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SIMOTICS 1LE0003超高效低压交流异步电动机

SIMOTICS 1LE0003 Premium Efficiency Low-voltage Motors

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总体介绍

SIMOTICS 1LE0003 系列超高效低压电动机是铸铁机壳通用型全封闭自扇冷却或强制冷却式三相异步电动机，其防护等级为 IP55，该系列电动机设计生产符合 ISO、IEC、GB 等相关标准的要求。

SIMOTICS 1LE0003 系列超高效低压电动机适用于连续工作制（S1）、恒转速或一定速度范围内的变频调速应用。

技术特性

- 机座材料：灰铸铁；
- 标准颜色：石头灰（RAL 7030）；
- 额定功率：0.55kW~315kW (50Hz)
- 0.75kW 及以上的 2、4、6 极电动机达到 GB18613-2012 标准能效等级 2 级，且 能满足 IEC 60034-30 标准中的 IE3 效率等级 (50Hz)；
- 优化的紧凑型结构；
- 标准安装结构类型（符合 IEC 60034-7 标准规定）：IM B3、IM B5、IM B35 等；
- 所有的电动机设计防护等级为 IP55（IEC 60034-5）；
- FS[1] 280 ~ 355 标配再润滑装置，FS[1] 100 ~ 250 的作为选项；
- 对于 FS 100 ~ 355 范围电动机，可选择增强悬臂力设计；
- 电动机可选 PTC 或 PT100 热敏电阻或 KTY84-130 进行绕组保护；

[1] FS，机座的英文（Frame Size）缩写。

Overview

SIMOTICS 1LE0003 low voltage premium efficiency motor with cast iron housing is Totally Enclosed Fan Cooled (TEFC) or Totally Enclosed Forced Ventilated with IP55 environmental protection, and applicable for general purpose use. These motors are designed and manufactured in accordance with ISO, IEC standards, GB standards.

SIMOTICS 1LE0003 low voltage premium efficiency motor is designed for constant or adjustable speed with continuous duty operation (S1) over a speed range.

Features

- Frame material: grey cast iron.
- Standard color: stone grey (RAL 7030)
- Rated power output: 0.55kW~200kW at 50Hz.
- Available in 2, 4, 6 pole motor （0.75kW and up）with efficiency grade 2. according to GB18613-2012 and efficiency class IE3（50Hz) according to IEC 60034-30.
- Optimized compact style construction.
- Standard mounting construction according to IEC 60034-7: IM B3, IM B5, IM B35 and etc.
- All motors are designed to IP55 degree of protection (IEC 60034-5) .
- Re-greasing devices for FS[1] 280 ~ 355 as standard, and for FS100 ~ 250 as option.
- Reinforced bearings for increased cantilever forces for FS100 ~ 355 as option.
- Winding protections with PTC, PT100 and KTY84-130 as option.

[1] FS，Frame Size

- 接线盒标准位置处于机座顶端，进线孔处于 右侧（从驱动端看），选项中接线盒位置和进线方向可变化；
- 绝缘系统按 155（F）温度等级设计，在额定输出和直接供电时按 130（B）温度等级使用；
- 电动机标准冷却方式为自扇冷却（IEC 60034-6 规定的 IC 411），可提供独立驱动风扇强制冷却；
- FS 100 ~ 355 电动机都有 2 个吊环，FS80~90 电动机没有吊环。

运行环境

- 防护等级 IP55（IEC 60034-5）；
- 高度不超过海拔 1000 m（IEC 60034-1）；
- 允许的环境温度在 -20 °C ~ 40 °C（IEC 60034-1）；
- 所允许的相对湿度：
  - -20 °C ≤ T ≤ 20 °C：100 %
  - 20 °C < T ≤ 30 °C：95 %
  - 30 °C < T ≤ 40 °C：55 %

对于更高的环境温度、以及（或者）高于海拔 1000 m 的地点，电动机的额定功率换算系数为 k_{HT}。所允许的功率值（P_{adm}）：

$$P_{adm} = P_{rated} \bullet k_{HT}$$

- Terminal box on top, and cable entry on right side (viewed from driven end). Variable location of connection boxes and cable entries as option.
- Insulation system is designed for temperature class 155 (F). At rated output with line-fed operation, the motors can be used in temperature class 130 (B).
- Self ventilated motors with radial-flow fans (cooling method IC 411 according to IEC 60034-6) as standard, forced air cool with external separately driven fans as option.
- FS 100 ~ 355 all motors have 2 eyebolts. FS80~90motor donot have eyebolt;

Environmental

- Degrees of motor protection IP55 (IEC 60034-5).
- Altitude shall not exceed 1000m above sea-level (IEC 60034-1).
- Allowed air temperature between -20 °C and 40 °C (IEC 60034-1).
- Permitted relative humidity:
  - -20 °C ≤ T ≤ 20 °C：100 %
  - 20 °C < T ≤ 30 °C：95 %
  - 30 °C < T ≤ 40 °C：55 %

For higher coolant temperatures and / or site altitudes higher than 1000 m above sea level, the specified motor output must be reduced by using the factor k_{HT}. The results in an admissible output (P_{adm}) of the motor:

$$P_{adm} = P_{rated} \bullet k_{HT}$$

对于不同高度和（或）不同环境温度的功率换算系数 k_{HT}
Factor k_{HT} for different side altitudes and / or coolant temperature

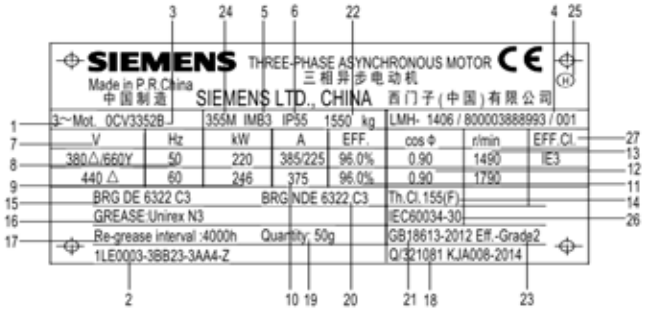
海拔高度 Site altitude above see level	对应海拔高度的环境温度 Site altitude above see level Coolant temperature					
	< 30 °C	30 ~ 40 °C	45 °C	50 °C	55 °C	60 °C
1000 m	1.07	1.00	0.96	0.92	0.87	0.82
1500 m	1.04	0.97	0.93	0.89	0.84	0.79
2000 m	1.00	0.94	0.90	0.86	0.82	0.77
2500 m	0.96	0.90	0.86	0.83	0.78	0.74
3000 m	0.92	0.86	0.82	0.79	0.75	0.70
3500 m	0.88	0.82	0.79	0.75	0.71	0.67
4000 m	0.82	0.77	0.74	0.71	0.67	0.63

电动机符合下面的电气和机械标准：

Standards:

名称 Title	IEC 标准 IEC standard	中国国家标准 Chinese standard
旋转电动机定额和性能 Rotating electrical machines – Part 1: Rating and performance	IEC 60034-1	GB 755
旋转电动机损耗与效率确定的标准测试方法 Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)	IEC 60034-2	GB/T 1032
旋转电机整体结构的防护等级（IP 代码）分级 Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification	IEC 60034-5	GB/T 4942.1
旋转电动机冷却方法 Rotating electrical machines – Part 6: Methods of cooling (IC Code)	IEC 60034-6	GB/T 1993
旋转电动机结构型式、安装型式及接线盒位置的分类（IM 代码） Rotating electrical machines – Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM Code)	IEC 60034-7	GB/T 997
旋转电动机旋转电机线端标志与旋转方向 Rotating electrical machines – Part 8: Terminal markings and direction of rotation	IEC 60034-8	GB/T 1971
旋转电机噪声测定方法及限值 第 3 部分：噪声限值 Rotating electrical machines – Part 9: Noise limits	IEC 60034-9	GB 10069.3
轴中心高为 56 mm 及以上电机的机械振动 振动的测量、评定及限值 Rotating electrical machines – Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher – Measurement, evaluation and limits of vibration severity	IEC 60034-14	GB 10068
旋转电机尺寸和输出功率等级 第 1 部分：机座号 56 ~ 400 和凸缘号 55 ~ 1080 Rotating electrical machines – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080	IEC 60072-1	GB/T 4772.1
中小型旋转电机安全要求 Safety requirements of small and medium size rotating electrical machines		GB 14711
旋转电动机温升 Electrical insulation – Thermal classification	IEC 60085	GB/T 11021
电工电子产品自然环境条件 温度和湿度 Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature – Temperature and humidity	IEC 60721-2-1	GB/T 4797.1
标准电压 Standard voltages	IEC 60038	GB/T 156

铭牌信息 Nameplate



1	三相异步电动机	Three-phase low-voltage motor
2	订货号	Order No.
3	型号	Type
4	产品序列号	Series number
5	安装结构形式	Type of construction
6	防护等级	Degree of protection
7	额定电压	Rated voltage and Winding connections
8	频率	Frequency [Hz]
9	额定功率	Rated output [kW]
10	额定电流	Rated current [A]
11	效率	Efficiency
12	功率因数	Power factor [cos]
13	额定转速	Rated speed
14	绝缘耐热等级	Thermal class
15	驱动端轴承	Bearing at the drive end
16	润滑脂类型	Grease type
17	再润滑周期	Re-grease interval
18	执行标准	Standards
19	再加润滑脂的重量	Quantity
20	非驱动端轴承	Bearing at the non-drive end
21	中国国家标准	GB standard
22	净重	Net weight
23	中国能效等级	GB efficiency grade
24	机座号	Frame size
25	平衡方式	Balance method
26	IEC 标准	IEC standard
27	IEC 能效等级	IEC efficiency class

机械特性

接线盒

接线盒标准位置处于机座顶端，且自身可 4×90° 旋转安装，从而使电缆可以从各个方向进入。所有接线盒都有两个进线孔，其中一个进线孔采用葛兰密封，另一个进线孔采用螺塞密封。

Mechanical design

Connection box

The connection box is located on the top of motor housing as standard, and can be rotated by 4×90° to allow for cable entry from each direction. All the connection box have 2 cable entries, one is sealed by the cable gland, and another sealed by screwed plug.

接线盒技术参数

Connection boxes technical data

机座号 Frame Size	主接线端子数 Number of main terminals	最多可容纳的辅助端子数 Max. allowable auxiliary terminals	接线螺钉螺纹 Contact screw thread	引接线最大截面积（mm^2） Max. connectable cross-section	外接电缆直径（mm） Outer cable diameter (sealing range)	进线孔尺寸（葛兰 + 螺塞） Cable entry size (Gland+Screwed plug)
80	6	12	M4	1.5	13~18	M25*1.5+M16*1.5
90	6	12		1.5		
100	6	12		4	18~25	M32*1.5+M32*1.5
112	6	12		4		
132	6	12		6		
160	6	14	M5	16	22~32	M40*1.5+M40*1.5
180	6	14	M5	16	22 ~ 32	M40×1.5+M40×1.5
200	6	14[1)]	M6	25	32 ~ 38	M50×1.5+M50×1.5
225	6	14[1)]	M8	35		
250	6	14[1)]	M10	120	37 ~ 44	M63×1.5+M63×1.5
280	6	14[1)]		120		
315	6	16[1)]	M12	240		
355	6	24[1)]	M16	240	44 ~ 57	M72×2+M72×2

注：[1)] 需要的辅助端子数若超过接线盒最多可容纳的辅助端子数时，须选择辅助接线盒（选件号：L97）

Note: [1)] An auxiliary connection box (option code: L97) is required when the total number of auxiliary terminals exceeds the number of allowable terminals in main connection box.

接线盒位置

接线盒除标准位置外，还可处于电动机机座的左侧或右侧。电动机接线盒位置可以在电动机订货号的第 16 位用数字 表示出。

接线盒的位置是指从电动机驱动端来看的位置。

- 标配接线盒在顶部，电动机订货号的第 16 位数字为 4；
- 接线盒在右边，电动机订货号的第 16 位数字为 5；
- 接线盒在左边，电动机订货号的第 16 位数字为 6。

Location of the connection box

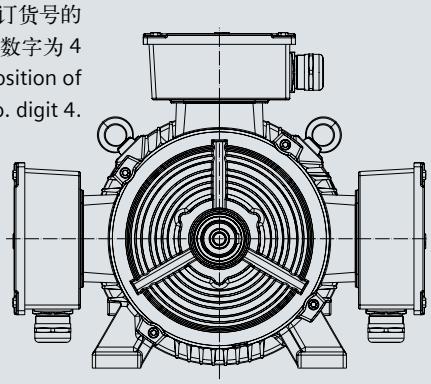
Besides standard position, the connection box also can be on the right or left of motor housing. The position of terminal box can be indicated on the 16th digit of motor order code.

The position of connection box is described by viewed from drive end (DE).

- On top (Standard), 16th position of Motor Order No. digit 4.
- On RHS, 16th position of Motor Order No. digit 5.
- On LHS, 16th position of Motor Order No. digit 6.

当电动机的接线盒位置与其它部件冲突时，可以将接线盒从驱动端移到非驱动端（选件号：H08）。

If there is interfere between the connection box and other components, the connection box can be moved from the drive end (DE) to non-drive end (NDE) (Option code: H08).



接线盒的进线孔

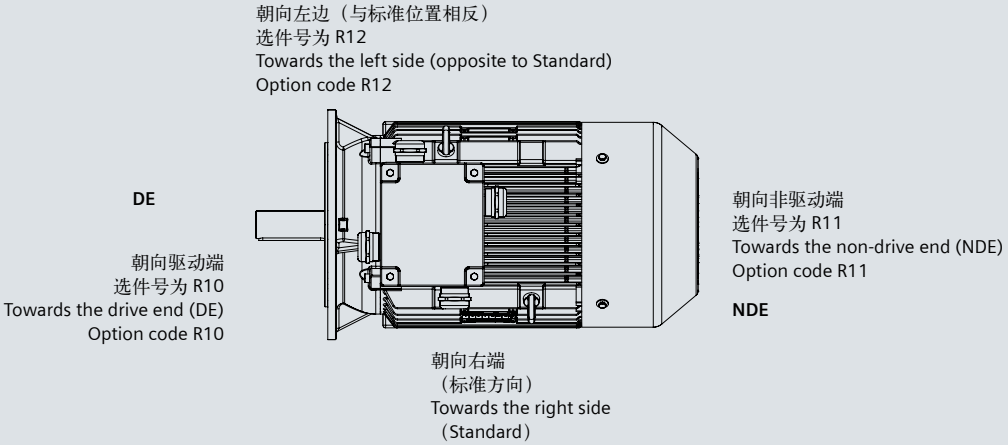
除非另作规定，否则进线孔的标准位置如下图所示。接线盒可以按照图示的位置旋转。

- 朝向驱动端
  接线盒旋转 90°，进线口朝向驱动端，选件号为 R10。
  对于 FS80 ~ 112 的带法兰（IM B5）电动机，只有接线盒在非驱动（选件号：H08）时，才可以选择进线孔朝向驱动端。
- 朝向非驱动端
  接线盒旋转 90°，进线口朝向非驱动端，选件号为 R11。
- 朝向左侧（与标准方向相反）
  接线盒旋转 180°，进线口位置相反，选件号为 R12。

Cable entry on connection box

Unless stated, otherwise the cable entry is located in the standard position as show in the following illustration. The connection box can also be rotated such that the cable entry is located.

- Towards the drive end (DE)
  Rotation of connection box by 90°, entry from DE, Option code R10.
  For flange motor (IM B5) from FS80 to FS100, only possible with connection box on NDE (Option code H08).
- Towards the non-drive end (NDE)
  Rotation of connection box by 90°, entry from NDE, Option code R11.
- Towards the left side (opposite to Standard)
  Rotation of connection box by 180°, entry from opposite end, Option code R12.



如果接线盒的位置改变时（如右侧或左侧），须要检查进线孔的位置是否方便进线。必要时，可以同时订购其它选件（R10，R11 和 R12）。

If the position of the connection box (connection box RHS or LHS) is changed, the position of the cable entry must be checked. If necessary, it can be ordered with the corresponding order codes (R10, R11 and R12).

安装结构型式 Construction and mounting type

结构型式 Construction type	机座带底脚，端盖无法兰 With feet and without flange on the end-shield (DE)					
安装型式 Mounting type	IM B3 FS 80 ~ 355	IM B6 FS 80 ~ 315	IM B7 FS 80 ~ 315	IM B8 FS 80 ~ 315	IM V5 [1] FS 80 ~ 315	IM V6 [2] FS 80 ~ 315
示意图 Diagram						
电动机订货号第 14 位号上对应的字母 Letter, position 14th of Motor code	A	T	U	V	C	D

结构型式 Construction type	机座不带底脚，端盖有法兰 Without feet and with flange on the end-shield (DE)			机座带底脚，端盖有法兰 With feet and with flange on the end-shield (DE)		
安装型式 Mounting type	IM B5 FS 80 ~ 315	IM V1 [1] FS 80 ~ 355	IM V3 [2] FS 80 ~ 315	IM B35 FS 80 ~ 355	IM V15 [1] FS 80 ~ 315	IM V35 [2] FS 80 ~ 315
示意图 Diagram						
电动机订货号第 14 位号上对应的字母 Letter, position 14th of Motor code	F	G	H	J	W	Y

结构型式 Construction type	机座不带底脚，端盖有标准小法兰 Without feet and with C-flange on the end-shield (DE)			机座带底脚，端盖有标准小法兰 With feet and with C-flange on the end-shield (DE)
安装型式 Mounting type	IM B14 FS 80 ~ 160	IM V18 [1] FS 80 ~ 160	IM V19 [2] FS 80 ~ 160	IM B34 FS 80 ~ 160
示意图 Diagram				
电动机订货号第 14 位号上对应的字母 Letter, position 14th of Motor code	K	M	L	N

[1] 室外使用时推荐使用护罩（选件号 H00）；

[2] 当户外安装时，推荐对电动机轴采取防护措施，避免水直接喷射到电动机轴上。

[1] At outdoor application, the using of protective cover (Option code H00) is recommended

[2] At out door application the protection of shaft again jet-water is recommended

冷却与通风

所有电动机标配装有径流（离心）式冷却风扇，其冷却效能与电动机的旋转方向无关（冷却方法符合 IEC60034-6 标准的 IC411）。

对于某些应用，可以考虑配置独立驱动风扇 ，如，

- 电动机在低速运行时，推荐使用独立驱动风扇，从而使电动机得到有效利用；
- 电动机在明显高于额定同步转速的速度运行时，同样推荐选用独立驱动风扇，这样有助于降低电动机噪声。

独立驱动风扇的选件号为 F70。当安装独立驱动风扇时，电动机的长度将增加 Δ L。

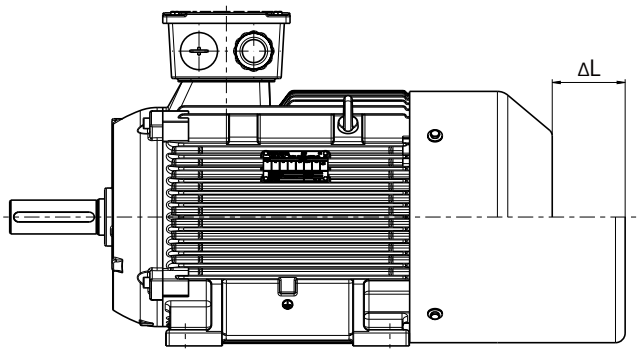
Cooling and ventilation

The 1LE0003 standard motors are fitted with an radial flow fan for cooling in accordance with IEC 60034-6 cooling method.

For some special application, separately driven fan should be considered to be configurated.

- The use of a separately driven fan is recommended to increase motor utilization at low speed;
- When motor speed significantly higher than the synchronous speed, the separately fan is also recommended to be used. It can help reduce the motor noise.

The separately driven fan can be supplied already fitted, Option code F70. When the separately driven fan is mounted, the length of the motor increase by Δ L.



独立驱动风扇技术参数 **Technical data for separately fan**

对应电动机机座号 Motor frame size	电压 Voltage (V)	频率 Frequency (Hz)	功率 Rated output (W)	电流 Current (A)	转速 Speed (r/min)	Δ L (mm)
80	380V	50	30	0.08	2800	60
90	380V	50	30	0.08	2800	70
100	380V	50	52	0.12	2800	80
112	380V	50	52	0.12	2800	90
132	380V	50	45	0.35	1400	75
160	380V	50	45	0.35	1400	55
180	380V	50	120	0.6	1400	35
200	380V	50	120	0.6	1400	65
225	380V	50	120	0.6	1400	60
250	380V	50	230	1.0	1400	65
280	380V	50	230	1.0	1400	110
315	380V	50	370	1.1	1250	90
355	380V	50	550	1.26	1350	100

注：风扇可以在 210 ~ 240VD/360 ~ 420VY 50Hz 电源供电下运行，也可以在 220 ~ 260VD/380 ~ 480VY 60Hz 电源供电下运行。其他电源供电，须特殊询价。

Note: The fan can be running with supply 210 ~ 240VD/360 ~ 420VY 50Hz, and also 220 ~ 260VD/380 ~ 480VY 60Hz. Other voltage supply, possible on request.

轴承系统

SIMOTICS 1LE0003 系列超高效低压电动机标准配置深沟球轴承或角接触球轴承，这些轴承是密封的或可再润滑型的。

FS80~160 范围的电动机驱动端与非驱动端轴承浮动。

FS180 ~ 355 电动机驱动端轴承浮动，非驱动端轴承固定。

标准配置的轴承可以承受一定的悬臂力，关于悬臂力可以参见第 11 页“电动机轴驱动端允许的最大悬臂力”。当电动机轴端承受的悬臂力较大时，可以考虑选择增强悬臂力的轴承设计（选件号：L22）。

FS80 ~ 250 范围电动机标配不带再润滑装置；FS280 ~ 355 范围的电动机标配可再润滑轴承，并标配再润滑装置。如果需要，FS100 ~ 250 范围的电动机也可选用可再润滑轴承和再润滑装置（选件号：L23）。

Bearing system

SIMOTICS 1LE0003 premium efficiency low voltage motor is supplied with the ball bearing as standard. These bearings are either of the sealed or regreasable type.

For FS80~160,the floating bearings are assembled;

for FS180 ~ 355, floating bearing at DE, and fixed bearing at NDE assembled.

The standard bearing can endure a maximum cantilever force, referred to page 11 - Permissible cantilever forces. If higher cantilever force on the shaft required, the increased cantilever bearing design (Option code: L22) should be considered.

As standard, FS80 ~ 250 motors are not with regreasing device, but FS280 ~ 355 motors with regreasable bearing and regreasing device. If necessary, FS100 ~ 250 motor can be configured with regreasable bearing and regreasing device (Option code: L23).

轴承选配

Bearing Assignment

机座号 Frame size	极数 Pole	标准配置 Standard design			增强悬臂力设计轴承（选件号：L22） Increased cantilever-bearing (Option code: L22)			再润滑轴承（选件号：L23） Re-greasing bearing (Option code: L23)	
		驱动端轴承 DE bearing	非驱动端轴承（水平安装） NDE bearing (Horizontal mounting)	非驱动端轴承（立式安装） NDE bearing (Vertical mounting)	驱动端轴承 DE bearing	非驱动端轴承（水平安装） NDE bearing (Horizontal mounting)	非驱动端轴承（立式安装） NDE bearing (Vertical mounting)	驱动端轴承 DE bearing	非驱动端轴承 NDE bearing
80	2,4,6	6204 2Z C3	6204 2Z C3	6204 2Z C3	-	-	-	-	-
90	2,4,6	6205 2Z C3	6205 2Z C3	6205 2Z C3	-	-	-	-	-
100	2,4,6	6206 2Z C3	6206 2Z C3	6206 2Z C3	6306 2Z C3	6206 2Z C3	6206 2Z C3	6206 C3	6206 C3
112	2,4,6	6206 2Z C3	6206 2Z C3	6206 2Z C3	6306 2Z C3	6206 2Z C3	6206 2Z C3	6206 C3	6206 C3
132	2,4,6	6208 2Z C3	6208 2Z C3	6208 2Z C3	6308 2Z C3	6208 2Z C3	6208 2Z C3	6208 C3	6208 C3
160	2,4,6	6209 2Z C3	6209 2Z C3	6209 2Z C3	6309 2Z C3	6209 2Z C3	6209 2Z C3	6209 C3	6209 C3
180	2,4,6	6210 Z C3	6210 Z C3	6210 Z C3	NU210	6210 Z C3	6210 Z C3	6210 C3	6210 C3
200	2,4,6	6212 Z C3	6212 Z C3	6212 Z C3	NU212	6212 Z C3	6212 Z C3	6212 C3	6212 C3
225	2,4,6	6213 Z C3	6213 Z C3	6213 Z C3	NU213	6213 Z C3	6213 Z C3	6213 C3	6213 C3
250	2,4,6	6215 C3	6215 C3	7215 AC	NU215	6215 C3	O.R.	6215 C3	6215 C3
280	2,4,6	6317 C3	6317 C3	7317 AC	NU317	6317 C3	O.R.	□	□
315	2,4,6	6319 C3	6319 C3	7319 AC	NU319	6319 C3	O.R.	□	□
355	2	6319 C3	6319 C3	7319 AC	NU319	6319 C3	O.R.	□	□
	4,6	6322 C3	6322 C3	7322 AC	NU322	6322 C3	O.R.	□	□

注：
DE 驱动端
NDE 非驱动端
– 不能满足
□ 标准配置
O.R. 须要特殊询价

Note:
DE Driven end
NDE Non driven end
– Not possible
□ Standard
O.R. Possible on request

轴承寿命（标称寿命）

轴承的标称额定寿命可根据 ISO 281 标准规定的标准计算程序计算出来的。如果电动机在该样本中所规定条件下运行，90% 甚至更高比例的轴承的运行时间可达到标称寿命。通常，轴承的使用寿命取决于轴承规格、轴承载荷、运行条件、转速以及润滑脂寿命。

当电动机水平安装，且不受轴向力的情况下，电动机的轴承寿命至少能够达到 40,000 小时。在承受最大容许载荷的情况下，其寿命也至少有 20,000 小时，这里所说的轴承寿命，指的都是电动机在 50 Hz 下正常运行的情况。

当电动机在非正常的条件下运行时，轴承的寿命会缩短。如下面几种情况：

- 当电动机的运行速度高于额定速度时，由于电动机的振动增大，使得轴承受到额外的径向力和轴向力，导致其寿命减少；
- 当环境或设备等因素引起电动机振动加大时，同样轴承也会因此受到额外的径向力和轴向力，而导致其寿命减少；
- 当环境温度每升高 10°C，润滑脂寿命以及再润滑时间缩短一半。

润滑脂寿命和再润滑周期

对于不可再润滑的轴承，其润滑脂寿命与轴承寿命相当。但是，这只能是在电机严格按照本样本中规定的技术数据运行。

对于以规定间隔再润滑的电机，轴承寿命可以延长，从而补偿不利因素，诸如温度、安装条件、转速、轴承规格和机械载荷造成的影响。

Bearing life time (nominal lifetime)

The nominal bearing lifetime is defined according standardized calculation procedures (ISO 281) and is reached or even exceeded for 90% of the bearings when the motors are operated in compliance with the data provide in the catalog. Generally, the bearing lifetime is defined by the bearing size, the bearing load, the operating condition, the speed and the grease lifetime.

The bearing lifetime of motors with horizontal type of construction is at least 40,000 hours if there is no additional axial loading at the coupling output and at least 20,000 hours with the maximum admissible loads. This assumes that the motor is operated at 50Hz.

When the motor runs outside of normal conditions, the bearing life will be reduced, such as the following conditions.

- When the motors runs beyond the rated speed, the increase of motor vibration will result in the extra radial and axial force on bearing. This will reduce the life of bearing;
- When the motor vibration increase due to the environment or other equipment, the bearing also will endure more radial and axial force. This also will reduce the life of bearing;
- If the coolant temperature is increased by 10 °C, the grease lifetime and regreasing interval is halved.

Grease life and re-greasing interval

For permanent lubrication, the bearing grease lifetime is matched to the bearing lifetime. This can, however, only be achieved if the motor is operated in accordance with the catalog specifications.

For motors which can be regreased at defined regreasing intervals, the bearing lifetime can be extended and/or unfavorable factors such as temperature, mounting conditions, speed, bearing size and mechanical load can be compensated.

润滑脂寿命和再润滑周期（电动机水平安装）

Grease life (Horizontal installation)

机座号 Frame size	极数 Poles	润滑脂寿命 Grease lifetime up to CT 40 °C [1]
持久润滑型轴承的润滑脂 Grease for permanent lubrication bearing		
80 ~ 250	2, 4, 6	20000 或 (or) 40000 [2]
可再润滑型轴承的润滑脂 Grease for regreasable bearing		
100 ~ 160	2, 4, 6	8000 小时 (h)
180 ~ 250	2	4000 小时 (h)
180 ~ 250	4, 6	8000 小时 (h)
280 ~ 315	2	3000 小时 (h)
280 ~ 315	4, 6	5000 小时 (h)
355	2	2000 小时 (h)
355	4, 6	4000 小时 (h)

注：

[1] 当环境温度每升高 10 °C，润滑脂寿命以及再润滑时间缩短一半。

[2] 在环境温度 25 度下，40000 小时适用于电动机水平安装，且轴不受额外的轴向力影响；

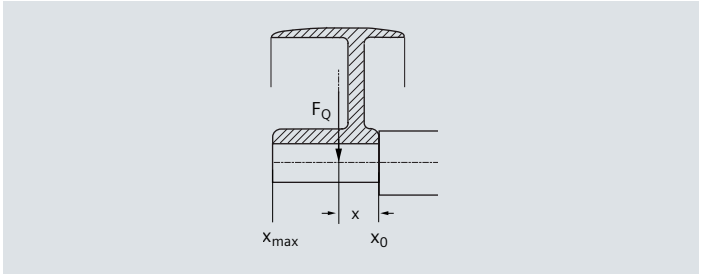
Note:

[1] If the coolant temperature is increased by 10 K, the grease lifetime and regreasing interval are halved.

[2] 40000 h apply to horizontally installed motors with coupling output without additional axial loads.

电动机轴驱动端允许的最大悬臂力

Permissible cantilever forces on DE shaft



为了计算径向负载的最大悬臂力，据轴肩处的悬臂力 F_Q（N）必须位于轴伸端以内，（长度为 x）。长度 x [mm] 是距离轴肩的距离。长度最长为 x_{max}，与轴伸长度相同。总的悬臂力 F_Q 使用以下公式计算。

$$F_Q = c \bullet F_U$$

预紧力系数 c 是从皮带制造商那得到的经验数值，下面的估算值可以应用。

- 对于一般扁平的皮带，c = 2；
- 对于 V 型皮带，c = 2 ~ 2.5；
- 对于特殊的皮带（取决于皮带类型和负载），c = 2 ~ 2.5。

计算切向力 F_U（N）使用下列公式：

$$F_U = 2 \bullet 10^7 \frac{P}{n \times D}$$

F_U 切向力（N）
P 额定功率（kW）
n 额定转速
D 滑轮直径（mm）

In order to calculate the admissible cantilever forces for a radial load, the line of force (i.e. the centerline of the pulley) of the cantilever force F_Q(N) must lie within the free shaft extension (dimension x).Dimension x [mm] is the distance between the point of application of force F_Q and the shaft shoulder. Dimension x_{max}. Corresponds to the length of the shaft extension. Total cantilever force is calculated using the following equation.

$$F_Q = c \bullet F_U$$

The pre-tension factor c is a value gained from experience from the belt manufacturer. The following approximate value can be assumed.

- For normal flat leather belts with an idler pulley, c = 2.
- For v-belts, c = 2 to 2.5.
- For special synthetic belts (depending on the type and load), c = 2 to 2.5.

The circumferential force F_U (N) is calculated using the following equation.

$$F_U = 2 \bullet 10^7 \frac{P}{n \times D}$$

F_U circumferential force in N
P rated motor power (transmitted power) in kW
n rated motor speed
D pulleys in mm.

假设电动机不受任何轴向力，下面的表格中列出了允许的径向悬臂力值（单位：牛顿）。

The table below contains the permissible Radial Force values in Newtons with the assumption of zero axial forces.

标准电机最大悬臂力
Admissible cantilever forces for standard version

机座号 Frame size	极数 Number of poles	悬臂力范围 [1] Admissible cantilever force [1]	
		for x_0 N	for x_{max} N
80M	2	620	510
	4	790	640
	6	910	740
90S/90L	2	700	560
	4	880	720
	6	1020	820
100L	2	980	790
	4	1230	990
	6	1420	1140
112M	2	980	790
	4	1230	990
	6	1420	1140
132S/132M	2	1440	1120
	4	1230	990
	6	2080	1630
180M 180L	2	1,820	1,470
	4	2,300	1,900
	6	2,630	2,150
200L	2	2,650	2,230
	4	3,350	2,800
	6	3,850	3,230
225S 225M	2	3,000	2,540
	4	3,700	3,000
	6	4,250	3,470
250M	2	3,150	2,620
	4	3,950	3,280
	6	4,600	3,820
280S 280M	2	6,600	5,550
	4	8,300	6,950
	6	9,650	8,120
315S 315M 315L	2	7,100	6,200
	4	8,700	7,250
	6	10,000	8,500
355M 355L	2	6,800	6,000
	4	11,500	10,000
	6	13,200	11,600

[1] 对于安装型式为 IM B6，IM B7，IM B8，IM V5，IM V6 时，在电机底脚的支撑力足够的情况下，皮 带张力垂直于或指向安装平面。采用底脚安装的电动机两个底脚必须牢固。

[2] 增强悬臂力型只适用于 FS100 ~ 355

增强悬臂力的轴向设计（编号 L22）
Bearing design for increased cantilever forces Order code L22

机座号 Frame size	极数 Number of poles	悬臂力范围 [1] Admissible cantilever force [1]	
		for x_0 N	for x_{max} N
80M	2	– [2]	– [2]
	4	– [2]	– [2]
	6	– [2]	– [2]
90S/90L	2	– [2]	– [2]
	4	– [2]	– [2]
	6	– [2]	– [2]
100L	2	1480	1220
	4	1870	1540
	6	2140	1720
112M	2	1480	1220
	4	1870	1540
	6	2140	1720
132S/132M	2	2100	1700
	4	2720	2170
	6	3100	2420
180M 180L	2	3,300	2,700
	4	4,200	3,400
	6	4,750	3,900
200L	2	5,000	4,200
	4	6,330	5,320
	6	7,250	6,080
225S 225M	2	5,650	4,800
	4	6,950	5,600
	6	7,900	6,500
250M	2	6,700	5,600
	4	8,500	7,000
	6	9,500	7,800
280S 280M	2	11,500	9,500
	4	17,000	14,000
	6	20,000	17,000
315S 315M 315L	2	14,600	12,300
	4	20,000	16,500
	6	23,000	19,000
355M 355L	2	15,800	14,000
	4	22,000	19,000
	6	25,000	22,000

[1] It should be considered that for types of construction IM B6, IM B7, IM B8, IMV5 and IM V6 the belt tension is only permitted to act parallel to the mounting plane or towards the mounting plane and the feet must be supported. Both feet must be secured for foot-mounting types of construction.

[2] Reinforced version only from FS100 ~ 355

噪声

噪声值

噪声值根据 DIN EN ISO 1680 标准在噪音室测得。表面声压级噪声 L_{pfa} 计算表示单位为 dB（A）。声压级噪声的空间平均值是在其测量面上测得的。测量面是距离电动机表面一立方米的地方。声功率级噪声用 L_{WA} 来表示，单位为 dB（A）。下面给出噪声值仅适用于电动机在 50 Hz 电源供电空载运行时的情况，容差为 +3 dB。当在 60 Hz 电源下空载运行时，偏差值大约为 +4 dB。

Noise levels

Noise levels for mains-fed operation

The noise levels are measured in accordance with DIN EN ISO 1680 in a dead room. It is specified as the A-valued measuring-surface sound pressure level L_{pfa} in dB (A). This is the spatial mean value of the sound pressure levels measured on the measuring surface. The measuring surface is a cube 1 m away from the motor surface. The sound power level is also specified as L_{WA} in dB (A). The following specified values are only valid for no load at 50 Hz with no load, and the tolerance is +3 dB. While motor operating 60 Hz with no load, the values are approximately +4 dB (A) higher.

机座号	同步转速 synchronous speed（r/min） L_{pfa} / L_{WA} （dB（A）） 3000（2 极 poles）	1500（4 极 poles）	1000（6 极 poles）
80	51 / 62	45 / 56	44 / 55
90	55 / 67	47 / 59	45 / 57
100	62 / 74	52 / 64	49 / 61
112	65 / 77	53 / 65	53 / 65
132	67 / 79	59 / 71	57 / 69
160	69 / 81	61 / 73	61 / 73
180	70 / 83	63 / 76	59 / 73
200	71 / 84	63 / 76	59 / 73
225	72 / 85	65 / 78	60 / 74
250	75 / 89	66 / 79	62 / 76
280	77 / 91	66 / 80	64 / 78
315	78 / 92	74 / 88	69 / 83
355	85/100	81/95	71/85

L_{pfa} – 声压级
L_{WA} – 声功率级

L_{pfa} – sound pressure level
L_{WA} – sound power level

振动

所有电动机转子都使用半键按照 A 级（标准）振动等级进行动态平衡。
电动机在空载时测得振动速度有效值不超过下表中的 A 级所列值。

Vibration

The rotors are dynamically balanced to severity grade A using a half key.
Table below contains the effective vibration values for unloaded motors.

振动等级 Vibration grade	机座号 Frame size (mm)	80 ≤ FS ≤ 132	160 ≤ FS ≤ 280	280 < FS ≤ 355
A	安装方式 Mounting	Vibration velocity 振动速度（mm/s）	Vibration velocity 振动速度（mm/s）	Vibration velocity 振动速度（mm/s）
	自由悬置 Free suspension	1.6	2.2	2.8
	刚性安装 Rigid mounting	1.3	1.8	2.3
B	自由悬置 Free suspension	0.7	1.1	1.8
	刚性安装 Rigid mounting	-	0.9	1.5

电气特性

额定输出

SIMOTICS 1LE0003 系列超高效低压电动机的额定功率是指电动机在连续运行的情况下 S1（IEC 60034-1），此时周围环境温度为 -20 °C ~ 40 °C，海拔高度不超过 1000 m。

电压、频率

IEC 60034-1 将电压和频率的偏差分为 A 类 (电压偏差 ±5 %，频率偏差 ±2 %) 和 B 类 (电压偏差 ±10 %，频率偏差 +3 % / -5 %) 。电动机均能够在 A 类和 B 类提供额定转矩。在 A 类中，温度比正常运行下温度大约提升 10 K。

Electrical design

Rated Output

SIMOTICS 1LE0003 premium efficiency low voltage motors' rated output powers means that the motor runs under continuous duty S1 (IEC 60034 - 1) operation when operated at ambient temperature from -20 °C to 40 °C and at altitudes of up to 1000 m over sea.

Voltage and Frequency

IEC 60034-1 differentiates between Category A (combination of voltage deviation ±5 % and frequency deviation ±2 %) and Category B (combination of voltage deviation ±10 % and frequency deviation +3 % / -5 %) for voltage and frequency fluctuations. The motors can supply their rated torque in both Category A and B. In Category A, the temperature rise is approximately 10 K higher than during normal operation.

标准 Standard 60034 - 1	类别 Category A	类别 Category B
电压偏差 Voltage deviation	±5 %	±10 %
频率偏差 Frequency deviation	±2 %	+3 % / -5 %
根据标准，不推荐电动机在 B 类情况下长时间运行 According to the standard, longer operation is not recommended for Category B.		

电气数据公差

- 效率 η
  $P_{rated} \leq 150$ kW: - 0.15 x (1 – η)
  $P_{rated} > 150$ kW: - 0.10 x (1 – η)
  效率 η 为小于 1 的值
- 功率因数：(1 – cos ϕ) / 6
  最小绝对值：0.02
  最大绝对值：0.07
- 转差率：±20 %（电动机的偏差 < 1 kW ± 30 % 时是允许的）
- 堵转电流：+20 %
- 堵转转矩：-15 % ~ +25 %
- 最大转矩：-10 %
- 转动惯量：±10 %

过载倍数

根据 IEC60034 标准要求，1LE0003 系列电动机能够在额定电压和频率下承受 1.5 倍的额定电流达 2 分钟。

Tolerance for electrical data

- Efficiency η at
  $P_{rated} \leq 150$ kW: - 0.15 x (1 – η)
  $P_{rated} > 150$ kW: - 0.10 x (1 – η)
  With η being a decimal number
- Power factor - (1 – cos ϕ) / 6
  Minimum absolute value: 0.02
  Maximum absolute value: 0.07
- Slip ±20 % (for motors < 1 kW ±30 % is admissible)
- Locked-rotor current +20 %
- Locked-rotor torque -15 % to +25 %
- Breakdown torque -10 %
- Moment of inertia ±10 %

Overload times

According to IEC60034, 1LE0003 series motors are designed to withstand overload capacity of 1.5 times rated current for 2 minutes at rated voltage and frequency.

绝缘系统

SIMOTICS 1LE0003 系列超高效低压电动机绝缘系统具有可靠性、耐用性好和寿命长、耐冲击能力强的特点。

SIMOTICS 1LE0003 系列超高效低压电动机标准设计温度等级为 155（F）。当 1LE0 电动机直接供电，且输出额定功率时，其绝缘系统按 130（B）温度等级使用。

电动机保护

电动机过热保护

电动机热保护是指将温度保护传感器或温度检测传感器嵌入电动机定子绕组或其他适当的地方，从而使其不会因为过热而受到破坏。

不同的电动机热保护方式可以在电动机订货号的第 15 位采用不同的字母或者选件号来表示。下面是电动机的绕组保护和轴承保护的几种保护方式。

绕阻保护

■ **PTC 热敏电阻温度保护**

目前，最常用的电动机绕组过热保护方式是采用在电动机绕组中安装 PTC 热敏电阻进行保护。由于热敏电阻的热容量较低以及其在绕足间优良的热传导特性，绕组温度可被准确的监控。当达到极限温度时（标称跳闸温度），PTC 热敏电阻阻值会出现一个阶跃变化。这一变化被跳闸装置捕捉后，即可断开辅助回路。

PTC 热敏电阻本身不能耐受大电流和高电压。否则会导致半导体器件损坏。PTC 热敏电阻和跳闸装置的开关滞后效应小，因此可以实现快速重起。对于重载起动、起动频率高、负载变化大、环境温度高或电源波动大等应用场合，建议电动机使用该类保护。

Insulation system

The insulation system of SIMOTICS 1LE0003 premium efficiency low voltage motor results in high reliability, a long service life and high resistance to stress, for example, during starting or under overload conditions.

SIMOTICS 1LE0003 premium efficiency low voltage motor is designed for temperature class 155 (F). At rated output with line-fed operation, the motors can be used in temperature class 130 (B).

Motor protection

Motor thermal overload protection

Motor thermal protection means to use of thermal protectors and thermal detectors incorporated into the stator windings or placed in other suitable positions in motor in order to protect them against serious damage due to thermal overloads.

The order variants for motor protection are coded with letters in the 15th position of the Motor Order No., or ordered with Option code. Some protection method about winding protection and bearing protection are shown in the following.

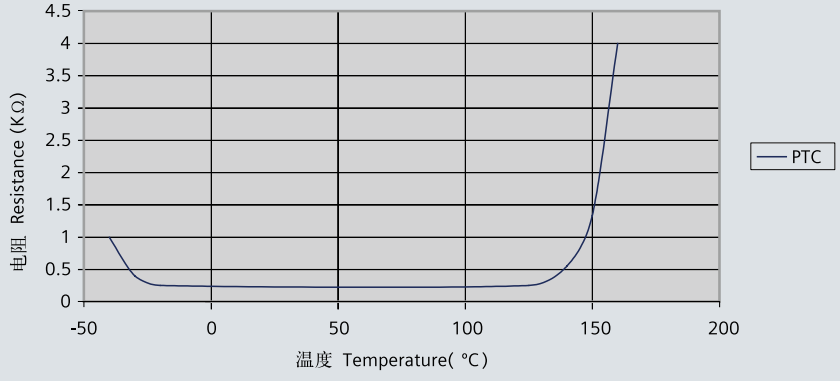
Winding protection

■ **PTC thermistors protection**

The most comprehensive protection against thermal overloading of the motor is provided by PTC thermistors (thermistor motor protection) installed in the motor winding. The temperature of the winding can be accurately monitored thanks to its lowheating capacity and the excellent heat contact with the winding. When a limit temperature is reached (nominal tripping temperature), the resistance of PTC thermistors will have a step change. This is evaluated by a tripping unit and can be used to open auxiliary circuits.

The PTC thermistors themselves cannot be subjected to high currents and voltages. This would result in destruction of the semiconductor. The switching hysteresis of the PTC thermistor and tripping unit is low, which supports fast restarting of the drive. Motors with this type of protection are recommended for heavy duty starting, switching duty, extreme changes in load, high ambient temperatures or fluctuating supply systems.

PTC 曲线图
The graph of PTC



两种 PTC 热敏电阻温度保护

– 电动机绕组带一组三芯串联的 PTC 热敏电阻用于跳闸，跳闸温度为 155 °C，电动机订货号第 15 位字母为“B”，需 2 个辅助接线端子。

– 电动机绕组带两组三芯串联的 PTC 热敏电阻，其中一组用于在电动机跳闸前报警，一组用于跳闸，报警温度为 145 °C，跳闸温度为 155 °C，电动机订货号第 15 位字母为“C”，需 4 个辅助接线端子。

2 alternatives of PTC protection

– Motor winding is protected with PTC thermistors with 3 embedded temperature sensors for tripping. Connection be done through 2 auxiliary terminals in the connection box. 15th position of Motor Order No. letter B.

– Motor winding is protected with two sets of three temperature sensors, one set is for warning, another set for tripping. The warning temperature is 145 °C, and tripping temperature is 155 °C. Connection be done through 4 auxiliary terminals in the connection box. 15th position of Motor Order No. letter C.

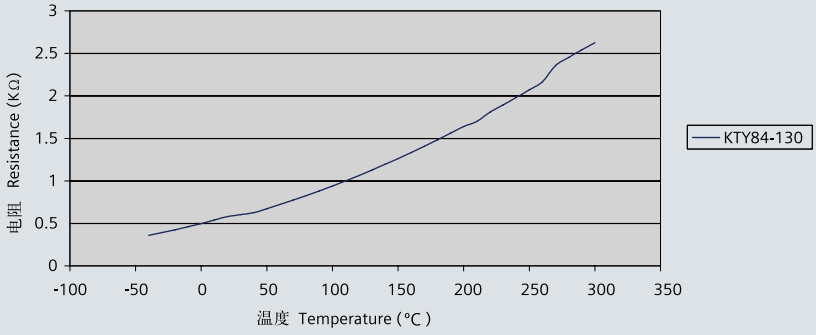
■ KTY84-130 温度传感器温度保护

当电动机变频应用时，推荐使用 KTY84-30 温度传感器进行绕组保护。KTY84-130 温度传感器特性曲线如下所示。

■ KTY84-130 temperature sensor protection

When motor with converter fed operation, KTY84-30 is recommended to be configured for winding protection. The following chart show the characteristic of KTY84-30.

在不同温度下 KTY84-130 的阻值
Resistance of KTY84-130 under different temperature



一些西门子变频器可以通过温度传感器的电阻来确定电动机的温度，从而设定电动机报警和跳闸的温度。

电动机绕组带一个 KTY 84-130 温度传感器，订货号第 15 位字母为“F”，需 2 个辅助接线端子。

Some converters from Siemens determine the motor temperature using the resistance of the temperature sensor. They can be set to a required temperature for alarm and tripping.

Motor winding with embedded temperature detector sensor KTY 84 -130. Two auxiliary terminals are provided in the connection box. 15th position of Motor Order No. letter F.

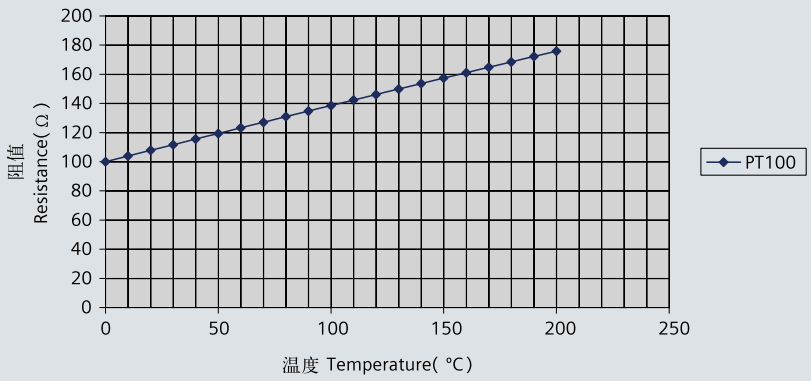
■ PT100 热敏电阻传感器温度保护

PT100 热敏电阻是一种精确高、灵敏度高的传感器，其线性温度阻值优于其他电阻式传感器，性能稳定、可靠性高，其特性曲线如下。

■ PT100 resistance thermometers protection

PT100 thermometers are a high precision, high sensitivity, better linear temperature resistance, more stable performance, and high reliability sensor, whose characteristics are as following.

在不同温度下 PT100 的阻值
Resistance of PT100 under different temperature



两种 PT100 热敏电阻温度保护

- 电动机绕组带 3 个 2 线制 PT100 测温元件，电动机订货号第 15 位字母为“H”，需 6 个辅助接线端子。
- 电动机绕组带 6 个 2 线制 PT100 测温元件，电动机订货号第 15 位字母为“J”，需 12 个辅助接线端子。

2 alternatives of PT100

- Installation of 3 PT100 resistance thermometers. Connection be done through 6 auxiliary terminals in the connection box. 15th position of Motor Order No. letter H.
- Installation of 6 PT100 resistance thermometers. Connection be done through 12 auxiliary terminals in the connection box. 15th position of Motor Order No. letter J.

轴承保护

电动机轴承标配不带任何保护。对于某些苛刻的应用，推荐对轴承采取保护措施。轴承保护是通过在电动机驱动端和非驱动端的轴承端盖拧入温度传感器来进行保护。温度传感器的引接线引入电动机主接线盒内。

电动机轴承装两个 PT100 测温元件，选件号为 Q5A，需 4 个辅助接线端子。

Bearing protection

Motors bearing has no protection as standard. For some severe application, such as high load, high coolant temperature and etc., the bearing is recommended to be protected. The bearing is protected through thermometers screwed into the bearing plates of motor driven end (DE) and non-drive-end (NDE). The wires are routed through the main connection box.

Installation of 2 PT100 screwed-in resistance thermometers for motor bearings, Option code: Q5A. Connection be done through 4 auxiliary terminals in the connection box.

防潮加热保护

当电动机处于较为恶劣的环境时，比如湿度非常大或者昼夜温差比较大，电动机的绕组很可能出现凝露的现象，这样会带来电动机烧毁的风险。对于这种情况，建议对电动机绕组配置防潮加热带（选件号：Q04）进行保护。

电动机防潮加热带必须在电动机工作过程中处于不工作状态；当电动机停机时，防潮加热带必须启动工作，为绕组加热。防潮加热带的电气参数如下表所示。

Anti-condensation heater

Motors whose windings are at risk of condensation due to the climatic conditions, e.g. inactive motors in humid atmospheres or motors that are subjected to widely fluctuating temperatures can be equipped with anti-condensation heaters (Option code: Q04).

Anti-condensation heaters must be switched off during operation. When motor shut down, the heaters must be switched on.

防潮加热带电气参数

Electrical data of Anti-condensation heater

机座号 Frame size	功率 Power（W）	电压 Vlotage
80 ~ 90	20	220 V
100 ~ 112	30	220 V
132 ~ 160	40	220 V
180 ~ 200	50	220 V
225 ~ 280	60	220 V
315	80	220 V
355	100	220 V

变频应用

Converter fed application

SIMOTICS 1LE0003 系列超高效低压电动机适于变转速、恒转速的各种应用，如风机、泵、压缩机、纺织机械等。

当变频器驱动电动机时，电磁干扰的程度大小取决于变频器的类型（种类，IGBT 数量，干扰控制措施及制造商）、布线、距离以及应用需求。在设计和应用阶段必须参考变频器制造商关于电磁兼容性的安装指导。

当电动机变频应用（变频器供电），且输出额定功率时，电动机的使用温度等级为 155 (F)。为了避免杂散电流对电动机轴承的损坏，推荐 FS250 ~ 355 电动机使用绝缘轴承。请向西门子咨询关于绝缘轴承的详细信息。

SIMOTICS 1LE0003 low voltage motors are suitable for pumps, fans, compressors, texitle machine and mechanical machine applications where variable or constant speed is required.

In application where the motor is driven by a converter, the degree of electrical interference depends on the type of converter used (type, number of IGBTs, interference suppression measures, and manufacturer), cabling, distance and application requirements. The installation guidelines of the converter manufacturer with regards to electromagnetic compatibility must be considered at all times during the design and implementation phases.

At rated output with converter fed operation, the motors will be used in temperature class 155 (F). To prevent damage as a result of bearing currents, insulated bearings are recommended to be assembled for FS250 ~ 355. Please inquire Siemens about the detailed information of insulated bearing.

变频器驱动运行

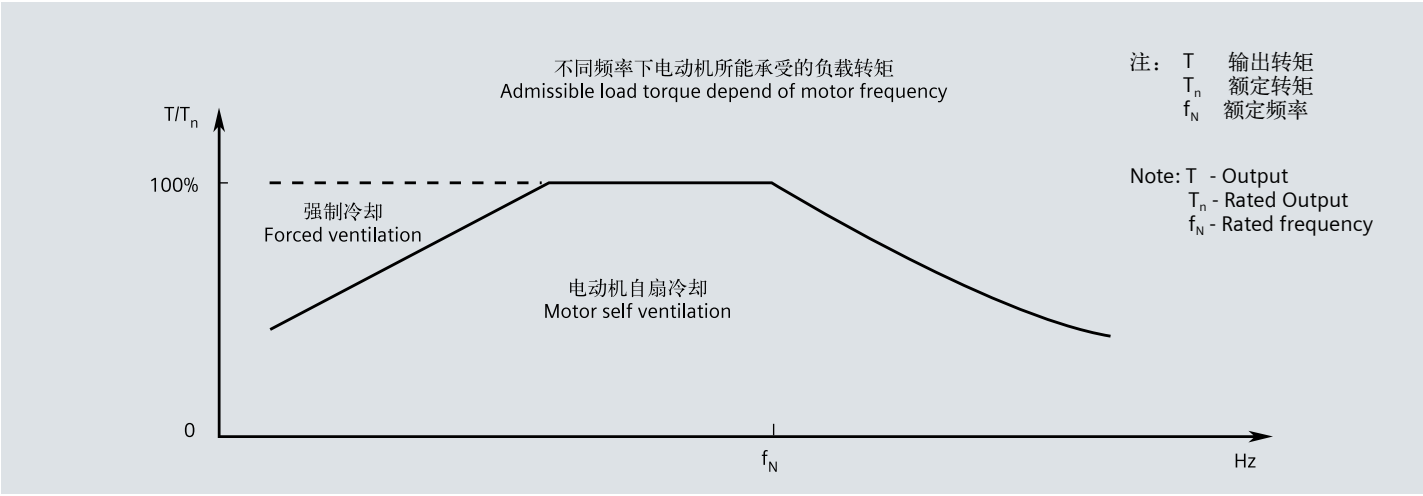
SIMOTICS 1LE0003 系列超高效低压电动机的标准绝缘系统设计要求，能够保证其在变频器供电电压不超过 460 V 时正常运行。

该系列电动机变频器驱动时，其负载扭矩特性如以下图表所示：

Converter-fed operation

The standard insulation of SIMOTICS 1LE0003 low voltage motors is designed such that operation is possible on the converter at mains voltage up to 460 V.

The load torque characteristics of this series motor is referred in the following diagram:



当负载转矩在允许的转矩范围内时，电动机能够自扇冷却；当负载转矩超过所允许的转矩时，电动机需要强迫冷却。

在电动机运行速度超过额定转速时，噪声和振动值将增加，并且轴承的寿命将缩短。需要注意再润滑周期和润滑脂的寿命。

变频运行时当频率超过 60 Hz 时，必需按照特定的限值进行动平衡。

By usage with admissible torque and below, the motor can be operated with self cooling; by usage over the admissible torque line, the motor with forced ventilation is needed.

At operating speeds above rated speed the noise and vibration levels increase and the bearing life time reduce. Attention should be paid to the re-greasing intervals and the grease service life.

For converter-fed operation with frequencies greater than 60 Hz special balancing is required for compliance with the specified limit values.

最大安全转速如下表

The allowed maximum safe operating speed is showns the diagram

机座号 Frame Size	2 极 2 pole		4 极 4 pole		6 极 6 pole	
	最高转速 Max. rpm	最大频率 fmax	最高转速 Max. rpm	最大频率 fmax	最高转速 Max. rpm	最大频率 fmax
80	5200	87	3600	120	2400	120
90	5200	87	3600	120	2400	120
100	5200	87	3600	120	2400	120
112	5200	87	3600	120	2400	120
132	4500	75	2700	90	2400	120
160	4500	75	2700	90	2400	120
180	4500	75	2700	90	2400	120
200	4500	75	2300	77	1800	90
225	3600	60	2300	77	1800	90
250	3600	60	2300	77	1800	90
280	3600	60	2300	77	1800	90
315	3600	60	2300	77	1800	90
355	3600	60	2300	77	1800	90

电压承受值

绕组绝缘的电介质应力决定于：

- 电压峰值，上升时间以及变频器产生的脉冲频率；

  变频器与电动机连接电缆的特性和长度；

- 绕组结构和其他系统参数，尤其是绝缘系统中不同绕组的对地电压（代表了绝缘系统的电介质应力）。

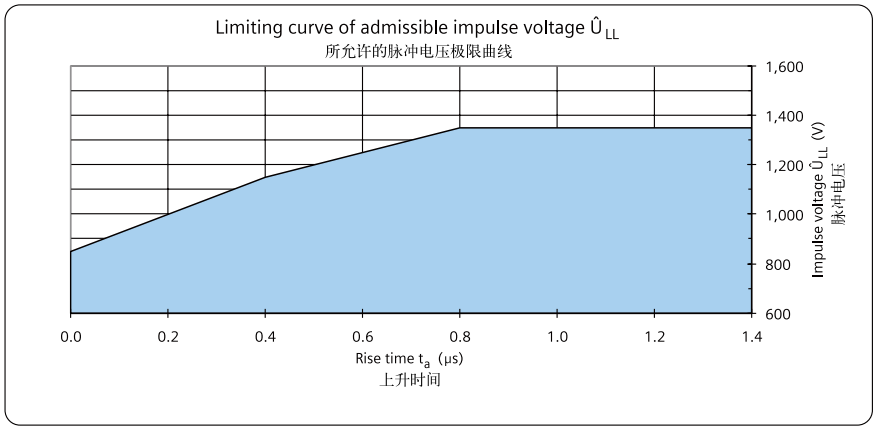
图表所示为 1LE0003 电动机标准绝缘能承受电压的峰值和上升时间：

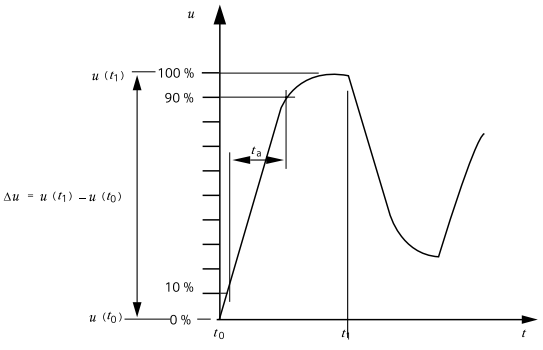
Voltage withstand levels

The dielectric stress of the winding insulation is determined by:

- the peak voltage, rise time and frequency of the impulses produced by the converter.
- the characteristics and the length of the connection leads between the converter and motor.
- the winding construction and other system parameters, especially the voltages between the different parts of the winding and the ground represent dielectric stress at the insulation system.

The standard insulation of the 1LE0003 motors is designed to withstand voltage peak and rise time which is showed in the diagram:





数值参照 IEC 60034-17，GB/T 20161-2008 标准。

The values refer to standard IEC 60034-17 and GB/T 20161-2008.