Configuration sheet
Strength calculation of thermowell acc. to ASME PTC 19.3

Configuration sheet for order No.: . . . . . .

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Data for strength calculation of thermowell

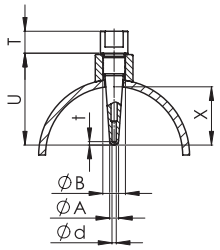
1. **JSP thermowell code number** (for example: WT70 C 01 V700 Z01 P02 L160 M03): . . . . . .
2. **JSP temperature sensor code number** (for example: T1070 04 1 J13 L160 H1 S3 D3 N1 P3): . . . . . .
3. **Thermowell specification by customer drawing No:** . . . . . .
4. **Basic thermowell parameters:**

Thermowell material:

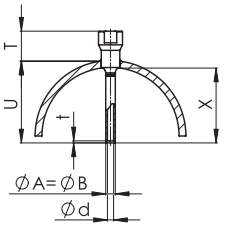
❑ 1.0570	❑ 1.7715
❑ 1.0425 (P265GH)	❑ 1.4541
❑ 1.5415 (15Mo3)	❑ 1.4571
❑ 1.7335 (13CrMo4-5)	❑ 1.4903
❑ 1.7380 (10CrMo9-10)	❑ Other: . . . . .

Thermowell connection:
❑ for screwing
❑ for welding
❑ with flange according to:
❑ DIN
❑ ANSI/ASM
DN: . . . . . PN: . . . . . .

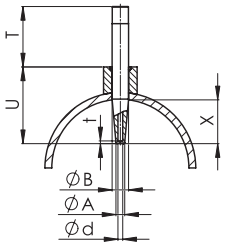
Thermowell construction:
❑ cylindrical (welded)
❑ conical



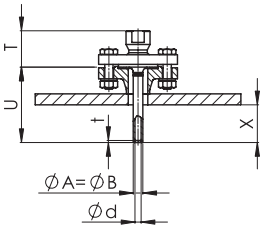
Conical thermowell for screwing



Cylindric thermowell for welding



Conical thermowell for welding



Cylindric thermowell with flange

Thermowell dimensions:
Thermowell immersion length in flowing medium **X** [mm]: . . . . . .
Thermowell length from the fixation **U** [mm]: . . . . . .
Inner thermowell diameter (bore) **d** [mm]: . . . . . .
Length of thermowell extension piece **T** [mm]: . . . . . .
Bottom thickness **t** [mm]: . . . . . .
Thermowell measuring end diameter **A** [mm]: . . . . . .
Thermowell diameter at fixation **B** [mm]: . . . . . .

5. **Operational conditions:**

Measured medium: ❑ liquid ❑ gas ❑ steam description of measured medium: . . . . . .
Maximal flow of medium: . . . . . operational medium flow: . . . . . units: . . . . . .
Medium pressure: ❑ absolute ❑ relative maximum: . . . . . minimum: . . . . . process: . . . . . units: . . . . .
Medium temperature: maximum: . . . . . minimum: . . . . . process: . . . . . units: . . . . .
Medium dynamic viscosity : . . . . . ., units: . . . . . (during operational conditions)
Medium density: . . . . . ., units: . . . . . (during operational conditions)
Piping with measured medium: inner diameter: . . . . . wall thickness: . . . . . .
Parameters of welded on piece: inner diameter: . . . . . wall thickness: . . . . . length of welded on piece: . . . . . .
(alternatively fill in JSP ordering code of welded on piece) . . . . . .

Caution!
Strength calculation should be used as a recommendation of thermowell design for specific application.
The calculation is based on theoretical methods and cannot be considered as a guarantee against possible failure of the thermowell.

Place . . . . . Date: . . . . . .

Customer signature

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Pressure and vibration induced by liquid flow
Thermowell strength depends on several parameters related to the thermowell construction and operation conditions. Standard versions of JSP thermowells guarantee sufficient strength for most of the applications when the proper selection of thermowell material, design and length with respect to application is done. Proper selection of thermowell depends on the type of the operation medium, temperature, pressure, and flow velocity. It is important to note that the thermowells are mostly damaged by vibrations caused by a medium flow.

Possible thermowell damage can be primarily caused by following reasons:

1) Vibrations induced by internal medium flow
Vibrations induced by internal medium flow
Behind the thermowell, the swirls with certain frequency are created. The frequency depends on the flow velocity. If this frequency is close to the natural frequency of the thermowell, resonance of these frequencies can cause massive absorption of energy by thermowell and its damage. If the thermowell is not damaged, it is likely that the measuring insert located inside the thermowell is excessive strained by vibration and this can cause damage or destruction of the sensor.

ASME regulations require the ratio of the excitation frequency to natural frequency of the thermowell lower than 0.8.
In cases, when the ratio is greater than 0.8 following two solutions can be used:

A) Reduce the excitation frequency from the flow by reducing the flow velocity or by using a larger diameter of the thermowell.
B) Increase the natural frequency of the thermowell by using a stronger construction (different type of thermowell, different material, or a shorter length of the thermowell).

2) Thermowell stress form the operation medium flow
The cross-section characteristic of medium flow is a function of flow velocity and density of the medium and defines the forces applied on the thermowell.
This stress is calculated and is compared with the strength of the material used for the thermowell.

3) Compression stress
Maximal static pressure that thermowell can handle is detected by calculation.

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