

# ADC Series

# AMELEC

SIGNAL CONDITIONING

## Compact 'A' Series

### SIGNAL TRANSMITTERS, TRIP AMPLIFIERS, ARITHMETIC UNITS



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## About Us

Originally formed in February 1975, AMELEC remains a wholly owned British manufacturing company celebrating our 35th year anniversary. In 2010 & 2011 we were awarded **100% score** in **quality** accreditation by the Achilles-UVDB verify scheme.

The instrumentation that AMELEC offers to the market place is based on analogue techniques, using readily available discrete components. The instruments contain no time dependent or microprocessor circuitry, are suitable for use in SIL 1, 2 or 3 rated safety systems/loops & all covered by up to 10 Year warranty.

Our design & everyday application engineering principles used in the instruments are based on well tried, proven in use for over thirty years, linear operational amplifier circuitry. Each instrument can be considered as a number of functional blocks assembled together to produce a specific control function.

A Signal Conditioner / Transmitter would comprise of an input circuit; a modulator / demodulator stage; an output circuit and the power supply/regulation circuitry. A trip amplifier might use the same input circuit, this time a comparator and relay driver stage plus the power supply / regulation circuitry.

By combining these functional blocks together we have produced a comprehensive range of Trip Amplifiers, Transmitters, Signal Converters / Isolators, Signal Splitters/Boosters, combined Trip Transmitters, Arithmetic (Add / Subtract / Select / Multiply / Divide) units, Power Supplies, Strain Gauge, Frequency & AC I/V Transducers, as well as Hart compatible units. The circuit building blocks we use today are essentially the same as the ones we have used for the last thirty years.

To confirm that the instruments are compliant with the latest standards, AMELEC have submitted a range of instruments with all the various circuit blocks in them to the test houses. The reference / standards used at the test houses have been:- the CEGB's EES1989, the BS6667, IEC801 and more recently the IEC61000. All instrumentation produced by AMELEC is controlled under our Lloyds approved **ISO 9001:2008 Quality system**.

Our vast client base is spread across all process industry sectors; originally to the likes of the CEGB, BNFL, GEC, British Gas, ICI, BP & Shell, today AMELEC continues to supply quality instrumentation to the Nuclear, Power Generation, Oil & Gas, Chemical, Pharmaceutical, Petrochem, Utilities, Food & Brewery sectors, as well as to many other general manufacturing industries & the Water Authorities throughout.

### Here are some of our clients:



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**Client Feedback**

*"I recently had one of your trip amplifiers go faulty on me. The said item is at least 21 years old, and had been in service for all this time. I was really pleased when you told me that you could supply me with a direct replacement that would not need any modifications done to make it fit. It is very rare for electronic equipment not to be obsolete after a couple of years, never mind 21 years!"*

*In all my dealings with your company I have always been impressed with the quality of your products. The manuals provided with each item are excellent, as is your after sales technical help. I think that your 10 years warranty speaks volumes about your faith in your products. I would never hesitate I recommending your company to anyone"*



*"Many thanks for your prompt response.....Great Service!"*



*"Thanks for the fast response."*



*"Thank you for the great service."*



*"Thanks again for the prompt response."*



*"Thanks for your support."*



*"This is just what we needed, so many many thanks."*



*"Many thanks for your very prompt service...we thank you for helping us on this urgent request, it is much appreciated."*



*"Thank you very much...please say thanks to Oscar & David."*



*"I'd like to thank you for your quick response to our request, and for getting the item to us on time"*



*"I just want to say thanks to you and your staff for your speedy response and efforts, received the unit yesterday and works a treat!"*

# AD SERIES GENERAL SPECIFICATION

## INPUT DATA

### Input source

For details see individual specification

### Open circuit response

For details see individual specification.

### Input Impedance (Voltage input)

>1Mohm at amplifier input. This will be shunted by burnout drive or input conditioning components.

## SUPPLY DATA

### Power supplies

AC models 115 / 230 VAC  $\pm 20\%$

DC models 24VDC  $\pm 2.5V$

2 wire 12- 60VDC

### Consumption

Transmitter / Trip amplifier 3VA

2 Wire transmitter 250mW

## OUTPUT DATA

### Output signals

Standard units

Any constant current from 0-100uA to 0-20mA (at up to 20V loop) or any constant voltage from 0-1V to 0-10V (at up to 20mA loading).

### 2-wire units

4-20mA or 10-50mA as modulation of supply voltage.

### Response time

<400mSec. Unless otherwise stated.

Typical response time for a Trip with 4-20mA input; <150uS for 1% step change and <100mS for 100% step change.

### Relay specification

DP/DT or SP/DT for each trip, unless otherwise stated. Contacts are rated at 250 VAC, 2A, 100 VA (Resistive).

### Relay function

Selected by PC link. Default is normally energised, relay to de-energise on trip (fail safe operation).

### Relay status

Indicated by a red LED for each trip, mounted on the front panel. Lit when relay is energised.

### Controls

ZERO  $\pm 25\%$

SPAN  $\pm 50\%$

TRIP (When fitted) 0-100%

DEADBAND (When fitted) 1-20%

## CONDITIONS

### Ambient temperature

Working -20°C to +60°C

Storage -40°C to +70°C

### Humidity

From 5% to 95% RH.

### Vibration

1g at 15Hz to 150Hz.

## ELECTRICAL STANDARDS

### Insulation Input-output-contacts-earth

1000V RMS continuous. 2000V for 20uSec. Derate to 500VDC for option 'K' enclosures.

### Fusing

Power supply fused.

## WIRING AND MOUNTING

### Terminals

For conductors up to 2.5mm<sup>2</sup>

### Weight

<1kg per module.

### Position

Any position is acceptable.

### Mounting

Standard units will fit onto a low profile 35mm DIN rail or be surface mounted by corner fixing holes. Option 'K' and 'DI' enclosures are suitable for DIN rail or panel mounting.

### Additional protection

Enclosures are available to NEMA 12 oiltight, NEMA 4 watertight and IP54 for N-protection.

## PERFORMANCE

### Input/output linearity

<0.1% error, unless otherwise stated

### Series mode rejection

<01% error for 50Hz input at 5% of span amplitude.

### Common mode rejection

<01% error for 250V RMS.

### Temperature effect on zero

<0.02% per °C.

### Temperature effect on span

<0.01% of span per °C or <0.1°C per °C, whichever is the greater.

**Temperature effect on suppression/elevation** <0.02% of suppression/elevation per °C.

### Supply voltage effect

<0.01% per % input change.

### Trip adjustment

By multiturn potentiometers, which are accessible through the front panel.

### Deadband

Standard 1%. Also available adjustable from 1 to 20% by multiturn potentiometer. (To special order only)

### RFI rejection

Standard units meet the CE requirements. However, for additional RFI protection, specify option 'K'.

### Permissible Input overload

mV input 20V

DC voltage Input 200V

DC current Input 500%

AC voltage Input 200%

AC current input 500%

Resistance Input 6V



# Arithmetic units

## ADC311, scale and bias transmitter

Models may be specified for input from thermocouple, millivolt, RTD, slidewire or process source.

When RTD or slidewire input is specified, third wire compensation is standard to reduce the effect of lead resistance. Thermocouple units have automatic cold junction compensation.

The output span may represent any portion of the input span, with control of offset and gain being by multiturn potentiometers, accessible through the front panel.

Output may follow input (rising input = rising output) or have a reversed characteristic (rising input = falling output).

Many other combinations are possible since the unit is designed to be customised to suit individual applications. Please consult our Technical Sales Department for further details.

## ADC312, square root extractor

This unit is designed to operate with any standard process voltage or current source.

It regards both input and output span - which need not necessarily be the same - as 0-1 and will convert 0.01 - 1 (1-100%) of input span to 0.1 - 1 (10-100%) of output span, using a square root law.

Since output accuracy is not specified below 1% input (10% output) a zero cut-off is fitted which will operate when the input moves into this region. It is normally preset to 0.5% and, while the input is between 0% and this level, the output will remain at 0%.

ACCURACY: <0.25% while input remains between 1% and 100%

LINEARITY: <0.25% while input remains between 1% and 100%.

RESPONSE TIME: <1Sec for the output to settle within tolerance after an input step change from 5% to 95%.

## ADC316, high/low limiter

Models may be specified for input from any standard voltage or current process source.

Under normal conditions, the output will follow the input. However, two additional controls are fitted to establish upper and lower limits on the output.

The HIGH limit may be adjusted over the range 40% to 100% and the LOW limit over the range 0% to 60%. Both these controls are blindset potentiometers, accessible through the front panel.

# Arithmetic units & applications

## ADC353, linear integrator

### INPUT/OUTPUT WIRING

This unit is designed to accept input from any standard voltage or current source.

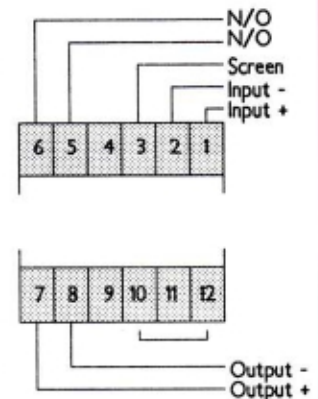
It will provide continuous integration and totalisation of quantities such as; flow, BTU, watt/hours volt/hours, etc.

Output pulses are 24V, 30mSec and are suitable for driving most electro-mechanical counters. If option 'R' is specified, output is also 30mSec pulses, from a set of voltage free contacts.

Output pulse rate is continuously adjustable from 0 - 50 to 0 - 50000 pulses per hour.

To ensure that spurious pulses are not generated at very low input levels, a zero cut-off control is fitted. This may be adjusted from 0 - 2% of input but is normally preset to .5%.

Input and output wiring is shown to the right. For supply wiring, please see page 14.



## ADC353 & ADC312, square root integrator

### INPUT/OUTPUT WIRING

This is designed to accept input from any standard voltage or current source.

It will provide continuous integration and totalisation of the output of devices such as; d/p flow transmitters, etc and, since it uses a square root law, enables total flow to be displayed in engineering units,

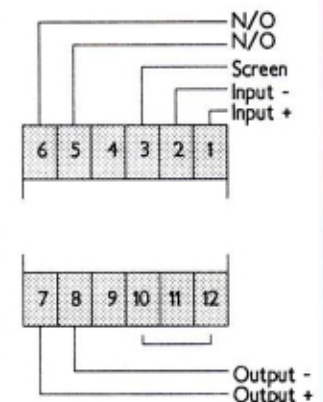
The input is applied to the ADC312, which conditions it with a square root law. It is then passed to the ADC353, which generates output pulses. The units are supplied as a pair. Pulse rate is continuously adjustable from 0-50 to 0-50000 pulses per hour.

Output pulses are 24V, 30mSec and are suitable for driving most electro-mechanical counters. If option 'R' is specified, output is also 30mSec pulses, from a set of voltage free contacts.

To ensure that spurious pulses are not generated at very low input levels, a zero cut-off control is fitted. This may be adjusted from 0 - 2% of input but is normally preset to .5%.

LINEARITY: <0.25% for inputs from 1 - 100%. Below 1% input, output is not specified.

Input and output wiring is shown to the right. For supply wiring, please see page 14.



## ADC353, & ADM280, pulse scaler

### INPUT/OUTPUT WIRING

This unit will accept input from any sine, square or triangular waveform from 100Hz to 10000Hz, provided the positive peak level exceeds the threshold level.

The pulses are converted to an analogue level by the ADM280 and passed to the ADC353, which generates output pulses at the desired rate.

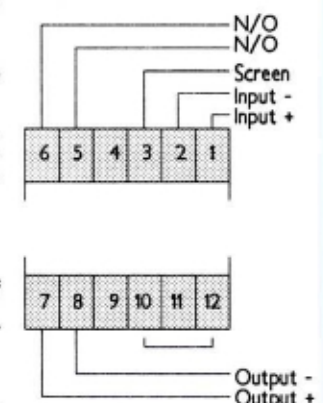
Output pulses are 24V, 30mSec and are suitable for driving most electro-mechanical counters. If option 'R' is specified, output is also 30mSec pulses, from a set of voltage free contacts.

Output pulse rate is continuously adjustable from 0 - 50 to 0 - 50000 pulses per hour.

To ensure that spurious pulses are not generated at very low input levels, a zero cut-off control is fitted. This may be adjusted from 0 - 2% of input but is normally preset to .5%.

The two units are tested together and supplied as a matched pair.

Input and output wiring is shown to the right. For supply wiring, please see page 14.





# Transducers

## ADP450/EP series, current/voltage transducer (With external power)

These are designed specifically for measurement of current or voltage in AC power applications.

Great care is taken to ensure absolute minimum burden on both the measuring and power supply inputs.

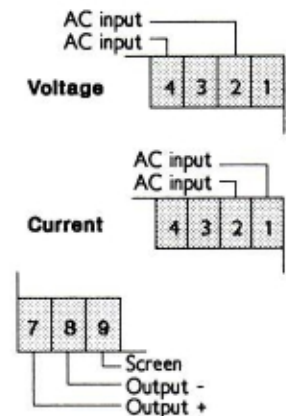
Any standard power supply or output signal may be specified.

Input may be any AC current from 0-1 to 1-10A or voltage from 0-150 to 0-600V.

### Models available

| Current input | Voltage input |
|---------------|---------------|
| ADP451/EP     | ADP452/EP     |

### INPUT/OUTPUT WIRING



For supply wiring, please turn to page 14.

## ADP450/SP series, current/voltage transducer (Self powered)

These will also measure current or voltage in AC power applications.

No external supply is necessary. All power for the unit is derived from the voltage or current being monitored. Despite this, burden is minimal.

Any constant output current may be specified from 0-1mA to 0-20mA, into any loop from 0-10V. Maximum output is 16V under open circuit loop conditions.

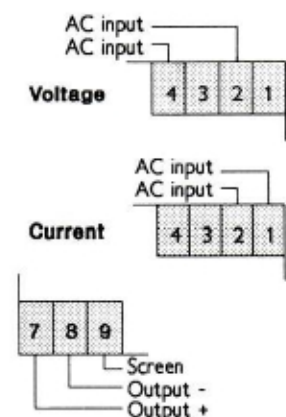
Input may be any AC current from 0-1 to 1-10A or voltage from 0-150 to 0-600V.

Accuracy/linearity: <0.5% from 1% to 110% input.

### Models available

| Current input | Voltage input |
|---------------|---------------|
| ADP451/SP     | ADP452/SP     |

### INPUT/OUTPUT WIRING



There is no separate supply wiring on this product.

## New products

The 'Compact A' series is a comparatively new range and, as such, is constantly under review.

The direction in which the range expands is largely dictated by customer demand and we are anxious to hear from you.

If you cannot find the instrument you require in this catalogue, and you wish to use a 'Compact A' product, please contact our Technical Sales Department. The product you require may already be in process of being engineered.

# Options

## Option 'DI', digital display

This 3½ digit indicator is available in 12.5mm LCD and is fitted to the top panel. It will display any level from -1999 to +1999 and has its own internal gain and offset controls allowing, for instance, full scale indication over a small portion of actual input span.

When this option is specified for use with a trip amplifier, 'READ' pushbuttons are fitted for each trip point.

Under normal conditions, the display will indicate the input to the unit, either as a percentage of total input or in engineering units. When a pushbutton is pressed, the display will indicate that tripset level, in the same units, allowing very accurate adjustment.

When using this option, the standard plastic enclosure is replaced with an extruded aluminium enclosure with an Alocrome finish. This is available in either DIN rail or panel mount versions.

## Option 'M', power supply

This is very similar to the ADP901/1 described on page 8 but is mounted internally. When fitted, it allows a standard unit to provide power to an external device, such as a strain gauge, input pre-amplifier or a 2-wire transmitter.

The output is adjustable over the range 2-25V at any current up to 25mA by an internal potentiometer which may, optionally, be fitted to the front panel. Load variation is better than 10mV over the full current range.

This option is available with a restricted range of products. Please contact the Technical Sales Department for further details.

## Other options

| Suffix | Description   |
|--------|---|
| /J★    | Input test injection jack.                                |
| /K★    | RFI protection to BS6667 Part 3.                          |
| /L     | Latched relay.  |
| /P★    | Calibration test point.                                   |
| /V     | Variable deadband (1-20% of span. To special order only). |

Some combinations of options are physically incompatible. If in doubt, please contact our Technical Sales. Those options marked with an asterisk are also suitable for 2-wire transmitters.



# Mounting and wiring

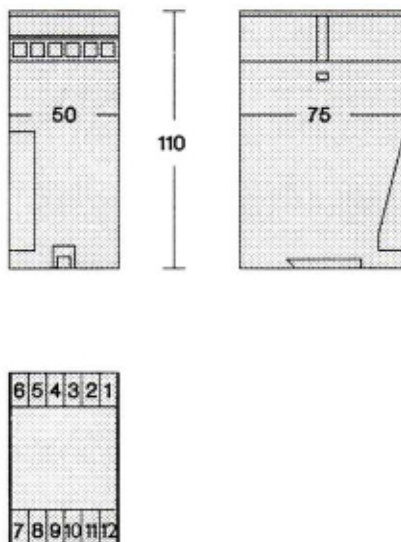
The standard method of mounting, unless options 'DI' or 'K' are specified, is a two-part plastic enclosure which is primarily designed for mounting to a low profile DIN rail, conforming to EN 50 022. Alternatively, the two external fixing holes may be used for securing the unit to a flat surface. These two holes are suitable for screws up to 4mm.

No tools are required when fitting a unit to a DIN rail. The moulded lugs at the base are simply hooked over one edge of the rail and, when the unit pressed firmly home, it will latch into place and be securely retained by a spring loaded metal clip. A screwdriver, or similar tool, should be used when removing the unit from a rail. It should be used to ease back the spring loaded metal clip, allowing the unit to be unhooked from the rail.

All input, output and supply connections are made via leaf type screw terminal blocks, which are integrally mounted just below the front panel. When wiring, provision must be made for a unit to be withdrawn from an enclosure without disturbing the wiring to adjacent units or the main wiring loom.

In the following drawings, all dimensions are in mm. Figures in brackets show the increased length of the option 'K' enclosure.

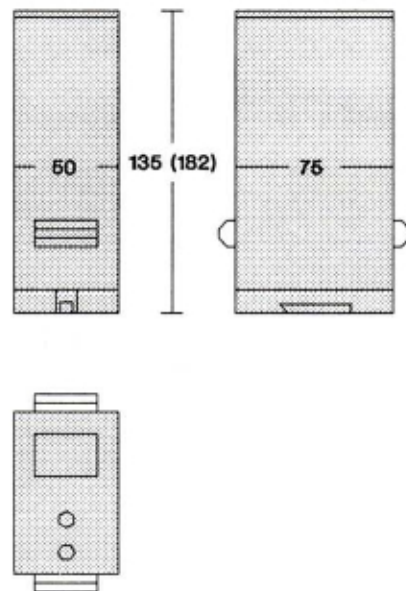
## Standard mounting



Option 'DI' and 'K' units are supplied in an extruded Anodised or Achromed aluminium enclosure and is available in two mounting options. Both of these are basically a 50mm X 75mm section extrusion with a display and/or any customer accessible controls/indicators accessible at the front. When both standard and 'DI' units are ordered, the standard units may be specified in matching metal enclosures.

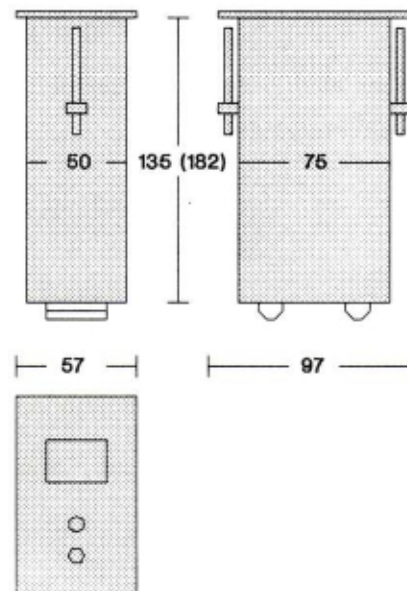
The first option is for surface mounting and is primarily for mounting to a low profile DIN rail. This option has two leaf type screw terminal blocks, which are mounted on the upper and lower surfaces of the enclosure (As seen when the unit is wall mounted to a horizontal DIN rail).

## DI & K DIN rail mounting



The unit is fitted to, and removed from, a DIN rail in much the same manner as a standard enclosure.

## DI & K Panel mounting



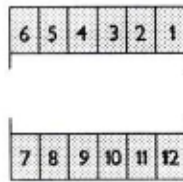
The second option is very similar to the above but is designed for panel mounting. This has a 57mm X 97mm front panel and the leaf type terminal blocks are mounted at the rear of the unit. These blocks will also accept cables up to 2.5mm<sup>2</sup>.

Only a screwdriver is required when fitting a unit to a panel. After the unit has been passed through the hole, from the front of the panel, the two fixing devices are clipped to the upper and lower surfaces of the unit and the screws are tightened against the rear of the panel.

# Mounting and wiring

## Types of termination

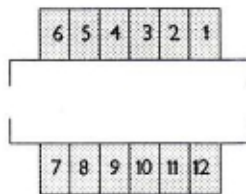
### Standard unit



Shown above is a front view of the terminal blocks on a standard plastic enclosure. The terminals are integral to the upper, removable, part of the enclosure.

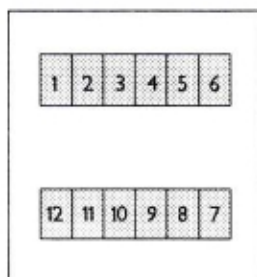
Under normal conditions, the terminal screw heads are protected by an engraved cover, which is retained by two compression clips. The cover has holes to allow access to controls and indicators.

### 'Dl' and 'K' DIN rail mounting



This is a view from the front, or top, of the terminals on the digital display or RFI rejection enclosure.

### 'Dl' and 'K' panel mounting



When viewed from the rear, the terminals are numbered clockwise from the top left rather than anti-clockwise from the top right.

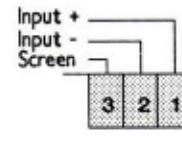
Throughout this catalogue, including on this page, all wiring drawings are shown based on the standard enclosure terminal layout.

When wiring a panel mounting unit, the terminal numbers should be regarded as more important than their physical location.

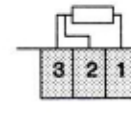
## Input wiring

Where input is specific to a particular unit, details are given in the individual specification sheet. Where a unit is specified for multiple input, details are given below.

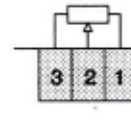
### Thermocouple, millivolt, process input



### Resistance temperature sensor

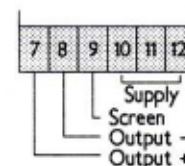
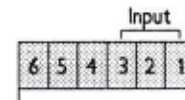


### Slidewire or potentiometer

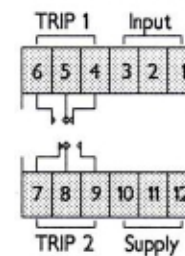


## Output wiring

### Transmitter, arithmetic unit

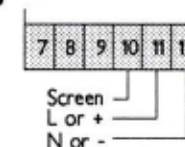


### Trip amplifier



On a single trip unit, both sets of relay contacts are operated by the single trip. On a double trip unit, each set of contacts is operated by its individual trip.

## Supply wiring





# Additional information

## Expansion to the range

The 'AH' range is still comparatively recent and is constantly being expanded. If the application you require is not covered in this catalogue, please contact our Technical Sales Department as the product may already be in process of being engineered.

## AGS products

Over the years, Amelec have been called upon to solve a wide variety of process control problems. Many of the resultant products have proved so successful they have become part of our standard range. Indeed, some appear in this catalogue as standard products.

Other products, however, are specifically designed to solve a particular problem. These models do not have sufficient demand to become standard products but, since they are manufactured to the same standard, they are kept on file, ready to solve similar problems for subsequent clients.

If you have a process control problem, please ask for our shortform AGS list. Alternatively, contact our Technical Sales Department, giving full details of the problem and they will either recommend an existing AGS product or design one to suit your particular application.

## Warranty and service

All Amelec products are guaranteed for ten years against faulty components or manufacture but not against misuse.

To claim under this warranty, equipment should be returned, carriage paid by the customer, to Amelec Instruments, Cochran Close, Crownhill, Milton Keynes, MK8 0AJ, together with details of the fault.

Attempted repairs or component replacement during the warranty period may render the warranty null and void, unless authorised by Amelec.

Amelec will undertake any repairs and will also supply replacement printed circuit board assemblies on an exchange price basis. Please contact the Technical Sales Department for further details.

Where the reported fault is a site problem, Amelec will make their own technical staff available to offer assistance. This service will be charged to the customer at the rate currently in force.

## Ordering

**When ordering, please give the following details:-**

1. Model number
2. Supply voltage and frequency
3. Mounting - Surface, Panel, Single end access or Rack
4. Input span, output span, offset and source
5. Open circuit response - If not specified, default is upscale for thermocouple, millivolt and resistance input units, downscale for process
6. Relay status and mode - If not specified, default is normally energised and single trips are set to Hi, double trips to Hi/Lo. LEDs are lit when relays are energised
7. Any options required
8. Information appropriate to any options ordered



## **Notes: Good Practice when installing any Din Rail mounted instrumentation**

To increase the life expectancy of your din rail mounted instruments, we recommend that the following guidelines are adhered to:

### **Mounting Instruments along a Din Rail**

Any signal conditioning/process control units will contain electronics which in certain conditions have to lose their excess energy as HEAT. Suppliers of such instruments cannot predict the site conditions or situations, so to make sure that hot spots do not occur it is recommended that electronic instruments are not bunched together horizontally in groups of more than FIVE units.

A space of 5-10mm every five units max will minimise temperature rise within that group of instruments.

If mounted vertically it is recommended that no more than two instruments are stacked together, then a minimum 5mm spacer between adjacent units/pairs.

### **Cabling/Relay Transient Suppression**

The electronics in process control units are generally mounted in a small enclosure, which by the very size means that the wiring entering and leaving each enclosure is physically close together. To avoid interference from one port to another we recommend the following rules of thumb:

- a) Power cables and wires that carry transients are routed separately to the signal wiring, ideally crossing at 90° to each other.
- b) Low level signal cables are kept as screened or twisted pairs where possible. On screened cables only earth the screen at one end.
- c) Relay contacts that switch inductive loads or other arcing devices should be suppressed, ideally at or across the inductance or other source.

On dc circuits a free wheeling diode should be used, it is PIV at least 4 times the working voltage.

On ac circuits, use an RC network, the values of the R and C chosen to match the L and R value of the coil itself.

These rules are very general, so if you encounter any specific problems please contact our sales support team for further assistance.

### **Amelec product**

The Amelec din rail mounted units are available in a number of product packages:-

**The Plastic enclosures**, which can be DIN rail or individually Surface mounted. They can be surface mounted by the corner fixing holes or clipped to the TS35 rail (light or heavy duty).

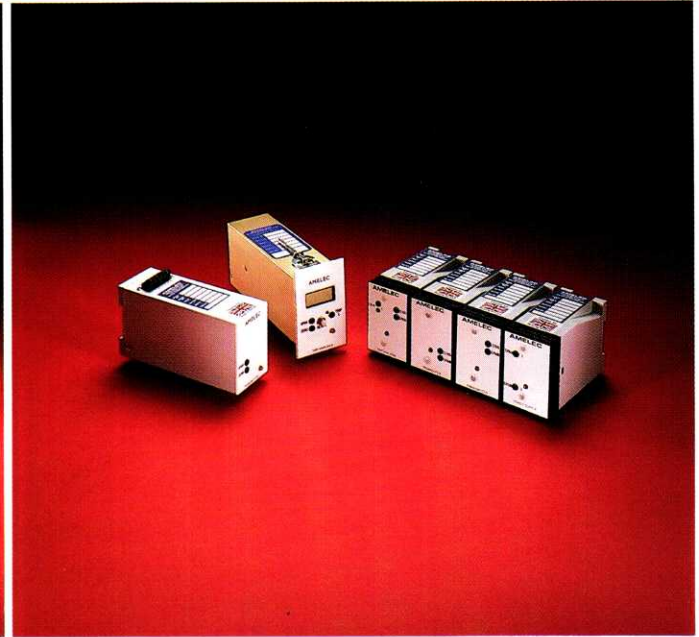
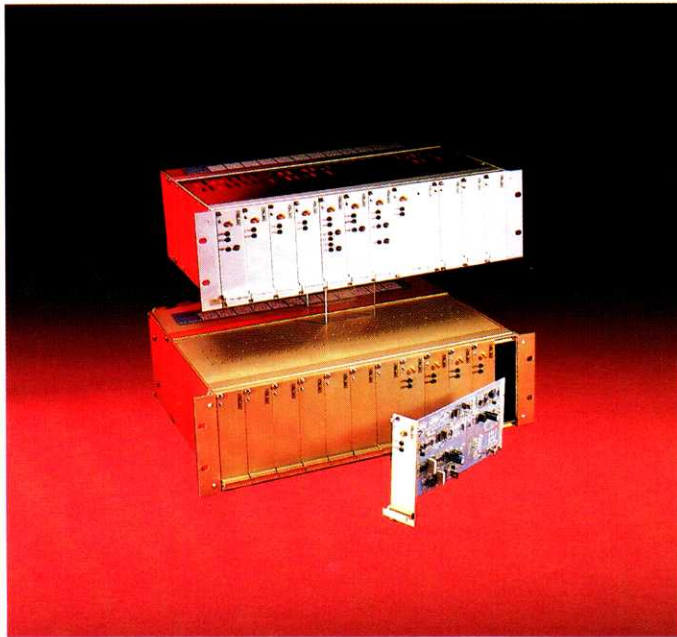
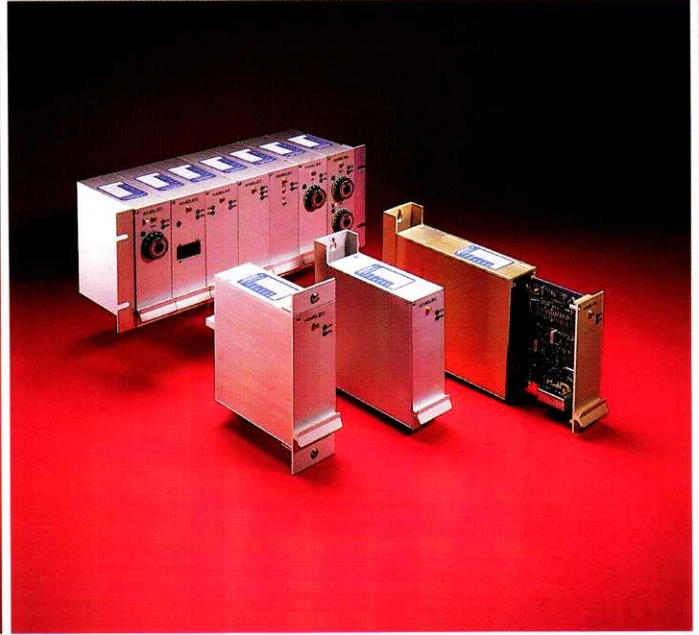
**The Metal enclosure** is supplied as standard for DIN rail mounting (TS35 heavy duty rail). An optional Keyhole plate is available to surface mount the instrument.

**The Panel mounted enclosure** is supplied in a metal enclosure. The panel cut out needs to be approximately 1mm more than the extrusion dimensions (50mm horizontally and 75mm vertically). Two brackets from inside your panel secure the units.

A complete range of Trip amplifiers, Signal conditioners and Arithmetic units are also available in these complementary ranges:-

**A** 4U X 12E Surface, Panel, SEA and Rack **AB** 3U X 7E Rack. **AD** DIN rail and Surface. **AH** 3U X 4E Rack

Please ask for our other catalogues



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