

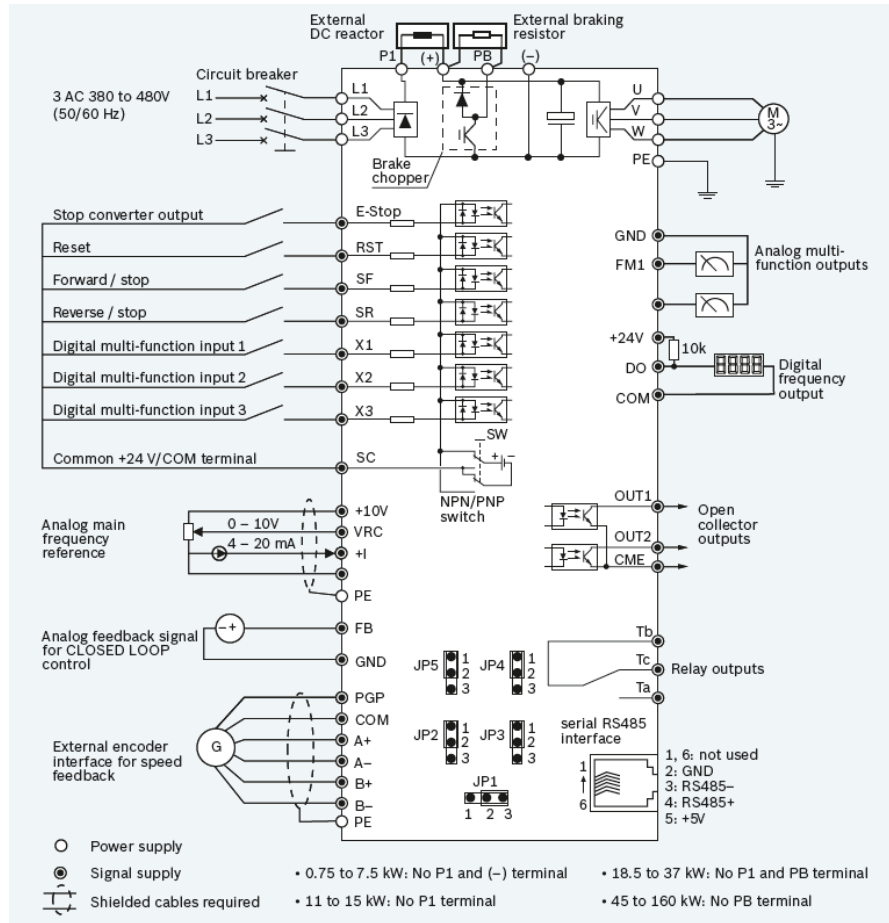
## Rexroth Fe

### V/f frequency converter V1.0



**Carsten Kobusch**  
**Date:**  
**Location:**

## Rexroth Fe – block diagram



## Rexroth Fe – terminal assignment

Category	Terminal strip	Signal function	Signal request
Digital input signals	E-Stop	Stop converter output	Dependent on the position of the NPN/PNP switch
	RST	Error reset	
	SF	Forward/stop	
	SR	Reverse/stop	
	X1, X2, X3	Multi-function inputs	
	SC	Shared +24 V/COM connection for digital input signals	
Analog input signals	+10 V	Supply voltage for external frequency setpoint value specified	10 V (max. current 10 mA)
	VRC	Analog main frequency reference	Switch 5, position 1-2: • Input voltage range: 0 to 5 V • Input resistance: 50 kΩ • Resolution: 1:2,000
			Switch 5, position 2-3: • Input voltage range: 0 to 10 V • Input resistance: 100 kΩ • Resolution: 1:2,000
	+I		• Input current: 4 to 20 mA • Input resistance: 165 Ω • Resolution: 1:1,000
	FB	Analog feedback signal for CLOSED LOOP control	• Input voltage range: 0 to 5 V • Input resistance: 100 kΩ • Resolution: 1:1,000
GND	Frame potential (0 V)	-	

## Rexroth Fe - terminal assignment

Digital output signals	OUT1/CME	Open collector output 1	Open collector outputs insulated via opto-electric couplers: • Max. output voltage range: 24 VDC • Max. output current: 50 mA
	OUT2/CME	Open collector output 2	
	DO/COM	Digital frequency output	Open collector output insulated via opto-electric coupler: • Max. output voltage range: 24 VDC • Max. output frequency range: 50 kHz
	+24 V	Shared +24 V connection for digital output signals	+24 VDC
	Ta	Relay changeover contacts	Contact transmitter capacity: • 250 VAC, 3 A • 30 VDC, 3 A
	Tc		
	Tb	Shared relay contact	
Analog output signals	FM1/GND	Analog multi-function output 1	Output voltage/current settable via switch 3 for FM1 and via switch 4 for FM2: • Output voltage: 0 or 2 to 10 V • Output current: 0 or 4 to 20 mA
	FM2/GND	Analog multi-function output 2	
Encoder signal	PGP/COM	Supply voltage +24 VDC	Max. output current: 100 mA
	A+	Encoder signal A	• Connection voltage: 8 to 24 V • Max. input frequency: 50 kHz
	A-		
	B+	Encoder signal B	
	B-		
Communication	485+	RS485 interface	-
	485-		

# Rexroth Fe - accessories

- **Braking resistor**

Necessary, if the drive has got regenerative power during the change of the speed

- **Brake chopper**

For Rexroth Fe  $\geq 18,5$  kW. (connection to the DC bus)  
(Rexroth Fe up to 15kW have got an internal brake chopper)

- **Line choke**

Reduces the harmonics on the line side

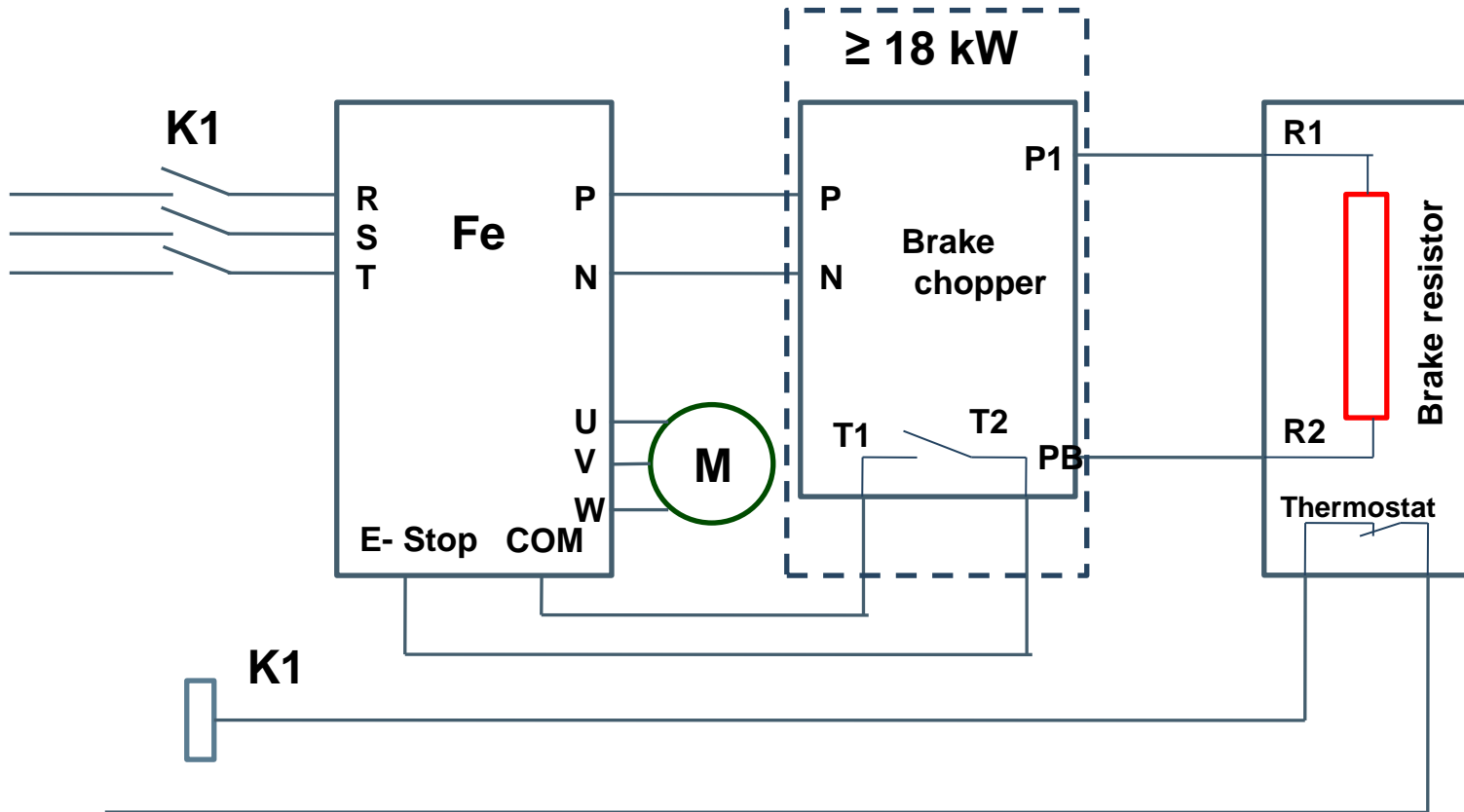
- **Line filter**

Compliance of the EMC norms

# Dimensioning of brake resistor and chopper

- Selection of the brake chopper and brake resistor from the table of chapter 10.3 of the documentation
- Up to 15kW the brake chopper is already integrated, just select the brake resistor
- Selection of the brake chopper depending on the power of the frequency converter
- Selection of the brake resistor depending on the power during the deceleration process. (Normally rated power of the frequency converter)
- $ED \text{ or } OT = (\text{Braking time} / \text{cycle time}) * 100\%$   
For the Rexroth Fe braking resistors with 10%, 20% and 40% ED are available  
The braking time has to be calculated with brake torque, speed and the inertia of the application

# Frequency converter with chopper and resistor



## Opening Instruction

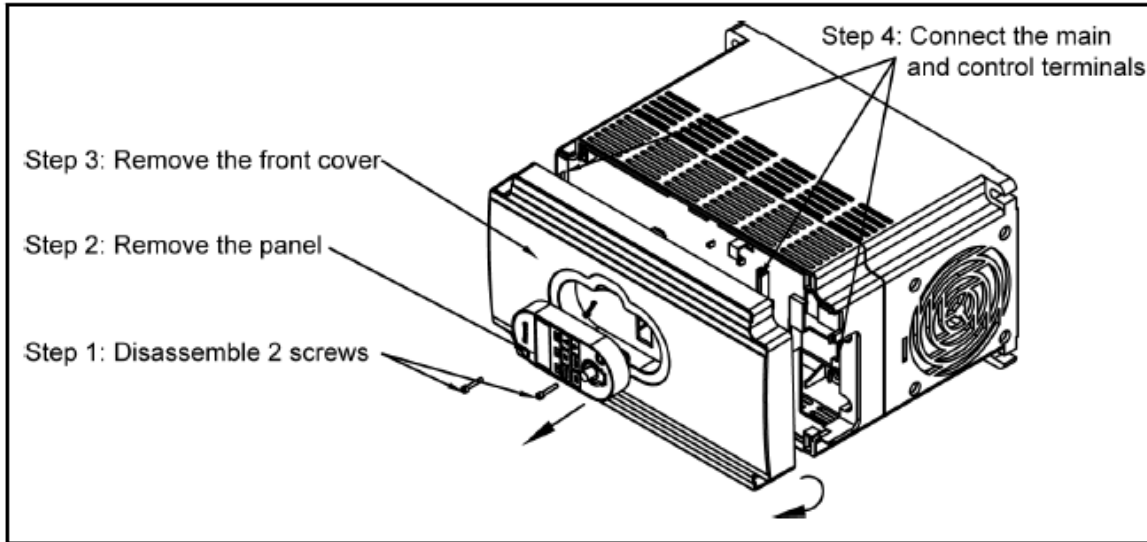


Fig.5-1: Opening instruction (0.75 to 7.5 kW)




Please follow the steps strictly to avoid destroy of the front cover buckle.

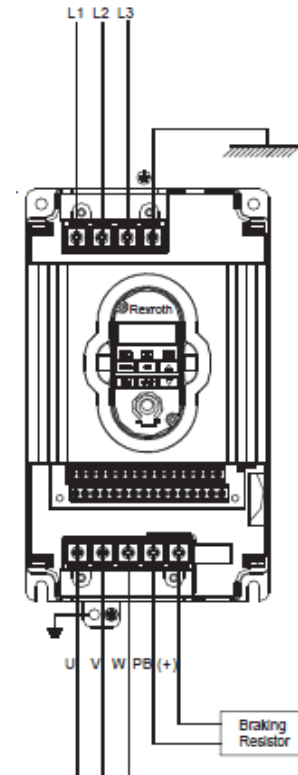
### Warning:

After switching off the line voltage wait for discharging of the DC capacitors. Before it is not allowed to touch any parts alive.



## Terminal description

Terminal	Description
L1, L2, L3	Mains power supply inputs
U, V, W	Frequency converter outputs (to be connected to the motor)
PB	Reserved terminal for external braking resistor (applicable to 0.75 kW to 15 kW frequency converters)
P1, (+)	DC positive bus outputs
(-)	DC negative bus output
	Grounding



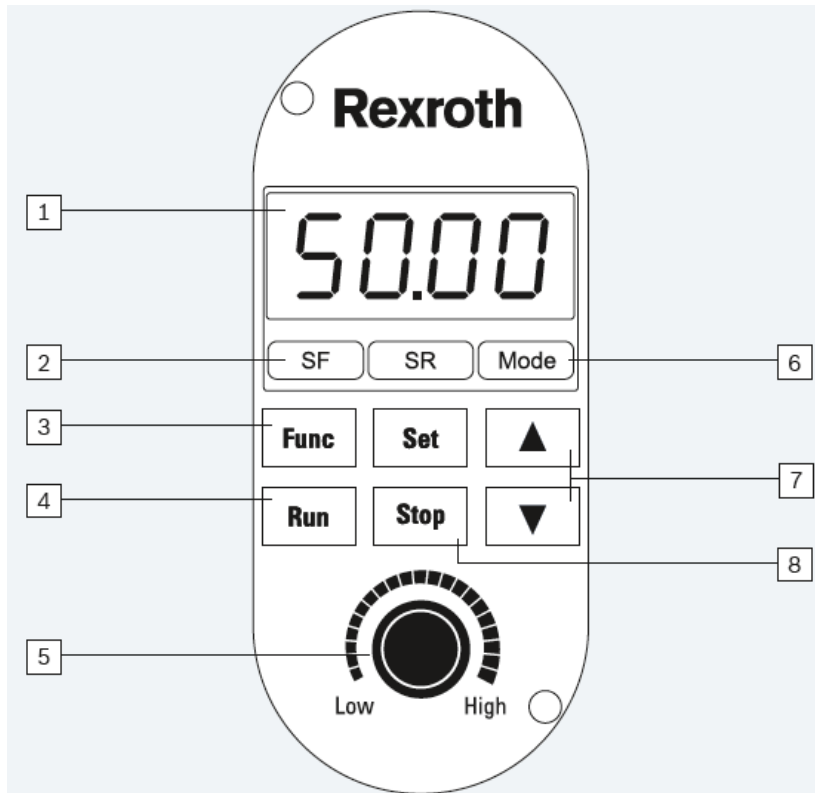
# Line connection

- On the line side must be placed a shut-off device  
e.g. main switch or contactor
- We recommend to select a line choke to reduce the harmonics on the line side (the harmonics are caused by the input diodes of the frequency converter)

# Motor connection

- An modern asynchronous motor can be connected directly to the frequency converter without any extra accessories. We recommend to select shielded motor cables.
- For retrofit of old machines / facilities (older than 5 to 10 years) you have to check, if the isolation of the motor can stand a voltage increase  $du/dt$  of 1500 to 2500 V/ $\mu$ s. Otherwise select a motor choke.

## Parameterization via operating panel



- 1 | LED display
  - ▶ output frequency
  - ▶ parameters
  - ▶ error codes
- 2 | Status LED
  - Status of frequency converter
  - ▶ SF: Motor turns forward
  - ▶ SR: Motors turns reverse
  - ▶ Mode: Parameterization
- 3 | Function key
  - ▶ One menu level up
- 4 | Run key
  - ▶ Start frequency converter
- 5 | Potentiometer for frequency converters up to 7.5 kW
  - ▶ Frequency setting
- 6 | Status LED, status of frequency converter
  - ▶ SF: Motor turns forward
  - ▶ SR: Motors turns reverse
  - ▶ Mode: Parameterization
- 7 | Arrow keys
  - ▶ select parameters
  - ▶ change parameters
- 8 | Stop key
  - ▶ stop frequency converter
  - ▶ error reset



## Digital inputs NPN / PNP selection

NPN – Reference 0V  
PNP – Reference +24V

Übersetzen

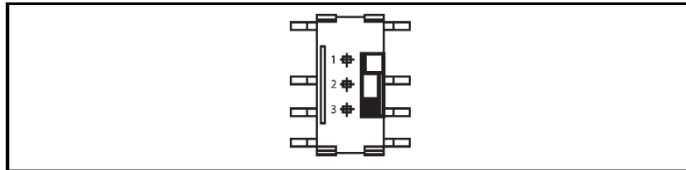


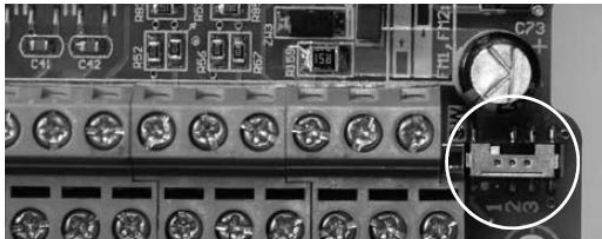
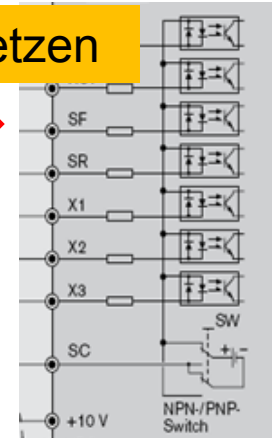
Fig.5-31: NPN/PNP Switch SW



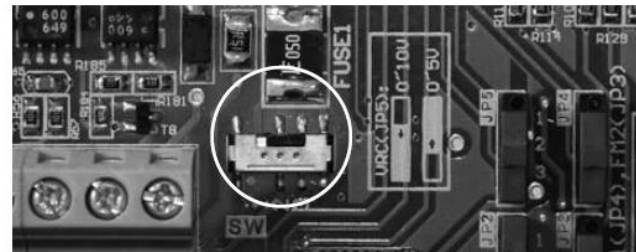
The factory default switch is NPN (Switch contact at position 3).

A three position switch determines:

1. The internal 24 V power supply or an external 24 V power supply is used for the inputs.
2. The inputs are activated by connection of 24 V to an input (PNP/ active input) or connection of 0 V to an input (NPN/ passive input).



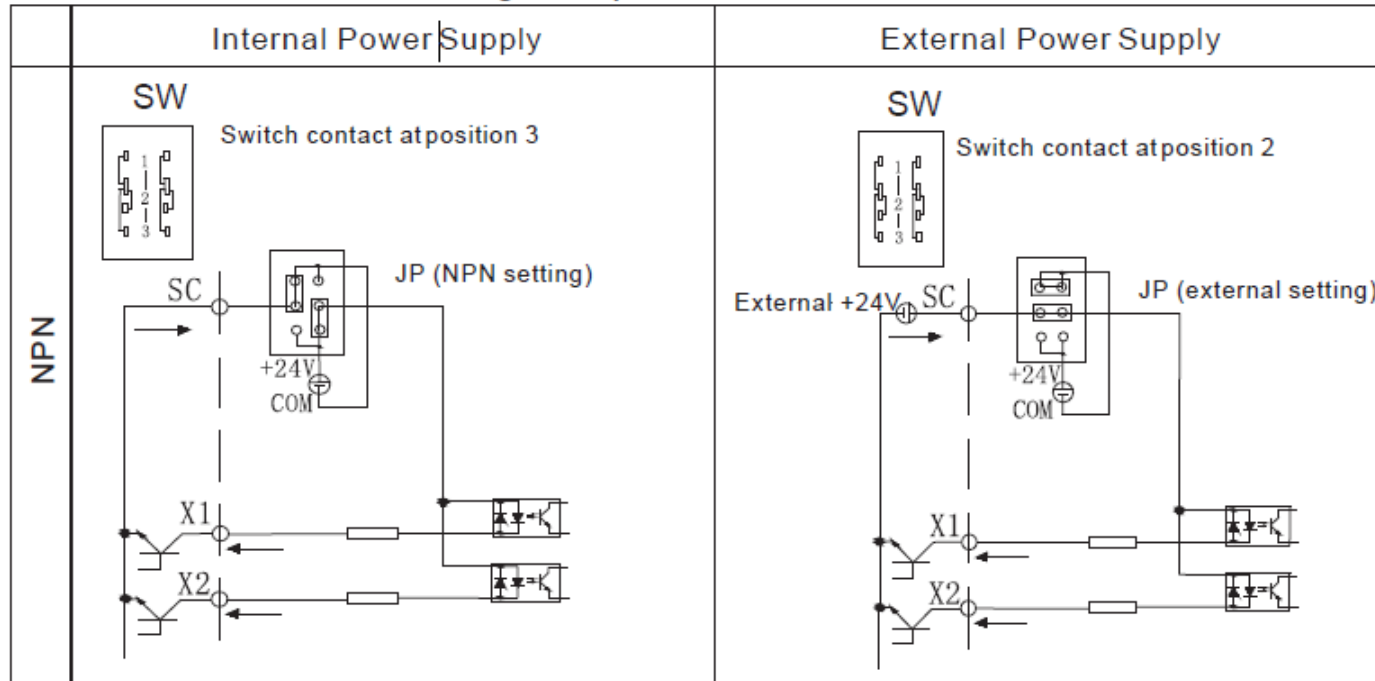
Size 1



Size 2 – 7

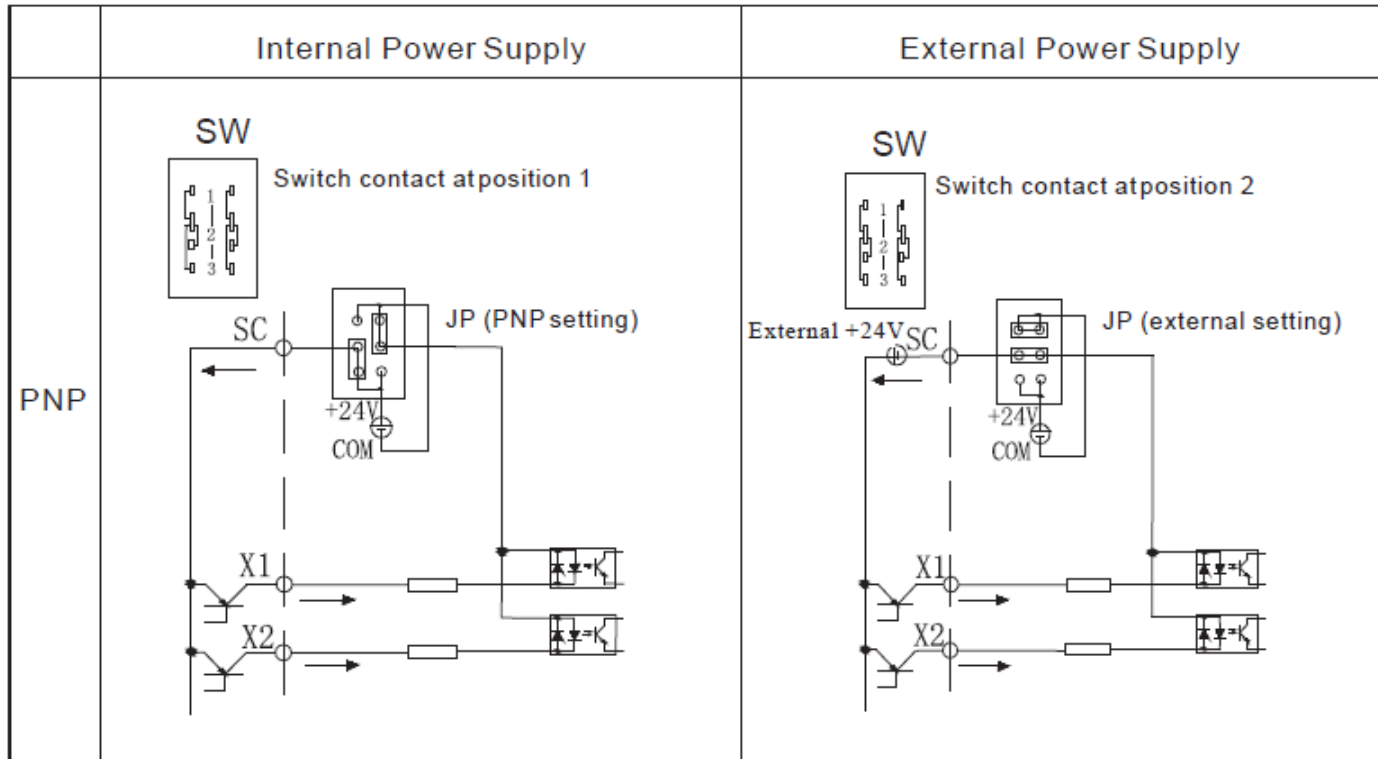
# Digital inputs NPN / PNP selection

## NPN – Reference 0V



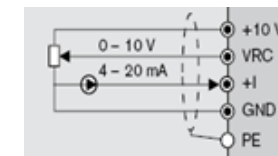
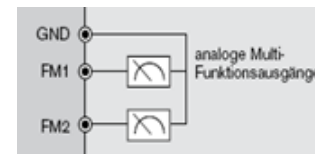
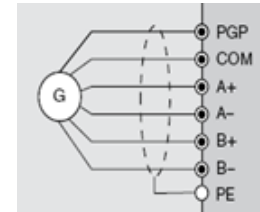
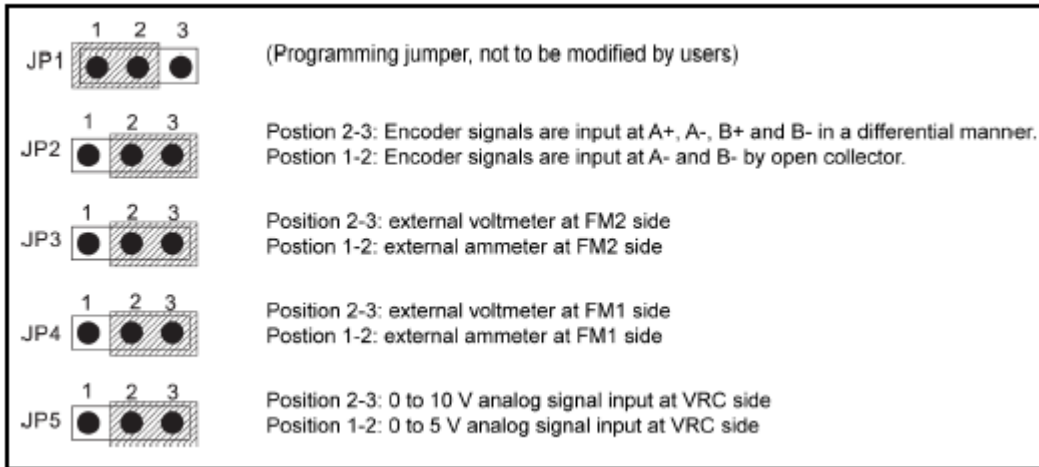
# Digital inputs NPN / PNP selection

## PNP – Reference +24V





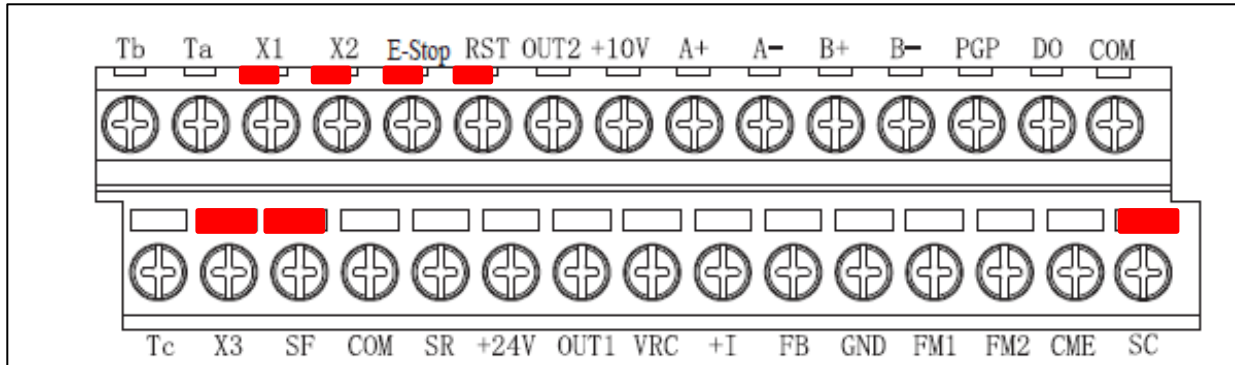
## Configuration switches



# E-stop input

- Without any additional arrangements is with the e-stop function no emergency stop possible
- For an emergency stop a disconnection with two channels is necessary – e.g. a connection with the acknowledgement of the central main contactor is a must !

## Digital inputs

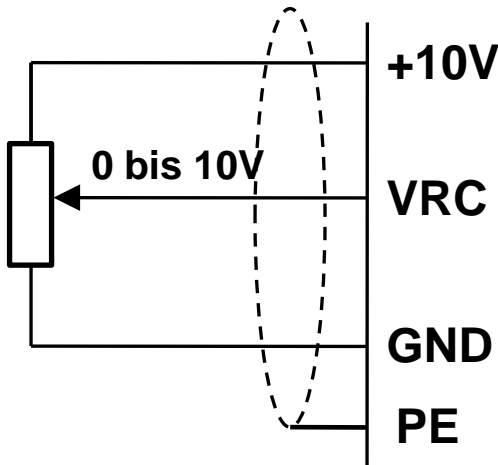
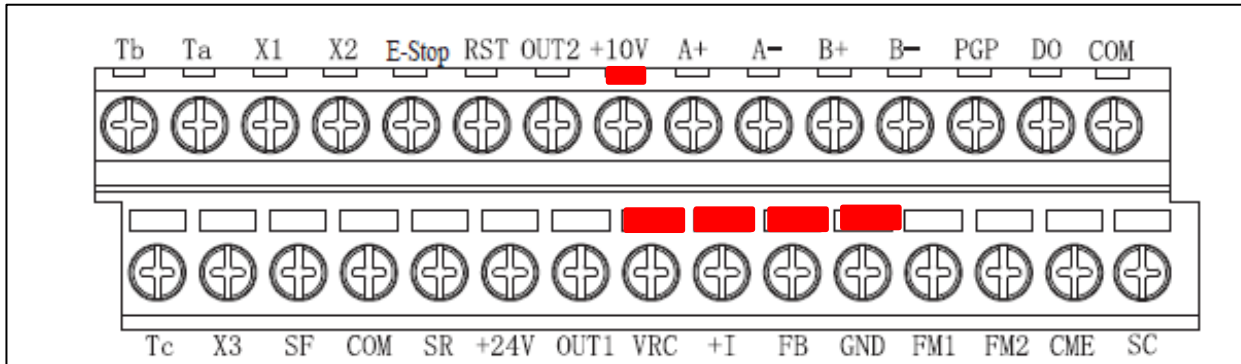


Type	Terminal description	Function of the signal	Remarks
Digital input signals	E - Stop	External abnormality input	E32, E33, E34
	RST	Error reset	Bridge to SC
	SF	Forward / Stop	b00 and E38
	SR	Reverse / Stop	b00 and E38
	X1, X2, X3	Multi-function- inputs	B00, b34, b35, E39, H07, H23
	SC	+24V/COM	Reference for digital signals

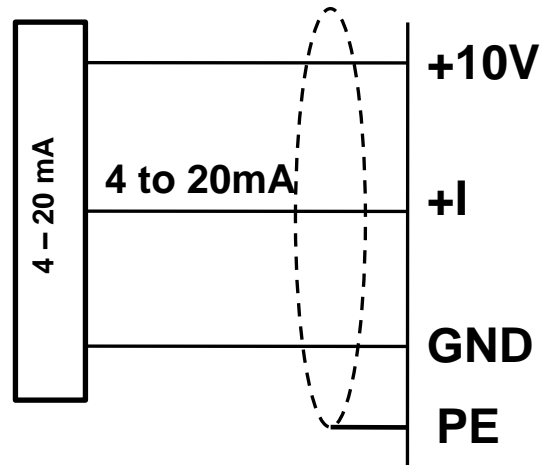
**Pay attention to the position of the PNP/NPN switch**

gl. jeder

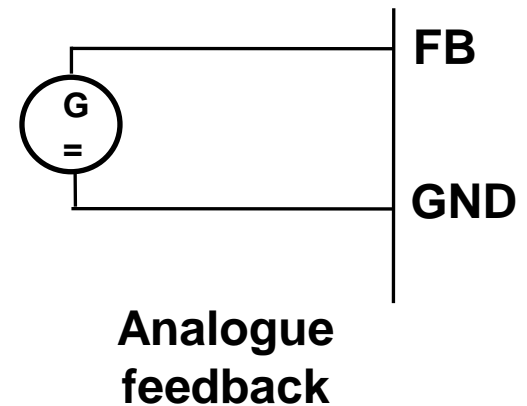
## Analogue inputs



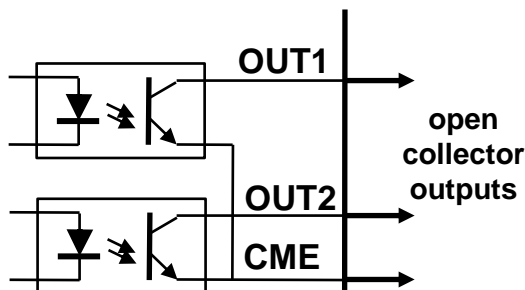
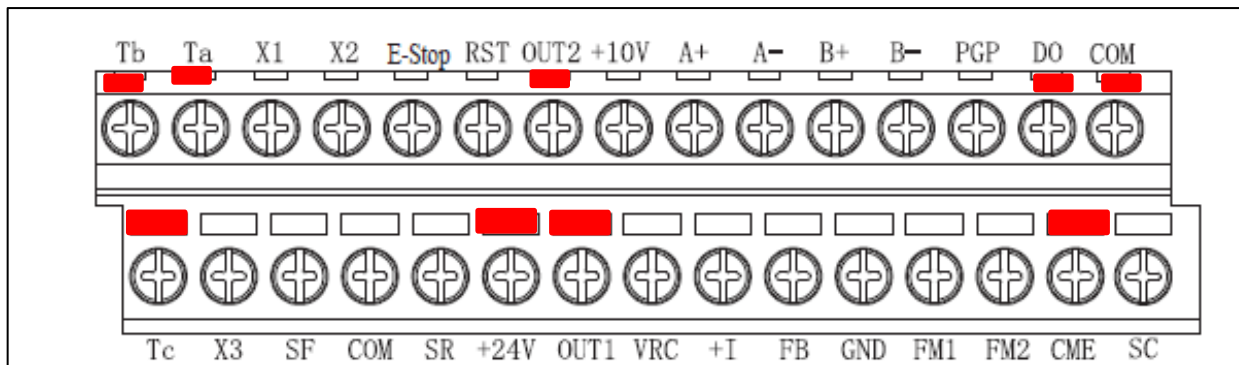
**Speed set-point  
analogue / voltage 0-10V**



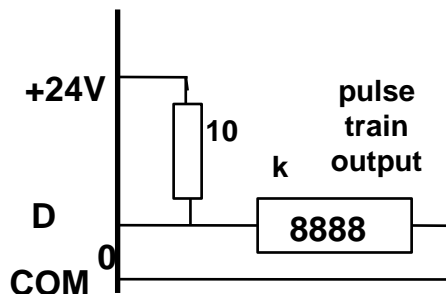
**Speed set-point /  
current 4-20mA**



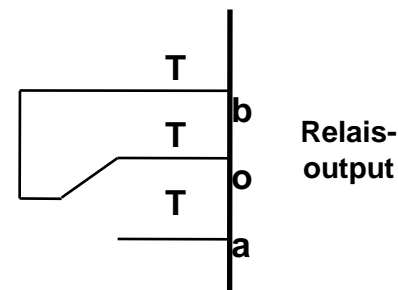
## Digital outputs



**Programmable digital output**

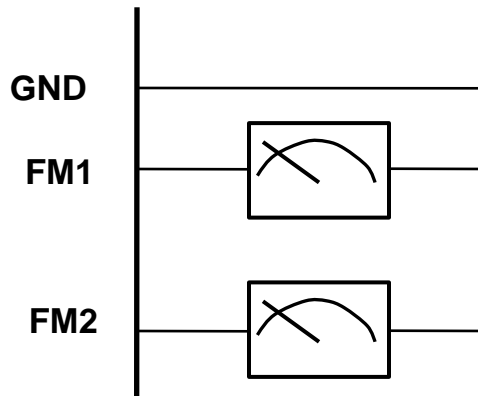
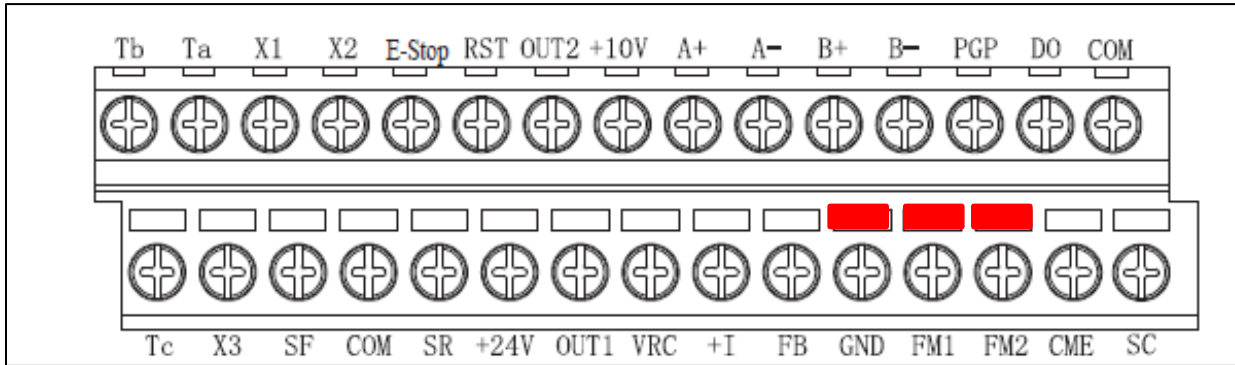


**Digital-frequency output**



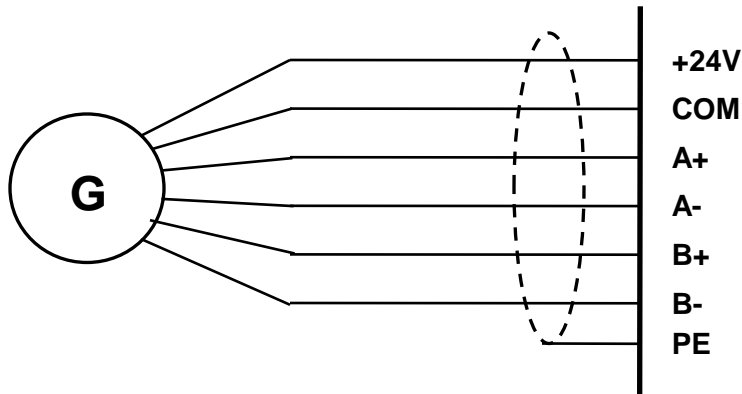
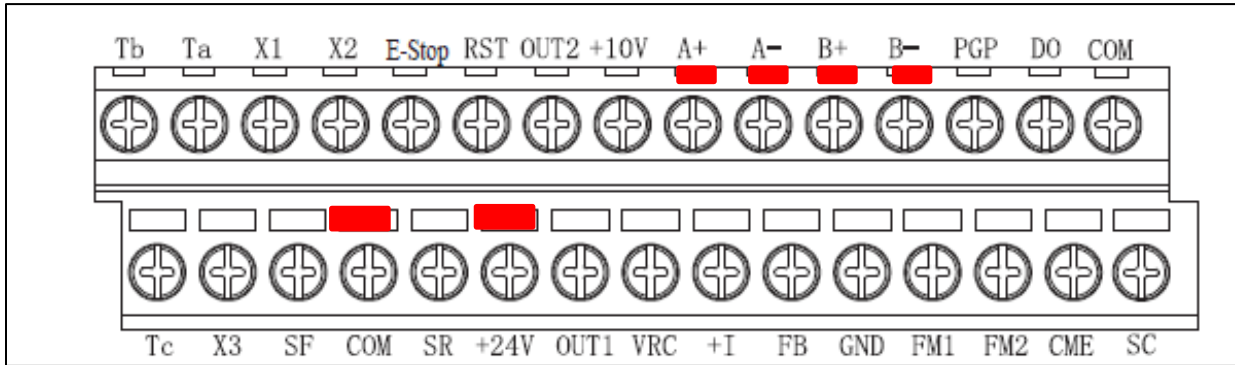
**Relais 250V AC, 3A**

## Analogue outputs



**Analogue multi  
function outputs**

## Encoder signals



**Encoder  
signals HTL  
encoder**

## Quick set up

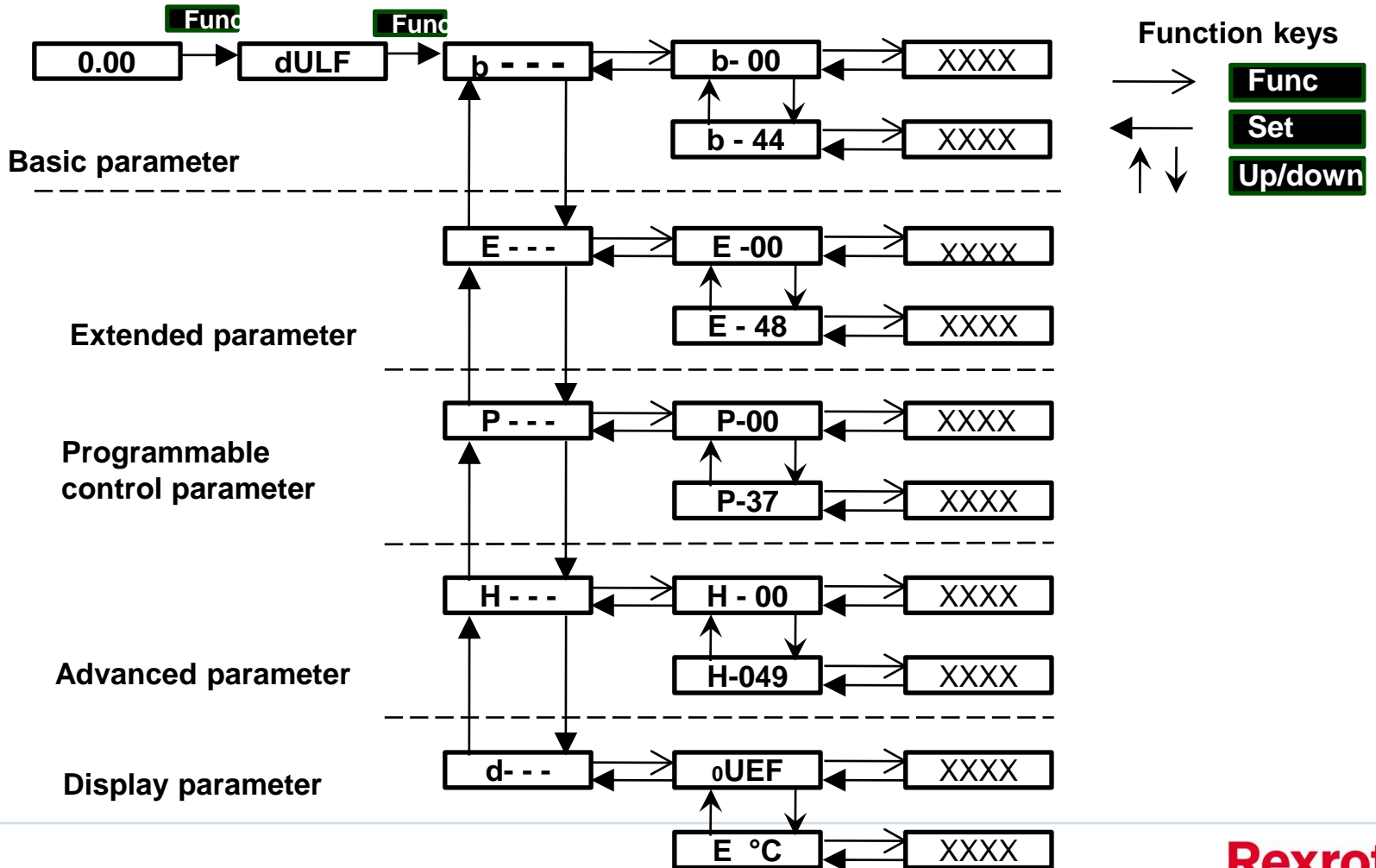
Parameter			
Code	Name	Description	Standard
Step 1			
b-04	Rated motor frequency	20 Hz bis max. Frequenz	50 Hz
b-05	Rated motor voltage	240 ... 480 V	380 V
b-40	Rated line voltage	380 ... 480 V	380 V
H-38	Motor pole number	2 to 12	4
H-39	Rated motor power	0,4 to 999,9 kW	Depending on the size
H-40	Rated motor current	0,1 to 999,9 A	
Step 2			
H-47	Automatic motor parameter identification	0: no automatic motor identification	
		1: motor parameter identification with motor in standstill	
		2: motor parameter identification with turning motor	



## Rexroth Fe Parameter



## Overview parameter



## Basic settings

Nr	Name	Setting range	Standard
b-00	Set the source of control commands	0: Run/Stop control with digital operating panel	0
		1: External via control terminals, Up/Down control	
		2: External via control terminals (including multispeed), while Stop key is activated	
		3: Logic control	
		4: External via control terminals (X3 is used to switch between internal/external sources of frequency command, while Stop key is activated)	
		5: External computer controls Run/Stop, while Stop key is activated	
		6: External computer controls Run/Stop, while Stop key is deactivated	

## Basic settings

Nr	Name	Setting range	Standard
b-01	Set frequency via digital operating panel	0.00 – HF (max. output frequency)	0
b-02	Set the source of frequency commands	0: Set via the digital operating panel	1
		1: Direct action of the digital operating panel's potentiometer Kv*(0 – 5 V)	
		2: Inverse action of the digital operating panel's potentiometer Kv*(5 – 0 V)	
		3: Direct action of external terminal Kv*(0 – 5 V)	
		4: Inverse action of external terminal Kv*(5 – 0 V)	
		5: Direct action of external terminal Kv*(0 – 10 V)	

## Basic settings

Nr	Name	Setting range	Standard
b-02	Set the source of frequency commands	6: Inverse action of external terminal Kv*(10 – 0 V)	
		7: Direct action of external terminal Ki*(4 – 20 mA)	
		8: Inverse action of external terminal Ki*(20 – 4 mA)	
		9: External terminal Kv*(0 – 5 V) + Ki*(4 – 20 mA)	
		10: VRC terminal Kv*(-10 – +10 V)	
		11: Pulse frequency input	
		12: External computer frequency setting	

## Basic settings

Nr	Name	Setting range	Standard
b-03	Highest frequency – HF	50 to 650 Hz	50.0
b-16	Acceleration time	0,1 to 6.500 s	10.0
b-17	Deceleration time	0,1 to 6.500 s	10.0
b-40	Line voltage	380 to 480 V	380.0

## Motor data

Nr	Name	Setting range	Standard
b-04	Rated motor frequency	20 to max. output frequency (HF)	50.0
b-05	Rated motor voltage	240 to 480 V	380.0
b-21	Upper frequency – UF (limitation max. output frequency)	min. max. output frequency (LF to HF)	50.0
H-38	Motor pole number	2 to 14	4
H-39	Rated motor power	0,4 to 999,9 kW	
H-40	Rated motor current	0,1 to 999,9 A	
H-47	Auto- tuning of parameters	0: no automatic motor identification	0
		1: automatic motor identification in standstill	*
		2: automatic motor identification with turning motor	

## Kommunikationseinstellungen

Nr	Name	Setting range	Standard
H-08	Communication protocol selection	0: ModBus 1: PROFIBUS	0
H-09	Local address	ModBus: 1 - 247 PROFIBUS: 1 – 126	1
H-10	Baud rate selection	0: 1.200 bps 1: 2.400 bps 2: 4.800 bps 3: 9.600 bps 4: 19.200 bps 5: 38.400 bps	3
H-11	Data format	0: N, 8, 2 (1 start bit, 8 data bits, 2 stop bits, without check) 1: E, 8, 1 (1 start bit, 8 data bits, 1 stop bit, even) 2: O, 8, 1 (1 start bit, 8 data bits, 1 stop bit, odd)	0



## Digitale Eingänge

Nr	Name	Setting range	Standard
b-35	Jogging mode selection	0: off 1: X1 2: X2 3: X3	0
E-38	SF and SR terminal function	0: Forward/reverse mode 1: Run/stop, forward/reverse mode 2: Key control holding mode	0

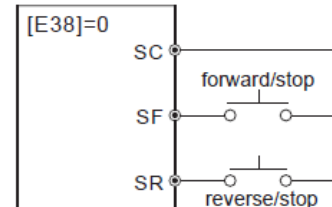
## Digital inputs – parameter E38

[E38]=0: Forward/reverse mode

SF/SC connected: Forward rotation

SR/SC connected: Reverse rotation

SF/SC and SR/SC connected or disconnected simultaneously: Stop



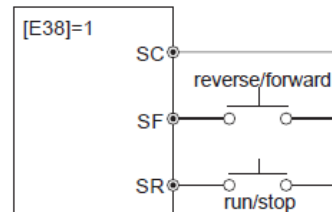
[E38]=1: Run/Stop, forward/reverse mode

SF/SC connected: Run

SF/SC disconnected: Stop

SR/SC connected: Reverse rotation

SR/SC disconnected: Forward rotation



[E38]=2: Key control holding mode

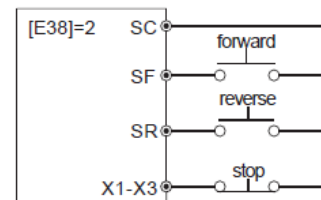
[E39] is used to select X1, X2 or X3 as the stopping terminal.

SF/SC connected: Forward rotation

SR/SC connected: Reverse rotation

X1-X3/SC disconnected: Stop

If the reverse key is pressed when the converter is rotating forward, the motor will decelerate to zero to stop before reversing its rotation to the set frequency.



## Digital inputs

Nr	Name	Setting range	Standard
E-32	E-Stop command input modes in the case of external problem	0: Stopping due to connected E-Stop/SC 1: Stopping due to disconnected E-Stop/SC	
E-34	E-Stop alarm modes in the case of external problem	0: No alarm output 1: Alarm output	

## Analogue output

Nr	Name	Setting range	Standard
E-04	Analogue output FM1	0: Output frequency 1: Output voltage 2: Output current 3: PI feedback signal 4: Set frequency	0
E-06	Analogue output FM2	0: Output frequency 1: Output voltage 2: Output current 3: PI feedback signal 4: Set frequency	0

## Digital output

Nr	Name	Setting range	Standard
E-16	Open collector output OUT1	0: Running 1: Frequency level detection signal 1 (FDT1) 2: Frequency level detection signal 2 (FDT2) 3: Frequency arrival signal (FAR) 4: Reserved 5: Under voltage 6: Overload (O.L.) 7: Reserved 8: Zero speed (lower than starting frequency) 9: E – Stop 10: Low voltage 11: No trip action 12: Fault 13: Programmable program running 14: Programmable program run	6

## Digital output

Nr	Name	Setting range	Standard
E-16	Open collector output OUT1	15: Run for one stage 16: Over current stall 17: Over voltage stall 18: In forward rotation command indication 19: In reverse rotation command indication 20: Zero speed (incl. stop) 21: Being braked 22: Accelerating 23: Decelerating 24: Fan action	6
E-17	Open collector output OUT2	Refer to E-16	0
E-18	Relais output	Refer to E-16	12

## Fault indications

Fault code	Fault name	Possible reason	Solution
O.C.-1	Over current at constant speed	Excessively reduced acceleration/ deceleration time	Increase acceleration/ deceleration time
		Load short circuit or sudden changes in load	Check motor, cable and load
		Low line voltage	Check input power supply
		A special motor or a motor larger than the maximum allowable capacity	Use a frequency converter with suitable power
O.C.-2	Over current during acceleration	Too short acceleration time	Increase acceleration time
		Improper V/F curve	Enable automatic torque increasing or manually adjust V/F curve settings
		The frequency converter power is too low	Select a frequency converter with higher power

## Fault indications

Fault code	Fault name	Possible reason	Solution
O.C.-3	Over current during deceleration	Too short deceleration time	Increase deceleration time
		Large load inertia torque or potential load	Add an appropriate dynamic brake chopper
		The frequency converter power is too low	Select a frequency converter with higher power
O.E.-1	Over voltage at constant speed (>800V)	Too high input voltage of power supply	Keep the input voltage of power supply within the specified range
		Excessively reduced acceleration/ deceleration time	Increase acceleration/ deceleration time
		Abnormality in load	Check the load
O.E.-2	Over voltage during acceleration	Too high input voltage of power supply	Keep the input voltage of power supply within the specified range
		Abnormality in load	Check the load



## Fault indications

Fault code	Fault name	Possible reason	Solution
O.E.-3	Over voltage during deceleration	Too large moment of inertia of load	Increase the deceleration time to suit the load inertia, or purchase a dynamic brake chopper
O.L.	Motor overload	Too large load, too short acceleration/ deceleration time or cycle	Adjust the load, acceleration/ deceleration time or cycle; or increase the frequency converter capacity
		Improper V/F characteristic curve settings	Adjust V/F curve settings
		Improper setting of electronic thermal relay	Correctly set the parameters of electronic thermal relay
O.H.	frequency converter overheat	Fan failure	Check if fan works normally
		Too high ambient temperature	Lower the ambient temperature
		Ventilation outlet obstructed	Clear dust and foreign matters at ventilation outlet

## Fault indications

Fault code	Fault name	Possible reason	Solution
d.r.	Drive protection	Damaged power component	Replace power component and seek technical support
		Incorrect operation of drive circuit protection	Remove interference and seek technical support
CPU-	EMI	CPU incorrect operation due to external interference	Remove nearby interference or other EMI
IPH.L	Phase loss at input side	Phase loss of the frequency converter's 3-phase input power supply	Check 3-phase input power supply or seek technical support
oPH.L	Phasenfehler auf der Motorseite	Unterbrochene Ader zum Motor Fehler im Umrichter Ausgang Unsymmetrie in der Motorlast	Motorleitungen überprüfen Umrichter Ausgang überprüfen Überprüfen auf Schwingneigung des Motor - Maschinensystems

## Fault indications

Fault name	Possible reason	Solution
Motor fails to start	Abnormal power supply voltage	Check input power supply
	External wiring between control terminal SF or SR is disconnected	Check external wiring between control terminal SF or SR
	Improper parameter setting	Check parameter setting
Motor cannot run at different speeds	The highest frequency is too low	Check the highest frequency
	Improper frequency setting mode	Confirm frequency setting mode
Motor stalls during acceleration	Too short acceleration time	Increase acceleration time
	Too large inertia of motor and load	Adjust acceleration time

## Fault indications

Fault	Possible reason	Solution
Too high motor temperature	Wrong V/F curve	Check V/F curve
	Long operating time at low speed	Select motor with external fan
	Too high load	Check load



# Thank you for your attention