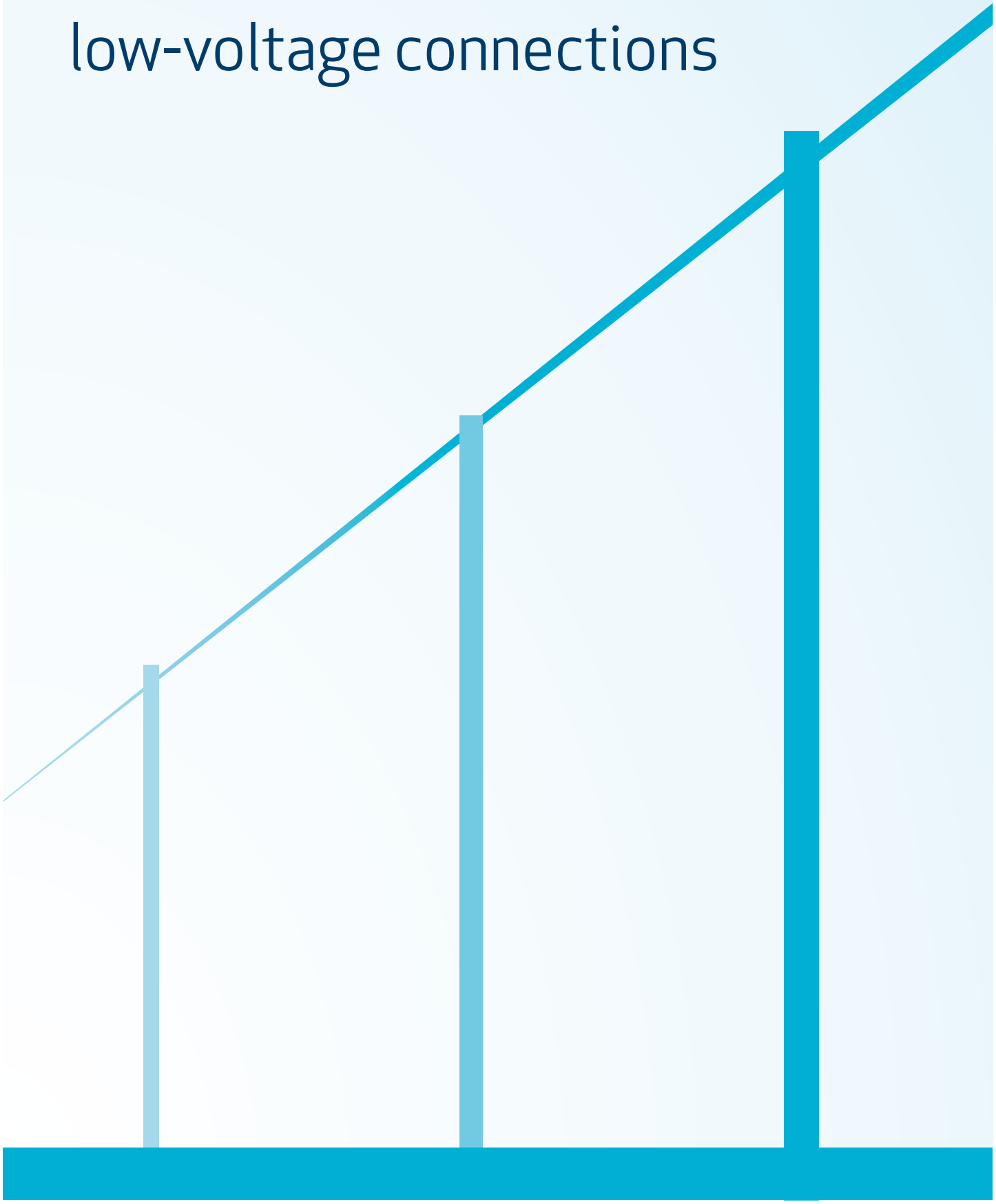
ELENIA

Technical instructions for low-voltage connections



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1 General information

These instructions summarise the technical requirements and specifications that concern low-voltage connections. The instructions are applied to new connections made to Elenia's low-voltage network, together with the connection contract and the terms and conditions of Finnish Energy. The requirements of the instructions are also applied in case of alterations, extensions or renovations of existing connection, especially the main distribution board and connection line, according to the scope of implementation. Deviations from the instructions must always be agreed in advance in writing.

The instructions are intended for the customer's electrical designer and contractor for the design, procurement and construction of the electrical connection. Electrical installations are primarily subject to electrical industry standards, general guidelines and regulations.

2. Electrical connection

2.1 Information necessary for acquiring a connection

In order to design and implement a connection, Elenia requires the following information:

- **Small locations** (≤ 3x63 A): address of construction site along with main fuse capacity and purpose of use of the connection. Important additional information includes the heating method used at the location, site plan, the planned route of the connection line, the location of the main distribution board and information about a possible expansion reservation (possible later increase of the main fuse capacity).
- **Large locations**(>3x63 A): construction site address, site plan, main fuse capacity, purpose of use of the connection as well as a main circuit diagram (incl. number of places of electricity use, fuse capacity and identifying information regarding the places of use). Important additional information includes the heating method used at the location, the planned route of the connection line, the location and rated current of the main distribution board. In addition, information on expansion reservations and possible devices that cause abnormal loads is important information for network planning.

The most accurate possible initial data will be speed up the processing of the connection order and the network feeding the connection and its capacity can be designed in a way that takes into account the needs of both the connecting party and Elenia in the long term and avoids unnecessary additional costs.

2.2 Connection point

The connection point is the point between the electrical equipment of Elenia and the connecting party (typically, the ownership, liability and delivery limit of the connection line). The connection point is defined by Elenia. The connection point is recorded in the connection contract.

Usually, the connection point is an underground cable at the boundary of the plot or connectors of an overhead line on a pylon. The connection point may also be located at the boundary of the yard, the link box, the transformer substation, the 0.4 kV fuse-switch or outside the metering panel.

3. Dimensioning of the electrical connection

The dimensioning of the electrical connection is always the responsibility of the customer or the electrical designer and contractor on their behalf. Elenia is responsible for dimensioning the electricity network that feeds the electricity connection according to the customer's needs. Elenia does not dimension the power of the electrical connection based on the loads of the customer's instruments or equipment, but the customer must calculate the connection capacity required for the equipment and its use.

Electrical connection installations and structures should be dimensioned in a way that takes into account any subsequent additions and extensions. However, in the initial phase, it is recommended that the ordered connection capacity be dimensioned as accurately as possible according to only the actual initial need. However, the customer must inform Elenia at an early stage of any subsequent additions, expansions and capacity changes for the purpose of dimensioning the supply network. It is easy to change the connection capacity later on, when the dimensioning has already been initially taken into account in the structures.

In Elenia's network, the maximum connection capacity to be implemented at low-voltage is 3x1250 A (the sum of the nominal values of the primary protection devices).

3.1 Connection line

The connection line is the electrical line between the electricity network and the main distribution board/ primary protection device of the connecting party. The minimum dimension of the connection line and the entry angle of the line is determined by Elenia. The installation of the connection line on the plot and in the building must be carried out in accordance with the provisions of the SFS 6000 series of standards. The route and length of the connection line within the property must be kept as short as possible. The cables used/supplied by Elenia are not classified in terms of fire behaviour, so the connection lines must be installed inside the building in their own fire compartment or their length in other fire compartments must be limited to as short as possible (maximum total length within the building is 5 m). The connection line must be protected against mechanical stress and installed in such a way that it does not touch any other cable at any point. Table 3.1 along with Figures 3.1 and 3.2 contain mandatory and instructive guidelines for the installation of the connection line.

It is recommended that the connection line is always installed in a fireproof manner. A fireproof installation refers to an installation that avoids the risk of a wider fire due to the heating caused by the load current of the line, a fault situation or a cable fire. In this case, there shall be no flammable materials in the vicinity of the cable. In addition, the general fire protection requirements (e.g. for exits) must be taken into account. A fireproof installation must be carried out from the outside (e.g. by means of a strong installation pipe) into a main distribution board room that forms a separate fire compartment or all the way to the main distribution board.

If the connection point is connectors of an overhead line on a pylon, the connecting party's electrical contractor must install the cable ready to the top of the pylon in such a way that:

- the cable is protected at the bottom of the pylon with a cable protector or similar strong pipe along any traffic routes and in their vicinity to a height of at least 2 m. The cable protector shall extend at least 20 cm below the ground.
- the cable is attached to the pylon above the mechanical shield using distance nails every 40–60 cm.
- the cable is fitted at the top with either an outdoor termination or a heat shrinkable cable breakout, and sufficient spacing must be reserved for connecting the cable.

Table 3.1. Protection of low-voltage ground cable without a metallic protective sheath (e.g. AXMK) at different installation depths.

Installation depth of cable or protective pipe h (depth of installation base)	**Protective plate, chute, tape or pipe in accordance with SFS-EN 61386-24 / SFS-EN 50626-1 or SFS-EN 50520 for impact and compression resistance.** The classification according to ISO 5608 is provided in brackets.
h ≥ 0.7 m	warning tape
0.5 m < h 0.7 m	L 450 (class C)
0.3 m < h 0.5 m in yard and park areas	N 750 (class A)
0.3 m < h 0.5 m in other areas	N 450 (class B)

Figure 3.1. Schematic of a cable trench.

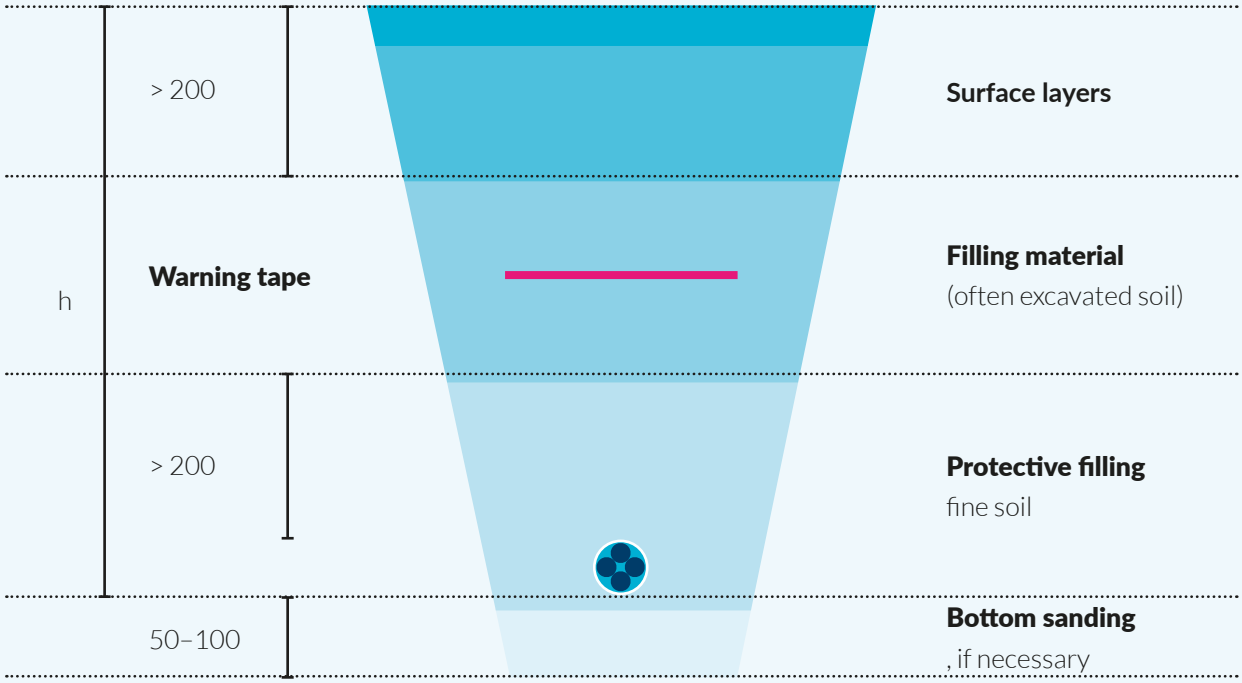
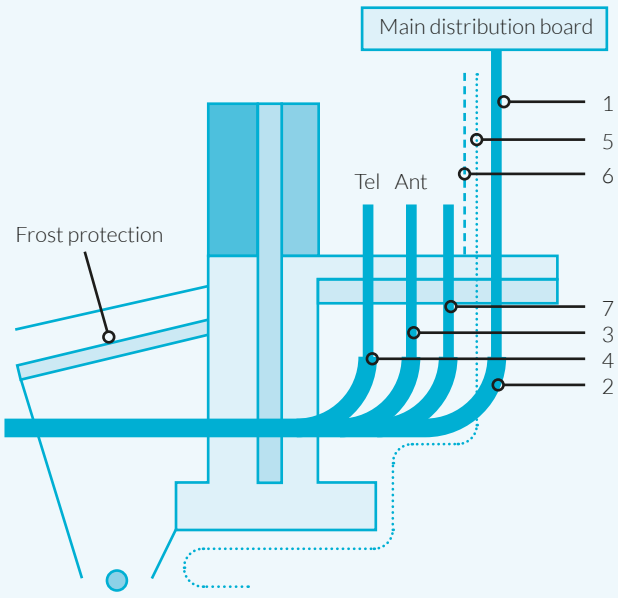


Figure 3.2. Protection of the connection line and earthing the building.

1. Protection of the connection line with electrical installation pipe (reaching outside the frost protection, at least 50 mm pipe is sufficient for a 4x25S cable)
2. Sufficiently gently sloping arc of the electrical installation pipe
3. Antenna ground cable protection pipe 40 mm
4. Telecommunications cable protection pipe 40 mm
5. Earthing electrode at least 16 mm^2 copper against the soil below the foundation or around the building or at least 20 m into the connection line trench, if the other options are not possible
6. Connection of concrete reinforcement, metal ventilation ducts etc. into the earth circuit connector
7. Spare pipes, for uses such as outdoor lighting

Alternatively, all feed-through piping can be implemented deep enough below the subsurface drains and the footing.



Usually, the connection line is implemented using AXMK type 4 conductor cables in accordance with the TN-C system and for waterway installations AMCMK type 4.5 wire cables. In the waterway installation cables, the PE and N wires are connected in parallel to make a PEN wire and both wires are connected to a PEN rail at the main distribution board/metering panel. If an Elenia transformer substation is located in the same building with the connection, the connection line must be implemented in accordance with the TN-S system with a 4.5 or 5 conductor cable and the dimensioning must be ensured by Elenia on a case-by-case basis.

For 3x25 A and larger new connections, the minimum connection line is 25 mm^2 of aluminium or 16 mm^2 of copper. Connection lines with smaller cross-sections shall not be connected to the network.

For new connections and additional connections, it is generally recommended that the connection line be dimensioned according to the rated current of the main distribution board or any reservation for subsequent expansion, according to Table 3.2, when the length of the connection line is less than 50 m in sparsely populated areas and less than 100 m in zoned area. In other cases, depending on the connection capacity and distances, it may be necessary to deviate from the maximum rated values according provided in the table on a case-by-case basis.

In general, the dimensioning of the connection lines must be agreed with Elenia before implementing the connection lines, and in particular when using the maximum dimensioning for a fireproof installation. The main fuse capacity may be initially or even permanently lower than the recommended dimensioning. All connection lines will be commissioned at an early stage, even if the capacity of the connection does not require the completion or deployment of all connection lines.

Table 3.2. Dimensioning of connection lines with cable types used by Elenia.

Main fuse capacity A (installation method D1, distance between adjacent pipes 0, no verification requirement for installation method/route)	**Connection line type** (AXMK)	**Maximum allowed main fuse capacity A** (Only in case of fireproof installation, in which case the implemented installation method/route must be verified with a clarification to the network company)
3x25 - 3x35	4x25S	3x63
3x25 - 3x63	4x50S	3x100
3x63 - 3x125	4x95S	3x160
3x63 - 3x160	4x150S	3x200
3x63 - 3x200	4x240S	3x250
2 x (3x200)	2 x 4x240S	2 x (3x250)
3 x (3x160)	3 x 4x240S	3 x (3x200)
4 x (3x160)	4 x 4x240S	4 x (3x200)
5 x (3x125)	5 x 4x240S	5 x (3x160)
6 x (3x125)	6 x 4x240S	6 x (3x160)
7 x (3x125)	7 x 4x240S	7 x (3x160)
8 x (3x125)	8 x 4x240S	8 x (3x160)
9 x (3x125)	9 x 4x240S	9 x (3x160)
10 x (3x100)	10 x 4x240S	10 x (3x160)

The report on the fireproof installation method/route is free-form, but it must outline the way in which the route and installation are carried out and the materials used in the installation. In addition, schematics, images or other illustrative documents may be included.

It is recommended that the section beyond the connection point is implemented with a cable type corresponding to the section before the connection, but cable with larger cross-section or of different type may also be used, according to the minimum dimensioning according to Table 3.3. Any abnormal connection line dimensioning must always be agreed on in advance with Elenia in order to ensure, the possibility of connecting the connection line, among other factors. Elenia does not procure or supply different types of connection lines.

Table 3.3. Connection line dimensioning for other cable types.

Main fuse capacity A (installation method D1, distance between adjacent pipes 0, no verification requirement for installation method/route)	**Other permissible type of connection line from the connection point** (e.g.)	**Maximum allowed main fuse capacity A** (Only in case of fireproof installation, in which case the implemented installation method/route must be verified with a clarification to the network company)
3x25	MCMK 3x16+16 AMCMK 3x25+16	3x63
3x35	AXMK 4x35S	3x80 A
3x100	AXMK 4x70S	3x125 A
3x160	AXMK 4x120S	3x160 A
3x200	AXMK 4x185S	3x200 A
3x250	AXMK 4x300S	3x315 A
2 x (3x160)	2 x AXMK 4x185S	2 x (3x200 A)
2 x (3x200)	2 x AXMK 4x300S	2 x (3x315 A)
3 x (3x125)	3 x AXMK 4x185S	3 x (3x160 A)
3 x (3x200)	3 x AXMK 4x300S	3 x (3x250 A)
4 x (3x160)	4 x AXMK 4x300S	4 x (3x250 A)
5 x (3x160)	5 x AXMK 4x300S	5 x (3x200 A)
6 x (3x160)	6 x AXMK 4x300S	6 x (3x200 A)
7 x (3x125)	7 x AXMK 4x300S	7 x (3x200 A)
8 x (3x125)	8 x AXMK 4x300S	8 x (3x200 A)

The existing old connection line can be used, taking into consideration the cable installation type as well cable condition and load capacity (also when increasing the main fuse capacity). If the old connection line or part of it is replaced, the replaced section of the line must be implemented in accordance with the minimum cross-sectional requirements for new connections.

3.2 Main distribution board

The main distribution boards of new low-voltage connections must be equipped with a primary protection device or connection line-specific overload protectors, regardless of the number of connection lines. The dimensioning and implementation of the main distribution board must take into account possible expansion reservations and dimensioning of the connection cables.

The main switch of new boards with direct measurement (≤ 3x63 A) must be located after the meter. This structure enables remote reading of the energy meter even when electricity has been cut off from the main switch.

The main distribution board must not be placed on Elenia's pylons. The preferred location for the main distribution board is a separate housing in the yard. If this is not possible, the main distribution board can also be located in a utility services room or a garage. In a permanently occupied or used location, the board may also be located elsewhere on the premises, but not in living areas. If there is a production equipment connected to the electricity network on the premises, there must always be unobstructed access to its separating switch.

Table 3.4. Access requirements for the main distribution board.

Location	**Access requirement for the main distribution board**
Detached house or similar permanent place of use	no access requirement
Leisure residence or equivalent part-time place of use	accessibility at all times
Terraced houses, blocks of flats and real estate companies	route key to key deposit cylinder
Industrial and production plants	route key to key deposit cylinder, access code and/or agreed procedure

The main distribution board and board installation must be generally carried out in accordance with valid rules and regulations. The installation and mounting of the board must be appropriate and reliable, regardless of scaffolding, mounting surface or structure, for both temporary and permanent installations. In all cases, the feeding cable must be properly installed and protected as required by the regulations.

If the main distribution board of an old installation is replaced, the replacement board must be located and implemented in accordance with the new guidelines, recommendations and protection requirements valid for a new connection of similar capacity.

3.3 Primary protection device and other protection devices

Each low-voltage connection must be fitted with a primary protection device or fuse-switch in accordance with the connection capacity or rated current of the connection contract, which are installed between the connection line or lines and the customer's main distribution board/metering panel. The primary protection device or fuses must be located together with the main distribution board and their rated current or setting value must be easily verifiable.

Fuse-switches are commonly used as primary protection devices. Circuit breakers that allow connecting one or more cables are also allowed in locations such as industrial sites. If a circuit breaker is used as the primary protection device, the circuit breaker must be capable of per-cable power monitoring and isolation. A circuit breaker can only be used as the primary protection device for small connections below 25 A, where the use is other than residential use. For a rated current of at least 50 A, it is recommended to use handle fuses instead of plug fuses as the main fuse.

When the electrical connection comprises only one electrical access point metered by Elenia, no separate protection devices are required for the access point. In this case, the primary protection device of the connection also serves as a primary protection device for the place of electricity use. If the electricity connection comprises more than one place of use metered by Elenia measurement, the metering input side of each place of use must have primary protection devices according to the nominal power or current of the electricity use contracts. It is recommended to use normal fuses as front fuses, but the use of actual circuit breakers is also possible, regardless of the intended use of the site, if the short-circuit and selectivity requirements of the protection can be ensured. The nominal position of the circuit breakers must not be easily altered, for example by laypeople.

It is recommended that the nominal values of the primary protection devices of individual places of electricity use be staggered in relation to the nominal values of the primary protection device in order to achieve better selectivity of the protection. However, the nominal values may, where appropriate, be equal. If changes are made to an old board, such as increasing the number of places of electricity use, the change must be implemented as clearly as possible. Breakout connections of unmetered electricity should always be implemented by means of fixed connectors and placed in the sealable parts of the board. After the changes and additions, all places of electricity use metered by Elenia must be equipped with separate primary protection devices specific to each metering.

3.4 Short-circuit current

The network that feeds new connections is dimensioned so that the single-phase short-circuit current at the primary protection device of the interface is at least the so-called 5 s value of the main fuse capacity, according to Table 3.5. In the old network, the actual short-circuit current of the connections varies according to the time of construction of the network and may be lower than 100 A.

If the short-circuit current generated by the primary protection device of an existing connection exceeds the rated values in Table 3.5, the lowest value of the short-circuit current of the internal network must be defined in accordance with the values set out in Table 3.5, as the input power network and the short-circuit current may change later. Rated values higher than those in the table can only be used if they have been separately agreed upon with Elenia. In other cases, if the short-circuit current generated by the primary protection device falls below the above-mentioned table values, the lowest rated value for short-circuit current must defined as the calculated short-circuit current of the primary protection device.

When the connection line consists of several cables connected in parallel, the rated short-circuit current can be generated by multiplying the rated 5 s value of the main fuse capacity with the number of cables in different situations.

Elenia shall provide, upon request, the maximum calculated short-circuit current value of a 1 or 3 phase connection, for purposes such as dimensioning and verifying the short-circuit proofness.

Table 3.5. Dimensioning short-circuit currents for new connections.

Connection capacity A (nominal value of the primary protection device/main fuse)	**Single-phase short-circuit current at the connection primary protection device/main fuse-switch A** (minimum)
3x25	250 (180[1])
3x35	250 (180[1])
3x50	250
3x63	320
3x80	425
3x100	580
3x125	715
3x160	950
3x200	1250
3x250	1650
3x315	2200
3x400[2]	2840[2]
3x500[2]	3800[2]
3x630[2]	5100[2]
2 x (3x125)	1430
2 x (3x160)	1900
2 x (3x200)	2500
2 x (3x250)	3300
2 x (3x315)	4400
3 x (3x125)	2145
3 x (3x160)	2850
3 x (3x200)	3750
3 x (3x250)	4950
4 x (3x125)	2860
4 x (3x160)	3800
4 x (3x200)	5000
4 x (3x250)	6600
N x (3x100)	N x 580
N x (3x125)	N x 715
N x (3x160)	N x 950
N x (3x200)	N x 1250

[1] In exceptional cases, the short-circuit current may be 180 A (e.g. in a sparsely populated area).

[2] Connection types only allowed for the expansion of existing connection when the main distribution board is not being renewed.

4. Earthing

Elenia installs earthing in the electricity network in accordance with the provisions, requirements and needs of the distribution network. Earthing in the distribution network is not a substitute for earthing requirements for electrical connections. Connection earthing may not be connected with earthing of the network in order to avoid stray current in the PEN conductor of the connection line. Earthing of a real estate transformer located in the same building must be connected to the earthing of the connection and the building if the connection line is either a 4.5 or 5 conductor cable.

An earth electrode must be applied to each new electrical connection. Also old connections (if the earth electrode is not available or its condition is unknown) must be equipped with a earth electrode in connection with renovation measures, such as renewing cabling or electrical installations. Thunder protection must also be taken into account in the dimensioning and implementation of the earth electrode. It is recommended to use at least 16 mm2 of bare copper rope as the earth electrode.

The earth electrode can be implemented in the following manners, in order of recommendability:

1. Building foundations (going around the building)
   - Cast inside the (footing of the) foundations
   - Or under the foundations (purposefully against the ground)
2. Around the building next to the foundations (below the subsurface drains, against the ground)
3. Horizontal electrode of at least 20 m to the connection line pit (below the connection line against the ground)
4. 2 pieces of horizontal electrodes at least 20 m in length installed in different directions or at least 40 m in length with a continuous loop in such a way that damage is as unlikely as possible

5. Overvoltage protection

Elenia does not install overvoltage protectors in its low-voltage network and does not allow other parties to install them on the side of the supplying distribution network of primary protection devices. Any overvoltage protectors installed on the connection pylon, for example, by the connecting party, will be removed by Elenia in connection with the maintenance of the electricity network, underground cabling or other measures. Removed overvoltage protectors will not be returned, replaced or reinstalled to the customer.

The connecting party must implement any overvoltage protection in accordance with the up-to-date requirements of the SFS 6000 series of standards, usually at least for the main distribution board. Overvoltage may occur in Elenia's underground cable network, overhead line network, or in the so-called mixed network formed by these due to factors such as climatic or connecting phenomena, so it is generally recommended to install overvoltage protectors on the main distribution board, regardless of the distribution network.

It is recommended to connect the overvoltage protectors of the main distribution board to the primary protection device connectors on the metering side before sealing/connecting the supply. Overvoltage protectors shall not be connected to the connectors on the electricity network side of the primary protection device. Overvoltage protectors can also be installed after the metering and the main switch, leaving part of the distribution board virtually unprotected.

6. Electric heating and controls

The electrical heating controls shall comply with the wiring recommendations by SLY.

If the meter installed by Elenia is used for night-time load control, a separate supplementary relay or contactor must be installed in the control circuit.

A separate tariff control device (clock), connected before the main switch, is not necessary in new locations, but a separate control fuse is required for the control circuit, which must be installed behind the metering from the input direction.

Metering devices with a remote reading connection have a delay in the switching on of the night-time load and the loads are switched according to the normal time between 10:00 pm and 11:00 pm. However, the nightly rate will be applied starting at 10 pm. The clocks of the meters stay year-round in official Finnish time, that is they take daylight savings time into account.

7. Engine loads and other abnormal loads

In accordance with the terms of the network service, it must be ensured from Elenia in advance that the equipment connected to the network does not cause interference to other electricity users. This includes devices with a high switching current in relation to the size of the main fuse and devices that connect with the network frequently.

The dimensioning of the interface and loads must be such that the rated current according to the primary protection device is not exceeded even in an abnormal load situation, for example by limiting the switching current if necessary or by disconnecting other loads.

A squirrel-cage motor can be connected to the network without a starter, depending on the rated current of the primary protection device of the connection, according to Table 7.1:

Table 7.1 Squirrel-cage motors connected to the network without a starter.

Primary protection device (A)	Engine (kW)
25-50	3
63	4
80	5.5
100-125	7.5
160	11
200	15
250	18.5
2x160 (315)	22
2x200 (400)	30
2x250 (500)	37
2x315 (630)	45
3x250 (4x200)	55
4x250	75

The starter can be a star-delta starter or at least a soft starter with the same current limiting function.

8. Compensation of reactive power

For power transmission products, reactive power is charged if the reactive power exceeds 16 % of the invoiced active power. Generally, it is advisable to compensate for the reactive power.

Compensation of reactive power also enables efficient use/dimensioning of the primary protection device. When purchasing a new main distribution board equipped with indirect metering, it is advisable to reserve room in the board for compensation. Compensated lights should be used for lighting.

There must be separate current transformers for regulating reactive power and the settings of the compensation must allow sufficiently precise adjustment (e.g. 5–25 kVar) in order to ensure that the regulating is accurate. Compensation of reactive power shall be dimensioned so that the unguided/fixed reactive power does not exceed 15 % of the invoiced active power.

9. Temporary electricity supply

Temporary underground cables are covered in the standard SFS 6000-8-814.

Temporary underground cables can be used, for example, for supplying power to construction sites. The connecting party is responsible for the excavation, installation and protection of the cable owned they own. When laying cables on the ground, it must be taken into account that:

- the cables are protected with at least a medium-heavy duty protective pipe (e.g. with a wooden chute)
- the cable covers are marked with a marker tape or plates
- the cable covers must be prevented from moving by attaching them to the ground

A cable intended for temporary use or for a short exceptional situation may not be laid across a road travelled by vehicles. The cable must also not be installed in a place where it is exposed to damage from heavy machinery. However, if it is necessary to install the cable across the road for a short period of time, the cable must be protected against traffic loads with a durable fixed shield.

Installation of temporary underground cables is only permitted in locations where the cable protection is monitored and any shortcomings in the protection are immediately rectified. Temporary installation must be dismantled when the reason for temporary or exceptional use has ceased (e.g. construction site completed).

10. Electricity production

Elenia's permission must be requested prior to the connection and commissioning of a production installation. It is advisable to communicate with Elenia even before acquiring a production plant, in order to ensure that the production plant is suitable for the connection location. Elenia will then also examine the possible need for network reinforcement.

The connection of the production facilities to the electricity network must follow the industry guidelines and regulations. Finnish Energy has published guidelines related to production plants:

- Connecting a power generating facility to the distribution network
- Technical annex 1 to the instructions for the connection of power generating facilities to the distribution network – connection of plants with a nominal capacity of 100 kVA or less
- Technical annex 2 to the instructions for the connection of power generating facilities to the distribution network – connection of plants with a nominal capacity of over 100 kVA

A general information sheet for small-scale production can be found on Elenia's website, which the customer can use to provide Elenia information of the production equipment with a rated output of up to 100 kVA for connection to the electricity network. The form shall be submitted to Elenia electronically. For production equipment with a rated output of more than 100 kVA, information in accordance with Table 7.1 of Annex 2 is required in addition to the general information sheet. In addition, a commissioning inspection record for the equipment is required.

The requirements for real-time data exchange apply to power plants above 0.5 MVA. For power plants with a capacity between 0.5 and 1 MVA, the need for real-time data exchange is determined by Elenia on a case-by-case basis, depending on the type of production, the characteristics of the network and whether the energy produced is consumed entirely behind the connection point. For power plants with more than 1 MVA, real-time data exchange is always required.

The connecting party provides the necessary information to Elenia and Elenia forwards it to Fingrid. The requirements for real-time data exchange are based on Fingrid's current grid code specifications and, where applicable, Fingrid's current guidelines for real-time data exchange. Real-time metering and status information must be available in Elenia's operation and control information system when a new power plant or substation is connected to the electricity network.

11. Energy metering

Elenia installs, maintains and owns the meters used for energy invoicing. The direct metering method can be used when the measurement front fuse does not exceed 63 A. Indirect metering shall be used when the front fuse exceeds 63 A. The plan for implementing indirect energy metering (e.g. a main circuit diagram of the equipment, measurement circuit diagram, nominal values of the instrument transformers) must be submitted and approved by Elenia on a case-by-case basis upon request.

The equipment and connections must comply with the standards in force at the time.

- SFS 3381 Mittauslaitteistot
- SFS 2532 Monimittarikeskukset
- SFS 2529 Energiamittarin alusta
- SFS 5601 Sähköenergiamittareiden tilat

11.1 Metering panels and locking

For an individual meter that is the responsibility of Elenia, one standard M2 meter grid is required for the energy meter. The grid is wired and the conductors are numbered.

Elenia must have unrestricted access to the metering panel of a multimeter site, for example, by means of a route key placed in a key deposit cylinder. The key deposit cylinder must be placed at the beginning of the route in an easy to find location. It is the responsibility of the real estate owner to select a locksmith and set the key deposit cylinder with Elenia's serialisation. If necessary, the locksmith can ask request the correct serialisation number from Elenia's contact person. After the key deposit cylinder has been serialised, a representative of the real estate owner shall arrange a meeting with Elenia's contact person, during which the route key is placed inside the key deposit cylinder. The real estate owner is responsible for ensuring that the key deposit cylinder is securely fixed, such as by anchoring or through-mounting. If there are alarm devices on the access route to the metering panel, Elenia is not responsible for the cost any of the alarms may cause.

There must be at least 0.8 m of free space in front of the metering panel for the installation and maintenance of the metering device.

11.2 Meter antennas and bus cabling

All the electrical meters used by Elenia are remotely readable. GSM connections and bus cabling between meters are utilised in remote reading.

Adequate GSM signal strength (above -85 dBm) must be available at each metering panel. If the above is not possible, the customer shall arrange a cable route from the space to a location where the signal strength is reached for the installation of an additional antenna. The required feed-through / pipe diameter is 20 mm (JAP or JM).

If the property's electrical meters are located in more than one metering panel location, a route must be reserved between them for bus cabling between the meters. In new properties with multimetering, the meters must be placed in a single point or space.

11.3 Current transformers

The customer is responsible for purchasing current transformers. The current transformers required for metering electrical energy shall be dimensioned, supplied and wired to the equipment or metering panel by the customer or the customer's electrical contractor. The selection of current transformers shall take into account possible expansions and the number of primary feed-throughs, taking into account the measured current.

Metering circuits for indirect metering grids are wired from the instrument transformers and numbered. The metering circuits must have interruptible so-called metering terminal blocks. The conductors shall be labelled with the number of the instrument or terminal block. The metering conductors (current and voltage circuits) must have a cross-section of at least 2.5 mm^2. When connecting current transformers, the correct direction of power must be taken into account.

No devices other than the energy meter used for invoicing shall be connected to the same secondary metering circuit. Voltage metering circuits are protected with 3x10 A overcurrent protection.

Current transformers must be installed in such a way that their shield values and connections area visible when the equipment is energised or the values and connections can otherwise be reliably verified.

Current transformers shall be selected so that the measured current corresponds to 5–120 % of the primary rated current of the current transformer. All phases must have their own return current conductors. Current transformers must have an accuracy class of at least 0.2s and a nominal load of no more than 5VA. The secondary current of the current transformers must be 5 A.

In order for the current transformers to remain within their accuracy class, the selection and dimensioning of current transformers and conductors must form a load of between 25 % and 100 % of the nominal load of the current transformers. If necessary, additional resistors shall be used to achieve an adequate load. The customer or the customer's electricity contractor performs the load calculation and acquires and installs any additional resistors that may be necessary. The load calculation shall be submitted to Elenia on request.

The nominal values of the current transformers and any possible primary current range allowed by the current transformers must be reported to Elenia in connection with the metering order at the latest.

In the event of a significant change in electricity use, the dimensioning of the current transformers must be adapted to correspond to the changed situation. Elenia must be notified in advance of the change and its schedule.

Table 11.1. Examples for selecting current transformers

Measurement front fuse	Transformation ratio	Primary feed through	Multiplier
A	A/A	qty	
3x63	75/5	1	15
	100/5	1	20
3x80	100/5	1	20
3x100	100/5	1	20
3x125	125/5	1	25
	150/5	1	30
3x160	200/5	1	40
	250/5	1	50
3x200	200/5	1	40
	250/5	1	50
3x250	250/5	1	50
3x315	300/5	1	60
3x400	400/5	1	80
3x500	500/5	1	100

Table 11.2. Current transformer loads and permissible conductor lengths at different cross-sections

Current transformer load [VA]	2.5 mm²		6 mm²	
	min [m]	max [m]	min [m]	max [m]
1.5	1	3	2	9
2.5	2	6	4	15
3	2	7	5	18
4	3	10	7	25
5	4	13	9	30
7.5	6	20	15	45
10	8	27	20	60
15	11	40	30	80
20	15	55	40	120
25	20	65	60	150

11.4 Sealing of the main distribution board

It must be possible to seal parts of the distribution board that contain unmetered electricity.

Including:

- protective connector covers of energy meters
- instrument transformer covers
- metering terminal block covers
- fuse-switch covers
- connection line connector housing (no other connections in the same housing)
- main fuse-switch housing (frame, connector or contact cover) or central compartment cover (excl. separate fuse cover or fuse covers)
- main switch box (frame/connector) or central block cover
- covers for connection points as well as the connectors of the rails or cables and connection points between the main fuse-switches and the front fuses of the places of use

The sealed part shall not include consumer installations. If it is necessary to open the sealing, Elenia's customer service must be contacted for sealing and inspection.

12. Electrical supply of fire protection systems

Elenia does not require an energy measurement for the electricity supply to fire protection systems. Such systems include, sprinkler pumps, smoke extraction fans, fire dampers and smoke extraction hatches. No other consumption shall be connected to the group feeding the above fire protection equipment. The power supply to the fire protection systems is connected directly to the electrical supply of the building before the main switch. In an emergency, the intention is to keep the fire protection system in operation as long as possible. If the fire protection equipment is connected to the main distribution board before the main switch, an additional sign must be added to the main distribution board to warn of parts remaining energized after the main switch. The sign must also indicate where the live parts can be de-energised, if necessary (see SFS 6000-5-53, section 537.1.2.). To ensure safe maintenance, it is recommended that the parts remaining energised after the main switch is unplugged are installed in their own bay or enclosure.