Hazardous zone separation with partition walls

for Pt100 temperature measurements

1 Introduction

In chapter 4.1.3, the EN 60079-26:2015 standard imposes requirements on partition walls that ensure zone separation between zone 0 (EPL Ga) and zone 1 (EPL Gb).

Partition walls may be pipe walls, tank walls, thermowell walls, etc.

2 Partition walls without additional protective elements

Partition walls can be combined with additional protective elements such as a flame-arresting gap or aeration. This is not considered below.

Different protective measures are required depending on the partition wall thickness (see chapter 4.1.3.3 of EN 60079-26:2015).

Partition wall thickness t	**Requirement**
t ≥ 3 mm	None
3 mm > t ≥ 1 mm	EPL Gb type of ex-protection on the zone 1 side
1 mm > t ≥ 0.2 mm	Intrinsic safety type of ex-protection "ib" on the zone 1 side and no ignition sources such as open switching contacts during operation
0.2 mm > t	Not permitted

If the partition wall thickness is less than 1 mm, it is important to ensure that the partition wall is not exposed to environmental stresses that can adversely affect the partition wall (see chapter 4.1.3.2 of EN 60079-26:2015).

The protective element material must be suitable for the medium and must be corrosion-resistant in this medium.

3 Temperature analysis

Zone 0 has more stringent requirements for permissible medium and ambient temperatures than zone 1. For devices for zone 0, only 80% of the permissible temperature in zone 1 may be reached (see chapter 6.4.2 of EN 1127-1:2019).

During the type test, a safety distance S to the maximum surface temperature of the respective temperature class is also taken into account when determining the maximum ambient and medium temperatures (see chapter 26.5.1.3 of EN IEC 60079-0:2018). The following applies:

S = 5 K for temperature classes T3 to T6
S = 10 K for temperature classes T1 and T2

The thermally isolated effect of the thermowell is difficult to quantify. For the purpose of a conservative approach, it is not taken into account in the following observation. This allows the permissible medium temperatures for zone 0 to be calculated as follows:

$T_{zone0} = T_{zone1} - 0.2 * (T_{class} - S)$

with the following values for the T_{class} (see chapter 5.3.2.2 of EN IEC 60079-0:2018):

Temperature class	T_{class}
T1	450 °C
T2	300 °C
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

4 Application on LABOM measuring inserts

The general standard requirements can be applied to LABOM Pt100 measuring inserts as follows:

4.1 Requirement on the thermowell

All LABOM explosion-protected Pt100 measuring inserts have at least an EPL Gb (suitable for zone 1) type of protection "ib". Thermowells for LABOM Pt100 measuring inserts must therefore meet the following requirements:

Thermowell wall thickness	Requirement
t >= 1 mm	No special requirements
1 mm > t >= 0.2 mm	The operator must ensure the integrity of the thermowell
0.2 mm > t	Not permitted

The wall thickness depends on the type of thermowell based on the following table:

Type	Wall thickness
HP1100 (HIT)	0.4 mm (thinnest point)
HP1200 (MiniTherm)	1 mm (standard) 0.4 mm (tapered tip)
HA / HB / HC	>1 mm, see data sheet for the exact dimension

It means that all LABOM thermowells are suitable for zone separation between zone 0 and zone 1. For HIT thermowells and MiniTherm thermowells with a tapered tip, the operator must ensure that the medium or cleaning processes cannot impair or damage the thermowell. For example, they can request a thermowell calculation from LABOM for their process conditions.

4.2 Temperature evaluation

The surface temperature on the thermowell and therefore the permissible medium temperature in zone 0 can be calculated as follows:

For	formula	For	formula
T1	$T_{Zone0} = T_{Zone1} – 88$ K	T4	$T_{Zone0} = T_{Zone1} – 26$ K
T2	$T_{Zone0} = T_{Zone1} – 58$ K	T5	$T_{Zone0} = T_{Zone1} – 19$ K
T3	$T_{Zone0} = T_{Zone1} – 39$ K	T6	$T_{Zone0} = T_{Zone1} – 16$ K

The value for zone 1 can be found in the respective ex-instructions for the measuring insert.