

Welding scheme for diaphragm seal(s) instruments



Diaphragm seal(s) weldings are a key factors while it comes to protect transmitters when measuring difficult fluids and expand the applications for pressure measurement solutions.

Measurement made easy

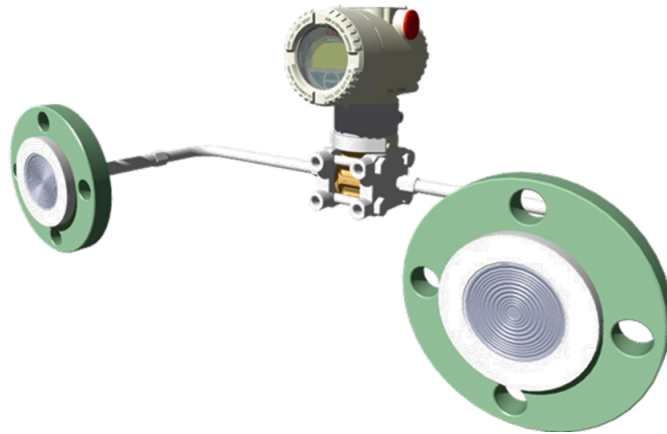
Quick and accurate measurement while maintaining transmitter protection

Introduction

An important construction feature of a diaphragm seal system is that it prevents in-leakage of air or other ambient gases, and it prevents the leakage of fill fluid out of the system.

The integrity of the hydraulic circuit is critical to the system's performance. Even a tiny air or gas bubble entrained in the fill fluid will cause adverse effects to the pressure measurement. This is especially vital for operation under vacuum conditions where the differential between the sub-atmospheric pressure in the system to the outside environment will attempt to pull the smallest gas molecules through any flaw, indefinitely.

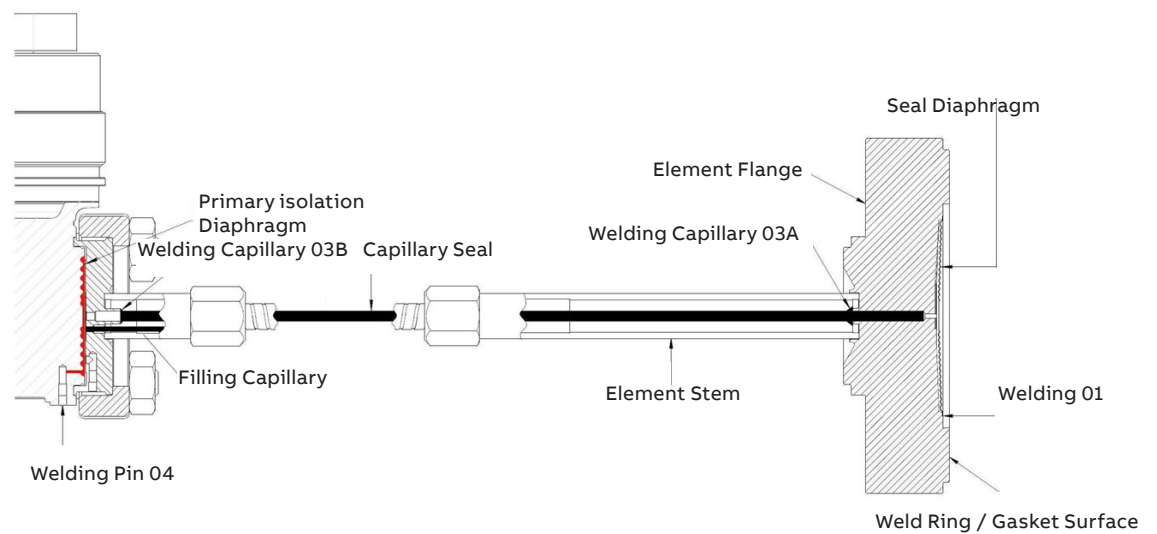
The purpose of this document is to describe the main construction phases of instruments with remote seals, with particular attention to welds in contact with the process media, and the welds subject to pressure stress.



The following drawing shows the construction detail of an instrument with remote seal(s).

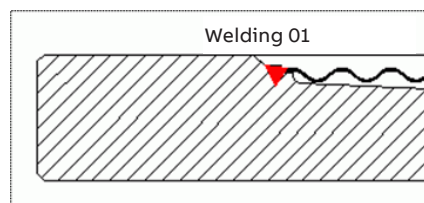
The relevant weldings are:

- 1 Welding 01 = Diaphragm welding on diaphragm support;
- 2 Transducer interface welding 02 = Remote seal transducer interface welding on transducer body;
- 3 Welding Capillary 03A and Welding Capillary 03B = Capillary weldings remote seal side and transducers side;
- 4 Welding Pin 04 = Pin welding in Fill fluid filling hole.



Picture 1 All-welded ABB's Standard Design.

Welding 01



The diaphragm welding on diaphragm support must guarantee perfect sealing of the instruments versus the process media.

The welding physical and chemical characteristics must be identical to the base material of the diaphragm and diaphragm support in order to guarantee resistance over time .

Furthermore, perfect sealing must guarantee.

All major welds are carried out with laser technologies, or in some cases with T.I.G. (Tungsten Inert Gas) technology, always without filler material.

These welds are carried out automatically; depending on the material, the welding and machine setup parameters and the necessary equipment change.

All the necessary precautions, equipment, welding gases, or welding protection gases are part of ABB's know-how and cannot be disclosed.

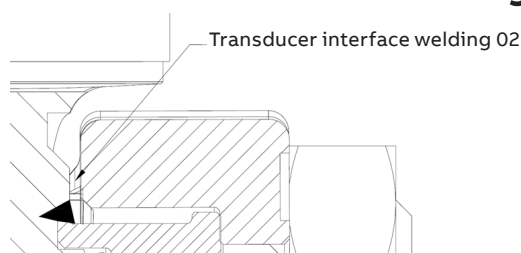
The operator responsible for supervising and managing the welding process, after the operation itself, must check the welding quality, including weld appearance and strength, so that:

- 1 The welding shows no inhomogeneity.
- 2 No discoloration phenomena (surface oxidation) is present.
- 3 No microporosity, cracks, holes or areas with no welding are found in the bead.

To better identify phenomena of this type, if necessary, proceed with detailed viewing under the microscope.

After the visual verification phase, it is necessary to test the perfect sealing with the use of a leak detector calibrated in helium (mass spectrometer). The machine parameters and the test execution time are part of ABB's know-how and cannot be disclosed.

Transducer interface welding 02



The welding between the transducer interface and the transducer body (plus or minus side) is carried out with Laser technology without filler metal.

These welds are carried out automatically.

All the necessary precautions, equipment, welding gases, or welding protection gases are part of ABB's know-how and cannot be disclosed.

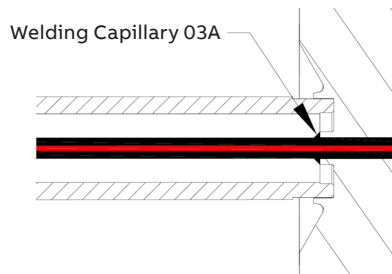
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Welding 03A and welding 03B



03A and 03B, welding of the capillary on the diaphragm support, or on the transducer interface, is a manual welding performed with T.I.G. (Tungsten Inert Gas) technology, without filler metals. This welding is carried out by an ABB operator, who has been qualified internally according to our internal procedures.

From the point of view of resistance, it does not present particular difficulties, as the thrust area is decidedly small.

The difficulty is in not blocking the small hole inside the capillary itself.

After welding, the operator must check the welding quality, including weld appearance and strength, so that:

- 1 The welding shows no inhomogeneity.
- 2 No discoloration phenomena (surface oxidation) is present.
- 3 No microporosity, cracks, holes or areas with no welding are found in the bead.

To better identify phenomena of this type, if necessary, proceed with detailed viewing under the microscope.

After the visual verification phase, it is necessary to test the perfect sealing with the use of a leak detector calibrated in helium (mass spectrometer). The machine parameters and the test execution time are part of ABB's know-how and cannot be disclosed.

Welding Pin 04

Pin welding is the last welding of the Instrument with remote seals.

This welding is carried out after filling operation, through the filling hole.

This welding redundantly guarantees the sealing of the filling hole, as the hole itself is pre-sealed with a stainless steel ball inside the filling hole, keyed and forced.

The addition of a welded pin guarantees and makes ABB instruments more reliable, which have always provided instruments with remote seals in all welded solutions.

This welding is carried out by an ABB operator, who has been qualified internally according to our internal procedures.

After welding, the operator must check the welding quality, including weld appearance and strength, so that:

- 1 The welding shows no inhomogeneity.
- 2 No discoloration phenomena (surface oxidation) is present.
- 3 No microporosity, cracks, holes or areas with no welding are found in the bead.

To better identify phenomena of this type, if necessary, proceed with detailed viewing under the microscope.

After the welding, and before the calibrated span of the instrument, a pressure test is carried out at the MWP or OVP value.

Note

All the tests described above (from chapter 2 to chapter 5) are to be considered routine tests (100% of our instruments).

All our instruments are designed, developed and tested (type test) to ensure resistance in accordance with ANSI / ISA-S 82.03 (hydrostatic test requirements).

ABB Measurement & Analytics

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