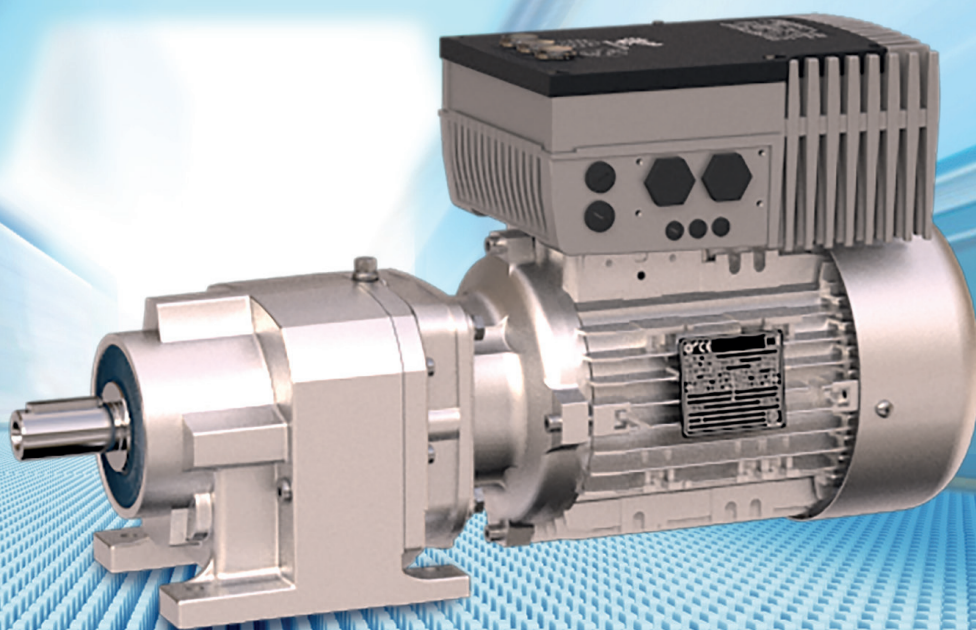


Intelligent Drivesystems, Worldwide Services


# ELECTRONIC VARIABLE SPEED DRIVES



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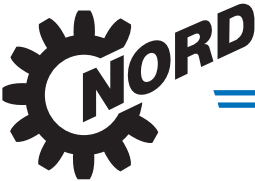
## PRODUCT INFORMATION G4014-1

NORDBLOC.1 Helical Gear Units, Helical Gear Units,  
Parallel Gear Units, Helical-Bevel Gear Units, Helical-Worm Gear Units

  
**DRIVESYSTEMS**

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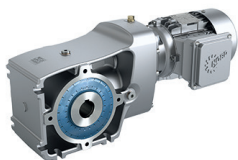


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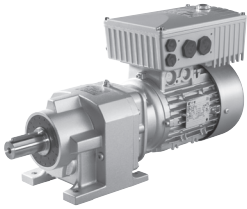
### Catalogue Overview

This „Electronic Variable Speed Drive“ catalogue contains the following gear unit types:

- **NORDBLOC.1 helical gear units**
- **Helical gear units (Unicase housing)**
- **Bevel helical gear units**
- **Parallel shaft gear units**
- **Helical-worm gear units**

All drives meet the **EUP directives. From 01.01.2015 also IE2 motors with frequency inverters.**

### NORDBLOC.1 helical gear units



Getriebebau NORD has made extensive further developments to the NORDBLOC compact geared motor. With this, NORD provides another gear unit type which is based on the proven Unicase concept.

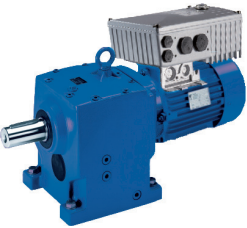
The **NORDBLOC.1** helical gear unit is available in 8 sizes **SK072.1 - SK973.1**. The housings of the NORDBLOC types are smooth and are made from die-cast aluminium up to an including the size SK 673.1.

The new aluminium housing considerably reduces the weight and enables very economical series production. The smooth aluminium surfaces have a robust, natural corrosion protection. Because of this, painting is not provided as standard, but is possible if required (with a surcharge).

The housings of the larger gear units **SK 772.1 to SK 973.1** are made of cast iron.

The new NORDBLOC design enables the installation of stronger bearings than in the previous series. This results in higher permissible radial and axial forces and a longer service life.

### Helical gear units



2-stage helical gear units with coaxial motor and drive shafts are available in 11 sizes **SK 02 - SK103**. For higher gear ratios, the 6 smaller types **SK 03 ... SK 53** can also be produced as 3-stage units with an attached housing.

The 5 larger sizes **SK 62/63 - SK103** can be supplied as 2/ or 3-stage units with the same housing. Double gear units with 4-, 5- and 6-stages are available for very high gear ratios.

Helical gear units are available in both foot and flange versions. For flange version helical gear units, the flange is cast on; therefore there are no screw connections between the flange and the housing.

The areas of application of helical gear units are very diverse.g. conveyors, agitators, crane travelling mechanisms, gear pumps, rolling mills or eccentric presses.

### Differences

The gear unit types **NORDBLOC.1 helical gear units** and **helical gear units** have the following essential differences:

- Surface properties
  - NORDBLOC.1 helical gear unit - die-cast aluminium
  - Helical gear unit - cast iron
- Different attachment dimensions
- Different torque levels

### 3 and 4-stage bevel helical gear units



The catalogue contains 2-stage bevel helical gear units with die-cast aluminium housings, as well as 3 and 4-stage bevel gear units with cast iron housings.

Bevel gear units are angular gear units in which the motor shaft and the output shaft form a 90° angle. This results in a favourable spatial arrangement of the drive unit.

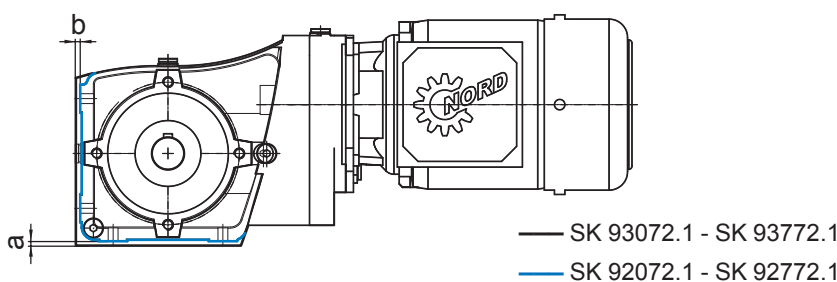
Bevel gear units are suitable for many applications, e.g. conveyor belts, lifting gear or warehouse systems.

The new optimised performance two-stage bevel helical gear units are an innovative NORD design with a high-strength die-cast aluminium housing.

In addition, NORD offers the gear unit series **SK 93072.1 - SK 93772.1** with cast aluminium housings, which is suitable for use in the food industry because of its especially smooth surface. **If you are interested, please contact us.**

Because the power data for the gear unit series SK 93072.1 - SK 93772.1 are identical to those for the SK 92072.1 - SK 92772.1 gear unit series, for reasons of clarity, this catalogue only contains the gear unit series SK 92072.1 - SK 92772.1.

Please note that for the SK 93072.1 - SK 93772.1 gear unit series, only flange mounting is available as standard. The flange mounts of both series are identical. The outline contours of both series of gear units only differ slightly as follows:



Size	SK 93072.1	SK 93172.1	SK 93372.1	SK 93672.1	SK 93772.1
a [mm]	3	2	4	4,5	5
b [mm]	3	2	4	4,5	5

For the gear unit types NORDBLOC.1 helical gear units and 2-stage bevel helical gear units, there is the option of treating the die-cast aluminium housing or the cast aluminium housing with **nsd tupH**. **This surface treatment provides special protection against corrosion.**

The parallel axle offset for parallel shaft gear units leads to a shorter design in comparison with helical gear units. In shaft mounted versions with a continuous hollow shaft, the gear unit can be mounted directly onto the drive shaft of the machine.

**SK 0182NB ... SK 5282** are available as 2-stage versions. **SK 1382NB ... SK 5382** are 3-stage versions for higher gear ratios. With the **SK 2382 ... SK 5382**, this is implemented with an additional add-on housing. For parallel shaft gear unit sizes **SK 6282 / SK 6382** and above, the gear units are built as 2- and 3-stage versions with the same housing.

Because of the shorter length are the parallel shaft gear units the optimal solution, where space is limited.

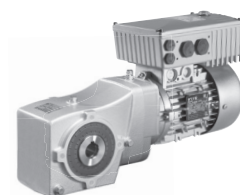
Helical worm gear units are angular gear units in which the motor shaft and the output shaft form a 90° angle. This results in a favourable spatial arrangement of the drive unit.

The helical gears of helical worm gear units are made of highly alloyed steel with case-hardened teeth. Optimised geometries and precise shaft alignment due to the UNICASE principle provide excellent load-bearing capacity, long operating life and low noise.

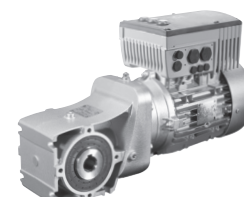
The helical worm gear units listed in this catalogue have multiple stages. **SK 02040 ... SK 42125** are available as 2-stage versions and can also be produced with add-on housings as **SK 13050 ... SK 43125** with 3-stages for higher gear ratios.

The application of this angle gear is versatile. They are preferably used in packaging machines, conveyors and hoists.

## 2-stage bevel helical gear units



SK 93072.1 - SK 93772.1



SK 92072.1 - SK 92772.1

Informations

## nsd tupH Surface Treatment

## Parallel shaft gear units



## Helical worm gear units





## Frequency inverter



SK 200E



SK 180E

With many years of experience in the field of electronic drive technology **NORD DRIVE-SYSTEMS** has produced decentralised frequency inverter drive technology since the end of the 1990s.

With its comprehensive basic equipment the SK 200E can be used for a wide variety of applications. All basic functions are available throughout the entire product range,

- **with the added benefit that the drive solution may be optimally matched to the application.**

- All necessary data that frequency inverter - Gear combinations are for certain power and their speed ranges finished calculated and can the lists contained in the catalog are be used.
- As a result, customers obtain a drive unit package which consists of a geared motor with a decentralised frequency inverter as a complete system solution.
- In the case of decentralised drive electronics is the frequency inverter a finished product, which can be quickly integrated into the machine quickly and conveniently. Based on the dimensional drawings can be checked installation situations of the selected gear units.

However, there will also be applications which cannot be covered by this catalogue, because they are too complex, e.g. for special temperature ranges, highly dynamic applications or special shaft loads.

In this case, Getriebbau NORD's engineering department will be pleased to assist you at any time.

NORD is not simply a supplier of components - NORD supplies optimum drive solutions, in both standardised and customised form.

The use of „electronic variable speed“ takes place mainly in

- Material Handling (Airport and Logistics)
- Agitators
- Centrifuges

**For these applications please contact Getriebbau NORD in Germany or your local NORD sales partner - available in 35 countries throughout the world.**



## Basic selection of the drive unit

The electronic variable speed drive unit consists of 3 basic components:

- Series SK200E und SK180E frequency inverters
- Asynchronous motor with efficiency class IE2 and IE3
- a NORD gear unit.

The frequency inverter, motor and gear unit is delivered completely assembled with all the selected options. The drive unit is ready-parameterised for the motor type.

All that the customer needs to do is to make special adjustments for the application, e.g. ramp time, minimum or maximum frequency or adjustments for restriction of the direction of rotation.

By providing a customised parameter set, it is also possible to order a ready-parameterised drive unit. In this case the customised data set is loaded into the frequency inverter in the final stage, after the standard tests.

Depending upon the installation requirement for the system, the SK 180E and SK 200E frequency inverters can also be mounted on a wall in the vicinity of the geared motor. For this, there is a special wall mount adapter kit.

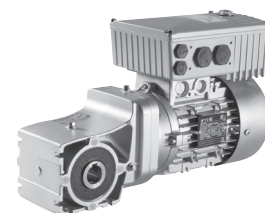
The drive unit selection in this catalogue assists you in the design of the drive unit.

Selection of the gear unit size with the aid of the operating factor for the application as well as the permissible axial and radial forces on the drive shaft should be carried out according to the technical descriptions and specifications outlined in NORD catalogue G1000.

For further information about the entire range of options for gear units, motors and the SK 200E/180E series please refer to the following catalogues:

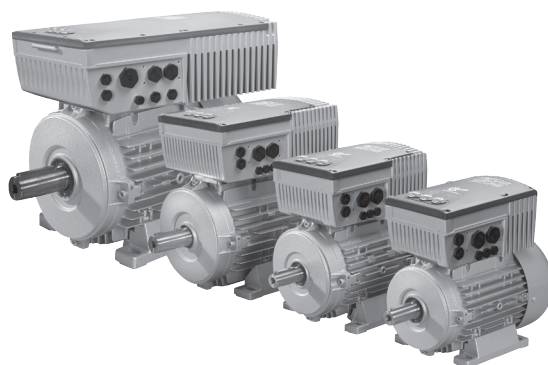
- **F3018:** SK 180E Pumps and material handling
- **F3020/21:** SK 200E Pump and fan applications  
Options: etpoint encoders, displays, bus variants, braking resistors
- **F3022:** SK 205E Material handling applications,  
Options: Setpoint encoders, displays, bus variants, braking resistors
- **G1000:** IE2 gear unit catalogue
- **G1035:** UNIVERSAL worm gear units IE1/IE2/IE3
- **G1012:** NORDBLOC.1 helical gear unit
- **M7000:** IE1/IE2/IE3 motor catalogue,  
Options for motor: brake, encoder, external fan

In the diagrams on pages  A10-12 the SK200E is used as a placeholder for all versions, and SK 180 is also a placeholder for SK 190E.



[Frequency inverter-  
Wall montage](#)

[Further information  
about options](#)



# Selection criteria



## Frequency inverter type code - Basic device

### SK 205E-370-323-A (-C)

IP protection class:	Standard IP55,	<b>C = IP66 (coated)</b>
Radio interference filter:	0 = Without	<b>A = Class C2,</b>
Mains voltage:	12 = 115V,	<b>23 = 230V, 40 = 400V</b>
Number of mains phases:	1 = Single phase,	<b>3 = 3-phase</b>
Digits before comma for power:	<b>0 = 0.xx,</b>	1 = x.x0,      2 = xx.0
Device rated power:	250 = 0,25kW, <b>370 = 0,37kW</b> , ... 222 = 22.0kW	
Device series:	SK 200E, <b>SK 205E</b> , SK 210E, SK 215E, SK 220E, SK 225E, SK 230E, SK 235E	

## Differences between the versions of the device series

Features	200E	205E	210E	215E	220E	225E	230E	235E
Integrated 24V power supply	x	-	x	-	x	-	x	-
Optionally available 24V mains unit	-	x	-	x	-	x	-	x
Number of digital inputs (DIN)	4	4	3	3	4	4	3	3
Number of digital outputs (DO)	2	1	2	1	2	1	2	1
Number of analog inputs (AIN)	2	-	2	-	1	-	1	-
Additional 2 potentiometers for minimal configuration	-	x	-	x	-	x	-	x
Electromechanical brake control	-	x	-	x	-	x	-	x
Safe pulse block (STO / SS1) ⇨ BU0230	-	-	x	x	-	-	x	x
AS interface (4I / 4O)	-	-	-	-	x	x	x	x

## Power, sizes

FI	Size				Mains / Power category SK 2xxE			
	Motor	IE2	IE3	kg **	1~ 110-120V 1)	1~ 200-240V 2)	3~ 200-240V	3~ 380-500V
Size I	Size 71L*	-	SP/LP	3	0.25 ... 0.37kW	0.25 ... 0.55kW	0.37 ... 1.1kW	0.55 ... 2.2kW
	Size 80	SH/LH	SP/LP					
	Size 90	SH/LH	SP/LP					
	Size 100	LH/AH	LP/AP					
Size II	Size 80	SH/LH	LP	4	0.55 ... 0.75hp	0.75 ... 1.1kW	1.5 ... 2.2kW	3.0 ... 4.0kW
	Size 90	SH/LH	SP/LP					
	Size 100	LH/AH	LP/AP					
	Size 112	MH	MP					
Size III	Size 100	LH/AH	LP/AP	7	-	-	3.0 ... 4.0kW	5.5 ... 7.5kW
	Size 112	MH	MP					
	Size 132	SH/MH	SP/MP					
Size 4	Size 132	LH	-	17	-	-	5.5 ... 7.5kW	11 ... 22kW
	Size 160	MH/LH	MP/LP					
	Size 180	MH/LH	MP/LP					

\* incl. adapter and seal (11015410, 13097000)

\*\* Weight of SK 2xxE without motor

1) only available as model SK 2x5E

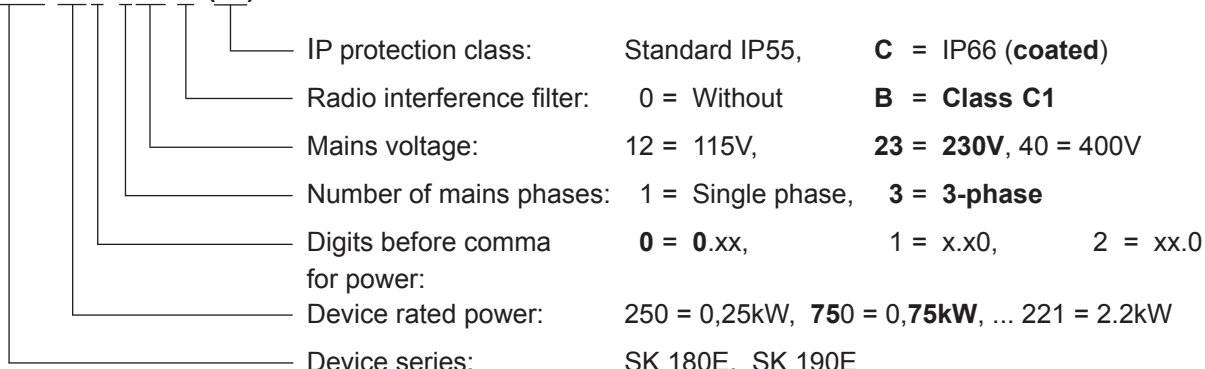
2) Model SK2x0E only available in Size 1





## Type code - Frequency inverter - Basic device

### SK 180E-750-340-B (-C)



## Versions in the series

Features	180E	190E
Integrated 24V power supply	x	x
Number of digital inputs (DIN)	3	3
Number of digital outputs (DO)	2	2
Number of analog inputs (AIN)	2	2
Electromechanical brake control	optional	optional
Safe pulse block (STO / SS1) ⇨ BU0230	-	-
AS interface (4I / 4O)	-	x

## Power, sizes

FI	Size			kg **	Mains / Power category SK 1xxE	
	Motor	IE2	IE3		3~ 200-240V	3~ 380-480V
Size I	Size 71 *	-	SP/LP	2	0.25 ... 0.55kW	0.25 ... 1.1kW
	Size 80	SH/LH	SP/LP			
	Size 90	SH/LH	SP/LP			
Size II	Size 80	SH/LH	LP	3.3	0.75 ... 2.2kW	1.5 ... 2.2kW
	Size 90	SH/LH	SP/LP			
	Size 100	LH/AH	LP/AP			

\* incl. adapter and seal (11015410, 13097000)

\*\* Weight of SK 1xxE without motor



## 1. Step: Selection of the speed range

### Adjustment ranges

The selection of the drive unit starts with the specification of the speed range. **This catalogue offers the adjustment ranges 1:5 and 1:10 and 1:8.7.**

**1 : 5** The speed range **1:5** enables continuous adjustment of the speed of the motor from 300 - 1500 1 rpm.

The maximum speed is therefore comparable with a 4-pole asynchronous motor on a 50 Hz mains voltage. In this case, the frequency inverter operates with a 50 Hz characteristic curve (see Figure 1). This means that the frequency inverter output also attains 400 V with an output frequency of 50 Hz.

**1 : 10** The speed range **1:10** covers motor speeds from 300 - 3000 rpm.

In this case the frequency inverter operates with a 100 Hz characteristic curve (see Figure 1), i.e. the output only attains 400 V at 100 Hz.

For this operating mode, the motor must have a 230 V / 400V  $\Delta/Y$  winding, which is then typically connected in a delta circuit instead of a star circuit.

### Advantages

- **Higher power with the same motor**

The higher speed and the lower rated voltage of the delta circuit make it possible to produce a higher power with the same motor than would be possible with the 50 Hz characteristic curve. A frequency inverter with a higher power is then also assigned.

- **Drive unit well cooled, even without an external fan**

In addition to the increase in power, the 100 Hz characteristic curve has a further advantage. The self-ventilated motor is well-cooled over a wide speed range and an external fan is often not required.

- This effect is additionally supported, as in this operating mode the motor is not operated with the full rated torque (only approx. 70%).

**1 : 8,7** The speed range **1:8,7** covers the speed range from 300 - 2,610 rpm with the constant rated torque of the motor.

This operating mode enables an even higher drive power than the operating mode 1:10. As in the 1:10 mode, the motor is connected in a delta circuit and then has a rated voltage of 230 V at 50 Hz. The inverter operates with an 87 Hz characteristic curve (see Fig. 1), i.e. it achieves an output voltage of 400 V with 87 Hz. As the rated torque of the motor is fully achieved over the entire speed range, the power output at higher speeds is increased by 1.74 times in comparison with the 50 Hz characteristic curve. The assignment of the frequency inverter must be modified due to the higher power. The inverter is one performance level higher than for the 100 Hz characteristic curve.

### Advantage

- **Highest power with the same motor**

However, there are less thermal reserves in the low speed range in comparison with 1:10 mode. There is also the possibility of using the speed range up to 3,000 rpm, however without a further power increase. In the range from 2,610 - 3,000 rpm, the rated torque reduces accordingly, so that the power remains constant.

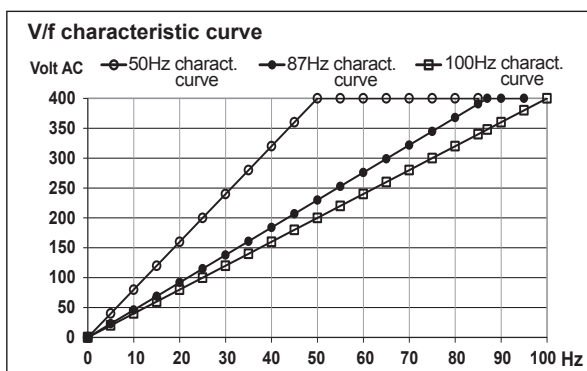


Fig. 1: V/f characteristic curve 400V/50 Hz, 400V/87 Hz, 400V/100 Hz

In fact, for technical reasons the maximum output voltage of the frequency inverter operation is always somewhat lower than the mains input voltage.

A further special feature is the slip regulation which is activated in the inverter. With this, the drive unit achieves and maintains the setpoint speed even with fluctuating loads.

In contrast, in mains operation, the actual speed of the asynchronous motor changes according to the load and only approaches the synchronous speed of 1500 rpm when there is no load.

Both of these points require current reserves in the inverter, which are taken into account in the allocation tables.

**For more information, see the motor catalog ⇒ A24-26.**



## 2nd Step: Selection of the drive unit from the 1:5, 1:8.7 and 1:10 power and speed tables (Section B)

After the specification of the adjustment range, the application-dependent selection of the required gear unit type is made according to the type of gear unit, the output torque and the output speed range.

### Selection example

$P_1$ [kW]	$n_2$ [min <sup>-1</sup> ]	$M_{2b}$ [Nm]	$f_B$	$i_{ges}$	$F_R$ [kN]	$F_A$ [kN]	Type	mm kg
2,20	7,4 - 37	572	1,1	39,32	8,9	25,0	SK 92772.1 - 100LH/4 - SK 200E - 221 - 340 - A (-C)	67 B22-23
	8,2 - 41	509	1,3	35,04	9,3	25,0	SK 92772.1 - 100LP/4 - SK 200E - 221 - 340 - A (-C)	
	9,1 - 45	463	1,4	31,85	9,5	25,0		
	10 - 51	413	1,5	28,38	9,7	25,0	SK 93772.1 - 100LH/4 - SK 200E - 221 - 340 - A (-C)	
	11 - 57	368	1,7	25,34	9,9	25,0	SK 93772.1 - 100LP/4 - SK 200E - 221 - 340 - A (-C)	
	13 - 64	328	2,0	22,59	10,0	25,0		

$P_1$ Rated motor power	$f_B$ Operating factor	$F_R$ Radial force
$n_2$ Output speed at rated motor speed	$i_{ges}$ Total gear ratio	$F_A$ Axial force
$M_{2b}$ Maximum output torque		

### 3. Step: Thermal check for the selection

After this, please check the thermal design of the selected drive unit. Due to the speed-dependent ventilation of the motor, there is less cooling of the motor and the frequency inverter at low speeds.

Check the selected drive unit on the basis of the next diagrams, taking your particular application into account (operating mode).

The diagrams take into account a maximum ambient temperature of 40°C and do not include an further safety reserves.

To check the drive unit, select the intended operating mode:

- 1. Continuous operation S1**
- 2. Short-term operation S2-15 min**  
- after 15 minutes, there is a longer cooling period down to the ambient temperature
- 3. Intermittent operation S3-10%**  
- corresponds to an operating period of 1 min and then a 9 min pause

From the following diagrams ⇒ A10-12, you can then obtain the maximum torque of the motor depending on the speed. From this percentage torque rating of the motor then the factor  $f_n$  can be formed.

$$f_n = \frac{\text{Torque in [\%]} \text{ (taken from the diagrams)}}{100}$$

With the factor  $f_n$  is then calculated the usable output torque  $M_2$  with the output torque from the power and speed tables  $M_{2b}$ .

$$M_2 = M_{2b} \cdot f_n \quad M_2 \text{ [Nm]}, M_{2b} \text{ [Nm]}$$

With 100%, the full output torque can be used.

It is assumed that the drive unit example from the 2nd step will be operated for a longer period (e.g. 1 h) at 600 rpm.

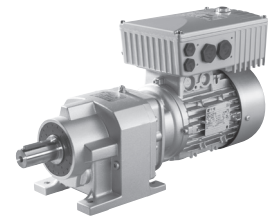
According to the diagram ⇒ A10 (continuous operation S1, 1:5, 50Hz characteristic curve) at 600 rpm 75% of the rated torque can be used:  $f_n = 0,75$

This results in a new output torque:

$$M_2 \text{ (S1, 600 } \frac{1}{\text{min}}) = 413 \text{ Nm} \cdot 0,75 = 309,75 \sim 310 \text{ Nm}$$

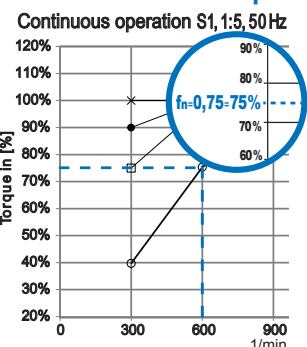
If the torque is no longer sufficient, the following options may provide an economic solution:

- Selection of an external fan
- Selection of a more powerful inverter
- Change to the adjustment range 1:10



Selection of operating mode

### Calculation example

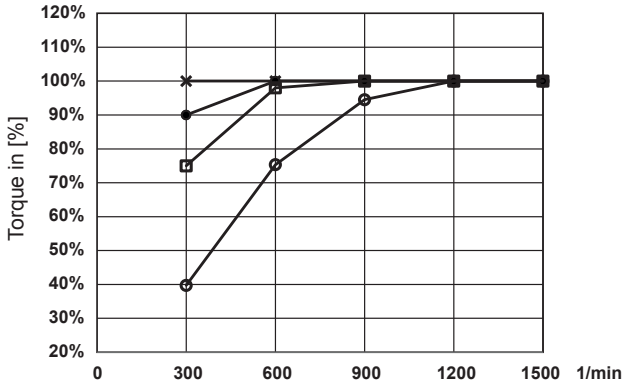


# Selection criteria



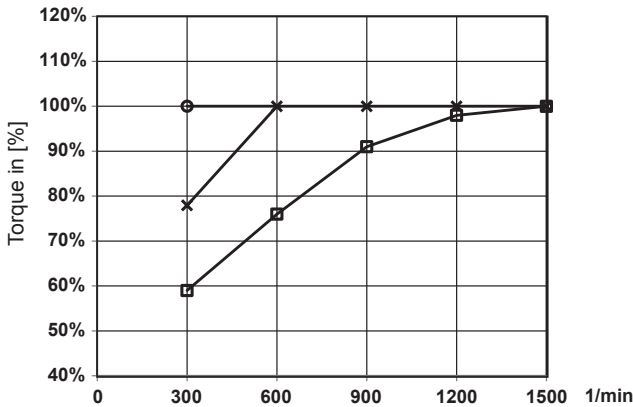
## Operating mode-dependent graphs - Adjustment range 1:5

Continuous operation S1, 1:5 - 50 Hz characteristic curve



- ✕ SK 180E - 550-340-B - 80SH/4
- SK 200E - 550-340-A - 80SH/4
- ✕ SK 180E - 750-340-B - 80LH/4
- SK 200E - 750-340-A - 80LH/4
- SK 200E - 111-340-A - 90SH/4
- SK 180E - 111-340-B - 90SH/4
- SK 180E - 151-340-B - 90LH/4
- SK 180E - 221-340-B - 100LH/4
- ▣ SK 200E - 151-340-A - 90LH/4
- SK 200E - 221-340-A - 100LH/4

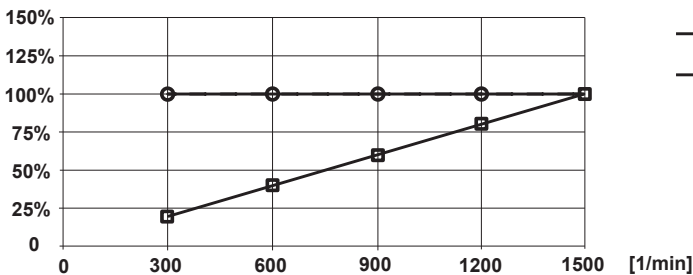
Continuous operation S1, 1:5 - 50 Hz characteristic curve



- ✕ SK 200E - 551-340-A - 132SH/4
- ▣ SK 200E - 301-340-A - 100AH/4
- ▣ SK 200E - 401-340-A - 112MH/4
- ▣ SK 200E - 751-340-A - 132MH/4
- SK 200E - 112-340-A - 132LH/4
- SK 200E - 112-340-A - 160MH/4
- SK 200E - 152-340-A - 160LH/4
- SK 200E - 182-340-A - 180MH/4
- SK 200E - 222-340-A - 180LH/4

Intermittent operation S2-15 min, 1:5, 50 Hz characteristic curve

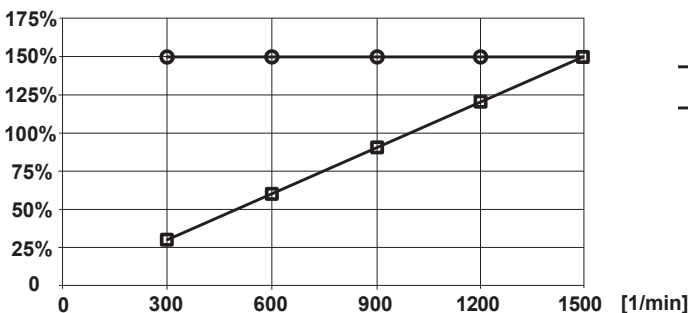
valid for all versions



- Torque
- ▣ Power

Intermittent operation S3-10%, 1:5, 50 Hz characteristic curve

valid for all versions

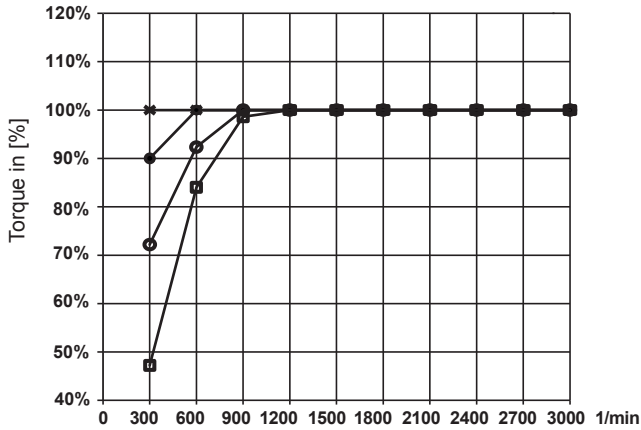


- Torque
- ▣ Power



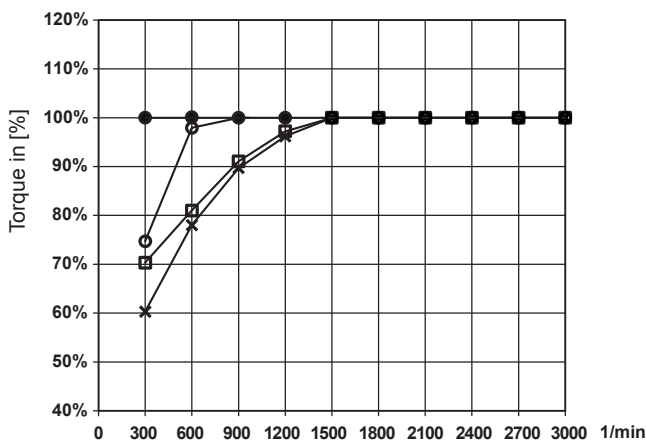
## Operating mode-dependent graphs - Adjustment range 1:10

Continuous operation S1, 1:10 - 100 Hz characteristic curve



- ✕ SK 180E - 550-340-B - 71L/4
- SK 200E - 550-340-A - 71L/4
- SK 180E - 750-340-B - 80SH/4
- SK 200E - 750-340-A - 80SH/4
- SK 180E - 111-340-B - 80LH/4
- SK 200E - 111-340-A - 80LH/4
- SK 180E - 151-340-B - 90SH/4
- SK 200E - 151-340-A - 90SH/4
- SK 180E - 221-340-B - 90LH/4
- SK 200E - 221-340-A - 90LH/4
- SK 200E - 301-340-A - 100LH/4

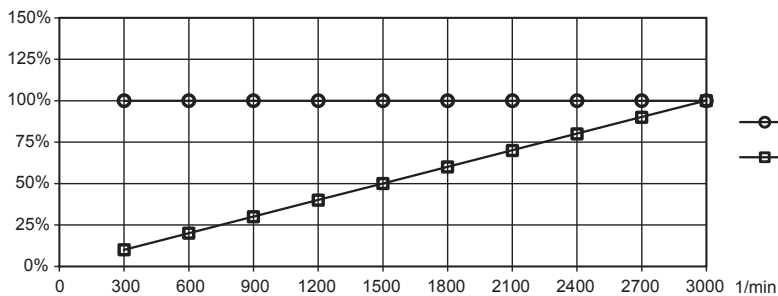
Continuous operation S1, 1:10 - 100 Hz characteristic curve



- ✕ SK 200E - 401-340-A - 100AH/4
- SK 200E - 551-340-A - 112MH/4
- SK 200E - 751-340-A - 132SH/4
- SK 200E - 112-340-A - 132MH/4
- SK 200E - 152-340-A - 132LH/4
- SK 200E - 222-340-A - 160LH/4

Intermittent operation S2-15 min, 1:10, 100 Hz characteristic curve

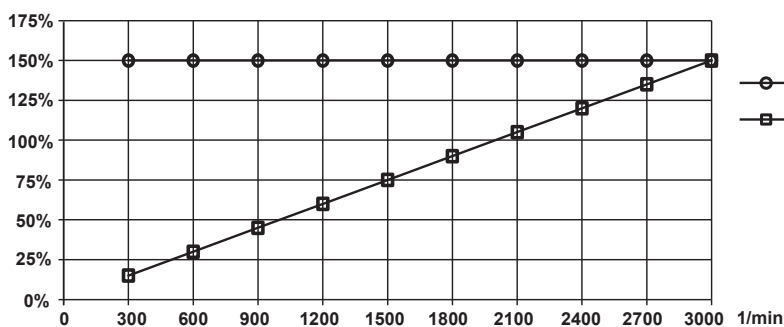
valid for all versions



- Torque
- Power

Intermittent operation S3-10%, 1:10, 100 Hz characteristic curve

valid for all versions



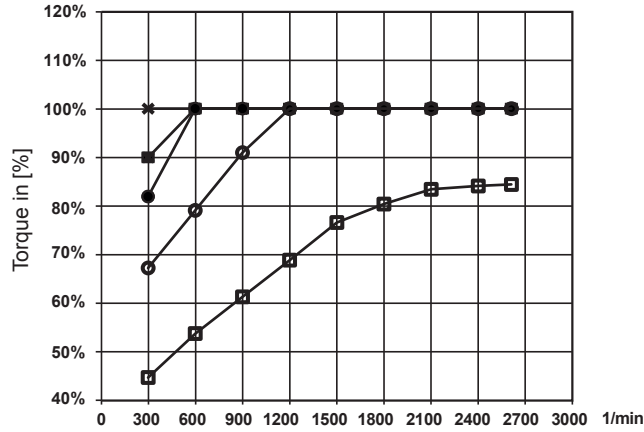
- Torque
- Power

# Selection criteria



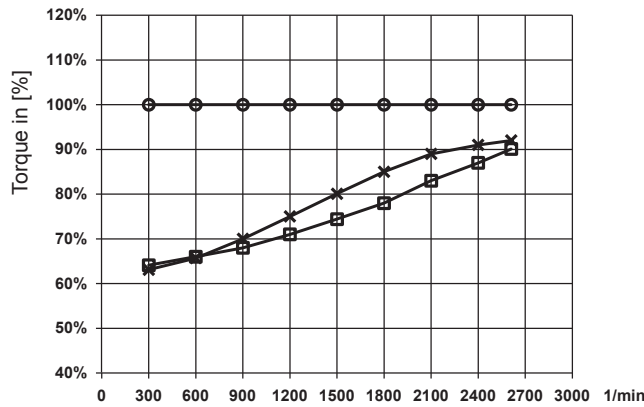
## Operating mode-dependent graphs - Adjustment range 1:8,7

Continuous operation S1, 1:8,7 - 87 Hz characteristic curve



- ✖ SK 180E - 750-340-B - 71L/4
- SK 200E - 750-340-A - 71L/4
- SK 180E - 111-340-B - 80SH/4
- SK 200E - 111-340-A - 80SH/4
- SK 180E - 151-340-B - 80LH/4
- SK 200E - 151-340-A - 80LH/4
- SK 180E - 221-340-B - 90SH/4
- SK 200E - 221-340-A - 90SH/4
- SK 200E - 301-340-A - 90LH/4
- SK 200E - 401-340-A - 100LH/4

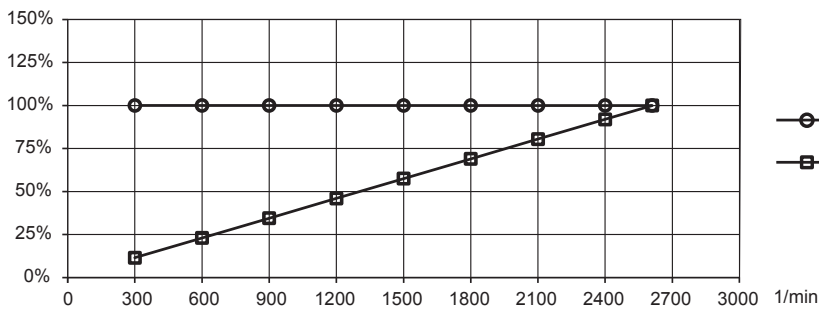
Continuous operation S1, 1:8,7 - 87 Hz characteristic curve



- ✖ SK 200E - 551-340-A - 100AH/4
- SK 200E - 751-340-A - 112MH/4
- SK 200E - 112-340-A - 132SH/4
- SK 200E - 152-340-A - 132MH/4
- SK 200E - 182-340-A - 132LH/4
- SK 200E - 222-340-A - 160MH/4

Intermittent operation S2-15 min, 1:8,7, 87 Hz characteristic curve

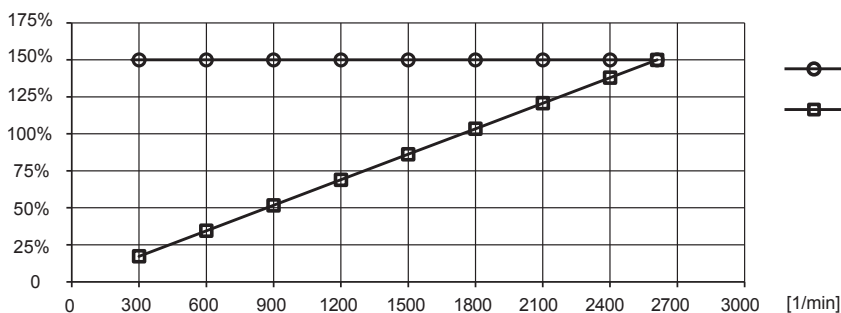
valid for all versions



- Torque
- Power

Intermittent operation S3-10%, 1:8,7, 87 Hz characteristic curve

valid for all versions



- Torque
- Power



## 4. Step: Check the generating power

Next the amount and the duration of the generating power must be checked.

Generating powers are typical for oscillating mass systems with low friction, braking of masses, such as with conveyor belts and centrifuges or the lowering of masses as with lifting gear and inclined elevators.

During generator operation, the motors feed this power back into the link circuit of the inverter.

In order to dissipate the generated power, the frequency inverter requires a brake chopper (electronic switch).

A brake resistor is connected to the brake chopper, which converts the excess energy in the link circuit into thermal energy.

In the SK 200E series, the brake chopper is always integrated, however for the SK 180E it is only integrated in Size 2.

If the design is not correct, the link circuit voltage may exceed its maximum value and cause a shut-down with an error message.

For the design of the braking resistor it is necessary to determine the peak and the continuous power.

In principle, applications can be divided into 4 categories:

<b>1. No braking resistor required</b> - Applications with larger frictional torque or slow acceleration/braking ramps (> 3 s)	SK 200E, SK 205E SK 180E, SK 190E
<b>2. Internal braking resistor in the connection unit</b> - Maximum power according to size from 1 to 2 kW - Continuous power from 25 to 50 W - Oscillating mass systems with low friction and dynamic ramps (< 3 s)	SK 200E, SK 180E only in Size 2
<b>3. Externally mounted braking resistors</b> - Maximum power according to size from 2.2 to 4.4 kW - Continuous power from 100 to 200 W - Typical for materials handling applications for braking centrifugal or inertial masses	SK 200E, SK 180E only in Size 2
<b>4. External separate braking resistor</b> - Maximum power and continuous power possible up to the full inverter power - Typical for lifting gear and centrifuges	SK 200E, SK 180E only in Size 2

## 5. Step: Differences between SK 200E and SK 500E

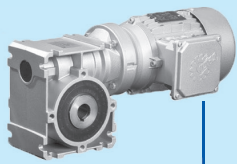
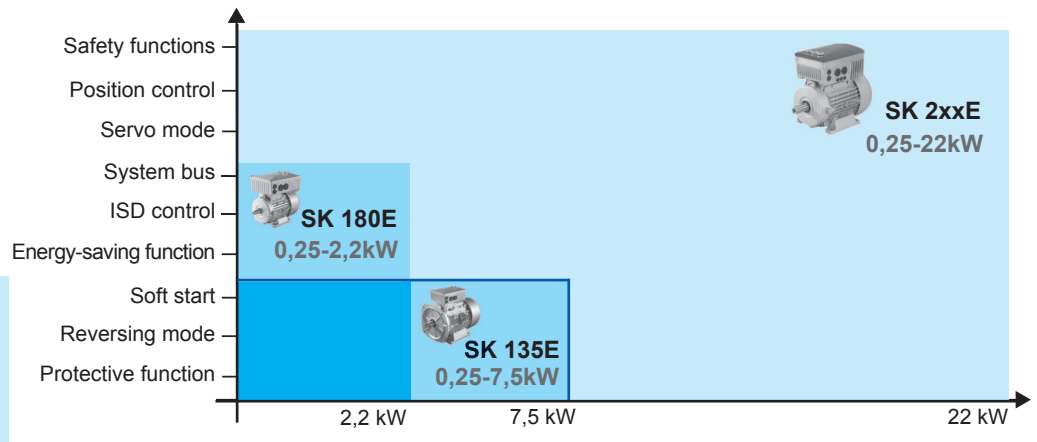
SK 200E	SK 180E
<b>Individual application</b> <ul style="list-style-type: none"> <li>Fans / Pumps with power up to 22 kW</li> </ul>	<b>Individual application</b> <ul style="list-style-type: none"> <li>Fans / Pumps with power ≤ 2.2 kW</li> </ul>
<b>Encoder interface</b> <ul style="list-style-type: none"> <li>Can be used for incremental encoders, magnetic encoders and absolute encoders</li> </ul>	<b>No encoder interface</b> <ul style="list-style-type: none"> <li>keine Schnittstelle nutzbar</li> </ul>
<b>Material transport</b> <ul style="list-style-type: none"> <li>for horizontal and vertical transport</li> </ul>	<b>Material transport</b> <ul style="list-style-type: none"> <li>for horizontal transport</li> </ul>
<b>Positioning</b> <ul style="list-style-type: none"> <li>„POSICON“ can be used</li> </ul>	<b>No positioning</b> <ul style="list-style-type: none"> <li>Positioning cannot be used</li> </ul>
<b>Electromechanical motor brake</b> <ul style="list-style-type: none"> <li>Brake rectifier included in SK 205E as standard</li> </ul>	<b>Electromechanical motor brake</b> <ul style="list-style-type: none"> <li>Brake rectifier always optional</li> </ul>
<b>Brake resistors for generator mode</b> <ul style="list-style-type: none"> <li>Brake resistors can be used for all devices</li> </ul>	<b>Brake resistors for generator mode</b> <ul style="list-style-type: none"> <li>Brake resistors can only be used for 0,75 / 1,1 kW (230V) and 1,5 / 2,2 kW (400V)</li> </ul>

# Selection criteria

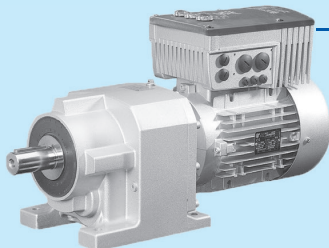


Informations

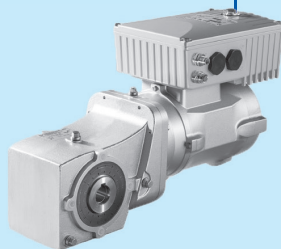
## Selection of frequency inverter



**SK 200E wall mounted frequency inverter**



**SK 200E frequency inverter integrated into motor**



**SK 180E frequency inverter integrated into motor**

**PLC**

**SK 135E starter with soft starting and reversing function**

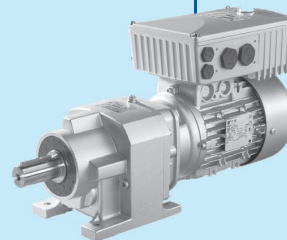
**Wall-mounted technology unit**



**IOs**

**Unicast operation via system bus**

**Broadcast mode via system bus**



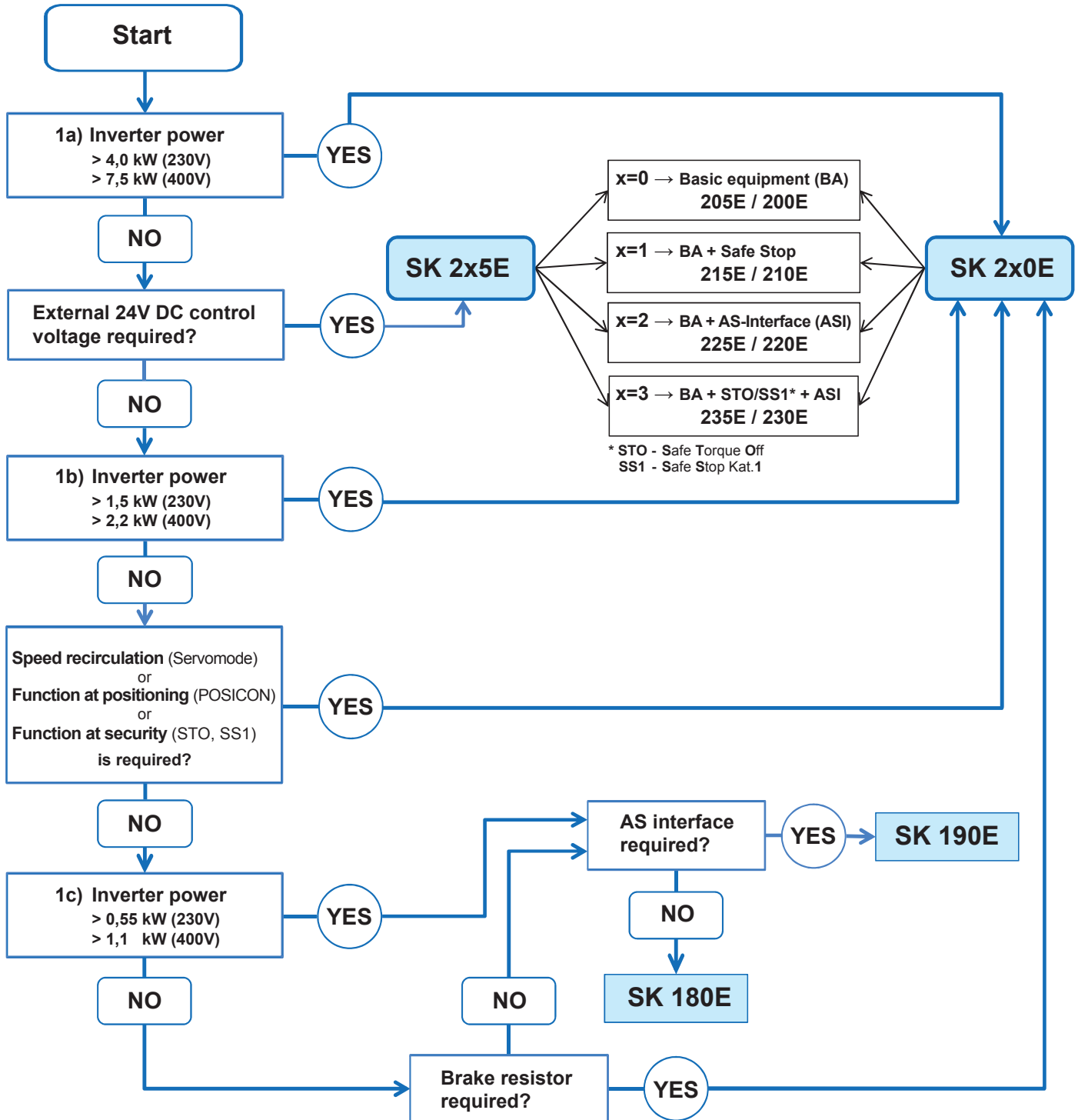
## Setting standards in decentralised drive technology

- Decentralised drive technology for all drive applications from a single source
- Perfect interaction of all components
- Communication via a common system bus (SK 180E and above) or field bus
- Identical and compatible optional modules
- Same operating and diagnostic tools
- „Look and Feel“
  - Uniform parameters
  - Common operating concept
  - Common design concept





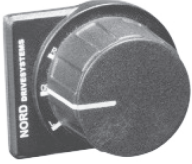



## Selection of frequency inverter



# Selection criteria

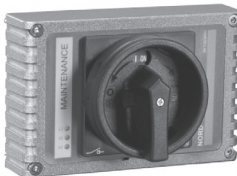







## Basic options

Basic option 1		Manual switch-on / Starting of drive unit	
<b>SK TIE4-SWT</b>  <b>Rotating knob with 3 positions</b> "L" = "ON" Rotation left "0" = "OFF" Drive unit not released "R" = "ON" Rotation right	Standard: IP66  	SK 2x0E	✓
		SK 2x5E	✓
		SK 180E	✓
		SK 190E	✓
Basic option 2		Manual speed adjustment	
<b>SK TIE4-POT</b>  <b>Continuously adjustable rotating knob</b> With the knob, the motor speed can be adjusted from 0% (standstill) up to 100%.	Standard: IP66  	SK 2x0E	✓
		SK 2x5E *	✓
		* Function can only be used with additional module CU4 (24V or IOE).	
		SK 180E	✓
SK 190E	✓		
Basic option 3a		Manual switch-on and manual speed adjustment	
<b>SK CU4-POT</b>  <b>Rotating knob 1 with 3 positions</b> "L" = "ON" Rotation left "0" = "OFF" Drive unit not released "R" = "ON" Rotation right  <b>Continuously adjustable rotating knob 2</b> With the knob, the motor speed can be adjusted from 0% (standstill) up to 100%.	Standard: IP66    Mounted directly on the inverter housing	SK 2x0E	✓
		SK 2x5E *	✓
		* Function can only be used with additional module CU4 (24V or IOE).	
		SK 180E	✓
SK 190E	✓		
Basic option 3b		Manual switch-on and manual speed adjustment	
<b>SK POT1-1</b>  <b>Rotating knob 1 with 3 positions</b> "L" = "ON" Rotation left "0" = "OFF" Drive unit not released "R" = "ON" Rotation right  <b>Continuously adjustable rotating knob 2</b> With the knob, the motor speed can be adjusted from 0% (standstill) up to 100%.	Standard: IP66    Mounted close to the motor, <b>not</b> directly on the inverter housing (3 m cable included in scope of delivery)	SK 2x0E	✓
		SK 2x5E *	✓
		* Function can only be used with additional module CU4 (24V or IOE).	
		SK 180E	✓
SK 190E	✓		



## Basic options

Basic option 4	Manual maintenance / repair switch		
<p><b>SK TU4-MSW + TI4-TU-MSW</b></p> <p><b>Robust rotary switch with 2 positions</b></p> <p>"1 ON" = "ON" Mains voltage on "0 OFF" = "OFF" Mains voltage off</p> <p>Mounted close to the motor*, or directly on the inverter housing * On separate plate for separate mounting on the wall or frame (Use wall-mounting kit)</p>	<p>Standard: IP55</p> 	SK 2x0E	✓
		SK 2x5E	✓
		SK 180E	✓
		SK 190E	✓
Basic option 5a	Control unit / Display unit "SetpointBox"		
<p><b>SK SSX-3A</b></p> <p><b>Direct local control and display with adjustment facilities</b></p> <ul style="list-style-type: none"> <li>• Display with 4 characters (numbers or letters)</li> <li>• Simple setting of values possible</li> <li>• Switchover to parameter mode possible</li> </ul> <p>Mounted close to the motor*, <b>not</b> directly on the inverter housing * Separate mounting, cable not included in scope of delivery!</p>	<p>Standard: IP54</p> 	SK 2x0E	✓
		SK 2x5E	✓
		SK 180E	✓
		SK 190E	✓
Basic option 5b	Control / Parameterisation / Diagnostic unit "ParameterBox"		
<p><b>SK PAR-3H / SK PAR-3E</b></p> <p><b>Direct local control and parameterisation possible</b></p> <ul style="list-style-type: none"> <li>• High resolution LCD display</li> <li>• 12 different languages are available</li> <li>• Password protection possible</li> <li>• 5 complete inverter data records can be saved</li> <li>• Direct connection to PC / laptop possible</li> </ul> <p>Handheld control unit = "3H" or for installation in control cabinet door = "3E" (3 m cable included in scope of delivery)</p>	<p>Handheld version "3H"</p>  <p>Installation version "3E"</p> 	SK 2x0E	✓
		SK 2x5E	✓
		SK 180E	✓
		SK 190E	✓
Basic option 5c	Simple control and parameterisation unit "SimpleBox"		
<p><b>SK CSX-3H / SK CSX-3E</b></p> <p><b>Direct local control and display with adjustment facilities</b></p> <ul style="list-style-type: none"> <li>• Display with 4 characters (numbers or letters)</li> <li>• Simple setting of values possible</li> <li>• Switchover to parameter mode possible</li> </ul> <p>Handheld control unit = "3H" or for installation in control cabinet door = "3E" (3 m cable included in scope of delivery)</p>	<p>Handheld version "3H"</p>  <p>Installation version "3E"</p> 	SK 2x0E	✓
		SK 2x5E	✓
		SK 180E	✓
		SK 190E	✓



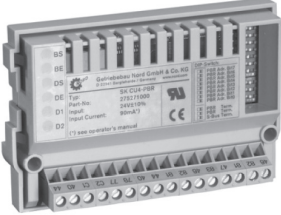
## Additional options - functional extensions

Equipment and operating characteristics	SK 200E	SK 205E	SK 180E	SK 190E
<b>Drive unit with generator mode</b> <ul style="list-style-type: none"> <li>• Brake resistor required                             <ol style="list-style-type: none"> <li>a) Internal brake resistor - for low amount of generator operation</li> <li>b) External brake resistor - for large amount of generator operation</li> </ol> </li> </ul>	optional	optional	optional only for Size 2	optional only for Size 2
<b>Drive unit with electromechanical brake</b> <ul style="list-style-type: none"> <li>• Brake rectifier required Optional - CU4-MBR module</li> </ul>	optional	Included in standard	optional, It is better to use SK 205E	optional, It is better to use SK 225E
<b>When Standard number of control signals too low</b> <ul style="list-style-type: none"> <li>• Extension of the number is possible                             <ol style="list-style-type: none"> <li>a) Optional - CU4-IOE module (installed in housing)</li> <li>b) Optional - TU4-IOE module (installed on housing)</li> </ol> </li> </ul>	optional	optional	optional	optional
<b>Inverter requires 24 V control voltage</b> <ul style="list-style-type: none"> <li>• Generation via mains unit                             <ol style="list-style-type: none"> <li>a) Optional - CU4-24V (installed in housing)</li> <li>b) Optional - TU4-24V (installed on housing)</li> </ol> </li> </ul>	Generated internally Included in standard	optional	Generated internally Included in standard	Generated internally Included in standard
<b>Speed adjustment "L / Off / R" and 24V</b> <ul style="list-style-type: none"> <li>• Combination in a module possible</li> </ul>	Not relevant CU4-POT can be used	optional	Not relevant CU4-POT can be used	Not relevant CU4-POT can be used
<b>Special control signals and relay outputs</b> <ul style="list-style-type: none"> <li>• -10V ... +10V can be used</li> <li>• Additional relays Optional - CU4-REL module</li> </ul>	optional	-	optional	optional
<b>Power plug necessary</b> <ul style="list-style-type: none"> <li>• Plug connector for motor power input and/or output for quicker installation or connection Optional - various plug versions are possible (these are mounted on the housing)</li> </ul>	optional	optional	optional	optional
<b>Plug connectors for signals or bus (as M12)</b> <ul style="list-style-type: none"> <li>• Input or output plug connectors for quicker installation or connection Optional - various plug versions (M12) are possible (these are mounted on the housing)</li> </ul>	optional	optional	optional	optional

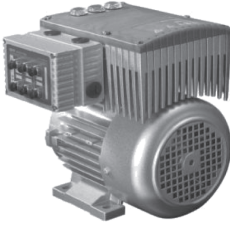
For each inverter a maximum of 1 CU4 module is possible (installed in the housing)!  
**Exception:** CU4-POT, this module is mounted on the housing and can also be used.



## Additional options - bus couplings / Communication

Additional equipment with bus couplings and increase in the number of control signals	SK 200E	SK 205E	SK 180E	SK 190E
<b>Profibus coupling (PBR)</b> Optional - CU4-PBR module (integrated into device) Optional - TU4-PBR module (mounted on device) 	optional	optional	optional	-
<b>CANopen (CAO)</b> Optional - CU4-CAO module (integrated into device) Optional - TU4-CAO module (mounted on device)	optional	optional	optional	-
<b>DeviceNET (DEV)</b> Optional - CU4-DEV module (integrated into device) Optional - TU4-DEV module (mounted on device)	optional	optional	optional	-

## Additional options - bus couplings /Ethernet-based communication

Additional equipment with bus couplings and increase in the number of control signals	SK 200E	SK 205E	SK 180E	SK 190E
<b>Profinet coupling (PNT)</b> Optional - CU4-PNT module (integrated into device) Optional - TU4-PNT module (mounted on device) 	optional	optional	optional	-
<b>EtherCAT (ECT)</b> Optional - CU4-ECT module (integrated into device) Optional - TU4-ECT module (mounted on device)	optional	optional	optional	-
<b>Ethernet IP (EIP)</b> Optional - CU4-EIP module (integrated into device) Optional - TU4-EIP module (mounted on device)	optional	optional	optional	-
<b>Powerlink (POL)</b> Optional - CU4-POL module (integrated into device) Optional - CU4-POL module (mounted on device)	optional	optional	optional	-

- A maximum of one bus nodule is possible for each inverter!
- To reduce costs, a TU4 bus module or CU4 (as a gateway) can communicate the data from a maximum of 4 inverters!
- For each inverter, a maximum of one CU4 module is possible (integrated into the housing)!  
**Exception:** CU4-POT, this module is mounted on the housing and can also be used.

 **By mounting from options, the outer contour changes ⇒  A21.**



## Fields of use of frequency inverters

Basic function / Features	SK 2x0E series	SK 2x5E series	SK 2x5E series	SK190E series
<b>Analog input (V, mA)</b> <ul style="list-style-type: none"> <li>Can be used to accept values such as pressure or speed (signals in V or mA)</li> </ul>	exists	not in standard can be extended With bus coupling or in material handling, this is usually not necessary	exists	exists
<b>Motor brake control (BRE)</b> <ul style="list-style-type: none"> <li>Controlled via the inverter</li> </ul>	not in standard can be extended	exists	Not in standard (use SK 225E)	Not in standard (use SK 225E)
<b>Control voltage (24 V DC)</b> <ul style="list-style-type: none"> <li>Available internally or provide externally</li> </ul>	exists	Separate external supply required or can be extended	exists	exists
<b>Energy-saving function</b> <ul style="list-style-type: none"> <li>All current savings mean cost savings (e.g. in partial load operation)</li> </ul>	exists	exists <b>i</b> Not permitted for use in lifting gear applications!	exists	exists
<b>Fields of application for inverters</b> <ul style="list-style-type: none"> <li>Standard equipment →</li> </ul>	<ul style="list-style-type: none"> <li>for individual devices such as: pumps or fans up to 22 kW (etc.),</li> <li>if no separate 24V supply is available</li> </ul>	<ul style="list-style-type: none"> <li>for use with bus couplings</li> <li>for use of motors with electromechanical brake</li> <li>if external 24V supply available, e.g. in intralogistics or for lifting gear</li> </ul>	<ul style="list-style-type: none"> <li>for individual devices such as: pumps or fans up to 2.2 kW (etc.),</li> <li>if no separate 24V supply is available</li> </ul>	<ul style="list-style-type: none"> <li>as for SK180E where an additional bus coupling via AS interface is required</li> </ul>

### Special case for powers >4.0 kW (230V) or >7.5 kW (400V):

For Size 4 and above, no differentiation is made between SK 2x0E and SK 2x5E. All of the functions listed above can be used. These devices are therefore uniformly designated as SK 2x0E



## 6. Step: Check the installation space


The dimensions of the drive unit may vary considerably depending on the selected options.

Extension with:

- Encoder
- External fan
- Brake mounting

The **external braking resistor** is provided for energy feedback, e.g. as occurs in pulsed drive units or lifting gear.

Expanded with:

- Power or bus plug connectors
- External braking resistor (BW) SK BRE4-...
- External technology unit, SK TU4-... (⇒  E2-3)

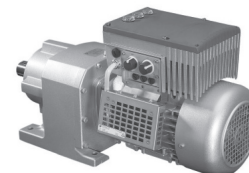
For the SK 180 and SK 200E product series, optional **Technology Units** are available, which can be mounted directly on the device or separately on the machine frame or other plant components.



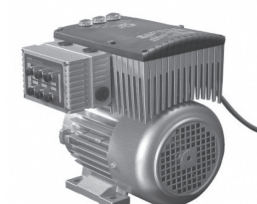
**External braking resistors can reach temperatures of up to 300°C!**

A free and unobstructed flow of air must be ensured. A distance of 10 cm from adjacent components is advantageous. Nearby sources of heat or direct sunlight must not additionally heat the drive unit.

External braking resistor



External technology unit







## G1000 Fixed speeds

### UNICASE housing 50 Hz, 60 Hz

- NORDBLOC.1 Helical geared motors
- Helical geared motors
- Parallel geared motors
- Bevel geared motors
- Helical worm geared motors

## G4014 Electronic variable speed drives

- NORDBLOC.1 Helical geared motors
- Helical geared motors
- Parallel geared motors
- Bevel geared motors
- Helical worm geared motors

## G1050 MAXXDRIVE Industrial gear units

### UNICASE housing 50 / 60 Hz

- Parallel-Axis
- Right-Angle

## G1035 UNIVERSAL Worm gear units

- SI and SMI

## F3018 Frequency inverter SK180E

## F3020 Frequency inverter SK200E





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Getriebebau NORD GmbH & Co. KG  
Getriebebau-Nord-Straße 1  
22941 Bargteheide, Germany  
Fon +49 (0) 4532 / 289-0  
Fax +49 (0) 4532 / 289-2253  
[info@nord.com](mailto:info@nord.com), [www.nord.com](http://www.nord.com)

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