



CASE STUDY

INDUSTRIAL SHIELDS



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AUTOMATION OF INDUSTRIAL ROBOTIC CELLS

Implementation of an industrial welding process using Industrial Shields equipments.

The cell of welding is composed by welding tools, robots, safety devices and Industrial Shields PLCs. Using our Arduino based PLCs, you can get the open source app Arduino IDE; it means that you do not have to pay for it as no licence is required. Moreover, you can visit Industrial Shields', Arduino's or others' websites and get a lot of examples to program our open source based PLCs.

SUMMARY

Replying to our customers' requests, we have been developing a solution for the automotive industry.

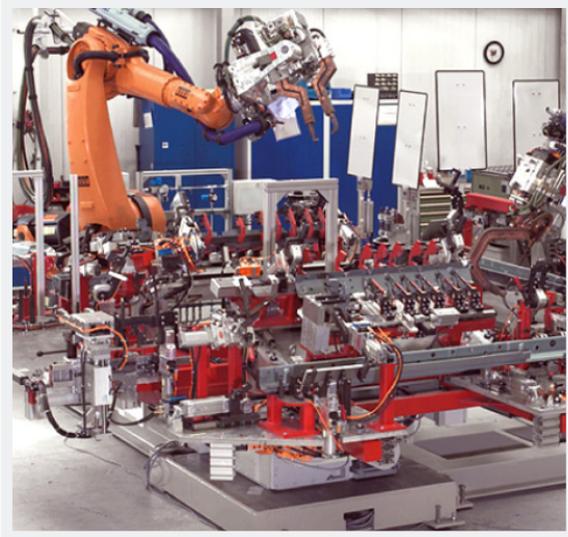
Some of the most common machines within this sector are robotic cells, which can be of painting, handling, palletizing or, in our case, welding.

Using industrial technics, we will be able to create a model of cell that could be easily replicated for all the processes where automation, monitorization and also interaction with the machine are needed.

It is important to say that this kind of project can be implemented not only in the automotive sector but in other sectors as well: metallurgical, plastic, etc. Basically, where serial production is requested.



CASE STUDY



GOAL

We need a machine capable to produce constantly with accuracy and complying with safety regulations. To reach this goal, all the components have to work in harmony controlled by a PLC and a PC Panel .

CONCLUSION (HARDWARE)

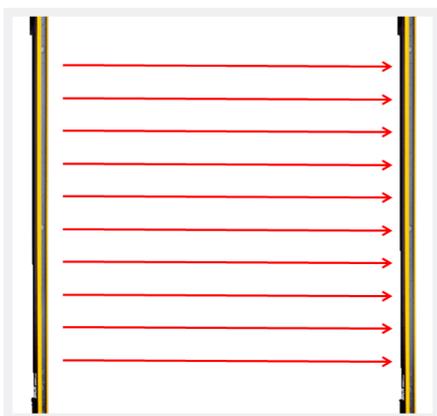
Industrial Shields equipment has to control and monitor all the I/O such as the welding tool, robots, lights and all the safety devices.

To understand how to interconnect the installation you can use the schematic below.

First, we will talk about **safety** because we believe that is the most important part of the machine.

To get the safety required by law, we will use the following devices connected directly to the inputs of our PLC; thus, we can guarantee its efectivity in case of danger.

- ✓ **Photoelectric safety barriers:** used to control the presence inside the cell. If, for example, the operator enters to charge a tool, the barriers will detect him and stop the power supply, the air and the robot so there will be no danger.
- ✓ **Safety lock:** used to control the backdoor through which we can acces to the robots. If the door is opened, the PLC will do the same as when you cross the barriers and it also will stop the robots and the spinning table.
- ✓ **Safety scanner:** we can put it under the welding tool to make sure that no piece falls in the cell as it could break the robots or the spinning table.



CASE STUDY



Secondly, we need to install the **robots** and the **spinning table**. This is where we will put the welding tools. Normally, there are two tables so while the robot is welding in one of them, the other can be charged; this let us win a lot of time cycle. The robots have their own program installed so we will use the PLC just to control them, that is to say, giving them orders about when they have to weld and get information from them, like which piece is being welded and other parameters of interest.

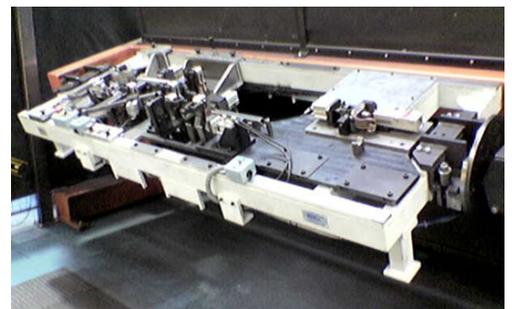
The next thing we need is a **welding machine**. In this case, it will be a robot which will control the characteristics of the welding and the different programs that it has inside.

Fourthly, we have to consider the **welding tools**. They are made to fix the pieces that we want to weld. These fixtures consist in pneumatic cylinders and clamps that are moved by an electrovalves pack. We also find sensors to know the state of the cylinders and presence sensors to detect the pieces we want to weld. These components are controlled by our PLC which gives an opening and closing sequence. Due to the elevate number of sensors, we need a signal distributor to connect them. However, we do not need too many I/O in our PLC because we can communicate them using Modbus, so every sensor and electrovalve will have its own address.

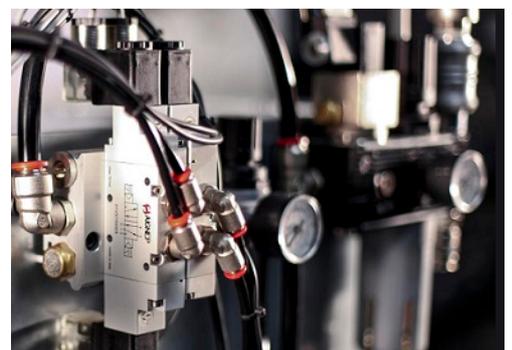
The pneumatic and gas system consists of a **fluid panel** where we can find the general valves that provide compressed air to the welding tools and gas to the robots. So, firstly, the air will enter in the general valve and then it will be distributed to the other ones. When one of our safety devices is activated, the general valve will cut the air in all the installation. The gas will enter also in a general valve of gas and will supply to the robots using other valves. The valves are controlled by the PLC, giving them orders to open or close depending on the situation.



Welding machine



Welding tools



Fluid panel

CASE STUDY

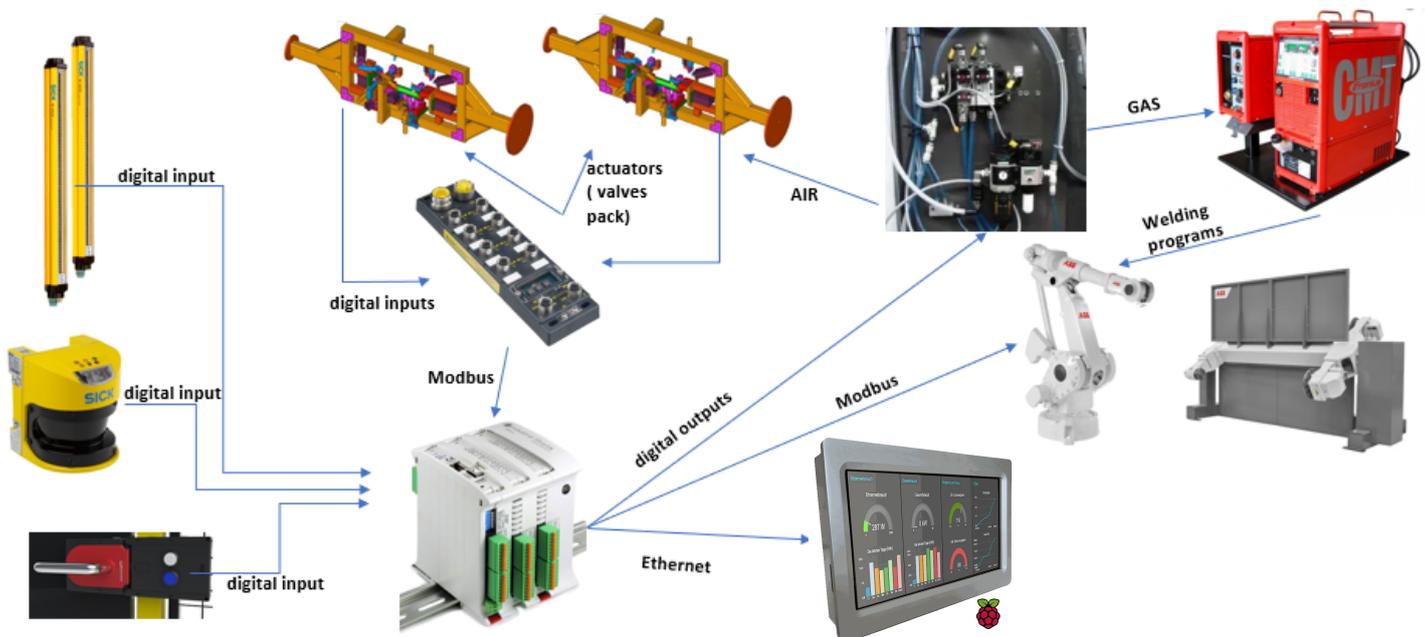
The **control panel** where the operator will have all the buttons to control work mode, reset error, stop emergency etc., will go directly to the inputs of the PLC .

As mentioned above, the PLC and the PC panel are the brain of this installation:

- ✓ Our Arduino based PLC will control everything inside the cell.
- ✓ On the PC panel, we will see the synoptic of the welding tools with every cylinder and sensor and we can navigate and know the state from there. Basically, thanks to this Panel we can monitor and control every parameter of this process.



In the **schematic** below you can see in a clear way the connections you will have to do for your project and also understand better the idea and distribution of the components of the cell.



As we said at the beginning of this case study, this example is applied to welding cells. In case different cells are needed -for example a painting one-, no welding tools nor a spinning will be required but the main structure will be the same, adding or removing the devices necessary for your application.