ETREL

ETREL INCH

TECHNICAL PRECONDITIONS FOR INSTALLATION OF ETREL INCH CHARGING STATIONS

Document version: 0.3

1 GENERAL CONDITIONS FOR INSTALLATION OF ETREL CHARGING STATIONS

CONFIRMATION OF READINESS

Before carrying out the installation, the client has to confirm his readiness usually with a statement (see appendix, Information on installation of new charging station), 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 and can be cancelled on these grounds.

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.

CONTACT ADDRESS OF THE MANUFACTURER

Etrel d.o.o.

Pod jelšami 6

SI-1290 Grosuplje

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phone: +38616010127

2 ETREL INCH CHARGING STATION AND REQUIRED SPACE

The dimensions of the charging station are 45x27x13,5 (LxWxH cm). Dimensions are without cable attached. If the cable is attached the length of charging station is increased by 13 cm due to magnetic cable holder. Bottom of the charger enclosure must be mounted at least 100 cm above finished floor. Charging station must be installed so the minimum space around station, as shown on picture below, is provided. This space is needed for installation and later maintenance.

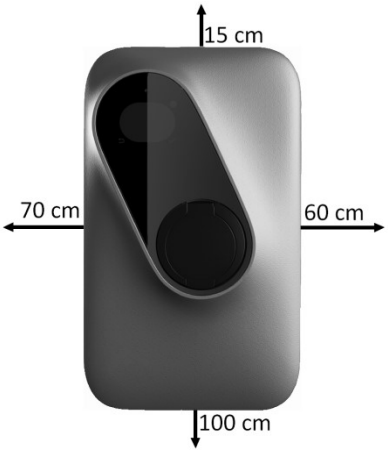


Image 1: Required space for installation and maintenance

3 INSTALLATION OPTIONS

There are multiple installation options:

1. wall mount,
2. installation of 1x Etrel INCH charger per stand-alone pole (pillar for **one** Etrel INCH charger)
3. installation of 2x Etrel INCH charger per stand-alone pole (pillar for **two** Etrel INCH chargers)

THE ORIENTATION OF THE BUILT-IN FOUNDATION INFLUENCES WHERE THE CHARGING STATION IS FACING.

The orientation of the built-in foundation influences where the charging station is facing and thus depends on the orientation of parking lots at particular location. Please find below a couple of possible scenarios of differently oriented parking lots. When installing the base anchor, pay particular attention to the correct orientation depending on parking lot.

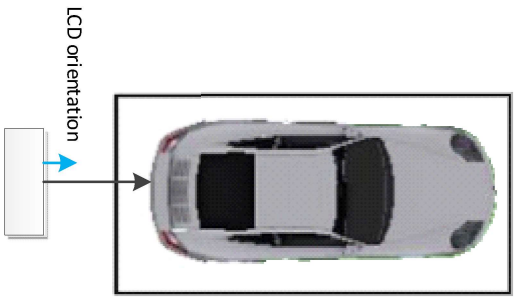


Image 2: Installation of one charger on parking lot

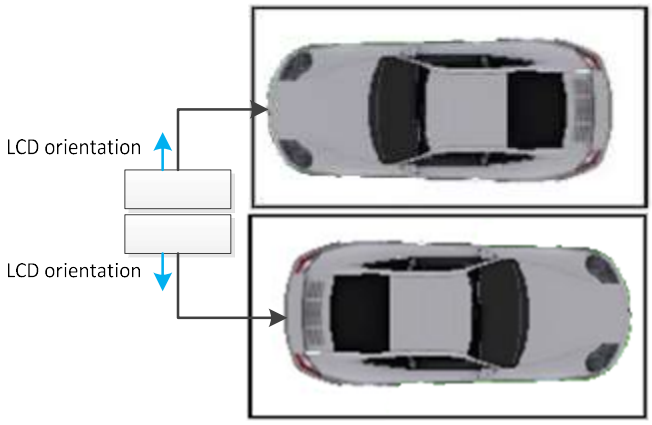


Image 3: Installation of two chargers on one stand-alone pole – orientation 1

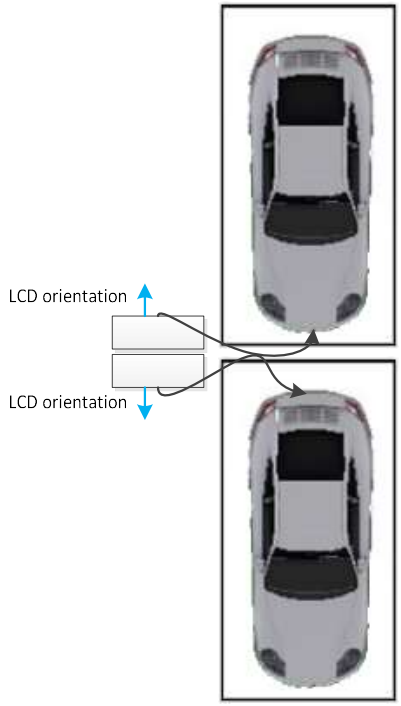


Image 4: Installation of two chargers on one stand-alone pole – orientation 2

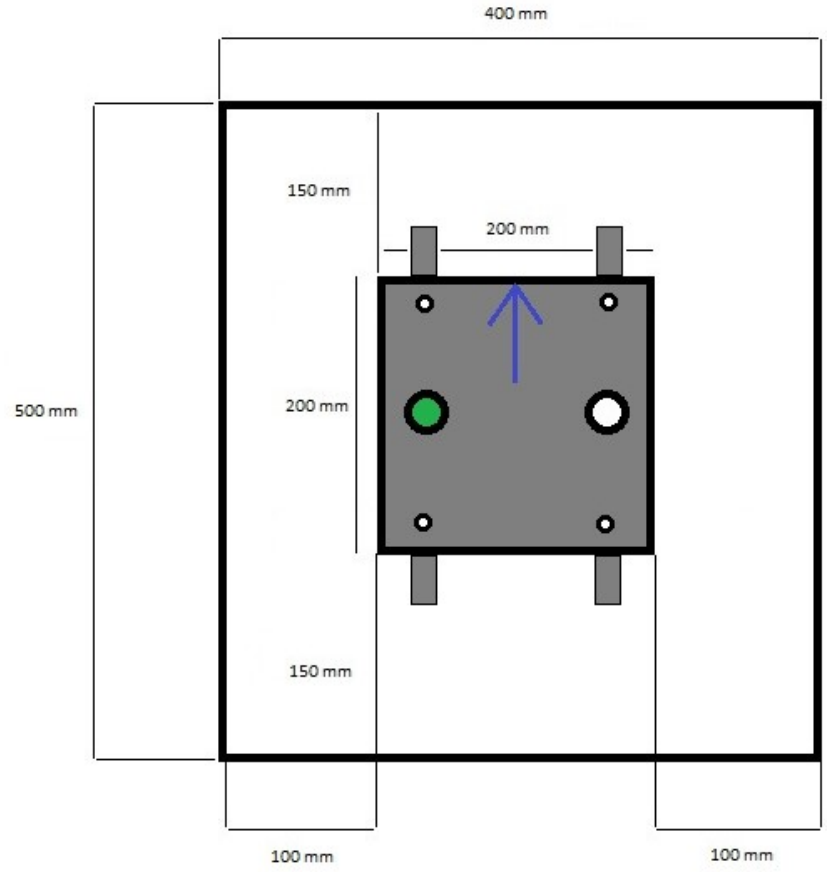


Image 5 Construction pit layout with built-in underground anchor. Orientation direction of the charging station is shown with blue arrow. If the single charging station is installed on stand-alone pole, power cable must be prepared through green hole.

4 FOUNDATION REQUIREMENTS (CHARGING STATION MOUNTED ON STAND-ALONE POLE)

UNDERGROUND ANCHOR INSTALATION

The underground anchor is made from stainless and galvanized steel and is built into concrete foundation. The concrete foundation can be combined with reinforced steel. Main function of the underground anchor is carrying the weight of the charging station and preventing the vertical inclination of the charging station.

Underground anchor dimensions: 200 mm x 350 mm (width x length).

In order to facilitate delivery of the package, the basic anchor is disassembled to individual elements, which must be properly assembled before the installation in the following steps. If you have received assembled anchor, you can skip the following steps:

1. Screw nuts on each anchor rod. There are four (4) rods in the anchor package. Be careful to observe the nut positions on the rod as pictured.

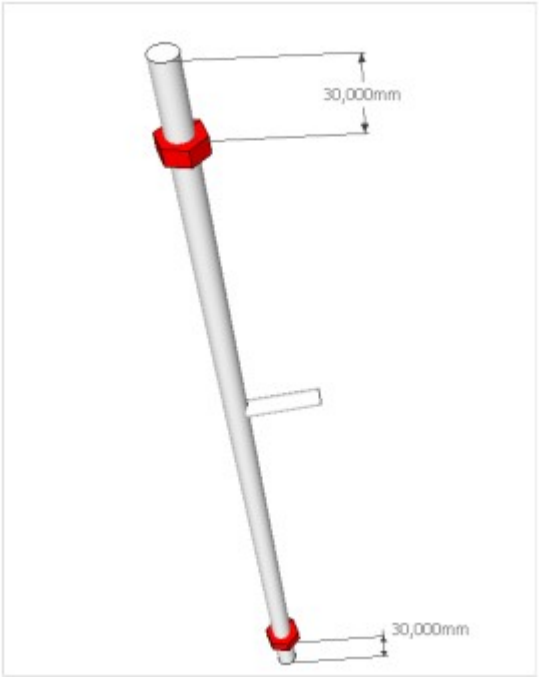


Image 6: Individual anchor rod with initial screw positions

2. Place the rods into the anchor frame holes. Screw nuts on the other side at the top of the frame, where the rod enters through the frame. Tighten upper and lower nut firmly. Repeat for all 4 rods.

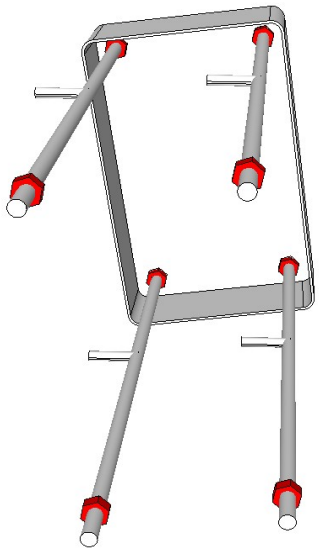


Image 7: Insertion of anchor rods into the upper frame (bottom view)

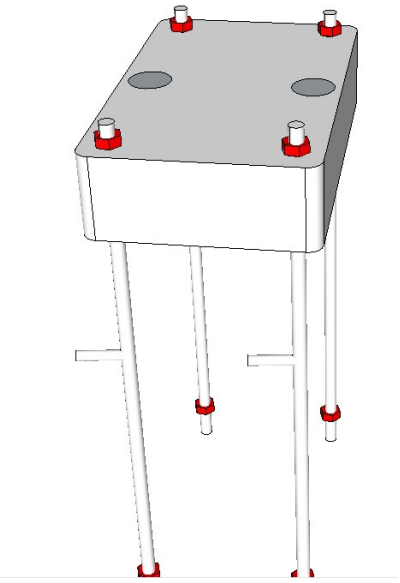


Image 8: Insertion of anchor rods into the upper frame (top view)

The underground anchor can be combined with reinforcing steel. It is recommended to add reinforcing steel into the L profile side holes to strengthen the anchor. You can use up to FI 12 construction steel.

3. Insert the L profile on the end of rods so there are two rods in line. Tighten upper and lower nut firmly. Repeat the process with the second L profile.

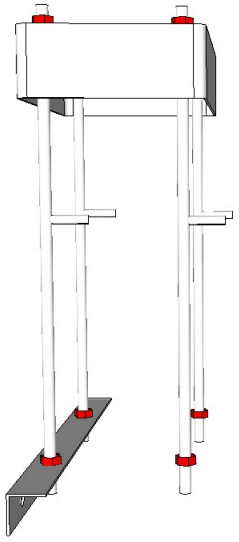


Image 9: Placement of L profile – side view

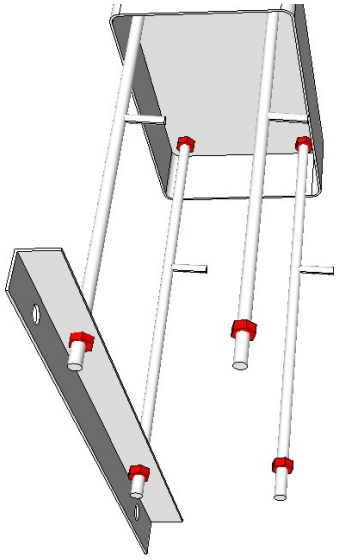


Image 10: Placement of L profile – bottom view

IT IS IMPORTANT THAT THE BASE ANCHOR IS INSTALLED HORIZONTALLY.

THE ORIENTATION OF THE BUILT-IN FOUNDATION INFLUENCES WHERE THE CHARGING STATION IS FACING. THE STICKER ON FOUNDATION SHOULD FACE THE SAME WAY AS THE CHARGING STATION SCREEN

The base anchor is installed in the concrete foundation. The preparation of the foundation (its dimensions) depends on the soil structure in the area where the charging station is installed.

The upper part of the underground anchor is equipped with a frame with the height of 60 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.

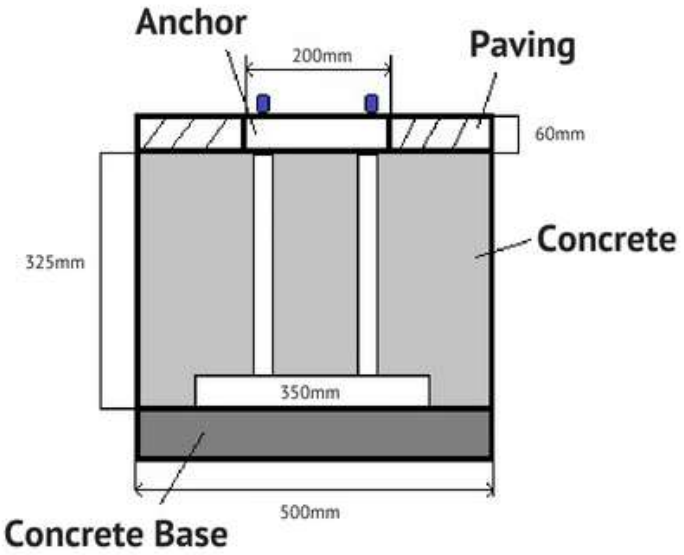


Image 11: Cross-section of the construction pit

Final mounting of stand-alone pole is done with four (4) protruding bolts of the underground anchor. The screws on each of the four bolts need to be removed

first to be used later for fixing the enclosure of the stand-alone pole to the foundation.

Basic excavation

The first step of the construction work is to prepare an excavation with the minimum basic dimensions of 40 cm x 550 cm and at least 46,5 cm in depth.

The concrete base should be levelled so that the anchor can be vertically aligned. Precise levelling of the underground anchor is important for later installation of the stand-alone pole. After the construction of the foundation is finished, the charging station pole cannot be realigned.

Lean concrete mix should be used for the concrete base. In the case of low temperatures, the concrete must contain anti-icing additives.

WARNING: IF CONCRETE BASE IS NOT LEVELED CORRECTLY, STAND-ALONE POLE CAN LEAN.

THE CONCRETE MUST BE LEFT TO DRY FOR AT LEAST 48 HOURS BEFORE THE CABLES ARE INSERTED INTO THE FOUNDATION AND THE STAND-ALONE POLE IS INSTALLED ON THE FOUNDATION.

The underground anchor has two openings for installation pipe and power cable. During concrete base construction, installation pipe with sufficient diameter must be added. Through which the power cable is later installed.

Supply cables are routed through the underground anchor with the use of the installation pipe as shown in the figure below. The installation pipe is built into the concrete foundation to be used for cabling and connection of the charging station. The exact way of routing the cables depends on the type of the cables used, their diameter (this is subject of project), and their bending radius.

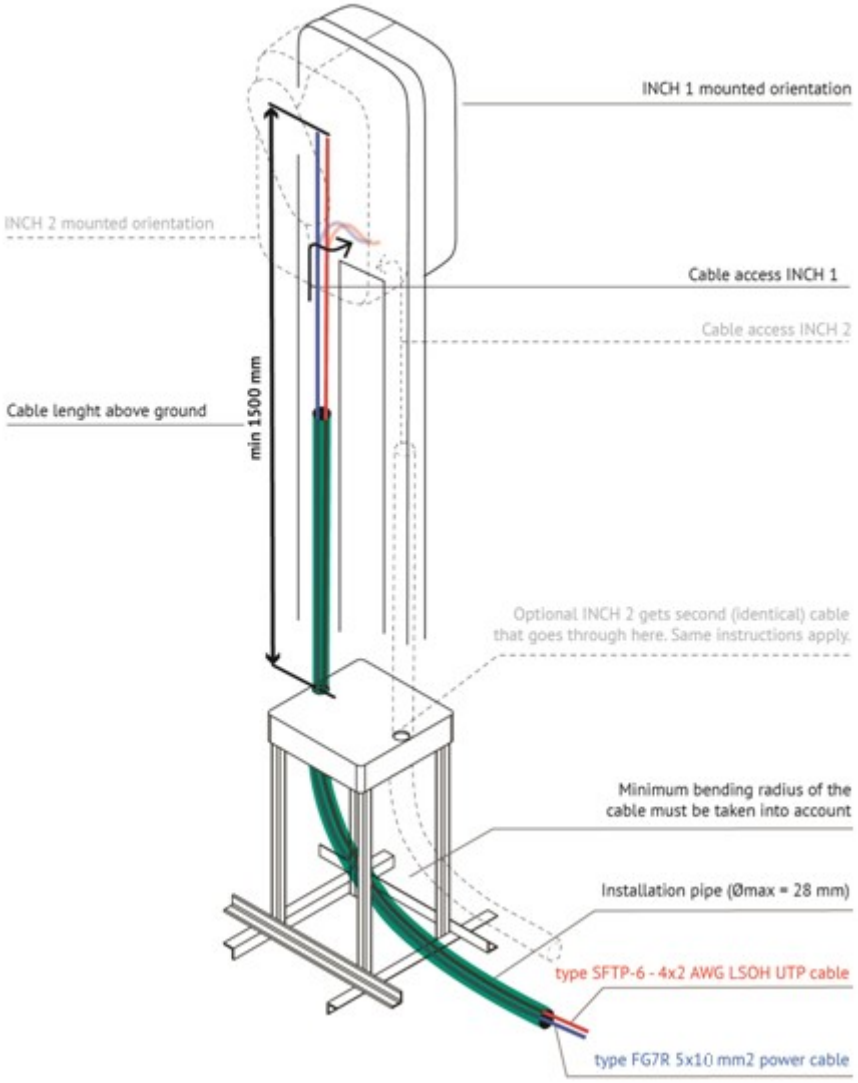


Image 12: Installing of installation pipe through concrete base and installation of power cable into installation pipe.

At least **150 cm** of the power cable and at least **150 cm** of the communication (CAT5) cable must reach through the upper opening of the anchor. Charging stations using wireless communication do not require the use of communication cables. **These minimum lengths of cables must be strictly observed to enable later connection of the charging station.**

Use pipes with diameter of 25 mm. Be careful that installation pipes, through which cables will be pulled, are firmly attached to the anchor when filling the foundation with concrete. Be careful that concrete cannot enter the installation

pipes when performing the works (we recommend filling the holes with paper or. similar material).

INSTALATION PIPES MUST BE INSTALLED THROUGH HOLE IN ANCHOR, AS SHOWN IN IMAGE ABOVE. IN CASE OF TWO CHARGING STATIONS ARE INSTALLED, TWO INSTALLATION PIPES NEEDS TO BE ROUTED, AS SHOWN IN THE IMAGE ABOVE.

On finished concrete base and installed anchor, a stand-alone pole is installed. This is done with screws which are part of anchor.

Excavation with optional safety rail

When safety rail (supplied by the charging station manufacturer) is installed together with the charging station, the contractor must prepare the foundation accordingly. Safety rail elements are placed in the same foundation which needs to be enlarged accordingly – 15 cm on the side of safety rail.

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

It is recommended that Etrel INCH model is combined with one or two safety arches (see below) that can be placed at both sides (2 arches) or at the front (1 arch) of the station. If the safety rail is placed on both sides, it must be aligned with the rear side of the station (underground anchor). When pole for two charging station is used the middle part of the safety rail should be aligned with middle part of the stand-alone pole.

The safety arches on the left and right side of the charging station must be placed **at a distance at least 15 cm from the station.**

The height of the installed arches is 70 cm above the final level of the foundation.

Both arches of the safety rail need to be precisely levelled during the construction works to prevent any later vertical inclines.

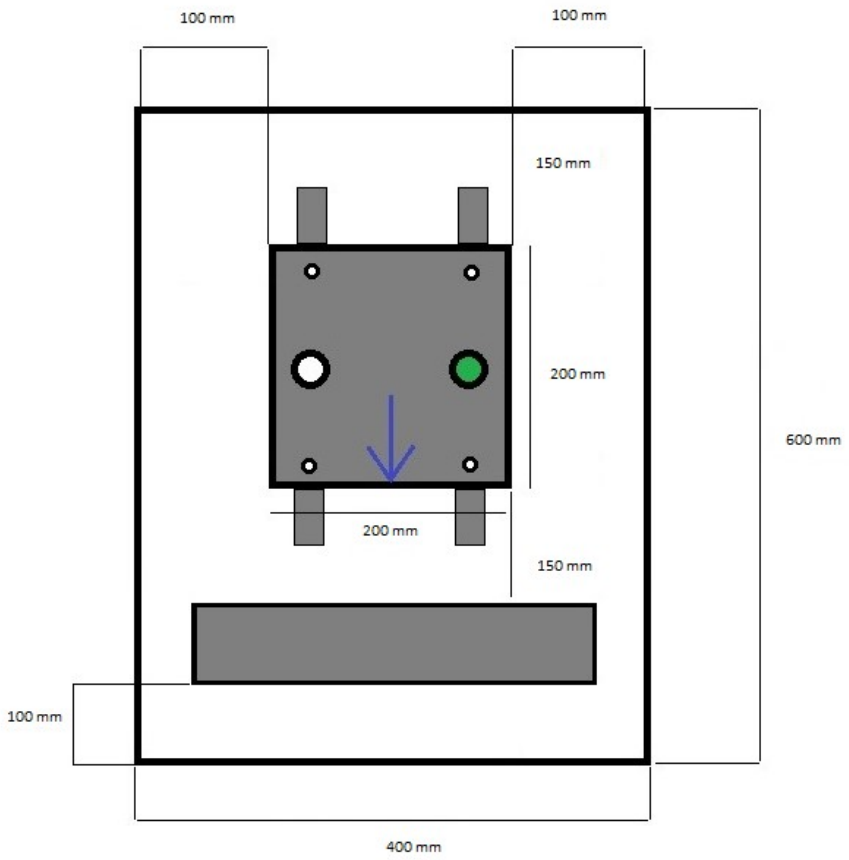


Image 13: Excavation with one safety rail in front of the charger. Orientation direction of the charging station is shown with blue arrow. If the single charging station is installed on stand-alone pole, power cable must be prepared through green hole.

In the case of placing the charging station on the sidewalk, it is necessary to place safety rail up to the edge of the sidewalk.

Positioning the stand-alone pole on the concrete floor

In the case of concrete floors and where it is impossible to dig out pit for the anchor, a special foundation plate is used, which is fastened directly to the concrete base by means of anchor screws. A self-standing post is then attached to the plate.

Base for installation of INCH stand-alone pole without anchor should be placed on the site of the station installation, where it is necessary to mark 4 holes to which the anchor bolts will be inserted. Drill holes in the concrete base for all anchor

bolts. Insert and fasten the screws in drilled holes. Fasten the base for installation of INCH stand-alone pole, by fastening the nuts on the anchor bolt secure the anchor bolt to the base and thus the base for installation of INCH stand-alone pole. Install the stand - alone pole for the charging station to the base.

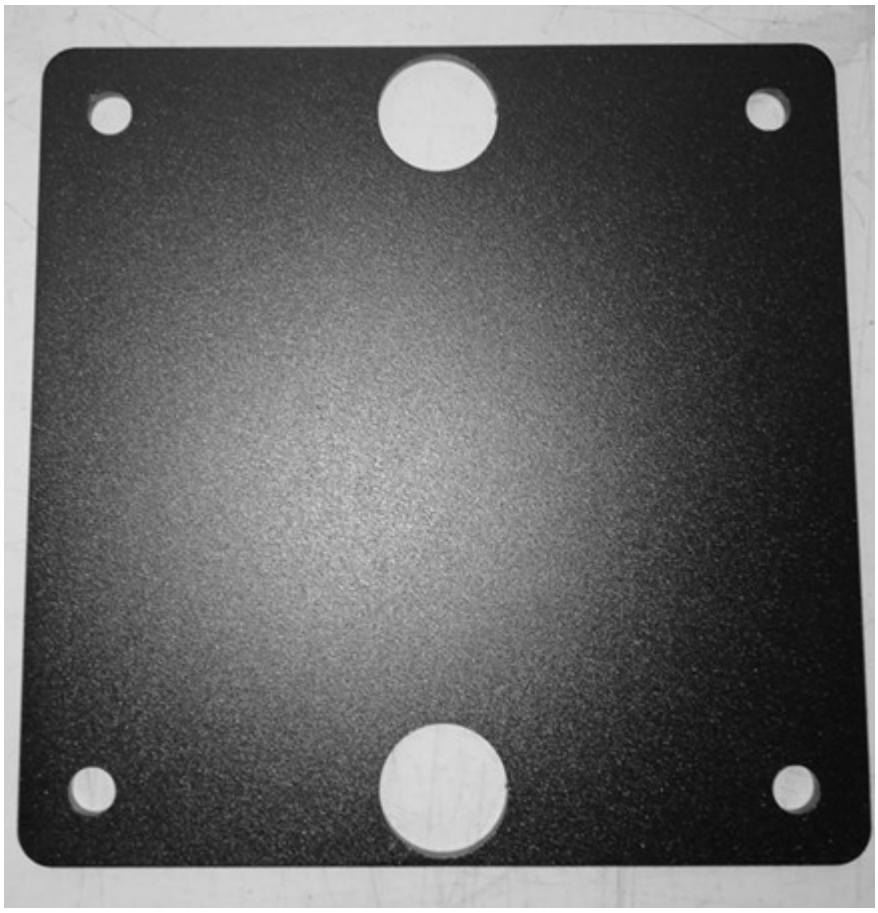


Image 14: Base for the stand-alone pole (200x200 mm)

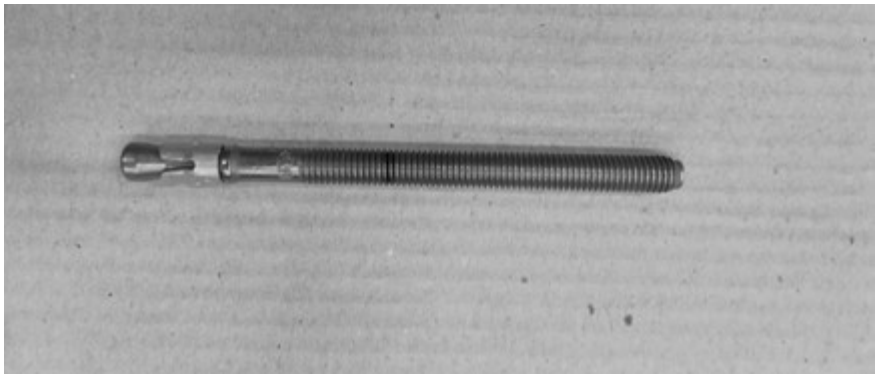


Image 15: Anchor bolts for installation of base on the concrete floor.

5 WALL MOUNTING WITH THE WALL INSTALATION SET

The dimensions of the charging station are 45x27x13,5 (LxWxH cm). Dimensions are without cable attached. If the cable is attached the length of charging station is increased by 13 cm due to magnetic cable holder. Bottom of the charger must be mounted at least 100 cm above finished floor. Charging station must be installed so the minimum space around station, as shown on picture below, is provided. This space is needed for installation and later maintenance.

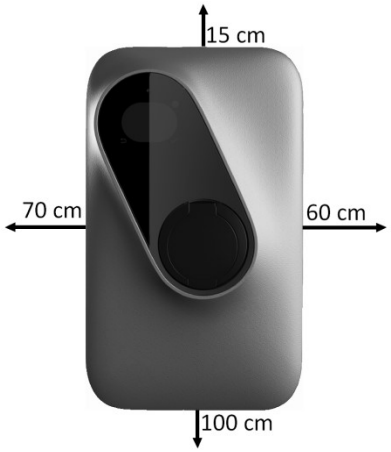


Image 16: Required space for installation and maintenance

Charging station is installed on wall mounting bracket, which must be correctly installed on the wall. Prior to installation of the charger, power and communication cable must be correctly prepared. There are two possible electrical installations. If the cables come from the wall (concealed installation), they can be put directly into the charger (through the wall). In case of surface installation, cables can be put into the charger from bottom or upper side of the charger.

In case of concealed cable, a hole in wall is required. The diameter of hole should be between 60 and 80 mm. The depth should be at least 60 mm. Rectangular hole can be used as well. It is recommended that cable in electrical box is in inserted from the side. **Height of hole from finished floor should be at 105 cm**.

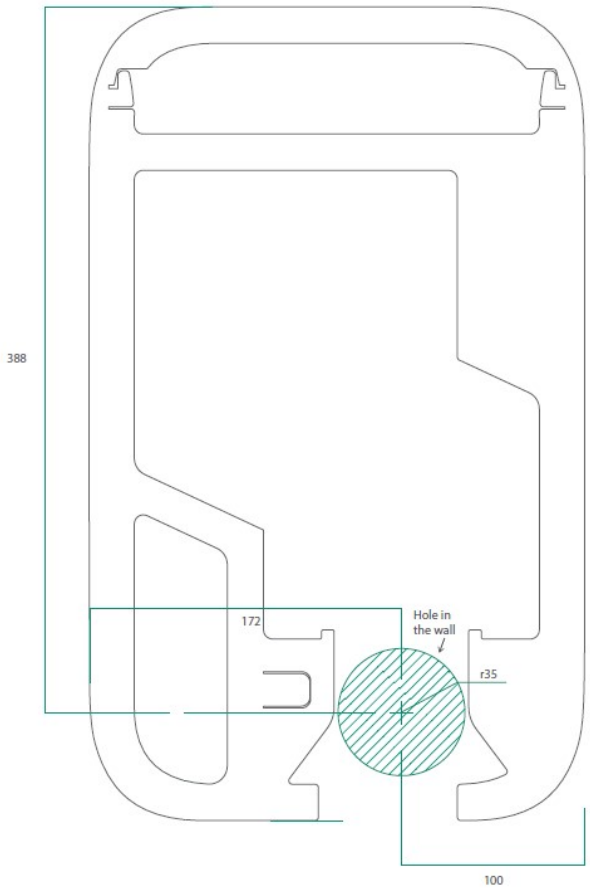


Image 17: A hole through the wall in case of concealed installation

In case of surface installation, cables are put into the charging station from bottom side of the charging station. Recommended dimensions of cable channel are 3 cm width and 2 cm depth. Cable channel can be brought to charging station from the upper side if necessary (see image 18). In case of cable channel being installed from upper side of charging station, provided spacers are used to install wall mounting bracket.

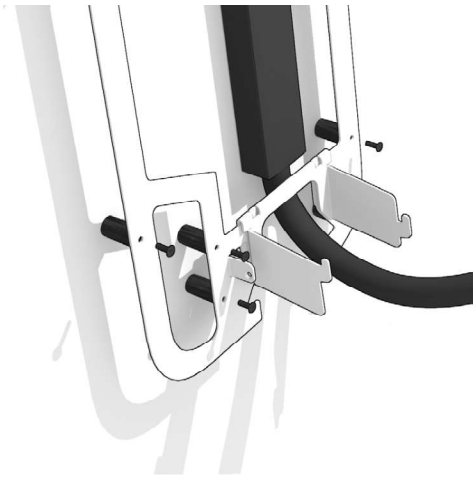


Image 18: Surface installation of cables (upper side of charger)

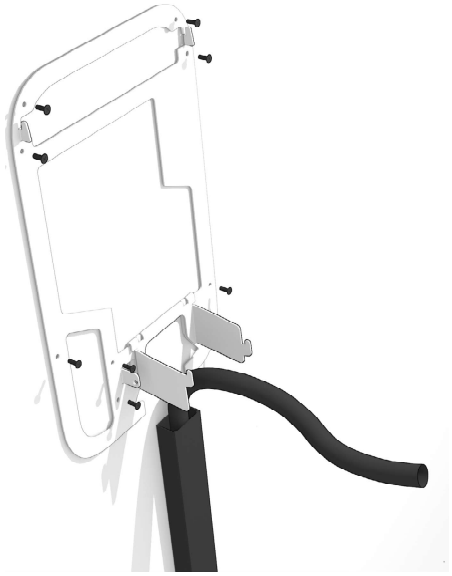


Image 19: Surface installation of cables (bottom side of charger)

RECOMMENDED DIMENSIONS OF CABLE CHANNEL ARE 3 CM WIDTH AND 2 CM DEPTH.

6 REQUIREMENTS FOR CONNECTION TO THE POWER SOURCE

WIRING DIAGRAM

In the wiring diagram below, you can see an example of a circuit diagram for the Etrel Inch station, with overcurrent protection installed. In this case, the RCD, overcurrent and overvoltage protection must be installed in the electrical cabinet. This is, if the building itself is not protected with overvoltage protection.

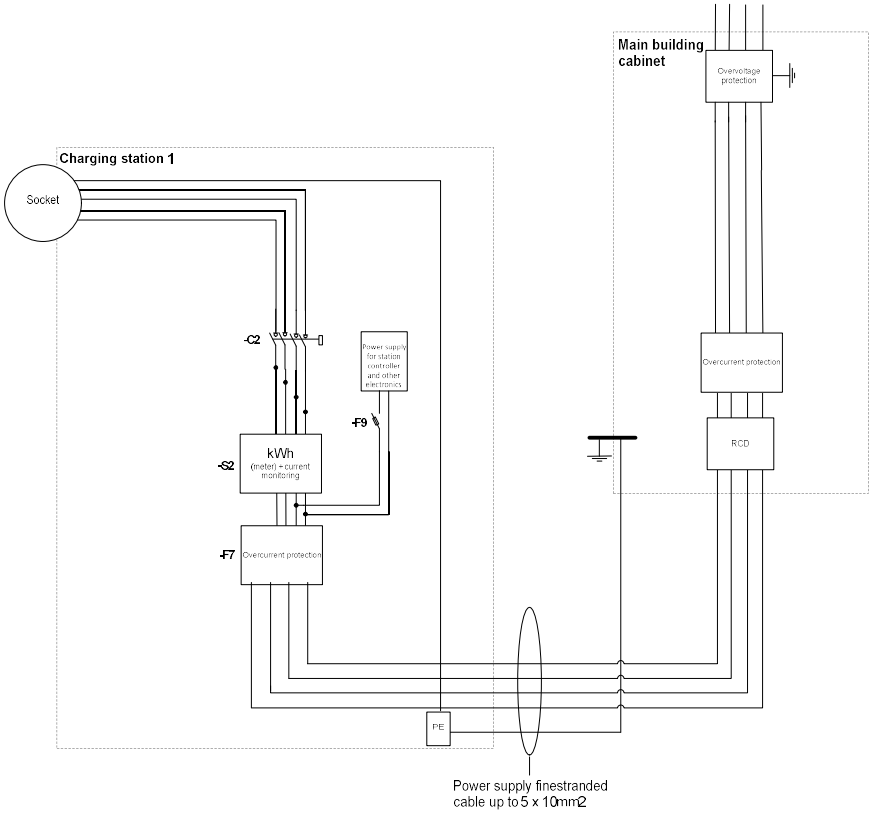


Image 20: Wiring diagram of Etrel INCH charger with overcurrent protection installed

SPECIFICS OF ETREL INCH CHARGER

Etrel INCH EV charging station supports max. charging power of 22 kW. This means that the charging station provides max. current of 32 A per each phase.

Maximum charging current can be limited as a factory setting from 6 A up to 32 A. Since some common electric vehicles, such as Renault ZOE, can face problems when charging with a current lower than 15 A, we recommend setting the minimum current at 15 A or higher.

Charging of one - phase EVs

Charger's first phase should be connected to least loaded phase in charger's network. If there are multiple chargers installed on site, each charger's first phase should be on its own network phase. This is important when two single-phase electric vehicles are charging at the same time (majority of vehicles on the market today are single-phase and can charge with up to 32 A).

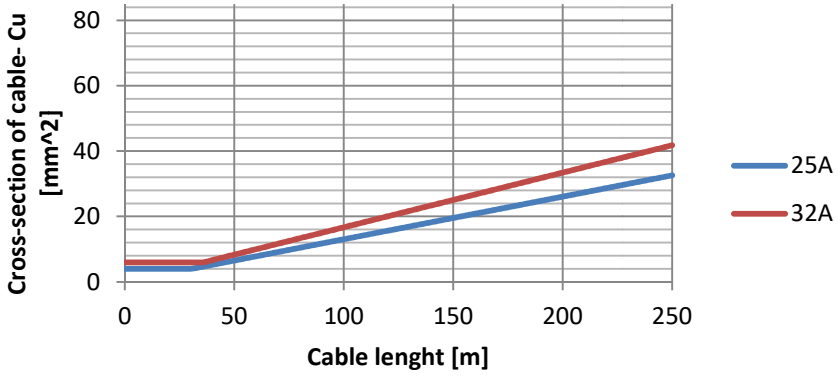
Local power management

When local power management is enabled, you can set a maximum allowed current that can be used by vehicle charging.

POWER CABLES (ETREL INCH CHARGER)

Cross-section of cables

Recommended power cable cross-sections are between **6 mm^2 and 10 mm^2 (Cu)** Please refer to the graph below to determine the minimum cross-section of power cables (based on desired charging power or power connection provided on site).



The graph shows required diameters for copper cables. If aluminium cables are used, the diameter must be doubled (as a rule of thumb).

IT IS VERY IMPORTANT TO PROPERLY DIMENSION THE POWER SUPPLY CABLE ACCORDING TO THE POWER YOU WANT TO SUPPLY AT THE CHARGER AND THE LENGTH OF THE POWER CABLE (SEE THE GRAPH ABOVE).

THE MAXIMUM STANDARD DIMENSION OF THE CONNECTION CLAMPS IN THE ETREL INCH CHARGING STATION IS 10 MM^2.

EXAMPLE: ETREL INCH CHARGING STATION WITH 22 KW (32A) AND POWER SUPPLY CABLE OF 30 M. RECOMMENDED DIMENSION OF THE POWER CABLE IS 6 MM2

IT IS MANDATORY TO USE SOFT-STRANDED WIRE, DUE TO EASIER INSTALLATION.

Mandatory

Number of wires

5-wire when grounding is done from the distribution cabinet (TN-S/TN-C-S grounding system)
4-wire if common PEN wire is used (TN-C grounding system)

Type of wires

Use of soft-stranded wire (with sufficient cross-section) is mandatory. Wiring with hard wire is difficult due to charger design.

ELECTRICAL PROTECTION (ETREL INCH)

Charging station can have built in differential or overcurrent protection inside. If the overcurrent protection is built into the charger, a differential and overcurrent protection must be installed in electrical cabinet. Overcurrent protection must be installed either way. Overvoltage protection is always installed in the electric cabinet.

Protection selectivity has to be achieved on three levels:

- Overcurrent (MCB) protection
    - Each charging connector has its own software overcurrent protection.
    - Overcurrent protection must be installed in electrical cabinet regardless of overcurrent protection in charger. Factory default setting is 32 A. Electric current can be restricted if weaker fuses are available.
- Differential (RCD/FID/RCCB) protection
    - Each connector can have its own differential protection ΔI = 30 mA(40 A)Type B
    - When charging station is supplied from an existing installation, another upstream protection is usually installed in the main cabinet that protects charging station. This RCD needs to support a bigger differential current (for example 300 mA).
- Overvoltage protection:

- When charging station is supplied from existing installation, upstream overvoltage protection is usually installed in the main cabinet. This protection is usually type B (and in some cases also type C protection is installed after it). It is recommended to install overvoltage protection at the grid connection point to cover all electrical appliances connected to the same electrical installation. **Etrel warranty does not cover damage caused to the station or connected vehicle caused by overvoltage events.**
- When charging station is supplied directly from a separate grid connection point, overvoltage protection Type B must be installed in the main electrical cabinet.

IT IS RECOMMENDED TO INSTALL THE OVERVOLTAGE PROTECTION TYPE B IN THE MAIN CABINET TO PROTECT THE CHARGING STATION AGAINST OVERVOLTAGE DISRUPTIONS.

LOCAL GROUNDING (MODEL ETREL INCH)

Local grounding is used to equalize the potential in case of longer lines in a TN-S or TN-C-S grounding system.

If the charging station is supplied from existing installation and is distant from the supply cabinet for more than 50 m, a potential can be present at the end of the grounding line (at the point of connection inside the charging station) that is different from the potential in the supply cabinet. To determine the need for extra equalizing of potential, the resistance of grounding line needs to be measured from the exposed conductive part of the appliance to the busbar of the grounding lines. If the resistance measured in this manner is higher than required by the equation below, extra equalizing of potential needs to be performed.

Rpe<Ul/Ia

Rpe = resistance of grounding line from charging station to busbar
Ul = maximum allowed voltage of 50 V
Ia = current which activates differential protection device (e.g. 30 mA)

Efficiency of extra equalizing of potential is measured between the exposed

conductive part and the foreign conductive part. The result gained this way should fulfil the condition:

R<Ul/Ia

International standard EN 61557-4

A GOOD IMPLEMENTATION OF GROUNDING (LOCAL GROUNDING OR EARTHING FROM THE NETWORK) IS VERY IMPORTANT. IN THE EVENT THAT THE GROUNDING IS NOT PROPERLY CARRIED OUT, YOU ARE LEAVING THE POSSIBILITY FOR POTENTIAL INJURIES.

7 COMMUNICATION

It is recommended to provide communication at charging station. There are three options:

- Mobile data (Etrel INCH PRO),
- Ethernet connection through existing communication device on site (Etrel INCH PRO & HOME),
- Wi-Fi (Etrel INCH HOME)

For each communication type steps described below must be taken.

MOBILE DATA – **ETREL INCH PRO**

- There is a mobile communication module installed inside Etrel INCH PRO which allows mobile data communication.
- Customer has to ensure active SIM card (in private APN) which needs to be provided to producer for testing and later use in electric charger.

Etrel APN network Profile=155 Ch.ocean.etrel.si

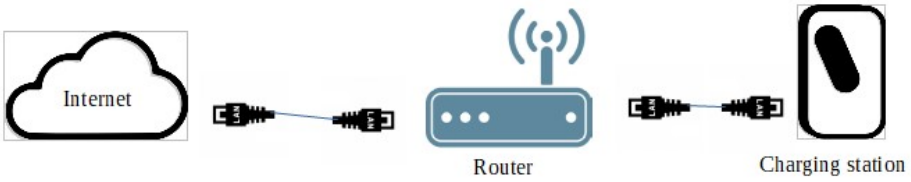
ETHERNET CONNECTION FROM EXISTING COMMUNICATION DEVICE ON THE LOCATION (STANDARD)

It is recommended to ensure static public IP address. Default IP address of the charging station is stated on sticker located on the inside of a charger maintenance door (IP address can be changed later). It is important that charging station and router are in the same IP segment (example: 192.168.1.xx).

1. For the purpose of network communication these are the information you have to send to supplier or have them ready for installer on site:
    a) gateway:
    b) DNS:
    c) Local router IP address:

d) Local IP address of charger (if different form default):

2. Ensure access to router / switch and enable port forwarding (NAT table below).
3. Maximum recommended cable length (cable type SFTP/UTP CAT 5):100 m



WI-FI FROM EXISTING COMMUNICATION DEVICE ON THE LOCATION – **ETREL INCH HOME**

When Wi-Fi is used for internet connection the process is identical to Ethernet connection. At charger is necessary to configure Wi-Fi type connection. This is done by connecting to charger station via ethernet cable. It is necessary that PC is in the same IP segment as charger. When in web interface correct Wi-Fi network must be selected. Process is than completed.

Station	Public TCP port	LAN IP address	LAN port
Station 1	10000	192.168.1.240	80
Station 1	10001	192.168.1.240	8002
Station 1	10002	192.268.1.240	8001
Station 1	10003	192.168.1.240	5900
Station 2	10010	192.168.1.241	80
Station 2	10011	192.168.1.241	8002
Station 2	10012	192.168.1.241	8001
Station 2	10013	192.168.1.241	5900
Station 3	10020	192.168.1.242	80
...	...	...	...

Table 1: NAT table settings