

User Manual

A Series A420

Interface Converter

RS-232 ↔ 20mA Current Loop



The interfacing specialists

A420 User Manual

Version 1.10

May 1999

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Alfatron Pty Ltd ACN: 005 410 819
P.O. Box 4161
Unit 9/36 New St.
Ringwood VIC 3134
AUSTRALIA

Web Site: www.alfatron.com.au



1.0 PRODUCT DESCRIPTION

The A Series A420 is an RS-232C to 20mA Current Loop level converter incorporating both Transient Protection and Optical Isolation.

The physical layout of the product is shown in the following diagram:

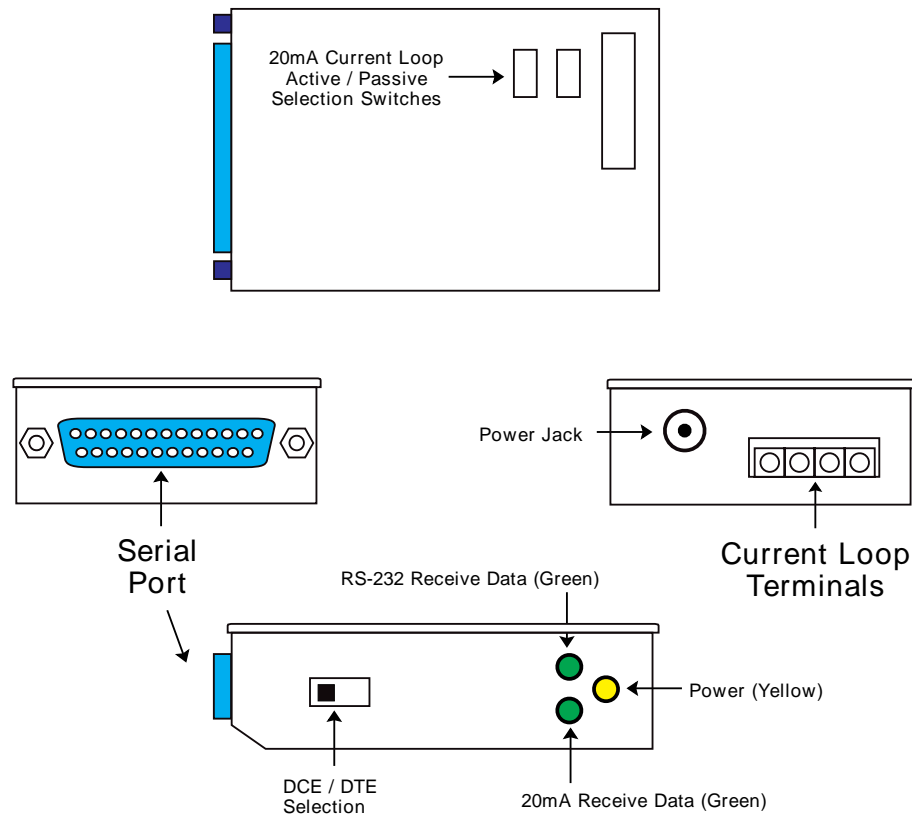


Figure 1.1 - A420 viewed from each angle

1.1 Overview of Features

The A420 has a number of features which make it particularly useful in industrial environments and inter-building connections:

- The Current Loop interface is particularly suited to environments with poor grounding or grounding problems.
- High data transfer rates are possible over long distances, e.g. 19,200bps at a 400 metre length.
- Optically isolated data lines provide immunity to ground imbalance, for example between buildings.
- High Speed Transient Voltage Suppressors on communication lines.
- Units may be ordered as a pre-set, fully isolated pair (2500Vac for 1 minute).
- Full duplex point-to-point communication uses only 4 wires, one pair each for receive and transmit data.
- Fully configurable Transmitter and Receiver sections - each unit may be either Active or Passive, so the unit may be used in any installation.

1.2 Isolation Details

The electrical isolation provided by the A420 is in three sections as follows:

(a) Power Supply Isolation

The A420 is supplied with authority approved power adapters which provide the initial mains supply to data link isolation.

(b) Isolation by Configuration

The 20mA Current Loop Transmitter and Receiver are optically isolated from the RS-232 interface giving the A420 very good Common Mode voltage tolerences.

In a 20mA Current Loop installation, typically, one side is configured as an isolated unit while the other is a non-isolated unit. The isolated unit has full breakdown isolation and is typically installed on the sensitive side.

(c) Data Link Isolation

The line drivers and receivers used in the A420 are specified to withstand 2500Vac for one minute. The design of the A420 allows this specification to be realised on the isolated unit.

1.3 Transient Protection

Power surges, or electrical transient voltages, can be induced into cabling by such things as lightning strikes, electric motors, switches and the operation of heavy industrial equipment. The use of long cables also increases the exposure to transient voltages.

A transient of the correct magnitude can destroy an unprotected interface converter. It is also possible for certain transients to pass though an unprotected interface converter and cause damage to the equipment which is attached.

By using High Speed Transient Voltage Suppressors on its communication lines, the A420 absorbs much of the transient energy on these lines and helps clamp these surge voltages to a safe level. This will ensure that both the A420 and any connected equipment are protected from damage due to transients.

The A420 uses a Transient Voltage Suppressor Diode on each of the following:

- Current Loop Transmitter and Receiver pairs
- RS-232 Transmitter and Receiver lines
- unused RS-232 handshake lines are tied to a common voltage rail

Each diode has a response time of less than 1ps, power dissipation of 1500 Watts for 1ms and a steady state power dissipation rating of 5 Watts.

1.4 Maximum Loop Lengths and Data Rates

In the A420 converter the maximum loop length is limited by the current loop cable resistance and the maximum data rate by the RS-232 driver. Typical data rate performance versus distance is shown in the following graph.

Please note that the maximum data rate of the A420 is 64kbps and that all loop lengths are measured in one direction only.

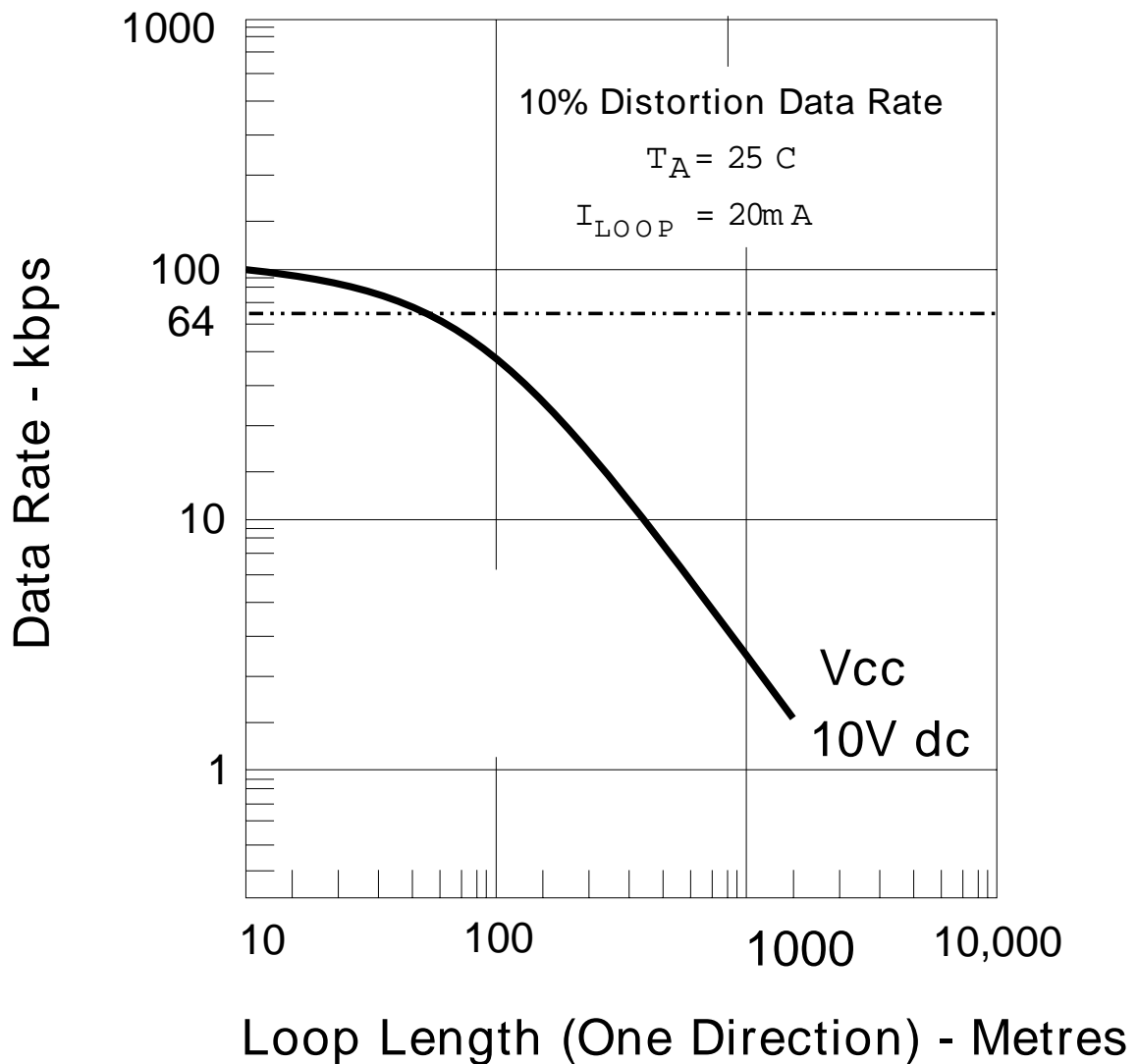


Figure 1.2 - Typical Data Rate vs. Distance

2.0 INSTALLATION

- All configuration and cabling to the A420 must be done while NO power is connected to the unit.
- No configuration required on the RS-232 Serial port, except for DCE/DTE selection, as the data rate is controlled by the driving device.
- On the 20mA Current Loop side the A420 is configured via two slide switches. These switches are located on top of the A420 as shown in Figure 1. For details of the switch configuration please refer to Section 6.
- Connect and secure the appropriate cables to the A420. Sections 4 and 5 contain details on cables along with various cable examples.
- After all cables have been connected and secured, insert the power plug into the jack socket and turn the power ON. The Yellow Power LED will illuminate and the A420 is now ready for use.

2.1 LED indicators

The Current Loop - Receive Data (RD) LED indicator will flash each time data is being received by the 20mA Current Loop Port.

The RS-232 Serial - Receive Data (RD) LED indicator will flash each time data is being received by the RS-232 Serial Port.

These LEDs will not operate at any other time.

Note: The 20mA Current Loop Standard specifies that 20mA in the loop represents the 'no data idle state' while 0mA represents the 'data state'. If nothing is connected to the 20mA Receive Data then the loop effectively carries no current, i.e. 'data state', and the Current Loop RD LED will remain ON.

2.2 Using A420s as RS-232 Line Extenders

A pair of A420s may be used to achieve connection of RS-232 devices over an extended distance. The A420s are connected via their 20mA Current Loop ports to take advantage of the greater data transfer distances and noise immunity available using the 20mA Current Loop protocol. Section 5 provides a cable example for this type of connection.

Please note that the RS-232 devices may only use Software (Xon/Xoff) Flow Control. The A420 does not permit Hardware (DTR/DSR) handshaking.

3.0 INTERFACE PORT PIN ASSIGNMENTS

3.1 RS-232 Serial Port Pinout

The RS-232C Serial Port of the A420 may be configured as DCE or DTE via a slide switch on the side of the unit as shown in Figure 1.

<u>Pin</u>	<u>Status</u>	<u>Set for DCE</u>	<u>Set for DTE</u>
1	Used	Frame Ground	Frame Ground
2	Input / Output	RD	TD
3	Output / Input	TD	RD
4	Not used-Pulled High 4K7	CTS	RTS
5	Not used-Pulled High 4K7	RTS	CTS
6	Not used-Pulled High 4K7	DTR	DSR
7	Used	Signal Ground	Signal Ground
8	Not used-Pulled High 4K7	DCD	DCD
20	Not used-Pulled High 4K7	DSR	DTR

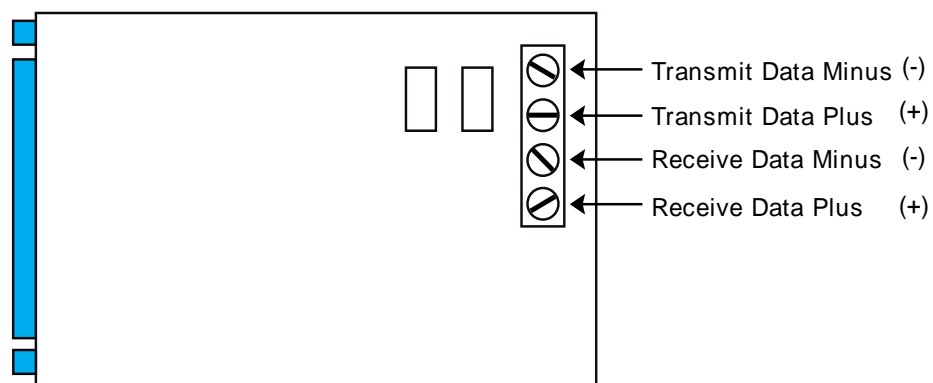
Note: Pins 4, 5, 6, 8 and 20 are pulled to the correct levels to allow a PC serial port to operate under most conditions without any additional loopback connections.

The Factory Default RS-232 Serial switch setting is DCE as follows:

DCE < > DTE



3.2 20mA Current Loop Port Pinout



4.0 CABLE REQUIREMENTS

Alfatron Pty Ltd recommends the use of shielded cable with all of its products. Shielding reduces Electro Magnetic Radiation and improves noise immunity. This helps minimise interference to other equipment and will improve the communications reliability.

4.1 Cable Construction

The recommended cable construction is as follows:

- Take the shield (surrounding cable wires) and solder it to the Frame Ground (FG) pin. If FG is not available, use Signal Ground (SG) but in this case always use a separate wire for ground which is connected at both ends.
- The shield must be connected at both ends of the cable.

4.2 Cable Diagrams

The cable diagrams in this manual represent the cable shield in the following manner:

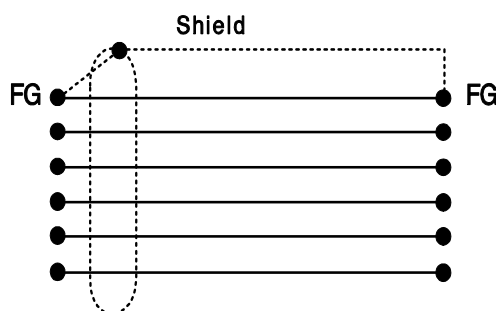


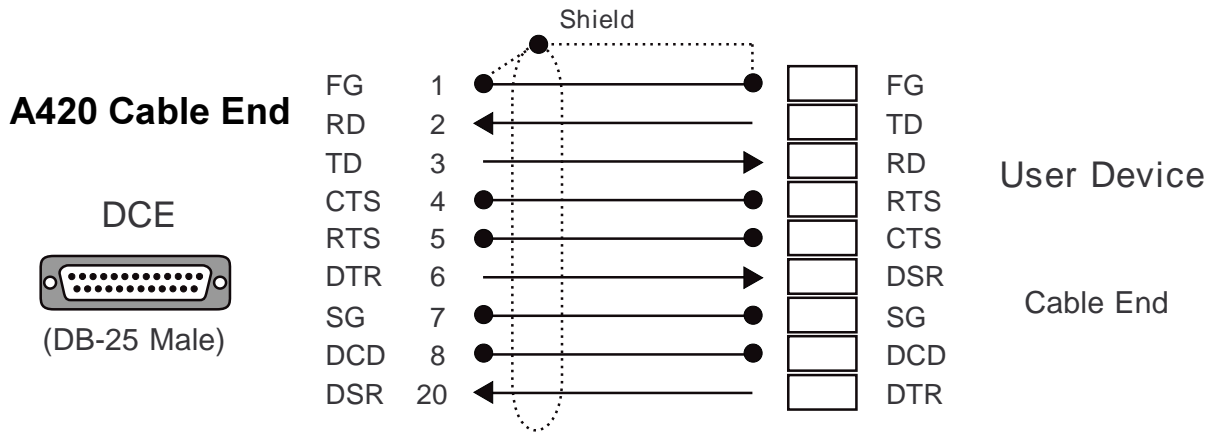
Figure 4.1 - Example of Shield representation in Cable Diagrams

This shows the shield soldered to FG at both ends of the cable and shows the shield running the full length of the cable. Please note that the shield is treated as a totally separate wire.

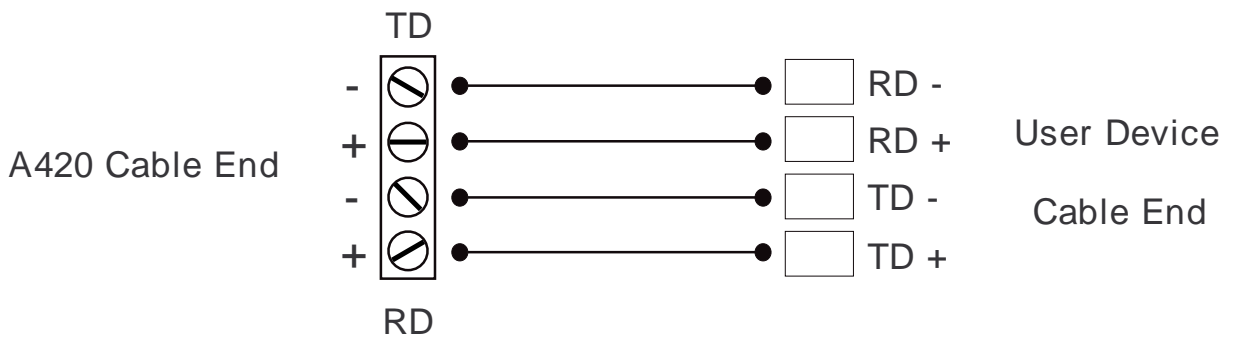
Note: The Current Loop should not be shielded because connecting it to 'Ground' at either side would render the optical isolation redundant.

5.0 CABLE EXAMPLES

5.1 RS-232 Connection to Other RS-232 Devices



5.2 Connecting 20mA Current Loop

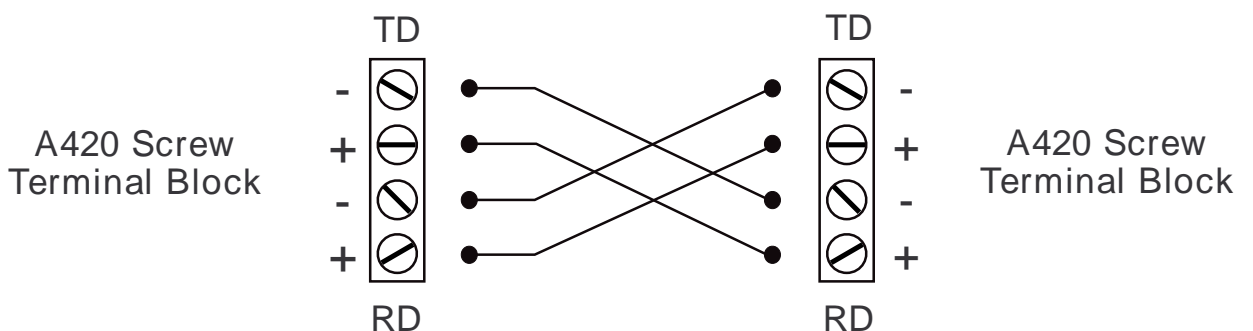


Note: Shielding and grounding wires are not recommended for Current Loop cables.

5.3 Using the A420 as an RS-232 Line Extender

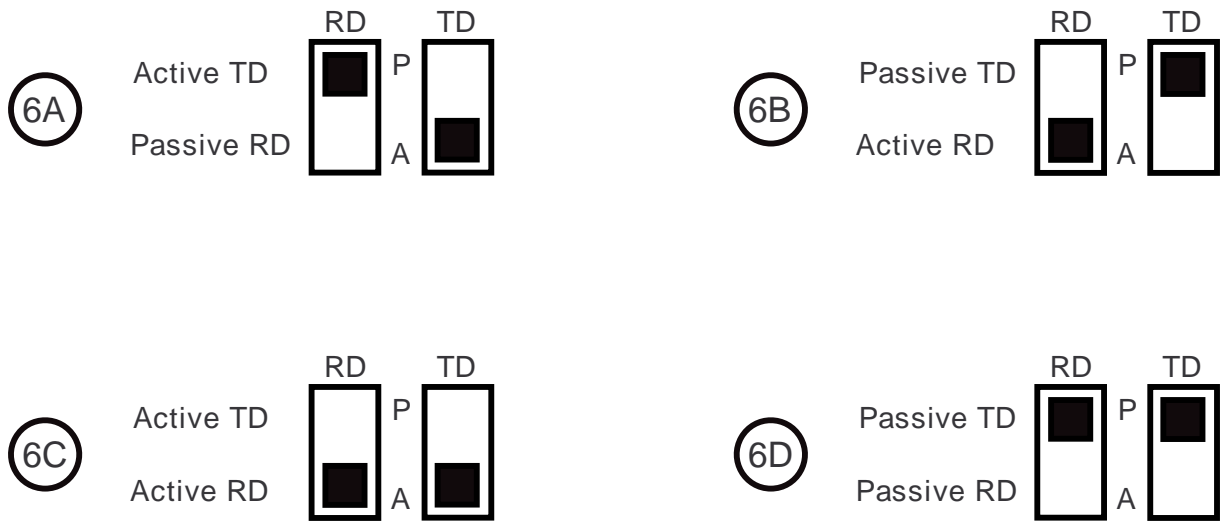
Two A420s may be connected together to extend the distance at which RS-232 data is transmitted. The A420s are connected together via the 20mA Current Loop ports. The following is an example of the cable used to connect A420s together via their 20mA Current Loop ports.

5.4 Cable for connecting A420s together



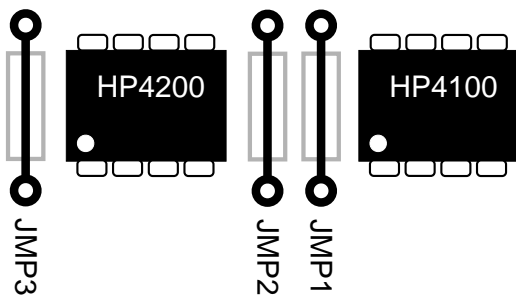
6.0 CURRENT LOOP CONFIGURATION

Refer to Figure 1.1 for the location of the 20mA Current Loop slide switches. The switch marked TD is for Transmit and the switch marked RD is for Receive.



6.1 Applications requiring Maximum Isolation

The A420 may be set up for maximum isolation of 2500VAC for one minute. To do this it is necessary to completely remove the tracks on the Printed Circuit board labelled JMP1, JMP2 and JMP3. These jumpers are located next to the optical isolating components labelled 'HP4100' and 'HP4200' as shown in the following diagram:




Note: When this modification is made the A420 can ONLY be configured as 'Passive Transmit' and 'Passive Receive'.

6.2 Factory Default

The A420 is shipped from the factory with the slide switches set to 'Active Transmit' and 'Passive Receive' as per item (6A) shown here and above:



7.0 SPECIFICATIONS

Serial Port:	Asynchronous RS-232C/V.24 Select as DCE or DTE DB-25 female connector Speed dependant on cable length - maximum 64kbps
Current Loop Port:	20mA Current Loop Optically Coupled 20mA Transmitter - HCPL-4100. Optically Coupled 20mA Receiver - HCPL-4200. Screw Terminal Block x 4 (2.5mm diameter). Receive Data and Transmit Data loops may each be configured as either ACTIVE or PASSIVE. Optically isolated for 20mA signal. Isolation in PASSIVE mode only.
Transient Protection:	Transient Voltage Supression Diodes used as follows: RS-232 - Transmit Data line. - Receive Data Line. - all unused handshake lines are tied to a common voltage rail. 20mA - Transmit Data pair. - Receive Data pair. Surge capacity of 1500 Watts per device at 1ms. Response Time of less than 1ps. Steady state power dissipation rating of 5 Watts.
Handshaking:	Software Handshaking (Xon/Xoff)
LED Indicators:	Receive Data - RS-232 (Green) Receive Data - Current Loop (Green) Power (Yellow)
Power Supply:	9V (200mA) DC Power Adapter Reverse polarity protection Plug jack - 5.5mm outer/2.5mm inner Outer Negative: 
Dimensions:	84mm x 58mm x 23mm
Weight:	160 grams
Operating Temperature:	10° to 35° C
Stroage Temperature:	0° to 45° C

All specifications subject to change without notice



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DECLARATION OF CONFORMITY

according to the European Commissions EMC Directive 89/336/EEC

We, Name of Manufacturer: ALFATRON PTY. LTD
of, Address of Manufacturer: UNIT 9, 36 NEW ST.
RINGWOOD VIC 3134
AUSTRALIA

Australian Company Number: ACN: 005 410 819

declare under sole responsibility that the product:

Product Name: ASeries RS-232 to 20mA Current Loop
Interface Converter

Model Number: A420

to which this declaration relates is in conformity with the following standards:

CISPR-22 / EN 55022 class B	EMI from Information Technology Equipment (ITE)
IEC 801-2 / prEN55024-2	Electro Static Discharge Immunity
IEC 801-3 / prEN55024-3	Radiated RF Immunity
IEC 801-4 / prEN55024-4	Electrical Fast Transients Immunity