

VSSG/VSG compressor for natural gas and process gas applications



Vilter™

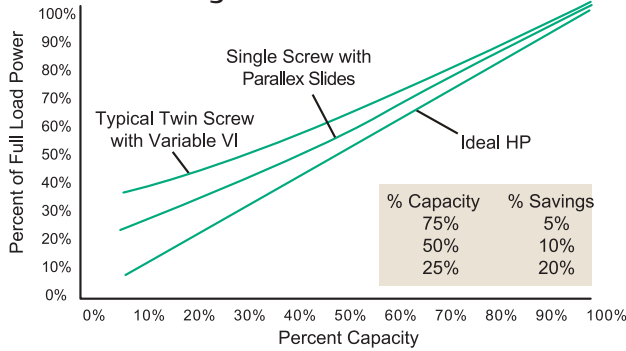
*The World's Best Compressors™
For Gas Compression*


EMERSON™
Climate Technologies

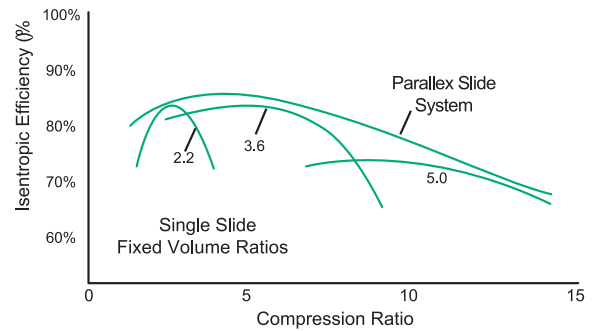
Why choose a Vilter™ single screw compressor?

Vilter's VSSG/VSG single screw gas compressors deliver longer life, higher reliability and better energy efficiency than twin screw compressors and have fewer moving parts than reciprocating compressors. The key to the single screw compressor's reliability is in its balanced design. At the core of the positive displacement rotary compressor is a single main rotor intermeshed with two opposing gaterotors. The balanced design results in ultra-low bearing loads with significantly decreased vibration and sound levels. The key to the single screw compressor's high energy efficiency is Vilter's exclusive Parallelx™ slide system allowing the compressor to run at optimum efficiency through its full range of capacity.

Part load energy consumption – single screw vs. twin screw



Isentropic efficiency comparison between variable and fixed volume



Applications

- Gas liquification
- Vapor recovery
- Flare gas recovery
- Coal bed methane recovery
- Field and fuel gas boosting
- Wellhead recovery
- Enhanced oil recovery
- Landfill gas recovery
- LNG boil off
- Gas gathering
- BIO - gas
- Digester
- CO₂
- Nitrogen
- Hydrogen
- Refrigerant

Features and benefits

- Displacements from 310 to 2,048 CFM
- Variable capacity control 10-100%
- Variable volume ratios 1.2 – 7.0
- Compression ratios 2 – 20
- Electronic actuators are weatherproof and conform to Class 1, Group C&D, Division 2 Classification
- Balanced main rotor with no axial or radial loads
- Parallelx™ slide system for maximum operating efficiency
- Low bearing loads – no hydrodynamic bearings
- High suction pressure capability is standard
- Clockwise rotation models available
- Low noise levels
- Low maintenance costs



Parallelx™ slide system

It's the key to part load efficiencies far superior to twin screw compressors. Capacity and volume slides move independently of each other based on load, eliminating over or under compression and saving motor horsepower.

Allen-Bradley programmable controller

The CompactLogix programmable controller with an A-B PanelView 1000 graphic display provides high performance in a small footprint for stand alone operation or for integrated system control.

Large capacity oil filter

Filters will remove all particles, 25 microns or larger, from the oil before the compressor. Filter assemblies are equipped with transducers to measure pressure drop and shut-off valves for isolation and servicing.

Oil cooling options

- Water cooled
- Air cooled



Unit features

Standard construction

- Main bearings – Roller and ball type angular contact thrust.
- Gaterotor bearings – Roller and ball type angular contact thrust.
- Hand wheels or optical slide valve motor for capacity and volume control. Suitable for Class 1, Group C+D, Div. II.
- Variable vi - Independent volume control and capacity control for improving efficiencies.
- Separate prelude oil pump with TEFC drive motor.
- Lube oil piping is carbon steel, using socket weld or butt weld connections. Threaded connections are kept to a minimum.
- ASME designed oil separator with coalescing oil filter.
- CompactLogix programmable controller with an A-B PanelView 1000 graphic display
- Separate stop and check valves for both suction and discharge lines.

Process gas circuit

- Suction gas stop and check valve.
- Suction line strainer – The strainer is stainless steel mesh construction and suited to process gas applications.
- Process gas/oil separator – The separator is capable of removing the oil from the discharge gas stream and is an ASME-coded vessel which uses five stages of separation to achieve an oil loss of below 4 ppm.
- Discharge oil separator relief valve.

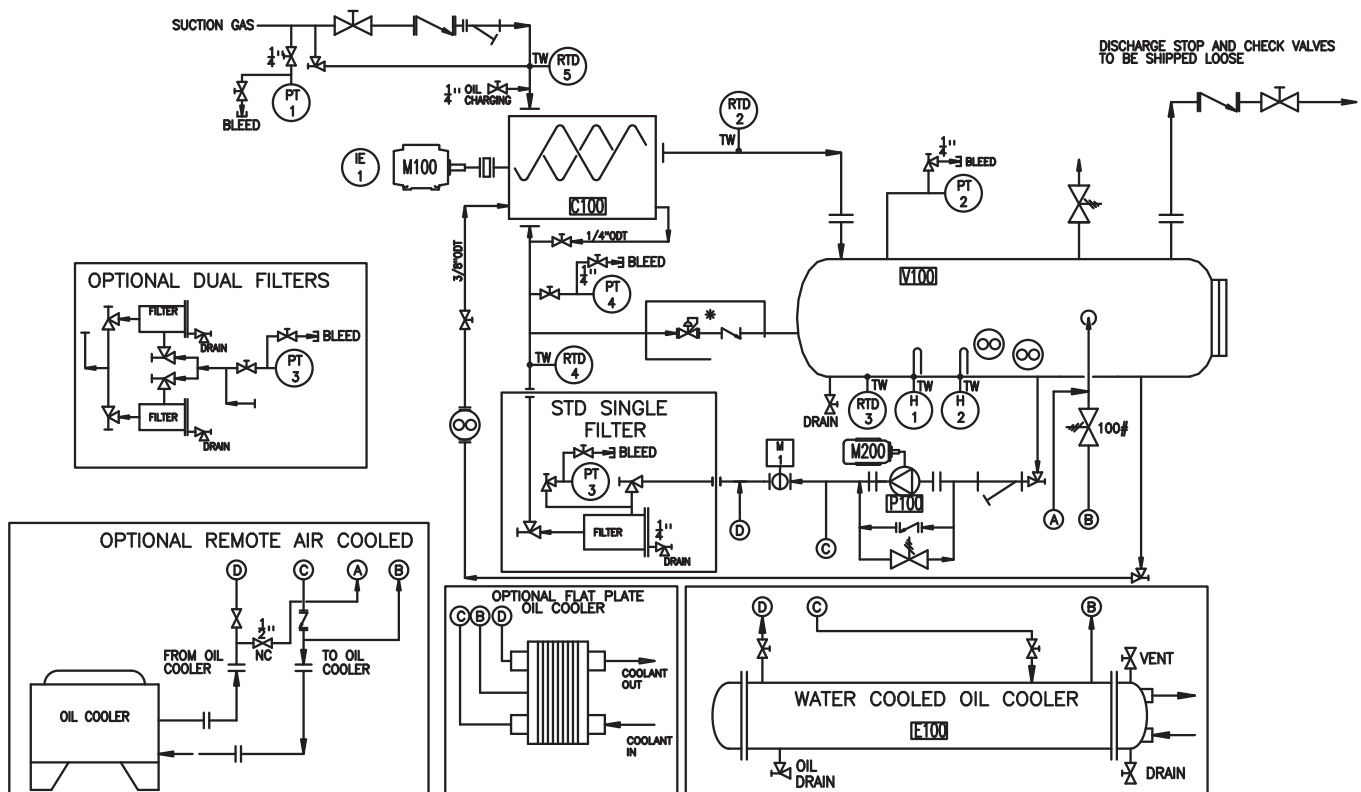
Injection oil circuit

- Oil prelude pump with TEFC motor.
- Oil cooler/temperature control valve – An oil cooler, either air or water cooled, must be used to remove the heat of compression from the oil stream. A two way temperature control valve is used to maintain precise oil injection temperature to the compressor VIA PID loop control in PLC
- Oil filtration – Filtration down to 25 microns nominal. Optional dual filters are recommended to allow replacement of one cartridge while the compressor continues running with the other cartridge in service
- Oil heater – Oil heaters are supplied to maintain oil temperature of at least 90°F when the compressor is not running

Available options

- Stainless steel lube oil circuit
- Suction bypass connection for fuel gas booster application
- Dual oil pumps
- Dual oil filters
- Water cooled or air cooled oil coolers
- High and low ambient temperature options

Note – Because the oil system on the VSSG/VSG compressor utilizes discharge gas pressure as the means to move the injection oil through the system, it must be remembered that all components of the oil system are exposed to full discharge pressure and must be pressure rated accordingly.



Flow Diagram (Figure 1)

Instrumentation

Pressure

There are four pressure transducers to read system pressures as listed below (Figure 1).

PT1 suction pressure transducer

(-15.0 - 400 PSIG) measures the gas suction pressure into the compressor housing.

PT2 discharge pressure transducer

(-15.0 - 400 PSIG) measures the discharge pressure of the process gas in the separator.

PT3 oil filter inlet pressure transducer

(-15.0 - 400 PSIG) measures the oil pressure as it enters the oil filter canisters.

PT4 oil manifold pressure transducer

(-15.0 - 400 PSIG) measures the oil pressure downstream of the oil filter as the oil is injected into the compressor.

Additional pressure transducers may be required and installed by the customer for pressure readings at customer specified points such as process gas discharge pressure from the package boundary, cooling water pressure to and/or from the oil cooler, etc.

Temperature

There are four temperature readings for processor control, as listed below (Figure 1).

RTD1 suction temperature RTD

measures the temperature of the incoming suction gas.

RTD2 discharge temperature RTD

measures the temperature of the gas/oil mixture as it is discharged from the compressor housing.

RTD3 oil separator temperature RTD

measures the temperature of the oil in the separator sump.

RTD4 oil Injection temperature RTD

measures the temperature of the oil as it is injected into the compressor.

Additional RTD's may be required and installed by the customer for temperature readings at customer specified points such as discharge gas temperature from the package boundary, cooling water temperature to and/or from the oil cooler, gas aftercooler temperature, etc.

Additional instrumentation

- Motor current transformer
- Optical actuators for capacity and volume slide indication

Other options

- Remote start/stop input
- Remote alarm/trip output

Alarm and shutdown annunciation/indication

The control system for the VSSG/VSG compressor must protect the machine from running outside of normal operating conditions. This is accomplished by providing operators with alarms when operating parameters have reached an abnormal condition, and by automatically stopping the compressor before these conditions can cause a unit failure.

Safety setpoints:

- Low gas suction temperature
- High gas discharge temperature
- Low oil separator start temperature
- Low oil separator run temperature
- Low oil injection temperature
- High oil injection temperature
- Low suction pressure
- High discharge pressure
- Prelube oil pressure
- Low oil pressure
- High starting oil filter differential pressure
- High running oil filter differential pressure
- High motor amperage limit

In most cases, the safety setpoints described will have settings which are dictated by process requirements, and not necessarily mechanical constraints of the compressor. Process pressures and temperatures may vary considerably depending on the application of the compressor. The VSSG/VSG compressor is designed to operate in a broad range of applications. Minimum and maximum values for each safety setpoint are provided, while precise settings for the safety setpoints must be derived for each installation.



Application guidelines

To ensure the successful operation of the VSSG/VSG compressor, the guidelines described below should be followed.

Proper lubrication is critical to the operation of the VSSG/VSG compressor. The compressor relies on the injected oil to absorb and remove the heat of compression, to seal the compression chambers formed in the flutes of the screw, and to lubricate all moving parts. For this reason, it is imperative that the oil chosen be of correct viscosity, and that sufficient oil flow be provided at all times, using an auxiliary oil pump when necessary. The oil chosen must be compatible with the process gas, to prevent absorption of the gas into the oil, which would dilute the oil and reduce the viscosity. Also oil filtration to 25 micron nominal particle size is required to ensure that only clean oil is injected into the compressor. For assistance in choosing the correct oil for the application and in sizing an auxiliary oil pump, consult a Vilter representative.

Injection oil temperature must be closely controlled for optimum performance. Oil temperature must be maintained a minimum of 15 - 20°F above the gas mixture dewpoint at anytime to prevent condensation or liquid knockout from occurring within the compressor.

Gas composition plays a role in the performance of the VSSG/VSG compressor as well. While the VSSG/VSG is capable of handling a wide variety of gases, if H₂S is present in the process gas in any concentration, special oil additives are required to protect the compressor from corrosion. Levels below 100 PPM of H₂S allow the standard warranty to apply.

Typical gases handled: Natural gas, landfill gas, carbon dioxide, propane, helium, propylene and ammonia. Other gases will need to be reviewed for compatibility and operational performance by Vilter.

VSG compressor capacity and design limitations - standard models

Description	VSG 301	VSG 361	VSG 401	VSG 501	VSG 601	VSG 701	VSG 751	VSG 901	VSG 791	VSG 891	VSG 1051	VSG 1201	VSG 1301	VSG 1551	VSG 1851	VSG 2101	VSG 2401	VSG 2601	VSG 2801	VSG 3001
Rotor diameter (mm)	205		240			280		310			312		350			401		401		
Gaterotor diameter (mm)	195	205	216	225	240	252	268	280	289	300	298	310	312	331	350	368	388	400	411	416
Max. HP 3600 RPM*	300 HP		500 HP			675 HP		2000 HP			675 HP		1000 HP			2000 HP				
Max. allowable torque (ft. lbs.)	444		739			998		2958			998		1479			2958				
Rotor speed (RPM)	1200-4200					1200-4000		1200-3800												
Direction of rotation	CCW facing drive end		CW facing drive end			CCW facing drive end														
Drive type	Direct drive, electric motor, gas engine																			
Built-in volume ratio	1.2 to 7.0 (Continuously variable automatic, or manual control)																			
Capacity range	10% to 100% (Continuously variable automatic, or manual control)																			
Bare comp. MAWP (psig)**	515			485		1100		485			535									
Max. pressure differential (psig)***	325																			
Min. inlet temp. (°F)	-50°F																			
Max. inlet temp. (°F)	180°F																			
Max. disch. temp. (°F)	225° (Contact Vilter for increased temperature limits)																			
Max. oil temp. (°F)	190° (Contact Vilter for increased temperature limits)																			

*Higher limits are available. Consult Vilter Manufacturing LLC.

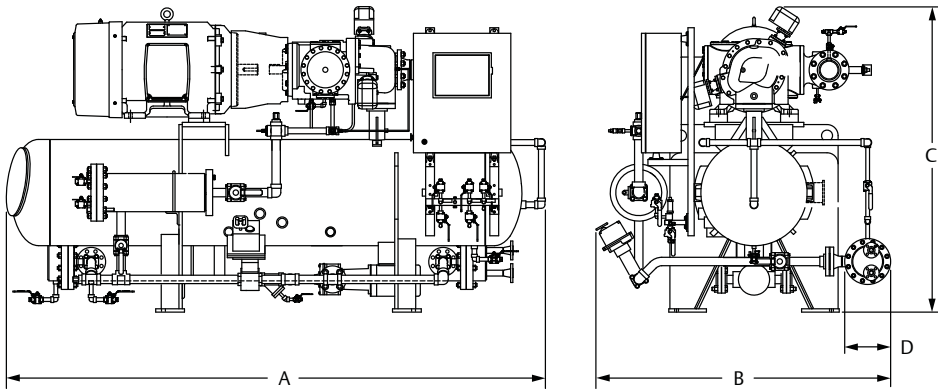
**Higher discharge pressures are achievable. Consult Vilter Manufacturing LLC. for approval.

***Higher differential pressures can be achieved. Consult Vilter Manufacturing LLC. for approval.

Note: MAWP (Maximum Allowable Working Pressure). The relief valve setting must be below the MAWP. The relief valve is usually set 10% lower than the MAWP.

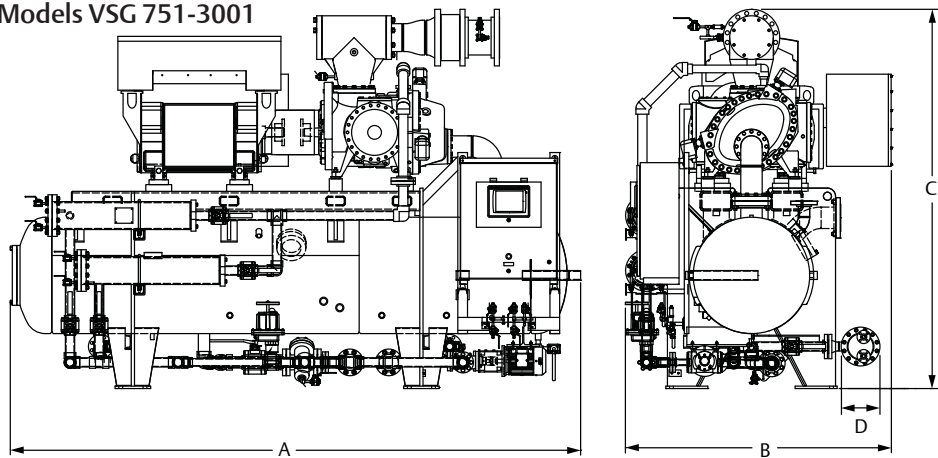
VSG unit dimensions and specifications

Models VSG 301-701



Models VSG 301-701, left, are shown with a standard C-Flange motor mount, single oil filter and standard water-cooled oil cooler which is noted by the D dimension on the drawing.

Models VSG 751-3001



Models VSG 751-3001 drawings illustrate the optional dual oil filter and the optional remote mounted oil cooler which can be air cooled.

It is important to note that all VSG models can be fitted with single or dual oil filters, water-cooled oil cooler or remote mounted oil cooler.

VSG unit dimensions

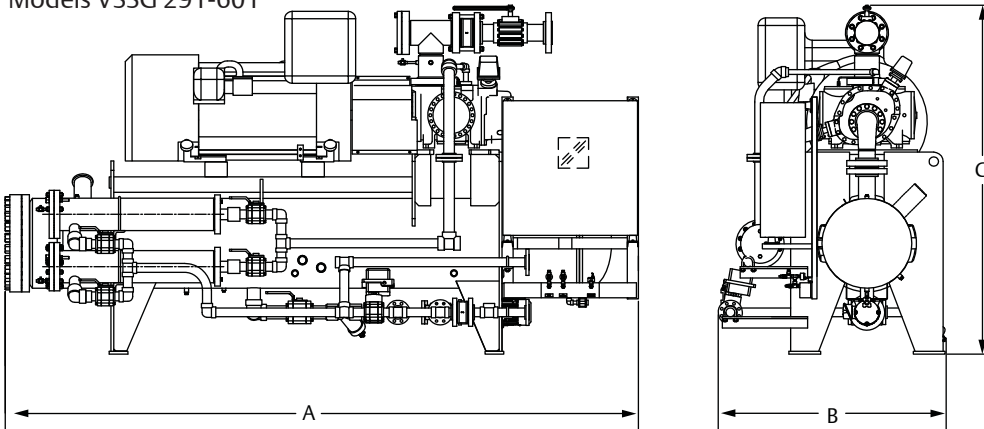
Vilter model	Standard connection size*		Unit dimensions (approx.)*				Approx. shipping weight (lbs)**
	Suction	Discharge	A Length	B Width	C Height	D Optional oil cooler	
VSG-301	3"	3"	8'-10"	4'-2"	6'	7-3/4"	7000
VSG-361	3"	3"	8'-10"	4'-2"	6'	7-3/4"	7300
VSG-401	3"	3"	8'-10"	4'-2"	6'	7-3/4"	7500
VSG-501	4"	3"	8'-9"	3'-8"	7'-6"	10-3/4"	8500
VSG-601	4"	4"	9'-10"	4'	7'-10"	10-3/4"	8800
VSG-701	4"	4"	9'-10"	4'	7'-10"	10-3/4"	9000
VSG-751	6"	4"	12'	3'-7"	8'	16"	14800
VSG-901	6"	4"	12'	3'-7"	8'	16"	15200
VSG-791	6"	4"	12'	3'-7"	8'	16"	14800
VSG-891	6"	4"	12'	3'-7"	8'	16"	15200
VSG-1051	6"	6"	13'-2"	4'-1"	8'-8"	16"	15500
VSG-1201	6"	6"	13'-2"	4'-1"	8'-10"	16"	16000
VSG-1301	6"	6"	13'-2"	4'-1"	8'-10"	16"	16000
VSG-1551	8"	6"	15'	5'-8"	10'	17"	18000
VSG-1851	8"	6"	15'	5'-8"	10'	17"	18200
VSG-2101	10"	6"	15'	5'-8"	10'	17"	18500
VSG-2401	12"	8"	17'-4"	7'-4"	11'-4"	17"	19000
VSG-2601	12"	8"	17'-4"	7'-4"	11'-4"	17"	19000
VSG-2801	12"	8"	17'-4"	7'-4"	11'-4"	17"	19200
VSG-3001	12"	8"	17'-4"	7'-4"	11'-4"	17"	19500

*Dimensions shown are approximate and should not be used for construction.

** Typical motor weight used, actual weight may differ.

VSSG unit dimensions and specifications

Models VSSG 291-601



Models VSSG 291-601 drawings illustrate the optional dual oil filter and the air cooled connections.

It is important to note that all VSSG models can be fitted with single or dual oil filters, water-cooled oil cooler or remote mounted oil cooler.

VSSG unit dimensions

Vilter model	Standard connection size *		Unit dimensions (approx.) *				Approx. shipping weight (lbs) **
	Suction	Discharge	A Length	B Width	C Height	D Optional oil cooler	
VSSG-291	3"	3"	8'-10"	4'-2"	6'	7-3/4"	7000
VSSG-341	3"	3"	8'-10"	4'-2"	6'	7-3/4"	7300
VSSG-451	3"	3"	8'-10"	4'-2"	6'	7-3/4"	7500
VSSG-601	4"	4"	9'-10"	4'	7'-10"	10-3/4"	8800

*Dimensions shown are approximate and should not be used for construction.

**Typical motor weight used, actual weight may differ.

VSSG compressor capacity and design limitations - standard models

Description	VSSG 291	VSSG 341	VSSG 451	VSSG 601
Rotor diameter (mm)	240	240	240	240
Gatorotor diameter (mm)	220	225	225	240
Max. HP 3600 RPM *	500 HP			
Max. allowable torque	739 ft. lbs.			
Rotor speed (RPM) *	1200-4200			
Direction of rotation	CW Facing Drive End			
Drive type	Direct drive, electric motor, gas engine			
Built-in volume ratio	1.2 to 7.0 (Continuously variable automatic, or manual control)			
Capacity range	10% to 100% (Continuously variable automatic, or manual control)			
Bare comp. MAWP (psig) **	535			
Max. pressure differential (psig) ***	325			
Min. inlet temp. (°F)	-50°F			
Max. inlet temp. (°F)	180°F			
Max. disch. temp. (°F)	225° (Contact Vilter for increased temperature limits)			
Max. oil temp. (°F)	190° (Contact Vilter for increased temperature limits)			

*Higher limits are available. Consult Vilter Manufacturing LLC.

**Higher discharge pressures are achievable. Consult Vilter Manufacturing LLC. for approval.

***Higher differential pressures can be achieved. Consult Vilter Manufacturing LLC. for approval.

Note: MAWP (Maximum Allowable Working Pressure). The relief valve setting must be below the MAWP. The relief valve is usually set 10% lower than the MAWP.

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