PROJECT:		
ELECTRICAL REVAMPING OF H/C 31		
DOCUMENT TITLE: **SUPPLY AND INSTALLATION OF NEW EQUIPMENT DRIVES AND PLC**		
PURPOSE OF ISSUE: FOR TENDER	Rev: 00	Date: 18/03/2025
Electrical & Power Distribution Department **Equipment & Maintenance Division**		

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PORT OF THESSALONIKI

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SCOPE OF WORK AND SUPPLY

The subject of the tender is the upgrade-modernization of the Hoisting/Grabbing, Luffing, Slewing and Gantry movements of the Electrical Harbor Crane (E/C) GANZ 16x25TN (No.31) of ThPA SA.

- The dismantling of the conventional automation control of the Hoisting/Grabbing, Luffing, Slewing and Gantry movements, for the above Electrical Crane.
- The dismantling of the existing Main PLC (Muller) which is placed in Grab electrical cabinet
- All the above materials that will be dismantled and with their accessories will be transported and collected in a place within the ort that will be indicated by the Equipment and Maintenance Division.
- The supply, delivery and installation until full operation, electrical AC motors in order to replace the already installed,
- The supply, delivery and installation until full operation, of new technology equipment of electronic motor speed regulators (Drives) and programmable logic controller (PLC) according to the technical specification of Equipment and Maintenance Division,
- The supply, delivery and installation of Joysticks for Hoist – Grab / Slew – Luff / Gantry,
- The supply, delivery and installation of absolute encoders for Hoist – Grab – Luffing,
- The supply, delivery and installation of a new main ACB 800A,
- The supply, delivery and installation of an anticollision system for the Electrical Crane,
- The supply, delivery and installation of a wind sensor,
- The supply, delivery and installation of auxiliary equipment (Circuit breakers, Fuses, Relays, Switches) in order the PLC and Drives be ready for operation,
- Implementation of the existing PLC Beckhoff to the new PLC,
- The parameterization of the new Drives for the respective electric motors, for full control of the mentioned movements of the E/C,
- The supply of new software and its adaptation to the PLC logic controllers.
- Also, a system for monitoring operation and diagnosing errors will be installed in the operator's cabinet, through a diagnostic HMI (Human Machine Interface) screen that will be appropriately programmed for this purpose.

- The scope of the tender also includes the supply of all necessary materials, micro-materials and components, unless otherwise specified in individual paragraphs below.

- The adaptation of all existing electrical drawings according to the new automation

- The delivery of the E/C No. 31 in full operation.

- Training of the technical staff of ThPA, in the port area. The training will concern the basic units of the equipment.
  (Installation, adjustment, operation, fault diagnosis and maintenance.)

OBLIGATIONS OF THE CONTRACTOR

Obligations of the contractor include:

Hoist – Grab

- The dismantling of the existing conventional automation control from the electrical panels.
- The dismantling of the existing resistance blocks from crane's loft. The Hoist movement has 7 blocks, and the Grab movement has 6 blocks. Dismantling includes also disconnections of existing old cables
- Installation of Drive in the existing old electrical panel
- Replacing of auxiliary equipment (relay, circuit breakers, switches, MCCB, etc.) in order the Drive to be ready for operation
- Rooting new cables to motor
- Installation, connection and commissioning an incremental encoder to motor
- Installation, connection and commissioning an absolute encoder to drum
- Installation, connection and commissioning of a sensor to the existing service motor-brake. This sensor will indicate the state of the service motor-brake when it's open and closed
- Installation, connection and commissioning a temperature sensor in the existing gearbox of each move
- Installation AC on the existing door
- Installation of main PLC in electrical Cabinet of Hoist movement

Luffing

- The dismantling of the existing conventional automation control from the electrical panels. The electrical panels of movement have been placed in the machinery room of crane
- The dismantling of the existing resistance blocks from crane's loft. The Jib movement has 1 block. Dismantling includes also disconnections of existing old cables
- Installation of Drive in the existing old electrical panel

- Replacing of auxiliary equipment (relay, circuit breakers, switches, MCCB, etc.) in order the Drive to be ready for operation
- Installation, connection and commissioning an incremental encoder to motor
- Installation, connection and commissioning an absolute encoder to drum
- Installation AC on the existing door

Slew

- The dismantling of the existing conventional automation control from the electrical panels. The electrical panels of movement have been placed in the machinery room of crane
- The dismantling of the existing resistance blocks from crane's loft. The slew movement has 11 blocks. Dismantling includes also disconnections of existing old cables
- Installation of 2 Drives in the existing old electrical panel.
- Replacing of auxiliary equipment (relay, circuit breakers, switches, MCCB, etc.) in order the Drive to be ready for operation
- Installation, connection and commissioning an incremental encoder to each slewing motor
- Installation AC on the existing door
- Installation remote I/O PLC in electrical cabinet of Slewing movement

Gantry

- The dismantling of the existing conventional automation control from the electrical panels. The electrical panels of movement have been placed on the first level of crane
- The dismantling of the existing resistance blocks from crane's 1st level. The gantry movement has 8 blocks. Dismantling includes also disconnections of existing old cables
- Installation of Drive in the existing old electrical panel.
- Replacing of auxiliary equipment (relay, circuit breakers, switches, MCCB, etc.) in order the Drive to be ready for operation
- Installation, connection and commissioning an incremental encoder in 1 of 8 Gantry motors
- Installation, connection and commissioning 4 anticollision sensors, 1 for each corner
- Installation, connection and commissioning of a sensor to the existing service motor-brake. This sensor will indicate the state of the service motor-brake when it's open and closed
- Installation AC on the existing door
- Installation remote I/O PLC in electrical cabinet of Gantry movement

Operators Cabinet

- Replacing of existing Main Circuit Breaker 630A
- Replacing of existing Hoist – Grab joystick with a new type that will communicate with the new PLC. The features are described below
- Replacing of existing Slewing – Jib joystick with a new type that will communicate with the new PLC. The features are described below
- Replacing of existing Gantry joystick with a new type that will communicate with the new PLC. The features are described below
- Installation of HMI

CURRENT CRANES CONDITION

General Specifications of Crane

- Supply voltage: AC 380V
- Current frequency: 50Hz
- Lighting and control circuit voltage: AC 220V
- Operating temperature: -10 to +45°C
- Capacity: 25/16t x 20/32m

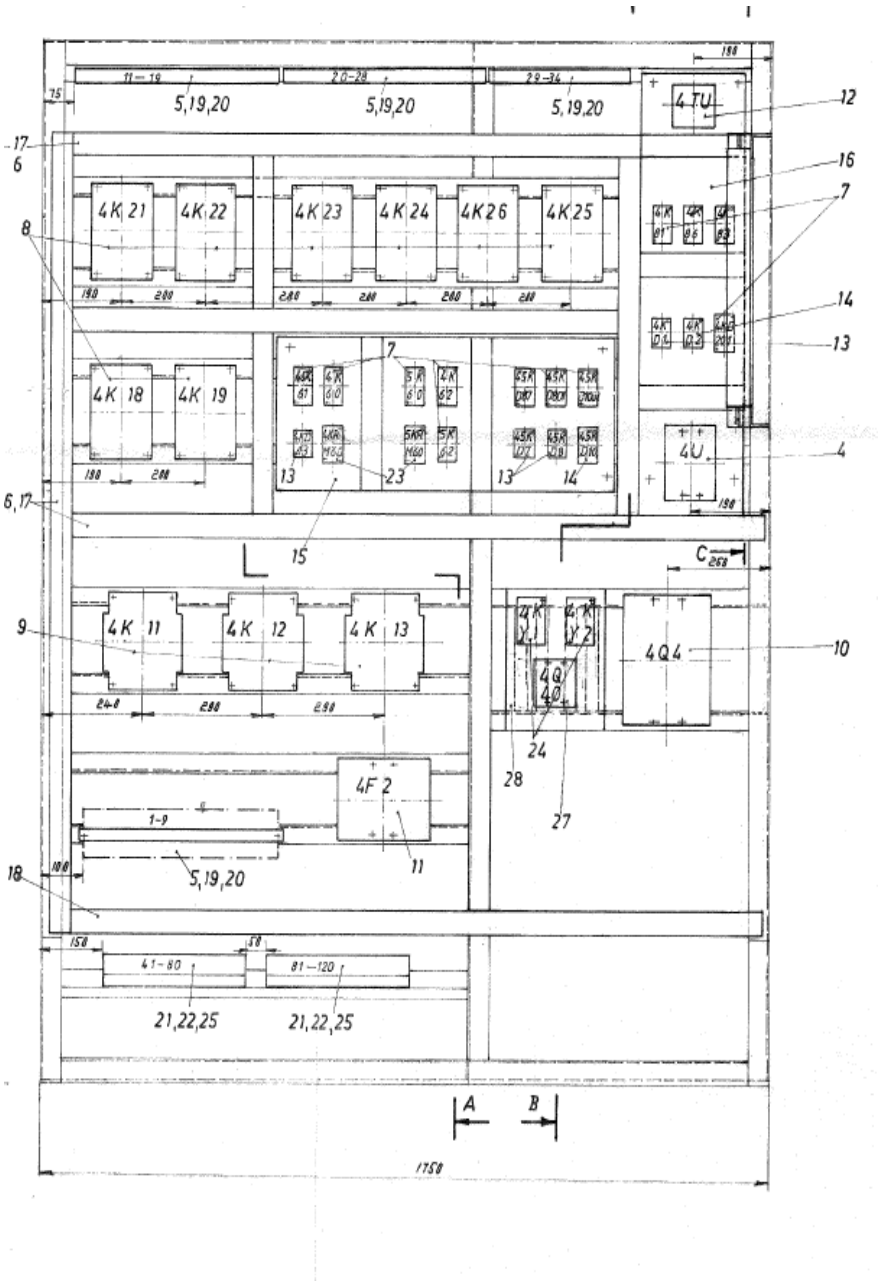
- Hoisting/Grabbing mechanism:
  - Number of motors: 2
  - Power of each motor: 100kW
  - Engine operating speed: 990 rpm/min
  - Engine coupling factor (duty factor): 60%

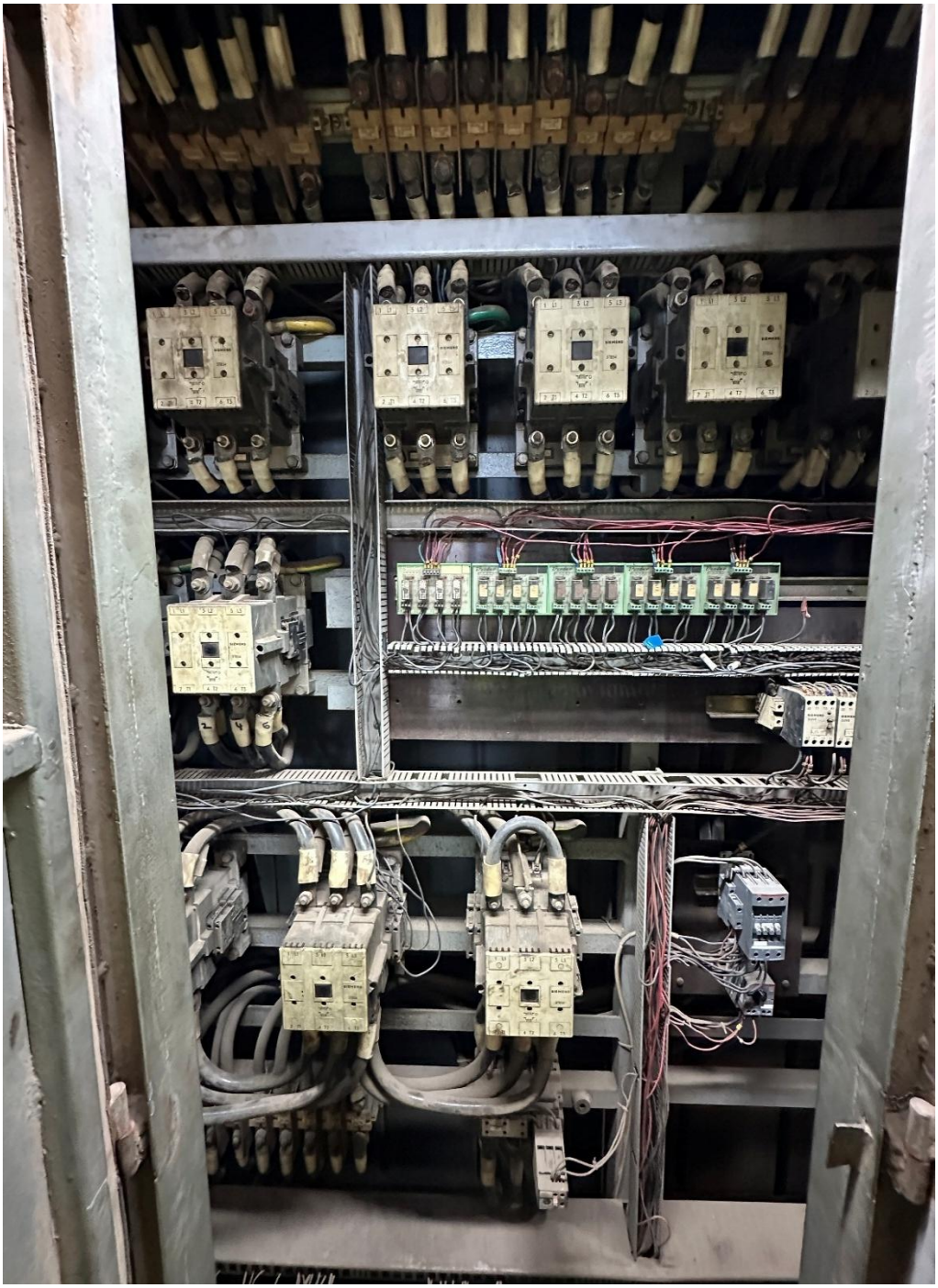
- Slewing mechanism:
  - Number of motors: 2
  - Power of each motor: 26kW
  - Operating speed: 980 rpm/min
  - Motor coupling factor (duty factor): 60%

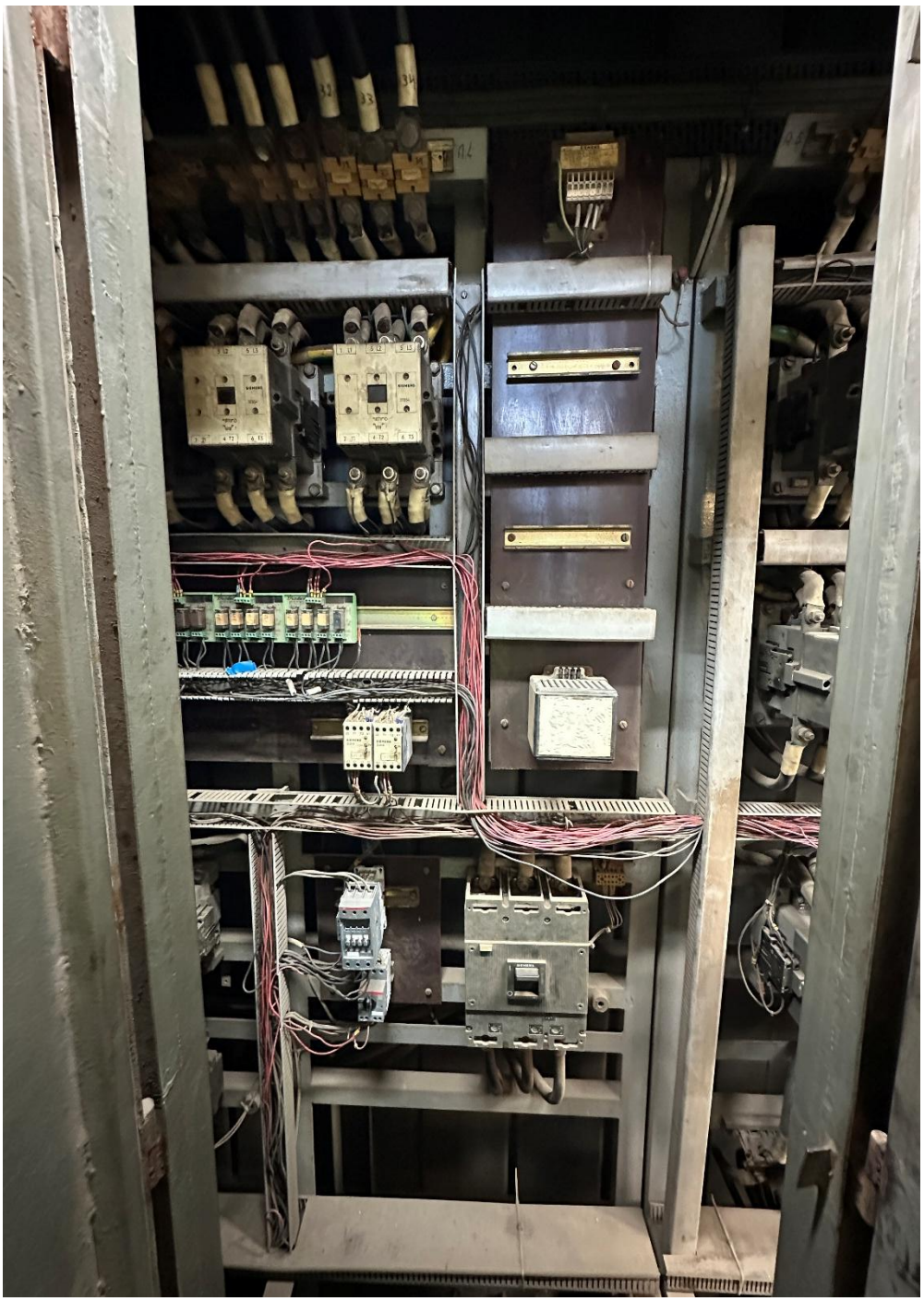
- Boom mechanism:
  - Number of motors: 1
  - Power of each motor: 25kW
  - Engine operating speed: 966 rpm/min
  - Engine coupling factor (duty factor): 40%

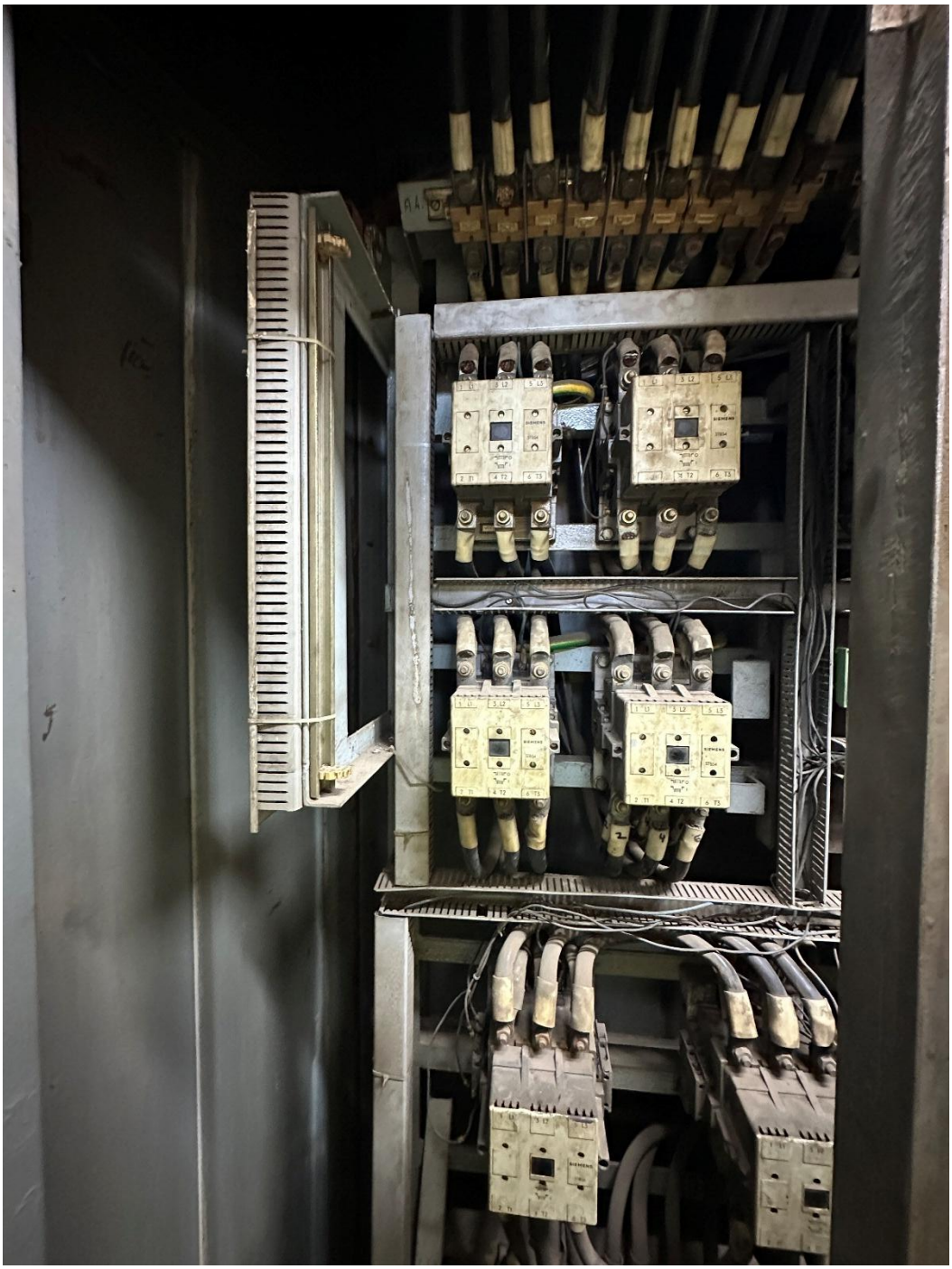
- Gantry mechanism:
  - Number of motors: 8
  - Power of each motor:10kW
  - Engine operating speed: 955 rpm/min
  - Engine coupling factor (duty factor): 40%

Hoist Electrical Cabinets

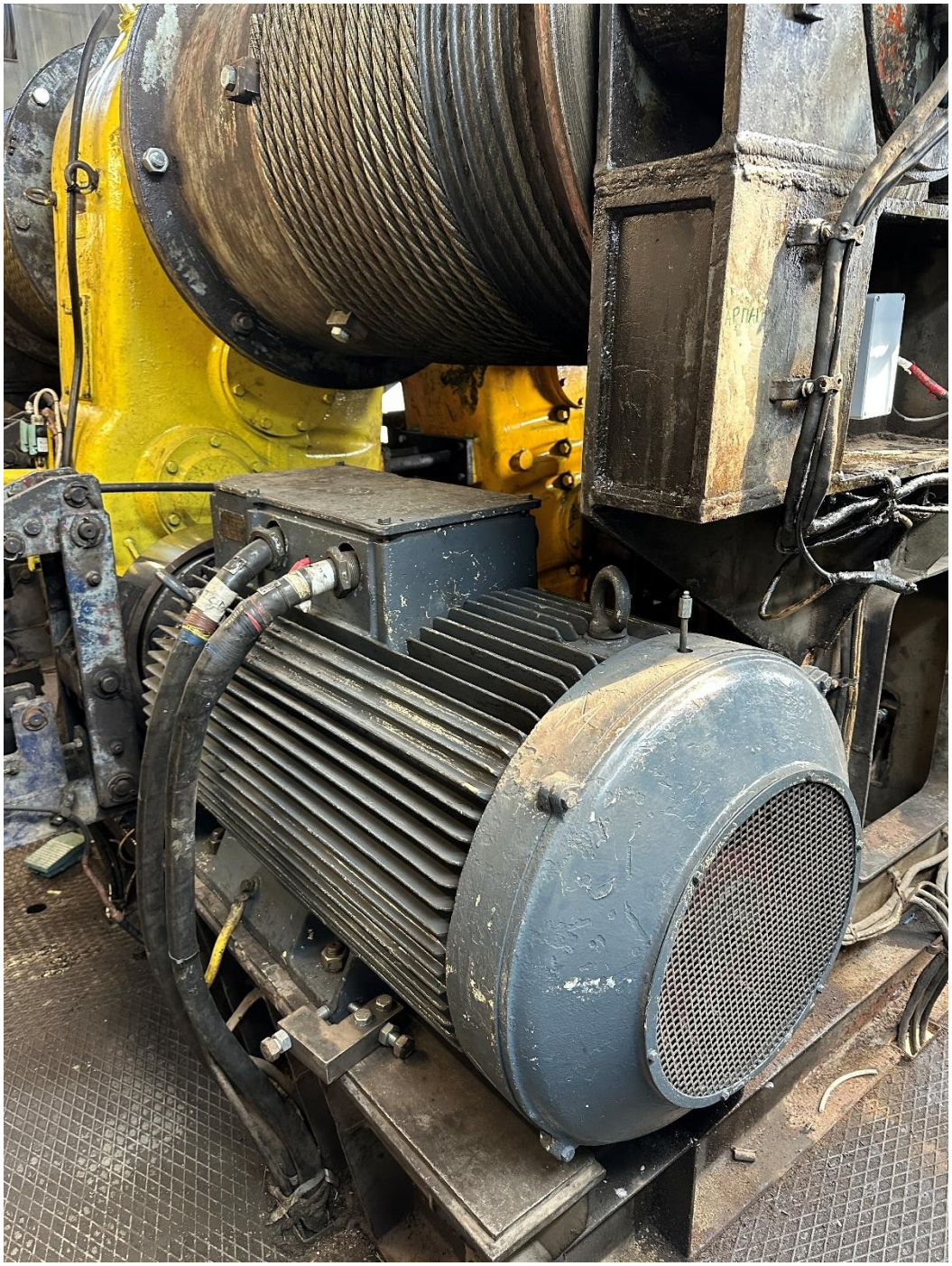






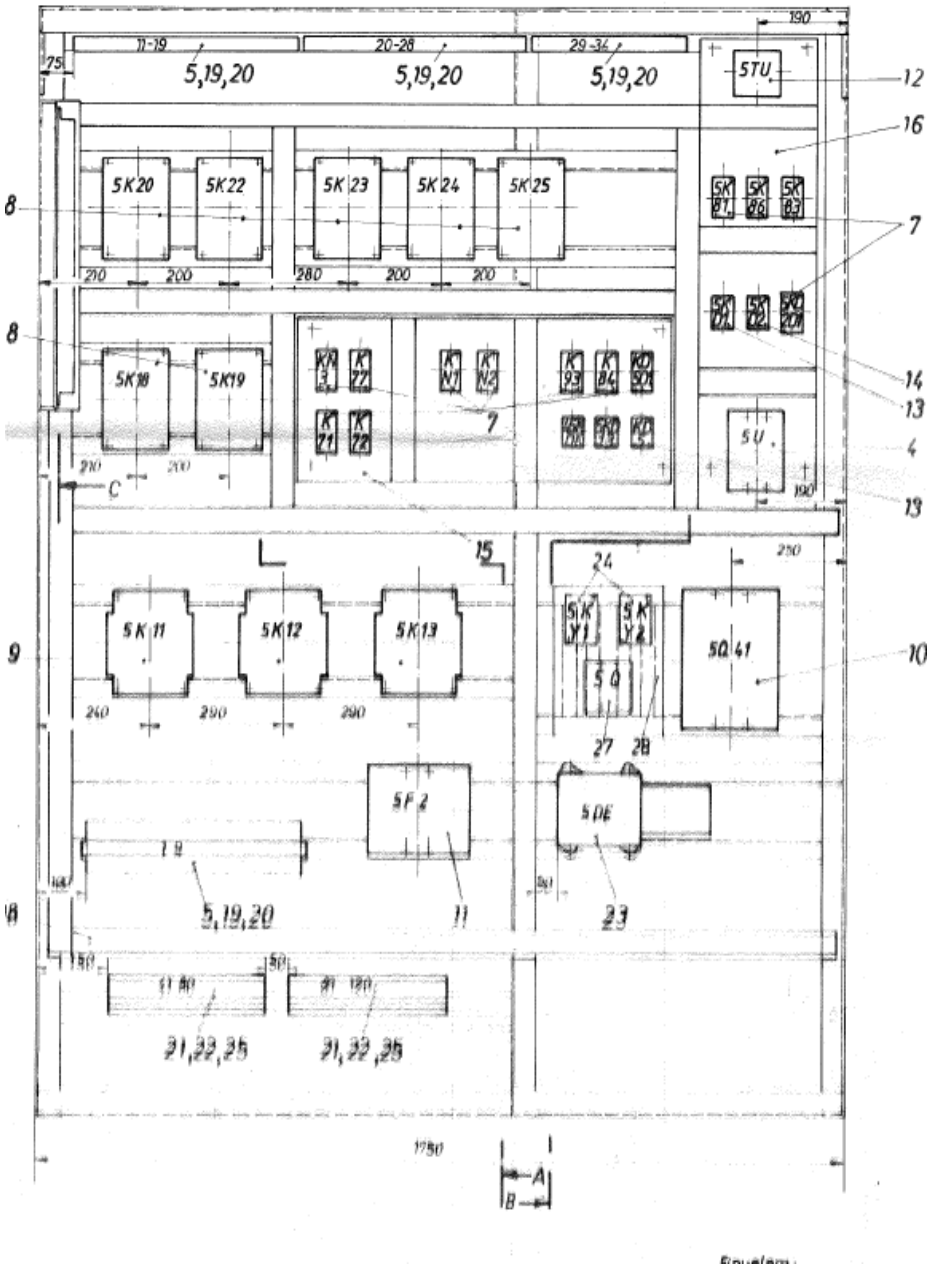


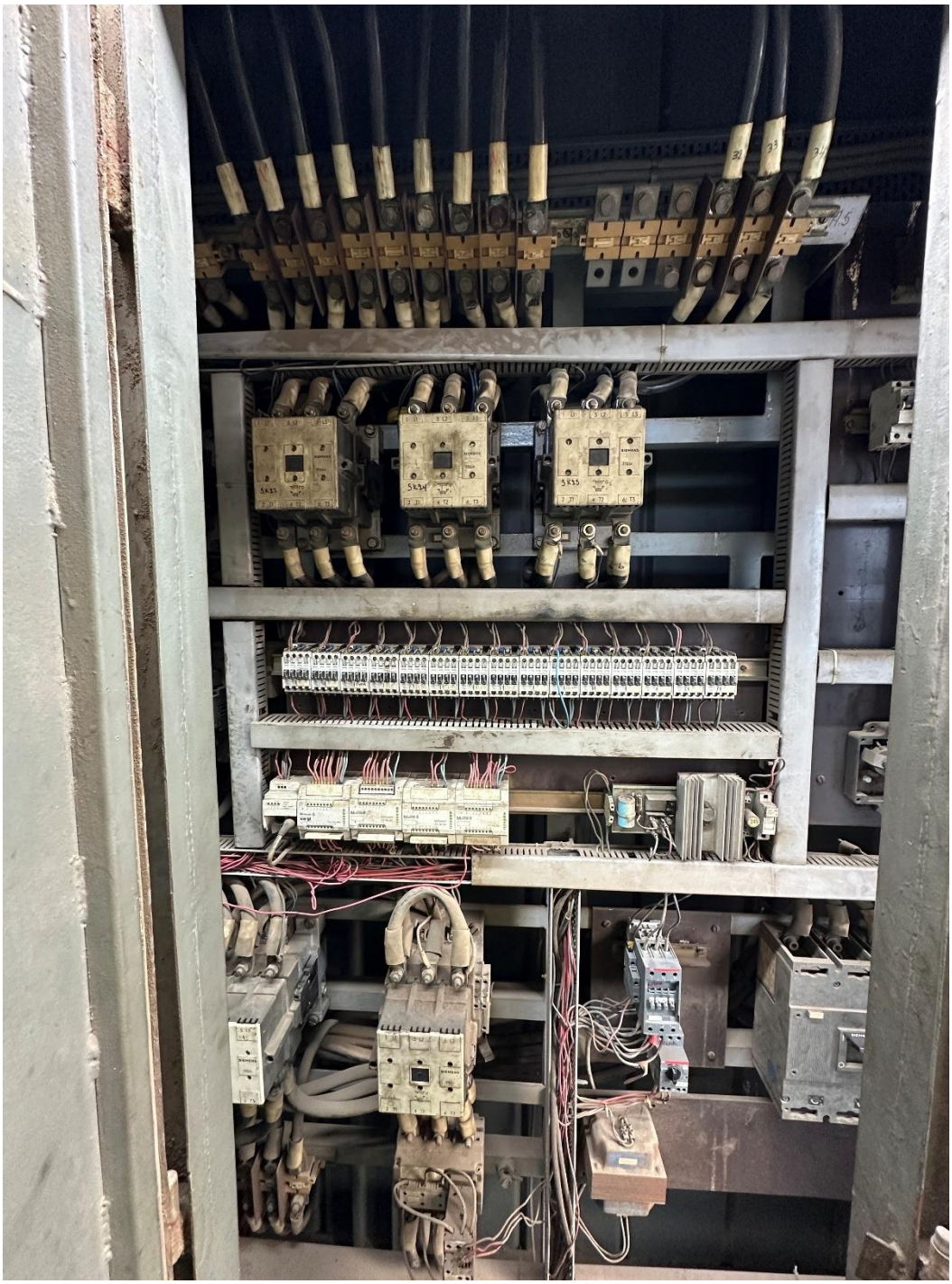
Hoist Electrical Motor

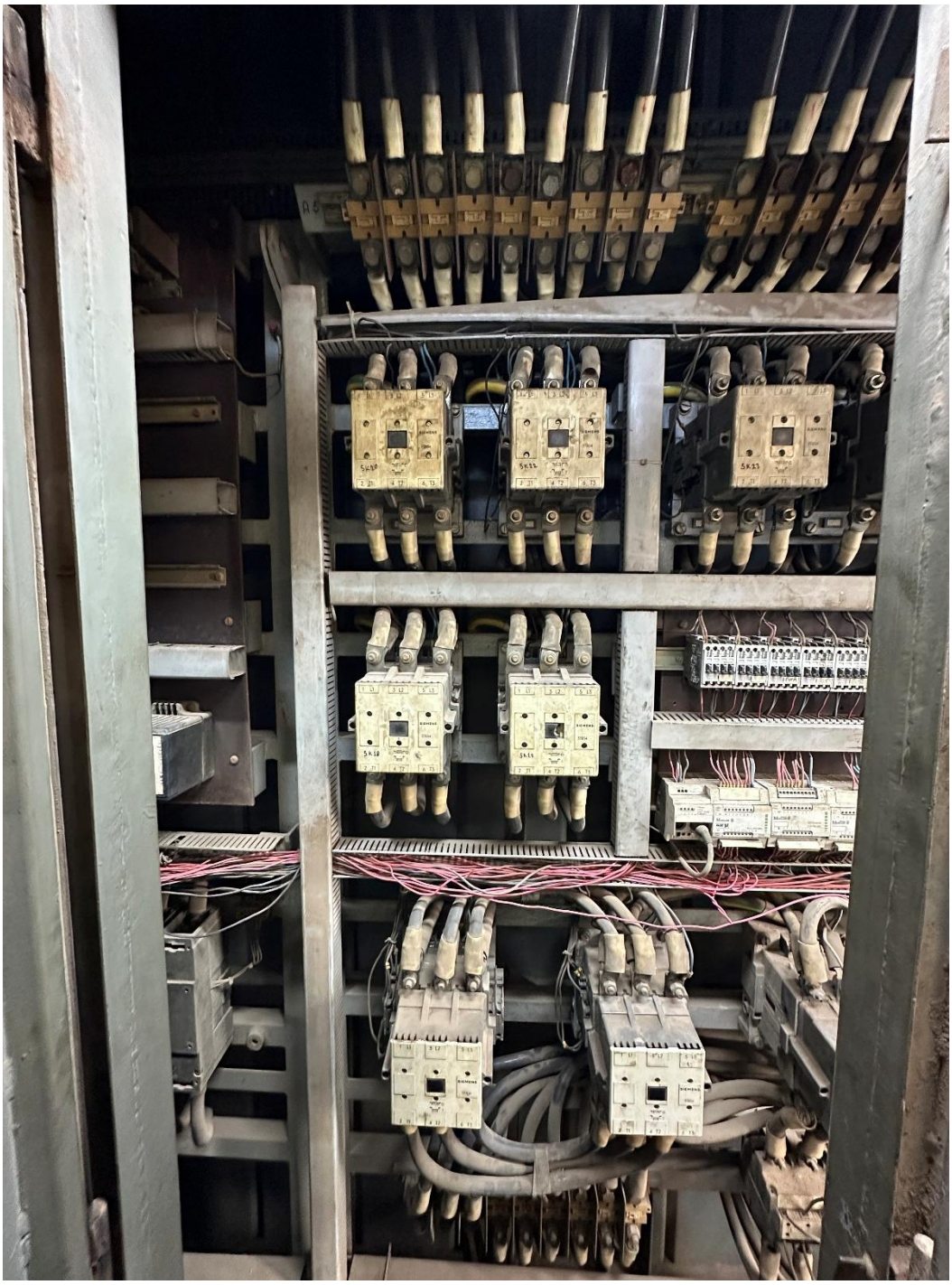


Hoist Drum Measuring Equipment

Grab Electrical Cabinets



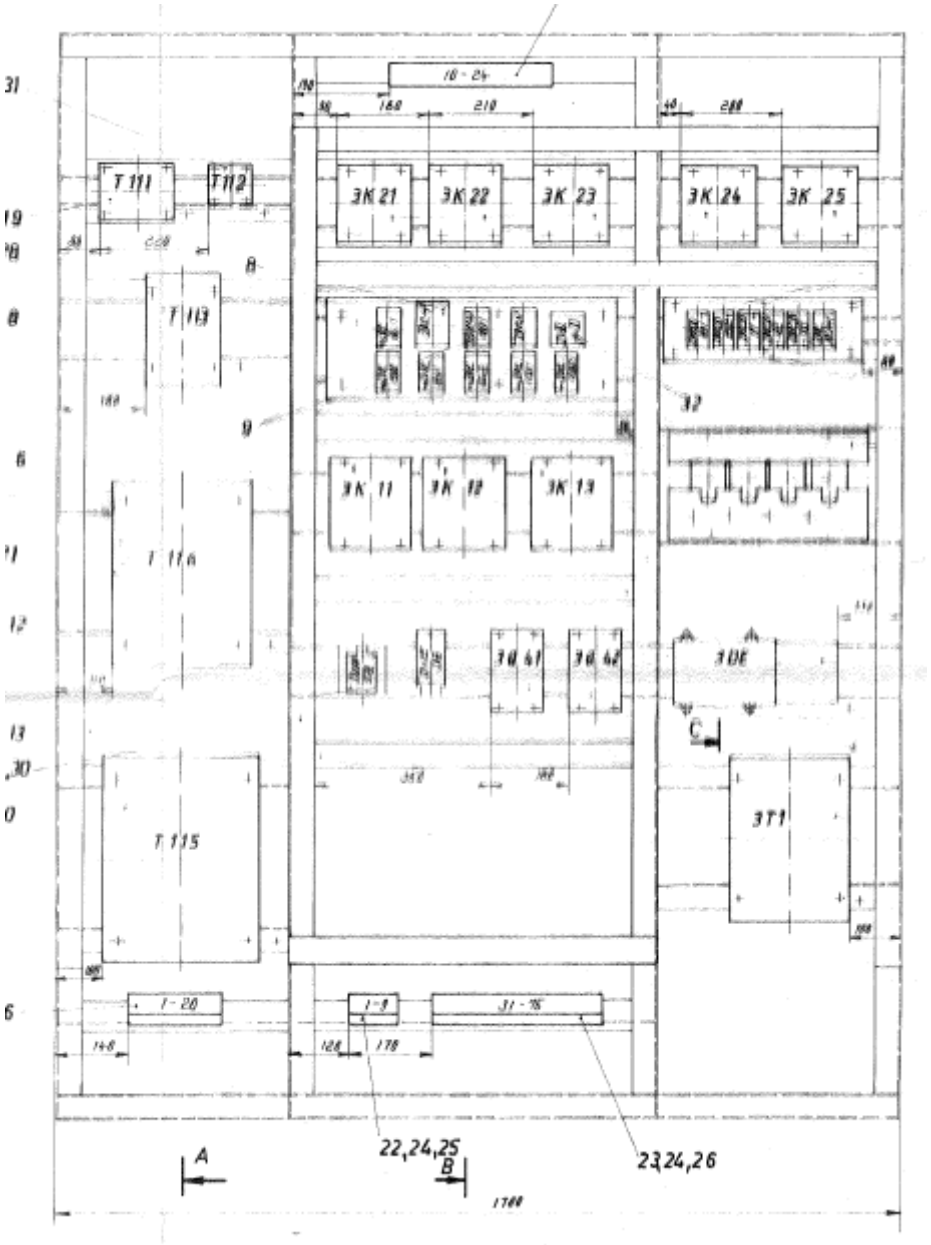


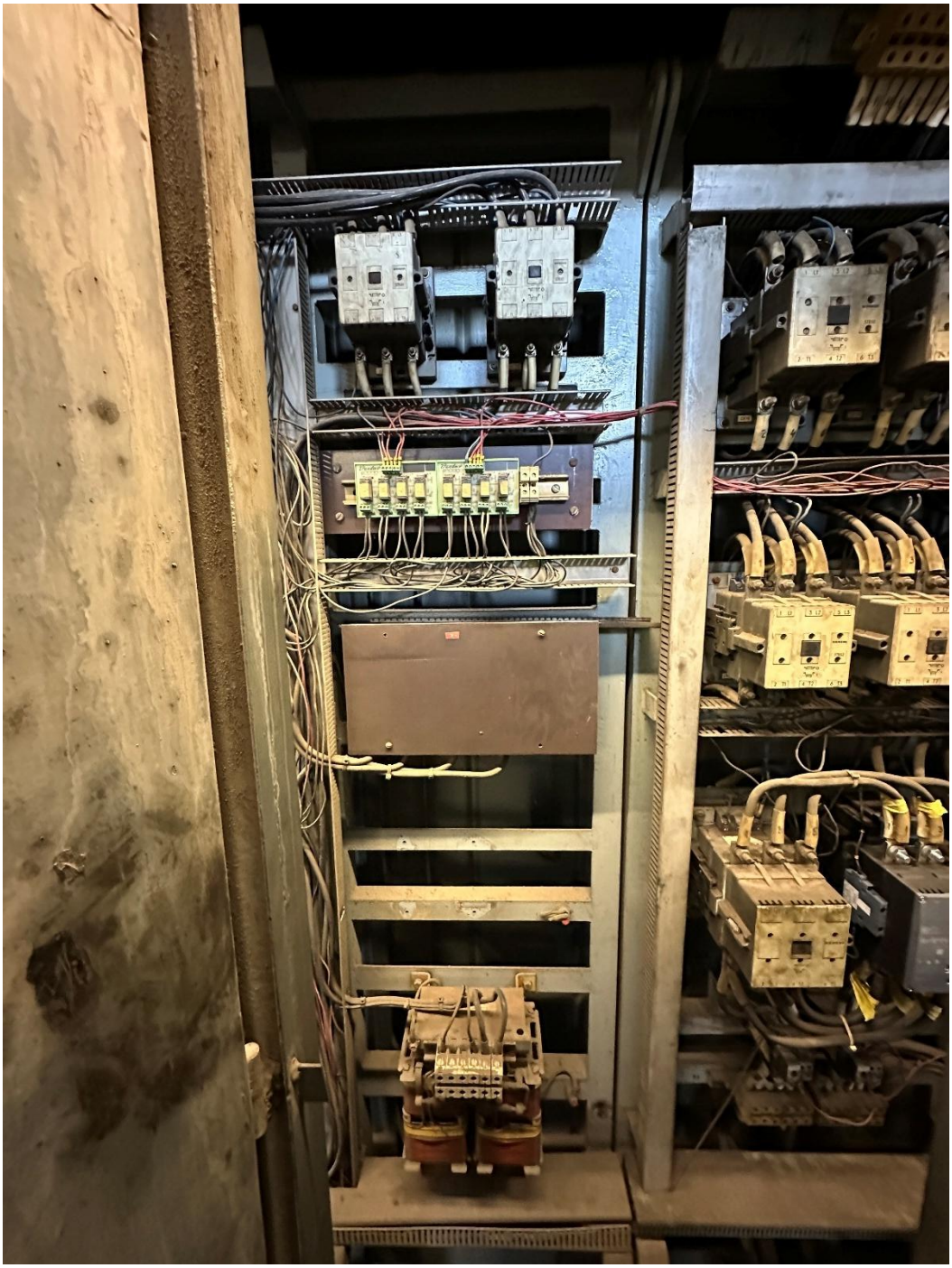


Grab Electrical Motor

Grab Drum Measuring Equipment

Luffing Electrical Cabinets

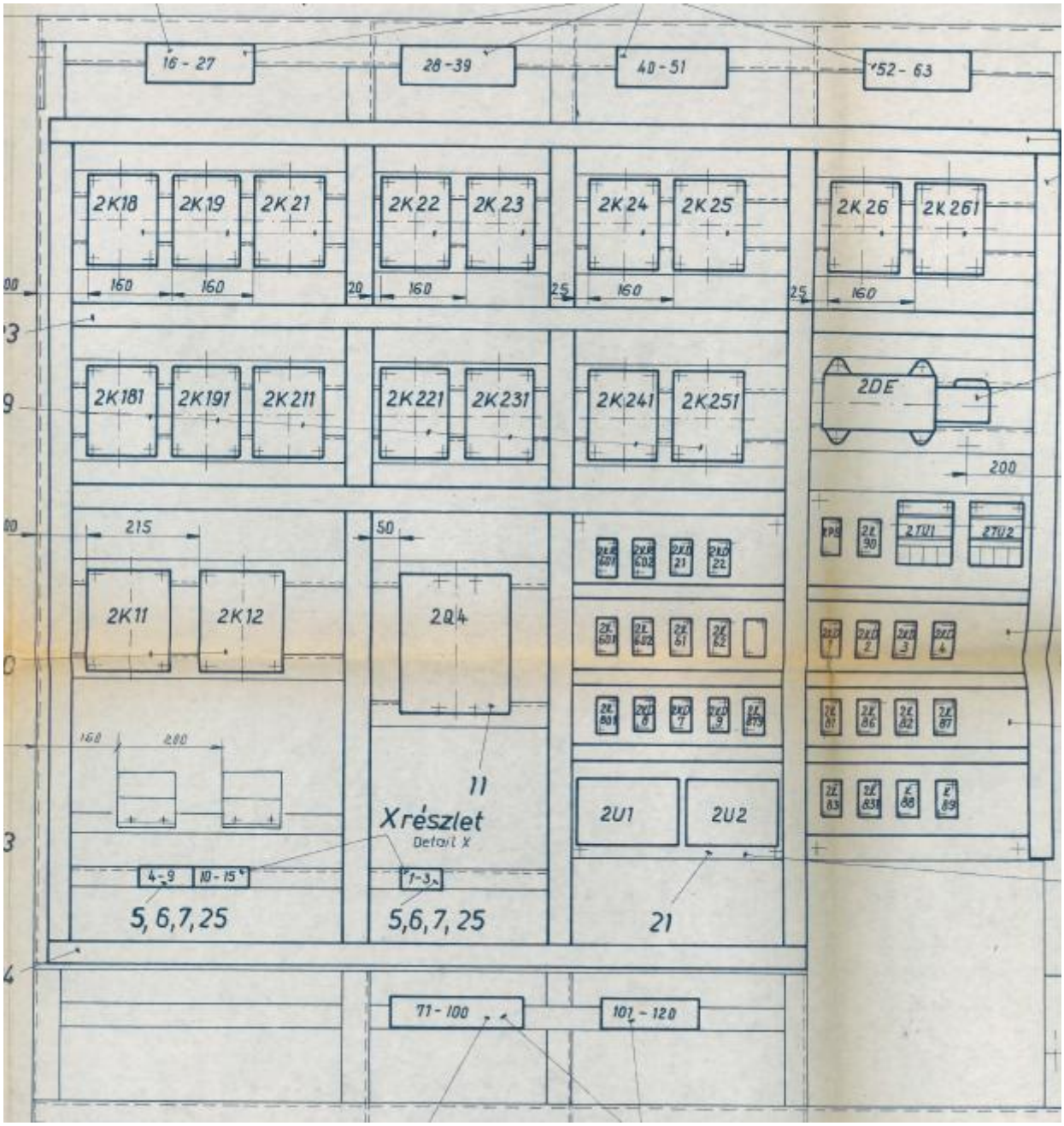


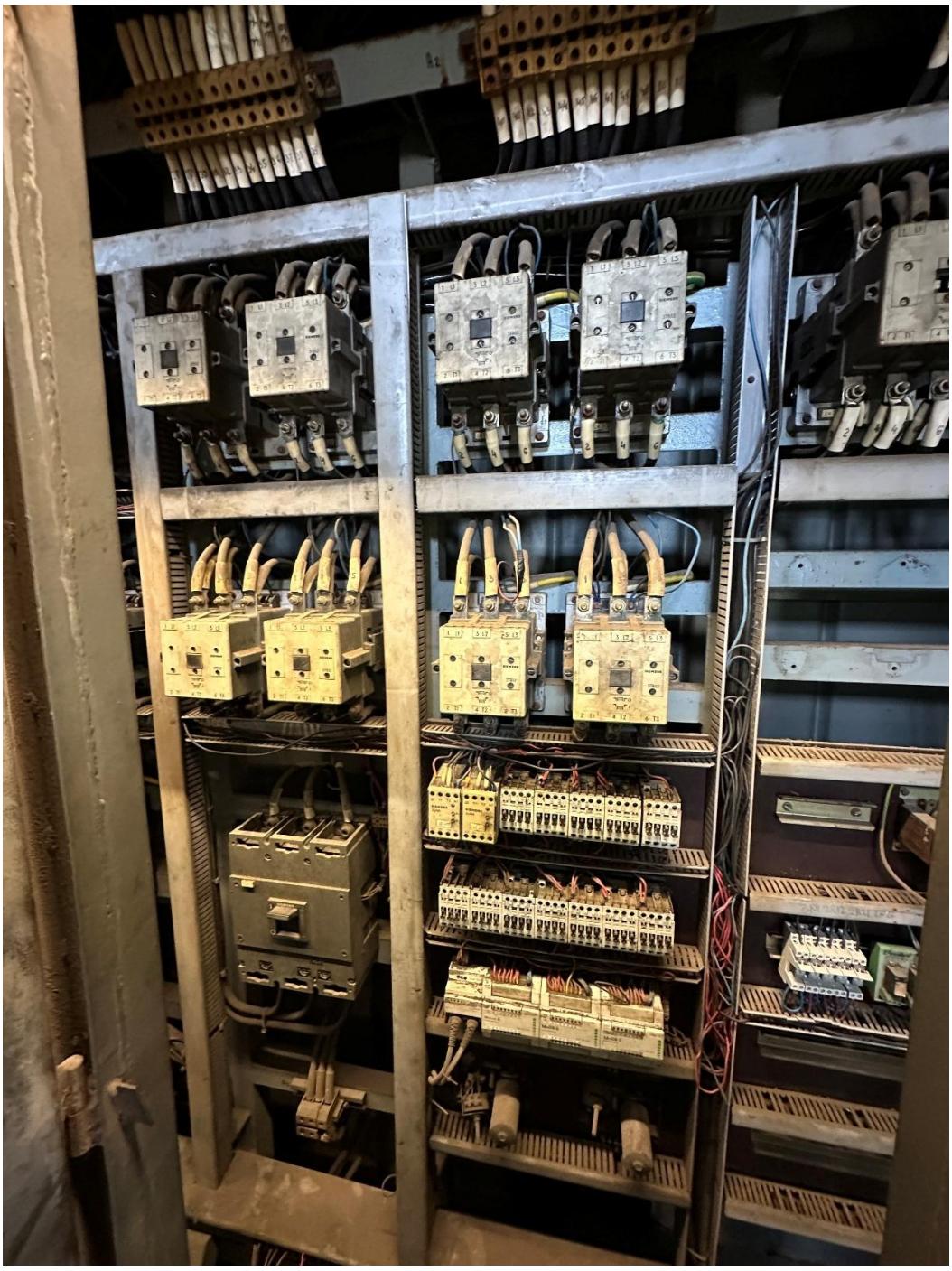


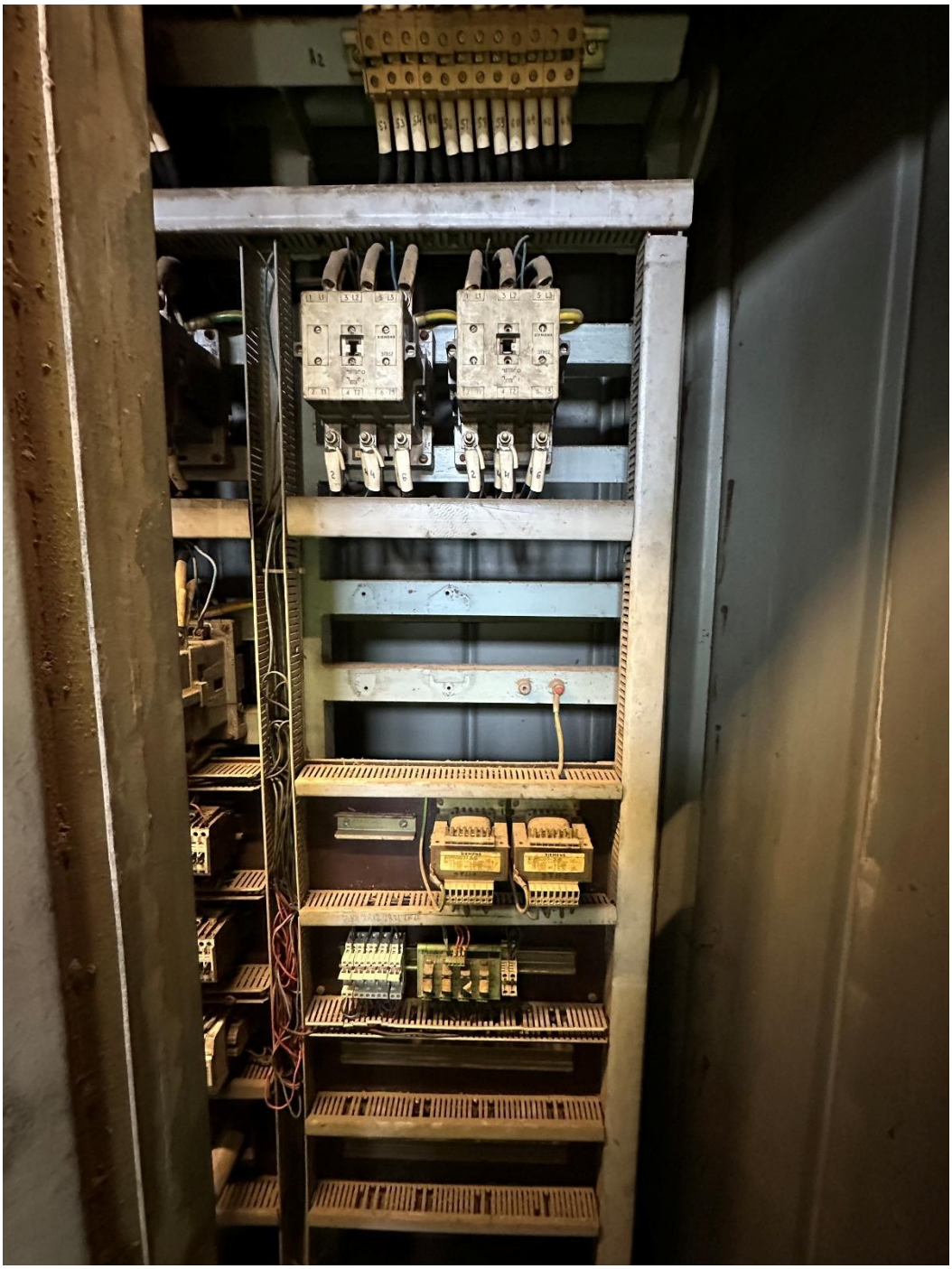
Luffing Electrical Motor

Luffing meter Measuring Equipment (Through gearbox)

Slew Electrical Cabinets







Slewing Electrical Motors

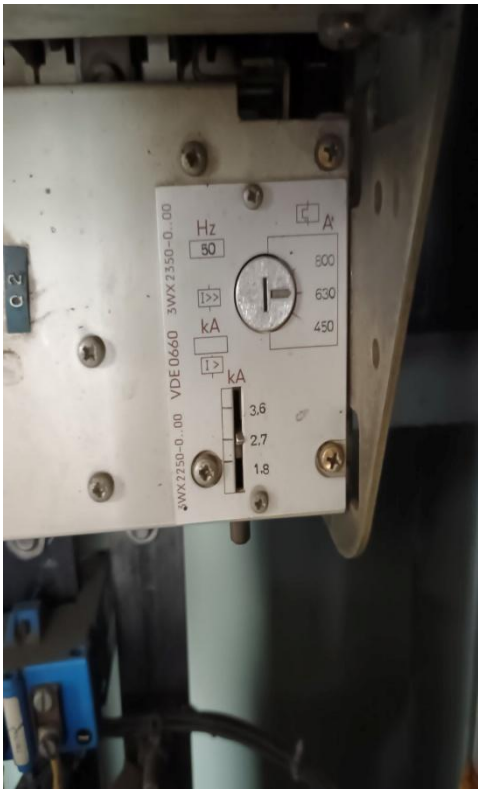
Operators Cabinet

Hoisting - Grabbing Joystick

Luffing – Slewing Joystick

Gantry Joystick

Main ACB 800A



PLC Beckhoff (Load, height and angle Sensors)

Beckhoff Signals:

1. Analogue input 1 (4-20mA) : Load Hoist 1
2. Analogue input 2 (4-20mA) : Load Hoist 2
3. Analogue input 3 (0-10V) : Height Hoist 1 (Drum)
4. Analogue input 4 (0-10V) : Height Hoist 2(Drum)
5. Analogue input 5 (0-10V) : Angle sensor
6. Digital Input 1 : Fast Gear
7. Digital Output 1 : Grab operation on
8. Digital Output 2 : Grab operation (Load on 50%)
9. Digital Output 3 : Grab operation (Load on 90%)
10. Digital Output 4 : Grab operation (Load on 115%)
11. Digital Output 5 : Overload Grab operation
12. Digital Output 6 : No hook
13. Digital Output 7 : Hook operation (Load on 50%)
14. Digital Output 8 : Hook operation (Load on 90%)
15. Digital Output 9 : Hook operation (Load on 115%)
16. Digital Output 10 : Overload Hook operation
17. Digital Output 11 : Spare

- **The above Inputs – Outputs must be implemented to new Main PLC**

NEW REQUESTED EQUIPMENT

1. AC MOTORS

For the procurement of new motors, full compliance with specific technical specifications is required to ensure efficiency, reliability, and compatibility with existing equipment. The motors should have a power range between 10 and 100 kW, operate at 400V/50Hz, and feature a protection rating of at least IP55. Additionally, they must comply with international energy efficiency standards (e.g. IE3 or higher) and be suitable for continuous operation in industrial environments.

The equipment to be procured, installed and configured includes the following as a **MINIMUM**:

- Supply motors should follow the following characteristics:

  - **HOIST – GRAB:**

    - Voltage: 380V AC
    - Frequency: 50 Hz
    - Power: 100 KW
    - S5: 60%
    - Current: 182 A
    - RPM: 990 min
    - COSφ: 0,88
    - Isolation class: F F

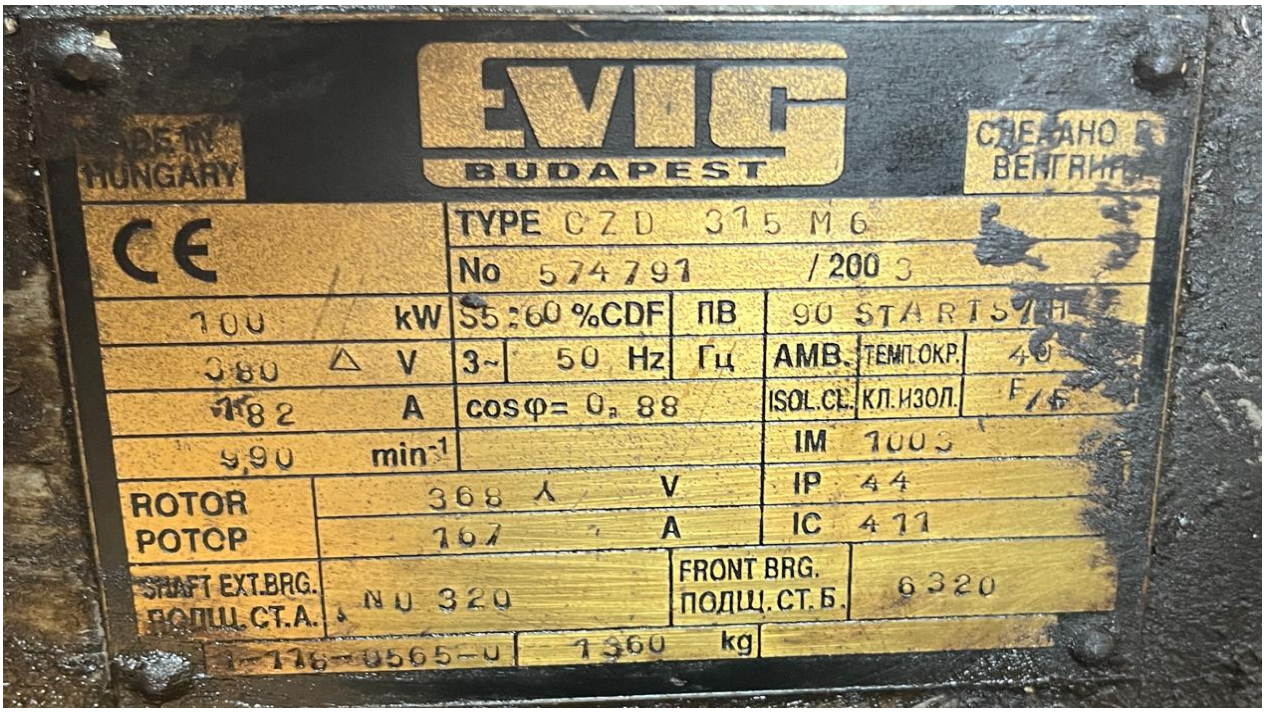


Photo of existing motor nameplate

- **SLEW:**
  - Voltage: 380V AC
  - Frequency: 50 Hz
  - Power: 26 KW
  - S5: 60%
  - Current: 53 A
  - RPM: 975 min
  - COSφ: 0,85
  - Isolation class: F F

Photo of existing motor nameplate

- **LUFF:**
  - Voltage: 380V AC
  - Frequency: 50 Hz
  - Power: 25 KW
  - S5: 40%
  - Current: 52 A
  - RPM: 955 min
  - COSφ: 0,85
  - Isolation class: F F

Photo of existing motor nameplate

- **GANTRY:**
  - Voltage: 380V AC
  - Frequency: 50 Hz
  - Power: 10 KW
  - S5: 60%
  - Current: 22,5 A
  - RPM: 950 min
  - COSφ: 0,85
  - Isolation class: F F

Photo of existing motor nameplate

2. DRIVES:

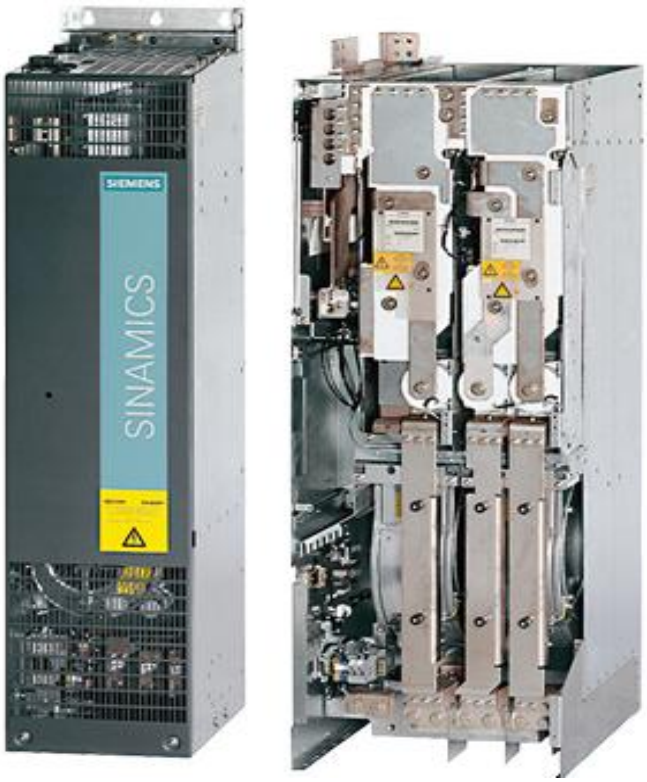
For the procurement of new drives (variable frequency drives – VFDs), full compliance with specific technical specifications is required to ensure energy efficiency, reliability, and compatibility with existing motors and automation systems. The drives should support output power in the range of 10 to 100 kW, operate on a 3x400V/50Hz supply voltage, and offer protection rating of at least IP20 (or higher, depending on installation environment). They must also provide vector control capabilities, integrated protection features (such as overload and short-circuit protection), and support standard communication protocols (e.g. Modbus, Profibus, or Ethernet/IP) for integration into industrial control networks.

- Supply drives should follow the following characteristics as **MINIMUM**:

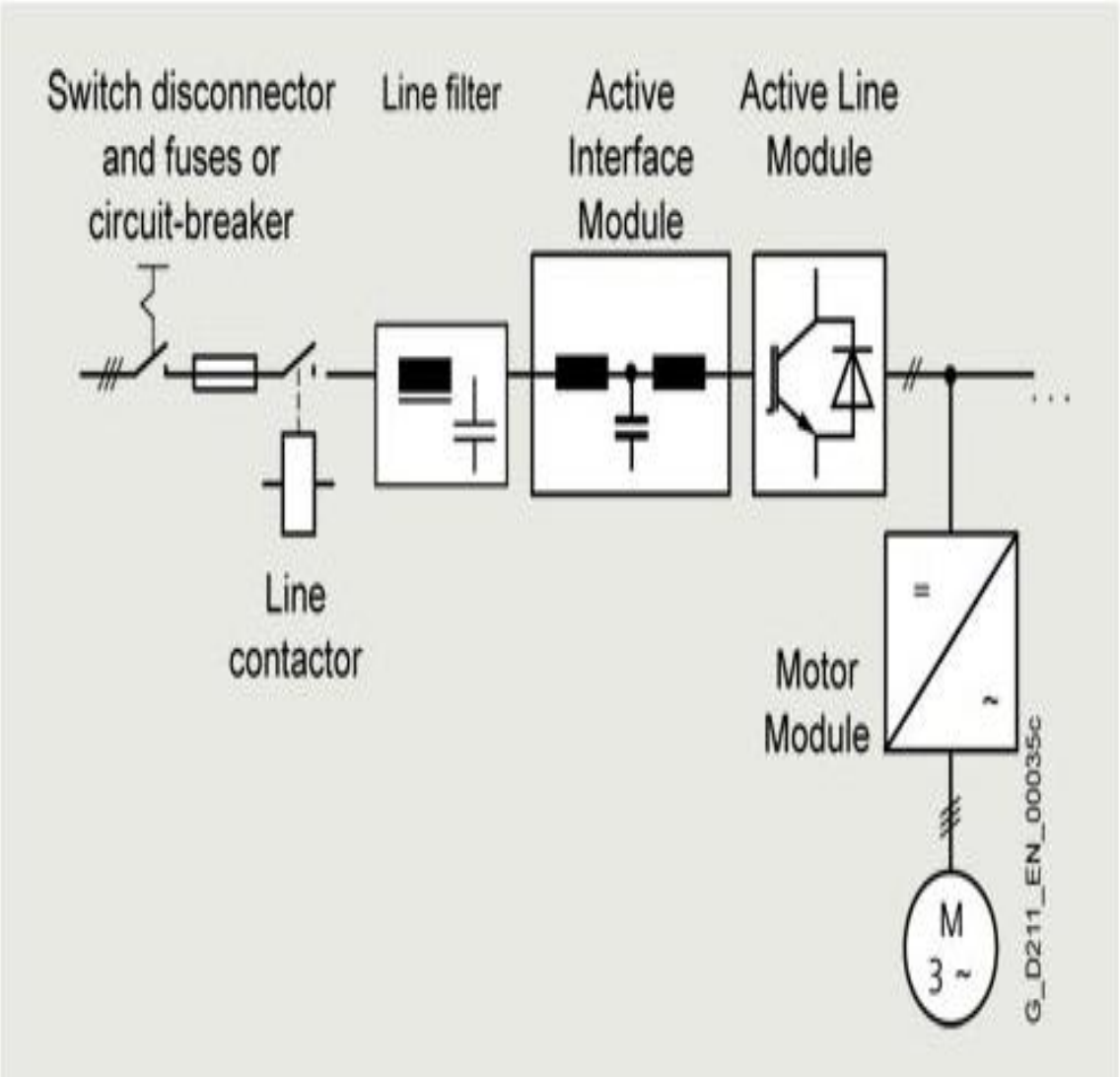
  - **HOIST – GRAB:**

    - Manufacturer: SIEMENS
    - Chassis format: REGENERATIVE ACTIVE LINE
    - Active line Module: 6SL3330-7TE33-8AA3
    - Active Interface Module: 6SL3300-7TE33-8AA1
    - Motor Modules: 6SL3320-7TE32-6AA3
    - Drive Type: S120
    - Power range: 260 A
    - Interface: Profinet

Regenerative Active Line Modules S120



Indicative photos of requested equipment



Indicative photos of requested equipment

- **SLEW:**

  - Manufacturer: SIEMENS
  - Chassis format: REGENERATIVE
  - Drive Type: G120
  - Power module: PM250
  - Type: 6SL3225-0BE35-5UA0
  - Operators panel: IOP
  - Power range: 145 A
  - Interface: Profinet

- **LUFF:**

  - Manufacturer: SIEMENS
  - Chassis format: REGENERATIVE
  - Drive Type: G120
  - Power module: PM250
  - Type: 6SL3225-0BE33-0UA0
  - Operators panel: IOP
  - Power range: 60 A
  - Interface: Profinet

- **GANTRY:**

  - Manufacturer: SIEMENS
  - Chassis format: REGENERATIVE
  - Drive Type: G120
  - Power module: PM250
  - Type: 6SL3225-0BE37-5UA0
  - Operators panel: IOP
  - Power range: 205 A
  - Interface: Profinet

Regenerative Modules G120

Indicative photos of requested equipment

3. PLC

For the procurement of new PLCs (Programmable Logic Controllers), full compliance with defined technical specifications is essential to ensure seamless integration, operational reliability, and scalability within existing industrial automation systems. The PLCs must support modular architecture with expandable I/O capabilities, high-speed processing, and real-time operation. They should offer compatibility with common communication protocols such as Modbus, Profibus, Profinet, or Ethernet/IP, and provide built-in diagnostic and remote monitoring features. The equipment must be CE certified and suitable for industrial environments, with an operating temperature range of at least -10°C to +55°C and a minimum protection rating of IP20 (or higher, depending on installation conditions).

- Supply PLC should follow the following characteristics as **MINIMUM**:

  - **Main Crane's PLC**

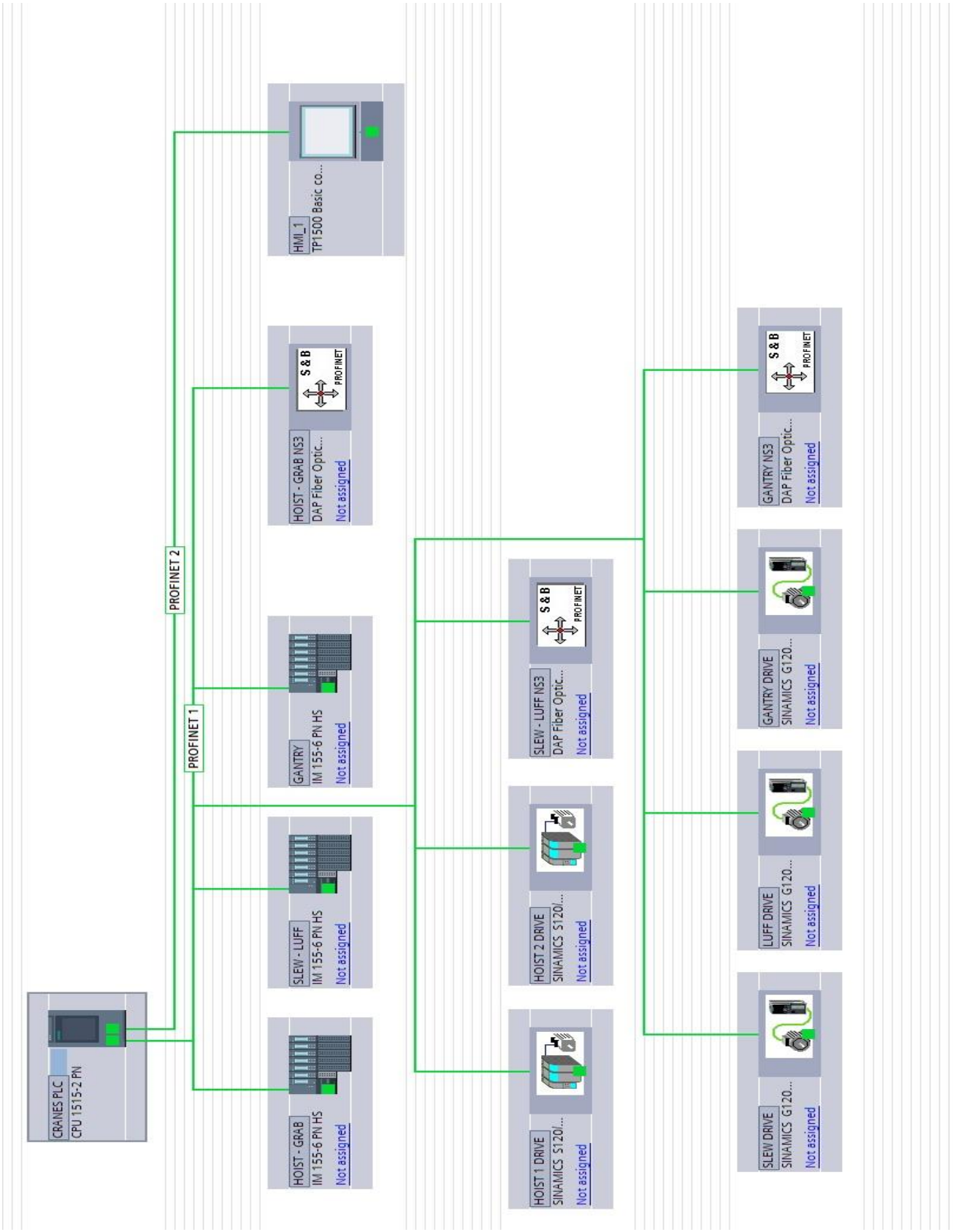
    - **CPU:**
      - Manufacturer: SIEMENS
      - Type: S7-1500-PN
      - Power Supply :24 VDC
      - Interface: Profinet
    - **Communication:**
      - PROFINET
    - **I/O Cards**
      - Manufacturer: SIEMENS
      - Type: S7-1500-PN
      - Power Supply :24 VDC

  - **Remote I/Os**

    - **CPU:**
      - Manufacturer: SIEMENS
      - Type: S7-1500-PN
      - Power Supply :24 VDC
      - Interface: Profinet
    - **Communication:**
      - PROFINET
    - **I/O Cards**
      - Manufacturer: SIEMENS
      - Type: S7-1500-PN
      - Power Supply :24 VDC

Indicative photos of requested equipment

➢ **Crane's Profinet topology**



➢ Crane's signal list

A/α	Crane Signal	Position	Signal Category
1	Limit up (Cam switch)	Hoist 1	Digital Input
2	Pre limit up (Cam switch)	Hoist 1	Digital Input
3	Limit down (Cam switch)	Hoist 1	Digital Input
4	Pre limit down (Cam switch)	Hoist 1	Digital Input
5	Safety limit up (Cam switch) ?	Hoist 1	Digital Input
6	Safety limit down (Cam switch)?	Hoist 1	Digital Input
7	Wire rope overlap	Hoist 1	Digital Input
8	Motor overspeed	Hoist 1	Digital Input
9	Oil gear box low level	Hoist 1	Digital Input
10	Gear box (FAST)	Hoist 1	Digital Input
11	Gear box (SLOW)	Hoist 1	Digital Input
12	Service brake power supply Ok (Circuit breaker)	Hoist 1	Digital Input
13	Service brake released	Hoist 1	Digital Input
14	Drive power supply Ok (Circuit breaker)	Hoist 1	Digital Input
15	Drive Field power supply Ok (Circuit breaker) ?	Hoist 1	Digital Input
16	Drive FAN power supply Ok (Circuit breaker) ?	Hoist 1	Digital Input
17	Main drive contactor released	Hoist 1	Digital Input
18	Motor overheat (Thermistor)	Hoist 1	Digital Input
19	Auxiliary 24V power supply Ok (Circuit breaker)	Hoist 1	Digital Input
20	Emergency stop	Hoist 1	Digital Input
21	Limit up (Cam switch)	Hoist 2	Digital Input
22	Pre limit up (Cam switch)	Hoist 2	Digital Input
23	Limit down (Cam switch)	Hoist 2	Digital Input
24	Pre limit down (Cam switch)	Hoist 2	Digital Input
25	Safety limit up (Cam switch) ?	Hoist 2	Digital Input
26	Safety limit down (Cam switch)?	Hoist 2	Digital Input
27	Wire rope overlap	Hoist 2	Digital Input
28	Motor overspeed	Hoist 2	Digital Input
29	Oil gear box low level	Hoist 2	Digital Input
30	Gear box (FAST)	Hoist 2	Digital Input
31	Gear box (SLOW)	Hoist 2	Digital Input

32	Service brake power supply Ok (Circuit breaker)	Hoist 2	Digital Input
33	Service brake released	Hoist 2	Digital Input
34	Drive power supply Ok (Circuit breaker)	Hoist 2	Digital Input
35	Drive Field power supply Ok (Circuit breaker) ?	Hoist 2	Digital Input
36	Drive FAN power supply Ok (Circuit breaker) ?	Hoist 2	Digital Input
37	Main drive contactor released	Hoist 2	Digital Input
38	Motor overheat (Thermistor)	Hoist 2	Digital Input
39	Auxiliary 24V power supply Ok (Circuit breaker)	Hoist 2	Digital Input
40	Set GRAB	Hoist 2	Digital Input
41	Set open limit (GRAB)	Hoist 2	Digital Input
42	Emergency stop	Hoist 2	Digital Input
43	Set close limit (GRAB)	Hoist 2	Digital Input
44	Main drive contactor order	Hoist 1	Digital output
45	Service brake open order	Hoist 1	Digital output
46	Main drive contactor order	Hoist 2	Digital output
47	Service brake open order	Hoist 2	Digital output
48	Set GRAB limits LED	Hoist 2	Digital output
49	GRAB open limit LED	Hoist 2	Digital output
50	GRAB close limit LED	Hoist 2	Digital output
51	Drive power supply Ok (Circuit breaker)	Slew 1	Digital Input
52	Main drive contactor released	Slew 1	Digital Input
53	Motor overheat (Thermistor)	Slew 1	Digital Input
54	Service brake released	Slew 1	Digital Input
55	Auxiliary 24V power supply Ok (Circuit breaker)	Slew 1	Digital Input
56	Drive power supply Ok (Circuit breaker)	Slew 2	Digital Input
57	Main drive contactor released	Slew 2	Digital Input
58	Motor overheat (Thermistor)	Slew 2	Digital Input
59	Service brake released	Slew 2	Digital Input
60	Emergency stop	Slew 2	Digital Input
61	Auxiliary 24V power supply Ok (Circuit breaker)	Slew 2	Digital Input
62	Main drive contactor order	Slew 1	Digital output
63	Service brake open order	Slew 1	Digital output
64	Main drive contactor order	Slew 2	Digital output
65	Service brake open order	Slew 2	Digital output
66	Limit out (Cam switch)	Luff	Digital Input
67	Pre limit out (Cam switch)	Luff	Digital Input

68	Limit in (Cam switch)	Luff	Digital Input
69	Pre limit in (Cam switch)	Luff	Digital Input
70	Safety limit out	Luff	Digital Input
71	Safety limit in	Luff	Digital Input
72	Motor overspeed	Luff	Digital Input
73	Drive power supply Ok (Circuit breaker)	Luff	Digital Input
74	Main drive contactor released	Luff	Digital Input
75	Motor overheat (Thermistor)	Luff	Digital Input
76	Auxiliary 24V power supply Ok (Circuit breaker)	Luff	Digital Input
77	Emergency stop	Luff	Digital Input
78	Main drive contactor order	Luff	Digital output
79	Anticollision power supply Ok (Circuit breaker)	Gantry	Digital Input
80	Anticollision 1 1st step (slow down)	Gantry	Digital Input
81	Anticollision 1 2nd step (stop)	Gantry	Digital Input
82	Anticollision 2 1st step (slow down)	Gantry	Digital Input
83	Anticollision 2 2nd step (stop)	Gantry	Digital Input
84	Anticollision 3 1st step (slow down)	Gantry	Digital Input
85	Anticollision 3 2nd step (stop)	Gantry	Digital Input
86	Anticollision 4 1st step (slow down)	Gantry	Digital Input
87	Anticollision 4 2nd step (stop)	Gantry	Digital Input
88	Drive power supply Ok (Circuit breaker)	Gantry	Digital Input
89	Main drive contactor released	Gantry	Digital Input
90	Auxiliary 24V power supply Ok (Circuit breaker)	Gantry	Digital Input
91	1st Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
92	1st Service brake released	Gantry	Digital Input
93	Motor 1 overheat (Thermistor)	Gantry	Digital Input
94	2nd Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
95	2nd Service brake released	Gantry	Digital Input
96	Motor 2 overheat (Thermistor)	Gantry	Digital Input
97	3rd Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
98	3rd Service brake released	Gantry	Digital Input
99	Motor 3 overheat (Thermistor)	Gantry	Digital Input
100	4th Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
101	4th Service brake released	Gantry	Digital Input
102	Motor 4 overheat (Thermistor)	Gantry	Digital Input

103	5th Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
104	5th Service brake released	Gantry	Digital Input
105	Motor 5 overheat (Thermistor)	Gantry	Digital Input
106	6th Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
107	6th Service brake released	Gantry	Digital Input
108	Motor 6 overheat (Thermistor)	Gantry	Digital Input
109	7th Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
110	7th Service brake released	Gantry	Digital Input
111	Motor 7 overheat (Thermistor)	Gantry	Digital Input
112	8th Service brake power supply Ok (Circuit breaker)	Gantry	Digital Input
113	8th Service brake released	Gantry	Digital Input
114	Motor 8 overheat (Thermistor)	Gantry	Digital Input
115	Gantry right order	Gantry	Digital output
116	Gantry left order	Gantry	Digital output
117	Gantry beacon right	Gantry	Digital output
118	Gantry beacon left	Gantry	Digital output
119	Gantry horn right	Gantry	Digital output
120	Gantry horn left	Gantry	Digital output
121	Joystick	Hoist 1-2	Profinet
122	Joystick	Luff - Slew	Profinet
123	Joystick	Gantry	Profinet
124	Position encoder Hoist 1 drum	Hoist 1	Profinet
125	Position encoder Hoist 2 drum	Hoist 2	Profinet
126	Position encoder Luffing	Luff	Profinet

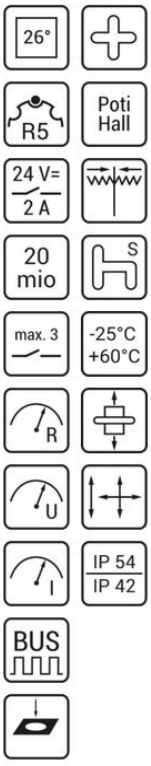
- **The above-mentioned signals are the minimum signals that will be included in the revamping**
- **The final number of I/Os' will be defined during engineering**

4. JOYSTICK

For the procurement of industrial joysticks, adherence to specific technical specifications is required to ensure precise control, durability, and compatibility with the existing control systems. The joysticks must be suitable for heavy-duty industrial use, offering multi-axis control (at least 2 axes), with configurable switches or buttons for custom functions. They should feature robust mechanical construction, with protection rating of at least IP65 for use in harsh environments and be rated for a minimum of one million operating cycles. Electrical interface must support Profinet communication protocol, and the units must be CE certified.

- **Technical Specifications:**

- **Manufacturer:** Spohn & Burkhurdt
- **Type:** NS3
- **Power Supply**: 24V DC (standard), optional 12V DC
- **Control Axes**: Up to 4 proportional control axes
- **Protection Rating**: IP65 (dust-tight and protected against water jets)
- **Switches**: Programmable switches (up to 6)
- **Operating Life**: Rated for over 1 million operating cycles
- **Electrical Output**: Analog (0-10V, 4-20mA) and digital signals
- **Communication Protocol**: **Profinet** for integration into automation systems
- **Temperature Range**: Operating temperature range from -20°C to +60°C
- **Certification**: CE certified



Indicative photos of requested equipment

5. ENCODERS

For the procurement of rotary encoders, both incremental and absolute, full compliance with defined technical specifications is required to ensure accurate position and speed feedback, reliable performance, and seamless integration with existing automation and drive systems. The encoders must be suitable for industrial environments, offering robust mechanical construction, high resistance to shock and vibration, and long operational life. Incremental encoders should provide high-resolution pulse outputs (e.g. TTL or HTL, with A/B/Z channels), while absolute encoders must deliver unique position values via standard industrial communication protocols such as SSI, CANopen, Profibus, or Profinet. Both types must be compatible with standard encoder mounting formats (solid shaft or hollow shaft) and offer protection ratings of at least IP65. The equipment must be CE certified and operate reliably within a temperature range of at least -20°C to +70°C. Encoders intended for heavy-duty applications (e.g. cranes, wind turbines, steel plants) should meet additional requirements such as magnetic sensing technology, redundancy options, and ATEX compliance where applicable.

➢ **Technical Specifications (incremental encoder):**

- **Manufacturer**: Hubner Giessen (Baumer Hübner)
- **Type**: FG 2 AK-1024G-90G-NG
- **Power Supply**: 24V DC
- **Output Voltage**: Typically 60 V/1000 rpm (other versions available: e.g. 20, 30, 90 V/1000 rpm)
- **Output Type**: Analog DC voltage
- **Nominal Speed Range**: Up to 6000 rpm (depending on version)
- **Linearity**: ±0.1% of full scale
- **Ripple**: <1% at nominal load
- **Load Resistance**: ≥5 kΩ
- **Protection Rating**: IP54 (standard), optional IP65 with additional sealing
- **Bearing Life**: ≥10,000 operating hours at nominal load
- **Operating Temperature Range**: –30°C to +100°C
- **Mechanical Design**: Rugged industrial housing with solid shaft; flange or foot mounting
- **Shaft Diameter**: Typically 11 mm or 14 mm (depending on version)
- **Certifications**: CE compliant

Indicative photos of requested equipment

- **Technical Specifications (absolute encoder):**

- **Manufacturer**: Johannes Hübner Giessen
- **Type**: AMP 40 K-1212 (Absolute Multiturn Encoder)
- **Power Supply**: 12–30 V DC (Class 2)
- **Current Consumption**: 140 mA @ 24 V
- **Resolution**:
  - **Singleturn**: Up to 12 bit (4096 steps per revolution)
  - **Multiturn**: Up to 12 bit (4096 revolutions)
- **Interface**: Profinet

Indicative photos of requested equipment

6. MCCBs – ACBs – MCBs – RCDs – RCBOs

➢ Molded Case Circuit Breakers (MCCBs) and Air Circuit Breakers (ACBs)

1. Scope

This specification covers the supply, delivery, and installation of Main Circuit Breakers for use in low-voltage electrical distribution panels. The equipment shall ensure safe and reliable operation under all expected electrical load and fault conditions.

2. General Requirements

- The main circuit breaker shall be either:
  - Molded Case Circuit Breaker (MCCB), or
  - Air Circuit Breaker (ACB),
    based on system capacity and project requirements.
- Breakers must provide full protection against overcurrent, short-circuit, and thermal-magnetic or electronic faults.
- Manual and automatic operation must be supported.
- The devices must allow safe disconnection of downstream circuits during maintenance or emergencies.

3. Technical Characteristics

- **Rated Voltage**: 400 V AC, 3-phase, 50 Hz
- **Rated Current (In)**:
  - MCCBs: Typically, from 160 A up to 1600 A
  - ACBs: Typically, from 800 A up to 6300 A
- **Breaking Capacity**:
  - MCCBs: ≥ 36 kA
  - ACBs: Up to 85 kA or as per design requirement
- **Trip Unit**: Adjustable thermal-magnetic or electronic trip settings
- **Compliance**: IEC 60947-1, IEC 60947-2 (MCCBs), IEC 60947-2 (ACBs)
- **Mounting**: Fixed or withdrawable (especially for ACBs)
- **Ingress Protection**: IP42 minimum, or higher based on environment
- **Accessories**:
  - Auxiliary contacts
  - Shunt trip
  - Undervoltage release
  - Manual/auto spring charging (for ACBs)
  - Communication module (if required)

4. Construction and Materials

- Devices must be enclosed in robust, flame-retardant, and high-insulation housing.
- All live terminals must be shrouded.
- Clearly visible ON/OFF/TRIP status indicators.
- Locking provision in the OFF position must be included

5. Testing and Certification

- All circuit breakers shall be factory-tested and accompanied by certified test reports.
- Products must carry third-party certifications (e.g., KEMA, UL, DEKRA).

6. Approved Manufacturers

- The equipment should preferably be from the following manufacturers:
  - **SIEMENS**
  - **ABB**

7. Documentation

The supplier must deliver:

- Product datasheets
- Type test certificates
- Installation and operation manuals
- Warranty documentation (minimum 2 years)

Indicative photos of requested equipment

➢ Miniature Circuit Breakers (MCBs) and Residual Current Devices (RCDs/RCBOs)

1. Scope

This section defines the technical requirements for the supply, installation, and commissioning of Miniature Circuit Breakers (MCBs) and Residual Current Devices (RCDs or RCBOs) for use in final sub-circuits of low-voltage electrical distribution systems.

2. General Requirements

- All protective devices shall ensure reliable and safe protection against overloads, short circuits, and residual (earth) current faults.
- Devices must be modular, DIN-rail mounted, and suitable for installation in standard distribution boards.
- All components shall be certified and compliant with current international standards.

3. Miniature Circuit Breakers (MCBs)

- Rated Voltage: 230/400 V AC, 50 Hz
- Rated Current: From 6 A to 63 A (as per circuit design)
- Breaking Capacity: Minimum 6 kA in accordance with IEC 60898-1
- Tripping Curve: Type B or C, depending on application (lighting, sockets, motors, etc.)
- Poles: 1P, 2P, 3P, or 4P as required
- Features: Thermal and magnetic protection, manual reset, ON/OFF indication

4. Residual Current Devices (RCDs) / RCBOs

- Rated Sensitivity (IΔn): 30 mA for personal protection; 100 mA or 300 mA for fire protection or equipment
- Rated Current: As per circuit requirement, typically 16 A to 63 A
- Poles: 2P or 4P
- Type: Type AC, A, or F depending on load characteristics
- Compliance: IEC 61008 for RCDs / IEC 61009 for RCBOs
- Features: Combined overcurrent and earth fault protection (for RCBOs), test button functionality

5. Construction and Safety

- Modular width (18 mm per pole or equivalent)
- Flame-retardant housing, high mechanical endurance (≥20,000 operations)
- Clear labeling and permanent marking of technical data
- Padlock provision (optional) for maintenance locking
- Terminal protection for user safety

6. Testing and Certification

- All devices shall be factory-tested and delivered with quality certificates.
- Compliance with CE marking and conformity to IEC standards is mandatory.

7. Approved Manufacturers

- The requested devices are preferred to be supplied by the following manufacturers:
  - SIEMENS
  - ABB

8. Documentation

- The supplier shall provide:
  - Manufacturer datasheets
  - Type test certificates
  - Installation and user manuals
  - Warranty documentation (minimum 2 years)

Indicative photos of requested equipment

7. WIND SPEED SENSOR

This wind speed sensor is designed for accurate and reliable measurement of wind velocity in industrial, meteorological, and environmental monitoring applications. With a robust analog 4–20 mA output and a measurement range of 0 to 50 meters per second, it is ideal for integration into SCADA systems, PLCs, and data loggers in harsh outdoor environments.

➢ Technical Specifications

- **Measurement Parameter**: Wind Speed
- **Measuring Range**: 0 to 50 m/s
- **Output Signal**: 4–20 mA (analog current loop)
- **Accuracy**: ±2% of full scale
- **Resolution**: 0.1 m/s
- **Response Time**: <1 second
- **Power Supply**: 12–30 V DC
- **Load Resistance**: Max 500 Ω (depending on supply voltage)
- **Operating Temperature**: -40°C to +70°C
- **Humidity Range**: 0–100% RH (non-condensing)
- **Protection Rating**: IP65 or higher
- **Sensor Type**: Cup anemometer
- **Material**: Anodized aluminum
- **Mounting**: Pole or bracket mountable
- **Cable Output**: Shielded cable, standard length (e.g., 2 m), extendable
- **Compliance**: CE certified and calibration certificated

Indicative photos of requested equipment

8. ANTI-COLLISION SENSOR

General Description

The anti-collision sensor is designed to detect proximity and prevent collisions between moving industrial equipment (e.g., overhead cranes, trolleys, AGVs). It ensures safe operation by triggering alarms or stop signals when a preset distance threshold is breached. The system is suitable for harsh industrial environments and integrates easily into automation systems.

- **Technical Specifications**

- **Manufacturer**: Pepperl+Fuchs
- **Type**: Ultrasonic distance sensor
- **Measuring Range**: 800 mm to 10,000 mm
- **Output Signals**:
  - 2 x digital PNP outputs
  - 1 x analog current output (4–20 mA)
- **Supply Voltage**: 15–30 V DC
- **Accuracy**:
  - Repeatability: ±15 mm
  - Linearity error: ≤1.5%
- **Operating Temperature**: –25°C to +70°C
- **Protection Rating**: IP65 (dust and water jet resistant)
- **Mounting**: Any position
- **Certifications**: CE, UL/cUL listed
- **Housing Material**: Industrial-grade plastic (UP1225)

Indicative photos of requested equipment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