synergy™

Quick Start Guide

FAIRFORD ELECTRONICS

Redefining Motor Control

synergy™

Original pioneers of soft start technology, Fairford Electronics Ltd have been at the forefront of motor control innovation since the 1970's. Fairford 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 synergy™, a new form of motor control that met the needs of those requiring functionality of a drive in a fixed speed application.

The key aspects of a drive-energy saving and communications as well incorporating original features of a soft start internal bypass and cost, this base design was enhanced even further. Size and cabinet capacity an ever increasing focus Fairford developed the world's smallest power to size ratio motor controller. Synergy™ utilises Fairford's globally renowned Automatic setup feature to programme the unit to each individual application using only a 4 button process. It has removed buttons and uses touch screen technology bringing the user interface to even greater management levels.

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

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
Fairford soft starters are not short circuit proof. After severe overload or short circuit, the operation of the soft starter should be fully tested by an authorised service agent.
Court-circuit
Les démarreurs progressifs Fairford 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.

Auto-start
Use the auto-start feature with caution. Read all the notes related to auto-start before operation.
Auto-start
Utiliser la fonction de démarrage automatique avec prudence. Lire toutes les notes relatives au démarrage automatique avant l'utilisation.

Important information
Installers should read and understand the instructions in this guide prior to installing, operating and maintaining the soft starter. The following symbols may appear in this guide or on the soft starter 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 entaîner 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.

 **Refer To Manual**
Refer to the relevant instructions detailed within the referenced document or manual.
Se référer au manuel
Se référer aux instructions appropriées décrites dans le document ou manuel référé.

Safety (continued)

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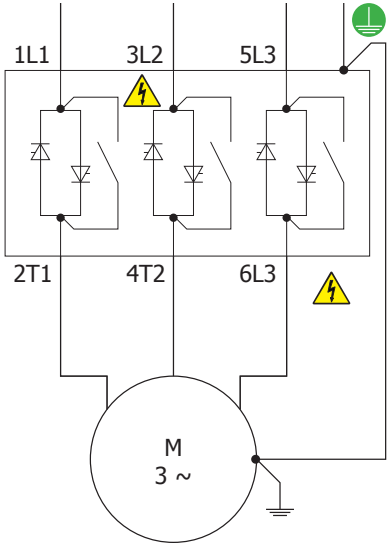
- Synergy soft starters contain dangerous voltages when connected to the mains supply. Only qualified personnel that have been completely trained and authorised, should carry out installation, operation and maintenance of this equipment.
- Les démarreurs progressifs Synergy contiennent des tensions dangereuses, 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 starter must be made in accordance with existing national electrical codes and regulations and have a minimum protection rating.
- Le démarreur progressif doit être installer conformément au code 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'installeur d'assurer la mise à la terre et la protection du circuit de branchement, conformément au code de sécurité électrique local.

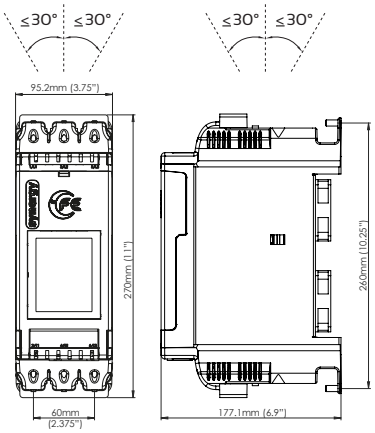
- This soft starter contains no serviceable or re-usable parts.
- Ce démarreur progressif ne contient pas de pièces réparables ou réutilisables.

- The STOP function of the soft starter does not isolate dangerous voltages from the output of the soft starter. An approved electrical isolation device must be used to disconnect the soft starter from the incoming supply before accessing electrical connections.
- La fonction STOP du démarreur progressif n'isole pas les tension dangereuses en sortie du démarreur progressif. Avant d'accéder aux raccordement électriques, il faut utiliser un dispositif d'isolation électrique approuvé pour déconnecter le démarreur progressif de la tension d'entrée.

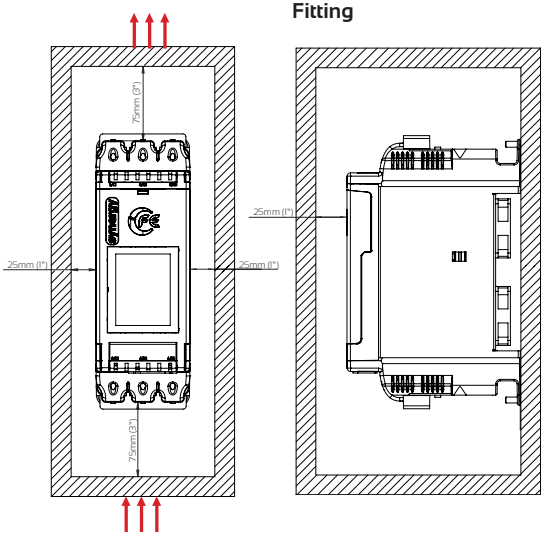


synergy™ Size 1.

Dimensions



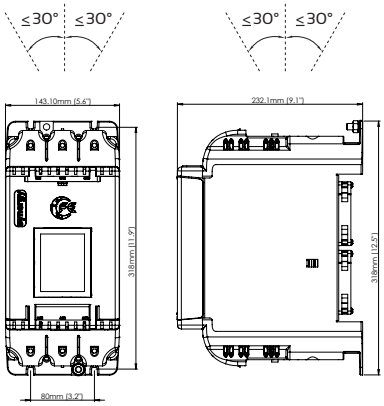
Fitting



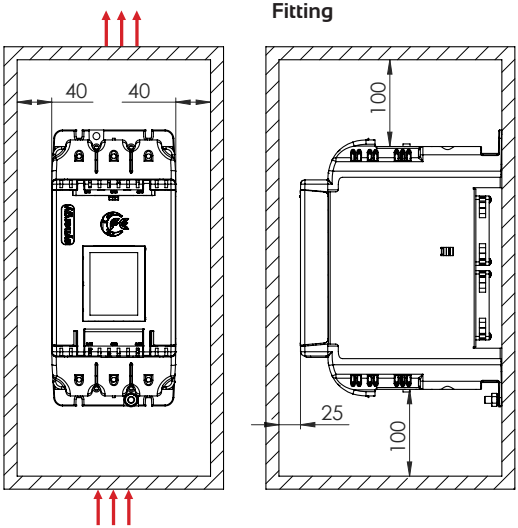
Weight = 3.5kg

synergy™ Size 2.

Dimensions



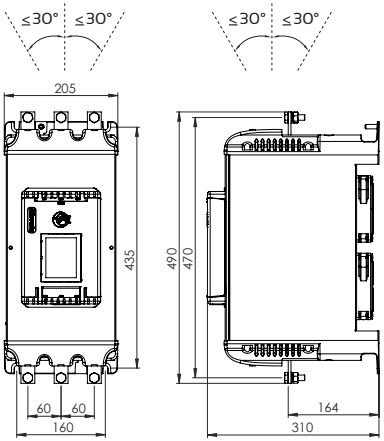
Fitting



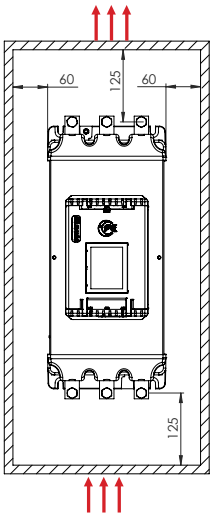
Weight = 6.5kg

synergy™ Size 3.

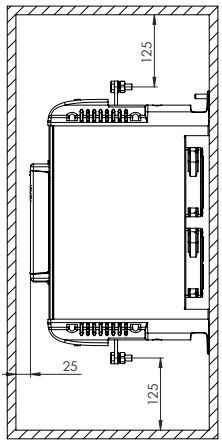
Dimensions



Weight = 18kg



Fitting



Enclosure Ventilation

When fitting 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 (synergy) = ½ x Synergy current rating x 3

Ventilation intérieure

Lorsque 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 tolérence 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.

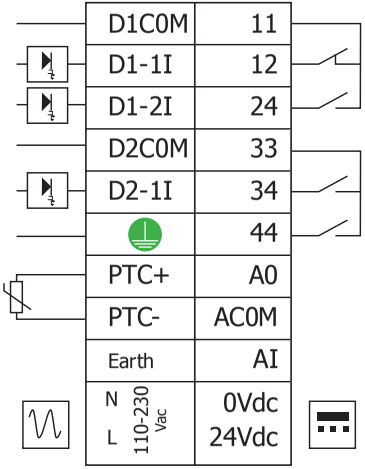
La puissance maximale de dissipation est atteint en mode économie d'énergie.
La chaleur dissipée peut être estimée par la formule suivante :
Watts (synergy) = 1/2 x courant nominal Synergy x 3

$$Q = \frac{4xWt}{(t_{max} - t_{amb})}$$

Q = volume of air (cubic meters per hour-m^3/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 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 - m3/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 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.

⚠	Required rating	Programmable	Default	Description
#1				Group 1 input common
#1	24VDC or 110VA or 230VAC +10% -15%	yes	start/ stop	opto-coupled input
#1	24VDC or 110VA or 230VAC +10% -15%	yes		opto-coupled input
#2				group 2 input common
#2	24VDC or 110VA or 230VAC +10% -15%	yes		opto-coupled input
				N/C
	3 x PTC in series (130°C)		OFF	thermistor
	3 x PTC in series (130°C)		OFF	thermistor
				N/C
#3	110Vac / 230Vac +10% -15%			control supply
#3	110Vac / 230Vac +10% -15%			control supply



Description	Default	Programmable	Required rating	⚠
group 1 relay common				
relay N/C	fault	yes	230Vac 1A ACI5, 30VDC 0.5 Resistive	
relay N/O	fault	yes	230Vac 1A ACI5, 30VDC 0.5 Resistive	
group 2 relay common				
relay N/O	run	yes	230Vac 1A ACI5, 30VDC 0.5 Resistance	
relay N/O	TOR	yes	230Vac 1A ACI5, 30VDC 0.5 Resistance	
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	
0V input			0V	#3
24V input			24Vdc + 10%-15%	#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 V30VDC

⚠	
#1	The programmed digital input setting on D1COM, 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 programmé sur D1COM, 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 programmé sur D2COM, D2-1I doit correspondre à la tension appliquée à ces bornes.
#3	The control supply can be 110 or 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 ou 230 Vca, appliquée aux bornes N et L, ou 24 Vcc, appliquée aux bornes d'entrée de 0 Vcc, 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.

Wiring connection

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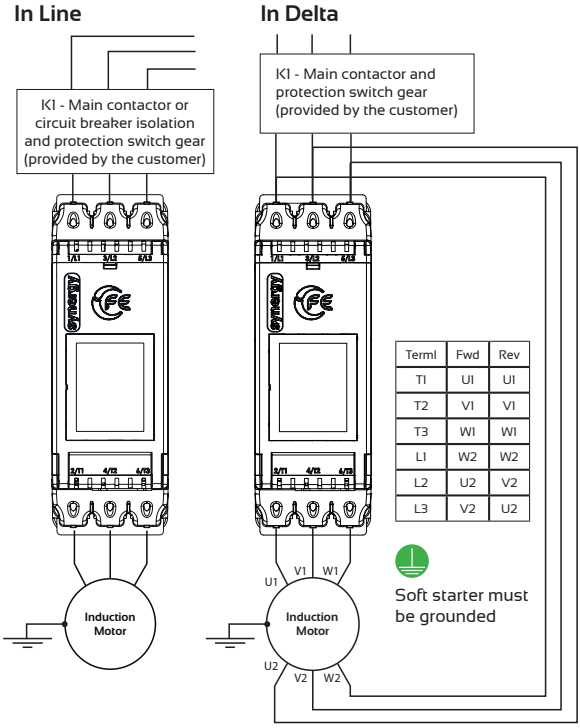

Terml	Fwd	Rev
T1	U1	U1
T2	V1	V1
T3	W1	W1
L1	W2	W2
L2	U2	V2
L3	V2	U2

In Delta
For this configuration applying the equation.

synergy™ ie =

ie (motor)/$\sqrt{3}$

In Delta
Pour cette configuration, appliquer l'équation.

suivante : synergy™ IE =

IE (moteur)/$\sqrt{3}$

Allows lower current rating synergy than the motor.

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

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

Lorsque In Delta configuration est utilisée, **IL FAUT** utiliser un sectionneur principal contrôlé par synergy, en In Delta mode de fonctionnement, sélectionné dans le menu avancé.

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.

Wiring connection

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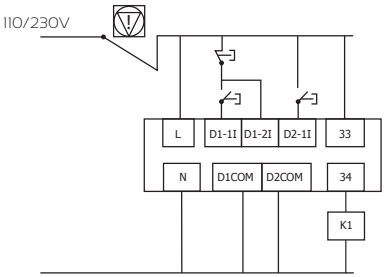
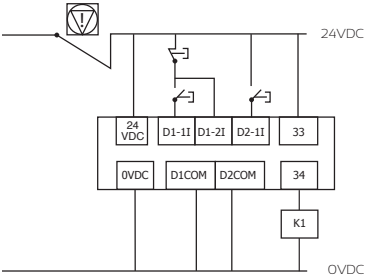
3 Wire Control Diagram
110/230V AC control supply
and digital input programming



24VDC control supply and
digital input programming

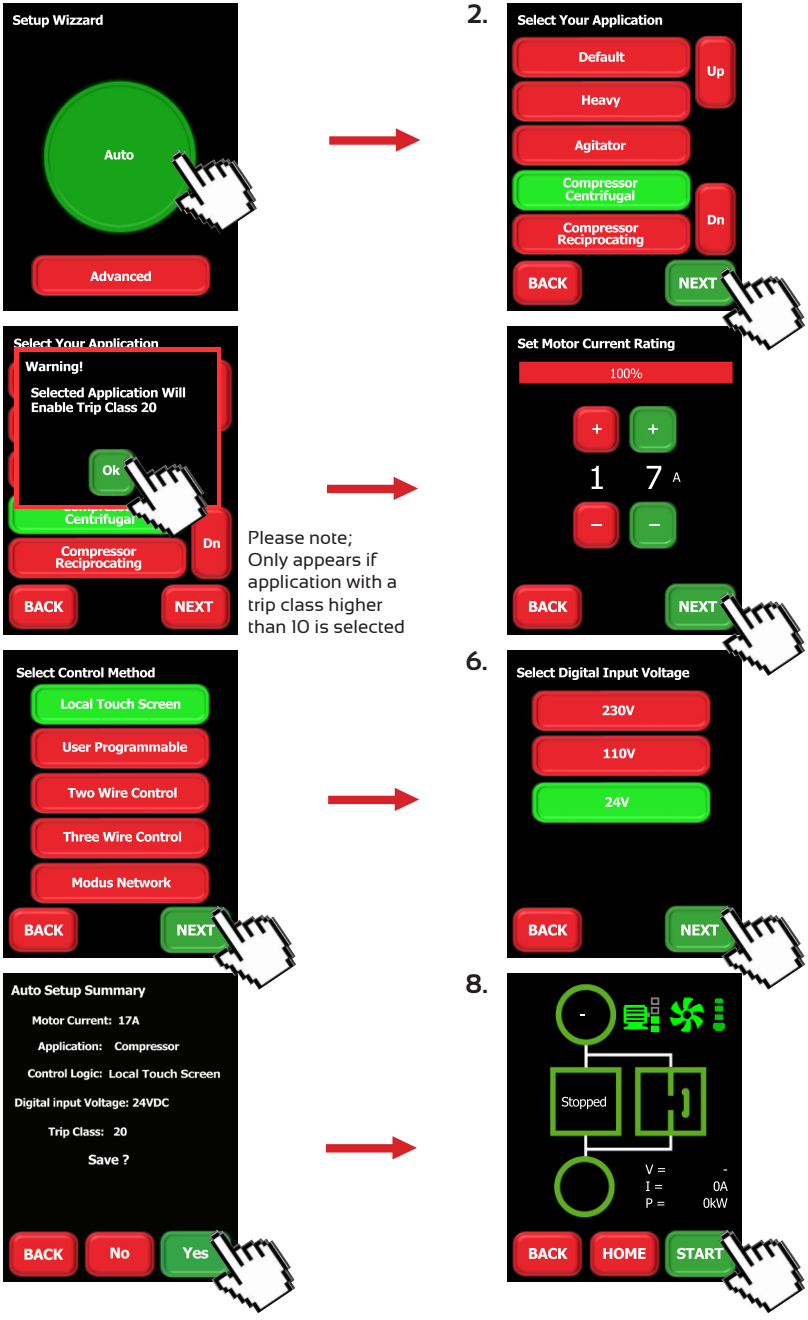


Digital input programming

DI - 1I = Start
DI - 2I = Stop
D2 - 1I = Reset

⚠ Power factor correction capacitors must **not** be positioned between the soft starter and the motor or there is a risk of damaging the thyristors due to current peaks.

Les condensateurs d'amélioration du facteur depuissance **ne** doivent pas être montés entre le démarreur progressif et le moteur, parce que les pointes de courant risquent à endommager les thyristors.


Setup Wizzard
Auto
Advanced
2.
Select Your Application
Default
Heavy
Agitator
Compressor Centrifugal
Compressor Reciprocating
Up
Dn
BACK
NEXT
3.
Select Your Application
Warning!
Selected Application Will Enable Trip Class 20
Ok
Centrifugal
Compressor Reciprocating
Dn
BACK
NEXT
Please note;
Only appears if application with a trip class higher than 10 is selected
Set Motor Current Rating
100%
+
+
1
7
A
–
–
BACK
NEXT
5.
Select Control Method
Local Touch Screen
User Programmable
Two Wire Control
Three Wire Control
Modus 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.
Stopped
V =
I =
P =
0A
0kW
BACK
HOME
START

Rating table

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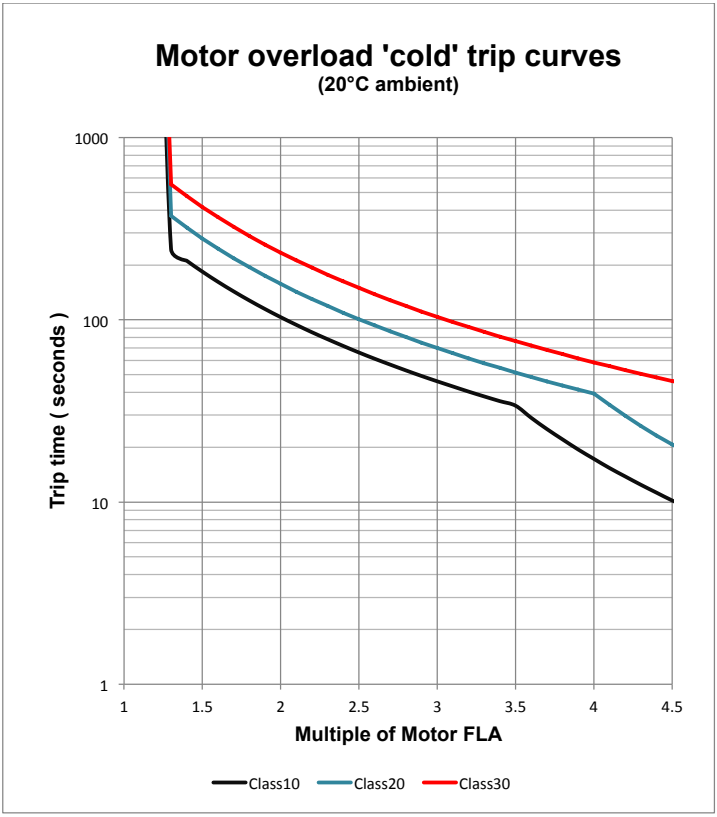
Type	IEC, I_e A [3]	kW [1]		UL, FLA A [4]	Hp [2]			
		230V	400V		200V	208V	220-240V	440-480V
SGY-101-4-01	17	4	7.5	17	3	5	5	10
SGY-103-4-01	22	5.5	11	21	5	5	5	15
SGY-105-4-01	29	7.5	15	27	7.5	7.5	10	20
SGY-107-4-01	35	7.5	18.5	34	10	10	10	25
SGY-109-4-01	41	11	22	40	10	10	10	30
SGY-111-4-01	55	15	30	52	15	15	15	40
SGY-113-4-01	66	18.5	37	65	20	20	20	50
SGY-115-4-01	80	22	45	77	25	25	30	60
SGY-117-4-01	100	30	55	96	30	30	30	75
SGY-201-4-01	132	37	75	124	40	40	50	100
SGY-203-4-01	160	45	90	156	50	50	60	125
SGY-205-4-01	195	55	110	180	60	60	75	150
SGY-301-4-01	242A	75	132	242	75	75	75	200
SGY-303-4-01	302A	90	160	302	100	100	125	250
SGY-305-4-01	361A	110	200	361	125	125	125	300
SGY-307-4-01	430A	132	250	414	150	150	150	350
SGY-309-4-01	500A	150	280	477	150	150	150	400

- Rated operational powers in kW according to IEC 60072-1 (primary series) corresponding to IEC current rating.
- Rated operational powers in hp according to UL508 corresponding to FLA current rating.
- The IEC, Ie rating will apply for EN 60947-4-2 max rating index 195A: AC-53a: 3.5-17: 90-5.
- 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.

Rated operational voltages	U_e	230Vac to 480Vac	
Rated operational current	I_e	See model ratings table below	
Rating index		SGY101 to SGY203	Ie: AC-53a: 3.5-17: 90-5
		SGY301 to SGY309	Ie: AC-53a: 3.5-17: 90-3
Rated frequency/frequencies		50 to 60Hz	
Rated duty		Uninterrupted	
Form designation		Form 1 Internally bypassed	
Rated insulation voltage	U_i	480V	
Rated impulse withstand voltage	U_{imp}	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_c	24Vdc, 110Vac or 230Vac	Protect with 4A UL Listed fuse
Rated control supply voltage	U_s	24Vdc, 110Vac or 230Vac	
Relay specification		AC-15 230Vac, 1A DC-13 30Vdc, 0.7A	
EMC Emission levels	EN 55011	Class A	
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) 1kV/5kHz (signal ports)	
	IEC 61000-4-5	2kV line-to-ground 1kV line-to-line	
	IEC 61000-4-6	10V	
	IEC 61000-4-11	0%Ue for 0.5 cycle 0%Ue for 1 cycle 40%Ue for 10/12 cycles 70%Ue for 25/30 cycles 80%Ue for 250/300 cycles	

Standards

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-20°c (-4°f) to 50°c (122°f) above 50°c de-rate by 2% per degree to a maximum of 60°c (140°f).

Maximum altitude above sea level 1000m (3281ft) above 1000m de rate by 1% per 100m (328ft) to a maximum altitude of 2000m (6562ft).

Please note for higher temperatures and altitudes contact your supplier.

Short circuit protection

*1 Suitable For Use On A Circuit Of Delivering Not More Than __Iq__ rms Symmetrical Amperes, 480 Volts Maximum, When Protected by Class J time delay Fuses with a Maximum Rating of __Z1__ or by a Circuit Breaker Having An Interrupting Rating Not Less Than __Z2__ rms Symmetrical Amperes, 480 Volts Maximum as in table below.

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

Type designation (e.g. SGY-101-4-01)			SGY 101	SGY 103	SGY 105	SGY 107	SGY 109	SGY 111	SGY 113	SGY 115	SGY 117
Rated operational currents	I_e	A	17	22	29	35	41	55	66	80	100
Rated conditional short circuit current	I_q	kA	5	5	5	5	5	5	5	10	10
Class J time-delay fuse #1	Maximum rating Z_1	A	30	40	50	60	70	100	125	150	175
UL Listed inverse-time delay-circuit breaker #1	Maximum rating Z_2	A	60	60	60	60	60	150	150	250	300
Semiconductor fuse (class aR) #2	Type		Mersen 6,9 URD 30_ Bussmann 170M30__ Bussmann 170M31__ Bussmann 170M31__								
	Fuse Rating	A	80A	80A	125A	125A	160A	200A	200A	250A	315A

Short Circuit protection (continued).

Type designation (e.g. SGY-101-4-01)			SGY 201	SGY 203	SGY 205	SGY 301	SGY 303	SGY 305	SGY 307	SGY 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	1200	1200
Semiconductor fuse (class aR) *2	Type	A	Mersen 6,9 URD 31 Bussmann 170M40 Bussmann 170M41 Bussmann 170M42			Mersen 6,9 URD 33 Bussmann 170M60 Bussmann 170M61 Bussmann 170M62				
	Fuse rating	A	400	550	550	700	800	900	1000	1100

Wire sizes and torques

Terminal		Models	Wire Size		Torque	
			mm^2	AWG	Nm	lb-in
Main Terminals Cu STR 75°C only	Terminal	SGY101 to SGY117	2.5 – 70	12 – 2/0	9	80
		SGY201 to SGY205	4 - 185	12-350MCM	14	123
	M10 stud	SGY301 to SGY305	2 x 95	2 x 2/0		
		SGY307 to SGY309	2 x 150	2 x 350MCM		
Control terminals		All models	0.2-1.5	24-16	0.5	4.5
Protective Earth [1] Cu Only	M6 stud	SGY101	≥ 4	≥ 12	8	70
		SGY103 to SGY111	≥ 6	≥ 10		
		SGY113 to SGY117	≥ 10	≥ 8		
	M8 stud	SGY201 to SGY205	≥ 16	≥ 6	12	105
		SGY301	≥ 25	≥ 4		
		SGY303 to SGY305	≥ 35	≥ 3		
		SGY307 to SGY309	≥ 35	≥ 2		
Protective Earth wire size based on bonding conductor requirements of UL508 Table 6.4 and UL508A Table 15.1.						

Notes

Notes

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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训练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!**
Uitsluitelijk deskundigen in elektriciteit en elektrotechnisch geinstrueerde personen is het toegestaan, de navolgend beschrevene werkzaamheden uit te voeren.

(da) **Livsfare på grund af elektrisk strøm!**
Kun uddannede el-installatører og personer der e 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 ηλεκτροτεχνίτες.

(pt) **Perigo de vida devido a corrente eléctrica!**
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 jännite!**
Vain pätevät sähköasentajat ja opastusta saaneet henkilöt saavat suorittaa seuraavat työt.

(cs) **Nebezpečí úrazu elektrickým proudem!**
Níže uvedené práce smějí provádět pouze osoby s elektrotechnickým vzděláním.

(et) **Eluohtlik! Elektrilöögioht!**
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 elektrotehniskām 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) **Atenţie! Pericol electric!**
Toate lucrările descrise trebuie efectuate numai de personal de specialitate calificat şi de persoane cu cunoştiinţe profunde în electrotehnică.

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