

Employer  
**SAKO BRNO A.S.**

Project  
**High-efficient combined heat and power facility utilizing renewable sources (OHB  
II - line K1)**

Date  
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# **PART III, APPENDIX 14.5B**

## **MEASUREMENT CONNECTIONS, WATER / STEAM SYSTEM**



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(OHB II - line K1)**

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## 1. GENERAL

### 1.1 Introduction

This specification provides requirements for the mechanical design of the connection for measuring equipment to the process equipment.

This specification covers connection of pressure, differential pressure and temperature, including flow and level measurement based on differential pressure measurements.

The design of other measuring connections shall be agreed with the Employer.

### 1.2 General

All parts shall be designed according to the media and design data for the ducts, on which they are mounted.

If it is not possible to establish a representative measurement at a single measuring point, the necessary number of measuring taps for set-up of a network measurement shall be established.

Detailed design of measuring taps shall be approved by the Employer.

Appropriate number and arrangement of measuring sensors to achieve a representative average value, when measuring on a duct with a certain temperature/flow profile, has to be decided in accordance with relevant standards.

Primary measurements i.e. measurements which will lead to plant shutdown, compromise personnel safety, plant security or environmental security, shall be carried out with 3 separate measuring points. In case of pressure-based measurements, the provision of interlocking arrangements shall guard against simultaneous shut-off of 2 measurements.

In pressure systems and in places where later installation is difficult, measuring points for temperature shall be installed by means of protective pockets. This shall facilitate the exchange of temperature sensor during operation of the process.

Measuring points shall be established in such a way that it is possible to inspect, clean, purge, exchange, measure and calibrate the instruments during operation of the plant.

Locations that requires use of ladders or similar are not allowed. If needed there should be established a platform with an associated staircase or ladder. In case it is not possible to establish a permanent platform, this must be specifically agreed with the Employer prior to construction.

The placement of measurement points must take into account sufficient space for mounting / replacement of instrument, cleaning and other servicing. As a basis a minimum of 500 mm to nearest obstacle is required.

Key words for the design setup shall be redundancy, maintenance and on-line calibration.

## 2. PRESSURE MEASUREMENTS

### 2.1 General

Pressure taps shall not be placed closer to each other than 300 mm. Measuring points shall have primary and secondary shut-off valves and snap action couplings for calibration.

The connected fittings, pipes and connections shall be made of non-corrosive material like stainless steel 1.4571. Impulse tubes must be welded and made of a suitable material.

Two primary shut-off valves per measuring tap shall be provided.

In horizontal pipes, the taps shall be positioned at a horizontal angle of  $20^\circ$  up- and downward as shown on Figure 1.

The measuring point shall be positioned as agreed with the Employer, so it is made possible to carry out mounting of instruments according to the instructions.

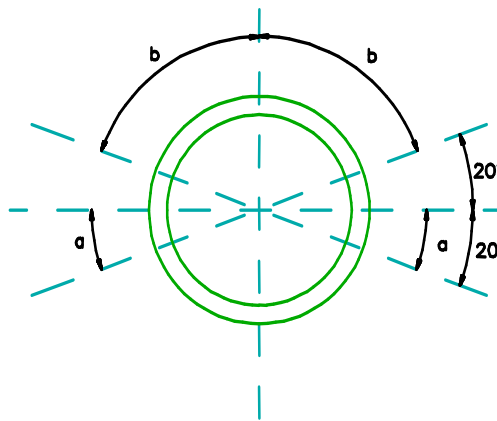


Figure 1 Position of taps in horizontal pipes.

## 2.2 Pressure Measurement

Measuring points shall be equipped with welding socket, primary shut-off valve, welding nipple for measuring pipe/valve and snap action coupling as shown on Figure 2.

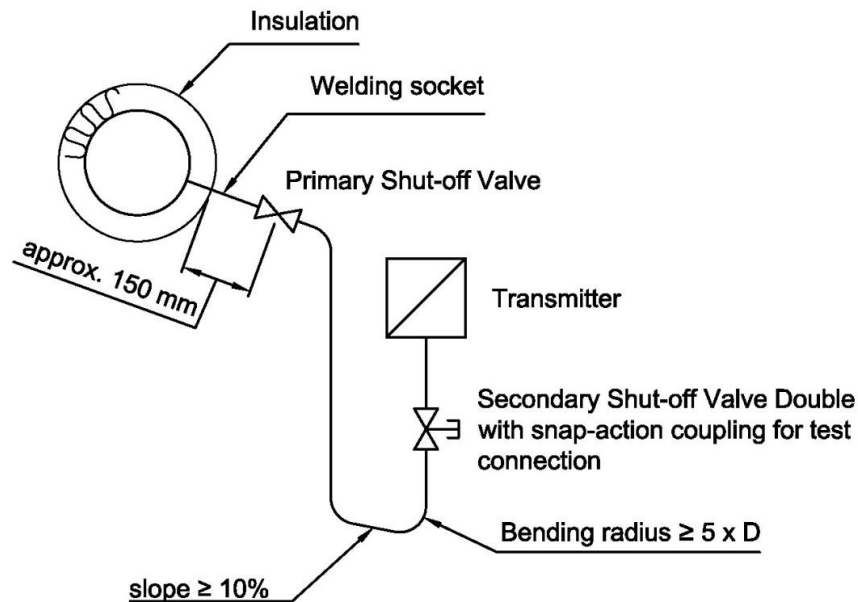


Figure 2 Necessary equipment for measuring points.

Measuring taps shall be dimensioned in consideration of process data and required mechanical strength.

The total length of the measuring tap shall be adjusted to the thickness of the insulation, so that the primary shut-off valve is positioned approx. 150 mm away from the insulation.

It must be ensured that there is a smooth transition from the tap to the inside of the pipe. The tap shall be positioned well away from curves and other obstructions to avoid faulty measurements due to dynamic pressure.

The primary shut off valve shall be mounted as close to the measuring tap as possible. The secondary shut off valve shall be a gauge valve with separate test connection according to DIN 16272.

For calibration purposes there should be established a secondary shut-off valve with a snap-action coupling.

## 2.3 Differential Pressure Measurement

When calibrating for zero point, two connected measuring taps with connecting pipes and shut-off valve positioned between the secondary shut-off valves shall be used as shown on Figure 3.

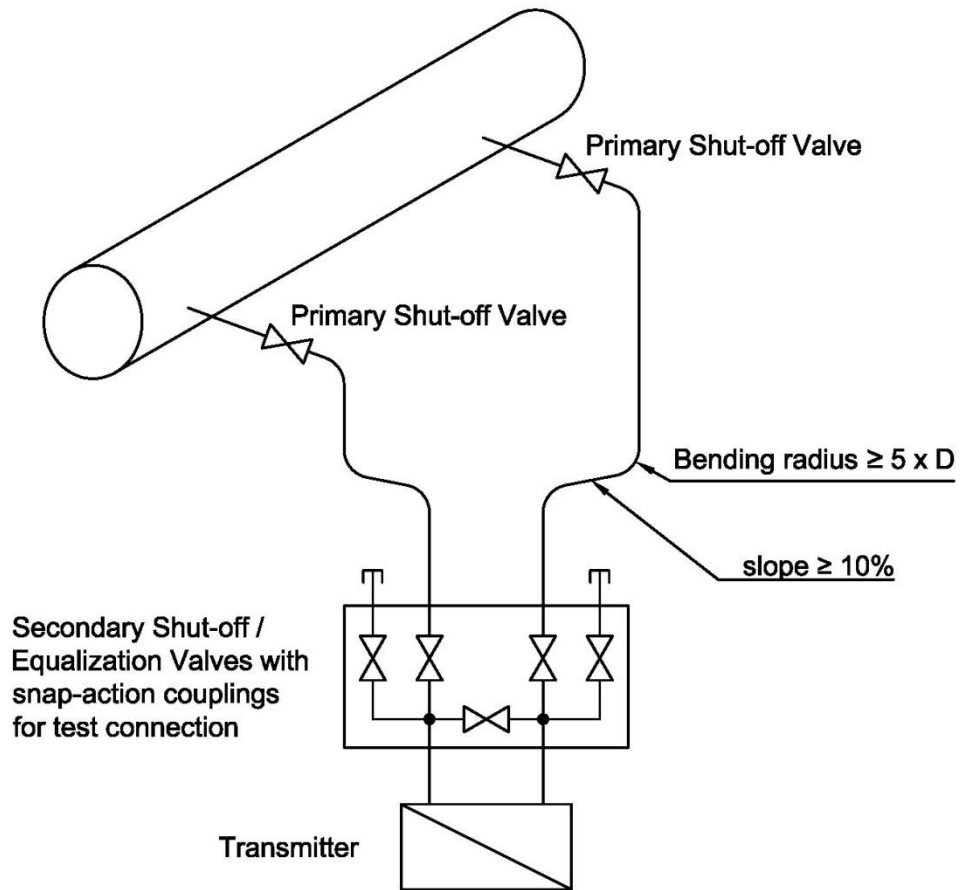


Figure 3 Design of system for pressure measurements.

## 3. TEMPERATURE MEASUREMENTS

### 3.1 General

Temperature sensors are to be mounted in protecting tubes in accordance to DIN 43772. The standard is form 4 with a bar diameter of 18 mm and a bore size of 3.5 mm. If the design data (pressure and temperature) exceeds the strength limits of materials the protection tubes can be changed to form 4 with a bar diameter of 24 mm and a bore size of 3.5 mm.

If there are process specific requirements for other types of tubes or solutions, this shall be agreed with the Employer for each individual case.

The measuring point shall be positioned so the sensor can be retracted and made accessible during operation without dismounting the insulation.

The welding socket for mounting the temperature pocket shall be dimensioned in consideration of process data and required mechanical strength.

The total length of the welding socket shall be adjusted according to the thermo-pocket. Choice of tap and pocket material shall be carefully reviewed to ensure the best possible welding conditions.