mecc alte

Totally Focused. Totally Independent.

Technical Specification

# ECP28 2 C




**The world's largest independent producer of alternators 1 – 5,000kVA**

Rev. 0

All electrical and mechanical data contained in this document is provided for reference only and represents typical values under optimal operating conditions.
Actual performances may be subjected to cumulative tolerances or variances due to materials, construction or other specific operating and loading conditions, in accordance with IEC 60034.

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## Regulations and Certifications

The alternators are designed, built and tested in accordance with **ISO 9001**, within a certified quality management system. The entire range meets the most common international specifications, including:

**CEI 2-3, IEC 34-1, EN 60034-1, VDE 0530**

**BS 4999-5000, NF 51.111, NEMA MG 1-2011**

**ISO 8528-3**

In addition, they comply with specific regulations for particular markets, such as:

**UL 1446, UL 1004-4, UL 1004-B**

**CAN/CSA-C22.2 No14-95 / No100-95**

The ECP and ECO series comply with EEC directives **2006/42/EC (Machinery Directive), 2014/35/EC (Low Voltage Directive), 2014/30/EC (Electromagnetic Compatibility Directive), 2011/65/EC (RoHS 2) and 2015/863 (RoHS 3).**

## Windings and performance

- All alternators feature **reduced-pitch** (2/3) windings, which:
  - Eliminate triple harmonics in the voltage waveform
  - Reduce neutral currents during parallel operation
- **Parallel operation** Use alternators of the same model and winding configuration. For different models, contact Mecc Alte Application Engineering to verify compatibility.
- **Damping cage** All models except the ECP3 series include an aluminum or copper damping cage for greater stability during load transients.
- **Reconnectable windings**
  - 12 leads: 50 Hz 380–440 V and 220/110–240/120 V (derating may apply); 60 Hz 380–480 V and 220/110–240/120 V (derating may apply)
  - 6 leads: 50 Hz 380–440 V and 220–240 V (derating may apply); 60 Hz 380–480 V and 220–240 V (derating may apply)

| Winding configurations | Standard | | Special (dedicated) | | | |
|---|---|---|---|---|---|---|
| | 12 reconnectable wires | 6 reconnectable wires | 380 V and 600 V 60 Hz | 690V 50/60Hz | 220-240V 1ph 50Hz | 220-240V 1ph 60Hz |
| ECP3 to ECO38 & (NPE) | ● | ○ | ○ | ○ | ○ | ○ |
| ECO40 to ECO46 | ○ | ● | ○ | ○ | ○ * | ○ * |
| ECO47 | ● 4 wires | | ○ | ○ | – | - |
| THD (Total Harmonic Distortion) | <3.5% at full load L-L | <3.0% at full load L-L | <3.5% at full load L-L | <3.5% at full load L-L | <4.5% at full load L-N | <4.5% at full load L-N |
| Interference suppression | VDE 0875 G/N/K, EN61000-6-3, EN61000-6-2, others available on request | | | | | |

* Only up to ECO40 series ● Standard ○ Optional

## Insulating Materials and Electrical Performance

- **Insulation Class:** H on the entire range
- **Efficiency:** High efficiency as standard
- **Motor Start:** Inrush current >300% for 20 seconds
- **THD (Total Harmonic Distortion):**
  - <3.5% L-L typical (three-phase windings)
  - <4.5% L-N typical (single-phase windings)

## Winding protection

Winding protection is crucial to ensure the longevity of the generator based on environmental conditions and electrical stress.

| Protection Level | Standard | Standard+ | Grey | Grey+ | Total+ | V-Type |
|---|---|---|---|---|---|---|
| Treated Components | Active parts | Exciter stator | Main stator + exciter | Stator + Exciter | Stator + Exciter + Rotor | Complete system |
| Type of Treatment | Impregnation resin only | Resin + Grey paint EG43 | Grey paint EG43 | Stator (EG43) + Exciter (Black severe ep.) | Black protection (stators) + EG43 (rotating parts) | Double VPI, Anti-Corona Wire, Double Layer Black |
| Series/Typical Application | ECP3, ECP4 (Standard Use) | ECP28, 30, 32 | Marine Applications / NPE, ECO, HCP | Harsh industrial environments | Extreme/abusive conditions | Harsh Environments (Extended Warranty) |

Detail of specific treatments

- **Grey paint EG43:** Standard protection against moisture and contaminants.
- **Black Protection:** Advanced physical barrier against chemicals and high humidity.
- **V-Type Treatment:** Includes vacuum impregnation (VPI), internal stator insulation, and corona-resistant materials for maximum reliability.

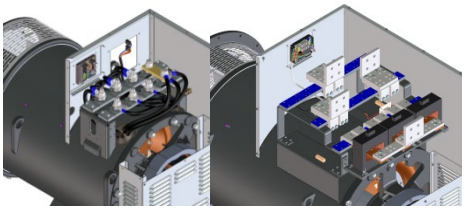
For more information visit: Insulation_System_Guide

## Construction

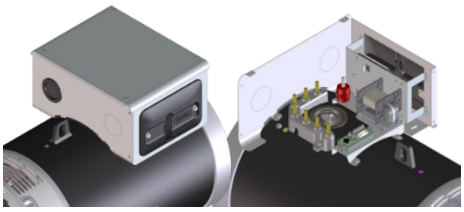
The robust mechanical structure withstands up to 5G in any direction and 9G vertically, and its design allows easy access to connections and components during routine maintenance checks. The mechanical design used the most advanced FEM techniques. The materials used are: DD12 steel for the frame, C45 steel for the shaft and cast iron or die-cast aluminum for the end brackets: the fans are made of die-cast aluminum and nylon reinforced with fiberglass, UL compliant materials. The rotors are dynamically balanced according to ISO 1940-1 grades 6.3 (up to series 32) or 2.5 (series 34 onwards).

## Terminals and terminal blocks

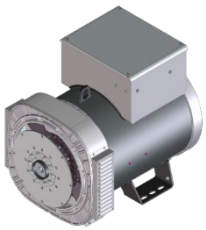
Easy access to the regulators is ensured by a pull-out drawer or drop-down panel to allow for safer adjustment. Large terminal blocks allow easy access of power cables, in the higher power ranges ECO43 and ECO46 terminals allow convenient choice of power cable or busbar connection with input and connection versatility. Current transformers are available as an option on the ECO 40, 43, 46 and 47 series with single or dual output.



A new AVR panel has been installed on the Type-C family. The terminal blocks have been redesigned in a special "L" configuration, specifically to facilitate connections with customers; With this type of terminal block, a second terminal block can be positioned in order to obtain 12 terminals available. Current transformers are available as an option on the ECO38 series with single or dual output.



## Protection for the environment



In addition to the protection on the windings themselves, alternators can have a higher degree of protection. The standard level is IP23 but the following solutions are also available: IP23 DP with ingress filters, IP23 with terminal box only in IP45, IP43 and IP45. Downgrades may apply.
For more information visit: Bulletin_IP

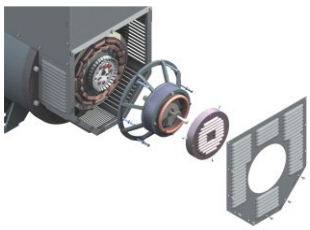
## Optional PMG

The MeccAlte PMG is optionally available factory-fitted on ECP28, ECP30, ECP32, ECP34 and ECO38; Alternatively, only the preparation for future mounting is optional.



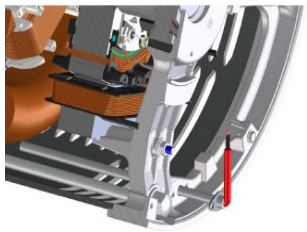
On the ECO 40, 43 and 46 series it is optionally available factory-fitted or retrofitted. On the ECO47 the PMG is standard.

The entire AVR range is fully compatible with MAUX and PMG systems, minimizing spare parts management and inventory flexibility, as one AVR adapts to all applications. The PMG delivers the same amount of kVA as the MAUX.



## Anti-condensation heater

Our entire range can be equipped with anti-condensation heaters of adequate power and sized to the alternator. The voltage for heaters must be specified when ordering. New cylindrical cartridge heaters are available on request and can be retrofitted.



## Accessories

Additional optional can be mounted on our alternator series, such as PTC or PT100 thermistors on both windings and bearings, anti-condensation heaters, high and low profile terminal blocks (on most series), parallel devices, current and voltage transformers, air filters, IP43 and IP45 protections and many more. For more information visit: C-type-accessories

## Excitation and regulation systems

All ECP/ECO series are equipped with MAUX auxiliary winding to power the digital controller.

## DxR

Both the DSR and DER1 are available for PC connection via the DxR2 USB interface and DxR TERMINAL software to query/download alarms and settings for analysis or for cloning other controllers. DER2 has a built-in USB connection and can be connected to your PC without any optional connection card. Through the DxR connection, other settings such as LAMS, synchronous external control based on digital RAM, and soft start can be achieved. Simple analog potentiometers are available for the most common adjustments.

## MxK

The digital controllers of the MxK series (M2K, M2KS, M3K, M3KS, M3KSHD) are configurable via the MeccAlte App for PC or mobile devices, using the USB2MxK (USB) or MxKonnect (Wi-Fi) accessories. The M3KSHD model integrates a USB port for direct connection to the PC, without the need for optional cards. The M2KS, M3KS and M3KSHD models also support CAN Bus communication (SAE J-1939) for integration with MeccAlte GC controllers. Software-accessible features include LAMS, external voltage control (±10V), soft start, and PID autotuning. The controller records up to 64 alarms in E2PROM memory and provides the current status via A ALARMS address. There are analog potentiometers for VOLT, STAB, AMP, and DROOP (the latter on M3K, M3KS, and M3KSHD models only). The M3KSHD includes High Dynamic Response (HDR) for a quick rush of excitement. All MxK regulators are equipped with protections against over/under excitation, overcurrent, V/f, short circuit and power overvoltage.

| Regulator | M2K | M2Ks | M3K | M3Ks | M3KsHD | DSR | DER1 | DER2 |
|---|---|---|---|---|---|---|---|---|
| ECP3 to ECO38 & (NPE) | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| ECO40 to ECO46 | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ |
| ECO47 | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ |
| Parallel operation | - | - | √ | √ | √ | √ | √ | √ |
| Network Parallel | - | - | √ | √ | √ | √ | √ | √ |
| Reference 3 phase (rms) | - | - | √ | √ | √ | - | √ | √ |
| Accuracy | +/-0.5% | +/-0.5% | +/-0.5% | +/-0.5% | +/-0.5% | +/-1% | +/-0.5% | +/-0.5% |
| Remote voltage control | √ | √ | √ | √ | √ | √ | √ | √ |
| Alarm log | √ | √ | √ | √ | √ | √ | √ | √ |
| Analog and digital configurable | √ | √ | √ | √ | √ | √ | √ | √ |
| LAMS (Load Acceptance V/f) | √ | √ | √ | √ | √ | √ | √ | √ |
| APO (Active Protection Output) | - | - | - | - | √ | √ | √ | √ |
| Soft start | √ | √ | √ | √ | √ | √ | √ | √ |
| High Dynamic Response | - | - | - | - | √ | - | - | √ |
| USB connection without external cards | - | - | - | - | √ | - | - | √ |

● Standard ○ Optional √ Available

## Derating coefficients

| | Ambient temperature (Celsius) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Altitude (meters) | 25 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| *≤ 1000* | 1.07 | 1 | 0.96 | 0.93 | 0.91 | 0.89 | 0.85 | 0.82 |
| *> 1000 ≤ 1500* | 1.01 | 0.96 | 0.92 | 0.89 | 0.87 | 0.84 | 0.81 | 0.77 |
| *> 1500 ≤ 2000* | 0.96 | 0.91 | 0.87 | 0.84 | 0.83 | 0.79 | 0.77 | 0.73 |
| *> 2000 ≤ 3000* | 0.90 | 0.85 | 0.81 | 0.78 | 0.76 | 0.73 | 0.71 | 0.68 |
| *> 3000 ≤ 4000* | 0.84 | 0.78 | 0.75 | 0.73 | 0.70 | 0.68 | 0.66 | 0.62 |
| *> 4000 ≤ 5000* | 0.78 | 0.72 | 0.69 | 0.67 | 0.65 | 0.62 | 0.59 | 0.56 |
| *> 5000 ≤ 6000* | 0.70 | 0.65 | 0.63 | 0.61 | 0.58 | 0.55 | 0.53 | 0.50 |

## Notes on short-circuit curves

The coefficients indicated must be used to correct the values of the three-phase short-circuit curves as a function of the nominal voltage.

| *50 Hz* | | *60 Hz* | |
|---|---|---|---|
| *Voltage* | *Factor* | *Voltage* | *Factor* |
| *380* | 0.93x | 415 | 0.85x |
| *400* | 1x | 440 | 0.90x |
| *415* | 1.04x | 460 | 0.95x |
| *440* | 1.10x | 480 | 1x |

The indicated coefficient must be used to correct the values of the three-phase short-circuit curves as a function of the type of short-circuit voltage.

| | *3 Steps* | *2 L-L phases* | *1 L-N phase* |
|---|---|---|---|
| *Instant* | 1x | 0.87x | 1.30x |
| *Minimum* | 1x | 1.80x | 3.20x |
| *Supported* | 1x | 1.50x | 2.50x |
| *Maximum duration* | 20 s | 10 s | 4 s |

All curves are shown for star connection in series or parallel at 400V 50 Hz or 480V 60 Hz. If the unit is reconnected from series to star parallel, the additional coefficient is 2x. From the star series to the delta series, it is 1.72x. From star in series to parallel triangle, it is 3.44x.

A smaller generator can be selected for a given engine starting service, as it has lower subtransient reactance values for nonlinear loads. The entire range from 6.5 to 3400 kVA is capable of delivering a sustained short-circuit current of >300% for up to 20 seconds.

## Selection & Sizing Tools

Online tools available at select.meccalte.com support alternator selection, sizing and configuration:

- **Sizing Tool** – power sizing, motor starting and electrical verification for industrial alternators.
- **Ratings Book** – complete kVA ratings reference, 50/60 Hz, all standard voltages and temperature classes.
- **PMG Configurator** – model selection and output configuration for permanent magnet generators.
- **3D/2D CAD Library** – STEP models and 2D drawings for alternators and AVR regulators.
- **Winding Resistance** – reference resistance data for all alternator families.

For more information visit: select.meccalte.com

## General characteristics

| | | | |
|---|---|---|---|
| Pole number | 2 | Insulation class | H |
| Phase number | 3 | Protection class | IP23 |
| Number of wires | 12 | NDE Bearing type | 6207-2RS |
| Execution | Brushless | DE Bearing type | 6309-2RS |
| Regulator type | M2K | Maximum Overspeed | 4500 |
| Winding pitch | 2/3 | Altitude | 0-1000 |
| Code voltage reference | T0405S3 | Balancing | ISO1940-1 |

## Ratings 50Hz

kVA / kW @ Temp. Rise / Ambient °C - 0.8 PF

| | | STANDBY-163/27 | | | | STANDBY-150/40 | | | | H-125/40 | | | | F-105/40 | | | | B-80/40 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series Star Y | | 380V | 400V | 415V | 440V | 380V | 400V | 415V | 440V | 380V | 400V | 415V | 440V | 380V | 400V | 415V | 440V | 380V | 400V | 415V | 440V |
| Parallel Star YY | | 190V | 200V | 208V | 220V | 190V | 200V | 208V | 220V | 190V | 200V | 208V | 220V | 190V | 200V | 208V | 220V | 190V | 200V | 208V | 220V |
| Series Delta Δ | | 220V | 230V | 240V | 254V | 220V | 230V | 240V | 254V | 220V | 230V | 240V | 254V | 220V | 230V | 240V | 254V | 220V | 230V | 240V | 254V |
| Parallel Delta ΔΔ | | 110V | 115V | 120V | 127V | 110V | 115V | 120V | 127V | 110V | 115V | 120V | 127V | 110V | 115V | 120V | 127V | 110V | 115V | 120V | 127V |
| **ECP28 M2 C** | **kVA** | 24 | **24** | 24 | 20,7 | 23 | **23** | 23 | 20 | 22 | **22** | 22 | 19 | 20 | **20** | 20 | 17,3 | 17,6 | **17,6** | 17,6 | 15,2 |
| | **kW** | 19,2 | **19,2** | 19,2 | 16,6 | 18,4 | **18,4** | 18,4 | 16 | 17,6 | **17,6** | 17,6 | 15,2 | 16 | **16** | 16 | 13,8 | 14 | **14** | 14 | 12,2 |
| **ECP28 1L2 C** | **kVA** | 29 | **29** | 27 | 24,7 | 28 | **28** | 26 | 24 | 27 | **27** | 25 | 23 | 25 | **25** | 23 | 21 | 21,6 | **21,6** | 20 | 18,4 |
| | **kW** | 23,2 | **23,2** | 21,5 | 19,8 | 22,5 | **22,4** | 20,7 | 19 | 21,6 | **21,6** | 20 | 18,4 | 20 | **20** | 18,4 | 16,7 | 17,3 | **17,3** | 16 | 14,7 |
| **ECP28 2L2 C** | **kVA** | 33,5 | **33,5** | 33,5 | 28,7 | 32,4 | **32,4** | 32,4 | 27,8 | 31,5 | **31,5** | 31,5 | 27 | 30 | **30** | 30 | 24,5 | 25,2 | **25,2** | 25,2 | 21,6 |
| | **kW** | 26,8 | **26,8** | 26,8 | 23 | 26 | **26** | 26 | 22,2 | 25,2 | **25,2** | 25,2 | 21,6 | 24 | **24** | 24 | 19,6 | 20,2 | **20,2** | 20,2 | 17,3 |
| **ECP28 VL2 C** | **kVA** | 43 | **43** | 43 | 36,6 | 41,3 | **41,3** | 41,3 | 35 | 40 | **40** | 40 | 34 | 37 | **37** | 37 | 31 | 32 | **32** | 32 | 27,2 |
| | **kW** | 34,4 | **34,4** | 34,4 | 29,2 | 33 | **33** | 33 | 28 | 32 | **32** | 32 | 27,2 | 29,6 | **29,6** | 29,6 | 24,7 | 25,6 | **25,6** | 25,6 | 21,8 |

## Ratings 60Hz

kVA / kW @ Temp. Rise / Ambient °C - 0.8 PF

| | | STANDBY-163/27 | | | | STANDBY-150/40 | | | | H-125/40 | | | | F-105/40 | | | | B-80/40 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series Star Y | | 415V | 440V | 460V | 480V | 415V | 440V | 460V | 480V | 415V | 440V | 460V | 480V | 415V | 440V | 460V | 480V | 415V | 440V | 460V | 480V |
| Parallel Star YY | | 208V | 220V | 230V | 240V | 208V | 220V | 230V | 240V | 208V | 220V | 230V | 240V | 208V | 220V | 230V | 240V | 208V | 220V | 230V | 240V |
| Series Delta Δ | | 240V | 254V | 265V | 277V | 240V | 254V | 265V | 277V | 240V | 254V | 265V | 277V | 240V | 254V | 265V | 277V | 240V | 254V | 265V | 277V |
| Parallel Delta ΔΔ | | 120V | 127V | 133V | 138V | 120V | 127V | 133V | 138V | 120V | 127V | 133V | 138V | 120V | 127V | 133V | 138V | 120V | 127V | 133V | 138V |
| **ECP28 M2 C** | **kVA** | 24,2 | 27,5 | 29 | **29** | 22,8 | 26 | 27,5 | **27,5** | 22 | 25 | 26,5 | **26,5** | 20 | 23 | 24 | **24** | 17,6 | 20 | 21,2 | **21,2** |
| | **kW** | 19,4 | 22 | 23,3 | **23,3** | 18,3 | 20,8 | 22 | **22** | 17,6 | 20 | 21,2 | **21,2** | 16 | 18,4 | 19,2 | **19,2** | 14 | 16 | 17 | **17** |
| **ECP28 1L2 C** | **kVA** | 29 | 33,4 | 35 | **35** | 27,8 | 32 | 33,5 | **33,5** | 27 | 31 | 32,5 | **32,5** | 24,5 | 28,5 | 30 | **30** | 21,6 | 24,8 | 26 | **26** |
| | **kW** | 23,3 | 26,7 | 28 | **28** | 22,3 | 25,6 | 26,8 | **26,8** | 21,6 | 24,8 | 26 | **26** | 19,6 | 22,8 | 24 | **24** | 17,3 | 19,8 | 20,8 | **20,8** |
| **ECP28 2L2 C** | **kVA** | 33,7 | 37,9 | 40 | **40** | 32,8 | 37 | 39 | **39** | 32 | 36 | 38 | **38** | 30 | 34 | 36 | **36** | 25,6 | 28,8 | 30,4 | **30,4** |
| | **kW** | 27 | 30,3 | 32 | **32** | 26,3 | 29,6 | 31,2 | **31,2** | 25,6 | 28,8 | 30,4 | **30,4** | 24 | 27,2 | 28,8 | **28,8** | 20,5 | 23 | 24,3 | **24,3** |
| **ECP28 VL2 C** | **kVA** | 43 | 48,3 | 51,5 | **51,5** | 41,3 | 46,5 | 49,6 | **49,6** | 40 | 45 | 48 | **48** | 37,5 | 41,5 | 44 | **44** | 32 | 36 | 38,4 | **38,4** |
| | **kW** | 34,3 | 38,6 | 41,2 | **41,2** | 33 | 37,2 | 39,7 | **39,7** | 32 | 36 | 38,4 | **38,4** | 30 | 33,2 | 35,2 | **35,2** | 25,6 | 28,8 | 30,7 | **30,7** |

## Reactance & Time constants- Class H / 400V

| Unsaturated (ref. EN60034-4) | | | ECP28 M2 C | ECP28 1L2 C | ECP28 2L2 C | ECP28 VL2 C |
|---|---|---|---|---|---|---|
| **Xd** | Direct-axis synchronous reactance | % | 225,4 | 234,3 | 244,3 | 243,3 |
| **X'd** | Direct-axis transient reactance | % | 8,55 | 7,94 | 7,63 | 7,56 |
| **X"d** | Direct-axis subtransient reactance | % | 5,12 | 4,46 | 3,97 | 3,93 |
| **Xq** | Quadrature-axis synchronous reactance | % | 129,4 | 127,6 | 130,3 | 135,7 |
| **X'q** | Quadrature-axis transient reactance | % | 129,4 | 127,6 | 130,3 | 135,7 |
| **X"q** | Quadrature-axis subtransient reactance | % | 29,6 | 25 | 22 | 21,2 |
| **$X_2$** | Negative-sequence reactance | % | 16,8 | 14,1 | 12,4 | 12 |
| **$X_0$** | Zero sequence reactance | % | 6,65 | 5,42 | 4,47 | 14,7 |
| Saturated | | | | | | |
| **Xd** | Direct-axis synchronous reactance | % | 191,6 | 199,2 | 207,7 | 206,8 |
| **X'd** | Direct-axis transient reactance | % | 7,27 | 6,75 | 6,49 | 6,43 |
| **X"d** | Direct-axis subtransient reactance | % | 4,35 | 3,79 | 3,37 | 3,34 |
| **Xq** | Quadrature-axis synchronous reactance | % | 110 | 108,5 | 110,8 | 115,3 |
| **X'q** | Quadrature-axis transient reactance | % | 110 | 108,5 | 110,8 | 115,3 |
| **X"q** | Quadrature-axis subtransient reactance | % | 25,2 | 21,2 | 18,7 | 18 |
| **$X_2$** | Negative-sequence reactance | % | 14,3 | 12 | 10,5 | 10,2 |
| **$X_0$** | Zero sequence reactance | % | 6,65 | 5,42 | 4,47 | 14,7 |
| | | | | | | |
| **Kcc** | Short circuit ratio | | 0,52 | 0,5 | 0,48 | 0,48 |
| **T'd** | Transient time constant | sec | 0,039 | 0,041 | 0,04 | 0,042 |
| **T"d** | Subtransient time constant | sec | 0,011 | 0,012 | 0,013 | 0,015 |
| **T'do** | Open circuit time constant | sec | 0,68 | 0,71 | 0,75 | 0,74 |
| **Ta** | Armature time constant | sec | 0,027 | 0,038 | 0,057 | 0,049 |

## Additional information - Class H / 400V

| | | | | | | |
|---|---|---|---|---|---|---|
| **Io** | Excitation current at no load | A | 0,9 | 0,88 | 1,1 | 0,7 |
| **Ic** | Excitation current at full load | A | 3,1 | 2,8 | 3,0 | 2,4 |
| Overload | | | | - | | |
| Overload per 20 sec. PRP or 10 sec. COP | | % | | 300 | | |
| Heat dissipation | | W | 2265 | 2945 | 2862 | 3398 |
| Telephone Harmonic Factor - THF | | % | <2 | <2 | <2 | <2 |
| Waveform Distors.(THD) full load LL/LN | | % | 2,9 / 4,5 | 2,3 / 2,1 | 2,7 / 2,9 | 2,8 / 3 |
| Waveform Distors.(THD) no load LL/LN | | % | 2,4 / 3,7 | 2,8 / 2,5 | 2,8 / 3 | 2,9 / 3,1 |

## Reactance & Time constants- Class H / 480V

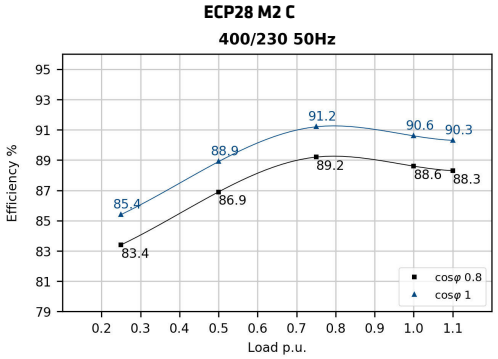
| Unsaturated (ref. EN60034-4) | | | ECP28 M2 C | ECP28 1L2 C | ECP28 2L2 C | ECP28 VL2 C |
|---|---|---|---|---|---|---|
| **Xd** | Direct-axis synchronous reactance | % | 226,3 | 235 | 245,6 | 243,3 |
| **X'd** | Direct-axis transient reactance | % | 8,58 | 7,96 | 7,67 | 7,56 |
| **X"d** | Direct-axis subtransient reactance | % | 5,14 | 4,47 | 3,99 | 3,93 |
| **Xq** | Quadrature-axis synchronous reactance | % | 129,9 | 128 | 131 | 135,7 |
| **X'q** | Quadrature-axis transient reactance | % | 129,9 | 128 | 131 | 135,7 |
| **X"q** | Quadrature-axis subtransient reactance | % | 29,7 | 25,1 | 22,1 | 21,2 |
| **$X_2$** | Negative-sequence reactance | % | 16,9 | 14,1 | 12,5 | 12 |
| **$X_0$** | Zero sequence reactance | % | 6,68 | 5,44 | 4,49 | 14,7 |
| Saturated | | | | | | |
| **Xd** | Direct-axis synchronous reactance | % | 192,4 | 199,8 | 208,8 | 206,8 |
| **X'd** | Direct-axis transient reactance | % | 7,29 | 6,77 | 6,52 | 6,43 |
| **X"d** | Direct-axis subtransient reactance | % | 4,37 | 3,8 | 3,39 | 3,34 |
| **Xq** | Quadrature-axis synchronous reactance | % | 110,4 | 108,8 | 111,4 | 115,3 |
| **X'q** | Quadrature-axis transient reactance | % | 110,4 | 108,8 | 111,4 | 115,3 |
| **X"q** | Quadrature-axis subtransient reactance | % | 25,2 | 21,3 | 18,8 | 18 |
| **$X_2$** | Negative-sequence reactance | % | 14,4 | 12 | 10,6 | 10,2 |
| **$X_0$** | Zero sequence reactance | % | 6,68 | 5,44 | 4,49 | 14,7 |
| | | | | | | |
| **Kcc** | Short circuit ratio | | 0,52 | 0,5 | 0,48 | 0,48 |
| **T'd** | Transient time constant | sec | 0,039 | 0,041 | 0,04 | 0,042 |
| **T"d** | Subtransient time constant | sec | 0,011 | 0,012 | 0,013 | 0,015 |
| **T'do** | Open circuit time constant | sec | 0,68 | 0,71 | 0,75 | 0,74 |
| **Ta** | Armature time constant | sec | 0,027 | 0,038 | 0,057 | 0,049 |

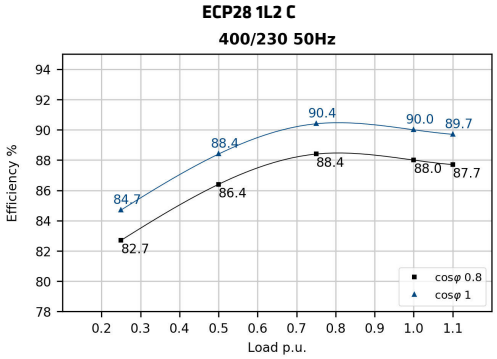
## Additional information - Class H / 480V

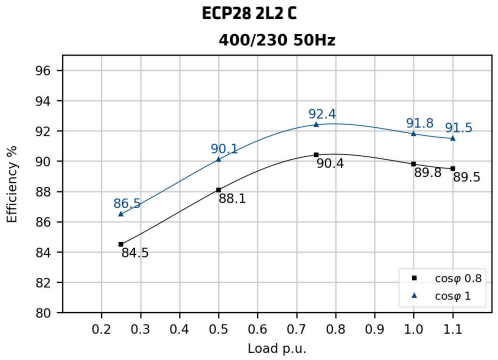
| | | | | | | |
|---|---|---|---|---|---|---|
| **Io** | Excitation current at no load | A | 0,9 | 0,9 | 1,0 | 0,7 |
| **Ic** | Excitation current at full load | A | 3,1 | 2,8 | 3,0 | 2,4 |
| Overload | | | | - | | |
| Overload per 20 sec. PRP or 10 sec. COP | | % | | 300 | | |
| Heat dissipation | | W | 3394 | 2986 | 2679 | 3158 |
| Telephone Interferance Factor - TIF | | | <45 | <45 | <45 | <45 |
| Waveform Distors.(THD) full load LL/LN | | % | 2,9 / 4,5 | 2,3 / 2,1 | 2,7 / 2,9 | 2,8 / 3 |
| Waveform Distors.(THD) no load LL/LN | | % | 2,4 / 3,7 | 2,8 / 2,5 | 2,8 / 3 | 2,9 / 3,1 |

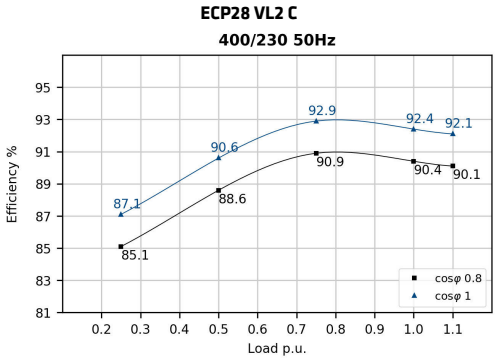
## Efficiencies @ 50Hz

| Models | | 380V 50Hz | | | | | 400V 50Hz | | | | | 415V 50Hz | | | | | 440V 50Hz | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.25 | 0.5 | 0.75 | 1 | 1.1 | 0.25 | 0.5 | 0.75 | 1 | 1.1 | 0.25 | 0.5 | 0.75 | 1 | 1.1 | 0.25 | 0.5 | 0.75 | 1 | 1.1 |
| ECP28 M2 C | % | 83,6 | 86,8 | 88,9 | 88,3 | 88,0 | 83,4 | 86,9 | 89,2 | 88,6 | 88,3 | 83,4 | 86,9 | 89,3 | 89,0 | 88,7 | 80,6 | 83,2 | 85,4 | 85,0 | 84,7 |
| ECP28 1L2 C | % | 82,7 | 86,4 | 88,4 | 88,0 | 87,7 | 82,7 | 86,4 | 88,4 | 88,0 | 87,7 | 82,4 | 86,5 | 88,4 | 87,8 | 87,5 | 82,7 | 86,4 | 88,4 | 88,0 | 87,7 |
| ECP28 2L2 C | % | 84,7 | 88,0 | 90,1 | 89,4 | 89,1 | 84,5 | 88,1 | 90,4 | 89,8 | 89,5 | 84,5 | 88,1 | 90,5 | 90,1 | 89,8 | 82,2 | 84,9 | 87,1 | 86,7 | 86,4 |
| ECP28 VL2 C | % | 85,3 | 88,5 | 90,6 | 90,0 | 89,7 | 85,1 | 88,6 | 90,9 | 90,4 | 90,1 | 85,1 | 88,6 | 91,1 | 90,7 | 90,4 | 82,2 | 84,9 | 87,1 | 86,7 | 86,4 |



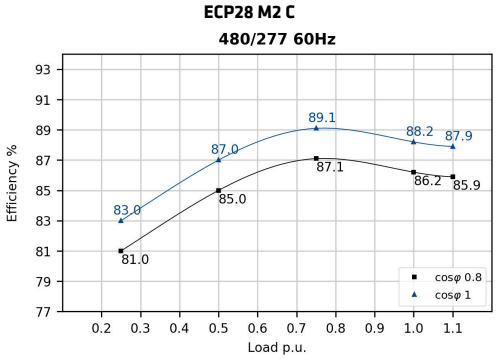



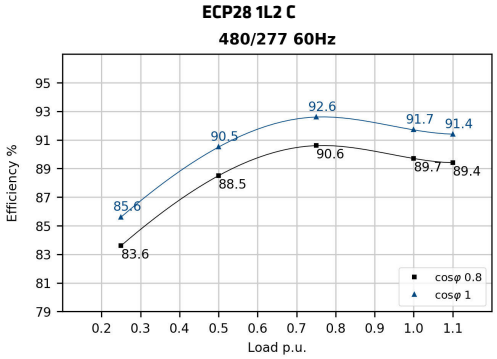



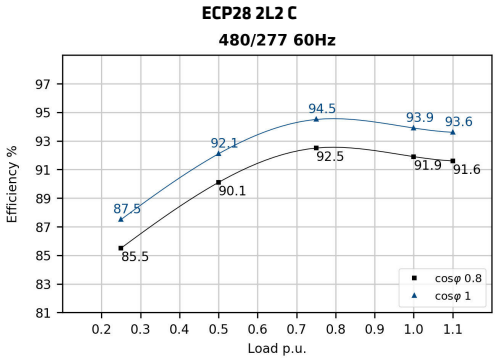



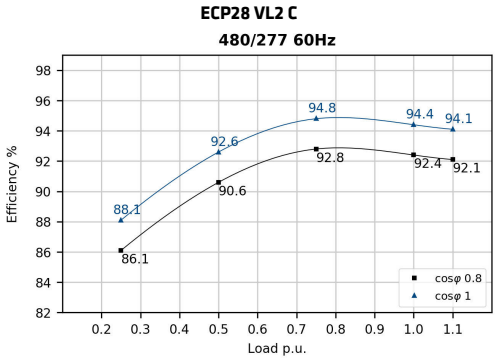
## Efficiencies @ 60Hz

| Models | | 415V 60Hz | | | | | 440V 60Hz | | | | | 460V 60Hz | | | | | 480V 60Hz | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.25 | 0.5 | 0.75 | 1 | 1.1 | 0.25 | 0.5 | 0.75 | 1 | 1.1 | 0.25 | 0.5 | 0.75 | 1 | 1.1 | 0.25 | 0.5 | 0.75 | 1 | 1.1 |
| ECP28 M2 C | % | 81,6 | 85,5 | 87,4 | 86,4 | 86,1 | 81,4 | 85,6 | 86,7 | 86,9 | 86,6 | 80,7 | 84,9 | 86,9 | 86,1 | 85,8 | 81,0 | 85,0 | 87,1 | 86,2 | 85,9 |
| ECP28 1L2 C | % | 83,7 | 88,2 | 90,0 | 88,9 | 88,6 | 83,7 | 88,3 | 90,2 | 89,5 | 89,1 | 83,7 | 88,4 | 90,5 | 89,5 | 89,1 | 83,6 | 88,5 | 90,6 | 89,7 | 89,4 |
| ECP28 2L2 C | % | 83,2 | 87,2 | 89,2 | 88,3 | 87,8 | 83,2 | 87,3 | 89,4 | 88,6 | 88,1 | 85,7 | 90,0 | 92,3 | 91,5 | 91,2 | 85,5 | 90,1 | 92,5 | 91,9 | 91,6 |
| ECP28 VL2 C | % | 86,3 | 90,3 | 92,2 | 91,5 | 91,2 | 86,3 | 90,4 | 92,4 | 91,8 | 91,5 | 86,3 | 90,5 | 92,6 | 92,0 | 91,7 | 86,1 | 90,6 | 92,8 | 92,4 | 92,1 |



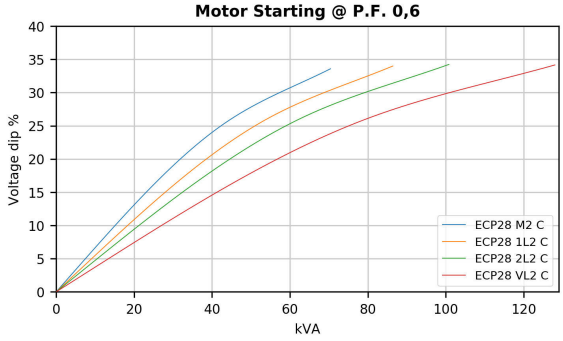



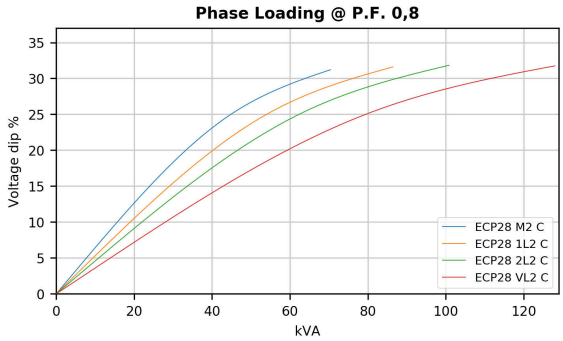



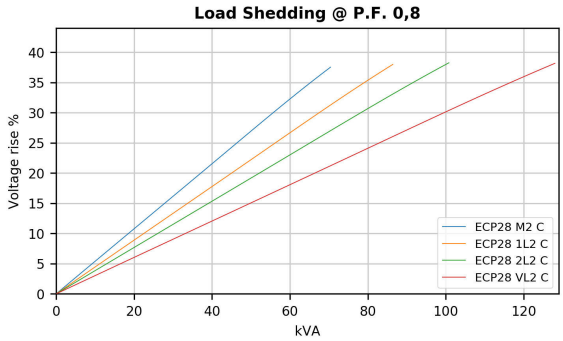



## Transients voltage

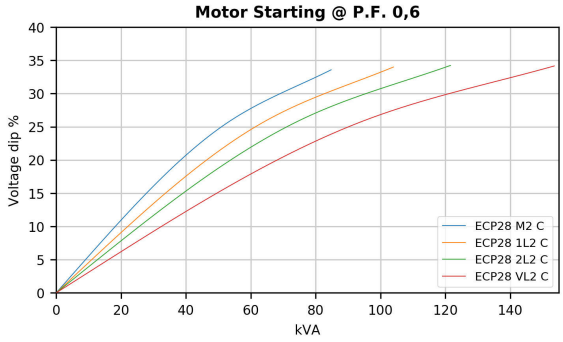
**400V - 50Hz**

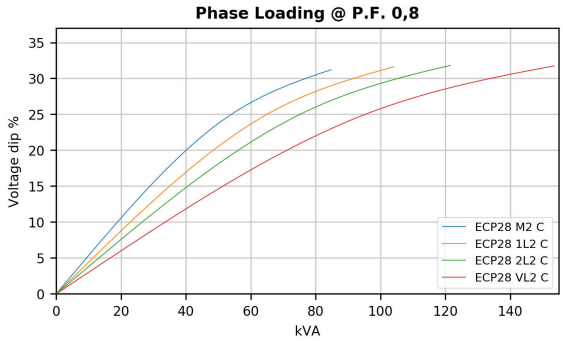


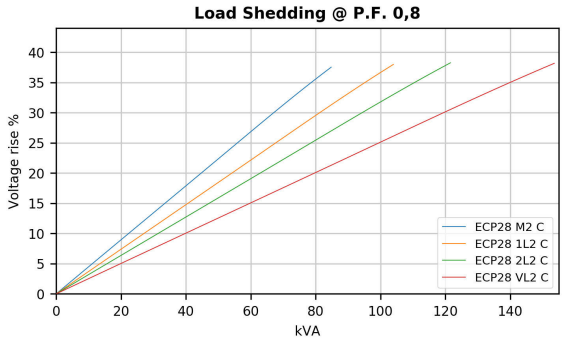




**480V - 60Hz**



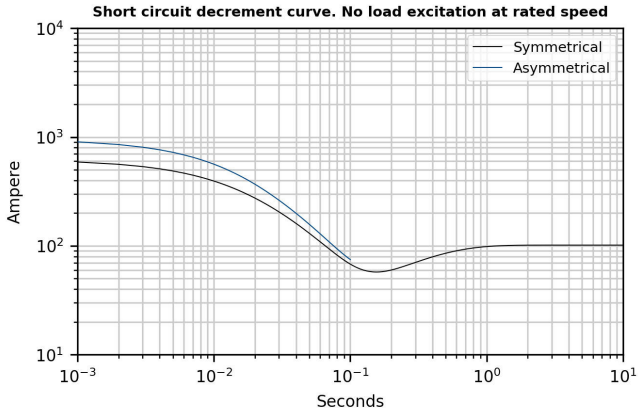

In order to scale transient curves as a function of a power factor or voltage if not indicated, please proceed as follows:

Power Factor coefficient corrector (PFCC), to be used on power factor 0.6 curves:
PFCC=sin(ARCcos (PFnew))/0.8
Example. The PFCC at power factor 0.3 is 1.192 [ PFCC= sin(ARCcos (0.3))/0.8 ]. This means that the voltage fall at a given power at pf 0.3 is equivalent to the one that can be read on the pf 0.6 curve if the load is considered 1.192 times bigger (19% higher value. ).
In this example, a 100 kVA load insertion at pf 0.3 is equivalent in voltage fall to a 119kVA load insertion at pf 0.6.

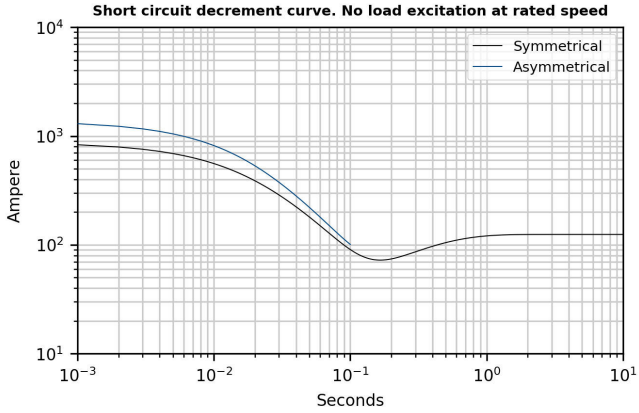
Voltage coefficient corrector (VCC):
VCC=(400/Vnew)2 if 50 Hz; VCC=(480/Vnew)2 if 60 Hz
Example. VCC at 415V 60 Hz is 1.338 [ VCC=(480/415)^2]. This means that the voltage fall at a given power at 415V is equivalent to the one that can be read on the power factor 0.6 curve if the load is considered 1.338 times bigger (33% higher value. ).
In this example, a 100 kVA load insertion at 415V is equivalent in voltage fall to a 133kVA load insertion at 480V.

## 50Hz Short circuit decrement curves - No load excitation at rated speed

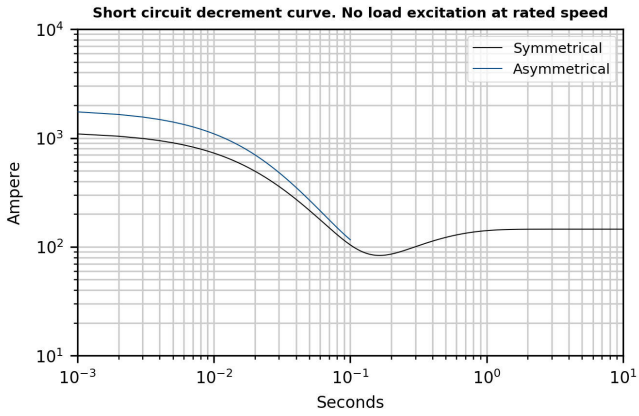
### ECP28 M2 C



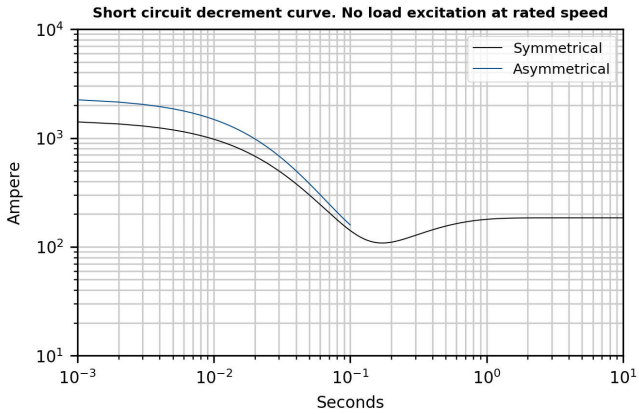

### ECP28 1L2 C




### ECP28 2L2 C



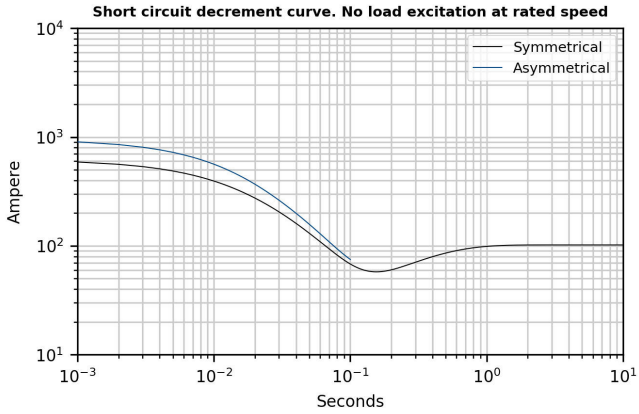

### ECP28 VL2 C



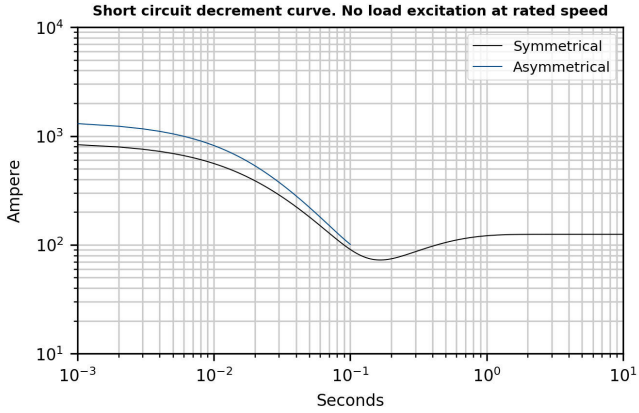

*Please refer to tables at page 6

## 60Hz Short circuit decrement curves - No load excitation at rated speed

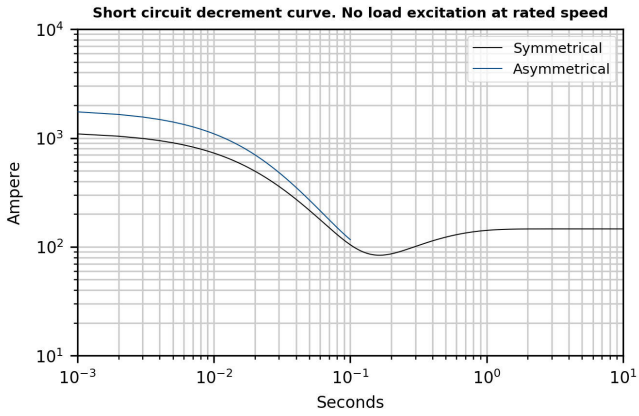
### ECP28 M2 C



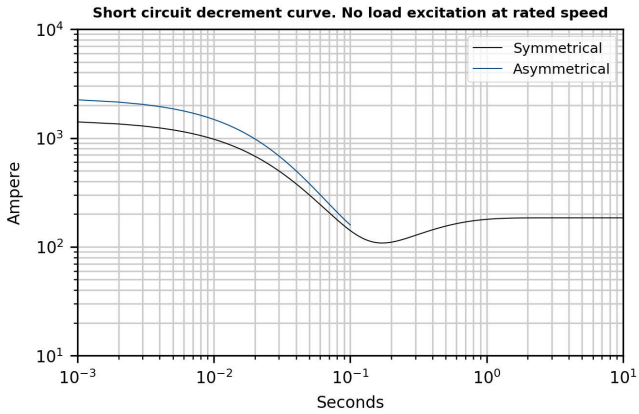

### ECP28 1L2 C




### ECP28 2L2 C




### ECP28 VL2 C

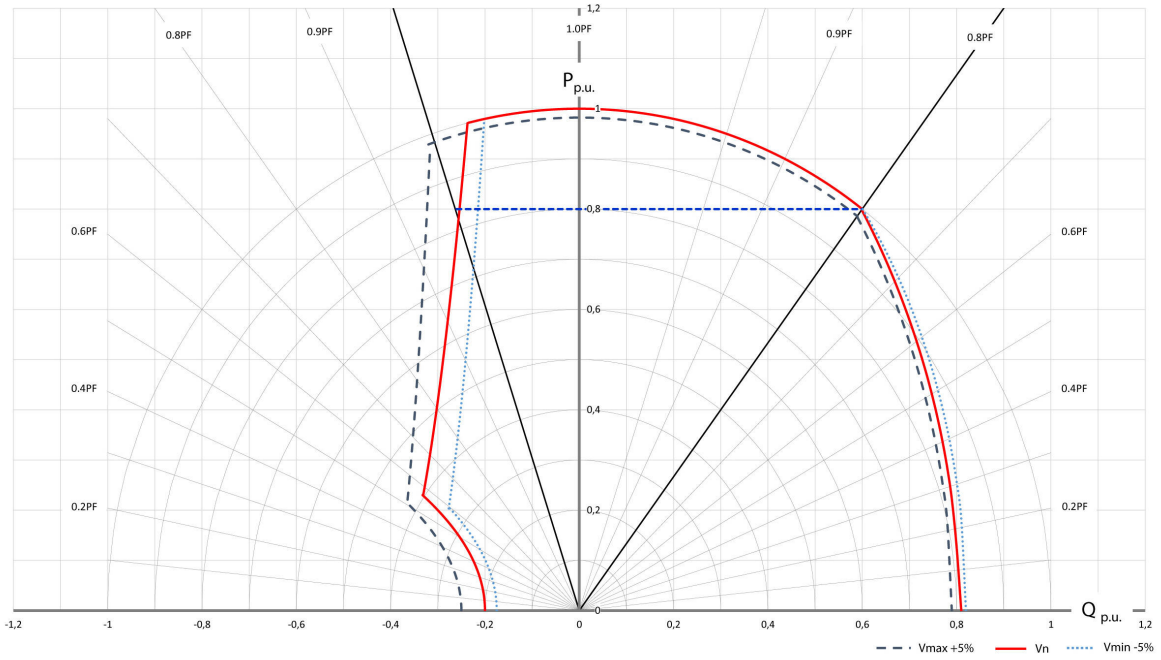



*Please refer to tables at page 6

## Additional Characteristics

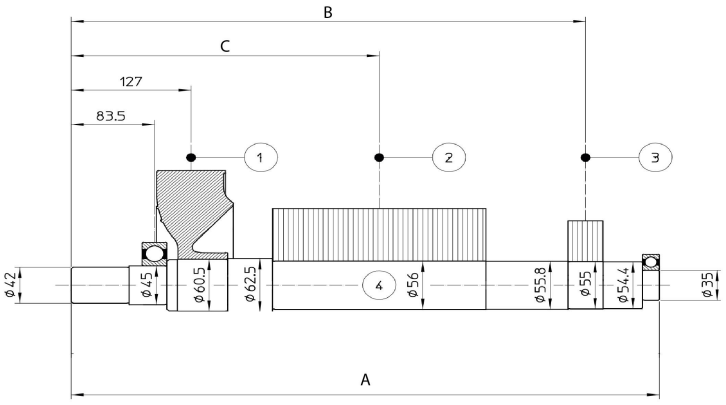
| Data | | ECP28 M2 C | | ECP28 1L2 C | | ECP28 2L2 C | | ECP28 VL2 C | |
|---|---|---|---|---|---|---|---|---|---|
| | | 50Hz | 60Hz | 50Hz | 60Hz | 50Hz | 60Hz | 50Hz | 60Hz |
| Damper cage | | Aluminium | | | | | | | |
| Single stator coil resistance (20°C) | Ω | 0,148 | | 0,124 | | 0,114 | | 0,071 | |
| Rotor Winding Resistance (20°C) | Ω | 4,877 | | 5,494 | | 5,593 | | 6,472 | |
| Stator Exciter Resistance (20°C) | Ω | 9,6 | | 9,6 | | 9,6 | | 9,6 | |
| Rotor Exciter Resistance (20°C) | Ω | 0,384 | | 0,384 | | 0,384 | | 0,384 | |
| Auxiliary Winding Resistance (20°C) | Ω | 0,887 | | 1,031 | | 1,012 | | 0,844 | |
| Weight of complete generator | kg | 126,0 | | 136,0 | | 141,0 | | 156,0 | |
| Unbalanced magnetic pull | kN/mm | 3,2 | | 3,5 | | 3,8 | | 3,6 | |
| Air flow | $m^3$/min | 9,7 | 11,0 | 9,7 | 11,0 | 9,7 | 11,0 | 9,7 | 11,0 |
| Noise level at 1m/7m | dB(A) | 86/74 | 90.5/78 | 86/74 | 90.5/78 | 86/74 | 90.5/78 | 86/74 | 90.5/78 |

## PQ Diagram




The PQ diagram above refers to three-phase application only.

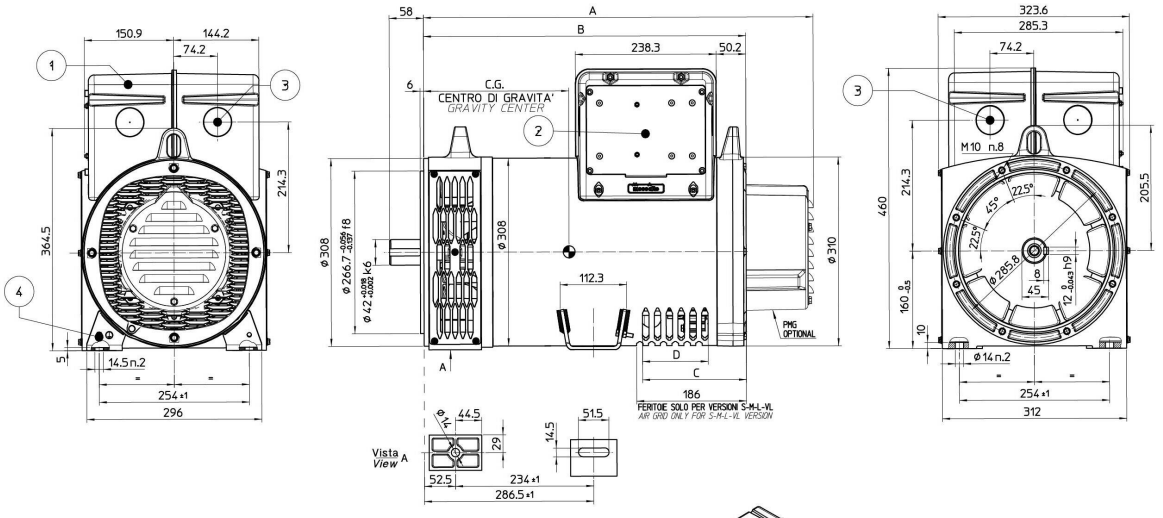
## MOMENTS OF INERTIA - DOUBLE BEARING




| POS. | 1 | | 2 | | 3 | | 4 | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| COMPONENT | FAN | | MAIN ROTOR | | EXCITER ROTOR | | SHAFT* | | | |
| | WEIGHT | J | WEIGHT | J | WEIGHT | J | WEIGHT | J | WEIGHT | J |
| TYPE | [kg] | [kgm²] | [kg] | [kgm²] | [kg] | [kgm²] | [kg] | [kgm²] | [kg] | [kgm²] |
| ECP28 M2 C | 0,7 | 0,0046 | 19,4 | 0,0712 | 4,4 | 0,0138 | 9,1 | 0,0037 | 33,6 | 0,0933 |
| ECP28 1L2 C | | | 23 | 0,0847 | | | 9,7 | 0,0038 | 37,8 | 0,1069 |
| ECP28 2L2 C | | | 24,3 | 0,0894 | | | 9,7 | 0,0038 | 39,1 | 0,1116 |
| ECP28 VL2 C | | | 30 | 0,1104 | | | 10,6 | 0,0042 | 45,7 | 0,133 |
| ECP28 1VS4 C | 0,7 | 0,0046 | 10,1 | 0,0406 | 4,4 | 0,0138 | 7,9 | 0,0031 | 23,1 | 0,0621 |
| ECP28 2VS4 C | | | 12 | 0,0484 | | | 7,9 | 0,0031 | 25 | 0,0699 |
| ECP28 1S4 C | | | 14 | 0,0561 | | | 8,7 | 0,0034 | 27,8 | 0,0779 |
| ECP28 2S4 C | | | 15,2 | 0,0613 | | | 8,7 | 0,0034 | 29 | 0,0831 |
| ECP28 3S4 C | | | 17,2 | 0,069 | | | 8,7 | 0,0034 | 31 | 0,0908 |
| ECP28 M4 C | | | 19,8 | 0,0794 | | | 9,1 | 0,0035 | 34 | 0,1013 |
| ECP28 L4 C | | | 24,5 | 0,0981 | | | 9,7 | 0,0038 | 39,3 | 0,1203 |
| ECP28 VL4 C | | | 30,5 | 0,1214 | | | 10,6 | 0,0042 | 46,2 | 0,144 |

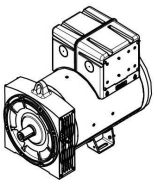
| DIMENSION | A | B | C |
|---|---|---|---|
| TYPE | [mm] | [mm] | [mm] |
| ECP28 M2 C | 510 | 436 | 271,5 |
| ECP28 1L2 C | 545 | 471 | 286,5 |
| ECP28 2L2 C | | | 291,5 |
| ECP28 VL2 C | 590 | 516 | 314 |
| ECP28 1VS4 C | 450 | 376 | 246,5 |
| ECP28 2VS4 C | | | 239 |
| ECP28 1S4 C | 490 | 416 | 271,5 |
| ECP28 2S4 C | | | 266,5 |
| ECP28 3S4 C | | | 259 |
| ECP28 M4 C | 510 | 436 | 269 |
| ECP28 L4 C | 545 | 471 | 286 |
| ECP28 VL4 C | 590 | 516 | 309 |

B0647_01_ECP28C_B3B14




| SERIE SERIES | MODELLO MODEL | A | B | C | D | C.G. |
|---|---|---|---|---|---|---|
| ECP28C/2 B3B14 | M | 579 | 465 | 116 | 51 | 237.3 |
| | 1L | 614 | 500 | 136 | 71 | 252.5 |
| | 2L | 614 | 500 | 136 | 71 | 254.8 |
| | VL | 659 | 545 | 176 | 111 | 276.4 |

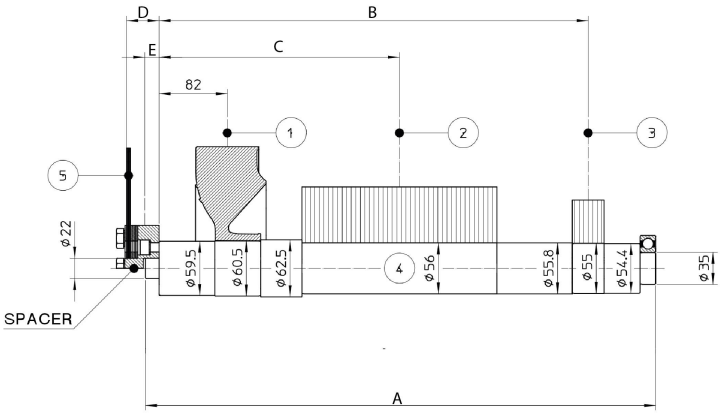
| SERIE SERIES | MODELLO MODEL | A | B | C | D | C.G. |
|---|---|---|---|---|---|---|
| ECP28C/4 B3B14 | 1VS | 519 | 405 | / | / | 216.1 |
| | 2VS | 519 | 405 | / | / | 210.7 |
| | 1S | 559 | 445 | 96 | 31 | 236.8 |
| | 2S | 559 | 445 | 96 | 31 | 233.3 |
| | 3S | 559 | 445 | 96 | 31 | 228.0 |
| | M | 579 | 465 | 116 | 51 | 237.0 |
| | L | 614 | 500 | 136 | 71 | 253.2 |
| | VL | 659 | 545 | 176 | 111 | 274.4 |



1) COPERCHIO REMOVIBILE PER ACCESSO AI TERMINALI PRINCIPALI
*REMOVABLE COVER FOR ACCESS TO MAIN TERMINALS*
2) PANNELLO REMOVIBILE PER ACCESSO AL REGOLATORE
*REMOVABLE PANEL FOR ACCESS TO AVR*
3) PRE-TAGLIO PER INGRESSO CAVI Ø48mm
*PRE-CUT FOR CABLE ENTRY Ø48mm*
4) VITE M6 PER MESSA A TERRA
*SCREW M6 FOR GROUNDING*

B0599_03_ECP28C_B3B14

## MOMENTS OF INERTIA - SINGLE BEARING

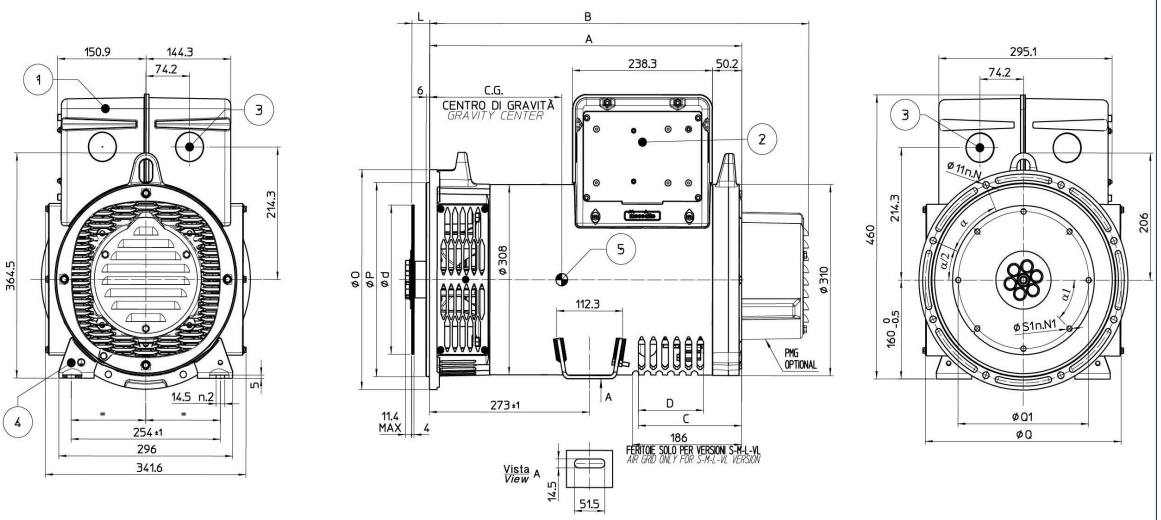



| POS. | 1 | | 2 | | 3 | | 4 | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| COMPONENT | FAN | | MAIN ROTOR | | EXCITER ROTOR | | SHAFT* | | | |
| | WEIGHT | J | WEIGHT | J | WEIGHT | J | WEIGHT | J | WEIGHT | J |
| TYPE | [kg] | [kgm²] | [kg] | [kgm²] | [kg] | [kgm²] | [kg] | [kgm²] | [kg] | [kgm²] |
| ECP28 M2 C | 0,7 | 0,0046 | 19,4 | 0,0712 | 4,4 | 0,0138 | 9,1 | 0,0037 | 33,6 | 0,0933 |
| ECP28 1L2 C | | | 23 | 0,0847 | | | 9,7 | 0,0038 | 37,8 | 0,1069 |
| ECP28 2L2 C | | | 24,3 | 0,0894 | | | 9,7 | 0,0038 | 39,1 | 0,1116 |
| ECP28 VL2 C | | | 30 | 0,1104 | | | 10,6 | 0,0042 | 45,7 | 0,133 |
| ECP28 1VS4 C | 0,7 | 0,0046 | 10,1 | 0,0406 | 4,4 | 0,0138 | 7,9 | 0,0031 | 23,1 | 0,0621 |
| ECP28 2VS4 C | | | 12 | 0,0484 | | | 7,9 | 0,0031 | 25 | 0,0699 |
| ECP28 1S4 C | | | 14 | 0,0561 | | | 8,7 | 0,0034 | 27,8 | 0,0779 |
| ECP28 2S4 C | | | 15,2 | 0,0613 | | | 8,7 | 0,0034 | 29 | 0,0831 |
| ECP28 3S4 C | | | 17,2 | 0,069 | | | 8,7 | 0,0034 | 31 | 0,0908 |
| ECP28 M4 C | | | 19,8 | 0,0794 | | | 9,1 | 0,0035 | 34 | 0,1013 |
| ECP28 L4 C | | | 24,5 | 0,0981 | | | 9,7 | 0,0038 | 39,3 | 0,1203 |
| ECP28 VL4 C | | | 30,5 | 0,1214 | | | 10,6 | 0,0042 | 46,2 | 0,144 |

| DIMENSION | A | B | C |
|---|---|---|---|
| TYPE | [mm] | [mm] | [mm] |
| ECP28 M2 C | 479,5 | 390,5 | 226 |
| ECP28 1L2 C | 514,5 | 425,5 | 241 |
| ECP28 2L2 C | | | 246 |
| ECP28 VL2 C | 559,5 | 470,5 | 268,5 |
| ECP28 1VS4 C | 419,5 | 330,5 | 201 |
| ECP28 2VS4 C | | | 193,5 |
| ECP28 1S4 C | 459,5 | 370,5 | 226 |
| ECP28 2S4 C | | | 221 |
| ECP28 3S4 C | | | 213,5 |
| ECP28 M4 C | 479,5 | 390,5 | 223,5 |
| ECP28 L4 C | 514,5 | 425,5 | 241 |
| ECP28 VL4 C | 559,5 | 470,5 | 263,5 |

| SAE N° | 5 | SHAFTS COUPLING FLEX PLATE | | |
|---|---|---|---|---|
| | D | E | WEIGHT [kg] | J [kgm²] |
| 6 1/2 | 4 | 2 | 1,4 | 0,0068 |
| 7 1/2 | 4 | 2 | 1,7 | 0,0104 |
| 8 | 35,6 | 28,3 | 2,8 | 0,0158 |
| 10 | 27,6 | 22,9 | 3,3 | 0,0303 |
| 11 1/2 | 14 | 11,2 | 3,6 | 0,0471 |

B0615_01_ECP28C_MD35

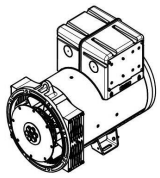



| SERIE SERIES | MODELLO MODEL | A | B | C | D | C.G. |
|---|---|---|---|---|---|---|
| ECP28C/2 MD35 | M | 452 | 566 | 116 | 51 | 218.1 |
| | 1L | 487 | 601 | 136 | 71 | 233.6 |
| | 2L | 487 | 601 | 136 | 71 | 236.1 |
| | VL | 532 | 646 | 176 | 111 | 258.1 |

| SERIE SERIES | MODELLO MODEL | A | B | C | D | C.G. |
|---|---|---|---|---|---|---|
| ECP28C/4 MD35 | 1VS | 392 | 506 | / | / | 194.6 |
| | 2VS | 392 | 506 | / | / | 190.0 |
| | 1S | 432 | 546 | 96 | 31 | 216.0 |
| | 2S | 432 | 546 | 96 | 31 | 213.0 |
| | 3S | 432 | 546 | 96 | 31 | 208.2 |
| | M | 452 | 566 | 116 | 51 | 217.6 |
| | L | 487 | 601 | 136 | 71 | 234.3 |
| | VL | 532 | 646 | 176 | 111 | 255.9 |

| SAE N. | FLANGIA/FLANGE BRIDE/FLANSCH | | | | |
|---|---|---|---|---|---|
| | O | P | Q | □ | N |
| 5 | 356 | 314.3 | 333.4 | 45° | 8 |
| 4 | 403 | 362.0 | 381.0 | 30° | 12 |
| 3 | 451 | 409.6 | 428.6 | 30° | 12 |
| 2 | 490 | 447.7 | 466.7 | 30° | 12 |

| SAE N. | GIUNTI A DISCHI / DISC COUPLING DISQUE DE MONOPALIER / SCHEIBENKUPPLUNG | | | | | |
|---|---|---|---|---|---|---|
| | d | L | Q1 | S1 | □1 | N1 |
| 6 1/2 | 215.90 | 30.2 | 200.00 | 9 | 60° | 6 |
| 7 1/2 | 241.30 | 30.2 | 222.25 | 9 | 45° | 8 |
| 8 | 263.52 | 62.0 | 244.47 | 11 | 60° | 6 |
| 10 | 314.32 | 53.8 | 295.27 | 11 | 45° | 8 |
| 11 1/2 | 352.42 | 39.6 | 333.37 | 11 | 45° | 8 |



1) COPERCHIO REMOVIBILE PER ACCESSO AI TERMINALI PRINCIPALI
*REMOVABLE COVER FOR ACCESS TO MAIN TERMINALS*
2) PANNELLO REMOVIBILE PER ACCESSO AL REGOLATORE
*REMOVABLE PANEL FOR ACCESS TO AVR*
3) PRE-TAGLIO PER INGRESSO CAVI ø48mm
*PRE-CUT FOR CABLE ENTRY ø48mm*
4) VITE M6 PER MESSA A TERRA
*SCREW M6 FOR GROUNDING*
5) CENTRO DI GRAVITA' IN CONFIGURAZIONE SAE 3 VOLANO 11.5
*GRAVITY CENTER IN CONFIGURATION SAE 3 FLYWHEEL 11.5*

B0578_03_ECP28C_MD35

**Mecc Alte SpA (HQ)**
Via Roma
20 – 36051 Creazzo
Vicenza – ITALY
T: +39 0444 396111
E: info@meccalte.it
aftersales@meccalte.it

**Mecc Alte Portable**
Via Roma
20 – 36051 Creazzo
Vicenza – ITALY
T: +39 0444 396111
E: info@meccalte.it

**Mecc Alte Power Products srl**
Via Melaro
2 – 36075 Montecchio
Maggiore (VI) – ITALY
T: +39 0444 1831295
E: info@meccalte.it

**Zanardi Alternatori srl**
Via Dei Laghi
48/B – 36077 Altavilla
Vicenza – ITALY
T: +39 0444 370799
E: info@zanardialternatori.it

**United Kingdom**
Mecc Alte U.K. LTD
6 Lands' End Way
Oakham
Rutland LE15 6RF
T: +44 (0) 1572 771160
E: info@meccalte.co.uk

**Spain**
Mecc Alte España S.A.
C/ Rio Taibilla, 2
Polig. Ind. Los Valeros
03178 Benijofar (Alicante)
T: +34 (0) 96 6702152
E: info@meccalte.es

**China**
Mecc Alte Alternator Haimen LTD
755 Nanhai East Rd
Jiangsu HEDZ 226100 PRC
T: +86 (0) 513 82325758
E: info@meccalte.cn

**India**
Mecc Alte India PVT LTD
Plot NO: 1, Sanaswadi
Talegaon
Dhamdhere Road Taluka:
Shirur. District:
Pune - 412208
Maharashtra, India
T: +91 2137 619600
E: info@meccalte.in

**U.S.A. and Canada**
Mecc Alte Inc.
1229 Adams Drive
McHenry, IL, 60051
T: +1 815 344 0530
E: info@meccalte.us

**Germany**
Mecc Alte Generatoren GmbH
Bucher Hang 2
D-87448 Waltenhofen
T: +49 (0)831 540755 0
E: info@meccalte.de

**Australia**
Mecc Alte Alternators PTY LTD
10 Duncan Road, PO Box 1046
Dry Creek, 5094, South
Australia
T: +61 (0) 8 8349 8422
E: info@meccalte.com.au

**France**
Mecc Alte International S.A.
Z.E.La Gagnerie
16330 ST.Amant de Boixe
T: +33 (0) 545 397562
E: info@meccalte.fr

**Far East**
Mecc Alte (F.E.) PTE LTD
19 Kian Teck Drive
Singapore 628836
T: +65 62 657122
E: info@meccalte.com.sg

mecc alte

**www.meccalte.com**