/2	1 or 3	3/4	1 or 3		18 DMC-25		
		30	3/4	1 or 3	1-1/2	3		18 DMC-30		
		40	1-1/2	1 or 3	3	3		18 DMC-40		
		50	2	1 or 3				18 DMC-50		
		60	3	3				18 DMC-60		
		70	3	3				18 DMC-70		
		75	3	3			1-1/2"	18 DMC-75		
		80	3	3				18 DMC-80		
		90	5	3				18 DMC-90		
		100	5	3				18 DMC-100		
150	21	20	1/2	1 or 3	3/4	1 or 3		21 DMC-20	125	4"
		25	3/4	1 or 3	3/4	1 or 3		21 DMC-25		
		30	3/4	1 or 3	1-1/2	3		21 DMC-30		
		40	1-1/2	1 or 3	3	3		21 DMC-40		
		50	2	1 or 3				21 DMC-50		
		60	3	3				21 DMC-60		
		70	3	3				21 DMC-70		
		75	3	3			1-1/2"	21 DMC-75		
		80	5	3				21 DMC-80		
		90	5	3				21 DMC-90		
		100	5	3				21 DMC-100		
200	30	20	3/4	1 or 3	3/4	1 or 3		30 DMC-20	125	4"
		25	3/4	1 or 3	3/4	1 or 3		30 DMC-25		
		30	1	1 or 3	1-1/2	3		30 DMC-30		
		40	1-1/2	1 or 3	3	3		30 DMC-40		
		50	2	1 or 3			1-1/2"	30 DMC-50		
		60	3	3				30 DMC-60		
		70	5	3				30 DMC-70		
		75	5	3				30 DMC-75		
		80	5	3				30 DMC-80		
		90	5	3				30 DMC-90		
		100	5	3				30 DMC-100		
250	35	20	3/4	1 or 3	3/4	1 or 3		35 DMC-20	160	4"
		25	1	1 or 3	1	1 or 3		35 DMC-25		
		30	1-1/2	1 or 3	2	3		35 DMC-30		
		40	2	1 or 3	3	3		35 DMC-40		
		50	3	1 or 3			1-1/2"	35 DMC-50		
		60	3	3				35 DMC-60		
		70	5	3				35 DMC-70		
		75	5	3				35 DMC-75		
		80	5	3				35 DMC-80		
		90	5	3				35 DMC-90		
		100	5	3				35 DMC-100		
300	42	20	1	1 or 3	1	1 or 3		42 DMC-20	260	4"
		25	1-1/2	1 or 3	1-1/2	1 or 3		42 DMC-25		
		30	1-1/2	1 or 3	2	3		42 DMC-30		
		40	2	1 or 3	3	3		42 DMC-40		
		50	3	1 or 3			1-1/2"	42 DMC-50		
		60	5	3				42 DMC-60		
		70	5	3				42 DMC-70		
		75	5	3				42 DMC-75		
		80	5	3				42 DMC-80		
		90	5	3				42 DMC-90		
		100	7-1/2	3				42 DMC-100		

TYPE DMC BOILER FEED UNITS

BOILER CAP. BHP	PUMP CAP. GPM	DISCH. PRESS. PSIG	MOTOR 3500 RPM		MOTOR 1750 RPM		DISCH. SIZE INCHES	CATALOG NO.	REC. CAP. GALS.	INLET SIZE INCHES
			HP	PHASE	HP	PHASE				
		20	1-1/2	1 or 3	1-1/2	1 or 3		55 DMC-20		
		25	2	1 or 3	1-1/2	3		55 DMC-25		
		30	2	1 or 3	2	3		55 DMC-30		
		40	3	1 or 3	3	3		55 DMC-40		
400	55	50	5	3			1-1/2"	55 DMC-50	260	4"
		60	5	3				55 DMC-60		
		70	7-1/2	3				55 DMC-70		
		75	7-1/2	3				55 DMC-75		
		80	7-1/2	3				55 DMC-80		
		90	7-1/2	3				55 DMC-90		
		100	7-1/2	3				55 DMC-100		
		20	2	1 or 3	2	3		82 DMC-20		
		25	3	1 or 3	2	3		82 DMC-25		
		30	3	3	3	3		82 DMC-30		
		40	5	3	3	3		82 DMC-40		
600	82	50	5	3			2"	82 DMC-50	500	4"
		60	7-1/2	3				82 DMC-60		
		70	7-1/2	3				82 DMC-70		
		75	7-1/2	3				82 DMC-75		
		80	10	3				82 DMC-80		
		90	10	3				82 DMC-90		
		100	10	3				82 DMC-100		
		20	3	1 or 3	2	3		104 DMC-20		
		25	3	1 or 3	2	3		104 DMC-25		
		30	3	1 or 3	3	3		104 DMC-30		
		40	5	3				104 DMC-40		
750	104	50	5	3			2"	104 DMC-50	500	4"
		60	7-1/2	3				104 DMC-60		
		70	10	3				104 DMC-70		
		75	10	3				104 DMC-75		
		80	10	3				104 DMC-80		
		90	10	3				104 DMC-90		
		100	15	3				104 DMC-100		

Charted units are a representation of the typical systems and sizes used. Higher pump pressures and larger pump capacities are available.

Type DMEC units are an elevated boiler feed which is used when various different styles of pumps are needed.

Model D Pump

If you want to use the standard Model D pump, which is used on the **DMC** units enclosed, just change the Catalog number to a **DMEC** unit. The Model D pump is a bronze fitted pump designed with NPSH requirements in mind. Vertical mounting saves floor space and avoids dirt and water. Industry standard motors available in single or three phase, 1750 RPM, or 3500 RPM, and Vertical or Horizontal flanged style. All units equipped with mechanical seals rated for 250°F as standard (higher temperature and special faces available upon request).

Model P Pump

See PC and PEC Literature—handles condensate and feed water temperatures to 210°F as **PMC** and 212°F as **PMEC**.

Model H Pump

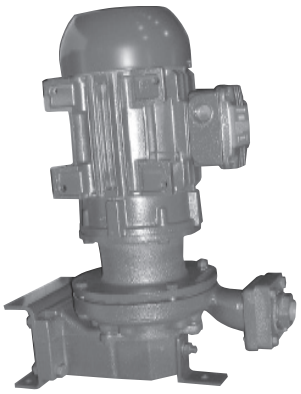
The Model H pump is a horizontal threaded suction pump with an industry standard motor available in single or three phase, 1750 RPM, or 3500 RPM. All units equipped with mechanical seals rated for 250°F as standard (higher temperature and special faces available upon request). The catalog number becomes a **DMEC-H** unit. The Model H pump is not available for all capacities and discharge pressures. Consult pump curves.

Model AWF Multistage Pumps

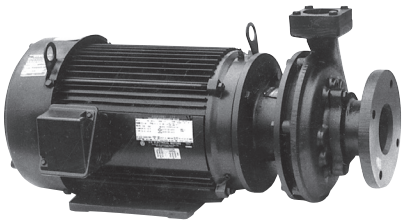
The Model AWF pump is a multistage bronze fitted pump. These pumps are rigid coupled with a self-aligning coupling. These pumps have ASA flanged suction and discharge openings. Pumps are low NPSH design, 3500 RPM with three phase motors. AWF pumps have coupling guards, flows up to 500 GPM and pressures up to 340 PSIG. All pumps come equipped with Carbide/Viton mechanical seals rated up to 300°F as standard. All pumps come equipped with an automatic flow control valve for balancing or throttling pump to the design condition point. The AWF-B version is mounted in either a horizontal or a vertical position to save floor space. The model AW is the close coupled version. The catalog number becomes a **DMEC-AWF** or **DMEC-AW** unit. This pump is typically used above 110 PSIG so as to lower the motor horsepower requirements.

Model T Pump

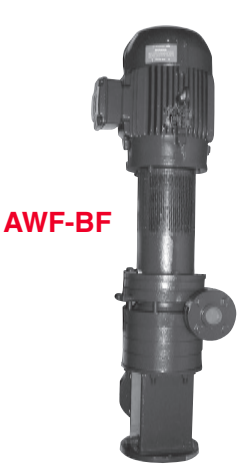
The Model T pump is a close coupled regenerative turbine pump. This pump is generally used as the least expensive alternative for low flow (up to 20 GPM) applications involving pressures above 110 PSIG (good to 700 feet). The Model 151 pumps deliver high efficiency performance with controlling costs. The catalog number becomes a **DMEC-T** unit. The Model T pump is not available for all capacities and discharge pressures. Consult pump curves. A suction strainer must be used with this pump to protect it from dirt and debris due to the close tolerance design.



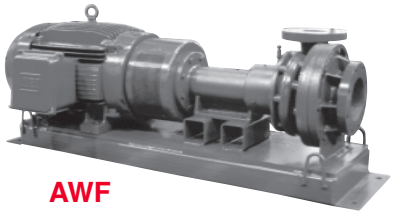
MODEL D & P
Vertical



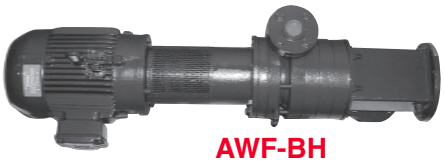
MODEL D & P
Horizontal



AWF-BF

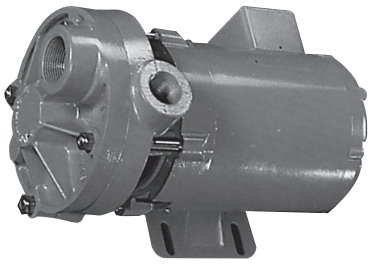


AWF



AWF-BH

MODEL AW / AWF / AWF-B — Multi-Stage



MODEL T — Horizontal

Optional Equipment

- Manual three-valve bypass around solenoid make-up valves (see Fig. A).
- Air gap assembly for make-up to meet state and/or local requirements.
- Inlet basket strainers to screen out debris in lieu of strainers when using non turbine boiler feed pumps (see Article on Suction Strainers in Bulletin for more information).
- Water level gauge to monitor water level in tank.
- Various styles of thermometers including dial, angle, digital, stainless steel, explosion proof, etc.
- On floor-mounted unit, suction isolation valves (see Fig. B) allow pump maintenance to be done without need to drain the receiver.
- Alarm bell with silencing relay and dry contacts for connection to building alarm systems.
- Low water cutoff to turn off boiler feed pumps if water level in tank gets too low.
- Low water and high water alarm to alert plant operators.
- Vinyl or metal jacketed insulation.
- Control panels that meet various NEMA ratings such as NEMA 1, NEMA 2, NEMA 4, NEMA 7, NEMA 12, etc. Panels may include either combination integral starter/circuit breakers or NEMA-rated starters with fused-disconnect or circuit breakers.
- Single point connection for control panels.
- Control circuit disconnects.
- Preheat. When injecting live steam into a receiver, external style float switch assemblies should be used because of the turbulence created that would cause a regular internal float switch assembly to bounce around (see Fig. C).

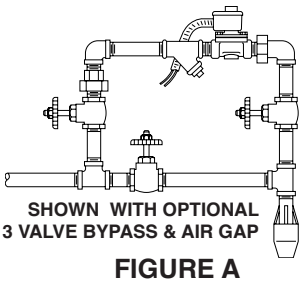


FIGURE A
Three-valve Make-up Bypass

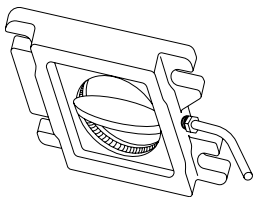


FIGURE B
Suction Isolation Valve (On Floor-mounted Units)

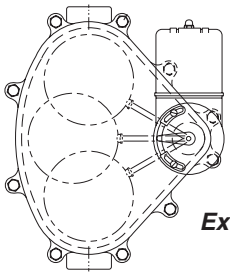


FIGURE C
External Float Switch Assembly

Preheat Option (Receivers 125 gallons and larger can be equipped with this option)

A boiler feed unit with a preheat option consists of a boiler feed receiver having an inlet for gravity and/or pumped returns. A stainless steel diffuser tube should be utilized for high-pressure returns and/or drips can be installed below the water line. A direct injection style heater assembly, sometimes called a preheat tube, made of slotted, stainless steel schedule 40 pipe is installed below the water to admit steam that is being regulated through a temperature regulator. Make-up water is admitted through a slow closing solenoid valve and external float switch assembly. An external float switch assembly should be used in lieu of an internal style for make-up, for cut-offs and alarms due to turbulence of the steam mixing with the water inside the vessel.

Sizing Boiler Feed Units

A properly sized and correctly installed Boiler Feed Unit can help reduce your overall operating costs by:

- Maintaining the proper water level for the most efficient operation.
- Retaining the high quality condensate to be reused and blended with the required make-up, thus reducing thermal shock and corrosion.

Sizing Pump Flow Rate

Pump selection is based on flow rate (GPM) and pump discharge pressure (PSIG). Boilers are usually rated in boiler horsepower (BHP). The evaporation rate (also referred to as condensing rate) of one boiler horsepower (BHP) is .069 gallons per minute (GPM). Therefore, to calculate the evaporation rate, multiply the BHP by .069. For example, the evaporation for 200 BHP would be 13.9 GPM (200 x .069).

However, sometimes the load of boilers may be stated in other metrics such as Square Feet EDR or lbs/hr. The table below shows equivalences to convert to BHP. For example, to convert EDR to BHP, divide load by 139.4.

	Condensing Rate (GPM)	BTUs/Hr.	Lbs/Hour	Sq. Ft. EDR
1 Boiler HP (BHP)	.069	33,475	34.5	139.4
1,000 Sq. Ft. EDR	.50	240,000	247.3	1,000

FIGURE D

Boiler Feed Applications

Pump flow rates are sized differently depending on the application:

a. Pumps Run On/Off

b. Pumps Run Continuously

For *On/Off applications*, the boiler feed pumps are typically sized at 2.0 times the evaporation rate.

For *Continuous Run* applications, the boiler feed pumps are typically sized at 1.5 times the evaporation rate.

This method of sizing boiler feed pumps helps to balance the boiler conditions and reduce thermal shock to the boiler. Thermal shock can be caused if the feed pumps are oversized. Oversizing also tends to cause short cycling. (Note: Some boiler manufacturers have special requirements that differ from the above guidelines.)

Surge Tank Applications

Surge tank pumps must be continuous run and are sized at the evaporation rate or full load of system.

For both boiler feed and surge tank applications, SHIPCO® pumps are fitted with bleed lines that eliminate the need for bypass orifices in most applications since the bleed line provides sufficient flow to protect the mechanical seal if the pump should dead head.

Sizing Pump Discharge Pressure

The rules-of-thumb for sizing the pump discharge pressure depend of whether pumps are used on a boiler feed unit or a surge tank and the type of application as explained below.

Boiler Feed Applications

Discharge pressure should be equal to the maximum boiler operating pressure, plus the increase in elevation, plus the friction loss of pipe, fittings, and valves, plus a safety margin of typically 5 to 10 PSIG. Good engineering practices also call for a balancing valve to be installed in the discharge piping. Balancing the pump will limit the motor horsepower load and help prevent cavitation.

Boiler feed units are usually located near the boilers they feed. To be safe you should determine the amount of vertical rise + friction loss in pipe + valve loss + feed valve loss (if any) + back pressure in line (boiler operating pressure) + a safety margin of approximately 5 PSIG. The amount of these values, or these values added together, are normally expressed in feet of head. To convert between PSIG and feet of head use the following equation: **2.31 feet of head = 1 PSIG**.

The discharge pressure on boiler feed pumps is sized differently depending on the type of application:

a. Boiler Feed Pump Runs On/Off
b. Boiler Feed Pump Runs Continuously (without a Stack Economizer)
c. Boiler Feed Pump Runs Continuously (with a Stack Economizer)

Boiler Feed On/Off applications generally have low-pressure steam boilers running in the range of .5 to 15 PSIG with returns. Returns could be gravity and pumped. Therefore, a discharge pressure of 20 PSIG should be adequate.

Boiler Feed Continuous Run without Stack Economizer application, an additional 10 PSIG is required to overcome the pressure drop through the modulating feed valve on the boiler. However, the Cv rating of the valve should be verified to ensure 10 PSIG is sufficient. Generally these applications have a high-pressure steam boiler.

Boiler Feed Continuous Run with Stack Economizer application, an additional 30 PSIG is required to overcome the pressure drop through both the modulating feed valve and the stack economizer. However, the Cv rating of the modulating valve and the pressure drop through the stack economizer should be verified to ensure the 30 PSIG is sufficient. Generally these applications have a high-pressure steam boiler.

Notes:

1) The discharge pressure for a boiler feed pump vessel must be able to overcome the boiler safety relief valve setting plus three percent of valve setting and meet most state and local codes.
2) The pressure drops mentioned above are based on the valves used in typical SHIPCO® designs. The pressure drops may vary based on the modulating valve used.

Surge Tank Applications

Transfer pumps run continuously. The discharge pressure of the transfer pumps on a surge tank are sized differently depending on the type of application:

a. Feeding an atmospheric deaerator
b. Feeding a pressurized deaerator

For *Atmospheric Deaerator* applications, the discharge pressure is 25 PSIG assuming a pressure drop of 10 PSIG through the modulating transfer valve.

For *Pressurized Deaerator* applications, the discharge pressure is 35 PSIG assuming a pressure drop of 10 PSIG through the modulating transfer valve and the safety relief valve set at 15 PSIG on the deaerator.

Notes:

1) The pressure drops mentioned above are based on the valves used in typical SHIPCO® designs. The pressure drops may vary based on the modulating valve used.

For more information on surge tanks, see SHIPCO® Bulletin 166.

Receiver Sizing — DMC and DMEC Units

The receivers in this series of units are sized to allow for approximately a 10 minute system lag time. The lag time of the system is the time from which the steam evaporated at the boiler, travels to the radiation device, condenses to water and returns to the boiler. This is adequate for most small systems. (Larger multi-building systems, the receiver is sized for a 15 minute lag time.)

Boiler required make-up water is added to the receiver on DMC Units. This helps, by tempering the make-up water, reduce thermal shock to the boiler.

Surge Tank Applications

On surge tank applications, the receiver is typically sized to provide 15 minutes Gross Gallons of storage, which equates to approximately 10 minutes of Net Gallons.

The Durable Line of Condensate Handling Equipment and Boiler Feed Pumps is constructed with Cast Iron Receivers that provide years of service even with the most aggressive waters.

- Receivers available from 25 gallon to 500 gallon capacity.
- Centrifugal Pumps designed for many years of dependable service with low maintenance.
- Pumps are bronze fitted to resist corrosion and prevent seizing.
- Bronze impellers are cast one piece construction trimmed and balanced to design capacities.
- Pump has no internal bearings. (Motor bearings—refer to motor manufacturer's instructions.)
- Units are available in most popular voltages.
- Control panels are (optional) available and can be factory mounted and wired to NEMA and J.I.C. specifications. (Note: Magnetic Starters should be provided for all three phase motors.)

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