

• 15P0071B5 •

ASAC

COMPACT SOFT STARTER

USER MANUAL -OPERATION GUIDE-

Agg. 05/07/04
R. 01

English

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Elettronica Santerno is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of Elettronica Santerno.
- Elettronica Santerno assumes no responsibility for the consequences resulting by the use of non-original spare-parts.
- Elettronica Santerno reserves the right to make any technical changes to this manual and to the device without prior notice. If printing errors or similar are detected, the corrections will be included in the new releases of the manual.
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1 CAUTION STATEMENTS



This symbol is used throughout this manual to draw attention to topics of special importance to the installation and operation of the ASAC Series soft starter.

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is therefore the installer's responsibility to adhere to all instructions in this manual, to follow good electrical practice and to seek advice before operating this equipment in a manner other than as detailed in this manual.

- Ensure that the ASAC is completely isolated from the power supply before attempting any work on the unit.
- Do not apply incorrect voltages to the control input terminals.
- Ensure cables to the control inputs are segregated from AC power and control wiring.
- Some electronic contactor coils are not suitable for direct switching with PCB mount relays. Consult the contactor manufacturer/supplier to see if this is advisable.
- Do not connect Power Factor Correction capacitors to the output of ASAC Series soft starters. If static power factor correction is employed, it must be connected to the supply side of the soft starter.

The examples and diagrams in this manual are included solely for illustrative purposes. Users are cautioned that 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 or indirect or consequential damages resulting from the use or application of this equipment.



CAUTION

GROUNDING AND BRANCH CIRCUIT PROTECTION

It is the responsibility of the user or person installing the ASAC to provide proper grounding and branch circuit protection according to the IEC rules and local codes.



DANGER

WARNING - ELECTRICAL SHOCK HAZARD

ASAC Series soft starter contains dangerous voltages when connected to line voltage. Only a competent electrician should carry out the electrical installation. Improper installation of the motor or the ASAC may cause equipment failure, serious injury or death. Follow this manual, IEC rules and local safety codes.



CAUTION

SHORT CIRCUIT

The ASAC is not short circuit proof. Therefore, after severe overload or short circuit, the operation of the starter should be fully tested.

2 SERIES OVERVIEW

2.1 OVERVIEW

The ASAC Series comprises two separate ranges, ASAC-0 and ASAC-1. These ranges share common power and mechanical designs but offer different features sets. These ranges include an internal bypass function that bypass the soft starter SCRs during run. This allows the ASAC to be installed in a non-ventilated enclosure without the need for an external bypass contactor.

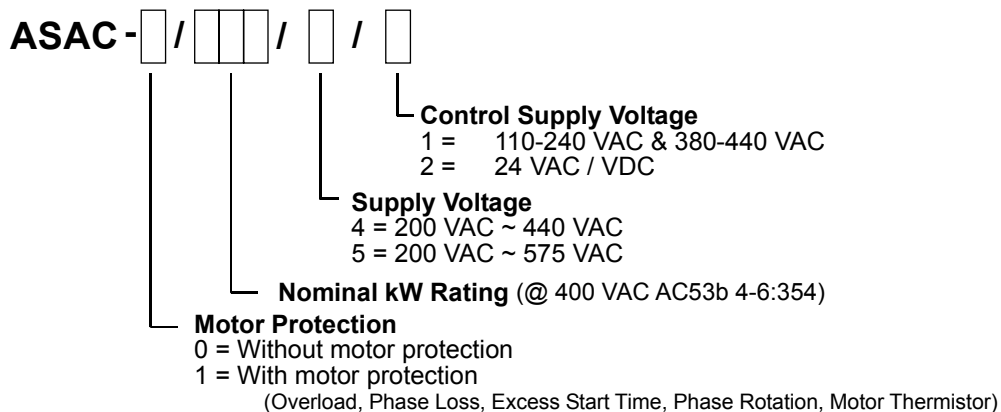
2.2 Feature list

Feature	ASAC-0	ASAC-1
Starting		
Timed Voltage Ramp	●	
Current Limit		●
Current Ramp		●
Stopping		
Coast To Stop	●	●
Soft Stop	●	●
Protection		
Motor Overload		●
Phase Loss		●
Excess Start Time		●
Phase Sequence		●
Motor Thermistor		●
Power Circuit Fault	●	●
Supply Frequency	●	●
Communications Failure	●	●
Interface		
Fixed Relay Output (Main Contactor Relay)	●	●
Programmable Relay (Trip or Run)		●
Accessories		
Remote Operator	○	○
MODBUS Interface	○	○
Profibus Interface	○	○
DeviceNet Interface	○	○
AS-I Interface	○	○
PC Set-up Software	○	○

● = Standard

○ = Optional

2.3 Part Number Format



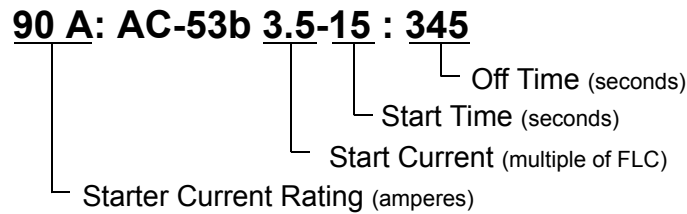
3 SPECIFICATIONS

3.1 CURRENT RATINGS

	Maximum overload 400% FLC AC53b 4-6:354 <1000 metres	Maximum overload 450% FLC AC53b 4-20:340 <1000 metres
	FLC	FLC
ASAC-007	18 A	17 A
ASAC-015	34 A	30 A
ASAC-018	42 A	36 A
ASAC-022	48 A	40 A
ASAC-030	60 A	49 A
	AC53b 4-6:594 <1000 metres	AC53b 4-20:580 <1000 metres
ASAC-037	75 A	65 A
ASAC-045	85 A	73 A
ASAC-055	100 A	96 A
ASAC-075	140 A	120 A
ASAC-090	170 A	142 A
ASAC-110	200 A	165 A

FLC: maximum motor Full Load Current

AC53b Utilization Category Format



Starter Current Rating: The Full Load Current rating of the soft starter given the parameters detailed in the remaining sections of the utilization code.

Start Current: The maximum available start current given the parameters detailed in the remaining sections of the utilisation code.

Start Time: The maximum available start time given the parameters detailed in the remaining sections of the utilisation code.

Off Time: The minimum allowable time between the end of one start and the beginning of the next start given the parameters detailed in the remaining sections of the utilisation code.

Contact your local supplier ratings under operating conditions not covered by the above ratings charts.

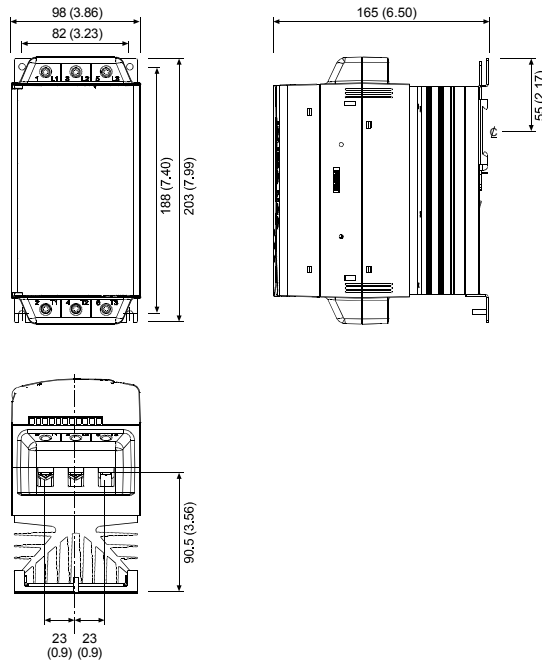
3.2 APPLICABLE MOTOR RATINGS

Soft Starter Model	Applicable motor power					FLC*
	200-240Vac kW	380-415Vac kW	440Vac kW	460-500Vac kW	575Vac kW	A
ASAC-0/ASAC-1 007	4,5	9,2	9,2	11	11	18
ASAC-0/ASAC-1 015	9,2	15	18,5	18,5	22	34
ASAC-0/ASAC-1 018	11	18,5	22	22	30	42
ASAC-0/ASAC-1 022	11	22	30	30	37	48
ASAC-0/ASAC-1 030	15	30	37	37	45	60
ASAC-0/ASAC-1 037	22	37	45	45	55	75
ASAC-0/ASAC-1 045	22	45	55	55	55	85
ASAC-0/ASAC-1 055	30	55	55	55	75	100
ASAC-0/ASAC-1 075	45	75	75	90	110	140
ASAC-0/ASAC-1 090	55	90	90	110	132	170
ASAC-0/ASAC-1 110	55	110	110	132	160	200
Soft starter power supply	200-440Vac			460-575Vac		

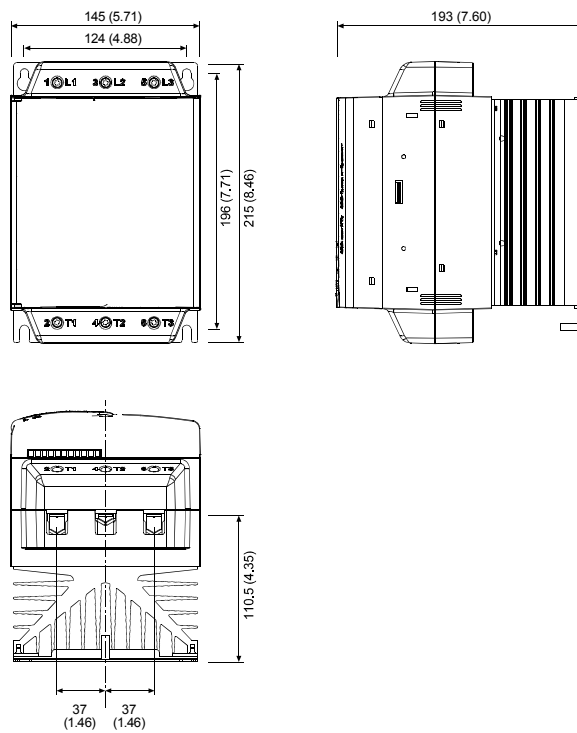
*FLC: maximum motor Full Load Current at 40°C environmental temperature.

3.3 Dimensions & Weights

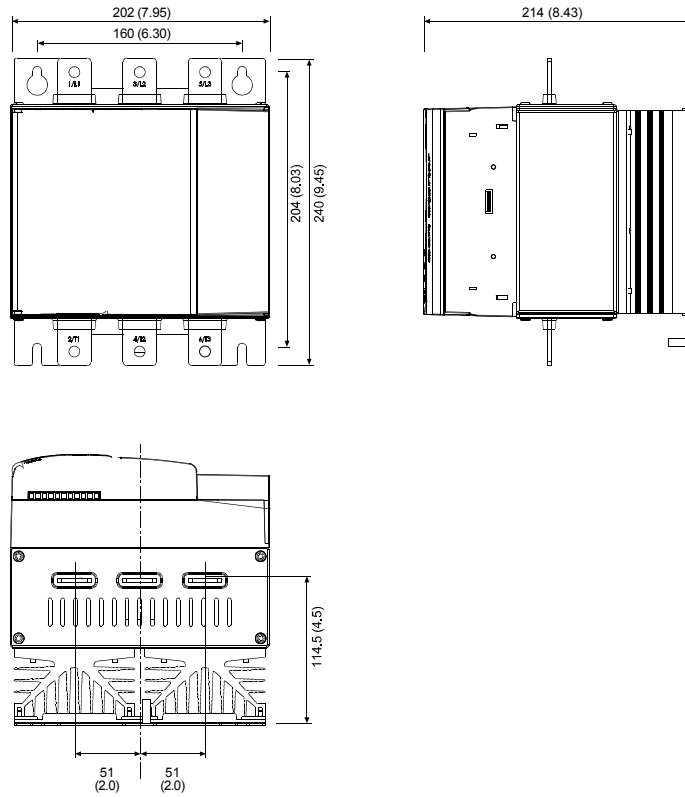
ASAC-0/007 ~ ASAC-0/030 (2.0kg)
ASAC-1/007 ~ ASAC-1/030 (2.1kg)



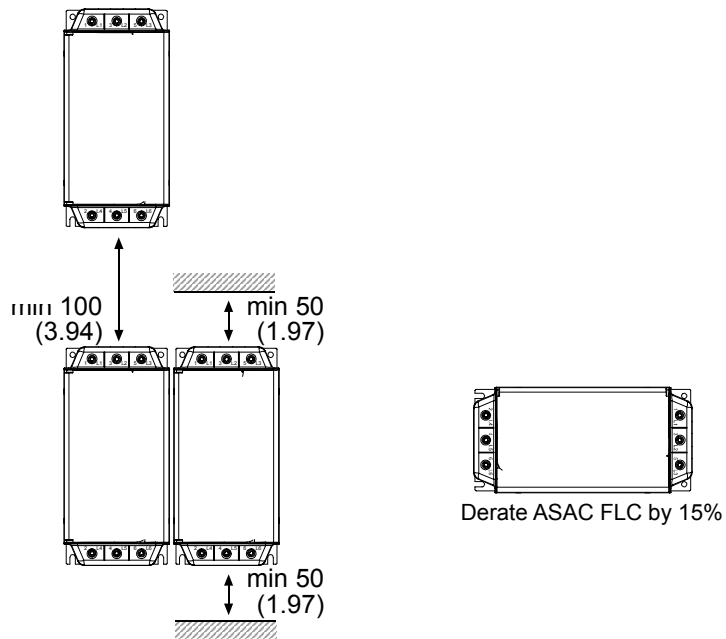
ASAC-0/037 ~ ASAC-0/055 (4.0kg)
ASAC-1/037 ~ ASAC-1/055 (4.3kg)



ASAC-0/075 ~ ASAC-0/110 (6.1kg)
ASAC-1/075 ~ ASAC-1/110 (6.8kg)



3.4 Mounting






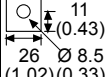




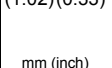

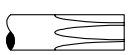

3.5 Fuses

The fuses can be used with the ASAC Series soft starter to reduce the potential for damage to SCRs from transient overload currents and for Type 2 coordination. Suitable Bussman & Ferraz semiconductor fuses are detailed below.

ASAC Model	SCR I ² t (A ² s)	European/IEC Style (North American Style)	Bussman Fuse
007	1150	6.6URD30xxxA0063 (A070URD30xxx0063)	170M-1314 (50 A)
015	8000	6.6URD30xxxA0125 (A070URD30xxx0125)	170M-1317 (100 A)
018	10500	6.6URD30xxxA0160 (A070URD30xxx0160)	170M-1318 (125 A)
022	15000	6.6URD30xxxA0160 (A070URD30xxx0160)	170M-1318 (125 A)
030	18000	6.6URD30xxxA0160 (A070URD30xxx0160)	170M-1319 (160 A)
037	51200	6.6URD30xxxA0250 (A070URD30xxx0250)	170M-1321 (250 A)
045	80000	6.6URD30xxxA0315 (A070URD30xxx0315)	170M-1321 (250 A)
055	97000	6.6URD30xxxA0315 (A070URD30xxx0315)	170M-1321 (250 A)
075	168000	6.6URD31xxxA0450 (A070URD31xxx0450)	170M-1322 (315 A)
090	245000	6.6URD31xxxA0450 (A070URD31xxx0450)	170M-3022 (550 A)
110	320000	6.6URD31xxxA0450 (A070URD31xxx0450)	170M-3022 (550 A)

xxx = Blade Type.
Refer Ferraz for options.

3.6 Power terminators

	L1/1, L2/3, L3/5, T1/2, T2/4, T3/6 mm ² (AWG)			A1, A2, A3, 01, 02, B4, B5, 13, 14, 23, 24 mm ² (AWG)				
	007 ~ 030		037 ~ 055	075 ~ 110	007 ~ 110			
	10 - 35 (8 - 2)		25 - 50 (4 - 1/0)		N.A.	 11 26 Ø 8.5 (1.02)(0.33)	0.14 - 1.5 (26 - 16)	
	10 - 35 (8 - 2)	 14 (0.55) mm (inch)	25 - 50 (4 - 1/0)	 14 (0.55) mm (inch)	N.A.	 6 (0.24) mm (inch)	0.14 - 1.5 (26 - 16)	
	Torx (T20) 3 - 5 Nm 2.2 - 3.7 ft-lb		Torx (T20) 4 - 6 Nm. 2.9 - 4.4 ft-lb		N.A.	N.A.	N.A.	
	7 mm 3 - 5 Nm 2.2 - 3.7 ft-lb		7 mm 4 - 6 Nm 2.9 - 4.4 ft-lb		N.A.	N.A.	3.5 mm 0.5 Nm max 4.4 lb-in max	

75°C Wire Use copper conductors only

3.7 General Technical Data

Mains supply (L1, L2, L3):	
ASAC/xxx/4/x	3 x 200 VAC ~ 440 VAC (+10% / - 15%)
ASAC/xxx/5/x	3 x 200 VAC ~ 575 VAC (+10% / - 15%)
Supply frequency (at start)	45Hz to 66 Hz
Rated insulation voltage	600 VAC
Rated impulse withstand voltage	4 kV (1, 2/ 50µs at 2000 m)
Form designation.....	Bypassed semiconductor motor starter form 1
Control supply (A1, A2, A3):	
ASAC/xxx/x/1	110-240VAC (+10% / - 15%) or 380-440 VAC (+10% / - 15%)
ASAC/xxx/x/2	24 VAC/VDC (±20%)
Control Inputs	
Start Terminal N1	Normally Open, 300 VAC max.
Stop Terminal N2	Normally Closed, 300 VAC max.
Relay Outputs	
Main Contactor (Terminals 13 & 14)	Normally Open 6 A, 30 VDC resistive / 2 A, 400 VAC, AC11
Programmable Relay (Terminals 23 & 24)	Normally Open 6 A, 30 VDC resistive / 2 A, 400 VAC, AC11
Environmental	
Degree of protection ASAC-007 to ASAC-055	IP20
Degree of protection ASAC-075 to ASAC-110	IP00
Operating Temperatures	-10 °C to + 60 °C
Humidity	5% to 95% Relative Humidity
Pollution Degree	Pollution Degree 3
Vibration	IEC 60068 Test Fc Sinusoidal 4Hz to 13.2Hz: ± 1mm displacement 13.2Hz to 200Hz: ± 0.7g
EMC Emission	
Equipment class (EMC)	Class A
Conducted radio frequency emission	0.15 MHz to 0.5 MHz : <90dB(µV) 0.5 MHz to 5 MHz : <76dB(µV) 5 MHz to 30 MHz : 80-60dB(µV)
Radiated radio frequency emission	30 MHz to 230 MHz : <30dB(µV/m) 230 MHz to 1000 MHz : <37dB(µV/m)
This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.	
EMC Immunity	
Electro static discharge	4 kV contact discharge, 8 kV air discharge
Radio-frequency electromagnetic field	0.15 MHz to 1000 MHz: 140dB(µV)
Fast transients 5/50 ns (Main & control circuits)	2 kV / 5.0 kHz
Surges 1.2/50 µs – 8/20 ms (Main & control circuits)	2 kV line to earth, 1 kV line to line
Voltage dip and short time interruption	5000 ms (at 0% nominal voltage)



Short Circuit	
Rated short-circuit current ASAC-007 to ASAC-037	5 kA
Rated short-circuit current ASAC-045 to ASAC-110	10 kA
Heat Dissipation	
During Start	3 watts / Ampere
During Run	< 4 watts
Standards Approvals	
C✓	IEC 60947-4-2
UL / C-UL	UL508
CE	IEC 60947-4-2
CCC	GB 14048.6

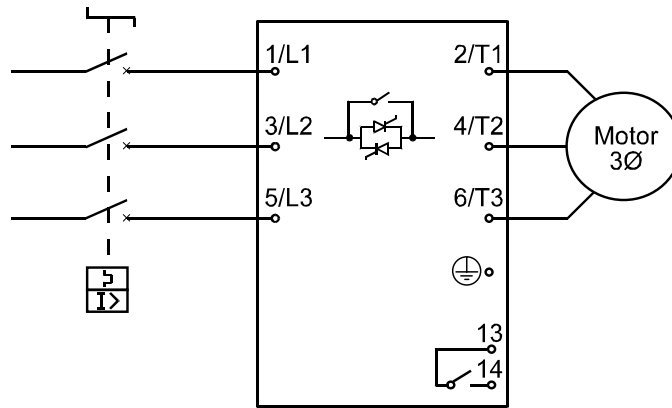
4 ASAC-0 SERIES

4.1 Overview

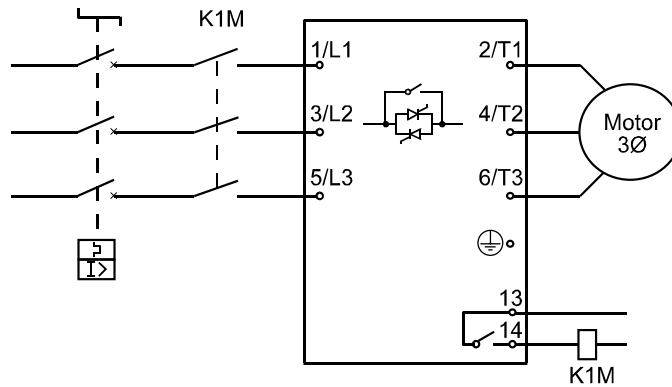
ASAC-0 starters provide soft start and soft stop control. They are designed to be used with an external motor protection device.

4.2 Electrical schematics

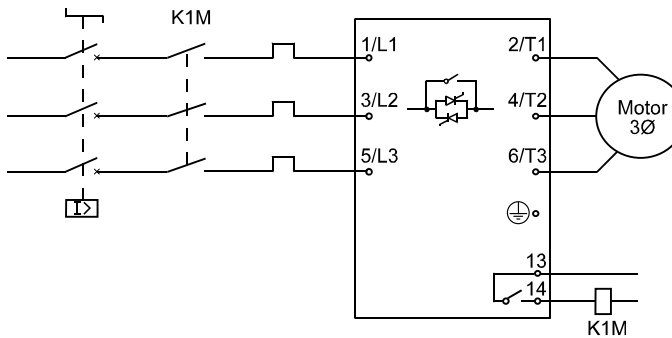
Example 1. ASAC-0 Series starter installed with a motor protection circuit breaker.



Example 2. ASAC-0 Series starter installed with motor protection circuit breaker and line contactor.



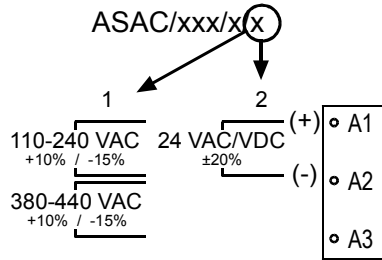
Example 3. ASAC-0 Series starter installed with system protection circuit breaker, separate overload and line contactor.



4.3 Control voltage

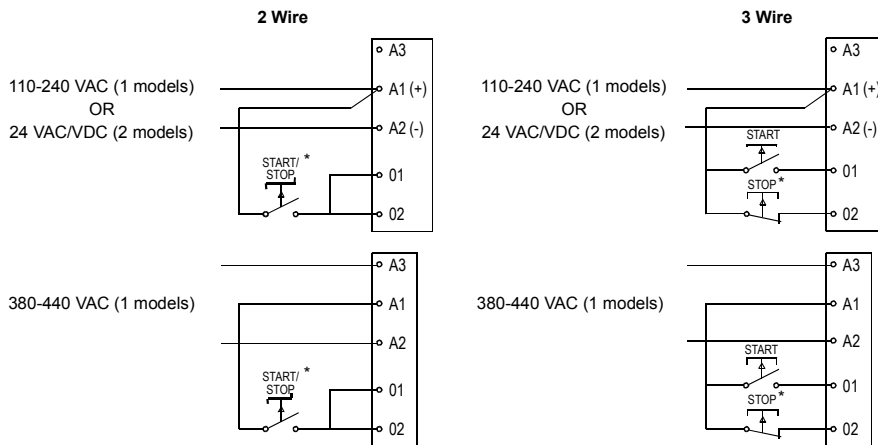
ASAC-0 Series can be supplied in either of two control voltage configurations.

ASAC-0/xxx/x/1 110-240VAC (+10% / - 15%) or 380-440 VAC (+10% / - 15%)
 ASAC-0/xxx/x/2 24 VAC/VDC (±20%)



WARNIG: Always apply control voltage before (or with) mains voltage.

4.4 Control circuits

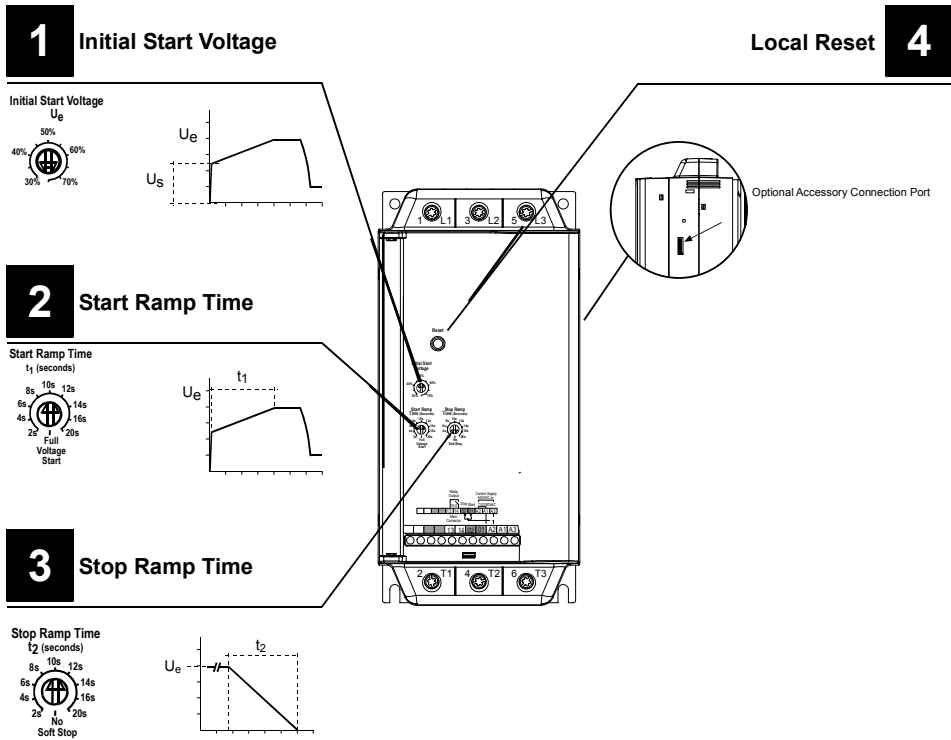


* Also resets trip states.

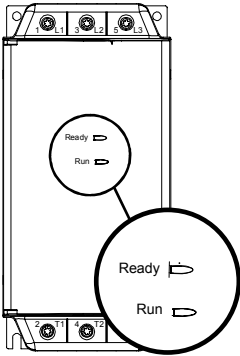


CAUTION: With 24Vac/Vdc use contacts rated for low voltage and low current (god1 flash or similar).

4.5 Trimming







4.6 Led



LED Status	Ready	Run
Off	No control power	Motor not running
On	Ready	Motor running at full speed
Flash	Starter tripped	Motor starting or stopping

4.7 Diagnostic trip codes

Ready LED	Description
 x 1	Power Circuit: Check mains supply L1, L2 & L3, motor circuit T1, T2 & T3 and soft starter SCRs.
 x 6	Supply Frequency: Check supply frequency is in range.
 x 8	Network Comms Failure (between accessory module and network): Check network connections and settings.
 x 9	Starter Comms Failure (between starter and accessory module): Remove and refit accessory module.

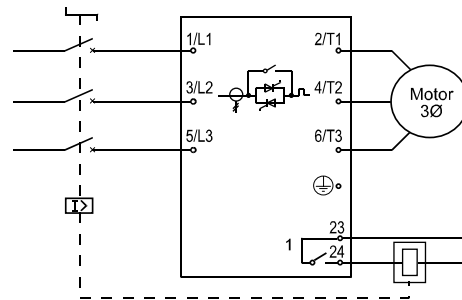
5 ASAC-1 SERIES

5.1 Overview

ASAC-1 starter provide current limit soft start, soft stop and a range of motor protection functions.

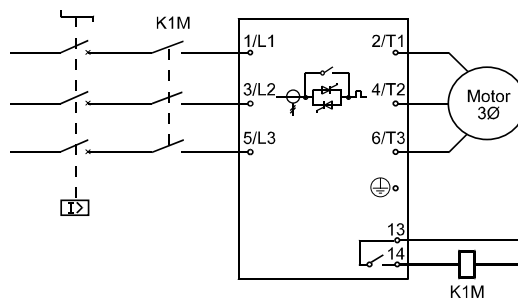
5.2 Electrical schematics

Example 1. ASAC-1 Series starter installed with system protection circuit breaker complete with a shunt trip device.



¹ Auxiliary Relay Function = Trip

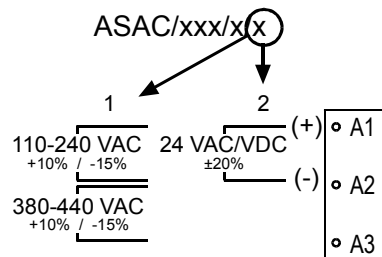
Example 2. ASAC-1 Series starter installed with a system protection circuit breaker and line contactor.



5.3 Control voltage

ASAC-1 Series can be supplied in either of two control voltage configurations.

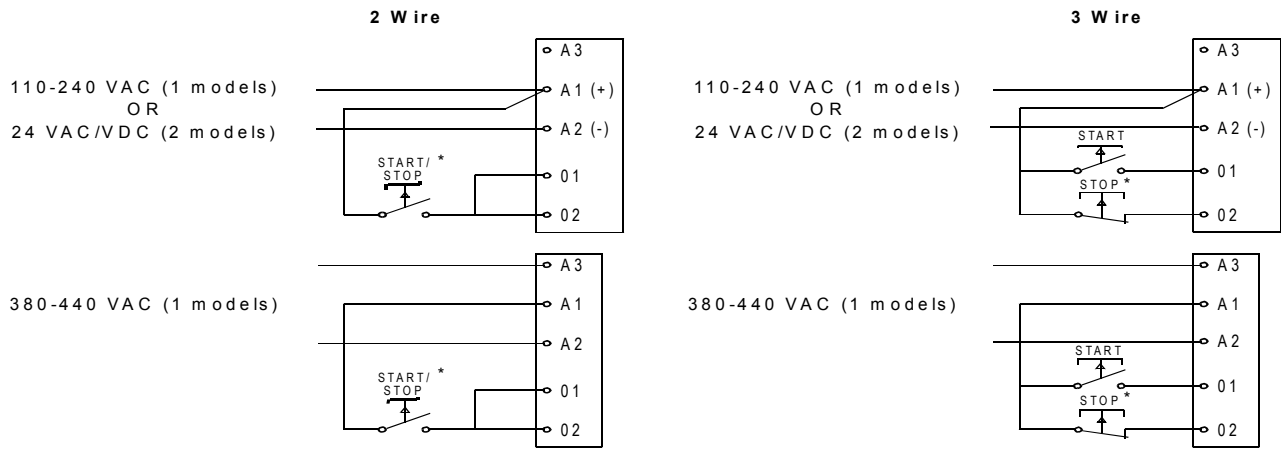
ASAC-1/xxx/x/1 110-240VAC (+10% / - 15%) or 380-440 VAC (+10% / - 15%)
ASAC-1/xxx/x/2 24 VAC/VDC (±20%)



WARNIG: Always apply control voltage before (or with) mains voltage.



5.4 Control circuits



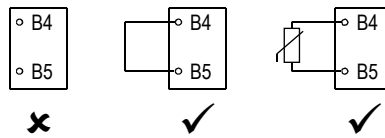
* Also resets trip states.



CAUTION: With 24Vac/Vdc use contacts rated for low voltage and low current (godl flash or similar).

5.5 Motor thermistor

Motor thermistors (if any) can be connected directly to the ASAC-1 terminals B4 & B5. If no motor thermistors are connected there must be a link between B4 & B5.

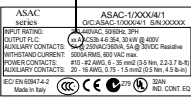


5.6 TRIMMING

1 Motor FLC

Motor FLC (% Soft Starter FLC) = $\frac{\text{Motor FLC}}{\text{ASAC FLC}}$

70% 80% 90%
60% 50% 100%

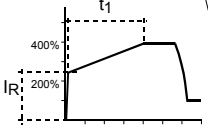


5 Local Reset

2 Current Ramp

Current Ramp (%FLC / Ramp Time) I_R / t_1 (Seconds)

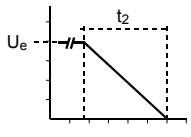
200% FLC
2s 5s 15s
15s 5s 2s
OFF



6 Soft Stop Time

Stop Time t_2 (seconds)

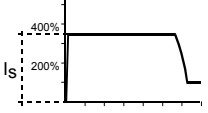
8s 10s 12s
6s 14s
4s 16s
2s 20s
No Soft Stop



3 Current Limit

Current Limit (% FLC)

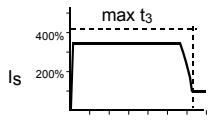
350%
300% 400%
250% 450%



7 Excess Start Time

Excess Start Time t_3 (seconds)

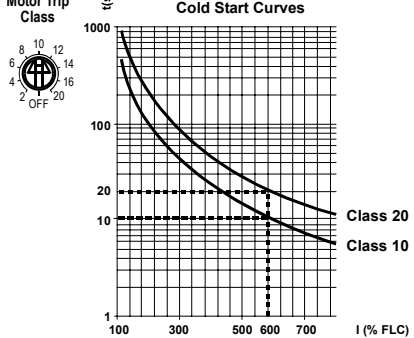
8 10 12
6 14
4 16
2 20
Off



4 Motor Trip Class

Motor Trip Class

Cold Start Curves



OFF = No overload protection

8 Phase Sequence Protection

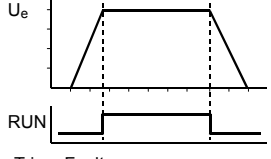
FWD ANY

L1	L2	L3	ASAC-1	✓	✓
L1	L2	L3	ASAC-1	✗	✓

Phase Sequence

ANY \rightarrow ANY
FWD \rightarrow FWD

9 Auxiliary Relay Function



Trip = Fault

8 9 Example

Phase Sequence = ANY

Phase Sequence = FWD

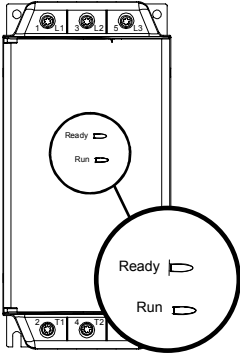
Aux Relay = Trip

Aux Relay = Run

ASAC-1












5.7 Led



LED Status	Ready	Run
Off	No control power	Motor not running
On	Ready	Motor running at full speed
Flash	Starter tripped	Motor starting or stopping

5.7.1 Diagnostic Trip codes

Ready LED	Description
 x 1	Power Circuit: Check mains supply L1, L2 & L3, motor circuit T1, T2 & T3 and soft starter SCRs.
 x 2	Excess Start Time: Check load, increase Current Limit or adjust Excess Start Time setting.
 x 3	Motor Overload: Allow motor to cool, reset soft starter and restart. Soft starter cannot be reset until motor has cooled adequately.
 x 4	Motor Thermistor: Check motor ventilation and thermistor connection B4 & B5. Allow motor to cool.
 x 5	Phase Imbalance: Check line current L1, L2 & L3.
 x 6	Supply Frequency: Check supply frequency is in range.
 x 7	Phase Sequence: Check for correct phase sequence.
 x 8	Network Comms Failure (between accessory module and network): Check network connections and settings.
 x 9	Starter Comms Failure (between starter and accessory module): Remove and refit accessory module.

6 REMOTE OPERATOR

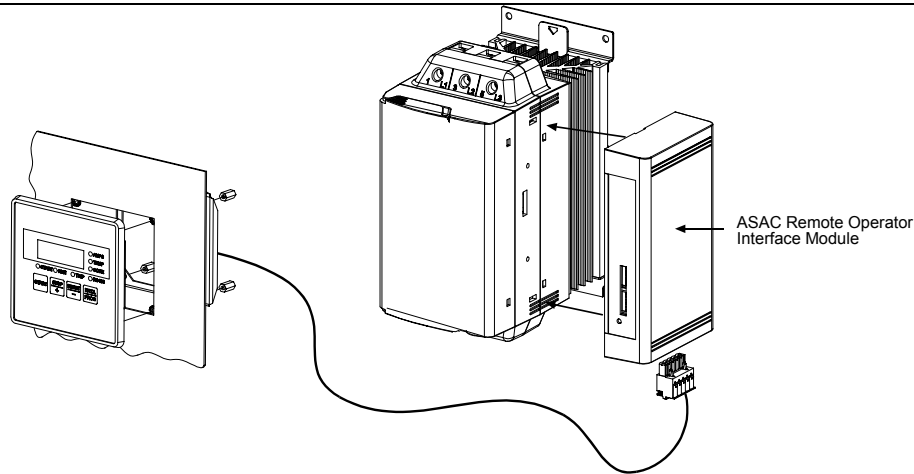
Part number: ZZ0071700 REMOTE OPERATOR

Part number: ZZ0071003 Remote operator interface module (AP ASCII)

Part number: ZZ0071004 Kit Remote operator interface module (AP ASCII) + REMOTE OPERATOR

The Basic Set-up Procedure describes the installation and connection procedures required for basic control and remote indication of ASAC Series soft starters. To make use of the more advanced ASAC Remote Operator functions consult the other sections of this manual.

6.1 Installation



1. Connect the ASAC Remote Operator Interface Module to the ASAC soft starter.

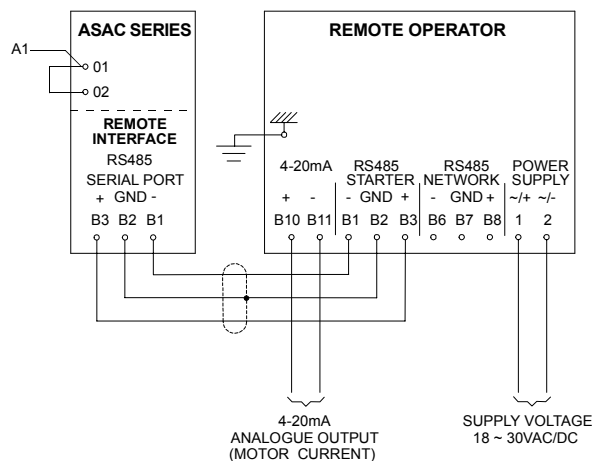


CAUTION

Control power and mains supply must be removed from the ASAC before attachment or removal of accessory modules. Failure to do so may result in equipment damage.

2. Cut a 92mm² hole in the panel and fit the ASAC Remote Operator.
3. Wire between the Remote Operator and ASAC as shown below.

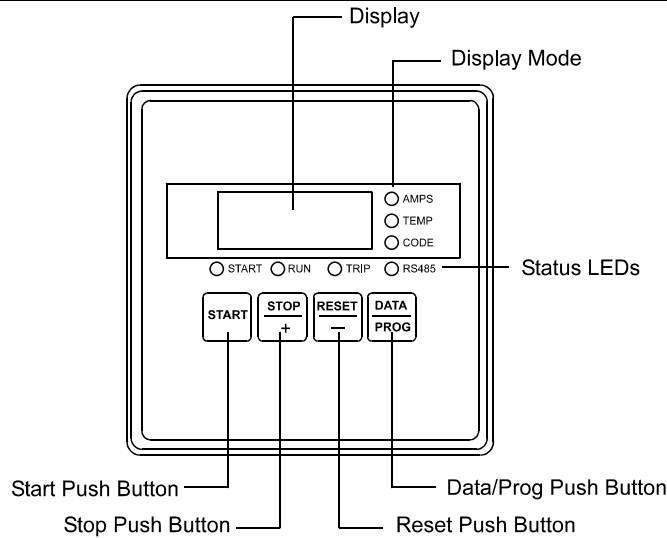
6.2 Connection



CAUTION

First application of control voltage to the ASAC will start the motor. Operational control is then possible via the ASAC Remote Operator. Ensure it is safe to start the motor when implementing the circuit above.

6.3 OPERATION



Start Push Button: Starts the motor.

Stop Push Button: Stops the motor

Reset Push Button: Resets the ASAC

Data/Prog Push Button: Select the data type to be shown on the display (Motor Current or Motor Temperature)

Display Mode: Indicates data type shown on the display.

Motor Current
Motor Temperature
Trip Code.

Display: Indicates the value of the currently selected data.



CAUTION

Motor current and motor temperature are only available when the Remote Operator is connected to ASAC-1 models. If connected to a ASAC-0 model, the display will be show 1.11 instead of motor temperature and 2222 instead of motor current.

Status LEDs: Indicates status of the ASAC and the RS485 link between the Remote Operator and ASAC.



CAUTION

Simultaneously pressing the Stop and Reset pushbuttons initiates a quick stop, which immediately removes voltage from the motor, ignoring any soft stop time set on the ASAC soft starter.

6.4 Trip Codes

Code	Description	ASAC-0	ASAC-1
1-1	Excess Start Time		<input type="checkbox"/>
1-2	Motor Overload		<input type="checkbox"/>
1-3	Motor Thermistor		<input type="checkbox"/>
1-4	Phase Imbalance		<input type="checkbox"/>
1-5	Supply Frequency	<input type="checkbox"/>	<input type="checkbox"/>
1-6	Phase Sequence		<input type="checkbox"/>
1-8	Power Circuit	<input type="checkbox"/>	<input type="checkbox"/>
1-C	Communications Failure	<input type="checkbox"/>	<input type="checkbox"/>

6.5 Overview

The ASAC Remote Operator can control and monitor ASAC Series soft starter performance. Functionality includes:

- Push Button Control (Start, Stop, Quick Stop & Reset)
- ASAC Status LEDs (Start, Run & Trip)
- Communication Status LED
- Motor Data Display (motor current & temperature)¹
- ASAC Trip Code Display
- 4-20mA Output (motor current)¹

¹ = ASAC-1 models only.

The ASAC Remote Operator can also acts as a gateway device for connection to a Modbus RTU or AP ASCII network.

6.6 Warnings

The Remote Operator allows remote operation of the soft starter. Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without Warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

Use all International recognised standard practice for RS485 communications when installing and using this equipment.

Users are cautioned that 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.

6.7 General Technical Data

Enclosure	
Front Panel Height	120 mm
Front Panel Width	120 mm
Inside Panel Depth (when mounted)	30 mm (max)
Panel Cut-out	92 mm ²
Weight	450 g

Power Supply	
Voltage	18 – 30 V DC or AC (50/60Hz)
Consumption	250 mA (max)
Connection (Terminals 1, 2)	2 pole spring clamp connector terminals

RS485 Serial Network Port (This Network Connection is Optional)	
RS485 Network Interface	AP ASCII or Modbus RTU protocol (selectable)
Connection (Terminals B6, B7, B8)	3 pole spring clamp connector terminals

RS485 Serial Starter Port (Soft Starter Connection)	
RS485 Soft Starter Interface	AP ASCII protocol as standard
Connection (Terminals B1, B2, B3)	3 pole spring clamp connector terminals

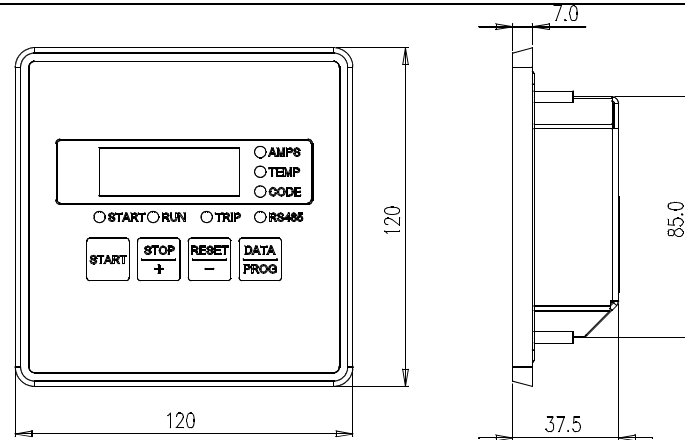
Analogue Output	
Motor Current Monitoring Interface	4 - 20 mA (max.burden 200 Ω)
Connection (Terminals B10, B11)	2 pole spring clamp connector terminals

Sundry	
Enclosure Rating	IP54 or NEMA 12 when correctly panel mounted
Pollution degree	Pollution Degree 3
Operating Temperature	- 5°C / + 60°C
Relative Humidity	5 – 95% (max non condensing)

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.

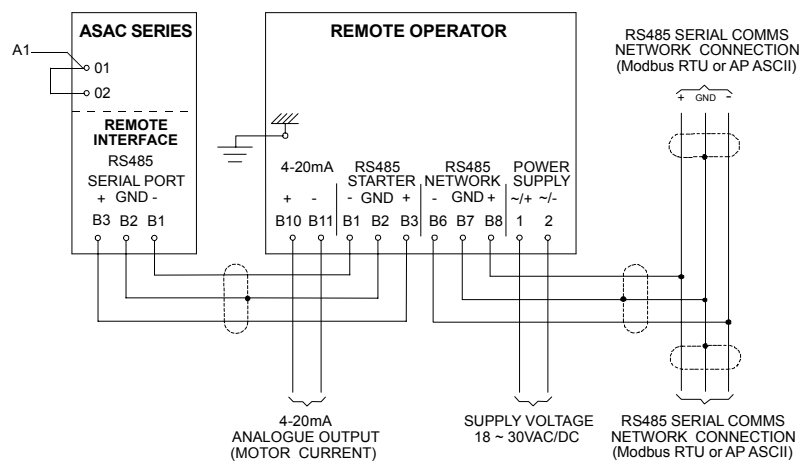
Standards Approvals	
CE	IEC 60947-4-2
UL and C-UL	UL 508
C✓	IEC 60947-4-2

6.8 Dimensions



6.9 Connection

This section details how to connect the ASAC Remote Operator to a RS485 serial communications network using either AP ASCII or Modbus RTU protocols.



Grounding and Shielding.

Twisted pair data cable with earth shield is recommended. The cable shield should be connected to a GND device terminal at both ends and one point of the site protective earth.

Termination Resistors.

In long cable runs prone to excessive noise interference, termination resistors should be installed. This resistance should match the cable impedance (typically 120 Ω). Do not use wire wound resistors.

RS485 Data Cable Connection.

Daisy chain connection is recommended. This is achieved by parallel connections of the data cable at the actual device terminals.

Remote Operator RS485 Network Connection Specifications.

Input Impedance: 12 KW

Common Mode Voltage range: -7 to +12 V

Input Sensitivity: +/- 200 mV

Minimum Differential Output Voltage: 1.5 V (with max. loading of 54 Ω)

6.10 Configuration

The ASAC Remote Operator must be configured to operate on the network. When configuring the ASAC Remote Operator the unit must be powered up with the soft starter in the “off” mode.

Programming Procedure

1. Enter program mode by holding down the [DATA/PROG] pushbutton for 4 seconds. The value of the first parameter will be displayed.
2. If required, adjust the parameter value using the [START/+] and or [STOP/-] pushbuttons.
3. Confirm the setting and move to the next parameter by pressing the [DATA/PROG] pushbutton.
4. Repeat steps 2 & 3 until all parameters have been set. The ASAC Remote Operator will automatically exit programming mode when the last parameter value has been set or if the keypad is left inactive for more than 20 seconds.

Parameter	Description	Default Setting	Adjustable Range
1	RS485 Network Baud Rate	4 (9600 baud)	2 = 2400 baud 3 = 4800 baud 4 = 9600 baud 5 = 19200 baud 6 = 38400 baud
2	RS485 Network Satellite Address	20	1 to 99
3	RS485 Network Time Out	0 seconds (= off)	0 to 100 seconds
4	RS485 Network Protocol	1 (AP ASCII)	1 = AP ASCII protocol 2 = Modbus RTU protocol
5	Modbus Protocol Parity	0 (no parity)	0 = no parity 1 = odd parity 2 = even parity
6	Motor FLC	10 A	1 to 2868 A
7	Analogue Output 4mA Offset	100%	80 to 120%

6.11 Modbus RTU

¹ Only available from ASAC-1 units.

MODBUS HEX Functions

Two functions are supported:
03 (Multiple Read)
06 (Single write)
The ASAC Series does not accept broadcast functions

Address	Function	Type	Description	
40002	Command	Write	1=Start 2=Stop 3=Reset 4=Quick Stop 5=Forced Comms Trip	
40003	Starter Status	Read	Bit 0-3 Description 0=Not used 1=Ready 2=Starting 3=Running 4=Stopping 6=Tripped	
			4	1=Forward Phase Sequence
			5	Unallocated
			6	Unallocated
			7	Unallocated
40004	Trip Code	Read	255=No Trip 1=Excess start time ¹ 2=Motor overload ¹ 3=Motor thermistor ¹ 4=Phase imbalance ¹ 5=Supply frequency 6=Phase sequence ¹ 8=Power circuit 16=Comms failure	
40005	Current	Read	¹	
40006	Temp	Read	¹	



CAUTION

Command, Starter Status, Trip Code, Current and Temperature must be sent individually. ie one data word request at a time

Examples

Command: Start

Message	Starter Address	Function Code	Register Address	Data	CRC
In	20	06	40002	1	CRC1, CRC2
Out	20	06	40002	1	CRC1, CRC2

Starter Status: ASAC Running

Message	Starter Address	Function Code	Address / Bytes Read	Number / Value	CRC
In	20	03	40003	1	CRC1, CRC2
Out	20	03	2	xxxx0011	CRC1, CRC2

Trip Code: Motor overload

Message	Starter Address	Function Code	Address / Bytes Read	Number / Value	CRC
In	20	03	40004	1	CRC1, CRC2
Out	20	03	2	00000010	CRC1, CRC2

6.12 AP ASCII Protocol

The details of the message fragments used in communicating with the ASAC Remote Operator are shown in the table below. The message fragments may be assembled into complete messages as described in the sections that follow.



CAUTION

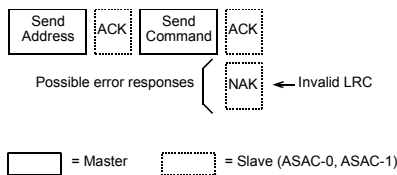
Data transmitted to and from the ASAC Remote Operator must be in 8 bit ASCII, no parity, 1 stop bit.

Message Fragment Type	ASCII Character String or (Hexadecimal Character String)
Send Address	EOT [nn] [lrc] ENQ or (04h [nn] [lrc] 05h)
Send Command	STX [ccc] [lrc] ETX or (02h [ccc] [lrc] 03h)
Send Request	
Receive Data	STX [dddd] [lrc] ETX or (02h [dddd] [lrc] 03h)
Receive Status	STX [ssss] [lrc] ETX or (02h [ssss] [lrc] 03h)
ACK (acknowledge)	ACK or (06h)
NAK (negative acknowledge)	NAK or (15h)
ERR (error)	BEL or (07h)

- nn = two byte ASCII number representing the soft starter address where each decimal digit is represented by n.
- lrc = two byte longitudinal redundancy check in hexadecimal.
- ccc = three byte ASCII command number where each character is represented by c.
- dddd = four byte ASCII number representing the current or temperature data where each decimal digit is represented by d.
- ssss= four byte ASCII number. The first two bytes are ASCII zero. The last two bytes represent the nibbles of a single byte of status data in hexadecimal.

Commands.

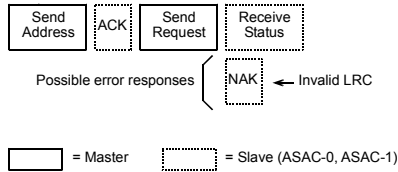
Commands can be sent to the ASAC Remote Operator using the following format:



Command	ASCII	Comment
Start	B10	Initiates a start
Stop	B12	Initiates a stop
Reset	B14	Resets a trip state
Coast to stop	B16	Initiates an immediate removal of voltage from the motor. Any soft stop settings are ignored.
Forced comms trip	B18	Causes a communications trip.

Status retrieval.

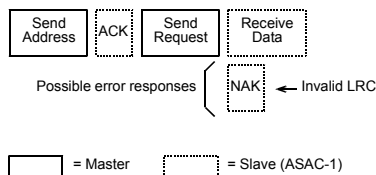
Starter status can be retrieved from the ASAC Remote Operator using the following format:



Request	ASCII	Receive Status (ssss)												
Trip Code	C18	Requests the trip status of the ASAC-0, ASAC-1. 255 = No trip 1 = Excess start time ¹ 2 = Motor overload ¹ 3 = Motor thermistor ¹ 4 = Phase imbalance ¹ 5 = Supply frequency ¹ 6 = Phase sequence ¹ 7 = Electronic shearpin ¹ 8 = Power circuit fault 16 = Comms failure ¹ ASAC-1 models only.												
Starter Status	C22	<table border="1"> <thead> <tr> <th>Bit No.</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0 - 3</td> <td>0 = Not used 1 = Waiting 2 = Starting (incl. Pre-start tests) 3 = Running 4 = Stopping 6 = Tripped</td> </tr> <tr> <td>4</td> <td>1 = Forward phase sequence detected</td> </tr> <tr> <td>5</td> <td>Unallocated</td> </tr> <tr> <td>6</td> <td>Unallocated</td> </tr> <tr> <td>7</td> <td>Unallocated</td> </tr> </tbody> </table>	Bit No.	Description	0 - 3	0 = Not used 1 = Waiting 2 = Starting (incl. Pre-start tests) 3 = Running 4 = Stopping 6 = Tripped	4	1 = Forward phase sequence detected	5	Unallocated	6	Unallocated	7	Unallocated
		Bit No.	Description											
		0 - 3	0 = Not used 1 = Waiting 2 = Starting (incl. Pre-start tests) 3 = Running 4 = Stopping 6 = Tripped											
		4	1 = Forward phase sequence detected											
		5	Unallocated											
6	Unallocated													
7	Unallocated													

Data retrieval.

Data can be retrieved from the ASAC-1 Series soft starter via the ASAC Remote Operator using the following format:





Request	ASCII I	Receive Data (dddd)
Current	D10	Requests motor current. The data is 4 byte decimal ASCII. Minimum value 0000 A, maximum value 9999 A.
Temperature	D12	Requests the calculated value of the motor thermal model as a % of Motor Thermal Capacity. The data is 4 byte decimal ASCII. Minimum value 0000%. Trip point 0105%.

Calculating the check sum (LRC).

Each command string sent to and from the ASAC Remote Operator includes a check sum. The form used is the Longitudinal Redundancy Check (LRC) in ASCII hex. This is an 8-bit binary number represented and transmitted as two ASCII hexadecimal characters.

To calculate LRC:

1. Sum all ASCII bytes
2. Mod 256
3. 2's complement
4. ASCII convert

For example Command String (Start):

ASCII STX B 1 0
or 02h 42h 31h 30h

ASCII	Hex	Binary	
STX	02h	0000 0010	
B	42h	0100 0010	
1	31h	0011 0001	
0	30h	0011 0000	
	A5h	1010 0101	SUM (1)
	A5h	1010 0101	MOD 256 (2)
	5Ah	0101 1010	1's COMPLEMENT
	01h	0000 0001	+ 1 =
	5Bh	0101 1011	2's COMPLEMENT (3)
ASCII	5 B		ASCII CONVERT (4)
or	35h 42h		LRC CHECKSUM

The complete command string becomes

ASCII STX B 1 0 5 B ETX
or 02h 42h 31h 30h 35h 42h 03h

To verify a received message containing an LRC:

1. Convert last two bytes of message from ASCII to binary.
2. Left shift 2nd to last byte 4 bits.
3. Add to last byte to get binary LRC.
4. Remove last two bytes from message.
5. Add remaining bytes of message.
6. Add binary LRC.
7. Round to one byte.
8. The result should be zero.

Response or status bytes are sent from the ASAC Remote Operator as an ASCII string.

STX [d1]h [d2]h [d3]h [d4]h LRC1 LRC2 ETX
d1 = 30h
d2 = 30h
d3 = 30h plus upper nibble of status byte right shifted by four binary places.
d4 = 30h plus lower nibble of status byte.

For example status byte = 1Fh, response is

STX 30h 30h 31h 46h LRC1 LRC2 ETX

6.13 4-20mA Output

The ASAC Remote Operator has a 4-20 mA analogue output for monitoring motor current.



CAUTION

The 4-20mA output is operational only when the Remote Operator is connected to ASAC-1 models.

Calibration The ASAC Remote Operator Motor FLC parameter (Par. 6) must be adjusted to match the Motor FLC setting in the soft starter. The 4 mA end of the analogue output signal can be calibrated using the Remote Operator Analogue Output 4 mA Offset parameter (Par. 7). This is set to give a 4 mA output signal when the motor current is zero.

Refer section 6.10 for the adjustment procedure.

The analogue output signal spans from 4 mA when the motor current is zero (ie, soft starter is not running) to 20 mA when the motor current is 125% of the Motor FLC setting in the Remote Operator parameter 6.

The 4-20 mA analogue output must only be used for motor current monitoring and metering. It is not designed for process signal control use.

6.14 Trouble Shooting

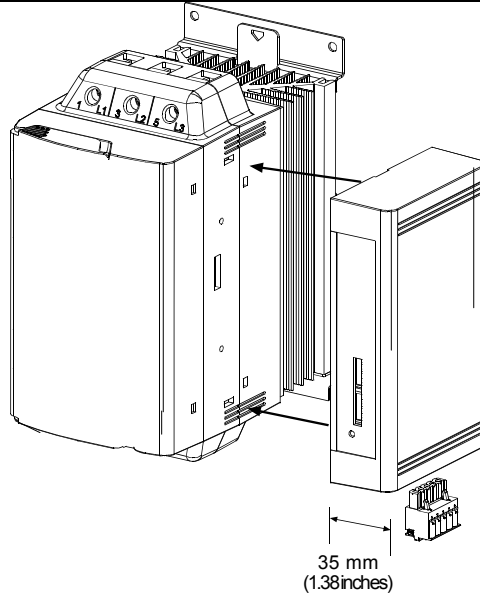
6.14.1 GENERAL FAULTS

Indication	Problem	Possible Solution
No display	No control supply voltage.	Check that correct voltage is present at terminals 1 and 2.
Four dashes on display and RS485 LED flashing	A loss of communication has been detected on the RS485 link to the soft starter.	Verify and solve the cause for loss of communication. If communication is restored before a soft starter RS485 Time Out trip, the display will regain active status and the RS485 LED will illuminate. If communication is restored after a soft starter RS485 Time Out trip, the display will indicate a trip code. Use the Reset pushbutton to reset the soft starter fault.
nEt on display	A loss of communication has been detected on the RS485 link to the network.	The Remote Operator has an RS485 Network Time Out Protection setting (Parameter 3). This mode is entered when loss of communication is longer than this time setting. If communication is restored the system becomes active again. To clear nEt on the display, press the DATA/PROG pushbutton momentarily.
	Incorrect or no 4-20 mA analogue output signal	Check the correct voltage is present at terminals 1 and 2. Check that correct polarity is used at terminals B10 and B11. Check that Motor FLC and Analogue Output 4 mA Offset parameters are set correctly.
	The motor cannot be started.	Check that control voltage is connected to the ASAC, and that terminals 01 and 02 are linked and connected to A1.

7 MODBUS INTERFACE

Part number: ZZ0071000

7.1 Installation



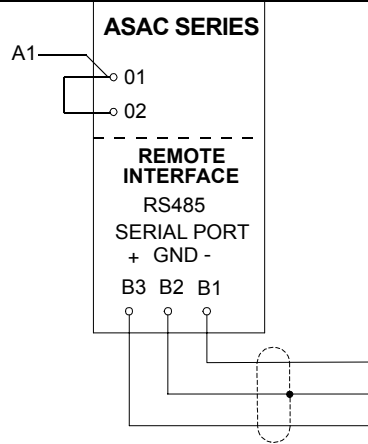
CAUTION

Control power and mains supply must be removed from the ASAC before attachment or removal of accessory modules. Failure to do so may result in equipment damage.

7.2 Adjustment

DIP SWITCH A	1	Protocol	AP ASCII	RTU		
	2		OFF	ON		
DIP SWITCH B	3	Address	Example: Address = 24			
	4		+16	0		
	5		+8	0		
	6		+4	0		
	NO		+2	0		
	ON		+1	0		
DIP SWITCH B	1	Baud Rate	4800	9600	19200	38400
	2		OFF	OFF	ON	ON
	3		OFF	ON	OFF	ON
	4		OFF	ON	OFF	ON
DIP SWITCH B	5	Parity	No Parity	ODD	EVEN	No Parity
	6		OFF	OFF	ON	ON
	NO		OFF	ON	OFF	ON
	ON		OFF	ON	OFF	ON
DIP SWITCH B	1	Time Out (seconds)	No Time Out	10 s	60 s	100 s
	2		OFF	OFF	ON	ON
	3		OFF	ON	OFF	ON
	4		OFF	ON	OFF	ON

7.3 Connection



7.4 Modbus register

¹ Only available from ASAC-1 units.

Address	Function	Type	Description	
40002	Command	Write	1=Start 2=Stop 3=Reset 4=Quick Stop 5=Forced Comms Trip	
40003	Starter Status	Read	Bit 0-3	Description 0=Not used 1=Ready 2=Starting 3=Running 4=Stopping 6=Tripped
			4	1=Forward Phase Rotation
			5	Unallocated
			6	Unallocated
			7	Unallocated
40004	Trip Code	Read	255=No Trip 0=Shorted SCR 1=Excess start time ¹ 2=Motor overload ¹ 3=Motor thermistor ¹ 4=Phase imbalance ¹ 5=Supply frequency ¹ 6=Phase sequence ¹ 8=Power circuit 16=Comms failure	
40005	Current	Read	¹	
40006	Temp	Read	¹	

7.5 Modbushex Functions

Two functions are supported:

03 (Multiple Read)

06 (Single write)

The ASAC Series does not accept broadcast functions



CAUTION

Command, Starter Status, Trip Code, Current and Temperature must be sent individually. ie one data word request at a time.

Examples

Command: Start

Message	Starter Address	Function Code	Register Address	Data	CRC
In	20	06	40002	1	CRC1, CRC2
Out	20	06	40002	1	CRC1, CRC2

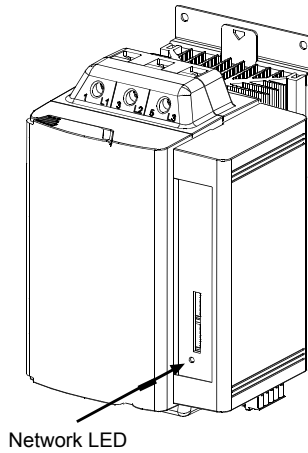
Starter Status: ASAC Running

Message	Starter Address	Function Code	Address / Bytes Read	Number / Value	CRC
In	20	03	40003	1	CRC1, CRC2
Out	20	03	2	xxxx0011	CRC1, CRC2

Trip Code: Motor overload

Message	Starter Address	Function Code	Address / Bytes Read	Number / Value	CRC
In	20	03	40004	1	CRC1, CRC2
Out	20	03	2	00000010	CRC1, CRC2

7.6 Network status led



OFF	ON	FLASH
No connection	Healthy communications	Communication failure



CAUTION

When a communications failure occurs the Network Status LED will flash. When communications are restored the Network Status LED will cease flashing.



CAUTION

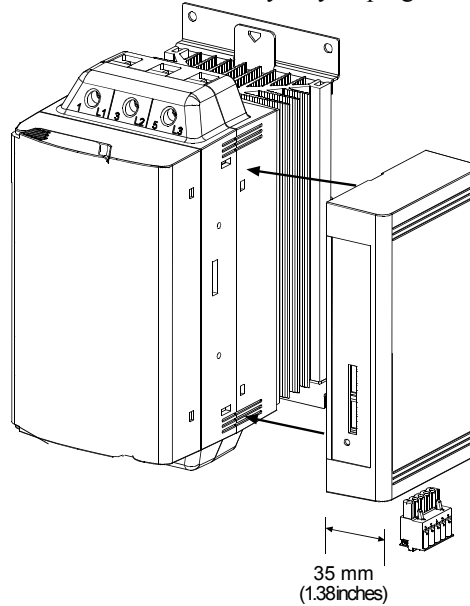
When a communications failure occurs, the ASAC will trip if the communication time out function has been set. When communications are restored the ASAC will require an independent reset.

8 OTHERS ACCESSORIES

8.1 Overview

The ASAC Series includes a range of others accessories including
Profibus Interface
DeviceNet Interface
ASi Interface
PC Set up Software

The accessory items interface with the ASAC Series starters by way of plug in module.



CAUTION

Control power and mains supply must be removed from the ASAC Series soft starters before attachment or removal of accessory items. Failure to do so may result in equipment damage.

8.2 Profibus Module

Part Number: ZZ_____

The Profibus Module can be used with both ASAC-0 and ASAC-1 models enable control and monitoring via a Profibus network.

Available 4nd Quarter 2004

8.3 DeviceNet Module

Part Number: ZZ0071001

The DeviceNet Module can be used with both ASAC-0 and ASAC-1 models enable control and monitoring via a DeviceNet network.

Available 4nd Quarter 2004

8.4 AS-i Module

Part Number: ZZ_____

The AS-i Module can be used with both ASAC-0 and ASAC-1 models enable control and monitoring via a AS-i network.

Available 4nd Quarter 2004

9 PC SET UP SOFTWARE

The PC Set Up Software can be used with ASAC-0, ASAC-1 and ASA soft starters to provide the following functionality for networks of up to 99 soft starters.

Feature	ASAC-0	ASAC-1	ASA
Operational Control (start, stop, reset, quick stop)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Status monitoring (ready, starting, running, stopping, tripped)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performance monitoring (motor current, motor temperature)		<input type="checkbox"/>	<input type="checkbox"/>
Upload parameter settings			<input type="checkbox"/>
Download parameter settings			<input type="checkbox"/>

System Requirements

- An x86-based personal computer (486 minimum, Pentium, or Pentium Pro). Pentium recommended.
- A hard disk with 6 megabytes of free space.
- A Microsoft Mouse or other compatible pointing device.
- An EGA, VGA, or compatible display (VGA or higher is recommended).
- 32 MB of random-access memory (48 MB recommended)
- Microsoft Windows 95/98/2000 and Windows NT or later
- An RS485 communication port or RS232 to RS485 converter

Additionally, each ASAC Series soft start connected to the network must be fitted with an MODBUS Module (ZZ0071000).