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SOURCETRONIC – Quality electronics for service, lab and production

User Manual

SPC/SMC Pump/Motor Control

Contents

1 General

1.1 About These Instructions

This operating manual is primarily intended for qualified personnel responsible for installation, commissioning, and maintenance. Operators should refer in particular to Chapter 6 Operating Instructions, which contains information about the various operating states.

The main component of the motor control is a Sourcetronic frequency inverter from the ST500 series. A very comprehensive operating manual is available for this product and can be downloaded from the Sourcetronic website.

The frequency inverter in your motor control is pre-configured. To start it up, you need to read the motor parameters from the motor nameplate and change the corresponding parameters. This is described in more detail in Chapter 4 Commissioning.

1.2 Safety

Warning	
	In this manual, this symbol indicates an imminent danger. Failure to observe this warning may result in property damage or serious injury, or even death!

1.3 Qualified Personnel

Warning	
	The installation, commissioning, and maintenance of the motor control must only be carried out by appropriately trained personnel. Before commissioning, the operating instructions for the frequency inverter must be read carefully and understood.

2 Product Description

2.1 Intended Use

This motor control may only be used with three-phase asynchronous motors.

The warranty and guarantee will be void if the motor control and its components are not used properly. This also applies if you make changes to the control cabinet.

2.2 Overview of Product Categories

Type	Power Class VFD [kW]	Input Current VFD [A]	Output Current VFD [A]	EMC Filter	Motor Reactor	Dimensions in mm (W× H× D)	Weight
SPC015	1.5	5	3.8	SFI-0007-TB	MR3 400/6	500×700×250	25kg
SPC022	2.2	5,8	5.1	SFI-0007-TB	MR3 400/6	500×700×250	25kg
SPC04	4	10.5	9	SFI-0016-TB	MR3 400/10	500×700×250	30kg
SPC055	5.5	14.6	13	SFI-0016-TB	MR3 400/13	500×700×250	30kg
SPC075	7.5	20.5	17	SFI-0030-TB	MR3 400/18	600×800×250	40kg
SPC11	11	26	25	SFI-0030-TB	MR3 400/24	600×800×250	40kg
SPC15	15	35	32	SFI-0042-TB	MR3 400/30	800×1000×300	55kg
SPC18	18.5	38.5	37	SFI-0042-TB	MR3 400/37	800×1000×300	65kg
SPC22	22	46.5	45	SFI-0050-TB	MR3 400/42	800×1000×300	75kg
SPC30	30	62	60	SFI-0065-TB	MR3 400/61	800×1000×300	80kg
SPC37	37	76	75	SFI-0080-TB	MDB 400/76	800×1200×400	100kg
SPC45	45	91	90	SFI-0100-TB	MDB 400/91	800×1200×400	125kg
SPC55	55	112	110	SFI-0150-TB	MDB 400/110	800×1200×400	150kg

SPC75 to SPC220 available on request.

2.3 Type Plate

The type plate of the control cabinet is located on the lower inside of the door on the side of the door hinge. It contains the following information:

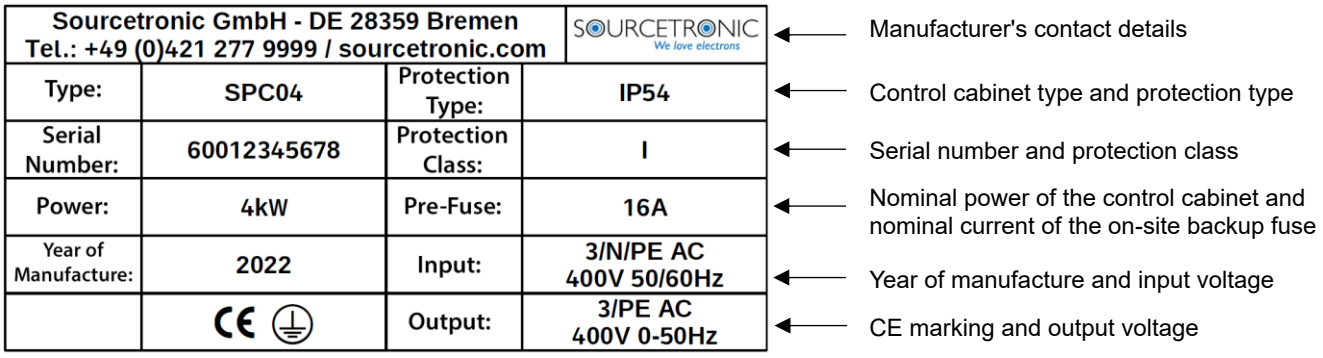


Figure 2-1 Example of a Type Plate

2.4 Structure of the Motor Control

Figure 2-2 Structure of the Motor Control

2.5 Operating Conditions

The control cabinet is designed for indoor installation.

The ambient temperature is between +15 °C and +25 °C with a maximum relative humidity of 50 %. The altitude of the installation site is no more than 500 m above sea level.

3 Assembly and Installation

3.1 Scope of Delivery

Check the contents of the shipment for completeness:

- Control cabinet
- Control cabinet key
- Cable glands
- Documentation
  - Circuit diagram
  - EU declaration of conformity
  - Test report
  - Individual parameter list
  - This operating manual

Report any visible transport damage to the shipping company immediately.

3.2 Assembly and Installation Instructions

Secure the control cabinet properly. We recommend using at least M10 hexagon screws with washers to ensure a secure hold. Make sure that the installation location is suitable for mounting the control cabinet.

If necessary, use the comprehensive range of accessories available from the enclosure manufacturer Rittal. They offer various fastening systems.

During installation, ensure that there is sufficient space for cooling around the switch cabinet. This also applies to the top and bottom of the switch cabinet, as heat is dissipated through the enclosure via active ventilation and natural convection.

Position the control cabinet as close as possible to the motor or pump to keep the connection cable as short as possible.

Warning!	
	Improper grounding can result in serious injury or even death. Ensure proper grounding!

Use shielded cables to connect the motor. Lay the motor cable separately from the mains supply and control cables to prevent EMC interference. Motor cables laid next to each other can induce voltages that charge capacitors in devices that are not switched on. This poses hazards that can result in serious injury or death. Please note this especially when using multiple frequency inverters.

Warning!	
	The frequency inverter can cause direct current in the protective conductor. If the connection of the control cabinet is protected by a residual current device (RCD), this must be all-current sensitive (type B). Failure to observe this instruction may result in the residual current circuit breaker not providing the desired protection.

The short-circuit resistance data can be found in the enclosed circuit diagram. Make sure that the circuit breaker is replaced immediately after a short-circuit shutdown.

Ensure that suitable cables are used for the wiring. These must be selected correctly, especially with regard to the cross-section and cable type.

The following figure shows an example of a motor control installation:

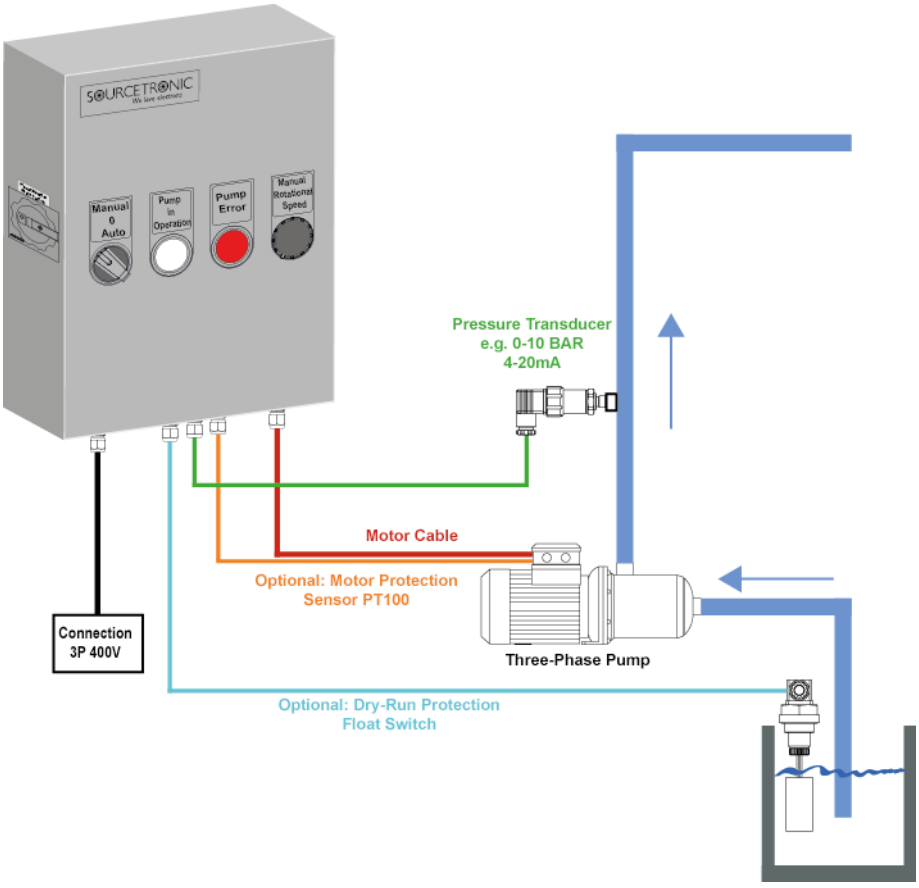


Figure 3-1 Example Use of the Motor Control

The power supply to the control cabinet is provided via terminals **-1XD0:1-5**. These are located on the lower mounting rail on the left-hand side.

The motor or pump is connected to terminals **-100XD2:1-4**. These are located on the right side of the lower mounting rail. A shielded cable must be used.

The shielding must be applied over a large area on both the cabinet and motor sides. Use suitable EMC cable glands for this purpose.

The terminal connections for control cables are located in the middle of the lower mounting rail.

Sensors can be connected as required as follows:

- A motor temperature contact can be connected to terminals **-100XD2:5-6**.

- A float switch can be connected to terminals **-100XD3:1-2** as dry-running protection.
- A pressure transducer can be connected to terminals **-100XD3:3-6**. The following assignment applies there:
  - -100XD3:3 +24 V DC (constant voltage supply)
  - -100XD3:4 GND
  - -100XD3:5 4 mA ~ 20 mA (analog input signal)
  - -100XD3:6 PE

Ensure correct strain relief for all cable connections using appropriate cable glands.

Check the power supply for clockwise rotation and correct connection. once you have ensured that everything is correct, you can continue with commissioning.

4 Commissioning

1) Before commissioning, ensure that the installation has been carried out correctly.
2) Switch on the control cabinet using the main switch on the left-hand side.
3) Enter the motor parameters in parameter group b0 of the frequency inverter. Figure 4-1 shows the control panel of the frequency inverter. To simplify the parameterization of the motor data, Figure 4-2 shows a schematic representation of the parameter levels.

Figure 4-1 Control Panel of the Frequency Inverter

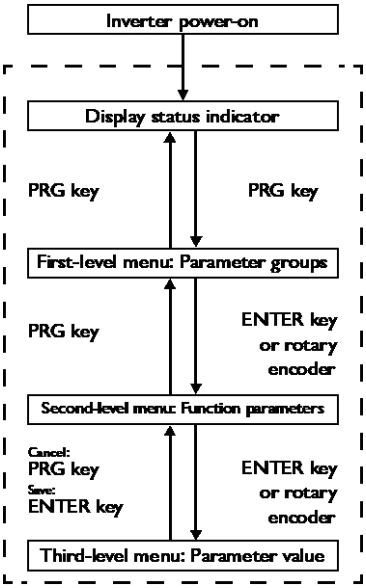


Figure 4-2 Parameterization

The necessary motor parameters can usually be found on the motor nameplate. The designations of the respective parameters are listed in the parameter list supplied. If the corresponding values were provided to us when the order was placed, they are also listed in the parameter list supplied. A detailed description of all parameters can be found in the frequency inverter manual.

4) Then check that the frequency inverter starts up correctly.
5) Perform a test run of the functions and check the motor rotation direction.

5 Parameter List

5.1 Default Settings on Delivery

Parameter	Function	Value
F0.03	Frequency control source = AI2	3
F0.04	Auxiliary frequency control source PID	8
F0.07	Switching between main and auxiliary frequency control source	2
F0.11	All control types possible	4
F0.13	Start ramp in seconds	3
F0.14	Stop ramp in seconds	3
F1.40	Multiple DI assignment possible	1
F1.01	DI2 = Forward command	1
F1.02	DI3 = Free stop (dry run protection)	8
F1.12	Minimum voltage at AI1 = 2V (corresponds to 4mA)	2
F1.35	DI3 = inverted; free hold is triggered when no voltage is applied to DI3.	00100
F1.47	Display scaling to voltage / d0.09 / d0.10	00
F2.00	SPB = Open collector switching contact	1
F2.01	SPB = Frequency inverter fault	2
F2.02	Relay 1 = Converter in operation (control cabinet fan)	1
F2.04	SPA = Converter in operation	1
E2.01	PID setpoint in percent (%), relative to the maximum possible value of the feedback variable at AI1	–
E3.01	VDI2 = Switch between main and auxiliary frequency	18
E3.04	VDI5 = User-defined error 1	44
E3.06	VDI2 = VDO2; VDI5 = VDO5	01101
E3.15	VDO5 is switched when voltage at AI1 is outside the limits of F7.50/F7.51	31
F4.00	U/f characteristic curve quadratic	2
F7.22	Start-up protection activated (signals present at restart are ignored)	1
F7.46	Wake-up frequency	30
F7.48	Frequency for sleep mode	20
F7.50	Value of AI1 (transmitter) in V, below which an error is triggered (10V = 20mA)	1
F7.51	Value of AI1 (transmitter) in V above which an error is triggered (10V = 20mA)	10
y0.00	Upload the set parameters to control panel memory location 2	12

5.2 Motor Parameters

Parameter	Function	Value
b0.01	Motor rated power in kW	–
b0.02	Motor rated voltage in V	–
b0.03	Motor rated current in A	–
b0.04	Motor rated frequency in Hz	–
b0.05	Motor rated speed in rpm	–

5.3 Optional Parameters for Optimization

Parameter	Function	Value
F0.13	Start ramp in seconds	–
F0.14	Stop ramp in seconds	–
F7.46	Wake-up frequency	–
F7.48	Frequency for sleep mode	–
F7.50	Value of AI1 (transmitter) in V below which an error is triggered (10 V = 20 mA)	–
F7.51	Value of AI1 (transmitter) in V above which an error is triggered (10 V = 20 mA)	–
F8.33	Only when a motor temperature contact is connected	1

5.4 PID Parameters

Parameter	Function	Value
E2.03	Behavior of the controlled system (1 = positive; 2 = negative)	–
E2.07	D component in %	–
E2.13	Proportional gain KP_1 (0.0 ~ 200.0)	–
E2.14	Integration time Ti_1 (0.01 s ~ 10.00 s)	–
E2.15	Differential time Td_1 (0.000 s ~ 10.000 s)	–

5.5 In Case of Problems

Parameter	Function	Value
F0.24	Change in direction of travel	1
Y0.00	Download the set parameters from control panel memory location 2	22

For a detailed explanation of the individual functions of the parameters, please refer to the manual.

6 Operating Instructions

The operating mode is selected using the "Manual-0-Auto" toggle switch located on the door.

- The "Pump In Operation" indicator lights up when the frequency inverter is in operation.
- The "Pump Error" indicator lights up when the frequency inverter has encountered an error. This can be caused, for example, by a broken control cable. An error code may appear on the converter display.

A list of typical errors that may occur can be found in Chapter 6.3 Troubleshooting. If this does not help, refer to the list of error codes in the frequency inverter manual or contact the Sourcetronic support team. We will be happy to help you.

6.1 Manual Operation

In manual mode, the target frequency is set using the potentiometer in the control cabinet door. The scale of 0 to 10 refers to the frequency range of 0 Hz ~ 50 Hz.

Please note that the wake-up frequency of the frequency inverter has been set to 30 Hz; the pump will not start running before this frequency is reached. In addition, the frequency for the idle state is 20 Hz. This means that when the pump is running, it will only stop if the pump frequency falls below 20 Hz or if manual mode is switched off.

6.2 Automatic Mode

In automatic mode, the frequency of the pump is pressure-controlled via a PID control integrated in the frequency inverter. The reference variable (setpoint) is entered in the frequency inverter control panel under parameter E2.01. The feedback variable is fed back via the connected pressure transducer (4 mA ~ 20 mA).

A float switch for dry-running protection and a motor temperature contact can be connected as options (see Chapter 3.2 Assembly and Installation Instructions).

If further modifications to the motor control are necessary, we recommend that you first familiarize yourself with the operation of the existing control before adding further functions with the help of the operating instructions.

6.3 Troubleshooting

If the red "Error" indicator light comes on, an error code is shown on the frequency inverter display. The following table lists typical errors, their possible causes, and possible solutions. A list of all error messages can be found in the operating instructions for the frequency inverter.

Error Code	Meaning	Possible Causes	Possible Solutions
Err.15	Error caused by external accessories	Dry run protection triggered	Check water level
		Cable break	Check the cable to the float switch for damage. If no float switch is installed but is intended to be installed due to parameterization, terminals **-100XD3:1** and **-100XD3:2** can be bridged or the corresponding parameter can be changed.
Err.27	User-defined error 1, here: Analog signal from the pressure transmitter outside the limits	Pressure transmitter defective	Check pressure transmitter
		Cable break	Check cable to pressure transmitter for damage.

Err.45	Motor temperature too high	Motor temperature too high	Change the carrier frequency (see operating instructions for the VFD) or improve motor cooling.
		Cable break	Check cable to sensor for damage
		Temperature sensor defective	Check temperature sensor

7 Maintenance

Do not perform any maintenance work when the control cabinet is connected to the power supply. Disconnect the power supply. Always observe the 5 safety rules.

Read the operating instructions for the frequency inverter before performing any maintenance work on it.

If the connection of the control cabinet is protected by a residual current device (RCD), its function must be checked regularly in accordance with the applicable regulations.

The screw connections in the control cabinet must be checked annually to ensure that they are tight. They must be retightened if necessary.

There are filter mats in both the filter fan and the air outlet filter. These must be checked regularly in accordance with the operating and ambient conditions and replaced if necessary.

8 Disposal

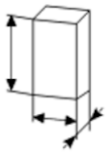
This control cabinet must **not** be disposed of with household waste.

Please check the applicable regulations before disposal!

9 Waste Heat Data in Accordance with DIN EN 61439-1

Proof of Heating IEC 60890, as required by DIN EN 61439

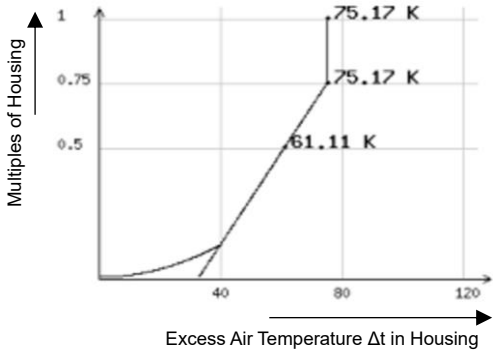
Calculation Example for an SPC/SMC055		
Housing Type: Single Housing 1057000		
Dimensions Relevant for Heating	Height: 700 mm	Installation Type: Single Housing for Wall Mounting
	Width: 500 mm	Ventilation Openings: No
	Depth: 250 mm	Number of Horizontal Partitions: 0

		Dimensions	A_0	Area factor B according to Table 3	A_e (col. 3)×(col. 4)
		m×m	m^2		m^2
		2	3	4	5
Effective Cooling Area	Top Side	0.50×0.25	0.13	1.40	0.18
	Front Side	0.50×0.70	0.35	0.90	0.32
	Back Side	0.50×0.70	0.35	0.50	0.18
	Left Side	0.25×0.70	0.18	0.90	0.16
	Right Side	0.25×0.70	0.18	0.90	0.16
				$A_e = \sum(A_0 - b) =$	1.0

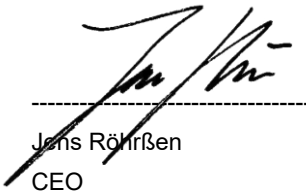
With Effective Cooling Surface A_e	
>1.25 m^2	≤1.25 m^2
$f = h^{1.35} \div A_b =$ (see 5.2.3)	$g = h \div w = 1.40$ (see 5.2.3)

Air inlet openings	[cm^2]	0
Housing constant k		0.635
Factor for horizontal partitions d		1.00
Effective power loss	[W]	293
$P^x = P^{***}$		96.24
$\Delta t_{0.5} = k \times d \times P^x$	[K]	61.11
Temperature distribution factor c		1.23
$\Delta t_{1.0} = c \times \Delta t_{0.5}$	[K]	75.17

Heating Characteristic Curve:



SPC and SMC Controls (Standard)

Manufacturer:	Sourcetronic GmbH Fahrenheitstr. 1 28359 Bremen Germany
	The designated product complies with the provisions of the following European directives:
	Low Voltage Directive EMC Directive Ecodesign Regulation (EU) 2019/1781
Applied Harmonized Standards:	EN 61439-1 EN 60204-1
Issuer:	Sourcetronic GmbH
Place, Date:	Bremen, May 6, 2025
Legally Binding Signature:	 --- Jens Röhrßen CEO

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This declaration certifies compliance with the specified guidelines, but does not constitute a guarantee of properties.

The safety instructions in the product information supplied must be observed.

SOURCETRONIC GMBH
Fahrenheitstrasse 1
28359 Bremen
Germany

T +49 421 2 77 99 99
F +49 421 2 77 99 98
info@sourcetronic.com
www.sourcetronic.com

CE