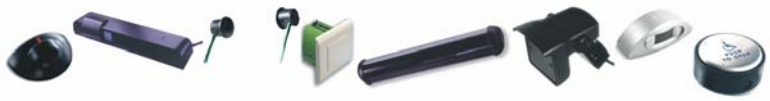
# APPLICATION NOTE



## Getting the very best out of the MICROCELL THREE

## 1 Introduction

The MICROCELL THREE beams have been first designed to be a Monitored version of the MICROCELL ONE/ TWO beams. The terms “Externally Monitored” refers to the fact that it is possible to check the sensor integrity by applying some control signal to the device. This is made by the use of the control inputs available on the sensor connection terminals.

As a consequence of this main application, it can be seen that the beam has a different output configuration than the MICROCELL ONE/TWO relay output. In fact, we have now two outputs. These outputs have been designed to use transistors for reasons explained in the following paragraphs.

The purpose of this paper is to try to explain several interesting features available in the sensor and to give possible applications to them. In fact, even without using the monitoring features of the sensor, it may be very useful in some application detailed here under.

## 2 Electrical interfacing

As a starting point, it is useful to give some details about the possibilities of interfacing the sensor with all possible kinds of operator. Several main topics are summarized below:

1. **The sensor has only a DC supply input.** No AC signal is allowed as a supply source. This is closely linked to the fact that a transistor output is used. This type of output requires a common line with the supply line.

2. **The sensor has two transistor outputs.** These outputs are not galvanic isolated like a relay for example. This is a consequence that a common point is always present between the supply lines and the output.

3. **The sensor has two galvanic isolated control inputs**. These inputs are used to enable the beams transmitters. When disabled, these transmitters are turned OFF and the sensor output must switch to give the same state as when a target crosses the beam.

4. **The sensor has two couples of IR transmitters / receivers.** These devices are separated and protected against TX/RX swap error.

**2.1. Sensor power supply.**

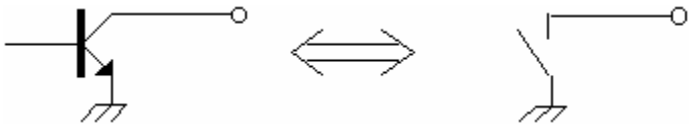
The sensor can be supplied by any voltage between 12V and 24V DC +/- 10%. The supply current of the sensor itself remains under 20 mA under any condition. Output current should be added to these figures. Please respect the given polarity for the connection. A protection diode protects the sensor against any bad connection.

**2.2. Sensor outputs.**

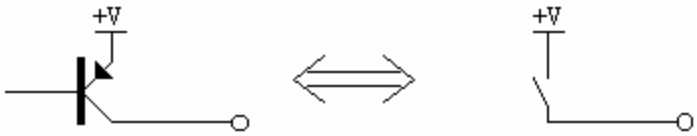
It is interesting to take a look to the possibilities offered by the sensor as output configurations. In fact, door operators may have a lot of different input types and logical configurations. For example, one door operator will consider the beam to be broken when a positive voltage equal to the beam supply voltage will be applied to its input. Another door operator will consider the beam to be broken when a ground connection will be removed from its input.

In order to clarify the type of beam outputs it is necessary to define some terms used in the past by B.E.A. beams sensor and kept here for the sake of understanding. On the beam programming dip switch, two switches are used to choose the right configuration:

1. **NPN / PNP** : NPN refers to a output type providing a negative voltage (ground voltage) In this case, the output configuration may be described by the drawing below :



PNP refers to a output type providing a positive voltage. In this case, the output configuration may be described by the drawing below :




It must be understood that in both configuration, when the transistor does not conduct, the output is left to the voltage provided by the door operator. ***The output is in a high impedance state.***

2. **NORMAL / REVERSE**: This Choice is necessary to take care of the way door operators are considering the information coming from the beam. In NORMAL configuration, the output transistor (either NPN or PNP) is conducting when the beam link is established. If something comes between the TX and RX, the transistor stops conducting.

In REVERSE configuration, it is the contrary: the output transistor (either NPN or PNP) is not conducting when the beam link is established. If something comes between the TX and RX, the transistor starts conducting.

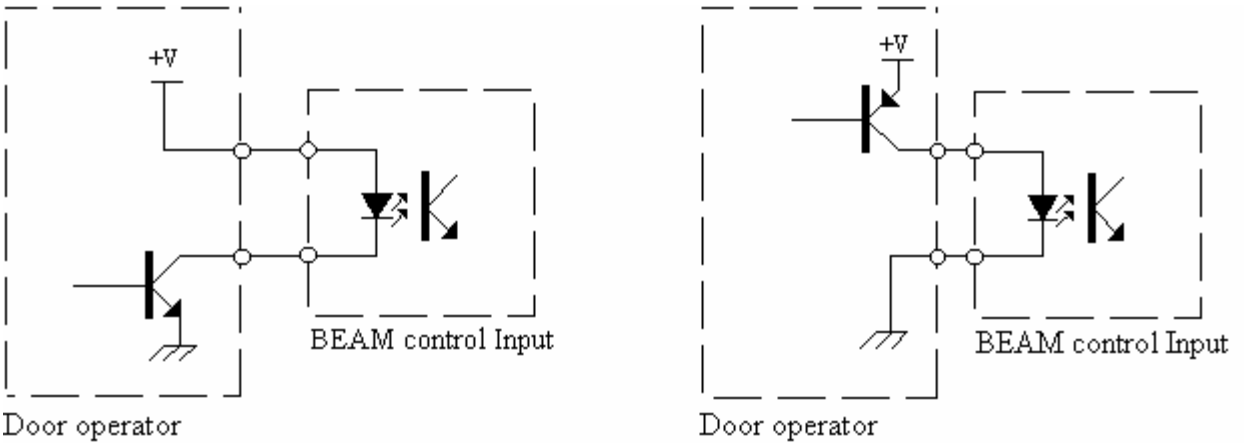
***The setting between NPN and PNP output configuration and between NORMAL and REVERSE logic is made through the use of the DIP SWITCHES. It is important to note that these two DIP SWITCH settings are valid for the two beams at the same time!!!***

**2.3. Sensor Control inputs.**

To allow the door operator to monitor the sensor , two inputs are necessary, one for each beam. By these inputs, the door operator creates artificially a fault in the IR beam link. This fault must have, as a consequence, an output state variation corresponding to what happens when somebody crosses the beam. If not, this means that the beam is not operating properly and should be serviced.

In order to keep compatibility with the most usual door operator topologies, the sensor control inputs have been designed so that they have to be supplied by a 12-24V voltage for the beam to run properly. When a control is needed, the door operator stops the supply of these inputs and waits for a change in the corresponding output state.

These inputs are using optocouplers to ease the connection to any type of door operator control output. The schematic below gives a idea of possible configurations:




***Always remember to connect the control lines to the supply lines when the beam is operated without door operator monitoring!!!***

### 2.4. IR Transmitter / Receiver connections

Two sets of IR RX / TX heads can be connected to the sensor. It must be emphasized that they are completely independent and have their own corresponding output and control input. One will pay attention to follow the installation manual in order to make the right connections on the control box. The sticker at the top of the control box is very helpful to avoid erroneous connections.

In case of accidental exchange between the RX and TX, no damage will arrive to the heads. A protection has been included in the design for that purpose.

## 3 Dip Switch Settings

The Beam sensor has four DIPSWITCHES having slightly different functionality the in the MICROCELL ONE version. The first two dip switches are configuring both sensors when dip switch N°3 only refers to Beam A and dip switch N°4 to beam B.

***Dip Switch N°1 : NPN/PNP output setting.*** As already described in the preceding paragraph, this setting is used to choose the type of transistor connection compatible with the door operator need. Dip switch OFF corresponds to NPN, Dip switch ON corresponds to PNP

***Dip Switch N°2 : NORMAL / REVERSE output logic setting***. With Dip Switch OFF, beam output is in NORMAL mode : the output transistor is conducting when the beam is established and not conducting when the beam is crossed. With Dip Switch ON, beam output is in REVERSE mode : logic makes the contrary.

***Dip Switch N°3 : NEAR / FAR sensitivity for BEAM A.*** When a long range is needed with beam A, the dip switch should be set to ON. For shorter ranges one should keep the Dip Switch OFF

***Dip Switch N°4 : NEAR / FAR sensitivity for BEAM B.*** When a long range is needed with beam B, the dip switch should be set to ON. For shorter ranges one should keep the Dip Switch OFF

## 4 Monitored Mode

The use of optocouplers as interface devices for the beam monitoring eases the connection to any type of door operator. The current needed by the optocouplers will always be less than 10 mA. Furthermore, it is not a capacitive load which would cause some problem to current sensitive operator control output stages.

Door operator CPU programming tips : as the beam needs a reaction time of typically 10 ms, the test of the beam output should be made at least after that period of time following the sensor test signal edge.

***One should remember that the monitoring of the beam by the door operator has to be made on a regular basis. Typically, 1 check every minute is a good periodicity. The fast reaction time of the beam (< 10ms) avoids any bad consequence on the true detection performance!!!***

## 5 Other Applications

### 5.1. High speed applications.

The faster reaction time of transistors over the relay may be an interesting feature in application where this is needed. Industrial applications may require such low reaction time and absence of relay aging problems.

### 5.2. Connecting the two beams on a single input.

In non monitored applications, it is possible to connect the two beams to a single door operator input using the following trick: Connect the output of the first beam to the control input of the second beam. Use the second beam output to connect with the door operator input.
It must be understood that this configuration may only be use in NORMAL logic configuration, because the second beam has to be supplied by the first one output in idle state. Reaction time will be 20 ms when a target will cross the first beam. NPN or PNP configurations are possible, be careful of the connections which are not the same.

***This type of arrangement can never be used for a monitored application!!!***

### 5.3. Taking benefit of the two beams.

In some applications, it could be interesting to use one of the two beams as a safety device and to use the second one as an activating device. This is possible with the MICROCELL THREE because the two beams are totally independent. So one output could be connected to the safety input of a door operator while the second one would be connected to the activating input.

A possible application of this could be gates at the supermarket where the MICROCELL THREE could take care of the activation of two gates, provided they have the same common supply.

### 5.4. Direct replacement of one or two SBK 111 beams.

The connections available on the sensor control box are directly compatible with the connection required for the use of two SBK-111 Beams. The advantage of the MICROCELL THREE lies in smaller heads and centralized control logic by a microprocessor.

All the connections needed to operate a SBK-111 beam are also present on the MICROCELL THREE. The transmitter connection becomes now the two beam control input lines and the receiver connections are the main supply lines and the corresponding output.



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