



SAFETY ASSESSMENT  
FEDERATION

# Guidance

## Pressure Systems

Acceptance of equipment, establishment of  
safe operating limits and fitness for service

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## **INTRODUCTION**

Regulation 7 of Pressure Systems Safety Regulations (PSSR) places duties on users of pressure systems to establish safe operating limits (SOL's). When the competent person is required to carry out an examination and issue a report on a pressure system it is essential that there is satisfactory evidence that SOL's have been established. In the vast majority of cases equipment which is being considered for inclusion in a PSSR Written Scheme of Examination (WSE) will have been supplied in accordance with the Pressure Equipment Directive (PED) (Implemented in the UK by the Pressure Equipment Regulations PER) or the Simple Pressure Vessel Directive (SPVD). If the item has been correctly supplied in accordance with the PED or SPVD then there should be sufficient evidence available to establish SOL's and to confirm the suitability of the equipment for service.

Paragraph 107 of the Approved Code of Practice (ACOP) to PSSR requires the WSE to specify, where appropriate, any examinations that a pressure system needs to undergo before it is taken into use for the first time. Checking supply documentation and confirming SOL's will undoubtedly form part of this first examination but the full scope of the examination will be dependent on the level of evidence available to the Competent Person as to its suitability. Competent Persons should apply the following guidance when considering the suitability of equipment that comes within the scope of the written scheme.

### **1. Individual item of equipment.**

Check to see if the item is CE marked and has a name plate or markings. Ask to see the manufacturer's declaration of conformity (D of C) and instructions for use where appropriate (The PED does not require a D of C to be provided with pressure equipment but in practice it generally is). If the name plate markings are adequate, the D of C is in order and suitable protective devices are fitted where appropriate then there may be sufficient evidence to confirm SOL and the fitness of the item for service.

If there is no CE mark, then the reason for this should be determined. If the item is built to 'Sound Engineering Practice' or is steam at  $\leq 0.5$  bar see paras 4.3 or 4.4. Where full manufacturer's documentation is available it may be possible for a fitness for service assessment to be carried out to ensure Regulations 4 and 5 of the PSSR can be complied with. However, if the legal requirements of the PER have been contravened see para 4.5.

The necessary content of a PED D of C is shown in Appendix 1. This will give details of the conformity assessment module chosen by the manufacturer and this may need to be taken into account by the competent person when considering the extent of the initial examination in accordance with PSSR ACOP para 107. Clarification on the meaning of pressure equipment is given in Appendix 2.

If the nameplate or markings cannot be located on an item of pressure plant that is already in service, it may be possible to establish the SOL using manufactures documentation or engineering drawings. The information should be applicable to the item being assessed.

If there is no evidence of a nameplate or markings and no documented evidence of design parameters, then some form of assessment should be carried out.

The level of the assessment should be commensurate to the risk. For example, a simple pressure vessel such as an air receiver would only require a simple assessment against an air receiver build code such as BS EN 286-1 with a thickness calculation being applied. A reactor vessel may require a full first principle design assessment or assessment against a known build code with suitable NDT on all welds and establishment of the material of construction.

The use of 'Grandfather rights' where the item has been examined for a number of years and has not failed is not considered suitable on its own to establish the SOL. Historical inspection data is useful as part of the design assessment process to assist in the establishing of the SOL.

Reference to the SOL assessment should be made on the report of examination and any documented calculations or certificates of assessment retained for future reference.

## **2. Assembly**

The PED defines an assembly as several individual items of pressure equipment that are put together to form a functional whole (e.g. a refrigeration system). Assemblies can also be combined to form larger assemblies. Typical examples are contained in Appendix 3. Where assemblies are supplied by one manufacturer, they should undergo global conformity assessment. In this case the Competent Person should check to see there is a CE mark for the assembly as a whole and that there is a global D of C. The D of C should describe the scope of the assembly and also whether there has been notified body involvement (which is required for all assemblies containing pressure equipment of category 2 and above). Where the notified body has inspected the assembly under a product verification or unit verification conformity assessment module then a certificate of conformity from the notified body should have been provided and should be requested. In many cases the manufacturer of the assembly will have chosen to use a quality assurance module for conformity assessment and a certificate of conformity will not have been issued. In either case for assemblies of Cat II and above the notified body number will appear on the nameplate adjacent to the CE mark.

Note: a list of the names and notified body number references together with the scope of their accreditation can be found on the European Commission Nando website. A web search for 'Nando Notified Body' will normally bring up the site.

If the documentation and markings are in order and if suitable protective devices are fitted where appropriate for the equipment making up the assembly, then there may be sufficient evidence to confirm SOL and the fitness of the assembly for service.

Where each of the items of pressure equipment in an assembly is CE marked as appropriate but there is no global CE mark and accompanying documentation then the user should be informed that his supplier (the manufacturer of the assembly) has not fully discharged his duties under the PED with respect to the global conformity assessment. If for whatever reason the supplier can not or will not carry this out, then an assessment of the assembly will have to be carried out to ensure that regulation 6 of the PSSR has been complied with. The objectives are to confirm that the various parts are compatible and suitable protective devices are fitted where appropriate. Operational aspects may also need to be considered such as its suitability for filling, venting, draining, etc.

## **3. Assemblies (installations) put together by the user**

Where a main contractor is responsible for designing/putting together an assembly on site he will be responsible for the global conformity assessment. However, there is an exception in the directive whereby the PED does not apply to an assembly put together on site under the responsibility of the user. The user may appoint contractors to assist in the process but for the exception to apply the contractor would need to be working under the direction and control of the user. Individual items of pressure equipment making up the assembly, where appropriate would still need to be CE marked in the normal way. This will include the piping systems put together on site.

Although the PED does not apply to such an assembly the PSSR will apply and the user will need to comply with regulations 4, 5 and 6. In such cases the Competent Person will need to establish that individual items of equipment to be included in the WSE are compliant with the PED as appropriate and that the installation is safe as a whole. This will follow a similar approach to the PED global conformity assessment to confirm that parts are properly integrated and adequately protected where appropriate. If the user cannot produce sufficient

documentary evidence to confirm the adequacy of the installation, then a fitness for purpose assessment may need to be carried out.

#### **4. Points to note:**

##### **4.1. Other applicable directives**

CE marking applies to a vast range of European directives and the CE mark on the nameplate does not automatically mean the item is compliant with the PED (e.g. Machinery directive, Low Voltage directive etc). The D of C should make it clear whether directive 97/23/EC (PED) has been applied

##### **4.2. Risk category I equipment**

Small, low-pressure equipment coming under PED risk category 1 and also built-in accordance with other directives (e.g. small cafeteria boilers built in accordance with the Low Voltage directive) are excluded from the PED. There should nevertheless be markings or documentation which confirm SOL's. As this type of equipment is excluded from the PED then Regulations 4 and 5 of PSSR will apply. Competent Persons will need to make an engineering judgment as to whether there is sufficient information to confirm SOL's.

##### **4.3. Sound Engineering Practice**

Small equipment falling within the scope of the PED may come under the "sound engineering practice" (SEP) category. Such equipment is only required to bear adequate markings and be supplied with adequate instructions for use. It is not CE marked nor is it supplied with a PED D of C. The markings/documentation should confirm SOL's. The PED is rather vague on what is considered to satisfy SEP and what markings are considered adequate. It states that the equipment or assembly has to be safe to use and the markings must identify the manufacturer. Competent Persons will need to make an engineering judgement as to whether there is sufficient information to confirm SOL's.

##### **4.4. Steam at $\leq 0.5$ bar pressure**

Equipment operating at pressures up to 0.5 bar falls outside the scope of PED but if the equipment contains steam it is within the scope of PSSR (e.g. some boiler blowdown receivers). In such cases the requirements of regulations 4 and 5 of PSSR will apply. Again judgment will need to be made as to whether there is sufficient information to confirm SOL's.

##### **4.5. Equipment failing to comply with PED**

If an item of equipment (or an assembly) has been put into service and is in breach of the Pressure Equipment Regulations (PER) the Competent Person has a duty of care to inform the User/Owner. This should be recorded on the first report issued, using suitable wording in the Observations section such as: "This item has been put into service in contravention of the Pressure Equipment Regulations." Where it has been possible to carry out



an assessment to confirm that the equipment is safe to use this should be confirmed in the report and the SOL's given.

The decision tree in Appendix 5 of this document provides further assistance in assessing new pressure equipment.

#### **4.6. Examples of recognised pressure equipment standards.**

Appendix 4 provides information on typical standards which would be considered suitable for pressure equipment manufacture. These standards are rarely used for SEP and cat I equipment. This is not an exhaustive list, and the Competent Person may need to seek further information on the suitability of the build specification.

### **5. Repairs and modifications.**

Competent Persons need to evaluate repairs and modification to existing pressure systems to confirm they remain safe, and that SOL's have not been compromised.

Major modifications should be subjected to assessment under PED if the modification changes the purpose of the equipment or the way that it operates. The PED should be applied if it is feasible to do so but for old equipment supplied prior to the implementation of the PED this may be impossible.

Therefore, if a major modification is to be undertaken then it needs to be discussed and agreed with the owner/user whether CE marking is practicable and appropriate. If not, the modification will need to be carried out in such a manner that Regulations 5 and 13 of the PSSR can be complied with.

Repairs which replace a whole item of equipment on a like for like basis have to be treated as new pressure equipment and CE marked accordingly (see Appendix 2 for what constitutes pressure equipment). Other repairs should comply with regulations 5 and 13 of PSSR.

## Appendix 1 — Contents of a declaration of conformity

Schedule 6 PER Regulations 7(3) (d), 8(3) (a) (iv) (Annex VII to the Pressure Equipment Directive) The EC declaration of conformity must contain the following particulars:

- name and address of the manufacturer or of his authorised representative established within the Community,
- description of the pressure equipment or assembly,
- conformity assessment procedure followed,
- in the case of assemblies, description of the pressure equipment constituting the assembly, and the conformity assessment procedures followed,
- where appropriate, name and address of the notified body which carried out the inspection,
- where appropriate, a reference to the EC type-examination certificate, EC design-examination certificate or EC certificate of conformity,
- where appropriate, name and address of the notified body monitoring the manufacturer's quality assurance system,
- where appropriate, the references of the harmonised standards applied,
- where appropriate, other technical standards and specifications used,
- where appropriate, the references of the other Community Directives applied,
- particulars of the signatory authorised to sign the legally binding declaration for the manufacturer, or his authorised representative established within the Community.

## **Appendix 2 – Individual items of pressure equipment - descriptions**

The terminology used for pressure equipment is not quite the same as the components making up a pressure system. They are described below:

### **Vessel**

A vessel is described as a housing built to contain fluids under pressure. It applies to anything storing, heating, cooling or processing a fluid under pressure. It can also have more than one chamber; hence a “U tube” heat exchanger tube bundle would not be considered as an item of pressure equipment until it is attached to the heat exchanger shell and bonnet. Therefore, a replacement tube bundle may just be considered as a repair under PSSR rather than a new item of equipment under PED.

### **Piping**

Piping is described as piping components (pipes, elbows, tees, flanges etc) connected together to form a piping system for the purpose of transporting fluids between items of equipment. A jacketed pipe heat exchanger should be considered as a vessel as opposed to piping.

### **Safety accessory**

Safety accessories are described as devices designed to protect pressure equipment against allowable limits being exceeded. Unlike “protective devices” in PSSR they do not include warning devices.

Examples of safety accessories include: safety valves, bursting discs, temperature limiters on hot water boilers and low water limiters (cut outs) on steam boilers.

### **Pressure accessory**

Pressure accessories are described as devices with an operational function which have a pressure bearing housing. Typical pressure accessories are valves. It should be noted that pressure gauges and liquid level gauges are also pressure accessories, although these may be considered as protective devices under PSSR (warning devices). A pressure switch is a pressure accessory but when it is connected to a controller and actuator which has a safety function then the whole chain becomes a safety accessory.

## Appendix 3 – Examples of pressure equipment assemblies

### Refrigeration assembly

Comprising: compressor, oil separator condenser, receiver, safety valve, piping, valves, evaporator and controls

### Boiler assembly

Comprising: boiler, full complement of fittings, feed pump, burner and controls

### Boiler plant

Comprising: all the boiler assemblies, associated pressure plant, controls and connecting piping within a boiler house

### Steam plant

Comprising: the boiler plant, steam distribution and associated steam receivers and controls within a factory

#### Appendix 4 — Examples of recognised pressure equipment standards

The following is a non-exhaustive list showing typical standards which would be considered suitable for the design and manufacture of pressure equipment

<b>Standard</b>	<b>Description</b>
<b>Vessels</b>	
PD 5500	Specification for unfired fusion welded pressure vessels
BS 5169	Specification for fusion welded steel air receivers
BS 2646	Autoclaves for sterilization in laboratories. Specification for design, construction, safety and performance
BS 853-1	Specification for vessels for use in heating systems. Calorifiers and storage vessels for central heating and hot water supply
EN 286	Simple unfired pressure vessels designed to contain air or nitrogen. Pressure vessels for general purposes
EN 378-2	Refrigerating systems and heat pumps. Safety and environmental requirements. Design, construction, testing, marking and documentation
EN 13831	Closed expansion vessels with built-in diaphragm for installation in water
EN 13445	Unfired pressure vessel
ASME VIII	Pressure vessels (USA)
AD 2000 (AD Merkblätter)	Pressure Vessels (Germany)
<b>Boilers</b>	
BS 2790	Specification for the design and manufacture of shell boilers of welded construction
BS 1113	Specification for the design and manufacture of water-tube steam generating plant
EN 12953	Shell boilers
EN 12952	Water-tube boilers
ASME I	Power Boilers (USA)
TRD	Technical Regulations for Boilers (Germany)
<b>Pipework</b>	
EN 13480	Metallic industrial piping
ASME B31.1	Power piping (USA)
ASME B31.3	Process piping (USA)
ASME B31.5	Refrigeration piping (USA)

Appendix 5 – Decision Tree



