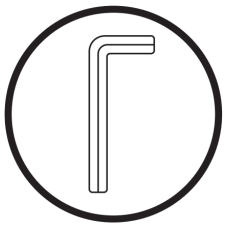
KIPP ZONEN DustIQ PV Soiling Monitoring Instruction Manual

KIPP ZONEN DustIQ PV Soiling Monitoring Instruction Manual

Contents

Requirements

- **Allen key 6 mm**



- **USB to RS-485 converter**

- **Spanner 13 mm**

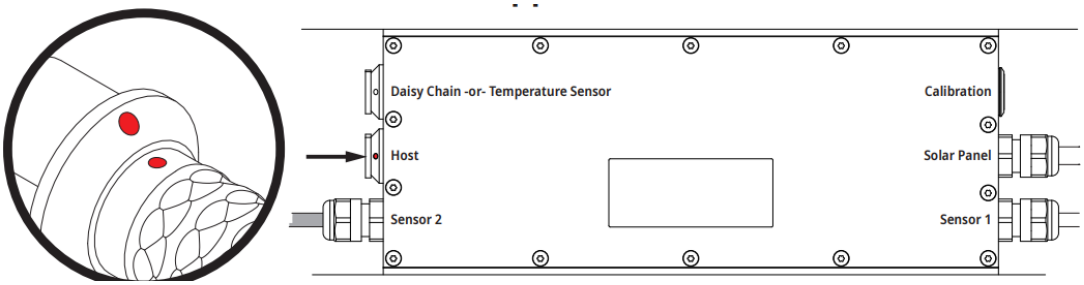
Cable connection

Wire	Function	Connect with
Yellow	Modbus® RS-485	Data +
Grey	Modbus® RS-485	Data –
White	Power 12 to 30 VDC	
Black	Power ground	
Blue	Modbus® common / Ground	Ground*
Shield	Housing	Ground*
* Connect to ground if DustIQ is not grounded		

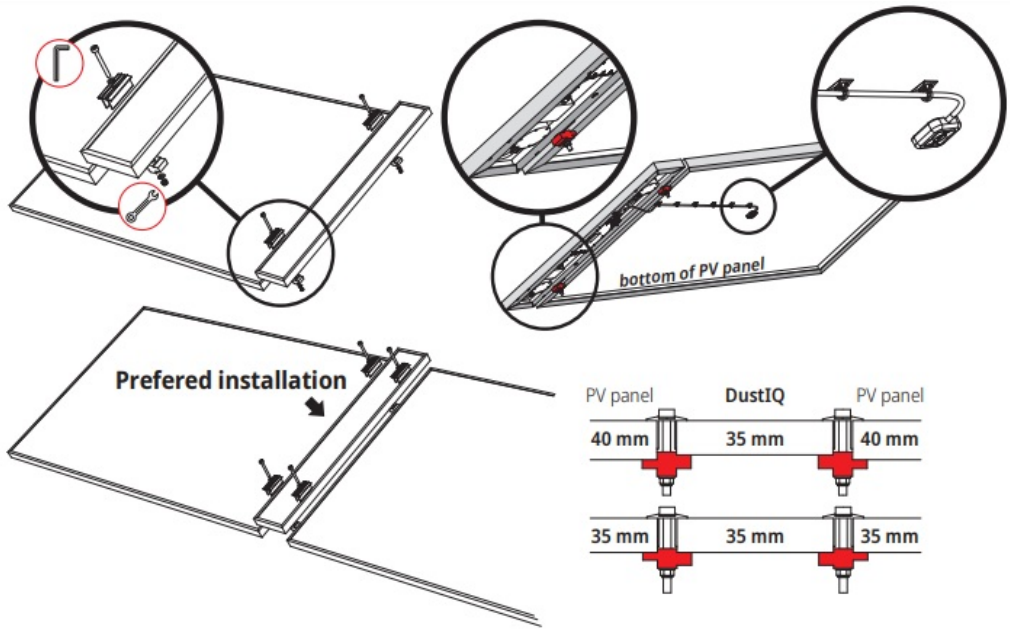
Default

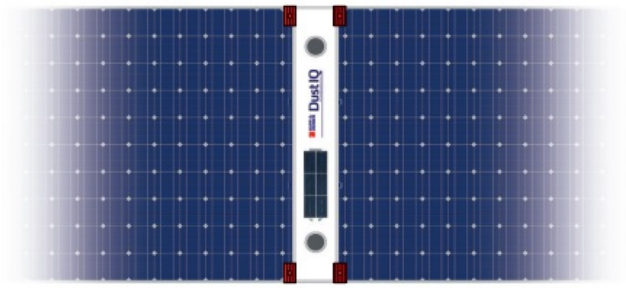
- Modbus® baud rate 19200
- Data bits 8
- Parity even
- Stop bits 1
- Address 1
- Factory dust profile Common desert dust

Push-Pull: Connect the supplied cable to the socket labelled ‘Host’

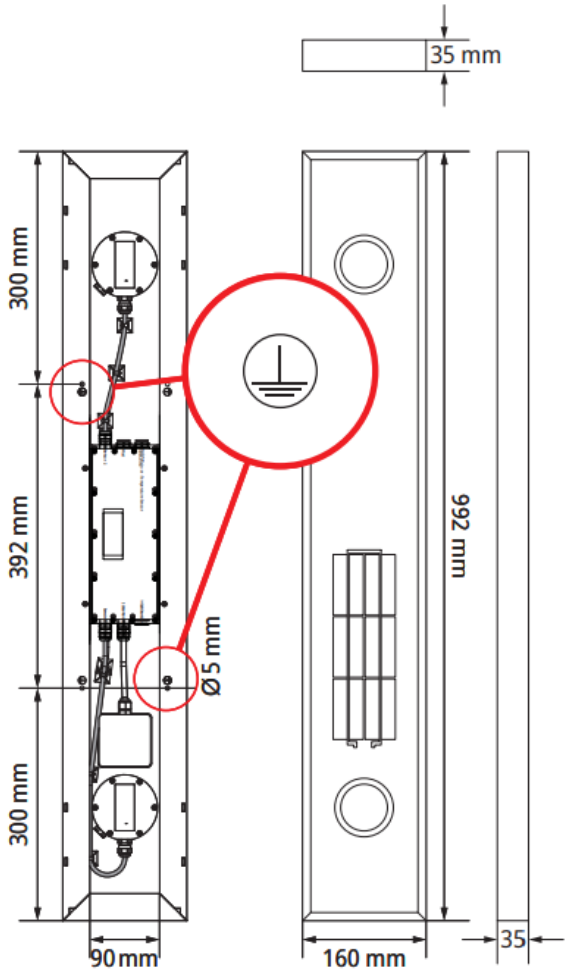


Positions and options





Dimensions



TARE INSTRUCTIONS

Needed before tare

1. Connected, working clean DustIQ with software version 2.15 or higher
2. DustIQ must be operative for minimal 3 minutes
3. Modbus registers 20-40 must be read and logged for soiling ratio's, transmission losses, status flags, dust slopes etc. (see manual section 4.2)
4. A person on-site and a remote person reading DustIQ data and the manual .
5. If moving from the back of the DustIQ to the front takes more than 20 seconds, then consider adding a third person, just to push the button

Time needed is 15 minutes


No clouds

Clear, sunny

Between 2 hours before and after solar noon

Clean, demineralised water and a sponge

Clean, dry cloth

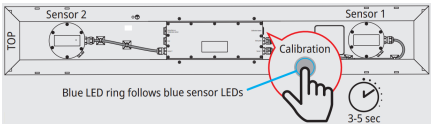
DustIQ LED light interpretation
Regular operation, 5 seconds of blue led light with a 60 second interval

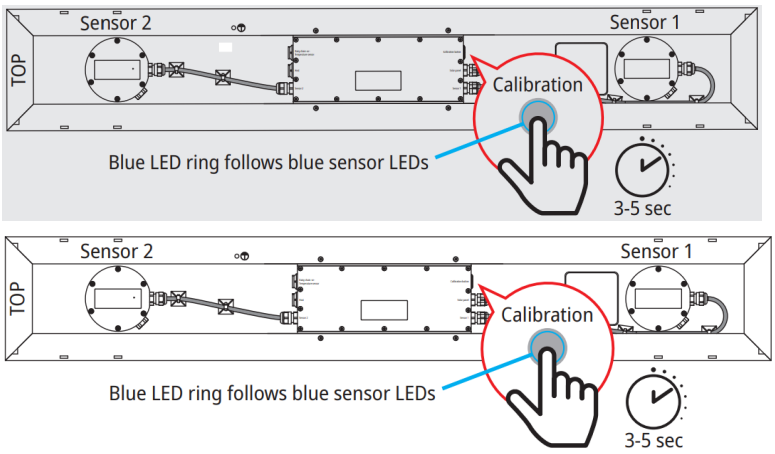
Feedback during the Tare or field calibration are given by the 2 sensors and the calibration button. There are 2 cases:

1. Slow blinking is 1x per second, confirmation and DustIQ awaiting next input
2. Fast blinking is 10x per second, this is the error signal for further information see error code in register 27

Both signals last 30 seconds in total, before normal operation restarts.

On-Site

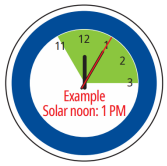
Validate installation	**During the procedure:** Do not cast a shadow on the DustI Q Do not cover the sensors 1. The DustIQ is mounted properly as per instructions. 2. Power cable is connected to the DustIQ. 3. DustIQ is cleaned.	No action needed
Wait	Wait 3 full minutes for the DustIQ to stabilize	No action needed
Push button 3 times	Push the Calibration button on the underside of the DustIQ 3 times in r apid succession.  Do NOT block the sunlight on the D ustIQ	No action needed
Wait	Sensors and button light up continu ously for 1 minute.	No action needed
Check sensors or button	Slow blinking = OK and finished. Inf orm person 2 of successful complet ion.	Confirm successful calibration in re gister 27 (manual section 4.2.2.)
	Fast blinking = error. Inform person 2 .	If unsuccessful read error code in r egister 27 for possible reasons and solutions.



BEFORE CALIBRATION

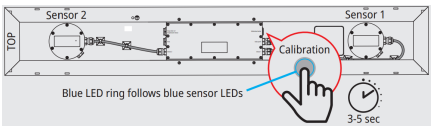
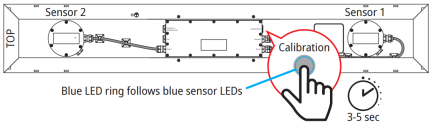
Needed before calibration

1. Connected, working, soiled DustIQ (3% transmission loss) with software version 2.15 or higher
2. DustIQ must be operative for minimal 3 minutes
3. Modbus registers 20-40 must be read and logged for soiling ratio’s, transmission losses, status flags, dust slopes etc. (see manual section 4.2)
4. A person on-site and a remote person reading DustIQ data and the manual .
5. If moving from the back of the DustIQ to the front takes more than 20 seconds, than consider adding a third person, just to push the button.
6. A clear sunny sky
    - 

Time needed is 15 minutes
    -  No clouds
    -  Clear, sunny day
    - 

Between 2 hours before and after solar noon
    -  Clean, demineralised water and a sponge
    -  Clean, dry cloth

The sky must be free of clouds and airplane contrails for at least 10 minutes.

	On-Site **During the procedure:** • Do not cast a shadow on the Du stIQ • Do not cover the sensors	**Remote office** Remote office
Contact Remote Office	Contact Remote Office	Check register 26 for enough soilin g and sun and inform on-site perso n 1. (the expected value is 3), for fu rther details check the cheat sheet
Local Check	Check for clear sky and no clouds. I nform person of start of calibration when OK. Do not cast a shadow on the DustIQ during the calibration pr ocess!	No action needed.
Push calibration button for 3 secon ds		No action needed.
Check sensors or button flash	Slow blinking = proceed with next s tep Fast blinking = stop and inform person	During calibration 0 will be presented in register 27. If an error occurs register 27 is updated with a specific code. (manual section 4.2. 2)
Push button again (for 3 sec.)	Do NOT block the sunlight on the D ustIQ! 	No action needed
Wait	Sensors and button light up continu ously for 1 minute Do not cast a shadow on the DustIQ Do not touch the DustIQ	No action needed. Wait for update f rom on-site person .
Check sensors or button	Slow blinking = OK and finished Inf orm person of successful completio n	Confirm successful calibration in re gister 27 (manual section 4.2.2). an d optionally read and use new dust slopes. (manual section 4.1).
	Fast blinking = error Inform person	If unsuccessful read error code in r egister 27 for possible reasons and solutions.

REMOTE OFFICE cheat sheet

Value	Meaning	Remarks
0	There is not enough sun light and not enough soiling on the sensors	On-site check for clear sky and local time is between 2 hours before and after local solar noon. Check if there is >3% transmission loss in registers 21 and 25.
1	Enough sunlight	There is > 500 W/m² solar irradiation on the DustIQ. But not (yet) enough soiling so wait for more soiling
2	Enough soiling on both sensors	There is >3% transmission loss in registers 21 and 25. But not enough sunlight (yet).
3	Enough sunlight and soiling on both sensors. Calibration possible	Contact people on-site to check readiness, time window and sky conditions and if OK they can start the 2 minute waiting time followed by pushing the button and cleaning.
4	Unstable soiled measurements	Before calibration the DustIQ, must have had 2 minutes of stable sunlight 4 and the two sensors must have had 2 minutes of stable soiling.

Register 27 after tare

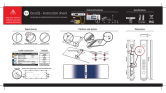
Value	Meaning	Remarks
3000	Tare successful	Tare procedure is completed.
3006		Attempted to start tare procedure without waiting the required 2minutes to allow for stabilization
3010	Hardware error	Signal is to low possible hardware failure.

Register 27 after calibration

Value	Meaning	Remarks
1	Successful calibration	The dust slopes in registers 36 and 38 have changed. Refer to chapter 4.1 to see how older data or data from other DustIQs on the same PV plant can be updated with the new calibration values. Valid values for register 36 and 38 are from 30 (extreme white soiling) to 300 (very dark soiling)

1000	Attempted to start without enough s un	Calibration was halted. Nothing has been changed. Register 26 should be checked before pushing the butt on.
1001	Attempted to start without enough s oiling	Calibration was halted. Nothing has been changed. Register 26 should be checked before pushing the butt on. 1002
1002	Attempted to start with unstable su nlight on PV cell	Clouds or a person has blocked the sunlight. the sunlight in the 2 minut es before pushing the button.
1003	Attempted to start with unstable du st measurement	On-site personnel touched the glas s area of sensor 1 or 2 during the 2 minutes before pushing the button.
1004	Button pushed but too short. This p revents accidental start	Push the button 3-5 seconds for the calibration to start.
1005	Time out. The button hasn't been p ushed a second time within 2 minut es from first push.	Could be by accident. Not pushing t he button a second time is also a s afe escape from the calibration procedure.
1006	Field calibration started withing 3 m inutes of start-up (without waiting)	
2010	Sensor 1 showed too little soiling c hange.	Sensor 1 not properly cleaned or dr ied
2020	Sensor 2 showed too little soiling c hange.	Sensor 2 not properly cleaned or dr ied.
2030	PV cell showed unreliable little change.	PV cell not properly cleaned or drie d. Or PV cell much cleaner than the sensors by e.g. accidental cleaning. OR Clouds or a person has blocked the sunlight.
2040	Clean measurement unstable	Disturbance during clean measure ment.
2050	Dustslope out of range	Dustslope is higher than expected but procedure was correct.
2060	Dustslope factor out of range	Dustslope is higher than expected but procedure was correct.

Documents / Resources

	**KIPP ZONEN DustIQ PV Soiling Monitoring** [pdf] Instruction Manual DustIQ PV Soiling Monitoring, DustIQ, PV Soiling Monitoring, Soiling Monitoring, Monitoring

References

- **DustIQ For Soiling Monitoring of PV**