PRC Petroleum Refining Chemical

Process compressors are typically used in petroleum, chemical and gas industry services for handling process gas with either lubricated or non-lubricated cylinders. These are moderate speed compressors meeting the demands of API-618 for critical service. API-618 has defined these compressor applications as having and expected uninterrupted operation of at least 3 years as a design criteria.

Process Compressors are separated from Oil and Gas compressors by function and required maintenance intervals. Oil and Gas compressors are commonly driven by natural gas fueled engines with major maintenance intervals of up to 18 months with regular preventative maintenance at every three months. Process compressors are generally electric motor driven and require a target of 3 years between any maintenance.

Ariel has developed a line of compressors to meet the demands for longevity and reliability dictated within API-618. This includes moderate rotating speed application, low average piston speeds, low piston wear band loading and process gas emissions control capabilities.

For applications guidelines on the Ariel Process Compressor refer to the Process Table of Contents.

These applications generally include any gas compressor application in:

- Refineries
- Petrochemical Plants
- Chemical Plants
- Industrial Gas Facilities

Excluded from Process Definition:

- Lubricated natural gas services
- Lubricated fuel gas boosters with up to 50% hydrogen
- Lubricated refrigeration
- Lubricated air, nitrogen or carbon dioxide
- Non-lubricated fuel gas boosters

Process Equipment Selection

Process Frames: JGA: JGJ: JGK: JGT: JGD: JGF: KBU: KBB

Process Cylinders: JG: RJ: K: T: D: F: U: B

Required Equipment for Process Offerings:

- Wearbands with a 5 psi piston and rod loading
- Ion nitrided cylinder bores
- Helium leak testing of cylinders in applications less than 12 MW
- Long two compartment distance pieces (API-618 Type C)
- Purged and water cooled packing with lapped packing cups
- Purged intermediate and wiper packing
- Indicator taps on cylinders

Optional Equipment Available for Process Offerings (typical additions)

- Non-lubricated cylinder design
- Suction valve unloaders
- Tungsten carbide piston rod coating
- BICERA crankcase doors
- Stainless steel tubing with stainless steel fittings
- Material certification

Capacity and Power Guarantee Tolerances within the Reciprocating Packager's Standard Section 2.

Process Frame Cyl Design

Ariel Process Frames include the JGA, JGJ, JGK, JGT, JGD, JGF, KBU and KBB. These frames offer:

- Shorter stroke to allow for wearbands for a 5 psi loading for lube and non-lube services
- Shorter stroke to allow for added piston rings for hydrogen compression and non-lube services
- Forged steel crankshafts
- Forged steel connecting rods
- Long two compartment distance pieces per API-618 Type C
- Piston speed limitations to meet most Process applications

Ariel Process Cylinders include the JG, RJ, K, T, D, F, U and B cylinder classes. These cylinders offer:

- Wearbands to meet 5 psi loading for both lubricated and non-lubricated services
- Wearband overtravel less than 50%
- Piston design to offer ring design and quantity sufficient for low molecular weight gases whether lubricated or non-lubricated
- Indicator connections
- Purged packing cases
- Water cooled packing cases
- Application specific valve design
- O-ring sealed valve covers
- Capacity and Load Control devices available
- 4100 series alloy carbon steel piston rods with ion nitride and optional tungsten carbide coating
- Ion-nitrided cylinder bore

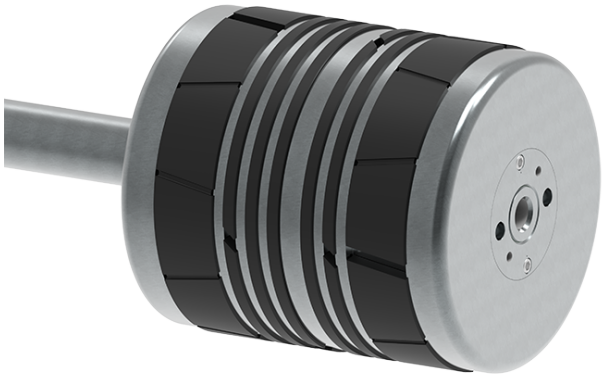
Process Piston

The Process piston includes wearbands designed for a 5 psi loading suitable for both lubricated and non-lubricated services. The piston ring and wearband materials are chosen to suit the Process gas, pressures and temperatures of each service.

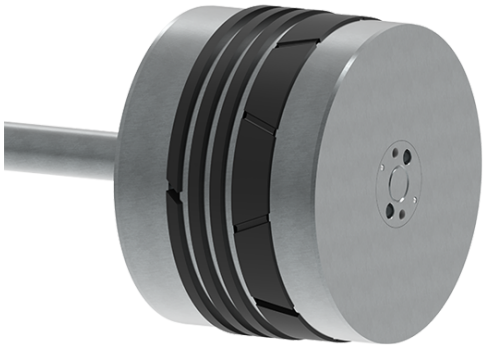
Larger class cylinders utilize two wearbands located outboard of the piston rings while smaller cylinder classes have one wearband on the outboard end of the piston. The cylinder bore has been extended to allow for the travel of the wearbands.

Figure: PRC Pistons

Double Wearband



Single Wearband



Piston rod materials for Process Applications are:

Service	Material	Coating
Non Corrosive Lubricated	4100 Series Carbon Steel	Ion Nitride
Non Corrosive Non-Lubricated	4100 Series Carbon Steel	Tungsten Carbide
Corrosive Lubricated and Non-Lubricated	17-4PH Stainless Steel	Tungsten Carbide

Process Rotative Speeds

Process rotating speeds are conservatively set to meet the design philosophy within API-618 for a target of 3 years uninterrupted operation. The maximum rotating speeds, and resulting piston speeds, are listed below.

Process Frame Maximum Speed				
		Rotative Speed	Piston Speed	
Frame	Stroke	rpm	fpm	m/s
JGA	3.00	1200	600	3.05
JGJ	3.50	1200	700	3.56
JGT	4.50	1000	750	3.81
JGK	5.50	750	688	3.49
JGF	5.00	900	750	3.81
JGD	5.50	750	688	3.49
KBU	5.75	750	719	3.65
KBB	7.25	600	725	3.68

Process Motor Sizing

The main motor driver for Process compressors will typically be a direct coupled electric induction motor or direct coupled electric synchronous motor. Drivers should be selected to provide enough power to meet the compression requirements. Best Practice and industry standard is to apply a 10% margin over the greatest compressor power demand for the driver selection. For electric motor drivers, this 10% margin can be applied to the motor rated horsepower, or to the Service Factor. If applied to the Service Factor, a specific review is required with the motor and motor controller suppliers to ensure continuous operation within Service Factor can be allowed. Users must also be aware and accept operation within Service Factor.

This 10% margin is a selection criterion to account for the variables affecting power demand and power supply. This is not meant to limit the use of the available driver power. Once installed, the full power rating may be used.

Refer to Driver Power Rating topic for information on what information is needed for quoting, purchasing and performing studies for electric drive compressors.

Motor driven reciprocating compressors typically require a torsional response analysis, current pulsation analysis and starting torque analysis. These studies will determine final coupling selection and if a flywheel is required.