

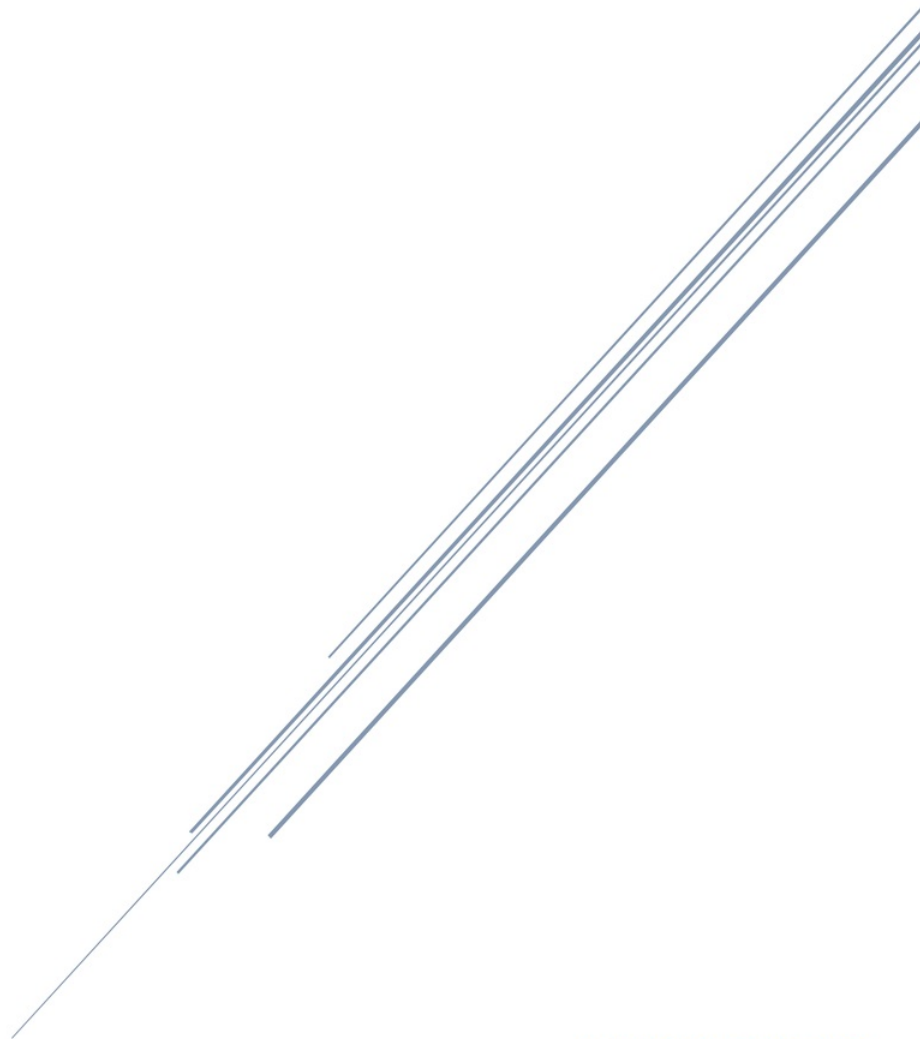
ASSIGNMENT 1

by Trystan Daniels

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HNC ELECTRICAL AND ELECTRONIC ENGINEERING PROJECT

PSDE 5007-ASSIGNMENT 1 – Interim report



TRYSTAN DANIELS

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Project proposal

This project will be located at DUNBIA (Felinfach). Dunbia is a multinational food company specialising in the production of beef, pork, and lamb. Dunbia Felinfach processes and packs beef for Sainsbury's.

The purpose for the conveyor is to transport meat from a freezer to a cutting machine. The current conveyor is run on an isolator where the conveyor must be manually switched off and on. The company require a system which starts and stops the conveyor automatically as the meat comes to the end of the conveyor and require an emergency stop circuit. The control panel must be waterproof as it will have been pressure washed every night. The panel must comply with food standards.

I have a budget of £3,000 on this project. The project will be built, tested and commissioned at the workplace during work hours. The project will require looking into different solution which will include different plc models and systems.

During the project a log book will run, recording down the activity's carried out each week. A gantt chart will be designed to keep the project on track with time. All recording and some of the research will be carried out during collage hours.

Signature:	Date:
Lecturer Signature:	Date:
Manager Signature:	Date:

Issue to be solved

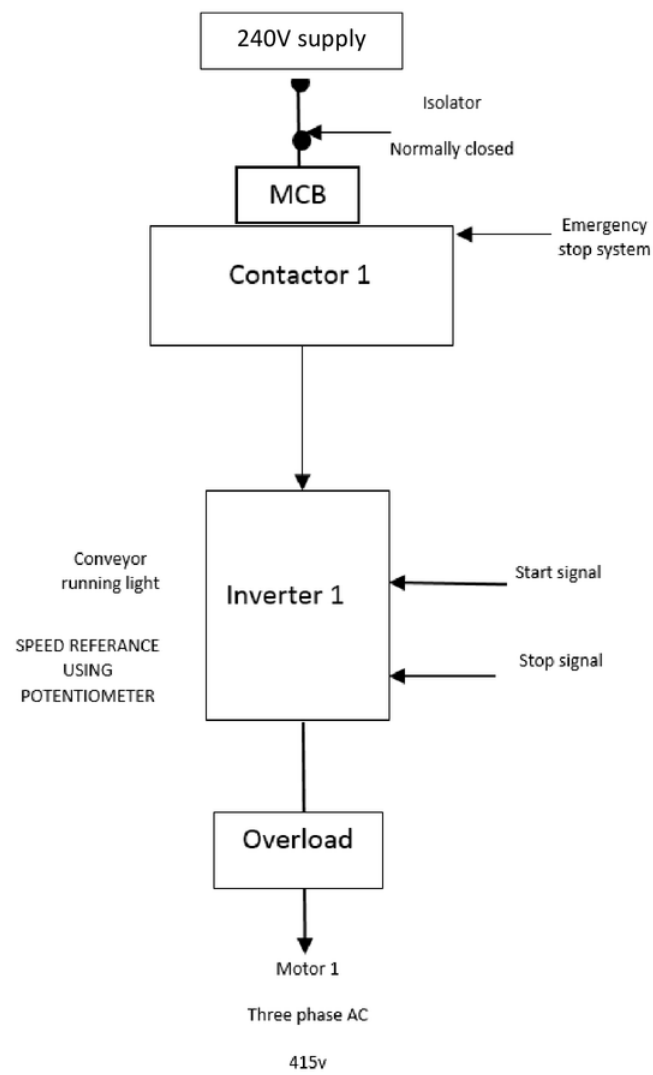
Overtime as machines have been moved around and even off site for new machines therefore the lines have been disconnected from themselves, therefore a new system needs to replace the current temp control.

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During the night the conveyors must be able to run during wash-down, also the emergency stops must work during this time to ensure safety to the cleaners.

Background research and solutions

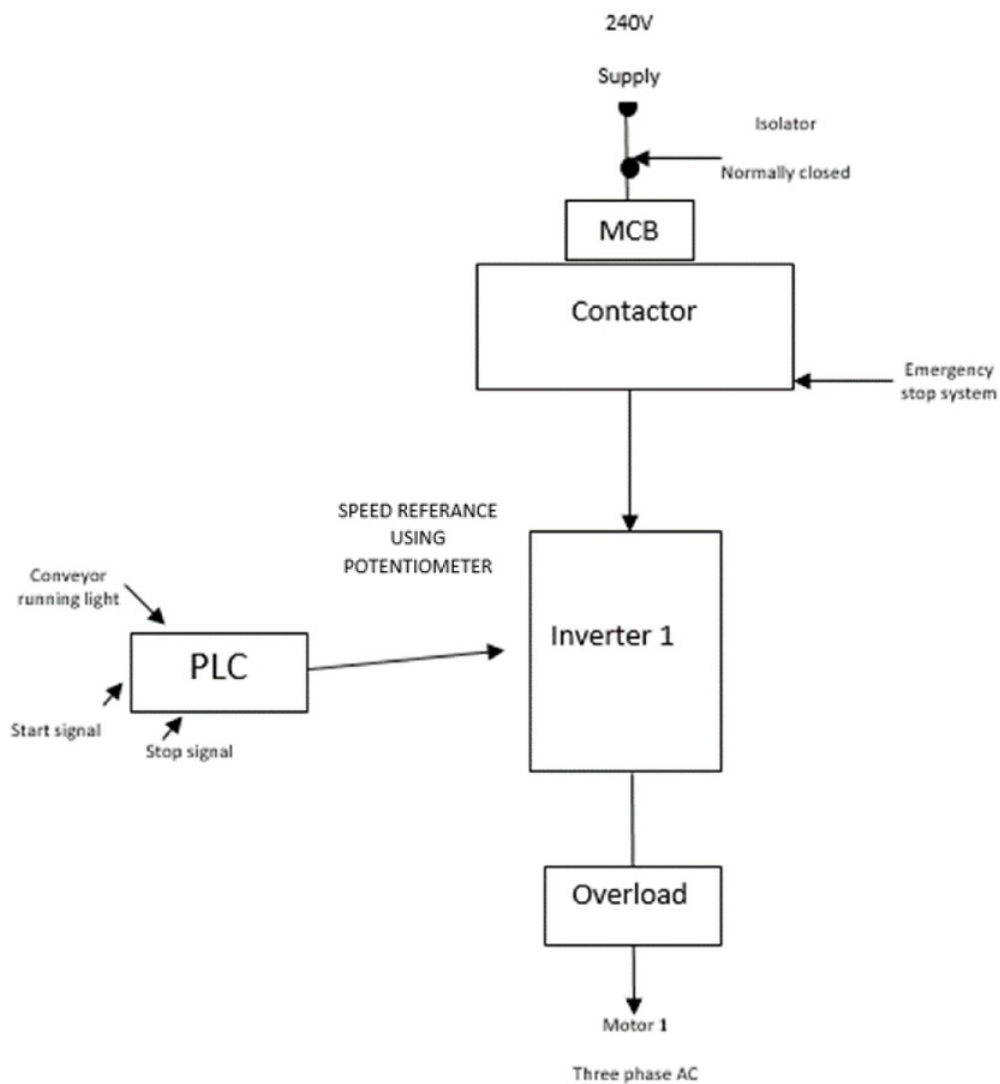
Solution 1



Cost	£1,443
Maintenance + Reliability	****
Ease of use	*****
Safety	****
Availability	*****

Solution 1 is the simplest of all solution, only costing £1,443. With a supply of 240V AC to a MCB then on through to the contactor. The emergency stop system will be linked to the contactor so if the safety relay isn't giving the contactor and output, the contactor won't pull in. From the contactor it goes to the inverter. The inverter is connected to a start and stop buttons. Also connected to the inverter will be speed reference using a potentiometer, and a conveyor running light. If the start button is pressed and the contactor is pulled in, the inverter should send a three phase supply down through the overload unit, then down to the three phase motor.

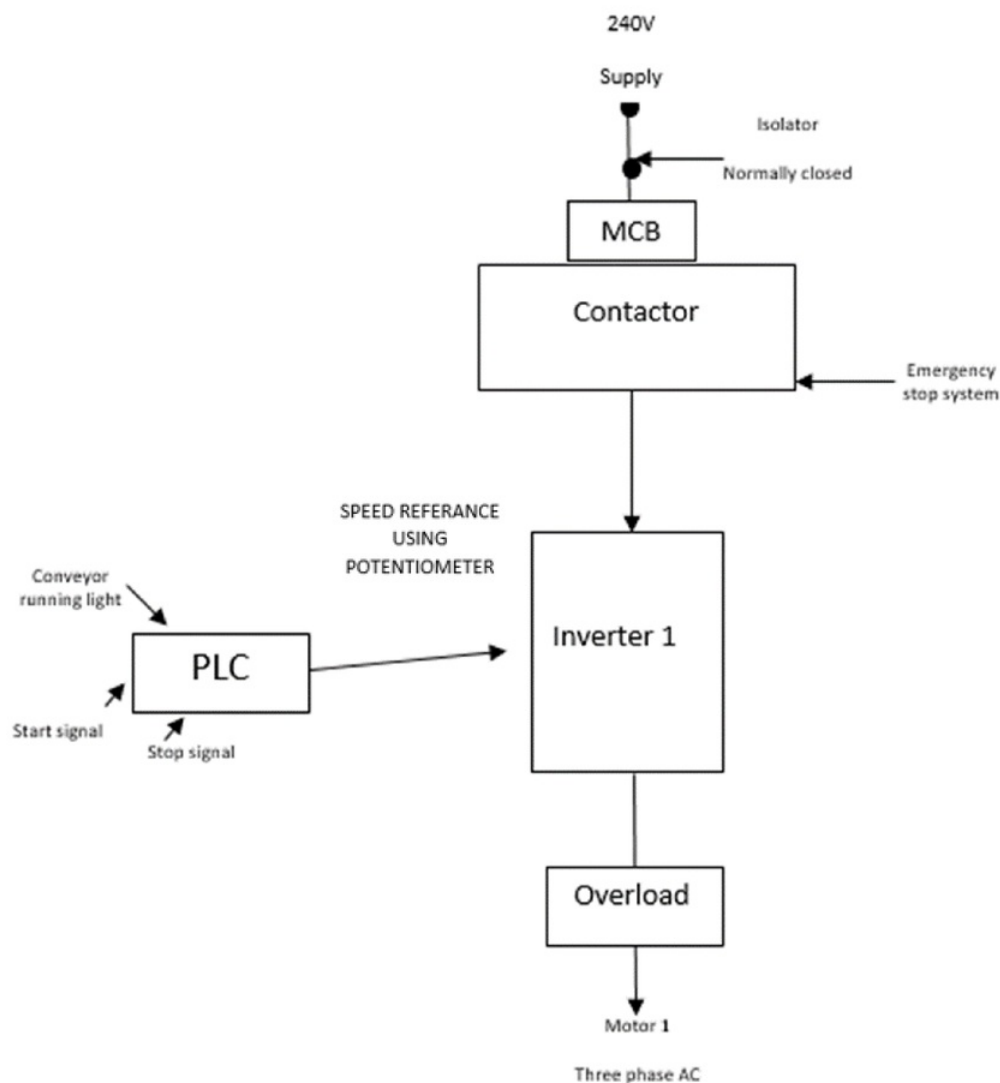
Solution 2



Cost	£3,543
Maintenance + Reliability	*****
Ease of use	**
Safety	****
Availability	**

Solution 2 uses a Siemens PLC, with a total cost of £3,543. With a supply of 240V AC to a MCB then on through to the contactor. The emergency stop system will be linked to the contactor or PLC so if the safety relay isn't giving the contactor or PLC an output, the contactor won't pull in. From the contactor it goes to the inverter. The inverter will be controlled by the PLC. Also connected to the inverter will be speed reference using a potentiometer. If the start button is pressed and the contactor is pulled in, the inverter should send a three phase supply down through the overload unit, then down to the three phase motor.

Solution 3



Maintenance + Reliability	*****
Ease of use	**
Safety	****
Availability	****

Solution 3 uses a Omron PLC, with a total cost of £2,500. With a supply of 240V AC to a MCB then on through to the contactor. The emergency stop system will be linked to the contactor or PLC so if the safety relay isn't giving the contactor or PLC an output, the contactor won't pull in. From the contactor it goes to the inverter. The inverter will be controlled by the PLC. Also connected to the inverter will be speed reference using a potentiometer. If the start button is pressed and the contactor is pulled in, the inverter should send a three phase supply down through the overload unit, then down to the three phase motor.

Chosen solution

The chosen solution is solution 3, this solution uses Omron PLC. An advantage of this is that some basic training has been already given to some of the engineers, so will give a good understanding of the PLC and programming if any faults occur.

Another advantage of using Omron is that the company do keep at least 1 in stock if one day it would go faulty it would be simple to replace and reprogram. The company do also have the correct software and cables to connect to this PLC already. For the future this solution can be easily modified to either add or remove motors from its control, which gives flexibility in the future. Using a 2 channel emergency stop system will also cover the requirements.

This is an improvement and update rather than using contactors and relays to control systems such as solution 1.

With solution 2 the company don't see enough of a benefit from the Siemens package for this project so cannot justify the extra cost.

Specification

This project is based in industry.

The aim of the project is to reduce downtime and the calling out of engineers to change the speed of the conveyors. The conveyors will simply be transporting meat from the start of the line, where it is unpacked, down the line into the first machine's conveyor which is a crust freezer. The speed of the crust freezer's conveyors varies for different products.

The control panel must drive two 3 phase motors (one for each conveyor). The conveyors must be capable of moving up to 40kg of meat down the line, it will have a three phase AC supply of 415V. It must also include an emergency stop circuit. The conveyor's speed must be capable of being varied for different products. The control panel must be able to operate in a room which will be kept at 5°C.

The control panel must be made of stainless steel and be waterproof (IP66). On the panel it must have the following features:

- green start button
- red stop button
- reset button
- emergency stop button
- isolator
- Device to set the speed of each conveyors.

This system must have the following functions:-

- Variable speed. It must be able to vary from 10m/min to 20m/min.
- Two channel emergency stop system.
- Isolator: - this will isolate the power to control panel when isolated.

Supply: - three phase 415V

The 3 phase motors must pass the insulation test of a 100megohms.

There will be no environmental impact from this project.

The project must adhere to the Food Safety Act 1990. Also it must adhere to the 17th edition of the IET regulations.

Preventative maintenance should be carried out on this conveyor weekly. The control panel should be checked with an infra camera to check the components aren't overheating. Also the control panel should be checked for water ingress. The 3 phase motors will be protected from overheating by the addition of an overload unit. The push buttons, lights and emergency stop system should be tested on a weekly preventative maintenance to ensure reliability during production.

The budget for this project is £3,000.

Testing plan

Test 1 (see figure 1)	PASS/FAIL	PASS/FAIL	PASS/FAIL
Capability of moving up to 40KG?			

Test 2 (see figure 2)	PASS/FAIL	PASS/FAIL	PASS/FAIL
Variable speed form 10m/min to 20m/min			

Test 3 (see figure 3)	PASS/FAIL	PASS/FAIL	PASS/FAIL
3 phase motor insulation test?			

Test 4	PASS/FAIL	PASS/FAIL	PASS/FAIL
Includes the following features: Green start button, red stop button.			

Test 5	PASS/FAIL	PASS/FAIL	PASS/FAIL
Test emergency stop and reset buttons			

Test 6	PASS/FAIL	PASS/FAIL	PASS/FAIL
Isolator			

Test 7	PASS/FAIL	PASS/FAIL	PASS/FAIL
Device to set the speed of conveyors			

Above is a testing table to carry out to ensure the project meets its requirements and safety, these tests must be carried out three times with 100% pass rate for the project to continue to commissioning.

Project plan

After choosing the best solution for the specification, the first step will be to draw the electrical drawings which will be critical for the project will be a success. This has taken me up to week 3 to ensure the electrical drawings are correct.

From the electrical drawings and the specification, the parts was ordered. This is by going through the stores administer who orders all parts. This process was spread through week 2 to week 4. Once all the parts are delivered and the layout of components has to been designed, the construct will start in the workshop.

For this task I made sure I follow the safety orders given to me by my health and safety advisor and wear all PPE which I will be given. For example, safety steel toe cap boots, ear plugs, hard hat, hi-viz jacket, overalls and gloves. This is in accordance with HASAWA 1974

The first job was to mount the DIN rail onto the back plate of the control panel. When drilling safety glasses was worn. Also, holes was drilled for cable glands on the bottom of the box and for the light and push buttons on the front of the panel. Next, the components can be mounted on the din rail in according to the layout designed.

Cable trunking must be put in the control panel to keep the cabling neat. Next, I wired the components up using my electric drawings, while complying with BS EN 60204, Safety of machinery, and electrical equipment of machines.

Once the control panel is all wired up I will mount it near the conveyor and connect up the three phase motors. Then I will connect the panel to a three phase supply.

Finally the control panel will be tested to ensure it meets the specification. If successful, the panel will be installed and commissioned out on the line.

See gantt chart below.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
Electrical Circuit Diagrams													
Order Parts													
Mechanical construction													
Electrical circuit construction													
Testing													
Install													
commission													

In the near future some research needs to be carried out into the following:

- Switches
- Isolator
- Circuit breakers
- Software
- Contactors
- Relay
- Terminals
- Buttons

Presentation



DUNBIA

- Multinational food company.
- Dunbia Felinfach specialises in processing and packing of beef for Sainsbury's.
- Fast moving environment.
- Downtime must be kept to minimum.

AIMS & OBJECTIVES

- To run conveyors transporting meat.
- Must be able to vary speed.
- To reduce downtime by changing speeds for products.
- Ensure safety with an emergency stop system
- Ensure food safety. (stainless IP rated panel)

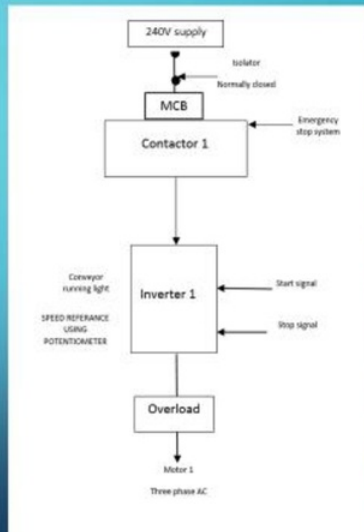


SPECIFICATION

- £3,000 budget
- Control panel of stainless steel.
- IP rated panel (IP66 or IP67).
- Emergency stop system.
- Capable of moving up to 40kg of meat.
- Variable speed.
- Must drive three phase motors.

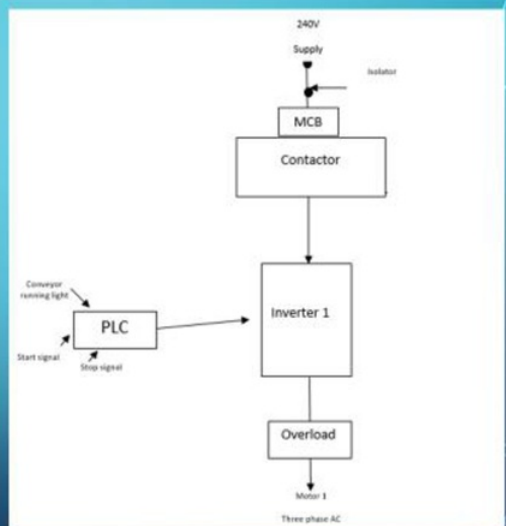
THREE SOLUTIONS

- Simple solution
- Total costing of £1,443
- Easy to use
- Speed variable using potentiometer



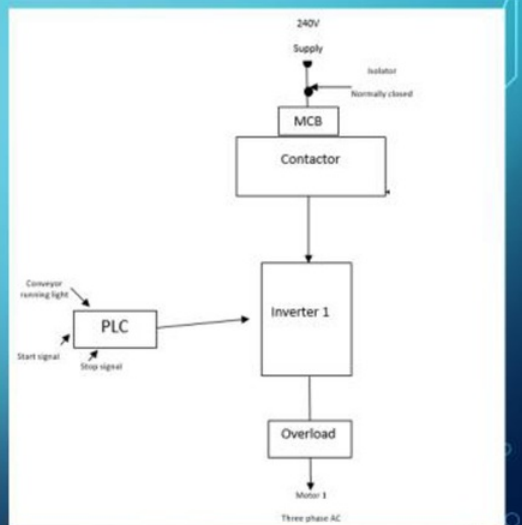
THREE SOLUTIONS

- Using Siemens PLC
- To use and diagnose any issues it requires high skill
- Requires software to write the program for the PLC



THREE SOLUTIONS

- Using Omron PLC
- Solution expense at £2,000
- To use and diagnose any issues it requires high skill
- Software available to write the program for the PLC
- Gives ability to make changes in future

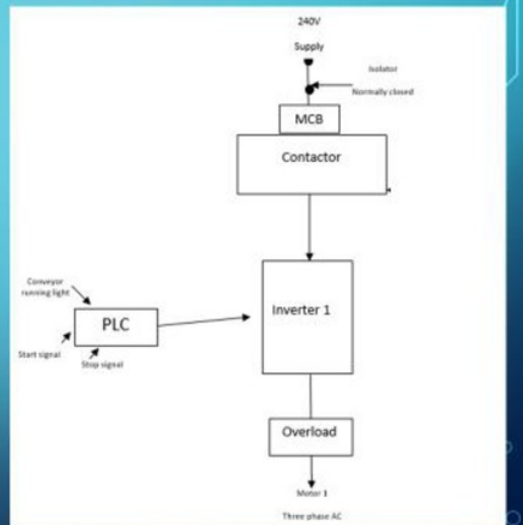


EVALUATION OF SOLUTIONS

Solution 1	
Cost	£1,443
Maintenance + Reliability	***
Ease of use	*****
Safety	*****
Availability	*****
Solution 2	
Maintenance + Reliability	*****
Ease of use	**
Safety	*****
Availability	0
Solution 3	
Cost	£2,000
Maintenance + Reliability	*****
Ease of use	***
Safety	*****
Availability	*****

THREE SOLUTIONS

- Using Omron PLC
- Solution expense at £2,000
- To use and diagnose any issues it requires high skill
- Software available to write the program for the PLC
- Gives ability to make changes in future



PLAN

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
Electrical Circuit Diagrams													
Order Parts													
Mechanical construction													
Electrical circuit construction													
Testing													
Install													
commission													

ASSIGNMENT 1

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

54/100

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GRADING FORM: CSG-RUBIC

TRYSTAN DANIELS

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RESEARCH-INFORMED LITERATURE



No refs used. Background research - evidence of reading around the subject area 9/15
References - Not used 0/10

9/25

KNOWLEDGE AND UNDERSTANDING



Proposal is good - 6/10
Spec is good. - 2.5/5
Design requirements have been identified - 5.5/10

14/25

ANALYSIS



A reasonable start. Use relevant sources to back up the analysis. Testing - Plan is present 6/10
Conclusion - needs more work, but there is a conclusion - 5/10

11/20

PRACTICAL APPLICATION AND DEP.



Application seems to be going well. Application - a good start 3/5
Quality of work - needs more organisation, but a good start - 3/5

6/10

SKILLS FOR PROFESSIONAL PRAC.



Proposal was good and a good start to the report.
Overall a good start - 7/10
presentation - Explained

14/20

well - 7/10