

Technical Regulation for Electricity-generating Facilities of 11 kW or lower

Regulation for grid connection TF 3.2.1

Version 1

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Revision view

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Summary (not part of the regulation)

This technical regulation includes provisions for *electricity-generating facilities* with a capacity of 11 kW or lower, but with maximum current up to 16 A per phase, connected to the *public Danish distribution network*.

The regulation applies to new facilities and existing facilities which undergo major modifications.

The regulation substantiates and confirms the European CENELEC standard EN50438 and thus contributes to harmonising the rules governing the connection of *electricity-generating facilities* of 11 kW or lower to the European distribution networks.

The regulation supplements and refers to national requirements in accordance with standard EN50438.

The regulation replaces previous specifications and recommendations issued by Eltra, Elkraft and ELFOR (see **Appendix 3**).

In case of any discrepancy between the Danish text and the English translation, the Danish text shall prevail.

Table of contents

Revision view	2
Summary (not part of the regulation).....	3
Table of contents	4
Introduction (not part of the regulation)	5
1. Definitions.....	6
2. Objective.....	7
3. Scope	8
4. Connection requirements	9
5. Protection.....	10
6. Power quality	11
7. Network and system stability.....	12
8. Operation and maintenance	13
9. Registration, verification and documentation	14
10. Decommissioning or replacement.....	16
11. Non-compliance	17
12. Exemptions and unforeseen circumstances.....	18
Appendix 1: Documentation.....	19
Appendix 2: Required relay protection according to EN50438.....	25
Appendix 3: Previous provisions (not part of the regulation).....	26
Appendix 4: Reference list (not part of the regulation).....	27

Introduction (not part of the regulation)

Requirements and delimitation

This technical regulation is part of the complete set of technical regulations issued by Energinet.dk, the Danish Transmission System Operator (TSO). The technical regulations comprise technical rules for the players regarding the connection to and operation of the *public distribution network*. Together with the market regulations, the technical regulations, including the system operation regulations, constitute the non-discriminating set of rules to be complied with by the players. The current version of the technical regulations is available at www.energinet.dk.

This technical regulation includes provisions for *electricity-generating facilities* with a capacity of 11 kW or lower, but with maximum current up to 16 A per phase, connected to the *public Danish distribution network*. The regulation includes elaborations of and supplements to the provisions of the European standard EN50438 governing the properties with which the facility must be designed and with which it must comply during its service life.

Definitions and comments

The regulation and the European standard EN50438 make extensive use of definitions. A number of definitions are described in the first section of the regulation. The definitions throughout the regulation are clarified by *italics* in the text.

Apart from sections with the provisions of the regulation, this document includes sections which support the use of the regulation. Such sections are not part of the actual regulation. It appears from the section headline if a section is not part of the actual regulation.

Responsibility for the regulation

The TSO is responsible for the technical regulations and for ensuring that the regulations are continuously adapted to the future *public distribution network* in Denmark.

The technical regulations are enforced by the individual electric power utilities. The TSO may give permission in writing to depart from the regulation.

Authority requirements and standards

All *electricity-generating facilities* must comply with Danish legislation, including the Danish Heavy Current Regulation and the 'Joint regulations of the electric power utilities'. In areas not covered by Danish legislation or by technical regulation TF 3.2.1, the CENELEC standards apply, and in areas where there are no such standards, the ISO and IEC standards apply.

1. Definitions

1.1 **Rated power**

Highest nominal output from the *electricity-generating facility* at nominal operating conditions. Stated in kW or kVA.

1.2 **Rated current**

Highest nominal current from the *electricity-generating facility* at nominal operating conditions.

1.3 **Nominal voltage**

Voltage in a connecting point where the system is designated 230 V single-phase or 230/400 V polyphase, for example.

1.4 **Electricity-generating facility (micro-generator)**

Facility producing single-phase, two-phase or three-phase alternating current.

1.5 **Public distribution network**

Transmission grids and distribution networks that transmit electricity for an indefinite group of electricity suppliers and consumers on the terms dictated by public authorities.

1.6 **Loss of mains (LoM)**

Failures in the connection to the *public distribution network*.

1.7 **Connection to the public distribution network**

Electricity-generating facilities connected electrically to the *public distribution network*. The connection can be either *direct network connection* or *installation connection*.

1.8 **Direct network connection**

Direct connection of an *electricity-generating facility* to the *public distribution network*.

1.9 **Installation connection**

Connection of an *electricity-generating facility* to the *public distribution network* via an electrical installation.

2. Objective

The objective of this technical regulation TF 3.2.1 is to specify, technically and in terms of design, the minimum requirements applying to *electricity-generating facilities* with *rated output power* of 11 kW or lower which are connected to the *public distribution network*.

Another objective is to ensure the technical quality and balance of the *public distribution network*. This includes the fulfilment of two basic technical conditions, namely that the total power production can be adjusted continuously to the consumption and that the voltage can be maintained.

To obtain a reliable and efficient electricity supply system, it is necessary to have coherent planning, plant design and operation, from production facilities to consumers.

This regulation outlines the minimum requirements. If better properties can be achieved without incurring extra costs, it should be done.

2.1 Legislation

The regulation has been prepared in pursuance of Section 26(1) of the Danish Electricity Supply (Consolidation) Act No. 1115 of 8 November 2006, cf. Section 7 of the Danish (Consolidation) Act No. 1463 of 19 December 2005 on Transmission System Operation and the Use of the Electricity Transmission Grid etc.

2.2 Administration of the regulation

The technical regulations are administered by the electric power utility to whose network the *electricity-generating facility* is connected on behalf of the TSO. The TSO may give permission in writing to depart from the regulation.

2.3 Complaints

This regulation has been registered with the Danish Energy Regulatory Authority. Complaints about the regulation can be lodged with the Danish Energy Regulatory Authority. Complaints about how the TSO has enforced the provisions of the regulation can also be lodged with the Danish Energy Regulatory Authority.

Complaints about how the individual electric power utility has enforced the provisions of the regulation can be lodged with the TSO.

3. Scope

The regulation applies to three-phase *electricity-generating facilities* with a capacity of up to 11 kW, or single-phase and two-phase facilities with *rated power* of up to 16 A per phase, connected to the *public distribution network*.

In areas not covered by Danish legislation or by technical regulation TF 3.2.1, the CENELEC standards apply, and in areas where there are no such standards, the ISO and IEC standards apply.

Electricity-generating facilities connected to the *public distribution network* in accordance with sections 3.1 and 3.2 must at any given time comply with the provisions of the regulation and the European standard EN50438.

Only type-tested facilities installed individually may be installed without the prior consent of the electric power utility.

3.1 New plants

The regulation applies to the above-mentioned *electricity-generating facilities* connected to the *public distribution network* in Denmark and commissioned on and after 30 June 2008.

3.2 Existing plants

Electricity-generating facilities connected to the *public distribution network* in Denmark before 30 June 2008 must comply with the requirements applicable at the time of commissioning.

If major modifications are made to the existing facility, it must comply with the regulation applicable at the time of commissioning.

In case of doubt, the electric power utility decides whether a modification is major.

3.3 Exemptions

The regulation does not apply to *electricity-generating facilities* where several small plants connected to the same installation together exceed a *rated power* of 11 kW in the connecting point. In that case, other technical regulations for network connection of *electricity-generating facilities* of more than 11 kW apply.

Single-phase and two-phase *electricity-generating facilities* with *rated power* of 16 A per phase are not allowed to be connected to the network without prior written agreement with the electric power utility on network connection and use of the network.

The regulation does not apply to requirements relating to *electricity-generating facilities* only used for emergency and reserve supply to an installation when the installation is not connected to the *public distribution network*.

4. Connection requirements

4.1 General

An *electricity-generating facility* and its installation must comply with the requirements of the Danish Heavy Current Regulation and section 4(1) of EN50438.

4.2 Metering

A *power station unit* must be connected to metering equipment in accordance with the regulations issued by the TSO.

There are two metering regulations that must be observed:

- metering regulation for settlement purposes, which describes the requirements for electric energy metering on the basis of quarter-hourly registration; and
- metering regulation for the purposes of system operation, which describes the requirements for electric energy metering on the basis of online metering.

4.3 Over-current protection

An *electricity-generating facility* must have over-current protection in compliance with the Danish Heavy Current Regulation and section 4(1.2) of EN50438.

4.4 Earthing

For an *electricity-generating facility*, earthing must be effected in compliance with section 4(1.3) of EN50438 and section 6 of the Danish Heavy Current Regulation.

5. Protection

5.1 General

Protection equipment requirements applying to *electricity-generating facilities* connected to the *public distribution network* are specified in section 4(2) of EN50438 and in EN50438 Annex A (DK – Denmark). Annex A is attached to this regulation as **Appendix 2**.

Protection equipment must ensure that the *electricity-generating facility* does not impair the properties of the power system or reduce the safety of personnel and materials.

The protection equipment must be insensitive to normal frequency and voltage fluctuations.

5.2 Frequency and voltage deviations

The *electricity-generating facility* must be disconnected automatically in case the frequency or the voltage exceeds the limits in the table for Denmark in EN50438 Annex A. Annex A is attached to this regulation as **Appendix 2**.

5.3 Detection of loss of mains

Loss of mains must result in automatic disconnection of the main circuit for the *electricity-generating facility*. The detection of *loss of mains* must comply with EN50438 Annex A (DK) for the parameter designation ROCOF (df/dt). Annex A is attached to this regulation as **Appendix 2**.

ROCOF will be replaced by overspeed relay set at 10-20% for *electricity-generating facilities* with asynchronous generator.

5.4 Automatic reconnection after a network outage

After a *loss of mains*, it must not be possible for the *electricity-generating facility* to reclose manually or automatically before the voltage and the frequency have been within the limits of EN50438 Annex A (DK) and section 4(2.4) of EN50438. Annex A is attached to this regulation as **Appendix 2**.

5.5 Synchronisation

Synchronisation of the *electricity-generating facility* with the network must be done automatically according to section 4(2.5) of EN50438.

6. Power quality

6.1 General

An *electricity-generating facility* must comply with the European EMC directive.

Wherever the EMC directive does not include specific product requirements, the generic requirements of section 5(1) of EN50438 must be fulfilled.

6.2 Voltage dips, flicker and overcurrents

The *electricity-generating facility* must comply with the requirements of section 5(1) of EN50438.

Furthermore, the inrush current may result in a voltage dip of no more than 4%, which shall be deemed to be fulfilled if the current is lower than the current values in Table 1 below.

Connection	Inrush current
Phase and zero	25 A
Three phases	40 A

Table 1 – Highest inrush currents.

6.3 DC injection of the facility

The DC injection of the *electricity-generating facility* must comply with the requirements of section 5(2) of EN50438. This shall be deemed to be fulfilled when the *electricity-generating facility* fulfils the requirements relating to DC injection of equipment as specified in IEC 61000-3-2.

6.4 Power factor

Unless another special agreement is made with the electric power utility, the *electricity-generating facility's* power factor (φ) must be in the interval specified in section 5(3) of EN50438.

7. Network and system stability

To ensure the operation of the *public distribution network*, the *electricity-generating facility* must be prepared for the establishment of telecommunication between the facility and the TSO in accordance with the TSO's regulations.

The *electricity-generating facility* or the ancillary installation must be equipped with a circuit-breaker device which can remote-disconnect the facility (digital input, throw-over relay, stop circuit or the like). The external breaker device must automatically disconnect the facility when the external circuit is broken.

When the external circuit for the breaker device is reclosed, the *electricity-generating facility* can again be synchronised as after *loss of mains*.

Upon request, the electric power utility must be given access to and room at the *electricity-generating facility* to install communication equipment and connect it to the breaker device for remote disconnection.

8. Operation and maintenance

When operating an *electricity-generating facility*, the plant owner must comply with the provisions in the manufacturer's requirements and recommendations, see section 6(5) of EN50438.

The *electricity-generating facility* must be maintained on a current basis so that the facility always lives up to this regulation, and so that the *electricity-generating facility* does not pose a risk to facilities in the interconnected *public distribution network*.

9. Registration, verification and documentation

9.1 Registration

Registration of installations must be made according to the 'Joint regulations of the electric power utilities' and in compliance with section 7(3.1) of EN50438 in case of change in supply volume and connection of an *electricity-generating facility*. This must be done by the certified electrician before installation is commenced.

An agreement must be made with the electric power utility on network connection and network protection not later than 30 days after commissioning of the facility in case of connection of an *electricity-generating facility* which does not require any prior consent of the electric power utility.

A type test of the *electricity-generating facility* must be made according to the specific standard for the product. If the product-specific standard does not include a type test, the *electricity-generating facility* must be tested according to EN50438.

Registration of a type-tested *electricity-generating facility* can be made together with the registration of the installation, see the 'Joint regulations of the electric power utilities' (in Danish only).

9.1.1 Single installation

The procedure for installing single *electricity-generating facility* units must comply with the requirements of section 7(3.1) of EN50438.

9.1.2 Multiple/planned units

The procedure for installing multiple or planned *electricity-generating facility* units must comply with the requirements of section 7(3.2) of EN50438.

Examples of multiple/planned units:

- Construction projects with several small *electricity-generating facilities* incorporated into the project
- Planned replacement of several gas burners for CHP plants in an area.

9.2 Documentation

According to the 'Joint regulations of the electric power utilities', the certified electrician must submit a registration to the electric power utility before the network connection of an *electricity-generating facility* which does not require any prior consent of the electric power utility.

The electric power utility must have received all documentation according to **Appendix 1** not later than 30 days after commissioning.

Appendix 1 can be downloaded in Word format from the TSO's website, www.energinet.dk.

Documentation must be supplied to the electric power utility in electronic form.

The electric power utility goes through and approves the documentation and forwards all the documentation in electronic form to the TSO.

9.3 Information plate

Required information is specified in sections 6(3) and 6(4) of EN50438.

10. Decommissioning or replacement

10.1 Decommissioning

Decommissioning of an *electricity-generating facility* must be effected according to section 7(4) of EN50438 by filling in a notification sheet for the decommissioning of *electricity-generating facilities* in **Appendix 1**.

10.2 Replacement

When an *electricity-generating facility* is to be replaced, the replaced facility must be decommissioning as described in section 10(1) whereupon the new facility must be registered as described in section 9(1).

10.3 Changes to the facility

According to section 7(5) of EN50438, the electric power utility must be informed when main components are to be replaced or altered or when protection equipment is to be altered.

11. Non-compliance

It is the responsibility of the plant owner to ensure that the provisions in this regulation and associated European standard EN50438 are complied with.

Unless otherwise expressly stated, expenses related to the compliance with the provisions of this regulation are the responsibility of the owner of the *electricity-generating facility*.

If an *electricity-generating facility* does not comply with the provisions of this regulation, the electric power utility is entitled to cut off the electrical connection to the facility.

12. Exemptions and unforeseen circumstances

The TSO may grant exemption from specific requirements in this regulation.

In order for an exemption to be granted:

- the deviation must not be contrary to the intention of EN50438 on harmonisation of network connection conditions for small *electricity-generating facilities*
- it must be a matter of particular conditions, for instance of local character
- the deviation must not cause appreciable deterioration of the technical quality and balance of the *public distribution network*
- the deviation must not be inappropriate from a socioeconomic viewpoint.

Exemption is granted by virtue of a written application to the electric power utility indicating which provisions the exemption concerns and the reason for the exemption. The electric power utility has the right to comment on the application before it is submitted to the TSO.

In the event of circumstances not foreseen in this technical regulation occurring, the TSO must consult the parties involved with the purpose of deciding what to do. If an agreement cannot be reached, the TSO must decide what to do. The decision must be made from what is equitable and, where possible, taking the views of the parties involved into consideration. the TSO's decision can be lodged with the Danish Energy Regulatory Authority.

Appendix 1: Documentation

The appendix comes in the shape of a form covering the main part of the expected documentation for an *electricity-generating facility*. The form must be filled in electronically and associated appendices from various suppliers must be attached as self-containing documents.

All documentation must be stated as commissioning data applying to the *electricity-generating facility* at the time of commissioning. If information is changed after commissioning, updated documentation must be forwarded.

B1.1. Registration form for stand-alone electricity-generating facilities for connection to the public distribution network

Identification

No.	Description	Value
A.2	Address of facility	
A.5	Telephone number	
A.6	Name, address and telephone number of user	
A.7	Name, address and telephone number of plant owner	
A.8	Allocated GSRN number of facility	
B.4	Name of electric power utility	
B.4.1	Address and telephone number of electric power utility	
A.99	Comments	

Installation

No.	Description	Value
Y.1	Certified electrician	
Y.2	Autorisation number	
Y.3	Address of certified electrician	
Y.4	Contact person	
Y.5	Telephone number	
Y.6	Fax number	
Y.7	E-mail address	

Description of the facility

No.	Description	Value
D.1	Facility make/plant type	
D.2	Fuel type	
D.5	Facility location in the installation	
Q.4	Rated power (kVA)	
Q.7	Power factor ($\cos \phi$ or $\tan \phi$)	
E.1	Number of phases connected	
D.6	Highest peak value of short-circuit current from the facility in case of short-circuiting immediately before the facility (A)	
D.8	Facility serial number	
D.9	Electricity-meter reading at the time of connection of the facility. (If more than one meter, register all meter readings)	
D.10	Electricity-meter number	
D.99	Comments	

Appendices attached

- Type test certificate
- Statement by supplier on compliance with Technical Regulation 3.2.1.
- Single-line form for the installation of the electricity-generating facility

Declaration to be completed by certified electrician

Comments:		
I hereby declare that the installation has been designed and established according to the requirements of the applicable technical regulation, executive orders and standards.		
Name:	Signature:	Date:

B1.2. Registration form for multiple/planned electricity-generating facilities for connection to the public distribution network

Identification

No.	Description	Value
A.2	Address of project or project area	
A.5	Telephone number	
A.6	Name, address and telephone number of user	
A.7	Name, address and telephone number of plant owner	
B.4	Name of electric power utility	
A.8	Allocated GSRN numbers of facilities	
A.99	Comments	

Installation

No.	Description	Value
Y.1	Certified electrician	
Y.2	Authorisation	
Y.3	Address of certified electrician	
Y.4	Contact person	
Y.5	Telephone number	
Y.6	Fax number	
Y.7	E-mail address	

Description of the facility

No.	Description	Value
D.1	Facility manufacturer/plant type	
D.2	Fuel type	
D.5	Facility location in the installation	
D.14	Facility number	
Q.4	Rated power (kVA)	
Q.7	Power factor (cos ϕ or tan ϕ)	
E.1	Number of phases	

D.6	Highest peak value of short-circuit current from the facility in case of short-circuiting immediately before the facility (A)	
D.11	Sketch of installation	
D.12	Earthing of the facility	
D.13	Site layout plan showing the location of the facility	

Appendices attached

- Type-test certificate
- Statement by supplier on compliance with Technical Regulation 3.2.1.
- Single-line form for the installation of the electricity-generating facility.

Declaration to be completed by certified electrician

Comments:		
I hereby declare that the installation has been designed and established according to the requirements of the applicable technical regulation, executive orders and standards.		
Name:	Signature:	Date:

Comments from electric power utility – comments made by electric power utility representative upon receipt of application for parallel coupling of electricity-generating facility

A representative of the electric power utility will attend the commissioning of the facility	Yes/no
As the representative of the electric power utility, I authorise network connection of the parallel-coupled electricity-generating facility. If not, see comments below.	
Comments:	
Electric power utility:	Contact: Date:

B1.3. Decommissioning form for electricity-generating facility

Identification

No.	Description	Value
A.2	Address of facility	
A.5	Telephone number	
A.6	Name, address and telephone number of user	
A.8	Allocated GSRN number of facility	
A.7	Name, address and telephone number of plant owner	
B.4	Name of electric power utility	
A.99	Comments	

Description of the facility

No.	Description	Value
E.1	Rated power of facility (kVA)	
D.1	Facility manufacturer/plant type	
D.8	Serial number of facility	
D.14	Electricity-meter reading when the facility is decommissioned. (If more than one meter, register all meter readings)	
D.10	Electricity-meter number	
D.99	Comments	

Contractor

No.	Description	Value
Z.1	Contractor/firm	
Z.2	Address of contractor	
Z.3	Contact person	
Z.4	Telephone number	
Z.5	Fax number	
Z.6	E-mail address	

Appendices attached

- Type-test certificate
- Statement by supplier on compliance with Technical Regulation 3.2.1.
- Single-line form for the installation of the electricity-generating facility.

Statement by contractor

The electricity-generating facility has been removed in compliance with the requirements of the manufacturer of the facility. All electric installations have been properly re-established.		
Comments:		
Name:	Signature:	Date:

Appendix 2: Required relay protection according to EN50438

Out of consideration for the network, the following relay protection functions **must** be established with the **settings stated**:

Relay type	Symbol	Setting range ^{a)}	Clearance time
Over voltage (stage 2) ^{b)}	$U_{>>}$	230 V+15%	0.2 s
Over voltage (stage 1)	$U_{>}$	230 V+10%	40 s
Under voltage (stage 1)	$U_{<}$	230 V-10%	10 s
Over frequency	$f_{>}$	53.0 Hz	0.2 s
Under frequency	$f_{<}$	47.0 Hz	0.2 s
'ROCOF' ^{c)}	df/dt	2.5 Hz/s	0.2 s

^{a)} All values are RMS values. The *electricity-generating facility* (micro-generator) must be disconnected or stopped if a parameter deviates more from its nominal value than the setting range. A parameter must not initiate a disconnection if it is between the nominal value and the setting range.

^{b)} Stage 2 over-voltage protection is required if the *electricity-generating facility* (micro-generator) can generate voltages that exceed 230 V + 15%.

^{c)} The use of phase shifting/vector jump protection as LoM protection is not permitted.

Disconnection of the *electricity-generating facility* (micro-generator) in response to an interface protection operation must be achieved either by the separation of mechanical contacts or by the operation of a suitably rated solid-state switching device.

Appendix 3: Previous provisions (not part of the regulation)

Below follows an overview of the previous provisions and recommendations applying to *thermal power station units*. Existing plants commissioned prior to this regulation coming into force are subject to the previous provisions and recommendations.

For power station units in the West Danish area (Jutland and Funen):

- 1995-2006: 'Kraftværksspecifikationer for produktionsanlæg mindre end 2 MW', (Power station specifications for generating facilities under 2 MW), memorandum NP91/SP-515h, Elsam, 1995.

For power station units in the East Danish area (Zealand and islands):

- 1990-1995: 'Driftstekniske specifikationer for mindre varmekraft anlæg, Tillæg nr. 1', (Operational performance specifications for small-scale CHP plants, amendment no. 1), Nordel, August 1990.
- 1995-2004: 'Operational Performance Specifications for small Thermal Power Units, Amendment no. 1', Nordel, 1995.
- 1999-2006: 'Standardvilkår for nettilslutning af lokale kraftvarmeanlæg mindre end 25 MW' (Standard terms for grid connection of local CHP plants smaller than 25 MW), Sjællandssamarbejdet, 1999.

Harmonised document for the whole Danish area:

- 2003-2007: 'Lavspændingsinstallationer med egenproduktion – Retningslinjer for nettilslutning af produktionsanlæg', (Low-voltage installations with autoproduction – Guidelines for grid connection of production plants), prepared for ELFOR, Eltra and Elkraft, DEFU report RA498, November 2003.

Appendix 4: Reference list (not part of the regulation)

Reference is made to the following documents in the regulation:

1. EN50438. 'Requirements for connection of micro-generators in parallel with public low-voltage distribution networks', January 2008.
2. 'Fællesregulativet 2007' (Joint regulations of the electric power utilities 2007), Danish Energy Association, August 2007.
3. The Danish Heavy Current Regulation, section 6, Danish executive order no. 12502 of 01/07/2001.
4. DEFU report 498 'Lavspændingsinstallationer med egenproduktion' (Low-voltage installations with autoproduction), November 2003.

Titles with reference to EN50428:

1. DS/EN 50110 series, 'Drift af elektriske anlæg' (Operation of electrical installations), Danish Heavy Current Regulation, section 5.
2. DS/EN 50160 'Karakteristika for spændingen i offentlige elektricitetsforsyningsnet' (Voltage characteristics of electricity supplied by public distribution systems).
3. DS/EN 60664-1 'Isolationskoordinering for udstyr til lavspændingssystemer – Del 1: Principper, krav og prøvninger' (Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests). (IEC 60664-1).
4. DS/EN 61000-3-2 'Elektromagnetisk kompatibilitet (EMC) – Del 3-2: Grænseværdier – Grænseværdier for udsendelse af harmoniske strømme (udstyrets strømforbrug op til og inklusive 16 A per fase)' (Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
5. DS/EN 61000-3-3 'Elektromagnetisk kompatibilitet (EMC) – Del 3-3: Grænseværdier – Begrænsning af spændingsændringer, spændingsfluktuationer og flimrer i offentlige lavspændingsforsyninger, fra udstyr med *mærkestrøm* op til og med 16 A pr. fase og ikke beregnet til betinget tilslutning' (Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection). (IEC 61000-3-3).
6. DS/EN 61000-6-1 'Elektromagnetisk kompatibilitet (EMC) – Del 6-1: Generiske standarder – Immunitet for bolig-, erhvervs- og let industrimiljøer' (Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments). (IEC 61000-6-1, mod.).
7. DS/EN 61000-6-3 2001 'Elektromagnetisk kompatibilitet (EMC) – Del 6-3: Generiske standarder – Emissionsstandard for bolig-, erhvervs- og let industrimiljøer' (Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments). (IEC 61000-6-3 Ed. 2.0).
8. EN 61000-6-3 + A11 2004 'Elektromagnetisk kompatibilitet (EMC) – Del 6-3: Generiske standarder – Emissionsstandard for bolig, erhverv og let industrimiljøer' (Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments). (IEC 61000-6-3:1996, mod.).
9. HD 384 / EN 60364 series 'Elektriske installationer i bygninger' (Electrical installations in buildings). (IEC 60364 series, mod.), Danish Heavy Current Regulation, section 6.