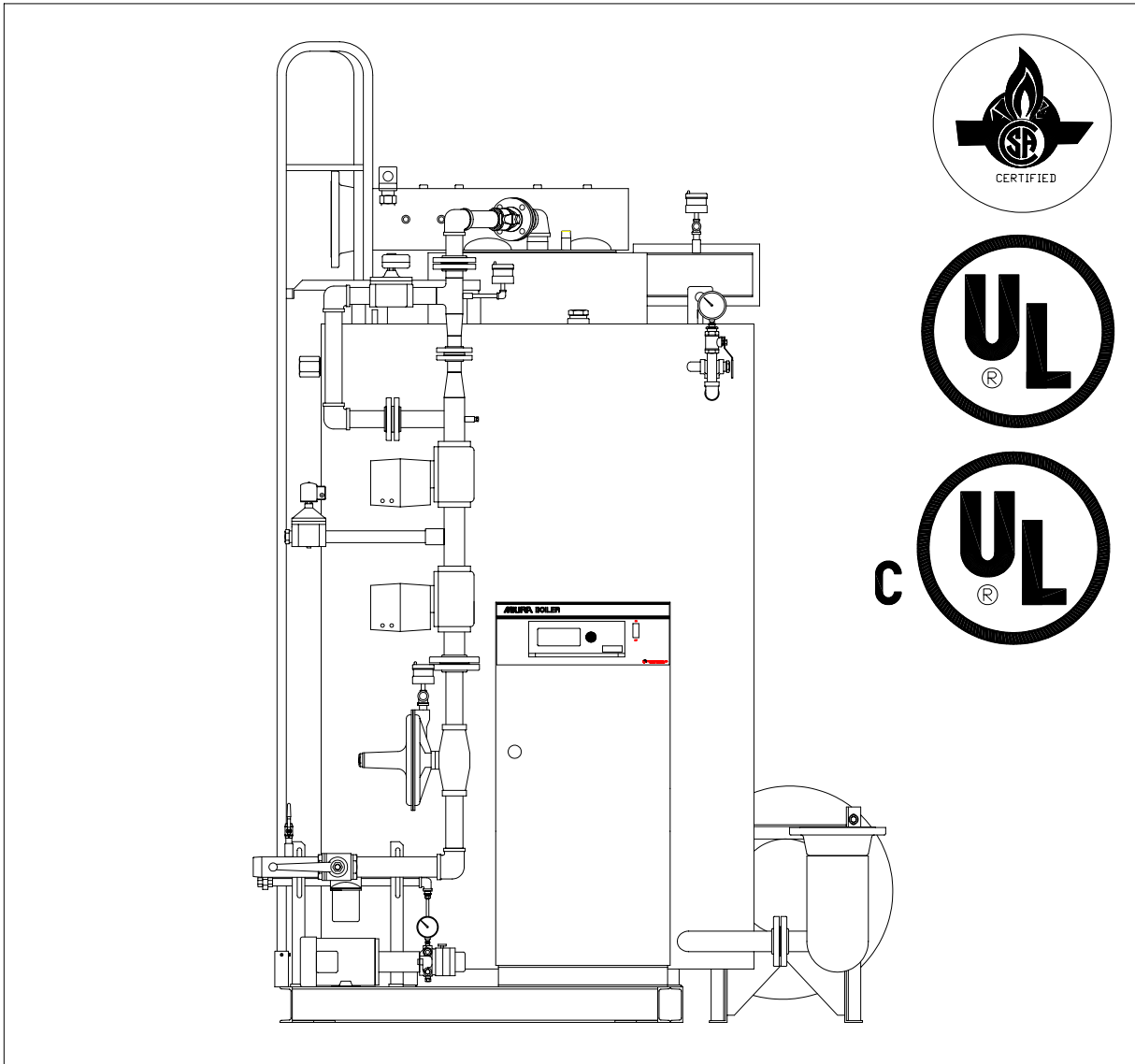


MIURA HOT WATER BOILER

INSTALLATION & OPERATION MANUAL

EXW – HIGH EFFICIENCY SERIES



* INFORMATION IN THIS MANUAL MAY BE CHANGED WITHOUT NOTICE.



MIURA BOILER CO., LTD.

BRANTFORD, ONTARIO, CANADA

OWNER SHALL MAINTAIN THIS MANUAL IN LEGIBLE CONDITION FOR FUTURE REFERENCE

Revised 22/02/05

TABLE OF CONTENTS

| | | |
|------------------|--|-----------|
| SECTION 1 | Introduction | 1 |
| 1.1 | Definitions and Symbols | 1 |
| 1.2 | Guarantee | 1 |
| 1.3 | Introduction | 1 |
| 1.4 | Features | 2 |
| 1.5 | Specifications | 5 |
| SECTION 2 | Acts & Regulations | 9 |
| 2.1 | Acts & Regulations | 9 |
| 2.2 | National Regulatory Organizations | 9 |
| SECTION 3 | Installation | 11 |
| 3.1 | Unloading | 11 |
| 3.2 | Assembling | 11 |
| 3.3 | Recommended Piping | 12 |
| 3.4 | Water Piping | 13 |
| 3.5 | Fuel Piping | 14 |
| 3.6 | Clearances and Ventilation | 18 |
| 3.7 | Stack & Breeching Installation (CGA Canada Only) | 19 |
| 3.8 | Electrical Installation | 20 |
| SECTION 4 | Operation & Maintenance | 22 |
| 4.1 | Preparation before Start-up | 22 |
| 4.2 | Start-up | 22 |
| 4.3 | Shut-down | 23 |
| 4.4 | Cautions During Operation | 23 |
| 4.5 | Safety Attachments | 24 |
| 4.6 | Water Treatment | 27 |
| SECTION 5 | Maintenance | 29 |
| 5.1 | Maintenance & Cleaning Schedule | 29 |
| 5.2 | Troubleshooting | 30 |
| 5.3 | Flow Chart of EXW Sequence Operation | 32 |

SECTION 1 INTRODUCTION

1.1 DEFINITIONS AND SYMBOLS

Note, Caution and Danger are used throughout this manual with the following definitions and symbols.

NOTE: Indicates an area or subject of special merit, emphasizing either the product capabilities or common errors in installation, operation or maintenance.

CAUTION: Indicates possible damage to equipment. It also indicates any condition or practice, which if not observed or remedied could result in damage or destruction of equipment.

DANGER: Indicates any condition or practice, which if not observed, could result in personal injury or possible death.

1.2 GUARANTEE

- Refer to warranty documents for specific details.
- SIX-MONTH labor warranty from boiler start up may be available, contact Local Sales and Service representatives for details. This labor warranty covers routine inspection and repairs at the job site. Travel and lodging expenses are not covered except within local representative service area.
- ONE YEAR Standard warranty for parts from boiler commissioning date or 18 months from shipping date whichever occurs first. Express shipping cost for overnight or next day delivery of parts is not included. Damage to the boiler or parts of the boiler occurring after leaving the factory are not covered. Parts replaced under this warranty must be returned to MIURA. If the failed part is not returned, the customer will be charged for the new item.
- SEVEN-YEAR limited factory warranty on pressure vessel against material or workmanship defects.

1.3 INTRODUCTION

Miura Boiler Co., Ltd. began North American activities in 1988, when the manufacturing plant in Brantford, Ontario, was established. Their engineering department developed procedures to meet ASME codes and listing approval from UL, CSA. The United States corporate sales office, Miura Boiler West, Inc., was established and has developed relationships with national, state and city inspectors and agencies.

The North American network consists of branches in Chicago, Los Angeles and Ontario. The parent Company, Miura Boiler Ltd. in Japan, is the leading manufacturer of boilers and other thermal equipment in the Pacific Rim holding more than 55% of the market. With factories in five countries, production now exceeds 14,000 units per year.

As a result of design necessities in Japan, such as limited space and total dependence on foreign energy, the MIURA BOILER has been engineered as a highly efficient, vertical water tube, once-through, forced-flow design. The MIURA Boiler features a compact unit with a low-water content and is designed to run with a minimum amount of maintenance with simple push-button controls. Operation is quiet and radiant heat losses are minimal. Miura Boilers are often installed in a multiple boiler network. MIURA Boilers, along with the patented MIURA Multiple Installation panel, allows appropriate horsepower to be brought on and off line quickly to meet sophisticated production needs with maximum fuel economy. The 40-year, field proven 'Miura Advantage' is the ability to reach full output from cold start in less than 5 minutes using the least amount of energy and having the lowest environmental impact. The high efficiency Miura Boiler has won numerous awards from Engineering Societies and Gas Associations because it is a compact, safe, cost-effective boiler.

1.4 FEATURES

The MIURA BOILER is a low water content, water tube design, which provides full output within 5 minutes. In addition, it is a compact, safe, cost saving boiler. Miura Boiler is designed to run with a minimum amount of maintenance with simple, push-button controls. With the patented Miura XJ1 computer controller, Miura can monitor detail boiler operation from our offices and provide fast, accurate data. Radiant heat losses are minimal. Miura Boilers are often installed in multiple boiler networks. Miura Boilers, along with the patented Miura Multiple Installation panel, allows appropriate horsepower to be brought on and off line quickly to meet sophisticated production needs with maximum economy. Such features contribute to the success of the boiler obtaining more than 50% of the market share in Japan, Korea and Taiwan.

The completely packaged EXW has the following items as standard equipments:

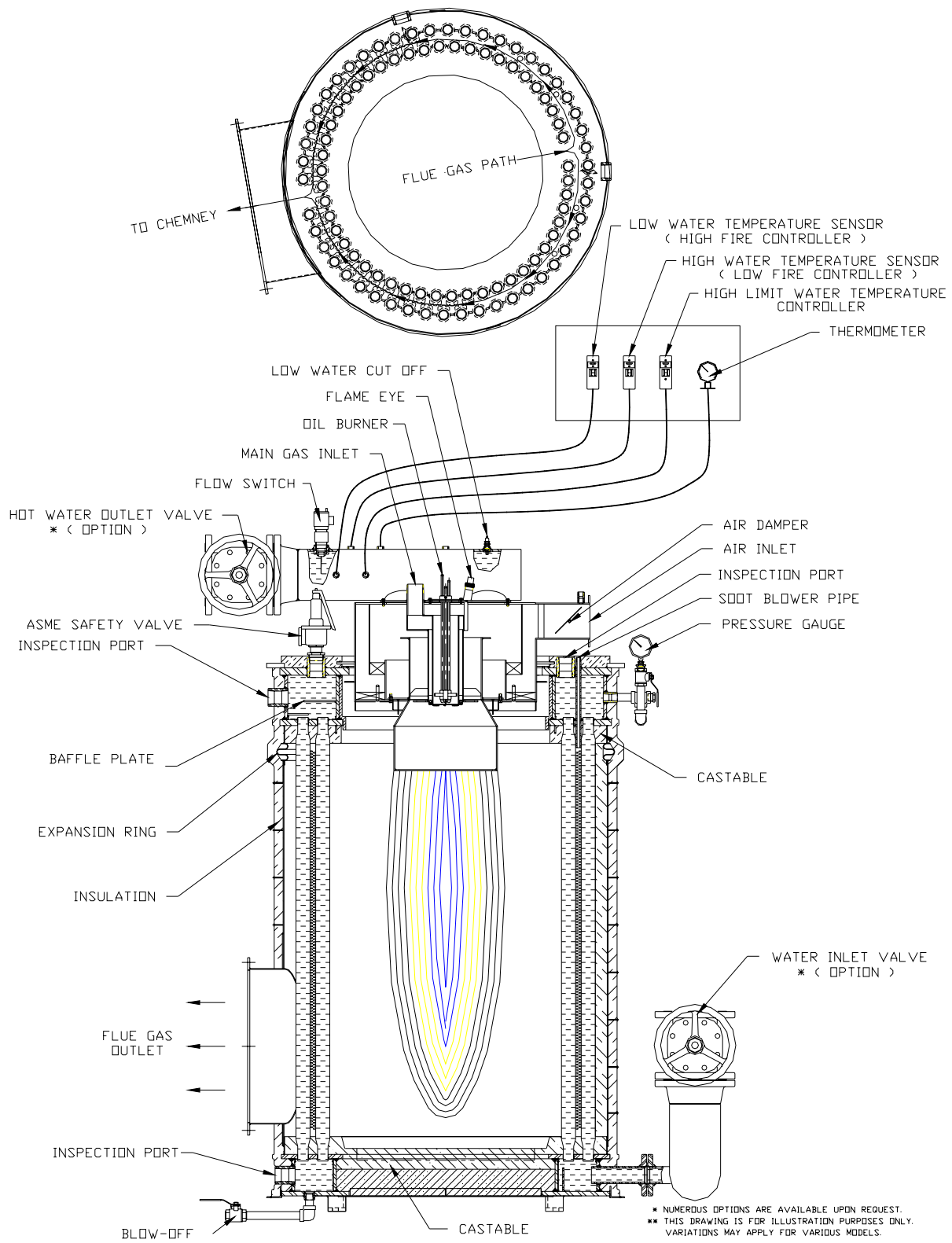
- High-Low Gas pressure switch
- Low Air pressure switch
- Control water temperature by thermocouple with water temperature switch backup
- Water flow switch
- ASME safety relief valve
- Main gas line & Pilot line regulators
- Dual pilot gas solenoid valves
- Dual main gas fluid actuator valves and plugged leak test port (vent valve available)
- Forced draft blower and motor
- Completely enclosed, heavy gauge casing
- ASME stamped Pressure Vessel with internal Inspection ports
- Two independent high temperature limit controls
- Low-water fuel cutoff with manual reset
- Digital display water temperature with back up thermometer gauge
- Pressure gauge
- Friendly digital display
- Communication interface capability
- Display of hours of operation and record of five most recent faults
- Remote monitoring of boiler performance and trouble shooting by modem link with Miura

factory is available.

- Oil pump with motor and oil solenoid valves for oil fired boilers

Please note that all flanges used on all EXW boilers are class 150# (EXH used class 300#) and comply with ASME/ANSI standard B16.5. The 150# stamping refers to a standard classification not Maximum Allowable Working Pressure (MAWP). As specified in Table A-361 of ASME codes, Section I, 1998 edition, the MAWP for 150# flanges is 205 PSIG for saturated steam service and 170 PSIG for Boiler Feed and Blow-off line service

DANGER: Change from standard boiler to FGR boiler must be properly set up by a Miura representative.



EXW BOILER SECTION VIEW

1.5 SPECIFICATIONS

1.5.1 SPECIFICATION FOR EXW-100

| ITEM | | UNITS | EXW-100 |
|---------------------------|-------------|---|--------------------------------|
| Boiler type | | Multiple water tubes | |
| Boiler Horsepower Rating | | BHP | 100 |
| Maximum working pressure | | PSIG (Kg/cm ²) | 160 (11.25) |
| Max. working temperature | | °F (°C) | 250 (121) |
| Heat input | Gas | Btu/Hr (Kcal/Hr) | 4,185,000 (1,054,000) |
| | Oil | | 4,083,000 (1,029,000) |
| Heat output | | | 3,348,000 (843,600) |
| Efficiency | | % | 80% Gas fired (82% Oil fired) |
| Heating surface area | | Ft ² (m ²) | 193 (17.9) |
| Full water content | | Gal (L) | 85.5 (325) |
| Operational Weight | | Lb (Kg) | 5,400 (2,450) |
| Shipping Weight | | | 4,700 (2,150) |
| Combustion control | | Step modulation: Hi-Low-Off | |
| Combustion system | | Proprietary Forced draft | |
| Ignition system | | Electric spark ignited, interrupted gas pilot | |
| Spark system (15,000V) | | High voltage electrical spark | |
| Power Supply | | 575, 460, or 230V, 3 phases, 60 Hz | |
| Max. Electric Consumption | | KVA | 11 |
| Blower Motor Output | | HP (KW) | 10 (7.5) |
| Fuel Type | | Natural Gas or Propane | |
| Fuel Gas Supply Pressure | | PSIG | 3 – 5 (Natural Gas or Propane) |
| Fuel consumption | Natural Gas | SCFH (Nm ³ /Hr) | 4,170 (121) * |
| | No. 2 Oil | US Gal/Hr (L/Hr.) | 29.2 (110) |
| Flue Gas Volume (Wet) | | SCFH (Nm ³ /Hr) | 55,900 (1,500) * |
| Flue Gas Volume (Dry) | | | 47,700 (1,279) * |
| Flue Gas Velocity | | Ft/s (m/s) | 26.0 (7.9) * |
| Flue Gas Temperature | | °F (°C) | 470 (240) |
| Main Water Inlet | | Inches | 4 |
| Main Water Outlet | | | 4 |
| Safety Valve Outlet | | | 2 |
| Fuel Inlet | | | 2" Gas - 3/4" Oil |
| Drain | | | 1 |
| Chimney Diameter | | | 14 |
| Flame Detector | | | Ultraviolet Flame eye |
| Overheating Protection | | Low water cutoff & Flow switch | |

NOTE:

- i. Fuel consumption is based on Natural Gas with a High heating value of 1,004 Btu/SCF.
- ii. Efficiency is based on high heating values of fuels.
- iii. Flue gas temperature and velocity calculated for natural gas with 100°F (40°C) feed water.

1.5.2 SPECIFICATION FOR EXW-200

| ITEM | | UNITS | EXW-200 |
|---------------------------|-------------|---|--------------------------------|
| Boiler type | | Multiple water tubes | |
| Boiler Horsepower Rating | | BHP | 200 |
| Maximum working pressure | | PSIG (Kg/cm ²) | 160 (11.25) |
| Max. working temperature | | °F (°C) | 250 (121) |
| Heat input | Gas | Btu/Hr (Kcal/Hr) | 8,369,000 (2,109,000) |
| | Oil | | 8,165,000 (2,057,000) |
| Heat output | | | 6,695,000 (1,687,000) |
| Efficiency | | % | 80% Gas fired (82% Oil fired) |
| Heating surface area | | Ft ² (m ²) | 323 (30.0) |
| Full water content | | Gal (L) | 140 (530) |
| Operational Weight | | Lb (Kg) | 9,600 (4,350) |
| Shipping Weight | | | 8,400 (3,810) |
| Combustion control | | Step modulation: Hi-Low-Off | |
| Combustion system | | Proprietary Forced draft | |
| Ignition system | | Electric spark ignited, interrupted gas pilot | |
| Spark system (15,000V) | | High voltage electrical spark | |
| Power Supply | | 575, 460, or 230V, 3 phases, 60 Hz | |
| Max. Electric Consumption | | KVA | 21 |
| Blower Motor Output | | HP (KW) | 20 (15) |
| Fuel Type | | Natural Gas or Propane | |
| Fuel Gas Supply Pressure | | PSIG | 3 – 5 (Natural Gas or Propane) |
| Fuel consumption | Natural Gas | SCFH (Nm ³ /Hr) | 8,340 (224) * |
| | No. 2 Oil | US Gal/Hr (L/Hr.) | 58.3 (220) |
| Flue Gas Volume (Wet) | | SCFH (Nm ³ /Hr) | 111,700 (3,000) * |
| Flue Gas Volume (Dry) | | | 95,500 (2,700) * |
| Flue Gas Velocity | | Ft/s (m/s) | 25.4 (7.8) * |
| Flue Gas Temperature | | °F (°C) | 470 (240) |
| Main Water Inlet | | Inches | 6 |
| Main Water Outlet | | | 6 |
| Safety Valve Outlet | | | 2 |
| Fuel Inlet | | | 2" Gas - 3/4" Oil |
| Drain | | | 1 |
| Chimney Diameter | | | 20 |
| Flame Detector | | Ultraviolet Flame eye | |
| Overheating Protection | | Low water cutoff & Flow switch | |

NOTE:

- i. Fuel consumption is based on Natural Gas with a High heating value of 1,004 Btu/SCF.
- ii. Efficiency is based on high heating values of fuels.
- iii. Flue gas temperature and velocity calculated for natural gas with 100°F (40°C) feed water.

1.5.3 SPECIFICATION FOR EXW-250

| ITEM | | UNITS | EXW-250 |
|---------------------------|-------------|---|--------------------------------|
| Boiler type | | Multiple water tubes | |
| Boiler Horsepower Rating | | BHP | 250 |
| Maximum working pressure | | PSIG (Kg/cm ²) | 160 (11.25) |
| Max. working temperature | | °F (°C) | 250 (121) |
| Heat input | Gas | Btu/Hr (Kcal/Hr) | 10,461,000 (2,636,000) |
| | Oil | | 10,206,000 (2,572,000) |
| Heat output | | | 8,369,000 (2,109,000) |
| Efficiency | | % | 80% Gas fired (82% Oil fired) |
| Heating surface area | | Ft ² (m ²) | 390 (36.2) |
| Full water content | | Gal (L) | 148 (560) |
| Operational Weight | | Lb (Kg) | 14,200 (6,440) |
| Shipping Weight | | | 12,900 (5,850) |
| Combustion control | | Step modulation: Hi-Low-Off | |
| Combustion system | | Proprietary Forced draft | |
| Ignition system | | Electric spark ignited, interrupted gas pilot | |
| Spark system (15,000V) | | High voltage electrical spark | |
| Power Supply | | 575, 460, or 230V, 3 phases, 60 Hz | |
| Max. Electric Consumption | | KVA | 27 |
| Blower Motor Output | | HP (KW) | 25 (18.6) |
| Fuel Type | | Natural Gas or Propane | |
| Fuel Gas Supply Pressure | | PSIG | 3 – 5 (Natural Gas or Propane) |
| Fuel consumption | Natural Gas | SCFH (Nm ³ /Hr) | 10,420 (279) * |
| | No. 2 Oil | US Gal/Hr (L/Hr.) | 72.9 (276) |
| Flue Gas Volume (Wet) | | SCFH (Nm ³ /Hr) | 139,600 (3,740) * |
| Flue Gas Volume (Dry) | | | 119,300 (3,200) * |
| Flue Gas Velocity | | Ft/s (m/s) | 18.7 (5.7) * |
| Flue Gas Temperature | | °F (°C) | 470 (240) |
| Main Water Inlet | | Inches | 8 |
| Main Water Outlet | | | 8 |
| Safety Valve Outlet | | | 2½ |
| Fuel Inlet | | | 2½" Gas - ¾" Oil |
| Drain | | | 1 |
| Chimney Diameter | | | 26 |
| Flame Detector | | | Ultraviolet Flame eye |
| Overheating Protection | | Low water cutoff & Flow switch | |

NOTE:

- i. Fuel consumption is based on Natural Gas with a High heating value of 1,004 Btu/SCF.
- ii. Efficiency is based on high heating values of fuels.
- iii. Flue gas temperature and velocity calculated for natural gas with 100°F (40°C) feed water.

1.5.4 SPECIFICATION FOR EXW-300

| ITEM | | UNITS | EXW-300 |
|---------------------------|-------------|---|--------------------------------|
| Boiler type | | Multiple water tubes | |
| Boiler Horsepower Rating | | BHP | 300 |
| Maximum working pressure | | PSIG (Kg/cm ²) | 160 (11.25) |
| Max. working temperature | | °F (°C) | 250 (121) |
| Heat input | Gas | Btu/Hr (Kcal/Hr) | 12,563,000 (3,163,000) |
| | Oil | | 12,256,000 (3,086,000) |
| Heat output | | | 10,050,000 (2,531,000) |
| Efficiency | | % | 80% Gas fired (82% Oil fired) |
| Heating surface area | | Ft ² (m ²) | 390 (36.2) |
| Full water content | | Gal (L) | 148 (560) |
| Operational Weight | | Lb (Kg) | 14,200 (6,440) |
| Shipping Weight | | | 12,900 (5,850) |
| Combustion control | | Step modulation: Hi-Low-Off | |
| Combustion system | | Proprietary Forced draft | |
| Ignition system | | Electric spark ignited, interrupted gas pilot | |
| Spark system (15,000V) | | High voltage electrical spark | |
| Power Supply | | 575, 460, or 230V, 3 phases, 60 Hz | |
| Max. Electric Consumption | | KVA | 27 |
| Blower Motor Output | | HP (KW) | 25 (18.6) |
| Fuel Type | | Natural Gas or Propane | |
| Fuel Gas Supply Pressure | | PSIG | 3 – 5 (Natural Gas or Propane) |
| Fuel consumption | Natural Gas | SCFH (Nm ³ /Hr) | 12,500 (336) * |
| | No. 2 Oil | US Gal/Hr (L/Hr.) | 87.5 (331) |
| Flue Gas Volume (Wet) | | SCFH (Nm ³ /Hr) | 167,500 (4,500) * |
| Flue Gas Volume (Dry) | | | 143,000 (3,840) * |
| Flue Gas Velocity | | Ft/s (m/s) | 22.6 (7.0) * |
| Flue Gas Temperature | | °F (°C) | 470 (240) |
| Main Water Inlet | | Inches | 8 |
| Main Water Outlet | | | 8 |
| Safety Valve Outlet | | | 2½ |
| Fuel Inlet | | | 2½" Gas - ¾" Oil |
| Drain | | | 1 |
| Chimney Diameter | | | 26 |
| Flame Detector | | | Ultraviolet Flame eye |
| Overheating Protection | | Low water cutoff & Flow switch | |

NOTE:

- iv. Fuel consumption is based on Natural Gas with a High heating value of 1,004 Btu/SCF.
- v. Efficiency is based on high heating values of fuels.
- vi. Flue gas temperature and velocity calculated for natural gas with 100°F (40°C) feed water.

SECTION 2 ACTS & REGULATIONS

2.1 ACTS & REGULATIONS

There are a number of codes, standards, laws and regulations for boilers and related equipment that should be considered. Regulatory requirements are dictated by a variety of sources and are focused primarily on safety. The equipment shall be installed in accordance with the current regulations, codes and specifications of the applicable City, Country, Provincial/State and Federal agencies. Authorities having jurisdiction should be consulted before installations are made. For more information on how the various rules affect boiler selection and operation, you may want to contact your local MIURA authorized representative or the engineering firm designing the boiler installation. Here are some essential rules to consider:

- a) The boiler industry is tightly regulated by the American Society of Mechanical Engineers (ASME) and ASME Codes, which controls boiler design, inspection, and quality assurance. All boilers' pressure vessels including economizers, deaerator, blowdown tank and other pressure vessels should have an ASME stamp.
- b) All pressure vessels should be inspected and registered with the National Board.
- c) In Canada, the design of all boilers, pressure vessels, fittings, and piping must be registered with local province as required in CSA B51.
- d) The insurance company insuring the facility or boiler may dictate additional requirements. Boiler manufacturers can provide special boiler trim according to the requirements of major insurance companies such as IRI, FM. Special boiler trim items usually pertain to added safety controls. Some industries, such as food processing, brewing, or pharmaceuticals may also have additional regulations that have an impact on the boiler and boiler room.
- e) CSA/CGA, c-UL, UL approval may be required to verify boiler safety performance.
- f) A full time boiler operator may be required. Operator requirements depend on the boiler's size, pressure, heating surface area and volume of water. Boilers can be selected to minimize the requirements; either by choosing boiler that is exempt from the rules or by installing special equipment that gives the operator more freedom in the facility. Contact the local boiler inspector for details.
- g) Most state/province or local authorities require a permit to install and operate a boiler. Additional restrictions may apply in non-attainment areas where air quality does not meet the national ambient air quality standards and emission regulations are more stringent.
- h) Most states or provinces require an annual boiler inspection. There may be other requirements on piping as well.
- i) Most areas have established a maximum temperature at which water can be discharged to the sewer. In this case, a blowdown separator or blowdown tank is required.
- j) For all new boilers with inputs over 10 million Btu/Hr, U.S. Federal emission standards apply including permitting and reporting procedures.

2.2 NATIONAL REGULATORY ORGANIZATIONS

MIURA Boiler recommends contacting your actual insurance provider as well as the utility companies for assistance in identifying and complying with codes and regulations.

A partial list of agencies having jurisdiction over boiler installation and operation is given below. This list is comprehensive but by no means all-inclusive.

UNDERWRITERS LABORATORIES

333 Pfingsten Rd.
Northbrook, IL
60062
(847) 272-8800

CSA INTERNATIONAL

178 Rexdale Blvd.
Etobicoke, Ontario
M9W 1R3
(416) 747-2300

NATIONAL BOARD

1055 Crupper Ave.
Columbus, OH
43229
(614) 888-8320

T.S.S.A.

3300 Bloor St., West
4th Floor, West Tower
Etobicoke, Ontario M8X 2X4
(416) 325-2000

A.S.M.E.

345 East 47th St.
New York, NY
10017
(212) 705-7800

N.F.P.A.

1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
(800) 344-3555

INDUSTRIAL RISK INSURERS

85 Woodland Street,
Hartford, CT 06105-1226

FACTORY MUTUAL RESEARCH CORPORATION

1151 Boston-Providence Turnpike,
Norwood, MA 02062
(617) 762-4300

AMERICAN GAS ASSOCIATION

1515 Wilson Boulevard
Arlington, VA 22209

AMERICAN NATIONAL STANDARD INSTITUTE

11 West 42nd Street,
New York, NY 10036

OCCUPATIONAL SAFETY & HEALTH ADM.

ENVIRONMENT PROTECTION AGENCY

LOCAL FIRE MARSHALL

LOCAL BUILDING & CONSTRUCTION INSP.

LOCAL BOILER INSPECTION

FOOD & DRUG ADMINISTRATION

SECTION 3 INSTALLATION

CAUTION: All boiler prices are F.O.B. the factory at Brantford, Ontario. This means that MIURA Boiler is not responsible for damage to the boiler occurring during shipping. We strongly recommend a complete inspection of all boiler shipments at place and time of delivery. This inspection should include photographs of the boiler and ancillary equipment packing crates. If any damage is found, do not release the driver or unload the equipment until a satisfactory arrangement is made with shipping company to cover the damage. MIURA Boiler makes reasonable effort to ensure that no vibration or shock damage will occur. However, if such damage occurs and is not discovered and noted at the time of delivery, MIURA Boiler is not responsible to pay for the cost of repairs and any damaged parts will not be under warranty.

NOTE: It is customer's responsibility to confirm utility availability before ordering the boiler and follow all local regulations.

3.1 UNLOADING

For transportation, the EXW boiler may be disassembled and shipped in separate components as follows:

- Boiler vessel with burner and control box (blower assembly may be shipped separated if required by customer)
- Optional parts such as silencer, filter box, valves etc.

NOTE: Some small parts, such as bolts and nuts etc. will be shipped inside associated control box for the boiler.

The EXW series boiler may be unloaded from the transport truck using a forklift. However, if a forklift is used, precautions should be taken to ensure that the boiler does not tip over. The boiler is top heavy and the weight is not centered. Because of the many variables involved such as model, size of forklift and size of the loading dock, MIURA is not able to recommend a specific method of unloading the boiler. As a general starting point, the boiler center of gravity will be the midpoint of the two lifting lugs. Securing the top of the boiler to the forklift with a chain or similar methods is strongly recommended.

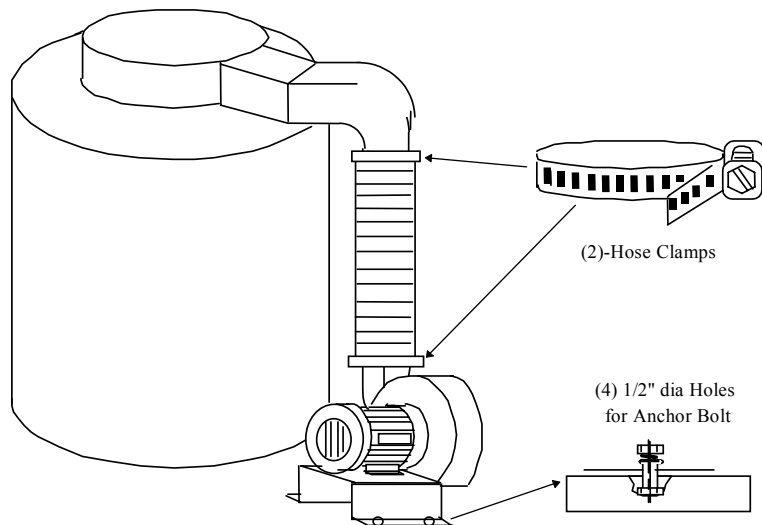
NOTE: Installer must identify emergency shut-off device, which includes power switch, main fuel, and water cock.

3.2 ASSEMBLING

CAUTION: This is a completely shop tested, assembled and fully packaged boiler. Each unit and assembly has been well adjusted in the factory. It is very important not to make any adjustments without first consulting your nearest authorized MIURA dealer. Field

3.2.1 BLOWER ASSEMBLY

Place the blower on the foundation so that the blower outlet is directly under the windbox inlet. Tighten the foundation bolts. Install air hose between blower outlet and windbox inlet as straight as possible to reduce the pressure drop in this duct. Ensure that the hose is placed as far as possible over the air duct to minimize leakage, the chance that it will blow off, as well as eliminate any bend in the hose (trim any excess length if required). Tighten hose clamps.



3.3 RECOMMENDED PIPING

3.3.1 CLOSED SYSTEM

A closed system should operate with little or no make-up. Consequently, very little water needs to be added over the years of servicing. Liming or scale build-up should be negligible unless the make-up is too great. The most common cause of problems due to excessive make-up is leaks in the system, automatic vent not valved off after start-up, improper air elimination and faulty pressure reducing valve. **It is important to realize that air elimination is a continuous process in a properly designed system.**

Simply venting off excessive air during start-up will not satisfy this requirement. The expansion tank provides the air cushion to accommodate the expansion and contraction of the system water. This tank should be sized to approximately $\frac{3}{4}$ full when the system is at maximum operating temperature and $\frac{1}{4}$ full when at ambient temperature. Therefore, $\frac{1}{2}$ of the tank capacity must accommodate the expansion of the entire system. This would include the water content of the heater system piping and all heat users or loops.

When the expansion tank has little or no air in it, it is referred to as being "water logged" which means that air has either escaped or migrated to some other part of the system instead of being properly returned to the expansion tank. Greater amounts of air occurring in the tank, in spite of attempts to bleed down, indicates that air is being drawn into the system at some point where there is a leak and the system pressure is below that of the atmosphere. This condition cannot occur if the circulation pump **intake** is located at the outlet of the boiler (i.e., water is being pulled from the

boiler rather than being pumped into the boiler). The cause for a water logged expansion tank must be quickly found and corrective action taken, otherwise there will be a constant loss of water from the relief valve, **constant make-up of water which will result in the liming of a system** that was intended to be closed.

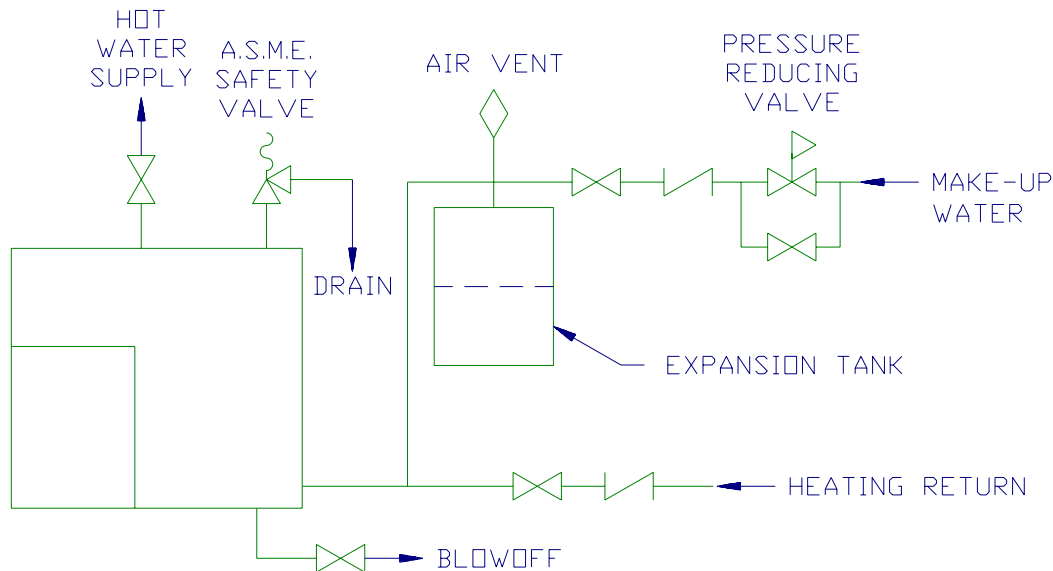
NOTE:

- **Dirt and scale from the entire system will tend to collect in the boiler and should be washed out until the system is clean.**
- **Periodic water analysis should be performed to see if additional treatment is needed.**

3.4 WATER PIPING

| | EXW-100 | EXW-200 | EXW-250/300 |
|----------------------------|---------|---------|-------------|
| Minimum flow (Gal/min) | 100 | 200 | 300 |
| Water Inlet (150# Flange) | 4" | 6" | 8" |
| Water Outlet (150# Flange) | 4" | 6" | 8" |
| Drain Outlet | 1" NPT | | |
| Safety Valve Outlet | 2" NPT | | |

- Please Contact your nearest MIURA representative or Distributor about accessories.



- Before the boiler is fired for the first time after installation is completed, flush all piping. MIURA is not responsible for damage as a result of debris in piping such as stuck open check valve.
- Practical experience has proven that even though hot water boilers generally operate on closed

systems, water losses and entrance of air may lead to pitting, corrosion and formation of sludge or scale. It is therefore essential to obtain suitable water treatment recommendations from specialists and to apply them rigidly. **A water meter is recommended to know the amount of make-up water used.**

- To avoid condensation in the boiler and the chimney, **do not operate boiler for extended periods of time at boiler outlet temperatures lower than 180°F** (minimum heating return temperature should be above 100°F). If the boiler is maintained at lower temperatures, the moisture in the flue gases will condense in the boiler tubes or chimney and form water. The net result is that corrosion occurs on the combustion side of the flues and in the vent stub and chimney. If lower water temperatures are required, mixing valves should be used.
- The GPM circulating rate in relation to full boiler output and system temperature drop may be determined from the Performance Curve or from the following formula:

$$GPM = \frac{BoilerOutput(Btu / Hr)}{500 \times SystemTemperatureDrop(^{\circ}F)}$$

- Main hot water piping should slope upward. If the slope is downward, it must be properly vented to remove air.
- Relief valve discharge outlet must be piped toward the drain, leaving the pipe open so as to enable observation of water flow, when active.

NOTE: In multiple installations of hot water boilers, the equalization of water flow to the boilers is an important consideration. This can be accomplished by using individual circulating pumps for the boilers with symmetrical piping to the boilers, or by using balancing valves or orifice plates and gauges in the piping to the individual boilers. If balancing valves or orifice plates are used, there must be a significant pressure drop across the balancing devices. If care is not taken to ensure equal flow, the unequal flow will cause an unequal-firing rate. The net result would be that the common header outlet water temperature would not be up to the desired temperature.

3.5 FUEL PIPING

3.5.1 GAS PIPING

FUEL TYPE: Natural & Propane Gas

SUPPLY PRESSURE: 3 - 5 PSIG *

NOTE: 3 – 5 PSIG is the setting range, NOT the allowable fluctuation range. Maintain steady, set gas supply pressure within 0.2 PSIG but NEVER below 3 PSIG during operation. This pressure must be at the regulator supplied with MIURA Boiler gas piping. If necessary, use larger pipe for long piping runs. Failure to maintain required gas flow rate pressure will result in frequent boiler misfire!

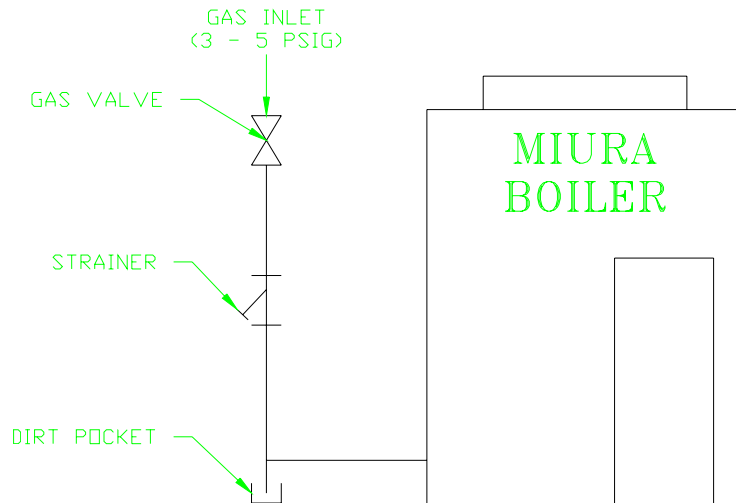
NOTE: Do not use any gas piping with a diameter smaller than the gas inlet piping to boiler. All main gas train piping to the burner is included, (except for individual regulator

and pressure switch vents).

CAUTION: Do not attempt to change any part of this gas train without first consulting the nearest authorized MIURA representative.

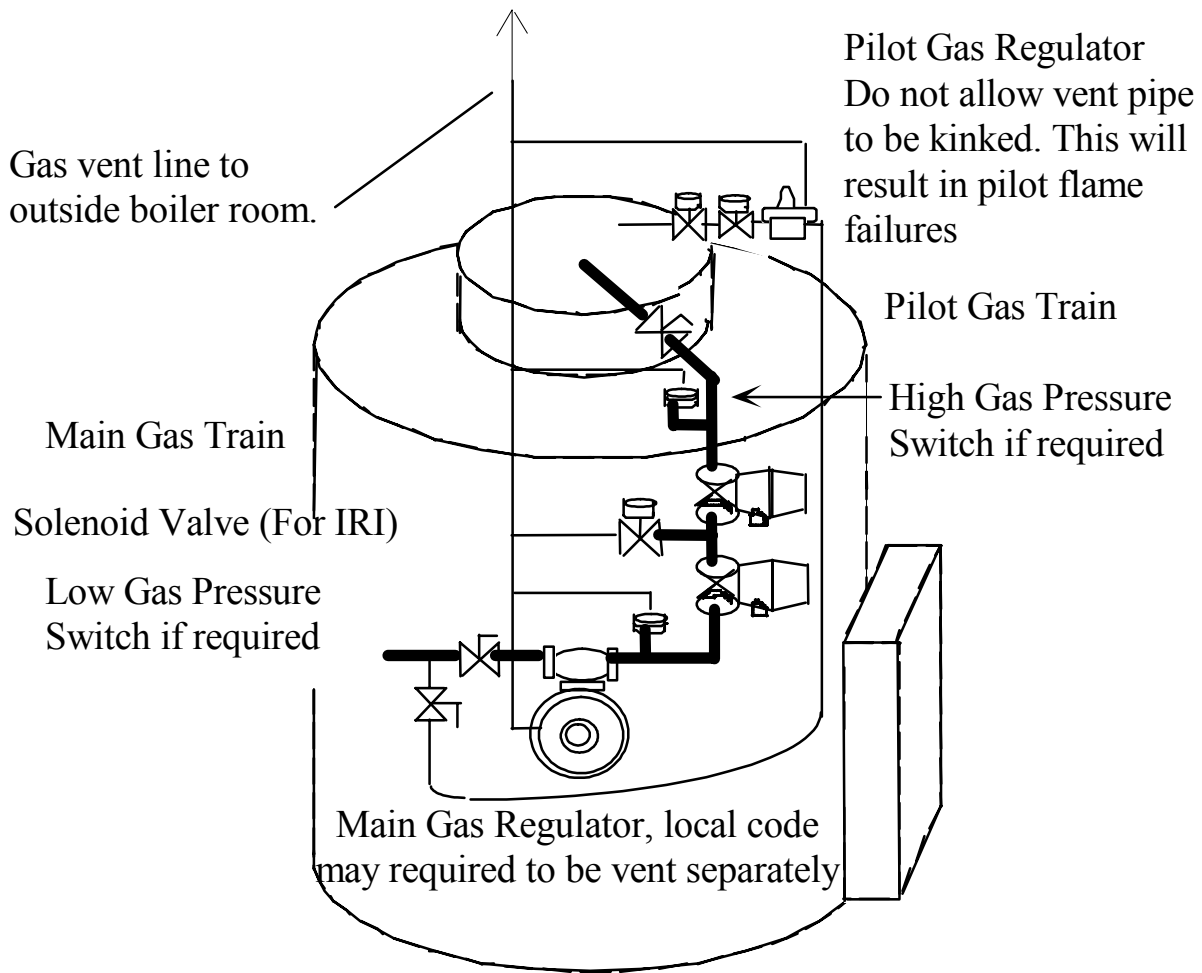
| | EXW-100 | EXW-200 | EXW-250/300 |
|--------------------------|----------|---------|-------------|
| Gas Inlet | 2" NPT | | 2 ½" NPT |
| Main Gas Regulator Vent | 1" NPT | | |
| Pilot Gas Regulator Vent | 1/8" NPT | | |
| Pressure Switches Vent | 1/8" NPT | | |
| Automatic Vent (option) | ¾" NPT | 1" NPT | 1¼" NPT |

Supply pressure of 3 to 5 PSIG required at boiler regulator inlet at full firing rate and when boiler combustion is stopped. Installation of a pressure gauge to monitor gas supply pressure is recommended. If the boiler is operated with propane as the fuel, MIURA Boiler STRONGLY recommends the use of a vaporizer. Collecting the propane gas from the top of the tank is possible, but not recommended due to variations in vapor space pressure depending on ambient air temperature. Also, ensure the vaporizer is sized for full boiler capacity even if the normal load is less than the maximum capacity of the boiler. This recommendation is based on the boiler operating at full rated fuel flow during the start up period.

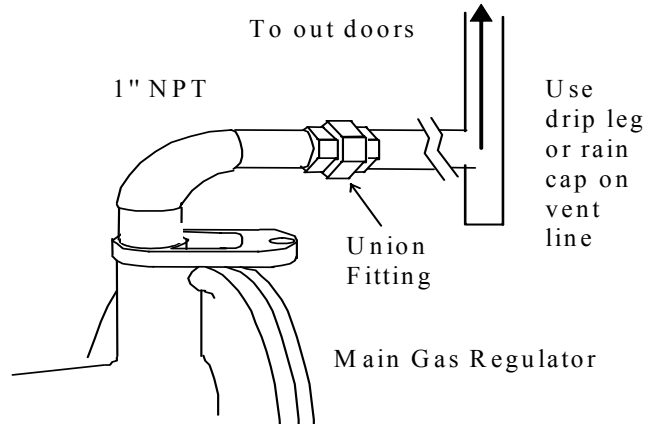
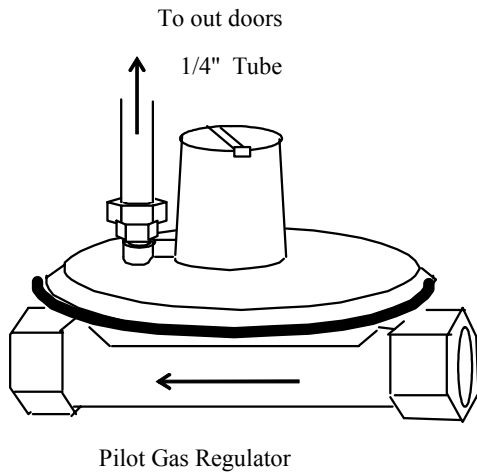


If the supply gas pressure is above 5 PSIG, use only one approved reducing station per boiler room to meet the required specifications. Do not use a separate reducing valve to supply each boiler. This would result in pressure oscillations that could result in boiler flame failures or momentary over firing conditions. Consult pressure regulator application engineers for correct sizing and regulator model selection.. Use an approved booster pump, if necessary, to meet the required minimum pressure specifications of 3 PSIG. To ensure an adequate volume of fuel is available to support combustion during firing rate changes, a 3 PSIG minimum is required at the inlet to the main regulator supplied with the boiler. Specifically, a change from burner Off to Low Fire, which is approximately 40% of rated fuel usage, occurs over a 10-15 second period. The fuel usage then goes from 40% to 100% rated consumption when the boiler goes to high fire. This change occurs in less than one second. Fuel consumption then changes from 100% to zero in less than one second when the boiler turns off. The utility gas regulator must maintain at least 3 PSIG and not exceed 5 PSIG under these conditions.

Install dirt pocket on Main gas inlet piping immediately up stream of boiler.

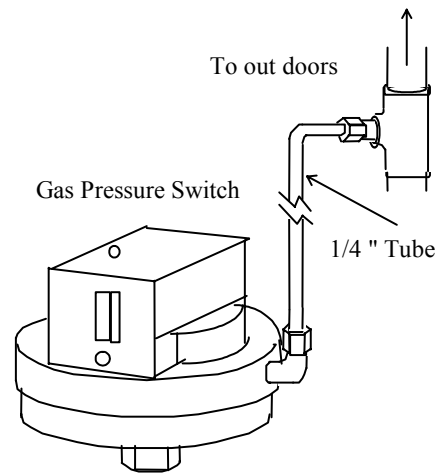


Two pressure switches, HIGH and LOW gas pressure, may be required to be vented to the atmosphere outside of the boiler room. Contact your local insurance provider and the Gas Company for specific requirements. Note that some boiler models may have ANTUNES RLGP-G 5~30' switches on the gas train which do not require venting to the atmosphere.



Typically, gas vent lines can be connected to a common vent line. The vent line will have a cross-sectional area not less than the area of the largest vent line plus 50 percent of the areas of all the additional vent lines.

An optional solenoid automatic vent valve located between the main gas blocking valves may be required for insurance purposes and is an additional cost option to meet IRI specifications. Ensure IRI is specified on the purchase order if necessary.



Follow all local regulations.

3.5.2 OIL PIPING

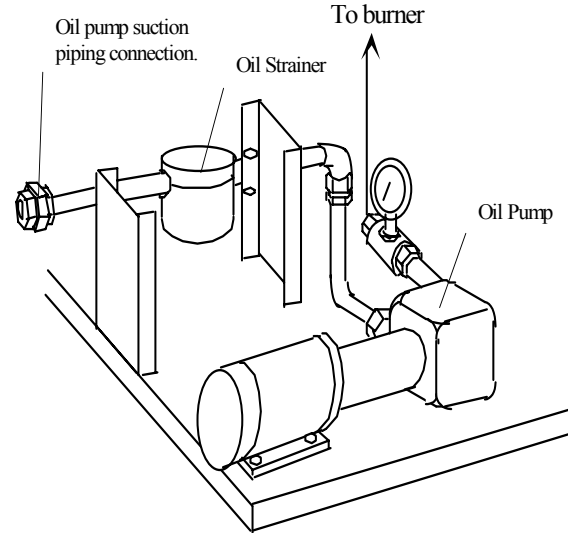
FUEL TYPE: No. 2 Oil

NOTE: All EXW oil fired boilers (except EXW-100) require Natural or Propane gas for pilot burner ignition.

CAUTION: Do not attempt to change any part of this oil train without first consulting the nearest authorized MIURA representative.

| | | | |
|-----------|----------|-----|-----|
| | 100 | 200 | 300 |
| Oil Inlet | 3/4" NPT | | |

- All oil piping to the burner is included.
- Install a manual fuel oil shut off valve at the boiler.
- In order to comply with National Fire Protection Code, the fuel pump suction pressure should not exceed 3 PSIG.
- Fuel pressure at pump suction must NOT be at a vacuum. Do not use the MIURA supplied oil pump to draw oil up from the tank, through the overhead, and down to the boiler. This arrangement almost always allows air to leak into the pump suction connection and results in very poor combustion.
- Avoid high points in the pump suction piping that would allow air to collect and result in loss of pump priming. Do not pipe from oil tank to ceiling and down to boiler without an air vent or air lock will occur. Piping along the floor is preferred.
- To prevent loss of Oil Pump priming, it may be necessary to install a re-circulation pump.
- Vent all air from the piping to prevent damage to the oil pump seal before running the pump.
- Follow all local regulations.



3.6 CLEARANCES AND VENTILATION

3.6.1 CLEARANCES

The EXW model was designed for non-combustible floors with minimum clearances from the unit and flue connector to combustible materials of:

| | | |
|-------------------|-----|------------|
| Boiler Top | 40" | (1,020 mm) |
| Boiler Right Side | 24" | (610 mm) |
| Boiler Left Side | 24" | (610 mm) |
| Boiler Rear | 24" | (610 mm) |
| Boiler Front | 48" | (1,220 mm) |

Follow all local regulations.

3.6.2 VENTILATION

The table below gives factory recommended minimums for ventilation of each boiler. The recommendation is based on Canadian Gas Association standards. However, please confirm with local building and safety codes as boiler room ventilation requirements vary by significant amounts. For multiple boiler installations, multiply the below areas by the number of boilers installed in the boiler room.

| | SUPPLY AIR AREA | VENTILATION AIR AREA | CHIMNEY DIAMETER |
|--|-----------------|----------------------|------------------|
|--|-----------------|----------------------|------------------|

| MODEL | (Sq. in.) | (Sq. in.) | (Inches) |
|---------|-----------|-----------|----------|
| EXW-100 | 139 | 14 | 14 |
| EXW-200 | 286 | 29 | 20 |
| EXW-300 | 415 | 41 | 26 |

Ventilation of the space occupied by the boiler should be provided by at least one opening directly in contact with the outdoors. Such an opening is to be located at the highest practical point for the purposes of generating natural convection processes of air circulation. The total cross-sectional area of such openings should be at least equal to those values in the table above.

In addition to the required openings for required air ventilation, there should be a permanent air supply via openings having a total cross-sectional area not less than what is required from the table above. The location of these openings should not interfere with the openings intended for the purposes of ventilation. These air supply openings should be either located at, or ducted to, a point not more than 18 inches (450 mm), and nor less than 6 inches (150 mm), above the floor level.

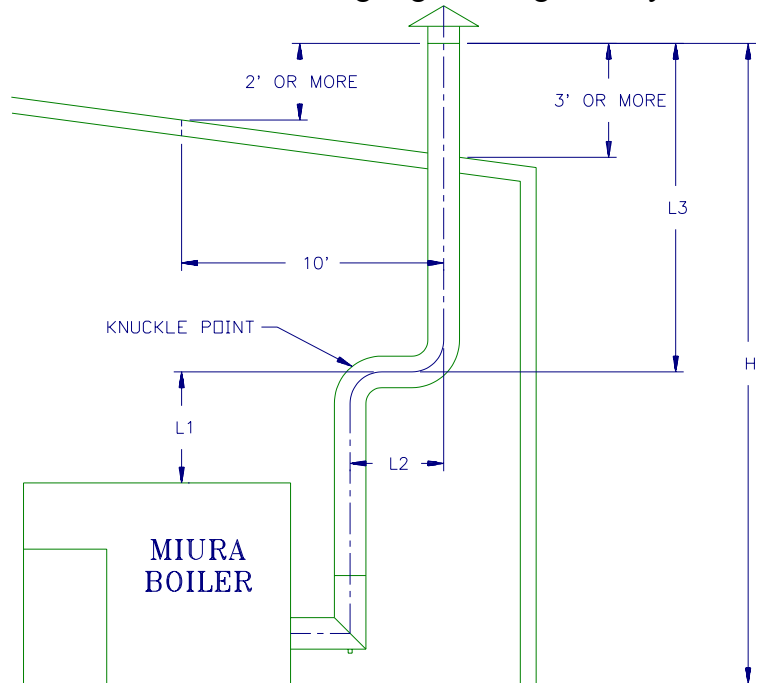
Follow all local regulations.

3.7 STACK & BREECHING INSTALLATION (CGA CANADA ONLY)

NOTE: Consultation with your Engineering Company or Exhaust Stack provider will insure a long lasting trouble free stack design. The stack must be designed to maintain available draft at the outlet of boiler between zero to -0.05" of water throughout the whole firing range (i.e. for four boilers; all boilers at high-fire or only one boiler at low-fire). Failure to maintain this value will adversely affect boiler performance and is not the responsibility of MIURA.

Proper installation of the chimney is a requirement for good boiler efficiency and safe operation. The following principles should be adhered to at all times when designing/installing chimneys:

1. Chimneys should be straight. Bends or offsets have a greater resistance to flow with consequent adverse effect on burner performance and thus, should be avoided whenever possible.
2. A stack should extend beyond the height of nearby structures to avoid downdrafts or eddy current. If this is not possible, a stack hood designed to prevent downdrafts should be considered.
3. The stack should project at least:
 - a) Two feet above the horizontal plane drawn from a point at least 10

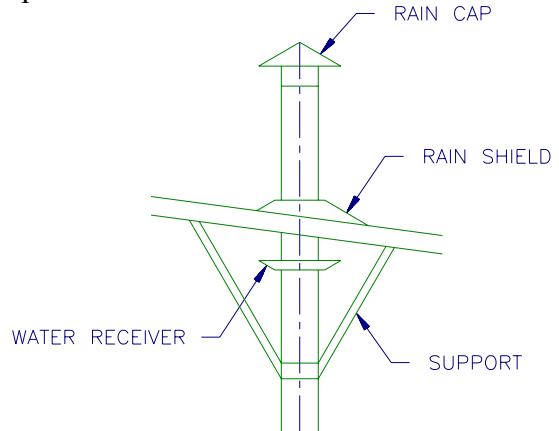


19 $L = L1 + L2 + L3$

feet away from the stack; and

b) Three feet above the lower side of the roof slope.

4. Include a rainhood for every stack and be sure to provide a rain shield for straight stacks, which penetrate through the roof.
5. Do not make the stack diameter smaller than the flue gas outlet on the boiler.
6. Provide supports if the stack exceeds 100 pounds. Also, clamp the stack firmly to the flue gas outlet.
7. Install the stack where it will be clear of any combustible materials and utilize insulation around the opening in the wall or the roof.
8. Follow all local regulations. Check your building, fire and mechanical code as minimal guidelines.



The equation below states the relationship between chimney draft and the pressure drop of flue gas:

$$0.82H > 0.49L + 1.5N + 1.5$$

$$0.25H > 0.15L + 1.5N + 1.5$$

H: Height of chimney end (Ft)

L: Total length of chimney (Ft)

N: Quantity of knuckle points.

H: Height of chimney end (m)

L: Total length of chimney (m)

N: Quantity of knuckle points.

Please ensure that the equation above is satisfied in order to obtain the full capacity of the EXW-Series.

STANDARD EMISSION FOR MIURA EXW SERIES BOILER

| | Stack Temperature | O ₂ | NO _x | CO | Smoke |
|--------|-------------------|----------------|-----------------|-----------|-------|
| EXW-G | 500°F | 5% ± 1% | < 100 PPM | < 100 PPM | N/A |
| EXW-O | 500°F | 7% ± 1% | < 120 PPM | < 300 PPM | < #2 |
| EXW-GF | 300°F | 5% ± 1% | < 49.6 PPM | < 100 PPM | N/A |
| EXW-OF | 300°F | 7% ± 1% | < 80 PPM | < 300 PPM | < #2 |

- These data are base on shop test boiler with 70°F feed water temperature. NO_x and CO are corrected to 3% O₂ based on Natural Gas and No. 2 oil combustion.
- On oil fire, SO_x is normally less than 20 PPM and depend on oil type.

3.8 ELECTRICAL INSTALLATION

NOTE: MIURA recommends that an Alarm or Caution light be installed in the control room if possible.

| | Voltages (V) | Input Rate (A) | Wire Gauge (AWG) | Disconnect Amperage |
|---------|-----------------|-------------------|---------------------|------------------------|
| EXW-100 | 575 | 12 | #12 x 3 + #14(G) | 15 |
| | 460 | 14 | | |
| | 230 | 27 | #8 x 3 + #10(G) | 30 |
| EXW-200 | 575 | 21 | #10 x 3 + #12(G) | 30 |
| | 460 | 26 | #8 x 3 + #10(G) | |
| | 230 | 51 | #4 x 3 + #8(G) | 60 |
| EXW-250 | 575 | 27 | #8 x 3 + #12(G) | 30 |
| EXW-300 | 460 | 34 | #6 x 3 + #10(G) | 40 |
| | 230 | 67 | #3 x 3 + #8(G) | 70 |

- Other voltages are available by special order.
- Optional equipment such as MIURA Multiple Installation (MI) system must be wired as specified in the individual instruction books.
- Comply with local building electrical codes.

SECTION 4 OPERATION & MAINTENANCE

DANGER: All cover plates, enclosures and guards must be in place at all times, except during maintenance and servicing.

CAUTION:

- This is a shop tested, assembled and fully packaged boiler. Each unit and assembly has been well adjusted at the factory. It is very important not to make any adjustments without first consulting your nearest authorized MIURA dealer.
- Daily water analysis should be performed to see if additional treatment is needed. Use a tester of 1 PPM or less sensitivity.

NOTE: See MIURA XJ1 manual for detailed operation of the control panel.

4.1 PREPARATION BEFORE START-UP

Check the following **everyday** before boiler start-up:

- a) Make sure all gauges are operating correctly.
- b) Make sure the boiler water is conditioned (for instructions on checking for soft water, refer to your water softener instruction manual).
- c) Make sure there are chemicals in the chemical feed tank.
- d) If using an independent circulation pump, makes sure it is working properly.

4.2 START-UP

CAUTION: The following start-up routine must be followed in sequence.

- a) Open all water inlet and outlet valves.
- b) Open the main fuel valve (gas or oil) and check that the required gas pressure (3 - 5 PSIG) on gas firing or oil level on oil firing is available. Then select fuel switch in control box.
- c) Turn the power source on. The "OPERATION" switch on the control panel will illuminate. The display on the panel will show "DISABLE" and supply water temperature.
- d) Make sure the drain valve is closed.
- e) Turn the "OPERATION" switch to "ON" and the display on the panel will show, "ENABLE".
- f) Push the "COMBUSTION ON/OFF" button. After a pre-purge cycle (for about 10 sec.), combustion will begin automatically.

NOTE: If the water volume is low or supply water temperature is high, the display on the panel will show "STANDBY". If there is anything wrong with any of the "INTERLOCK" sensor, the display on the panel will show "ALARM" with the alarm condition and the alarm will sound after pushing the "COMBUSTION ON/OFF" button.

g) Combustion sequence to full fire for all EXW-100 oil fire is as follows:

- 1) Pre-purge
- 2) Low fire main burner ignition
- 3) Low fire main burner confirmation
- 4) High fire main burner (if required)

Combustion sequence to full fire for all other boilers is as follows:

- 1) Pre-purge
- 2) Pilot gas ignition
- 3) Pilot flame confirmation
- 4) Low fire main burner ignition
- 5) Low fire main burner confirmation
- 6) Pilot gas shut-off
- 7) High fire main burner (if required)

4.3 SHUT-DOWN

CAUTION: The following shutdown routine must be followed in sequence.

- a) Push the "COMBUSTION ON/OFF" button. Combustion will stop and post-purge will begin.
- b) Once post-purge has finished, turn the "OPERATION" switch to "OFF" position.
- c) Stop the circulation pump, if using an independent pump.
- d) Close all water inlet and outlet valves.
- e) Close the fuel valve.
- f) Turn off the main power supply to the boiler.
- g) After a prolonged shutdown, follow start up procedure to re-start the boiler.

IN AN EMERGENCY, PUSH THE "STOP" BUTTON FIRST, CLOSE THE FUEL VALVE SECOND, AND THEN CUT OUT THE MAIN POWER SUPPLY TO THE BOILER.

4.4 CAUTIONS DURING OPERATION

DANGER: The following points MUST be followed to avoid damage or injury.

- a) Always open the main inlet and outlet valves before running the boiler.
- b) If there is a misfire or flame failure, locate the cause of the problem, (as discussed in Section Troubleshooting) fix it, push the "COMBUSTION ON/OFF" button, then push the reset button on the display and re-start the boiler. If the same problem persists, shut the boiler down and call the nearest MIURA representative or distributor.
- c) If the circuit breaker tripped, check it, and then reset it. In this case, re-test the low water interlock by blowing down as described in the section on blowdown. If the alarm does not sound when tested, call your nearest MIURA representative or distributor.
- d) Proper balance of gas and airflow is needed to assure complete combustion and optimum efficiency. Contact your nearest MIURA representative or distributor to adjust air flow.
- e) Do not change the setting on the high temperature limit.

- f) When unsure of any boiler trouble, shutdown the boiler, turn the power source off and contact your nearest MIURA representative or distributor.
- g) If you smell gas, immediately shutdown the boiler, turn off all power sources, and contact your gas company and then a MIURA representative or distributor.**
- h) Be careful when you take a sample of water from the boiler. Please be sure to open the valve very slowly.
- i) Do not re-light pilot or start burner with the combustion chamber full of gas or with a very hot combustion chamber.**

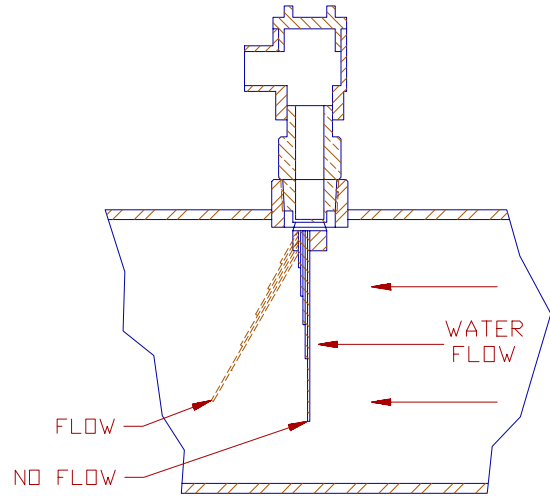
4.5 SAFETY ATTACHMENTS

4.5.1 NO FLOW CUT-OFF

If water flow, for any reason, falls below the predetermined flow, combustion will immediately be stopped; a warning alarm will sound. The display will show "ALARM" and "LOW FLOW".

4.5.2 LOW WATER VOLUME CUT-OFF

If the water volume, for any reason, falls below the pre-determined water volume, combustion will immediately be stopped and a warning alarm will be activated. The display will show "ALARM" and "LOW WATER LEVEL".



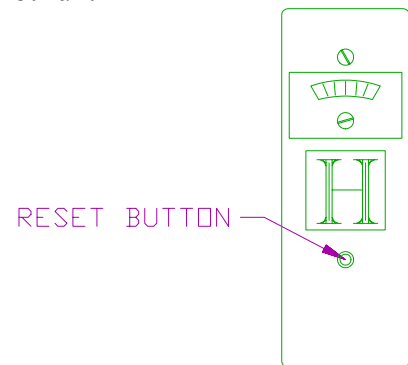
4.5.3 OVER HEAT MONITOR TEMPERATURE

If the temperature of the overheat thermocouple on the water tubes should, for any reason rise above the pre-set temperature, the XJ1 Microcomputer will shut down the boiler, activating the alarm. The display will also show "HIGH W TUBE TEMP".

For testing these functions, use the "Set Clock" menu. Record the present setting temperature then set it to lower than the tube temperature. It will shut down the boiler when the tube temperature reaches the new preset value. We suggest changing only the hundreds value. After testing, do not forget to reset to original setting or the boiler will not run.

4.5.4 HIGH TEMPERATURE LIMIT CUT-OFF SWITCH

If the water temperature should, for any reason, rise above the pre-set temperature (Max. 250°F), the High Temperature Limit Switch will be activated, the boiler will be shut down and the alarm will sound. The display will show "ALARM" and "EMERGENCY STOP".



If the boiler shuts down because of high temperature, you need to

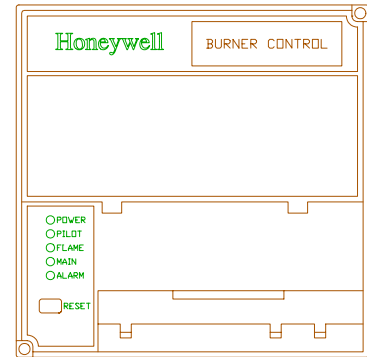
press the reset on the temperature switch in order to restart. Please check the thermocouple and setting of the XJ1 Microcomputer as well as the Control Temperature switch for any malfunction or incorrect setting. The Control Temperature switch should have a lower setting than the High Temperature Limit switch.

For testing the High Temperature Limit Switch, set it lower than the XJ1 Microcomputer setting. When the boiler temperature reaches the set temperature, it will shutdown. After testing, be sure to set it back to the original setting and reset the High Temperature Limit switch.

4.5.5 MISFIRE

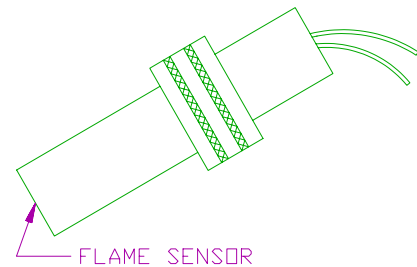
If ignition is not achieved after the ignition period, burner operation will immediately be stopped. After a purge cycle, the safety switch of the Flame Safeguard will be activated, a warning alarm will sound, and the display will show "ALARM" and "FLAME FAILURE".

For testing the Flame Safeguard, close the pilot gas valve, and then start the boiler. Misfire will happen after the first or second attempt for pilot. After testing, don't forget to open the pilot valve and reset the XJ1 Microcomputer.

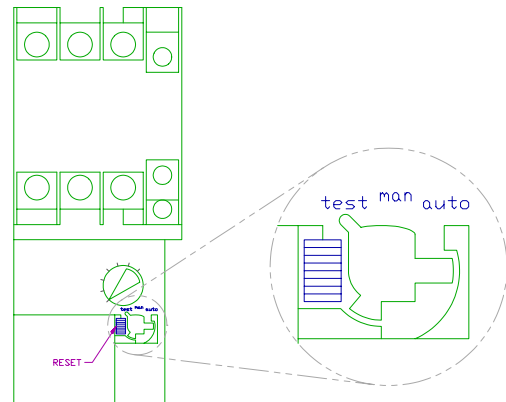


4.5.6 FALSE SIGNALS

Should there be any false signals emitted during ignition, pre-purge, or should pre-purge timing be off, the safety switch of the Flame Safeguard will be activated, the boiler will be shut-down, and a warning alarm will sound. The display will show the reason for interlock.



For testing, during pre-purge, take the flame eye out and point it to a flame (of a cigarette lighter for example). The boiler will continue to purge, but the pilot will not come on. After testing, do not forget to put the flame eye back to its original position and reset the XJ1 Microcomputer.



4.5.7 POWER OVERLOAD

Overload or short-circuiting of blower motor will result in boiler shutdown, the alarm will sound and the display will show "ALARM" and "AIR PRESS FAULT". Some motors have an internal stator winding thermal overload feature. If thermal overload – 49F has not tripped in the boiler control panel, operation will not resume until the blower motor has cooled down.

4.5.8 DAMPER MICRO-SWITCH

If damper should for any reason stay in the wrong position, the micro-switch on the damper will shut down the boiler, activating the alarm and the display will also show “ALARM” and “AIR PRESS FAULT”.

4.5.9 AIR PRESSURE

If the air pressure in air duct, for any reason, falls below the predetermined pressure, combustion will be immediately be stopped and a warning alarm will sound. The display will also show “ALARM” and “AIR PRESS FAULT”.

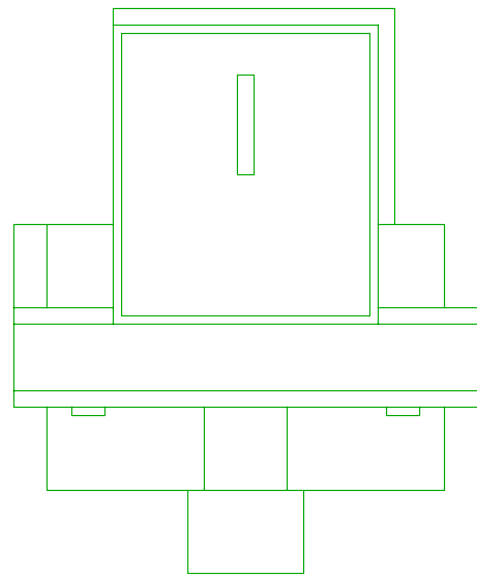
For testing, turn the setting of overload protector #88F to "TEST". During combustion, press and hold the reset button of overload protector #88F. The blower will slow down to a stop, as there will not be enough airflow and the boiler will shut down. Release the reset button, set overload protector #88F back to manual and reset the boiler.

4.5.10 FUEL GAS PRESSURE

When the "COMBUSTION ON/OFF" button is pushed prior to combustion, if there is not enough gas pressure, the burner cannot ignite and the warning alarm will sound. If, during the process of boiler operation, gas pressure falls below the required range, combustion will stop, and the alarm will sound. In addition, the display will show “ALARM” and "LOW GAS PRESS" or "HIGH GAS PRESS".

For testing the Low Gas pressure switch, close the main gas valve up-stream of the gas train during combustion. Boiler will shut off because of low gas pressure and Misfire. After resetting the XJ1 Microcomputer, the boiler will not restart because of low gas pressure until the main gas valve is opened again.

For testing the High Gas pressure switch, close the main gas burner inlet valve down-stream of the gas train during combustion. Boiler will shut off because of high gas pressure and Misfire. After resetting the XJ1 Microcomputer, the boiler will not restart because of high gas pressure until the main gas valve is opened again.



4.5.11 FUEL OIL PRESSURE (STANDARD ON UL BOILER, OPTION ON OTHER)

If, during the process of boiler operation, the oil pressure falls below the required range, combustion will stop and the alarm will sound. Also, the display will show "ALARM” and “LOW OIL PRESS”.

For testing, open the circuit breaker of oil pump during combustion. The boiler will shut off because

of low oil pressure and Misfire. After resetting the Flame Safeguard, the boiler still cannot restart because of low oil pressure, until the oil circuit breaker is closed again.

4.6 WATER TREATMENT

CAUTION: Check with your water treatment representative for details.

NOTE: Miura Boiler Co., Ltd. cannot be responsible for any problems encountered with the boiler due to unsuitable water treatment. Please contact a reliable water treatment company and follow their directions.

4.6.1 PREVENTATIVE MAINTENANCE FOR EXTENDED BOILER SHUT-DOWN

To prevent internal corrosion during periods of extended shutdown (7 days or more), the following must be done:

- a) Raise the boiler water pH level between 11-12 to reduce corrosion OR
- b) Drain the water and dry the boiler completely. Add an inert gas or a deoxidizing agent.

Since the EXW is a small water content boiler series, keeping the water in the boiler and raising the pH is the preferred preventative method. However, in places where freezing is a problem and shutdown is more than 7 days, it is preferred that the boiler be drained of all water. Contact your nearest MIURA representative or distributors for further details.

Finally check to make sure all manual valves (water inlet & outlet, main & pilot gas, oil inlet...) are closed tightly and turn off the main power supply to boiler during shutdown.

4.6.2 BOILER MAKE-UP WATER MAINTENANCE

CAUTION: Proper water treatment MUST be adhered to starting with the first time the boiler is operated. The following system is a typical example of a good operating system, which will save the owner and operator from expensive repairs and increased operating costs.

MIURA MAKE-UP WATER MAINTENANCE CHECK

In order to keep your EXW Series running in top condition, be sure to check the following daily:

- a) CHEMICAL FEED PUMP
 - i. Proper chemical feed.
 - ii. Sufficient liquids to properly dissolve chemicals.
 - iii. No air in the chemical feed pump or lines.
- b) WATER SOFTENER
 - i. Boiler Make-up water should have no hardness.
 - ii. Check to make sure the water softener timer is working every day.
 - iii. Check to make sure there is no hardening of the salt. In case of salt hardening, break into

small pieces.

- iv. Check to make sure the by-pass valve is closed and the inlet and outlet valves are open.

STANDARD BOILER WATER SPECIFICATIONS FOR THE EXW SERIES

The chemistry values given in the table below are specific guidelines established by MIURA Boiler. Analysis is to be performed by the customer or a boiler water treatment company.

| ITEM | | | STANDARD RANGE |
|------------------------|-------------------------------|-------|----------------|
| pH (at 25°C) | | | 7.0 - 8.6 |
| Conductivity (at 25°C) | | μS/cm | Below 200 |
| Hardness | CaCO ₃ | PPM | ≈ 0 |
| M Alkalinity | CaCO ₃ | PPM | 50 - 100 |
| Silica | SiO ₂ | PPM | Below 30 |
| Iron | Fe | PPM | Below 0.3 |
| Chloride | Cl ⁻ | PPM | Below 30 |
| Sulfur trioxide ion | SO ₃ ²⁻ | PPM | Below 20 |
| Copper | Cu | PPM | Below 0.05 |
| Magnesium | Mg | PPM | Below 0.3 |
| Carbonate Ion | CO ₃ ²⁻ | PPM | Below 4 |

SECTION 5 MAINTENANCE

5.1 MAINTENANCE & CLEANING SCHEDULE

In order to protect the high efficiency and to prevent costly breakdowns of your EXW Series, perform the following maintenance and cleaning.

| MAINTENANCE ITEM | EVERY DAY | EVERY 3-4 MONTHS | AS NEEDED | CHECK POINTS | REMARKS |
|--|-----------|---------------------|-----------|--|----------------------------|
| Combustion conditions | Visual | Tune up by analyzer | | Check combustion, sound & flame color. | Cause of misfire. |
| Flow switch | ☺ | | | Check flow. | For overheat protection. |
| Check gas pressure | ☺ | | | Check gas pressure gauge needle for any abnormalities. | Poor combustion. |
| Check blower cover | ☺ | | | Clean blower cover. | Poor combustion. |
| Boiler inside inspection (upper and lower holes) | | ☺ | | Check for scale & sludge. | Overheating, pitting. |
| Expansion tank | | ☺ | | Check leakage. | Waste water. |
| Check windbox flange bolts | | ☺ | | Check for tightness. | Cause of flue gas leakage. |
| Check air duct | | ☺ | | Check for air leakage. | Cause of poor combustion. |
| Check damper setting bolts | | ☺ | | Check for tightness. | Cause of poor combustion. |
| Check damper motor & setting | | ☺ | | Check coupling & operation. | Cause of poor combustion. |
| Pilot burner condition and combustion | | ☺ | | Check for electrode wear and ceramic condition. | Cause of poor ignition. |
| Clean burner | | Oil | Gas | Check for soot & dirt | Cause of poor combustion. |
| Soot blow boiler | | | Oil | Check for high stack temperature | Efficiency. |
| Check water quality | | | ☺ | Is water good? | Scale, corrosion. |
| Low water cut-off | | | ☺ | Check electrode, wire, ... | For overheat protection. |
| Strainer | | | ☺ | Clean inside. | Cause of low water. |
| Electrical wiring | | | ☺ | Check for loose wires. | |
| Check pressure gauge & thermometer | | | ☺ | Compare zero point to pressure gauge. | Unsuitable for operation. |
| Check oil pump motor | | | ☺ | Check coupling wear. | |

This is a basic maintenance schedule. If the fuel or the water is of exceptionally poor quality, maintenance checks will naturally increase. Compare the water quality with our standards and adjust the schedule accordingly.

Electric motors are pre-lubricated at the factory and do not require additional lubrication at start up. Motors with grease fittings should only be lubricated with lithium-base grease at the time intervals given in the table below:

| TYPE OF SERVICE | FREQUENCY OF GREASING |
|--|-----------------------|
| Seasonal (Motor/Boiler is idle for more than 6 months) | Yearly |
| Intermittently (normal daily operation of Boiler) | Semi-annually |
| Continuous | Quarterly |

Do not over grease the bearings. Over greasing will cause increased bearing heat and can result in bearing and motor failure.

The battery in the XJ1 Microcomputer should be replaced as soon as possible if the display shows “REPLACE BATTERY”.

It is recommended to replace the battery every 3 years.

- a) Turn off the power supply.
- b) Open CPU panel covers.
- c) Remove the battery from holder and remove the connector.
- d) Insert the connector of a new battery immediately.
- e) Fit a compatible battery into the holder and replace the panel cover.

For a recommended SPARE PARTS LIST of your boiler, please contact a Miura representative or distributor.

5.2 TROUBLESHOOTING

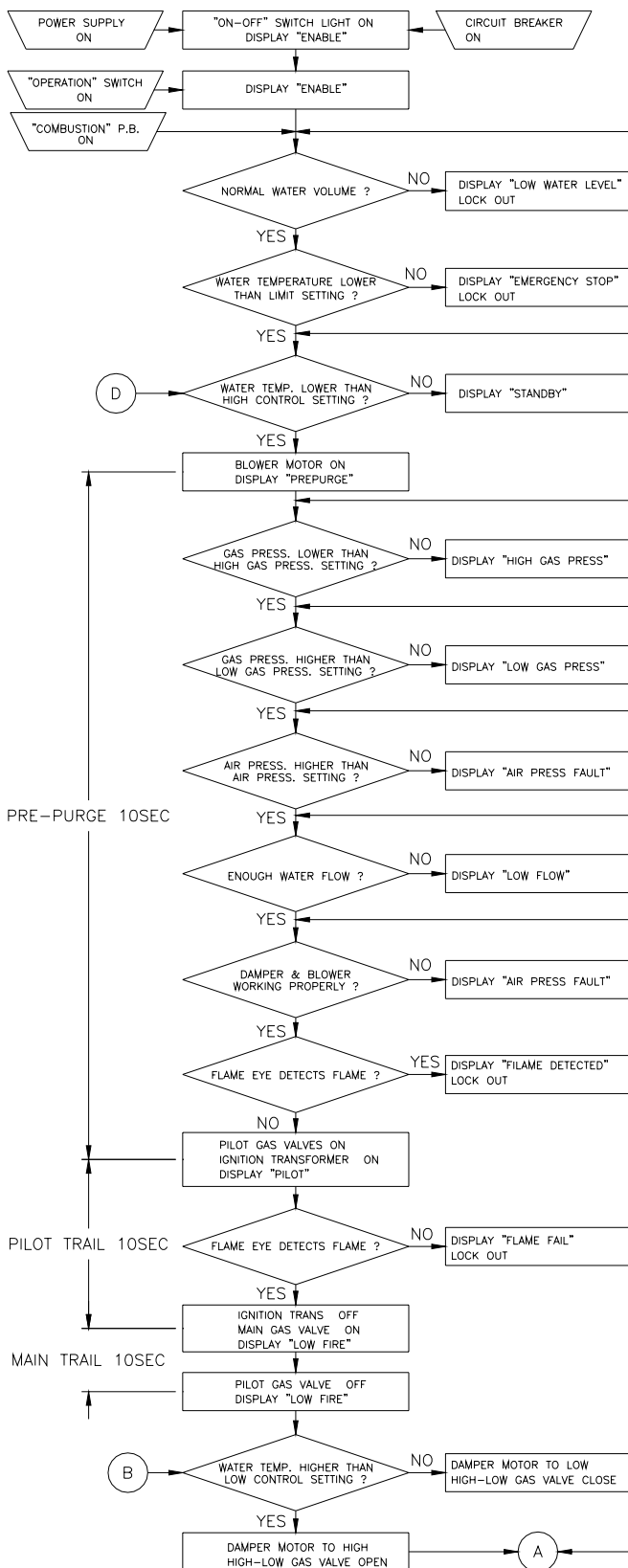
| PROBLEM | ITEM TO CHECK | CAUSE | REMEDY |
|--|---|--|---|
| 1. No light in "OPERATION" switch. | a) Main power switch on? | | Turn main power breaker on |
| | b) Main power fuse tripped? | Short circuiting | Find the cause of short circuit repair/replace fuse |
| | c) Circuit breaker broken OR wires are loose? | | Replace circuit breaker OR* tighten terminal wires |
| 2. No display on panel. | a) No display inside control box? | Short circuiting OR circuit breaker triple | Find the cause of short circuit repair/reset circuit breaker. |
| | b) Still display inside control box? | Loose wires OR broken display | Tighten terminal wires OR* replace display |
| | | Wrong direction connect | Reconnect cable |
| 3. Circulation water pump runs but water not being fed into boiler OR water flow is too small. | a) Main water circulation valve open? | | Open main boiler inlet & outlet water valves |
| | b) Water in the system? | | Add water. |
| | c) Completely release air from air release valve? | Air in circulation pump has stopped water from flowing | Release air completely |
| | d) Pump motor's rotated in right direction? | | Reverse wires for circulation water pump |
| | e) Water strainer plugged? | | Clean the strainer |
| | f) None of the above? | Pump capacity is too low | Change pump* |
| 4. Water is escaping from boiler's safety valve. | a) Safety valve pressure setting wrong? | Setting pressure lower than operating pressure | Replace if required OR change operating pressure |
| | b) High Limit or Control switch setting? | Too high setting OR broken | Adjust setting OR replace if required |

| PROBLEM | ITEM TO CHECK | CAUSE | REMEDY | |
|--|--|---|--|---|
| 5. Even after "OPERATION" switch turn "ON" & "COMBUSTION ON/OFF" button is pushed, boiler doesn't start. | a) No alarm & display show "STANDBY"? | Enough water temperature | Will automatic start when temperature drop | |
| | b) Alarm on? Check problem show on display | | Fix the problem & reset boiler | |
| 6. Combustion will not start. | a) Main fuel cock open? | No fuel for combustion | Open main fuel valve | |
| | b) Damper setting adjusted? | Insufficient air flow | Adjust to proper setting | |
| | c) Blower cover clean? | | | |
| | d) Main fuel valve open? | Loose wiring OR faulty fuel valve | Tighten wires OR replace | |
| | e) Spark rod working properly? | Loose wire | Tighten wires | |
| | | Faulty cord on spark plug | Replace spark plug cord | * |
| | | Carbon on spark rod | Clean up | |
| f) Ultraviolet flame eye registering the flame? | Flame eye wire is loose OR faulty flame eye | Tighten wires OR replace | * | |
| 7. There is ignition but the flame dies out. | a) Main fuel cock open? | No fuel for combustion | Open fuel cock | |
| | b) Incorrect fuel pressure OR damper setting? | | Adjust to proper setting | |
| 8. Too much smoke from chimney. Misfire becomes a problem. | a) Fuel pressure is too high? | Too much fuels for combustion | Set accordingly | |
| | b) Damper setting is off? OR retainer is loose? | Not enough air for combustion | Set accordingly OR replace | * |
| | c) Oil nozzle | Broken or worn | Replace nozzle | |
| 9. Strange sound occurs during combustion | a) Fuels pressure is low? | Not enough fuels | Adjust accordingly | |
| | b) Damper setting properly? | Too much air for combustion | | |
| 10. Flame dies out when going from high-fire to low-fire. | a) Check fuels pressure | Not enough fuel | Adjust accordingly | |
| | b) Damper setting properly? | Too much air for combustion | | |
| 11. Boiler cannot go from low-fire to high-fire. | a) Check fuels pressure? | Insufficient fuel pressure | Adjust accordingly | |
| | b) Damper setting properly? | Not enough air | | |
| | c) High-fire Solenoid valve working properly? | Not enough fuels | Tighten wires OR replace | |
| | d) Air duct fixture | Air leakage | Tighten OR replace | |
| | e) Aquastat control setting | Reached setting temperature OR wrong wiring | | |
| | f) Check oil supply pressure and piping | Too much suction | | |
| | g) FGR stack temperature or delay timer setting. | Set too high | Lower setting | |
| 12. Blower motor runs but no ignition. | a) Check air pressure switch | Incorrect setting, broken, OR loose wiring | Replace, reset, OR tighten terminal contacts | |
| | b) Check blower rotation | Reversed rotation | Reverse wire | |
| | c) Check spark rod | Faulty | Replace | |
| | d) Check flame safeguard | Test switch on | Set back to off | |
| | | Loose wire or faulty | Tighten wires OR replace | |

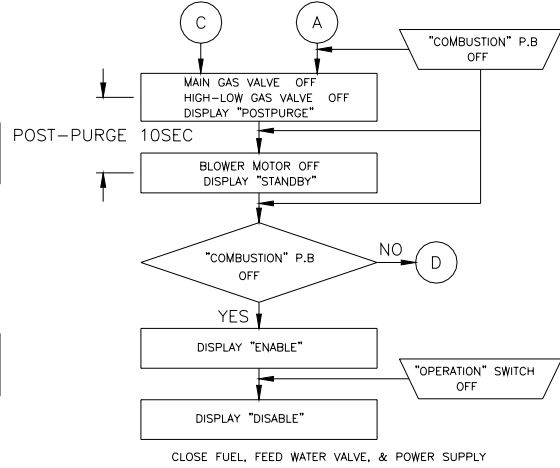
* ALWAYS CONTACT YOUR NEAREST MIURA REPRESENTATIVE.

5.3 FLOW CHART OF EXW SEQUENCE OPERATION

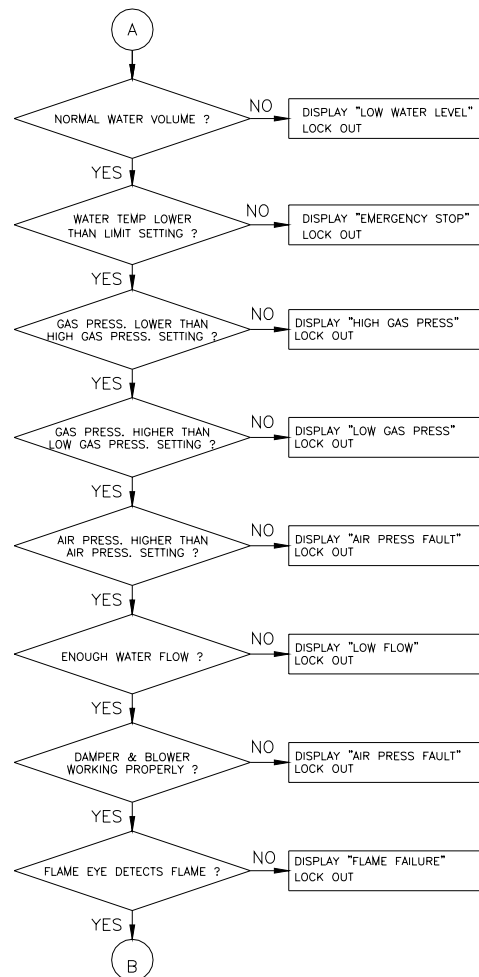
BOILER START-UP



BOILER STOPPAGE



INTER-LOCK ON COMBUSTION



| DISTRIBUTOR INFORMATION | |
|-------------------------|--|
| NAME | |
| ADDRESS | |
| TELEPHONE | |
| FAX | |
| DATE OF INSTALLATION | |
| BOILER MODEL | |

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