© BCAS FACT SHEET NO. 312

Pressure Systems Compliance - Safe operating limits and safety valve settings

Note: The following interpretation only applies in Great Britain where the Pressure Systems Safety Regulations apply.

1 Scenario

It is common practice that air receiver manufacturers supply air receivers complete with a pressure relief safety valve. It is also common practice that compressor manufacturers who incorporate these air receivers into a compressor set/package include the same pressure relief safety valve. The compressor set/package is then purchased for use without regard for the setting of the pressure relief safety valve having any relevance to the operating pressure of either the compressor or the compressed air system.

2 Air receiver manufacturer legislation

Air receivers may be manufactured in accordance with 1 of 2 relevant EU legislative provisions;

a) Simple Pressure Vessels Directive (SPVD), 2009/105/EC (formerly 87/404/EEC)

b) Pressure Equipment Directive (PED), 97/23/EC

Both directives use the same identifier for pressure which can be found on the data plate of an air receiver and this is 'PS'.

- SPVD identifies 'PS' as 'maximum working pressure'; the meaning is given in EN 286-1 and states "*the maximum gauge pressure which may be exerted under normal conditions of use*"
- PED identifies 'PS' as 'maximum allowable pressure' and is stated to mean "*the maximum pressure for which the equipment is designed, as specified by the manufacturer*"

With respect to air receivers and for all practical purposes this is taken to mean that where 'PS' is identified on the data plate, for either directive then that pressure shall not be exceeded in use.

3 Air receiver manufacturer practices

There are two identified practices for the supply of an air receiver into the marketplace;

3.1 Unknown final application

Where the manufacturer of an air receiver places it on the general market and is unaware of its final application then if it is chosen to supply a pressure relief safety valve this is supplied against the only known factor. That factor is the identified 'PS' for that air receiver.

In choosing the value of that pressure relief safety valve the SPVD and EN 286-1 have some helpful information in relation to the definition of 'PS', which is;

"***the set pressure of the pressure relief device is never greater than PS, but after pressure relief has commenced, the pressure can exceed PS by 10% maximum, momentarily***"

Taking this into account the air receiver manufacturer usually fits a pressure relief safety valve having a set pressure equal to 'PS'.

3.2 Known final application

3.2.1 Quantity supply to compressor manufacturer

An air receiver manufacturer often supplies quantities of such receivers to a compressor manufacturer for incorporation into a compressor set/package. In this case it is up to the compressor manufacturer to stipulate the pressure performance expected of the air receiver. It is possible that the compressor manufacturer incorporates an air receiver having a 'PS' equal to the maximum pressure output of the compressor in which case a pressure relief safety valve equal to 'PS' would be fitted.

3.2.2 Compressor family

There is also the situation where the compressor manufacturer only stipulates the maximum working pressure of a particular compressor in a family, other compressors having adjustable lower working pressures. The agreement is for the air receiver manufacturer to supply with a pressure relief safety valve suitable for the maximum working pressure of the compressor family or the 'PS' of the air receiver if 'PS' is greater.

3.2.3 'PS' 1

The compressor manufacturer may ask for an air receiver having a particular 'PS' and a pressure relief safety valve suitable for that pressure value without relation to the compressor's pressure output.

3.2.4 'PS' 2

The compressor manufacturer only stipulates the need for a particular 'PS' without reference to a pressure relief safety valve and the air receiver manufacturer reverts to the practice as if the application was unknown.

4 Compressor manufacturer practices

Compressor manufacturers may follow the practices identified above in 3.2, however in many instances they may only stipulate the maximum working pressure of the compressor and utilise an air receiver to match this output fitted with a pressure relief safety valve supplied by the air receiver manufacturer. The compressor manufacturer often adopts the final scenario in 3.2.4 and accepts what is supplied as far as the pressure relief safety valve is concerned.

5 User practices

The user of the air receiver or compressor set/package generally only identifies what operating pressure is required at the point of use. The value of the pressure relief safety valve is not considered only that the equipment supplied has one fitted.

6 Pressure Systems Safety Regulations (PSSR) – S.I. 2000:128

This is a suite of regulations that apply to compressed air systems in-use in Great Britain. As part of those regulations the owner/user of a compressed air system is required to meet the provisions of Regulation 7.

6.1 Safe operating limits

Regulation 7 – requires the setting of the safe operating limits of the compressed air system.

The definition of 'safe operating limits' is stated as "*the operating limits (incorporating a suitable margin of safety) beyond which system failure is liable to occur*".

The regulation states **"The user of an installed system and owner of a mobile system shall not operate the system or allow it to be operated unless he has established the safe operating limits of that system.**"

6.2 Competent person

The PSSR also requires that the owner/user has a written scheme of examination drawn up and certified by a competent person. The owner/user will need expert advice for some decisions and that could come from the competent person. Advice such as the setting of safe operating limits and pressure relief safety valve values are relevant here.

7 Safe operating limit and setting of the pressure relief safety valve

It is clear that from the manufacturer of the air receiver through to the manufacturer of the compressor set/package and then to the actual owner/user there are different requirements being met and required to be met.

7.1 Air receiver manufacturer

The air receiver manufacturer when and if he supplies a pressure relief safety valve does so in compliance with EU law which only has a passing bearing on actual use. The safe operating limit of the compressed air system is not his concern.

Warning – The user should identify the pressure relief safety valve setting and if it is set at the 'PS' of the air receiver then this should be compared to the current safe operating limit of the compressed air system. The suitability of the pressure relief safety valve setting should be confirmed with the competent person who certified the written scheme.

7.2 Compressor manufacturer

The compressor manufacturer considers the supply of a compressor set/package against identified pressure outputs as given in published literature. The supply of any pressure relief safety valve supplied with the equipment is related to the published pressure performance of the compressor and generally having no direct relationship with in-use requirements in respect of the pressure relief safety valve. The safe operating limit of the compressed air system is not his concern.

Warning – The user should identify the output pressure of the compressor set/package and compare this with the 'PS' of the air receiver and the pressure relief safety valve setting. The suitability of the pressure relief safety valve setting should be confirmed with the competent person who certified the written scheme. The competent person should take into account the current safe operating limit of the compressed air system and the output pressure of the compressor set/package. The output pressure may be lower than 'PS' of the air receiver which will be reflected in a lower safe operating limit in which case the pressure relief safety valve will also reflect the lower safe operating limit.

7.3 User

The user is only concerned with what is purchased as being able to provide the pressure to run his compressed air system.

It is only when the PSSR is applied that there is a requirement to co-ordinate these various aspects to relate the necessities of identifying the safe operating limits for the compressed air system and the setting of the pressure relief safety valve. The safe operating limit of the compressed air system is clearly the users concern.

8 PSSR and setting the pressure relief safety valve

The definition of **'pressure system**' as identified in the PSSR is;

"*a system comprising one or more pressure vessels of rigid construction, any associated pipework and protective devices*;"

The definition of 'safe operating limits' as identified in the PSSR is;

"*the operating limits (incorporating a suitable margin of safety) beyond which system failure is liable to occur* "

The pressure relief safety valve is therefore set at a value relevant to the entire compressed air system and not just the air receiver. In principle the pressure relief safety valve setting will be guided by the 'weakest link' in the compressed air system and taking into account the general operating pressure of the compressed air system as identified by the user.

What is not acceptable is the continued use of the pressure relief safety valve supplied with either a standalone air receiver or one that forms part of a compressor set/package unless it is confirmed that this is compatible with and related to the safe operating limit identified by the user of the compressed air system as required by Regulation 7 of PSSR.

9 Conclusion

The pressure relief safety valve for any particular compressed air system should be identified at the time of the enquiry by the customer (user). The supplier of a standalone air receiver or a compressor set/package should establish the requirement for a pressure relief safety valve for a customer's compressed air system based on knowledge of that system's safe operating limit.

10 Example

10.1 Safe Operating limit lower than 'PS' of air receiver

The safe operating limit of a compressed air system may be based on the 'PS' of a piece of equipment in the compressed air system or the operating pressure of the compressor which could be lower than the air receiver 'PS'. In these cases where the safe operating limit as identified by the user is lower than the 'PS' of the air receiver(s) installed then the pressure relief safety valve shall have a set pressure related to the SOL and taking into account that this pressure may be exceeded momentarily by 10% of the set pressure.

10.2 System operating pressure and energy saving

With the need to apply energy efficiencies to compressed air systems it is now the case that compressed air system operating pressures are being reduced. Where existing compressed air systems are subjected to this practice that then raises the question about safe operating limits and ultimately questions arise about the setting of the pressure relief safety valve.

If the only changes that have been made to the system is the lowering of the pressure and no other physical changes have been made to introduce equipment that have lower operating pressures then there should be no need to reconsider setting the safe operating limit at a lower value.

A risk assessment should be applied after the reduction in system pressure due to energy efficiency issues to determine if there is any increased hazard. In general the lowering of system pressure for energy efficiency saving should not create any additional risk although this should be confirmed with the competent person certifying the written scheme.

Note – The 'safe operating limit' for a compressed air system is the safety factor that has been applied taking into account all the factors governing that value. Where the system pressure has been reduced the safety factor is still as it was. The safety factor built into the 'safe operating limit' would only be compromised and need re-assessing if the system operating pressure has been increased.

BCAS runs regular 1-day workshops on the background to written schemes for those wishing to gain knowledge of the Pressure Systems Safety Regulations.

BCAS also runs a 5-day Examiner's course in support of the Pressure Systems Safety Regulations which for those who successfully complete the 3 examinations during the week receive a numbered certificate valid for 3 years. The successful candidate's name will be entered into the BCAS register of Examiners.

Contact BCAS for details on either course or further information on the Pressure Systems Safety Regulations.