

Intelligent Drivesystems, Worldwide Services



SK 2xOE

Decentralised drive
technology for pump drives

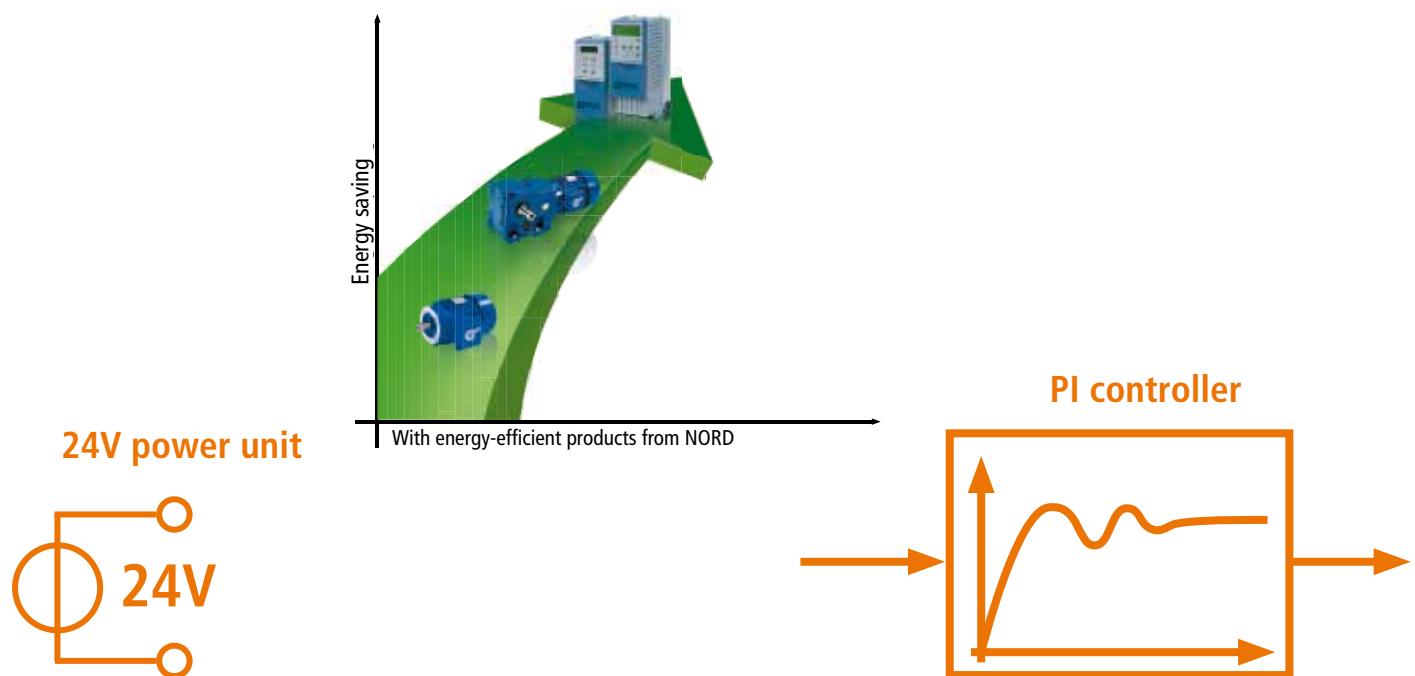


NORD
DRIVESYSTEMS

The logo features the word "NORD" in a bold, black, sans-serif font. The letter "O" is replaced by a stylized gear icon with multiple teeth. Below "NORD", the words "DRIVESYSTEMS" are written in a smaller, standard black font.

SK 2x0E: the frequency inverter for pump applications

Energy-saving function



Regulated pump drives? Of course!

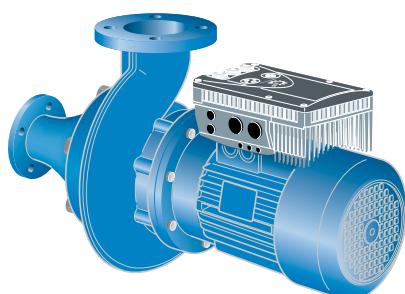
How else can the pressure or flow rate be adapted to the actual requirements without wasting energy with valves and flaps? But what other advantages can such a drive offer?

It can be operated completely independently. Either set to a fixed setpoint value or adjusted manually via an integrated potentiometer, the inverter perfectly adjusts its energy consumption to the actual power requirements ("Automatic flux optimisation").

Pumps which are operated in parallel can be matched to each other by coupling several SK 2x0E frequency inverters via the integrated system bus. With the integrated PI-controller an entire group of pumps can independently

adjust itself to load fluctuations or interference values. Linking the drives via a field bus system such as an AS interface, Profibus DP or EtherCat enables central control and monitoring of the drives via an external PLC. The best thing is that you obtain the drive from a single source - pre-assembled and if required, optimally adapted to your application. We offer not only support for planning, scheduling and configuration, but also for commissioning. Take a look

We are your partner for planning,
commissioning and service.

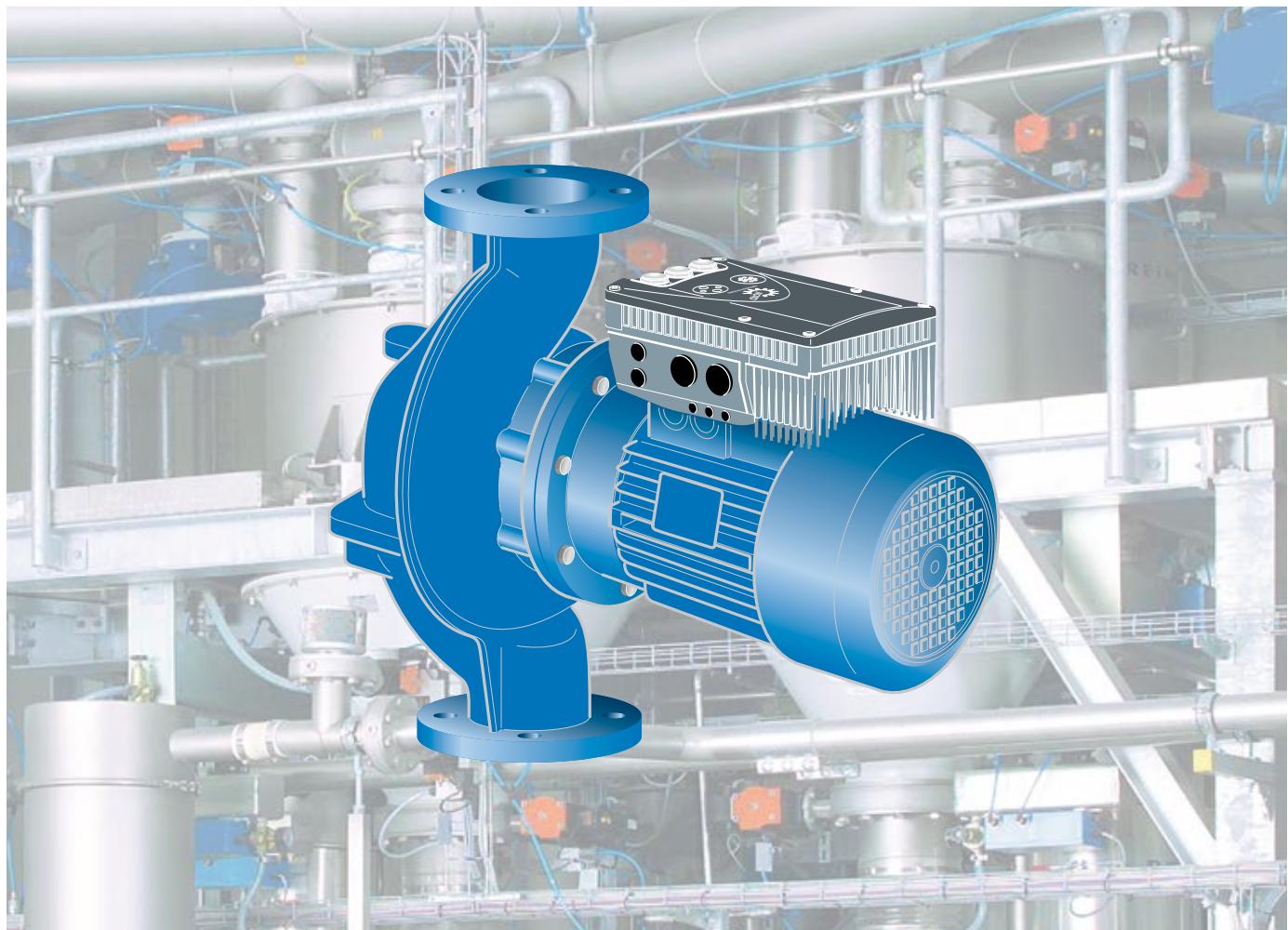




Power and function for the pump industry

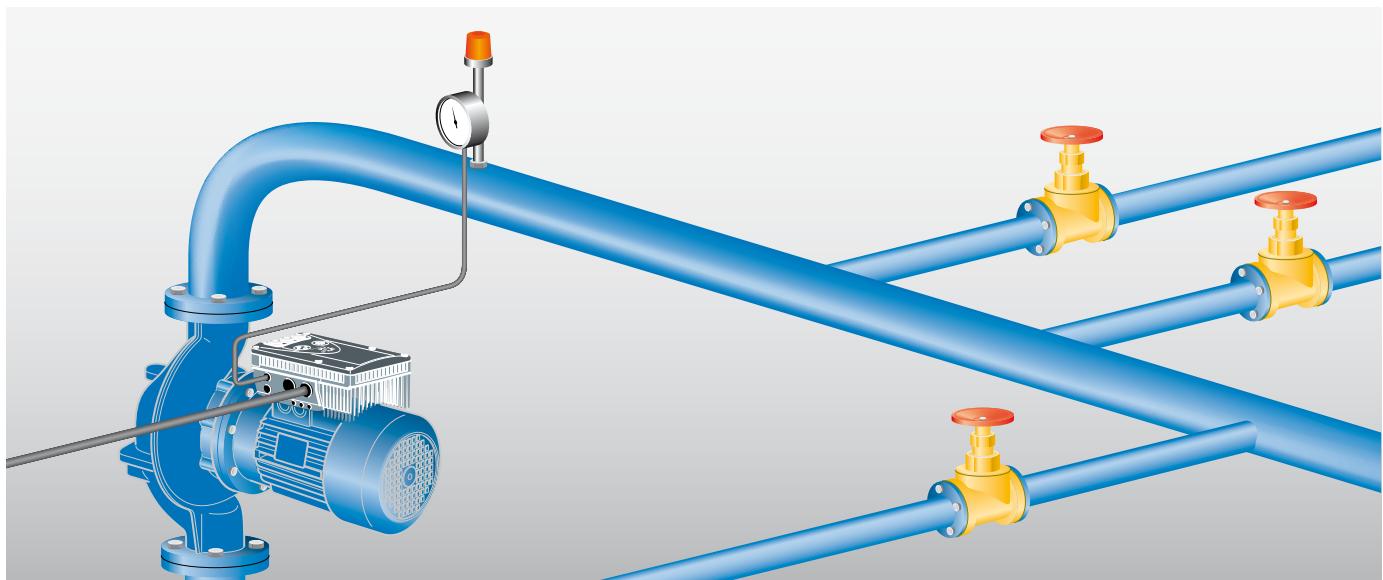
Your benefits	Implemented with
Universal use	<ul style="list-style-type: none"> - Mains voltages, 1~115V, 1/3~ 200V - 240V or 3~380V - 500V - Robust devices for use under harsh ambient conditions IP55 / IP66, climate class 3K4 and vibration class 3M7 - Versions available for operation in ATEX Zone 22 Category 3D
Simple to use, fast and convenient commissioning	<ul style="list-style-type: none"> - Interface for the connection of display, parameterisation and control elements - Connection of supply and control cables via an easily accessible connection unit on the frequency inverter
Wide range of functions	<ul style="list-style-type: none"> - Integrated PI-controller, skip frequencies, flying start circuit etc. - 2 integrated analog inputs for connection of pressure and flow sensors or setpoint providers. - Connection of switches and sensors or display elements via integrated digital inputs and outputs
Safe operation with comprehensive monitoring	<ul style="list-style-type: none"> - High overload reserves up to 200% - Diagnostic facility via status LEDs and error memory - Thermistor input for reliable monitoring of motor temperature - Integrated digital output for reporting operating states and limiting values - Safety functions STO and SS1 can be implemented
Modification to individual requirements	<ul style="list-style-type: none"> - Optional field bus modules available (Profibus, EtherCat, etc.) - Optional I/O extensions available for additional control signals (start / stop / right-hand/left-hand running) and feedback (error, limit value reached etc.) - Cascaded use of pump drives possible - Master – Slave operation of inverters possible (e.g. for parallel operation of drives) via integrated system bus
Environmental protection and cost limitation	<ul style="list-style-type: none"> - Reduction of energy and operating costs through standard "Automatic flux optimisation" function - Interference suppression via integrated Class A (C2) mains filter
High system availability	<p>Short standstill times and reduced risk of assembly errors thanks to:</p> <ul style="list-style-type: none"> - Extensive, optional range of plug connectors for power and control cables - Attachment to the motor with only 4 screws - Inverter replacement without reprogramming through plug-in EEPROM memory module

Basic requirements for drive technology



Requirement	Solution with NORD technology
Regulated decentralised drive unit	Drive unit consisting of SK 2x0E frequency inverter with connection unit mounted on an IE2 motor (see pages 8-9)
Wall-mounting kit for mounting the frequency inverter near to the motor.	Wall-mounting kit SK TIE-WMK-x, (up to IP 66) -> Note: derating is possible) Wall-mounting kit SK TIE-WMK-L, (IP 55 with fan)
Large adjustment range	50Hz characteristic curve: Inverter power class = Motor power class for 87Hz motor characteristic curve: the power class of the inverter is up to two power classes greater than that of the motor (motor 230 V, inverter 400V)
Thermal monitoring of motor	Thermistor input integrated into the FI

SK 2xOE, typical features for a pump drive



Requirement	Solution with NORD technology	Option (Part No.)
Solution for very simple applications with constant speeds		
Variable, but usually constant speed, right/left/stop	Switch / potentiometer adapter for mounting on the frequency inverter	SK CU4-POT (275271207)
Feedback of operating status	Digital output	Integrated (2x)
Solutions for regulated applications, pump groups, central control		
Regulation of pressure or flow rate	PI controller	SK CU4-POT (275271207)
Feedback of analog measurement values from external encoders	Analog inputs	Integrated (2x)
Control via analog and digital I/O via external PLC, or Control via field bus system such as Profibus, EtherCat, etc. (instead of potentiometer adapter)	1 or 2 analog or 3 or 4 integrated digital inputs, extendable with I/O extension module E.g.: Optional Profibus module for installation in the frequency inverter	Internal: SK CU4-IOE (275271006) External: SK TU4-IOE (275281106) + SK TI4-TU-BUS (275280000) Internal: SK CU4-PBR (275271000) External: SK TU4-PBR (275281100) + SK TI4-TU-BUS (275280000)

Basic equipment of the SK 2x0E

SK 200E power range:
1~115 V to 3~500 V
0.25 - 22 kW*



Control signals

4 digital inputs

e.g. for left/right release, fixed frequencies or switching over of parameters

2 digital outputs

e.g. reporting of errors or various limit values

2 analog inputs

e.g. for connection of speed setpoint or process signals

Service-Kit (Accessory)

- Convenient bag for SK CSX-3H control box or SK PAR-3H
- Separate pocket for connection cable

(Part No. 611 22 22)



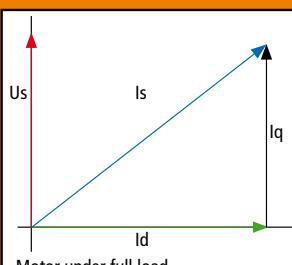
SK 200E basic equipment:

- Integrated 24V power unit
- Sensorless current vector control (ISD)
- Plug-in memory storage module (EEPROM)
- PTC input
- Immediate-access RS 232 diagnostic interface
- Energy-saving function

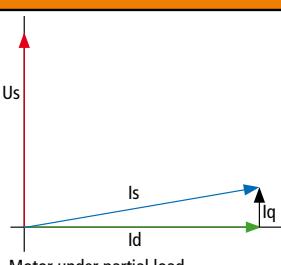
Energy Efficiency

Automatic flux optimisation

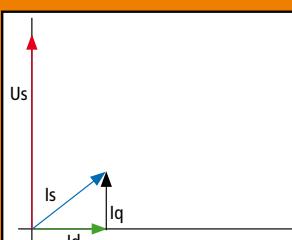
Savings under partial load: NORD SK 200E series frequency inverters can automatically reduce the flux in asynchronous motors and therefore achieve energy savings of up to 30%



Motor under full load



Motor under partial load
without flux optimisation
($I_d = \text{constant}$)



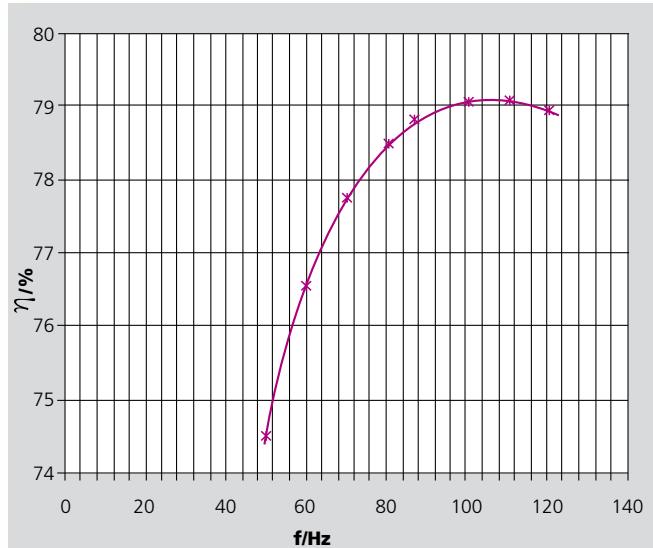
Motor under partial load with flux
optimisation with NORD frequency
inverter: The resulting motor current
(I_s) is significantly smaller, thus saving
energy.

These diagrams illustrate the automatic flux optimisation function by means of the voltage vector at the motor and the resulting current vectors:

U_s = Voltage vector at motor,
 I_s = Motor current vector,
 I_d = Current component of magnetisation,
 I_q = Current component of torque

Energy-saving know-how: increased efficiency in 87 Hz operation

230V/400V Δ/Y motors connected in a delta circuit can be operated at nominal torque with a 400V frequency inverter, taking into account the rated current up to 87Hz. In addition, the motor power is increased by $\sqrt{3}$ times the rated power. Up to approx. 100 Hz, this increase in frequency results in a gain in the efficiency of the motor by up to 5%.





Pre-assembled regulated pump drives

Power		SK 200E IP55				SK 200E	
kW	hp	Part No. SK 200E	Designation SK 200E...	Part No. Connection unit	Designation of connection unit	Part No. SK 200E	Designation SK 200E...
0.55	3/4	275226305	...550-340-A	275270140	SK TI4-1-200-3	275226805	...550-340-A-C
0.75	1	275226306	...750-340-A	275270140	SK TI4-1-200-3	275226806	...750-340-A-C
1.1	1 1/2	275226307	...111-340-A	275270140	SK TI4-1-200-3	275226807	...111-340-A-C
1.5	2	275226308	...151-340-A	275270140	SK TI4-1-200-3	275226808	...151-340-A-C
2.2	3	275226309	...221-340-A	275270140	SK TI4-1-200-3	275226809	...221-340-A-C
3.0	4	275226310	...301-340-A	275270141	SK TI4-2-200-3	275226810	...301-340-A-C
4.0	5	275226311	...401-340-A	275270141	SK TI4-2-200-3	275226811	...401-340-A-C
5,5	7 1/2	275226312	...551-340-A	275270142	SK TI4-3-200-3	275226812	...551-340-A-C
7,5	10	275226313	...751-340-A	275270142	SK TI4-3-200-3	275226813	...751-340-A-C
11,0	15	275226314	...112-340-A	275270143	SK TI4-4-200-340	275226814	...112-340-A-C *
15,0	20	275226315	...152-340-A	275270143	SK TI4-4-200-340	275226815	...152-340-A-C *
18,5	25	275226316	...182-340-A	275270143	SK TI4-4-200-340	275226816	...182-340-A-C *
22,0	30	275226317	...222-340-A	275270143	SK TI4-4-200-340	275226817	...222-340-A-C *



Illustrated with
optional gear unit

IE IP66		2-pole IE2 motors		4-pole IE2 motors		6-pole IE2 motors	
Part No. Connection unit	Designation of connection unit	Motor designation	Torque Nm	Motor designation	Torque Nm	Motor design- nation	Torque Nm
275270640	SK TI4-1-200-3-C	on request		80 SH/4	3.7	on request	
275270640	SK TI4-1-200-3-C	80 LH/2	2.5	80 LH/4	5.1	90 LH/6	7.6
275270640	SK TI4-1-200-3-C	80 LH/2	3.7	90 SH/4	7.3	90 AH/6	11.2
275270640	SK TI4-1-200-3-C	90 SH/2	5.0	90 LH/4	10.1	100 LH/6	15.0
275270640	SK TI4-1-200-3-C	90 LH/2	7.2	100 LH/4	14.5	112 MH/6	21.8
275270641	SK TI4-2-200-3-C	100 AH/2	9.8	100 AH/4	20.3	132 SH/6	29.5
275270641	SK TI4-2-200-3-C	112 MH/2	13.0	112 MH/4	26.6	132 MH/6	39.4
275270642	SK TI4-3-200-3-C	132 SH/2	18,0	132 SH/4	36,0	132 LH/6	54,4
275270642	SK TI4-3-200-3-C	132 MH/2	24.2	132 MH/4	49.1	160 MH/6	73.2
275270643	SK TI4-4-200-340-C	160 SH/2	35,4	160 MH/4	71,7	160 LH/6	108,0
275270643	SK TI4-4-200-340-C	160 MH/2	48,3	160 LH/4	97,8	180 LH/6	147,0
275270643	SK TI4-4-200-340-C	160 LH/2	59,7	180 MH/4	120,0	on request	
275270643	SK TI4-4-200-340-C	180 MH/2	71,0	180 LH/4	143,0	on request	

* Size 4: Frequency inverter version with IP66 measures, however with retention of protection class IP55

** Motors with efficiency classes IE1, IE3 and IE4 are also available.



Options

EtherCAT®

CANopen

PROFI
NET



Flush-mounted switches / potentiometers	<ul style="list-style-type: none"> SK TIE4-SWT IP66, (Part No. 275 274 701) SK TIE4-POT IP66, (Part No. 275 274 700) 	
External Potentiometer Unit	<ul style="list-style-type: none"> SK POT1-1 IP66, (Part No. 278 910 120) 	
ATEX potentiometer (screw-in, e.g. for PI setpoint)	<ul style="list-style-type: none"> SK ATX-POT IP66, (Part No. 275 142 000) 	
Maintenance switch	<ul style="list-style-type: none"> SK TU4-MSW IP55, (Part No. 275 281 123) +SK TI4-TU-MSW IP55, (Part No. 275 280 200) SK TU4-MSW-C IP66, (Part No. 275 281 173) +SK TI4-TU-MSW-C IP55, (Part No. 275 280 700) 	
Parameter boxes	<p>ParameterBox (Full-text display in 12 languages)</p> <ul style="list-style-type: none"> SK PAR - 3H Handheld (Part. No. 275 281 014) SK PAR - 3E Control cabinet installation (Part. No. 275 281 414) <p>SimpleBox (7-segment display)</p> <ul style="list-style-type: none"> SK CSX - 3H, Handheld (Part. No. 275 281 013) SK CSX - 3E, control cabinet installation (Part. No. 275 281 413) 	
SetpointBox (Display of speed and specified setpoints)	<ul style="list-style-type: none"> SK SSX - 3A IP54, (Part No. 275 281 513) 	



For further options see
brochure F 3020



Enquiry form

Company _____

Contact _____

Street _____

E-mail _____

Postcode, Town
and Country _____

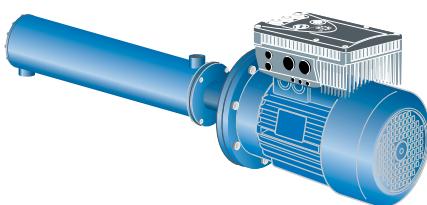
Motors			
Number of poles	<input type="radio"/> 2	<input type="radio"/> 4	<input type="radio"/> 6
Voltage			
Power			
Protection class	<input type="radio"/> IP 55	<input type="radio"/> IP 66	
Flange	<input type="radio"/> B3	<input type="radio"/> B14	<input type="radio"/> B3/B14
	<input type="radio"/> B5	<input type="radio"/> B3/B5	<input type="radio"/>
Operating mode	<input type="radio"/> S1	<input type="radio"/> S9	
Number			

Options	Number
<input type="radio"/> Profibus	
<input type="radio"/> Profibus M12	
<input type="radio"/> DeviceNet	
<input type="radio"/> DeviceNet M12	
<input type="radio"/> CANopen	
<input type="radio"/> CANopen M12	
<input type="radio"/> I/O extension	
<input type="radio"/> I/O extension M12	
Protection class	<input type="radio"/> IP 55 <input type="radio"/> IP 66
Mounting	<input type="radio"/> Inverter mounted <input type="radio"/> Wall mounted

SK 200E	
Mains phases	<input type="radio"/> 1 <input type="radio"/> 3
Voltage	
Power	
Protection class	<input type="radio"/> IP 55 <input type="radio"/> IP 66
Characteristic curve	<input type="radio"/> 50 Hz <input type="radio"/> 87Hz
Mounting	<input type="radio"/> Motor mounted <input type="radio"/> Wall mounted
Number	

Operation	Number
<input type="radio"/> PotentiometerBox	
<input type="radio"/> Poti-Adapter	
<input type="radio"/> ParameterBox Handheld	
<input type="radio"/> ParameterBox control cabinet installation	
<input type="radio"/> SimpleBox Handheld	
<input type="radio"/> SimpleBox control cabinet installation	
<input type="radio"/> SetpointBox	

System connectors	Number
<input type="radio"/> Power, 3-phase In	
<input type="radio"/> Power, 3-phase In/Out	
<input type="radio"/> Motor output	
<input type="radio"/> M12 for initiators	
<input type="radio"/> M12 for bus system	





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