

General

Products, that may have a direct or indirect impact on public health, must be produced according to national and international guidelines, that differ depending on the trading area. The guidelines contain rules for the implementation and organization of methods, production, production environments and inspections.

The hygienic design of production plant and thus of the pressure gauges as well is a basic requirement for the production of faultless products. Pressure gauges must be constructed and installed so that no contamination-prone constellations can arise during operation and that impeccable cleaning is assured.

Classification of equipment and components

The EHEDG (European Hygienic Equipment Design Group) has classified plants according to its cleanability in three categories:

- Category I: Cleaning in place (CIP, removing dirt and microorganisms without dismantling the plant (CIP process))
- Category II: Cleanability of a plant by dismantling
- Category III: Cleanability of a plant and its microorganism tightness (closed processes)

Requirements for measuring instruments

Besides metrological aspects, there are a number of other conditions to be considered when designing hygienic pressure gauges, for example:

- manufacturing processes
- surface formation of wetted parts
- connectivity
- instrument designs
- durability/compatibility of materials
- special process conditions

Surface formation of wetted parts

The surface quality of wetted parts is of major importance for the efficiency of CIP processes. Scratches, dead spots, microscopic pinholes, cavities and fissures should be avoided in order to prevent contamination by undesirable substances, such as product residues, microorganisms and cleaning and disinfecting residues.

Typically, good surface cleanability can be achieved with an average roughness value of $Ra \leq 0.8 \mu\text{m}$ for smooth surfaces and $Ra \leq 1.6 \mu\text{m}$ near welds. No improvement in cleanability can be expected below $Ra = 0.4 \mu\text{m}$.

LABOM supplies standard instruments in hygienic design with the following surface qualities for media-contacting duties:

Turned parts	$Ra \leq 0.8 \mu\text{m}$
Foils	$Ra \leq 0.4 \mu\text{m}$
Laser welds:	
Foil/foil	$Ra \leq 0.8 \mu\text{m}$
Foil/body	Ra approximately $1.5 \mu\text{m}$ (depending on material)

Improved surface qualities can be achieved with electro-polishing. The release of oxygen when polishing chromium-nickel steel gives rise to a homogeneous passive layer on the material surface, which exhibits considerably improved corrosion stability with respect to surfaces that have been treated differently. Other methods of treatment and reduced surface roughness are available upon request.

Connectivity

Known pipe connection systems such as unions according to DIN 11851 are unsuitable for CIP processes. They belong to category II type equipment according to EHEDG.

Aseptic unions with the features listed below have been developed for use in CIP-compatible plant:

- centring with cylindrical guide
- metallic stop in tensioned state
- defined-prestressed sealing element
- seal without clearance inside the pipe

These demands are met by pipe unions with round threads and by flange connections according to DIN 11864. Custom connection systems with other threads or clamp straps are also supplied.

LABOM instruments for pressure and temperature are fitted with integral connections to comply with

- aseptic pipe unions according to DIN 11864-1
- aseptic flange connections according to DIN 11864-2
- manufacturer specifications from companies such as Südmo, Neumo, Guth, Tuchenhausen and others

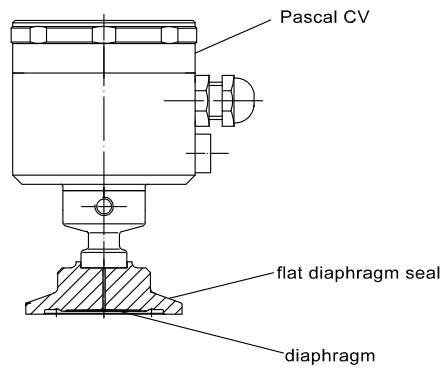
Seal materials

Because sealing elements depend greatly on a variety of process parameters they are not part of the standard delivery programme.

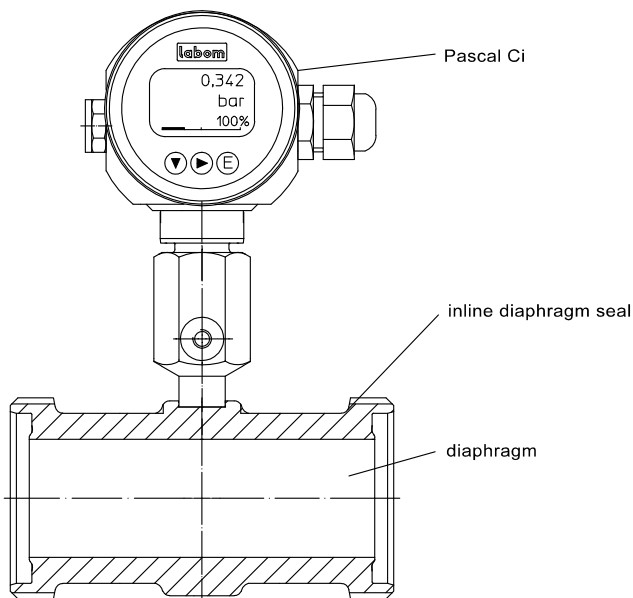
A seal must be suitable technically and exhibit a range of properties:

- good sterilisability
- smooth surfaces for efficient removal of any adherent particles
- completely non-toxic materials
- resistant to ageing and decomposure
- colourless and tasteless
- durability with respect to the product and if necessary to the cleaning and disinfecting agents and to the effects of CIP cycles

The applicable regulations and approvals from the appropriate authorities (LMBG, FDA, US 3A-Sanitary Standards and so forth) should be followed when choosing sealing elements.



Pressure transmitter with flat diaphragm seal
(Aseptic clamping joint per DIN 11864-3)



Digital Pressure transmitter with inline diaphragm seal
(Aseptic pipe connection per DIN 11864-1)

Pressure measuring technology

Pressure gauges with integrated or attached diaphragm seals are ideally suited for service in hygienic measuring arrangements. With the correct choice of components a variety of measurement problems can be solved:

- dead-zone free arrangement of measuring points under very hygienic conditions
- instrument protection against aggressive, highly viscous or crystallizing measured media
- protection against high measured-media temperatures and temperature fluctuations
- instrument protection against vibrations by coupling with capillaries
- use of special materials for separating diaphragms and surface coatings for special applications

Pressure gauges supplied by almost all manufacturers can be fitted with LABOM diaphragm seals. Specially designed LABOM pressure gauges with reduced dead volumes are suited for duties at high process and cleaning temperatures.

Connecting elements

Connecting elements serve to connect pressure gauge and diaphragm seal. LABOM supplies different versions for process temperatures up to 260 °C.

Diaphragm seals

Inline diaphragm seals and **flat diaphragm seals** with the appropriate aseptic connections are ideally suited for particularly stringent hygienic requirements. The diaphragms are very mildly corrugated and are self-draining when appropriately arranged.

Materials

- Basic body material no. 1.4404
- Diaphragms material no. 1.4435

Special materials for diaphragms

- Tantalum
- Monel 400
- Hastelloy C276

Further materials, coatings and chromium-nickel steel according upon request.

Fluids for diaphragm seals

A range of substances available as pressure transmission fluids to suit the particular duty. Please refer to the table below and the appropriate data sheets for detailed information.

The American authority FDA has classified substances that may be used as process materials in food processing technology. In cases where substances may come into unintentional contact with foodstuffs, only substances in the highest category H1 may be used.

Fluids of diaphragm seals				
type	FD1	FNM20	FVE	FGW
designation	food oil	Neobee	VE water	glycerine/water
operating temperature				
$P_{abs} < 1 \text{ bar}$	-10...+120	-20...+160	0...+20	---
$P_{abs} \geq 1 \text{ bar}$	-10...+200	-20...+200	0...+95	-20...+120
application	Food processing applications. Listed in the positive FDA list, approval category USDA-H1	Synthetic oil, free of silicon for foodstuff industry, FDA listed, class USDA-H1. Standard oil. The product is also accredited at the IFANCA.	Food processing, bio-engineering, chemical engineering and paints industry	Food processing (at 120 °C $p \geq 3 \text{ bar abs}$)