

Innovation in soft start technology



agility

QUICK START GUIDE

agility Quick Start Guide

© Fairford Electronics Ltd
Bristow House
Gillard Way, Ivybridge
PL21 9GG
UK
www.fairford.com

[Full User Manual (MAN-AGY-001) available from www.fairford.com]

© 2017 by Fairford Electronics, all rights reserved

Copyright subsists in all Fairford Electronics deliverables including magnetic, optical and/or any other soft copy of these deliverables. This document may not be reproduced, in full or in part, without written permission. Enquiries about copyright of Fairford Electronics deliverables should be made to Fairford Electronics Ltd. If, by permission of the copyright owner, any part of this document is quoted, then a statement specifying the original document shall be added to the quotation. Any such quotation shall be according to the original (text, figure or table) and may not be shortened or modified.

Safety

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.



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.



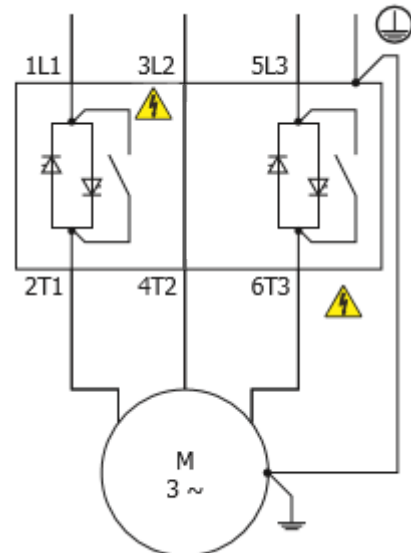
Protective Earth (Ground)

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

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.

⚠
<ul style="list-style-type: none"> • agility 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.
<ul style="list-style-type: none"> • 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.
<ul style="list-style-type: none"> • It is the responsibility of the installer to provide suitable grounding and branch circuit protection in accordance with local electrical safety codes.
<ul style="list-style-type: none"> • This soft start contains no serviceable or re-usable parts.
<ul style="list-style-type: none"> • 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.



Mechanical Installation

Mounting

Fix the unit to a flat, vertical surface using the mounting holes (or slots) on its base-plate. The mechanical outline diagrams, shown on Page 4, give the dimensions and mounting hole positions for each model. Ensure that:

- The orientation of the unit has the 'TOP' uppermost.
- The location allows adequate front access.
- You can view the touchscreen.

Do not install other equipment that generates significant heat close to the soft starter.

Requirements for an Enclosure

For a typical industrial environment, an enclosure would provide the following:

- A single location for the unit and its protection/isolation switch-gear.
- The safe termination of cabling and/or bus-bars.
- Means to effect proper air flow through the enclosure.



Enclosure Ventilation

When fitting agility into a cabinet, ventilation must be provided. The heat dissipated can be approximated with the formula:-

Starting

Watts (agility) = start current(A) x start time(s) x number of starts per hour / 1800

Running

Watts(agility) = 0.4 x running amps

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.

$$Q = (4 \times W_t / (T_{max} - T_{amb}))$$

Q = volume of air (cubic metres per hour-m³/h)

W_t = Heat produced by the unit and all other heat sources within the enclosure (Watts) T_{max}

= Maximum permissible temperature within the enclosure (40°C for a fully rated agility™)

T_{amb} = Temperature of the air entering the enclosure (°C) [to work in CFM, substitute °F for °C. Q is now in CFM]

Altitude Derate

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

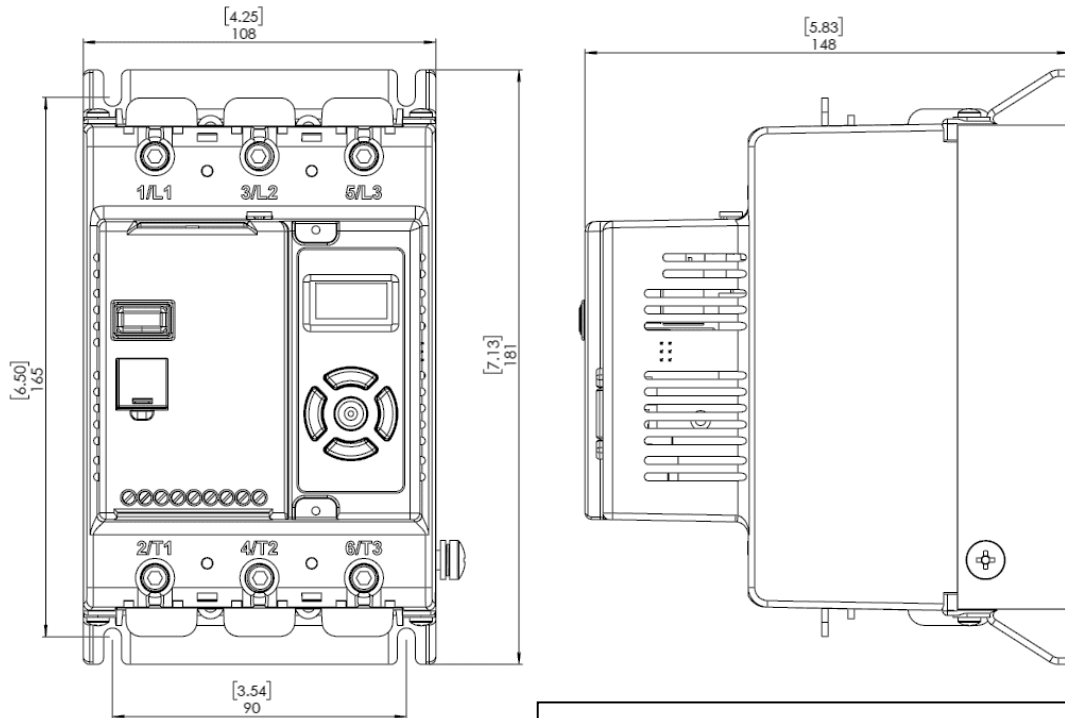
Ambient Temperature Derate

-20°C (-4°F) to 40°C (104°F). Above 40°C de-rate linearly by 2% of agility i.e. per °C to a maximum of 60°C (140°F).

Mechanical Installation (continued)

Dimensions AGY-101 to AGY-113

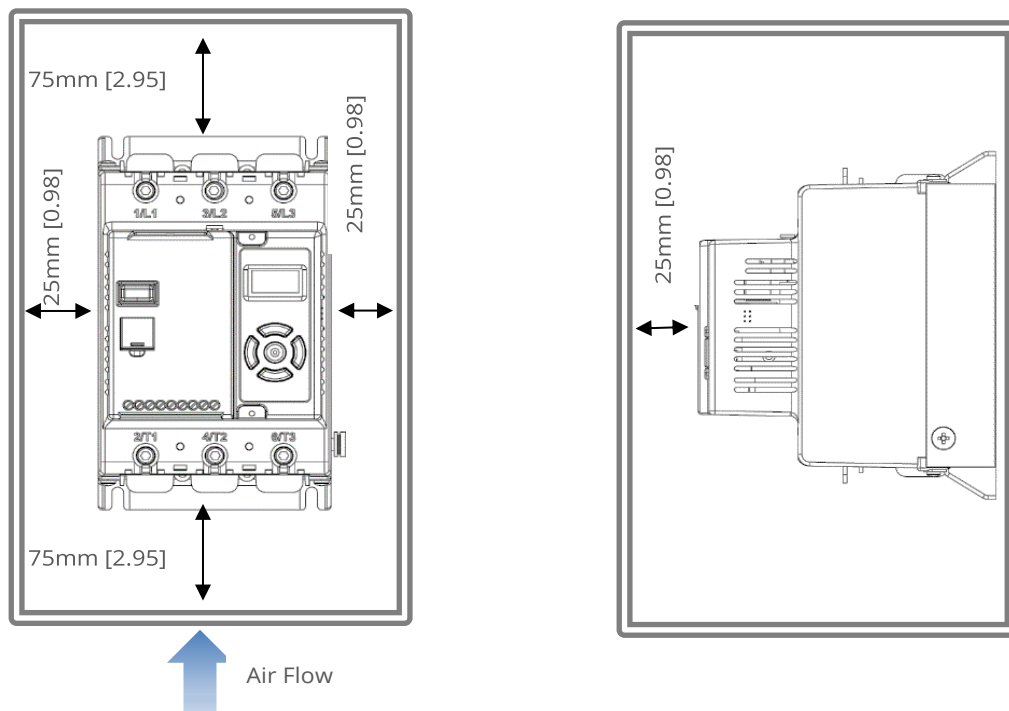
[] = inch



Weight 1.97kg (3.75lb)

Note: The unit may be horizontally mounted with deration. See Horizontal Mounting Rating Table

Fitting



Electrical Installation

Warnings

Isolation



Caution: agility uses semiconductor devices in the main circuit and is not designed to provide isolation. For this reason isolation means must be installed in the supply circuit in accordance with the appropriate wiring and safety regulations

Electrical Control Supply Requirements



All electrical connections are made to power input and output terminals, control terminals and an earth stud .

Fuse Protection



The Mains Supply and the Control Supply each require protection. Although all units have electronic overload protection for the Soft Start, the installer should always fit fuses, for motor protection, between the unit and the Mains Supply, not between the unit and the motor. Semiconductor fuses can be supplied as an option for short-circuit protection of the semiconductors. These fuses must be fitted externally to the agility chassis to comply with certain standards. It is the responsibility of the installer and system designer/specifier to ensure that the required standards or regulations are not affected by so doing.

Safety



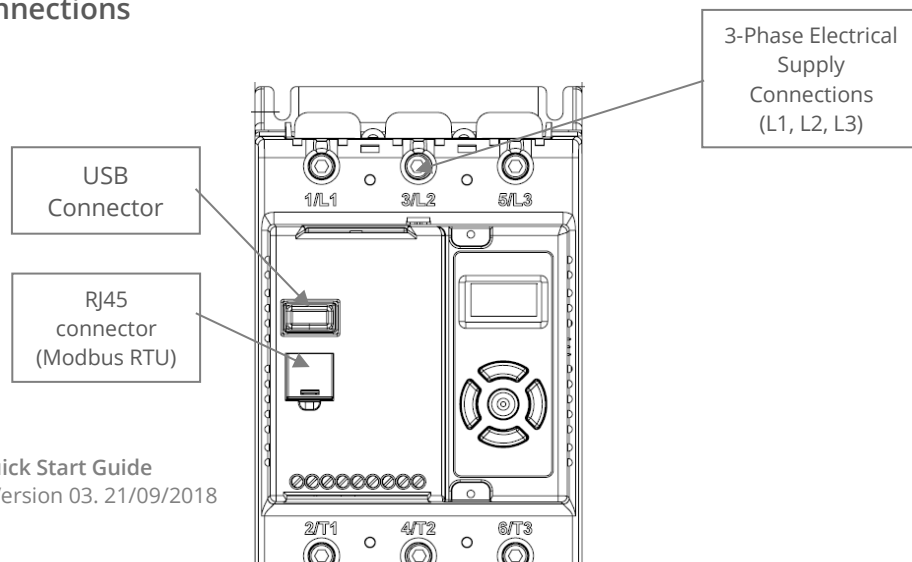
agility soft starters contain hazardous voltages when connected to the electrical power supply. Only qualified personnel who are trained and authorized should carry out installation, operation and maintenance of this equipment. Refer to and carefully follow all of the 'Warnings' section at the beginning of this user manual, as well as other warnings and notes throughout the manual.

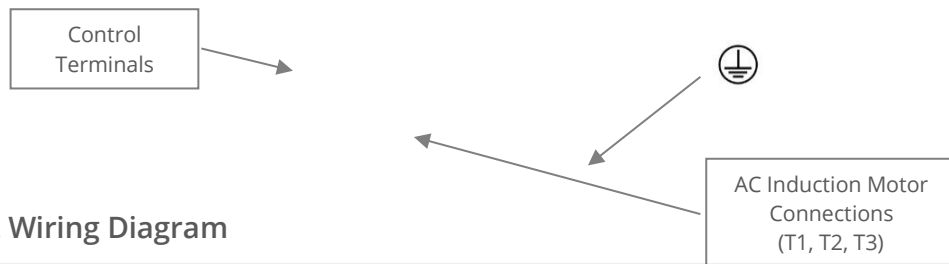
Electrical Supplies

The unit requires a 3-phase balanced Mains Supply to provide the power for the controlled motor, and a 24Vdc for the internal control circuitry. The unit will not operate unless the control supply voltage is within the specified limits.

Electrical Installation (continued)

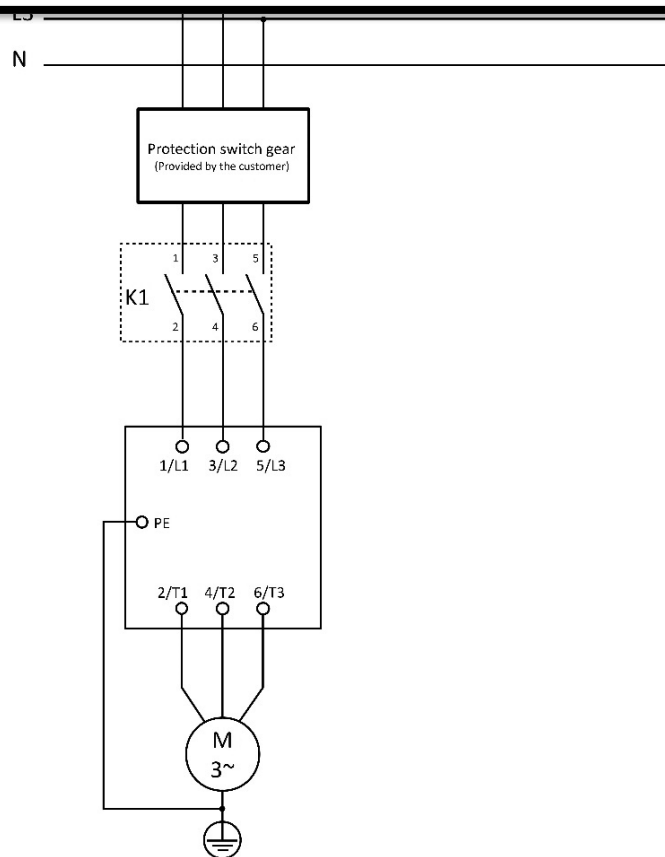
Electrical Connections



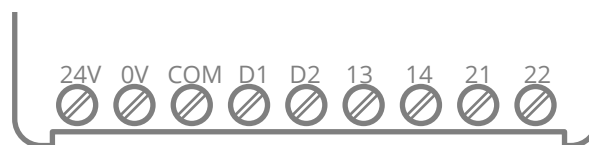


Mains Circuit Wiring Diagram

Electrical Installation (continued)



Control Terminal Connections



Control Terminal Functions

Terminal	Description	Default	Function Selectable	Note
24Vdc	Control Supply +Us	-	No	#1
0V	Control Supply -Us	-	No	
COM	Digital Inputs Common	-	No	
D1	Digital Input 1	-	No	#2
D2	Digital Input 2	-	Yes	#2
13/14	Main Contactor Control (Run Relay)	-	No	#3
21/22	Fault Relay	-	Yes	#3

#1 24V dc Specification: 24V 10VA, residual ripple < 100mV, spikes/switching peaks < 240mV,

#2 The voltage applied to the digital inputs D1 and D2 must not exceed 24V dc

#3 230Vac, 1A, AC15. 30Vdc, 0.5A resistive

Digital Input 2 (D2) Selectable Functions

Different functions may be assigned to Digital Input 2 in the I/O menu. Available assignments are:

Reset

Hold Start Ramp

Enable

Fire Mode



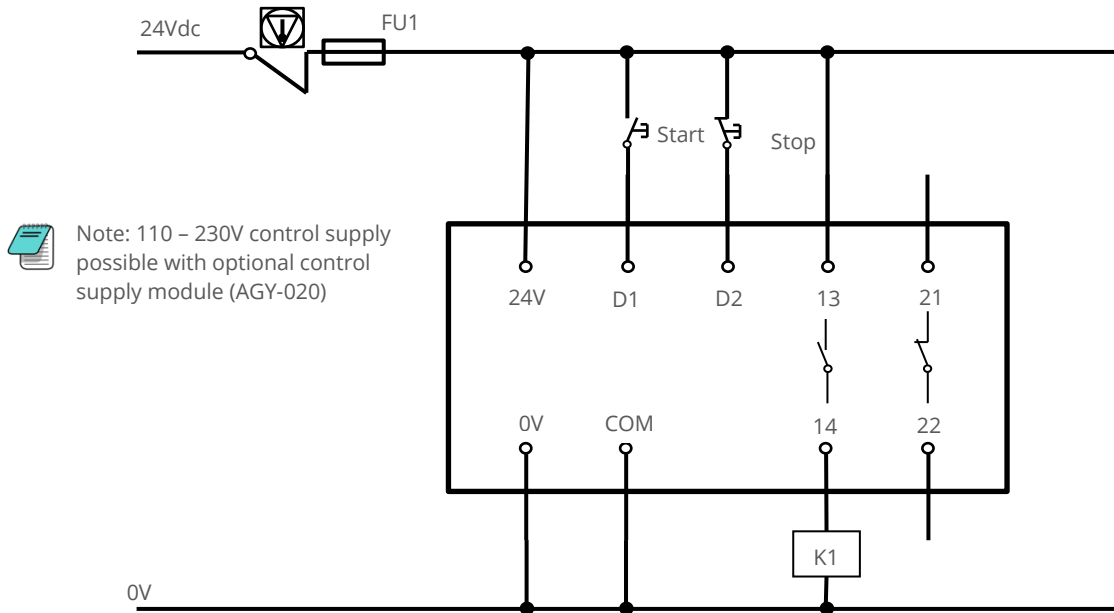
In Fire Mode all trips are disabled.

Digital Output 21/22 Selectable Functions

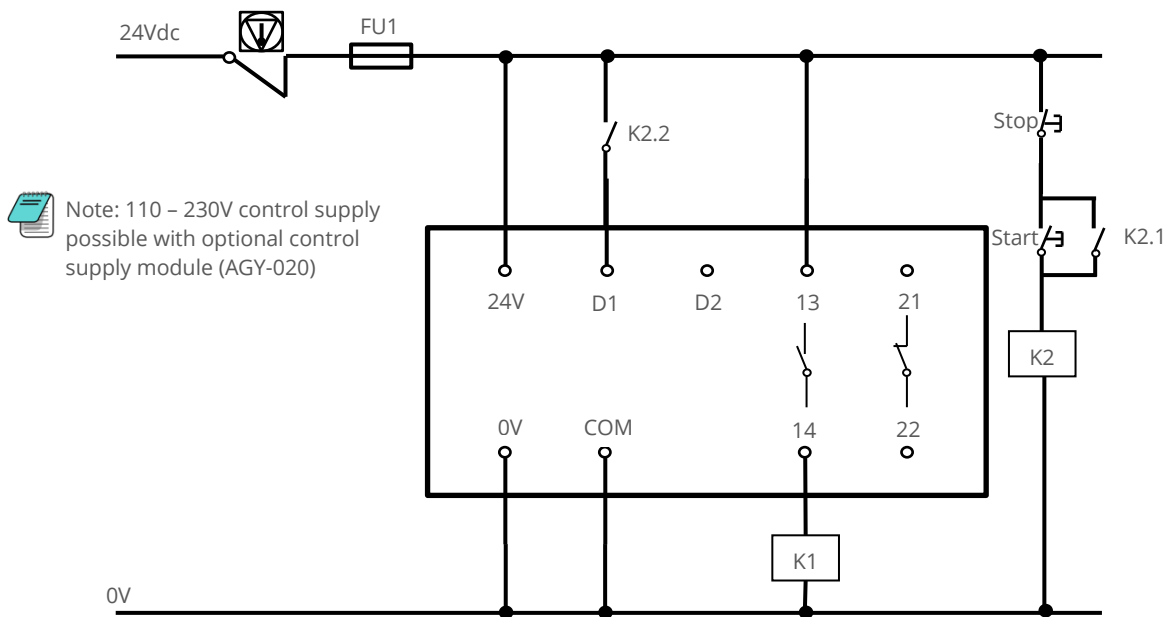
The output may be mapped to Fault or Top-of-Ramp indication

Electrical Installation (continued)

3-Wire Control Circuit Wiring Diagram

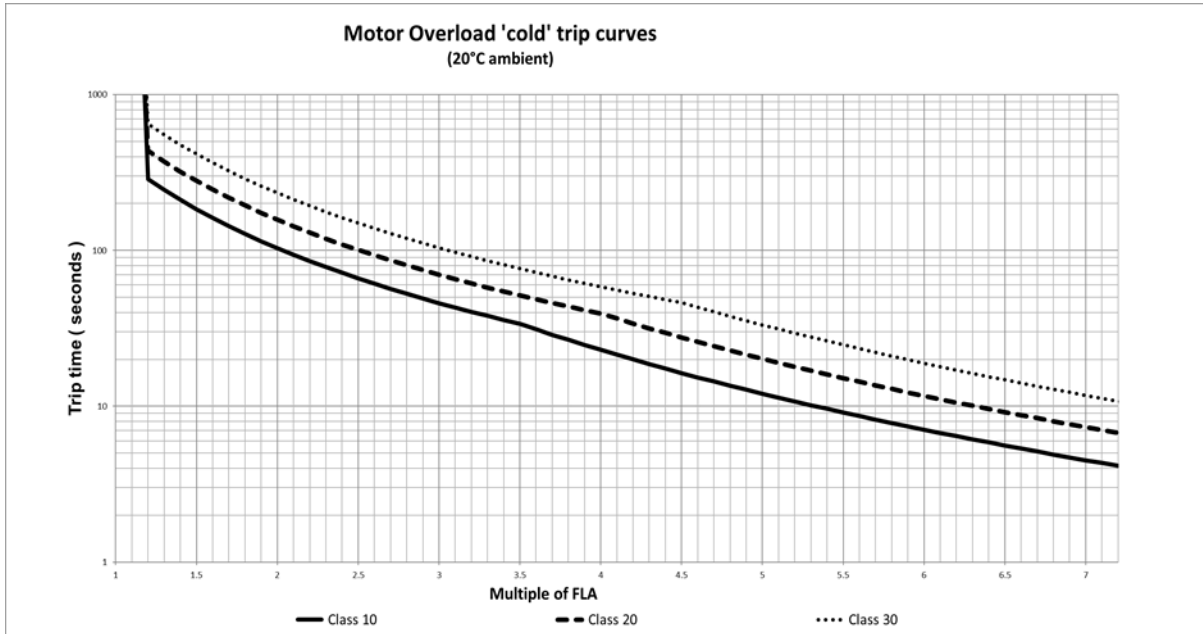


2-Wire Control Wiring Diagram



Motor Overload

agility provides full motor overload protection, configurable through the user interface. Overload trip settings are determined by the Motor Current setting and the Trip Class setting. Trip class choices are Class 10, Class 20, and Class 30. The agility soft starters are protected using full I²T motor overload with memory.

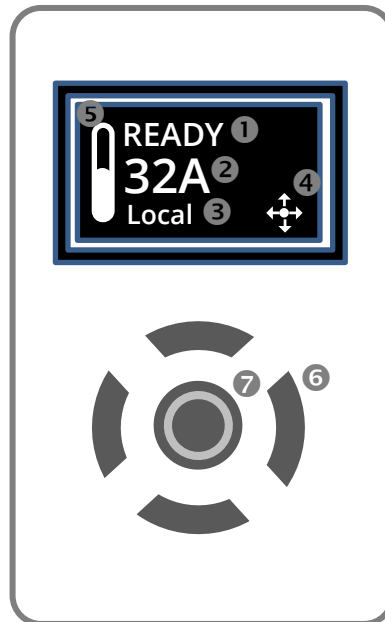


Please note: When the overload has tripped, there is a forced cooling time to allow the overload to recover before the next start.

The 'warm' trip times are 50% of the 'cold' trip time

Configuration and Parameters

Display and Controls



Key

- ① Status messages
- ② Instantaneous motor current
- ③ Control scheme: Local. Control terminal. Modbus RTU
- ④ Keypad guidance wizard: Displays which keys are valid for specific menu items
- ⑤ Motor overload level; 0 to 100%
- ⑥ Control keypad
- ⑦ Status LED (incorporated into centre button) – Green/Red

Keypad Guidance Examples



All keys active



Left & Right keys active



Right, Down & Centre keys active

Note: A flashing centre button indicates that a menu item may be selected or saved.

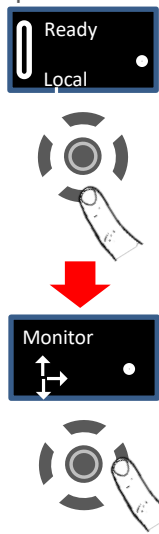
Configuration and Parameters (continued)

Operation

Local Motor Start



Example

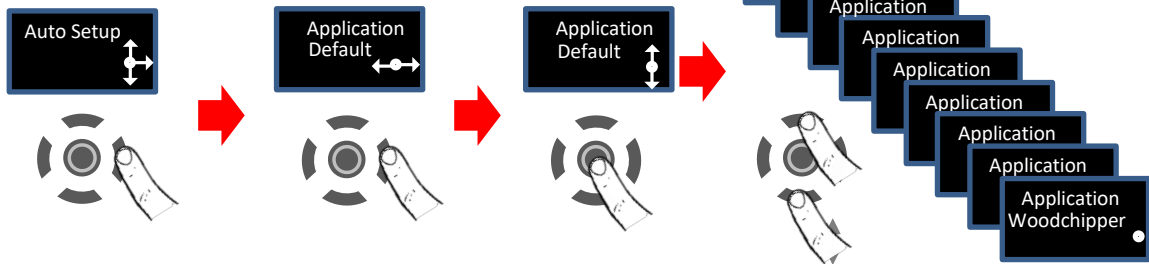


Navigation Method

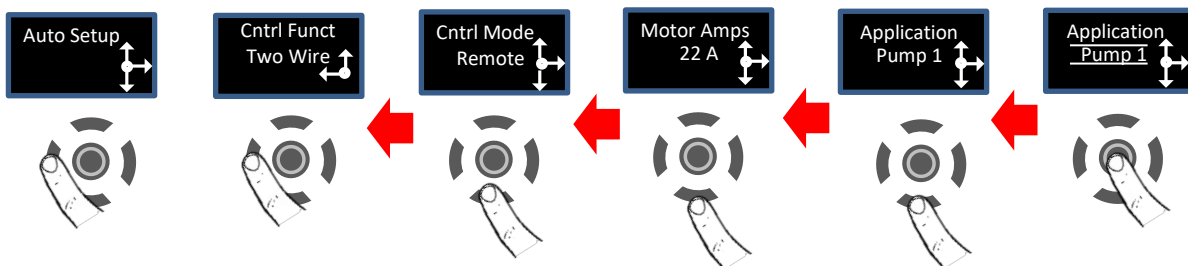


Quick Return to Status Screen

Auto Application Setup



(Centre button to adjust)



Configuration and Parameters (continued)

Auto Application Setup Parameter Settings

	Initial Volts	Start Time	Stop Time	Trip Class	Current Limit	Current Limit Time
Unit	%	s	s	-	*FLC	s
Default	20%	10	0	10	3.5	30
Heavy	40%	10	0	20	4	40
Agitator	30%	10	0	10	3.5	25
Compressor 1	40%	15	0	20	3.5	25
Compressor 2	35%	7	0	10	3.5	25
Conveyor Loaded	10%	10	7	20	5.5	30
Conveyor Unloaded	10%	10	7	10	3.5	30
Crusher	40%	10	0	30	3.5	60
Fan High Inertia	40%	10	0	30	3.5	60
Fan Low Inertia	30%	15	0	10	3.5	30
Grinder	40%	10	0	20	3.5	40
Mill	40%	10	0	20	3.5	40
Mixer	10%	10	0	20	4	25
Moulding M/C	10%	10	0	10	4.5	25
Press Flywheel	40%	10	0	20	3.5	40
Pump 1	10%	10	60	10	3.5	25
Pump 2	10%	10	60	20	3.5	25
PumpJack	40%	10	0	20	3.5	40
SawBand	10%	10	0	10	3.5	25
SawCircular	40%	10	0	20	3.5	40
Screen Vibrating	40%	10	0	20	4.5	40
Shredder	40%	10	0	30	3.5	60
Wood Chipper	40%	10	0	30	3.5	60

Compressor 1 = Centrifugal, Reciprocating, Rotary Screw

Compressor 2 = Rotary Vane, Scroll

Pump 1 = Submersible: Centrifugal, Rotodynamic

Pump 2 = Positive Displacement: Reciprocating, Rotary

Technical Information / Specification

General Specification			
Product Standard		EN 60947-4-2: 2012	
Rated operational voltages	U_e	200Vac to 600Vac (See Key to part numbers)	
Rated operational current	I_e	See Rating Table	
Rating index		See Rating Table	
Rated frequency/frequencies		50 - 60Hz ± 5Hz	
Rated duty		Uninterrupted.	
Form designation		Form 1, Internally Bypassed	
Method of operation		Symmetrically controlled starter	
Method of control		Semi-automatic	
Method of connecting		Thyristors connected between windings and supply	
Number of poles		3 main poles, 2 main poles controlled by semiconductor switching element	
Rated insulation voltage	U_i	Main circuit	600Vac
		Control supply circuit	24Vdc
Rated impulse withstand voltage	U_{imp}	Main circuit	6 kV
		Control supply circuit	4 kV
IP code		Main circuit	IP00 (IP20 optional)
		Supply and Control circuit	IP20
Overvoltage Category / Pollution degree		III / 3	
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 Tables for rated conditional short-circuit current and required current rating and characteristics of the associated SCPD	



Note: The current limit function and phase loss protection is limited to the ramping period only

Technical Information / Specification

General Specification (continued)				
As Standard	Control Supply ²⁾	Supply input	0, 24V	Protect with 4A UL listed fuse
		Kind of current, rated frequency	d.c.	
		Rated voltage U_s	24Vd.c.	
		Maximum power consumption	12VA	
	Control Circuit ²⁾	Programmable opto-isolated inputs	D1, D2	
		Common input, marking	COM	
		Kind of current, rated frequency	d.c.	
		Rated voltage U_c	24Vd.c.	
With extra module	Control Supply	Supply input	L, N	UL listed fuse
		Kind of current, rated frequency	a.c., 50 - 60Hz \pm 5Hz	
		Rated voltage U_s	110V to 230V a.c.	
		Rated input current	1A	
	Control circuit	Programmable opto-isolated inputs	D1, D2	
		Common input	COM	
		Kind of current, rated frequency	a.c., 50 - 60Hz \pm 5Hz	
		Rated voltage U_c	110V to 230V a.c.	
Auxiliary circuit ¹⁾	Form A – Single gap make -contact (normally open)	13, 14		
	Form B – Single gap break-contact (normally closed)	21, 22		
	Utilization category, voltage rating, current rating	Resistive load, 250Vac, 2A. Cos ϕ =0.5, 250Vac, 2A ³⁾		
Electronic overload relay with manual reset and thermal memory	Trip Class		10 (factory default), 20 or 30 (selectable)	
	Current setting		7A to I_e	
	Rated frequency		50 to 60Hz \pm 5Hz	
	Time-current characteristics		See 'Motor Overload 'cold' trip curves'	
<p>1) Compliant with Annex S of IEC 60947-1:2007 at 24Vd.c.</p> <p>2) Must be supplied by class 2, limited voltage current or protected by a 4A UL 248 listed fuse.</p> <p>3) Not applicable for UL.</p> <p>4) The safety functions were not evaluated by UL. Listing is accomplished according to requirements of Standard UL 508 and CSA14-13, general use applications</p>				

Technical Information / Specification

Mechanical Specifications							
Model (AGY-)	101	103	105	107	109	111	113
Frame Size	1						
Heat output (W)	9	12	14	16	20	25	30
Weight kg [lb]	1.97 [4.20]						
Ambient Operating Temp.	-20°C [-4°F] to 40°C [104°F] ; above 40°C derate linearly by 2% of agility I _e per °C to a maximum of 60°C (140°F)						
Transportation and Storage Temperature	-20°C to 60°C [-4°F to 140°F] continuous						
Humidity	max 85% non-condensing, not exceeding 50% @ 40°C [104°F]						
Maximum Altitude	1,000m [3281ft] ; above 1000m derate by 1% of agility I _e per 100m (328ft) to a maximum altitude of 2,000m (6562ft)						
Environmental Rating	Main Circuit: IP00 (IP20 with optional finger guards); Control Circuit: IP20; No corrosive gases permitted						

Electromagnetic Compatibility		
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 and power ports)
		1kV/5kHz (signal ports)
	IEC 61000-4-5	2kV line-to-ground 1kV line-to-line
IEC 61000-4-6	10V	
<p>□ NOTICE: This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances, in which case the user may be required to take adequate mitigation measures</p>		

Wire Sizes and Torques				
Terminal	Wire Size		Torque	
	mm ²	AWG	Nm	lb-in
Main terminals Cu STR 75°C only	2.5 - 70	12- 2/0	9	80
Control terminals	0.5-1.5	20-16	0.8	7.0
M6 screw Protective Earth ¹⁾ Cu only	≥ 10	≥ 8	8	70
<p>¹⁾ Protective Earth wire size based on bonding conductor requirements of UL508 Table 6.4 and UL508A Table 15.1.</p>				

Technical Information / Specification

Short Circuit Protection																
Type designation (AGY-)			101-4	101-6	103-4	103-6	105-4	105-6	107-4	107-6	109-4	109-6	111-4	111-6	113-4	113-6
Rated operational current	I_e	A	17	22	29	35	41	55	66	66						
Rated conditional short circuit current	I_q	kA	5	5	5	5	5	5	5	5	5	5	5	5	5	10
Class J time-delay fuse #1	Maximum rating Z_1	A	30	40	50	60	70	100	125	125						
UL Listed inverse-time delay circuit breaker #1	Maximum rating Z_2	A	60	60	60	60	60	60	150	150	150					
Semiconductor fuse (class aR) #2, duty ≤ 5 starts per hour.	Type		Mersen 6,9 URD 30 _ Bussmann 170M30__ Bussmann 170M31__ Bussmann 170M32__ SIBA 20 61__													
	Fuse rating	A	100A	100A	160A	160A	160A	200A	200A	200A	200A					
Semiconductor fuse(class aR), #2 duty > 5 starts per hour #3.	Type		Mersen 6,9 URD 30 _ Bussmann 170M30__ Bussmann 170M31__ Bussmann 170M32__ SIBA 20 61__				Mersen 6,9 URD 31 _ Bussmann 170M40__ Bussmann 170M41__ Bussmann 170M42__ SIBA 20 61__									
	Fuse rating	A	160A	160A	200A	200A	250A	250A	250A	250A	250A					

- # 1. Suitable For Use On A Circuit Capable Of Delivering Not More Than I_q rms Symmetrical Amperes, 600Volts Maximum, When Protected by Class J time delay Fuses with a Maximum Rating of Z_1 or by a Circuit Breaker with a Maximum Rating of Z_2 .
- # 2. Correctly selected semiconductor fuses can provide additional protection against damage to the agility unit (This is sometimes referred to as type 2 co-ordination). These semiconductor fuses are recommended to provide this increased protection.
- # 3. Only when optional fan is fitted, see Rating table (Note 5).

Technical Information / Specification

Rating Table - Vertical Mounting												
I _e A ³⁾	kW ¹⁾			FLA A ³⁾	Hp ²⁾					Trip Class 10	Trip Class 20	Trip Class 30
	230V	400V	500V ⁴⁾		200V	208V	220-240V	440-480V	550-600V ⁴⁾	I _e : AC-53a: 3.5-17: 90-5 ⁵⁾	I _e : AC-53a: 4-19: 90-5 ⁵⁾	I _e : AC-53a: 4-29: 90-5 ⁵⁾
17	4	7.5	7.5	17	3	5	5	10	15	-	-	AGY-101
17	4	7.5	7.5	17	3	5	5	10	15	-	AGY-101	AGY-103
17	4	7.5	7.5	17	3	5	5	10	15	AGY-101	AGY-103	AGY-105
22	5.5	11	11	22	5	5	7.5	15	20	AGY-103	AGY-105	AGY-107
29	7.5	15	15	27	7.5	7.5	7.5	20	25	AGY-105	AGY-107	AGY-109
35	7.5	18.5	22	34	10	10	10	25	30	AGY-107	AGY-109	AGY-111
41	11	22	22	41	10	10	10	30	40	AGY-109	AGY-111	AGY-113
55	15	30	37	52	15	15	15	40	50	AGY-111	AGY-113	-
66	18.5	37	45	65	20	20	20	50	60	AGY-113	-	-

Rating Table - Horizontal Mounting												
I _e A ³⁾	kW ¹⁾			FLA A ³⁾	Hp ²⁾					Trip Class 10	Trip Class 20	Trip Class 30
	230V	400V	500V ⁴⁾		200V	208V	220-240V	440-480V	550-600V ⁴⁾	I _e : AC-53a: 3.5-17: 90-5 ⁵⁾	I _e : AC-53a: 4-19: 90-5 ⁵⁾	I _e : AC-53a: 4-29: 90-5 ⁵⁾
17	4	7.5	7.5	17	3	5	5	10	15	-	AGY-101	AGY-103
17	4	7.5	7.5	17	3	5	5	10	15	AGY-101	AGY-103	AGY-105
17	4	7.5	7.5	17	3	5	5	10	15	AGY-103	AGY-105	AGY-107
22	5.5	11	11	22	5	5	7.5	15	20	AGY-105	AGY-107	AGY-109
29	7.5	15	15	27	7.5	7.5	7.5	20	25	AGY-107	AGY-109	AGY-111
35	7.5	18.5	22	34	10	10	10	25	30	AGY-109	AGY-111	AGY-113
41	11	22	22	41	10	10	10	30	40	AGY-111	AGY-113	
55	15	30	37	52	15	15	15	40	50	AGY-113		-

- 1) Rated operational powers in kW as per IEC 60072-1 (primary series) corresponding to IEC current rating.
- 2) Rated operational powers in HP as per UL508 corresponding to FLA current rating.
- 3) The I_e and FLA rating applies for a maximum surrounding air temperature of 40°C. Above 40°C de-rate linearly by 2% of I_e or FLA per °C to a maximum of 60°C.
- 4) kW and HP ratings applicable for AGY-101-6 to AGY-113-6 models only.
- 5) A duty cycle F-S of up to 90-40 (up to 40 starts per hour) is possible with optional fan fitted

Electric current, Danger to life!

Only skilled or instructed persons may carry out the operations.

Lebensgefahr durch Strom!

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

Tension électrique dangereuse!

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

¡Corriente eléctrica! ¡Peligro de muerte!

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

Tensione elettrica: Pericolo di morte!

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

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。

Электрический ток! Опасно для жизни!

Только специалисты или проинструктированные лица могут выполнять следующие операции.

Levensgevaar door elektrische stroom!

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

Livsfare på grund af elektrisk strøm!

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

Προσοχή, κίνδυνος ηλεκτροπληξίας!

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

Perigo de vida devido a corrente eléctrica!

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

Livsfara genom elektrisk ström!

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

Hengenvaarallinen jännite!

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

Nebezpečí úrazu elektrickým proudem!

Niže uvedené práce směji provádět pouze osoby s elektrotechnickým vzděláním.

Eluhtlik! Elektrilöögiolt!

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

Életveszély az elektromos áram révén!

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

Elektriskā strāva apdraud dzīvību!

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

Porażenie prądem elektrycznym stanowi zagrożenie dla życia!

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

Livsfara genom elektrisk ström!

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

Hengenvaarallinen jännite!

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

Nebezpečí úrazu elektrickým proudem!

Niže uvedené práce směji provádět pouze osoby s elektrotechnickým vzděláním.

Eluhtlik! Elektrilöögiolt!

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

Életveszély az elektromos áram révén!

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

Elektriskā strāva apdraud dzīvību!

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

Pavojus gvybei dėl elektros srovės!

Tik elektrikai ir elektrotechnikos specialistai gali atlikti žemiau aprašytus darbus.

Porażenie prądem elektrycznym stanowi zagrożenie dla życia!

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

Življenjska nevarnost zaradi električnega toka!

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

Nebezpečnost ohrozenia života elektrickým prúdom!

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

Опасност за живота от электрически ток!

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

Atenție! Pericol electric!

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

Življenjska nevarnost zaradi električnega toka!

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

Nebezpečnost ohrozenia života elektrickým prúdom!

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

Опасност за живота от электрически ток!

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

Atenție! Pericol electric!

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

Pavojus gvybei dėl elektros srovės!

Tik elektrikai ir elektrotechnikos specialistai gali atlikti žemiau aprašytus darbus.