Honeywell

MAXON

Oxygen-fuel burner OXY-THERM® LE

OPERATING INSTRUCTIONS

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1 SAFETY

1.1 Please read and keep in a safe place

Please read through these instructions carefully before installing or operating. Following the installation, pass the instructions on to the operator. This unit must be installed and commissioned in accordance with the regulations and standards in force. These instructions can also be found at www.docuthek.com.

1.2 Explanation of symbols

1, **2**, **3**, **a**, **b**, **c** = Action

➔ = Instruction

1.3 Liability

We will not be held liable for damage resulting from non-observance of the instructions and non-compliant use.

1.4 Safety instructions

Information that is relevant for safety is indicated in the instructions as follows:

⚠ DANGER
Indicates potentially fatal situations.

⚠ WARNING
Indicates possible danger to life and limb.

⚠ CAUTION
Indicates possible material damage.

All interventions may only be carried out by qualified gas technicians. Electrical interventions may only be carried out by qualified electricians.

1.5 Conversion, spare parts

All technical changes are prohibited. Only use OEM spare parts.

1.6 Instructions provided by the company

Instructions provided by the company or individual responsible for the manufacture and/or overall installation of a complete system incorporating MAXON burners take precedence over the installation and operating instructions provided by MAXON. If any of the instructions provided by MAXON are in conflict with local codes or regulations, please contact MAXON before initial start-up of equipment.

2 CHECKING THE USAGE

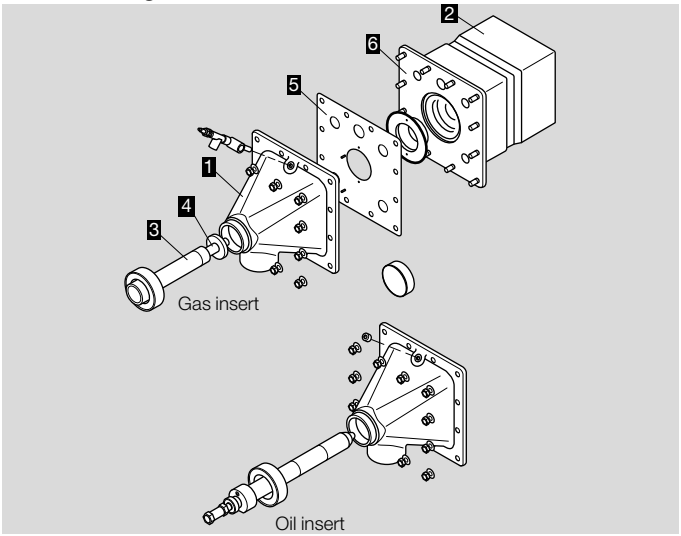
OXY-THERM LE burners can be used in furnaces and melters, steel reheat furnaces, reverberatory furnaces, and other high temperature applications.

OXY-THERM LE burners have a unique design which allows fuel interchangeability and easy maintenance. With no tools, the burner fuel inserts can be removed or changed while the furnace is still in operation. With a large service nut and no tools, the burner fuel insert may be removed.
This function is only guaranteed when used within the specified limits – see page 5 (7 Technical data). Any other use is considered as non-compliant.

2.1 Type code

OT LE	OXY-THERM LE burner
6	Series 600
9	Series 900
12	Series 1200
00	Gas burner size (one size only)
07, 10, 15, 20, 30, 40	Oil burner size 70, 100, 150, 200, 300, 400
N	Natural gas
O	Other gas (see Engineering)
P	Propane
2	#2 fuel oil
6	Preheated #6 fuel oil
A	Block material: alumina/zirconia/silica
Z	Block material: zirconia
N	No pilot choosen
O	Oxy pilot without UV location
U	Oxy pilot with UV location

2.2 Part designations



1 Burner housing
2 Block*
3 Gas body
4 Gas nozzle
5 Mounting gasket
6 Block frame

** Extended block version only available in AZS block material*

3 APPLICATION REQUIREMENTS

3.1 View port

➜ A view port to observe burner flame is essential to inspect the flame aspect. Locate the view port downstream of the flame, looking back to the burner block. Make sure the complete flame can be evaluated.

3.2 Supporting burner air and gas piping

➜ The OXY-THERM LE burner shall not be used as support for the piping to the burner. Gas and air piping shall be supported in such a way that no additional loads will be created on the burner. Flexible connections are typically recommended for all OXY-THERM LE installations for both fuel and oxygen to prevent transferring mechanical loads or vibrations to the burner's ceramic parts.

3.3 Burner mounting flange loads

➜ Check burner weight and reinforce burner mounting flange or combustion chamber/furnace back wall if necessary to take the complete burner weight.

4 INSTALLATION

4.1 Storage of OXY-THERM LE Burners

OXY-THERM LE Burners shall be stored dry (inside). Burner blocks have been cured carefully before shipment and shall be kept dry. Wetting of the blocks could result in premature failures.

4.2 Handling of OXY-THERM LE burners

➜ OXY-THERM LE burners are shipped as complete units. Handle burners with care, using proper equipment during unpacking, transport, lifting and installation.

⚠ WARNING

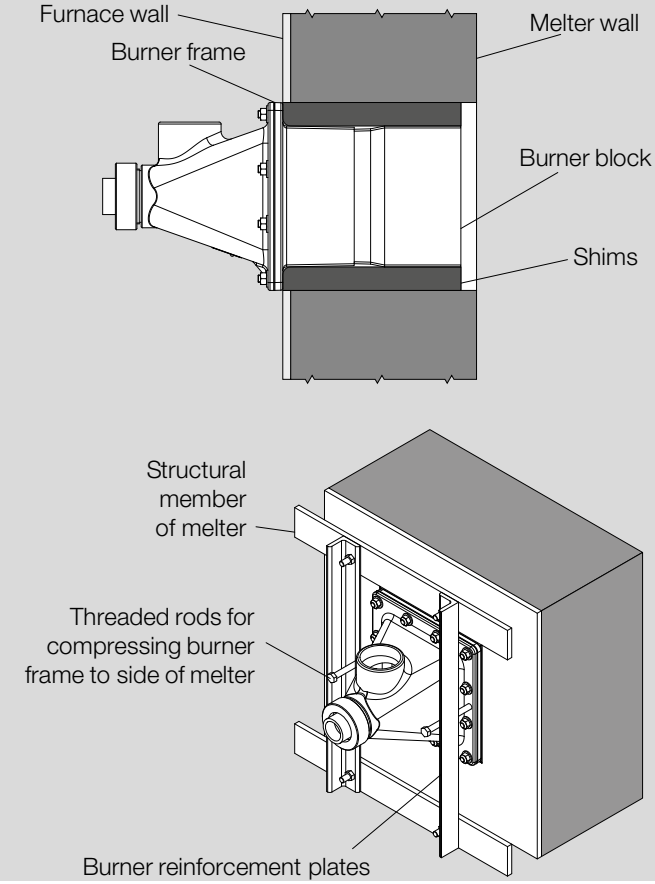
Any impact on the burner could result in damage.

➜ To prevent damage in transit, accessories such as flame rods, control valves and/or UV-scanners, may be packed separately and shipped loose.

4.3 Burner mounting

⚠ CAUTION

For maximum burner life, burner frame must be protected from hot gases.



➜ Burners should not be installed in a down-fired position. If this mounting arrangement is required, please contact Honeywell Maxon for additional assistance.

➜ The primary objective is to compress the frame against the wall of the melter and to support the weight of any system piping.

➜ The burner block sits on the sill or wall. The block must rest flat on the sill or wall without rocking to allow weight to be equally distributed. Failure to do so could result in cracking and block

failure. If burner port holes are too large, shims may be used to align the burner.

➔ Burner block failure could result from external forces and stresses transmitted to the burner through the piping. Under no circumstances should the burner be the only support for the piping. Flexible connections are recommended in all piping to reduce piping stresses and alignment/shifting problems. Installation of such connectors at certain key spots in the oxygen or gas manifolding can prevent damage to the burners from uneven thermal expansion.

➔ The opening of the furnace wall should provide 1/16" clearance on all sides. High temperature furnace sealant or gasketing should be used between burner mounting flange and furnace wall.

4.4 Burner installation procedure

⚠ CAUTION

Failure to follow the proper installation sequence noted below could result in damage or destruction of vital burner components. Cooling oxygen or air flows should be present at all times when the burner housing and metal components are mounted to a hot furnace.

➔ To prevent damage in transit, the fuel inserts, mounting gaskets and burner housing may be packed separately. In most cases, the burner will be shipped assembled but with the mounting nuts only finger-tight. In either case, the burner block and frame will need to be disassembled from the rest of the burner to allow installation of the block into the furnace wall.

➔ A 3/4" socket is required for mounting nuts. A manual speed wrench is recommended for quick and easy burner mounting.

1 If fuel insert is shipped inside burner housing, remove the fuel insert and insert nut and set aside in a protected area.

2 Install service nut on the burner housing.

3 Remove burner housing from the block/frame assembly. Use caution to prevent damage to the mounting gasket. The mounting gasket should be sandwiched between the burner housing and the nozzle body insert.

4 Install block/frame assembly into furnace wall. Refer to next section for hot installation procedure for burner blocks.

5 Pre-pipe quick-connect devices to the combustion oxygen, fuel and atomizing connections on the burner housing and burner fuel inserts.

6 Confirm that cooling air or oxygen is available at the individual burner ports and control stations before installing burner housing. Block cooling wind is sufficient as a cooling air source.

7 Confirm that mounting gasket is in good condition and that nozzle body insert is held firmly in place by the two spring pins.

8 Confirm that service nut is installed on the housing (to prevent hot furnace gases from blowing out of the housing).

9 Mount housing to block/frame studs.

10 Install and snug the four corner mounting nuts and washers only.

11 Connect the cooling oxygen/air source to the combustion oxygen connection on the burner housing and begin cooling flow.

12 Install and snug the remaining mounting washers and nuts. Do not overtighten the mounting nuts.

13 Apply an oxygen-compatible lubricant to the two O-rings on the fuel insert.

14 Remove service nut from housing.

15 Install the fuel insert into the housing.

16 Fuel oil burners: Push the insert into the housing until both O-rings are inside and the machined flange on the oil insert con- tacts the housing.

17 Fuel gas burners: The gas nozzle is designed to lock into the nozzle body insert. Push the insert into the housing until both O- rings are inside housing. Once gas nozzle contacts the nozzle body insert, wiggle the fuel gas insert while pushing forward at the same time. This should ensure that the nozzle has locked into the nozzle body insert. Unlike the fuel oil insert, there is no machined stop on the fuel gas insert.

➔ If the fuel gas nozzle is not locked into the nozzle body insert, poor burner performance and higher emissions will result. The resulting improper flows generated could destroy the gas nozzle.

18 Confirm that cooling oxygen or air is flowing. If not, remove fuel insert and establish cooling flow through housing.

19 Thread the insert nut onto the housing until it bottoms out against the fuel insert. The insert nut can be used to push the fuel insert fully into the housing. Once the insert nut bottoms out, back the nut off 1/16 of a turn. It is not necessary for the insert nut to be tight.

20 Connect fuel supply and atomizing medium (fuel oil firing) to the fuel insert.

➔ Burner installation is complete.

➔ Other system safeguards and approvals must be completed before burner can be lit. These safeguards include but are not lim- ited to: furnace operating temperature at the burner location must exceed the ignition temperature of the fuel being used (for burners with no pilot) and oxygen/fuel control must be functional and characterized to provide the proper oxygen/fuel ratio to the burner.

➔ Start-up instructions are specific to each application. Contact your Honeywell Maxon representative for instructions for your particular application.

4.5 Hot installation procedure for AZS (Alumina/Zirconia/ Silica blend) burner blocks

The following procedure has to be used to install AZS burner blocks without interrupting operations.

1 The block should be warmed (>212 °F (>100 °C)) for up to 4 hours and all moisture removed before starting installation.

2 Where the new block contacts older, hot materials, Fiberfrax paper should be used as a thermal buffer.

3 Remove the old block and clean the opening.

4 Insert the new block into the furnace.

5 Allow the new block to heat up to near ambient temperatures (usually about one half to three quarters of an hour).

6 Resume normal operations.

4.6 Hot installation procedure for Zirconia burner blocks

⚠ CAUTION

Prior to installing the block, be certain that the block will rest on a smooth, flat surface for the full length of the block once it is in place. The weight of the block is not to be supported or rested on the frame flange. (This will prevent putting stress on the block by having the weight supported at two points - the front and back.) During installation, the block should be supported for its entire length.

1 The block should be warmed to a temperature greater than 212 °F (>100 °C) and all moisture removed before starting installation.

2 Leave the firing end of the block exposed for one inch and have a strip of ceramic wool insulation covering the remaining length of the block.

3 Set the exposed end of the block into the hole for one hour. If the customer chooses to leave the housing connected to the block during installation, cooling air should be connected and blowing through the housing and block at all times.

➔ Any portion of the block that is exposed and outside the furnace wall after the block is in position should be wrapped with ceramic wool insulation and completely supported on a flat surface.

4 After one hour of preheat per step 3, remove the ceramic wool insulation strip and insert the remaining portion of the block into the opening.

5 Once the block is installed, it should be shimmed and sealed. If the block is not properly sealed, hot furnace gases can damage or destroy the frame.

6 The burner's piping must be supported independently to minimize additional stresses applied to the block.

7 Allow the new block to heat up to near ambient temperatures (approximately 1 hour) and then resume normal operations.

5 COMMISSIONING

⚠ CAUTION

– Read the combustion system manual carefully before initiating the start-up and adjustment procedure.
– Verify that all of the equipment associated with and necessary to the safe operation of the burner system has been installed correctly.
– Verify that all pre-commissioning checks have been carried out successfully and that all safety related aspects of the installation are properly addressed.

⚠ WARNING

– Initial adjustment and light-off should be undertaken only by a trained commissioning engineer.

5.1 First firing or restart after shut-down

➔ During first start-up of the burner, and after every longer installation shut-down, the temperature rise shall be limited. Allow the burner to fire on low fire for some time to allow the parts to heat up slowly.

5.2 Checks during and after start-up

➔ During and after start-up, check the integrity of the system. Check all bolted connections after first firing (first time on temperature) and retighten if necessary.

5.3 Pilot ignition

1 Before ignition of the pilot, adjust the combustion air to the minimum burner air flow.
➔ Pilot will not ignite if too high an air flow exists.
2 Set pilot gas flow to the correct value before pilot ignition attempt.

5.4 Main burner ignition

1 Set correct gas flow for burner minimum capacity before attempt of main burner ignition.
2 After ignition of main burner, allow some time on minimum capacity to allow the burner parts to heat up slowly.

5.5 Burner adjustment and control

➔ Oxygen-fuel burners require accurate control of both fuel and oxygen for optimum performance. Piping to individual burners should include control valves for both oxygen and fuel. In addition, flow meters for oxygen and fuel capable of local or remote readout are required for proper burner adjustment.
➔ If required, flame sensing may be accomplished by UV scanner. Burner design can incorporate a UV scanner port suitable for supervision of both pilot and main flames. UV scanner, if used, should be kept as close to burner as feasible. Heat block, if used, may affect signal strength with some brands of UV scanners.

⚠ CAUTION

Oxygen should only be used with approved materials, properly cleaned pipe and equipment, and specially designed systems. Ordinary materials can be extremely flammable in the presence of oxygen and air enriched with oxygen.

5.6 Typical ignition sequence

1 Pre-purge of burner and installation, according to the applicable codes and the installation's requirements.
2 Combustion oxygen control valve shall be in the minimum position to allow minimum oxygen flow to the burner.
3 In case of oil firing: Atomizing oxygen/air/gas should be applied to the burner. If a burner with optional pilot burner is used, execute the following three steps.
4 Pre-ignition (typically 2s sparking in air).
5 Open pilot gas and continue to spark the ignitor (typically 5s). Trip burner if no flame can be detected from here on.
6 Check pilot flame stability (typical 5s to prove the stable pilot).
7 Open main gas or oil valves and allow enough time to have main gas or oil in the burner (typical 5s + time required to have main gas or oil in the burner).
8 Close the pilot gas valves (in case a pilot burner is used).
9 Release to modulation (allow modulation of the burner).

5.7 Flame supervision

The use of a flame rod for flame detection is not possible. If required, flame sensing may be accomplished by UV scanner. If a pilot is used (installed into the ½ connection), the only flame scanner option is to use a tee on the main fuel gas inlet connection and sight a scanner down the fuel tube. If there is no pilot used, the ½ pilot hole could be used for a scanner. Burner design can incorporate a UV scanner port suitable for supervision of both pilot and main flames. UV scanner, if used, should be kept as close to burner as feasible. Heat block, if used, may affect signal strength with some brands of UV scanners. In case of oil firing where flame supervision is required, contact Honeywell MAXON for alternative options.

5.8 Piping

Burner and piping should be supported as shown in the installation instructions. Unsupported piping puts stresses on the block/frame assembly resulting in block failure.

5.9 Fuels

OXY-THERM LE burners are designed for firing on any clean fuel gas or light and heavy oils.

5.10 Expected emissions

OXY-THERM LE burners utilize a patented oxygen staging technology to reduce the formation of NO_X in high temperature furnaces. Through deep staging of the oxidant flow, NO_X is controlled to levels typically lower than less advanced oxy-fuel burners. By reduction in total flue gas volume, the total mass of NOx created is often lower than air fuel firing.
Best results are achieved in furnaces which are sealed tight from ambient air infiltration or running a slight positive pressure to prevent the infiltration of nitrogen compounds. Results will vary widely by application. Contact Honeywell Maxon for estimates and consultation on best practice.
Exact emissions performance may vary in your application. Contact Honeywell Maxon for information on installation-specific estimates and guaranteed values. No guarantee of emissions is intended or implied without specific, written guarantee from Honeywell Maxon.

6 MAINTENANCE

Safety requirements

➔ Regular inspection, testing and recalibration of combustion equipment according to the installation's manual are an integral part of its safety.
➔ Inspection activities and frequencies shall be carried out as specified in the installation's manual.
➔ Perform the following activities at least annually as part of a recommended preventative maintenance routine:
1 Inspect burner internal parts for wear and oxidation, paying special attention to the refractory of the burner block (when applicable).
2 Inspect associated control instruments and devices for function with particular attention to all safety permissive switches.
3 Perform leak tests on fuel shut off valves according to any schedule established by the authority having jurisdiction.

Visual inspections

➔ Regular visual inspection of all connections (air and gas piping to the burner, bolting of the burner mounting flange) and burner flame shape and aspect are essential for safe operation.

6.1 Spare parts

➔ Keep local stock of spark ignitor if burner is equipped with pilot. It is not recommended to keep local stock of other burner parts.
➔ A list of spare parts can be found at www.partdetective.de.

7 TECHNICAL DATA

7.1 OXY-THERM LE gas burners

7.1.1 Imperial

Typical burner data

Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.

Type	Maximum capacity range	Turndown	Approximate flame size	
			Diameter	Length per MBTU/h
	MBTU/h		inches	ft
Series 600	0.2–2.7	5:1	18	2.2–2.0
Series 900	1.5–11	5:1	30	2.0–1.6
Series 1200[4)]	5–13[5)]	5:1	36	2.0–1.3

Natural gas/Propane

– Natural gas at 60 °F
with 1000 BTU/ft^3 (st) HHV – sg = 0.6[1)]

– Propane at 60 °F
with 2500 BTU/ft^3 HHV – sg = 1.57[1)]

Type	Pressures required to burner inlet for maximum capacities[2)]		Typical oxygen to fuel volumetric ratios[3)]	
	Natural gas	Propane	To natural gas	To propane
	psig	psig		
Series 600	0.5–8	1–20	2.05–1	5–1
Series 900	0.5–8	1–20	2.05–1	5–1
Series 1200[4)]	0.5–8	1–20	2.05–1	5–1

Natural gas/Propane mixed with Hydrogen

– 80 % Natural gas/20 % Hydrogen at 60 °F
with 863 BTU/ft^3 (st) HHV – sg = 0.49[1)]

– 80 % Propane/20 % Hydrogen at 60 °F
with 2070 BTU/ft^3 HHV – sg = 1.232[1)]

Type	Pressures required to burner inlet for maximum capacities[2)]		Typical oxygen to fuel volumetric ratios[3)]	
	80 % NG/20 % H_2	80 % Propane/20 % H_2	To 80 % NG/20 % H_2	To 80 % Propane/20 % H_2
	psig	psig		
Series 600	0.55–0.88	1.19–23.75	1.7–1	4.2–1
Series 900	0.55–0.88	1.19–23.75	1.7–1	4.2–1
Series 1200[4)]	0.55–0.88	1.19–23.75	1.7–1	4.2–1

[1)] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft^3) (st))

[2)] Gas OXY-THERM Burners are custom sized to meet your application and utility requirements. Please contact Honeywell Maxon for specific details. For oxygen refer to page 8 (7.3 Combustion oxygen pressure - gas burner)

[3)] Exact calorific values should be checked and oxygen/fuel ratio adjusted accordingly.

[4)] Series 1200 not available in LE EX (extended block) version

[5)] Capacities greater than 15 MBTU are possible. Contact Honeywell Maxon for specific details.

7.1.2 Metric

Typical burner data

Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.

Type	Maximum capacity range	Turndown	Approximate flame size	
			Diameter	Length per kW
	kW		mm	mm
Series 600	59–790	5:1	460	2.35–2.1
Series 900	440–3225	5:1	760	2.12–1.6
Series 1200[4)]	1465–4400[5)]	5:1	920	2.12–1.36

Natural gas/Propane

– Natural gas at 15 °C with 10.9 kWh/m³ (st) HHV – sg = 0.6[1)]

– Propane at 15 °C with 26.8 kWh/m³ (st) HHV – sg = 1.57[1)]

Type	Pressures required to burner inlet for maximum capacities[2)]		Typical oxygen to fuel volumetric ratios[3)]	
	Natural gas	Propane	To natural gas	To propane
	mbar	mbar		
Series 600	34–552	69–1379	2.05–1	5–1
Series 900	34–552	69–1379	2.05–1	5–1
Series 1200[4)]	34–552	69–1379	2.05–1	5–1

Natural gas/Propane mixed with Hydrogen

– 80 % Natural gas/20 % Hydrogen at 15 °C with 10.9 kWh/m³ (st) HHV – sg = 0.6[1)]

– 80 % Propane/20 % Hydrogen at 15 °C with 26.8 kWh/m³ (st) HHV – sg = 1.57[1)]

Type	Pressures required to burner inlet for maximum capacities[2)]		Typical oxygen to fuel volumetric ratios[3)]	
	80 % NG/20 % H_2	80 % Propane/20 % H_2	To 80 % NG/20 % H_2	To 80 % Propane/20 % H_2
	mbar	mbar		
Series 600	37–608	82–1637	1.7–1	4.2–1
Series 900	37–608	82–1637	1.7–1	4.2–1
Series 1200[4)]	37–608	82–1637	1.7–1	4.2–1

[1)] sg (specific gravity) = relative density to air (density air = 1.293 kg/m³ (st))

[2)] Gas OXY-THERM Burners are custom sized to meet your application and utility requirements. Please contact Honeywell Maxon for specific details. For oxygen refer to page 8 (7.3 Combustion oxygen pressure - gas burner)

[3)] Exact calorific values should be checked and oxygen/fuel ratio adjusted accordingly.

[4)] Series 1200 not available in LE EX (extended block) version

[5)] Capacities greater than 4400 kW are possible. Contact Honeywell Maxon for specific details.

7.2 OXY-THERM LE oil burners

7.2.1 Imperial

Typical burner data

Fuel: light oil (#2): 19.4 Btu/lb

Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.

Type	Size	Maximum capacity range	Maximum fuel flow	Minimum fuel flow	Turndown	Approximate flame diameter at maximum output	Approximate flame length at maximum output
		MBTU/h	gallons/h	gallons/h		inches	ft
Series 600 or 900	70	3.1	21	4.2	5:1	18	6
Series 900	100	4.4	30	6	5:1	18	8
Series 900	150	7.5	52	10	5:1	24	11.55
Series 900	200	10	69	15	4.6:1	30	14
Series 900	300	14.9	103	26	4:1	30	18
Series 1200	300	14.9	103	26	4:1	30	18
Series 1200	400	19.9	137	34	4:1	36	20

Atomizing oxygen/air/gas flow: Refer to pressure curves page 8 (7.5 Atomizing oxygen/air flow vs. pressure)

Oxygen pressure to burner inlet: Refer to pressure curves page 8 (7.4 Combustion oxygen pressure - oil burner)

Fuel pressure to burner at maximum: Refer to pressure curves page 9 (7.6 Fuel oil flow vs. pressure)

7.2.2 Metric

Typical burner data

Fuel: light oil (#2): 12.5 kWh/kg

Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.

Type	Size	Maximum capacity range	Maximum fuel flow	Minimum fuel flow	Turndown	Approximate flame diameter at maximum output	Approximate flame length at maximum output
		kW	l/h	l/h		mm	m
Series 600 or 900	70	910	80	16	5:1	460	1.8
Series 900	100	1290	115	23	5:1	460	2.5
Series 900	150	2200	195	39	5:1	610	3.5
Series 900	200	2930	260	57	4.6:1	760	4.5
Series 900	300	4370	390	98	4:1	760	5.5
Series 1200	300	4370	390	98	4:1	760	5.5
Series 1200	400	5830	520	130	4:1	920	6.0

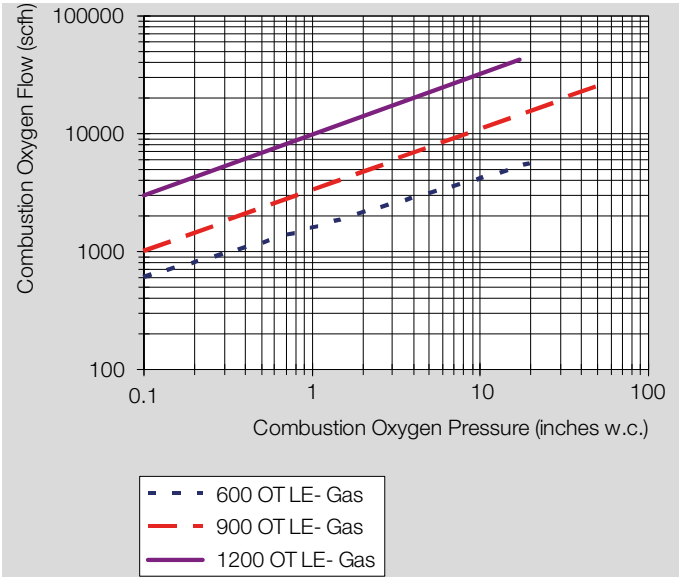
Atomizing oxygen/air/gas flow: Refer to pressure curves page 8 (7.5 Atomizing oxygen/air flow vs. pressure)

Oxygen pressure to burner inlet: Refer to pressure curves page 8 (7.4 Combustion oxygen pressure - oil burner)

Fuel pressure to burner at maximum: Refer to pressure curves page 9 (7.6 Fuel oil flow vs. pressure)

7.3 Combustion oxygen pressure - gas burner

Imperial



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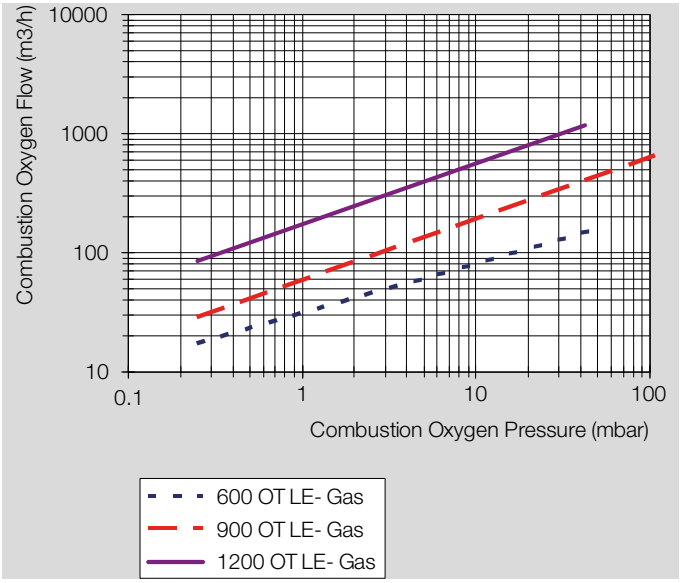
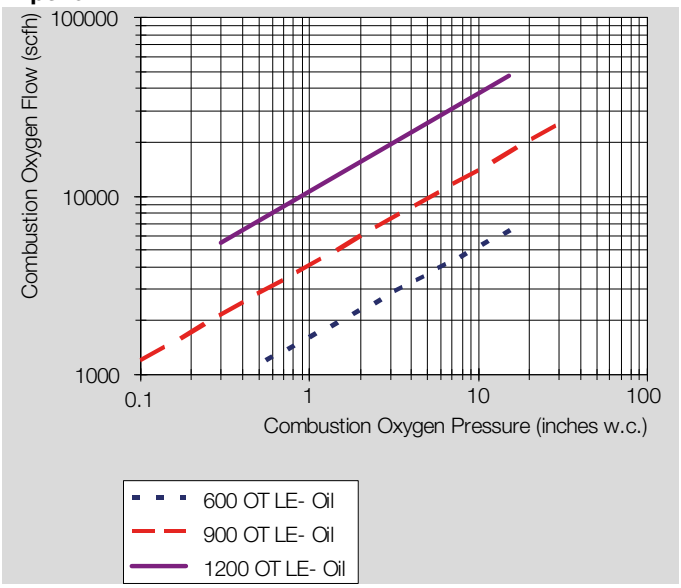


7.4 Combustion oxygen pressure - oil burner

Imperial



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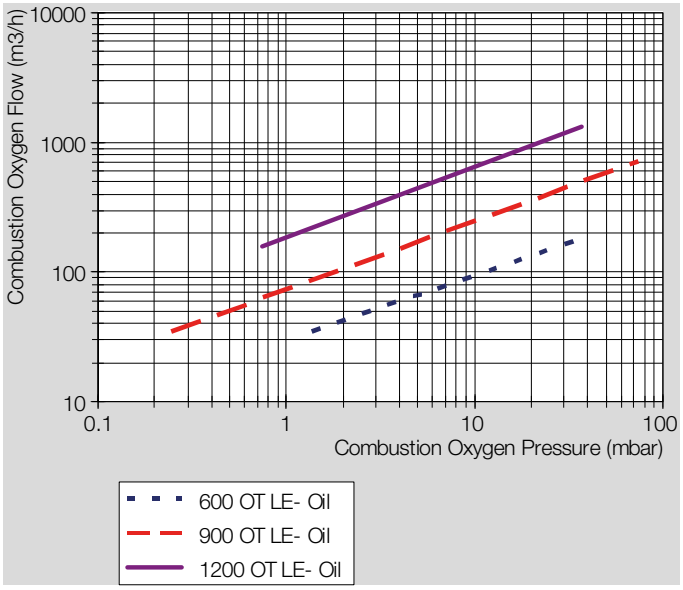
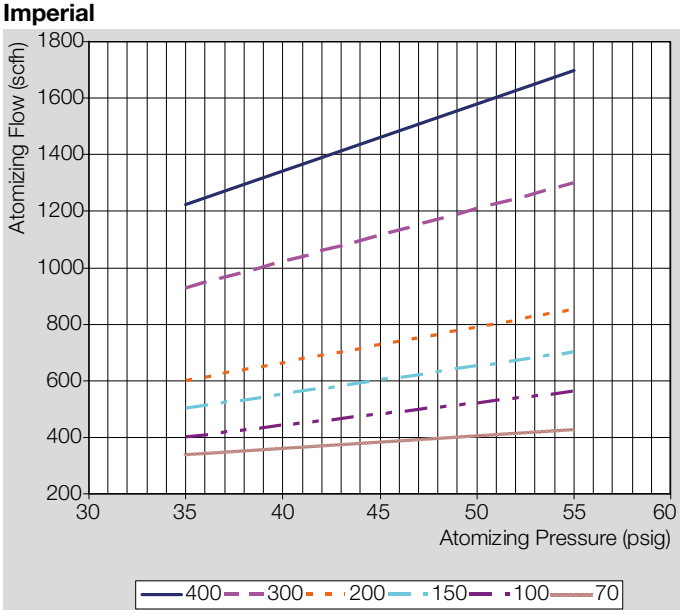


7.5 Atomizing oxygen/air flow vs. pressure

Imperial



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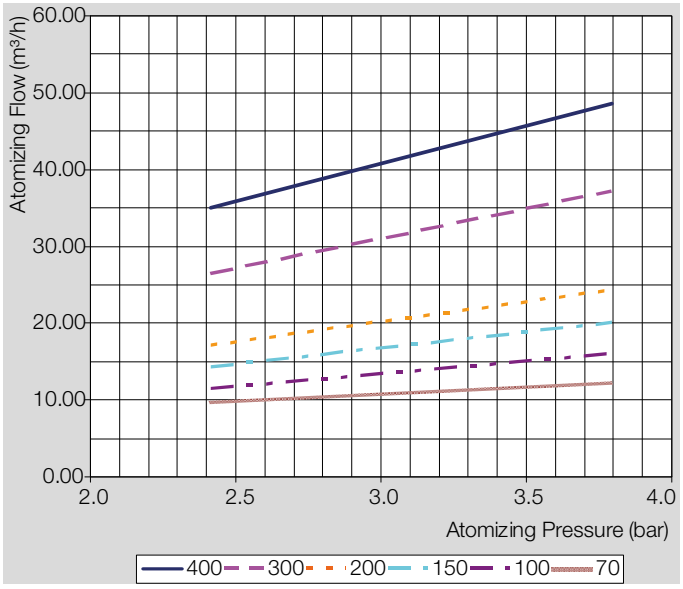
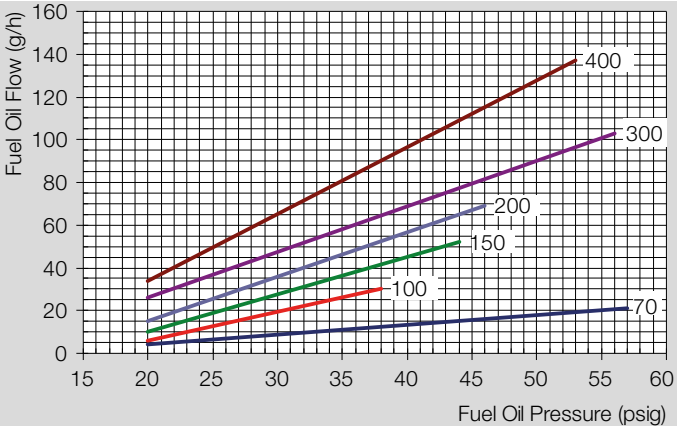


7.6 Fuel oil flow vs. pressure

Imperial



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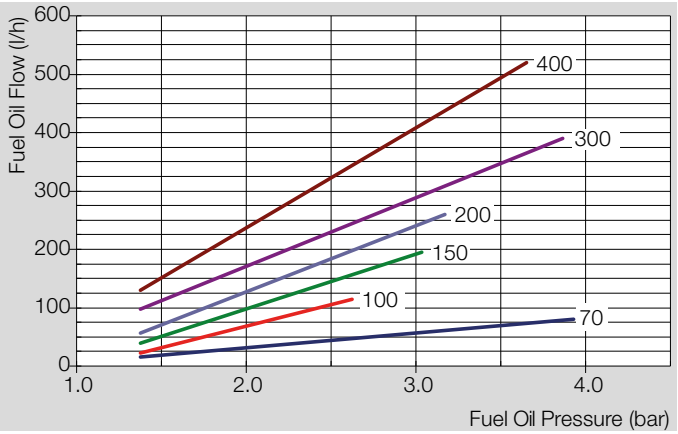

8 DISPOSAL

Devices with electronic components:

WEEE Directive 2012/19/EU – Waste Electrical and Electronic Equipment Directive

At the end of the product life (number of operating cycles reached), dispose of the packaging and product in a corresponding recycling centre. Do not dispose of the unit with the usual domestic refuse. Do not burn the product. On request, old units may be returned carriage paid to the manufacturer in accordance with the relevant waste legislation requirements.

FOR MORE INFORMATION

The Honeywell Thermal Solutions family of products includes Honeywell Combustion Safety, Eclipse, Exothermics, Hauck, Kromschröder and Maxon. To learn more about our products, visit ThermalSolutions.honeywell.com or contact your Honeywell Sales Engineer.

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