

Capacitive sensors

Volume sensors

Volume sensors measure the water content of the soil or substrate in volume fractions; this is displayed as a percentage based on m³ of water per m³ of soil or substrate. This is a measurement of soil moisture without any specification on the availability of water (the suction tension of the soil). This is a direct capacitive measurement. The volume sensor, with its probe or electrodes, forms a capacitor with the soil. Its capacitance changes depending on changes in the dielectric property of the soil due to the changing humidity. It should be noted that the dielectric property of the soil is also determined by its structure. The volume sensors must have clearly established contact. Thus, hollow cavities at the sensor must be avoided at all costs. The salt content of the soil also has a small influence on the measurement (lower for SMT 100 than for SMT 50). Optionally, the sensor can be calibrated to the corresponding soil type.

The total water content is measured; for heavier soils (not substrates) this may only be partially relevant for plants. Another difference with the tensiometer is that moisture differences on the measuring surface are output as an average value. Depending on the type of irrigation, this can be advantageous for monitoring purposes.

Measured values (by default): low values = dryness, high values = humidity. The measuring range of the sensors can be chosen up to 100 %, but the saturation value of soils and substrates is usually only in the middle range. Therefore, a measuring range of 0 to 50 % is usually selected.

TECHNICAL SPECIFICATIONS:	
	SMT 50
Output signal:	analogue- 0 – 3 V
Power supply:	3.5 – 30 VDC
	SMT 100 /Aquaflex
Output signal:	digital: T-bus, MODbus (RS485) or SDI-12, analogue: 0 – 3 V analogue: 0 – 10 V analogue: 4 – 20 mA (without temperature compensation)
Power supply:	4 to 24 VDC

Aquaflex – 501665 /7

SMT50 – 501651

SMT 100 – 501660 /1



There are differences in the construction of the volume sensors. The FDR sensors usually have 2 to 3 electrodes and are inexpensive. They have a higher frequency so they are sufficiently salt tolerant, but react more sensitively to soil irregularities because of the smaller measuring volume. With the TDR and TDT sensors, the transit time of the signal is measured on the probe. They achieve high accuracy with a large measuring volume and have good salt tolerance, but are generally more complex (more expensive) (particularly the TDR variant). In contrast, TDT sensors have construction advantages that make them more cost-effective with equally good measurement results. Volume sensors are maintenance-free, very stable and suitable for underground installation.

Usage

Volume sensor SMT50: Measures soil moisture according to the FDR principle (Frequency Domain Reflectory) for simple measurements

Volume sensor SMT100: Precisely measures soil moisture according to the TDT principle (Time Domain Transmissometry) and soil temperature. Factory calibrated for medium mineral soil with a measuring range up to 50 %.

Aquaflex: Measures soil moisture according to the TDT principle (Time Domain Transmissometry) for measurements as an average value over the length. This is well suited for row crops with drip irrigation or for lawn irrigation.

	SMT 50	SMT 100	Aquaflex 100/300	
Measurement technique	FDR	TDT	TDT	
Measurement range	0 to 50 vol. %	0 to 50 vol. % factory default 0 to 100 vol. % possible	0 to 50 vol. % factory default 0 to 100 vol. % possible	
	-20 °C to +85 °C	-40 °C to +80 °C (digital) -40 °C to +60 °C (analogue)	-40 °C to +80 °C (digital) -40 °C to +60 °C (analogue)	
Measurement precision	± 3% in mineral soils	± 3 vol. % in mineral soils ± 1 vol. % for soil-specific Calibration	± 3 vol. % in mineral soils ± 2 vol. % for soil-specific Calibration	
	± 0.8 °C	± 0.4 °C (digital) ± 0.8 °C (analogue)	± 0.4 °C (digital) ± 0.8 °C (analogue)	
Power supply	3.3 – 30 V	4 – 24 V 12 – 24 V (analogue, 0 – 10 V) Typ. 24 V (current sensor)	4 – 24 V 12 – 24 V (analogue, 0 – 10 V) Typ. 24 V (current sensor)	
Dimensions	approx. 13.5 x 2.15 cm	approx. 18.2 x 3 x 1.2 cm	100 x 2 cm	300 x 2 cm
Cable length	10 m	10 m	10 m	10 m
Output signals				
0 to 3 VDC	501651		On request	On request
0 to 10 VDC		501660	501665	501667
4 to 20 mA		501662		
Digital (SDI-12, T-bus, MOD-bus)		501661	On request	On request