nemi WAMS Node

Wireless sensor node for monitoring cracks, strains and temperatures

Description

nemi WAMS Node is the sensor node for data acquisition in i4M's **W**ide **A**rea **M**onitoring **S**ystem. In addition to the integrated humidity and temperature sensors, it offers connection options to measure strain, temperatures or distances.

nemi WAMS was developed for applications that do not require high data rates but large area coverage with sensors and long battery runtimes. This is made possible by i4M's own highly efficient radio technology nemi Link 868.

Key Features

- **Variety of connection options** for data collection to choose from
- Integrated **humidity** and **temperature sensors**
- **Completely wireless** due to radio technology nemi Link 868 and **integrated battery**
- More than 5 **years of battery life**
- Transmission of **raw data** or **pre-evaluated / smart data** by edge computing
- **Data sampling** every 1 to 20 minutes, **alarm via SMS** every 1 to 5 minutes
- Robust, weatherproof **IP 67 housing**

Connection of up to **3 strain gauge full bridges**

Connection of up to **3 displacement sensors**

Connection of up to **3 Pt100 / Pt1000 temperature sensors**

nemi Link 868 - i4M's own robust **long-range radio technology** in the 868 MHz frequency band; range up to 1000 m

Climate sensor for measuring the **temperature** and **humidity in the** environment

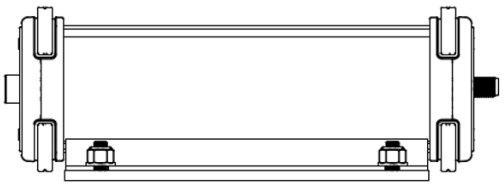
Battery life approx. 7 years with transmission of one measured value per 20 minutes

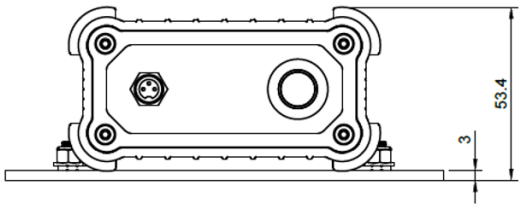
Specifications

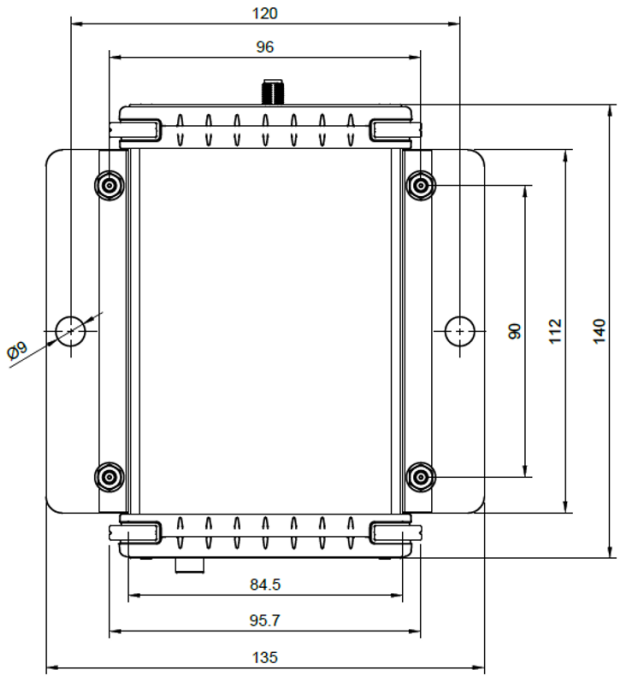
General information		
Dimensions (without antenna, connectors and retaining plate)	140 x 95.7 x 50.4	mm
Weight (with retaining plate)	510	grams
Internal power supply	Lithium primary cell (Type Saft 14500)	-
Running time with full battery	Approx. 7 (with transmission of one measured value per 20 minutes)	years
Temperature range permitted during operation	-20 to 60	°C
Onboard MCU usable for edge computing	48 MHz ARM Cortex M0+, 256 KB Flash, 32 KB RAM	-
Housing protection class	IP 67	-
External sensors with analog output		
Connectable sensors	• Wheatstone full bridges (e.g. strain gauge) or potentiometer sensors • Resistance sensors with constant current supply (e.g. Pt100 / Pt1000) • potentiometric displacement sensors	-
Number of channels	max. 3	-
Max. Sampling rates (for internal calculations only, no live transmission, with active channels)	19,200 (1 channel) / 1,000 (3 channels)	Hz
Selectable signal gains	128, 64, 32, 16, 8, 4, 2, 1	-
Max. Measuring range of the input voltage	0 – 2.5 (with a signal gain of 1)	V
Input impedance	> 1	MΩ
Possible feed currents	1000, 750, 500, 250, 100, 50	µA
Supply voltage	2.5	V
Signal resolution	24	bit
Inaccuracy	<< 1	%
Integrated climate sensor measuring to the outside		
Sampling rate	1	Hz
Measuring range temperature sensor	-40 to 125	°C
Signal resolution temperature sensor	0.015	°C
Inaccuracy temperature sensor	± 0.2	°C
Measuring range humidity sensor	0 - 100	% rH
Signal resolution humidity sensor	0.02	% rH
Inaccuracy humidity sensor	± 1.8	% rH

Dimensions

(All dimensions in mm)







Connection and configuration options for external sensors

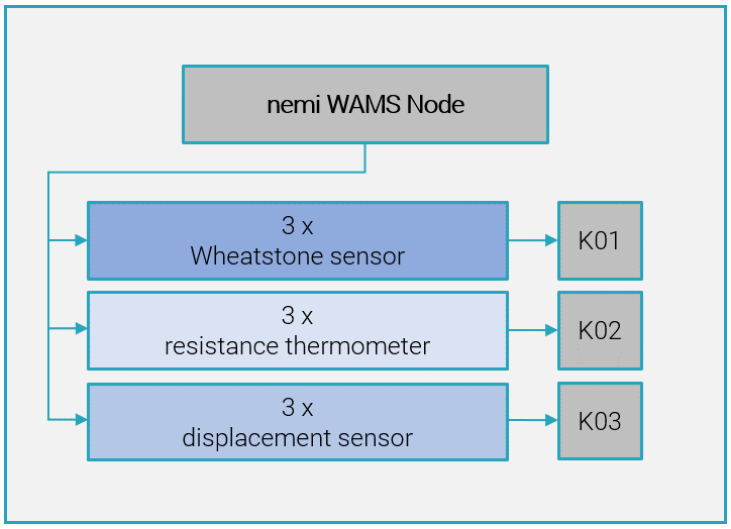
nemi WAMS Node offers various connection options for external sensors with analog output. The following options are available:

- Up to 3 Wheatstone sensors in full bridge circuit e.g. strain gauges **or**
- Up to 3 Pt100 / Pt1000 resistance thermometers or other resistance sensors with constant current supply **or**
- Up to 3 potentiometric sensors e.g. displacement sensors

The configuration of the analog inputs of nemi WAMS Node must be defined and specified before delivery. Subsequent modification is only possible by i4M technologies.

The following graphic shows the various configuration options K01 - K03.

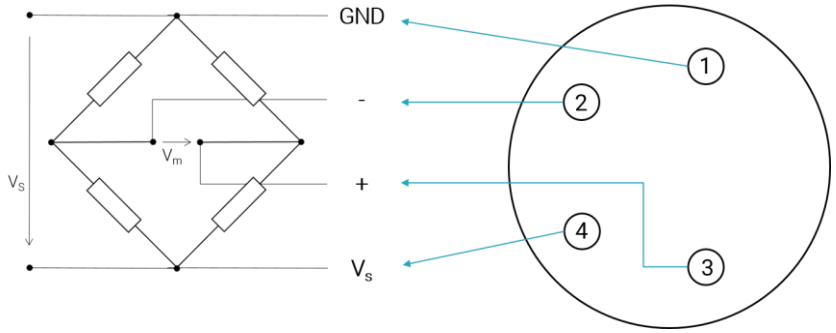
Configuration options of nemi WAMS Node



Pin Assignment

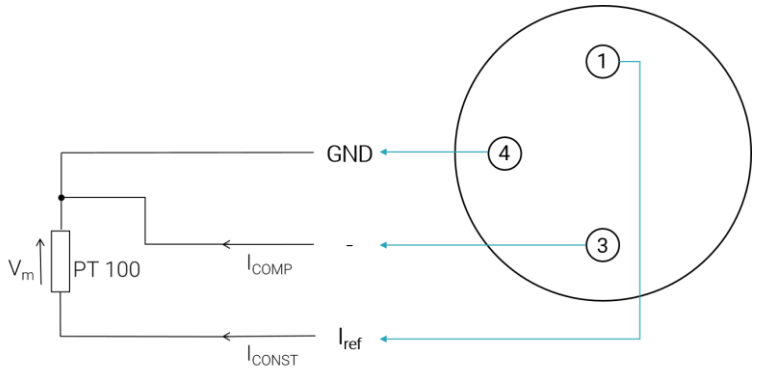
nemi WAMS Node has 4 pins that are used to connect external sensors with analog output. The possible pin assignments of the configuration options K1 - K3 are shown in the following figures:

Pin Assignment of configuration option K01 (Wheatstone sensors)

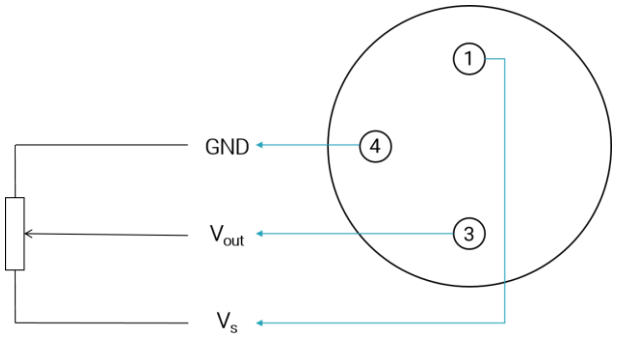


As an alternative to connecting Wheatstone sensors, K01 configuration can also be used to **measure voltages.** Up to three voltages with a measuring range of 0 - 2.5 V can be measured. In this case, pin 1 and pin 4 remain free and the measurement voltage V_m is measured between pin 2 and pin 3.

Pin Assignment of configuration option K02 (resistance thermometer)



Pin Assignment of configuration option K03 (potentiometric displacement sensors)



V_m ≙ Measuring voltage

I_{ref} ≙ Reference current

GND ≙ Ground

V_{out} ≙ Output voltage

I_{CONST} ≙ Constant current

V_S ≙ Supply voltage

I_{COMP} ≙ Compensation current

Radio technology nemi Link 868

Long-range radio network

Our own radio technology nemi Link 868 is a **wireless, battery-powered sensor network** in the 868 MHz frequency band with star topology and receiver / gateway module. It is the **high efficiency of** our robust radio technology that **enables the long battery runtimes** of our products. Our wireless sensors synchronize their internal clocks to the clock of the receiver module with small deviations.

Radio technology nemi Link 868		
Radio channel	868 MHz ISM frequency band	-
Time synchronization deviation	100	ms
Radio range	up to 1.000	m
Max. Sum sample rate at 24 bit pr o Sample	approx. 200	Hz
Sensor nodes per gateway	30	-

Compatible receiver modules in the nemi Link 868 wireless network

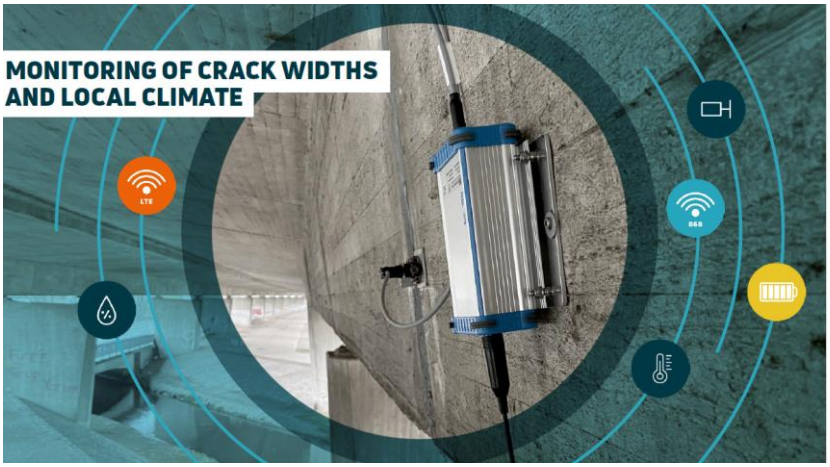
nemi WAMS Node is compatible with all receiver modules in i4M's nemi Link 868 network. The following product is available under the nemione® trademark:

nemi WAMS Bridge

Application

Due to the elimination of cabling, nemi WAMS enables easy installation even on large assets and structures. Examples for use cases are climate or crack monitoring on bridges or continuous temperature monitoring on rolling bearings in big facilities.

Download Use Case:



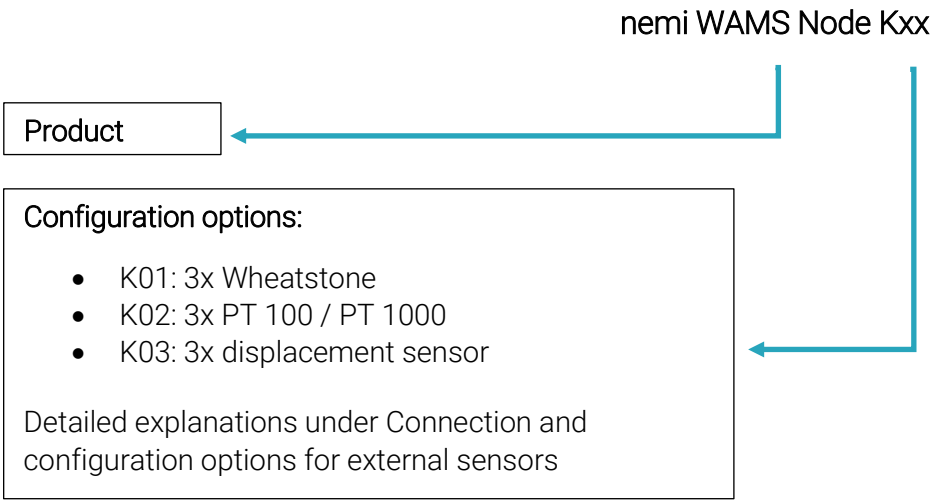
Data Analysis

Upon request, we will be happy to support you with data analysis. The data analyses can be performed directly in the sensor or in the gateway by edge analytics as well as on the server or measuring computer. A great advantage of edge analytics is the **reduction of the transmitted data to the essentials** ("smart data"). This **reduces storage space** and **increases battery runtimes**.

Based on our knowledge from a multitude of previous projects, we have developed **algorithms for data evaluation** to generate **maximum added value** for our customers. We will gladly advise you on this. In addition to our existing algorithms we create **individualized scripts** upon request.

At the same time, the **data remains your capital**: We do not rely on big cloud providers but **keep the data in your IT ecosystem**. Alternatively, you can rely on our nemione® cloud solutions - hosted in the European Union.

Ordering options of nemi WAMS Node



Contact

nemione® is a trademark of

i4M technologies GmbH
Försterstrasse 5
52072 Aachen
+49 (0) 157 34 10 59 30
info@nemi.one

www.nemi.one
www.i4M-tech.de