

HIGH PRESSURE CNG REFUELING SOLUTIONS

Intermech BBR/FBR/VIP CNG Compressors (75-600 hp)



Atlas Copco

Compressed Natural Gas

Compressed Natural Gas



Atlas Copco: Committed to your sustainable productivity

▶ Atlas Copco

Atlas Copco is an industrial group with world-leading positions in compressors, expanders and air treatment systems, construction and mining equipment, power tools and assembly systems. The company founded in 1873 is based in Stockholm, Sweden, and has a global reach spanning more than 170 countries.

All around the world, companies rely on Atlas Copco's expertise and innovations to contribute to their business growth. Atlas Copco helps them cut costs and boost productivity while taking care of the environment.

With a comprehensive product offering, Atlas Copco is a trusted partner in the Compressed Natural Gas (CNG) industry. Atlas Copco invests heavily in R & D to ensure that the latest technology is available to their customers.

▶ Benefits of working with Atlas Copco

Gas station owners require their CNG compressors to be reliable and energy efficient with no compromise on safety. Gas stations rarely have stand-by compressors - therefore reliability is an extremely important criteria when investing in the right compressor. The Atlas Copco CNG machines are built to run trouble free with long service intervals and are ideal for such a demanding application.

Gas station owners look for the lowest operating costs. Atlas Copco range of INTERMECH BBR /FBR /VIP machines ensure one of the lowest operating costs in the market which adds to the bottom line of the gas station owner.

Gas stations prefer working with Atlas Copco CNG products. These machines produce dense cool gas

▶ Major innovation

1895

Crepelle introduces the first horizontal piston compressor.

1921

Greenfield (earlier known as Sulzer Burckhardt) develops a methane compressor for filling vehicles.

1930

Crepelle introduces the first process gas piston compressor.

1960

Crepelle introduces the first teflon ring oil free piston compressors.

1993

Intermech launches first BBR horizontal balanced opposed CNG compressor with direct coupled pressurized crank case.

1980

Intermech launches the first dedicated CNG compressor with W configuration.



ensuring safe filling of all storage cylinders and more standard cubic meters are filled into each vehicle or trailer. Reliability, cost efficiency and good performance makes Atlas Copco's CNG compressors preferred by gas station owners.

The station owners look upon the compressor vendor to assist them with reliable aftermarket support. Atlas Copco with its qualified team of aftermarket specialist and presence in over 170 countries is well equipped to meet such demands.

1994

Intermech launches the first mother-daughter station in North-Western China.
Greenfield launches the "DM" CNG compressor range, with "oil-less" technology.

2005

Atlas Copco acquires Intermech with its range of CNG compressor and accessories.

2009

Atlas Copco launches the variable inlet pressure daughter station compressor with VSD drive to be one of the best in class.

1997

Atlas Copco acquires Crepelle based in Lille, France.

2007

Atlas Copco acquires Greenfield and its complete CNG business.
Atlas Copco launches the FBR gas engine driven compressor and broadens its CNG market further.

2012

Atlas Copco expands its CNG production lines in Houston (USA), Lille (France), Wuxi (China) and Pune (India).

Atlas Copco total CNG solution

▶ Atlas Copco INTERMECH BBR/FBR/VIP stations are appreciated for their quality, safe operation, smooth running and compact design.

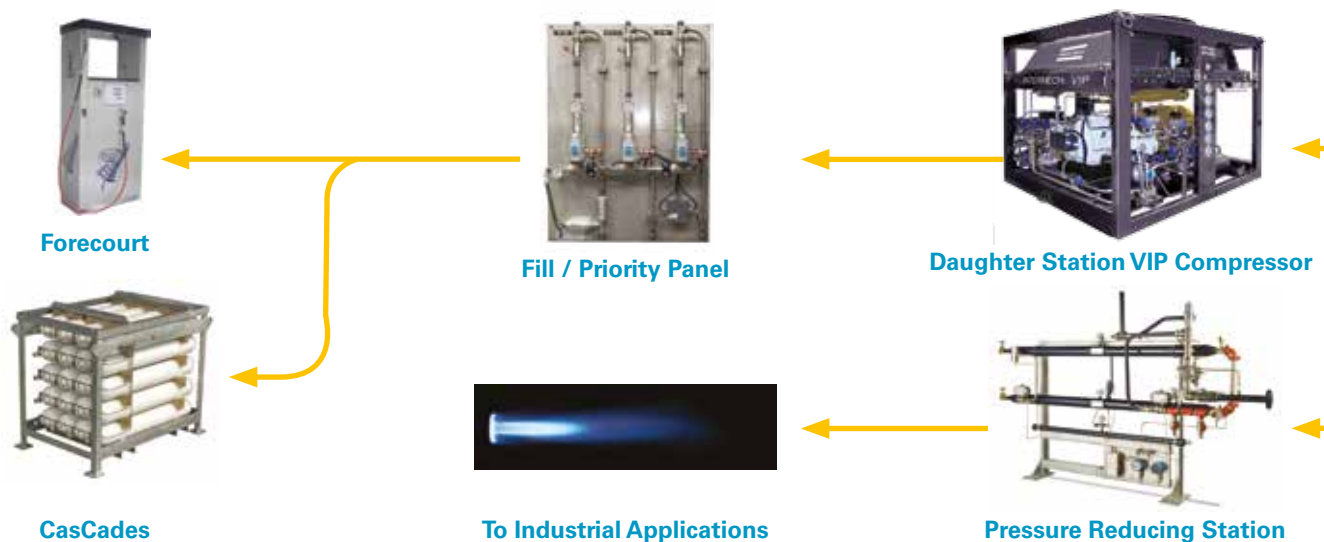
Online Station - Standard

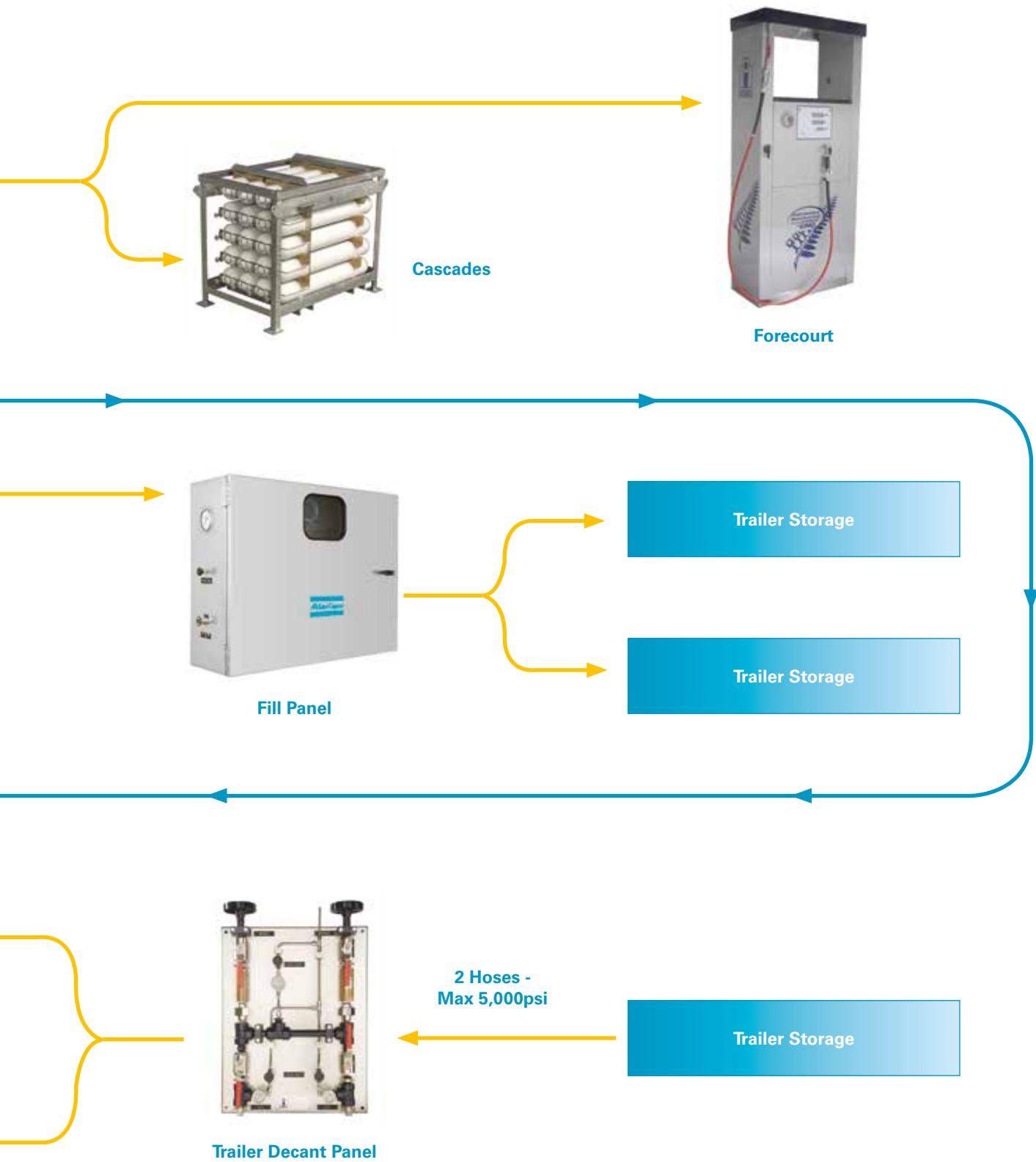


Mother Station - To truck



Daughter Station - From truck





* Component not required for dedicated trailer filling station

The three pillars of productivity



1. High Reliability High Reliability High Reliability

Atlas Copco CNG compressors are highly dependable and keep on performing with minimal cost of ownership.

Low maintenance due to direct drive

- ▶ Avoids lateral loads on crankshaft and bearings
- ▶ Belts not required to be replaced every six months

Air cooled machines for trouble free running

- ▶ Air cooled machines avoid stoppages due to scaling, pump and cooling tower failures
- ▶ ASME designed air cooled heat exchangers with straight seamless expanded L-finned tubes for life long duty

Soft starter* enhances component life

- ▶ Reduces electrical shock loads and results in longer life

Maximum up-time due to 100% matched components

- ▶ Integrated inter-stage separators extract oil and aerosols from the gas stream and provide pulsation dampening after each stage therefore extending valve life
- ▶ Generous sizing of downstream coalescing filters result in long change intervals
- ▶ Use of heavy duty roller bearings and fullflow pressurized lubrication system for the bearings



* Applicable to specific models, refer specific technical quotes for details



Mini lube design gives longer life

- ▶ Metered drop lubrication of cylinders through separate lubricator divider system reduce wear on rings
- ▶ Restricted piston speeds result in longer ring and valve life
- ▶ Synthetic rings result in low friction and reduced wear

Reduced maintenance due to low temperature

- ▶ Low discharge temperatures by proper staging and large oversized efficient intercoolers, result in longer valves and piston life.
- ▶ Separate oil cooler extends period of oil change

Minimum vibrations reduce maintenance

- ▶ Horizontal balanced opposed design and 3 dimensional balancing of components result in low vibrations
- ▶ Concrete filled H-frame with integrated blowdown vessel and 3 point vibration pads further reduce the vibration of the package

Reliability through material design

- ▶ Use of latest technological advancement in material selection, valve selection and surface coating technology
- ▶ High quality oil flooded mechanical seal
- ▶ Superior material of the crankshaft

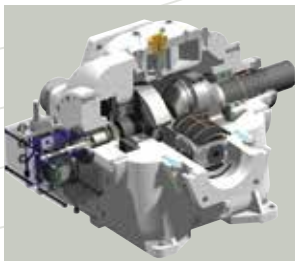


The three pillars of productivity



2. Smart Energy Smart Energy Smart Energy

With energy consumption costs typically accounting for 80% of the total cost of ownership, the Atlas Copco range of INTERMECH CNG compressors are unmatched in their ability to provide guaranteed energy efficiency.



Zero leakage through pressurized crankcase

- ▶ Pressurized crankcase up to 25 bar(e) results in zero gas loss to atmosphere
- ▶ Gas savings of up to 3% over unsealed compressors at first start up. After time the wear causes the unsealed compressors to leak more, resulting in saving up to 6% with a sealed crankcase.
- ▶ Payback of the complete compressor within few months just on gas saving



Unloaded soft starting

Part load power consumption is reduced by a combination of integrated blowdown vessel, soft starter and smart PLC programming / controls. This allows the compressor to be programmed to load / unload, start / stop as per consumption levels.





Optimized Package design

- ▶ Oversized heat exchangers have low approach temperatures and efficient intercooling, reducing power consumption
- ▶ Generously sized internal piping and vessels have the lowest pressure drop resulting in lower power consumption



Direct drive

- ▶ Up to 1800 rpm compressor running speed for direct coupling of compressor to the prime mover, gas or electric
- ▶ No belt transmission losses results in saving up to 5-7% of total energy costs



Efficiency through design

- ▶ Optimized number of stages ensure low power consumption
- ▶ Balanced opposed design and high degree of balancing of components, forces and dynamic loads allow close tolerances ensuring high volumetric efficiency
- ▶ Wear and tear is reduced due to smooth running and minimal vibrations leading to lower power losses



The three pillars of productivity



3. Safety Safety Safety

With many years of experience in CNG compressors and an enviable track record of safe operation extending over millions of compressor running hours, safety is an integral part of all our CNG compressors.

Safety due to design

- ⦿ The design of Atlas Copco CNG machines refers to international codes like TEMA, API and ASME assuring safety.
- ⦿ Control system are designed to monitor critical control points to guarantee safe operation
- ⦿ Machines are designed for zoned area using explosion proof motors and suitable instruments
- ⦿ CSA / NFPA 37 approved gas engine
- ⦿ CSA insulated and sealed electronic digital ignition

Safety due to modern manufacturing

- ⦿ All components are built as per the latest industry standards using the state of the art for machining , welding and assembly. Modern welding techniques with ASME qualified welders are used to construct the rugged designs
- ⦿ Optional independent third party design verification of all pressure vessels, welding procedures and hydrostatic pressure tests





Safety due to worldclass sub vendors

- ▶ Our philosophy of "Safety First" ensures that we qualify our vendors based on their safety track record . Our critical key components are sourced from world renowned companies who have built a reputation of safety and reliability in the oil and gas market

Safety due to quality

- ▶ Atlas Copco's philosophy is to provide customers with products that have been designed, manufactured and serviced to internationally recognized ISO 9001 quality assurance standards. This ensures that there is full documentation and traceability of all materials and components



Safety due to Testing

- ▶ Each compressor is fully performance and safety tested with natural gas at its designed capacity at a state-of-the-art test facility with optional 3rd party certification.

Safe installation

- ▶ Integrated design including pre-piped pulsation dampeners cum separators, blowdown vessels, suction and discharge filters and non return valve ensure that the installations are designed to promote safety features
- ▶ Atlas Copco's experienced technical and field staff ensure safety guidelines are explained

Atlas Copco range of compressors

▶ INTERMECH BBR & FBR compressors with electric motor or gas engine

Package scope:

- ▶ Inlet filter to compressor block
- ▶ Pressurized crankcase up to 25 bar(e)
- ▶ Electric motor/gas engine drive
- ▶ Flexible direct coupling with coupling guard
- ▶ Air cooled intercooler/aftercooler and air cooled oil cooler
- ▶ Piping / stainless steel tubing
- ▶ Integrated moisture separator / pulsation dampener
- ▶ Duplex final filtration using coalescing filters to remove aerosols to less than 5 ppm
- ▶ Integrated blowdown vessel
- ▶ Lubricating system including gear pump, oil filter
- ▶ Necessary instrumentation as per area classification



Standard features:

- ▶ Standalone PLC based control panel
- ▶ Soft starter above 110kW
- ▶ Star delta starter 110kW and below

Compressor service characteristics:

Lubrication	Top up daily
Valves	6000 h
Over haul	15000 h
Main bearings	35000 h

Optional features:

- ▶ Acoustic canopy suitable for 75 dBA
- ▶ Weatherproof canopy
- ▶ 3rd party certification
- ▶ Gas detector
- ▶ Flame detector
- ▶ Bleed and block valves for instruments
- ▶ Flameproof lighting
- ▶ Remote monitoring
- ▶ VSD soft starter
- ▶ Chain hoist system



Advanced solutions with custom design

▶ Customize standard products to customer requirements

We customize our machines to offer tailor-made solutions for real-time country conditions.

Our solutions include:

- ▶ Weatherproof acoustic enclosure for outdoor duty
- ▶ Operation in sub-zero temperatures
- ▶ Peak performance in very high ambient and dusty environments
- ▶ Corrosion resistance for windy, coastal and offshore applications



One such customization is the Mobile Refueling Unit (MRU)

Sometimes a mobile solution is required for remote location wherein the complete gas station is to be mounted on a movable trailer

This may be a temporary station used for checking the feasibility of the site or as a solution to be used till the time the permanent daughter station is set up.

The Atlas Copco Mobile Refuelling Unit or MRU is a self-contained, skid-mounted unit for the compression, cooling, storage, and dispensing of CNG. Mounted on a semi-trailer truck, it is quickly transportable and can be used as a mother, daughter or conventional station. Housed in its acoustic canopy the MRU creates minimal sound disturbance.

It includes

- ▶ On board CNG dispenser
- ▶ Priority control system
- ▶ Flexible hose for connection to CNG trailer or gas mains
- ▶ Pressure reduction system for trailer operation
- ▶ Metering and regulating system
- ▶ On board storage cascade

The MRU is a compact design and light weight. It is easy to install and operate.

Variable inlet pressure (VIP) compressor



The Atlas Copco range of INTERMECH VIP models are 2-stage compressor packages especially designed for daughter station service. They ensure efficient and quick unloading of trailers.

Match trailer pressure to avoid costly regulation and re-compression:

The VIP package utilizes the pressure of the trailer gas to reduce daughter station power requirements. Conventional daughter station compressors use

a pressure reducing valve or a regulator to bring down the trailer pressure to 30-40 bar(e) and then recompress the same to 250 bar(e). The INTERMECH VIP uses a combination of innovative valve switching and a variable speed drive to accept the variable inlet pressure.

Why choose an efficient VSD daughter station?

Variable inlet pressure

- ▶ No pressure reduction and use pressure of trailer
- ▶ Lowest energy cost

Inverter VSD drive

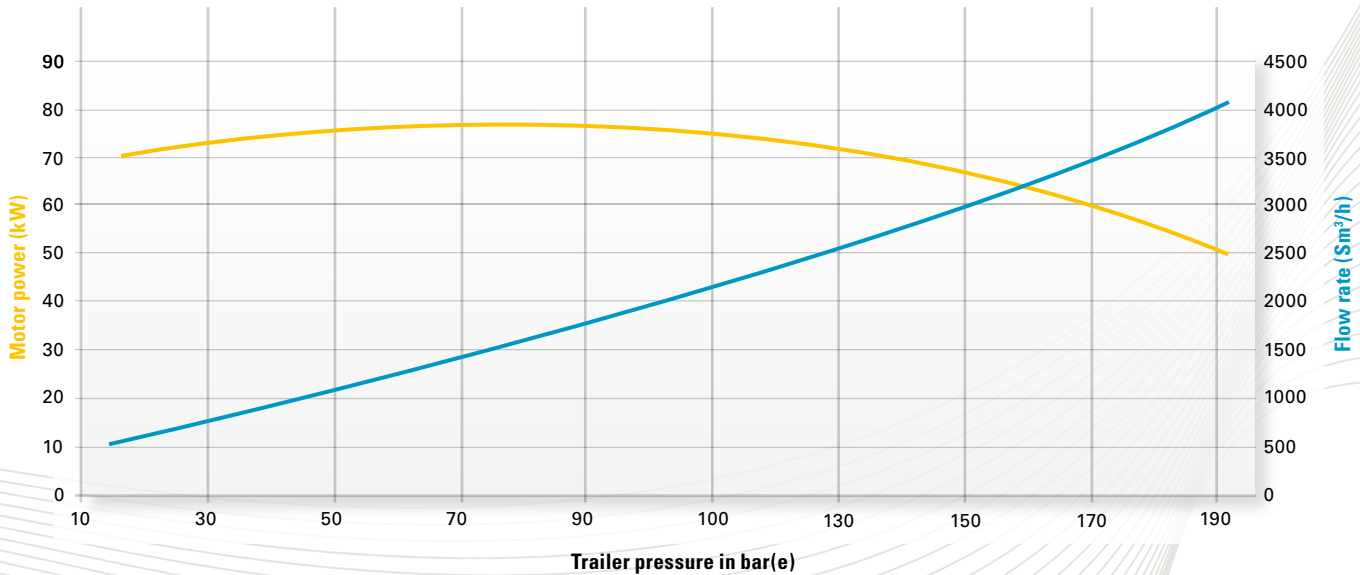
- ▶ Runs at different speeds depending upon suction pressure
- ▶ Maximum capacity specially at lower pressure
- ▶ Less time for unloading

Largest operation band

- ▶ Can work to minimum 15 bar(e) trailer suction pressure
- ▶ 8 % more gas unloaded as compared to others
- ▶ Less gas returned in each trip
- ▶ Less transport cost and quicker turnaround



Representative INTERMECH VIP 2715 D Performance Chart



Average flow rate: 1590 Sm³/h* considering reference conditions and correct installation as per Atlas Copco guidelines

— Power (kW)
— Flow rate (Sm³/h)



Integrated oil tank

- ⦿ Cylinder lubrication from gravity fed integrated oil tank
- ⦿ Simplifies daily maintenance (no separate reservoir)

Footprint

- ⦿ Extremely compact

* Typical average flow between 190 - 15 bar(e) suction pressure actual performance depends upon pressure range, trailer volume, installation, gas properties and ambient conditions.

CNG accessories

▶ CNG accessories

The Atlas Copco CNG accessories are a result of over 30 years of design philosophy crafted to deliver equipment that is highly functional and robust, with full flow and minimal restricting points. They are working in numerous installations giving trouble free service to gas station owners, day after day.

Priority fill panel

In case of fluctuating demand especially for public gas stations, a 3 bank system helps to decant more gas than a single bank system. It also helps in reducing NGV fill times and reduces potential service problems of the compressor.

Priority panels allow compressors to top up vehicles before directing the to the gas storage tank.

Atlas Copco wall mounted priority fill panels use

- ▶ Generously sized connections and piping from reputed brand



- ▶ Mechanical prioritisation
 - Have special springs loaded to achieve excellent memory and consistent efficient sequencing
 - Have full bore for high flow
 - Are hand adjustable
 - Are designed to prevent lower than set pressure in the storage vessel

Electronic prioritisation

- High flow rate design is achieved by use of 1/2" air actuated normally closed ball valves - in the event of air failure valves will be shut off by spring.





- ▷ Atlas Copco non return valves
 - Proven for non-jamming technology
 - Incorporates cleanable SS mesh filters



- ▷ Very large bore emergency air actuated ball valves to isolate forecourt dispensers from high pressure gas flow sources



Model	Prioritization	Number of lines	Capacity up to Sm ³ /h	Dimensions
FPA 17 A	mechanical	4	2500	0.3 x 0.6 x 1.1
FPA 19 A	mechanical	3	2500	0.3 x 0.6 x 1.1
FPA 23 A	electronic	3	5000	0.26 x 0.85 x 1.15
FPA 31 A	electronic	4	10000	0.4 x 1.45 x 1.45

CNG accessories

▶ Gas flow systems

Atlas Copco has a large range of gas flow systems which are designed for:

Energy efficiency:

Engineered solutions to provide the highest flow rate by incorporating efficient low pressure drop by using very large bore fittings, tubing and hoses.

Reliability:

- ▶ Zinc plated fittings and stainless steel tubing from worldclass manufacturers
- ▶ Stainless steel frame or weather-proof stainless steel IP 23 cabinet (optional) to ensure long life
- ▶ Instrumentation from world-class manufacturers

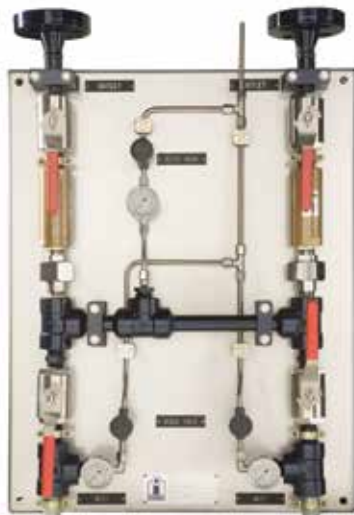
Safety:

- ▶ Break-away coupling to ensure safe operation
- ▶ Flame proof emergency push button

Some examples

▶ Trailer decant post DMA-TD2

Twin hose trailer decanting 70 kg/min fitted with nozzle designed to ISO 7241-1AS



▶ Trailer fill panel DIN-100 M1W

Single hose metered cabinet dispenser suitable for 100 kg/min



▶ Cascade

Atlas Copco 3 - bank buffer storage are fully corrosion resistant and designed to the most stringent international standards and regulations. These form an integral part of the total station solution.



Benefits:

As per international standard

- ▶ 30 mm air gap between all cylinders.
- ▶ Features burst disks on all valves to relieve gas pressure slowly in the event of an emergency
- ▶ Feature at least 3/8 inch (9.525 mm) SS Pigtail connection for thermal and shipping movement allowance

Standards and Approvals

- ▶ DOT – 3AA standard cylinders used
- ▶ Compliant with NZS5425 which requires access to all valves at less than 1.5m of height

Model	Low bank	Medium and high bank	Dimension
CAS 2054 A/B	20 x 50 WL	12 x 50 WL + 8 x 50 WL	1.94 x 1.64 x 1.2
CAS 3054 A/B	30 x 50 WL	18 x 50 WL + 12 x 50 WL	1.94 x 1.64 x 1.5
CAS 4054 A/B	40 x 50 WL	24 x 50 WL + 16 x 50 WL	1.94 x 1.64 x 1.7

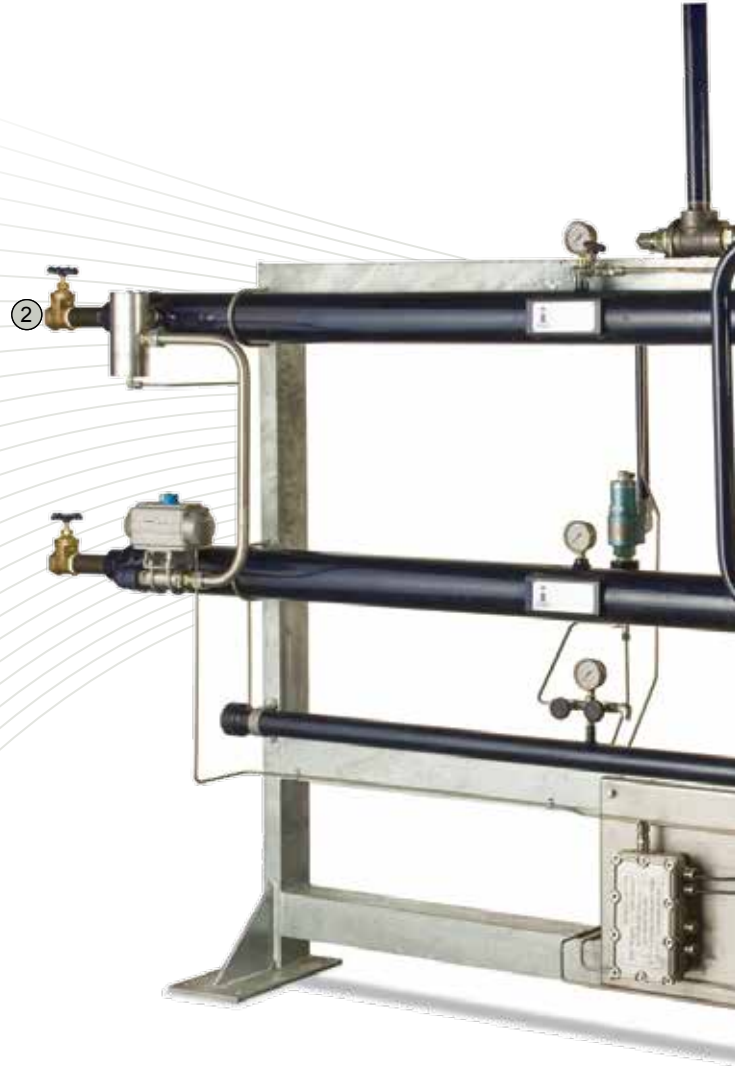
CNG accessories

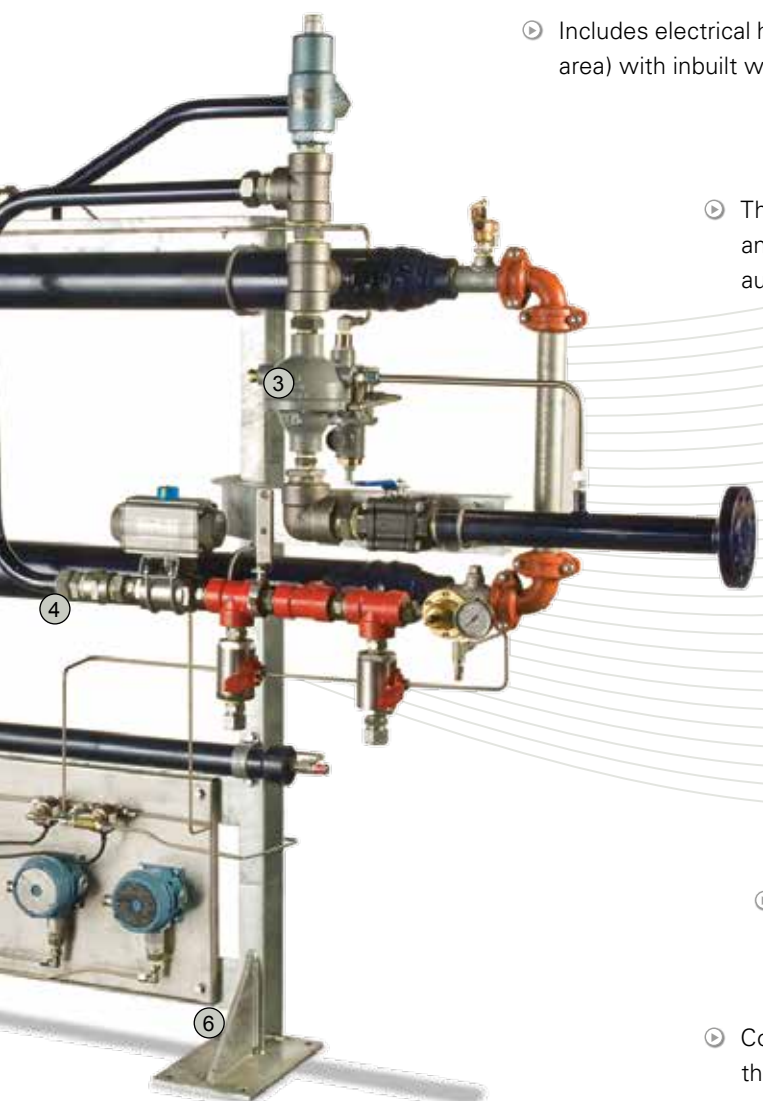
▶ Pressure reducing system (PRS)

Atlas Copco PRS reduce gas pressure from as high as 259 bar(e) to an exact output pressure (50 – 1 bar(e)) without hydrate (icing) formation. They drain trailer to extremely low pressure. The CNG is heated before regulation by using hot water available from the customer. We get an accurate output pressure from the PRS.

PRS Principle components – features and benefits

- 1 TEMA design water-in-tube shell and tube heat exchangers
- 2 Atlas Copco full bore spring or dome loaded regulator valves for regulating pressure in the first stage
- 3 Accurate high flow final Regulator
- 4 Atlas Copco non return valves proven for non-jamming technology
- 5 Pressure gauges and relief valves on both stages and discharge
- 6 Galvanized frame and feet, pre-drilled for concrete anchoring to minimize corrosion





PRS*:

- Includes electrical heater (loose supply – suitable for safe area) with inbuilt water pump and temperature controller
- The on board PLC system monitors flow , pressure and temperature and controls actuated valves for automated control of the PRS
- Inlet filter to remove particles and protect equipment

Advantages:

- When trailer pressure reaches critical level the first stage of regulation and heating is cut out to maximize system efficiency. This helps to maintain flow rate down to very low trailer pressure
- In the event of water temperature drop the PRS automatically shuts down, preventing damage to tubes
- Completely compatible with Atlas Copco trailer decant panel, the PRS provides an option of trailer pressure monitoring and seamless transition from empty to full trailers

Performance:

Model	Capacity
PRS 010*	Upto 1000 Sm ³ /h
PRS 060*	Upto 3000 Sm ³ /h

Our parts and service offering



▶ Global presence – local service

At Atlas Copco, our responsibility does not stop when the product is delivered. Guaranteed serviceability ensures optimum availability and reliability of your CNG systems with the lowest possible operating costs.

Checks by Atlas Copco expert technicians following factory standards minimize the risk of breakdowns and production loss. Through an audit of your production process, we can optimize the performance of your equipment. We do that with a keen eye on maximum availability at lowest cost.

We deliver this complete service guarantee through our extensive service network established in over 170 countries of the world through our own companies or our partners

▶ The value of Atlas Copco support plans:

- ▶ Most cost-effective approach
- ▶ Longer life expectancy for your compressor
- ▶ Global presence, local service, never more than a phone call away
- ▶ Quality and productivity
- ▶ Dedicated local support in your language
- ▶ Support around the clock
- ▶ World-class logistics
- ▶ Committed service personnel
- ▶ Complete diagnostic reports after every inspection
- ▶ Proactivity: service ahead of time

Technical specifications

Model	Inlet Pressure Range (bar(e))		Nominal Sm ³ /h at 1485rpm (50Hz)		Nominal Sm ³ /h at 1650rpm (gas engine)	
	Min	Max	Min	Max	Min	Max
4 stage						
INTERMECH BBR 107 series	0.5	1.3	468	724	517	800
INTERMECH BBR 100 series	1	2.8	515	996	568	1097
INTERMECH BBR 90 series	2	4.5	645	1204	713	1330
INTERMECH BBR 80 series	2.5	7	620	1452	685	1600
INTERMECH BBR 60 series	4.5	12	598	1452	660	1605
3 stage						
INTERMECH BBR 50 series	5	12	632	1490	696	1643
INTERMECH BBR 42 series	5	18	445	1600	492	1770
INTERMECH BBR 40 series	5.5	20	420	1555	460	1720
INTERMECH BBR 35 series	6	22	423	1548	468	1714
INTERMECH BBR 32 series	7	25	435	1566	481	1734
INTERMECH BBR 30 series	8	29	430	1569	469	1734
2 stage						
INTERMECH BBR 37 series	18	40	1162	2965	1288	3290
INTERMECH BBR 32 series	18	50	875	2875	970	3191
INTERMECH BBR 27 series	22	70	745	2961	826	3287

Model	Nominal Sm ³ /h at 1485rpm (50Hz)			
	Min	Max	Min	Max
4 stage				
INTERMECH FBR 107 series	1	5.2	556	2075
INTERMECH FBR 90 series	3.5	12	933	3034
3 stage				
INTERMECH FBR 62 series	5	12.8	916	2547
INTERMECH FBR 60 series	6	16.8	969	3016
INTERMECH FBR 55 series	7	25	834	3525
INTERMECH FBR 50 series	8	28	893	3638
INTERMECH FBR 45 series	9	32	797	3365
2 stage				
INTERMECH FBR 52 series	17	39	1831	5346
INTERMECH FBR 50 series	20	50	2002	6464
INTERMECH FBR 45 series	23	63	1816	6696
INTERMECH FBR 42 series	24	70	1707	6808

VIP	Inlet Pressure Range (bar(e))		Nominal Scmh at 1485rpm (50Hz)	
	Low	High	Low	High
VIP 2715	15	190	550	3650
Average Flow	1590 Sm ³ /h			

* Reference conditions:

1. 1 bar(e) ambient temprature 20, gas inlet temprature 20
2. Specific gravity: 0.6
3. Due to continuos improvement we reserve the right to change these capacities.
4. Capacity given above are for standard models, please contact Atlas Copco for other capacity.

COMMITTED TO SUSTAINABLE PRODUCTIVITY

We stand by our responsibilities towards our customers,
towards the environment and the people around us.
We make performance stand the test of time.
This is what we call — Sustainable Productivity.

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