

# IoT for leak detection and cathodic protection

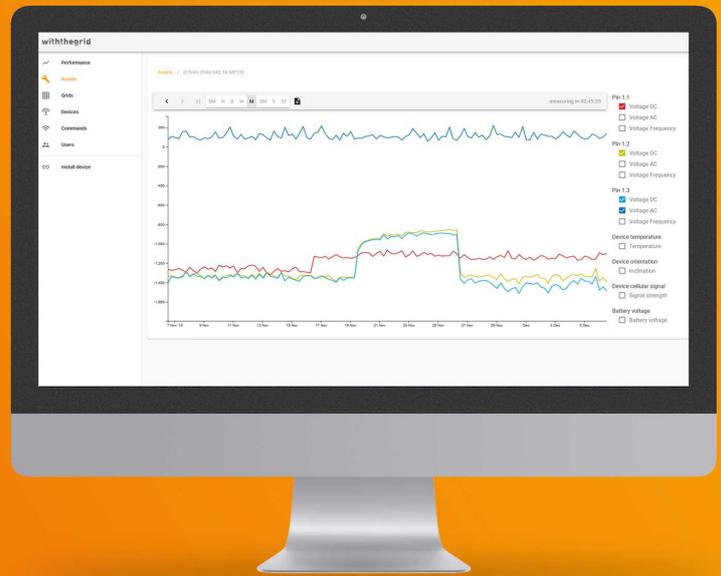


## For whom?

Asset owners, asset managers and operators

## What?

IoT devices and online platform for leak detection and cathodic protection monitoring



## Always the latest status of your infrastructure

Withthegrid provides devices that can be used for district heating leak detection and to monitor the cathodic protection of steel pipes. These devices ensure the continuous monitoring of pipes. In the event of a malfunction, the correct person immediately receives a message. This makes it possible to always have the latest status of the network, reduce operational costs and deploy scarce technicians more effectively.



### About leak detection

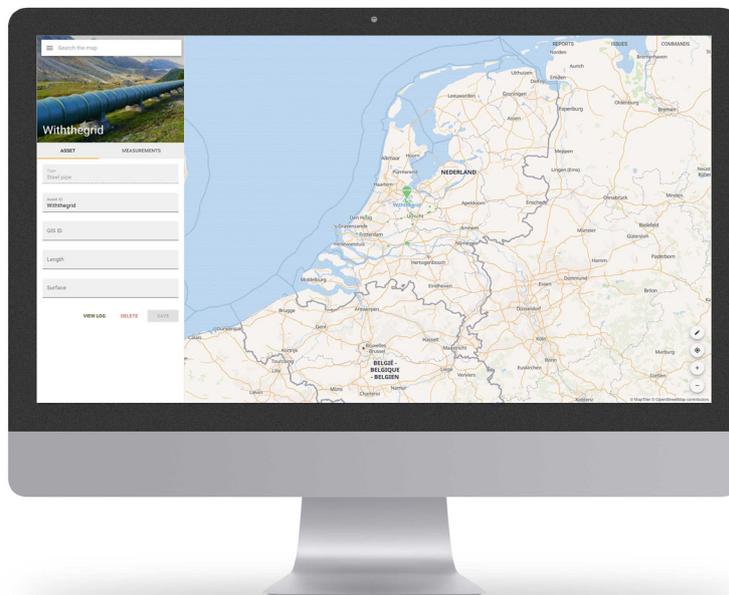
To monitor leaks in district heating, the devices are connected to the measuring wires of the pipe. Because the devices are battery or mains powered, they can be placed both in stations and in posts and pits. By measuring the loop and insulation resistance, it is possible to monitor whether there is excavation damage or a leak.

### About cathodic protection

To monitor the cathodic protection (CP) of steel pipes, the devices are connected to the rectifier and to the various measuring points along the network. In this way the entire CP system is monitored. Both DC / AC voltage and current are measured. Switching can also be done at the rectifier to perform open circuit potential measurements or to be able to perform works on the network.

## An online platform with all measurement history

The devices send their encrypted measurement data to the Withthegrid platform. The map shows which pipe sections function correctly or need attention. In an overview it becomes clear which actions need to be carried out.



## About Withthegrid devices



### Energy efficient

The withthegrid devices are designed to last. In addition to a large battery, energy-efficient electronics and communication equipment is used. The service life of the communication is also guaranteed by means of a 2in1 or 3in1 module with GPRS / NB-IoT / LTE-M.



### Secure

All data is encrypted (DTLS) so that data cannot be read by third parties. Over-the-air (OTA) firmware updates are possible enabling the ability for remote security updates or the addition of new software functionalities.



### Easy

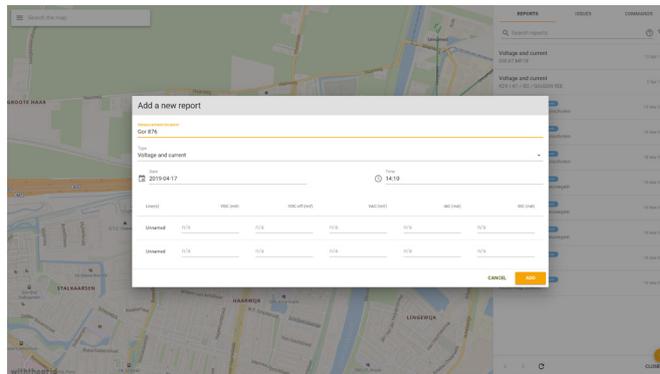
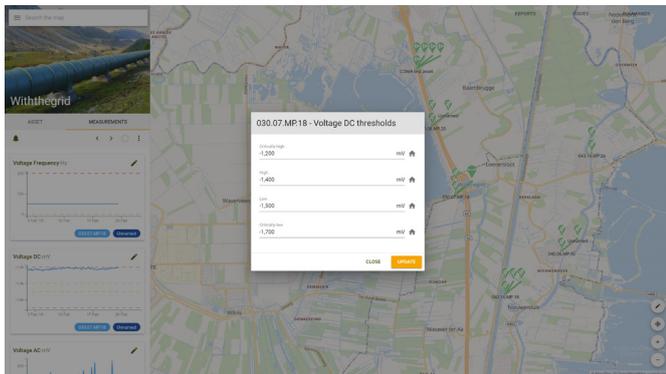
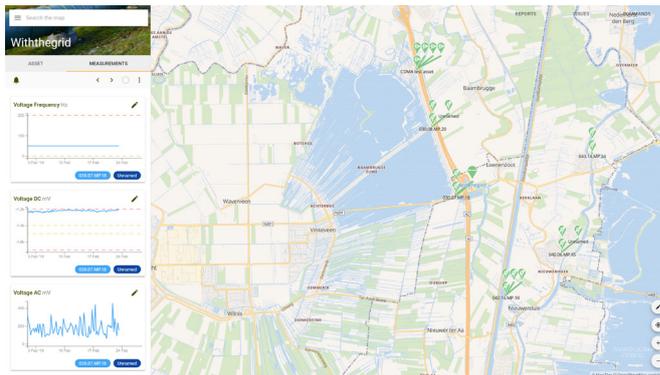
The devices are designed in such a way that they are easy to install by field engineers or contractors (plug and play sensors). With an automatic connection to the Withthegrid platform and customer GIS systems, the device is also directly linked to the correct asset (for example, a measuring pole or pipe section) and the correct measurements are immediately stored in the right manner in the customer systems.

# All functionalities for operator, asset manager and asset owner

The integrated solution of devices in combination with a software platform ensures ease of use and supports the different roles in the process.

## Historical measurements

The history of measurement values and issues are stored so that a complete overview is created per measurement location, pipeline network or area. Data can be visualised per day, month, year or 5 year period.

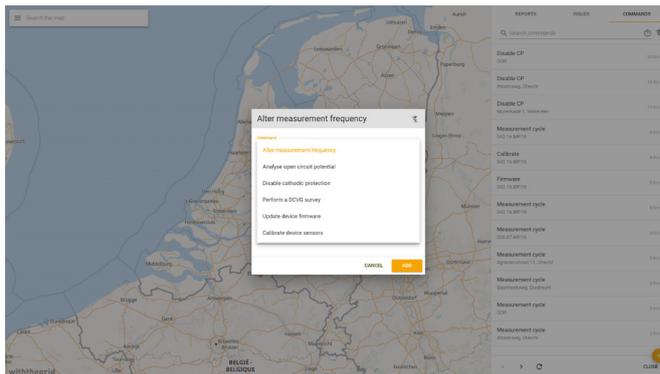
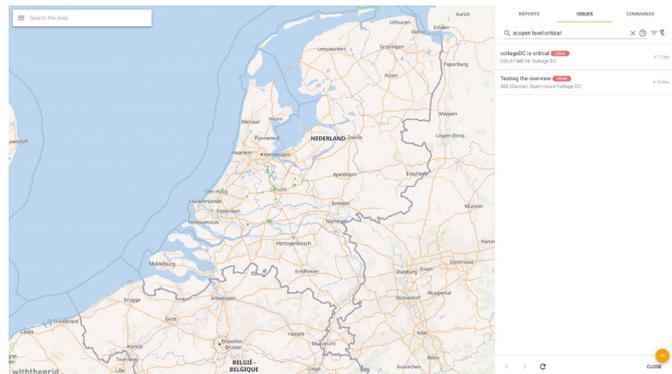


## Thresholds and alarms

Thresholds per measurement can be set per location, pipe network or area. In addition, it can be determined which user receives which alarms when a threshold is crossed and with what frequency.

## Manual measurements

In addition to an overview of measurements from devices, manual measurements can also be added to the platform if desired.



## Issue tracking

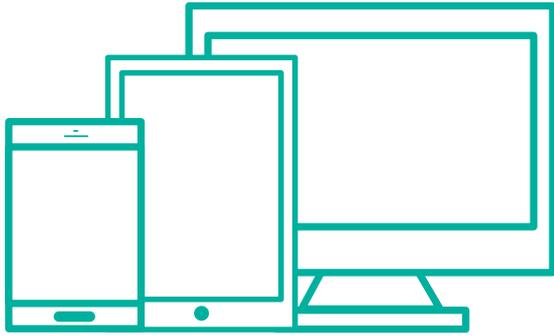
If the threshold values are exceeded, an issue is automatically created. The user can comment and discuss each issue. Depending on a successful follow-up action, the issue can be closed. Issues can also be created manually for, for example, an additional inspection.

## Productspecifieke commando's

Commands can also be sent to the devices from the online platform. For example:

- Adjusting measurement frequency (1X / 5 minutes to 1X / week)
- Carry out open circuit potential measurements or perform a DCVG
- Switch of the devices to carry out works on the pipelines

## Widely accessible, secure and able to connect to other IT systems through APIs

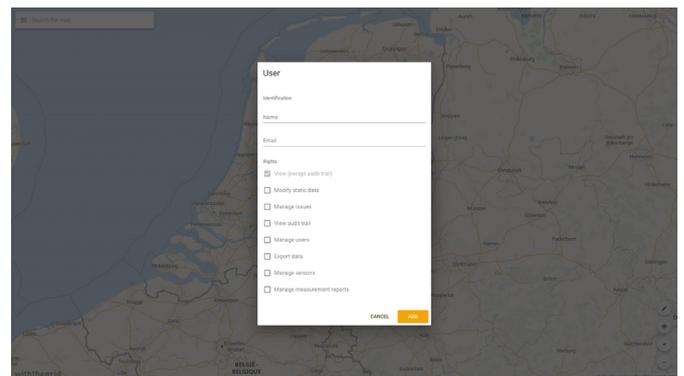


### Access

The platform can be accessed via computer, tablet and mobile phone.

### Security

The encrypted data is stored with daily backups in an ISO:9001 environment. Two-factor authentication or Active Directory link (single sign on) is possible on request.



### Link with other IT systems

All measurement data can be made available through API links. Real-time synchronization with customer GIS is also possible. Generated issues can on request also be sent to the customers work order systems.

### Users

Rights can be assigned per user (read only, set threshold values, adjust measuring frequency, etc.). An audit trail also keeps track of historical changes made.

## Install it yourself and monitor it or through Withthegrid maintenance partners

The devices can be installed by in-house engineers, after which monitoring can be carried out by the same engineers or by other employees. Another possibility is to have the installation of the devices carried out by a Withthegrid maintenance partner. Monitoring and carrying out any follow-up actions can also be taken care of.

### Self service



### Managed service



## Benefits

### Strategic

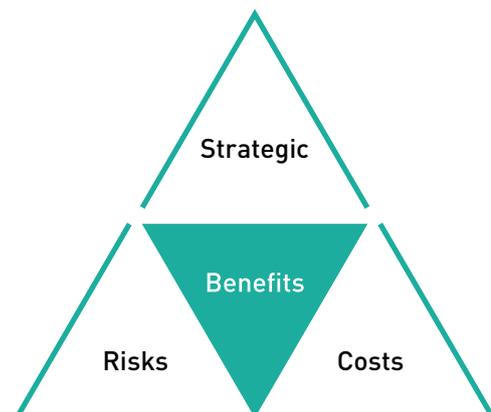
- Dealing more effectively with scarce technical staff
- Clear audit trail with complete measurement history

### Costs

- Faster detection of damages (also detection of mowing damages)
- Reduction of operational costs (incl. fewer car movements and reduced CO2 emissions)

### Risks

- Better insight into asset quality (faster, more and more accurate measurement data)
- Can be used at locations that are difficult to reach or dangerous
- One digital environment for all (automatic and manual) measurements



## Leak detection overview - What is measured where

For district heating pipes that are protected by an insulation layer with measuring wires. The devices enable the detection of moist insulation which indicates a leakage or (excavation) damage from the outside. In line with NEN-EN 14419: 2009, the withthegrid system can be used to measure at heat production locations, heat transfer stations and measuring points. Loop resistances and insulation resistances can be measured and the devices can be switched off to carry out works on the pipelines.

### 1. Leak detection 230V

- 4 or 8 measuring loops per device
- Insulation resistance
- Loop resistance

Extra functionality

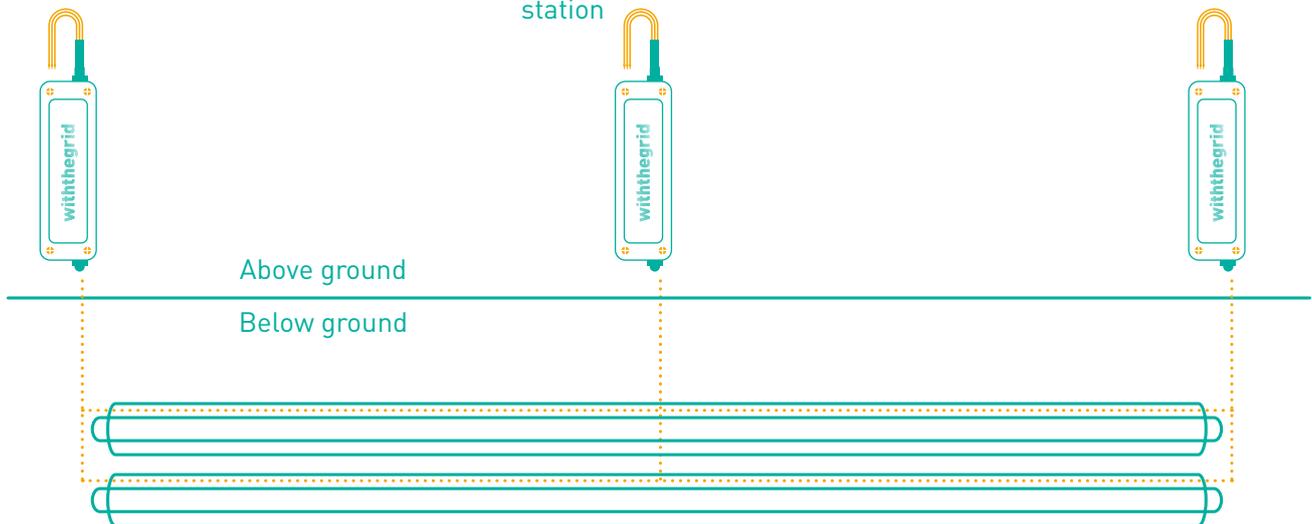
- Switching off the device to carry out works



Heat production

Heat transfer station

Measurement point



Devices



(Isolated)  
pipe



Measurement wire

### 2. Leak detection battery

- 4 or 8 measuring loops per device
- Insulation resistance
- Loop resistance

Extra functionality

- Switching off the device to carry out works



# Overview Cathodic protection – What is measured where

For a steel pipe network that is protected by cathodic protection. The devices can monitor whether the cathodic protection is still sufficiently protecting the infrastructure. In line with EN13509: 2003, EN12954: 2001, EN50162: 2004, the Withthegrid system can be used to measure at measuring points, isolation joints, drains and at rectifiers. On potential and open circuit potential can be measured as well as and stray currents. Furthermore, switching of the rectifier gives the ability to carry out specific measurements such as DCVG.

**1. Rectifier**

- Voltage AC+DC (Anode / Cathode and grids)
- Current AC+DC
- Frequency AC+DC

Extra functionality

- Switching CP for open circuit potential measurement
- Switch CP for DCVG
- Switch off the device to carry out works
- Modify rectifier setting (Modbus version)

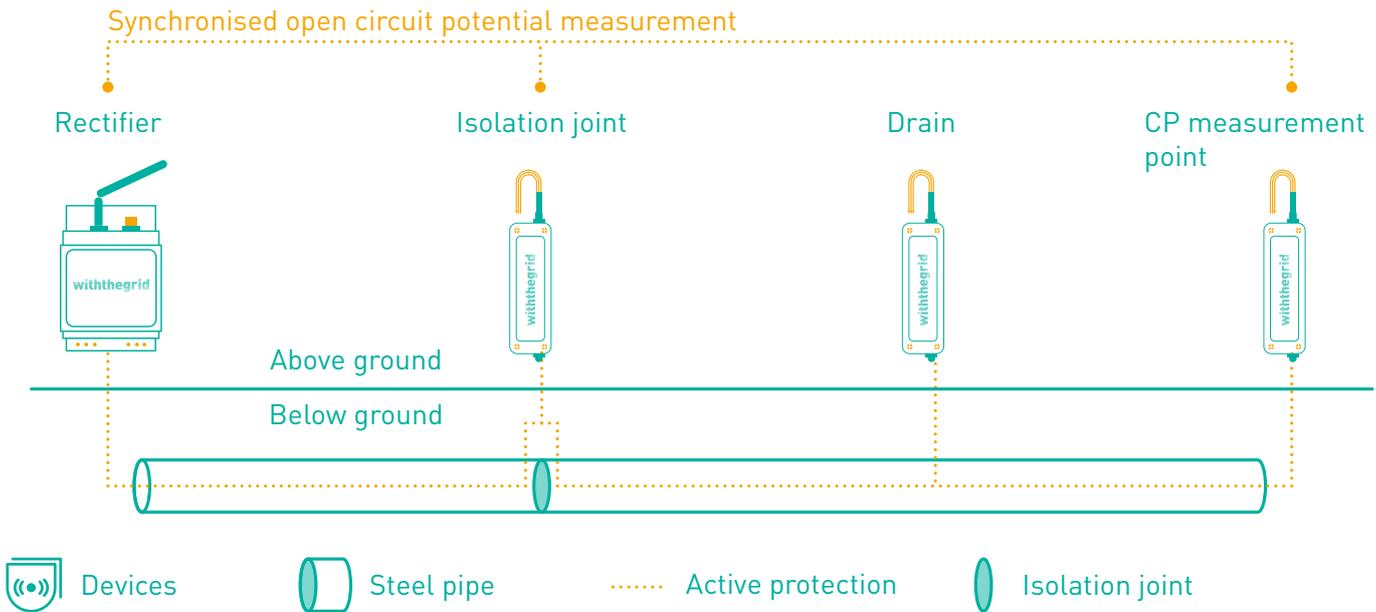


**2. CP measurement (endpoint)**

- Voltage AC+DC (max. 5 grids)
- Frequency AC+DC (Coupon IR-free)
- Current (coupon)

Extra functionality

- Open circuit potential measurement (together with rectifier)
- 24hr on potential measurement
- 24hr stray current measurement (Coupon)

**3. Isolation joint**

- Voltage AC+DC
- Frequency

Extra functionality

- Current AC+DC
- Open circuit potential measurement (together with rectifier)



**4. Drainage**

- Voltage AC+DC (Pipe, rail)
- Frequency
- Current AC+DC (Coupon, drain)

Extra functionality

- 24hr drain measurement AC+DC



## Specifications leak detection:

- Number of measurement loops: 4 (for 1 or 2-wire pipe system) or 8 (for 4-wire pipe system)
- Insulation resistance (range: 5k Ohm - 1G Ohm, accuracy:  $\pm 10\% + 0.1\%$  of range)
- Loop resistance (range: 0-500 Ohm, accuracy:  $\pm 2\% + 0.1\%$  of range)
- Communication protocol: GPRS / NB-IoT / LTE-M
- Remote adjustable measuring frequency (1X / 5 minutes to 1X / week)
- Switching off the device to carry out works
- IP rating 65



## Specifications cathodic protection:

- Range and accuracy of AC+DC voltage:  $\pm 50\text{mV}-35\text{V}$  @  $\pm 1\% + 1$  digit resolution
- Range and accuracy AC+DC current:  $\pm 10\text{mA}-20\text{A}$  @  $\pm 2.5\% + 1$  digit resolution
- Frequency AC: 16 - 100 Hz (digitally filtered)
- Number of AC+DC voltage channels: 5 + 1 ref.
- Number of channels voltage current: 1 (in combination with max. 3 voltage channels)
- Impedance:  $> 4 \text{ MOhm}$
- Switch accuracy:  $\pm 1 \text{ ms}$
- Power supply: Battery (without replacement for 6 years with 4X / day measurement) or 230V
- Communication protocol: GPRS / NB-IoT / LTE-M
- Possibility of modifying rectifiers settings remotely with Modbus communication device
- Remote adjustable measuring frequency (1X / 5 minutes to 1X / week)
- Switching off the device to carry out works
- IP rating: 65 (Modbus variant: IP20)



## Withthegrid devices are compliant with:

- IEC 61000-6 1/2/4
- IEC 61000-4 2/3/4/6
- IEC 55011

**Want to know more?**  
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