

**ETREL**

# **ELECTRIC VEHICLE CHARGING STATION**

## **ETREL INCH**

### **PHYSICAL INSTALLATION**

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# 1

## **BASIC DESCRIPTION**

### **ABOUT THIS DOCUMENT**

The safety and installation instructions "Quick Start Guide" that come with the charging station includes quick installation procedure should be read first:

- *Etrel\_INCH\_QuickStartGuide.pdf*
- *Etrel\_INCH\_QuickStartGuide\_Figures.pdf*

The document in front of you contains information on the physical layout of the INCH charging station. As it is necessary to think in advance about the accompanying electrical works, basic information about them is also included.

More information about electrical works is available in the document "Electrical Installation Specifics":

- *Etrel\_INCH\_Electrical\_Installation\_Specifics.pdf*

All the documents are available in the installation manuals section, accessible from the INCH product page, at the web page <https://etrel.com/charging-solutions/inch/>

### **SITE PREPARATION**

#### **CONFIRMATION OF READINESS**

Before carrying out the installation, the client must confirm his readiness usually with a statement, that all the requirements for the preparation of the location and additional image material are met, which allows remote checking of compliance.

#### **ACCESS TO INSTALLATION SITE**

An access to the location should be made possible to service vehicle for installation and servicing of charging stations.

#### **SUPPORT DURING INSTALLATION**

The responsible staff for both electricity installations and IT communications should be present on the location or available for immediate remote support.

### **EXTERNAL FACTORS**

Installation cannot be carried out in the event of extremely rainy or snowy weather or other external factors that can prevent safe mounting, installation, and commissioning of charging stations. The charging station installation should be cancelled under such circumstances.

### **INSTRUCTIONS VALIDITY**

The client shall check with manufacturer for the latest valid version of instructions before the preparation of location(s) for installation of charging stations. Please make an inquiry with the point of contact at the retailer or manufacturer's support of your charging station to request the latest instructions version when necessary.

## **PERMITS**

### **LOCATION AND BUILDING PERMIT**

The charging station is a simple object and there is usually no need to acquire any building permits for its installation. If the installation site is a part of municipal property, consent of the relevant authorities must be acquired before the charging station can be installed. Installations must be performed in accordance with possible additional requirements of the national regulation.

### **CONNECTION TO THE GRID**

The charging station must be connected to the low-voltage electricity distribution network. No special permit is required to connect to an existing network behind the metering point. The connection can be done by any authorised electrician. Installations must be performed in accordance with possible additional requirements of the national regulation.

### **PARKING PERMITS**

Parking must be possible in the direct vicinity of the station and permitted by the operator or owner of the parking area. Estimated time for a full charge depends on the current state of the battery and the vehicle's charging power. Charging procedure usually takes between 30 minutes and up to 8 hours. Installations must be performed in accordance with possible additional requirements of the national regulation.

## **LOCATION**

Charging station should be installed in the vicinity of the parking spot that will be used to park and charge electric vehicles. They can have charging socket located in various positions. Consequently, cable length to connect EV and charging station is important.

The sufficient cable length to easily connect the electric vehicle with the charging station, regardless of where the EV's charging socket is located, should be between 3 and 7 m and depends on the charging station location in comparison to parking spot. Shorter length cables are recommended as they are easier to handle.

Make sure that in a typical connection scenario there are no obstructions in the way of the charging cable. When in use, the charging cable should be laid so that it will not be stepped on, tripped over, or otherwise subjected to damage or stress.

Charging station should be mounted so that the plug of the charging station is located approximately 120 cm above the ground. This height enables averagely high user the easiest operation of charging station and connection of charging cable. It also provides best view and operation of the LCD screen.

EtreI INCH charging station and its components (cable, casing, LCD screen...) are developed to be installed in the outside area meaning that charging station is resilient to the external actors (UV rays, rain, snow, cold etc.). Installing it in the closed-up area, for example in garage, will prolong the lifespan of the charging station and keep it in a pristine condition for longer.

### **THERE IS NO FUNCTION OF VENTILATION IMPLEMENTED IN THE CHARGING STATION.**

Location of the charging station must meet the following criteria:

- The charging station must not be submersed in water or any other fluid and should not be installed in flood risk areas.
- The operational temperature of the charging station is between - 25°C and + 65°C.

For locations where the charging station will be exposed to direct sunlight and high ambient temperatures during the day, it is recommended to install protection from direct sunlight, otherwise the temperature inside the station may exceed 65°C.

- Charging station must not be installed in explosion hazardous areas (EX zone)

## REQUIRED SPACE

Charging station can be mounted on the wall or installed on the mounting pole. Mounting plate for installation on the wall is supplied with every INCH and mounting pole is additional component that can be ordered.

Basic installation of the charging station's mounting pole without arches requires an excavation of minimal dimensions of 500 mm x 420 mm (floor plan) and depth of 600 mm. If the charging station is installed together with two safety arches, dimensions of the required dimensions are approximately 750 mm x 500 mm. Please find more information in chapter Construction Works.

## CHARGING STATION DIMENSIONS

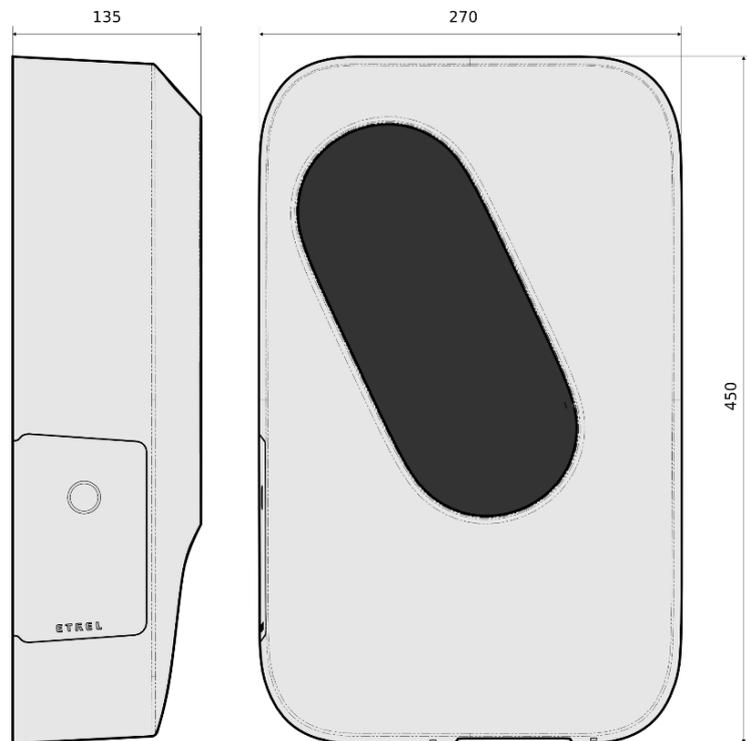


Figure 1: Charging station INCH dimensions

Additional considerations of dimensions:

- Basic dimensions of the station: 450 mm x 270 mm x 135 mm
- Free space needed:
  - 150 mm on the right side
  - 400 mm on the left side (where the maintenance door is)
  - 500 mm at the front (space to enable simple operation and maintenance).

Charging station is equipped with standard socket or with charging cable and standard Type 2 vehicle connector (Type 2 according to EN 61851-1 or EN 62196-2). EV parking place must be placed within the reach of the charging cable.

## **CONTENT, OPTIONAL AND EXTRA EQUIPMENT**

- Charging station (with Type 2 cable or Type 2 socket),
- Wall mounting bracket,
- 9 × wall plugs for securing the mounting bracket using screws to the wall,
- 9 × screws to mount the bracket to the wall,
  - Screws dimensions: 4.5 x 40 and 4.5 x 60 [mm],
- Cable gland rubber seal for smaller cable dimensions,
- \*9 × wall spacers
- \*2 × keys to open charging station service doors,
- \*Hex key to open charging station maintenance doors,
  - Hex key dimensions: 2.5,
- Installation bracket,
- \*Magnetic cable holder,
- \*INCH mounting pole,
- \*Underground anchoring structure,
- \*Safety arches / Protective railing,
- \*Etrell Load Guard device.

*\*Optional, depending on the purchased model.*

## **TOOLS**

To execute the installation of charging station multiple tools are needed:

- Screwdriver PH1, PH2,
- Hex screwdriver (if charging station without key lock on maintenance doors),
- Utility knife,
- Self-adjusting crimping pliers for cables' end sleeves,
- Wire trippers and
- Cable rippers.



Figure 2: Equipment used for the installation of charging station

## **POSSIBLE CHARGING STATION PLACEMENTS**

The placement of charging station into its environment must allow easy access to all electric vehicles for which the station is intended. The charging station can be installed on the pavement, parking lot, in a parking garage or elsewhere, considering the specific conditions of each of these placements. In all these placement options, the station can also be installed together with the safety arches.

Due to the station's service doors opening outwards, the space in front of the station (approximately 50 cm) needs to be free of any obstacles to enable simple charging. Safety arches (or car park barriers or bollards) can be used to prevent direct contact of vehicles with the charging station.

### **STREET (PAVEMENT) PLACING**

The charging station must be placed so that it does not interfere with pedestrian mobility while providing EV charging services. When certain interference is unavoidable, the placement of the station should prioritise pedestrian safety and minimise the risks of tripping over charging cables or suffering collisions with the station. The charging station should be placed as close to the roadside curb as possible.

When the charging station is combined with safety arches, these need to be placed as close to the roadside curb as possible, while the station is moved further back from the roadside so that its back edge is aligned with the front side of the rear arches of the safety arches. The safety arches should be mounted at least 15 cm away from both sides of the station.

### **PARKING LOT PLACEMENT**

#### Single station

A single charging station is usually placed on one of the sides of the parking lot. The station must be placed in a way to enable simple and practical charging of electric vehicle.

It is recommended to install safety arches to prevent any collisions with the station while parking the vehicle. Safety arches should be placed as close to the curb as possible, and the back edge of the station should be aligned with the front side of the rear poles of the safety arches. The safety arches must be mounted at least 15 cm away from both sides of the charging station to simplify any maintenance. If several charging stations are installed on the same parking lot, the stations should optimally cover specific individual parking spots.

#### A pair of stations

Back-to-back placing of two charging stations can be used to place together two charging stations, usually in the central position of the parking lot. It is strongly recommended to add safety arches to this

placement. In this case, both charging stations can be mounted on the same installation pole within one pair of safety arches.

### **PARKING GARAGE PLACEMENT**

In the parking garage placement, the specific installation of supply cables needs to be considered. The cables are routed to the charging station from the bottom or from the top. In case of clustering of larger number of charging stations, considerations about the needed cables cross-section must be made.

### **POSSIBLE PARKING ARRANGEMENTS**

It is recommended that each INCH charging station to have dedicated parking spot.

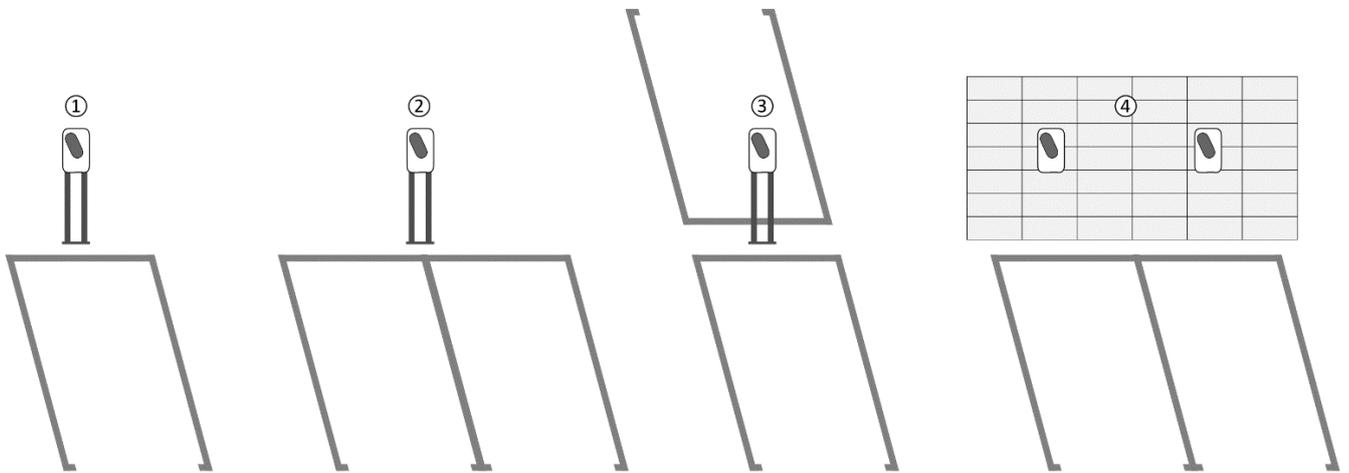


Figure 3: Possible parking arrangements

1: Common arrangement, installation on pole with dedicated parking place. 2 and 3: Although possible, arrangement of two parking spots per one INCH charging station is not recommended. 4: Common arrangement, installation on wall with dedicated parking places.

Charging station INCH can be equipped with cable or with socket. If it is equipped with a socket, users need to have their own cable. Standard cable length of 2.5 m should be taken into consideration when determining correct placement of charging station and parking space.

Both options (for the charging cable to be plugged at either the front or the rear end of the vehicle) should be considered. Each charging station can serve more than one parking spaces, however only one vehicle can charge at the same time.

### **RECOMMENDATIONS**

Use street signs or special marking to designate special EV parking places, which should be easily distinguishable from conventional parking places.

When the national or municipal decrees do not determine otherwise, the parking spaces should be marked by a symbol denoting an electric vehicle, together with an explanatory sign that the parking space is reserved for electric vehicles only. The parking regime should be monitored to prevent other vehicles (with internal combustion engines) from parking on special EV parking places.

Barriers can be installed between the station and the parking place to ensure extra protection. It is also recommended to install safety arches, which can be supplied as an additional option.

The arrangement of parking places should be planned in a way to ensure simple use of the charging cable. Since there is yet no standard placement of the charging connector on the EV (it is usually placed either at the front or on one of the rear corners of the vehicle), each of these options must be considered. The user must be able to reach any of these positions with a standard-length charging cable.

Provide a secure environment for EV users and prevent vandalism or theft:

- Install the station in a location where it can be clearly seen and easily monitored.
- Consider maintaining a 24-hour security control of the station (from the charging infrastructure Control centre).
- Install sufficient lighting in the vicinity of the charging station to ensure better safety and improved user experience.
- Allow charging only for identified users. This means that only users who identify themselves with their RFID card (or via SMS messages where applicable) can use the charging station.
- Electrical work should be carried out by a professionally qualified person.
- Electrical installation must be performed in accordance with local laws and safety regulations. The diameter of the electrical conductor depends on its length, method of installation, etc. Up to 5 x 10 mm<sup>2</sup> cables can be used directly. This must be determined by the contractor.

## **GRID CONNECTION**

The charging station can be connected directly to the electricity distribution network or to an existing electrical installation nearby.

The following supply power is required:

- **22 kW (32 A):** three-phase charging spots with cable or with socket. The maximum charging current is 32 A per phase.

Supply cables must be dimensioned appropriately. Charging power can be limited in the settings of the charging station between 6 A and 32 A.

In the execution phase of the grid connection project, the following requirements need to be met:

- Selectivity of the functioning of protection devices needs to be ensured:
  - The main overcurrent protection should be at least one class greater than the one used for the protection of the charging station or have a higher delay.
  - Differential protection (RCD) which is used in the charging station operates at a low current ( $\Delta I$  30 mA, without delay). The selectivity of this protection on the level of facility is achieved with a higher delay or a greater current differential.
- Five wires are routed to the station, including three phase wires, grounding wire, and the neutral wire (when connecting to an existing installation). For single phase connection (slow charging option), only one phase wire with sufficient diameter can be routed to the station, together with neutral and earthing conductor. Dimensioning of the wires is determined in the project documentation. Grounding wire must be connected to the main grounding busbar.

## **CONNECTION TO THE STATION OPERATOR'S COMMUNICATION NETWORK**

The charging station uses network connection to communicate with the Control centre in order to cyclically send information about its status, perform identification of users (on the Control centre level), forward events that occur during its operation and execute billing for the services performed.

The connection also enables communication from the Control centre towards the charging station, which enables remote access to the station for needs of maintenance or remote control.

The charging station could require a connection to the station operator's WAN network (charging infrastructure control centre). To access the WAN network via an internet connection, some additional security requirements need to be observed.

Network connection can be executed in several different ways:

- Direct connection to the station operator's WAN network. Connection can be established directly with a UTP cable or a fibre optic converter.
- Wireless connection. The station connects to an existing 2G/3G/4G mobile network with an GPRS/UMTS router built into the station.

## 2

**CONSTRUCTION WORKS****UNDERGROUND ANCHOR**

The underground anchoring structure is built into concrete foundation and is made of stainless steel. The preparation of the foundation depends on the structure of the ground on the designated location. The underground anchoring structure can be combined with reinforcing steel.

The self-standing charging station set contains an underground anchoring element which has a double function:

- It supports the weight of the charging station.
- It prevents tilting of the charging station.

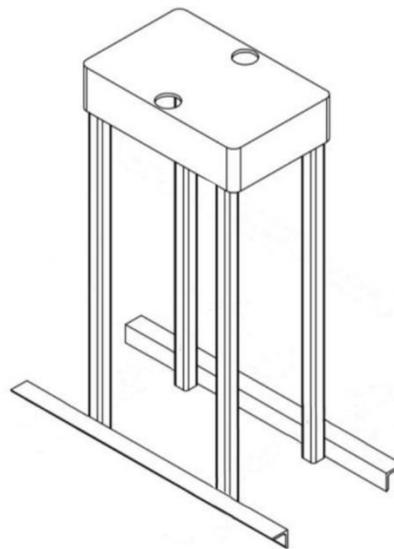


Figure 4: Assembled underground anchoring element

Dimensions of the underground anchoring system:

- Width: 345 mm,
- Length: 410 mm,
- Basic depth without reinforcing steel and concrete base: 504 mm.

The frame enables concreting of the foundation to its final height and placement of finishing tiles or paving stones on the surface surrounding the charging station.

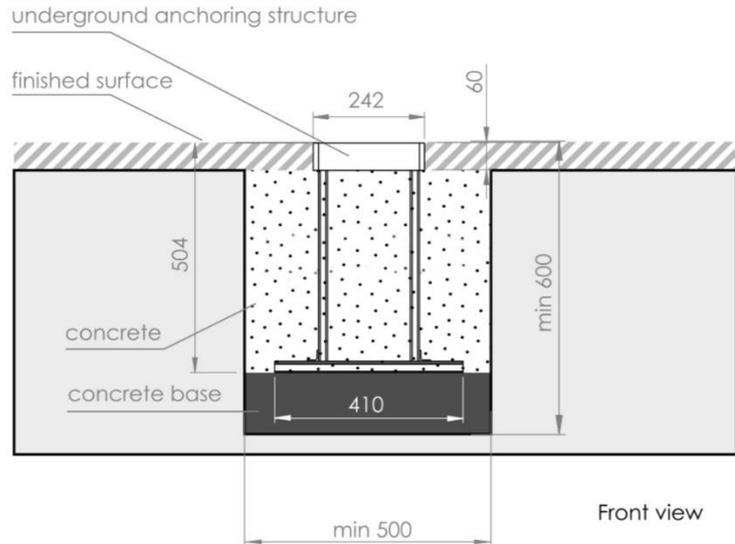
The upper plate of the foundation has an opening for the insertion of supply cables. During installation, a pipe with a sufficient bending radius is placed into the foundation.

The pipe is later used for the insertion and connection of supply cables. The installation pole designed for two units allow the connection with two separate pipes.

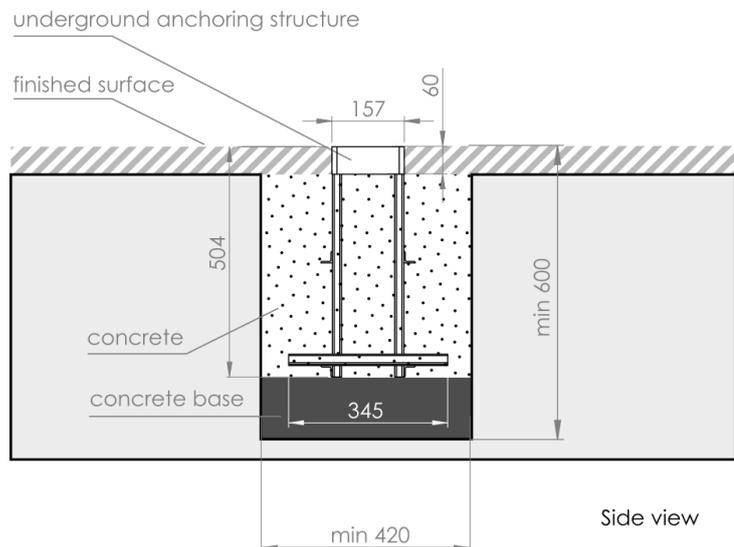
## **EXCAVATION**

The first step of the construction work is to prepare an excavation with the minimum basic dimensions of 500 mm x 420 mm and at least 600 mm in depth. If the charging station is combined with safety arches, a larger excavation is needed.

If necessary, the dimensions of the foundation can be enlarged by adding reinforcing steel to the concrete foundation to enable construction of a larger foundation.



**Figure 5: Basic excavation - longitudinal section**



**Figure 6: Basic excavation - transversal section**

The two figures above show a longitudinal and transversal section of the basic excavation, together with the dimensions of the underground anchoring element which is concreted into the foundation. The basic excavation is suitable for installation of charging station without safety arches.

One of the requirements of basic installation is to carefully observe that the height of the upper edge of foundation is precisely aligned with the height of surface finish in the area around the charging station.

## **CONSTRUCTION OF THE FOUNDATION**

For construction of foundation and placement of anchoring structure into concrete follow these steps:

**Important:** Make sure that the anchoring structure is completely inserted, that is in horizontal position and that the part with holes is oriented towards the sky.

**Important:** When inserting the anchoring structure be sure that the orientation is appropriate depending on how you want your charging station turned.

1. According to the alignment of the power cable, the location of the installation pipe is determined. The pipe is placed into the foundation and used to connect the charging station to the network. It is recommended that the installation pipe ends over the foundation and not beneath the foundation. The bending radius of the power cables must be considered when placing the installation pipe. The dimension of the pipe depends on the number and diameter of power cables which will be inserted. In the case of clustering of charging stations in the same area, it must be considered that two power cables will be inserted into the installation pipe. The size of the opening at the top of foundation enables the installation of two installation pipes that are used when the clustering of charging stations is executed.
2. The concrete base is placed into the construction pit to the level that enables the top of the underground anchoring element to reach the desired final height. The final height in this case is the level of surface finish after completed works (for example the top level of paving stones, tiles, or curb). The concrete base is levelled so that the anchoring element can be vertically aligned. It is of utmost importance that the anchoring element is aligned very precisely. Lean concrete mix should be used for the concrete base (with less cement than water).
3. The installation pipe is inserted through the opening of the underground foundation anchor and attached with a wire to prevent it from slipping into the foundation during concrete works. The installation pipe, which has been cut to its final length, must be clogged on both ends with paper or similar material, so that the concrete cannot enter the pipe.
4. The concrete works can be started at this point. First the area around the installation pipe is concreted, where the pipe must remain accessible after the concrete works are finished.
5. Once the concrete reaches the level of the frame, the concrete works continue through the upper opening of the underground anchoring element, where the installation pipe is placed. The entire space inside the frame must be filled with concrete. In the case of low temperatures, the concrete must contain anti-icing additives.
6. The next step is precise levelling of the foundation and the concrete around the frame, where the finishing tiles will be placed. Precise

levelling of the underground anchoring element is important for later installation of the charging station. After the construction of the foundation is finished, the charging station can be aligned only with the use of washers, placed on the bolts of the underground anchoring element.

7. The concrete must be left to dry for at least 48 hours (two days) before the cables are inserted into the foundation and the charging station is installed on the foundation.

## **INSTALLATION OF SAFETY ARCHES**

The charging station manufacturer supplies optional safety arches:

- Safety arches prevent mechanical damage to the charging station which may result from collisions with vehicles.

The manufacturer normally supplies a set of safety arches (2 pieces), which are installed at both sides of the charging station.

If safety arches are added to the charging station, the foundation needs to be prepared in advance, to add the safety arches to the same foundation as for the underground anchor.

## **EXCAVATION AND FOUNDATION CONSTRUCTION FOR SAFETY ARCHES**

When safety arches are installed together with the charging station, the contractor must prepare the foundation accordingly. Safety arches are placed in the same foundation together with the charging station. If safety arches are added to the charging station, the foundation needs to be enlarged accordingly (as presented on the figures below).

There are several guidelines that need to be observed when installing safety arches:

- The safety arches protect the front side of the charging station; therefore, the arch must be aligned with the rear side of the station (underground anchoring structure).
- The safety arches on the left and right side of the charging station must be placed at a distance at least 10 cm from the station,
- The height of the installed arches is 70 cm above the final level of the foundation.

If the charging station is located on the pavement, the two front ends of the safety arches on one side must be installed at the edge of the roadside curb and the charging station must be placed away from the roadside curb so that its rear end is aligned with the two rear ends of the safety arches.

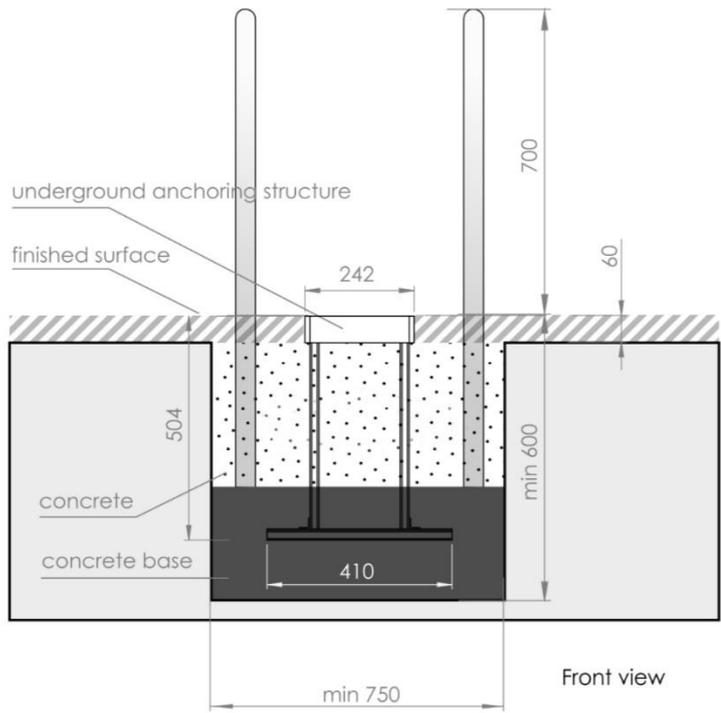


Figure 7: Longitudinal section of the excavation with safety railings

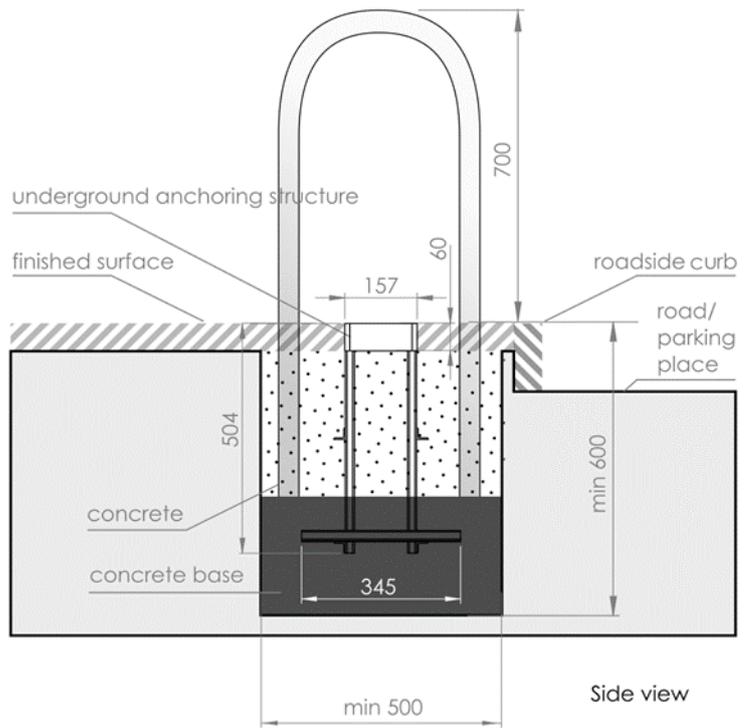


Figure 8: Transversal section of the excavation and safety railings on the curb

# 3

## INSTALLATION

### INSTALLATION OF THE POLE ON THE FOUNDATION

In the case when charging station will be installed on the pole, there is no need to drill any holes to insert the bracket as it comes already installed on the column. But the underground anchoring structure needs to be prepared.

After the foundation with the built-in anchoring structure and installation pipe is constructed, the charging station installation pole can be installed on the foundation.

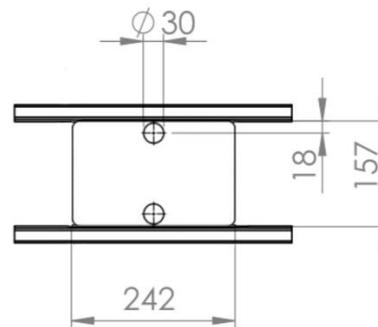


Figure 9: Upper view of the anchoring structure

The figure above shows the upper plate of the underground anchoring structure, together with its dimensions. The installation pole for INCH charging station(s) is fixed to the bolts on the underground anchoring structure. A ring spanner is used to fix the station to the foundation. The pole has at the strategically located height weakened structure. This allows pole to break at that specific point in case a car hit it. A pole already has drilled holes where mounting bracket can be attached and secured with bolts.

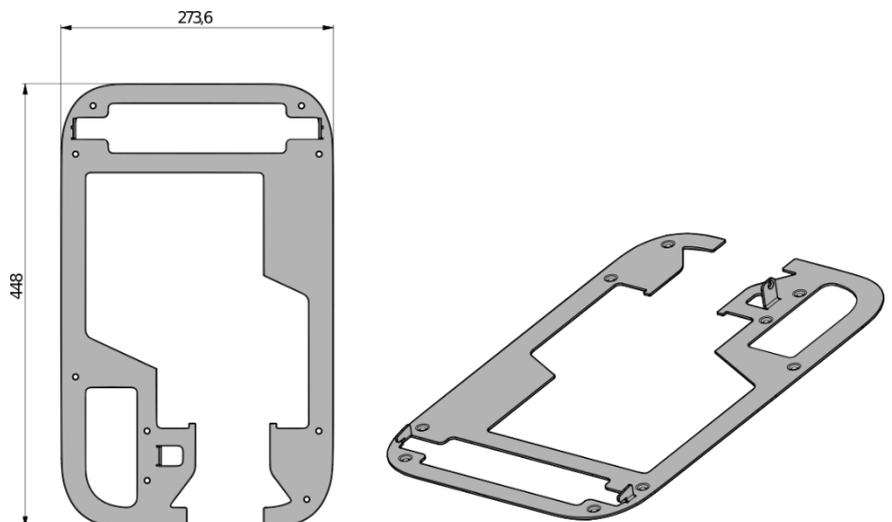


Figure 10: Dimensions of the wall mounting bracket

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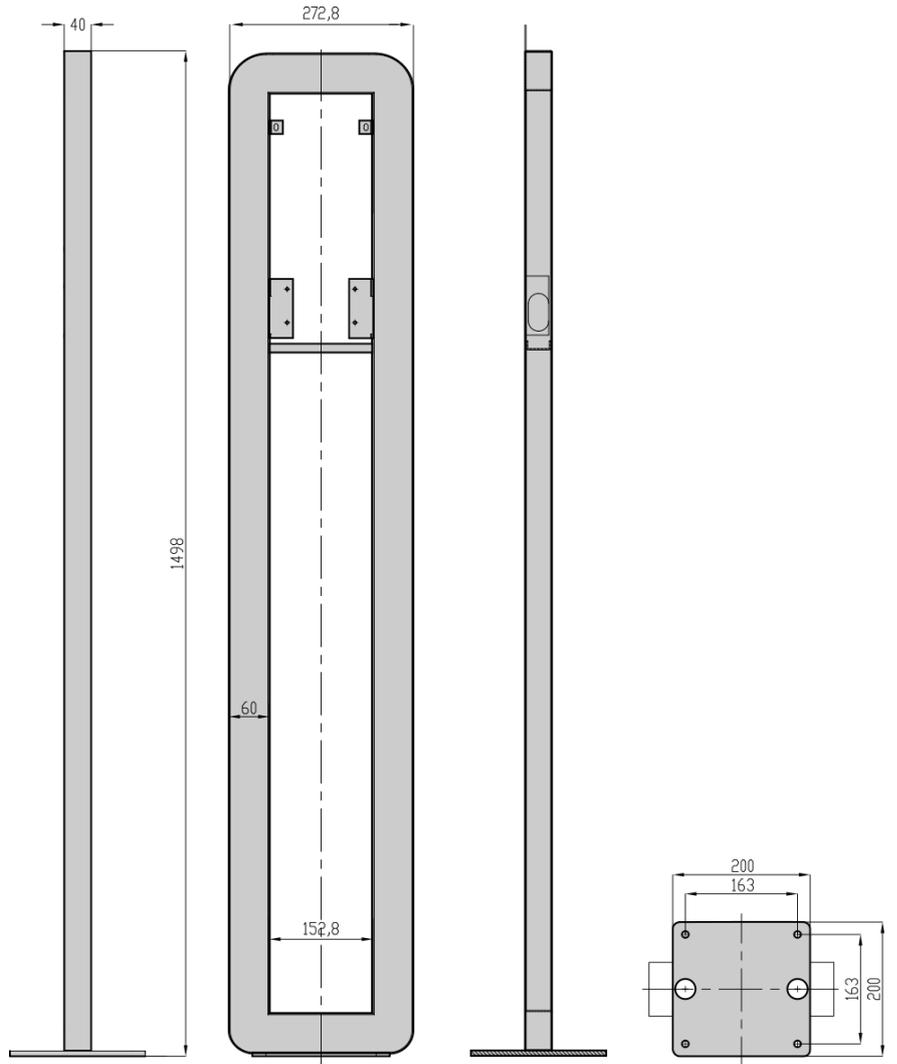


Figure 11: INCH mounting pole



Figure 12: Completely covered hole after the installation on the pole



Figure 13: Column hole on the base of standing pole where cables can be inserted from anchoring structure



Figure 14: Exit cable hole located behind the position where the charging station will be attached to the standing pole



Figure 15: Cables pulled from the top of anchoring structure and through the column hole in the bottom

When pulling the cables through the column you can help yourself using the cable and duct tape to lead the power supply and UTP cables.

Once the cable is through the hole you can start managing the cable (removing cable jack, insulation, adding the ferrules...) like it is shown on the following figures.



Figure 16: Pulling the cable through the column with leading cable and duct-tape.



Figure 17: Procedure of pulling the cables through the hole.



Figure 18: Standing pole with the hole on the horizontal plate where charging cable goes. This kind of pole is used for charging station with installed charging cable.



Figure 19: Charging station standing pole with wall mounting bracket attached.

After the installation of the charging station on the standing pole is finished no cables will be visible and the hole at the bottom of the charging station will be completely covered due to the specific design of the pole.



Figure 20: Charging station on the self-standing pole after the installation

## **INSTALLATION ON A WALL**

### **CABLES ROUTED TO THE BACK OF THE STATION THROUGH THE WALL**

When installing the wall mounting bracket cable location behind the wall needs to be known and hole drilled where cable will be routed into the charging station. Hole should be located on the right bottom side of the mounting bracket. Measurements of the hole should be sufficient to allow manipulation with cables and their installation inside the charging station.

### **CABLES ROUTED TO THE BACK OF THE STATION FROM ABOVE**

When the cables are connected from the top before the mounting bracket is installed four wall spacers need to be attached to the mounting bracket. Wall spacers will allow the cable to come from the top and behind the mounting bracket from where they will be inserted into the charging station.

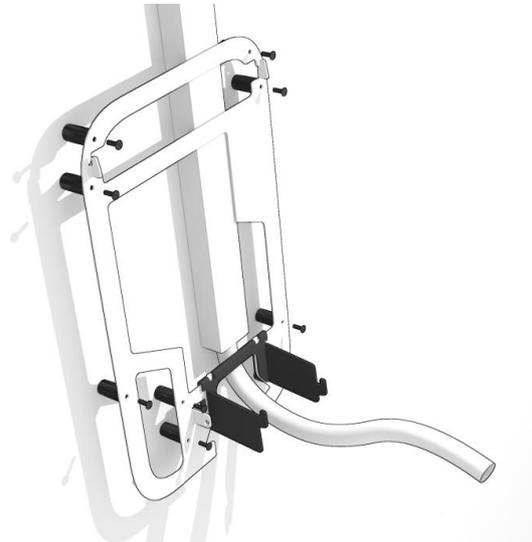


Figure 21: Mounting bracket installed on the wall spacers

### **CABLES ROUTED TO THE BACK OF THE STATION FROM THE GROUND**

Cables are routed to the bottom of the station through a cable duct/raceway. The cable raceway must be positioned so that it leads directly to the black round rubber seal at the bottom edge in the middle of the station.

To correctly position the cable raceway, it should be fixed only after the mounting bracket is installed and the station is attached to the hooks. Max dimensions of cable raceway should be: height 6 cm and width 2.5 cm. This will allow cable raceway to fit at the back of the charging station.



Figure 22: Wall mounting bracket installed on mounting pole with temporarily attached installation holder

## **INSTALLATION OF WALL MOUNTING BRACKET**

Users have two possibilities how to mount the charging station. In the first option charging station is mounted to the wall. In the second option, mounting pole is used that comes with already attached bracket. In both options the charging station is mounted to “wall mounting bracket”.

Wall used for mounting the charging station must be able to support 12 kg of extra weight. Installation of mounting bracket can be possible on many types of walls: Wooden, Knauf, concrete ...

When installing the charging station on the wall serviceman must consider measurements of the station that are 45x27x13.5 cm, additionally to that dimensions extra space around the station must be available for installation purposes and later for maintenance.

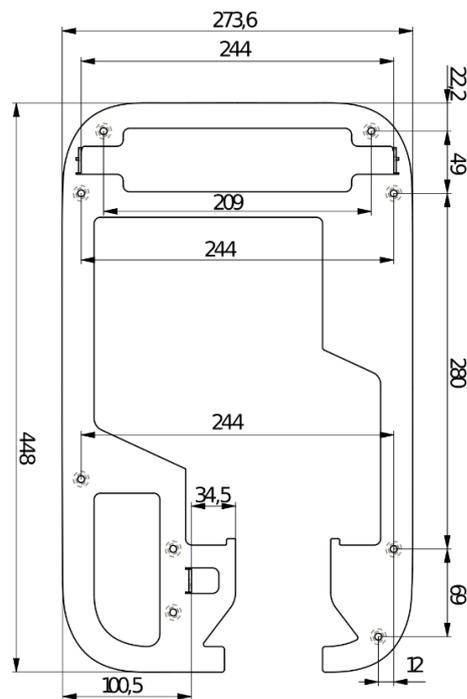


Figure 23: Positions of drilling holes of the wall mounting bracket

At the top, on the left side and at the bottom of the station at least 10 cm of space needs to be kept free to simplify later maintenance. On the right side where the maintenance door is located at least 40 cm of room needs to be available to allow serviceman to open the door and access the charging station insides to conduct maintenance.

1. Measure and mark the final mounting height on the selected location of the installation. Height of the wall mounting bracket bottom should be around 100 - 120 cm from the ground.
  - a. When considering the height and location of the charging station keep in mind if the cables come from the other side of the wall into the charging station, hole needs to be drilled where cable will be routed into the charging station.

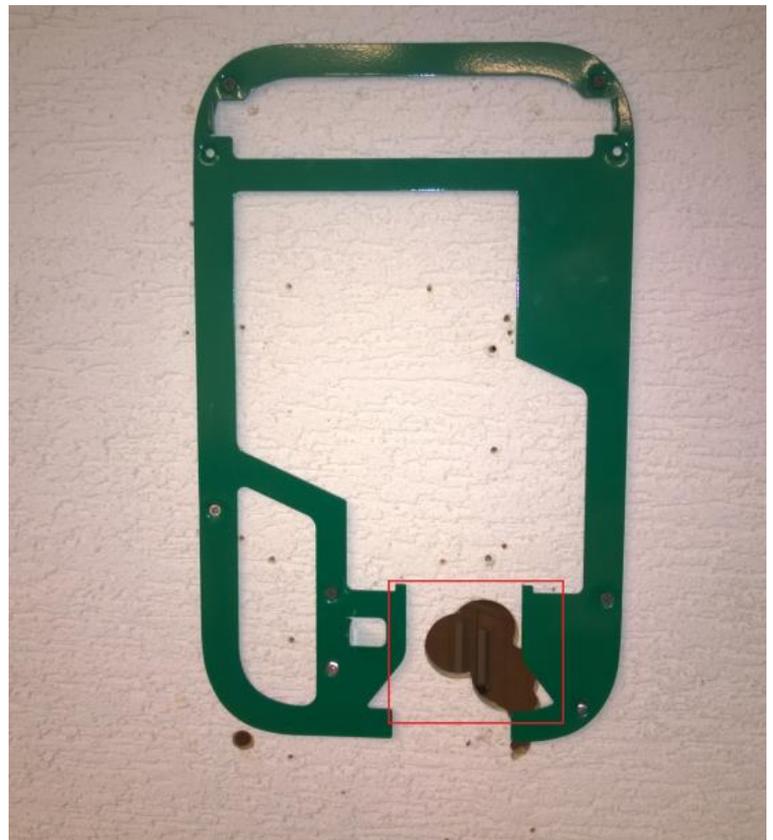


Figure 24: Location of the hole when the cable comes from the other side of the wall

**Important:** In some cases for example when the mounting bracket is secured to the soft insulation e.g. Styrofoam special wall plugs are needed.

Hole should be located on the right bottom side of the mounting bracket. Area for hole is drawn on the picture with the red square. Hole should be big enough so that you can put the cables through it and that you can easily manage them.

2. Press the mounting bracket against the wall and mark the places where holes need to be drilled to insert the anchors and screws. If cables are routed through the wall, make sure that the electrical box has been installed at the right location before installing the mounting bracket. On the picture below screws location is shown with the red circles.

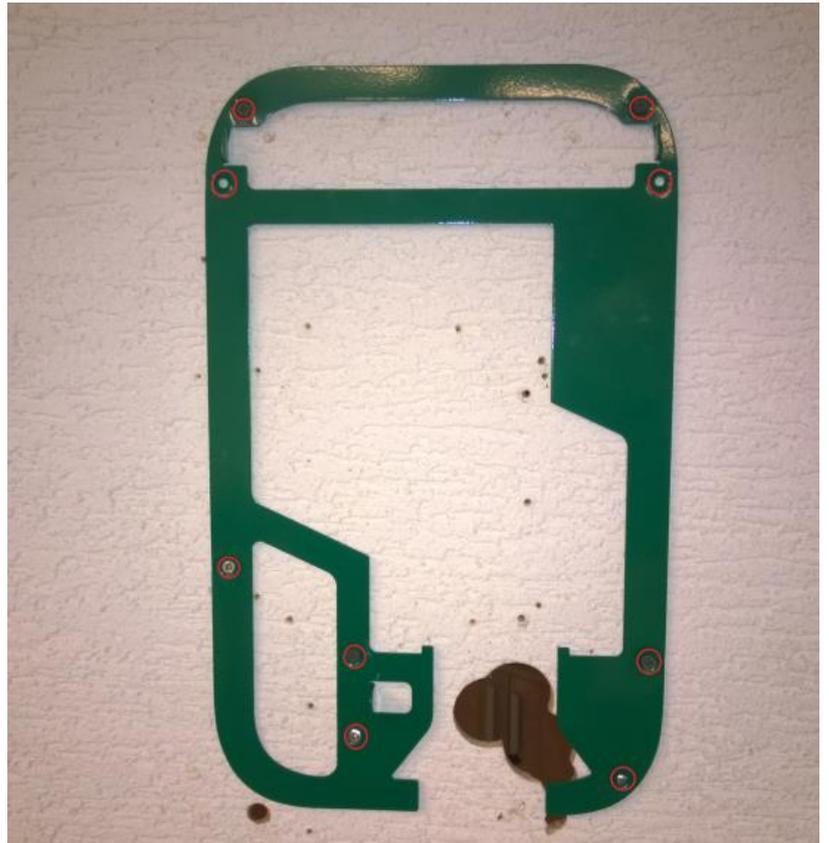


Figure 25: Location of screws where the holes need to be made in the wall

3. Drill 9 holes and insert the anchor screws in each hole.
4. Align the bracket with the drilled holes and insert the screws to attach the mounting bracket to the wall in its final position.
5. Before you fasten the screws attach the installation holder. It is very hard to attach it later when the bracket is already secured to the wall with screws. Removing it after the installation is easy due to the design of the holder.



Figure 26: Frontside view of the installation holder

6. Fasten the screws so that the wall mounting bracket is secured to the wall.



Figure 27: Bracket fasten on to the wall with the installation holder in its place

## **INSTALLATION OF WALL MOUNTING BRACKET ON A NARROW POLE**

Installation on a surface that is narrower than the wall mounting bracket requires additional consideration and material. The solution is to prepare an adapter plate that will be used to install mounting bracket.

The exact dimensions are dependent on the installation, e.g., what kind of wall is being used is important in decision if the support is adequate, and on determining the number and the position of holes to be drilled in the mounting surface and what kind of screws should be used.

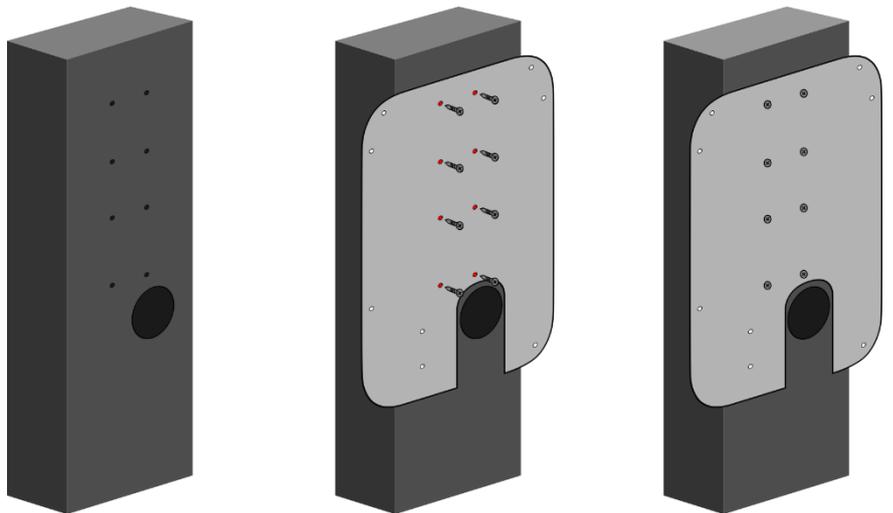


Figure 28: Possible mounting of adapter plate for installation of mounting bracket

The presented middle holes are meant for mounting of the adapter plate to the surface (narrow pole or wall). It is important that the position of screws does not obstruct the alignment of the mounting bracket is connected to the adapter plate.

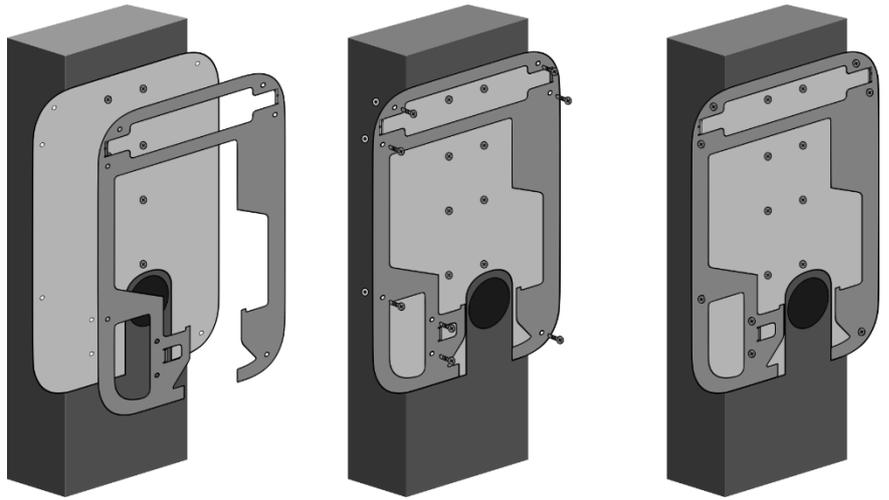


Figure 29: Possible mounting of the mounting bracket to the adapter plate

Information of dimensions presented below is only a guidance on how to construct adapter plate that is specific to location in cases where it is needed.

The final position of holes should be confirmed in comparison with mounting bracket and enough tolerance should be included to enable rigid connection without bending of any of the elements.

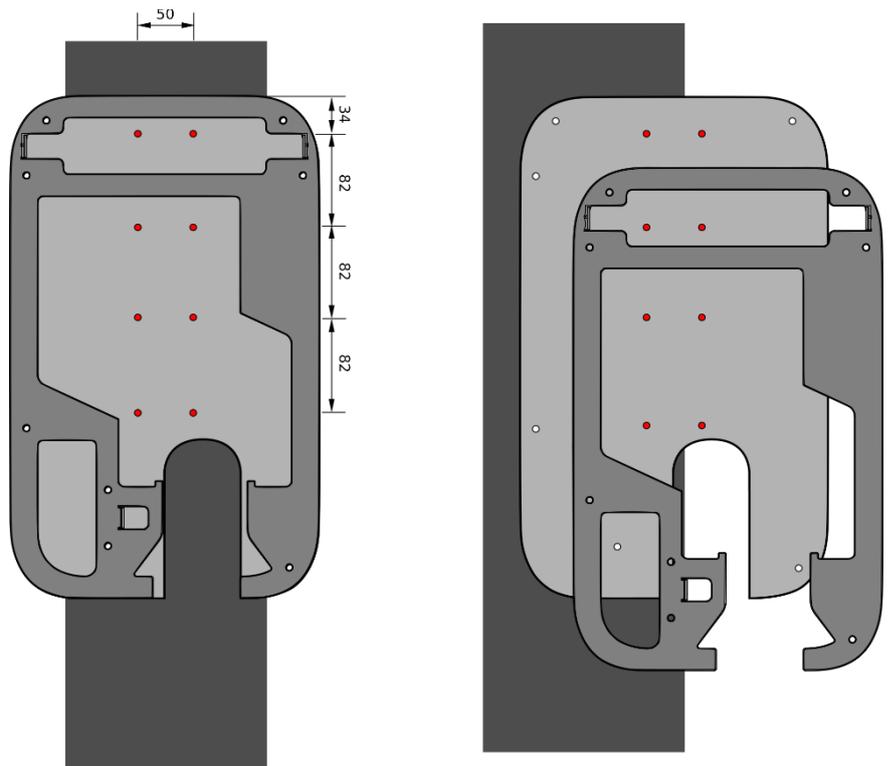


Figure 30: Possible locations of holes to screw the adapter plate to the surface

# 4

## CABLE MANAGEMENT

Before the mounting bracket is secured to the wall or the pole it is vital to consider from which direction cables will be routed into the charging station as every option need some sort of a variation with the installation of the mounting bracket.

### INSERTION OF CABLES THROUGH THE INSTALLATION PIPE

After the installation pipe is built into the concrete foundation, it is used for cabling and connection of the charging station. The concrete foundation must be left to dry for at least two days before the cables can be inserted in the installation pipe.

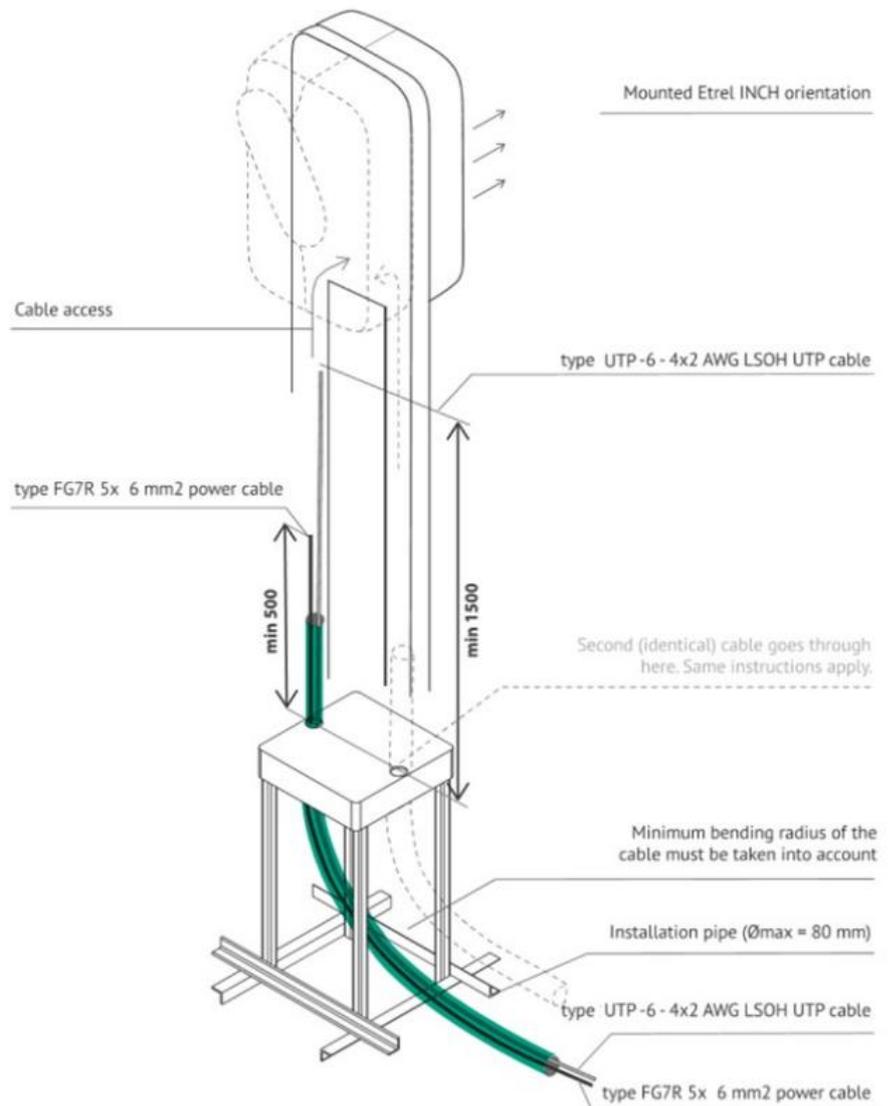


Figure 31: Placing of installation pipe and insertion of cables.

Supply cables are routed through the underground anchoring structure with the use of the installation pipe as shown in the previous figure. The exact way of routing the cables depends on the type of the cables used and their diameter (which is determined in the electrical installation project documentation). When dealing with cables with larger diameters, their bending radius must be considered.

Appropriate length of cables must reach through the upper opening for later connection of the charging station (around 40 cm).

## **PREPARATION OF CABLES**

Connection of cables can be done once the mounting bracket is securely fastened either on the wall or on the pole and the charging station installation holder is attached to the bracket.

1. Pull the power supply cable through the drilled hole in the wall if the cables are located on the other side of the wall. If cables are connected to the charging station from above or below make sure that they are long enough.
  - Main cable length available for the installation should be around 40 cm.

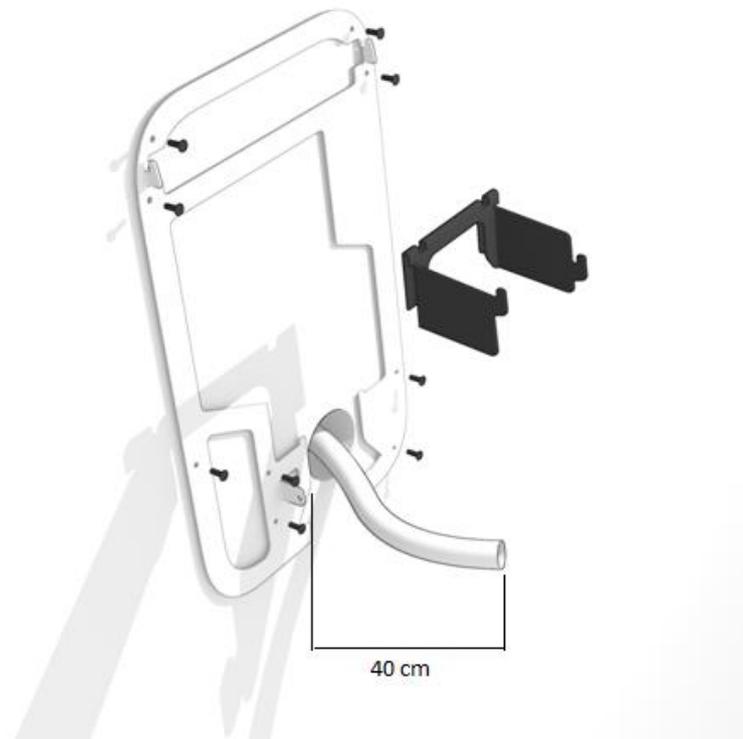


Figure 32: Available length of the main cable

2. On the backside of the charging station unscrew the screws and remove the green cover of the maintenance space to access the maintenance space.

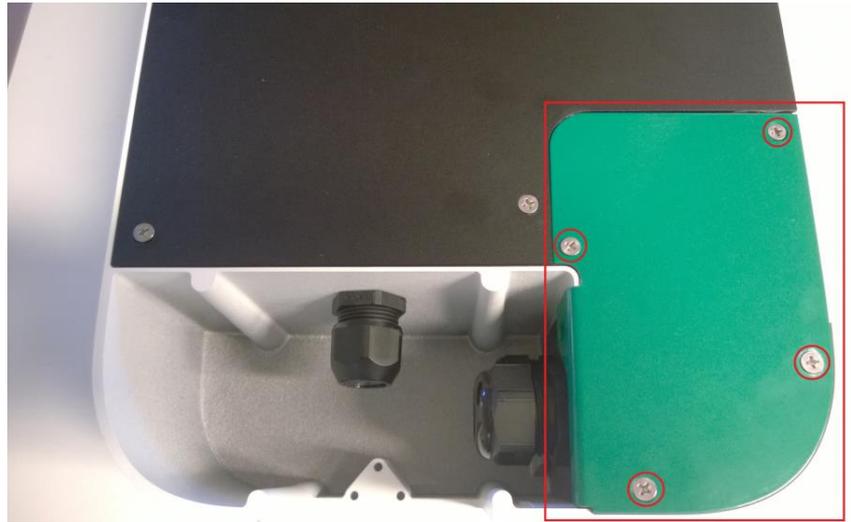


Figure 33: Screws located on the green back maintenance cover

**Important:** Key to unlock the key-lock comes with the charging station.

3. Remove the maintenance doors on the side either using hex key or regular key if the enclosure came with the keyhole.



Figure 34: Doors with keylock



Figure 35: Doors with hex screw

4. After the removal of the green back-maintenance cover un-tighten the screws on the plate with cable glands and remove the plate.

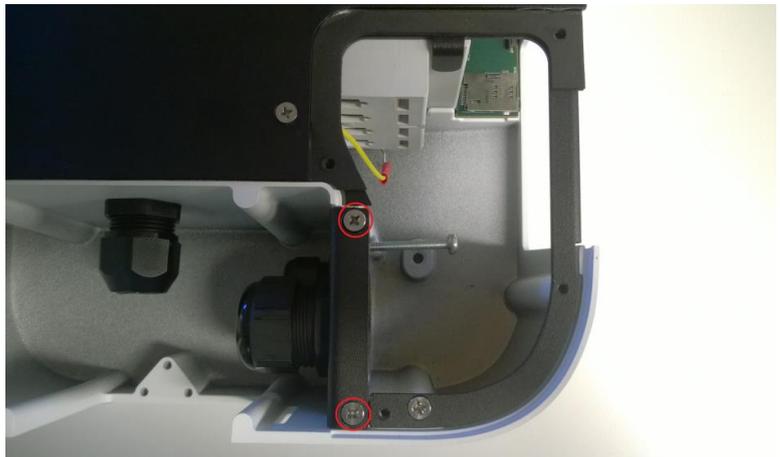


Figure 36: Screws on the cable gland plate

**Important:** Diameter of gland rubbers are 1.5 cm for the tighter of the rubbers and 2.1 cm for the looser one.



Figure 37: Cable gland plate

Bigger cable gland is meant for power supply cables and smaller for the ethernet cable. As is seen from the picture above smaller gland has a plug inside and should be removed if the ethernet UTP cable is used to connect to LAN. Plug is used so that in case when ethernet UTP cable is not used the gland remains closed and prevents water build-up inside the charging station. Inside each gland there is a rubber that makes sure cables are tightly secured inside the gland, that they cannot be removed, and that any liquid or small dust particles cannot enter the charging station interior.

5. In the bigger gland you should make sure that the rubber inside is of correct size. For cable's dimensions of up to 5x6 mm<sup>2</sup> use the tighter rubber which should be already inside the gland by default. For the cables with the 5x10 mm<sup>2</sup> use looser rubber.
  - Diameters of gland rubbers are: 1.5 cm for the tighter and 2.1 cm for the looser one.



Figure 38: Rubbers in cable gland

6. The rubber can be changed after the removal of the gland plastic top (it need to be unscrewed) and by simply pushing the rubber out of the gland. After the new rubber is inserted into the gland screw the plastic gland top back on.
7. Proceed with the preparation of cables. First the cable jacket of power supply cables needs to be removed. Around 15 cm should be

**Important:** Inserting cables through the gland is easier by loosening the gland screw cap by turning it counter-clockwise.

removed so that the wires lengths are sufficient to connect them to the elements inside the charging station.

8. Pull the power supply cable through the gland. About 15 cm of power supply cable should be pulled to the other side of the gland. About 2 cm of cable jackets should be put through the cable gland as well. This will make cable manipulations inside the charging station easier.

The gland can be tightened by turning the plastic gland top in clockwise direction. Make sure that the cable is fastened securely with the gland so that it cannot be pulled out.

9. Length of the cables with skinned cable jacket and with isolation still on, through the gland should be:
  - All phase cables and neutral: 12 cm
  - Protective earthing cable: 9 cm
  - Ethernet cable: 17 cm

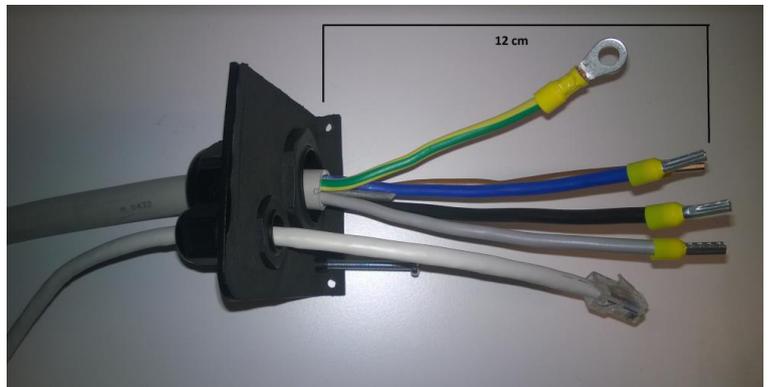


Figure 39: Power supply cable pulled through the plastic gland – side view



Figure 40: Power supply cable pulled through the gland – front view

10. Protective earthing conductor should be around 5 cm shorter in comparison to other conductors. Make sure you shorten it and after that remove the insulation from all the conductors using special insulation stripping pliers.

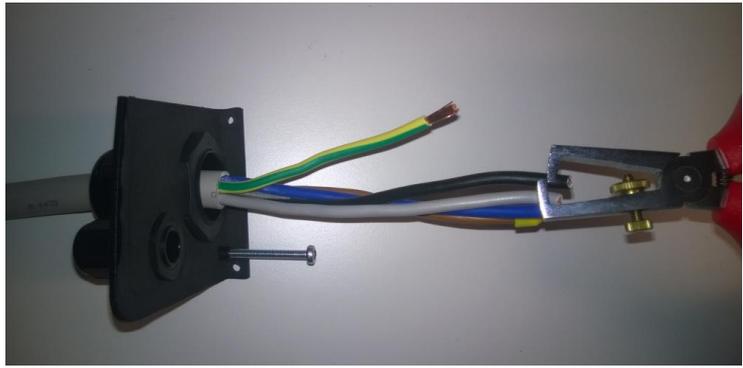


Figure 41: Removing the insulation of the conductors

11. Once all the conductors are stripped of insulation attach ferrules on the end of the cables so that conductor can be connected to the main connection element (which is either RCD, or overcurrent protection, or MID meter). Squeeze the ferrules with the pliers.



Figure 42: Cable ferrule for phase conductors and neutral



Figure 43: Cable ferrule for the protective earthing conductor

**Important:** Make sure that cables are inserted in correct cable glands.



Figure 44: Squeezing the ferrules of the wiring

12. Now that the power supply cables are ready, prepare the ethernet UTP cable in the same manner. First step is to remove the UTP gland filler. Filler is part of the gland rubber. The filler can simply be pushed out of the gland after the gland cap is removed by unscrewing it in counter-clockwise direction. Insert the rubber back into the gland as it will likely come out together with the filler.



Figure 45: UTP gland rubber with filler



Figure 46: Removed filler from the gland rubber

13. Insert the UTP cable through the gland. About 20 cm of UTP cable should be put out of the gland.

**Important:** Make sure that each wire is in its own slot of the connector.

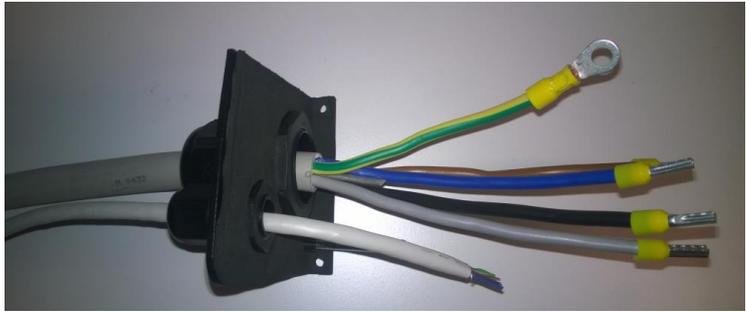


Figure 47: Ethernet cable with the removed cable jacket pulled through the UTP gland

14. After the cable is through the gland put the UTP plug on the UTP cable without cable jacket.

**Important:** UTP cable used should be UTP Category 6, 4x2 AWG LSOH.



Figure 48: UTP cable plug

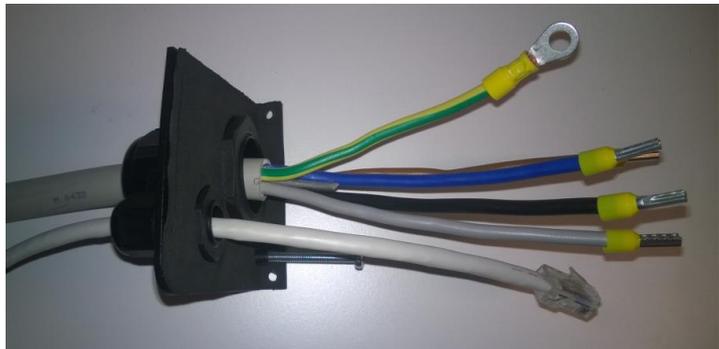


Figure 49: UTP cable with inserted connector

# 5

## MOUNTING OF THE CHARGING STATION AND INSTALLATION OF CABLES

Once the cables had been prepared the start of the installation of cables into the charging station can begin.

1. Mount the station on the holder that is already attached to the bracket from when you installed the bracket to the wall. The holder is strong enough to hold the charging station during the installation of cables.



Figure 50: Charging station mounted on the holder - front view



Figure 51: Charging station mounted on the holder - side view

2. Place the gland plate in its position so that the plate holes are in line with holes of the enclosure.
  - Make sure that cables are long enough so that they could be connected with appropriate connection.

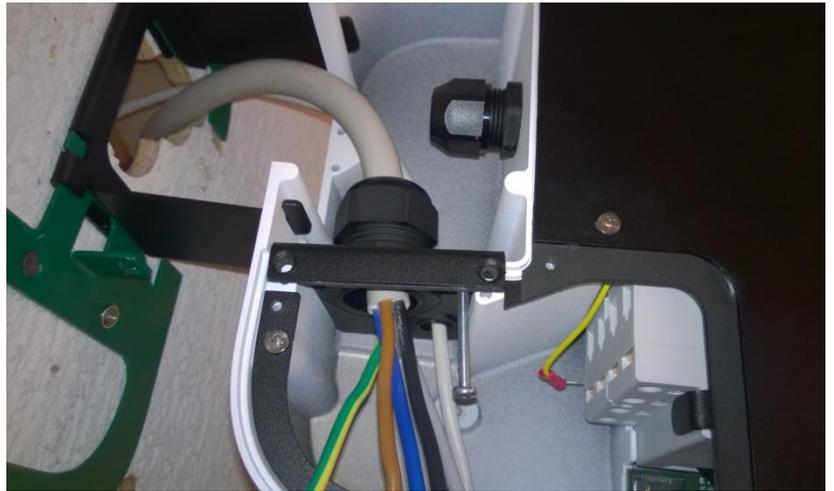


Figure 52: Cable gland plate inserted in the appropriate spot

3. Insert the screws in the cable gland plate holes and tighten them so that the cable gland plate is secured in its location. Use the regular cross screwdriver.

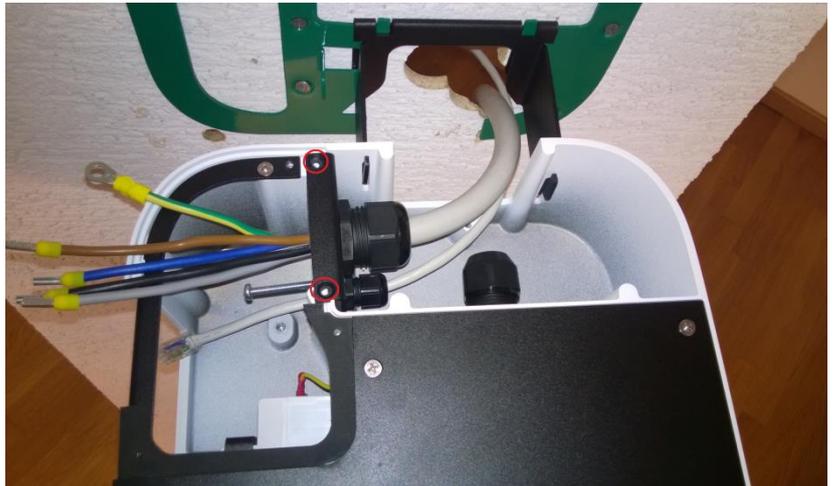


Figure 53: Red colour marks the holes where screws need to be inserted

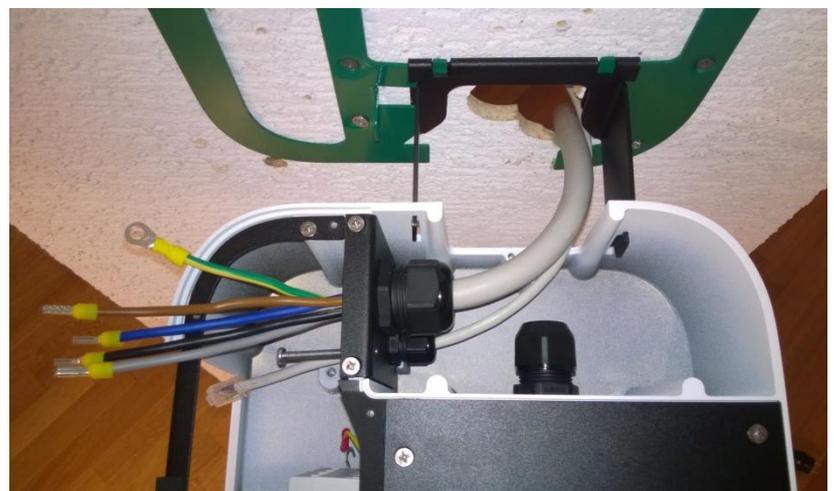


Figure 54: Screwed in screws that hold the cable gland plate in place

- Next action is to secure the earthing conductor to the enclosure to ground it. Ground conductor (yellow and green) should be secured with the screw in the hole that is part of the enclosure.



Figure 55: Ground wire secured to the enclosure using the screw

- Next step is to connect cables to connection element (RCD, MCB or MID meter). Connection of all the elements is practically the same. The only difference is that the RCD element needs additional protection wire. The procedure described below will be for RCD, but you can follow it also for other elements.
- There is a sticker on main connection element showing the correct designation of phases and neutral conductor. Remove the sticker and make sure that screws inside the RCD/MCB/MID in which conductors will be connected are unscrewed.



Figure 56: Check that the marked screws are unscrewed so that you can insert the conductors

7. Only for RCD element: Insert the additional protection wire to enable RCD trip into the fourth slot (Neutral) like it is shown on the figure below – the neutral slot is the closest to the enclosure.

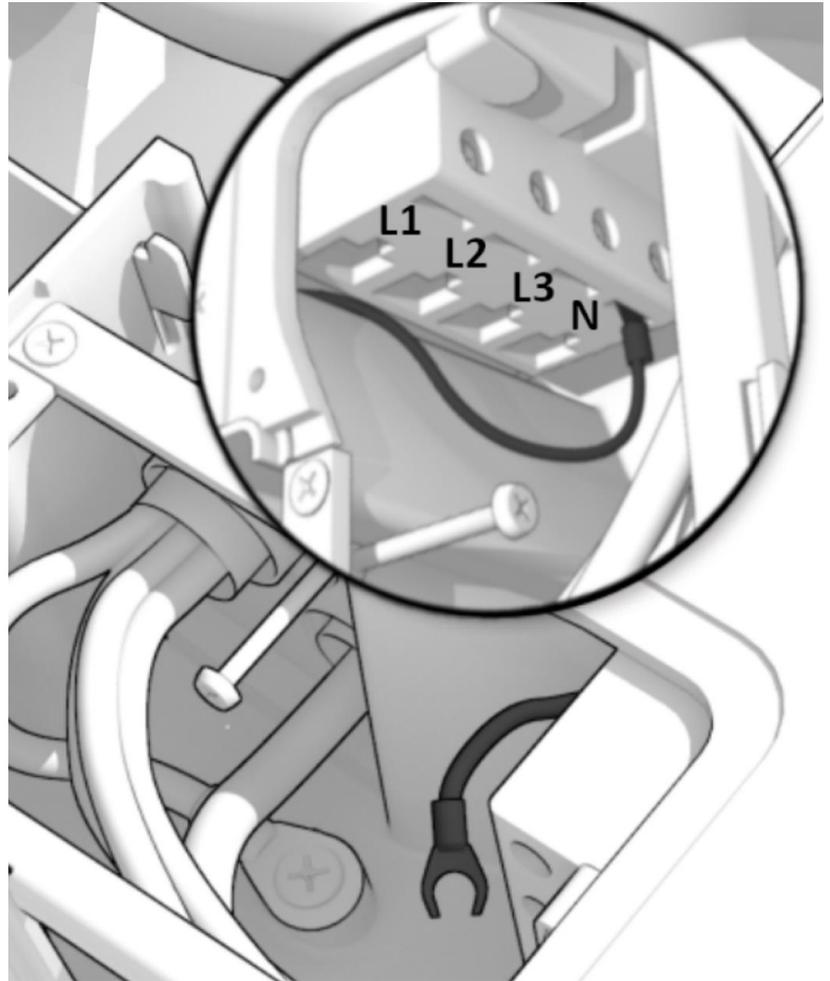


Figure 57: Protection to enable RCD trip inserted into the slot of neutral

8. Now insert all the wires into the RCD/overcurrent/MID unit. Order of the wires and how they are connected is important. In the top connector, which is phase one (L1) of the charging station, wire that will be used to charge one phase EVs should be connected. It is advisable that least loaded phase is used. The order of second and third phase is more important when charging station is part of the cluster. Bottom connector should be used to connect neutral wire (N).
9. After connecting the conductors, all the screws should be tightened so that the wires cannot be unplugged. Under IEC rules, correct order and colour of conductors is explained below.  
(In some countries the colour of the conductors can be different.)

### Three-phase connection

Phase 1: Brown, Phase 2: Black, Phase 3: Grey, Neutral: Blue.

The order should be followed from top down. At the top is Phase 1 (brown) conductor and the conductor closest to the enclosure is Neutral (blue).

The order of three phase conductors can be different in case of wiring of clusters. To provide better spread of the load across all three phases in case of charging of vehicles, that can only charge in single-phase, the conductors of individual charging stations can be switched while still retaining the phase sequence.

Possible options, wiring from top to bottom:

Charger 1: Phase 1 – Phase 2 – Phase 3 – Neutral

Charger 2: Phase 2 – Phase 3 – Phase 1 – Neutral

Charger 3: Phase 3 – Phase 1 – Phase 2 – Neutral

### Single phase connection

One of the phase conductors should be connected to first phase of the connection element (on top). The neutral (blue) should be connected at bottom, the closest position to the enclosure).

### Special single phase configuration case, MID meter with RCD

In case of a single-phase configuration of INCH, with single-phase MID meter and with single-phase RCD element, the power connection is made using the MID meter as indicated on the labels.

Phase conductor is inserted in the top slot (left side of the MID meter) and neutral conductor is inserted in the second slot of the MID meter (right side of the meter). In addition, the red wire needs to be inserted in the neutral pole of the RCD, at the bottom (right side of the RCD). This wire enables tripping of the RCD.

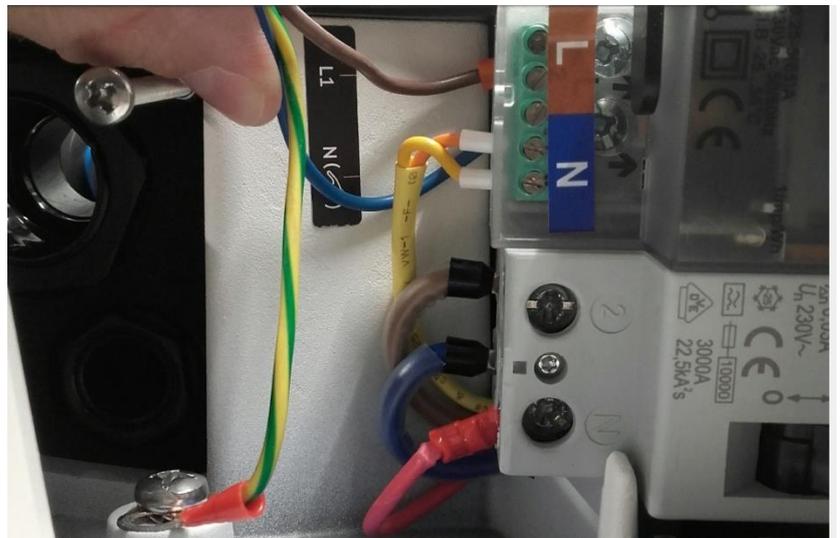


Figure 58: Protection to enable RCD trip inserted into the slot of neutral

10. Connect the ethernet UTP cable into an ethernet connector next to the connection element.



Figure 59: Ethernet UTP cable connected to the connector next to the protection element (RCD in this case)

11. Attach the green back-maintenance cover back onto the enclosure and use the screw to secure it to the location.



Figure 60: Side view of the reattached back maintenance door



Figure 61: Secure the green back-maintenance cover with screws

12. Remove the charging station off the installation holder and remove the holder from the mounting bracket. While doing this make sure you hold the charging station as it will not be supported by the holder anymore.



Figure 62: Charging station is removed from the holder



Figure 63: Installation holder is removed

13. If using charging station with cable for charging, cable holder must be attached when the charging station is removed from the station holder. There is not enough space available to do it while the charging station sits on top of the holder. To attach enclosure to the plate, align the cable holder holes with holes on the plate.

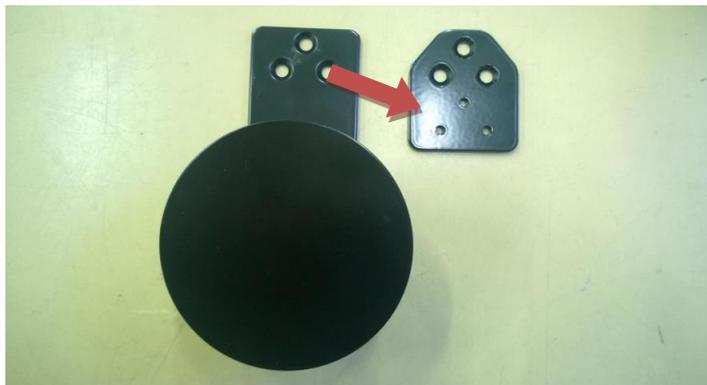


Figure 64: Cover the holes of the metal hook with the holes on the plate that is located on the enclosure as it is shown on the figure



Figure 65: Hook with circle on top of the plate that you can find located on the bottom of the enclosure



Figure 66: Installed metallic cable holder



Figure 67: Charging station with the installed small metal circle where magnetic cable hand can be attached to

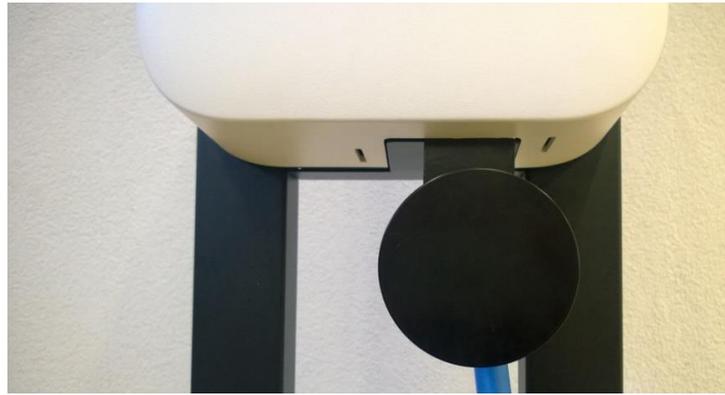


Figure 68: Charging station with installed big metal circle where magnetic cable hand can be attached to

14. Attach the charging station to the wall bracket. First attach it to the top hooks and gently push it to the wall.



Figure 69: Attach the charging station to the top hooks of the mounting bracket and push it to the wall

15. Tighten the screw until it is completely fastened and charging station will be completely secured to the wall.



Figure 70: Tighten the screw shown

16. Last step is to secure the side doors using the hex key or regular key if the charging station came with it. Key should have come together with the station. While pushing the maintenance doors tighten the screw or lock the doors using the key.



Figure 71: Attach the side doors to the enclosure



Figure 72: Secure maintenance doors to the enclosure



Figure 73: Charging station with short cable

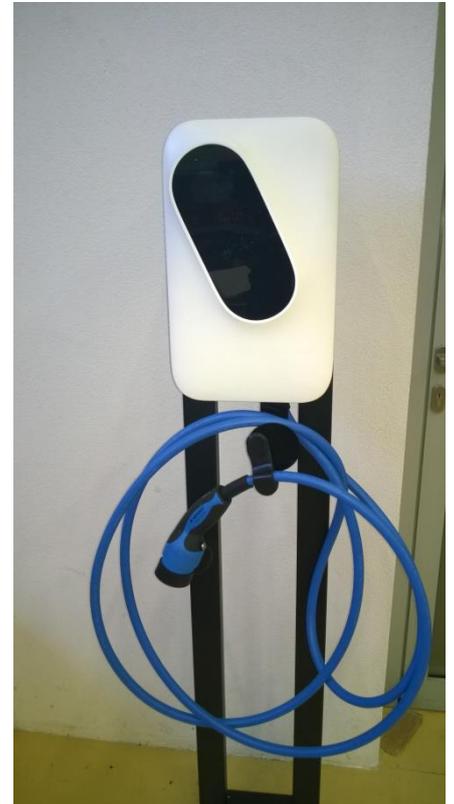


Figure 74: Charging station with long cable

# 6

## CONTACT INFORMATION

### TECHNICAL SUPPORT DEPARTMENT

e-mail: [support@etrel.com](mailto:support@etrel.com)

phone: +386 1 601 0127

### CUSTOMER SUPPORT DEPARTMENT

e-mail: [sales@etrel.com](mailto:sales@etrel.com)

phone: +386 1 601 0175

### AUTHORISED SERVICE CENTRES

e-mail: [support@etrel.com](mailto:support@etrel.com)

phone: +386 1 601 0075

**Etrel d.o.o.**

**Pod jelšami 6**

**1290 Grosuplje**

**Slovenia**

**EU**

**[www.etrel.si](http://www.etrel.si)**