Installation and Operators Manual

Model: Tower Clean (TC) & Sidestream Clean (TB)

Systems Start-Up Instructions

FRESNO, CALIFORNIA, USA

LS-591F REV(2/24)

Tower Clean (TC) & Side Stream Clean (TB) System I&O Manual

I. INTRODUCTION

The LAKOS Tower Clean and Side Stream Clean are compact filtration packages for the removal of grit, airborne particles and scale from cooling tower water in order to avoid system fouling.

Featuring the centrifugal-action performance of a LAKOS Separator, the packages combine quality, reliability and engineered efficiency to control the accumulation of troublesome solids in a heat transfer system. This control leads to a reduction in tower cleaning, system shutdown, maintenance & servicing costs, blowdown and water/chemical loss. You will enjoy the energy/operating savings of reduced solids fouling.

The Tower Clean System continuously recirculates the tower basin water, where appropriate using LAKOS HydroBoosters to provide the necessary directed turbulence and to prevent not only solids accumulation in the basin, but also help protect the entire system from solids fouling. The Side Stream Series is installed as a side stream system off of a pump discharge in a main water line.

II. Warranty

Refer to www.lakos.com/warranty for full warranty details.

All products manufactured and marketed by this corporation are warranted to be free of defects in material and workmanship for a period of at least one-year from the date of delivery. Extended warranty or no coverage applies as follows:

**All LAKOS separators---five year warranty
**Pump seals are not covered under warranty

All other components and coatings: 12 months - beginning at the ship date from factory.

If a fault develops, notify us or your local representative, giving a complete description of the alleged malfunction. Include the model numbers(s), date of delivery and operating conditions of subject products(s). We will subsequently review this information and, at our option, supply you with either servicing data or

shipping instructions with a returned materials authorization number. Upon prepaid receipt of subject product(s) at the instructed destination, we will perform such necessary product repairs or replace such product(s) at our expense. This limited warranty does not cover any products, damages or injuries resulting from misuse, misapplication, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or cost resulting from any such defective product(s).

This warranty supersedes any and all previous warranties provided by LAKOS Corporation.

III. PRE-ASSEMBLY/PRE-START-UP CHECK LIST

1. A licensed and/or trained/experienced plant electrician and millwright-pipe fitter should install this packaged system.

2. Ensure that the concrete pad is level and structurally sound to accommodate the weight of the system, including liquid weight.

3. To firmly position this unit, appropriate size anchor bolts are necessary.

4. To minimize pipe strain to the separator, suction and discharge pipes should be supported independently.

5. The pump suction line should be sized for about 5 ft/sec. regardless of the actual pump suction size. Minimize suction lengths (no more than 30') and restrictions such as elbows. These practices will minimize friction losses and help extend pump seal life. Exceptions may apply if a qualified individual calculates NPSHA and NPSHR for the pump.

6. The threads of the pipe fittings screwed into the pump must be sealed with pipe sealants, Teflon tape, R.T.V. or other sealing materials approved for pipe threads. In case of flanged connections, rubber gaskets should be used.

7. Tighten pump and pipe fittings only as much as required to avoid leaks and air intrusion. Air entrapment into the pump may affect its efficiency and result in cavitation. DO NOT OVER-TIGHTEN.

8. The control panel must be wired for the proper voltage and rotation of

the pump (see wiring diagram in control box door). All wiring should be done by a licensed electrician in accordance with local codes.

Motor nameplates indicate voltage, amperage draw, cycles, phase, speed and other motor information.

9. **Allow water to enter the pump**, jog-start the pump to verify correct rotation as indicated in the pump's housing. Reverse terminal leads as necessary.

10. LAKOS Separators & Systems must be installed downstream of the main System Pump. Do not install on the suction side of the main system pump. Flow must be pushed through the separator and not pulled. Consult LAKOS for questions.

IV. START-UP AND OPERATION

1. FOR FLOODED SUCTION

The pump suction strainer needs to be filled with water before starting the Pump (Tower Clean Systems only). Partially close (approximately 25%) the discharge valve and make sure that the suction valve is fully open (valves may be used as dual purpose throttling/isolation). Start the pump and observe the pressure gauge which reads the discharge pressure of the pump at the inlet of the separator. The needle of the gauges might flicker for a few seconds and will then settle, indicating that any air in the system is being bled off naturally. If it continuously flickers and if the pump cavitates for more than a minute, bleed-off air from the system.

Once pressure has reached 20 psi or more (Tower Clean System) or 15 psi (Side Stream System), slowly open the discharge valve to ensure proper pump operation. If the valve cannot be fully opened without the pump cavitating, be sure there are the correct number of Hydro-Boosters installed downstream of the Tower Clean System. The hydroboosters do provide some back pressure to the system, but the piping between the LAKOS filtration package may create a need for additional throttling of the discharge valve to bring the system within the acceptable pressure drop range. So in Tower Clean and Side Stream System applications, the discharge valve (throttling/isolation) may need to be adjusted to ensure proper back-pressure on the pump. This is normal.

NOTE:
Make sure that all suction valves (from the source of water to the pump intake) are fully opened when the pump is running. Operating the system with a partially closed suction valve can damage the pump and/or affect the system's performance. Each model requires a minimum liquid submergence level (above the pump intake) to meet the pump's Net

Positive Suction Head Required (NPSHR) to avoid air intrusion or cavitation (vortexing at point of source). See appropriate pump curve included with this manual. This is also very important when LAKOS Hydroboosters are in use.

Entrapped air will always seek the highest elevation in the system. A valve in the system outlet will be at the highest elevation. When partially opened during start-up, it will relieve air from the system.

The Solids Recovery System, if installed with your system, must also be primed and vented at the solids collection vessel (SRV). Please see SRV operating procedure.

DO NOT DRY-RUN THE PUMP. All pumps require a wet/primed suction before starting, using water as a lubricant for their seals. John Crane-type seals (e.g., Silicon Carbide Seals) can wear out in 20 seconds of dry operation. It only takes a small amount of water to lubricate the seal, and it vaporizes during pump operation. Also, when replacing the seals, avoid touching the Silicon Carbide faces; oils, moisture and dirt from fingers escalate seal wear.

2. FOR NEGATIVE SUCTION (LIFT)

If the water level of the sump is lower than the centerline of the pump inlet, the use of a self-priming pump might be necessary. Follow priming procedures every time the pump is started.

Consult the factory for systems requiring suction lift.

3. WINTERIZING

In areas subject to freezing winter temperatures, protect the pump when not in use by removing both drain plugs (from the pump volute and from the suction strainer). Use a compressed air hose to remove any water trapped in the pump casing or flush the system with antifreeze. Do not replace the plugs. Store them in the strainer basket for the winter.

Alternatively, remove the pump and motor from the plumbing entirely. Store them indoors in a warm and dry place.

The separator and the purge line should also be drained of liquid to prevent damage from freezing. To remove trapped water from the separator, use a compressed air hose, directed into the acceptance chamber. Alternatively, flush system with antifreeze.

Heat tracing or pipe insulation may be used. Please contact your local supplier of these products to ensure proper usage.

V. MAINTENANCE

1. A TC/TB System START-UP FORM is included in this manual. Record all readings (inlet and outlet pressures, motor amperage draw and liquid flow rate) during start-up as reference point (see note 3). Please complete the required information and return this form to your local representative as soon as possible. You may want to keep a copy for your records.

2. Record and compare these readings whenever periodic check-up and maintenance is required. These records will be helpful in troubleshooting the system when a problem occurs during the operational life of the system.

   A. SUCTION STRAINER BASKET:

   The suction strainer basket is sized to allow a maximum pressure drop of 2 psi at the specified flow rate. It will protect the pump, separator, flow control valves and other equipment from becoming plugged by dirt and debris 1/4" in size and greater. The strainer basket is easy to clean. Isolate the strainer by closing the isolation valves installed before the pump and after the separator outlet. These are not provided as a standard option by Lakos, but are available if a valve kit is ordered. Loosen the nuts or threaded stud and remove the lid. Remove the basket and clean. Inspect the 'O' ring or gasket and, if damaged, replace. Replace the lid and tighten the nuts.

   B. PUMP AND MOTOR

   Make sure that there are no leaks in the pump housing. If leaks occur at the back of the volute casing, you may have a damaged seal (pump seals are not covered under warranty) and/or loose bolts. Replace and/or tighten as necessary.

   Whenever maintenance or repair is needed for the pump, SHUT-OFF and LOCK-OUT power into the panel feeding the pump; close the suction and discharge valves, open drain plug/valve, making sure no air or hydraulic pressure is in the system before unhooking the pump. Refer to Pump Manual.

   Outside air is very important to cool the motor. The TEFC motor has a fan in the back. Ensure that the fan is rotating when motor is energized. Zerk fittings were installed in the front and back of the

pump shaft/bearing housing. A small amount of grease might be needed periodically to replenish the old grease in the housing. Whenever new grease is injected, the old grease will ooze out on the opposite side. Wipe it clean. Whenever motor is required to be unhooked/repaired, follow shut-off lock-out procedure and refer to the pump/motor manufacturers I&O manual as required.

C. CONTROL PANEL/PUMP STARTER:

A blown-out fuse and/or consistently kicked-back circuit breaker is indicative of a motor overloading/overheating. The built-in thermostat in the motor is experiencing an excessive rise in temperature, which might be caused by sudden voltage increase/drop, phase imbalance or over-torqued shaft. Verify motor bearings, terminal connections for looseness and correctness. Verify pump is rotating freely. Mechanical interference inside the pump might be causing this problem.

Under-rated circuit breakers, contactors, relays and/or heaters will also cause this situation. Use appropriately sized components. Also, undersized wires/cables might cause shorting and overheating. An excessively hot environment might also cause premature failure of motor and electrical components. Avoid installing system in direct sunlight or near heated objects or equipment. Vibrating equipment may cause loosening of terminal bolts and screws; make sure vibration is dissipated whenever the TC System is required to be installed in such a location.

D. PRESSURE GAUGES:

Stuck needles/pegged gauges might indicate false readings. Verify their operation by opening and closing petcock valve installed before the gauges. Replace gauges, if necessary.

NOTE: *Each System is provided with either a SRV Solids Recovery System (see "E" below), Compact Motorized Ball Valve (see "F" below) or ABV (see G below) for evacuating separated solids from the system. Follow the appropriate instructions for your system componentry.*

E. SRV SOLIDS RECOVERY VESSEL:

SYSTEM DESCRIPTION
LAKOS Solids Recovery Systems are intended for the purpose of continuously collecting and concentrating separated particle matter from the purge outlet of a LAKOS Separator.

EQUIPMENT CHECK & ASSEMBLY

The basic SRV System includes a bag-like housing. Standard systems include an auto air vent assembly and either 2 solids collection bags (single bag units) or 6 solids collection bags (triple bag units), typically inserted in the SRV vessel for shipping. Open the vessel and remove all extra items (except for one bag per basket assembly, properly seated in the internal basket). Be sure the stainless steel basket is seated properly with the o-ring under the upper lip.

START-UP PROCEDURES

Do not attempt to start-up the SRV System until the LAKOS Separator is in full operation. Then, follow these steps:

1. Close the manual valve going to the pump suction.
2. Fully open the manual valve on the purge line coming from the separator.
3. The Auto Vent on the top of the SRV lid will vent air (this will be audible) until the SRV is filled with water.
4. Fully open the valve going to the pump suction. If the Indicator Package is installed, check the sight glasses for proper flow to and from the SRV vessel. System is now in operation.

MAINTENANCE PROCEDURES

Separated solids collected in the SRV vessel must be periodically removed. The collector bag may be cleaned and re-used (up to three times) or discarded and replaced. This operation can be performed without interrupting system flow or the LAKOS Separator's operation (see instructions below). Recommended maximum solids load per bag is 25 lbs. (11 kg) or until 18 psid is reached indicated by the "red" zone on the differential gauge attached to the SRV.

The Indicator Package uses a pressure-differential sensor to identify when the bag should be serviced. The standard gauge will point to a red zone, indicating service is needed. The optional dry electric contact will engage whatever indicator is connected (a light, buzzer, horn, etc. which is not provided as a standard option).

Follow these steps:

1. Close the manual valve on the purge line off the separator.
2. Close the manual valve on the line going to the pump suction. **IMPORTANT:** *Wait until <u>all</u> pressure has been released before proceeding.* Open the lid to the SRV vessel. Grasp the handle

and remove the entire assembly from the SRV vessel. Remove the bag(s) and clean/replace in the basket.

3. Check o-rings on the basket lip and SRV vessel lid; replace if damaged. Replace the basket/bag assembly in the SRV vessel. Close lid and secure properly.
4. Fully open the manual valve on the purge line.
5. The Auto Vent will vent all air from the SRV vessel.
6. Fully open the valve going to the pump suction. If the Indicator Package is installed, check the sight glasses for proper flow to and from the SRV vessel. System is now back in operation.

F. <u>COMPACT MOTORIZED BALL VALVE:</u>

COMPONENT FUNCTION

The LAKOS Compact Motorized Ball Valve provides for periodic and automatic flushing of separated solids at timed intervals selected by the system operator.

PROGRAMMING FUNCTIONS

The controls for programming this valve are located within the cover on the valve's actuator. **CAUTION: Before removing the valve cover to program the valve, disconnect power to the TC System's control box in order to avoid electrical shock.**

Loosen the valve cover's screws and remove the cover to reveal a bank of eight (8) switches. Each must be programmed in order to set the Purge Duration (how long the valve will stay open each time) and the Purge Frequency (how often the valve will open). To set these times, the switches must be set ON (marked below as an "O") or OFF (marked below as an "X") in the exact pattern as shown.

(see charts on next page)

PURGE DURATION

Switch No.				
sec.	1	2	3	4
12	X	O	X	X
18	O	O	X	X
24	X	X	O	X
30	O	X	O	X
36	X	O	O	X
42	O	O	O	X
48	X	X	X	O
54	O	X	X	O
60	X	O	X	O
66	O	O	X	O
72	X	X	O	O
78	O	X	O	O
84	X	O	O	O
90	O	O	O	O

PURGE FREQUENCY

Switch No.				
hr:min.	5	6	7	8
:15	O	X	X	X
:30	X	O	X	X
:45	O	O	X	X
1:00	X	X	O	X
1:15	O	X	O	X
1:30	X	O	O	X
1:45	O	O	O	X
2:00	X	X	X	O
2:15	O	X	X	O
2:30	X	O	X	O
2:45	O	O	X	O
3:00	X	X	O	O
3:15	O	X	O	O
3:30	X	O	O	O
3:45	O	O	O	O

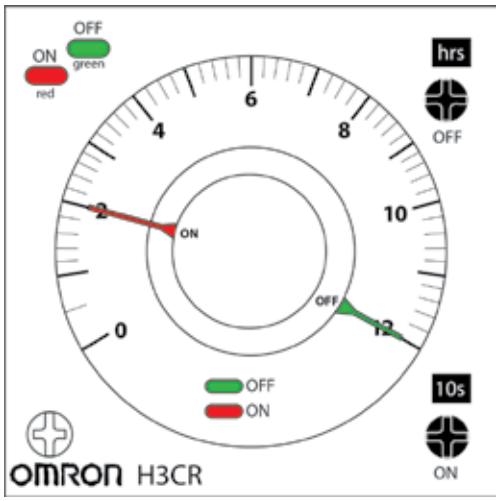
Once the valve has been programmed, be sure to replace the cover and tighten securely.

To manually open the valve, press and hold the external button on the valve housing. Valve will open for the purge duration that has been programmed.

G. ABV (Automatic Ball Valve w/ controller)

COMPONENT FUNCTION
The LAKOS Automatic Ball Valve provides for periodic and automatic flushing of separated solids at timed intervals selected by the system operator.

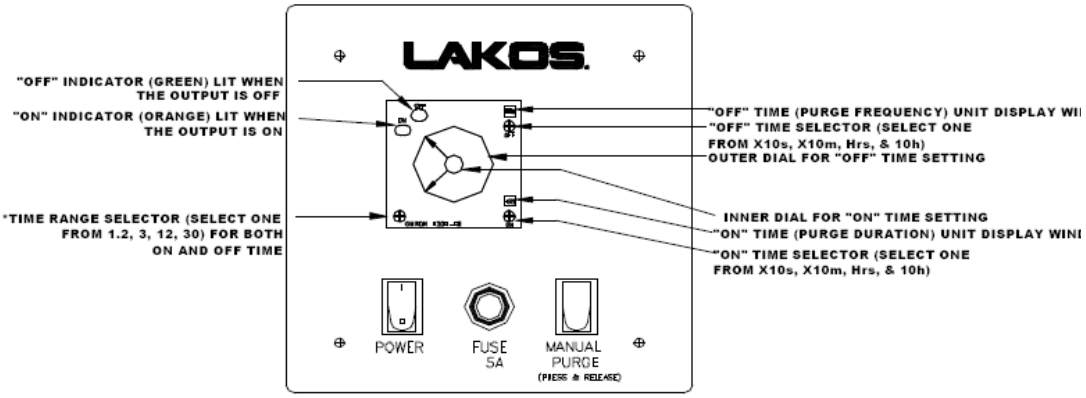
PROGRAMMING FUNCTIONS
The controls for programming this valve are located in the main motor starter control panel. Timer should be factor preset to the settings below. If settings need to be changed based on field conditions, please consult the programming instructions on the next page. **CAUTION: Before changing time settings, be sure the main power is off.**



TC/TB Package Factory Setting
(20 second purge every 12 hours)

See ABV programming instructions below. Please note that the picture shown represents a separate timer box assembly that was supplied on older systems. All newer TC and TB systems have the timer located in the main starter control panel and a manual purge button on the panel front door. Timer settings can still be made using the instructions below.

See programming instructions below if you have this option.



TIME RANGE	TIME UNITS			
	10s	10min	hrs	10h
1.2	1.2 TO 12	1.2 TO 12	.12 TO 1.2	1.2 TO 12
3	3 TO 30	3 TO 30	.3 TO 3	3 TO 30
12	12 TO 120	12 TO 120	1.2 TO 12	12 TO 120
30	30 TO 300	30 TO 300	3 TO 30	30 TO 300

NOTE: The Time range number corresponds with the last number on the scale.

INSTRUCTIONS

Setting Purge Frequency ("OFF" Time): Use the chart above to select the appropriate display window setting. Use outer dial to adjust time setting.

Setting Purge Duration ("On" Time): Use the chart above to select the appropriate display window setting. Use inner dial to adjust time setting.
"Motorized Ball Valve Purge Duration Must be a Minimum of 10sec"

***Time Range Selector:** The time range is factory set for a range of 1.2.

Manual Purge: The manual purge can be performed at any time when the timer is not purging. Press and release the purge switch. A timed purge will occur at the current time setting. Repeat as necessary.

WARNING:
All time adjustments are to be made with the power switch off!

VII. TROUBLESHOOTING PROCEDURES

A. PUMP WILL NOT PRIME (if pump is not self-priming). Possible causes and solutions:

1. Make sure the strainer basket is not clogged (if applicable).
2. Make sure the strainer basket is positioned correctly (if applicable).
3. Tighten the strainer lid down completely (if applicable).
4. Make sure the strainer is full of water (if applicable).
5. Tighten all the fittings and seal all the joints on the suction side.
6. Open all the valves on the return and suction lines.
7. Remove and replace the pump seal if needed.
8. Check the compatibility of the pump and motor.
9. Check pump rotation. Reverse motor wire terminals if necessary.

B. MOTOR RUNS HOT Possible causes and solutions:

1. Motors will run warm to the touch. The motor starter thermal and overload module will function to turn off the motor if there is an overload current problem.

2. Factors which will increase the operating temperature:
    a. The pump is installed in the direct sun.
    b. Poor ventilation in the area the pump is located.
    c. Low voltage is available to the pump.
    d. The wiring is the incorrect size for the load.
    e. The solids loading requires more than the pump's motor horsepower rating.
    f. The pump is operated above the full load amp rating of the motor.
    g. Motor is experiencing imbalance load (in case of 3 phase; it is doing a single phase.)
    h. Fan is broken/missing.

C. THE MOTOR WILL NOT TURN The following procedure advises a warning and caution:

There is a safety/shock hazard. Have a qualified electrician perform the testing. Opening the motor starter box does not shut off power into the box; it only disconnects the starter module and control transformer. Follow electro-mechanical safety lock-out procedure.

1. If the system does not start, open the motor control box and check for power and/or blown control transformer fuses. If the motor overload trips, check the overload amp setting. Adjust the overload module to the motor's full load amp rating. Replace the overload

with the correct overload module going from 460 to 230 system and re-wire the control transformer and motor terminals inside the motor junction box. Do not set or adjust to above full load amp rating.

2. If deadhead pressure cannot be met:

   a. First determine if the pump motor is rotating in the correct direction. Jog-start the motor control box, hand switch off and on while observing the motor shaft/fan rotation.
   b. If the pump is not rotating correctly, shut off the power and switch two of the motor lead wires.

   c. If the pump is rotating correctly, check for shut valves on the suction line, a clogged suction line at inlet, a clogged strainer basket, or a clogged pump.

Adjust the separator outlet valve to the required pressure drop across the separator for the desired flow. If the flow rate cannot be obtained, check for closed valves downstream of the separator, or restricted outlet piping. Systems with LAKOS HydroBoosters can use the HydroBoosters to act as a control valve.

D. <u>NO SOLIDS IN THE SOLIDS RECOVERY VESSEL (Filter Bag Housing)</u>

1. Purge valve to the inlet of the SRV is closed.

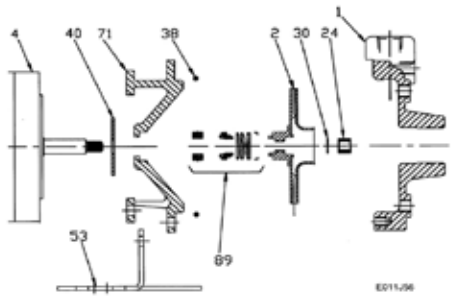
2. Air is locked in the system, bleed SRV of trapped air. Follow SRV maintenance procedure.

3. Purge line is blocked. Isolate the system from pressure by closing the purge line and liquid recovery line valves. Remove piping and clean out the blockage or replace the appropriate components.

VII. STANDARD PUMP CURVES & PARTS LIST

Models: TCX & TCI (0030)
Flow-rate: 30gpm
Impeller Trim: 4.88
Motor HP: 1
Pump part number: 128936
Pump Repair Kit number: 129137

Pump 11 • Iron • J56 Frame • 3500 RPM



KEY NO.	PART NAME	PUMP NO. 11	
1	CASE, IRON, 1.25 x 1 NPT	130.000.161X	
2	IMPELLER, 7/16" THREADED, STAINLESS, ENCLOSED:		
	3.50 DIA	131.000.763R	
	3.75 DIA	131.000.763P	
	4.00 DIA	131.000.763J	
	4.25 DIA	131.000.763F	
	4.50 DIA	131.000.763E	
	4.75 DIA	131.000.763	
	4.88 DIA	131.000.763D	
	5.00 DIA	131.000.763C	
4	MOTOR:		
	J56, ROUND BODY	See Chart	
	J56, 3.5" RIGID BASE	See Chart	
24"+	NUT, STAINLESS	105.000.465	
30"+	D WASHER, STAINLESS	104.000.168	
40"	FLINGER, NEOPRENE	104.000.171	
53	BASE, STEEL	119.000.231A	
71	ADAPTER, IRON	132.000.337X	
73*	GASKET, CASE, BUNA	116.000.146	
89*	5/8" SEALS:		
	NO RETAINER: (not shown)		
	TYPE 6, BN-CARB/CM	101.000.110	
	WITH RETAINER:		
	TYPE 21, VN-CARB/CM	101.000.103	
	TYPE 21, VN-CARB/SIL	101.000.120	
	TYPE 21, VN-SIL/SIL	101.000.239	
	TYPE 21, EPDM-CARB/SIL	101.000.173	
	TYPE 21, EPDM-CARB/CM	101.000.327	
	TYPE 21, EPDM-SIL/SIL	101.000.236	
–	REPAIR KITS:	3 PHASE:	† 1 PHASE:
	BN-CARB/CM SEAL	118.000.340	118.000.340.1
	VN-CARB/CM SEAL	118.000.340A	118.000.340A.1
	VN-CARB/SIL SEAL	118.000.340B	118.000.340B.1
	VN-SIL/SIL SEAL	118.000.340J	118.000.340J.1
	EPDM-CARB/SIL SEAL	118.000.340C	118.000.340C.1
	EPDM-CARB/CM SEAL	118.000.340R	118.000.340R.1
	EPDM-SIL/SIL SEAL	118.000.340D	118.000.340D.1

* DENOTES COMPONENTS INCLUDED IN REPAIR KIT.
+ NOT REQUIRED ON 1/3 TO 1-1/2 HP 1 PHASE MOTORS.
† USE 3 PHASE KIT ON 2-3 HP 1 PHASE MOTORS.

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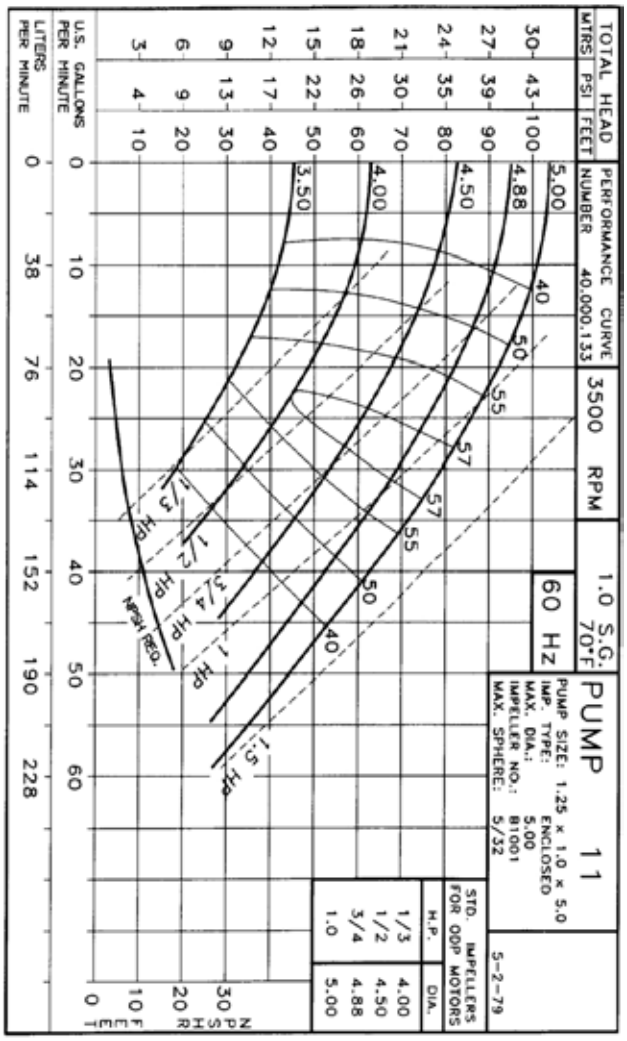
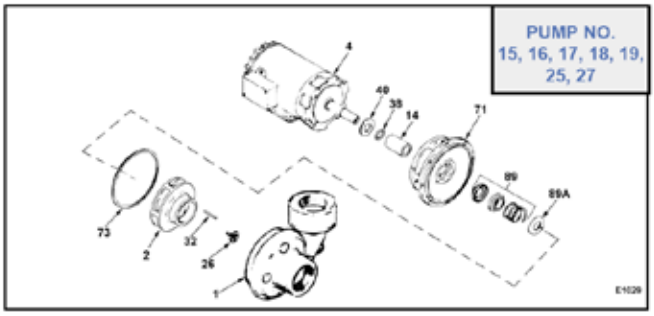


Models: TCX & TCI (0065)
Flow-rate: 65gpm
Impeller Trim: 5.13
Motor HP: 3
Pump part number: 124026
Pump Repair Kit number: 112197

IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP



KEY NO.	PART NAME	5.75" FIT PUMP NO. 15, 16, 17, 18, 19, 25, 27
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR, JM	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.178
--	SHAFT SLEEVE, STAINLESS	110.000.192
26 †	IMPELLER RETAINER	118.000.111A
32 †	KEY	102.000.102
38 †	O-RING, SHAFT	116.000.117
40 †	FLINGER	104.000.165
71	ADAPTER, IRON - JM140/180	132.000.194
--	ADAPTER, IRON - JM210	132.000.195
73 †	GASKET, CASE	116.000.146
89 †	SEAL, 1 1/2"	See Chart
89A †	SEAL RETAINER	104.000.175
--	*REPAIR KITS:	
†	BN-CM SEAL	118.000.343
	VN-CM SEAL	118.000.343A
	VN-NR SEAL	118.000.343B
	EPDM-NR SEAL	118.000.343D

† DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

SEALS 1½"
TYPE 21

BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175
EPDM-NR	101.000.175B

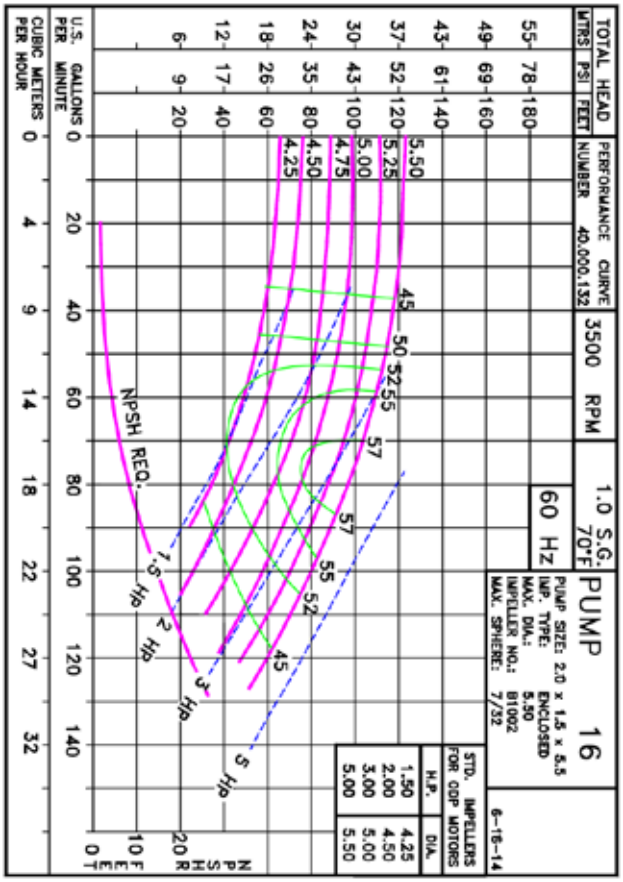
CASES

PUMP NO.	SIZE (NPT) SUCT	DISCH	IRON
15	3	3	130.000.224X
16	2	1.5	130.000.181X
17	2	2	130.000.168X
18	2.5	2	130.000.169X
19	2.5	2	130.000.166X
25	3	3	137.000.178X
27	3	2	130.000.314X

ENCLOSED IMPELLERS - SPECIFY DIAMETER
7/8" KEYED DESIGN

PUMP NO.	CONSTRUCTION CI/BR	IRON	BRONZE
15	131.000.827	137.000.106	131.000.805
16	131.000.826	137.000.127	131.000.808
17/27	131.000.823	137.000.128	131.000.806
18	137.000.131	137.000.132	137.000.130
19+	--	137.000.135	137.000.124
25+	--	137.000.342	131.000.807

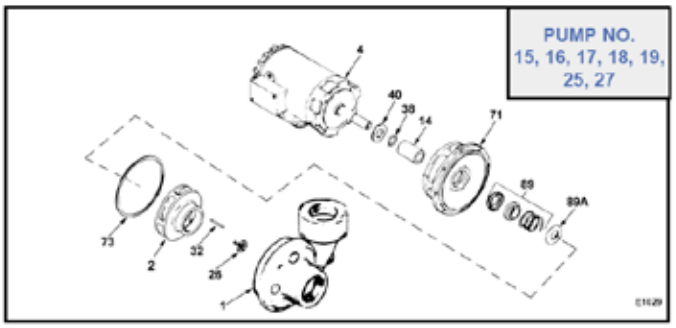
+ PUMP NOS. 19 & 25 HAVE SEMI-OPEN IMPELLERS



Models: TCX & TCI (0100)
Flow-rate: 100gpm
Impeller Trim: 5.37
Motor HP: 5
Pump part number: 124027
Pump Repair Kit number: 112197

Models: TCX & TCI (0145)
Flow-rate: 145gpm
Impeller Trim: 5.37
Motor HP: 5
Pump part number: 124027
Pump Repair Kit number: 112197

IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP



KEY NO.	PART NAME	5.75" FIT PUMP NO. 15, 16, 17, 18, 19, 25, 27
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR, JM	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.178
--	SHAFT SLEEVE, STAINLESS	110.000.192
26 †	IMPELLER RETAINER	118.000.111A
32 †	KEY	102.000.102
38 †	O-RING, SHAFT	116.000.117
40 †	FLINGER	104.000.165
71	ADAPTER, IRON - JM140/180	132.000.194
--	ADAPTER, IRON - JM210	132.000.195
73 †	GASKET, CASE	116.000.146
89 †	SEAL, 1 1/2"	See Chart
89A †	SEAL RETAINER	104.000.175
--	*REPAIR KITS:	
†	BN-CM SEAL	118.000.343
	VN-CM SEAL	118.000.343A
	VN-NR SEAL	118.000.343B
	EPDM-NR SEAL	118.000.343D

† DENOTES COMPONENTS INCLUCED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

SEALS 1½"

TYPE 21	
BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175
EPDM-NR	101.000.175B

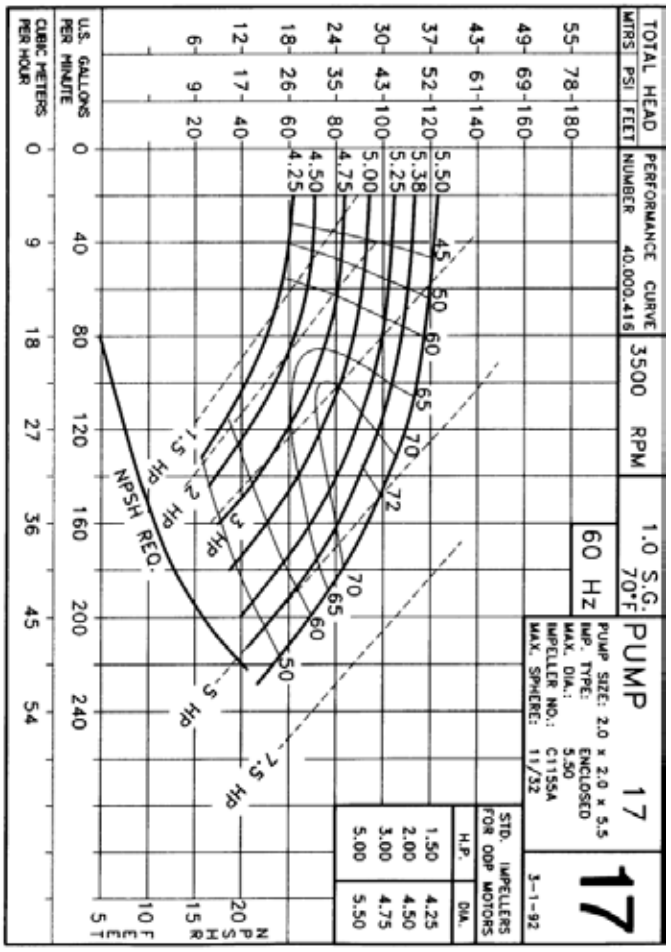
CASES

PUMP NO.	SIZE (NPT) SUCT	DISCH	IRON
15	3	3	130.000.224X
16	2	1.5	130.000.181X
17	2	2	130.000.168X
18	2.5	2	130.000.169X
19	2.5	2	130.000.166X
25	3	3	137.000.178X
27	3	2	130.000.314X

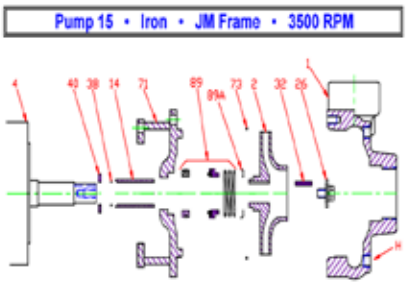
ENCLOSED IMPELLERS - SPECIFY DIAMETER

7/8" KEYED DESIGN			
PUMP NO.	CONSTRUCTION CI/BR	IRON	BRONZE
15	131.000.827	137.000.106	131.000.805
16	131.000.826	137.000.127	131.000.808
17/27	131.000.823	137.000.128	131.000.806
18	137.000.131	137.000.132	137.000.130
19+	--	137.000.135	137.000.124
25+	--	137.000.342	131.000.807

+ PUMP NOS. 19 & 25 HAVE SEMI-OPEN IMPELLERS

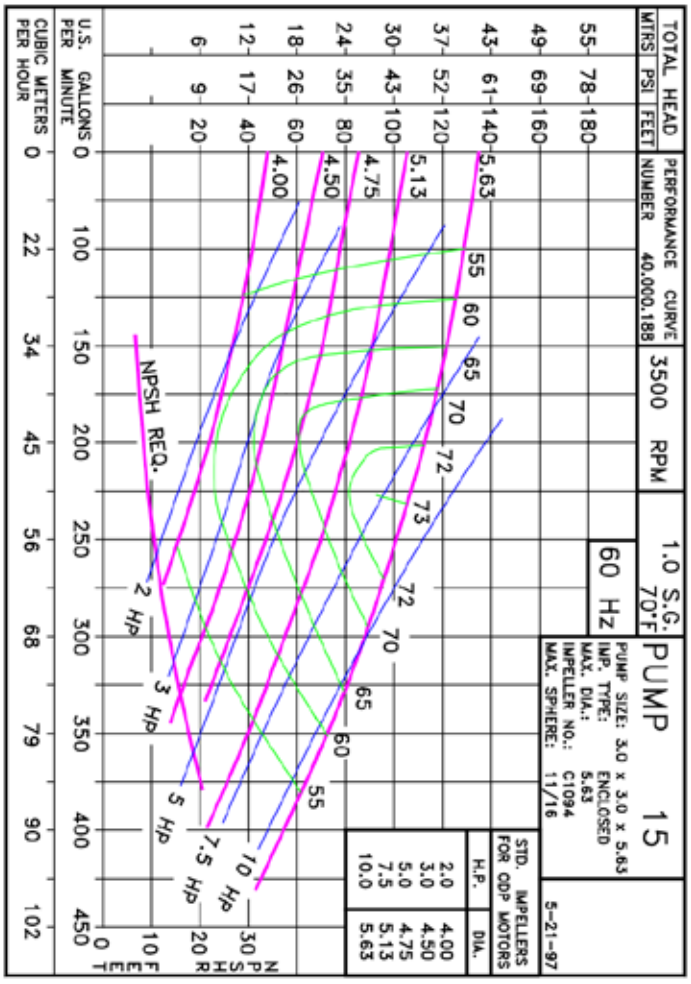


Models: TCX & TCI (0200) – Used on 2010 and newer
Flow-rate: 200gpm
Impeller Trim: 5.25
Motor HP: 7 1/2
Pump part number: 130185
Pump Repair Kit number: 112197



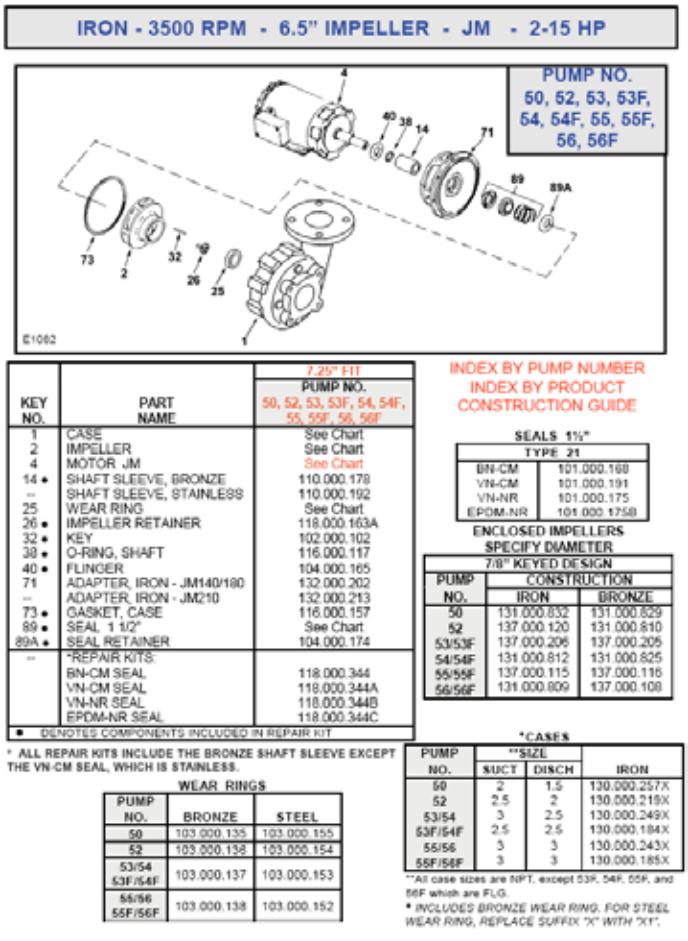
KEY NO.	PART NAME	PUMP NO. 15
1	CASE, IRON, 3 x 3 NPT	130.000.224X
2	IMPELLER, 7/8" KEYED, ENCLOSED, SPECIFY DIAMETER:	
	CI/BR	131.900.827
	IRON	137.900.106
	BRONZE	131.900.805
4	MOTOR, JM140/180	See Chart
	MOTOR, JM210	See Chart
14*	SHAFT SLEEVE, BRONZE	110.900.178
	SHAFT SLEEVE, STAINLESS	110.900.192
26*	IMPELLER RETAINER, STAINLESS	118.000.111A
32*	KEY, STAINLESS	102.900.102
38*	O-RING, SHAFT, BUNA	116.900.117
	O-RING, SHAFT, VITON	116.900.105
40*	RLINGER, STAINLESS	104.900.105
71	ADAPTER, IRON, JM140/180	132.000.194X
	ADAPTER, IRON, JM210	132.000.195X
73*	GASKET, CASE, BUNA	116.900.146
89*	'IX' SEALS:	
	BN-CARB/CM	101.900.158
	VN-CARB/CM	101.900.191
	VN-CARB/SIL	101.900.175
	VN-SIL/SIL	101.900.204
	EPDM-CARB/SIL	101.000.175B
	EPDM-SIL/SIL	101.000.204A
89A*	SEAL, RETAINER	104.900.175
-	* REPAIR KITS:	
	BN-CARB/CM SEAL	118.900.343
	VN-CARB/CM SEAL (S)	118.000.343A
	VN-CARB/CM SEAL	118.000.343M
	VN-CARB/SIL SEAL	118.000.343B
	VN-SIL/SIL SEAL (S)	118.000.343F
	EPDM-CARB/SIL SEAL	118.000.343D
	EPDM-SIL/SIL SEAL	118.000.343J

* DENOTES COMPONENTS INCLUDED IN REPAIR KIT.
* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE (S) INDICATED, WHICH IS STAINLESS WITH VITON SHAFT O-RING.



Models: TCX & TCI (0200) – Used on 2009 and older
Flow-rate: 200gpm
Impeller Trim: 5.25
Motor HP: 7 1/2
Pump part number: 124029
Pump Repair Kit number: 113206

Models: TCX & TCI (0280)
Flow-rate: 280gpm
Impeller Trim: 5.37
Motor HP: 10
Pump part number: 124030
Pump Repair Kit number: 113206



IRON - 3500 RPM - 6.5" IMPELLER - JM - 2-15 HP

KEY NO.	PART NAME	7.25" FIT PUMP NO. 50, 52, 53, 53F, 54, 54F, 55, 55F, 56, 56F
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR JM	See Chart
14 •	SHAFT SLEEVE, BRONZE	110.000.178
--	SHAFT SLEEVE, STAINLESS	110.000.192
25	WEAR RING	See Chart
26 •	IMPELLER RETAINER	118.000.163A
32 •	KEY	102.000.102
38 •	O-RING, SHAFT	116.000.117
40 •	FLINGER	104.000.165
71	ADAPTER, IRON - JM140/180	132.000.202
--	ADAPTER, IRON - JM210	132.000.213
73 •	GASKET, CASE	116.000.157
89 •	SEAL 1 1/2"	See Chart
89A •	SEAL RETAINER	104.000.174
--	*REPAIR KITS:	
	BN-CM SEAL	118.000.344
	VN-CM SEAL	118.000.344A
	VN-NR SEAL	118.000.344B
	EPDM-NR SEAL	118.000.344C

• DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

INDEX BY PUMP NUMBER
INDEX BY PRODUCT
CONSTRUCTION GUIDE

SEALS 1½"

TYPE 21	
BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175
EPDM-NR	101.000.175B

ENCLOSED IMPELLERS
SPECIFY DIAMETER

7/8" KEYED DESIGN		
PUMP NO.	CONSTRUCTION	
	IRON	BRONZE
50	131.000.832	131.000.829
52	137.000.120	131.000.810
53/53F	137.000.206	137.000.205
54/54F	131.000.812	131.000.825
55/55F	137.000.115	137.000.116
56/56F	131.000.809	137.000.108

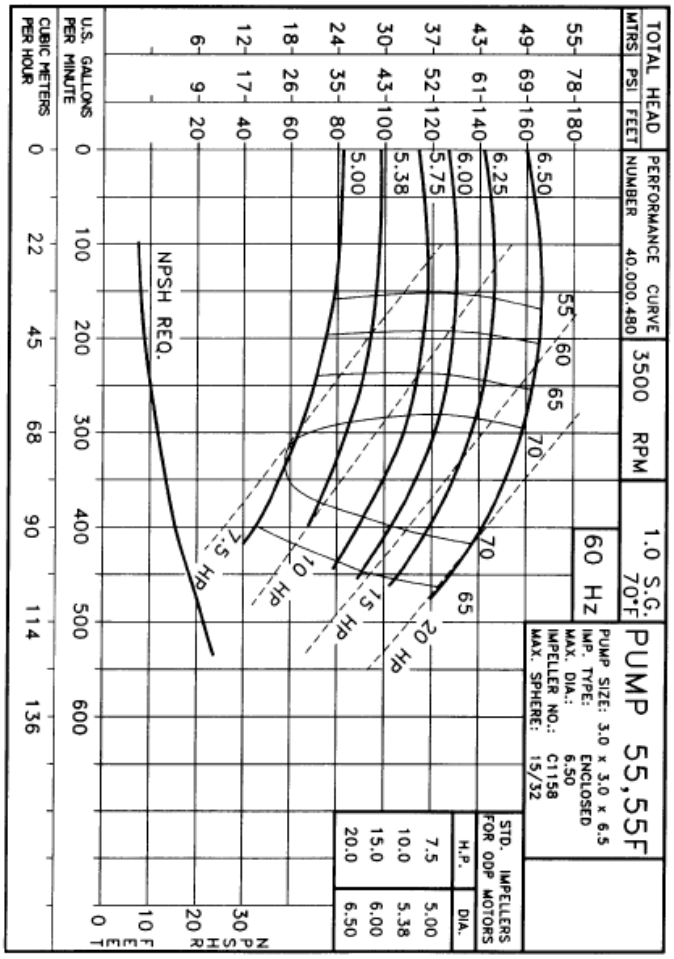
WEAR RINGS

PUMP NO.	BRONZE	STEEL
50	103.000.135	103.000.155
52	103.000.138	103.000.154
53/54 53F/54F	103.000.137	103.000.153
55/56 55F/56F	103.000.138	103.000.152

*CASES

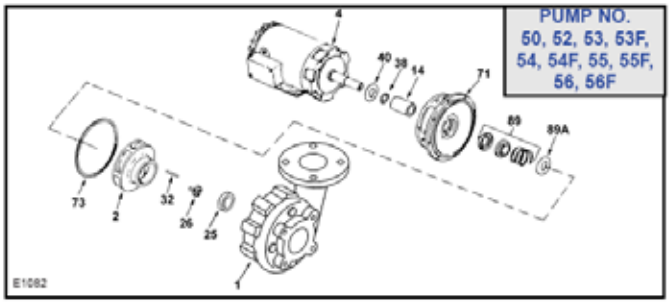
PUMP NO.	**SIZE SUCT	**SIZE DISCH	IRON
50	2	1.5	130.000.257X
52	2.5	2	130.000.219X
53/54	3	2.5	130.000.249X
53F/54F	2.5	2.5	130.000.184X
55/56	3	3	130.000.243X
55F/56F	3	3	130.000.185X

**All case sizes are NPT, except 53R, 54R, 55R, and 56R which are FLG.
* INCLUDES BRONZE WEAR RING. FOR STEEL WEAR RING, REPLACE SUFFIX "X" WITH "X1".



Models: TCX & TCI (0400)
Flow-rate: 400gpm
Impeller Trim: 5.50
Motor HP: 15
Pump part number: 124031
Pump Repair Kit number: 113206

IRON - 3500 RPM - 6.5" IMPELLER - JM - 2-15 HP



KEY NO.	PART NAME	7.25" FIT PUMP NO. 50, 52, 53, 53F, 54, 54F, 55, 55F, 56, 56F
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR JM	See Chart
14 •	SHAFT SLEEVE, BRONZE	110.000.178
--	SHAFT SLEEVE, STAINLESS	110.000.192
25	WEAR RING	See Chart
26 •	IMPELLER RETAINER	118.000.163A
32 •	KEY	102.000.102
38 •	O-RING, SHAFT	116.000.117
40 •	FLINGER	104.000.165
71	ADAPTER, IRON - JM140/180	132.000.202
--	ADAPTER, IRON - JM210	132.000.213
73 •	GASKET, CASE	116.000.157
89 •	SEAL 1 1/2"	See Chart
89A •	SEAL RETAINER	104.000.174
--	*REPAIR KITS:	
	BN-CM SEAL	118.000.344
	VN-CM SEAL	118.000.344A
	VN-NR SEAL	118.000.344B
	EPDM-NR SEAL	118.000.344C

• DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

INDEX BY PUMP NUMBER
INDEX BY PRODUCT
CONSTRUCTION GUIDE

SEALS 1½"

TYPE 21	
BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175
EPDM-NR	101.000.175B

ENCLOSED IMPELLERS
SPECIFY DIAMETER
7/8" KEYED DESIGN

PUMP NO.	CONSTRUCTION IRON	CONSTRUCTION BRONZE
50	131.000.832	131.000.829
52	137.000.120	131.000.810
53/53F	137.000.206	137.000.205
54/54F	131.000.812	131.000.825
55/55F	137.000.115	137.000.116
56/56F	131.000.809	137.000.108

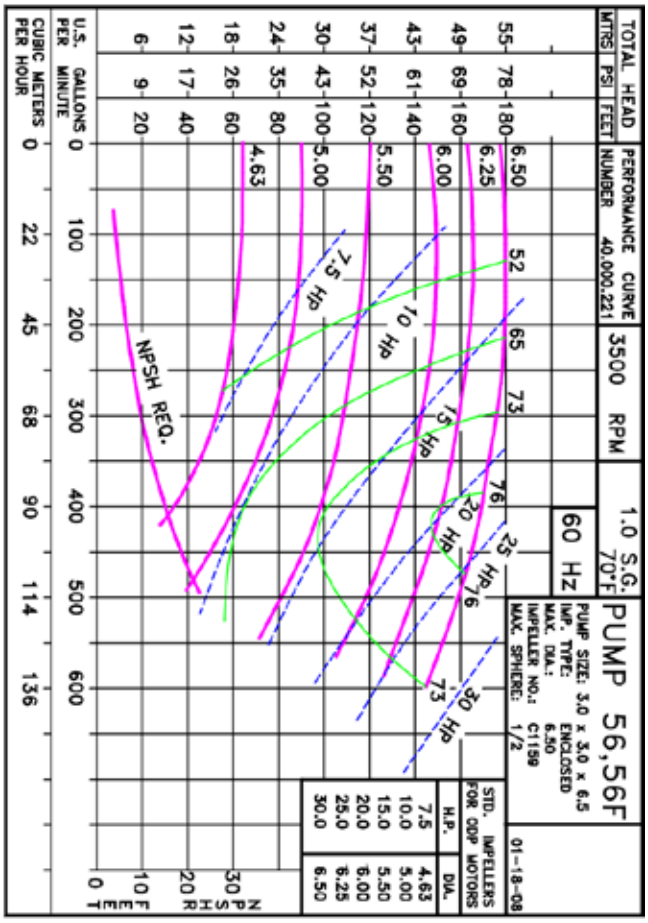
WEAR RINGS

PUMP NO.	BRONZE	STEEL
50	103.000.135	103.000.155
52	103.000.136	103.000.154
53/54 53F/54F	103.000.137	103.000.153
55/56 55F/56F	103.000.138	103.000.152

*CASES

PUMP NO.	**SIZE SUCT	**SIZE DISCH	IRON
50	2	1.5	130.000.257X
52	2.5	2	130.000.219X
53/54	3	2.5	130.000.249X
53F/54F	2.5	2.5	130.000.184X
55/56	3	3	130.000.243X
55F/56F	3	3	130.000.185X

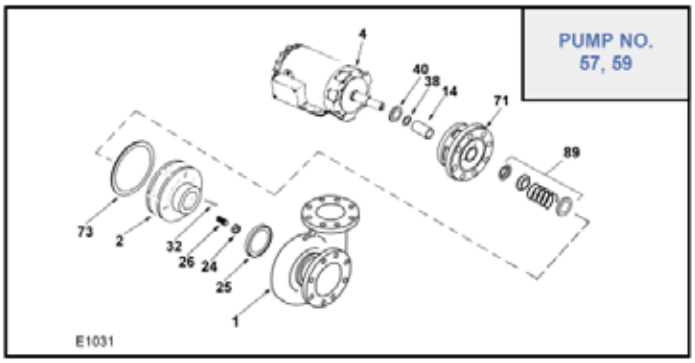
**All case sizes are NPT, except 53F, 54F, 55F, and 56F which are FLG.
* INCLUDES BRONZE WEAR RING. FOR STEEL WEAR RING, REPLACE SUFFIX "X" WITH "X1".



Models: TCX & TCI (0525)
Flow-rate: 525gpm
Impeller Trim: 5.50
Motor HP: 20
Pump part number: 124032
Pump Repair Kit number: 124074

Models: TCX & TCI (0600)
Flow-rate: 600gpm
Impeller Trim: 5.50
Motor HP: 20
Pump part number: 124032
Pump Repair Kit number: 124074

IRON - 3500 RPM - 6.5" IMPELLER - JM FRAME - 20-75 HP



KEY NO.	PART NAME	7.0 FIT PUMP NO. 57	7.5 FIT PUMP NO. 59
1	CASE	See Chart	See Chart
2	IMPELLER	See Chart	See Chart
4	MOTOR JM	See Chart	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.366	110.000.366
--	SHAFT SLEEVE, STAINLESS	110.000.365	110.000.365
24††	NUT, BRONZE	137.000.407	--
--	NUT, STAINLESS	110.000.304A	110.000.304A
25	WEAR RING, BRONZE	103.000.197	137.000.565
--	WEAR RING, STEEL	103.000.218	--
26 †	STUD	105.000.385	105.000.385
32 †	KEY	102.000.257	102.000.257
38 †	O-RING, SHAFT	116.000.218	116.000.218
40 †	FLINGER	104.000.200	104.000.200
71	ADAPTER, IRON - JM250	132.000.316	--
--	ADAPTER, IRON - JM290/320/360	132.000.317	137.000.568
73 †	GASKET, CASE	116.000.273	116.000.184
89 †	SEAL 1 3/4"	See Chart	See Chart
--	*REPAIR KITS:		
†	BN-CM SEAL	118.000.385	118.000.530
	VN-CM SEAL	118.000.385A	118.000.530A
	VN-NR SEAL	118.000.385B	118.000.530B
	EPDM-NR SEAL	118.000.385C	118.000.530C

† DENOTES COMPONENTS INCLUDED IN REPAIR KIT

SEALS 1¾"

TYPE 21	
BN-CM	101.000.196
VN-CM	101.000.216
VN-NR	101.000.221

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

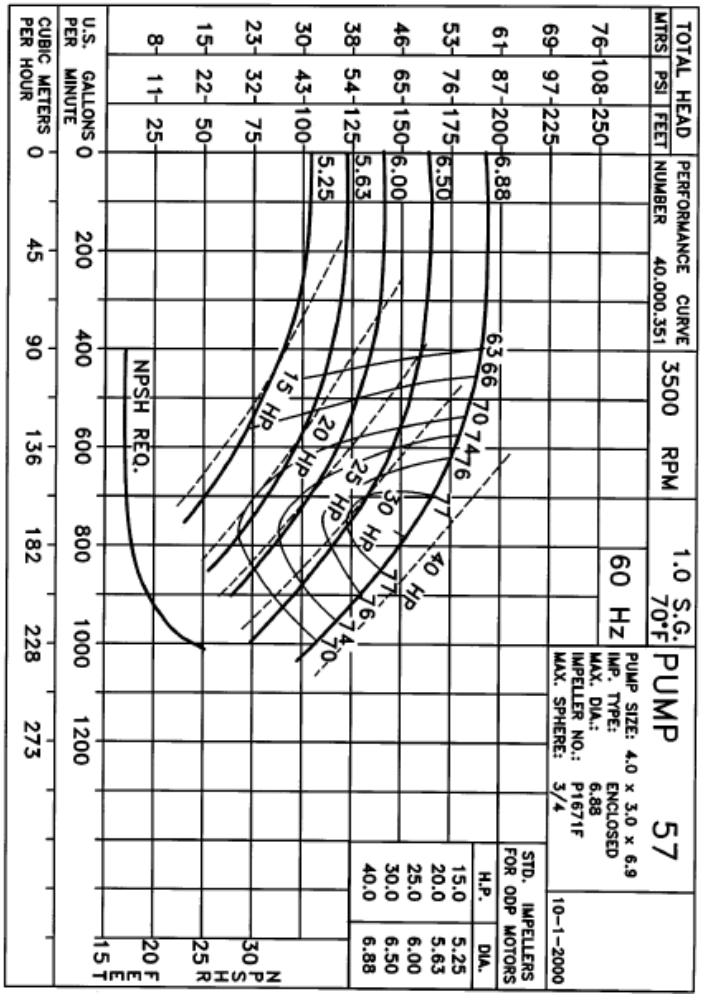
*CASES

PUMP NO.	SIZE (FLG) SUCT	SIZE (FLG) DISCH	IRON
57	4	3	130.000.297X
59	6	5	137.000.563X

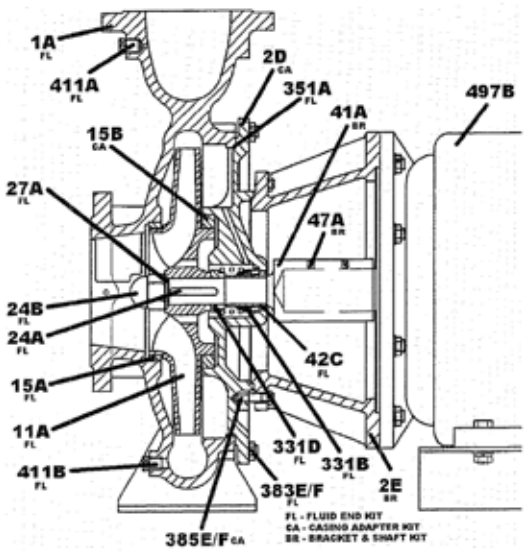
* INCLUDES BRONZE WEAR RING. FOR STEEL WEAR RING, REPLACE SUFFIX "X" WITH "X1".

ENCLOSED IMPELLERS
SPECIFY DIAMETER

PUMP NO.	1 1/4" KEYED DESIGN CONSTRUCTION IRON	BRONZE
57	131.000.830	137.000.133
59	137.000.569	137.000.734

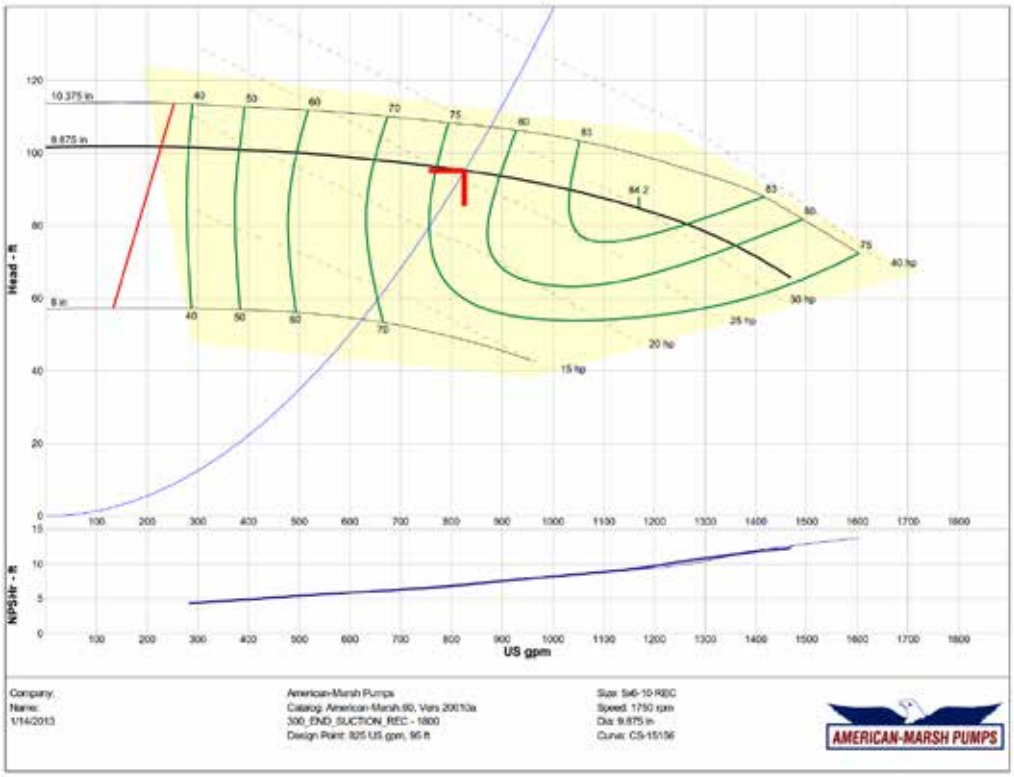


Models: TCX & TCI (0825)
Flow-rate: 825gpm
Impeller Trim: 9.88
Motor HP: 30
Pump part number: 134911
Pump Repair Kit number: 132636

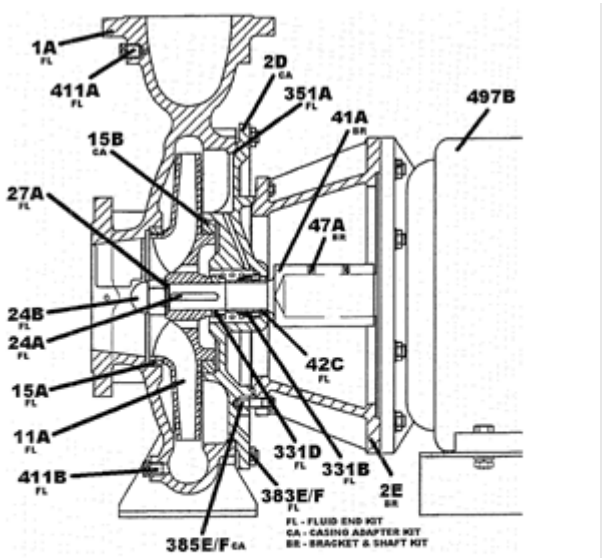


Item Number	Item Description	Num. Req.
1A	Casing	1
2D	Casing Adapter	1
2E	Motor Bracket	1
11A	Impeller	1
15A	Case Wear Ring, Front	1
15B	Case Wear Ring, Rear	Varies
24A	Impeller Key	1
24B	Impeller Nut	1
27A	Impeller Washer	1
41A	Shaft	1

Item Number	Item Description	Num. Req.
42C	Shaft Sleeve	1
47A	Shaft Set Screw	Varies
331B	Mechanical Seal	1
331D	Mechanical Seal Locking Collar	1
351A	Casing Gasket	1
383E/F	Casing Stud & Nut	Varies
385E/F	Motor Bracket Stud & Nut	Varies
411A	Plug, Vent	1
411B	Plug, Drain	1
497B	C-Face Motor	1



Models: TCX & TCI (1100)
Flow-rate: 1100gpm
Impeller Trim: 10.38
Motor HP: 40
Pump part number: 135609
Pump Repair Kit number: 132636

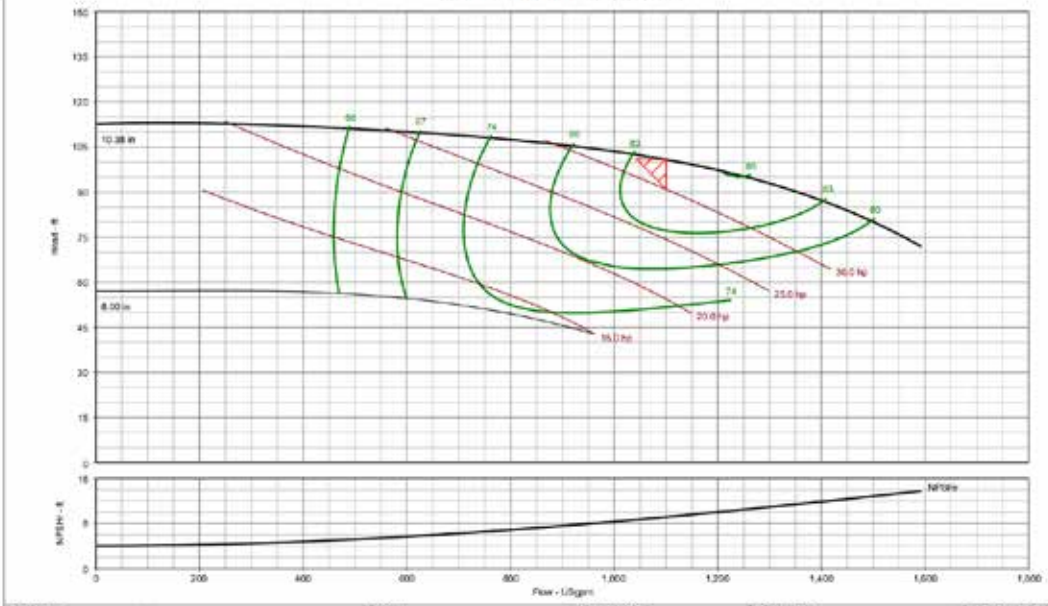


Item Number	Item Description	Num. Req.
1A	Casing	1
2D	Casing Adapter	1
2E	Motor Bracket	1
11A	Impeller	1
15A	Case Wear Ring, Front	1
15B	Case Wear Ring, Rear	Varies
24A	Impeller Key	1
24B	Impeller Nut	1
27A	Impeller Washer	1
41A	Shaft	1

Item Number	Item Description	Num. Req.
42C	Shaft Sleeve	1
47A	Shaft Set Screw	Varies
331B	Mechanical Seal	1
331D	Mechanical Seal Locking Collar	1
351A	Casing Gasket	1
383E/F	Casing Stud & Nut	Varies
385E/F	Motor Bracket Stud & Nut	Varies
411A	Plug, Vent	1
411B	Plug, Drain	1
497B	C-Face Motor	1

American-Marsh Pumps Quotation System 15.0.4.0

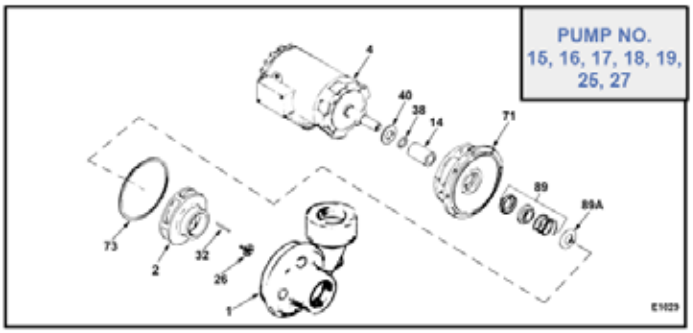
Pump Performance Curve



Customer		Size	: 6x6-10 REC	Flow, rated	: 1,100.0 USgpm
Customer reference		Stages	: 1	Differential head / pressure, rated	: 101.0 ft
Item number	: 005	Speed, rated	: 1,750 rpm	Fluid density, rated / max	: 1.000 / 1.000 SG
Service		Based on curve number	: 6x6-10 RE	Viscosity	: 1.00 cP
Quantity	: 1	Efficiency	: 84.10 %	Cp/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Quote number	: 283233	Power, rated	: 33.29 hp		
Date last saved	: 24 Mar 2015 4:58 PM	NPSH required	: 9.15 ft		

Models: TBX & TBI (0065)
Flow-rate: 65gpm
Impeller Trim: 4.50
Motor HP: 1 1/2
Pump part number: 116474
Pump Repair Kit number: 104111

IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP



KEY NO.	PART NAME	5.75" FIT PUMP NO. 15, 16, 17, 18, 19, 25, 27
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR JM	See Chart
14 ?	SHAFT SLEEVE, BRONZE	110.000.178
--	SHAFT SLEEVE, STAINLESS	110.000.192
26 ?	IMPELLER RETAINER	118.000.111A
32 ?	KEY	102.000.102
38 ?	O-RING, SHAFT	116.000.117
40 ?	FLINGER	104.000.165
71	ADAPTER, IRON - JM140/180	132.000.194
--	ADAPTER, IRON - JM210	132.000.195
73 ?	GASKET, CASE	116.000.146
89 ?	SEAL 1 1/2"	See Chart
89A ?	SEAL RETAINER	104.000.175
--	*REPAIR KITS:	
?	BN-CM SEAL	118.000.343
	VN-CM SEAL	118.000.343A
	VN-NR SEAL	118.000.343B
	EPDM-NR SEAL	118.000.343D

? DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

SEALS 1½"

TYPE 21	
BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175
EPDM-NR	101.000.175B

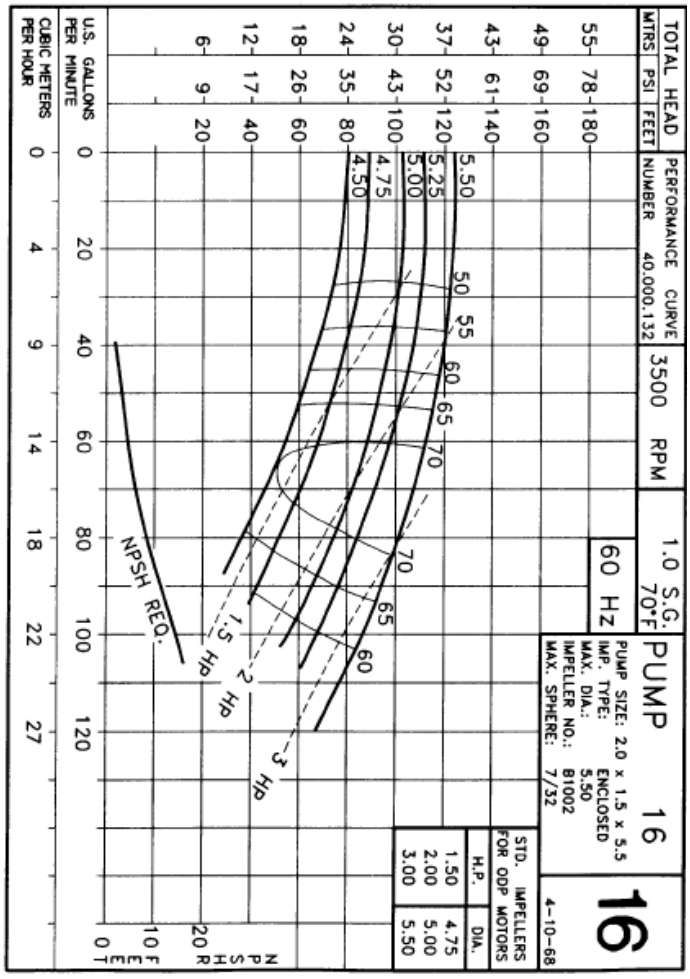
CASES

PUMP NO.	SIZE (NPT) SUCT	DISCH	IRON
15	3	3	130.000.224X
16	2	1.5	130.000.161X
17	2	2	130.000.168X
18	2.5	2	130.000.169X
19	2.5	2	130.000.166X
25	3	3	137.000.178X
27	3	2	130.000.314X

ENCLOSED IMPELLERS - SPECIFY DIAMETER

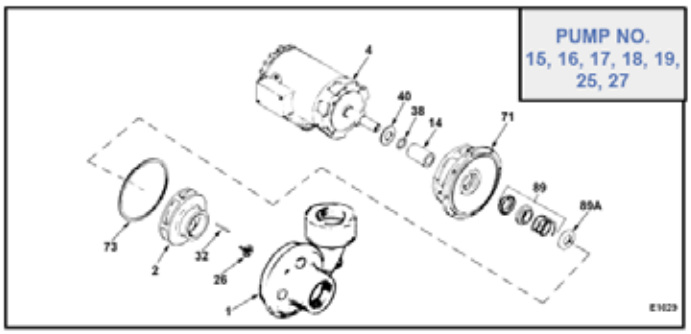
7/8" KEYED DESIGN			
PUMP NO.	CONSTRUCTION CI/BR	IRON	BRONZE
15	131.000.827	137.000.106	131.000.805
16	131.000.826	137.000.127	131.000.808
17/27	131.000.823	137.000.128	131.000.806
18	137.000.131	137.000.132	137.000.130
19+	--	137.000.135	137.000.124
25+	--	137.000.342	131.000.807

+ PUMP NOS. 19 & 25 HAVE SEMI-OPEN IMPELLERS.



Models: TBX & TBI (0100)
Flow-rate: 100gpm
Impeller Trim: 4.25
Motor HP: 2hp
Pump part number: 114296
Pump Repair Kit number: 104111

IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP



KEY NO.	PART NAME	5.75" FIT PUMP NO. 15, 16, 17, 18, 19, 25, 27
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR JM	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.178
--	SHAFT SLEEVE, STAINLESS	110.000.192
26 †	IMPELLER RETAINER	118.000.111A
32 †	KEY	102.000.102
38 †	O-RING, SHAFT	116.000.117
40 †	FLINGER	104.000.165
71	ADAPTER, IRON - JM140/180	132.000.194
--	ADAPTER, IRON - JM210	132.000.195
73 †	GASKET, CASE	116.000.146
89 †	SEAL 1 1/2"	See Chart
89A †	SEAL RETAINER	104.000.175
--	*REPAIR KITS:	
†	BN-CM SEAL	118.000.343
	VN-CM SEAL	118.000.343A
	VN-NR SEAL	118.000.343B
	EPDM-NR SEAL	118.000.343D

† DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

SEALS 1¼"

TYPE 21	
BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175
EPDM-NR	101.000.175B

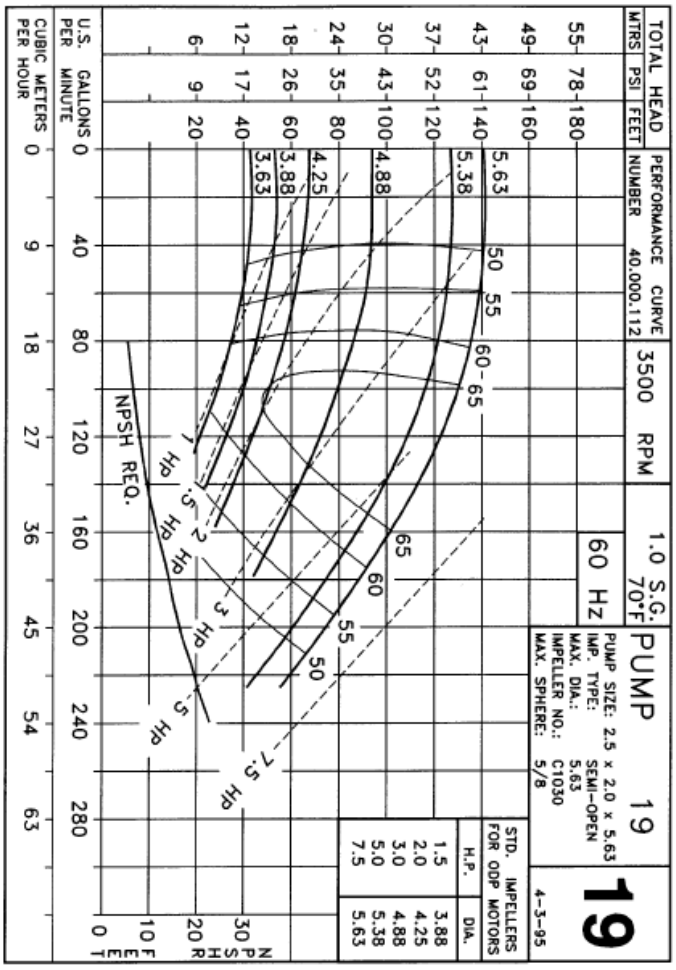
CASES

PUMP NO.	SIZE (NPT) SUCT	SIZE (NPT) DISCH	IRON
15	3	3	130.000.224X
16	2	1.5	130.000.181X
17	2	2	130.000.168X
18	2.5	2	130.000.169X
19	2.5	2	130.000.166X
25	3	3	137.000.178X
27	3	2	130.000.314X

ENCLOSED IMPELLERS - SPECIFY DIAMETER

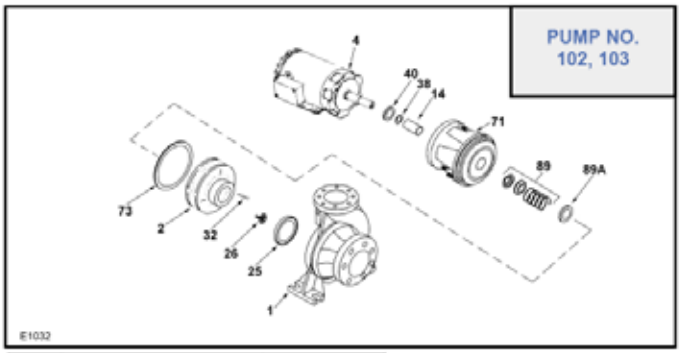
PUMP NO.	7/8" KEYED DESIGN CONSTRUCTION CI/BR	IRON	BRONZE
15	131.000.827	137.000.106	131.000.805
16	131.000.826	137.000.127	131.000.808
17/27	131.000.823	137.000.128	131.000.806
18	137.000.131	137.000.132	137.000.130
19+	–	137.000.135	137.000.124
25+	–	137.000.342	131.000.807

+ PUMP NOS. 19 & 25 HAVE SEMI-OPEN IMPELLERS



Models: TBX & TBI (0145)
Flow-rate: 145gpm
Impeller Trim: 7.00
Motor HP: 3hp
Pump part number: 116270
Pump Repair Kit number: 118206

IRON - 1750 RPM - 8.0" IMPELLER - JP FRAME - 2-5 HP



KEY NO.	PART NAME	8.20 FIT PUMP NO. 102, 103
1	CASE	See Chart
2	IMPELLER	See Chart
4	MOTOR JP	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.399
--†	SHAFT SLEEVE, STAINLESS	110.000.361
25	WEAR RING	See Chart
26 †	IMPELLER RETAINER	118.000.163B
32 †	KEY	102.000.256
38 †	O-RING, SHAFT	116.000.117
40 †	FLINGER	104.000.256
71	ADAPTER, IRON - JP140/180	132.000.391
73 †	GASKET, CASE	116.000.276
89 †	SEAL 1 1/2"	See Chart
89A †	SEAL RETAINER	104.000.174
-- !	*REPAIR KITS:	
	BN-CM SEAL	118.000.413
	VN-CM SEAL	118.000.413A
	VN-NR SEAL	118.000.413B

† DENOTES COMPONENTS INCLUDED IN REPAIR KIT

SEALS 1½"
TYPE 21

BN-CM	101.000.168
VN-CM	101.000.191
VN-NR	101.000.175

WEAR RINGS

PUMP NO.	BRONZE
102	NONE
103	137.000.434

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

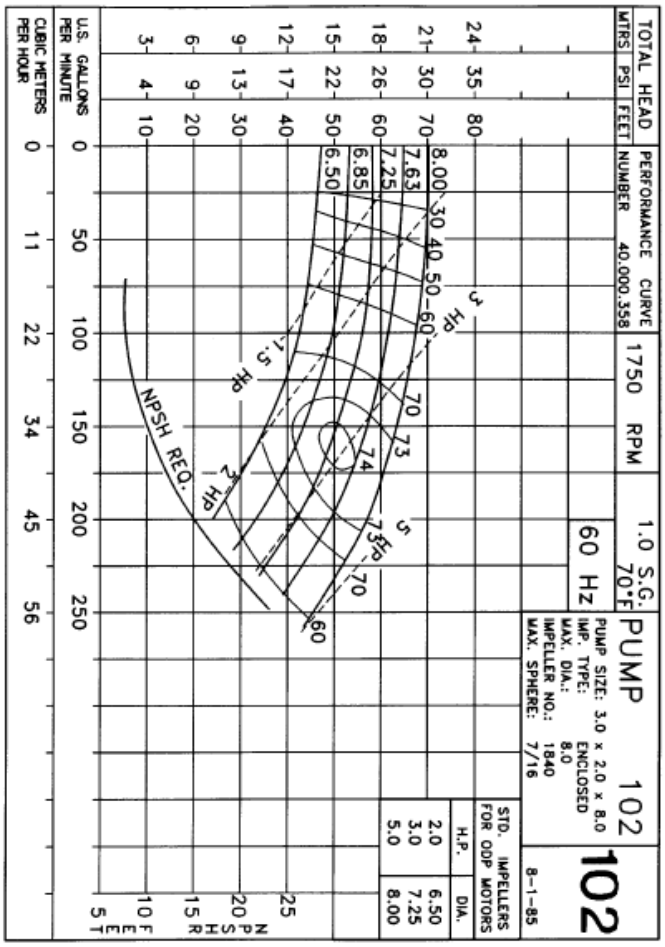
CASES

PUMP NO.	SIZE (FLG) SUCT	DISCH	IRON
102	3	2	130.000.308X
103 *	4	2.5	130.000.309X

* INCLUDES BRONZE WEAR RING.

ENCLOSED IMPELLERS
SPECIFY DIAMETER
7/8" KEYED DESIGN

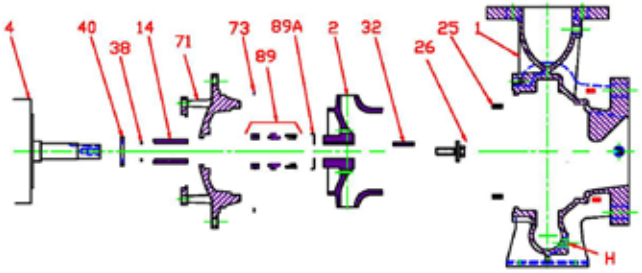
PUMP NO.	CONSTRUCTION IRON	BRONZE
102	--	137.000.173
103	--	137.000.204



Models: TBX & TBI (0200)
Flow-rate: 200gpm
Impeller Trim: 6.88
Motor HP: 5hp
Pump part number: 132177
Pump Repair Kit number: 118206

Models: TBX & TBI (0280)
Flow-rate: 280gpm
Impeller Trim: 6.88
Motor HP: 5hp
Pump part number: 132177
Pump Repair Kit number: 118206

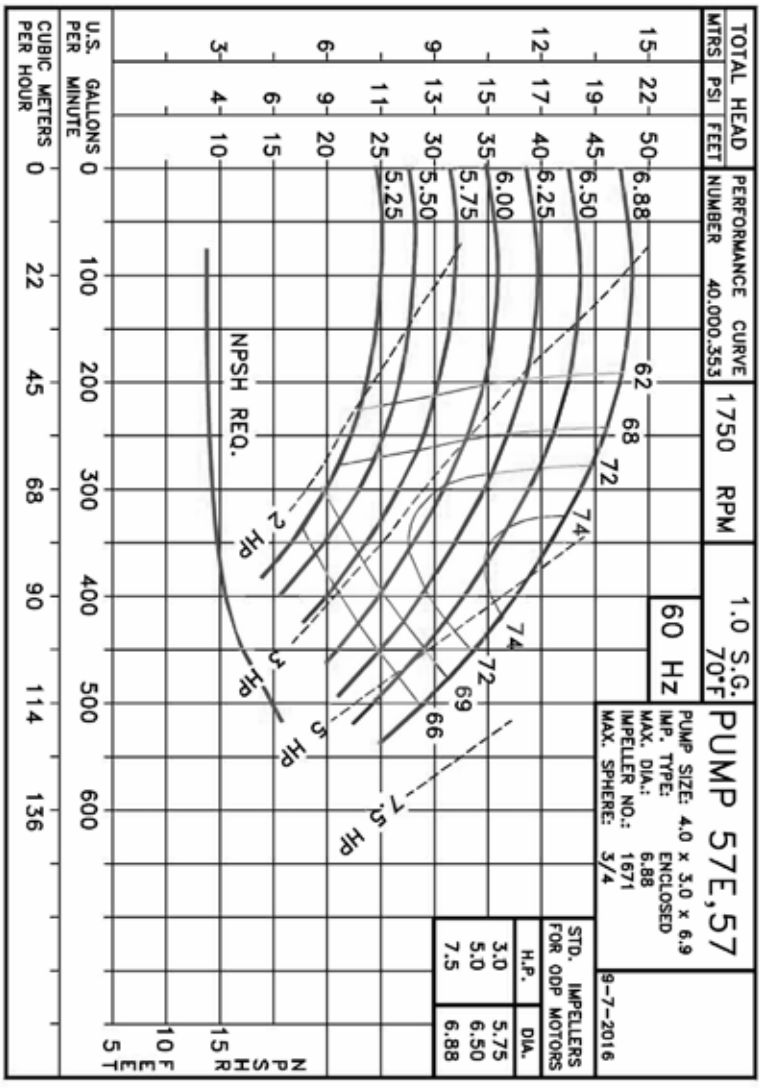
Pump 57 • Iron • JM Frame • 1750 RPM



KEY NO.	PART NAME	PUMP NO. 57
1+	CASE, IRON, 4 x 3 FLG	130.000.297X
	IMPELLER, 7/8" KEYED, ENCLOSED, SPECIFY DIAMETER:	
2	IRON	137.000.122
	BRONZE	137.000.222
4	MOTOR, JM140/180	See Chart
	MOTOR, JM210	See Chart
14*	SHAFT SLEEVE, BRONZE	110.000.215
	SHAFT SLEEVE, STAINLESS	110.000.373
25	WEAR RING, BRONZE	103.000.197
	WEAR RING, STEEL	103.000.218
26*	IMPELLER RETAINER, STAINLESS	118.000.163A
32*	KEY	102.000.256
38*	O-RING, SHAFT, BUNA	116.000.117
	O-RING, SHAFT, VITON	116.000.105
40*	FLINGER, STAINLESS	104.000.256
71	ADAPTER, IRON - JM140/180	132.000.339X
73*	GASKET, CASE, FIBER	116.000.273
	1⅛" SEALS:	
89*	BN-CARB/CM	101.000.188
	VN-CARB/CM	101.000.191
	VN-CARB/SIL	101.000.175
	VN-SIL/SIL	101.000.204
	EPDM-CARB/SIL	101.000.175B
	EPDM-SIL/SIL	101.000.204A
89A*	SEAL RETAINER, STAINLESS	104.000.174
	* REPAIR KITS:	
-	BN-CARB/CM SEAL	118.000.383
	VN-CARB/CM SEAL (S)	118.000.383A
	VN-CARB/CM SEAL	118.000.383G
	VN-CARB/SIL SEAL	118.000.383B
	VN-SIL/SIL SEAL (S)	118.000.383E
	EPDM-CARB/SIL SEAL	118.000.383C
	EPDM-SIL/SIL SEAL	118.000.383D

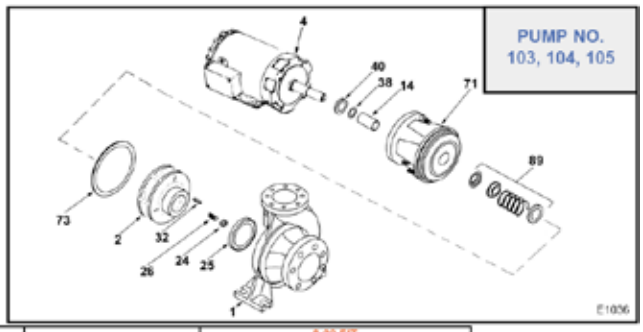
* DENOTES COMPONENTS INCLUDED IN REPAIR KIT.
+ INCLUDES BRONZE WEAR RING. FOR STEEL WEAR RING, REPLACE SUFFIX "X" WITH "X1".
° ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE (S) INDICATED, WHICH WHICH IS STAINLESS WITH VITON SHAFT O-RING.

E057JM180
H12
P0571750JM



Models: TBX & TBI (0400)
Flow-rate: 400gpm
Impeller Trim: 7.63
Motor HP: 7 1/2hp
Pump part number: 115068
Pump Repair Kit number: 118207

IRON - 1750 RPM - 8.0" IMPELLER - JP FRAME - 7.5-15 HP



KEY NO.	PART NAME	8.20 FIT PUMP NO. 103	PUMP NO. 104	PUMP NO. 105
1	CASE	See Chart	See Chart	See Chart
2	IMPELLER	See Chart	See Chart	See Chart
4	MOTOR, JP	See Chart	See Chart	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.398	110.000.398	110.000.398
--	SHAFT SLEEVE, STAINLESS	110.000.360	110.000.360	110.000.360
24 †	NUT, BRONZE	137.000.407	137.000.407	137.000.407
--	NUT, STAINLESS	110.000.304A	110.000.304A	110.000.304A
25	WEAR RING, BRONZE	137.000.434	103.000.202	103.000.204
--	WEAR RING, STEEL	--	103.000.185	103.000.186
26 †	STUD	105.000.385	105.000.385	105.000.385
32 †	KEY	102.000.257	102.000.257	102.000.257
38 †	O-RING, SHAFT	116.000.218	116.000.218	116.000.218
40 †	FLINGER	104.000.200	104.000.200	104.000.200
71	ADAPTER, IRON - JP210/250	132.000.378	132.000.374	132.000.374
73 †	GASKET, CASE	116.000.276	116.000.261	116.000.261
89 †	SEAL, 1 3/4"	See Chart	See Chart	See Chart
-	*REPAIR KITS:			
†	BN-CM SEAL	118.000.410	118.000.412	
	VN-CM SEAL	118.000.410A	118.000.412A	
	VN-NR SEAL	118.000.410B	118.000.412B	

† DENOTES COMPONENTS INCLUDED IN REPAIR KIT

SEALS 1¾"

TYPE 21	
BN-CM	101.000.196
VN-CM	101.000.216
VN-NR	101.000.221

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL WHICH IS STAINLESS.

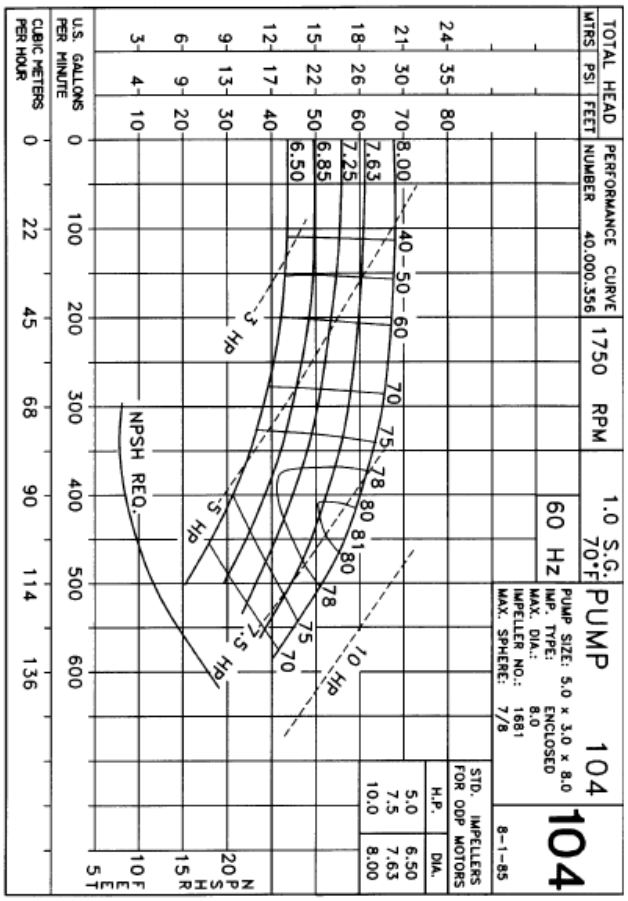
*CASES

PUMP NO.	SIZE (FLG) SUCT	DISCH	IRON
103	4	2.5	130.000.309X
104	5	3	130.000.310X
105	5	4	130.000.311X

* INCLUDES BRONZE WEAR RING. FOR STEEL 104, 105 PUMP WITH WEAR RING, REPLACE SUFFIX "X" WITH "X1".

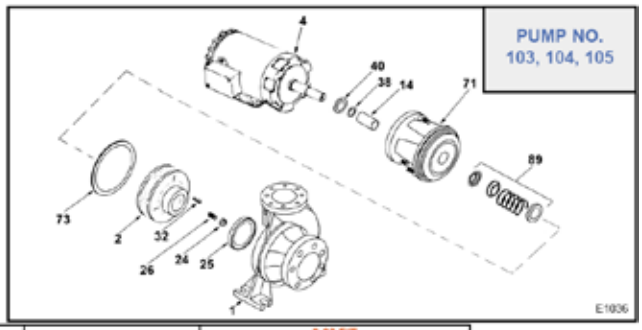
ENCLOSED IMPELLERS
SPECIFY DIAMETER
1 1/4" KEYED DESIGN

PUMP NO.	CONSTRUCTION IRON	BRONZE
103	-	131.000.825
104	137.000.148	137.000.147
105	137.000.107	137.000.193



Models: TBX & TBI (0525)
Flow-rate: 525gpm
Impeller Trim: 8.00
Motor HP: 15hp
Pump part number: 114875
Pump Repair Kit number: 118207

IRON - 1750 RPM - 8.0" IMPELLER - JP FRAME - 7.5-15 HP



KEY NO.	PART NAME	8.20 FIT PUMP NO. 103	PUMP NO. 104	PUMP NO. 105
1	CASE	See Chart	See Chart	See Chart
2	IMPELLER	See Chart	See Chart	See Chart
4	MOTOR JP	See Chart	See Chart	See Chart
14 †	SHAFT SLEEVE, BRONZE	110.000.308	110.000.308	110.000.308
--	SHAFT SLEEVE, STAINLESS	110.000.360	110.000.360	110.000.360
24 †	NUT, BRONZE	137.000.407	137.000.407	137.000.407
--	NUT, STAINLESS	110.000.304A	110.000.304A	110.000.304A
25	WEAR RING, BRONZE	137.000.434	103.000.202	103.000.204
--	WEAR RING, STEEL	--	103.000.185	103.000.186
26 †	STUD	105.000.385	105.000.385	105.000.385
32 †	KEY	102.000.257	102.000.257	102.000.257
38 †	O-RING, SHAFT	116.000.218	116.000.218	116.000.218
40 †	FLINGER	104.000.200	104.000.200	104.000.200
71	ADAPTER, IRON - JP210/250	132.000.378	132.000.374	132.000.374
73 †	GASKET, CASE	116.000.276	116.000.261	116.000.261
89 †	SEAL 1 3/4"	See Chart	See Chart	See Chart
--	*REPAIR KITS:			
?	BN-CM SEAL	118.000.410	118.000.412	
	VN-CM SEAL	118.000.410A	118.000.412A	
	VN-NR SEAL	118.000.410B	118.000.412B	

? DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

SEALS 1¾"

TYPE 21	
BN-CM	101.000.190
VN-CM	101.000.216
VN-NR	101.000.221

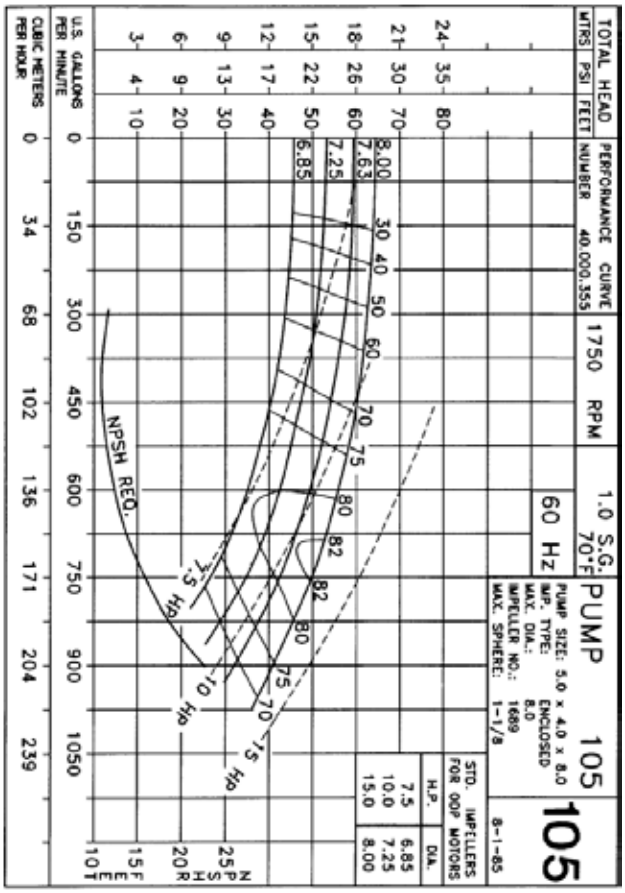
***CASES**

PUMP NO.	SIZE (FLG) SUCT	DISCH	IRON
103	4	2.5	130.000.306X
104	5	3	130.000.310X
105	5	4	130.000.311X

* INCLUDES BRONZE WEAR RING. FOR STEEL 104, 105 PUMP WITH WEAR RING, REPLACE SUFFIX "X" WITH "XY".

ENCLOSED IMPELLERS
SPECIFY DIAMETER
1 1/4" KEYED DESIGN

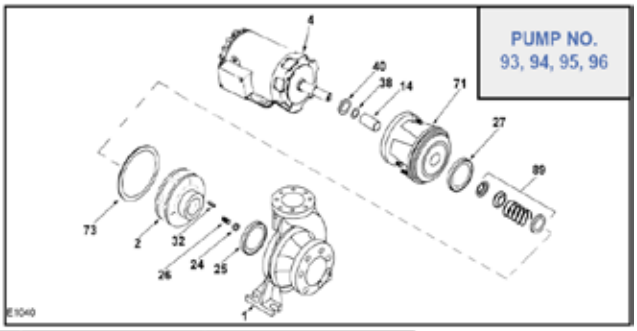
PUMP NO.	CONSTRUCTION IRON	BRONZE
103	--	131.000.528
104	137.000.148	137.000.147
105	137.000.107	137.000.193



Models: TBX & TBI (0825)
Flow-rate: 825gpm
Impeller Trim: 8.50
Motor HP: 20hp
Pump part number: 123138
Pump Repair Kit number: 118208

Models: TBX & TBI (1100)
Flow-rate: 1100gpm
Impeller Trim: 8.63
Motor HP: 20hp
Pump part number: 111541
Pump Repair Kit number: 118208

IRON - 1750 RPM - 10.0" IMPELLER - JP FRAME - 7.5-30 HP



KEY NO.	PART NAME	10.20 FIT PUMP NO. 93, 94	PUMP NO. 95, 96
1	CASE	See Chart	See Chart
2	IMPELLER	See Chart	See Chart
4	MOTOR, JP	See Chart	See Chart
14 ‡‡	SHAFT SLEEVE, BRONZE	110.000.396	110.000.396
--	SHAFT SLEEVE, STAINLESS	110.000.360	110.000.360
24 ‡‡	NUT, BRONZE	137.000.407	137.000.406
--	NUT, STAINLESS	110.000.304A	110.000.304
25	WEAR RING (CASE)	See Chart	See Chart
26 ‡	STUD	105.000.385	105.000.484
27	WEAR RING (ADAPTER)	See Chart	See Chart
32 ‡	KEY	102.000.282	102.000.284
38 ‡	O-RING, SHAFT	116.000.218	116.000.218
40 ‡	FLINGER	104.000.200	104.000.200
71 *	ADAPTER, IRON - JP210/250	132.000.361X	132.000.357X
--	ADAPTER, IRON - JP280/320	--	132.000.362X
73 ‡	GASKET, CASE	116.000.267	116.000.267
89 ‡	SEAL, 1 3/4"	See Chart	See Chart
--	*REPAIR KITS:		
?	BN-CM SEAL	118.000.404	118.000.405
	VN-CM SEAL	118.000.404A	118.000.405A
	VN-NR SEAL	118.000.404B	118.000.405B

? DENOTES COMPONENTS INCLUDED IN REPAIR KIT

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

SEALS 1¾"
TYPE 21

BN-CM	101.000.196
VN-CM	101.000.216
VN-NR	101.000.221

WEAR RINGS - BRONZE

PUMP NO.	KEY #25 (CASE)	KEY #27 (ADAPTER)
93	103.000.201	103.000.202
94	103.000.202	103.000.202
95	103.000.204	103.000.199
96	103.000.199	103.000.199

WEAR RINGS - STEEL

PUMP NO.	KEY #25 (CASE)	KEY #27 (ADAPTER)
95	103.000.186	103.000.194
96	103.000.194	103.000.194

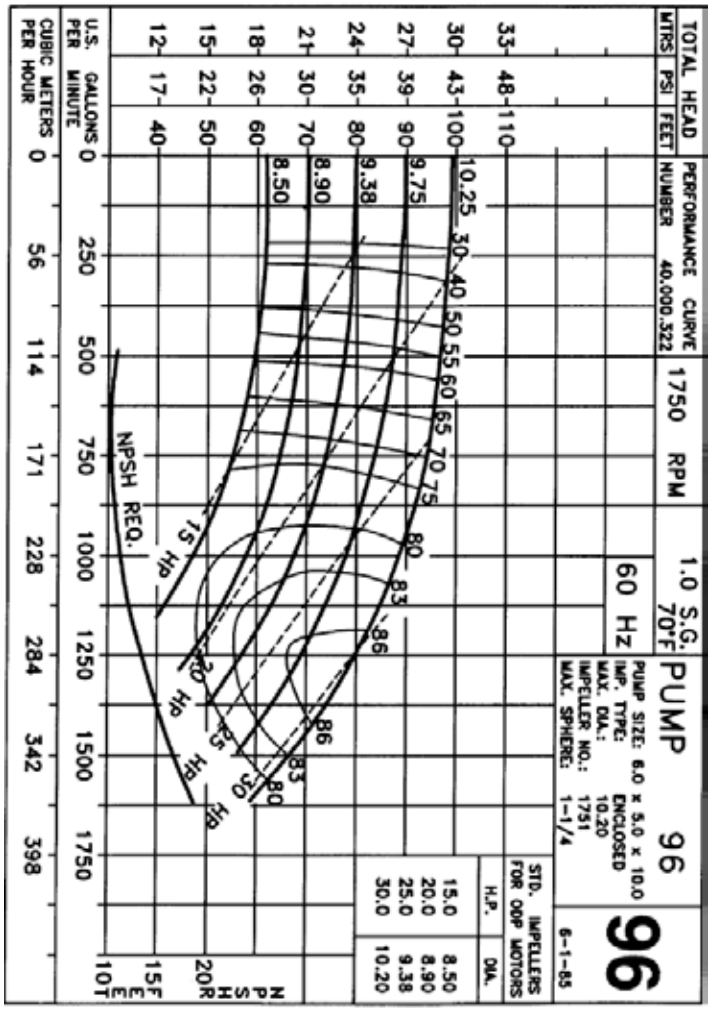
***CASES**

PUMP NO.	SIZE (FLG) SUCT	DISCH	IRON
93	4	2.5	130.000.305X
94	5	3	130.000.306X
95	6	4	130.000.370X
96	6	5	130.000.372X

* INCLUDES BRONZE WEAR RING. FOR STEEL WEAR RING, REPLACE SUFFIX "X" WITH "01".

ENCLOSED IMPELLERS
SPECIFY DIAMETER
1 1/4" KEYED DESIGN

PUMP NO.	CONSTRUCTION IRON	BRONZE
93	--	137.000.156
94	137.000.161	--
95	137.000.142	137.000.110
96	137.000.149	137.000.111



VIII. STANDARD PUMP CONTROL PANEL WIRING DIAGRAMS

A. The following control panel wiring schematics represent our LAKOS standard control panels for the TC and TB system packages. All control panels supplied by LAKOS are provided with NEMA-4X enclosures and are UL Listed. If the system you purchased has a different voltage or phase than those shown on the drawings, please request the correct control panel wiring schematic for your model from LAKOS.

B. There are three sizes of control panels sized on the horsepower of the pump for each system. Please refer to the title block on the drawings and select the panel which represents your package. Pump horsepower ratings can be found on each page of the pump curve data supplied in this manual.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

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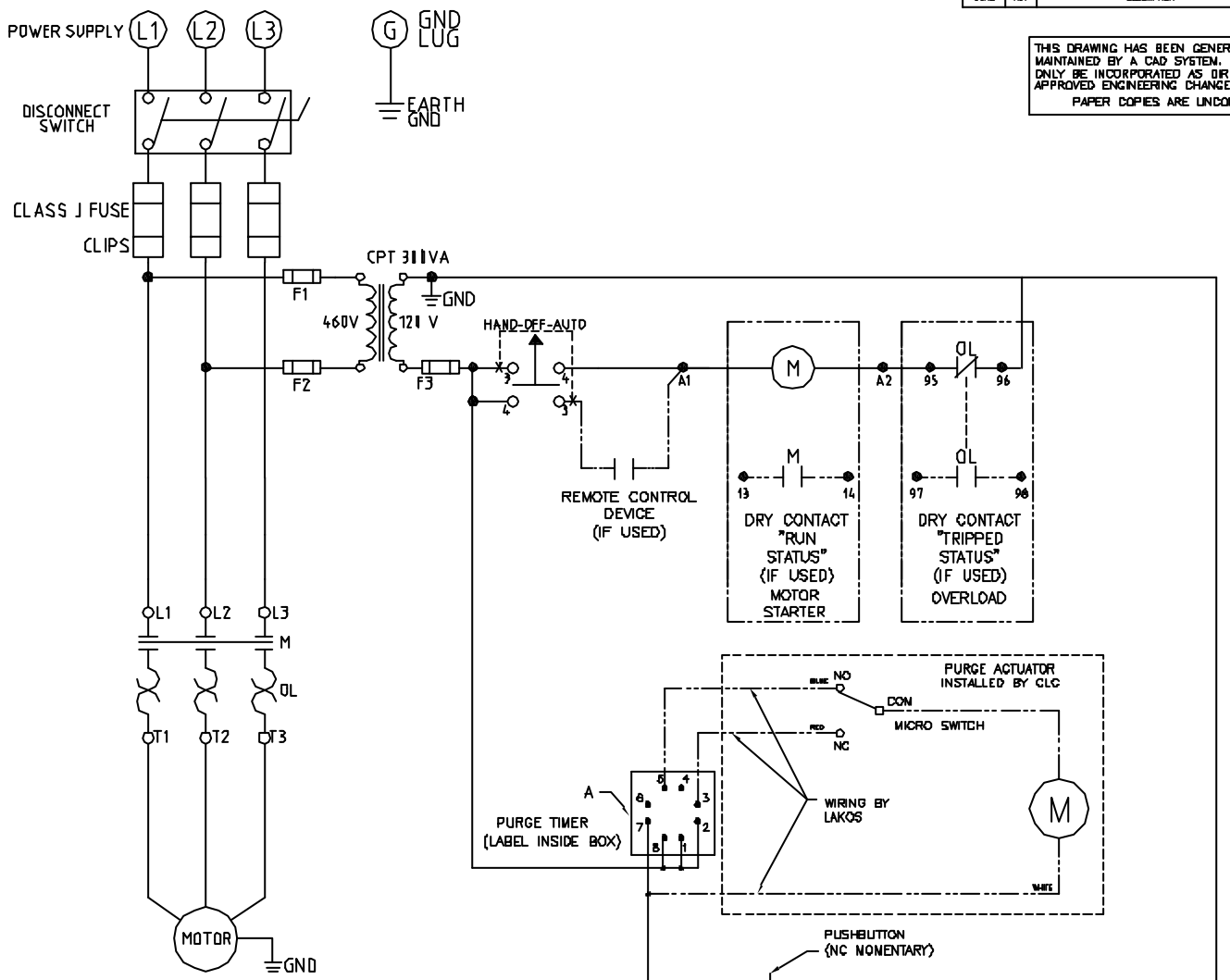
FUSE SIZE BY HP CLASS J FUSES @460V	
HP	AMP
1/2	2
3/4	2
1	3
1-1/2	4
2	5
3	6



MOTOR CONTROL BOX

A. OMRON TIMER: SUPPLIED BY CLAUDE LAVAL CORP. CLC# 121226.
TIMER, REPEAT CYCLE ON START, OMRON H3CR-F8N-300, 100-240V 50/60 HZ.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [mm] TOLERANCES ARE FRACTIONS DECIMALS ANGLES ±1/4" .XX ±0.02 .XXX ±0.005 .XXXX ±0.0005 ±1/4° DO NOT SCALE DRAWING	ENGINEERED FOR 1/2-3HP ABV	LAKOS CLAUDE LAVAL CORP. 1368 N. CLOVIS AVE. FRESNO, CALIFORNIA 93727
MATERIAL	APPROVALS DATE	TITLE MOTOR CTRL BOX, 23AMP 3/60/460V/12DV COIL 18 x 14 x 7, 1/2-3HP, TC SYSTEM ABV
FINISH	DRAWN ADJ 5/25/07	SIZE C MODEL NO. DWG NO. 128023 REV. -
	ENGR	SCALE 1/8 SHEET 1 OF 1
	QTY.	
	WORK ORDER	

DWG NO. 128023 REV. - SHEET 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

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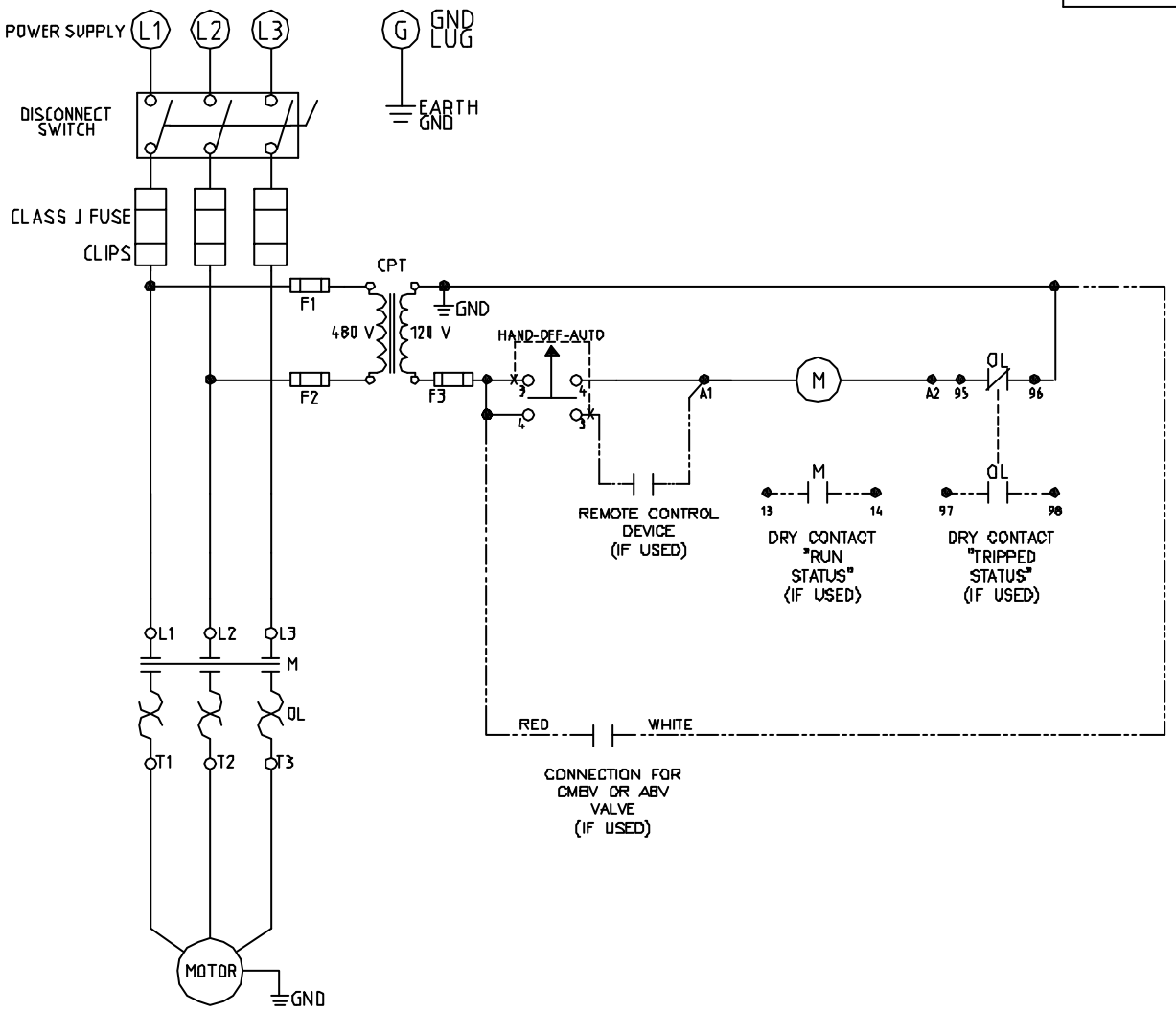

MOTOR CONTROL BOX

DIMENSIONS FOR	1.5-3HP		
APPROVALS		DATE	
DRAWN	ADJ	8/28/08	
ENGR			
QTY			
WORK ORDER		QTY.	

CLAUDE LAVAL CORP., 1335 N. CLOVIS AVE. FRESNO, CALIFORNIA 93727

LAVAL DISTINCTIVE SERVICE

TITLE: MOTOR CTRL BOX, 23AMP 3/60/460V/12DV COIL
16 x 14 x 7, 1.5-3HP, TC SYSTEM

SIZE	MODEL NO.	DWG NO.	REV.
C		126265	–

SCALE 1/8 | SHEET 1 OF 1

126265 | 1 | –

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REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

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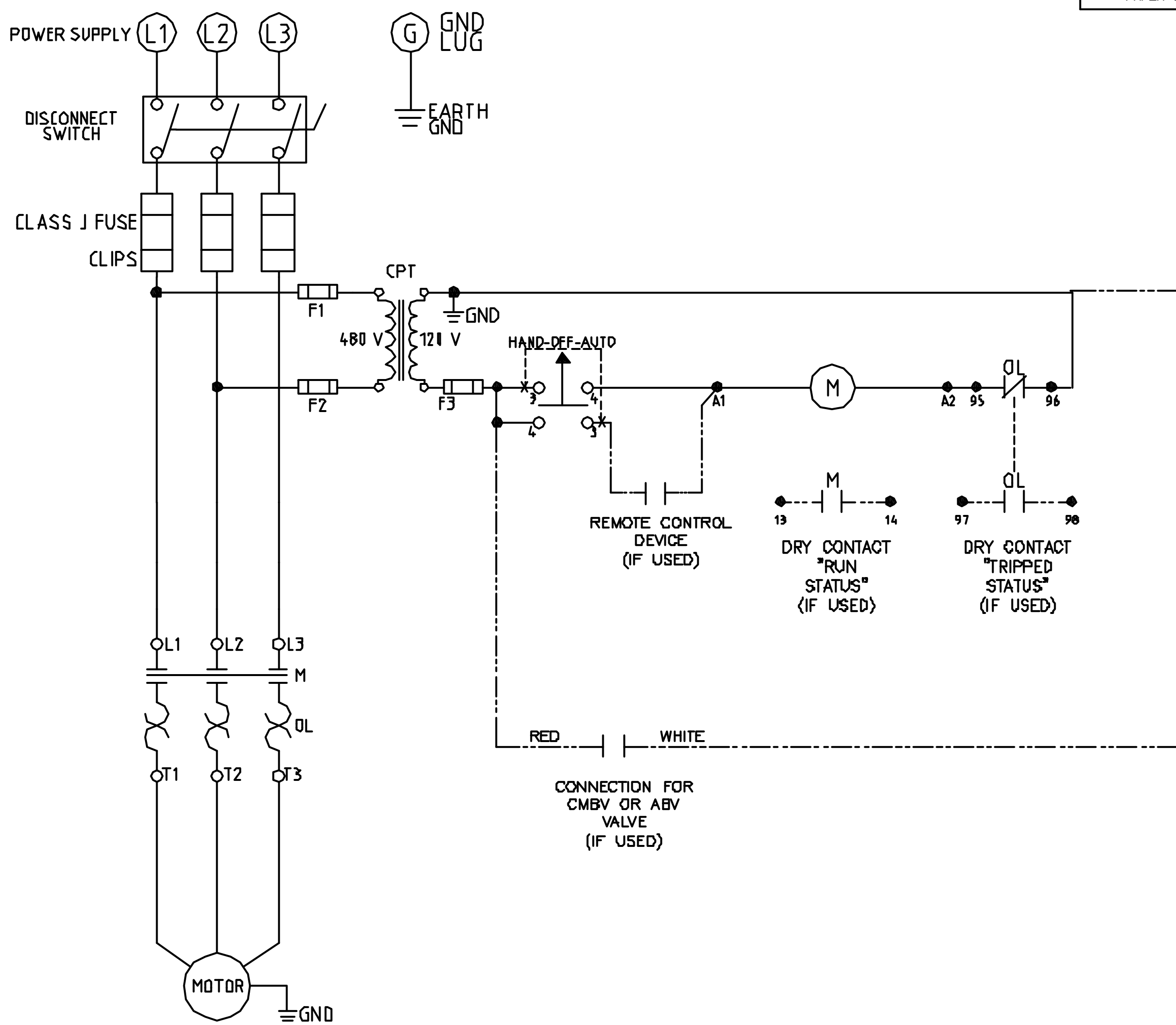
FUSE SIZE BY HP
CLASS J FUSES

HP	AMP
5	10
7.5	15
10	20
15	30



MOTOR CONTROL BOX

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES [mm]; TOLERANCES ARE: FRACTIONS ±1/4"; DECIMALS .XX ±.01, .XXX ±.005; ANGLES ±1/4°; DO NOT SCALE DRAWING	ENGINEERED FOR: 5-15HP
MATERIAL	APPROVALS: DRAWN ADJ; DATE 9/1/08
FINISH	

LAKOS — CLAUDE LAVAL CORP., 1365 N. CLOVIS AVE., FRESNO, CALIFORNIA 93727 — LAVAL

TITLE: MOTOR CTRL BOX, 23AMP 3/60/460V/120V COIL
15 x 14 x 7, 5-15HP, TC SYSTEM

SIZE	MODEL NO.	DWG NO.	REV.
C		126266	–

SCALE 1/8 — SHEET 1 OF 1

DWG NO. 126266 — SH 1 — REV. –

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

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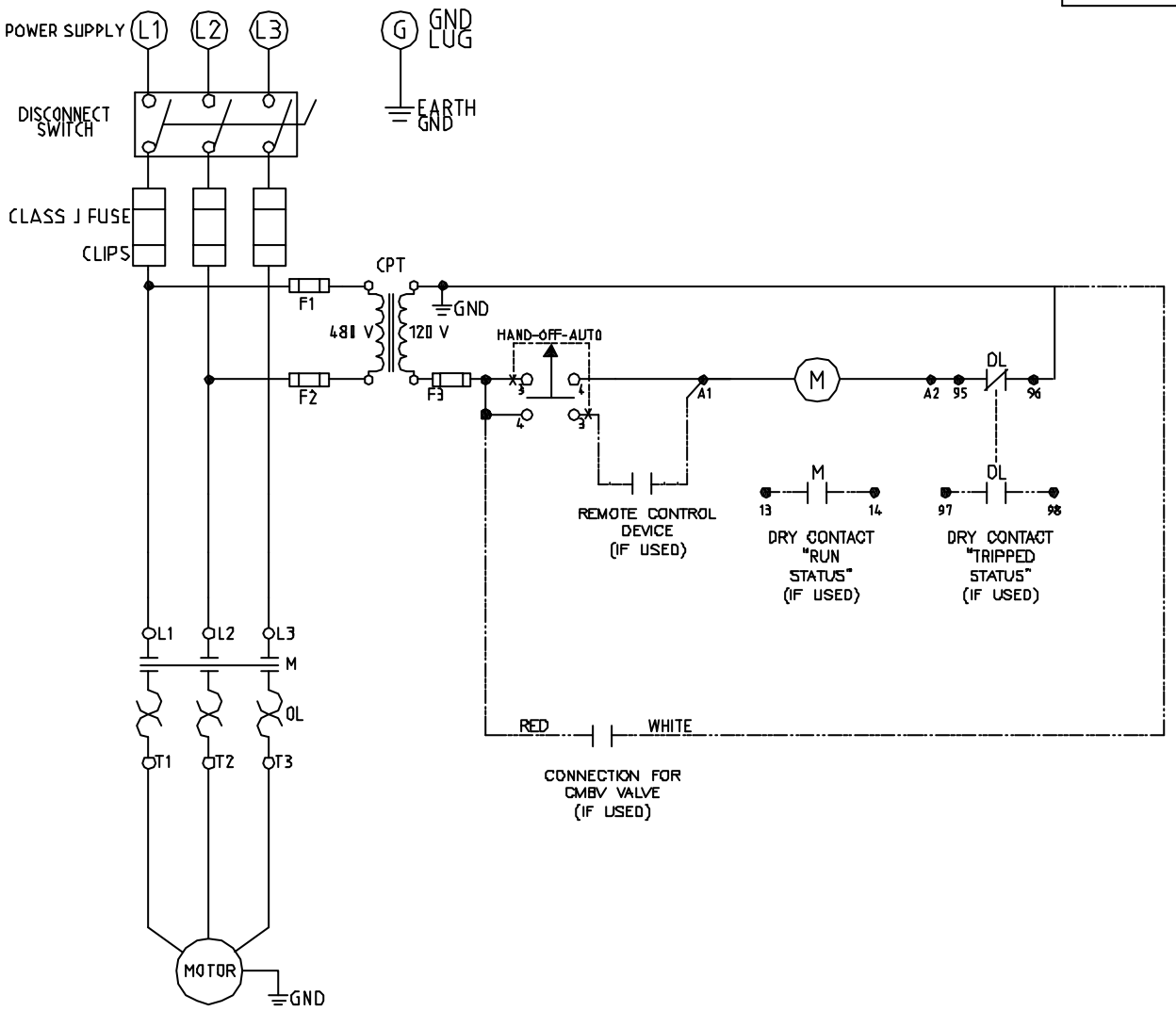
PAPER COPIES ARE UNCONTROLLED.

FUSE SIZE BY HP CLASS J FUSES	
HP	AMP
20	35
30	50



MOTOR CONTROL BOX

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [mm] TOLERANCES ARE: FRACTIONS ±1/64 DECIMALS .XX ±.02 .XXX ±.005 ANGLES ±1/4° DO NOT SCALE DRAWING	DIMENSIONS FOR 20-30HP	LAKOS	CLAUDE LAVAL CORP. 1366 N. CLOVIS AVE. FRESNO, CALIFORNIA 93727
MATERIAL	APPROVALS / DRAWN ADJ 11/1/05	TITLE	MOTOR CTRL BOX, 43AMP 3/60/460V/120V COIL 16x14x7, 20-30HP, TC SYSTEM
FINISH	CHKD / MFG / WORK ORDER / QTY.	SIZE C	MODEL NO. / DWG NO. 126267 / REV –
		SCALE 1/8	SHEET 1 OF 1

126267

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REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

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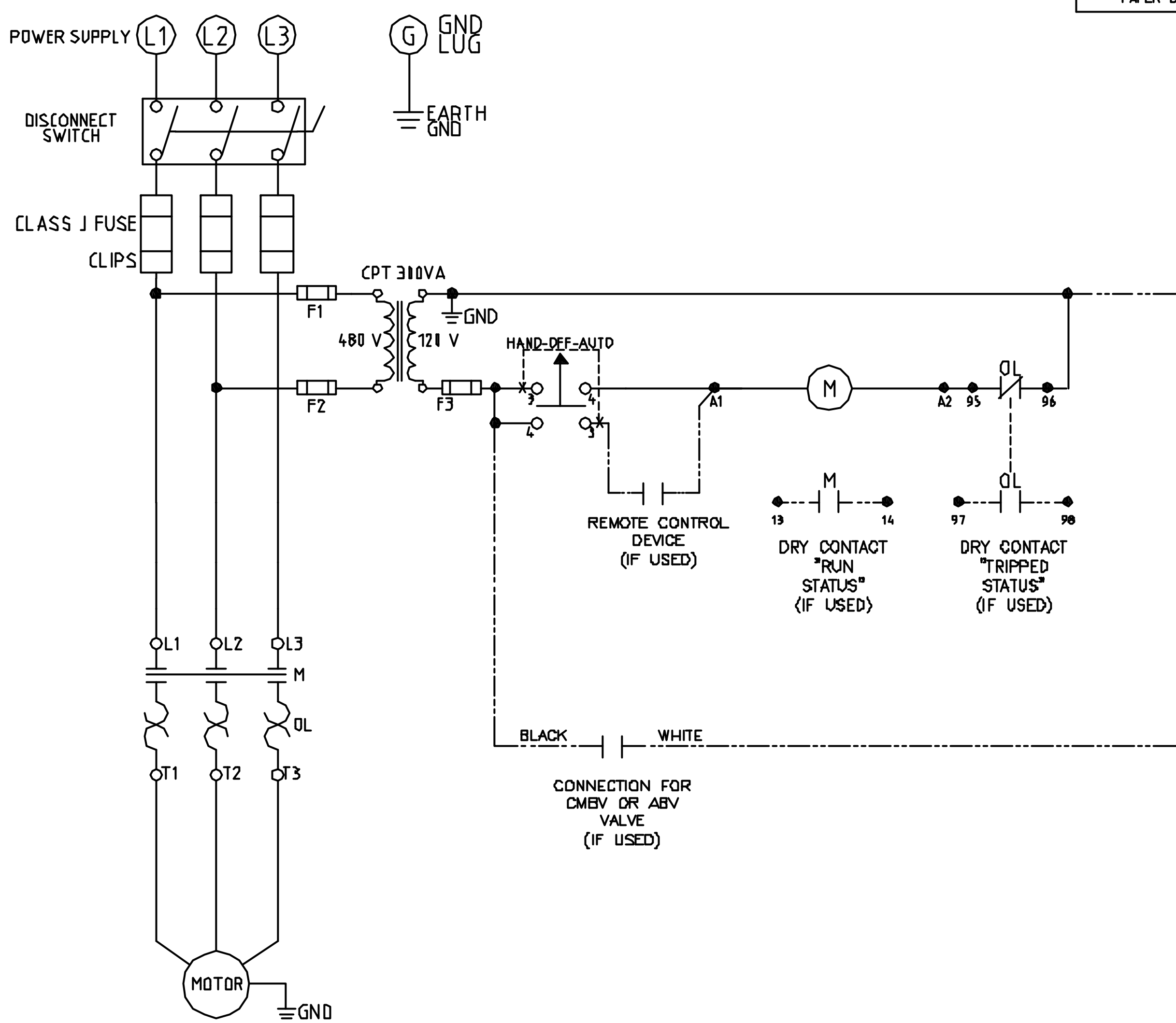

MOTOR CONTROL BOX

FUSES CONTROL TRANSFORMER	
F1	2AMP
F2	2AMP
F3	4AMP

ENGINEERED FOR	30-40HP
DRAWN	ADJ
	LAKOS — CLAUDE LAVAL CORP. 1365 N. CLOVIS AVE. FRESNO, CALIFORNIA 93727
TITLE	MOTOR CTRL BOX, 60AMP 3/60/460V/120V COIL 16 x 14 x 7, 30-40HP, TC SYSTEM
SIZE	C
DWG NO.	126414
REV.	—
SCALE	1/8
SHEET	1 OF 1

DO NOT SCALE DRAWING

IX. SPARE PARTS FOR TC & TB SYSTEMS

SRV replacement bags (set of 10):

- CBX-1610-25 (25 micron) LAKOS P/N 104181
- CBX-1610-50 (50 micron) LAKOS P/N 104182

TC/TB Pump Repair Kits**:

- Pump repair kits to be selected based on pump model. Please refer to the pump curve and parts breakdown pages in this manual and select the kit based on your system. The LAKOS Pump Repair Kit part number is listed for each pump on the corresponding page.

**ALL KITS INCLUDE (1) SHAFT SLEEVE, (1) IMPELLER RETAINER, (1) IMPELLER KEY, (1) SHAFT O-RING, (1) FLINGER, (1) CASE GASKET, (1) MECHANICAL SEAL ASSEMBLY

SRV Parts:

- AUTO VENT LAKOS P/N 111016
- GASKET FOR LID (NITRILE) LAKOS P/N 106213
- STAINLESS STEEL BASKET LAKOS P/N 105355
- O-RING FOR BASKET (BUNA-N) LAKOS P/N 106807

SRI Parts:

- DIFFERENTIAL PRESSURE INDICATOR LAKOS P/N 101849
- SIGHT GLASS LAKOS P/N 106276
- FLOW CONTROL ORIFICE (10 GPM) LAKOS P/N 115183
- MANUAL ISOLATION BALL VALVE (3/4”) LAKOS P/N 108034

X. STANDARD PUMP I&O MANUAL, MECHANICAL SEAL I&O MANUAL

A. LAKOS supplies Scot Pumps and American Marsh Pumps on our standard TC and TB system packages. The following manuals are for reference when servicing or repairing a Scot Pump and American Marsh Pump. Please review these manuals before attempting any disassembly of the pump. LAKOS would highly recommend that any pump repairs by done by a certified pump repair service technician. A pump identification guide page is included (prior to manuals) to help you identify the Scot Pump supplied with your system. **LAKOS recommends that the SPECIFICATION NUMBER, SALES ORDER NUMBER, and DATE CODE be documented and kept with the records for the system. These codes will be requested by LAKOS for any type of warranty issues that may arise with the pump and motor.**

B. If your pump is other than a Scot or American Marsh pump, please contact LAKOS and request the supplied pump manufacturer's I&O manuals.

C. There are multiple Scot Pump I&O manuals based on the size of the pumps. The manuals are arranged in the following order:

- I&O Manual for C56 & JM Frames
    - Scot Pump models #16, #17, #19, #54, #55, #56F, #57, #59

- I&O Manual for TCZ & JP Frames
    - Scot Pump models #96, #102, #103, #104

- I&O Manual for Mechanical Seal (Type 21)
    - Supplied in all Scot Pump models listed above

D. The American Marsh Pump I&O manual is 24012 Series 300 & 310 – REF, REC, & REI END SUCTION. LAKOS uses the REC model only on the standard TC/TB systems.

TOWER-CLEAN/SIDESTREAM-CLEAN SYSTEMS

START-UP FORM

DATE OF START-UP: _____

COMPANY NAME: _____

ADDRESS: _____

_____

_____

PROJECT NAME/DESCRIPTION: _____

_____

CONTACT PERSON(S): _____

(Please include titles) _____

DESCRIPTION OF LIQUID & SOLIDS (type, size, etc.)**:** _____

_____

TEMPERATURE OF SYSTEM FLUID: _____

COOLING TOWER BASIN SIZE: _____

NUMBER OF COOLING TOWER CELLS SERVICED: _____

DOES SYSTEM USE HYDROBOOSTERS IN THE TOWER BASIN:

θ Yes θ No **Number of Hydroboosters per Cell:** _____

Prior to start-up, please record this data:

PUMP SERIAL NUMBER: _____

MOTOR MAKE AND FULL LOAD AMPS: _____/_____

TC PACKAGE SERIAL NUMBER: _____

For start-up, please record this data:

MOTOR AMPS: ___/____/____ **MOTOR VOLTAGE:** _____

PRESSURE TO INLET OF SEPARATOR: _____

PRESSURE AT OUTLET OF SEPARATOR: _____

ADDITIONAL OBSERVATIONS/REMARKS:_____

_____

_____

Please complete this form and send a copy to LAKOS; keep a copy for your records.

1365 North Clovis Avenue ~ Fresno, California 93727 USA
Telephone:(559) 255-1601 • Fax:(559) 255-8093 • E-Mail: info@lakos.com
Toll-Free: (800) 344-7205 (USA, Canada & Mexico)