

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Adjustable speed electrical power drive systems –  
Part 3: EMC requirements and specific test methods for PDS and machine tools**

**Entraînements électriques de puissance à vitesse variable –  
Partie 3: Exigences de CEM et méthodes d'essai spécifiques pour les PDS et  
machines-outils**

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## CONTENTS

FOREWORD.....	7
1 Scope.....	9
2 Normative references .....	10
3 Terms and definitions .....	11
3.1 Content of the power drive system (PDS) and its installation.....	12
3.2 Content of the machine tool (MT) and its installation .....	13
3.3 Locations and equipment categories .....	14
3.4 Ports and interfaces.....	15
3.5 Components of the PDS.....	19
3.6 Test-related definitions .....	20
3.7 Phenomena-related definitions.....	21
4 Common requirements.....	25
4.1 General conditions .....	25
4.2 Tests .....	26
4.2.1 Conditions .....	26
4.2.2 Test report.....	27
4.3 Documentation for the user .....	27
5 Immunity requirements .....	27
5.1 General conditions.....	27
5.1.1 Performance (acceptance) criteria .....	27
5.1.2 Conditions during the test.....	29
5.2 Basic immunity requirements – Low-frequency (< 150 kHz) disturbances .....	30
5.2.1 Harmonics .....	30
5.2.2 Voltage dips and short interruptions.....	32
5.2.3 Frequency variations .....	34
5.2.4 Supply influences – Magnetic fields .....	35
5.3 Basic immunity requirements – High-frequency (≥ 150 kHz) disturbances .....	36
5.3.1 Conditions .....	36
5.3.2 Residential, commercial and light industrial environment .....	36
5.3.3 Industrial environment .....	37
5.4 Application of immunity requirements – Alternative verification methods .....	39
5.4.1 General .....	39
5.4.2 Simulation and calculation of harmonics .....	40
5.4.3 Alternative verification methods for voltage dips and short interruptions .....	40
5.4.4 Frequency variations .....	40
5.4.5 Immunity against electromagnetic fields by subcomponents testing .....	40
6 Emission.....	41
6.1 General emission requirements.....	41
6.2 General emission requirements for MT.....	41
6.3 Basic low-frequency (< 150 kHz) emission limits.....	41
6.3.1 Harmonics and interharmonics.....	41
6.3.2 Voltage fluctuations and flicker .....	42
6.3.3 Emissions in the frequency range from 2 kHz to 150 kHz.....	43
6.3.4 Common mode harmonic emission (low-frequency common mode voltage) .....	43
6.4 Conditions related to high-frequency (≥ 150 kHz) emission measurement .....	43
6.4.1 General requirements for measurements on a test site .....	43

6.4.2	Application of emission limits above 1 GHz.....	50
6.4.3	Connection requirements.....	50
6.4.4	Measurements requirements when a standard setup is not used.....	50
6.5	Basic high-frequency emission limits.....	51
6.5.1	EUT of categories C1 and C2.....	51
6.5.2	EUT of category C3.....	53
6.6	Engineering practice.....	54
6.6.1	EUT of category C4.....	54
6.6.2	General conditions.....	55
6.6.3	Filtering in IT power supply systems.....	55
6.6.4	Limits outside the boundary of an installation, for an EUT of category C4 – Example of propagation of disturbances.....	56
Annex A	(informative) EMC techniques.....	59
A.1	Application of PDSs and EMC.....	59
A.2	Load conditions regarding high-frequency phenomena.....	59
A.2.1	Load conditions during emission tests.....	59
A.2.2	Load conditions during immunity tests.....	60
A.2.3	Load test.....	60
A.3	Immunity to electromagnetic fields.....	60
A.3.1	Immunity to power frequency magnetic fields.....	60
A.3.2	Immunity to high frequency conducted disturbances.....	60
A.3.3	Immunity to high frequency fields.....	61
A.4	High-frequency emission measurement techniques.....	62
A.4.1	Impedance/artificial mains network (AMN).....	62
A.4.2	Performing high-frequency in-situ emission tests.....	64
A.4.3	Established experience with high power EUTs.....	64
Annex B	(informative) Low-frequency phenomena.....	65
B.1	Commutation notches.....	65
B.1.1	Evaluation conditions.....	65
B.1.2	Occurrence – Description.....	65
B.1.3	Calculation.....	68
B.1.4	Recommendations regarding commutation notches.....	69
B.2	Definitions related to harmonics and interharmonics.....	70
B.2.1	General discussion.....	70
B.2.2	Conditions of application.....	71
B.3	Application of harmonic emission standards.....	75
B.3.1	General.....	75
B.3.2	Public networks.....	75
B.3.3	Summation methods for harmonics in an installation – Practical rules.....	80
B.4	Installation rules – Assessment of harmonic compatibility.....	82
B.4.1	Low power industrial three-phase system.....	82
B.4.2	Large industrial system.....	85
B.4.3	Interharmonics and voltages or currents at higher frequencies.....	87
B.5	Voltage unbalance.....	87
B.5.1	Origin.....	87
B.5.2	Definition and assessment.....	88
B.5.3	Effect on BDM/CDM/PDS/MTs.....	90
B.6	Voltage dips – Voltage fluctuations.....	90
B.6.1	Voltage dips.....	90

B.6.2	Voltage fluctuation .....	92
Annex C (informative)	Reactive power compensation – Filtering .....	93
C.1	Installation .....	93
C.1.1	Usual operation .....	93
C.1.2	Power definitions under distorted conditions .....	93
C.1.3	Practical solutions .....	94
C.1.4	Reactive power compensation .....	95
C.1.5	Filtering methods .....	99
C.2	Reactive power and harmonics .....	101
C.2.1	Usual installation mitigation methods .....	101
C.2.2	Other solutions .....	103
Annex D (informative)	Considerations on high-frequency emission .....	107
D.1	User guidelines .....	107
D.1.1	Expected emission of BDM/CDM/PDS/MTs .....	107
D.1.2	Guidelines .....	109
D.2	Safety and RFI-filtering in power supply systems .....	111
D.2.1	Safety and leakage currents .....	111
D.2.2	Safety and RFI-filtering in power supply systems isolated from earth .....	111
Annex E (informative)	EMC analysis and EMC plan for EUTs of category C4 .....	113
E.1	General – System EMC analysis applied to EUTs .....	113
E.1.1	Electromagnetic environment .....	113
E.1.2	System EMC analysis techniques .....	114
E.2	Example of EMC plan .....	116
E.2.1	Project data and description .....	116
E.2.2	Electromagnetic environment analysis .....	116
E.2.3	EMC analysis .....	117
E.2.4	Establishment of installation rules .....	118
E.2.5	Formal result and maintenance .....	119
E.3	Example of supplement to EMC plan for particular application .....	120
E.3.1	Electromagnetic environment complementary analysis .....	120
E.3.2	EMC analysis .....	121
Bibliography	.....	123
Figure 1	– Content of the PDS and its installation .....	12
Figure 2	– Content of the MT and its installation .....	13
Figure 3	– Internal interfaces of the PDS and examples of ports .....	17
Figure 4	– Internal interfaces of the MT and examples for ports .....	17
Figure 5	– Power interfaces of a PDS with common DC link .....	18
Figure 6	– Power interfaces with common input transformer .....	19
Figure 7	– Example for a typical cable arrangement for measurements in 3 m separation distance, for a table-top or wall-mounted equipment, top view .....	46
Figure 8	– Example for a typical cable arrangement for measurements in 3 m separation distance for a table-top or wall-mounted equipment, side view .....	47
Figure 9	– Example for a typical test set up for measurement of conducted and/or radiated disturbances from a floor-standing PDS, 3D view .....	48
Figure 10	– Typical arrangement for measurement of radiated disturbances from an MT (top view) .....	49
Figure 11	– Propagation of disturbances .....	56

Figure 12 – Propagation of disturbances in installation with an EUT rated > 1 000 V.....	57
Figure B.1 – Typical waveform of commutation notches – Distinction from non-repetitive transient .....	66
Figure B.2 – PCC, IPC, installation current ratio and $R_{SI}$ .....	73
Figure B.3 – PCC, IPC, installation current ratio and $R_{SC}$ .....	74
Figure B.4 – Assessment of the harmonic emission of an EUT .....	77
Figure B.5 – Test set-up with mechanical load .....	78
Figure B.6 – Test set-up with electrical load replacing the loaded motor .....	78
Figure B.7 – Test set-up with resistive load.....	79
Figure B.8 – Assessment of harmonic emission where EUT is used (apparatus, systems or installations) .....	84
Figure C.1 – Reactive power compensation .....	96
Figure C.2 – Simplified diagram of an industrial network.....	98
Figure C.3 – Impedance versus frequency of the simplified network.....	98
Figure C.4 – Example of passive filter battery .....	100
Figure C.5 – Example of inadequate solution in reactive power compensation .....	102
Figure C.6 – VSI PWM active filter topologies .....	104
Figure C.7 – Boost mode converter.....	104
Figure C.8 – Front-end inverter system .....	105
Figure D.1 – Conducted emission of various unfiltered EUTs .....	108
Figure D.2 – Expected radiated emission of EUT up to rated voltage 400 V – Peak values normalised at 10 m .....	109
Figure D.3 – Safety and filtering.....	112
Figure E.1 – Interaction between systems and EM environment.....	113
Figure E.2 – Zone concept.....	114
Figure E.3 – Example of drive .....	115
Table 1 – Criteria to prove the acceptance of a BDM, CDM or PDS against electromagnetic disturbances.....	28
Table 2 – Criteria to prove the acceptance of an MT against electromagnetic disturbances .....	29
Table 3 – Minimum immunity requirements for individual harmonic orders on AC power ports of low voltage EUT .....	31
Table 4 – Minimum immunity requirements for harmonics on AC main power ports of EUTs of rated voltage above 1 000 V.....	32
Table 5 – Minimum immunity requirements for voltage dips and short interruptions on AC power ports of low voltage EUTs .....	32
Table 6 – Minimum immunity requirements for dips and short interruptions on AC main power ports of rated voltage above 1 000 V of EUTs.....	33
Table 7 – Minimum immunity requirements for dips and short interruptions on low voltage AC auxiliary power ports of EUTs .....	34
Table 8 – Minimum immunity requirements for frequency variations on AC power ports of low voltage EUTs .....	34
Table 9 – Minimum immunity requirements for frequency variations on AC main power ports of rated voltage above 1 000 V of EUTs .....	35
Table 10 – Minimum immunity requirements for frequency variations on auxiliary AC low voltage power ports of EUTs.....	35

Table 11 – Minimum immunity requirements for EUTs intended for use in a residential, commercial or light industrial location .....	36
Table 12 – Minimum immunity requirements for EUTs intended for use in an industrial location.....	38
Table 13 – Approach to type-test assessment of different MT configurations .....	41
Table 14 – Required highest frequency for radiated measurement .....	50
Table 15 – Limits for mains terminal disturbance voltage in the frequency band 150 kHz to 30 MHz – Categories C1 and C2 .....	51
Table 16 – Limits for electromagnetic radiation disturbance in the frequency band 30 MHz to 6 000 MHz – Categories C1 and C2 .....	52
Table 17 – Limits of disturbance voltage on the power interface in a residential, commercial or light industrial location .....	52
Table 18 – Limits for mains terminal disturbance voltage in the frequency band 150 kHz to 30 MHz – Category C3 .....	53
Table 19 – Limits for electromagnetic radiation disturbance in the frequency band 30 MHz to 6 000 MHz – Category C3 .....	54
Table 20 – Limits for propagated disturbance voltage ("outside" in a residential location).....	57
Table 21 – Limits for propagated disturbance voltage ("outside" in a non-residential location).....	57
Table 22 – Limits for propagated electromagnetic disturbance above 30 MHz.....	58
Table 23 – Limits for electromagnetic disturbance below 30 MHz.....	58
Table B.1 – Maximum allowable depth of commutation notches at the PC.....	69
Table B.2 – Recommended immunity requirements for commutation notches on power ports of EUTs.....	70
Table B.3 – Harmonic current emission requirements relative to the total current of the agreed power at the PCC or IPC.....	86
Table E.1 – EM interaction between subsystems and environment.....	115
Table E.2 – Frequency analysis .....	122



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**ADJUSTABLE SPEED ELECTRICAL  
POWER DRIVE SYSTEMS –****Part 3: EMC requirements and specific test methods  
for PDS and machine tools****FOREWORD**

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IEC 61800-3 has been prepared by subcommittee 22G: Adjustable speed electric power drive systems (PDS), of IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

It has the status of a product EMC standard in accordance with IEC Guide 107.

This fourth edition cancels and replaces the third edition published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) extension of the scope to machine tools with one or more embedded PDS;
- b) extension of the frequency range for radiated immunity tests to 6 GHz;
- c) general updates in the normative part and the informative annexes.

The text of this International Standard is based on the following documents:

Draft	Report on voting
22G/461/FDIS	22G/466/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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## ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

### Part 3: EMC requirements and specific test methods for PDS and machine tools

#### 1 Scope

This part of IEC 61800 specifies electromagnetic compatibility (EMC) requirements for adjustable speed power drive systems (PDSs) and machine tools (MTs). A PDS is an AC or DC motor drive including an electronic converter. Requirements are stated for AC and DC PDSs and MTs with input and/or output voltages (line-to-line voltage), up to 35 kV AC RMS. This document applies to equipment of all power ratings.

As a product EMC standard, this document can be used for the assessment of PDS and MT. It can also be used for the assessment of complete drive modules (CDM) or basic drive modules (BDM).

NOTE 1 BDMs and CDMs are parts of the PDS which are often marketed separately.

Traction applications and electric vehicles are excluded. Equipment which is defined as group 2 in CISPR 11:2015 is excluded.

NOTE 2 Examples of group 2 equipment are:

- welding equipment (arc welding, resistance welding, etc);
- electro-discharge machining equipment (EDM).

This document does not give requirements for the electrical machine which converts power between the electrical and mechanical forms within the PDS. Requirements for rotating electrical machines are covered by the IEC 60034 series. In this document, the term "motor" is used to describe the electrical machine, whether rotary or linear, and regardless of the direction of power flow.

This document is applicable to BDMs, CDMs, PDSs and MTs with or without radio function. However, this document does not specify any radio transmission and reception requirements.

NOTE 3 It is planned that the future edition 7 of CISPR 11<sup>1</sup> will contain a procedure how to address radio transmission and reception requirements, which is also applicable to products in the scope of this document.

This document defines the minimum requirements for emission and immunity in the frequency range from 0 Hz to 400 GHz. Tests are not required in frequency ranges where no requirements are specified.

BDMs, CDMs, PDSs and MTs covered by this document are those installed in residential, commercial and industrial locations. Requirements are given according to the environment classification.

BDMs, CDMs and PDSs are often included in a larger system. The system aspects are not covered by this document, but guidance is provided in the informative annexes.

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<sup>1</sup> Under preparation. Stage at the time of publication: CISPR/NFDIS 11:2022.

This document is intended as a complete product EMC standard for the EMC conformity assessment of products. As a product EMC standard for BDMS, CDMs, PDSs and MTs, according to IEC Guide 107, this document takes precedence over all aspects of the generic standards.

NOTE 4 If a PDS or MT is included as part of equipment covered by a separate product EMC standard, the separate EMC standard applies to the complete equipment.

NOTE 5 The requirements have been selected to ensure EMC for PDSs and MTs at residential, commercial and industrial locations. Changes in the EMC behaviour of a PDS or an MT as a result of fault conditions are not considered.

NOTE 6 This document does not specify any safety requirements for the equipment such as protection against electric shocks, insulation co-ordination and related dielectric tests, unsafe operation, or unsafe consequences of a failure. It also does not cover safety and functional safety implications of electromagnetic phenomena.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61000-2-4:2002, *Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances*

IEC 61000-3-2:2018, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase)*  
IEC 61000-3-2:2018/AMD1:2020

IEC 61000-3-3:2013, *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  $\leq 16$  A per phase and not subject to conditional connection*  
IEC 61000-3-3:2013/AMD1:2017  
IEC 61000-3-3:2013/AMD2:2021

IEC 61000-3-11:2017, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current  $\leq 75$  A and subject to conditional connection*

IEC 61000-3-12:2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current  $> 16$  A and  $\leq 75$  A per phase*  
IEC 61000-3-12:2011/AMD1:2021

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*  
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

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CISPR 11:2015/AMD1:2016

CISPR 11:2015/AMD2:2019

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CISPR 16-1-2:2014/AMD1:2017

CISPR 16-1-4:2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

CISPR 16-1-4:2019/AMD1:2020

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

CISPR 32:2015/AMD1:2019

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

### 3.1 Content of the power drive system (PDS) and its installation

#### 3.1.1 basic drive module BDM

electronic power converter and related control, connected between an electric supply and a motor

Note 1 to entry: The BDM transmits power from the electric supply to the motor and power from the motor to the electric supply.

Note 2 to entry: The BDM controls some or all of the following aspects of power transmitted to the motor and motor output: current, frequency, voltage, speed, torque, force.

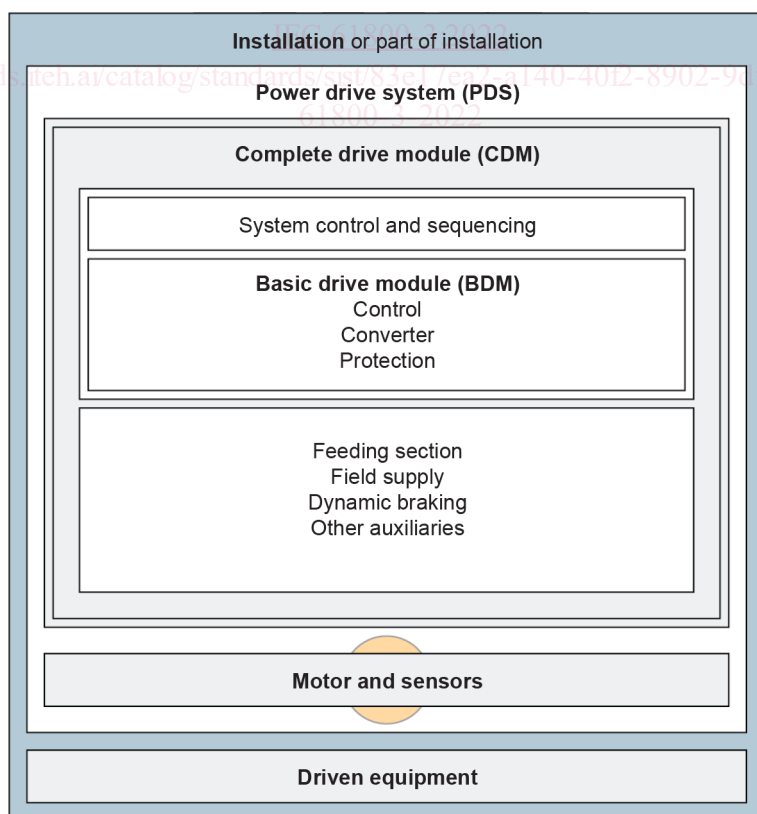
#### 3.1.2 complete drive module CDM

drive module consisting of, but not limited to, the BDM and extensions such as protection devices, transformers and auxiliaries, but excluding the motor and the sensors which are mechanically coupled to the motor shaft

#### 3.1.3 power drive system PDS

system consisting of one or more complete drive module(s) (CDM) and a motor or motors, and any sensors which are mechanically coupled to the motor shaft, but not including the driven equipment

Note 1 to entry: Figure 1 illustrates the major items in the PDS. It also shows the relationship between the PDS and the installation.



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Figure 1 – Content of the PDS and its installation

**3.1.4****installation**

equipment (one or more) which includes at least both the PDS and the driven equipment

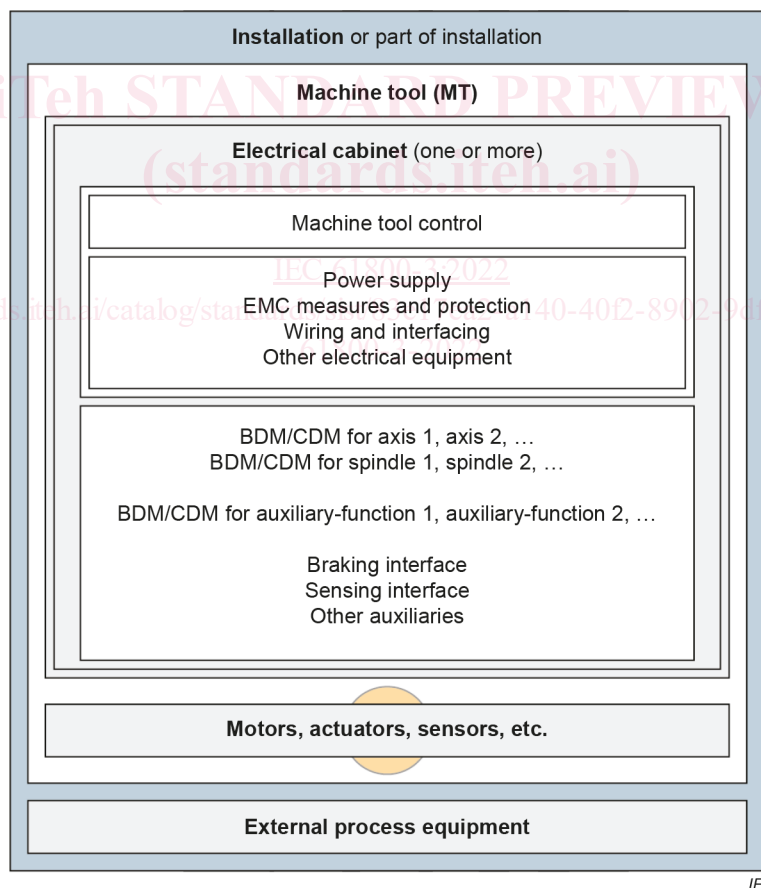
**3.2 Content of the machine tool (MT) and its installation****3.2.1****machine tool****MT**

mechanical device which is fixed (i.e. not mobile) and powered (typically by electricity and compressed air), used to process workpieces by selective removal/addition of material and/or by mechanical deformation

Note 1 to entry: Machine tool operation can be mechanical, controlled by humans or by computers. Machine tools can have a number of peripherals used for machine tool cooling/heating, process conditioning, workpiece and tool handling (workpiece feeding excluded), recyclables and waste handling and other tasks connected to their main activities.

Note 2 to entry: The machine tool is normally equipped with a power supply, an electrical and electronic assembly for power and control and one or more power drive systems for the movement of mobile elements or workpieces.

Note 3 to entry: Figure 2 illustrates the major parts of the machine tool. It also shows the position of the machine tool in the installation.



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**Figure 2 – Content of the MT and its installation**

[SOURCE: ISO 14955-1:2017, 3.16, modified – Note 2 to entry and Note 3 to entry have been added with Figure 2.]