

Instructions for handling of the HD2-Set, please note!

Thank you very much for deciding to purchase the HD2-Set. In the following you find important information do use the HD2-Set with best possible accuracy, please notice the advice!



1. Presettings in the system

- a. The system is delivered with pre-calibrations for sand, gravel and grit (**see figure 1**). All calibrations were prepared under laboratory conditions with different varieties of sand and gravel. Depending on site-directed circumstances (fine fraction, soiling, and type of rock), measurement deviations of the single calibrations are possible in ranges of >1%.
- b. To use the system with the best possible accuracy of **±0,2..0,3% (absolute moisture content in %/gravimetric)**, it is recommended to perform a 2-point calibration as described in the handbook on page 14-15 (**see also point 2**), with the certain sand, gravel or grit. If this is not done, compromising in accuracy must be taken into account!

Cal.	Name	Cal.	Name	Cal.	Name
1	Sand D=1.5kg/l	6	Gravel 8..16mm	11	Grit 11..16mm
2	Sand D=1.6kg/l	7	Gravel 16..32mm	12	Grit 16..22mm
3	Sand D=1.7kg/l	8	Grit 2..5mm	13	Grit 22..32mm
4	Sand D=1.8kg/l	9	Grit 5..8mm	14	Gravel/Sand 0..16mm
5	Gravel 2..8mm	10	Grit 8..11mm	15	1/10tp

Fig. 1: List of 15 selectable probe calibrations

2. Creation/adaption of material specific calibrations

To adapt the system with best possible accuracies, depending on site specific conditions, it is necessary to calibrate the system with two different moisture values (**2-point calibration**). In practice please observe the following:

- a. The lower of the two calibration points may not be at 0%, because the systems shows a different sensitivity in absolutely dry material at exactly 0% (**please note also point 3c**).
- b. The upper of the two calibration points may not be at the highest saturation point of the material, because this could falsify the measurements due to too much free water.
- c. Optimal solution for a **2-point calibration** is, to find the two calibration points at **20% and 80% saturation** of the aggregate. That means, for sand with a maximum moisture content of 10%, these calibration points are ideally at 2% and 8% moisture content. For gravel with maximum moisture content of 5%, these calibration points are ideally at 1% and 4% moisture content.

3. Remarks concerning handling and accuracy

- a. If the pre-installed calibration number inside the SONO-M1 probe has been validated, or if a precise **2-point calibration** has been done, attainable accuracies of **$\pm 0,2..0,3\%$ (absolute moisture content in %/gravimetric)** are possible, compared with kiln drying results. It is to mention, that it is possible with the SONO-M1 probe to control a larger quantity of material in very short time. This ensures a higher quality of measurement and a higher degree of correlation of the measured data.
- a. To reach the described accuracies it is also important to perform the measurement in a standardized procedure. Especially in practical use and in order to prevent **"personalized calibrations"**, it is essential that different persons come to the same measurement results due to a standardized measuring procedure. You can find **more details in this standardized measuring procedure in the HD2 manual on page 22-24.**
- a. It must also be noted, that in dry materials with measurement ranges **lower 15% of the maximum moisture saturation**, the measurement results are being distorted in small amounts in the upper range. This is caused from a very low internal friction of the aggregates if the moisture tends to 0% and therefore the density of the aggregates is a little higher. This small distortion can be corrected by using a simple empirical formula: Subtract a correction value **"Maximum moisture content / 100 * 3"** from the measured value.
 - i. Example: Measured moisture value in dry sand is 1.2% (this means 12% saturation at a maximum saturation value of 10% in sand):
 1. 1,2% - (Maximum moisture content / 100 * 3)
 2. 1,2% - (10% / 100 * 3)
 3. 1,2% - 0,3% = 0,9% (corrected moisture value in dry sand)

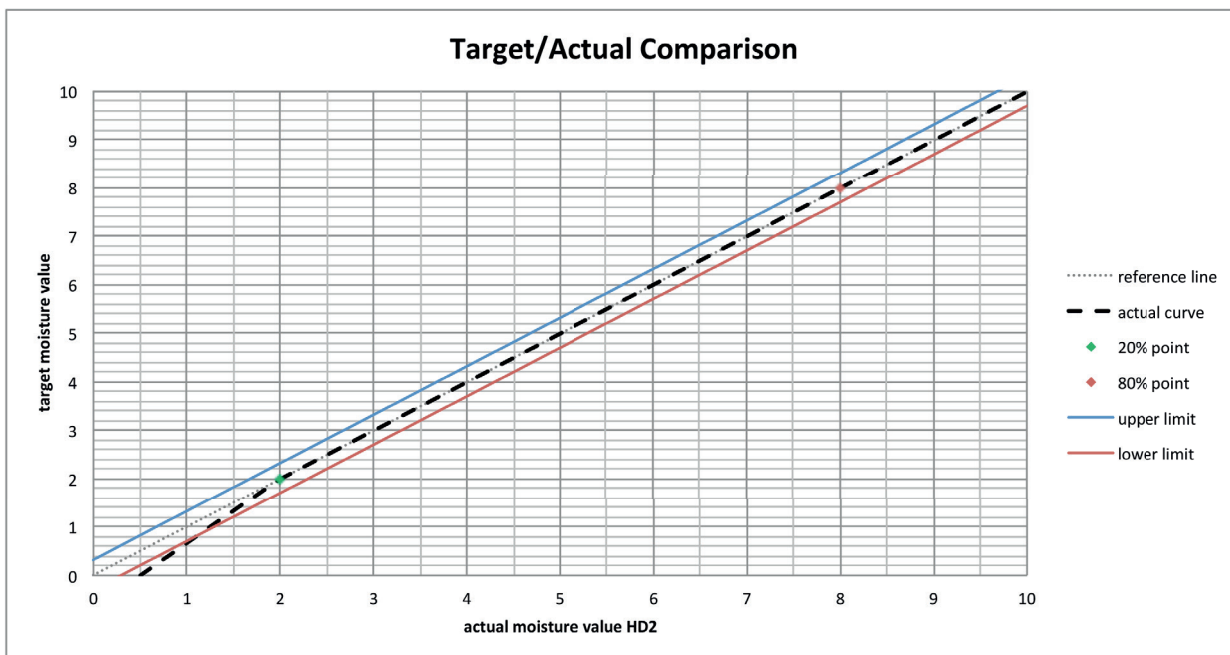


Fig2: The diagram shows a small deviation in the drier moisture range.

- b. Please note: The core water is also measured with the SONO-M1. Depending on aggregate type, core moisture can be greater than 0.5%. This should be taken into consideration when calculating the water/cement ratio, because the core moisture is not relevant for the w/c-ratio.

