Product Lines - Appliance

- Commercial Cooking Portfolio
- Complimentary Components
- Commercial Cooking Market Overview

GLOBAL TRAINING
Acronyms

- BTU = British Thermal Units
- LP = Liquid Propane
- MV = Main Valve
- mV = milliVolts
- NAT = Natural Gas
- PD = Pressure Drop
- PV = Pilot Valve
- PSI = Pound per Square Inch
- PTT = Push-To-Turn
- V AC = Alternating Current Voltage
- WC = Water Column
## Fuel Characteristics

<table>
<thead>
<tr>
<th>Natural Gas</th>
<th>Characteristics</th>
<th>Liquid Propane (LP)</th>
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<tr>
<td>0.64</td>
<td>Specific Gravity</td>
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<tr>
<td>1000</td>
<td>BTUs / Cubic Feet</td>
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<td>7”WC – 10.5”WC</td>
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<td>11”WC – 14”WC</td>
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<td>1200°F</td>
<td>Ignition Temperature</td>
<td>950°F</td>
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<tr>
<td>10/1</td>
<td>Combustion</td>
<td>24/1</td>
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<tr>
<td></td>
<td>Air/Gas Ratio</td>
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</table>

- Natural gas is lighter than air and rises
- LP gas is heavier and puddles in the lowest area it can find
Our commercial cooking portfolio

Full product range providing system solutions for Commercial Foodservice Equipment
**Ovens**

- Holding / Cook & Hold Cabinets
- Bakery Ovens
- Deck / Pizza Ovens
- Conveyor Ovens

**Controls**

- Mechanical and Electronic Thermostats
- Gas Valves
- High Limit Switches
- Flame Safety Valves
- Gas Thermostats
- Solenoid Gas Valves
- Electronic User Interface Controls
- Humidity Control
- Pilots and Igniters
- Thermocouples / Thermopiles
- Burners
- Ignition Modules
- Fan / Conveyor Motor Control
Grills and Cooktops

- Finishing Oven / Salamander
- Char Broiler
- Griddle
- Induction Cooktop

Controls

- Mechanical and Electronic Thermostats
- Gas Valves
- High Limit Switches
- Flame Sense
- Gas Thermostats
- Solenoid Gas Valves

- Electronic User Interface Controls
- Energy Regulators
- Pilots and Igniters
- Thermocouples / Thermopiles
- Burners
- Ignition Modules
Fryers

- Single Fryer
- Network Fryer Battery
- Table Top Fryer

Controls
- Mechanical and Electronic Thermostats
- Gas Valves
- High Limit Switches
- Flame Sense
- Gas Thermostats
- Solenoid Gas Valves
- Electronic User Interface Controls
- Pilots and Igniters
- Thermocouples / Thermopiles
- Burners
- Ignition Modules
- Combination Valves
Warming Appliances

- Heated Merchandisers and Displays
- Heated Well
- Soup Kettle
- Food Warmers and Warming Drawers

Controls

- Energy Regulator
- Multi-Zone Temperature Controls
- Humidity Controls
- Mechanical and Electronic Thermostats
- High Limit Switches
- Electronic Controls
Hot Beverages

- Drip Coffee Makers
- Hot Beverage Dispensers
- Espresso Machines
- Hot Water Boosters

Controls
- Mechanical and Electronic Thermostats
- Inlet Valves
- Dump Valves
- High Limit Switches
- Energy Regulators
- Electronic Controls
**Our products: gas valves**

**TS11 Gas Oven Safety**
- Typically used in mV oven, broiler and griddle applications
- Cuts off main burner gas flow in event of pilot outage
- Available in ‘J’ and ‘K’ versions
- Capacity: up to 210k BTU/HR (natural gas)
- Ambient Temp: 32°F (0°C) to 350°F (177°C)

**7000 Low Capacity Gas Valve**
- Typically used in fireplaces, wall heaters, space heaters
- Available for mV up to 24V AC applications
- Capacity: up to 70k BTU/HR (natural gas)
- Higher and lower capacity versions available
- Ambient Temp: 40°F (4°C) to 175°F (79°C)

**7000 Regulated Gas Valve**
- Typically used in various commercial applications (e.g. fryers)
- Available for mV up to line voltage applications
- Capacity: up to 360k BTU/HR (natural gas)
- Higher and lower capacity versions available
- Ambient Temp: 32°F (0°C) to 175°F (79°C)

**FJ and SG Gas Solenoid**
- Normally closed solenoid available in single or dual versions
- Capacity: Single up to 119k BTU/HR. Dual up to 110k BTU/HR each outlet, 165k BTU/HR total with both sides open
- 24, 120 and 240V AC versions available
- Ambient temp: -40°F (-40°C) to 275°F (135°C)

Gas valves available for all applications, from mV to full electronic system delivery
Our products: gas valves

- TS11 Gas Oven Safety – 1720 Series
  - 1720-004
  - 1720-005
  - 1720-007
  - 1720-008
  - 1720-801
  - 1720-802

- Low Capacity Regulated Gas Valve
  - 710-203
  - 710-205
  - 710-402
  - 710-501
  - 710-502
  - 710-503
  - 710-511

- 7000 Regulated Gas Valve
  - 700-804
  - 700-886
  - 700-887

- FJ Gas Solenoid
  - 4075-029
  - 4075-200

Gas valves available for all applications, from mV to full electronic system delivery.
Our products: gas thermostats

BJWA Gas Thermostat
- Combination gas cock and bypass type thermostat
- Typically used in oven, broiler and griddle applications
- Modulating seat action
- Capacity: up to 70k BTU/HR (natural gas)
- Ambient Temp: 32°F (0°C) to 350°F (177°C)

GS Gas Thermostat
- Snap acting hydraulic thermostat
- Typically used in small ovens, warming cabinets and fryers
- Snap acting from ‘off’ to full gas flow
- Capacity: up to 30k BTU/HR (natural gas)
- Ambient Temp: 32°F (0°C) to 200°F (93°C)

FD Gas Thermostat
- Heavy duty, high capacity thermostat
- Modulating only or modulating with snap by-pass versions
- Typically used in heavy duty ranges, deck, convection and baking ovens
- Capacity: up to 100k BTU/HR (natural gas)
- Ambient Temp: 32°F (0°C) to 350°F (177°C)

RX Thermostat
- Typically used in millivolt / milliamp direct current applications
- Hermetically sealed reed switch
- Temperature ranges to 550°F (288°C)
- Electrical Rating: 0.67 Amps @ 5V DC
- Max Ambient temperature: 230°F (110°C)

Robertshaw® thermostats with proven reliability and Global recognition
Our products: gas thermostats

- BJWA Gas Thermostat
  - 4350-015
  - 4350-027
  - 4350-028
  - 4350-029
  - 4350-040
  - 4350-127
  - 4350-128

- GS Gas Thermostat
  - 4290-006
  - 4290-008
  - 4290-020

- FD Gas Thermostat
  - 4200-005
  - 4200-007
  - 4200-011
  - 4200-025
  - 4200-026
  - 4200-503
  - 4200-505
  - 4200-508

- RX Thermostat
  - 5300-401
  - 5300-406

Robertshaw® thermostats with proven reliability and global recognition
Our products: electric thermostats and limit controls

K/S Thermostat
- Snap acting, single-pole, single throw type thermostat
- Precise and reliable switch mechanism. Rugged and compact design
- Temperature ranges to 650°F (343°C)
- Electrical Rating: up to 30 Amps @ 277V AC
- Ambient temp: 32°F (0°C) to 200°F (93°C)

B10 Thermostat
- Typically used in steam tables
- Direct acting, single-pole, slow make and break type thermostat
- Tight temperature differential
- Fine silver contacts
- Temperature ranges to 550°F (288°C)
- Electrical Rating: 20 Amps @ 125V AC (15 Amps @ 250V AC)
- Ambient temp: 32°F (0°C) to 150°F (66°C)

D1 Thermostat
- Typically used in applications requiring double pole operation and accurate temperature control.
- Double pole with positive OFF
- Temperature ranges up to 650°F (343°C)
- Electrical Rating: 30 Amps @ 120V AC (10 Amps @ 480V AC)
- Ambient temp: up to 150°F (66°C)
- Additional dial, bezel and case options

Limit Controls
- Proven safety control for various gas and electric commercial applications
- Provides protection from over-temperature
- Automatic and manual reset versions available
- Temp settings from 150°F to 600°F in 5°F increments (65°C to 316°C)
- Electrical Rating: up to 30 Amps @ 250V AC
- Ambient temp: 32°F (0°C) to 185°F (85°C)
Our products: electric thermostats and limit controls

- K/S Thermostat
  - 5300-146
  - 5300-175
  - 5300-219
  - 5300-502
  - 5300-612
  - 5300-614
  - 5300-618
  - 5300-641
  - 5300-651
  - 5300-671
  - 5300-711
  - 5300-735
  - 5300-766

- B10 Thermostat
  - 5210-125

- D1 Thermostat
  - 5000-811
  - 5000-851

- Limit Controls
  - 5225-009
  - 5225-010
  - 5225-047
  - 5225-054
  - 5225-112
**Our products: other commercial cooking**

**Voltage Sensitive Energy Regulator**
- Typically used in mV oven, broiler and griddle applications
- 120, 208 and 240V AC versions available
- Multiple shaft configurations
- Electrical Rating: up to 15 Amps @ 120/240V AC
- Ambient temp: up to 266°F (130°C)

**M Series Energy Regulator**
- Very small size, allowing for innovative designs
- Single, dual and triple outputs
- Controllable range from 2.5% to 85% of output power. Full On detent for 100% available.
- 120, 208 and 240V AC versions available
- Push-To-Turn options available
- Electrical Rating: up to 15 Amps @ 120/240V AC
- Ambient temp: -4°F (-20°C) to 257°F (125°C)

**Spark Ignition**
- Typically used in ranges, ovens, fryers and griddles
- Valve drive and intermittent pilot versions available
- Multiple models available, including flame sensing and non-flame sensing
- Ambient temp: 32°F (0°C) to 200°F (93°C)
Our products: other commercial cooking

Voltage Sensitive Energy Regulator
▪ 5505-468

INF Series Energy Regulator
▪ 5500-102M
▪ 5500-134M
▪ 5500-135M
▪ 5500-200M
▪ 5500-202M
▪ 5500-234M
▪ 5500-235M
▪ 5500-287M

Spark Ignition
▪ 41-521
Pilot Assemblies
- Designed for use on various commercial self-powered (mV) gas control systems
- Multiple hood and mounting bracket options available
- Bracket capable for mounting thermocouple / thermopile
- Proven for use with Robertshaw gas valves

Thermocouples & Thermopiles
- Designed for use on various commercial self-powered (mV) gas control systems
- Available for two lead or coaxial type connection
- Proven for use with Robertshaw gas valves
Our products: complimentary components

Pilot Assemblies
- 1820-009
- 1820-019
- 1830-001
- 1830-210
- 1830-489
- 1830-490
- 1830-491
- 1830-717

Thermocouples & Thermopiles
- 1950-001
- 1950-532
- 1951-001
- 1951-536
- 1960-027
- 1970-024
- 1980-024
Commercial Cooking Market Overview

- Over 1 million cooking controls sold annually
- Model mix - 80% gas, 20% electric
- Electronics driving new technology
- Henny Penny®, Pitco®, Frymaster® Import – ITW®, Vulcan®, Electrolux®, Rationale®
- Appliances are Energy Star rated
- Robertshaw is the North American market leader in Hydraulic Thermostats, Energy Regulators and Gas Valves
- Partnership prevalent with all major appliance manufacturers
## Gas Valve Market Groups

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Robertshaw®</th>
<th>Honeywell®</th>
<th>White-Rodgers®</th>
<th>Dexen®</th>
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</table>

- Robertshaw® has USA-based engineering and technical services
### Robertshaw® is Total Solutions Provider

<table>
<thead>
<tr>
<th>Types</th>
<th>Robertshaw®</th>
<th>Alpha Brass®</th>
<th>Baso®</th>
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<th>EGO®</th>
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# Gas Thermostats and Manufacturers

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<tr>
<th>Types</th>
<th>Robertshaw®</th>
<th>Alpha Brass®</th>
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<tr>
<td>Gas Thermostats - Modulating</td>
<td>BJWA</td>
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<td>Gas Thermostats - Snap Acting</td>
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# Electric Thermostats and Manufacturers

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<th>Robertshaw*</th>
<th>EGO*</th>
<th>Selco*</th>
<th>Peco* (formerly Sunne)</th>
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## Gas Products and Manufacturers

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# Solenoid Valve Manufacturer Comparison

<table>
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<tr>
<th>Features</th>
<th>Robertshaw®</th>
<th>Robertshaw®</th>
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<th>Baso®</th>
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<td>Image</td>
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<tr>
<td>Series</td>
<td>FJT</td>
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<td>AS01 AS02 AS03</td>
<td>BGA110 BGA158 BGA171</td>
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<td>Ambient Temperature</td>
<td>-40°F to 275°F</td>
<td>-30°F to 300°F</td>
<td>-4°F to 275°F</td>
<td>-20°F to 175°F</td>
<td>-40°F to 140°F</td>
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<td>¼” tabs</td>
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<td>Screw Terminals</td>
<td>DIN or Amp Tap Connector</td>
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<td>Mounting Bracket</td>
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<td>×</td>
</tr>
<tr>
<td>AC Rectified for Silent Operation</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>×</td>
</tr>
</tbody>
</table>
# Solenoid Valve Pros and Cons

<table>
<thead>
<tr>
<th>Features</th>
<th>Robertshaw®</th>
<th>Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>Wider range allows for more applications</td>
<td>Smaller range limits applications</td>
</tr>
<tr>
<td>Inlet/Outlet Sizes</td>
<td>More plumbing options</td>
<td>Fewer plumbing</td>
</tr>
<tr>
<td>Max Capacity BTU</td>
<td>Faster heat response / more applications</td>
<td>Slow heat response / fewer applications</td>
</tr>
<tr>
<td>Terminals</td>
<td>Quick and easy to install</td>
<td>More steps required to install</td>
</tr>
<tr>
<td>Mounting Bracket</td>
<td>More mounting options</td>
<td>Fewer mounting options</td>
</tr>
<tr>
<td>Upside Down Mounting</td>
<td>Fewer field issue due to incorrect mounting</td>
<td>More field issues do to incorrect mounting</td>
</tr>
<tr>
<td>AC Rectified for Silent Operation</td>
<td>Fewer service calls for noisy valve operation or buzzing</td>
<td>More field calls for noisy valve operation or buzzing</td>
</tr>
</tbody>
</table>
## Robertshaw Solenoid Valve Value Proposition

<table>
<thead>
<tr>
<th>Features</th>
<th>Wholesaler / Distributor</th>
<th>Contractor</th>
<th>End-User</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>More applications</td>
<td>More applications</td>
<td>Fewer issues with related failures</td>
</tr>
<tr>
<td>Inlet/Outlet Sizes</td>
<td>More applications</td>
<td>Flexibility to use existing plumbing – easier to install</td>
<td>Fewer plumbing changes = lower cost installation</td>
</tr>
<tr>
<td>Max Capacity BTU</td>
<td>Fewer SKU’s</td>
<td>More applications</td>
<td>More heat</td>
</tr>
<tr>
<td>Terminals</td>
<td>Universal electrical connections</td>
<td>Easy to install</td>
<td>Faster installation</td>
</tr>
<tr>
<td>Mounting Bracket</td>
<td>More applications</td>
<td>Field serviceable</td>
<td>Faster installation</td>
</tr>
<tr>
<td>Upside Down Mounting</td>
<td>Up-sell</td>
<td>More flexibility in mounting configuration</td>
<td>Reliability</td>
</tr>
<tr>
<td>AC Rectified for Silent Operation</td>
<td>Sell benefit</td>
<td>Fewer customer complaints</td>
<td>Quieter operation</td>
</tr>
</tbody>
</table>
# Troubleshooting Tips for Gas Systems

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Cause</th>
<th>Possible Cure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flame Too Large</strong></td>
<td>1. Outlet pressure too high</td>
<td>1. Change gas valve</td>
</tr>
<tr>
<td></td>
<td>2. Defective regulator</td>
<td>2. Change regulator</td>
</tr>
<tr>
<td></td>
<td>3. Orifice too large</td>
<td>3. Change orifice</td>
</tr>
<tr>
<td><strong>Noisy Flame</strong></td>
<td>1. Excessive primary air</td>
<td>1. Adjust air shutter</td>
</tr>
<tr>
<td></td>
<td>2. Noisy pilot</td>
<td>2. See Proper Pilot Flame slide</td>
</tr>
<tr>
<td></td>
<td>3. Burr in orifice</td>
<td>3. Remove burr or replace orifice</td>
</tr>
<tr>
<td><strong>Yellow Tip Flame</strong></td>
<td>1. Too little primary air</td>
<td>1. Adjust air shutter</td>
</tr>
<tr>
<td></td>
<td>2. Clogged burner ports</td>
<td>2. Clean burner ports</td>
</tr>
<tr>
<td></td>
<td>3. Misaligned orifice</td>
<td>3. Realign orifice and burner</td>
</tr>
<tr>
<td><strong>Floating Flame</strong></td>
<td>1. Blocked venting</td>
<td>1. Inspect vent and clean</td>
</tr>
<tr>
<td></td>
<td>2. Insufficient primary air</td>
<td>2. Adjust air shutter</td>
</tr>
</tbody>
</table>
# Troubleshooting Tips for Gas Systems

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Cause</th>
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</thead>
</table>

- When all else fails... check gas supply is in the “ON” position
## Proper Pilot Flame

<table>
<thead>
<tr>
<th>Correct Flame</th>
<th>Tip of thermocouple or thermopile 3/8” to 1/2” into pilot flame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavy Blue Flame</td>
<td>Draft condition at pilot</td>
</tr>
</tbody>
</table>
| Noisy, Lifting Blowing Flame   | High gas pressure  
Wrong pilot orifice                                                   |
| Lazy Yellow Flame              | Clogged primary air opening  
Low gas pressure  
Clogged pilot orifice                                                     |
| Hard Sharp Flame               | High gas pressure  
Pilot orifice too small                                                  |
| Small Blue Flame               | Wrong pilot orifice size  
Low gas pressure  
Clogged pilot tube                                                        |