

ABB Webinář Elektromotory

Téma I.

Legislativní změny v oblasti požadavků na energetickou účinnost motorů uváděných na trh v roce 2021 (MEPS)

Téma II.

Nová nomenklatura značení Ex motorů (ATEX)

5.11.2020

ABB WEBINÁŘ - ELEKTROMOTORY (MEPS, ATEX) 5.11.2020

Agenda



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New efficiency regulation in the EU

Electric motors and VSDs



Ecodesign regulation for motors and VSDs – new requirements

Since 2009, European Union has applied minimum efficiency regulation for low voltage electric motors

- General requirements are set under Ecodesign directive, detailed requirements in the specific Regulation 640/2009

The EU has agreed upon new, more demanding regulation, replacing regulation 640/2009, with following main features (year to come in force in brackets)

- VSD energy efficiency requirements incorporated first time
 - 3 phase LV AC drives, range 0.12 kW – 1000 kW, only diode front end (2021)
- Motors scope extensions :
 - range from 0,12kW up to 1000 kW (2021)
 - 8 pole motors (2021)
 - 60 Hz motors (2021)
 - Ex motors, TEAO – motors, brake motors with external brake (2021-2023)
 - IE4 introduced (2023)

Current regulation – valid until 1.7.2021

Electric motors

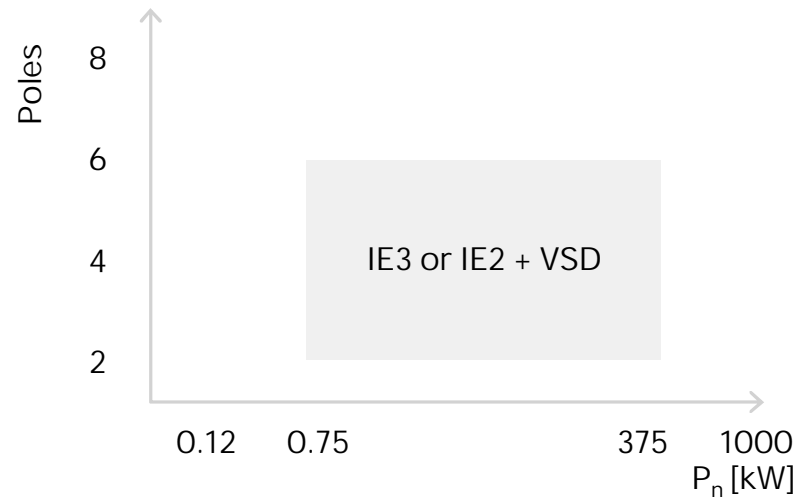
Applies to “normal motors” (= single speed, 3-phase 50 Hz or 50/60 Hz, squirrel cage induction motor for continuous duty¹⁾)

Major exemptions:

Ex – motors, brake motors, submersible motors

Drives

No efficiency requirements imposed on variable speed drives.

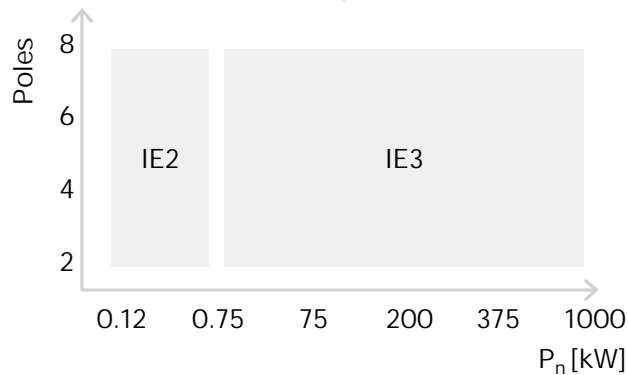


New Regulation

Low Voltage induction motors

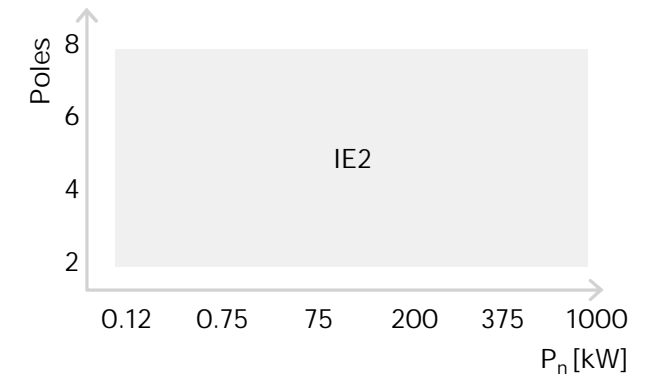
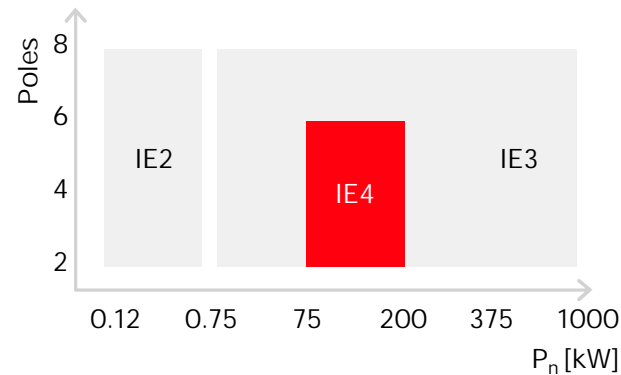
Step 1: Starting 01.07.2021

- Coverage:
 - 3 phase single speed motors 50Hz, 60Hz, 50/60 Hz
 - Brake motors with external brake
 - Ex t, Ex ec, Ex d and Ex de
 - Duty class: S1, S3 > 80%, S6 > 80%
 - TEAO motors
 - NOTE: IE2+VSD option ceases



Step 2: starting 01.07.2023 – additions to Step 1

- Coverage:
 - IE4 for 3 phase, 2-6 poles single speed motors between 75-200 kW
- Coverage:
 - Ex eb motors
 - 1 phase single speed motors

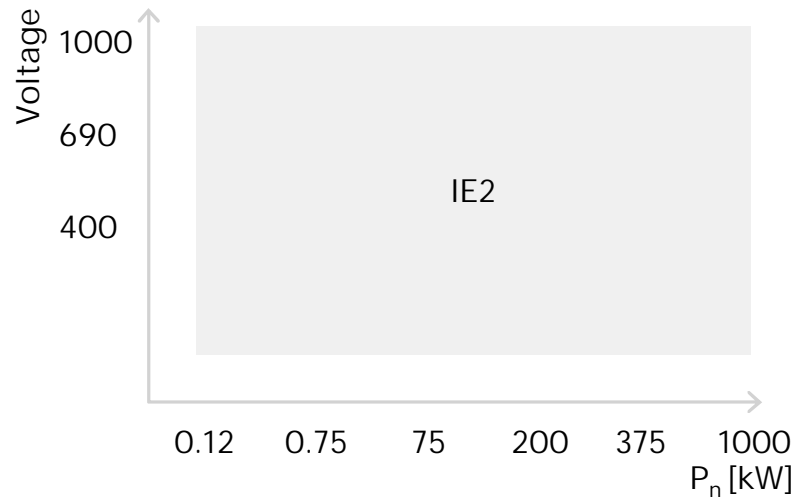


New Regulation

Variable Speed Drives

Step 1: Starting 01.07.2021

- Coverage:
 - 3ph standard drives (diode rectifier)
 - $0.12 \text{ kW} \leq P_n \leq 1000 \text{ kW}$



Exclusions

- LV AC Drives:
 - Regenerative drives
 - Low-harmonic drives (THD < 10%)
 - Multiple AC-output drives
 - 1ph drives

Exclusions

- Drive types:
 - MV Drives
 - DC Drives
 - Traction Drives

How regulation is evolving

Ecodesign		Year and minimum efficiency requirements (2016 onwards)				
Induction motor <= 1000V		2016-2020		2021	2022	2023 onwards
0,12 < 0,75 kW	3 phase, 2/4/6 pole ²	excluded		IE2		
	3 phase, 8 pole ²			IE2		
0,75 ... 7,5 kW	3 phase, 2/4/6 pole ²	IE2	IE2 + VSD / IE3	IE3		
	3 phase, 8 pole ²	excluded		IE3		
7,5 ... 75 kW	3 phase, 2/4/6 pole ²	IE2 + VSD / IE3		IE3		
	3 phase, 8 pole ²	excluded		IE3		
75 ... 200 kW	3 phase, 2/4/6 pole ²	IE2 + VSD / IE3		IE3		IE4 ¹
	3 phase, 8 pole ²	excluded		IE3		
200 ... 375 kW	3 phase, 2/4/6 pole ²	IE2 + VSD / IE3		IE3		
	3 phase, 8 pole ²	excluded		IE3		
375 ... 1.000 kW	3 phase, 2/4/6 pole ²	excluded		IE3		
	3 phase, 8 pole ²	excluded		IE3		
> 0.12 kW	Ex eb motors	excluded				IE2
	1 phase	excluded				IE2
Mining motors		excluded, but TEAO motors are in scope (TENV remain out of scope)				
High voltage motors DC motors		excluded excluded				
Variable Speed drives <= 1000V						
0.12 – 1.000 kW (Diode bridge)				IE2		
Regenerative drives				excluded		
Low harmonic drives (THD < 10%)				excluded		
1 phase drives				excluded		
AC drives with multiple AC outputs				excluded		
MV drives DC drives		excluded excluded				

Comparison between Regulation 640/2009 and 2019/1781 (1/3)

	Today	As of July 1st, 2021	As of July 1st, 2023
Standard IM	IE2 +VSD IE3 0.75 kW...375 kW	IE3 (0.75 kW...1000 kW) IE2 (0.12 kW...0.75 kW)	IE4 (75 kW...200 kW; 2-, 4-, 6-poles)
VSD only motors (PM, SynRM, HDP)	Exempted	Exempted	Exempted
Motors specifically designed for VSD operation and marked as such (no indication about 50 Hz or 60 Hz)	Exempted	Exempted	Exempted
Mining Ex motors (specifically designed and certified for mining acc. to Directive 2014/34/EU)	Exempted	Exempted	Exempted
Motors designed specifically for traction of electric vehicles	Exempted	Exempted	Exempted
Motors completely integrated into mechanical equipment (e.g. gear, pump, fan, compressor, ...)¹	Exempted	Exempted	Exempted
Motors with integrated VSD²	Exempted	Exempted	Exempted
Brake motors (with external brake)	Exempted	Included	Included
Brake motors (with internal brake)	Exempted	Exempted	Exempted
Ex t, Ex ec, Ex d and Ex de	Exempted	Included	Exempted (IE3)
Ex eb	Exempted	Exempted	Exempted (IE2)

Notes: 1) Condition that energy performance cannot be tested independently from the product, even with the provision of a temporary end-shield and drive-end bearing and the motor must share common components with the driven unit (e.g. shaft or housing)

2) Condition that energy performance cannot be tested independently from the product

Comparison between Regulation 640/2009 and 2019/1781 (2/3)

	Today	As of July 1st, 2021	As of July 1st, 2023
Totally Enclosed Air Over motors (TEAO)	Exempted	Included	Included
Totally Enclosed Non-Ventilated (TENV)	Exempted	Exempted	Exempted
Submersible motors	Exempted	Exempted	Exempted
1-phase motors	Exempted	Exempted	Exempted (IE2)
Above 4'000m of sea level	Exempted	Exempted	Exempted
Ambient air >60 °C	Exempted	Exempted	Exempted
Maximum operating temperatures above 400 °C	Exempted	Exempted	Exempted
Air temperatures are less than -30 °C	Exempted	Exempted	Exempted
Water coolant temperature at the inlet to a product is below 0 °C or above 32 °C	Exempted	Exempted	Exempted
Multi-speed motors	Exempted	Exempted	Exempted
Motors specifically qualified for the safety of nuclear installations (2009/71/Euratom)	Exempted	Exempted	Exempted

Comparison between Regulation 640/2009 and 2019/1781 (3/3)

	Today	As of July 1st, 2021	As of July 1st, 2023
S1	Included	Included	Included
S3 >=80%	Included	Included	Included
S6 <80%	Included (all %)	Excluded	Excluded
S6 >= 80%	Included	Included	Included
S9	Included	Excluded	Excluded
S2,S4, S5, S7, S8 and S10	Excluded	Excluded	Excluded

NOTE: 'When a motor is rated for other duty types and is also marked as such but may nevertheless be operated at rated power in continuous duty the regulation applies.'

CEMEP/CAPIEL- 1st Edition – September 2020 -Final

Spare part motors 2019/1781 2(m)

Regulation 2(m) of Article 2:

'motors placed on the market before 1 July 2029 as substitutes for identical motors integrated in products placed on the market before 1 July 2022, and specifically marketed as such;'

For motors exempt from the efficiency requirements in accordance with point 2(m) of Article 2, the motor or its packaging and the documentation must clearly indicate;

'Motor to be used exclusively as spare part for' and the product(s) for which it is intended.

Such information shall be provided by customer when ordering a motor.

Placing on the market

- The action 'Placing on market' is reserved either for a **manufacturer or an importer** that are the only economic operators who place products on the market.
- It requires an offer or an agreement (written or verbal) between two or more legal (or natural persons) for the transfer of ownership etc. after the stage of manufacture has taken place. This transfer could be for payment or free of charge. It does not require the physical handover of the product.
- When a **manufacturer or an importer supplies a product to a distributor or an end-user** for the first time, the operation is always labelled in legal terms as 'placing on the market'. Any subsequent operation, for instance, from a distributor to distributor or from a distributor to an end-user is defined as making available and not placing on the market.
- Motors in manufactures stock(s) are not considered to be 'placed on the market' but if/when sold to 'second party' e.g. new distributor is then considered to be 'placed on the market' and can be sold to end-user even the new legislation has changed.

Example: IE2 motor sold from the CSE to a 'new distributor' before 1st of July 2021 will be 'placed on the market' and after 1st of July the 'new distributor' can sell that IE2 motor to a new customer even the new Regulation 2019/1781 will be in force.

CE marking from 1st of July 2021

- Motors covered by the Regulation shall be of IE2 (0.12 kW and <0.75 kW) or IE3 (from 0.75kW up to 1000 kW) and can be CE marked fulfilling also two other Directives.
- Motors above 0.75 kW and of IE2 (or IE1) or motors below 0.75 kW and of IE1 or lower but falling into the scope of the Regulation **cannot be CE marked** regardless where motors are sold, delivered or used.
 - **NOTE:** Such motors for the re-export business can be sold and used outside EU respecting local requirement without CE mark.
- Motors specified to operate exclusively with VSD (motors that cannot be used directly online) are excluded from the Regulation and can be CE marked without IE class.
 - Declaration of Conformity (DoC) shall be prepared accordingly ie. fulfilling two other Directives.
- Motors from manufacturer's production and stock(s) shall be CE marked or CE removed accordingly and having updated DoC after 1st of July 2021

Our product portfolio and new regulation

What's in for the customer

Motor customer

- Our wide motor portfolio covers well already today the new requirements set in the coming regulation, including motor types that are exempted in the current regulation like
 - Ex-motors
 - TEAO – motors
 - motors for 60 Hz network.

Drive customer

- Drive models which fall under the regulation will be tested and conformity assessed during 2019/2020
- There are no compliance issues expected with our current product portfolio. Compliance of major product families (ACS880, ACS580, ACH580, ACQ580, ACS380) is already confirmed
- Manuals and product markings will be updated accordingly

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Changes in marking of flame proof equipment

New revision of IEC/EN 60079-0 standard

Background

The introduction of several protection levels e.g. b or c for flame proof and increased safety protection types

- Protection level must be marked separately for each protection type used
- Equipment protection level EPL for complete equipment is marked last as before

New way of marking was introduced as an alternative method in IEC/EN 60079-0 Edition 6

In IEC/EN 60079-0 Edition 7 the old method has been removed

Edition 6 is harmonized in EU until 6th July 2021 meaning that old markings can be used under ATEX until this date

M3JP – flame proof frame and box

Old marking: Ex d IIB T4 Gb

New marking: Ex db IIB T4 Gb

New markings implemented on new M3JP 80-132, project to update 160-450 started

M3KP – flame proof frame and increased safety box

Old marking: Ex de IIB T4 Gb

New marking: Ex db eb IIB T4 Gb

New markings implemented on new M3KP 80-132, project to update 160-450 started

During transition period will both old and new markings be used depending on product

Flame proof motors – protection type 'db'

Example of new marking

Marking according to ATEX-directive

CE 0081



II

2

G

for Gas

Equipment category (Zone 1)

Equipment group for surface industry

Use in explosive atmosphere

CE-marking

Number of notified body

Marking acc. to EN and IEC -standards

Ex db II B T4 Gb

Ex - Explosion protected equipment

Type of Protection: 'd'

Level of protection: 'b' for type 'd'

Group: II (gas)

Sub group: B

Temperature class: T4 (=135°C)

EPL Protection level for complete equipment

ABB Oy, Motors and Generators
Strömbergin puistatie 5 A
65320 Vaasa, Finland

CE 0081 IE3 IEC60034-1 Ex II 2G

3 Motor M3JP 100LKA 4 IMV1/IM3011 2019

Ex db II B T4 Gb

1662153-50

No. 3G1F1945636622

V	Hz	kW	r/min	A	cos φ	Duty	
400	Y	50	2.2	1452	4.2	0.83	S1
230	D	50	2.2	1452	7.4	0.83	S1
380	Y	50	2.2	1445	4.4	0.84	S1
220	D	50	2.2	1445	7.7	0.84	S1
415	Y	50	2.2	1455	4.1	0.82	S1
460	Y	60	2.2	1761	3.7	0.82	S1

Ins. cl. F IP 65

IE3-50Hz-88.8%(100%)-90.1%(75%)-90.3%(50%) / IE3-60Hz-89.9%(100%)

Product code 3GJP102810-BSK005066

LCIE 19 ATEX 3029 X / IECEX LCIE 19.0039X

Manual: 3GZF500730-47

6206-2Z/C3 6205-2Z/C3 79 kg

New edition of IEC/EN 60079-7 standard

Marking will be changed Ex n A -> Ex ec

Ex nA motor requirements

IEC 60079-15



Ex e motor requirements

IEC 60079-7



One standard

IEC 60079-7

- Marking will be changed
 - Ex nA -> Ex ec
 - Ex e -> Ex eb



ČESKÁ TECHNICKÁ NORMA
ICS 29.260.20

Červen 2017

Výbušné atmosféry –
Část 7: Ochrana zařízení zajištěným provedením „e“

ČSN
EN 60079-7
ed. 3
33 2320

idt IEC 60079-7:2015

- Ex ec motors designated as “Increased safety Ex ec motors” in sales tools



Changes in marking of increased safety and non-sparking equipment

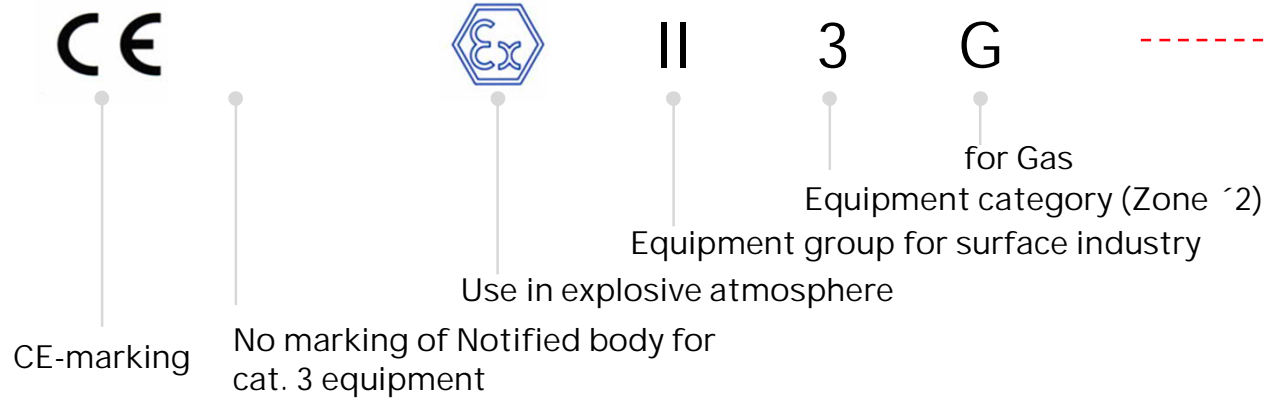
Last revision of IEC/EN 60079-7

- The technical requirements for Ex nA motors have been moved to new 2015 version of IEC/EN 60079-7
 - Very similar protection concept in 'e' and 'nA'
- In practice there are now two levels of increased safety protection
 - Ex eb = old Ex e (EPL Gb for high level of protection for zone 1)
 - Ex ec = old Ex nA (EPL Gc for enhanced level of protection for zone 2)
- Implementation in ABB PG IEC LV products
 - Ex ec was implemented for all products in 2018
 - M3HP is still having old marking 'Ex e' but product is otherwise meeting requirements in latest revision of applicable standard and does hence comply with the ATEX directive
 - Products certified according to local directives such as CNEx, EAC etc might still have old marking as local standards are not updated yet

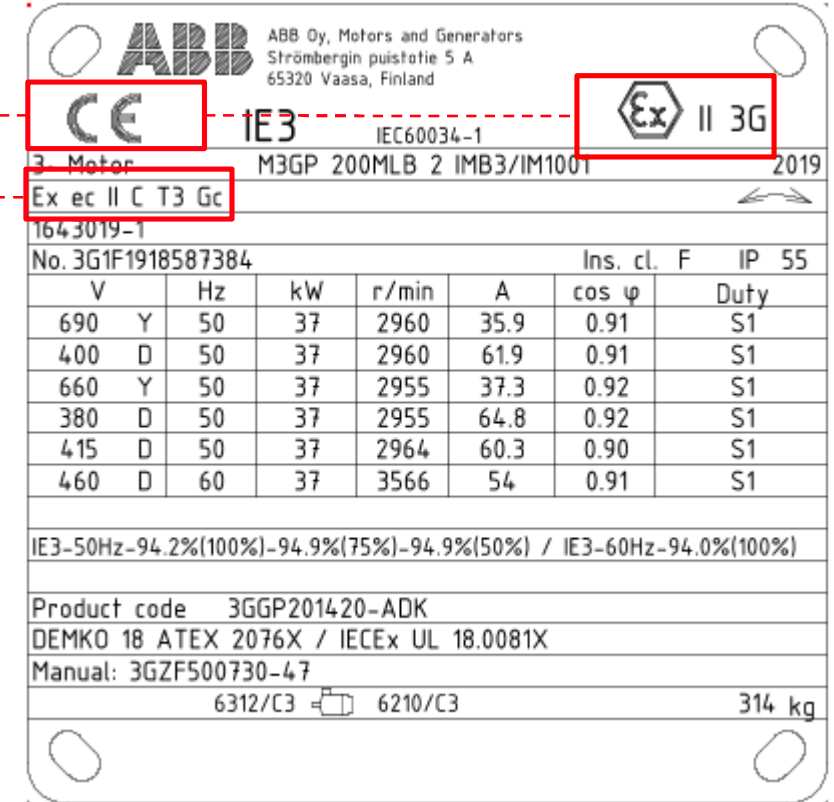
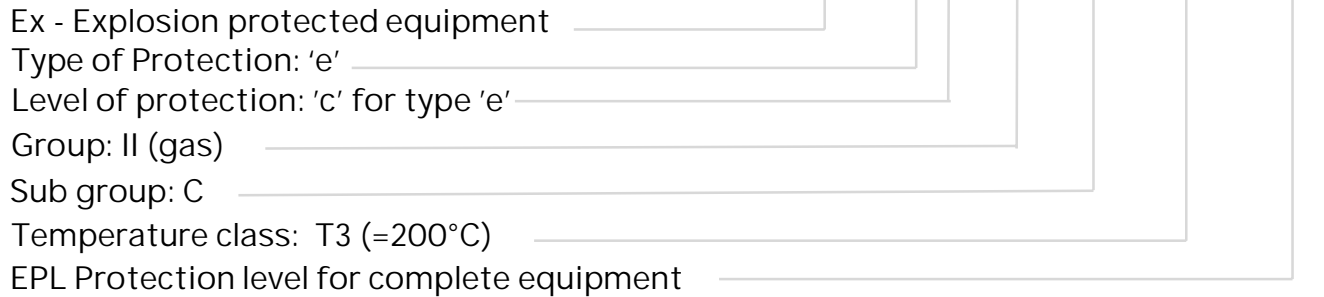
Increased safety motors – protection type 'ec'

Example of marking

Marking according to ATEX-directive



Marking acc. to EN and IEC -standards



Skupiny plynu IIA/IIB/IIC vs. Teplotní třídy T1-T6

Přehled

Skupina	Teplotní třídy												Teplotní třída elektrického zařízení	Maximální povrchová teplota elektrického zařízení	Teplota vznícení plynů nebo par
	T1		T2		T3		T4		T5		T6				
	Název látky	Teplota vznícení °C	Název látky	Teplota vznícení °C	Název látky	Teplota vznícení °C	Název látky	Teplota vznícení °C	Název látky	Teplota vznícení °C	Název látky	Teplota vznícení °C			
IIA ¹⁾	Aceton	540	i-Amylacetát	380	Benzín		Acetaldehyd	140					T1	450 °C	> 450 °C
	Etan	515	n-Butan	365	Benzín aut.	²⁾							T2	300 °C	> 300 °C
	Ethylacetát	460	n-Butyl-alkohol	340	Speciální benzín	²⁾							T3	200 °C	> 200 °C
	Etylchlorid	510	Cyclohexanon	430	Diesel	²⁾							T4	135 °C	> 135 °C
	Čpavek	630	1,2-Dichlorethan	440	Topné oleje	²⁾							T5	100 °C	> 100 °C
	Benzol	555	Anhydrid kyseliny octové	330	n-Hexan	240							T6	85 °C	> 85 °C
	Kyselina octová	485													
	Oxid uhelnatý	605													
	Metan	595													
	Metanol	455													
	Metylchlorid	625													
	Naftalen	520													
	Fenol	595													
	Propan	470													
	Toluen	535													
IIB ¹⁾	Svítiplyn	560	Etylalkohol	425	Sirovodík	270	Etyléter	180							
			Etylen	425											
			Etylenoxid	440											
IIC ¹⁾	Vodík	560	Acetylén	305							Sírouhlík	95			

Dust III Ex tb / Ex tc

Ex protection types, sub groups and variant codes

- ATEX and IECEx certificates
- Dust areas designated as zone 21 or 22, conductive or non-conductive dust and flyings

Zone	EPL	ATEX equipment category	Sub group	Marking	IP class	Variant code
21	Db	2D	IIIB	Ex tb IIIB T125°C Db	IP65	334
21	Db	2D	IIIC	Ex tb IIIC T125°C Db	IP65	336
22	Dc	3D	IIIB	Ex tc IIIB T125°C Dc	IP55	335
22	Dc	3D	IIIC	Ex tc IIIC T125°C Dc	IP65	337

Dust Ex tb / Ex tc

Rating plates

ABB Oy, Motors and Generators
Vaasa, FINLAND

CE 0081¹⁾ IE2 IEC 60034-1 Ex II 2D²⁾

3~ motor M3AA 160MLA 2 IMB3/IM1001 2016

Ex tb IIB T125°C DB³⁾

order no.
No. 3G1F16xxxxxxx Ins. cl. F⁴⁾ IP 65

V	Hz	kW	r/min	A	cos φ	Duty
690 Y	50	11	2938	11.1	0.90	S1
400 D	50	11	2938	19.2	0.90	S1
415 D	50	11	2943	18.7	0.90	S1
440 D	60	11	3541	17.4	0.91	S1
460 D	60	11	3547	16.7	0.90	S1

IE2-50Hz-90.2%(100%)-91.1%(75%)-90.7%(50%) / IE2-60Hz-90.2%(100%)

Prod. code 3GAA161410-ADG334

VTT 13 ATEX 060X / IECEx VTT 13.0017X⁵⁾

Manual: 3GZF500730-47

6309-2Z/C3 6209-2Z/C3 91 kg

Marking of Ex equipment

Summary of changes over last 10 years

Area	Marking before introduction of EPL	Marking with EPL	Marking in latest revision of IEC/EN
Gas	Ex d IIB T4	Ex d IIB T4 Gb	Ex db IIB T4 Gb
	Ex de IIB T4	Ex de IIB T4 Gb	Ex db eb IIB T4 Gb
	Ex e II T3	Ex e IIC T3 Gb	Ex eb IIC T3 Gb
	Ex nA II T3	Ex nA IIC T3 Gc	Ex ec IIC T3 Gc
Dust	Ex tD A22 T125°C IP5X	Ex tc IIIB T125°C Dc	
	Ex tD A22 T125°C IP6X	Ex tc IIIC T125°C Dc	
	Ex tD A21 T125°C IP6X*	Ex tb IIIB T125°C Db	
		Ex tb IIIC T125°C Db	

Spouštění motorů Ex ec

EN 60079-7 Ed.3

POZNÁMKA 1 Požadavky této normy pro úroveň „ec“ předpokládají, že přítomnost výbušné plyné atmosféry a spouštění motoru nenastanou současně a úroveň ochrany „ec“ pro případy, kdy obě tyto podmínky nastanou současně, není obecně vhodná. Motory s úrovní ochrany „ec“ se zvýšeným nebezpečím jiskření na rotoru, viz 5.2.7, nejsou určeny pro použití tam, kde pravděpodobnost úniku výbušné plyné atmosféry nemůže být zcela vyloučena pro dobu spouštění motoru jako nezávislá událost. U olejového těsnicí systém u radiálních kompresorů je známo, že během spouštění vytvářejí takovéto úniky.

POZNÁMKA 2 Za „normální“ provozní podmínky pro elektrické stroje s úrovní ochrany „ec“ se považují ustálené podmínky při plném jmenovitém zatížení. Spouštění (rozběh) točivých elektrických strojů je pro úroveň ochrany „ec“ vyloučen z „normálního“ provozu při druhu zatížení S1, S2, S6 nebo S9. Z důvodů možného častějšího spouštění motorů s druhem zatížení S3, S4, S5, S7, S8 nebo S10 definují požadavky pro jiskření rotoru nebezpečí jiskření na rotoru při spouštění jako „normální“ provozní podmínky. Definice druhu provozu S1 až S10 jsou uvedeny v IEC 60034-1.

Webináře ABB na webových stránkách

<https://new.abb.com/drives/cs/webinare>

Přehled webinářů

Připojte se z kanceláře nebo z domova a získajte nové znalosti a tipy. **Webináře jsou zdarma.**

Nízkonapěťové motory

MEPS 2021 / Motory do výbušného prostředí

5. 11. 2020 (9.30 - 11.30)

[REGISTRACE NA WEBINÁŘ ZDE](#)

[INFORMACE K WEBINÁŘI](#)



Elektromotory - jak fungují? Série naučných videí.
→ klikněte zde



Záznamy z webinářů
→ klikněte zde

ABB