PSW Pre-Start Warning System User Manual

Issue: R3 Dec 2010

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Designed and Manufactured in Australia by Ampcontrol CSM Pty Limited ABN 35 000 770 141

User Manual Part No: 119158

AMPCONTROL®

Ampcontrol CSM Contact details

7 Billbrooke Close, Cameron Park, NSW, 2285
P +61 2 4903 4800 | F +61 2 4903 4888

EMAIL: electronicsorders@ampcontrolgroup.com
WEB: www.ampcontrolgroup.com

Safety and other Warnings

WARNING! 	This safety alert symbol identifies important safety messages in this manual and indicates a potential risk of injury or even death to the personnel. When you see this symbol, be alert, your safety is involved, carefully read the message that follows, and inform other operators.

CAUTION! 	This safety alert symbol identifies important information to be read in order to ensure the correct sequence of work and to avoid damage or even destruction of the equipment, and reduce any potential risk of injury or death to the personnel.

	Supplementary information not directly affecting safety or damage to equipment. Carefully read the message that follows, and inform other relevant personnel.

	Information concerning possible impact on the environment and actions required for prevention and proper response.

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Ampcontrol further reserves the right to alter the specification of the system and/or manual without obligation to notify any person or organisation of these changes.

Before You Begin

We would like to take a moment to thank you for purchasing the PSW Pre-Start Warning Device.

WARNING!	
	To become completely familiar with this advanced protection and control relay system and to ensure correct operation, we recommend that you take the time to read this user manual thoroughly.

If this document is being read via a computer the hyper links may be used (Press control and click on the blue highlighted text to go to that topic).

TABLE OF CONTENTS

1. Introduction

The Ampcontrol Pre-Start Warning System (PSW) has been designed by Ampcontrol to fulfil the requirements of the Australian Standard 1755 (Conveyor Safety Requirements), where pre-start warning devices are required on all new conveyors. The System also complies with Standard AS/ANZ 60079 parts 0 & 11 (Explosion protected, Intrinsically Safe) ANZEx 11.3003X.

Ease of installation into existing conveyors was an important design consideration incorporated in the PSW design. The existing coil connection to the main drive motor control relay is simply redirected through the PSW Controller. Also taken into account was the advance and retraction of conveyors, which is standard practice in underground mining applications.

The PSW Controller performs the necessary pre-start warning function when a start condition of the conveyor is initiated.

The controller has two relays used for control and fault indication. A LED display indicates system status and pin points fault locations. Four open collector, common emitter opto-isolated outputs allow monitoring by PLC/SCADA systems. Two 16 position rotary switches set the number of Audio Visual Modules (AVM's) connected to the system and the number of alarm cycles. This allows the system to be configured without power being applied.

The PSW Controller is DIN rail mounted and is powered from a dedicated power supply available with either 240VAC or 110VAC operation.

The controller is connected to the field AVM's using a twisted pair of conductors. The modules incorporate piezo alarms and high intensity LEDs to provide warning tones and a light flash that progress along the string of modules.

The AVM's are down line powered, eliminating the possibility of battery failure and increasing system reliability. Up to 15 AVM's can be installed on one Intrinsically Safe system. Multiple IS Systems can be used simultaneously on long conveyors or where additional modules are required.

2. Installation

The PSW Controller and Power Supply are installed in the conveyor starter. The Controller is connected to the respective control circuits and to the field AVM's by a minimum 0.75mm^2 twisted two-wire line (see Drawing PSW-A-005). The field modules are compact, offering a simple stud mounting direct onto the pullkey. Separate mounting is also an option.

The dedicated PSW Power Supply can be ordered in 240VAC or 110VAC options and provides power to the PSW Controller using 20-0-20VAC output connections.

3. Operation

Normal system operation begins once the control unit is powered up via the power supply module. However, if the test push button is depressed during power up, the system will enter a test mode. This mode is identified by illumination of the 7-segment display decimal point and should only be used by Authorized Ampcontrol Employees.

Once the system powers up normally it enters stand-by mode indicated by a hyphen " – " on the 7-segment display. The control relay will be de-energised and the auxiliary relay will be energised.

During stand-by mode the system waits on the initiate input becoming active. The initiate input must be active for 200ms before an alarm sequence will be activated. When a Pre-Start Alarm is initiated the rotary switch configuration is scanned and the read settings are used for the initiated alarm. The initiate input is checked at the end of each alarm cycle and if lost, the system stops the initiated alarm sequence and returns to stand-by mode.

The "Modules Rotary Switch" is used to select the number of modules connected to the control unit. If the rotary switch is set to 0, a worst-case value of 15 will be substituted. If the system detects a number of modules different from that set, an error condition results.

A "Too Many" (TM) error results if a greater number of modules are detected than the set number and the following condition will occur:

- The auxiliary relay will de-energise to indicate a fault.
- The "Too Many" OPTO/LED combination will activate.
- The number of the last module detected will flash on the display.

A "Too Few" (TF) error results if a fewer number of modules are detected than the set number and the following condition will occur:

- The auxiliary relay will de-energise to indicate a fault.
- The "Too Few" OPTO/LED combination will activate.
- The number of the last module detected will flash on the display.

The "Cycles Rotary Switch" is used to select the desired number of Pre-Start alarm cycles (x10). If the rotary switch is set to 0, a worst case value of 15 (x10 = 150) will be substituted.

The control relay energises after 50% of the Pre-Start alarm cycles have been completed. Both the control relay and auxiliary relay will de-energise if a fault is detected.

While the Pre-Start alarm is active, the "Alarm Active" (AA) OPTO/LED combination is activated and the 7-segment display shows the number of the currently operating AVM.

If a "Short Circuit" (SC) is detected the following will occur.

- The auxiliary relay will de-energise to indicate a fault.
- The control relay will de-energise if it was energised.
- The "Short Circuit" OPTO/LED combination will activate.
- The number of the module shorted will flash on the display indicating that the SC is somewhere between this module and the previous module. ie., the short circuit is somewhere between the red lead of the displayed module and the blue lead of the previous module or the module is faulty.

The system status is latched from the time it is determined until loss of the initiate input.

The system is a secure system. The control relay only energises if the system is operating correctly. The auxiliary relay is fail-safe, de-energising for any system fault.

System status is indicated by a combination of LED's and a 7 segment display according to Table 1, Page 9.

Setting BOTH rotary switches to zero can defeat the system. During this mode the control relay simply tracks the initiate input. ie. the control relay is energised while ever the initiate input is active. The letter "d" on the 7-segment display indicates this mode of operation. Note that the letter "d" only appears whilst the initiate input is active, during which time the control relay will be energised. Once the initiate input is lost, the display will return to the stand-by hyphen "–" and the control relay will de-energise. The auxiliary relay is unaffected during defeat mode, remaining energised.

The "Test" button can be momentarily depressed to cause a system test. When pressed the system operates as if the initiate input became active. The system will operate for the set number of cycles but the control and auxiliary relays are not affected.

If the system is healthy at the end of the set cycles the display will indicate the healthy state for about 5 seconds before returning to stand-by mode.

If a fault occurs the status LED's and 7 segment display will indicate the fault type and location for approximately 5 seconds before returning to stand-by mode.

4. Timing

The total duration of a Pre-Start alarm is given by the following formula:

Total Alarm Active Duration (AA) = Number of Set Cycles x (Number of Set Modules x 120ms + 555ms) seconds.

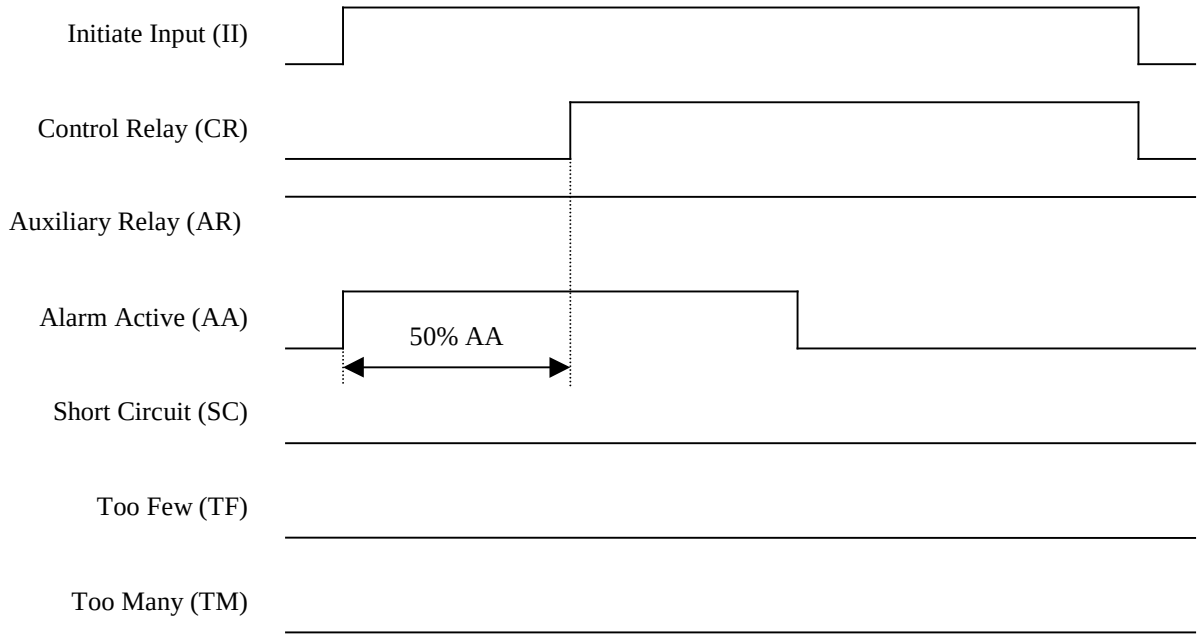


Figure 4.1 Logic Showing Healthy System Operation

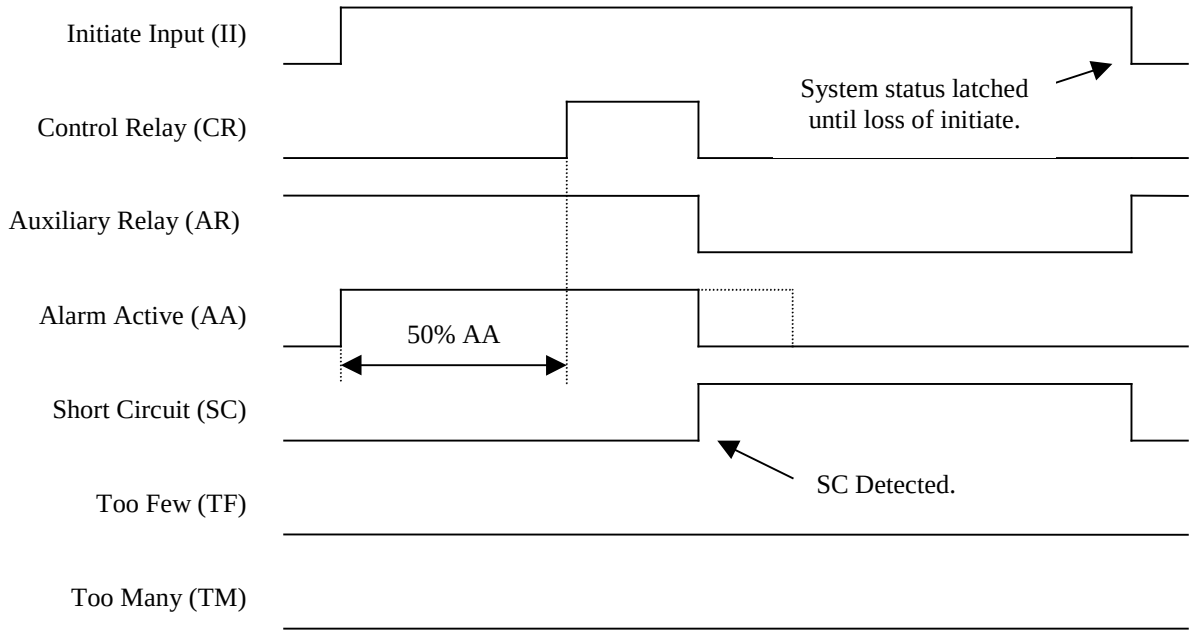


Figure 4.2 Logic Showing Short Circuit Fault

5. PSW Controller Status Indication

LED/OPTO	7 Segment Display	RELAYS	
		CTRL	AUX
Alarm Active (AA)	Indicates number of currently operating AVM	In *	In
Short Circuit (SC)	Indicates short circuit between displayed module number and previous module	Out	Out
Too Many (TM)	Indicates the total number of modules detected which is greater than the rotary switch setting	Out	Out
Too Few (TF)	Indicates the total number of modules detected which is less than the rotary switch setting	Out	Out
None	" – " Hyphen indicates standby mode	Out	In
None	" 8 " Figure 8 pattern indicates alarm issued	In	In

* Relay operates after 50% of the selected number of cycles have operated

Table 1

6. Equipment List

118803 PSW Controller
118812 PSW Audio Visual Module (AVM)
118833 PSW 110VAC/20-0-20VAC Power Supply
118834 PSW 240VAC/20-0-20VAC Power Supply

7. Specifications

PSW Controller

Power Supply
20-0-20VAC ± 10% 15VA 50Hz

Relay Outputs
Control Relay - 1 C/O 240VAC, 5A (100VA maximum for IS compliance)
Auxiliary Relay - 1 C/O 240VAC, 5A (100VA maximum for IS compliance)

Open Collector Opto Isolated Outputs
Alarm Active (AA), Short Circuit (SC), Too Many (TO) and Too Few (TF):
V_{CE} max = 28VDC
I_C max = 5mA
Common Emitter

Initiate Input
110~240VAC ±10% 50Hz

Cycles Rotary Switch
Number of Alarm Cycles = Switch Setting x 10

Modules Rotary Switch
Number of Audio Visual Modules (AVM's) = Switch Setting x 1

Dimensions
75H x 100W x 110D mm

Audio Visual Module (AVM)

AVM Piezo Sound Pressure Level
Piezo 90db, on an A-weighted ANSI Type 2 sound level meter at 2 feet (0.61m) on axis in free field, for each Piezo alarm.

Light Output
6 x 10mm high intensity red LED's

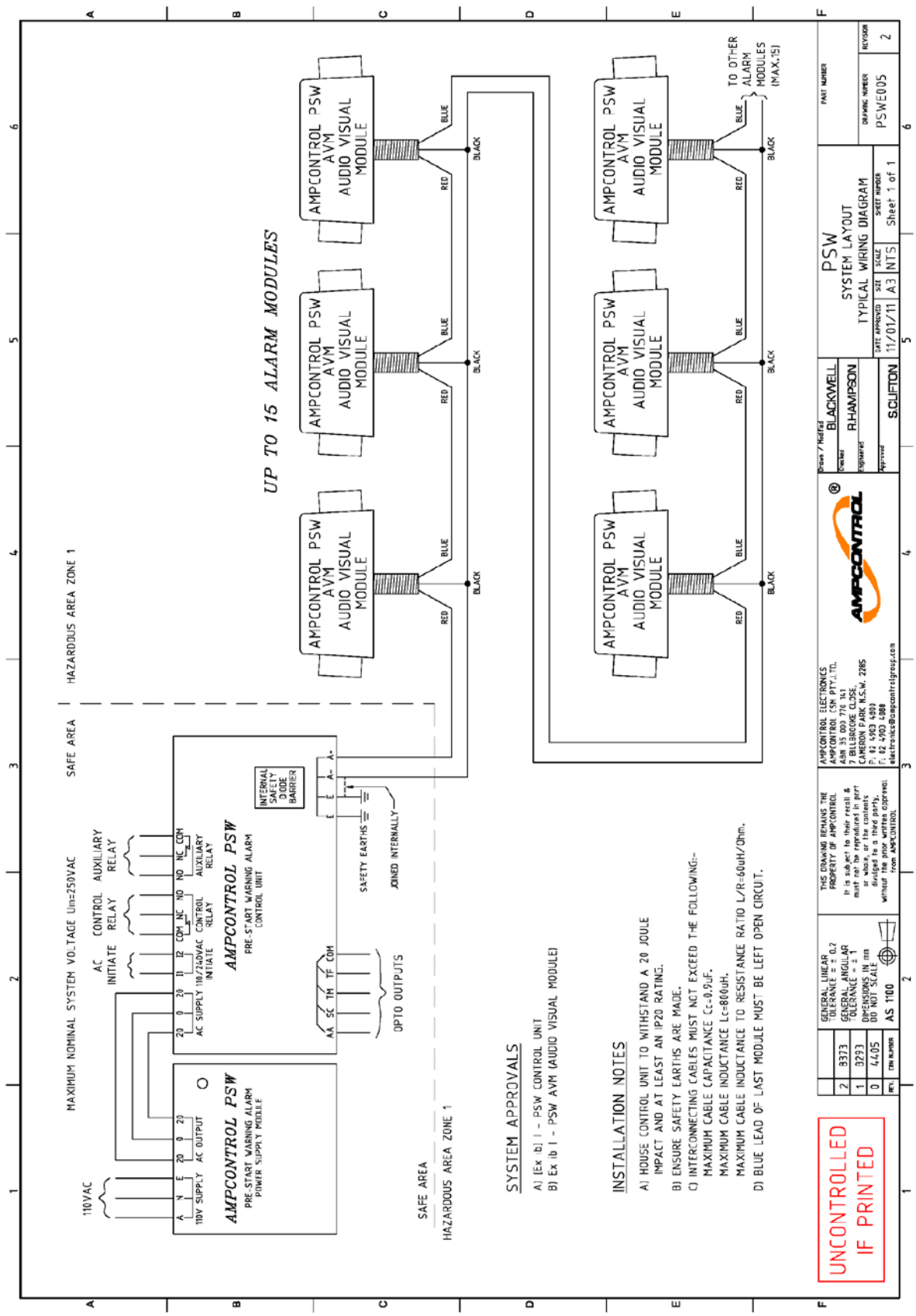
Dimensions
61.5H x 90W x 45D mm

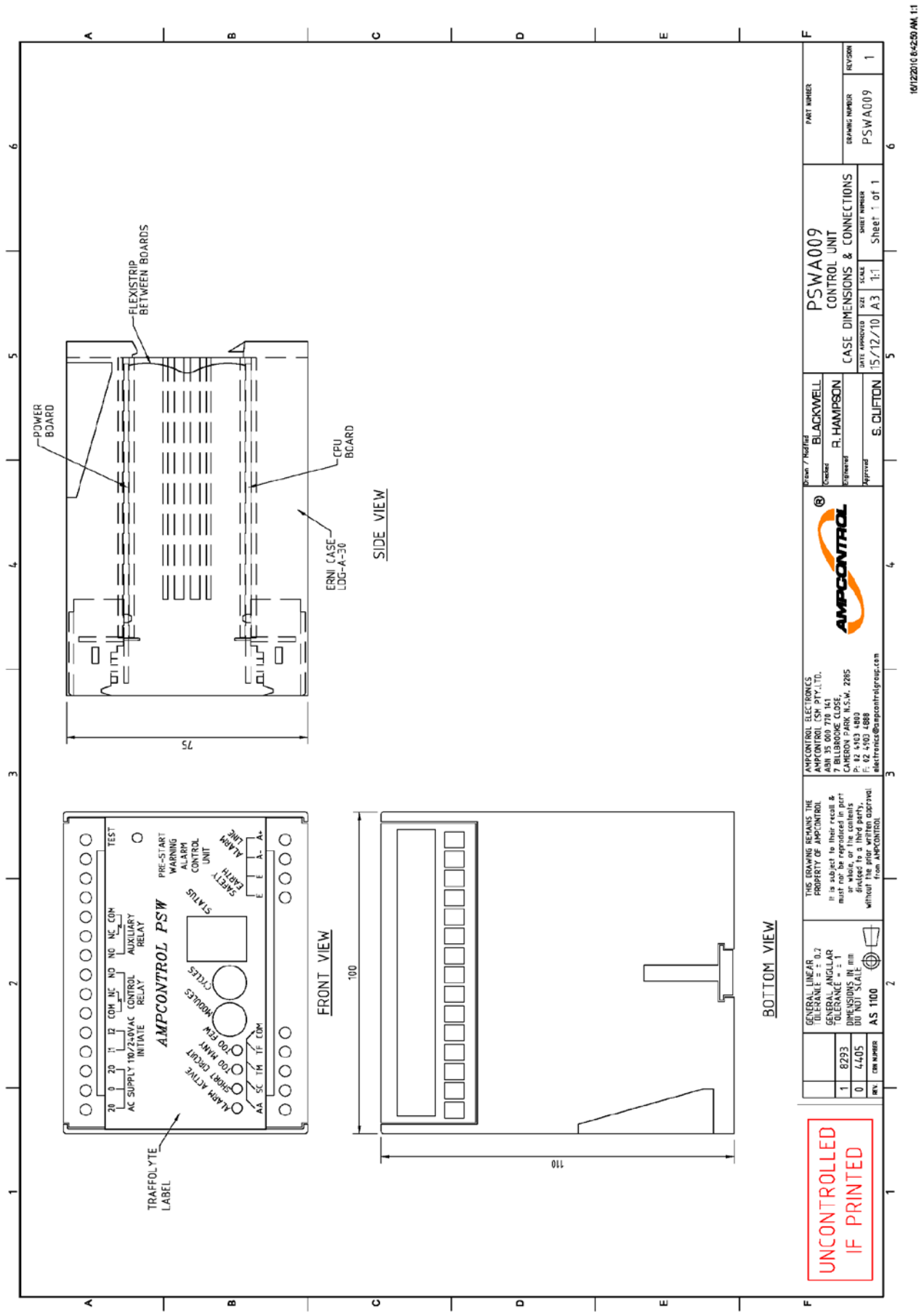
PSW Power Supply

Power Supply
110VAC ± 10% 15VA 50Hz
Or
240VAC ± 10% 15VA 50Hz

Dimensions
75H x 55W x 110D mm

8. Drawings


UP TO 15 ALARM MODULES
AMPCONTROL PSW AVM AUDIO VISUAL MODULE
TO OTHER ALARM MODULES (MAX.15)
HAZARDOUS AREA ZONE 1
SAFE AREA
MAXIMUM NOMINAL SYSTEM VOLTAGE Uin=250VAC
110VAC
AMPCONTROL PSW
PRE-START WARNING ALARM POWER SUPPLY MODULE
AMPCONTROL PSW
PRE-START WARNING ALARM CONTROL UNIT
AC INITIATE
CONTROL RELAY
AUXILIARY RELAY
INTERNAL SAFETY DIODE BARRIER
SAFETY EARTHS
JOINED INTERNALLY
OPTO OUTPUTS
SYSTEM APPROVALS
A) [Ex ib] I - PSW CONTROL UNIT
B) Ex ib I - PSW AVM (AUDIO VISUAL MODULE)
INSTALLATION NOTES
A) HOUSE CONTROL UNIT TO WITHSTAND A 20 JOULE IMPACT AND AT LEAST AN IP20 RATING.
B) ENSURE SAFETY EARTHS ARE MADE.
C) INTERCONNECTING CABLES MUST NOT EXCEED THE FOLLOWING:-
MAXIMUM CABLE CAPACITANCE Cc=0.9uF.
MAXIMUM CABLE INDUCTANCE Lc=800uH.
MAXIMUM CABLE INDUCTANCE TO RESISTANCE RATIO L/R=60uH/Ohm.
D) BLUE LEAD OF LAST MODULE MUST BE LEFT OPEN CIRCUIT.
UNCONTROLLED IF PRINTED
PSW
SYSTEM LAYOUT
TYPICAL WIRING DIAGRAM
PSWE005
Sheet 1 of 1


FLEXISTRIP BETWEEN BOARDS
POWER BOARD
CPU BOARD
ERNI CASE LDG-A-30
SIDE VIEW
75
FRONT VIEW
TRAFFOLYTE LABEL
AMPCONTROL PSW
PRE-START WARNING ALARM CONTROL UNIT
STATUS
TEST
AUXILIARY RELAY
CONTROL RELAY
AC SUPPLY 110/240VAC INITIATE
ALARM ACTIVE
SHORT CIRCUIT
LOW PRESS
LOW FLOW
MODULES
CYCLES
SAFETY EARTH
ALARM LINE
100
110
BOTTOM VIEW
UNCONTROLLED IF PRINTED
PSWA009
CONTROL UNIT
CASE DIMENSIONS & CONNECTIONS
BLACKWELL
R.HAMPSON
S.CLIFTON
15/12/10
A3
1:1
Sheet 1 of 1
PSWA009
AMPCONTROL ELECTRONICS
AMPCONTROL (SW PTY.LTD.
ABN 35 000 770 141
7 BILLBROOKE CLOSE,
CAMERON PARK N.S.W. 2285
P: 02 4903 4800
F: 02 4903 4888
electronics@ampcontrolgroup.com
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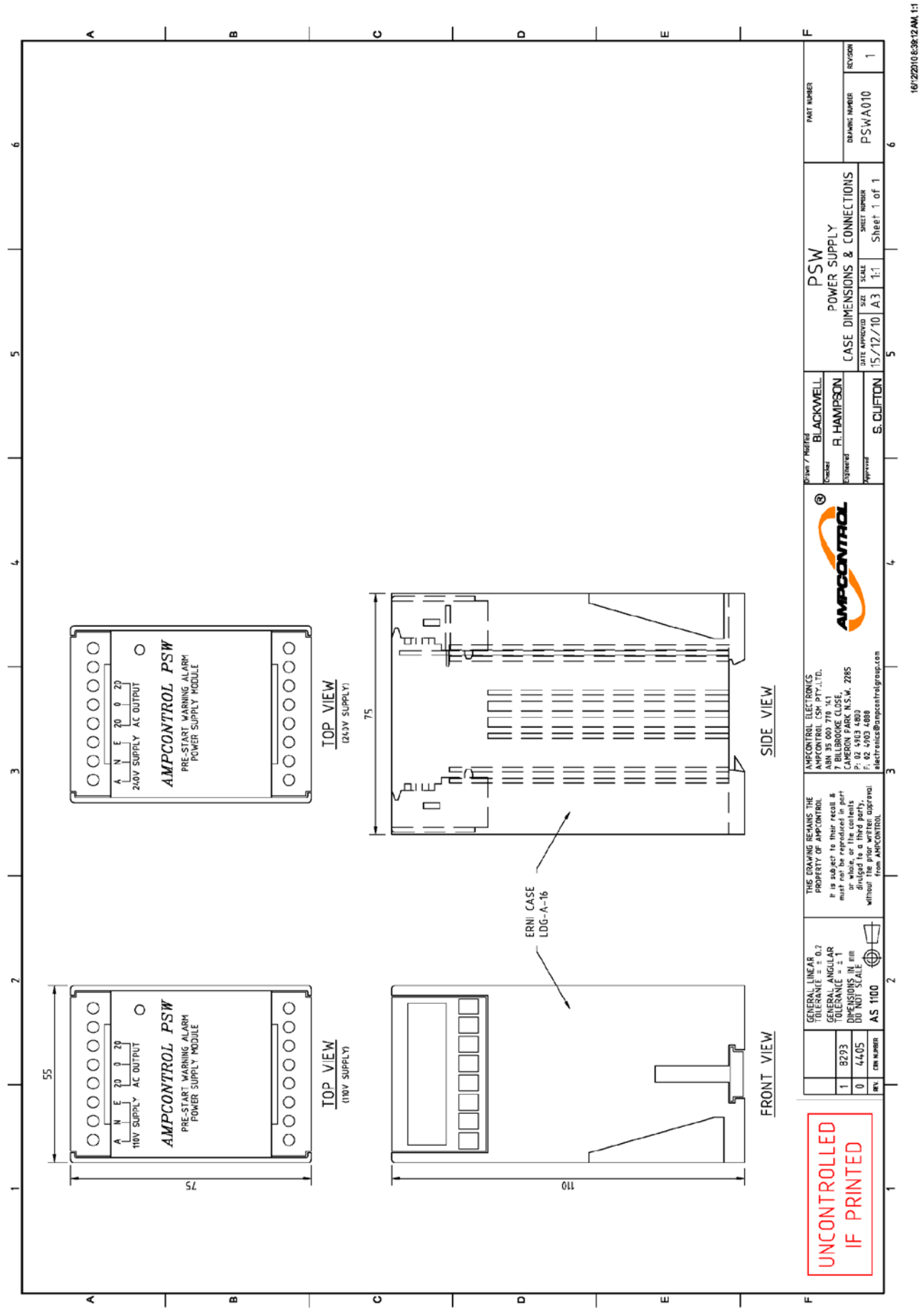
GENERAL LINEAR TOLERANCE ± ± 0.2
GENERAL ANGULAR TOLERANCE ± ± 1
DIMENSIONS IN mm UNLESS NOTED
AS 1100
1 8293
0 4405
16/12/2010 8:42:50 AM 1:1


AMPCONTROL PSW
PRE-START WARNING ALARM
POWER SUPPLY MODULE
A N E 20 0 20
240V SUPPLY AC OUTPUT
TOP VIEW
(240V SUPPLY)
AMPCONTROL PSW
PRE-START WARNING ALARM
POWER SUPPLY MODULE
A N E 20 0 20
110V SUPPLY AC OUTPUT
TOP VIEW
(110V SUPPLY)
ERNI CASE
LDG-A-16
SIDE VIEW
FRONT VIEW
75
55
75
110
UNCONTROLLED
IF PRINTED
PSW
POWER SUPPLY
CASE DIMENSIONS & CONNECTIONS
PSWA010
S. CLIFTON
R. HAMPSON
BLACKWELL
AMPCONTROL ELECTRONICS
AMPCONTROL (SW PTY.)LTD.
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GENERAL LINEAR TOLERANCE = ± 0.2
GENERAL ANGULAR TOLERANCE = ± 1
DIMENSIONS IN mm
DO NOT SCALE
AS 1100
8293
4405
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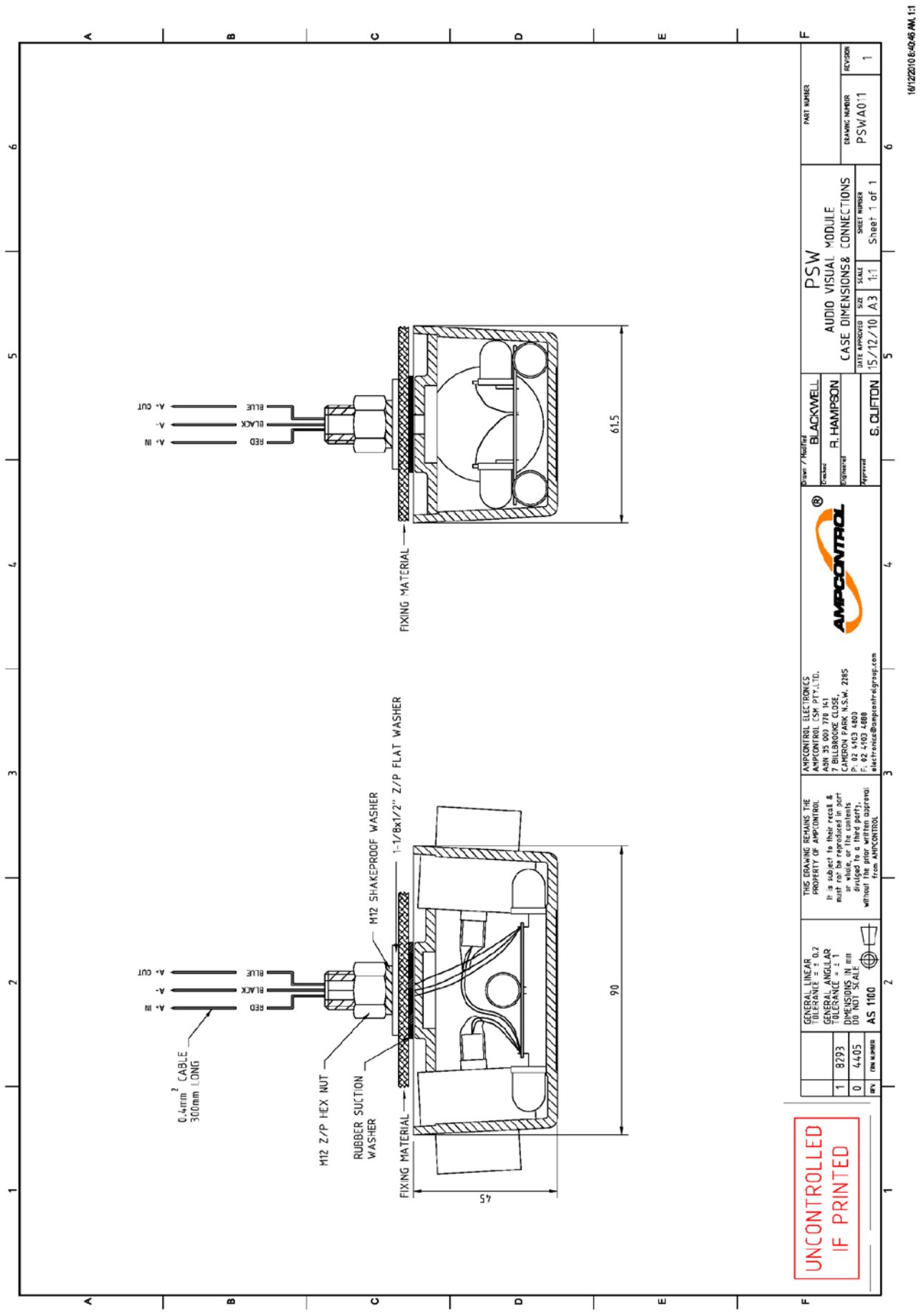
A+ IN
A- OUT
RED
BLACK
BLUE
61.5
FIXING MATERIAL
0.4mm² CABLE
300mm LONG
M12 Z/P HEX NUT
RUBBER SUCTION
WASHER
M12 SHAKEPROOF WASHER
1-1/8x1/2" Z/P FLAT WASHER
90
45
UNCONTROLLED
IF PRINTED
PSW
AUDIO VISUAL MODULE
CASE DIMENSIONS& CONNECTIONS
PSWA011
Sheet 1 of 1
AMPCONTROL ELECTRONICS
AMPCONTROL PTY LTD.
ABN 35 009 778 141
7 BILLBROOKE CLOSE
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GENERAL LINEAR TOLERANCE ± 0.2
GENERAL ANGULAR TOLERANCE ± 1
DIMENSIONS IN mm
DO NOT SCALE
AS 1100
DRAWN / Modified BLACKWELL
Checked R.HAMPSON
Engineered
Approved S.CLIFTON
DATE APPROVED 15/12/10
SIZE A3
SCALE 1:1
PART NUMBER
DRAWING NUMBER
REVISION
1
16/12/2010 8:40:46 AM 1:1

9. Approvals

Australian/New Zealand
Certification Scheme for
EXPLOSION-PROTECTED ELECTRICAL EQUIPMENT
ANZEx Scheme

Certificate of Conformity

Certificate No.: **ANZEx 11.3003X** Issue No.: **0** Date of Issue: **07 June 2011**

Applicant:	Ampcontrol CSM Pty Ltd 7 Billbroke Close Cameron Park NSW 2285 Australia
Electrical Apparatus:	PSW Pre-Start Warning System
Type of Protection:	PSW Control Unit: [Ex ib] AVM Audio Visual Module: Ex ib
Marking Code:	AMPCONTROL PSW Control Unit [Ex ib] I AMPCONTROL PSW AVM Ex ib I ANZEx 11.3003X
Manufacturer:	Ampcontrol CSM Pty Ltd 7 Billbroke Close Cameron Park NSW 2285 Australia
Manufacturing Location(s):	As above

The EPEE certification database located at http://www.anzex.com.au shows the validity of this Certificate.

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Certificate issued by:

TestSafe Australia
919 Londonderry Road, Londonderry NSW 2753
Australia
Phone: +61 2 4724 4900 Fax: +61 2 4724 4999
http://www.testsafe.com.au

www.jas-anz.com.au/register

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Australian/New Zealand
Certification Scheme for
EXPLOSION-PROTECTED ELECTRICAL EQUIPMENT
ANZEx Scheme

Certificate of Conformity

Certificate No.: **ANZEx 11.3003X**	Issue No.: **0**	Date of Issue: **07 June 2011**

*This certificate is granted subject to the conditions as set out in Standards Australia/Standards New Zealand Miscellaneous Publication **MP87.1:2008**.*

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

AS/NZS 60079.0:2005	Electrical equipment for explosive atmospheres - Explosion-protection techniques – Part 0: General requirements (incorporating amendment 1)
AS/NZS 60079.11:2006	Electrical equipment for explosive atmospheres - Explosion-protection techniques – Part 11: Intrinsic safety i

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standard(s) listed above.*

ASSESSMENT & TEST REPORTS:

The equipment listed has successfully met the assessment and test requirements as recorded in:

Test Report No. and Issuing Body:	32616A TestSafe
Quality Assessment Report No. and Issuing Body:	06.002/2010,TestSafe
File Reference:	2010/018088

Signed for and on behalf of issuing body

07 June 2011
Date of Issue

Quality & Certification Manager
Position

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This certificate is not transferable and remains the property of the issuing body and must be returned in the event of it being revoked or not renewed.

EPF019_16

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Australian/New Zealand
Certification Scheme for
EXPLOSION-PROTECTED ELECTRICAL EQUIPMENT
ANZEx Scheme

Certificate of Conformity

Certificate No.: **ANZEx 11.3003X**	Issue No.: **0**	Date of Issue: **07 June 2011**

Schedule

EQUIPMENT:

The Ampcontrol PSW Pre-Start Warning System is designed primarily for use on underground conveyors. The system consists of a PSW control unit which supplies power to up to fifteen AVM Audio-Visual modules installed in the hazardous area.

The PSW control unit consists of two printed circuit boards mounted in a plastic enclosure measuring 110 x 100 x 75 mm approximately. A power supply module provides the stepped down a.c. voltage to the control unit. This control unit is meant to be installed in safe area within host enclosure. The 'Earth' terminal on the control unit is infallibly connected to the protective earth.

The AVM Audio Visual Module consists of a single printed circuit board that is encapsulated in a transparent plastic enclosure measuring 90 x 62 x 45 mm approximately. Two piezo's protrude from each end of the module to provide an audio alarm. Six large LED's inside each module provide a visual warning.

CONDITIONS OF CERTIFICATION:

Conditions of safe use:

1. The following parameters are to be considered when installing:

Parameters PSW Control Unit	Terminal 20-0-20 AC Supply
Maximum Input Voltage Um	250 VAC

Australian/New Zealand
Certification Scheme for
EXPLOSION-PROTECTED ELECTRICAL EQUIPMENT
ANZEx Scheme

Certificate of Conformity

Certificate No.: **ANZEx 11.3003X**	Issue No.: **0**	Date of Issue: **07 June 2011**

2. Following cable parameters are to be considered when interconnecting PSW Control Unit and Audio Visual Module.

Cable Parameters	Terminals 'A+' and 'A-'
Cable Capacitance *Cc*.	0.9 µF
Cable Inductance *Lc*	800 µH
Or Cable Inductance-to-Resistance ratio *L/R*	60 µH/Ω

3. The PSW-Pre Start Warning Control Unit is to be mounted in host enclosure of IP20 in safe area.

DOCUMENTS:

Document Number	Sheets	Document Title	Revision	Date
PSWZ001	1	PSW Integrated I.S. System Overview	4	2011/01/11
PSWZ002	1	PSW Control Unit Internal I.S. Schematic	2	2011/01/11
PSWZ003	1	PSW Control Unit I.S. PCB Artwork	2	2010/11/25
PSWZ004	1	PSW Control Unit Assembly Details	1	2010/11/25
PSWZ005	1	PSW AVM (Audio Visual Module) Internal I.S. Schematic	2	2010/11/25
PSWZ006	1	AVM (Audio Visual Module) PCB Artwork	1	2010/11/25
PSWZ007	1	PSW AVM (Audio Visual Module) Assembly Details	1	2010/11/25
PSWZ008	1	PSW I.S. Labels Layout Details	8	2011/06/01
PSW-Z-009	1	PSW Serial Number Sticker Manufacturing Details	0	2011/02/09