



TOWLE WHITNEY LLC



TW1111-15R-50

VARIABLE SPEED BOOSTER SYSTEM

Revised 12/31/18



The **TW1111-15R-50** booster system is equipped with a Stainless Steel centrifugal pump and regulated by a NEMA4 variable frequency drive. The system will supply 15 GPM with a 50 PSI overboost. This system is built, programmed, and tested. The plumbing components are assembled in the field.

Rating

- Yaskawa VFD IP66 / NEMA 4 / 122F (derated)
- Disconnect Box IP65 / NEMA 4
- Pump IP54 / 131F
- Transducer IP65
- Wire Submersible Pump UL SEOOW

Lead-Free (Wetted) components:

- Centrifugal Pumps: 304 SS
- Relief valves: Lead Free Brass
- Pressure Gauges: SS
- Transducer: SS
- Valves Lead Free Brass
- Fittings: Lead Free Copper or SS

* All lead-free brass shall contain <.25% Pb



Technical Specifications:

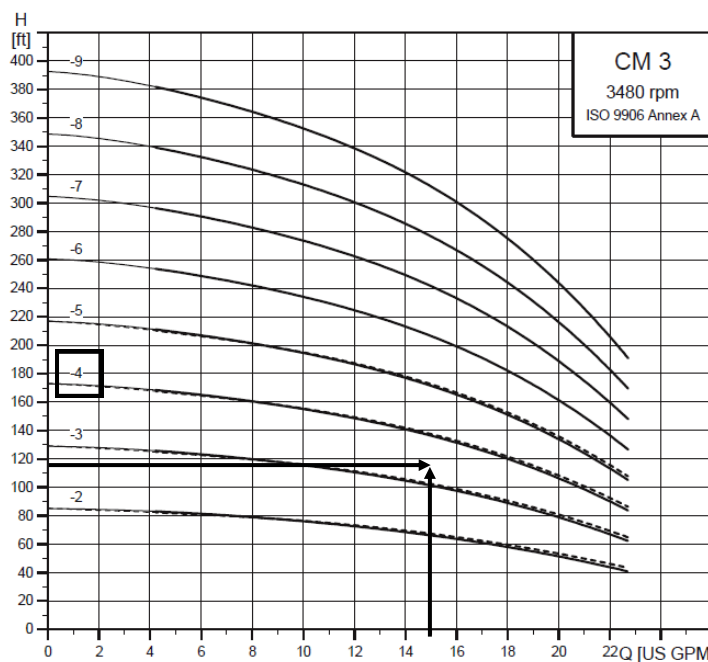
Pump: Grundfos CM3-4 (I) series TEFC/ 1 Hp
Controller: Yaskawa
Flow Rate: 15 GPM
Boost: 50 PSI (115')
Suction: 1 inch
Discharge: 1 inch
Footprint: 18" W x 32" H x 12" D
Weight (appr): 70 lbs
Disconnect: Prewired to VFD

SPECIFY WHEN ORDERING

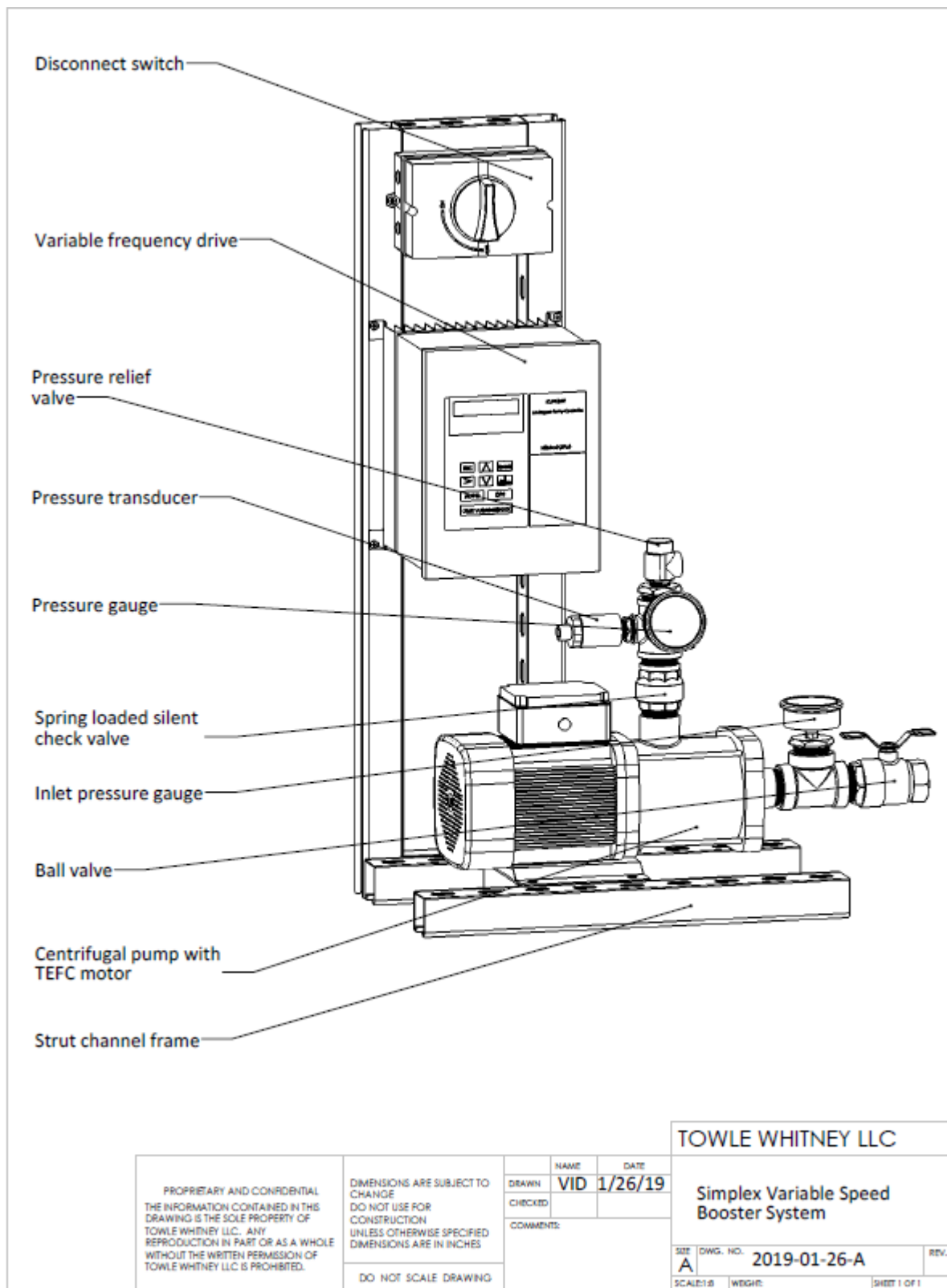
1. Discharge Pressure: _____ PSI
2. Power: Independent circuit recommended

* use VFD Input amps for circuit breaker sizing

	VFD Input*	VFD Output	Pump
	Current (Amps)	to pump	Amps
208/1	13.8	6.0	3.6
208/3	7.3	6.0	3.6
480/3	4.3	4.1	1.8



Pump performance curve





GENERAL SPECIFICATIONS

Assembled Units:

- All “wetted surfaces” shall be lead free (<.25% Pb) in conformance with the 1/4/14 federal law
- Shall have a NEMA4 variable frequency drive (VFD) for OUTDOOR USE
- System supplied with a pressure transducer, pressure gauge, and two relief valves
- Each system shall rely on existing roof-top expansion tanks
- System shall be wired to a separate and NEMA4 independent disconnect box

Variable Frequency Drive (VFD) shall:

- Be IP66 / NEMA 4 rated
- Cover for control pad protection
- Shall be rated for specified power requirement, efficiency shall be 98% or better at full speed
- All factory preset values and/or last saved data values must remain available in the event of a complete power outage
- Operate to a program that protects the pump against damaging hydraulic conditions such as:
 - Motor overload, pump overflow surges, loss of prime due to incoming water supply interruption, hunting, overload through frequency/current optimization, hydraulic damage by restricting the pumps to operate beyond their published end of curve
- Automatically restart after an over-current, over-voltage, under-voltage or loss of input signal protective trip
- Include a feature to upload / download parameters into an external device.
- Have a removable non-volatile memory device
- Transducer inputs must be wired to the variable frequency drive for continuous scan and comparison function.
- Utilize a proportional ladder logic program - integral - derivative control function
- Display the following values:
 - Pump running/standby, pump speed in Hz, user adjustable parameters such as PID set points
 - Motor frequency, motor current, threshold set points for PID error, minimum operating frequency

Transducer:

- Shall be IP65 rated
 - Protected from total dust ingress
 - Protected from low pressure water jets from any direction
- Shall be provided to supply all pressure signals to the variable frequency drive
- Shall be rated for required system pressure and shall be 4-20 mA analog

Centrifugal pump:

- Shall be IP55 rated
 - Protected from limited dust ingress
 - Protected from water spray from any direction
- Shall have 304 stainless steel casing and impellers.
- Shall have a 316 stainless steel shaft sleeve and a replaceable tungsten carbide + HNBR mechanical seal
- Mechanical seal shall be rated to withstand pressure of up to 142 PSI
- Motor shall be totally enclosed fan cooled (TEFC) and manufactured in compliance with CE, RoHS and CSA

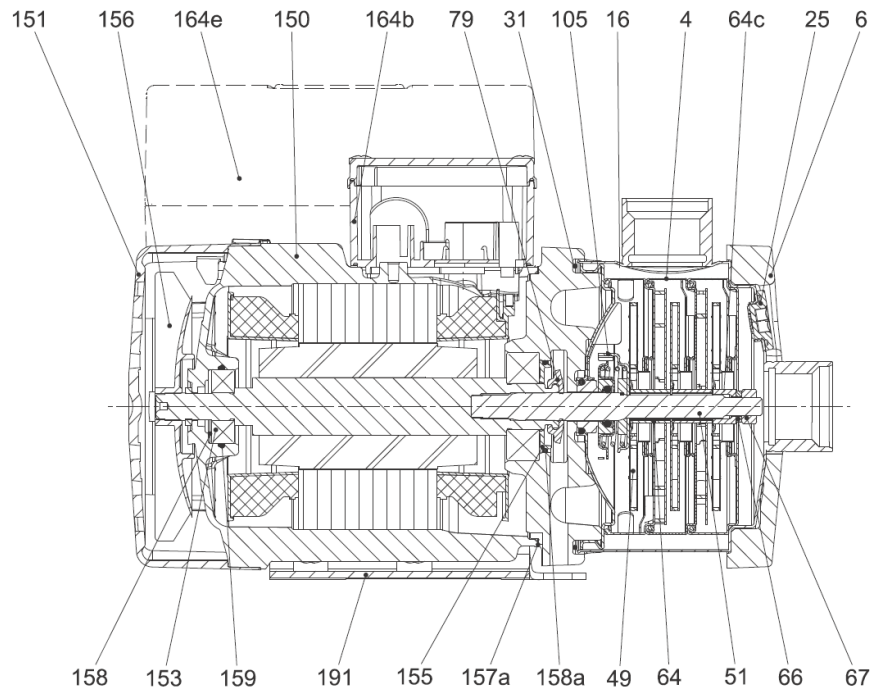
Pneumatic expansion tank: Supplied by Others

- Shall be pre-charged to a pressure of 10 PSI below system operating pressure

Valves and fittings: Installed on-site

- Shall be sized appropriately to allow water velocity not exceeding 10 ft/sec, to minimize cavitation and turbulence
- Check valve shall be spring-loaded and silen
- Suction ball valve shall be provided
- Double check backflow assembly shall be supplied

DCA Backflow Preventer: Supplied by Others, Installed on-site



TM04 3722 3809

Fig. 8 CM(E) 1-3 with ML(E) 71 motor

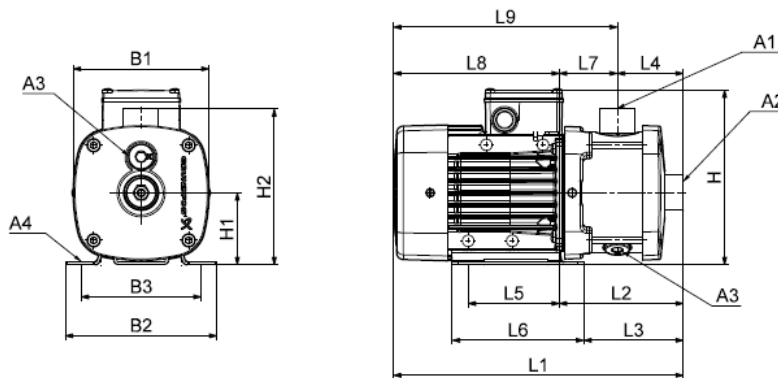
Components

Pos.	Component	Pos.	Component	Pos.	Component
4	Chamber	64c	Clamp	155	Bearing cover plate
6	Flange	66	Washer (NORD-LOCK®)	156	Fan
16	Sleeve	67	Nut	157a	Gasket
25	Plug	79	Diverting disc	158	Corrugated spring
31	O-ring	105	Shaft seal	158a	O-ring
49	Impeller	150	Stator housing	159	O-ring
51	Pump shaft	151	Fan cover	164b, 164e	Terminal box
64	Spacing pipe	153	Ball bearing	191	Base plate



Material specification

Pos. Description Material			Pump material version			
			CM(E) A Cast iron (ASTM A48 CL30/ EN-GJL-200)		CM(E) I Stainless steel (AISI 304 / EN 1.4301)	
			DIN W.-Nr.	ISO/AISI/ASTM	DIN W.-Nr.	ISO/AISI/ASTM
Motor parts						
156b	Motor flange	Cast iron				
150	Stator housing	Silumin (Alu)				
151	Fan cover	Composite PBT/PC				
153	Ball bearing					
156	Fan	Composite PA 66 30 % GF				
158	Corrugated spring	Steel				
164b	Terminal box, MG	Composite PC/ASA or silumin (Alu)				
164e	Terminal box, MGE					
191	Base plate	Steel, electro-coated	1.0330.3	ASTM A366 / A611-C1	1.0330.3	ASTM A366 / A611-C1
		Steel, powder-coated, 60 to 120 µ, NCS 7005				
79	Diverting disc	Silicone fluid (LSR)				
155	Bearing cover plate	PPS				
Pump parts						
105	Shaft seal, steel parts	Stainless steel	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}
	Shaft seal, seal faces	SiC/SiC or Al ₂ O ₃ /carbon				
51	Pump shaft	Stainless steel	1.4301	AISI 304	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}
11 31 ¹⁾ 158a 159	O-rings	EPDM, FKM or FFKM				
157a ¹⁾	Gasket	Paper				
139b ²⁾	Gasket	Aramide fibers (nbr)				
2 ²⁾	Discharge part	Cast iron				
6 ²⁾	Inlet part	Cast iron				
4	Chamber	Stainless steel	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}
25	Plug	Stainless steel	1.4404	AISI 316L	1.4404	AISI 316L
49	Impeller	Stainless steel	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}	1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}
64	Spacing pipe	Stainless steel	1.4401	AISI 316	1.4401	AISI 316
64c	Clamp	Stainless steel	STX2000 ³⁾		STX2000 ³⁾	
6 ¹⁾	Flange	Cast iron				
16	Sleeve	Stainless steel			1.4301/ 1.4401 ^{*)}	AISI 304/ AISI 316 ^{*)}
67	Nut	Stainless steel A4				
66	Washer (NORD-LOCK®)	Steel	1.4547 ⁴⁾		1.4547 ⁴⁾	



TM04 2246 2208

Dimensions

3 x 208-230 V / 440-480 V, 60 Hz (supply voltage E)

3 x 575 V, 60 Hz (supply voltage H)

Pump type	Frame size	P ₂ [hp]	NPT			Rp	Dimensions [in (mm)]														
			A1	A2	A3		A4	B1	B2	B3	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	L8
CM 3-2	71	0.58	1"	1"	3/8"	0.39 (10)	5.59 (142)	6.22 (158)	4.92 (125)	7.52 (191)	2.95 (75)	6.50 (165)	12.00 (305)	5.16 (131)	4.21 (107)	2.83 (72)	3.78 (96)	5.39 (137)	2.36 (60)	6.85 (174)	9.21 (234)
CM 3-3	71	1.0	1"	1"	3/8"	0.39 (10)	5.59 (142)	6.22 (158)	4.92 (125)	7.52 (191)	2.95 (75)	6.50 (165)	12.00 (305)	5.16 (131)	4.21 (107)	2.83 (72)	3.78 (96)	5.39 (137)	2.36 (60)	6.85 (174)	9.21 (234)
CM 3-4	71	1.0	1"	1"	3/8"	0.39 (10)	5.59 (142)	6.22 (158)	4.92 (125)	7.52 (191)	2.95 (75)	6.50 (165)	12.72 (323)	5.87 (149)	4.92 (125)	3.54 (90)	3.78 (96)	5.39 (137)	2.36 (60)	6.85 (174)	9.21 (234)
CM 3-5	80	1.4	1"	1"	3/8"	0.39 (10)	5.59 (142)	6.22 (158)	4.92 (125)	7.52 (191)	2.95 (75)	6.50 (165)	15.0 (381)	6.57 (167)	5.63 (143)	4.25 (108)	3.78 (96)	5.39 (137)	2.36 (60)	8.43 (214)	10.79 (274)
CM 3-6*	80	1.7	1"	1"	3/8"	0.39 (10)	5.59 (142)	6.22 (158)	4.92 (125)	7.52 (191)	2.95 (75)	6.50 (165)	16.42 (417)	7.99 (203)	7.05 (179)	5.67 (144)	3.78 (96)	5.39 (137)	2.36 (60)	8.43 (214)	10.79 (274)
CM 3-7*	90	2.3	1"	1"	3/8"	0.39 (10)	7.00 (178)	7.00 (178)	5.51 (140)	7.87 (200)	3.54 (90)	7.09 (180)	18.39 (467)	9.57 (243)	8.98 (228)	5.67 (144)	4.92 (125)	6.10 (155)	3.90 (99)	8.82 (224)	12.72 (323)
CM 3-8*	90	3.4	1"	1"	3/8"	0.39 (10)	7.00 (178)	7.00 (178)	5.51 (140)	7.87 (200)	3.54 (90)	7.09 (180)	19.80 (503)	10.98 (279)	10.39 (264)	7.09 (180)	4.92 (125)	6.10 (155)	3.90 (99)	8.82 (224)	12.72 (323)
CM 3-9*	90	3.4	1"	1"	3/8"	0.39 (10)	7.00 (178)	7.00 (178)	5.51 (140)	7.87 (200)	3.54 (90)	7.09 (180)	19.80 (503)	10.98 (279)	10.39 (264)	7.09 (180)	4.92 (125)	6.10 (155)	3.90 (99)	8.82 (224)	12.72 (323)

3 x 208-230 V/440-480 V, 60 Hz (supply voltage E)

Frame size	P ₂ [hp]	Service factor	I _{1/1} [A]
71	0.58	1.0	1.9 - 1.7 / 1.0 - 0.8
71	1.0	1.0	3.4 - 3.6 / 1.7 - 1.8
80	1.4	1.0	4.1 - 3.9 / 2.0 - 2.0
80	1.7	1.0	5.1 - 4.9 / 2.48 - 2.46
90	2.3	1.0	6.25 - 5.85 / 3.1 - 2.8
90	3.4	1.0	9.8 - 8.9 / 2.98 - 2.85

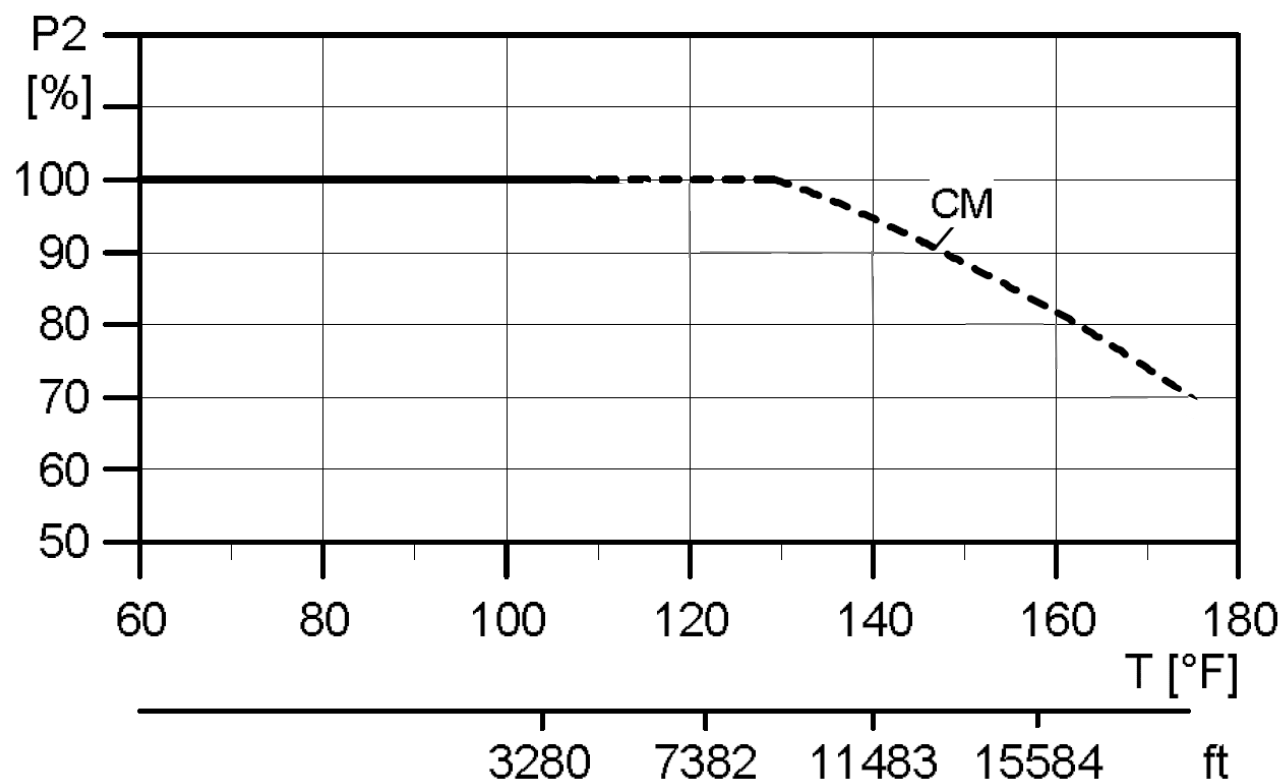


Ambient temperature and altitude

Maximum ambient temperature in relation to liquid temperature

The maximum ambient temperature depends on the liquid temperature as shown in the table below.

Max. ambient temperature [F° (°C)]	Liquid temperature [F° (°C)]
+131 (+55) ¹⁾	+194 (+90)





VARIABLE FREQUENCY DRIVE WARRANTY AND SPECIFICATIONS



The V1000-4X is a version of the standard V1000 in an integral enclosure that meets NEMA type 4X/12 indoor use requirements, UL type 4X/12 standards, and the IP66 rating of IEC 529. This enclosure provides the protection required in tough washdown or dust-tight environments, common in Food and Beverage Processing, Packaging, Metal Machining, Woodworking, Pumping, Refrigeration, and Printing. The enclosure is coated to protect against the harmful effects of sanitizing chemicals commonly used in food industries.

NEMA 4 YASKAWA

Performance Features

- Ratings:
 - 1/8 to 3 HP at 200-240 VAC 1-Phase
 - 1/8 to 25 HP (ND) at 200-240 VAC 3-Phase
 - 1/2 to 25 HP (ND) at 380-480 VAC 3-Phase
- Overload Capacity:
 - 150% for 60 sec. (Heavy Duty)
 - 120% for 60 sec. (Normal Duty)
- Control Methods: V/f Control, Open Loop Current Vector Control, PM Open Loop Current Vector Control, Simple closed loop speed control
- DC injection braking, ramp to stop
- Electronic reversing
- Adjustable accel/decel: 0.01 to 6000 seconds
- Controlled speed range:
 - 40:1⁽¹⁾ 100:1⁽²⁾
- Speed Regulation:
 - ± 0.5 to 1% with slip compensation⁽¹⁾
 - ± 0.2%⁽²⁾
- Displacement power factor: 0.98
- Output frequency: 0 to 400 Hz
- Frequency resolution:
 - 0.01 Hz with digital reference
 - 0.06 / 60 Hz with analog reference
- Frequency accuracy:
 - 0.01% with digital command
 - 0.5% with analog command
- Volts / hertz ratio: infinitely adjustable pattern
- DC Injection braking: adjustable amplitude, duration, current limited
- Torque boost: full range, auto
- Power loss ride-thru: 0.5 sec.
- Speed search
- Auto restart
- 3 Critical frequency rejection settings
- Slip Compensation
- Energy Savings Function
- Enhanced PID with loss of feedback function

Design Features

- Dual microprocessor logic
- Digital keypad operator, 5 digits
- LED status display, door-mount
- Remote Mount Keypad Capability
- RJ-45 Style Digital Operator Connector
- 7 multifunction digital inputs
- 3 multifunction digital outputs
- Hardwire baseblock (EN954-1 Cat. 3)
- Programmable form C output contact for customer use: 1A at 250 VAC or 30 VDC
- 24 VDC control logic compatible with sourcing or sinking outputs (PNP or NPN)
- Carrier frequency: 15 kHz max; swing PWM
- 16 multi-speed settings plus jog speed
- 2 Remote speed references:
 - 0-10 VDC (20 kohms) or isolated
 - 4-20 mA (250 ohms)
- Signal follower: bias and gain
- 2 programmable open collector outputs
- Analog monitor output:
 - 0-10 VDC proportional to output frequency or output current
- Approximately 400 parameters
- Digital pulse train input (33 kHz max.)
- Cooling fan controlled by drive run/stop
- RS-422/485 Modbus 115 kbps
- UL recognized electronic overload
- MTBF: 28 years
- Built-in Dynamic Braking Transistor
- NEMA 4X/IP66 enclosure
- Application presets
- Maintenance monitors

⁽¹⁾ V/f Mode

⁽²⁾ Open Loop Current Vector Mode

Protective Features

- Current limit, stall prevention during accel, decel, and run
- Motor and drive overload
- Over voltage prevention function
- Instantaneous over current
- Short circuit
- Under voltage
- Heatsink overheat
- Ground fault protection
- Over/under torque
- Short circuit withstand rating: 30K RMS

Service Conditions

- Ambient service temperature:
 - 10° to 40°C (+14° to 104°F) NEMA 1
 - 10° to 50°C (+14° to 122°F) Open Chassis
- Ambient storage temperature:
 - 20° to 60°C (-4° to 140°F)
- Humidity: to 95% non-condensing
- Altitude: to 3300 ft; higher by derating
- Service factor: 1.0
- Input voltage: -15% to +10%
 - 200 to 240 VAC, 380 to 480 VAC
- Input frequency: +/-5%; 50/60 Hz
- Input phase sequence insensitive

Options

- 120VAC Interface
- Profibus-DP, DeviceNet Communications
- Modbus TCP/IP, EtherNet/IP Communications
- DriveWizard™ Plus
- Y-Stick Copy Unit
- Reactors, 3% and 5%
- Dynamic Braking Resistor (external)
- Multi-lingual, full text remote LCD with copy
- EMC filter Type C1

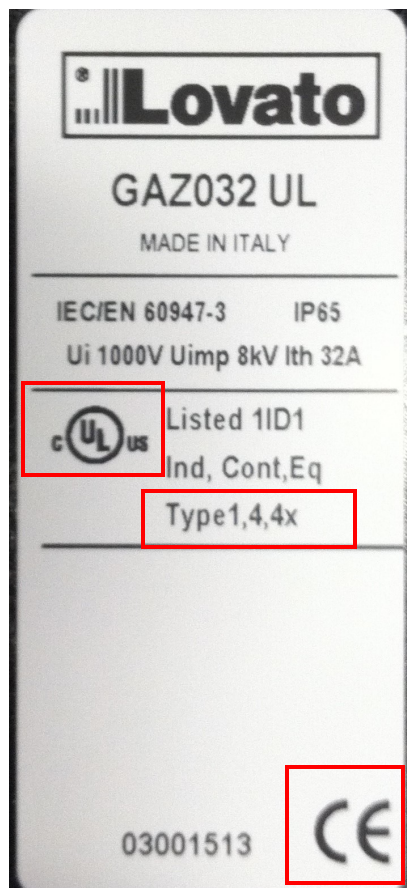
Standards

- UL 508C (Power Conversion)
- CSA 22.2 No. 14-95 (Industrial Control Equipment)
- UL, cUL listed; CE marked
- RoHS compliant
- EN 50178 (LVD)
- EN 50081-2, EN 50082-2 (EMC)
- EN 954-1, Category 3 Safety Standard
- EN 61800-3
- IEC 529, 146
- FCC CFR 47 Part 15 Subpart B (w/ External Filter)
- TUV
- NEMA type 4X/12
- IP66 rating of IEC60529

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Booster Pump System Three Year Limited Warranty



This warranty applies to booster pump systems built by Towle Whitney LLC for Evaporcool, and shall exist 36 months from the date of shipment.

Towle-Whitney LLC liability under this warranty shall be limited to the repair or replacement of any part or parts found to be defective (material or workmanship) within the warranty period. Towle-Whitney LLC shall determine whether the part needs to be returned, or field scrapped. The warranty excludes:

- Any water damage or consequential damage.
- Transducers and pump seals.
- Debris in water causing internal pump damage.
- Systems not installed in accordance with Installation and Maintenance Instructions.
- Labor, transportation, and related costs incurred by the customer.
- Misuse, negligence, inappropriate chemicals or additives in water.
- Inadequate protection from freezing.
- Lightning, high voltage spikes, accidents, floods, or acts of God.
- Re-Installation costs of repaired or replacement equipment.
- Re-Imbursement for the loss caused by interruption of service.

This warranty applies to all states and territories of the United States and Canada only. There are no express or implied warranties, including merchantability or fitness for a particular purpose, which extend beyond those warranties described or referred to above.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.