PROJECT: LET'S COOPERATE!

NO: 2024-1-PL01-KA210-VET-000256641

SUPLEMENTARY MATERIALAS

Course

“LIFT EQUIPMENT INSTALLER AND SERVICE TECHNICIAN”

Co-funded by the European Union

TABLE OF CONTENTS

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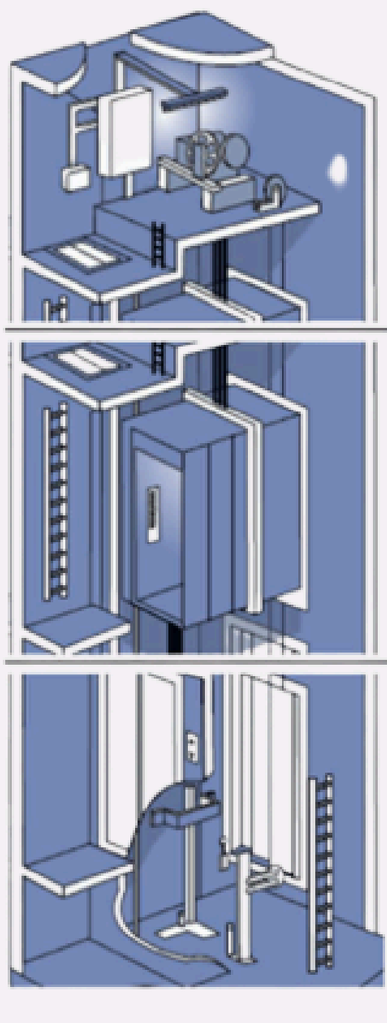
1. GRAPHIC MATERIALS

Source: LECTURER HANDOUT,
Chapter I Safety and Health at workplace for the role of Lift Equipment Installer and Service Technician,
Section: 4. Occupational risks of the job,
Page 3.



Risk of electric shock

Risk of falling - access to machinery

Risk of being crushed by unsecured moving equipment

Slipping hazards

Risk of head injury from low ceilings

Tripping hazards

Asbestos

Risk of electric shock

Risk of falling from the car roof

Risk of being crushed by unsecured moving equipment

Slipping hazards

Risk of crushing in the overhead area and drive system

Tripping hazards

Falling objects

Asbestos

Risk of electric shock

Risk of falling from a stop or ladder to the pit

Risk of being crushed by unsecured moving equipment

Slipping hazards

Risk of crushing by the cabin, counterweight, or neighboring lift

Tripping hazards

Falling objects

Source: LECTURER HANDOUT,
Chapter I Safety and Health at workplace for the role of Lift Equipment Installer and Service Technician,
Section: 5. Individual protection measures,
Page 3.

Source: LECTURER HANDOUT,
Chapter I Safety and Health at workplace for the role of Lift Equipment Installer and Service Technician,
Section: 1.3. First aid in accidents related to, among other things, electrocution, falls from heights, crushing, etc. ,
Page 6.

1.3.1. ELECTRIC SHOCK

1. ENSURE YOUR OWN SAFETY

Do not touch the injured person until you are sure that the power source has been disconnected!

2. DISCONNECT THE POWER SOURCE

Switch off the fuses or pull the plug from the socket. If this is not possible, use a dry, insulating object (e.g. a wooden stick) to pull the casualty away from the source.

3. CHECK VITAL FUNCTIONS

Is he breathing? Does he have a pulse? If he is not breathing - start CPR (cardiopulmonary resuscitation).

4. CALL FOR HELP

Call the emergency number 112.

5. SECURE THE INJURED PERSON

If he is conscious, lay him down and observe him. Provide psychological support and cover with a blanket (if necessary).

Source: LECTURER HANDOUT,
Chapter I Safety and Health at workplace for the role of Lift Equipment Installer and Service Technician,
Section: 1.3. First aid in accidents related to, among other things, electrocution, falls from heights, crushing, etc. ,
Page 6.

1.3.2. FALL FROM HEIGHT

1. SECURE THE ACCIDENT AREA

Make sure you are not threatened by anything from above or around you.

2. DO NOT MOVE THE INJURED PERSON!

Suspect a spinal injury! Do not move it unless it is in further danger.

3. CHECK STATE OF CONSCIOUSNESS AND BREATHING

If there is no breathing - start CPR. If they are breathing, but unconscious - place in the lateral safe position, if there is no spinal injury.

4. CALL FOR HELP - 112

Source: LECTURER HANDOUT,
Chapter I Safety and Health at workplace for the role of Lift Equipment Installer and Service Technician,
Section: 1.3. First aid in accidents related to, among other things, electrocution, falls from heights, crushing, etc.,
Page 7.

1.3.3.CRUSHING (E.G. BY A HEAVY OBJECT, MACHINE)

→ **1. ENSURE SAFETY**

Assess whether you can approach without risk.

→ **2. DO NOT REMOVE THE OBJECT YOURSELF IF:**

It is very heavy, crushing the chest or pelvis - this can worsen the victim's condition (e.g. cause internal bleeding).

→ **3. CHECK VITAL FUNCTIONS**

If there is no breathing or pulse - start CPR.

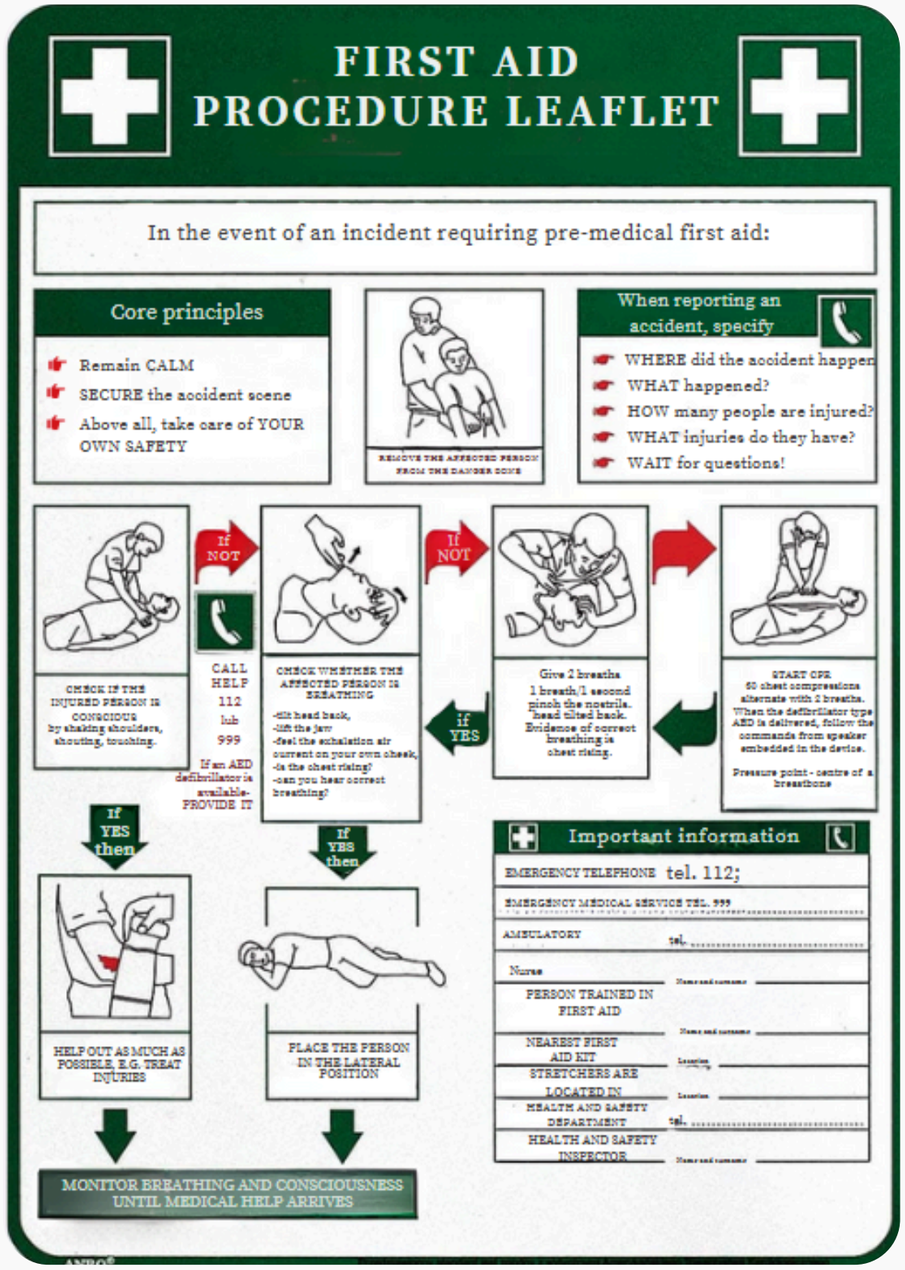
→ **4. CALL FOR HELP**

Call the emergency number 112.

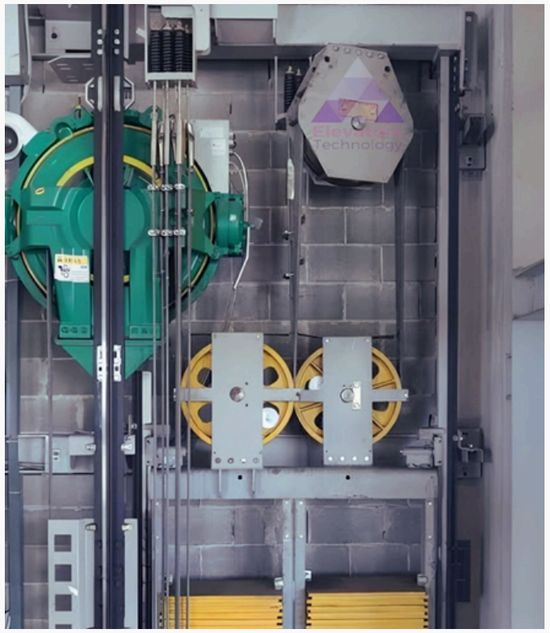
→ **5. PROVIDE SUPPORT**

If the person is conscious - maintain contact with them.

Source: LECTURER HANDOUT,
Chapter I Safety and Health at workplace for the role of Lift Equipment Installer and Service Technician,
Section: 1.3. First aid in accidents related to, among other things, electrocution, falls from heights, crushing, etc.,
Page 7.



Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 1.1. Lifts according to drive system,
Page 8.



Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment ,
Section: 1.3. Lifts according to purpose of use,
Page 9.

ESCALATORS AND MOVING WALKWAYS

Used for continuous mass transport in high-traffic areas such as shopping centres, airports and underground stations. Although their basic operating principles differ from those of lifts, their mechanical and electrical maintenance principles are similar.

FREIGHT LIFTS

Designed for transporting heavy loads in factories, warehouses, shopping centres, etc. Capacity and durability are the top priorities.

SERVICE LIFTS (DUMBWAITERS/FOOD LIFTS)

Used to transport small loads (food, documents, etc.) in restaurants, hotels, etc. The cabins are small and generally not designed for transporting people.

PASSENGER LIFTS

Used to transport people in residential, commercial, office buildings, etc. Comfort, speed and safety are the most important factors.

STRETCHER/BED LIFTS

Specially designed and equipped for transporting patients on stretchers in hospitals and healthcare facilities. A large cabin and smooth movement are prioritized.

LIFTS FOR DISABLED PEOPLE

Designed to ensure accessibility for people with physical disabilities. They operate at low speeds and with special precautions.

Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 3. Standards for lifting equipment,
Page 10.

EN 81 series standards: Primary safety rules for lifts established by the European Union and harmonised with national regulations by national standardisation bodies (e.g. PN-EN 81 in Poland, DIN EN 81 in Germany, BS EN 81 in the United Kingdom, TS EN 81 in Turkey).

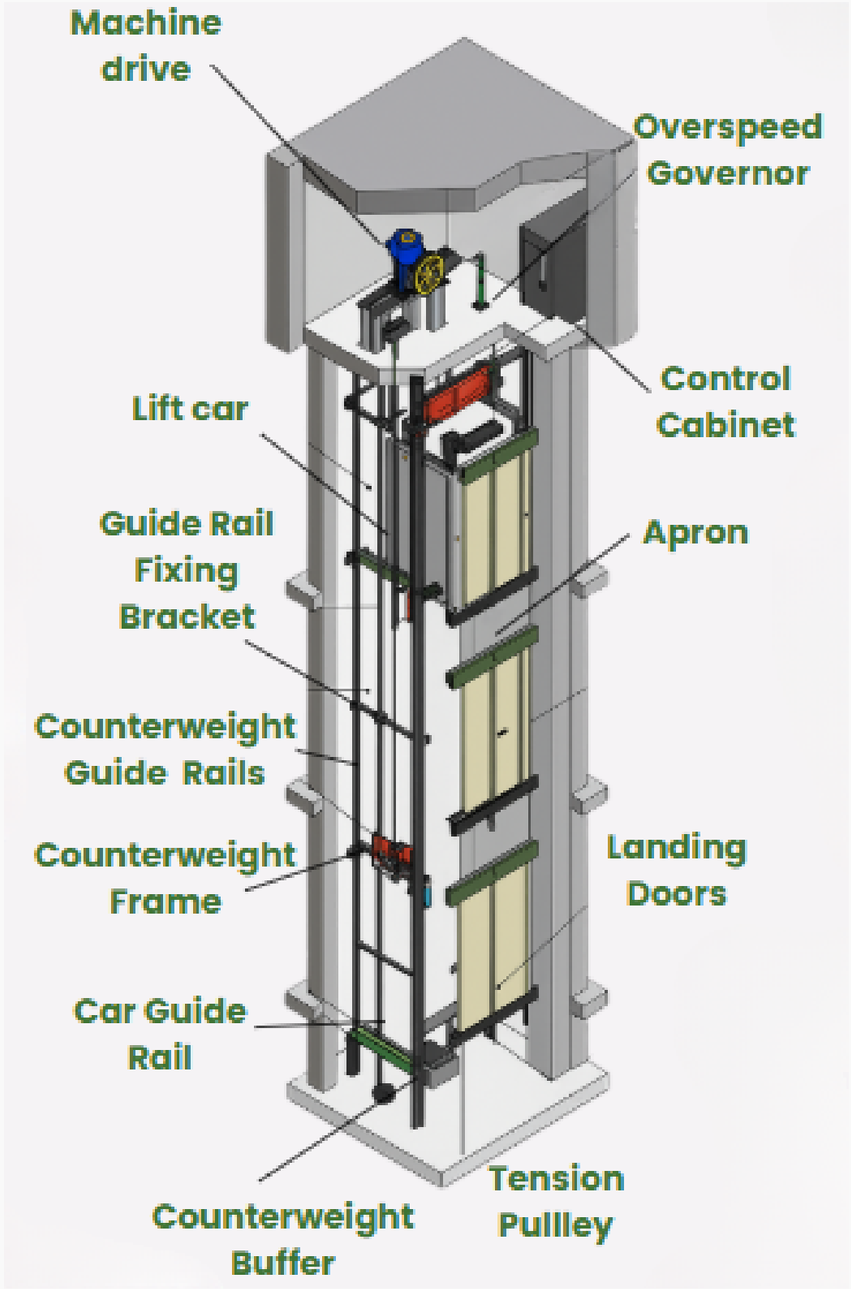
CE marking: A mark indicating that products comply with health, safety, environmental and consumer protection requirements for free movement within the European Economic Area (EEA). This marking is mandatory for lift components and complete lifts.

LIFT DIRECTIVE (2014/33/EU):

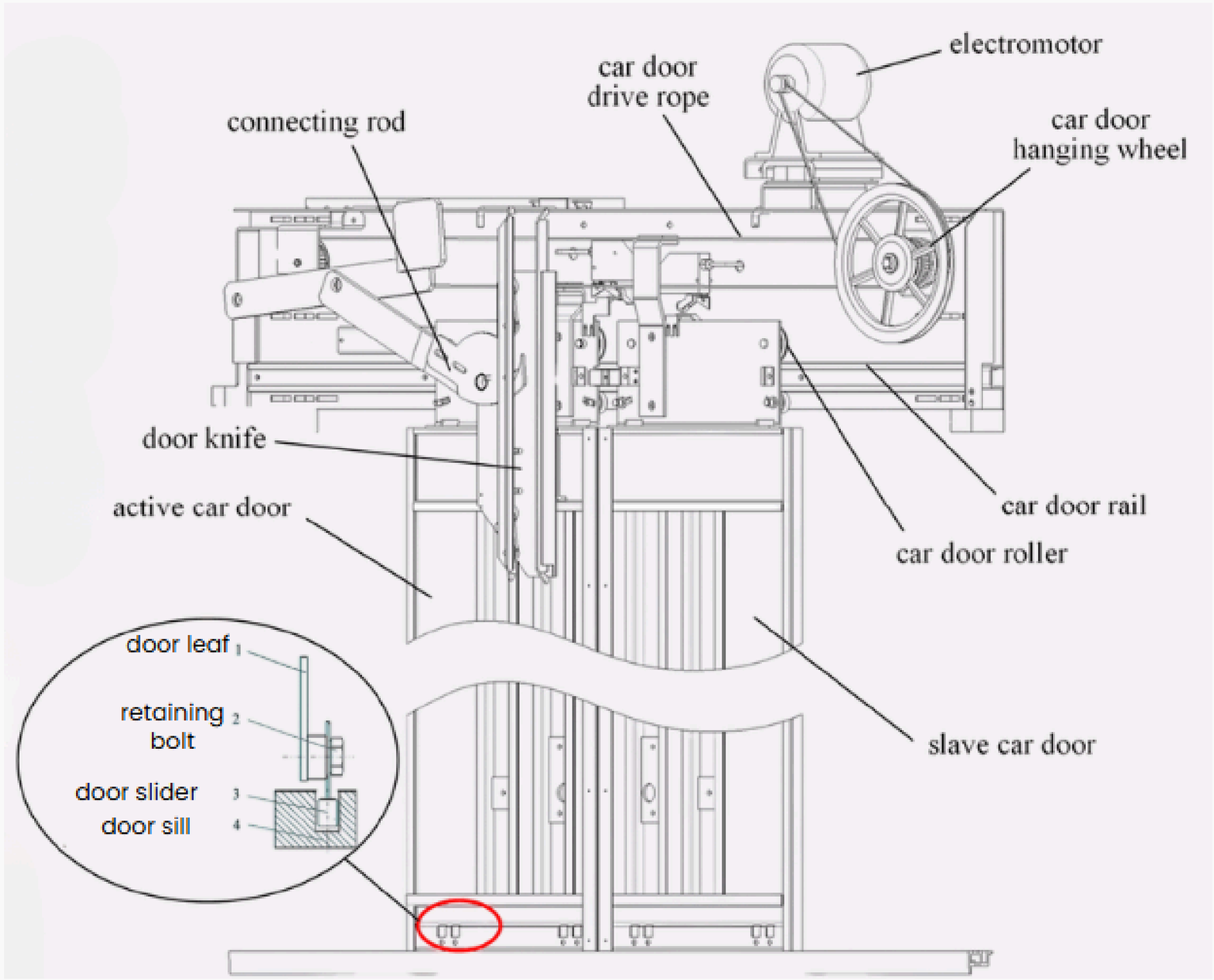
Source: LECTURER HANDOUT,
Chapter IV. Electrical installation of lift equipment,
Section: 5. Standards and regulations,
Page 41.

- **The installations must meet the requirements of the standards:**
  - **PN-EN 81 - for passenger and goods lifts.**
  - **PN-HD 60364 - for low voltage electrical installations.**
  - **Decrees of the Office of Technical Inspection (UDT).**
  - **Health, safety and accident prevention regulations.**
  - **Machinery directives**

Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 5. Mechanical components of lifting equipment and their purpose,
Page 12.



Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 5.5. Door mechanisms,
Page 14.



Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 6. Components of lifting equipment,
Page 14.

EQUIPMENT INSIDE THE CABIN:

CONTROL PANEL (COP - CAR OPERATING PANEL):
A panel located inside the cabin, containing call buttons, door open/close buttons, an alarm button, an emergency telephone and floor indicators.

FLOOR INDICATORS:
Digital or analogue displays showing the current floor of the vehicle or direction of travel.

EMERGENCY COMMUNICATION SYSTEMS:
Usually activated by an alarm button, these systems provide two-way voice communication from the cabin to an external entity (service company or emergency services).

VENTILATION:
Fans or air conditioning systems that ensure air circulation inside the cabin.

LIGHTING:
Lighting fixtures in the cabin and emergency lighting.

LCP (LANDING CALL PANELS)

CALL BUTTONS:
Directional up/down buttons located on each floor for calling the lift.

FLOOR INDICATORS:
Displays on the landing panel showing the current floor and the direction of travel of the lift.

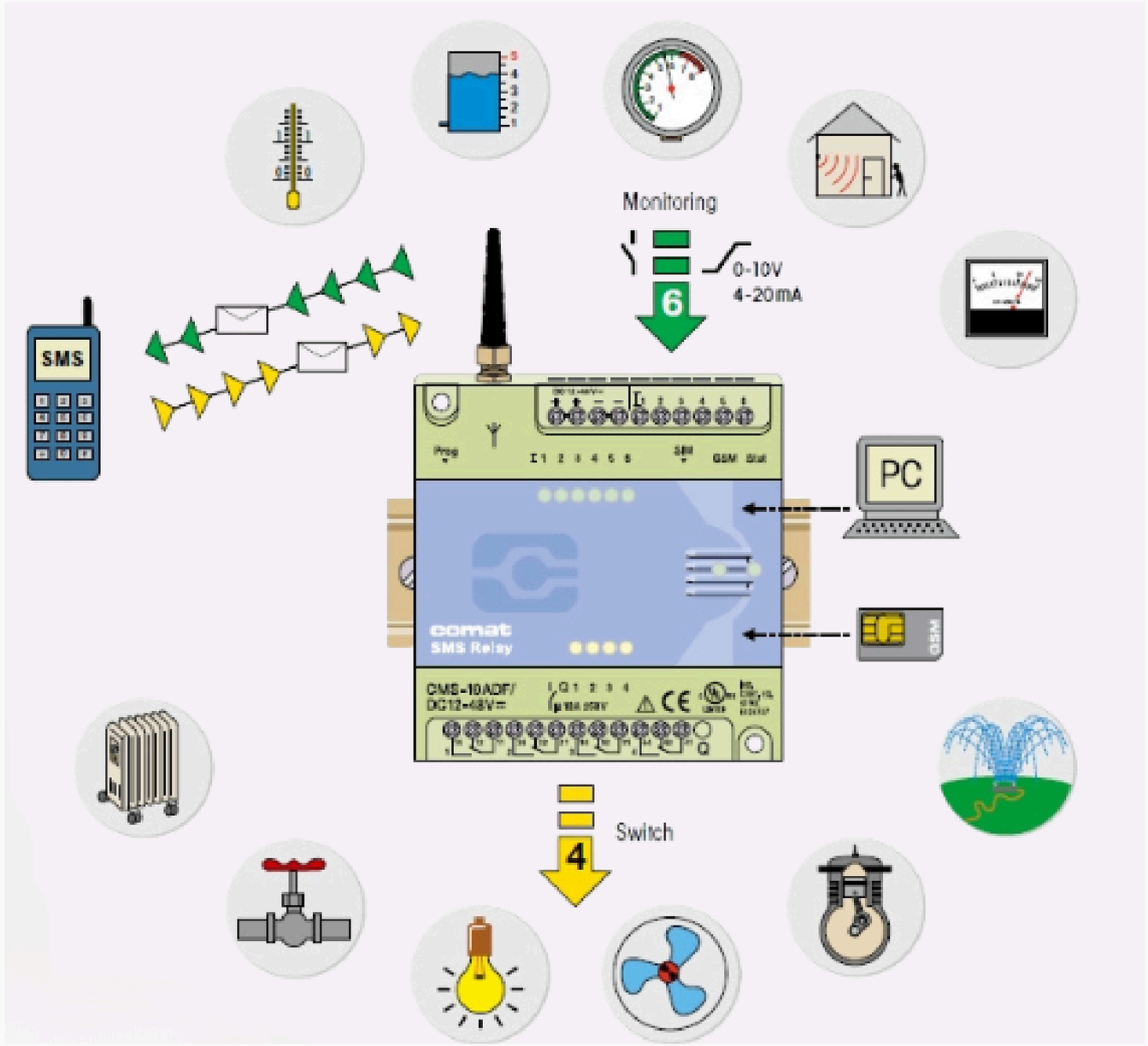
EMERGENCY EQUIPMENT

EMERGENCY STOP BUTTON:
A button located inside the cabin or on some landing panels that immediately stops the lift in emergency situations.

ALARM BUTTON:
A button that activates an emergency siren if passengers are trapped in the cabin.

FIRE SENSORS/SYSTEMS:
In some buildings, integrated fire protection systems ensure that the lift travels to the designated floor (usually the evacuation floor) and opens the doors before shutting down in the event of a fire.

Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 12. Microprocessor-based control systems,
Page 18.



Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 16. Terms and conditions for the installation and dismantling of lifting equipment,
Page 21.

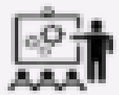
Basic safety steps:

Personal Protective Equipment (PPE): Full and correct use of all PPE is mandatory, from safety helmets to safety footwear, gloves and safety glasses. A safety harness is essential for working at height.

Lockout/Tagout (LOTO): Disconnect and lock out electrical power sources in the work area and attach warning tags such as 'Work in progress, do not operate!'. This prevents uncontrolled re-energising.

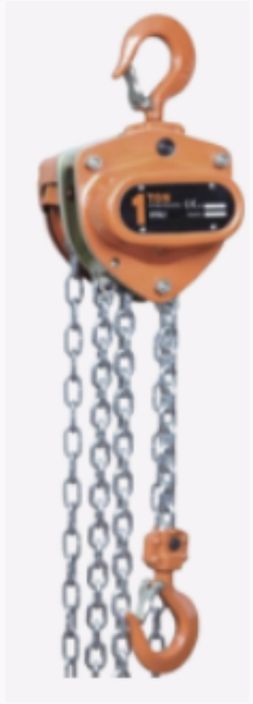
Workplace safety: Ensuring adequate safe distances in the hoisting shaft overhead and in the shaft, using handrails or barriers to prevent falls. Ensuring safety of working platforms at height.

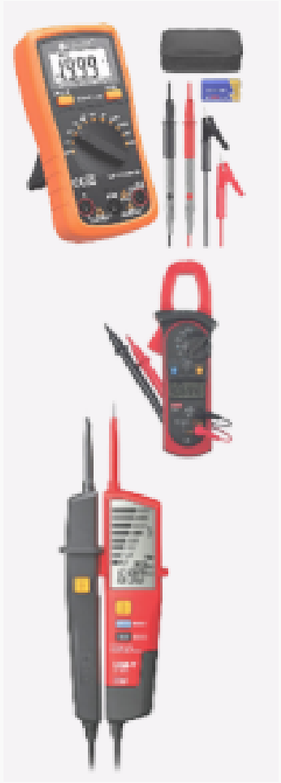
Warning signs: Placement of warning signs "Construction site", "Elevator installation", "Danger" in prominent locations.



Training: Ensuring that all employees are fully trained and aware of the safety rules at work.

Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 17. Tools and measuring instruments for assembling and disassembling the lifting device,
Pages 22-23.





Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 18. work with technical documentation, assembly instructions and operating instructions,
Page 25 .

CRITICAL STEPS:

- **CONTROL OF SAFETY CIRCUITS:**
  Ensuring that all safety switches (limit, safety, door interlocks) are working correctly and the circuit is closed.
- **MOTOR DIRECTION TESTS AND BRAKE:**
  Check that the motor is rotating in the correct direction and that the brake is working effectively.
- **FLOOR LEVELLING AND ADJUSTMENT:**
  Precise adjustment of the floor sensors and making sure the cab stops exactly at floor level.
- **OVERLOAD TEST:**
  Testing whether the lift operates safely with a load exceeding its nominal load capacity (specified percentage).
- **TEST OF THE OVERSPEED REGULATOR:**
  Testing that the over-speed regulator and safety gearbox activate if a certain speed is exceeded (carried out by authorised inspection bodies).

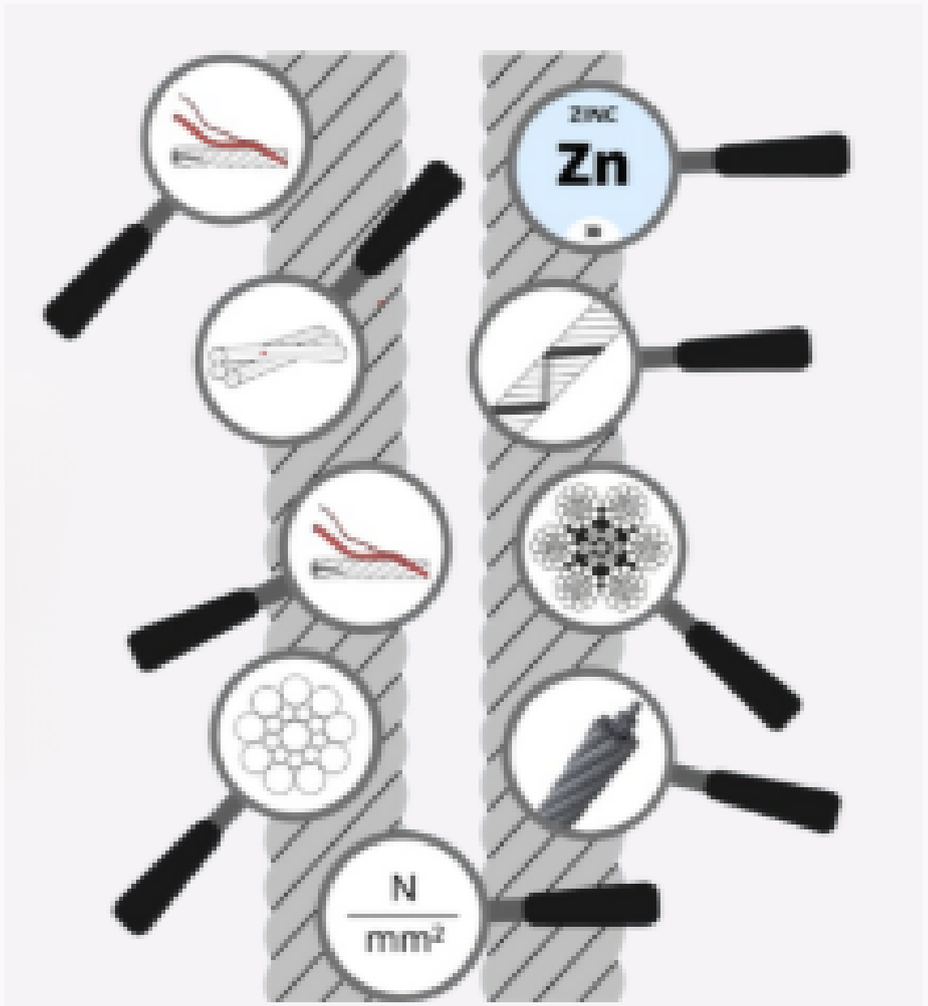
Source: LECTURER HANDOUT,
Chapter II. Characteristis of lift equipment,
Section: 20. Periodic inspection and technical testing of lifting equipment,
Page 27 .

Source: LECTURER HANDOUT,
Chapter III. Mechanical assembly of lift equipment,
Section: 1. Health and safety rules during the assembly of the mechanical part of a lifting device,
Page 31.

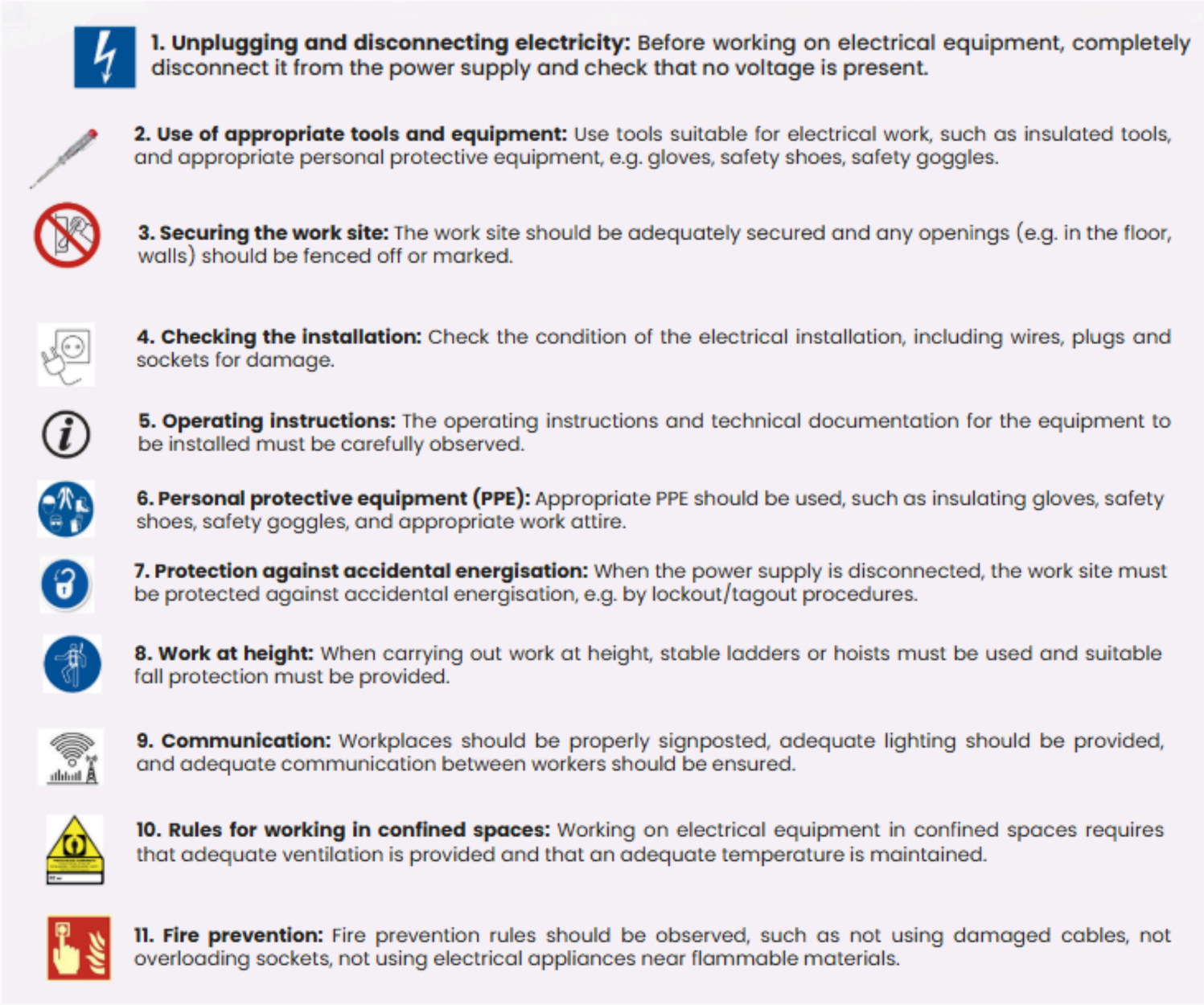
Source: LECTURER HANDOUT,
Chapter III. Mechanical assembly of lift equipment,
Section: 4. Installation of mechanical equipment in the engine room,
Page 33.

Source: LECTURER HANDOUT,
Chapter III. Mechanical assembly of lift equipment,
Section: 5. installation of cabin components,
Page 34.

Source: LECTURER HANDOUT,
Chapter III. Mechanical assembly of lift equipment,
Section: 6. Installation of crane cables and straps,
Page 36.



Source: LECTURER HANDOUT,
Chapter IV. Electrical installation of lift equipment,
Section: 1. Health and safety rules during the assembly of electrical components,
page 37.



1. Unplugging and disconnecting electricity: Before working on electrical equipment, completely disconnect it from the power supply and check that no voltage is present.

2. Use of appropriate tools and equipment: Use tools suitable for electrical work, such as insulated tools, and appropriate personal protective equipment, e.g. gloves, safety shoes, safety goggles.

3. Securing the work site: The work site should be adequately secured and any openings (e.g. in the floor, walls) should be fenced off or marked.

4. Checking the installation: Check the condition of the electrical installation, including wires, plugs and sockets for damage.

5. Operating instructions: The operating instructions and technical documentation for the equipment to be installed must be carefully observed.

6. Personal protective equipment (PPE): Appropriate PPE should be used, such as insulating gloves, safety shoes, safety goggles, and appropriate work attire.

7. Protection against accidental energisation: When the power supply is disconnected, the work site must be protected against accidental energisation, e.g. by lockout/tagout procedures.

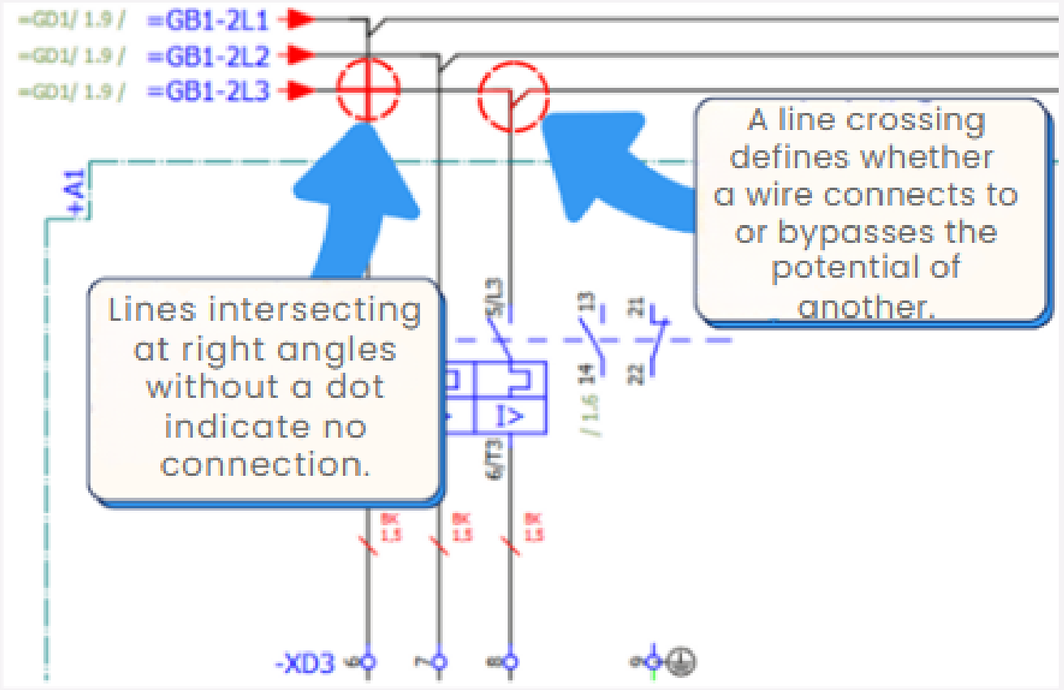
8. Work at height: When carrying out work at height, stable ladders or hoists must be used and suitable fall protection must be provided.

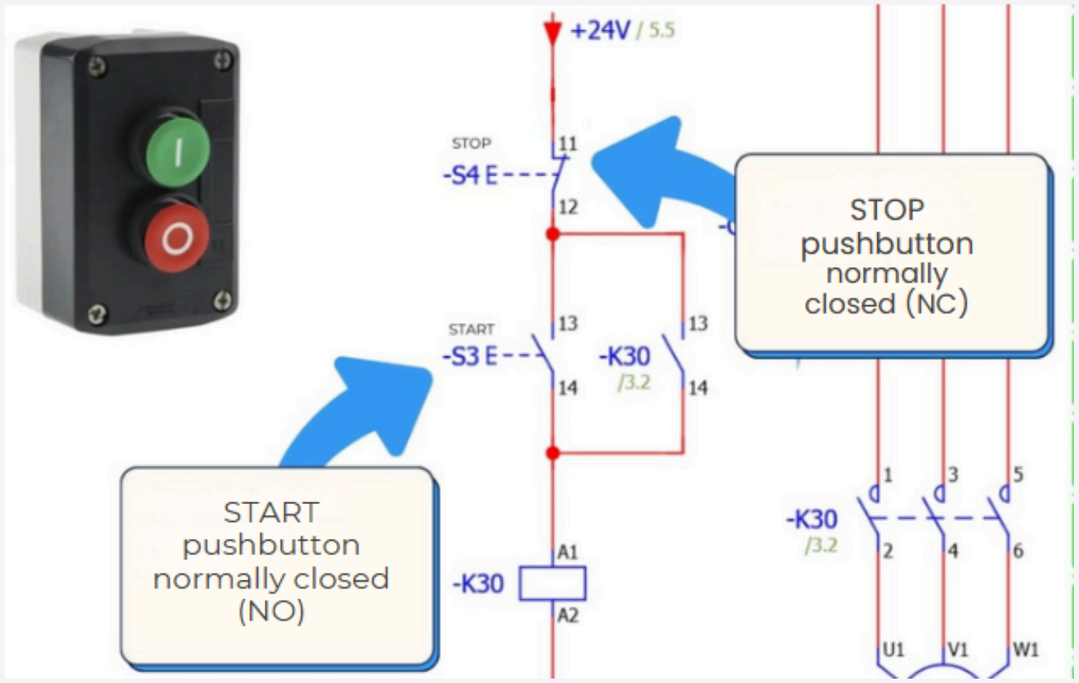
9. Communication: Workplaces should be properly signposted, adequate lighting should be provided, and adequate communication between workers should be ensured.

10. Rules for working in confined spaces: Working on electrical equipment in confined spaces requires that adequate ventilation is provided and that an adequate temperature is maintained.

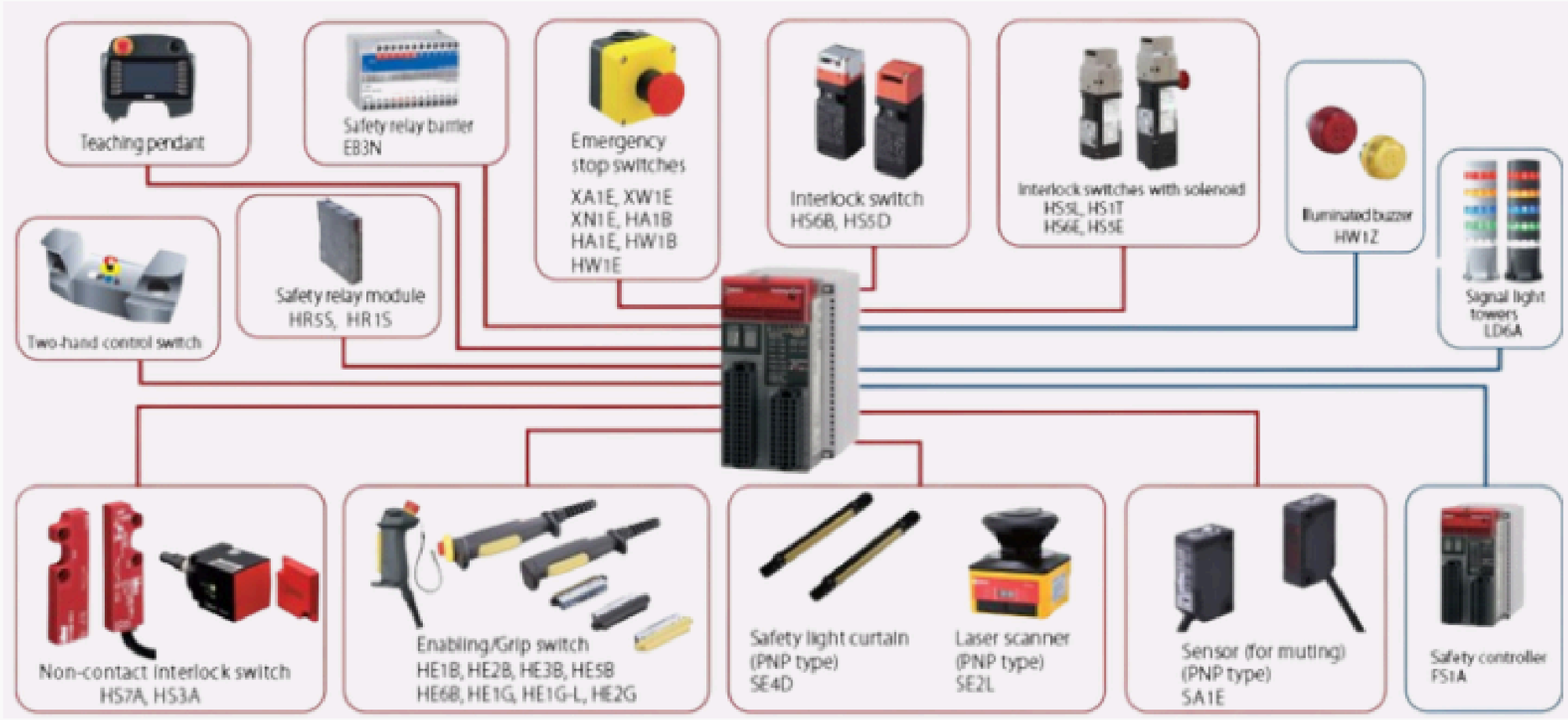
11. Fire prevention: Fire prevention rules should be observed, such as not using damaged cables, not overloading sockets, not using electrical appliances near flammable materials.

Source: LECTURER HANDOUT,
Chapter IV. Electrical installation of lift equipment,
Section: 2. Analysis of the wiring diagrams for connecting the lifting equipment,
page 38-39.



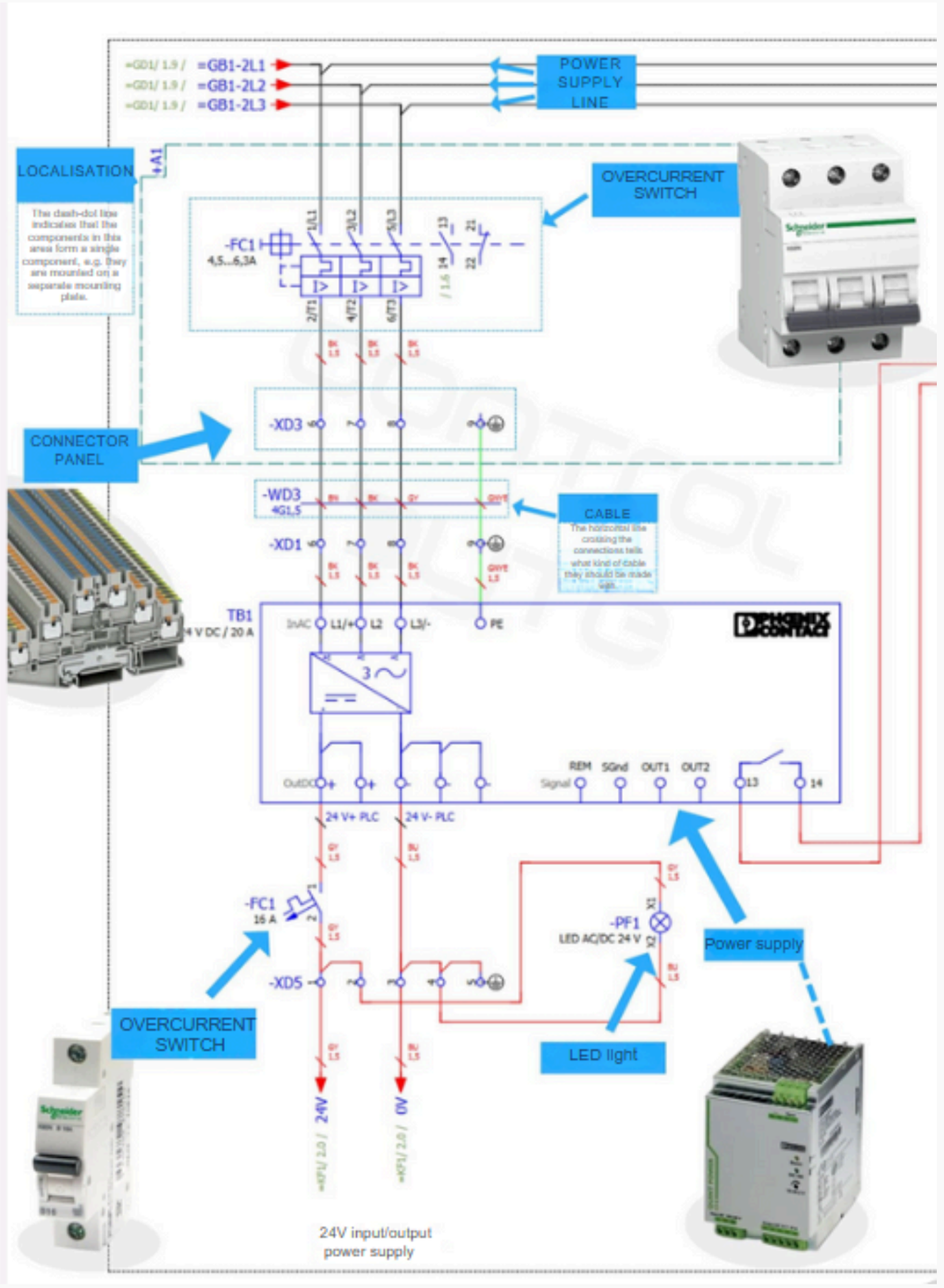


Source: LECTURER HANDOUT,
Chapter IV. Electrical installation of lift equipment,
Section: 3. Installation of power supply and protection systems for lifting equipment,
page 40.



Phase wire (L1)	
Phase wire (L2)	
Phase wire (L3)	
Neutral conductor (N)	
Protective conductor(PE)	

Source: LECTURER HANDOUT,
Chapter IV. Electrical installation of lift equipment,
Section: 7. Installation of speed control systems for lifting equipment,
page 47.

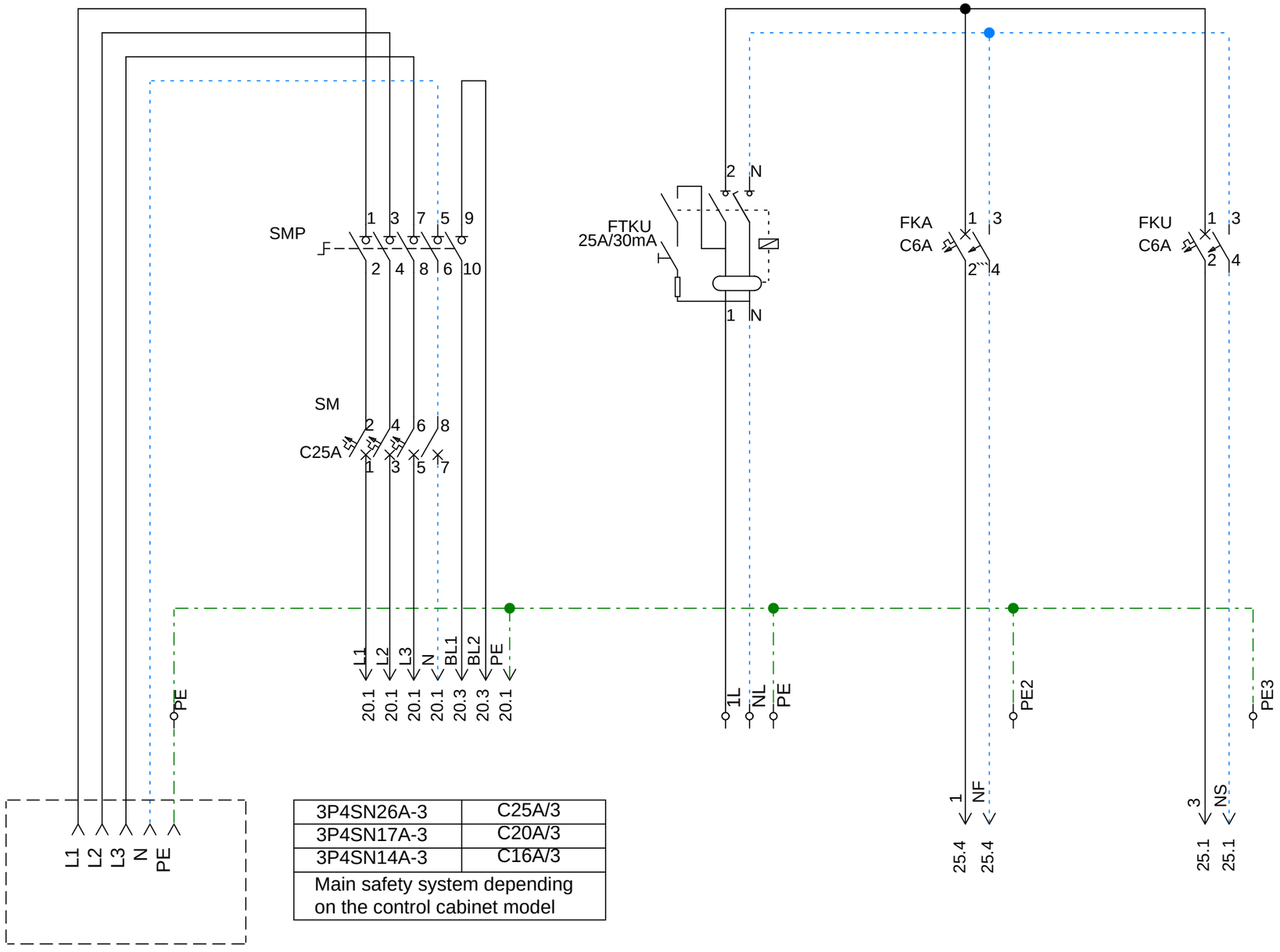


2.SCHEMATICS

Source:

ElektroLift
WINDY | PLATFORMY | DŹWIGI

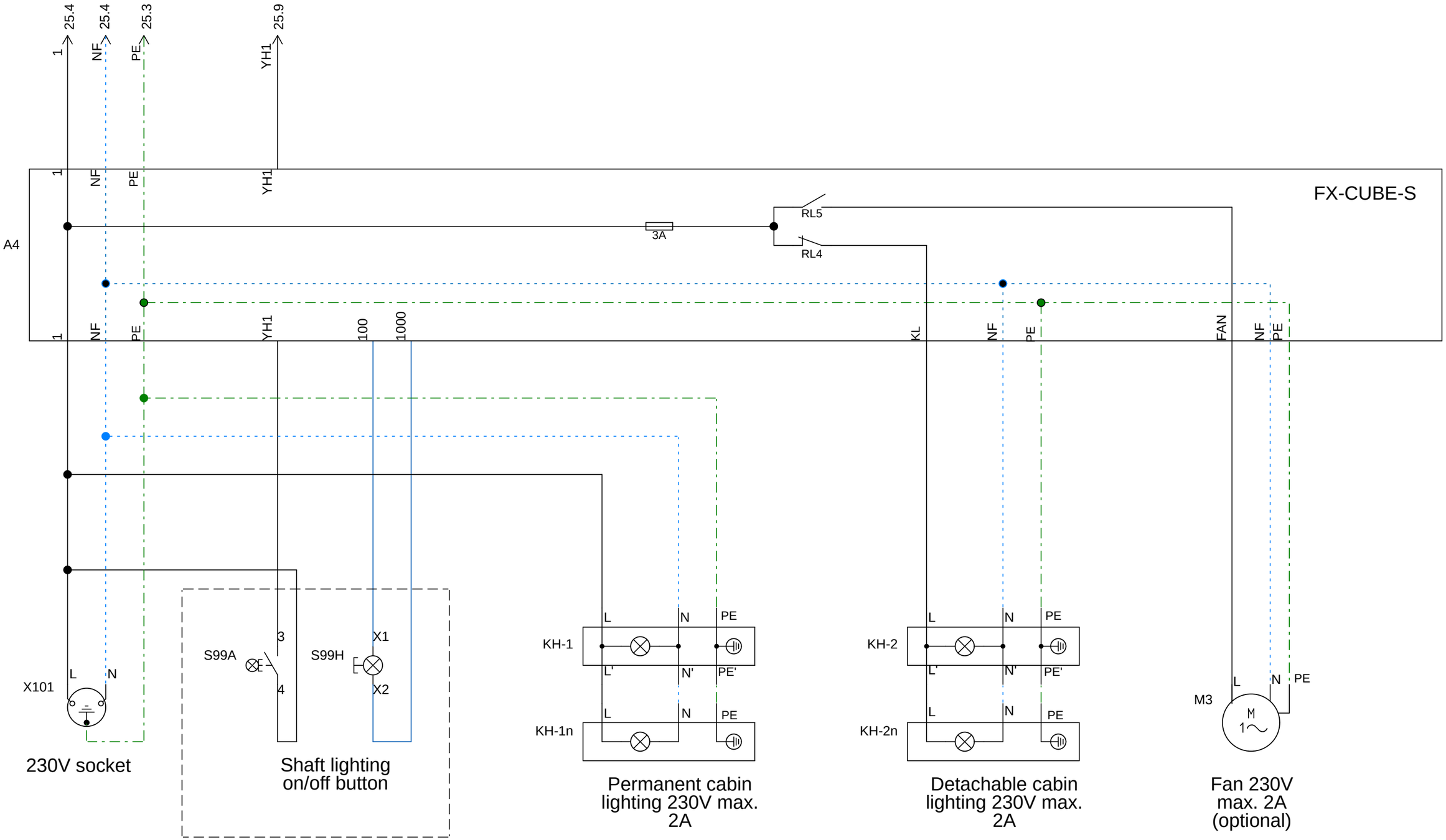
Operating voltage:	400V AC
Safety circuit voltage.:	42V AC
Control voltage:	24V DC
Power:	11kW



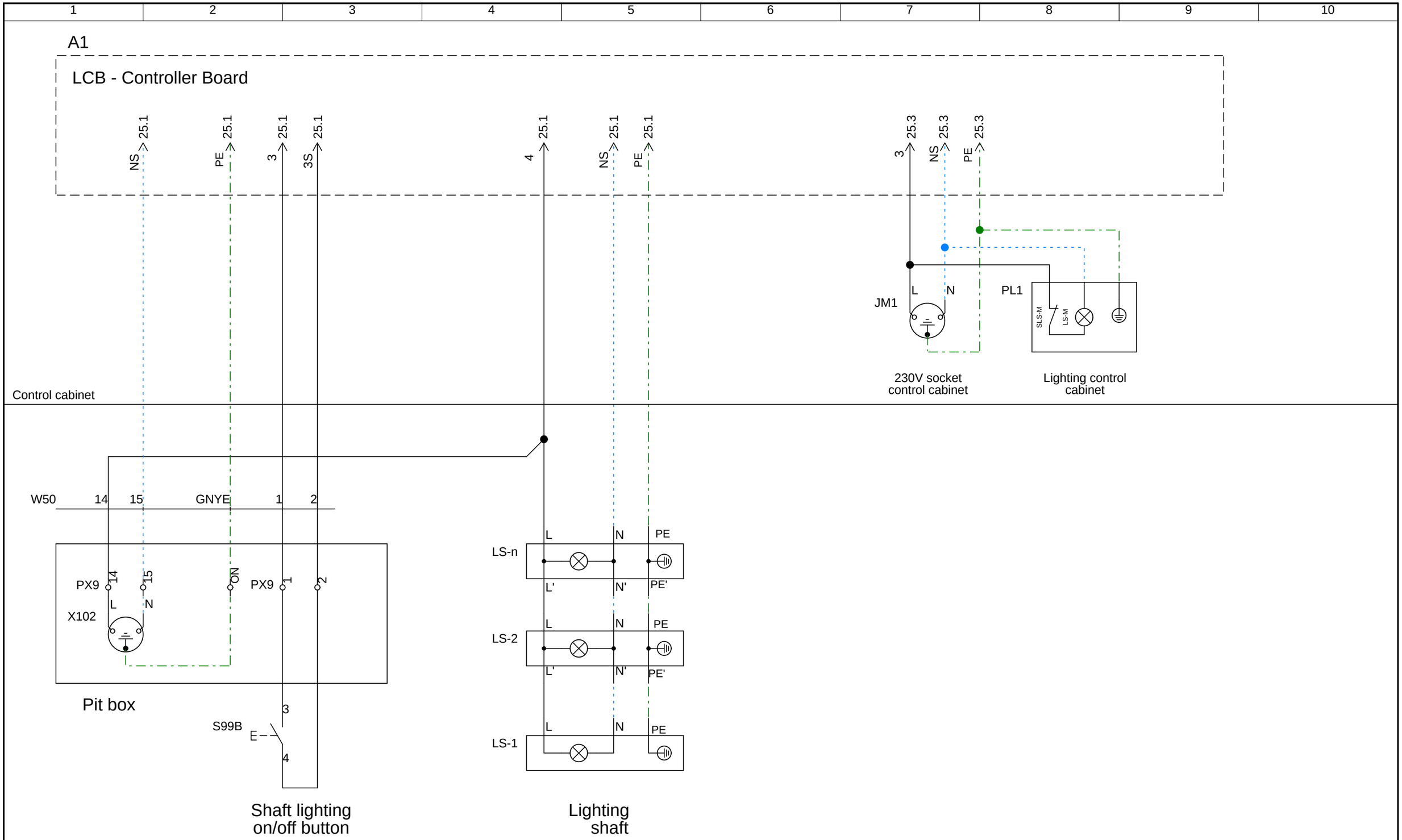
3P4SN26A-3	C25A/3
3P4SN17A-3	C20A/3
3P4SN14A-3	C16A/3
Main safety system depending on the control cabinet model	

Main power supply 3P+N+PE 400V 50Hz		Administrative power supply 230V AC	Cabin lighting	Shaft lighting	Shaft lighting relay

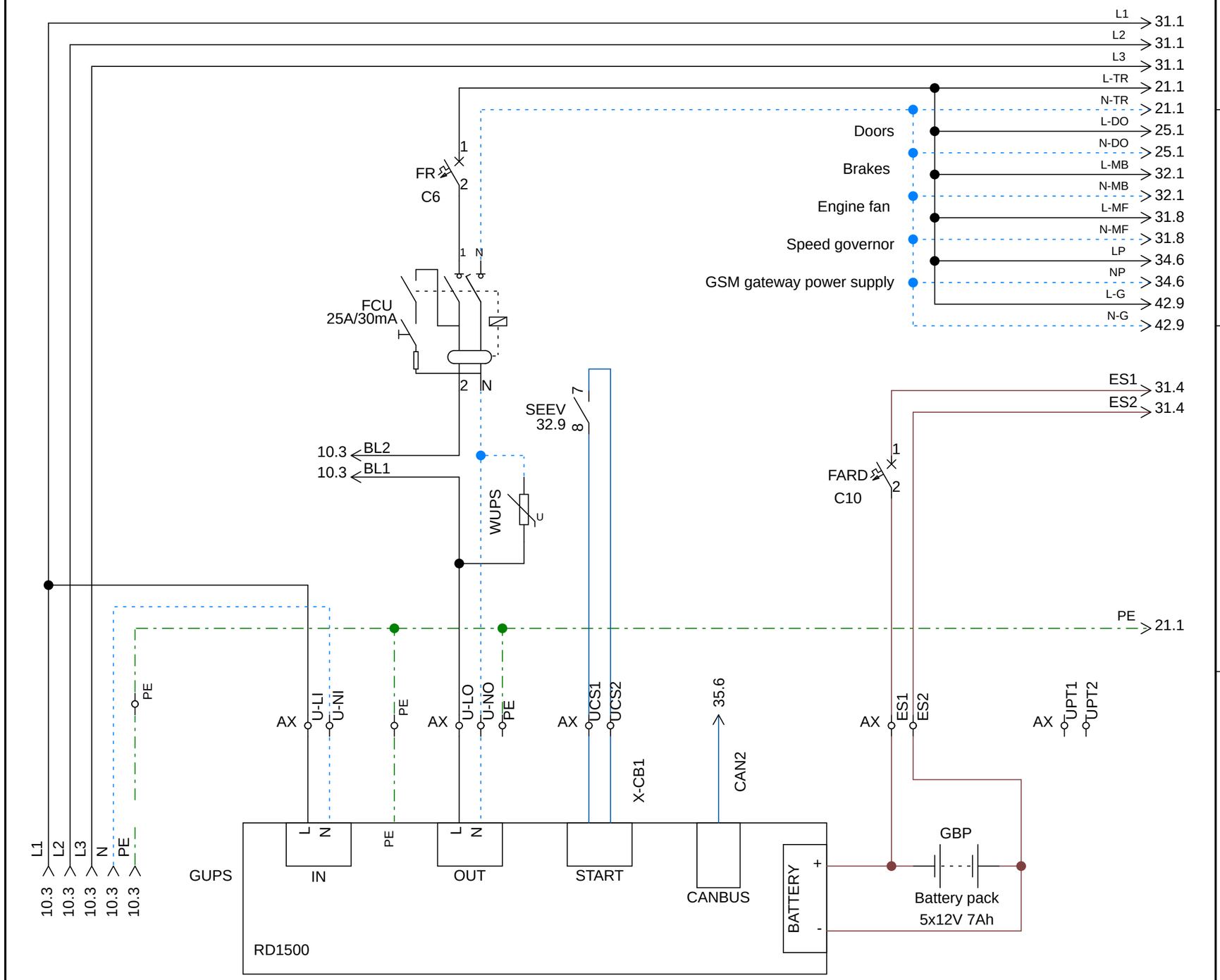
			Created:	Project: 25UD7032P	Main power supply Administrative power supply Switching on shaft lighting	
			Modified:	Order No.:		
			Designed by:	Scheme No.: 1721/2025/E		27
			Reviewed by:		Standard: PN-EN 61439-1:2021	



			Created:	Project: 25UD7032P	230V administrative cabin lighting and ventilation	
			Modified:	Order No.:		
			Designed by:	Scheme No.: 1721/2025/E		
			Reviewed by:		Standard: PN-EN 61439-1:2021	28

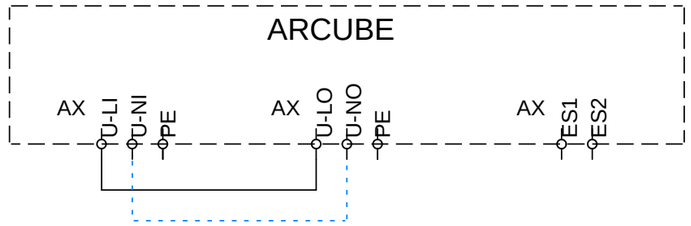


			Created:	Project: 25UD7032P	Shaft lighting Socket and cabinet lighting		
			Modified:	Order No.: Scheme			
			Designed by:	No.:			
			Reviewed by:	1721/2025/E	Standard: PN-EN 61439-1:2021	◀	29 ▶

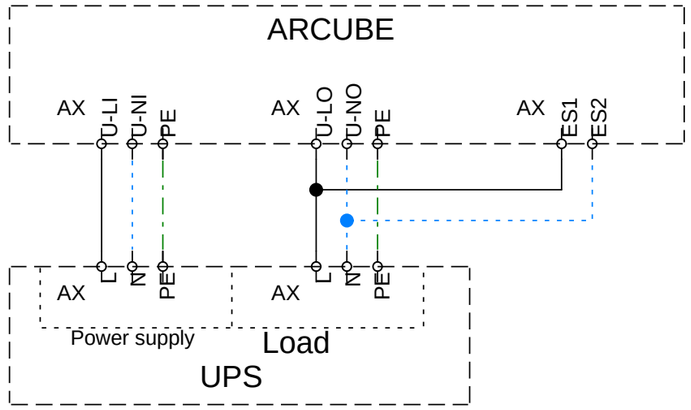


Optional emergency power supply systems

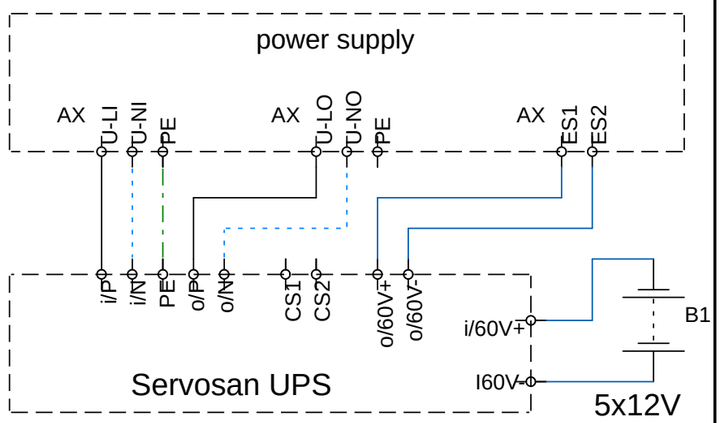
Without emergency power supply



UPS emergency power supply

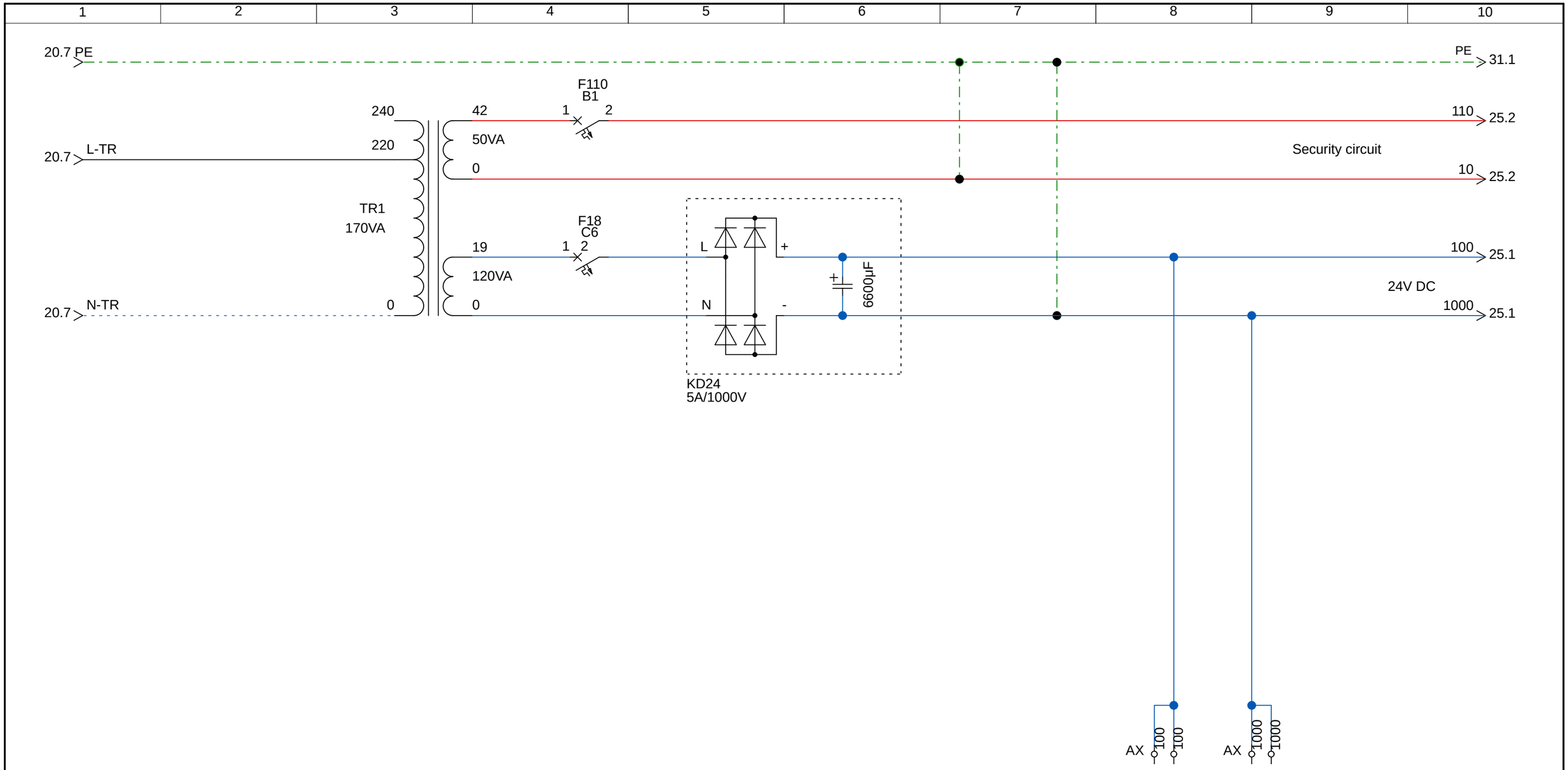


SERVOSAN ARCUBE emergency



Section in the lecturer's handout: 4. Testing and commissioning
Page 41

Created:	Project: 25UD7032P	Main and emergency power supply	
Modified:	Order No.:		
Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	30
Reviewed by:			



			Created:	Project: 25UD7032P	Safety circuit power supply Control power supply 24VDC		
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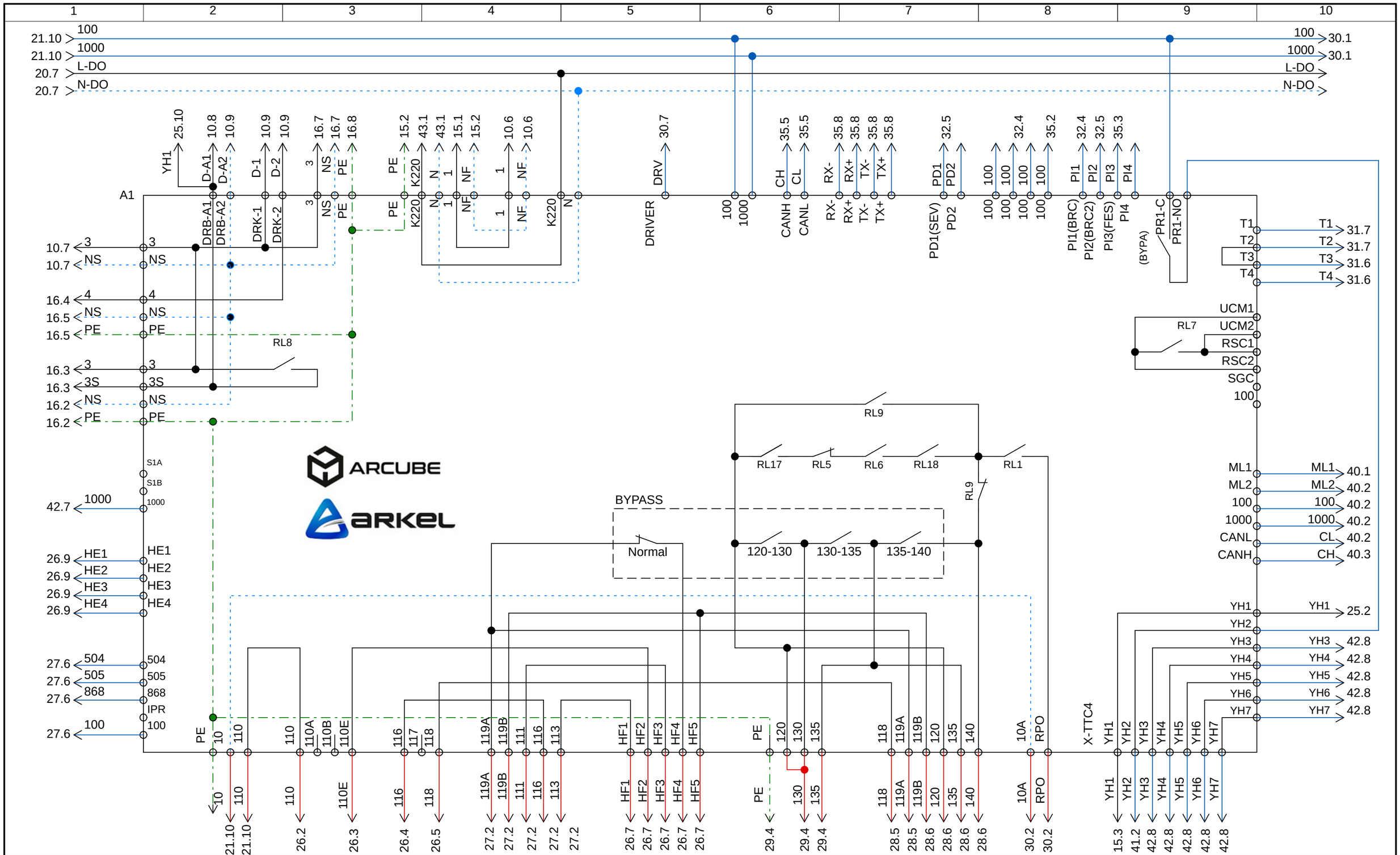
			Designed by:	Scheme No.: 1721/2025/E		◀	31 ▶
			Reviewed by:		Standard: PN-EN 61439-1:2021		



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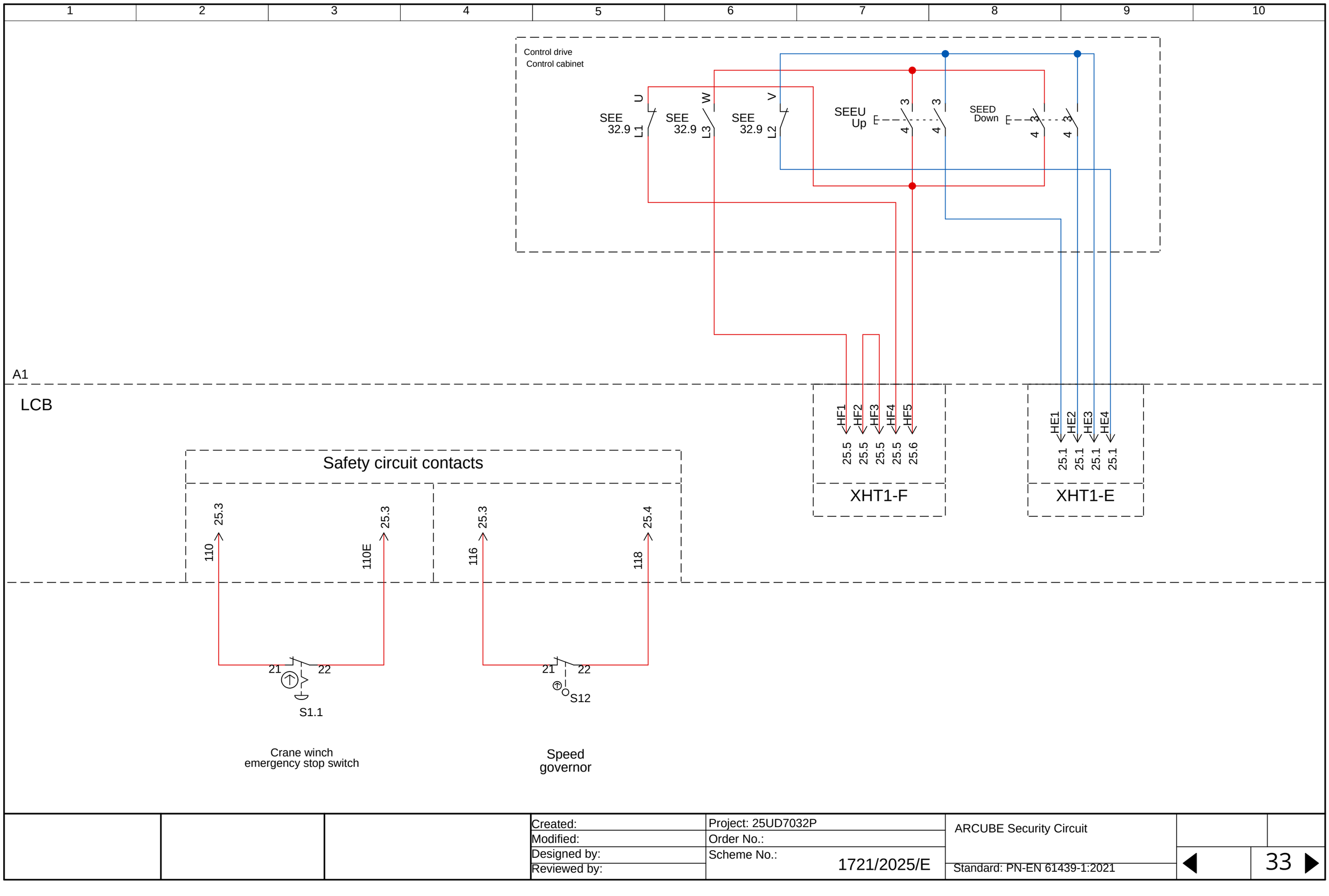

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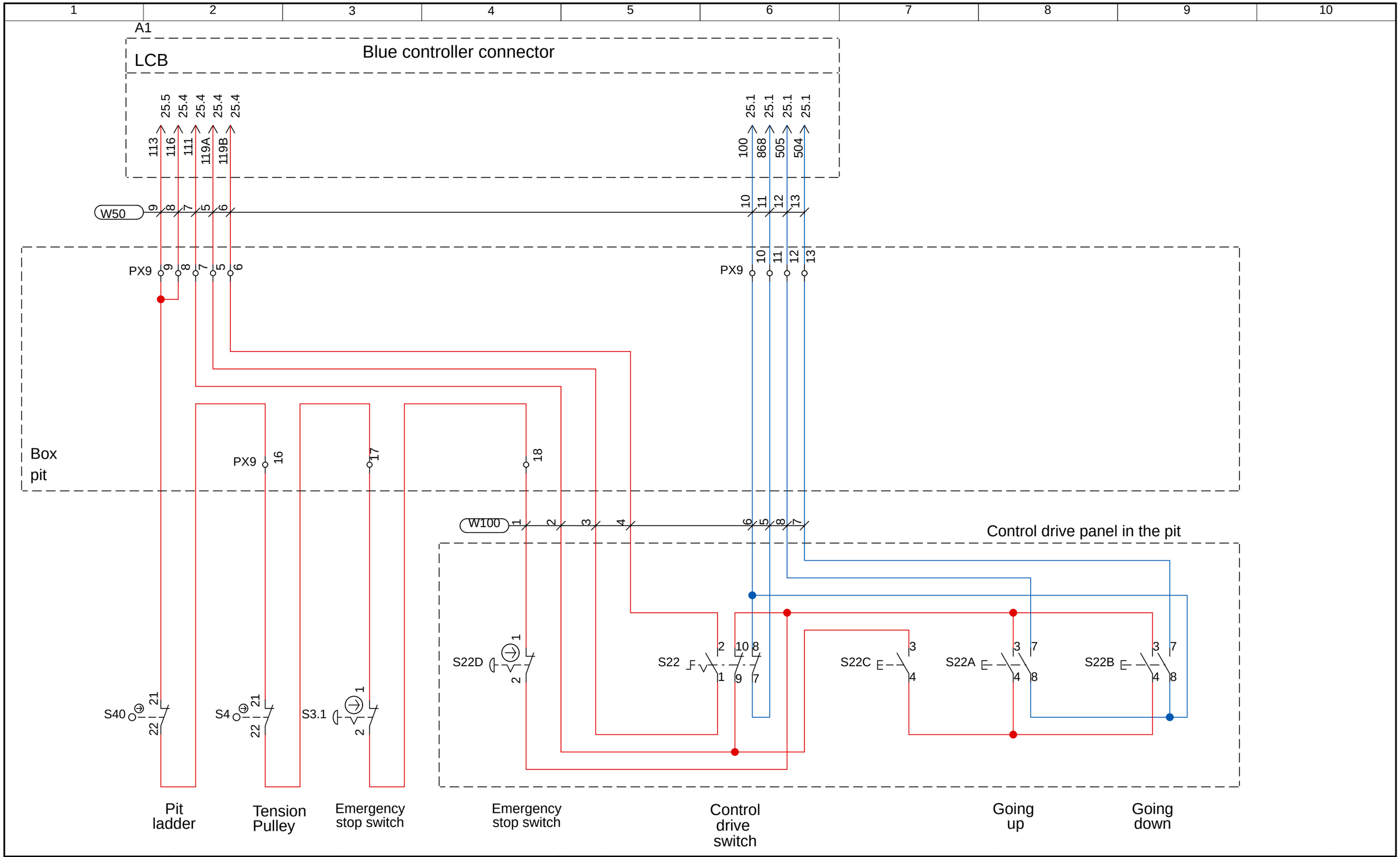

			Created:	Project: 25UD7032P	Pit safety circuit	
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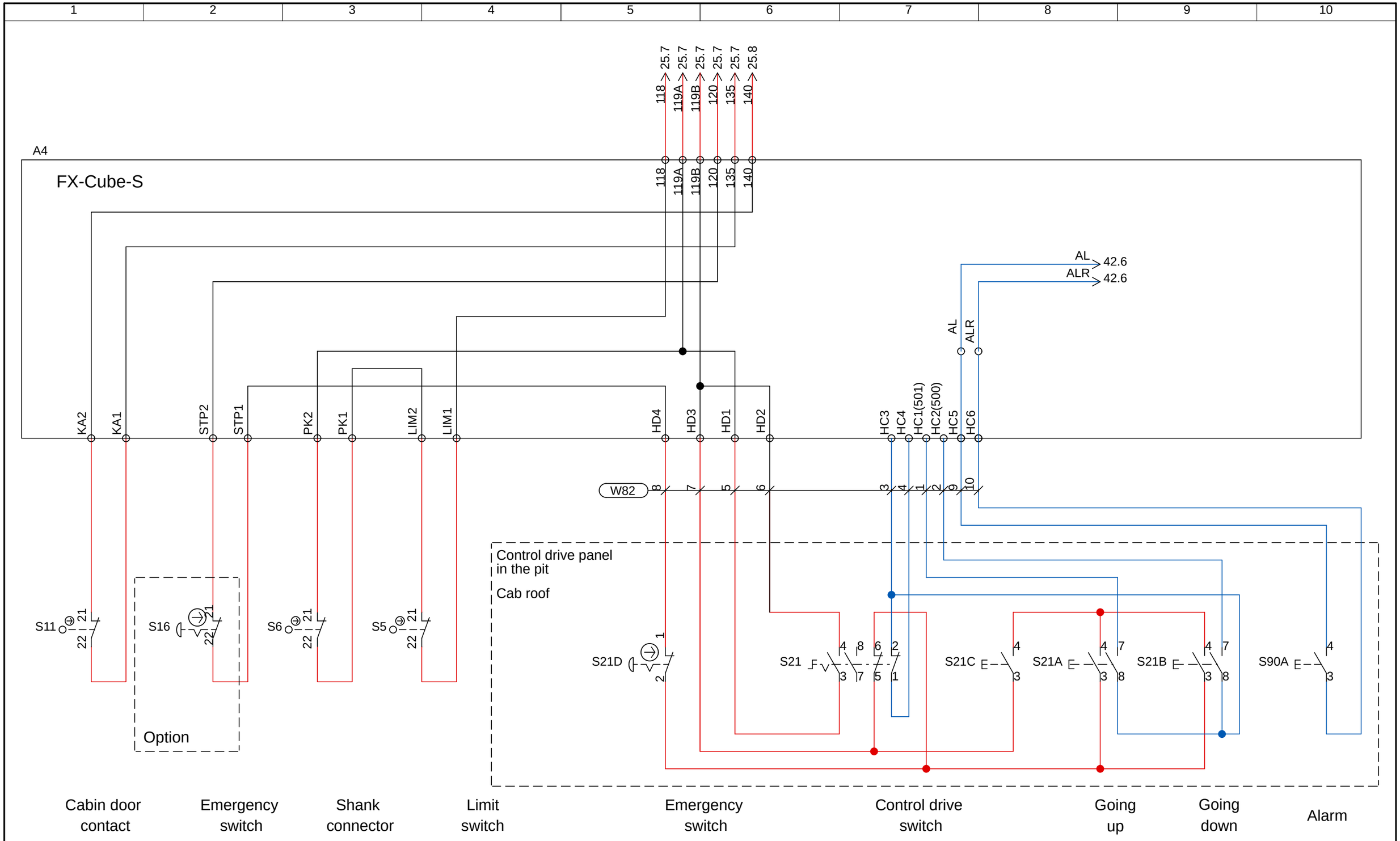
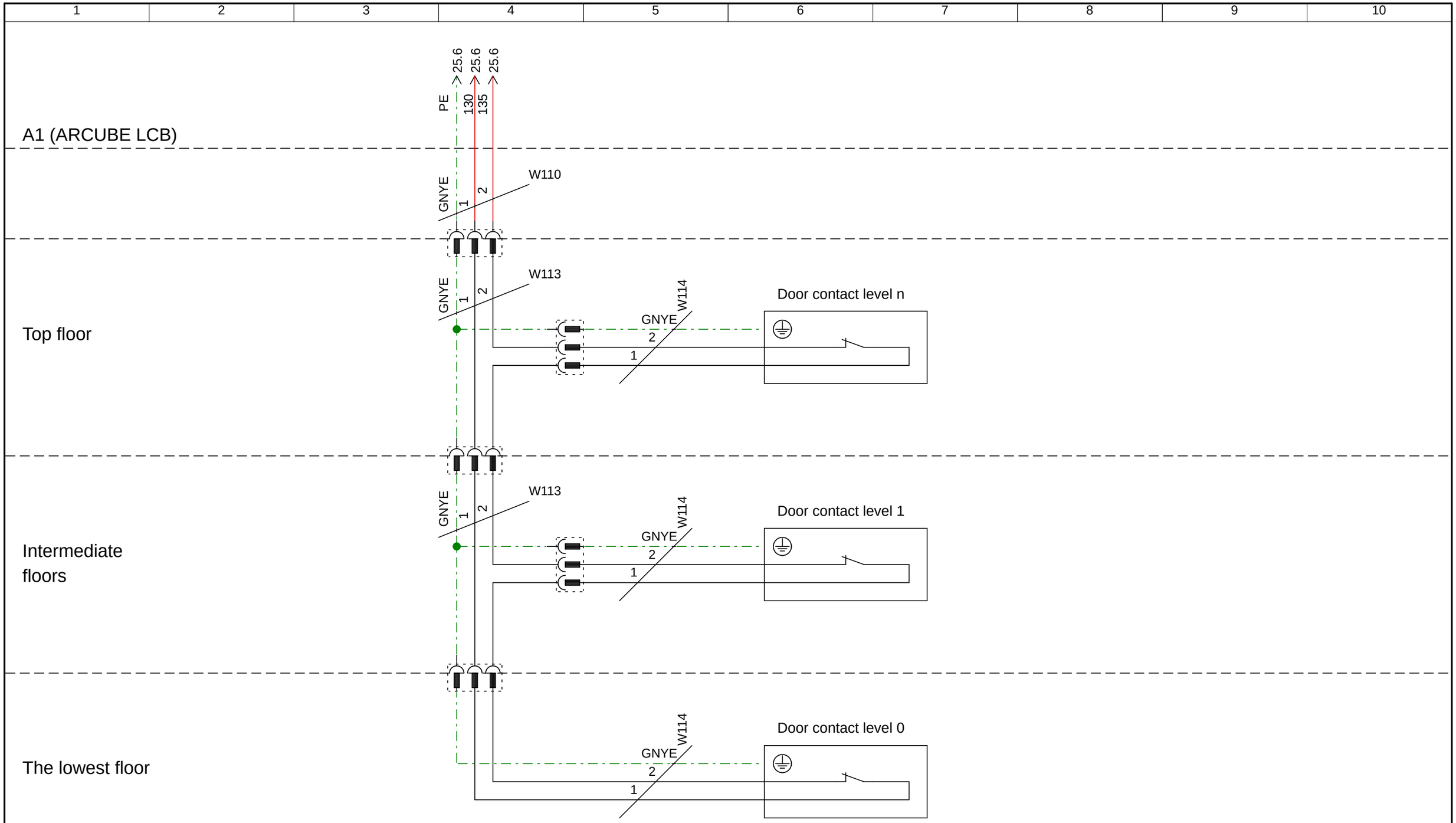
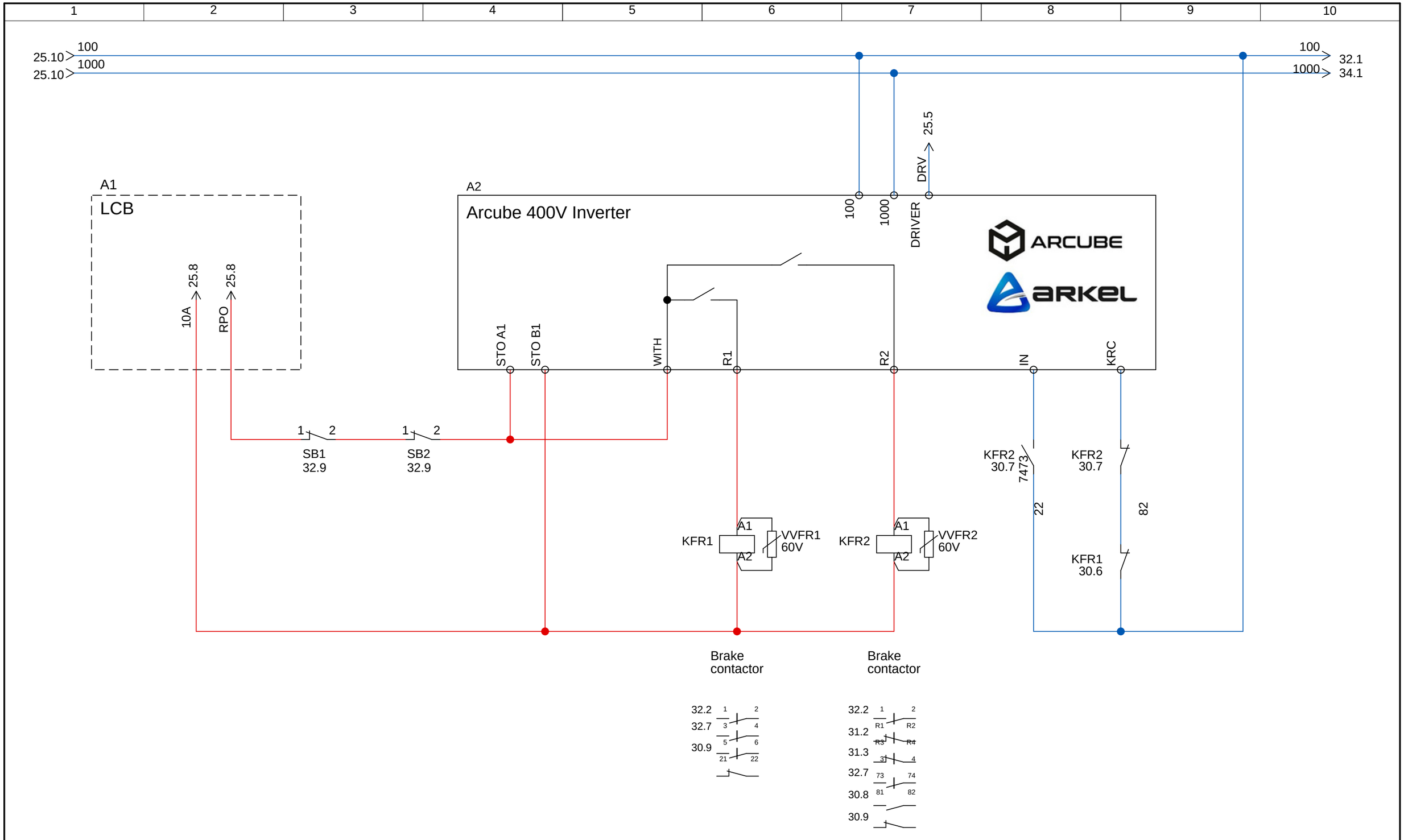
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	34
			Checked by:			



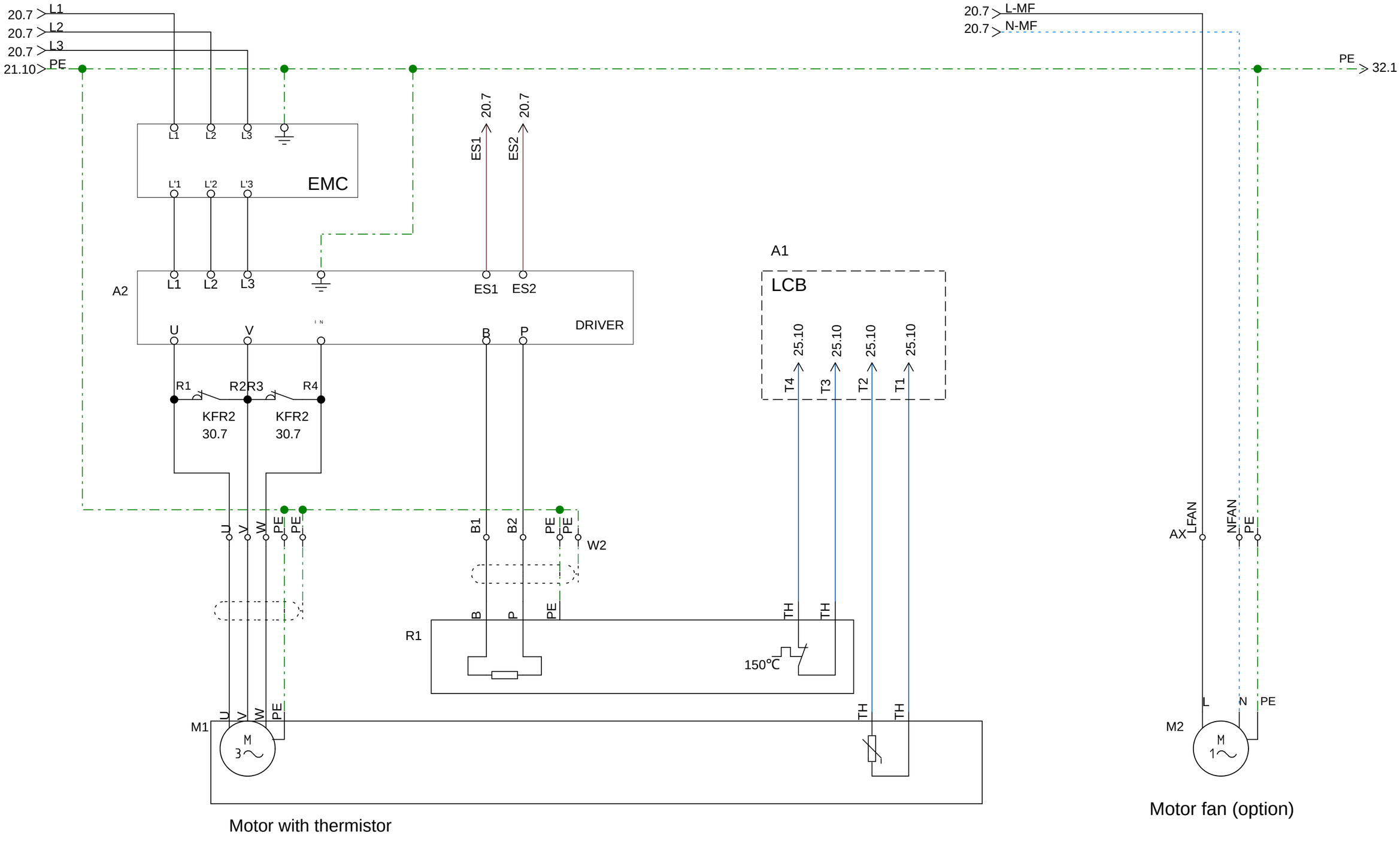
Created:	Project: 25UD7032P	Cabin safety circuit	
Modified:	Order No.: Scheme		
Designed by:	No.:		
Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021	35



			Created:	Project: 25UD7032P	Shaft door circuit		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E		◀	36 ▶
			Checked by:		Standard: PN-EN 61439-1:2021		

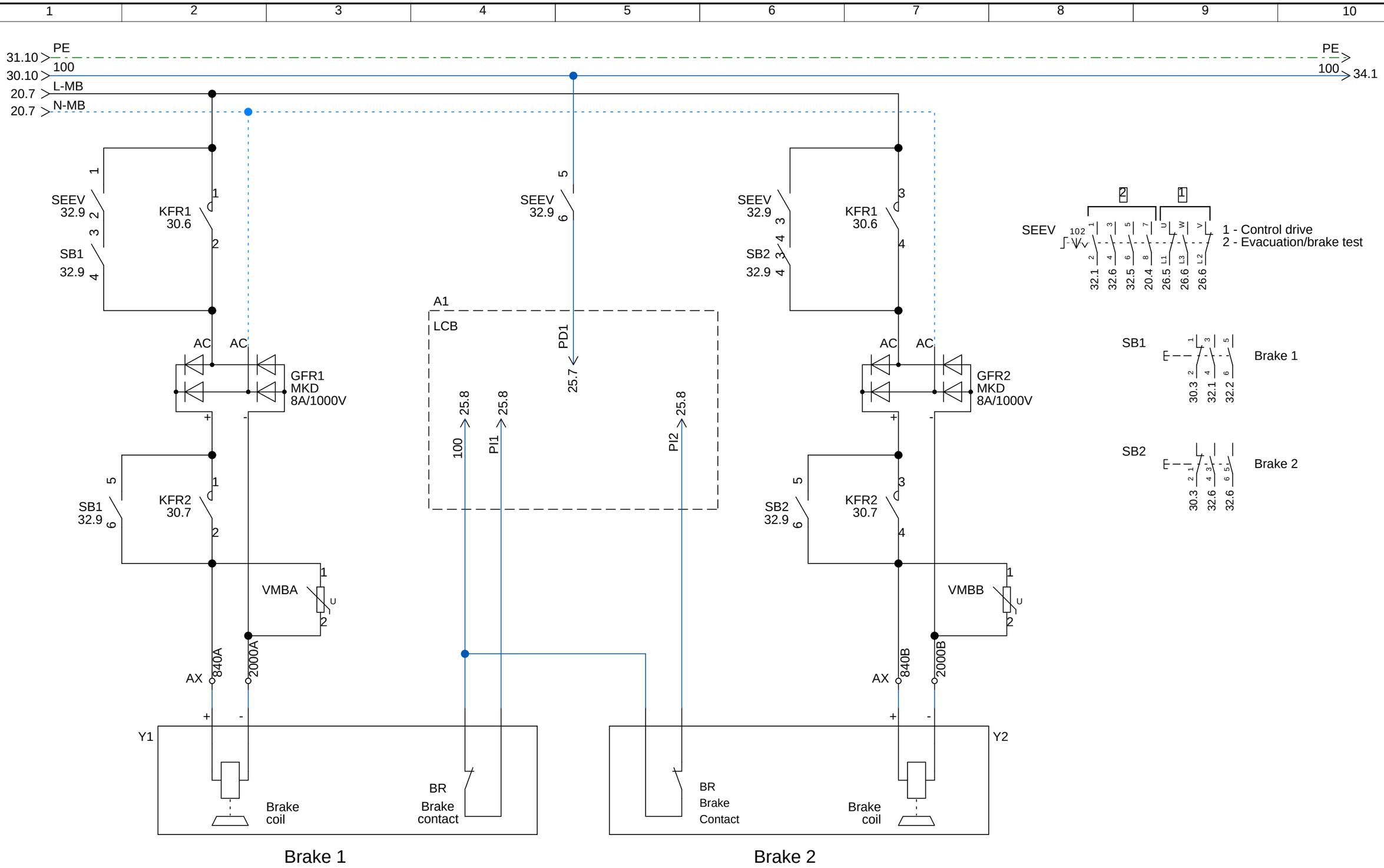


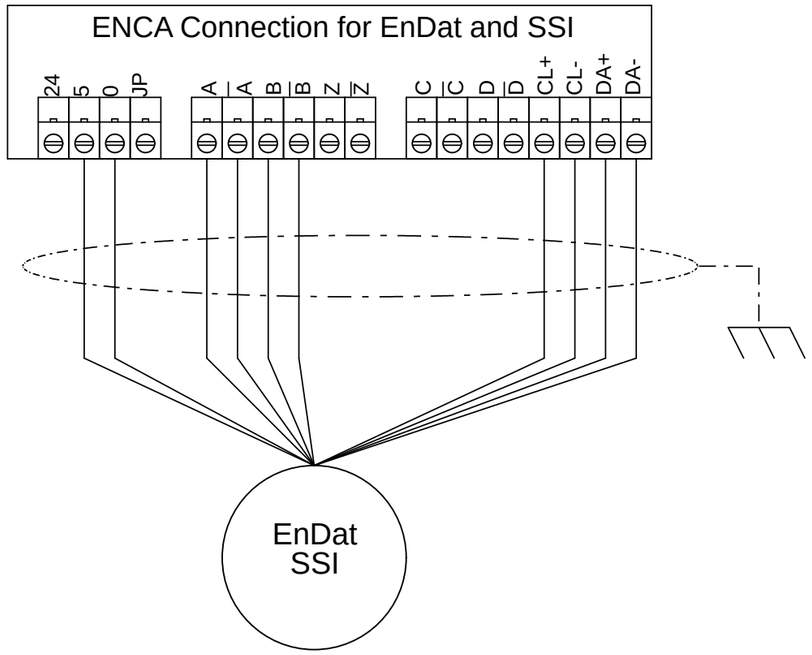
			Created:	Project: 25UD7032P	Braking control		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	37 ▶
			Checked by:				

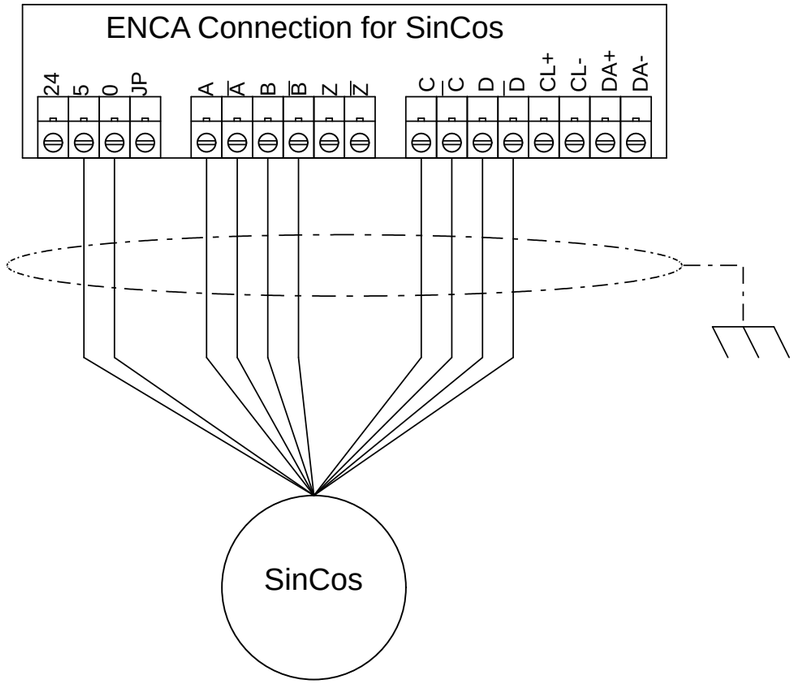


Motor with thermistor

Motor fan (option)


1
2
3
4
5
6
7
8
9
10
PE
31.10
100
30.10
L-MB
20.7
N-MB
20.7
PE
100
34.1
SEEV
32.9
KFR1
30.6
SB1
32.9
SEEV
32.9
SEEV
32.9
KFR1
30.6
SB2
32.9
A1
LCB
PD1
25.7
AC
AC
GFR1
MKD
8A/1000V
AC
AC
GFR2
MKD
8A/1000V
SB1
32.9
KFR2
30.7
SB2
32.9
KFR2
30.7
100
PI1
25.8
PI2
25.8
VMBA
VMBB
AX
840A
2000A
840B
2000B
Y1
Y2
Brake
coil
BR
Brake
contact
BR
Brake
Contact
Brake
coil
Brake 1
Brake 2
SEEV
102
32.1
32.6
32.5
20.4
26.5
26.6
26.6
1 - Control drive
2 - Evacuation/brake test
SB1
30.3
32.1
32.2
Brake 1
SB2
30.3
32.6
32.6
Brake 2





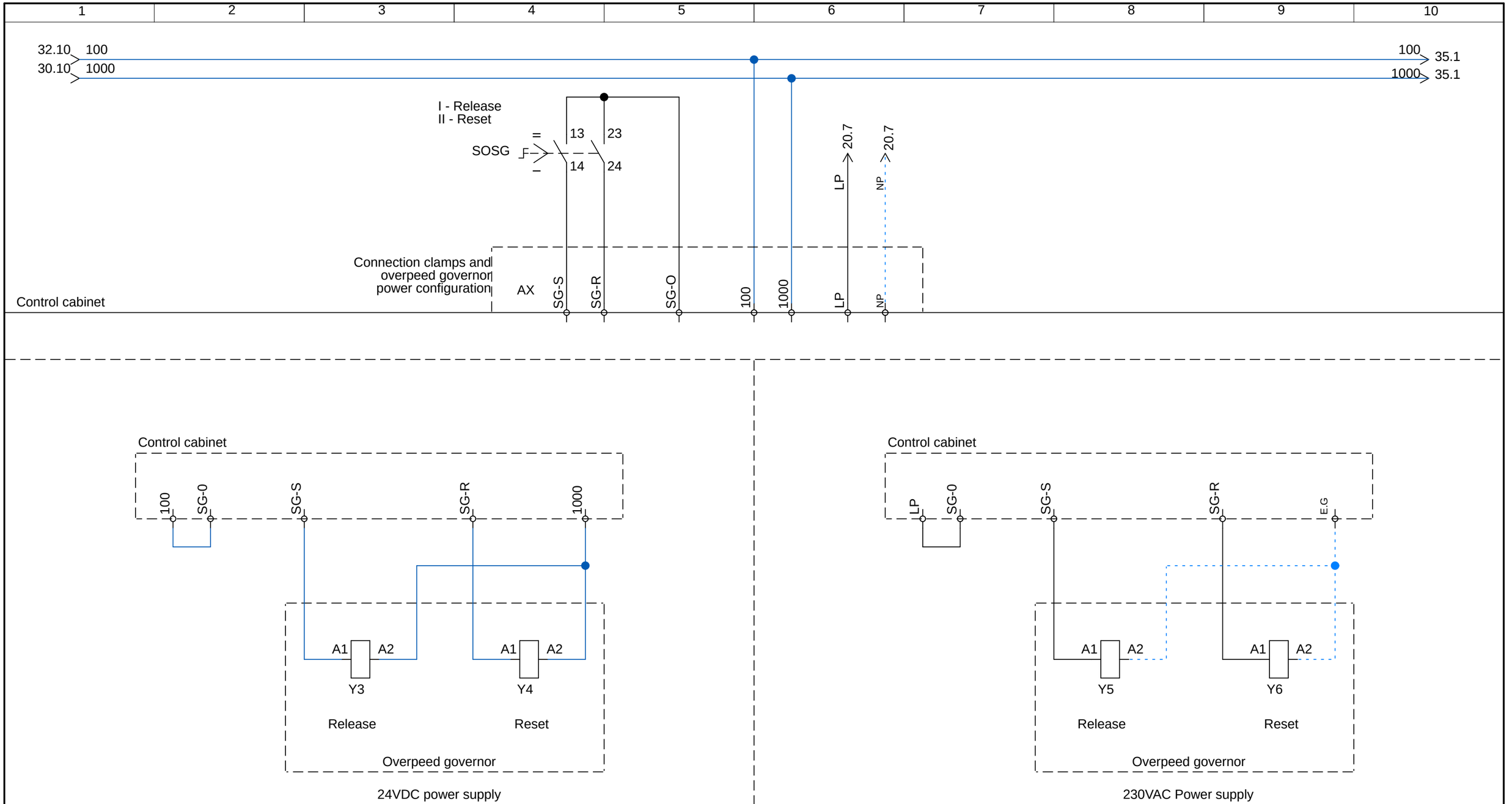
NOTE! Before connecting, check the machine drive's DTR

Clamp marking	Encodery EnDat											
	WITTUR		ZIEHL-ABEGG (HEIDENHEIN) 10-core cable		ZIEHL-ABEGG (HEIDENHEIN) 10-core cable		TORIN		SICOR			
A	gray	(15)	yellow	(K)	gray/pink	(K)	green	(J1-1)	gray/ pink	(8)		
$\overline{A}$	pink	(16)	green	(L)	red/blue	(L)	brown	(J1-9)	red/blue	(5)		
B	green	(12)	blue	(F)	blue	(F)	blue	(J1-3)	black	(10)		
$\overline{B}$	yellow	(13)	red	(M)	red	(M)	yellow	(J1-11)	purple	(3)		
CL+	black	(8)	purple	(H)	purple	(H)	purple	(J1-8)	green	(2)		
CL-	purple	(9)	black	(G)	black	(G)	white	(J1-15)	yellow	(11)		
DA+	white	(14)	white	(A)	white	(A)	gray	(J1-5)	gray	(6)		
DA-	brown	(17)	brown	(B)	brown	(B)	colorless	(J1-13)	pink	(7)		
5V	red	(7)	gray	(D)	gray	(D)	orange	(J1-4)	brown	(1)		
									red	(12)		
0V	blue	(10)	pink	(E)	pink	(E)	orange/ white	(J1-2)	white	(4)		
									blue	(9)		

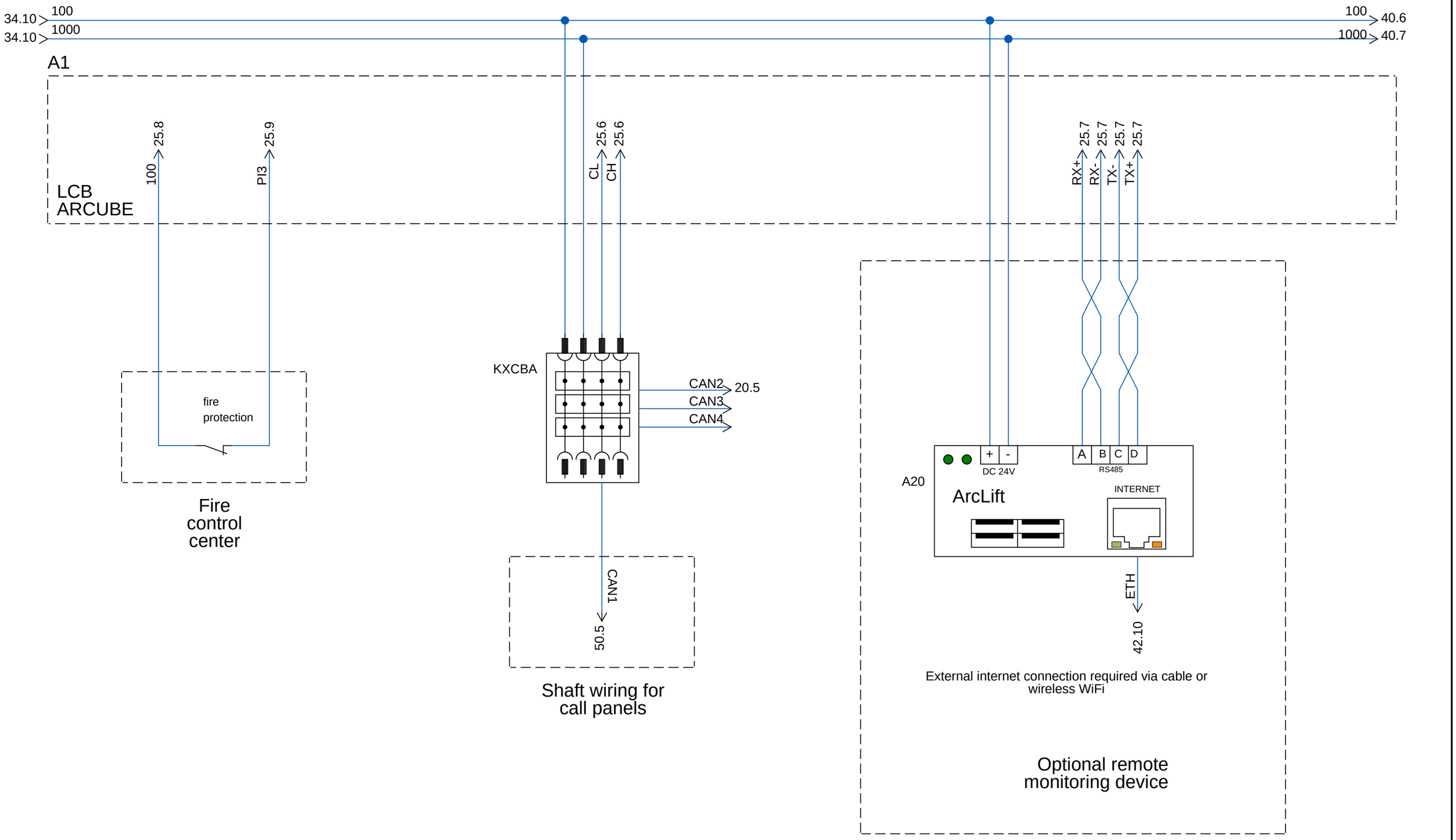
Created:
Modified:
Designed by:
Checked by:

Project: 25UD7032P
Order No.:
Scheme No.: 1721/2025/E

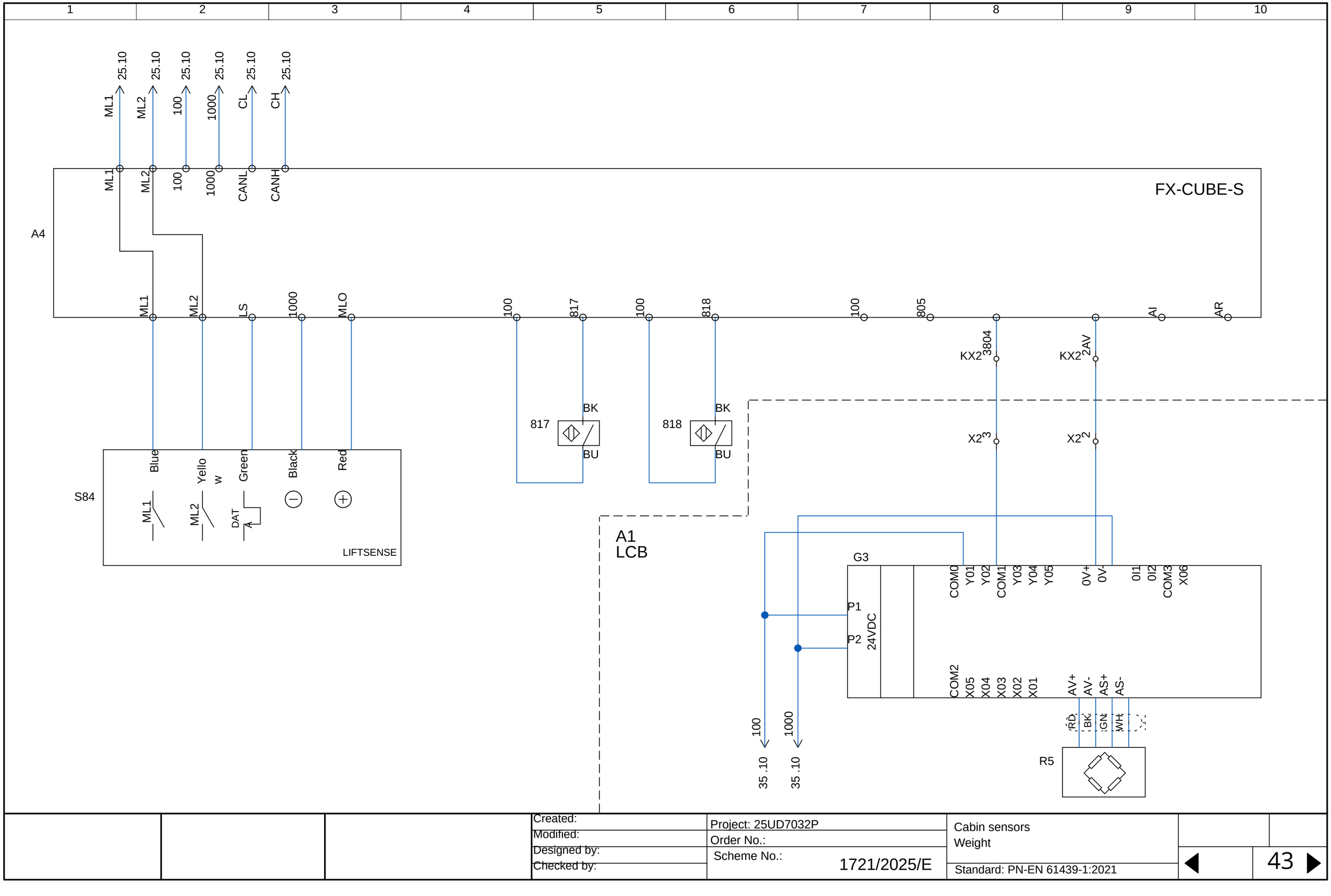
Encoder
Standard: PN-EN 61439-1:2021



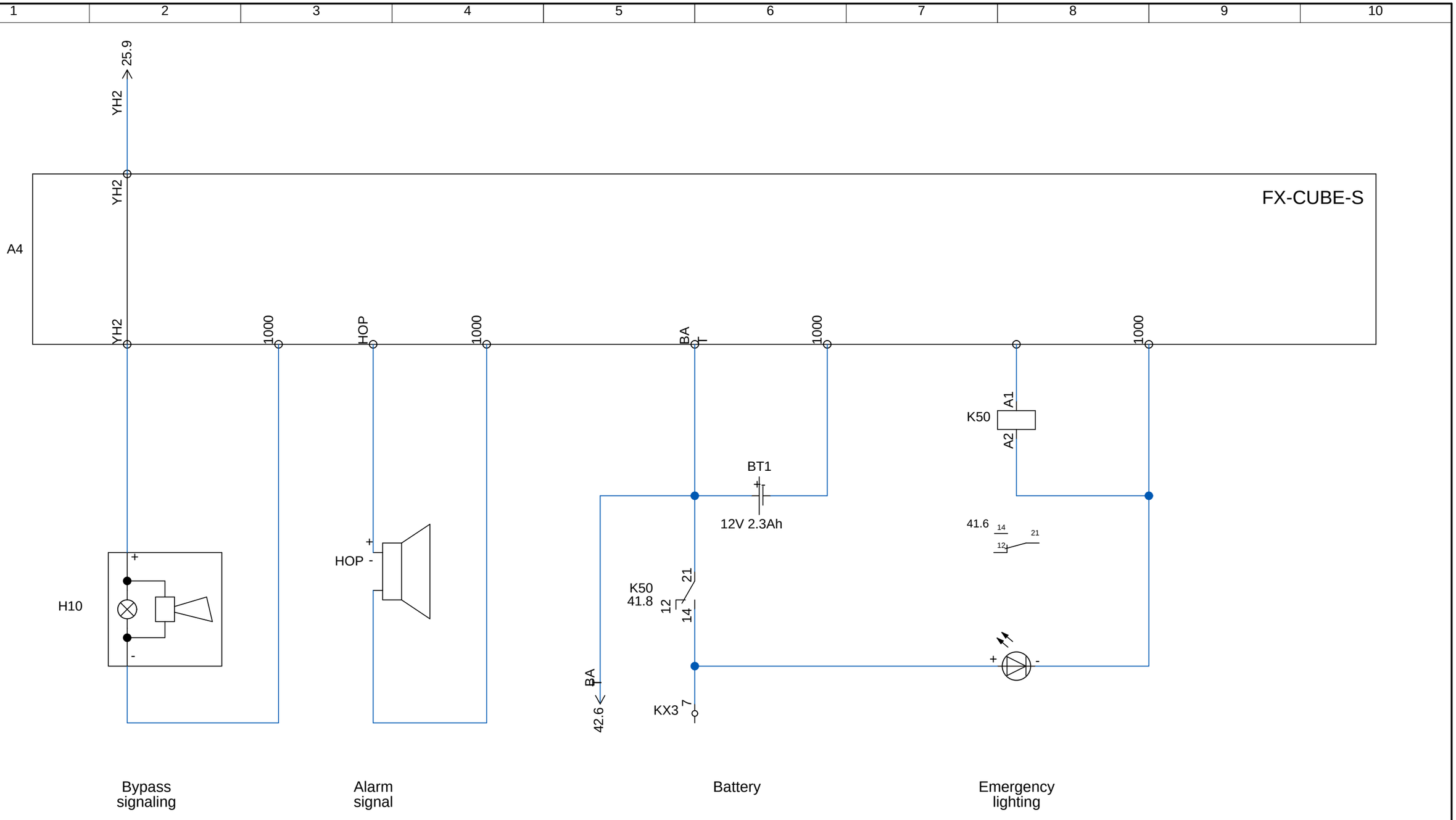
			Created:	Project: 25UD7032P	Overspeed governor		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	41 ▶
			Checked by:				



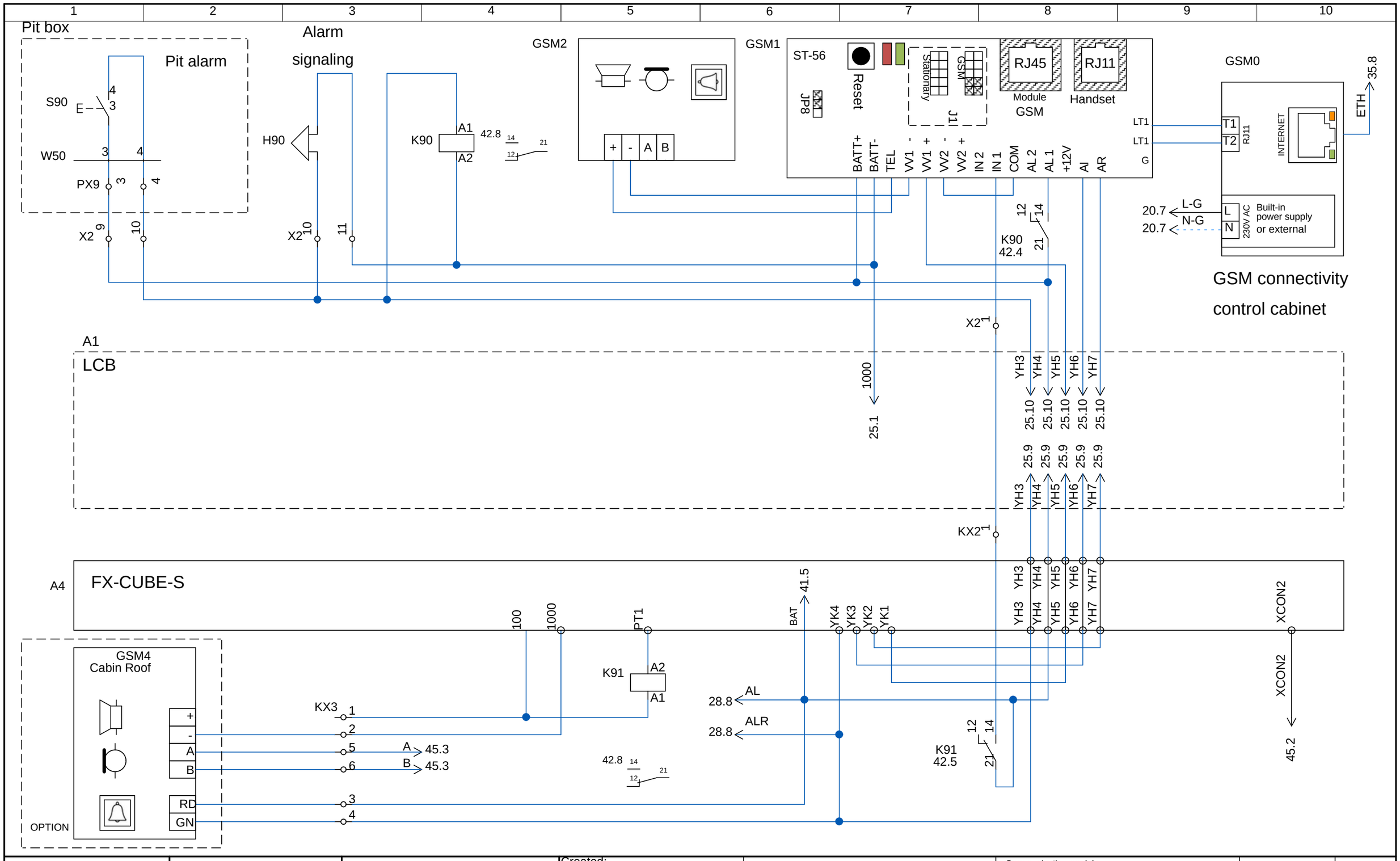
			Created:	Project: 25UD7032P	Signal from the fire alarm control panel, CanBUS output ArcLift output - remote monitoring		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	42 ▶
			Checked by:				



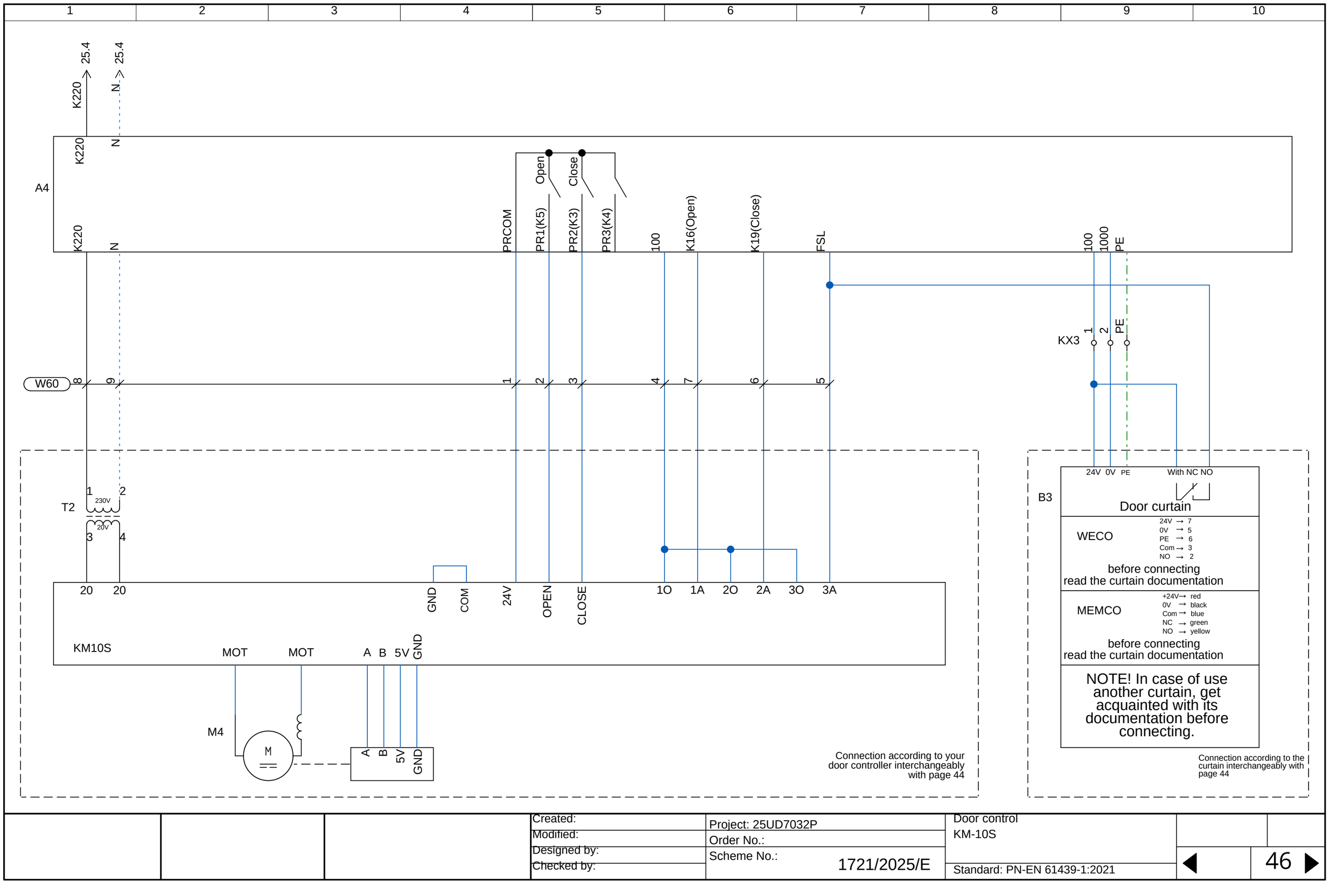
			Created:	Project: 25UD7032P	Cabin sensors Weight	
			Modified:	Order No.:		
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	43
			Checked by:			



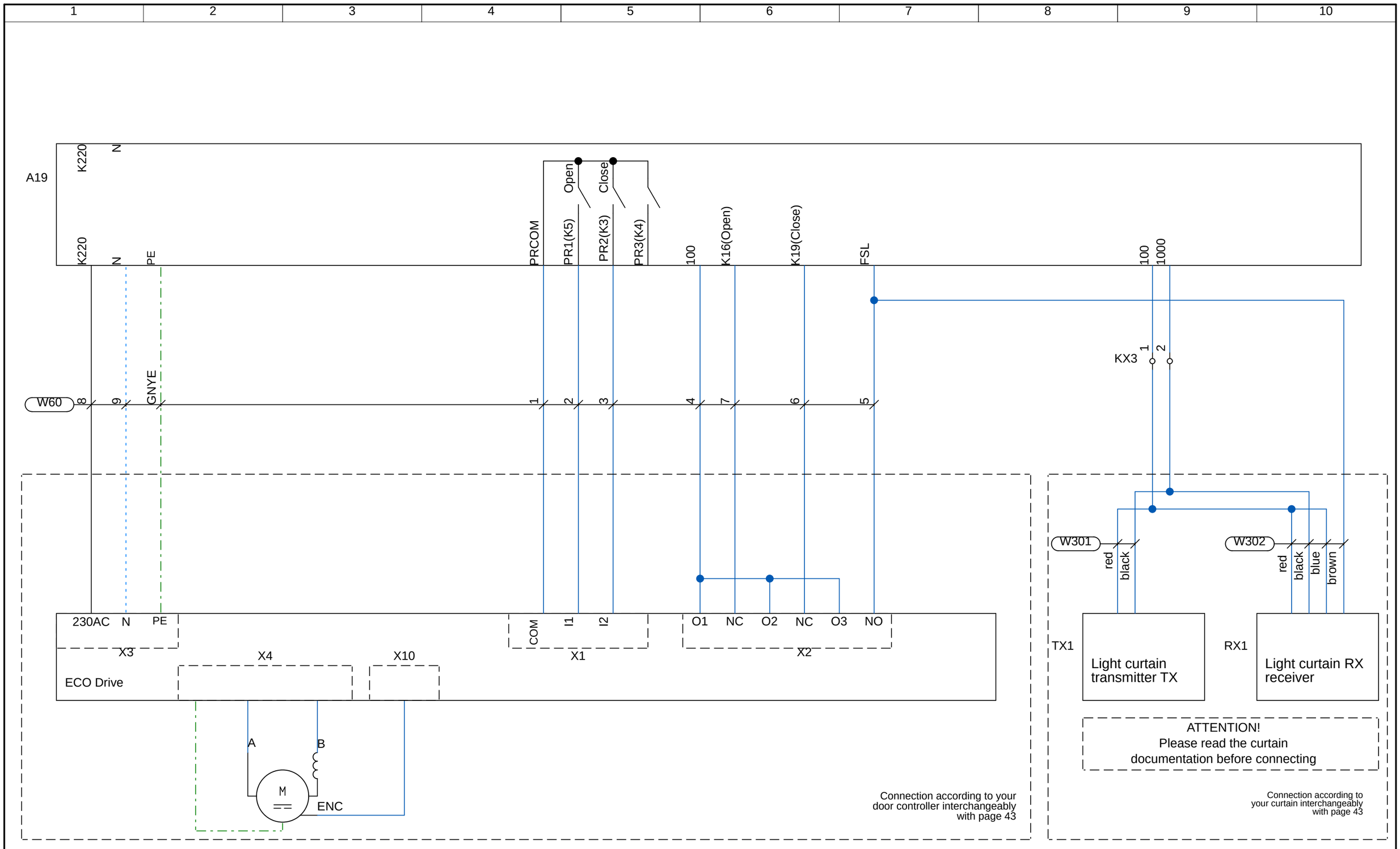
			Created:	Project: 25UD7032P	Cabin signalling Emergency power supply		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	44 ▶
			Checked by:				



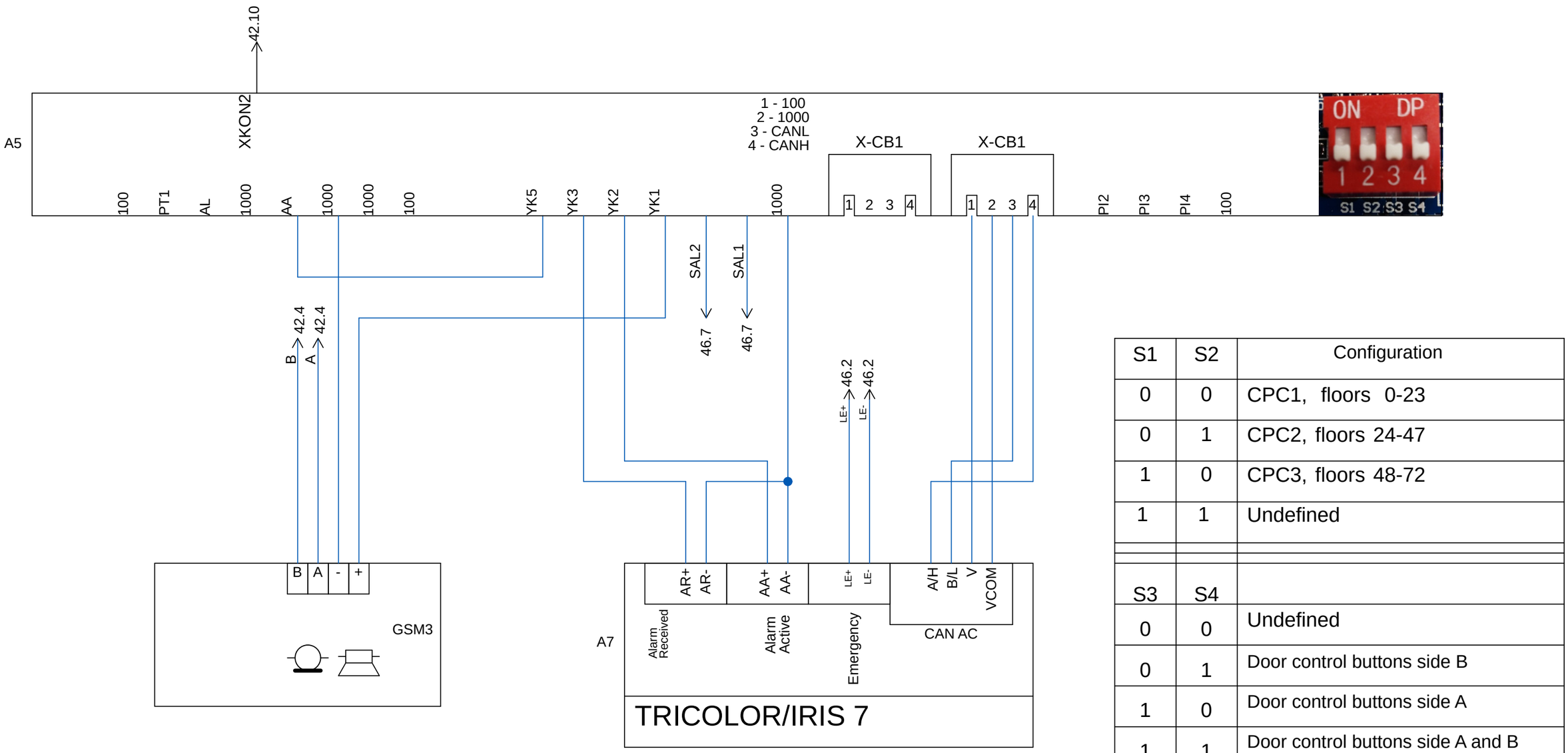
			Created:	Project: 25UD7032P	Communication module GSM gateway		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	45 ▶
			Checked by:				



			Created:	Project: 25UD7032P	Door control KM-10S	
			Modified:	Order No.:		
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	46
			Checked by:			

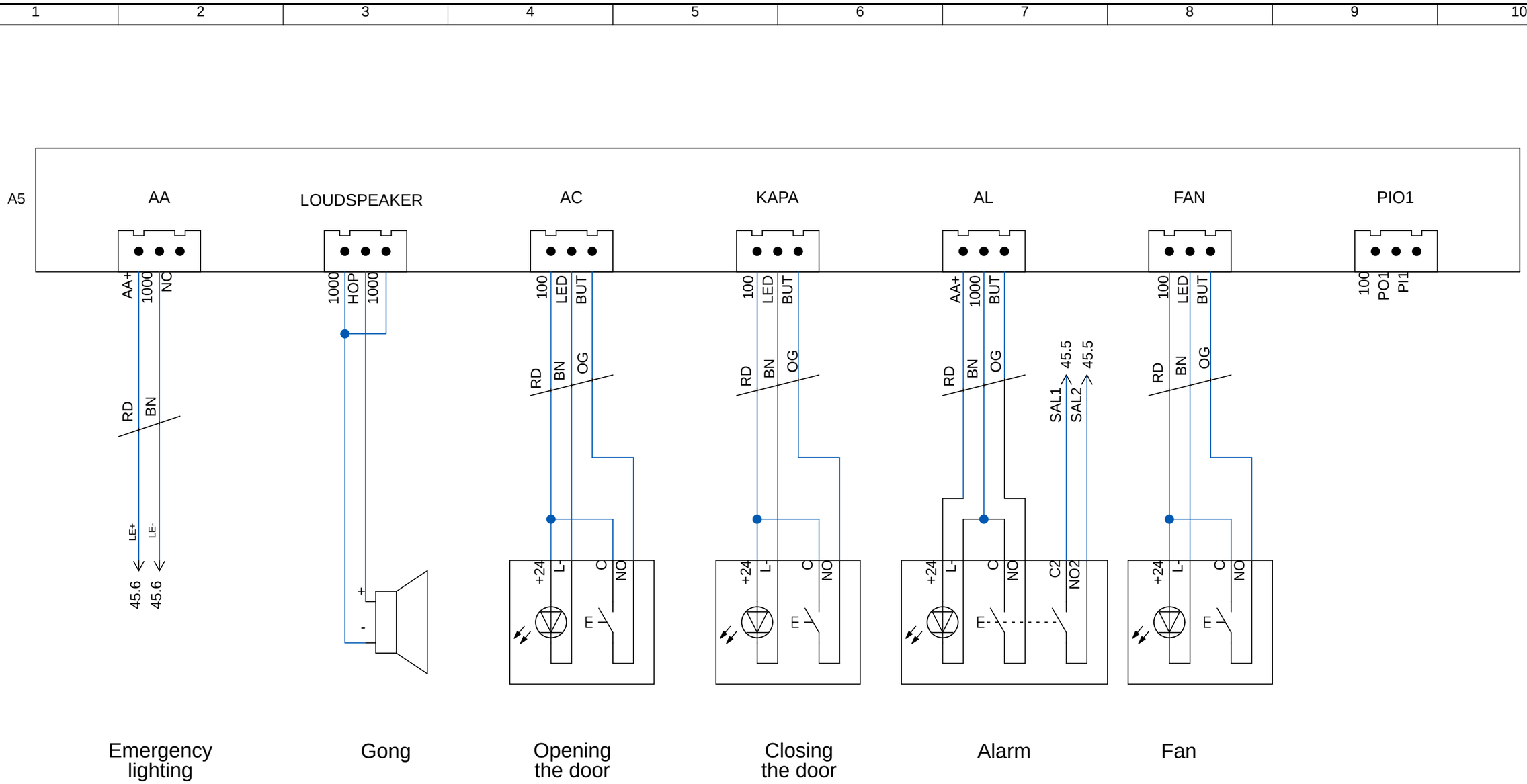


			Created:	Project: 25UD7032P	Door control ECO Drive		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	47 ▶
			Checked by:				



S1	S2	Configuration
0	0	CPC1, floors 0-23
0	1	CPC2, floors 24-47
1	0	CPC3, floors 48-72
1	1	Undefined

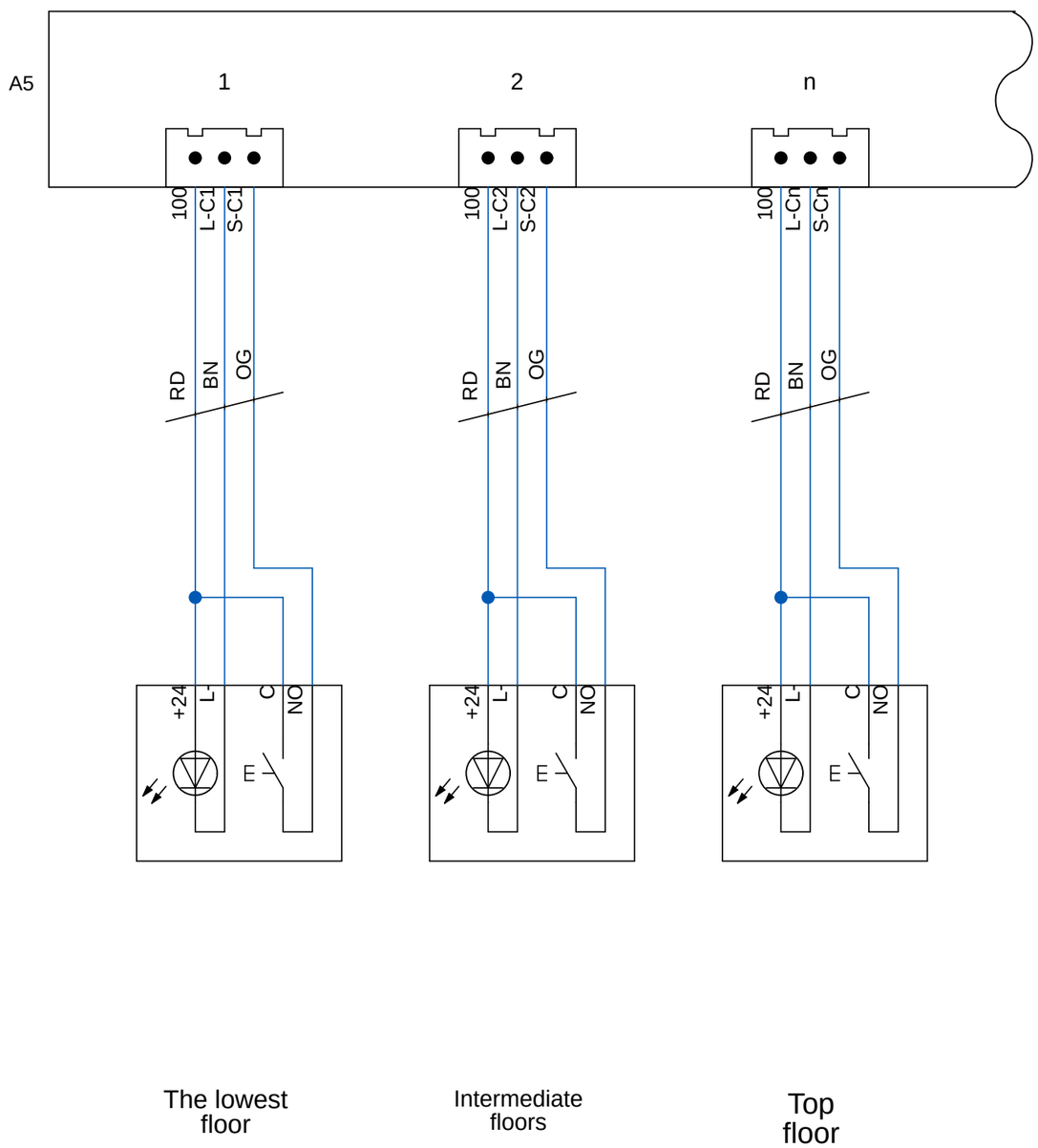
S3	S4	
0	0	Undefined
0	1	Door control buttons side B
1	0	Door control buttons side A
1	1	Door control buttons side A and B



			Created:	Project: 25UD7032P	Dispatch panel Function buttons		
			Modified:	Order No.:			
			Designed by:	Scheme No.:			
			Checked by:	1721/2025/E	Standa rd: PN-EN 61439-1:2021	◀	49 ▶

RD-Red
BN-Brown
OG-Orange

Connecting the control buttons

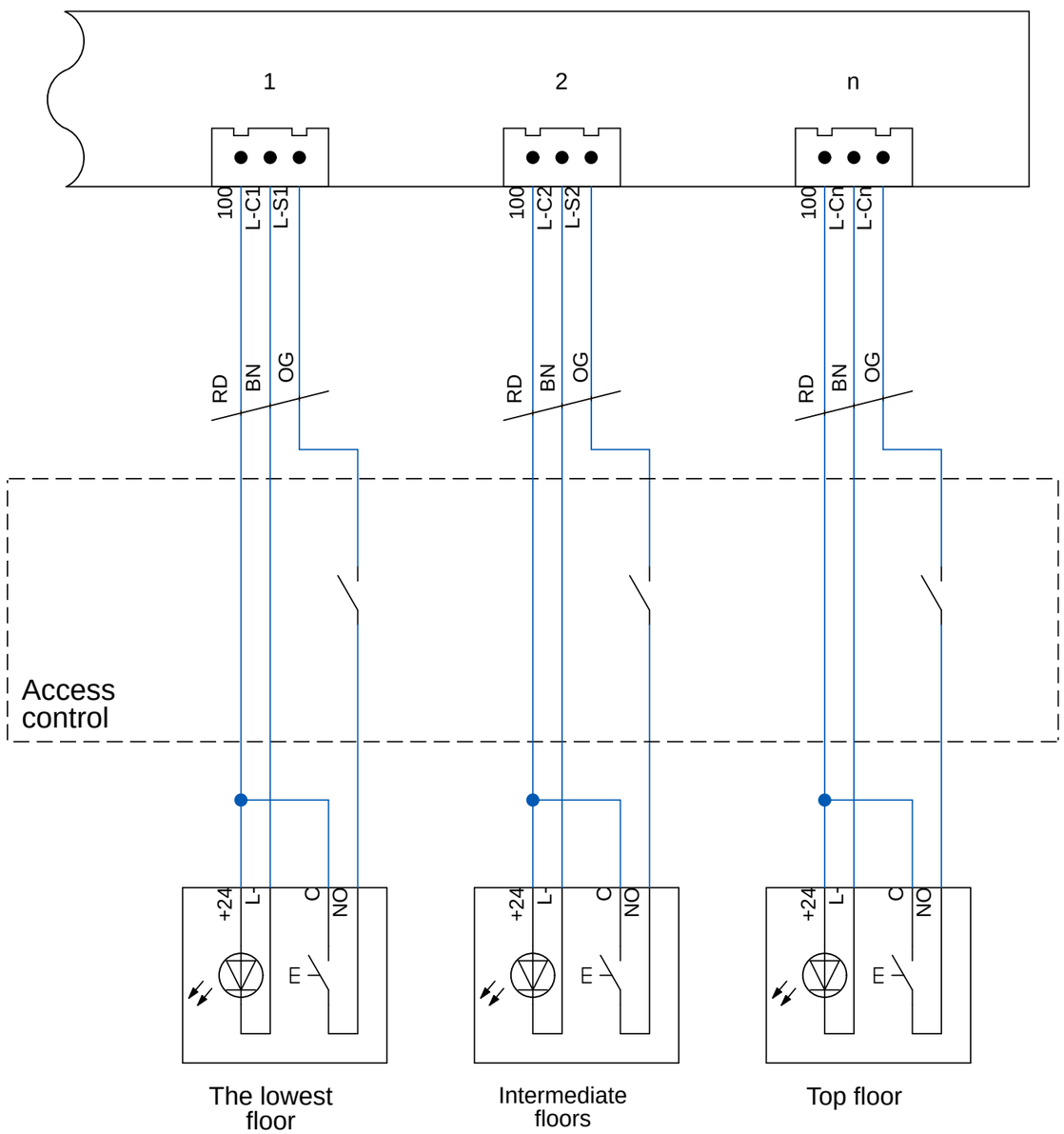


The lowest floor

Intermediate floors

Top floor

Connecting access buttons with access control

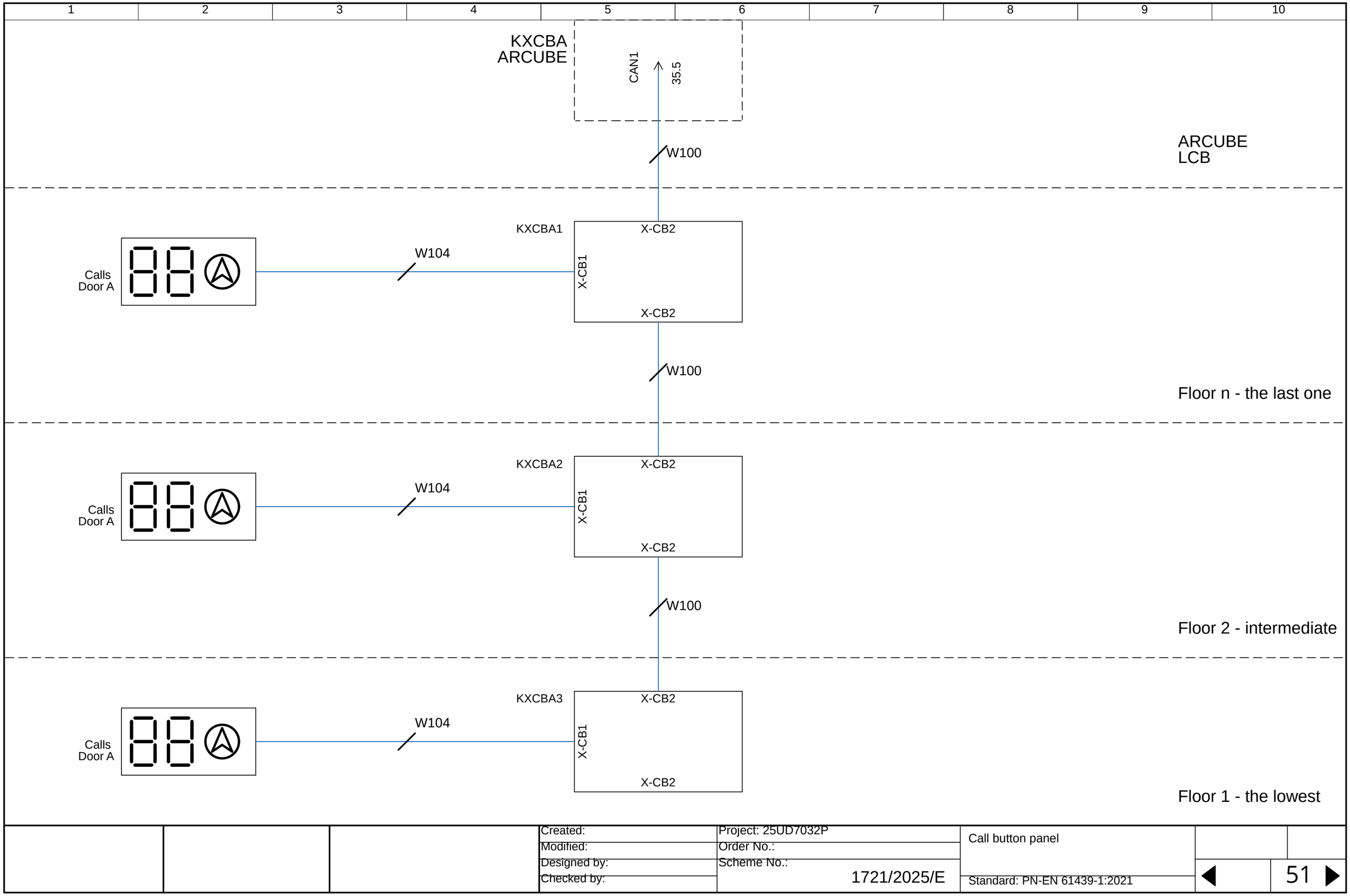


The lowest floor

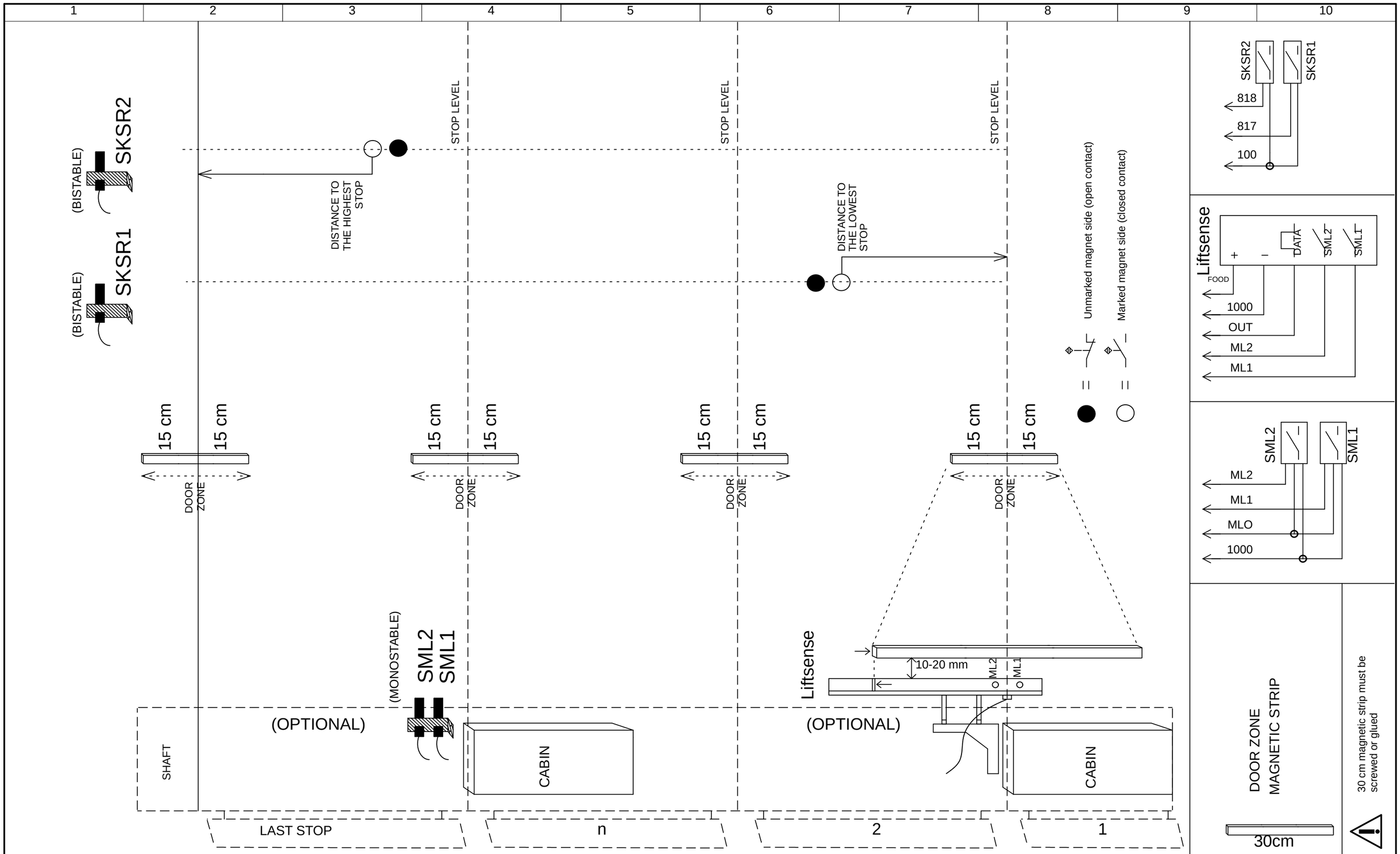
Intermediate floors

Top floor

			Created:	Project: 25UD7032P	Accesss panel Access buttons		
			Modified:	Order No.:			
			Designed by:	Scheme No.:			
			Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021		50



			Created:	Project: 25UD7032P	Call button panel		
			Modified:	Order No.:			
			Designed by:	Scheme No.:			
			Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021	◀	51 ▶



			Created:	Project: 25UD7032P	Magnet arrangement	
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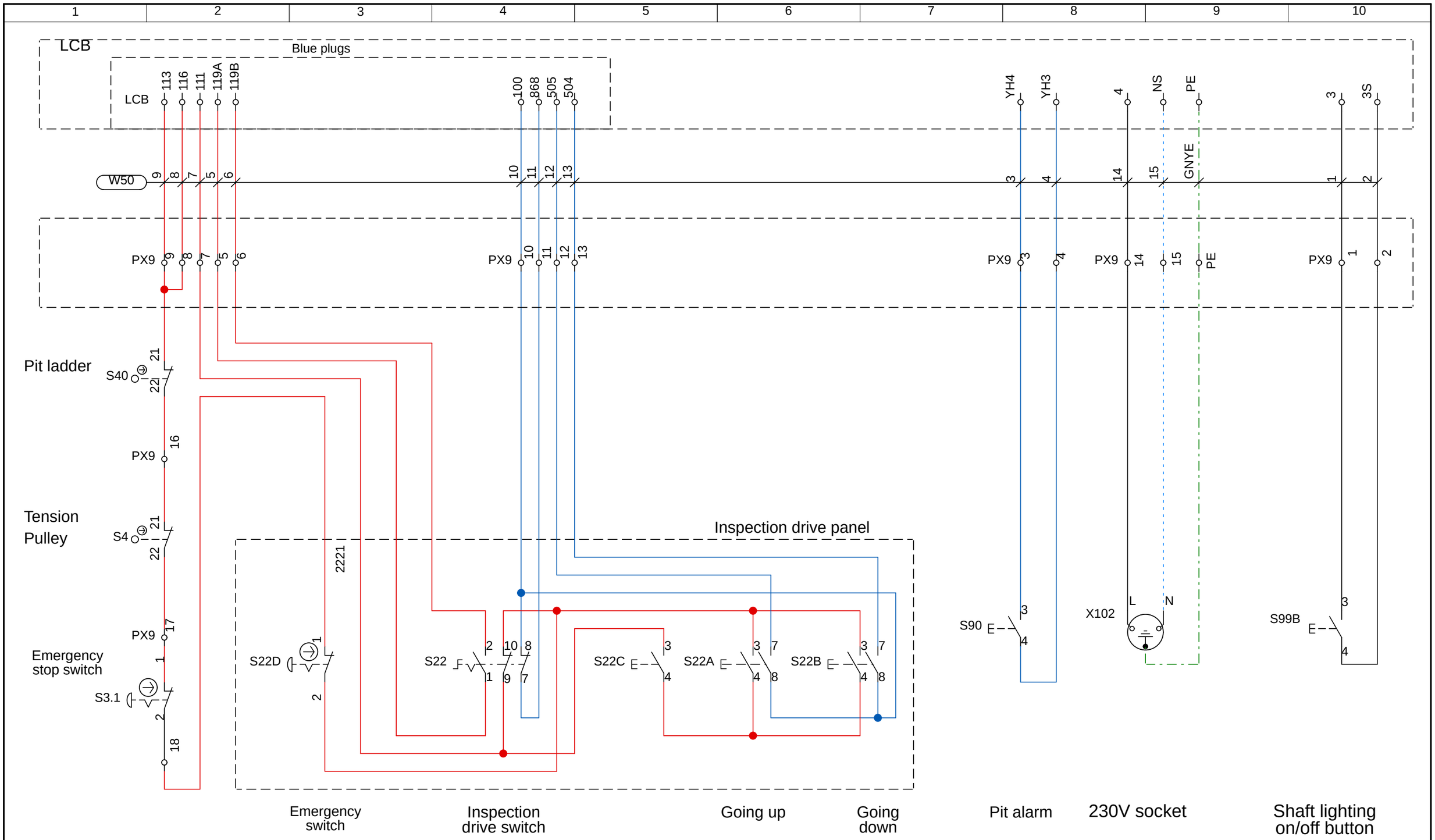
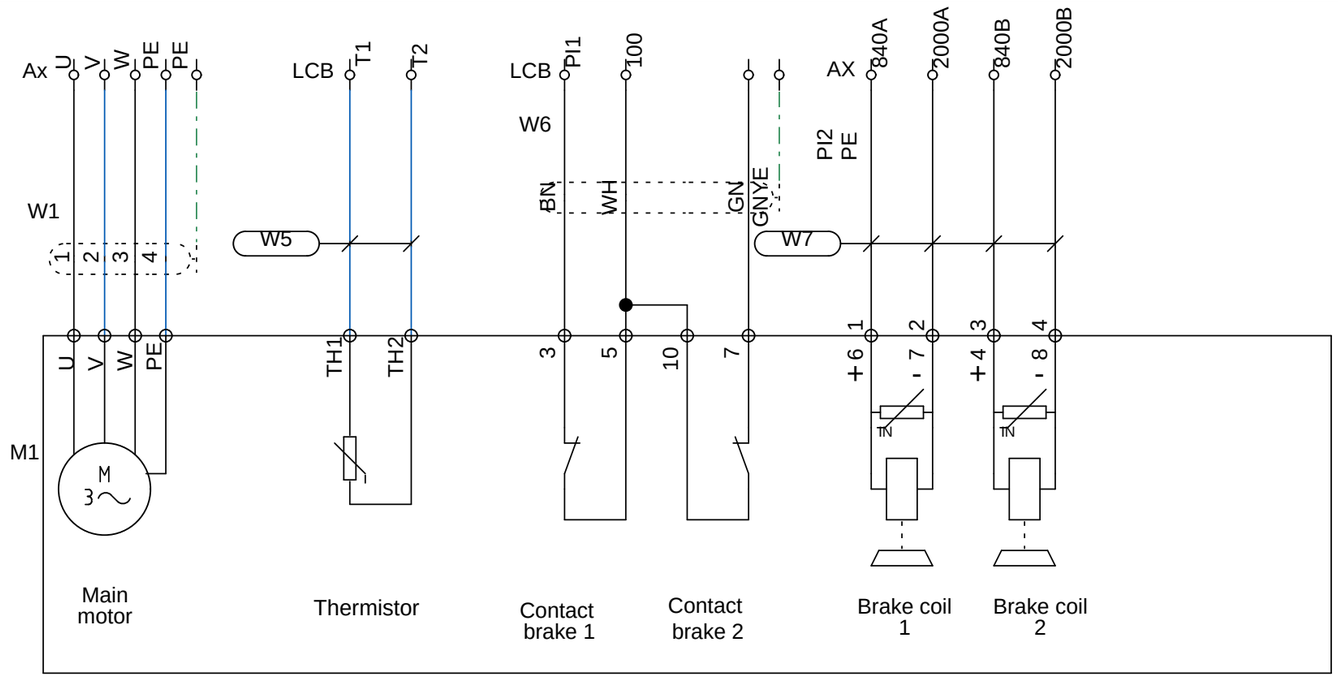
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	52
			Checked by:			



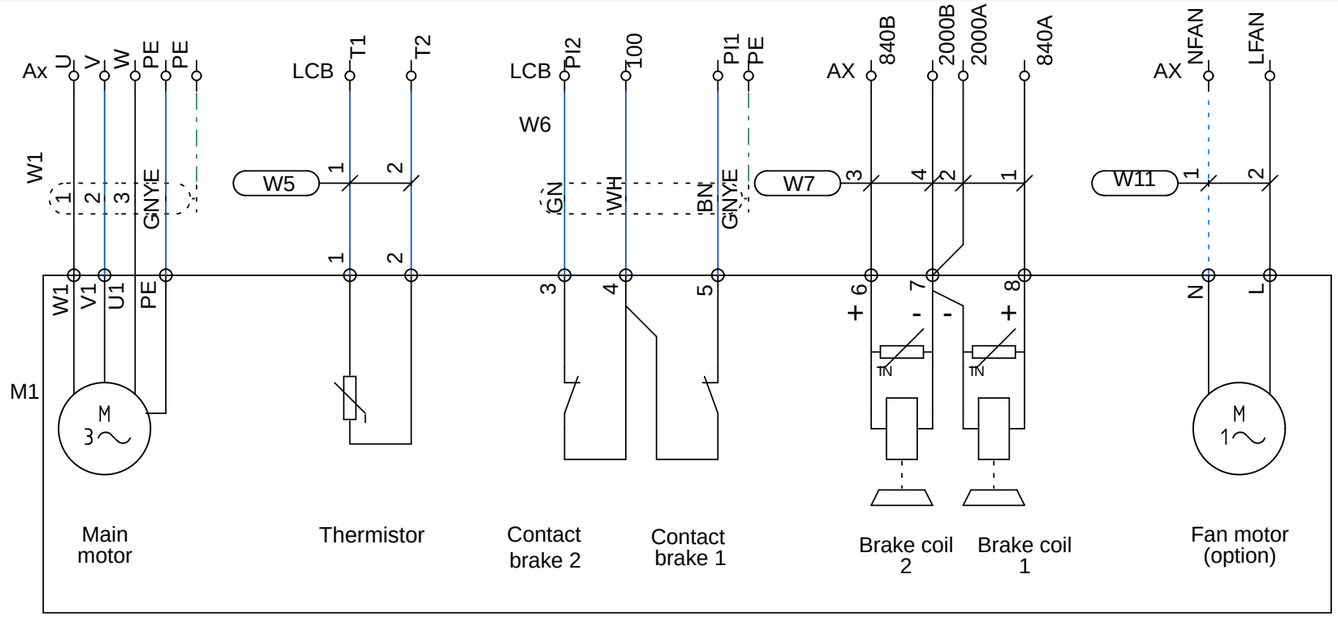
			Created:	Project: 25UD7032P	Connecting the pit box		
			Modified:	Order No.:			
			Designed by:	Scheme No.:		◀	53 ▶
			Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021		



Ziehl-Abegg motor

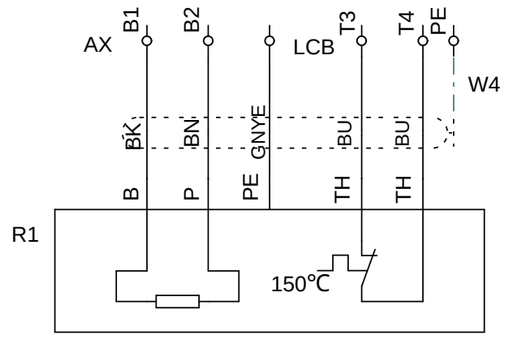
NOTE! Before connecting, read the documentation for the Ziehl-Abegg machine drive.

WH - white
BN - brown
GN - green
BK - black
BU - blue
GNYE - yellow-green



SICOR motor

NOTE! Before connecting, read the documentation for the SICOR machine drive.

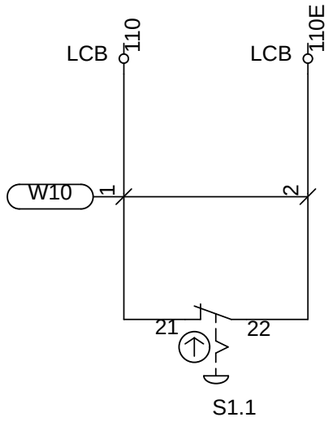


Connecting the resistor

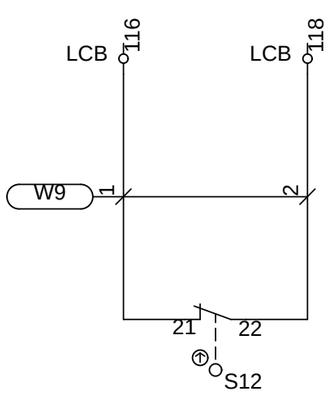
ATTENTION!
if there is no thermistor, make a lock solenoid

			Created:	Project: 25UD7032P	Connecting the motor	
			Modified:	Order No.:		
			Designed by:	Scheme No.:		
			Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021	

ARCUBE
LCB
board

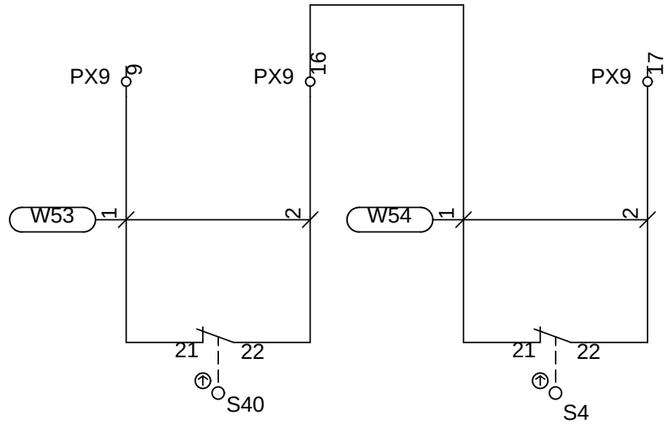


Machine drive emergency switch



Overspeed governor

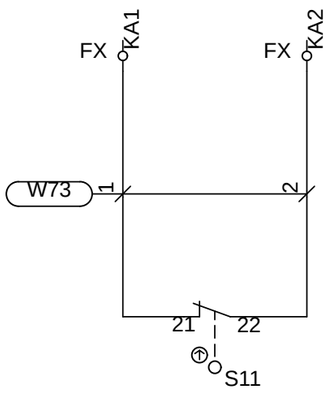
Pit
box



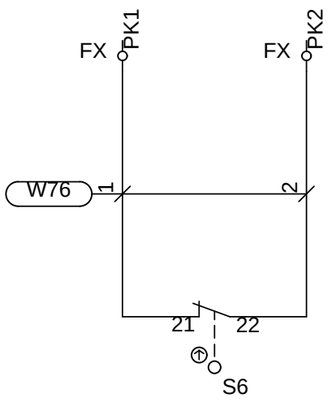
Pit ladder

Tension pulley

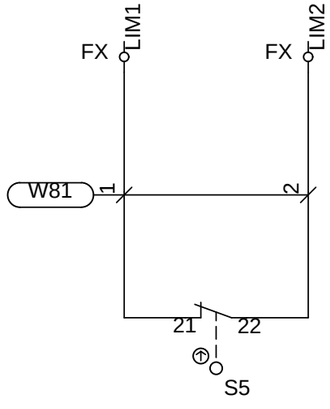
FX-CUBE-S
Cabin Roof



Cabin door connector

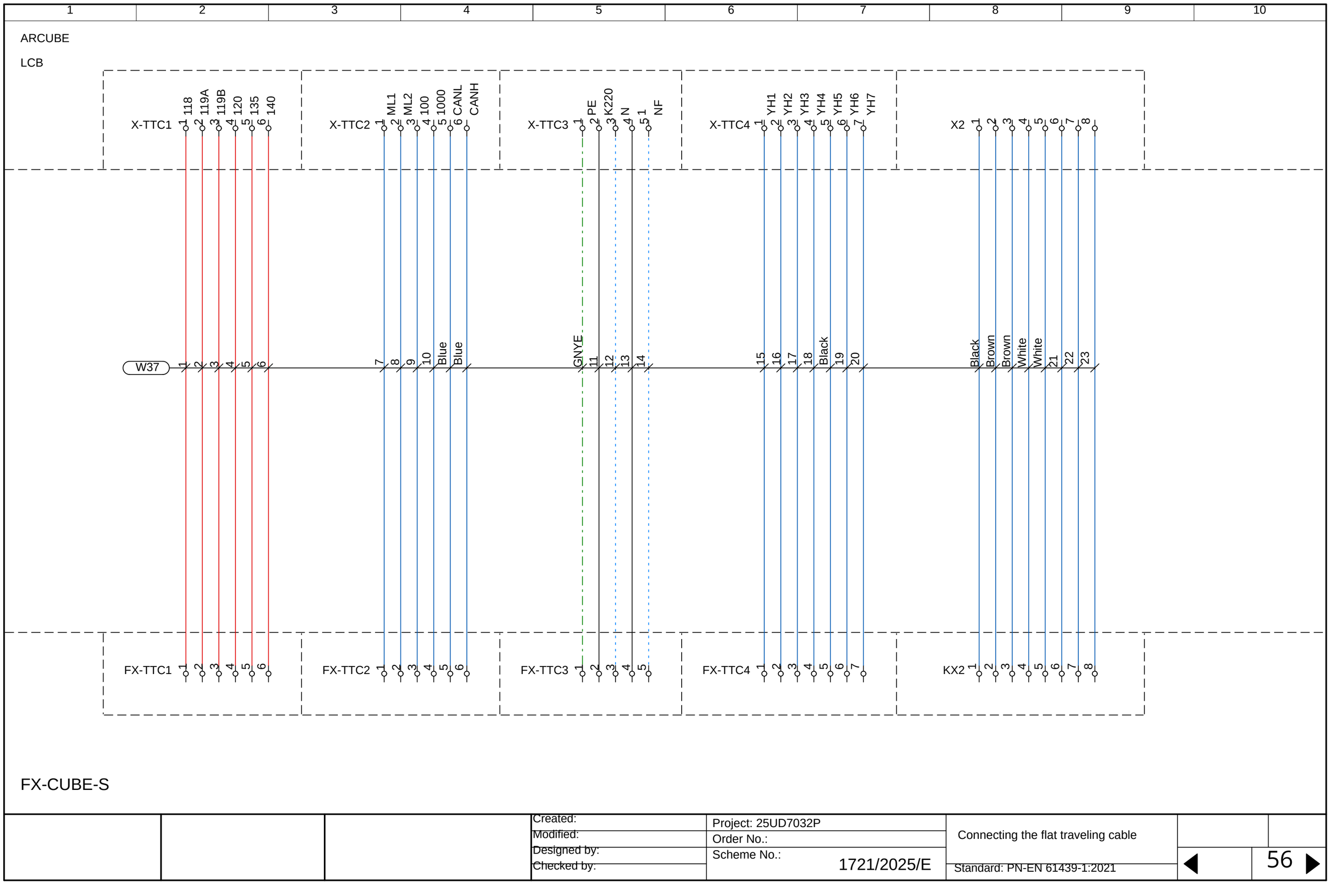


Shanks



Up/down limit switch

			Created:	Project: 25UD7032P	Connecting the safety circuit		
			Modified:	Order No.:			
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	◀	55 ▶
			Checked by:				

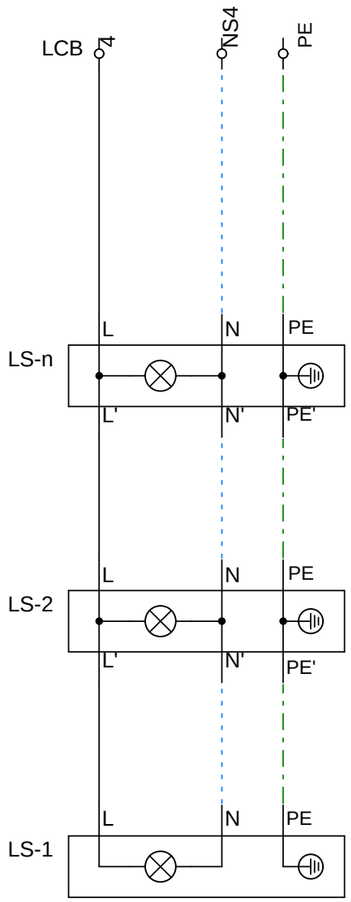


			Created:	Project: 25UD7032P	Connecting the flat traveling cable	
			Modified:	Order No.:		
			Designed by:	Scheme No.: 1721/2025/E	Standard: PN-EN 61439-1:2021	56
			Checked by:			

1	2	3	4	5	6	7	8	9	10

ARCUBE

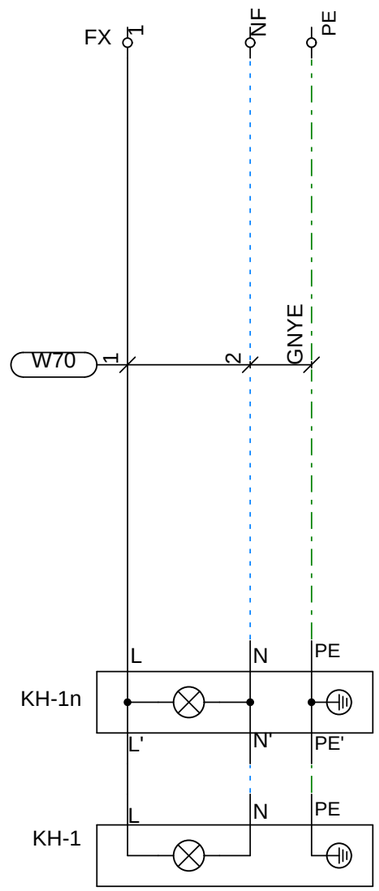
Connection to LCB



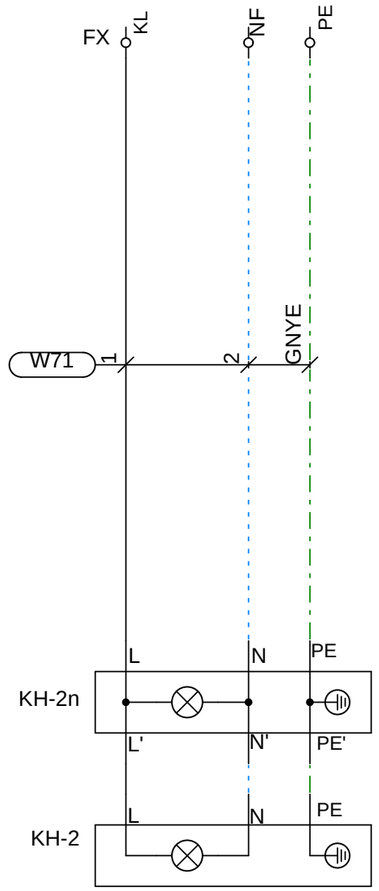
Shaft lighting

FX-CUBE-S

Cabin Roof



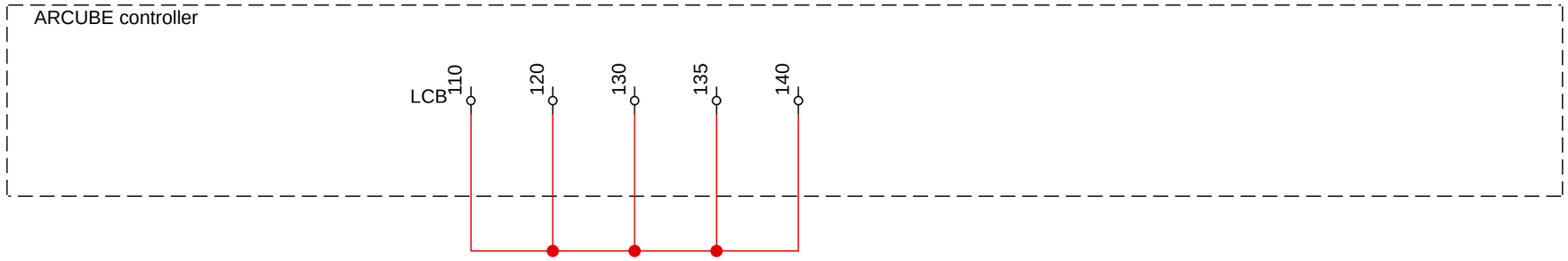
Cabin lighting 230V max. 2A



Detachable cabin lighting 230V max. 2A

			Created:	Project: 25UD7032P	Connecting the lighting		
			Modified:	Order No.:			
			Designed by:	Scheme No.:			
			Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021	◀	57 ▶

For assembly mode, make lock solenoids



			Created:	Project: 25UD7032P	Assembly mode		
			Modified:	Order No.:			
			Designed by:	Scheme No.:			
			Checked by:	1721/2025/E	Standard: PN-EN 61439-1:2021	◀	58 ▶

3. MEASUREMENTS AND TIPS

IN THE “LECTURER’S HANDOUT:

5.1. Main support systems

Page 12

Maintenance note: The interior lighting, ventilation and emergency buttons should be checked regularly to ensure they are working properly. The door mechanism is crucial for smooth door opening and closing and shock-free movement.

Maintenance note: Regularly check the tension of the rope, its wear (broken wires, reduced diameter), corrosion and correct seating in the sheave grooves. Correct rope tension is crucial for the efficient operation of the traction system.

Maintenance note: Check the lubrication of the rails, the tightness of the rail mounting screws, and the absence of bends, wear or rust on the rails. Adjusting the rails is important for a comfortable lift ride.

Maintenance note: Ensure that the counterweight blocks are not displaced, their frame is solid and they move smoothly along the guide rails.

5.3. Drive systems

Pages 12–13

Maintenance note: Check the oil level in the engine and gearbox (if applicable), the condition of the bearings, noise and vibration levels, brake system adjustment and temperature.

Maintenance note: Check the condition of the pulley grooves (groove depth and profile), surface cleanliness, and correct seating of the ropes in the pulley. A worn pulley can lead to rope slippage and system failure.

Maintenance note: Brake shoe wear, brake coil operation, brake gap adjustment and braking force should be checked regularly. A reliable brake is essential for lift safety.

5.4. Safety systems

Page 13

Maintenance note: The speed governor should be checked periodically for cleanliness, rope tension and speed settings. Annual testing is mandatory.

Maintenance note: Check the mobility of the safety gear mechanism, the condition of the brake linings, the release mechanism and the contact surfaces with the rails. Safety gear tests are carried out very rarely and in special circumstances by teams of experts.

Maintenance note: Check the proper functioning of the door locking mechanisms, the cleanliness of the electrical contacts and their adjustment. It is important that the doors move freely and do not jam when closing.

Maintenance note: Check the physical condition of the buffers, the oil level in the hydraulic buffers and that they are securely fastened to the shaft floor.

5.5. Door mechanisms

Page 14

Maintenance note: Check the operation of the door motor, the tension of the door belts or cables, the cleanliness and lubrication of the door guides, and the operation of the photocells or light curtains. It is important that the doors open and close smoothly and quietly.

Application: In the lift you are working on, carry out a visual inspection of the main load-bearing systems (cabin, counterweight, ropes, rails).

Pay attention to the physical condition (wear, corrosion, damage) of each component. Follow health and safety rules during the inspection.

6. Components of lifting equipment

Page 15

Note on maintenance: These smart systems allow maintainers to remotely monitor and diagnose faults, but also require software updates and cyber security checks.

7. Elements of electrically powered lifts

Page 15

Maintenance note: Drives tend to operate at high temperatures, so cooling fans and heat sinks should be cleaned regularly and electrical connections checked for leaks. Error codes can be read from the drive display.

Maintenance note: Periodically check the wear condition of the brake linings, the correct operation of the brake coil, the brake gap and the brake torque adjustment. A reliable brake is essential for the safety of the lift.

8. Electrical components of lifting equipment

Page 16

Maintenance note: Periodically check the continuity of the main power connections, the condition of the fuses and the general cleanliness of the panel.

Maintenance note: Check that cables are not worn, damaged, crushed or cracked. Ensure that cable trays are tidy and open and that connections are tight and free from corrosion.

Maintenance note: Check the physical condition of the switches, continuity of connections, adjustment range and correct triggering.

Maintenance note: Check the cleanliness, position and correct response of the sensors. Today's lifts are increasingly using more advanced and reliable light curtain sensors.

A note on maintenance: In such systems, the integrity of communication cables and connectors, the integrity of the signal and software settings are extremely important.

9. Electrical power units

Page 17

Maintenance note: Check LED indicators on the board, error codes and tightness of connections. A software update may be required.

Maintenance note: The operation of each safety circuit element (switches), the state of the contacts and the operation of the safety relays on the board must be tested regularly.

Maintenance note: These systems allow software updates, parameter adjustments and remote access for fault diagnosis.

11. Contactor-relay control systems

Page 18

Maintenance note: Check contactor and relay contacts for cleanliness, wear condition, coil operation and absence of mechanical jamming.

Maintenance note: Fault diagnosis on these systems requires the ability to read schematics and knowledge of the function of each relay/contactor. Fault location is identified by circuit tracing and measurements.

10. Power supply and protection systems for lifting equipment

Page 17

Maintenance note: The correct ratings of these safety components, their physical condition and their operation must be checked regularly using test buttons.

Note on maintenance: Visual inspection and occasionally testing of these systems should be carried out. Damaged safety devices should be replaced.

A note on maintenance: These systems may require more complex software and network management skills.

Maintenance note: UPS battery status, charge level, system activation time and automatic rescue scenario functionality should be tested periodically.

12. Microprocessor-based control systems

Page 18

Note on maintenance: Software reliability, parameter settings and fault code interpretation are important in these systems.

Maintenance note: LED indicators on control boards, diagnostic displays (LCDs), test points and remote access ports are important tools for fault diagnosis. Software updates and parameter backups should be performed regularly.

13. Electrical circuits for lifting equipment

Page 19

Maintenance note: Faults in these circuits usually lead to irregular lift operation or inability to access certain floors.

Important: The safety circuit must never be bridged or bypassed. This creates a serious safety risk.

Maintenance note: Check the operation of the light fittings, the functionality of the cabin fans and the condition of the emergency lighting batteries.

14. Electronic circuits for lifting equipment

Page 19-20

Maintenance note: Check jumper settings, potentiometers, LED indicators and fault codes on the board.

Maintenance note: Check the integrity of the communication cables and connectors, signal integrity and the status of the communication LEDs. Communication errors can lead to many lift faults.

Maintenance note: Check the operation of the buttons, the backlighting of the LEDs, the readability of the displays
and the tightness of the board connections.

Use: Trace the main safety circuit on the electrical diagram of the lift and identify which components are connected in series with this circuit. Then, using a multimeter, measure the voltage at the contacts of the components in question and check the integrity of the circuit (when taking measurements on the actual lift, always observe safety precautions and work under the supervision of a qualified expert)..

15. The installation of power, protection, control and regulation systems for lifting equipment

Pages 20–21

Safety note: Care must be taken not to damage the cables when routing them, avoiding sharp edges and excessive tension. All connections must be fully insulated.

Tip: Particularly in modern systems, the wiring layout and labelling of panels ensures ease of quick intervention in the event of a fault. Industry leaders (Otis, Kone) use modular panels and plug-and-play connectors to reduce wiring complexity.

Important: An incorrectly adjusted sensor or switch can lead to faulty operation of the lift, deterioration of stopping accuracy or safety risks.

Note on maintenance: Although these systems can lead to faster initial installation, they may require specialised diagnostic hardware and software for troubleshooting.

16. Terms and conditions for the installation and dismantling of lifting equipment

Pages 21-22

Remember: Any mistake made during lift installation and removal can have serious consequences, potentially costing lives. Safety must always be the highest priority.

Tip: For confined spaces or areas with restricted access, specialised compact lifting solutions and robot assistants can be used.

Important: Using checklists at each stage ensures that no detail is overlooked.

Note on maintenance: Modular systems allow for faster intervention in the event of part replacement or failure, but may require more sophisticated diagnostic tools.

17. Tools and measuring instruments for assembling and disassembling the lifting device

Page 24

Application: Identify basic hand tools and measuring instruments. Explain the purpose of each tool and the rules for its safe use. For example, practise performing a cable continuity test using a multimeter.

18. Work with technical documentation, assembly instructions and operating instructions

Pages 24–25

Learning Tip: Find out what each symbol means, the cable numbering system and the logic of the circuit. Try to match the component on the schematic to its counterpart in the actual jack.

Consider: think about how a minor error during the installation or dismantling of a lift can lead to significant safety risks or costly failures in the future. Why is attention to detail so important in this area?

19. Inspection of the technical condition of the lifting equipment

Page 26

Use: On the lift you are working on, visually check the main connection points in the power panel. Check for any signs of overheating or burning. If you have access to a thermal imaging camera, observe the temperature distribution in the live panel and identify any abnormally hot spots.

20. Periodic inspection and technical testing of lifting equipment

Page 27

Maintenance note: The levelling accuracy is corrected by adjusting the motor drive or adjusting the magnetic switch.

2. Analysis of the wiring diagrams for connecting the lifting equipment

Page 39

1. will the unit stop in the event of door opening or overload?
2. are all directions of movement protected by limit switches?

3. do the contactors have mutual electrical/mechanical interlocking (e.g. up-down)?
4. does a power failure automatically stop the unit?
5. does the scheme include a phase sequence control relay?

Use: Check the correct operation of the lift after assembling the main and safety circuit wiring diagram by following the simplified logic diagram:

4. Testing and commissioning

Page 41

Note: Carry out control tests on all security features, without omitting any.

Note: When carrying out a wire continuity check with a universal meter, switch off the power sources.

Use: According to the diagram, perform a continuity check of the power supply and protection circuits with a multimeter with the power supply switched off in accordance. Record the results and compare with the data in the technical documentation.

5. Installation of safety circuits for lifting equipment

Page 42

Practical notes on installation: It is advisable to use safety relays with a self-test function (TEST).

Important: No bridging or bypassing is allowed in the safety circuit (except in service mode with supervision).

Important: The installation and test documentation must be complete - this is required for acceptance by the OTI.

6. Installation of contactor-relay control for lifting equipment

Page 43

Use: Carry out the assembly of the contactor-relay control system according to the schematic and assembly diagram . Using a multimeter, check the continuity of the circuit with the power off. Start up the system and check its correct operation. If necessary, correct the settings of limit sensors and time relays.

INSTRUCTIONS FOR TAKING MEASUREMENTS

GUIDELINES FOR TAKING ELECTRICAL MEASUREMENTS FOR LIFTS EQUIPPED WITH A CONTROL PANEL WITH AN ARCUBE ARKEL CONTROLLER

INSULATION RESISTANCE MEASUREMENTS

1. Position the cabin between stops with the doors closed.
2. Disconnect the main switch ‘SMP’
3. Disconnect the grounding cable from the control panel.
4. Disconnect all electronic components located in the control panel, in the box on the cabin roof and in the box with the frequency converter in the lift shaft.
   - Disconnect the ARCUBE controller by removing all plugs connected by electrical cables entering it. And disconnect all cables.
   - Disconnect the A1 module by removing all plugs from it. And disconnect all cables.
   - Disconnect the LCB module by disconnecting all plugs and cables from it.
   - Disconnect the display under the cabin control panel by removing all plugs from its sockets.
   - Disconnect the RD 1500 module by removing all plugs from it. And disconnect all cables.
   - Disconnect the G1 power supply by disconnecting the cables from it.
   - Disconnect the GSM and Tel control panel by disconnecting all cables from it.
5. If the panel has been adapted for emergency descent, disconnect the UPS located in the lift shaft.
6. In accordance with PN-HD 60364-6, perform a measurement between the phase conductors connected together with the neutral conductor (bridged terminals L1, L2, L3, N) and ground.
7. In accordance with PN-HD 60364-6, for the lighting circuit, take a measurement between the phase conductor connected to the neutral conductor (bridged terminals L, N) and ground.
8. In accordance with PN-HD 60364-6, take a measurement of the circuits for which all operating conductors are switched off:
   - electric lift, rope-driven, with adjustable drive: bridge the output terminals of the frequency converter; measure between the wheatstone bridge and ground
   - circuit of the stop door switches: perform the measurement by disconnecting two wires from the S-Fn terminal strip (120, 130, 133, 135, 140) located in the control panel on the KBK-12 module.
   - In order to measure the insulation of the motor brake power supply cable, disconnect the cable on the X1 terminal block with terminals (840A, 2000A, 840B, 2000B) and disconnect the other side in the M1 motor junction box.

- In order to measure the main motor M1 power cable, disconnect the cables from terminal block X1 with terminal numbers (U, V, W, PE) and disconnect the other side at motor M1.
- In order to measure the insulation of the power cables for the cabin lighting circuits, cabin fan and 230 VAC socket on the cabin box, disconnect all plugs in the control panel (make sure that all electronic components in the control panel, intermediate boxes on the cabin roof and frequency converter box have been disconnected). The other side of this hanging cable should be disconnected in the box on the cabin roof at terminals numbered XATC1 to XATC4.
- In order to measure the insulation of the speed limiter power cable, disconnect the cables from the terminal strip in the control panel with terminal numbers (SG-S, SG-R, NP, depending on the type of control) and disconnect the other end of the cable at the speed limiter.
- In order to measure the insulation of the shaft lighting cables, disconnect the cables from terminal block X1 with terminal numbers (4, NS, PE, depending on the type of control). If the motor is powered by 24VDC, this measurement is not performed.
- In order to measure the insulation of the power cables supplying the box in the headframe, disconnect the X9 plug in the control panel. Disconnect all cables in the box in the headframe on the other side. The cables through which 230 VAC voltage flows are PE(1,2,5,6.....do PE)
- In order to measure the insulation of the door motor power cable, disconnect the plugs on the cabin roof and disconnect the other end of the cable at the door transformer (this must be done without fail). If the door drive motor is single-phase (motor controller powered by 230V, motor powered by 24VDC), this measurement is not performed.

INSTRUCTIONS FOR PERFORMING TESTS ON A LIFT

Instructions for performing friction tests on electric hoists (testing is not recommended when using CTP ropes)

In order to perform a friction test, carry out the following steps:

1. Call the cabin to the top floor.
2. Continue as described below at the lift control panel.
3. Activate the inspection mode on the lift control panel.
4. To check friction (attempt to pull the cabin up when the counterweight is resting on the buffer). Press the inspection travel button for the up direction, causing the cabin to move upwards.
5. The cabin will move upwards and the ropes surrounding the friction wheel will slide on it.

1. Load the cabin with a weight equal to 125% of its nominal load capacity.
2. Call the cabin to the top stop.
3. Send the cabin down.
4. When the cabin is at the bottom of the shaft, press the emergency switch.
5. The cabin should stop before hitting the buffer.

1. Call the empty cabin to the top stop.
2. When the cabin is at the top of the shaft, press the emergency switch.
3. The cabin should stop before hitting the buffer.

Instructions for checking the correct operation of the upper and lower limit switches

In order to check the correct functioning of the limit switches, proceed as follows:

1. Go to Tools >> Function test >> Upper limit switch test >> confirm with the Enter key.
2. The cabin will automatically move to the upper limit switch.
3. The cabin will stop when it reaches the limit switch, which is indicated by the 120 LED on the controller-inverter display going out.
4. Press the call button on the call panel. If the lift does not accept calls, the limit switches are functioning properly.
5. Activate inspection mode on the lift control panel.
6. Use the inspection travel up or down buttons to move the cabin downwards.
7. Perform the same operation for the lower limit switch.

Instructions for braking with one brake shoe

1. Load the cabin with the nominal load.
2. Send the cabin to the top stop.
3. Send the cabin to the lowest stop.
4. While travelling, when the cabin reaches the nominal speed, press the ‘brake release preparation’ and ‘brake release 1’ buttons simultaneously.
5. The cabin will stop automatically by braking with one brake shoe.
6. Perform the test in the same way for the second brake shoe.

Instructions for checking the correct operation of the grippers
***before first use 125% of the nominal load capacity,**
***during periodic testing with an empty cabin**

In order to check the correct functioning of the grippers (sliding), proceed as follows:

1. Disconnect the overload sensor (PI2 input on card A1 on the cabin roof).
2. Load the cabin with 125% of the nominal load capacity. The load should be distributed evenly on the cabin floor.
3. Call the cabin to the top floor.
4. Give the command to go down.
5. Release the safety gear using the ‘speed limiter release’ button.
6. When the safety catches (and the limiter) are activated, the safety circuit will be interrupted and the lift will be mechanically locked on the guides.
7. After the safety catches have been activated, release (loosen) them.
8. Manually reset the catchers.
9. It is mandatory to check the structure of the lift frame and the cabin mounting. Level any marks left by the catcher rollers on the surface of the guides.
10. After completing the tests, connect the overload sensor.

Instructions for verifying the safety devices against excessive speed of the cabin in the upward diection

1. Close the doors for maintenance. Go to Tools > System Tools > Disable Doors.
2. Call an empty cabin to the lowest stop.
3. Issue instructions in the upward direction.
4. When the cabin is more than halfway up the shaft and has passed the counterweight, manually activate the speed limiter (in the case of an upper machine room) or remotely via a button (machine room at the stop).
5. The safety circuit will be interrupted > Error 35.
6. After the test, reset the speed limiter - restore it to its original state.

Instructions for checking the elongation of ropes and the deflection of flexible elements

Correction of travel in the event of a total elongation of ropes and flexible elements exceeding 20 mm.

To correctly check the above assumptions, proceed as follows:

1. Set the cabin to the lowest stop.
2. Check that it stops correctly. Mark the threshold level.

3. Load the cabin with a weight corresponding to the nominal load capacity.
4. Measure the level of the cabin threshold in relation to the first mark.
5. After a successful test, travel to the highest stop and return to the lowest stop.
6. Check that the stop is correct. Mark the level of the threshold.
7. Unload the mass corresponding to the nominal load capacity from the cabin.
8. Measure the level of the cabin threshold in relation to the previous mark.

Instructions for bypassing the doors using the bypass switch:

1. In position 2, bypassing the stop doors, inspection runs with the shaft doors open are signalled by an audible and visual signal located under the cabin.
2. In position 3, bypassing the cabin doors, inspection runs with the cabin doors closed (confirmation of the cabin doors being fully closed is required)
are signalled by an audible and visual signal located under the cabin.

Instructions for checking the operation of the winch brake as a safeguard against uncontrolled movement of the cabin

It is strictly forbidden to enter the cabin during the test!!!
The system consists of a winch brake compliant with EN PN 81-20:2020 based on type examination certificate number EU-BD 845/3 and a control system that detects failure of one of the brake coils. In order to check the redundancy of the brake and its effectiveness in the event of a failure, proceed as follows:

1. Set the cabin at any stop.
2. Use the programmer to program input PI15 from the main controller (10-manual release travel to position 0-undefined). Then save the changes.
3. On the control panel in the engine room, press the S17 button - 'brake release permission' and simultaneously press 'brake release 1' - S16A. This will release one brake coil.
4. After performing the above steps, error no. 12 - mechanical brake hold not detected - will appear on the programmer. Wait until the error disappears.
5. Try again. A permanent error with the same number will appear, which must be deleted in the system tools >> clear permanent error function. Reset the system.
6. Perform the same steps for the second brake coil.
7. On the dashboard in the engine room, press the S17 button - 'brake release permission' and simultaneously press 'brake release 2' - S16B. This will release one brake coil.
8. During the above steps, we send the cabin to any stop.

9. The control system rejects the call/command.

10. Reprogram input PI15 on the main controller. (0-undefined to position 10-manual release drive).

Failure to accept the call/command confirms the redundancy of the safety component used.