Kuka Setup Guide

Connections

Before setting up the connections between SD100 and KR C5 Micro, be sure to follow the *Quick Guide* in the safedoor manual to ensure correct functionality of SD100.

When the Safedoor has been set up correctly, connect the Safedoor Controller to the KR C5 Micro according to the table below. The table uses the names: “Signal Name”, “Safedoor Port Name” and “KR C5 Port Connection”.

Safedoor Signal Name refers to the name by which the connection will be referred to throughout the guide. *Safedoor Connection* refers to the name of the IO as described in the *IO Connections section* in the safedoor manual. *KR C5 Micro Connection* referrers to the possible port connections between the *Safedoor Connection* and the KR C5 Controller.

Safedoor KRC5 Micro Connections

Safedoor Signal Name	Safedoor Connection	KR C5 Micro Connection
Open	J1 Pin 1	Any even Port Number between 10 – 40 on the XG12 Interface
Close	J1 Pin 2	Any even Port Number between 10 – 40 on the XG12 Interface
Robot 24V	J1 Pin 3	Port Number 4 on the XD12.1 Interface
Opened	J3 Pin 1	Any uneven Port Number between 9 – 39 on the XG12 Interface
Closed	J3 Pin 2	Any uneven Port Number between 9 – 39 on the XG12 Interface
Error	J3 Pin 3	Any uneven Port Number between 9 – 39 on the XG12 Interface
Robot GND	J3 Pin 4	Port Number 3 on the XD12.1 Interface

The Safedoor IOs are galvanically isolated, and support both NPN and PNP, and therefore support both high-side and low-side configurations of the XG12 interface.

Connection Example

Figure 03 shows an example of how the Safedoor controller can be wired to the KR C5 Micro.

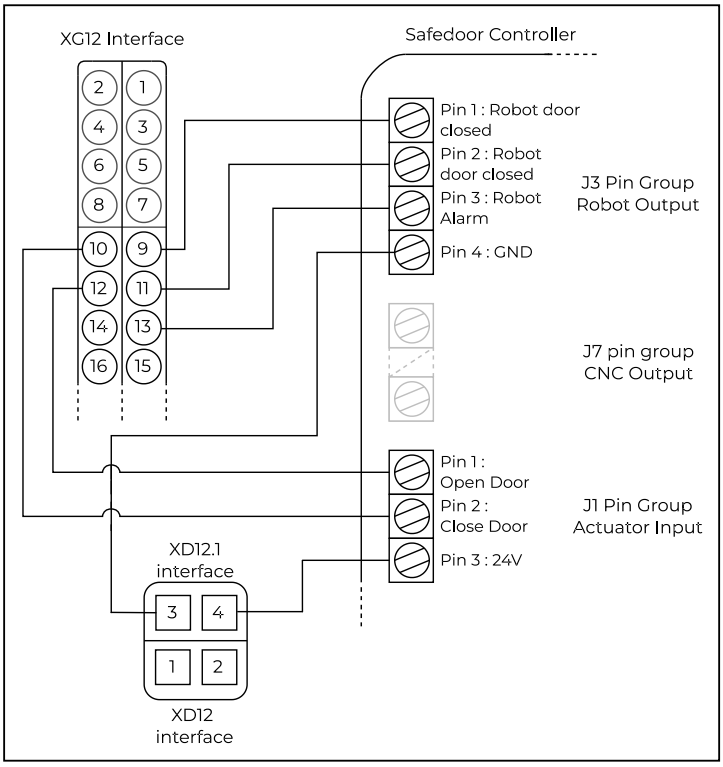


Figure 03: Connection Example

The table below contains the example connections made in figure 03.

Suggested Signal Name	Safedoor Signal Name	Safedoor Connection	KR C5 Micro Connection
OpenCNC	Open	J1 Pin 1	XG12 Port 12
CloseCNC	Close	J1 Pin 2	XG12 Port 10
-	Robot 24V	J1 Pin 3	XD12.1 Port 4
OpenedCNC	Opened	J3 Pin 1	XG12 Port 9
ClosedCNC	Closed	J3 Pin 2	XG12 Port 11
ErrorCNC	Error	J3 Pin 3	XG12 Port 13
-	Robot GND	J3 Pin 4	XD12.1 Port 3

I/O Configuration on the Kuka Cobot

For IO configuration, see official Kuka documentation here: https://xpert.kuka.com/ID/CS316.

Software Program Setup

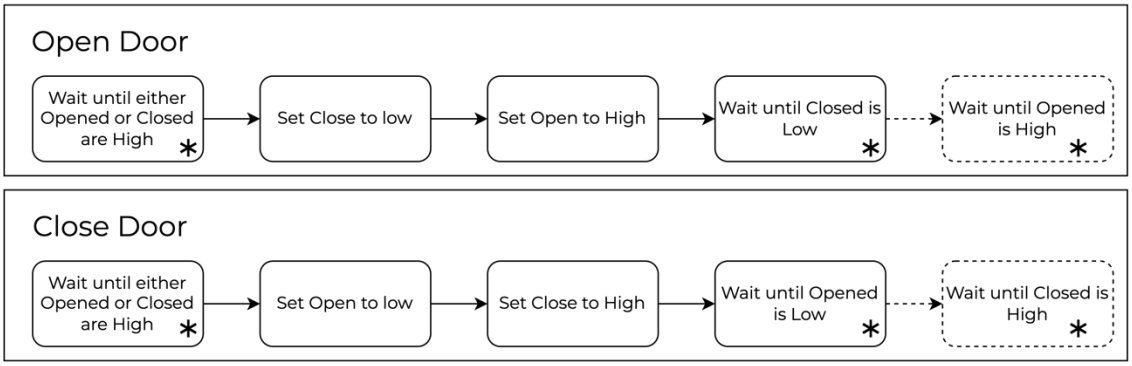
In this section it is described how to setup software programs to create collaboration between the Safedoor System and KR C5 micro.

The software programs for the KR C5 micro will serve the purpose of opening or closing the door correctly, with monitoring of the SD *Error* signal.

Open & Close Door Program

The programs will work by setting the IOs connected to the Safedoor Controller, making the actuator open or close. It opens by clearing the “Close” signal and setting the “Open” signal high and closes by clearing the “Open” signal and setting the “Close” signal high while also checking the state of the system before making decisions.

A recommended program flow for each action is shown below, ensuring the system is in a valid state before proceeding its flow:

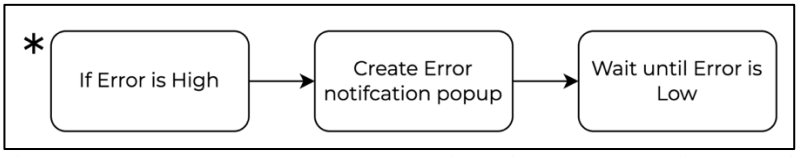


The 1st step ensures that the Safedoor system is in either of its final states (And not moving), before setting the output signals

The 2nd step waits till the Closed/Opened signal is cleared, indicating that the signal to move the door was properly received and the motion initiated.

The last step, marked with dashed lines, are an optional addition. It makes the program flow wait until the door is in its final state before proceeding. *It is recommended to add this to the Open Door program, as it ensures that the robot can safely enter the CNC machine.*

On the steps marked with an asterisk, it’s recommended to add monitoring of the *Error* signal. A recommended error monitoring flow is shown below:



The intent of the error monitoring is to ensure that the program flow safely stops, if any error occurs on the Safedoor system.

Example Program Implementation

The example shows how an open door program implementation for the Safedoor could look like:

(Please note that the example does contain the wait until opened code block)