SQM

Sequence Control Module

Summary

The iMAC SQM Module is an Intrinsically Safe Sequence Control Relay output module that allows the iMAC System to sequence control Non-iMAC equipment. There are three SQM variants to suit 24 VDC, 110 VAC, or 240 VAC power supplies.

The iMAC System provides two dedicated control bits for sequence control. These two bits are called the 'Sequence Up' Bit and the 'Sequence Down' Bit and are generally used for conveyor sequence control but can be used for other user-defined applications.

The iMAC Controller can be programmed to instruct the SQM relay to energise when user-defined conditions are met. For example, the SQM relay can be driven by a contact input to the iMAC controller. The SQM also provides a voltage free digital input for reverse sequence operation.

There are no programmable parameters for the SQM Module; however, it will respond to iMAC Controller rollcall commands.
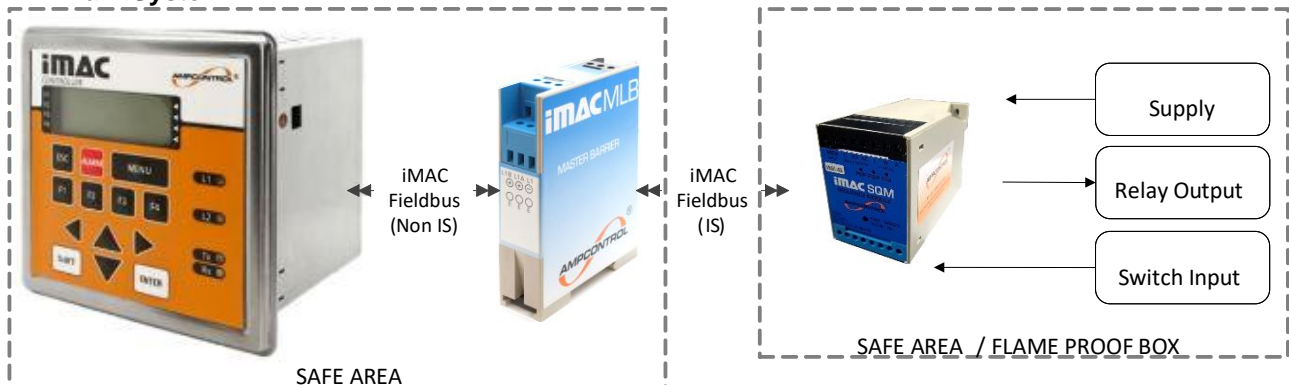
Data Register(s)

1 (Control/Status)

Features

- Intrinsically Safe IECEx [Ex ia] Group I Ma
- Provides a relay output for conveyor sequence control
- Provides a voltage free digital input for conveyor reverse sequence control
- Configurable sequence relay output delay
- iMAC Fieldbus electrically isolated
- Variety of power supply options
- Power healthy LED indicator
- Sequence relay energised LED indicator
- Reverse sequence digital input LED indicator
- Multifunction iMAC fieldbus diagnostic status LED
- Remotely monitored and controlled via the iMAC Controller
- Standard DIN rail or foot mounting

Minimum System

iMAC Fieldbus (Non IS)

iMAC Fieldbus (IS)

SAFE AREA

Supply

Relay Output

Switch Input

SAFE AREA / FLAME PROOF BOX

iMAC SQM Technical Datasheet
IMACB062 Version 3
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| CAUTION!	Modules used in non-I.S. systems shall not be re-used in I.S. systems (as the integrity of internal components upon which intrinsic safety depends may have been compromised).
	Inductive loads must include transient suppression (snubber) to prevent output relay contact damage (refer to output relay ratings).
	Custom iMAC Controller application software (SLP code) is required to operate this module.
	When connected to an iMAC intrinsically safe communication line, the iMAC SQM Relay must be installed in a safe area or a flameproof enclosure.

Electrical Connections

24 VDC Model
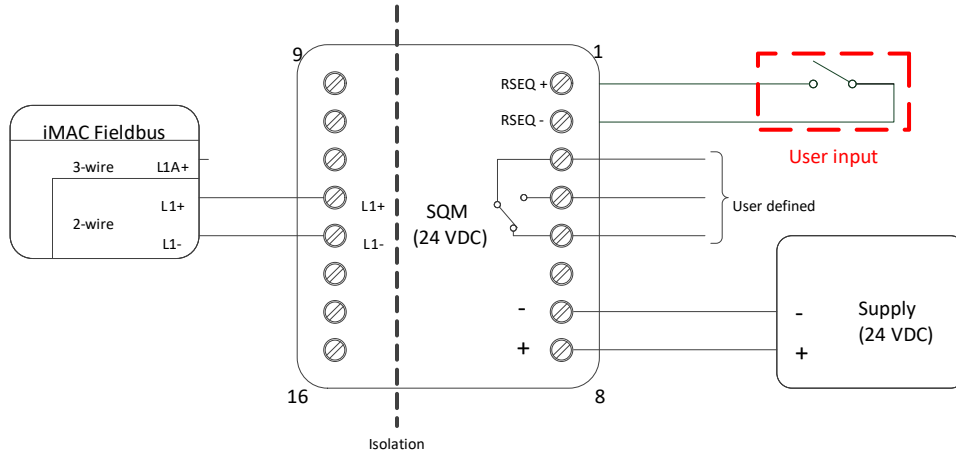
110 VAC Model
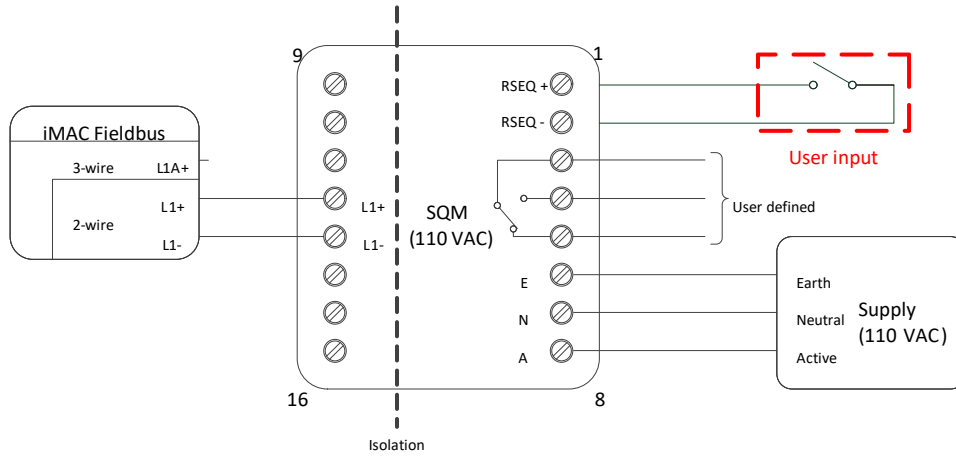
240 VAC Model
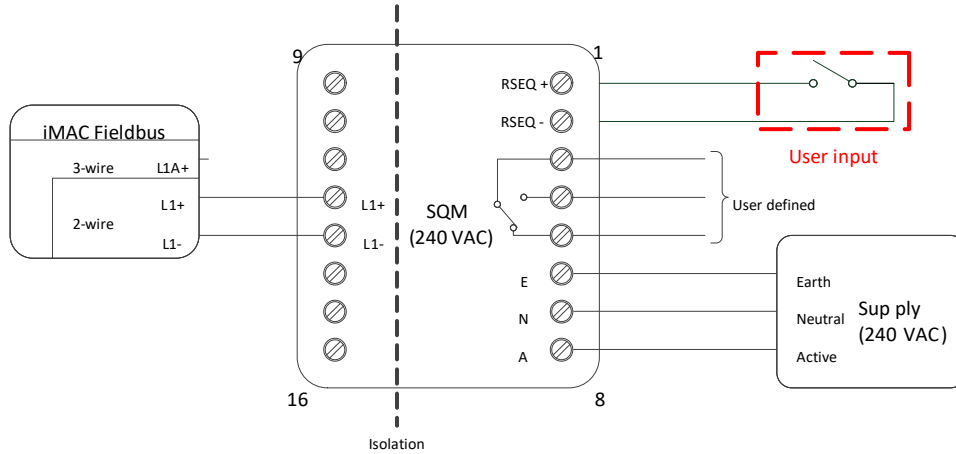
Note: refer to iMACB094 – iMAC Installation Requirements

Terminal	Label	Type	Description
1	RSEQ +	Switch input	Reverse sequence (feedback)
2	RSEQ -		
3	C	Relay output	Sequence (control)
4	NO		
5	NC		
6	E	Power supply input	AC / DC – model dependent (E connection required for AC models only)
7	N / (-)		
8	A / (+)		
9, 10, 11	-	-	-
12	L1+	L1 Comms	iMAC Fieldbus (2 wire)
13	L1-		
14, 15, 16	-	-	-

Data Register(s)			
iMAC Register			
Bit	**Description**	**Bit Value**	**R / W**
15	-	X	W
14	-	X	W
13	-	X	W
12	-	X	W
11	Assert Down bit on L1 (SeqDownOnL1)	1 = energise (SQM Relay)	W
10	-	X	W
9	-	X	W
8	-	X	W
7	-	X	R
6	-	X	R
5	-	X	R
4	-	X	R
3	Up bit from L1 (SeqUpFromL1)	1 = On (SQM RSEQ Input closed)	R
2	-	X	R
1	-	X	R
0	-	X	R

Configuration Parameters

(Refer to document IMACB005 - iMAC module parameters programming procedure)

Input Register Parameters (roll-call name: SQM Status)					
No	**Description**	**Range**	**Default**	**Units**	**R/W**
1	Not used (Fixed at 0)	0	0	-	R
2	Relay energize delay time	0 - 75 (4Bh)	0	S	R (set via rotary switch)
3	L1 comms – Checksum error counter	0 - 65535	0	-	R
4	Not used (Factory use)	-	-	-	R

Parameter Details…

Parameter 2: Relay energise delay time – set via the rotary dial behind the modules front cover.

Relay energize delay time selection			
Rotary switch	**Delay time (s)**	**Rotary switch**	**Delay time (s)**
0	0	8	40
1	5	9	45
2	10	A	50
3	15	B	55
4	20	C	60
5	25	D	65
6	30	E	70
7	35	F	75

Functional Logic

SQM modules can be connected at any location along the conveyor to provide additional sequence relay outputs for example sequencing side loading conveyors. Multiple SQM modules may be connected in an installation, the reverse sequence inputs operate in a wired-OR fashion; that is, if any of the connected SQM module reverse sequence input contacts are closed, the sequence up bit in the iMAC controller will be set. This bit will clear once all connected SQM module reverse sequence inputs are open.

The closing of the sequence control contact can be delayed by the adjustment of a 16-position time delay rotary switch, located beneath the front fascia. The delay is from 0 to 75 seconds and commences from the moment the iMAC Controller sequence down bit is asserted. The time delay is read at the time of applying power to the processor from the L1 line. That is, if the rotary switch setting is changed, the change won't take effect the module has been disconnected and reconnected to the iMAC L1 fieldbus or power is cycled to the iMAC Controller.

LED Indicators		
Status LED (RED)		
Flash Sequence		**Module - iMAC Comms Status**	**Module - Function Status**
Off		Unknown (check connections)	Unknown (check connections)
Slow Flash		Healthy	-
2 Flashes		Healthy (has been roll-called)	-
3 Flashes		Error (address clash)	-
Fast Flash		Warn (general)	-
Power LED (PWR)		
Off	The module is not powered	
On	The module is powered	
Sequence LED (SEQ)		
Off	Relay is de-energised	
On	Relay is energised	
Reverse Sequence LED (RSEQ)		
Off	The RSEQ+ input is open	
On	The RSEQ+ input is connected to RSEQ-	

| Certification / Approvals	
Intrinsic Safety	
Type	[Ex ia] I Ma
Certificate number	IECEx ITA 07.0017X
Module type	SA16
IP rating	Must be installed in an enclosure not less than IP20 (IP54 recommended)
Other	Must be installed in safe area or flame proof box. Must be connected in accordance with iMAC system drawing IMACZ032. L1+ L1- terminals must only connect to a single MLB (Master Line Barrier).
I/O parameters	Terminals 1 - 8 Um = 250 V Terminals 12 wrt 13 (L1+ wrt L1-) Ui = 21.5 V (44.65 R source resistor) Ci = Negligible Li = Negligible Uo = 0 V Io = 0 A
Ambient temperature (Ta)	-20 °C to +40 °C (refer to operating environment specifications)
This table is provided for quick reference purposes only: refer to latest issue of the Certificate of Conformity for all system designs.	

Certification / Approvals	
QPS	
File Number	LR1527
Model	115157 MODULE IMAC SQM 24VDC IECEx
Environment	Indoor use (or must be installed in a suitable outdoor enclosure with minimum IP54 rating) Altitude up to 2000 m Mains supply fluctuations up to 15 % of the nominal voltage Transient overvoltage's up to the levels of Overvoltage Category II Pollution Degree 2
Relay Output (1 C/O)	150 VAC @ 8 A or 30 VDC @ 5 A
The specified values approved by these standards may differ from the general specifications detailed elsewhere in this datasheet.	

Specifications		
Mechanical		
Dimensions (H x W x D)	75 x 55 x 110 mm	
Weight	230 g	
IP Rating	IP20	
Mounting	Standard 35 mm DIN rail (Top Hat Rail – EN50022)	
Electrical Connections	ERNI screw terminals (maximum wire size of 4 mm^2, maximum torque or 0.4 Nm)	
Environmental		
Operating Temperature	0 °C to +50 °C	
Power Supply (external)		
Voltage	24 VDC (±15 %)	110 VAC (±15 %)	240 VAC (±15 %)
Current (qty relays on)	7 mA (0) / 26 mA (1)	36.4 mA (4 W max)	16.7 mA (4 W max)
Digital Inputs (1 self-wetting)		
Limits	12 VDC @ <11 mA	
Relay Outputs (1 C/O)		
Limits	240 VAC @ 8 A (100 VA max) or 30 VDC @ 5 A (resistive) (100 VA max)	
Communications (iMAC L1)		
Hardware interface	2 wire (+/-18 VDC I.S. via MLB barrier or +/-21 VDC non I.S. iMAC Fieldbus)	
Line Speed	300 - 1000 baud	
Bit protocol	iMAC proprietary	
L1 Isolation	3.5 kV AC	
L1 Line Loading (baud)	Relay energised: 0.80 mA (300) / 1.32 mA (500) / 3.56 mA (1000)	
	Relay de-energised: 0.52 mA (300) / 0.82 mA (500) / 2.16 mA (1000)	
Find Out More		
For more information on this product, contact Ampcontrol Customer Service on +61 1300 267 373 or *customerservice@ampcontrolgroup.com* or visit the Ampcontrol website: www.ampcontrolgroup.com		

Dimensions

FRONT VIEW

SIDE VIEW
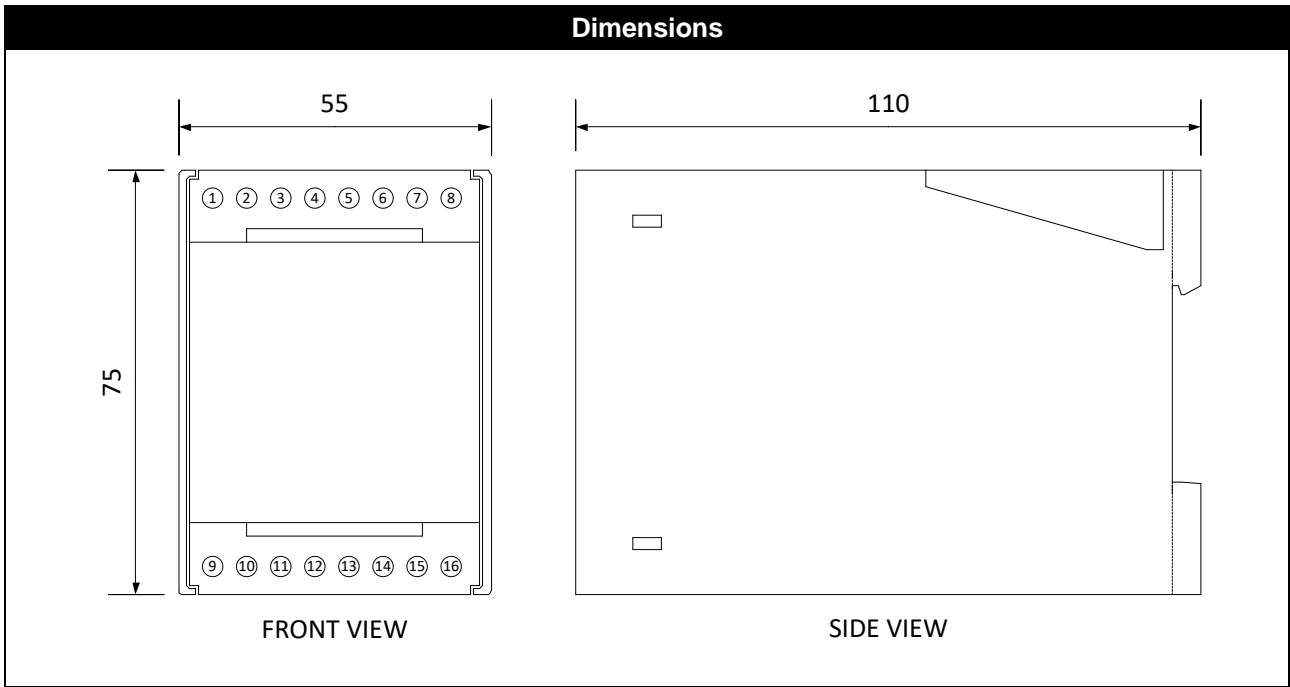
Equipment List	
Part Number	**Description**
115157	MODULE IMAC SQM 24VDC IECEx
115160	MODULE IMAC SQM 110VAC IECEx
115158	MODULE IMAC SQM 240VAC IECEx
141065	MODULE IMAC SQM 110VAC IECEx (South Africa)

DISCLAIMER

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