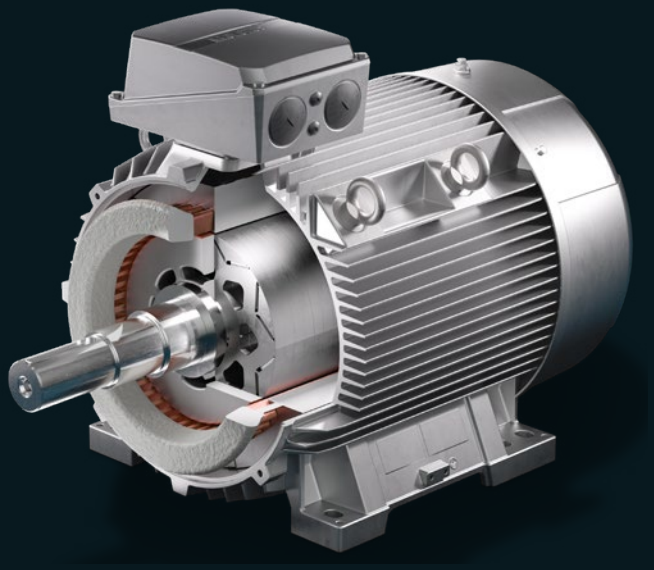
INNOMOTICS



Basic Converter Recommendation

Main Preconditions:

- Converter must be capable of controlling the chosen motor technolgy (ASM[1], SRM[2], PM[3])
- The converter's I_n[4] and I_{max}[5] capability must be matched with the rated motor values to ensure that the required load profile can be achieved

High Priority Conditions / Requirements:

Minimum pulse frequency without derating	
≤ 90 kW	≥ 4 kHz
> 90 kW; ≤ 250 kW	≥ 2 kHz
> 250 kW	≥ 1.25 kHz

Maximum DC-link voltage	
≤ 500 V (U_n[6])	750 V
≤ 690 V (U_n)	1035 V

1) ASM = Asynchronous motors
2) SRM = Synchronous Reluctance motors
3) PM = Permanent Magnet motors
4) In = Nominal current
5) Imax = Maximum current
6) U_n = Nominal voltage

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Fundamental voltage at the motor terminals	
Converter capable motors	**$U_{H01} \geq 95\% U_n$**
Converter duty motors Winding is adapted/prepared for 5% voltage drop due to converter impact	$U_{H01} \geq 95\% U_n$

Maximum permissible phase-to-ground voltage rise at the motor terminals		
≤ 500 V (U_n)	**> 500 V; ≤ 690 V (U_n)**	**Minimum rise time**
900 V	1050 V	100 ns
1050 V	1230 V	200 ns
1260 V	1470 V	400 ns

Maximum permissible peak-to-peak voltage at the motor terminals		
	Phase-to-ground	**Phase-to-phase**
≤ 480 V (U_n)	2200 V	3000 V
≤ 500 V (U_n)	2800 V	3200 V
≤ 690 V (U_n)	3000 V	4400 V

Overview

All motors in the Innomotics generation are equipped with innovative insulation systems, consisting of high-quality enamel wires and insulating sheet materials in conjunction with highly temperature-resistant impregnations.

The motors can be operated with SINAMICS G and SINAMICS S converters (controlled and uncontrolled infeed) while adhering to the admissible voltage peaks in accordance with the adjacent table.

Continuous operation while fully utilizing the admissible voltage tolerances must be avoided and is not recommended in accordance with IEC 60034-1 2011 Chapter 7.3.

The preferred supply system configurations are TT systems and TN systems with neutral-point grounding. We do not recommend operation in TN systems because of the higher voltage load.

Operation on non-grounded IT systems is also possible. However, in a ground fault, the insulation is excessively stressed. In the case of a ground fault, the process should be terminated as quickly as possible (t < 2 h), and the fault resolved.

For motors with protruding connection cables (order codes **R20, R21, R22, R23**, and **R24**), please inquire in the case of converter operation.

Impulse Voltage Insulation Class (IVIC) – category C (strong)

The insulation system of Innomotics motors significantly exceeds the requirements of stress category C (IVIC C = high stress). If voltage peaks higher than those specified according to IVIC C can occur, observe the data in the following table.

- For a line voltage (converter input voltage) up to 500 V and operation connected to a SINAMICS G/SINAMICS S converter with uncontrolled infeed (BLM, SLM), the relevant guidelines for the motor and converter configuration must be observed.
- For a line voltage (converter input voltage) up to max. 480 V and operation connected to a SINAMICS S converter with controlled infeed (ALM), the relevant guidelines for the motor and converter configuration must be observed.
- For line voltages (converter input voltages) higher than those stated above (max. 690 V), motors that are ordered for converter operation must have a suitable insulation system.
- For operation of a converter of another manufacturer, the permissible voltage peaks according to IEC 60034-18-41 in accordance with stress category C (see table below) must be observed, depending on the particular line voltage (converter input voltage) and the motor insulation system.

		Line voltage U_{rated}					
		400 V		480 V		500 V	
Standard		IVIC C	Inno-motics	IVIC C	Inno-motics	IVIC C	Inno-motics [1]
U_{phase} $U_{phase\text{-}to\text{-}ground}$	$V_{pk/pk}$	1664	2200	1997	2200	2080	2800
$\hat{U}_{phase\text{-}to\text{-}ground}$	V_{pk}	832	1100	999	1100	1040	1400
U_{phase} $U_{phase\text{-}to\text{-}phase}$	$V_{pk/pk}$	2377	3000	2852	3000	2971	3200
$\hat{U}_{phase\text{-}to\text{-}phase}$	V_{pk}	1189	1500	1426	1500	1486	1600

		Line voltage U_{rated}			
		500 V		690 V	
PREMIUM		IVIC C	Inno-motics	IVIV C	Inno-motics
U_{phase} $U_{phase\text{-}to\text{-}ground}$	$V_{pk/pk}$	2080	3000	2870	3000
$\hat{U}_{phase\text{-}to\text{-}ground}$	V_{pk}	1040	1500	1435	1500
U_{phase} $U_{phase\text{-}to\text{-}phase}$	$V_{pk/pk}$	2971	4400	4100	4400
$\hat{U}_{phase\text{-}to\text{-}phase}$	V_{pk}	1486	2200	2050	2200

Minimal to IEC60034-18 0.1 µs (0.3+/-0.2).

The voltages according to EN 60034-18-41/IVIC C are specified as peak-to-peak values ($V_{pk}/_{pk}$). For information, the conventional peak values (V_{pk}) are also stated.

Insulation systems for converter operation > 480 V/500 V

The Innomotics motors can be operated in their standard version on SINAMICS converters without an additional filter up to a maximum converter input voltage of 500 V 3 AC on uncontrolled infeeds (SINAMICS G/S/V, BLM/SLM) and up to 480 V 3 AC on controlled infeeds (SINAMICS S, ALM). The specific configuration guidelines for motors and converters must be observed.

For higher converter input voltages, > 480 V/500 V 3 AC (max. 690 V), a special insulation system of the motor (PREMIUM) is required.
This is available for converter motors, such as Innomotics GP/SD VSD10, Innomotics DP crane motors, Innomotics FD, and the converter-capable Innomotics SD Pro motors.

For IE3 standard motors, the PREMIUM insulation system is available depending on the type.

[1] Only for motors with voltage code 27 or 40.

B&P ELEKTROMOTOREN BV

Expeditieweg 21
6657 KM Boven-Leeuwen

info@bnpelektromotoren.nl
+31 (0)344 616 267

BTW nr. **NL819113918B01**
KvK nr. **30237800**
ING Bank **NL60 INGB 0675 304 792**

B&P Elektromotoren