

# REMOTE CONTROL INTERFACE

## General description

The Remote Control Interface (RCI) provides the means to control generator voltage or power factor from a remote point. It is designed to be connected to Newage Power Factor Controllers (PFC's) and Automatic Voltage Regulators (AVR's).

Generators that run in parallel with the National Electricity Supply Network (Mains), require automatic control of Power Factor, to prevent high reactive current as the Mains voltage varies within its tolerance band. Many of these generators run for long periods unattended and it is often desirable to change the generators operating power factor from a remote point, to suit local site conditions. Additionally, following a Mains failure there is often a requirement to adjust the voltage of several generators simultaneously with one control signal, to allow voltage matching to the restored Mains supply before paralleling.

The RCI provides these facilities and can be coupled to proprietary process control equipment using industry standard control signals.

The RCI has two inputs which accept unipolar 4-20mA or bipolar 0-10 volt signals to control generator power over the range 0.7 lag to 0.7 lead or voltage up to +/- 10%. The input circuitry is fully floating for maximum application flexibility. Loss of the control signal provides a default Unity Power Factor setting or returns the voltage to the AVR no-load setting.

The unit is designed for generator mounting when fitted to a standard AVR anti-vibration mounting chassis. Power is derived from the generator terminals. Retro fitting to existing installations is possible.

## Technical specification

|                     |                           |
|---------------------|---------------------------|
| <b>Power input.</b> | (usually from generator). |
| 115 range           | 110-125v ac 50-60 Hz.     |
| 220 range           | 200-230v ac 50-60 Hz.     |
| 240 range           | 231-250v ac 50-60 Hz.     |
| 277 range           | 251-290v ac 50-60 Hz.     |

**VA rating** 5.

### **Control inputs.**

|                   |                           |           |
|-------------------|---------------------------|-----------|
| 4 - 20 mA         | input resistance          | 100 ohms. |
| 0 - 10 volts      | input resistance          | 38k ohms. |
| Isolation voltage | 1kV dc (input to output). |           |

### **Power Factor control range.**

|                   |                   |
|-------------------|-------------------|
| 0.7 lead at 4 mA  | 0.7 lag at 20 mA. |
| 0.7 lead at -10 v | 0.7 lag at +10v.  |

### **Approximate voltage control range.**

(depends on AVR type and VTRIM setting).

|               |                |
|---------------|----------------|
| -10% at 4 mA  | +10% at 20 mA. |
| -10% at -10 v | +10% at +10v.  |

### **PF Transfer characteristics.** (see graph on page 5).

4 - 20 mA.  
Milliamps required for lag =  $12 + (8(\tan(\cos^{-1} PF)))$ .  
Milliamps required for lead =  $12 - (8(\tan(\cos^{-1} PF)))$ .  
0 - 10 volts.  
Voltage required for lag =  $10(\tan(\cos^{-1} PF))$ .  
Voltage required for lead =  $-10(\tan(\cos^{-1} PF))$ .

### **Voltage Transfer characteristics.** (see graph on page 5).

4 - 20 mA.  
Milliamps required for + V% =  $12 + (8(v\%/10))$ .  
Milliamps required for - V% =  $12 - (8(v\%/10))$ .  
0 - 10 volts.  
Voltage required for + V% =  $10(v\%/10)$ .  
Voltage required for - V% =  $-10(v\%/10)$ .

### **Response time constant.**

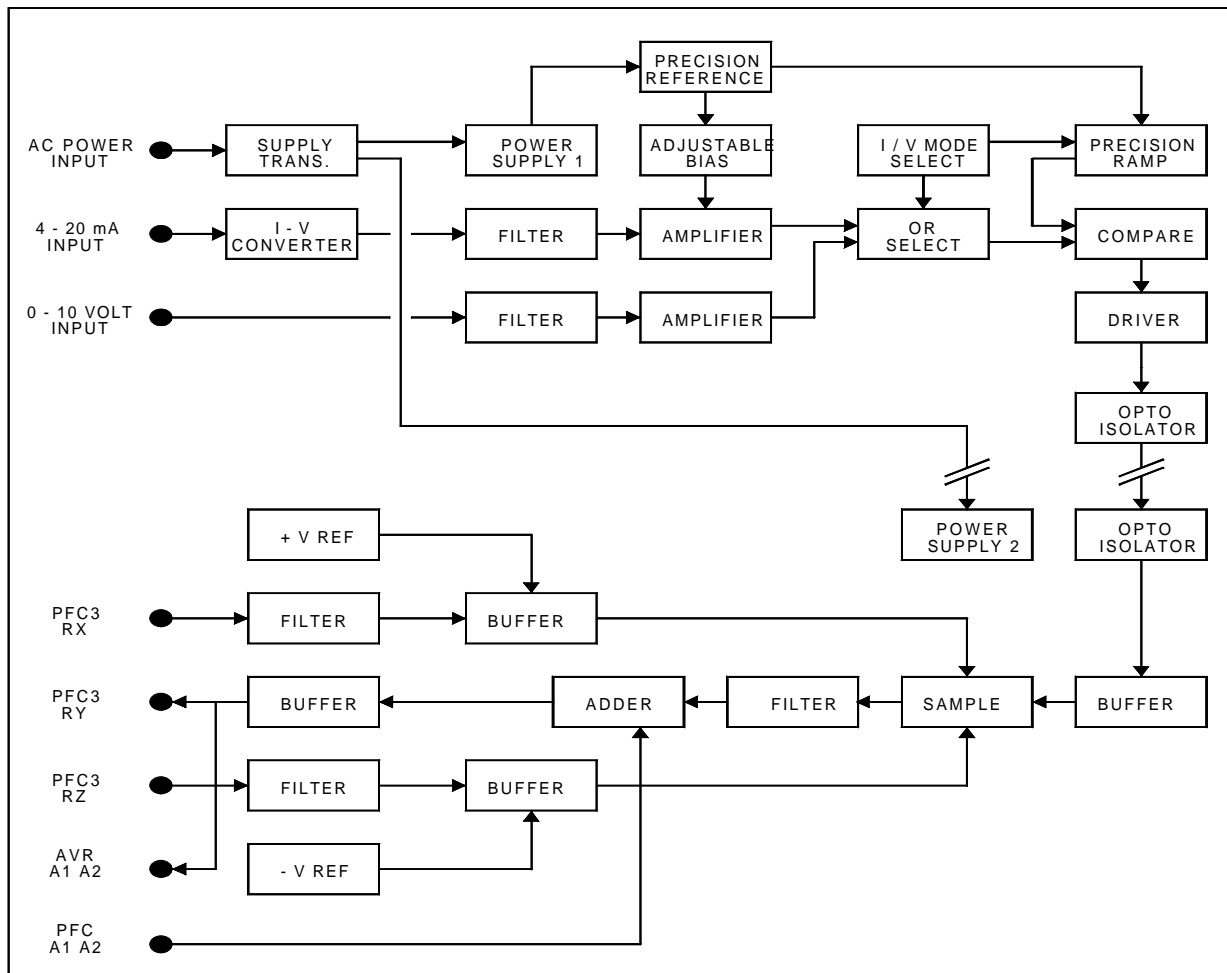
< 20 mS.

### **Dimensions.**

100 x 135 x 45 mm high.

### **Environmental.**

|                       |             |               |
|-----------------------|-------------|---------------|
| Vibration             | 5-10Hz      | 1mm pk.       |
|                       | 10-100Hz    | 50mm/sec RMS. |
|                       | 100Hz-300Hz | 4.4g pk.      |
| Relative humidity     | 0-70c       | 95%.          |
| Operating temperature |             | -40 to +70c.  |
| Storage temperature   |             | -55 to +80c.  |



The AC power input connects to a Supply Transformer which has primary voltage tapplings, allowing operation over a wide voltage range.

Secondary windings on the Supply Transformer are provided to create two isolated power supplies, Power supply 1 and Power supply 2. Power supply 1 provides +/- 12 volts dc for the input conditioning electronics. Power supply 2 provides +/- 12 volts dc for the output driving electronics.

The 4-20 mA input signal is converted into a voltage by the I-V converter. Noise is reduced by a filter and an Amplifier increases the magnitude of the signal.

The 0-10 volt input is processed in a similar manner with a similar Filter and Amplifier.

A Precision reference provides a stable voltage for generating a Precision ramp and Adjustable bias circuit for offset trimming of the Amplifier.

The Precision ramp is used for comparison with the input signal.

The I/V Mode select allows the user to select between 4-20 mA (I Mode) or 0-10 volt (V Mode), controlling signals.

The Compare circuit receives inputs from the Precision ramp and the controlling signal. The output from the Compare circuit is a continuous stream of duty cycled controlled pulses. The duty cycle of these pulses change according to the magnitude of the controlling signal. The output of the Compare circuit feeds a Driver circuit for the Opto Isolator transmitter. The purpose of the Opto Isolator is to provide galvanic isolation between input and output circuitry.

One operating mode of the output circuit is to act like a potentiometer across PFC terminals RX RY RZ. This is achieved electronically by sampling terminals RX and RZ and feeding a signal back into terminal RY that is a controlled proportion of the RX, RZ signals.

Another operating mode of the output circuit is to add a voltage proportional to the input controlling signal, to the AVR A1 A2 terminals, allowing control of generator output voltage.

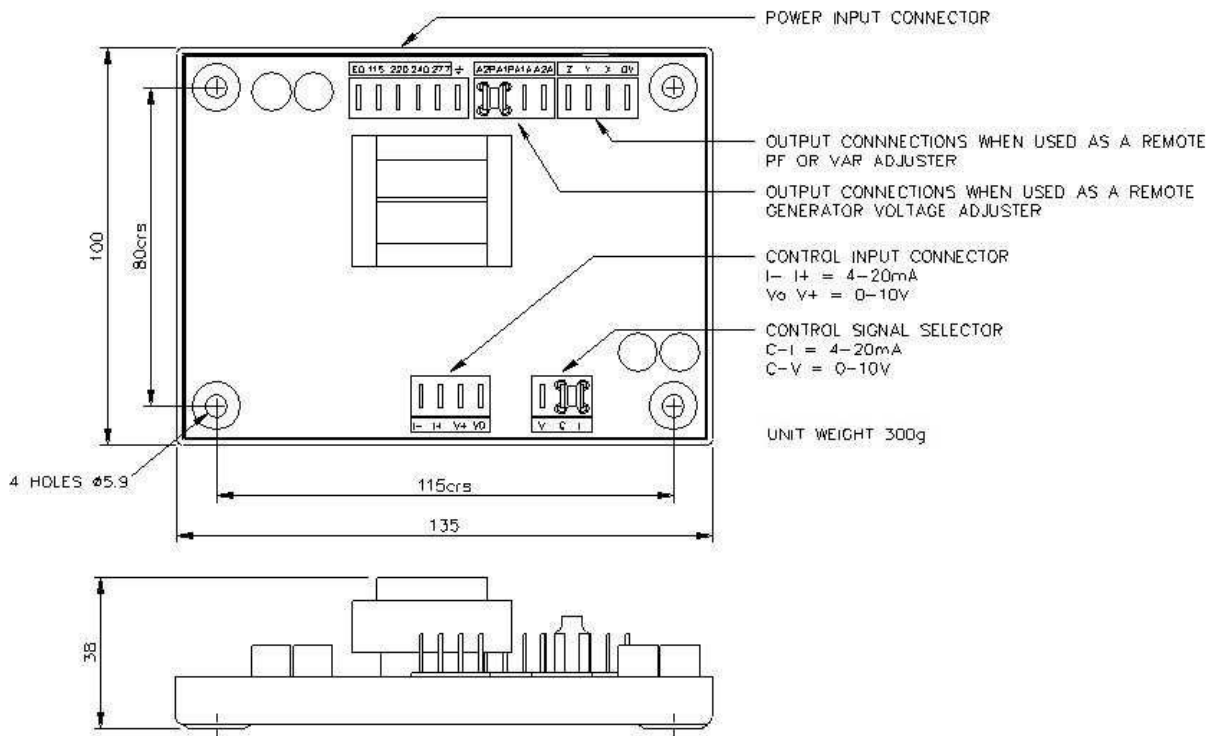
When used for Power Factor adjustment, the remote potentiometer terminals on the PFC (RX RZ), are passed through Filter and Buffer circuits to reduce noise and lower impedance. The Opto Isolator receiver signals are passed through a similar Buffer and then on to the Sample circuit which acts like a potentiometer. RX and RZ signals are duty cycle sampled in proportion to the demands on the 4-20 mA or 0-10 volt input controlling signal. The output from the Sample circuit is passed to a Filter to convert the duty cycle samples into a smooth dc signal. The Adder circuit in this mode of operation adds zero to the signal. The output of the Adder is passed finally through a Buffer to provide a low impedance output drive to the PFC.

When used for generator Voltage adjustment, the PFC RX RY RZ terminals are unused. The V REF circuits provide +/- precision voltage references which are fed through Buffer circuits to reduce noise and lower impedance. The Opto Isolator receiver signals are passed through a similar Buffer and then on to the Sample circuit which acts like a potentiometer. The +/- V REF signals are duty cycle sampled in proportion to the demands on the 4-20 mA or 0-10 volt input controlling signal. The output from the Sample circuit is passed to a Filter to convert the duty cycle samples into a smooth dc signal. This signal is added to the PFC A1 A2 output signal by the Adder circuit. The output of the Adder is passed finally through a Buffer to provide a low impedance output drive to the AVR A1 A2 terminals.

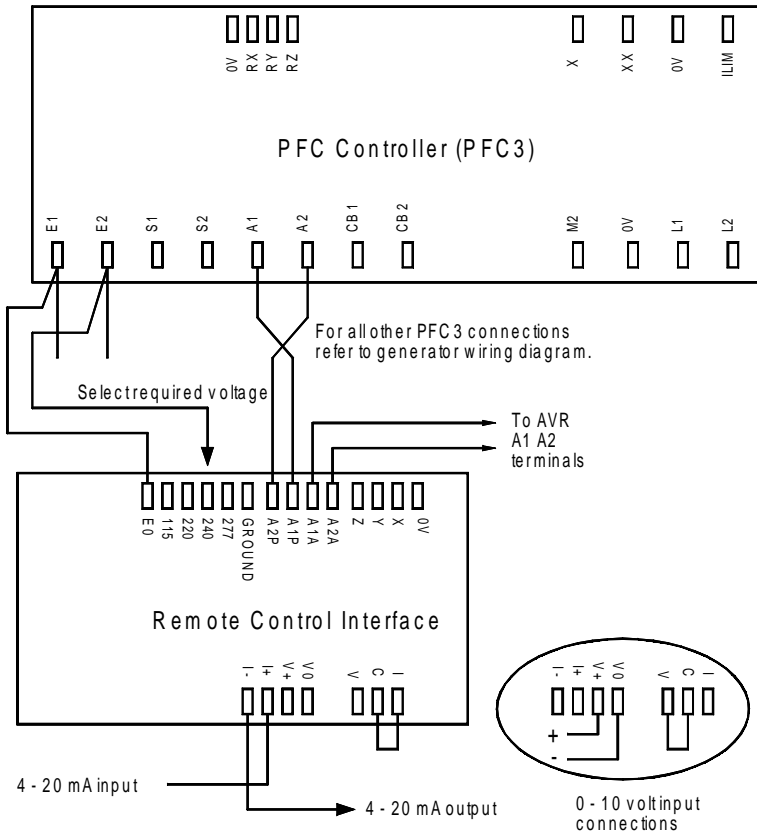
**Application notes.**

**General.**

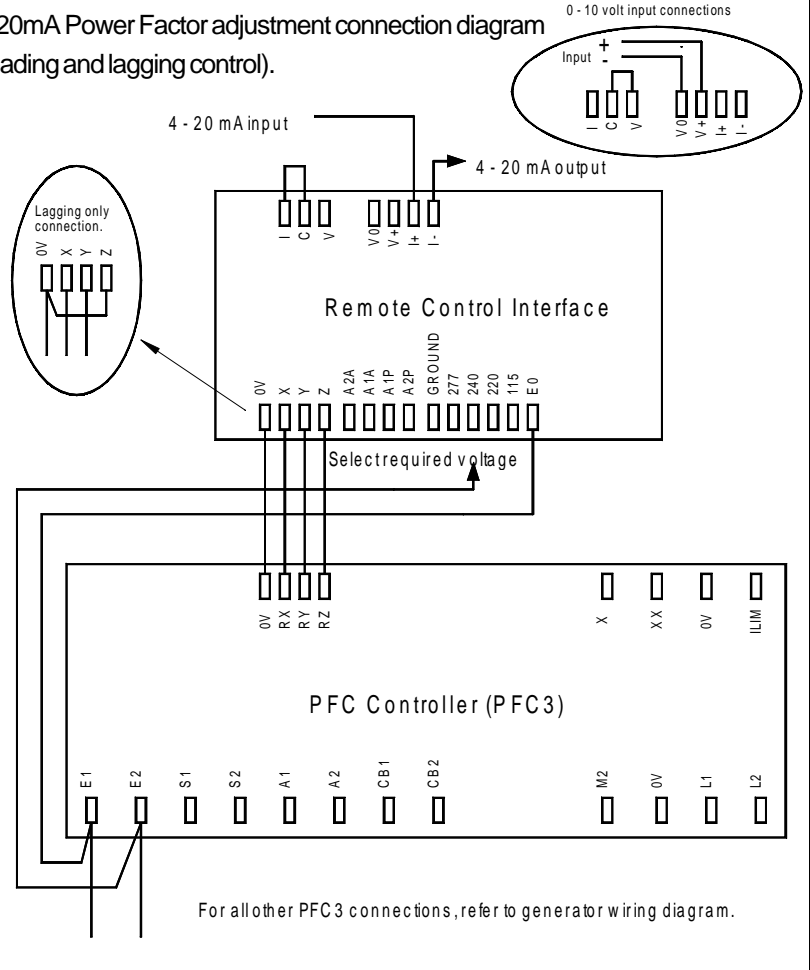
4-20mA control is preferred as this is more immune to noise than 0-10 volts. 'Twisted pair' or screened cable should be used to reduced 50 / 60Hz pick-up. Running the 4-20mA control cable along side power cables should be avoided if possible. Any adjustments made to the Generator Voltage or Power Factor using 4-20mA control, should be carried out as smoothly as possible to prevent undue stress on the generating set. In the case of remote power factor adjustment, It is recommended that the 4-20mA signal be applied when the generator is at rest and set to a default value of 12mA. In the case of remote voltage adjustment, It is recommended that the 4-20mA signal be applied when the generator is at rest and set to a default value of 12mA. After voltage matching in 'Island Mode', when re-connection to the Mains supply has been completed, the 4-20mA signal should be smoothly returned to 12mA over a period of not less than 15 seconds. This will allow sufficient time for the power factor controller (PFC3) to compensate. If the 4-20mA signal is not returned to 12mA, then the PFC3 operating range may be reduced.



Voltage adjustment connection diagram

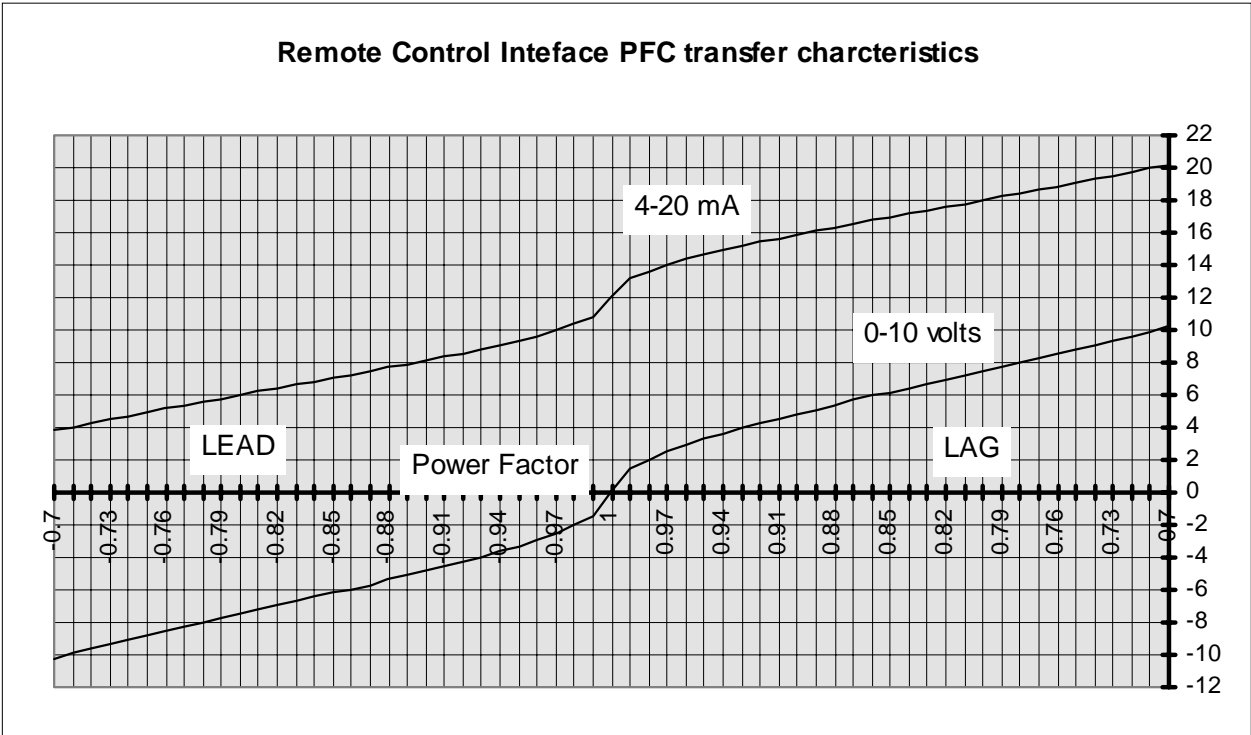


4-20mA Power Factor adjustment connection diagram (leading and lagging control).

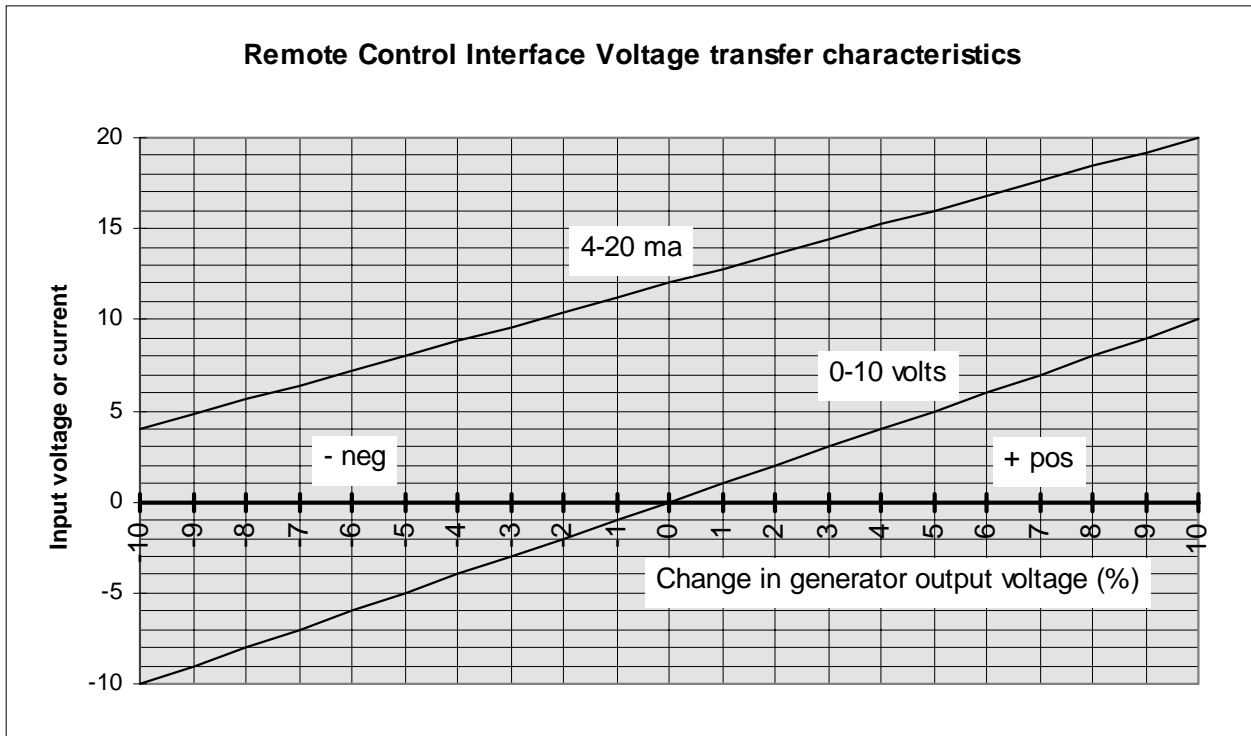


# TRANSFER CHARACTERISTICS

## Remote Control Interface PFC transfer characteristics

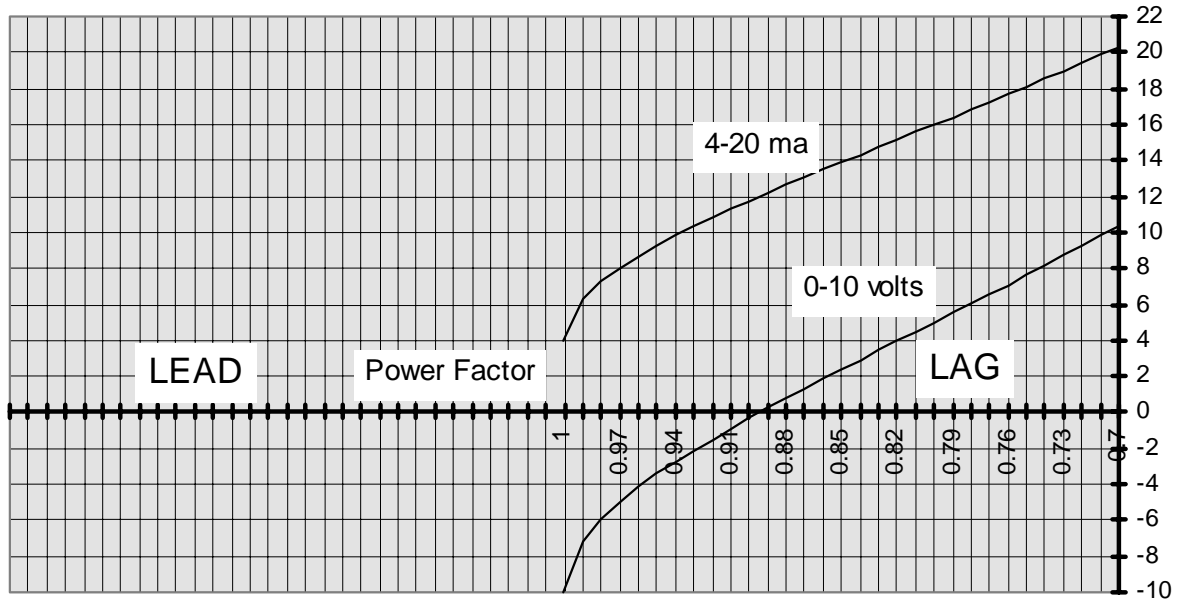


## Remote Control Interface Voltage transfer characteristics



# TRANSFER CHARACTERISTICS

Remote Control Interface transfer characteristics  
(lag only connection).



## NEWAGE INTERNATIONAL LIMITED

Registered Office and Address:

PO Box 17, Barnack Road, Stamford, Lincolnshire PE9 2NB England.

Telephone: 44 (0) 1780 484000 Fax: 44 (0) 1780 484100 Website: [www.newagestamford.com](http://www.newagestamford.com)

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