Test Project

C1

Electrical Installations

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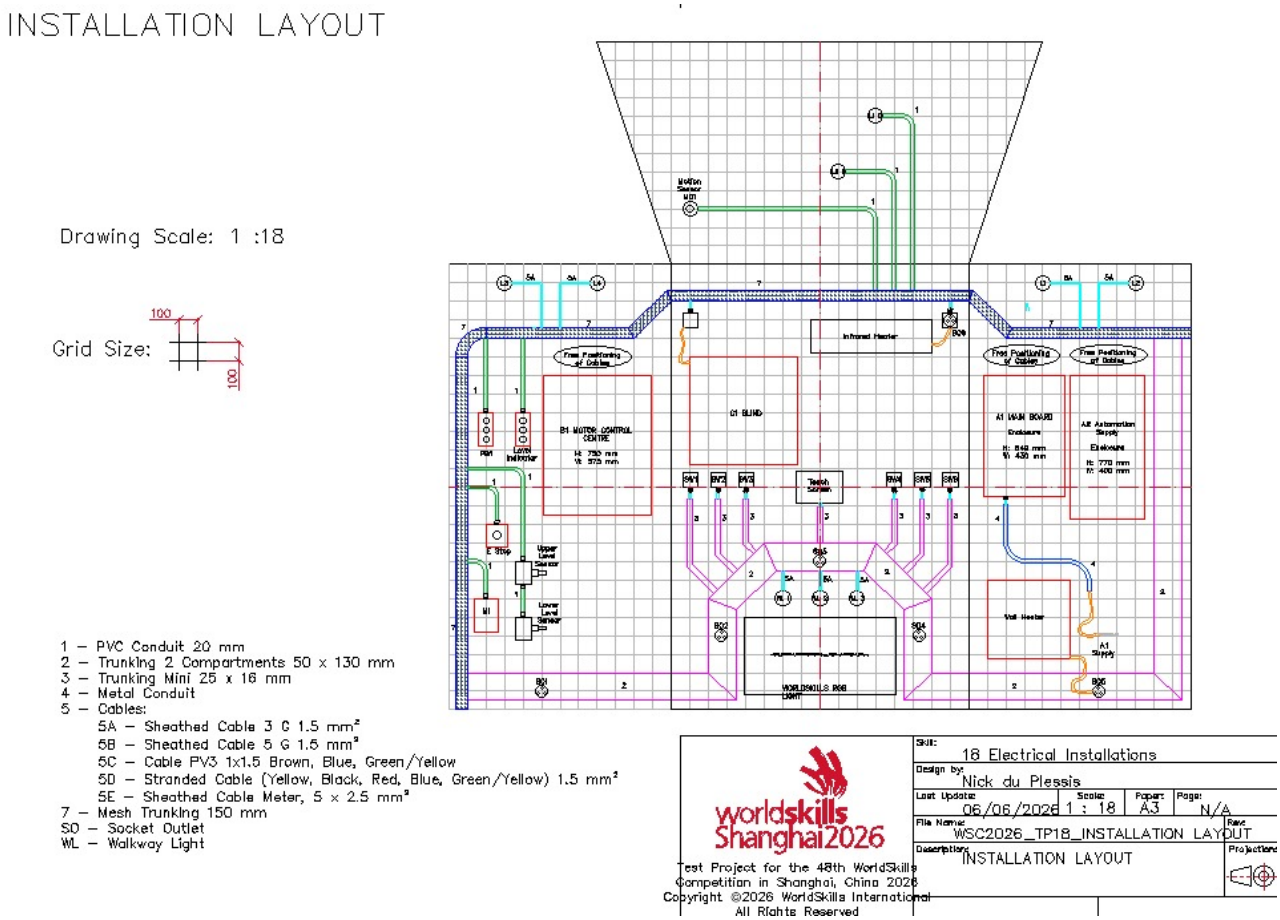
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Project overview



Completion requirements by day

DAY	WORK TO BE COMPLETED PER DAY
Day 2	Install all equipment (PVC trunking, PVC conduit, metal conduit, mesh tray and A1, A2 and B1) Complete mesh tray earth bonding. Install all switch and motor control boxes and sockets NOTE: ALL TRUNKING COVERS TO BE FITTED
Day 3	Complete all wiring in A1, A2 and B1.
Day 4	Device labels. Have the installation fully complete, with all equipment and covers fitted, before requesting power. Provide the correct continuity test result. Programming of KNX and LOGO.

1.1 Equipment references

Use these references to identify the equipment in the installation drawings, circuit schedules and control functions.

REFERENCE	EQUIPMENT OR FUNCTION
A1	Main switchboard
A2	Automation switchboard
B1	Motor control centre
C1	Motorised blind
L1D and L2D	DALI lights 1 and 2
L1 to L4	Lights 1 to 4
WL1 to WL3	Walkway lights 1 to 3
WS	WorldSkills logo RGB light
SO1 to SO6	Socket outlets 1 to 6
SW1 to SW4	GVS 8 fold KNX push button (CHPLE-08/02.1.00)
SW5	Siemens 1 gang – 2 way switch. Switching L4 On/Off
SW6	Siemens 1 gang – 2 way switch. Wired to Siemens Logo inputs
MD1	KNX motion detector (GC07ps001)
A1 Supply	Main supply to the A1 switchboard
M1	Motor
ULS and LLS	Upper-level and lower-level sensors
E-STOP	Emergency Stop push button
PB1	Push buttons for Pump control
Level Indicator	Indication lights for Pump control
Touch Screen	Siemens KNX Touchscreen (5WG1205-2AB_2)
Wall Heater	Wall heater
Infrared Heater	Infrared Heater

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1.2 Conductors and cables

Conductor cross sections

CIRCUIT	CROSS SECTION
Power supply to A1 (PS–A1)	2.5 mm²
A1 to B1	2.5 mm²
Socket outlet circuits	2.5 mm²
Motor circuit	1.5 mm²
Blind circuit	1.5 mm²
Lighting circuits	1.5 mm²
Control circuits inside boards	1.5 mm²/0.75 mm²

Conductor colours

CONDUCTOR	COLOUR
L1	Brown
L2	Black
L3	Grey
N	Blue
PE	Green/yellow
0 V	Blue/white
+24 V	Violet
KNX –	Black
KNX +	Red

Blind

CONDUCTOR	COLOUR
Up	Brown
Down	Black
Neutral	Blue
PE	Green/yellow

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Worldskills sign

CONDUCTOR	COLOUR
Color RED (-)	Red
Color GREEN (-)	Green
Color BLUE (-)	Blue
24V (+)	Black

Cable schedule

CABLE SPECIFICATION	ITEM
Sheathed cable, 3 core, 1.5 mm²	5A
Sheathed cable, 5 core, 1.5 mm²	5B
PV3 cable, 1 × 1.5 mm²; brown, blue and green/yellow	5C
Stranded cable, 1.5 mm²; yellow, black, red, blue and green/yellow	5D
Sheathed cable, 5 core, 2.5 mm²	5E

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1.3 A1 Main Switchboard

Figure 1 identifies the three (3) rows in A1. Install the equipment in the order listed below.

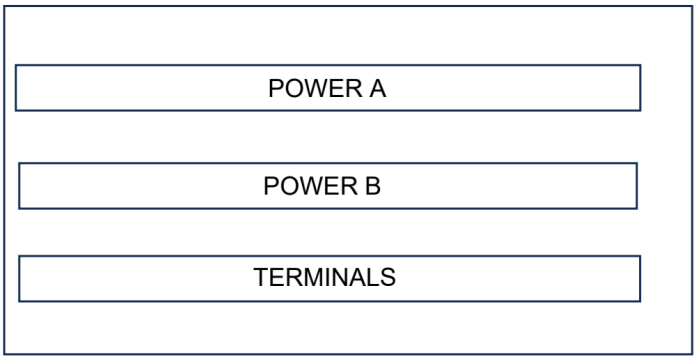


Figure 1 A1 layout — POWER A at the top, POWER B in the middle and TERMINALS at the bottom

POWER A top row

ORDER	EQUIPMENT AND RATING	CIRCUIT OR PURPOSE
1	**RCCB; 6 kA; 3P+N; type A; 30 mA, 25A**	Main switch
2	MCB; 230 V; 6 kA; 2P; C20 A	SO2 and SO3
3	MCB; 230 V; 6 kA; 2P; C20 A	SO4
4	MCB; 230 V; 6 kA; 2P; C20 A	SO1
5	MCB; 230 V; 6 kA; 2P; C20 A	SO6 – Infrared heater

POWER B middle row

ORDER	EQUIPMENT AND RATING	CIRCUIT OR PURPOSE
1	MCB; 230 V; 6 kA; 2P; C25 A	A2 Supply
2	**RCBO; 6 kA; 3P+N; type A; 30 mA, 16A**	B1 Supply

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1.4 A2 Automation Switchboard

Figure 2 identifies the four (4) rows in A2.

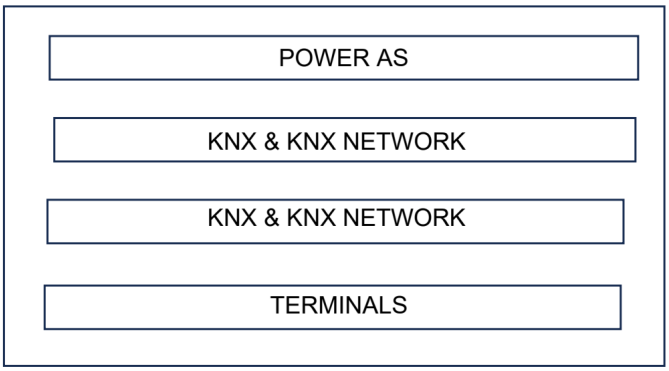


Figure 2 A2 layout — POWER AS, two (2) KNX and KNX NETWORK rows, then TERMINALS

POWER AS top row

ORDER	EQUIPMENT AND RATING	CIRCUIT OR PURPOSE
1	MCB; 230 V; 6 kA; 2P; C25 A	Power inn from A1
2	MCB; 230 V; 6 kA; 2P; C6 A	KNX control circuit
3	MCB; 230 V; 6 kA; 2P; C6 A	DALI light L1D
4	MCB; 230 V; 6 kA; 2P; C6 A	DALI light L2D
5	MCB; 230 V; 6 kA; 2P; C6 A	L1 ,L2, L3 and L4
6	MCB; 230 V; 6 kA; 2P; C6 A	WL1 to WL3
7	MCB; 230 V; 6 kA; 2P; C6 A	WS RGB light
8	MCB; 230 V; 6 kA; 2P; C6 A	Blind C1
9	RCBO; 6 kA; 1P+N; type A; 30 mA, 25A	SO5

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1.5 Automation channels and scenarios

Install the following automation devices in switchboard A2. Keep the actuator references separate from the switchboard references.

Actuator	Device	Output allocation
A0	GVS BBPS -02/640.1	-
A1	GVS ARED-03/20.1	A → SO1 B → SO5 C → SO6
A2	GVS ARED-03/20.1	A → SO2 B → SO3 C → SO4
A3	GVS AWBS-04/06.2	A → Blind Up A → Blind Down
A4	GVS ARSA-08/16.S	A → L1 B → L2 C → L3 D → E → WL1 F → WL2 G → WL3 H →
A5	GVS BTDG-01/64.2	DALI lights L1D and L2D
A6	GVS ADLD-04/03.1	RGB controller WorldSkills Logo A → RED B → GREEN C → BLUE D →
A7	6EP3333-6SC00-0AY0	24V RGB

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1.6 B1 Motor Control Centre

B1 controls the motor representing a borehole pump supplying a storage tank.



Figure 3 B1 layout — TIER 1, TIER 2 and TERMINALS

TIER 1 power and motor equipment

ORDER	EQUIPMENT
1	MCB; 400 V; 6 kA; 3P+N; C10 A; Main Switch
2	MCB; 230 V; 6 kA; 2P; C6 A; Control circuit
4	Main contactor M1
4	Siemens SIRIUS 3RU2126-1DB0 thermal overload relay, 2.2–3.2 A, manual reset for function testing
5	LOGO Switch
6	KNX IP Router

TIER 2 control equipment

ORDER	EQUIPMENT
1	LOGO power supply
2	LOGO 8 controller
3	LOGO Expansion module
4	KNX CMK2000

The Emergency Stop push button cuts motor main power through the main contactor.

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1.7 Local panels and indicators

Install the components from top to bottom in each three (3) hole enclosure, as shown in Figure 4. PB1 contains the operator controls and the green run indicator. PB2 contains the fault and level indicators.

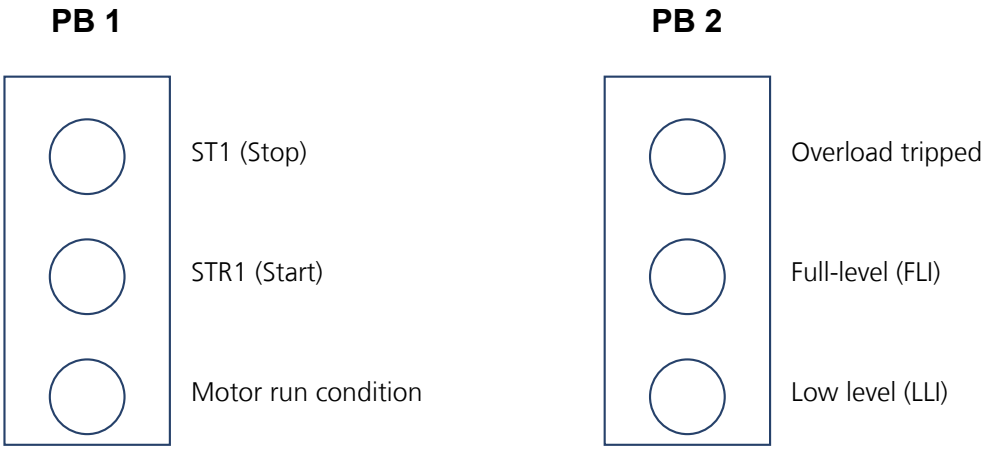


Figure 4 PB1 and PB2 — component positions from top to bottom

POSITION	PB1	PB2
Top	Red Stop push button, ST1	Amber pilot light: Overload tripped
Middle	Start push button, STR1	White pilot light: Full-level (FLI)
Bottom	Green pilot light: Motor run condition	Blue pilot light: Low level (LLI)

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1.8 LOGO inputs and outputs

Use the following assignments from the LOGO 8 schedule. The table retains the source output references; confirm the physical allocation between the controller and expansion module [C04].

INPUT	ASSIGNED FUNCTION	OUTPUT	ASSIGNED FUNCTION
I1	Start push button (Auto mode)	Q1	MCC — main contactor
I2	Stop push button (stop mode)	Q2	White pilot light
I3	Full-level (FLI) -	Q3	Blue pilot light
I4	Low level (LLI) -	Q4	Amber pilot light
I5	Overload tripped	Q5	Green pilot light
I6	Emergency stop	Q6	Not assigned
I7	Not assigned	Q7	Not assigned
I8	Not assigned	Q8	Not assigned

Expansion module

INPUT	ASSIGNED FUNCTION	OUTPUT	ASSIGNED FUNCTION
I1	SW6 button On;	Q1	Not assigned
I2	SW6 button Off;	Q2	Not assigned
I3	Not assigned	Q3	Not assigned
I4	Not assigned	Q4	Not assigned
I5	Not assigned	Q5	Not assigned
I6	Not assigned	Q6	Not assigned
I7	Not assigned	Q7	Not assigned
I8	Not assigned	Q8	Not assigned

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1.9 Pump operating sequence

The pump represents a borehole water supply serving a storage tank. The full-level and low-level switches represent the water conditions.

Startup and operating mode

When control power is first switched on or restored, the pump must be in Stop mode and remain stopped until START is pressed. START selects automatic mode even when the tank is full. With a full tank, the pump remains stopped but is ready to respond when the level falls.

Automatic filling

In automatic mode, the pump must start 5 seconds after the tank is no longer full. If the tank is already below full level when START is pressed, the 5 second delay begins at that point. If the tank becomes full during the delay, the pump must remain stopped. The next demand must receive a new, 5 second delay.

After the pump stops because the tank is full, automatic mode must remain selected. The pump must respond to the next fall in level without another press of START.

The green pilot light should blink with at 1 HZ for 2 seconds and then stay off for 2 seconds and repeat this process as long as the motor is running.

Low level and recovery indication

The blue low-level lamp must remain continuously lit while the level is at the low-level point.

When the level rises above this point while the pump is running, the blue lamp must flash for 15 seconds at one flash per second, with equal ON and OFF periods. The pump must continue running throughout these same 15 seconds, even if the tank becomes full. This indication shows that the pump is filling the tank above low level.

If the level returns to low level during this period, the blue lamp must immediately return to continuous illumination, and the recovery period must end. Each subsequent rise above low level while the pump is running must begin a new, complete 15-second period. A rise above low level while the pump is stopped must not start flashing or cause the pump to start.

Reaching full level

The white full-level lamp must remain lit whenever the tank is full. If the tank becomes full during the 15-second recovery period, the white lamp must light while the blue lamp continues flashing and the pump continues running.

At the end of this period, the blue lamp must turn OFF. If the tank is already full, the pump must stop immediately; the full-level switch must not need to be operated again. If the tank is not yet full, the pump must continue until full level is reached. Outside the recovery period, reaching full level must stop the pump immediately. These full-level stops must leave automatic mode selected.

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Stopping and protection

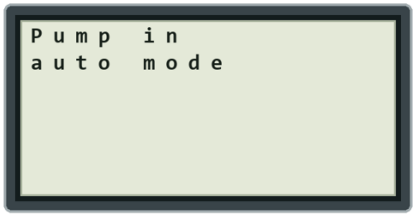
Pressing STOP, operating the emergency stop, an overload trip or loss of control power must stop the pump immediately, including during the recovery period. The pump must return to Stop mode, and any start delay or recovery period must end.

Releasing the emergency stop, resetting the overload protection or restoring power must not restart the pump. A new press of START is required to select automatic mode again. The blue lamp must remain continuously lit if low level is still present and control power is available; any recovery flashing must cease.

An overload trip must illuminate the amber lamp. Operating the overload relay TEST control must produce this condition. Resetting the relay must clear the trip indication but leave the pump in Stop mode.

Display indications

LOGO display indications

Operating condition	Display appearance
Automatic mode START has enabled automatic operation. Backlight: White	
Stop mode Shown at power-up, after STOP, and after protection has been cleared. A new START is required. Backlight: Amber	
Overload tripped Replaces the mode message while the overload is tripped. Resetting the overload returns the pump to Stop mode. Backlight: Amber	
Emergency stop Overrides every other message. The controller remains powered. After release, Stop mode is shown unless an overload remains active. Backlight: Red	

1.10 LOGO!–KNX interworking

The SW6 push buttons shall control the KNX lighting through the LOGO! controller and the CMK2000 communication module.

- **SW6-On:** Switch L1 On
- **SW6-Off:** Switch L1 Off

The push-button signals shall be received by LOGO!. The resulting switching commands shall be transmitted through the CMK2000 to the appropriate KNX actuators.

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