

# VMX-synergy™



# MOTORTRONICS

*Solid State AC Motor Control*

## Quick Start Guide

---



The original pioneers of soft start technology, Motortronics have been at the forefront of motor control innovation since the 1970's. Motortronics have manufactured and supplied over 1 million products into the market place and are recognised as the reference point for many control solution providers worldwide.

In 2009, the need for a new technology that bridged the gap between drive technology and soft start was recognised and the development process began for VMX-synergy™, a new form of motor control that met the needs of those requiring the functionality of a drive in a fixed speed application. The key aspects of a drive (energy saving and communications) as well as original features of a soft start including internal bypass and lower cost, meant the base design was enhanced even further.

iERS (Intelligent Energy Recovery System) is Motortronics patented energy saving system with a combined internal bypass to save energy on lightly loaded motors. iERS reduces the voltage and current supplied to lightly loaded motors to only allow the motor to consume the exact amount of energy required to maintain the speed at that load.

When the motor is at full load the internal bypass closes, this reduces the losses produced by the control element. This combined approach enables iERS to save more energy in more applications than any other competing technology.

iERS has been market proven over the past 10 years and has now reached its latest development realising even greater savings. Applications such as compressors, refrigerators, pump jacks, moulding machines and chillers can typically see savings of around 8-40% of total energy consumption when lightly loaded.

With size and cabinet capacity an ever increasing focus, Motortronics developed the world's smallest power to size ratio motor controller. VMX-synergy™ utilised Motortronics's globally renowned Automatic Setup feature to programme the unit to each individual application using only a 8 button process. Since then it has removed buttons and uses touch screen technology bringing the user interface to even greater management levels.

With full motor overload protection as well as full data logging, upgradeable software in the field and extensive input/output programmability, VMX-synergy™ meets all of the key design criteria.

## Important information

Installers should read and understand the instructions in this guide prior to installing, operating and maintaining the soft start. The following symbols may appear in this guide or on the soft start to warn of potential hazards or to draw attention to certain information.



### Dangerous Voltage

Indicates the presence of a hazardous voltage which could result in personal injury or death.

Tension dangereuse

Indique la présence d'une tension dangereuse qui peut entraîner des blessures ou la mort.



### Warning/Caution

Indicates a potential hazard. Any instructions that follow this symbol should be obeyed to avoid possible damage to the equipment, and personal injury or death.

Avertissement/Mise en garde

Indique un danger potentiel. Toutes les instructions suivant ce symbole doivent être observées, afin d'éviter les dommages de l'équipement et les blessures ou la mort.



### Protective Earth (Ground)

Indicates a terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault.

Mise à la terre (Masse)

Indique une borne dont l'usage prévu est d'être connecter à conducteur externe pour assurer la protection contre les chocs électriques en cas de défauts.

## Caution Statements

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

Mises en garde

Les exemples et les schémas de ce manuel ne sont donnés qu'à titre illustratif. Les informations présentées dans ce manuel peuvent être modifiées sans avis préalable.

En aucun cas nous n'assumons la responsabilité ou l'obligation pour les dommages directs, indirects ou consécutifs qui résultent de l'utilisation ou application de cet équipement.

## Short Circuit

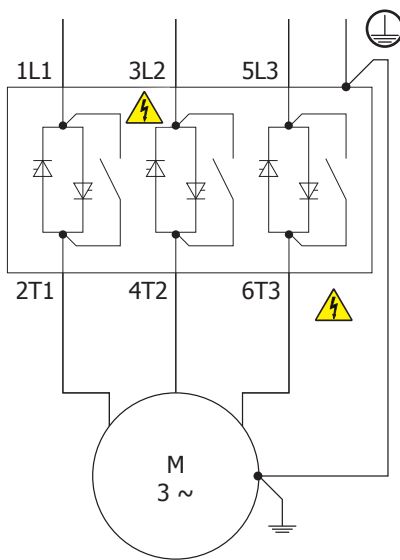
Motortronics soft starts are not short circuit proof. After severe overload or short circuit, the operation of the soft start should be fully tested by an authorised service agent.

Court-circuit

Les démarreurs progressifs Motortronics ne sont pas à l'épreuve des courts-circuits. Après une forte surcharge ou un court-circuit, le fonctionnement du démarreur progressif doit être intégralement vérifié par un agent de maintenance agréé.



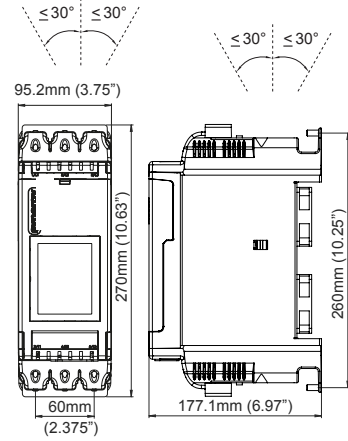
- VMX-Synergy™ soft starts contain dangerous voltages when connected to the mains supply. Only qualified personnel that have been completely trained and authorised, should carry out installation, operation and maintenance of this equipment.
- Les démarreurs progressifs VMX-Synergy™ contiennent des tensions dangereuses, lorsqu'ils sont connectés à la tension secteur. Les activités d'installation, d'utilisation et d'entretien de cet équipement doivent être effectuées par un personnel qualifié, dûment formé et habilité.
- Installation of the soft start must be made in accordance with existing local and national electrical codes and regulations and have a minimum protection rating.
- Le démarreur progressif doit être installé conformément au code local et nationale d'électricité et à la réglementation en vigueur, et il doit avoir un indice de protection minimal.
- It is the responsibility of the installer to provide suitable grounding and branch circuit protection in accordance with local electrical safety codes.
- Il appartient à l'installateur d'assurer la mise à la terre et la protection du circuit de branchement, conformément au code de sécurité électrique local.
- This soft start contains no serviceable or re-usable parts.
- Ce démarreur progressif ne contient pas de pièces réparables ou réutilisables.
- The STOP function of the soft start does not isolate dangerous voltages from the output of the soft start. An approved electrical isolation device must be used to disconnect the soft start from the incoming supply before accessing electrical connections.
- La fonction STOP du démarreur progressif n'isole pas les tensions dangereuses en sortie du démarreur progressif. Avant d'accéder aux raccordements électriques, il faut utiliser un dispositif d'isolation électrique approuvé pour déconnecter le démarreur progressif de la tension d'entrée.



# Environment - installation

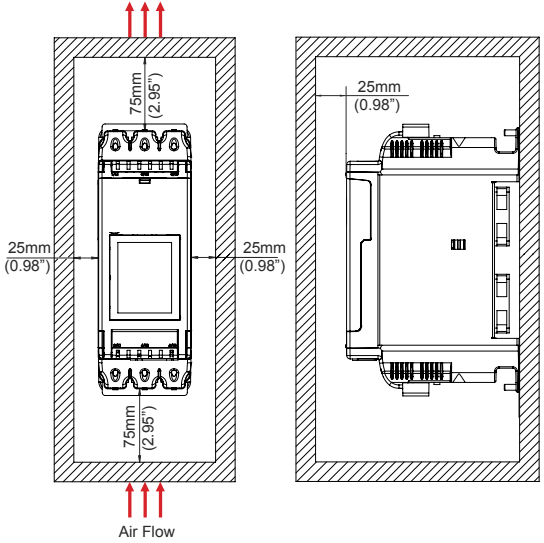
**VMX-synergy**<sup>™</sup> Size 1, VMX-SGY-101 to VMX-SGY-117.

## Dimensions



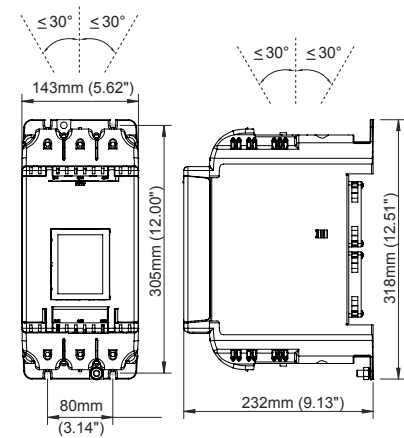
VMX-SGY-101 to VMX-SGY-105 lower fan only  
Weight = 3.50 kg (7.71 lbs)

## Fitting



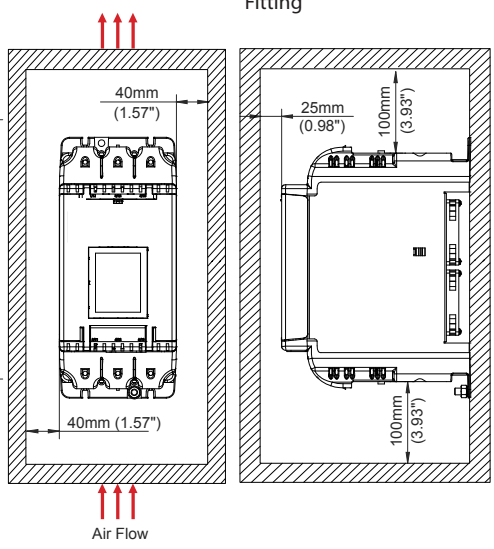
**VMX-synergy**<sup>™</sup> Size 2, VMX-SGY-201 to VMX-SGY-205

## Dimensions

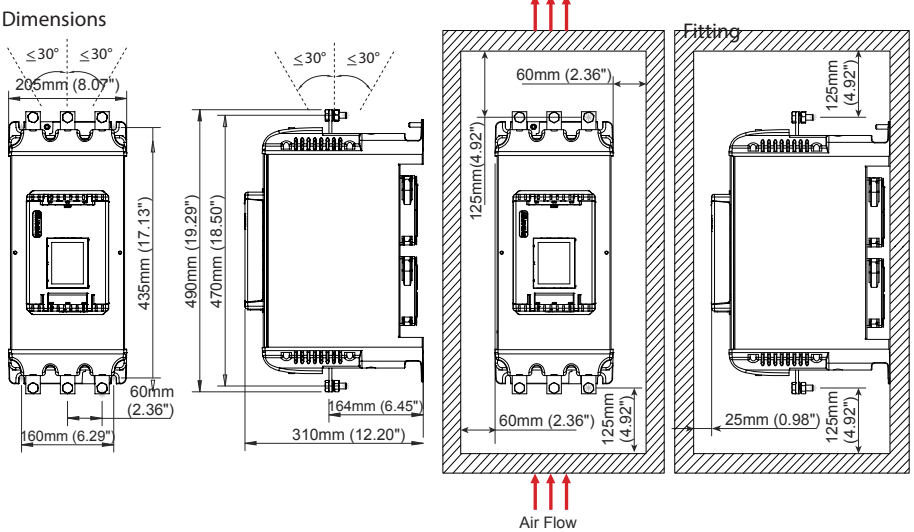


Weight = 6.50 kg (14.33 lbs)

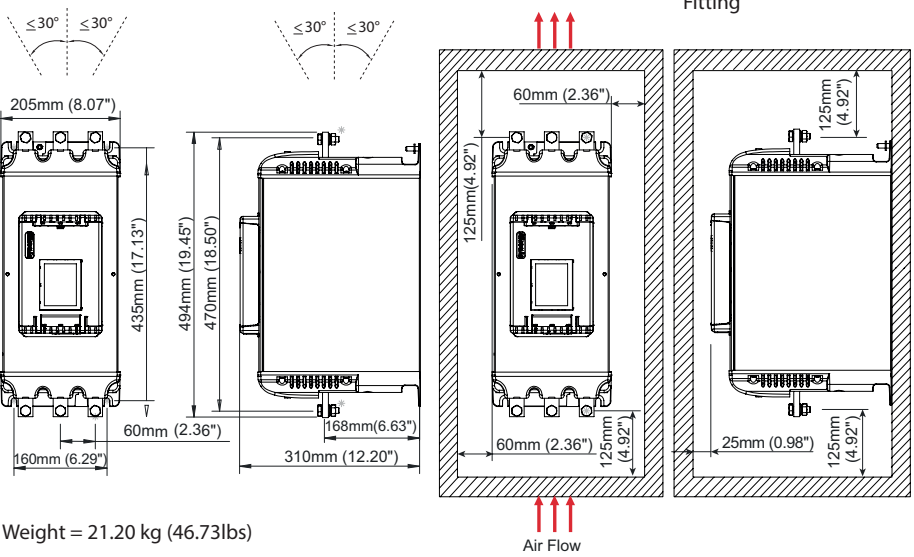
## Fitting



VMX-synergy™ Size 3, VMX-SGY - 301 to VMX-SGY - 305



VMX-synergy™ Size 3, VMX-SGY - 307 & VMX-SGY - 309





## Enclosure Ventilation

When fitting VMX-synergy™ into a cabinet, ventilation must be provided if the heat output of the unit is greater than the cabinet will dissipate. Use the following formula to determine the fan requirement. An allowance has been incorporated into the formula so that the figure for Q is the air delivery in the fan suppliers data.

The maximum power dissipation occurs when energy saving.

Heat dissipated can be approximated with the formula:-

Watts (VMX-synergy™) = 1/2 x VMX-synergy™ current rating x 3

## Ventilation intérieure

Lorsque VMX-synergy™ est installé dans une armoire, il faut assurer sa ventilation, si la chaleur produite de l'unité est plus important que la capacité de dissipation de l'armoire. Utiliser la formule suivante pour déterminer la demande de ventilateur. Une tolérance a été incorporé dans la formule, ainsi la figure donnée dans Q est le débit d'air indiqué dans les données du fournisseur du ventilateur.

La puissance maximale de dissipation est atteint en mode économie d'énergie.

La chaleur dissipée peut être estimée par la formule suivante :

Watts (VMX-synergy™) = 1/2 x courant nominal VMX-synergy™ x 3

$$Q = \frac{4 \times Wt}{(T_{\max} - T_{\text{amb}})}$$

Q = volume of air (cubic metres per hour-m<sup>3</sup>/h)

Wt = Heat produced by the unit and all other heat sources within the enclosure (Watts)

Tmax = Maximum permissible temperature within the enclosure

(50°C for a fully rated VMX-synergy™)

Tamb = Temperature of the air entering the enclosure (°C)

If you prefer to work in CFM, substitute °F for °C. Q is now in CFM

Q = quantité d'air (mètre cube par heure - m<sup>3</sup>/h)

Wt = Chaleur produite par l'unité et toutes autres sources de chaleur dans l'armoire (Watts)

Tmax = Température maximale admissible dans l'armoire (50°C pour VMX-synergy™ en puissance maximale)

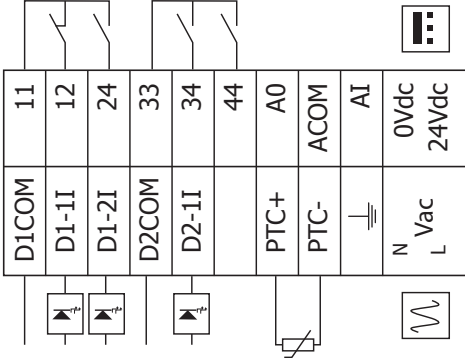
Tamb = Température de l'air entrant dans l'armoire (°C)

Pour calculer en CFM, remplacer °C par °F. Ainsi Q est en CFM.

# Wiring connection

Representative of terminal label. See TABLE 1, U<sub>3</sub> for AC supply rating as marked on actual VMX-synergy model.

|  | Required rating             | Programmable | Default     | Description          |
|-------------------------------------------------------------------------------------|-----------------------------|--------------|-------------|----------------------|
| #1                                                                                  |                             |              |             | Group 1 input common |
| #1                                                                                  | SEE TABLE 1, U <sub>C</sub> | yes          | start/ stop | opto-coupled input   |
| #1                                                                                  | SEE TABLE 1, U <sub>C</sub> | yes          | None        | opto-coupled input   |
|                                                                                     |                             |              |             | group 2 input common |
|                                                                                     | SEE TABLE 1, U <sub>C</sub> | yes          | reset       | opto-coupled input   |
|                                                                                     |                             |              |             | not used             |
| 3 x PTC in series (130°C)                                                           |                             |              | OFF         | thermistor           |
| 3 x PTC in series (130°C)                                                           |                             |              | OFF         | thermistor           |
|                                                                                     |                             |              |             | signal ground        |
| #3                                                                                  | SEE TABLE 1, U <sub>3</sub> |              |             | control supply       |
| #3                                                                                  | SEE TABLE 1, U <sub>3</sub> |              |             | control supply       |



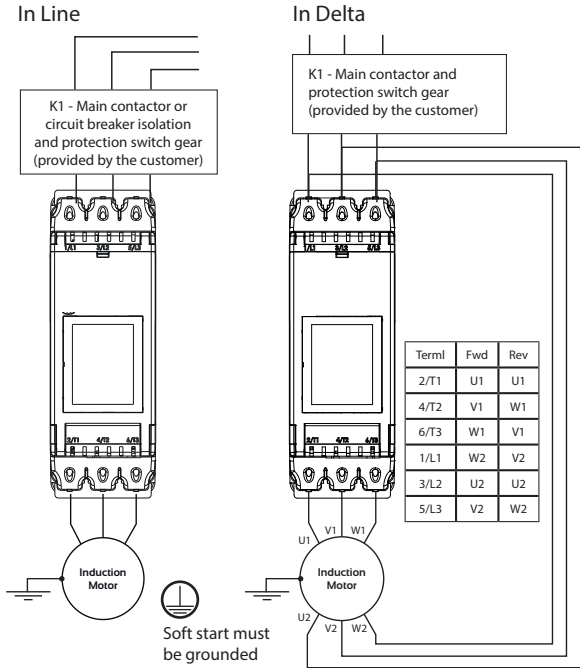
| Description          | Default      | Programmable | Required rating                      |  |
|----------------------|--------------|--------------|--------------------------------------|-----------------------------------------------------------------------------------|
| group 1 relay common |              |              |                                      |                                                                                   |
| relay N/C            | fault        | yes          | 230Vac 1A AC15, 30Vdc 0.5A Resistive |                                                                                   |
| relay N/O            | fault        | yes          | 230Vac 1A AC15, 30Vdc 0.5A Resistive |                                                                                   |
| group 2 relay common |              |              |                                      |                                                                                   |
| relay N/O            | running      | yes          | 230Vac 1A AC15, 30Vdc 0.5A Resistive |                                                                                   |
| relay N/O            | end of start | yes          | 230Vac 1A AC15, 30Vdc 0.5A Resistive |                                                                                   |
| analog output        | 0-10V        | yes          | 0 to 10V 10mA / 4-20mA               |                                                                                   |
| analog 0V            |              |              | 0V                                   |                                                                                   |
| analog input         | 0-10V        | Yes          | 0 to 10V 10mA / 4-20mA               |                                                                                   |
| control supply       |              |              | SEE TABLE 1, U <sub>3</sub>          | #3                                                                                |
| control supply       |              |              | SEE TABLE 1, U <sub>3</sub>          | #3                                                                                |

\*24Vdc Specification  
24Vdc 60W  
Residual ripple 100mV  
Spikes/switching Peaks 240mV  
Turn On/Off response  
No overshoot of V out  
Overvoltage voltage protection output voltage must be clamped to <30Vdc

VMX-SGY-101 to VMX-SGY-305 Control Power Consumption 60W  
VMX-SGY-307 to VMX-SGY-309 Control Power Consumption 120W  
Table 1: Interface Control Voltages, 2 Amp supply (continuous).

| Model No (6):                        | U <sub>C</sub> (+10% -15%) | U <sub>3</sub> (+10% -15%) | Notes                                                                                                                                                                                                                                                                                   |
|--------------------------------------|----------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VMX-SGY-101-4-01 to VMX-SGY-305-4-01 | 110Vac or 230Vac or 24Vdc  | 110 - 230Vac or 24Vdc      |  The system can have either a 110/230Vac mains or 24Vdc input. NOT both. Le système peut avoir soit une alimentation principale de 110/230 Vac ou de 24 Vdc, mais en aucun cas les deux simultanément. |
| VMX-SGY-307-4-02 / VMX-SGY-309-4-02  | 230Vac factory default     | 230Vac                     |                                                                                                                                                                                                                                                                                         |
| VMX-SGY-307-4-03 / VMX-SGY-309-4-03  | 230Vac default d'usine.    | 230Vac                     |                                                                                                                                                                                                                                                                                         |

| Notes |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1    | The programmed digital input setting on D1COM, D1-1I, D1-2I must correspond to the voltage applied to these terminals to avoid risk of damage to the equipment. Afin d'éviter d'endommager l'équipement, le réglage de l'entrée numérique programmée sur D1COM, D1-1I, D1-2I doit correspondre à la tension appliquée à ces bornes.                                                                                                                                                                                                     |
| #2    | The programmed digital input setting on D2COM, D2-1I must correspond to the voltage applied to these terminals to avoid risk of damage to the equipment. Afin d'éviter d'endommager l'équipement, le réglage de l'entrée numérique programmée sur D2COM, D2-1I doit correspondre à la tension appliquée à ces bornes.                                                                                                                                                                                                                   |
| #3    | The control supply can be 110 to 230Vac applied to the N, L terminals or 24Vdc applied to the 0Vdc, 24V input terminals. The correct voltage as specified must only be applied to one of these supply inputs to avoid risk of damage to the equipment. L'alimentation contrôle peut être 110 à 230 Vca appliquée aux bornes N et L, ou 24 Vcc, appliquée aux bornes d'entrée de 0Vcc, 24 V. Afin d'éviter d'endommager l'équipement, la tension appropriée selon les indications ne doit être appliquée qu'à une entrée d'alimentation. |
| #4    | Refer to VMX-Synergy User Manual MAN-SGY-031 for factory default settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



Note: Circuit breaker isolation alone is not allowed for In Delta operation. K1 (Main contactor) controlled by the Running relay MUST be used for isolation.

**!** For suitable short circuit protection devices (SCPD's) see short Circuit Protection in the Technical Information/ standards section of this guide.

Pour un dispositif de protection approprié contre le court-circuit, voir la protection contre le court-circuit dans la section « Informations techniques/normes » du présent guide.

**!** For wire size and torque requirements see Technical Information/ standards section of this guide.

Pour les dimensions de câble et les besoins en couple, voir la section « Informations techniques/normes » du présent guide.

**!** In Delta For this configuration applying the equation.

$$I_{e} = I_{m} / \sqrt{3}$$

Allows lower current rating VMX-synergy™ than the motor.

When In Delta configuration is used a line contactor controlled by VMX-synergy™ MUST be used with the In Delta Firing Mode selected in the advanced menu.

**!** En Delta Pour cette configuration, appliquer l'équation.

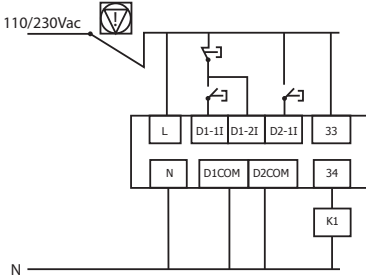
suivante :  $I_{e} = I_{m} / \sqrt{3}$   
le (moteur)/

Cela permet le courant nominal inférieur de VMX-synergy™ par rapport au moteur.

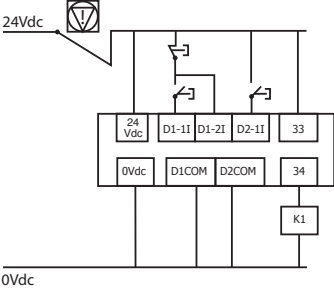
Lorsque En Delta configuration est utilisée, IL FAUT utiliser un sectionneur principal contrôlé par VMX-synergy™, En Delta mode de fonctionnement, sélectionné dans le menu avancé.

# Wiring connection

3 Wire Control Diagram  
110/230Vac control supply ( $U_s$ )  
and digital input ( $U_c$ ) programming.



3 wire Control Diagram 24Vdc control supply ( $U_s$ )  
and digital input ( $U_c$ ) programming (only  
applicable for VMX-SGY-101 to VMX-SGY-305).

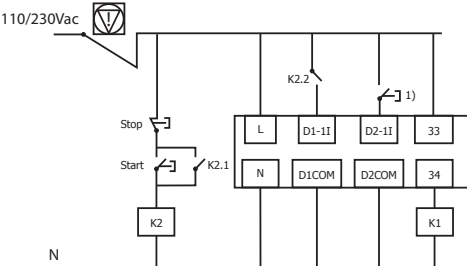


Digital  
input  
programming

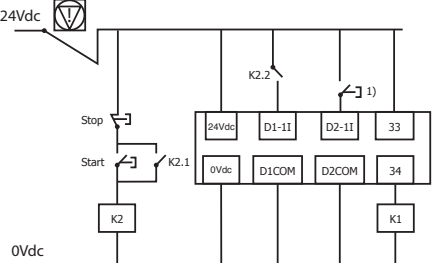
|                 |
|-----------------|
| D1 - 1I = Start |
| D1 - 2I = Stop  |
| D2 - 1I = Reset |

| CAUTION |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1      | <p>REFER to TABLE 1 on page 8 for input control voltages.</p> <p>These recommended wiring diagrams are specifically where the control supply voltage (<math>U_s</math>) is identical to the control circuit voltage (<math>U_c</math>) and not to be supplied separately. Other wiring configurations must also be in accordance with existing local and national codes and regulations.</p> <p>RÉFÉRER au TABLEU 1 à la page 8 pour des tensions de contrôle d'entrée.</p> <p>Ces schémas de câblage sont recommandées spécifiquement lorsque la tension d'alimentation de commande (<math>U_s</math>) est identique à la tension du circuit de commande (<math>U_c</math>). <math>U_s</math> et <math>U_c</math> ne doivent pas être alimentés séparément. Toutes les configurations de câblage doivent également être en conformité avec les codes et les règlements locaux et nationaux en vigueur.</p> |
| #2      | <p>Power factor correction capacitors must NOT be positioned between the soft start and the motor or there is a risk of damaging thyristors due to current peaks.</p> <p>Condensateurs de correction de facteur de puissance NE doivent pas être placés entre le moteur et le démarreur progressif ou il y a un risque d'endommager les thyristors en raison des pics de courants.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

110/230Vac ( $U_s$ ) and ( $U_c$ ) user  
programmable control diagram



24Vdc ( $U_s$ ) and ( $U_c$ ) user programmable control  
diagram (only applicable for VMX-SGY-101 to  
VMX-SGY-305)



User programmable Inputs  
are fully programmable

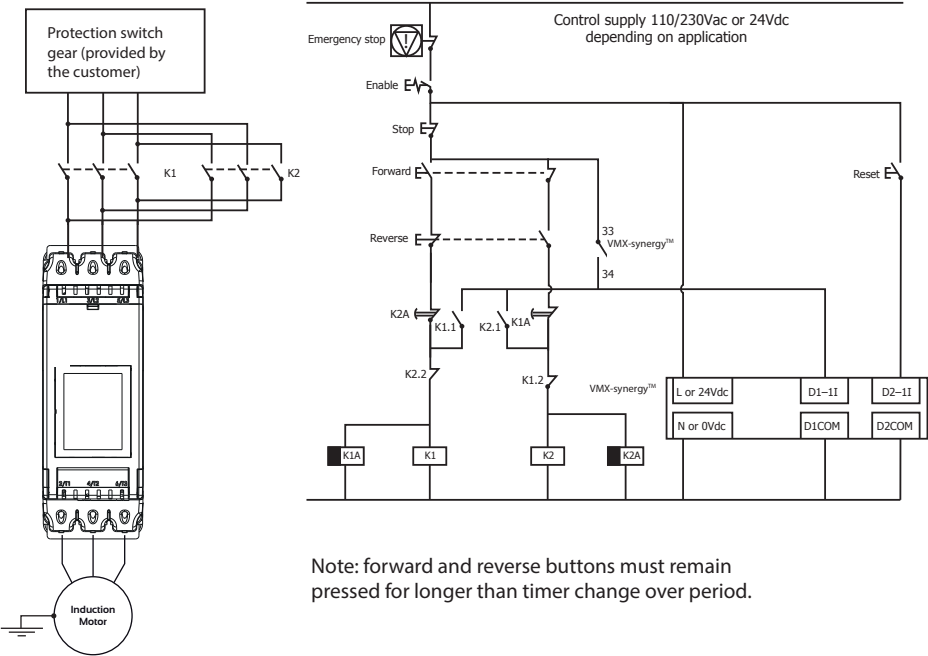
|                                 |
|---------------------------------|
| D1 - 1I = High Start / Low Stop |
| D1 - 2I = None                  |
| D2 - 1I = High Reset            |

1) Optional high reset. If this reset is required ensure "User Programmable" is selected in the control method menu found in the Digital Inputs menu. If you would prefer the reset to work by removing and reapplying the Start Signal on D1 - 1I then select "Two wire control" in the control method menu.

Soft start motor reversing circuit

VMX-synergy™

Below is a soft start reversing circuit without soft stop, it shows the main components required. You must follow your local wiring and electrical regulations when constructing this circuit, set to 'User Programmable' control.



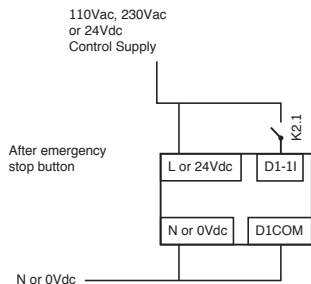
CAUTION

REFER to TABLE 1 on page 8 for input control voltages.  
RÉFÉRER au TABLEU 1 à la page 8 pour des tensions de contrôle d'entrée.

| Item         | Description                          |
|--------------|--------------------------------------|
| K1, K2       | AC3 rated forward/reverse contactors |
| K1A, K2A     | 1 second drop out delay timers       |
| VMX-synergy™ | VMX-synergy™ soft start              |

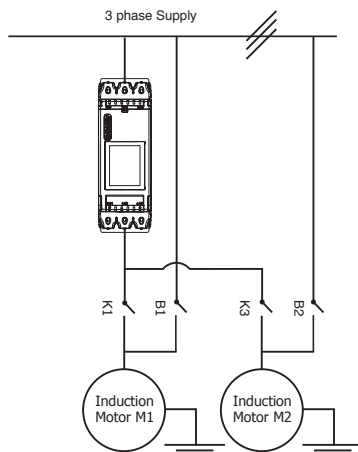
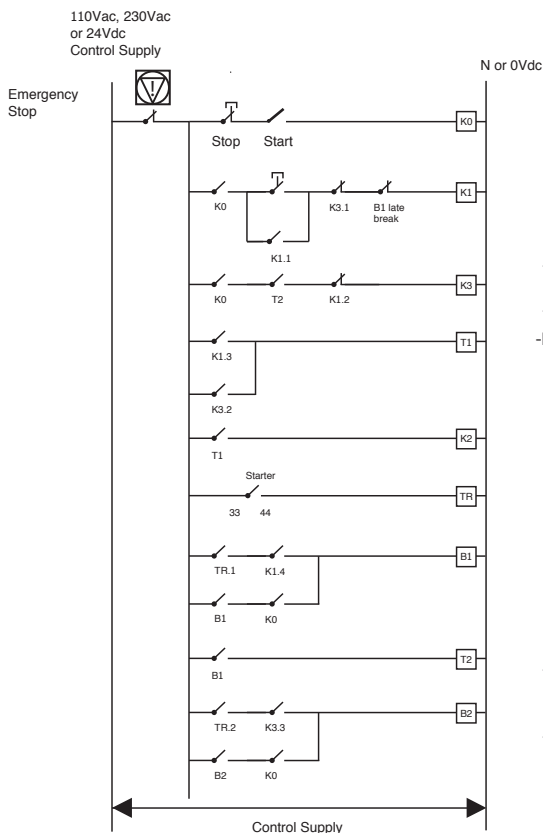
These are the major components of the system. Local wiring regulations should be observed. Note the use of timers to ensure that a reversed voltage is not applied to the starter/motor before the motor field has had some chance to die away.

The thermal capabilities of VMX-synergy™ should be considered.



 **CAUTION**

REFER to TABLE 1 on page 8 for input control voltages.  
RÉFÉRER au TABLEU 1 à la page 8 pour  
des tensions de contrôle d'entrée.



## Notes

Soft Starter must have stop time set to 0  
T1 Time between K1 or K3 closing and the  
starter being energised - 0.5 sec minimum.  
T2 Time between B1 closing and K3 closing  
-Dependant on application - 0.5 sec minimum.

Set to 'Two wire control'

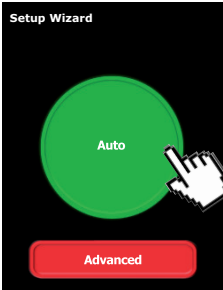
Emergency stop switch cuts off control supply and drops out starter and motors.  
Stop switch drops control supply from contactors and timers stopping both motors.  
Start switch initiates softstart then bypass of motor 1 immediately followed by softstart then bypass of motor 2.

Soft Starter must be rated for combined starting duty.

The control logic can be continued for more motors.

The thermal capabilities of VMX-synergy™ should be considered.

1. Setup Wizard



2. Select Your Application

Default

Heavy

Agitator

Compressor Centrifugal

Compressor Reciprocating

BACK

Up

Dn

NEXT

3. Select Your Application

Warning!

Selected Application Will Enable Trip Class 20

Ok

Centrifugal

Compressor Reciprocating

BACK

NEXT

4. Set Motor Current Rating

100%

+

+

17 A

-

-

BACK

NEXT

5. Select Control Method

Local Touch Screen

User Programmable

Two Wire Control

Three Wire Control

Modbus Network

BACK

NEXT

6. Select Digital Input Voltage

230V

110V

24V

BACK

NEXT

7. Auto Setup Summary

Motor Current: 17A

Application: Compressor

Control Logic: Local Touch Screen

Digital input Voltage: 24Vdc

Trip Class: 20

Save ?

BACK

No

Yes

8. Main Control Screen

Stopped

OL= 0%

I= 0A

P= 0kW

BACK

HOME

START

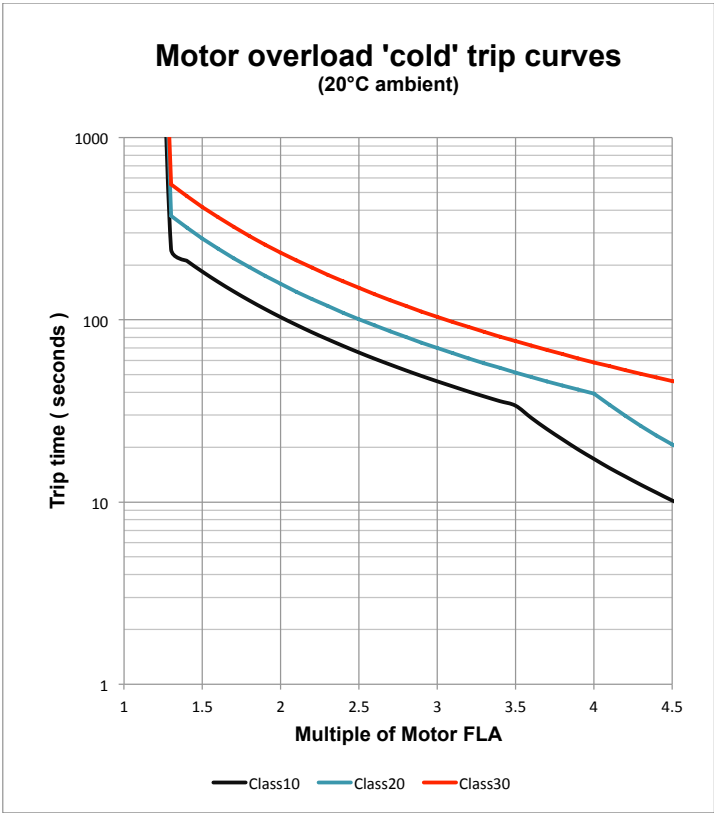
Please note;  
Only appears if  
application with a  
trip class higher  
than 10 is selected

13

# Rating table

| Type             | IEC, I <sub>e</sub><br>A <sup>3)</sup> | kW <sup>1)</sup> |      | UL, FLA<br>A <sup>4)</sup> | HP <sup>2)</sup> |      |              |              | Control<br>supply<br>U <sub>s</sub>   |
|------------------|----------------------------------------|------------------|------|----------------------------|------------------|------|--------------|--------------|---------------------------------------|
|                  |                                        | 230V             | 400V |                            | 200V             | 208V | 220-<br>240V | 440-<br>480V |                                       |
| VMX-SGY-101-4-01 | 17                                     | 4                | 7.5  | 17                         | 3                | 5    | 5            | 10           | 24Vdc<br>or<br>110Vac<br>to<br>230Vac |
| VMX-SGY-103-4-01 | 22                                     | 5.5              | 11   | 21                         | 5                | 5    | 5            | 15           |                                       |
| VMX-SGY-105-4-01 | 29                                     | 7.5              | 15   | 27                         | 7.5              | 7.5  | 7.5          | 20           |                                       |
| VMX-SGY-107-4-01 | 35                                     | 7.5              | 18.5 | 34                         | 10               | 10   | 10           | 25           |                                       |
| VMX-SGY-109-4-01 | 41                                     | 11               | 22   | 40                         | 10               | 10   | 10           | 30           |                                       |
| VMX-SGY-111-4-01 | 55                                     | 15               | 30   | 52                         | 15               | 15   | 15           | 40           |                                       |
| VMX-SGY-113-4-01 | 66                                     | 18.5             | 37   | 65                         | 20               | 20   | 20           | 50           |                                       |
| VMX-SGY-115-4-01 | 80                                     | 22               | 45   | 77                         | 20               | 25   | 25           | 60           |                                       |
| VMX-SGY-117-4-01 | 100                                    | 30               | 55   | 96                         | 30               | 30   | 30           | 75           |                                       |
| VMX-SGY-201-4-01 | 132                                    | 37               | 75   | 124                        | 40               | 40   | 40           | 100          |                                       |
| VMX-SGY-203-4-01 | 160                                    | 45               | 90   | 156                        | 50               | 50   | 60           | 125          |                                       |
| VMX-SGY-205-4-01 | 195                                    | 55               | 110  | 180                        | 60               | 60   | 60           | 150          |                                       |
| VMX-SGY-301-4-01 | 242                                    | 75               | 132  | 242                        | 75               | 75   | 75           | 200          |                                       |
| VMX-SGY-303-4-01 | 302                                    | 90               | 160  | 302                        | 100              | 100  | 100          | 250          |                                       |
| VMX-SGY-305-4-01 | 361                                    | 110              | 200  | 361                        | 125              | 125  | 150          | 300          |                                       |
| VMX-SGY-307-4-02 | 430                                    | 132              | 250  | 414                        | 150              | 150  | 150          | 350          | 110Vac                                |
| VMX-SGY-309-4-02 | 500                                    | 150              | 280  | 477                        | 150              | 150  | 150          | 400          |                                       |
| VMX-SGY-307-4-03 | 430                                    | 132              | 250  | 414                        | 150              | 150  | 150          | 350          | 230Vac                                |
| VMX-SGY-309-4-03 | 500                                    | 150              | 280  | 477                        | 150              | 150  | 150          | 400          |                                       |

- 1) Rated operational powers in kW according to IEC 60072-1 (primary series) corresponding to IEC current rating.
- 2) Rated operational powers in HP according to UL508 corresponding to FLA current rating.
- 3) The IEC, I<sub>e</sub> rating will apply for EN 60947-4-2 max rating index 195A: AC-53a: 3.5-17: 90-5 and 500A: AC-53a: 3.5-17: 90-3.
- 4) The UL, FLA rating applies for a maximum surrounding air temperature of 50°C.



\* Please note: When the overload has tripped there is a forced cooling time to allow the overload to recover before the next start.

# Technical information/Standards **VMX-synergy**<sup>TM</sup>

|                                                                                                                                                                                                                                              |                  |                                                                                                                                                                             |                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Rated operational voltages                                                                                                                                                                                                                   | U <sub>e</sub>   | 200Vac to 480Vac                                                                                                                                                            |                                |
| Rated operational current                                                                                                                                                                                                                    | I <sub>e</sub>   | See Rating table                                                                                                                                                            |                                |
| Rating index                                                                                                                                                                                                                                 |                  | VMX-SGY-101 to VMX-SGY-205                                                                                                                                                  | Ie: AC-53a: 3.5-17: 90-5       |
|                                                                                                                                                                                                                                              |                  | VMX-SGY-301 to VMX-SGY-309                                                                                                                                                  | Ie: AC-53a: 3.5-17: 90-3       |
| Rated frequency                                                                                                                                                                                                                              |                  | 50 to 60Hz                                                                                                                                                                  |                                |
| Rated duty                                                                                                                                                                                                                                   |                  | Uninterrupted                                                                                                                                                               |                                |
| Form designation                                                                                                                                                                                                                             |                  | Form 1 Internally bypassed                                                                                                                                                  |                                |
| Rated insulation voltage                                                                                                                                                                                                                     | U <sub>i</sub>   | 480V                                                                                                                                                                        |                                |
| Rated impulse withstand voltage                                                                                                                                                                                                              | U <sub>imp</sub> | Main circuit                                                                                                                                                                | 4kV                            |
|                                                                                                                                                                                                                                              |                  | Control supply circuit                                                                                                                                                      | 2.5kV                          |
| IP code                                                                                                                                                                                                                                      |                  | Main circuit                                                                                                                                                                | IP00 (IP 20 optional)          |
|                                                                                                                                                                                                                                              |                  | Supply and control circuit                                                                                                                                                  | IP 20                          |
| Pollution degree                                                                                                                                                                                                                             |                  | 2                                                                                                                                                                           |                                |
| Rated conditional short-circuit current and type of co-ordination with associated short circuit protective device (SCPD).                                                                                                                    |                  | Type 1 co-ordination. See short circuit protection table for rated conditional short-circuit current and required current rating and characteristics of the associated SCPD |                                |
| Rated control circuit voltage (programmable)                                                                                                                                                                                                 | U <sub>c</sub>   | 24Vdc, 110Vac or 230Vac                                                                                                                                                     | Protect with 4A UL Listed fuse |
| Rated control supply voltage                                                                                                                                                                                                                 | U <sub>s</sub>   | See Rating table, 2 Amp supply (continuous).                                                                                                                                |                                |
| Relay specification                                                                                                                                                                                                                          |                  | AC-15 230Vac, 1A<br>DC-13 30Vdc, 0.7A                                                                                                                                       |                                |
| EMC Emission levels                                                                                                                                                                                                                          | EN 55011         | Class A <b>1</b>                                                                                                                                                            |                                |
| EMC Immunity levels                                                                                                                                                                                                                          | IEC 61000-4-2    | 8kV/air discharge or 4kV/contact discharge                                                                                                                                  |                                |
|                                                                                                                                                                                                                                              | IEC 61000-4-3    | 10 V/m                                                                                                                                                                      |                                |
|                                                                                                                                                                                                                                              | IEC 61000-4-4    | 2kV/5kHz (main power and ports)<br>1kV/5kHz (signal ports)                                                                                                                  |                                |
|                                                                                                                                                                                                                                              | IEC 61000-4-5    | 2kV line-to-ground<br>1kV line-to-line                                                                                                                                      |                                |
|                                                                                                                                                                                                                                              | IEC 61000-4-6    | 10V                                                                                                                                                                         |                                |
| Humidity                                                                                                                                                                                                                                     |                  | Max. 85% non-condensing, not exceeding 50% at 40°C                                                                                                                          |                                |
| <b>NOTICE:</b> This product has been designed for environment A. Use of this product in environment <b>1</b> B may cause unwanted electromagnetic disturbances, in which case the user may be required to take adequate mitigation measures. |                  |                                                                                                                                                                             |                                |



-20°C (-4°F) to 50°C (122°F). Above 50°C de-rate linearly by 4% of VMX-synergy™ I<sub>e</sub> per °C to a maximum of 60°C (140°F).



Altitude above sea level 1000m (3281ft). Above 1000m de-rate by 1% of VMX-synergy™ I<sub>e</sub> per 100m (328ft) to a maximum altitude of 2000m (6562ft).

Please note for higher temperatures and altitudes contact your supplier.

VMX-synergy™ models bearing the ETL listing mark are ETL UL508 and CSA C22.2 No.14 listed to US and Canadian safety standards respectively.

Short circuit protection

#1 Suitable for use in a circuit delivering not more than \_\_I<sub>q</sub>\_\_ rms Symmetrical Amperes, 480 Volts maximum, when protected by Class J time delay fuses with a maximum rating of \_\_Z<sub>1</sub>\_\_ or by a circuit breaker with a maximum rating of \_\_Z<sub>2</sub>\_\_ as in table below.

#2 Correctly selected semiconductor fuses can provide additional protection against damage to the VMX-synergy™ unit (this is sometimes referred to as type 2 co-ordination). These semiconductor fuses are recommended to provide this increased protection

| Type designation (VMX-SGY-***)                  |                               |                                                                                                    | 101 | 103 | 105 | 107 | 109 | 111 | 113 | 115 | 117 |
|-------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Rated operational                               | I <sub>e</sub>                | A                                                                                                  | 17  | 22  | 29  | 35  | 41  | 55  | 66  | 80  | 100 |
| Rated conditional short circuit current         | I <sub>q</sub>                | kA                                                                                                 | 5   | 5   | 5   | 5   | 5   | 5   | 5   | 10  | 10  |
| Class J time-delay fuse #1                      | Maximum rating Z <sub>1</sub> | A                                                                                                  | 30  | 40  | 50  | 60  | 70  | 100 | 125 | 150 | 175 |
| UL Listed inverse-time delay-circuit breaker #1 | Maximum rating Z <sub>2</sub> | A                                                                                                  | 60  | 60  | 60  | 60  | 60  | 150 | 150 | 250 | 300 |
| Semiconductor fuse (class aR) #2                | Type                          | Mersen 6,9 URD 30__<br>Bussmann 170M30__<br>Bussmann 170M31__<br>Bussmann 170M32__<br>SIBA 20 61__ |     |     |     |     |     |     |     |     |     |
|                                                 | Fuse Rating                   | A                                                                                                  | 100 | 100 | 160 | 160 | 160 | 200 | 200 | 250 | 315 |

## Short Circuit protection (continued).

| Type designation (VMX-SGY-***)                  |                      |    | 201                                                                                                          | 203 | 205 | 301                                                                                                          | 303 | 305  | 307  | 309  |
|-------------------------------------------------|----------------------|----|--------------------------------------------------------------------------------------------------------------|-----|-----|--------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Rated operational currents                      | $I_e$                | A  | 132                                                                                                          | 160 | 195 | 242                                                                                                          | 302 | 361  | 430  | 500  |
| Rated conditional short circuit current         | $I_q$                | kA | 10                                                                                                           | 10  | 10  | 18                                                                                                           | 18  | 18   | 18   | 18   |
| Class J time-delay fuse #1                      | Maximum rating $Z_1$ | A  | 225                                                                                                          | 300 | 350 | 450                                                                                                          | 500 | 500  | 600  | 600  |
| UL Listed inverse-time delay-circuit breaker #1 | Maximum rating $Z_2$ | A  | 350                                                                                                          | 450 | 500 | 700                                                                                                          | 800 | 1000 | 1000 | 1000 |
| Semiconductor fuse (class aR) #2                | Type                 | A  | Mersen 6,9 URD 31____<br>Bussmann 170M40____<br>Bussmann 170M41____<br>Bussmann 170M42____<br>SIBA 20 61____ |     |     | Mersen 6,9 URD 33____<br>Bussmann 170M60____<br>Bussmann 170M61____<br>Bussmann 170M62____<br>SIBA 20 63____ |     |      |      |      |
|                                                 | Fuse rating          | A  | 400                                                                                                          | 550 | 550 | 700                                                                                                          | 800 | 900  | 1000 | 1100 |

## Wire sizes and torques

| Terminal                                                                                                                                             |          | Models                     | Wire Size |            | Torque |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------|-----------|------------|--------|-------|
|                                                                                                                                                      |          |                            | mm²       | AWG        | Nm     | lb-in |
| Main Terminals Cu STR<br>75°C only                                                                                                                   | Terminal | VMX-SGY-101 to VMX-SGY-117 | 2.5 – 70  | 12 – 2/0   | 9      | 80    |
|                                                                                                                                                      |          | VMX-SGY-201 to VMX-SGY-205 | 4 - 185   | 12-350MCM  | 14     | 123   |
|                                                                                                                                                      | M10 bolt | VMX-SGY-301 to VMX-SGY-305 | 2 x 95    | 2 x 2/0    |        |       |
|                                                                                                                                                      |          | VMX-SGY-307 to VMX-SGY-309 | 2 x 150   | 2 x 350MCM |        |       |
| Control terminals                                                                                                                                    |          | All models                 | 0.2-1.5   | 24-16      | 0.5    | 4.5   |
| <br>Protective Earth <sup>1)</sup><br>Cu Only<br>Single conductor | M6 stud  | VMX-SGY-101                | ≥ 4       | ≥ 12       | 8      | 70    |
|                                                                                                                                                      |          | VMX-SGY-103 to VMX-SGY-111 | ≥ 6       | ≥ 10       |        |       |
|                                                                                                                                                      |          | VMX-SGY-113 to VMX-SGY-117 | ≥ 10      | ≥ 8        |        |       |
|                                                                                                                                                      | M8 stud  | VMX-SGY-201 to VMX-SGY-205 | ≥ 16      | ≥ 6        | 12     | 105   |
|                                                                                                                                                      |          | VMX-SGY-301                | ≥ 25      | ≥ 4        |        |       |
|                                                                                                                                                      |          | VMX-SGY-303 to VMX-SGY-305 | ≥ 35      | ≥ 3        |        |       |
|                                                                                                                                                      |          | VMX-SGY-307 to VMX-SGY-309 | ≥ 35      | ≥ 2        |        |       |

1) Protective Earth wire size based on bonding conductor requirements of UL508 and UL508A and CSA C22. No.14

[illegible]

## Quick Start Guide

### **(EN) Electric current! Danger to life!**

Only skilled or instructed persons may carry out the operations.

### **(DE) Lebensgefahr durch Strom!**

Nur Elektrofachkräfte und elektrotechnisch unterwiesene Personen dürfen die im Folgenden beschriebenen Arbeiten ausführen.

### **(FR) Tension électrique dangereuse!**

Seules les personnes qualifiées et averties doivent exécuter les travaux ci-après.

### **(ES) ¡Corriente eléctrica! ¡Peligro de muerte!**

El trabajo a continuación descrito debe ser realizado por personas cualificadas y advertidas.

### **(IT) Tensione elettrica: Pericolo di morte!**

Solo persone abilitate e qualificate possono eseguire le operazioni di seguito riportate.

### **(ZH) 触电危险!**

只允许专业人员和受过专业培训的人员进行下列工作。

### **(RU) Электрический ток! Опасно для жизни!**

Только специалисты или проинструктированные лица могут выполнять следующие операции.

### **(NL) Levensgevaar door elektrische stroom!**

Uitsluitend deskundigen in elektriciteit en elektotechnisch geïnstrueerde personen is het toegestaan, de navolgend beschreven werkzaamheden uit te voeren.

### **(DA) Livsfare på grund af elektrisk strøm!**

Kun uddannede el-installatører og personer der er instruerede i elektrotekniske arbejdsopgaver, må udføre de nedenfor anførte arbejder.

### **(EL) Προσοχή, κίνδυνος ηλεκτροπληξίας!**

Οι εργασίες που αναφέρονται στη συνέχεια θα πρέπει να εκτελούνται μόνο από ηλεκτρολόγους και ηλεκροτεχνίτες.

### **(PT) Perigo de vida devido a corrente elétrica!**

Apenas electricistas e pessoas com formação electrotécnica podem executar os trabalhos que a seguir se descrevem.

### **(SV) Livsfara genom elektrisk ström!**

Endast utbildade elektriker och personer som undervisats i elektroteknik får utföra de arbeten som beskrivs nedan.

### **(FI) Hengenvaarallinen jännitel!**

Vain pätevät sähköasentajat ja opastusta saaneet henkilöt saavat suorittaa seuraavat työt.

### **(CS) Nebezpečí úrazu elektrickým proudem!**

Níže uvedené práce smíjí provádět pouze osoby s elektrotechnickým vzděláním.

### **(ET) Eluhohtlik! Elektrilöögiaoht!**

Järgnevalt kirjeldatud töid tohib teostada ainult elektriala spetsialist või elektrotehnilise instrueerimise läbinud personal.

### **(HU) Életveszély az elektromos áram révén!**

Csak elektromos szakemberek és elektrotechnikában képzett személyek végezhetik el a következőkben leírt munkákat.

### **(LV) Elektriskā strāva apdraud dzīvību!**

Tālāk aprakstītos darbus drīkst veikt tikai elektrospeciālisti un darbam ar elektrotehnikām iekārtām instruētās personas!

### **(LT) Pavojus gyvybei dėl elektros srovės!**

Tik elektrikai ir elektrotechnikos specialistai gali atlikti žemiau aprašytus darbus.

### **(PL) Porażenie prądem elektrycznym stanowi zagrożenie dla życia!**

Opisane poniżej prace mogą przeprowadzać tylko wykwalifikowani elektrycy oraz osoby odpowiednio poinstruowane w zakresie elektrotechniki.

### **(SL) Življenjska nevarnost zaradi električnega toka!**

Spodaj opisana dela smejo izvajati samo elektrostrokovnjaki in elektrotehnično poučene osebe.

### **(SK) Nebezpečenstvo ohrozenia života elektrickým prúdom!**

Práce, ktoré sú nižšie opísané, smú vykonávať iba elektroodborníci a osoby s elektrotechnickým vzdelaním.

### **(BG) Опасност за живота от електрически ток!**

Операциите, описани в следващите раздели, могат да се извършват само от специалисти-електротехници и инструктиран електротехнически персонал.

### **(RO) Atenție! Pericol electric!**

Toate lucrările descrise trebuie efectuate numai de personal de specialitate calificat și de persoane cu cunoștințe profunde în electrotehnică.

California Customers: California Proposition 65 Warning

**WARNING:** this product and associated accessories may contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

For more information visit <https://p65warnings.ca.gov>

