

## **Diving with PDIS (Profile-Dependent Intermediate Stop)**

The main purpose of a dive computer is to track your nitrogen uptake and recommend a safe ascent procedure. Diving within the so called no-stop limits means that at the end of the dive you can ascend directly to the surface, albeit at a safe ascent rate, while for dives outside of the no-stop limit (so-called decompression dives), you must perform stops at certain depths below the surface and allow time for excess nitrogen to be expelled from your body before finishing the dive.

In both cases, it can be beneficial to stop for a few minutes at an intermediate depth between the maximum attained depth during the dive and the surface or, in case of a decompression dive, the first (deepest) decompression stop.

An intermediate stop of this kind is beneficial as soon as the ambient pressure at that depth is low enough to ensure that your body is predominantly offgassing nitrogen, even if under a very small pressure gradient. In such a situation, you can still cruise along the reef and enjoy the dive, while your body gets a chance to slowly release nitrogen.

In recent times, so called “deep” stops have been introduced in some dive computers and tables, defined as half the distance from the maximum reached depth and the surface (or the lowest decompression stop). However, recent medical research<sup>1,2,3</sup> has shown that for brief excursions to depth such a deep stop does not have beneficial effects but rather the contrary.

With PDIS, as the name suggests, Galileo interprets your dive profile and suggests an intermediate stop that is a function of your nitrogen uptake so far. Along the same lines, PDIS will account for the accumulated nitrogen from previous dives, hence PDIS is also repetitive-dive dependent. Conventional deep stops completely ignore these facts.

The following figures quantify the extent of PDIS and illustrate its dependence on cumulative nitrogen uptake for selected dive profiles. These figures also show the conceptual difference between PDIS and the rather rudimentary “deep” stops.

Figure 1 shows a comparison between PDIS and conventional deep stops for a decompression dive to 50m/165ft and figure 2 shows the same comparison for a no stop dive to 30m/100ft. Figure 3 shows how PDIS interprets two dives with the same maximum depth but an otherwise different profile.

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<sup>1</sup> Gutvik et al., “Difference in bubble formation using deep stops is dependent on length of bottom time. Experimental findings and theoretical support.”, 146-149, Proceedings of the 33<sup>rd</sup> Annual Scientific Meeting of the EUBS, Sharm El Sheikh, September 8-15, 2007

<sup>2</sup> Schellart et al., “Effect of a deep stop on VGE bubbles after a 20msw dive.”, 150, Proceedings of the 33<sup>rd</sup> Annual Scientific Meeting of the EUBS, Sharm El Sheikh, September 8-15, 2007

<sup>3</sup> Blatteau et al., “Bubble incidence after staged decompression from 50 or 60msw: effect of adding deep stops.”, Aviation, Space and Environmental Medicine, 2005; 76:490-492

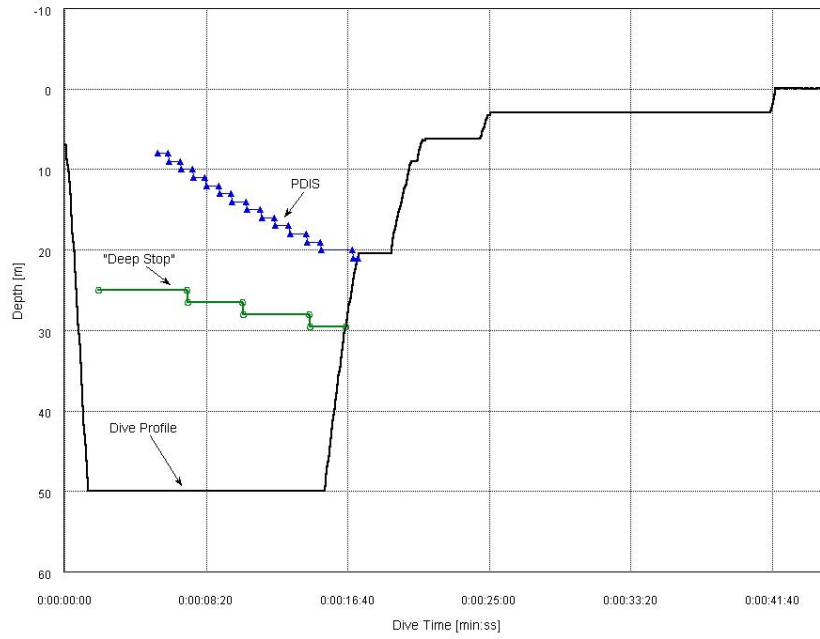


FIGURE 1: Decompression dive to 50m/165ft.

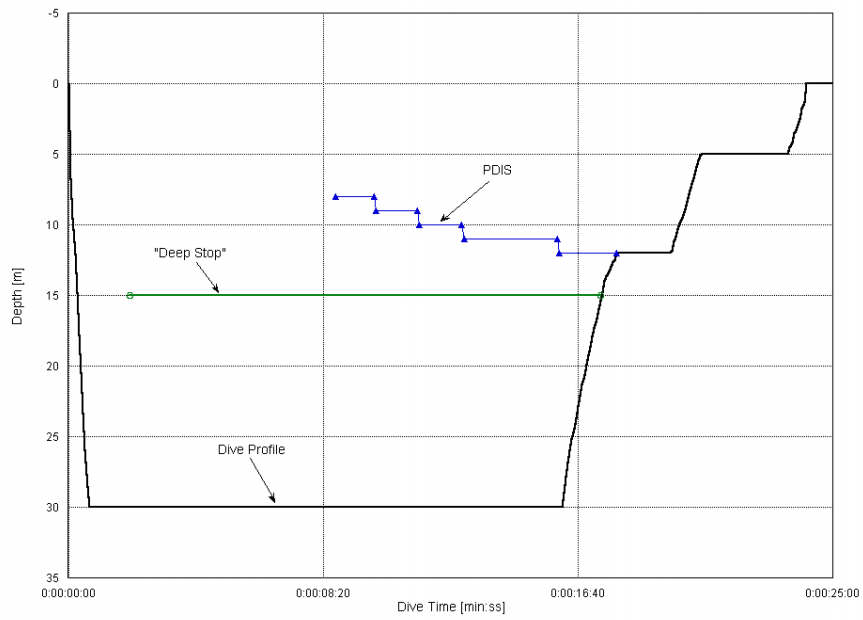


FIGURE 2: No-stop dive to 30m/100ft.

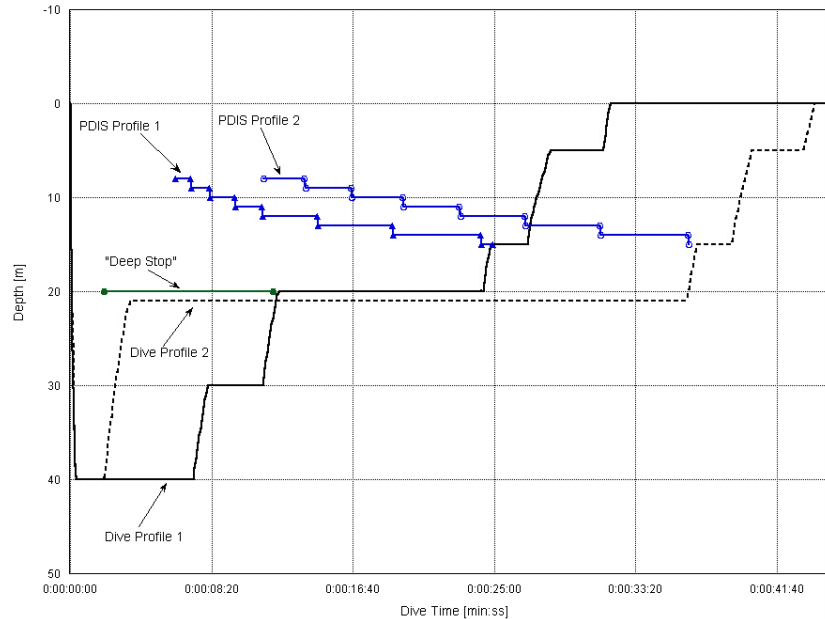


FIGURE 3: Different profiles to 40m/132ft.

## 1. How does PDIS work?

The mathematical decompression model in Galileo, called ZH-L8 ADT MB PMG, tracks your decompression status by dividing your body into 8 so-called compartments and mathematically following the uptake and release of nitrogen in each with the appropriate laws of physics. The various compartments simulate parts of your body such as central nervous system, muscles, bones, skin and so on.

The intermediate depth is calculated as the depth at which the leading compartment for the decompression calculation switches from ongassing to offgassing, and the diver is advised to perform a 2-minute stop **above** the displayed depth (this is the opposite of a decompression stop, where you are asked to remain just **beneath** the displayed depth). During this intermediate stop, the body is not taking up any more nitrogen in the leading compartment, but rather releasing nitrogen (though under a very small pressure gradient). This, combined with the relatively high ambient pressure, inhibits bubble growth.

It should be noted that the two fastest compartments, with 5 and 10 minutes half times respectively, are not considered for the determination of the intermediate stop depth. This

is due to the fact that these compartments are only “leading” for very short dives, for which an intermediate stop is not required at all.

*Note: **PDIS is not a mandatory stop** and it is **NOT** a substitute for the 3-5 minute safety stop at 5m/15ft.*

**WARNING: Even when performing a PDIS stop, you still MUST perform a safety stop at 5m/15ft for 3 to 5 minutes. Performing a 3 to 5 minute stop at 5m/15ft at the end of any dive is still the best thing you can do for yourself!**

## **2. Special considerations when diving with more than one gas mixture (PMG).**

Switching to a higher oxygen concentration mix during the dive influences the PDIS. This needs to be accounted for, in line with the predictive nature of multigas handling in ZH-L8 ADT MB PMG.

When diving with more than one gas mixture, Galileo displays the PDIS depth according to the following rules:

- if the PDIS calculated for the bottom mix (gas 1) is deeper than the switch depth, than this depth is displayed
- if the PDIS calculated for gas 1 is shallower than the switch depth to the next gas (gas 2 or gas d), then the displayed PDIS is a function of the next gas.

In case of a missed gas switch, Galileo reverts to the PDIS for the actively breathed mix.

## **3. Diving with PDIS.**

*Note: To use the PDIS feature, you must set **PDIS** to **ON** in the **PDIS** menu under **DIVE SETTINGS**.*



When the calculated Intermediate Stop is deeper than 8m, Galileo shows it on the display and continues to do so until the displayed depth is reached during an ascent. The displayed value changes during the dive as Galileo tracks the uptake of nitrogen in the 8 compartments and updates the PDIS depth accordingly to reflect the optimum at all times.

How the PDIS is displayed differs depending on whether you are in **NO STOP** or **DECOMPRESSION** and on the screen configuration.

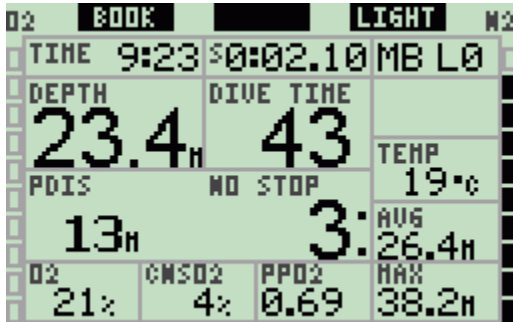
### 3.1 PDIS during NO STOP diving.

In **CLASSIC** and **FULL** screen configurations:

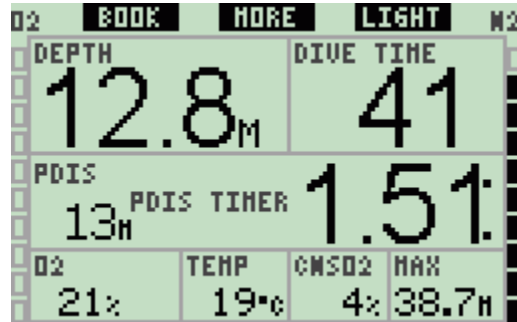
The PDIS depth is shown to the left of the no-stop time, with the label **PDIS**. As soon as you reach that depth during an ascent, a 2-minute countdown will appear in place of the no-stop value with label **PDIS TIMER**. You can have one of three situations:

- you have spent 2 minutes within 3m/10ft above the indicated depth. The countdown timer disappears, the **PDIS** label and value are replaced by the label **PDIS OK** as an indication that you have performed the intermediate stop;
- you have descended by more than 0.5m/3ft below the PDIS. The countdown timer disappears and will reappear again, starting at 2 minutes, the next time you ascend to the PDIS depth;
- you have ascended by more than 3m/10ft above the PDIS. The **PDIS** label, value and countdown timer are replaced by the label **PDIS NO** to indicate the fact that you have not performed the PDIS stop.

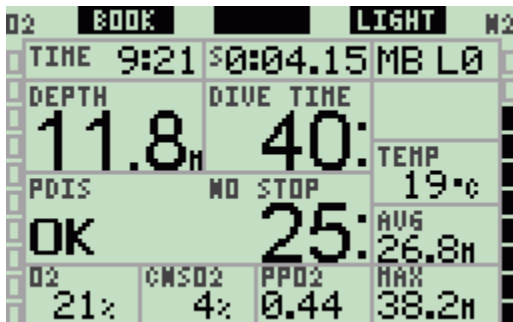
PDIS display (**FULL**)



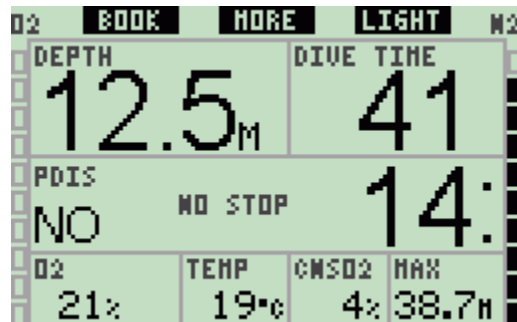
PDIS timer (**CLASSIC**)



PDIS OK (**FULL**)



PDIS NO (**CLASSIC**)

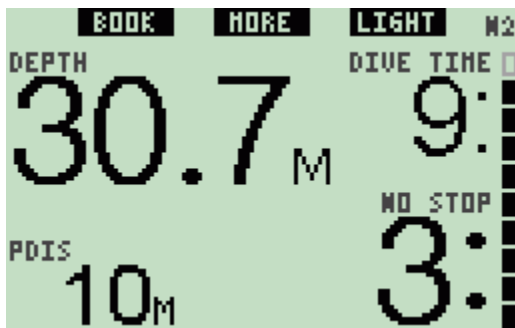


In **LIGHT** screen configuration:

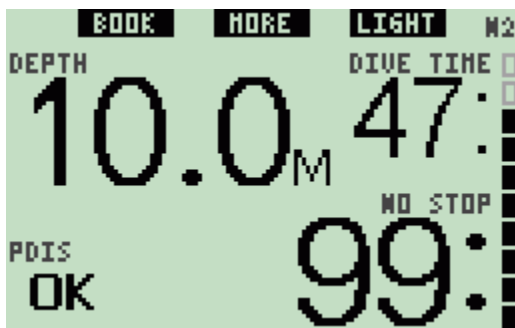
The PDIS depth is shown in the **MORE** sequence after the O2% and before the temperature. As soon as you reach that depth during an ascent, a 2-minute countdown will appear in place of the no-stop value with label **PDIS TIMER**. You can have one of three situations:

- you have spent 2 minutes within 3m/10ft above the indicated depth while the timer is showing on the display. The **PDIS** label and value in the **MORE** sequence are replaced by the label **PDIS OK** as an indication that you have performed the intermediate stop;
- you have descended by more than 0.5m/3ft below the PDIS. The countdown timer disappears and will reappear again, starting at 2 minutes, the next time you ascend to the PDIS depth;
- you have ascended by more than 3m/10ft above the PDIS. The **PDIS** label and value in the **MORE** sequence are replaced by the label **PDIS NO** to indicate the fact that you have not performed the PDIS stop.

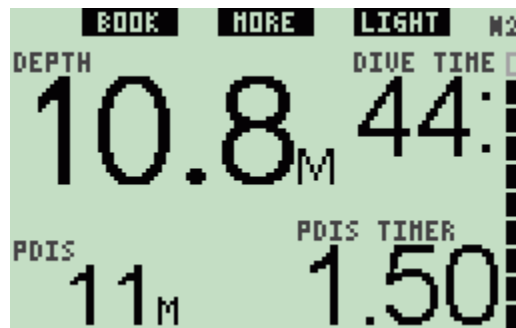
PDIS display



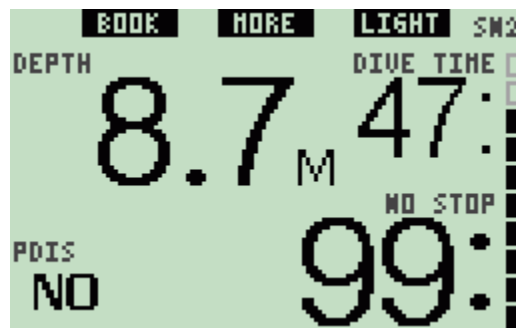
PDIS OK



PDIS timer



PDIS NO

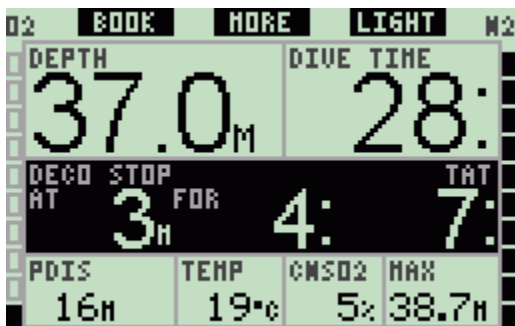


*Note: Galileo issues no warnings relating to a missed PDIS stop.*

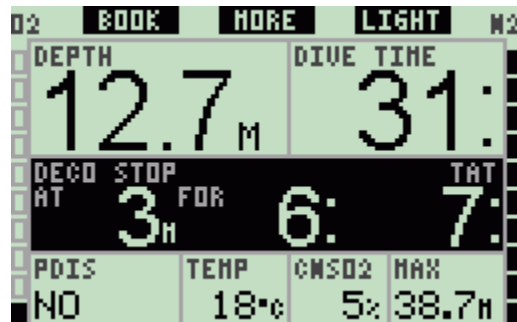
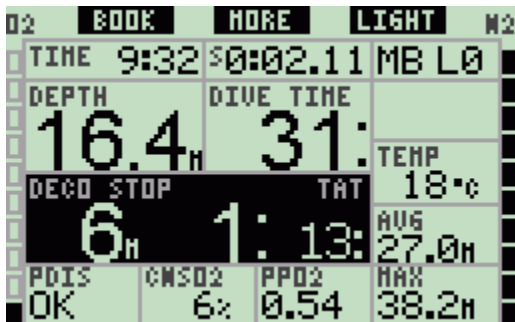
### 3.2 PDIS during DECOMPRESSION diving.

In **CLASSIC** and **FULL** screen configuration, upon entering decompression the PDIS information is moved to the lower left corner and becomes part of the **MORE** sequence. This prevents the potential misinterpretation between the intermediate stop and the decompression stop depth. Additionally, in order to avoid conflicts between the PDIS range and a decompression stop, a PDIS stop is displayed only if it is 3m/10ft deeper than the deepest decompression stop.

As soon as you reach that depth during an ascent, the 2-minute countdown is initiated. A timer as described in the **NO-STOP** case is not displayed here, but the switch of the label from **PDIS** to **PDIS OK** alerts you when the timer has reached 2 minutes.



Descending by more than 0.5m/3ft below the PDIS or ascending by more than 3m/10ft above the PDIS follows the same rules as described in the **NO-STOP** case.



### 3.3 PDIS during dives with MB levels.

When diving with MB levels, PDIS follows the same rules as described above. MB levels, however, introduce stops earlier and deeper than the L0 base algorithm. As such, the PDIS display may be delayed and for certain dives it may not be displayed at all. This for instance would be the case for a shallow dive with air (21% oxygen) and MB level L5.