

# ACTIVE NEXT GENERATION

210/410/510/610 Series

Servo drives

 **Bonfiglioli**



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# THE HIGHEST LEVEL OF PRECISION, EFFICIENCY AND ENERGY OPTIMIZATION

With more than 20 years of experience in creating tailored and forward-thinking motion control systems, Bonfiglioli has proven being a reliable partner as **one-stop shop for mechatronic applications** in industrial automation. Bonfiglioli engineering specialists work side by side with customers to develop dedicated integrated solutions, covering the entire motion drive train according to an **Industry 4.0 approach**.

Thanks to the extensive know-how and the long-term collaboration with key customers, our two centers of excellence, located in Italy and Germany, develop **breakthrough mechatronic innovations**, including low backlash planetary gearboxes, servomotors, open and closed loop inverters, servo drives and energy regenerative units.

This, combined with a comprehensive range of **Professional Services**, enables us to respond to customers' requests by:

- providing **user friendly, plug & play solutions**
- **increasing** applications' **efficiency** and **productivity**
- designing **flexible, modular solutions** targeted to a wide range of applications
- granting access to real time data for **diagnostic, maintenance** and **predictive analytics**



ASSESSMENT &  
RECOMMENDATION



ENGINEERING &  
PLANNING



INSTALLATION &  
COMMISSIONING



RETROFIT &  
UPGRADE



MAINTENANCE &  
REPAIR

## Fully committed to the efficiency of customers' system over its life cycle

Bonfiglioli technical sales experts support customers with a proactive, flexible and dedicated approach **throughout the system's entire life cycle**.

- **Assessment and recommendation:** our team provides support starting from the very early stage of the project by assessing the requirements and developing a targeted analysis of the application, guiding customers in the choice of the most suitable components for their drive solution.
- **Engineering and planning:** our experts work with customers to co-engineer their application, offering consultancy in sizing, fine tuning and selecting the optimized drive train, always considering life cycle cost optimization.
- **Installation and commissioning:** we partner with our customers to ensure a quick, cost-effective and successful installation, optimizing the benefits and functions of their drive technology.
- **Retrofit and upgrade:** we update customers' machines with state-of-the-art technology to ensure constant levels of productivity, reliability and performance.
- **Maintenance and repair:** we work side by side with customers to avoid failures, reduce down times and ensure the best system operation.

# A COMPLETE INTEGRATED SOLUTION FOR ALL INDUSTRIAL APPLICATIONS

Our engineering specialists **work side by side with customers** to create the most effective solution, whether the request is to optimize an existing machine or to develop a new one. Our relationship with customers is based on an **active partnership** with fast decision-making processes to develop individually tailored offers. Our full-range and modular offering provides the necessary products for the development of vertically integrated solutions in **a variety of sectors**, such as material handling, automated storage, textile and packaging. Our team of experts assists customers in designing cost effective and energy efficient machines, aligning performance to meet the specific requirements.



## A COMPLETE INTEGRATED SOLUTION

- Precision Planetary Gearboxes
- Industrial Gearboxes
- Permanent Magnet Synchronous Motors
- Synchronous Reluctance Motors
- Asynchronous Motors
- Servo Drives
- Frequency Inverters
- Energy Regenerative Inverters
- Motion Control
- Industry 4.0 solutions

## INDUSTRY SECTOR EXPERTISE

 MATERIAL HANDLING	 HOIST & CRANES
 FOOD & BEVERAGE	 AUTOMATED WAREHOUSE
 PACKAGING	 TEXTILES
 MATERIAL WORKING	

# BONFIGLIOLI DIGITAL TOOLS

Thanks to a powerful set of **software tools** and **online platforms**, developed through partnerships with the main market leaders, Bonfiglioli enables its customers to **engineer tailored applications** in a smooth and productive way: the components selection and sizing, as well as the design of the whole motion drive train, are made simpler and more reliable.

In addition, thanks to its in-depth knowledge of industrial solutions, **Bonfiglioli engineering team is ready to assist customers** in their selection and design process, providing high quality technical support for specific application developments.



## SERVOSOFT | Develop optimized solutions

Bonfiglioli and SERVOSOFT® work together to **support customers in sizing complete multi-axis servo systems**, including motors, gearboxes and servodrives with 15 mechanisms and up to 50 axes in a shared bus or standalone configuration.

With the Bonfiglioli products available on SERVOSOFT, customers are able to select, size and design their customized and high performance applications.

In addition, the Bonfiglioli engineering team, thanks to its in-depth knowledge of the products, uses the high level servosizing tool SERVOSOFT® to provide a **top level customer support** service by developing **optimized, energy-efficient and tailored engineering solutions** to meet individual needs.



## MOSAICO | Product configuration and order assistant

Bonfiglioli's **complete e-business system** guides customers, distributors and agents through the process of **selecting the right product** for their specific needs, and provides support for **design activities** and **order management**, greatly accelerating the selection and ordering process and improving accuracy.

Thanks to this web-based technology, customers can get in touch with Bonfiglioli technical service any time from anywhere around the world.



## EPLAN | Enhance your electrical design

Bonfiglioli and EPLAN work together to **provide efficient engineering solutions**, aimed at reducing the gap between the initial concept and its development, programming and commissioning, thanks to:

- Always up-to-date device data and documentation
- Easy drag and drop function to develop optimized electrical drawings

# BONFIGLIOLI FREQUENCY INVERTERS AND SERVO DRIVES

## The right solution for a wide spectrum of applications

Our wide portfolio of frequency inverters and servo drives provides customers across a variety of sectors with **unprecedented levels of flexibility**, thanks to:

- the compatibility with a wide range of motors types
- scalable control performances from basic to demanding applications
- wide power range (from 0.25 to 1,200 kW)
- extensive input/output connectivity
- the support of major fieldbus protocols.

Whether in the textile industry, packaging, material working, automated storage or other sectors, our frequency inverters and servo drives are **optimized for numerous applications**.

Our team of experts constantly works with the aim of providing **innovative and highly performant solutions**, introducing continuous improvements in terms of better control of your processes, lower energy consumption, improved productivity and user experience.

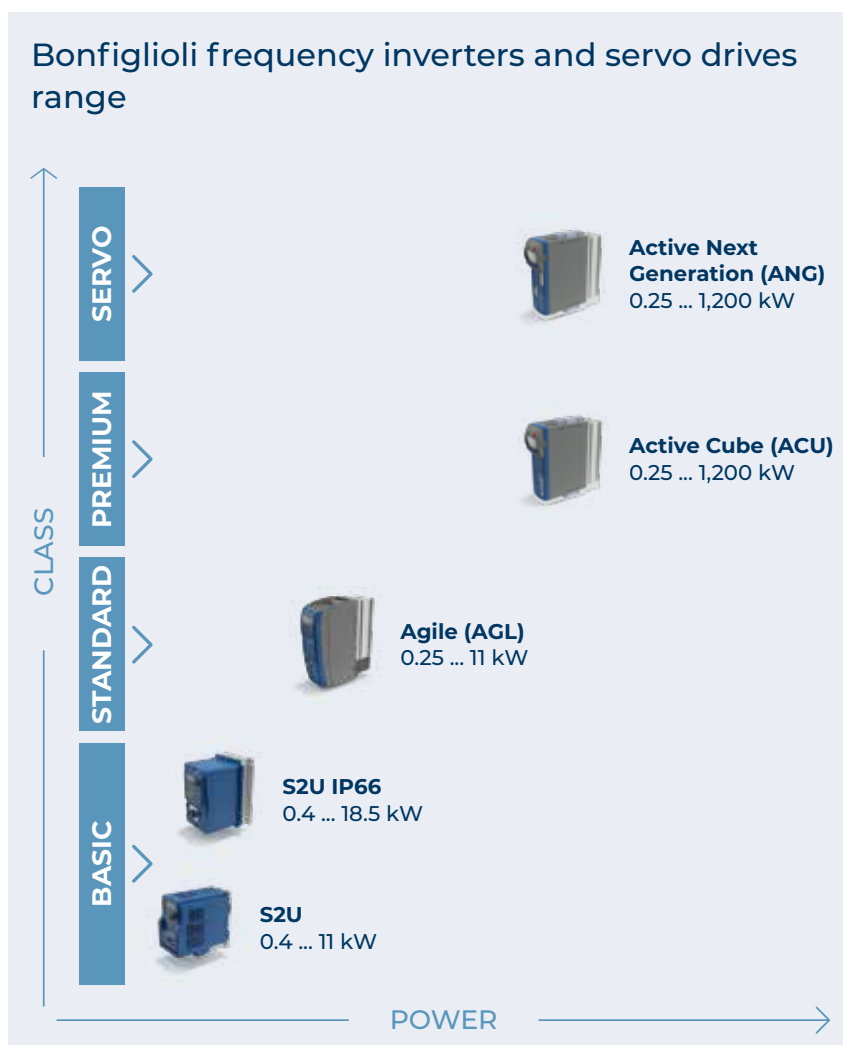
## Highest energy efficiency

Our frequency inverters and servo drives portfolio fulfil the **highest IE2 efficiency class** in compliance with the **EN 61800-9-2 EcoDesign** regulation, for the reduction of energy consumption and the impact on the environment connected to industrial production.

Our drives give a major contribution to **energy consumption optimization and saving** to the entire plant. Several **incorporated functions** are available through parameter setup allowing to reduce the electrical energy needed to power motors, such as standby mode and automatic flux reduction.

## Top level user experience

All our drives provide **intuitive engineering software** and **user-friendly programming interfaces** for parameter setting, diagnostic and supported commissioning.



# ACTIVE NEXT GENERATION SERIES

Active Next Generation (ANG) is the servo inverter series providing **high performance for standard and servo applications**.

Thanks to its **wide power range** (from 0.25 kW to 400 kW - with parallel connection up to 1200 kW), its **cutting edge control technology, broad connectivity** and **high power density**, this series perfectly matches the requirements of high performance and motion applications, both in open and closed loop.

For the integration into Functional Safety environments, ANG offers **Safe Torque Off (STO)** functionality according to SIL 3 and PL e.

The series include:

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





# APPLICATIONS

## Extremely fast control and communication for high performance motion applications

Active Next Generation series is particularly suitable for motion control applications in sectors such as packaging, textile, automatic storage and material working, especially in **closed loop control**, thanks to **extremely accurate control of speed, position and current, fast Ethernet response time** and **encoder evaluation always on board**.

In addition, thanks to the **single axis for the control of servo and asynchronous motors**, ANG delivers high dynamic response, high performance and application versatility.

Our offer expands far beyond standard, providing **the right solutions** tailored to the most demanding customers' requirements.

### PACKAGING



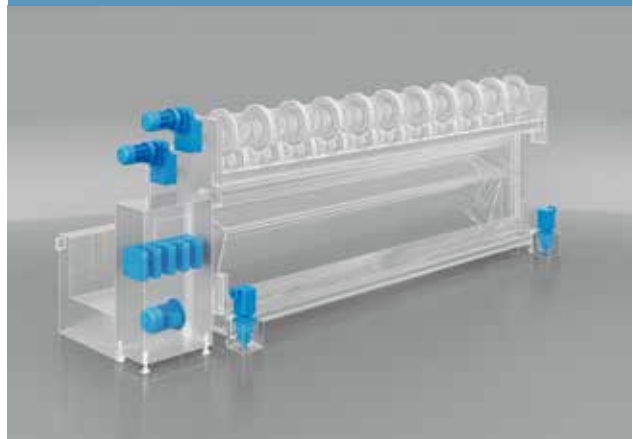
### AUTOMATED STORAGE



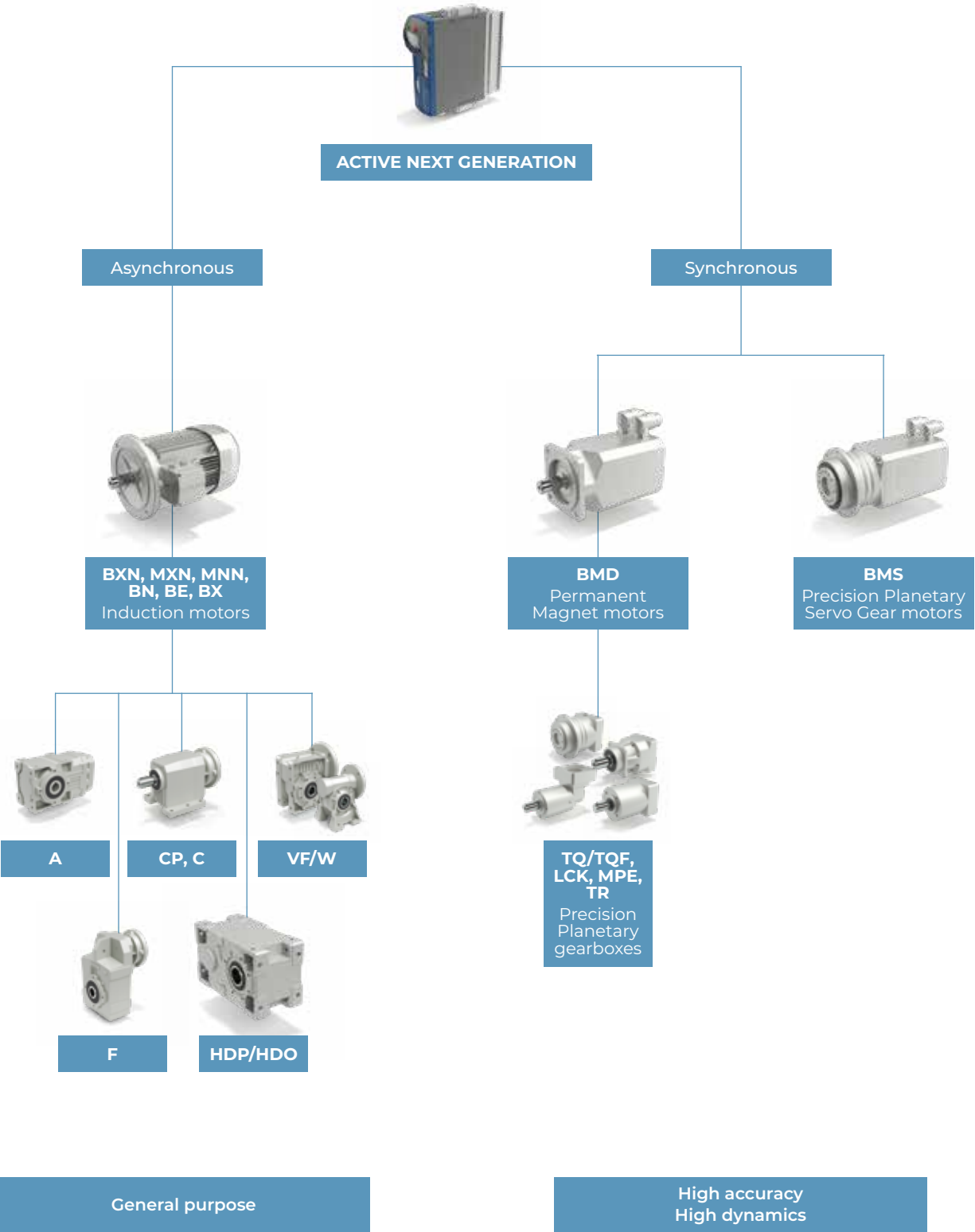
### MATERIAL WORKING



### TEXTILE



# ACTIVE NEXT GENERATION SYSTEM RANGE



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



# ACTIVE NEXT GENERATION KEY FEATURES AND BENEFITS



## HIGH DYNAMIC CONTROL AND APPLICATION VERSATILITY

The **single axis for servo and asynchronous motors**, together with **fast control loops** deliver high dynamics and performance. Great flexibility is ensured by the **variety of integrated feedback sensors evaluation**: resolvers, absolute and incremental encoders. ANG, in addition, is **both a system and a servo drive**, focusing on applications where Ethernet-based communication and absolute encoders are used at the same time. The **VPLC functions** allow the **customization of the operational behavior**.



## APPLICATION-SPECIFIC MOTION FEATURES

ANG offers a set of features ideal for motion control applications, such as a **high level of accuracy** thanks to precise position and speed control, **optimized Ethernet response time and simultaneous encoders evaluation**. In addition, **enhanced motion functions** are embedded in ANG, including **cyclic synchronous velocity and cyclic synchronous positioning** mode with **cubic interpolation** for high dynamic applications, enhanced **brake control** and evaluation of **feedback contacts**.



## BROAD CONNECTIVITY

Smooth integration into automation networks thanks to the **compatibility with a wide range of fieldbus protocols**.



## WIDE POWER RANGE

The Active Next Generation series offers power ranges **from 0.25 to 400 kW**. Through parallel connection **1200 kW are achievable**. The 525V and 690V supply voltages respond to the demanding requirements of the **heavy and steel industry**.



## USER FRIENDLY

The user-friendly **engineering software VPlus** provides an effective support for the **commissioning, tuning and monitoring** of ANG frequency inverters **from a PC**. In addition, the optional **keypad** module is an **easy to use** tool to perform **setup and diagnosis** directly on the inverter.



## FULL CONFIGURABILITY

ANG series offers **different variants of automation modules**, which can be selected to facilitate a smooth integration into automation networks. The series, in addition, can be flexibly adapted to meet many different application requirements by selecting among the **great variety of accessories** like brake resistors, main chokes and filters.

# THE DESIGNATION OF ANGx10 SERIES

ANG	410	-	07
			<div> <div>Power</div> <div> <div>01 0.25 kW</div> <div>03 0.37 kW</div> <div>05 0.55 kW</div> <div>07 0.75 kW</div> <div>09 1.1 kW</div> <div>11 1.5 kW</div> <div>13 2.2 kW</div> <div>15 3.0 kW</div> <div>18 4.0 kW</div> <div>19 5.5 kW</div> <div>21 7.5 kW</div> <div>22 9.2 kW</div> <div>23 11 kW</div> <div>25 15 kW</div> <div>27 18.5 kW</div> <div>29 22 kW</div> <div>31 30 kW</div> <div>33 37 kW</div> <div>35 45 kW</div> <div>37 55 kW</div> <div>39 65 kW</div> <div>43 75 kW</div> <div>45 90 kW</div> <div>47 110 kW</div> <div>49 132 kW</div> <div>51 160 kW</div> <div>53 200 kW</div> <div>55 250 kW</div> <div>57 315 kW</div> <div>59 355 kW</div> <div>61 400 kW</div> </div> </div> <div> <div>Drive Version</div> <div> <div>- Standard</div> <div>DS Spindle Drive</div> </div> </div>
	<div> <div>Device</div> <div> <div>210 1/3 x 230 V<sub>AC</sub></div> <div>410 3 x 400 V<sub>AC</sub> / 480 V<sub>AC</sub></div> <div>510 3 x 525 V<sub>AC</sub></div> <div>610 3 x 690 V<sub>AC</sub></div> </div> </div>		

Inverter series Active Next Generation



1	F	A
		<b>Version</b> A Standard C Coldplate L Liquid Cooling, stainless Steel, open cooling circuit M Liquid Cooling, Aluminium, closed cooling circuit
	<b>Filter</b> F Integrated EMC-filter (blank) Without EMC-filter	
<b>Mechanical Size</b> 1 Frame Size 1 ... 8 Frame Size 8		

## THE ORDER CODE OF ANGx10 SERIES

[illegible]

## Inverter series Active Next Generation

D	S	X	O
			<div>■</div> <div>0</div> <div>00</div> <div>Reserved for future use (version with integrated EMC filter)</div> <div>Reserved for future use (version without integrated EMC filter)</div>
		<div>■</div> <div><b>Mains operation*</b></div> <div>W</div> <div>X</div> <div>Usage in TN mains environments (Standard)</div> <div>Usage in IT mains environments or in combination with sinusoidal AEC mains units</div>	
	<div>■</div> <div><b>Functional Safety</b></div> <div>S</div> <div>STO (Safe Torque Off)</div>		
<b>Communication ANG</b>			
A	EtherCAT		
D	EtherCAT without Absolute Encoder		
J	PROFINET		
R	Ethernet/IP		
V	Varan		

**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

- Very high performance for speed, position and current control
- Both “system drive” and “servo drive” focusing on applications where Ethernet-based communication and Absolute encoder is used at the same time
- Optimized combination with Bonfiglioli BMD servomotor series
- Integration of Ethernet based Communication and encoder evaluation ex factory

## 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)
- Isolated CAN terminals (usable for either CANopen or Bonfiglioli Vectron System bus for fast communication among Bonfiglioli ANG drives)
- Encoder support: TTL, HTL, Resolver, SinCos, Hiperface, EnDat 2.1, EnDat 2.2, SSI

## Single and Multiple Encoder evaluation

- Evaluation as single encoder (motor encoder) for speed and position control
- Evaluation of motor encoder for speed control and application encoder for position control

## 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

- 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 to Bonfiglioli BMD servomotors
- Compatible with Mains unit AEC allowing to feed back generatoric energy to the mains

## 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<sup>(1)</sup>
- Vibration robustness according to DIN EN 60068-2-6: Test Fc and DIN EN 60068-2-27: Test Ea

<sup>(1)</sup> In Frame size 8 for some device a UPS (uninterrupted power supply) is internally equipped, where the boards are not coated. A UPS is included in 525 V and 690 V devices and devices marked with “X” for mains operations.



# SOFTWARE

## Flexibility

- Control of asynchronous and synchronous 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
  - Field oriented (vector) control with Absolute encoder
  - Sensorless field oriented (vector) and V/f 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
- 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 drive features

- 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
- Cyclic Synchronous Velocity and Cyclic Synchronous Positioning Mode including Cubic Interpolation
- 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 management 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)
- Logic function programming section with 64 functions

# GENERAL TECHNICAL DATA

## Environment

### Operating conditions

- 0°C - 40°C (40°C - 55°C with derating)
- Pollution Degree 2
- Overvoltage Category III for mains connection
- Overvoltage Category III for relay connector circuit up to 2000 m
- Overvoltage Category II for relay connector circuit above 2000 m

### Environment class

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

### Altitude of installation

- Up to 1000m (up to 4000m 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

### Mains voltage operation

- ANG 210 in the range 184-0% ... 240 V+10%
- ANG 410 in the range 320-0% ... 480 V+10%
- ANG 510 with 525 V
- ANG 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/UL61800-5-1/CSA 22.2

# ANG210 | Technical data (from 0.25 to 3.0 kW)

ANG210-	01	03	05	07	09	11	13	15
			Size 1				Size 2	
Filter Variant:			F				F	
Mechanical Variants:			A, C				A, C	

## Output, motor side <sup>(1)</sup>

Recommended rated motor power	P <sub>n</sub> kW	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
Rated motor current output	I <sub>n</sub> 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 <sub>n</sub> V	3 x (from 0 to mains voltage)							
Overload current (60 s)	I <sub>oc</sub> A	3.2	5.0	5.4	6.0	7.3	10.5	14.3	16.2
Peak current (1 s)	I <sub>pk</sub> A	3.2	5.0	6.0	8.0	8.0	14.0	19.0	19.0
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>(2)</sup>							

## Input, mains side

Rated mains voltage	U V	230							
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

## General

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	

## Environment

Cooling temperature	T <sub>n</sub> °C	From 0 to 40							
Relative air humidity	- %	From 15 to 85, non-condensing							

## Options & accessories

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)			
EMC filter	-	-	Internal Filter: Category C3 / External Filter or external choke: Category C2 / C1 <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



# ANG210 | Technical data (from 4.0 to 9.2 kW)

ANG210-	18	19	21	22
	Size 3		Size 4	
Filter Variant:	F		-	
Mechanical Variants:	A, C		A, C	

## Output, motor side <sup>(1)</sup>

Recommended rated motor power	P <sub>n</sub>	kW	4.0	5.5	7.5	9.2
Rated motor current output	I <sub>n</sub>	A	18.0	22.0	32.0	35.0
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	26.3	30.3	44.5	51.5
Peak current (1 s)	I <sub>pk</sub>	A	33.0	33.0	64.0	64.0
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>(2)</sup>			

## Input, mains side

Rated mains voltage	U	V	230			
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

## General

Connection Signal terminals <sup>(1)</sup>	A	mm²	0.2 ... 1.5 (detachable terminals)	
Connection Power terminals <sup>(1)</sup>	A	mm²	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	-	-	-	UL508c/CSA 22.2-No.14

## Environment

Cooling temperature	T <sub>n</sub>	°C	From 0 to 40			
Relative air humidity	-	%	From 15 to 85, non-condensing			

## Options & accessories

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)	
EMC filter	-	-	For selection of EMC 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

# ANG410 | Technical data (from 0.25 to 3.0 kW)

ANG410-	01	03	05	07	09	11	12	13	15
	Size 1				Size 2				
Filter Variant:	F				F				
Mechanical Variants:	A, C				A, C				

## Output, motor side <sup>(1)</sup>

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>								

## Input, mains side

Rated mains voltage	U	V	400								
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		

## General

Connection Signal terminals <sup>(1)</sup>	A	mm²	0.2 ... 1.5 (detachable terminals)	
Connection Power terminals <sup>(1)</sup>	A	mm²	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	

## Environment

Cooling temperature	T <sub>n</sub>	°C	From 0 to 40								
Relative air humidity	-	%	From 15 to 85, non-condensing								

## Options & accessories

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)			
EMC filter	-	-	Internal Filter: Category C3 / External Filter or external choke: Category C2 / C1 <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



# ANG410 | Technical data (from 4.0 to 15 kW)

ANG410-	18	19	21	22	23	25
	Size 2		Size 3			Size 4
Filter Variant:	F		- or F			-
Mechanical Variants:	A, C		A, C			A, C

## Output, motor side <sup>(1)</sup>

Recommended rated motor power	P <sub>n</sub> kW	4.0	5.5	7.5	9.2	11.0	15.0
Rated motor current output	I <sub>n</sub> A	9.0	14.0	18.0	22.0	25.0	32.0
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	13.5	21.0	26.3	30.3	37.5	44.5
Peak current (1 s)	I <sub>pk</sub> A	18.0	28.0	33.0	33.0	50.0	64.0
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>(2)</sup>					

## Input, mains side

Rated mains voltage	U V	400					
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	

## General

Connection Signal terminals <sup>(1)</sup>	A	mm²	0.2... 1.5 (detachable terminals)		
Connection Power terminals <sup>(1)</sup>	A	mm²	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		

## Environment

Cooling temperature	T <sub>n</sub> °C	From 0 to 40					
Relative air humidity	- %	From 15 to 85, non-condensing					

## Options & accessories

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)		
EMC filter	- -	For selection of EMC 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

# ANG410 | Technical data (from 18.5 to 65 kW)

ANG410-	27	29	31	33	35	37	39
		<b>Size 5</b>				<b>Size 6</b>	
Mechanical Variants:		A, C, L				A, L	
Brake Chopper Variant:		S				S, X	

## Output, motor side <sup>(1)</sup>

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) <sup>(5)</sup>						
Output frequency	f <sub>n</sub> Hz	0 ... 599 Hz <sup>(2)</sup>						

## Input, mains side

Rated mains voltage	U V	400						
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	

## General

Connection Signal terminals <sup>(1)</sup>	A	mm²	0.2 ... 1.5 (detachable terminals)	
Connection Power terminals <sup>(1)</sup>	A	mm²	... 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"	-	-	-	

## Environment

Cooling temperature <sup>(4)</sup>	T <sub>n</sub> °C	From 0 to 40						
Relative air humidity	- %	From 15 to 85, non-condensing						

## Options & accessories

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)	
EMC filter	-	-	For selection of EMC 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

(5) Higher Switching frequencies available on request



# ANG410 | Technical data (from 75 to 200 kW)

ANG410-	43	45	47	49	51	53 <sup>(4)</sup>
	Size 7					
Mechanical Variants:	A, L					
Brake Chopper Variant:	S, X					

## Output, motor side <sup>(1)</sup>

Recommended rated motor power	P <sub>n</sub>	kW	75	90	110	132	160	200
Rated motor current output	I <sub>n</sub>	A	150	180	210	250	305	380
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	225	270	315	332	460	570
Peak current (1 s)	I <sub>pk</sub>	A	270	325	375	375	550	680
Switching frequency	f <sub>c</sub>	kHz	From 2 to 8 kHz (Default: 4 kHz) <sup>(7)</sup>					
Output frequency	f <sub>n</sub>	Hz	0 ... 599 Hz <sup>(2)</sup>					

## Input, mains side

Rated mains voltage	U	V	400					
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

## General

Connection Signal terminals <sup>(1)</sup>	A	mm²	0.2 ... 1.5 (detachable terminals)		
Connection Power terminals <sup>(1)</sup>	A	mm²	... 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"	-	-	-		-

## Environment

Cooling temperature <sup>(6)</sup>	T <sub>n</sub>	°C	From 0 to 40					
Relative air humidity	-	%	From 15 to 85, non-condensing					

## Options & accessories

Pass through mounting kit			MPVS7					
Input line choke	-	-	External (depending on mains supply)					
EMC filter	-	-	For selection of EMC 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

(7) Higher Switching frequencies available on request



# ANGx10 | echnical data (from 160 to 400 kW)

ANG410-/510-/610-	51	53	55	57	59	61
	Size 8					
Mechanical Variants:	A, L, M, N					
Brake Chopper Variant:	S, X					

## Output, motor side <sup>(1)</sup>

Recommended rated motor power	P <sub>n</sub> kW	160	200	250	315	355	400
Rated motor current output	I <sub>n</sub> A	305	380	475	595	645	735
ANG410 Long-term overload current (60s)	I <sub>oc</sub> A	460	570	715	895	970	1100
Short-term overload current (1s)	I <sub>pk</sub> A	550	685	855	1070	1160	1330
Rated motor current output	I <sub>n</sub> A	230	290	360	450	490	560
ANG510 Long-term overload current (60s)	I <sub>oc</sub> A	345	435	540	675	735	840
Short-term overload current (1s)	I <sub>pk</sub> A	420	520	650	810	880	1000
Rated motor current output	I <sub>n</sub> A	180	230	280	350	400	450
ANG610 Long-term overload current (60s)	I <sub>oc</sub> A	270	350	420	530	600	675
Short-term overload current (1s)	I <sub>pk</sub> A	330	420	510	630	720	810
Rated motor voltage output	U <sub>n</sub> V	Maximum input voltage, three-phase					
Switching frequency	f <sub>c</sub> kHz	From 2 to 8 kHz (Default: 4 kHz) <sup>(6)</sup>					
Output frequency	f <sub>n</sub> Hz	0 ... 599 Hz					

## Input, mains side

Rated mains voltage	U V	400					
ANG410 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
Rated mains voltage	U V	525					
ANG510 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
Rated mains voltage	U V	690 (reduced for UL: 600)					
ANG610 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

## General

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	- -	ANG410: UL 61800-5-1/CSA 22.2   ANG510 & 610: -					

## Environment

Cooling temperature <sup>(5)</sup>	T <sub>n</sub> °C	-25 ... 45					
Relative air humidity	- %	From 15 to 85, non-condensing					

## Options & accessories

Input line choke	- -	External (depending on mains supply)					
EMC filter	- -	For selection of EMC 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 Uk=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  
 (6) Higher Switching frequencies available on request



# AUTOMATION MODULES

## Variants

With ordering the ANG device the Communication version has to be selected.



Variant					
Device Designation part	A	D	J	R	V
Module name	EM2-AUT-01	EM2-AUT-04	EM2-AUT-11	EM2-AUT-21	EM2-AUT-31

### Protocol

Ethernet	EtherCAT	EtherCAT	PROFINET	Ethernet/IP	Varan
CAN <sup>(1)</sup>	Yes <sup>(2)</sup>	Yes <sup>(2)</sup>	Yes	Yes	Yes

### Encoder Interface X412

Hiperface	Yes	No	Yes	Yes	Yes
EnDat 2.2 with SinCos tracks (EnDat01)	Yes	No	Yes	Yes	Yes
EnDat 2.2 without SinCos tracks (EnDat22)	Yes	No	Yes	Yes	Yes
SSI	Yes	No	Yes	Yes	Yes
SinCos	Yes	No	Yes	Yes	Yes
TTL	Yes	No	Yes	Yes	Yes

### Encoder Interface X410

Resolver	Yes	Yes	Yes	Yes	Yes
TTL	Yes	Yes	Yes	Yes	Yes

### Analogue Multifunctions IO Functions

0....+10 V Input	Yes	No	Yes	Yes	Yes
-10....+10 V Input	Yes	No	Yes	Yes	Yes
0...20 mA Input	Yes	No	Yes	Yes	Yes
PTC Input (KTY, PT1000, PT100)	Yes	No	Yes	Yes	Yes
0...10 V Output	Yes	Yes	Yes	Yes	Yes

(1) CAN Interface can be used for CANopen or Systembus

(2) CANopen and EtherCAT cannot be used at the same time.

EtherCAT

EtherCAT

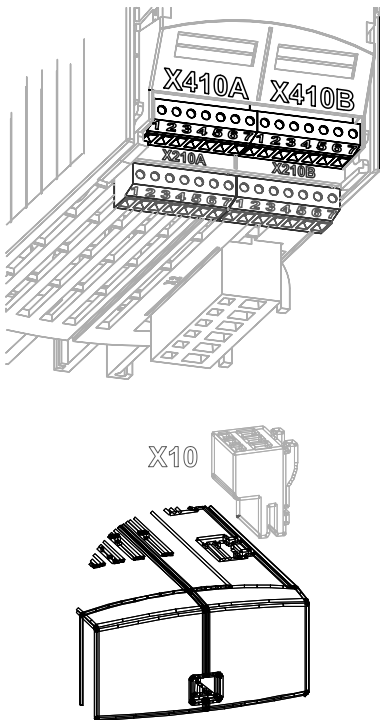
PROFI<sup>®</sup>  
NET

PROFINET



VARAN

## 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 <sup>(1)</sup> (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, $\pm 10$ V, PT1000/KTY, 0 ... 20 mA
X210B.7	Ground 10 V

### Relay output X10

S3OUT	Relay output <sup>(1)</sup> Make Contact: AC 5 A / 240 V, DC 5 A (ohmic) / 24 V Break Contact: AC 3 A / 240 V, DC 1 A (ohmic) / 24 V
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(1) Control terminals are freely configurable.

### Control terminal X410A

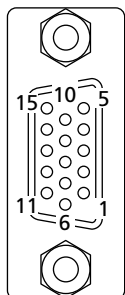
X410A.1	Depends on selected Expansion module
X410A.2	Depends on selected Expansion module
X410A.3	Depends on selected Expansion module
X410A.4	Depends on selected Expansion module
X410A.5	Depends on selected Expansion module
X410A.6	Depends on selected Expansion module
X410A.7	Depends on selected Expansion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

## Sensor and PTC input X412 (HD-Sub-D socket)

	Contact	Sin/Cos / TTL	Hiperface	Function EnDat 2.1	EnDat 2.2	SSI
	Housing	PE	PE	PE	PE	PE
	1			Clock-	Clock-	Clock-
	2			Clock+	Clock+	Clock+
	3	Cos- / B-	Cos-	B- / Cos-		(optionally B- / Cos-)
	4	Cos+ / B+	Cos+	B+ / Cos+		(optionally B+ / Cos+)
	5	TM <sub>PTC</sub> -	TM <sub>PTC</sub> -	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>	V <sub>Enc</sub>	V <sub>Enc</sub>
	7					
	8	- / R- <sup>(1)</sup>	Data -	Data -	Data -	Data -
	9	Sin- / A-	Sin-	Sin-		(optionally A- / Sin-)
	10	TM <sub>PTC</sub> +	TM <sub>PTC</sub> +	TM <sub>PTC</sub> +	TM <sub>PTC</sub> +	TM <sub>PTC</sub> +
	11	V <sub>EncSense</sub>		V <sub>EncSense</sub>	V <sub>EncSense</sub>	V <sub>EncSense</sub>
	12					
	13	- / R+ <sup>(1)</sup>	Data +	Data +	Data +	Data +
	14	Sin+ / A+	Sin+	Sin+		(optionally A+ / Sin+)
	15	GND	GND	GND	GND	GND



(1) R-/R+ evaluation is only available for TTL encoders.



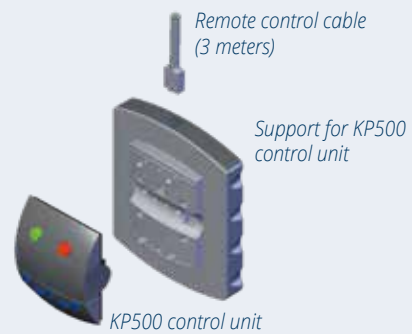
## CONTROL UNIT | KP500



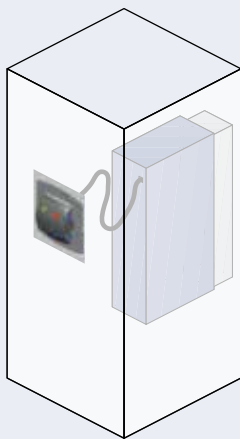
Active Next Generation is designed to ensure the highest hardware flexibility to suit every control requirement. Machine designers can select an optional Keypad for diagnosis or parameterization independent from a Personal Computer. An optional remote unit gives the possibility to mount the keypad on a cabinet door or convert a keypad into a handheld.



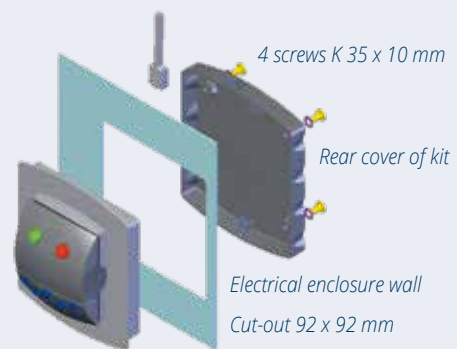
Control unit remote installation kit / KPCMK  
The KPCMK kit is used to remotely control the inverter from the KP500 unit.



Handheld remote control unit

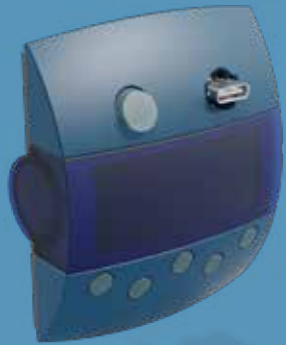


Remote installation on exterior of enclosure

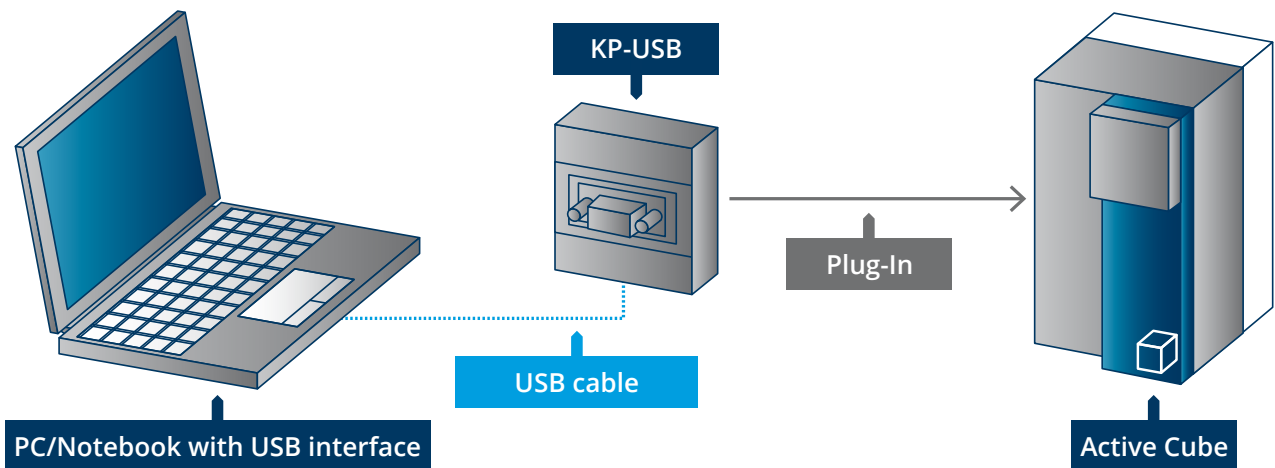


Fixing to enclosure

## INTERFACE | KP-USB



The KP-USB adapter 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 USB point-to-point connection allows in an easy way the connection between inverter series ACTx10/ACUx10/ANGx10 and PC.



# 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 Next Generation inverter range.

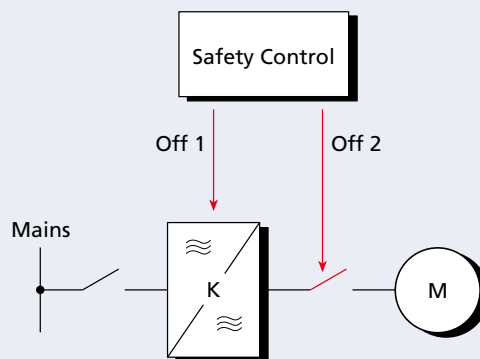
When triggering the STO function the frequency inverter switches off the rotating field to the motor.

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

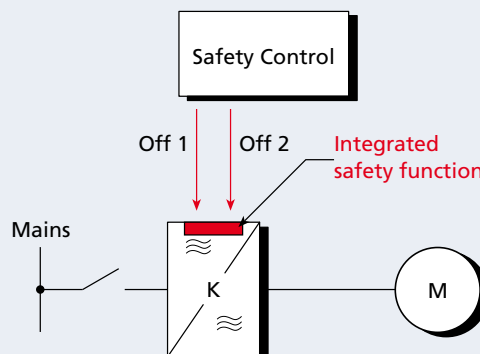
Continuous monitoring tests are done by the inverter to detect possible control failures.

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

Without STO



With STO



# MOUNTING OF STANDARD DEVICES

A wide range of mechanical accessories is available for Active Next Generation 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.

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

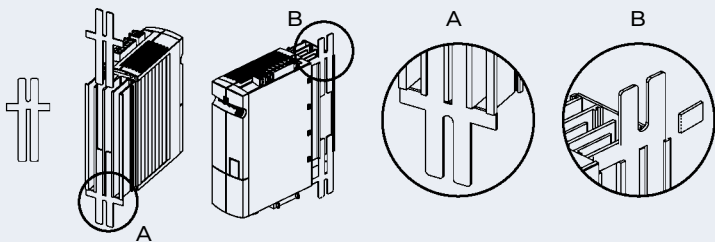
For the mechanical sizes 1 to 5 screen plates are available for the mounting of electrical cable screens.



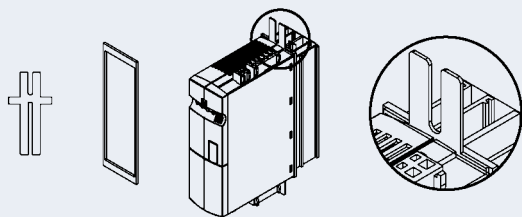
# MOUNTING OF SIZE 1

Active Next Generation	Mounting	Description
210-xx 1 ... 410-xx 1 ...	Standard	Standard mounting
	MPSV1	Thru-type mounting
	MNVIB1	Antivibration mounting
	MDIN1	DIN rail mounting

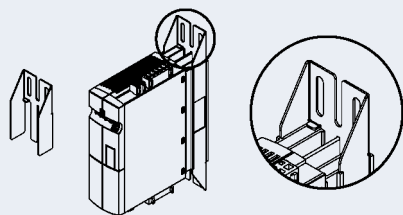
MSTD1-2  
(STANDARD MOUNTING)



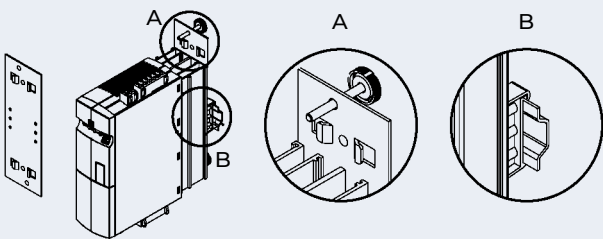
MPSV1



MNVIB1



MDIN1

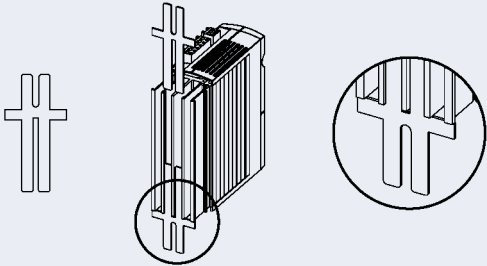




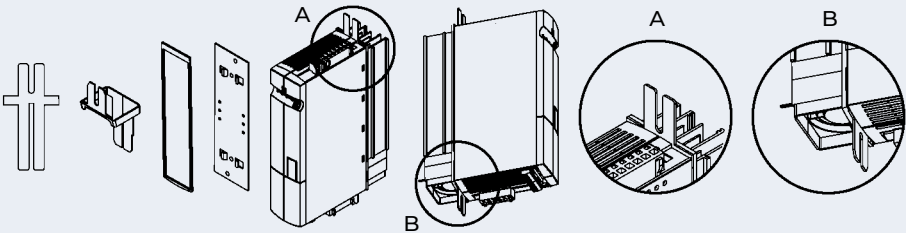
# MOUNTING OF SIZE 2

Active Next Generation	Mounting	Description
210-xx 2 ... 410-xx 2 ...	Standard	Standard mounting
	MPSV2	Thru-type mounting
	MNVIB2	Antivibration mounting
	MDIN2	DIN rail mounting

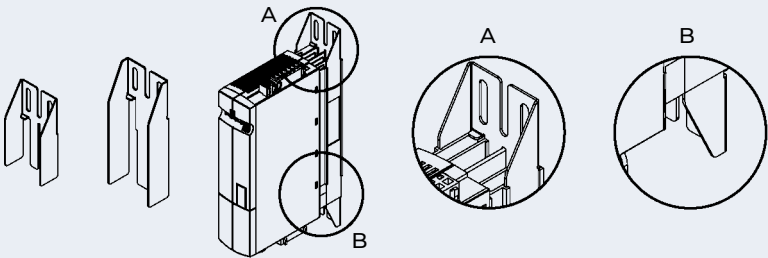
MSTD1-2  
(STANDARD MOUNTING)



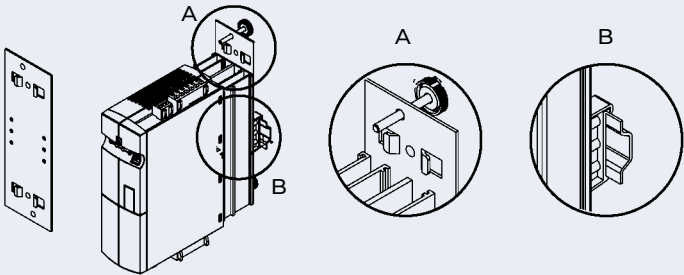
MPSV2



MNVIB2

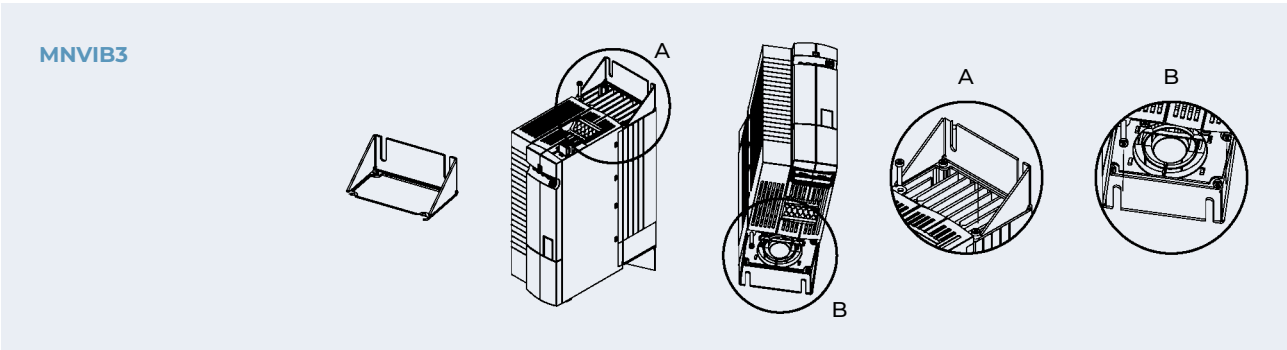
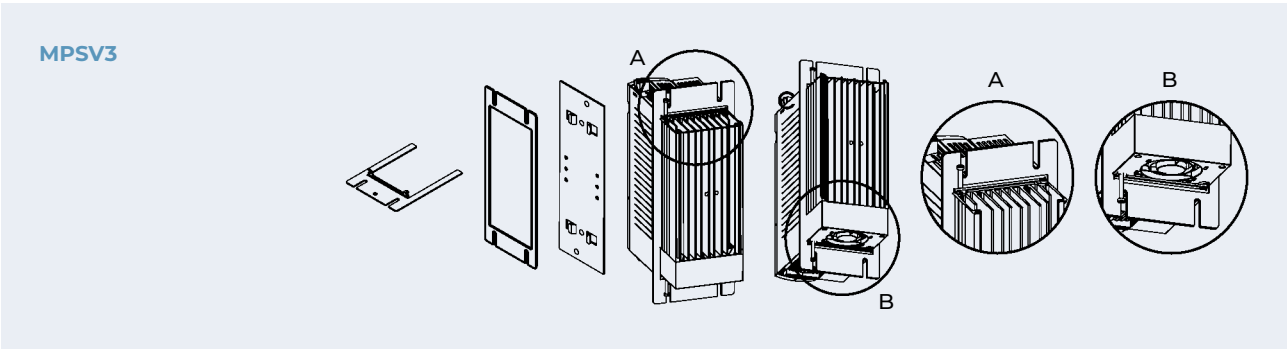
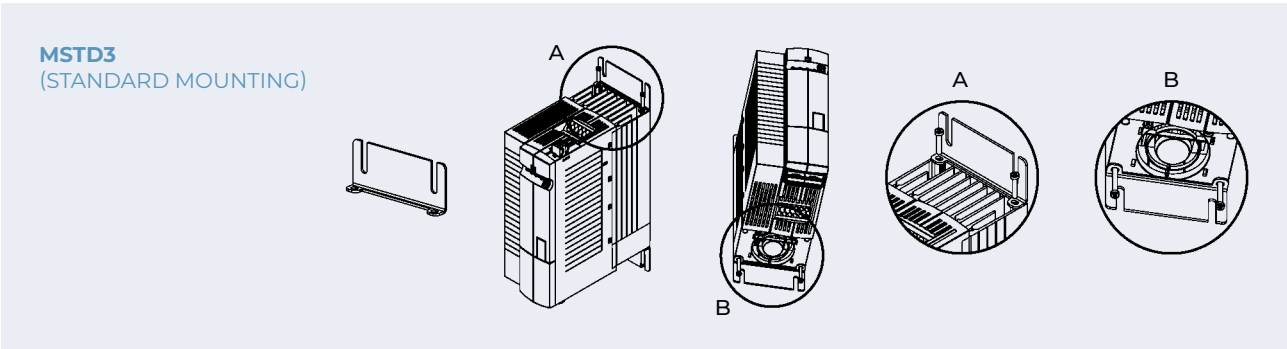


MDIN2



# MOUNTING OF SIZE 3

Active Next Generation	Mounting	Description
210-xx 3 ... 410-xx 3 ...	Standard	Standard mounting
	MPSV3	Thru-type mounting
	MNVIB3	Antivibration mounting



# MOUNTING OF SIZE 4

Active Next Generation	Mounting	Description
210-xx 4 ... 410-xx 4 ...	Standard	Standard mounting
	MPSV4	Thru-type mounting
	MNVIB4	Antivibration mounting

**MSTD4**  
(STANDARD MOUNTING)

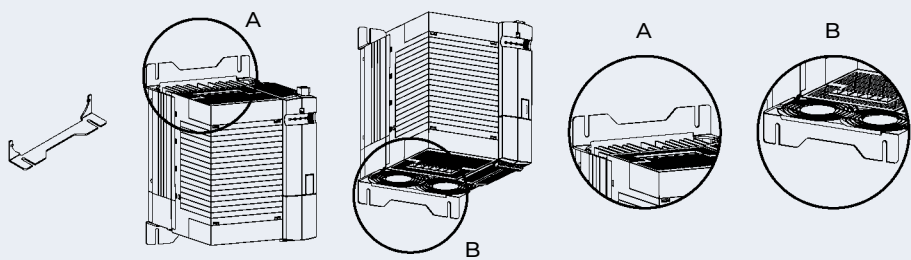
**MPSV4**

**MNVIB4**

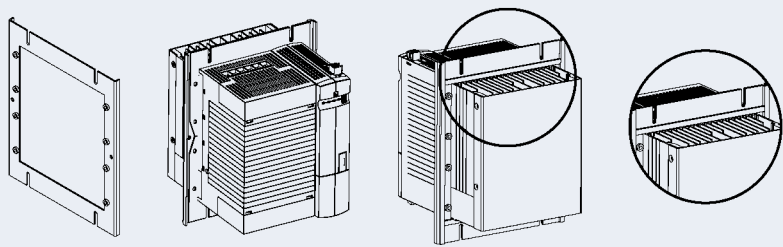
# MOUNTING OF SIZE 5

Active Next Generation	Mounting	Description
410-xx 5 ...	Standard	Standard mounting
	MPSV5	Thru-type mounting
	MNVIB5	Antivibration mounting

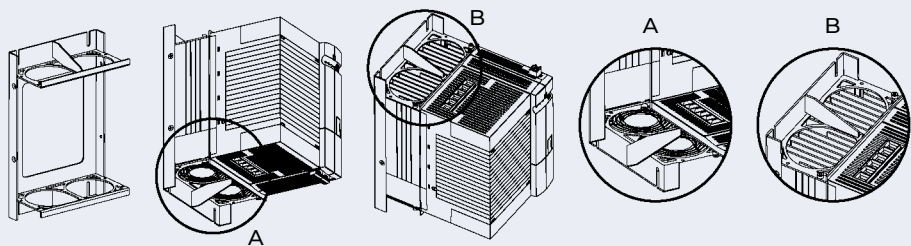
MSTD5  
(STANDARD MOUNTING)



MPSV5

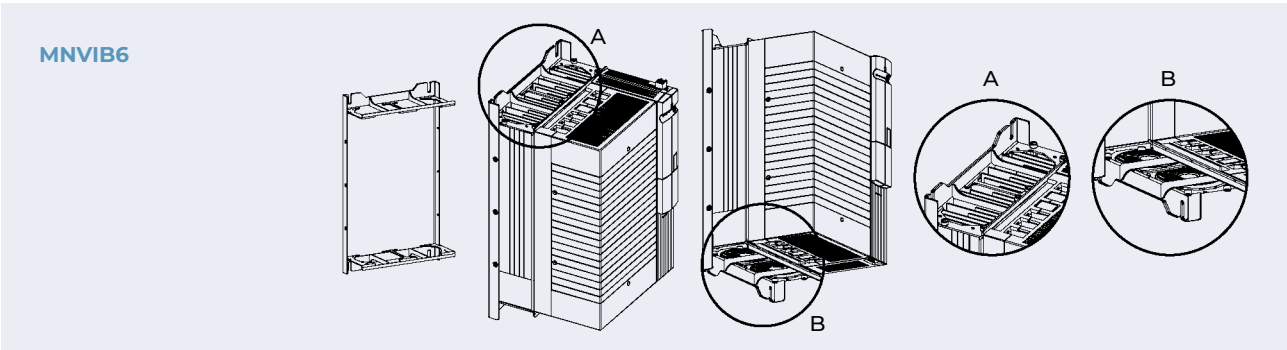
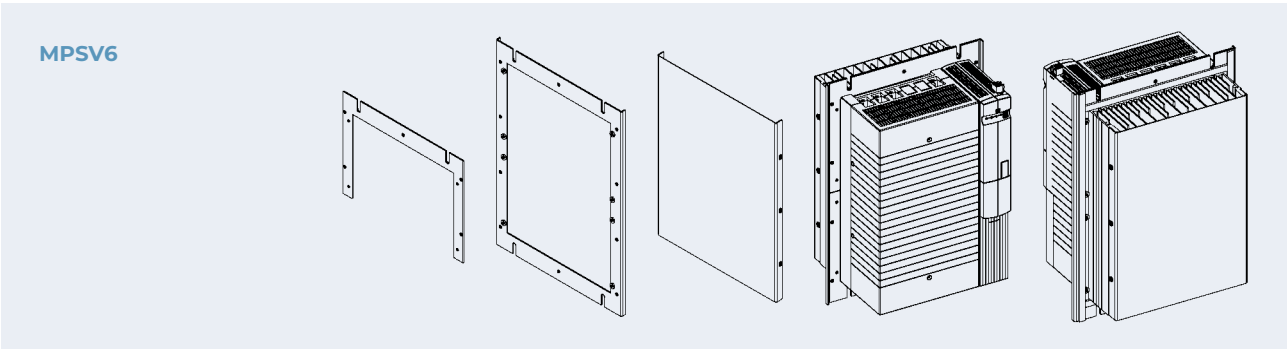
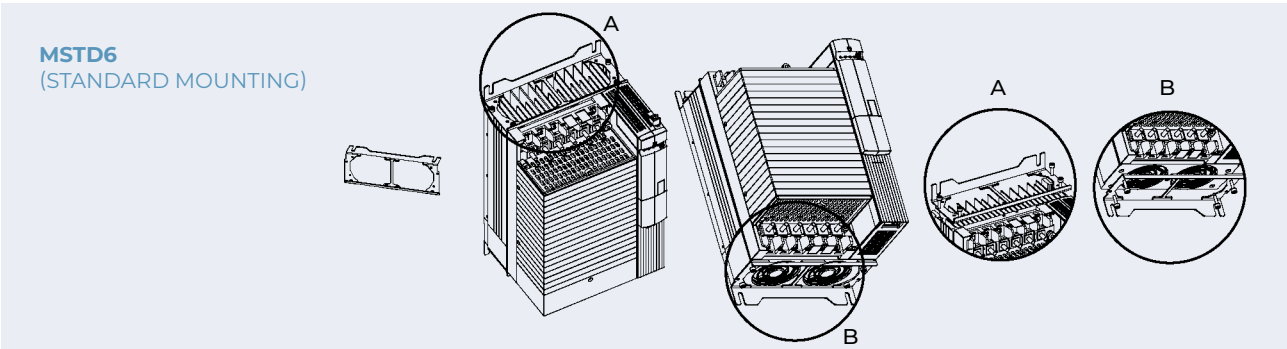


MNVIB5



# MOUNTING OF SIZE 6

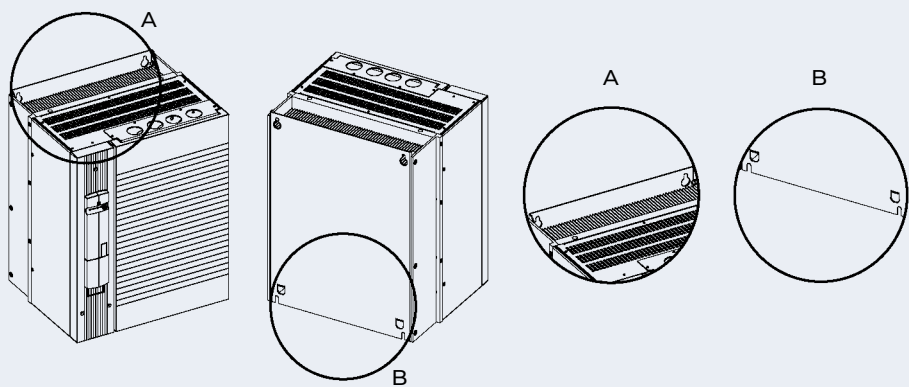
Active Next Generation	Mounting	Description
410-xx 6 ...	Standard	Standard mounting
	MPSV6	Thru-type mounting
	MNVIB6	Antivibration mounting



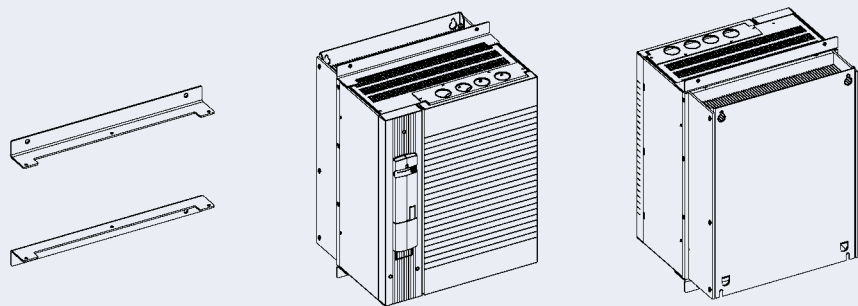
# MOUNTING OF SIZE 7

Active Next Generation	Mounting	Description
410-xx 7 ...	Standard	Standard mounting
	MPSV7	Thru-type mounting

MSTD7  
(STANDARD MOUNTING)

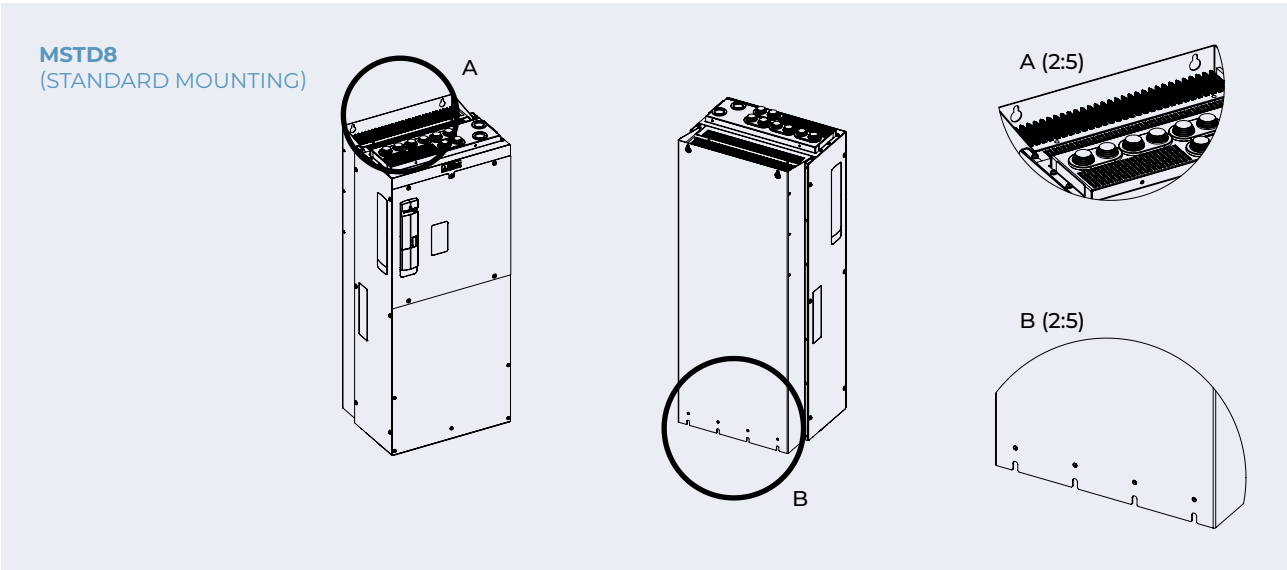


MPSV7



# MOUNTING OF SIZE 8

Active Next Generation	Mounting	Description
410-xx 8 ... 510-xx 8 ... 610-xx 8 ...	Standard	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 EMC filters (attenuation of EMC 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. EMC filter
4. Inverter

## EMC Standards

The standard EN 61800-3 defines the EMC levels for drive systems and for machinery. Depending on the EMC environment different solutions on the inverter side are available to achieve the required EMC level.

### 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 EMC filter. A line choke is highly recommended when the PCC (Point of common coupling) of the mains power supply for the drive has an RSC higher than 100.
- A line choke is recommended for the ANG210 and ANG410 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 ANG210 frequency inverters and in sizes 7 and 8. For other devices please check the markings in the technical data tables.

### EMC filter

- An EMC filter can be used in order to achieve Class C3, C2 or C1 interference suppression.
- The EMC filter is available in a low leakage current version for special applications.
- The EMC - 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 Next Generation inverter - Line choke / EMC filter combination

EN 55011	Compliance with CLASS A (GROUP 2)		Compliance with CLASS A (GROUP 1)		Compliance with CLASS B	
EN61800-3	Compliance with CATEGORY C3		Compliance with CATEGORY C2		Compliance with CATEGORY C1	
Motor cable length	< 10 m	< max*	< 10 m	< max*	< 10 m	< max*
ANG size 1 (standard internal filter)	Standard	external choke	Standard	external filter	external choke	external filter
ANG size 2 (standard internal filter)	Standard	external choke	Standard	external filter	external choke	external filter
ANG size 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
ANG size 4	external choke	external choke	external filter	external filter	external filter	external filter + external choke
ANG size 5	external choke	external choke	external filter	external filter	external filter	external filter + external choke
ANG size 6	external choke	external choke	external filter	external filter	external filter	external filter
ANG size 7	external choke	external filter	external filter	external filter	—	—
ANG size 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.

The line choke must be installed between the mains connection point and the EMC 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.

## Technical data

### Mains voltage

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

### Frequencies

- 50/60 Hz
- uk (a IN / 50 Hz) 4%

### Insulating material class

- T40/F

### Ambient temperature

- 40°C

### Protection degree (EN 60529)

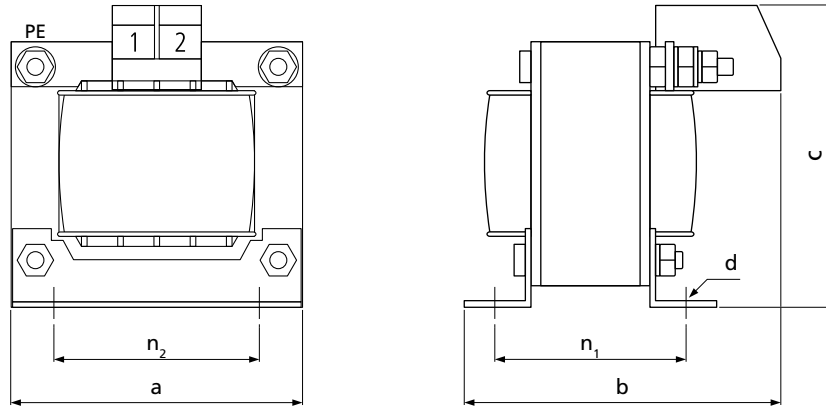
- IP00

### Connection type

- Contact-protected terminals

# LINE CHOKE

## LCVS006 ... LCVS018



## Technical data

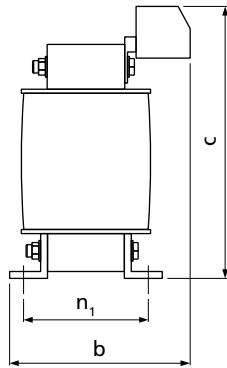
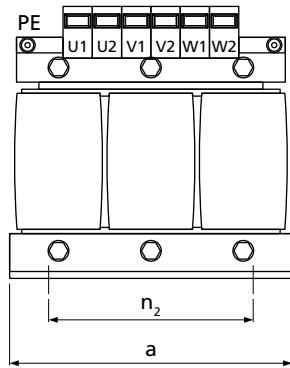
Bonfiglioli frequency inverter - Line choke combination, **1x230V~**

Inverter type	Line choke	Nominal current	Power dissipation
		[A]	[W]
<b>ANG 210-01</b>	LCVS006	6	8.0
<b>ANG 210-03</b>			
<b>ANG 210-05</b>			
<b>ANG 210-07</b>	LCVS008	8	8.0
<b>ANG 210-09</b>	LCVS010	10	10.0
<b>ANG 210-11</b>	LCVS015	15	12.0
<b>ANG 210-13</b>	LCVS018	18	15.0

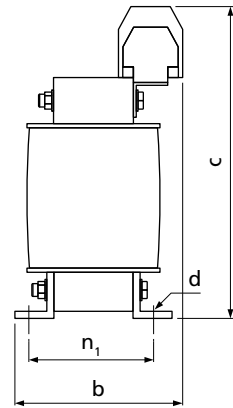
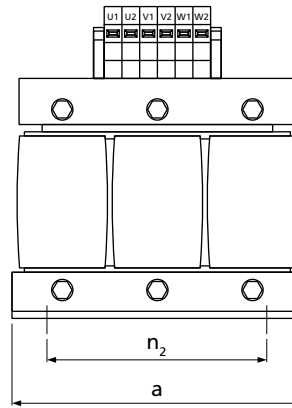
## Technical assembly data

Line choke	Dimensions				Assembly		Weight	Connection terminal		
	a	b	c	n <sub>2</sub>	n <sub>1</sub>	d	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

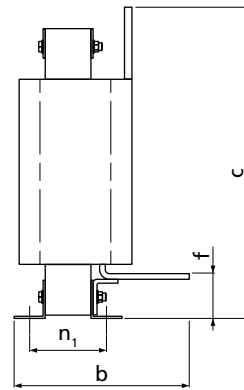
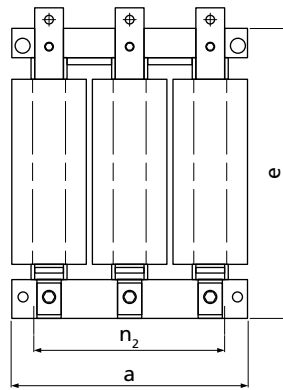
LCVT004 ... LCVT025



LCVT034 ... LCVT250



LCVT280AL-xxx ... LCVT690AL-xxx



## Technical data

Bonfiglioli frequency inverter – Line choke combination, 3x230V~

Inverter type	Line choke	Nominal current	Choke	Power dissipation
		[A]	[mH]	[W]
ANG 210-01	LCVT004	4	7.32	20
ANG 210-03				
ANG 210-05				
ANG 210-07				
ANG 210-09	LCVT006	6	4.88	25
ANG 210-11	LCVT008	8	3.66	30
ANG 210-13	LCVT010	10	2.93	30
ANG 210-15	LCVT015	15	1.95	45
ANG 210-18	LCVT018	18	1.63	70
ANG 210-19	LCVT025	25	1.17	70
ANG 210-21	LCVT034	34	0.86	85
ANG 210-22				

# LINE CHOKE

## Technical data

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

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

## Technical assembly data

Line choke	Dimensions			Assembly			Weight	Connection terminal		
	a	b	c	n <sub>2</sub>	n <sub>1</sub>	d	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

Line choke	Dimensions					Assembly		Weight	Connection terminal			
	a	b	c	e	f	n <sub>2</sub>	n <sub>1</sub>	[kg]	Phases	[Nm]	PE	[Nm]
<b>ANG410</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>ANG10</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>ANG610</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



# EMC FILTERS

Because of their intrinsic characteristics, all frequency inverters often generate undesired high frequency voltages generally referred to as “interference”. EMC filters are installed on the mains side to reduce this interference. The reference standard EN 61800-3 defines the thresholds for electromagnetic interference for different classes of equipment.

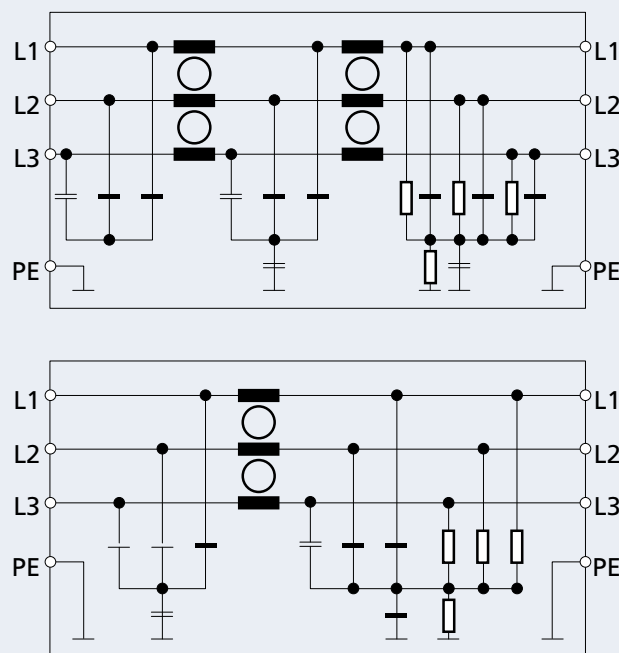
Active Next Generation series frequency inverters up to size 9.2 kW can be ordered with a built-in EMC filter conforming to the requirements of the standard for “Category C2” environments.

Two series of external EMC filters are available for larger size Active Next Generation frequency inverters and for installations where conformity to the requirement “Category C1” 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 Next Generation 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 Next Generation 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 EMC 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 ANG 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 EMC filter must be connected to the metal baseplate with a short, large section earth connection.

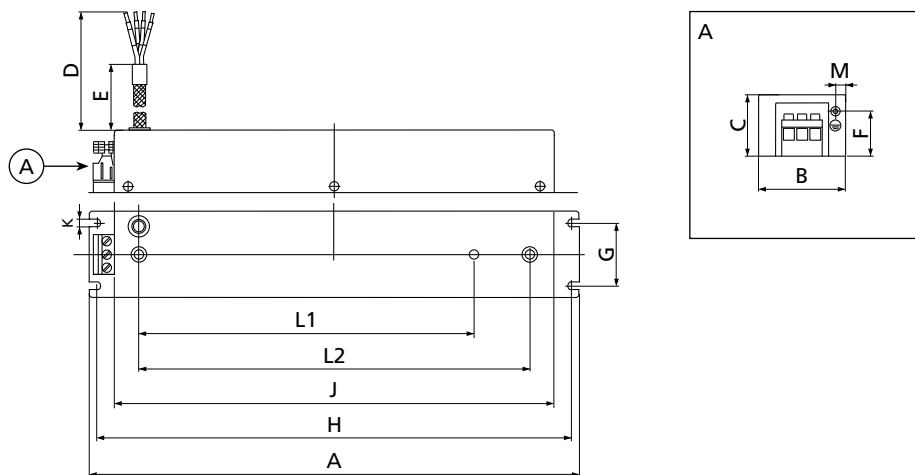
Overload capacity is 1.5 times rated current for 1 minute, every 30 minutes.

Inverter type		EMC filter	Rated current	Leakage current	Power dissipation	Weight
Size	Type		[A]	[mA]	[W]	[kg]
1	ANG 210-01	FTV007B	8	5	10	1.5
	ANG 210-03					
	ANG 210-05					
	ANG 210-07					
	ANG 210-09					
	ANG 410-01					
	ANG 410-03					
	ANG 410-05					
	ANG 410-07					
	ANG 410-09					
	ANG 410-11					
2	ANG 210-11	FTV018B	18	1.5	20	3.5
	ANG 410-12					
	ANG 410-13					
	ANG 410-15					
	ANG 410-18					
3	ANG 410-19	FTV018B	18	1.5	20	3.5
	ANG 410-21					
4	ANG 410-23	FTV040B	40	1.2	35	3.5
	ANG 410-25					



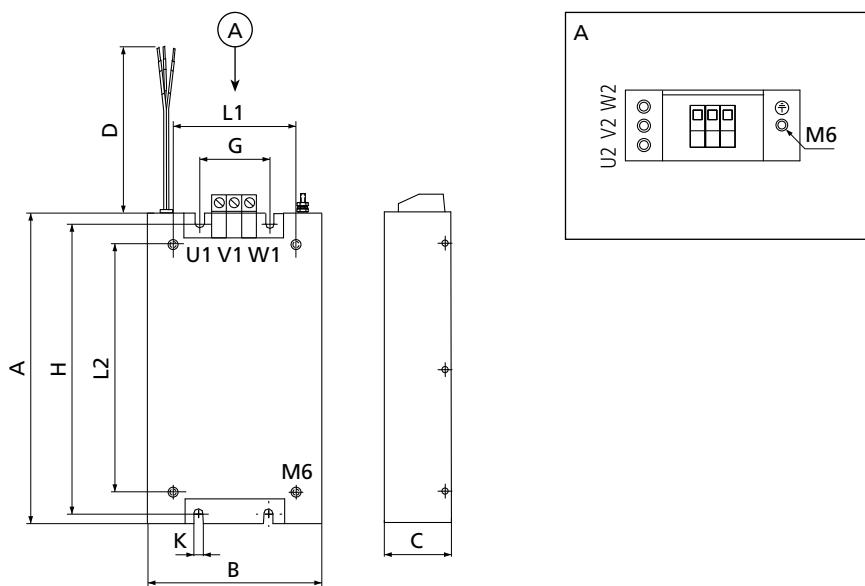
# BACKPLATE EMC FILTERS

## Dimensions FTV007B



EMC filter	A	B	C	D	E	F	G	H	J	K	L1	L2	M
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



EMC filter	A	B	C	D	G	H	K	L1	L2
FTV018B	315	100	65	300	35	300	6.3	76	270
FTV040B	315	125	65	300	60	300	6.3	125	270



# BOOK TYPE EMC 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:

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

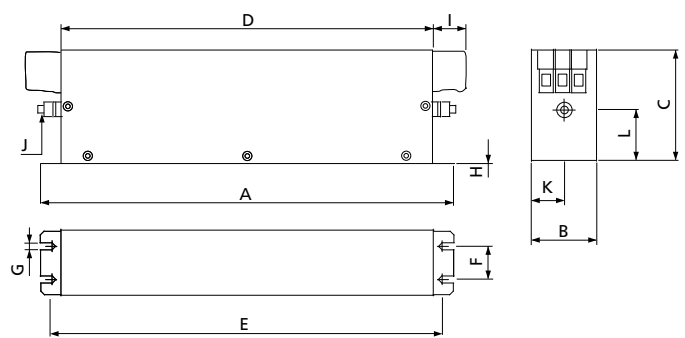
## Note

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

Inverter type		EMC filter	Rated current	Leakage current	Power dissipation	Weight
Size	Type		[A]	[mA]	[W]	[kg]
1	ANG 210-01	FTV007A	7	33	3.8	0.5
	ANG 210-03					
	ANG 210-05					
	ANG 210-07					
	ANG 210-09					
	ANG 410-01					
	ANG 410-03					
	ANG 410-05					
	ANG 410-07					
	ANG 410-09					
	ANG 410-11					
2	ANG 210-11	FTV016A	16	33	6.1	0.8
	ANG 410-12					
	ANG 410-13					
	ANG 410-15					
	ANG 210-13					
3	ANG 210-15	FTV030A	30	33	11.8	1.2
	ANG 410-18					
	ANG 410-19					
	ANG 410-21					
4	ANG 210-18	FTV055A	55	33	25.9	2.0
	ANG 210-19					
	ANG 410-22					
5	ANG 210-21	FTV075A	75	33	32.2	2.7
	ANG 410-23					
	ANG 410-25					
6	ANG 210-22	FTV100A	100	33	34.5	4.3
	ANG 410-27					
	ANG 410-29					
7	ANG 410-31	FTV130A	130	33	43.1	4.5
	ANG 410-33					
	ANG 410-35					
8	ANG 410-37	FTV180A	180	33	58.3	6.0
	ANG 410-39					
	ANG 410-43					
9	ANG 410-45	FTV250A	250	98	90	12.4
	ANG 410-47					
	ANG 410-49					
10	ANG 410-51	FTV401A	400	42	55	12.2
	ANG 410-53					
	ANG 410-55					
11	ANG 410-57	FTV630A	630	42	65	17.8
	ANG 410-59					
	ANG 410-61					
12	ANG 510-51	FTV401A	400	42	55	15.2
	ANG 510-53					
	ANG 510-55					
13	ANG 510-57	FTV630A	630	42	65	17.8
	ANG 510-59					
	ANG 510-61					
14	ANG 610-51	FTV400A-690	400	17	55	11.0
	ANG 610-53					
	ANG 610-55					
15	ANG 610-57	FTV400A-690	400	17	55	11.0
	ANG 610-59					
	ANG 610-61					

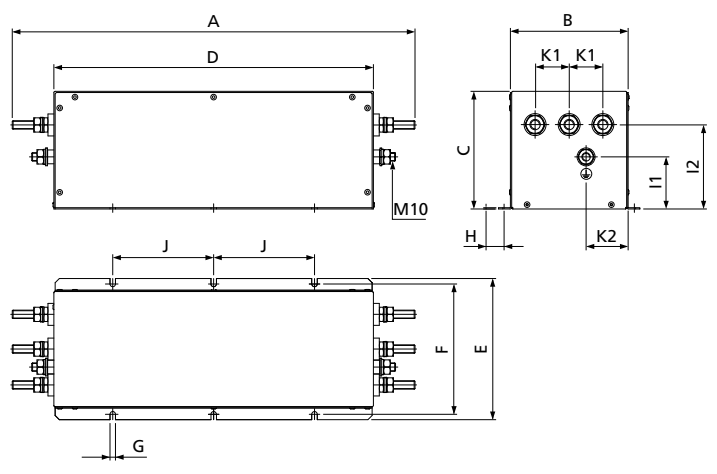
# BOOK TYPE EMC FILTERS

## Dimensions FTV007A ... FTV180A



EMC filter	A	B	C	D	E	F	G	H	I	J	K	L
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

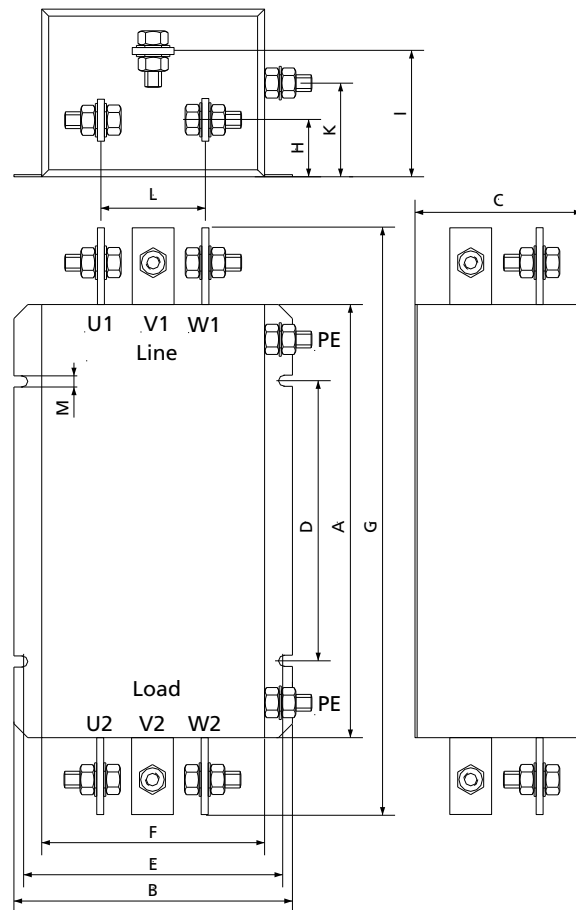
## Dimensions FTV250A



EMC filter	A	B	C	D	E	F	G	H	I1	I2	J	K1	K2
FTV250A	482	140	140	380	168	155	6.5	1.5	62	100	120	40	50



# Dimensions FTV401A ... FTV630A



EMC filter	A	B	C	D	E	M Ø	F	G	PE	H	I	K	L	Bus Bar
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.

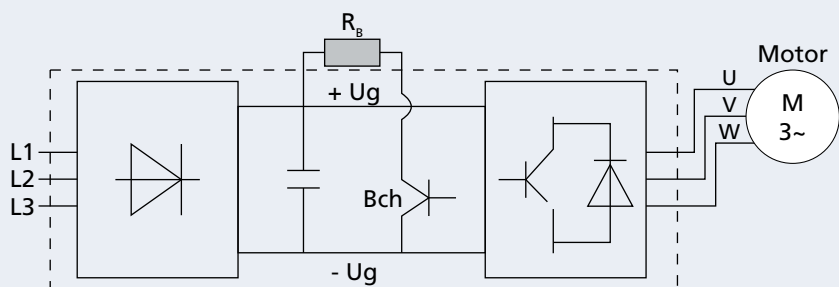
Mostly, they are equipped with built-in thermal protection.



## Connection diagram

$R_b$  = external braking resistor

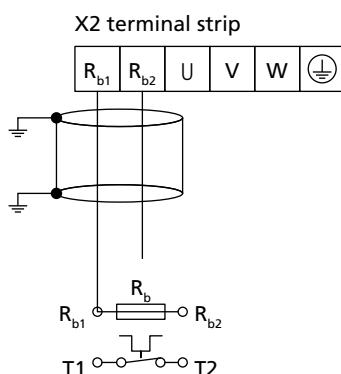
Bch= brake chopper integrated in standard Active Cube inverter



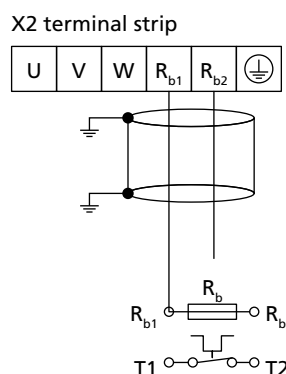
## Connection terminals

The  $R_{b1}$  and  $R_{b2}$  braking resistor terminals on AxiaVert frequency inverters are located on the X2 power output terminal strip. Access to these terminals on sizes 1 to 4 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.

### Frequency inverter (from 0.25 to 4.0 kW)



### Frequency inverter (from 5.5 to 132 kW)



## Active Next Generation drive combination chart

These charts show recommended combinations for each model in the Active Next Generation 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.

Inverter type		Bonfiglioli braking resistor	Resistance	Continuous rated power	Duty cycle at the drive's rated power
kW			Ohm	[W]	[%]
ANG 210-01	0.25	BR 160/100	100	160	64%
ANG 210-03	0.37	BR 160/100	100	160	43%
ANG 210-05	0.55	BR 160/100	100	160	29%
ANG 210-07	0.75	BR 160/100	100	160	21%
ANG 210-09	1.1	BR 160/100	100	160	15%
ANG 210-11	1.5	BR 432/37	37	432	29%
ANG 210-13	2.2	BR 432/37	37	432	20%
ANG 210-15	3	BR 432/37	37	432	14%
ANG 210-18	4	BR 667/24	24	667	17%
ANG 210-19	5.5	BR 667/24	24	667	12%
ANG 210-21	7.5	BR 1333/12	12	1333	18%
ANG 210-22	9.2	BR 1333/12	12	1333	14%
ANG 410-01	0.25	BR 213/300	300	213	85%
ANG 410-03	0.37	BR 213/300	300	213	57%
ANG 410-05	0.55	BR 213/300	300	213	39%
ANG 410-07	0.75	BR 213/300	300	213	28%
ANG 410-09	1.1	BR 213/300	300	213	19%
ANG 410-11	1.5	BR 213/300	300	213	14%
ANG 410-12	1.85	BR 471/136	136	471	25%
ANG 410-13	2.2	BR 471/136	136	471	21%
ANG 410-15	3	BR 471/136	136	471	16%
ANG 410-18	4	BR 696/92	92	696	17%
ANG 410-19	5.5	BR 1330/48	48	1330	24%
ANG 410-21	7.5	BR 1330/48	48	1330	18%
ANG 410-22	9.2	BR 1330/48	48	1330	14%
ANG 410-23	11	BR 2000/32	32	2000	18%
ANG 410-25	15	BR 2000/32	32	2000	13%
ANG 410-27	18.5	BR 4000/16	16	4000	22%
ANG 410-29	22	BR 4000/16	16	4000	18%
ANG 410-31	30	BR 4000/16	16	4000	13%
ANG 410-33	37	BR 8000/7	7.5	8000	22%
ANG 410-35	45	BR 8000/7	7.5	8000	18%
ANG 410-37	55	BR 8000/7	7.5	8000	15%
ANG 410-39	65	BR 8000/7	7.5	8000	12%
ANG 410-43	75	BR8000/7	7.5	8000	11%
ANG 410-45	90	BR8000/7	7.5	8000	9%
ANG 410-47	110	2xBR8000/7	3.75	16000	15%
ANG 410-49	132	2xBR8000/7	3.75	16000	12%

For further information refer to the Bonfiglioli braking resistor catalogue.



# OUR GLOBAL PRESENCE

Thanks to an international network of closely interconnected commercial and production sites, we can guarantee the same high standards of Bonfiglioli quality anywhere at any given time. We know that our direct presence in local markets is the key to long-lasting success, so our family includes 18 production sites, 23 commercial sites and more than 550 distributors around the world.

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

  
**18**

PRODUCTION SITES

  
**23**

COMMERCIAL SITES

  
**80**

COUNTRIES

  
**550**

DISTRIBUTORS

  
**~4,700**

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