LAUNDRY SYSTEMS

Washer Extractor

INSTRUCTION MANUAL

MODEL
SP 125

IM2505-SP0106-16
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KEY SYMBOLS

Anyone operation or servicing this machine must follow the safety rules in this manual. Particular attention **must be** paid to the **DANGER**, **WARNING**, and **CAUTION** blocks which appear throughout the manual

The lightening flash and arrowhead within the triangle is a warning sign alerting you of the presence of dangerous.

The exclamation point within the triangle is a warning sign alerting you of important instructions concerning the machine.

This warning symbol alerts you to the presence of possible dangerous drive mechanisms within the machine. Guards **should always be** in place when the machine is in operation.

This warning symbol indicated the presence of possibly dangerous chemicals. Proper precautions **should be** taken when handling corrosive or caustic material.

This warning symbol indicated the presence of hot surfaces that could cause serious burns. Stainless steel and steam lines can become extremely got and **<u>should not be</u>** touched.

This warning symbol indicates the presence of possible dangerous pinch – points. Moving mechanical parts can crush and / or sever body parts.

Before servicing any equipment, make certain it is disconnected from the electrical power source. Never allow operation of the machine when any safety device is malfunctioning. Never bypass safety devices.

SECTION 1

IMPORTANT INFORMATION

The SOFTMOUNT line is the professional fixed mount washer – extractor series of machines. It is an open pocket washer – extractor with a large and unloading. It has been developed for the in premise market, and is suitable for commercial laundries, hotel and other places where laundry might be processed.

The design allows for top performance at lowest possible operation cost and investment. The flexible electronic control center ensures that maximum productivity is obtained.

The SOFTMOUNT Series utilizes high quality material, such as 304 (18/8) stainless steel in vital parts in contact with the wash solution. It has a stainless steel cabinet for long life with easily removable panels.

The key advantages of this series are the simplicity of the microprocessor and the electronic AC drive system, which utilizes only one motor. The system allows for washing and extraction at suit any textile fiber used today and tomorrow. The high speed final extraction saves time and energy in the finishing operation.

A multi compartment supply dispenser for powder and liquid detergents is standard and machine is designed to accept the connection of 4 chemical lines and pumps.

SAFETY CHECK LIST

Before Initial start up of a washer – extractor perform the following safety check:

A. Make sure all electrical and plumbing connections have been made in accordance with applicable codes and regulations.

B. Make sure the machine is grounded electrically.

C. Make sure the machine has flexible water fill and drain connections of the correct size, length and type, with no kinks, and that they are securely attached and/or clamped.

Before machine is placed in operation, the door safety interlock **must be** checked for proper operation as follows:

A. When the washer is energized electrically and in operation, the loading door **must be** locked in the closed position. Verify this by attempting to open the loading door when the machine is operating. If necessary, check the door safety interlock and sensors for proper operation. Consult the service manual, or call a qualified service technician if necessary.

B. When the washers loading door is open, it **should not be** possible to start the machine. Verify this by attempting to start the washer with the door open. Also, close the door without locking it and verify. That it is not possible to start the machine with the door not locked. If necessary, check the door lock sensors for proper operation. Consult the service manual, or call a qualified service technician. If additional information is required, contact your local distributor or call the manufacturer of the machine

Before servicing any equipment, make certain it is disconnected from the electrical power source. Never allow operation of the machine when any safety device is malfunctioning. Never bypass safety devices.

Never insert hands or objects into basket until it has completely stopped. Doing so could result in serious injury.

To provide personal safety and keep the machine in proper working order, follow all maintenance and safety procedures presented in this manual. If questions regarding safety arise contact the factory immediately.

Use factory authorized spare parts to avoid safety hazards.

OPERATOR SAFETY

To ensure the safety of machine operators the following maintenance checks must be performed daily.

1. Prior to operating the machine, verify that all warning signs are present and legible. Missing or illegible signs must be replaced immediately. Make certain that spares are available.
2. Check door interlock before starting operation of the machine, see safety checklist.
3. **Do not** attempt to operate the machine if any of the flowing conditions are present.
   a. The door does not remain securely locked during the entire cycle.
   b. Excessively high water level is evident.
   c. Machine is not connected to a properly grounded circuit.

Do not bypass any safety devices in the machine.

Never operate the machine with a bypassed or disconnected out – of – balance switch. Operating the machine with severe out – of – balance loads could result in personal injury and serious equipment damage.

Do not place volatile or flammable fluids in any machine. **Do not** clean the machine with volatile or flammable fluids such as acetone, lacquer thinners, enamel reducers, carbon tetrachloride, gasoline, benzene, naphtha, etc. Doing so could result in serious personal injury and/or damage to the machine.

Safe Operation Environment

Safe Operation Environment Safe operation requires an appropriate operating environment for both the operator and the machine. If questions regarding safety arise, contact the factory.

Environmental Conditions

1. **Ambient temperature.**

   Water in the machine will freeze at temperatures of 32 °F (0 °C) or below. Temperatures above 120 °F (50 °C) will result in more frequent motor overheating and, in some cases, malfunction

or premature damage to solid state devices that are used in the machines. Special cooling devices may be necessary.

2. **Humidity.**

   Relative humidity above 90% may cause the machine's electronics or motors to malfunction or may trip the ground fault interrupter. Corrosion problems may occur on some metal components. If the relative humidity is below 30% belts and rubber hose leaks, with adjacent electrical equipment.

3. **Ventilation.**

   The need for make – up air openings for such laundry room accessories as dryers, ironers, water heaters, etc. **must be** evaluated periodically. Louvers, screens, or other separating devices may reduce the available air opening significantly.

4. **Radio Frequency Emissions.**

   A filter is available for machines in installations where floor space is shared with equipment sensitive to radio frequency emissions. All machined that are shipped to CE countries are equipped with this filter and comply with the EMI regulations.

5. **Elevation.**

   If the machine is to be operated at elevations over 3280 feet (100 meter) above sea level, pay special attention to water levels and electronic settings (particularly temperature) or desired result may not be achieved.

6. **Chemicals.**

   Keep stainless steel surfaces free of chemical residues to avoid corrosion.

7. **Water damage.**

   Do not spray the machine with water. Short circuiting and serious damage may result. Repair immediately all seepage due to faulty gaskets, etc.

Replace all panels that are removed to perform service to perform service and maintenance procedures. **Do not** operate the machine with missing guards or with broken or missing parts. **Do not** bypass any safety devices.

Machine Location

1. **Foundation.** The concrete floor must be of sufficient strength and thickness to handle the floor loads generated by the machine at high extract speeds.
2. **Service/Maintenance Space.** Provide sufficient space to allow comfortable performance of service procedures and routine maintenance. This is especially important in connection with machine equipped with AC inverter driver. Consult installation instructions for specific details.

Input and output services

1. **Water pressure.**

   Best performance will be realized if water or provided at a pressure of 30 – 87 psi (2 – 6 bar). Although the machine will function properly at lower pressure, increased fill time will occur. Water pressure higher than 120 psi (8.0 bar) may result in damage to machine plumbing. Components failure (s) and personal injuries.

2. Optional Steam heating pressure.

Best performance will be realized if steam pressure is provided at a pressure of 30 – 80 psi (2 – 5.5 bar). Steam pressure higher than 125 psi (8.6 bar) may result in steam components and may cause personal injuries. For machines equipped with optional steam heat, install piping in accordance with approved commercial steam

3. Drainage System.

Provide drain lines or trough large enough to accommodate the total quantity of water that could be dumped if all machines on the site drained at the same time from the highest attainable level. If drain troughs are used, they **should be** covered to support light foot traffic.

4. Power.

For personal safety and for proper operation, the machine must be grounded in accordance with state and local codes. The ground connection must be to a proven earth ground, not to conduits or water popes. An easy access disconnect switch **should be** provided

Ensure that a ground wire from a proven earth ground is connected to the ground lag in the electrical junction box on this machine. Without proper grounding personal injury form electrical shock could occur and machine malfunctions may be evident. Computer controlled machines **must have** a proper ground to prevent computer malfunctions.

Always disconnect power and water supplies before a service technician performs any service procedure. Where applicable, steam and/or compressed air supplies **should also be** disconnected before service is performed

AC Inverter Drive

Machines equipped with AC drives require special attention with regard to the operating environment.

1. An especially dusty or linty environment will require more frequent cleaning of the AC drive cooling fan filter and of the AC drive itself.
2. Power line fluctuations from sources such as an interruptible power supplies (UPS) can adversely affect machines equipped with the AC drive. Proper suppression devices **should be** utilized on the incoming power to the machine to avoid problems.
3. A clean power supply free from voltage spikes and surges is absolutely essential for machines equipped with the AC drive. Nonlinear inconsistencies (peaks and valleys) in the power can cause the AC drive to generate nuisance errors. If voltage is above 230V for 200V installations or above 440V for 400V installations, a buck/boost transformer is recommended. If voltage is above 240V or 480V, a buck/boost transformer is required unless the factory advises differently.
4. Sufficient space to perform service procedures and routine preventive maintenance is especially important for machines equipped with AC drives.

Machinery Misuse

Even though this machine is an atmospheric vessel, never use it for any purpose other than washing fabrics.

1. Never wash petroleum – soaked rags in the machine. This could result in an explosion.

2. Never wash machine parts or automotive parts in the machine. This could result in serious damage to the basket.
3. Never stone wash in the machine. It could wear the basket and serious damage might occur to the machine.
4. Never use the machine for dying and with harsh chemicals that can cause corrosion and other health hazards.
5. Never allow children to play on or around this machine become trapped in the machine. **Do not** leave children unattended while the machine door is open. These cautions apply to animals as well.

In case of deterioration products (ISO14001)

1. The defective products or parts can be sold to increase the financial value.
2. The defective products able to separate into parts and bring the materials which can convert into new functional products.
3. The defective products can be reused by repairing and making the products is in good condition.

SECTION 2

SPECIFICATIONS / COMPONENT IDENTIFICATION

DELIVERY INSPECTION

Upon delivery, visually inspect crate, protective cover, and unit for any visible shipping damage. If the crate, protective cover, or unit are damaged or signs of possible damage are evident, have the carrier note the condition on the shipping document before the shipping receipt is signed, or advise the carrier of the conditions as soon as it is discovered.

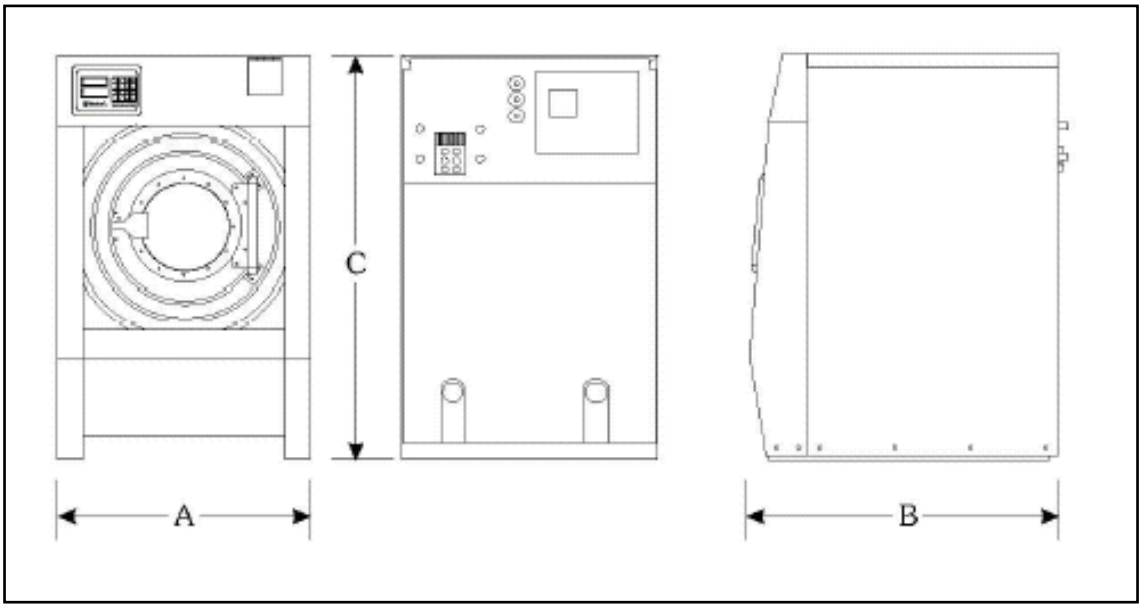
Remove the crate and protective cover as soon after delivery as possible. If any damages discovered upon removal of the crate and/or protective cover, advise the carrier and file a written claim immediately.

A record of each machine is on file with the manufacturer. The serial number decal is located at the rear of the machine. Always provide the machine's serial number and model number when ordering part or when seeking technical assistance.

NOTE: Keep the manuals, installation instruction and the wiring diagrams which accompany the machine in a safe place for ready reference. They have been included with the machine at no charge. Additional copies are available at a nominal charge.

A. TECHNICAL SPECIFICATION

Model	Metric	US	125 lbs.
Maximum capacity:	kg.	lbs.	56.7 (125)
OVERALL DIMENSIONS:			
A – Machine Width	mm.	inch	1203 (47.4")
B – Machine Depth	mm.	inch	1394 (54.9")
C – Machine Height	mm.	inch	1812 (71.3")
CYLINDER INFORMATION:			
Basket Diameter	mm.	inch	920 (36.2")
Basket Depth	mm.	inch	718 (28.3")
Basket Volume	cu.m.	cu.ft.	0.45 (16.04)
DOOR OPENING AND HEIGHT:			
Door Opening Diameter	mm.	inch	510 (20.1")
Height Of Door Bottom Above Floor	mm.	inch	740 (29.1")
DRIVE INFORMATION:			
Number of Motors	Number		1
Size of Motor	kW	HP	7.5 (10)
CYLINDER SPEEDS (PROGRAMMABLE):			
Wash	RPM	G-Force	39 (0.8)
Distribution	RPM	G-Force	62 (2)
Extract 1	RPM	G-Force	309 (50)
Extract 2	RPM	G-Force	817 (350)
WATER INLETS AND CONSUMPTION:			
Hot water size	NPT		1"
Cold water size			1"
Additional water Inlet			1"
Average **HOT** water consumption/cycle	liters	gal	60 (16)
Average **COLD** water consumption/cycle	liters	gal	172 (46)
DRAIN OUTLETS AND CAPACITY:			
Number of drains	Standard	Optional	1 (2)
Drain size	mm	inch	76.2 (3")
Drain capacity	liters/min	gal/min	916 (242)
STEAM INLETS AND CONSUMPTION:			
Steam Inlet Connection	NPT		1/2"
Steam Pressure	bar	psi	8 (125)
Steam Consumption	kg/hr	lb/hr	149 (328)
Compressed Air System:			
Air Inlet Connection	NPT		N/A
Air Pressure	bar	psi	N/A
POWER OF ELECTRICAL HEATING :			
Electrical Power	kW		36
WEIGHT AND SHIPPING INFORMATION :			
Net Weight	kg.	lbs.	1003 (2211.2)
Domestic Shipping Weight	kg.	lbs.	1037 (2286.2)


C
A
B

SECTION 3

INSTALLATION PROCEDURES

A. DIMENSIONL CLEARANCES

When installing the washer – extractor, it is important to allow adequate clearance on all sides of the machine. When multiple machines are installed, it is important to allow for the specified minimum clearances between machines. The following table shows recommended minimum clearances for the various freestanding models.

NOTE: The dimensions are approximate and subject to normal manufacturing tolerances. If exact dimensions are required for construction purposes, request certified drawings from the factory. We reserve the right to make changes at any time without notice.

Detail		UNTIS Metric	UNITS US	SP Series			
				Recommended		Minimum	
(A)	Minimum rear clearance	mm	in	760	30	305	12
(B)	Minimum clearance between machine and wall	mm	in	455	18	25	1
(C)	Minimum clearance between machines	mm	in	455	18	25	1
(D)	Minimum font clearance	mm	in	850	33	838	33

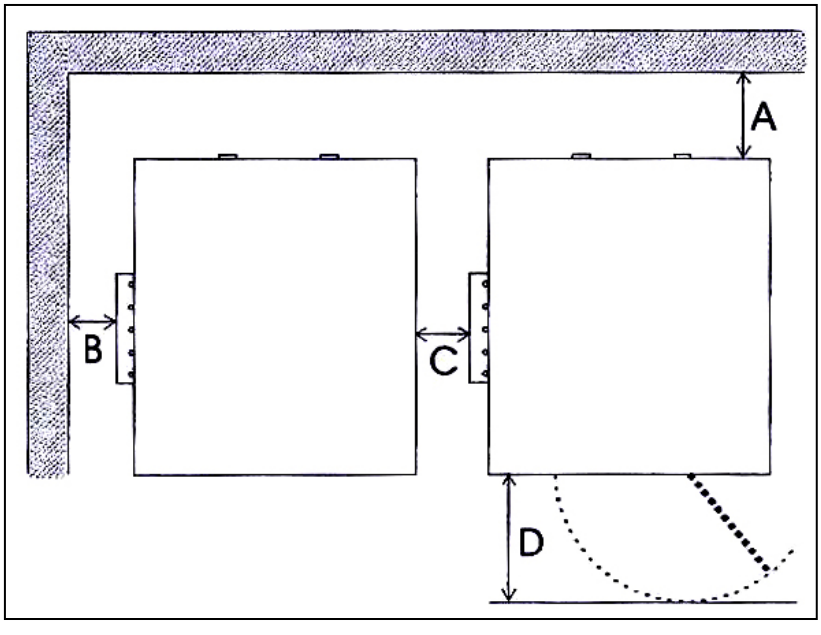


Figure 3-1 Dimensions for construction

B. MACHINE FOUNDATION

Thoroughness of details **must be** stressed with all foundation work to insure a stable unit installation, eliminating possibilities of excessive vibrations during extraction.

The machine **must be** anchored to a smooth level surface so that the entire base of the machine is supported and rest on the mounting surface. **Note! Do not** support the machine on only four points.

NOTE: High Spin soft-mount machine has to be levelling and bolting according to the installation instruction.

Special care **must be** taken when machines are installed on an upper floor. Make sure that the floors are designed to carry the static and dynamic loads of the machines.

Further vibrations **should be** taken into consideration so that the machine does not create vibrations in the building. Static and dynamic loads on the floor or foundation are shown in the table below. This table can be used as reference when designing floors and foundations. See figure for mounting bolt layout measurement and pattern.

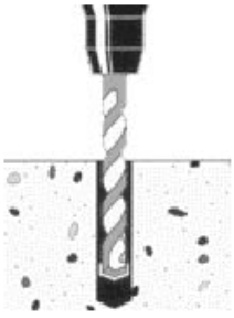
Ensure that the machine is installed on a level floor of sufficient strength and that the recommended clearances for inspection and maintenance are provided. Never allow the inspection and maintenance space to be blocked.

Table 3-1 Machine foundation

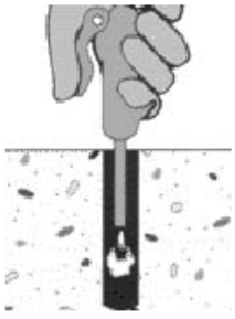
	Static floor load		**Static pressure**		**Dynamic floor load**		**Max dynamic load**		**Dynamic pressure**		**Dynamic Frequency**
	kN	lbs	kN/m2	Lbs-ft2	kN	lbs	kN	lbs	kN/m2	Lbs-ft2	Hz
125 lbs.	9.3	2100	5.9	123.7	2.3	525	2.3	525	1.46	30.9	13.75

C. MOUNTION BOLT TNSTALLATION

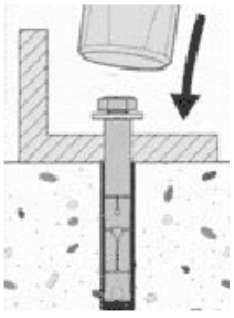
All washers – extractors **must be** secured by the use of machinery anchor bolts. High strength machinery anchors **should be** embedded in 3500 psi (24000 N/m2) reinforced concrete. For detailed information regarding the machine anchor bolt, see the instructions included with the anchor bolts themselves. The following information is just an example. After the concrete has cured, proceed as follows:



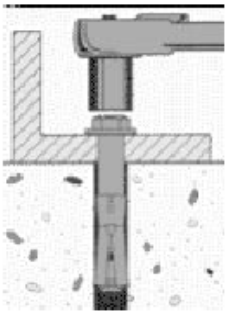
Select a carbide drill bit with a diameter equal to the anchor diameter.
Drill hole to any depth exceeding the desired embedment.



Clean hole or continue drilling to accommodate drill fines (concrete dust). Please wear eye protection.



Drive the anchor into the hole through material being fastened until washer is flush with material.



Expand bolt by tightening the anchor 3 to 5 turns, or to the specified torque requirements.

Figure 3-2 Mounting bolt installation

Place the machine adjacent to the foundation. **Do not** attempt to move it by pushing on the sides.

1. Remove the wood skid by unscrewing the carriage bolts holding it to the bottom frame of the machine.
2. Carefully place the machine over the anchor bolts. Raise and level it 1/2 inch above the floor on four points, using spacers that can be removed.
3. Fill the spaces between the machine base and floor with machinery grout. Grout completely under all frame members. Remove front panel and rear panel to gain access to all frame members. Force grout under the machine base until all voids are filled.
4. Remove the spacers carefully, allowing the machine to settle into the wet grout.
5. Attached the mounting bolt washers and lock nuts to the anchor bolts after the grout has hardened. Tighten the lock nuts by even increments one after the other until all are tightened evenly and the machine is fastened securely to the floor. The nuts **should be** tightened in a diagonal fashion, which will help ensure equal tension at all anchor points.

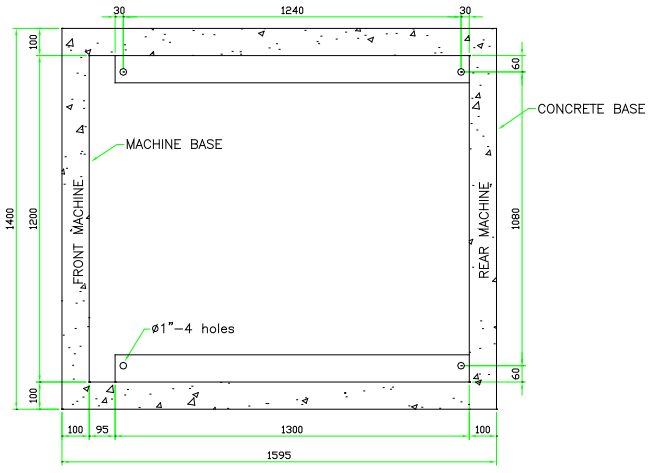


Figure 3-3 Mounting bolt installation

Mounting Bolt installation

Washer – extractors 125 lbs. uses M 20 bolts. Embed the bolts in 3500 psi reinforced concrete with a minimum of 12" thickness. The threaded end of the bolt should extend 2 inches from the surface of the floor. As an option, a welded bolt locating fixture is available (rebar frame). This rigid welded assembly is made of reinforcing rod (rebar) and is designed to be encased in concrete.

Remove bolt front and rear transportation brackets, as well as the bracket located on the lower inside right of the machine. Failure to remove shipping brackets before operation of the SP series will void your warranty.

D. DRAIN CONNECTION

A drain system of adequate capacity is essential to the machine performance. Ideally the water should empty through a 4 inch vented pipe directly into a sump or floor drain. See figure 3-4.

A flexible connection **must be** made to a vented drain system to prevent an airlock or siphon effect. If proper drain size is not available or practical, a surge tank is required. A surge tank in conjunction with a sump pump **should be** used when gravity drainage is not possible, such as in below – ground – level installations.

Before any deviation from specified installation procedures is attempted, the customer or installer should contact the manufacturer. Increasing the drain hose length, installing elbows, or causing bends will decrease drain flow rate and increase drain time, impairing machine performance. If the drain arrangement is inadequate, the machine will not extract and will not discharge water properly. See table below for specific drain information.

Table 3-2 Drain sizing

	Units		**125 lbs.**	
	Metric	**US**		
Drain connection Size	mm.	in	76	3
Drain flow capacity	liters/min	gpm	581	150
Minimum drain it size	liters	gal	388	100

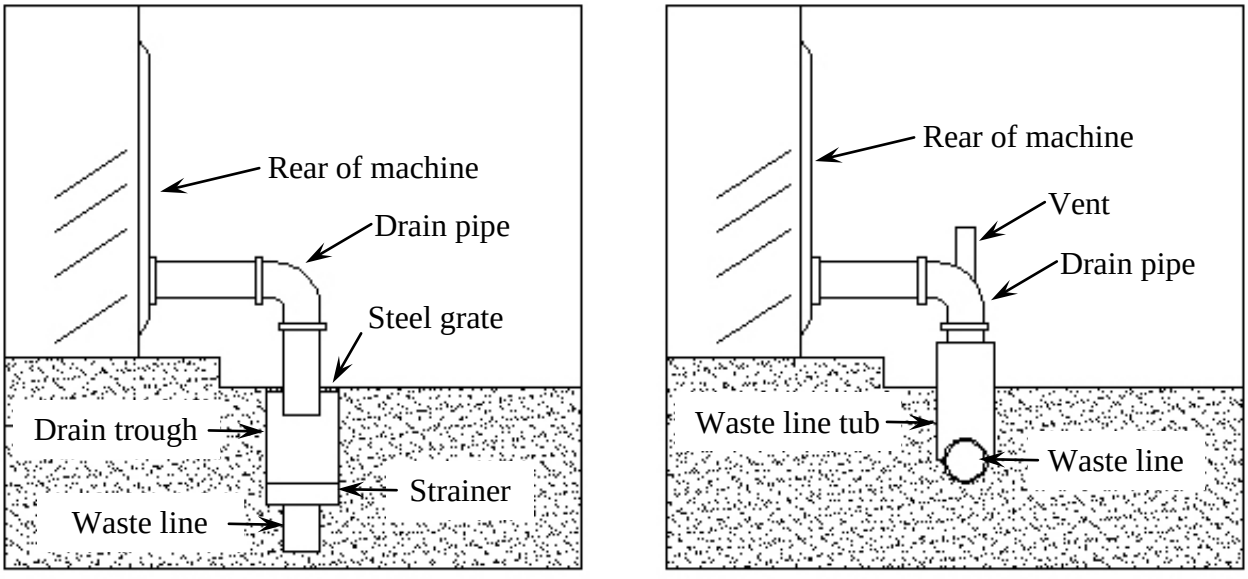


Figure 3-4 Drain installation

E. ELECTRICAL INSTALLATION

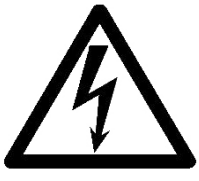
The AC drive requires a clean power supply free from voltage spikes and surges. A voltage monitor **should be** sued to check incoming power. The customer's local power company may provide such a monitor.

The AC drive provides for an internal circuit breaker. A separate circuit breaker governs the control circuit.

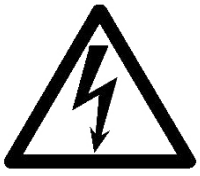
If input voltage measures above 230V for a 200V drive, or above 440V for a 400V drive, either ask the power company if their representative can lower the voltage or install a step-down transformer kit available from the manufacturer. Voltages above 250V and 490V require additional measures. Contact the distributor or the manufacturer for assistance.

This machine **must be** installed, adjusted, and serviced by qualified electrical maintenance personnel familiar with the construction and operation of this type of machinery. They **must also be** familiar with the potential hazards involved. If this warning is not observed, personal injury or equipment damage resulting in voiding the warranty may result.

When controlling the AC drive with a parameter unit, the machine's computer and its safety features are bypassed. This would allow the basket to rotate at high speeds with the door open. When using a parameter unit to control the AC drive, a large sign **should be** placed on the front of the machine warning people of the imminent danger



Never touch terminals or components of theca drive unless power is disconnected and the "CHARGE" indicator LED is off. The AC drive retains potential deadly voltage for some time after the power is disconnected. There are no user serviceable parts inside the AC drive. Tampering with the drive will void the warranty.



Dangerous voltages are present in the electrical control boxes and at the motor terminals. Only qualified personnel familiar with electrical test procedures test equipment, and safety precautions **should attempt** adjustments and troubleshooting. Disconnect power from form the machine before removing the control box cover, and before attempting any service procedures.

Table 3-3 Electrical Service Requirements

Machine	200-240V			380-480V		
	Max Amps	**Breaker**	**Wire Size**	**Max Amps**	**Breaker**	**Wire Size**
125 lbs.	25	30	10ga / 4 mm	12	15	14ga / 2.5mm

NOTE: Wire sizes shown are for copper, THHN, 90 conductor per NEC article 310 (USA).

The machine **should be** connected to an individual branch circuit not shared with lighting or other equipment.

The connection **should be** shielded in a liquid tight or approved flexible conduit with proper conductor of correct size installed in accordance with National Electric Code (USA) or other applicable codes. The connection must the wiring diagram provided with the machine. See the Electrical Connection data Chart for correct wire sizes.

Use wire sizes indicated in the chart for runs up to 50 feet (15m). Use next larger size for runs of 50 to 100 feet (15-30m). Use 2 sizes larger for runs greater than 100 feet (30m).

For personal safety and for proper operation, the machine **must be** grounded in accordance with state and local codes and in the USA in accordance with the National Electric Code, article 250-96.

The ground connection **must be** to a proven earth ground, not to conduit or water pipes. **Do not** connect the system is used, the neutral (N) leg at the terminal strip.

If a DELTA supply system is used, the high leg may be connected to L1, L2 or L3, as the machines are equipped with control transformer.

F. WATER CONNECTION

Individual hot and cold plumbing lines with individual shut-off valves **must be** available to the machine. Hot water **should be** of 160°F (70°C). If lower temperature water is used the machine **should be** equipped for steam heating to heat the wash solution to desired temperature. Best performance will be realized if water is provided at a pressure of 30 – 87 psi (2 – 6Bar). Although the machine will function properly at lower pressures, increased fill times will occur.

Flush the water system for at least two minutes prior or initial use.

Use flexible hoses and install separate screen filters in the lines to keep rust and other foreign particles out of the solenoid valves. Hang the hoses in a large loop. **Do not** allow the hoses to link. The water connections to the machine **should be** supplied by a hot and cold water line of least the sizes shown in the table below. Installation of additional machines will require proportional larger water lines, see table.

To avoid eventual water hammer in the water line, suitable devices to reduce the water hammer **should be** installed.

Table 3-4 Water Connection Detail

NUMBER OF MACHINES	Pipe Size SP Series	
	DN	Inch
1	25	1
2	25	1
3	40	1-1/2
4	40	1-1/2
5	50	2
6	50	2

G. STEAM CONNECTION

Never touch internal or external steam pipes, connections, or components. These surfaces can be extremely hot and will cause severe burns. The steam **must be** turned off and the pipe, connections, and components allowed to cool before the pope can be touched

For machines equipped with optional steam heat, install piping in accordance with approved commercial steam practices. Steam requirements are shown in the table below. Failure to install the supplied steam filter may void the warranty.

MODEL	UNITS		125 lbs.	
STEAM INLET and CONSUMPTION:				
Steam inlet size	DN	In	13	½
Required steam to heat bath 10F (5.55C) LOW	kg	lbs	6.4	14
Required steam to heat bath 10F (5.55C) HIGH	kg	lbs	7.3	16
Average Steam consumption per cycle	kg/hr	BHP	60	3.8

H. EXTERNAL CHEMICAL SUPPLIES

Wear Eye and hand protection when handling chemicals. Always avoid direct contact with raw chemicals. Read the manufacturer's directions for accidental contact before handling chemicals. Ensure that an eye-rinse facility and an emergency shower are within easy reach. Check at regular intervals for chemical leaks.

The following procedures **must be** observed when connecting any chemical injector to the washer-extractor. See the figure for a typical supply injection system setup. Undiluted chemicals dripping can damage the machine. Therefore, all chemicals supply dispenser pumps **should be** mounted below the washer's injection point. All dispensers tubing should also run below the injection point. Loops **do not** prevent drips if these instructions are not followed. Failure to follow these instructions could damage the machine and void the warranty.

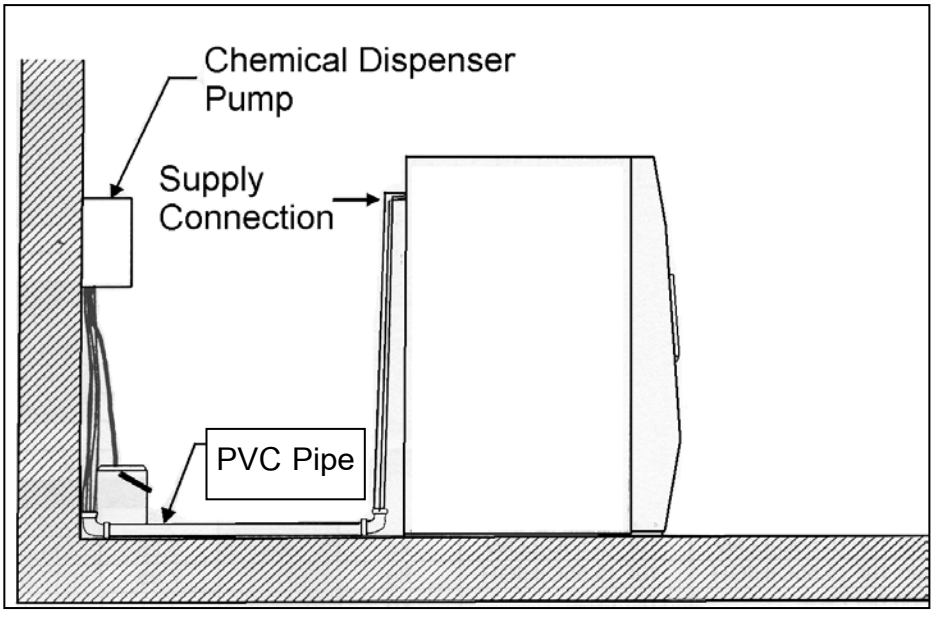


Figure 3-5 External chemical supply

The supply compartment on the SP models is located on the front of the machine. Supply cups can be accessed by opening the dispenser lid. The supply cups can be removed and filled as desired. Supply compartments are numbered 1, 2, 3 and 4 from the left of the machine to the right for the optional 5 cup system.

External supply connections for the SP washer-extractors are located on rear of the machine. Hose connections **should be** made via the threaded connectors. See figure.

1. Remove plug from base. See figure. Plug is assembled inside the tubing ring.
2. Install strain relief, included in the seal nut.
3. Insert tubes into the adapter. For the plastic supply box, you must drill the nipples prior to use (max 1/4" bit). A 1/2 NPT connection is also provided for flushing systems.

I. ELECTRICAL CONNECTIONS

Connection terminals are located in the rear control box for output signals to the chemical injection supply pump.

Terminals SUPPLY 1 through SUPPLY 4 provide contact closings for external chemical supply pumps. The contact rating is maximum 3 amps at 24-220V 50/60Hz.

Do not attempt to increase fuse rating as this cause damage to the washer-extractor circuitry.

Any injection system pump, which requires 24-220V AC, **must be** powered by a separate external power source.

Attempting to obtain power from the machine terminals may damage the machine circuit and/or the chemical injection system. Consult the chemical injection supply system instructions for operational details.

J. CONTROL FUNCTION TEST

The machine **should be** cleaned after the installation is complete. A function test should then be executed on the unloaded machine as follows:

1. Check the proper supply for such characteristics as correct voltage, phase, and cycles to be certain they are correct for the machine.
2. Open manual shut-off water valves to the machine.
3. Press Emergency Stop button.
4. Apply power to the machine.
5. Release the Emergency button.
6. Check the door interlock before starting the machine.
    a. Attempt to start the machine with the door open. The machine **should not** start with the door open.
    b. Close the door without locking it and attempt to start the machine. The washer **should not** start with the door unlocked.
    c. Close and lock the door and start a cycle. Attempt to open the door while the cycle is in progress. The door **should not** open. If the door lock and interlock are not functioning properly, call a service technician.
7. For standard processing, select program 30 by pressing key 3 and key 0 on the keypad. Then press enter and the Start key. Run the complete program, checking operation of water inlet valves, drain, and extract functions. Program 30 is a test program that goes through most machine functions.
8. Cylinder rotation **must be** counter clockwise in the extract step. If rotation is not correct, disconnect the power to the machine. A qualified technician must reverse any two leads between the AC drive and the motor. See figure.

K. THEORY OF OPERATION

The SP models use a single-speed motor to drive the cylinder is supported via V-belts in all speeds. The cylinder is supported by two spherical roller bearings located in a bearing housing made of cast iron.

The motor is controlled by the computer control located in the front and the AC inverter drive located in the rear panel. Any speed can be programmed for any wash cycle. Some speed ranges are blocked out for programming due to safety reasons. This speed range is not important and normally speeds for wash or extraction are not selected within this range. Any wash speed in the range of 10-50 RPM and extraction speeds 150-Maximum RPM can be programmed. Further any reversing action can be programmed. Normal reversing action is 18 seconds forward, pause for 3 seconds, and 18 seconds reverse. Any temperature between 70F to 200F (20-95C) can be programmed. Any water level in the range of the machine parameters can be programmed is centimeters. The computers will automatically provide safety levels for steam injection and door operations.

Water entry into the machine is through electromagnetic water valves controlled by the computer. The computer also controls the drain, supply dispenser, any external liquid supplied,

steam injection and any other vital functions of the wash program. The computers can even record cycles and data of importance that could be used for maintenance purpose.

The steam, if installed is injected in the bottom of the shell via a steam injector. The steam is controlled by a steam valve that is programmed by the micro computer.

The cylinder is perforated, allowing water to pass through and drain from within during drain and extract steps. Lifting ribs inside the cylinder lift the load from the wash solution and allow the load to tumble and falling back into the solution when the load from the wash solution and allow the load to tumble and falling back into the solution when the load reaches the approximate 10-1 o'clock or 1-2 o'clock positions. This mechanical action removes soil from the fabric. Furthermore, the lifters are perforated on the top so that water can cascade over the goods and wet them quickly. This reduces water consumption as water is picked up at the cylinder's lowest point and lifted and splashed over the goods at the highest point as the cylinder rotates.

A stainless steel door is provided for loading and unloading. A door lock system prevents operation of the machine when the door is open. The door is locked during operation utilizing an air cylinder and a manual latch for safety reasons. The door lock is provided with magnetic sensor to indicate that the machine is locked and provide for start of the machine when the door is closed and locked.

The AC drive, contractor, circuit overload protectors, input power supply connections, external supply connection, and control transformer are behind a cover of the rear of the machine.

The supply dispenser is mounted on the front of the machine and is accessed by unlatching the cover door. Supplies, both liquid and powder; may be added by pulling the dispenser cups out and placing the appropriate supply in each. Supplies are flushed into the machine at the proper time in the cycle, controlled by the microcomputer.

Holes are provided at the rear of the machine for connection to an external, central liquid supply unit. Electrical connections are provided for the liquid supply unit on a terminal strip inside the rear control module.

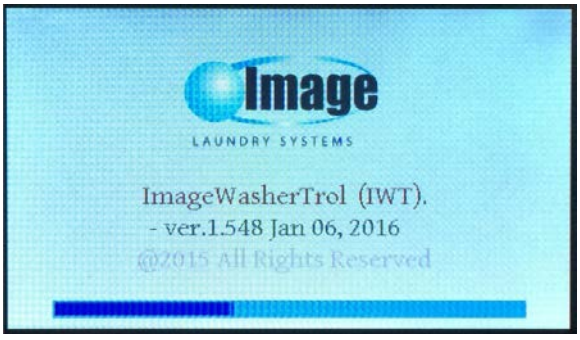
SECTION 4

OPERATING INSTRUCTIONS

IWT 03 CONTROLLER

BOOTING SCREEN

The screen will be start when open the machine. The screen will show logo, version detail with setting default to main mode for using in next step.



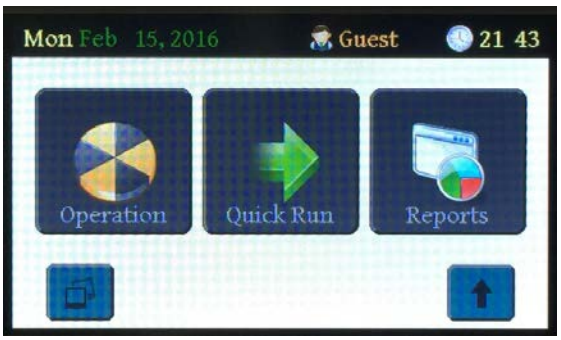
DEFAULT MAIN SCREEN

1. When boot the machine, the screen will show 3 functions for operation include operation, quick run and report. The screen will show current date and time, current user login and button for login system.

2. Operation for run cycle program that programmed in system.

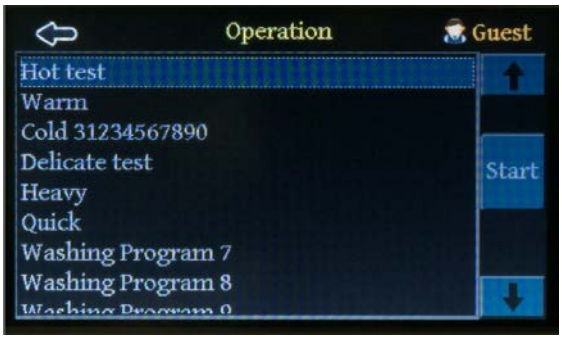
3. 6 Quick run programs for washing.

4. Report for check and record data of machine.

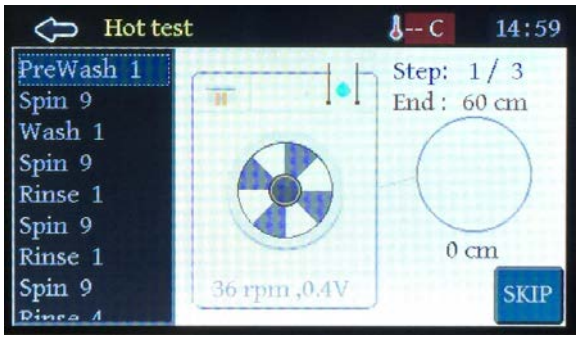


OPERATION SCREEN

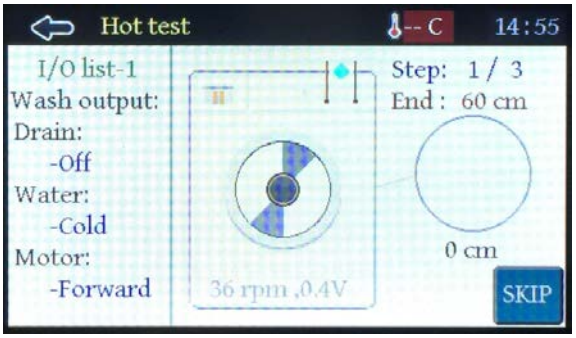
- Selection of washing program by press Start button for run selected program.



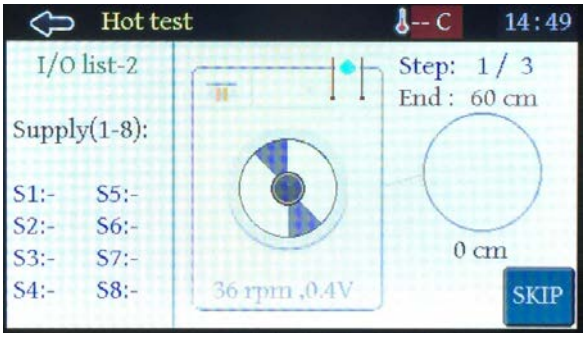
- Running Screen: The screen will show washer running.



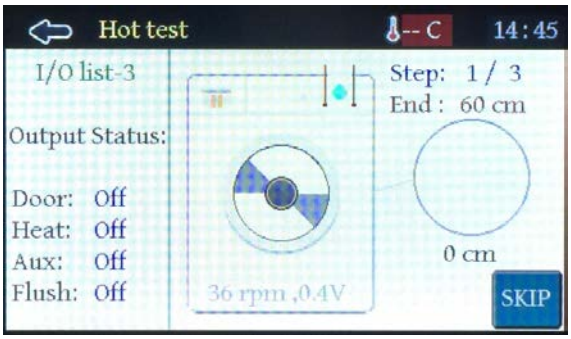
- Real-Time #1 Screen: The screen will show working result in real time for wash output, drain, water and motor.



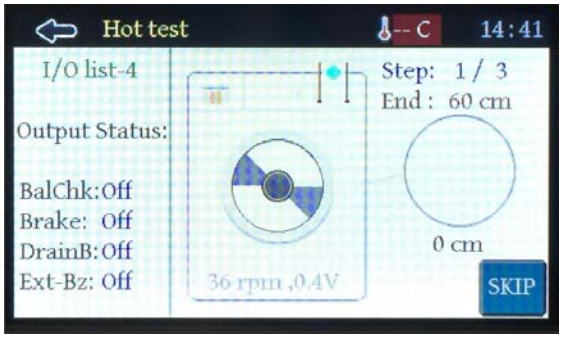
- Real-Time #2 Screen: The screen will show working result in real time for Supply 1-8.



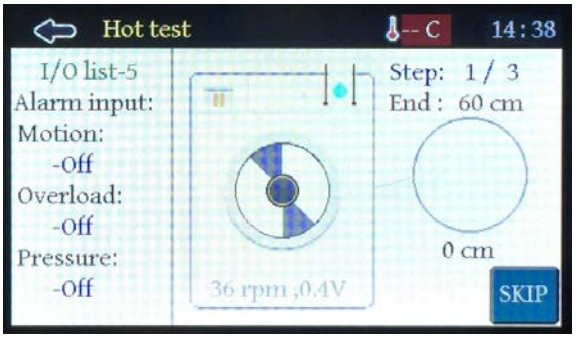
- Real-Time #3 Screen: The screen will show working result in real time for Output status: Door, Heat, Aux and Flush.



- Real-Time #4 Screen: The screen will show working result in real time for Output status: Balance Checking, Break Motor, DrainB and External Buzzer.

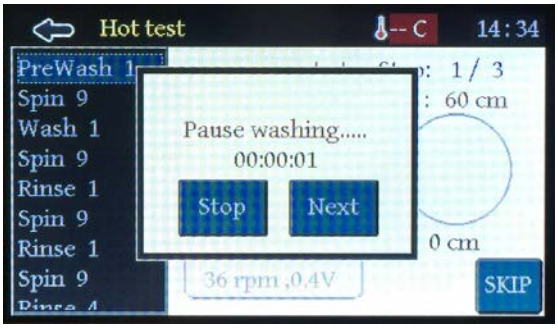


- Real-Time #5 Screen: The screen will show working result in real time for Alarm input: Motion, Overload and Pressure.



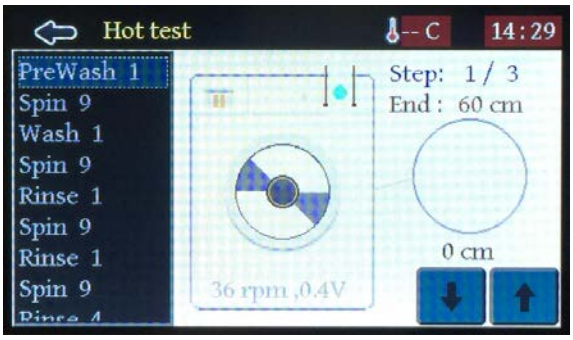
PAUSE SCREEN

You can pause the machine while washing by press pause button at left-top of washer picture.



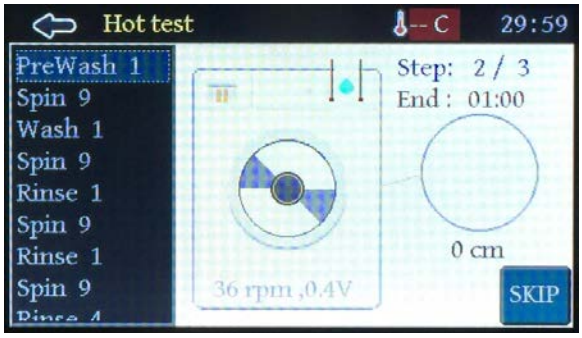
EDIT SCREEN

You can edit setting value while washing by press time icon. Then the arrow icon will appear for edit value.



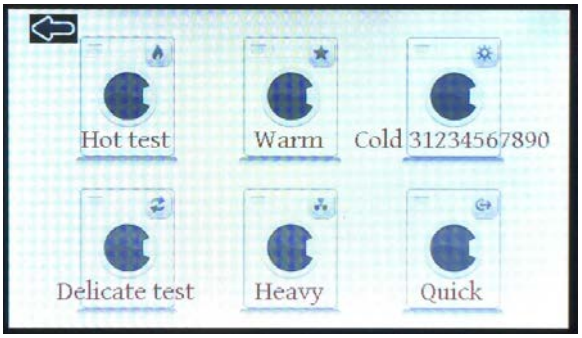
SKIP FUCNTION

You can press SKIP button in order to next step.



QUICK RUN SCREEN

Quick run have 6 modes and running immediately when press at any icon.

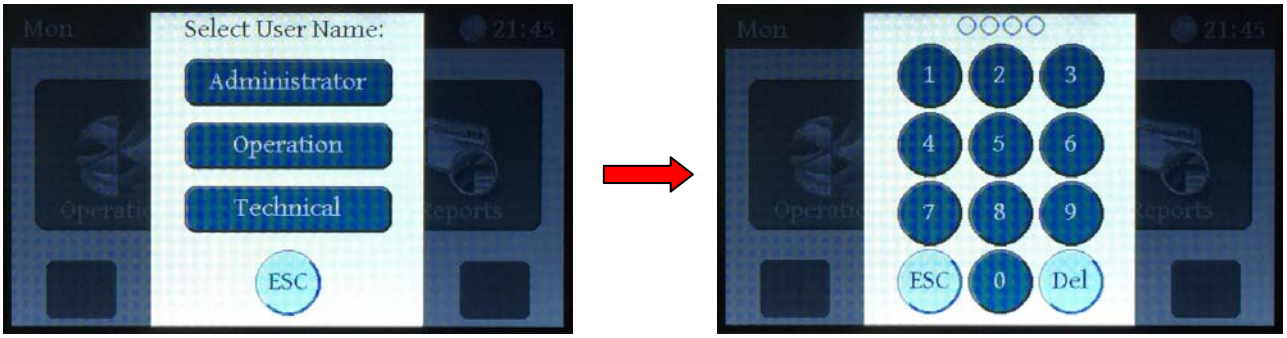


REPORT SCREEN

You can check working backward which record time and program operation.

LOGIN SCREEN

Press MENU button for login by selection 3 users and input password. The initial passwords are 1233.

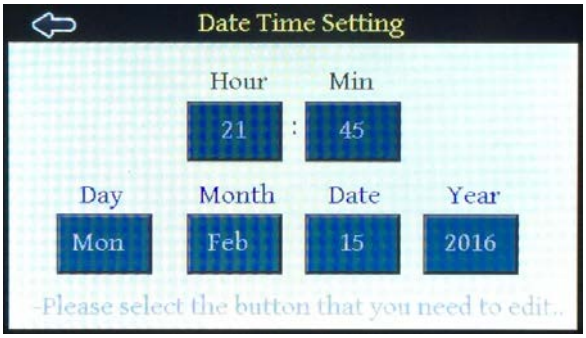


MENU SCREEN

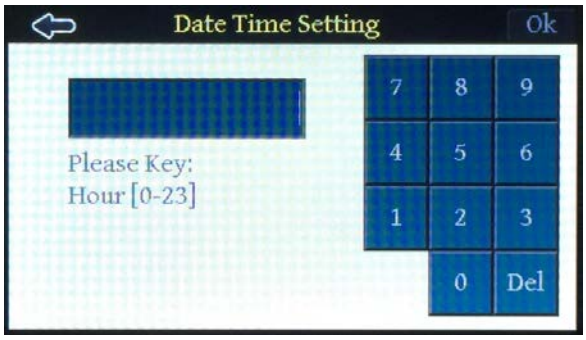
This screen will show menu for setting machine.

DATE-TIME SETTING SCREEN

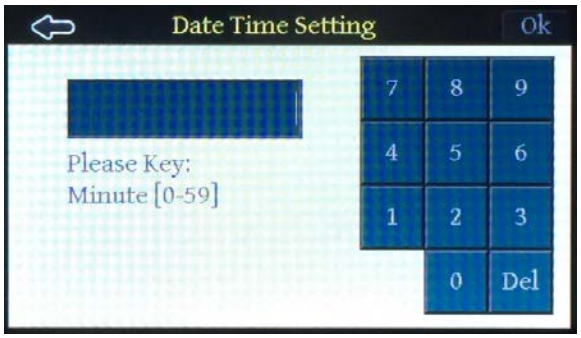
- This screen will show set date and time setting of system.



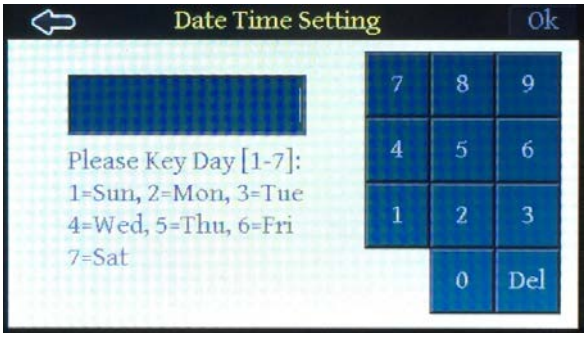
- This screen will show hour setting.



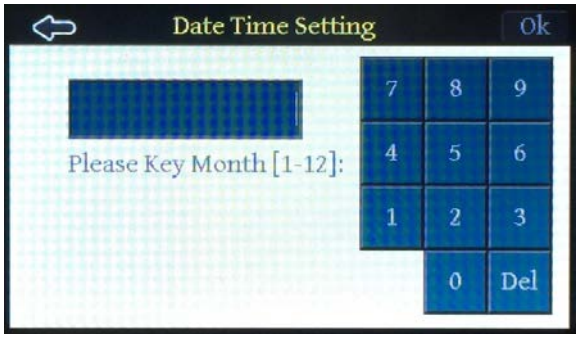
- This screen will show minute setting.



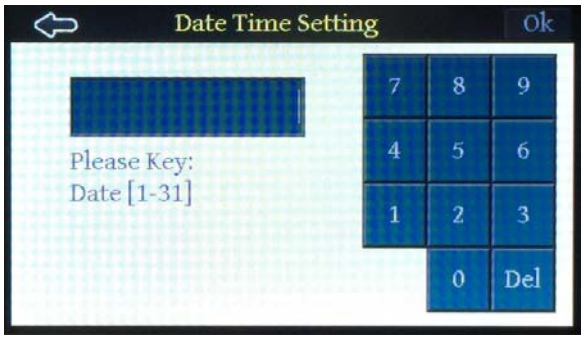
- This screen will show day setting.



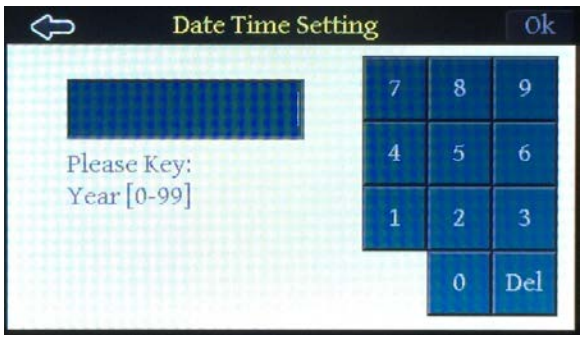
- This screen will show month setting.



- This screen will show date setting.



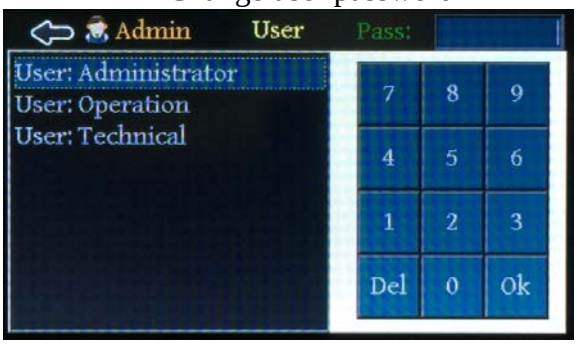
- This screen will show year setting.



USER SETTING SCREEN

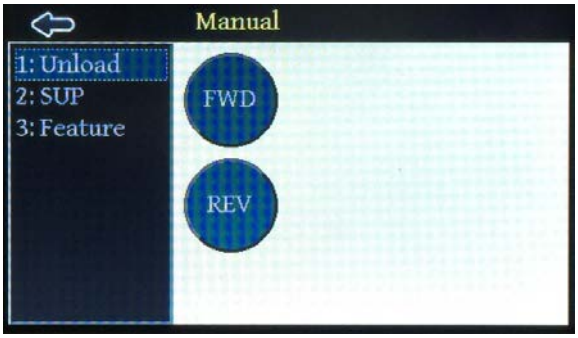
Edit user password

Change user password

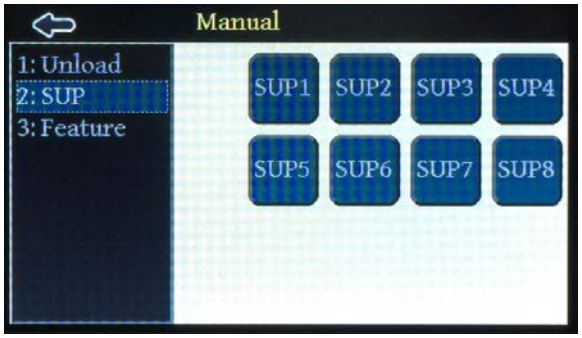


MANUAL SCREEN

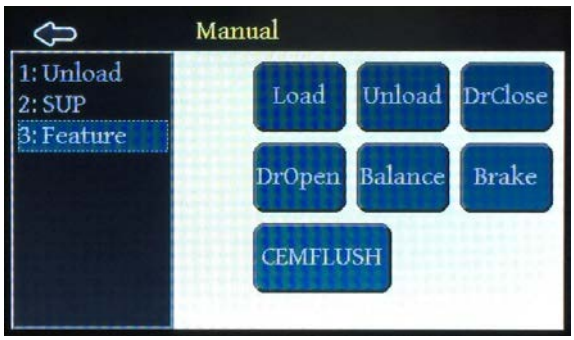
1. Testing Manual Unload



2. Testing Manual Supply

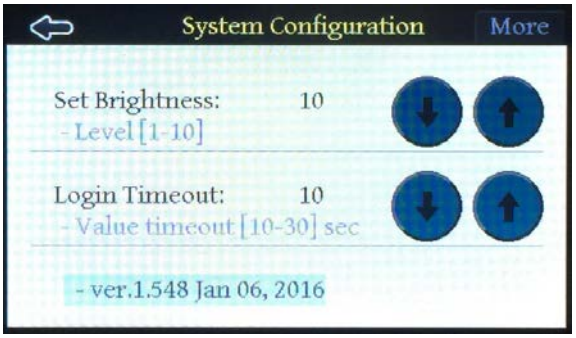


3. Testing Manual feature

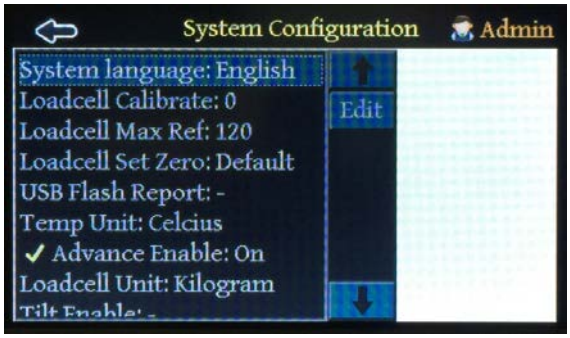


SYSTEM CONFIG SCREEN

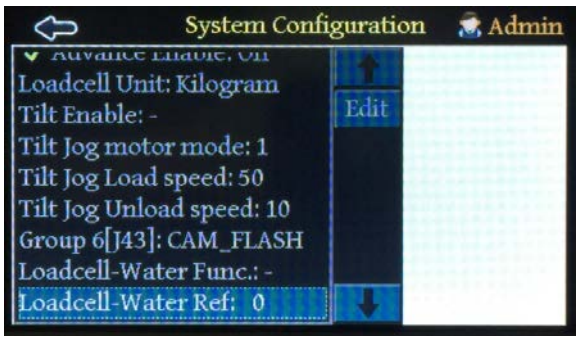
- 10 levels for setting screen brightness.
- Set timeout to main operation when login fail.
- "MORE" (top-right) is the button for more setting.



- Setting system language
- Setting Loadcell operation consist of Loadcell calibrate, Loadcell Max Ref and Loadcell set zero.
- Setting USB Flash operation
- Setting Temperature unit
- Setting Loadcell Unit

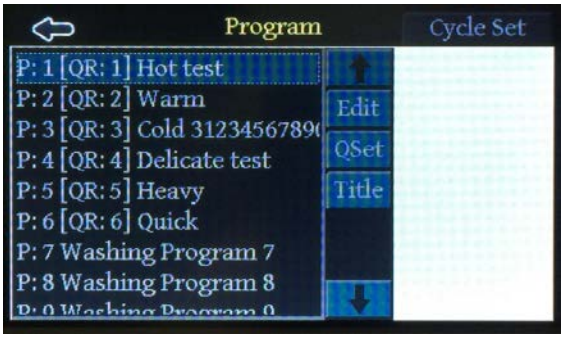


- Setting operation with tilt
- Setting Operation of output J43
- Setting function of loadcell that affect with water level

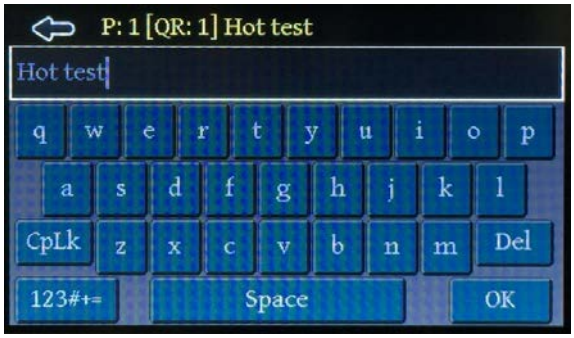


PROGRAM SETTING SCREEN

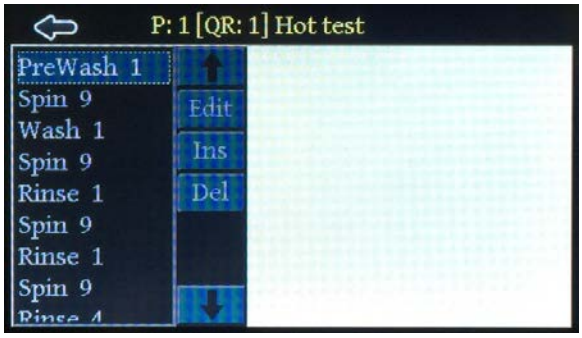
- Setting operation of washing program to edit operation cycle
- The program can set quick run (QR) 6 modes
- Change the at Title button



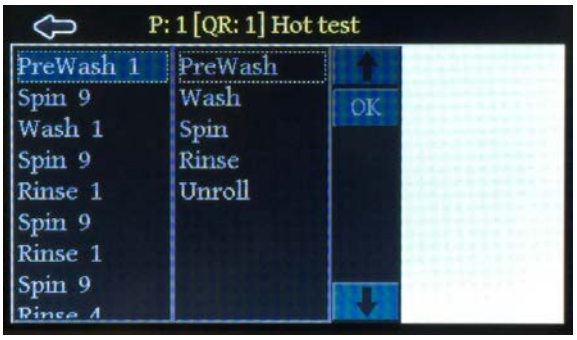
- Display show edit title name of program.



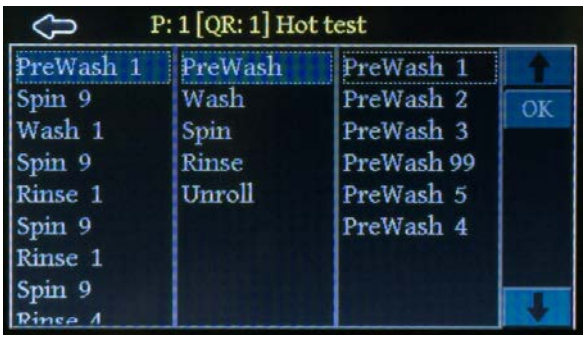
- Setting operation of each washing program whether it's Edit, Insert and Delete.



- Setting operation program of changing cycle

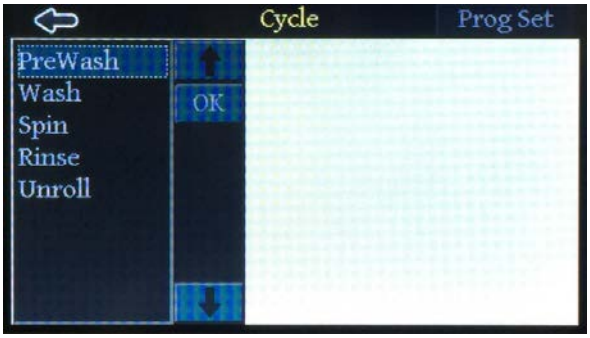


- Setting operation program of changing step

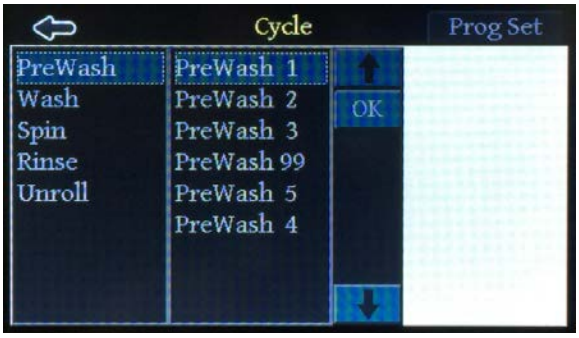


CYCLE SETTING SCREEN

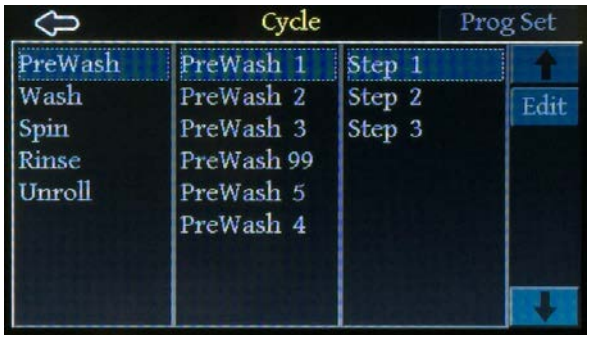
- Press “Cycle Set” button to setting operation program of cycle in Program Setting Screen and select cycle to adjustment.



- Select number of cycle in order to edit and set the program operation.

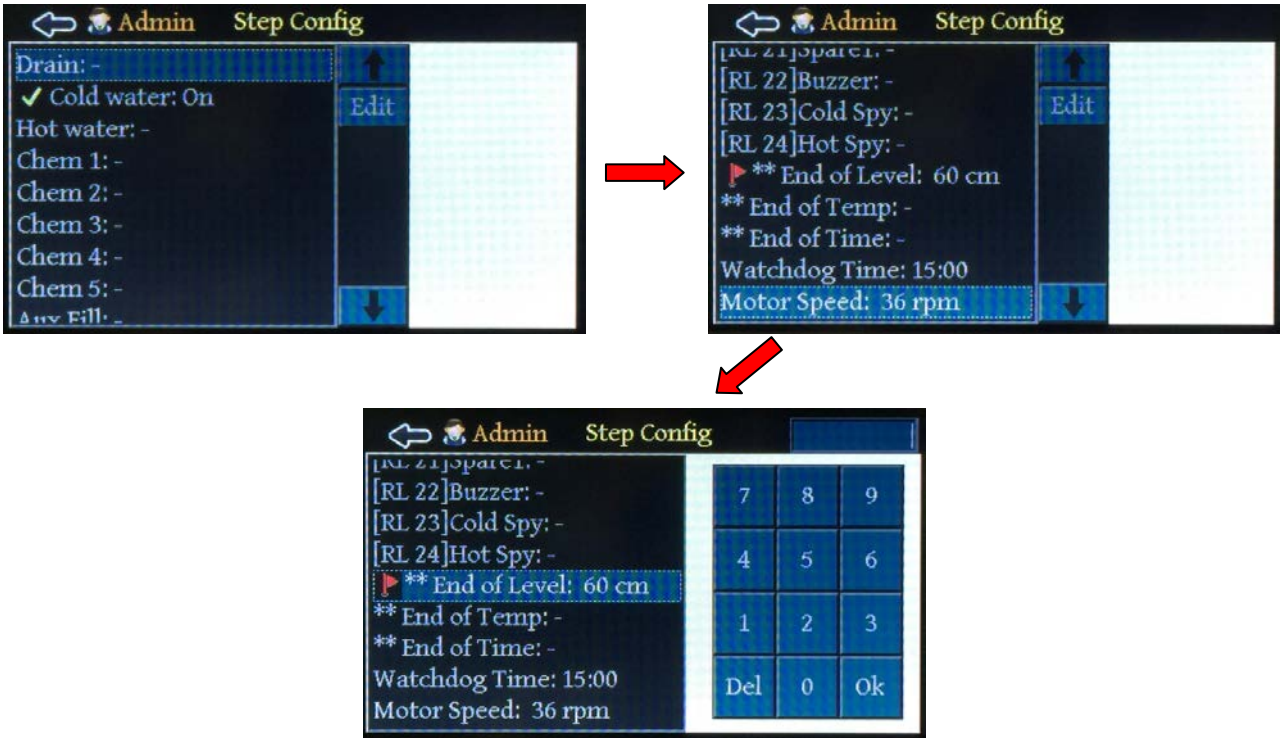


- Setting operations of step program by choose the number of Step and press “Edit” button.



STEP CONFIG SCREEN

You can edit data of any step as you needed.

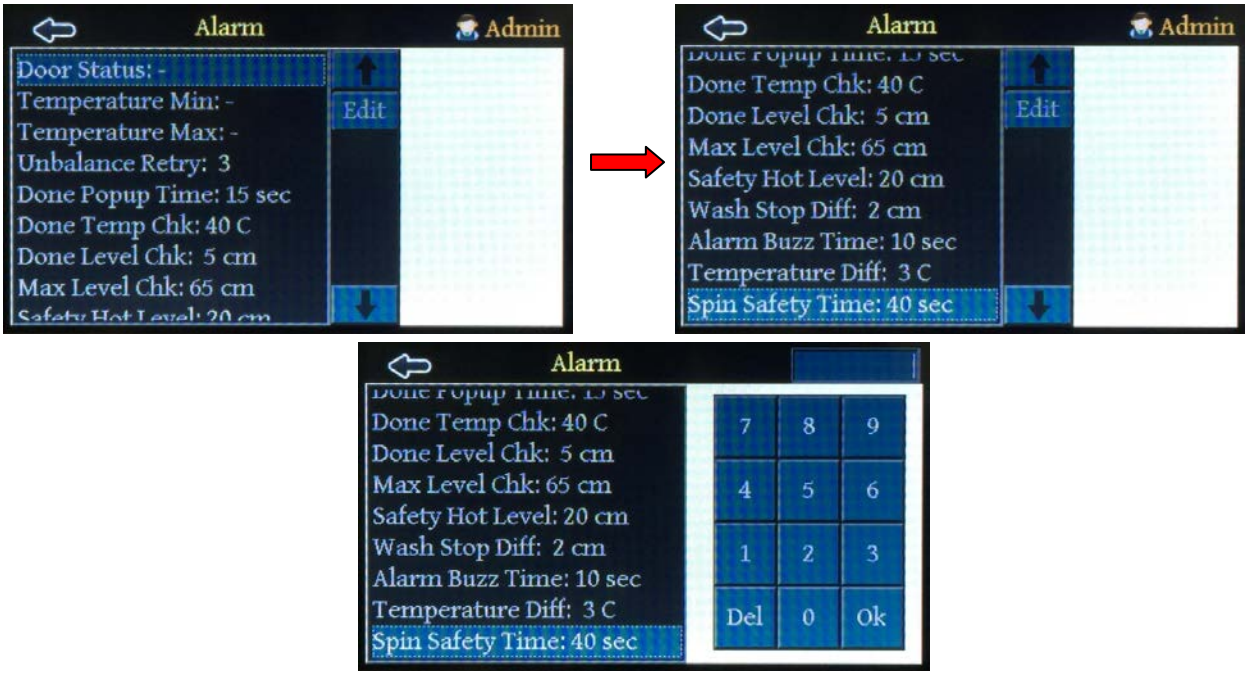


COMMUNICATION SCREEN

For programming Value with computer and IWS software, the machine will show this screen and into communication mode. After that, computer that connected will show communication device.

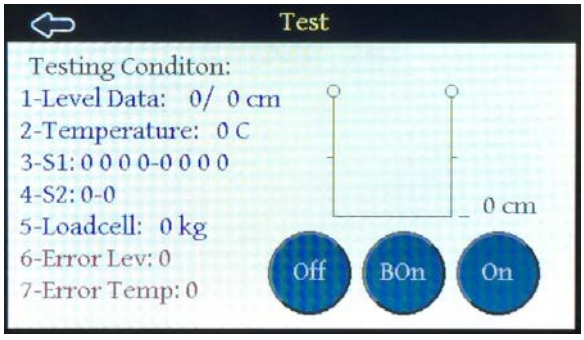
ALARM SETTING SCREEN

- Setting alarm system



TEST SCREEN

Test screen all input-output that connect with machine by system administrator only.



LOGOUT SCREEN

When pressing arrow up button at bottom right of Main Operation screen, system will logout the user as login to User guest at the same.

SECTION 5

MAINTENANCE

Routine Maintenance

Routine maintenance maximizes operating efficiency and minimizes downtime. The maintenance procedures described below will prolong the life of the machine and help prevent accidents.

Daily, weekly, monthly, and quarterly checklists are provided at the end of this section. Laminate the checklists to preserve them for repeated copying. Operators and technicians are encouraged to add checks specific to their machine's particular application. When possible, space is provided on the checklists for this purpose.

The following maintenance procedures **must be** performed regularly at the required intervals.

The following maintenance procedures **must be** performed regularly at the required intervals. Install all panels that are removed to perform service and maintenance procedures. **Do not** operate the machine with missing guards or with broken or missing parts. **Do not** bypass any safety devices!

Daily

Beginning of the day

1. Inspect water inlet valve hose connections on the back of the machine for leaks.
2. Inspect steam hose connections for leaks, where applicable.
3. Verify that insulation is intact on all external wires and that all connections are secured. If bare wire is evident, call a service technician.
4. Check door interlock before starting operation:
   a. Attempt to start the washer with the door open. The washer **should not be** start with the door open.
   b. Close the door without locking it and attempt to start the machine. The machine **should not be** start with the door open.
   c. Close and lock the door and start a cycle. Attempt to open the door while the cycle is in progress. The door **should not be** open. If manual latch is moved out of position the machine should stop.

NOTE: If the door lock and interlock are not functioning properly, call a service technician.

End of the day

1. Clean the door gasket of residual detergent and foreign matters.
2. Clean the automatic supply dispenser and the lid inside and out with mild detergent. Rinse with clean water.
3. Clean the washer top, front and side panels with mild detergent. Rinse with clean water.
4. Leave loading door open at the end of each day to allow moisture to evaporate.

NOTE: Leave loading door open at end of each complete cycle to allow moisture to evaporate. Unload the machine promptly after each completed cycle to prevent moisture build up.

Weekly

1. Check the machine for leaks.
   a. Start an unloaded cycle to fill the machine.
   b. Verify that door and door gaskets do not leak.
   c. Verify that the drain valve is operating. If water does not leak or during the pre – wash segment, drain valve is closed and functioning properly.

Monthly

NOTE: Disconnect power to the machine at its source before performing the monthly maintenance procedures.

1. Each month or after every 200 hours of operation, lubricate bearing and seals. See instructions on the machine.
   a. Use premium grade lithium complex grease. Never mix two types of grease, such as petroleum and silicone.
   b. Pump the grease gun slowly, permitting only the following number of strokes:
      - Bearing grease fitting, 2 strokes.
      - Seal grease fitting, 1 stroke.

Do not pump the grease gun if grease comes out of the bearing housing. This can result in over lubrication, causing damage to bearings and seals.

2. If the machine is provided with automatic lubricators, check that they are injecting grease. Normally they last for approximately one year. Mark new lubricators with installation date.
3. Clean the AC drive fins:
   a. Remove the AC drive box cover.
   b. Blow the fins clean using compressed air at a pressure of 60 – 90 psi (4 – 6 bar) or by using canned compressed air. Use care to avoid damaging cooling fan or other components.

NOTE: No amount of visible foreign matter **should be** allowed to accumulate on fins or the finger guard.

4. Use the following procedures to determine if V – belts require replacement or adjustment. Call a qualified service technician in either case.
   a. Check V – belts for uneven wear and frayed edges.
   b. After disconnecting power to the machine and removing all panels necessary for access to the drive belts, use the following method to verify that the V – belts are properly tensioned. Belt tensioning is straightforward and accomplished by loosening the tension adjusting bolts and adjusting the belts to the proper tension. Then the bolts should be tightened.

c. Verify that V – belts are properly aligned by checking pulley alignment. Place a straightedge across both pulley faces. The straight edge should make contact with the pulleys in four places.

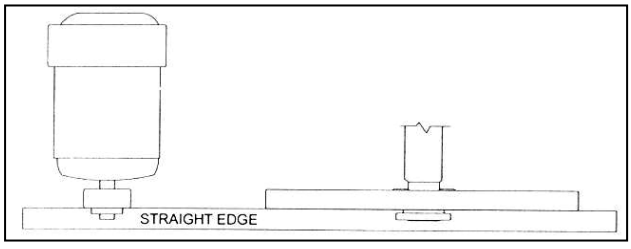


Figure 5-1 Proper Pulley Alignment

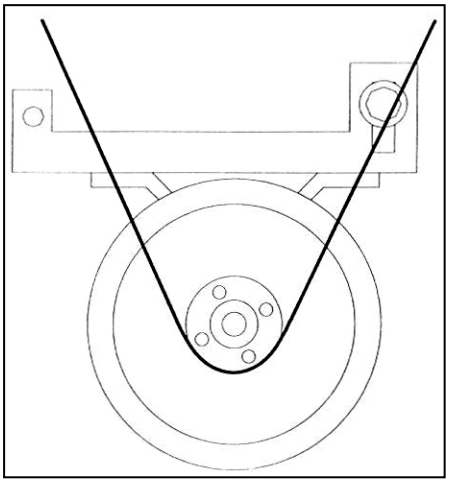
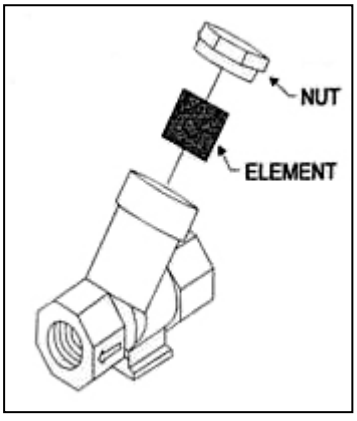


Figure 5-2 Belt Tensioning Bolt

Quarterly

NOTE: Disconnect power to the machine before performing the quarterly maintenance procedures.

1. Tighten door hinges and fasteners, if necessary.
2. Tighten anchor bolts, if necessary.
3. Check all painted surfaces for bare metal (matching paint is available from the manufacturer.)
   a. If bare metal is showing, paint with primer or solvent – based paint.
   b. If rust appears, remove it with sandpaper or chemical means. Then paint with primer or solvent – based paint.
4. Clean steam filter, where applicable. See picture of steam filter.
   a. Turn off steam supply and allow time for the valve to cool.
   b. Unscrew nut on filter.
   c. Remove filter element and clean.
   d. Replace element and nut, if necessary.



5. Remove back panel and check overflow hose and drain hose for leaks.
6. Remove top cover and check the supply dispenser hoses and hose connections.
7. Clean inlet hose filter screen:
   a. Turn water off and allow valve to cool, if necessary.
   b. Unscrew inlet hose and remove filter screen.
   c. Clean with compressed air and reinstall. Replace if worn or damage.
8. Tighten motor mounting bolts and bearing housing bolts, if necessary.
9. Use compressed air to clean lint from motor.
10. Clean external water and steam filters

Care of stainless steel

Maintain the natural beauty of stainless steel and prolong its service lift by following these steps.

1. Ordinary deposits if dirt and grease can be remove with detergent and water. The metal **should be** thoroughly rinsed and dried after washing. Periodic cleaning will help to maintain the bright surface appearance and prevent corrosion.
2. Contact with dissimilar metal **should be** avoided whenever possible. This will help prevent galvanic corrosion when salty or acidic solutions are present.
3. Salty or acidic solutions should not be allowed to evaporate and dry on stainless steel. They may cause corrosion. Ensure that the stainless steel is wiped clean of acidic solution residues.
4. Deposits that adhere to the stainless steel **should be** removed, especially from crevices and corners. When using abrasive cleaners, always rub in the direction of the polish lines or grain of the stainless steel to avoid scratch marks. Never use ordinary steel wool or steel brushes on the stainless steel. Use stainless steel wool or soft non – metal bristle brushes.
5. If the stainless appears to be rusting the source of the rust may actually be an iron or steel part not made of stainless steel, such as a nail or screw. One remedy is to paint all carbon steel parts with a heavy protective coating. Stainless steel fasteners **should be** used when possible.
6. Discoloration or heat tint from overheating may be removed by scouring with powder or by employing special chemical solutions.
7. Sanitizes or sterilizing solution **should not be** left in stainless steel equipment for prolonged periods of time. They often contain chlorine, which may cause corrosion. The stainless steel **should be** cleaned and rinsed thoroughly of any solution containing chlorine.

8. When an external chemical supply system is used, make certain that no siphoning of chemicals occurs when the washer – extractor is not in use. Highly concentrated chemicals can cause severe damage to stainless steel and other components within the machine. Damage of this kind is not covered by the manufacturer warranty. Locate the pump below the washer's injection point to prevent siphoning of chemicals into the machine.

SECTION 6

DECOMMISSIONING

In the event that the machine **must be** decommissioned, follow the following steps:

1. **Remove the chemical injection supply system, if applicable**.
   a. Have a qualified electrician disconnect power to the chemical infection supply system and the re – circulation pump at their source.
   b. Using the manufacturer's instructions, carefully remove the chemical injection supply system from the machine. Make certain that no chemicals come in contact with or clothing.
2. **Clean interior of machine, both basket and shell.**
   a. Flush supply dispenser with water.
   b. Run a short rinse cycle to clean chemical residues from the interior of the machine.
3. **Disconnect electrical power.**
   a. Shut off main power supply at the breaker box or main control panel.
   b. **Do not** attempt to disconnect power supply wires from power supply. Have a qualified electrician disconnect power to machine at is source.
4. **Disconnect hoses.**
   a. Disconnect drain hose from sump. Gutter or drain. Turn off water supply.
   b. Disconnect individual hot and cold water inlet hoses from the machine.
   c. Disconnect the compressed air supply to the machine.
   d. Allow time for residual water in the machine to drain. Then disconnect drain hoses from the machine.
   e. Disconnect necessary plumbing on the re-circulation system, if applicable.
5. **Disconnect steam hoses, if applicable.**
   a. Turn off steam supply and allow time for the valve to cool.
   b. Disconnect steam hose from machine.
6. **Remove the machine from its foundation pad.**
   a. Keep all panels in place to provide stability when moving the machine.
   b. Verify that door is closed and secure.
   c. Loosen and remove anchor bolts holding the machine base to the floor.
   d. Break the grout seal at each corner of the machine, using a crowbar.
   e. Place the machine on skid and bolt the frame to the skid. This will facilitate the removal of the machine, on to a truck.
7. **Recycle.**

   The manufacturer uses the highest quality material in their products so that those materials may be recycled at the end of the product's service life.

SECTION 7

TROUBLE SHOOTING

Before proceeding with Troubleshooting

WARNING! If any of the protective functions have been activated, first remove the cause. Then, after checking that the all run commands are set to off, reset the alarm. Note that if the alarm is reset while any run commands are set to on, the inverter any supply the power to the motor which may cause the motor to rotate.

Injury may occur.

- Even though the inverter has interrupted power to the motor, if the voltage is applied to the main circuit power input terminals L1/R, L2/S and L2/T (L1/L and L2/N for single – phase voltage input), voltage may be output to inverter output terminals U, V, and W.
- Some electric charge may remain in the DC bus capacitor even after the power is turned off. Therefore, it may take some time until the DC link circuit voltage reaches a safe level. Before touching the circuit, wait for at least five minutes after the power has been turned off and check that the DC voltage between main circuit terminals P (+) and N(-) is less than +25 VDC using a multi – meter.

Electric shock may occur.

Follow the procedure below to solve problems.

1. First, check that the inverter is correctly wired, referring “Wiring for Main Circuit Terminals and Grounding Terminals”
2. Check whether an alarm code is displayed on the LED monitor. If no alarm code appears on the LED monitor

If any problems persist after the above recovery procedure, contact the shop where you bought the inverter or your local Fuji branch office.

Quick reference table of alarm codes

Alarm code	Name	Refer to
OC1	Over current protection	**P.7-8**
OC2		
OC3		
OU1	Over voltage protection	**P.7-9**
OU2		
OU3		
LU	Under voltage protection	**P.7-10**
L in	Input phase loss protection	**P.7-11**
OPL	Output phase loss protection	**P.7-11**
OH1	Overheat protection for heat sink	**P.7-11**
OH2	External alarm input	**P.7-12**
OH4	PTC thermistor for motor protection	**P.7-12**
dbH	Overheat protection for braking resistor	**P.7-13**
OL1	Electronic thermal overload relay	**P.7-14**
OLU	Overload protection	**P.7-14**
Er1	Memory error	**P.7-15**
Er2	Remote keypad communications error	**P.7-15**
Er3	CPU error	**P.7-16**
Er6	Operation protection	**P.7-16**
Er8	RS485 communications error	**P.7-16**
ErF	Data save error during under voltage	**P.7-17**

If No Alarm Code Appears on the LED Monitor

Motor is running abnormally

1. The motor does not rotate.

Possible Causes	What to Check and Suggested Measures
1. No power supplied to the inverter.	Check the input voltage, output voltage and inter phase voltage unbalance. → Turn on a molded case circuit breaker, an earth leakage circuit breaker (with the exception of those exclusively designed for protection from ground faults) or a magnetic contactor. → Check for voltage drop, phase loss, poor connections, or poor contacts, and fix them if necessary.
2. No forward/reverse operation command was inputted, or both the commands were inputted simultaneously (external signal operation).	Check the input status of the forward/reverse command with menu#4 "I/O checking" using the keypad. → Input a run command. → Set either the forward or reverse operation command to off if both commands are being inputted. → Correct the assignment of commands (FWD) and (REV) to function codes E98 and E99. → Connect the external circuit wires to control circuit terminals (FWD) and (REV) correctly.
3. No indication of rotation direction (keypad operation).	Check the input status of the forward/reverse rotation direction command with Menu#4 "I/O Checking" using the keypad. → Input the rotation direction (F02=0), or select the keypad operation with which the rotation direction is fixed (F02=2 or 3)
4. The inverter could not accept any run commands from the keypad since it was not in Running mode.	Check which operation mode the inverter is in, using the keypad. → Shift the operation mode to Running mode.
5. A run command with higher priority than the one attempted was active, and the run command was stopped.	While referring to the block diagram of the drive command generator check the higher priority run command with Menu#2 "Data checking: and Menu#4 "I/O checking" using the keypad. Refer to the FRENIC-Mini User's Manual (MEH446), → Correct any incorrect function code data settings (e.g. cancel the higher priority run command).
6. The set frequency was set to the same or lower than the value of the starting or stop frequency.	Check that a frequency command has been entered, with Menu#4 "I/O checking" using the keypad. → Set her value of the set frequency to the same of higher than that of the starting or stop frequency (F23 of F25). → Reconsider the starting and stop frequencies (F23 and F25), and if necessary, change them to lower values. → Inspect the frequency command devices, signal converters, switches or relay contacts. Replace any ones that are faulty. → Connect the external circuit wires correctly to terminals (13), (12), (11) and (C1).

Possible Causes	What to Check and Suggested Measures
7. A frequency command with higher priority than the one attempted was active.	Check the higher priority run command with Menu#2 "Data checking" and Menu#4 "I/O checking" using the keypad, referring to the block diagram of the drive command generator. Refer the FRENIC-Mini User's Manual (MEH446), → Correct any incorrect function code data settings (e.g. cancel the higher priority run command).
8. The peak and bottom frequencies for the frequency limiters were set incorrectly.	Check the data of function codes F15 and F16. → Change the peak and bottom frequencies (F15 and F16) the correct ones.
9. The coast-to-stop command was effective.	Check the data of function codes E01, E02, E03, E98 and E99 with Menu#2 "Data Checking" and the input signal status with Menu#4 "I/O checking" using the keypad. → Release the coast-to-stop command setting.
10. Broken wire, incorrect connection or poor contact with the motor.	Check if the output current and connection are correct. → Repair the wires to the motor, or replace them.
11. Overload	Check that the output current is not too large. → Lighten the load (e.g. operate the mechanical brake correctly).
12. Torque generated by the motor was insufficient.	Check that the motor starts running if the value of torque boost (F09) is increased. → Increase the value of torque boost (F09) and try to run the motor
	Check the data of function codes F04, F05, H50, and H51. → Change the V/f pattern to match the motor's characteristics.

2. The motor rotates, but the speed does not increase.

Possible Causes	What to Check and Suggested Measures
1. The maximum frequency was set to too low a value.	Check the data of function code F03. → Correct the data of the maximum frequency (F03).
2. The peak frequency of the frequency limiter was set to too low a value.	Check the data of function code F15. → Correct the data of the peak frequency of the frequency limiter (F15).
3. The set frequency was set to too low a value.	Check the signals for the set frequency from the control circuit terminals with Menu#4 "I/O checking" using the keypad. → Increase the set frequency. → If an external potentiometer for fre3quency command, signal converter, switches, or relay contacts are malfunctioning, replace them. → Connect the external circuit wires to terminals (13), (12), (11), and (C1) correctly.
4. A frequency command with higher priority than the one attempted (e.g. multistep frequency, communications or jogging operation, etc.) was active and the set frequency was set to too low a value.	Check the higher priority run command with Menu#2 "Data checking" and Menu#4 "I/O checking" using the keypad, referring to the block diagram of the drive command generator. Refer to the FRENIC-Mini User's Manual (MEH446) → Correct any incorrect function code data settings (e.g. cancel the higher priority run command, etc).
5. The acceleration/deceleration time was too long.	Check the data of function code F07, F08, E10, E11 and H54. → Change the acceleration/deceleration time to match the load.
6. Overload	Measure the output current. → Lighten the load (e.g. operate the mechanical brake correctly).
7. The current limiting operation did not increase the output frequency.	Check whether current limiting is active or not with Menu#3 "Drive monitoring" and check the current limiting level (F44) using the keypad. → Change the level of the current limiting (F44) to an appropriate value.
	Decrease the value of torque boost (F09), then turn the power off and back on again and check if the speed increases. →
	Check the data of function codes F18, C50, C32, C34, C37 and C39 → Change the bias and gain to correct values.
8. Bias and grain set incorrectly.	Check the data of function codes F18, C50, C32, C34, C37 and C39 → Change the bias and gain to correct values.

3. The motor runs in the opposite direction to the command.

Possible Causes	What to Check and Suggested Measures
1. Wiring had been connected to the motor incorrectly	Check the wiring to the motor. → Connect terminals U, V, and W of the inverter to the respective U, V, and W terminals of the motor.
2. Incorrect connection and settings for run commands and rotation direction command (FWD) and (REV)	Check the data of function codes E98 and E99 and the connection to terminals (FWD) and (REV). → Correct the data of the function codes and the connection.
3. The setting for the rotation direction via keypad operation is incorrect.	Check the data of function code F02. → Change the data of function code F02 to 2 (forward rotation) or 3 (reverse rotation).

4. If the speed variation and current vibration (such as hunting) occur at the regular speed.

Possible Causes	What to Check and Suggested Measures
1. The frequency command fluctuated.	Check the signals for the frequency command with Menu#4 “I/O checking” using the keypad. → Increase the filter constants (C33 and C38) for the frequency command.
2. The external frequency command device was used.	Check that there is no noise in the control signal wires from external sources. → Isolate the control signal wires from the main circuit wires as far as possible. → Use shielded or twisted wires for the control signal.
3. The slip compensation gain was too large.	Check that the motor vibration is absorbed if the slip compensation (P09) is cancelled. → Correct or cancel the slip compensation (P09) data.
4. The vibration system having low stiffness in a load caused hunting or the current is irregular due to special motor constants.	Cancel the automatic control system (automatic torque boost, slip compensation, energy saving operation, overload prevention control, current limiting) and check that the motor vibration is suppressed (F37, P09, H70, and F43). → Cancel the functions causing the vibration. → Readjust the data of the oscillation suppression gain (H80) currently set.
	Check that the motor vibration is Suppressed if you decrease the carrier frequency (F26) or set the sound tune to level 0 (F27=0). → Decrease the carrier frequency (F26) or set the sound tune level 0 (F27=0).

5. If grating sound can be heard from motor.

Possible Causes	What to Check and Suggested Measures
1. The carrier frequency was set too low.	Check the data of function codes F26 and F27. → Increase the carrier frequency (F26). → Select the optimal value to the selection function (F27).

6. The motor dose not accelerates and decelerates at the set time.

Possible Causes	What to Check and Suggested Measures
1. The inverter ran the motor by S-curve or curvilinear pattern.	Check the data of function code H07. → Select the linear pattern.
2. The current limiting prevented the output frequency from increasing.	Check that current limiting is enabled with Menu#3 "Drive monitoring" and check the current limiting level (F44) using the keypad. → Change the current limiting level (F44) to a correct value. → Increase the acceleration and deceleration time (F07, F08, E10, and E11).
3. The automatic deceleration was active.	Check the data of function code H69. → Consider the use of a braking resistor. → Increase the deceleration time (F08 and E11).
4. Overload	Measure the output current. → Lighten the load.
5. Torque generated by the motor was insufficient.	Check that the motor starts running if the value of the torque boost (F09) is increased. → Increase the value of the torque boost (F09).
6. An external frequency command device is being used.	Check that the there is no noise in the external signal wires. → Isolate the control signal wires from the main circuit wires as far as possible. → Use shielded wire or twisted wire for the control signal wires.

7. Even if the power recovers after an instantaneous power failure, the motor does not restart.

Possible Causes	What to Check and Suggested Measures
1. The setting of function code F14 did not make the motor restart even if the power recovered after an instantaneous power failure.	Check if an under voltage trip occurs. → Change the data of function code F14 to 4 or 5.
2. The run command stayed off even after the power recovered.	Check the input signal with Menu#4 "I/O checking" using the keypad. → Check the power recovery sequence with an external circuit. If necessary, consider the use of a relay that can keep the run command on.

Problems with inverter settings

1. If the data of function codes cannot be changed

Possible Causes	What to Check and Suggested Measures
1. An attempt was made to change function code data that cannot be changed when the inverter is running.	Check if the inverter is running with Menu#3 "Drive monitoring" using the keypad and then confirm whether the data of the function codes can be changed when the motor is running by referring to the function code tables. → Stop the motor then change the data of the function cades.
2. The data of the function codes is protected.	Check the data of function code F00 → Disable data protection of function codes.
3. The WE – KP command ("Enable editing of function codes data from keypad") is not input though it has been assigned to a digital input terminal.	Check the data of function code E01, E02, E03, E98 and E99 and the input signals with Menu#4 "I/O checking" using the keypad. → Cancel data protection of the function codes or turn on the "Enable editing of function codes data from keypad" command.
4. DC link circuit voltage was below the under voltage detection level.	Check the DC link circuit voltage with Menu #5 "Maintenance information" and measure the input voltage using the keypad. → Supply power to match the inverter's input rating and change the data of the function codes.

2. The desired menu is not displayed.

Possible Causes	What to Check and Suggested Measures
1. The limiting menus function was not selected appropriately.	Check the data of function code E52. → Change the data of function code E52 to display the desired menu.

3. Nothing appears on the LED monitor.

Possible Causes	What to Check and Suggested Measures
1. No power supplied to the inverter.	Check the input voltage, output voltage and inter phase voltage unbalance. → Connect a molded case circuit breaker, an earth leakage circuit breaker (with the exception of those exclusively designed for protection from ground faults) or a magnetic contactor. → Check for voltage drop, phase loss, poor connections, or poor contacts, and fix them if necessary.
2. The power for the control circuit did not reach a high enough level.	Check if the jumper bar has been removed between terminals P1 and (+) or if there is poor contact between the jumper bar and the terminals. → Connect the jumper bar to terminals P1 and P (+) or tighten the screws. Or connect a DC reactor. → Replace the inverter if it is malfunctioning.

If an alarm code appears pm the LED monitor

1. "OCn" Over current protection

Problem The inverter output current momentarily exceeded the over current level.

OC1 Over current occurred during acceleration.

OC2 Over current occurred during deceleration.

OC3 Over current occurred when running at a constant speed.

Possible Causes	What to Check and Suggested Measures
1. The inverter output terminals were short circuited.	Remove the wires connected to the inverter output terminals (U, V, and W) and measure the inter phase resistance. Check if the resistance is too low. → Remove the part that short-circuited (including replacement of the wires, relay terminals and motor).
2. Ground faults occurred at the inverter output terminals.	Remove the wires connected to the inverter output terminals (U, V, and W) and perform a Mugger test. → Remove the part that short-circuited (including replacement of the wires, relay terminals and motor).
3. Loads were too heavy.	Measure the motor current with a measuring device, and to trace the current trend. Therefore, use this information to judge if the trend is over the calculated load value for your system design. → If the load is too heavy, decrease it or raise the inverter capacity.
	Trace the current trend and check if there are any sudden changes in the current. → If there are any sudden changes, make the load variation smaller or raise the inverter capacity. → Enable current limiting (H12)
4. The value set for torque boost (F09) was too large. F37 = 0, 1, 3, or 4)	Check that the output current decreases and that the motor does not come to stall if you set a lower value than the current one for F09. → Lower the value for torque boost (F09) if the motor is not going to stall.
5. The acceleration/deceleration time was too short.	Check that the motor generates enough torque required during acceleration/deceleration. That torque is calculated from the moment of inertia for the load and the acceleration / deceleration time. → Increase the acceleration/deceleration time (F07, F08, E10, E11, and H54). → Enable current limiting (F43). → Raise the inverter capacity.
6. Malfunction caused by noise.	Check if noise control measures are appropriate (e.g. correct grounding and routing of control and main circuit wires). → Implement noise control measures. → Enable the auto-reset function (H04).

2. "OUn" Over voltage protection

Problem The DC link circuit voltage was over the detection level of over voltage.

OU1 Over voltage occurs during the acceleration.

OU2 Over voltage occurs during the deceleration.

OU3 Over voltage occurs during running at constant speed.

Possible Causes	What to Check and Suggested Measures
1. The power supply voltage was over the range of the inverter's specifications.	Measure the input voltage. → Decrease the voltage to within that of the specifications.
2. The acceleration time was too short.	Check if the over voltage alarm occurs after sudden acceleration. → Increase the acceleration time (F07, E10, and H54). → Select the S-curve pattern (H07). → Consider the use of a braking resistor.
3. The deceleration time was too short for the moment of inertia for load.	Recalculate the deceleration torque from the moment of inertia for load and the deceleration time. → Increase the deceleration time (F08, E11, and H54). → Enable automatic deceleration (H69=1) so that when the DC link circuit voltage exceeds the over voltage suppression level, the inverter changes the deceleration time to three times longer than the set value. → Set the rated voltage (at base frequency) (F05) to 0 to improve braking ability. → Consider the use of a braking resistor.
4. Loads were suddenly removed.	Check if the alarm occurs when loads are suddenly removed. → Check if the inverter operation suddenly changes from driving operation to braking operation. → Consider the use of a braking resistor.
5. Braking load was too heavy.	Compare the braking torque of the load with that of the inverter. → Set the rated voltage (at base frequency) (F05) to 0 to improve braking ability. → Consider the use of a braking resistor.
6. Malfunction caused by noise.	Check if the DC link circuit voltage was below the protective level when the alarm occurred. → Improve noise control. → Enable the auto-reset function (H04).

3. "LU" Under voltage protection

Problem DC link circuit voltage was below the under voltage detection level.

Possible Causes	What to Check and Suggested Measures
1. An instantaneous power failure occurred.	Reset the alarm. → If you want to restart running the motor without making the alarm occur, set 4 or 5 to F14 depending on load.
2. The power inverter was switched back on too soon (with F14=1)	Check that you switch the inverter on after the power for the control circuit had reached an appropriate level. This can be checked using the display on the LED monitor. → Wait for a longer time than the last time before switching the inverter on.
3. The power supply voltage did not reach the range of the inverter's specifications.	Measure the input voltage. → Increase the voltage to within that of the specifications.
4. Peripheral equipment for the power circuit malfunctioned, or the connection was incorrect.	Measure the input voltage to find where the peripheral equipment malfunctioned or which connection is incorrect. → Replace any faulty peripheral equipment, or correct any incorrect connections.
5. Other loads were connected to the same power system and required a large current to start running to the extent that it caused a temporary voltage drop.	Measure the input voltage and check the voltage variation. → Reconsider the power system configuration.
6. Inrush current caused the power voltage drop because power transformer capacity was insufficient.	Check if the alarms occurs when you switch on a molded case circuit breaker, an earth leakage circuit breaker (with the exception of those exclusively designed for protection from ground faults) or a magnetic contactor. → Reconsider the capacity of the power transformer.

4. "Lin" Input phase loss protection

Problem Input phase loss occurred, or interphase voltage unbalance rate was large.

Possible Causes	What to Check and Suggested Measures
1. Main circuit power input wires broken.	Measure the input voltage. → Repair or replace the wires.
2. The terminal screws for the main circuit power input were not tight enough.	Check if the terminal screws have become loose. → Tighten the terminal screws to the recommended torque.

Possible Causes	What to Check and Suggested Measures
3. Inter – phase unbalance rate of three phase voltage was too large.	Measure the input voltage. → Connect an AC reactor (ACR) or a DC reactor (DCR) to lower the rate. → Raise the inverter capacity.
4. Overload cyclically occurred.	Measure ripple wave of DC link circuit voltage. → If the ripple is large, raise the inverter capacity.
5. Single – phase voltage was inputted to the inverter instead of three – phase voltage input.	Check the inverter type. → Change the inverter to one for single – phase voltage input.

5. "OPL" Output phase loss protection

Problem Output phase loss occurred.

Possible Causes	What to Check and Suggested Measures
1. Inverter output wires are broken	Measure the output current. → Replace the output wires.
2. Wire for motor winding are broken	Measure the output current. → Replace the motor.
3. The terminal screws for inverter output were not tight enough.	Check if any terminal screws have become loose. → Tighten the terminal screws to the recommended torque.
4. A single-phase motor has been connected	Single – phase motor cannot be used. Note that the FRENIC – Mini only drives three – phase induction motors.

6. "OH1" Overheat protection for heat sink

Problem Temperature around heat sink rose.

Possible Causes	What to Check and Suggested Measures
1. Temperature around the inverter exceeded that of inverter specifications.	Measure the temperature around the inverter. → Lower the temperature around the inverter (e.g. ventilate the enclosure well). → Lighten the load.
2. Accumulated running time of the cooling fan exceeded the standard period for replacement, or the cooling fan malfunctioned	Check the accumulated running time (E52=2). Refer to "Reading Maintenance Information". → Replace the cooling fan.
	Visually check that the cooling fan rotates normally. → Replace the cooling fan.

Possible Causes	What to Check and Suggested Measures
3. Air vent is blocked.	Check if there is sufficient clearance around the inverter. → Increase the clearance. → Check if the heat sink is clogged. → Clean the heat sink.
4. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before the overload protection occurs using the overload early warning (E34). → Decrease the carrier frequency (F26). → Enable the overload protection control (H70).

7. "OH2" External alarm input

Problem External alarm was inputted (THR).

Possible Causes	What to Check and Suggested Measures
1. An alarm function of the external equipment was activated.	Inspect external equipment operation. → Remove the cause of the alarm that occurred.
2. Connection ha been performed incorrectly.	Check if the wire for the external alarm signal is correctly connected to the terminal to which the "Alarm from external equipment" has been assigned. → Connect the wire for the alarm signal correctly.
3. Incorrect settings.	Check if the "Alarm from external equipment" has been assigned to an unassigned terminal. → Correct the assignment.

8. "OH4" PTC thermistor for motor protection

Problem Temperature of the motor rose abnormally.

Possible Causes	What to Check and Suggested Measures
1. Temperature around the motor exceeded that of motor specifications.	Measure the temperature around the motor. → Decrease the temperature. → Lighten the load.
2. Cooling system for the motor malfunctioned.	Check if the cooling system is operating normally. → Repair or replace the cooling system.
3. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before overload occurs using the overload early warning (E34) function). → Decrease the temperature around the motor. → Increase the carrier frequency (F26).

Possible Causes	What to Check and Suggested Measures
4. The set activation level (H27) of the PTC thermistor for motor overheat protection was inadequate.	Check the thermistor specifications and recalculate the detection voltage. → Reconsider the data of function code H27.
5. A PTC thermistor and pull-up resistor were connected incorrectly or their resistance was inadequate.	Check the connections and resistance. → Correct the connections and resistance.
6. The value set for the torque boost (F09) was too high.	Check the data of function code F09 and readjust the data so that the motor does not stall even if you set the data to a lower value. → Change the data of the function code.
7. The V/f pattern did not match the motor.	Check if the base frequency (F04) and rated voltage (at base frequency) (F05) match the values on the nameplate on the motor. → Match the function code data to the values on the nameplate of the motor.

9. "dbH" Overheat protection for barking resistor

Problem Thermal protection for braking resistor activated.

Possible Causes	What to Check and Suggested Measures
1. Braking load was too heavy.	Recalculate the relation between the braking load and braking capacity. → Lighten the braking load. → Reconsider the braking resistor in order to improve braking ability. Resetting the data of function codes F50 and F51 is also required.
2. The deceleration time was too short.	Recalculate the required deceleration torque and time from the moment of inertia for the load and the deceleration time. → Increase the deceleration time (F08, E11, and H54). → Reconsider the braking resistor in order to improve the braking ability. Resetting the data of function codes F50 and F51 is also required.
3. Incorrect values have been set for the data of function codes F50 and F51.	Check the braking resistor specifications. → Reconsider and change the data of function codes F50 and F51.

NOTE: The inverter does not detect the overheating alarm of a braking resistor by monitoring its surface temperature, but by monitoring its load magnitude. Therefore, even if the surface temperature itself does not rise, the alarm may be detected if the resistor is used more frequently than the set data of function codes F50 and F51. If you use the resistor to the limit of its capacity, you **must adjust** the data of function codes F50 and F51 while checking the surface temperature of the resistor.

10. "OL1" Electronic thermal overload relay

Problem Electronic thermal function for motor overload detection activated.

Possible Causes	What to Check and Suggested Measures
1. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before overload occurs using the overload early warning (E34).
2. The acceleration / deceleration time was too short.	Check that the motor generates enough torque for acceleration/deceleration, This torque is calculated from the moment of inertia for the load and the acceleration/deceleration time. → Increase the acceleration/deceleration time (F07, F08, E10, E11 and H54).
3. The characteristics of electronic thermal did not match those of the motor overload.	Check the motor characteristics. → Reconsider the data of function codes P99, F10 and F12. → Use an external thermal relay.
4. Activation level for the electronic thermal relay was inadequate.	Check the continuous allowable current of the motor. → Reconsider and change the data of function code F11.

11. "OLU" Overload protection

Problem Temperature inside inverter rose abnormally.

Possible Causes	What to Check and Suggested Measures
1. Temperature around the inverter exceeded that of inverter specifications.	Measure the temperature around the inverter. → Lower the temperature (e.g. ventilate the enclosure well). → Lighten the load.
2. The service life of the cooling fan has expired or the cooling fan malfunctioned.	Check the accumulated running time of cooling fan (E52=2). → Refer to "Reading Maintenance Information". → Replace the cooling fan.
	Visually check that the cooling fan rotates normally. → Replace the cooling fan.
3. Air vent is blocked.	Check if there is sufficient clearance around the inverter. → Increase the clearance.
	Check if the heat sink is clogged. → Clean the heat sink.
4. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before overload occurs using the overload early warning (E34). → Decrease the carrier frequency (F26). → Enable overload protection control (H70).

Possible Causes	What to Check and Suggested Measures
5. The acceleration / deceleration time was too short.	Recalculate the required acceleration/deceleration torque and time from the moment of inertia for the load and the deceleration time. → Increase the acceleration/deceleration time (F07, F08, E10, E11 and H54).
6. The wires to the motor are too long and caused a large amount of current to leak from them.	Measure the leak current. → Connect an output circuit filter (OFL).

12. "Er1" Memory error

Problem Error occurred in writing the data to the memory in the inverter.

Possible Causes	What to Check and Suggested Measures
1. The power supply was turned off when the inverter was writing data (especially initializing data), and the remaining control circuit voltage was not high enough to enable writing of data.	Check if pressing the PRG/RESET key resets the alarm after the function code data are initialized by setting the data of H03 to 1. → Return the initialized function code data to their previous settings, and then restart the operation.
2. A high intensity noise was given to the inverter while data (especially initializing data) was being written.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). Alternatively, perform the same check as described in (1) above. → Improve noise control. Alternatively, return the initialized function code data to their previous settings, and then restart the operation.
3. The CPU did not operate normally.	Initialize the function code data by setting H03 to 1, and then reset the alarm by pressing the PRG/RESET key and check that the alarm goes on. → This problem was caused by a printed circuit board (PCB) (including the CPU) malfunction, so it is necessary to replace the PCB.

13. "Er2" Remote keypad communications error

Problem a communications error occurred between the remote keypad and the inverter.

Possible Causes	What to Check and Suggested Measures
1. Break in the communications cable or poor contact.	Check continuity of the cable, contacts and connections. → Replace the cable.
2. A high intensity noise was given to the inverter.	→ Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control.
3. The remote keypad malfunctioned.	Check that alarm Er2 does not occur if you connect another remote keypad to the inverter. → Replace the remote keypad.
4. The RS485 communications card malfunctioned.	Check that alarm Er2 does not occur even if you connect another remote keypad to the inverter. → Replace the card.

14. "Er3" CPU error.

Problem a CPU error (e.g. erratic CPU operation) occurred.

Possible Causes	What to Check and Suggested Measures
1. A high intensity noise was given to the inverter.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control.
2. The printed control circuit board in the inverter malfunctioned.	→ Replace the board.

15. "Er6" Operation protection

Problem an error occurred due to incorrect operation of the motor.

Possible Causes	What to Check and Suggested Measures
1. The STOP key was pressed when H96 = 1 or 3.	→ Change the setting for H96 so that the STOP key priority function is invalid to ensure that the inverter does not operate unexpectedly.
2. The start check function was activated when H96 = 2 or 3.	Check that Er6 occurs when: - The power is switched on - An alarm is released (by pressing the PRG/RESET key or turning reset alarm (RST) on). - The link command (LE) has switched the inverter operations. → Reconsider the running sequence to avoid input of the run command when Er6 has occurred. → Change the setting for H96 so that the STOP key priority functions is invalid to ensure the inverter does not operate unexpectedly. (To reset the alarm, turn the run command off.)

16. "Er8" RS485 communications error

Problem a communications error occurred during RS485 communications.

Possible Causes	What to Check and Suggested Measures
1. Host controllers (e.g. PLCs and personal computers) did not operate due to incorrect settings and/or defective software/hardware.	Check the controllers. → Remove the cause of the controller error.
2. Relay converters (e.g. RS232C/RS485 converter) did not operate due to incorrect connections and settings, and defective hardware.	Check the converter (e.g. check for poor contact). → Change the various converter settings, reconnect the wires, or replace hardware (such as recommended devices) as appropriate.
3. Broken communications cable or poor contact.	Check continuity of the cable, contacts and connections. → Replace the cable.
4. Even though no response error detection time (y08) has been set, communications did not occur cyclically.	Check the host controllers. → Change the settings of host controller software, or make the no response error detection time invalid (y08=0).
5. A high intensity noise was given to the inverter.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control. → Improve measures against noise from host controllers. → Replace the relay converter with a recommended insulated converter.
6. Conditions for communications differ between the inverter and host controllers.	Compare the settings of the y codes (y01to y10) with those of the host controllers. → Correct any settings which differ.
7. The RS485 communications card malfunctioned.	→ Replace the card.

17. "ErF" Data save error during under voltage

Problem The inverter was unable to save data such as the frequency commands, timer, and PID process commands set through the keypad when the power was switched off.

Possible Causes	What to Check and Suggested Measures
1. The control circuit voltage dropped suddenly while the data was being saved when the power was turned off, because the electric charge in the DC bus capacitor was rapidly discharged.	Check how long it takes for the DC link circuit voltage to drop to the preset voltage when the power is turned off. → Remove whatever is causing the rapid discharge of the electric charge. After pressing the PRG/RESET key and releasing the alarm, reset the data (such as the frequency commands, timer, and PID process commands) set with the keypad to the correct settings and then restart the motor.
2. A high intensity noise was given to the inverter while data was being written when the power was turned off.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control. Press the PRG/RESET key to release the alarm, then reset the data (e.g. frequency commands, timer, and PID process commands) set through the keypad to the correct settings. Restart the motor.
3. The CPU did not operate normally.	Check if ErF occurs each time the power is switched off. → This problem was caused by a printed circuit board (PCB) (including the CPU) malfunction, so it is necessary to replace the PCB.

SECTION 8

PARTS LIST

ORDERING SPARE PARTS

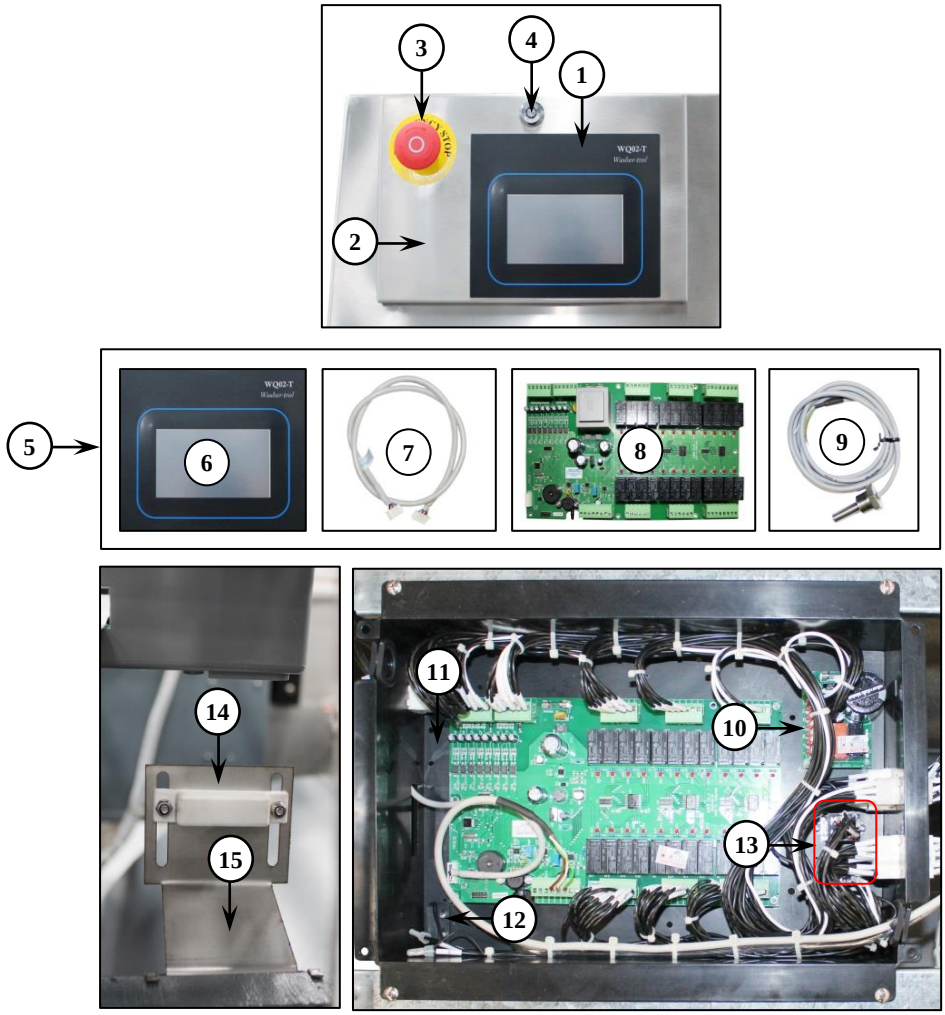
In case spare parts are needed, please include the following information with your order:

1. Model and serial number of the equipment (located on the name plate).
2. Part number, part name, and quantity required. Use this manual to facilitate ordering.
3. When ordering electrical motors, please include complete name plate data, motor manufacturer, and wiring diagram number.

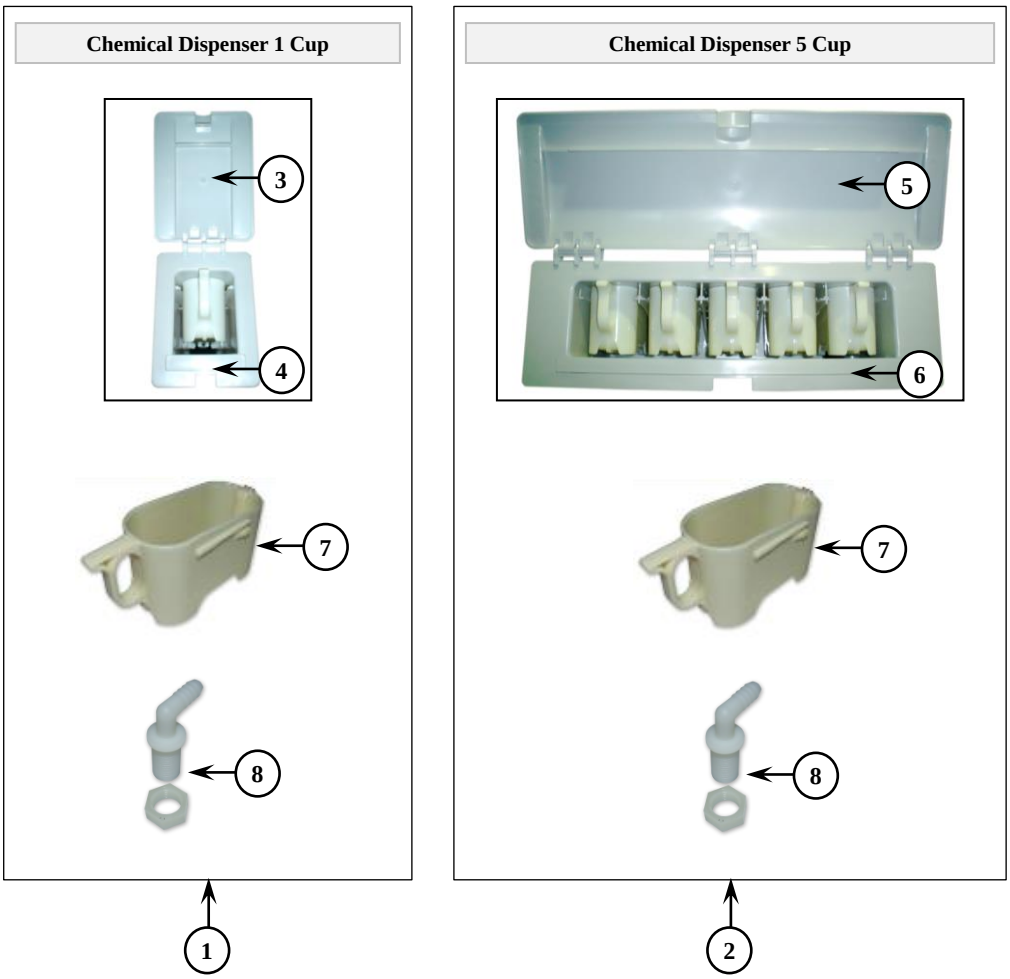
Our service and spare parts department consists of specially trained personnel to assist you with your needs. Please **do not** hesitate to call if we can be of any assistance to you.

Section 8	Part List : Front Side Machine Assembly	Page 1

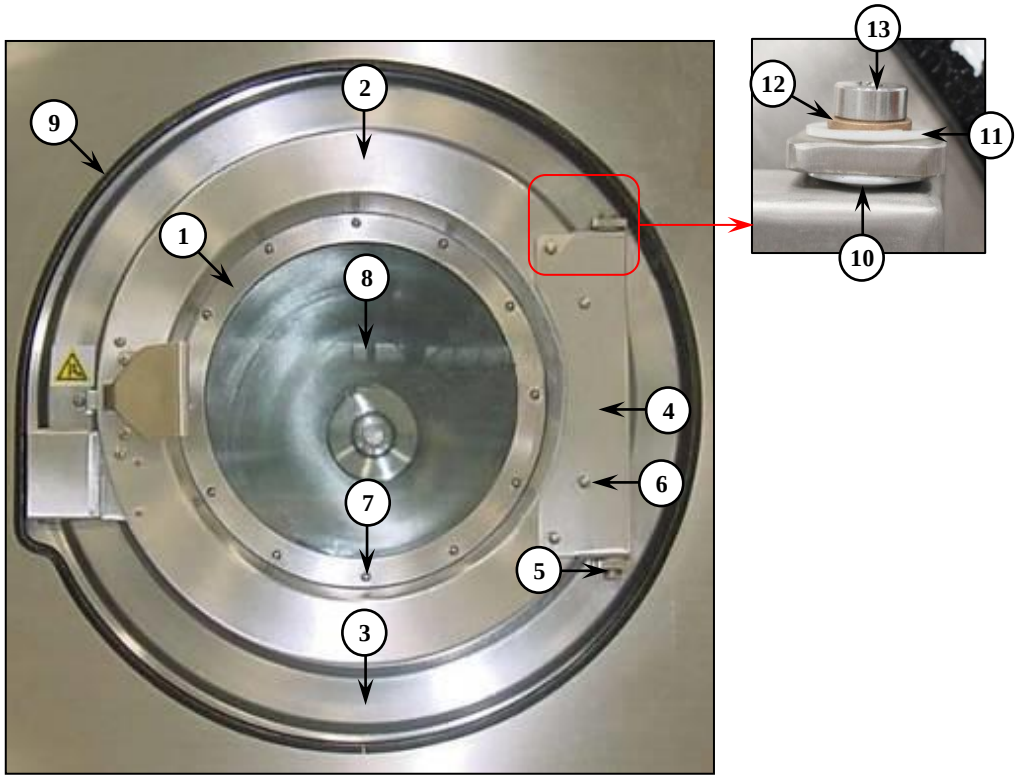
Item	Part No.	Qty.	Description
1	A1-S101-053	1	Panel, Front top 1 Cup (SUS)
	A1-S101-052	1	Panel, Front top 5 Cup (SUS)
2	A1-S101-002	1	Panel, Front middle (SUS)
3	A1-S101-003	1	Panel, Front lower (SUS)
4	A1-S101-004	1	Right panel assembly (SUS)
5	A1-S101-005	1	Left panel assembly (SUS)
6	A1-S101-074	1	Front column, Top-Right (SUS)
7	A1-S101-075	1	Front column, Top-Left (SUS)
8	A1-S101-072	1	Front column, Lower-Right (SUS)
9	A1-S101-073	1	Front column, Lower-Left (SUS)
10	A0-A078-650	32	Hexagon bolt
11	A0-A068-015	14	Screw
12	A0-A038-008	1	Base, Guard, Bumper
	A0-A038-003	1	Insert, Guard, Bumper



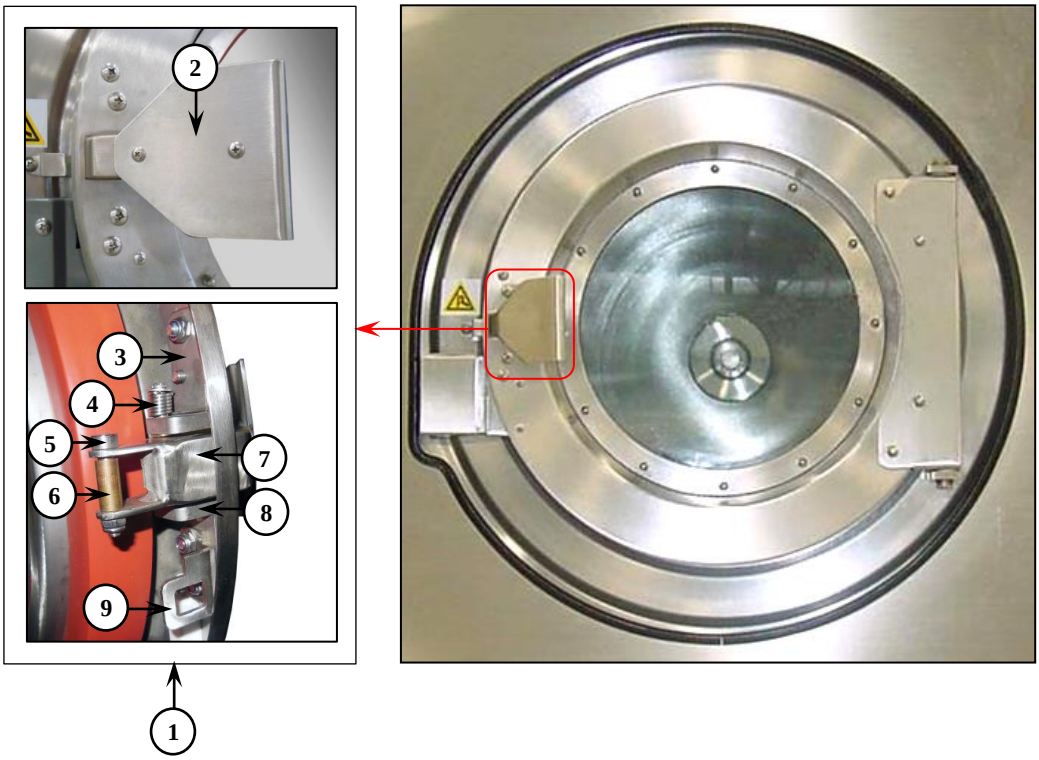
Item	Part No.	Qty.	Description
1	A0-A090-131	1	Sticker Decal
2	A1-SSP2-068	1	Face Panel Control
3	A0-E032-022	1	Emergency stop button (Head)
	A0-E032-023	1	Emergency stop contactor base
	A0-E032-024	1	Emergency stop contactor
4	A0-A013-001	1	Lock + key
5	A0-E007-711	1 Set	IWT 03 Washtrol T 4.3" Controller + Lan Complete Set
6	A0-E007-710	1	IWT 03 Washtrol T, Display CPU Control
7	A0-E007-202	1	IWT 03 Washtrol T, Connector Cable
8	A0-E007-203	1	IWT 03 Washtrol T, IO Power Board, 24V
9	A0-E007-059-01	1	Temp Probe
10	A0-E015-026	1	Board PCB, Door lock
11	A0-A050-027	1	Electrical Control Box Upper
	A0-A050-028	1	Plate Cover Electrical Control Box Upper
12	A0-E014-007	1	Switch, Magnet reed
13	A0-E009-017	2	Relay
14	A0-A036-001	1	Magnet (Actuator For Magnetic Reed Swicth)
15	A1-SSP2-039	1	Bracket for Motion Balance Switch



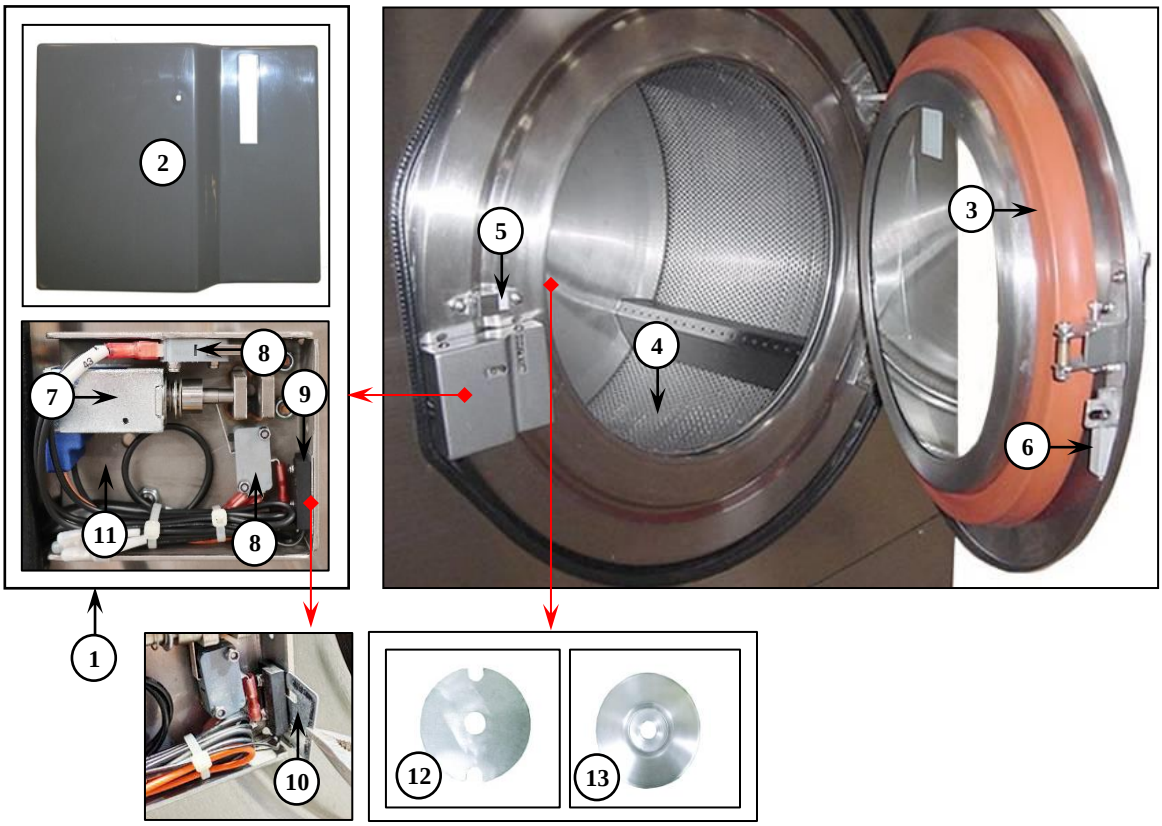
Item	Part No.	Qty.	Description
1	A0-A178-003	1 Set	Set Supply Chemical Dispenser 1 Compartment
2	A0-A178-005	1 Set	Set Supply Chemical Dispenser 5 Compartment
3	A0-A095-061-02	1	Lid, Chemical dispenser 1 compartments
4	A0-A095-061-01	1	Body, Chemical dispenser 1 compartments
5	A0-A095-063-02	1	Lid, Chemical dispenser 5 compartments
6	A0-A095-063-01	1	Body, Chemical dispenser 5 compartments
7	A0-A030-006	1,5	Plastic cup
8	A0-A095-002	1,5	Nozzle, Chemical dispenser



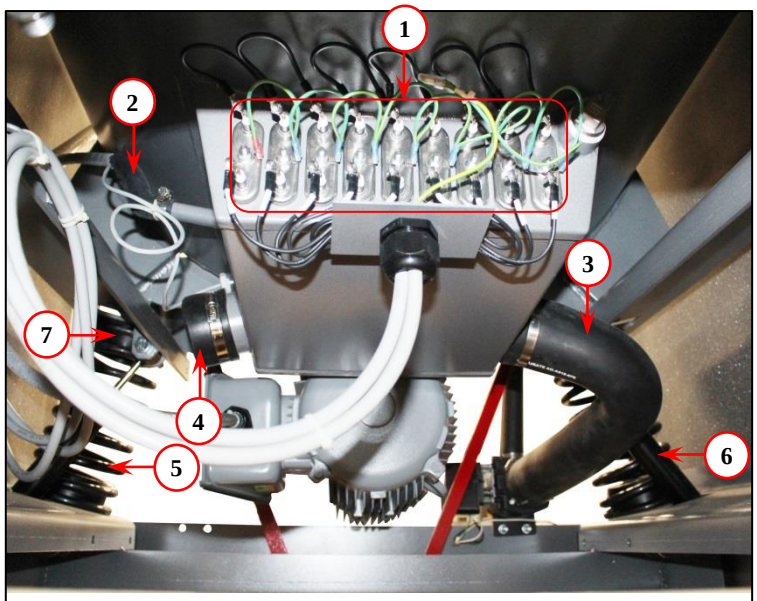
Item	Part No.	Qty.	Description
1	A1-SSP2-105	1	Glass retainer ring
	A0-A001-042	1	Gasket, Door glass
2	A1-SSP2-108	1	Door tub
3	A1-S101-012	1	Front panel tub
4	A1-SSP2-112	1	Door hinge
5	A1-SSP2-109	1	Door hinge bracket
6	A0-A081-006	4	Cap nut
	A0-A057-003	4	Bolt Studs Stainless
7	A0-A081-005	12	Cap Hex. nut
	A0-A057-002	12	Bolt Studs Stainless
8	A0-A003-004	1	Door glass
9	A0-A001-004	1	Rim protection Gasket
10	A1-SSP2-005	2	Door hinge washer
11	A1-SSP2-118	2	Door hinge washer
12	A0-A033-002	2	Door hinge bushing
13	A0-A033-003	2	Bolt, Shoulder, Door Hinge



Item	Part No.	Qty.	Description
1	A1-ST00-001	1 Set	Door Handle and Brackets complete set
2	A1-ST00-001-03	1	Door Handle-B Grip
3	A1-ST00-001-01	1	Door Handle Upper hinge bracket-B
4	A0-TSA01-496	1	Door Handle Pivot Spring
5	A0-A033-005	1	Door Latch Shoulder Bolt
6	A0-A033-004	1	Door Handle latch Bush
7	A1-ST00-001-04	1	Door Handle- B body
8	A1-ST00-001-02	1	Door handle Lower hinge Bracket-B
9	A1-ST00-001-05	1	Door Lock Tongue (Square)

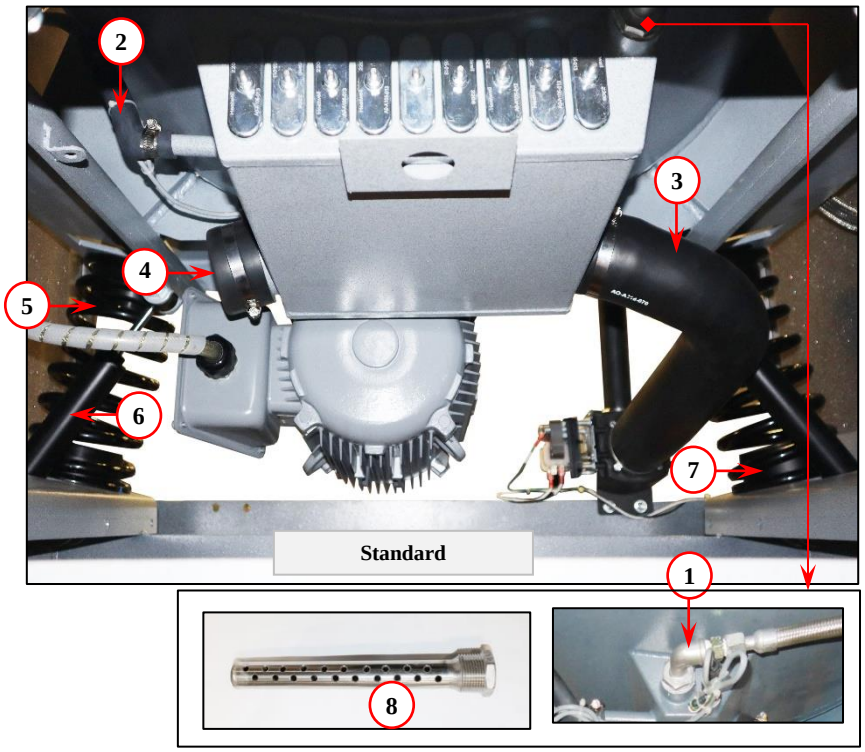


Item	Part No.	Qty.	Description
1	A1-SSP2-141	1 Set	Door lock assembly complete set
2	A0-A237-001	1	Door lock Cover Plastic
3	A0-A001-014	1	Door gasket silicone orange
4	A1-S101-018	1	Basket stainless steel
5	A1-SSP2-078	1	Door lock block
6	A0-A036-001	1	Magnet (White)
7	A0-E015-052	1	Solenoid Door Lock Magnetic , Latching 1 Coil 24VDC. + Pin
8	A0-E014-015	2	Micro switch
9	A0-E014-007	1	Switch, Magnet reed
10	A1-SSP2-077	1	Plate, Reed Switch Shield
11	A1-ST00-002-01	1	Base box with Guides
12	A1-SSP2-071	1	Shaft basket support plate
13	A1-SSP2-070	1	Cover shaft basket

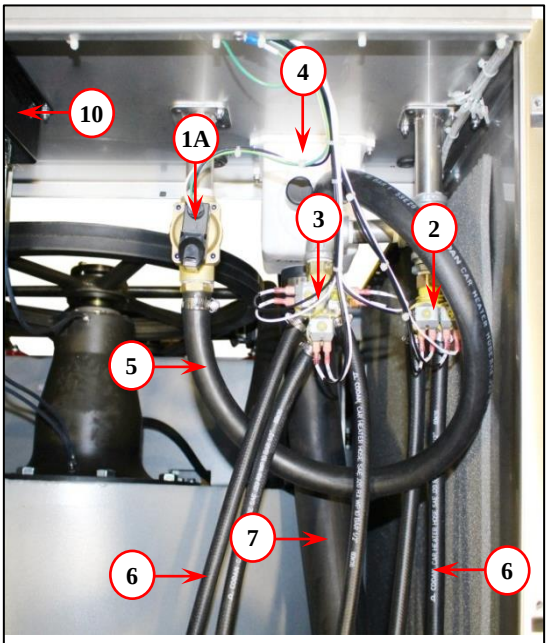


Standard

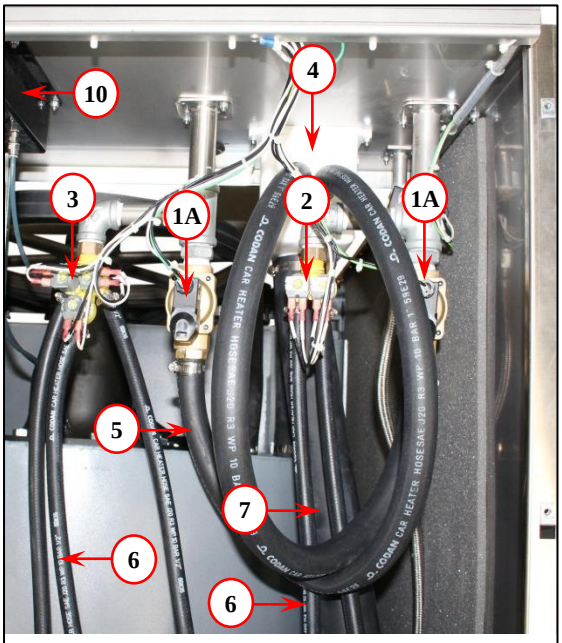
Item	Part No.	Qty.	Description
1	A0-E005-001	9	Heating Element 4000W
2	A0-A018-090	1	Hose, Water level
3	A0-A018-070	-	Drain Hose (STD=1 Qty.) (Option=2 Qty.)
4	A0-A001-034	1	Plug, Drain reuse
5	A0-A008-005	4	Spring
6	A0-A031-120	6	Medium Shock Absorber
7	A0-A122-001	8	Spring Guide



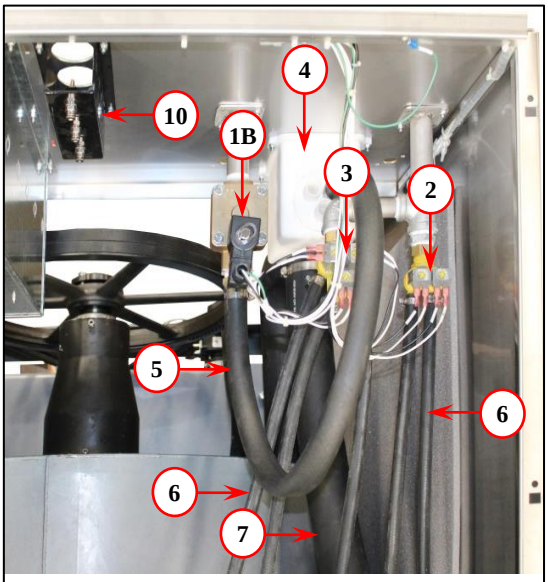
Item	Part No.	Qty.	Description
1	A0-A009-032	1	Elbow
2	A0-A018-090	1	Hose, Water level
3	A0-A018-070	-	Drain Hose (STD=1 Qty.) (Option=2 Qty.)
4	A0-A001-034	1	Plug, Drain reuse
5	A0-A008-005	4	Spring
6	A0-A031-120	6	Medium Shock Absorber
7	A0-A122-001	8	Spring Guide
8	A1-SSP2-037	1	Steam Injector Size 1"X1/2"(for Steam Type)



Type 1



Type 2



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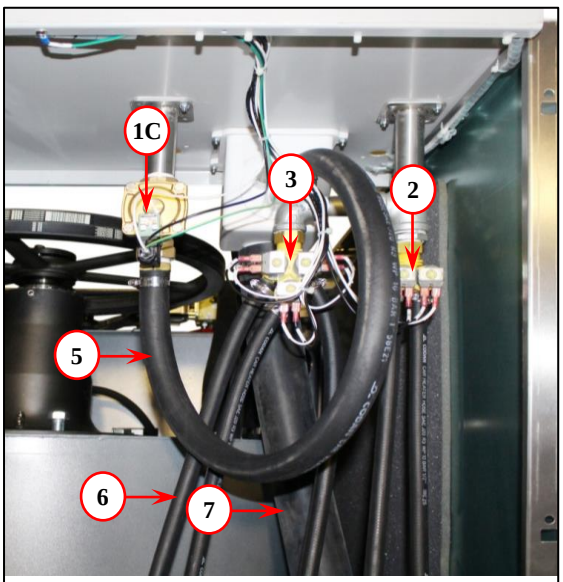
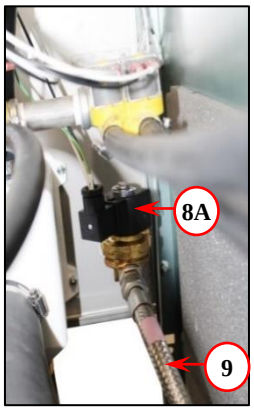
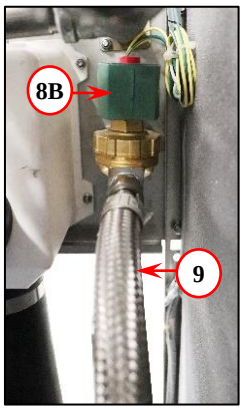


Type 4

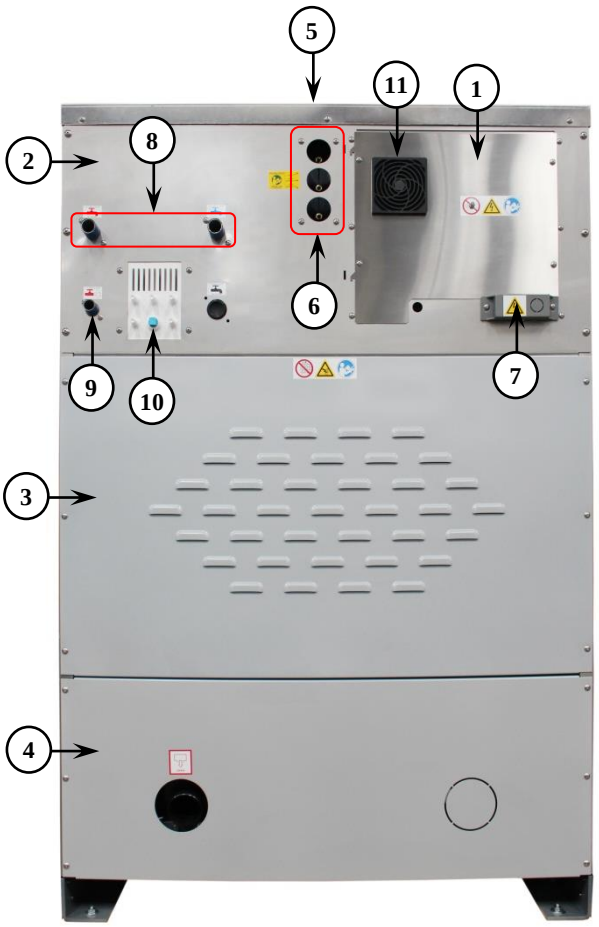


Steam Type (Type 1)

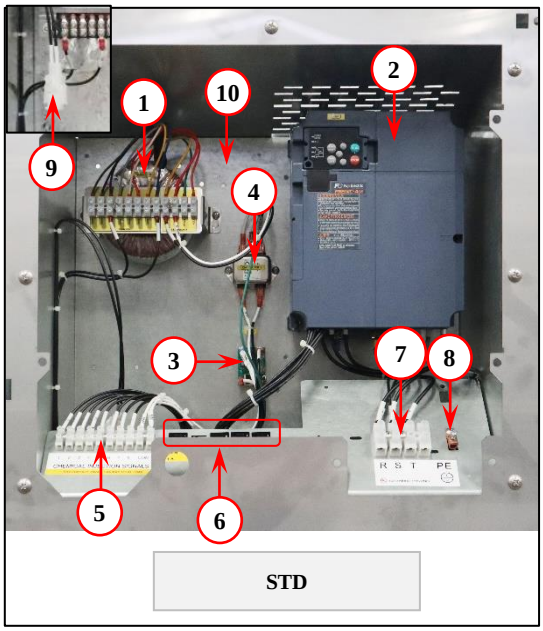


Steam Type (Type 2)

Item	Part No.	Qty.	Description
1A	A0-E040-084	-	Solenoid Water Valve 1" NC 24VAC. 50/60Hz. (Type 1=1 Qty.)(Type 2=2 Qty.)
1B	A0-E040-008	1	Solenoid Water Valve 24VAC, 50/60HZ
	A0-E056-001	1	Plug Connector
1C	A0-E040-073	1	Solenoid Water Valve Size 1" NC 24VAC. 60Hz.
2	A0-E040-090	1	Double Solenoid valve 3/4", 24 VAC, 50/60 Hz
3	A0-E040-091	1	3-Way Solenoid valve 3/4", 24 VAC, 50/60 Hz
4	A0-A127-003	1	Vacuum breaker plastic
5	A0-A018-013	-	Hose, Water supply 1" (Type 1,Type3=1 Qty.)(Type 2=2 Qty.)
6	A0-A018-016	5	Hose, Water dispenser
7	A0-A018-030	1	Dispenser hose/air vent
8A	A0-E047-005	1	Solenoid Steam Valve 1/2", 24VAC, 50/60HZ
	A0-E056-001	1	Plug Connector
8B	A0-E047-110	1	Solenoid Steam Valve Size. 1/2" 24VAC, 50Hz.
	A0-E047-111	1	Solenoid Steam Valve Size. 1/2" 24VAC, 60Hz.
9	A0-A017-012	1	Flexible Pipe, 1/2" x 1800 mm. (for Steam Type)
10	A0-A237-002	1	Box Plastic Grease Fitting (Black)

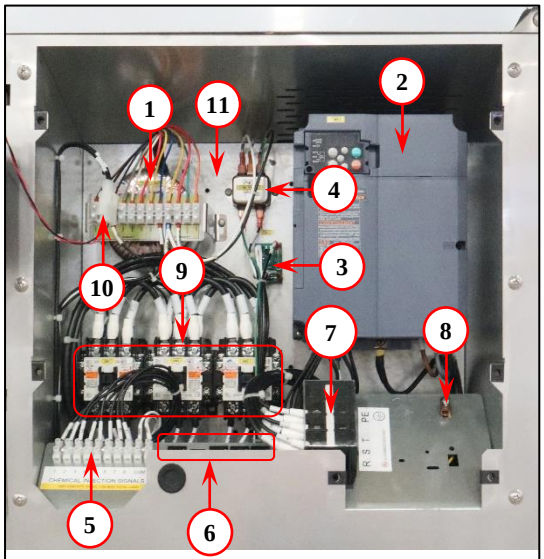


Item	Part No.	Qty.	Description
1	A1-SSP2-116	1	Cover, Inverter control
	A1-SSP2-100	1	Cover, Inverter control(Plainted)
2	A1-S101-007	1	Rear panel assembly, Top
3	A1-S101-008	1	Rear panel assembly, Middle
4	A1-S101-009	1	Rear panel assembly, Lower
5	A1-S101-024	1	Top panel assembly, Front (SUS)
	A1-S101-057	1	Top panel assembly, Rear (SUS)
6	A0-A024-002	3	Grease Fitting 1/4"
	A0-A237-002	1	Box Plastic Grease Fitting
7	A0-A237-003	1	Electric Service Mounting Plate
8	A1-SSP2-072	2	Pipe, water inlet 1"
9	A1-SSP2-002	1	Pipe, Steam Inlet 1/2"
10	A0-A105-011	1	Plug PVC.
11	A0-E012-009	1	Filter for fan
	A0-E012-026	1	Fan, Cooling



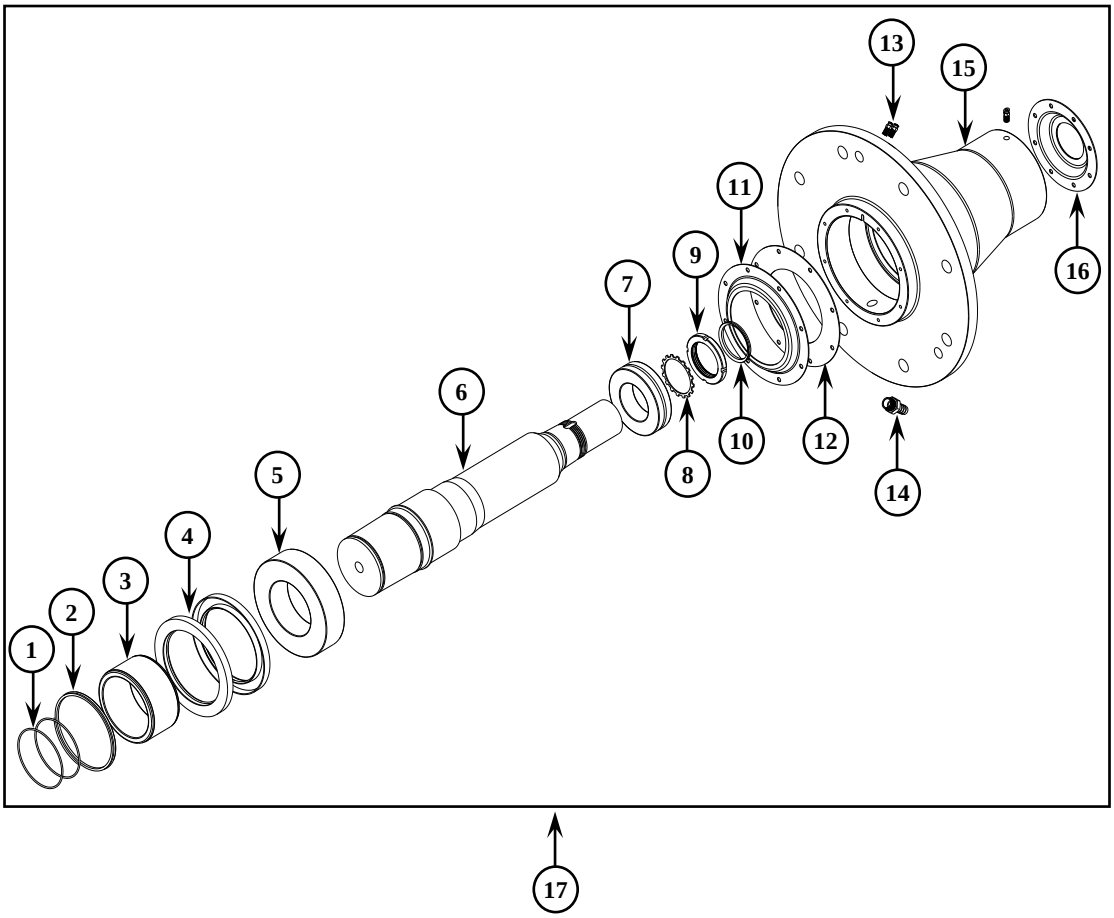
STD

Item	Part No.	Qty.	Description
1	A0-E006-074	1	Transformer, Toroidal, Rating: 150VA.
	A0-A090-130	1	Decal For Transformer Terminal Block
	A0-E021-188	1	Terminal Block 12P, 450V, 25A
2	A0-E001-339	1	Inverter 10HP. 230V. 3PH.
	A0-E001-335	1	Inverter 10HP. 430V. 3PH.
3	A0-E007-319	1	Power Supply 24VDC.
4	A0-E003-026	1	EMI Filter 240V. 1PH
5	A0-E021-039	1	Terminal block
6	A0-E010-031	1	Circuit breaker 1A
	A0-E010-029	1	Circuit breaker 6A
	A0-E010-035	2	Circuit breaker 2A
7	A0-E021-031/1	1	Terminal Block 3 Pole
	A0-E021-031/2	1	Terminal Block 4 Pole
8	A0-E055-001	1	Connector, Ground Lug
9	A0-E055-051	1	Connector Housing Male 2 Pos
	A0-E055-052	1	Connector Housing Femal 2 Pos
10	A1-SSP2-084	1	Electric enclosure, Rear

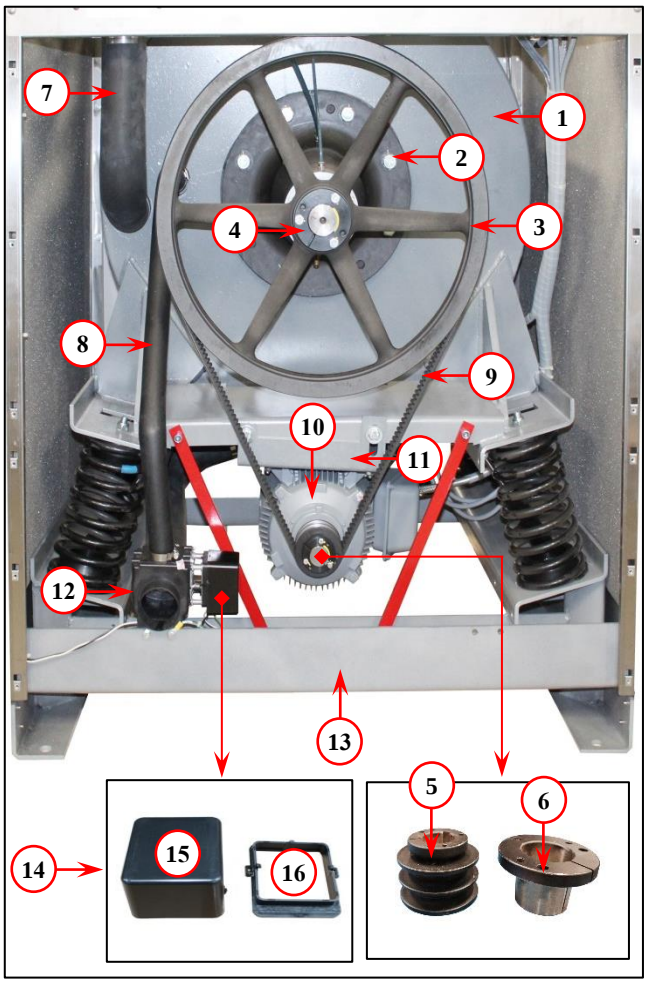


STD

Item	Part No.	Qty.	Description
1	A0-E006-074	1	Transformer, Toroidal, Rating: 150VA.
	A0-A090-130	1	Decal For Transformer Terminal Block
	A0-E021-188	1	Terminal Block 12P, 450V, 25A
2	A0-E001-339	1	Inverter 10HP. 230V. 3PH.
	A0-E001-335	1	Inverter 10HP. 430V. 3PH.
3	A0-E007-319	1	Power Supply 24VDC.
4	A0-E003-026	1	EMI Filter 240V. 1PH
5	A0-E021-039	1	Terminal block
6	A0-E010-031	1	Circuit breaker 1A
	A0-E010-029	1	Circuit breaker 6A
	A0-E010-035	2	Circuit breaker 2A
7	A0-E021-140	1	Terminal Block 4P
8	A0-E055-001	1	Connector, Ground Lug
9	A0-E004-071	3	Magnetic Contactor 24 VAC.
10	A0-E055-051	1	Connector Housing Male 2 Pos
	A0-E055-052	1	Connector Housing Femal 2 Pos
11	A1-SSP2-084	1	Electric enclosure, Rear



Item	Part No.	Qty.	Description
1	A0-A005-148	2	Seal, O-Ring
2	A0-A005-003	1	Seal, V-ring
3	A0-A006-023	1	Collar Seal
4	A0-A005-016	2	Seal, Oil
5	A0-A004-058	1	Bearing
6	A0-M011-021	1	Basket Shaft
7	A0-A004-008	1	Bearing
8	A0-A006-014	1	Lock, Washer
9	A0-A006-015	1	Lock, Nut
10	A0-A005-102	1	Seal, V-Ring
11	A1-S101-043	1	Seal Plate, Front
12	A1-S101-045	1	Seal Plate, Flat Front
13	A0-P006-070	3	fitting
14	A0-A106-004	1	Hose Nipple
15	A0-A007-014	1	Housing
16	A1-S101-044	1	Seal Plate, Rear
17	A1-S101-051	1 Set	Bearing Housing Complete set



Item	Part No.	Qty.	Description
1	A1-S101-080	1	Assembly, Shell
2	A0-A074-558	8	Hex. Bolt Full Thread Zinc HT M20x50
3	A0-M008-120	1	Basket pulley
4	A0-M009-082	1	Basket pulley bushing
	A0-A074-654	3	Hexagon bolt
5	A0-M008-123	1	Motor Pulley
6	A0-M009-091	1	Motor Pulley Bushing
7	A0-A018-066	1	Fill Hose
8	A0-A018-076	1	Overflow hose
9	A0-A002-174	2	V-Belt
10	A0-E008-883	1	Motor 10 HP./4 P/190/380V. 60Hz.
11	A1-S101-039	1	Plate, Motor Mounting
12	A0-E041-032	1	Drain Valve With Overflow 3", (Black)
13	A1-S101-082	1	Base machine
14	A0-A237-005	1 Set	Cover Box + Mounting Box Drain Valve, Plastic Complete Set
15	A0-A237-005-02	1	Cover Box Drain Valve, Plastic
16	A0-A237-005-01	1	Mounting Box Drain Valve, Plastic

e-Front runners

Fuji Electric FA Singapore Pte.Ltd.

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Dec.5, 2006

K.H.T. Central Supply Co., Ltd.
27/3-4 Yenakat Lane 2,
Yannawa, Bangkok 10120, Thailand
Tel: (662) 249-0987
Fax: (662) 249-0986

Dear Mr. Wittaya Mahachavaroj,

Subject : Phase Loss Protection of Fuji Electric AC Low voltage Inverters

We supply the following series of inverters for your machines at present.

1) FRNXXXC1S-2J/ 4J/ 7J
2) FRNXXXE1S-2BM/ 4BM
3) FRNXXXE1S-2A/ 4A
4) FRNXXXG11S-2BK/ 4BK
5) FRNXXXG11S-2BM/ 4BM

All of the above mentioned models have "Phase Loss Protection" at both input and output of the inverters. This function for input protects the inverter from being damaged by adding extreme stress caused by a power phase loss or imbalance between phases.
The one for output detects breaks in inverter output wiring at the start of operation and during running, and shut off the inverter output.

We hope you could understand above answers.
Should you have any questions on that, please feel free to contact us.

Yours faithfully,

A.Shirayama
Sales Manager/ Drive Systems Division
Fuji Electric FA Singapore Pte. Ltd
/ Regional HQ of Fuji Electric FA Components and Systems Co., Ltd. , Japan