

Operating and maintenance instruction manual “English version”

Connected tension meter

Reference: ENSCTS

SNCF approval N°: DEO 19370





Dear customer,

You have purchased a Measurement solution from 4NRJ.

We thank you for the confidence you have placed in our products range and hope you will be fully satisfied with your purchase.

We kindly ask you to pay close attention to the recommendations contained in this document.

To ensure that the equipment is always available and can be used in the safest possible conditions, it must be regularly inspected and maintained. The service life of the product directly depends on the level of care taken in using and maintaining it.

To ensure that the product's characteristics are preserved, 4NRJ would like to highlight the following points:

- Follow the maintenance yearly interval.
- Replace defective components with original parts.
- Do not make any modifications.

We hope that our equipment which has been designed and developed using cutting-edge technology, will serve you with expected satisfaction.

Dear Customer, we remain fully at your service.

4NRJ



Service page

Written by: Paul Santerre

Date of first issue: 24/09/2020

Revision record

Date	Nature of the change	Made by	Index
24/09/2020	Original issue	Paul Santerre	A
31/01/2022	Measurement range table modified	Anthony Le Guel	B
14/02/2023	Add temperature note	Anthony Le Guel	C



Declaration of conformity

Original version



The undersigned manufacturer: 4NRJ
2 Rue Albert Calmette
ZA Les Gailletrous
41260 La Chaussée-Saint-Victor (France)

The only legal entity authorised to compile the technical file

Certifies that the equipment designated hereafter:

Designation: Connected tension meter
Type: CTS
Year of manufacture: 2020

Complies with the regulatory provisions laid down in the directive(s):

- 2006/42/EC
- 2011/65/EU
- 2014/30/EU

Complies with the regulatory provisions laid down in the "harmonised" standard(s):

- EN 50581: 2013
- EN 55011/A: 2017
- EN 61000

Complies with the regulatory provisions laid down in the standard(s):

These applicable or non-applicable regulations and standards are in the process of being checked.

Location: La Chaussée-Saint-Victor, France Date: 24/09/2020

Name: Benoit Gasselien Job title: Managing Director Signature:



4NRJ
Aérodrome Bois Le Breuil
Bâtiment 48
41330 VILLERANCOEUR
Tel: +33 (0)2 54 42 05 12
contact@4nrj.com
EURL au capital de 400 000 euros
RCS Nantes 508 455 817

IMPORTANT:

Any modification made to the machine without the manufacturer's written consent will render this declaration null and void

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Introduction



The instruction manual forms an integral part of this product. It contains important instructions on safety and use. Before using the product, please read all the operating and safety instructions.

The product must be used in accordance with the instructions given in this document and solely for areas that are suitable for work on the catenary.

Please keep this document in a safe place.

Compliant application scope

Please, comply to the designated conditions of use for this product.

Failing this, 4NRJ will not be in a position to:

- Guarantee the results of any measurements obtained.
- Be held responsible for the consequences of improper use.

This device is designed to measure the mechanical tension present in catenary contact wires. The operation is carried out from the ground using an SNCF-approved telescopic catenary insulating pole and can be displayed on a smartphone using an application developed by 4NRJ.



Warnings!

- ! This product is designed to be used by people who know and understand the best practices of catenary engineering.
- ! Caution: if the product is defective, has been dropped, used improperly or modified, it may lead to incidents.
- ! Make sure you have the appropriate personal protective equipment (list not exhaustive).



Description

Composition of the CTS tension meter



*Not shown in the photo.

N°	Designation	Reference
1	Carrying case	CTSVAL
2	Connected tension meter	CTS
3	Control gauge	CTSCALIB
4	230 V power supply module	CTSALIM
5	Emergency extraction tool	CTSEXTRAC
6	SNCF approved telescopic insulating pole with safety ring and storage bag*	KICPI56 +SPI

Technical characteristics

Use:	On 1500 V and 25000 V networks
Measurement range:	Refer to the table on page 12
Resolution:	± 5 daN
Error:	See table on the next page
Measurement cycle time:	20 seconds < T < 60 seconds
Dimensions of the device (2):	380 x 380 x 150 mm
Weight of the device (2):	4.60 kg
Overall weight:	12 kg
Power supply:	Battery charger via 230 V mains socket
Battery voltage:	16.8 V
Battery capacity:	3.45 Ah
Battery duration:	Approximately 250 measurements
Battery recharging time:	2 hours 30 minutes
Bluetooth:	4.0
Type of mounting on insulating pole:	P-FIX aluminium coupling
Operating temperature*:	-15°C to +50°C*
Outdoor use:	All weather conditions
Accessibility by dynamic QR code:	Instruction manual, certificate of conformity, inspection date





 The accuracy of the device may be affected by extreme temperatures.

Table of measurement ranges and accuracy at 15°C (non-exhaustive list)

	Accuracy at rated voltage	Measurement range (daN)
Contact Wire		
107 Cu hard	± 40 daN to 1000 daN	100 to 2000
107 Cu Sn	± 40 daN to 1300 daN	100 to 2500
107 Cu Cd	± 40 daN to 1300 daN	150 to 2600
150 Cu hard	± 50 daN to 1400 daN	100 to 2800
150 Cu Sn	± 50 daN to 1800 daN	150 to 2700
150 Cu hard Flat	± 50 daN to 1400 daN	100 to 2800
Auxiliary Catenary Wires		
ACW 104 Cu round	± 30 daN to 600 daN	150 to 1900
ACW 143 Cu round	± 40 daN to 800 daN	300 to 2500
ACW 143 Cu	± 80 daN to 800 daN	300 to 2500
Principal Catenary Wires		
PCW 65 Bz 60%	± 60 daN to 1150 daN	300 to 2100
PCW 116 Bz 72%	± 80 daN to 1820 daN	600 to 2600
Feeders		
145.8 Cu	± 60 daN to 1150 daN	300 to 2200
228 Al Steel	± 80 daN to 1500 daN	500 to 2500
262 Cu	± 120 daN to 2000 daN	1000 to 3200
Other		
Protective catenary wire Al Steel	± 20 daN to 400 daN	150 to 1000

-  If the contact wire is worn, the angle of the tool is important in order to obtain a value within the tolerance range.
-  Values obtained in the 4NRJ laboratory at constant temperature.
-  Leave the tool in the ambient air for 15 or 20 minutes before use (this is to stabilize the temperature probe).

Bill of materials

Carrying case

All the equipment must be transported to the worksite in the carrying case. Each item has a predefined location.

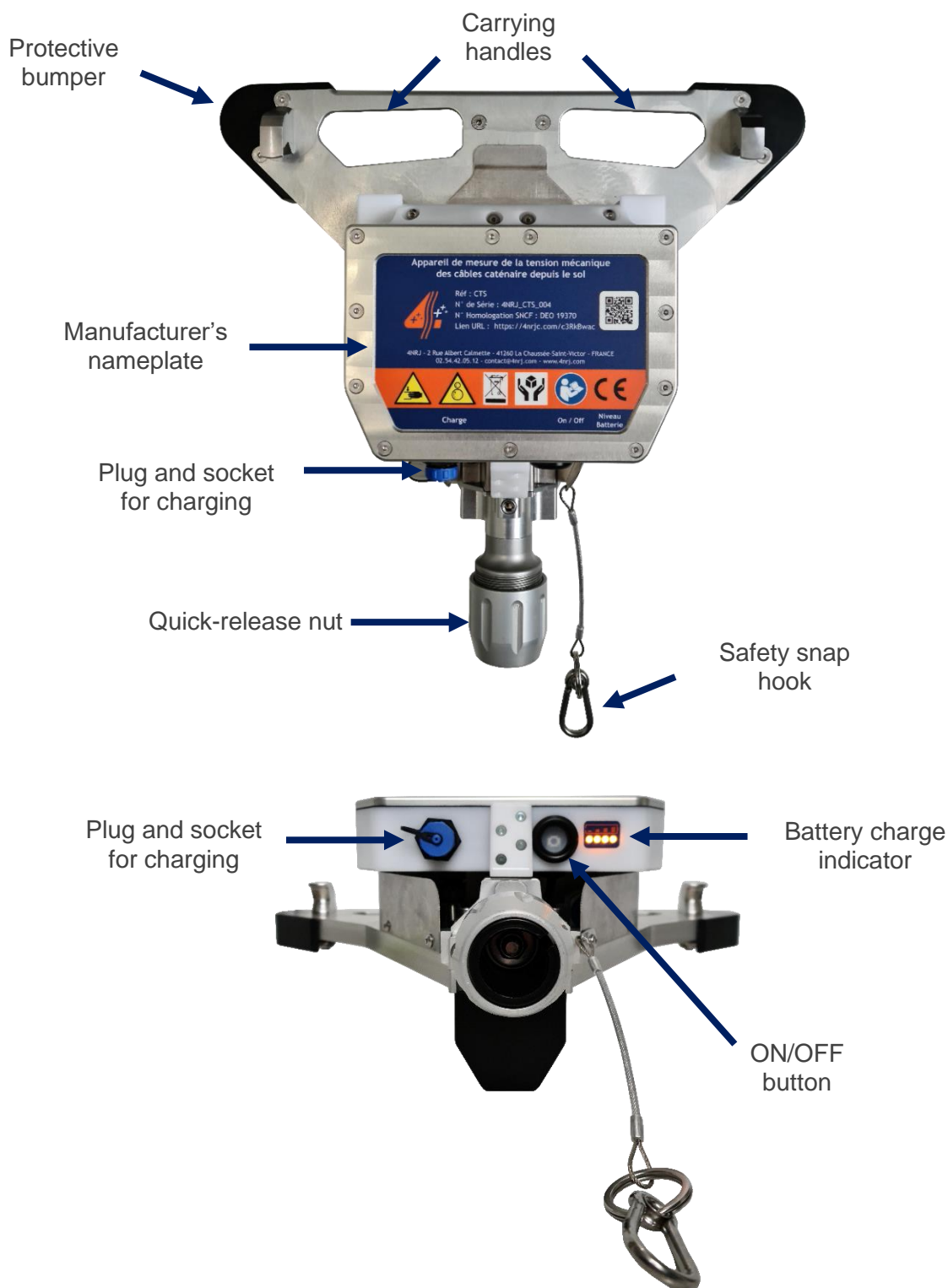
(Please unlock the 4 latches to open the case)

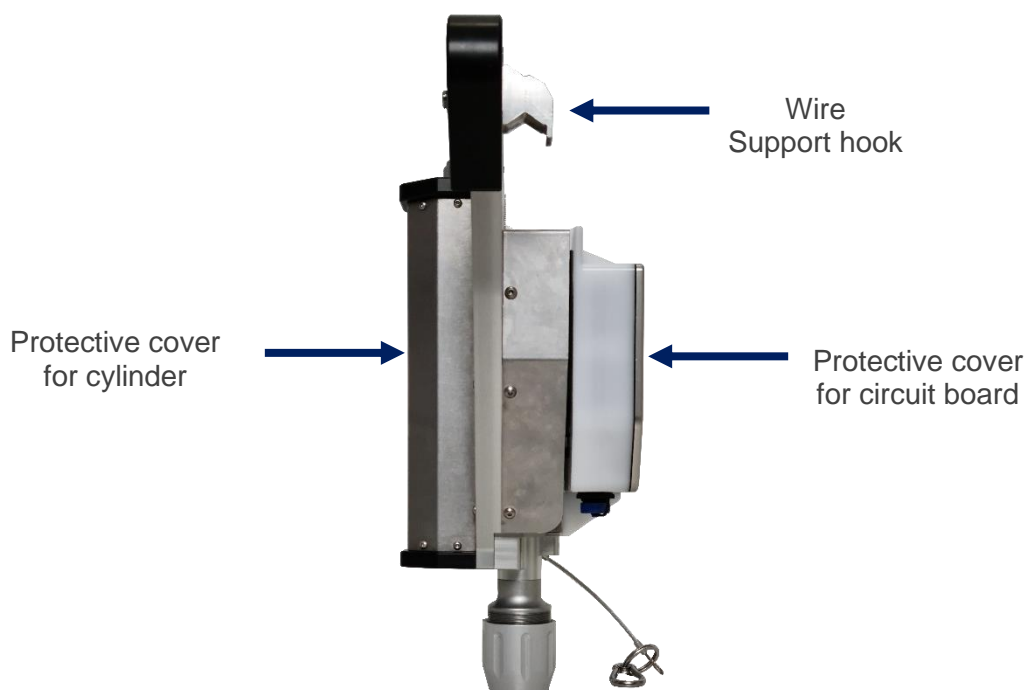
(Please store each item in its intended location after using the product).



Measuring device

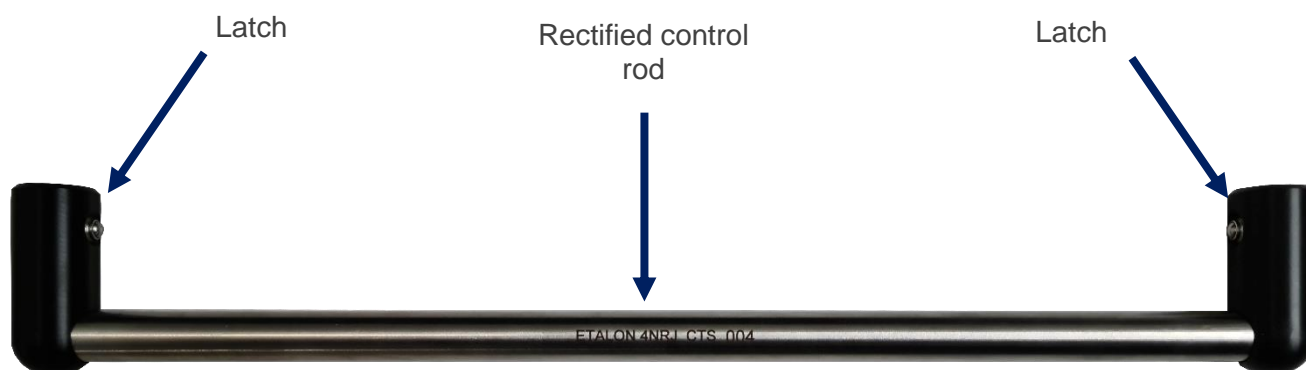
The measuring device is a battery-operated tool that can be recharged using the power plug supplied with the tension meter. The device uses a cylinder that drives a mechanism. It is strictly forbidden to place your hands near the device during the measurement. Maintenance is restricted to 4NRJ.





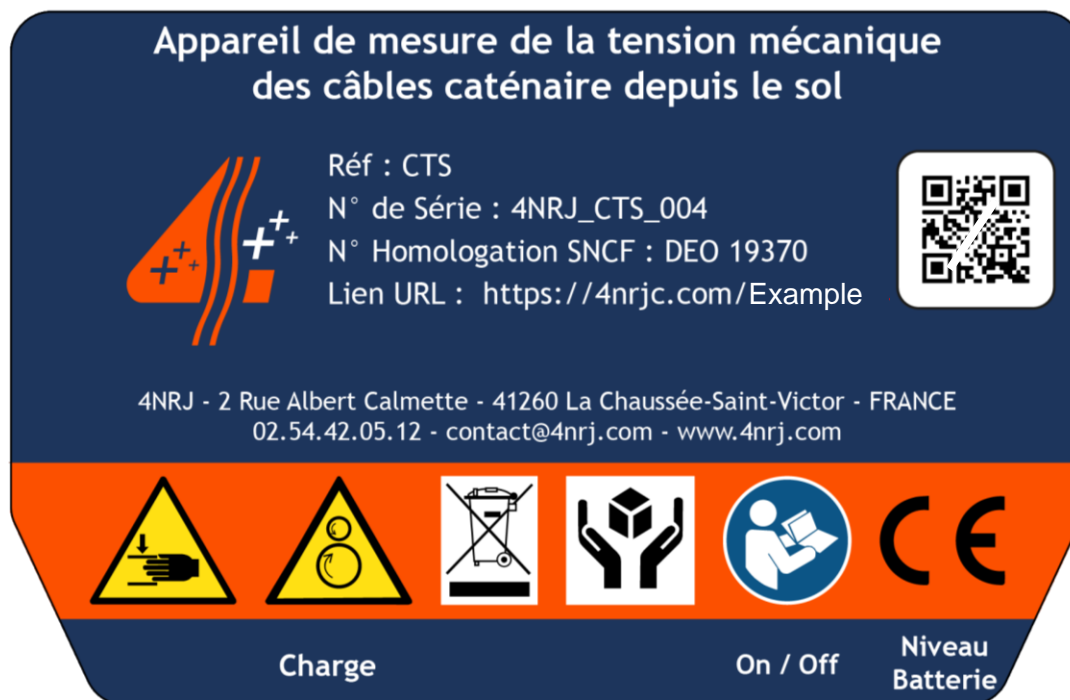
Control gauge

The control gauge must be used before each measurement campaign at a temperature between 15° C and 25° C. This ensures that the measuring device is correctly calibrated. Each control gauge has a unique serial number. (Refer to the paragraph "Calibration control procedure").



Manufacturer’s nameplate

The measuring device has several required indications.



Appareil de mesure de la tension mécanique des câbles caténaire depuis le sol	Device to measure the mechanical tension of catenary wires from the ground
Réf : CTS N° de Série : 4NRJ_CTS_004 N° Homologation SNCF: DEO 19370 Lien URL: https://4nrjc.com/Exemple	Ref.: CTS Serial N°: 4NRJ_CTS_004 SNCF approval N°: DEO 19370 URL: https://4nrjc.com/Exemple
Charge	Charging
On / Off	On / Off
Niveau Batterie	Battery Level

Overview of risks and recommendations


To ensure that the tool operates correctly and fulfils its primary safety function, it is important to continually check that it is in good condition before and after use.

Always comply to the network lockout procedure.

Risks of use:

 Do not place your hands on the device during a measurement, as there is a risk of crushing or pinching.



 Do not remove the protective cover.

 Be sure to strictly follow the instructions in the operating manual of the device.

General recommendations (non-exhaustive list):

- ✓ Visually inspect the condition of the tool before use.
- ✓ Visually inspect the condition of the pole before use.
- ✓ Protect your tool and your pole from impacts.
- ✓ Follow the different steps in the operating procedure.
- ✓ In case of damage, please contact the 4NRJ after-sales service.
- ✓ It is forbidden to change the physical appearance of your tool (non-exhaustive list: painting, engraving or marking).
- ✓ All modifications must be approved in writing by 4NRJ.

Storage & transport (non-exhaustive list):

- ✓ Carry the tool in its case until it is ready to be used.
- ✓ Take care to avoid damaging the device during transport.
- ✓ Store the tool in a place protected from moisture.
- ✓ Storage temperature: -15°C to +50°C.

Cleaning (non-exhaustive list):

- ✓ Wipe the device with a clean, lint-free cloth before and after each time it is used. Do not use flammable products.

Tool repair:

- ✓ Where relevant, some of the components must be replaced by components of the same type. Please contact the 4NRJ after-sales service department.

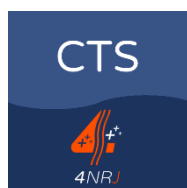
If required or in doubt, please return the product to 4NRJ for inspection and repair.

4NRJ
2 Rue Albert Calmette
ZA Les Gailletrous
41260 LA CHAUSSEE-SAINT-VICTOR
France
Phone: +33 (0)2 54 42 05 12
E-mail: contact@4nrj.com

Use

The CTS measuring set is a measuring device to measure the mechanical tension of catenary wires and contact wires. However, if the equipment is not maintained and checked, it may result in erroneous measurements (refer to the periodic inspection section). Certain rules must be followed for it to be used correctly.

Before you begin, please download the “TENSIOMETRE CTS” application onto your smartphone (Android system) via the Play Store.



TENSIOMETRE CTS

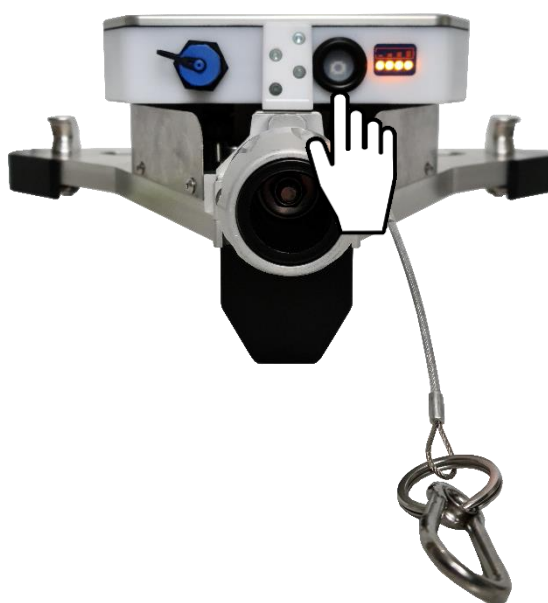
As this is a test instrument, it must be kept perfectly clean at all times to prevent damage to the tool.

Procedure to connect to the device

Follow the instructions below to connect your smartphone to the measuring device.

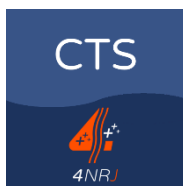
1. Press the ON/OFF button to switch on the tool.

The battery charge indicator lights up.



Keep an eye on the battery charge level.

2. Start the “TENSION METER CTS” application on your smartphone.



TENSION METER CTS

When you connect for the first time, the application will ask you for permission to access various information related to your smartphone. Allow access for the application to work properly.

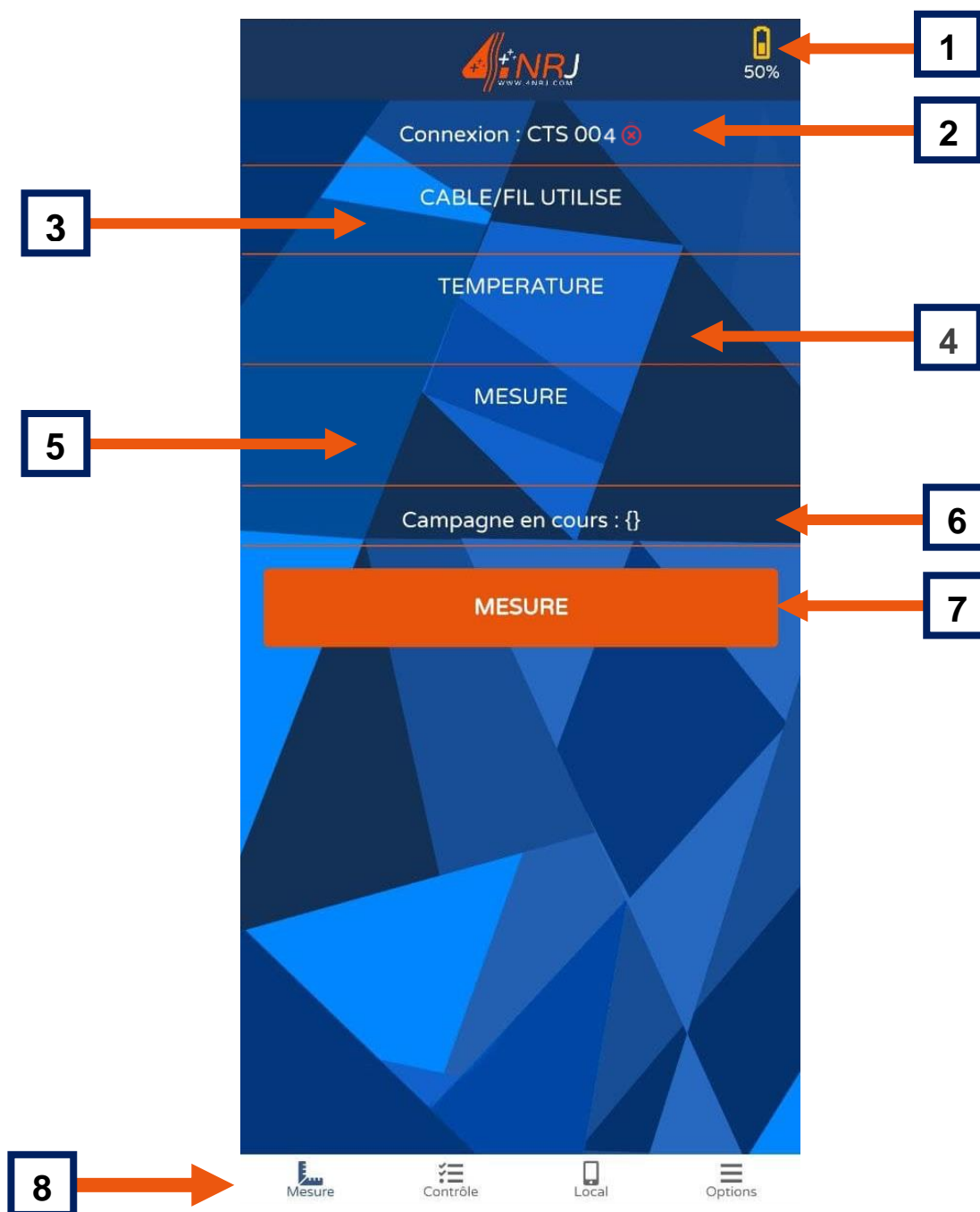
The tool connects to your smartphone via the application using a BLUETOOTH connection. Ensure that BLUETOOTH is enabled on your phone.



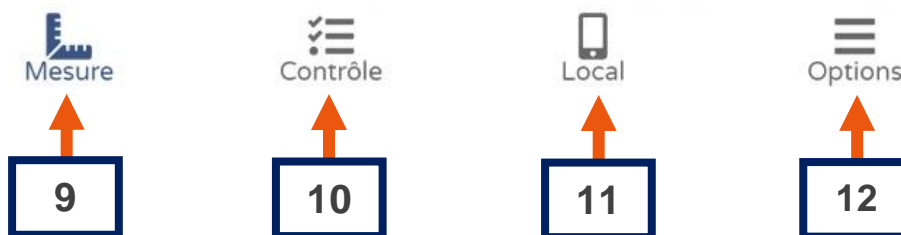
Two methods are available:

- Connection using the QR code on the device.
- Connection by searching for the device’s Bluetooth signal.

View of the application



1	Battery level of the connected device
2	Connected device and button to disconnect
3	Information on the wire being measured
4	Temperature measurement
5	Contact wire or catenary wire measurement (in daN)
6	Name of the measurement campaign
7	Initiate a measurement
8	Menu bar




9	Measuring
10	Calibration control procedure
11	Measurements saved on the phone and/or server
12	Options (Clear the memory)



13	Type selection: contact wire or catenary wire to be measured
14	Information to be entered on the characteristics of the contact wire or catenary wire
15	Wire thickness to be entered (For contact wires only)
16	Line number to be entered (Optional)
17	Track number to be entered (Optional)
18	Support number to be entered (Optional)
19	Mileage point to be entered (Optional)
20	Name of the measurement campaign (Optional)
21	Initiate the measurement

Calibration control procedure

- ❗ Before each measurement campaign! It is recommended to check the tool using the control gauge provided in the carrying case.
- ❗ The check must be carried out at a temperature between 15°C and 25°C.

1. Press the button  on the menu bar. If a check has been previously carried out, it will be displayed.

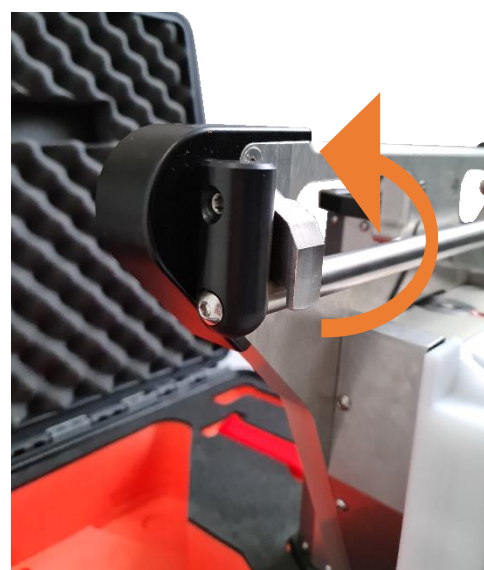


2. Follow the control procedure.

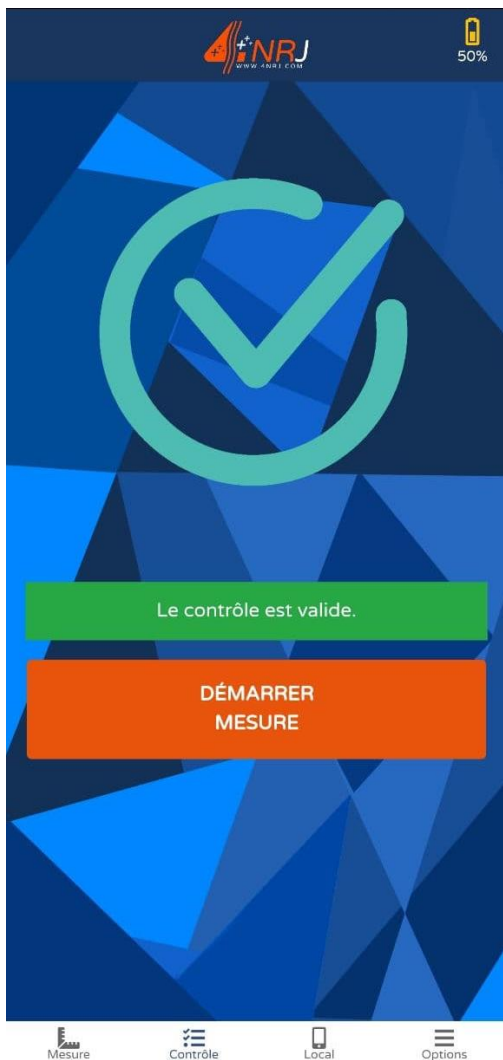
A. Place the device in the control area of the suitcase provided for this purpose.



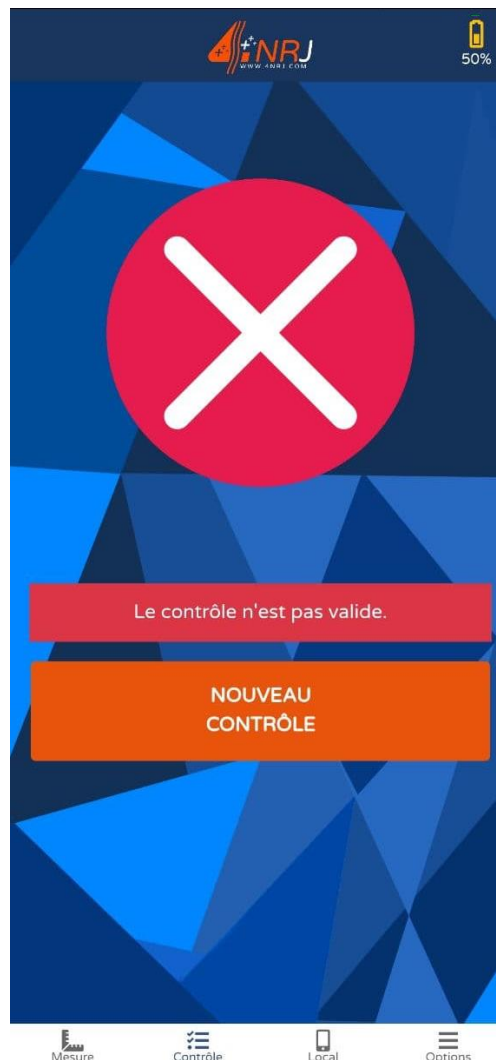
B. Place the control gauge on the measuring tool. Place the gauge on the supports and rotate to lock the gauge.



C. Press the “DEMARRER CONTRÔLE” (START TEST) button and view the result.



**Calibration control procedure
successfully completed**



**Calibration control procedure not
validated**

If the calibration control procedure is not validated, please repeat the operation.
If a second control procedure is not validated, please contact 4NRJ.

4NRJ
2 Rue Albert Calmette
ZA Les Gailletrous
41260 LA CHAUSSEE-SAINT-VICTOR
Phone: +33 (0)2 54 42 05 12
E-mail: contact@4nrj.com

Fitting the TENSION METER onto the insulating pole

Once you have paired your smartphone with the measuring device and completed the control procedure, you can fit the measuring device onto the catenary pole supplied with the set.

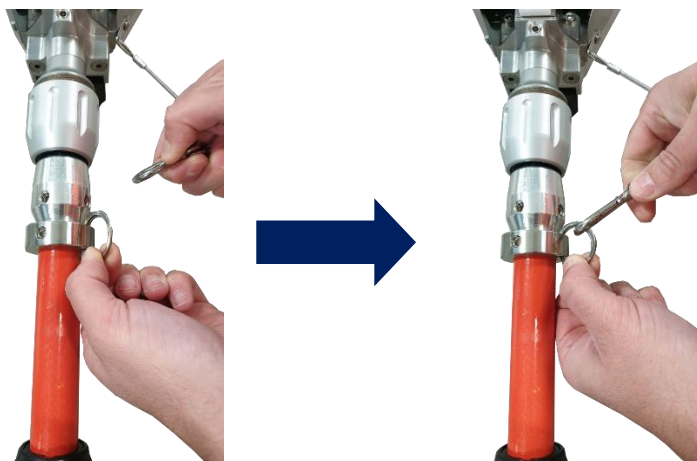
1. Insert the end of the pole into the clamping nut ECRCS2017 and tighten it by hand.



 **The pole must be in very good condition to retain its characteristics.**

 **The pole must be fitted with a safety ring.**


2. For safety, attach the snap hook to the safety ring.



Fitting the CTS

Once the measuring device has been fitted onto the catenary pole, the various tubes of the telescopic pole must be extended in order to position the device at the height of the contact wire or catenary wire to be measured.

1. Extend the pole

 **CAUTION: The padded top tube of the insulating pole must be fully extended. The length is adjusted using the middle tube (white).**

 **The raising procedure must be carried out by two people.**



2. Place the contact wire or catenary wire against the protective cover of the circuit board, then slide the contact wire onto the guide.



! The catenary pole must be suspended and it must not touch the ground.

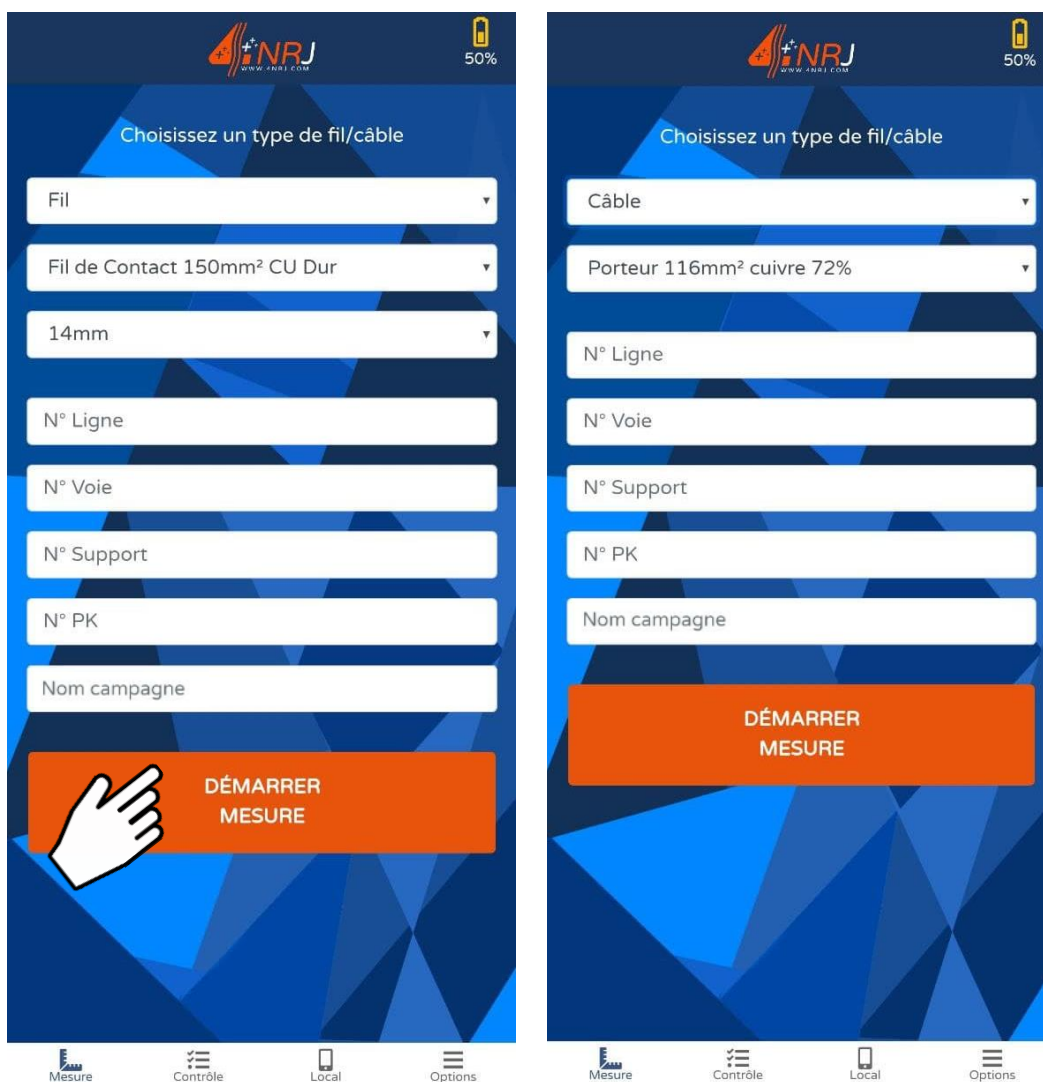
! Do not position the tool close to:
Contact wire junction, droppers and clamps within one meter.

Measurement of the mechanical tension

1. Start a new measurement by clicking on “MESURE” (MEASURE).



- Complete the required and optional fields, and start the measurement by clicking on the “DEMARRER MESURE” (START MEASUREMENT) button.



! The measurement can take between 30 seconds and one minute.


! During the measurement, the battery level LEDs are flashing.



- The value is displayed.
Click on “MESURE” (MEASURE) if you want to make another measurement.



Saving the data

The values measured with the application are automatically saved locally on your smartphone and can be reached by clicking on  Local .

! By default, the measurements are stored in the phone’s memory.

The measurements can be transferred to the server.

1. Log in to your space, if you are not yet logged in.

! If you do not have an account, please ask 4NRJ for one.

Phone: +33 (0)2 54 42 05 12

E-mail: contact@4nrj.com



Filter the measurement campaigns

Synchronise the measurements with the server / Delete

OR

When you are not logged in

Measured values already stored on the server (green)

Measured values stored on the smartphone (white)

	Date	Mesure (daN)	Campagne	
<input type="checkbox"/>	09/02/2021 14:23:31	875	Chantier 2	
<input type="checkbox"/>	09/02/2021 14:17:38	960	Chantier 1	
<input type="checkbox"/>	09/02/2021 14:16:07	955	Chantier 1	
<input type="checkbox"/>	09/02/2021 14:15:11	1185	Chantier 1	
<input type="checkbox"/>	09/02/2021 14:12:03	1670	Chantier 1	

2. Select the measurement campaigns or the individual measurement you want to transfer and click on synchronise.

End of worksite

Remove the measuring device.



 **When carrying out these operations, handle the pole with care so that the pole and the tool do not fall to the ground.**

 **Do not drop the measuring instrument. This could damage it.**

1. Retract the tubes of the pole to release the contact wire or catenary wire that was being measured.



Store the various parts of the set in the carrying case in the spaces provided, after cleaning them beforehand.

- ! **Be sure to clean the tools with a clean, lint-free cloth to remove any dirt and moisture that may cause condensation to form inside the case. Do not use flammable products.**

Do not forget to recharge the measuring device each time after it is used, using the charger supplied with the set.

The battery status is displayed on the application.

The indicator light on the tool will also become red if the device has exceeded the battery safety voltage threshold.

- ! **Please use the charger provided in the case. If another charger is used, it may have different charging characteristics.**
- ! **Put the USB-C dust cap back on after the device has been charged. This prevents pollution from getting inside the device.**

Emergency extraction

⚠ This procedure is provided in accordance with the current Machinery Directive (2006/42/EC) in the event and only in the event that the device is unable to be released from the contact wire or catenary wire on which a measurement is being taken.

⚠ This operation requires access to the device.

1. Insert the extraction key as far as it will go on one of the two support hooks.



2. Rotate the hook to release the device from the wire.



Periodic inspection

! It is essential to inspect a product to ensure that it has a long service life.

Refer to the table below to follow the inspection intervals.

Inspection intervals	Before each measurement campaign	After each time it is used	1 year
Calibration inspection	X		
Cleaning with a cloth		X	
Factory inspection			X

The connected tension meter (Ref: ENSCTS) must be inspected every year by 4NRJ.

! Even if the device is kept in storage, it must be inspected by 4NRJ every year.

If you have any problems, please contact our customer service department and specify your needs:

Phone: +33 (0)2 54 42 05 12

E-mail: contact@4nrj.com

Disposal



The product must not be disposed of with household waste.

Recycle the product through an approved waste disposal company or through your local recycling service.



Comply with the regulations in force.

If in doubt, please contact your recycling center.

Guarantee

Object of the guarantee

The guarantee covers damage to the device resulting from an internal defect. Only a device invoiced by 4NRJ and still under a 2-year distributor warranty can be guaranteed by 4NRJ.

Contents of the guarantee

The guarantee covers the cost of repairing the device specified below:

- The cost of parts.
- The cost of labour.
- The cost of transport.

The guarantees only apply to transport costs in Metropolitan France.

Replacements

Where repair is impossible or the cost of repair is greater than the cost of replacement, a new device with equivalent technical characteristics will be provided to replace it.

Loan

When the repair is expected to take a long time, functional equipment in good condition may be provided on loan, depending on availability.

Effective date and duration of the guarantee

The guarantee takes effect on the date of delivery of the equipment. The guarantee limit covers up to 2 years

To benefit from the guarantee

In the event of a claim, the owner must:

- Report the damage, within 5 working days, specifying the date, nature and circumstances, to 4NRJ (info below).

On receipt of the equipment:

- 4NRJ will conduct an assessment to determine whether the equipment will be covered by the guarantee.

The guarantee does not apply to:

- Devices that are not used in accordance with the manufacturer's instructions or that are not maintained or cleaned properly.
- The transport costs for the device, the repairer's travel costs and labour costs relating to an unjustified request for work or damage that is not guaranteed or not established by the after-sales service.
- Any work or repairs carried out by persons not approved by 4NRJ, any makeshift or temporary repairs remaining at the customer's expense, and the consequences of any aggravation of the damage resulting thereof.
- Any damage due to causes external to the device (non-exhaustive list): theft, fall, lightning, flood, fire, etc.
- Accessories and wearing parts (non-exhaustive list) (batteries, cables, seals, filters, etc.)
- Any cosmetic damage

4NRJ
2 Rue Albert Calmette
ZA Les Gailletrous
41260 La Chaussée-Saint-Victor - France
Phone: +33 (0)2 54 42 05 12
E-mail: contact@4nrj.com



APPENDICES

Appendix A - Presentation of the QR Code

Appendix B - Recording the data

Appendix C - Managing 4NRJ products using QR Codes

Appendix A - Presentation of the QR Code

Each measuring instrument (Ref: CTS) has a unique QR code. It can be used to connect to the tool, to find out diverse information about the device and to keep track of the date of the next factory inspection.



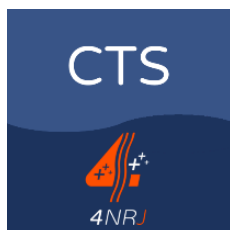
How does the QR code work?

The QR code can be used in three different ways.

- **1st method:** The “TENSIOMETRE CTS” application, which is used to connect to the device and take measurements (available on the PLAY STORE).
- **2nd method:** The “4NRJ Codes” QR Code reader available exclusively on the PLAY STORE (ANDROID Smartphone and Tablet).
Most 4NRJ tools have a QR code. This application can also be used to carry out customer inspections of your tools, if required (not necessary for the CTS).
- **3rd method:** A QR code reader available on the PLAY STORE, APP STORE or WINDOWS PHONE.

1st method: MESUREFC

- Download the “TENSIOMETRE CTS” application from the PLAY STORE.



TENSIOMETRE CTS

Open the application, press the “QRCODE” button and scan the QR code with your smartphone.

Refer to the chapter “Use”.



2nd method: 4NRJ CODES

- Download the “4NRJ CODES” application from the PLAY STORE.





4NRJ CODES



PLAY STORE

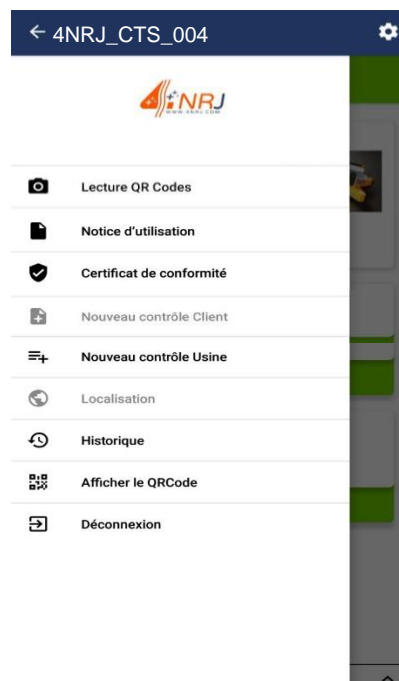
- Open the application and scan the QR code with your smartphone.

You can access the following:

- The validity status of the product (date of the next factory inspection and number of days remaining).
- The instruction manual for the product (by pressing ).
- The certificate of conformity for the product (by pressing .



View of the product validity status




Product menu

With the 4NRJ Codes application, you can also carry out customer inspections for tools that are required and view the history of scanned tools.

3rd method: QR Code reader

- Download a QR Code reader application from the PLAY STORE, APP STORE or WINDOWS Phone (QR Droid, QR Code Reader, etc.).
- Open the application and scan the QR code with your phone or tablet. You can access the following:
 - The validity status of the product (Date of the next factory inspection and number of days remaining before factory inspection).
 - The instruction manual for the product.
 - The certificate of conformity for the product.

✓ VALIDE



Type d'outils
CTS

Numéro d'outil
4NRJ_CTS_004

Validité contrôle usine :
21/09/2021
 Jours restants avant fin de validité usine : 365


📄 Notice d'utilisation

Communication :

Vous réalisez des contrôles ?

Veuillez utiliser l'application mobile 4NRJ

Disponible [ici](#)



© 2021 4NRJ - QR CODE
 Tél. : +33 (0)2 54 42 05 12
 Mail : contact@4nrj.com

Appendix B – Recording the data

Once you have taken the measurements with your device, you can process the data on your computer.

To do this, go to the address below and select “TENSIOMETRE”.

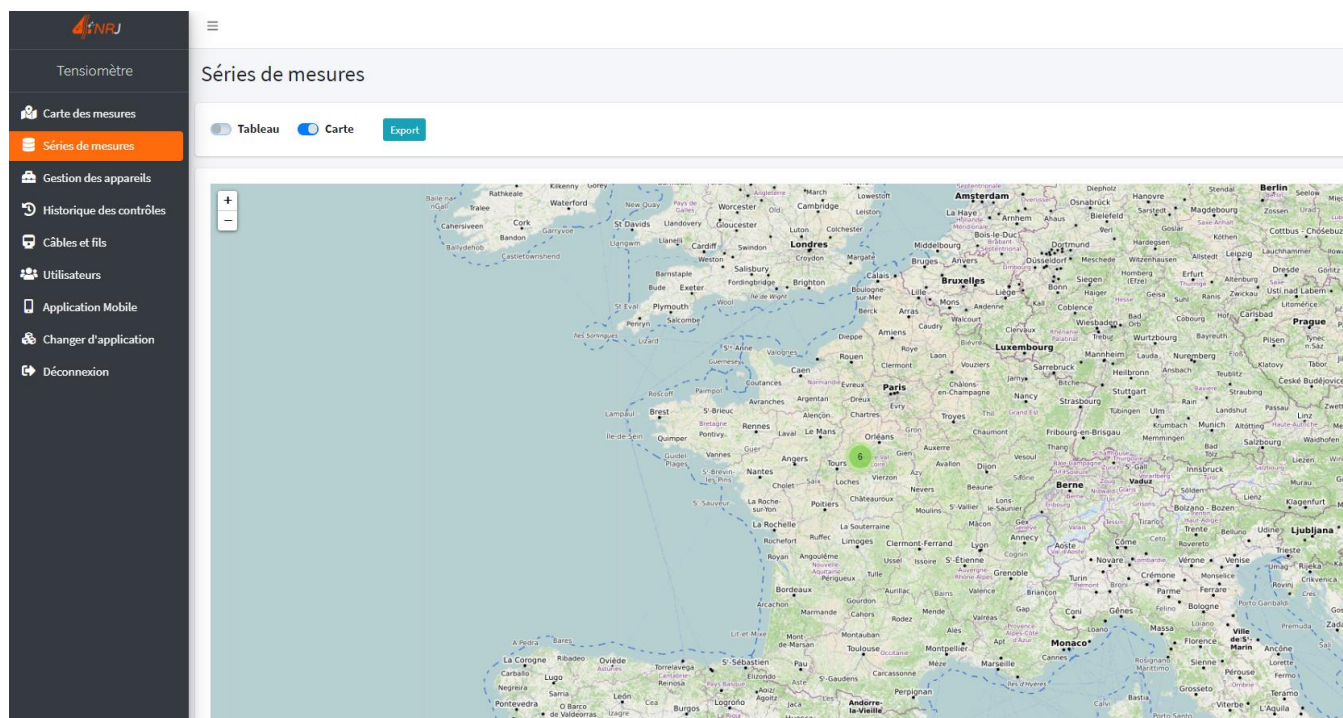
<https://4nrj-apps.fr/>

 **If you do not have an account, please ask 4NRJ for one.**

Phone: +33 (0)2 54 42 05 12

E-mail: contact@4nrj.com

You can view the measurements that you have taken on the map.



You can also view the list of your measurements and sort them using your search criteria.

Séries de mesures

Afficher 100 éléments

Affichage de l'élément 1 à 6 sur 6 éléments (filtré à partir de 598 éléments au total)

Rechercher:

Précédent 1 Suivant

ID	Utilisateur	Nom Campagne	Câble / Fil	Diamètre	Num Ligne	Num Voie	Num Support	Num PK	Temp.	Tension Calculée	Boîtier	Date Mesure
596	p.santerre@4nrj.com	Chantier 1	CDPA	12					15	960	CTS 004	09/02/2021 14:1
597	p.santerre@4nrj.com	Chantier 1	CDPA	12					15	955	CTS 004	09/02/2021 14:1
598	p.santerre@4nrj.com	Chantier 1	CDPA	12					15	1185	CTS 004	09/02/2021 14:1

Appendix C - Managing 4NRJ products using QR Codes

The validity status of all your tools can now be tracked by QR code.

To do this, simply log in to your account on the website 4nrj.com.

If you do not have an account, you can ask for one at contact@4nrj.com.

To add tools to your account, send the serial numbers of your devices and the account to which you wish to link them to contact@4nrj.com.

If you log in to your account, you will be able to see the validity status, the certificates of conformity of your devices and carry out customer inspections on them.

There are two types of account; the supervisor account and the inspector account.

Supervisor account

The supervisor account can manage several inspector accounts as well as the tools that are associated with each inspector.

- To create an inspector account (linked to the supervisor account), click on “Manage rights”, then on “Manage users” and on the “Add user” button.



- Fill in the various fields and press “Save”.

Inspector account

The inspector account only has access to the tool list that has been assigned to it.

Operating and maintenance instruction manual “English version”

N°: NUF16AC00001-C-EN

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Notes

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4NRJ
WWW.4NRJ.COM



Follow the latest updates to the instruction manual by scanning the QR code.

Or through the internet via the link: <https://4nrj.com/enscts-en.pdf>