

## Operation of general purpose I/Os with programmable logic controllers 201704/v1.0/2017-05-18

### Description

This document describes an approach for changing / amplifying the output level of a camera's GPIO in order to interact with a PLC's input.

### Products

Baumer VCXG, VCXU and MXU cameras

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## 1 Technical Background

In industrial environment such as automation technology, the control and synchronization of the cameras and other components like sensors and actuators is realized by programmable logic controllers (PLC). Here higher switching levels – in comparison with transistor-transistor logic (TTL) – result in a higher electromagnetic noise immunity of both inputs and outputs and thus increase the interference resistance of the whole application.

State	TTL switching levels	PLC switching levels
High	2.8 V up to 5.0 V	11.0 V up to 30.0 V
Forbidden zone	0.8 V up to 2.8 V	4.5 V up to 11.0 V
Low	0.0 V up to 0.8 V	0.0 V up to 4.5 V

Table 1: Switching levels of TTL and PLC

On input side general purpose I/Os typically come with high levels ranging from 2.8 up to 30.0 V and thus are suitable for the operation in connection with a PLC.

On output side this does not apply since high level of a general purpose I/Os typically is 3.3 V and a PLC detects high level starting from 11.0 V.

GPIO		Input	Output
Wiring diagram	<p>3.3 V</p> <p>300 Ω</p> <p>FPGA</p> <p>Pin 1 / 8</p> <p>High: 2.0 V .. 3.0 V</p> <p>Low: 0 V .. 0.8 V</p> <p>Pin 7</p>	<p>3.3 V</p> <p>300 Ω</p> <p>FPGA</p> <p>Pin 1 / 8</p> <p>High: 2.4 .. 3.3 V</p> <p>Low: 0 V .. 0.4 V</p> <p><math>I_{\text{sink max}} = 50 \text{ mA}</math></p> <p>Pin 7</p>	
Suitable for direct PLC use	yes	no	

Table 2: GPIO wiring diagrams

## 2 Remedy

With the DEK-TR/INV (Part Number 2964319) Phoenix Contact offers a switching amplifier that is able to increase the GPIO's high level of 3.3 V to a PLC conform switching level of 11.0 V or more. This hat rail module can be clamped between the camera's output and input of the PLC.

Figure 2 shows the wiring diagram of the GPIO of a Baumer VCXG, VCXU or MXU camera, the Phoenix Contact switching amplifier and the digital input of a PLC.

In this wiring the line inverter of the camera's output needs to be activated since the output works active-low.

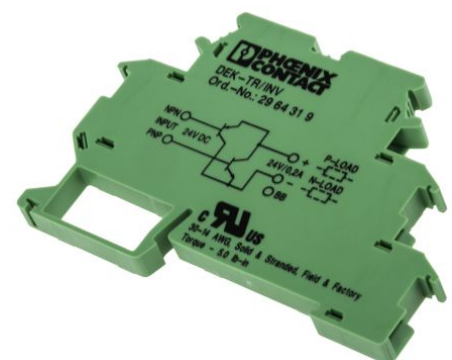


Figure 1: Phoenix Contact DEK-TR/INV  
(Photo: <http://media.rs-online.com>)

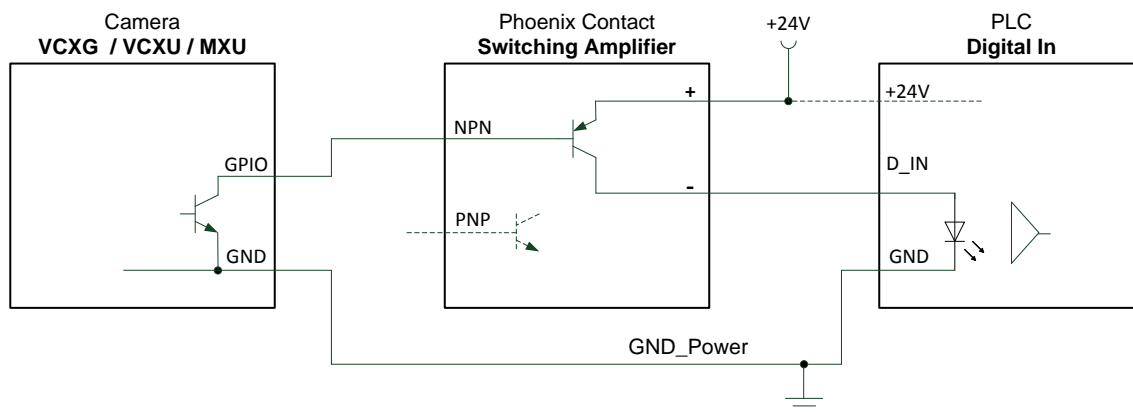


Figure 2: Wiring diagram for the switching amplifier DEK-TR/INV

### 3 Support

In the case of any questions or for troubleshooting please contact our support team.

#### Worldwide

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### 4 Legal Notes

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