COMPRESSOR LOADED EXPANDERS

PERFORMANCE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expander Ns Range</td>
<td>40 – 140</td>
</tr>
<tr>
<td>Expander Efficiency</td>
<td>up to the low 90%s</td>
</tr>
<tr>
<td>Expander Pressure Ratio</td>
<td>up to 24:1</td>
</tr>
<tr>
<td>Tip Speed</td>
<td>up to 1,500 ft/sec (457 m/s)</td>
</tr>
<tr>
<td>Rotor Speed</td>
<td>up to 115,000 RPM</td>
</tr>
<tr>
<td>Refrigeration Production</td>
<td>up to 10,000 HP (7,457 kW)</td>
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</tbody>
</table>

APPLICATIONS

- Industrial gas production
- Air separation
- Liquefaction

FLUIDS HANDLED

- Air
- Nitrogen
- Waste gas (high oxygen content)
- Carbon dioxide & carbon monoxide

FEATURES & BENEFITS

- Compact footprint
- “Zero leakage” inlet guide vanes
- Rugged rotor design
- Components individually balanced for ease of field replacement
- Tapered shaft wheel attachment for field interchangeability
- Labyrinth shaft seal design minimizes seal gas consumption and prevents process stream contamination
- Shaft-driven boost compressor reduces power consumption, increasing plant efficiency

AVAILABLE OPTIONS

- Inlet screens
- Inlet trip valves
- Surge control system
- Low hysteresis high cycle inlet guide vanes
- Cable trays or conduit
- Safe area or hazardous area location
- International code compliance (HPGSL, PED, GOST, etc.)
- Cryogenic performance testing
- Spare cartridge with nozzle assembly
**Turbo Expander Compressor (TC) Series**

**CROSS SECTION: TC-4000**

- "Zero Leakage" Inlet Guide Vanes
  - Adjustable inlet guide vanes provide optimum flow patterns as well as precise and continuous control across the machine’s full operational spectrum
  - Self-energizing back plate maintains zero sidewall clearance for maximum expander efficiency
  - Zero backlash variable guide vane configuration provides smooth turn-up capability to 125% of design flow

- Rugged Rotor Design
  - Stiff rotor shaft and high capacity tilt pad bearings assure maximum stability at all operating loads and speeds
  - High capacity tilt pad thrust bearings provide the extra margin necessary to handle transients
  - Numerous bearing designs available to accommodate specific process applications, including hydrodynamic (journal and tilt pad) bearings, ball bearings, ceramic bearings, and air/foil bearings
  - Sealing design offers robust construction and reliable performance

- Dual Independent Labyrinth Shaft Seal
  - Reliable teeth-on-shaft design is precision machined to ultra close clearances, minimizing seal gas consumption
  - Dual port, atmospheric center vent prevents process stream contamination

- Self-Aligning Wheel Attachment
  - Tapered bore and stretch rod design automatically compensates for thermal and mechanical changes to maintain alignment under all operating conditions
  - Precision machined tapered bore/shaft attachment allows independent balancing of turbine wheel and shaft to facilitate field repair

**Technical Highlights**

- Oil drain
- Bearings
- Seals
- Compressor wheel
- Expander wheel
- Guide vanes
- Expander outlet
- Compressor outlet
- Expander inlet
- Compressor inlet

**Specifications Subject to Change Without Notice**

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