

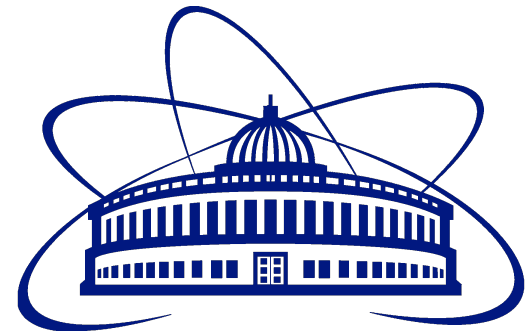
# Status of the NICA-MPD-Platform

Author:

**Krystian Rośton**

on behalf of

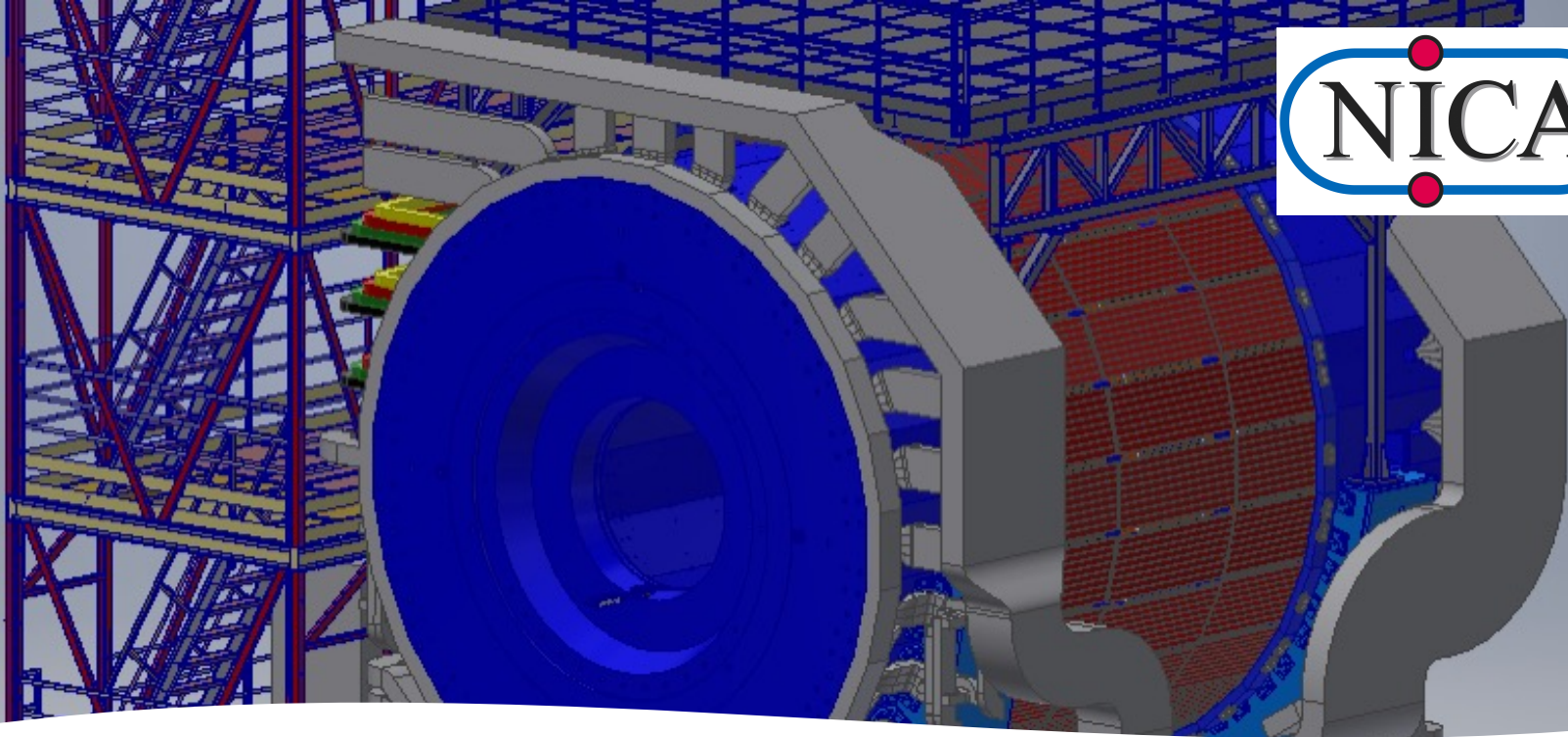
the Sector No 3; Engineering Support for  
the MPD installation,  
Joint Institute for Nuclear Research



# OUTLINE

- Ducting system,
- IT RACKS on the NMP,
- Raised floor,
- Power Supply,
- Cooling System,
- Structural Cabling,
- Access control and management system,
- Video based fire detection,
- CCTV video surveillance system,
- Emergency sound notification system,
- Radiation monitoring system,
- Magnetic field measurement system,
- Autonomous fire extinguishing system,
- Intelligent Power Distributor,





## DUCTING SYSTEM

- **Why the NICA-MPD-Platform (NMP) is such important for the whole project?**

It is responsible for the collecting all information coming from the MPD detector. On the NMP, connected to the detector, RACKs cabinets will be located. All services (cables, pipes, FO) from the MPD will go inside the cable ducts to the NMP.

# DUCTING SYSTEM

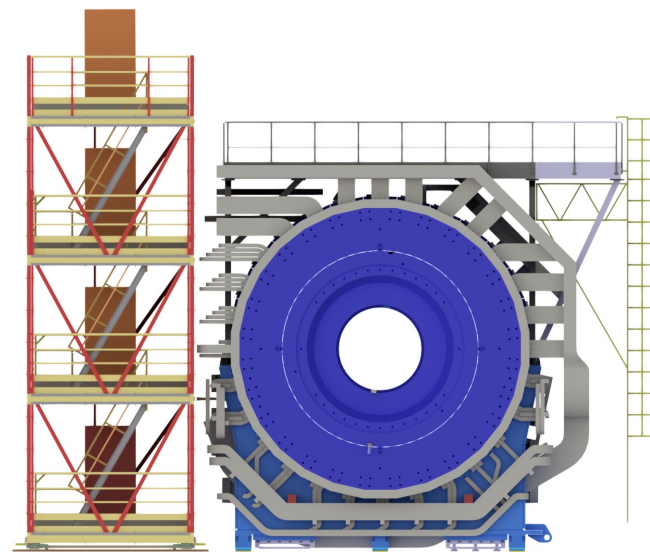
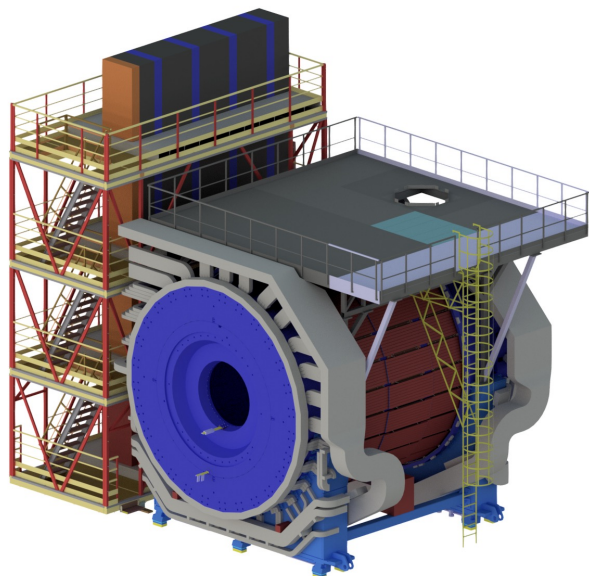


- **Priority of the length:**

1. Cooling and gas pipes,
2. LV and analog signals cables
3. HV cables
4. Fiber Optics

It took a while to propose the conception that does not collide with works doing by other groups.

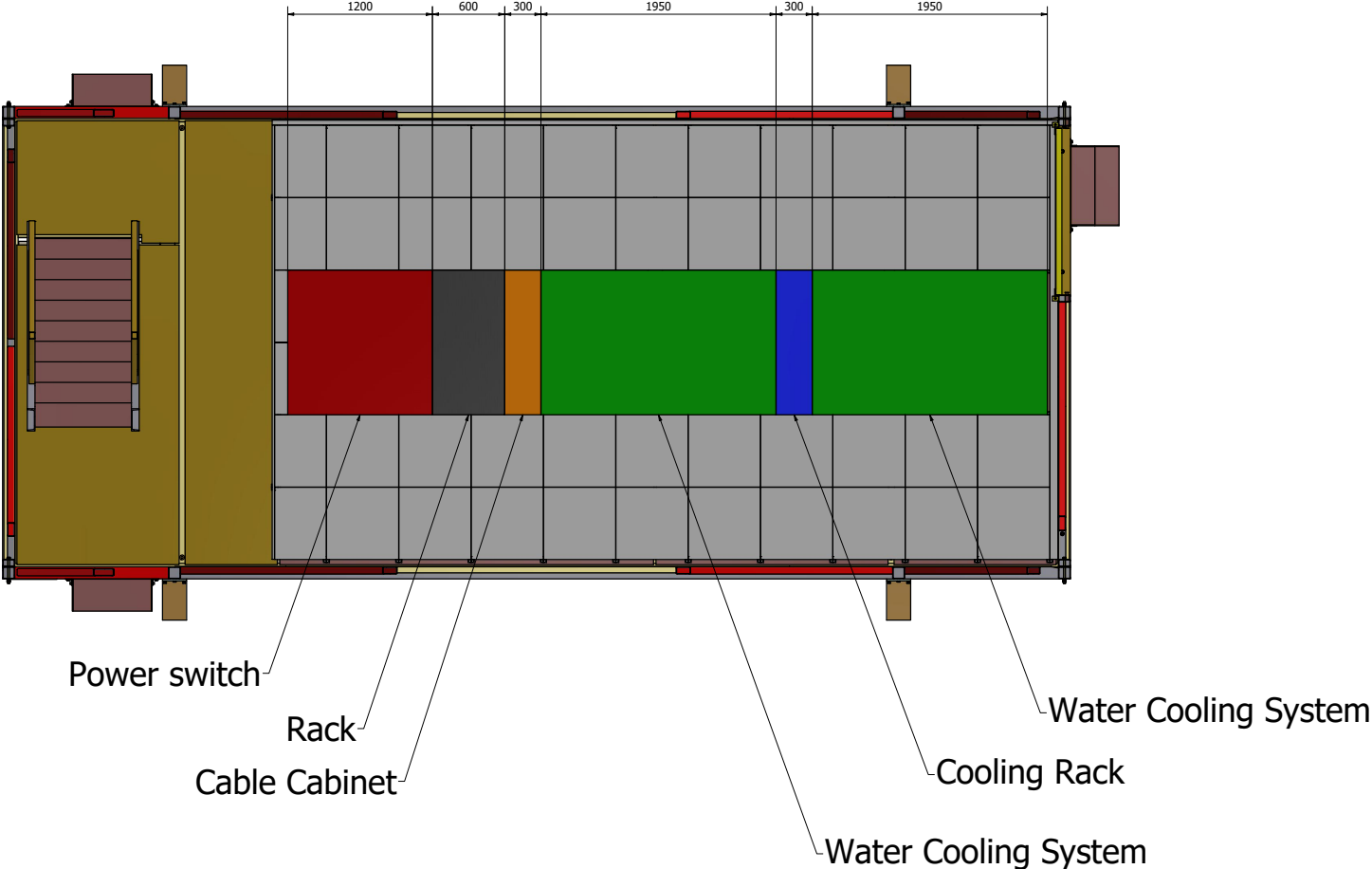
The solution is to move the end-cap mounting construction 300 mm away from the detector structure



# IT RACKS on the NMP



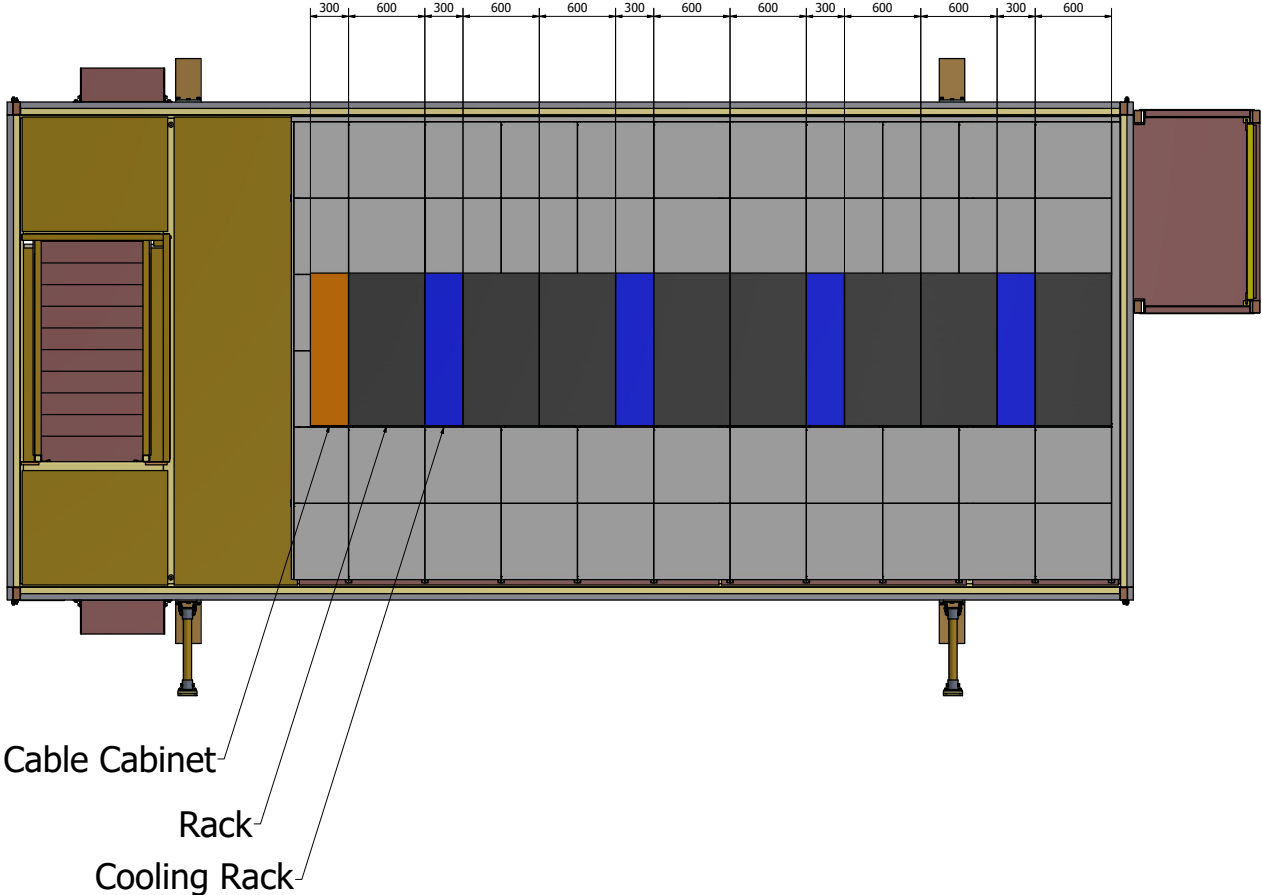
First floor



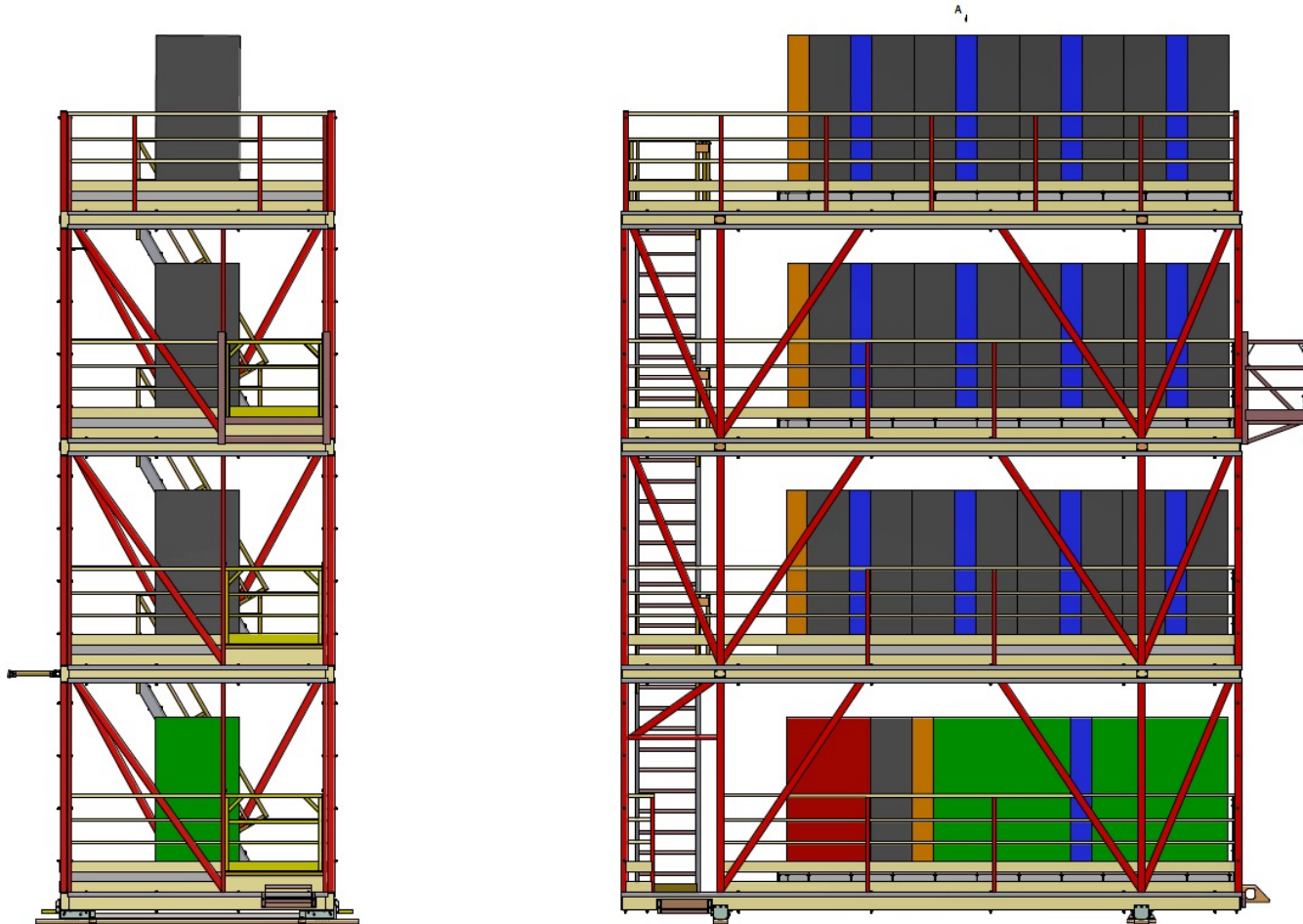
# IT RACKS on the NMP



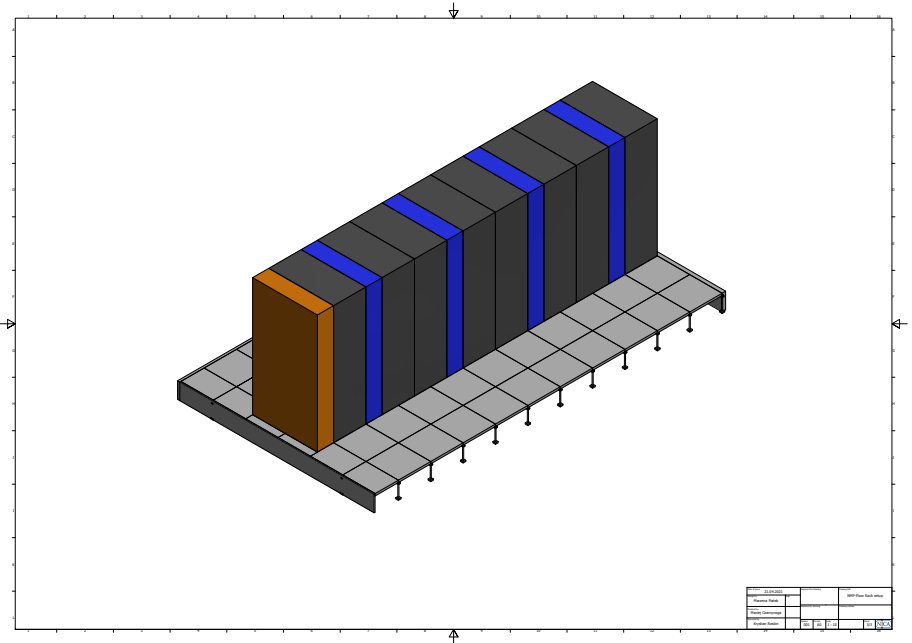
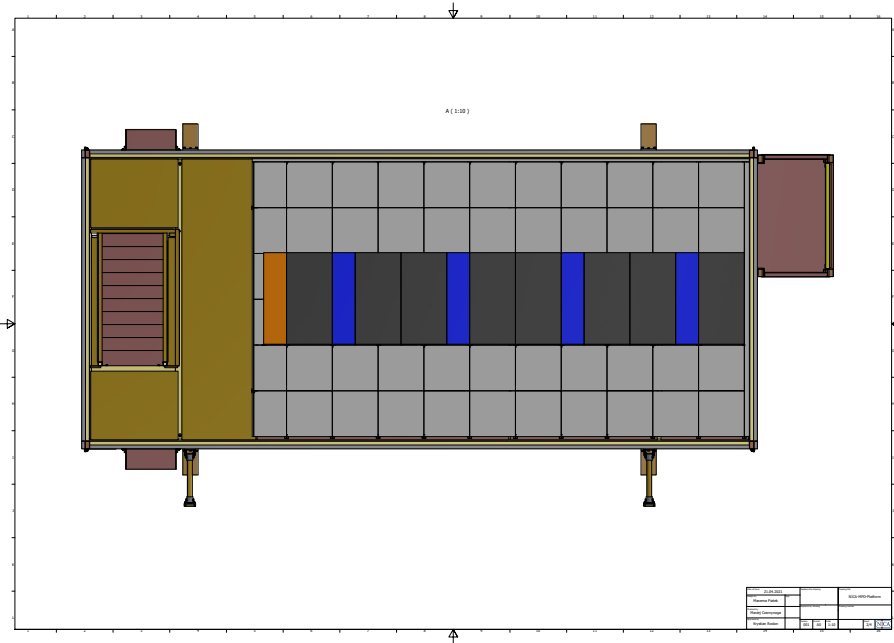
Second, third, fourth floors



# IT RACKS on the NMP

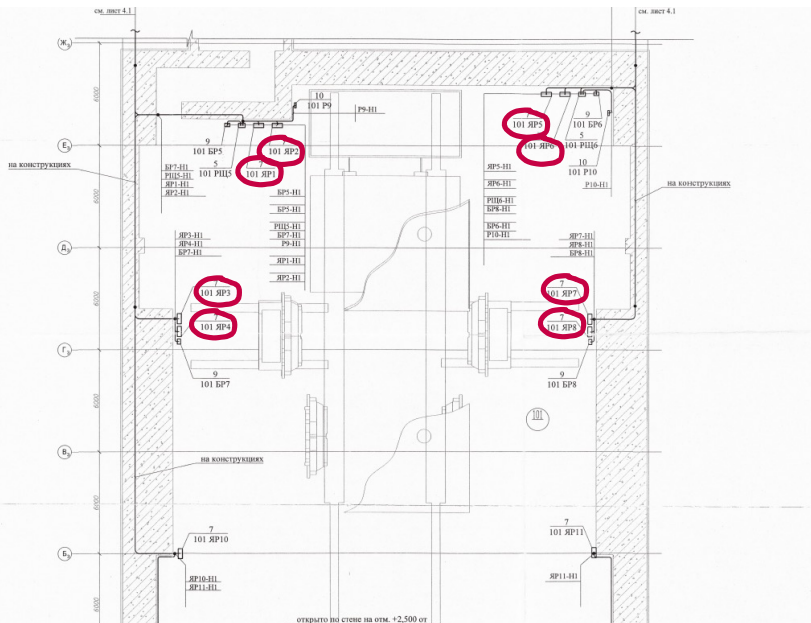


# RAISED FLOOR



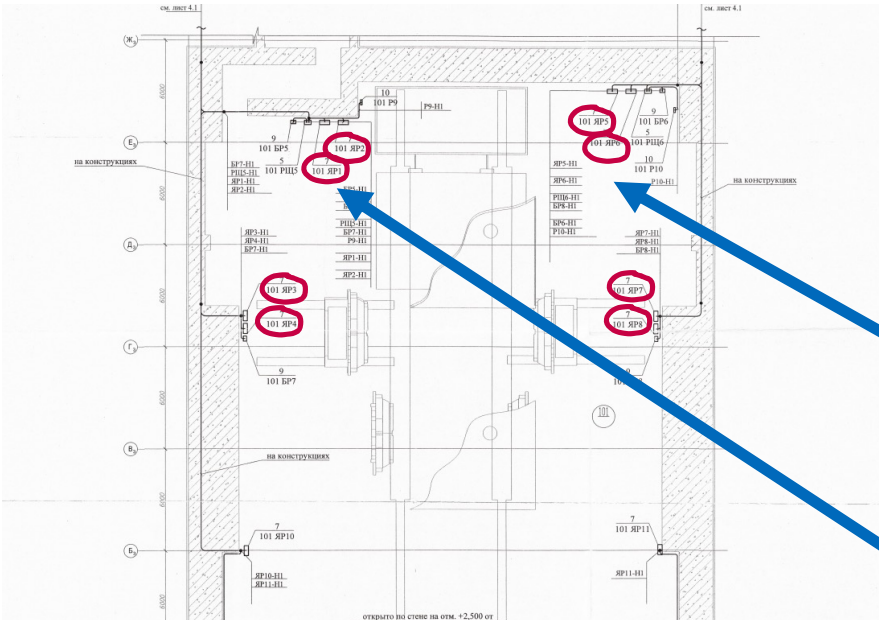


# POWER SUPPLY

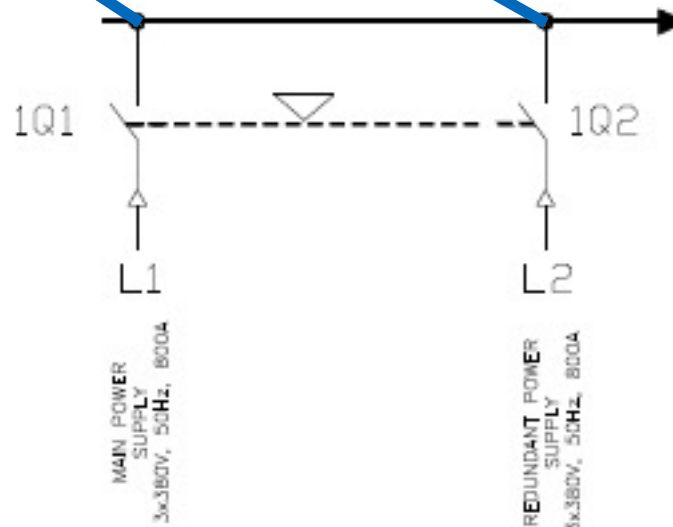


- 4 electrical box for both MPD states: RUN and SERVICES.
- while the MPD movement, cables will be unplugged.
- the main line for plugging the power supply is LN2 (ЯР 5, ЯР 6, ЯР 7, ЯР 8),
- ground cable has to be connected even during the movement of MPD.

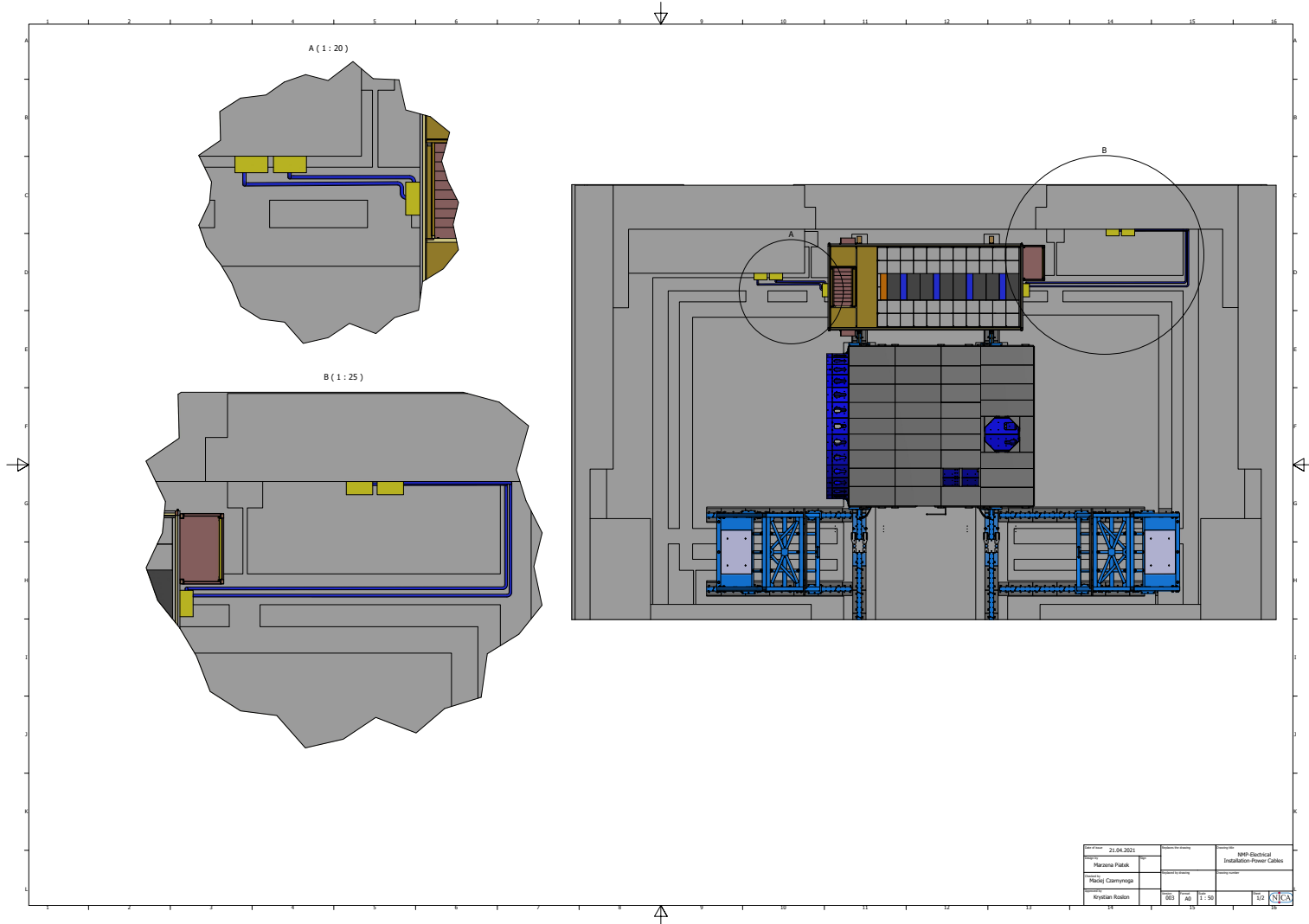
# POWER SUPPLY



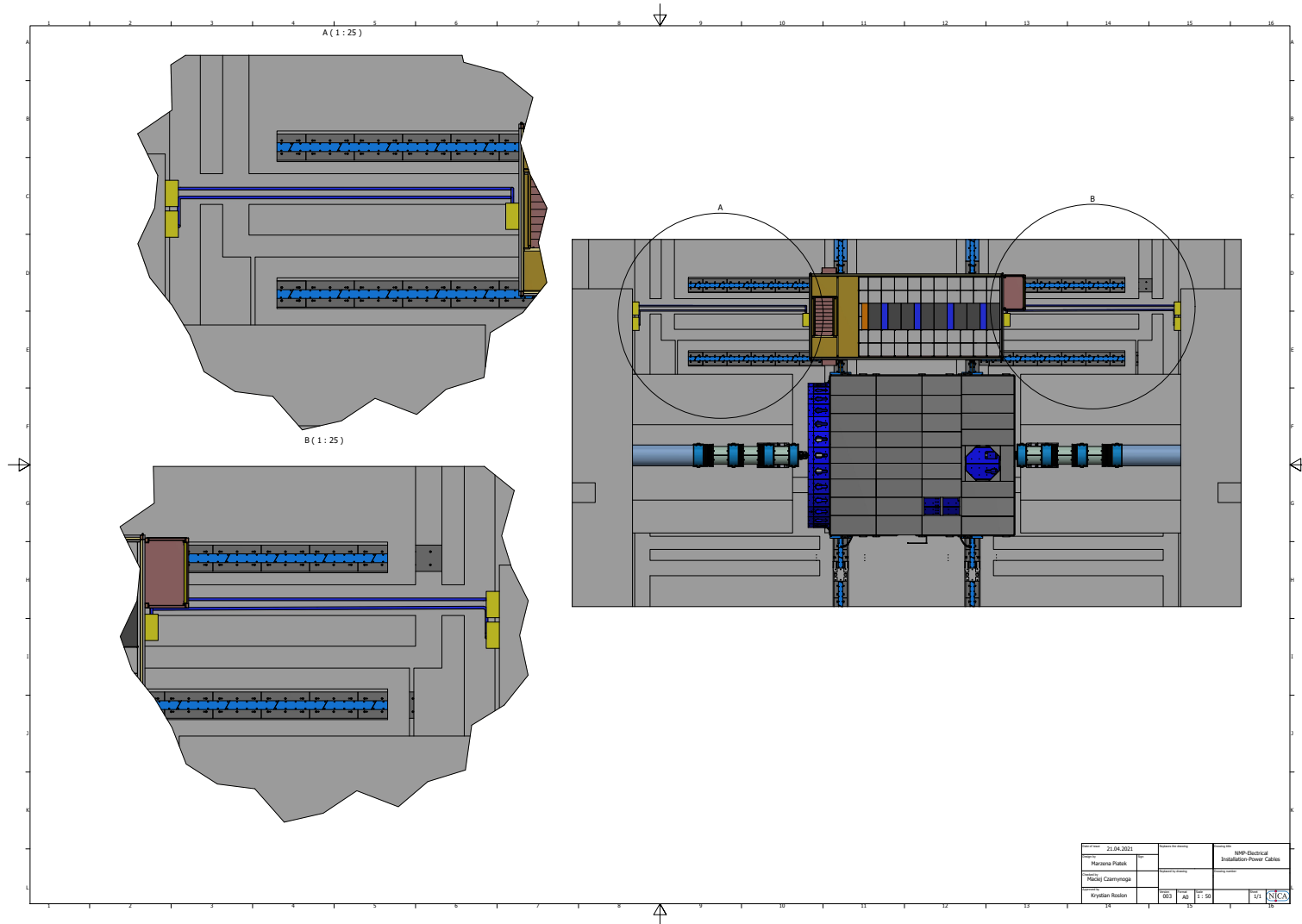
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# POWER SUPPLY ( SERVICE )



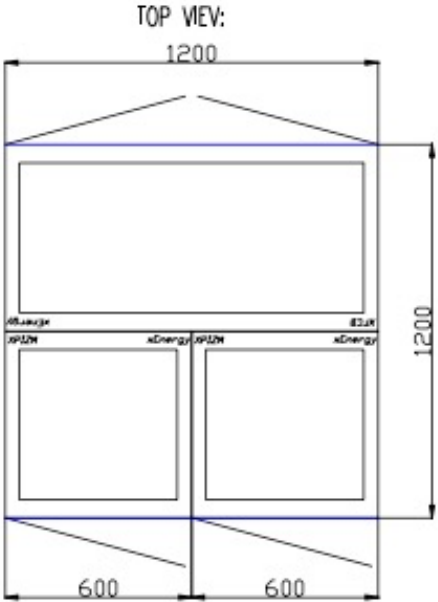
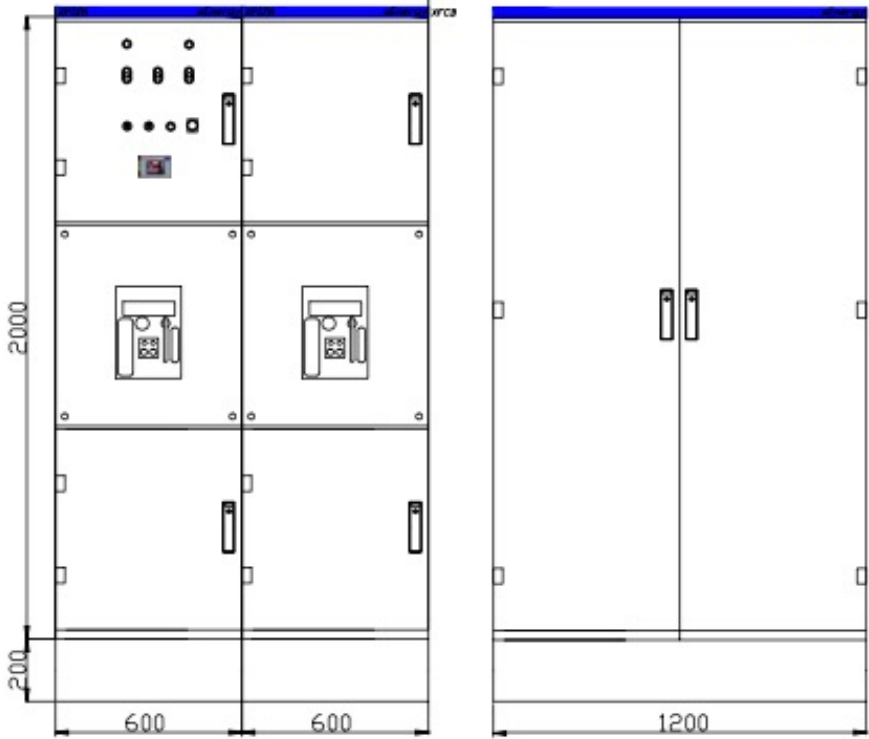
# POWER SUPPLY (RUN)



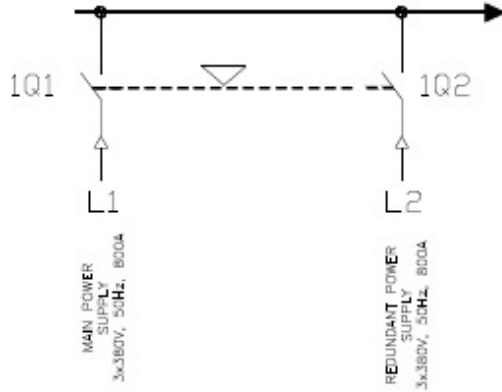
# POWER SUPPLY



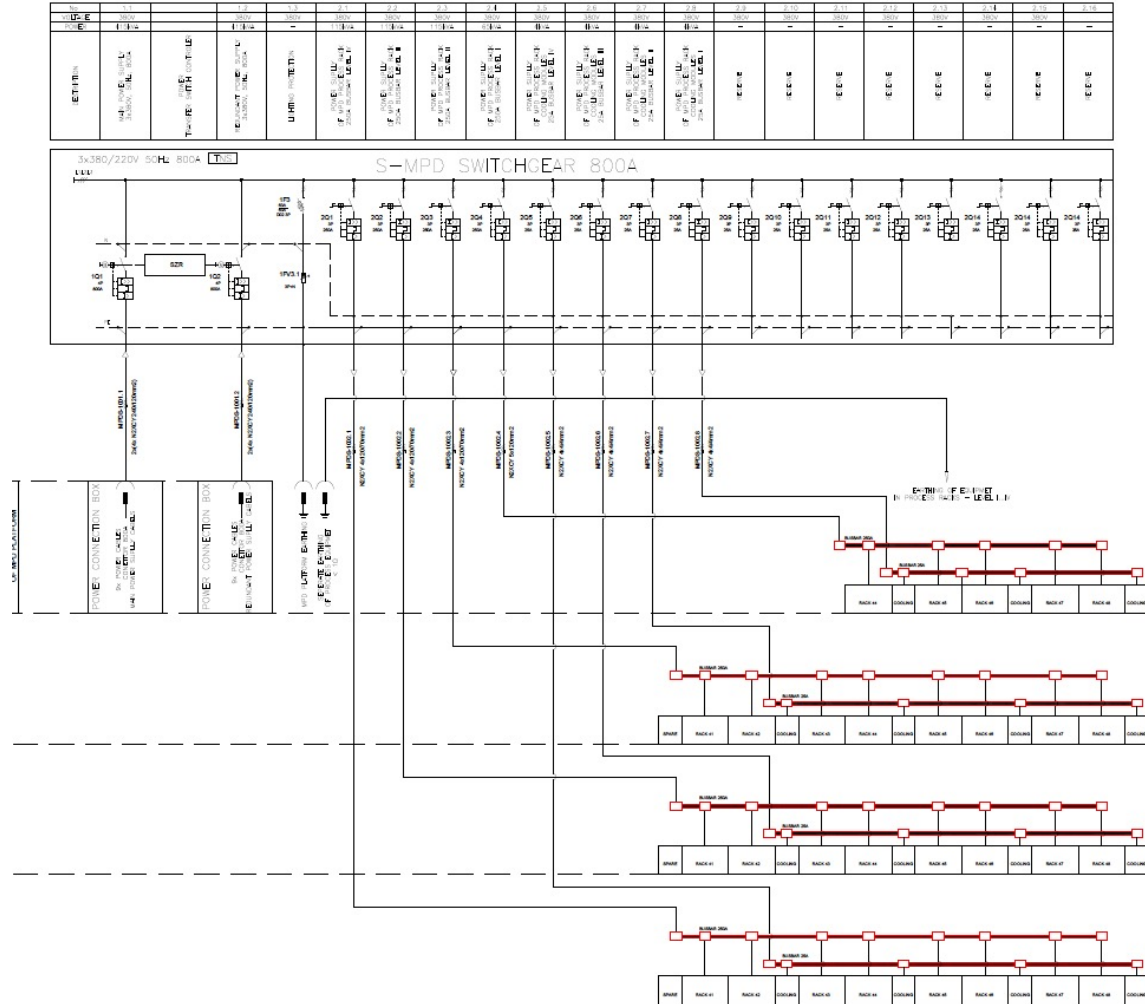
## First floor



# POWER SUPPLY



Power Transfer Switch			
L1	L2	1Q1	1Q2
1	1	0	1
1	0	1	0
0	1	0	1

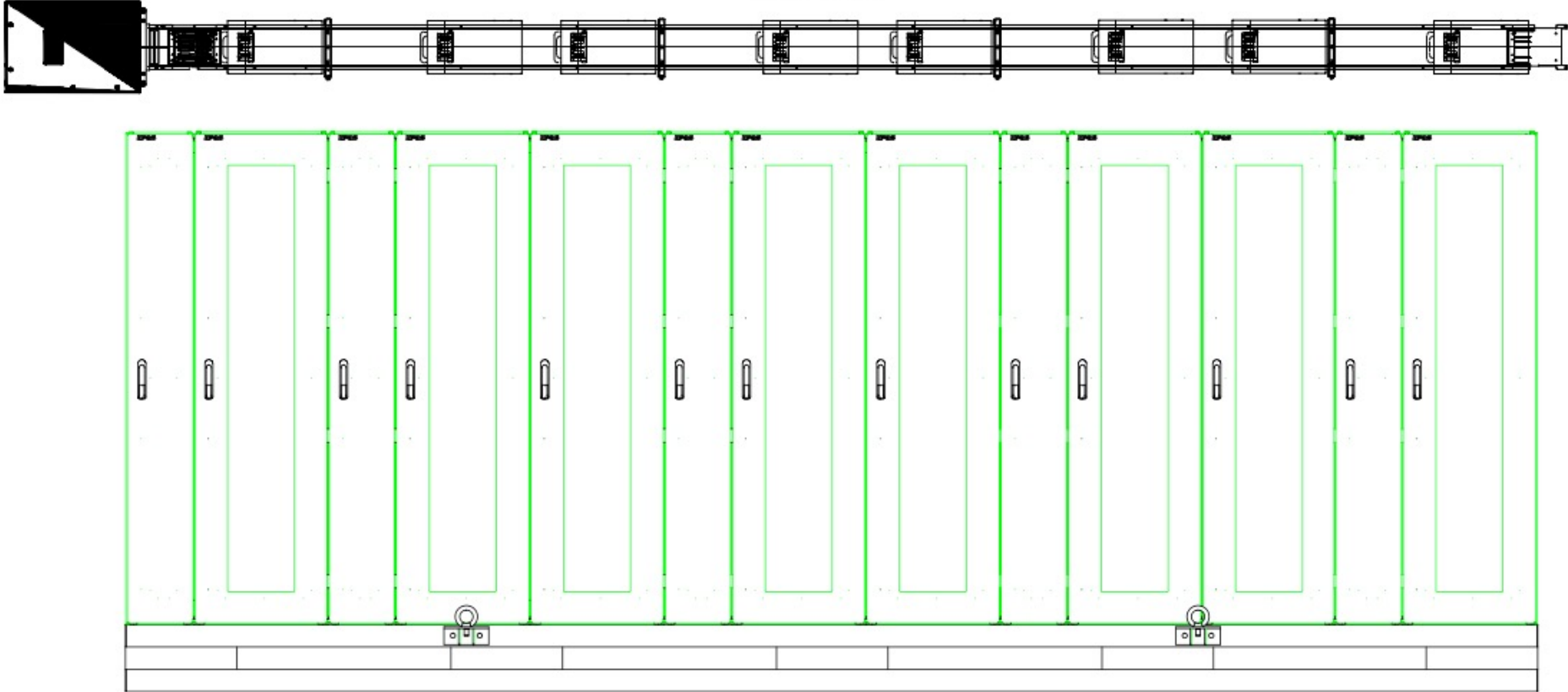


# POWER SUPPLY



## Second, third, fourth floors

LEVEL II, III, IV



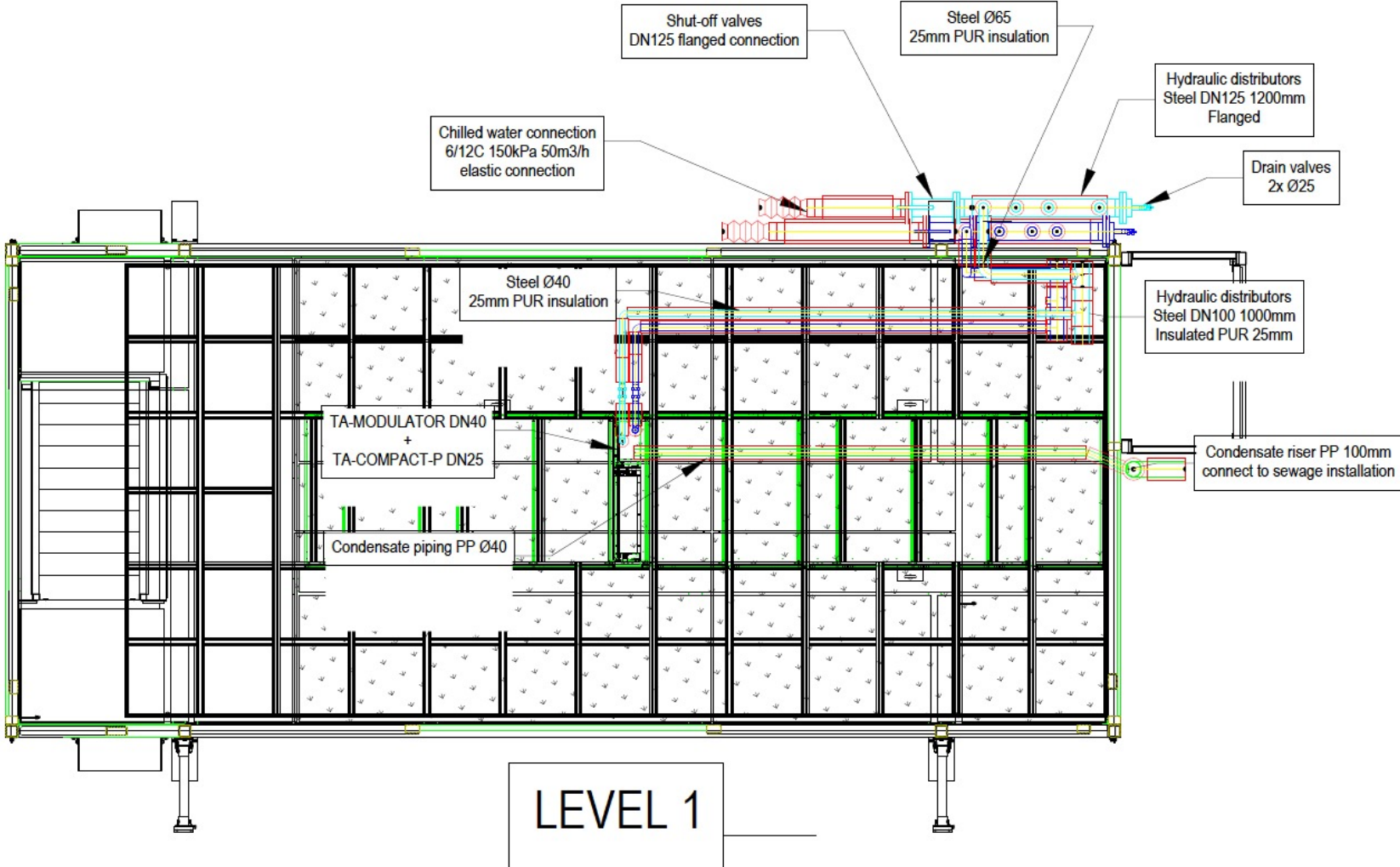
# POWER SUPPLY/COOLING



Level	No. Of units	Unit	Cooling. Power kW	Flow m3/h	Water parameters	Electrical supply	Electrical Power kW
1	K1-1	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-60	0,91
2	K2-1	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-61	0,91
2	K2-2	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-62	0,91
2	K2-3	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-63	0,91
2	K2-4	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-64	0,91
3	K3-1	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-65	0,91
3	K3-2	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-66	0,91
3	K3-3	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-67	0,91
3	K3-4	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-68	0,91
4	K4-1	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-69	0,91
4	K4-2	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-70	0,91
4	K4-3	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-71	0,91
4	K4-4	RAWB2C2A20SB	26,8	3,8	6/12 water	230/1/50-72	0,91
			<b>348,4</b>	<b>49,4</b>			<b>11,83</b>
			<b>kW</b>	<b>m3/h</b>	<b>minimum dp water flow 150kPa</b>		<b>kW</b>



# COOLING SYSTEM

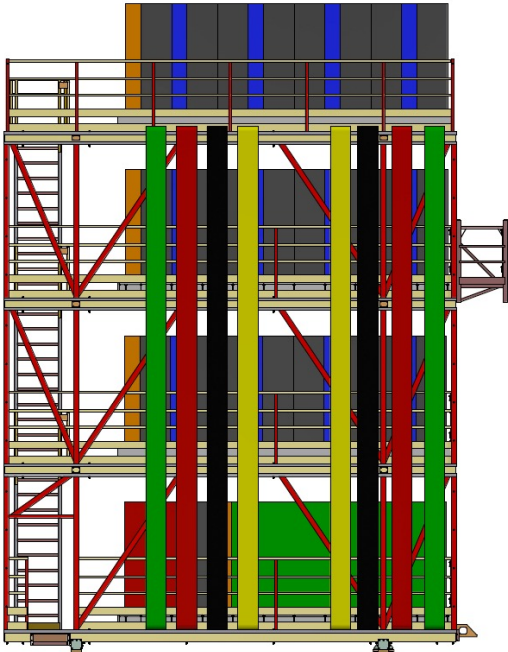
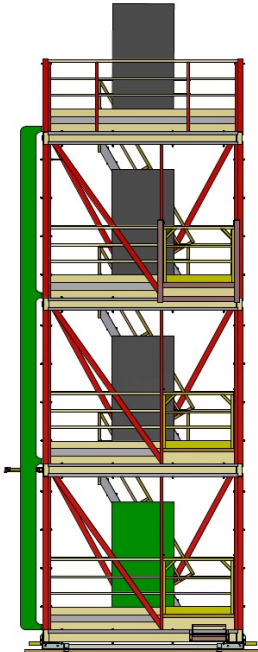
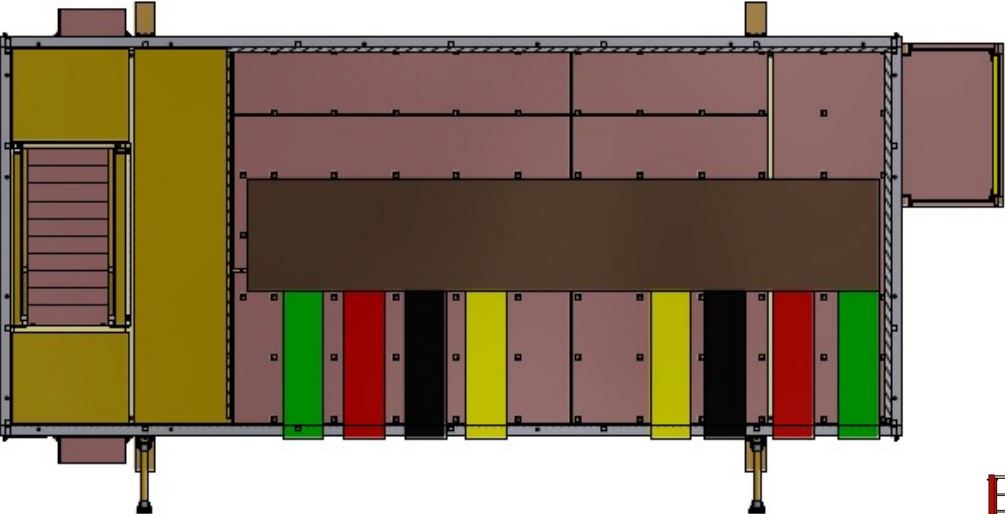


# COOLING SYSTEM

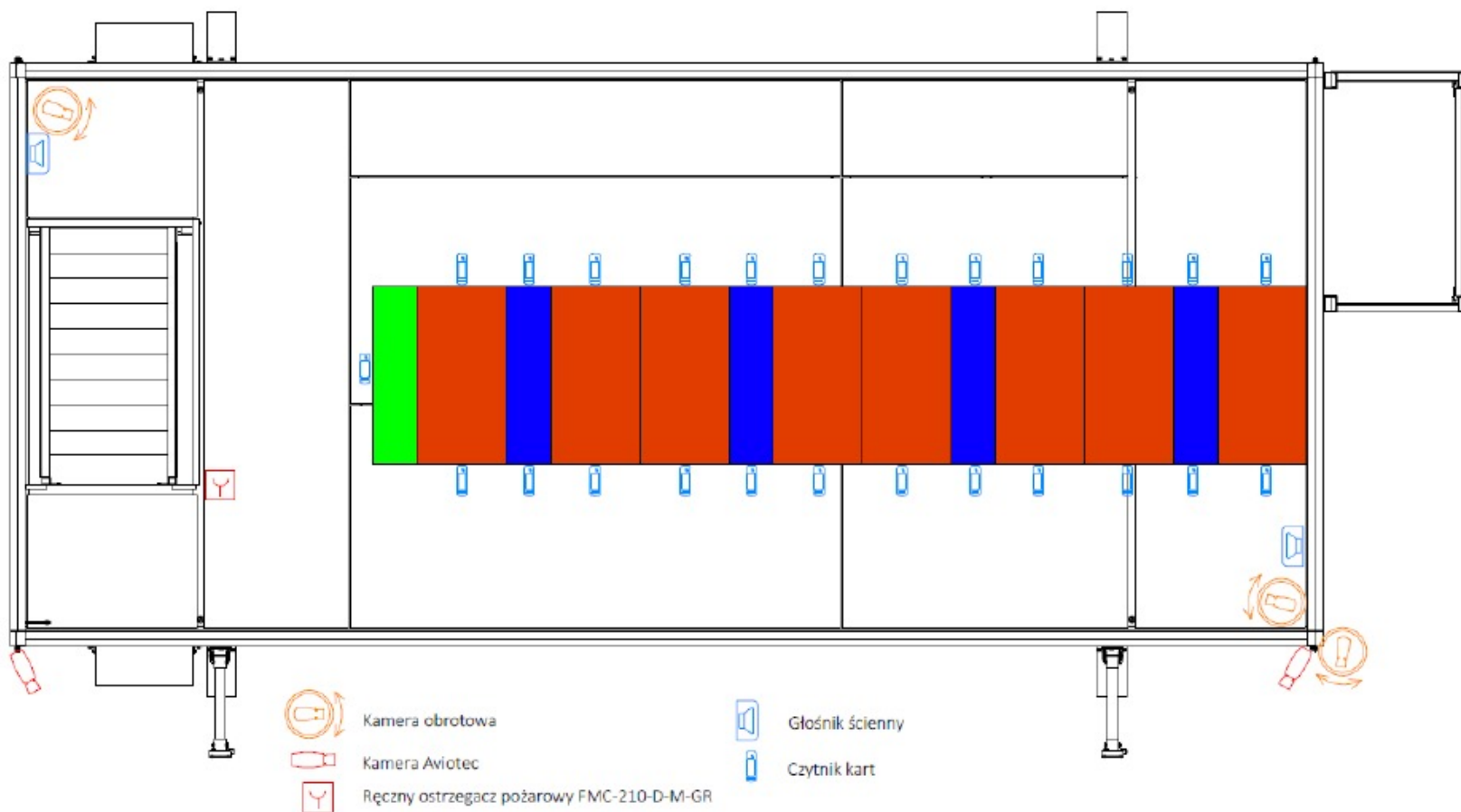




# STRUCTURAL CABLING



- Access control and management system,
- Video based fire detection,
- CCTV video surveillance system,
- Emergency sound notification system,



# RADIATION MONITORING



Type	EKO-C	EGM-104
Measuring range	10 nSv/h – 1 mSv/h	10 nSv/h – 10 Sv/h
Number of GM tubes	1	3
Gamma energy range	50 keV – 1500 keV	40 keV – 3000 keV
Interfaces	RS-485	RS-485, RS-232, USB
Manufacturer	POLON-EKOLAB	NuviaTech Instruments
Country	Poland	Czech Republic



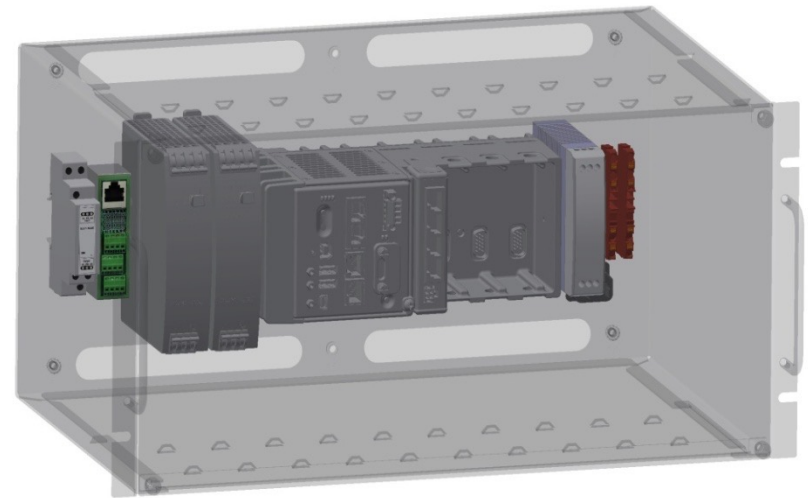
# RADIATION MONITORING



***FHT 762  
neutron  
probe***



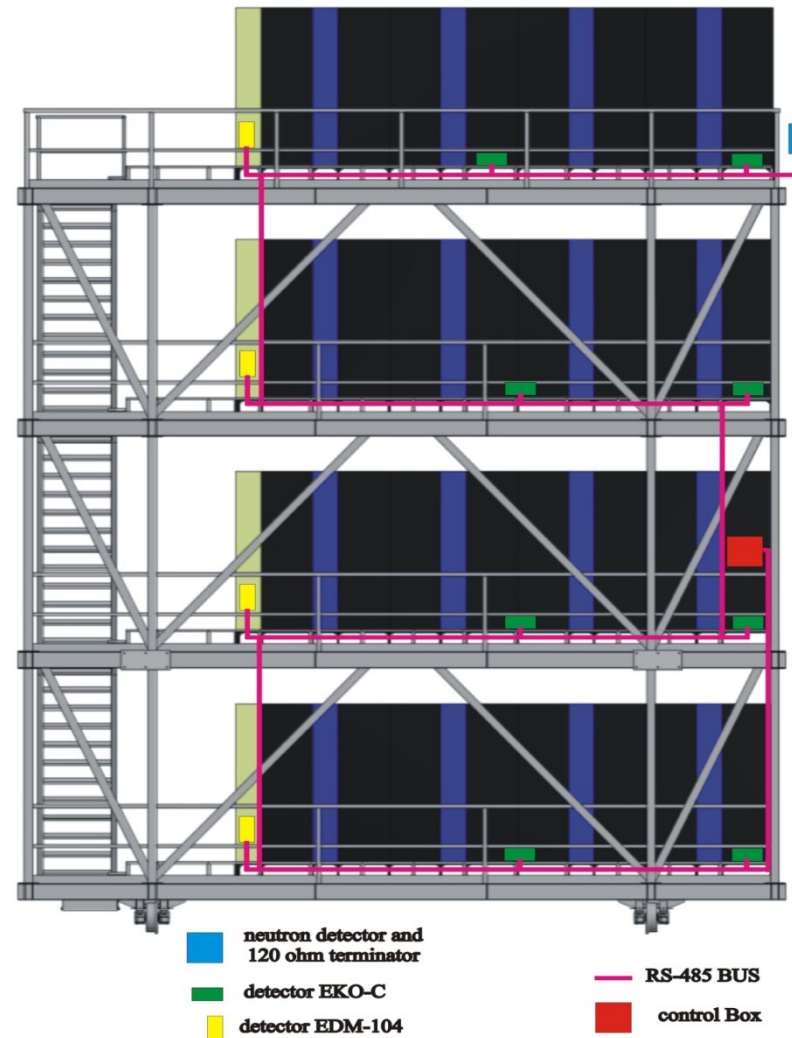
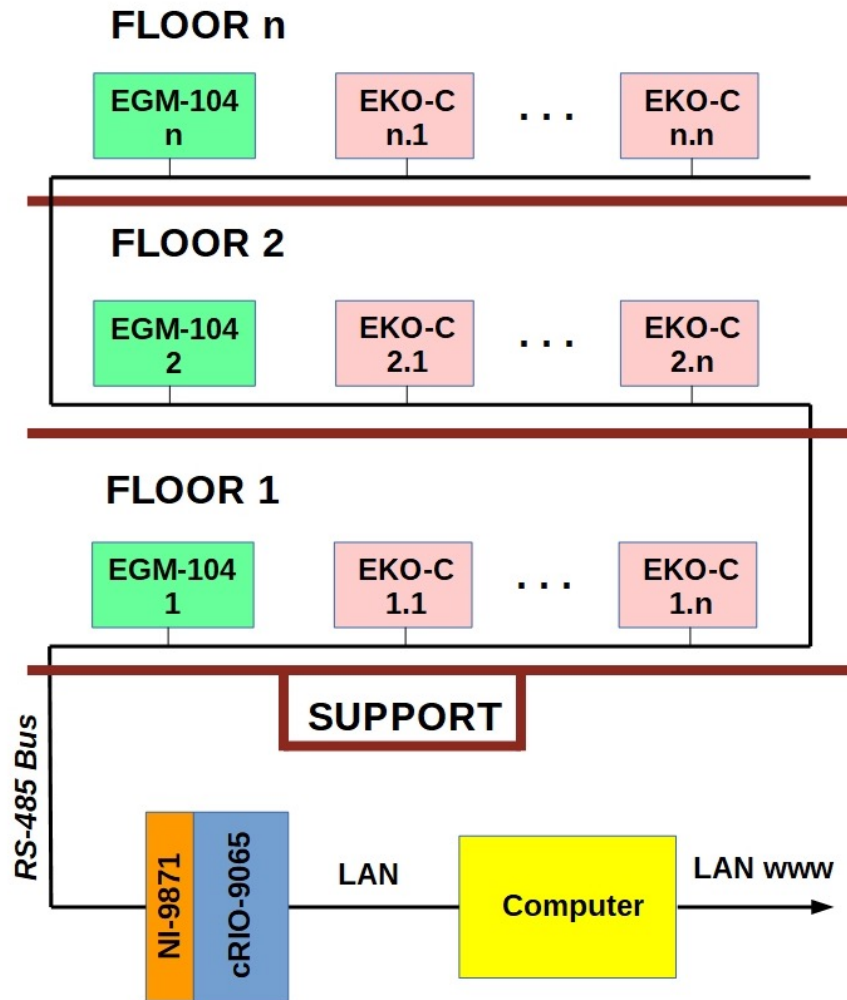
***FHT 6020  
controller***



***Full system control box  
with cRIO and power  
supplies***



# RADIATION MONITORING





## Magnetic field measurement

### 1. Brief description

Magnetic field measurement is based on Xtrinsic MAG3110 Three-Axis, Digital Magnetometer manufactured by NXP semiconductors company. The sensor is connected to the controller using an 8P8C connector. Communication with other devices is realized using the I<sup>2</sup>C standard serial interface. On each of the NMP's floor, there will be located one MAG3110. The device requires calibration before using it.



*Figure 1 Mag3110 placed on a printed circuit board*

# Autonomous fire extinguishing system



FRS-RACK is a stand-alone unit that was developed to detect and extinguish fires. Compact **1U height** unit consists of an extinguishing unit, a power supply unit, and a fully **automatic fire detection** system for fire control, ongoing analysis of the received signals, and their appropriate communication.



Located in the topmost slot of the RACK cabinet, the system monitors the hazard zone. Upon detection of a fire or manual activation, the device will release the extinguishant into the hazard zone through the nozzle.

The extinguishing agent NOVEC™ 1230 is non-corrosive, non-conductive and can be used to extinguish live sensitive electric equipment with a nominal voltage up to 1,000 V.



## General functions:

Extinguishing agent Novec 1230 by 3M™

- Fire detection by 2 internal and 4 external sensors with configurable algorithms
- Internal container with extinguishing agent to protect up to 2m<sup>3</sup>
- Control of External Devices and Output Signals by internal relays:
  - RACK's equipment power-off
  - Alarm signals to Fire Department
- Ethernet protocols for remote control and EqDB event logging
- 12V DC backup battery to provide energy required in case of no power and during extinguishing.
- Safe for use in occupied space
- Environmentally sustainable
- Electrically non-conductive
- Recognized by international standards such as NFPA 2001 and ISO 14520
- Able to extinguish the fire at the incipient stage
- Not leave residue

# Autonomous fire extinguishing system

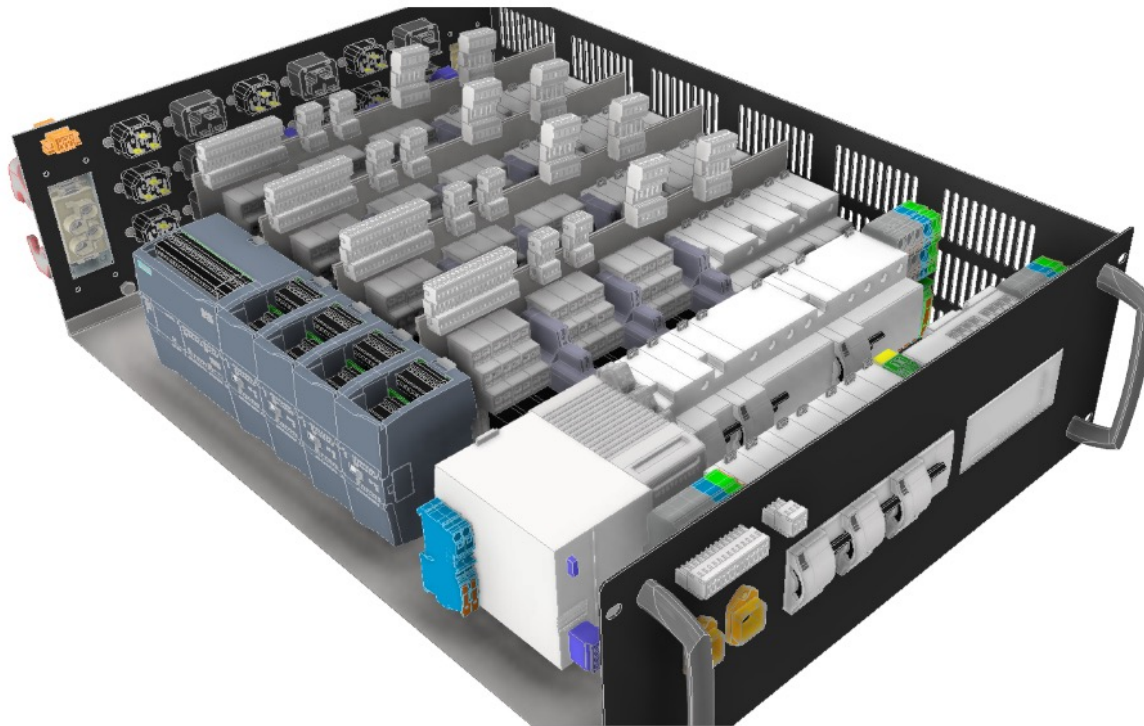


Zápis z technického jednání  
o implementaci FRS-RACK 3  
v rámci projektu NICA  
v JINR, 09.03.2021



Протокол технических  
переговоров о поставке  
**FRS-RACK 3** для проекта  
NICA ОИЯИ, 09.03.2021

# INTELLIGENT POWER DISTRIBUTOR

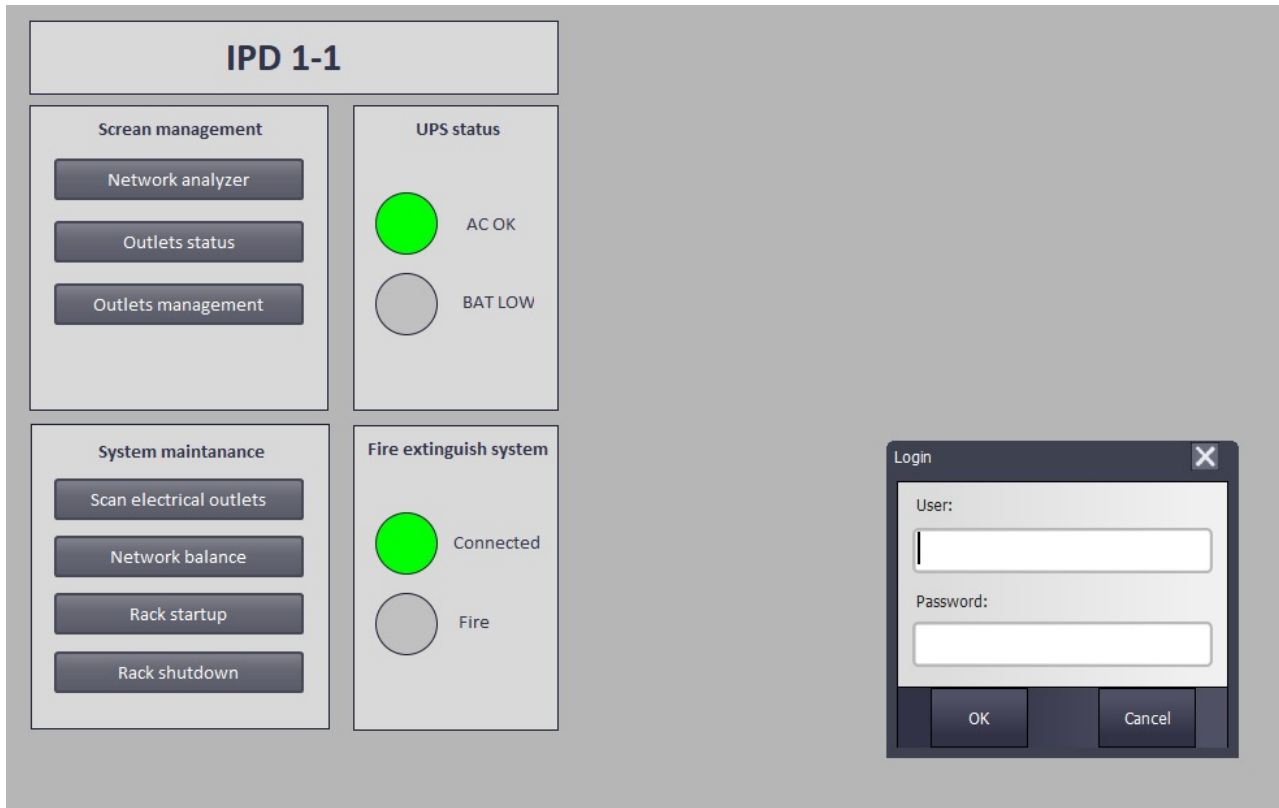


# INTELLIGENT POWER DISTRIBUTOR



- **Separate control of the power supply for each connected device**
  - turn ON and OFF of the power supply
  - phase switching
  - protection and remote control
    - shortcut circuit protection
    - signaling of the Circuit Breaker CB position
    - signaling the CB fault
    - remote set and reset of the CB mechanism
- **Soft start - zero volts turn on provided for all connected devices**
- Sequential start - selected startup and shutdown sequence for connected devices
- Power monitoring
  - Constant electrical network monitoring for each rack unit
  - True RMS up to 63'th harmonic - detection of disruptive equipment
  - Measurements of connected electrical devices characteristics - detecting and separating noisy electric devices
- **Convenient integration with Fire Alarming System**
- Possible integration with secondary sensors such as temperature and humidity sensors
- Continuous power supply in case of phase failure - automatic switching of devices to active network phases
- **Network balancing**
- Convenient control and communication - fast integration with other parts of the MPD platform
- Modularity and scalability – the single IPD unit can be connected with other units to extend the number of connected devices and provide more global optimization of the power supply
- Clustering of electrical devices

# INTELLIGENT POWER DISTRIBUTOR

The image shows a control interface for an Intelligent Power Distributor (IPD 1-1). The interface is divided into several sections: "Screen management" with buttons for "Network analyzer", "Outlets status", and "Outlets management"; "System maintenance" with buttons for "Scan electrical outlets", "Network balance", "Rack startup", and "Rack shutdown"; "UPS status" with a green indicator for "AC OK" and a grey indicator for "BAT LOW"; and "Fire extinguish system" with a green indicator for "Connected" and a grey indicator for "Fire". A "Login" dialog box is open in the bottom right corner, containing fields for "User:" and "Password:" and "OK" and "Cancel" buttons.

**IPD 1-1**

**Screen management**

- Network analyzer
- Outlets status
- Outlets management

**System maintenance**

- Scan electrical outlets
- Network balance
- Rack startup
- Rack shutdown

**UPS status**

- AC OK
- BAT LOW

**Fire extinguish system**

- Connected
- Fire

**Login**

User:

Password:

OK Cancel

# SUMMARY



NAME	STATUS	COMMENTS
Ducting system,		Should be defined till the end of April
IT RACKS on the NMP,		Conceptual
Raised floor,		Conceptual
Power Supply,		Conceptual
Cooling System,		Conceptual
Structural Cabling,		Designed
Access control and management system,		Designed
Video based fire detection,		Designed
CCTV video surveillance system,		Designed
Emergency sound notification system,		Designed
Radiation monitoring system,		In Dubna
Magnetic field measurement system,		In Dubna
Autonomous fire extinguishing system,		Should be delivered in May
Intelligent Power Distributor,		Should be delivered in May





Thank You for Your  
Attention

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Email: [roslon@jinr.ru](mailto:roslon@jinr.ru)