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3000 MK3 SERIES
Batch Controller

Model 3000BCL

User Guide

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Specification

Primary Display	6 decade (or 5 decade and sign), 7-segment high brightness red LED, 14mm high	
Secondary Display	6 decade (or 5 decade and sign), 7-segment high brightness red LED, 8mm high	
Decimal point	Programmable via display	
Scaling	Programmable via display, retained in non-volatile memory	
Signal inputs	Protected to 100Vdc	
Standard sensitivity mode	From 90mV @ 10Hz, 170mV @ 10kHz	
High sensitivity mode	From 12mV @ 10Hz, 20mV @ 10kHz	
Frequency	Up to 50kHz maximum (200Hz in Reed Mode)	
Impedance	15kΩ minimum	
Accuracy	<0.01% with square wave at 1V peak	
Alarms & Status Outputs	60Vdc maximum, sink of 150mA maximum	
Relay Outputs	Normally Open and Normally Closed - contacts rated to 8A @ 240Vac.	
Digital Output *("D" option only)*	Pulse to supply, internal 4.7kΩ pull-up to supply or sink of 150mA maximum	
Analogue Voltage & Current *("A" option only)*	User selectable as	0 - 5V, or 1 - 5V, or 0 - 10V, or 2 - 10V 0 - 20mA, or 4 - 20mA
Connections	Plug-in connectors & screw terminals on rear panel	
Power requirement		
AC	100Vac to 240Vac, 50/60Hz	
or		
DC	10 to 30Vdc via Vs and 0V terminals	
Power Output *(when using AC supply)*	100mA @ 9Vdc nominal via Vs and 0V terminals	
Temperature range	**Operating**	-20°C to +70°C
	Storage	-20°C to +85°C
Dimensions	96 x 96 x 108mm (panel cut-out 92 x 92mm)	

General Description

The 3000BCL Batch Controllers are 6-decade, seven segment, high brightness red LED display instruments. They feature a primary display which displays the count for the batch in progress. The secondary display can be used to monitor rate, total count, batch status or display the batch target count. They are built into DIN (96 mm x 96 mm) panel mounting housings and operate from either 110Vac/230Vac or 12V-30Vdc power supplies.

The signal input can set to operate in one of three modes: standard sensitivity, high sensitivity or reed switch. The input also has a sensitivity setting, which the user can adjust electronically via the front panel.

The batch controller counts the input pulses (depending on the mode selected), then scales this value according to the user set scaling factor to relate the pulse count to the quantity batched. The result of this calculation is then displayed. By appropriate configuration of the scaling factor, the unit can be configured to display the quantity batched in the desired unit such as litres.

The frequency of the input signal is also calculated and scaled according to the user defined rate scaling factor. By appropriate configuration of the scaling factor the unit can be configured to display speed for instance in m/s, mph, or RPM, or the frequency can be related to another measurement such as flow rate (e.g. litres/min) in the case of flow metering applications.

The 3000BCL has two configurable alarm outputs as standard, which can be set to operate as either high or low alarms at the set scaled frequency thresholds.

3000BCL models are available with factory fitted options, which must be specified when ordering. Additionally, we can customise the programmed operating modes of these instruments to suit specialised applications. Please contact our sales office to discuss this.

3000BCL Variants

3000BCL - Standard 3000BCL Series Batch Controller

3000BCLX 3000BCL Series Batch Controller with optional extra features, where X can be one or more of the following:

A - Analogue Voltage/Current Output

D - Digital Output (pulse to Vs)

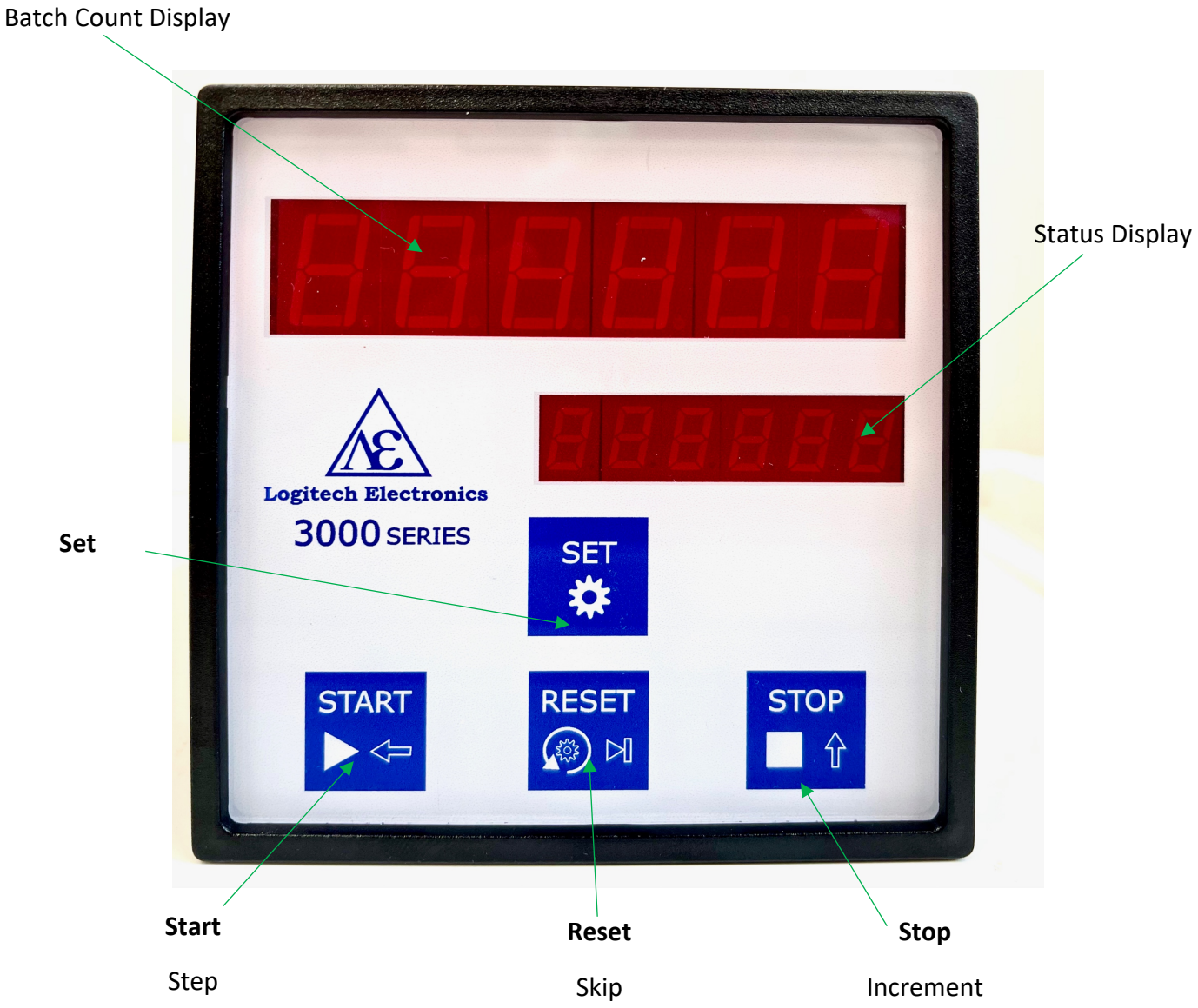
L - Latching alarm outputs

USB - USB port for setup, control and monitoring

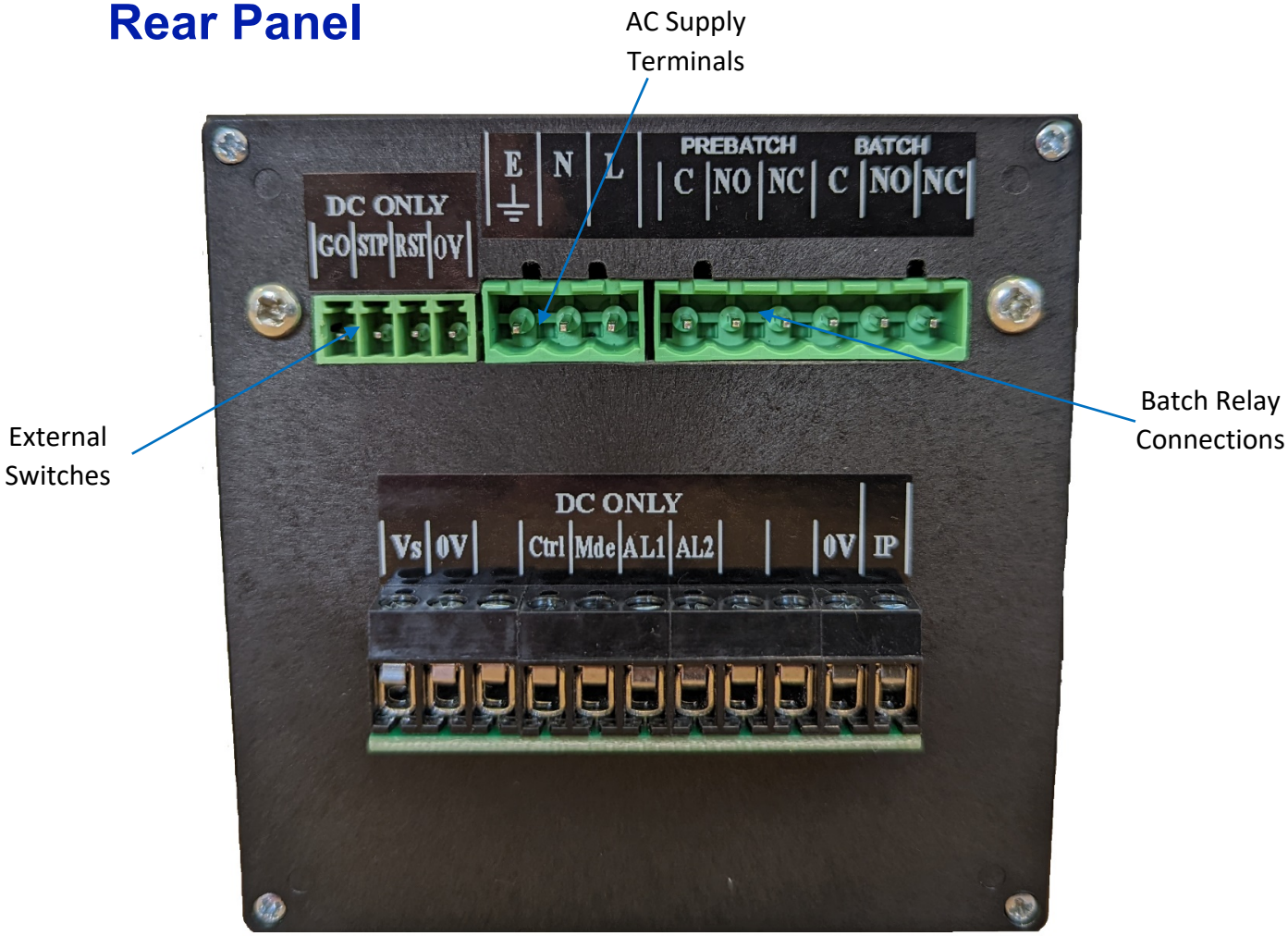
Front Panel

The panel has four touch buttons, which are used to control the batching process: Set, Start, Reset and Stop.

The buttons also have secondary functions, used to enter and configure the instrument's settings. These functions are indicated by the symbols shown on the buttons, and are: Step, Skip and Increment. Combinations of the button presses are also used to activate certain features, such as entering the settings menu or adjusting the sensitivity of the input.



Rear Panel



The image above shows the rear panel of a standard 3000BCL instrument. The actual terminals available, along with their position on the rear panel, will vary by model. Below are the definitions of each of the terminals that may be present. Refer to the terminal labels on the instrument and match these with the functions below.

Upper Terminals

Connections to the upper terminals are made using the supplied plug-in connectors. The terminals are as follows (left to right).

External Switches (DC only)

GO = Start input. Connect to 0V momentarily to start the batching process, equivalent to pressing “Start” on the front panel.

STP = Stop input. Connect to 0V momentarily to stop the batching process, equivalent to pressing “Stop” on the front panel.

RST = Reset input. Connect to 0V momentarily to reset the batching process, equivalent to pressing “Reset” on the front panel.

0V = 0V terminal provided to simplify wiring of external batch switches.

AC Supply Terminals

When fitted with an AC power module, these terminals will be present on the back panel. The unit can be supplied by 100-240Vac at 50/60Hz via the Live (L) and Neutral (N) terminals. When doing so, the earth terminal (E) must be connected to earth.

E = Earth terminal. Connect to mains earth for safety when using the ac supply module, or when switching loads in excess of 50V (ac or dc) via the batch relays.

N = AC power neutral connection.

L = AC power live connection.

Batch Relay Terminals

The batch controller is fitted with two relays, both of which have normally open (NO) and normally closed (NC) outputs. The batch relay will be activated for the entire batching process. The prebatch relay will activate at the start of the batch and then be deactivated at the configured quantity before the batch target is reached. Refer to the batching section for more information.

Prebatch C – Common connection for prebatch relay.

Prebatch NO – Prebatch normally open connection (closes during batch until prebatch quantity remaining)

Prebatch NC - Prebatch normally closed connection (opens during batch until prebatch quantity remaining)

Batch C – Common connection for batch relay.

Batch NO – Batch normally open connection (closes during batch)

Batch NC - Batch normally closed connection (opens during batch)

Lower Terminals

Vs = Supply voltage. If powered using the ac supply module, this terminal will provide a supply of 9Vdc nominal, with which to power external sensors or status LEDs for example. Alternatively, if not using the ac power module, apply 12-30Vdc to power unit.

0V = 0V/ground passed through from ac power module, or connect to 0V if powering the unit from the lower rear terminals.

Ctrl = Control input. Connect to 0V to enable access to full settings menu and sensitivity setting. Otherwise only the batch target may be altered by the user.

ARst =Alarm reset input. Used to reset the latching alarms, where this option has been fitted. Connect to 0V to activate the reset.

Mde =Mode change input. Used to toggle between display modes on the secondary display. Connect to 0V momentarily to change to the next configured mode.

AL1 = Alarm Output 1. The alarm direction and threshold are user set.

AL2 = Alarm Output 2. The alarm direction and threshold are user set.

Ao = Analogue output. The type and range of the analogue output is determined by the user selected option (setting A OUT).

Do = Digital output. As standard this will provide a pulse to Vs at a scaled frequency, determined by the user set division factor (setting D OUT).

Bch = Batch output. Switches to 0V when batching is active.

Pbc = Prebatch output. Switches to 0V when prebatch quantity remaining.

IP = Signal Input. Input type (standard, high sensitivity or reed switch) & sensitivity user set.

Blank = No connection.

USB

A micro-USB port will be available next to the IP terminal on models fitted with the USB option.

Programming the Instrument

Choice of CALC Setting

In most cases the 3000BCL has sufficient digits to accurately represent the scaling factor whether it is multiplicative or reciprocal, and the calculation can be chosen based on preference. However, in the case of very small numbers (where most of the entered digits would be zero), greater accuracy can be obtained by inverting the scaling factor and changing the calculation type. Flowmeter K-factors are an example of when this can be a useful approach. With the unit in division mode, the K-factor can be entered as the scaling factor directly, and the display would give a readout in litres per second.

Calculated Rate

The result will be calculated according to the options and values selected for the mode, calculation, scaling factor and offset, which are described in detail below. If displaying the rate batch units per second, the scaling factor for the rate will be the same as for the batch count. By setting a different rate scaling factor it is possible to instead display units per minute or RPM for example. The offset function can be used to instead display the rate as a deviation from a nominal value. The equation for the rate display will be as follows:

CALC:

MUL $D = (R \times S) + O$

DIV $D = {}^{R}/_{S} + O$

Where:

D is the displayed value.

S is the rate scaling factor.

R is the rate (frequency) of the input signal.

O is the offset.

The value D calculated according to the equations above will be shown on the display with each update. Where this manual refers to the scaled frequency value, it is this result that is considered (e.g. alarm outputs, analogue output).

Calculating a rate scaling factor

The scaling factor is often most easily calculated by considering the maximum input frequency expected and by deciding what the display should read at this frequency. The scaling factor can then be determined from the appropriate calculated result equation.

A few common examples are given below for reference:

D is the displayed value in the desired units
R_A is the measured frequency in pulses per second (Hz)
S_A is the required scaling factor

Gear in RPM:

$$D = (R_A \times S_A)$$

$$S_A = \frac{60}{N}$$ where N is the number of teeth on the target gear.

Flowmeter in litres per minute (lpm):

$$D = \frac{R_A}{S_A}$$

$$S_A = \frac{K}{60}$$ where K is the flowmeter K-factor in pulses per litre.

Vehicle speed e.g. km per hour, miles per hour:

$$D = (R_A \times S_A)$$

$$S_A = \frac{60 \times 60 \times \Delta s}{N}$$ where Δs is the distance travelled per rotation of the target gear.
N is the number of teeth on the target gear.

The scaling factor range is 0.00001 to 999999 and it may be necessary to round off the calculated value to fit within this range. When setting the scaling factor it is important to ensure that with the decimal point position selected, there are enough digits to display the maximum value for the application. Otherwise, the number of decimal places will need to be reduced or the display units altered, with the scaling factor adjusted accordingly.

Setting an Offset

The 3000BCL has an OFFSET facility that can be either positive or negative. It is a very useful addition to the rate scaling factor and can be used to the deviation from a nominal value.

For example: If the nominal frequency on Input A is 1000 Hz, by setting the scaling factor to 1 and the OFFSET to -1000, the display will show the deviation from 1000 Hz.

Batch Scaling Factor

The batch scaling factor is used to relate the number of pulses counted to the quantity of material produced/dispensed. This enables the pulse count to be converted into a meaningful readout. The batch scaling factor and rate scaling factor will have the same value if measuring rate in units per second. The scaling factors can also differ, for instance when displaying rate in units per minute instead. On entering a rate scaling factor for the first time, the batch scaling factor will automatically default to the same value.

Whether the scaled result is determined by multiplying or dividing by the scaling factor, is determined by the unit's calculation (CALC) setting as below.

MUL $D = C \times S$

DIV $D = {}^{C}/_{S}$

Where:

D is the displayed value.

S is the scaling factor

C is the pulse count

Examples:

1. If a one for one count is required then enter a scaling factor of 1, regardless of the calculation setting.

2. If you have a requirement for counting flow in litres from an associated pulse rate, the following procedure could be followed. Suppose the flow meter output is 340 pulses per litre. For a batch readout in litres:

   MUL $S = \frac{1}{340} = 0.00294$ $D = C \times 0.00294$

   DIV $S = 340$ $D = {}^{C}/_{340}$

If instead the readout was required to be in millilitres, then the signal from the flow meter could be considered as being 0.34 pulses per millilitre.

MUL $S = \frac{1}{0.34} = 2.94117$ $D = C \times 2.94117$

DIV $S = 0.34$ $D = {}^{C}/_{0.34}$

3. For a cut-to-length system where 1 pulse equates to 25mm of material. To batch the amount of material in mm, the scaling factor would be:

   MUL $S = 25$ $D = C \times 25$

   DIV $S = \frac{1}{25} = 0.04$ $D = {}^{C}/_{0.04}$

   To instead display the quantity in metres, 1 pulse would now be 25/1000 = 0.025m:

   MUL $S = 0.025$ $D = C \times 0.025$

   DIV $S = \frac{1}{0.025} = 40$ $D = {}^{C}/_{40}$

The advantage of switching between the calculation modes of multiply or divide can also be seen above, as this can simply the value to be entered. Changing the calculation mode and instead using the reciprocal can improve accuracy, as with the batch scaling factor of example 2, by reducing or removing the truncation of the number to fit within the available 6 digits on the display.

Total Scaling Factor

The total count displays the total quantity batched, which is calculated from the scaled all-time pulse count. While the total scaling factor will default to a value of 1, applying the same scaling factor for the total count as for the batch count may result in the available 6 digits on the display being quickly overflowed, which will instead display “high”. To prevent this, the total scaling factor is used to further scale the batch scaling factor as follows:

MUL $D_T = C_T \times S_B \times S_T$

DIV $D_T = {}^{C_T}/_{(S_B \times S_T)}$

Where:

D_T is the displayed total value.

C is the pulse count

S_B is the batch count scaling factor

S_T is the total count scaling factor

While the total scaling factor is commonly a power of 10, this need not be the case, and by applying the appropriate scaling factor the total can be scaled to display in completely different units to the batch count.

As an example, with the batch scale set to count in millilitres, the overall total could be set to be display in litres as follows:

MUL $S_T = 0.001$ $D_T = C_T \times S_B \times 0.001$

DIV $S_T = 1000$ $D_T = {}^{C_T}/_{(S_B \times S_T)}$

The total scaling factor can be changed at any time without affecting the stored count, allowing it to be rescaled if the available digits have been exceeded. Follow the standard procedure as described under Settings to do so.

Decimal Places

The decimal point position can be user set and adjusted to either increase or reduce the number of decimal places displayed. The result will automatically be rounded to the set number of decimal places. Batch outputs, alarms and other outputs will however always use the calculated result and not the rounded display value.

The number of decimal places is altered in the settings menu. The batch count, rate and total count all have separate decimal place settings. When setting these, it is important to ensure that the maximum possible display value can be displayed in the remaining digits. The display will read HIGH when the result is larger than can be displayed with the current settings, or -HIGH when the result is more negative than can be displayed with current settings.

Update Time

The update time determines the rate at which the frequency calculation is performed and the rate value (and analogue output on “A” models) updated. The user can select between a number of options for this: 100ms, 250ms, 500ms, 1000ms (1s), 3000ms (3s).

Wait Time

Provided that a pulse has been detected within the configured update time, the display will update at this configured interval as described above. The wait time determines the additional time (in seconds) for which the unit will wait to receive a pulse, before setting the calculated frequency to zero. This setting is independent of the update time. The wait time

can be user set anywhere between 1s and 20s. If the wait time is set to 0, the unit will not wait beyond the configured update time.

Alarm Outputs

The 3000BCL has two configurable alarm outputs. Both outputs are NPN (switch to 0V on activation), with a maximum voltage of 60Vdc (DC only) and sink current of 150mA.

When configured as a high alarm (HI), the alarm will be activated when the scaled frequency (for the active mode) is greater than, or equal to, the programmed value.

When configured as a low alarm (LO), the alarm is activated when the scaled frequency (for the active mode) is less than, or equal to, the programmed value.

The alarm outputs automatically reset when the value shown on the scaled frequency no longer meets the selected criteria.

If specified at time of ordering (type “L”), a 3000BCL can be supplied with a latching facility for the alarm outputs. Resetting the outputs is then performed by grounding the reset terminal (ARst) on the rear panel or reset via the front panel.

Batch Indicator Outputs

The 3000BCL may be fitted with batch indicator outputs (terminals BCH and PBC). Both outputs are NPN (switch to 0V on activation), with a maximum voltage of 60Vdc (DC only) and sink current of 150mA.

The batch indicator output (BCH) will be switched to 0V when the batching process is active. The prebatch (PBH) indicator output will be switched to 0V once the prebatch quantity is reached.

These outputs can be used to illuminate batch status indicators, or provide a logic level signal to start the batch or prebatch process.

Output Options

Analogue Output

“A” models are configured with an analogue output terminal, labelled “Ao” on the rear terminals. The analogue output can be set to be either voltage or current. The output modes are selectable as:

Voltage: 0 - 5V, 1 - 5V, 0 - 10V or 2 - 10V

Current: 0 - 20mA or 4 - 20mA

In addition to selecting the type and range of the output, the reference and full-scale values must also be set. Scaled frequency values at or below the reference will be set to the lowest output value in the selected range. Scaled frequency values at or above the full-scale value will be set to the maximum value in the selected range. In between the reference and full-scale values, the analogue output will be set linearly according to the reference, full-scale and scaled frequency value.

Digital Output

“D” models are configured with a digital output terminal. This digital frequency divider provides a scaled frequency square wave output. The scaling factor can be set anywhere between 0 (output off) and 1 (output equal to input frequency). For example, if set to 0.5 the frequency of the digital output will be equal to half of the frequency of the input signal. In Frequency A and Frequency B mode the digital output provides a divided version of the respective channel. In A/B mode the frequency on Input A determines that of the digital output and in B/A this is determined by Input B.

The digital output provides a pulse to supply (Vs) with a 4.7kΩ pull-up resistor and can sink up to 150mA.

The digital divider function will reduce the maximum frequency capability of the instrument and standard units with this option have a maximum frequency of 30kHz.

Settings

On first power up from factory settings, the unit will enter set mode.

Set Mode can also be accessed after initial configuration by ensuring that the “Ctrl” input is connected to 0V and then holding down both the “Set” and “Reset” buttons. The display will step through **SET 3** …. **SET 2** …. **SET 1** …. **SET 0**. **SET 0** will remain displayed until the buttons are released, after which the main display will show “SET”, followed by the first setting in the menu as described in the section below.

If the “Ctrl” input is open instead of connected to 0V, only the Batch Count setting can be accessed. To set the batch count hold down the Set and Reset buttons as described above. When released following SET 0, the display will show “**BCHSET**” and then allow the batch count to be altered.

In either case, the settings cannot be accessed while a batch is in progress. The batch must be stopped in order to access the settings.

The order and function of each of the settings is listed below. Please note that the unit’s sensitivity setting is configured outside of the general set menu, by activating the set sensitivity mode as described in the following section. The settings title will be displayed on the status display and the current value on the main display.

The start, stop and reset buttons have secondary functions used in the set mode, which are shown by the symbols on the buttons as follows:

STOP = Increment ↑, alter the currently selected value

START = Select ←, move to the next digit or to the decimal point position.

RESET = Step ▶|, move to the next setting

1. **INPUT** = Signal Input Mode [Default STD]
   Press increment ↑ to change between from the below options.
   STD = Standard sensitivity (from 100mV)
   HI SENS = High sensitivity (from 12mV)
   REED = Reed switch (max. input frequency 200Hz)
   Press step ▶| or select ← to move to the next setting.

2. **CALC** = Set Value Calculation Mode [Default MUL]
   Press increment ↑ to change between the below options.
   DIV = Divide by scaling factor
   MUL = Multiply by scaling factor

Press step ▶| or select ← to move to the next setting.

3. **RSCALE** = Rate (Frequency) Scaling Factor [Default 000000]
   Enter the scaling factor to be applied to the measured frequency value. Depending on the calculation mode selected the measured frequency will either be multiplied or divided by this value.
   Press select ← to select digit and increment ↑ to change value. After cycling through all seven digits, the decimal point position can be altered by pressing increment ↑.
   Pressing select ← after setting the decimal point position will return to the first digit.
   For the current rate to be viewable on the status display, the rate scaling factor must have a non-zero value.
   Press step ▶| at any time to move to the next setting.

4. **RATEDP** = Rate Decimal Places [Default 1DP]
   Select the number of decimal points to display the scaled frequency value. The decimal point position can be altered by pressing increment ↑. This limits the range of values that can be displayed. The unit will display "**high**" when the calculated value is greater than can be displayed on the number of digits available. The remaining rate based settings (offset and alarms) will also be limited to this number of decimal places.
   Press step ▶| or select ← to move to the next setting.
   NOTE: This setting is now independent of the scaling factor value, e.g. a setting of 1 decimal place does not require the scaling factor to be multiplied by 10.

5. **OFFSET** = Rate Offset [Default 000000]
   Press select ← to select digit and increment ↑ to change value.
   The offset is added to the scaled rate (frequency) value. The offset is permitted to have a negative value, for instance to display the deviation from a nominal rate. The 6th digit can instead be set to "**-**", in order to change the sign of the rate offset. As a display is required to show the sign, negative numbers can only be displayed to 5 digits, so this should be considered when setting the number of decimal places for the rate. The number of decimal places is limited according to the RATEDP setting.
   Press step ▶| at any time to move to the next setting.

6. **TSCALE** = Total Count Scaling Factor. Set the total scaling factor. [Default 000000]
   Enter the scaling factor to be applied to the total (all time) pulse count. Depending on the calculation mode selected, the total count will either be multiplied or divided by this value.

Press select ← to select digit and increment ↑ to change value. After cycling through all six digits, the decimal point position can be altered by pressing increment ↑. Pressing select ← after setting the decimal point position will return to the first digit.
For the total count to be viewable on the status display, the total scaling factor must have a non-zero value.
Press step ▶| at any time to move to the next setting.

7. **TOT DP** = Total Count Decimal Places [Default 1DP]
   Select the number of decimal places for the display of the scaled total count value. The decimal point position can be altered by pressing increment ↑. This limits the range of values that can be displayed. The unit will display "**high**" when the calculated value is greater than can be displayed on the number of digits available.
   Press step ▶| or select ← to move to the next setting.
   NOTE: This setting is now independent of the scaling factor value, e.g. a setting of 1 decimal place does not require the scaling factor to be multiplied by 10.

8. **ALARM 1** = Alarm Output 1
   Set rate alarm output 1 direction and threshold value.
   Press increment ↑ to select from the below options.
   HI = High alarm (output switched to 0V when scaled frequency value ≥ value)
   LO = Low alarm (output switched to 0V when scaled frequency value ≤ value)
   Low alarms are only active when batching is in progress, and only after the low alarm rate has been reached.
   Press select ← or step ▶| once the alarm type is selected, to then set the alarm value.
   Enter the scaled frequency value below which the low alarm will be activated.
   Press select ← to select digit and increment ↑ to change value. The low alarm is permitted to be negative, which may be required where a negative offset has been set. The 6th digit can instead be set to "**-**", in order to change the sign of the alarm value. The decimal point position is locked to the display value set under RATEDP.
   Press step ▶| at any time to move to the next setting.

9. **ALARM2** = Alarm Output 2
   This is configured by following the same process as for ALARM1.

10. **WAIT** = Wait Time [Default 0]
    Set the wait time in seconds that the unit will wait to receive a pulse on the input before displaying zero (or the offset value if this has been set).

This setting can be anywhere between 0 and 20. When set to 0, the unit will not wait beyond the configured update time period.
When the automatic batch correction feature is activated, the unit will wait until no further pulses have been received in this time period, before calculating the overrun/underrun and adjusting the compensation value accordingly.
Press increment ↑ to change value.
Press step ▶| or select ← to move to the next setting.

11. **UPDATE** = Update Time. Set the display update time [Default 1000MS]
    Press increment ↑ to select from the below options.
    100 MS = 100ms (0.1s)
    250 MS = 250ms (0.25s)
    500 MS = 500ms (0.5s)
    1000 MS = 1000ms (1s)
    3000 MS = 3000ms (3s)
    Press step ▶| or select ← to move to the next setting.

12. **BSCALE** = Batch Scale. Set the batch scaling factor. [Default 000000]
    Enter the scaling factor to be applied to the batch pulse count. Depending on the calculation mode selected, the batch pulse count will either be multiplied or divided by this value.
    Press select ← to select digit and increment ↑ to change value. After cycling through all six digits, the decimal point position can be altered by pressing increment ↑. Pressing select ← after setting the decimal point position will return to the first digit.
    For the batching functionality to be available, the batch scaling factor must have a non-zero value.
    Press step ▶| at any time to move to the next setting.

13. **BCH DP** = Batch Count Decimal Places [Default 1DP]
    Select the number of decimal points to display the scaled total count value. The decimal point position can be altered by pressing increment ↑. This limits the range of values that can be displayed. The unit will display "**high**" when the calculated value is greater than can be displayed on the number of digits available.
    Press step ▶| or select ← to move to the next setting.
    NOTE: This setting is now independent of the scaling factor value, e.g. a setting of 1 decimal place does not require the scaling factor to be multiplied by 10.

14. **BCHDIR** = Batch Count Direction [Default UP]

Press increment ↑ to select from the below options.

UP = Batch counts up from 0.

DOWN = Batch counts down from batch count (BCHCNT).

Press step ▶| or select ← to move to the next setting.

15. **PBCCNT** = Prebatch Count [Default 000000]

    This is the scaled count **before the batch total**, at which the prebatch output will switch. This ensures that changes to the batch count do not also require the prebatch count to be altered. This is commonly used to begin a slowdown process in preparation for reaching the full batch quantity.

    Press select ← to select digit and increment ↑ to change value. After cycling through all seven digits, the decimal point position can be altered by pressing increment ↑. The number of decimal places is limited by the BCH DP setting.

    Press step ▶| at any time to move to the next setting.

16. **BCHCNT** = Batch Count [Default 000000]

    This is the target scaled count for the batch.

    Press select ← to select digit and increment ↑ to change value. After cycling through all seven digits, the decimal point position can be altered by pressing increment ↑. The number of decimal places is limited by the BCH DP setting.

    Press step ▶| at any time to move to the next setting.

17. **BCHCOR** = Batch Correction [Default UP]

    Set whether the batch correction feature is active and view/alter the current scaled correction value. This feature is used to correct for overrun that may occur when the batch total is reached.

    Press increment ↑ to select from the below options [Default AUTO].

    AUTO = Batch overrun/underrun is calculated at the end of the completed batch and the compensation adjusted for the next batch.

    OFF = No correction, the batch output will switch once the batch total is reached.

    Press select ← or step ▶| to continue.

    The current scaled count value for the overrun compensation will be displayed. This is the scaled count before reaching the batch total, at which the batch output will be deactivated. It is possible to enter a seed value for the process correction, or to modify the value. This setting is intended for minor corrections and is limited to 5% of the total batch quantity.

    Press select ← to select digit and increment ↑ to change value.

    Press step ▶| at any time to move to the next setting.

Setting the Sensitivity [Default 50]

Sensitivity can only be adjusted with the control input “Ctrl” connected to ground. This mode cannot be entered while batching is in progress. To enter sensitivity mode, Hold “Set” then press “Stop”. The display will show **SENS** and then the current value is displayed. Sensitivity ranges from 0 (least sensitive) to 63 (most sensitive).

Press select ← to reduce the value or increment ↑ to increase it. After 2s of neither button being touched the unit will apply the selected sensitivity value and return to run mode. It is recommended that the sensitivity level is set only as high as necessary to obtain a steady signal. This minimises the risk of detecting spurious signals.

Resetting the Total Count

To reset the total count, enter sensitivity mode as described above. While sensitivity mode is still active, hold down the reset button. The display will show **TRST 3** …. **TRST 2** …. **TRST 1** …. **TRST 0**. **TRST 0** will remain displayed until the button is released. The status display will indicate **TRESET** to confirm that the total count has been successfully reset.

Power Loss

The current counts will automatically be retained in the event of a power loss. If the system was batching at the time of the power loss, it will resume in the stopped condition. Pressing start will then resume the batch from its previous position.

Viewing the Settings

The current values of all settings can be viewed at any time in run mode. To do so, press and release the settings button ✸. The display will show DISPSET and will then display the title and current value of each setting in order. To skip over a setting, press the settings button ✸. The display will automatically return to run mode once all settings have been displayed. Press and hold settings ✸ then press increment ↑ to immediately return to run mode at any time.

Batching

The quantity to be batched is set using the procedure described in the Settings section. With the “Ctrl” input open, press and hold the “Set” and “Reset” buttons. When released following SET 0, the display will show “BCHSET” and then allow the batch count to be altered.

Once the batch quantity has been configured, press “Set” and “Reset” together to return to run mode. To start the batching process, press either “Start” on the front panel, or make a momentary connection between the external start input and 0V as described below. Depending on the configured batch direction setting, the instrument will either count up from 0, or count down from the set batch quantity.

Press Stop at any time during the batching operation to pause the process. While stopped, the batch quantity can be amended, or the process can be reset. Press Start to resume batching from the current count.

Pressing Reset will reset the batch count, allowing the process to be restarted.

When batching, the status display can be configured to show the current status of the batching process. In other display modes, when the batch status changes the status display will briefly show the new status, before reverting to the selected function.

The batch statuses are:

1. Stopped (STOP)
2. Reset (RESET)
3. Batching (BATCH)
4. Prebatch (PREBCH)
5. Complete (END)

External Start, Stop and Reset

Start (GO), Stop (STP) and Reset (RST) inputs are available on the back panel for the connection of external momentary push switches to control the batching process. A momentary connection to 0V is required to trigger the input, and a 0V terminal is provided on the same connection block for this purpose.

Changing the Status Display Mode

There are four options for the status display, which can be toggled by the user at any time. Regardless of the mode selected, the status display will notify of changes to the progress of the batching status, before reverting to its configured mode. There are two methods to change the active status display mode.

1. The external mode input (Mde) will change the currently selected mode when momentarily connected to 0V. An external momentary push switch can be connected between the Mde terminal and 0V for this purpose.

2. Press and hold the “SET” button on the front panel. Hold the set button for around 2 seconds (without pressing any of the other buttons on the panel) until the status display notifies of the mode change. Repeat the process to again change the mode.

The order and function of the status display modes are as follows:

1. **RATE** = Scaled Rate Display. The status display will show the current rate, based on the configured rate scaling factor and rate decimal place settings. If the rate scaling factor is equal to zero, this mode will not be available.

2. **TOTAL** = Scaled Total Count Display. The status display will show the current total (all time) pulse count, based on the configured total scaling factor and decimal place settings. If the rate scaling factor is equal to zero, this mode will not be available.

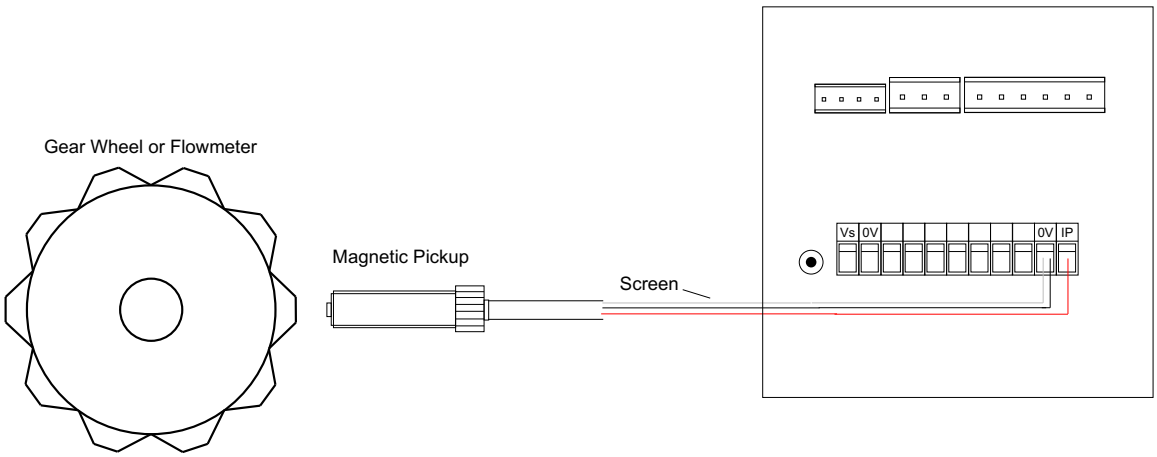
3. **STATUS** = Batch Status. The current batch status is displayed.

4. **BCHCNT** = Batch Count. The target batch count is displayed.

Input Connections

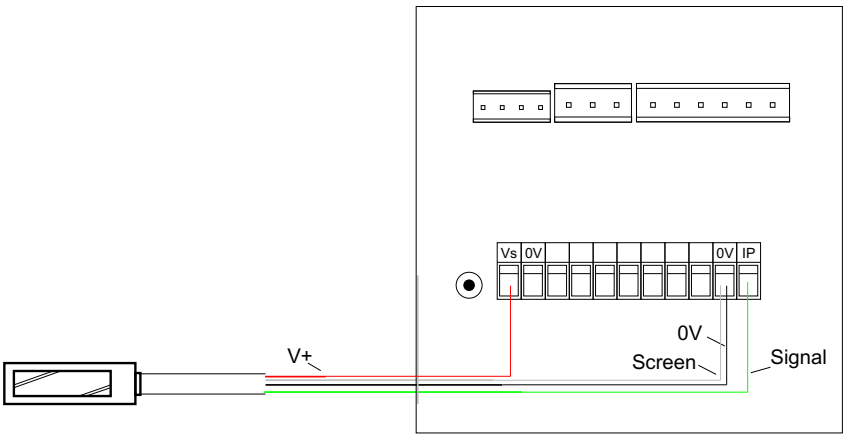
Variable Reluctance Magnetic Pickups

Set input type (INPUT) to standard sensitivity (STD) or high sensitivity (HS) depending on target diameter and rotational speed. Connect the cable screen and one of the two wires from the magnetic pickup to the common 0V terminals (shown as the black wire below). Connect the other wire from the magnetic pickup to the input (IP). Adjust sensitivity to ensure that the correct value displayed at the minimum rotational speed.



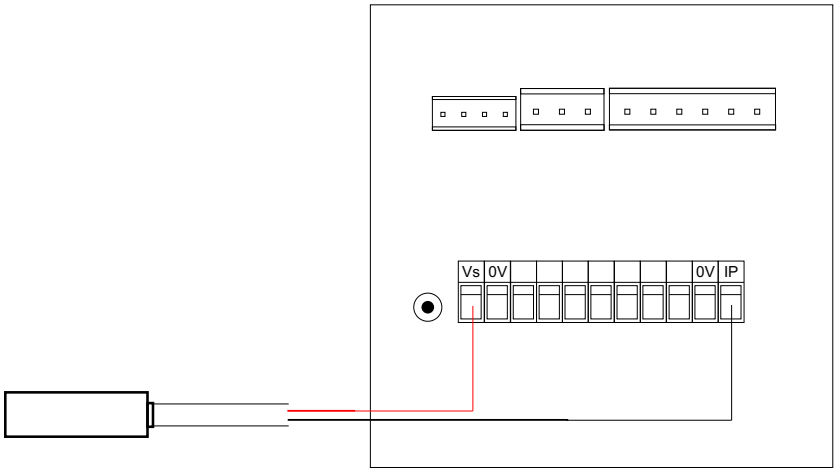
Electronic Sensors and Rotary Encoders

Set input type (INPUT) to standard sensitivity (STD). The sensor/encoder can be supplied from the Vs terminal, provided that the sensor is rated to operate at this voltage. For units with a DC supply, the voltage on the Vs terminal will be as supplied via the power connector. For units with the AC supply module, Vs is nominally 9Vdc. Otherwise, power the sensor/encoder from an external supply and connect the 0V terminals of the external supply to a 0V terminal on the instrument. The sensor/encoder's 0V connection should be made to any of the common 0V terminals, along with the cable screen if this is not connected to 0V at the sensor/encoder end.



Reed Switch

Set input type (INPUT) to reed switch (REED). Connect one switch terminal to the supply voltage (Vs) and the other to the input terminal IP. The maximum frequency is limited to 200Hz. Adjust the sensitivity until the correct value is displayed at the maximum frequency of operation.

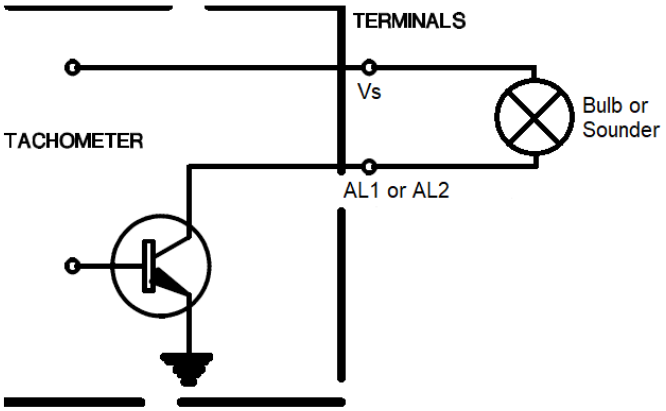


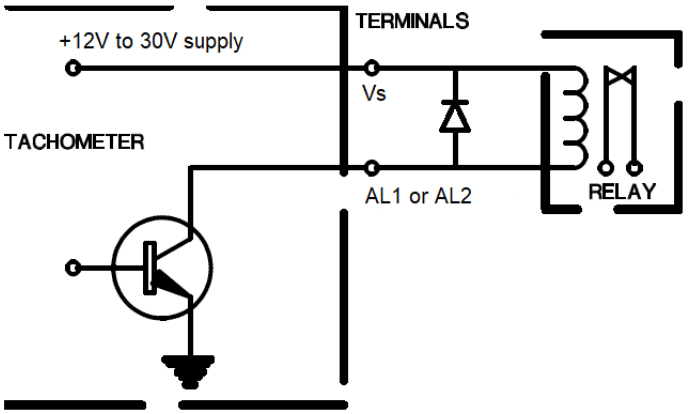
Alarms and Batch/Prebatch Indicator Connections

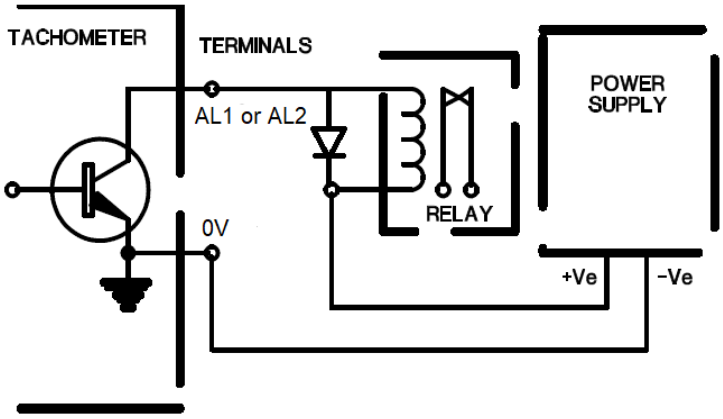
Example alarm/indicator configurations are shown below. The alarms and batch indication outputs (where available) are for connection to DC only, with a maximum voltage of 60Vdc and sink current of 150mA. The operation of the alarms will be determined by the configured alarm direction, and these will be switched to 0V once the criteria is met. The batch indicator output (BCH) will be switched to 0V when the batching process is active. The prebatch (PBH) indicator output will be switched to 0V once the prebatch quantity is reached.

NOTE: Switching Relays.

If the relay module does not have integrated back EMF suppression, it is essential that a diode is connected across the coil as shown in the diagrams.







Relay Connections

The batch and prebatch outputs are two independent volt free relays. These can be used to switch AC or DC voltages and the contacts are rated to 8A at 240Vac. The relays are SPDT with a normally open (NO) and normally closed (NC) terminal. The relays will energise on commencement of the batching process. The prebatch relay will then switch off once the remaining quantity is equal to the configured prebatch quantity. The batch relay will switch off on completion of the batching process.

Relay Protection Circuitry

There is a snubber network built into the instrument circuitry across the relay contacts to prolong the operating life and reduce the risk of interference from contact arcing. This protection circuit has a leakage current of 3.5mA at 240Vac (negligible on DC supplies) which may, under certain circumstances, hold some loads - eg low power relays - in the "ON" state. If this problem occurs please contact our Sales Office for advice.

Electro-Magnetic Precautions

A great deal of noise immunity has been designed into the product in accordance with the EMC directive 2014/30/EU, the Electromagnetic Compatibility Regulations 2016, BS EN IEC 61000-6-2 and BS EN IEC 61000-6-4.

However, it is still vital to use good EMC (Electro-Magnetic Compatibility) techniques on installation of both this and other associated electronic equipment and sensors in order to ensure reliable operation.

It is important to note that if used with systems that radiate high levels of harmonic noise such as DC Drives, AC Inverters and Servo Drives then the levels of imposed interference can greatly exceed that of the European Standards.

In such cases it is important to ensure that mains leads are routed as far as possible from all cables carrying power to such equipment and that the supply should, if viable, be taken from a clean source. Where this is not possible, it is advisable to use a good quality mains filter mounted as close to the instrument as possible, ensuring that the cable between the filter

and the instrument is kept separate from any cables carrying high levels of current or any fast-switching transients.

All signal connections to the instrument should be made using a screened lead with the screen connected to ground/0V at one end only.

Low Voltage Directive

When supplied via the AC power module, it is essential that the mains supply to the instrument is fused externally to no more than 1A and that the cabling supplying power to the instrument is rated for at least 3A. Low voltage signal cables should not be run in the same conduit or twisted or tied to cables carrying voltages in excess of 50V (AC or DC).

The instrument should be earthed via the earth “E” terminal on the connection block when power is supplied via the L & N terminals, or when switching in excess of 50V (AC or DC).

If the instrument is not installed fully in accordance with the instructions in this User's Guide it may not comply with the requirements of the Low Voltage Directive.

Warranty

3000BCL instruments carry a two-year warranty that is only valid where there is no damage caused by accident, negligence, misapplication, or repairs/modifications attempted by unauthorised personnel.