

# **Bonfiglioli** Vectron

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## Active

Solution Drive



# Power, control and green solutions



## Bonfiglioli, one name for a large international group

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It was back in 1956 that Clementino Bonfiglioli established in Bologna, Italy, the company that still bears his name. Now, some fifty years later, the same enthusiasm and dedication is driving Bonfiglioli to become the world's top name in power transmission and control solutions. Through directly controlled subsidiaries and production plant around the world, Bonfiglioli designs, manufactures and distributes a complete range of gearmotors, drive systems and planetary gearboxes, and boasts the most integrated offering on the market today.

Now, to emphasise its commitment to health, safety and environmental sustainability, Bonfiglioli is adding the term "green" to the description of its offering.

This commitment can be seen too in the Group's new trademark, made up of three shapes and colours identifying Bonfiglioli's three main business areas - Power, Control & Green Solutions and symbolising a set of values that includes openness and respect for other cultures.

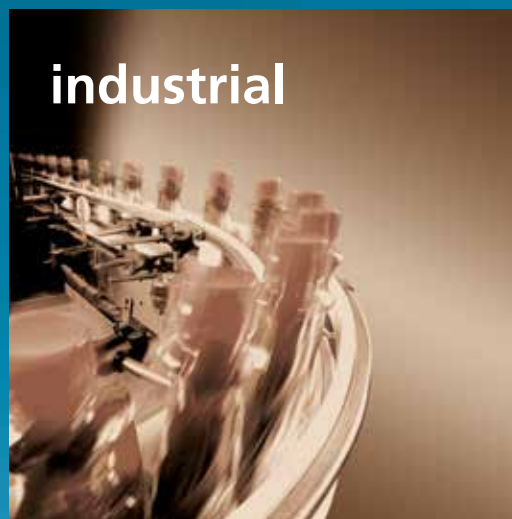
In a market in which excellent product quality alone is no longer sufficient, Bonfiglioli also provides experience, know-how, an extensive sales network, excellent pre-sales and after-sales service and modern communication tools and systems to create high level solutions for industry, mobile machinery and renewable energy.

# Bonfiglioli solutions

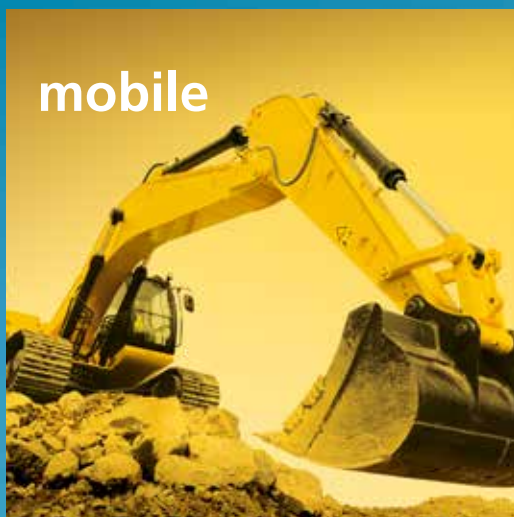
wind



industrial



mobile



photovoltaic



## Innovative solutions for industrial field.

Bonfiglioli Riduttori today is one of the top brands in the power transmission industry.

The company's success is the result of a business strategy that relies on three fundamental factors: know-how, innovation and quality.

The complete range of Bonfiglioli brand gearmotors offers excellent technical characteristics and guarantees the highest performance. Substantial investment and technical expertise have enabled the company to achieve an annual production output of 1600000 units using completely automated processes.

Certification of the company's Quality System by DNV and TÜV is proof of the high quality standards achieved.

With the acquisition of the Vectron brand, Bonfiglioli is now established as leader of the industrial automation sector.

Bonfiglioli Vectron delivers products and services for completely integrated inverter solutions.

These solutions complement Bonfiglioli's power transmission and control offering to the industrial sector.

Since 1976, Bonfiglioli Trasmital's know-how in the power transmission industry has focused on special applications offering 100% reliability in the manufacturing of gearmotors for mobile machinery.

This includes the full range of slew and wheel drive applications and gearboxes for wind turbine pitch and yaw drive systems.

Today Bonfiglioli Trasmital stands at the forefront of the industry as a key partner to top manufacturers worldwide.





# Solution Drive



## Advanced technologies for all industrial fields.

Bonfiglioli Active frequency inverters are powerful and innovative units specifically designed to control electric motors in sophisticated automation systems.

Bonfiglioli Active range includes both single and three phase units for mains voltages of 230 V or 400 V, ranging from 0.55 kW to 132 kW.

Power ratings within Active range have been chosen to ensure a perfect match with Bonfiglioli motor ratings. The use of Active drives together with Bonfiglioli electric motors exploits at best technical synergy between these two product series.

Hardware flexibility is a fundamental feature of the Active series, and is achieved by means of a generous selection of expansion and communication modules that can be used to "configure" inverters to suit specific application requirements.

Active 401/201 is a "System Drive". Thanks to integrated PLC functions and wide connectivity with mostly used bus systems, Active 401/201 integrates seamlessly with a vast range of automation solutions.

Other main features of Active series:

- extremely compact dimensions
- accurate motor control and silent running, thanks to an 8 kHz switching frequency without derating

- easy mounting and connections, with a large number of panel mounting kits and easy disconnectable plug-in terminals
  - exceptional software configurability through a streamlined, intuitive user interface
  - versatile control, with very few configuration parameters needed to drive synchronous and asynchronous, feedback and sensorless, braked and brakeless motors
  - choice of motor control technologies, including robust scalar control, vectorial sensorless control and accurate field-oriented feedback control: Active frequency converters provide an adequate level of accuracy and dynamics to satisfy the needs of a wide range of applications
  - speed and position synchronisation in "multi-drive" automation systems
  - extensive choice of accessories, all guaranteed and tested with Active drives, including mains side inductors, EMC filters and braking resistors
- Active frequency inverters provide the perfect control solution for any application, from the simplest machine automation systems to the most complex control architectures granting perfectly repeatable high-tech results.



# Designation

## ACT201 series

### Basic variants

| ACT 201 | 13   | F  | A   |
|---------|--|--|---|
|         |  |  | <b>Construction style</b><br><b>A</b> style with standard cooling<br><b>C</b> style with cold-plate cooling |
|         |  | <b>EMI filter</b><br><b>F</b> internal filter<br><b>(blank)</b> no internal filter |   |
|         | <b>Size 1</b><br><b>05</b> 0.55 kW<br><b>07</b> 0.75 kW<br><b>09</b> 1.1 kW<br><br><b>Size 2</b><br><b>11</b> 1.5 kW<br><b>13</b> 2.2 kW<br><b>15</b> 3.0 kW (only 3 ph)<br><br><b>Size 3</b><br><b>18</b> 4.0 kW (only 3 ph)<br><b>19</b> 5.5 kW (only 3 ph)<br><br><b>Size 4</b><br><b>21</b> 7.5 kW (only 3 ph)<br><b>22</b> 9.2 kW (only 3 ph) |  |   |

#### Series

- ACT 201** inverter ACTIVE 1ph/3ph x 200-240 VAC +/- 10%

### Optional variants

| MPSV   | EMSYS   | CMCAN  | KP500   |
|--|---|--|---|
|  |   |  | <b>User interface</b><br><b>(blank)</b> no user interface<br><b>KP500</b> programming control unit<br><b>KP232</b> RS232 serial interface |
|  |   | <b>Communication modules</b><br><b>(blank)</b> no communication module<br><b>CM-CAN</b> CANopen communication module<br><b>CM-PDP</b> Profibus DP communication module<br><b>CM-232</b> RS232 serial communication module<br><b>CM-485</b> RS485 serial communication module |   |
|  | <b>Expansion modules</b><br><b>(blank)</b> no expansion modules<br><b>EM-SYS</b> SYSTEMBUS expansion module<br><b>EM-IO-...</b> (01, 02, 03, 04) I/O expansion modules<br><b>EM-ENC-...</b> (01, 02, 03, 04, 05) ENCODER expansion modules<br><b>EM-RES-...</b> (01, 02) RESOLVER expansion modules |  |   |
| <b>Mounting kit</b><br><b>(blank)</b> standard panel mounting kit<br><b>MPSV</b> thru-type mechanical installation kit without fan<br><b>MDIN</b> DIN rail mechanical installation kit<br><b>MNVIB</b> antivibration mechanical installation kit |   |  |   |



## ACT401 series

### Basic variants

| ACT 401 | 15  | F  | A   |
|---------|---|--|---|
|         |   |  | <b>Construction style</b><br><b>A</b> style with standard cooling<br><b>C</b> style with cold-plate cooling |
|         |   | <b>EMI filter</b><br><b>F</b> internal filter<br><b>(blank)</b> no internal filter   |   |
|         | <b>Size 1</b><br><b>05</b> 0.55 kW<br><b>07</b> 0.75 kW<br><b>09</b> 1.1 kW<br><b>11</b> 1.5 kW<br><br><b>Size 2</b><br><b>12</b> 1.85 kW<br><b>13</b> 2.2 kW<br><b>15</b> 3.0 kW<br><b>18</b> 4.0 kW<br><br><b>Size 3</b><br><b>19</b> 5.5 kW<br><b>21</b> 7.5 kW<br><b>22</b> 9.2 kW<br><br><b>Size 4</b><br><b>23</b> 11 kW<br><b>25</b> 15 kW | <b>Size 5</b><br><b>27</b> 18.5 kW<br><b>29</b> 22 kW<br><b>31</b> 30 kW<br><br><b>Size 6</b><br><b>33</b> 37 kW<br><b>35</b> 45 kW<br><b>37</b> 55 kW<br><b>39</b> 65 kW<br><br><b>Size 7</b><br><b>43</b> 75 kW<br><b>45</b> 90 kW<br><b>47</b> 110 kW<br><b>49</b> 132 kW |   |

### Optional variants

| MPSV   | EMSYS   | CMCAN  | KP500   |
|--|---|--|---|
|  |   |  | <b>User interface</b><br><b>(blank)</b> no user interface<br><b>KP500</b> programming control unit<br><b>KP232</b> RS232 serial interface |
|  |   | <b>Communication modules</b><br><b>(blank)</b> no communication module<br><b>CM-CAN</b> CANopen communication module<br><b>CM-PDP</b> Profibus DP communication module<br><b>CM-232</b> RS232 serial communication module<br><b>CM-485</b> RS485 serial communication module |   |
|  | <b>Expansion modules</b><br><b>(blank)</b> no expansion modules<br><b>EM-SYS</b> SYSTEMBUS expansion module<br><b>EM-IO-...</b> (01, 02, 03, 04) I/O expansion modules<br><b>EM-ENC-...</b> (01, 02, 03, 04, 05) ENCODER expansion modules<br><b>EM-RES-...</b> (01, 02) RESOLVER expansion modules |  |   |
| <b>Mounting kit</b><br><b>(blank)</b> standard panel mounting kit<br><b>MPSV</b> thru-type mechanical installation kit without fan<br><b>MDIN</b> DIN rail mechanical installation kit<br><b>MNVIB</b> antivibration mechanical installation kit |   |  |   |

#### Series

- ACT 401** inverter ACTIVE 3ph x 360-480VAC +/- 10%

# Technical features

## ACT201-05 ... ACT201-15 series

### Power range up to 9.2 kW / 200-240 V three phase and 2.2 kW / 200-240 V single phase

#### Designation

ACT201

#### Size

From 0.55 to 1.1 kW / from 1.5 to 3.0 kW / from 4 to 5.5 kW / from 7.5 to 9.2 kW

#### Basic equipment

- 200 - 240 V single-phase and three-phase ( $\pm 10\%$ ) / 50 - 60 Hz ( $\pm 10\%$ )
- TN and IT mains compatible
- overload capacity: 150% for 60s, 200% for 1s
- switching frequency 2 to 16 kHz
- integral EMI filter to EN 61800-3
- speed sensor connection
- integral braking transistor
- DC link connection
- plug-in power terminals up to 4 kW
- plug-in programmable control terminals
- 6 digital inputs, 1 multifunction input
- 1 digital output, 1 multifunction output
- relay output
- freely selectable motor control:  
sensorless control, sensorless field-oriented control,  
field-oriented control with speed sensor
- additional control and application systems available on request
- motor temperature monitoring
- Standard installation kit

#### Versions

Cold-plate finish on request

#### Expansions

- KP500: removable control unit with parameter copy function
- KP232: removable RS232 interface adapter
- CM-232: RS232 interface
- CM-485: RS485 interface
- CM-CAN: CANopen interface
- CM-PDP: Profibus-DP interface
- EM-I/O-01: I/O expansion (3xDI, 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 2xRelay, SYSTEMBUS)
- EM-I/O-02: I/O expansion (3xDI, 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 1xPTC, 1xRelay, SYSTEMBUS)
- EM-I/O-03: I/O expansion (2xDI, 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 1xAO 0-20 mA, 1xRelay, 1xPTC, SYSTEMBUS)
- EM-I/O-04: I/O expansion (1xDI/DO, 2xDI (PNP/NPN), 1xPTC/KTY, SYSTEMBUS)

- EM-ENC-01: expansion for Line Driver Incremental Speed Sensor at DC 5 V (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , speed sensor signals repetition FFA,  $\bar{F}F\bar{A}$ , FFB,  $\bar{F}F\bar{B}$ , 1xAI DC  $\pm 10$  V, SYSTEMBUS)
- EM-ENC-02: expansion for Line Driver Incremental Speed Sensor at DC 5 V (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , 1xDI/DO, 1xAI DC ( $\pm 10$  V/ $\pm 20$  mA), 1xAO DC 0/4-20 mA, PTC, SYSTEMBUS)
- EM-ENC-03: expansion for Line Driver Incremental Speed Sensor (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , SYSTEMBUS). Speed sensor external power supply
- EM-ENC-04: expansion for Line Driver Incremental Speed Sensor at 5 V or 24 V with zero signal (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ ) 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 1xRelay
- EM-ENC-05: expansion for Line Driver Incremental Speed Sensor at 5 V or 24 V with zero signal (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ ) 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, SYSTEMBUS)
- EM-RES-01: expansion for Resolver (input signals SIN, COS, REF resolver power supply, repetition frequency output FFA,  $\bar{F}F\bar{A}$ , FFB,  $\bar{F}F\bar{B}$ , 1xAI (DC  $\pm 10$  V/ $\pm 20$  mA)), SYSTEMBUS)
- EM-RES-02: expansion for Resolver (input signals SIN, COS, REF resolver power supply, repetition frequency output FFA,  $\bar{F}F\bar{A}$ , FFB,  $\bar{F}F\bar{B}$ , frequency reference signal, 1xAI (DC  $\pm 10$  V/ $\pm 20$  mA))
- EM-SYS: SYSTEMBUS expansion

#### Development tools

- VPlus: software for inverter programming and monitoring on PC with Windows operating system. Oscilloscope Function with 4 programmable traces

#### Accessories

- Installation kit: various mechanical installation kits (MPSV, MPVIB, MDIN) for different types of enclosure mounting solutions
- Line choke: input filter for reducing current harmonics
- EMI filter: Input filter for EMC regulation compliance
- dV/dt filter: output filter for dV/dt attenuation
- Sine wave filter: output filter for long inverter/ motor cable
- Mains unit: PFC and network recovery of regeneration energy
- Braking Resistor: external resistor for dynamic braking

# Technical features

## ACT401-05 ... ACT401-49 series

### Power range up to 132 kW / 360-480 V three-phase

#### Designation

ACT401

#### Size

From 0.55 to 1.5 kW / from 1.85 to 4.0 kW / from 5.5 to 9.2 kW / from 11 to 15 kW / from 18.5 to 30 kW / from 37 to 65 kW / from 75 to 132 kW

#### Basic equipment

- 360 - 480 V three-phase ( $\pm 10\%$ ) / 50 - 60 Hz ( $\pm 10\%$ )
- TN and IT mains capable
- overload capacity: 150% for 60s, 200% for 1s
- switching frequency 2 to 16 kHz
- integral EMI filter to EN 61800-3 up to 7.5 kW
- speed sensor connection
- motor temperature monitoring
- integral braking transistor
- DC link connection
- plug-in power terminals up to 4 kW
- plug-in programmable control terminals
- 6 digital inputs, 1 multifunction input
- 1 digital output, 1 multifunction output
- relay output
- freely selectable motor control system: sensorless control, sensorless field-oriented control, field-oriented control with speed sensor
- additional control and application systems available on request
- Standard installation kit

#### Versions

Cold-plate finish on request

#### Expansions

- KP500: removable control unit with parameter copy function
- KP232: removable RS232 interface adapter
- CM-232: RS232 interface
- CM-485: RS485 interface
- CM-CAN: CANopen interface
- CM-PDP: Profibus-DP interface
- EM-I/O-01: I/O expansion (3xDI, 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 2xRelay, SYSTEMBUS)
- EM-I/O-02: I/O expansion (3xDI, 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 1xPTC, 1xRelay, SYSTEMBUS)
- EM-I/O-03: I/O expansion (2xDI, 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 1xAO 0-20 mA, 1xRelay, 1xPTC, SYSTEMBUS)
- EM-I/O-04: I/O expansion (1xDI/DO, 2xDI (PNP/NPN), 1xPTC/KTY, SYSTEMBUS)

- EM-ENC-01: expansion for Line Driver Incremental Speed Sensor at DC 5 V (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , speed sensor signals repetition FFA,  $\overline{FFA}$ , FFB,  $\overline{FFB}$ , 1xAI DC  $\pm 10$  V, SYSTEMBUS)
- EM-ENC-02: expansion for Line Driver Incremental Speed Sensor at DC 5 V (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , 1xDI/DO, 1xAI DC ( $\pm 10$  V/ $\pm 20$  mA), 1xAO DC 0/4-20 mA, PTC, SYSTEMBUS)
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- EM-ENC-04: expansion for Line Driver Incremental Speed Sensor at 5 V or 24 V with zero signal (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ ) 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, 1xRelay
- EM-ENC-05: expansion for Line Driver Incremental Speed Sensor at 5 V or 24 V with zero signal (input signals A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ ) 1xAI DC  $\pm 10$  V, 1xAO DC  $\pm 10$  V, SYSTEMBUS
- EM-RES-01: expansion for Resolver (input signals SIN, COS, REF resolver power supply, repetition frequency output FFA,  $\overline{FFA}$ , FFB,  $\overline{FFB}$ , 1xAI (DC  $\pm 10$  V/ $\pm 20$  mA)), SYSTEMBUS
- EM-RES-02: expansion for Resolver (input signals SIN, COS, REF resolver power supply, repetition frequency output FFA,  $\overline{FFA}$ , FFB,  $\overline{FFB}$ , frequency reference signal, 1xAI (DC  $\pm 10$  V/ $\pm 20$  mA))
- EM-SYS: SYSTEMBUS expansion

#### Development tools

- VPlus: software for inverter programming and monitoring on PC with Windows operating system. Oscilloscope Function with 4 programmable traces

#### Accessories

- Installation kit: various mechanical installation kits (MPSV, MPVIB, MDIN) for different types of enclosure mounting solutions
- Line choke: input filter for reducing current harmonics
- EMI filter: input filter for EMC regulation compliance
- dV/dt filter: output filter for dV/dt attenuation
- Sine wave filter: output filter for long inverter/motor cable
- Mains unit: PFC and network recovery of regeneration energy
- Braking Resistor: external resistor for dynamic braking

## Hardware

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- Range of voltage area: 200 - 240 V single-phase and three-phase ( $\pm 10\%$ ), 360 - 480 V three-phase ( $\pm 10\%$ )
- TN and IT mains capable thanks to adaptation of basic devices
- Integral EMI filter to EN 61800-3 on devices up to 9.2 kW
- DC link bus for energy exchange and central power feeding
- Plug-in power terminals up to 4 kW
- Plug-in control terminals: ensures easy connection and separation of control terminals
- Multifunction input: ensures high flexibility in defining the reference value using a range of different signal sources
- Connection of digital inputs to software modules in the form of logic signals
- Multifunction output selectable from among a vast range of parameters
- Facility to connect digital outputs and relay output to the software modules for programming requirements
- Motor overtemperature protection by means of thermo-evaluation
- Speed sensor input for high dynamics applications requiring high precision speed and torque control
- Integral braking transistor to limit DC bus voltage in braking operation
- Folding type attachment for extremely compact installation
- DIN rail installation facility for units up to 4 kW
- Lateral installation facility for units up to 4 kW
- Construction with high IP protection ratings thanks to Cold-Plate option
- Supports master / slave operation in basic version for electronic gear applications and similar
- Optional expansion modules to extend control inputs and outputs
- Optional encoder modules to evaluate TTL & HTL encoder and Resolver
- Optional communication modules to connect to standard field bus networks and point-to-point connections
- KP500 control unit with copy function to facilitate parameterisation and control operations
- KP232 interface adapter for high communication flexibility via a serial protocol

## Software

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- Selectable motor control system:
  - sensorless control
  - sensorless field-oriented control
  - field-oriented control with speed sensor (FOC)
  - brushless motor
- Coupling with various reference value sources on reference frequency channel and reference percentage channel
- Intelligent current limits for load-dependant optimisation of operational behaviour
- Mains voltage monitoring enables programmable behaviour in the event of faults
- Use of kinetic energy in the drive system for power failure bridging or controlled motor stopping in mains power loss conditions
- Motor phase monitoring to avoid stressing the coupled load
- Speed sensor monitoring with continuous control of sensor signals
- Overload protection and automatic switching frequency adaptation
- Motor circuit breaker for protection of the connected motor
- Motor chopper function (reduces braking energy without brake unit)
- Programmable starting and stopping behaviour so the drive can be started, stopped, and controlled down to standstill
- S-ramp for separately adjustable acceleration and deceleration ramps and for smooth speed changes (jerk limitation)
- Motor potentiometer controlled via digital input, control unit and communication interface
- Four data sets for parameterisation of various operational behaviour modes
- Parameter identification of the connected motor (tuning) as a supplementary facility of the guided commissioning function
- Auto set-up of dependent parameters during guided commissioning procedure
- Synchronization function to catch a spinning motor
- Auto-start after alarm or power loss
- Automatic acknowledgement of selected faults without motor switch-off (pre-alarm)
- Integrated PI control let to implement (for example) pressure, volumetric flow or speed control (with tacho generator)
- Brake Control and Load Detection for lifting applications
- Programmable timer and logical functions included in the software modules
- Flow control to optimise operational behaviour
- Continuous torque monitoring for control of drive behaviour under load
- Surge-free speed / torque control switch-over
- System bus for transmission of parameter settings, actual and nominal values
- Positioning from reference point with programmable stopping behaviour
- Stability control in synchronous tie applications
- Memory of real mean and peak values
- Alarms video page and report generation with adjustable limits and behaviour responses
- Alarm memory and environment



## General technical data

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### Environment

Operating temperature

- 0°C - 40°C (40°C - 55°C with derating)

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

- IP20

### Electrical

Rated mains voltage

- ACT 201 in the range 184 ... 264 V
- ACT 401 in the range 320 ... 528 V

Rated mains frequency

- 45 ... 66 Hz

Overload current

- 150% of rated current (200% for 0.25 and 0.37 kW)

Peak current

- 200% of rated current for most ratings

Electric protection

- Short circuit / Earth fault proof

Braking transistor

- Built-in on standard devices

### Standards

CE conformity:

- Low voltage directive 73/23/EEC and EN50178 / DIN VDE 0160 and EN61800

Interference immunity

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

UL approval

- UL marked, according to UL508c

## ACT201 - Technical data (from 0.55 to 3.0 kW)

| ACT201-                                 |                 |     | 05  | 07   | 09  | 11                 | 13   | 15   |
|---|-----------------|-----|---|------|-----|--------------------|------|------|
| Size 1 (F, A or C)                      |                 |     |   |      |     | Size 2 (F, A or C) |      |      |
| Output, motor side                      |                 |     |   |      |     |                    |      |      |
| Recommended rated motor power           | P <sub>n</sub>  | kW  | 0.55  | 0.75 | 1.1 | 1.5                | 2.2  | 3.0  |
| Rated motor current output              | I <sub>n</sub>  | A   | 3.0   | 4.0  | 5.5 | 7.0                | 9.5  | 12.5 |
| Rated motor voltage output              | U <sub>n</sub>  | V   | 3 x (from 0 to mains voltage)   |      |     |                    |      |      |
| Overload current for 60 s               | I <sub>pk</sub> | A   | 4.5   | 6.0  | 7.3 | 10.5               | 14.3 | 16.2 |
| Overload current for 1 s                | I <sub>pk</sub> | A   | 6.0   | 8.0  | 8.0 | 14.0               | 19.0 | 19.0 |
| Switching frequency                     | f <sub>c</sub>  | kHz | From 2 to 16  |      |     |                    |      |      |
| Rated motor frequency                   | f <sub>n</sub>  | Hz  | From 0 to 1000  |      |     |                    |      |      |
| Input, mains side                       |                 |     |   |      |     |                    |      |      |
| Nominal mains voltage                   | U               | V   | 184 ... 264   |      |     |                    |      |      |
| Nominal mains frequency                 | f               | Hz  | 45 ... 66   |      |     |                    |      |      |
| Nominal current 3 ph/PE                 | I               | A   | 3.0   | 4.0  | 5.5 | 7.0                | 9.5  | 10.5 |
| Nominal current 1 ph/N/PE; 2 ph/PE      | I               | A   | 5.4   | 7.2  | 9.5 | 13.2               | 16.5 | 16.5 |
| EMI filter                              | -               | -   | Built-in  |      |     |                    |      |      |
| General                                 |                 |     |   |      |     |                    |      |      |
| Short circuit / ground fault protection | -               | -   | Yes, unlimited  |      |     |                    |      |      |
| Mounting position                       | -               | -   | Vertical  |      |     |                    |      |      |
| Protection class                        | -               | -   | IP 20 (EN60529)   |      |     |                    |      |      |
| Dimensions Std. A                       | HxWxD           | mm  | 190 x 60 x 175  |      |     | 250 x 60 x 175     |      |      |
| Cold Plate Opt. C                       | HxWxD           | mm  | 190 x 82 x 140  |      |     | 250 x 85 x 140     |      |      |
| Weight (approx.)                        | m               | kg  | 1.2   |      |     | 1.6                |      |      |
| Environment                             |                 |     |   |      |     |                    |      |      |
| Cooling temperature                     | T <sub>n</sub>  | °C  | From 0 to 40 (3K3 DIN IEC 721-3-3)  |      |     |                    |      |      |
| Relative air humidity                   | -               | %   | From 15 to 85, non-condensing   |      |     |                    |      |      |
| Derating                                | P               | -   | 2,5%/K above 40°C; Tmax = 55°C;<br>5%/1000m above 1000m installation altitude; hmax = 4000m |      |     |                    |      |      |
| Options & accessories                   |                 |     |   |      |     |                    |      |      |
| Line choke                              | -               | -   | External (depending on mains supply)  |      |     |                    |      |      |
| EMI filter                              | -               | -   | Internal (EN 61800-3); external   |      |     |                    |      |      |
| Brake unit                              | -               | -   | Internal brake transistor   |      |     |                    |      |      |
| Digital control unit                    | -               | -   | Yes   |      |     |                    |      |      |

## ACT201 - Technical data (from 4.0 to 9.2 kW)

| ACT201-                                 |                 |     | 18  | 19   | 21                 | 22   |
|---|-----------------|-----|---|------|--------------------|------|
| Size 3 (- or F, A or C)                 |                 |     |   |      | Size 4 (-, A or C) |      |
| Output, motor side                      |                 |     |   |      |                    |      |
| 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 for 60 s               | I <sub>pk</sub> | A   | 26.2  | 30.3 | 44.5               | 51.5 |
| Overload current for 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  |      |                    |      |
| Rated motor frequency                   | f <sub>n</sub>  | Hz  | From 0 to 1000  |      |                    |      |
| Input, mains side                       |                 |     |   |      |                    |      |
| Nominal mains voltage                   | U               | V   | 184 ... 264   |      |                    |      |
| Nominal mains frequency                 | f               | Hz  | 45 ... 66   |      |                    |      |
| Nominal current 3 ph/PE                 | I               | A   | 18  | 20   | 28.2               | 35.6 |
| Mains fuses 3 ph/PE                     | I               | A   | 25  |      | 35                 | 50   |
| General                                 |                 |     |   |      |                    |      |
| Short circuit / ground fault protection | -               | -   | Yes, unlimited  |      |                    |      |
| Mounting position                       | -               | -   | Vertical  |      |                    |      |
| Protection class                        | -               | -   | IP 20 (EN60529) <sup>(0)</sup>  |      |                    |      |
| Dimensions Std. A                       | HxWxD           | mm  | 250 x 100 x 200   |      | 250 x 125 x 200    |      |
| Cold Plate Opt. C                       | HxWxD           | mm  | —   |      |                    |      |
| Weight (approx.)                        | m               | kg  | 3.0   |      | 3.7                |      |
| Environment                             |                 |     |   |      |                    |      |
| Cooling temperature                     | T <sub>n</sub>  | °C  | From 0 to 40 (3K3 DIN IEC 721-3-3)  |      |                    |      |
| Relative air humidity                   | -               | %   | From 15 to 85, non-condensing   |      |                    |      |
| Derating                                | P               | -   | 2.5%/K above 40 °C; Tmax = 55 °C;<br>5%/1000 m above 1000 m installation altitude; hmax = 4000m |      |                    |      |
| Options & accessories                   |                 |     |   |      |                    |      |
| Line choke                              | -               | -   | External (depending on mains supply)  |      |                    |      |
| EMI filter                              | -               | -   | Internal (EN 61800-3); External   |      |                    |      |
| Brake unit                              | -               | -   | Internal brake transistor   |      |                    |      |
| Digital control unit                    | -               | -   | Yes   |      |                    |      |

Note: (0) = for protection classes higher than IP20 consult your local Bonfiglioli Drives Service Center

## ACT401 - Technical data (from 0.55 to 3.0 kW)

| ACT401-                                 |                 |     | 05  | 07   | 09  | 11  | 12                 | 13   | 15   |
|---|-----------------|-----|---|------|-----|-----|--------------------|------|------|
| Size 1 (F, A or C)                      |                 |     |   |      |     |     | Size 2 (F, A or C) |      |      |
| Output, motor side                      |                 |     |   |      |     |     |                    |      |      |
| Recommended rated motor power           | P <sub>n</sub>  | kW  | 0.55  | 0.75 | 1.1 | 1.5 | 1.85               | 2.2  | 3.0  |
| Rated motor current output              | I <sub>n</sub>  | A   | 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 for 60 s               | I <sub>pk</sub> | A   | 2.7   | 3.6  | 4.8 | 5.7 | 6.3                | 8.7  | 11.7 |
| Overload current for 1 s                | I <sub>pk</sub> | A   | 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  |      |     |     |                    |      |      |
| Rated motor frequency                   | f <sub>n</sub>  | Hz  | From 0 to 1000  |      |     |     |                    |      |      |
| Input, mains side                       |                 |     |   |      |     |     |                    |      |      |
| Nominal mains voltage                   | U               | V   | 320 ... 528   |      |     |     |                    |      |      |
| Nominal mains frequency                 | f               | Hz  | 45 ... 66   |      |     |     |                    |      |      |
| Nominal current 3 ph/PE                 | I               | A   | 1.8   | 2.4  | 2.8 | 3.3 | 4.2                | 5.8  | 6.8  |
| Mains fuses 3 ph/PE                     | I               | A   | 6   |      |     |     | 10                 |      |      |
| General                                 |                 |     |   |      |     |     |                    |      |      |
| Short circuit / ground fault protection | -               | -   | Yes, unlimited  |      |     |     |                    |      |      |
| Mounting position                       | -               | -   | Vertical  |      |     |     |                    |      |      |
| Protection class                        | -               | -   | IP 20 (EN60529) <sup>(0)</sup>  |      |     |     |                    |      |      |
| Dimensions Std. A                       | HxWxD           | mm  | 190 x 60 x 175  |      |     |     | 250 x 60 x 175     |      |      |
| Cold Plate Opt. C                       | HxWxD           | mm  | 190 x 82 x 140  |      |     |     | 250 x 85 x 140     |      |      |
| Weight (approx.)                        | m               | kg  | 1.2   |      |     |     | 1.6                |      |      |
| Environment                             |                 |     |   |      |     |     |                    |      |      |
| Cooling temperature                     | T <sub>n</sub>  | °C  | From 0 to 40 (3K3 DIN IEC 721-3-3)  |      |     |     |                    |      |      |
| Relative air humidity                   | -               | %   | From 15 to 85, non-condensing   |      |     |     |                    |      |      |
| Derating                                | P               | -   | 2.5%/K above 40 °C; Tmax = 55 °C;<br>5%/1000 m above 1000 m installation altitude; hmax = 4000m |      |     |     |                    |      |      |
| Options & accessories                   |                 |     |   |      |     |     |                    |      |      |
| Line choke                              | -               | -   | External (depending on mains supply)  |      |     |     |                    |      |      |
| EMI filter                              | -               | -   | Internal (EN 61800-3); External   |      |     |     |                    |      |      |
| Brake unit                              | -               | -   | Internal brake transistor   |      |     |     |                    |      |      |
| Digital control unit                    | -               | -   | Yes   |      |     |     |                    |      |      |

Note: (0) = for protection classes higher than IP20 consult your local Bonfiglioli Drives Service Center



## ACT401 - Technical data (from 4.0 to 15 kW)

| ACT401-                                 |                 |     | 18   | 19              | 21                      | 22   | 23                 | 25   |
|---|-----------------|-----|--|-----------------|-------------------------|------|--------------------|------|
|   |                 |     | Size 2 (F, A2 or C2)   |                 | Size 3 (- or F, A or C) |      | Size 4 (-, A or C) |      |
| Output, motor side                      |                 |     |  |                 |                         |      |                    |      |
| 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 for 60 s               | I <sub>pk</sub> | A   | 13.5   | 21.0            | 26.3                    | 30.3 | 37.5               | 44.5 |
| Overload current for 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   |                 |                         |      |                    |      |
| Rated motor frequency                   | f <sub>n</sub>  | Hz  | From 0 to 1000   |                 |                         |      |                    |      |
| Input, mains side                       |                 |     |  |                 |                         |      |                    |      |
| Nominal mains voltage                   | U               | V   | 320 ... 528  |                 |                         |      |                    |      |
| Nominal mains frequency                 | f               | Hz  | 45 ... 66  |                 |                         |      |                    |      |
| Nominal current 3 ph/PE                 | I               | A   | 7.8  | 14.2            | 15.8                    | 20.0 | 26.0               | 28.2 |
| Mains fuses 3 ph/PE                     | I               | A   | 10.0   | 16.0            | 25.0                    |      | 35.0               |      |
| General                                 |                 |     |  |                 |                         |      |                    |      |
| Short circuit / ground fault protection | -               | -   | Yes, unlimited   |                 |                         |      |                    |      |
| Mounting position                       | -               | -   | Vertical   |                 |                         |      |                    |      |
| Protection class                        | -               | -   | IP 20 (EN60529) <sup>(0)</sup>   |                 |                         |      |                    |      |
| Dimensions Std. A                       | HxWxD           | mm  | 250 x 60 x 175   | 250 x 100 x 200 |                         |      | 250 x 125 x 200    |      |
| Cold Plate Opt. C                       | HxWxD           | mm  | 250 x 85 x 140   | 250 x 125 x 144 |                         |      | 250 x 150 x 144    |      |
| Weight (approx.)                        | m               | kg  | 1.6  | 3.0             |                         |      | 3.7                |      |
| Environment                             |                 |     |  |                 |                         |      |                    |      |
| Cooling temperature                     | T <sub>n</sub>  | °C  | From 0 to 40 (3K3 DIN IEC 721-3-3)   |                 |                         |      |                    |      |
| Relative air humidity                   | -               | %   | From 15 to 85, non-condensing  |                 |                         |      |                    |      |
| Derating                                | P               | -   | 2.5%/K above 40 °C; Tmax = 55 °C;<br>5%/1000 m above 1000 m installation altitude; hmax = 4000 m |                 |                         |      |                    |      |
| Options & accessories                   |                 |     |  |                 |                         |      |                    |      |
| Line choke                              | -               | -   | External (depending on mains supply)   |                 |                         |      |                    |      |
| EMI filter                              | -               | -   | Internal (EN 61800-3); External  |                 |                         |      | External           |      |
| Brake unit                              | -               | -   | Internal brake transistor  |                 |                         |      |                    |      |
| Digital control unit                    | -               | -   | Yes  |                 |                         |      |                    |      |

Note: (0) = for protection classes higher than IP20 consult your local Bonfiglioli Drives Service Center

## ACT401 - Technical data (from 18.5 to 30 kW)

| ACT401-                                 | 27              |     | 29   |      | 31    |
|---|-----------------|-----|--|------|-------|
| Size 5 (-, A or C)                      |                 |     |  |      |       |
| Output, motor side                      |                 |     |  |      |       |
| Recommended rated motor power           | P <sub>n</sub>  | kW  | 18.5   | 22.0 | 30.0  |
| Rated motor current output              | I <sub>n</sub>  | A   | 40.0   | 45.0 | 60.0  |
| Rated motor voltage output              | U <sub>n</sub>  | V   | 3 x (from 0 to mains voltage)  |      |       |
| Overload current for 60 s               | I <sub>pk</sub> | A   | 60.0   | 67.5 | 90.0  |
| Overload current for 1 s                | I <sub>pk</sub> | A   | 80.0   | 90.0 | 120.0 |
| Switching frequency                     | f <sub>c</sub>  | kHz | From 2 to 8  |      |       |
| Rated motor frequency                   | f <sub>n</sub>  | Hz  | From 0 to 1000   |      |       |
| Input, mains side                       |                 |     |  |      |       |
| Nominal mains voltage                   | U               | V   | 320 ... 528  |      |       |
| Nominal mains frequency                 | f               | Hz  | 45 ... 66  |      |       |
| Nominal current 3 ph/PE                 | I               | A   | 35.6   | 52.0 | 58.0  |
| Mains fuses 3 ph/PE                     | I               | A   | 50.0   |      | 63.0  |
| General                                 |                 |     |  |      |       |
| Short circuit / ground fault protection | -               | -   | Yes, unlimited   |      |       |
| Mounting position                       | -               | -   | Vertical   |      |       |
| Protection class                        | -               | -   | IP 20 (EN60529) <sup>(0)</sup>   |      |       |
| Dimensions Std. A                       | HxWxD           | mm  | 250 x 200 x 260  |      |       |
| Cold Plate Opt. C                       | HxWxD           | mm  | 250 x 225 x 171  |      |       |
| Weight (approx.)                        | m               | kg  | 8.0  |      |       |
| Environment                             |                 |     |  |      |       |
| Cooling temperature                     | T <sub>n</sub>  | °C  | From 0 to 40 (3K3 DIN IEC 721-3-3)   |      |       |
| Relative air humidity                   | -               | %   | From 15 to 85, non-condensing  |      |       |
| Derating                                | P               | -   | 2.5%/K above 40 °C; Tmax = 55 °C;<br>5%/1000 m above 1000 m installation altitude; hmax = 4000 m |      |       |
| Options & accessories                   |                 |     |  |      |       |
| Line choke                              | -               | -   | External (depending on mains supply)   |      |       |
| EMI filter                              | -               | -   | External   |      |       |
| Brake unit                              | -               | -   | Internal brake transistor  |      |       |
| Digital control unit                    | -               | -   | Yes  |      |       |

Note: (0) = for protection classes higher than IP20 consult your local Bonfiglioli Drives Service Center

## ACT401 - Technical data (from 37 to 65 kW)

| ACT401-                                 |                 |     | 33   | 35    | 37    | 39    |
|---|-----------------|-----|--|-------|-------|-------|
| Size 6 (-, A)                           |                 |     |  |       |       |       |
| Output, motor side                      |                 |     |  |       |       |       |
| Recommended rated motor power           | P <sub>n</sub>  | kW  | 37.0   | 45.0  | 55.0  | 65.0  |
| Rated motor current output              | I <sub>n</sub>  | A   | 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 for 60 s               | I <sub>pk</sub> | A   | 112.5  | 135.0 | 165.0 | 187.5 |
| Overload current for 1 s                | I <sub>pk</sub> | A   | 150.0  | 180.0 | 220.0 | 250.0 |
| Switching frequency                     | f <sub>c</sub>  | kHz | From 2 to 8  |       |       |       |
| Rated motor frequency                   | f <sub>n</sub>  | Hz  | From 0 to 1000   |       |       |       |
| Input, mains side                       |                 |     |  |       |       |       |
| Nominal mains voltage                   | U               | V   | 320 ... 528  |       |       |       |
| Nominal mains frequency                 | f               | Hz  | 45 ... 66  |       |       |       |
| Nominal current 3 ph/PE                 | I               | A   | 72   | 86    | 105   | 120   |
| Mains fuses 3 ph/PE                     | I               | A   | 80   | 100   | 125   | 125   |
| General                                 |                 |     |  |       |       |       |
| Short circuit / ground fault protection | -               | -   | Yes, unlimited   |       |       |       |
| Mounting position                       | -               | -   | Vertical   |       |       |       |
| Protection class                        | -               | -   | IP 20 (EN60529) <sup>(0)</sup>   |       |       |       |
| Dimensions Std. A                       | HxWxD           | mm  | 400 x 275 x 260  |       |       |       |
| Cold Plate Opt. C                       | HxWxD           | mm  | —  |       |       |       |
| Weight (approx.)                        | m               | kg  | 20   |       |       |       |
| Environment                             |                 |     |  |       |       |       |
| Cooling temperature                     | T <sub>n</sub>  | °C  | From 0 to 40 (3K3 DIN IEC 721-3-3)   |       |       |       |
| Relative air humidity                   | -               | %   | From 15 to 85, non-condensing  |       |       |       |
| Derating                                | P               | -   | 2.5%/K above 40 °C; Tmax = 55 °C;<br>5%/1000 m above 1000 m installation altitude; hmax = 4000 m |       |       |       |
| Options & accessories                   |                 |     |  |       |       |       |
| Line choke                              | -               | -   | External (depending on mains supply)   |       |       |       |
| EMI filter                              | -               | -   | External   |       |       |       |
| Brake unit                              | -               | -   | Internal brake transistor  |       |       |       |
| Digital control unit                    | -               | -   | Yes  |       |       |       |

Note: (0) = for protection classes higher than IP20 consult your local Bonfiglioli Drives Service Center

## ACT401 - Technical data (from 75 to 132 kW)

ACT401-

43

45

47

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Size 7 (-, A)

### Output, motor side

|                               |                 |     |                               |       |       |       |
|-------------------------------|-----------------|-----|-------------------------------|-------|-------|-------|
| Recommended rated motor power | P <sub>n</sub>  | kW  | 75.0                          | 90.0  | 110.0 | 132.0 |
| Rated motor current output    | I <sub>n</sub>  | A   | 150.0                         | 180.0 | 210.0 | 250.0 |
| Rated motor voltage output    | U <sub>n</sub>  | V   | 3 x (from 0 to mains voltage) |       |       |       |
| Overload current for 60 s     | I <sub>pk</sub> | A   | 225.0                         | 270.0 | 315.0 | 332.0 |
| Overload current for 1 s      | I <sub>pk</sub> | A   | 270.0                         | 325.0 | 375.0 | 375.0 |
| Switching frequency           | f <sub>c</sub>  | kHz | From 2 to 8                   |       |       |       |
| Rated motor frequency         | f <sub>n</sub>  | Hz  | From 0 to 1000                |       |       |       |

### Input, mains side

|                         |   |    |             |     |     |     |
|-------------------------|---|----|-------------|-----|-----|-----|
| Nominal mains voltage   | U | V  | 320 ... 528 |     |     |     |
| Nominal mains frequency | f | Hz | 45 ... 66   |     |     |     |
| Nominal current 3 ph/PE | I | A  | 143         | 172 | 208 | 249 |
| Mains fuses 3 ph/PE     | I | A  | 160         | 200 | 250 | 315 |

### General

|   |       |    |                                |  |    |  |
|---|-------|----|--------------------------------|--|----|--|
| Short circuit / ground fault protection | -     | -  | Yes, unlimited                 |  |    |  |
| Mounting position                       | -     | -  | Vertical                       |  |    |  |
| Protection class                        | -     | -  | IP 20 (EN60529) <sup>(0)</sup> |  |    |  |
| Dimensions Std. A                       | HxWxD | mm | 510 x 412 x 351                |  |    |  |
| Cold Plate Opt. C                       | HxWxD | mm | —                              |  |    |  |
| Weight (approx.)                        | m     | kg | 45                             |  | 48 |  |

### Environment

|                       |                |    |  |  |  |  |
|-----------------------|----------------|----|--|--|--|--|
| Cooling temperature   | T <sub>n</sub> | °C | From 0 to 40 (3K3 DIN IEC 721-3-3)   |  |  |  |
| Relative air humidity | -              | %  | From 15 to 85, non-condensing  |  |  |  |
| Derating              | P              | -  | 2.5%/K above 40 °C; Tmax = 55 °C;<br>5%/1000 m above 1000 m installation altitude; hmax = 4000 m |  |  |  |

### Options & accessories

|                      |   |   |                                      |  |  |  |
|----------------------|---|---|--------------------------------------|--|--|--|
| Line choke           | - | - | External (depending on mains supply) |  |  |  |
| EMI filter           | - | - | External                             |  |  |  |
| Brake unit           | - | - | Optional internal brake transistor   |  |  |  |
| Digital control unit | - | - | Yes                                  |  |  |  |

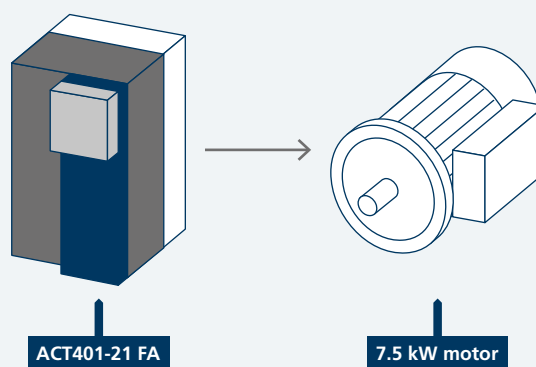
Note: (0) = for protection classes higher than IP20 consult your local Bonfiglioli Drives Service Center



## Inverter selection criteria

Choosing the product size with the ACT 401/201 series is even simpler: one model for each motor power size.

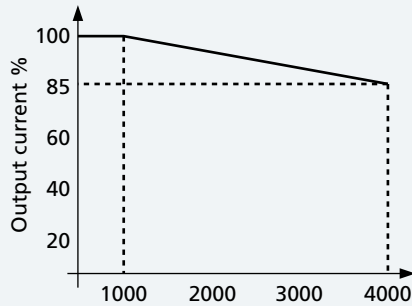
In addition, the new sizes correspond perfectly to the motor sizes in the BONFIGLIOLI range.



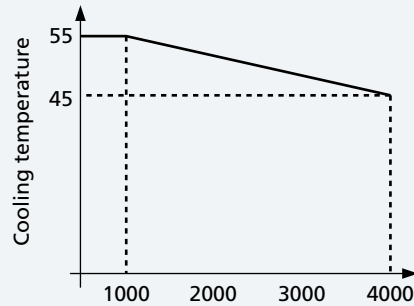
# Inverter Derating

## Installation altitude

Power supply reduction (derating):  
5%/1000 m a.s.l.;  $h_{max} = 4000$  m



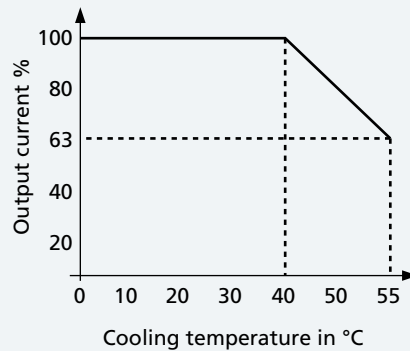
Max. cooling temperature  
3.3°C/1000 m above 1000 m a.s.l.



Installation altitude in metres above sea level

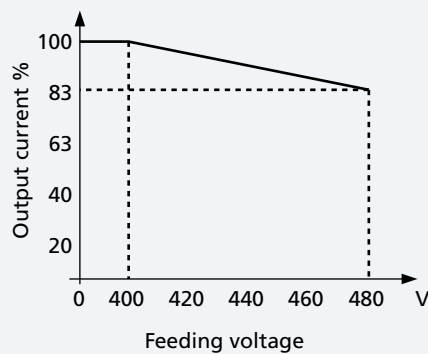
## Cooling temperature

Derating in relation to  
installation temperature  
2.5%/K above 40°C;  
 $T_{max} = 55^\circ\text{C}$



## Mains voltage

Derating in relation to  
power feeding voltage  
0.22%/V beyond 400V;  
 $V_{max} = 480$  V



## Optional components

Thanks to the modularity of their hardware components, ACTIVE frequency inverters are easily integrated in automation applications. Optional on-board modules are automatically recognised by the inverter when present (plug and play) right from the initialisation phase, and the internal control functions of the unit are automatically adapted accordingly.

The modules available for connector **A** (see figure)

can be plugged into the inverter directly, while the cover must be removed in order to gain access to plug-in sections **B** and **C**. If a communication module is added to section B the perforated part of the cover must be eliminated. Further information on installation and management of the optional modules is given in the specific documentation (optional equipment user handbooks).

### Hardware modularity

#### A) Interface module

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

#### B) CM communication module

Connection panel for various communication protocols:

- CM-232, RS232 interface
- CM-485, RS485 interface
- CM-PDP, Profibus-DP interface
- CM-CAN, CANopen interface
- Other protocols on request

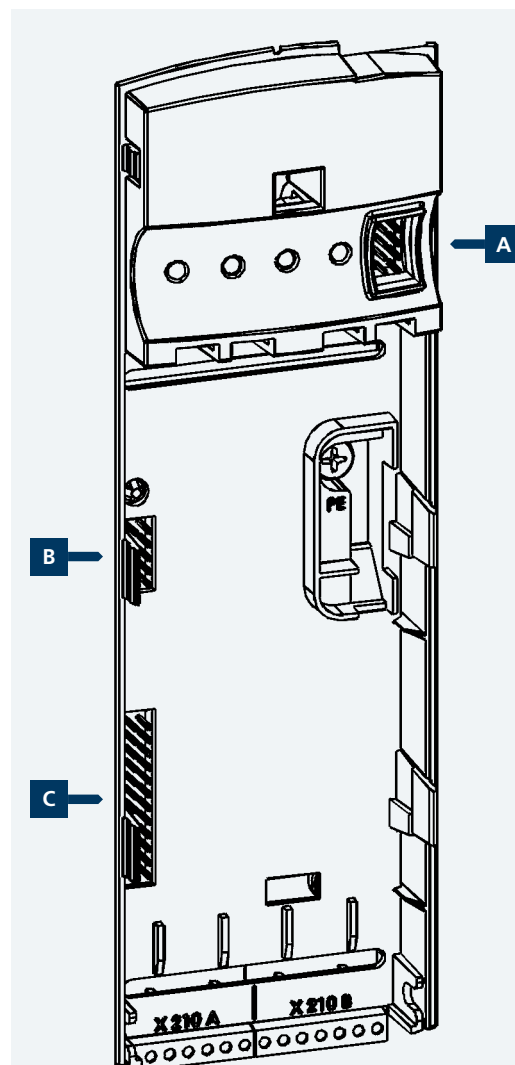
#### C) EM expansion module

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 2 variants
- EM-SYS, system bus for Systembus communication (On request, system bus combined with CM-CAN communication module)
- Other personalisable modules on request

A single module at a time taken from each corresponding list can be installed in each location (A, B, C). The modules of each seat are compatible with those of the other two, with the exception of CM-CAN and EM-SYS, which cannot be installed together on the same inverter.

KP232 and CM-232 are two RS232 serial interfaces accommodated in different locations. The two interfaces are mutually compatible but feature different communication speeds. Only KP232 is compatible with the use of the Oscilloscope function forming part of the VPlus management software.



## Control unit / KP500

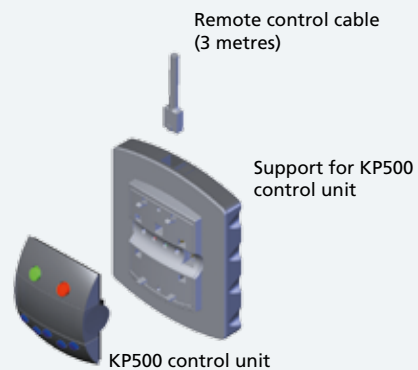
The KP500 control unit is equipped with a Parameters Copy function that allows the user to upload parametric values from the inverter to a non-volatile memory installed in the KP500 device, allowing the same values to be subsequently downloaded to another inverter.

The control unit makes it possible to set up the inverter for specific applications and allows the display of the service values of physical and electrical parameters.

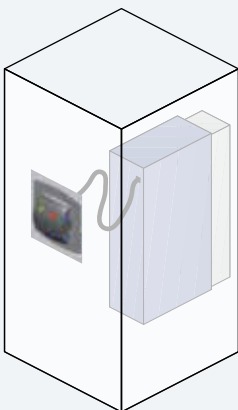
The inverter can also be controlled from the control unit for start/stop and frequency reference increase/decrease commands. Since the control unit is not essential for inverter operation it can be connected when the user considers it useful or necessary.



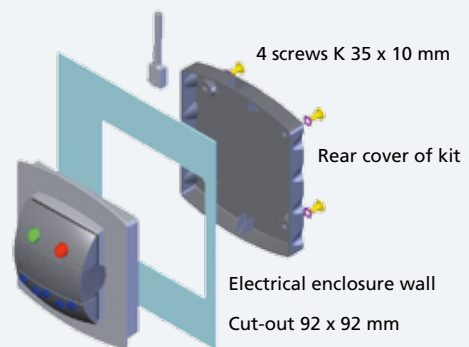
*Control unit remote installation kit / KPCMK  
The KPCMK kit is used to remotely control the inverter from the KP500 unit.*



*Handheld remote control unit*



*Remote installation on exterior of enclosure*



*Fixing to enclosure*



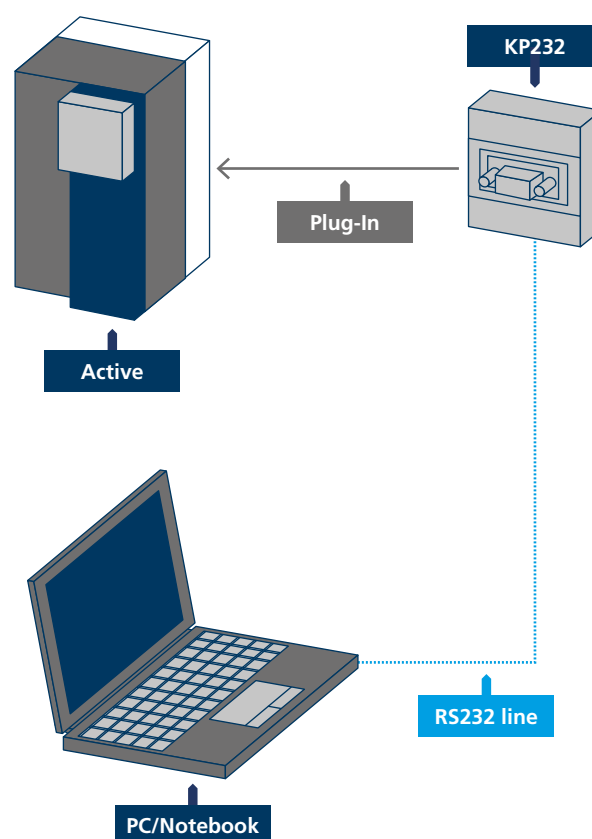


## Interface / KP-232

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 DB9 male connector on the inverter side. The KP232 interface is compatible with lines no longer than 15 metres. The serial transmission protocol ensures high data security and does not require handshake signals between computer and inverter. The VPlus software application can be supplied as an accessory. This program, which runs in Windows, is dedicated to the complete management of the ACTIVE inverter from a PC, including the functions of commissioning and parameterisation, which calls for the presence of hardware interface KP232, CM232 or CM485. The VPlus package also includes a digital Oscilloscope Function. The oscilloscope has four traces configurable for inverter monitoring also with graphic capabilities.

### Technical data

|                   |                |
|-------------------|----------------|
| Baud rate (kBaud) | Up to 115.2 kb |
|-------------------|----------------|



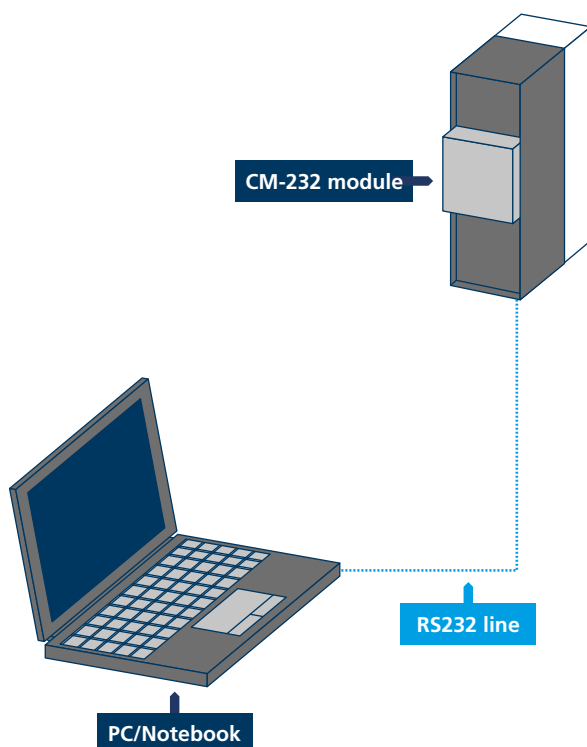
## RS232 / CM-232 serial communication

The optional CM-232 communication card enables RS232 serial connection of the ACTIVE inverter to an external control device or PC to ANSI standard EIA/TIA-232E and CCITT V.28. The standard defines the electrical and mechanical characteristics of serial connections between data terminating equipment (DTE) and data communication equipment (DCE). The serial interface, in the form of a DB9 plug, features DCE type pinouts. The serial transmission protocol guarantees high data security and allows connection, also without handshake signals, thereby reducing the required number of connection lines to just three. Maximum allowed distance between the various bus nodes (inverters) and the master (PC, PLC) depends on the cable used and the selected transmission rate. This option can be used as well for inverter programming and monitoring with VPlus software.



| Cable lenght | Max Baud rate |
|--------------|---------------|
| up to 30m    | 19.2          |
| up to 10m    | 115.2         |

*Cable length limits the transmission bandwith. Above table shows the match between admissible cable lengths and corresponding max kBaud rates. Values are indicative and may significantly change in relation to the transmission cable characteristics.*



Location of CM-232 module on the frequency inverter

## RS485 / CM-485 serial communication



The CM-485 communication module is designed for high speed data transmission over long distances in industrial applications. RS485 bus supports data exchange among 30 nodes in a bidirectional 2-wires system.

The interface is based on a DB9 connector, following the standards for physical transmission of data ITU V.11 and ANSI EIA/TIA-422B

CM-485 communication card includes the end-of-line terminating resistor that can be activated or disconnected by means of an on-board dip switch.

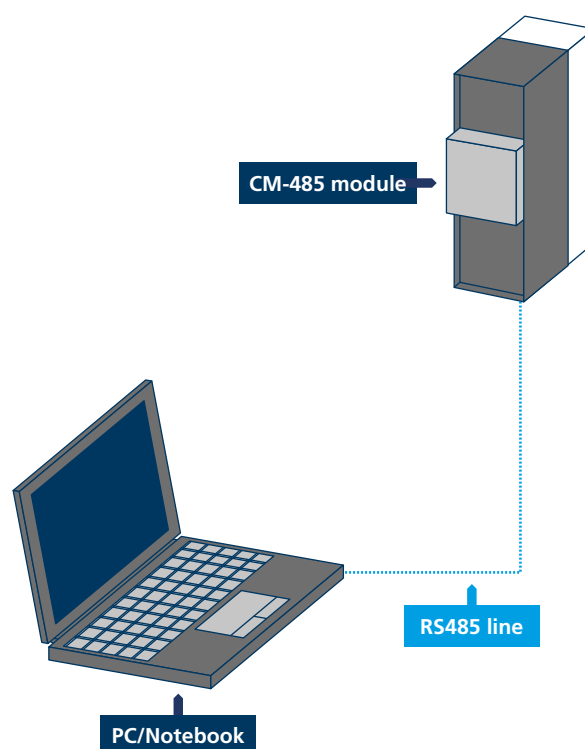
The RS485 network address of the inverter is set by software parameters either via KP500 control unit or by means of PC in serial communication with KP-232. The RS485 complies with ISO standard 1745 for code-bound data transmission. The standard data exchange rate and monitoring functions can be set using VPlus software.

| Cable lenght | Max Baud rate |
|--------------|---------------|
| up to 12000m | 4.8           |
| up to 2000m  | 19.2          |

*Cable length limits the transmission bandwidth. Above table shows the match between admissible cable lengths and corresponding max kBaud rates. Values are indicative and may significantly change in relation to the transmission cable characteristics.*



Location of CM-485 module on the frequency inverter



# RS485 / CM-485 serial and Modbus communication

## Modbus communication

The communication module CM-485 allows to use the Modbus Communication profile to be used. The communication profile can be easily changed to Modbus with a parameter. Therefore a very inexpensive solution is available to integrate the Active inverters in a Modbus Communication environment with the standard Active devices and a standard module.

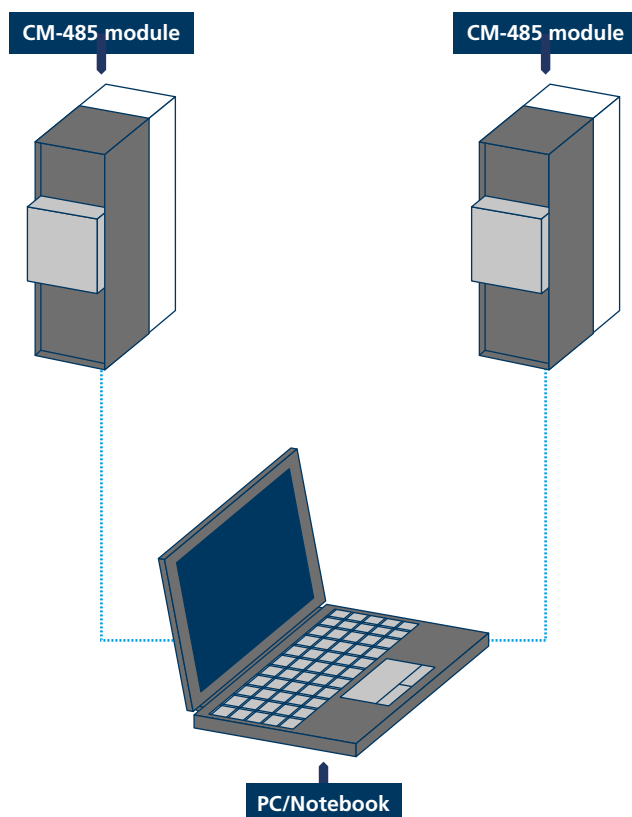
There are two profiles available. The Modbus RTU profile is well established and known to the experienced Modbus user, which offers quick communication between different devices. Additionally, Modbus ASCII is supported as well, which allows easy set up and diagnosis of the communication between different devices.

The address range allows values in the range between 1 to 247.



| Cable length | Max Baud rate |
|--------------|---------------|
| up to 12000m | 4.8           |
| up to 2000m  | 19.2          |

*Cable length limits the transmission bandwidth. Above table shows the match between admissible cable lengths and corresponding max kBaud rates. Values are indicative and may significantly change in relation to the transmission cable characteristics.*



Location of module CM-485 on the frequency inverter



Internal dipswitch to enable the 220 terminating burden resistor incorporated in the module

# DP / CM-PDP Profibus Communication

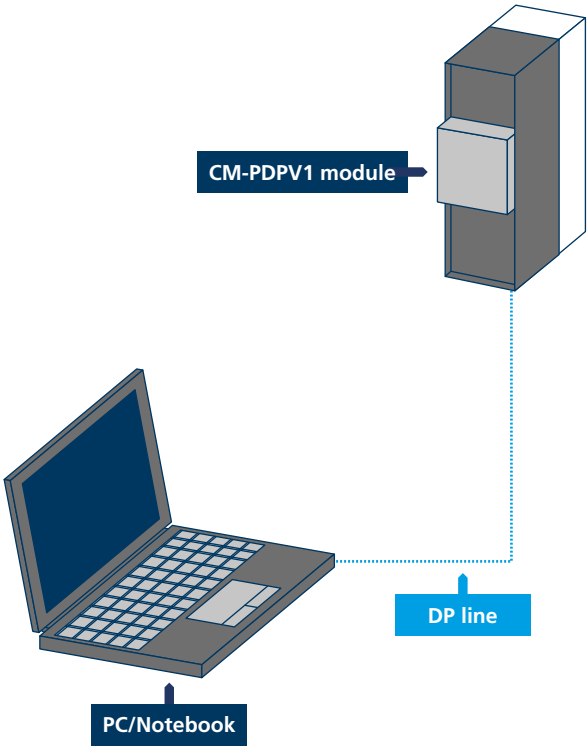
Profibus DP interface fulfils fieldbus standard DIN 19245. This Profibus version, which is optimized in order to provide excellent performance in terms of speed and low connection costs, has been adapted for communication between automation systems and decentralized peripheral devices. Following “variable speed drive” profiles defined by Profidrive for electrical drive technology are supported by CMP-DP: PPO1, PPO2, PPO3, PPO4. CM-PDP interface supports different transmission rates in compliance with EN 50170 standard. The transmission rate automatically adjusts to the settings of the fieldbus master. CM-PDP module is equipped with a DIP switch to activate end-of-line terminating resistor, included into CM-PDP.

| Cable lenght | Max Baud rate |
|--------------|---------------|
| up to 1200m  | 93.75         |
| up to 1000m  | 187.5         |
| up to 400m   | 500           |
| up to 200m   | 1500          |
| up to 100m   | 12000         |

Cable length limits the transmission bandwith. Above table shows the match between admissible cable lengths and corresponding max kBaud rates. Values are indicative and may significantly change in relation to the transmission cable characteristics.



Location of module CM-PDP on the frequency inverter



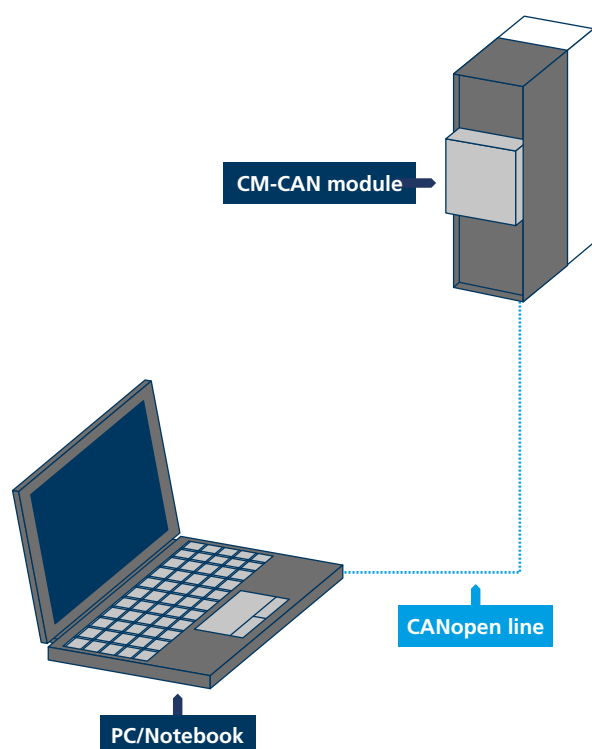


## CANopen/ CM-CAN communication

The CM-CAN communication option with controller area network interface, complies with ISO/DIS 11898 transmission standard. The pinout of connector DB9 is based on the "CAN in Automation e.V." specification, which allows the connection of up to 127 nodes in the network. The network node addresses are assigned via software. The endburden resistor is activated by means of a DIP switch on the module. The end of line terminating current transmission protocol complies with CANopen specifications DS-301 V4.02. The maximum allowed distance between the bus nodes depends on the cable used and the selected transmission rate. See table.



*Internal dipswitch to enable the terminating resistor incorporated in the module*



| Cable length | Max Baud rate |
|--------------|---------------|
| up to 5000m  | 10            |
| up to 2500m  | 20            |
| up to 1000m  | 50            |
| up to 800m   | 100           |
| up to 500m   | 125           |
| up to 250m   | 250           |
| up to 100m   | 500           |
| up to 25m    | 1000          |

*Cable length limits the transmission bandwidth. Above table shows the match between admissible cable lengths and corresponding max kBaud rates. Values are indicative and may significantly change in relation to the transmission cable characteristics.*



*Location of CM-CAN module on the frequency inverter*



## System bus / EM-SYS module

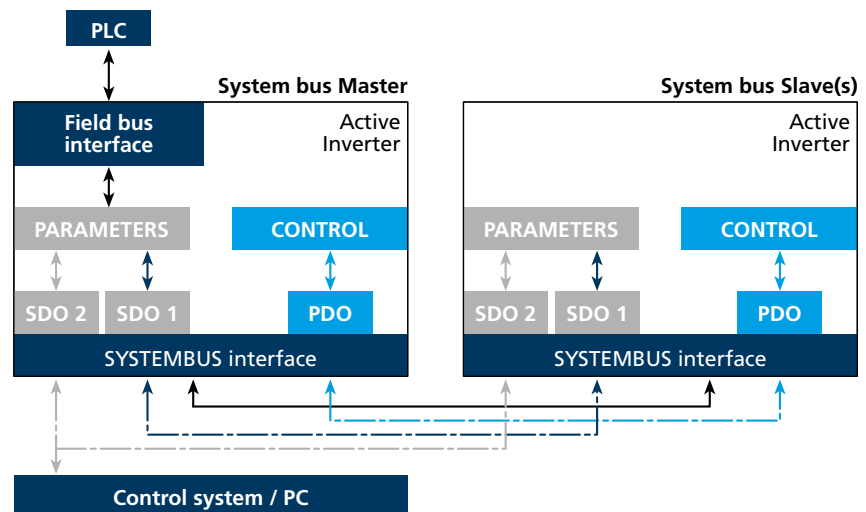
The "System Bus" of Active inverters is a proprietary communication bus, based on CANopen protocol that allows fast exchange of data between the inverters and access, by a system bus master, to the parameters of all devices connected on the network. The system bus nodes (max. 64) are connected by a two-wire 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.



Location of EM-SYS module on the frequency inverter

## Input-output module / EM-IO-01

The EM-IO-01 expansion modules extends the number of the standard inputs and outputs provided on the ACT 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 constitutes an alternative for the activation of high power with respect to the relay output available as a standard feature. The SYSTEMBUS is available on two control terminals and supports easy control of decentralised drive systems. The module is equipped with a removable terminal board divided into two parts (X410A and X410B) that are physically separated one from the other.

- 3 Digital inputs
- 2 Relay outputs
- 1 Analogue input
- 1 Analogue output
- DC 20 V output
- Systembus



**Terminal board X410A**

|  | Terminal | Function   |
|--|----------|--|
|  | X410A.1  | 20 VDC power supply output (180 mA)  |
|  | X410A.2  | 20 V power supply GND  |
|  | 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  | EM-S1INA +/- 10 V and +/- 20 mA analog input                                |
|  | X410B.3  | EM-S1OUTA +/- 10 V multifunction analog output                              |
|  | X410B.4  | CAN-Low Systembus   |
|  | X410B.5  | CAN-High Systembus  |
|  | X410B.6  | GND for +/- 10 V signals  |
|  | X410B.7  | GND for +/- 10 V signals  |



*Location of EM-IO-01 module on the frequency inverter*



## Input-output module / EM-IO-02

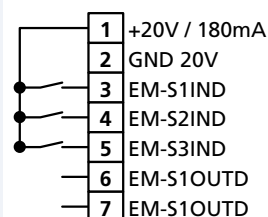
Like the previously illustrated EM-IO-01, the EM-IO-02 expansion module extends the standard inputs and outputs featured on ACT frequency inverters.

The EM-IO-02 module has a slightly modified layout compared to the -01 version, featuring an input for a PTC thermal probe in place of one of the module relay outputs.

The functions of all the other terminals are identical to the version illustrated above.

- 3 Digital inputs
- 1 Relay outputs
- 1 Analog input
- 1 Analog output
- DC 20 V output
- Motor PTC evaluation
- Systembus

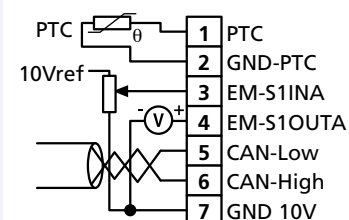
**Terminal board X410A**



**Terminal Function**

|         |  |
|---------|--|
| X410A.1 | 20 V power supply output (180 mA)  |
| X410A.2 | 20 V power supply GND  |
| 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 and +/- 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 for +/- 10 V signals                       |



Location of EM-IO-02 module on the frequency inverter

## Input-output module / EM-IO-03

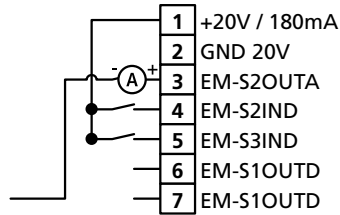
The EM-IO-03 expansion module is another variant for the extension of I/O facilities of ACTIVE frequency inverters.

- 2 Digital inputs
- 1 Relay outputs
- 1 Analog input
- 2 Analog output
- DC 20 V output
- Motor PTC evaluation
- Systembus



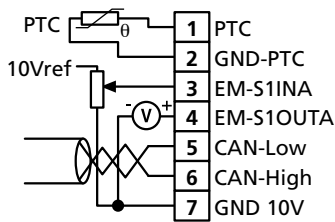
**Terminal board X410A**

| Terminal | Function     |
|----------|--------------|
| 1        | +20V / 180mA |
| 2        | GND 20V      |
| 3        | EM-S2OUTA    |
| 4        | EM-S2IND     |
| 5        | EM-S3IND     |
| 6        | EM-S1OUTD    |
| 7        | EM-S1OUTD    |



**Terminal board X410B**

| Terminal | Function  |
|----------|-----------|
| 1        | PTC       |
| 2        | GND-PTC   |
| 3        | EM-S1INA  |
| 4        | EM-S1OUTA |
| 5        | CAN-Low   |
| 6        | CAN-High  |
| 7        | GND 10V   |



Location of EM-IO-03 module on the frequency inverter

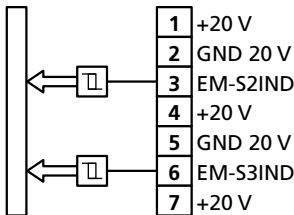


# Input-output module / EM-IO-04

The EM-IO-04 expansion module is another variant for the extension of I/O facilities of ACTIVE frequency inverters.

- 2 Digital inputs
- 1 Digital Port (input or output)
- DC 20 V output
- Motor PTC or KTY evaluation
- Systembus

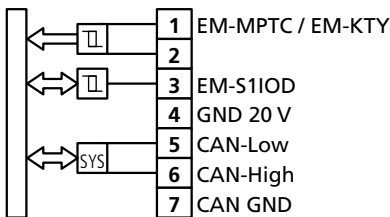
Terminal board X410A



Terminal      Function

|         |                        |
|---------|------------------------|
| X410A.1 | Voltage output 20 V    |
| X410A.2 | Earth / GND 20 V       |
| X410A.3 | Digital input EM-S2IND |
| X410A.4 | Voltage output 20 V    |
| X410A.5 | Earth / 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 | Digital Port EM-S1IOD / Digital input or digital output                               |
| X410B.3 | Earth / GND 20 V  |
| X410B.4 | CAN-Low Systembus   |
| X410B.5 | CAN-High Systembus  |
| X410B.6 | CAN GND   |
| X410B.7 | Earth / GND   |



Location of EM-IO-04 module on the frequency inverter

## Speed sensor module / EM-ENC-01

The EM-ENC-01 expansion module extends the number of speed sensor inputs with respect to the standard terminal board of the frequency inverter, and also increases the number of configurable pulse outputs.

This module is able to manage TTL and HTL incremental speed sensors to standard EIA RS422 (line driver) with 5-volt logic. The EM-ENC-01 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 the output signals of one unit as the input signals of the next.

The DC +/- 10 V analog input can be used for the inverter frequency reference signal.

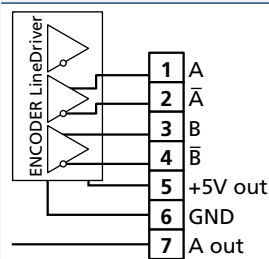
The same terminal board also provides a DC + 5 V (200 mA) power supply for the line driver speed sensor.

Like the other EM expansion modules, the EM-ENC-01 features a Systembus interface.

- TTL or HTL encoder evaluation (without Zero-Pulse)
- DC +5 V encoder supply
- Analog output
- Frequency repetition output



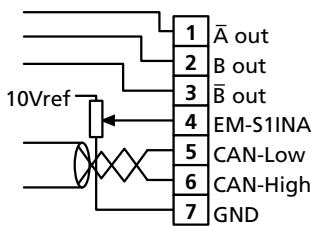
**Terminal board X410A**



**Terminal Function**

| 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  | Speed sensor channel A repetition output |

**Terminal board X410B**



**Terminal Function**

|         |  |
|---------|--|
| X410B.1 | Channel $\bar{A}$ speed sensor repetition output |
| X410B.2 | Channel B speed sensor repetition output         |
| X410B.3 | Channel $\bar{B}$ speed sensor repetition output |
| X410B.4 | EM-S1INA +/- 10 V analog input                   |
| X410B.5 | CAN-Low Systembus                                |
| X410B.6 | CAN-High Systembus                               |
| X410B.7 | GND  |



*Location of EM-ENC-01 module on the frequency inverter*





## Speed sensor module / EM-ENC-02

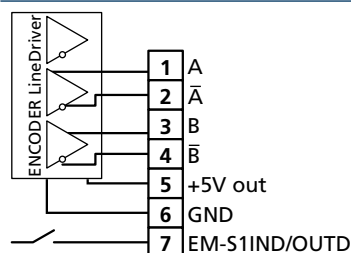
The EM-ENC-02 speed sensor module extends the standard terminal board of the inverter, providing an interface for line driver encoders with relative DC + 5 V power supply.

The same module is equipped also with a DC 0 ... 20 mA and  $\pm 20$  mA analog input and a DC + 20 mA analog output, together with an input for a PTC thermal probe and a digital port configurable as an input or output.

Also this module is equipped with a Systembus port.

- TTL or HTL encoder evaluation (without Zero-Pulse)
- DC +5 V encoder supply
- 1 Digital Port (input or output)
- 1 Analog input
- 1 Analog output
- Motor PTC evaluation
- Systembus

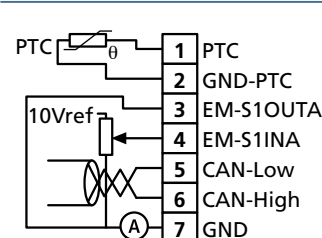
**Terminal board X410A**



**Terminal Function**

| 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**

| 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 $\pm 10$ V and $\pm 20$ mA analog input |
| X410B.5  | CAN-Low Systembus                                |
| X410B.6  | CAN-High Systembus                               |
| X410B.7  | GND  |



Location of EM-ENC-02 module on the frequency inverter

## Speed sensor module / EM-ENC-03

The EM-ENC-03 extends the standard terminal board of the inverter, providing an interface for line driver speed sensors.

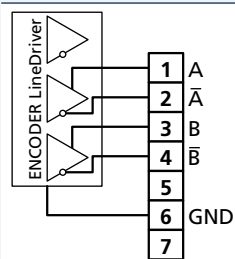
Also this module is equipped with a Systembus port.

Unlike the other EM-ENC-XX modules, the EM-ENC-03 module is not equipped with a power supply output for the speed sensor.

- TTL or HTL encoder evaluation (without Zero-Pulse)
- Systembus



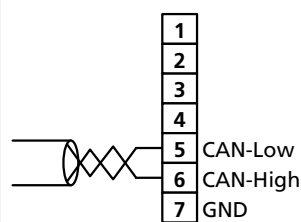
**Terminal board X410A**



**Terminal Function**

| 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                |



*Location of EM-ENC-03 module on the frequency inverter*



## Speed sensor module / EM-ENC-04

The EM-ENC-04 speed sensor module extends the standard terminal board of the inverter, providing an interface for line driver speed sensors with Z channel.

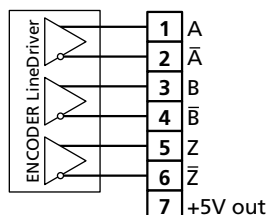
This module is able to manage TTL, HTL, or push-pull incremental speed sensors to standard EIA RS422 (line driver). The EM-ENC-04 speed encoder module is equipped with 6 control terminals for A,  $\bar{A}$ , B,  $\bar{B}$  direction signals and Z and  $\bar{Z}$  zero signals transmitted by the speed sensor.

The same module also features a  $\pm 10$  V and  $\pm 20$  mA analog input and a  $\pm 10$  V voltage output in addition to a digital relay output.

The module also features two output voltages (+ 5 V and + 24 V) for the speed sensor power supply.

- TTL or HTL encoder evaluation (with Zero-Pulse)
- DC +5 V encoder supply
- DC +20 V encoder and external supply
- 1 Relay output
- 1 Analog input
- 1 Analog output

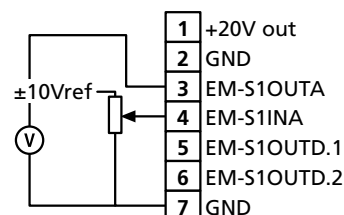
**Terminal board X410A**



**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 | $\pm 10$ V analog input   |
| X410B.5 | EM-S1OUTD multifunction relay output, $U_{max} = 24$ V, 1 A (ohmic) |
| X410B.6 |   |
| X410B.7 | GND   |



Location of EM-ENC-04 module on the frequency inverter

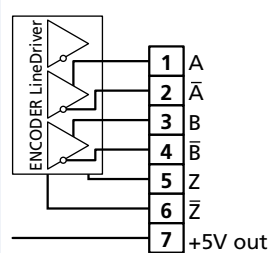
## Speed sensor module / EM-ENC-05

The EM-ENC-05 speed sensor module extends the standard terminal board of the inverter, providing an interface for line driver speed sensors with Z channel. This module is able to manage TTL, HTL, or push-pull incremental speed sensors to standard EIA RS422 (line driver). The EM-ENC05 speed encoder module is equipped with 6 control terminals for A,  $\bar{A}$ , B,  $\bar{B}$ , direction signals and Z and  $\bar{Z}$  zero signals transmitted by the speed sensor. The same module also features a  $\pm 10$  V and  $\pm 20$  mA analog input and a  $\pm 10$  V voltage output in addition to a digital relay output. It is also equipped with a SYSTEMBUS communication bus.

- TTL or HTL encoder evaluation (with Zero-Pulse)
- DC +5 V encoder supply
- DC +20 V encoder and external supply
- 1 Analog input
- 1 Analog output



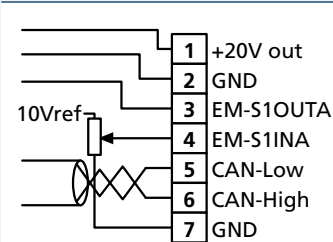
**Terminal board X410A**



**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 | EM-S1OUTATA 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  |



*Location of EM-ENC-05 module on the frequency inverter*



# Resolver Module / EM-RES-01

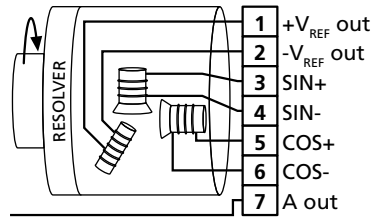
The EM-RES-01 angular position transducer module extends the standard functions of the frequency inverter by providing a supplementary input for a resolver (electromechanical absolute speed sensor). Resolver gives the instantaneous motor shaft position value even at standstill, and its angular position within a revolution.

EM-RES-01 provides 6 terminals for connection of the two  $\sin\theta$  and  $\cos\theta$  track signals generated by the transducer and also carry the resolver power supply voltage. The module EM-RES-01 also supplies an output signal emulating a digital incremental speed sensor through the generation of squarewave signals A,  $\bar{A}$ , B,  $\bar{B}$ , which can be used for shaft synchronisation of any connected slave inverters.

The EM-S11NA multifunction analog input ( $\pm 10$  V or  $\pm 20$  mA) and a Systembus communication port extend the standard functions of the ACT frequency inverter.

- Resolver evaluation
- Frequency repetition output without Zero-Pulse
- Analog input
- Systembus

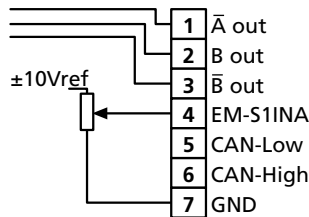
Terminal board X410A



Terminal    Function

|         |                                    |
|---------|------------------------------------|
| X410A.1 | (+) ~6 VAC resolver power supply   |
| X410A.2 | (-) ( $I_{max} = 60mA$ )           |
| X410A.3 | Resolver $\sin\theta$ signal input |
| X410A.4 |                                    |
| X410A.5 | Resolver $\cos\theta$ signal input |
| X410A.6 |                                    |
| X410A.7 | Channel A speed sensor emulation   |

Terminal board X410B



Terminal    Function

|         |  |
|---------|--|
| X410B.1 | Channel $\bar{A}$ speed sensor emulation |
| X410B.2 | Channel B speed sensor emulation         |
| X410B.3 | Channel $\bar{B}$ speed sensor emulation |
| X410B.4 | $\pm 10$ V or $\pm 20$ mA analog input   |
| X410B.5 | CAN-Low Systembus                        |
| X410B.6 | CAN-High Systembus                       |
| X410B.7 | GND                                      |



Location of EM-RES-01 module on the frequency inverter

## Resolver Module / EM-RES-02

EM-RES-02 angular position transducer module extends the standard functions of the frequency inverter by providing a supplementary input for a resolver. This module shares all the features of EM-RES-01 except for the emulation of the encoder zero signal, which in this case replaces the Systembus port.

- Resolver evaluation
- Frequency repetition output with Zero-Pulse
- Analog input



**Terminal board X410A**

|  |   | Terminal       | Function                                   |
|--|---|----------------|--|
|  | 1 | $+V_{REF}$ out | X410A.1 (+) ~6 VAC resolver power supply   |
|  | 2 | $-V_{REF}$ out | X410A.2 (-) ( $I_{max} = 60mA$ )           |
|  | 3 | SIN+           | X410A.3 Resolver $\sin\theta$ signal input |
|  | 4 | SIN-           |  |
|  | 5 | COS+           | X410A.5 Resolver $\cos\theta$ signal input |
|  | 6 | COS-           |  |
|  | 7 | A out          | X410A.7 Channel A speed sensor emulation   |

**Terminal board X410B**

|  |   | Terminal      | Function   |
|--|---|---------------|--|
|  | 1 | $\bar{A}$ out | X410B.1 Channel $\bar{A}$ speed sensor emulation |
|  | 2 | B out         | X410B.2 Channel B speed sensor emulation         |
|  | 3 | $\bar{B}$ out | X410B.3 Channel $\bar{B}$ speed sensor emulation |
|  | 4 | EM-S1INA      | X410B.4 $\pm 10$ V or $\pm 20$ mA analog input   |
|  | 5 | Z out         | X410B.5 Channel Z speed sensor emulation         |
|  | 6 | $\bar{Z}$ out | X410B.6 Channel $\bar{Z}$ speed sensor emulation |
|  | 7 | GND           | X410B.7 GND                                      |



Location of EM-RES-02 module on the frequency inverter

## Engineering software

### VPlus for PC

VPlus is a software application for management of Bonfiglioli ACTIVE and VCB inverters using a PC connected to the drive by means of an RS232 or RS485 serial interface.

For this purposes the ACTIVE inverter must be equipped with the optional KP232 interface or with communication module CM232 or CM485. The program is a highly useful accessory in all phases of the application, from inverter commissioning to run-time monitoring.

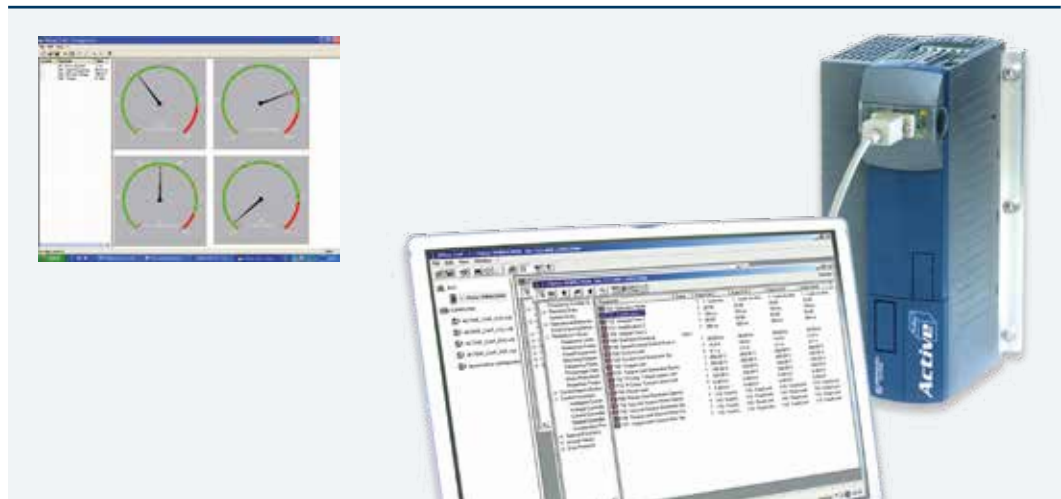
The user interface features an ergonomic structure that supports the user during programming, management, and monitoring, allowing storage of data sets by saving them to file and subsequent

retrieval for the reverse procedure of downloading to the inverter.

VPlus requires a PC running Windows 98/NT/2000/XP and an RS232 or RS485 standard serial port with DB9 connector, grounded to avoid problems of disturbance on signals exchanged between inverter and computer.

The menus / submenus structure provides subdivision of parameters by uniform groups. The interface language can be English, Italian, or German.

The VPlus program also provides the facility for modem connection for remote diagnostics operations on the inverter.



### OSCILLOSCOPE function

The Oscilloscope Function of the ACTIVE inverter is an application package integrated in the Bonfiglioli VPlus program which, by means of the acquisition of signals arriving from the drive core, enables the graphic representation of both the power and control waveforms for the purposes of field technical diagnosis optimisation of the applications.

An essential requirement for the use of the integrated oscilloscope is the installation of interface module KP232 on the inverter. When connected to the PC using a standard DB9 female-female cable this interface creates 115 kbit/s acquisition channels of the four traces shown on the computer screen.

Salient features of the Oscilloscope Function:

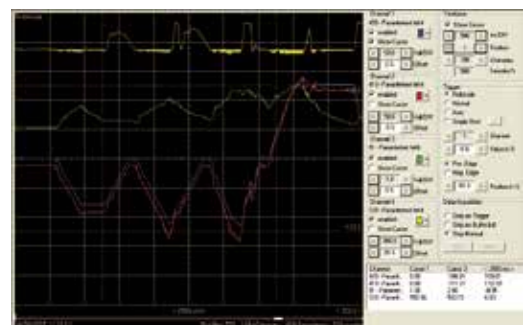
- 4 channels
- Display of absolute values
- Amplitude and time measurement cursors
- Timebase from 20 ms/div to 50 s/div
- Various trigger types
- Graphic memory up to 1 Mbyte
- Trace recording memory up to 60 min.
- Sampling times from 2 ms to 32 ms (depending on the PC)
- Various trace storage formats

Minimum inverter requirements:

- ACTIVE with firmware version 4.1.X or higher
- KP232 interface ver. 0204 or more recent

### ACTIVE oscilloscope graphic presentation

*The functionality and practicality of the virtual oscilloscope are identical to those of a powerful and modern conventional oscilloscope, with the added benefit that all the parameters controlled by the inverter microprocessor can be displayed, whether of a physical nature (current, voltage, frequency, etc.) or a virtual nature (internal control variables, timer signals, comparator signals, internal digital signals, etc.).*





## Configurations implementable with the ACT frequency inverter (parameter P030)

- 110: Simple Sensorless Control
- 111: Simple Sensorless Control with PI function
- 115: Simple Sensorless Control with master / slave control
- 116: Simple Sensorless Control with synchronisation control
- 160: Simple Sensorless Control with Brake Control and Load Detection
- 210: Field-oriented control with speed sensor
- 211: Field-oriented control with speed sensor and PI function
- 215: Field-oriented control with speed sensor with master / slave function
- 216: Field-oriented control with speed sensor with electric shaft
- 230: Field-oriented control with speed sensor with torque/speed switching
- 260: Field-oriented control with speed sensor with Brake Control and Load Detection
- 410: Sensorless Control with extended tuning
- 411: Sensorless field orientation control with PI regulator
- 415: Sensorless field orientation control with electronic gearbox and position control
- 430: Sensorless Control with extended tuning and torque / speed control switching
- 460: Sensorless Control with extended tuning and with Brake Control and Load Detection
- 510: Sensorless field orientation control of a synchronous machine
- 515: Sensorless field orientation control of a synchronous machine with electronic gear and position control
- 516: Sensorless field orientation control of a synchronous machine with electronic gear and index control
- 530: Sensorless field orientation control of a synchronous machine with torque/speed switching
- 560: Sensorless field orientation control of a synchronous machine with electronic gear and position control

By default the ACT frequency inverter is supplied with configuration 110.

Configurations can be changed from the control unit or PC (VPlus) by means of parameter P030. Configuration 110 is recommended for low dynamic applications or for speed control of several motors in parallel (in the event that the inverter selection criterion is based on the sum of the rated currents of the motors to be driven). Configuration 111 is recommended for driving turbine machinery (pumps and fans).

Configuration 410 provides high dynamic performance also at low speed without the use of a speed sensor. For enhanced performance the motor data must be entered and the system must be tuned; in addition, the speed controller must be set up for the optimisation of dynamic performance in accordance with the moment of inertia of the load.

This configuration can also be used for simple resolvers by implementing the internal function for positioning from an external reference point (e.g. proximity switch).

Configuration 460 is particularly suitable for elevators and lifting drives in general (cranes, travelling hoists, etc.).

Configuration 210 requires the use of a speed sensor (push-pull or line driver); this configuration allows the most precise load control in terms of speed and torque, including control with nominal torque at zero rpm (standstill with torque).

Configuration 216 can be utilised for synchronous tie applications between several motors with definition of angular phase differences between each axis.

Configuration 510 is the standard synchronous motor operation. This configuration needs a synchronous motor with Resolver and an ACT device with EM-RES.

Configuration 515 adds the functionality of the electronic gear to the configuration 510.

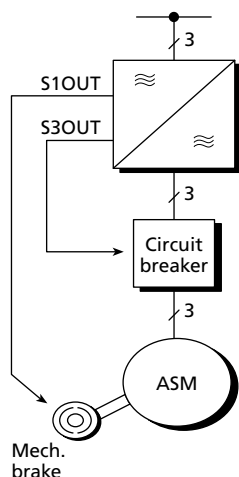
Configuration 516 allows synchronous tied applications with an index control.

Configuration 560 adds extended brake control and is suited especially for vertical movements.

## Functions implemented in standard firmware

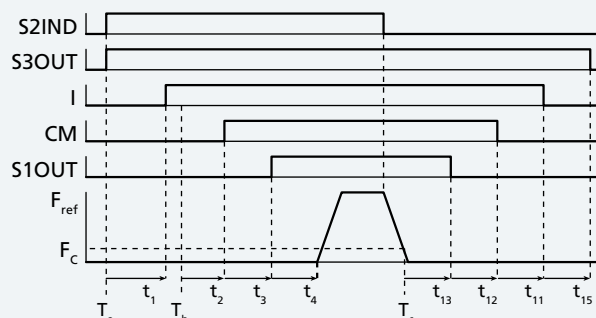
### Parking brake control (X60 configurations)

Many drives, particularly in the mechanical engineering industry, require a holding brake that maintains the position that has been reached even in the event of power losses. An extended system is available for holding brake control for lifting drives. In addition to holding brake control, this includes also control of the circuit breaker



between motor and inverter in certain cases (e.g. elevators).

To compensate for the response time of mechanical components, parameterisation of switching times can be executed with timers. This solution makes it possible to optimise starting and stopping behaviour in the case of suspended loads.



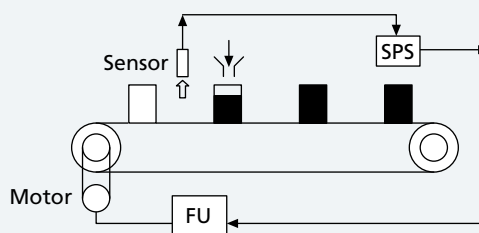
### Motor brake (motor chopper) parameter P507

The Motor Chopper function (P507) allows efficient braking of drives with high flywheel loads without requiring external components such as brake units or mains recovery devices.

### Positioning (parameters from P458 to P464)

With "Positioning from a reference point" (Parameters P458 to P464), users can position a

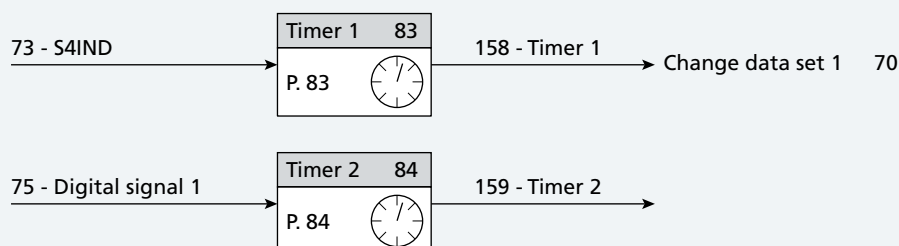
drive starting from an external signal (e.g. proximity switch). The reference point is acquired on the digital inputs and the target position can be parameterised. "Positioning from a reference point" can be employed independently of the control configuration (with/without speed sensor). Since it is possible to select drive behaviour once the target position has been reached, "Positioning from a reference point" is also suitable for fully automatic drive systems.



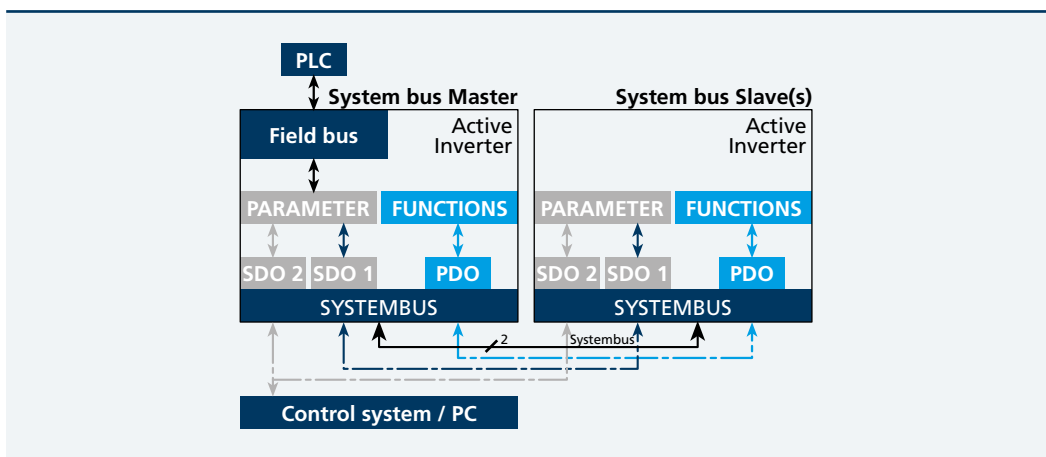
### Timer Functions (parameters P790 to P795)

The system is equipped with two timers which are connected, in the standard configuration, to a digital input and a digital output but which can be associated, by means of programming, with the I/Os and several internal functions.

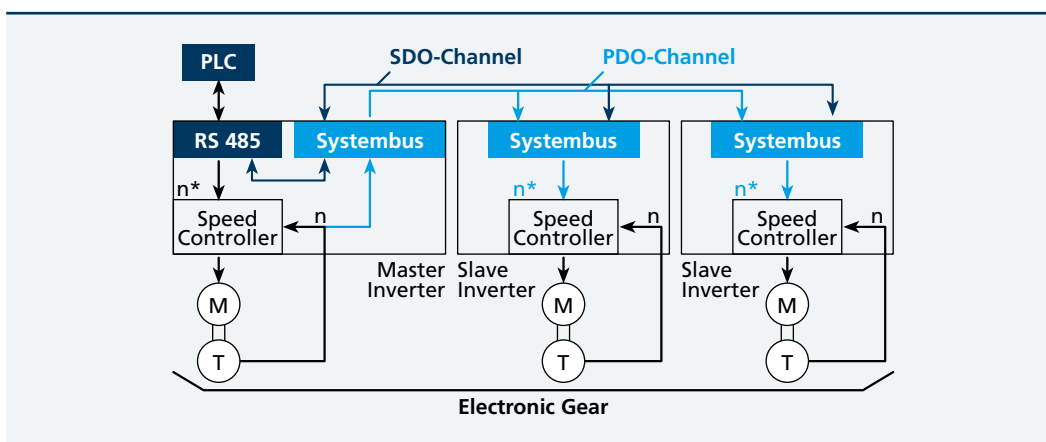
Delay times can be programmed in a range from 10 ms up to 650 hours. Multiple operating modes permit the adaptation of the Timer function to meet the requirements of a broad range of applications.



is based on CAN and is implemented along the lines of CANopen methods. The systembus has two SDO channels and three PDO channels.



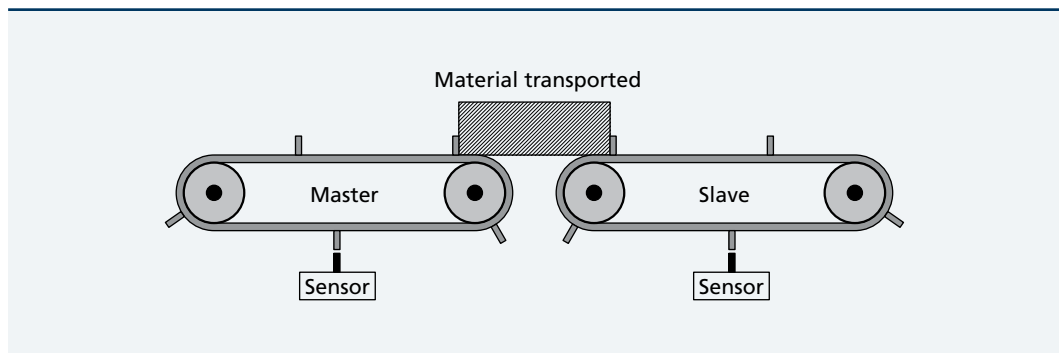
interfaced with the field bus. Channel SDO2 is used for connection of a PC display tool for Windows. This display tool allows parameterisation and monitoring of the process on-line.



the slaves. This strategy makes it possible to obtain an adjustable speed ratio between the master and one or more slaves. In the case that speed sensors are used on the master and on the slaves, it is possible to implement a synchronous tie with angular ratios that can be modified on-line.

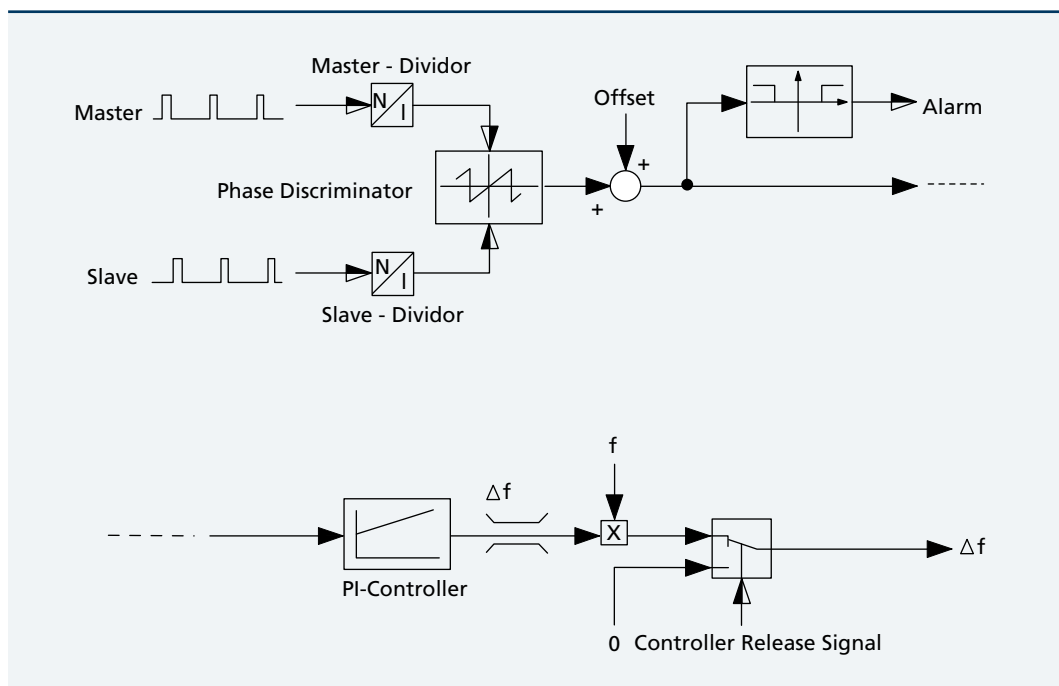
# Master/slave synchronisation (X16 configurations)

Synchronisation of handling processes (e.g. conveyor belts) is one of the functions available with the standard firmware.



There are several dedicated inputs for synchronisation signals (electronic gear). For master-slave control it is possible to set angular ratios with very high resolution. An offset can be programmed between two conveyor belts. The synchronism regulator can be activated/deactivated by means of a programmable digital

input, e.g. for alignment procedures. For functional control the current deviation between master and slave can be monitored. If a programmable threshold value is exceeded an error signal can be generated by means of a freely configurable digital output.



# Mounting

---

A wide range of mechanical accessories is available for ACT Series frequency converters, to make installation extremely easy in all sorts of application.

In standard mountings the unit can be installed directly on the mounting plate or through-the-wall. 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 practically 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 with a standard installation kit for fixing to an electrical cabinet mounting panel.

3 different optional installation kits are available on request.

### **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

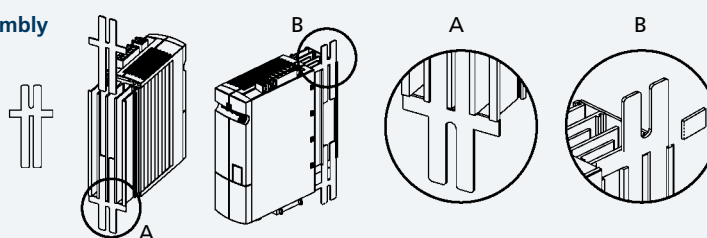
### **MDIN**

DIN rail assembly for fast and modular installation / coupling

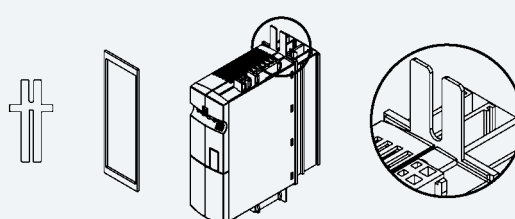
# Size 1

| Inverter Bonfiglioli                                   | Mounting | Description            |
|--|----------|------------------------|
| ACT 201-05 ... ACT 201-09<br>ACT 401-05 ... ACT 401-11 | MPSV1    | Thru-type assembly     |
|  | MNVIB1   | Antivibration assembly |
|  | MDIN1    | DIN rail assembly      |

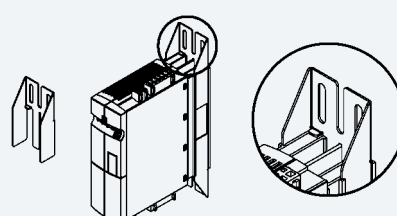
## Standard assembly



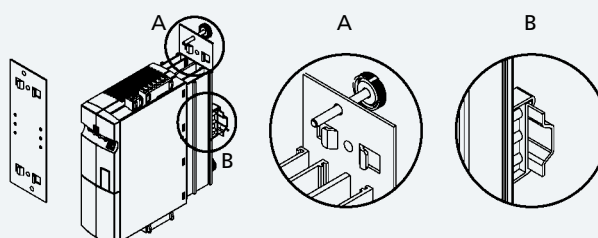
## MPSV1



## MNVIB1



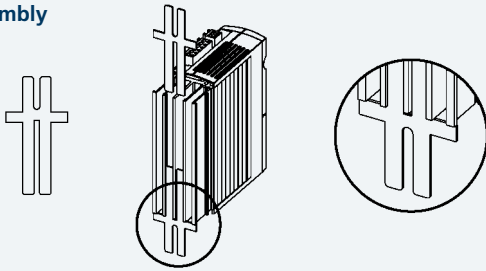
## MDIN1



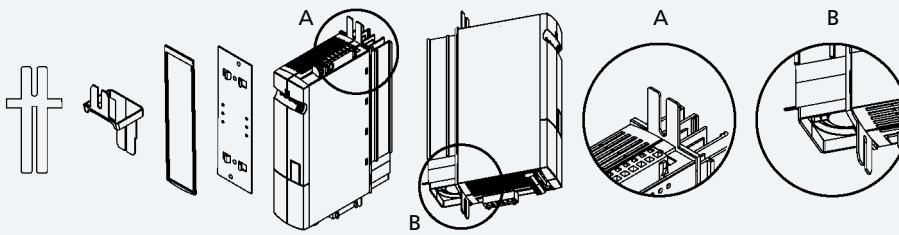
## Size 2

| Inverter Bonfiglioli                                   | Mounting | Description            |
|--|----------|------------------------|
| ACT 201-11 ... ACT 201-15<br>ACT 401-12 ... ACT 401-18 | MPSV2    | Thru-type assembly     |
|  | MNVIB2   | Antivibration assembly |
|  | MDIN2    | DIN rail assembly      |

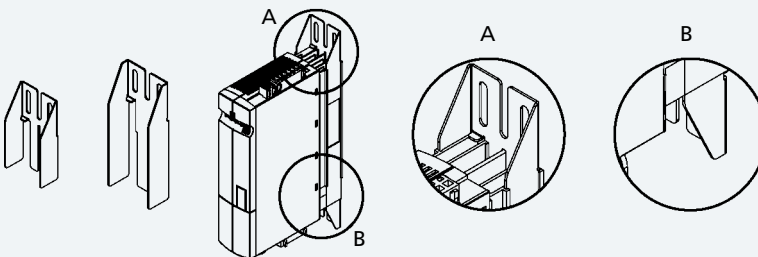
### Standard assembly



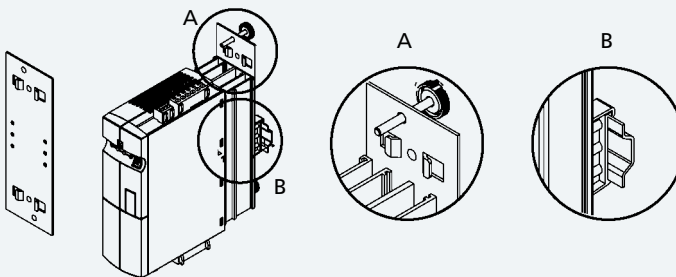
### MPSV2



### MNVIB2



### MDIN2

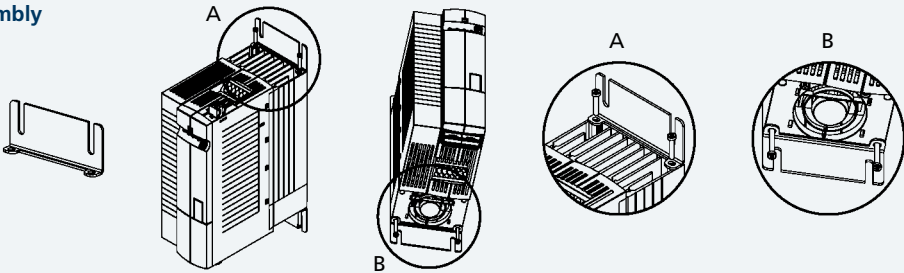




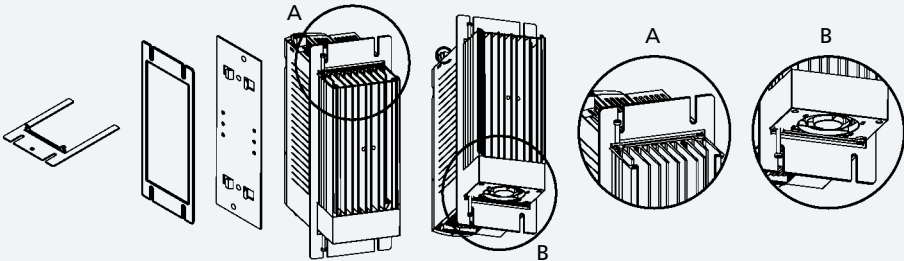
# Size 3

| Inverter Bonfiglioli      | Mounting | Description            |
|---------------------------|----------|------------------------|
| ACT 201-18 ... ACT 201-19 | MPSV3    | Thru-type assembly     |
| ACT 401-19 ... ACT 401-22 | MNVIB3   | Antivibration assembly |

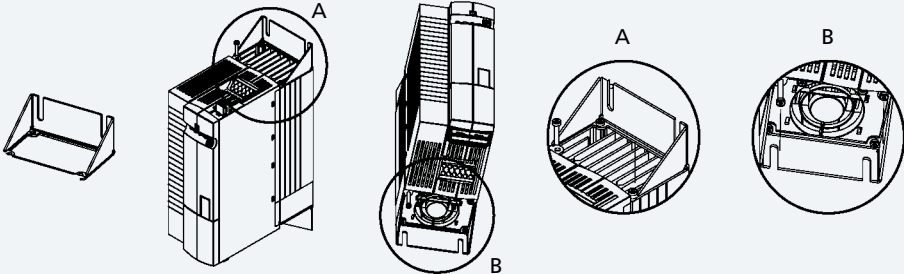
## Standard assembly



## MPSV3



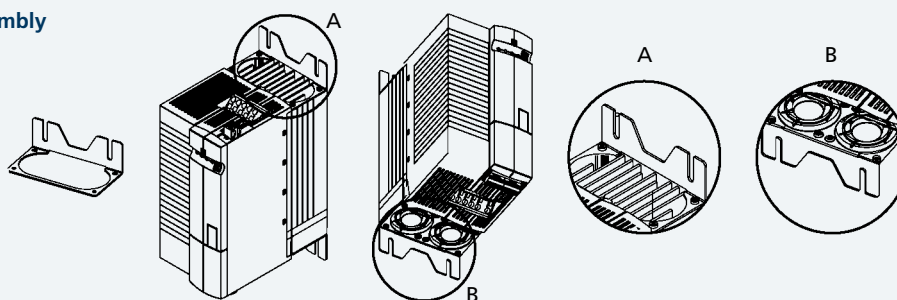
## MNVIB3



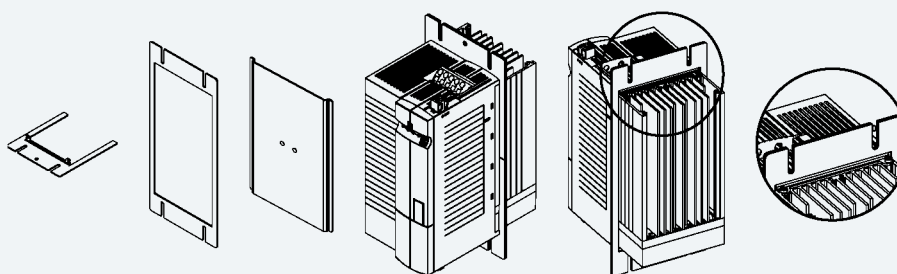
## Size 4

| Inverter Bonfiglioli      | Mounting | Description            |
|---------------------------|----------|------------------------|
| ACT 201-21 ... ACT 201-22 | MPSV4    | Thru-type assembly     |
| ACT 401-23 ... ACT 401-25 | MNVIB4   | Antivibration assembly |

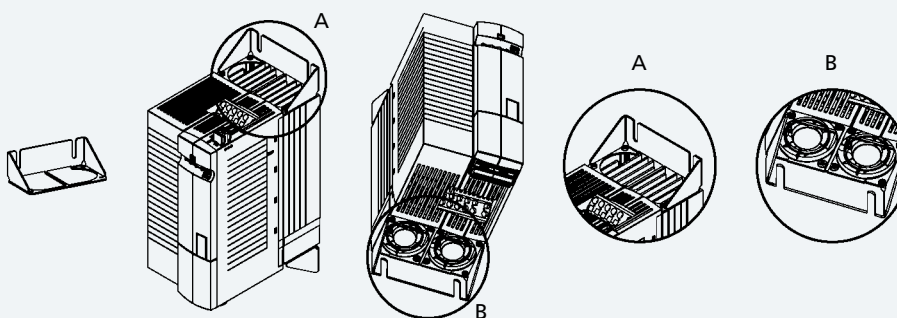
### Standard assembly



### MPSV4



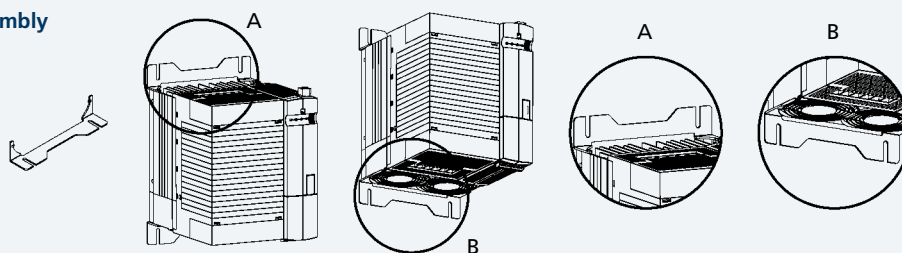
### MNVIB4



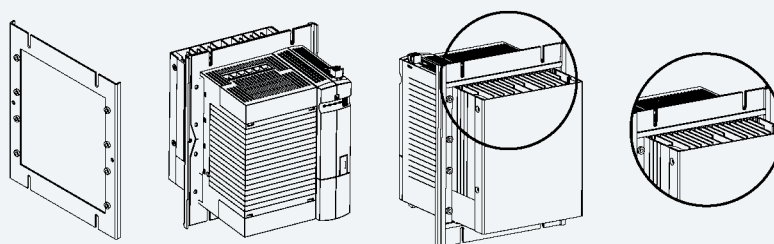
## Size 5

| Inverter Bonfiglioli      | Mounting | Description            |
|---------------------------|----------|------------------------|
| ACT 401-27 ... ACT 401-31 | MPSV5    | Thru-type assembly     |
|                           | MNVIB5   | Antivibration assembly |

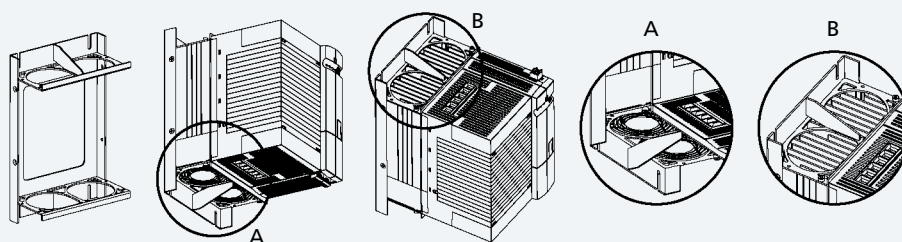
### Standard assembly



### MPSV5



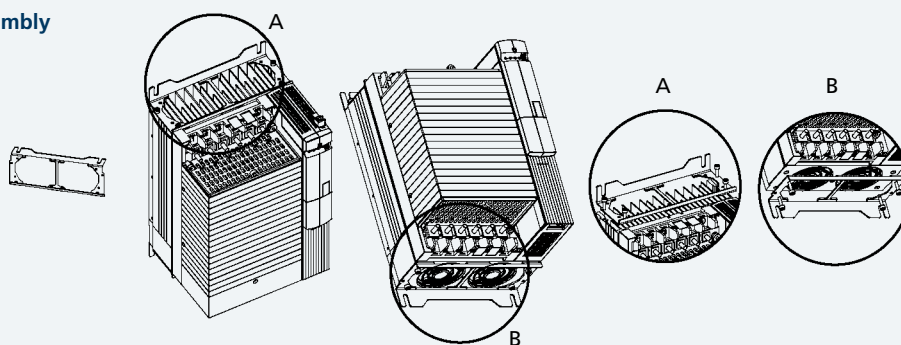
### MNVIB5



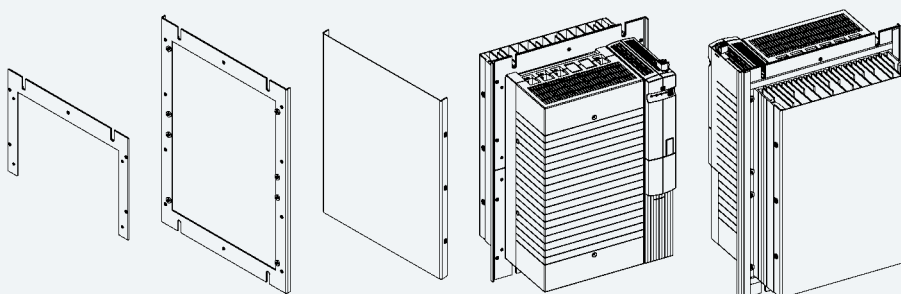
## Size 6

| Inverter Bonfiglioli      | Mounting | Description            |
|---------------------------|----------|------------------------|
| ACT 401-33 ... ACT 401-39 | MPSV6    | Thru-type assembly     |
|                           | MNVIB6   | Antivibration assembly |

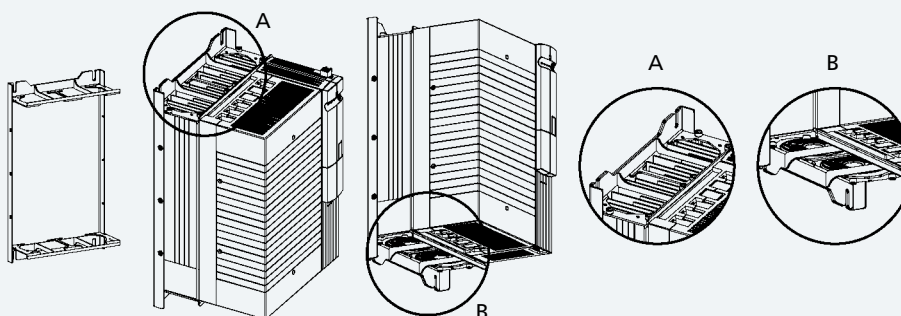
### Standard assembly



### MPSV6



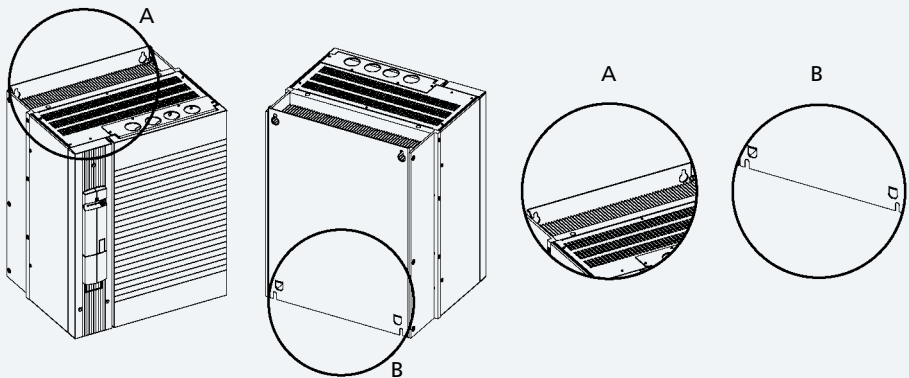
### MNVIB6



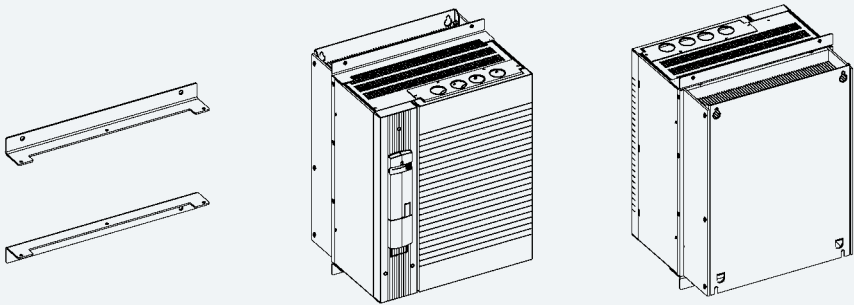
# Size 7

| Inverter Bonfiglioli      | Mounting | Description        |
|---------------------------|----------|--------------------|
| ACT 401-43 ... ACT 401-49 | MPSV7    | Thru-type assembly |

## Standard assembly



## MPSV7



# 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 returns 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.

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

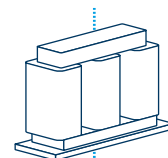
## Line choke

- Line chokes are not mandatory: their use 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%.

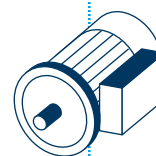
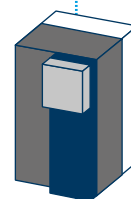
- A line choke is recommended for the ACU201 and ACU401 frequency inverter series in the presence of high continuous input current required by the application, in order to increase the lifetime of the electrolytic capacitors.
- A line choke is always required in single and two-phase operation of the ACU201 frequency inverters.

## EMI filter

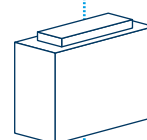
- An EMI filter can be used in order to achieve Class "A" (groups 1, 2) or Class "B" interference suppression
- The EMI filter is available in a low leakage current version for special applications.
- The EMI - filter is part of the standard outfit in sizes of up to 4.0 kW and it is supplied as an optional for higher sizes in an internal (up to 7.5 kW) or external (above 7.5 kW) version.



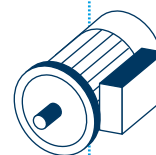
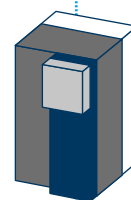
Line choke



Power feeding line



EMI filter



Power feeding line

## ACTIVE inverter - Line choke / EMI filter combination

| Mains 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*                                 |
| ACT 1<br>(standard internal filter) | Standard                                | external choke                          | external choke                         | external filter                        | external choke                         | external filter                        |
| ACT 2<br>(standard internal filter) | Standard                                | external choke                          | external choke                         | external filter                        | external choke                         | external filter                        |
| ACT 3                               | internal filter<br>or<br>external choke | internal filter<br>or<br>external choke | internal filter<br>+<br>external choke | internal filter<br>+<br>external choke | internal filter<br>+<br>external choke | external filter                        |
| ACT 4                               | external choke                          | external filter                         | external filter                        | external filter                        | external filter                        | external filter<br>+<br>external choke |
| ACT 5                               | external choke                          | external choke                          | external filter                        | external filter                        | external filter                        | external filter<br>+<br>external choke |
| ACT 6                               | external choke                          | external choke                          | external filter                        | external filter                        | external filter                        | external filter                        |
| ACT 7                               | external choke                          | external choke                          | external filter                        | external filter                        | —                                      | —                                      |

\* 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% voltage drop.

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 European reference standard for harmonics is EN 60 555, while in the US and Canada systems must comply with standard IEEE 519 and various generic national regulations.

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.

### Technical data

#### Nominal voltages

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

#### Frequencies

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

#### Insulating material class

T40/F

#### Ambient temperature

40°C

#### Protection class

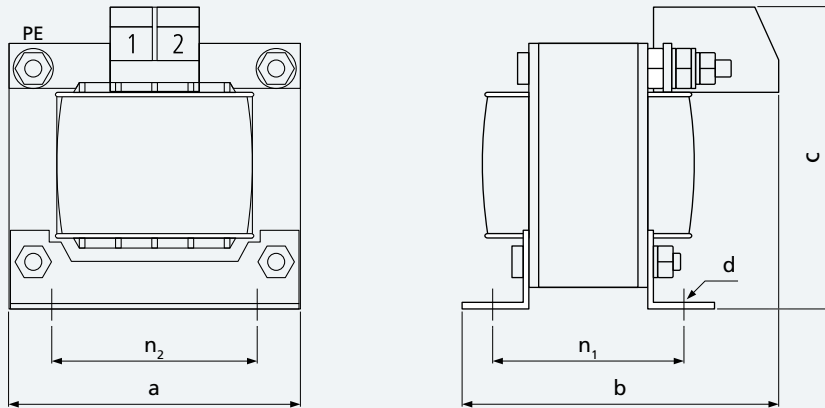
IP00 / VBG4

#### Connection type

Contact-protected terminals

# Line choke

## Dimensions



### Technical data

Bonfiglioli frequency inverter - Line choke combination, 1x230V~

| Bonfiglioli inverter | Bonfiglioli choke | Nominal current | Power dissipation |
|----------------------|-------------------|-----------------|-------------------|
|                      |                   | [A]             | [W]               |
| ACT 201-05           | LCVS006           | 6               | 8.0               |
| ACT 201-07           | LCVS008           | 8               | 8.0               |
| ACT 201-09           | LCVS010           | 10              | 10.0              |
| ACT 201-11           | LCVS015           | 15              | 12.0              |
| ACT 201-13           | LCVS018           | 18              | 15.0              |

### Technical assembly data

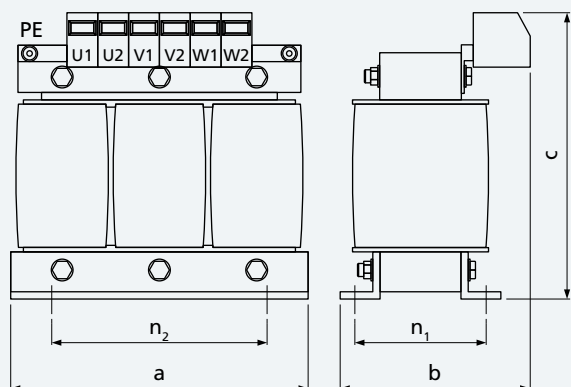
| Bonfiglioli choke | Dimensions |           |           | Assembly               |                        |           | Weight | Connection terminal |         |                     |
|-------------------|------------|-----------|-----------|------------------------|------------------------|-----------|--------|---------------------|---------|---------------------|
|                   | a<br>[mm]  | b<br>[mm] | c<br>[mm] | n <sub>2</sub><br>[mm] | n <sub>1</sub><br>[mm] | d<br>[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                  |



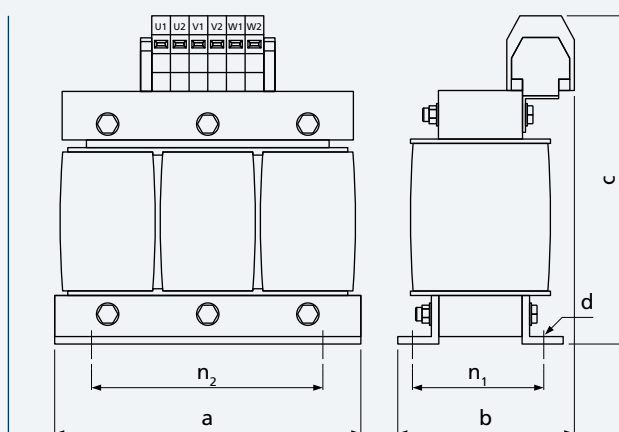
# Line choke

## Dimensions

LCVT004 ... LCVT025



LCVT034 ... LCVT250



### Technical data

Bonfiglioli frequency inverter – Line choke combination, 3x230V~

| Bonfiglioli inverter | Bonfiglioli choke | Nominal current | Choke | Power dissipation |
|----------------------|-------------------|-----------------|-------|-------------------|
|                      |                   | [A]             | [mH]  | [W]               |
| ACT 201-05           | LCVT004           | 4               | 7.32  | 20                |
| ACT 201-07           |                   |                 |       |                   |
| ACT 201-09           | LCVT006           | 6               | 4.88  | 25                |
| ACT 201-11           | LCVT008           | 8               | 3.66  | 30                |
| ACT 201-13           | LCVT010           | 10              | 2.93  | 30                |
| ACT 201-15           | LCVT015           | 15              | 1.95  | 45                |
| ACT 201-18           | LCVT018           | 18              | 1.63  | 70                |
| ACT 201-19           | LCVT025           | 25              | 1.17  | 70                |
| ACT 201-21           | LCVT034           | 34              | 0.86  | 85                |
| ACT 201-22           |                   |                 |       |                   |

# Line choke

## Technical data

Bonfiglioli frequency inverter – Line choke combination, 3x400V~

| Bonfiglioli inverter | Bonfiglioli choke | Nominal current | Choke | Power dissipation |
|----------------------|-------------------|-----------------|-------|-------------------|
|                      |                   | [A]             | [mH]  | [W]               |
| ACT 401-05           | LCVT004           | 4               | 7.32  | 20                |
| ACT 401-07           |                   |                 |       |                   |
| ACT 401-09           |                   |                 |       |                   |
| ACT 401-11           |                   |                 |       |                   |
| ACT 401-12           |                   |                 |       |                   |
| ACT 401-13           | LCVT006           | 6               | 4.88  | 25                |
| ACT 401-15           | LCVT008           | 8               | 3.66  | 30                |
| ACT 401-18           | LCVT010           | 10              | 2.93  | 30                |
| ACT 401-19           | LCVT015           | 15              | 1.95  | 45                |
| ACT 401-21           | LCVT018           | 18              | 1.63  | 70                |
| ACT 401-22           | LCVT025           | 25              | 1.17  | 70                |
| ACT 401-23           | LCVT025           | 25              | 0.86  | 85                |
| ACT 401-25           | LCVT034           | 34              | 0.86  | 85                |
| ACT 401-27           | LCVT050           | 50              | 0.59  | 100               |
| ACT 401-29           |                   |                 |       |                   |
| ACT 401-31           | LCVT060           | 60              | 0.49  | 100               |
| ACT 401-33           | LCVT075           | 75              | 0.37  | 110               |
| ACT 401-35           | LCVT090           | 90              | 0.33  | 120               |
| ACT 401-37           | LCVT115           | 115             | 0.25  | 140               |
| ACT 401-39           | LCVT135           | 135             | 0.22  | 180               |
| ACT 401-43           | LCVT160           | 160             | 0.18  | 180               |
| ACT 401-45           | LCVT180           | 180             | 0.16  | 185               |
| ACT 401-47           | LCVT210           | 210             | 0.14  | 200               |
| ACT 401-49           | LCVT250           | 250             | 0.12  | 210               |

## Technical assembly data

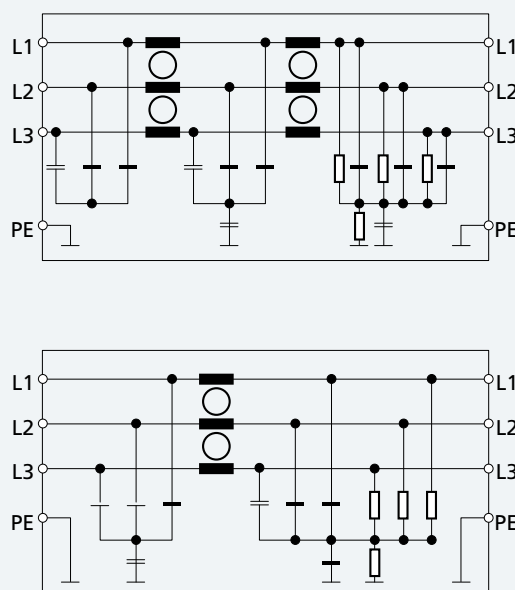
| Bonfiglioli choke | Dimensions |           |           | Assembly               |                        |           | Weight | Connection terminal |           |                   |
|-------------------|------------|-----------|-----------|------------------------|------------------------|-----------|--------|---------------------|-----------|-------------------|
|                   | a<br>[mm]  | b<br>[mm] | c<br>[mm] | n <sub>2</sub><br>[mm] | n <sub>1</sub><br>[mm] | d<br>[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                |

## 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. Within the European Union reference standard EN 61800-3 defines the thresholds for electromagnetic interference for different classes of equipment. Active 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 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 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 sizes up to 130 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 CEI 25/100/21)

### Ambient temperature

+40°C maximum

### Protection class

IP00

### Connection type

Contact-protected terminals

Strand connection on load side (only up to ACT 401-18)

Metal fasteners are included in the supply

### Note

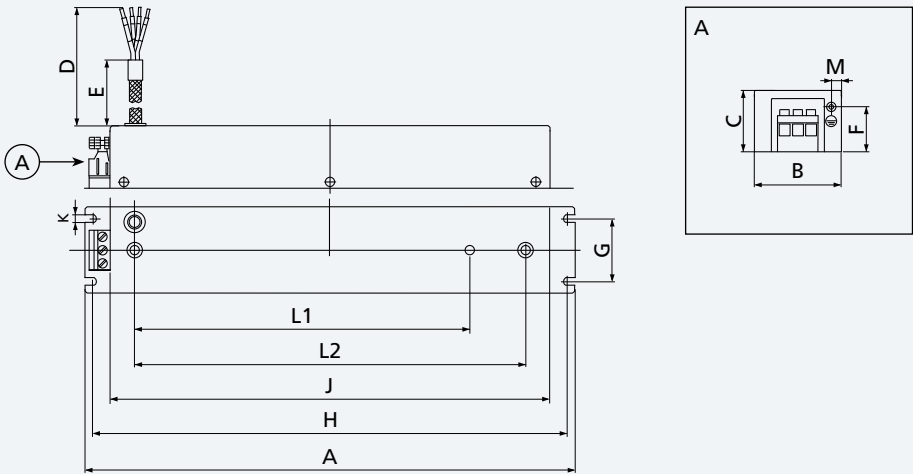
These mains filters are installed between the line choke and the frequency inverter. The frequency inverter installed on the EMI filter must be connected to the metal baseplate with a short, large section earth connection.

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                    | ACT 201-05 | FTV007B                | 8             | 5               | 10                | 1.5    |
|                      | ACT 201-07 |                        |               |                 |                   |        |
|                      | ACT 201-09 |                        |               |                 |                   |        |
|                      | ACT 401-05 |                        |               |                 |                   |        |
|                      | ACT 401-07 |                        |               |                 |                   |        |
|                      | ACT 401-09 |                        |               |                 |                   |        |
|                      | ACT 401-11 |                        |               |                 |                   |        |
| 2                    | ACT 201-11 | FTV007B                | 8             | 5               | 10                | 1.5    |
|                      | ACT 401-12 |                        |               |                 |                   |        |
|                      | ACT 401-13 |                        |               |                 |                   |        |
|                      | ACT 401-15 |                        |               |                 |                   |        |
|                      | ACT 401-18 |                        |               |                 |                   |        |
| 3                    | ACT 401-19 | FTV018B                | 18            | 1.2             | 10                | 3.5    |
|                      | ACT 401-21 |                        |               |                 |                   |        |
| 4                    | ACT 401-23 | FTV040B                | 40            | 1.2             | 10                | 3.5    |
|                      | ACT 401-25 |                        |               |                 |                   |        |

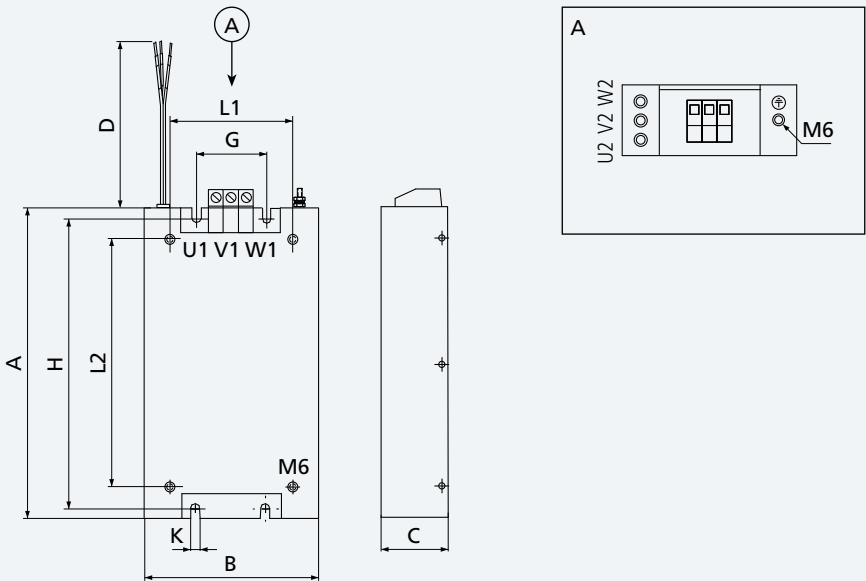
# Backplate EMI filters

## 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 ... 130 A

### Frequency

up to 60 Hz

### Operating and storage temperature

-25 °C ... +80 °C (climate class acc. to CEI 25/80/21)

### Type of protection

IP20

### Maximum length of motor cables:

ACT 401-01 to -15: 25 m class B

ACT 401-18 to -25: 50 m class B

ACT 401-27 to -39: 10 m class B, 100 m class A group 1

ACT 401-43 to -49: 10 m class B, 100 m class A group 1

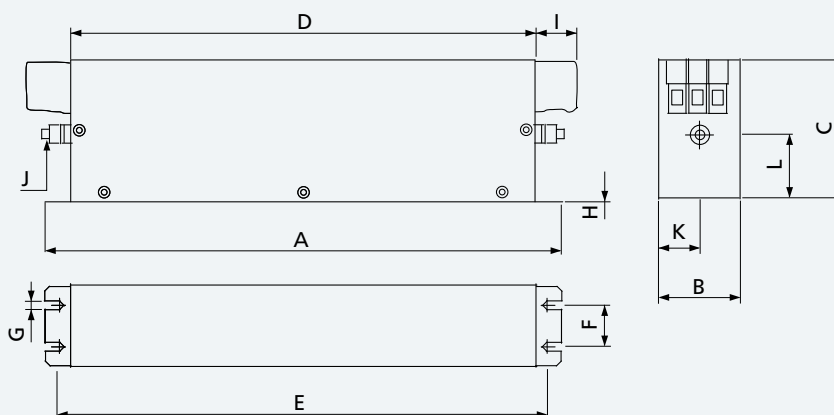
### Note

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

| Bonfiglioli Inverter |            | Bonfiglioli EMI filter | Rated current | Leakage current | Power dissipation | Weight |
|----------------------|------------|------------------------|---------------|-----------------|-------------------|--------|
| Size                 | Type       |                        | [A]           | [mA]            | [W]               | [kg]   |
| 1                    | ACT 201-05 | FTV007A                | 7             | 33              | 3.8               | 0.5    |
|                      | ACT 201-07 |                        |               |                 |                   |        |
|                      | ACT 201-09 |                        |               |                 |                   |        |
|                      | ACT 401-05 |                        |               |                 |                   |        |
|                      | ACT 401-07 |                        |               |                 |                   |        |
|                      | ACT 401-09 |                        |               |                 |                   |        |
|                      | ACT 401-11 |                        |               |                 |                   |        |
| 2                    | ACT 201-11 | FTV016A                | 16            |                 | 6.1               | 0.8    |
|                      | ACT 401-12 |                        |               |                 |                   |        |
|                      | ACT 401-13 |                        |               |                 |                   |        |
|                      | ACT 401-15 |                        |               |                 |                   |        |
| 3                    | ACT 201-13 | FTV030A                | 30            |                 | 11.8              | 1.2    |
|                      | ACT 201-15 |                        |               |                 |                   |        |
|                      | ACT 401-18 |                        |               |                 |                   |        |
|                      | ACT 401-19 |                        |               |                 |                   |        |
|                      | ACT 401-21 |                        |               |                 |                   |        |
| 4                    | ACT 201-18 | FTV055A                | 55            |                 | 25.9              | 2.0    |
|                      | ACT 201-19 |                        |               |                 |                   |        |
|                      | ACT 401-22 |                        |               |                 |                   |        |
| 5                    | ACT 401-27 | FTV075A                | 75            |                 | 32.2              | 2.7    |
|                      | ACT 401-29 |                        |               |                 |                   |        |
|                      | ACT 401-31 |                        |               |                 |                   |        |
| 6                    | ACT 401-33 | FTV100A                | 100           | 34.5            | 4.3               |        |
|                      | ACT 401-35 |                        |               |                 |                   |        |
|                      | ACT 401-37 | FTV130A                | 130           | 43.1            | 4.5               |        |
|                      | ACT 401-39 |                        |               |                 |                   |        |
| 7                    | ACT 401-43 | FTV150                 | 150           | 13              | 88                | 6.0    |
|                      | ACT 401-45 | FTV180                 | 180           |                 | 150               |        |
|                      | ACT 401-47 | FTV210                 | 210           |                 | 180               | 12.4   |
|                      | ACT 401-49 | FTV250                 | 250           |                 |                   |        |

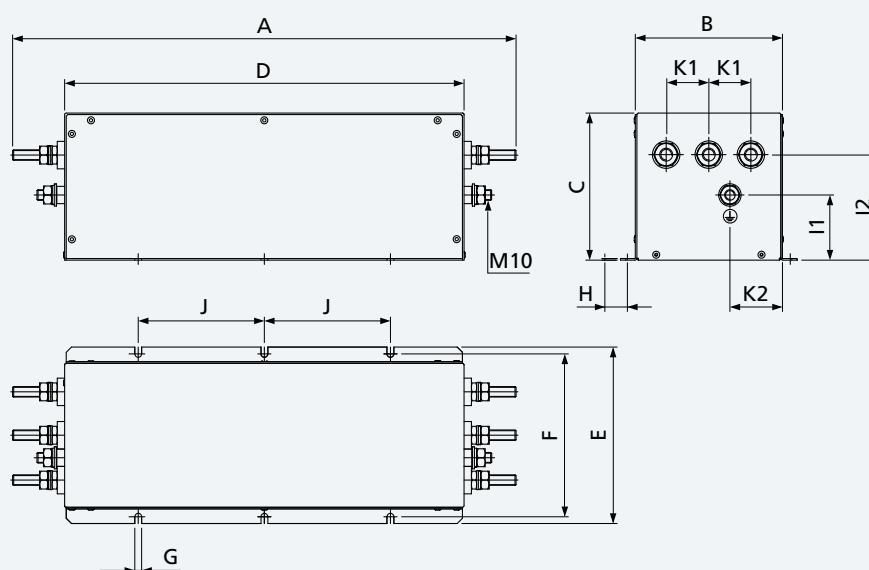
# Book type EMI filters

## 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 |

## 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".

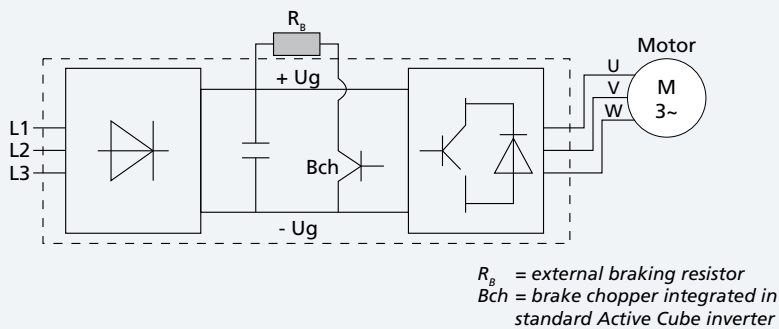
BR series are designed for panel mounting.

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

BR models have been thoroughly tested with Bonfiglioli frequency inverters, therefore they can be used together with all Active, Synplus, and VCB models.



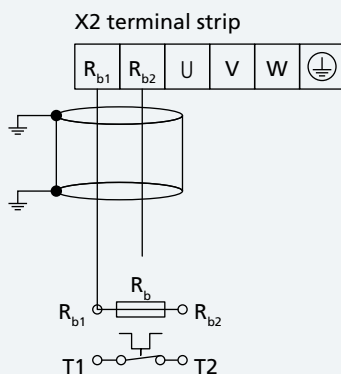
Connection diagram



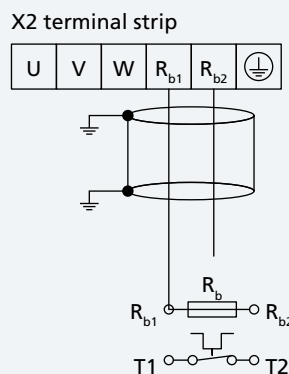
### Connection terminals

The  $R_{b1}$  and  $R_{b2}$  braking resistor terminals on Active 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.

Frequency inverter  
(from 0.55 to 4.0 kW)



Frequency inverter  
(from 5.5 to 132 kW)





## Braking resistors

### Active drive combination chart

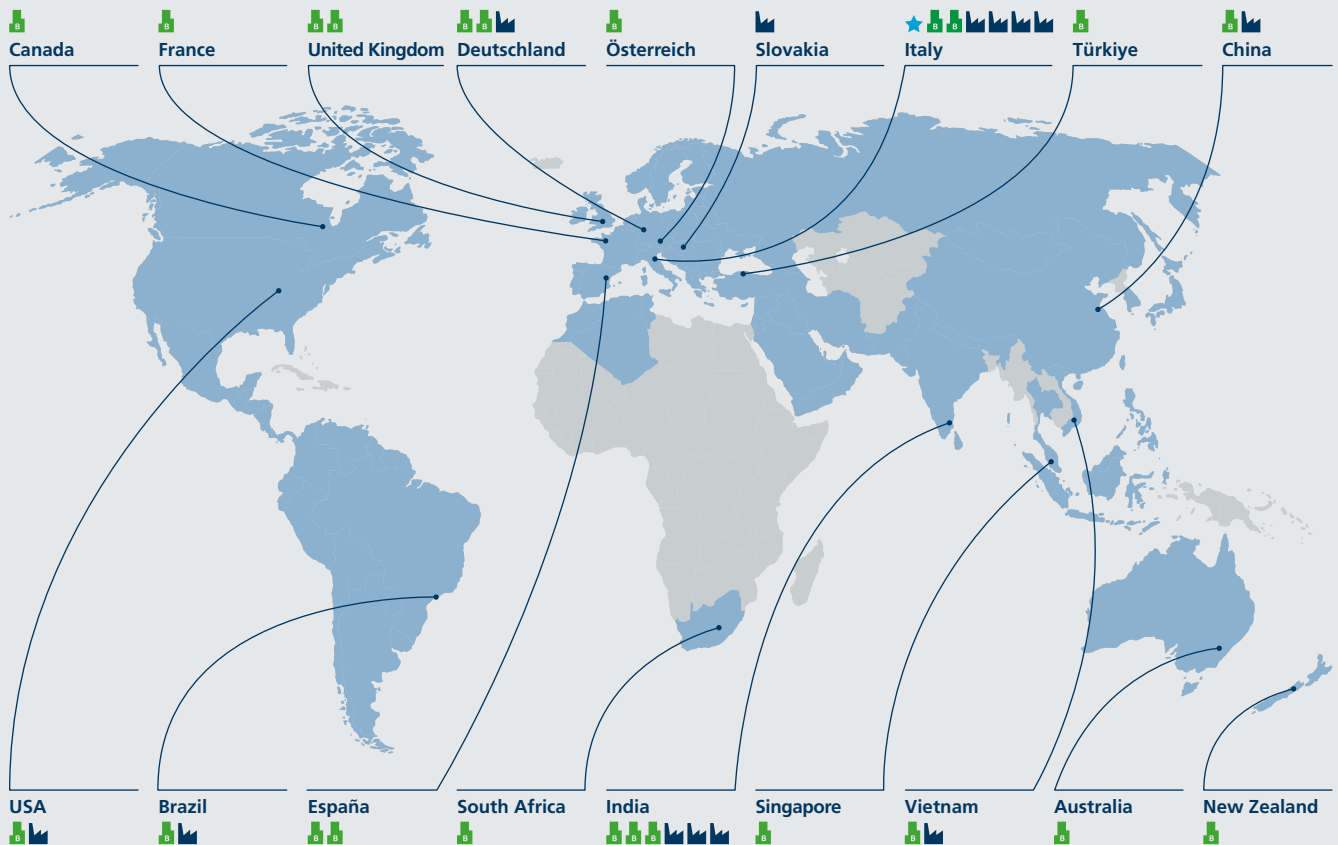
These charts show recommended combinations for each model in the Active range, and specify the corresponding duty cycles on the basis of rated drive

power. Contact your nearest Bonfiglioli Drive Centre for particularly heavy-duty braking applications or if you need to customise a product.

| Active Series |      | Bonfiglioli<br>braking resistor | Resistance | Continuous<br>rated power | Duty cycle at the<br>drive's rated power |
|---------------|------|---------------------------------|------------|---------------------------|--|
| kW            |      |                                 | Ohm        |                           | [W]                                      |
| ACT 201-05    | 0.55 | BR 160/100                      | 100        | 160                       | 29%                                      |
| ACT 201-07    | 0.75 | BR 160/100                      | 100        | 160                       | 21%                                      |
| ACT 201-09    | 1.1  | BR 160/100                      | 100        | 160                       | 15%                                      |
| ACT 201-11    | 1.5  | BR 432/37                       | 37         | 432                       | 29%                                      |
| ACT 201-12    | 2.2  | BR 432/37                       | 37         | 432                       | 20%                                      |
| ACT 201-15    | 3    | BR 432/37                       | 37         | 432                       | 14%                                      |
| ACT 201-18    | 4    | BR 667/24                       | 24         | 667                       | 17%                                      |
| ACT 201-19    | 5.5  | BR 667/24                       | 24         | 667                       | 12%                                      |
| ACT 201-21    | 7.5  | BR 1333/12                      | 12         | 1333                      | 18%                                      |
| ACT 201-22    | 9.2  | BR 1333/12                      | 12         | 1333                      | 14%                                      |
| ACT 401-05    | 0.55 | BR 213/300                      | 300        | 213                       | 39%                                      |
| ACT 401-07    | 0.75 | BR 213/300                      | 300        | 213                       | 28%                                      |
| ACT 401-09    | 1.1  | BR 213/300                      | 300        | 213                       | 19%                                      |
| ACT 401-11    | 1.5  | BR 213/300                      | 300        | 213                       | 14%                                      |
| ACT 401-12    | 1.85 | BR 471/136                      | 136        | 471                       | 25%                                      |
| ACT 401-13    | 2.2  | BR 471/136                      | 136        | 471                       | 21%                                      |
| ACT 401-15    | 3    | BR 471/136                      | 136        | 471                       | 16%                                      |
| ACT 401-18    | 4    | BR 696/92                       | 92         | 696                       | 17%                                      |
| ACT 401-19    | 5.5  | BR 1330/48                      | 48         | 1330                      | 24%                                      |
| ACT 401-21    | 7.5  | BR 1330/48                      | 48         | 1330                      | 18%                                      |
| ACT 401-22    | 9.2  | BR 1330/48                      | 48         | 1330                      | 14%                                      |
| ACT 401-23    | 11   | BR 2000/32                      | 32         | 2000                      | 18%                                      |
| ACT 401-25    | 15   | BR 2000/32                      | 32         | 2000                      | 13%                                      |
| ACT 401-27    | 18.5 | BR 4000/16                      | 16         | 4000                      | 22%                                      |
| ACT 401-29    | 22   | BR 4000/16                      | 16         | 4000                      | 18%                                      |
| ACT 401-31    | 30   | BR 4000/16                      | 16         | 4000                      | 13%                                      |
| ACT 401-33    | 37   | BR 8000/7                       | 7.5        | 8000                      | 22%                                      |
| ACT 401-35    | 45   | BR 8000/7                       | 7.5        | 8000                      | 18%                                      |
| ACT 401-37    | 55   | BR 8000/7                       | 7.5        | 8000                      | 15%                                      |
| ACT 401-39    | 65   | BR 8000/7                       | 7.5        | 8000                      | 12%                                      |
| ACT 401-43    | 75   | BR8000/7                        | 7.5        | 8000                      | 11%                                      |
| ACT 401-45    | 90   | 2xBR8000/7                      | 3.75       | 16000                     | 18%                                      |
| ACT 401-47    | 110  | 2xBR8000/7                      | 3.75       | 16000                     | 15%                                      |
| ACT 401-49    | 132  | 2xBR8000/7                      | 3.75       | 16000                     | 12%                                      |

For further information refer to the Bonfiglioli braking resistor catalogue.

# Bonfiglioli Worldwide



## Headquarters

**ITALY** • Lippo di Calderara, Bologna



## Branches

**AUSTRALIA** • Sydney  
**AUSTRIA** • Wiener Neustadt  
**BRAZIL** • São Paulo  
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**FRANCE** • Paris  
**GERMANY** • Neuss  
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**INDIA** • Mannur  
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**SINGAPORE** • Singapore  
**SPAIN** • Barcelona  
**SPAIN** • Madrid  
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**UNITED KINGDOM** • Redditch  
**UNITED KINGDOM** • Warrington  
**USA** • Cincinnati  
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## Production facilities

**ITALY** • Calderara di Reno, Bologna  
 Casting and gearcutting plant  
 Assembly HDP, HDO, 300 series  
**ITALY** • Vignola, Modena  
 Gearmotor assembly plant  
 Precision gearbox manufacturing and assembly plant  
**ITALY** • Forlì  
 Planetary gearboxes manufacturing and assembly plant  
**ITALY** • Rovereto, Trento  
 Brushless motor production  
**GERMANY** • Krefeld  
 Inverter plant  
**SLOVAKIA** • Považská Bystrica  
 Large gearboxes manufacturing plant  
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 Planetary gearbox manufacturing and assembly plant  
**INDIA** • Mannur  
 Gearmotors manufacturing and assembly plant  
**INDIA** • Bangalore  
 Photovoltaic Inverter assembly  
**VIETNAM** • Ho Chi Minh  
 Electric motor plant  
**CHINA** • Shanghai  
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**BRAZIL** • São Paulo  
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 Planetary gearboxes manufacturing and assembly plant



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## Bonfiglioli is your partner worldwide for power transmission and motion control.

Customer satisfaction has always been one of Bonfiglioli's key values. It is pursued around the world, and in a wide range of contexts, by a network of subsidiaries located in 17 countries and on 5 continents. Each subsidiary provides rapid and efficient pre-sales and after-sales service, and can guarantee prompt deliveries from local assembly plant and warehouses. In addition to our directly controlled subsidiaries, Bonfiglioli can also rely on an extensive network of authorised dealers, selected for their ability to guarantee excellent pre-sales and after-sales assistance.

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Bonfiglioli has been designing and developing innovative and reliable power transmission and control solutions for industry, mobile machinery and renewable energy applications since 1956.

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