

# Temperature, inclination and current sensor node

## For power line monitoring, with wireless transmission

### Model TIC-1-W

WIKA data sheet SP 63.29

#### Applications

- Determination of the electrical current-carrying capacity (ampacity) of high-voltage conductors
- Determination of an current-carrying capacity value (ampacity) over a period of up to 10 days
- Ice loading detection

#### Special features

- High-precision sensor system for various physical measurands: Temperature, inclination, current, torsion
- Private LoRa® communication network (autonomous and secure)



Sensor node, model TIC-1-W

#### Description

Power line monitoring is a proven monitoring system for high and extra-high voltages. By reliably capturing measured data, the line potential can be optimised, faults located more quickly and maintenance carried out more efficiently. In the process, several unique selling points of power line monitoring deliver economic advantages.

The model TIC-1-W sensor node monitors the transmission lines directly on the conductor. For this purpose, the energy-autonomous model TIC-1-W sensor nodes are installed directly on the conductor in the spans to determine the various measured values locally and integrally (inclination).

The system is highly efficient and suitable for the following application areas:

- Forecasting of current-carrying capacity (ampacity forecasting)
- Increase of current-carrying capacity (ampacity)
- Hazard identification (conductor breaks)
- Ice loading detection

#### Basis of power line monitoring

The autonomous model TIC-1-W sensor nodes form the basis of the monitoring system. They generate the energy required for operation directly from the live conductor. The system is supplied by the electrostatic fringe field of the high-voltage conductor (capacitive harvesting). As soon as the required mains voltage is present, the sensor nodes automatically enter the operating state and simultaneously establish wireless communication with the base station.

Thanks to the modularity of the system, the collected measured data can be transmitted in many different ways. Aggregated data (e.g. traffic light values) can be made available directly to the control system for plant operation via IEC protocols (60870-5-101/104).

Power line monitoring provides a comprehensive technical basis for spatially resolved monitoring through the decentralised determination of real, physical measured values.

### TIC-1-W sensor node

The autonomously operating sensor nodes are usually attached to the conductor directly after a tower at distances of up to 4,000 m [2.49 mi]. The captured measured values are transmitted wirelessly along the sensor chain to a data input point of the network control technology and fed into the control system. The interface to the control system is formed by a base station (model IPC-1) and a server with the software required for the respective applications.

## Technical data, complete system

| Overview of versions |                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------|
| Model TIC-1-W        | Temperature, inclination and current sensor node with wireless transmission, also referred to as sensor node |
| Model WS-1-W         | Weather station with wireless transmission                                                                   |
| Model IPC-1          | Industrial PC for power line monitoring                                                                      |

| Basic information, TIC-1W sensor node  |                                                                           |
|----------------------------------------|---------------------------------------------------------------------------|
| <b>Size</b>                            |                                                                           |
| Diameter                               | 300 mm [11.81 in]                                                         |
| Length                                 | 450 mm [17.72 in]                                                         |
| <b>Case</b>                            | Polycarbonate (UV-resistant)                                              |
| <b>Mounting clamp material</b>         | Aluminium                                                                 |
| <b>Conductor diameter, receptacle</b>  | 10 ... 30.5 mm [0.39 ... 1.20 in]                                         |
| <b>Ingress protection (IP code)</b>    | IP67                                                                      |
| <b>Weight</b>                          | 3.9 kg [8.59 lb]                                                          |
| <b>Installation</b>                    |                                                                           |
| Method                                 | Drone for installation on live lines or on deenergised lines (dead wires) |
| Conductor position                     | Best results at a short distance from the insulator                       |
| Installation on live lines             | Compatible with installation technologies for drones                      |
| <b>Permissible ice layer thickness</b> | ≤ 24 mm [0.94 in]                                                         |

| Measuring range / Resolution / Operating range, TIC-1W sensor node |                                  |
|--------------------------------------------------------------------|----------------------------------|
| <b>Operating range</b>                                             | 0 ... 1.5 kA                     |
| <b>Measuring range</b>                                             |                                  |
| Current sensor                                                     | 20 ... 600 A                     |
| Temperature sensor                                                 | -25 ... +85 °C [-13 ... +185 °F] |
| Inclination sensor                                                 | ±30°                             |
| Torsion sensor                                                     | ±30°C                            |
| <b>Resolution</b>                                                  |                                  |
| Current sensor inside measuring range                              | 1 A                              |
| Temperature sensor                                                 | 0.1 °C [32.18 °F]                |
| Inclination sensor                                                 | 0.01°                            |
| Torsion sensor                                                     | 0.01°                            |
| <b>Accuracy</b>                                                    |                                  |
| Temperature sensor                                                 | ±1 °C [±33.8 °F]                 |

| Environmental parameters, WS-1-W weather station |                                  |                                                   |
|--------------------------------------------------|----------------------------------|---------------------------------------------------|
|                                                  | Measuring range                  | Accuracy/Resolution                               |
| Ambient temperature                              | -50 ... +60 °C [-58 ... +140 °F] | 0.5 °C [32.9 °F]                                  |
| Humidity                                         | 0 ... 100 % relative humidity    | ±3 % for 0 ... 90 %<br>±5 % for 0 ... 100 %       |
| Wind speed                                       | 0 ... 60 m/s                     | 0.1 m/s, ±3 % (< 35 m/s),<br>±5 % (35 ... 60 m/s) |
| Wind direction                                   | 0 ... 360°                       | 1°                                                |
| Barometric pressure                              | 600 ... 1,100 hPa                | 1 hPa                                             |
| Precipitation                                    |                                  |                                                   |
| Rain                                             | 0 ... 200 mm/h                   | 0.1 mm/h                                          |
| Hail                                             | 0.1 hit/cm <sup>2</sup>          | 0.1 hit/h                                         |
| Solar irradiation                                | 0 ... 1,400 W/m <sup>2</sup>     | 400 ... 1,100 nm (spectral range)                 |

| Operating conditions      |                                   |
|---------------------------|-----------------------------------|
| Place of use              | Outdoor (power line)              |
| Ambient temperature range | -50 ... +180 °C [-58 ... +356 °F] |
| Condensation              | Condensation permissible          |

## Approvals

| Logo                                                                               | Description                                  | Region         |
|------------------------------------------------------------------------------------|----------------------------------------------|----------------|
|  | EU declaration of conformity                 | European Union |
|                                                                                    | EMC Directive                                |                |
|                                                                                    | RoHS directive                               |                |
|                                                                                    | Short Range Devices (SRD)<br>DIN EN 300220-2 | European Union |

## Test report

| Description |                                                                                                                                                                                                                                                                                                                                                                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -           | Environmental: IP67, IEC 60068-2-68, IEC 60529, IEC 60068-2-11, IEC 60068-2-52, IEC 60068-2-5, IEC 60068-2-18, IEC 60068-2-30<br>Electrical: IEC 61000-4-3, IEC 61000-4-2, IEC 61000-4-6, IEC 61284, IEC 62475, IEC 60060-1<br>Physical and conductor protection: IEC 60068-2-1, IEC 60068-3-1, IEC 61284, IEC 61284, IEC 60068-2-64, IEC 60068-2-27, IEC 60068-2-6, IEC 61284 |

## Certificates

| Description  |                                                                                                           |
|--------------|-----------------------------------------------------------------------------------------------------------|
| Certificates | ■ 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, material proof, indication accuracy) |
| Calibration  | ■ Factory calibration certificate (inclination sensor)                                                    |

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### Ordering information

To order the described product, the order number is sufficient.

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