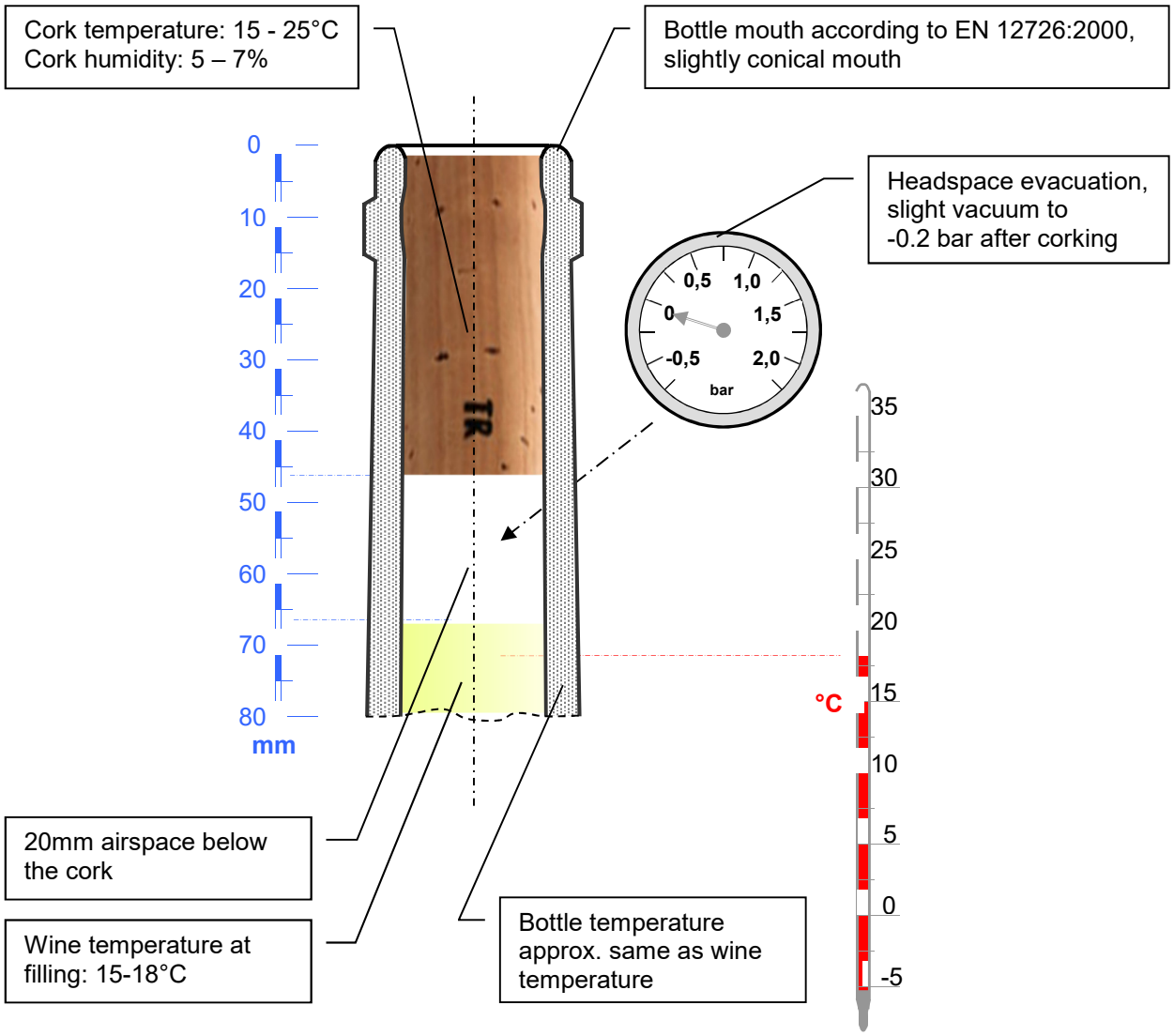
Ideal corking conditions



Natural cork and the bottle
Interplay within the permitted tolerances

Bottle according to **EN 12726:2000** (excerpt)

In the entrance area, 3 mm below the upper edge of the mouth:
Diameter: **18.5 ± 0.5 mm** → **Ø17.75/18.25** to **Ø18.75/19.25**
Ovality: **<= 0.5 mm**

At 45 mm depth:
Diameter: **20.0 ± 1.0 mm** → Average **Ø19.00** to **Ø21.00**
Ovality: **undefined**

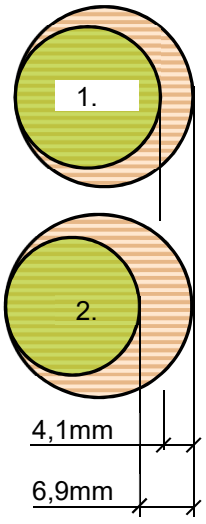
In order to ensure effective corking, the average diameter at up to 45 mm depth must not be smaller than the actual entrance diameter.

The standard defines the band mouthpiece of a bottle for the use of natural corks according to ISO 3863 and for wine with a CO_2 content of not more than 1.2g/l.

Natural cork according to ISO 3863:1989 (excerpt)

Diameter: **d ± 0.4 mm**
Ovality: **<= 0.5 mm**

In extreme cases, the following values apply for 24 mm corks: → **Ø23.35/23.85** or **Ø24.15/24.65**



Two examples of bottle and natural cork combinations within permissible tolerances:

1. Bottle with the largest and natural cork with the smallest diameter

2. Bottle with the smallest and natural cork with the largest diameter

From the different diameter ratios alone it can be seen that the corks fit differently.

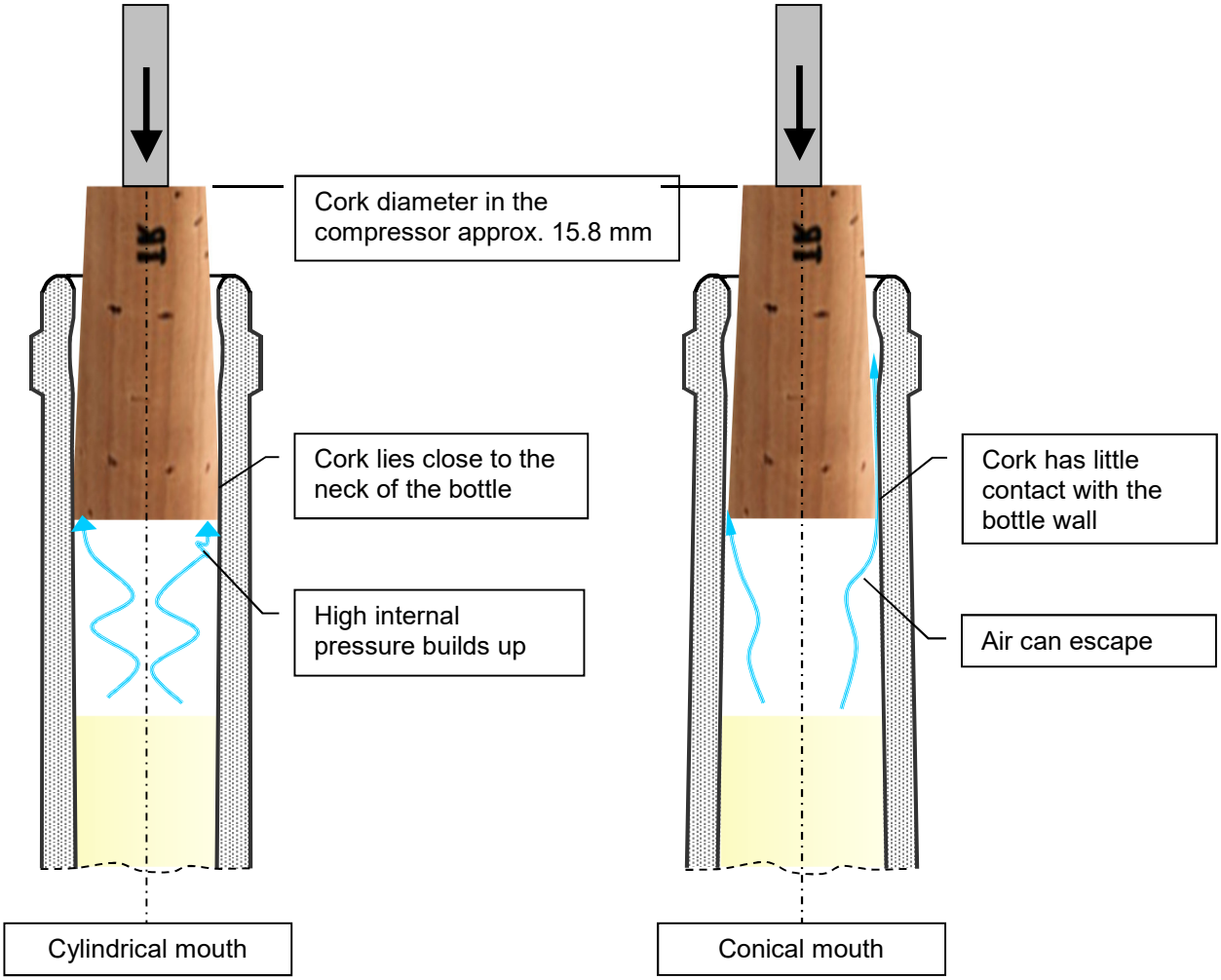
Permitted differences in the length of the natural cork and different mouth profiles of the bottles are added.

In the case of natural corks, the number of annual rings, the density and the cork moisture also influence the contact pressure

At the limit range the differences become visible in how the cork sits.

Impact of the bottle mouth on the corking process

During corking

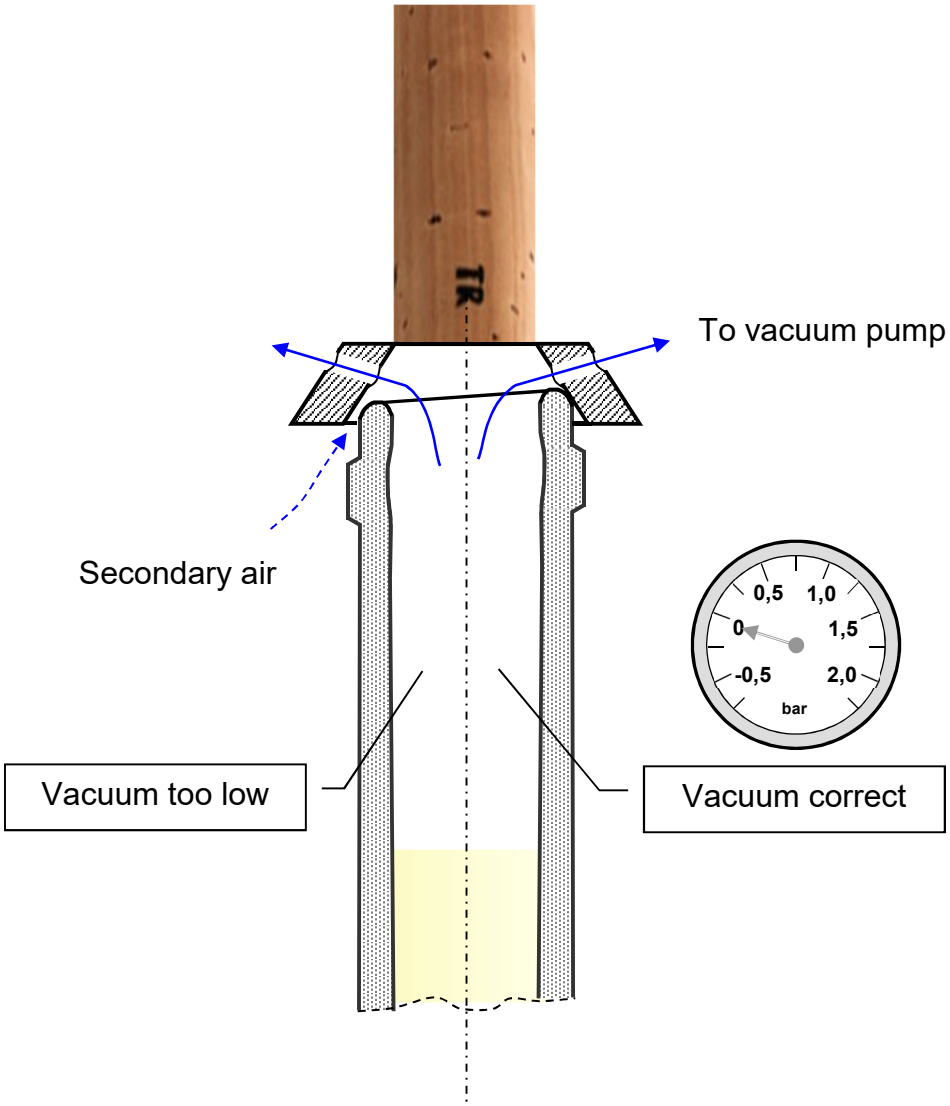


Other influencing factors:

Undercuts in the course of the mouth	→	Air outflow is obstructed
Incorrect centered openings	→	Cork hits the glass
Neck diameter is smaller than mouth diameter	→	Air cannot escape
Mouth not at right angles to the central axis	→	Only limited evacuation possible

Impact of the bottle mouth on the vacuum

During corking

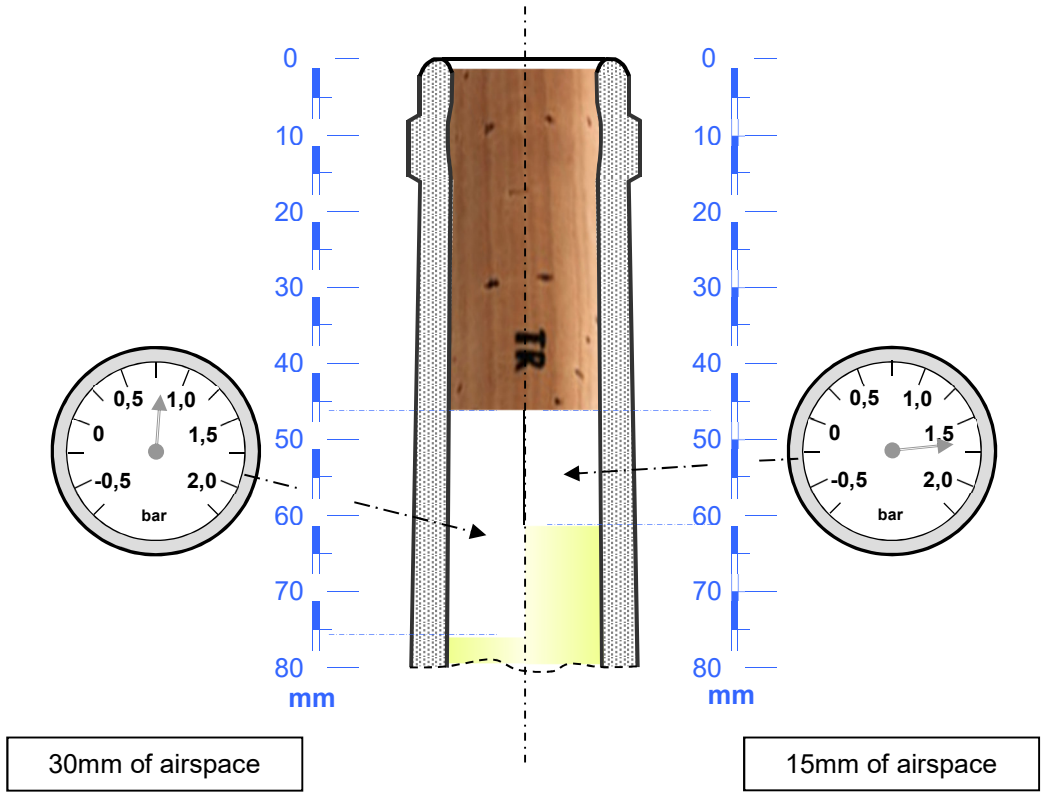


Schematic drawing of the airflow

Depending of the gap size, only part of the air can be sucked out of the headspace of the bottle mouth. A pressure build-up, albeit possibly reduced, results from the corking process.

Impact of the filling level on internal pressure

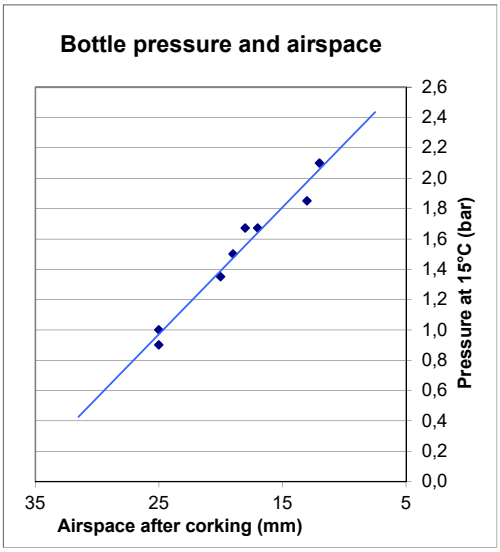
Corking without pressure-reducing measures



Natural corks can withstand pressures up to 1.5 bar for a short time without being taxed or leaking.

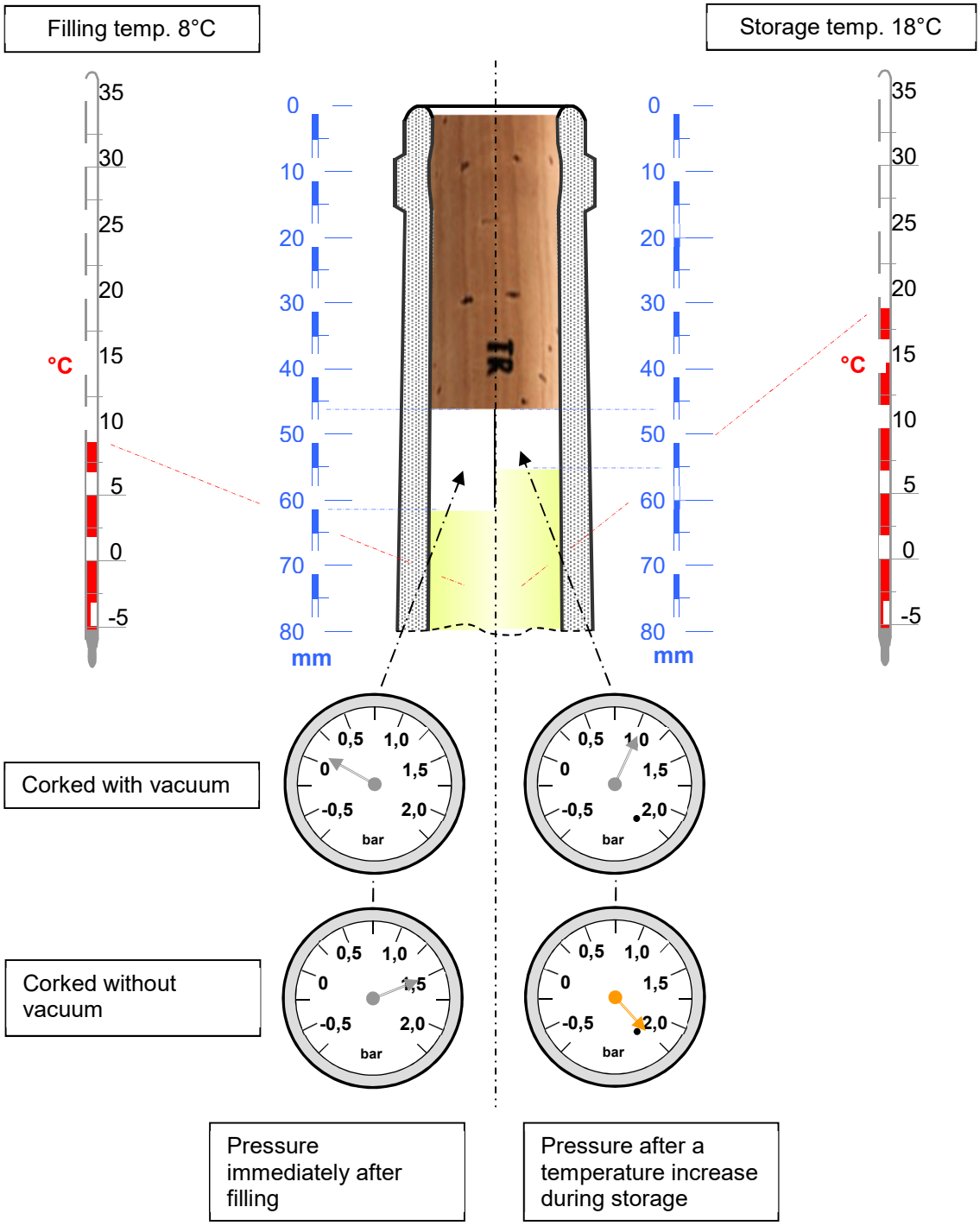
In some cases, pressures above 2.0 bar are possible.

At 1.5 bar pressure, the cork has usually reached its natural performance limit.

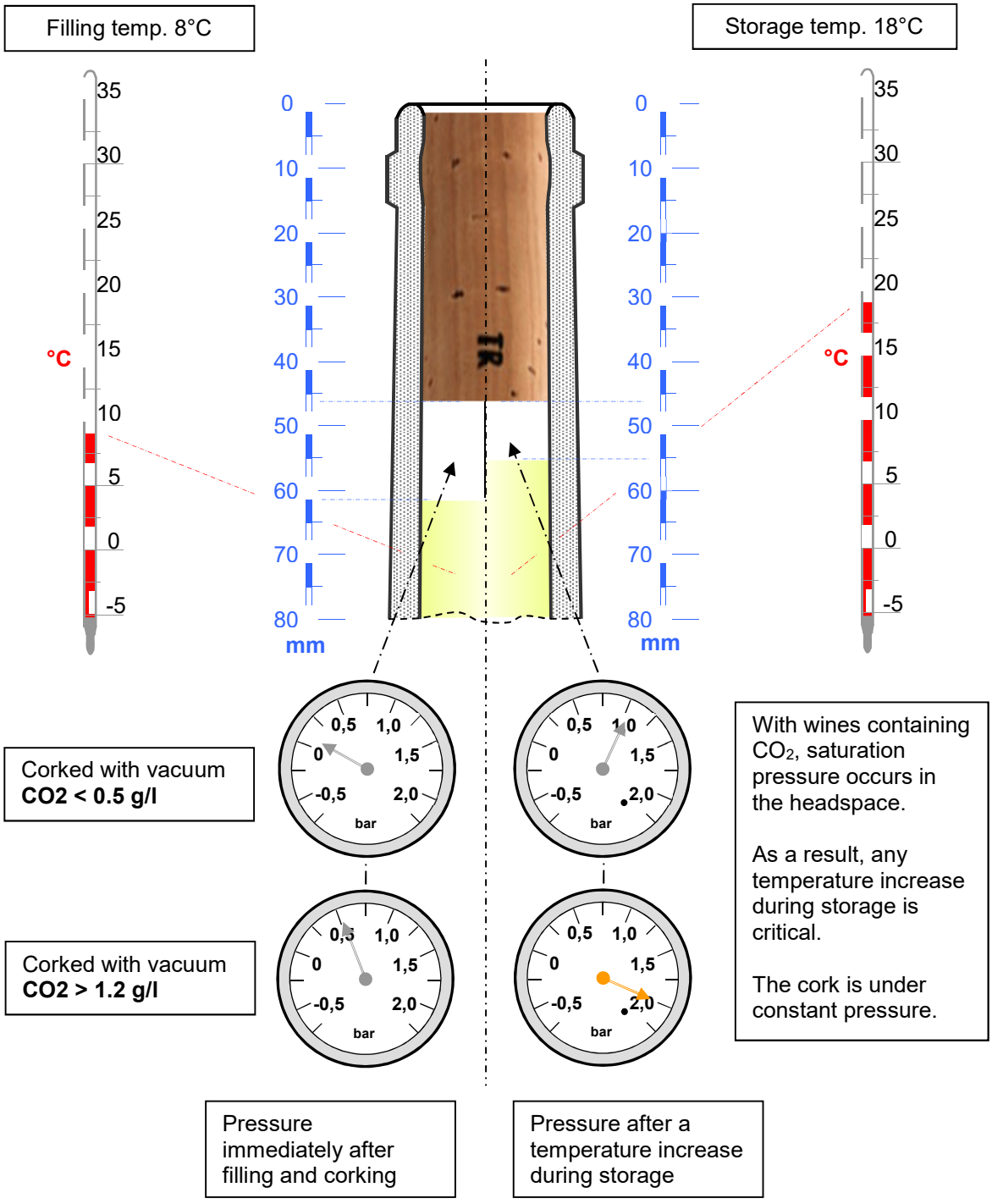


Impact of temperature increase on internal pressure

After corking

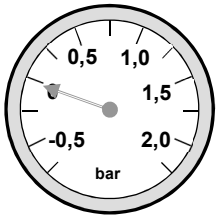


Influence of high CO_2 levels on internal pressure



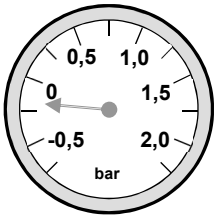
Pressure and air volume

$P_{Indicated}$	=	0.0 bar
$P_{Ambient}$	=	1.0 bar
$P_{Absolute}$	=	1.0 bar

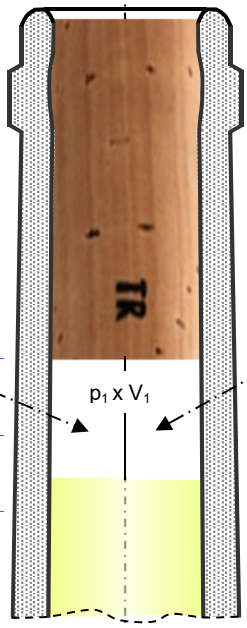


A barometer shows the pressure difference relative to the ambient pressure.

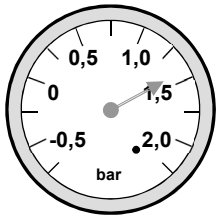
Corked with vacuum



$P_{Indicated}$	=	**- 0.2 bar**
$P_{Ambient}$	=	1.0 bar
$P_{Absolute}$	=	0.8 bar

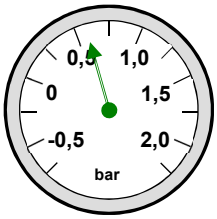


Corked without vacuum

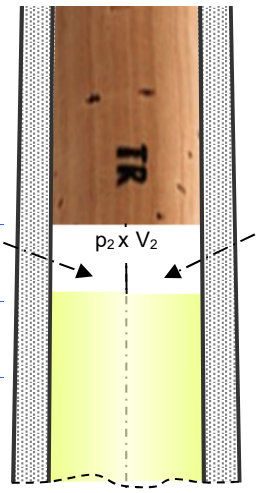


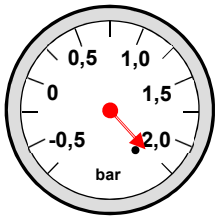
$P_{Indicated}$	=	**1.4 bar**
$P_{Ambient}$	=	1.0 bar
$P_{Absolute}$	=	2.4 bar

Halving the airspace causes a doubling of the pressure
$p_1 \times V_1 = p_2 \times V_2$ → $p_2 = p_1 \times V_1/V_2$ for: $V_2 = ½ V_1$ applied: **$p_2 = 2 \times p_1$**



$P_{Indicated}$	=	**0.6 bar**
$P_{Ambient}$	=	1.0 bar
$P_{Absolute}$	=	1.6 bar



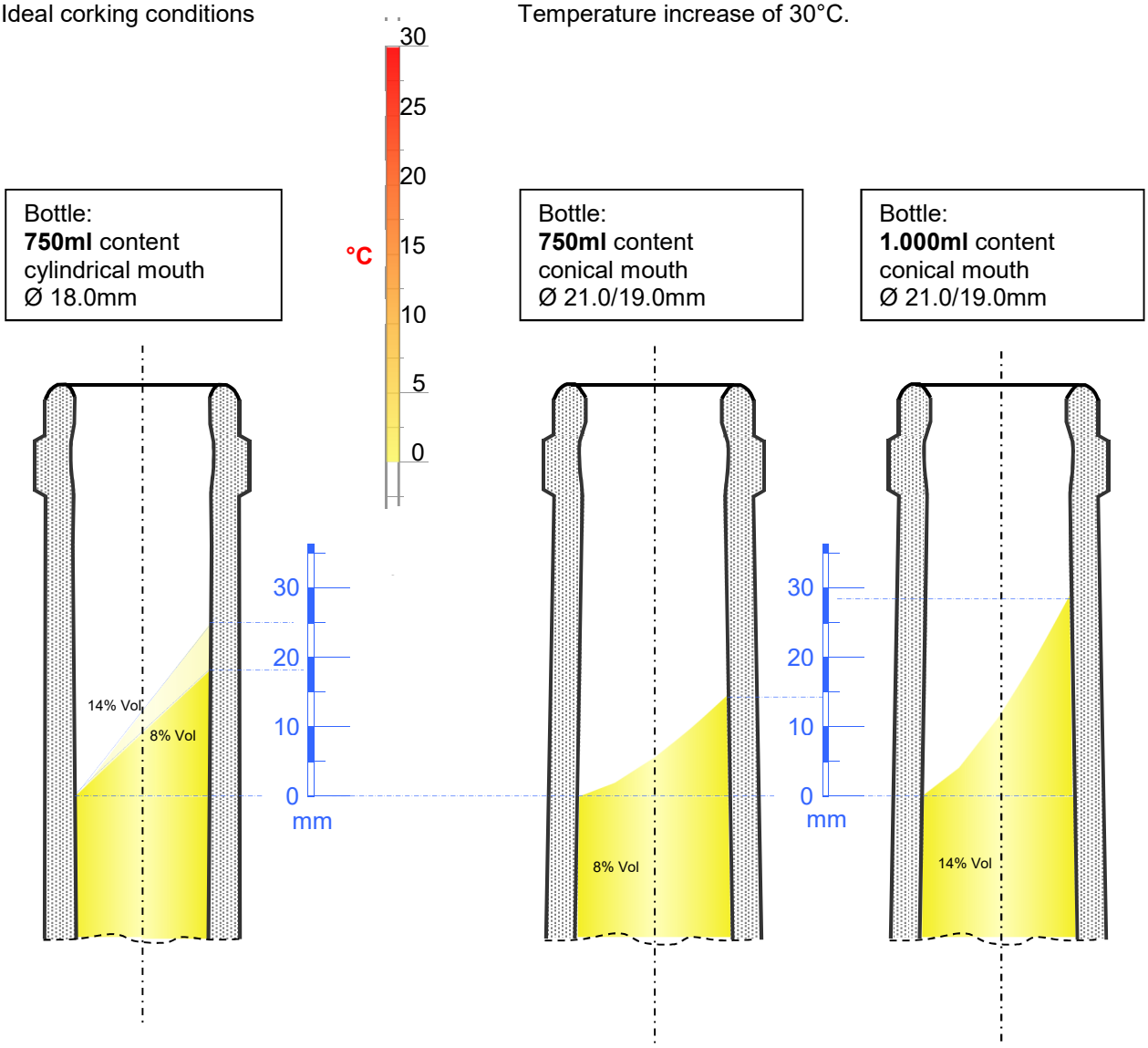


$P_{Indicated}$	=	**3.8 bar**
$P_{Ambient}$	=	1.0 bar
$P_{Absolute}$	=	4.8 bar

Ideal corking conditions

Ideal corking conditions

Temperature increase of 30°C.



The volume increase depends on:

The filling quantity	→	large initial volume = large volume increase
Alcohol content	→	high alcohol content = large volume increase

The **rise height** is determined by the bottle diameter at the level of the liqiud level.

→ narrow, cylindrical bottle = high rise height