

**10 tips for getting more reliability
from your air-conditioning system**

[reliability]

A guide for installers, specifiers, contractors and architects
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Given its importance, reliability is often an afterthought when buying an air-conditioning system. While we will often choose one product over another because of a 10% difference in price, the prospect of a product lasting an extra year or two is rarely such a factor. But reliability is not simply a function of brand. While there are products that are proven to last longer than others, there are other factors too. So we asked a selection of leading engineers consultants to put together some guidelines that may help extend the life of the air-conditioning systems you specify, install and use. We hope you find it useful.

1. Product design and quality

When you come to choose your air-conditioning system, it is important to ensure you choose one that will stand the test of time.

Reliability of an air-conditioning product stems back to the manufacturer. A poorly designed and constructed system will undoubtedly increase the risk of it malfunctioning in the future.

The reliability of your system also relies heavily on the quality of the components. The best air-conditioning systems are those where the manufacturer produces most of the main components such as compressors and heat exchangers. This increases the likelihood that the components are to the manufacturer's specification and standards.

Most major brands invest huge amounts of money into research, design and testing – almost to destruction – but buying the most expensive brand is not always a guarantee of durability.

Look out for brands that are ISO (ISO 14001) accredited to ensure the highest quality build standards and, to make sure the product is safe, look for compliance to all relevant CE Directives.

Finally, to guarantee your products will stand the test of time, look for those that are Eurovent certified.

2. Sizing and selection

The sizing and selection of your air-conditioning equipment will always impact upon system reliability.

By choosing an air-conditioning system that is too small for its location, you will increase the possibility of system failure. A small system will struggle to achieve desired temperatures in a larger space. It will have to work longer and harder to reach those temperatures which will, in turn, reduce the life expectancy of the compressors.

Under-sizing may also result in more frequent de-frost cycles when in heating mode and further impact upon the operation and reliability of the system.

Try to give thought to where you place your air-conditioning equipment, as restrictions in airflow and/or excessive pipe runs will affect performance and reliability, especially if airflows are impeded.

All businesses will want to consider the cost of running an air-conditioning system. In areas where the system will be in regular use, consideration should be given to the design of run and standby installations or the practicality of load-sharing systems to provide full standby or reduced load on each system.

3. Installation

When you come to set up your air-conditioning system, there are lots of things you should bear in mind to ensure reliability.

The Copper Tube: Be sure to select the correct copper pipe for your system. Whether it's soft or hard-drawn tube, you'll need to check the wall thickness is suitable for the operating pressures of the system. A pipe with a larger diameter will need a thinner wall. When you bend a pipe, the wall thickness is reduced.

To prevent moisture and foreign matter from entering the pipe work, try to cap or seal pipe work during the storage and installation process.

Moisture in a system will cause the oil to become acidic and attack compressor windings and break down seals, eventually causing leaks. Foreign particles will also block strains, valves and even cause the compressor to mechanically fail. Brazing should always be done whilst purging the pipe work with OFN (oxygen free nitrogen). If OFN is not used, oxidization will occur internally in the pipe and collect in strainers and dryers when the system is operating.

Pipe Support: The pipe work must always be supported. Movement from system operation and accidental movement to the pipe can not only cause weakening and possible refrigerant leaks but also seriously injure anybody near the discharged refrigerant. Remember, refrigerant can burn and, as it is heavier than oxygen, it can result in asphyxiation in certain conditions.

Pressure Testing: Once you've installed your system, you should always test the pipe work for strength and leaks. Can the pipe withstand the maximum operating pressure of the system and will it stay leak free for the duration of the plant's life? F-Gas regulations state to what pressure the pipe work should be pressurised to and for how long. These regulations also cover the importance of evacuating the area whilst strength testing. A pipe failing under pressure can cause serious injury!

Insulation: One important thing to consider is the thickness of the wall. The higher the humidity, the greater the wall thickness should be. Always glue/tape the joints together as the insulation may contract over time, exposing the pipe and reducing the efficiency, and therefore increasing the demand on the compressor.

Wiring: The power supply should always comply with current regulations, and consideration should be taken when RCD's and RCBO's are being used. Can the existing circuit accommodate the load from another electrical item without causing nuisance tripping? Many of today's electronic goods (including air-conditioners) generate a small amount of earth leakage. Interconnecting cables should be seamless where possible as loose/broken connections can be very difficult to find! The cable should be neat and tidy, and in many cases run with the pipe work. Coiled and bundled cables and cables crossing or running near other cables can cause noise on the air-conditioning communication line, resulting with the system possibly faulting or failing.

Condensate: Always use the manufacture's maximum lift specification on pumps as condensate flooding back can not only damage the air-conditioner but can also be costly to the user. As with any mechanical components, pumps can fail, so certain applications may require a high-level alarm and/or cut off preventing costly water damage.

4. Commissioning

Vacuum: Evacuating the pipe work may be time consuming, but is very important. The only way to prove if there is any moisture in the pipe work is by monitoring the vacuum process. Every commissioning engineer should have a calibrated Torr gauge, a well-maintained vacuum pump, and a clean and well-maintained manifold set. A rising Torr gauge is an indication of moisture in the system and, as previously mentioned, moisture in a system will cause acid, leading to inevitable failure and costly repairs.

Refrigerant charging: Always check the manufacture's additional charge details because some systems require no additional refrigerant while others require a precise additional charge depending on the length and diameter of installed pipe work. The refrigerant should always be virgin to avoid any chance of contamination and be weighed in accordingly. Try to be careful when charging a system that you prevent liquid refrigerant returning to the compressor, as compressors are not designed to pump liquid and can mechanically fail. This also applies to over-charging a system.

Addressing: Addressing a system is very simple by using switches, buttons, and controllers. Whichever way the system is addressed it is very important to get it right; incorrect addressing may lead to the wrong indoor unit talking to the wrong outdoor unit, or the wrong controller talking to the wrong indoor unit etc, all resulting in excessive run times and operating conditions.

Test run: Most systems require power to the condenser prior to it operating. This is because the crankcase heater removes liquid refrigerant from the compressor sump by boiling it off and preventing the compressor from failing due to pumping liquid refrigerant. The system monitors all necessary temperatures and pressures to ensure it is operating correctly and efficiently. Many air-conditioners allow PCs to interface so you can monitor these readings, for instance if a valve box is left unplugged, or fan is not rotating it can be easily identified preventing future costly repairs.

5. Maintenance

Maintenance is probably the single most important factor in the reliability of any mechanical component.

A well-maintained air-conditioner is efficient and therefore reliable!

Many expensive bills can be avoided just by educating the end-user on the importance of cleaning the filter and ensuring the airflow is not restricted. The operator of the air-conditioner is also legally responsible for ensuring the system is regularly checked for leaks under F-Gas regulations. The quantity of refrigerant in a system depends on the frequency of this leak check and proves whether or not the system is operating efficiently. An efficient system is a reliable system!

Refrigerant shortage will increase the demand on the system, the operation temperature of the compressor, and the transistor PCBs controlling the frequency (speed) to the inverter compressor. As the temperature of these components increases, so does the chance of failure.

6. Controls and monitoring

Simple controls guarantee to extend the life of your air-conditioner. Firstly, timers can be used to reduce the operating time and the set temperature when the system is being used sparingly.

Airflow adjustment via fan speed and louver settings allows the system to evenly distribute the air to condition the whole space. This prevents it from going over the set point or continually running without ever achieving set point. Positioning of the controller plays an important part in controlling the air-conditioning efficiently by reducing operation times. Many controllers are equipped with return air sensors. Therefore sensible consideration should be taken when positioning the controller. Try to keep it away from direct heat sources, drafts and air discharged from the system to increase the efficiency and reduce the run time and/or compressor frequency.

7. Manufacturer's support

Although there are lots of ways you can prolong the life expectancy of your air-conditioning system, there are times when you cannot avoid the inevitable. Components will fail from time to time. Ensuring that your supplier has a full technical back-up service and helpline facility will ensure that, if and when you do get a problem with your system, the problem can be quickly and accurately assessed and diagnosed by a qualified and experienced team of engineers. Should there be the need for remedial work involving spare parts then ensure that your supplier has a readily available stock of spares or access to all spares as and when necessary.

Although cost will be an issue for everyone, for certain hi-dependency applications consideration should always be given to holding a stock of 'recommended spares'. Most major manufacturers will be able to provide you with a list of recommended spares.

8. Notes for the User

The user should be aware of how he/she can keep their air-conditioning system running reliably. A system will run better and for longer if it is only used when it is needed. The use of timers will mean the system only runs when required and simply keeping doors and windows closed will avoid the system fighting against unexpected heat gains or losses.

Users should avoid setting the set temperatures on the controller lower or higher than the desired set temperature when the system is first switched on. This action will not achieve the desired set condition any quicker and will only result in the overshooting of the desired set temperature, increasing compressor usage.

As explained earlier, regular maintenance is a must for air-conditioning systems, not only to ensure reliability but also to maintain manufacturer's warranty. Therefore, all users should be encouraged to take up maintenance contracts with their installers or implement a regular maintenance regime with another party.

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If you have worked in the industry for some time, you probably knew all that. If so, we hope it confirmed that you are following best practice. If, however, we have pointed out something that you had not considered before, we hope we have helped you to offer your customers greater levels of reliability, helping them to realise the importance of having a well constructed and maintained air-conditioning system.

If you would like to know more about how **FG Eurofred** and **Fujitsu** can help you achieve more reliability, please contact us on **020 8731 3442**.