

ESA SUMMARY OVERVIEW OF API 682 4th Ed.

This document is a very short overview of API 682 4th Ed. It highlights some areas where there can be misinterpretation of the standard. A more detailed document, along with references, is available from the ESA either in the Members Area for members or contact the European Sealing Association for more details at:

info@europeansealing.com

API 682 was first published in 1994 and the 4th Ed. in 2014. It is the industry leading document for mechanical seals promoting proven, high reliability seal solutions across refining, chemical, petrochemical and other industries.

It should be noted that

- API 682 is not a specification.
- Some end users have adopted API 682 into their own standards.
- API 682 does not attempt to cover all refinery duties
- Default sealing recommendations in the standard do not imply technical preference but reflect installed base and experience.

It is important to note that API 682 does not attempt to define seal design and application outside the scope of the standard.

API 682 4th Edition Key Elements

Objectives of API 682 continue to be

- Seals should operate continuously for 25,000 hrs (3 yrs)
- Arrangement 2 outer seals should operate for at least 25,000 hrs at chamber pressure ≤ 0.7 bar
- Seals should achieve compliance with local emissions regulations or a maximum of 1000 ppm

IMPORTANT

These are performance **objectives** not a performance specification. The API Task Force recognises that **seal performance is dependent on operation**. No standard can fully cover all potential applications.

API 682 4th Edition Scope

Applications covered by the scope of API 682 are

Seal Chamber	Category 1	Category 2 & 3
Size	ASME B73.1 or ASME B73.2	API 610
Maximum Pressure	20 barg 300 psig	40 barg 600 psig
Temperature Range	- 40 °C to 260 °C - 40 °F to 500 °F	- 40 °C to 400 °C - 40 °F to 750 °F

Notes.

1. Seals covered by each Category are not required to be able to meet all maximum values listed
2. Any seal operating with service conditions outside the scope of the standard is designated an Engineered Seal (ES) and is not covered by the requirements of the standard

API 682 applies to seal spares as well as original equipment and may be applied for upgrading existing plant.

API 682 seals are identified in terms of Category, Arrangement and Type. API 682 4th Ed. has however adapted the definition of seal types to be less prescriptive. Dual seals can be of mixed types e.g. a type C inner seal with a type A outer seal.

Seal Categories are used to identify the equipment type and market to which seals are normally applied. They do not exclude use of seals across categories, this is a customer choice.

- Category 1 - use in non-API 610 pump seal chambers (ASME B73.1, and ASME B73.2)
- Category 2 - use in seal chambers meeting API 610 chamber dimensions
- Category 3 – as Category 2 but with increased documentation requirements

Seal Arrangements identify the seal assembly and whether designs are single or multiple seals. 4th Ed. API 682 states that configurations are 'technically equivalent' and should be selected on merit

API 682 Design Requirements define Default and Optional Seal Configurations.

Historical defaults are based on installed population not on performance, there is no technical preference for Default configurations over Optional configurations.

Seal Face Materials and Face Material Combinations must pass the relevant qualification test

- One ring shall be premium grade, blister-resistant, carbon graphite, except for services where two hard materials are required
- One ring shall be reaction-bonded or self-sintered silicon carbide (dependant on chemical compatibility/ recommendation).

For **Seal System & Accessory Design** the purchaser and the mechanical seal manufacturer shall mutually agree which piping plan or plans shall be used

Seal Inspection & Test

A **Hydrostatic Air Integrity Test** shall be conducted after final assembly. The test is to demonstrate that seal cartridge has been correctly assembled, the seals are not expected to be leak-free. Results are not representative of the seal performance in liquid.

The purpose of **seal qualification testing** is to provide the end user with a high degree of confidence that a manufacturer's commercial product seal will perform as required by API 682 across a wide range of duties. Seals are, however, designed for specific applications (e.g. high temperature) and a single design will not be suitable for all applications, so it is only necessary to qualify seals for the services in which they will be used.

API 682 4th Ed. updated the seal qualification procedures to simplify (and reduce the cost) of seal qualification while retaining the important benefit of providing user confidence of seal performance.

API 682 includes an Annex for **Standard piping plans**

- This annex contains drawings, descriptions, and tutorials of standard piping plans and auxiliary hardware which have regularly been used in industry.
- The details for each piping plan represents the minimum requirements for the plan. Users of API 682 may specify slight variations to plans.
- Substitutions for the instrumentation requirements in these plans are allowed (with purchaser's approval) while still retaining the piping plan designations
- To accommodate piping plans not shown in this annex, a Plan 99 should be selected which allows the purchaser to fully specify the requirements of the piping plan.