



# Active Cube

## 210/410/510/610 Series

System Drive Solutions



PRODUCTS &  
SOLUTIONS



## The highest level of precision, efficiency and energy optimization.

With over 15 years of experience in creating dedicated motion control systems, Bonfiglioli has gained an enviable reputation in the world of industrial automation.

Bonfiglioli offers its customers the highest possible level of precision, efficiency and energy optimization for their machines.

Our solutions include low backlash planetary gearboxes, induction motors, servomotors and synchronous reluctance motors, open and closed loop inverters, servo inverters and regenerative inverters. A unique combination of mechatronic solutions plus a vast range of products for industry make Bonfiglioli a one-stop-shop for applications in many different sectors.

Our two centers of excellence develop breakthrough mechatronic innovations thanks to their deep expertise and strong synergy, to provide customers with a complete motion automation offer.

Bonfiglioli's team based in Krefeld, Germany, has the cutting-edge technical know-how and capacity to design and manufacture advanced electronic devices such as frequency inverters and servo drives.

Our team based in Rovereto, Italy, benefits from a pool of talents focused on the development and production of highly sophisticated mechatronics products such as servo motors and low backlash planetary gearboxes, with the additional capability to offer to customer complete motion control solutions and application software development services.

Bonfiglioli's mission is to improve the profitability of customers worldwide by acting as a risk-free partner. Our group's international capacity enables us to work alongside our customers as day-to-day partners, ensuring that their individual needs are satisfied and their full potential is realised.

# System Drive Solutions



# Bonfiglioli Active Cube Series: The drive designed for all industrial applications

Bonfiglioli Active Cube series are specifically designed for automation machines. Allowing an extensive control of the motor, these series are fitting a wide range of industrial sectors.

The range includes:

- 1 phase 230 V: 0.25...4 kW
- 3 phase 230 V: 0.25...9.2 kW
- 3 phase 400/480 V: 0.25...400...1200 kW
- 3 phase 525 V: 160...400...1200 kW
- 3 phase 690 V: 160...400...1200 kW

Size 8 offers the opportunity as single device to power installations up to 400 kW and up to 1200 kW with parallel connection of two or three Active Cube Units.

The Active Cube includes many features making it suitable for universal use, both as an effective "System drive", and also as a "Servo drive". Several enhanced functionalities are embedded in the Active Cube including Cyclic Synchronous Positioning (CSP) mode, brake control and encoder evaluation. Moreover, the new single axis for the control of servo motors, induction motors and synchronous reluctance motors, delivers high dynamic response, high performance and application versatility. Thanks to various communication protocols, the Active Cube offers the broadest connectivity with the most advanced control technology.

Active Cube benefits from the full compatibility with the extensive program of Bonfiglioli synchronous servomotors and accessories (BMD series), which together provide the possibility of a total Bonfiglioli servo system.

The combination of Active Cube and Bonfiglioli Synchronous Reluctance motor (BSR) offers new solutions for application demands regarding efficiency (IE4) and power density.

## Key Features

- Supported Motor types: Asynchronous motors, Synchronous motors, Reluctance motors
- Safety: STO (safe torque off, SIL 3)
- Optionally supported Communication protocols: CANopen, PROFIBUS, Modbus RTU, Modbus ASCII, Devicenet, PROFINET, EtherCAT, Modbus/TCP, EtherNet/IP.
- Supported Feedback sensors: HTL encoder
- Optionally Supported Feedback sensors: TTL, Resolver, Hiperface, EnDat 2.1, SSI, SinCos
- Optional Keypad and PC-Service Interface available
- PLC functions
- Motion tasks
- Fast control loops
- Brake control

## Customer Benefits

- PLC functions with graphical software tool
- Cubic interpolation for high dynamic interpolated axis
- 525V and 690V supply voltages for heavy and steel industry.
- High precision closed loop configuration.



## Bonfiglioli drive power/control range



**S2U**

Power range:  
0.4...11 kW



**S2U IP66**

Power range:  
0.4 ... 18.5 kW



**Agile**

Power range:  
0.25 ... 11 kW



**Active**

Power range:  
0.55 ... 132 kW



**Active Cube**

Power range:  
0.25 ... 1200 kW



**ANG**

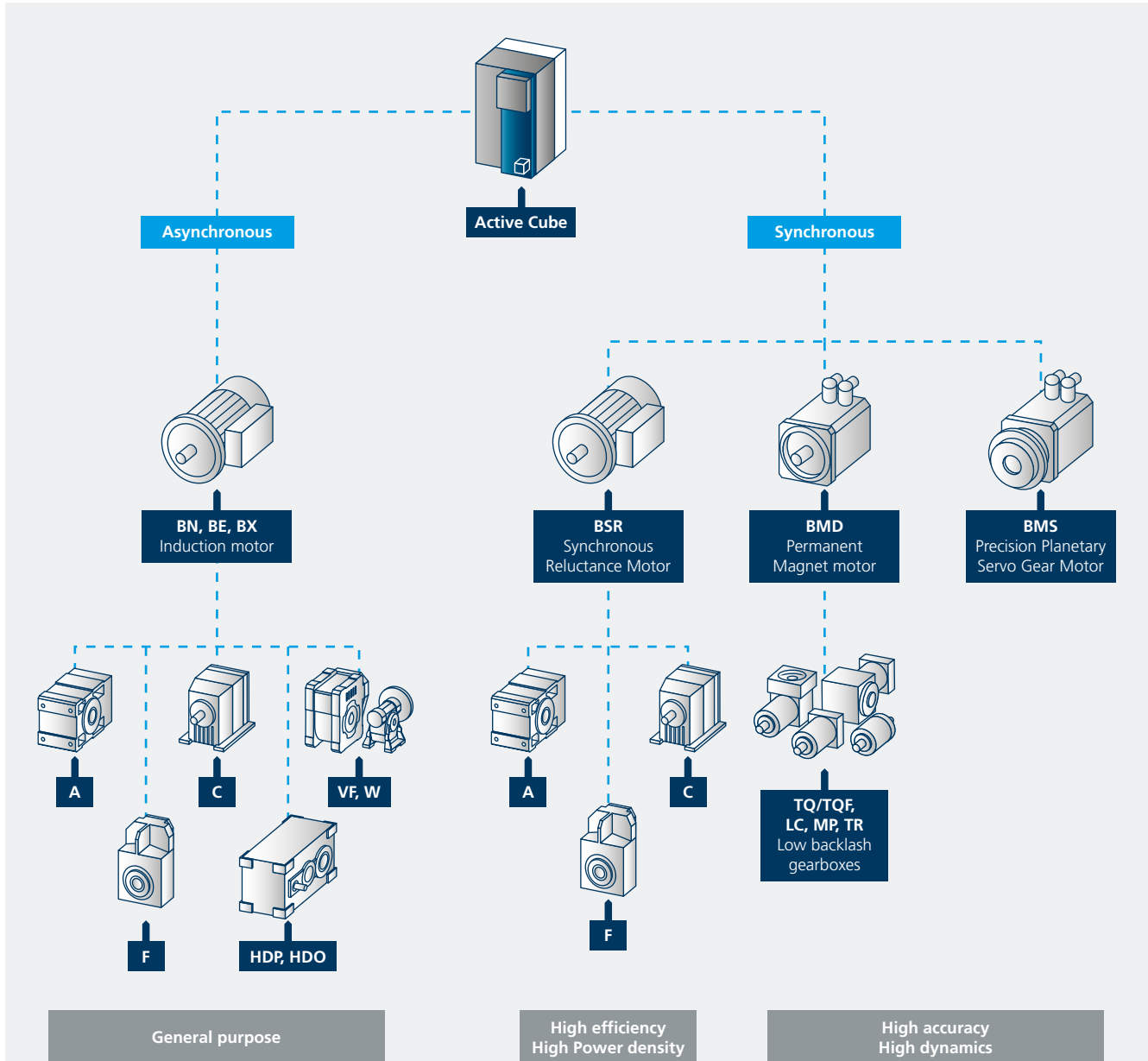
Power range:  
0.25 ... 1200 kW



**iBMD**

Torque range  
2.7...36 Nm

# Bonfiglioli system range ACU210/410/510/610



*This catalogue concerns Active Cube series and Active Cube accessories.  
For information about the other products showed in above overview, please refer to relevant catalogues.*

# The designation of ACUx10 series

**ACU** **410** **-** **07** **1** **F** **A**

**Version**

- A** Standard
- C** Coldplate
- L** Liquid Cooling, stainless Steel, open cooling circuit
- M** Liquid Cooling, Aluminium, closed cooling circuit

**Filter**

- F** Integrated EMI-filter
- Without EMI-filter

**Mechanical Size**

- 1** Frame Size 1
- ...
- 8** Frame Size 8

**Power**

<b>01</b> 0.25 kW	<b>18</b> 4.0 kW	<b>31</b> 30 kW	<b>49</b> 132 kW
<b>03</b> 0.37 kW	<b>19</b> 5.5 kW	<b>33</b> 37 kW	<b>51</b> 160 kW
<b>05</b> 0.55 kW	<b>21</b> 7.5 kW	<b>35</b> 45 kW	<b>53</b> 200 kW
<b>07</b> 0.75 kW	<b>22</b> 9.2 kW	<b>37</b> 55 kW	<b>55</b> 250 kW
<b>09</b> 1.1 kW	<b>23</b> 11 kW	<b>39</b> 65 kW	<b>57</b> 315 kW
<b>11</b> 1.5 kW	<b>25</b> 15 kW	<b>43</b> 75 kW	<b>59</b> 355 kW
<b>13</b> 2.2 kW	<b>27</b> 18.5 kW	<b>45</b> 90 kW	<b>61</b> 400 kW
<b>15</b> 3.0 kW	<b>29</b> 22 kW	<b>47</b> 110 kW	

**Device**

- 210** 1/3 x 230 V<sub>AC</sub>
- 410** 3 x 400 V<sub>AC</sub> / 480 V<sub>AC</sub>
- 510** 3 x 525 V<sub>AC</sub>
- 610** 3 x 690 V<sub>AC</sub>



# The order code of ACUx10 series

<b>ACU</b>	<b>410</b>	<b>-</b>	<b>07</b>	<b>1</b>	<b>F</b>	<b>A</b>	<b>S</b>	<b>B</b>	<b>X</b>	<b>S</b>	<b>X</b>	<b>0</b>
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**0** Reserved for future use

**IT Bridge\***  
**X** Without IT Bridge  
**W** With IT Bridge (Standard)

**Safety**  
**S** STO (Safe Torque Off)

**Module**  
**X** Reserved for future use

**Coating**  
**B** With Coating

**Brake Chopper**  
**X** Without BC (size 6, 7 and 8 only)  
**S** BC included (standard)

**Version**  
**A** Standard  
**C** Coldplate (Size 1 to 5)  
**L** Liquid Cooling, stainless Steel, open cooling circuit (Size 5 to 8)  
**M** Liquid Cooling, Aluminium, closed cooling circuit (Size 8)

**Filter**  
**F** Integrated EMI-Filter  
**(blank)** Without EMI-filter

**Mechanical Size**  
**1** Frame Size 1  
 ...  
**8** Frame Size 8

Power			
<b>01</b>	0.25 kW	<b>18</b>	4.0 kW
<b>03</b>	0.37 kW	<b>19</b>	5.5 kW
<b>05</b>	0.55 kW	<b>21</b>	7.5 kW
<b>07</b>	0.75 kW	<b>22</b>	9.2 kW
<b>09</b>	1.1 kW	<b>23</b>	11 kW
<b>11</b>	1.5 kW	<b>25</b>	15 kW
<b>13</b>	2.2 kW	<b>27</b>	18.5 kW
<b>15</b>	3.0 kW	<b>29</b>	22 kW
<b>31</b>	30 kW	<b>33</b>	37 kW
<b>35</b>	45 kW	<b>37</b>	55 kW
<b>39</b>	65 kW	<b>43</b>	75 kW
<b>45</b>	90 kW	<b>47</b>	110 kW
<b>49</b>	132 kW	<b>51</b>	160 kW
<b>53</b>	200 kW	<b>55</b>	250 kW
<b>57</b>	315 kW	<b>59</b>	355 kW
<b>61</b>	400 kW		

**Drive Version**  
**-** Standard  
**P** Synthetic Mains (in Progress)  
**S** Spindle Drive (in Progress)  
**W** Winding Drive (in Progress)

**Device**  
**210** 1/3 x 230 V<sub>AC</sub>  
**410** 3 x 400/480 V<sub>AC</sub>  
**510** 3 x 525 V<sub>AC</sub>  
**610** 3 x 690 V<sub>AC</sub>

**Notes:**  
 (\*) In Sizes 1...4 the IT Bridge can be permanently removed by the user.  
 Sizes 5...8 have to be ordered according to the application requirements to receive the necessary modifications ex factory.

# Hardware

## Mounting and Cooling

- Standard Cabinet Mounting with Air Cooling (all mechanical sizes)
- ColdPlate Mounting (mechanical sizes 1...5)
- Liquid Cooling (mechanical sizes 5...8)
- DIN Rail mounting (mechanical sizes 1 & 2)
- Vibration resilient mounting kit for Air Cooling devices (mechanical sizes 1...6)

## Performance

- High speed control loop and fast response time
- Both "system drive" and "servo drive"
- Optimized combination with Bonfiglioli BMD and BCR servomotor and BSR synchronous reluctance motor series

## Automation

- Small dimensions and high power density in all sizes
- "Book shape" in smaller sizes for easy integration in automation cabinets
- External 24V<sub>DC</sub> supply input for control board supply from backup systems
- Motor thermal evaluation
- Position and speed feedback input (encoder/resolver)
- Encoder support with Expansion modules: TTL, HTL, Resolver, SinCos, Hiperface, EnDat 2.1, SSI

## Electrical

- Plug in control terminals for easy and fast connection
- Plug in power terminals up to 4 kW
- DC link bus for "energy sharing" in multidrive system architectures
- Integral EMI filters (EN 61800-3) up to 9.2 kW
- Integrated brake transistor on all sizes by default, sizes 6...8 available without brake transistor as option

## Options and accessories

- Optional expansion modules to increase the I/Os and feedback acquisition of the inverter
- Optional communication modules to connect Active Cube to control devices through Fieldbus connection
- Proprietary fieldbus (System bus) for fast communication among Bonfiglioli Active Cube drives
- Multifunction keypad with monitoring and programming functions
- Drive-PC connection kit for advanced configuration with engineering software VPlus
- Comprehensive power and control cable packs for fast and easy connection of Active Cube to Bonfiglioli BMD and BCR servomotors

## Functional Safety

- Safe Torque Off (STO)
- Safe Stop 1 (SS1 c) with Safety Switch
- SIL3 (EN61800-5-2) and PL e (EN ISO13849-1)

## Robustness

- Coated boards to enhance the device resilience
- Vibration robustness according to DIN EN 60068-2-6: Test Fc and DIN EN 60068-2-27: Test Ea

# Software

## Flexibility

- Control of asynchronous motors, synchronous motors and synchronous reluctance motors (all without or with encoder feedback)
- Preset values for Bonfiglioli motors to decrease commissioning times
- Full set of operation modes, freely selectable:
  - Servo synchronous control with Resolver or Absolute encoder feedback (depending on option module)
  - Field oriented (vector) control with Absolute encoder or Incremental encoder
  - Sensorless field oriented (vector) control for all supported motor types
- Flexible assignment of digital inputs and outputs to interface with software and hardware functions
- "Motor chopper" function to increase braking power without brake resistors
- 4 independent data sets
- Flying restart

## Automation

- Easy and powerful engineering software for parameter setting, diagnostic and aided commissioning
- Integrated powerful logic functions
- Speed and position synchronization between drives through Systembus
- Master/Slave operation
- Electronic gear with optional Phasing
- PI control with advanced derivative control
- Intelligent current limits
- Motor potentiometer control via digital input, control unit and communication interface

## Servo

- Configurable position control and speed control via parameters
- Integrated motion software including homing functions and flying homing, units converter, programmable motion blocks to design and test even complex motion profiles
- Rotary table function
- S-ramps selection with separate adjustable acceleration/deceleration and jerk limitation
- Easy integration with CiA402 objects and functionality
- Auto-Tuning for angle determination (Resolver or absolute encoder) for Synchronous motors

## Safety

- Mains voltage monitoring and buffering function to overcome short time power failures
- Adjustable Motor protection functions
- Overload protection and automatic best switching frequency adjustment

## Diagnosis

- Phase monitoring
- Mean and peak values storage
- Fault register (application and device)
- Optional Extension with Keypad and PC connection

## Advanced application functions

- Power failure regulation to ramp down in a controlled way
- Spindle control with "tool change" positioning
- "Traverse" function for winders
- "Index" function for enhanced sensorless synchronization
- Advanced brake release control (lifting applications)
- Load detection function

## Engineering software

- Extended Brake Control
- Easy programming interface
- Real time oscilloscope and variable values monitor for enhanced troubleshooting analysis
- Effective and easy management of motion block parameters
- A simple and guided procedure for set up with Bonfiglioli motors (asynchronous, synchronous, synchronous reluctance)
- Logic function programming section with 32 functions

## General technical data

### Environment

#### Operating conditions

- 0°C - 40°C (40°C - 55°C with derating)
- Pollution Degree 2
- Overvoltage Category III

#### Environment class

- Operation 3K3 (EN60721-3-3)
- Relative humidity 15% ... 85%, no moisture condensation

#### Altitude of installation

- Up to 1000m (up to 4000 with derating)

#### Storage conditions

- According to EN50178

#### Protection degree (EN 60529)

- IP20 with correctly mounted covers and connection terminals

#### Environmental operation conditions according to DIN EN 60721-3-3:

- 3Z1 (negligible thermal radiation)
- 3B1 (no biological impact)
- 3C1 (chemically active substances, limits as per standard)
- 3S1 (mechanically active substances, no sand in air, limits as per standard)
- 3M4 (mechanical vibration and shocks, limits as per standard)

### Electrical

#### Rated mains voltage

- ACU 210 in the range 184-0% ... 264 V+0%
- ACU 410 in the range 320-0% ... 528 V+0%
- ACU 510 with 525 V
- ACU 610 with 690 V

#### Rated mains frequency

- 45 ... 66 Hz

#### Overload current / Peak current

- 150 % Rated current for 60 s (200 % for 0.25 and 0.37 kW)
- 200 % Rated Current for 1 s for most ratings

#### Electric protection

- Short circuit / Earth fault proof

#### Braking transistor

- Built-in by default, optionally available without in mechanical sizes 6,7 & 8

### Standards

#### CE conformity:

- 2014/35/EU (Low voltage directive)
- 2014/30/EU (Electromagnetic Compatibility Directive)
- 2011/65/EU (RoHS Directive)
- EN61800-5-1:2007 (Adjustable speed electrical power drive systems - Safety requirements - Electrical, thermal and energy)
- EN61800-3:2004 + A1:2012 (Adjustable speed electrical power drive systems - EMC requirements and specific test methods)

#### Interference immunity

- According to EN 61800-3 for use in industrial environments

#### UL/CSA approval

- UL/CSA approval, according to ul508c/CSA 22.2-No.14

## ACU210 - Technical data (from 0.25 to 3.0 kW)

ACU210-			01	03	05	07	09	11	13	15	
			Size 1 (F, A or C)					Size 2 (F, A or C)			
<b>Output, motor side<sup>(1)</sup></b>											
Recommended rated motor power	$P_n$	kW	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0	
Rated motor current output	$I_n$	A	1.6	2.5	3.0	4.0	5.4	7.0	9.5	12.5 <sup>(1)</sup>	
Rated motor voltage output	$U_n$	V	3 x (from 0 to mains voltage)								
Overload current (60 s)	$I_{oc}$	A	3.2	5.0	5.4	6.0	7.3	10.5	14.3	16.2	
Peak current (1 s)	$I_{pk}$	A	3.2	5.0	6.0	8.0	8.0	14.0	19.0	19.0	
Switching frequency	$f_c$	kHz	From 2 to 16 kHz (Default: 4 kHz)								
Output frequency	$f_n$	Hz	0 ... 599 Hz <sup>(2)</sup>								
<b>Input, mains side</b>											
Rated mains voltage	U	V	230 (184 ... 264)								
Rated current 3 ph	I	A	1.6	2.5	3.0	4.0	5.5 <sup>(4)</sup>	7.0	9.5	10.5 <sup>(4)</sup>	
Recommended Mains fuses 3ph	I	A	6	6	6	6	10	10	16	16	
Rated current 1 ph/N; 2 ph	I	A	2.9	4.5	5.4	7.2	9.5 <sup>(4)</sup>	13.2	16.5 <sup>(4)</sup>	16.5 <sup>(4)</sup>	
Recommended Mains fuses 1 ph/N; 2ph	I	A	6	10	10	10	16	16	20	20	
<b>General</b>											
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)								
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)								
Short circuit / ground fault protection	-	-	Yes								
Mounting position	-	-	Vertical								
Dimensions Standard Device	HxWxD	mm	190 x 60 x 175					250 x 60 x 175			
Dimensions ColdPlate Device	HxWxD	mm	190 x 82 x 140					250 x 85 x 140			
Weight (approx.)	m	kg	1.2					1.6			
Brake chopper	-	-	Internal brake chopper								
UL/CSA approval	-	-	ul508c/CSA 22.2-No.14								
<b>Environment</b>											
Cooling temperature	$T_n$	°C	From 0 to 40								
Relative air humidity	-	%	From 15 to 85, non-condensing								
<b>Options &amp; accessories</b>											
Screen sheet for cable screens	-	-	SCR1-2								
Pass through mounting kit	-	-	MPVS1					MPVS2			
Increased Vibration mounting kit	-	-	MNVIB1					MNVIB2			
DIN rail mounting kit	-	-	MDIN1					MDIN2			
Input line choke	-	-	External (depending on mains supply)								
EMI filter	-	-	Internal Filter: Class A2 / External Filter or external choke: Class A1 / B <sup>(3)</sup>								

### Notes:

(1) Please check the Operating Instructions for additional data

(2) Higher frequencies available on request

(3) For more details, please check the Input filter table in this catalogue

(4) Continuous operation with rated current requires a line choke

## ACU210 - Technical data (from 4.0 to 9.2 kW)

ACU210-			18	19	21	22
			Size 3 (- or F, A or C)		Size 4 (-, A or C)	
<b>Output, motor side <sup>(1)</sup></b>						
Recommended rated motor power	$P_n$	kW	4.0	5.5	7.5	9.2
Rated motor current output	$I_n$	A	18.0	22.0	32.0	35.0
Rated motor voltage output	$U_n$	V	3 x (from 0 to mains voltage)			
Overload current (60 s)	$I_{oc}$	A	26.3	30.3	44.5	51.5
Peak current (1 s)	$I_{pk}$	A	33.0	33.0	64.0	64.0
Switching frequency	$f_c$	kHz	From 2 to 16 kHz (Default: 4 kHz)			
Output frequency	$f_n$	Hz	0 ... 599 Hz <sup>(2)</sup>			
<b>Input, mains side</b>						
Rated mains voltage	U	V	230 (184 ... 264)			
Rated current 3 ph	I	A	18	20 <sup>(3)</sup>	28.2 <sup>(3)</sup>	35.6 <sup>(3)</sup>
Recommended Mains fuses	I	A	25		35	50
<b>General</b>						
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)			
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 6		0.2 ... 16	
Short circuit / ground fault protection	-	-	Yes			
Mounting position	-	-	Vertical			
Dimensions Standard Device	HxWxD	mm	250 x 100 x 200		250 x 125 x 200	
Dimensions ColdPlate Device	HxWxD	mm	250 x 125 x 144		250 x 150 x 144	
Weight (approx.)	m	kg	3.0		3.7	
Brake chopper	-	-	Internal brake chopper			
UL/CSA approval	-	-	-			
<b>Environment</b>						
Cooling temperature	$T_n$	°C	From 0 to 40			
Relative air humidity	-	%	From 15 to 85, non-condensing			
<b>Options &amp; accessories</b>						
Screen sheet for cable screens	-	-	SCR3		SCR4	
Pass through mounting kit	-	-	MPVS3		MPVS4	
Increased Vibration mounting kit	-	-	MNVIB3		MNVIB4	
Input line choke	-	-	External (depending on mains supply)			
EMI filter	-	-	For selection of EMI related components, please check the Input filter table in this catalogue			

### Notes:

(1) Please check the Operating Instructions for additional data

(2) Higher frequencies available on request

(3) Continuous operation with rated current requires a line choke

## ACU410 - Technical data (from 0.25 to 3.0 kW)

ACU410-		01	03	05	07	09	11	12	13	15		
		Size 1 (F, A or C)						Size 2 (F, A or C)				
<b>Output, motor side<sup>(1)</sup></b>												
Recommended rated motor power	P <sub>n</sub>	kW	0.25	0.37	0.55	0.75	1.1	1.5	1.85	2.2	3.0	
Rated motor current output	I <sub>n</sub>	A	1.0	1.6	1.8	2.4	3.2	3.8	4.2	5.8	7.8	
Rated motor voltage output	U <sub>n</sub>	V	3 x (from 0 to mains voltage)									
Overload current (60 s)	I <sub>oc</sub>	A	2.0	3.2	2.7	3.6	4.8	5.7	6.3	8.7	11.7	
Peak current (1 s)	I <sub>pk</sub>	A	2.0	3.2	3.6	4.8	6.4	7.6	8.4	11.6	15.6	
Switching frequency	f <sub>c</sub>	kHz	From 2 to 16 kHz (Default: 4 kHz)									
Output frequency	f <sub>n</sub>	Hz	0 ... 599 Hz <sup>(1)</sup>									
<b>Input, mains side</b>												
Rated mains voltage	U	V	400 (320 ... 528)									
Rated current 3 ph	I	A	1.0	1.6	1.8	2.4	2.8 <sup>(3)</sup>	3.3 <sup>(3)</sup>	4.2	5.8	6.8 <sup>(3)</sup>	
Recommended Mains fuses	I	A	6						6	10		
<b>General</b>												
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)									
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)									
Short circuit / ground fault protection	-	-	Yes									
Mounting position	-	-	Vertical									
Dimensions Standard Device	HxWxD	mm	190 x 60 x 175						250 x 60 x 175			
Dimensions ColdPlate Device	HxWxD	mm	190 x 82 x 140						250 x 85 x 140			
Weight (approx.)	m	kg	1.2						1.6			
Brake chopper	-	-	Internal brake chopper									
UL/CSA approval	-	-	ul508c/CSA 22.2-No.14									
<b>Environment</b>												
Cooling temperature	T <sub>n</sub>	°C	From 0 to 40									
Relative air humidity	-	%	From 15 to 85, non-condensing									
<b>Options &amp; accessories</b>												
Screen sheet for cable screens	-	-	SCR1-2									
Pass through mounting kit	-	-	MPVS1						MPVS2			
Increased Vibration mounting kit	-	-	MNVIB1						MNVIB2			
DIN rail mounting kit	-	-	MDIN1						MDIN2			
Input line choke	-	-	External (depending on mains supply)									
EMI filter	-	-	Internal Filter: Class A2 / External Filter or external choke: Class A1 / B <sup>(4)</sup>									

### Notes:

(1) Please check the Operating Instructions for additional data

(2) Higher frequencies available on request

(3) Continuous operation with rated current requires a line choke

(4) For more details, please check the Input filter table in this catalogue

## ACU410 - Technical data (from 4.0 to 15 kW)

ACU410-			18	19	21	22	23	25
			Size 2 (F, A or C)	Size 3 (- or F, A or C)			Size 4 (-, A or C)	
<b>Output, motor side <sup>(1)</sup></b>								
Recommended rated motor power	$P_n$	kW	4.0	5.5	7.5	9.2	11.0	15.0
Rated motor current output	$I_n$	A	9.0	14.0	18.0	22.0	25.0	32.0
Rated motor voltage output	$U_n$	V	3 x (from 0 to mains voltage)					
Overload current (60 s)	$I_{oc}$	A	13.5	21.0	26.3	30.3	37.5	44.5
Peak current (1 s)	$I_{pk}$	A	18.0	28.0	33.0	33.0	50.0	64.0
Switching frequency	$f_c$	kHz	From 2 to 16 kHz (Default: 4 kHz)					
Output frequency	$f_n$	Hz	0 ... 599 Hz <sup>(2)</sup>					
<b>Input, mains side</b>								
Rated mains voltage	U	V	400 (320 ... 528)					
Rated current 3 ph	I	A	7.8 <sup>(3)</sup>	14.2	15.8 <sup>(3)</sup>	20.0 <sup>(3)</sup>	26.0	28.2 <sup>(3)</sup>
Recommended Mains fuses	I	A	10.0	16.0	25.0		35.0	
<b>General</b>								
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)					
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)	0.2 ... 6			0.2 ... 16	
Short circuit / ground fault protection	-	-	Yes					
Mounting position	-	-	Vertical					
Dimensions Standard Device	HxWxD	mm	250 x 60 x 175	250 x 100 x 200			250 x 125 x 200	
Dimensions ColdPlate Device	HxWxD	mm	250 x 85 x 144	250 x 125 x 144			250 x 150 x 144	
Weight (approx.)	m	kg	1.6	3.0			3.7	
Brake chopper	-	-	Internal brake chopper					
UL/CSA approval	-	-	ul508c/CSA 22.2-No.14					
<b>Environment</b>								
Cooling temperature	$T_n$	°C	From 0 to 40					
Relative air humidity	-	%	From 15 to 85, non-condensing					
<b>Options &amp; accessories</b>								
Screen sheet for cable screens	-	-	SCR1-2	SCR3			SCR4	
Pass through mounting kit	-	-	MPVS2	MPVS3			MPVS4	
Increased Vibration mounting kit	-	-	MNVIB2	MNVIB3			MNVIB4	
DIN rail mounting kit	-	-	MDIN2	-			-	
Input line choke	-	-	External (depending on mains supply)					
EMI filter	-	-	For selection of EMI related components, please check the Input filter table in this catalogue					

**Notes:**

(1) Please check the Operating Instructions for additional data

(2) Higher frequencies available on request

(3) Continuous operation with rated current requires a line choke



## ACU410 - Technical data (from 18.5 to 65 kW)

ACU410-			27	29	31	33	35	37	39
			Size 5 (A or C or L)			Size 6 (- or N, A or L)			
<b>Output, motor side<sup>(1)</sup></b>									
Recommended rated motor power	P <sub>n</sub>	kW	18.5	22.0	30.0	37.0	45.0	55.0	65.0
Rated motor current output	I <sub>n</sub>	A	40.0	45.0	60.0	75.0	90.0	110.0	125.0
Rated motor voltage output	U <sub>n</sub>	V	3 x (from 0 to mains voltage)						
Overload current (60 s)	I <sub>oc</sub>	A	60.0	67.5	90.0	112.5	135.0	165.0	187.5
Peak current (1 s)	I <sub>pk</sub>	A	80.0	90.0	120.0	150.0	180.0	220.0	250.0
Switching frequency	f <sub>c</sub>	kHz	From 2 to 8 kHz (Default: 4 kHz)						
Output frequency	f <sub>n</sub>	Hz	0 ... 599 Hz <sup>(2)</sup>						
<b>Input, mains side</b>									
Rated mains voltage	U	V	400 (320 ... 528)						
Rated current 3 ph	I	A	42.0	50.0	58.0 <sup>(3)</sup>	87.0	104.0	105.0 <sup>(3)</sup>	120.0 <sup>(3)</sup>
Recommended Mains fuses	I	A	50.0		63.0	100.0	125.0	125.0	
<b>General</b>									
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)						
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	... 25			... 70			
Short circuit / ground fault protection	-	-	Yes						
Mounting position	-	-	Vertical						
Dimensions Standard Device	HxWxD	mm	250 x 200 x 260			400 x 275 x 260			
Dimensions ColdPlate Device	HxWxD	mm	250 x 225 x 171			-			
Dimensions Liquid Cooling Device	HxWxD	mm	480 x 300 x 220			480 x 300 x 208			
Weight Standard Device (approx.)	m	kg	8.0			20.0			
Weight ColdPlate Device (approx.)	m	kg	6.0			-			
Weight Liquid Cooling Device (approx.)	m	kg	22.0			25.0			
Brake chopper	-	-	Internal brake chopper			Internal brake chopper, optionally available without			
UL/CSA approval: Device series "A" & "C"	-	-	ul508c/CSA 22.2-No.14						
UL/CSA approval: Device series "L"	-	-	-						
<b>Environment</b>									
Cooling temperature <sup>(4)</sup>	T <sub>n</sub>	°C	From 0 to 40						
Relative air humidity	-	%	From 15 to 85, non-condensing						
<b>Options &amp; accessories</b>									
Screen sheet for cable screens	-	-	SCR5			-			
Pass through mounting kit	-	-	MPVS5			MPVS6			
Increased Vibration mounting kit	-	-	MNVIB5			MNVIB6			
Input line choke	-	-	External (depending on mains supply)						
EMI filter	-	-	For selection of EMI related components, please check the Input filter table in this catalogue						

### Notes:

(1) Please check the Operating Instructions for additional data

(2) Higher frequencies available on request

(3) Continuous operation with rated current requires a line choke

(4) When using Liquid Cooling devices, please check the Additional Operating Instructions for Liquid Cooling

## ACU410 - Technical data (from 75 to 200 kW)

ACU410-			43	45	47	49	51	53 <sup>(4)</sup>
Size 7 (- or N, A or L)								
<b>Output, motor side <sup>(1)</sup></b>								
Recommended rated motor power	$P_n$	kW	75	90	110	132	160	200
Rated motor current output	$I_n$	A	150	180	210	250	305	380
Rated motor voltage output	$U_n$	V	3 x (from 0 to mains voltage)					
Overload current (60 s)	$I_{oc}$	A	225	270	315	332	460	570
Peak current (1 s)	$I_{pk}$	A	270	325	375	375	550	680
Switching frequency	$f_c$	kHz	From 2 to 8 kHz (Default: 4 kHz)					
Output frequency	$f_n$	Hz	0 ... 599 Hz <sup>(2)</sup>					
<b>Input, mains side</b>								
Rated mains voltage	U	V	400 (320 ... 528)					
Rated current 3 ph	I	A	143 <sup>(5)</sup>	172 <sup>(5)</sup>	208 <sup>(5)</sup>	249 <sup>(5)</sup>	302 <sup>(5)</sup>	377 <sup>(5)</sup>
Recommended Mains fuses	I	A	160	200	250	315	400	500
<b>General</b>								
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)					
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	... 2x95			... 2x120		
Short circuit / ground fault protection	-	-	Yes					
Mounting position	-	-	Vertical					
Dimensions <sup>(3)</sup>	HxWxD	mm	510 x 412 x 351			510 x 412 x 389		
Weight (approx.)	m	kg	48		48		52	
Brake chopper	-	-	Internal brake chopper, optionally available without					
UL/CSA approval: Device series "A"	-	-	ul508c/CSA 22.2-No.14			-		
UL/CSA approval: Device series "L"	-	-	-			-		
<b>Environment</b>								
Cooling temperature <sup>(6)</sup>	$T_n$	°C	From 0 to 40					
Relative air humidity	-	%	From 15 to 85, non-condensing					
<b>Options &amp; accessories</b>								
Pass through mounting kit			MPVS7					
Input line choke	-	-	External (depending on mains supply)					
EMI filter	-	-	For selection of EMI related components, please check the Input filter table in this catalogue					

### Notes:

(1) Please check the Operating Instructions for additional data

(2) Higher frequencies available on request

(3) Dimensions are the same for Standard and Liquid

(4) -53 is available as Liquid Cooling device

(5) Operation requires a line choke

(6) When using Liquid Cooling devices, please check the Additional Operating Instructions for Liquid Cooling

## ACUx10 - Technical data (from 160 to 400 kW)

ACU410-/510-/610-			51	53	55	57	59	61	
Size 8 (- or N, A or L or M)									
<b>Output, motor side<sup>(1)</sup></b>									
Recommended rated motor power	$P_n$	kW	160	200	250	315	355	400	
ACU410	Rated motor current output	$I_n$	A	305	380	475	595	645	735
	Long-term overload current (60s)	$I_{oc}$	A	460	570	715	895	970	1100
	Short-term overload current (1s)	$I_{pk}$	A	550	685	855	1070	1160	1330
ACU510	Rated motor current output	$I_n$	A	230	290	360	450	490	560
	Long-term overload current (60s)	$I_{oc}$	A	345	435	540	675	735	840
	Short-term overload current (1s)	$I_{pk}$	A	420	520	650	810	880	1000
ACU610	Rated motor current output	$I_n$	A	180	230	280	350	400	450
	Long-term overload current (60s)	$I_{oc}$	A	270	350	420	530	600	675
	Short-term overload current (1s)	$I_{pk}$	A	330	420	510	630	720	810
Rated motor voltage output	$U_n$	V	Maximum input voltage, three-phase						
Switching frequency	$f_c$	kHz	From 2 to 8 kHz (Default: 4 kHz)						
Output frequency	$f_n$	Hz	0 ... 500 Hz						
<b>Input, mains side</b>									
ACU410	Rated mains voltage	U	V	400 (320 ... 528)					
	Rated current 3 ph <sup>(2)</sup>	I	A	280 <sup>(4)</sup>	350 <sup>(4)</sup>	440 <sup>(4)</sup>	550 <sup>(4)</sup>	620 <sup>(4)</sup>	690 <sup>(4)</sup>
	Recommended Mains fuses 3 ph <sup>(3)</sup>	I	A	400	500	630	700	800	900
ACU510	Rated mains voltage	U	V	525					
	Rated current 3 ph <sup>(2)</sup>	I	A	215 <sup>(4)</sup>	270 <sup>(4)</sup>	335 <sup>(4)</sup>	420 <sup>(4)</sup>	470 <sup>(4)</sup>	525 <sup>(4)</sup>
	Recommended Mains fuses 3 ph <sup>(3)</sup>	I	A	315	350	450	550	630	700
ACU610	Rated mains voltage	U	V	690 (reduced for UL: 600)					
	Rated current 3 ph <sup>(2)</sup>	I	A	160 <sup>(4)</sup>	200 <sup>(4)</sup>	250 <sup>(4)</sup>	320 <sup>(4)</sup>	360 <sup>(4)</sup>	410 <sup>(4)</sup>
	Recommended Mains fuses 3 ph <sup>(3)</sup>	I	A	252	315	350	450	500	550
<b>General</b>									
Connection Signal terminals <sup>(1)</sup>	A	mm <sup>2</sup>	0.2 ... 1.5 (detachable terminals)						
Connection Power terminals <sup>(1)</sup>	A	mm <sup>2</sup>	... 2x240						
Short circuit / ground fault protection <sup>(3)</sup>	-	-	Yes						
Mounting position	-	-	Vertical						
Dimensions	HxWxD	mm	1063 x 439 x 375						
Weight (approx.)	m	kg	120	120	120	140	140	140	
Brake chopper	-	-	Internal brake chopper, optionally available without						
UL/CSA approval	-	-	Available on request						
<b>Environment</b>									
Cooling temperature <sup>(5)</sup>	$T_n$	°C	-25 ... 45						
Relative air humidity	-	%	From 15 to 85, non-condensing						
<b>Options &amp; accessories</b>									
Input line choke	-	-	External (depending on mains supply)						
EMI filter	-	-	For selection of EMI related components, please check the Input filter table in this catalogue						

### Notes:

(1) Please check the Operating Instructions for additional data

(2) Related value with recommended motor power, rated mains voltage and mains inductance  $U_k=4\%$

(3) Semiconductor fuses recommended (in example Bussmann Type 170M)

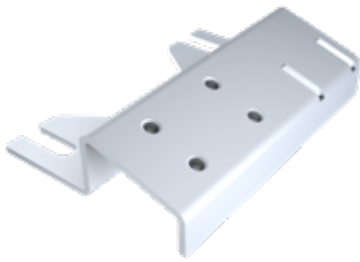
(4) Operation requires a line choke

(5) When using Liquid Cooling devices, please check the Additional Operating Instructions for Liquid Cooling

## Screen plates

### SCR1-2, SCR3, SCR4, SCR5

For the mechanical sizes 1 to 5 screen plates are available for the mounting of electrical cable screens.



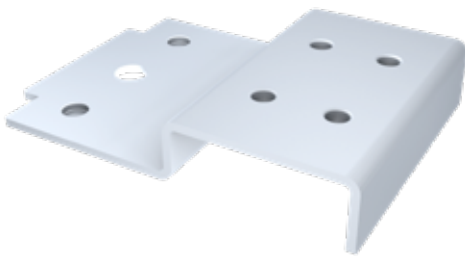
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SCR1-2



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SCR3



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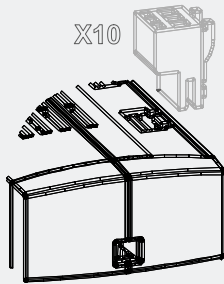
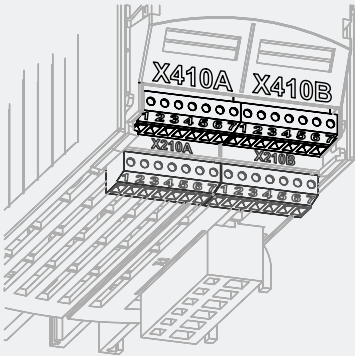
SCR4



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SCR5

# Control terminals



### CONTROL TERMINAL X210A

X210A.1	Voltage output DC +20 V or input for external power supply DC 24 V $\pm 10\%$	
X210A.2	GND 20 V/ GND 24 V (ext.)	
X210A.3	Digital Input STOA (first shut-down path)	
X210A.4	Digital input <sup>(1)</sup>	Start Clockwise (default setting)
X210A.5	Digital input <sup>(1)</sup>	Start Anticlockwise (default setting)
X210A.6	Digital input <sup>(1)</sup>	Data Set Changeover 1 (default setting)
X210A.7	Digital input <sup>(1)</sup>	Data Set Changeover 2 (default setting)

### CONTROL TERMINAL X210B

X210B.1	Digital input <sup>(1)</sup>	
X210B.2	Digital input STOB (second shut-down path)	
X210B.3	MF3: Digital input / digital output <sup>(1)</sup>	
X210B.4	MF2: Multifunction input/output (1) (voltage signal, proportional actual frequency, default setting), digital input	
X210B.5	Supply voltage DC +10 V for reference value potentiometer, ( $I_{max} = 4$ mA)	
X210B.6	MF1: Multifunction input <sup>(1)</sup> 0V ... +10V, $\pm 10V$ , PT1000/KTY, 0 ... 20 mA	
X210B.7	Ground 10 V	

### RELAY OUTPUT X10

S3OUT	Parameterizable relay output
-------	------------------------------

(1) Control terminals are freely configurable.

### CONTROL TERMINAL X410A

X410A.1	Depends on selected Expansion module
X410A.2	Depends on selected Expansion module
X410A.3	Depends on selected Expansion module
X410A.4	Depends on selected Expansion module
X410A.5	Depends on selected Expansion module
X410A.6	Depends on selected Expansion module
X410A.7	Depends on selected Expansion module

### CONTROL TERMINAL X410B

X410B.1	Depends on selected Expansion module
X410B.2	Depends on selected Expansion module
X410B.3	Depends on selected Expansion module
X410B.4	Depends on selected Expansion module
X410B.5	Depends on selected Expansion module
X410B.6	Depends on selected Expansion module
X410B.7	Depends on selected Expansion module

# Option modules

Active Cube is designed to give the highest flexibility in drive hardware to suit every control requirement. Machine designers can select from an extensive range of possible expansion hardware modules that can be fitted directly into the 3 available slots on the standard Active Cube unit. Mounting and connection is fast and easy thanks to onboard fastening devices.

Using option modules, Active Cube features and integration ability can be greatly expanded: the number of possible hardware configurations offers solutions for a wide variety of requirements and applications.

Build the best hardware configuration of Active Cube for your machine!

## Hardware modularity



### Interface module

Connection of optional control unit KP500, serial interface adapter KP232, or the control unit remote cable for accessory KPCMK

## Hardware modularity



### CM communication module

Connection panel for various communication protocols:

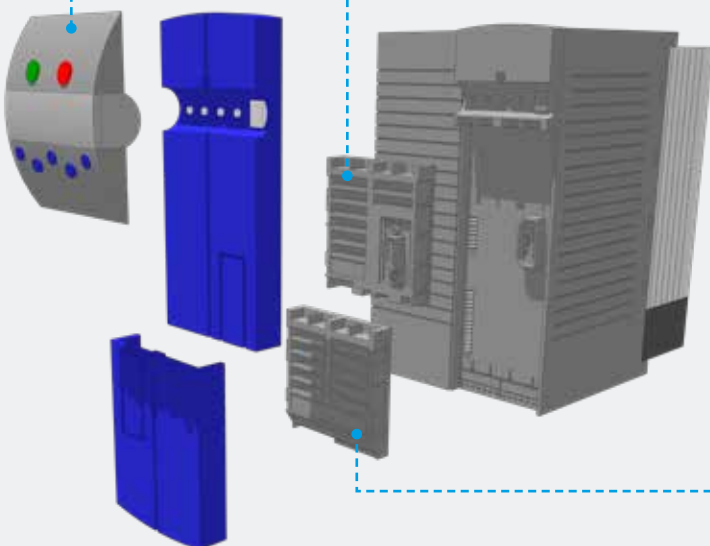
- CM-232, RS-232 interface
- CM-485, RS-485 interface
- CM-PDP V1, Profibus DP V1 interface
- CM-CAN, CANopen interface
- CM-DEV, DeviceNet interface
- CM-EtherCAT®, EtherCAT® interface
- CM-Profinet, Profinet interface
- CM-VABus/TCP, Ethernet VABus/TCP interface
- Other protocols on request



### EM expansion module

Connection panel for adaptation of control inputs and outputs to the various applications on the basis of specific customer requirements:

- EM-IO, analog and digital inputs and outputs, available in 4 variants
- EM-ENC, speed sensor interface, frequency output and system bus, available in 5 variants
- EM-RES, resolver interface, frequency output and system bus, available in 3 variants
- EM-SYS, system bus for Systembus communication (On request, system bus combined with CM-CAN communication module)
- EM-ABS, absolute encoder module
- Other customised modules available on request









## Option modules

Option modules can be ordered either separately or together with ACU base unit, as an “extended” power package.

The majority of Active Cube option modules can also be used in the Active series, thus allowing drives from both series to be easily used in the same automation system.

Select from below the hardware module to customize Active Cube and build a unique drive which best fits to the needs of your application.

		AI	AO	DI	DO	RELAY	RF	SPEED ENCODER		SYSTEM BUS
								TYPE (s)	ZERO PULSE	
Basic equipment of Active Cube		1 <sup>(2)</sup>	-	6 <sup>(3)</sup>	1	1	-	HTL	yes	yes
	EM-IO-01	1	1	3	-	2	-	HTL	yes	yes
	EM-IO-02	1	1	3	-	1	-	HTL	yes	yes
	EM-IO-03	1	2	2	-	1	-	HTL	no	yes
	EM-IO-04	-	-	2	1 <sup>(1)</sup>	-	-	-	-	yes
	EM-ENC-01	1	-	-	-	-	yes <sup>(5)</sup>	TTL & HTL	no	yes
	EM-ENC-02	1	1	-	1 <sup>(1)</sup>	-	-	TTL & HTL	no	yes
	EM-ENC-03	-	-	-	-	-	-	TTL & HTL	no	yes
	EM-ENC-04	1	1	-	-	1	-	TTL & HTL	yes	no
	EM-ENC-05	1	1	-	-	-	-	TTL & HTL	yes	yes
	EM-RES-01	1	-	-	-	-	yes <sup>(5)</sup>	Resolver		yes
	EM-RES-02	1	-	-	-	-	yes <sup>(6)</sup>	Resolver		no
	EM-RES-03	1	-	3	2	-	-	Resolver <sup>(4)</sup>		yes
	EM-SYS	-	-	-	-	-	-	-	-	yes
	EM-ABS-01	1	-	3	2	-	yes <sup>(5)</sup>	EnDat 2.1, Hiperface, SSI		yes

1) Can be used as digital input alternatively

2) MF1 can be used as digital input alternatively

3) One is used for control enable. DI can be used for encoder 1 if required.

4) EM-RES-03: Resolver and PTC are run through a DSub 9 connector.



5) Repetition frequency without Zero Pulse

6) Repetition frequency with Zero Pulse

RF: Repetition frequency, speed sensor simulation.

All inputs/outputs are realized with disconnectable terminals

### COMMUNICATION

	CM-CAN	Connectors realized with DSUB-9 connector	
	CM-PDPV1		
	CM-485		
	CM-232		
	CM-CAN-T		Bus connection via Spring-type terminal
	CM-PDPV1-T		
	CM-485-T		
CM-DEV			
	CM-EtherCAT	EtherCAT module with 2 usable RJ45 ports	
	CM-ProfiNet	PROFINET module with 1 usable RJ45 port	
	CM-Ethernet/IP	Ethernet/IP module with 1 usable RJ45 port	
	CM-Ethernet/IP-2P	Ethernet/IP module with 2 usable RJ45 ports	
	CM-Modbus/TCP	Modbus/TCP module with 1 usable RJ45 port	
	CM-Modbus/TCP-2P	Modbus/TCP module with 2 usable RJ45 ports	
	CM-VABus/TCP	VABus/TCP module with 1 usable RJ45 port	
	CM-VABus/TCP-2P	VABus/TCP module with 2 usable RJ45 ports	


## Control unit / KP500

Active Cube is designed to give the highest flexibility in drive hardware to suit every control requirement. Machine designers can select from an extensive range of possible expansion hardware modules that can be fitted directly into the 3 available slots on the standard Active Cube unit. Mounting and connection is fast and easy thanks to onboard fastening devices.

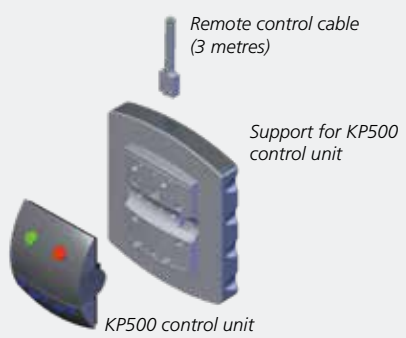
Using option modules, Active Cube features and integration ability can be greatly expanded: the number of possible hardware configurations offer solutions for a wide variety of requirements and applications.

Build the best hardware configuration of Active Cube for your machine!



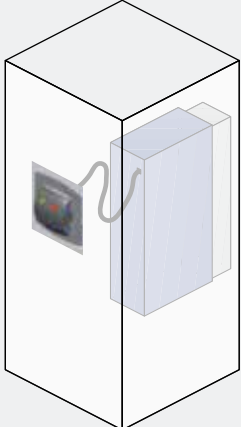


**Control unit remote installation kit / KPCMK**  
The KPCMK kit is used to remotely control the inverter from the KP500 unit.

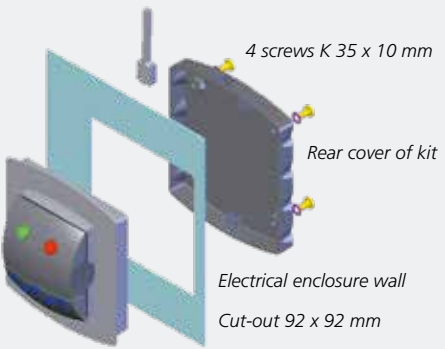


*Remote control cable (3 metres)*  
*Support for KP500 control unit*  
*KP500 control unit*

**Handheld remote control unit**



**Remote installation on exterior of enclosure**



*4 screws K 35 x 10 mm*  
*Rear cover of kit*  
*Electrical enclosure wall*  
*Cut-out 92 x 92 mm*

**Fixing to enclosure**



## Interface / KP-232



Serial interface KP232 can be used as an alternative to control unit KP500. This connection enables parameterisation, monitoring, setting management, inverter control and even commissioning from a PC or laptop computer. The serial point-to-point connection between inverter and PC complies with specifications for transmission between data terminals (DTE) and data communication equipment (DCE), requiring, in this mode, a serial pin-to-pin cable with SUBD-9 male connector on the inverter side.

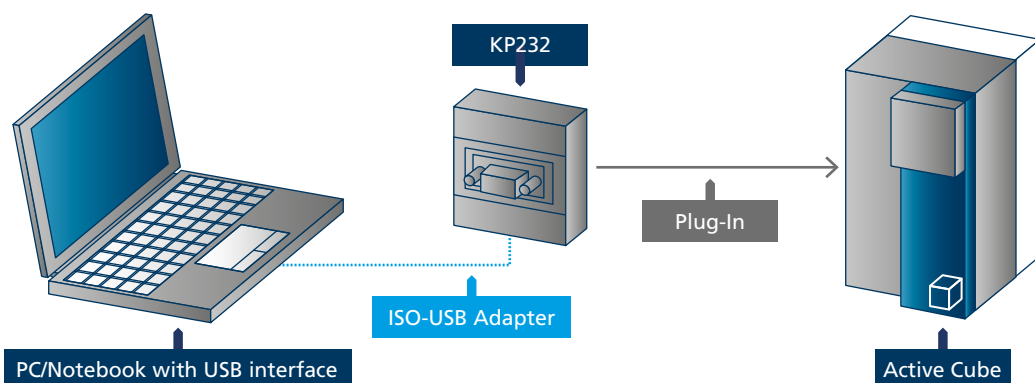
The KP232 interface is compatible with lines up to 15 metres. The serial transmission protocol ensures high data security and does not require handshake signals between computer and inverter.

TECHNICAL DATA	
Baud rate (kBaud)	Up to 115.2 kb

**ISO-USB Interface**

The ISO-USB Interface links the KP232 or CM-232 to a USB port of your PC. This interface uses an isolated USB/RS232 converter to improve the robustness against possible EMC disturbances. This Interface can be used with PCs using Windows 10, Windows 8/8.1, Windows Vista and Windows XP with FTDI drivers provided with the VPlus installation package. The Interface uses USB serial numbers and therefore the PC is able to assign uniquely the COM port.

The USB side is compatible with USB1.1 and USB2.0.



# Communication Modules

For integration into field bus networks you can install an optional module with an additional network interface.

Active Cube inverters can therefore be integrated in existing fieldbus networks simply by adapting inverter communications to the hardware and software of the existing communications standard.

Active Cube inverters share the same communication module platform with other Bonfiglioli inverter series like Agile reducing stock costs when using different Bonfiglioli inverter series. They also profit from the same plug & play functionality, so that the inverter recognises and enables the new module automatically as soon as it is powered on.



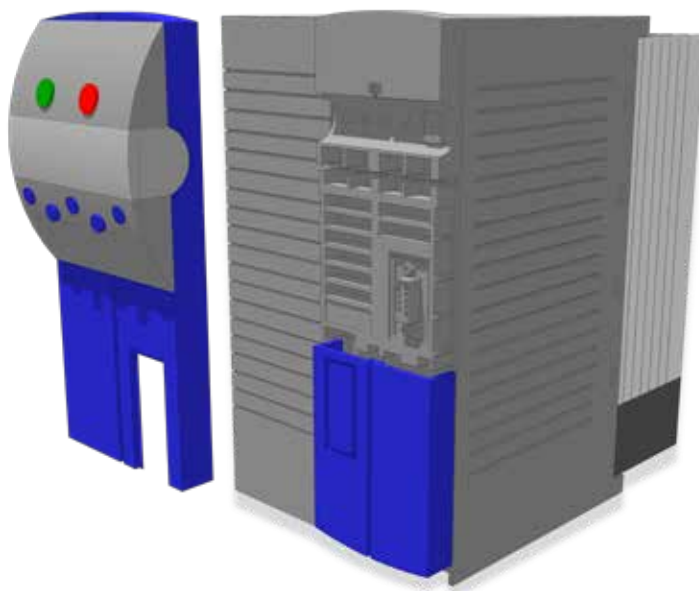
Active Cube inverters support various communication standards with option modules. See the table alongside.

All optional modules are identical in shape and size, but differ in electronic functioning according to the standards of the type of field bus they communicate with.

Communication modules are installed in slots in the front of the inverter. Simply remove the protective cover to access the slots. A secure push-fit ensures an efficient electrical connection.

With the front panel removed, the connector (typically SUBD-9 or RJ45) for the communication module is also accessible.

Field bus	Optional module
CANopen	CM-CAN
Profibus DP V1	CM-PDP-V1
RS-232	CM-232
RS-485 Modbus	CM-485
DeviceNet	CM-DeviceNet
EtherCAT	CM-EtherCAT
Profinet	CM-Profinet
	CM-Ethernet/IP
Ethernet	CM-Ethernet/IP-2P
	CM-Modbus/TCP
Modbus/TCP	CM-Modbus/TCP-2P
	CM-VABus/TCP
VABus/TCP	CM-VABus/TCP-2P



# System bus / EM-SYS module



The "System Bus" of Active Cube inverters is a proprietary communication bus, based on CANopen protocol that allows fast exchange of data between the inverters and access, by a system bus master, to the parameters of all devices connected on the network.

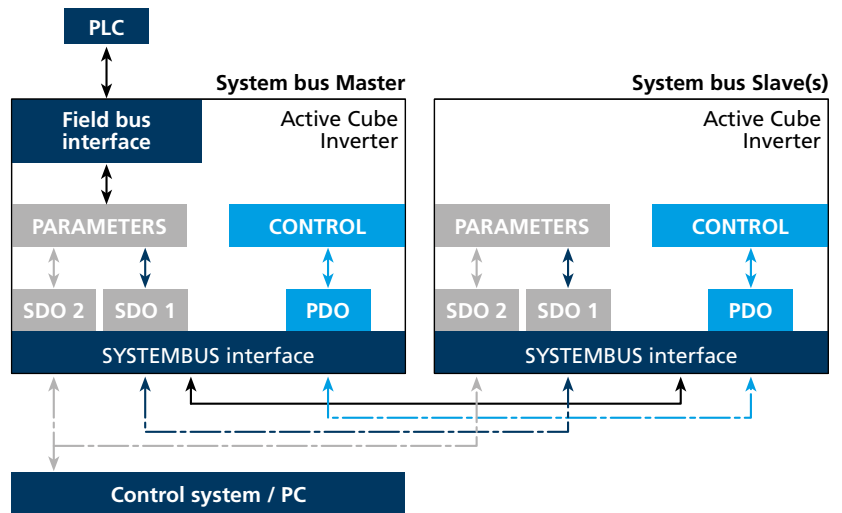
The system bus nodes (max. 64) are connected by a three-wire line.

The Bus termination (at either first or last node) can be activated via DIP switches of the EM-SYS module.

The system bus is equipped with three PDO (Process Data Object) channels that allow rapid exchanges of process data for each inverter. There are also two SDO (Service Data Object) channels for parameterisation purposes.

Thanks to the three PDO channels, with one transmission and one reception channel, all inverter data can be transmitted. Among other advantages, this makes it possible to create master/slave and daisy chain configurations easily, while ensuring very high precision and speed.

Each transmission and reception channel includes 8 bytes that can be freely occupied by objects, thereby offering the maximum flexibility for a very broad range of applications. The selection of transmission objects and reception objects is made easy by the VPlus program, and no additional configuration tools are needed.



# Expansion module EM-IO-xx

The EM-IO-xx expansion module extends the number of the standard inputs and outputs provided on the Active Cube inverter for connection of various applications.

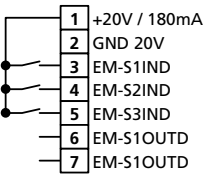
Analog inputs and outputs can be available also with bipolar signals and must therefore be configured with inverter parameters.

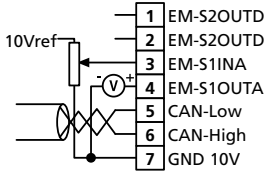
The supplementary digital inputs provided on the expansion module are electrically equivalent to the standard inputs. The relay changer contact represents an alternative for the activation of high power to the relay output available as a standard feature.

Systembus is available on three control terminals and supports easy control of decentralised drive systems.

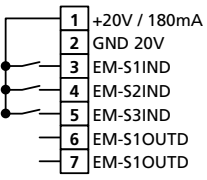


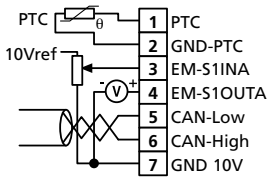
## EM-IO-01

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	20 V power supply output (180 mA)
	X410A.2	GND 20 V
	X410A.3	EM-S1IND multifunction digital input $V_{max} = 30\text{ V}$ (24 V/10 mA), PLC compatible
	X410A.4	EM-S2IND multifunction digital input $V_{max} = 30\text{ V}$ (24 V/10 mA), PLC compatible
	X410A.5	EM-S3IND multifunction digital input $V_{max} = 30\text{ V}$ (24 V/10 mA), PLC compatible
	X410A.6	EM-S1OUTD multifunction relay output, $U_{max} = 24\text{ V}$ , 1 A (ohmic)
	X410A.7	

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	EM-S2OUTD multifunction relay output, $U_{max} = 24\text{ V}$ , 1 A (ohmic)
	X410B.2	
	X410B.3	EM-S1INA +/- 10 V or +/- 20 mA analog input
	X410B.4	EM-S1OUTA +/- 10 V multifunction analog output
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-IO-02

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	20 V power supply output (180 mA)
	X410A.2	GND 20 V
	X410A.3	EM-S1IND multifunction digital input $V_{max} = 30\text{ V}$ (24 V/10 mA), PLC compatible
	X410A.4	EM-S2IND multifunction digital input $V_{max} = 30\text{ V}$ (24 V/10 mA), PLC compatible
	X410A.5	EM-S3IND multifunction digital input $V_{max} = 30\text{ V}$ (24 V/10 mA), PLC compatible
	X410A.6	EM-S1OUTD multifunction relay output, $U_{max} = 24\text{ V}$ , 1 A (ohmic)
	X410A.7	

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Input for motor PTC
	X410B.2	GND for motor PTC
	X410B.3	EM-S1INA +/- 10 V or +/- 20 mA analog input
	X410B.4	EM-S1OUTA +/- 10 V multifunction analog output
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-IO-03

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	20 V power supply output (180 mA)
	X410A.2	GND 20 V
	X410A.3	EM-S2OUTA analog output 0(4)-20 mA, $U_{max} = 10$ V
	X410A.4	EM-S2IND multifunction digital input $V_{max} = 30$ V (24 V/10 mA), PLC compatible
	X410A.5	EM-S3IND multifunction digital input $V_{max} = 30$ V (24 V/10mA), PLC compatible
	X410A.6	EM-S1OUTD multifunction relay output, $U_{max} = 24$ V, 1 A (ohmic)
	X410A.7	

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Input for motor PTC
	X410B.2	GND for motor PTC
	X410B.3	EM-S1INA +/- 10 V or +/- 20 mA analog input
	X410B.4	EM-S1OUTA +/- 10 V analog output
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-IO-04

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Voltage output 20 V
	X410A.2	GND 20 V
	X410A.3	Digital input EM-S2IND
	X410A.4	Voltage output 20 V
	X410A.5	GND 20 V
	X410A.6	Digital input EM-S3IND
	X410A.7	Voltage output 20 V

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Motor PTC thermistor connection EM-MPTC or connection motor temperature sensor EM-KTY
	X410B.2	
	X410B.3	Digital Port EM-S1IOD / Digital input or digital output
	X410B.4	GND 20 V
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

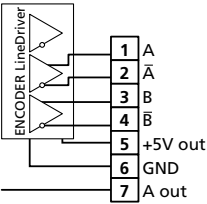
# Speed sensor modules EM-ENC-xx

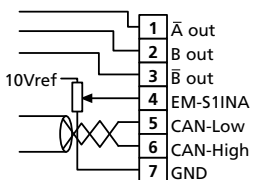
The EM-ENC-xx expansion module extends the number of speed sensor inputs of terminal board of the frequency inverter, and also increases the number of configurable pulse outputs with encoder repetition output with encoder repetition output.

EM-ENC-xx is able to acquire both TTL and HTL incremental speed sensors according to standard EIA RS422 (line driver) with 5-volt logic. The EM-ENC-xx speed sensor module is equipped with connection terminals for signals A,  $\bar{A}$ , B and  $\bar{B}$  of the line driver speed sensor and terminals for repetition output of the same signals (speed sensor emulation). This makes it possible to create master-slave configurations between several separate units using output signals of one unit as input signals of the next.

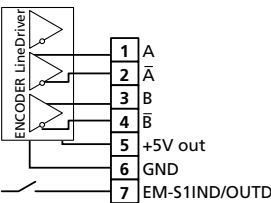


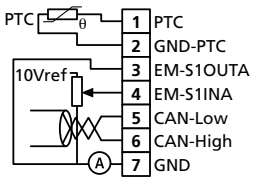
## EM-ENC-01

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Channel A speed sensor input
	X410A.2	Channel $\bar{A}$ speed sensor input
	X410A.3	Channel B speed sensor input
	X410A.4	Channel $\bar{B}$ speed sensor input
	X410A.5	+ 5 V (200 mA) power supply output
	X410A.6	5 V power supply GND
	X410A.7	Channel A repetition frequency output

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Channel $\bar{A}$ repetition frequency output
	X410B.2	Channel B repetition frequency output
	X410B.3	Channel $\bar{B}$ repetition frequency output
	X410B.4	EM-S1INA +/- 10 V or +/- 20 mA analog input
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-ENC-02

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Channel A speed sensor input
	X410A.2	Channel $\bar{A}$ speed sensor input
	X410A.3	Channel B speed sensor input
	X410A.4	Channel $\bar{B}$ speed sensor input
	X410A.5	+ 5 V (200 mA) power supply output
	X410A.6	5V power supply GND
	X410A.7	EM-S1IND/OUTD digital input/output

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Input for motor PTC
	X410B.2	GND for motor PTC
	X410B.3	EM-S1OUTA 0 ... 20 mA analog output
	X410B.4	EM-S1INA +/- 10 V and +/- 20 mA analog input
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-ENC-03

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Channel A speed sensor input
	X410A.2	Channel $\bar{A}$ speed sensor input
	X410A.3	Channel B speed sensor input
	X410A.4	Channel $\bar{B}$ speed sensor input
	X410A.5	-
	X410A.6	GND
	X410A.7	-

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	-
	X410B.2	-
	X410B.3	-
	X410B.4	-
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-ENC-04

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Channel A speed sensor input
	X410A.2	Channel $\bar{A}$ speed sensor input
	X410A.3	Channel B speed sensor input
	X410A.4	Channel $\bar{B}$ speed sensor input
	X410A.5	Channel Z speed sensor input
	X410A.6	Channel $\bar{Z}$ speed sensor input
	X410A.7	+ 5 V power supply output (200mA)

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	+ 20 V power supply output (180 mA)
	X410B.2	Power supply GND
	X410B.3	$\pm 10$ V analog output
	X410B.4	EM-S1INA +/- 10 V or +/- 20 mA analog input
	X410B.5	EM-S1OUTD multifunction relay output, $U_{max} = 24$ V, 1 A (ohmic)
	X410B.6	
	X410B.7	GND

## EM-ENC-05

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Channel A speed sensor input
	X410A.2	Channel $\bar{A}$ speed sensor input
	X410A.3	Channel B speed sensor input
	X410A.4	Channel $\bar{B}$ speed sensor input
	X410A.5	Channel Z speed sensor input
	X410A.6	Channel $\bar{Z}$ speed sensor input
	X410A.7	+ 5 V power supply output (200mA)

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	+ 20 V power supply output (180 mA)
	X410B.2	Power supply GND
	X410B.3	$\pm 10$ V analog output
	X410B.4	EM-S1INA +/- 10 V and +/- 20 mA analog input
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

# Resolver Module EM-RES-01/EM-RES-02

- Resolver evaluation
- Frequency repetition output (Two channels without Zero-Pulse channel)
- Analog input
- Systembus



## EM-RES-01

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	(+) ~4 V <sub>rms</sub> resolver power supply
	X410A.2	(-) (I <sub>max</sub> = 60mA)
	X410A.3	Resolver sinθ signal input
	X410A.4	
	X410A.5	Resolver cosθ signal input
	X410A.6	
	X410A.7	Channel A Repetition frequency output

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Channel $\bar{A}$ Repetition frequency output
	X410B.2	Channel B Repetition frequency output
	X410B.3	Channel $\bar{B}$ Repetition frequency output
	X410B.4	± 10 V or ± 20 mA analog input
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

## EM-RES-02

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	(+) ~4 V <sub>rms</sub> resolver power supply
	X410A.2	(-) (I <sub>max</sub> = 60mA)
	X410A.3	Resolver sinθ signal input
	X410A.4	
	X410A.5	Resolver cosθ signal input
	X410A.6	
	X410A.7	Channel A Repetition frequency output

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	Channel $\bar{A}$ Repetition frequency output
	X410B.2	Channel B Repetition frequency output
	X410B.3	Channel $\bar{B}$ Repetition frequency output
	X410B.4	±10 V or ± 20 mA analog input
	X410B.5	Channel Z Repetition frequency output
	X410B.6	Channel $\bar{Z}$ Repetition frequency output
	X410B.7	GND



# Resolver Module EM-RES-03



EM-RES-03 resolver module extends the standard functions of Active Cube servo inverter providing a supplementary input for resolver.

It is designed specifically for BMD/BCR synchronous servomotors resolver feedback acquisition. EM-RES-03 is equipped with a DSUB-9 connector, that allows fast and easy connection to Bonfiglioli synchronous servomotors, when using BMD/BCR power and control cables.

## EM-RES-03

TERMINAL BOARD X410A	TERMINAL	FUNCTION
<p>1 +24 V / 180 mA 2 GND 24 V 3 EM-S1OUTD 4 EM-S2OUTD 5 N.C. 6 EM-S1INA 7 GND 10 V</p>	X410A.1	DC-24 V output (max. 180 mA)
	X410A.2	Ground 24 V
	X410A.3	Digital output EM-S1OUTD
	X410A.4	Digital output EM-S2OUTD
	X410A.5	Not connected
	X410A.6	EM-S1INA +/- 10 V analog input
	X410A.7	GND

TERMINAL BOARD X410B	TERMINAL	FUNCTION
<p>1 N.C. 2 EM-S1IND 3 EM-S2IND 4 EM-S3IND 5 CAN-Low 6 CAN-High 7 GND</p>	X410B.1	Not connected
	X410B.2	Digital input EM-S1IND
	X410B.3	Digital input EM-S2IND
	X410B.4	Digital input EM-S3IND
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

RESOLVER- AND PTC INPUT (DSUB-9)	PIN	DESIGNATION	FUNCTION
	Socket	Shielding	Connected with PE
	1	PE	Protective earth conductor
	2	PTC+	PTC thermistor connection
	3	COS+	Cosinus track
	4	SIN+	Sinus track
	5	+UE	Excitation voltage (7 V <sub>rms</sub> )
	6	PTC-	PTC thermistor connection
	7	COS-	Cosinus track
	8	SIN-	Sinus track
9	-UE	Excitation voltage (7 V <sub>rms</sub> )	

# Absolute encoder Module EM-ABS-01

The expansion module EM-ABS-01 extends the ability of Active Cube inverter to acquire an absolute encoder feedback through a DSUB-15 connector.

The following encoder standards can be connected to the drive via EM-ABS-01:

- SinCos (optionally with commutation tracks for synchronous motors)
- Endat 2.1 with SinCos track
- Hiperface
- SSI (optionally with TTL[RS-422] or SinCos track)

Additional signal and functions are available when using EM-ABS-01:

- System bus CAN (Can interface ISO-DIS 11898, CAN High Speed, max 1 Mbaud)
- Analog input DC -10..+10V or DC 0..+10V
- 3 digital inputs
- 2 digital outputs



## EM-ABS-01

TERMINAL BOARD X410A	TERMINAL	FUNCTION
	X410A.1	Voltage input DC 24 V
	X410A.2	GND DC 24 V
	X410A.3	Digital output EM-S10UTD
	X410A.4	Digital output EM-S20UTD
	X410A.5	Voltage output DC 5 ... 12 V
	X410A.6	EM-S1INA +/- 10 V analog input
	X410A.7	GND

TERMINAL BOARD X410B	TERMINAL	FUNCTION
	X410B.1	GND
	X410B.2	Digital input EM-S1IND
	X410B.3	Digital input EM-S2IND
	X410B.4	Digital input EM-S3IND
	X410B.5	CAN-Low Systembus
	X410B.6	CAN-High Systembus
	X410B.7	GND

CONTACT	FUNCTION			
	Sin/Cos	Hiperface	EnDat 2.1	SSI
	Housing	PE	PE	PE
	1	D-		Clock-
	2	D+		Clock+
	3	Cos-	Cos-	B- / Cos-
	4	Cos+	Cos+	B+ / Cos+
	5	TM <sub>PTC</sub> -	TM <sub>PTC</sub> -	TM <sub>PTC</sub> -
	6	V <sub>ENC</sub>	V <sub>ENC</sub>	V <sub>ENC</sub>
	7	R-		
	8	C-	Data-	Data-
	9	Sin-	Sin-	A- / Sin-
	10	TM <sub>PTC</sub> +	TM <sub>PTC</sub> +	TM <sub>PTC</sub> +
	11	V <sub>ENC</sub> Sensor		V <sub>ENC</sub> Sensor
	12	R+		
	13	C+	Data+	Data+
	14	Sin+	A+ / Sin+	A+ / Sin+
15	GND	GND	GND	

## Safe Torque Off (STO)

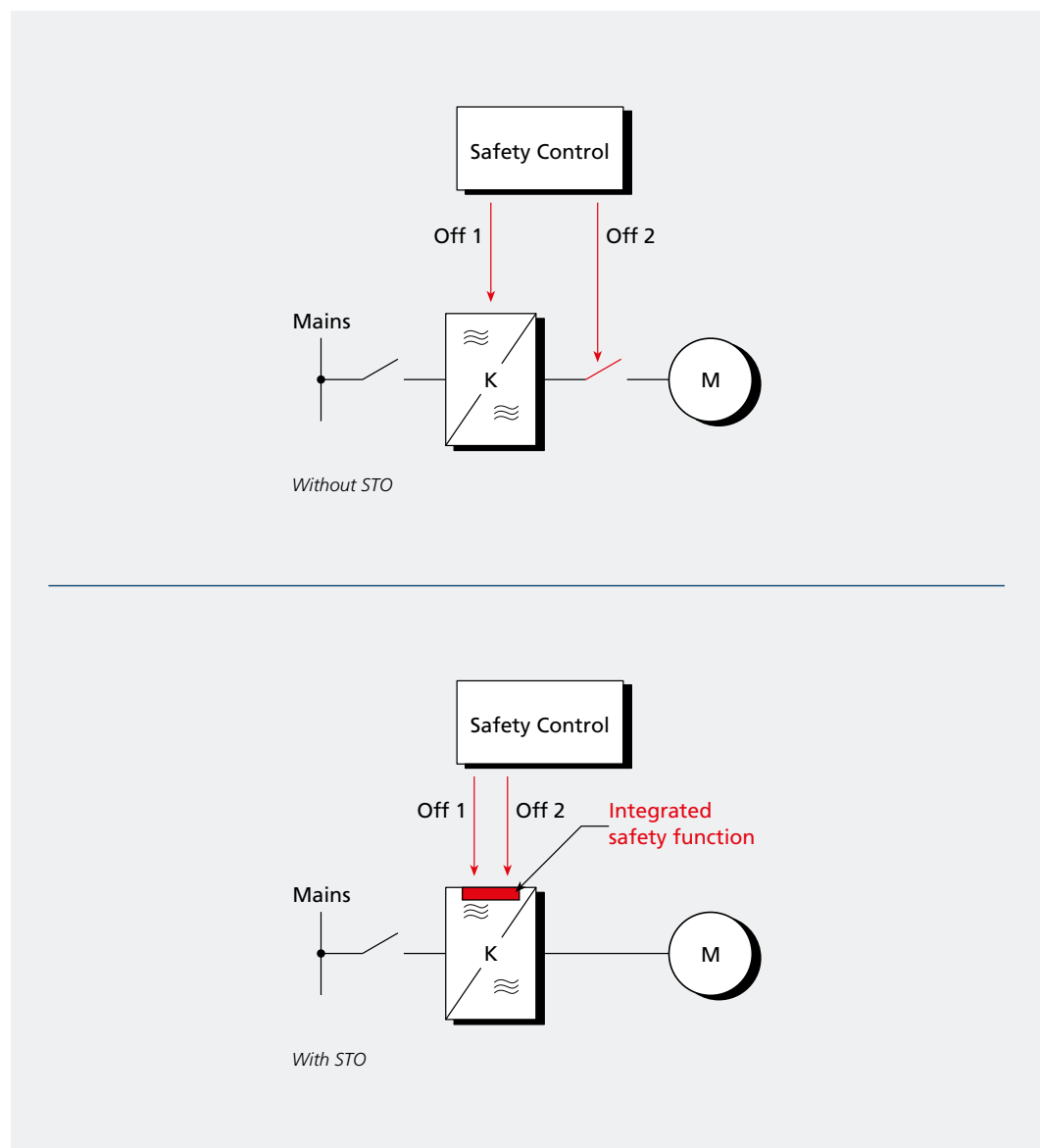
The Functional Safety Function "Safe Torque Off" (STO) with the safety integrity level SIL 3 (EN 61508 and DIN IEC 61800-5-2) and Performance level PL e (EN 13849-1) is implemented into standard Active Cube inverter range.

When triggering the STO function the frequency inverter switches off the rotating field to the motor.

Deactivation of the inverter supply is carried out via two switch off paths in no-signal current mode, thus performing redundant switch off control.

Continuous monitoring tests are done by the inverter to detect possible control failures.

"Safe Torque Off" function greatly improves safety level of your automation system without the need of additional components.



## Mounting of Standard devices

A wide range of mechanical accessories is available for Active Cube Series frequency inverters, to make installation as easy as possible in all sorts of applications.

In standard mountings the unit can be installed directly on the mounting plate or through-the-wall with optional mounting equipment. A vibration-proof mounting variant and a standard DIN bar mounting variant are also available. The range of mounting variants also includes an optional support with shielded brackets, so that the right solution for all possible needs can always be found.

Installations are almost identical for all sizes, so the examples shown below can be taken as representative solutions and ideal for all installers seeking a mechanically simple, compact installation solution.

### Types of mounting kits

The drive is supplied complete for fixing to an electrical cabinet mounting panel.  
3 optional installation kits are additionally available.

#### **MSTD (Standard Mounting Kit)**

The Standard Mounting Kit is always included for devices for mounting version "A"

#### **MPSV**

Thru-type assembly for higher protection classes or enhanced cooling characteristics

#### **MNVIB**

Anti-vibration mounting for installations on machines that generate significant vibrational stress

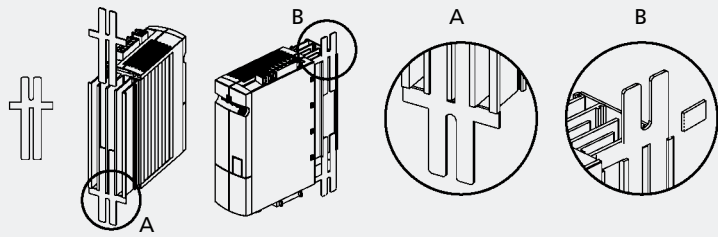
#### **MDIN**

DIN rail assembly for fast and modular installation / coupling

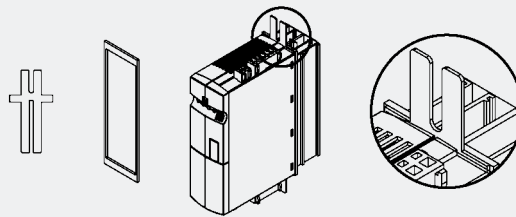
# Size 1

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
210-xx 1 ... 410-xx 1 ...	Standard	Standard mounting
	MPSV1	Thru-type mounting
	MNVIB1	Antivibration mounting
	MDIN1	DIN rail mounting

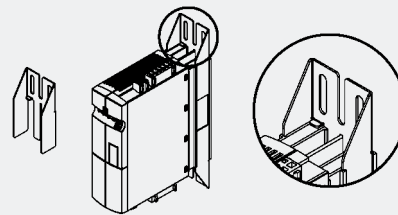
**MSTD1-2**  
(STANDARD MOUNTING)



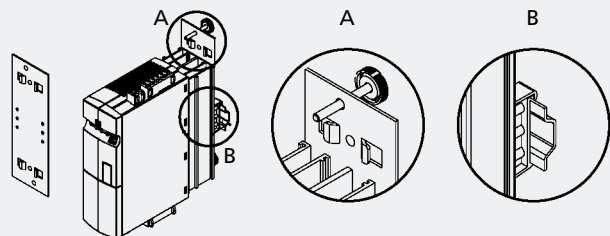
**MPSV1**



**MNVIB1**



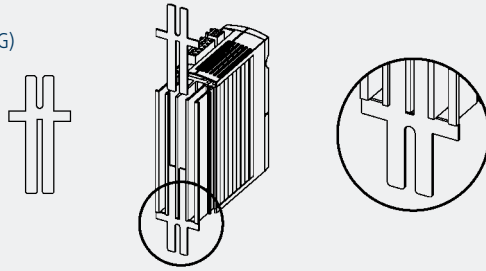
**MDIN1**



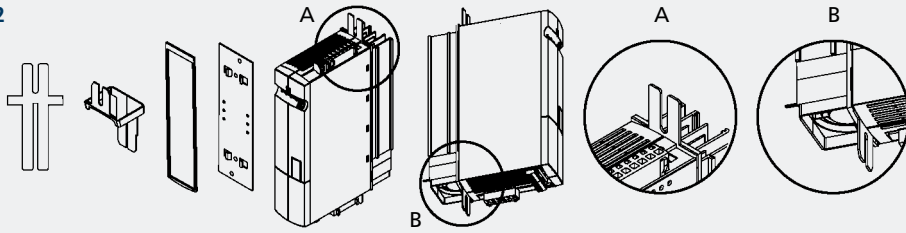
# Size 2

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
210-xx 2 ... 410-xx 2 ...	Standard	Standard mounting
	MPSV2	Thru-type mounting
	MNVIB2	Antivibration mounting
	MDIN2	DIN rail mounting

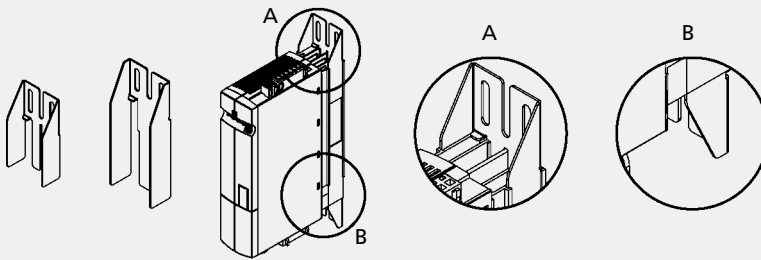
**MSTD1-2**  
(STANDARD MOUNTING)



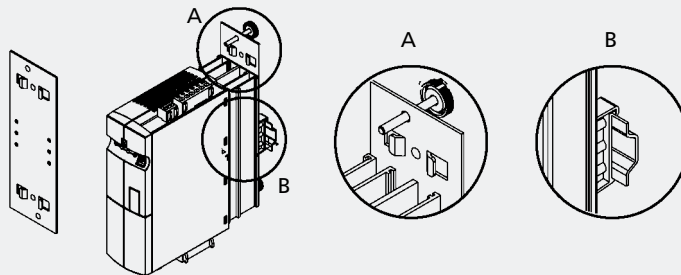
**MPSV2**



**MNVIB2**



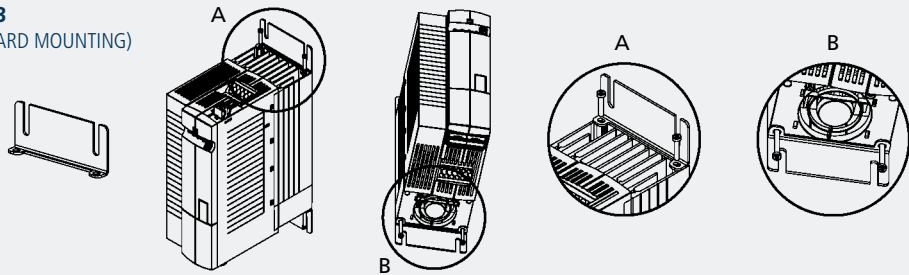
**MDIN2**



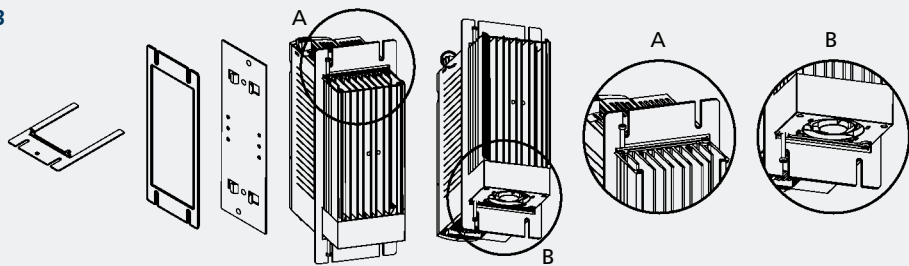
## Size 3

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
210-xx 3 ... 410-xx 3 ...	Standard	Standard mounting
	MPSV3	Thru-type mounting
	MNVIB3	Antivibration mounting

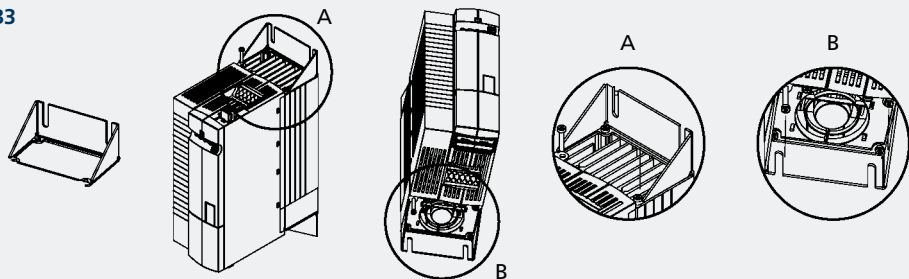
**MSTD3**  
(STANDARD MOUNTING)



**MPSV3**



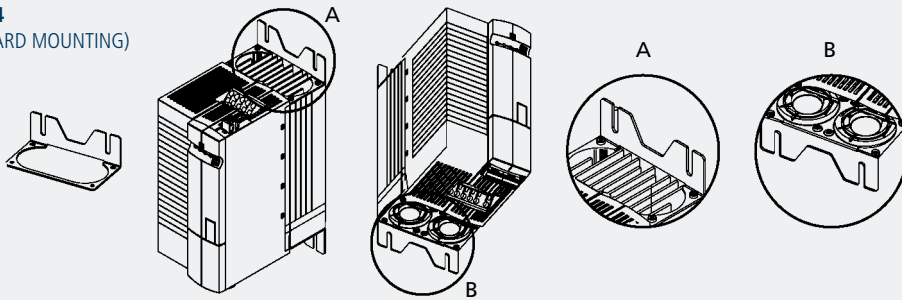
**MNVIB3**



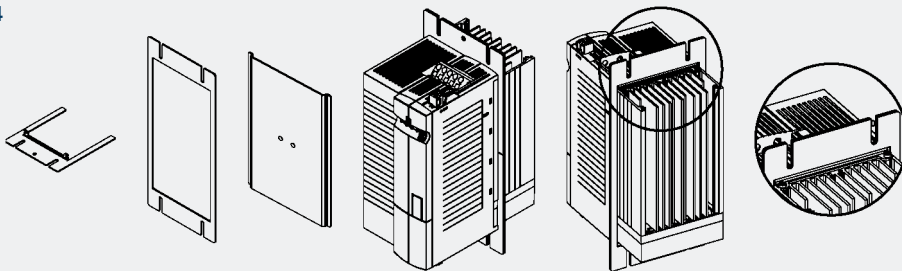
# Size 4

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
210-xx 4 ... 410-xx 4 ...	Standard	Standard mounting
	MPSV4	Thru-type mounting
	MNVIB4	Antivibration mounting

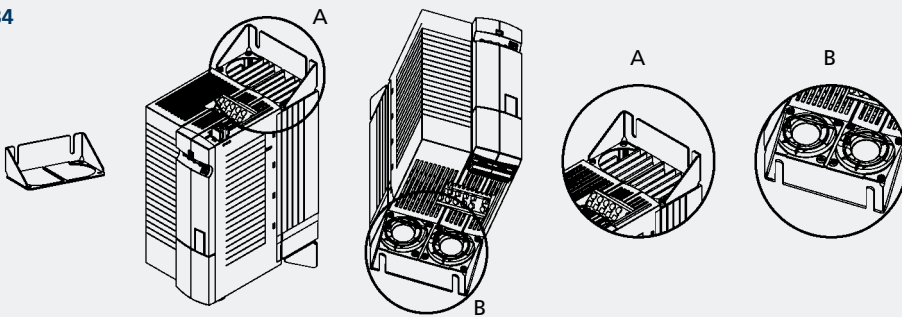
**MSTD4**  
(STANDARD MOUNTING)



**MPSV4**



**MNVIB4**

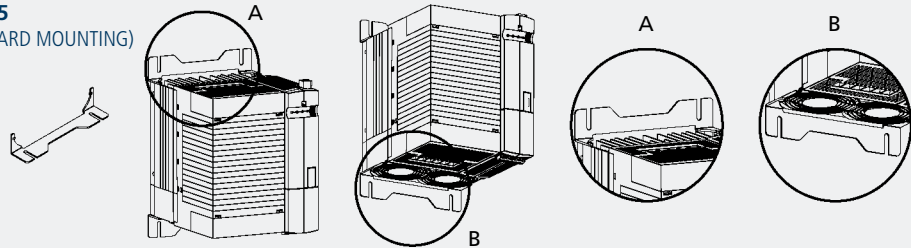




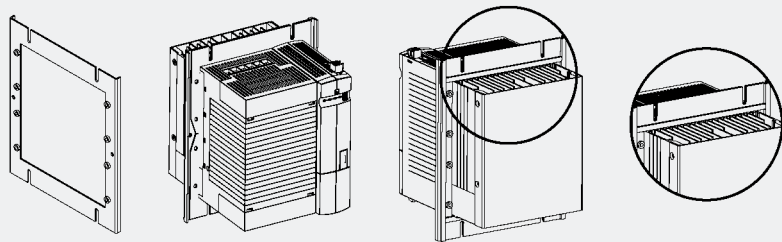
# Size 5

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
410-xx 5 ...	Standard	Standard mounting
	MPSV5	Thru-type mounting
	MNVIB5	Antivibration mounting

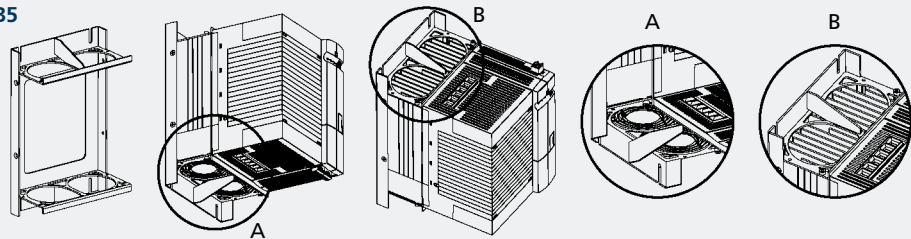
**MSTD5**  
(STANDARD MOUNTING)



**MPSV5**



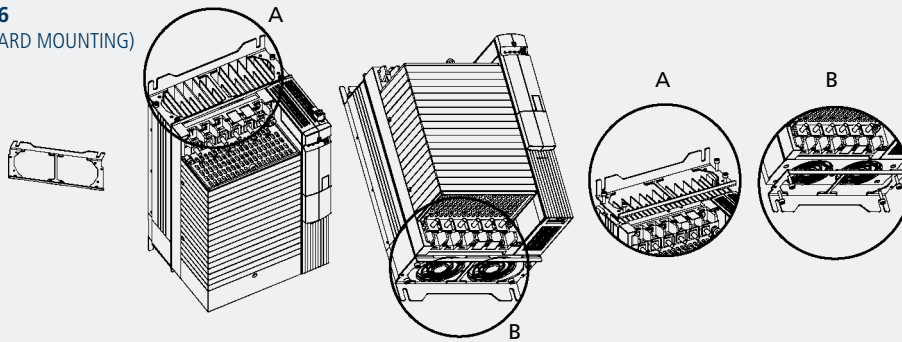
**MNVIB5**



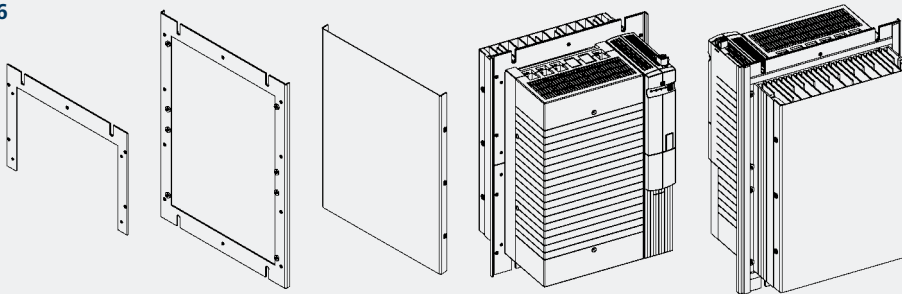
## Size 6

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
410-xx 6 ...	Standard	Standard mounting
	MPSV6	Thru-type mounting
	MNVIB6	Antivibration mounting

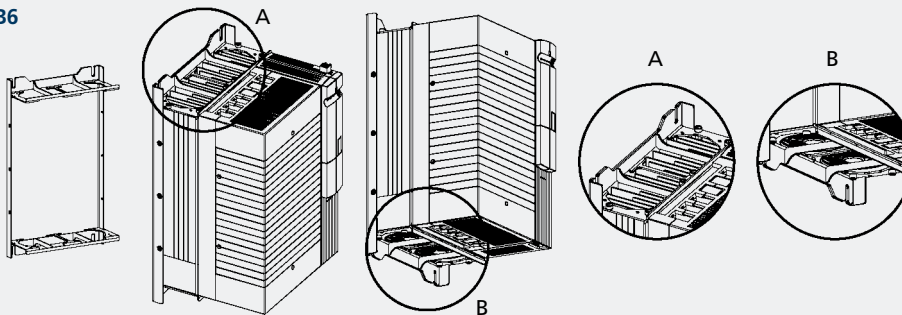
**MSTD6**  
(STANDARD MOUNTING)



**MPSV6**



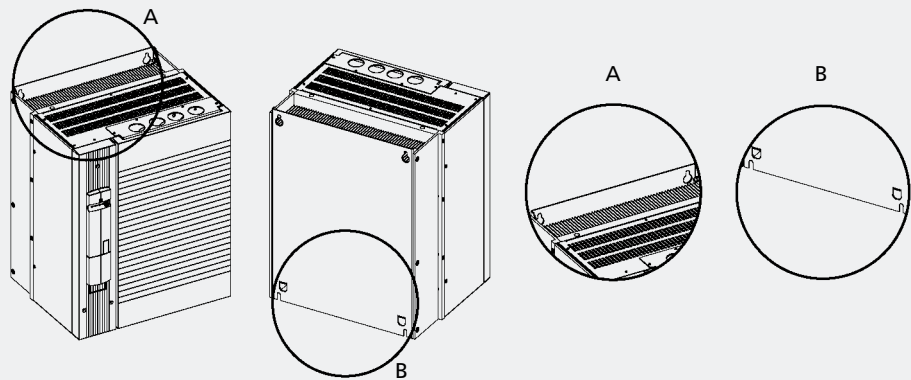
**MNVIB6**



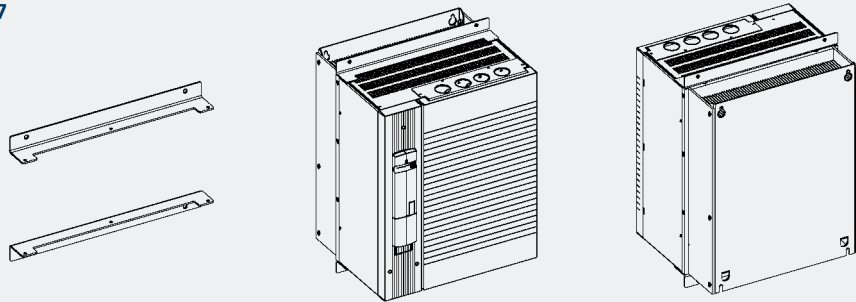
## Size 7

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
410-xx 7 ...	Standard	Standard mounting
	MPSV7	Thru-type mounting

### STANDARD MOUNTING



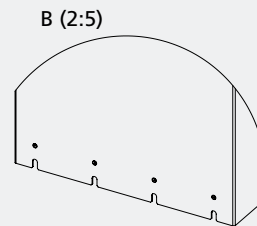
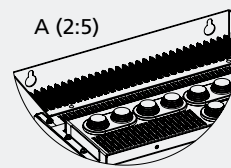
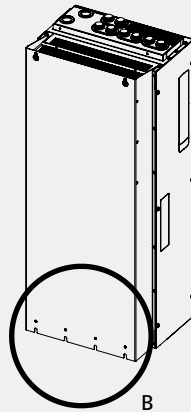
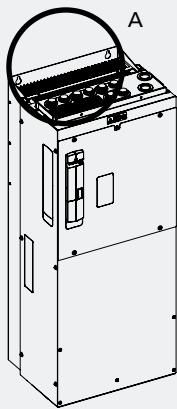
### MPSV7



## Size 8

INVERTER BONFIGLIOLI	MOUNTING	DESCRIPTION
410-xx 8 ... 510-xx 8 ... 610-xx 8 ...	Standard	Standard mounting

### STANDARD MOUNTING



# Input filter

## Why an input filter?

An Input Filter is a filtration device to be installed up-line from the frequency inverter and down-line from the power feeding contactor. The AC/DC rectifier at the inverter input generates harmonic disturbance on the absorbed current and emits disturbance generated by switching components towards the mains.

This harmonic current causes voltage distortions on the mains resulting in electromagnetic interference phenomena.

This harmonic distortion is reduced by means of line chokes, while disturbance is countered with EMI filters (attenuation of EMI voltages) such as those described below.

*Note: the use of input filters reduces the inverter input voltage. If required, these filters should be installed up-line from the inverter in the following order:*

1. Mains supply
2. Line choke
3. EMI filter
4. Inverter

## Line choke

- The use of Line chokes depends on the system engineer's need to reduce harmonic distortion in the short circuit point and the need to reinforce the action of the EMI filter. A line choke is normally used if the mains short circuit power is lower than 1%.
- A line choke is recommended for the ACU210 and ACU410 frequency inverter series in the presence of high continuous input current required by the application, in order to increase the lifetime of the electrolytic capacitors.
- A line choke is always required in single and two-phase operation of the ACU210 frequency inverters and in sizes 7 and 8 for all supported voltage ranges. For other devices please check the markings in the technical data tables.

## EMI filter

- An EMI filter can be used in order to achieve Class "A" (groups 1, 2) or Class "B" interference suppression
- The EMI filter is available in a low leakage current version for special applications.
- The EMI - filter is part of the standard outfit in mechanical sizes 1 & 2 and it is supplied as an internal option in mechanical size 3 and external option in size 3 and bigger.

## Active Cube inverter - Line choke / EMI filter combination

Motor cable length	COMPLIANCE WITH CLASS A (GROUP 2)		COMPLIANCE WITH CLASS A (GROUP 1)		COMPLIANCE WITH CLASS B	
	< 10 m	< max*	< 10 m	< max*	< 10 m	< max*
ACU 1 (standard internal filter)	Standard	external choke	external choke	external filter	external choke	external filter
ACU 2 (standard internal filter)	Standard	external choke	external choke	external filter	external choke	external filter
ACU 3	internal filter or external choke	internal filter or external choke	internal filter + external choke	internal filter + external choke	internal filter + external choke	external filter
ACU 4	external choke	external choke	external filter	external filter	external filter	external filter + external choke
ACU 5	external choke	external choke	external filter	external filter	external filter	external filter + external choke
ACU 6	external choke	external choke	external filter	external filter	external filter	external filter
ACU 7	external choke	external filter	external filter	external filter	—	—
ACU 8	external choke	external choke	external filter + external choke	external filter + external choke	—	—

\* See the operation manual

## Line choke

The simplest way of reducing high harmonic components and hence reactive power is connecting a choke in series on the mains side of the inverter. Depending on the system, reactive power consumption can be reduced by approximately 20% of the figure without line choke.

The line choke increases inductance towards the mains. Mains feed line choke can be regarded as sufficient if short-circuit power is from 20 to 40 times higher than the inverter nominal output.

The inverter is suitable for connection to public or industrial mains supplies in compliance with technical data. If the supply mains transformer output is  $\leq 500$  kVA, the optional mains choke is needed only if specified in the inverter technical data. The other inverters are suitable for the connection to the mains without a mains choke with relative impedance  $\geq 1\%$ . If it is desired to connect more than one inverter, use the sum of the nominal outputs as a basis.

Since experience has shown that the nominal short circuit power on the inverter connection point is often unknown, BONFIGLIOLI recommends the use of mains chokes with 4% relative short circuit voltage.

The relative short circuit voltage equivalent to a 4% voltage drop represents the percentage of the nominal voltage at which a current equal to rated current flows in the case of a short circuit.

### Technical data

**Nominal voltages**

- 230V +/- 10%
- 400V +/- 10%

**Frequencies**

- 50/60 Hz
- $u_k$  (a IN / 50 Hz) 4%

**Insulating material class**

- T40/F

**Ambient temperature**

- 40°C

**Protection degree (EN 60529)**

- IP00

**Connection type**

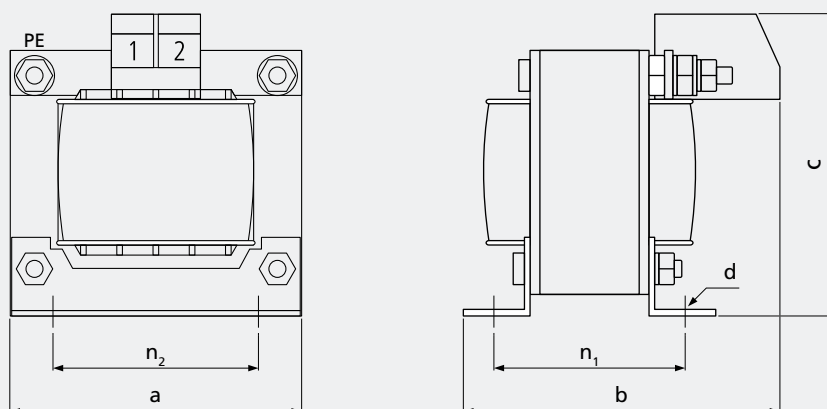
- Contact-protected terminals



The line choke must be installed between the mains connection point and the EMI filter. Both the line choke and inverter should be installed on a common metal baseplate and each should be connected to the metal mounting plate and earthed by means of a large contact area copper braid.

# Line choke

LCVS006 ... LCVS018



## TECHNICAL DATA

Bonfiglioli frequency inverter - Line choke combination, **1x230V~**

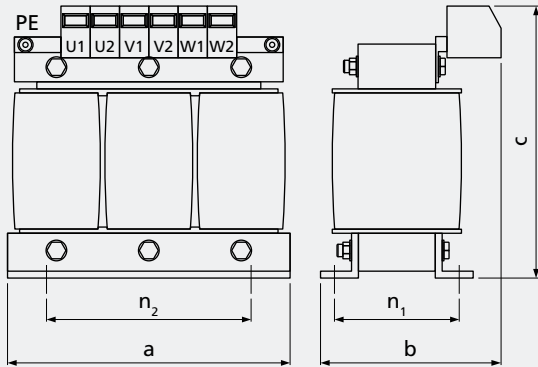
BONFIGLIOLI INVERTER	BONFIGLIOLI CHOKE	NOMINAL CURRENT	POWER DISSIPATION
		[A]	[W]
ACU 210-01	LCVS006	6	8.0
ACU 210-03			
ACU 210-05			
ACU 210-07	LCVS008	8	8.0
ACU 210-09	LCVS010	10	10.0
ACU 210-11	LCVS015	15	12.0
ACU 210-13	LCVS018	18	15.0

## TECHNICAL ASSEMBLY DATA

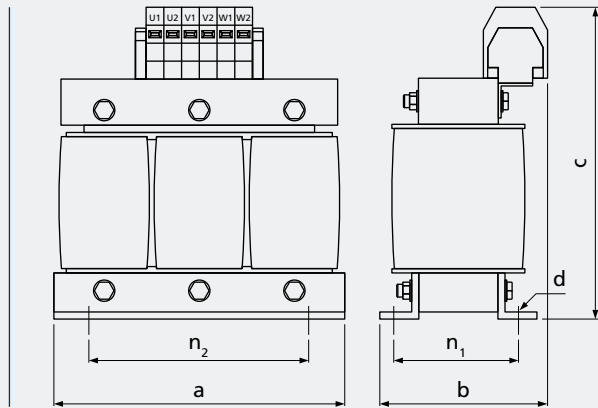
BONFIGLIOLI CHOKE	DIMENSIONS			ASSEMBLY			WEIGHT	CONNECTION TERMINAL		
	a [mm]	b [mm]	c [mm]	n <sub>2</sub> [mm]	n <sub>1</sub> [mm]	d [mm]	[kg]	[mm]	[Nm]	PE
LCVS006	60	62	75	44	38	3.6	0.5	0.75-2.5	1.0-1.2	2.5 mm <sup>2</sup>
LCVS008	60	67	75	44	43	3.6	0.6	0.75-2.5	1.0-1.2	2.5 mm <sup>2</sup>
LCVS010	66	80	70	50	51	4.8	0.8	0.75-2.5	1.0-1.2	M4
LCVS015	78	78	80	56	49	4.8	1.1	0.75-4.0	1.5-1.8	M4
LCVS018	85	85	95	64	50	4.8	1.8	0.75-4.0	1.5-1.8	M4

# Line choke

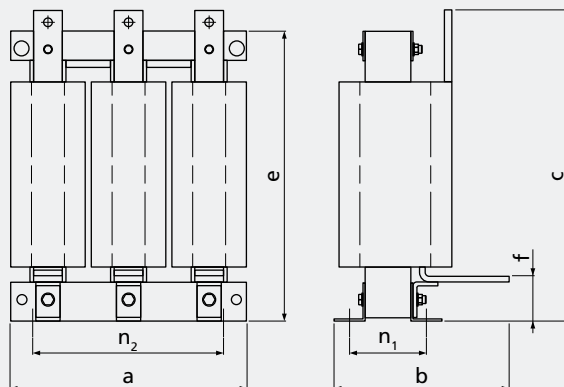
LCVT004 ... LCVT025



LCVT034 ... LCVT250



LCVT280AL-xxx ... LCVT690AL-xxx



**TECHNICAL DATA**

Bonfiglioli frequency inverter – Line choke combination, **3x230V~**

BONFIGLIOLI INVERTER	BONFIGLIOLI CHOKE	NOMINAL CURRENT	CHOKE	POWER DISSIPATION
		[A]	[mH]	[W]
ACU 210-01	LCVT004	4	7.32	20
ACU 210-03				
ACU 210-05				
ACU 210-07				
ACU 210-09	LCVT006	6	4.88	25
ACU 210-11	LCVT008	8	3.66	30
ACU 210-13	LCVT010	10	2.93	30
ACU 210-15	LCVT015	15	1.95	45
ACU 210-18	LCVT018	18	1.63	70
ACU 210-19	LCVT025	25	1.17	70
ACU 210-21	LCVT034	34	0.86	85
ACU 210-22				



# Line choke

## TECHNICAL DATA

Bonfiglioli frequency inverter – Line choke combination, **3x400V~**, **3x525V~**, **3x690V**

BONFIGLIOLI INVERTER	BONFIGLIOLI CHOKE	NOMINAL CURRENT	CHOKE	POWER DISSIPATION
		[A]	[mH]	[W]
ACU 410-01	LCVT004	4	7.32	20
ACU 410-03				
ACU 410-05				
ACU 410-07				
ACU 410-09				
ACU 410-11				
ACU 410-12				
ACU 410-13	LCVT006	6	4.88	25
ACU 410-15	LCVT008	8	3.66	30
ACU 410-18	LCVT010	10	2.93	30
ACU 410-19	LCVT015	15	1.95	45
ACU 410-21	LCVT018	18	1.63	70
ACU 410-22	LCVT025	25	1.17	70
ACU 410-23	LCVT025	25	0.86	85
ACU 410-25	LCVT034	34	0.86	85
ACU 410-27	LCVT050	50	0.59	100
ACU 410-29	LCVT060	60	0.49	100
ACU 410-31				
ACU 410-33	LCVT075	75	0.37	110
ACU 410-35	LCVT090	90	0.33	120
ACU 410-37	LCVT115	115	0.25	140
ACU 410-39	LCVT135	135	0.22	180
ACU 410-43	LCVT160	160	0.18	180
ACU 410-45	LCVT180	180	0.16	185
ACU 410-47	LCVT210	210	0.14	200
ACU 410-49	LCVT250	250	0.12	210
ACU 410-51	LCVT280AL-525	280	0.105	460
ACU 410-53	LCVT350AL-525	350	0.084	500
ACU 410-55	LCVT440AL-525	440	0.068	630
ACU 410-57	LCVT550AL-525	550	0.052	680
ACU 410-59	LCVT690AL-400	620	0.046	640
ACU 410-61	LCVT690AL-400	690	0.046	790
ACU 510-51	LCVT215AL-525	215	0.13	370
ACU 510-53	LCVT280AL-525	270	0.105	430
ACU 510-55	LCVT350AL-525	335	0.084	460
ACU 510-57	LCVT440AL-525	420	0.068	575
ACU 510-59	LCVT470AL-525	470	0.06	610
ACU 510-61	LCVT550AL-525	525	0.052	620
ACU 610-51	LCVT160AL-690	160	0.33	350
ACU 610-53	LCVT200AL-690	200	0.27	420
ACU 610-55	LCVT250AL-690	250	0.21	480
ACU 610-57	LCVT320AL-690	320	0.18	570
ACU 610-59	LCVT360AL-690	360	0.15	630
ACU 610-61	LCVT410AL-690	410	0.13	660

# Line choke

## TECHNICAL ASSEMBLY DATA

BONFIGLIOLI CHOKE	DIMENSIONS			ASSEMBLY			WEIGHT	CONNECTION TERMINAL		
	a [mm]	b [mm]	c [mm]	n <sub>2</sub> [mm]	n <sub>1</sub> [mm]	d [mm]	[kg]	[mm]	[Nm]	PE
LCVT004	80	65	95	55	37	4	0.8	0.75-2.5	1.0-1.2	4 mm <sup>2</sup>
LCVT006	100	65	115	60	39	4	1.0	0.75-2.5	1.0-1.2	4 mm <sup>2</sup>
LCVT008	100	75	115	60	48	4	1.5	0.75-2.5	1.0-1.2	4 mm <sup>2</sup>
LCVT010	100	75	115	60	48	4	1.5	0.75-2.5	1.0-1.2	4 mm <sup>2</sup>
LCVT015	125	85	135	100	55	5	3.0	0.75-4.0	1.5-1.8	4 mm <sup>2</sup>
LCVT018	155	90	135	130	57	8	4.0	0.75-4.0	1.5-1.8	4 mm <sup>2</sup>
LCVT025	155	100	160	130	57	8	4.0	0.75-10	4.0-4.5	4 mm <sup>2</sup>
LCVT034	155	100	190	130	57	8	4.5	2.5-16	2.0-4.0	M5
LCVT050	155	115	190	130	72	8	4.5	2.5-16	2.0-4.0	M5
LCVT060	190	110	220	170	58	8	9.0	2.5-35	2.5-5.0	M5
LCVT075	190	120	250	170	68	8	12	25-50	3.0-6.0	M6
LCVT090	190	130	250	170	78	8	12	25-50	3.0-6.0	M6
LCVT115	210	140	270	180	82	8	14	25-50	3.0-6.0	M6
LCVT135	240	160	300	190	100	11	20	16-70	6.0-7.0	M8
LCVT160	240	160	310	190	100	11	20	50-95	6.0-12.0	M8
LCVT180	240	175	320	190	106	11	22	50-95	6.0-12.0	M8
LCVT210	240	200	335	190	121	11	26	95-150	10.0-20.0	M8
LCVT250	240	210	350	190	126	11	28	95-150	10.0-20.0	M8

BONFIGLIOLI CHOKE	DIMENSIONS					ASSEMBLY		WEIGHT	CONNECTION TERMINAL			
	a [mm]	b [mm]	c [mm]	e [mm]	f [mm]	n <sub>2</sub> [mm]	n <sub>1</sub> [mm]	[kg]	Phases	[Nm]	PE	[Nm]
<b>ACU410</b>												
LCVT280AL-525	360	213	335	362	65	325	112	47	M10	25-30	M8	20-25
LCVT350AL-525	360	225	335	361	65	325	124	55	M10	25-30	M10	40-50
LCVT440AL-525	394	266	450	434	74	325	127	70	2xM12	25-30	M10	40-50
LCVT550AL-525	394	291	470	435	75	325	142	83	2xM12	25-30	M10	40-50
LCVT690AL-400	394	291	520	485	75	325	142	85	2xM12	25-30	M12	75-85
<b>ACU510</b>												
LCVT215AL-525	360	195	285	311	65	325	99	35	M10	25-30	M8	20-25
LCVT280AL-525	360	213	335	362	65	325	112	47	M10	25-30	M8	20-25
LCVT350AL-525	360	225	335	361	65	325	124	55	M10	25-30	M10	40-50
LCVT440AL-525	394	266	450	434	74	325	127	70	2xM12	25-30	M10	40-50
LCVT470AL-525	394	325	449	433	74	325	127	72	2xM12	25-30	M10	40-50
LCVT550AL-525	394	291	470	435	75	325	142	83	2xM12	25-30	M10	40-50
<b>ACU610</b>												
LCVT160AL-690	360	220	284	310	65	325	124	50	M8	15-20	M8	20-25
LCVT200AL-690	394	221	343	381	74	325	127	65	M10	25-30	M8	20-25
LCVT250AL-690	394	221	394	433	74	325	126	73	M10	25-30	M8	20-25
LCVT320AL-690	465	291	517	515	87	400	143	110	2xM12	25-30	M10	40-50
LCVT360AL-690	465	291	517	515	86	400	143	105	2xM12	25-30	M10	40-50
LCVT410AL-690	465	291	517	515	87	400	143	112	2xM12	25-30	M10	40-50

## EMI filters

Because of their intrinsic characteristics, all frequency inverters often generate undesired high frequency voltages generally referred to as "interference". Mains filters are installed to reduce this interference.

The reference standard EN 61800-3 defines the thresholds for electromagnetic interference for different classes of equipment.

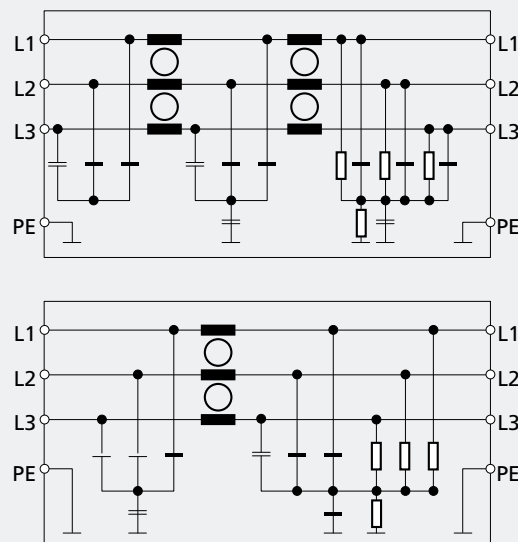
Active Cube series frequency inverters up to size 9.2 kW can be ordered with a built-in EMI filter conforming to the requirements of the standard for "class A – group 2" environments.

Two series of external interference filters are available for larger size Active Cube frequency inverters and for installations where conformity to the stricter requirements of class B is necessary. The two series differ both in construction and power range.

The first set of filters are "backplate filters or foot print". They are available in sizes 7 to 40 A (suitable for Active Cube frequency inverters up to size 4), and allow the frequency inverter to be installed on board the filter itself. The second series of filters are "book filters". They cover all other Active Cube sizes up to 630 A and are designed for installation on the same mounting panel alongside the drive.

Mains filters with very low dispersion currents are available upon request for specific applications.

*Basic circuit diagram*



# Backplate EMI filters

**Mains voltage**

- 3 x 480V~ maximum +10%

**Nominal current**

- 8A ... 40A

**Frequency**

- 50/60 Hz

**Operating and storage temperature**

- -25 °C ... +100 °C (climate class acc. to EN60721-3-3)

**Ambient temperature**

- +40°C maximum

**Protection degree (EN 60529)**

- IP00

**Connection type**

- Contact-protected terminals
- Strand connection on load side (only up to ACU 410-18)
- Metal fasteners are included in the supply

**Note**

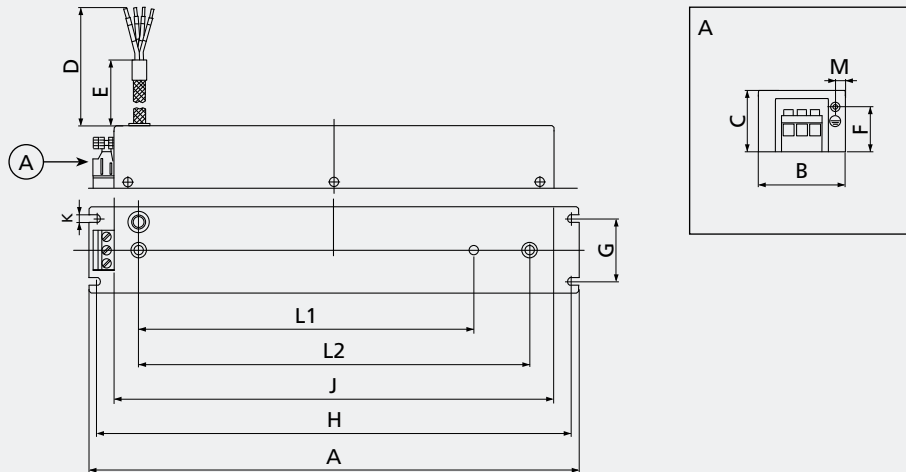
These mains filters are installed between the line choke and the frequency inverter. The frequency inverter installed on the EMI filter must be connected to the metal baseplate with a short, large section earth connection.

Overload capacity is 1.5 times rated current for 1 minute, every 30 minutes.

BONFIGLIOLI INVERTER		BONFIGLIOLI EMI FILTER	RATED CURRENT	LEAKAGE CURRENT	POWER DISSIPATION	WEIGHT
Size	Type		[A]	[mA]	[W]	[kg]
1	ACU 210-01	FTV007B	8	5	10	1.5
	ACU 210-03					
	ACU 210-05					
	ACU 210-07					
	ACU 210-09					
	ACU 410-01					
	ACU 410-03					
	ACU 410-05					
	ACU 410-07					
	ACU 410-09					
	ACU 410-11					
2	ACU 210-11	FTV018B	18	1.5	20	3.5
	ACU 410-12					
	ACU 410-13					
	ACU 410-15					
	ACU 410-18					
3	ACU 410-19	FTV018B	18	1.5	20	3.5
	ACU 410-21					
4	ACU 410-23	FTV040B	40	1.2	35	3.5
	ACU 410-25					

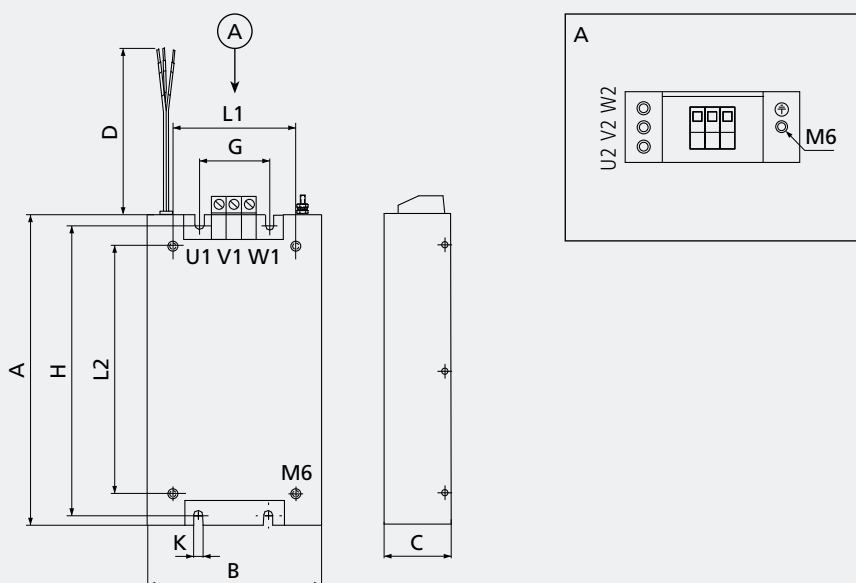
# Backplate EMI filters

## Dimensions FTV007B



EMI FILTER	A	B	C	D	E	F	G	H	J	K	L1	L2	M
[mm]													
FTV007B	351	62	45	200±10	160±10	33	45±0.2	340±0.3	315	5.5	240±0.2	280±0.2	7

## Dimensions FTV018B - FTV040B



EMI FILTER	A	B	C	D	G	H	K	L1	L2
[mm]									
FTV018B	315	100	65	300	35	300	6.3	76	270
FTV040B	315	125	65	300	60	300	6.3	125	270

## Book type EMI filters

### Mains voltage

- 3 x 480 VAC

### Rated current

- 7 A ... 630 A

### Frequency

- up to 60 Hz

### Operating and storage temperature

- -25 °C ... +80 °C (climate class acc. to EN60721-3-3)

### Protection degree (EN 60529)

- IP20

### Maximum length of motor cables:

- ACU 410-01 to -15: 25 m class B
- ACU 410-18 to -25: 50 m class B
- ACU 410-27 to -39: 10 m class B, 100 m class A group 1
- ACU 410-43 to -49: 10 m class B, 100 m class A group 1

### Note

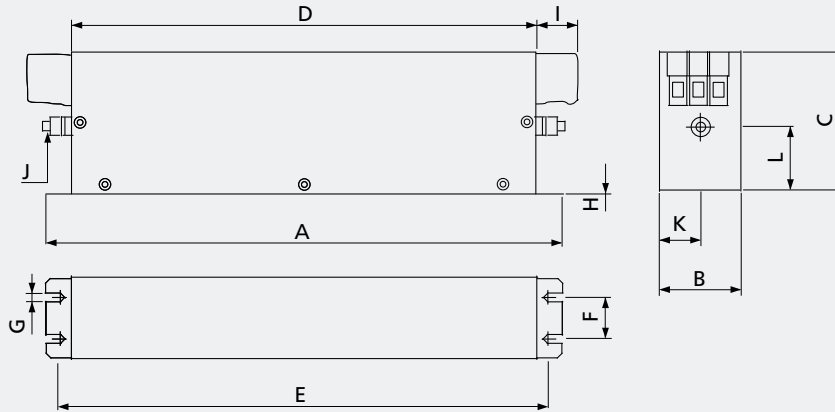
Overload capacity is 4 times rated current at switch-on; 1.5 times rated current for 1 minute, once per hour.

## Book type EMI filters

BONFIGLIOLI INVERTER		BONFIGLIOLI EMI FILTER	RATED CURRENT	LEAKAGE CURRENT	POWER DISSIPATION	WEIGHT
Size	Type		[A]	[mA]	[W]	[kg]
1	ACU 210-01	FTV007A	7		3.8	0.5
	ACU 210-03					
	ACU 210-05					
	ACU 210-07					
	ACU 210-09					
	ACU 410-01					
	ACU 410-03					
	ACU 410-05					
	ACU 410-07					
	ACU 410-09					
ACU 410-11						
2	ACU 210-11	FTV016A	16	33	6.1	0.8
	ACU 410-12					
	ACU 410-13					
	ACU 410-15					
	ACU 210-13					
ACU 210-15						
ACU 410-18						
ACU 410-19						
ACU 410-21						
3	ACU 210-18	FTV030A	30		11.8	1.2
	ACU 210-19					
	ACU 410-22					
4	ACU 210-21	FTV055A	55		25.9	2.0
	ACU 410-23					
	ACU 410-25					
5	ACU 210-22	FTV075A	75		32.2	2.7
	ACU 410-27					
	ACU 410-29					
	ACU 410-31					
6	ACU 410-33	FTV100A	100		34.5	4.3
	ACU 410-35					
	ACU 410-37					
	ACU 410-39					
7	ACU 410-43	FTV130A	130	33	43.1	4.5
	ACU 410-45					
	ACU 410-47					
	ACU 410-49					
8	ACU410-51	FTV180A	180	98	58.3	6.0
	ACU410-53					
	ACU410-55					
	ACU410-57					
	ACU410-59	FTV250A	250	42	90	12.4
	ACU410-61					
	ACU510-51					
	ACU510-53					
	ACU510-55	FTV401A	400		55	15.2
	ACU510-57					
	ACU510-59					
	ACU510-61					
	ACU510-59	FTV630A	630		65	17.8
	ACU510-61					
ACU610-51						
ACU610-53						
ACU610-55						
ACU610-57						
ACU610-59						
ACU610-61	FTV400A-690	400	17	55	11.0	
ACU610-51						
ACU610-53						
ACU610-55						
ACU610-57						
ACU610-59						
ACU610-61						

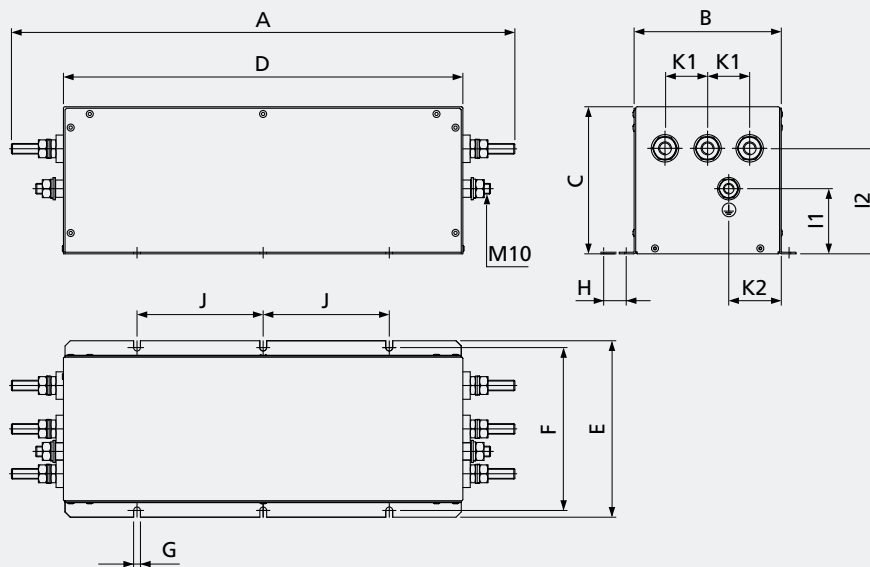
# Book type EMI filters

## Dimensions FTV007A ... FTV180A



EMI FILTER	A	B	C	D	E	F	G	H	I	J	K	L
[mm]												
FTV007A	190	40	70	160	180	20	4.5	1	22	M5	20	29.5
FTV016A	250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5
FTV030A	270	50	85	240	255	30	5.4	1	25	M5	25	39.5
FTV055A	250	85	90	220	235	60	5.4	1	39	M6	42.5	26.5
FTV075A	270	80	135	240	255	60	6.5	1.5	39	M6	40	70.5
FTV100A	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
FTV130A	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
FTV180A	380	120	170	350	365	102	6.5	1.5	49.5	M10	60	47

## Dimensions FTV250A

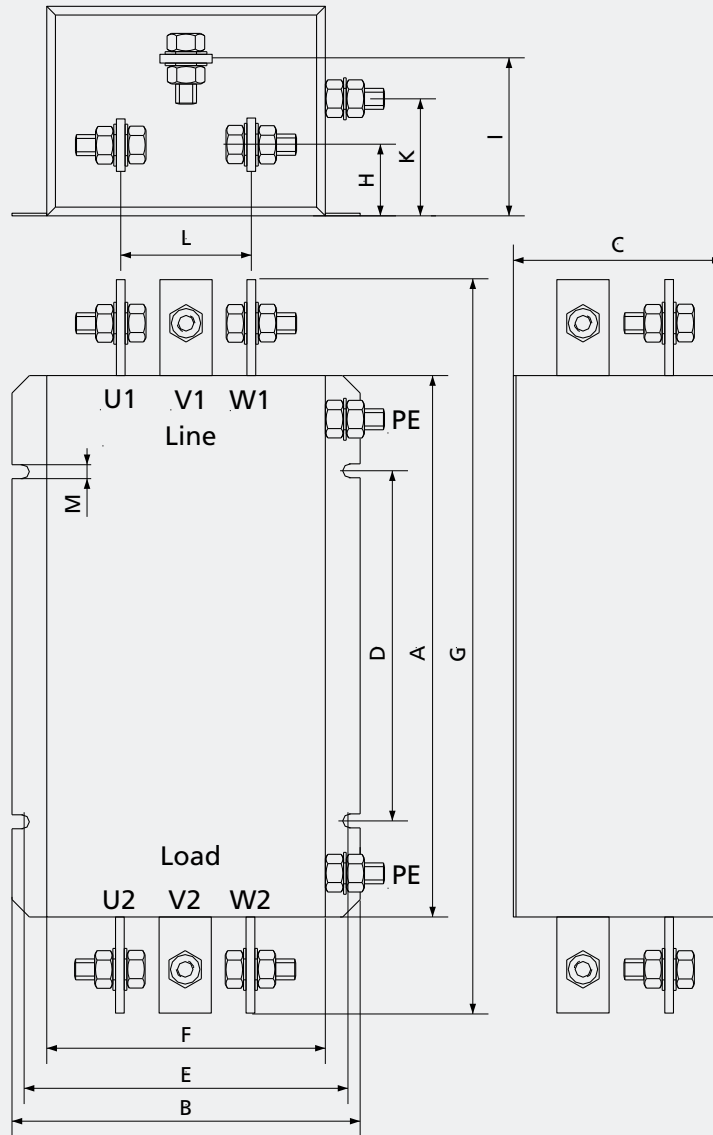


EMI FILTER	A	B	C	D	E	F	G	H	I1	I2	J	K1	K2
[mm]													
FTV250A	482	140	140	380	168	155	6.5	1.5	62	100	120	40	50



# Book type EMI filters

## Dimensions FTV401A ... FTV630A



EMI FILTER	A	B	C	D	E	M ø	F	G	PE	H	I	K	L	Bus Bar
[mm]														
FTV401A	350	240	150	200	220	M8	200	480	M12	69	110	30	128	8x25 M10
FTV400A-690	350	240	150	200	220	M8	200	480	M12	69	110	30	128	8x25 M10
FTV630A	350	240	150	200	220	M8	200	480	M12	69	110	30	128	8x25 M10

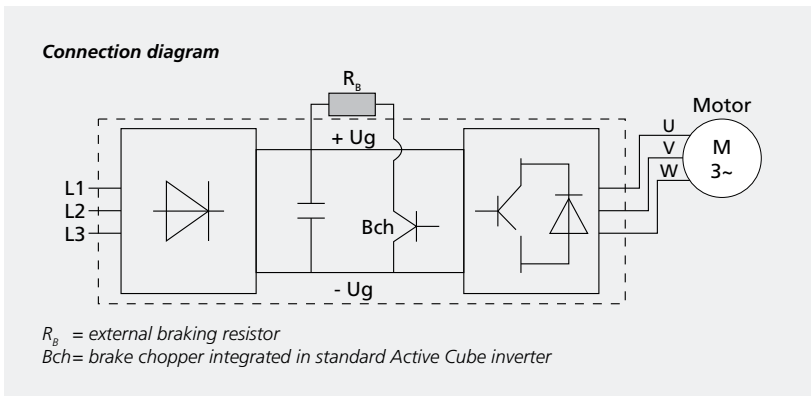
# Braking resistors

When speed of an inverter-controlled ac motor is reduced, the motor acts as a generator, feeding back energy to the frequency inverter. As a result, voltage in the intermediate circuit of the inverter increases. When a specific threshold is exceeded, the energy must flow to an external braking system in order to avoid drive failures. Braking resistors are designed to absorb such energy and to dissipate it into heating. The use of brake resistors allows drives to fulfil the requirements of particularly severe duty cycles, for example those featured by frequent braking, long lasting braking or impulsive braking.

Bonfiglioli Vectron offers a wide range of safe and compact braking resistors with IP20 degree of protection: "BR series".

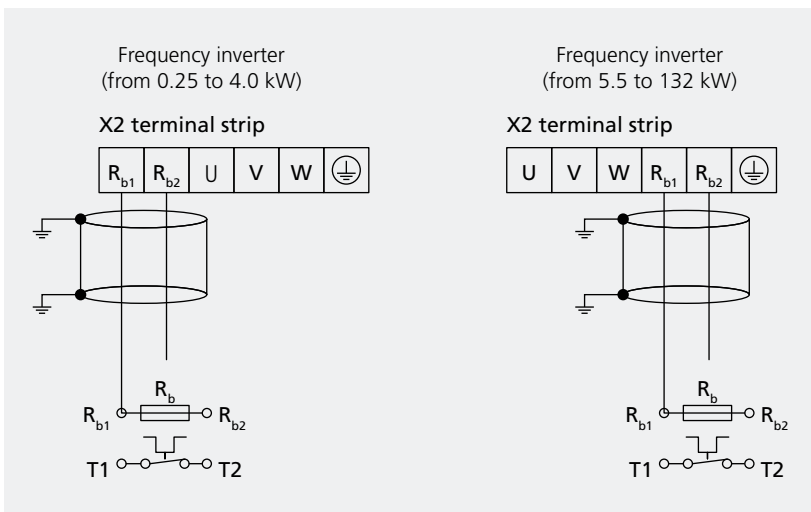
BR series are designed for panel mounting.

Mostly, they are equipped with built-in thermal protection.



## Connection terminals

The  $R_{b1}$  and  $R_{b2}$  braking resistor terminals on Active Cube frequency inverters are located on the X2 power output terminal strip. Access to these terminals on size 1 and 2 units is made even easier by the use of disconnectable power terminal strips. Refer to the manual provided with your frequency inverter for further details on materials and connection methods.



## Braking resistors

### Active Cube drive combination chart

These charts show recommended combinations for each model in the Active Cube range, and specify the corresponding duty cycles on the basis of rated drive power. Contact your nearest Bonfiglioli Drive Centre for particularly heavy-duty braking applications or if you need to customise a product.

ACU SERIES	BONFIGLIOLI BRAKING RESISTOR		RESISTANCE	CONTINUOUS RATED POWER	DUTY CYCLE AT THE DRIVE'S RATED POWER
	kW		Ohm		[W]
ACU 210-01	0.25	BR 160/100	100	160	64%
ACU 210-03	0.37	BR 160/100	100	160	43%
ACU 210-05	0.55	BR 160/100	100	160	29%
ACU 210-07	0.75	BR 160/100	100	160	21%
ACU 210-09	1.1	BR 160/100	100	160	15%
ACU 210-11	1.5	BR 432/37	37	432	29%
ACU 210-13	2.2	BR 432/37	37	432	20%
ACU 210-15	3	BR 432/37	37	432	14%
ACU 210-18	4	BR 667/24	24	667	17%
ACU 210-19	5.5	BR 667/24	24	667	12%
ACU 210-21	7.5	BR 1333/12	12	1333	18%
ACU 210-22	9.2	BR 1333/12	12	1333	14%
ACU 410-01	0.25	BR 213/300	300	213	85%
ACU 410-03	0.37	BR 213/300	300	213	57%
ACU 410-05	0.55	BR 213/300	300	213	39%
ACU 410-07	0.75	BR 213/300	300	213	28%
ACU 410-09	1.1	BR 213/300	300	213	19%
ACU 410-11	1.5	BR 213/300	300	213	14%
ACU 410-12	1.85	BR 471/136	136	471	25%
ACU 410-13	2.2	BR 471/136	136	471	21%
ACU 410-15	3	BR 471/136	136	471	16%
ACU 410-18	4	BR 696/92	92	696	17%
ACU 410-19	5.5	BR 1330/48	48	1330	24%
ACU 410-21	7.5	BR 1330/48	48	1330	18%
ACU 410-22	9.2	BR 1330/48	48	1330	14%
ACU 410-23	11	BR 2000/32	32	2000	18%
ACU 410-25	15	BR 2000/32	32	2000	13%
ACU 410-27	18.5	BR 4000/16	16	4000	22%
ACU 410-29	22	BR 4000/16	16	4000	18%
ACU 410-31	30	BR 4000/16	16	4000	13%
ACU 410-33	37	BR 8000/7	7.5	8000	22%
ACU 410-35	45	BR 8000/7	7.5	8000	18%
ACU 410-37	55	BR 8000/7	7.5	8000	15%
ACU 410-39	65	BR 8000/7	7.5	8000	12%
ACU 410-43	75	BR8000/7	7.5	8000	11%
ACU 410-45	90	BR8000/7	7.5	8000	9%
ACU 410-47	110	2xBR8000/7	3.75	16000	15%
ACU 410-49	132	2xBR8000/7	3.75	16000	12%

For further information refer to the Bonfiglioli braking resistor catalogue.

# Global Presence



Bonfiglioli is a market force with a presence spanning 22 countries on 5 continents. Our organization makes the most of geographic proximity to offer complete solutions combining efficiency and competence.



3780  
EMPLOYEES



20  
BRANCHES



13  
PLANTS



550  
DISTRIBUTORS



80  
COUNTRIES

## We Are a Global Company

Thanks to an international network of sales branches and closely interconnecting production plants, we can guarantee the same high standards of Bonfiglioli quality anywhere at any given time. Aware that our direct presence in local markets is the key to long-lasting success, our family includes 20 sales branches, 13 production plants and more than 500 distributors around the world.

**Our organization is always close by, offering complete and efficient solutions and supporting our customers with dedicated services, such as co-engineering or after-sales assistance.**



# Bonfiglioli Worldwide Locations

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We have a relentless commitment to excellence, innovation and sustainability. Our team creates, distributes and services world-class power transmission and drive solutions to keep the world in motion.

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