

# Catalog of Rexroth EFC Frequency Converters



# EFC 3610 & 5610

The Rexroth EFC 3610 & 5610 series has been developed for the worldwide market. With the relevant certifications of CE, UL, cUL, RCM, EAC TÜV, RoHs, etc., consolidated sales and service is provided worldwide.

The power output range of EFC 3610 is 0.4...22 kW (Heavy duty), and the power range of EFC 5610 is 0.4...160 kW (Heavy duty). The EFC series contains enhanced features such as synchronous motor control (EFC 5610), FOC control built-in EMC filter, and multi-Ethernet communication to satisfy worldwide customer more application demands.



## Synchronous Motor Drives

- ▶ Except asynchronous motor, EFC 5610 has the capability of synchronous motor drives to improve the control accuracy and reduce energy consume.

## Built-in mains filter

- ▶ Complies with EN61800-3 category C3 requirements and reduces electromagnetic interference on the power grid.
- ▶ Shielding motor cable length: 15m (up to 4 kW), 30 m (5.5...18.5 kW), 50m (30...90 kW), 75 m (110...132 kW)
- ▶ EMC filter can be disconnected by EMC screw for use in environments that require especially low leakage currents.

## Built-in DC Reactor

- ▶ Built-in DC reactor of EFC 5610 30 kW and above EFC 5610 30 kW.

## Safety Torque off(STO)

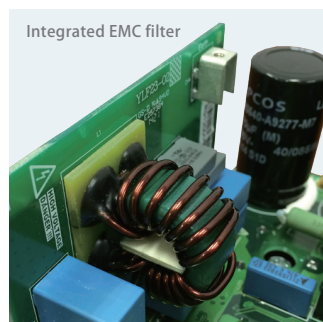
- ▶ Class 0 cutoff refers to EN60204-1 standard, and got SIL3 certificate.
- ▶ Frequency converter false tripping prevent for operation and maintenance safety.

## Up to 45 °C ambient temperature without derating

- ▶ The EFC series can be used in up to 45 °C ambient temperature (VFC 40 °C) without a reduction of output power.

## Additional communication options

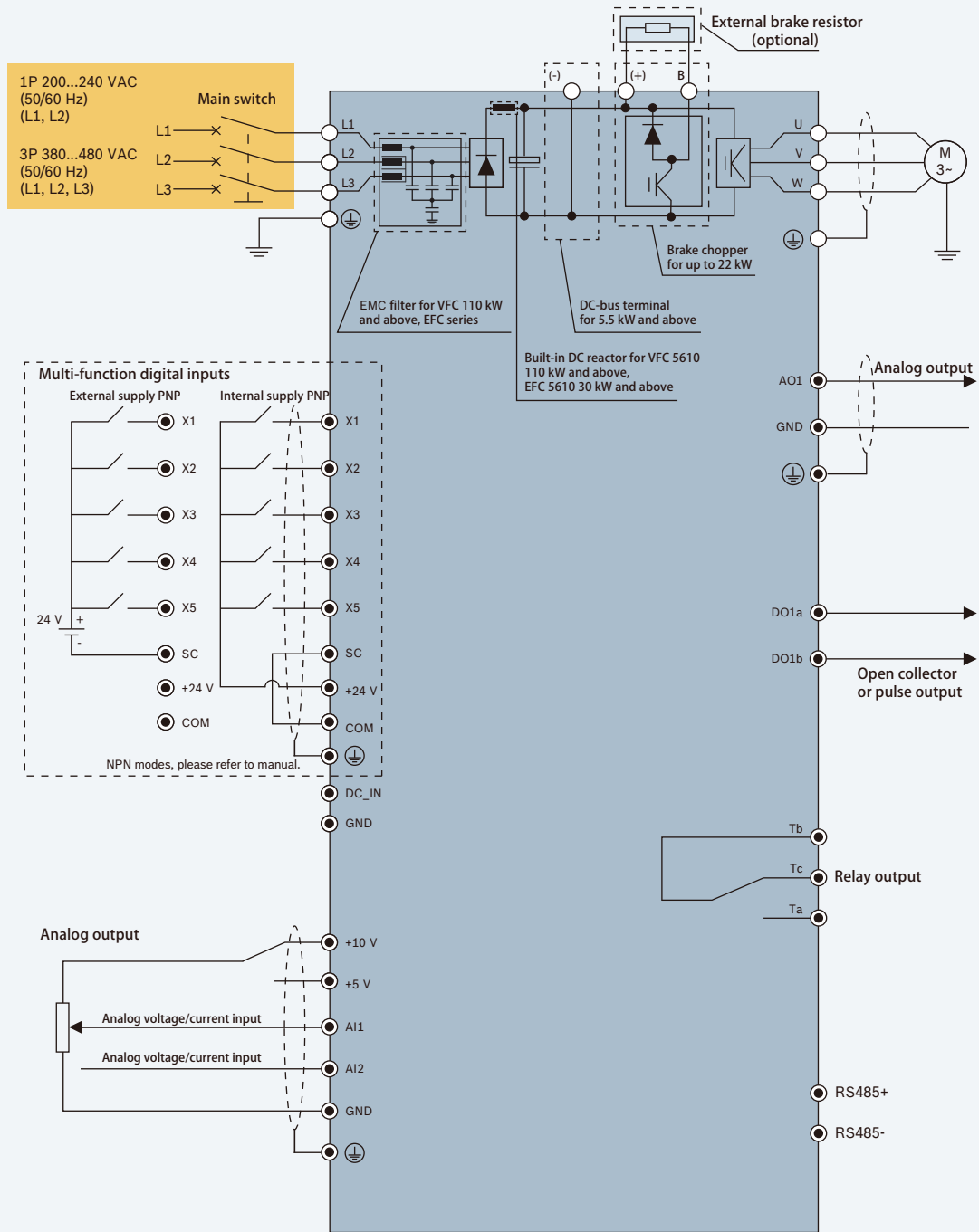
- ▶ In addition to PROFIBUS DP and CANopen also a SERCOS III, PROFINET IO, Ethernet IP, Modbus TCP, EtherCAT are available. Especially, the Rexroth exclusive SERCOS III communication function Communication rate could be microsecond level.



# Technical Details

		EFC 3610	EFC 5610	
Input	1P 200 VAC	Rated output power	0.4...2.2 kW	
		Mains voltage	200...240 V ± 10 %	
		Supply frequency	50/60 Hz ± 5 %	
	3P 380 VAC	Rated output power	Heavy-duty: 0.4...22 kW Normal-duty: 7.5...30 kW	Heavy-duty: 0.4...160 kW Normal-duty: 7.5...200 kW
		Mains voltage	-15 % 380 V...480 V + 10 %	
	Supply frequency	50/60 Hz ± 5 %		
Output	Output frequency		0...400 Hz	
	Control technology		V/f	
	Motor type		Asynchronous motors	
Functions	Overload capacity		Heavy-duty: 150 %, 60 s; 200 %, 1 s Normal-duty: 120 %, 60 s	
	Mains filter		C3	
	built-in DC reactor		-	
	Frequency resolution		1...15 kHz (0.4...22 kW); 1...12 kHz (30 kW及以上)	
	Speed regulation range		1:50	
	Start-up torque		3 Hz 150 % 1.5 Hz 100 %	
	PID control		1	
	Control panel type		Standard detachable LED and optional detachable LCD	
I/O terminals	Analog input	+10 V	✓	
		+5 V	✓	
		AI1	0(2)...10 V/0(4)...20 mA	
		AI2	0(2)...10 V/0(4)...20 mA	
	Analog output	AO1	0(2)...10 V/0(4)...20 mA	
	Digital input	+24 V	max. 100 mA	
		DI1...DI4	PNP/NPN terminal, 24 VDC, 8 mA/12 VDC, 4 mA	
		DI5 (Pulse input)	PNP/NPN terminal, 24 VDC, 8 mA/12 VDC, 4 mA; Maximum pulse input 50 kHz	
	Digital output	DO1	Open collector output	Pull-up/pull-down, 30 VDC, 50 mA
			Pulse output	max. 32 kHz
Relay output	RO1 (Ta, Tb, Tc)	250 VAC, 3 A/30VDC, 3 A		
Communication		Modbus RTU		
Extension Card	I/O card		4DI, 1AI, 1AO, 1OC, 1 relay output	
	Relay card		4Relay outputs, 250 VAC, 3 A/30VDC, 3 A	
	Communication card		PROFIBUS DP, CANopen, SERCOS III, PROFINET IO, Ethernet IP, Modbus TCP, EtherCAT	
Ambient conditions and certificates	Ambient temperature		-10...45 °C; 45...55 °C, derating 1.5 %/1 °C	
	Humidity		≤90 %	
	Altitude		1000 m; 1000...4000 m, derating 1 %/100 m	
	Protection category		IP20	
	STO		-	
Certificate		CE, UL, cUL, RCM, EAC, TÜV, RoHS		

EFC 3610 & 5610 Block Diagram



○ Power supply

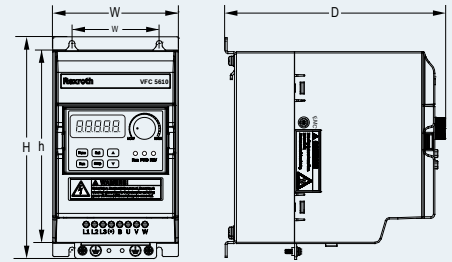
● Signal supply

⎓ Shielded cable required

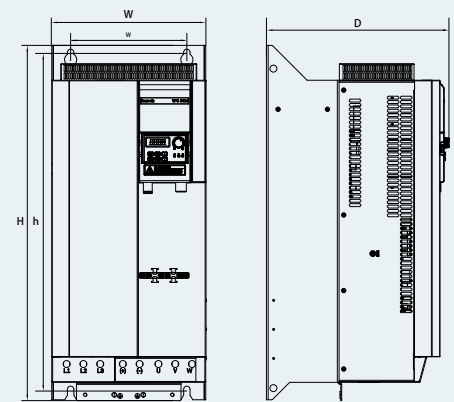


EFC 3610 & 5610 Mechanical Data										
	Type EFC	Rated motor power [kW]		Rated continuous current [A]		W [mm]	w [mm]	H [mm]	h [mm]	D [mm]
		Heavy duty	Normal duty	Heavy duty	Normal duty					
1P 200 VAC	0K40-1P2-MxA-xx	0.4	-	2.4	-	95	66	166	156	167
	0K75-1P2-MxA-xx	0.75	-	4.1	-					
	1K50-1P2-MxA-xx	1.5	-	7.3	-	95	66	206	196	170
	2K20-1P2-MxA-xx	2.2	-	10.1	-	120	80	231	221	175
3P 400 VAC	0K40-3P4-MxA-xx	0.4	-	1.3	-	95	66	166	156	167
	0K75-3P4-MxA-xx	0.75	-	2.3	-					
	1K50-3P4-MxA-xx	1.5	-	4.0	-	95	66	206	196	170
	2K20-3P4-MxA-xx	2.2	-	5.6	-					
	3K00-3P4-MxA-xx	3.0	-	7.4	-	120	80	231	221	175
	4K00-3P4-MxA-xx	4.0	-	9.7	-					
	5K50-3P4-MxA-xx	5.5	7.5	12.7	16.8	130	106	243	228	233
	7K50-3P4-MxA-xx	7.5	11	16.8	24.3					
	11K0-3P4-MxA-xx	11	15	24.3	32.4	150	125	283	265	233
	15K0-3P4-MxA-xx	15	18.5	32.4	39.2					
	18K5-3P4-MxA-xx	18.5	22	39.2	45.0	165	140	315	300	241
	22K0-3P4-MxA-xx	22	30	45.0	60.8					
	30K0-3P4-MxA-xx	30	37	60.8	73.7	250	200	510	492	272
	37K0-3P4-MxA-xx	37	45	73.7	89.1					
	45K0-3P4-MxA-xx	45	55	89.0	108	265	200	585	555	325
	55K0-3P4-MxA-xx	55	75	108	147					
	75K0-3P4-MxA-xx	75	90	147	176	325	200	760	727	342
	90K0-3P4-MxA-xx	90	110	176	212					
	110K0-3P4-MxA-xx	110	132	212	253	385	250	923	893	350
	132K0-3P4-MxA-xx	132	160	253	303					
160K0-3P4-MxA-xx	160	200 <sup>1</sup>	303	379 <sup>1</sup>	480	400	1030	995	360	

▶ 0.4...37 kW



▶ 45...160 kW



x: MDA= Built-in EMC filter (only apply to EFC) xx: 7P=Operating panel NN=No operating panel (with Dust cover)

<sup>1</sup>: Only apply to EFC, EFC 160 Kw (Heavy-duty) equals 200 Kw (Normal duty) with 379 A output current (Normal duty)

# EFC serie Applications



## HVAC

Fans, pumps, air conditioning

Energy savings calculator

- ▶ Keeps track of the achieved energy savings.

Life time reminder

- ▶ Reduces downtime by helping to organize the maintenance schedule.

Speed tracing

- ▶ For smooth catching and restarting of a running fan.

Dry pump protection

- ▶ Automatically detects a dry running pump to protect the equipment.

Pump cascading

- ▶ Use Application Specific Firmware and relay card, 4 maximum pumps could be circularly controlled by frequency converter.



## Textile and Dyeing

Heat setting stenter, twister, air-flow spinning

Smart cooling concept

- ▶ Double duct design isolates heat sink and semiconductor to prevent semiconductor from pollution.
- ▶ No cooling fan up to 1.5 kW and detachable cooling fan above 1.5 kW for cotton fiber easy clean.

Import PCBA coating

- ▶ Coating materials is made in Germany, enhanced anticorrosion in high temperature and humidity.

Low voltage ride-through

- ▶ Derating output when voltage reduced on power grid.

DC generatrix<sup>1</sup>

- ▶ DC generatrix operation to reduce the technical influence from instable power supply, and save energy through load sharing.



## Woodworking machinery

Welt fitting machine, Tenoning machin, Grooving machine, Carving machine, Sanding machine, CNC machine

Compact Size

- ▶ Subminiature compact design.
- ▶ Side by Side mounting.

Easy Operation

- ▶ LEC panel with same parameter structure, Parameter copy function of 3610 series, easy to use.
- ▶ Structuring parameter convenient to commissioning.

Cost-performance function design

- ▶ 60 seconds last of 150 % rated torque output.
- ▶ Over excitation control to reduce stop time.
- ▶ Standard equipped Modbus RTU.
- ▶ Built-in Mini USB connected with computer for commissioning, parameter copy and software updating.



# EFC serie Applications



## Metal processing machinery

Lathe, grinder, drill, planer, boring, cold forging

### Compact design

- ▶ DIN rail and side by side mounting to save space.

### High start torque

- ▶ To meet the process demand of high strength metal cutting, avoid overcurrent and overload during low speed operation .

### Quick and dynamic response

- ▶ Accurate speed control for highly smoothness and quality especially for concavo-convex workpiece surface.

### Over excitation braking

- ▶ Can help to reduce braking times up to 50 %, without an external break resistor.

### Safety Torque off(STO)<sup>2</sup>

- ▶ Frequency converter false tripping prevent for operation and maintenance safety.



## Food and packaging

Conveyor, blow molding, blender, cutter, labeling machines

Quick connectors and DIN rail mounting (up to 7.5 kW)

- ▶ Quick and easy installation and maintenance.

### Counter function

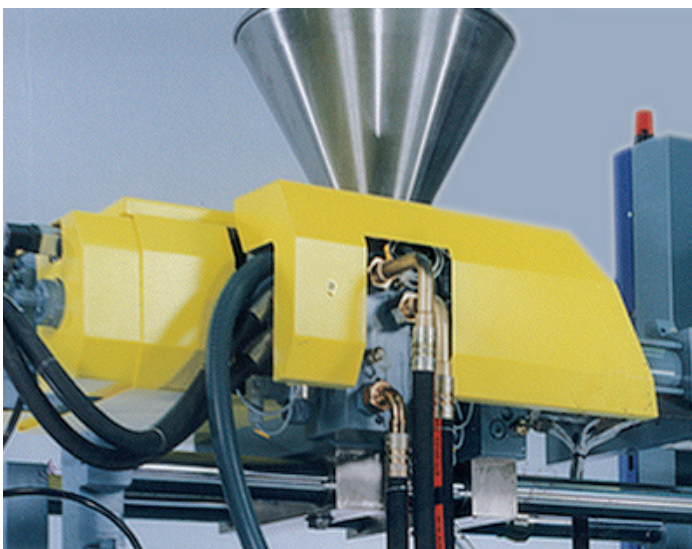
- ▶ Built-in Counter to realize the classification and packing of food & drink industry.

### Removable control panel

- ▶ Parameter copy function for efficient commissioning of multiple drives.
- ▶ Remote panel support for convenient and safe monitoring and operation.

### Integrated sequence control (16 steps)

- ▶ Multi-stage speed control without an additional PLC.



## Rubber and plastic machinery

Scroll extruder, pelletizer, bagging machine

### Compact design

- ▶ DIN rail mounting (up to 7.5 kW) and side by side mounting (up to 22 kW), to save cabinet space.

### High start torque, 200 % at 0.5 Hz

- ▶ To ensure the extruder can start up and operate during the uneven heating temperature environment.

### High control accuracy, fast dynamic response

- ▶ Precise control is to ensure the material thickness evenly, in order to save cost and ensure the quality of products.

### Torque limit and slip compensation

- ▶ Especially used for constant output torque. Minimize the torque fluctuation and improve the extrusion process quality.

# Accessories<sup>1</sup>



## Mounting plates and panel extension cables<sup>2</sup>

Mounting plates are used for installing the panel in order to operate and monitor frequency converter without opening control cabinet.

- ▶ Make the hole 85mm(horizontal) \* 75mm (vertical) on cabinet door.
- ▶ Remove the panel to install in the mounting plates. Then connect the panel with frequency converter via panel extension cables.
- ▶ Extension cables 2m, 3m, and 5m are available, and the longest operation distance is 5m.



## LED/LCD panel<sup>2</sup>

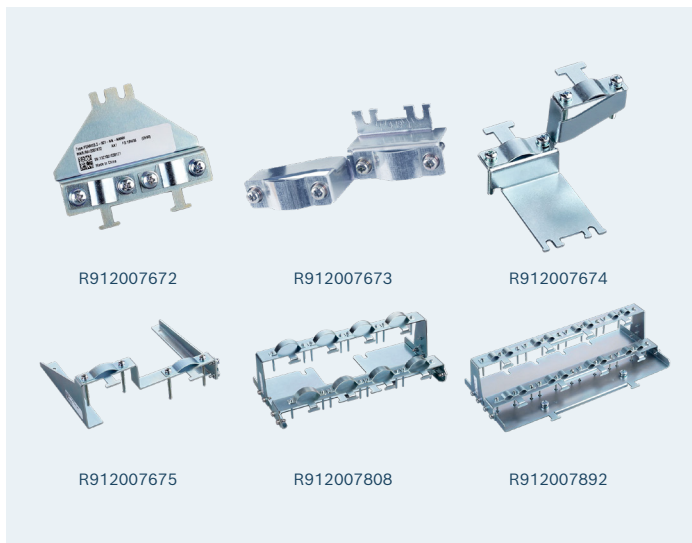
LED and LCD Panel options of EFC series.

### LED panel

- ▶ Parameter edit and commissioning via LED panel.
- ▶ Real-time display of operating data, fault display and diagnosis maintenance.
- ▶ Parameter copy.

### LCD panel

- ▶ Available in Chinese, English, Germany, and other 9 languages.
- ▶ Six line big display screen with backlight, easy to commissioning.
- ▶ Parameter copy.



## Shield Connector

The shielding layer of shielded cables must be reliably connected to the shielding terminals of the frequency converter. Accessories (connector and screws) for shielded cable connection are available for the connection convenience.

R912007672	FEAM03.2-001-NN-NNNN	Shield Connector for B,C,D housing
R912007673	FEAM03.2-002-NN-NNNN	Shield Connector for E,F,G housing
R912007674	FEAM03.2-003-NN-NNNN	Shield Connector for H housing
R912007675	FEAM03.2-004-NN-NNNN	Shield Connector for I,J housing
R912007808	FEAM03.2-005-NN-NNNN	Shield Connector for K housing
R912007892	FEAM03.2-006-NN-NNNN	Shield Connector for L housing

<sup>1</sup>: Only apply to EFC 3610/5610 <sup>2</sup>: All the accessories need to be purchased individually, please inquire Rexroth distributor for details



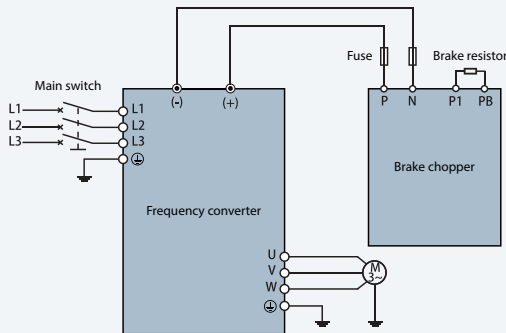
### Brake Chopper<sup>1</sup>

The brake chopper is used for consuming electric energy transmitted from external motor to frequency converter and limiting bus voltage within a reasonable range to improve its braking performance and fast stop of the motor.

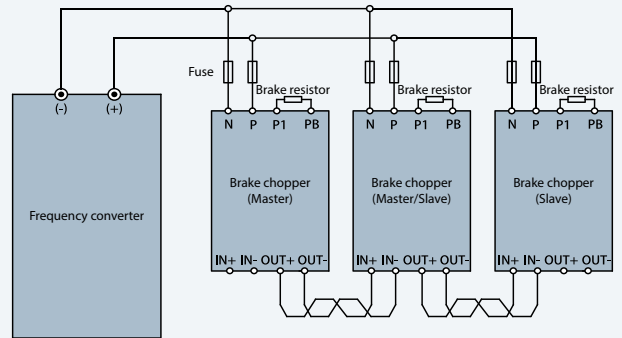
The brake chopper has standard dust cover, but you can also set the parameters with the use of LED and LCD operating panel of EFC series<sup>1</sup>. It supports the linkage input and linkage output with paralleling up to 3 braking units in maximum. And it also has overvoltage, overcurrent, overheating, short circuit resistance, overheating protection.

- ▶ Operation voltage: 600...785 V, parameter adjusting step size: 0.01 V
- ▶ The length between brake chopper and frequency converter plus the length between brake chopper and brake resistor should not be more than 5m.

#### Basic wiring mode

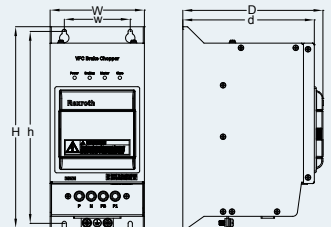


#### Brake chopper in paralleling wiring mode<sup>1</sup>



<sup>1</sup>: Paralleling wiring mode applies when the capacity of a single brake chopper could not meet the requirement

Brake chopper dimensions								
Material Number	Type code	Applicable FC type	W (mm)	H (mm)	D (mm)	w (mm)	h (mm)	d (mm)
R912007181	FEAE07.1-EA1-NNNN	EFC 5610 30...55 kW	100	215	149	70	205	140
R912007182	FEAE07.1-EA2-NNNN	EFC 5610 75...90 kW						



<sup>1</sup>: Only apply to EFC 5610



# Extension card module

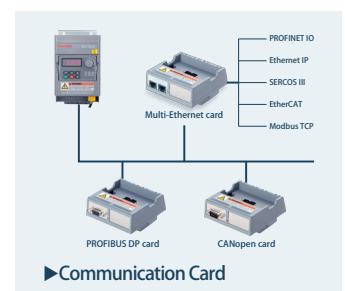
As part of the modular design concept for the EFC series, the separately available Option Card Module offers the user a variety of customization options, which benefits for operation cost reducing.

The extension card module provides two slots that can be used for a range of extension card module. Cards include an I/O extension card, a multi relay card and various communication extension card module, such as Profibus DP and CANopen.



Please check below table for the possible card combinations.

	Slot 1	Slot 2
Combination 1 <sup>*</sup>	I/O Card	Multi Relay Card
Combination 2 <sup>*</sup>	I/O Card	Communication Card
Combination 3 <sup>*</sup>	Multi Relay Card	Communication Card



\* It is not possible to combine 2 extension card modules.

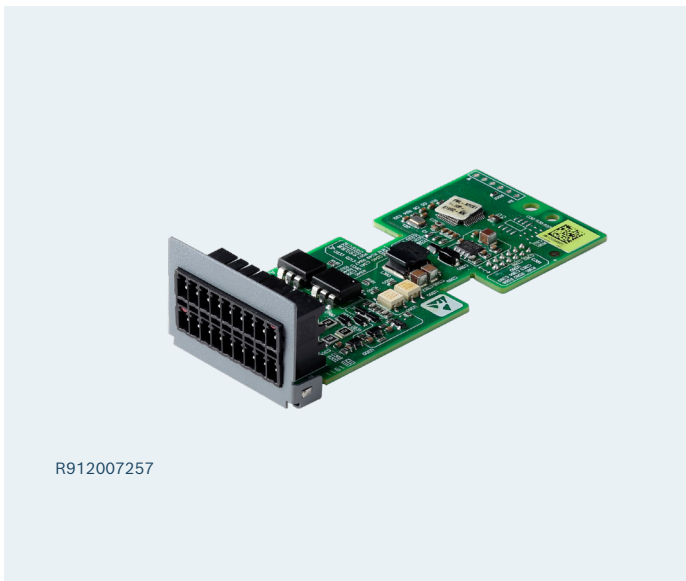


R912006050

## I/O Extension Card

To extend the I/O terminals on EFC frequency converter, an I/O extension card is available. The maximized I/O points of frequency converter with I/O extension card could be: 9DI, 3AI, 2AO, 2OC, 2 relay output.

Terminal	Function	Description
EX1...EX4	4 multi-function digital inputs	24 VDC, 8 mA/12 VDC, 4 mA
EAI1	Analog input	-10...10 V/0(2)...10 V/0(4)...20 mA
EAO1	Analog output	0(2)...10 V/0(4)...20 mA
EDO1	Open collector output	30 VDC, 50 mA
ETa, ETb, ETc	Relay	250 VAC, 3 A/30 VDC, 3 A



R912007257

## I/O Plus Card

To extend the I/O terminals on EFC frequency converter, an I/O plus card is available. The maximized I/O points of frequency converter with I/O Plus card could be: 10DI, 3AI, 2AO, 3OC, 1 relay output, 1 TSI.

Terminal	Function	Description
EX1...EX5	5 multi-function digital inputs	24 VDC, 8 mA/12 VDC, 4 mA
EAI1,EAI2	2 Analog input	-10...10 V/0(2)...10 V/0(4)...20 mA
EAO	Analog output	-10...10V/0(2)...10 V/0(4)...20 mA
TSI	Thermal Sensor Input	Supported sensor types: KTY 84/130, PT100, PT1000, TDK G1551_8320 (NTC)
ED01a,ED01b ED02a,ED02b	Open Collector Output	30 VDC, 50 mA



R912006051

## Multi Relay Card

The Multi Relay Card offers 4 programmable relay outputs, that can be especially useful in pump and fan control, drive status monitoring or water supply applications.

- By combining the Multi Relay Card and the I/O Extension Card it is possible to take advantage of up to 6 relays at the same time and save extra wiring cost and installing space.

Terminal	Signal requirement	Description
R1a, R1c, R1b	Rated capacity: 250 VAC, 3 A 30 VDC, 3 A	R1b, R2b, R3b, R4b are relay outputs shared connections
R2a, R2c, R2b		
R3a, R3c, R3b		
R4a, R4c, R4b		



R912006134

### Multi-Ethernet Card<sup>1</sup>

- ▶ Below communication protocols are supported by Multi-Ethernet Card, which only needs Exchange parameters in frequency converter. PROFINET IO, Ethernet IP, SERCOS III, EtherCAT, Modbus TCP.
- ▶ A multi-application card, with which users need only communication protocol switching by setting parameters.

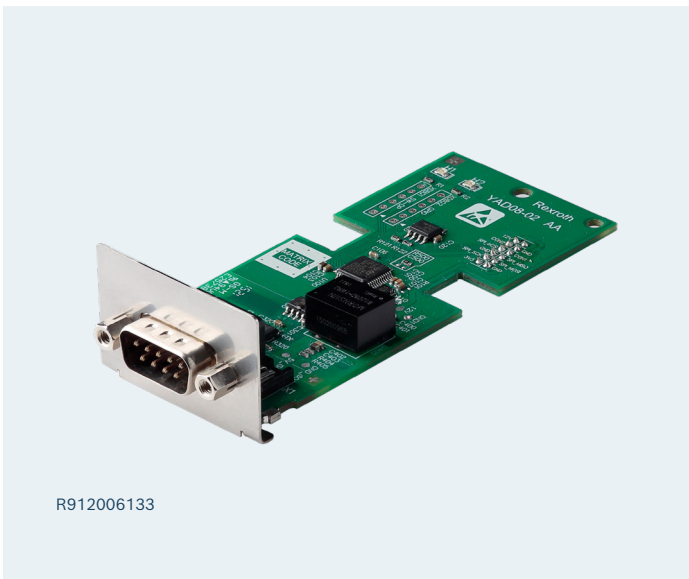
<sup>1</sup>: Only apply to EFC series



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### PROFIBUS DP adapter

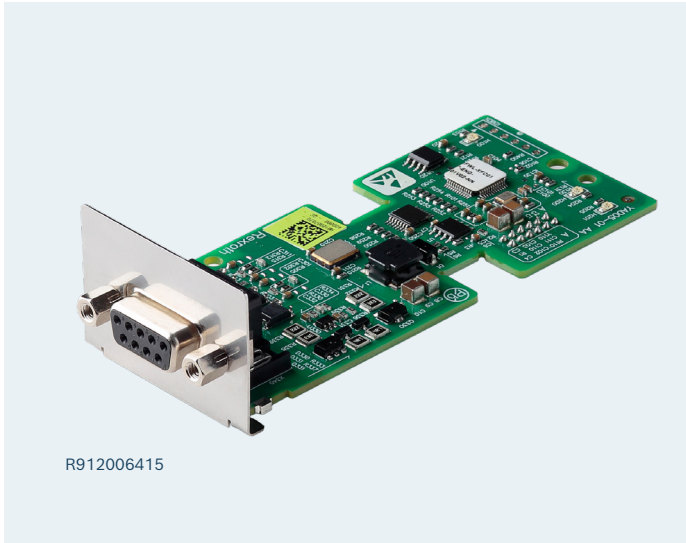
- ▶ Simple connection
- ▶ Wide installation base, Good compatibility
- ▶ Maximum 127 stations



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### CANopen adapter

- ▶ Short response time
- ▶ High communication quantity and performance. Reduced EMC problem and cable cost
- ▶ Built-in terminated resistor



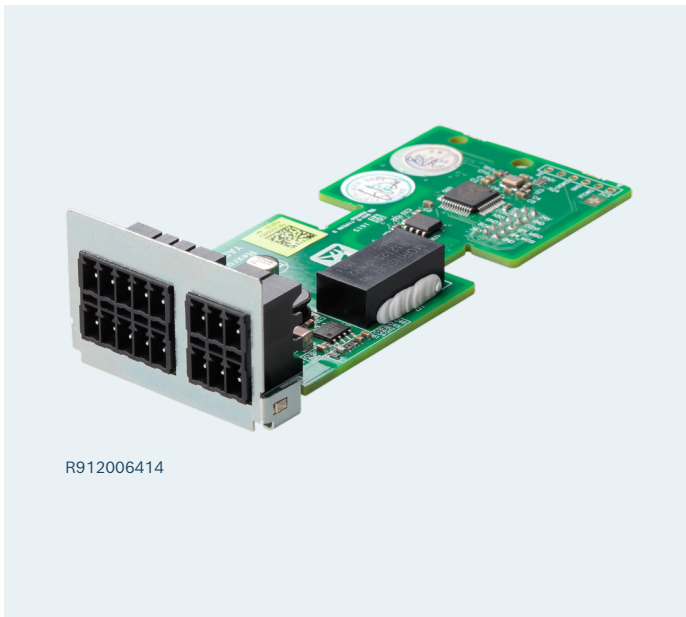
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## Resolver Card

- ▶ Standard extension card of Rexroth EFC 5610 series product
- ▶ Interface of Resolver
- ▶ Extended in the same way as other option cards. Mounting position is optional

### Technical Data

Resolver power supply	Voltage	5 Vrms
	Frequency	10 kHz
Resolver card input signal	Voltage	1.7...2.8 Vrms
	Frequency	10 kHz
Connector type	DB9 (Female)	
Transformation ratio	0.35...0.55	



R912006414

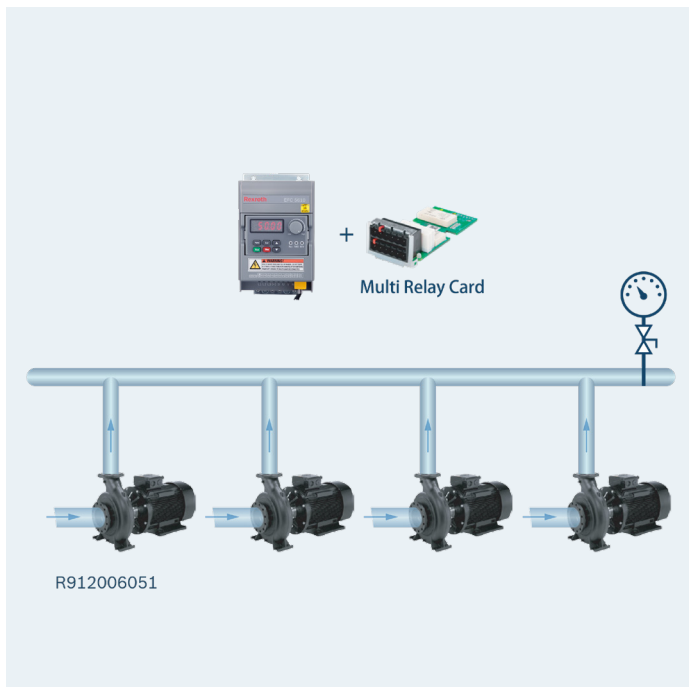
## ABZ Incremental encoder Card

- ▶ Standard extension card of Rexroth EFC 5610 series product
- ▶ Variety of voltage levels match the common 5 V encoder and 9...30 V wide voltage encoders in market
- ▶ Supports various encoders, covering open collector and push-pull type
- ▶ Frequency output interface of encoder signal included supporting NPN and PNP output
- ▶ Extended in the same way as other option cards. Mounting position is optional

### Technical Data

Encoder power supply	5 V $\pm$ 5 % (200 mA) 12 V $\pm$ 5 % (150 mA)
Maximum input pulse frequency	300 kHz
Pulse input voltage	5...24 V
Terminal type	Quick connector
Pulse output	1:1 push-pull output

# Application Specific Firmware ASF



## Application Specific Firmware<sup>2</sup> – Download firmware for different specific applications

- ▶ Different application specific firmware easy for different application demands. (textile, printing, water supply, etc.)
- ▶ Download ASF to frequency converter through USB and IndraWorks software.
- ▶ Each standard frequency converter could be updated to application specific firmware product via installing ASF.
- ▶ Reducing customer and partner's stock, only standard equipment is fine.



# PC Software



## PC Software<sup>1</sup> - easy commissioning

The Rexroth EFC frequency converters can be commissioned and operated remotely with the free PC software. The connection to the PC is established via a standard Mini-USB interface.

### Parameter Comparison Function

- ▶ Compared adjusted parameter with default parameter, comparison between 2 parameter groups.

### Online Commissioning

- ▶ Connected with PC, it is easy to online start-up and stop, parameter revise, and back-up.

### Online Monitor Signal

- ▶ Real time monitoring signal data for fast diagnosis and monitoring.

## Core Firmware Update<sup>1</sup>

- ▶ Core firmware updated via IndraWorks software, easy and convenient to get latest function.

### Open Platform for flexible applications

According to various of special application demand, and based on standard software of frequency converter, Application Specific Firmware( e.g. water supply ASF) could be downloaded to frequency converter via commissioning software.

- ▶ ASF via frequency converter commissioning software, your frequency converter now available for serving special function request.

<sup>1</sup>: Please download latest PC software via [www.boschrexroth.com/cn/fc](http://www.boschrexroth.com/cn/fc).