# CHANNEL ADJUSTABLE VOLTAGE SENSITIVE RELAY AVR4C

## *FEATURES*

- **Linear operation**
- **12Amp/ 120VAC relay contacts**
- **Cage clamp terminal block termination**
- **Four channel for staging**
- **Jumper selectable dual inputs**
- **LED relay position indication**

## *APPLICATIONS*

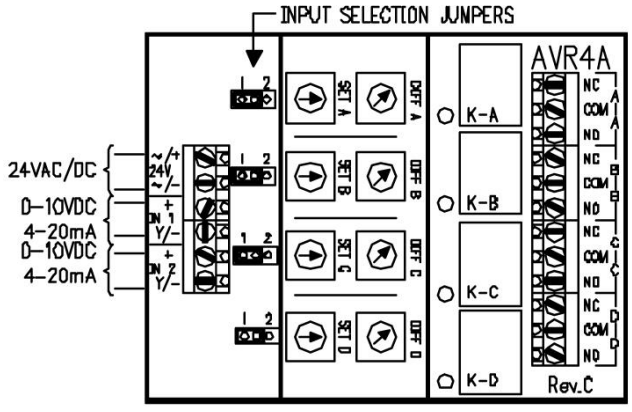
- **Analog to on/off conversion**
- **Analog signal alarms**
- **Low/ high limit set points**
- **Four step staging control**

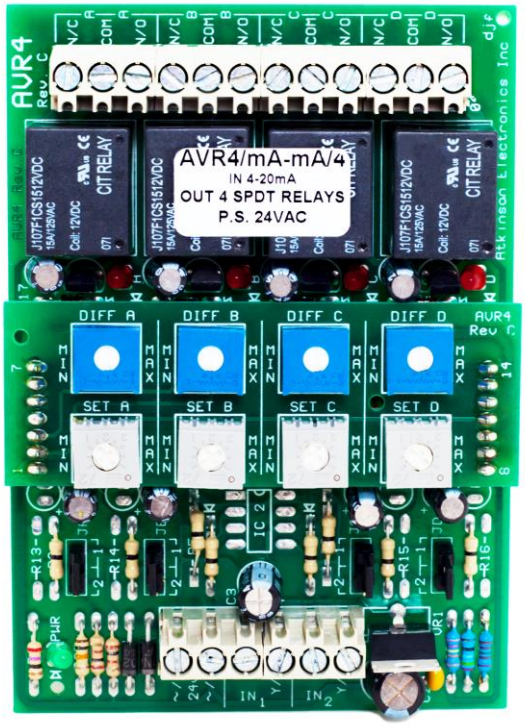
## *DESCRIPTION & OPERATION*

The AVR4C is a four channel, voltage sensitive relay module. It has individual adjustable differential and set point, and input selection jumper for each channel. It is factory configured to accept one of three types of input signals: 4-20mA, 0-10VDC, or 0-20VDC phase cut. The AVR4C can be used in applications where an analog signal needs to stage on two-position loads such as circulating pumps, relief fans, etc.

The AVR4C can be powered by either a 24VAC or DC supply, it uses a half-wave bridge rectifier (one side of AC line is common to input). The input signals are fed through an op Amp stage where the set point and differential settings are set. Four sets of two signal-turn potentiometers are used to calibrate the trip point and differential settings for each channel. An LED indicates when each relay has engaged. Calibration of the AVR4C is quite simple (see field calibrations).

## *WIRING CONFIGURATION*




## *SPECIFICATIONS*

| | |
|---|---|
| SIZE: | 4.25”L x 3”W x 1.25”H |
| MOUNTING: | 3” RDI Snap track (supplied) |
| POWER: | 24VAC 5.6VA, 50/60Hz, or<br>24VDC 85mA |
| INPUT SIGNALS: | 0-20V Phase cut isolated<br>0-10VDC non-isolated<br>0-15VDC non-isolated<br>4-20mA non-isolated |
| INPUT IMPEDANCE: | ≥3.6KΩ Phase cut<br>≥10KΩ 0-10VDC, 0-15VDC<br>≥100Ω 4-20mA |
| ACTION: | Make on voltage/ current rise |
| SET POINT RANGE | 2 – 18V Phase cut per channel<br>2 – 9VDC per channel<br>2 – 14VDC per channel<br>5 – 18mA per channel |
| DIFFERENTIAL: | 1 - 16V phase cut per channel<br>1 - 9V phase per channel<br>1 - 14V phase per channel<br>1 – 15mA per channel |
| RELAY CONTACT: | SPDT |
| RELAY RATING: | 12 Amps continuous<br>250VAC maximum voltage<br>Mechanical life > 30 million ops |
| AMBIENT TEMPERATURE: | 0-50º |

## ORDERING INFORMATION

**AVR4C/XXX-XXX/SPDT/X**

- X — # of Channels (2,3,4)
- SPDT — SPDT Relay @ 12Amps
- XXX — Secondary Input Option Code
- XXX — Primary Input Option Code

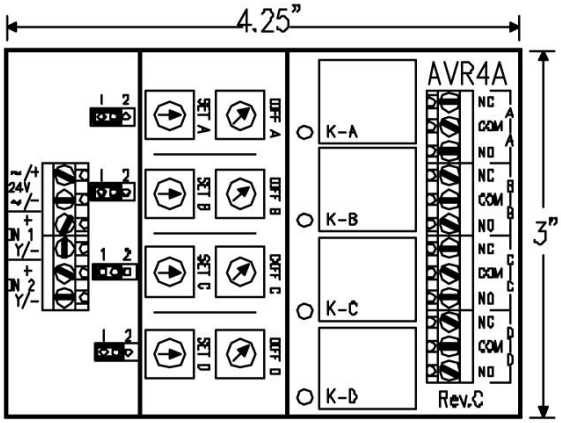
## INPUT OPTION CODES

| | |
|---|---|
| 5V | 0-5VDC input |
| 10V | 0-10VDC inputs |
| 15V | 0-15VDC inputs |
| mA | 4-20mA inputs |
| PC | 0-20V phase cut inputs |

## ORDERING CODE EXAMPLES

| | |
|---|---|
| AVR4C/PC-PC/4 | Two 0-20V Phase cut isolated inputs with four sets SPDT relay contacts. |
| AVR4C/10V-mA/4 | 0-10VDC and 4-20mA non-isolated inputs with four sets SPDT relay contacts. |
| AVR4C/mA-mA/4 | Two 4-20mA non-isolated selectable inputs with four sets SPDT relay contacts. |
| AVR4C/10V-mA/3 | 0-10VDC and 4-20mA non-isolated inputs with three sets SPDT relay contacts. |

## PHYSICAL CONFIGURATION




## RELAY OUTPUT SPECIFICATIONS

| | |
|---|---|
| Relay type: | HASCO #KLT1C12DC12 |
| Contact configuration: | 1 Form C per channel |
| N.O.contact rating: | 15 Amp @ 28VDC resistive<br>15 Amp @ 120V, 250V AC resistive |
| N.C. contact rating: | 12 Amp @ 28VDC resistive<br>12 Amp @ 120V, 250VAC resistive |
| Contact material: AgCdO | |
| Min electrical life: | > 250k operations (12A, 250VAC) |
| Min mechanical life: | > 30 million operations |
| Dielectric Strength: | 1500V RMS AC coil/contact |

## FIELD CALIBRATIONS AND SET POINT ADJUSTMENT INSTRUCTIONS

To adjust the turn on and differential potentiometers for each stage you need to be aware of the following:

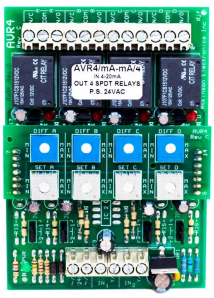
1. The "SET POINT" potentiometer adjustment is the point at which an increasing input signal causes a respective relay coil to energize. Its minimum to maximum adjustment is about 110% of the input signal low to high levels.
2. The "DIFFERENTIAL" potentiometer setting for each stage is not the "drop-out" point, but rather how much of the input signal must drop after the respective relay is energized for that relay to de-energize.
3. The "DIFFERENTIAL" potentiometer must be set lower than the "SET POINT" potentiometer or an energized relay may never drop out. The set point and differential potentiometers have minimal, if not negligible interaction.

Begin by adjusting all potentiometers to their maximum settings (clockwise). Next, set the input signal to the desired turn-on point for the first channel and adjust the set point potentiometer counter-clockwise until the relay is engaged indicated by the LED. Then adjust the input signal to the desired trip out point and adjust the differential potentiometer counter- clockwise until the relay turns off. Adjust input signal to the turn-on point and verify first trip point. You must repeat this process for all the other channels.

2 Channel

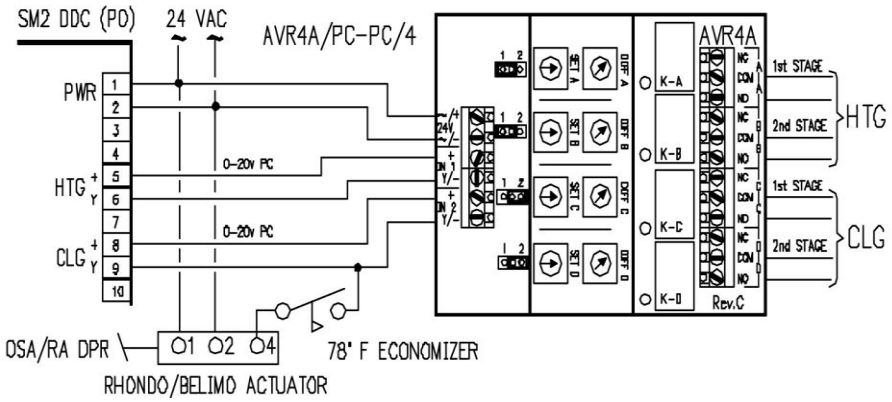
3 Channel

4 Channel



***APPLICATION 1***

## *1 HEATING/ COOLING WITH OSA DAMPER (SM2 PHASE CUT VERSION)*

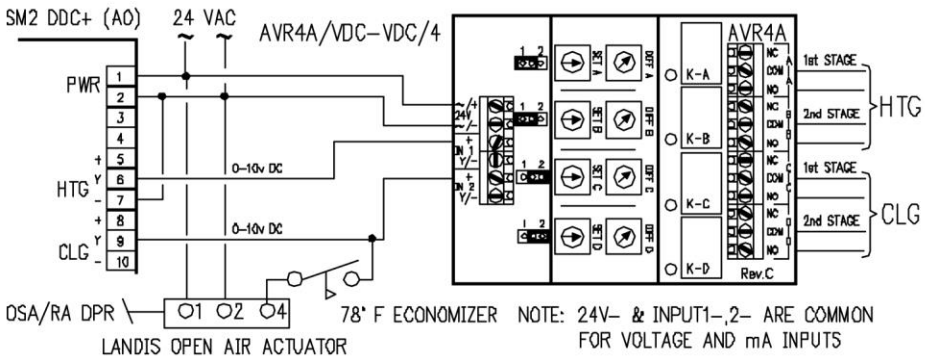



Separate heating & cooling outputs from the controller that are used to sequence the heating and cooling stages of a package roof-top unit through the AVR4C. A drop in temperature below the heating set point will cause the analog signal to rise which stages on two heating contacts. Likewise a rise in space temperature above the cooling set point causes the OSA dampers to open over 2-10VPC and the stage on two cooling contacts.

- Note that the phase cut inputs are optically isolated and an isolation transformer is not needed.

***APPLICATION 1+***

## *HEATING/ COOLING WITH OSA DAMPER (SM2 PLUS 0-10V VERSION)*

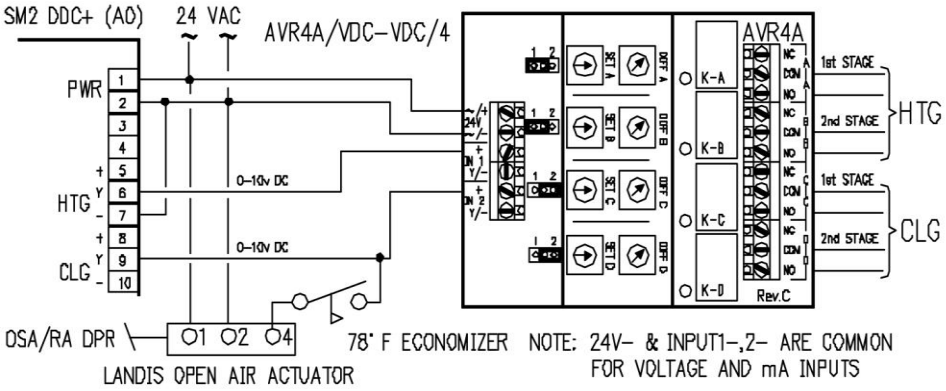



The application 1+ is the same as 1 but the diagram is updated for the STAEFA's SM2 plus controller and actuator.

- Note that the AVR4C's terminal #2 is common to both of the input commons.
- Note that commons are all shared and an isolation transformer is not needed.

***APPLICATION 2***

## *4 STAGE STEP CONTROL*

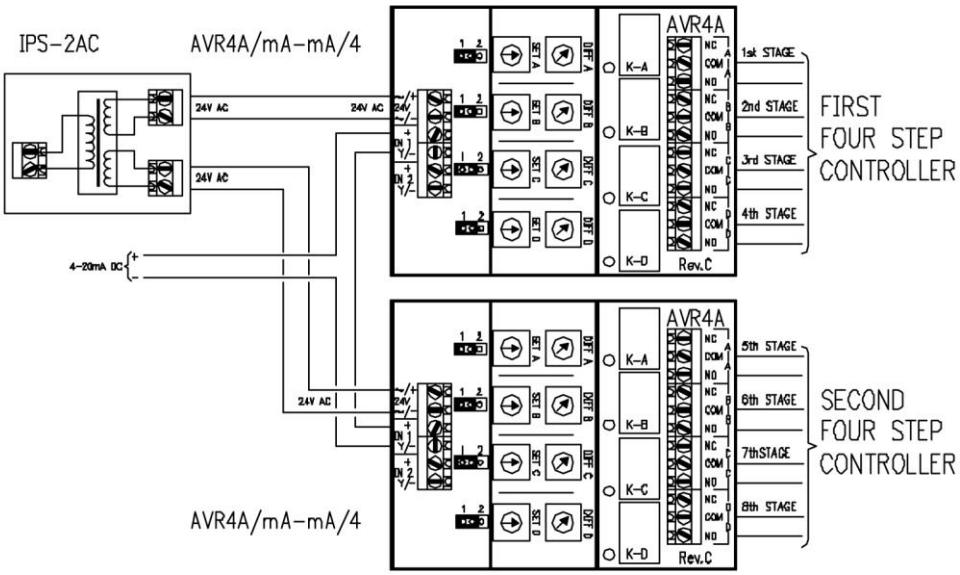



A DDC controller with either a 0-10VDC or 4-20mA output signal drives an AVR4C to stage four relay outputs. The relay outputs are adjusted so that the AVR4C will stage all four outputs over the full input signal variation. Typical applications may be; discharge air control, electric heat staging, or chiller sequencing.

- Note an isolation transformer may or may-not be needed.

***APPLICATION 3***

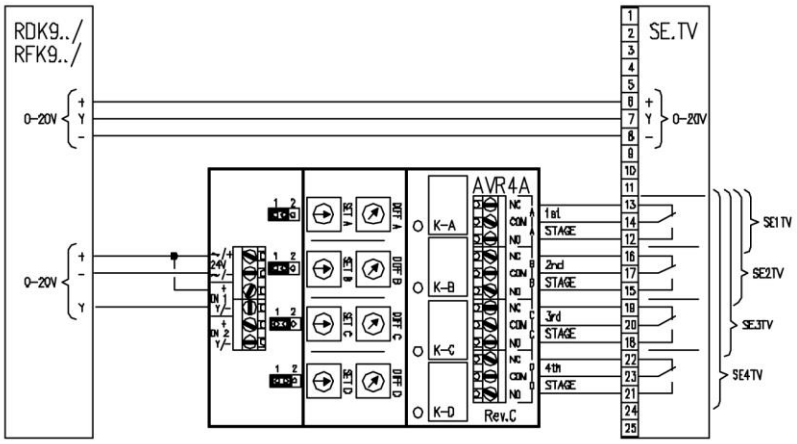
## *8 STAGE STEP CONTROL WITH 4-20MA INPUT*




A DDC controller with a 0-10VDC or 4-20mA output signal drives two AVR4C to stage eight relay outputs. The relay outputs are adjusted so that the first AVR4C will stage its four outputs over the first half of the input signal while the second AVR4C will stage its outputs over the second half of input signal. An isolation transformer *IPXFMR2/2/24 IS NEEDED* when connecting a 4-20mA signal in series to two AVR4Cs. It provides the power supply isolation necessary to isolate the power supply commons which are connected to the input commons, without the transformer the input of the second AVR4C would be shorted. For eight relay stages with a 0-10VDC signal the inputs are connected in parallel and the isolation transformer is not needed.

***APPLICATION 4***

## *SE4TV REPLACEMENT*




The AVR4C can be used to replace a STAEFA SE4TV step controller that does not use the time delay function of the SE4TV. The AVR4C can be powered by the same (+/-) 20VDC from the Kilmo controller. The + Ref. Is connected to the + input terminal of the AVR4C, the Y signal is connected to the Y/- Input terminal. The trip points and differential voltage points are set on the sub board of the AVR4C.

## *SET POINT ADJUSTMENT INSTRUCTIONS*

To adjust the turn-on and differential potentiometers for each stage, you should be aw are of the following:

1. The set point potentiometer adjustment is the point at which an increasing input signal causes a respective relay coil to energize. Its minimum to maximum adjustment is about 110% of the input signals low and high levels.
2. The differential potentiometer setting for each stage is not the actual drop-out point, but determines how much the input signal must drop after the respective relay is energized for that relay to de-energize, hence differential setting.
3. The differential potentiometer must be set lower than the “set point” potentiometer or the relay may energize but never drop out. The set point and differential potentiometers have minimal, if not negligible interaction.