

Atlas Copco H & H2-Pack Compressors

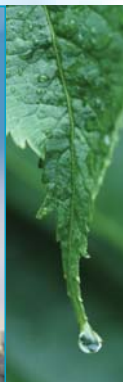
Engineered and pre-engineered process compressors



FOR A
CLEANER
ENVIRONMENT

Atlas Copco

From a yellow past to a green future



Catalytic cracking holds little secrets for today's petrochemical plant. But among the components that emerge from this process, sulphur is definitely on the blacklist. The increasing concern for our environment, embodied in initiatives such as the Kyoto protocol, put ever more stringent demands on refineries to deal with sulphur once and for all.

Sulphur - the point of no return

Where the allowable sulphur content in car fuel was still 500 ppm in 1996, the European Union wants a reduction to 10 ppm by January 2009. More than 80 countries have put similar stringent legislation in place, stimulated by the negative impact of sulphur on air pollution and on the proper operation of catalytic converters in cars.



Hydrogen comes to rescue

Hydrodesulphurisation has proven to be an effective method to reduce sulphur content in the refinery process, despite the hydrogen consumption and the high temperature and pressure requirements. New methods to counter the negative effect on the octane number, such as two stage HDS and the use of specific catalysts hold a promising future for hydrodesulphurisation. More than ever, cost efficient and energy friendly equipment in the hydrogen supply system is vital to maintaining a healthy profitability level, even when legislation demands for additional investments in desulphurisation plants.

Hydrogen compressors you can trust

Experienced compressionists

Founded in 1837, Atlas Copco Crépelle has built itself an enviable reputation as a master in compression technology. With an installed base of thousands of machines worldwide and a long term specialization and commitment to hydrogen compressors, Atlas Copco engineers know their customers' business needs.

The strength of an international group

Atlas Copco Crépelle is a company within the Atlas Copco Group, the industry leader in compressor technology, with manufacturing plants and customer centres all over the world. Dedicated teams worldwide will ensure that your investment is in good hands.

Worldwide service organisation

Expert technicians are only a phone call away. They speak your language and know your business. A quick intervention will solve every problem without delay. World class logistics and strategically placed warehouses ensure that original quality spare parts are there when you need them.

Quality and EMS certified

Atlas Copco Crépelle is certified to design and manufacture according to the ISO 9001 quality standard. Its Environmental Management System is certified to the ISO 14001 standard. More important than these qualifications is the commitment of the Atlas Copco team to win and keep the customers' trust.



Atlas Copco Crépelle is ISO 9001 certified.



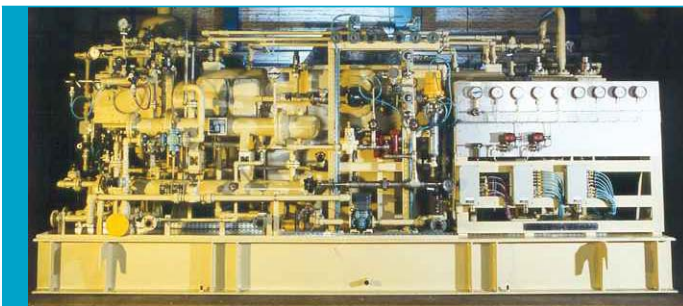
The Environmental Management System at the production facility in Lille, France, is ISO 14001 certified.

Pre-engineered to meet your budget

To counter the increased investment requirements in desulphurisation, Atlas Copco offers H2-PACK, a range of pre-engineered hydrogen compressor packages. The H2-PACK range benefits from the accumulated engineering expertise and the economies of scale of the Atlas Copco organisation. Contrary to typical engineering projects where lead times are long and development costs high, H2-PACK can be built as soon as the order is signed.



- equipment, instrumentation and options tailored to the refinery business
- standardisation in design and packaging, optimised for low production costs
- compliant with API 618 and high level package standards
- fast response to quotation requests
- minimal delivery times



Atlas Copco Crépelle has installed numerous hydrogen compressors around the world.



Pre-engineered to meet your process requirements

Despite the pre-engineered design, the H2-PACK range can cover most hydrodesulphurisation requirements. The different models offer single or two-stage compression, a wide range of inlet and outlet pressures, capacities, power ratings etc. And because the customer is king, many of these features can be adjusted to individual requirements.

In short, H2-PACK combines the flexibility of custom design with the efficiency of standard production.



- oil-free (mini-lubrication on request)
- single or two stage compression
- compression ratio: 1.2 to 6 (max. ratio per stage: 3)
- inlet pressure: 15 to 70 bar
- outlet pressure: 30 to 90 bar
- molecular weight of gas:
2 (pure hydrogen) to 15 (hydrogen/hydrocarbons mixture)
- compression power: 150 to 500 kW
- selected frames: HNX2 and HPX2 (two cylinders)
- all designs based on API 618 and ISO13.707



Technical data (typical)

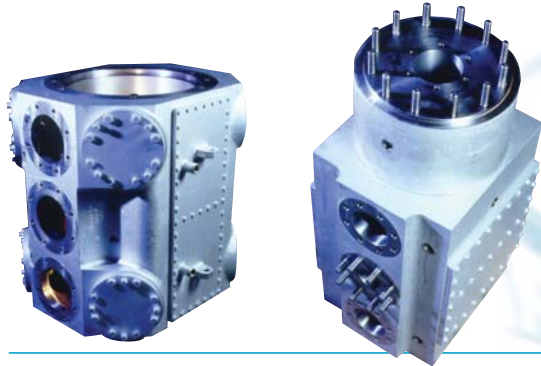
Compressor	Stages	Inlet pressure bar(a)	Outlet pressure bar(a)	Capacity Nm ³ /h	Capacity m ³ /h	Rotational speed rpm	Piston speed m/s
1 EHNX2 GT	1	15 to 70	30 to 90	3800 to 11000	115 to 660	600	3.2
1 EHPX2 GT	1	15 to 70	30 to 90	7800 to 20000	235 to 1040	500	3.3
2 EHNX2 GT	2	15 to 40	70 to 90	1800 to 4300	130 to 150	600	3.2
2 EHPX2 GT	2	15 to 40	70 to 90	3500 to 7800	240 to 290	500	3.3

H2-PACK: proven technology

Every H2-PACK is designed and built according to the API specifications and relies on decades of experience in hydrogen compression. Atlas Copco never compromises when it comes to reliability, energy efficiency, serviceability and safety. The H2-PACK is no exception.

Cylinders

- double acting horizontal cylinders
- suction on top side
- made of nodular cast iron or cast steel (depending on pressure)
- horizontal design avoids accumulation of condensate



Cylinder liners

- fitted as standard
- dry - not directly cooled
- held in position by a shoulder to prevent unwanted movements
- made of cast iron with controlled roughness and hardness



Valves

- valve damping, velocity and material carefully selected according to process
- disk-type or ring-type valve, with Peek or plastic disk
- stainless steel valve seats and guards
- all inlet valves fitted with unloaders of the fail-safe type

Oil-free elements

- piston rings, wear bands and packing rings made of PTFE Compound or synthetic resin
- two compartment distance pieces are API type C standard



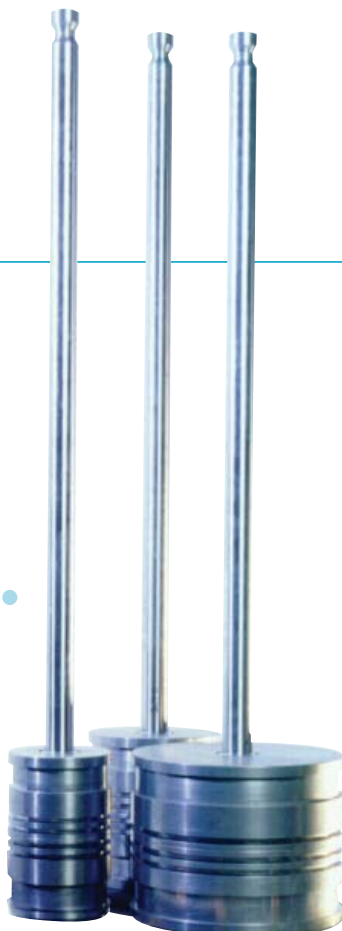
Piston and piston rods

- designed for reduced friction loads, minimum inertia forces and optimum reciprocating force balance
- made of cast iron or aluminium alloy (depending on gases and compression characteristics) with stainless steel ring support
- surface of piston rod friction zones is hardened or coated with carbide tungsten, for a long packing ring life
- compliant with NACE specifications (upon request)
- maximum rod load never exceeds 85 % of design rod load, in all process conditions, including at relief valve pressure
- conservative piston speed (< 4 m/s)
- low rotational speed (< 600 rpm)
- piston to piston rod connection using SUPERBOLT® for maximum safety



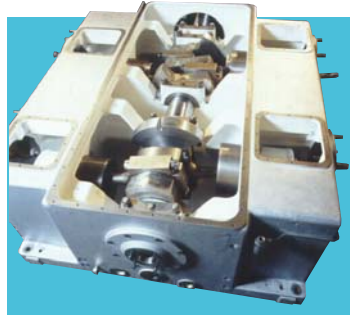
Piston rod packing

- oil wiper packing, intermediate partition packing and cylinder packing are of segmented rings type with garter springs
- stainless steel packing cases
- intermediate partition packing and cylinder packing fitted with purge connection for inert buffer gas
- cylinder packing fitted with vent/drain and liquid cooling connections



Crankcase

- heavy and strong crankcase, with built-in crosshead support
- removable crosshead guide
- double bearing at flywheel end, preventing overloading of large flywheels
- crankshaft driven oil-pump
- forged steel crankshaft and connecting rods
- easy access to all moving parts
- hydraulic tightening of the piston rod onto the crosshead (on HPX2 frame)



Coupling

- direct drive, low speed
- flexible metallic coupling with spacer for easier maintenance
- no wearing parts



Pulsation dampers

- made of low carbon type steel, with post-weld heat treatment
- sized according to API, using in-house developed specialised software
- NACE specification (upon request)



Control and monitoring

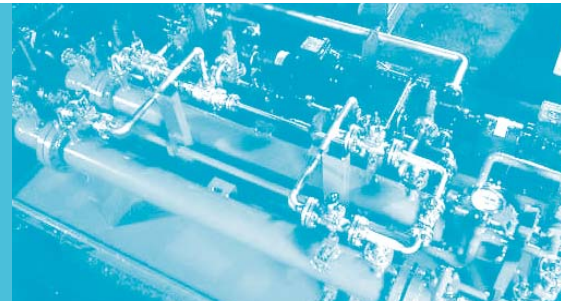
- control panel to be installed in safe area
- based on renowned PLC with Modbus serial link for customer DCS
- local gauge board, installed on the skid, includes main switches and indicators for local control

Stepped capacity control

- model 1 EHPX 2 GT and 1 EHNX2 GT (single stage):
0 – 25 – 50 – 75 and 100 % stepped control
- model 2 EHPX2GT and 2 EHNX 2 GT (two-stage):
0 – 50 – 100 % stepped control

OPTION: water cooling console

- required in case of risk of condensation in the cylinder or poor water quality
- controlled water temperature (heated or cooled) at set-point slightly above gas inlet temperature (conform to API 618 Figure G1).



PACKAGE

The H2-PACK compressors are fitted on three skids that allow for easy transport and containerisation, thus reducing shipping costs:

- compressor skid
- electric motor skid
- oil console skid

The skids are pre-fitted and come ready to install.

Junction boxes are mounted on the skid.

Complete piping and cabling of all instruments are included.

Engineered and built by experts



Design office

Experienced contract engineers form the indispensable interface with the customer throughout the production cycle. Progress meetings are held as part of the certification, and strict and regular follow-up is established in accordance with the Atlas Copco Quality Control Manual.

Research and development

Atlas Copco researchers of the R&D department have powerful computational means at their disposal to develop future technologies, products, components and software, both in the medium and long term. They continuously improve compressors, parts and materials, building on the most recent technological evolutions.



Compressor calculation

Atlas Copco Crépelle has developed its proprietary computational software. It relies on a database that holds all mechanical parameters of the compressors and integrates state-of-the-art thermodynamic calculation algorithms.

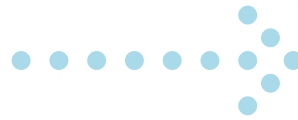
Inspection and testing

Every process compressor is submitted to a comprehensive quality control plan, specifically adapted to hydrogen compressors, conforming to all requirements of the API 618 and common customer requirements. Mechanical operational tests and a complete package shop assembly inspection are always part of the rigorous quality control procedures.

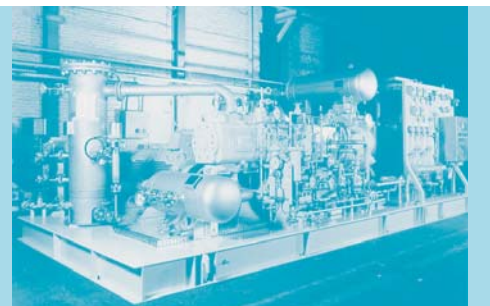


Part of a well respected family

The H2-PACK range is only a small part of a wide range of process air and gas compressors, designed and built by Atlas Copco Crépelle. All these machines share the benefits of global expertise and industry leadership. Below is a comprehensive overview of the “family tree”.



Frame	Max. power kW	Max. rod loading daN	Stroke mm	Connecting rods	Max. speed rpm	Max. cylinder bore mm
HX1	55	2900	120/130	1	750	310
HX2	110	2900	120/130	2	1000	310
HA2	132	3500	150	2	750	405
HA4	250	3500	150	4	750	405
HN2	280	6300	150/160	2	1000	560
HNX4	550	7100	150/160	4	1000	560
HNX2	315	7100	150/160	2	1000	560
HPX2	600	11500	165 to 200	2	750	660
HPX4	1000	11500	165 to 200	4	750	660
HD2	800	20700	165 to 275	2	750	850
HD4	1500	20700	165 to 275	4	750	850



Gas/medium: hydrocarbons, air, carbone dioxide, nitrogen

Compressor shaft power: 30 - 1500 kW / 40 - 2040 HP

Compressor speed: ≤ 1000 rpm

Maximum working pressure:

100 % oil-free: $P_{max} = 90 \text{ bar(g)} / 1300 \text{ psig}$

mini-lub: $P_{max} = 200 \text{ bar(g)} / 3000 \text{ psig}$

full lubrication: $P_{max} = 350 \text{ bar(g)} / 5000 \text{ psig}$

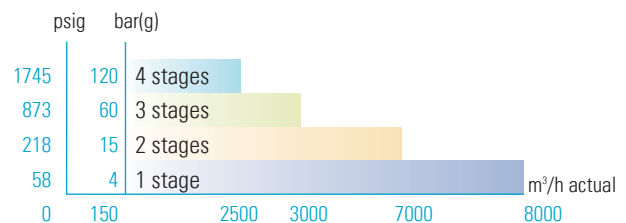
Minimum pressure ratio: 1.2

Minimum working pressure: 2 bar(g) / 30 psig

Minimum suction temperature: -50°C / -60°F

Pressure dewpoint at gas inlet: -80°C / -112°F

Maximum actual flow





The face of innovation

What sets Atlas Copco apart as a company is our conviction that we can only excel in what we do, if we provide the best possible know-how and technology to really help our customers produce, grow and succeed.

There is a unique way of achieving that - we simply call it the Atlas Copco way. It builds on **interaction**, on long-term relationships and involvement in the customers' process, needs and objectives. It means having the flexibility to adapt to the diverse demands of the people we cater for.

It's the **commitment** to our customers' business that drives our effort towards increasing their productivity through better solutions. It starts with fully supporting existing products and continuously doing things better, but it goes much further, creating advances in technology through **innovation**. Not for the sake of technology, but for the sake of our customer's bottom line and peace-of-mind.

That is how Atlas Copco will strive to remain the first choice, to succeed in attracting new business and to maintain our position as the industry leader.