WIRELESS IOT VIBRATION MONITORING SOLUTION

Smart industrial IoT measurement solution for condition monitoring applications.

Sensor devices if device is out of range from gateway its data is routed via another device

Data is sent to cloud over wired or wireless connection

Gateway data can be stored and analyzed in the backend

Wireless connection to Gateway over 2.4GHz

We provide confidence for visionary engineers

althensensors.com
CONDITION MONITORING

Condition monitoring is the process of monitoring a particular condition in machinery such as for instance vibration and temperature to identify changes that could indicate a developing fault. It is a major part of predictive maintenance as implementing condition monitoring allows for maintenance to be scheduled and preventive actions taken to prevent damage, future failure and subsequent unplanned downtime of the machinery.

Condition monitoring with vibration sensors is one of the most innovative ways that businesses and manufacturing companies can save money. Condition monitoring techniques are used on a range of equipment, including rotating machinery, auxiliary systems and parts such as compressors, pumps, motors and presses.

REPAIRS AND REACTIVE MAINTENANCE

Manufacturing companies are majorly dependent on heavy machinery on-site, but also across large distances and sometimes at remote locations. These machines like: pumps, turbines, boilers and conveyors, need to be maintained. Manhours are invested for engineers to stay on-site all the time. Even then the machines will break down over time. Repairs and reactive maintenance must be carried out by the engineers.

INCREASE EFFICIENCY WITH PREDICTIVE MAINTENANCE

Management and maintenance of machines are crucial for manufacturing industries. Investments in new advanced machinery are big and depreciation costs are high.

Machine faults and operational stoppages cost companies incredible sums of money. The longer the downtime and the bigger the company, the greater the revenue loss and operating cost. To maintain and even improve efficiency predictive maintenance is essential.

INDICATIONS FOR FUTURE MACHINE FAILURE

Abnormal vibrations or high temperatures give early signs of machine failure due to component imbalance, misalignment, wear or improper use of equipment. These can be now effortlessly identified without manual measurements or expensive wired equipment to increase machine uptime and extend mean time between failures.
WE LOVE SOLVING CHALLENGES

Althen develops, produces and implements custom hardware solutions to solve problems. By implementing these devices and coupling them with our secure back-end and easy-to-use dashboard, we help our customer to get started. This helps us to solve our customers problems, whether it’s their goal to reduce costs, improve quality, increase safety or control their operations.

YOUR END-TO-END INDUSTRIAL IOT SOLUTION PARTNER

SMART SENSOR HARDWARE

RELIEABLE BACK-END DATA STORAGE

USER FRIENDLY DASHBOARD

BENEFITS OF CONDITION MONITORING WITH VIBRATION SENSORS

- Reduce machine faults
- Cut downtime machinery
- Reduce maintenance costs
- Increase energy efficiency
- Increase company yield
- Increase plant throughput

WIRELESS IOT CONDITION MONITORING SOLUTION FROM ALTHEN SENSORS & CONTROLS

Together with our technology partner Treon, we developed a smart industrial Internet of things (IoT) measurement solution for condition monitoring applications. The wireless IoT vibration and temperature sensor measurement solution consists of wireless battery powered industrial sensor nodes, and a gateway for communication to transmit data to the cloud.
VIBRATION AND TEMPERATURE DATA WIRELESSLY SENT TO THE CLOUD

The wireless IoT monitoring system consists of a network of sensor nodes, which can send their data via an IoT gateway to any computer network or cloud platform. We offer two different nodes: the industrial sensor nodes measure and monitor tri-axial vibrations and surface temperature of (rotating) equipment, such as pumps, motors, agitators and mixers. The ambient nodes monitor air quality, temperature, humidity, ambient light, noise level and air pressure.

The wireless battery-operated nodes can be easily and cost-efficiently mounted on existing equipment, but can also be part of large-scale mesh networks for collecting sensor data in smart buildings, cities and factories.

Together with our technology partner Treon we supply a smart industrial IoT measurement solution for condition monitoring applications.

BUILT FOR WIRELESS MESH NETWORK

The wireless IoT monitoring system consists of a network of sensor nodes, which can send their data via an IoT gateway to any computer network or cloud platform. We offer two different nodes: the industrial sensor nodes measure and monitor tri-axial vibrations and surface temperature of (rotating) equipment, such as pumps, motors, agitators and mixers. The ambient nodes monitor air quality, temperature, humidity, ambient light, noise level and air pressure.

The wireless battery-operated nodes can be easily and cost-efficiently mounted on existing equipment, but can also be part of large-scale mesh networks for collecting sensor data in smart buildings, cities and factories.

Together with our technology partner Treon we supply a smart industrial IoT measurement solution for condition monitoring applications.

BENEFITS

- **Cost-efficient**
  Low installation & maintenance cost, which make this the most cost-efficient solution in the market to monitor every machine in the factory.

- **Scalable**
  Tens to many thousands of wireless sensors can work together in an intelligent mesh network to enable condition monitoring at scale.

- **Widely compatible**
  Can be integrated with any cloud backend, which makes it extremely convenient to include in a wide range of IIoT solutions.

- **Fully configurable**
  Performance indicators such as RMS, PEAK and Kurtosis, along with FFT or high resolution acceleration waveform when needed for analysis with external tools.

ADDITIONAL INFORMATION

- althensensors.com/custom-solutions
- althensensors.com/industries
OVERVIEW OF PRODUCTS

INDUSTRIAL VIBRATION & TEMPERATURES SENSOR NODE
A wireless condition monitoring sensor that is cost-efficient and easy to deploy. It measures tri-axial vibration and surface temperature of rotating equipment, such as pumps, motors, and compressors. Industrial Sensor Node enables identifying abnormal vibrations or high temperatures, which are early signs of machine failure due to component imbalance, misalignment, wear, or improper use of equipment.

INDUSTRIAL VIBRATION & TEMPERATURES SENSOR NODE 6
Industrial Sensor Node 6 measures vibration up to 6kHz, identifying abnormal vibrations, which are early signs of machine failure due to component imbalance, misalignment, wear, or improper use of equipment. Industrial Node 6 provides the needed high resolution data to not only identify emerging issues but also do root-cause analysis.

AMBIENT SENSOR NODE
A compact sensor that measures air quality index, temperature, humidity, ambient light, and barometric pressure. Ambient Sensor Node includes an accelerometer for measuring vibration and movement as well as a HAL-sensor for magnet proximity detection to make it a complete platform to trial or deploy a wide range of IoT-use cases.

INDUSTRIAL IOT GATEWAY
A critical part of any IoT solution. Industrial IoT Gateway collects, processes, and transmits data from sensors to any cloud backend over a wide range of wired and wireless connectivity. It can be freely configured, extended, and run customer edge applications to enable any IoT solution.

INDUSTRIAL IOT GATEWAY PROTECTIVE ENCLOSURE
Industrial IoT Gateway water and dust-proof enclosure is designed to protect the Industrial IoT Gateway in outdoor or harsh indoor conditions. The enclosure includes a gateway AC/DC power supply and DC cable.
WIRELESS CONDITION MONITORING APPLICATIONS

The system consists of wireless battery powered industrial sensor nodes and a gateway for communication to transmit data to the cloud. On this page you can find some examples of applications where the sensor system could be of value and improve your operational maintenance.

COST-EFFICIENT WAY TO CAPTURE VIBRATION AND TEMPERATURE DATA ON FULL OPERATIONAL PUMPS.

EASY DEPLOYMENT TO EXISTING MACHINERY. FULLY WIRELESS, NO NEED FOR WIRING. PLUG AND PLAY.

INDUSTRIAL ATEX NODE DESIGNED FOR DEMANDING CONDITIONS SUCH AS EXPLOSION PROOF ENVIRONMENTS.
Wireless Industrial IoT Vibration Sensor Node 6
Wireless IoT Vibration and Temperature Measurement Solution

PREVENT DOWNTIME AND IMPROVE EFFICIENCY OF VENTILATION AND AIR INSTALLATIONS.

Wireless Industrial IoT Vibration Sensor Node 6
Wireless IoT Vibration and Temperature Measurement Solution

COST-EFFICIENT, SCALABLE, AND EASY IMPLEMENTABLE SENSORS FOR PAPER PRODUCTION MACHINES.

Wireless Ambient Sensor Node
Environmental quality from offices to data centers

WATER & DUST PROOF PROTECTIVE ENCLOSURE. PRACTICAL FOR INDUSTRIAL USE AND DEMANDING ENVIRONMENTS.

Industrial IoT Gateway Protective Disclosure
When surrounding are harsh
WHY WE DO, WHAT WE DO
We provide confidence for visionary engineers

coming together is a beginning, keeping together is progress, working together is success

Henry Ford
DASHBOARDING & ANALYTICS
Our user-friendly data analytic and machine learning solutions assist in keeping you on top of things and your business running smoothly.

DASHBOARD FEATURES

RICH DATA VISUALIZATION
- A great choice of widgets for different visualizations
- Clear (and fast) overviews for subjects and events
- Powerful filter and aggregation options

POWERFUL ANALYTICS
- Easy-to-use data explorer to uncover new patterns
- Drill-down on events to more granular levels
- Give everyone in the company a tool to explore and analyze the data

TO MEET YOUR MEASUREMENT NEEDS

ON DEMAND MEASUREMENT
Measurement executed immediately on command
Can trigger up to 8 different measurements

3 TIMED INTERVALS
Configurable timers to execute measurements
Can trigger up to 8 different measurements

8 MEASUREMENT SETTINGS
Pre-configured sets of measurement parameters
G-range
Axis
Sample amount
Select calculations
Measurement setting can be associated with time interval or on-demand measurement

15 CALCULATION SETTINGS
Pre-configured sets of calculation parameters
What is calculated
Filters
FFT parameters
Calculation setting can be associated with one or more measurements

1 AT HOUR INTERVAL
KEY TREND VALUES
Triaxial
v-RMS, PEAK, P2P
G-range
Axis
Sample amount
Select calculations
Measurement setting can be associated with time interval or on-demand measurement

6 AT HOUR INTERVAL
LOW RANGE FFT
Triaxial
10-1000Hz
Overlap 40%
Hanning window
From 4096 samples
From 3648 samples
From 16484 samples

FULL SPECTRUM FFT
Triaxial
10-6300Hz
Overlap 40%
Hanning window
From 4096 samples
From 3648 samples
From 16484 samples

WITH ON DEMAND
RAW DATA SAMPLES
Triaxial, 34134 samples
1.28s sampling time and/or
Vertical, 88268 samples
2.56s sampling time

DASHBOARDS
INDUSTRIAL VIBRATION & TEMPERATURE SENSOR NODE

Industrial Nodes operate in a wireless mesh network for easy, cost efficient deployment and continuous monitoring of tens or hundreds of machines.

A wireless condition monitoring sensor that is cost-efficient and easy to deploy. It measures tri-axial vibration and surface temperature of rotating equipment, such as pumps, motors, and compressors. Industrial Node enables identifying abnormal vibrations or high temperatures, which are early signs of machine failure due to component imbalance, misalignment, wear, or improper use of equipment.

PRODUCT FEATURES

- **EDGE CALCULATION**
  Choice to process the vibration data already in the Industrial Node, send less data but get the same value.

- **LONG BATTERY LIFE**
  Large battery, with an estimated lifetime of up to 6 years, depending on the configuration and operating environment.

- **CONFIGURABLE**
  Select your own measurement parameters, update intervals and what data to send to make it your own. One size does not fit all.

- **DURABLE**
  Marked with an IP67 rating, which allows the device to withstand harsh factory conditions.

- **PLUG & PLAY**
  Fast and easy to deploy on a large scale. Mount the sensors, and just press the on button. That’s it.

SPECIFICATIONS

**VIBRATION**
- Acceleration measurement on 3-axis Axial, Horizontal and Radial.
- Dynamic range +/- 4G (configurable to 2, 4, 8 or 16)
- Frequency range 10-1000Hz
- Sampling rate 6600Hz
- Resolution 16-bit
- FFT resolution 1Hz/bin

**TEMPERATURE**
- Measurement range -40°C to +150°C
- Resolution 0.1°C
- Accuracy +/- 0.3°C (mounting dependent)
- Repeatability +/- 0.1°C

**WIRELESS COMMUNICATION**
- 2.4GHz / Wirepas Mesh

**BATTERY**
- 3.6V lithium thionyl chloride
- Battery lifetime up to 8 years (Battery life is dependent on operating temperature and configuration)

**DIMENSIONS**
- 78.5 x 28 mm
- Mounting to M8 thread
- Weight 129g
- Cover material 316 ss
- Top cap material PE HD

**ENVIRONMENT**
- Operating -40°C to +85°C
- Storage 30°C maximum
- IP67

**CERTIFICATIONS**
- CE, FCC, ISED, BIS (India)
- ATEX II 2 G Ex ib IIC T4 Zone 1 & 2 -40°C ≤ Ta ≤ +60°C

**SOFTWARE**
- Fully configurable data delivery and integration to major clouds
- Customer cloud application
- Device management
INDUSTRIAL VIBRATION & TEMPERATURE
SENSOR NODE 6
A higher-resolution vibration data capturing device. Made for condition monitoring on a massive scale.

Industrial Node measures vibration up to 6kHz, identifying abnormal vibrations, which are early signs of machine failure due to component imbalance, misalignment, wear, or improper use of equipment. Industrial Node 6 provides the needed high resolution data to not only identify emerging issues but also do root-cause analysis.

PRODUCT FEATURES

- **TRIAXIAL MEASUREMENT OVER ULTRA-WIDE BANDWIDTH**
  Frequency range up to 6.3kHz (+/-3dB) with 26667Hz sampling rate.

- **CONFIGURABLE DATA ACQUISITION AND ADVANCED DATA PROCESSING**
  Configurable measurement sample amount, filtering and decimation

- **PRE-CALCULATED KEY PARAMETERS FOR FAST ASSESSMENT**
  Based both on velocity and acceleration. Fully configurable FFT calculation on the edge.

- **HIGH RESOLUTION MEASUREMENT DATA**
  For advanced backend diagnostics. High frequency, high resolution waveform up to over 100000 measurement samples

SPECIFICATIONS

<table>
<thead>
<tr>
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<td>• Frequency range 10-6300Hz (-3dB)</td>
<td>• Battery lifetime up to 6 years (Battery life is dependent on operating temperature and configuration)</td>
<td>• IP67</td>
<td>•</td>
<td>• Device management</td>
</tr>
<tr>
<td>• Sampling rate 26.7 kHz</td>
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<tr>
<td>• Resolution 16-bit</td>
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<td>• FFT resolution 1Hz/bin</td>
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- **WIRELESS COMMUNICATION**
  2.4GHz / Wirepas Mesh

- **BATTERY**
  3.6V lithium thionyl chloride

- **DIMENSIONS**
  78.5 x 28 mm

- **SOFTWARE**
  Fully configurable data delivery and integration to major clouds

- **CERTIFICATIONS**
  CE, FCC, ISED, BIS (India)

- **ENVIRONMENT**
  Operating -40°C to +85°C

- **PRODUCT FEATURES**
  TRIAXIAL MEASUREMENT OVER ULTRA-WIDE BANDWIDTH
  Frequency range up to 6.3kHz (+/-3dB) with 26667Hz sampling rate.

- **CERTIFICATIONS**
  CE, FCC, ISED, BIS (India)

- **SOFTWARE**
  Fully configurable data delivery and integration to major clouds

- **ENVIRONMENT**
  Operating -40°C to +85°C

- **SOFTWARE**
  Fully configurable data delivery and integration to major clouds
Predictive maintenance for explosive atmospheres.

Industrial Node 6 Ex measures vibration up to 6kHz, delivering data to identify abnormal vibrations. These vibrations indicate possible future machine failure because of various possible reasons like wear, component imbalance, misalignment, or potential improper use of the machine. ATEX certification allows measuring vibration in potentially explosive atmospheres. Industrial Node 6 Ex provides the needed high-resolution wide bandwidth data to identify emerging issues.

### Product Features

- **ATEX Certified**
  Certified for the use in potentially hazardous areas. ATEX certificate for explosive atmospheres.

- **Triaxial Measurement over Ultra-Wide Bandwidth**
  Frequency range up to 6.3kHz (+/-3dB) with 26667Hz sampling rate

- **High Resolution Measurement Data**
  High frequency, high resolution waveform up to over 100000 measurement samples

- **Configurable Data Acquisition and Advanced Data Processing**
  Configurable measurement, sample amount, filtering and decimation

### Specifications

#### Vibration

- Acceleration measurement on 3-axis Axial, Horizontal and Radial.
- Dynamic range +/- 4G (configurable to 2, 4, 8 or 16)
- Frequency range 10-1000Hz
- Sampling rate 6600Hz
- Resolution 16-bit
- FFT resolution 1Hz/bin

#### Temperature

- Measurement range -40°C to +150°C
- Resolution 0.1°C
- Accuracy +/− 0.3°C (mounting dependent)
- Repeatability +/− 0.1°C

#### Wireless Communication

- 2.4GHz / Wirepas Mesh

#### Battery

- 3.6V lithium thionyl chloride
- Battery lifetime up to 8 years (Battery life is dependent on operating temperature and configuration)

#### Environment

- Operating -40°C to +85°C
- Storage 30°C maximum
- IP67

#### Certifications

- CE, FCC, ISED, BIS (India)
- ATEX II 2 G Ex ib IIC T4 Zone 1 & 2
- -40°C ≤ Ta ≤ +60°C

#### Dimensions

- 78.5 x 28 mm
- Mounting to M8 thread
- Weight 129g
- Cover material 316 ss
- Top cap material PE HD

#### Software

- Fully configurable data delivery and integration to major clouds
- Customer cloud application
- Device management
**AMBIENT SENSOR NODE**

The Ambient Sensor Node is packed with sensors to measure data from environmental quality to machine vibrations. It is powered with 1000mAh battery or optionally via USB-cable.

**PRODUCT FEATURES**

**HARDWARE**
- 2.4GHz / Wirepas Mesh
- Dual-MCU
- NRF52 (connectivity)
- STM32 (application)
- Battery CR2477, 1000 mAh
- Operating temp -20 to +70°C
- Size: ø41.5mm x 14.9mm

**SUPER-SET OF SENSORS**
- 3-axis accelerometer
- Air Quality (VOC)
- Temperature and Humidity
- Barometric pressure and altitude
- Ambient noise and light
- HAL-sensor

**CUSTOMIZATION OPTIONS**
- BT LE or BT mesh
- IP67 protection
- Branding and color

**FIXING METHODS**
- Integrated magnets
- Attachment plates
- Adhesive

**SPECIFICATIONS OF SENSORS IN NODE**

**ACCELEROMETER**
- High-performance 3-axis linear accelerometer
- ±±2g/±4g/±8g/±16g dynamically selectable full scales
- Measuring accelerations with data rates of 1 Hz to 5 kHz
- 6D/4D orientation detection, Free-fall detection, Motion detection
- “Sleep-to-wake” and “Return-to-sleep”

**HUMIDITY**
- 0 to 100% RH operating range, +/− 4% typical accuracy error

**TEMPERATURE**
- High-precision temperature sensor with operational range -55°C up to +150°C (battery range limiting)
- Sensor accuracy, max +/− 0.2°C

**BAROMETER**
- Pressure range 300 - 1100 hPa, -40 - 85°C (battery range limiting)
- Typical error +/− 1hPa

**AMBIENT LIGHT**
- Approximate the human-eye response
- High accuracy requires a direct line of sight to the sensor (on the right side of the node button)

**HAL**
- Magnet proximity binary detection.

**AIR QUALITY (VOC)**
- Detects a broad range of gases to measure air quality, including Volatile Organic Compounds

**AMBIENT NOISE (BETA)**
- Approximate to human-ear noise range, output in dB
- Acoustic sensor, a low noise input buffer and an output amplifier
- Omnidirectional with RF immunity
- -40 to +100°C operating range (battery range limiting)
INDUSTRIAL IOT GATEWAY

Industrial IoT Gateway connects a mesh from few to hundreds of sensor nodes to your backends. It collects, processes and transmits data to the cloud.

FOR MESH NETWORKS
When there is a need for high density of connected devices, a mesh network is the perfect solution for connectivity. Industrial IoT Gateway comes with preloaded support for Wirepas Mesh and its hardware is ready to support Bluetooth Mesh.

EDGE COMPUTING
Industrial IoT Gateway provides a powerful ARM-based Linux platform for running edge compute applications. Developers can easily deploy and execute Python, Node.js, native GCC and other compiled applications. Industrial IoT Gateway provides 16GB of storage and it can be further extended via USB.

FULL CONNECTIVITY
Industrial IoT Gateway provides a connectivity option for any deployment from wired Ethernet to wireless with Bluetooth, Wi-Fi and cellular connection. Easy integration with Microsoft Azure and Amazon Web Services is included and with our integration service the gateway can be connected to any cloud backend.

HARDWARE SPECIFICATIONS

HARDWARE
- ARM Cortex-A8 1GHz Processor
- 1 GB DDR3L RAM
- 16 GB eMMC Storage

POWER
- Power supply 5V DC

CERTIFICATIONS
- CE, FCC, ISED, India, Brazil

CONNECTIVITY
- Wirepas Mesh 2.4GHz
- 2G, LTE CAT M1 / NB-IOT
- Wi-Fi 2.4GHz
- Ethernet RJ45
- USB A Host Port

ENVIRONMENT
- IP20
- Operating temperature 0°C to +50°C

DIMENSIONS
- Size: ø95mm x 18.3mm

FIXING METHODS
- Wall/ceiling mount available

SOFTWARE

DEVELOPMENT ENVIRONMENT
- ARM-based Linux OS (Yocto)
- Pre-loaded Python and Node.js
- SDK, Native GCC
- Optional tools on request

NETWORKING
- Firewall (iptables)
- Linux TCP/IP stack
- MQTT (paho)
- Bluetooth (bluez)
- Wirepas Connectivity Library

CLOUD SUPPORT
- Microsoft Azure integrated
- Integration service to connect the gateway with any cloud
INDUSTRIAL IOT GATEWAY IN PROTECTIVE ENCLOSURE

Industrial IoT Gateway Water and Dust proof enclosure has been designed to protect the Industrial IoT Gateway (model 1111) in outdoor or industrial indoor conditions. Enclosure includes gateway AC/DC power supply and DC cable. Class II design (no FG pin).

SPECIFICATIONS

AMBIENT CONDITIONS
- Ambient temperature -20-50°C
- Storage temperature -40-85°C
- Relative humidity 20-90%, noncondensing
- Pressure equalizer

MATERIALS
- Material polycarbonate
- Base color RAL 7035 - light grey
- Cover color Smoked Grey
- TPE gasket

POWER SUPPLY
- Voltage Range 85-264VAC
- Frequency Range 47-440Hz
- Power Consumption 30VA Max
- Electrical connection variants:
  - EURO TYPE F UNGROUNDED 2 WIRE
  - NEMA 1-15 Class II Power Cords
- SAFETY and EMC:
  - Safety UL60950-1, TUV EN60950-1
  - EMC immunity EN61000 1,2,3,5,6,8,11
  - Surge L-N 1kV

DIMENSIONS
- Size: 180 x 130 x 81 mm
- Excluding cable sealing clamps

MOUNTING
- Wall mounting with wall mounting lugs

OTHER INDUSTRIAL IOT PRODUCTS: ASSET NODE

Asset Node enables identifying, monitoring and locating assets in harsh conditions. Asset Node supports a battery assisted global RFID, captures shocks up to 200G, monitors temperature accurately and reports any abnormal behavior wirelessly over a Wirepas Mesh network.

SPECIFICATIONS

CPU
- Nordic Semiconductor nRF52840

WIRELESS COMMUNICATION
- 2.4GHz / Wirepas Mesh
- BT Beacon: Eddystone
- NFC: ISO/IEC 14443

RFID
- ISO/IEC 18000-63 (Gen2)
- Passive/battery-assisted
- Global band 860-960
- Optimized for on-metal surface

SHOCK DETECTION
- Measurement range [g] 200
- Measurement accuracy [%] +/-0.5
- Frequency range 200Hz - 3200Hz (max. 6400Hz)

TEMPERATURE SENSOR
- Range [°C] -40 to +125
- Accuracy typ. +/- 0.3 max. +/- 0.4
- Resolution 0.1

BATTERY
- 3.6V lithium thionyl chloride
- Lifetime estimate: up to 6 years

ENVIRONMENT
- IP68
- Polycarbonate UL94-V0
- Operating temperature -30°C to +85°C

DIMENSIONS
- 185.6 x 35.6 x 24mm

ATTACHMENT
- 2 x rivet / screw (max. 6mm)
- Distance between openings 150mm