The G225 LE “Mako” Compressor Package

**Features:**

- PSI HD 11.1 L Engine (228 HP)
- 3 Stage / 2 Throw
- High Speed Poppet Valves
- Flexible Process Pipe
- Can Move Up to 1.5 MMSCFD
- On Demand Cooling Through Programmable Interstage Temperature Control
- Programmable Cells-Auto/Manual Option
- Transportation Friendly
- Remote Monitoring Standard
- Power Transfer Using Drive Shaft
- Pressure and Temp Monitoring in/out of Each Cell

*The G225 LE “Mako” unit is reshaping the compression industry. This compressor package has been designed to mirror the constant advancement of technology in the world today. PC3 Technologies and its partners, have engineered the G225 to have a revolutionary cooling system, engine model, interface/control system, flexible process gas line piping, and design for a natural gas compressor.*
One of the most revolutionary aspects of the G225 LE is the **Patent Pending design** of the AERIS Cooling System which, allows for maximum flexibility that grants the user unprecedented control over the temperature of the gas. The purpose of the LE is to **improve upon every facet of the industry standard** Small HP compressor. The design of the standard compressor package has remained relatively the same for decades. The LE will outperform these packages in all facets, including, but not limited to: weight, transportation, price, performance, and footprint.

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**Specifications:**

<table>
<thead>
<tr>
<th>Height</th>
<th>Length</th>
<th>Width</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>7’ 6”</td>
<td>18’ 6”</td>
<td>7’ 8”</td>
<td>15,800 lbs.</td>
</tr>
</tbody>
</table>

**Frame:**
- 7.250”/5.375”/3.125”

**Cooling:**
- 105 Ambient & <20 °F Approach

**Driver:**
- 225 BHP @ 1800 RPM

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**Light Weight Design:**
- Estimated Weight: 15,800 lbs.
- Width/Length: 7’8” x 18’6”
- Height: 7’6”
- ~ 60% lighter than competition
- Removed ~ 100 ft of process pipe
  - Increases control and reduces pressure drop
- NOT a permit load

**Psi 11.1L Engine:**
- Inline 6-cylinder turbocharged
- 225 HP @ 1800 RPM
- ACES Engine Controls
- Rich Burn

**NG Frame:**
- 2 throw, 3 stage
- 7.250" x 5.375" x 3.125"
- 3” Stroke 21,000 lb. combined rod load
- Utilizing Hi-speed Poppet Valves
- Direct piping to valves
  - Increased efficiency

**Roll-Off Design:**
- Increased precision
- Safer design
- Can be rolling tail boarded or crane lifted

**Controls:**
- Murphy Gen 1 Control System
- Remote monitoring through Mastertrak (24/7)
- PV450 Display
- Pressure/temperature monitoring into and out of each stage
- Wiring harness

**Flexible Pipe:**
- Controls pulsation
- Isolates Vibration

**Patent-Pending Cooling Design:**
- Increased efficiency
- Temperature set points
- Increased operational control (liquids management)
- 105 Ambient & <20 degree approach

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**Images:**

1. Diagram of the G225 LE with highlighted features.
2. Photographs of the G225 LE installation site.
Genis Holdings, LLC.

G225 LE MAKO

Three Stage Compressor Package

### Standard Equipment

**Compressor**
- NG MAKO 225 (2 throw, 3 stage)
- 3” Stroke 21,000 lb. combined rod load
- 7.250” DA Cylinder MWP 420 psig
- 5.375” SAHE Cylinder MWP 1050 psig
- 3.125” SAFE Cylinder MWP 1500 psig

**Engine**
- PSI 11.1L industrial engine rated 228 HP @ 1800 RPM
- Ratings- Elevation 3000 and 100 F Ambient
- Inline Six Cylinder Turbocharged 673 Cubic Inches
- ACES Electronic engine control system
- Industrial grade exhaust silencer
- Electronic governor controlled
- Standard 24V starter w/ battery/alternator system
- Rich Burn
- Engine-driven radiator

**Coolers - Fresco AC225**
- Air-cooled, forced draft, electric fan powered from engine alternator
- Programmable individual interstage temperature control
- Finned Tube type high efficiency
- Designed for 105F Ambient & <20 °F approach
- B31.3 process gas sections
- 1st Stage Intercooler section rated @ 1440 psig @ 350 F
- 2nd Stage Intercooler section rated @ 1440 psig @ 350 F
- After cooler section rated @ 1440 psig @ 350 F

**Vessels**
- Suction: Vertical 10” OD 425 psig MAWP @ 150 °F
- 1st Interstage: Vertical 10” OD 425 psig MAWP @ 150°F
- 2nd Interstage: Vertical 10” OD 900 psig MAWP @ 150°F
- Designed to ASME Section VIII, Division 1 Code Stamp with National Board Registration.
- Hydro tested to 1.3 times MAWP
- Automatic liquid level control system
- High level shutdown
- Manual drain valve

**Safety**
- Process safety valves (PSV) sized for maximum flow at design pressures.
- PSV relief piping to atmosphere above head height
- Package Inlet PSV connection provided. PSV by others
- 1st Interstage PSV set @ 425 psig
- 2nd Interstage PSV set @ 900 psig
- 3rd Interstage PSV set @ 1440 psig

### Process Gas Piping
- Designed to ANSI B 31.3
- Manual cold gas recycle valve
- Stainless-steel braided flexible piping for process gas

### Skid
- 7’8” X 18’6” Structural steel skid, partially concrete filled
- One-piece smooth steel deck plate
- All piping mounted on stand-offs for ease of cleaning
- Environmental rails around perimeter coming to four drain points
- Lockable battery box

### Control Panel
- Murphy GEN 1 Control System Evolution control panel
- Remote monitoring standard through Mastertrak Standard
- Shock mounted inner panel
- Shutdown interlocks and sensors:
  - **Compressor:**
    - High/low suction pressure
    - High/low interstage pressures (1st & 2nd)
    - High/low discharge pressure
    - High discharge temperature each stage
    - Compressor low lube oil pressure
    - Compressor no lube oil flow
    - Compressor low lube oil level
    - High scrubber liquid level
    - One spare set of contacts with terminal plug
  - **Engine:**
    - Engine low lube oil pressure
    - Engine low lube oil level
    - Engine high lube oil temperature
    - Engine high jacket water temperature
    - Engine over speed
    - Engine high/low intake manifold pressure
    - Excessive vibration
    - Emergency shutdown contact
    - Fuel gas pressure regulators included

### Surface Preparation and Painting
- Mechanical wash assembled unit
- Prime coat
- Standard is Gray and White. Custom Top coat colors may be available from Dealers

### Estimated Weight
- 15,800 pounds
The PSI HD 11.1L-ACES is a U.S. EPA-Compliant natural gas engine developed from the block up to be a reliable and durable power unit. Built upon a proven marine-diesel grade block, the 6-cylinder inline configuration, turbocharged and after-cooled engine features replaceable dry liners and water-cooled exhaust manifold.

Superior engine performance is driven by an ECU that integrates and coordinates all critical functions including: Governor, Variable Ignition Timing, Air Fuel Ratio Control, Knock Suppression and enhanced Engine Protection.

PSI is the market leader in providing heavy-duty products. PSI has seven models in its HD product lineup with displacements of 8.1L, 11.1L, 14.6L, 18.3L, 21.9L, 32L, 39L and 65L. These engines are an extension of the PSI industrial product line, which is based upon blocks from 650cc to 8.8L. All PSI engines feature the same fuel systems and controls, simplifying your application development and support.

GENERAL DATA
- Water-cooled, turbo-charged, air-to-air inter-cooled, stoichiometric with replaceable dry cylinder liners
- Cast iron block & heads, 10.5:1 compression ratio, overhead valve/2V configuration
- Crankshaft gear-driven oil system with canister-type filter, gear-driven centrifugal water pump
- 24VDC Starter and Alternator
- CANBUS J1939 interface
- 3-Way Catalytic Converter, included
- UL-recognized air filtration
- Integrated knock sensing and control
- Full ECU engine control with “smart-coils” with misfire detection feedback ignition
- Proven durability based on robust marine-diesel strength

FEATURES
- U.S. EPA-Compliant and CARB-Compliant, Stationary & Mobile
- 120F/50C Ambient Cooling Capacity
- UL2200-Compliant or Listed Components
- MasterTrak Telematics service (included for 1 year)

GENERATION 2 ENHANCEMENTS
- Enhancements for prime & continuous power
- Dual Fuel Auto Switch-Over Capable (NG to LP)
- Brushless Alternator
- Serpentine, Self-Tensioning Fan Belt
- UL Class 1 Division 2 ignition system (option)
- Advanced diagnostics for improved up-time
- ACES control system offers same features as our EPA-Certified 4G controller, but in EPA-Compliant format for wider range of non-commercial grade fuel acceptance

**PSI 11.1L-ACES ENGINE DATA**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>D111L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinders</td>
<td>I-6 (in-line)</td>
</tr>
<tr>
<td>Induction system</td>
<td>Turbocharged &amp; air-to-air charge cooled</td>
</tr>
<tr>
<td>Combustion system</td>
<td>Spark-ignited</td>
</tr>
<tr>
<td>Cooling system</td>
<td>Water-cooled</td>
</tr>
<tr>
<td>Displacement</td>
<td>673 cid (11,051 cc)</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>10.5:1</td>
</tr>
<tr>
<td>Bore &amp; Stroke</td>
<td>4.84 in x 6.1 in (123 mm x 155 mm)</td>
</tr>
<tr>
<td>Fuel Type</td>
<td>Natural Gas / Propane</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>Counter-clockwise viewed on flywheel</td>
</tr>
<tr>
<td>Dry Weight</td>
<td>2,600 lb (1,179 kg)</td>
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</table>

**POWER RATINGS (CONTINUOUS*)**

<table>
<thead>
<tr>
<th>RPM</th>
<th>BHP</th>
<th>kWm</th>
</tr>
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<tbody>
<tr>
<td>1800</td>
<td>228</td>
<td>170</td>
</tr>
<tr>
<td>1500</td>
<td>190</td>
<td>142</td>
</tr>
</tbody>
</table>

*Based on commercial quality NG fuel gas. Ratings subject to PSI application and duty cycle guidelines.
HORSEPOWER & FUEL CONSUMPTION

Natural Gas Fuel

All ratings are gross flywheel horsepower corrected to 77°F at an altitude of 328 feet with no cooling fan or alternator losses using LHV for NG of 920 BTU/scf. Production tolerances in engines and installed components can account for power variations of +/- 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.

**PSI HD 11.1L Natural Gas Engine Performance**

228 bhp (170 kWm)
@ 1,800 rpm

**PSI HD 11.1L Natural Gas Engine Fuel Economy**

POWERING A GREENER FUTURE
G225 LE MAKO

NG323 Compressor Frame - Truly balanced opposed, no offset, no couples

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED (RPM)</td>
<td>1800</td>
</tr>
<tr>
<td>RATED HP (COMPRESSION)</td>
<td>290</td>
</tr>
<tr>
<td>NO. of THROWS</td>
<td>2</td>
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</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>VALUE</th>
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</thead>
<tbody>
<tr>
<td>Max Gas Rod Loads (lbs)</td>
<td>Compression: 11,000, Tension: 10,000</td>
</tr>
<tr>
<td>Max Net Rod Loads (lbs)</td>
<td>Compression: 11,000, Tension: 10,000</td>
</tr>
<tr>
<td>COMBINED ROD LOAD (lbs)</td>
<td>21,000</td>
</tr>
<tr>
<td>STROKE (in)</td>
<td>3</td>
</tr>
<tr>
<td>PISTON ROD DIAMETER (in)</td>
<td>1</td>
</tr>
<tr>
<td>CRANKSHAFT MATERIAL</td>
<td>Forged Steel Ion Nitrided</td>
</tr>
<tr>
<td>CONNECTING ROD MATERIAL</td>
<td>65-45-12</td>
</tr>
<tr>
<td>CRANKSHAFT Master PIN DIAMETER (in)</td>
<td>3.12</td>
</tr>
<tr>
<td>CRANKSHAFT Master Pin WIDTH MAJOR</td>
<td>2.19</td>
</tr>
<tr>
<td>CRANKSHAFT Slave PIN DIAMETER</td>
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</tr>
<tr>
<td>CRANKSHAFT Slave PIN BEARING WIDTH MINOR</td>
<td>1.81</td>
</tr>
<tr>
<td>CRANKSHAFT MAIN BEARINGS</td>
<td>Spherical Roller Bearings</td>
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<tr>
<td>UNIT LENGTH (in)</td>
<td>31</td>
</tr>
<tr>
<td>UNIT WIDTH (in)</td>
<td>80</td>
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<tr>
<td>UNIT WEIGHT DRY (lbs)</td>
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<table>
<thead>
<tr>
<th>ITEM No.</th>
<th>PART No.</th>
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<th>QUANTITY</th>
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<tbody>
<tr>
<td>1</td>
<td>C23BT-3-2#1</td>
<td>CYLINDER ASSEMBLY</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CA23002#1</td>
<td>CYLINDER/FRAME LUBRICATION ASSEMBLY</td>
<td>1</td>
</tr>
<tr>
<td>3*</td>
<td>FR23001#1</td>
<td>FRAME ASSEMBLY</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>C23C-3-2#1</td>
<td>CYLINDER ASSEMBLY</td>
<td>1</td>
</tr>
<tr>
<td>Cylinder</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>HE</td>
<td>CE</td>
<td>HE</td>
</tr>
<tr>
<td>Compression Stage (0=Omit Cyl)</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Frame Throw Number</td>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Bore Diameter (in)</td>
<td>7.25</td>
<td>7.25</td>
<td>5.375</td>
</tr>
<tr>
<td>Rod Diameter (in)</td>
<td>0</td>
<td>1.125</td>
<td>3.125</td>
</tr>
<tr>
<td>Fixed Clearance %</td>
<td>22.49</td>
<td>18.57</td>
<td>26.26</td>
</tr>
<tr>
<td>Suction Valves Per Corner</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Suct: Valve Nose Diameter Inches</td>
<td>4.518</td>
<td>4.518</td>
<td>4.175</td>
</tr>
<tr>
<td>Disch. Valves Per Corner</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Disch: Valve Nose Diameter Inches</td>
<td>4.518</td>
<td>4.518</td>
<td>4.175</td>
</tr>
<tr>
<td>Max Discharge Temp (F)</td>
<td>350</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>MWP</td>
<td>425</td>
<td>425</td>
<td>900</td>
</tr>
<tr>
<td>Suction Connection Diameter</td>
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<td>3</td>
<td>3</td>
</tr>
<tr>
<td># of Suction Connections</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rating #</td>
<td>300</td>
<td>300</td>
<td>600</td>
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<tr>
<td>Discharge Connection Diameter</td>
<td>3</td>
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<td>600</td>
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<tr>
<td>ANSI</td>
<td>B16.5</td>
<td>B16.5</td>
<td>B16.5</td>
</tr>
<tr>
<td>Material</td>
<td>SA 105</td>
<td>SA 105</td>
<td>SA 105</td>
</tr>
</tbody>
</table>

**Direct Coupling of “Piping” to cylinder**

- Gas flows directly to and from the valves
- Reduces pressure losses in piping and gas passages
- Eliminates valve chair or cage holding valve in place
- Cylinders using high speed poppet valves.
Fresco 24VDC Individual Electric Coolers Powered by the "Engine Alternator"

- One cooling cell per stage, two fans per cooling cell
- Allows for the most efficient layout for the package
- No parasitic load
- Patent-pending set temperature control
- Automatic or Manual temperature control
- Increased operational liquids management
- On-demand power
- Allows customer to prevent freeze ups during winter time
  - Raise interstage temperature set points
- Design for 105 degree ambient and <20 degree approach
Controls/Monitoring

- Murphy “Gen 1” control panel
- Murphy Engine Integrated Control System “EICS”
- ACES – Advanced Controls Emission System
- Mastertrack remote monitoring 24/7 scada system (free of charge)
  - Can be accessed via web based or mobile app
  - Data reporting, Shutdown alerts, Maintenance schedules
Skid & Structural

- NOT A PERMIT LOAD
- Skid roll off design – can be rolling tail boarded, forklift or crane lifted.
- Oil drain lines piped underneath the skid.
- Skid drains at each corner of the skid.
- Concrete underneath the compressor pedestal.
Utilizing Fresco Thermal’s Patent Pending cooling technology allows the Aeris Cooler Line to have maximum modularity and fit most any natural gas cooling application. The Aeris Line consists of 3 sizes of coolers: 4x24, 3x18, and 2x12 (# of Cells X Volume). Each individual cell and rack are rated for a volume of 6 MMSCFD and can be added and subtracted from the package based on the customer’s needs with ease. This level of modularity coupled with the state-of-the-art cooling technology puts this product at the forefront of oil field technology.
The patent pending design of the Aeris Cooling System allows for maximum flexibility that allows up to four individual cells to be operated independently in either automatic or manual mode that can run in any combination of parallel, series or separate process flows. Each cell is fitted with 2” NPT connection to allow for individual relief valve based upon conditions and preferences.

<table>
<thead>
<tr>
<th>Height – 7’</th>
<th>Length – 20’</th>
<th>Width – 8’</th>
<th>Weight 11,750# (4 Panel System)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAWP – 1440#</td>
<td>Inlet/Outlet – 2”-900# RF</td>
<td>Power Requirements – 480v 3Phase (60Amp)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NG Flowrate</th>
<th>NG Inlet Temp</th>
<th>NG Pressure drop 1000#</th>
<th>NG Pressure drop 500#</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSCFD</td>
<td>F</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>4</td>
<td>220</td>
<td>1.25</td>
<td>2.43</td>
</tr>
<tr>
<td>5</td>
<td>220</td>
<td>1.93</td>
<td>3.77</td>
</tr>
<tr>
<td>6</td>
<td>220</td>
<td>2.77</td>
<td>5.41</td>
</tr>
</tbody>
</table>

100 Degrees Ambient 1000 PSI Inlet Pressure