



CO-ORDINATING WORKING GROUP

"CLASSIFICATION SOCIETIES – DIESEL"

(WG2)

**Proposal towards IACS Machinery Panel**

St. Stutz/Secretary WG2/ST-12-065

29.11.2012

**Subject: Piping – Tightness of Pipe Connections**

**Status Quo / Situation**

The presently available requirements with regard to the tightness of pipe connections for flammable, highly inflammable and potentially explosive media and fluids are clearly requesting tightness.

Explosive and highly flammable liquid fuels are already defined with regard to their temperature rise up to its ignition point and above, in some cases also up to 10°C or less below the flash point (wording according to SOLAS).

In some cases certain technical regulations the "technical tightness" is requested.

However, a clear definition of this qualitative requirement and about acceptable leakage rates are not existing at all.

Instead of a clear definition, one tries, by means of additional requirements for technical protective means and organizational measures, to safeguard the tightness before commissioning and in operation and to minimize the risk in case of potential leakages.

Such additional measures are:

- Pressure- and tightness tests
- Safeguard the installation place by gas detecting devices and leakage monitoring
- Technical ventilation measures
- Doublewalled execution of pipework as kind of secondary barrier leakage protection

Today's actual requirements:

- Laws and provisions:
  - o EU Pressure equipment directive
  - o Machinery directive
  - o European ATAX directive
  - o Interime guideline to the IGF-code
  - o German emission protection law
- Various Standards

### ***Technical background***

The tightness of flange connections is basically depending on equal pressing on the seal and the conservation of the pretension force in service.

Thus, the flange screws and the flange itself with the seal are working as a “spring system”.

Leakages of piping systems in service mostly occur due to bad workmanship on welded pipe connections, insufficient pipe supports, not adequately considered additional loads as vibration, weight, thermal expansion, restrained elongation of piping. On that background, the possible sources of faults leading to leakages of flange connections in service must be considered. This could also be wrong design, wrong construction and assembly of the unit “flange connection”, consisting of flange type – bolts – gasket.

The verification of the tightness will generally done by means of visual checks under test- and service over pressure using noncompressionable, nonpoisoning test media such as e.g. water.

For pipings and vessels containing gases additional tightening checks are performed using foaming agents. But such test just allow at the moment of testing under the given test conditions a limited statement about the tightness of the connection.

With the unrestricted accessibility and visibility of the flange connections as well as the propriety of the pressure tests, taking into consideration the pressure curve when pressure testing (surrounded gas volumina, pressure increase due to heating up) there can no reasonable guarantee be given for a required tight pipe connection.

Therefore, additional technical protection measures must be applied against possible leakages of the respective media.

Flange connections according to EN 1591 part 1 to 4 enable a tight execution with defined leakage rates between  $10^1$  and  $10^{-6}$  [mbar\*l/(m\*s)] under Helium as test medium. By applying this method, dangerous areas can be identified via the leaking media and appropriate protection measures can be determined and thus the basic safety state of the art requirements according to the EU guidelines will be proved.

DIN EN 1591 – 1 is a harmonized standard based on the Pressure Equipment Directive 97/23/EC.

### ***Proposal***

The relevant IACS Rules and Regulations shall be adapted in such a way that the afore mentioned leakage rates are taken into consideration and thus to allow the construction, implementation, installation of flange connections according to the approved standard EN 1591 part 1 to 4 or equal.

As consequence additional leakage tests are not necessary any more due to the inadequate testing accuracy.