

## N<sub>2</sub>O Wastewater System – Calibration of Customized Low Range, Standard, Medium, and High Range Sensor Heads

Please follow this work instruction to calibrate Unisense Environment Customized Low Range (LR), Standard, Medium (MR), and High Range (HR) Sensor Heads. It should be used as an addition to the instructions given with the calibration kit (10-step guide). See below for an overview of the available sensor heads and their concentration ranges.

Product	Working range N <sub>2</sub> O-N (mg/L)	Detection limit N <sub>2</sub> O-N (mg/L) *	Example application
E-N <sub>2</sub> O Head LR	0-0.3	0.001	
E-N <sub>2</sub> O Head SR	0-1.5	0.005	activated sludge
E-N <sub>2</sub> O Head MR	0-9	0.03	
E-N <sub>2</sub> O Head HR	0-110	0.4	
E-N <sub>2</sub> O Head HT SR	0-1.5	0.005	
E-N <sub>2</sub> O Head HT MR	0-9	0.03	deammonification and side stream
E-N <sub>2</sub> O Head HT HR	0-110	0.4	

\*Indicative only, valid recent specifications found on [www.unisense-environment.com](http://www.unisense-environment.com)

The sensors react linearly to nitrous oxide. Therefore, a calibration point that is lower than the full working range yields a valid calibration. However, the concentrations used to calibrate sensors should be adjusted to reflect the working range. This is done by mixing different amounts of calibration liquid with different volumes of water. Refer to the following table for the exact concentrations of N<sub>2</sub>O to be used in calibration, how to produce them and the target slopes for calibration. The table also applies for High Temperature (HT) Sensor Heads.

Product	Volume calibration liquid (mL)	Volume water to dissolve (L)	Resulting concentration N <sub>2</sub> O (mg/L)
E-N <sub>2</sub> O Head LR	2	4	0,376
E-N <sub>2</sub> O Head SR	5	4	0,94
E-N <sub>2</sub> O Head MR	5	2	1,88
E-N <sub>2</sub> O Head HR	10*	0,5	15,04

\*Using 2 calibration ampules

For general guidance on how to calibrate the sensors, please refer to this [video link](#) and the calibration quick guide. Make sure to type in the relevant resulting concentration in step 8 of the calibration guide. For the High Range sensors, one should use a smaller vessel to hold the water and ensure that the tip is fully submerged in liquid. This can be achieved by using a measuring cylinder or other beaker. Note that the calibration is sensitive to changes in temperature of the calibration liquid, an effect that is enlarged the smaller the volume of water is. The sensor body is made of aluminum, which can cool down the liquid significantly. Therefore, it is advised to take the sensor directly out of the process water and to rinse it (if required) with water that is also at process temperature.

If there is a large difference between process temperature and ambient temperature, it is advisable to use a thermos-type of container to perform the calibration in. It can help to prepare water at a slightly higher temperature than needed. Make sure to measure the temperature in the calibration liquid right after performing the calibration and input this temperature under "user level" on the N<sub>2</sub>O controller.