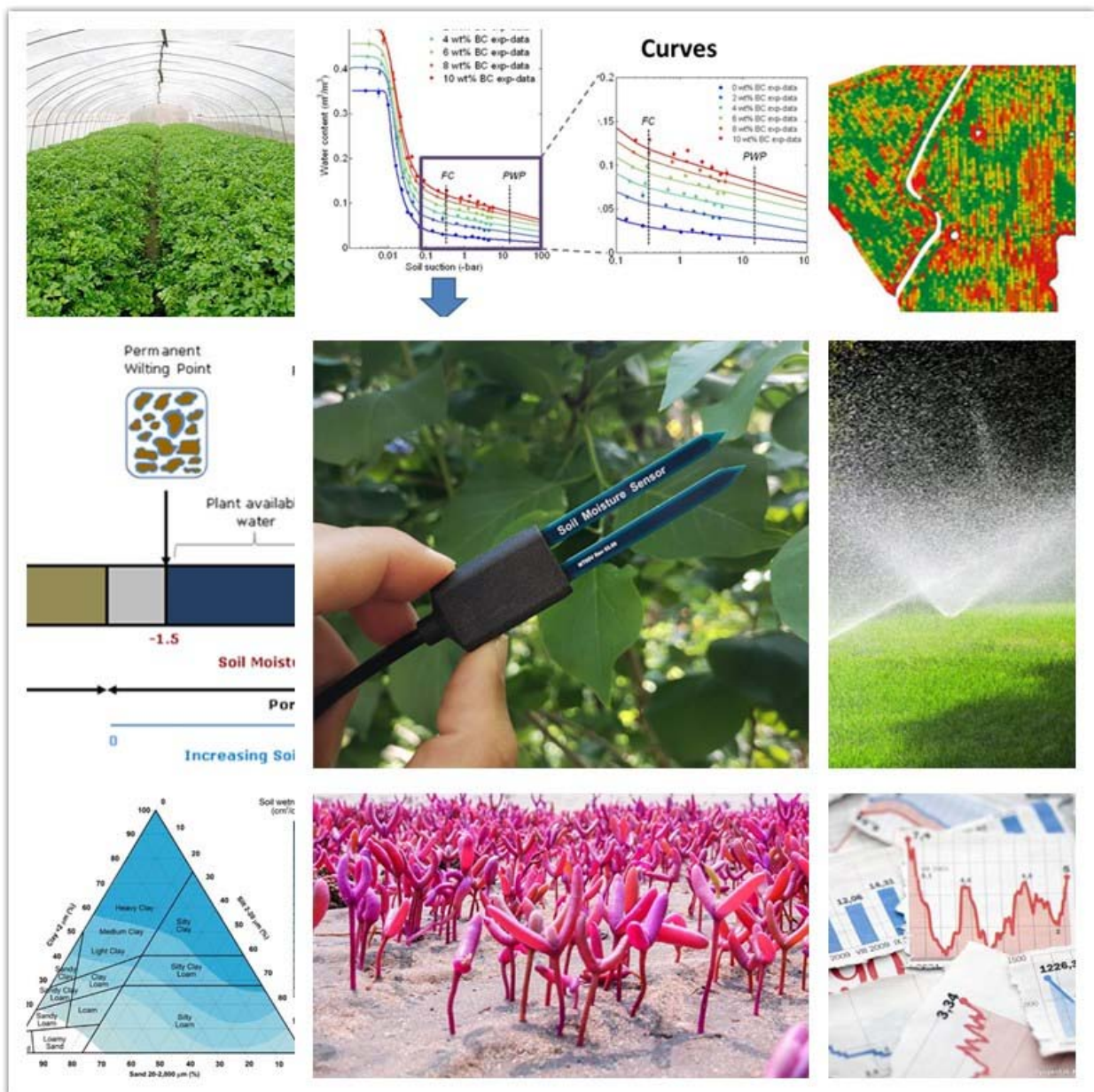


MT05V

Soil Moisture Sensor

User Manual V1.0



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1 Customer Support

Thank you very much for your order. Our success comes from the continuous faith in the excellence of our products and services, something we are committed to and would never sacrifice. Our customer service, especially in the after sales phase, guarantees the satisfaction of our clients. In line with this strategy, we appreciate that you can share with us your feedback at any time for our improvement, be it positive or negative, so if we can serve you better in anyway, please do inform us.

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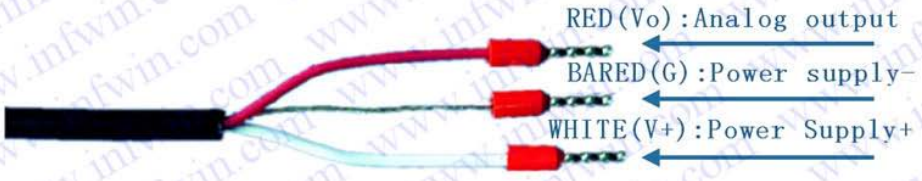



2 Introduction

MT05V measures soil moisture content. It sealed with resin packaged plastic body with sensing rods which can be insert directly into the soil with long time stability. Sensor with relatively small size and can be used for pot culture and Seedling tray. The sensor is applicable for science research, irrigation, greenhouse, smart agriculture etc.

- Soil Moisture measurement with high sensitivity and accuracy
- Relatively small size 20*11*95mm for pot culture and Seedling tray
- Output Interface with Voltage
- Calibration formula for different growing media
- Low salinity sensitivity
- Minimal soil disturbance
- Water proof to IP68 ratings and can be directly buried into soil
- High accuracy with excellent stability
- Reverse power protection and Built-in TVS/ESD protection

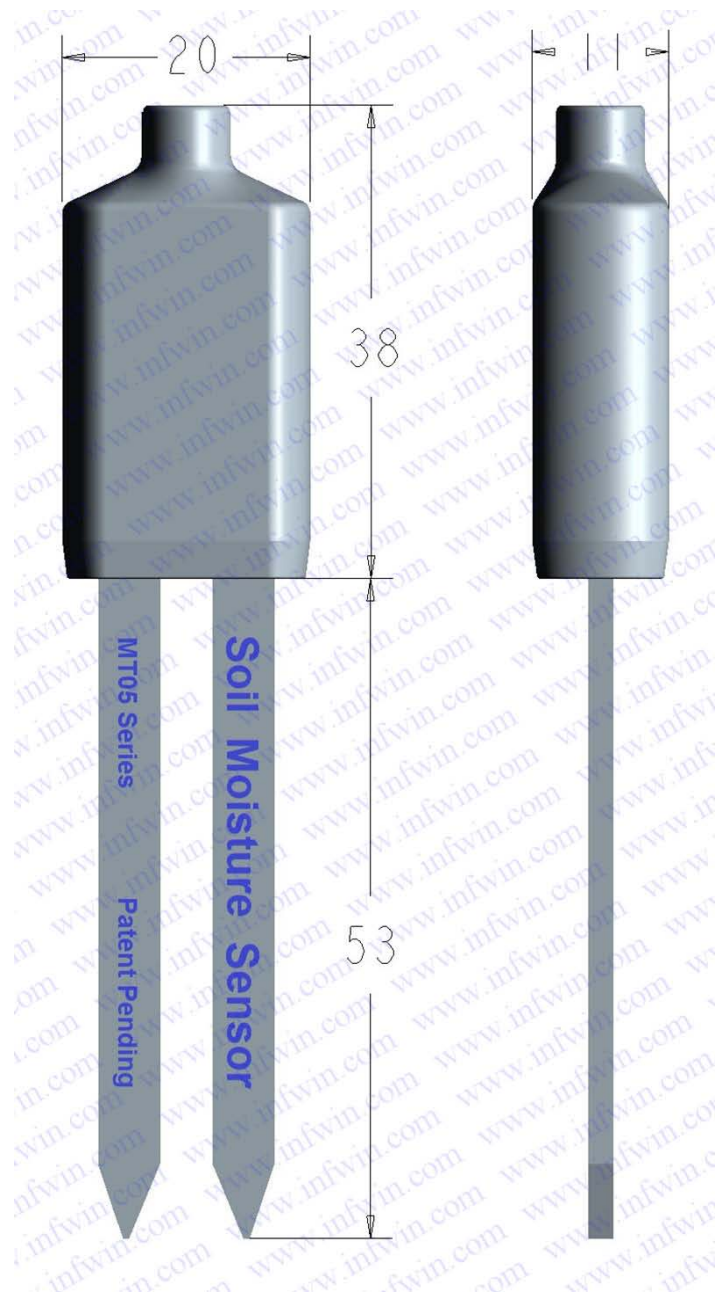
Specification-MT05V	
Measuring parameters	Soil Moisture (Volumetric Water Content)
Power Supply	2.5-16V DC @ 15mA
Output Interface	Analog voltage: max 2000mV Output impedance: 2Kohm
Soil Moisture Range	Range:0-100% Resolution: 0-55%: 0.1%; 55%-100%:1.5%. Accuracy: 0-50%:±3%; 50%-100%: ±5%.
Measuring Method	FDR
IP Ratings	IP68
Operating Temperature	-40~85°C
Sensor Sealed	Epoxy resin
Installation	Surface or buried installation
Cable Length	5 meters, or Customize
Dimension	20*11*95mm

3 Wiring diagrams

Type	Wiring Diagrams
<p>MT05V analog voltage output interface</p>	<div data-bbox="432 405 1406 456" style="background-color: #4F81BD; color: white; padding: 5px; text-align: center;">Cold pressed terminal and tinned lead wires</div>  <div data-bbox="432 748 1406 799" style="background-color: #4F81BD; color: white; padding: 5px; text-align: center;">3.5 mm stereo plug</div>  <div data-bbox="432 1111 1406 1162" style="background-color: #4F81BD; color: white; padding: 5px; text-align: center;">Wiring Diagram</div> <div style="display: flex; justify-content: space-between;"> <div data-bbox="448 1173 746 1576"> <p>Datalogger Analog Input</p> <p>Analog input Vin</p> <p>Analog ground G</p> <hr/> <p>DC Power Supply</p> <p>Negative -</p> <p>Positive +</p> </div> <div data-bbox="911 1173 1315 1234" style="text-align: center;"> <p>Datalogger without sensor power excitation</p> </div> <div data-bbox="975 1330 1369 1420">  </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div data-bbox="448 1630 746 1877"> <p>Datalogger Analog Input</p> <p>Analog input Vin</p> <p>Analog ground G</p> <p>Excitation EX+</p> </div> <div data-bbox="887 1621 1337 1682" style="text-align: center;"> <p>Datalogger with sensor power excitation</p> </div> <div data-bbox="975 1742 1369 1832">  </div> </div>

4 Dimension and Ordering Information

4.1 Dimension



Unit:mm

4.2 Ordering Information

Parameters	Code	Comments
Code 1: Product Series	MT05V	Soil Moisture measurement, 2.5-16VDC Power supply, Analog voltage output.
Code 2: Connector	A B C	3.5mm phone jack Cold pressed terminal pre-tinning wire
Code 6: Cable Length	005 XXX	5 meters Customize, XXX is required cable length(Unit: meter)
Ordering Code Example: MT05V Soil Moisture measurement, 2.5-16VDC Power supply, Analog voltage output, Cold pressed terminal, Cable Length 5 meters. Ordering Code is : MT05V-B 005		

5 Safty ,Care and Installation

5.1 Care and Safty

- The rods of the Sensor are sharp for ease insertion. Care must be taken and handling precautions followed.
- Avoid touching the rods or exposing them to other sources of static damage, particularly when powered up.
- Do not pull the sensor out of the soil by its cable.
- If you feel any resistance when inserting the sensor into soil, it is likely you have encountered a stone. Stop pushing and re-insert at a new location.

5.2 Installation

Surface installation

- Clear away any stones. Pre-form holes in very hard soils before insertion.
- Push the sensor into the soil until the rods are fully inserted. Ensure good soil contact.
- If you feel strong resistance when inserting the sensor, you have probably hit a stone. Stop, and re-insert at a new location.

Note: The sensor is suitable for soil surface temperature measurements.

Installing at depth

- Make a 45mm diameter hole, preferably at about 10° to the vertical using a auger.
- Push the sensor into the soil until rods are fully inserted. Ensure good soil contact.
- Fill and repack the hole with soil.

Alternatively

- Dig a trench, and install horizontally.

6 Output Signal Conversion

6.1 MT05V Conversion Formula

In the description below, V_s is sensor power supply voltage, MV is milli-voltage of sensor output (max 2000mV), VWC is volumetric water content (0.0%-100.0%), ξ_a is epsilon (0.88-81.88).

6.1.1 Conversion for Commonly used mineral soil

VWC simplified conversion formula, used for Volumetric water content conversion, VWC ranges from 0%-saturated (0%- saturated)

Power supply	Conversion formula	Comment
$V_s=2.5V$	$VWC=0.0007668*MV-0.4124162$	N/A
$V_s=2.6V$	$VWC=0.0007632*MV-0.4254611$	N/A
$V_s \geq 2.7V$	$VWC=0.0007564*MV-0.4261409$	N/A

VWC full range conversion formula, used for Volumetric water content conversion, VWC ranges from 0%-100%

Power supply	Conversion formula	Comment
$V_s=2.5V$	When $MV \leq 1203mV$: $VWC = 3.5458197E-07 * MV^2 + 1.7633114E-04 * MV - 1.9187369E-01$ When $MV > 1203mV$: $VWC = 7.5595667E-05 * MV^2 - 1.8141573E-01 * MV + 1.0937923E+02$	N/A
$V_s=2.6V$	When $MV \leq 1227mV$: $VWC = 3.2251602E-07 * MV^2 + 2.0814992E-04 * MV - 2.1048563E-01$ When $MV > 1227mV$: $VWC = 7.3693990E-05 * MV^2 - 1.8031010E-01 * MV + 1.1083086E+02$	N/A
$V_s \geq 2.7V$	When $MV \leq 1240mV$: $VWC = 3.1651746E-07 * MV^2 + 2.0687817E-04 * MV - 2.1126387E-01$ When $MV > 1240mV$: $VWC = 5.4820108E-05 * MV^2 - 1.3474890E-01 * MV + 8.3335703E+01$	N/A

6.1.2 Conversion for potting soil

Power supply	Conversion formula	Comment
$V_s=2.5V$	When $MV \leq 1212mV$: $VWC = 4.5968970E-09 * MV^3 - 1.2904363E-05 * MV^2 + 1.3230902E-02 * MV - 4.3850236E+00$ When $MV > 1212mV$:growing media saturated,force $MV=1212mV$ for calculation	N/A
$V_s=2.6V$	When $MV \leq 1237mV$: $VWC = 4.1267600E-09 * MV^3 - 1.1941604E-05 * MV^2 + 1.2651331E-02 * MV - 4.3233389E+00$ When $MV > 1237mV$:growing media saturated,force $MV=1237mV$ for calculation	N/A
$V_s \geq 2.7V$	When $MV \leq 1250mV$: $VWC = 4.0985755E-09 * MV^3 - 1.1901467E-05 * MV^2 + 1.2643467E-02 * MV - 4.3400540E+00$ When $MV > 1250mV$:growing media saturated,force $MV=1250mV$ for calculation	N/A

6.1.3 Conversion for rock wool

Power supply	Conversion formula	Comment
$V_s=2.5V$	When $MV \leq 1000mV$: $VWC = -5.2284103E-09 * MV^3 + 1.0973620E-05 * MV^2 - 6.1765070E-03 * MV + 1.1018837E+00$ When $MV > 1000mV$:growing media saturated,force $MV=1000mV$ for calculation	N/A
$V_s=2.6V$	When $MV \leq 1020mV$: $VWC = -4.7824052E-09 * MV^3 + 1.0189069E-05 * MV^2 - 5.7502508E-03 * MV + 1.0102167E+00$ When $MV > 1020mV$:growing media saturated,force $MV=1020mV$ for calculation	N/A
$V_s \geq 2.7V$	When $MV \leq 1030mV$: $VWC = -4.4977589E-09x^3 + 9.6406909E-06x^2 - 5.4229721E-03x + 9.4298186E-01$	N/A

	When MV>1030mV:growing media saturated,force MV=1030mV for calculation	
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6.1.4 Conversion for perlite

Power supply	Conversion formula	Comment
V _s =2.5V	When MV≤1070mV: $VWC = -3.6427604E-09 * MV^3 + 8.1594992E-06 * MV^2 - 4.7537898E-03 * MV + 7.8831286E-01$ When MV>1070mV:growing media saturated,force MV=1070mV for calculation	N/A
V _s =2.6V	When MV≤1090mV: $VWC = -3.4253078E-09 * MV^3 + 7.8086768E-06 * MV^2 - 4.6118698E-03 * MV + 7.6450087E-01$ When MV>1090mV:growing media saturated,force MV=1090mV for calculation	N/A
V _s ≥2.7V	When MV≤1110mV: $VWC = -3.2285063E-09 * MV^3 + 7.4140452E-06 * MV^2 - 4.3738042E-03 * MV + 7.1574605E-01$ When MV>1110mV:growing media saturated,force MV=1110mV for calculation	N/A

6.1.5 Conversion for Epsilon

ξ_a is media epsilon,for conversion from voltage output to epsilon (0.88-81.88)

Power supply	Conversion formula	Comment
V _s =2.5V	When MV≤1004mV: $\xi_a = 4.3203692E-05 * MV^2 - 2.7665077E-02 * MV + 4.2257250E+00$ When MV>1004mV: $\xi_a = 3.8662858E-06 * MV^3 - 1.2256430E-02 * MV^2 + 1.3020159E+01 * MV - 4.6105918E+03$	N/A
V _s =2.6V	When MV≤1026mV:	N/A

	$\xi_a = 4.0593611E-05 * MV^2 - 2.5665015E-02 * MV + 3.5715591E+00$ <p>When $MV > 1026mV$:</p> $\xi_a = 3.7399889E-06 * MV^3 - 1.2070000E-02 * MV^2 + 1.3047273E+01 * MV - 4.7001585E+03$	
$V_s \geq 2.7V$	<p>When $MV \leq 1038mV$:</p> $\xi_a = 3.8845836E-05 * MV^2 - 2.4119747E-02 * MV + 3.1538131E+00$ <p>When $MV > 1038mV$:</p> $\xi_a = 2.8198246E-06 * MV^3 - 9.0840887E-03 * MV^2 + 9.8205864E+00 * MV - 3.5398361E+03$	N/A

Appendix

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Version Control

Date	Version	Comment	Updated by
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