

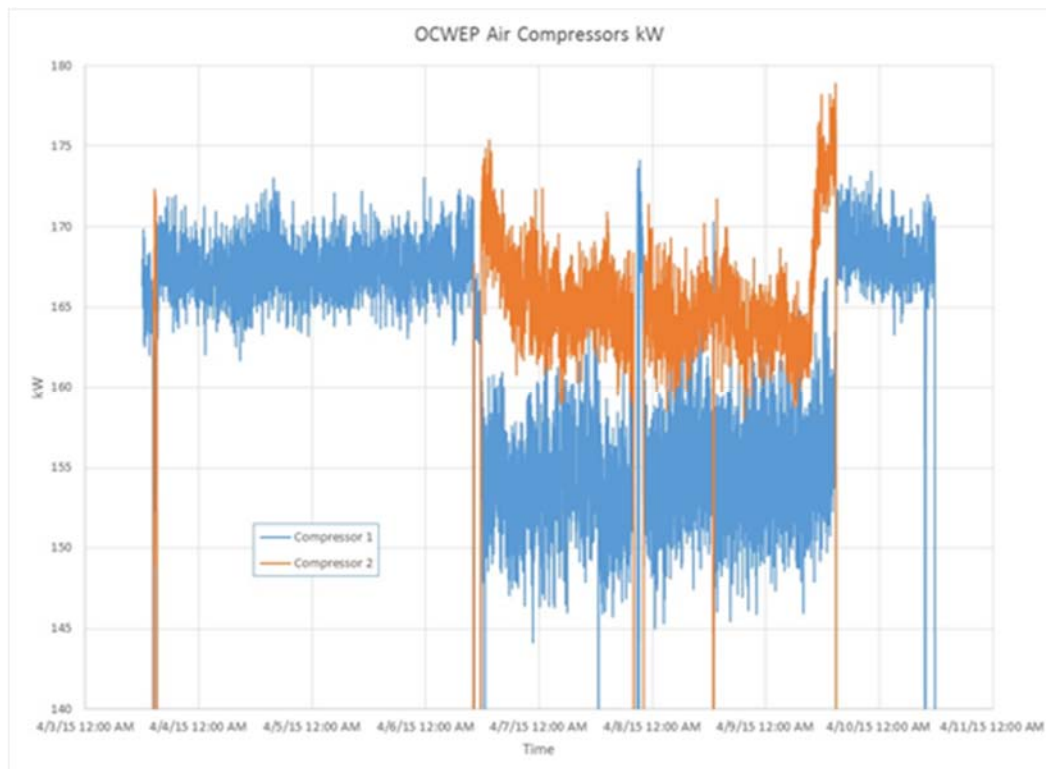


To: Onondaga County Water Environmental Protection
From: Jim Olcott, P.E.
Subject: Preliminary Compressed Air Analysis
Date: May 19, 2015

1. Background

C&S was asked to evaluate a sound attention solution for OCWEP's Baldwinsville Treatment Facility. Upon reviewing the originally proposed solution of an intake silencer, C&S felt the sound was not emanating from the intake of the air compressors but rather from the structural vibration caused by the prime movers. C&S felt attenuation on the intake would have little effect on this vibration. C&S then examined the potential of upgrading the air compressors to remove the cause of the sound at the source. A brochure for a potential replacement product is attached to this memo. C&S installed a true three phase power meter on each of the units over the course of a week. During this period OCWEP operators agreed to run the two machine simultaneously to demonstrate the load profile during excess noise period.

Based on this investigation and subsequent discussions with OCWEP it was determined that the machines are producing compressed air at 50 psi with relatively unregulated flow. This means there is no modulation within the process. The machines simply produce as much air as possible based on the outlet configuration. The figure below demonstrates the results of the metering.



2. Preliminary Calculations

The current configuration will not realize the benefit of a new variable frequency drive machine due to the fact that the units only produce at a single flow. This means that the only savings estimate which can be calculated is that of a newer machine which produces more cfm with less horsepower. The following equation quantifies this opportunity:

kWe = Existing kW of running compressors
CFMe = Estimated existing air flow (cfm)
CFMp = Estimated proposed air flow (cfm) at equivalent kWe
Hr = Run hours of two units
R = Utility blended rate per kWh
S = Cost Savings

Where,

$$S = ((kWe) - (CFMe / CFMp) \times kWe) \times Hr \times R$$

Therefore,

$$S = (325 \text{ kW} - (1,634 \text{ cfm} / 2,064 \text{ cfm}) \times 325 \text{ kW}) \times 8,760 \text{ hrs} \times \$0.10 / \text{kWh}$$

$$S = \$59,313 / \text{yr}$$

Installation Estimate

Without considering the specific conditions onsite and without considering any unique configuration at the facility C&S estimated the following project cost. This pricing does not include any professional services required by OCWEP.

(2x) oilfree VFD machines,	\$190,000
Installation mechanical	\$25,000
Installation electrical	<u>\$35,000</u>
	\$250,000

3. Recommendation

The analysis above is simply intended to demonstrate the potential of the opportunity at its worst case scenario. The effort does not capture the real benefit of this type of solution which would be the utilization of the machines to their fullest extent by enabling the modulation of the load based on the process' oxygen demand. At our last meeting, C&S approximated this additional benefit by simply assuming a 30% average modulation would capture an additional \$75,000, and assuming this modulation comes with a \$50,000 cost effort, the final project outline would be as follows.

Project Cost	\$300,000
Project Savings	\$134,000
Incentive	\$65,000
Payback	1.8 years

C&S recommends that we:

- a. **Quantify the actual load profile throughout the various seasons.** This will help establish the ideal configuration. Not only will this provide additional energy savings but it will ensure the lowest maintenance and capital cost. Additionally, this load analysis will include consideration of various size compressors to ensure the ideal system configuration in order to optimize the system's operations.
- b. **Explore a partnership with National Grid to participate in the funding this work as a design-build project contracted through National Grid.** C&S can initiate the process with National Grid and lead OCWEP through the process. In a design-build scenario, this project might require 6 to 10 months to complete. The primary source of uncertainty in the schedule is the finalizing of the contractual agreement. As a frame of reference, a design-bid-build project might require 10 to 12 months to complete.
- c. **Explore the option of securing a National Grid efficiency grant and letting C&S perform an Article 9 turn-key (professional services) project through one of its existing WEP contracts.** The project might take 4 to 5 months to complete using this arrangement. As a frame of reference, a design-bid-build project might require 10 to 12 months to complete.

Disclaimer The only values that have been completely vetted are the actual existing consumption of the compressors for the three days of operation. The incentive kWh rate is an estimate at this time. National Grid will be consulted for the actual incentive rate. We note that the existing consumption was measured during a non-peak period and that actual annual savings will likely be greater than calculated. Although the installation seems fairly straight forward, actual removal and installation has not been scoped, and no unique situations have been identified such as asbestos abatement or structural concerns. Interaction with the building's heating system was also not considered within this analysis.

Atlas Copco

Oil-free rotary screw compressors



ZR/ZT 55-90 FF & ZR/ZT 90 VSD-FF

55-90 kW/75-120 hp



Atlas Copco

Setting the standard in energy efficiency, safety and reliability

▶ Energy, safety & reliability

The shortest route to superior productivity is to minimize operational cost while maintaining an uninterrupted supply of the right quality of air. The Atlas Copco Z compressor series is focused on effectively saving energy, ensuring product safety – only oil-free machines exclude contamination risks

for 100 % – and guaranteeing the utmost reliability around the clock. And not just today, but day after day, year after year, with minimal maintenance cost, few service interventions and long overhaul intervals.

Core technology

Atlas Copco masters each compression principle and offers the most energy efficient technology for the application.



The right drive

Fixed speed machines are efficient at full load but when air demand fluctuates, a Variable Speed Drive ensures substantial savings.

The innovative accessories

The integrated IMD adsorption dryer offers high quality dry air with the lowest pressure drop and uses the heat of the compressor for regeneration. Two features that lead to significant energy savings.

Optimal use

Central control of a multi-compressor installation reduces the pressure band and achieves the lowest overall energy cost. Optimization also covers operation of machines at their most optimal point.



Oil-free compression

Atlas Copco oil-free screw compressors have compressor chambers completely free of oil. This is possible because there is no metal contact between the precision cut rotors and hence no need for lubrication.



Complete safety

Process, products and environment are safeguarded from contamination. The first air compressors TÜV-certified as "oil-free" (ISO 8573-1 CLASS 0).

Expertise

Since 1903, Atlas Copco's philosophy has been to continually improve our products through intensive R&D, with the aim to maximize the value for our customers.



The integrated design

Internal piping, high end design features, Variable Speed Drive, 100 % matched components... the only way to ensure total reliability.



Trouble-free installation & commissioning

Each machine is tested to ensure it meets specifications, complete security and no surprises. The ZR oil-free compressor is truly plug-and-play. Put it on a flat floor, connect the power line and the air outlet... and push the start button.

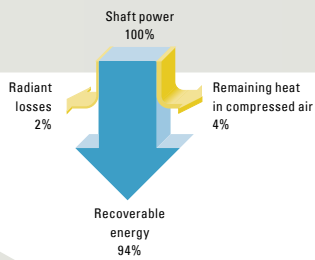




Energy recovery

Heat of compression can be recovered and put to good use in industrial processes like pre-heating of boiler feed water, heating of buildings etc.

Energy



Safety

The professional follow-up

Service Contracts will ensure maximal machine uptime, preventive maintenance, immediate response and genuine spare parts... all over the globe.

Reliability



ISO 8573-1 CLASS 0

Atlas Copco sets a new industry standard

▶ Class zero

When it comes to clean, oil-free compressed air for your critical processes, you can't afford to compromise. Atlas Copco, a pioneer in oil-free air screw technology, is known for its range of compressors designed especially for applications that require oil-free air.

Now Atlas Copco has achieved a new milestone: Setting the standard for air purity as the first manufacturer to be certified ISO 8573-1 CLASS 0.



▶ Why a new class?

Industries such as pharmaceuticals, food and beverages, electronics and textiles must exclude any risk of contamination. Otherwise severe consequences could follow: spoiled or unsafe products, production downtime and damage to both brand and reputation. To address the needs of critical applications where air purity is essential, the ISO 8573-1 compressed air standard was revised in 2001. Along with a more comprehensive measuring methodology, a new and more stringent class was added to the five existing purity classes: ISO 8573-1 CLASS 0.

▶ First to achieve ISO 8573-1 CLASS 0

As the industry leader committed to meeting the needs of the most demanding customers, Atlas Copco requested the renowned TÜV institute to type-test its Z range of oil-free screw compressors. Using the most rigorous testing methodologies available, all possible oil forms were measured across a range of temperatures and pressures. The TÜV found no traces of oil at all in the output air stream. Thus Atlas Copco not only became the first compressor manufacturer to receive CLASS 0 certification, but also exceeded ISO 8573-1 CLASS 0 specifications.

CLASS	Concentration total oil (aerosol, liquid, vapour) mg/m ³
0	As specified by the equipment user or supplier and more stringent than class 1
1	≤ 0.01
2	≤ 0.1
3	≤ 1
4	≤ 5

▶ Atlas Copco eliminates any risk

Only oil-free compressors deliver oil-free air. Whether your activities are in pharmaceutical production, food processing, critical electronics or a similarly exacting industry, it is essential to eliminate risk. That's why you need an Atlas Copco risk-free solution: oil-free screw compressors especially for applications demanding the highest levels of purity. Zero oil means zero risk. Zero risk of contamination. Zero risk of damaged or unsafe products. Zero risk of losses from operational downtime. Above all, zero oil means zero risk of ruining your hard-won reputation.



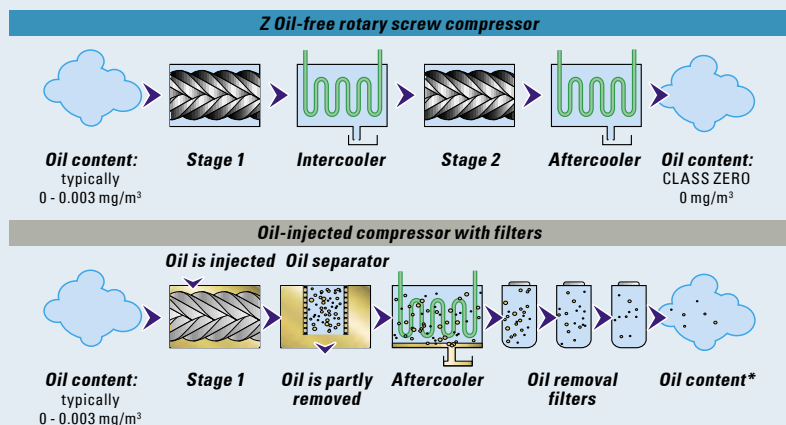
▶ **The most stringent air purity testing available**

Most manufacturers prefer “partial flow” testing, which targets only the center of the air flow. The Atlas Copco Z range of oil-free screw compressors was tested using the more stringent “full flow” method. This examines the entire air flow to measure aerosols, vapors and wall flow. Even with such rigorous testing, no traces of oil were found in the output air stream.

TÜV (Technische Überwachungsverein/Technical Monitoring Association) reporting on the Atlas Copco Z range of oil-free screw compressors

▶ **Can oil-injected compressors with oil removal filters deliver oil-free air?**

Often referred to as “technically oil-free air”, this system relies on air cooling devices (e.g. refrigeration dryers) and several stages of oil removal with multiple components. A failure of any of these components or inadequate maintenance can result in oil contamination of a process. Therefore, with oil-injected compressors there will always be a risk of contamination and the possibility of severe consequences for your business.

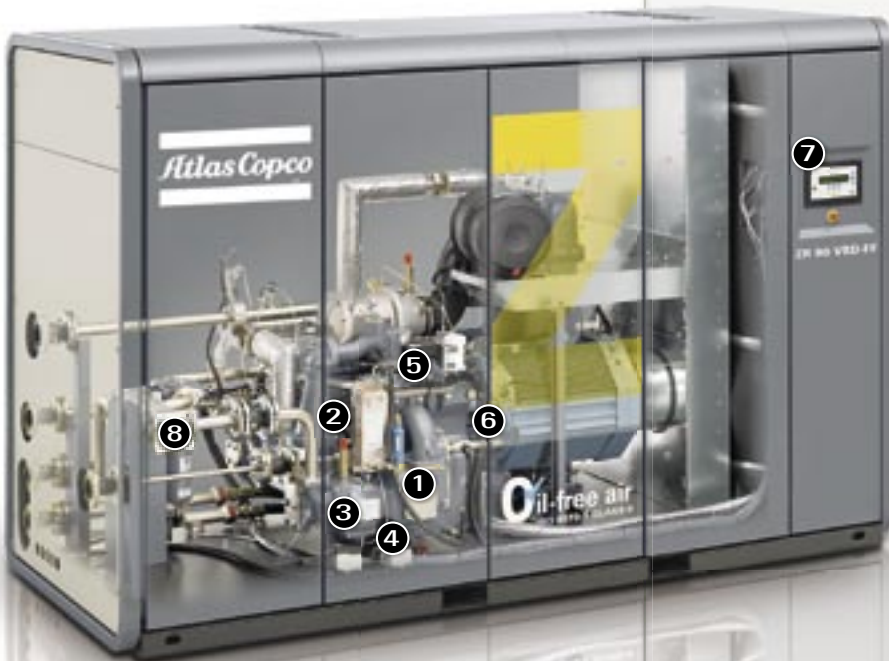


* If low ambient temperature + clean filters = Class 2 edition 2001 ($\leq 0.1 \text{ mg/m}^3$)
If high ambient temperature + saturated filters = Class 3 edition 2001 ($\leq 1 \text{ mg/m}^3$)

Move up to a risk-free standard.
Visit www.classzero.com

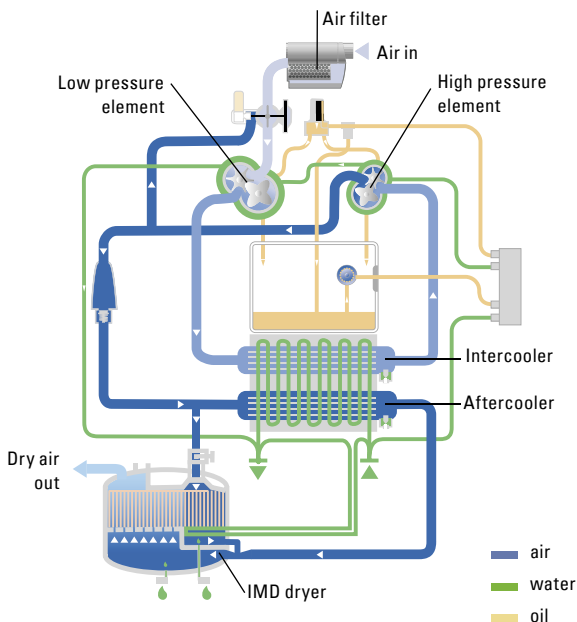
Proven Z-technology in one complete package

- ▶ Watercooled ZR 55-90 VSD-FF
Integrated VSD, Full Feature version
with IMD dryer and Energy Recovery

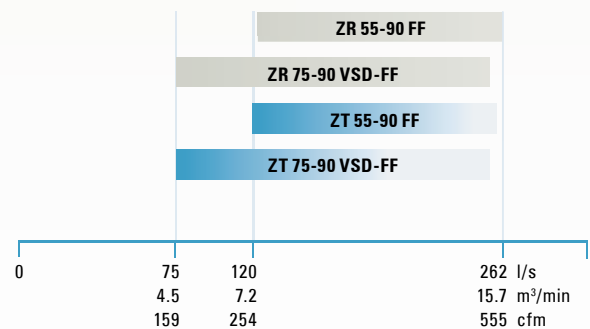


- ❶ High efficiency cooling
- ❷ Element bearings
- ❸ Water separator
- ❹ Electronic water drains
- ❺ Gearbox breather
- ❻ High precision gears
- ❼ Advanced Elektronikon® control and monitoring system
- ❽ Energy Recovery system

- ▶ Watercooled ZR-FF:
air/oil/coolant flow



- ▶ ZR/ZT 55-90 FF and
ZR/ZT 90 VSD-FF
Capacity range (50 & 60 Hz)

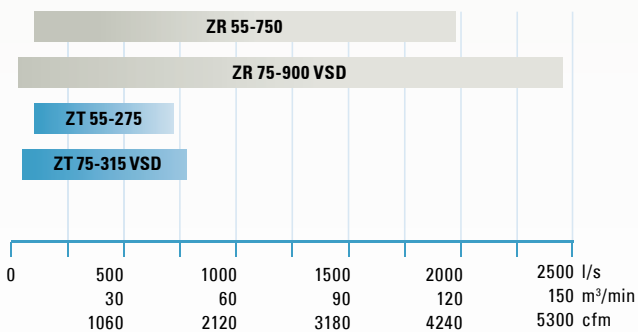


▶ Aircooled ZT 55-90 VSD-FF
Integrated VSD, Full Feature version
with IMD dryer

- ❶ Oil-free screw compression element
- ❷ Advanced Elektronikon® control and monitoring system
- ❸ Gearbox breather
- ❹ High precision gears
- ❺ Electronic water drains

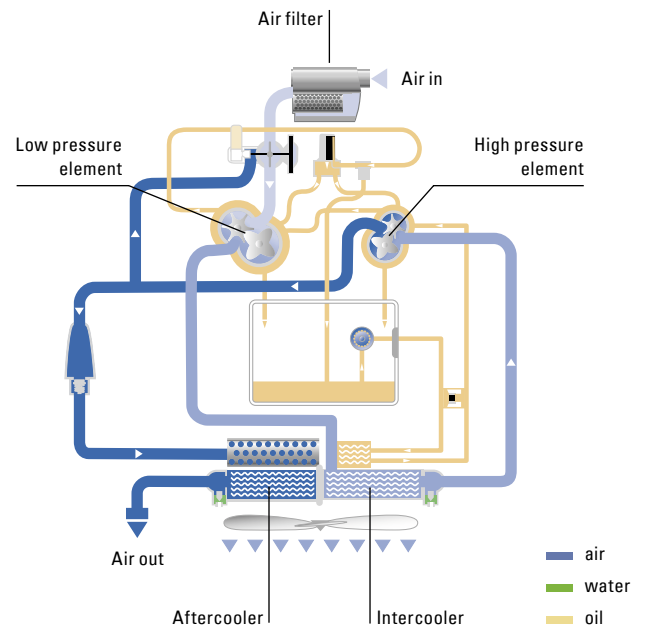


▶ Complete ZR/ZT range



ZT: Aircooled / ZR: Watercooled / VSD: Variable Speed Drive / FF: Full Feature.
See data pages for range details.

▶ Aircooled ZT:
air/oil/coolant flow



Superior design in every detail



▶ Proven Z-technology

World class oil-free compression element

- ▶ 100 % oil-free rotary screw compression
- ▶ high quality air
- ▶ low speed to capacity ratio
- ▶ high overall efficiency, thanks to:
 - superior rotor coating
 - element cooling jackets
- ▶ no oil disposal problems downstream as air is completely oil-free



Superior element bearings

- ▶ high stability under varying load conditions
- ▶ easily adapt to changing loads
- ▶ no need for pre-lubrication/stabilisation time



Effective electronic water drains

- ▶ sensitive and precise operation
- ▶ reliable solid state actuation
- ▶ no loss of air
- ▶ alarm for malfunction on the Elektronikon® display



▶ High precision drive system

AGMA Q13/DIN Class 5 gears in the main drive

- ▶ long lifetime
- ▶ low transmission losses
- ▶ low noise and vibration



Totally enclosed motor

- ▶ IP55 TEFC protection against dust and humidity
- ▶ highly efficient conforming to EFF1





▶ Cooling system designed for life

High efficiency + high reliability water cooling (ZR)

- ▶ corrosion resistant stainless steel tubing
- ▶ highly reliable robot welding; no risk of leaks
- ▶ aluminium star insert increases heat transfer
- ▶ highly efficient cooling reduces energy consumption and dryer loads



High efficiency + high reliability air cooling (ZT)

- ▶ stainless steel pre-cooler with fins
- ▶ excellent heat transfer
- ▶ easy access for cleaning
- ▶ low noise + low energy radial cooling fans



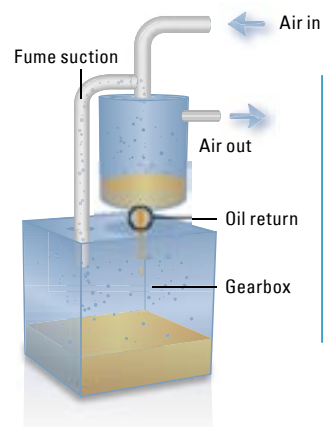
▶ Reliability in every detail

Water separator

- ▶ the labyrinth design efficiently separates the condensate from the compressed air
- ▶ low moisture carry-over protects downstream equipment:
 - long High Pressure element lifetime
 - better dryer performance

Integrated gearbox breathing system

- ▶ simple filter combined with venturi system
- ▶ keeps the oil inside the gearbox
- ▶ no oil fumes vented to the atmosphere



Advanced Elektronikon® control and monitoring system

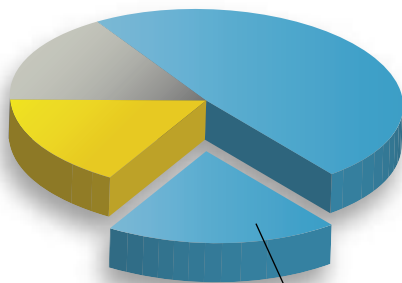
- ▶ overall system performance status with pro-active service indications, alarms for malfunctions and safety shutdowns
- ▶ multi-language selectable display
- ▶ all monitoring and control functions via one interface
- ▶ wide communication possibilities
- ▶ integration possible in many process control systems (field bus system)



Why Variable Speed Drive (VSD) compressors?

▶ Direct energy savings of up to 35 %

- ▶ Unload losses are reduced to a minimum
- ▶ No blow-off of compressed air to the atmosphere
- ▶ Load/no load transition losses are eliminated
- ▶ The precise pressure control of the VSD compressor allows for a tighter pressure band and a lower average working pressure, resulting in reduced energy consumption



Predicting your savings

Call upon the expertise of Atlas Copco specialists and have an assessment carried out in your factory. A detailed report will show your current operation and the achievable savings when adding a VSD solution to your compressed air system.

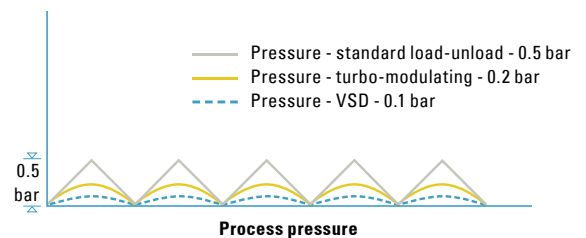


▶ Indirect energy savings

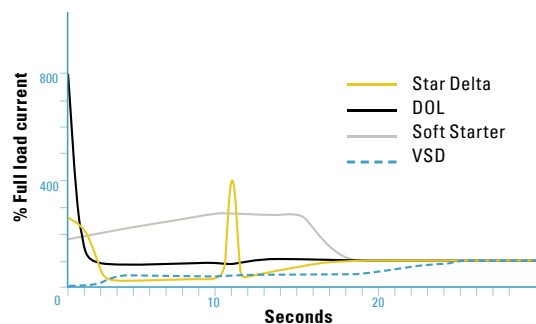
- ▶ The lower system pressure obtained by VSD results in up to 10 % additional yearly savings:
 - lower energy consumption of (other) base load machines
 - leak losses are significantly reduced: e.g. leakage at 6 bar is 13 % lower than at 7 bar
 - most compressed air applications consume less air at a reduced pressure

▶ Additional VSD benefits

- ▶ **The stable system** pressure provides stability for all processes using compressed air.



- ▶ **No current peaks** during start-up
 - unlimited starting and stopping
 - no risk of current peak penalties upon starting

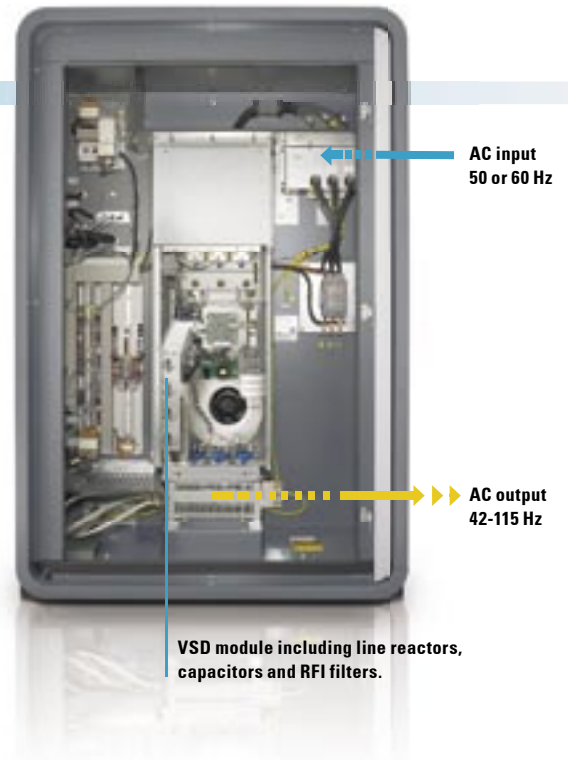


- ▶ Savings in electrical installation - smaller breakers, fuses, transformers and cables.

▶ The magic of VSD

The supply frequency from the frequency converter to the electric motor, is steered by the air demand. When demand is low, frequency is reduced, thereby slowing down the motor and reducing compressor output. When demand is high, the process is reversed.

This method ensures a perfect match between air demand and air supply, dramatically cutting down energy requirements. Pressure overshoots are also eliminated.

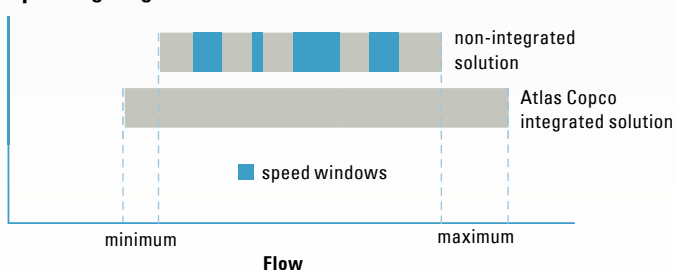


▶ Integrated VSD - The only way

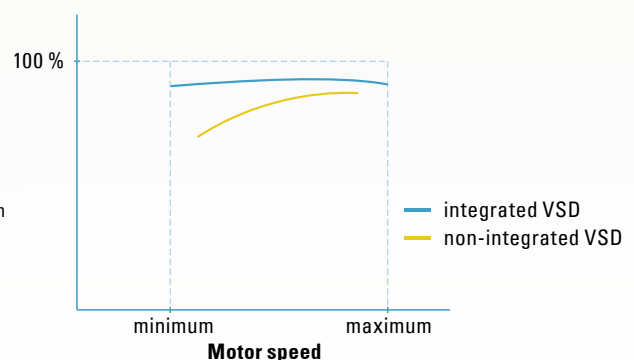


- ▶ **Elektronikon® controls compressor and inverter**
 - maximum machine safety
 - easy networking of the compressor
- ▶ **EMC tested and certified**
 - no influence of external sources
 - no emissions to other equipment
- ▶ **Mechanical enhancements**
 - proper lubrication to gears and bearings for all speeds
 - all components operate below critical vibrations
- ▶ **Inverter duty motor specifically designed for VSD**
 - bearings protected against induced bearing currents
 - motor & converter perfectly tuned to obtain best efficiency over entire speed range
 - optimized cooling air flow, preventing overheating
 - maximum operating range without torque starvation
- ▶ **Tested over complete speed range**
 - elimination of “speed windows”, ensuring stable pressure and consistent energy savings

Operating range



Combined motor/converter efficiency



The Full Feature compressor – a compact, all-in-one quality air solution

▶ Dry compressed air out of the box

- ▶ The Full Feature concept is a total installation, providing dry compressed air. Integrating the IMD dryer and its Variable Speed Drive on VSD models, this compact package offers high quality air at the lowest cost.
- ▶ The IMD adsorption dryer eliminates the moisture before it enters the air net, ensuring a reliable process and an impeccable end product.
No external energy is needed to dry the air, resulting in large savings in comparison to conventional dryers.
- ▶ The pressure drop through the dryer is minimal, which again cuts down the operating cost.
- ▶ The IMD dryer needs **no purge air**: no compressed air is wasted.
- ▶ The Full Feature compressor is a pre-wired and pre-piped solution, ready to use.



The IMD drying principle

- 1 Hot air in for regeneration
- 2 Cold wet air in
- 3 Cold dry air out
- 4 Regeneration area
- 5 Drum rotation

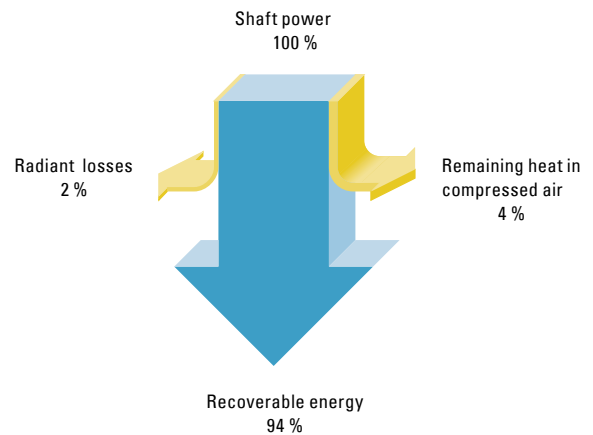


**Watercooled
ZR 90 VSD-FF**

Maximize your savings: recover energy

▶ What energy?

Air compression creates heat that is normally wasted in the coolers. Atlas Copco has designed energy recovery systems which enable most of this heat to be recovered. Energy recovery could be as high as 94 % of the shaft input of the compressor.



▶ Why recover energy?

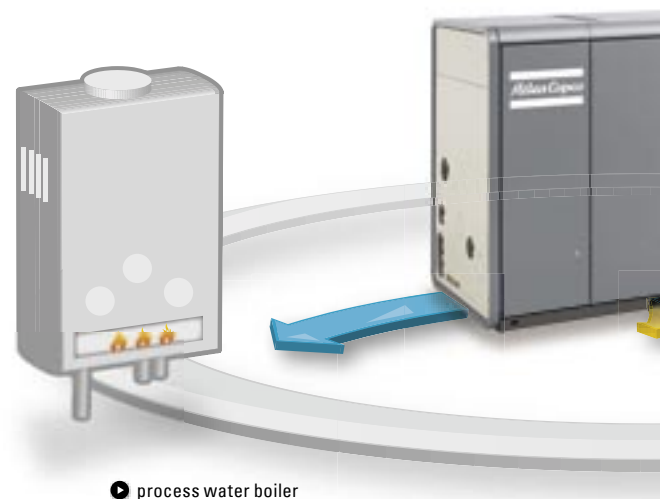
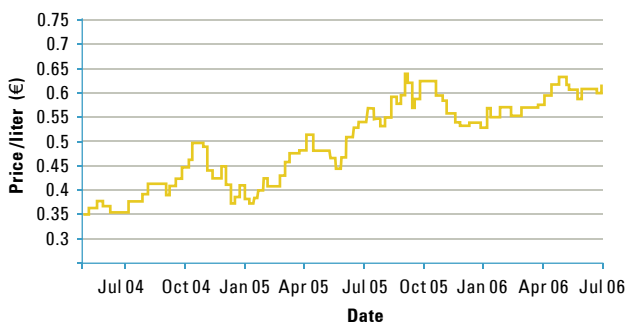
Energy costs can amount to up to 80 % of the total cost for the production of compressed air. With rising energy prices, saving energy also means a **substantial cost saving**.

With global warming, Kyoto norms, the gradual depletion of classical sources of energy: everybody is becoming increasingly aware that we all need to contribute to **overall energy conservation** as much as possible.

▶ How is the energy recovered?

Energy recovery systems are **comprehensive modules** that recover heat which is otherwise wasted. The heat in the form of hot water (85-90 °C) is directly usable as a source of energy. The main module of the recovery system is built in into the compressor.

Evolution of the fuel oil prices (example from a European country)



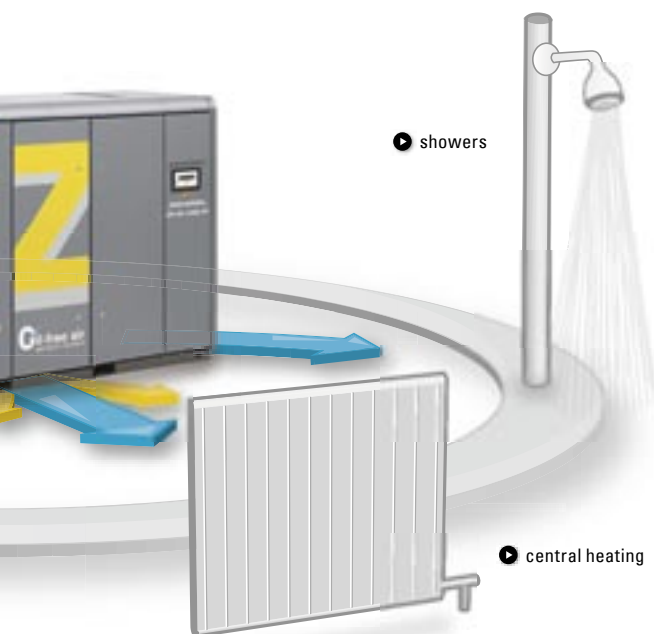
▶ process water boiler

▶ How can the recovered energy be used?

The hot water generated can be put to several uses in the industry:

- ◉ as **preheated boiler feed water** for industrial processes
- ◉ for **space heating** by circulation in radiators or for **showers**
- ◉ for other **industrial applications** like dyeing textiles, operation of absorption chillers, and others

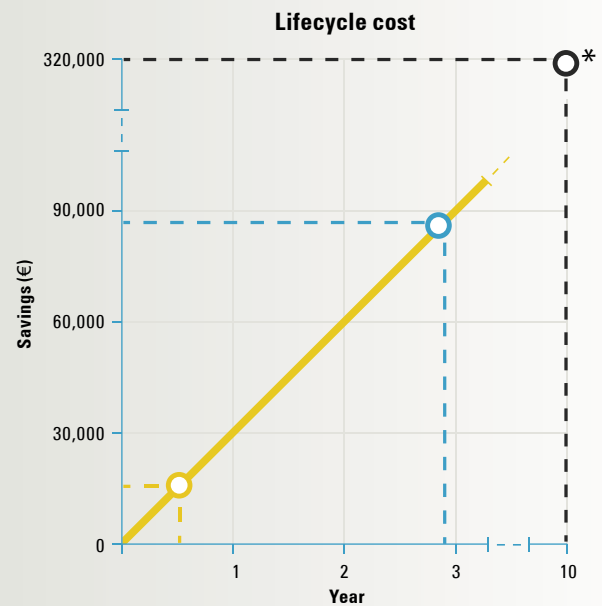
Hot water from the ZR compressors should always be used as an auxiliary source of energy, as the load of the compressor, and hence the hot water produced, may vary.



▶ How do I benefit?

You **save energy** wherever you add the recovered energy as an auxiliary source to reduce your operating costs.

The investments needed for linking the hot water from the compressor to existing circuits are relatively modest and the payback period can be very short.

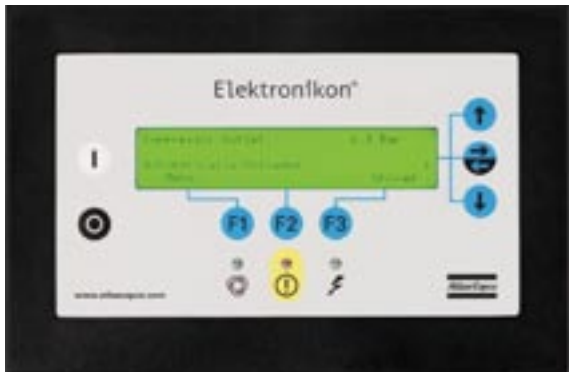


- The energy recovery system is paid back in less than 6 months
- Compressor is paid back in less than 3 years
- Net gain of € 230,000 in 10 years *

* Only includes calculation on energy as maintenance will remain almost the same as a standard compressor

Assumptions

- ◉ example chosen is a 90 kW ZR compressor
- ◉ 8,000 running hours/year at full load and full energy recovery
- ◉ cost of fuel oil: 0.55 €/l
- ◉ The figures shown are an example. Price calculations can be made case by case.



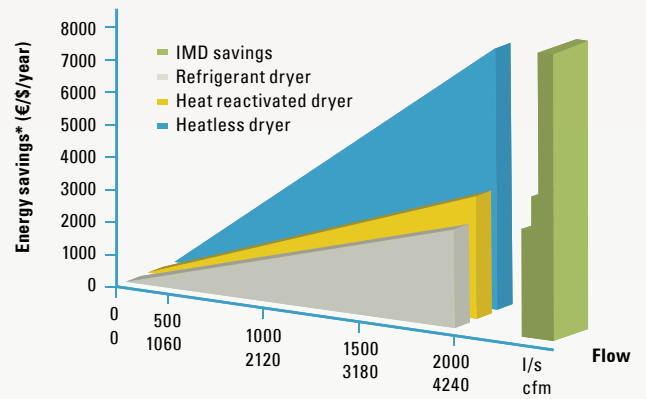
Overall system control and monitoring

- ▶ One integrated control system for compressor and dryer
- ▶ Monitoring of the IMD dryer includes:
 - Temperature readings of
 - IMD dryer inlet and outlet
 - regeneration air inlet and outlet
 - mix air inlet

▶ Energy savings with Full Feature/MD

Direct savings

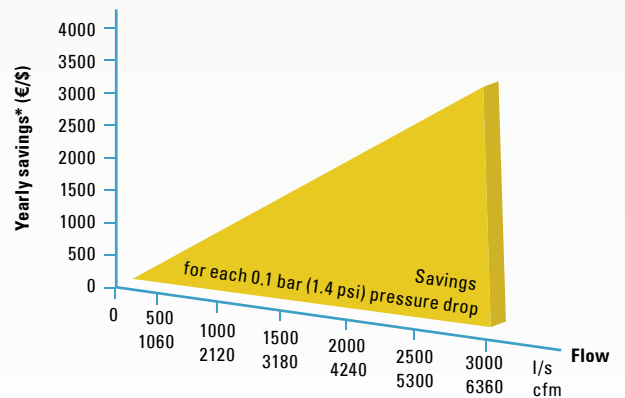
The IMD drying process requires no external energy; over time this results in large savings.



* Assumptions: 1 kWh = 0.05 €/€/\$ – 8000 h/year

Indirect savings

Other than direct energy input, the pressure drop in dryers causes indirect energy consumption as well. IMD dryers have a very low pressure drop, which leads to a further reduction in energy cost.



Custom*Design*

▶ The answer to every non-standard question

The new generation of Z-compressors is designed as standard to perform in a wide range of operating and site conditions.

However, some environments call for additional measures. For all those special requests Atlas Copco's Custom*Design* department offers an adequate solution.

- ▶ **Customizing** the standard products to fit your local plant standards. Meeting these standards on electrical voltage, colour coatings, explosion proof zones, documentation, test and inspection requirements...
- ▶ **Designing** products to secure operation in harsh environments. Allow outdoor installation in sub-zero temperatures, increase corrosion resistance for windy coastal and off-shore applications or ensure performance in hot, moist or dusty environments...
- ▶ **Extending** the range to nitrogen compressors and booster units to suit your specific application...

All this while retaining the high standards on energy, safety and reliability, inherent to all Atlas Copco products.

With dedicated teams in both Product Companies and Regional Engineering Centers Custom*Design* offers close-to-home solutions fitting your applications world-wide.



Global presence – local service



Our Aftermarket product portfolio is designed to add maximum value for our customers by ensuring the optimum availability and reliability of their compressed air equipment with the lowest possible operating costs. We deliver this complete service guarantee through our extensive Aftermarket organization, maintaining our position as the leader in compressed air.

▶ Full range of available Aftermarket products

Activity	Product*
Genuine parts	Atlas Copco Service kits & oils
Extended warranties	AIRXtend
Service contracts	ServicePlan
System audits	AIRScan™
Remote monitoring	AIRConnect™
Energy saving	AIROptimizer™
Product improvements	Upgrade programs

* More information is available from your local Atlas Copco customer centre

Complete scope suiting all needs

Features and benefits

Numerous features are included as standard. Some applications may also need or benefit from one of the factory installed options.

Standard

<input checked="" type="checkbox"/>	Air intake filter and silencer	<input checked="" type="checkbox"/>	AGMA class 13, DIN class 5 gears
<input checked="" type="checkbox"/>	Air intake flexible	<input checked="" type="checkbox"/>	Electric motor pre-mounted
<input checked="" type="checkbox"/>	Stainless steel inter and aftercooler cores*	<input checked="" type="checkbox"/>	IP 55 motors
<input checked="" type="checkbox"/>	Inter and aftercooler water traps and electronic drains	<input checked="" type="checkbox"/>	Starters
<input checked="" type="checkbox"/>	Outlet air silencer	<input checked="" type="checkbox"/>	Pre-mounted electrical and VSD cubicles
<input checked="" type="checkbox"/>	Terminal expansion joints – air and water side	<input checked="" type="checkbox"/>	Silencing canopy
<input checked="" type="checkbox"/>	Outlet air flange	<input checked="" type="checkbox"/>	Skid with no need for foundations
<input checked="" type="checkbox"/>	Complete water circuit*	<input checked="" type="checkbox"/>	Electronic drains
<input checked="" type="checkbox"/>	Single point inlet and outlet connection	<input checked="" type="checkbox"/>	Suppression of emissions/harmonic distortions (in VSD)
<input checked="" type="checkbox"/>	Back-flush arrangement for cooler cleaning*		
<input checked="" type="checkbox"/>	Complete oil circuit pre-piped		
<input checked="" type="checkbox"/>	Built-in oil breather system		

Option/Model	ZR 55-90	ZR 75-90 VSD	ZR 55-90 FF	ZR 75-90 VSD-FF	ZT 55-90	ZT 75-90 VSD	ZT 55-90 FF	ZT 75-90 VSD-FF
<input type="checkbox"/> SPM monitoring equipment (loose kit)	•	•	•	•	•	•	•	•
<input type="checkbox"/> Kit for purge of dry air during standstill (for tropical environment)	•	•	•	•	•	•	•	•
<input type="checkbox"/> High ambient temperature version (required when ambient temperature is above 40 °C)					•			
<input type="checkbox"/> Energy recovery	•	•	•	•				
<input type="checkbox"/> Teflon-free elements	•	•	•	•	•	•	•	•
<input type="checkbox"/> Water shut-off valve	•	•	•	•				
<input type="checkbox"/> Material certificates (check if you require pressure vessel approval certificates)	•	•	•	•			•	•
<input type="checkbox"/> Test certificate	•	•	•	•	•	•	•	•
<input type="checkbox"/> Witnessed performance test	•	•	•	•	•	•	•	•
<input type="checkbox"/> High resolution display for Elektronikon MkIV (required for Chinese, Korean and Japanese characters)	•	•	•	•	•	•	•	•
<input type="checkbox"/> Wooden case protection packaging	•	•	•	•	•	•	•	•
<input type="checkbox"/> Thermistors in motor windings	•	•	•	•	•	•	•	•
<input type="checkbox"/> Anti-condensation heaters in main motor	•	•	•	•	•	•	•	•
<input type="checkbox"/> Anchor pads	•	•	•	•	•	•	•	•
<input type="checkbox"/> Earthing system IT, TT or TN network		•		•		•		•
<input type="checkbox"/> PDP sensor			•	•			•	•
<input type="checkbox"/> Low load kit			•	•			•	•

* For watercooled versions

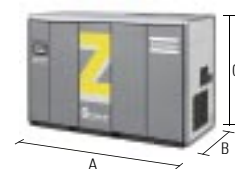
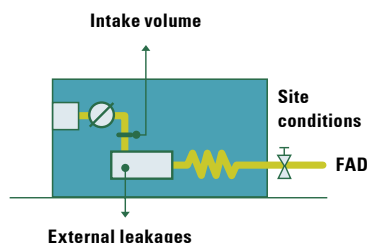
** Only for watercooled versions with free-standing MD dryers

Technical data

True performance

Atlas Copco Z-compressors are measured according to ISO 1217, Edition 3, Annex C stipulating the FAD (Free Air Delivery) measurement at the outlet of the package, net of all losses.

Atlas Copco specifications correspond to the capacity and pressure that are effectively available to the user, not to the air volume that is sucked in. Differences can be substantial.



Dimensions & weight

	A	B	C	Weight
ZR 55	2180	1450	2184	1640
ZR 75	2180	1450	2184	1715
ZR 90	2180	1450	2184	1780
ZR 75 VSD	2630	1450	2184	2030
ZR 90 VSD	2630	1450	2184	2030
ZT 55	2180	1450	2184	1760
ZT 75	2180	1450	2184	1835
ZT 90	2180	1450	2184	1900
ZT 75 VSD	2630	1450	2184	2100
ZT 90 VSD	2630	1450	2184	2100

	A	B	C	Weight
ZR 55 FF	2180	1450	2184	1890
ZR 75 FF	2180	1450	2184	1965
ZR 90 FF	2180	1450	2184	2030
ZR 75 VSD-FF	2630	1450	2184	2280
ZR 90 VSD-FF	2630	1450	2184	2280
ZT 55 FF	2880	1450	2184	2360
ZT 75 FF	2880	1450	2184	2475
ZT 90 FF	2880	1450	2184	2500
ZT 75 VSD-FF	3330	1450	2184	2700
ZT 90 VSD-FF	3330	1450	2184	2700

	A	B	C	Weight
ZR 55 *	2180	1450	2184	1640
ZR 75 *	2180	1450	2184	1715
ZR 90 *	2180	1450	2184	1780
ZR 75 VSD *	2630	1450	2184	2030
ZR 90 VSD *	2630	1450	2184	2030
ZR 55 FF *	2880	1450	2184	1990
ZR 75 FF *	2880	1450	2184	2065
ZR 90 FF *	2880	1450	2184	2130
ZR 75 VSD-FF *	3330	1450	2184	2370
ZR 90 VSD-FF *	3330	1450	2184	2370

* Equipped with Energy Recovery system

- Reference conditions:
 - dry air
 - absolute inlet pressure 1 bar(a)
 - cooling and air intake temperature 20 °C
 - nominal working pressure
 - performance of the compressor package measured according to ISO 1217, Third Edition, Annex C
- Cooling water temperature rise of 15 °C
- Max. capacity is at reference pressure and not at max. pressure

- Pressure dewpoint is specified for
 - 20 °C cooling air/water temperature
 - relative humidity of 60 %
 - nominal working pressure
 - load level of minimum 50 %
 - For VSD: at reference speed
- ± 3 dB(A) measured at a distance of 1 m and according to ISO 2151:2004 and using ISO 9614-2
- Maximum intake / cooling air temperature is 50 °C for HAT versions

Conversions

- 1 kg = 2.2 lbs
- 1 mm = 0.039 inch
- °F = °C x 9/5 + 32

▶ ZR 55-90 FF compressor range

ZR/ZR FF Watercooled oil-free compressors	Free air delivery ⁽¹⁾			Installed motor		Cooling water consumption ⁽²⁾		Pressure dewpoint ⁽⁴⁾	Sound pressure level ⁽⁵⁾	
	Type	l/s	m ³ /min	cfm	kW	hp	ZR l/s	ZR-FF l/s	ZR-FF °C	dB(A)
50 Hz units										
ZR 55 - 7.5	143	8.6	303	55	75	0.9	1.3	-24	65	
ZR 55 - 8.6	131	7.9	278	55	75	0.9	1.3	-24	65	
ZR 55 - 10	121	7.3	257	55	75	0.9	1.3	-25	65	
60 Hz units										
ZR 55 - 7.25	155	9.3	329	55	75	1	1.4	-24	65	
ZR 55 - 9	138	8.3	293	55	75	1	1.4	-25	65	
ZR 55 - 10.4	128	7.7	271	55	75	1	1.4	-25	65	
50 Hz units										
ZR 75 - 7.5	194	11.6	411	75	100	1.2	1.8	-26	65	
ZR 75 - 8.6	184	11.0	390	75	100	1.2	1.8	-26	65	
ZR 75 - 10	174	10.4	369	75	100	1.2	1.8	-27	65	
60 Hz units										
ZR 75 - 7.25	213	12.8	452	75	100	1.3	1.9	-26	65	
ZR 75 - 9	194	11.6	411	75	100	1.3	1.9	-27	65	
ZR 75 - 10.4	185	11.1	392	75	100	1.3	1.9	-27	65	
50 Hz units										
ZR 90 - 7.5	234	14.0	496	90	120	1.4	2.1	-27	65	
ZR 90 - 8.6	220	13.2	466	90	120	1.4	2.1	-28	65	
ZR 90 - 10	209	12.5	443	90	120	1.4	2.1	-28	65	
60 Hz units										
ZR 90 - 7.25	262	15.7	555	90	120	1.6	2.3	-26	65	
ZR 90 - 9	235	14.1	498	90	120	1.6	2.3	-28	65	
ZR 90 - 10.4	224	13.4	475	90	120	1.6	2.3	-29	65	

(1) Reference conditions:

- dry air
- absolute inlet pressure 1 bar(a)
- cooling and air intake temperature 20 °C
- nominal working pressure
- performance of the compressor package measured according to ISO 1217, Third Edition, Annex C

(2) Cooling water temperature rise of 15 °C

(3) Max. capacity is at reference pressure and not at max. pressure

- (4) Pressure dewpoint is specified for
- 20 °C cooling air/water temperature
 - relative humidity of 60 %
 - nominal working pressure
 - load level of minimum 50 %
- For VSD: at reference speed

(5) ± 3 dB(A) measured at a distance of 1 m and according to ISO 2151:2004 and using ISO 9614-2

(6) Maximum intake / cooling air temperature is 50 °C for HAT versions

Conversions

- 1 kg = 2.2 lbs
- 1 mm = 0.039 inch
- °F = °C x 9/5 + 32

▶ ZR 75-90 VSD-FF compressors

ZR VSD / ZR VSD-FF Watercooled oil-free compressors	Free air delivery ⁽¹⁾			Cooling water consumption ⁽²⁾		Pressure dewpoint ⁽⁴⁾	Sound pressure level ⁽⁵⁾	
	Types – 50/60 Hz	l/s	m ³ /min	cfm	ZR l/s	ZR-FF l/s	ZR-FF °C	dB(A)
ZR 75 VSD-9 bar (e)								
Max ⁽³⁾	220	13.2	466		1.25	1.92	-30	65
Min	75	4.5	159					
ZR 75 VSD-10.4 bar (e)								
Max ⁽³⁾	198	11.9	420		1.25	1.92	-30	65
Min	98	5.9	208					
ZR 90 VSD-9 bar (e)								
Max ⁽³⁾	258	15.5	547		1.25	1.92	-30	65
Min	75	4.5	159					
ZR 90 VSD-10.4 bar (e)								
Max ⁽³⁾	232	13.9	492		1.25	1.92	-30	65
Min	98	5.9	208					

▶ ZT 55-90 FF compressor range

ZT/ZT FF Aircooled oil-free compressors	Free air delivery ⁽¹⁾			Installed motor		Installed fan motor		Pressure dewpoint ⁽⁴⁾	Sound pressure level ⁽⁵⁾	
	Type	l/s	m ³ /min	cfm	kW	hp	ZT kW	ZT-FF kW	ZT-FF °C	dB(A)
50 Hz										
ZT 55 - 7.5	142	8.5	301	55	75	2	3.1	-28	72	
ZT 55 - 8.6	130	7.8	276	55	75	2	3.1	-28	72	
ZT 55 - 8.6 HAT ⁽⁶⁾	120	7.2	254	55	75	2	-	-	72	
ZT 55 - 10	120	7.2	254	55	75	2	3.1	-28	72	
60 Hz										
ZT 55 - 7.25	154	9.2	326	55	75	2	3.6	-28	72	
ZT 55 - 8.6 HAT ⁽⁶⁾	127	7.6	269	55	75	2	-	-	72	
ZT 55 - 9	137	8.2	290	55	75	2	3.6	-28	72	
ZT 55 - 10.4	127	7.6	269	55	75	2	3.6	-29	72	
50 Hz										
ZT 75 - 7.5	193	11.6	409	75	100	3.6	4.7	-30	72	
ZT 75 - 8.6	184	11.0	390	75	100	3.6	4.7	-30	72	
ZT 75 - 8.6 HAT ⁽⁶⁾	174	10.4	369	75	100	3.6	-	-	72	
ZT 75 - 10	174	10.4	369	75	100	3.6	4.7	-31	72	
60 Hz units										
ZT 75 - 7.25	212	12.7	449	75	100	3.8	5.6	-30	72	
ZT 75 - 8.6 HAT ⁽⁶⁾	184	11.1	390	75	100	3.8	-	-	72	
ZT 75 - 9	194	11.6	411	75	100	3.8	5.6	-31	72	
ZT 75 - 10.4	184	11.0	390	75	100	3.8	5.6	-31	72	
50 Hz units										
ZT 90 - 7.5	233	14.0	494	90	120	3.6	4.7	-31	72	
ZT 90 - 8.6	220	13.2	466	90	120	3.6	4.7	-32	72	
ZT 90 - 8.6 HAT ⁽⁶⁾	208	12.5	441	90	120	3.6	-	-	72	
ZT 90 - 10	208	12.5	441	90	120	3.6	4.7	-32	72	
60 Hz units										
ZT 90 - 7.25	261	15.7	553	90	120	3.8	5.6	-32	72	
ZT 90 - 8.6 HAT ⁽⁶⁾	222	13.3	470	90	120	3.8	-	-	72	
ZT 90 - 9	236	14.2	500	90	120	3.8	5.6	-32	72	
ZT 90 - 10.4	222	13.3	471	90	120	3.8	5.6	-33	72	

▶ ZT 75-90 VSD-FF compressors

ZT VSD / ZT VSD-FF Aircooled oil-free compressors	Free air delivery ⁽¹⁾			Pressure dewpoint ⁽⁴⁾	Sound pressure level ⁽⁵⁾
	Types – 50/60 Hz	l/s	m ³ /min	cfm	ZT-FF °C
ZT 75 VSD-9 bar (e)					
Max ⁽³⁾	220	13.2	466	-30	72
Min	75	4.5	159		
ZT 75 VSD-10.4 bar (e)					
Max ⁽³⁾	198	11.9	420	-30	72
Min	98	5.9	208		
ZT 90 VSD-9 bar (e)					
Max ⁽³⁾	258	15.5	547	-30	72
Min	75	4.5	159		
ZT 90 VSD-10.4 bar (e)					
Max ⁽³⁾	232	13.9	492	-30	72
Min	98	5.9	208		



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.



ISO 9001

A consistent quality earned us the industry's leadership and the customer's trust.



ISO 14001

Atlas Copco's Environmental Management System forms an integral part of each business process.

Never use compressed air as breathing air without prior purification in accordance with local legislation and standards.

Atlas Copco