IKEA Industry

ELECTRICAL MACHINE INSTALLATION STANDARD

ORIENTATION

What it is

This is an Electrical Technical Standard which defines the criteria governing the system design and outline solution to requirements by Ikea Industry AB.

How it helps

This standard is developed for to standardize the electrical installations on machines. By using this standard, known problems can be avoided and good long lasting functionality can be obtained.

What is in it

This standard describes aspects to consider when contracting to build a new, or expand, an existing plant.

The standard describes in detail some of the most common problems identified by IKEA Industry during past years

This standard shall be used together with Technical drawings and valid European standards.

RELEASE NOTES/REVISION LOG

Revision Date	Version	Summary of changes	Reviewed by	Remarks
2010-12-31	02	Revised document, with changes from latest Electrical Manual	Tommy Hesselgård	
2012-01-25	04	Standard structure, new author and approver, chapter change:2, 3.7-8, 3.11, 3.13-14	Viktoria Wigström, Tommy Hesselgård	
2014-05-01	05	Name change to Ikea Industry AB	Tommy Hesselgård	
2020-04-22	06	Complete revision	Tommy Hesselgård	

Electrical Machine Installation Standard

Contents

1 BACKGROUND

Ikea Industry AB recognized that there was a lack of properly documented information of many of the important aspects of a project that need to be considered when contracting with Suppliers to build new, or modify existing, electrical installation for Ikea Industry AB. This Standard is intended to provide that missing information.

2 INTRODUCTION

The Standard describes in detail some basic technical requirements for machine installations.

Main idea with the standard is to verify all necessary correspondence between Ikea Industry AB and Contractor.

3 PROJECT SPECIFIC DOCUMENTS

The following information shall be specified by Ikea Industry AB beforehand and given to potential Suppliers:

- Technical conditions
- Building drawings
- Classification plan, special care shall be taken in case of ATEX classing (Lowest accepted IP-class in Production and storage areas are IP 54)

3.1 Standards

2006/42/EC The machinery directive

2014/35/EU Low Voltage directive

IEC/EN 60 204-1:2016, Safety on machines

ISO 31000:2009: Risk management - Principles and guidelines

IEC/EN 60 529, edition 2.1, Degrees of protection provided by enclosures (IP Code)

IEC 61537 Cable tray systems and cable ladder systems for cable management

IEC/EN 60439-1 type-tested and partially type-tested assemblies

IEC/EN 60439-2 particular requirements for busbar trunking systems.

IEC 61535 Installation couplers intended for permanent connection in fixed installations

EN 62491:2008 Labelling of cables and cores

IEC/EN 61 000-3-2 Electromagnetic compatibility (EMC). Limits-limits for harmonic current emissions

IEC/EN 61 000-5-7 Electromagnetic compatibility (EMC). Installation and mitigation guidelines

IEC/EN 61 000-6-2 Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments

IEC/EN 61 000-6-4 Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments

Valid IEC standard series IEC 60364 Electrical installations of building.

IEC/EN 60364-5-51 Electrical installations of building. Selection and erection of electrical equipment-common rules

IEC/EN 60364-5-54 Electrical installations of building. Selection and erection of electrical equipment-Grounding arrangements, protective conductors and protective bonding conductors

IEC/EN 60445, edition 4, Basic and safety principles for man-machine interface, marking and identification. Identification of conductors by colours or numerals

IEC/EN 60446, edition 4, Basic and safety principles for man-machines interface, marking and identification. Identification of equipment terminals and terminations of certain designated conductors, including general rules for alphanumeric systems.

IEC/EN standards series 61024 Protection of structures against lightning

IEC/EN standards series 62305 Protection against lightning

IEC 60079-14 contains the specific requirements for the design, selection, erection and initial inspection of electrical installations in, or associated with, explosive atmospheres

ATEX Directive: Atmosphere Explosible 2014/34/EU

4 TECHNICAL DEMANDS

4.1 Mains

The machine must only have one feeding point for power supply

Main voltage 0, 4 kV/230 V AC 50 Hz

TN-S system (3 phases, neutral and protection earth PE)

Control system voltage 230 V AC or 24 V DC

Any kind of Illumination on or inside machinery, service posts shall be feed before the main switch and equipped with an own power switch.

All set points for breakers, switches and adjusted parameters on inverters etcetera shall be checked by the machine suppliers' start up team and notified and signed in a ring binder before test are allowed to start. Set points for overload protection etc. shall be visualized in each cubicle

The equipment shall be installed in a way providing easy access and shall also be prepared for future expansion without any re-construction.

Static frequency changer larger than 1, 5 kW shall be of type 3-phase. Static frequency changer shall be affected with harmonic filter and shall be provided with an effective EMC-filter.

4.2 Electrical cubicles

All electrical equipment shall be coordinated together with mechanical installations, such as exhaust systems, compressed air, and sprinkler etcetera.

Protection class of all electrical cubicles shall follow classification plan in each separate case, but for production areas and warehouses never lower then IP 54

Distribution boards which are placed in a corrosive environment shall be of rustproof style.

Distribution boards which are placed outdoors or in areas with high moisture shall be provided with thermostat-controlled electric heating.

Distribution boards that are placed in warm spaces were the equipment generates heat shall have such a ventilation or cooling, which shall prevent temperatures more than 35 ° C inside the cubicle.

Cubicles shall be built in a way securing no condensate.

In the distribution board there shall be a special place for documentation.

Information on impedance and short-circuit current shall be noted in the distribution board, as well as in the documentation.

All live components in the distribution boards shall be in semi-protected design. Lowest IP 20

4.2.1 Low voltage switch gears belonging to machine

The low voltage switchgears shall be manufactured in accordance with valid European norms and consist of a steel cabinet and built in consequent modules for flexibility.

Switch gears shall be at least of type 4a

MCCB (moulded case circuit breakers) shall be equipped with electronic releases featuring microprocessor-based technology and be adjustable.

All MCBs shall be of the toggle operating type, with single operation mechanism to provide ON/OFF switching and restoration of the service after automatic tripping. All units shall make quick break action and have trip free mechanism. Triple pole units shall have tripping mechanism acting from any one phase such that a fault occurring on any one phase of a three or four pole MCB shall trip the breaker.

All distribution boards or bus duct shall be equipped with MCCB or fuses. (Note: Fuses are never accepted for a bigger load then 100 Ampere)

4.2.2 Materials & Equipment

Materials and equipment shall preferably be selected from well-known producers and from suppliers who are represented and have stock and after sales organization in the country were the machine shall be placed. Existing component standard in each unit shall be followed whenever possible.

All breakers, fuses etcetera inside cubicles shall be tested together ensuring function. Different brands of the same type of equipment inside a cubicle are not allowed without special permission from Ikea Industry AB.

4.3 Cable trays

All cable ladders & trays shall be galvanized with factory-fabricated accessories such as bends, supports, joints, etc.

Trays shall be of open type, without cover.

Trays shall be mounted vertical, not direct to the floor and feed all cubicles or operator panels from above if the cable intake is lower than 1 meter above finished floor level.

Ladders and trays shall be able to carry design full load without deformation. Ladders and trays shall be able to carry 1.7 x the designated full load without break.

Ladders for a uniform load of 600 N shall have maximum distance of 6 000 mm between brackets/fixings. They shall also be able to carry an occasional point load as to the heavy duty ladder

Ladders for a uniform load of at least 200 N shall have maximum distance of 2 000 mm between brackets/fixings.

Cable trays shall be provided between main-, sub- and control panels and from distribution boards to the cable ducts.

Plastic channels in production halls, warehouse, packaging and mechanical rooms or storage are banned.

Height of the installation shall be coordinated together with all other technical installations and approved by Ikea Industry AB

Spare capacity of not less than 20% shall be available on each machine trunk.

4.4 Cables

Cables made of other material than PVC shall be used if minor cost differences.

All openings in walls made during cable installation shall be tightening back to original fire class.

Cables on the floor are not accepted and shall be installed in a way securing easy cleaning.

Fire rated cables shall be used for emergency equipment and other essential installations. National and local regulations must be followed. If using fire rated cable, this shall be protected when passing other fire sections.

Cables shall be laid straight in cable trays, ladders, etc. No unnecessary crossings shall be made.

Cables de-routed from canalization to e.g. a wall, shall be supported if distances exceeds 0, 5 meter.

Shielded cable shall be used for all sensitive parts like; servo motors, frequency inverters, filters, encoders, pulse sensors, thermoelectric devices

Robot cables shall always be used, when machine or cable itself is moving during production or set-ups. Highest possible cable class shall be used

EMC cable gland shall be used for shielded cables.

Cable with a diameter of less than 16 mm2 shall always be copper; diameter above can be either copper or aluminium.

All internal wiring ought to be equipped with insulated or welded end sleeves

4.5 Grounding system/potential equalizing

The machine shall be grounded and potential equalized according valid European Standard for TN-S system.

Yellow/green colour cables are only for grounding purposes.

The building is equipped with foundation earth connected electrodes and each machine shall be connected to this structure.

All switchgear units, iron grids and other parts, which are conductive, shall be connected to the earth connection system with a cable system minimum 6 mm^2 up to 35 mm^2.

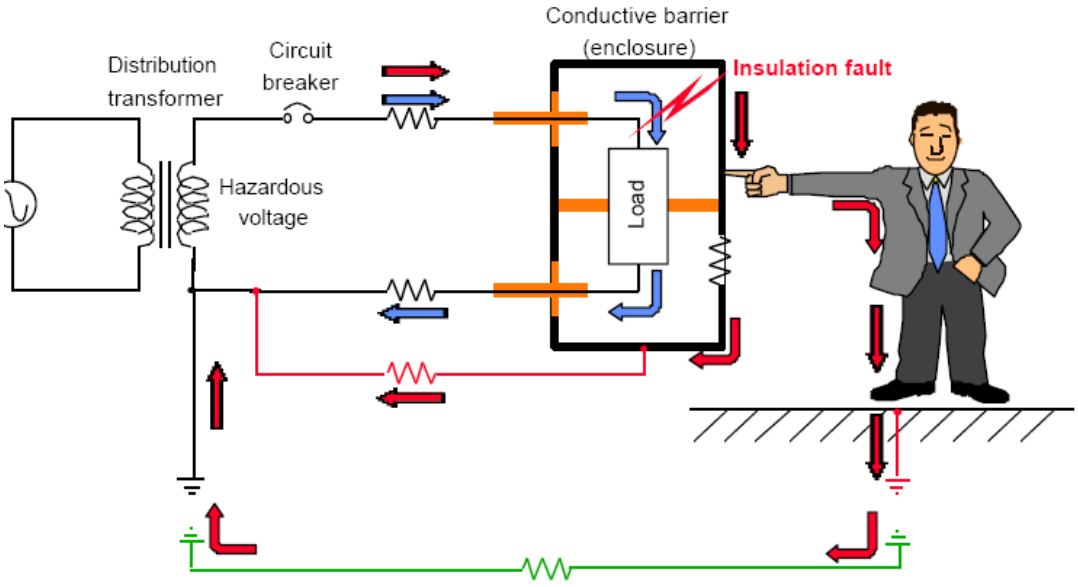
The cable shall be connected inside the switch gear units.

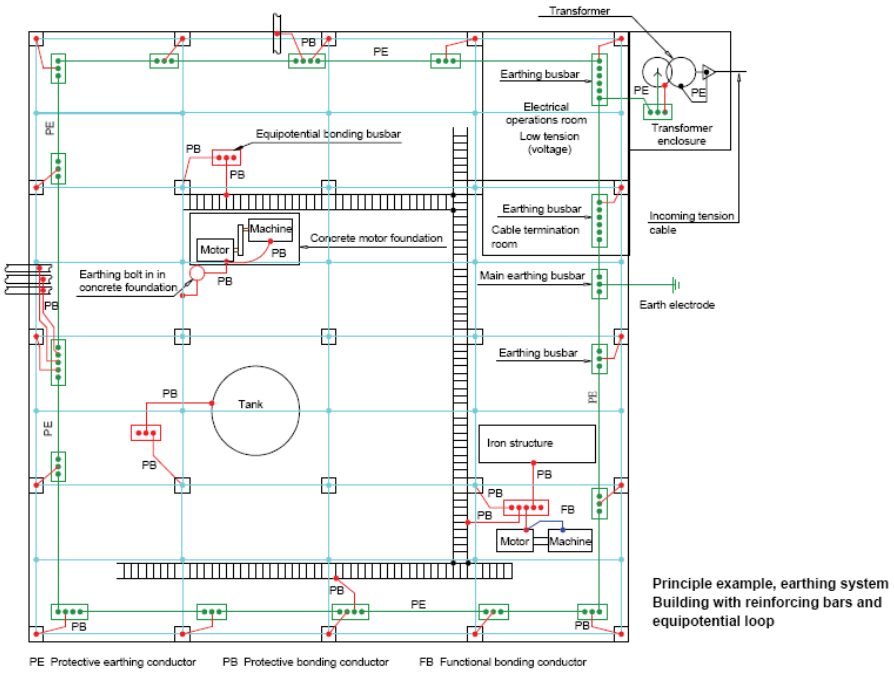
Special action is necessary in case of ATEX

Maximum one cable is allowed to be fixed under each screw on the Potential bonding bar

Serial bonding is prohibited. Each machine shall be connected to a main earth bar in 400 V switch room

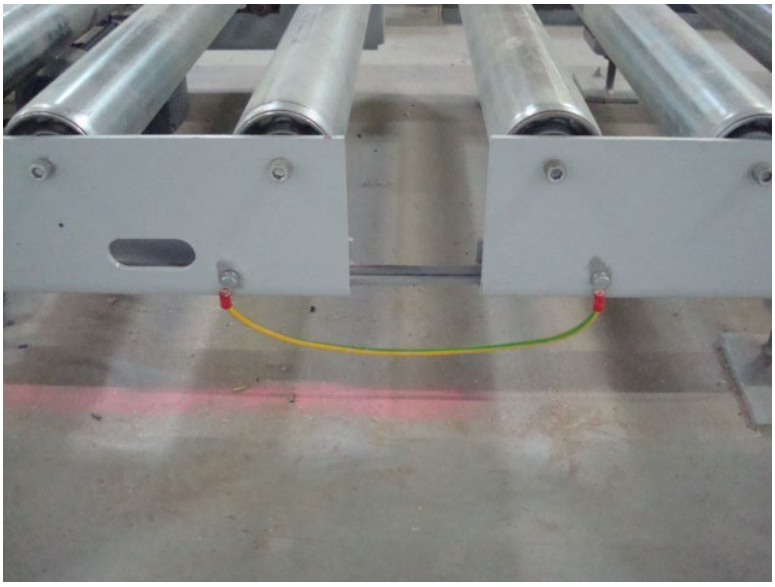
Basic requirements for ground and equipotent bonding of electrical apparatus are given in the standards:





Principle example, earthing system
Building with reinforcing bars and equipotential loop

Factory grounding/ bonding system



Potential equalizing

4.6 Electromagnetic compatibility (EMC)

The EMC directive regards the resistance capacity of electrical components to different types of electrical interference/phenomenon. It also regulates the effects that electrical equipment can have on surroundings.

The initial task of the EMC directive is to ensure that apparatus, equipment and systems operate satisfactorily in their electromagnetic environments without contributing unacceptable electromagnetic interference to anything in that environment.

Valid European standard shall be used concerning EMC directive. If installation is outside the European Union can National standard can sometimes be stronger and shall if so replace European standard.

4.6.1 EMC interference

There are four important main issues to bear in mind and follow to follow as far as possible the EMC requirements and reduce interference during the installation and connection of motor drive systems.

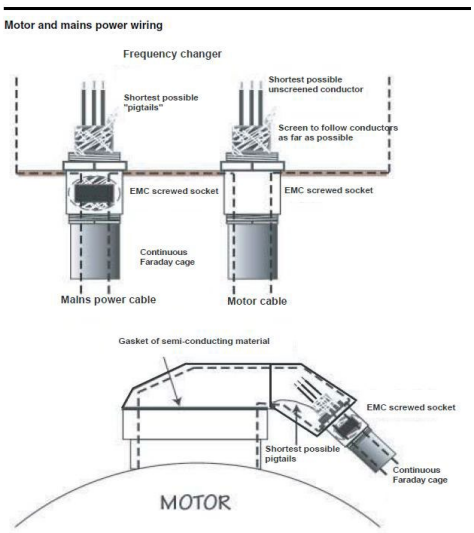
These are:

• To follow the general installation practices

• Secure earth connections (5-conductor and potential equalization systems)

• The necessary screening, Shielded cable shall always be used.

• Filters ensuring the EMC directive.



Cable connections using shielded cables

4.7 Safety Switches/isolator switch

All electrical motors shall have a safety switch close to each motor with an auxiliary contact, easy accessible for the operator to secure safe maintenance work. This switch shall isolate the power in all 3 phases. In case of smaller machines or machines with different sections can this

be solved with a separate LOTO switch together with written information shall be provided how to operate the switch.

Safety switch

The safety switch auxiliary contact shall release the power before main switch will be opened. In some places can this be solved with a main switch on main cubicle, but only if it is functional and not creating and hazardous risks. This solution is not acceptable if different parts of the machine are placed in different locations and cannot be overviewed from the main cubicle

The safety switch shall also have the possibility to be locked in turned off position.

Emergency stops can never replace the function similar with safety breaker/ isolator switch

Lock out/Tag out

4.8 Protective functions

To fulfil the safety and CE regulations the design of the machines etc. shall be in that way that fences can be avoided. If fences are necessary (must be discussed with the Purchaser)

Doors must be equipped with “non manipulative” switches. The keys etc. for the safety switches must be permanent mounted (welded, glued etc.)

All machines shall be de-energized direct when any of the security systems are activated; this includes pneumatic systems hot oil system, compressed air and similar systems.

Emergency stops, reset buttons and protective gates/light beams placement and number shall be risk assessed and approved by Ikea Industry AB.

In integrated lines, extra important is to risk assess the interfaces to other connected machines as emergency stops shall stop all other machines in the line. Final solution has to be approved by Ikea Industry AB.

All emergency stops and other switches with protective functionality shall be in 2-circuit design with monitoring included. Be installed in a way securing easy testing of the function.

4.9 Marking and Labelling

All installations shall be labelled in local Country language.

The main circuit diagram shall be mounted by the service central.

All components shall have a visible label withstanding the environment and lasting over time. Components hidden behind protection or heating plates shall have the marking attached fully visible outside the protections.

The designation for each electrical component shall come back in all electrical drawings, program lists, hydraulic- and pneumatic charts as well as in all instructions.

A cable list shall be produced indication all feeders, cable numbers, sizes, fuses approximately length, etc.

Equipment such as breakers, contactors, relays, transformers, etc. inside electrical cabinets shall be indicated with a durable label for reference according to the relevant wiring diagram. Not fixed to the component itself

Suitable cable marking shall be attached to every cable entering any distribution boards. Can be attached in or outside the gland

Appropriated warning signs shall be fixed to all electrical equipment and doors to electrical rooms.

The manufacture of the machine shall provide samples of the proposed labelling system prior to installation.

4.10 Testing reports

The electrical contractor shall perform the following tests:

- Insulation.
- Controlling of all neutral connections and all protected earth connections.
- Release tests of engine safety circuit breaker, automatic fuses and earth fault circuit breakers.
- Total grounding resistance.
- The result of the test shall be notified in reports and be underwritten by the Contractor or his supervisors.