



HYDRO-PAC INC.



**FLEXI-POWER™
High-Pressure Gas
Compressors**



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HYDRO-PAC

FLEXI-POWER™ High-Pressure Gas

Compressors are manufactured to meet the requirements of many industries. These FX compressors are available in powers to 200 hp and for pressures to 60,000 psi and even higher.

Because numerous industry applications involve pressurizing closed vessels, Hydro-Pac developed a new generation of compressors that fully utilizes the power supply.

Compressor Design

FLEXI-POWER™ High-Pressure Gas

Compressors have two basic components, an intensifier and a hydraulic power unit.

The Intensifier, mounted on top of the console, is made up of first- and second-stage gas cylinders and a hydraulic drive cylinder. Each cylinder contains a piston.

Tie-rods attach the gas cylinders to the hydraulic cylinder. A hydraulic flange and isolation spacer between each gas cylinder and hydraulic cylinder separate the hydraulic fluid from the process cylinders.

The Hydraulic Power Unit, contained within the console, is made up of an electric motor, hydraulic pump, oil reservoir, directional control valve and other hydraulic components.

The power unit provides pressurized hydraulic oil to the intensifier. The intensifier uses this pressurized hydraulic oil to compress gas.

The four-way valve controls the direction of hydraulic oil flow to and from the intensifier.

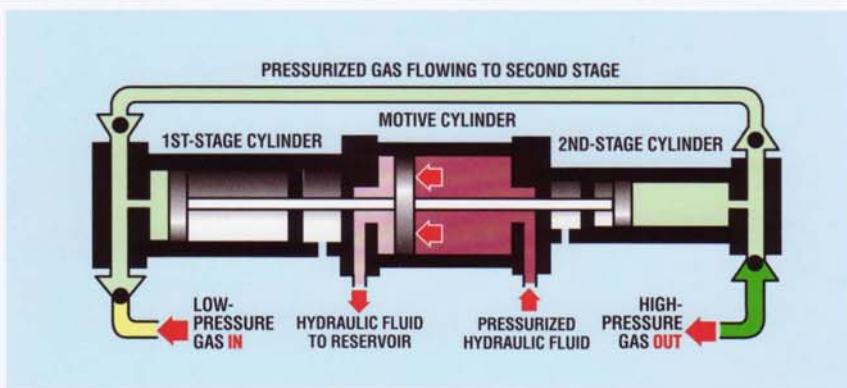
Intensifier Operation

Stage I Compression

Gas flows through the inlet check valve and fills the larger diameter first-stage cylinder.

Pressurized hydraulic fluid, acting on the hydraulic piston, strokes the piston assembly to the left compressing the gas in the first-stage cylinder.

Gas in the first-stage cylinder flows through the check valves into the smaller diameter second-stage cylinder.



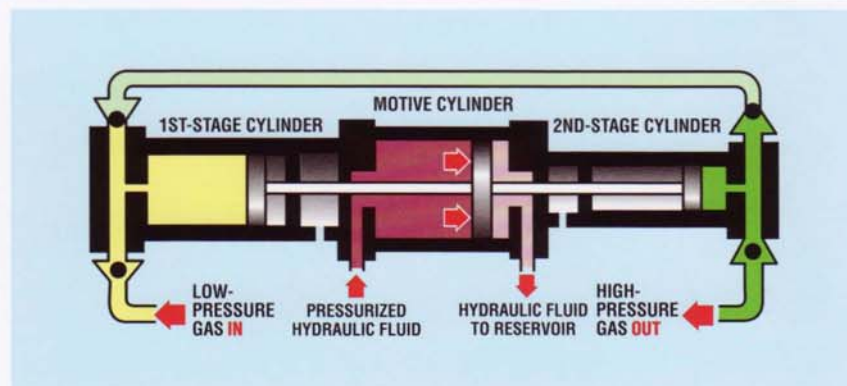
STAGE I COMPRESSION

Stage II Compression

At the end of stage I compression, the four-way valve changes position and directs pressurized hydraulic fluid to the left side of the hydraulic piston.

The piston assembly moves to the right compressing gas in the second-stage cylinder. Gas flows out of the second-stage cylinder into the discharge gas line.

The piston assembly reverses direction at the end of the second-stage stroke and the cycle repeats.



STAGE II COMPRESSION



Advances

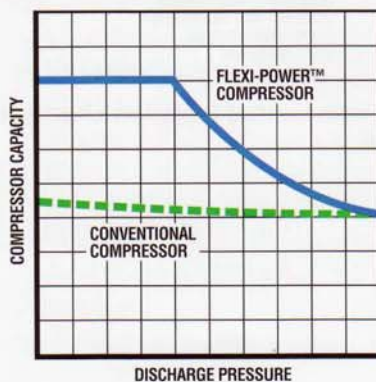
Increased Capacity at Lower Operating Pressure

FX compressors adjust their stroke rate automatically according to the operating conditions.

This increase in stroke rate makes full use of available horsepower and results in higher capacity when the discharge pressure is low. For batch process applications, a higher capacity can significantly reduce the compression time.

Variable Inlet Pressure

FX compressors efficiently accommodate a wide range of inlet pressures. It is usually unnecessary to provide an expensive pressure regulator. In addition, operation with the highest available inlet pressure increases the capacity of the machine.

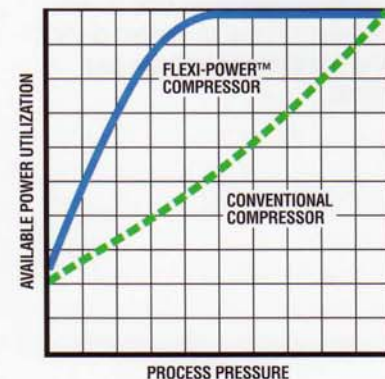
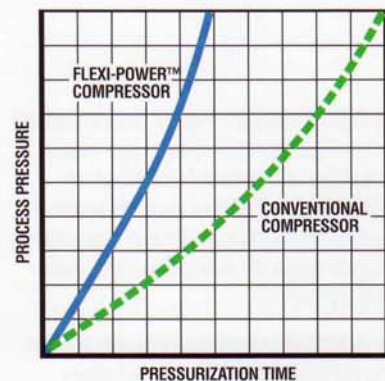


FLEXI-POWER™ Compressor Efficiency

Conventional, fixed-displacement compressors produce a near constant flow of gas when operating at fixed inlet conditions, *regardless of the discharge conditions*. When process pressures are low, a relatively small percentage of available horsepower is utilized by the compressor. These compressors waste power and time.

FLEXI-POWER™ compressors use most of their power, even when discharge pressures are low. At low discharge pressures, the intensifier strokes faster displacing more gas.

As pressure increases, FLEXI-POWER™ compressors slow down to produce a higher pressure and corresponding maximum flow-rate. At the maximum discharge pressure, the FLEXI-POWER™ compressor displaces the same amount of gas as a conventional fixed-displacement compressor.

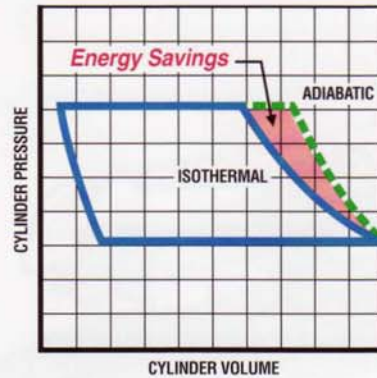


Intensifier Design Features

Near-Isothermal Compression

The long, slow stroke of Hydro-Pac compressors allows heat removal during the compression cycle. This near-isothermal compression cycle requires less power than the faster compression cycle of a diaphragm or crank-driven machine.

The near-isothermal compression cycle of Hydro-Pac compressors consumes less energy and requires less power to pressurize a given volume.

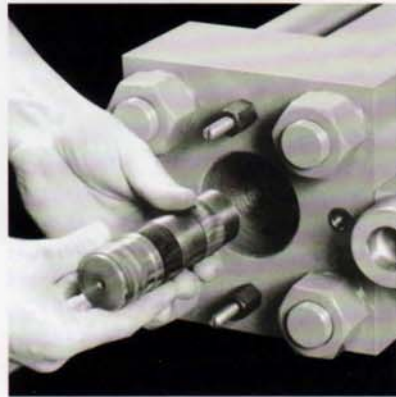


Check Valves

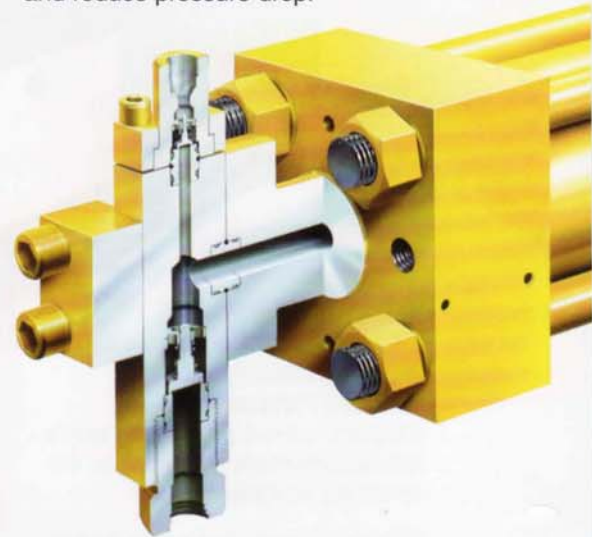
Inlet and discharge check valves are housed in a check valve body. The valve seats are reversible. The poppet, guide and spring are a cartridge. The guide accurately aligns the poppet with the seat. Large ports allow free flow of gas and reduce pressure drop.

Patented Free-Piston Design

Hydro-Pac's patented free-piston design allows replacement of the high-pressure packing in minutes without major disassembly of the intensifier. These pistons are pressure energized allowing them to adjust automatically for wear. The pistons are nonlubricated unless specifically requested by the user.



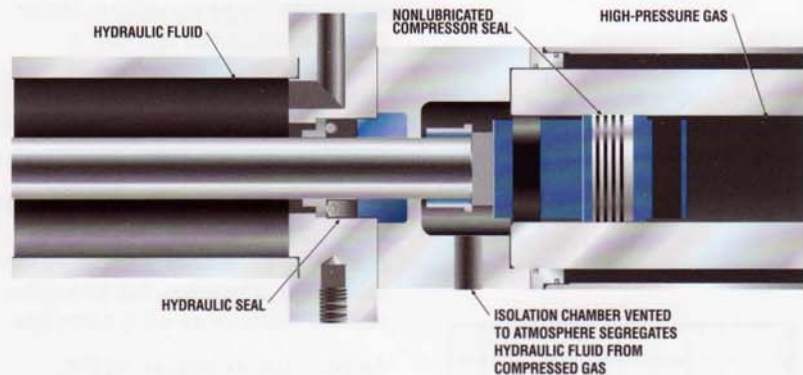
Patented Free-Piston is easily replaced in minutes by unthreading a single nut.



Fail-Safe Freedom from Contamination

Hydro-Pac compressors are non-lubricated eliminating lubrication contamination of the gas. In addition, a vented isolation chamber separates the gas cylinder from the hydraulic drive cylinder.

For applications requiring ultra-pure gas, optional full-length isolation spacers are available that do not allow entry of the oil-wetted portion of the plunger rod into the gas cylinder.



Nonlubricated Hydro-Pac compressor with vented isolation chamber ensures protection from contamination.



Hydraulic Drive System Features

An advanced hydraulic drive system powers the Hydro-Pac FLEXI-POWER™ compressor.

- Easily removable, sound-dampening panels enclose the hydraulic drive system.
- The hydraulic drive system allows the machine to be started under full load. Special unloading devices are not required.
- The slow operating speed and low inertia load eliminate the need for special foundations.
- Hydraulic oil is cooled and constantly filtered.
- Oil reservoir is baffled for cooling and foam dispersion, and is furnished with a clean-out cover.

Safety

FLEXI-POWER™ High Pressure Gas Compressors are designed and built for maximum safety. Some of the specific safety features are:

- An interstage relief valve protects the interstage and first stage of the compressor from over-pressurization.
- A pressure-compensated hydraulic pump and backup hydraulic relief valve provide redundant protection against over-pressurization of the hydraulic system.
- Protective panels shield the hydraulic drive system and electric motor.
- Leak-before-failure design of the high-pressure seals enhances safety.

Hydro-Pac Quality

We are committed to providing the best compressor possible. Some of the many steps taken to ensure the quality of Hydro-Pac compressors are:

- Careful, conservative engineering of all equipment.
- Hydrostatic pressure testing of all gas cylinders prior to assembly.
- All machines run at maximum-rated conditions prior to shipment.

Applications

FLEXI-POWER™ High-Pressure Gas Compressors are ideally suited for:

- Hot isostatic pressing
- Supercritical extraction
- Pneumatic testing
- Shock tube pressurization
- Wind tunnel storage pressurization
- Calibration of transducers and other instruments
- Gas transfer and circulation
- High-pressure chemical reactions
- Well injection
- Material testing
- Gas leak testing

Service and Spare Parts

- Trained service technicians are available for field repair.
- We provide training on the operation and maintenance of our products.
- Complete product overhaul and rebuild can be done at our facility.
- Our computer based inventory allows parts shipment from stock.

Standard Equipment

FLEXI-POWER™ High-Pressure Gas Compressors are furnished as complete units.

- Gas intensifier with inlet, interstage and discharge check valves
- Electric motor, 230/460 v, 3 ph, 60 Hz, TEFC
- Hydraulic power unit with pump, directional control valve and filter
- Gauges for oil pressure, level and temperature
- Sensors for low oil level and high oil temperature
- Interstage relief valve
- Heat exchanger for hydraulic oil
- Interstage gas cooler
- Instruction manual with parts list

Standard Gases

- Argon
- Nitrogen
- Helium
- Carbon dioxide
- Dry air
- Mixtures of 20% oxygen and other inert gas
- Methane
- Other inert gases

Options are available for Compressing

- Hydrogen
- Ethylene
- Other gases

Optional Equipment

- Spare-parts kit
- Enclosure for intensifier
- Motor starter
- Pressure gauges for suction, interstage and discharge
- Relief valves for gas inlet and discharge lines
- Aftercooler
- Coolant-flow sensor
- Gas piston lubrication
- Heater for oil reservoir
- Explosion-proof motor and controls
- Special motor and control power
- Complete compressor packages
- Installation assistance

Utilities

- Electrical:
230/460 v, 3 ph, 60 Hz
(Other voltages available)
- Cooling water is required. The amount depends on the machine.

Selecting a Compressor

The selection of a FLEXI-POWER™ compressor for a batch process requires the solution of a first-order differential equation.

Hydro-Pac has developed a computer program for this solution which uses actual gas data to model the changing capacity of a FLEXI-POWER™ compressor.

This program considers changing inlet and discharge pressures, temperature, and type of gas when selecting a compressor.

Hydro-Pac can optimize compressor selection - a task best accomplished by our computer.



Specifications

Model	Discharge Pressure		Power		Reservoir		Length		Height		Width		Weight	
	psi	MPa	hp	kW	gal	liter	in	mm	in	mm	in	mm	lb	kg
C10-10FX	10,000	70	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
C10-20FX	10,000	70	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
C10-40FX	10,000	70	40	30	70	265	110	2795	59	1500	34	865	4000	1815
C10-60FX	10,000	70	60	45	80	300	122	3100	65	1650	37	940	7500	3400
C10-75FX	10,000	70	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
C10-100FX	10,000	70	100	75	165	625	144	3660	75.5	1920	44	1120	9350	4240
C15-10FX	15,000	105	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
C15-20FX	15,000	105	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
C15-40FX	15,000	105	40	30	70	265	110	2795	59	1500	34	865	4000	1815
C15-60FX	15,000	105	60	45	80	300	122	3100	65	1650	37	940	7500	3400
C15-75FX	15,000	105	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
C15-100FX	15,000	105	100	75	165	625	144	3660	75.5	1920	44	1120	9350	4240
C20-10FX	20,000	140	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
C20-20FX	20,000	140	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
C20-40FX	20,000	140	40	30	70	265	110	2795	59	1500	34	865	4000	1815
C20-60FX	20,000	140	60	45	80	300	122	3100	65	1650	37	940	7500	3400
C20-75FX	20,000	140	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
C20-100FX	20,000	140	100	75	165	625	144	3660	75.5	1920	44	1120	9350	4240
C30-10FX	30,000	210	10	7,5	30	115	74	1880	43	1090	26.5	675	1500	680
C30-20FX	30,000	210	20	15	40	150	93	2360	51	1295	26.5	675	2600	1180
C30-40FX	30,000	210	40	30	70	265	110	2795	56.5	1435	34	865	4000	1815
C30-60FX	30,000	210	60	45	80	300	122	3100	65	1650	37	940	7500	3400
C30-75FX	30,000	210	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
C30-100FX	30,000	210	100	75	165	625	144	3660	75.5	1920	44	1120	9500	4300
C45-10FX	45,000	310	10	7,5	30	115	74	1880	43	1090	26.5	675	1500	680
C45-20FX	45,000	310	20	15	40	150	93	2360	51	1295	26.5	675	2600	1180
C45-40FX	45,000	310	40	30	70	265	110	2795	56.5	1435	34	865	4100	1860
C60-10FX	60,000	415	10	7,5	30	115	74	1880	43	1090	26.5	675	1500	680
C60-20FX	60,000	415	20	15	40	150	93	2360	51	1295	26.5	675	2600	1180
C60-40FX	60,000	415	40	30	70	265	110	2795	56.5	1435	34	865	4200	1900

Capacity curves and operating envelopes are available upon request.

When ordering or inquiring about FLEXI-POWER[™] Compressors please specify:

- Operating pressure
- Discharge vessel volume, temperature and starting pressure
- Inlet storage volume and starting pressure
- Time allowed to reach pressure
- Type of gas
- Utilities, voltage and frequency
- Indoor or outdoor installation
- Ambient temperature
- Options
- Model number (if known)

Other Products

Hydro-Pac designs and manufactures equipment to generate, control and monitor high-pressure fluids and gases.

- Low-pressure gas compressors 1000 to 10,000 psi, 3 to 40 hp.
- Large high-pressure gas compressors 2000 to 100,000 psi through 200 hp.
- High-pressure pumps 10,000 to over 100,000 psi, 1/2 to 400 hp.
- Large port valves, fittings and tubing for high-flow requirements at 40,000 to 100,000 psi.

- Electrical power and thermocouple glands to operate furnaces and electronic equipment in pressurized environments to 60,000 psi.
- Large high-pressure vessels designed and manufactured in accordance with ASME Code Section VIII, Divisions 1, 2 and 3.
- Complete high-pressure systems.

Call or write Hydro-Pac Inc. for your pressure equipment requirements. Our complete Product Catalog is available upon request.



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