

# *Blancett*®

**Programmable K-Factor Scaler  
B220-885  
and  
Programming Software Kit  
B220-900**

**INSTALLATION & INSTRUCTION  
MANUAL**



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**NOTE:** *Blancett reserves the right to make any changes or improvements to the product described in this manual at any time without notice.*

# INTRODUCTION

The Blancett K-Factor Scaler is a field adjustable frequency divider, which interfaces the output signal from a turbine meter with a magnetic pick-up to the input of a PLC, RTU, CPU data acquisition card or similar totalizer device. The adjustable frequency divisor, referred to as the K-factor, allows the pulses being sent from a turbine meter to be divided into a recognizable unit that an end device, such as a PLC, can count and display.

Different K-factors allow the device to display in any number of volume measurements such as gallons, cubic meters, liters, barrels, etc. A calibration sheet provided with a turbine meter will list a nominal K-factor (for the range of the meter) tested to a specific volumetric flow rate. This K-factor can be placed directly into the K-Factor Scaler to provide an output with the same volumetric flow rate or modified to a different volumetric flow rate by re-calculating the K-factor with the appropriate conversion factor.

In addition, if the K-factor is set to 1, the K-Factor Scaler can be used as a preamplifier where the frequency from a low-level turbine meter is proportional to the logic level frequency output needed by a PLC or CPU data acquisition card. This option allows the end device to control the dividing process of the turbine meter output to a recognizable flow rate.

## OPERATING PRINCIPLE

Fluid moving through a turbine flow meter causes the rotor to rotate in relation to the flow rate. The rotation of the rotor blades cuts through the magnetic field generated by the magnetic pick-up which in turn generates a frequency output signal that is directly proportional to the speed of the rotor.

The signal produced is received by the K-Factor Scaler input amplifier, which has an input sensitivity of 30mV p-p to 30V p-p. The signal is then sent to an onboard microcontroller, which acts as a divisor with a range of 1 to 999,999,999. The divisor (K-factor) is user adjustable and set by programming it into the board. The microcontroller handles the dividing process by counting the input pulses and comparing it to the programmed K-factors. Once the count equals this value, an output pulse occurs for a selectable time period and the counting process starts over.

# SPECIFICATIONS

## External Power:

Input Voltage: 8.5 to 30 Vdc ( Diode protected )

Maximum Current Draw: 18 mA (using internal resistor  
@ 30 Vdc input)

## Environmental:

Operating Temperature: -22 °F to +158 °F (-30 °C to +70 °C)

## Inputs (Magnetic Pick-up):

Frequency Range: 0 to 4000 Hz

Trigger Sensitivity: 30 mV p-p to 30 V p-p

## Output Signal:

Max Voltage: 30 Vdc

Max Power: 0.25 W

Pulse Type (using internal pull-up resistor):

$V_H$  = Power Input Voltage – 0.7 Vdc

$V_L$  = Less then 0.4 V @ max input power

Pulse Type (using external pull-up resistor):

$V_H$  = Input Voltage to external pull-up resistor

$V_L$  =  $[V_H / (\text{selected resistor value} + 47 \Omega)] \times 47 \Omega$

Pulse Length: 150µs, 1ms, 25ms, 100ms, 500ms, 1s, or Auto mode

## Internal Pull-up Resistor:

Jumper disable option: 3.6K Ω

## Enclosure:

Killark aluminum capped elbow Y-3

## Agency Listings:

CSA: Hazardous Locations

Class I, Div 1, Groups C and D;

Class II, Groups E, F, and G; and Class III

Type 4X; T6 @ 70 °C

C22.2 No. 30 for Canada

Pollution Degree 2, Overvoltage Category III

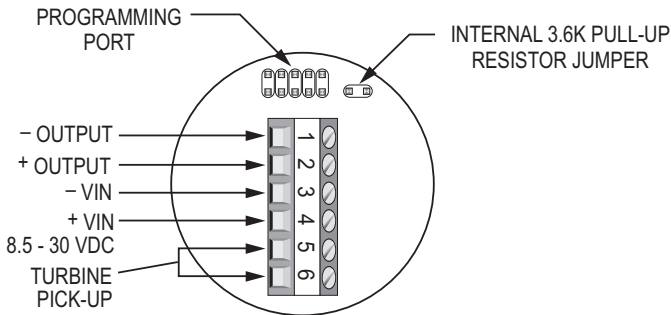
**Pollution Degree 2:** Normally only non-conductive pollution occurs. Occasionally, a temporary conductivity caused by condensation must be expected.

**Overvoltage Category III:** Distribution level, fixed installation, with smaller transient overvoltage than installation category IV (Primary supply level).

**IMPORTANT:** For this CSA rating to be valid, the circuit board must be mounted in a certified Killark 1" model Y-3 conduit outlet box.

# INSTALLATION

The programmable K-Factor Scaler was designed to provide a lower cost alternative to the Blancett model B220-880 K-Factor Scaler. The programmable version allows fewer components to be used which reduces the size of the board and enclosure. Refer to **Figure 1** below for the I/O terminal connections. The board connections include Power Input, Turbine Meter Input, and the Pulse Output to a totalizing device.



**Figure 1**  
*Input/Output Terminal Connections*

## **Enclosure Mounting** (necessary for CSA certification)

If the circuit board assembly is supplied without an enclosure, it must be mounted within a certified Killark 1" NPT model Y-3 conduit elbow outlet box to maintain the CSA "Ordinary Locations" certification.

## **Power**

The K-Factor Scaler requires 8.5 to 30 Vdc to operate and is protected by a diode. Polarity is shown in **Figure 1**.

## **Turbine Meter**

The turbine meter connections are non-polarized. Shielded, twisted pair wire is recommended for this connection.

## **Pulse Output**

Either the internal or external pull-up resistor must be used for the K-Factor Scaler to provide an output pulse. This option is controlled by the onboard jumper. With the jumper installed, the internal pull-up resistor is connected.

## Internal Pull-up Resistor

The internal pull-up resistor allows for a simple installation, but care must be taken to ensure that the device being connected to by the pulse output can handle voltage levels as high as the supply feeding the K-Factor Scaler. Another important setup consideration when using the internal pull-up resistor is to make sure the output pulse from the K-Factor Scaler can supply enough current for the receiving device to be able to read the pulse. The available current that the K-Factor Scaler can supply to the receiving device can be calculated with the following equation.

$$\text{Available Current} = \left( \frac{\text{Input Voltage} - 0.7 \text{ V}}{3600 \Omega + 47 \Omega} \right)$$

Verify that the receiving device input current requirement is below this value for proper operation. Otherwise, an external pull-up resistor less than 3.6K  $\Omega$  will have to be used.

## External Pull-up Resistor

Using an external pull-up resistor offers the end user greater flexibility of controlling the output pulse provided by the K-Factor Scaler to the receiving device. Since power sources and receiving devices differ between users, different resistor values may be required by different setups.

The external pull-up resistor is connected between the receiving device's input and external power source. This power source would be the maximum input voltage (of the pulse) to the receiving device. Refer to the following equation to help determine the resistor value needed.

$$R = \left( \frac{\text{Supply Voltage}}{I} \right)$$

Where: **R** = Resistor value in Ohms

**Supply Voltage** = External supply voltage connected to the external pull-up resistor

**I** = Input current required by the receiving device in amps

After the resistor value has been calculated, make sure in the following equation, that “P” is less than or equal to 0.25. “P” represents the power capability of the output and should not exceed 0.25 Watts. Exceeding this value could damage the K-Factor Scaler. Raising the resistor value will decrease the available power output.

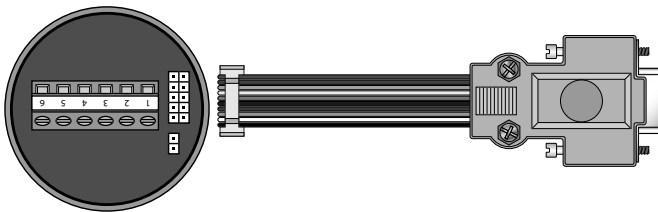
$$P = (\text{Supply Voltage}) \left( \frac{\text{Supply Voltage}}{R + 47} \right)$$

## START-UP AND CONFIGURATION USING OPTIONAL PROGRAMMING SOFTWARE KIT B220-900

(Software Sold separately)

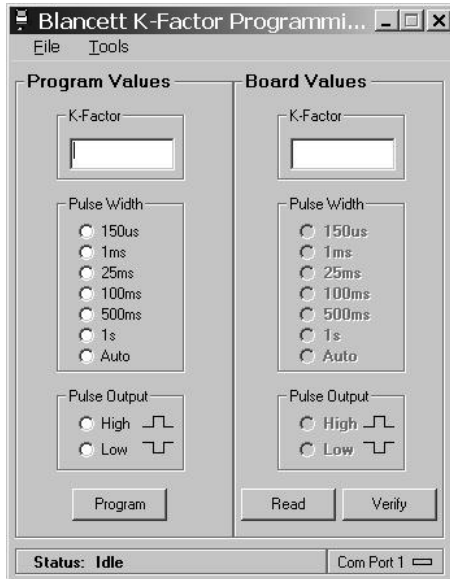
The programmable K-Factor Scaler can be factory or user configured through a serial port of a PC by a Windows® compatible software utility. A programming adapter is required that interfaces the serial port from the PC to the programming port on the board.

To program the K-Factor Scaler, begin with the power turned off and connect the adapter cable to the K-Factor Scaler board. See **Figure 1**. Then, connect the Serial -to-TTL converter (black box) to the adapter cable. Next, attach the serial extension cable to the Serial-to-TTL converter and connect the opposite end to an available 9-pin serial port of a PC. Lastly, make sure power is being supplied. Power must be supplied to the K-Factor Scaler in order to program.



**Figure 1**  
*Interface connection*

The programming software is divided into two columns as shown in **Figure 2** on page 8. The ‘Program Values’ column is the information that is to be programmed into the K-Factor Scaler and can be entered by the user. The ‘Board Values’ column contains the information that the K-Factor Scaler currently contains and can not be altered by the user. The ‘Board Values’ column will only display the contents of the board after a program, read or verify function was performed.



**Figure 2**  
*Programming software screen*

The proper computer serial port must be selected within the Blancett K-Factor programming software for it to communicate with the board. This is done by going to TOOLS – COM PORT, from the menu bar, and selecting the Com Port (1 through 16) that the serial programming cable is connected to on the computer.

If the serial port selected is invalid, the software will show the message “ERROR - Invalid Com Port” when trying to program the board. If the serial port selected is the incorrect port (or if there is a problem with the cable), the software will show the message “<< No Response>>” after trying to program the board. All information under the ‘Program Values’ column must be entered before the software will allow the K-Factor Scaler to be programmed.

The PROGRAM button programs the K-Factor, Pulse Width and Pulse Output to the K-Factor Scaler. After the program function is complete, the board is automatically read and verified. The K-Factor Scaler will retain these values when disconnected from power and can be reprogrammed at any time.

The READ button reads the current information from the K-Factor Scaler and displays it under the ‘Board Values’ column of the PC software.

The VERIFY button performs the same function as the READ button, but compares the ‘Board Values’ to the ‘Program Values’ and displays an error if



the two do not match.

Configuring the K-Factor Scaler consists of the following four items:

- Setting the K-factor (divider)
- Setting the output pulse width
- Setting the pulse output level normally high or normally low
- Setting the output pulse to use the internal or external pull-up resistor

### **Setting the K-factor**

The K-factor is the ratio of input pulses per each output pulse and can be viewed as a divisor. The minimum K-factor can be set to 1 where each input pulse yields an output pulse. The maximum K-factor can be set to 999,999,999 where it would take this many input pulses to yield one output pulse.

The K-factor is set by entering it in the 'Program Values' column of the software under K-Factor. The K-factor will be programmed when the PROGRAM button is pressed, but note that all values must be entered before programming is allowed by the software.

### **Setting the output pulse width**

The output pulse width is the length of time the pulse remains active before resetting to its resting state. The K-Factor Scaler has a total of six different pulse widths to choose from. Some end devices require that the pulse be a certain length or longer in order for proper detection of each incoming pulse. For these devices, it's important to select a pulse width that is long enough for the end device to recognize.

The pulse width option is set by selecting the desired pulse width radio button in the 'Program Values' column of the software. The Pulse Width option will be programmed into the board when the PROGRAM button is pressed, but note that all values must be entered before programming is allowed by the software.

In addition to the six pre-set pulse widths, another option, "Auto" mode, is available. This mode acts in the same manor, but does not restrain the output pulse to a specific length. Instead, it varies and is dependent on output frequency. The higher the output frequency, the shorter the pulse width output. The lower the frequency output, the longer the pulse width output. This option turns off the 'Pulse Output' option because it does not apply in this mode.

### **Setting the output level normally high or normally low**

Most end devices will be unaffected by this setting but the K-Factor Scaler has the ability to invert the output pulse level. This option is set by selecting the desired pulse output radio button in the 'Program Values' column of the software. The Pulse Output option will be programmed into the board when the PROGRAM button is pressed, but note that all values must be entered before programming is allowed by the software.

When the Pulse Output option "High" is selected, the output level is normally low and the duration of the selected pulse width is high. When the Pulse Output option "Low" is selected, the output level is normally high and the duration of the selected pulse width is low.

### **Setting the output to use the internal or external pull-up resistor**

Either the internal pull-up resistor or an external resistor must be used for the K-Factor Scaler to provide an output pulse. This option is controlled by the onboard jumper and not by the software.

With the jumper installed, the internal 3.6K $\Omega$  pull-up resistor is connected to the input voltage of the board. With the jumper uninstalled, the internal pull-up resistor is disconnected and an external pull-up resistor and supply voltage are required.

## STATEMENT OF WARRANTY

Blancett Flow Meters, Division of Racine Federated Inc. warrants to the end purchaser, for a period of one year from the date of shipment from the factory, that all flow meters manufactured by it are free from defects in materials and workmanship. This warranty does not cover products that have been damaged due to defects caused by misapplication, abuse, lack of maintenance, modified or improper installation. Blancett's obligation under this warranty is limited to the repair or replacement of a defective product, at no charge to the end purchaser, if the product is inspected by Blancett and found to be defective. Repair or replacement is at Blancett's discretion. A return goods authorization (RGA) number must be obtained from Blancett before any product may be returned for warranty repair or replacement. The product must be thoroughly cleaned and any process chemicals removed before it will be accepted for return.

The purchaser must determine the applicability of the product for its desired use and assumes all risks in connection therewith. Blancett assumes no responsibility or liability for any omissions or errors in connection with the use of its products. Blancett will under no circumstances be liable for any incidental, consequential, contingent or special damages or loss to any person or property arising out of the failure of any product, component or accessory.

All expressed or implied warranties, including **the implied warranty of merchantability and the implied warranty of fitness for a particular purpose or application are expressly disclaimed** and shall not apply to any products sold or services rendered by Blancett.

The above warranty supersedes and is in lieu of all other warranties, either expressed or implied and all other obligations or liabilities. No agent or representative has any authority to alter the terms of this warranty in any way.

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Printed in USA  
Form No. B410-002 11/10