

Wessex Compressors Limited

V2/24

Compressed Air System Guide

www.wessexcompressorsltd.co.uk



Wessex Compressors Limited Introduction

Since 1992 Wessex Compressors have provided a professional and knowledgeable service for customers with many varied compressed air demands across the South of England. With a combined experience of over 80 years in the compressed air industry, we are able to offer unsurpassed guidance to ensure your compressed air system works best for your requirements. From system planning and pipework installation to maintenance and regulatory compliance services we offer the complete compressed air service.

As a company we are a full member of the British Compressed Air Society (BCAS) and our Engineers are fully trained by industry leading compressor manufacturers. We are a platinum partner for the German built Boge compressor range and a UK distributor for Almig compressor systems. In addition, we are a local distributor for Abac, Air Industrial and Bambi piston (reciprocating) compressors. We are also suppliers for a variety of quality air treatment and pipework manufacturers such as Walker Filtration, BEKO technologies, EQO fluids and Teseo.

Our customers range from high quality air users such as hospitals, dental surgeries, precision engineering and laser technology firms through to companies requiring only occasional and low-quality air. We currently have planned preventative maintenance schedules in place for customers with compressors manufactured by Boge, Almig, Hydrovane, Compair, HPC, Atlas Copco, Mark, Ingersoll Rand and many more. We pride ourselves in only using genuine manufacturers spare and service parts by utilising suppliers from as far apart as Belgium, Cumbria and Herefordshire to ensure your compressor is kept in optimum condition.

Our Expertise

- Design of full compressed air systems and alterations ensuring maximum performance and energy efficiency.
- Installation of pipework systems in medium weight galvanised steel or aluminium pipe.
- Supply of Compressors for any requirement and ancillary equipment such as dryers, air receivers and filtration.
- We offer a full preventative maintenance plan individually tailored to suit each customer only using **GENUINE** manufacturer supplied service and spare parts.
- We offer a 24hr breakdown service with a team of experienced mobile Engineers trained on all rotary vane, rotary screw, piston compressors and ancillary equipment.
- Pressure Systems Safety Regulations (PSSR) testing and certification.
- We stock a wide selection of used and reconditioned compressors for both resale and hire.

"I have used Wessex Compressors Limited for many years here across the Beaulieu visitor attraction and National Motor Museum Complex. I have always found their service to be prompt, precise, and polite and always at a competitive price. Also their advice accurate and helpful"

Doug Hill, Museum Manager – Chief Engineer, Beaulieu National Motor Museum.

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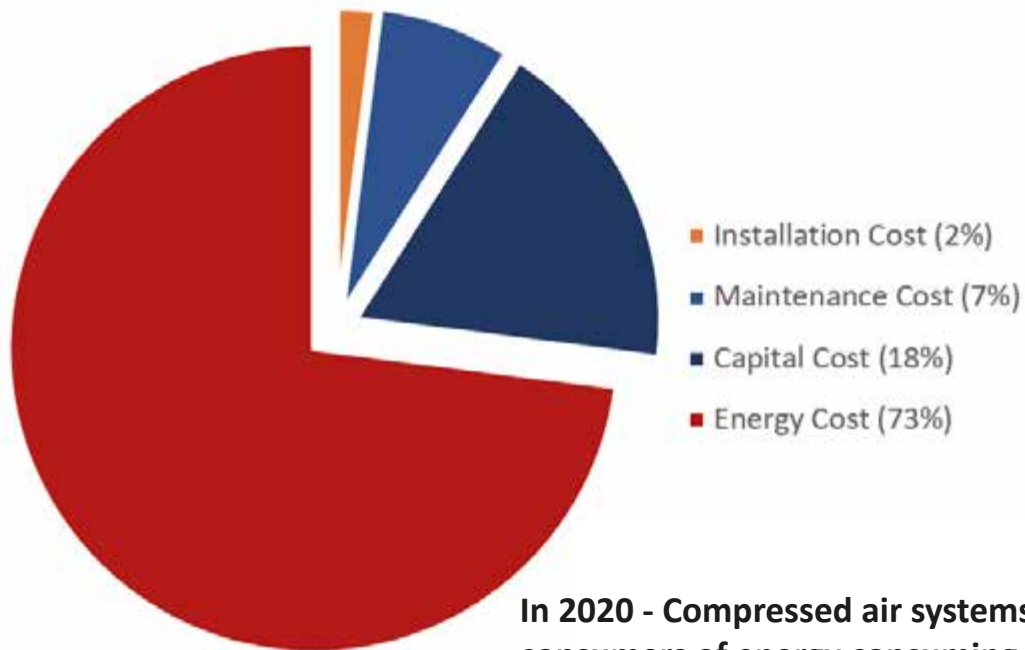
Pressure conversion chart

BAR	1	2	3	4	5	6	7	8	9	10	11	12	13
PSI	14.5	29	43.5	58	72.5	87	101.5	116	130.5	145	159.5	174	188.5



Wessex Compressors Limited
Sales • Service • Installation • Hire

Average Compressor Cost Over a 10 Year Period



In 2020 - Compressed air systems are large consumers of energy consuming around 10% of all industrial electrical consumption or 8.8TWh each year resulting in CO₂ emissions of 3,100 kt/year.

Improving your energy efficiency

Your compressed air system is one of your biggest consumers of energy. Improving energy efficiency can drastically impact your cost and help reduce your CO₂ footprint.

How can YOU improve your compressed air system efficiency

- Check oil levels on a weekly basis – A compressor running over temperature requires more power to drive the motor.
- Check pre-filters (intake air filtration) and clean weekly or as required to again assist in temperature increases.
- Check for air leaks in the pipework system.

Where can Wessex Compressors assist?

- Planned preventative maintenance schedule (Service Agreement) – We offer a package to ensure your compressed air system is kept at its optimum efficiency.
- We can supply and install frequency controlled, inverter driven rotary screw compressors by BOGE or Almig. These compressors all produce air to demand of downstream equipment therefore minimising off-load running and reducing energy costs significantly.
- We can advise on various heat recovery solutions.

Energy Saving Compressors

Reducing energy wastage and ultimately energy costs has become an increasing priority for all business, locally, nationally, and globally. At WCS we are proud to sell Boge and Almig compressors, all of which have vastly improved their energy efficiency over recent years with the introduction of advanced controlling equipment and inverter controlled variable speed compressors.

Variable speed compressors can reliably and efficiently meet the often-varying air demand on most compressed air systems. Use of an inverter to control the motor speed, the output of the compressor can be continuously matched to system demand. With the right variable speed compressor in the right application, significant energy savings can be achieved.

Key Benefits –

- Direct Energy Saving – From partial load running capability of a variable speed machine. Typically, with the reduced motor speed, savings between 5% - 30% can be made.
- Additional Indirect Energy Saving - The compressor running speed control enhances system pressure control. For reference a system running at 6 Bar of pressure may be as much as 7% cheaper to run than a 7 Bar system.
- Less Mechanical Stress - Compressors will soft start with no peak amp draw.

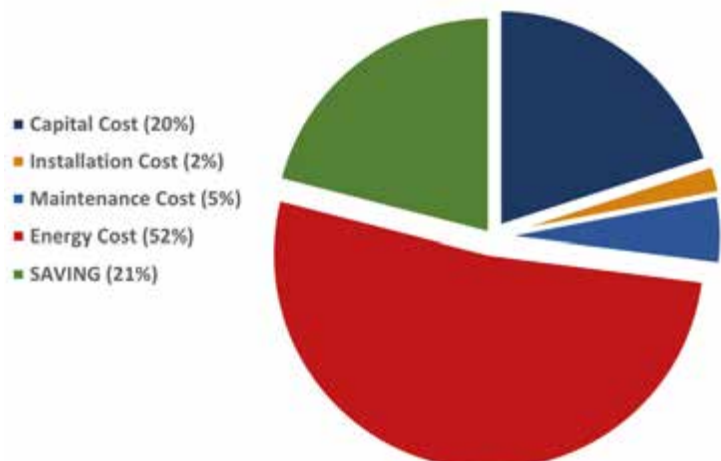


**Boge C16F VSD
Compressor (11kW)**

“Since the installation of our Boge CF25 VDS variable speed compressor we have been monitoring the energy consumption and subsequent cost savings. We have a largely fluctuating air demand dependant upon which lines are in operation during our 24/7 operating schedule. Although we have upgraded from an 11kw fixed compressor to this 18kw variable speed unit we have recorded electricity savings within the region of £1000 per quarter.”

**Nick Moth, Managing Director –
C&M Mould Tools Ltd.**

Potential Savings with a Variable Speed Compressor



Pressure Systems Safety Regulations (PSSR)

What is PSSR 2000? -

The Pressure Systems Safety Regulations (PSSR) 2000 came into force in its current guise on 21st February 2000. Users and owners of pressure systems are required to demonstrate that they know the safe operating limits. Principally, pressure and temperature of their pressure systems and that the systems are safe under those conditions. They need to ensure that a suitable written scheme of examination is in place before the system is operated. They also need to ensure that the pressure system is examined in accordance with the written scheme of examination.

Who does this affect? –

Under the Pressure Systems Safety Regulations 2000, a written scheme of examination is required for most pressure systems. A pressure vessel with a capacity of 250 bar litres or more must be examined. [Volume (Litres) X Pressure (bar)].

How the Regulations affect the owner/user:

- Regulation 7 – Establish the safe operating limits of the pressure system and durably label this information so it is legible and clearly visible.
- Regulation 8 – Have a suitable written scheme of examination (WSE) drawn up and/or certified by a competent person for the examination at appropriate intervals of pressure vessels, all protective devices, and any pipework that is potentially dangerous.
- Regulation 9 – Arrange to have examinations carried out by a competent person at intervals set down in the written scheme of examination.
- Regulation 10 & 11 – Provide adequate operating instructions to ensure the system is operated within its safe operating limits and emergency instructions.
- Regulation 12 – Ensure that the system is properly maintained.
- Regulation 14 – Keep adequate records for the system, including maintenance history, the most recent examination and any suppliers' records supplied with new or used plant.



Safety Relief Valve

Pressure gauge



Air Receivers



How can Wessex Compressors help?

- a. To act as a competent person (body corporate).**
- b. Prepare a written scheme of examination & maintenance dossier.**

This will involve an initial site visit to gather the necessary information and provide an initial survey report advising of any issues that need addressing. We will then produce a Regulatory Compliance Management Dossier (RCMD). This will outline the responsibilities under the legislation that you are obliged to comply with, including the written scheme of examination. This package will in essence give you a “one folder contains all” for your compressed air system showing your competence during future H&S inspections.
- c. Ensure continued compliance.**

We will carry out all necessary examinations as specified by the written scheme on an annual or biannual basis and provide reports of our findings.
- d. Repair or replace.**

We will be able to repair or replace any critical safety components as necessary to ensure your compressed air system remains in safe working order.

All of our inspectors are trained by the British Compressed Air Society

Compressed Air Treatment

Why treat compressed air?

Modern production equipment needs compressed air. The many conditions in which it is used range from untreated blowing air to absolutely dry, oil-free, and sterile compressed air. The impurities in our atmosphere are usually invisible to the naked eye. However, they can seriously impede the reliable operation of a pneumatic system and consumer devices. Impurities also have an adverse effect on the quality of products.

1m³ of untreated ambient air can contain as much as 180 million particles of dirt, 50%-80% water vapour and oil in the form of unburned hydro-carbons. With the compression process the concentration of these particles increases. At 10 Bar of pressure the air may now contain over 2 billion dirt particles after an eleven fold increase.

Benefits of treating compressed air

- Increased working life of consumer devices.
- Improved and consistent product quality.
- Pipework and pneumatic lines free of rust and condensate.
- Lower servicing outlay.
- Lower pressure loss from flow and leakage resistance.
- Lower energy loss due to lower pressure loss.



**Boge-
F12-2 Filter**

ISO 8573 – The compressed air standard

This is the group of international standards relating to the quality of compressed air. ISO 8573-1:2010 defines compressed air quality classes. The table below details the purity classes from 0 to X, specifying a maximum solid particulate, water, and oil allowable per m3 of compressed air.

Class 0 is the highest air purity class and is defined as “free from oil and contaminants”. Class 0 does not mean zero contamination, but it means that the air is free from oil aerosols, oil vapours, and particulates. Class X designates the highest concentration of a contaminant when the contamination level falls within that class.

CLASS	Solid particulate (maximum per m ³)			Water Vapour Pressure dewpoint (°C)	Oil including vapour (mg/m ³)
	0.1-0.5 micron	0.5-1.0 micron	1.0-5.0 micron		
ISO 0	As specified by the equipment user or supplier and more stringent than Class 1				
ISO 1	≤ 20,000	≤ 400	≤ 10	≤ -70	≤ 0.01
ISO 2	≤ 400,000	≤ 6,000	≤ 100	≤ -40	≤ 0.1
ISO 3	-	≤ 90,000	≤ 1,000	≤ -20	≤ 1
ISO 4	-	-	≤ 10,000	≤ +3	≤ 5
ISO 5	-	-	≤ 100,000	≤ +7	-
ISO 6	-	-	-	≤ +10	-
ISO 7	-	-	-	-	-
ISO 8	-	-	-	-	-
ISO 9	-	-	-	-	-
ISO X				> 10	> 5

ISO 8573 – Designating ISO 8573-1 Purity Classes

Using the classes, a maximum level can be specified for each contaminant, this figure would normally be expressed in the manner ISO 8573-1:2010 [A:B:C]*and specified by your air using equipment manufacturer.

*ISO 8573-1 uses the letters ABC, where A: Solid Particulates, B: Water and C: Oil

i.e. – ISO 8573-1:2010 [1:2:1]

which would equate to –

Class 1 Solid Particulates	@ 0.1 – 0.5 micron	≤ 20,000
	@ 0.5 - 1.0 micron	≤ 400
	@ 1.0 – 5.0 micron	≤ 10

Class 2 Water Vapour	
Pressure dewpoint -	≤ -400C

Class 1 Oil Aerosol and Vapour	≤ 0.01 mg/m ³
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*Video Showing Operation of
Dryer Bypass System*

What is the right treatment for you?

At Wessex Compressor Services we supply and maintain a vast variety of compressed air system with varying degrees of air treatment requirements. From basic blow gun and sand blasting applications to extremely clean and dry pharmaceutical, medical and food industry standards we are able to offer full ranges of drying and filtration from the industry's leading manufacturers.

Please see the compressed air systems application drying and filtration guide-table enclosed in this guide to assess your requirements. For more specific information please refer to your application equipment handbook for manufacturers specifications.



*Walker PD
Desiccant Dryer Series*



Beko RA Refrigerant Dryer

Wessex Compressors Limited Installations



Twin Almig F-Drive 37 (37kW/50hp) compressor system operating in duty rotate. Factory fitted with Almig heat recovery system.



Twin 110kW, BOGE S111-4LF compressor package offering 100% duty back-up across the installation. The German built compressors will output 5.5-21.1 m³/min (194-745 cfm) @ 7.5bar. Also showing the duplex refrigerant dryer installation and full by-pass facility using EQO pipework system.



Bespoke compressed air package designed and constructed for our customer in the WCS workshop producing an air quality of ISO8573 Class 1,1,1. Utilising the Boge C4LDR Compressed Air Station with Walker Filtration Pro-dry and filtration package. All condensate treated by the Sterling CS75 oil/water separator.

Wessex Compressors Limited Installations



Twin 75kW, variable speed drive, Boge S76-4LF package with 100% duty back-up across the system. Both compressors are factory fitted with Duotherm heat recovery system for pre-heating water used in processes within the factory.

Super Silenced BOGE C15LDR-350 Compressed Air Station operating @68dB(A)



Compressor system upgrade with the installation of this Boge S111-4 LF Variable Speed Drive Compressor.

Breathing Air Quality (Low Pressure Systems)

The required quality of breathing air is stated in EN12021 & EN12021:2014 - this provides information on the safe limits of potentially harmful contaminant gases, oil and ensures the correct amount of oxygen is present. UK EN12021 advises that samples of air should be tested every 3 months, whilst HSE document HSG53 states you should base the frequency of tests on a risk assessment, however they should take place periodically at an interval of no greater than 3 monthly.

All employers have a duty of care to their employees to ensure that the breathing air they are supplied with is adequate for the Respiratory Protective Device (RPD) they are using and is safe to breathe.



The following should be tested to satisfy the EN12021 standard:

Odour	The gas shall be free from unsatisfactory odour or taste
Oxygen	21% (+/- 1%) by volume
Carbon Dioxide CO ₂	≤ 500PPM
Carbon Monoxide CO	≤ 5PPM
Oil	≤ 0.5 mg/m ³
Water (less than 40bar)	Where the apparatus is stored at a known temperature the pressure dewpoint shall be 5°C below the likely lowest temperature. Where the conditions of storage and usage are not known the pressure dewpoint shall not exceed -11°C
Flow Rate	Suitable for correct operation of the RPD (170 – 200l/min)

Wessex Compressors Ltd can offer Breathing Air Testing on a price per test basis with a minimum of 3 tests per visit. Please call us to discuss alternative pricing options for your site. We utilise the latest Factair safe air tester F6000 test equipment using automatically controlled tests utilising electronic sensors and a Draeger oil impactor for oil testing.

A test report will be produced for each test carried out, these reports should be kept for a period of 5 years and be available for inspection.

For further guidance see the following not exhaustive list:
 COSHH L6, BS EN12021, EN529, EH40, Respiratory Equipment at Work HSG53

Example of a Breathing Air Test Report

SAFE-AIR

factair

Test Date: 04 Dec 2017
 Tester Serial Number: 60999
 Tester Calibration Date: 30 Nov 2017
 Tester Model: F6000
 Test Category: Airline below 40 Bar
 Location: - Spray Booth 1
 Oil: Impactor

TEST	READING	RESULT	*REQUIREMENTS/NOTES
Ambient Temperature:	17°C	--	
Test Point Volume:	0 L/min	N/A	** Suitable for RPD
Test Pressure:	5.5 Bar	Pass	** Suitable for RPD
System Pressure:	5.5 Bar	--	
Odour:	OK	Pass	Without significant odour or taste
Oxygen (O2):	21.0 %	Pass	20 - 22% by volume
Carbon Monoxide (CO):	0.7 ppm	Pass	5ppm (5ml per m3) max
Carbon Dioxide (CO2):	129 ppm	Pass	500ppm (500ml per m3) max
Oil Mist:	0.1 - 0.5	Pass	Less than 0.5 mg/m3
Water Vapour:	5 mg/m3	--	
Pressure Dewpoint:	-49.0°C	Pass	Must be at least 5°C below ambient

* = Requirements according to EN12021:2014

** = If not applicable (N/A), then certificate covers air quality only.

Overall Result: Pass

Next Test Due: 04 Feb 2018

SIGNED:

Paul Brayshaw
 Wessex Compressors
 Unit 9 Chantry Park
 2 Cowley Road
 Poole, BH17 0UJ

Name: Paul Brayshaw

DATE: 17 Oct 2018

Compressed Air Condensate

What is compressor condensate?

Definition: condensate is the liquid formed from water vapour in the air as a result of a drop in temperature and/or an increase in pressure. Most times it is an oil/water mixture; sometimes it is formed as an oil/water emulsion. This liquid mixes with atmospheric hydrocarbon contaminants as well as oil carried over from lubricated compressors to form acidic, oily condensate sludge. An 18kw (25hp) compressor may produce up to 10,000 litres of oil contaminated condensate per year.

The regulations – how they affect the owner/ user

The Hazardous Waste regulations in their new guise were introduced in July 2005. These affect all owners of compressed air systems with respect to the proper disposal of condensate. The UK Water Resources Act states that it is an offence to knowingly permit entry of toxic waste to surface or ground water. It is an offence with a fine of £20,000 or more in a Crown Court.



BEKOMAT 13 Nil/Loss Auto-drain



Sterling CS Oil Water Separator Range

How can we help?

- Supply and installation of industry leading condensate drain and oil/water separator products to assist with your compliance with current regulation and legislation.
- Carry out servicing to installed condensate treatment products and remove filtration media for correct disposal as licensed waste carriers.



WCS Installation 2023

Conversion Factors

Convert From	Multiply By	Convert To
Cubic feet per minute (cfm)	1.69	Metres cubed per hour (m ³ /h)
cfm	0.0283	Metres cubed per minute (m ³ /min)
cfm	0.4719	Litres per second (l/s)
cfm	28.316	Litres per minute (l/m)
m ³ /h	0.588578	cfm
m ³ /min	35.315	cfm
l/s	2.119	cfm
l/min	0.03531	cfm
Horse Power (hp)	0.746	Kilowatts (kW)

Compressed Air System Installation

Pipework installations

With a combined experience of well over 80 years within the compressed air industry we are able to draw on vast knowledge in order to design and implement the correct pipework system for your needs.

Our installation engineers are more than happy to meet with you to discuss your compressed air requirements. No matter what your industry, whether its food, chemical, engineering, pharmaceutical, medical, nuclear or packaging we can assist. We endeavour to make sure your air arrives where it is needed, in the correct quantity, at the required pressure and with the requisite level of treatment necessary.

Pipework systems

- **Galvanised Steel pipework system** – from ½” – 4” bore.
- **EQO Fluid Pipework** – reconfigurable aluminium system designed specifically for compressed air.
- **TESEO pipework system** – alternative box sectioned reconfigurable aluminium system.

“We would advise a ring main to potentially double the flow rate of your pipework system”

Pipework flow rates

Applied Pressure Gauge	Medium Weight Galvanised Steel Pipework System Tube Diameter (Flow Rates Shown in cubic feet per minute (cfm))				
PSI	½”	¾”	1”	1½ ”	2”
40	23	31	62	200	385
60	34	50	93	290	560
100	51	80	150	470	900
150	80	115	220	680	1350
200	108	155	290	910	1750

Length of Pipework System	Aluminium Pipework System Tube Diameter (Flow Rates Shown in cubic feet per minute (cfm)) @6 Bar Pressure				
Metres	20mm	25mm	32mm	40mm	63mm
50	60	125	254	473	1768
75	46	95	215	380	1450
100	41	79	170	300	1109
150	32	65	152	273	995

Air leaks on a Pipework System

Do you know the approximate cost of air leaks on a pipework system? It is also worth noting that leaks on a pipework system are continuous.

Leakage Loss and Associated Cost in Compressed Air Systems*

Orifice Diameter (mm)	Leakage rate @7 Bar g(m ³ /hr)	Power Required to Generate (kW)	Electrical Unit Cost (£/kWh)**	System Operating Time (hrs)	Annual Cost (£)
0.50	0.83	0.078	0.1249	8000	77.44
1.00	3.31	0.310	0.1249	8000	311.00
1.50	7.46	0.700	0.1249	8000	700.69
2.00	13.30	1.250	0.1249	8000	1249.00
4.00	53.00	4.980	0.1249	8000	4978.51
6.00	119.30	11.210	0.1249	8000	11204.78

*BCAS, *Compressed Air Installation Guide, Best Practice Guide 101-6 (BPG 101-6)*

** Electricity figures originally calculated in December 2021. As energy costs are continuously rising, savings now are likely to be significantly higher. Please refer to your current electricity unit charge.

**Ask Wessex Compressors Limited to arrange an audit
Contact the office for further details on organising a
compressed air system assessment.**

“I was very impressed by the Tesco pipework installed in our 400m² factory. We have nearly 100 machines on site, both CNC and manual that all require compressed air. Installation was completed by Wessex Compressor Services, who did a first class job with minimum interruption to on-going production. I would highly recommend the design, implementation, product and service provided by Wessex Compressors.”

**Tony Podesta,
Westwind Air Bearings.**



**WCS 2023 Package Installations
using EQO Fluids Pipework**

Fluorinated Gases (F Gas) in Refrigerant Dryers

What is F Gas?

Fluorinated gases (F gases) are a group of man-made gases used in various industrial applications, including use in refrigeration, air conditioning and fire safety systems. In the compressed air industry, F gases are used in refrigerant dryers, which are used to remove moisture from the compressed air in the refrigerant process.

There are several different types of F gases which differ in their chemical composition; the main types are hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

There are several issues with widely using F gases, with the largest cause for concern being F gases are very strong greenhouse gases, with a global warming effect up to 23,000 times that of carbon dioxide. This has led to increasingly strict regulations being imposed on the use and handling of F gases to try and reduce harmful emissions. The negative effects of F gases on climate change cannot be understated as some can stay in the atmosphere for thousands of years once released.

Regulations

Refrigerants must be handled in accordance with:

- Environmental Protection (controls on ozone-depleting substances) Regulations
- The Kyoto Protocol
- The Montreal Protocol
- The Fluorinated Greenhouse Gases Regulations
- Health and Safety at Work Act
- Environmental Protection Act
- Waste Regulations

F Gas Leak Checks

Mandatory documented leak checks apply to air conditioning and refrigeration equipment based on how much damage could be caused to the atmosphere if the whole charge were released. The frequency of the test inspections is based on the Global Warming Potential (GWP) of the refrigerant multiplied by the estimated volume contained in each individual system – this gives the CO₂e figure. If the system contains between:

- 5 and 50 tonnes CO₂e it requires one inspection per year.
- 50 to 500 tonnes CO₂e require inspection every six months.
- Greater than 500 tonnes CO₂e require quarterly inspections.

If permanent leak detection systems are fitted, leak checking frequency can be halved. Permanent leak detection systems are mandatory for system charges of 500 tonnes CO₂ equivalent and above.

Refrigerant	Global Warming Potential (GWP)	Frequency of System Leak Checking Frequency		
		Once per Year	Twice per year	Quarterly
R410A	2088	> 2.39kg	> 23.9kg	> 239kg
R407C	1774	> 2.81kg	> 28.1kg	> 281kg
R404A	3922	> 1.27kg	> 12.7kg	> 127kg
R134a	1430	> 3.49kg	> 34.9kg	> 349kg



Wessex Compressors Ltd have fully certified and registered engineers (Cat 1) who are trained and competent in the safe handling of refrigerant gases.

We can carry out routine leak detection and full repairs to any refrigerant dryer.

Wessex Compressors Limited Partners



End User Compressed Air System Weekly Checks

Please follow the relevant links to view a short video outlining a basic weekly check routine



4kW to 22kW



26kW to 55kW



55kW and Above

CONTACT INFORMATION:

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