The Formwork Experts.

Concremote

Original Operating Instructions
Please retain for future reference
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Introduction

Elementary safety warnings

User target groups

▪ This booklet is aimed at all persons who will be working with the Doka product or system that it describes. It contains information on the standard design for setting up this system, and on correct, compliant utilisation of the system.

▪ All persons working with the product described herein must be familiar with the contents of this booklet and with all the safety instructions it contains.

▪ Persons who are incapable of reading and understanding this booklet, or who can do so only with difficulty, must be instructed and trained by the customer.

▪ The customer is to ensure that the information materials provided by Doka (e.g. User Information booklets, Instructions for Assembly and Use, Operating Instruction manuals, plans etc.) are up to date and available to all users, and that they have been made aware of them and have easy access to them at the usage location.

▪ In the relevant technical documentation and formwork utilisation plans, Doka shows the workplace safety precautions that are necessary in order to use the Doka products safely in the usage situations shown.

In all cases, users are obliged to ensure compliance with national laws, standards and regulations throughout the entire project and to take appropriate additional or alternative workplace safety precautions where necessary.

Hazard assessment

▪ The customer is responsible for drawing up, documenting, implementing and continually updating a hazard assessment at every job-site.

This booklet serves as the basis for the site-specific hazard assessment, and for the instructions given to users on how to prepare and utilise the system. It does not substitute for these, however.

Remarks on this booklet

▪ This document can be used as general Instructions for Assembly and Use (Method Statement) or be incorporated into site-specific Instructions for Assembly and Use (Method Statement).

▪ The graphics, animations and videos in this document or app sometimes depict partially assembled assemblies and may require additional safety equipment and/or measures to comply with safety regulations.

The customer must ensure all applicable regulations are complied with, even if they are not shown or implied in the graphics, animations and videos provided.

▪ Individual sections contain further safety instructions and/or special warnings as applicable.

Planning

▪ Provide safe workplaces for those using the formwork (e.g. for when it is being erected/dismantled, modified or repositioned etc). It must be possible to get to and from these workplaces via safe access routes!

▪ If you are considering any deviation from the details and instructions given in this booklet, or any application which goes beyond those described in the booklet, then revised static calculations must be produced for checking, as well as supplementary assembly instructions.

Regulations; industrial safety

▪ All laws, Standards, industrial safety regulations and other safety rules applying to the utilisation of our products in the country and/or region in which you are operating must be observed at all times.

▪ If a person or object falls against, or into, the side-guard component and/or any of its accessories, the component affected may only continue in use after it has been inspected and passed by an expert.
Rules applying during all phases of the assignment

▪ The customer must ensure that this product is erected and dismantled, reset and generally used for its intended purpose in accordance with the applicable laws, standards and rules, under the direction and supervision of suitably skilled persons.

These persons’ mental and physical capacity must not in any way be impaired by alcohol, medicines or drugs.

▪ Doka products are technical working appliances which are intended for industrial / commercial use only, always in accordance with the respective Doka User Information booklets or other technical documentation authored by Doka.

▪ The stability and load-bearing capacity of all components and units must be ensured during all phases of the construction work!

▪ Do not step on or apply strain to cantilevers, closures, etc. until suitable measures to ensure their stability have been correctly implemented (e.g. by tie-backs).

▪ Strict attention to and compliance with the functional instructions, safety instructions and load specifications are required. Non-compliance can cause accidents and severe injury (risk of fatality) and considerable damage to property.

▪ Sources of fire in the vicinity of the formwork are prohibited. Heaters are permissible only when used correctly and situated a correspondingly safe distance from the formwork.

▪ Customer must give due consideration to any and all effects of the weather on the equipment and regards both its use and storage (e.g. slippery surfaces, risk of slipping, effects of the wind, etc.) and implement appropriate precautionary measures to secure the equipment and surrounding areas and to protect workers.

▪ All connections must be checked at regular intervals to ensure that they are secure and in full working order.

   In particular threaded connections and wedged connections have to be checked and retightened as necessary in accordance with activity on the jobsite and especially after out-of-the-ordinary occurrences (e.g. after a storm).

▪ It is strictly forbidden to weld Doka products – in particular anchoring/tying components, suspension components, connector components and castings etc. – or otherwise subject them to heating.

   Welding causes serious change in the microstructure of the materials from which these components are made. This leads to a dramatic drop in the failure load, representing a very great risk to safety.

   It is permissible to cut individual tie rods to length with metal cutting discs (introduction of heat at the end of the rod only), but it is important to ensure that flying sparks do not heat and thus damage other tie rods.

   The only articles which are allowed to be welded are those for which the Doka literature expressly points out that welding is permitted.

Assembly

▪ The equipment/system must be inspected by the customer before use, to ensure that it is in an acceptable condition. Steps must be taken to exclude components that are damaged, deformed, or weakened due to wear, corrosion or rot (e.g. fungal decay).

▪ Using our safety and formwork systems together with those of other manufacturers can create risks that may lead to injury and damage to property. This requires separate verification.

▪ The equipment/system must be assembled and erected in accordance with the applicable laws, standards and rules by trained customer personnel whilst maintaining any applicable safety inspections that may be required.

▪ It is not permitted to modify Doka products; such modifications constitute a safety risk.

Closing the formwork

▪ Doka products and systems must be set up so that all loads acting upon them are safely transferred!

Pouring

▪ Do not exceed the permitted fresh-concrete pressures. Over-high pouring rates overload the formwork, cause greater deflection and risk breakage.

Stripping the formwork

▪ Do not strip out the formwork until the concrete has reached sufficient strength and the person in charge has given the order for the formwork to be stripped out!

▪ When stripping out the formwork, never use the crane to break concrete cohesion. Use suitable tools such as timber wedges, special pry-bars or system features such as Framax stripping corners.

▪ When stripping out the formwork, do not endanger the stability of any part of the structure, or of any scaffolding, platforms or formwork that is still in place!
Transporting, stacking and storing

▪ Observe all country-specific regulations applying to the handling of formwork and scaffolding. For system formwork the Doka slinging means stated in this booklet must be used – this is a mandatory requirement.

If the type of sling is not specified in this document, the customer must use slinging means that are suitable for the application envisaged and that comply with the regulations.

▪ When lifting, always make sure that the unit to be lifted and its individual parts can absorb the forces that occur.

▪ Remove loose parts or secure them so that they cannot slip out of position and drop.

▪ All components must be stored safely, following all the special Doka instructions given in the relevant sections of this document!

Maintenance

▪ Only original Doka components may be used as spare parts. Repairs may only be carried out by the manufacturer or authorised facilities.

Miscellaneous

The weights as stated are averages for new material; actual weights can differ, depending on material tolerances. Dirt accretions, moisture saturation, etc. can also affect weight.

We reserve the right to make alterations in the interests of technical progress.

Symbols used

The following symbols are used in this document:

DANGER
This is a notifier drawing attention to an extremely dangerous situation in which non-compliance with this notifier will lead to death or severe, irreversible injury.

WARNING
This is a notifier drawing attention to a dangerous situation in which non-compliance with this notifier can lead to death or severe, irreversible injury.

CAUTION
This is a notifier drawing attention to a dangerous situation in which non-compliance with this notifier can lead to slight, reversible injury.

NOTICE
This is a notifier drawing attention to a situation in which non-compliance with this notifier can lead to malfunctions or damage to property.

Instruction
Indicates that actions have to be performed by the user.

Sight-check
Indicates that you need to do a sight-check to make sure that necessary actions have been carried out.

Tip
Points out useful practical tips.

Reference
Cross-references other documents.

Manufacturer

▪ Concrefy B.V.

▪ Subject to change without notice in the course of technological development.

Support

Landline:
International, Netherlands, Belgium:
+31 77 850 7220

Germany, Austria:
+49 281 1649 0890

E-mail:
support@concremote.com
Services

Support in every stage of the project

- Project success assured by products and services from a single source.
- Competent support from planning through to assembly directly on site.

Project assistance from start to finish

Every single project is unique and calls for individualised solutions. When it comes to the forming operations, the Doka team can help you with its consulting, planning and ancillary services in the field, enabling you to carry out your project effectively, safely and reliably. Doka assists you with individual consulting services and customised training courses.

Efficient planning for a safe project sequence

Efficient formwork solutions can only be developed economically if there is an understanding of project requirements and construction processes. This understanding is the basis of Doka engineering services.

Optimise construction workflows with Doka

Doka offers special tools that help you in designing transparent processes. This is the way to speed up pouring processes, optimise inventories and create more efficient formwork planning processes.

Custom formwork and on-site assembly

To complement its system formwork range, Doka offers customised formwork units. And specially trained personnel assemble load-bearing towers and formwork on site.

Just-in-time availability

Formwork availability is a crucial factor in realising your project on time and on budget. The worldwide logistics network puts the necessary formwork quantities on site at the agreed time.

Rental and reconditioning service

The formwork material needed for any particular project can be rented from Doka’s high-performing rental park. Doka Reconditioning cleans and overhauls both client-owned equipment and Doka rental equipment.

High performance, in all stages of the project

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upbeat construction
digital services for higher productivity

From planning through to completion - with upbeat construction we’ll be moving construction forward and upping the beat for more productive building with all our digital services. Our digital portfolio covers the entire construction process and is being extended all the time. To find out more about our specially developed solutions go to doka.com/upbeatconstruction.
System description

Intended use

Concremote measures concrete & ambient temperatures on site using Concremote sensors. These upload readings by wireless link to a data centre which computes in real-time the concrete strength development against a previously calculated calibration curve.

Concrete monitoring: how it works, how it is used

Measuring concrete strength in real time.
Concremote is an 'on-site' service for performing non-destructive real-time measurement of concrete strength in structural members (floor-slabs, walls, beams, etc.).

This service comprises two parts:
▪ measuring-sensors
▪ data management and processing

The sensors placed on the structural member continuously measure the heat development of the concrete, which is mainly influenced by the hydration heat of the cement and by ambient temperatures. The more intense the heat development, the faster the strength development of the concrete.

The measured data (temperature measurements) from the structural member are transmitted to the computing centre via the mobile communications network as data packets. At the computing centre, they are automatically evaluated by the maturity monitoring method, using calibration measurement.

A separate calibration measurement is needed for each different grade of concrete to be measured at the site. This calibration measurement must be performed either by the clients themselves, by the concrete supplier or by an appointed test laboratory – ideally, using the Concremote calibration box. In this process several test samples (cubes or cylinders) are stored under defined semi-adiabatic conditions. The samples are tested at different times, depending on the target value (for stripping, curing, etc.). Each of these tests yields a compressive strength value, and the temperature value associated with it. From this calibration measurement, the relationship can be computed between the strength and the maturity of the grade of concrete concerned.

The Concremote Web portal continuously provides the data and strengths to its users. This enables the user to follow temperature and strength development in the structural member in real-time.

As soon as the target value is reached, the next steps (stripping, pre-stressing, etc.) can be taken.

Follow the directions in the 'Concremote' Operating Instructions!

Precise measurement facilitates accurate control

Efficient construction processes
The strength values computed by Concremote according to the mainstream maturity methods (de Vree, Arrhenius, Nurse-Saul), permit targeted control of forming and concreting operations in real time.

Concremote provides very accurate results on the basis of reference values obtained from the calibration measurement.

It records profiles of both the concrete temperature and the ambient temperature around the sensors.

Multi-functional

2 types of sensor
The Concremote slab sensor and the Concremote cable sensor can be used in a targeted manner in all areas of cast-in-place building construction.

▪ CIP concrete slabs
▪ Wall and column formwork
▪ Crane-climbed and automatic climbing projects
▪ Bridge and tunnel building sites
▪ Mass concrete structures

Easy to use

Wireless data transmission and easy access from anywhere
The user-friendly Concremote Web portal can be used effortlessly and can be accessed from any internet-enabled device at any time.
Certainty for the construction project

Helps you take decisions and records your data
▪ Compliant decision-making based on the measured data.
▪ Strength development can be estimated early on from graphs.
▪ Printing and storage of data for long-term verification.

Exact results enabled by calibration

The Concremote calibration box is used to calibrate the different grades of concrete used. These calibration measurements provide reference data for computing the compressive strength development in relation to the maturity.
Before the sensors are used, Concremote generates a calibration curve for each grade of concrete, by means of the Concremote calibration boxes.

Online data access

Via the user-optimised, web-based Concremote Web portal, users can access the data at any time. Furthermore, they can grant read and write permissions.
Users can store data and unlock them for use by authorised persons.
Accurate documentation ensures both certainty for the building process and transparency.

The temperature, maturity and strength data will help you take many decisions more accurately:
▪ Stripping time
▪ Crack width limitation (stresses)
▪ Loads
▪ Curing measures
▪ Pre-stressing
▪ Cycle times
▪ Temporary reshoring
▪ Construction conditions
▪ Concrete orders
▪ Team coordination etc.

Process scheme

Follow the directions in the ‘Concremote Web portal’ User Manual.
Use of Concremote

The use of Concremote can be split into three stages:

1. Preparation
2. Calibration
3. Implementation

![NOTICE](image)
- Concremote in no way replaces the prescribed concrete tests.
- If you have any questions, please ask your Doka contact person!

Preparation

- Plan what the sensors will be used for (see the section 'Areas of use').
- Specify the target value in consultation with the structural engineer (for more detailed information see the section 'Reshoring props, concrete technology and striking').
- Decide on the calibration measurements to be made for the concrete mixtures used, and choose a test laboratory (see the 'Concremote calibration box' User Information booklet).
- Perform a function test (see the 'Concremote Web portal' User Manual).

![NOTICE](image)
Check the measuring devices (sensors, calibration boxes) regularly, at least once a year, to ensure that they are in full working order. Compare the values measured by Concremote with those of a calibrated temperature sensor.
If you have any questions, please ask your Doka contact person!

Calibration

Each different concrete mixture needs to be calibrated with the Concremote calibration box so that its strength development can be calculated, based on the temperature data measured by the sensors.
When cubes are used for calibration, 2 Concremote calibration boxes (with 3 concrete cubes in each calibration box) are needed. When cylinders are used for calibration, 1 Concremote calibration box (with 6 cylinder forms) is needed.
Prior to using the sensors for the first time, a calibration measurement must be made for each concrete mixture to be measured with Concremote.

Calibration at a glance:
- The calibration boxes are filled with concrete either on the site or in the concrete mixing plant, depending on the project.
- The filled calibration boxes must be transported to the test laboratory either within 2 hours, or between 18 and 24 hours, to ensure that the hardening process is not affected.
- The six samples are tested at prescribed intervals.

After completion of all the compressive strength tests, the calibration curve for the concrete that has been tested is generated automatically. From this point on, the data is available in the Concremote Web portal.
For more detailed information on use of the calibration box, please refer to the User Information booklet supplied with the calibration box.
Implementation

Performing a measurement involves two steps:
▪ Positioning the sensor in the structural member
▪ Adding the data in the Concremote software

NOTICE
In some special cases, calibration and installation of the sensors can be done at the same time. Please ask your Doka contact person if you have any questions regarding this!

Positioning the sensor in the structural member

➤ Position the sensor in the structural member and make sure it does not disrupt any further building processes or subsequent work steps (e.g. travelling of tables, mounting of plumbing accessories, the projecting reinforcement etc.).

➤ Record a name for the structural member in question (e.g. Floor-slab above GF house 1), the installation time and the sensor's serial number. This data will be entered in the Concremote Web portal later.

Adding the measurement in the Concremote Web portal

➤ A new structural member or new measurement is added directly on the graph page of the Concremote Web portal.
➤ Sensors are assigned to a structural member by their serial number and the recorded installation time.
Data analysis with the Concremote Web portal

The measured data is automatically processed. Users can access various graphs (temperature, maturity and compressive strength development over time, temperature differences), or alternatively view this data in list form. The measurement results can be printed and exported.

General

Data analysis takes place on the Concremote Web portal, which is also the user interface for data entry and output. The sensors are activated in the Concremote Web portal on their delivery. The login data is sent to the users by e-mail. The Concremote Web portal does not require installation on your computer. The Concremote Web portal is supported by most internet-enabled devices and can be accessed from your browser at concremote.doka.com.

Use

➤ Log in at concremote.doka.com by entering the login data you have received by e-mail.
➤ Add the project (e.g. House 1).
➤ Add the location (e.g. Level 1).
➤ Add the structural member (e.g. Floor-slab).
➤ Add the measurements (e.g. Floor-slab section 1).
➤ Assign the sensors (sensor / date / installation time).
➤ Read the data.

NOTICE

▪ If a battery fails, data will be lost.
▪ In the event of a transmission error, the measured data is buffered in the sensor for a minimum of 24 hours.

Remedies

Concremote shows the strength development of a specific, previously calibrated concrete mixture in the area surrounding the sensors.

1. Optimising the target value

The compressive strength target value can be optimised in consultation with the structural engineer / designer. For assistance, please refer to the section ‘Reshoring props, concrete technology and stripping out’.
2. Improving strength developments

Optimising the concrete mixture
- Increase the fresh concrete temperature in mixing (heating of aggregates and/or of mixing water)
- Modification of the binder and/or cement
- Modification of chemical and mineral admixtures

Preventing heat loss of the structural member
- By covering the structural member with sheeting or insulation
- By providing enclosures and/or by heating the member

NOTICE
All of these measures must comply with the relevant standards and rules, and may be taken only after consultation with the concrete supplier and the structural engineer / designer.

The Concremote Web portal is described in detail in the 'Concremote Web portal' user guide or at [www.doka.com/concremote](http://www.doka.com/concremote)!
Areas of use

Concremote is non-formwork dependent and can be used in any kind of structural concrete element. For each structural element and cycle, a minimum of 2 sensors are required. The information given herein must be observed at all times depending on the specific area of use. The installation points are determined separately for each project. The examples given in this section are to be considered as possible applications of Concremote. The advice of the structural engineer should be sought for determining those points that are critical for static requirements. The sensors must be positioned at points relevant for measuring temperature and strength development, for example at locations of maximum stress or other most critical points. If necessary, protect the sensors from factors such as sunlight, radiant heaters, etc.

**WARNING**

➤ The Concremote system must be handled and used correctly in order for it to function properly. Non-compliance with the information provided herein may lead to accidents.

Floor-slabs

In floor-slabs, the use of slab sensors is recommended. For thick slabs (> 40 cm) we recommend using cable sensors and lost measuring cables.

Number of sensors in a floor-slab cycle:
- up to 500 m²: at least 2 sensors
- more than 500 m²: more than 2 sensors, as required

Mass concrete structures

Cable sensors are recommended for registering heat development in solid concrete structural members (mass concrete).

The measuring points of the cables can be chosen freely (cables are fixed to the reinforcement using cable ties), but stipulations laid down in applicable standards, for example, apply and must be met in each individual case.

Fix the measuring points (black marks on the cable) at an adequate distance from the reinforcement in order to prevent the temperature of the reinforcement from affecting the concrete measurement.

For performing measurements at any desired position in the concrete, an auxiliary, single-use construction may have to be fitted by the user (e.g. reinforced steel).
Climbing formwork

In the area of suspension points

In order for a climbing formwork suspension point to provide sufficient load-bearing capacity, the concrete must have sufficient strength.

With Concremote, the strength development of the concrete can be displayed easily and in a verifiable manner.

For measuring the strength development at a suspension point, use the cable sensor in conjunction with the wall sensing unit.

A cable sensor with cable can also be used as an alternative.

For measuring core temperatures, the cable sensor in combination with a measuring cable (up to 3 measuring points) is best suited.

Example: Climbing cycle

A Concremote cable sensor installed in the wall formwork
B Concremote wall sensing unit

At least 2 measuring positions are required for each climbing cycle.

For protection screens

Slab sensors can be used to determine the concrete strength in the area of suspension points.
**Bridge formwork**

**Cross sections through bridges**

Example: single-celled bridge cross section

Example: three-celled bridge cross section

| A | Concremote slab sensor |
| B | Concremote wall sensing unit |
| C | Measuring point, Concremote cable |

For cycles of up to 10 linear metres in length, measure the critical points in at least two cross-sectional planes. Further sensors are recommended to be used every additional 5 linear metres.

**Bridge edge beams**

Slab sensors can be used in the manufacture of edge beams. For up to 15 linear metres, 2 sensors are necessary.
Further sensors are recommended to be used every additional 10 linear metres.

**Free cantilever construction**

Concremote helps you determine the earliest possible time of pre-stressing the concrete or of stripping the cantilever forming traveller.
Tunnel formwork

In tunnel forming, Concremote is used for determining early concrete strengths as well as to ensure sufficient strength of the concrete in the bottom slab for the ground anchors.

Other areas of use

- Pre-stressing applications
- Monolithic concrete tanks
- Temperature measurement
- Curing
- Road construction
  - Saw cutting
- Hall floors

**NOTICE**

The smallest compressive concrete strength that can be measured using Concremote is 5 N/mm².

For bored tunnels, check in advance that network connectivity will be maintained.

A Concremote slab sensor
B Concremote wall sensing unit
C Measuring point, Concremote cable
Overview of Concremote sensor generations

Concremote sensors can be used anywhere and enable recording and monitoring of temperature and strength development at or in the concrete structural member.

2 generations of Concremote sensors:

<table>
<thead>
<tr>
<th>Concremote (generation 1.0 launched in 2013)</th>
<th>Concremote 2.0 (2019 onward)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 2G data transmission</td>
<td>• Bluetooth BLE</td>
</tr>
<tr>
<td>• High-power, long-life battery</td>
<td>• 2G, 3G and 4G data transmission *)</td>
</tr>
<tr>
<td>• Robust, designed for use on construction sites</td>
<td>• Rechargeable battery</td>
</tr>
<tr>
<td></td>
<td>• LED status indicator on the sensor</td>
</tr>
<tr>
<td></td>
<td>• IP67 certification *) different versions (modems) available. For more information, please consult your Doka contact person!</td>
</tr>
</tbody>
</table>

The choice of ideal sensor/monitoring solution depends on:

- Measuring point positions (concrete surface or in the concrete structural member)
- Construction procedure (e.g. wall sensing unit is repositioned together with the formwork)
- On-site conditions (e.g. weather, heating appliances, enclosure)

Note:
Your Doka contact person will be happy to provide advice and assistance for selecting the ideal sensor solution.

Positioning the sensors

Positioning relative to the area:
The positioning of the sensor on the concrete surface (slab) depends primarily on statical loading and on the construction process (concreting sequence). As a rule, at least one sensor should be placed in the area of the highest statical load, and another sensor at the end of the concreting section.

Positioning relative to the cross-section:
In approximately 80 % of all cases with slabs between 20 and 40 cm in thickness, positioning the sensor on the top surface or underside of the slab has no significant effect on the result of measurement for determining strength development. This is because generally, the difference in the daily mean ambient temperature at the top of the slab and the air temperature at the underside (structure shell, interior rooms) is <8°C.

If the difference in mean air temperature at the top surface and underside of the slab is more than 8 °C, it is advisable to measure with a sensor positioned where worst case conditions prevail:

- **Winter**: Perform measurement at the top surface of the slab (inside temperature in the shell structure is greater than outside temperature by a difference >8°C)
- **Summer**: Perform measurement at the underside of the slab (average outside temperature is greater than the cooler inside temperature in the shell structure by a difference >8°C)

Use the table below for assistance in positioning the sensors.

<table>
<thead>
<tr>
<th>Recommended positioning of sensors on slab structural members (cement types CEM I, CEM II, CEM III)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of year (daily mean ambient temperatures at the top surface of the slab)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Summer (~25°C)</td>
</tr>
<tr>
<td>Spring/autumn (~15°C)</td>
</tr>
<tr>
<td>Winter (~0°C)</td>
</tr>
</tbody>
</table>

Caution:
Decisions based on results obtained from unsuitable measuring points can lead to injury and damage!

➤ Consult your superstructure planner regarding positioning of the measuring points.
Concremote 2.0 (2019 onward)

New features enhance the tried-and-tested first-generation Concremote sensors in the new 'Concremote 2.0' sensor generation.

Features:
▪ Bluetooth BLE
▪ 2G, 3G and 4G data transmission
  Different versions (modems) available. (For more information, please consult your Doka contact person.)
▪ Rechargeable battery
▪ LED status indicator on the sensor
▪ IP67 certification

Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of use</td>
<td>-20 to +60°C / -4 to +140°F</td>
</tr>
<tr>
<td>Measuring range:</td>
<td>-10 to +85°C / +14 to +185°F</td>
</tr>
<tr>
<td>Accuracy 1%</td>
<td>-55 to +125°C / -67 to +257°F</td>
</tr>
<tr>
<td>Battery type</td>
<td>Lithium ion (integral)</td>
</tr>
<tr>
<td>Charging time</td>
<td>Up to 24 hours (depending on residual charge, actively controlled). Charging with AC adapter supplied (12 V DC / 1A) in dry environment.</td>
</tr>
<tr>
<td>Battery runtime</td>
<td>Up to 90 days*)</td>
</tr>
<tr>
<td>Measuring interval</td>
<td>10 minutes (default)</td>
</tr>
<tr>
<td>Data transmission interval</td>
<td>60 minutes (default)</td>
</tr>
</tbody>
</table>

*) Battery runtime depends on network reception and on measuring and data transmission intervals. Battery charge state can be monitored on the Concremote Web portal.

Note:
The built-in battery must be fully charged before first use.

IP code

<table>
<thead>
<tr>
<th>IP</th>
<th>Protection against penetration</th>
<th>1st digit: protection against foreign matter and touch</th>
<th>2nd digit: protection against water</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Dustproof</td>
<td>Immersion to a depth of 1 metre</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>No dust penetration; complete protection against touch (dustproof).</td>
<td>Ingress of water in health-endangering quantity is not possible when the housing is immersed in water under defined pressure and time conditions (depth of immersion up to 1 metre).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A vacuum must be created. Test duration up to 8 hours based on the airflow.</td>
<td>Test duration: 30 minutes Tested with the lowest point of the housing 1000 mm below the surface of the water.</td>
<td></td>
</tr>
</tbody>
</table>
LED status indicator on the sensor

<table>
<thead>
<tr>
<th>Condition</th>
<th>Situation</th>
<th>LED</th>
<th>LED behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mode</td>
<td>Measuring cycle</td>
<td>1 weak flash in 4 seconds, followed by 3-second pause</td>
<td></td>
</tr>
<tr>
<td>Measurement</td>
<td>Temperature measurement</td>
<td>Steady green for 2 seconds</td>
<td></td>
</tr>
<tr>
<td>Charging 0-24 %</td>
<td>On docking station, connected to power supply</td>
<td>1 flash in 4 seconds, followed by 3-second pause</td>
<td></td>
</tr>
<tr>
<td>Charging 25-49%</td>
<td>On docking station, connected to power supply</td>
<td>2 flashes in 2 seconds, followed by 2-second pause</td>
<td></td>
</tr>
<tr>
<td>Charging 50-74%</td>
<td>On docking station, connected to power supply</td>
<td>3 flashes in 3 seconds, followed by 1-second pause</td>
<td></td>
</tr>
<tr>
<td>Charging 75-99%</td>
<td>On docking station, connected to power supply</td>
<td>4 flashes in 4 seconds</td>
<td></td>
</tr>
<tr>
<td>Charging 100%</td>
<td>On docking station, connected to power supply</td>
<td>Continuously ON</td>
<td></td>
</tr>
<tr>
<td>Charging 0-99%</td>
<td>On docking station without power supply</td>
<td>Red flash (1 second) followed by green flash (1 second) followed by 2-second pause</td>
<td></td>
</tr>
<tr>
<td>Charging 100%</td>
<td>On docking station without power supply</td>
<td>Directly to hibernation mode</td>
<td></td>
</tr>
<tr>
<td>Bluetooth Low Energy (BLE) Connection</td>
<td></td>
<td>Activated continuously for the duration of the BLE connection</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Phase of initialisation with the Concremote cloud</td>
<td>Alternating</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Data transfer with Concremote cloud</td>
<td>Continuously ON</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Set the Concremote device (sensor) on the docking station</td>
<td>Alternating at first to start the connection, followed by continuously ON during data transmission</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Lift the Concremote device (sensor) off the docking station</td>
<td>Alternating at first to start the connection, followed by continuously ON during data transmission</td>
<td></td>
</tr>
<tr>
<td>Temperature too high</td>
<td></td>
<td>2 seconds alternating</td>
<td></td>
</tr>
</tbody>
</table>

Note:
- Concremote devices (sensors, calibration boxes) measure the temperature every 10 minutes. The data is transmitted via the mobile phone network every 60 minutes.
- Concremote devices (sensors) start the transmission of data via the mobile phone network when they are removed from or placed on the docking station.
- When the equipment is used for the first time in a country, it can take longer for data transfer to start because a data roaming connection has to be established.
- Use the docking station only inside enclosed spaces. Green LED status indicator on the docking station shows that the station is operational.
- If the charge level drops below 20%, no more data is transmitted via the mobile network. However, the measurement of the data and storage on the device will continue to take place.
Concremote slab sensor 2.0

Features:
- Sensor for horizontal concrete members
- As-delivered condition: Slab sensor including docking station and power supply unit with set of international AC adapters.
- Power supply by battery (rechargeable)
- Rechargeable battery (battery life up to 3 months) built into the sensor
- For multiple use, with no 'lost' parts
- Wireless data transfer
- Easy to install — 'floats' when set on top of the concrete
- Sturdy design for site use

Storage with minimal battery drain:
When not in use the battery can be sat on the docking station, where it switches to energy-saving mode.

Use

NOTICE
- Sensors and accessories must be installed and mounted from safe workplaces only.
- Wet concrete areas on each slab sensor to have release agent applied.
- Do not apply force to the sensors when installing or removing them.
- Protect the sensors against theft and mechanical damage.
- Each sensor has its own serial number (A). This number is printed on the housing and on the docking station.

- Check at regular intervals if all components work properly. Any technical problems must be reported to us immediately.

➤ Immediately after pouring and levelling / trowelling the concrete, place the sensor on the concrete surface with its tip pointing downwards. The sensor may sink into the concrete, depending on the texture. There is no need to push the sensor down into the concrete. The insertion depth is sufficient when the sensor’s tip is immersed in the concrete.

<table>
<thead>
<tr>
<th>a</th>
<th>12 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>6.3 cm</td>
</tr>
</tbody>
</table>

A Concremote slab sensor 2.0

Transport and storage

Up to 3 Concremote slab or cable sensors 2.0, complete with accessories, can be stored in the Concremote transport box M 2G.
Concremote cable sensor 2.0

Features:
- Possible connections:
  - Concremote wall sensing unit (can be used many times over)
  - Concremote cable with one or several measuring point(s) (lost part)
- Measuring points inside the structural member can be chosen freely
- As-delivered condition: Cable sensor including docking station and power supply unit with set of international AC adapters.
- Power supply by battery (rechargeable)
- Rechargeable battery (battery life up to 3 months) built into the sensor
- Sturdy design for site use

Storage with minimal battery drain:
When not in use the battery can be set on the docking station, where it switches to energy-saving mode.

Use

NOTICE
- Sensors and accessories must be installed and mounted from safe workplaces only.
- Do not apply force to the sensors when installing or removing them.
- Protect the sensors against theft and mechanical damage.
- Each sensor has its own serial number.
- The sensor number (A) is printed both on the lid and inside the battery compartment.

- Check at regular intervals if all components work properly. Any technical problems must be reported to us immediately.
- When not in use, the connection must be closed with the protection cap to prevent water ingress.

The cable can be installed in the structural member from above or below or can be inserted through the formwork.

Note:
The Concremote cable sensor mounting-plate 2.0 is required for attachment to a formwork sheet.

Practical examples

Transport and storage

Up to 3 Concremote slab or cable sensors 2.0, complete with accessories, can be stored in the Concremote transport box M 2G.
Concremote cable sensor 2.0 accessories

Concremote wall sensing unit

Features:
▪ Designed for repeated measurement at the concrete surface
▪ Reusable
▪ 2 design variants:
  - 9 - 21 mm: For sheet thicknesses up to 21 mm
  - 9 - 70 mm: For sheet thicknesses up to 70 mm

Use

The wall sensing unit is designed to be used many times over. It can be used only in combination with the Concremote cable sensor.
➢ Determine the position of the cable sensor and the measuring point and fix the sensor in place.
➢ At the measuring point, drill a hole 25 mm in diameter in the formwork sheet.
➢ Fit the cable and fasten the sensing unit to the formwork sheet using three suitable screws.
➢ Connect the cable of the sensing unit by screwing it into the cable sensor. This activates the sensor and measurement or data transfer by the sensor starts.

Practical example

➢ Clean the measuring point on the sensing unit after each use.

Concremote cable

Features:
▪ Different kinds of Concremote cables with either one or three measuring point(s) are available, depending on the specific application.
▪ Measuring points inside the concrete (e.g. sensors fixed to reinforcement).

➢ The cable length is chosen separately for each project. Special lengths are available if needed. (Longer delivery time!)
▪ Non-reusable part

<table>
<thead>
<tr>
<th>Concremote cable, 3 sensors</th>
<th>Concremote cable, 1 sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of measuring points</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Available lengths</td>
<td></td>
</tr>
<tr>
<td>8 m (6-1-1 m)</td>
<td>0.6 m</td>
</tr>
<tr>
<td>10 m (6-2-2 m)</td>
<td>1.5 m</td>
</tr>
<tr>
<td>special length</td>
<td>special length</td>
</tr>
</tbody>
</table>

*) The values in brackets are the cable lengths between the measuring points, starting at the screw connection of the cable sensor.
Use

The Concremote cables can be used only in combination with the Concremote cable sensor.

Note:
Make sure that the cables do not get damaged during concreting operations (e.g. by internal vibrators).

Measurement at exposed positions in the structural member may require an auxiliary construction to be fitted by the user (e.g. additional brackets).

Installation:
➤ Determine the position of the cable sensor and fix the sensor securely/properly.
➤ Fit the cable and fasten it to the reinforcement using cable ties.
➤ Connect the cable to the cable sensor by turning it in the socket (sensor starts data transmission).

Dismantling:
➤ Unplug the cable from the cable sensor.
➤ Cut the cable flush with the concrete surface.
Concremote calibration boxes 2.0

**NOTICE**
- A fully charged battery lasts up to 4 weeks (charger is included with the calibration box).
- Ensure that connectivity of the calibration box is maintained at all times. The quality of the connection can be checked online.
- Calibration is performed either by the user himself or by someone appointed by the user. Concremote support provides assistance with this process.

### Technical data

<table>
<thead>
<tr>
<th>Area of use</th>
<th>-20 to +60°C / -4 to +140°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range:</td>
<td>-10 to +85°C / +14 to +185°F</td>
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<tr>
<td>Accuracy 1%</td>
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</tr>
<tr>
<td>Battery type</td>
<td>Lithium ion (integral)</td>
</tr>
<tr>
<td>Charging time</td>
<td>Up to 24 hours (depending on residual charge, actively controlled). Charging with AC adapter supplied (12 V DC / 1A) in dry environment.</td>
</tr>
<tr>
<td>Battery runtime</td>
<td>Up to 4 weeks*)</td>
</tr>
<tr>
<td>Measuring interval</td>
<td>10 minutes (default)</td>
</tr>
<tr>
<td>Data transmission interval</td>
<td>60 minutes (default)</td>
</tr>
</tbody>
</table>

*) Battery runtime depends on network reception and on measuring and data transmission intervals. Battery status can be monitored on the Concremote Web portal.

Follow the directions in the 'Concremote calibration box' Operating Instructions.

Concremote calibration-box cube 2.0

A Cube mould 15x15x15 cm (3)
B Measuring device and battery (1 sensor; installed)
C Insulation (lids, middle parts and bottom covers, 3 each)

**Easy calibration of concrete**
- Contains measuring device and 3 cube moulds
- Use of standard 15x15x15 cm cylinder moulds
- 2 calibration boxes (6 concrete cubes) are needed for calibration.
- For multiple use, with no 'lost' parts

- The Concremote calibration-box cube can be used for concrete types with a maximum grain size of up to 32 mm.
Concremote calibration-box cylinder 2.0

Shown here without insulating lid

A  Cylinder mould 4x8" (10x20 cm) (6, lost parts)
B  Measuring device and battery (1 sensor; installed)
C  Insulation (insulating lid, middle part, bottom cover)

Easy calibration of concrete
- Contains measuring device and 6 cylinder moulds for initial calibration.
- Use of standard 4x8" (10x20 cm) cylinder moulds
- With integral drilling template for cylinder moulds
- The Concremote calibration-box cylinder can be used for concrete types with a maximum grain size of up to 25.4 mm (1").

Additional cylinder moulds and lids can be ordered as required through the following links:
- Cylinder mould:  https://www.atlanticsupply.com/?post_type=product&s=clm4x8lep
- Lid for cylinder mould:  https://www.atlanticsupply.com/?post_type=product&s=clmlid4l
What to do in the event of sensor malfunction

Correct functioning of the sensors depends on battery power, good network connectivity and smooth functioning of the Concremote Web portal. If data transfer is interrupted, persons with write access are automatically notified to this effect by email.

Failure and what to do in the event of sensor malfunction

Failure due to connectivity problems

In areas with a poor or with no network connection, a microwave link can be set up by the user. If wireless transmission temporarily fails, the sensor will buffer the measured data for at least 24 hours, and subsequently transmit them when the wireless connection is restored.

In some cases it may be sensible to remove the sensor from where it is installed, and to temporarily put it in a location with better connectivity for data transmission. After this, the sensor can be fitted back onto the structural member.

Failure due to low battery power

A sensor with a discharged battery cannot save data. In the event of a failure due to low battery power, the battery must be recharged as quickly as possible.

Battery state of charge can be monitored on the Concremote Web portal

Other failures

In the event of a failure which is not due to connectivity problems or low battery power, resetting the sensor may solve the problem:

- Set the sensor on the docking station for 10 minutes (= hibernation mode). For this initial step, make sure that the docking station is not connected to the AC supply.
- Connect the docking station to the AC supply. If necessary, leave it connected for 24 hours, if necessary (Periodically check the battery charge level in the sensor via the LED’s.)
- Remove the sensor from the docking station.
- The sensor will now restart the connection and resume working in the normal operating mode.
Declaration of conformity

concrefy

Hereby we,

Company name of Manufacturer: Concrefy
Address: Olivier van Noortweg 10
Zip code & city: 5928 LX Venlo
Country: The Netherlands
Telephone number: +31 77 850 7222

declare that this DoC is issued under our sole responsibility and that these products:

<table>
<thead>
<tr>
<th>Article description</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concremote slab Sensor 2.0 E</td>
<td>583064000</td>
</tr>
<tr>
<td>Concremote cable Sensor 2.0 E</td>
<td>583087000</td>
</tr>
</tbody>
</table>

are in conformity with the relevant Union harmonization legislation: Radio Equipment directive: 2014 / 53 / EU

<table>
<thead>
<tr>
<th>Device</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSM850/GSM900</td>
<td>33dBm±2dB</td>
</tr>
<tr>
<td>DCS1800/PCS1900</td>
<td>30dBm±2dB</td>
</tr>
<tr>
<td>GSM850/GSM900 (8-PSK)</td>
<td>27dBm±3dB</td>
</tr>
<tr>
<td>DCS1800/PCS1900 (8-PSK)</td>
<td>26dBm±3dB</td>
</tr>
<tr>
<td>WCDMA-bands B1,B2,B4,B5,B8</td>
<td>24dBm+1/-3dB</td>
</tr>
<tr>
<td>LTE-FDD bands B1,B2,B3,B4,B5,B7,B8,B12,B13,B18,B19,B20,B26,B28</td>
<td>23dBm±2dB</td>
</tr>
<tr>
<td>LTE-TDD-band B40</td>
<td>23dBm±2dB</td>
</tr>
<tr>
<td>BLE 2.4GHz</td>
<td>+4dBm</td>
</tr>
</tbody>
</table>
Hoofdstuk: Certificates

Document: 01-11 Concremote Sensor DoC -Plug.in

With reference to the following standards applied:

<table>
<thead>
<tr>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 301 489-1 V2.2.0</td>
</tr>
<tr>
<td>EN 301 489-3 V2.1.1</td>
</tr>
<tr>
<td>EN 301 489-17 V3.2.0</td>
</tr>
<tr>
<td>EN 301 489-52 V1.1.0</td>
</tr>
<tr>
<td>EN 301 511 v12.5.1 Clauses 5.3.16 and 5.3.17</td>
</tr>
<tr>
<td>EN 301 908-1 v11.1.1 clause 4.2.2</td>
</tr>
<tr>
<td>EN 300 328 v2.2.0 clause 4.3.2.8 and 4.3.2.10</td>
</tr>
<tr>
<td>EN 303 413 v1.1.1 clause 4.2.2.2</td>
</tr>
<tr>
<td>FCC Part 15 Subpart C §15.209, §15.207</td>
</tr>
<tr>
<td>RSS-GEN Issue 5</td>
</tr>
</tbody>
</table>

The Notified Body Telefication B.V., with Notified Body number 0560 performed:

Module: B

Where applicable:
The issued EU-type examination certificate: 182140242/AA/00

Description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the DoC:
Wall adapter: GE1212-P-I
Software version: 2.3.12

Signed for and on behalf of:

Venlo, 1st October 2018

(Place, date)

Ir. A.J.E.J. van Casteren
Managing Director
Concrefy
(autorisied signature)
Concremote (generation 1.0 launched in 2013)

Features:
- 2G data transmission
- High-power, long-life battery
- Robust, designed for use on construction sites

Technical data

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<td>Replaceable Concremote battery</td>
</tr>
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<td>10 minutes (default)</td>
</tr>
<tr>
<td>Data transmission interval</td>
<td>60 minutes (default)</td>
</tr>
</tbody>
</table>
Concremote slab sensor

Features:
▪ Sensor for horizontal concrete members
▪ Power supply by battery (battery life up to 4 months)
▪ For multiple use, with no 'lost' parts
▪ Wireless data transfer
▪ Easy to install – 'floats' when set on top of the concrete
▪ Sturdy design for site use

Battery-saving storage:
Store the slab sensor with its tip pointing upwards. The power supply to the sensor is turned off, extending battery life.

Use

Prior to installing the sensor for the first time, turn the top lid open and

➤ connect the battery by means of the white plug.
➤ Then close the lid again.
➤ Immediately after pouring and levelling / trowelling the concrete, place the sensor on the concrete surface with its tip pointing downwards.

The sensor may sink into the concrete, depending on the texture. There is no need to push the sensor down into the concrete. The insertion depth is sufficient when the sensor's tip is immersed in the concrete.

a ... 19.2 cm
b ... 13.6 cm

Transport and storage

▪ Transport box S:
  For up to 2 Concremote cable sensors, complete with accessories.
▪ Transport box M:
  For up to 2 Concremote slab sensors, complete with accessories.
▪ Transport box:
  For up to 2 Concremote slab or cable sensors, complete with accessories.

NOTICE
▪ Sensors and accessories must be installed and mounted from safe workplaces only.
▪ Wet concrete areas on each slab sensor to have release agent applied.
▪ Do not apply force to the sensors when installing or removing them.
▪ Protect the sensors against theft and mechanical damage.
▪ Each sensor has its own serial number.
▪ The sensor number is printed both on the housing and inside the battery compartment.

A Serial number of the sensor

NOTICE
Check at regular intervals if all components work properly. Any technical problems must be reported to us immediately.
Concremote cable sensor

Features:
- Possible ways of connecting:
  - Concremote wall sensing unit (can be used many times over)
  - Concremote cable with one or several measuring point(s) (lost part)
- Sensor for universal application
- Power supply by battery (battery runtime up to 4 months)
- Wireless data transfer
- Measuring points inside the structural member can be chosen freely
- Sturdy design for site use
- Measurement with Concremote cable with one or more measuring points or with Concremote wall sensing unit

Battery-saving storage:
Unplug the cable from the cable sensor. The power supply to the cable sensor is turned off, extending battery life.

Use

NOTICE
- Sensors and accessories must be installed and mounted from safe workplaces only.
- Do not apply force to the sensors when installing or removing them.
- Protect the sensors against theft and mechanical damage.
- Each sensor has its own serial number (A). This is printed on the side of the housing.
- When not in use, the connection must be closed with the protection cap to prevent water ingress.

NOTICE
Check at regular intervals if all components work properly. Any technical problems must be reported to us immediately.

The cable sensor can be fixed in different positions, depending on the specific application:
- to the formwork
- to the projecting reinforcement

The cable can be installed in the structural member from above or below or can be inserted through the formwork.

Practical examples

Changing the battery:
➤ Carefully remove the small side covers.
➤ Remove the screws.
➤ Carefully tilt the lid to the side.
➤ Change the battery.
➤ Reclose the housing.

➤ Carefully reinstall the side covers.

Transport and storage

Transport box S:
For up to 2 Concremote cable sensors, complete with accessories.

Transport box M:
For up to 2 Concremote slab sensors, complete with accessories.

Transport box:
For up to 2 Concremote slab or cable sensors, complete with accessories.
Concremote cable sensor accessories

Concremote wall sensing unit

Features:
▪ Designed for repeated measurement at the concrete surface
▪ Reusable
▪ 2 design variants:
  - 9 - 21 mm: For sheet thicknesses up to 21 mm
  - 9 - 70 mm: For sheet thicknesses up to 70 mm

Use

The wall sensing unit is designed to be used many times over. It can be used only in combination with the Concremote cable sensor.

➤ Determine the position of the cable sensor and the measuring point and fix the sensor in place.
➤ At the measuring point, drill a hole 25 mm in diameter in the formwork sheet.
➤ Fit the cable and fasten the sensing unit to the formwork sheet using three suitable screws.
➤ Connect the cable of the sensing unit by screwing it into the cable sensor. This activates the sensor and measurement or data transfer by the sensor starts.

Practical example

➤ Clean the measuring point on the sensing unit after each use.

Concremote cable

Features:
▪ Different kinds of Concremote cables with either one or three measuring point(s) are available, depending on the specific application.
▪ Measuring points inside the concrete (e.g. sensors fixed to reinforcement).

▪ The cable length is chosen separately for each project. Special lengths are available if needed. (Longer delivery time!)
▪ Non-reusable part

<table>
<thead>
<tr>
<th>Concremote cable, 3 sensors</th>
<th>Concremote cable, 1 sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of measuring points</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Available lengths</td>
<td></td>
</tr>
<tr>
<td>8 m (6-1-1 m) *)</td>
<td>0.6 m</td>
</tr>
<tr>
<td>10 m (6-2-2 m) *)</td>
<td>1.5 m</td>
</tr>
</tbody>
</table>

*) The values in brackets are the cable lengths between the measuring points, starting at the screw connection of the cable sensor.
Use

The Concremote cables can be used only in combination with the Concremote cable sensor.

Note:
Make sure that the cables do not get damaged during concreting operations (e.g. by internal vibrators).

Measurement at exposed positions in the structural member may require an auxiliary construction to be fitted by the user (e.g. additional brackets).

Installation:
➤ Determine the position of the cable sensor and fix the sensor securely/properly.
➤ Fit the cable and fasten it to the reinforcement using cable ties.
➤ Connect the cable to the cable sensor by turning it in the socket (sensor starts data transmission).

Dismantling:
➤ Unplug the cable from the cable sensor.
➤ Cut the cable flush with the concrete surface.
Concremote battery 10.8V/5.8Ah Li-SOCl₂

Lithium battery (not rechargeable) < 100 Wh

Features:
▪ Disposable battery
▪ Used in the cable sensor and the slab sensor.
▪ Battery runtime is up to 4 months (depending on wireless network reception, measuring and data transmission intervals).

Technical data

<table>
<thead>
<tr>
<th>Battery type</th>
<th>Li-SOCl₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage / electric charge</td>
<td>10.8 V/ 5.8 Ah</td>
</tr>
<tr>
<td>Storage at</td>
<td>Max. +30°C (+86 °F) dry and well ventilated</td>
</tr>
</tbody>
</table>

Note:
For details on how to change the battery, see the sections headed 'Concremote slab sensor' and 'Concremote cable sensor'.

---
Concremote calibration boxes

**NOTICE**

- A fully charged battery lasts up to 4 weeks (charger is included with the calibration box).
- Ensure that connectivity of the calibration box is maintained at all times. The quality of the connection can be checked online.
- Calibration is performed either by the user himself or by someone appointed by the user. Concremote support provides assistance with this process.

### Technical data

<table>
<thead>
<tr>
<th>Area of use</th>
<th>-20 to +60°C / -4 to +140°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range: Accuracy 1%</td>
<td>-10 to +85°C / +14 to +185°F</td>
</tr>
<tr>
<td></td>
<td>-55 to +125°C / -67 to +257°F</td>
</tr>
<tr>
<td>Battery type</td>
<td>Lithium ion (integral)</td>
</tr>
<tr>
<td>Charging time</td>
<td>Up to 24 hours (depending on residual charge, actively controlled). Charging with AC adapter supplied (12 V DC / 1A) in dry environment.</td>
</tr>
<tr>
<td>Battery runtime</td>
<td>Up to 4 weeks*</td>
</tr>
<tr>
<td>Measuring interval</td>
<td>10 minutes (default)</td>
</tr>
<tr>
<td>Data transmission interval</td>
<td>60 minutes (default)</td>
</tr>
</tbody>
</table>

*) Battery runtime depends on network reception and on measuring and data transmission intervals. Battery status can be monitored on the Concremote Web portal.

Follow the directions in the ‘Concremote calibration box’ Operating Instructions.

Concremote calibration-box cylinder

**Easy calibration of concrete**

- Contains measuring device and 6 cylinder moulds for initial calibration.
- Use of standard 4x8" (10x20 cm) cylinder moulds
- With integral drilling template for cylinder moulds

Additional cylinder moulds and lids can be ordered as required through the following links:

- Cylinder mould: [https://www.atlanticsupply.com/?post_type=product&s=clm4x8lep](https://www.atlanticsupply.com/?post_type=product&s=clm4x8lep)
- Lid for cylinder mould: [https://www.atlanticsupply.com/?post_type=product&s=clmlid4](https://www.atlanticsupply.com/?post_type=product&s=clmlid4)

Concremote calibration box (cube)

**Easy calibration of concrete**

- Contains measuring device and 3 cube moulds
- Use of standard 15x15x15 cm cube moulds
- 2 calibration boxes (6 concrete cubes) are needed for calibration.
- For multiple use, with no ‘lost’ parts
What to do in the event of sensor malfunction

Proper functioning of the sensors depends on battery power, good network connectivity and smooth functioning of the Concremote Web portal. If data transfer is interrupted, persons with write access are automatically notified to this effect by email.

Failure and what to do in the event of sensor malfunction

Failure due to connectivity problems

In areas with a poor or with no network connection, a microwave link can be set up by the user. If wireless transmission temporarily fails, the sensor will buffer the measured data for at least 24 hours, and subsequently transmit them when the wireless connection is restored.

In some cases it may be sensible to remove the sensor from where it is installed, and to temporarily put it in a location with better connectivity for data transmission. After this, the sensor can be fitted back onto the structural member.

Failure due to low battery power

A sensor with a discharged battery cannot save data. Therefore, in case of a failure due to low battery power, the battery must be replaced as quickly as possible. If data transmission is interrupted for too long, the measurement may be lost.

It is advisable to have spare batteries in stock at the building site.

Other failures

In case of a failure that is not due to connectivity problems or low battery power, resetting the sensor may solve the problem:

- Hold the slab sensor with its tip pointing upward for 1 minute.
- Cable sensor: unplug the cable and leave it unplugged for 1 minute.

If the problem continues, please notify the Concremote support team.
Reshoring props, concrete technology and stripping out

When is the best time to strip out the formwork?

The concrete strength needed before the formwork can be stripped out will depend upon the load factor $\alpha$. This can be read off from the following table.

### Load factor $\alpha$

This is calculated by:

$$\alpha = \frac{DL_{\text{concrete}} + LL_{\text{construction state}}}{DL_{\text{concrete}} + DL_{\text{finishing}} + LL_{\text{final state}}}$$

<table>
<thead>
<tr>
<th>Slab thickness 'd' [m]</th>
<th>Load factor $\alpha$</th>
<th>2.00 [kN/m²]</th>
<th>3.00 [kN/m²]</th>
<th>4.00 [kN/m²]</th>
<th>5.00 [kN/m²]</th>
</tr>
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<tbody>
<tr>
<td>0.14</td>
<td>0.67</td>
<td>0.69</td>
<td>0.69</td>
<td>0.53</td>
<td>0.48</td>
</tr>
<tr>
<td>0.16</td>
<td>0.69</td>
<td>0.61</td>
<td>0.65</td>
<td>0.55</td>
<td>0.50</td>
</tr>
<tr>
<td>0.18</td>
<td>0.71</td>
<td>0.63</td>
<td>0.67</td>
<td>0.57</td>
<td>0.52</td>
</tr>
<tr>
<td>0.20</td>
<td>0.72</td>
<td>0.65</td>
<td>0.69</td>
<td>0.59</td>
<td>0.54</td>
</tr>
<tr>
<td>0.22</td>
<td>0.74</td>
<td>0.67</td>
<td>0.67</td>
<td>0.61</td>
<td>0.56</td>
</tr>
<tr>
<td>0.25</td>
<td>0.76</td>
<td>0.69</td>
<td>0.69</td>
<td>0.63</td>
<td>0.58</td>
</tr>
<tr>
<td>0.30</td>
<td>0.78</td>
<td>0.72</td>
<td>0.67</td>
<td>0.67</td>
<td>0.62</td>
</tr>
<tr>
<td>0.35</td>
<td>0.80</td>
<td>0.75</td>
<td>0.69</td>
<td>0.69</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Valid for a finishing-load $DL_{\text{finishing}} = 2.00$ [kN/m²] and a live load in the early-stripped state of $LL_{\text{construction state}} = 1.50$ [kN/m²].

Example: Slab thickness 0.20 m with a final live load of 5.00 [kN/m²] results in a load factor $\alpha$ of 0.54.

This means that formwork removal / stress-release can take place once the concrete has reached 54% of its 28-day strength. The load-bearing capacity will then correspond to that of the finished structure.

### Why put up reshoring props after stripping out the formwork?

After the formwork has been stripped and the slab has been stress-relieved or dismantled, the slab is able to bear its dead load and live loads resulting from the construction state, but not the concreting loads from subsequent floor-slabs.

The temporary reshoring serves to support the floor-slab and distribute the concreting loads across several floors.

### Positioning the reshoring props correctly

Reshoring props have the job of spreading loads between the new floor-slab and the floor beneath it. The load distribution will depend on the relationship between these two floor-slabs and their rigidity.

**NOTICE**

As a rule, the question of using reshoring props should be referred to the responsible experts, regardless of the information given above.

Observe all local standards and regulations!

### Deflection of the new concrete

The concrete's modulus of elasticity develops faster than its compressive strength. At 60 % of its compressive strength $f_{ck}$, the concrete has already reached approximately 90% of its modulus of elasticity $E_{c(28)}$.

The increase in the elastic deformation taking place in the new concrete is thus only negligible.

The creep deformation, which only finally ceases after several years, is several times more than the elastic deformation.

Early striking – e.g. after 3 days instead of 28 – thus only leads to an increase in the total deformation of less than 5%.

The part of this deformation accounted for by creep deformation, however, may be anything between 50% and 100% of the standard value, due to such variable influences as the strength of the aggregates, and the atmospheric humidity. This means that the total deflection of the floor-slab is practically independent of the time at which the formwork was struck.

### Cracks in new concrete

The bonding strength between the reinforcement steel and the concrete develops more rapidly in the new concrete than does its compressive strength. This means that early stripping does not have any negative influence upon the size and distribution of cracks on the tension side of reinforced concrete constructions.

Other cracking phenomena can be countered effectively by appropriate curing methods.
Curing of new concrete

New site-placed concrete is exposed to influences which may cause cracking and slow down its strength development:
- premature drying
- over-rapid cooling in the first few days
- excessively low temperatures or frost
- mechanical damage to the surface of the concrete
- hydration heat
- etc.

The simplest precaution is to leave the formwork on the concrete surface for longer. As well as the familiar extra curing measures, this measure should be carried out in any case.

Removing the load from the formwork from wide-spanned floor-slabs with support centres of over 7.5m

In the case of thin, wide-spanned concrete floor-slabs (e.g. in multistorey car parks), the following points must be remembered:
- When the formwork beneath these floor-slab spans is released (i.e. when the load is taken off the floor props), the floor props that are still in place are briefly subjected to additional loads. This may lead to over-loading, and to the floor props being damaged.
- Please consult your Doka technician.

**NOTICE**

As a basic rule:
- Stress-release should always be carried out working from one side towards the other, or from the middle of the floor slab (mid-span) towards the slab-edges.
- For wide spans, this procedure MUST be followed!
- Stress-release must NEVER be carried out from both sides towards the middle!

![Diagram of load redistribution](image)

**Weighted maturity method**

This procedure for determining the strength of the concrete with reference to its maturity has been technically established for several decades. By default, Concremote uses the maturity determination method developed by de Vree. Calculation of the De Vree weighted maturity is performed as follows:

\[
R_g = 10 \cdot \frac{\left[C(0.1T - 1.245) - C(-2.245)\right]}{\ln C}
\]

where:
- \(R_g\) = weighted maturity per hour [C°h/h]
- \(T\) = mean hardening temperature of the concrete in one hour
- \(C\) = reactivity coefficient of the binding agent

Concrete maturity is calculated by totalling the weighted maturities per hour. [1]

On the basis of the strength values from the calibration measurement, each maturity level has a particular compressive strength assigned to it.

This method for determining the concrete strength with reference to the maturity-level is addressed in the following technical documents and standards:
- DBV Code of Practice, ‘Concrete formwork and stipulated stripping times’, edition 06/2013
- DIN 1045-3, Concrete, reinforced and prestressed concrete structures - Part 3, edition 03/2012 with DIN EN 13670:2011-03

**Note:**

On customer request, Concremote can also be used with other methods of calculation (Arrhenius, Nurse-Saul, etc.). For more information, please consult your Doka contact person.

**Use and benefits**

Based on the measured strength data, the Concremote concrete monitoring system allows you to assure, optimise and speed up your building process by taking the appropriate measures.

Concremote can be used for the following:
- Determining stripping times in a reliable and precise manner – cycle time optimisation – cycle time reduction
- Process reliability – decisions are based on measured rather than estimated values
- Determining curing times by means of the measured strength development
- Safety in using climbing formwork
- Measurement of the hydration heat development in structural mass elements
- Seasonal adjustment and optimisation of the concrete mixture based on the continuous measurement of the compressive strength development (e.g. slow strength development in the winter period – change of the concrete mixture for faster strength development)
Concremote 2.0

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
<th>Weight/kg</th>
<th>Article No.</th>
</tr>
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<td>Concremote slab sensor 2.0 A</td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>

Concremote-Deckensensor 2.0
Height: 8.8 cm
Diameter: 12 cm
Follow the directions in the "Operating Instructions"!

Concremote cable sensor 2.0 E                                    1.5 583067000
Concremote cable sensor 2.0 AU                                   1.4 583068000
Concremote cable sensor 2.0 A                                    1.4 583066000

Concremote-Kabelsensor 2.0
Height: 12.6 cm
Diameter: 12 cm
Follow the directions in the "Operating Instructions"!

Concremote cable sensor mounting-plate 2.0                    0.09 583069000

Concremote wall sensing unit 9-21mm                              0.70 583061000

Concremote wall sensing unit 9-70mm                              0.77 583062000

Concremote cable, 3 sensors 8.00m                                0.27 583043000
Concremote cable, 3 sensors 10.00m                               0.33 583044000

Concremote-Kabel, 3 Messfühler

Concremote cable, 1 sensor 0.60m                                 0.10 583047000
Concremote cable, 1 sensor 1.50m                                 0.12 583046000

Concremote 1.0

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
<th>Weight/kg</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
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<td>Concremote slab sensor</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

Concremote-Deckensensor
Grey
Height: 15 cm
Diameter: 18.5 cm

Concremote cable sensor                                       1.3 583041000

Concremote-Kabelsensor
Grey
Length: 26 cm
Width: 14 cm
Height: 9 cm

Concremote battery 10.8V/5.8Ah Li-SOCl2                         0.16 583048000

Concremote-Batterie 10,8V/5,8Ah Li-SOCl2
Black

Concremote wall sensing unit 9-21mm                              0.70 583061000

Concremote wall sensing unit 9-70mm                              0.77 583062000

Concremote-Kabel, 1 Messfühler

Concremote calibration-box cube 2.0 E                           26.4 583070000
Concremote calibration-box cube 2.0 AU                           26.4 583071000

Concremote-Kalibrierbox Würfel 2.0
Length: 104 cm
Width: 36.5 cm
Height: 37.5 cm
Follow the directions in the "Operating Instructions"!

Concremote calibration-box cylinder 2.0 E                        20.0 583073000
Concremote calibration-box cylinder 2.0 AU                       20.0 583074000
Concremote calibration-box cylinder 2.0 A                       20.0 583072000

Concremote-Kalibrierbox Zylinder 2.0
Length: 84 cm
Width: 43 cm
Height: 40 cm
Follow the directions in the "Operating Instructions"!

Concremote transport box M G2                                    1.9 583060000

Concremote-Transportbox M G2
Length: 40 cm
Width: 30 cm
Height: 23.5 cm

Concremote-Deckensensor
Grey
Height: 15 cm
Diameter: 18.5 cm

Concremote-Kabelsensor
Grey
Length: 26 cm
Width: 14 cm
Height: 9 cm

Concremote-Batterie 10,8V/5,8Ah Li-SOCl2
Black

Concremote-Messfühler Wand 9-21mm                                0.70 583061000

Concremote-Messfühler Wand 9-70mm                                0.77 583062000

Concremote-Kabel, 1 Messfühler

Follow the directions in the "Operating Instructions"!
<table>
<thead>
<tr>
<th>Component Overview</th>
<th>Weight [kg]</th>
<th>Article No.</th>
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<td>Concremote-Kabel, 3 Messfühler</td>
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<tr>
<td>Concremote cable, 1 sensor 0.60m</td>
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<tr>
<td>Concremote-Transportbox</td>
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</tbody>
</table>

**Dimensions:**
- **Yellow:** Length: 102 cm, Width: 36 cm, Height: 37 cm
- **Yellow:** Length: 84 cm, Width: 43 cm, Height: 40 cm
- **Yellow:** Length: 40 cm, Width: 30 cm, Height: 13.5 cm
- **Yellow:** Length: 40 cm, Width: 40 cm, Height: 23.5 cm
Near to you, worldwide

Doka is one of the world leaders in developing, manufacturing and distributing formwork technology for use in all fields of the construction sector.

With more than 160 sales and logistics facilities in over 70 countries, the Doka Group has a highly efficient distribution network which ensures that equipment and technical support are provided swiftly and professionally.

An enterprise forming part of the Umdasch Group, the Doka Group employs a worldwide workforce of more than 6000.

www.doka.com/concremote